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Heater Selection Matrix

Heating Solids

Heater Type	Application Description	Sheath Materials	Typical Max. Watt Densities W/in²	W/cm²	Max. Operating Temperatures °F	°C	Catalog Page
Cartridge/ Insertion Heaters	Inserted into a close fit hole, i.e. platens, dies and molds.	Incoloy® Stainless steel	up to 300 up to 300	46.5 46.5	1400 1000	760 540	13 13
Tubular Heaters	Clamped to the object to be heated, usually exterior surfaces of tanks or other process vessels or fitted into milled grooves in a platen.	Flat: Incoloy® Stainless steel Round: Incoloy® Stainless steel	40 40 40 40	6.2 6.2 6.2 6.2	1400 1200 1600 1200	760 650 870 650	99 99 73 73
Flexible Heaters	Bonded or otherwise fastened to the part. Commonly used to heat irregular surfaces and shapes, or applications requiring distributed wattage or limited space.	Polyimide Silicone rubber	20 10	3.1 1.6	390 500	200 260	455 421
Cast-in Heaters	Integrating a tubular or cable heating element into a casting to form a heated part. Commonly used to reduce the toatal number of equipment parts.	Aluminum	60	9.3	700	370	461
High Temperature/ High Performance Heaters	MULTICELL - Loosely inserted into the platen hole for radiant heating. Can also be used in any static or dynamic non-contact application as a radiant heat source. Commonly used for extreme high temperature applications, i.e. glass bending and tempering or super plastic forming and diffusion bonding of titanium and other exotic aerospace alloys.	Inconel® Incoloy®	60 60	9.3 9.3	2250 2250	1230 1230	65 65
	Ceramic fiber - Form the heaters into an oversized chamber to surround the object being heated. Using radiant and convection heat transfer, ceramic fiber heaters are used as ovens and furnaces.	Molded ceramic fiber	30	4.6	2200	1205	477
	ULTRAMIC advanced ceramic - Bonded or clamped to the object being heated.	Aluminum nitride	1000	155	752	400	471
Band/ Barrel Heaters	Clamped to cylindrical surfaces. i.e. extrusion barrels and nozzles.	Aluminized steel with mica insulation Stainless steel with mica insulation Stainless steel with mineral insulation	20-55 20-55 30-200	3-8.5 3-8.5 4.6-31	900 1000 1400	480 540 760	537 537 505
Strip/ Clamp-on Heaters	Bolted or clamped to surface of, i.e. dies, molds, ovens. Often used for freeze and moisture protection.	Aluminized steel with refractory insulation Stainless steel with mica insulation Stainless steel with mineral insulation Aluminized steel with mica insulation	50 30 100 25	7.7 5.4 15.5 3.8	1200 1000 1400 900	650 540 760 480	567 557 553 557
Coil/Cable Heaters	Can be formed to heat flat or curved surfaces, or wound around the object being heated. Typical applications include platen heating and plastic injection molding nozzles.	Inconel® or stainless steel	30	4.6	1200	650	581
Radiant Heaters	Used in any static or dynamic, non-contact application where conduction or convection heating is not practical. Commonly used in laminating processes, thermoforming and paint drying. Note: quartz tubes supply quick heat up and cool down.	Incoloy® tubular Molded ceramic fiber Quartz tube Stainless steel emitter strip	40 20 45 30	6.2 3 7 4.6	1500 2000 1600 1300	815 1095 870 700	629 623 635 619

Heater Selection Matrix

Heating Liquids/Surface Heating and Immersion

Heater Type	Application Description	Sheath Materials	Typical Max. Watt Densities W/in²	W/cm²	Max. Operating Temperatures °F	°C	Catalog Page
Cartridge/ Insertion Heaters	Used as an immersion heater placed either directly in the liquid, or in a protective well. Recommended for immersion in water or 90 plus percent water soluble solutions.	Incoloy®	Up to 300 in water	46.5	212 in water	100	13
Tubular Heaters	Immersed directly in the liquid being heated. Most commonly used when high kilowatts are required. Multiple style mounting adaptors, such as flanges and NPT fittings, provide excellent pressure boundaries.	Flat: Incoloy® Stainless steel Round: Copper Incoloy® Stainless steel Steel	60 60 60 60 60 60	9.3 9.3 9.3 9.3 9.3 9.3	1400 1200 350 1600 1200 750	760 650 180 870 650 400	99 99 73 73 73 73
Immersion Heaters	FIREBAR - Multiple elements mounted in a flange or screw plug fitting. Immersed directly in a fluid or in a protective well.	Incoloy®	Up to 100	15.5	212 in water	100	123
	WATROD - Multiple elements mounted in a flange or screw plug fitting. Immersed directly in a fluid or in a protective well.	Incoloy® 316 stainless steel Steel Copper	Up to 100	15.5	212 in water 1400 in air	100 760	123
Circulation Heaters	CAST-X - Cast with tubing through which liquids pass and are heated. Most often used where long life, resistance to contamination and reliability are critical.	Tubing 316 stainless steel	60	9.3	500	260	313-329
	FREEFLEX - Heater polymeric tubing. Used to maintain temperature in medical applications where heated flexible tubing is required.	Polyimide	72 W/ft	22 W/m	212	100	301
	Thick film - Applied to the surface of a quartz tube. Used in deionized water and aggressive chemical heating.	Quartz	100	15.5	266	130	309
	UNIVERSAL SOLVENT - Cast with tubing through which liquids pass and are heated. Most often used where long life, resistance to contamination and reliability are critical.	Tubing 316 stainless steel	60	9.3	392	200	332
	Tubular - Multiple elements mounted in a screw plug or ANSI flange fitting and placed in a vessel through which fluid is passed. FIREBAR or WATROD elements may be utilized.	Round: Incoloy® Copper Stainless steel Steel	60 60 60 60	9.3 9.3 9.3 9.3	1600 350 1200 750	870 180 650 400	333 333 333 333
Flexible Heaters	Applied to the surface of a pipe vessel containing a liquid. Well suited for curved surfaces and irregular shaped objects. Frequently used for freeze protection.	Polyimide Silicone rubber	20 10	3.1 1.6	390 500	200 260	455 421
Cast-in Heaters	Cast with tubing through which liquids pass and are heated. Most often used where long life, resistance to contamination and reliability are critical.	Aluminum	60	9.3	700	370	461
High Temperature/ High Performance Heaters	Assemble heaters into a chamber which surrounds the tank, vessel, crucible or bath. Radiant and convection heat transfer heat the load.	Molded ceramic fiber	30	4.6	2200	1205	477
Band/ Barrel Heaters	Clamped to cylindrical surfaces, most commonly used to heat liquids flowing through pipes as freeze protection.	Aluminized steel with mica insulation Stainless steel with mica insulation Stainless steel with mineral insulation	20-55 20-55 30-200	3-8.5 3-8.5 4.6-31	900 1000 1400	480 540 760	537 537 505
Strip/ Clamp-on Heaters	Bolted or clamped to the wall of a tank or vessel. Used in food warming and other applications offering a flat mounting surface.	Aluminized steel with refractory insulation Stainless steel with mica insulation Stainless steel with mineral insulation Aluminized steel with mica insulation	50 30 100 25	7.7 4.6 15.5 3.8	1200 1000 1400 900	650 540 760 480	567 557 553 557
Coil/Cable Heaters	Wrapped or wound around pipe or vessel containing a liquid, or used directly as an immersion heater. Often used in applications with space limitations, i.e. photo processing equipment, scientific instruments and heat tracing.	Inconel® or stainless steel	30	4.6	1200	650	581
Nozzle/ Slip-on Heaters	Syringe - Formed heater to fit cylindrical part. Often used in medical applications for heating contrast media. Often incorporates sensor and on-board system.	Lexan Silicone rubber	2 3	0.31 0.47	185 428	85 220	605 605

Heater Selection Matrix

Heating Gases

Heater Type	Application Description	Sheath Materials	Typical Max. Watt Densities W/in²	W/cm²	Max. Operating Temperatures °F	°C	Catalog Page
Cartridge/ Insertion Heaters	Mounted in pipes or vessels through which gases pass. Can be placed in protection tubes, making access and wiring easier.	Incoloy® or stainless steel	100	15.5	Contact Watlow		13
Tubular Heaters	Multiple elements mounted in an array and placed in a duct or vessel through which gases pass. Flat tubular elements can be modified with the addition of fins to increase surface area.	Flat: Incoloy® Stainless steel Round: Incoloy® Inconel®	30 30 30 30	4.6 4.6 4.6 4.6	1400 1200 1600 1800	760 650 870 980	99 99 73 73
Circulation Heaters	Cast-in - Cast with tubing through which gases pass and are heated, functioning as a circulation heater. Most often used where long life, resistance to contamination and reliability are critical.	Tubing 316 stainless steel	60	9.3	500	260	313-329
	Tubular - Multiple elements mounted in a screw plug or ANSI flange fitting and placed in a vessel through which fluid is passed. FIREBAR or WATROD elements may be utilized.	Flat: Incoloy® 304 stainless steel Round: Incoloy® Inconel®	30 30 30 30	4.6 4.6 4.6 4.6	1400 1200 1600 1800	760 650 870 980	333 333 333 333
Air Heaters	Duct - Multiple elements placed in a duct through which gases pass.	Incoloy®	20 to 30	3 to 4.6	1400	760	392
	Enclosure - Prevents freezing and condensation in electrical and mechanical housings.	Stainless steel	15	2.3	1200	650	415
	Finned FIREBAR - Aluminized steel fins attached to a FIREBAR element. Used for forced air heating and radiant heating in drivers, ovens and duct work.	Stainless steel	Up to 50	7.7	1200	650	121
Flexible Heaters	Applied to the surface of a pipe or vessel containing gases. Well suited for curved surfaces and irregular shaped objects. Excellent for use in enclosures.	Polyimide Silicone rubber	5 5	0.8 0.8	390 500	200 260	455 421
High Temperature/ High Performance Heaters	MULTICELL - Multiple elements placed in a duct or vessel through which gases pass. Designs also available to heat pass tube externally to isolate gas from the element. Excellent for use in high temperature/high pressure applications.	Inconel® Incoloy®	60 60	9.3 9.3	2100 2100	1150 1150	65 65
	Ceramic fiber - Used to construct chambers and furnaces through which gases are passed. Heaters function as high temperature radiant heaters surrounding transfer pipes or other special vessels.	Molded ceramic fiber	30	4.6	2200	1205	477
Strip/ Clamp-on Heaters	Generally modified with the addition of fins to increase surface area. Commonly used for air heating, drying ovens and space heaters.	Aluminized steel with refractory insulation Stainless steel with mica insulation Stainless steel with mineral insulation Aluminized steel with mica insulation	60 20 100 20	9.3 3 15.5 3	1200 1000 1400 900	650 540 760 480	567 557 553 557
Coil/Cable Heaters	Cable heaters are sinuated or wound into coils which can be inserted into a pipe or vessel to heat flowing air or gases. Cable heaters readily lend themselves to applications where space is restricted.	Inconel® or stainless steel	30	4.6	1200	650	581

Heater Selection Matrix

Heating Vacuums

Heater Type	Application Description	Sheath Materials	Typical Max. Watt Densities W/in²	W/cm²	Max. Operating Temperatures °F	°C	Catalog Page
Cartridge/ Insertion Heaters	Mounted in a vacuum vessel for radiant energy transfer.	Incoloy® Stainless steel	up to 35 up to 35	5.4 5.4	1400 1000	760 540	13 13
Tubular Heaters	Mounted in a vacuum vessel for radiant energy transfer.	Flat: Incoloy® Stainless steel Round: Incoloy® Inconel®	30 30 30 30	4.6 4.6 4.6 4.6	1400 1200 1600 1800	760 650 870 980	99 99 73 73
Flexible Heaters	Applied to the exterior surface of a pipe or vessel. Well suited for curved surfaces and irregular shaped objects. Note: Polyimide is the only flexible heater type recommended for use in the vacuum.	Polyimide Silicone rubber	7 10	1.1 1.6	390 500	200 260	455 441
Cast-in Heaters	Construction of a vacuum vessel with cast-in heaters so that the interior surface acts as a radiant heater. Possible zoned interior surface.	Aluminum	60	9.3	700	370	461
High Temperature/ High Performance Heaters	MULTICELL - Mounted in a vacuum vessel for radiant energy transfer.	Inconel® Incoloy®	60 60	9.3 9.3	2250 2250	1230 1230	65 65
	Ceramic fiber - Surround the exterior surface of a vacuum vessel, using radiant energy for heat transfer.	Molded ceramic fiber	30	4.6	2200	1205	477
	ULTRAMIC advanced ceramic - Bonded or clamped to the object being heated.	Aluminum nitride	1000	155	752	400	471
Band and Barrel Heaters	Applied to exterior surface of a pipe or vessel.	Stainless steel with mineral insulation	100	15.5	1400	760	505
Coil/Cable Heaters	Wound into a coil or sinuated and mounted in a vacuum vessel for radiant energy transfer.	Inconel® or Stainless steel	20	3	1200	650	581
Radiant Heaters	Mounted in a vacuum for radiant energy transfer.	Stainless steel	30	4.6	1300	700	635

Code Number Index

How To Use This Index

This easy cross reference contains the alpha or numeric prefixes for all Watlow product code numbers contained in this catalog. The spaces (_) shown in some of the following prefixes indicate additional characters.

Note: Some code numbers include a suffix alpha character. This is the last alpha character that appears in the product code number.

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Cartridge/Insertion Heaters

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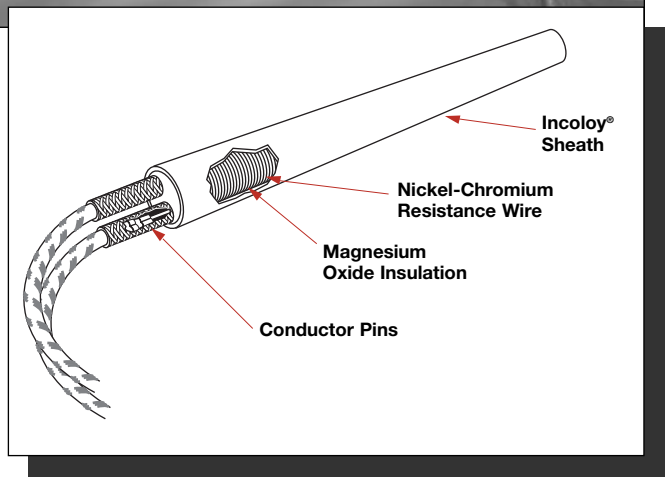


FIREROD® Cartridge Heaters

Watlow® FIREROD® cartridge heaters revolutionized the heating element industry in 1954 when it was patented as the first swaged cartridge heater. With premium materials and tight manufacturing controls, the FIREROD heater continues to provide superior heat transfer, uniform temperatures and resistance to oxidation and corrosion even at high temperatures.

FIREROD offers many delivery programs to meet your needs: same day shipment, ship-to-stock or just-in-time. Watlow's experience in customized engineering is reflected in over 250,000 FIREROD cartridge heater designs. Stock or made-to-order, the Watlow FIREROD delivers heat in a hurry.





Performance Capabilities

- Part temperatures to 1400°F (760°C) on Incoloy® sheath
- Part temperatures to 1000°F (540°C) on optional stainless steel sheath
- Watt densities to 400 W/in^2 (62 W/cm^2)

Features and Benefits

Nickel-chromium resistance wire
- Assures even, efficient distribution of heat to the sheath

Conductor pins
- Ensures trouble-free electrical continuity

Magnesium oxide insulation of specific grain and purity
- Results in high dielectric strength and contributes to faster heat-up

Incoloy® sheath
- Resists oxidation and corrosion from many chemicals, heat and atmospheres

Minimal spacing between the element wire and sheath
- Results in lower internal temperature, giving you the ability to design with fewer or smaller heaters that operate at higher watt densities

UL® and CSA approved flexible stranded wires
- Insulates the wires to temperatures of 480°F (250°C)

Patented lead adapter (LA) method
- Allows same day shipment on more than 150,000 configurations of stock FIREROD heaters and lead combinations

Applications

- Molds
- Dies
- Platens
- Hot plates
- Sealings
- Fluid heating
- Life sciences
- Aerospace
- Semiconductor
- Foodservice equipment

FIREROD Cartridge Heaters

Applications and Technical Data

Tolerances

Diameter

- 1 in. (25 mm) units: ±0.003 in. (±0.08 mm)
- All other units: ±0.002 in. (±0.05 mm)

Length

- All units to 4½ in. (115 mm) long: ±3⁄32 in. (±2.4 mm)
- ⅛ in. diameter units over 4½ in. (115 mm) long: ±3%
- All other units over 4½ in. (115 mm) long: ±2%

Wattage

- ⅛ in. units: +10%, -15%
- All other units: +5%, -10%

Resistance

- ⅛ in. units: +15%, -10%
- All other units: +10%, -5%

Resistance changes with temperature. There are three circumstances under which resistance can be measured:

1. Room temperature (before use): nominal ohms are 90% of ohm's law calculation.
2. Room temperature (after use): nominal ohms are 95% of ohm's law calculation.
3. At temperature (during use): depending on application nominal ohms are approximately 100% of ohm's law.

Camber

Units to 12 in. (305 mm) long: 0.005 in. (0.1 mm) per 6 in. (152 mm) length. Standard camber tolerance varies as the square of the length, in feet, is multiplied by 0.020 in. (0.5 mm). For example, a 36 in. (914 mm) FIREROD has a camber tolerance of 0.020 in. x $(3)^2$ = 0.180 in. Normally, slight camber does not present a problem since the heater will flex enough to fit into a straight, close fit hole.

Component Recognition File Numbers

- UL® component rated to 240V~(ac)
- CSA component rated to 240V~(ac)
- VDE component rated to 240V~(ac)

Note: Not all options or combination of options are covered. UL®, CSA and VDE marking is available upon request.

Dimensional Data

This table gives minimum/maximum lengths for available FIREROD diameters.

FIREROD Diameter			Length			
Nominal	Actual		Min.		Max.	
in.	in.	(mm)	in.	(mm)	in.	(mm)
⅛	0.122	(3.1)	1¼	(32.0)	12	(305)
¼	0.246	(6.3)	⅞	(22.2)	36	(915)
⅜	0.371	(9.4)	⅞	(22.2)	48	(1220)
½	0.496	(12.6)	⅞	(22.2)	60	(1520)
⅝	0.621	(15.8)	1	(25.0)	72	(1830)
¾	0.746	(18.9)	1	(25.0)	72	(1830)
1	0.996	(25.3)	1¼	(32.0)	72	(1830)

Indicates **recommended** maximum length; however longer lengths may be available.

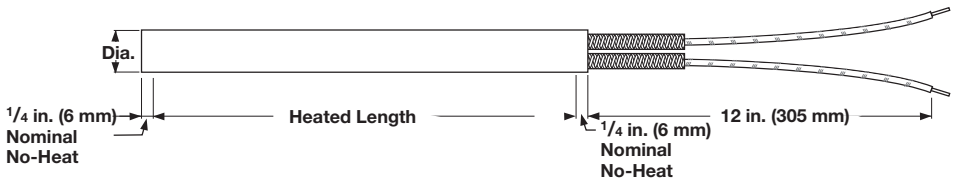
FIREROD Cartridge Heaters

Applications and Technical Data *(Continued)*

Electrical Data

The table below will assist you in selecting the correct FIREROD heater for your application, according to available voltage, amperage and wattage.

Please note, some combinations of minimum and maximum wattages are not available on the same heater diameter. Also, if you need to exceed limitations shown, contact your Watlow representative.



FIREROD Diameter in.	Volts Max.	Ampere Max. ①	Min. Watts @ 120V ③ Heater Length			Max. Watts				
			1 in. (25 mm)	1½ in. (38 mm)	2 in. (50 mm)	120V 1-phase	240V 1-phase	480V 1-phase	240V 3-phase	480V 3-phase
⅛	240	3.1	—	8	5	360	720	—	—	—
¼	240	4.4②	100	55	40	525	1050	—	—	—
⅜	240	6.7	65	35	25	800	1600	—	⑤	—
½	240	9.7	40	25	20	1160	2320	—	⑤	—
⅝	480	23.0	35	20	15	2760	5520	11,000	⑤	—
¾	480	23.0	30	15	10	2760 ④	5520	11,000	9550	19,100
1	480	23.0	—	15	10	2760 ④	5520	11,000	9550 ④	19,100④

Number Of Circuits ⑥		
Diameter in.	1-phase	3-phase
¾	3	1
1	5	2

① Determined by the current carrying capacity of standard internal parts and standard lead wire. Alternate material may be available.

② For ¼ in. (6 mm) units with thermocouple maximum amperage is 3.1A.

③ Determined by the limitation of space for resistance winding. For minimum wattage of 240V~(ac) multiply value by four.

④ Higher wattages are available using more than one set of power leads. Multiply the wattage from the table by the applicable factor.

⑤ Contact your Watlow representative for data.

⑥ On ¾ in. (19 mm) diameter units, either three single- phase circuits or one three-phase delta or wye circuit is available. On 1 in. (25 mm) diameter units, either five single-phase or two three-phase delta circuits are available.

FIREROD Cartridge Heaters

Maximum Allowable Watt Density

The following four charts detail maximum allowable watt densities for applications involving metal, steam, air or gas heating. Please review these respective charts and applicable data to determine the correct watt density for your application.

Correction Factors

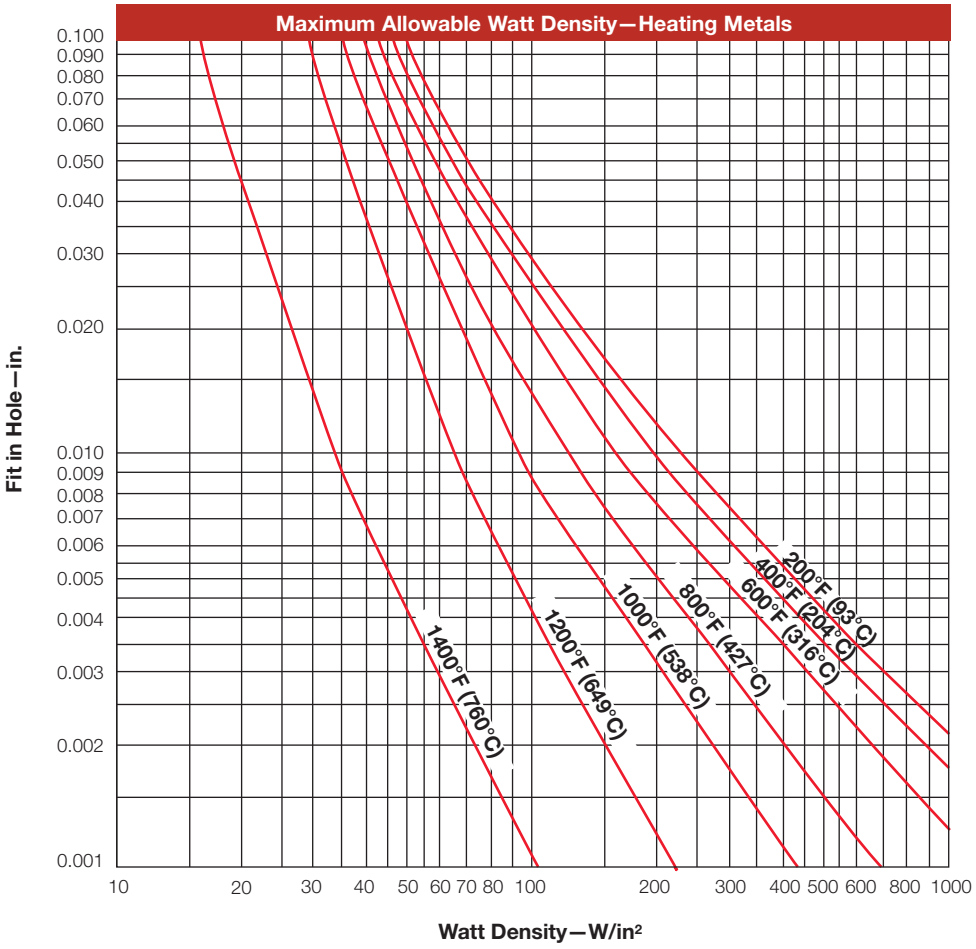
Also note, these graphs depict FIRERODs used in steel parts. Therefore, for either stainless steel, aluminum or brass, refer to applicable correction factors:

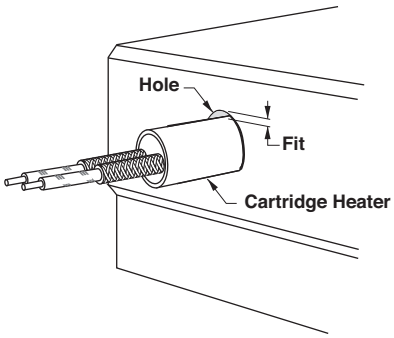
1. For stainless steel, enter the graph with a fit 0.0015 in. (0.04 mm) larger than actual.
2. For aluminum and brass, enter the graph with a temperature 100°F (38°C) above actual temperature.

Heating Metals

The *Maximum Watt Density— Heating Metals* chart will show you either the maximum hole fit or recommended watt density of the heater. Enter the chart with either known variable, part fit in hole dimension or W/in². Then find the application temperature by reading up or over on the chart.

If the fit of the heater in the hole dimension is not known, it is easily determined. Subtract the minimum diameter of the FIREROD (nominal diameter minus tolerance) from the maximum hole diameter. For example, take a hole diameter of 0.500 (13 mm) minus a heater diameter of 0.496 in. (12.6 mm) ±0.002 in. (0.05 mm). The hole fit would be 0.006 in. (0.15 mm). For FIREROD heaters in square holes or grooves, contact your Watlow representative for the fit in hole dimension.





Fit in hole = maximum hole I.D. minus minimum heater O.D.

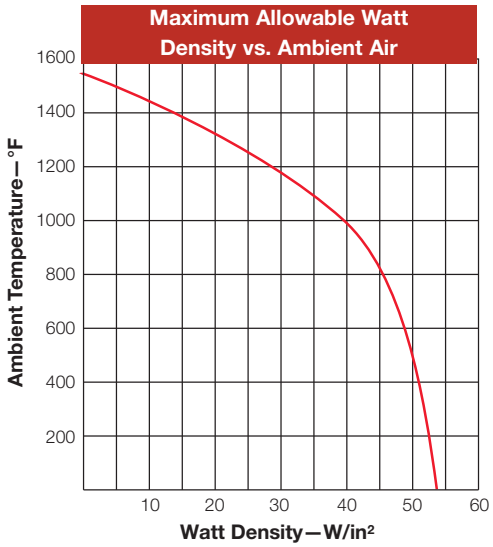
FIREROD Cartridge Heaters

Maximum Allowable Watt Density *(Continued)*

Watt Density vs. Ambient Air Temperature

The *Watt Density vs Ambient Air Temperature* graph shows the maximum allowable watt density when one FIREROD is operated in air or similar gas.

For FIRERODs grouped in a single row, with no less than one diameter between elements, multiply value from graph by 0.95. When a reflector is placed behind the heaters, multiply the maximum allowable watt density value from the graph by 0.85.

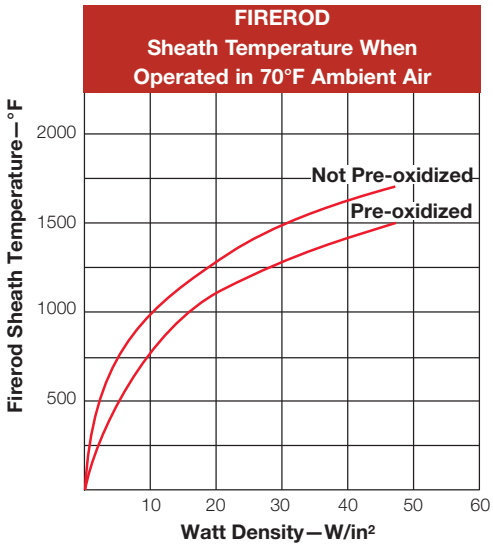


Sheath Temperature in Ambient Air

The *Sheath Temperature in Ambient Air* graph indicates the watt density required to bring a pre-oxidized FIREROD to a given sheath temperature when operated in 70°F (21°C) ambient air.

At 44 W/in² (6.8 W/cm²), the sheath temperature would be 1450°F (784°C). At this temperature, one year life would be expected, provided that cycling is not too frequent.

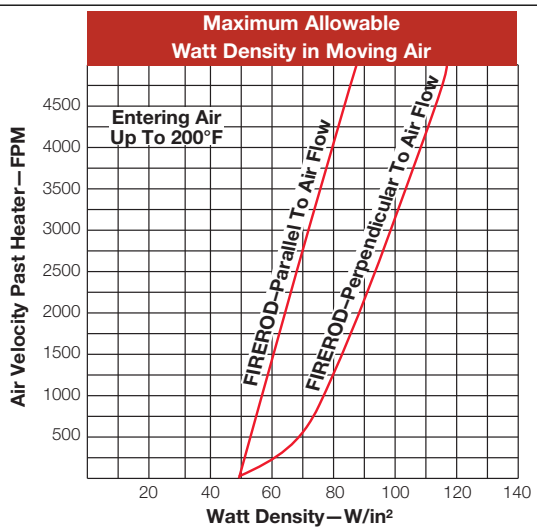
Higher temperatures would result in reduced heater life.



Watt Density in Moving Air

The *Watt Density in Moving Air* graph gives the maximum allowable watt density of a FIREROD in moving air.

The air movement is expressed in feet per minute (FPM). If the air flow is known in cubic feet per minute (CFM), divide the CFM by the net free area around the heater (ft²). The net free area is the total area of the enclosure minus the area occupied by the heater.



FIREROD Cartridge Heaters

Lead and Diameter Information

Standard Lead Specifications

Heater Diameter in.	Gauge	Max. Voltage	Max. Temperature Fiberglass	Max. Temperature Teflon®	Size Tolerance Fiberglass	Size Tolerance Teflon®	Standard SS Hose I.D.	Standard SS Braid I.D.
⅛	24	300	482°F (250°C) ①	392°F (200°C)	0.044 - 0.058	0.036 - 0.044	⅛	⅛
¼	24	300	842°F (450°C)	392°F (200°C)	0.066 - 0.078	0.050 - 0.058	5/32	⅛
⅜	22	300	842°F (450°C)	392°F (200°C)	0.076 - 0.088	0.056 - 0.064	7/32	3/16
½	18	300	842°F (450°C)	392°F (200°C)	0.089 - 0.101	0.074 - 0.084	9/32	¼
⅝	18 fiberglass ② 14 Teflon®	600	842°F (450°C)	392°F (200°C)	0.108 - 0.124	0.097 - 0.113	7/16	⅜
¾	18 fiberglass ② 14 Teflon®	600	842°F (450°C)	392°F (200°C)	0.108 - 0.124	0.097 - 0.113	7/16	⅜
1	18	600	482°F (250°C) ①	392°F (200°C)	0.095 - 0.109	0.087 - 0.101	NA	NA

Lead length tolerances:
1 to 36 in. (25 to 914 mm) = -½ in. (13 mm), +1½ in. (38 mm)
> 36 to 72 in. (914 to 1829 mm) = -1, +3 in. (-25 + 76 mm)
> 72 in. (1829 mm) = ±4 in. (102 mm)

SS hose and braid tolerances: same as lead wire.

Units constructed with 480V require MGT or Teflon® leads. If connecting heaters in series above 300V, MGT leads are also required.

Ratings: GGS, 300V, 482°F (250°C)
MGT, 600V, 842°F (450°C)
Teflon®, 600V, 392°F (200°C)
Silicone rubber, 600V, 302°F (150°C)

① 842°F (450°C) MGT fiberglass lead wire available.

② 14 gauge GGS fiberglass leads available for ⅝ and ¾ in. diameters (0.155 to 0.163 O.D.)

Additional Lead Specifications

Lead Gauge	Nickel Ampacity	N.C.C. Ampacity	SPC/NPC
26	2.5	4.2	6.0
24 stranded	3.1	5.2	7.5
24 solid	3.1	5.2	7.5
22	4.4	7.2	10.5
20	N/A	N/A	14.0
18	7.6	12.6	18.0
16	9.7	16.1	23.0
14	12.5	21.0	30.0
12	16.8	28.0	40.0
10	23.0	38.5	55.0

FIREROD Cartridge Heaters

Non-Lead Adapter (LA) Stock

Modification Coding

Watlow offers heaters in various diameters, lengths and volt-wattage combinations that are ready for shipping. Any stock heaters can have basic modifications made and shipped the same day. These modifications include flanges, threaded fittings, locating rings, ceramic beads and crimped on leads. The following is a list of all available non-LA modifications and their code numbers.

Mounting Option Codes

BA - Small flange FS (available on ⅛, ¼, ⅜ and ½ in.)
BB - Medium flange FM (available on ¼, ⅜, ½, ⅝ and ¾ in.)
BC - Large flange FL (available on ⅝ and ¾ in.)
BD - Locating ring (available on ¼, ⅜, ½, ⅝ and ¾ in.)
BE - Single brass fitting
BF - Double brass fitting
BG - Single stainless steel fitting
BH - Double stainless steel fitting
BY - Stainless steel reversed
BZ - Brass reversed

Pin Option Codes

AA - Short pins 5⁄16 in. (7.9 mm)
AB - Medium pins ⅝ in. (15.9 mm)
AC - Long pins 1¾ (45 mm)
AD - Stagger pins
AE - Ceramic beads ½ in. (13 mm)
AF - Ceramic beads ¾ in. (19 mm)
AG - Ceramic beads 1 in. (25 mm)
AH - Ceramic beads 1¼ in. (32 mm)
AJ - Ceramic beads 1½ in. (38 mm)

FIREROD Cartridge Heaters

Lead Adapter (LA) Stock

Termination Options

Patented LA Modification Method

Watlow has developed a patented LA program for customers in need of heaters quickly. The LA program takes a stock heater adds leads and lead protection, if requested. The LA adder has a standard 12 in. (305 mm) of protection and 14 in. (356 mm) of leads, but additional lengths can be added. The leads and protection can also be attached in a right angle configuration for applications with restricted space.

LA configurations are permanently attached to the heater. Most configurations can be ordered with no-heat extensions. These can also have mounting options including flanges, threaded fittings or locating rings.

LA adders can be used on either stock heaters or made-to-order heaters. The LA adders usually take one to three days to ship.

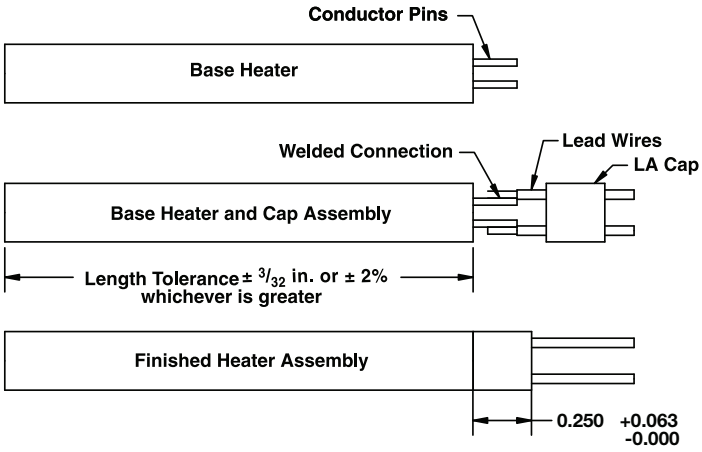


1000°F (538°C) maximum on LA cap

To Configure a FIREROD With Swaged-in Leads

Watlow:

- Cuts the pins off
- Welds the leads to pins
- Places an LA cap over the lead end of the heater
- Swages the heater to produce a rugged unit with swaged-in leads



LA options available on ⅜ to ¾ inch diameters.

Notes: Limited LA options available on ¼ inch diameter.

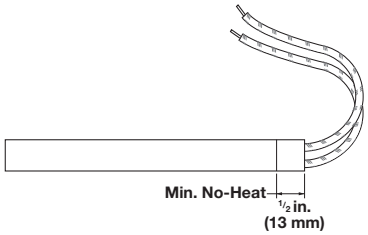
Maximum temperature of LA cap is 1000°F (538°C) except for mineral insulated (MI) leads option.

FIREROD Cartridge Heaters

LA Stock

Termination Options *(Continued)*

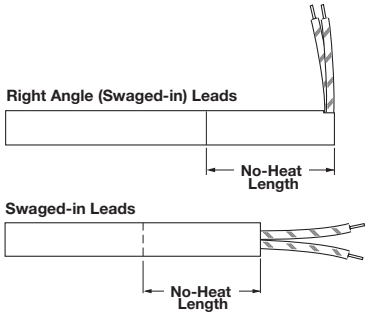
LA Swaged-in Flexible Leads



LA swaged-in flexible leads are used in applications where a high degree of flexing exists or the leads must be bent sharply adjacent to the heater without exposing or breaking the conductor. The stranded wire leads are connected internally and exit through the lead end. The overall length of the heater is extended by ¼ in. (6 mm). To order, specify **length adder code E** bringing the total lead end no-heat to ½ in. (13 mm).

This LA option is not available on ⅛ in. (3.2 mm) diameter. On ⅛ in. (3.2 mm) diameter FIRERODs, leads are connected externally using a solid conductor lead wire. If stranded wire is desired on ⅛ in. (3.2 mm) diameter units, contact your Watlow representative.

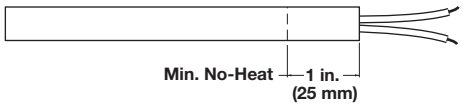
No-Heat Extensions



No-heat extensions are recommended in applications where leads may be exposed to excessive heat, thus requiring a cooler lead end. Also used when heat is not required along the entire length of the FIREROD.

No-heat extensions are available for most LA stock options in diameters of ⅜, ½, ⅝ and ¾ in. (9.5, 13, 15.9 and 19 mm). These extensions are designed to provide a total no-heat length of 1, 1½, 2 or 2½ in. (25, 38, 51 or 65 mm) at the lead end of stock FIRERODs only. Contact your Watlow representative for available LA options.

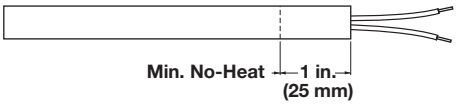
LA Teflon® Seal and Leads



LA Teflon® seal and leads protect the heater against moisture/contamination from lubricating oil, cleaning solvents, plastic material or fumes and organic tapes. This seal is effective to 400°F (204°C) under continuous operation.

Please note when ordering this option, that a minimum no-heat section is required to allow for construction. Additional no-heat may be required to keep the seal below effective temperatures. The minimum lead end no-heat is 1 in. (25 mm). The LA cap adds ¾ in. (19 mm) to the overall length of the heater. To order, specify **option code T**.

LA Silicone Rubber Seal and Leads



LA silicone rubber seal and leads protect the heater against moisture/contamination from lubricating oil, cleaning solvents, plastic material or fumes and organic tapes. This seal is effective to 300°F (149°C) under continuous operation.

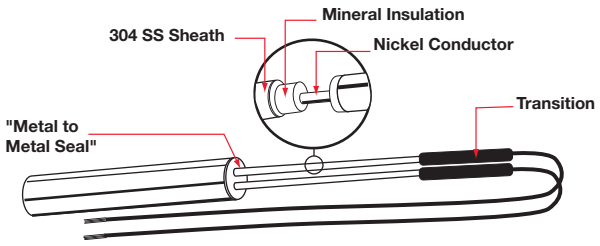
Please note when ordering this option, that a minimum no-heat section is required to allow for construction. Additional no-heat may be required to keep the seal below effective temperatures. The minimum lead end no-heat is one in. The LA cap adds ¾ in. (19 mm) to the overall length. To order, specify **option code P**.

FIREROD Cartridge Heaters

LA Stock

Termination Options *(Continued)*

Mineral Insulated (MI) Leads



MI leads handle both high temperatures and contamination, and resist other problems like abrasion and excessive vibration. The metal seal and swaged-in, formable MI cable leads are capable of handling temperatures up to 1500°F (815°C). In addition, the lead end seal resists moisture and other forms of contamination, including gases, oils, plastic drool, solvents and water.

The Watlow FIREROD with the patented MI lead and seal option is covered by a two-year limited warranty. This extended warranty for this product only applies to manufacturing defects or failures due to over-temperature or product failure due to contamination.

This LA option is also available as a manufactured item. Specify MI leads and seal, as well as volts, watts, cable length, lead length and type. Unless specified a 6 in. (152 mm) of MI cable and 12 in. (305 mm) of Teflon® leads will be supplied. To order, specify **option code J.**

Product Benefits

- Increases heater life
- Less down time
- No need for a soft start due to moisture penetration
- Ability to use a cartridge heater where not possible before
- Abrasion and vibration resistant
- Able to be formed or bent to fit the contours of wiring raceways
- No additional insulation of lead wires is needed to protect against high temperatures
- Lead cables and seal will not out-gas in vacuum environments

Applications

- Vacuum forming
- Plastic molding
- Medical device manufacturing
- Food handling equipment
- Zinc die-casting

Technical Data

Max. temp. of cable: 1500°F (813°C)

Max. temp. of cable to lead transition: 300°F (149°C) *(where flexible leads attach to cable)*

Cable sheath material: 304 SS

Conductor material: nickel

Max. voltage: 240V

Lead Types

Teflon® 392°F (200°C) – T

Silicone rubber 300°F (149°C) – S

GGS 482°F (250°C) – No code

MGT 842°F (450°C) – H

Heater Diameter in.	Max. Current Amperes	Conductor Diameter in.	Cable Diameter in.	Transition Diameter in.	Cable Length Min. in.	Cable Length Max. in.	Min. Bend Radius	Max. Voltage in.	Length Adder
3/8	7.0	0.044	0.108	0.230	6	72	0.225	240	G (3/8)
1/2	7.0	0.044	0.108	0.230	6	72	0.225	240	K (9/16)
5/8	9.7	0.062	0.138	0.250	6	72	0.280	240	L (5/8)
3/4	9.7	0.062	0.138	0.250	6	72	0.280	240	L (5/8)

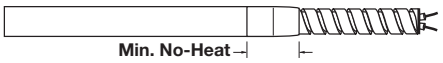
The above information pertains to standard FIREROD heaters. However, variations in these parameters may be accommodated to suit specific customer needs.

FIREROD Cartridge Heaters

LA Stock

Termination Options *(Continued)*

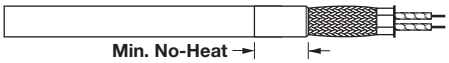
LA Straight Stainless Steel Hose



LA straight stainless steel hose provides the best protection against abrasion from sharp edges. It also offers ease of handling and wiring in abrasive environments. Unless specified, 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than hose as a standard but, longer leads are available.

Minimum lead end no-heat required is ¾ in. (19 mm). Option adds ½ in. (13 mm) to overall length on stock units. To order, specify **option code H**.

LA Straight Stainless Steel Braid

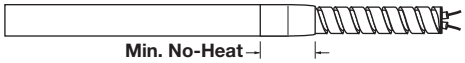


LA straight stainless steel braid is designed to protect leads from abrasion against sharp edges. It is the most flexible of Watlow's protective lead arrangements.

Unless specified, 12 in. (305 mm) braid is supplied. Standard leads are 2 in. (51 mm) longer than braid, but longer leads are available.

Minimum lead end no-heat required is ¾ in. (19 mm). Option adds ½ in. (13 mm) to overall length on stock units. To order, specify **option code C**.

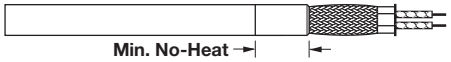
LA Straight Stainless Steel Hose with Teflon® Leads and Seal



LA straight stainless steel hose with Teflon® leads and seal provides the ultimate combination of abrasion protection and a moisture resistant seal. Unless specified, standard 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than hose as a standard but, longer leads are available.

Minimum lead end no-heat required is 1 in. (25 mm). Option adds ¾ in. (19 mm) to overall length on stock units. To order, specify **option code G**.

LA Straight Stainless Steel Braid with Teflon® Leads and Seal



LA straight stainless steel braid with Teflon® leads and seal provides Watlow's most flexible lead protection with a moisture resistant seal. Unless specified, 12 in. (305 mm) braid is supplied. Leads are 2 in. (51 mm) longer than the braid as a standard but, longer leads are available.

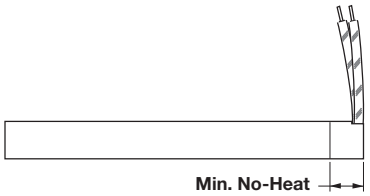
Minimum lead end no-heat required is 1 in. (25 mm). Option adds ¾ in. (19 mm) to overall length on stock units. To order, specify **option code F**.

FIREROD Cartridge Heaters

LA Stock

Right Angle Options

LA Right Angle Leads



LA right angle leads are used in applications with a high degree of flexing and when space limitations are critical. Stranded lead wires are connected internally (swaged-in) and exit at a 90 degree angle at the end of the heater.

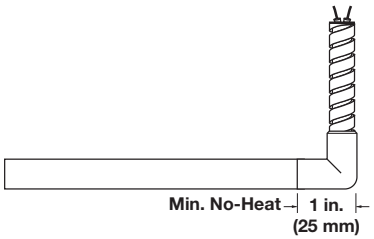
To order, specify **option code R**.

Minimum No-Heat Required in. (mm)					
Dia.	¼	⅜	½	⅝	¾
In.	13⁄16 (20.6)	¾ (19.0)	13⁄16 (20.6)	13⁄16 (20.6)	13⁄16 (20.6)

To order right angle leads with Teflon® leads and seals, specify **option code B**.

Note: Option is not available on ¼ in. (6 mm) diameter. Minimum no-heats are longer, contact your Watlow representative.

LA Right Angle Stainless Steel Hose

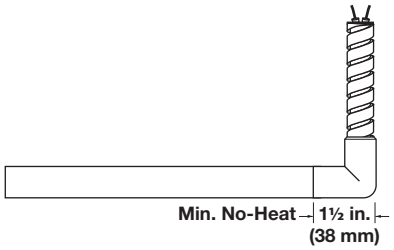


LA right angle stainless steel hose is provided for wiring convenience. Like the LA straight stainless steel hose, it protects leads from abrasion against sharp edges. Unless specified, 12 in. (305 mm) hose is supplied. Standard leads are 2 in. (51 mm) longer than hose, but longer leads are available.

To order, specify **option code W**. Option adds ¾ in. (19 mm) to overall length. Minimum lead end no-heat is 1 in (25 mm).

Note: Option is not available on ¼ in. (6 mm) diameter.

LA Right Angle Stainless Steel Hose with Teflon® Leads and Seal



LA right angle stainless steel hose with Teflon® leads and seal provides the ultimate combination of abrasion protection and a moisture resistant seal with wiring convenience. Unless specified, 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than hose as a standard, but longer leads are available.

Minimum lead end no-heat required is 1½ in. (38 mm). Option adds 1¼ in. (32 mm) to overall length on stock units.

To order, specify **option code M**.

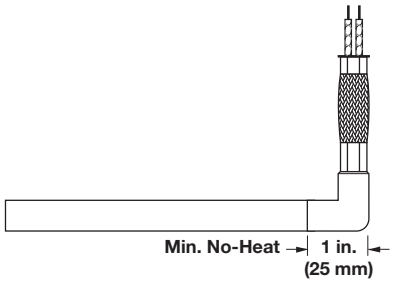
Note: Option is not available on ¼ in. (6 mm) diameter.

FIREROD Cartridge Heaters

LA Stock

Right Angle Options *(Continued)*

LA Right Angle Stainless Steel Braid



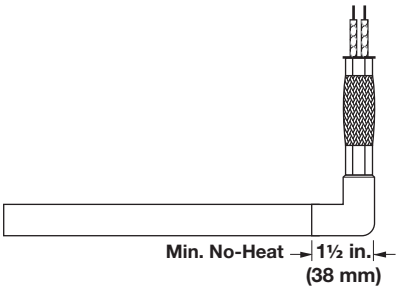
LA right angle stainless steel braid is provided for wiring convenience. Like the LA straight braid, it protects leads from abrasion against sharp edges.

Unless specified, 12 in. (305 mm) braid is supplied. Standard leads are 2 in. (51 mm) longer than braid, but longer leads are available.

To order, specify **option code Y**. Option adds ¾ in. (19 mm) to overall length. Minimum lead end no-heat is 1 in. (25 mm)

Note: Option is not available on ¼ in. (6 mm) diameter.

LA Right Angle Stainless Steel Braid with Teflon® Leads and Seal



LA right angle stainless steel braid with Teflon® leads and seal provides Watlow's most flexible lead protection and moisture resistant Teflon® seal with wiring convenience. Unless specified, 12 in. (305 mm) braid is supplied. Standard leads are 2 in. (51 mm) longer than the braid, but longer leads are available.

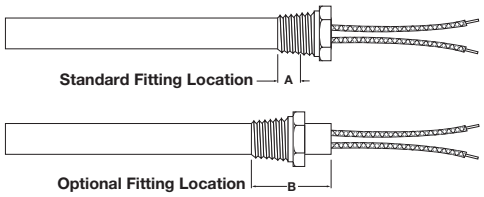
Minimum lead end no-heat required is 1½ in. (38 mm). Option adds 1¼ in. (32 mm) to overall length on stock units.

To order, specify **option code A**.

Note: Option is not available on ¼ in. (6 mm) diameter.

Mounting Options

LA Stock Threaded Fittings



Fitting overlaps the unheated section and is silver soldered to the sheath.

Threaded fittings allow for fast, water-tight installation of the heater into a threaded hole. These fittings can be ordered in either brass or 304 stainless steel. Other stainless steel alloys are available upon request. Double threaded fittings are also available.

To order, specify either **brass** or **stainless steel threaded fittings**.

On LA stock give location of fittings, if no-heat extension option is requested. Specify location from disc end to bottom of threads.

Lead Arrangement	STD Fitting ① Location Dimension A in. (mm)
Crimped Leads	¼ (6)
Swaged in Leads	5/16 ②④ (8)
STR SS Hose	½ ③ (13)
STR SS Braid	½ (13)
Teflon® Seal & LDS	⅞ (22)
Silicone Seal & LDS	⅞ (22)

① The location of the threaded fitting from thread end of fitting to the lead end of heater.

All optional fitting locations are available only with LA stock no-heat extensions. Contact your Watlow representative for details.

② On ¼ in. diameter FIREROD only "A" dimension is 7/16 in. (11.1 mm).

③ On ¼ in. diameter FIREROD only "A" dimension is ⅝ in. (15.9 mm).

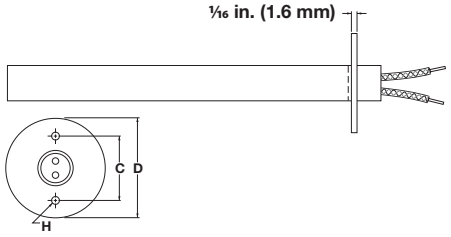
④ On ⅝ in. and ¾ in. the fitting is located at ⅞ in. from lead end using a ¾ no-heat extension. In order to locate at 5/16 in. the fitting must be epoxied.

FIREROD Cartridge Heaters

LA Stock

Mounting Options *(Continued)*

Flanges



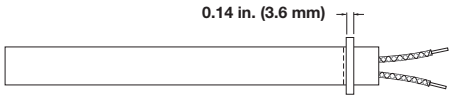
Stainless steel flanges are a convenient mounting method as well as a way to position a heater within an application. The standard flange is staked on and located ¼ in. (6 mm) from the lead end. The flange can be located up to 2¼ in. (57 mm) from the lead end as long as it is over a no-heat section. Use this option in combination with most LA configurations.

To order, specifiy **flange**, size and locations.

Flange Specifications

FIREROD Diameter in.	Flange Size	in. (mm)		
		D	C	H
¼, ⅜, ½	FS	1 (25.0)	¾ (19.0)	0.144 (3.7)
¼, ⅜, ½ ⅝, ¾	FM	1½ (38.0)	1⅛ (28.5)	0.156 (4.0)
⅝, ¾, 1	FL	2 (51.0)	1½ (38.0)	0.201 (5.1)

Locating Ring



A stainless steel locating ring can be used as a retaining collar to position a FIREROD if mounting requirements are not critical.

On LA Stock, give location if the no-heat extension option is requested. On in-stock FIRERODs without an LA option, location will be on the last ¼ in. (6 mm). To order, specify **locating ring**.

Locating Ring Specifications

Diameter	¼	⅜	½	⅝	¾
Ring O.D. in. (mm)	½ (13.0)	⅝ (15.9)	¾ (19.0)	⅞ (22.2)	1 (25.0)

FIREROD Cartridge Heaters

LA Stock

LA Stock Options

Option	Minimum Length Adders Per Diameter Per Option in. (mm)					Option Code
Heater Diameter	¼ (6 mm)	⅜ (9.5 mm)	½ (13 mm)	⅝ (15.9 mm)	¾ (19 mm)	
Swaged-in leads	E ¼ (6 mm)	E ¼ (6 mm)	E ¼ (6 mm)	E ¼ (6 mm)	E ¼ (6 mm)	**None**
Right angle leads	K 9⁄16 (14.3 mm)	J ½ (13 mm)	K 9⁄16 (14.3 mm)	K 9⁄16 (14.3 mm)	K 9⁄16 (14.3 mm)	**R**
Teflon® seal and leads	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	**T**
Right angle Teflon® seal and leads	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	**B**
Silicone seal and leads	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	**P**
Straight hose	J ½ (13 mm)	J ½ (13 mm)	J ½ (13 mm)	J ½ (13 mm)	J ½ (13 mm)	**H**
Right angle hose	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	R ⅞ (22.2 mm)	**W**
Straight hose with Teflon® seal and leads	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	**G**
Straight braid	J ½ (13 mm)	J ½ (13 mm)	J ½ (13 mm)	J ½ (13 mm)	J ½ (13 mm)	**C**
Right angle braid	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	R ⅞ (22.2 mm)	**Y**
Right angle braid with Teflon® seal and leads	— —	1E 1¼ (32 mm)	1E 1¼ (32 mm)	1E 1¼ (32 mm)	1E 1¼ (32 mm)	**A**
Straight braid with Teflon® seal and leads	— —	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	N ¾ (19 mm)	**F**
Right angle hose with Teflon® seal and leads	— —	1E 1¼ (32 mm)	1E 1¼ (32 mm)	1E 1¼ (32 mm)	1E 1¼ (32 mm)	**M**

LA options are available on all stock FIRERODs, except ⅛ in. diameter. To order any of these options, please build the order number by specifying Watlow code number, length adder code, option code and lead length.

Ordering Example: The order number **J12A89-N72W74** indicates you have ordered a 12 in. (305 mm) FIREROD with 72 in. (1830 mm) right angle stainless steel hose and 74 in. (1880 mm) leads. The overall heater length equals 12¾ in. (324 mm).

Note: No-heat extensions are available for most LA options in diameters of ⅜, ½, ⅝ and ¾ in. Contact your Watlow representative for available LA options. No-heat length extensions are available in the following dimensions.

To order any of these dimensions, please specify the applicable length adder code shown. No-heat extensions on all termination options are shipped within two to three days.

No-Heat Length Adder Codes

No-Heat Option in. (mm)	Length Adder Code
¾ (19)	**N**
1¼ (32)	**1E**
1¾ (44)	**1N**
2¼ (56)	**2E**

How to Order

To order Stock FIREROD cartridge heaters, specify:

- Watlow code number
- Quantity
- Options
- Lead length: if not specified, 12 in. (305 mm) crimped on leads will be shipped.

For **made-to-order** FIRERODs, please specify:

- Diameter
- Overall length
- Volts
- Watts
- LA Lead option and length or terminal configuration
- Lead end no-heat if different from standard
- Optional accessories, finishing, internal construction, sensors/controllers and mounting

Availability

Stock: Same-day shipment on many FIREROD stock options

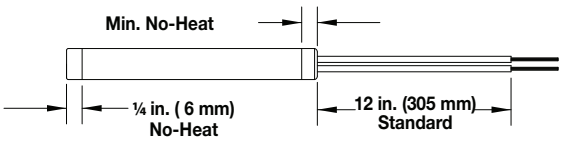
Made-to-Order: Contact your Watlow representative

FIREROD Cartridge Heaters

Made-to-Order

Straight Options

Swaged-in Flexible Leads



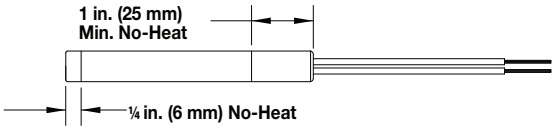
Swaged-in flexible leads are used in applications where a high degree of flexing exists or the leads must be bent sharply adjacent to the heater without exposing or breaking the conductor. The stranded wire leads are connected internally and exit through the lead end.

Standard lead wire type is high temperature fiberglass. The maximum temperature of the standard fiberglass end piece is 842°F (450°C). Unless specified, 12 in. (305 mm) leads are supplied.

Minimum lead end no-heat is ¼ in. (6 mm). High amperage designs require longer lead end no-heat. Additional no-heat may be required to keep the end piece and leads below maximum operating temperatures.

Heater Diameter	Standard Lead Gauge	Amperes	Min. No-Heat (in.)	Amperes	Min. No-Heat (in.)
¼	24	0 - 3.1	¼	>3.1	7⁄16
⅜	22	0 - 4.4	¼	>4.4	7⁄16
½	18	0 - 7.6	¼	>7.6	7⁄16
⅝	18	0 - 12.6	¼	>12.6	½
¾	18	0 - 12.6	7⁄16	>12.6	½

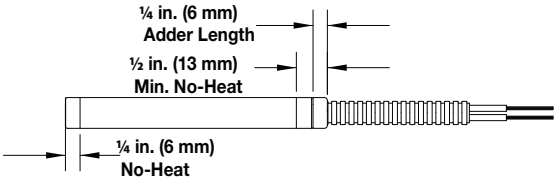
Teflon® Seal and Leads



Teflon® seal and leads protect the heater against moisture and contamination from cleaning solvents, plastic material or fumes and organic tapes. This seal is effective to 392°F (200°C) under continuous operation.

Teflon® seal and leads will have a minimum lead end unheated section of 1 in. (25 mm). Additional no-heat may be required to keep the seal below its maximum operating temperature.

Straight Stainless Steel Hose



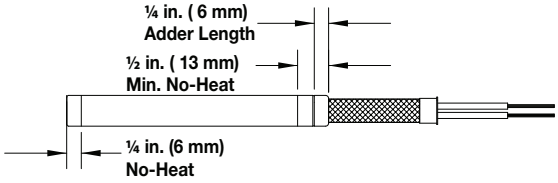
Straight stainless steel hose provides the best protection against abrasion from sharp edges. It also offers ease of handling and wiring in abrasive environments.

Unless specified, 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than hose.

Option adds ¼ in. (6 mm) to overall length of heater.

Note: This option is available with Teflon® leads and seal. Minimum no-heats are longer, contact your Watlow representative details.

Straight Stainless Steel Braid



Straight stainless braid is designed to protect leads from abrasion against sharp edges. It is the most flexible of Watlow's protective lead arrangements.

Unless specified, 12 in. (305 mm) braid is supplied. Leads are 2 in. (51 mm) longer than braid.

Option adds ¼ in. (6 mm) to overall length of heater.

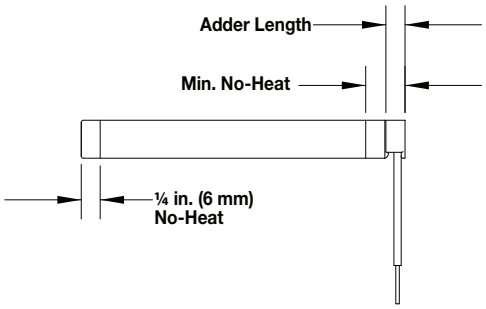
Note: This option is available with Teflon® leads and seal. Minimum no-heats are longer, contact your Watlow representative for details.

FIREROD Cartridge Heaters

Made-to-Order

Right Angle Options

Right Angle Leads

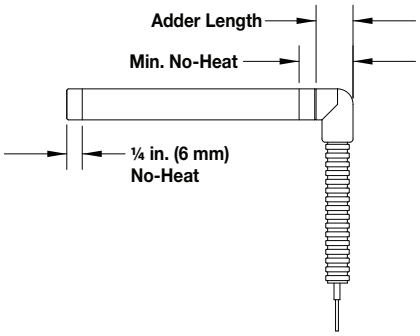


Right angle leads are used in applications with a high degree of flexing and when space limitations are critical. Standard lead wires are connected internally (swaged-in) and exit at a 90° angle at the end of the heater.

Diameter	¼	⅜	½	⅝	¾
Adder length (in.)	¼	¼	5⁄16	7⁄16	7⁄16
Min. No-Heat (in.)	½	½	9⁄16	11⁄16	⅞

Note: This option is available with Teflon® leads and seal. Minimum no-heats are longer, contact your Watlow representative for details.

Right Angle Stainless Steel Hose



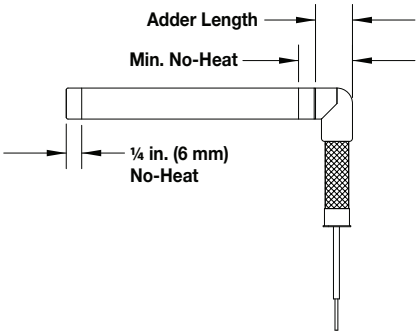
Right angle stainless steel hose is provided for wiring convenience. Like straight stainless steel hose, it protects leads from abrasion against sharp edges.

Unless specified, 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than hose.

Diameter	¼	⅜	½	⅝	¾
Adder length (in.)	5⁄16	⅜	9⁄16	11⁄16	13⁄16
Min. No-Heat (in.)	9⁄16	⅝	13⁄16	15⁄16	1 1⁄16

Note: This option is available with Teflon® leads and seal. Minimum no-heats are longer, contact your Watlow representative for details.

Right Angle Stainless Steel Braid



Right angle stainless steel braid is provided for wiring convenience. Like straight braid, it protects leads from abrasion against sharp edges.

Unless specified, 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than hose.

Diameter	¼	⅜	½	⅝	¾
Adder length (in.)	5⁄16	⅜	9⁄16	11⁄16	13⁄16
Min. No-Heat (in.)	9⁄16	⅝	13⁄16	15⁄16	1 1⁄16

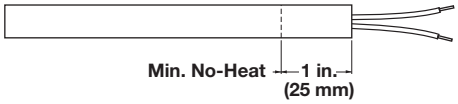
Note: This option is available with Teflon® leads and seal. Minimum no-heats are longer, contact your Watlow representative for details.

FIREROD Cartridge Heaters

Made-to-Order

Termination Options

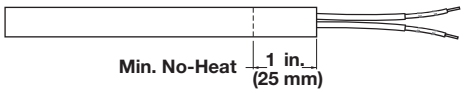
Silicone Rubber Seal and Leads



Made-to-order silicone rubber seal and leads protect the heater against moisture/contamination from lubricating oil, cleaning solvents, plastic material or fumes and organic tapes. This seal is effective to 450°F (230°C) under continuous operation.

Silicone rubber seal and leads for made-to-order units greater than 10 in. (250 mm) long will have a minimum no-heat section of approximately 12 percent of the overall length. Longer no-heat sections are available if required.

Epoxy Seal



Epoxy seals help protect the heater against moisture/contamination from lubricating oil, cleaning solvents, plastic material or fumes and organic tapes. These seals are effective to 500°F (260°C) under continuous operation.

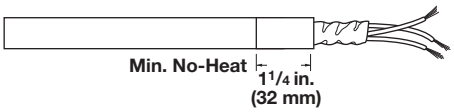
Epoxy seals can be ordered only on units greater than ⅛ in. (3.2 mm) diameter with crimped on leads. Minimum no-heat section at the lead end is 1 in. (25 mm). Longer no-heat sections are available upon request.

To order, specify **epoxy seal**.

Passivation

During the manufacturing and handling of stainless steel, particles of iron or tool steel may be embedded in the sheath. If not removed, these particles may corrode and produce rust spots. In critical sheath contact applications, like the medical industry, passivation will remove free iron from the sheath. To order, specify **316L stainless steel sheath** and **passivation**.

SJO Cord

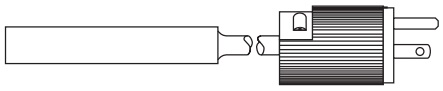


SJO cord is used in low temperature applications where lead wires require protection against moisture or when UL® listed plugs are needed. This cord is limited to 140°F (60°C) under continuous operation.

FIRERODs greater than 10 in. (250 mm) long will have a minimum no-heat section of approximately 12 percent + ¼ in. (6 mm) of the overall length.

To order, specify either **two conductor or three conductor** as well as **overall length**.

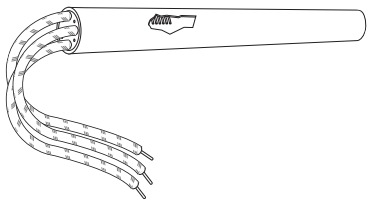
UL® Listed Plugs



UL® listed plugs are a safe, convenient method of installation, especially when frequent connection or disconnection is required. These plugs have a nylon dead front, a molded-in cord grip and either straight or Twist-Lock® blades with or without ground.

Use UL® listed plugs with stainless steel hose, conduit, braid or lead wires with sleeving. To order, specify **UL® listed plugs**.

Ground Lead



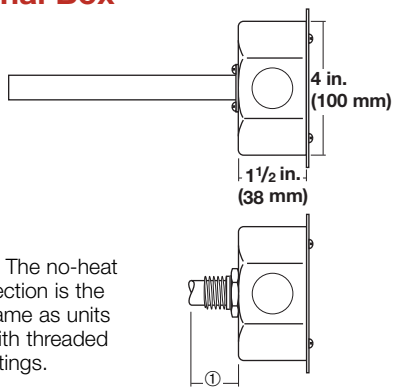
Ground leads are a safety feature to protect both workers and equipment. This configuration is not available on all options. contact your Watlow representative for additional information. To order, specify **ground lead**.

FIREROD Cartridge Heaters

Made-to-Order

Termination Options *(Continued)*

Terminal Box

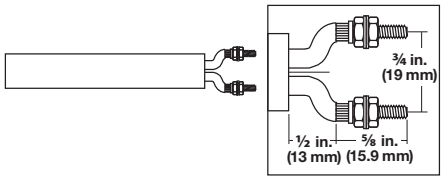


① The no-heat section is the same as units with threaded fittings.

A 4 in. (100 mm) NEMA 1 octagonal terminal box is mounted on a flange or a threaded fitting. Boxes have ½ in. (13 mm) conduit knockouts for electrical connection.

Hazardous location (NEMA 4 and NEMA 7) terminal boxes are also available. contact your Watlow representative for details. Terminal boxes are available on ½ in. (13 mm) through 1 in. (25 mm) diameter FIRERODs. To order, specify **terminal box** and **NEMA type**.

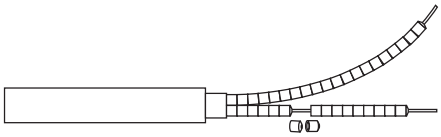
Post Terminals



Post terminals provide a quick, secure connection with ring or fork connectors, or bus bars. Threaded 6-32 studs are soldered to the solid power pins. Nuts and washers are provided.

Post terminals are available on FIRERODs of ½, ⅝, ¾ and 1 in. (13, 15.9, 19 and 25 mm) diameter. On 1 in. (25 mm) diameters, pins are straight. To order, specify **post terminals**.

Ceramic Bead Insulation



Ceramic bead insulation protects the leads from high ambient temperatures above 840°F (450°C).

The beads fit over solid conductors that are extended long enough to reach a cooler area where flexible wires can be attached.

This option is not available on ⅛ in. (3.2 mm) diameter. The maximum available length on stock FIRERODs is 1½ in. (38 mm). To order, specify **ceramic beads** and length, and additional lead length.

Low Electrical Leakage

This construction technique minimizes current leakage of the heating element. It is especially useful in critical applications, like the medical field where low set point ground fault interrupts are used.

Low electrical leakage is available on ⅜, ½, ⅝ and ¾ in. (9.5, 13, 15.9 and 19 mm) diameter FIRERODs. To order, specify **low electrical leakage**.

Centerless Grinding

Centerless grinding can be used to furnish precision diameters, thus permitting closer heater-to-part fit. Therefore, higher watt densities can be used.

For centerless ground heaters, the heater must either have Teflon® leads and seal (maximum 12 in. (305 mm) lead length) or have crimped on leads. Longer lead lengths are available, but require external connection. The length of a FIREROD available for centerless grinding is dependent on the construction, please contact your Watlow representative for assistance. To order, specify **centerless grinding**.

FIREROD Diameter in.	Actual Precision Diameter in.
¼	0.241 ± 0.0005
⅜	0.363 ± 0.0005
½	0.488 ± 0.0005
⅝	0.613 ± 0.0005
¾	0.738 ± 0.0005
1	0.984 ± 0.0005

FIREROD Cartridge Heaters

Made-to-Order

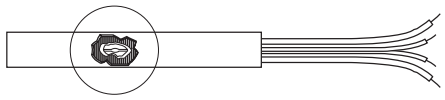
Options

Thermocouple Types

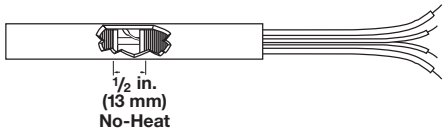
ASTM Code	Conductor Characteristics		Temperature Range °F (°C)
	Positive	Negative	
J	Iron (Magnetic) (White)	Constantan (Non-Magnetic) (Red)	0 to 1400 (-20 to 760)
K	Chromel® (Non-Magnetic) (Yellow)	Alumel® (Magnetic) (Red)	0 to 2300 (-20 to 1260)

For other ISA types, contact your Watlow representative.

Style A



Style B



Style C



Internal Thermocouple

A Style A internal thermocouple can be used to evaluate heat transfer efficiency of an application, a measure that enables you to cut energy costs and increase heater life. This ungrounded junction is located in the heater core to monitor the internal temperature of the heater.

The Style B internal thermocouple gives a good approximation of part temperature and can be located anywhere along the length of the heater. Due to variations in production, this style may be grounded or ungrounded.

This junction is located adjacent to the inside heater sheath in the center of the heated section unless otherwise specified. A ½ in. (13 mm) unheated section is required.

A Style C internal thermocouple is useful in applications where material flows past the end of the heater, as in plastic molding. This grounded junction is embedded in a special end disc. Unless requested, the disc end is not mechanically sealed.

To order, specify **internal thermocouple**, **Style A, B** or **C** and **thermocouple ASTM Type J** or **K**.

If not specified, 12 in. (305 mm) power and thermocouple leads are supplied.

Availability

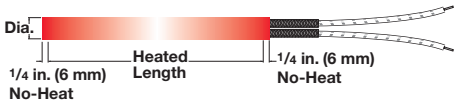
All styles are available on all diameters with the exception of ⅛ in. (3.2 mm) diameter, which is available only with Style C and 1 in. (25 mm) which is available only with Style A and B.

FIREROD Cartridge Heaters

Made-to-Order

Options *(Continued)*

Distributed Wattage



Distributed wattage varies the watt density along the length of the heater. This construction technique is used to compensate for heat losses along the edges of heated parts. This is ideal for seal bar applications.

To order, specify **distributed wattage** and give the length and wattage for each section.

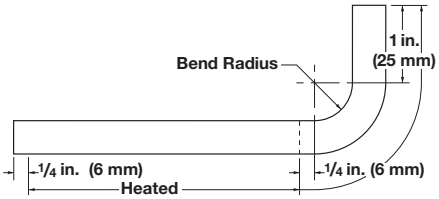
Individually Controlled Heat Zones

Individually controlled heat zones give the flexibility of controlling temperature by zones, along the length of the FIREROD. This is an advantage for heating requirements of certain applications, like seal bars. This internal construction can be ordered on ⅝, ¾ and 1 in. (16, 19 and 25 mm) diameter FIRERODs. To order, specify **individually controlled heat zones** as well as wattage and length per zone.

Dual Voltage

When the FIREROD requires the flexibility of operating on two voltages, use this internal construction. Dual voltage is not compatible for all lead options. Contact your Watlow representative for availability. To order, specify **dual voltage** and voltage requirements.

Bent FIREROD



In applications where the leads must exit at an angle, a bend can be made in the unheated section only. Heated sections may be on either side of the bend. It is recommended that the heater be bent at the Watlow factory.

A 304 stainless steel sheath is used on bent FIRERODs. If the sheath temperature exceeds 1000°F (540°C), contact your Watlow representative.

See dimensions noted on the chart, or contact your Watlow representative, if you need to exceed limitations shown.

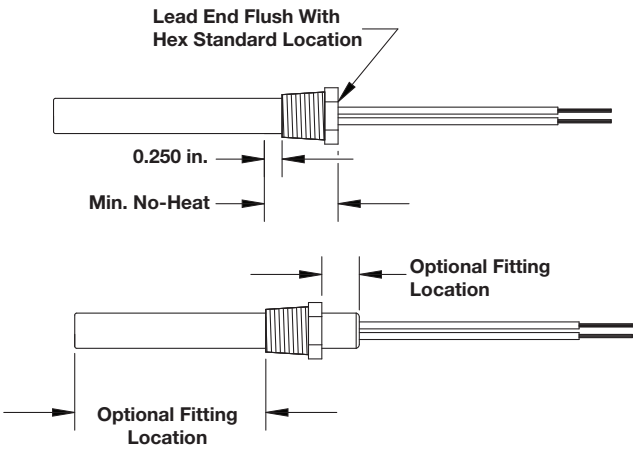
FIREROD Diameter in.	Min. Required No-Heat Length in.	(mm)	Bend Radius in.	(mm)
¼	2¼	(56)	½	(13)
⅜	2⅜	(60)	½	(13)
½	2⅞	(72)	¾	(19)
⅝	3 5/16	(83)	1	(25)
¾	3 13/16	(98)	1¼	(32)

FIREROD Cartridge Heaters

Made-to-Order

Mounting Options

Threaded Fittings



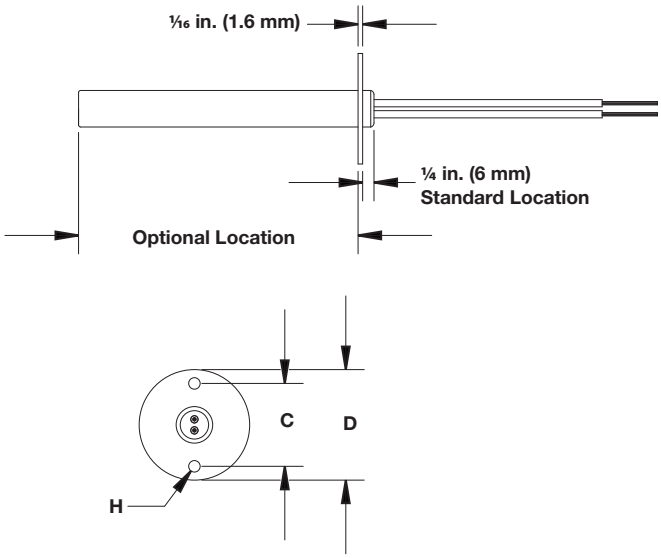
Threaded fittings allow for fast, water-tight installation of the heater into a threaded hole. Standard fittings are 304 stainless steel and welded to the heater sheath. Other materials are available upon request. Double threaded fittings are also available.

Unless specified, the fitting hex will be located flush with the lead end.

Threaded Fittings Specifications

Heater Diameter in.	Pipe Thread Size (NPTF) in.	(mm)	Single Thread Fitting Length in.	(mm)	Double Thread Fitting Length in.	(mm)
¼	⅛	(3.2)	½	(13.0)	⅞	(22.2)
⅜	¼	(6.0)	⅝	(15.9)	1 5/16	(49.2)
½	⅜	(9.5)	¾	(19.0)	1⅜	(34.9)
⅝	½	(13.0)	⅞	(22.2)	1 13/16	(46.0)
¾	¾	(19.0)	1	(25.0)	1 13/16	(46.0)
1	1	(25.0)	1	(25.0)	1½	(38.0)

Flanges



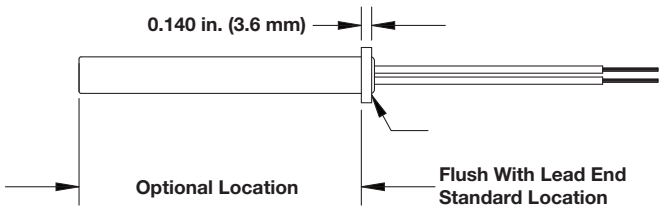
Stainless steel flanges are a convenient mounting method as well as a way to position a heater within an application. Standard location is ¼ in. (6 mm) from lead end; however, a specific location may be requested any place on the no-heat section. Unless specified, flanges will be staked to the sheath.

To order, specify **flange,** size and location.

Flange Specifications

FIREROD Diameter in.	Flange Size	D in. (mm)	C in. (mm)	H in. (mm)
¼, ⅜, ½	FS	1 (25.0)	¾ (19.0)	0.144
¼, ⅜, ½, ⅝, ¾	FM	1½ (38.0)	1⅛ (28.6)	0.156
⅝, ¾, 1	FL	2 (51.0)	1½ (38.0)	0.201

Locating Rings



A stainless steel locating ring can be used as a retaining collar to position a FIREROD if mounting requirements are not critical. Standard locating rings are staked to the heather sheath.

To order, specify **locating ring,** and location.

Locating Ring Specifications

Diameter - in.	¼	⅜	½	⅝	¾
Ring O.D. in. (mm)	½ (13.0)	⅝ (15.9)	¾ (19.0)	⅞ (22.2)	1 (25.0)

FIREROD Cartridge Heaters

Stock Heater Code Numbers

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
⅛	1¼	(32.0)	120	25	87	(13)	0.02	(0.009)	Stock	**C1E14**
	1¼	(32.0)	120	50	174	(18)	0.02	(0.009)	Stock	**C1E13**
	1¼	(32.0)	240	35	113	(27)	0.02	(0.009)	Stock	**C1E42**
	1½	(38.0)	120	30	78	(12)	0.02	(0.009)	Stock	**C1J5**
	1½	(38.0)	120	60	156	(24)	0.02	(0.009)	Stock	**C1J6**
	2	(51.0)	120	50	87	(13)	0.02	(0.009)	Stock	**C2A4**
	2	(51.0)	120	100	174	(27)	0.02	(0.009)	Stock	**C2A5**
¼	1	(25.0)	120	80	208	(32)	0.02	(0.009)	Stock	**E1A51**
	1	(25.0)	120	100	260	(40)	0.02	(0.009)	Stock	**E1A52**
	1	(25.0)	120	150	390	(60)	0.02	(0.009)	Stock	**E1A53**
	1	(25.0)	240	100	250	(39)	0.02	(0.009)	Stock	**E1A66**
	1¼	(32.0)	120	75	130	(20)	0.02	(0.009)	Stock	**E1E41**
	1¼	(32.0)	120	100	173	(27)	0.02	(0.009)	Stock	**E1E42**
	1¼	(32.0)	120	150	260	(40)	0.02	(0.009)	Stock	**E1E43**
	1¼	(32.0)	240	225	390	(60)	0.02	(0.009)	Stock	**E1E61**
	1½	(38.0)	120	50	65	(10)	0.02	(0.009)	Stock	**E1J39**
	1½	(38.0)	120	100	130	(20)	0.02	(0.009)	Stock	**E1J40**
	1½	(38.0)	120	150	195	(30)	0.02	(0.009)	Stock	**E1J41**
	1½	(38.0)	240	175	228	(35)	0.02	(0.009)	Stock	**E1J49**
	1½	(38.0)	120	200	260	(40)	0.02	(0.009)	Stock	**E1J42**
	1½	(38.0)	240	200	260	(40)	0.02	(0.009)	Stock	**E1J52**
	1½	(38.0)	240	250	325	(50)	0.02	(0.009)	Stock	**E1J35**
	2	(51.0)	120	80	68	(11)	0.03	(0.014)	Stock	**E2A136**
	2	(51.0)	120	100	87	(13)	0.03	(0.014)	Stock	**E2A55**
	2	(51.0)	240	125	108	(17)	0.03	(0.014)	Stock	**E2A82**
	2	(51.0)	120	150	130	(20)	0.03	(0.014)	Stock	**E2A56**
	2	(51.0)	240	150	130	(20)	0.03	(0.014)	Stock	**E2A77**
	2	(51.0)	120	200	173	(27)	0.03	(0.014)	Stock	**E2A57**
	2	(51.0)	240	200	173	(27)	0.03	(0.014)	Stock	**E2A50**
	2	(51.0)	120	250	217	(33)	0.03	(0.014)	Stock	**E2A72**
	2	(51.0)	240	250	215	(33)	0.03	(0.014)	Stock	**E2A76**
	2	(51.0)	240	300	260	(40)	0.03	(0.014)	Stock	**E2A83**
	2½	(64.0)	120	250	159	(25)	0.03	(0.014)	Stock	**E2J80**
	2½	(64.0)	240	250	159	(25)	0.03	(0.014)	Stock	**E2J49**
	3	(76.0)	120	100	52	(8)	0.04	(0.018)	Stock	**E3A48**
	3	(76.0)	120	200	104	(16)	0.04	(0.018)	Stock	**E3A49**
	3	(76.0)	240	200	104	(16)	0.04	(0.018)	Stock	**E3A60**
	3	(76.0)	240	250	128	(20)	0.04	(0.018)	Stock	**E3A124**
	3	(76.0)	120	300	156	(24)	0.04	(0.018)	Stock	**E3A50**
	3	(76.0)	240	300	156	(24)	0.04	(0.018)	Stock	**E3A51**
	4	(102.0)	120	100	37	(6)	0.04	(0.018)	Stock	**E4A28**
	4	(102.0)	120	200	74	(11)	0.04	(0.018)	Stock	**E4A29**
	4	(102.0)	240	200	74	(11)	0.04	(0.018)	Stock	**E4A32**
	4	(102.0)	120	300	111	(17)	0.04	(0.018)	Stock	**E4A30**
	4	(102.0)	240	300	111	(17)	0.04	(0.018)	Stock	**E4A6**
	4½	(114.0)	120	200	64	(10)	0.05	(0.023)	Stock	**E4J30**
	5	(127.0)	240	350	101	(16)	0.05	(0.023)	Stock	**E5A45**
	5	(127.0)	120	400	113	(18)	0.05	(0.023)	Stock	**E5A57**
	5	(127.0)	240	400	113	(18)	0.05	(0.023)	Stock	**E5A34**
	6	(152.0)	240	400	94	(14)	0.06	(0.027)	Stock	**E6A46**
	8	(203.0)	240	800	136	(21)	0.08	(0.036)	Stock	**E8A76**

CONTINUED

12 inch crimped on GGS leads supplied unless otherwise specified.

FIREROD Cartridge Heaters

Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
⅜	1	(25.0)	120	55	95	(15)	0.03	(0.014)	Stock	**G1A71**
	1	(25.0)	120	100	172	(26)	0.03	(0.014)	Stock	**G1A29**
	1	(25.0)	120	150	259	(40)	0.03	(0.014)	Stock	**G1A38**
	1	(25.0)	240	200	344	(53)	0.03	(0.014)	Stock	**G1A83**
	1¼	(32.0)	120	100	115	(18)	0.03	(0.014)	Stock	**G1E91**
	1¼	(32.0)	120	125	144	(22)	0.03	(0.014)	Stock	**G1E74**
	1¼	(32.0)	120	150	172	(27)	0.03	(0.014)	Stock	**G1E92**
	1¼	(32.0)	240	150	172	(27)	0.03	(0.014)	Stock	**G1E93**
	1¼	(32.0)	120	200	230	(35)	0.03	(0.014)	Stock	**G1E94**
	1¼	(32.0)	240	200	230	(36)	0.03	(0.014)	Stock	**G1E95**
	1¼	(32.0)	120	400	426	(66)	0.03	(0.014)	Stock	**G1E99**
	1⅝	(33.3)	120	100	104	(16)	0.03	(0.014)	Stock	**G1F13**
	1⅝	(33.3)	240	100	104	(16)	0.03	(0.014)	Stock	**G1F15**
	1⅝	(33.3)	120	150	160	(25)	0.03	(0.014)	Stock	**G1F17**
	1⅜	(34.9)	240	160	151	(23)	0.03	(0.014)	Stock	**G1G23**
	1⅞	(36.5)	120	100	94	(15)	0.03	(0.014)	Stock	**G1H6**
	1½	(38.0)	120	50	43	(7)	0.04	(0.018)	Stock	**G1J25**
	1½	(38.0)	120	75	65	(10)	0.04	(0.018)	Stock	**G1J70**
	1½	(38.0)	120	80	68	(11)	0.04	(0.018)	Stock	**G1J66**
	1½	(38.0)	120	100	86	(13)	0.04	(0.018)	Stock	**G1J59**
	1½	(38.0)	240	100	86	(13)	0.04	(0.018)	Stock	**G1J110**
	1½	(38.0)	240	125	106	(16)	0.04	(0.018)	Stock	**G1J182**
	1½	(38.0)	120	150	129	(20)	0.04	(0.018)	Stock	**G1J31**
	1½	(38.0)	240	150	129	(20)	0.04	(0.018)	Stock	**G1J39**
	1½	(38.0)	120	200	173	(27)	0.04	(0.018)	Stock	**G1J85**
	1½	(38.0)	240	200	173	(27)	0.04	(0.018)	Stock	**G1J73**
	1½	(38.0)	120	250	216	(33)	0.04	(0.018)	Stock	**G1J86**
	1½	(38.0)	240	250	216	(33)	0.04	(0.018)	Stock	**G1J54**
	1¾	(45.0)	120	125	86	(13)	0.05	(0.023)	Stock	**G1N45**
	1¾	(45.0)	120	175	122	(19)	0.05	(0.023)	Stock	**G1N46**
	1¾	(45.0)	120	250	172	(27)	0.05	(0.023)	Stock	**G1N43**
	1¾	(45.0)	240	250	172	(27)	0.05	(0.023)	Stock	**G1N32**
	1 13⁄16	(46.0)	240	150	98	(15)	0.05	(0.023)	Stock	**G1P14**
	1 13⁄16	(46.0)	120	200	129	(20)	0.05	(0.023)	Stock	**G1P15**
	1 13⁄16	(46.0)	240	250	161	(25)	0.05	(0.023)	Stock	**G1P11**
	1⅞	(47.6)	120	250	152	(24)	0.05	(0.023)	Stock	**G1R14**
	2	(51.0)	120	50	29	(5)	0.06	(0.027)	Stock	**G2A53**
	2	(51.0)	120	75	42	(7)	0.06	(0.027)	Stock	**G2A192**
	2	(51.0)	120	100	57	(9)	0.06	(0.027)	Stock	**G2A84**
	2	(51.0)	240	100	57	(9)	0.06	(0.027)	Stock	**G2A76**
	2	(51.0)	120	150	86	(13)	0.06	(0.027)	Stock	**G2A56**
	2	(51.0)	240	150	86	(13)	0.06	(0.027)	Stock	**G2A81**
	2	(51.0)	120	200	115	(18)	0.06	(0.027)	Stock	**G2A127**
	2	(51.0)	240	200	115	(18)	0.06	(0.027)	Stock	**G2A37**
	2	(51.0)	120	250	144	(22)	0.06	(0.027)	Stock	**G2A47**
	2	(51.0)	240	250	144	(22)	0.06	(0.027)	Stock	**G2A73**
	2	(51.0)	120	300	172	(27)	0.06	(0.027)	Stock	**G2A139**
	2	(51.0)	240	300	172	(27)	0.06	(0.027)	Stock	**G2A98**
	2	(51.0)	120	400	230	(36)	0.06	(0.027)	Stock	**G2A153**
	2	(51.0)	240	400	230	(36)	0.06	(0.027)	Stock	**G2A146**
	2	(51.0)	120	500	282	(44)	0.06	(0.027)	Stock	**G2A95**

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FIREROD Cartridge Heaters

Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
3/8	2	(51.0)	240	500	282	(44)	0.06	(0.027)	Stock	**G2A97**
	2 1/8	(54.0)	240	200	106	(16)	0.06	(0.027)	Stock	**G2C13**
	2 1/4	(57.0)	120	75	37	(6)	0.07	(0.032)	Stock	**G2E88**
	2 1/4	(57.0)	120	125	62	(10)	0.07	(0.032)	Stock	**G2E89**
	2 1/4	(57.0)	240	125	62	(10)	0.07	(0.032)	Stock	**G2E138**
	2 1/4	(57.0)	240	150	73	(11)	0.07	(0.032)	Stock	**G2E68**
	2 1/4	(57.0)	120	175	86	(13)	0.07	(0.032)	Stock	**G2E90**
	2 1/4	(57.0)	120	250	123	(19)	0.07	(0.032)	Stock	**G2E2**
	2 1/4	(57.0)	240	250	123	(19)	0.07	(0.032)	Stock	**G2E78**
	2 1/4	(57.0)	120	300	148	(23)	0.07	(0.032)	Stock	**G2E108**
	2 1/4	(57.0)	240	300	148	(23)	0.07	(0.032)	Stock	**G2E12**
	2 1/4	(57.0)	120	350	173	(27)	0.07	(0.032)	Stock	**G2E91**
	2 1/4	(57.0)	240	350	173	(27)	0.07	(0.032)	Stock	**G2E75**
	2 1/2	(64.0)	120	200	87	(13)	0.07	(0.032)	Stock	**G2J110**
	2 1/2	(64.0)	240	200	87	(13)	0.07	(0.032)	Stock	**G2J81**
	2 1/2	(64.0)	120	250	108	(17)	0.07	(0.032)	Stock	**G2J46**
	2 1/2	(64.0)	240	250	108	(17)	0.07	(0.032)	Stock	**G2J80**
	2 1/2	(64.0)	120	300	130	(20)	0.07	(0.032)	Stock	**G2J118**
	2 1/2	(64.0)	240	300	130	(20)	0.07	(0.032)	Stock	**G2J119**
	2 1/2	(64.0)	120	400	174	(27)	0.07	(0.032)	Stock	**G2J26**
	2 1/2	(64.0)	240	400	174	(27)	0.07	(0.032)	Stock	**G2J146**
	2 1/2	(64.0)	120	500	216	(33)	0.07	(0.032)	Stock	**G2J109**
	2 1/2	(64.0)	240	500	216	(33)	0.07	(0.032)	Stock	**G2J52**
	2 13/16	(71.4)	120	60	22	(3)	0.08	(0.036)	Stock	**G2P9**
	2 13/16	(71.4)	120	250	92	(14)	0.08	(0.036)	Stock	**G2P3**
	2 13/16	(71.4)	240	300	110	(17)	0.08	(0.036)	Stock	**G2P5**
	3	(76.0)	120	100	34	(5)	0.08	(0.036)	Stock	**G3A55**
	3	(76.0)	240	100	34	(5)	0.08	(0.036)	Stock	**G3A137**
	3	(76.0)	120	150	52	(8)	0.08	(0.036)	Stock	**G3A121**
	3	(76.0)	120	200	69	(11)	0.08	(0.036)	Stock	**G3A61**
	3	(76.0)	240	200	69	(11)	0.08	(0.036)	Stock	**G3A39**
	3	(76.0)	120	250	86	(13)	0.08	(0.036)	Stock	**G3A52**
	3	(76.0)	240	250	86	(13)	0.08	(0.036)	Stock	**G3A54**
	3	(76.0)	120	300	104	(16)	0.08	(0.036)	Stock	**G3A73**
	3	(76.0)	240	300	104	(16)	0.08	(0.036)	Stock	**G3A92**
	3	(76.0)	120	400	138	(21)	0.08	(0.036)	Stock	**G3A44**
	3	(76.0)	240	400	138	(21)	0.08	(0.036)	Stock	**G3A65**
	3	(76.0)	120	500	173	(27)	0.08	(0.036)	Stock	**G3A119**
	3	(76.0)	240	500	173	(27)	0.08	(0.036)	Stock	**G3A120**
	3	(76.0)	240	600	208	(32)	0.08	(0.036)	Stock	**G3A133**
	3 5/16	(84.2)	120	500	152	(24)	0.08	(0.036)	Stock	**G3F24**
	3 1/2	(89.0)	120	250	72	(11)	0.09	(0.041)	Stock	**G3J77**
	3 1/2	(89.0)	240	250	72	(11)	0.09	(0.041)	Stock	**G3J65**
	3 1/2	(89.0)	120	300	87	(13)	0.09	(0.041)	Stock	**G3J87**
	3 1/2	(89.0)	240	300	87	(13)	0.09	(0.041)	Stock	**G3J68**
	3 1/2	(89.0)	120	500	144	(22)	0.09	(0.041)	Stock	**G3J22**
	3 1/2	(89.0)	240	500	144	(22)	0.09	(0.041)	Stock	**G3J63**
	3 13/16	(96.8)	120	150	38	(6)	0.09	(0.041)	Stock	**G3P8**
	3 13/16	(96.8)	240	500	128	(20)	0.09	(0.041)	Stock	**G3P3**

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Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
⅜	4	(102.0)	120	125	31	(5)	0.09	(0.041)	Stock	**G4A54**
	4	(102.0)	240	125	31	(5)	0.09	(0.041)	Stock	**G4A163**
	4	(102.0)	120	150	37	(6)	0.09	(0.041)	Stock	**G4A78**
	4	(102.0)	120	175	43	(7)	0.09	(0.041)	Stock	**G4A191**
	4	(102.0)	120	250	62	(10)	0.09	(0.041)	Stock	**G4A40**
	4	(102.0)	240	250	62	(10)	0.09	(0.041)	Stock	**G4A87**
	4	(102.0)	120	300	74	(11)	0.09	(0.041)	Stock	**G4A94**
	4	(102.0)	240	300	74	(11)	0.09	(0.041)	Stock	**G4A95**
	4	(102.0)	120	400	99	(15)	0.09	(0.041)	Stock	**G4A48**
	4	(102.0)	240	400	99	(15)	0.09	(0.041)	Stock	**G4A44**
	4	(102.0)	240	450	109	(17)	0.09	(0.041)	Stock	**G4A64**
	4	(102.0)	120	500	123	(19)	0.09	(0.041)	Stock	**G4A96**
	4	(102.0)	240	500	123	(19)	0.09	(0.041)	Stock	**G4A92**
	4	(102.0)	120	550	134	(21)	0.09	(0.041)	Stock	**G4A200**
	4¼	(108.0)	240	300	67	(10)	0.09	(0.041)	Stock	**G4E25**
	4¼	(108.0)	240	750	167	(26)	0.09	(0.041)	Stock	**G4E15**
	4½	(114.0)	120	300	65	(10)	0.10	(0.045)	Stock	**G4J54**
	4½	(114.0)	240	300	65	(10)	0.10	(0.045)	Stock	**G4J33**
	4½	(114.0)	120	500	108	(17)	0.10	(0.045)	Stock	**G4J55**
	4½	(114.0)	240	500	108	(17)	0.10	(0.045)	Stock	**G4J37**
	4 13/16	(122.2)	240	300	59	(9)	0.11	(0.050)	Stock	**G4P11**
	4 13/16	(122.2)	240	500	98	(15)	0.11	(0.050)	Stock	**G4P3**
	5	(127.0)	120	150	29	(4)	0.11	(0.050)	Stock	**G5A68**
	5	(127.0)	240	150	29	(4)	0.11	(0.050)	Stock	**G5A56**
	5	(127.0)	120	300	58	(9)	0.11	(0.050)	Stock	**G5A69**
	5	(127.0)	240	300	58	(9)	0.11	(0.050)	Stock	**G5A70**
	5	(127.0)	120	500	96	(15)	0.11	(0.050)	Stock	**G5A38**
	5	(127.0)	240	500	96	(15)	0.11	(0.050)	Stock	**G5A71**
	5	(127.0)	240	750	144	(22)	0.11	(0.050)	Stock	**G5A67**
	5	(127.0)	240	1000	192	(30)	0.11	(0.050)	Stock	**G5A115**
	5¼	(133.0)	240	200	45	(7)	0.12	(0.054)	Stock	**G5E16**
	5½	(140.0)	240	600	104	(16)	0.12	(0.054)	Stock	**G5J36**
	5½	(140.0)	240	1000	173	(27)	0.12	(0.054)	Stock	**G5J45**
	6	(152.0)	120	200	31	(5)	0.13	(0.059)	Stock	**G6A80**
	6	(152.0)	120	250	39	(6)	0.13	(0.059)	Stock	**G6A40**
	6	(152.0)	240	250	39	(6)	0.13	(0.059)	Stock	**G6A92**
	6	(152.0)	120	400	63	(10)	0.13	(0.059)	Stock	**G6A81**
	6	(152.0)	240	400	63	(10)	0.13	(0.059)	Stock	**G6A82**
	6	(152.0)	120	500	79	(12)	0.13	(0.059)	Stock	**G6A125**
	6	(152.0)	240	500	79	(12)	0.13	(0.059)	Stock	**G6A59**
	6	(152.0)	120	600	94	(15)	0.13	(0.059)	Stock	**G6A56**
	6	(152.0)	240	600	94	(15)	0.13	(0.059)	Stock	**G6A51**
	6	(152.0)	240	750	117	(18)	0.13	(0.059)	Stock	**G6A46**
	6	(152.0)	240	1000	157	(24)	0.13	(0.059)	Stock	**G6A83**
	6½	(165.0)	240	600	86	(13)	0.14	(0.064)	Stock	**G6J23**
	6½	(165.0)	240	1000	144	(22)	0.14	(0.064)	Stock	**G6J33**
	7	(178.0)	120	250	33	(5)	0.14	(0.064)	Stock	**G7A40**
	7	(178.0)	240	250	33	(5)	0.14	(0.064)	Stock	**G7A32**
	7	(178.0)	240	500	65	(10)	0.14	(0.064)	Stock	**G7A30**
	7	(178.0)	120	600	80	(12)	0.14	(0.064)	Stock	**G7A41**

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Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
⅜	7	(178.0)	240	600	80	(12)	0.14	(0.064)	Stock	**G7A42**
	7	(178.0)	240	1000	133	(21)	0.14	(0.064)	Stock	**G7A43**
	7½	(191.0)	240	600	74	(11)	0.15	(0.068)	Stock	**G7J27**
	7½	(191.0)	240	1000	124	(19)	0.15	(0.068)	Stock	**G7J28**
	7 13/16	(198.5)	240	750	87	(13)	0.15	(0.068)	Stock	**G7P5**
	8	(203.0)	120	300	34	(5)	0.16	(0.073)	Stock	**G8A54**
	8	(203.0)	240	300	34	(5)	0.16	(0.073)	Stock	**G8A47**
	8	(203.0)	120	400	45	(7)	0.16	(0.073)	Stock	**G8A109**
	8	(203.0)	120	500	58	(9)	0.16	(0.073)	Stock	**G8A81**
	8	(203.0)	240	500	58	(9)	0.16	(0.073)	Stock	**G8A32**
	8	(203.0)	120	600	69	(11)	0.16	(0.073)	Stock	**G8A53**
	8	(203.0)	240	600	69	(11)	0.16	(0.073)	Stock	**G8A37**
	8	(203.0)	240	700	79	(12)	0.16	(0.073)	Stock	**G8A98**
	8	(203.0)	240	1000	115	(18)	0.16	(0.073)	Stock	**G8A45**
	8⅝	(219.0)	240	500	52	(8)	0.17	(0.077)	Stock	**G8L3**
	9	(229.0)	240	1000	100	(16)	0.18	(0.082)	Stock	**G9A37**
	9½	(241.0)	240	600	57	(9)	0.19	(0.086)	Stock	**G9J20**
	9½	(241.0)	240	1000	96	(15)	0.19	(0.086)	Stock	**G9J12**
	10	(254.0)	120	400	36	(6)	0.19	(0.086)	Stock	**G10A48**
	10	(254.0)	120	600	54	(8)	0.19	(0.086)	Stock	**G10A35**
	10	(254.0)	240	600	54	(8)	0.19	(0.086)	Stock	**G10A31**
	10	(254.0)	240	1000	91	(14)	0.19	(0.086)	Stock	**G10A32**
	10 13/16	(274.7)	240	375	31	(5)	0.20	(0.091)	Stock	**G10P5**
	12	(305.0)	120	400	30	(5)	0.22	(0.100)	Stock	**G12A45**
	12	(305.0)	120	600	45	(7)	0.22	(0.100)	Stock	**G12A29**
	12	(305.0)	240	600	45	(7)	0.22	(0.100)	Stock	**G12A46**
	12	(305.0)	240	1000	75	(12)	0.22	(0.100)	Stock	**G12A47**
	12 13/16	(325.5)	240	1000	69	(11)	0.23	(0.104)	Stock	**G12P3**
½	1	(25.0)	120	50	65	(10)	0.06	(0.027)	Stock	**J1A30**
	1	(25.0)	120	150	193	(30)	0.06	(0.027)	Stock	**J1A31**
	1¼	(32.0)	120	50	43	(7)	0.07	(0.032)	Stock	**J1E50**
	1¼	(32.0)	120	125	107	(17)	0.07	(0.032)	Stock	**J1E51**
	1¼	(32.0)	240	125	107	(17)	0.07	(0.032)	Stock	**J1E58**
	1¼	(32.0)	240	200	172	(27)	0.07	(0.032)	Stock	**J1E52**
	1¼	(32.0)	240	250	212	(33)	0.07	(0.032)	Stock	**J1E88**
	1½	(38.0)	120	50	32	(3)	0.08	(0.036)	Stock	**J1J47**
	1½	(38.0)	120	150	97	(15)	0.08	(0.036)	Stock	**J1J48**
	1½	(38.0)	240	150	97	(15)	0.08	(0.036)	Stock	**J1J96**
	1½	(38.0)	120	200	128	(20)	0.08	(0.036)	Stock	**J1J59**
	1½	(38.0)	240	200	128	(20)	0.08	(0.036)	Stock	**J1J38**
	2	(51.0)	120	75	32	(5)	0.09	(0.041)	Stock	**J2A80**
	2	(51.0)	120	200	86	(13)	0.09	(0.041)	Stock	**J2A49**
	2	(51.0)	240	200	86	(13)	0.09	(0.041)	Stock	**J2A75**
	2	(51.0)	120	250	108	(17)	0.09	(0.041)	Stock	**J2A85**
	2	(51.0)	240	250	108	(17)	0.09	(0.041)	Stock	**J2A71**
	2	(51.0)	120	300	128	(20)	0.09	(0.041)	Stock	**J2A95**
	2	(51.0)	240	300	128	(20)	0.09	(0.041)	Stock	**J2A96**
	2	(51.0)	120	400	171	(27)	0.09	(0.041)	Stock	**J2A81**
	2	(51.0)	240	400	171	(27)	0.09	(0.041)	Stock	**J2A82**

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Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
½	2¼	(57.0)	120	75	28	(4)	0.10	(0.045)	Stock	**J2E86**
	2¼	(57.0)	120	125	46	(7)	0.10	(0.045)	Stock	**J2E87**
	2¼	(57.0)	120	250	92	(14)	0.10	(0.045)	Stock	**J2E56**
	2¼	(57.0)	240	250	92	(14)	0.10	(0.045)	Stock	**J2E69**
	2¼	(57.0)	120	400	147	(22)	0.10	(0.045)	Stock	**J2E114**
	2¼	(57.0)	240	400	147	(22)	0.10	(0.045)	Stock	**J2E115**
	2¼	(57.0)	120	500	184	(29)	0.10	(0.045)	Stock	**J2E64**
	2¼	(57.0)	240	500	184	(29)	0.10	(0.045)	Stock	**J2E88**
	2⅜	(60.3)	120	100	34	(5)	0.10	(0.045)	Stock	**J2G35**
	2⅜	(60.3)	240	100	34	(5)	0.10	(0.045)	Stock	**J2G28**
	2⅜	(60.3)	120	250	86	(13)	0.10	(0.045)	Stock	**J2G34**
	2⅜	(60.3)	240	250	86	(13)	0.10	(0.045)	Stock	**J2G37**
	2⅜	(60.3)	120	500	172	(27)	0.10	(0.045)	Stock	**J2G36**
	2⅜	(60.3)	240	500	172	(27)	0.10	(0.045)	Stock	**J2G38**
	2½	(64.0)	120	100	32	(5)	0.11	(0.050)	Stock	**J2J67**
	2½	(64.0)	240	100	32	(5)	0.11	(0.050)	Stock	**J2J57**
	2½	(64.0)	120	250	81	(13)	0.11	(0.050)	Stock	**J2J68**
	2½	(64.0)	240	250	81	(13)	0.11	(0.050)	Stock	**J2J69**
	2½	(64.0)	120	300	96	(15)	0.11	(0.050)	Stock	**J2J109**
	2½	(64.0)	240	300	96	(15)	0.11	(0.050)	Stock	**J2J110**
	2½	(64.0)	120	400	128	(20)	0.11	(0.050)	Stock	**J2J81**
	2½	(64.0)	240	400	128	(20)	0.11	(0.050)	Stock	**J2J82**
	2½	(64.0)	120	500	161	(24)	0.11	(0.050)	Stock	**J2J66**
	2½	(64.0)	240	500	161	(24)	0.11	(0.050)	Stock	**J2J70**
	2⁹⁄₁₆	(65.1)	120	350	108	(17)	0.11	(0.050)	Stock	**J2K6**
	2⁹⁄₁₆	(65.1)	240	300	93	(14)	0.11	(0.050)	Stock	**J2K3**
	2¾	(70.0)	240	400	115	(18)	0.11	(0.050)	Stock	**J2N43**
	2¾	(70.0)	120	400	115	(18)	0.11	(0.050)	Stock	**J2N45**
	3	(76.0)	120	125	32	(5)	0.12	(0.054)	Stock	**J3A108**
	3	(76.0)	240	125	32	(5)	0.12	(0.054)	Stock	**J3A109**
	3	(76.0)	120	250	64	(10)	0.12	(0.054)	Stock	**J3A107**
	3	(76.0)	240	250	64	(10)	0.12	(0.054)	Stock	**J3A89**
	3	(76.0)	120	300	78	(12)	0.12	(0.054)	Stock	**J3A65**
	3	(76.0)	120	350	89	(14)	0.12	(0.054)	Stock	**J3A173**
	3	(76.0)	240	300	78	(12)	0.12	(0.054)	Stock	**J3A73**
	3	(76.0)	120	400	104	(16)	0.12	(0.054)	Stock	**J3A132**
	3	(76.0)	240	400	104	(16)	0.12	(0.054)	Stock	**J3A29**
	3	(76.0)	120	500	129	(20)	0.12	(0.054)	Stock	**J3A110**
	3	(76.0)	240	500	129	(20)	0.12	(0.054)	Stock	**J3A111**
	3	(76.0)	120	600	154	(24)	0.12	(0.054)	Stock	**J3A51**
	3	(76.0)	240	600	154	(24)	0.12	(0.054)	Stock	**J3A127**
	3	(76.0)	120	750	193	(30)	0.12	(0.054)	Stock	**J3A137**
	3	(76.0)	240	750	193	(30)	0.12	(0.054)	Stock	**J3A112**
	3	(76.0)	120	1000	254	(39)	0.12	(0.054)	Stock	**J3A79**

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12 inch crimped on GGS leads supplied unless otherwise specified.

FIREROD Cartridge Heaters

Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
½	3½	(89.0)	120	250	54	(8)	0.14	(0.064)	Stock	**J3J44**
	3½	(89.0)	240	250	54	(8)	0.14	(0.064)	Stock	**J3J64**
	3½	(89.0)	240	350	75	(12)	0.14	(0.064)	Stock	**J3J65**
	3½	(89.0)	120	500	107	(17)	0.14	(0.064)	Stock	**J3J45**
	3½	(89.0)	240	500	107	(17)	0.14	(0.064)	Stock	**J3J46**
	3½	(89.0)	240	750	162	(25)	0.14	(0.064)	Stock	**J3J63**
	3 13/16	(96.8)	120	500	96	(15)	0.15	(0.068)	Stock	**J3P9**
	3 13/16	(96.8)	240	250	48	(7)	0.15	(0.068)	Stock	**J3P2**
	4	(102.0)	120	150	28	(4)	0.15	(0.068)	Stock	**J4A117**
	4	(102.0)	240	150	28	(4)	0.15	(0.068)	Stock	**J4A122**
	4	(102.0)	120	250	46	(7)	0.15	(0.068)	Stock	**J4A118**
	4	(102.0)	240	250	46	(7)	0.15	(0.068)	Stock	**J4A90**
	4	(102.0)	120	300	56	(9)	0.15	(0.068)	Stock	**J4A63**
	4	(102.0)	240	300	56	(9)	0.15	(0.068)	Stock	**J4A26**
	4	(102.0)	120	350	65	(10)	0.15	(0.068)	Stock	**J4A1**
	4	(102.0)	240	350	65	(10)	0.15	(0.068)	Stock	**J4A103**
	4	(102.0)	120	400	74	(11)	0.15	(0.068)	Stock	**J4A139**
	4	(102.0)	240	400	74	(11)	0.15	(0.068)	Stock	**J4A68**
	4	(102.0)	120	500	92	(14)	0.15	(0.068)	Stock	**J4A16**
	4	(102.0)	120	550	100	(16)	0.15	(0.068)	Stock	**J4A242**
	4	(102.0)	240	500	92	(14)	0.15	(0.068)	Stock	**J4A92**
	4	(102.0)	120	750	138	(21)	0.15	(0.068)	Stock	**J4A198**
	4	(102.0)	240	750	138	(21)	0.15	(0.068)	Stock	**J4A119**
	4	(102.0)	240	1000	184	(28)	0.15	(0.068)	Stock	**J4A73**
	4½	(114.0)	120	500	80	(12)	0.17	(0.077)	Stock	**J4J69**
	4½	(114.0)	240	500	80	(12)	0.17	(0.077)	Stock	**J4J57**
	4½	(114.0)	120	750	120	(19)	0.17	(0.077)	Stock	**J4J70**
	4½	(114.0)	240	750	120	(19)	0.17	(0.077)	Stock	**J4J32**
	4 13/16	(122.2)	240	300	44	(7)	0.19	(0.086)	Stock	**J4P3**
	4 13/16	(122.2)	240	1000	148	(23)	0.19	(0.086)	Stock	**J4P6**
	5	(127.0)	120	200	29	(4)	0.19	(0.086)	Stock	**J5A85**
	5	(127.0)	240	200	29	(4)	0.19	(0.086)	Stock	**J5A74**
	5	(127.0)	120	350	50	(8)	0.19	(0.086)	Stock	**J5A86**
	5	(127.0)	240	350	50	(8)	0.19	(0.086)	Stock	**J5A63**
	5	(127.0)	120	400	58	(9)	0.19	(0.086)	Stock	**J5A98**
	5	(127.0)	240	400	58	(9)	0.19	(0.086)	Stock	**J5A46**
	5	(127.0)	120	500	72	(11)	0.19	(0.086)	Stock	**J5A52**
	5	(127.0)	240	500	72	(11)	0.19	(0.086)	Stock	**J5A45**
	5	(127.0)	120	750	108	(17)	0.19	(0.086)	Stock	**J5A121**
	5	(127.0)	240	750	108	(17)	0.19	(0.086)	Stock	**J5A72**
	5	(127.0)	240	1000	143	(22)	0.19	(0.086)	Stock	**J5A87**
	5½	(140.0)	240	200	25	(4)	0.20	(0.091)	Stock	**J5J38**
	5½	(140.0)	120	500	64	(10)	0.20	(0.091)	Stock	**J5J43**
	5½	(140.0)	240	500	64	(10)	0.20	(0.091)	Stock	**J5J33**
	5½	(140.0)	240	650	83	(13)	0.20	(0.091)	Stock	**J5J69**
	5½	(140.0)	120	750	97	(15)	0.20	(0.091)	Stock	**J5J44**
	5½	(140.0)	240	750	97	(15)	0.20	(0.091)	Stock	**J5J45**
	5¾	(146.0)	120	700	86	(13)	0.20	(0.091)	Stock	**J5N6**
	5¾	(146.0)	240	700	86	(13)	0.20	(0.091)	Stock	**J5N8**
	5 13/16	(147.6)	240	300	36	(6)	0.21	(0.095)	Stock	**J5P10**

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FIREROD Cartridge Heaters

Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
½	6	(152.0)	120	250	29	(4)	0.21	(0.095)	Stock	**J6A114**
	6	(152.0)	240	250	29	(4)	0.21	(0.095)	Stock	**J6A171**
	6	(152.0)	240	300	35	(6)	0.21	(0.095)	Stock	**J6A66**
	6	(152.0)	240	350	41	(7)	0.21	(0.095)	Stock	**J6A119**
	6	(152.0)	120	500	59	(9)	0.21	(0.095)	Stock	**J6A115**
	6	(152.0)	240	500	59	(9)	0.21	(0.095)	Stock	**J6A94**
	6	(152.0)	120	750	88	(14)	0.21	(0.095)	Stock	**J6A99**
	6	(152.0)	240	750	88	(14)	0.21	(0.095)	Stock	**J6A90**
	6	(152.0)	120	1000	117	(18)	0.21	(0.095)	Stock	**J6A53**
	6	(152.0)	240	1000	117	(18)	0.21	(0.095)	Stock	**J6A36**
	6½	(165.0)	240	500	54	(8)	0.23	(0.104)	Stock	**J6J45**
	6½	(165.0)	240	1000	108	(17)	0.23	(0.104)	Stock	**J6J27**
	7	(178.0)	120	250	25	(4)	0.24	(0.109)	Stock	**J7A79**
	7	(178.0)	120	500	50	(8)	0.24	(0.109)	Stock	**J7A80**
	7	(178.0)	240	500	50	(8)	0.24	(0.109)	Stock	**J7A57**
	7	(178.0)	120	600	60	(9)	0.24	(0.109)	Stock	**J7A50**
	7	(178.0)	240	600	60	(9)	0.24	(0.109)	Stock	**J7A95**
	7	(178.0)	240	1000	99	(15)	0.24	(0.109)	Stock	**J7A81**
	7½	(191.0)	240	500	46	(7)	0.26	(0.118)	Stock	**J7J25**
	7½	(191.0)	240	1000	92	(14)	0.26	(0.118)	Stock	**J7J26**
	8	(203.0)	120	300	26	(4)	0.28	(0.127)	Stock	**J8A71**
	8	(203.0)	240	300	26	(4)	0.28	(0.127)	Stock	**J8A111**
	8	(203.0)	120	500	43	(7)	0.28	(0.127)	Stock	**J8A64**
	8	(203.0)	240	500	43	(7)	0.28	(0.127)	Stock	**J8A66**
	8	(203.0)	120	1000	86	(13)	0.28	(0.127)	Stock	**J8A84**
	8	(203.0)	240	1000	86	(13)	0.28	(0.127)	Stock	**J8A60**
	8	(203.0)	240	1500	129	(20)	0.28	(0.127)	Stock	**J8A100**
	8	(203.0)	240	2000	172	(27)	0.28	(0.127)	Stock	**J8A101**
	8½	(216.0)	240	300	24	(4)	0.29	(0.132)	Stock	**J8J39**
	8½	(216.0)	240	500	40	(6)	0.29	(0.132)	Stock	**J8J30**
	8½	(216.0)	240	1000	80	(12)	0.29	(0.132)	Stock	**J8J28**
	9	(229.0)	240	500	38	(6)	0.30	(0.136)	Stock	**J9A35**
	9	(229.0)	240	1000	76	(12)	0.30	(0.136)	Stock	**J9A58**
	9½	(241.0)	240	500	36	(6)	0.32	(0.145)	Stock	**J9J14**
	9½	(241.0)	240	1000	72	(11)	0.32	(0.145)	Stock	**J9J12**
	10	(254.0)	120	500	34	(5)	0.33	(0.150)	Stock	**J10A61**
	10	(254.0)	240	500	34	(5)	0.33	(0.150)	Stock	**J10A62**
	10	(254.0)	120	1000	68	(11)	0.33	(0.150)	Stock	**J10A63**
	10	(254.0)	240	1000	68	(11)	0.33	(0.150)	Stock	**J10A42**
	10	(254.0)	240	1500	102	(16)	0.33	(0.150)	Stock	**J10A33**
	10	(254.0)	240	2000	136	(21)	0.33	(0.150)	Stock	**J10A64**
	11	(279.0)	240	1000	61	(9)	0.36	(0.163)	Stock	**J11A60**
	12	(305.0)	120	500	28	(4)	0.40	(0.181)	Stock	**J12A63**
	12	(305.0)	240	500	28	(4)	0.40	(0.181)	Stock	**J12A76**
	12	(305.0)	120	1000	56	(9)	0.40	(0.181)	Stock	**J12A40**
	12	(305.0)	240	1000	56	(9)	0.40	(0.181)	Stock	**J12A49**

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Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
½	12	(305.0)	240	1500	84	(13)	0.40	(0.181)	Stock	**J12A37**
	12	(305.0)	240	2000	112	(17)	0.40	(0.181)	Stock	**J12A89**
	14	(356.0)	240	1000	48	(7)	0.48	(0.218)	Stock	**J14A41**
	14	(356.0)	240	2300	110	(17)	0.48	(0.218)	Stock	**J14A39**
	15	(381.0)	240	1500	66	(10)	0.50	(0.227)	Stock	**J15A19**
	16	(406.0)	240	1000	41	(7)	0.52	(0.236)	Stock	**J16A12**
	18	(457.0)	240	1500	55	(9)	0.57	(0.259)	Stock	**J18A19**
	18	(457.0)	240	1700	62	(9)	0.57	(0.259)	Stock	**J18A23**
⅝	1¼	(32.0)	120	50	34	(5)	0.10	(0.045)	Stock	**L1E26**
	1¼	(32.0)	120	200	137	(21)	0.10	(0.045)	Stock	**L1E24**
	1¼	(32.0)	120	250	171	(27)	0.10	(0.045)	Stock	**L1E27**
	1½	(38.0)	120	250	128	(20)	0.11	(0.050)	Stock	**L1J23**
	1½	(38.0)	240	250	128	(20)	0.11	(0.050)	Stock	**L1J24**
	2	(51.0)	120	100	34	(5)	0.13	(0.059)	Stock	**L2A48**
	2	(51.0)	120	200	68	(11)	0.13	(0.059)	Stock	**L2A49**
	2	(51.0)	240	500	170	(26)	0.13	(0.059)	Stock	**L2A54**
	2¼	(57.0)	120	100	29	(4)	0.14	(0.064)	Stock	**L2E49**
	2¼	(57.0)	120	250	73	(11)	0.14	(0.064)	Stock	**L2E50**
	2¼	(57.0)	240	250	73	(11)	0.14	(0.064)	Stock	**L2E12**
	2¼	(57.0)	120	350	103	(16)	0.14	(0.064)	Stock	**L2E40**
	2¼	(57.0)	240	350	103	(16)	0.14	(0.064)	Stock	**L2E51**
	2⅜	(60.3)	120	280	77	(12)	0.16	(0.073)	Stock	**L2G18**
	2⅜	(60.3)	240	280	77	(12)	0.16	(0.073)	Stock	**L2G19**
	3	(76.0)	120	150	31	(5)	0.20	(0.091)	Stock	**L3A81**
	3	(76.0)	120	250	51	(8)	0.20	(0.091)	Stock	**L3A82**
	3	(76.0)	240	250	51	(8)	0.20	(0.091)	Stock	**L3A9**
	3	(76.0)	120	400	81	(13)	0.20	(0.091)	Stock	**L3A94**
	3	(76.0)	120	500	102	(16)	0.20	(0.091)	Stock	**L3A113**
	3	(76.0)	240	500	103	(16)	0.20	(0.091)	Stock	**L3A33**
	3	(76.0)	240	750	154	(24)	0.20	(0.091)	Stock	**L3A71**
	3¾	(95.0)	120	525	82	(13)	0.24	(0.109)	Stock	**L3N12**
	3¾	(95.0)	240	525	82	(13)	0.24	(0.109)	Stock	**L3N1**
	4	(102.0)	120	250	37	(6)	0.26	(0.118)	Stock	**L4A99**
	4	(102.0)	240	250	37	(6)	0.26	(0.118)	Stock	**L4A104**
	4	(102.0)	240	400	58	(9)	0.26	(0.118)	Stock	**L4A47**
	4	(102.0)	240	500	73	(11)	0.26	(0.118)	Stock	**L4A53**
	4	(102.0)	240	600	88	(14)	0.26	(0.118)	Stock	**L4A44**
	4	(102.0)	240	750	110	(17)	0.26	(0.118)	Stock	**L4A100**
	4	(102.0)	240	1000	146	(23)	0.26	(0.118)	Stock	**L4A71**
	5	(127.0)	120	250	28	(4)	0.29	(0.132)	Stock	**L5A76**
	5	(127.0)	240	250	28	(4)	0.29	(0.132)	Stock	**L5A107**
	5	(127.0)	240	500	57	(9)	0.29	(0.132)	Stock	**L5A24**
	5	(127.0)	240	750	86	(13)	0.29	(0.132)	Stock	**L5A31**
	5	(127.0)	240	1000	114	(18)	0.29	(0.132)	Stock	**L5A77**
	5⅜	(85.7)	120	800	84	(13)	0.30	(0.136)	Stock	**L5G3**
	5⅜	(85.7)	240	800	84	(13)	0.30	(0.136)	Stock	**L5G1**
	6	(152.0)	120	300	28	(4)	0.34	(0.154)	Stock	**L6A28**
	6	(152.0)	240	300	28	(4)	0.34	(0.154)	Stock	**L6A64**
	6	(152.0)	240	500	47	(7)	0.34	(0.154)	Stock	**L6A73**
	6	(152.0)	240	750	70	(11)	0.34	(0.154)	Stock	**L6A70**
	6	(152.0)	240	1000	93	(14)	0.34	(0.154)	Stock	**L6A71**

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FIREROD Cartridge Heaters

Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
⅝	6	(152.0)	120	1500	139	(22)	0.34	(0.154)	Stock	**L6A163**
	6	(152.0)	240	1500	140	(22)	0.34	(0.154)	Stock	**L6A94**
	6½	(165.0)	120	500	43	(7)	0.38	(0.172)	Stock	**L6J43**
	6½	(165.0)	240	500	43	(7)	0.38	(0.172)	Stock	**L6J55**
	7	(178.0)	120	500	39	(6)	0.40	(0.181)	Stock	**L7A42**
	7	(178.0)	240	500	39	(6)	0.40	(0.181)	Stock	**L7A15**
	7	(178.0)	240	1000	79	(12)	0.40	(0.181)	Stock	**L7A37**
	7	(178.0)	240	1500	118	(18)	0.40	(0.181)	Stock	**L7A12**
	8	(203.0)	120	500	34	(5)	0.47	(0.213)	Stock	**L8A96**
	8	(203.0)	240	500	34	(5)	0.47	(0.213)	Stock	**L8A46**
	8	(203.0)	240	850	58	(9)	0.47	(0.213)	Stock	**L8A115**
	8	(203.0)	240	1000	68	(10)	0.47	(0.213)	Stock	**L8A10**
	8	(203.0)	240	1500	102	(16)	0.47	(0.213)	Stock	**L8A37**
	8	(203.0)	240	2000	137	(21)	0.47	(0.213)	Stock	**L8A80**
	10	(254.0)	120	500	27	(4)	0.53	(0.240)	Stock	**L10A51**
	10	(254.0)	240	500	27	(4)	0.53	(0.240)	Stock	**L10A40**
	10	(254.0)	240	750	40	(6)	0.53	(0.240)	Stock	**L10A69**
	10	(254.0)	240	1000	54	(8)	0.53	(0.240)	Stock	**L10A52**
	10	(254.0)	480	1000	54	(8)	0.53	(0.240)	Stock	**L10A193**
	10	(254.0)	240	1500	81	(13)	0.53	(0.240)	Stock	**L10A8**
	10	(254.0)	240	2000	108	(17)	0.53	(0.240)	Stock	**L10A50**
	12	(305.0)	120	500	22	(3)	0.66	(0.300)	Stock	**L12A81**
	12	(305.0)	240	500	22	(3)	0.66	(0.300)	Stock	**L12A80**
	12	(305.0)	240	900	40	(6)	0.66	(0.300)	Stock	**L12A102**
	12	(305.0)	120	1000	45	(7)	0.66	(0.300)	Stock	**L12A82**
	12	(305.0)	240	1000	45	(7)	0.66	(0.300)	Stock	**L12A34**
	12	(305.0)	120	1500	66	(10)	0.66	(0.300)	Stock	**L12A147**
	12	(305.0)	240	1500	67	(10)	0.66	(0.300)	Stock	**L12A39**
	12	(305.0)	240	2000	89	(14)	0.66	(0.300)	Stock	**L12A63**
	14	(356.0)	240	3700	140	(22)	0.79	(0.358)	Stock	**L14A21**
	15	(381.0)	240	750	27	(4)	0.84	(0.381)	Stock	**L15A35**
	15	(381.0)	240	2400	84	(13)	0.84	(0.381)	Stock	**L15A20**
	15	(381.0)	480	2500	88	(14)	0.84	(0.381)	Stock	**L15A88**
	15	(381.0)	240	4000	141	(22)	0.84	(0.381)	Stock	**L15A41**
	16	(406.0)	240	2500	82	(13)	0.91	(0.412)	Stock	**L16A33**
	16	(406.0)	240	4500	148	(23)	0.91	(0.412)	Stock	**L16A40**
	18	(457.0)	240	1500	44	(7)	1.03	(0.467)	Stock	**L18A32**
	18	(457.0)	240	3000	87	(13)	1.03	(0.467)	Stock	**L18A34**
	18	(457.0)	240	4700	137	(21)	1.03	(0.467)	Stock	**L18A36**
	20	(508.0)	240	1500	40	(6)	1.25	(0.567)	Stock	**L20A19**
	20	(508.0)	240	3500	92	(14)	1.25	(0.567)	Stock	**L20A13**
	20	(508.0)	480	3500	92	(14)	1.25	(0.567)	Stock	**L20A96**
	20	(508.0)	240	4700	123	(19)	1.25	(0.567)	Stock	**L20A14**
	24	(610.0)	240	2000	44	(7)	1.47	(0.667)	Stock	**L24A19**
	24	(610.0)	240	4700	102	(15)	1.47	(0.667)	Stock	**L24A14**
	36	(914.0)	240	3000	43	(7)	2.30	(1.04)	Stock	**L36A8**
¾	2¼	(57.0)	120	200	49	(8)	0.19	(0.086)	Stock	**N2E8**
	3	(76.0)	120	250	43	(7)	0.24	(0.109)	Stock	**N3A11**
	3	(76.0)	240	500	85	(13)	0.24	(0.109)	Stock	**N3A12**

CONTINUED

12 inch crimped on GGS leads supplied unless otherwise specified.

FIREROD Cartridge Heaters

Stock Heater Code Numbers *(Continued)*

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
¾	4	(102.0)	120	250	31	(5)	0.31	(0.141)	Stock	**N4A16**
	4	(102.0)	240	500	61	(9)	0.31	(0.141)	Stock	**N4A17**
	4	(102.0)	240	1000	122	(19)	0.31	(0.141)	Stock	**N4A15**
	5	(127.0)	120	300	28	(4)	0.38	(0.172)	Stock	**N5A19**
	5	(127.0)	240	500	47	(7)	0.38	(0.172)	Stock	**N5A12**
	5	(127.0)	240	1000	95	(15)	0.38	(0.172)	Stock	**N5A20**
	6	(152.0)	120	500	39	(6)	0.44	(0.200)	Stock	**N6A19**
	6	(152.0)	240	500	39	(6)	0.44	(0.200)	Stock	**N6A20**
	6	(152.0)	240	1000	78	(12)	0.44	(0.200)	Stock	**N6A21**
	6	(152.0)	480	1000	78	(12)	0.44	(0.200)	Stock	**N6A225**
	6	(152.0)	240	1500	116	(18)	0.44	(0.200)	Stock	**N6A82**
	6	(152.0)	240	2000	155	(24)	0.44	(0.200)	Stock	**N6A22**
	7	(178.0)	120	500	33	(5)	0.51	(0.231)	Stock	**N7A15**
	7	(178.0)	240	500	33	(5)	0.51	(0.231)	Stock	**N7A1**
	7	(178.0)	240	1000	66	(10)	0.51	(0.231)	Stock	**N7A16**
	8	(203.0)	120	500	28	(4)	0.58	(0.263)	Stock	**N8A19**
	8	(203.0)	240	500	28	(4)	0.58	(0.263)	Stock	**N8A20**
	8	(203.0)	240	1000	57	(9)	0.58	(0.263)	Stock	**N8A21**
	8	(203.0)	240	2000	114	(17)	0.58	(0.263)	Stock	**N8A22**
	10	(254.0)	240	1000	45	(7)	0.72	(0.327)	Stock	**N10A15**
	10	(254.0)	240	2000	90	(14)	0.72	(0.327)	Stock	**N10A14**
	12	(305.0)	240	1000	37	(6)	0.84	(0.381)	Stock	**N12A15**
	12	(305.0)	240	2000	74	(11)	0.84	(0.381)	Stock	**N12A24**
	12	(305.0)	480	2000	74	(11)	0.84	(0.381)	Stock	**N12A198**
	12	(305.0)	240	4000	148	(23)	0.84	(0.381)	Stock	**N12A25**
	13	(330.0)	240	1000	34	(5)	0.93	(0.422)	Stock	**N13A26**
	14	(356.0)	240	1250	40	(6)	1.03	(0.467)	Stock	**N14A22**
	14	(356.0)	240	2500	79	(12)	1.03	(0.467)	Stock	**N14A20**
	14	(356.0)	240	4500	142	(22)	1.03	(0.467)	Stock	**N14A21**
	15	(381.0)	240	1500	44	(22)	1.09	(0.494)	Stock	**N15A26**
	16	(406.0)	240	1800	49	(8)	1.14	(0.517)	Stock	**N16A26**
	16	(406.0)	240	4700	129	(20)	1.14	(0.517)	Stock	**N16A18**
	18	(457.0)	240	2000	49	(8)	1.25	(0.567)	Stock	**N18A13**
	18	(457.0)	240	5000	122	(19)	1.25	(0.567)	Stock	**N18A15**
	20	(508.0)	240	1150	25	(4)	1.40	(0.635)	Stock	**N20A21**
	20	(508.0)	240	2250	49	(8)	1.40	(0.635)	Stock	**N20A22**
	20	(508.0)	240	5250	115	(18)	1.40	(0.635)	Stock	**N20A10**
	24	(610.0)	240	1375	25	(4)	1.80	(0.816)	Stock	**N24A24**
	24	(610.0)	240	2750	50	(8)	1.80	(0.816)	Stock	**N24A23**
	24	(610.0)	480	2750	50	(8)	1.80	(0.816)	Stock	**N24A78**
	24	(610.0)	240	5500	100	(16)	1.80	(0.816)	Stock	**N24A13**
	36	(914.0)	240	2500	30	(6)	2.50	(1.13)	Stock	**N36A4**

12 inch crimped on GGS leads supplied unless otherwise specified.

FIREROD Cartridge Heaters

Heaters for Hot Runner Systems

Diameter in.	Sheath Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number	Reference Part No.
¼	1½	(38.0)	240	200	260	(40)	0.03	(0.014)	Stock	**E1JX442A**	—
	2	(51.0)	240	200	172	(27)	0.04	(0.018)	Stock	**E2AX619A**	—
	2½	(64.0)	120	200	129	(20)	0.04	(0.018)	Stock	**E2JX287A**	—
	2½	(64.0)	240	200	129	(20)	0.04	(0.018)	Stock	**E2JX288A**	—
	3	(76.0)	240	200	103	(16)	0.05	(0.023)	Stock	**E3AX575A**	—
	3½	(89.0)	240	250	108	(17)	0.05	(0.023)	Standard	**E3JX155A**	—
	4	(102.0)	240	250	93	(14)	0.05	(0.023)	Stock	**E4AX509A**	—
	5	(127.0)	240	250	71	(11)	0.06	(0.027)	Stock	**E5AX299A**	—
⅜	1¾	(45.0)	240	200	142	(22)	0.09	(0.041)	Stock	**G1NX39E**	TJ38017
	2	(51.0)	240	250	152	(24)	0.09	(0.041)	Stock	**G2AX163B**	TJ38020
	2½	(64.0)	240	250	112	(17)	0.10	(0.045)	Stock	**G2JX131D**	TJ38025
	3	(76.0)	240	260	92	(14)	0.10	(0.045)	Stock	**G3AX238K**	TJ38030
	3½	(89.0)	240	320	91	(14)	0.12	(0.054)	Stock	**G3JX114K**	TJ38035
	4	(102.0)	240	370	92	(14)	0.12	(0.054)	Stock	**G4AX255D**	TJ38040
	4½	(114.0)	240	420	90	(14)	0.13	(0.059)	Standard	**G4JX84E**	TJ38045
	5	(127.0)	240	470	108	(17)	0.14	(0.064)	Stock	**G5AX183E**	TJ38050
	5½	(140.0)	240	525	91	(14)	0.15	(0.068)	Standard	**G5JX64C**	TJ38055
	6	(152.0)	240	575	90	(14)	0.15	(0.068)	Standard	**G6AX222D**	TJ38060
	6½	(165.0)	240	625	93	(15)	0.16	(0.073)	Standard	**G6JX34C**	TJ38065
	7	(178.0)	240	675	92	(14)	0.17	(0.077)	Standard	**G7AX105C**	TJ38070
	7½	(191.0)	240	725	101	(16)	0.18	(0.082)	Standard	**G7JX36D**	TJ38075
	8	(203.0)	240	775	91	(14)	0.19	(0.086)	Stock	**G8AX202C**	TJ38080
½	3½	(89.0)	240	420	92	(14)	0.17	(0.077)	Stock	**J3JX103C**	TJ12035
	4	(102.0)	240	490	90	(14)	0.19	(0.086)	Stock	**J4AX372A**	TJ12040
	4½	(114.0)	240	550	80	(12)	0.20	(0.091)	Standard	**J4JX62C**	TJ12045
	5	(127.0)	240	625	89	(14)	0.22	(0.100)	Standard	**J5AX178B**	TJ12050
	5½	(140.0)	240	700	91	(14)	0.23	(0.104)	Standard	**J5JX54B**	TJ12055
	6	(152.0)	240	775	104	(16)	0.25	(0.113)	Standard	**J6AX412A**	TJ12060
	6½	(165.0)	240	850	104	(16)	0.26	(0.118)	Standard	**J6JX45C**	TJ12065
	7½	(191.0)	240	975	100	(16)	0.29	(0.132)	Stock	**J7JX88A**	TJ12075

Note: ¼ inch diameter heaters have Type J thermocouple, Style B (location at the end disk) with 36 inch swaged-in GGS leads.
⅜ and ½ inch heaters have Type J thermocouple, Style C (location in the end disk) with 36 inch swaged in GGS leads.

High-Temperature (HT) FIREROD® Heaters

The Watlow® HT FIREROD® heater has been especially designed for high temperature platen applications up to 1800°F (982°C). Both the HT FIREROD and standard FIRERODs utilize the same basic design principles. However, there are certain differences which are important in high temperature applications:

- HT FIRERODS are specially constructed with an end seal that is virtually airtight to reduce the effects of resistance wire oxidation
- The high temperature sheath is treated to improve its emissivity for better heat transfer

Using the HT FIREROD in an application suited for a standard FIREROD will not normally offer significantly longer heater life. The HT offers better life than the standard FIREROD **only** if the limits of the standard FIREROD are exceeded.

Performance Capabilities

- Platen temperatures to 1800°F (980°C)
- Maximum watt density to 100 W/in^2 (15.5 W/cm^2)
- Maximum voltage 277V~(ac) to ground
- Length tolerance: +0, -4 percent standard diameters; +0, -8 percent for special diameter

Made-to-Order Availability

Nominal Diameter in.	Actual Diameter in.	Max. Amperes
½	0.496 ± 0.004	10
⅝	0.580 ± 0.004 0.621 ± 0.004	23 23
¾	0.710 ± 0.004 0.746 ± 0.004	46 46
1	0.960 ± 0.004 0.996 ± 0.006	46 46

Contact your Watlow representative, for special diameter requests.



* First 2 in. (51 mm) at lead end must be kept below 1000°F (538°C)

Features and Benefits

High temperature seal

- Reduces exposure to the atmosphere which minimizes oxidation of the winding wires; the end result is longer life of the element

  Note: First 2 in. (51 mm) must be outside the platen in free air.

Incoloy® sheath

- Transfers heat more efficiently

High emissivity sheath

- Provides better heat transfer and longer life

Applications

- Thermo plastic
- Super plastic forming of titanium aircraft parts
- Diffusion bonding to laminate and shape titanium

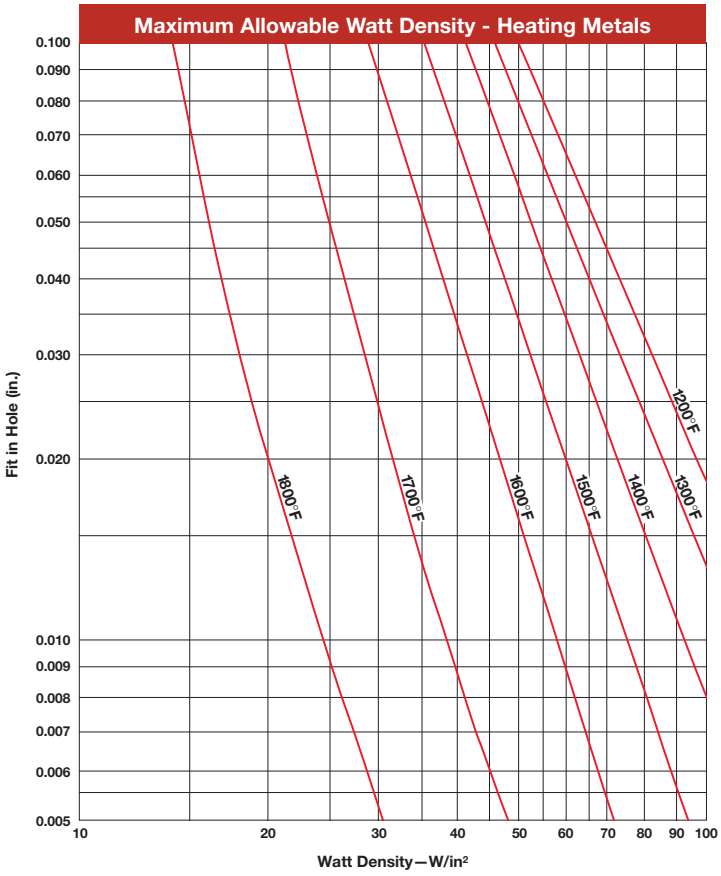
High-Temperature FIREROD Heaters

Applications and Technical Data

Options

- Thermocouples
- Independently controllable heat zones
- Distributed wattage
- Flanges
- Post terminals
- Conduit NEMA boxes
- Bent FIREROD

For consideration of the HT FIREROD for your application, use the recommended *Maximum Watt Density graph* to the right for these units.



How to Order

HT FIRERODs are available only as **made-to-order** units. To place an order, please specify:

- Diameter
- Overall length
- No-heat length, if greater than minimum
- Volts
- Watts
- Intended application and temperature
- Atmospheric information
- Lead length or terminal configuration
- Options including finishing, internal construction and mounting

Metric FIREROD® Cartridge Heaters



The Watlow® FIREROD® not only set the industry standard for cartridge heaters, it continues making improvements in construction and design. Among those improvements is the metric FIREROD, a variation of the FIREROD cartridge heater built to meet the exact specifications of the global market.

Like its counterpart, the metric FIREROD consistently outperforms other cartridge heaters because of design solutions such as its exclusive resistance wire winding process, bringing the resistance wire closer to the sheath and compacting the MgO insulation to maximize heat transfer. The end result is longer service life and better efficiency.

Performance Capabilities

- Part temperatures to 760°C (1400°F) on Incoloy® sheath
- Watt densities to 50 W/cm² (330 W/in²)

Features and Benefits

Nickel-chromium resistance wire precisely wound and centered in the unit

- Ensures even, efficient heat distribution to the sheath

Conductor pins metallurgically bonded to the resistance wire

- Ensures trouble-free electrical continuity

MgO insulation of specific grain and purity, swaged to the proper density

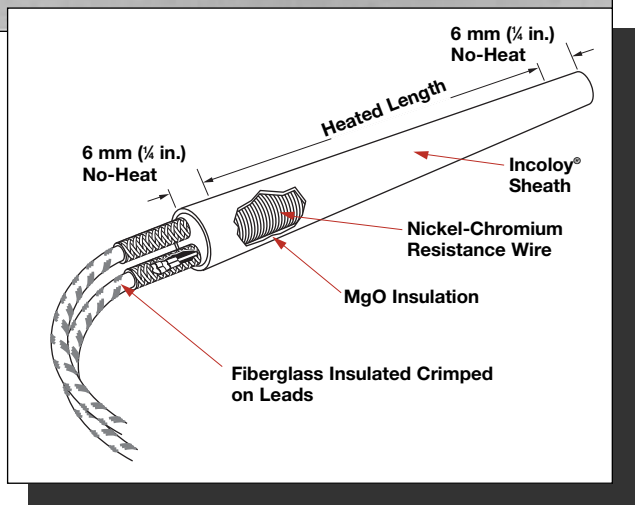
- Results in high dielectric strength and contributes to faster heat-up

Incoloy® sheath

- Resists oxidation and corrosion from chemicals, heat and atmospheres

Minimal spacing between the element wire and sheath

- Results in lower internal temperature
- Accommodates a design with fewer or smaller heaters operating at higher watt densities



Applications

- Molds
- Dies
- Platens
- Hot plates
- Sealings
- Gas and liquid heating

Metric FIREROD Cartridge Heaters

Applications and Technical Data

The *Electrical Data* table will assist you in selecting the correct metric FIREROD heater for your application, according to available voltage, amperage and wattage.

Electrical Data

Heater Diameter (mm)	6.5	8	10	12.5	16	20
Nominal Diameter (in.)	0.256	0.315	0.394	0.492	0.630	0.787
Max. Voltage	250	250	250	400	480	480
Crimped on Leads						
Max. Amperes	7.2	7.2	16.1	16.1	21	21
Max. Wattage @ 230V	1650	1650	3700	3700	4830	4830
Max. Wattage @ 400V				6440	8400	8400
Swaged-in Leads						
Max. Amperes	5.2/7.2 ①	5.2/7.2 ①	12.6	12.6	12.6/21 ①	21
Max. Wattage @ 230V	1190/1650	1190/1650	2880	2890	2890/4830	4830
Max. Wattage @ 400V	—	—	—	5040	5040/8400	8400

① On certain lead constructions, maximum amperes are 5.2 or 12.6. In these instances, amperes are determined by internal construction and the current carrying capacity of internal parts to the lead wire. For more information about these amperes restrictions or higher current requirements, please contact your Watlow representative.

Tolerances

Diameter: -0.02 mm, -0.08 mm (-0.0008 in., -0.0031 in.)

Length: ±2% with ±2.4 mm (±3⁄32 in.) min.

Wattage: +10%, -5%, wattage decreases approximately 5% with temperature. Wattage tolerances are for heaters at operating temperature.

Resistance: +5%, -10%, resistance is measured at room temperature following first heater operation.

Camber: 0.25 mm (0.01 in.) max. on any length to 300 mm (12 in.). For lengths over 300 mm:

$$\frac{[\text{Heater Length (mm)}]^2}{182{,}900}$$

Metric FIREROD Cartridge Heaters

Maximum Allowable Watt Density

The following four graphs detail maximum allowable watt densities for applications involving metal heating or steam, air and gas heating. Please review these respective graphs and applicable data to determine the correct watt density for your application.

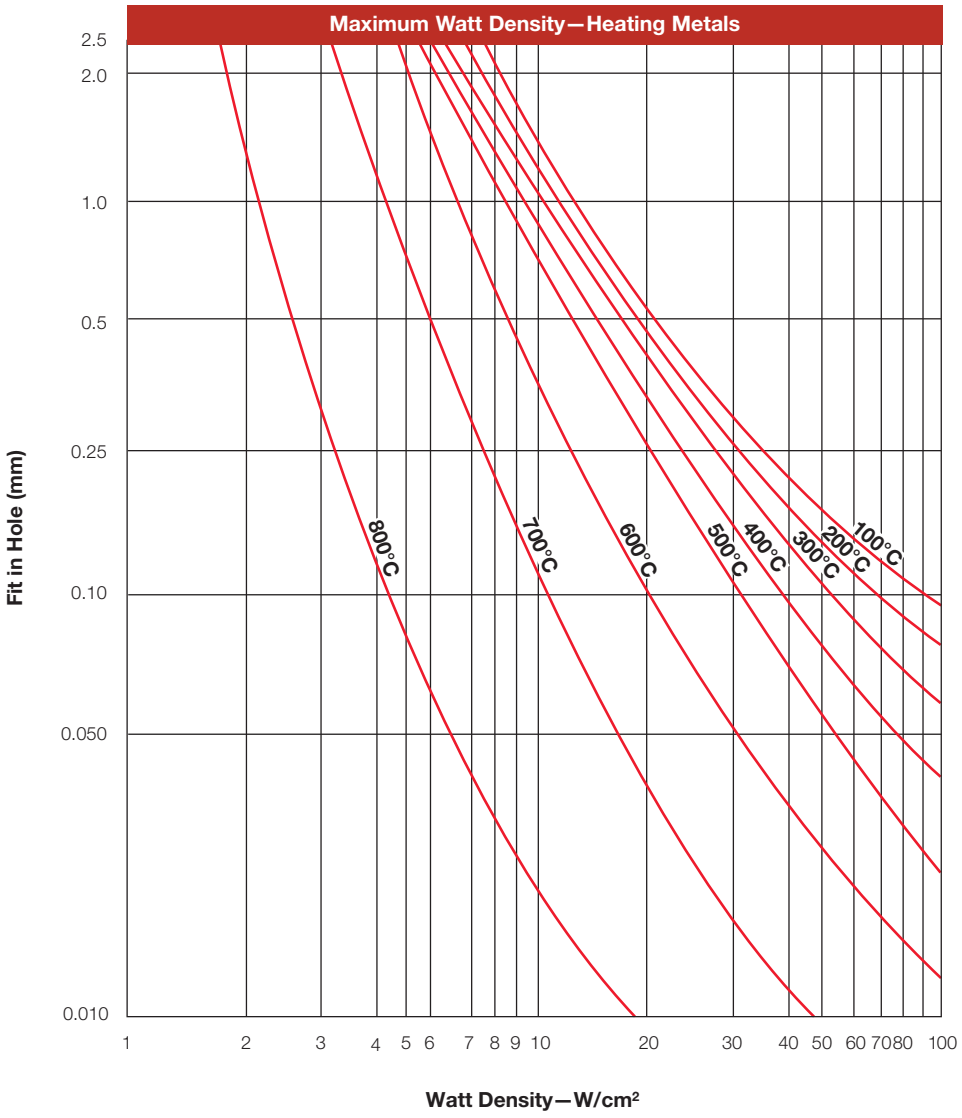
Heating Metals

The *Maximum Watt Density—Heating Metals* graph will tell you either the maximum hole fit or recommended watt density of the heater. Enter the chart with either known variable, part fit in hole dimension or watt density. Then, find the application temperature by reading up or over on the chart.

If the fit of the heater in the hole dimension is not known, it is easily determined. Subtract the minimum diameter of the metric FIREROD (nominal diameter minus tolerance) from the maximum hole diameter. For example, take a hole diameter of 16.1 mm minus a heater diameter of 16 mm - 0.08 mm. The hole fit would be 0.18 mm. For metric FIREROD heaters in square holes or grooves, contact your Watlow representative for fit in hole dimension.

Correction Factors:

Also note, the *Maximum Watt Density—Heating Metals* graph depicts metric FIRERODs used in steel parts. Therefore, for either stainless steel, aluminum or brass, refer to applicable correction factors ① and ②.



① For SS, enter the graph with a fit 0.04 mm (0.0015 in.) larger than actual.

② For aluminum and brass, enter the graph with a temperature 55°C (100°F) above actual temperature.

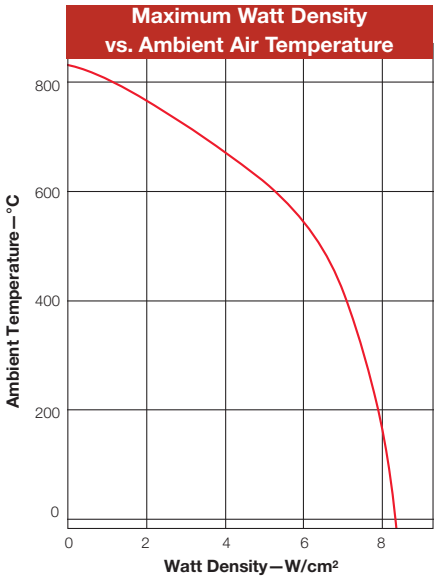
Metric FIREROD Cartridge Heaters

Maximum Allowable Watt Density *(Continued)*

Watt Density vs. Ambient Air

The *Watt Density vs. Ambient Air Temperature* graph shows the maximum allowable watt density when one metric FIREROD heater is operated in air or similar gas.

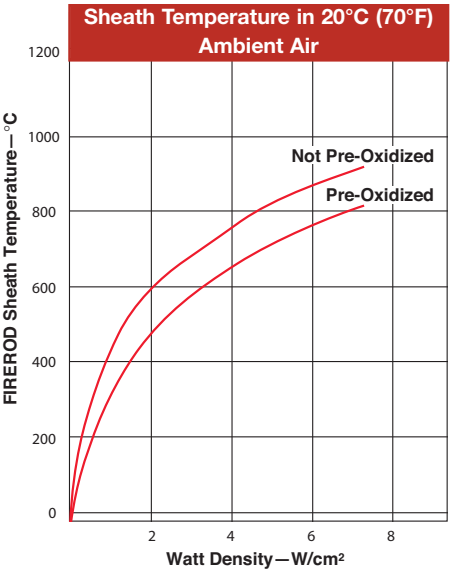
For metric FIRERODs grouped in a single row, with no less than one diameter between elements, multiply value from graph by 0.95. When a reflector is placed behind the heaters, multiply the maximum allowable watt density value from the graph by 0.85.



Sheath Temperature in Ambient Air

The *Sheath Temperature in Ambient Air* graph indicates the watt density required to bring a metric FIREROD heater to a given sheath temperature when operated in 20°C (70°F) ambient air.

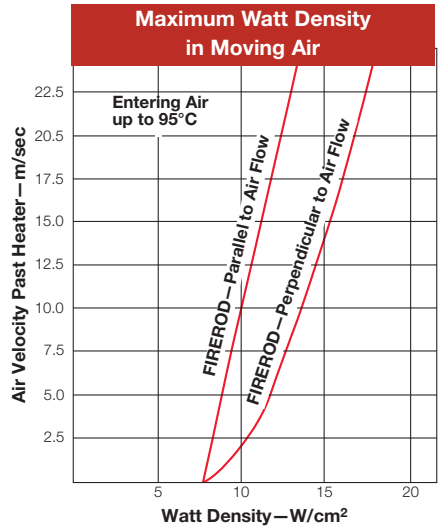
At 7 W/cm² (44 W/in²), the sheath temperature will be 790°C (1450°F). At this temperature, one year of heater life would be expected, provided that cycling is not too frequent. Higher temperatures would result in reduced heater life.



Watt Density in Moving Air

The *Watt Density in Moving Air* graph gives the maximum allowable watt density of a metric FIREROD heater in moving air.

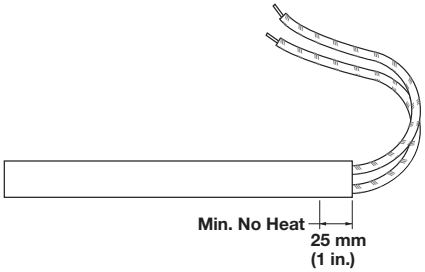
If the volumetric flow rate of air is known in m³/s (or CFM), divide this value by the net free area in m² (or ft²) around the heater to determine air flow velocity. The net free area is the total area of the enclosure minus the area occupied by the heater.



Metric FIREROD Cartridge Heaters

Termination Options

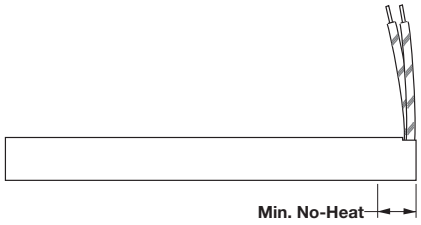
Swaged-in Flexible Leads



Swaged-in flexible leads, with silicone-fiberglass insulation, are recommended for applications in which the leads must be bent at the exit point from the heater. Unless longer length is specified, 250 mm (10 in.) leads are supplied.

Heaters 150 mm (6 in.) or shorter generally have a 6 mm (¼ in.) no-heat section. Heaters to 250 mm (10 in.) require a 25 mm (1 in.) no-heat section. Heaters greater than 250 mm may require more than a 25 mm no-heat section. To order, please specify **swaged-in flexible leads**.

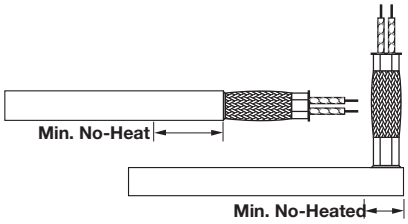
Right Angle Leads



Right angle leads are used in applications with a high degree of flexing and when space limitations are critical. Lead wires exit at a 90° angle through the side of the heater sheath. To order, specify **right angle leads** and lead length.

Metric FIREROD Diameter mm	Min No-Heat Length mm (in.)
6.5	15 (9/16)
8.0	15 (9/16)
10.0	17 (2/3)
12.5	18 (11/16)
16.0	20 (3/4)
20.0	21 (13/16)

Stainless Steel Braid



A stainless steel braid is designed to protect leads from abrasion against sharp edges. It is the most flexible of Watlow's protective lead arrangements.

When the leads exit straight out, the braid is swaged into the no-heat section of the heater. When the leads exit at a right angle, a crimp connector is used to attach the braids.

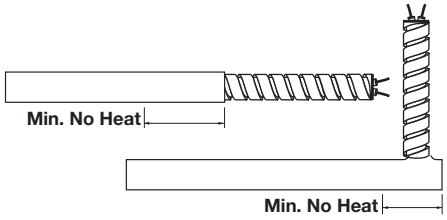
Unless otherwise specified, leads are 350 mm (14 in.) and the braid is 300 mm (12 in.) long. To order, specify either **straight or right angle stainless steel braid**, lead length and no-heat section.

Metric FIREROD Diameter mm	Min. No-Heat Length	
	Straight mm (in.)	Right Angle mm (in.)
6.5	30 (1⅛)	N/A
8.0	30 (1⅛)	15 (9/16)
10.0	30 (1⅛)	17 (2/3)
12.5	30 (1⅛)	18 (11/16)
16.0	30 (1⅛)	20 (3/4)
20.0	30 (1⅛)	21 (13/16)

Metric FIREROD Cartridge Heaters

Termination Options *(Continued)*

Stainless Steel Hose

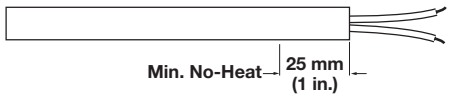


Stainless steel hose provides the best protection against abrasion from sharp edges or abrasive equipment. It also offers ease of handling and wiring in abrasive environments.

When the leads exit at a right angle to the heater, the hose is silver soldered to the sheath. Unless otherwise specified, leads are 350 mm (14 in.) long and the hose is 305 mm (12 in.) long. To order, specify **stainless steel hose**, lead length and no-heat section.

Metric FIREROD Diameter mm	Min. No-Heat Length		SS Hose O.D.
	Straight mm (in.)	Right Angle mm (in.)	mm (in.)
6.5	30 (1⅛)	N/A	4.7 (3⁄16)
8.0	30 (1⅛)	15 (9⁄16)	5.7 (7⁄32)
10.0	30 (1⅛)	17 (⅝)	7.6 (3⁄10)
12.5	30 (1⅛)	18 (1 1⁄16)	9.5 (⅜)
16.0	30 (1⅛)	20 (¾)	12.7 (½)
20.0	30 (1⅛)	21 (1 3⁄16)	15.8 (⅝)

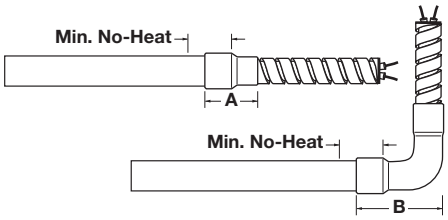
Teflon® Seal and Leads



Teflon® seal and leads protect the heater against moisture and contamination from lubricating oil, cleaning solvents, plastic material or fumes and organic tapes. This seal is effective to 200°C (400°F) under continuous operation.

Please note, when ordering this option, that a 25 mm (1 in.) minimum no-heat section is required to allow construction. Additional no-heat area may be required to keep the seal below effective temperatures. To order, specify **Teflon® seal and leads** and lead length.

Galvanized Conduit

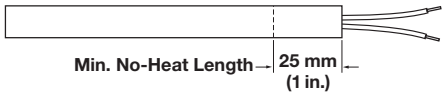


Galvanized conduit equals stainless steel hose in its abrasion protection.

The conduit is attached with 90° elbow copper coupler which overlaps the heater sheath. Unless specified, 250 mm (10 in.) leads are supplied. To order, specify **galvanized conduit**, lead length and no-heat section.

Metric FIREROD Diameter mm	Min. No-Heat Length mm (in.)	Dimension A mm (in.)	Dimension B mm (in.)	Galvanized Conduit O.D. mm (in.)
6.5	12 (7⁄16)	22 (⅞)	29 (1⅛)	10 (⅜)
8.0	12 (7⁄16)	22 (⅞)	29 (1⅛)	10 (⅜)
10.0	12 (7⁄16)	22 (⅞)	29 (1⅛)	10 (⅜)
12.5	12 (7⁄16)	28 (1⅛)	30 (1 3⁄16)	14 (½)
16.0	12 (7⁄16)	28 (1⅛)	34 (1 5⁄16)	14 (½)
20.0	12 (7⁄16)	29 (1⅛)	36 (1 7⁄16)	16 (⅝)

Silicone Rubber Seal and Leads



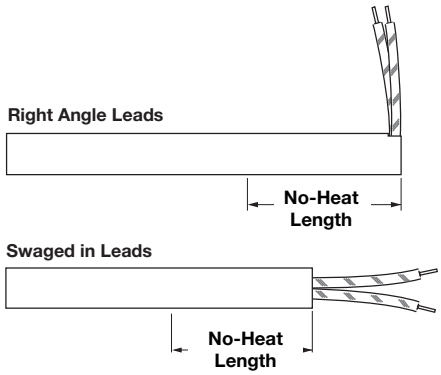
Silicone rubber seals and leads protect the heater against moisture and contamination from lubricating oil, cleaning solvents, plastic material or fumes and organic tapes. This seal is effective to 230°C (450°F) under continuous operation. Epoxy potting for up to 260°C (500°F) for continuous operation is available upon request.

Please note, when ordering this option, that a 25 mm (1 in.) minimum no-heat section is required to allow for construction. Additional no-heat may be required to keep the seal below effective temperatures. To order, specify **silicone or epoxy seal and leads** and lead length.

Metric FIREROD Cartridge Heaters

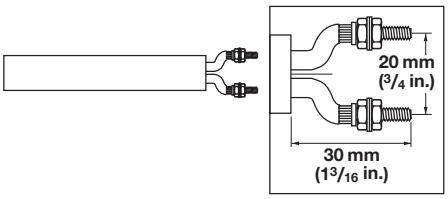
Termination Options *(Continued)*

No-Heat Section



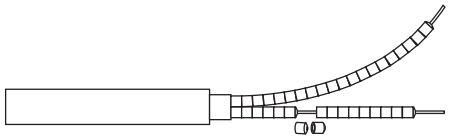
No-heat sections are recommended in applications where leads may be exposed to excessive heat, thus requiring a cooler lead end. Also use when heat is not required along the entire length of the metric FIREROD. No-heat extensions are available on all diameters with both pin style and swaged-in leads. To order, specify **no-heat** section and length of no-heat.

Post Terminals



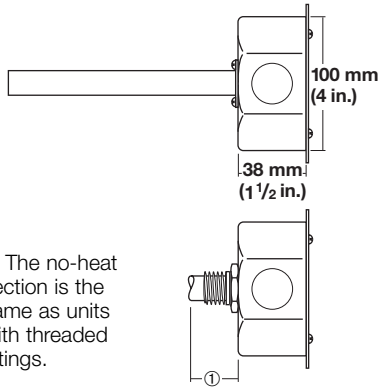
Post terminals provide a quick, secure connection with ring or fork connectors or bus bars. Threaded M4 x 12 mm studs are soldered to the solid power pins. Nuts and washers are provided. This termination is available on 16 and 20 mm (0.63 and 0.79 in.) diameter units. To order, specify **post terminals.**

Ceramic Bead Insulation



Ceramic bead insulation protects the leads from high temperature ambients above 450°C (840°F). The beads fit over solid conductors that are extended long enough to reach a cooler area where flexible wires can be attached. To order, specify **ceramic bead insulation.**

Terminal Box



NEMA 1, NEMA 4 (moisture-proof) and NEMA 7 (explosion-proof) octagonal terminal boxes can be mounted to a flange or threaded fitting on the 12.5, 16 and 20 mm diameter units. These 100 mm (4 in.) terminal boxes have conduit knockouts to protect electrical connections.

Aluminum and macrolon plastic terminal boxes are also available in the following sizes:

- 50 x 50 x 30 mm nominal size for heaters to 10 mm in diameter;
- 80 x 80 x 55 mm nominal size for heaters 12.5 mm or larger in diameter.

To order, specify **terminal box**, NEMA type and/or material type.

Metric FIREROD Cartridge Heaters

Options

Accessories

WATLUBE

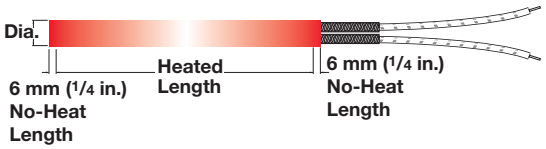
WATLUBE is an electrically non-conductive lubricant that acts as a barrier against high-temperature oxidation, thus making heater removal easier. In addition, it aids in the transfer of heat from the metric FIREROD to the block. However, do not use it as a substitute for proper hole fit. WATLUBE is packaged in 118 ml (4 oz) bottles. To order, specify **WATLUBE**.

External Finishing

Centerless Grinding

Centerless grinding can be used to finish precision diameters, thus permitting closer heater-to-part fit and higher watt densities. Centerless grinding of metric FIREROD heaters with swaged-in flexible leads is limited to 305 mm (12 in.) lead length. Longer lead lengths are available, but require external connection. To order, specify **centerless grinding**.

Distributed Wattage



Distributed wattage varies the watt density along the length of the heater. This construction technique is used to compensate for heat losses along the edges of heated parts. To order, specify **distributed wattage** and give the length and wattage for each section.

Individually Controlled Heat Zones

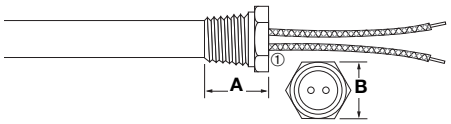
Individually controlled heat zones give the flexibility of controlling temperature by zones, along the length of the metric FIREROD. This is an advantage for heating requirements of certain applications, like seal bars. This internal construction can be ordered on 12.5, 16 and 20 mm diameter units. If not specified, 250 mm crimped on leads will be supplied. To order, specify **individually controlled heat zones** as well as length and wattage per zone and length of crimped on leads.

Dual Voltage

When the metric FIREROD requires the flexibility of operating on two voltages, use this internal construction. Dual voltage is available on 12.5, 16 and 20 mm diameter units. If not specified, 250 mm crimped on leads will be supplied. To order, specify **dual voltage**, voltage requirements and length of crimped on leads.

Threaded Fittings

DIN Thread Size



Metric FIREROD Diameter mm	Min. No-Heat Length mm (in.)	Thread Size DIN 13	A mm (in.)	B mm (in.)	Length of Threaded Section
6.5	16 (5/8)	M10 X 1.0	10.0 (3/8)	12 (7/16)	6.0 (1/4)
8.0	16 (5/8)	M12 X 1.0	11.0 (7/16)	14 (1/2)	6.5 (1/4)
10.0	18 (11/16)	M14 X 1.5	11.5 (7/16)	17 (5/8)	6.5 (1/4)
12.5	19 (3/4)	M16 X 1.5	12.0 (7/16)	19 (3/4)	6.5 (1/4)
16.0	20 (3/4)	M20 X 1.5	15.0 (9/16)	24 (15/16)	9.0 (3/8)
20.0	22 (7/8)	M26 X 1.5	16.0 (5/8)	30 (1 3/16)	10.0 (3/8)

① Swaged in unit pictured.

National Pipe Thread (NPT) Thread Size

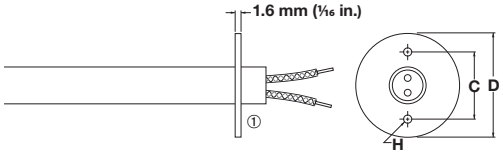
Threaded fittings allow for fast, water-tight installation of the heater into a threaded hole. These fittings can be ordered in either brass or stainless steel. Double threaded fittings are also available. See dimensions noted on the *DIN Thread Size and NPT Thread Size* charts or contact your Watlow representative if you need to exceed limitations shown.
To order, specify stainless steel **threaded fittings**.

Metric FIREROD Diameter mm	Min. No-Heat Length mm (in.)	Thread Size NPT (in.)	A mm (in.)	B mm (in.)	Length of Threaded Section
6.5	19 (3/4)	(1/8)	13.5 (1 1/20)	11.0 (7/16)	9.5 (3/8)
8.0	22 (7/8)	(1/4)	17.0 (5/8)	14.0 (1/2)	13.0 (1/2)
10.0	22 (7/8)	(1/4)	17.0 (5/8)	14.0 (1/2)	13.0 (1/2)
12.5	25 (1)	(3/8)	20.0 (7/8)	17.5 (1 1/16)	14.0 (1 1/20)
16.0	28 (1 1/8)	(1/2)	23.0 (9/10)	22.0 (15/16)	16.0 (5/8)
20.0	32 (1 1/4)	(3/4)	26.0 (1)	29.0 (1 1/8)	19.0 (3/4)

Metric FIREROD Cartridge Heaters

Options *(Continued)*

Flanges



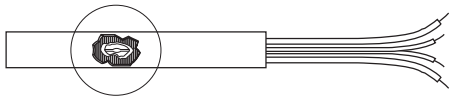
Stainless steel flanges are a convenient mounting method as well as a way to position a heater within an application. These flanges can be located in any no-heat section of the heater sheath. To order, specify **flange**, flange size and location.

Metric FIREROD Diameter mm	Flange Size	D mm (in.)	C mm (in.)	H mm (in.)
6.5, 8, 10,12.5, 16	FS	25 (1)	19.0 (¾)	4.3 (⅜)
6.5, 8, 10, 12.5, 16, 20	FM	38 (1½)	28.5 (1⅛)	4.3 (⅜)
16, 20	FL	51 (2)	38.0 (1½)	5.3 (⅜)

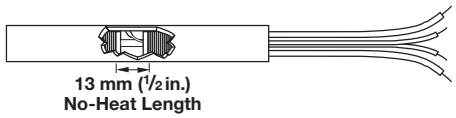
① Swaged-in unit pictured.

Internal Thermocouple Sensors

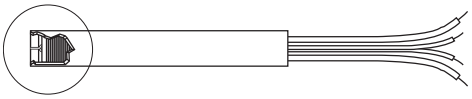
Style A



Style B



Style C



The **Style A** internal thermocouple can be used to evaluate heat transfer efficiency of an application, a measure enabling a customer to cut energy costs and increase heater life.

The **Style B** internal thermocouple gives a good approximation of part temperature and is only available for diameters 8 mm and above. The thermocouple junction can be in contact with the inside of the heater sheath, located in the 13 mm (½ in.) no-heat section anywhere along the heater length.

A **Style C** internal thermocouple is useful in applications where material flows past the end of the heater, as in plastic molding. This junction is embedded in a special end disc. Style C is not available on 20 mm diameter units. Unless requested, the disc end is not mechanically sealed.

To order, specify **internal thermocouple Style A, B** or **C** and thermocouple **Type J** or **K**. If not specified, 250 mm (10 in.) thermocouple leads are supplied.

Thermocouple Types

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

For other thermocouple types, contact your Watlow representative.

Metric FIREROD Cartridge Heaters

Options *(Continued)*

How to Order

Metric FIREROD cartridge heaters are available as **made-to-order** units only. To order, please specify:

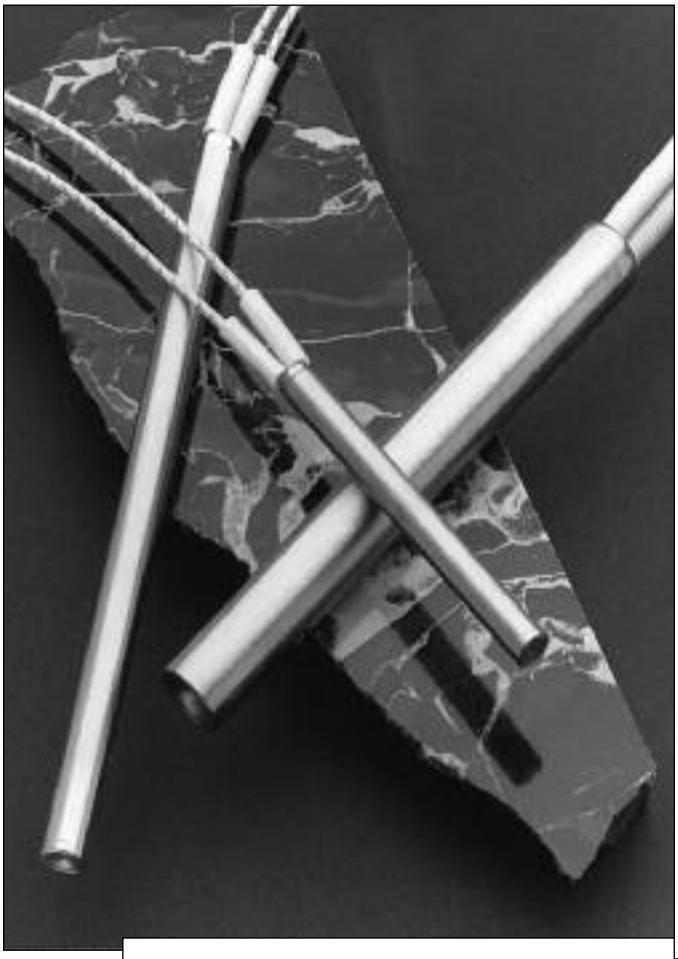
- Diameter
- Overall length
- Volts
- Watts
- Lead type and length or terminal configuration
- Options

Availability

Made-to-Order: Shipment within three weeks

Metric EB Cartridge Heaters

The Watlow® EB cartridge heater is a proven performer like the metric FIREROD®. That is because the same quality materials go into its construction; MgO insulation, nickel-chromium resistance wire, silicone-fiberglass insulated lead wires. The only difference is that the EB cartridge is packaged in a more economical design. Instead of having the high-watt density capabilities of a metric FIREROD, it's made for medium-watt density applications.



Performance Capabilities

- Part temperatures to 600°C (1100°F)
- Maximum watt density to 30 W/cm² (190 W/in²)
- Maximum voltage to 480V~(ac)

Features and Benefits

MgO insulation compacted to proper density

- Results in high dielectric strength and contributes to faster heat-up

Nickel-chromium resistance wire precisely wound through the heated length

- Ensures even, efficient distribution of heat to the sheath

Metallurgically-bonded conductor pins crimp connected to the resistance wires

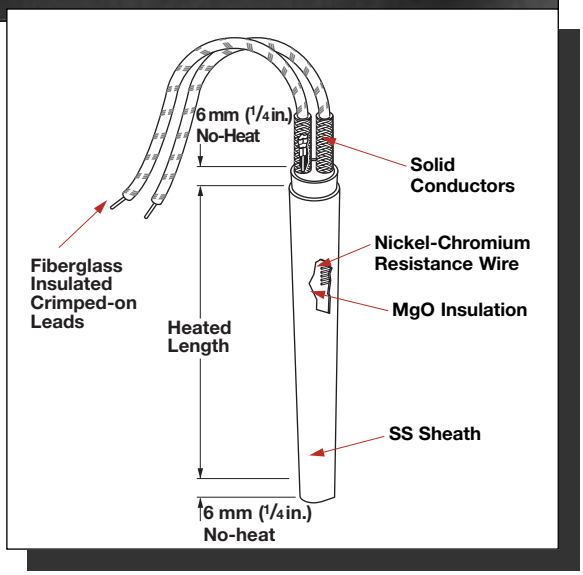
- Ensures trouble-free electrical continuity, this process provides lead flexibility just 8 mm (5⁄16 in.) from the end of the heater

Flexible stranded wires with silicone-fiberglass sleeve

- Insulates the wires to temperatures of 450°C (840°F)

Optional lead end with silicone rubber seal

- Protects the leads against moisture and other contaminants



Applications

- Plastic injection molds, dies and sealing jaws
- Hot melt systems, labeling
- Industrial and textile manufacturing equipment

Metric EB Cartridge Heaters

Applications and Technical Data

Maximum Allowable Watt Density

Both the *Maximum Allowable Watt Density* metric and inch-base charts will tell either the hole fit or recommended watt density in relationship to part temperature. Enter the chart with either known variable, part fit in hole dimension or watt density. Then, find the part temperature by reading up or over on the chart. The part temperature curves shown are measured 13 mm (½ in.) from the heater in a mild steel block. For stainless steel blocks, enter the graph with a fit of 0.04 mm (0.0015 in.) larger than actual. For aluminum and brass blocks, enter the graph with a temperature 55°C (100°F) above actual block temperature.

On-Off Cycling: On-off cycling shortens heater life. If the heater cycles more than once per hour, multiply the watt density (shown on the chart) by 0.8 to determine the maximum allowable watt density for the application. If the heater cycles more than once a minute, multiply by 0.7.

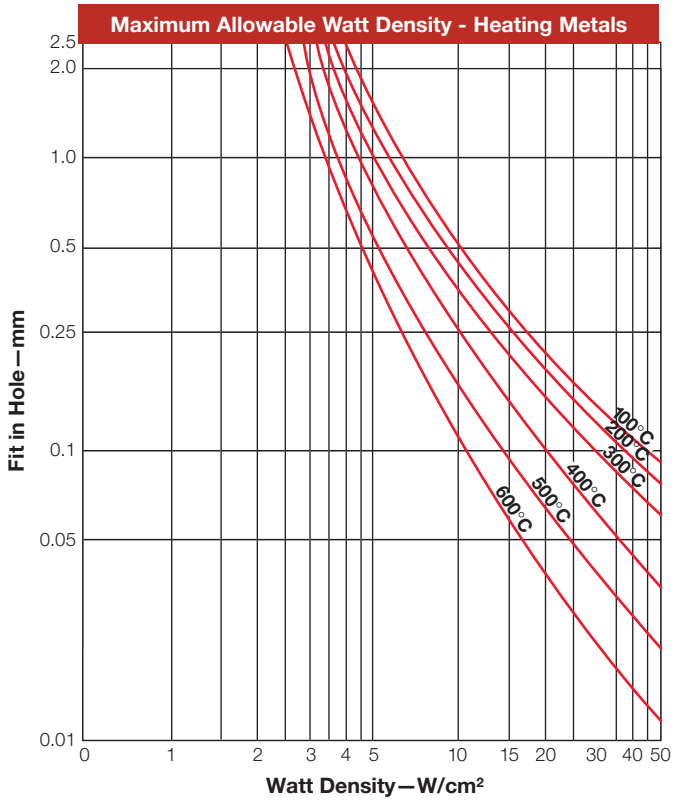
Tolerances

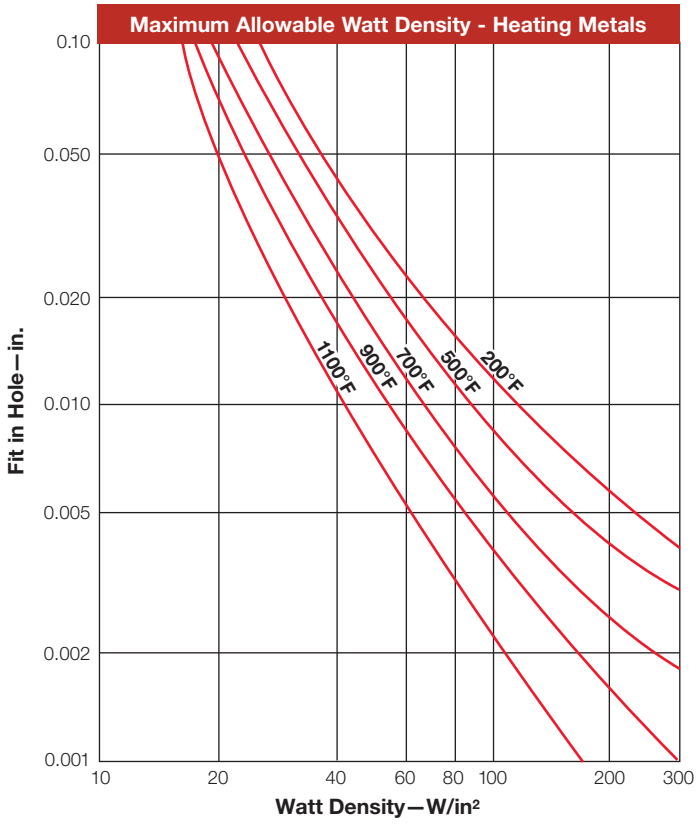
Diameter: -0.02 mm, -0.08 mm (-0.0008 in., -0.0031 in.)

Length: ±3% with ±2.4 mm (±3⁄32 in.) min.

Resistance: +5%, -10%, resistance is measured at room temperature following first heater operation.

Wattage: +10%, -5%, wattage decreases approximately 5% with temperature. Wattage tolerances are for heaters at operating temperature.





Metric EB Cartridge Heaters

Applications and Technical Data *(Continued)*

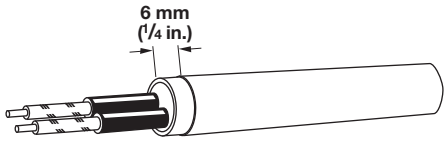
Dimensional and Electrical Data

Heater Diameter (mm)	6.5	8	10	12.5	16	20
Nominal Diameter (in.)	0.256	0.315	0.394	0.492	0.630	0.787
Max. Voltage	250	250	250	400	480	480
Crimped-on Leads						
Max. Amperes	7.2	7.2	7.2	16.1	21	21
Max. Wattage @ 230V	1650	1650	1650	3700	4830	4830
Max. Wattage @ 400V				6440	8400	8400
Swaged-in Leads						
Max. Amperes	5.2/7.2 ①	7.2	7.2	12.6	12.6/21 ②	21
Max. Wattage @ 230V	1190/1650	1650	1650	2890	2890/4830	4830
Max. Wattage @ 400V	—	—	—	5040	5040/8400	8400

① On certain lead construction, maximum amperes are 5.2A. Please contact your Watlow representative.
② On certain lead construction, maximum amperes are 12.6A. Please contact your Watlow representative.

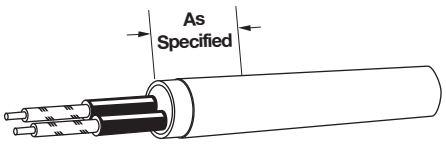
Termination Options

Crimped-on Lead



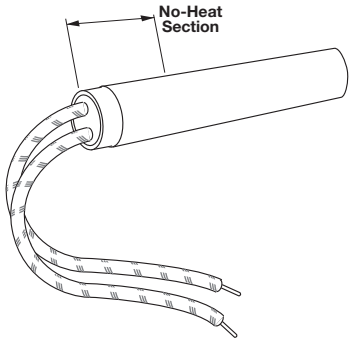
Crimped-on leads with a 6 mm (¼ in.) no-heat section are recommended for applications where the lead wire temperature does not exceed 450°C (840°F). Unless a longer length is specified, 250 mm (10 in.) leads will be supplied. To order, request **crimped-on leads** and desired lead length.

No-Heat Zone



A no-heat section can be used to extend the leads safely into a cool zone in a high-temperature application. Leads should be kept below 250°C (480°F) for maximum service life. To order, specify **no-heat zone** and length of no-heat section.

Swaged-in Flexible Lead

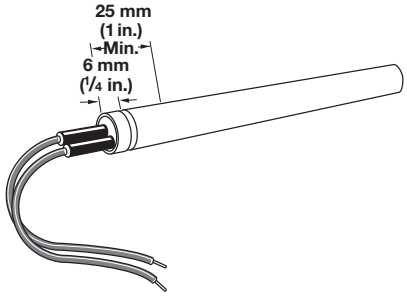


Swaged-in, flexible leads (with a silicone-fiberglass insulation) are recommended for applications where the leads must be bent at the exit point from the heater. Unless longer length is specified, 250 mm (10 in.) leads are supplied. Heaters 140 mm (5.5 in.) or shorter generally have a 6 mm (¼ in.) no-heat section. Heaters to 250 mm (10 in.) require a 25 mm (1 in.) no-heat section. Heaters greater than 250 mm may require more than a 25 mm (0.98 in.) no-heat section. To order, please specify **swaged-in, flexible leads.**

Metric EB Cartridge Heaters

Termination Options

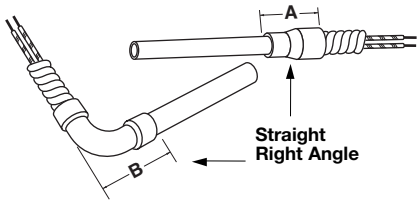
Moisture-Resistant Seal



Silicone rubber, moisture-resistant seals can be provided at the lead end to virtually seal the heater. This seal is rated to 230°C (450°F) continuous operation.

A 25 mm (1 in.) no-heat section is required at the lead end. Solid pin leads exit through the seal with crimped-on silicone rubber insulated lead wires and silicone rubber sleeves extending into the seal. Swaged-in leads are also an option where flexibility at the lead exit is required. To order specify, **silicone rubber moisture-resistant seal** and either **crimped-on** or **swaged-in leads**.

Galvanized Conduit



Flexible galvanized conduit can be installed over the leads for abrasion protection. It is attached with either a straight or 90° elbow copper coupler. The copper coupler overlaps the heater sheath by 6 mm (¼ in.). A no-heat section is required. To order, specify **galvanized conduit, straight** or **right angle.**

Stainless Steel Hose

Stainless steel hose also protects leads against abrasion. It is attached with a straight or 90° elbow copper coupler. The copper coupler overlaps the heater sheath by 6 mm (¼ in.). It can also be swaged-in straight or silver soldered to the heater sheath at a right angle. A no-heat section is required. To order, specify **stainless steel hose, straight** or **right angle with copper coupler, straight swaged-in** or **right angle silver soldered.**

Galvanized Conduit and Stainless Steel Hose Dimensions

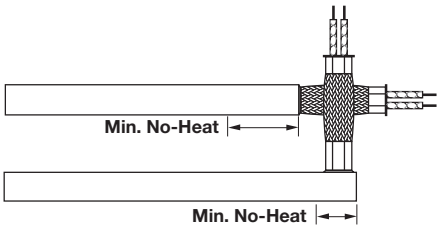
Heater Diameter mm	Min. No-Heat Length mm (in.)	Dimension A mm (in.)	Dimension B mm (in.)	Galvanized Conduit O.D. mm (in.)	SS Hose O.D. mm (in.)
6.5	12 (7/16)	22 (7/8)	29 (1 1/8)	10 (3/8)	4.7 (3/16)
8.0	12 (7/16)	22 (7/8)	29 (1 1/8)	10 (3/8)	5.7 (7/32)
10.0	14 (1/2)	22 (7/8)	29 (1 1/8)	10 (3/8)	7.6 (3/10)
12.5	16 (5/8)	28 (1 1/8)	30 (1 3/16)	14 (9/16)	9.5 (3/8)
16.0	19 (3/4)	28 (1 1/8)	34 (1 3/8)	14 (9/16)	12.7 (1/2)
20.0	22 (7/8)	29 (1 1/8)	36 (1 7/16)	16 (5/8)	15.8 (5/8)

Dimensions are shown for designs with copper coupler only.

Metric EB Cartridge Heaters

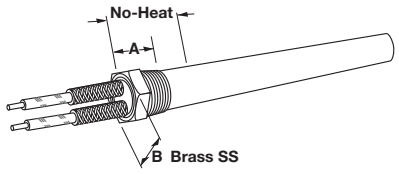
Termination Options *(Continued)*

Stainless Steel Braid



Like a stainless steel hose, stainless steel braid also protects against abrasion. Stainless steel braid is swaged-in straight or crimped-on to the heater at a right angle. Metal braid is recommended when excellent flexibility with good physical protection is needed. A no-heat section is required. To order, specify **stainless steel braid, straight** or **right angle.**

Threaded Fitting



Either brass or stainless steel threaded fittings for screw-in mounting can be added to units having moisture-resistant seals. Available dimensions are shown on the *Thread Size* charts. To order, please request **brass** or **stainless steel threaded fittings** and location on the heater. **Note:** For liquid immersion applications, please also specify **heavy weld end disc**.

DIN Thread Size

Heater Diameter mm	Min. No-Heat Length mm (in.)	Thread Size DIN 13	Dimension A mm (in.)	Dimension B mm (in.)	Length of Threaded Section mm (in.)
6.5	16 (5/8)	M 10 X 1	10.0 (3/8)	12 (7/16)	6.0 (1/4)
8.0	16 (5/8)	M 12 X 1	11.0 (7/16)	14 (1/2)	6.5 (1/4)
10.0	18 (11/16)	M 14 X 1.5	11.5 (7/16)	17 (5/8)	6.5 (1/4)
12.5	19 (3/4)	M 16 X 1.5	12.0 (7/16)	19 (3/4)	6.5 (1/4)
16.0	20 (3/4)	M 20 X 1.5	15.0 (9/16)	24 (15/16)	9.0 (3/8)
20.0	22 (7/8)	M 26 X 1.5	16.0 (5/8)	30 (1 3/16)	10.0 (3/8)

NPT Thread Size

Heater Diameter mm	Min. No-Heat Length mm (in.)	Thread Size NPT in.	Dimension A mm (in.)	Dimension B mm (in.)	Length of Threaded Section mm (in.)
6.5	19 (3/4)	1/8	13.5 (11/20)	11.0 (7/16)	9.5 (3/8)
8.0	22 (7/8)	1/4	17.0 (5/8)	14.0 (1/2)	13.0 (1/2)
10.0	22 (7/8)	1/4	17.0 (5/8)	14.0 (1/2)	13.0 (1/2)
12.5	25 (1)	3/8	20.0 (7/8)	17.5 (11/16)	14.0 (11/20)
16.0	28 (1 1/8)	1/2	23.0 (9/10)	22.0 (7/8)	16.0 (5/8)
20.0	32 (1 1/4)	3/4	26.0 (1)	29.0 (1 1/8)	19.0 (3/4)

Metric EB Cartridge Heaters

Options

Internal Thermocouple

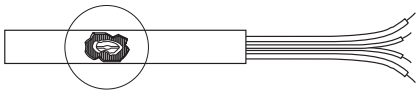
Style A is used to evaluate heat transfer efficiency of an application. The junction is located in the heater core to monitor the internal temperature of the heater.

Style B approximates part temperature and is available for diameters 8 mm (5⁄16 in.) and above. The thermocouple junction can be in contact with the inside of the heater sheath, located in the 13 mm (½ in.) no-heat section anywhere along the heater length.

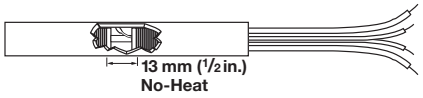
Style C is useful in applications where material flows past the end of the heater. This junction is embedded in a special end disc. Type C is available only on 6.5, 8, 10, 12.5 and 16 mm diameter units. Unless requested, the disc end is not mechanically sealed.

To order, specify **internal thermocouple**, **Style A, B** or **C** and **thermocouple ASTM Type J** or **K**. If not specified, 250 mm (10 in.) thermocouple leads are supplied.

Style A



Style B



Style C



Thermocouple Types

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

For other ASTM types, contact your Watlow representative.

How to Order

For **made-to-order** units, please specify:

- Diameter
- Overall length
- Volts
- Watts
- Termination options, and length of leads

Availability

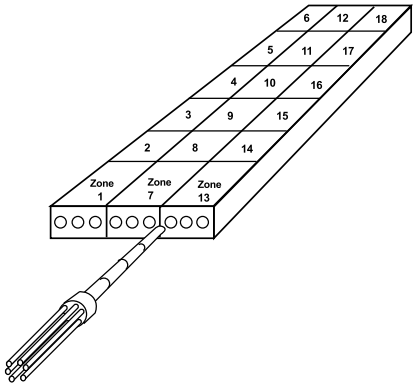
Made-to-Order: Shipment within three weeks

MULTICELL Heaters

The advanced design of the MULTICELL insertion heater from Watlow® offers three major advantages: extreme process temperature capability, independent zone control for precise temperature uniformity and loose fit design for easy insertion and removal.

Performance Capabilities

- Engineered to achieve sheath temperatures up to 2050°F (1120°C)
- Up to eight independently controllable zones



Features and Benefits

Multiple, independently controllable zones

- Allows process temperature uniformity not possible with any other single sheathed heater

Radiant design of heater

- Allows for loose insertion in boiling holes and piping holes
- Permits easy removal and replacement with minimal down time since it will not bind or seize in the hole

Oxidized sheath

- Provides high emissivity and improves the heater's performance as oxidation increases

Individually metal-sheathed coils swaged into a larger, high temperature alloy other sheath

- Provides maximum protection against element burnout through the outer sheath

Quick disconnect plug and jack

- Permits fast replacement of individual elements while the press stays at operating temperature

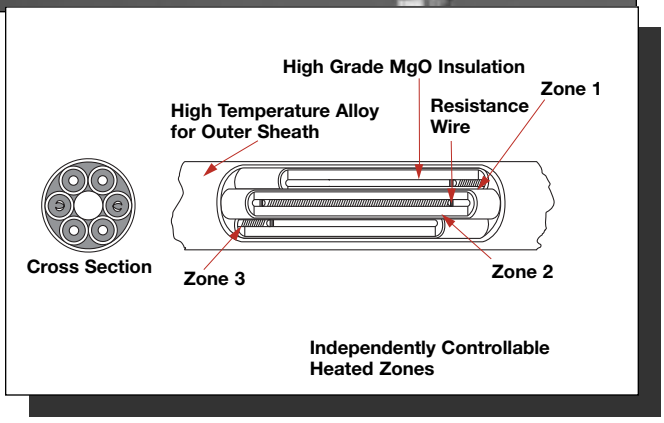
Special bending capabilities

- Solves unusual machinery needs and keeps leads away from heated zones

Flexible leads up to 986°F (530°C)

- Protects termination from high temperature environment





Applications

- Hot isothermal forming
- Soil remediation
- Hot forging dies
- Heated platens
- Super plastic forming
- Heated platens (single and multiple zones)
- Heat treating processes
- Super plastic forming with diffusion bonding

MULTICELL Heaters

Applications and Technical Data

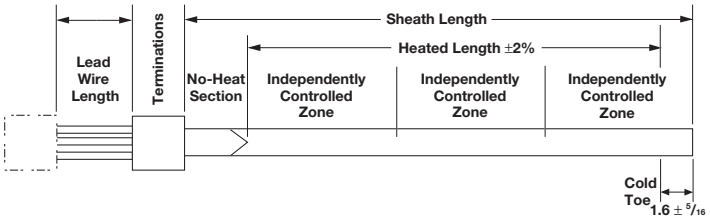
Definition of Terms

Cold Toe: A physical minimum requirement of 1⅝ ± 5/16 inch

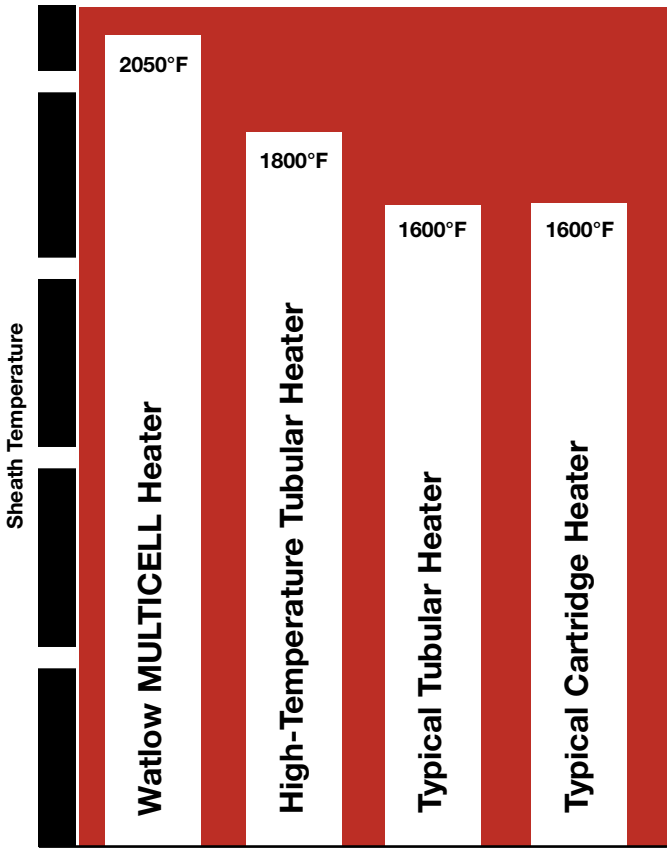
Independent Zone: Up to three, separately controlled zones which can be of varying lengths and wattages

Heated Length: The combined sum of all independent zones

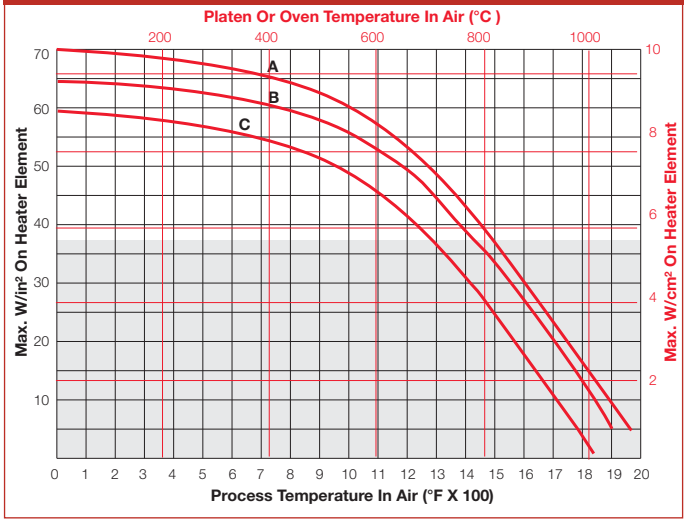
Wattage: Ratings are the combined sum of all independent zones



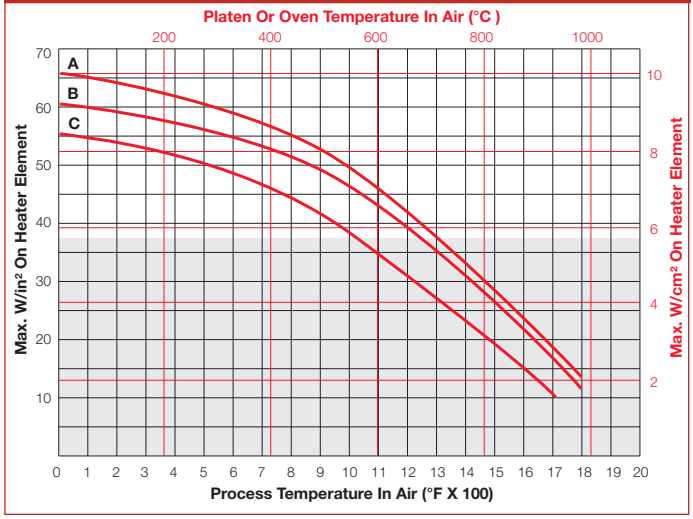
MULTICELL Heaters: The High Temperature Choice



Maximum Allowable Watt Density Single Zone ①



Maximum Allowable Watt Density Three Zone ①



A = 6 cell, 0.935 in. diameter, 240V~(ac), 3-phase
B = 6 cell, 0.685 in. diameter, 240V~(ac), 3-phase
C = 6 cell, 0.935 in. diameter, 480V~(ac), 3-phase

Note: Shaded area is standard, non-shaded area contact your Watlow representative.

① Other designs and voltages with higher temperature capabilities are available, Contact your Watlow representative.

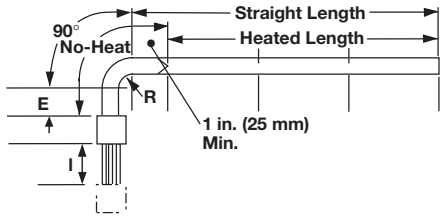
MULTICELL Heaters

Applications and Technical Data (Continued)

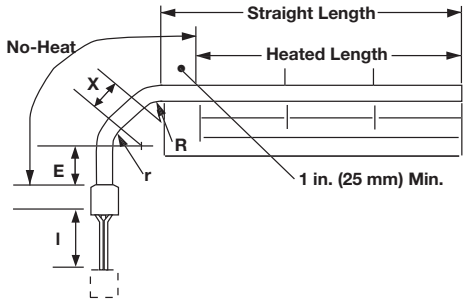
Physical Design Parameters

All bending of a MULTICELL heater is restricted to the cold area of the heater. All bend radii points must be 1 in. (25 mm) from the hot/cold junction.

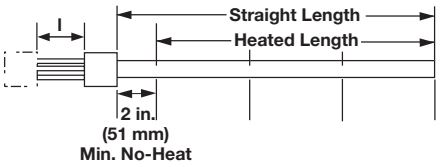
"L"



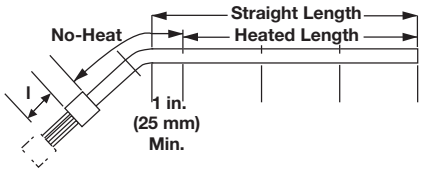
Droop



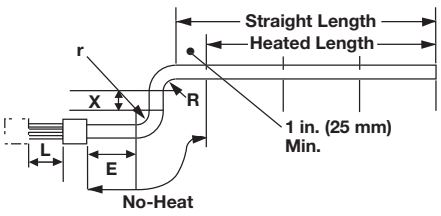
Straight



Angle



Crank



0.935 Inch Diameter MULTICELL Heater

Diameter in.	Bending Style	Sheath Length Min./Max. in. (mm)	Min. No-Heat Length in. (mm)	Total Heated Length Min./Max. in. (mm)
0.935	Straight	14 (356)	Contact Watlow	6 (152.0)
		225 (5715)	Contact Watlow	160 (4064.0)
0.935	Angle	17 (432)	Contact Watlow	6 (152.0)
		225 (5715)	Contact Watlow	172½ (4382.0)
0.935	L	18 (457)	Contact Watlow	6 (152.0)
		225 (5715)	Contact Watlow	170¼ (4324.4)
0.935	Crank	23 (584)	Contact Watlow	6 (152.0)
		225 (5715)	Contact Watlow	163 (4140.0)
0.935	Droop	18 (457)	Contact Watlow	6 (152.0)
		225 (5715)	Contact Watlow	168 (4267.0)

Symbol	E	r	X	R	I
Min. Length in. (mm)	4 (102)	2½ (38)	1½ (38)	2½ (38)	12 (305)

Zones	1	2	3
Min. Heated in. (mm)	6 (152)	6 (152)	6 (152)

0.685 Inch Diameter MULTICELL Heater

Diameter in.	Bending Style	Sheath Length Min./Max. in. (mm)	Min. No-Heat Length in. (mm)	Total Heated Length Min./Max. in. (mm)
0.685	Straight	14 (356)	Contact Watlow	6 (152)
		225 (5715)	Contact Watlow	178 (4521)
0.685	Angle	17 (432)	Contact Watlow	6 (152)
		225 (5715)	Contact Watlow	173½ (4407)
0.685	L	18 (457)	Contact Watlow	6 (152)
		225 (5715)	Contact Watlow	172 (4369)
0.685	Crank	18 (457)	Contact Watlow	6 (152)
		225 (5715)	Contact Watlow	163 (4267)
0.685	Droop	15½ (394)	Contact Watlow	6 (152)
		225 (5715)	Contact Watlow	170 (4331)

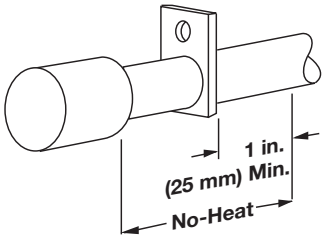
Symbol	E	r	X	R	I
Min. Length in. (mm)	4 (102)	1½ (38)	1½ (38)	1½ (38)	12 (305)

Zones	1	2	3
Min. Heated in. (mm)	6 (152)	6 (152)	6 (152)

MULTICELL Heaters

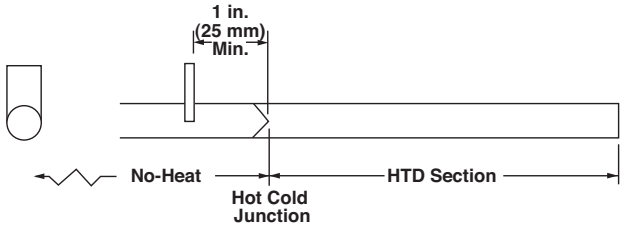
Applications and Technical Data (Continued)

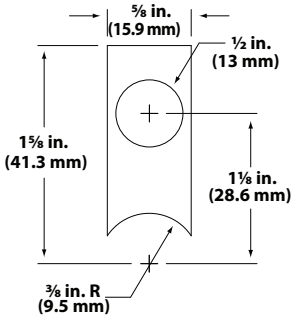
Tab Styles



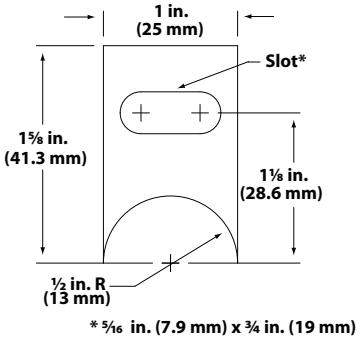
Full View

Weldments to the MULTICELL Heater Element



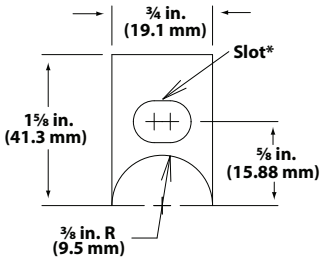


Style S1



* 5⁄16 in. (7.9 mm) x ¾ in. (19 mm)

Style S2

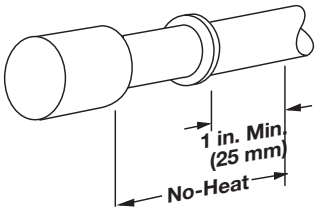


* 5⁄16 in. (7.9 mm) x 7⁄16 in. (11.1 mm)

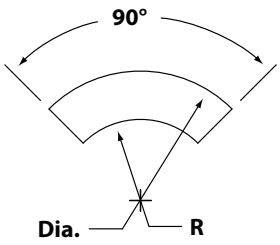
Style S3

Tabs and rings are used to hold the heater in place and keep it from creeping.

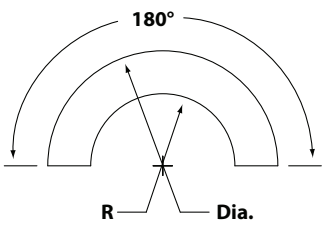
Ring Styles



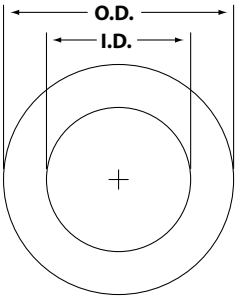
Full View



Style S4



Style S5

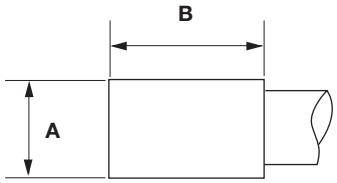


Style H1

MULTICELL Heaters

Termination Standards

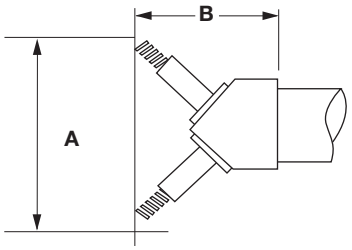
Potting Sleeves



Heater O.D. in.	Dimension A in. (mm)	Dimension B in. (mm)	Zone	Phase	Type No.
0.685	¾ (19)	1½ (38)	1	1	61L
0.935	1 1/16 (27)	1½ (38)	1	1	91L
0.935	1 1/16 (27)	1½ (38)	1	3①	91L

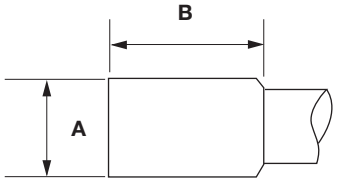
① 3 wire only

Ceramic Wedge with 10-32 Threaded Terminals



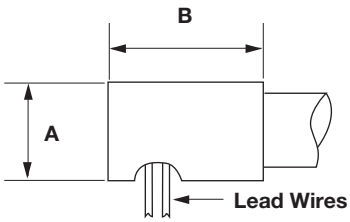
Heater O.D. in.	Dimension A in. (mm)	Dimension B in. (mm)	Zone	Phase	Type No.
0.685	1¼ (32.0)	1¼ (32.0)	1	1	61T
0.935	1⅝ (41.3)	1⅝ (41.3)	1	1	91T

Potting Cups



Heater O.D. in.	Dimension A in. (mm)	Dimension B in. (mm)	Zone	Phase	Type No.
0.685	1⅜ (34.9)	1⅜ (34.9)	2	1	62L
0.685	1⅜ (34.9)	1⅜ (34.9)	3	1	62L
0.685	1⅜ (34.9)	1⅜ (34.9)	1	3	62L
0.685	1⅜ (34.9)	1⅜ (34.9)	2	3	62L
0.935	1⅜ (34.9)	1⅜ (34.9)	2	1	92L
0.935	1⅜ (34.9)	1⅜ (34.9)	3	1	92L
0.935	1⅜ (34.9)	1⅜ (34.9)	1	3	92L
0.935	1⅜ (34.9)	1⅜ (34.9)	2	3	92L

Potting Cup for Right Angle Exit

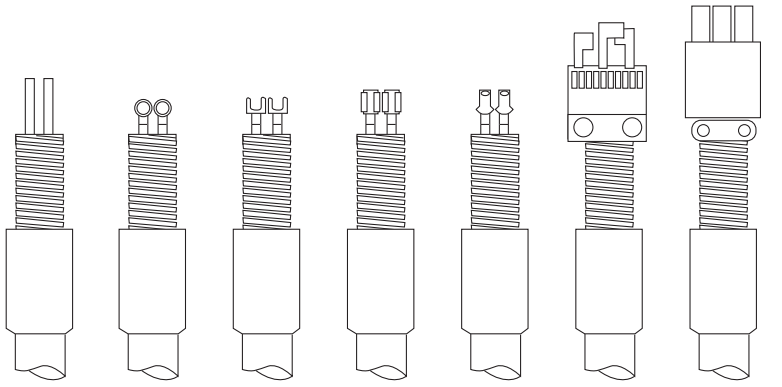


Heater O.D. in.	Dimension A in. (mm)	Dimension B in. (mm)	Zone	Phase	Type No.
0.685	¾ (19)	1½ (38)	1	1 or 3	RAE1
0.935	1 1/16 (27)	1½ (38)	1	1 or 3	RAE2

MULTICELL Heaters

Termination Assemblies

All termination assemblies are available with potting sleeves or cups, with or without armorflex lead wire protection. Please specify **potting vessel** and **lead cover option** when ordering.



Termination illustrations shown with armorflex covering.

Options

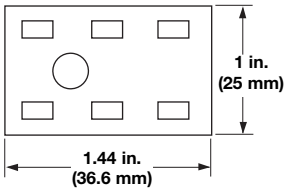
Plug and Socket and Twist-Lock® Plug Variations

Three zone heaters requiring a quick disconnect plug will typically be supplied with a six contact plug and socket. Twist-Lock® plug variations are typically supplied with single zone MULTICELL heaters. When ordering a Twist-Lock® plug, please specify the **NEMA type** as shown below.

For any other plug variations, please contact your Watlow representative.

Note: Mating connectors are also available for plug terminations listed. Contact your Watlow representative.

Plug and Socket



6 Contacts

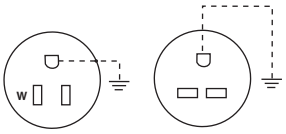
Male Plug	Zones	Type	Voltage	Amperage	Blade Type
P406-CCT	3	6 wire	600	30	Straight
4570C	1	3 wire	250	15	Twist-Lock®
4720C	1	3 wire	125	15	Twist-Lock®
5266C	1	3 wire	125	15	Straight
5666C	1	3 wire	250	15	Straight
7102C	1	2 wire	250	20	Twist-Lock®
7545C	1	2 wire	250	15	Twist-Lock®
7567C	1	3 wire	125	10	Twist-Lock®

Twist-Lock®



4720C **4570C** **7567C** **7102C** **7545C**

Straight



5266C **5666C**

How to Order

To order MULTICELL insertion heaters, please specify:

- Sheath diameter
- Heater length
- Configuration
- Potting vessel
- Connector
- Lead cover
- Flexleads
- Watts
- Volts
- Lead wire length (12 in. [305 mm] standard)
- NEMA type for Twist-Lock®/straight plugs, if required
- Process temperature
- Controller system
- Ground voltage

Availability

Made-to-Order: Contact your Watlow representative.

Tubular Heaters



Tubular Heaters

WATROD Single/ Double-Ended Heaters.....73
- High-Temperature Tubular Heaters.....93
- MULTICOIL Tubular Heaters.....95
- Milled Groove Tubular Heaters.....97

FIREBAR® Single/ Double-Ended Heaters.....99

FINBAR Single/ Double-Ended Heaters.....119

WATROD Single/Double-Ended Heaters

Available in single- or double-ended termination styles, the versatile and economical WATROD tubular heating element from Watlow® lends itself to virtually the entire range of immersion and air heating applications.

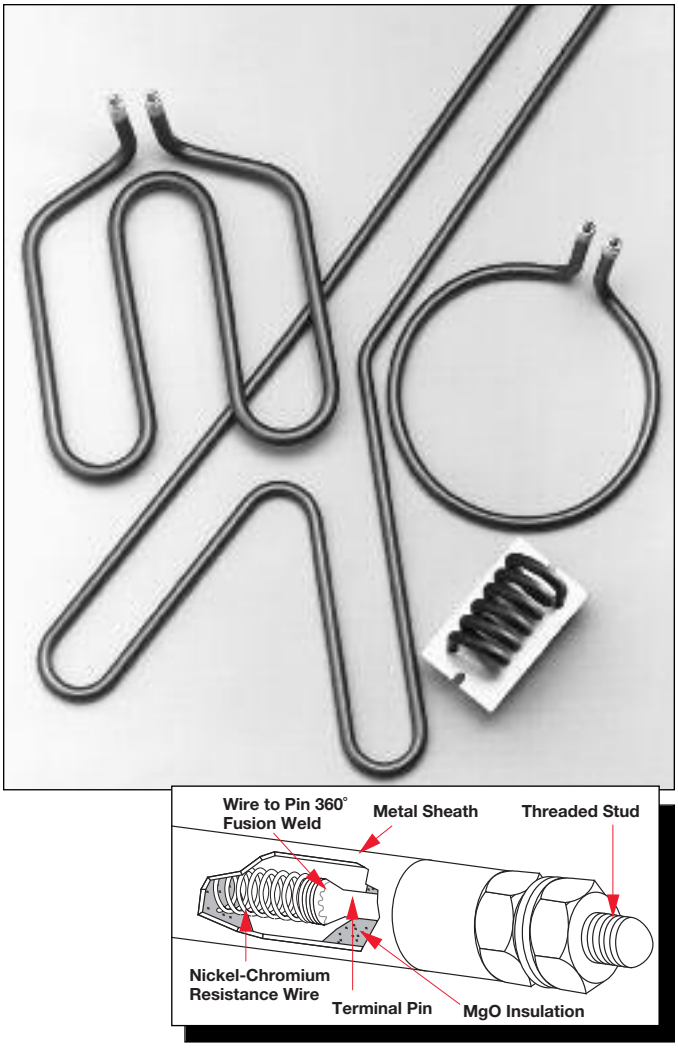
The single-ended WATROD tubular design has both terminals at one end. The opposite end is sealed. Standard 12 in. (305 mm) flexible lead wires are crimp connected to the terminal pin and have silicone-impregnated fiberglass oversleeves.

The double-ended WATROD, with its round cross-sectional geometry, is highly adaptable for bending—especially when bending is performed in the field.

Watlow's double-ended MULTICOIL tubular elements offer various combinations of resistor coils and thermocouples inside one sheath. They have the ability to sense the heater's internal temperature accurately every time, or offer three-phase capability in one element.

Both single- and double-ended WATRODs share many construction features that deliver long life—the resistance wire is centered in the heater sheath and electrically insulated with compacted, high-grade magnesium oxide for superior heating performance.

WATROD heating elements have a variety of mounting and termination options that make them highly popular among industrial customers.



Single-Ended WATROD Performance Capabilities

- Watt densities to 45 W/in² (6.9 W/cm²)
- UL® and CSA component recognition to 240V~(ac)
- Incoloy® and stainless steel sheath temperatures to 1200°F (650°C)

Double-Ended WATROD Performance Capabilities

- Watt densities up to 120 W/in² (18.6 W/cm²)
- UL® and CSA component recognition to 600V~(ac)
- Incoloy® sheath temperatures to 1600°F (870°C)
- Stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)
- Inconel® 600 sheath temperatures to 1800°F (982°C)

Features and Benefits

Precision wound nickel-chromium resistance wire

- Distributes heat evenly to the sheath for optimum heater performance

Silicone resin seals

- Protects against moisture contamination and is rated to 390°F (200°C)

MgO insulation filled sheath

- Maximizes dielectric strength, heat transfer and life

Standard sheath materials

- Copper, steel, 316 stainless steel and Incoloy®
- Optional materials available on made-to-order include 304 stainless steel, Inconel® Monel® and titanium

36 standard bend formations

- Allows forming the heating element to the application. Spirals, compound bends and multi-axis and multi-plane configurations

Stainless steel studs

- Fusion welded to terminal pins for mechanical strength

Popular termination, mounting and moisture seal options available

WATROD Single/Double-Ended Heaters

Specifications

Double-Ended



Single-Ended



Applications	Direct immersion Hot runner mold (manifold) Forced air Ovens Radiant Clamp-on		Vacuums Semiconductor		Platens Forced air Deicing antennas Plastic wrap cutting Seal bars			
Watt Density W/in² (W/cm²)	Stock: Made-to-Order (M-t-O):		up to 60 up to 120	(9.3) (18.6)	Stock: M-t-O:		up to 20 up to 45	(3.1) (6.9)
Element Diameters in. (mm) **and Surface Area per Linear** in. (cm) Diameter Tolerance ± 0.005 in. (0.13 mm)	**Dia.** 0.210 0.260 0.315 0.332 0.375 0.430 0.475 0.490 0.625	**in²** 0.660 0.817 0.990 1.043 1.178 1.351 1.492 1.539 1.963	**Dia. (mm)** (5.33) (6.60) (8.00) (8.43) (9.53) (10.92) (12.07) (12.45) (15.88)	**cm²** (4.26) (5.27) (6.38) (6.73) (7.60) (8.72) (9.63) (9.93) (12.66)	**Dia.** 0.375 0.430 0.475 0.490 0.625	**in²** 1.178 1.351 1.492 1.539 1.963	**Dia. (mm)** (9.53) (10.92) (12.07) (12.45) (15.88)	**cm²** (7.600) (8.717) (9.626) (9.930) (12.665)
Sheath Materials **Max. Operating** **Temperature**	Stock:	Incoloy® 316 SS Steel Copper	1600°F 1200°F 750°F 350°F	(870°C) (650°C) (400°C) (175°C)	Stock:	Incoloy®	1200°F	(650°C)
	M-t-O:	Inconel® 600 Incoloy® 316 SS 304 SS Steel Copper Monel® Titanium	1800°F 1600°F 1200°F 1200°F 750°F 350°F Contact Watlow Contact Watlow	(980°C) (870°C) (650°C) (650°C) (400°C) (175°C)	M-t-O:	Incoloy® 316 SS 304 SS	1600°F 1200°F 1200°F	(870°C) (650°C) (650°C)
Sheath Length By Diameter in. (mm)	**Dia.** Stock: 0.260 0.315 0.375 0.430 0.475	**Sheath Length** 20 to 80 12 to 100 11 to 180 15 to 120 20 to 157	**Dia. (mm)** (6.60) (8.00) (9.53) (10.92) (12.07)	**Sheath Length** (510 to 2030) (305 to 2540) (275 to 4555) (380 to 3050) (510 to 3990)	**Dia.** Stock: 0.375	**Sheath Length** 15 to 40	**Dia. (mm)** (9.53)	**Sheath Length** (380 to 1015)
	M-t-O: 0.210 0.260 0.315 0.332 0.375 0.430 0.475 0.490 0.625	 9 to 130 9 to 275 9 to 270 9 to 237 11 to 300 11 to 268 11 to 275 11 to 265 11 to 275	 (5.33) (6.60) (8.00) (8.53) (9.53) (10.92) (12.07) (12.45) (15.88)	 (230 to 3300) (230 to 6980) (230 to 6850) (230 to 3170) (280 to 7620) (280 to 6810) (280 to 6985) (280 to 6731) (280 to 6985)	M-t-O: 0.375 0.430 0.475 0.490 0.625	 11 to 125 11 to 106 11 to 125 11 to 125 11 to 125	 (9.53) (10.92) (12.07) (12.45) (15.88)	 (280 to 3175) (280 to 2690) (280 to 3175) (280 to 3175) (280 to 3175)

WATROD Single/Double-Ended Heaters

Specifications *(Continued)*

Double-Ended



Single-Ended



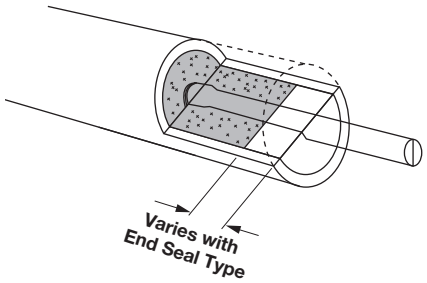
Min. No-Heat Length in. (mm)	**Sheath Length**	**No-Heat Length**	**Sheath Length**	**No-Heat Length**	**Sheath Length**	**No-Heat Length**	**Sheath Length**	**No-Heat Length**
	11 to 20	1	(280 to 510)	(25)	11 to 20	1½	(280 to 5100)	(38)
	21 to 50	1¼	(535 to 1270)	(32)	21 to 50	1¾	(533 to 1270)	(44)
	51 to 80	1½	(1295 to 2030)	(38)	51 to 80	2⅛	(1295 to 2030)	(54)
	81 to 110	1⅝	(2055 to 2795)	(42)	81 to 110	2⅜	(2055 to 2795)	(60)
	111 to 140	1¾	(2820 to 3555)	(44)	111 to 125	2⅝	(2820 to 3175)	(67)
	141 to 170	2	(3580 to 4320)	(51)				
	171 to 200	2¼	(4345 to 5080)	(57)				
	201 & up	2½	(5105 & up)	(64)	**½ in. (13 mm) No-heat length on all blunt ends**			
Max. Voltage/Amperage By Dia. in. (mm)	**Dia.**	**Volts**	**Amperes**		**Dia.**	**Volts**	**Ampere**	
	0.260 (6.6)	250V~(ac)	15		0.375 (9.53)	480V~(ac)	30	
	0.315 (8.0)	480V~(ac)	30		0.430 (10.92)	480V~(ac)	30	
	0.332 (8.43)	480V~(ac)	30		0.475 (12.07)	480V~(ac)	30	
	0.375 (9.53)	480V~(ac)	30		0.490 (12.45)	480V~(ac)	30	
	0.430 (10.92)	600V~(ac)	40		0.625 (15.88)	480V~(ac)	30	
	0.475 (12.07)	600V~(ac)	40					
	0.490 (12.45)	600V~(ac)	40					
	0.625 (15.88)	600V~(ac)	40					
Ohms Per Heated Inch By Dia. in.	**Dia.**	**Min.**	**Max.**		**Dia.**	**Min.**	**Max.**	
	0.210	0.130Ω	14Ω					
	0.260	0.080Ω	16Ω		0.375	0.150Ω	25Ω	
	0.315	0.050Ω	25Ω		0.430	0.150Ω	24Ω	
	0.332	0.050Ω	24Ω		0.475	0.150Ω	22Ω	
	0.375	0.030Ω	20Ω		0.490	0.150Ω	24Ω	
	0.430	0.030Ω	25Ω		0.625	0.150Ω	22Ω	
	0.475	0.035Ω	25Ω					
	0.490	0.035Ω	21Ω					
	0.625	0.030Ω	21Ω					
Terminations	Stock:	Threaded stud			Stock:	Flexible lead wires		
	M-t-O:	Threaded stud Screw lug (plate) Quick connect (spade) Flexible lead wires Rubber overmolds			M-t-O:	Flexible lead wires Rubber overmolds		
Seals	Stock:	Silicone resin	390°F	(200°C)	Stock:	Silicone resin	390°F	(200°C)
	M-t-O:	Ceramic base	2800°F	(1535°C)	M-t-O:	Silicone rubber (RTV)	500°F	(260°C)
		ULTRAGARD	700°F	(375°C)		Silicone resin	392°F	(200°C)
		Ceramic-to-metal	500°F	(260°C)		Epoxy resin	194/356°F	(90/180°C)
		Silicone rubber (RTV)	500°F	(260°C)				
		Silicone resin	392°F	(200°C)				
		Epoxy resin	194/356°F	(90/180°C)				
Mounting Options	Threaded bulkheads Mounting brackets Locator washers Mounting collars				Threaded bulkhead Locator washers Mounting collars			
Surface Finish Options	Bright anneal Passivation				Bright Anneal Passivation			
Agency Recognition	UL® Component to 480V~(ac) (file # E52951/E56488) CSA Component to 600V~(ac) (file # 31388)				UL® Component to 240V~(ac) (file # E52951) CSA Component to 240V~(ac) (file # 31388) ①			

WATROD Single/Double-Ended Heaters

Options

Moisture Resistant Seals

WATROD's MgO insulating material is hygroscopic. To control the rate of moisture entering the heater, an appropriate moisture seal must be used. Choosing the correct seal is important to the life and performance of the heater. All materials have varying rates of gas vapor transmission. Be sure the maximum continuous use temperature is not exceeded at the seal location. Most end seals are applied with a small cavity in the end of the heater. The seal will also help prevent arcing at the terminal ends

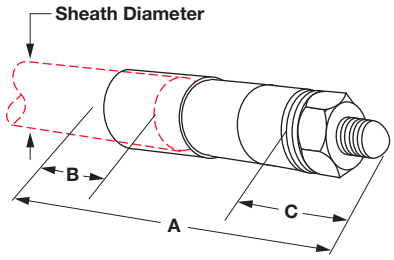


End-Seal Options

End-Seal	Code Number	Color	UL® Recognition	Max. Cont. Use Temperature	Typical or General Usage/Application
Standard Epoxy	**EC**	Cream	Yes	194°F (90°C)	Long term stable insulation resistance
Intermediate Epoxy	**EB**	Black	Yes	356°F (180°C)	Long term stable insulation resistance
High-Temp. Epoxy	**HTE**	Amber	No	450°F (232°C)	Long term stable insulation resistance
Silicone Resin	**SR**	Clear	Yes	392°F (200°C)	General usage on tubular products - porous
Silicone Fluid	**SF**	Clear	No	392°F (200°C)	Moisture resistance of the MgO, or High-Temp. ceramic seal (storage only) - porous
Lavacone	**LC**	Dark Brown	Yes	392°F (200°C)	Porous seal for the FIREBAR
Silicone Rubber RTV	**RTV**	Red-Orange	Yes	500°F (260°C)	General usage on FIREBAR applications - porous
ULTRAGARD	**UG**	Clear	Yes	700°F (350°C)	High temp. around seal area and for low vapor transmission rate
High-Temp. Ceramic	**HTC**	White	Yes	2800°F (1538°C)	Very high temperature applications - for extremely low vapor transmission rate

Ceramic-to-Metal End-Seal

Ceramic-to-metal end-seals with threaded stud terminations provide an air-tight seal for continuous terminal temperatures up to 500°F (260°C). Watlow does not recommend this seal if terminations are exposed to temperatures exceeding 500°F (260°C).



Sheath Diameter in.	Sheath Diameter (mm)	A in.	A (mm)	B in.	B (mm)	C in.	C (mm)	Thread Size
0.260	(6.6)	1 11/16	(42.9)	½	(13)	13/32	(10.32)	#8-32
0.315	(8.0)	1⅞	(47.6)	½	(13)	13/32	(10.32)	#10-32
0.430	(10.9)	2⅛	(54.0)	½	(13)	21/32	(10.32)	#¼-28

To order specify, **ceramic-to-metal end seal**.

External Finishes

Bright Annealing

Bright annealing is a process that produces a smooth, metallic finish. It is a special annealed finish created in a non-oxidizing atmosphere. This finish is popular in the pharmaceutical and food and beverage markets.

To order, specify **bright annealing**.

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process. For critical sheath applications, passivation will remove free iron from the sheath.

To order, specify **passivation**.

WATROD Single/Double-Ended Heaters

Terminations

Double-ended WATROD elements are available with a variety of terminations. Single-ended WATROD elements are available with only flexible lead wires.

The following table and illustrations detail the terminations available with double- or single-ended WATRODs—for each available sheath diameter.

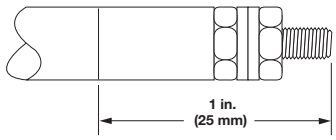
Standard flexible lead wires are 12 in. (305 mm), Sil-A-Blend™ 390°F (200°C) unless otherwise specified. Insulation options include TGGT 480°F (250°C) plus other temperature ratings. Contact your Watlow representative.

Overmolds are available for flexible lead wires only. Available in silicone rubber 390°F (200°C) and neoprene 212°F (90°C). Contact your Watlow representative.

WATROD Element	Sheath Diameter in.	(mm)	Threaded Stud① A	Screw Lug (Plate) B	C	D	Quick Connect (Spade) E	F	G	Flexible Lead Wires H	Lead Wire Overmolds J
Double-Ended	0.260	(6.6)	#6-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	0.315	(8.0)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	0.335	(8.5)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	0.375	(9.5)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	0.430	(10.9)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	0.475	(12.1)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	0.490	(12.5)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
	0.625	(15.9)	#10-32	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No
Single-Ended	0.375	(9.53)	No	No	No	No	No	No	No	Yes	No
	0.430	(10.9)	No	No	No	No	No	No	No	Yes	Yes
	0.475	(12.1)	No	No	No	No	No	No	No	Yes	Yes
	0.490	(12.5)	No	No	No	No	No	No	No	Yes	No
	0.625	(15.9)	No	No	No	No	No	No	No	Yes	Yes

Threaded Stud

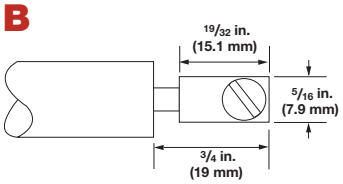
A



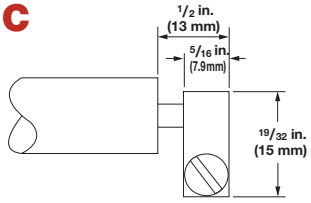
① Optional #8-32, ¼ in. and 4 or 5 mm studs available. Consult factory for details.

Screw Lug (Plate)

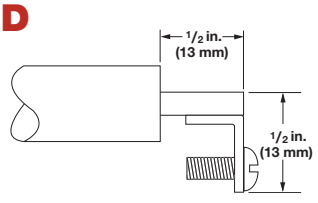
B



C

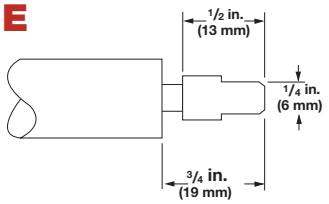


D

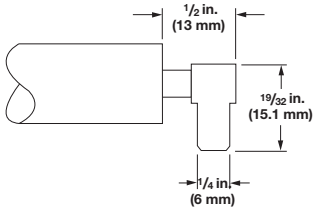


Quick Connect (Spade)

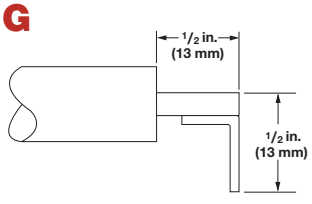
E



F

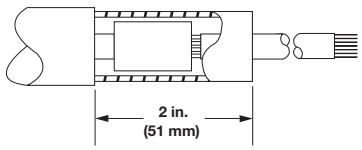


G



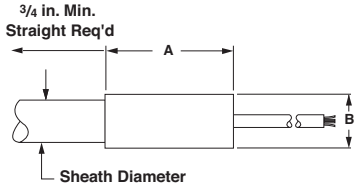
Flexible Lead Wires

H



Rubber Overmolds

J



Overmold Availability

Sheath Diameter in.	(mm)	A in.	(mm)	B in.	(mm)
0.260	(6.6)	2½	(64)	½	(13.0)
0.315	(8.0)	2½	(64)	½	(13.0)
0.375	(9.5)	2½	(64)	⅝	(15.9)
0.430	(10.9)	2½	(64)	⅝	(15.9)
0.475	(12.0)	2½	(64)	⅝	(15.9)
0.625	(15.9)	2½	(64)	⅞	(22.2)

WATROD Single/Double-Ended Heaters

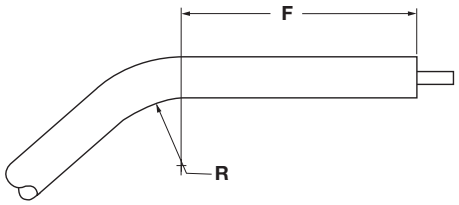
Bend Formations

Double-Ended WATROD Bend Formations

Double-ended WATROD heating elements can be formed into spirals, compounds, multi-axis and multi-planes from 36 common bend configurations. Custom bending with tighter tolerances can be made to meet specific application needs.

Formation is limited by the minimum bend radius (R) and the straight length (F) required beyond the bend. In order to locate the end of a heated length within a bend, the radius must be 3 in. (76 mm) or larger. Additionally, overall length tolerance (T) must be included in one or more of the straight lengths.

Minimum radius for various sheath diameters and lengths are shown in the *Bend Formations* chart below. Illustrated on pages 78 to 84 are the 36 common bend configurations available on both stock and made-to-order WATROD heating elements.



WATROD Length Tolerance (T)			
Sheath Length		Length Tolerance	
in.	(mm)	in.	(mm)
11-50	(280-1270)	±⅛	(±3)
51-110	(1295-2795)	±3⁄16	(±5)
111-170	(2820-4320)	±¼	(±6)
171-200	(4345-5080)	±⅜	(±10)
201 & up	(5105 & up)	±½	(±13)

Single-Ended WATROD Bend Formations

Watlow does not recommend field bending single-ended WATROD elements. Formation is limited by the minimum radius of a bend (R) and the straight length (F) beyond the bend. The radius must be 3 in. (75 mm) or more for the heated length's end to be inside a bend.

Additionally, the overall length tolerance (T) must be provided for in one or more of the specified lengths.

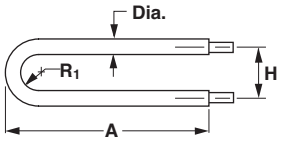
The four common bend configurations available for standard and made-to-order single-ended WATROD elements are Figures 1, 6, 22 and 28.

To order a common bend formation, specify the **bend figure number**, dimensions and critical tolerances.

WATROD Minimum Radius							
Sheath Diameter		Field Bend R①		Factory R①		F② Dimension	
in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
0.260	(6.6)	¾	(19.0)	⅜	(9.5)	½	(13.0)
0.315	(8.0)	¾	(19.0)	½	(13.0)	½	(13.0)
0.332	(8.43)	1	(25.0)	½	(13.0)	1	(25.0)
0.375	(9.52)	1	(25.0)	½	(13.0)	½	(13.0)
0.430	(10.92)	1	(25.0)	½	(13.0)	¾	(19.0)
0.475	(12.07)	1	(25.0)	⅝	(15.9)	1	(25.0)
0.490	(12.45)	1	(25.0)	⅝	(15.9)	1	(25.0)
0.625	(15.88)	1½	(38.0)	¾	(19.0)	1½	(38.0)

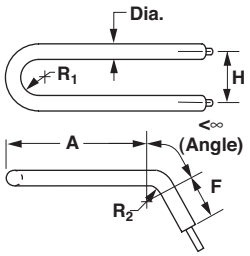
① R is the inside radius of a bend.
② F is the distance from the sheath's end to the start of the first bend.

Figure 1



SL = 2A + 1.14R_1 - 0.43 Dia.
(For pricing, use 1 bend)

Figure 2

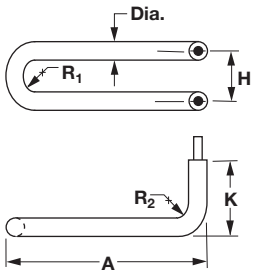


SL = 2A + 2F + 1.14R_1 + 0.0175 (<°)
(2R_2 + Dia.) - 0.43 Dia.
(For pricing, use 3 bends)

WATROD Single/Double-Ended Heaters

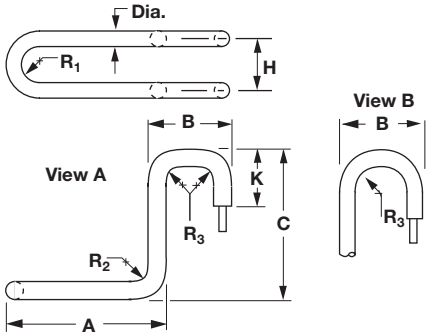
Bend Formations (Continued)

Figure 3



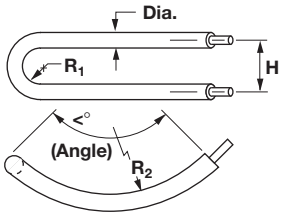
SL = 2K - 0.86R_2 - 2.86 Dia. + 2A + 1.14R_1
(For pricing, use 3 bends)

Figure 4



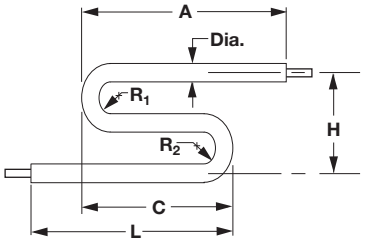
View A: SL = 2K- 1.72R_3 - 7.72 Dia. + 2C
- 0.86R_2 + 2A + 1.14R_1
View B: SL = 2K- 2.28R_3 - 3.72 Dia. + 2C
- 0.86R_2 + 2A + 1.14R_1
(For pricing, use 5 bends)

Figure 5



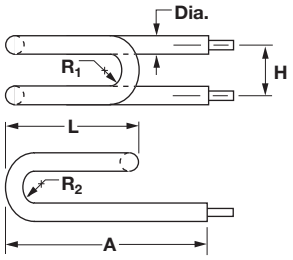
SL = 0.0175(<°) (2R_2 + Dia.)
+1.14R_1 + 0.43 Dia.
(For pricing, use 3 bends)

Figure 6



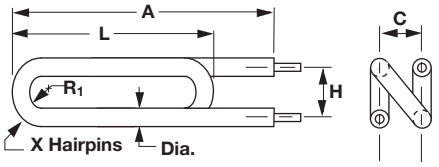
SL = L + 1.14R_2 - 0.86 Dia. + C + 1.14R_1 + A
(For pricing, use 2 bends)

Figure 7



SL = 2A + 2.28R_2- 1.29 Dia. + 2L + 1.14R_1
(For pricing, use 3 bends)

Figure 8

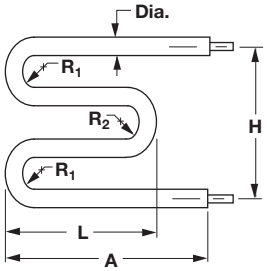


X = number of outside hairpins
SL = 2A + 3.42R_1 - 1.29 Dia. + 2L
(For pricing, use 5 bends)

WATROD Single/Double-Ended Heaters

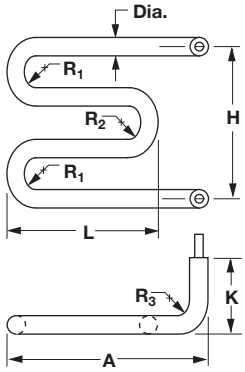
Bend Formations *(Continued)*

Figure 9



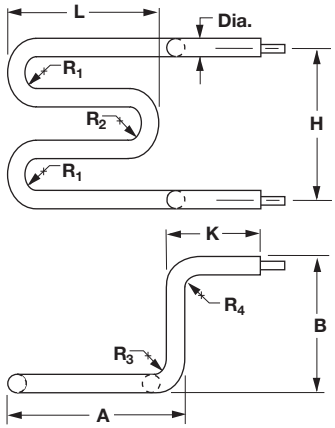
SL = 2A + 2.28R_1 - 1.29 Dia. + 2L + 1.14R_2
(For pricing, use 3 bends)

Figure 10



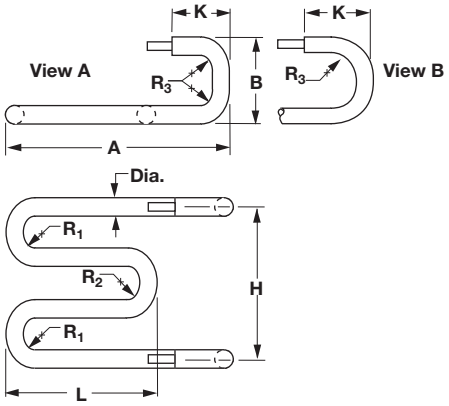
SL = 2K - 0.86R_3 - 3.72 Dia. + 2A + 2L
+ 2.28R_1 + 1.14R_2
(For pricing, use 5 bends)

Figure 11



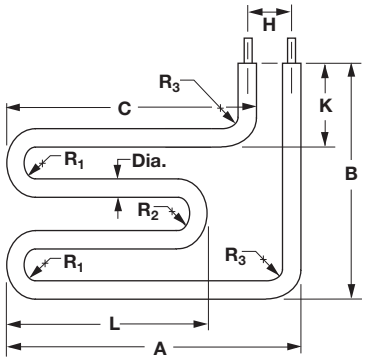
SL = 2K - 086R_3 - 0.86R_4 - 6.15 Dia. + 2B + 2A
+ 2L + 2.28R_1 + 1.14R_2
(For pricing, use 7 bends)

Figure 12



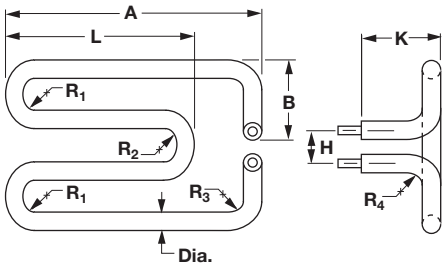
View A: SL = 2K + 2B + 2A + 2L + 2.28R_1
+ 1.14R_2 - 1.72R_3 - 6.15 Dia.
View B: SL = 2K + 2A + 2L + 2.28R_1+ 1.14R_2
- 2.28R_3 - 2.15 Dia.
(For pricing, use 5 bends)

Figure 13



SL = 2B + 2A + 2L - 6.717 Dia. - 1.717R_1
- H - 0.858R_2 - 0.858R_3
(For pricing, use 5 bends)

Figure 14

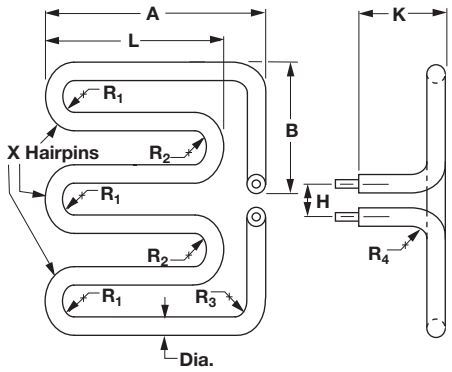


SL+2K+2A+2L+2.28R_1+1.14R_2+2B
-6.15 Dia. -0.86R_3+0.86R_4
(For pricing use 7 bends)

WATROD Single/Double-Ended Heaters

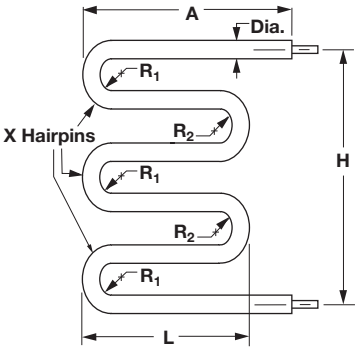
Bend Formations (Continued)

Figure 15



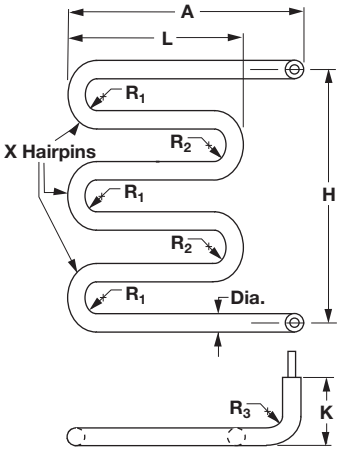
X = number of outside hairpins
SL = 2K + 2A + 2K(X - 1) + 2B - 0.86R_3 - 0.86R_4 + 1.14R_1 (X) + 1.14R_2 (X - 1) - 4.86 Dia. - (2X - 1) 0.43 Dia.
(For pricing, use 9 bends if X = 3 hairpins)

Figure 16



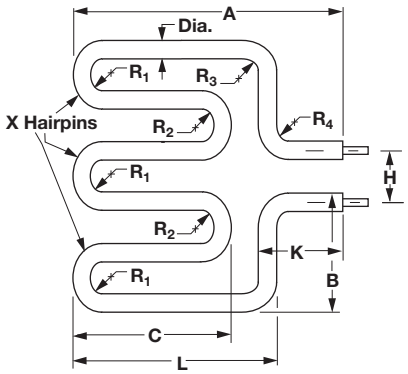
X = number of outside hairpins
SL = 2A + 0.43 Dia. (1 - 2X) + 2L (X - 1) + 1.14R_1 + 1.14R_2 (X - 1)
(For pricing, use 5 bends if X = 3 hairpins)

Figure 17



X = number of outside hairpins
SL = 1.14R_2 X - 0.88 Dia. X - 1.14R_2 - 2 Dia. + 1.14R_1 X -0.86R_3 + 2L X - 2L + 2A + 2K
(For pricing, use 7 bends if X = 3 hairpins)

Figure 18

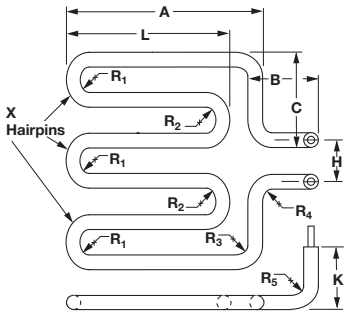


X = number of outside hairpins
SL = 2L + 2K + 2B + 2C (X - 1) - 0.86R_3 - 0.86R_4 - 4.86 Dia. + 1.14R_1 (X) + 1.14R_2 (X - 1) - (2X - 1) 0.43 Dia.
(For pricing, use 9 bends if X = 3 hairpins)

WATROD Single/Double-Ended Heaters

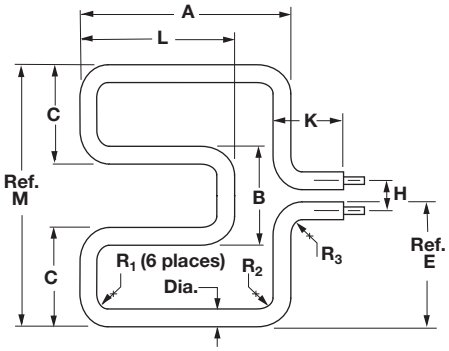
Bend Formations *(Continued)*

Figure 19



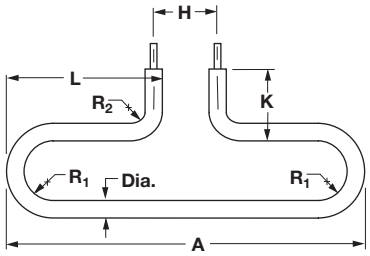
X = number of outside hairpins
SL = 2K + 2A + 2B + 2C + 2L (X - 1) + 1.14R_1 (X) + 1.14R_2 (X - 1) - 0.86R_3 - 0.86R_4 - 0.86R_5 - 7.29 Dia. - (2X - 1) 0.43 Dia.
(For pricing, use 11 bends if X = 3 hairpins)

Figure 20



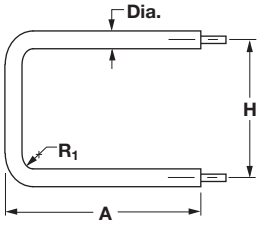
SL = 2K + 2C + B + 2A + 2L - 2.58R_1 - 0.86R_2 - 0.86R_3 - 12.15 Dia.
(For pricing, use 10 bends)

Figure 21



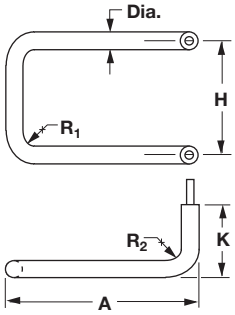
SL = 2A + 2K - H - 2.28R_1 - 0.86R_2 - 3.29 Dia.
(For pricing, use 4 bends)

Figure 22



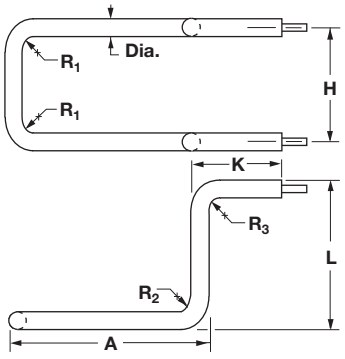
SL = 2A - 0.86R_1 - 1.43 Dia. + H
(For pricing, use 2 bends)

Figure 23



SL = 2K - 0.86R_2 - 3.86 Dia. + 2A - 0.86R_1 + H
(For pricing, use 4 bends)

Figure 24

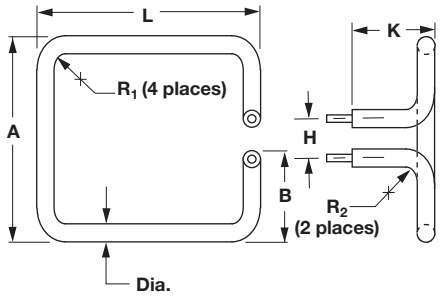


SL = 2K + 2L + H - 0.86R_1 - 0.86R_2 - 0.86R_3 - 7.29 Dia.
(For pricing, use 6 bends)

WATROD Single/Double-Ended Heaters

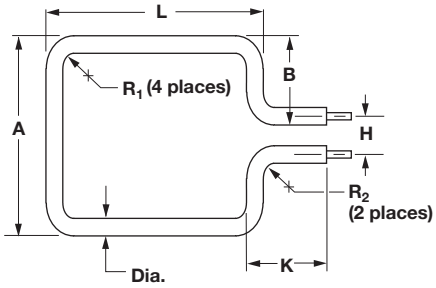
Bend Formations (Continued)

Figure 25



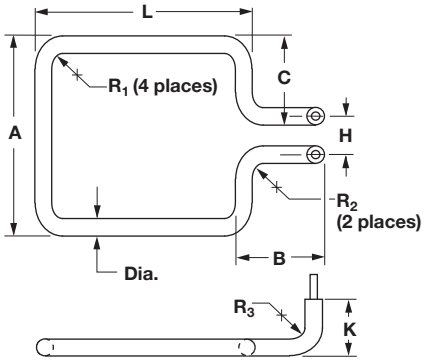
SL = 2K + 2A + 2L - H - 1.72R_1 - 0.86R_2
- 6.92 Dia.
(For pricing, use 6 bends)

Figure 26



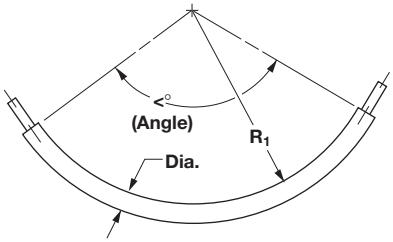
SL = 2K + 2A + 2L - H - 1.72R_1 - 0.86R_2
- 6.29 Dia.
(For pricing, use 6 bends)

Figure 27



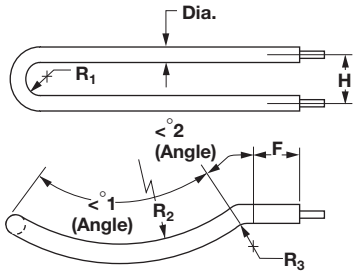
SL = 2K + 2A + 2L + 2B - H - 1.72R_1
- 1.72R_2 - 8.72 Dia.
(For pricing, use 8 bends)

Figure 28



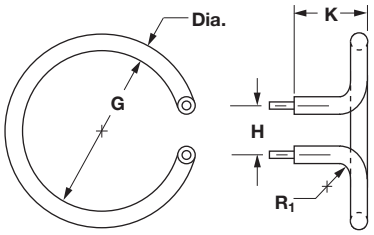
SL = 0.0175 <° (R_1 + 0.5 Dia.)
(For pricing, use 1 bend)

Figure 29



SL = 0.0175 <°1 (2R_2 + Dia.) + 2F + 1.14R_1
+ 0.0175 <°2 (2R_3 + Dia.) - 0.43 Dia.
(For pricing, use 5 bends)

Figure 30

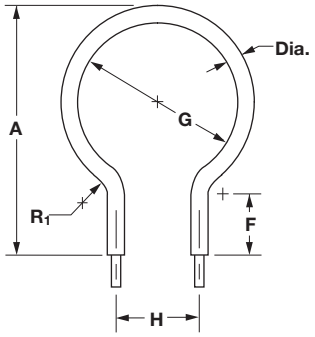


SL = (G + Dia.) 3.14 + 1.14R_1 + 2K
+ 3.28 Dia. - H
(For pricing, use 4 bends)

WATROD Single/Double-Ended Heaters

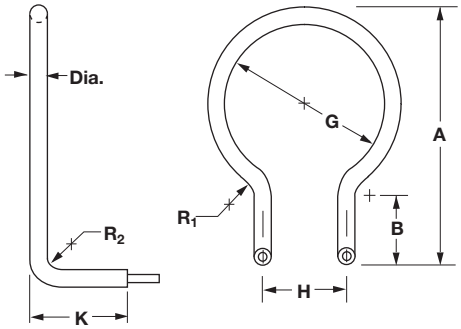
Bend Formations *(Continued)*

Figure 31



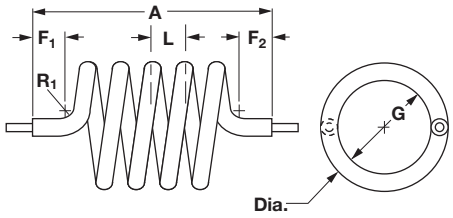
SL = (G + Dia.) 3.14 + 1.14R_1 + 2F
+ 3.71 Dia. - H
(For pricing, use 4 bends)

Figure 32



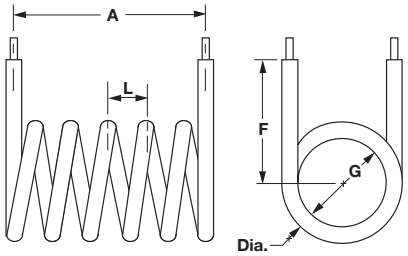
SL = (G + Dia.) 3.14 + 1.14R_1 + 2B + 1.14R_2 +
2K + 3.28 Dia. - H
(For pricing, use 6 bends)

Figure 33



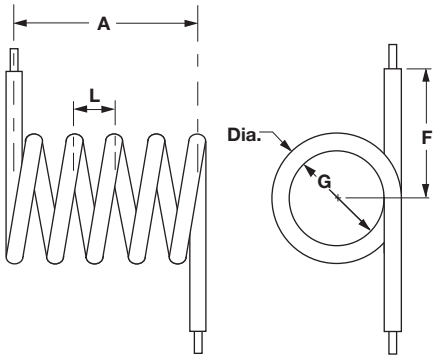
SL = [(G + Dia.) (3.14) (Number of 360°'s)]
+ F1 + F2
(For pricing, contact Watlow)

Figure 34



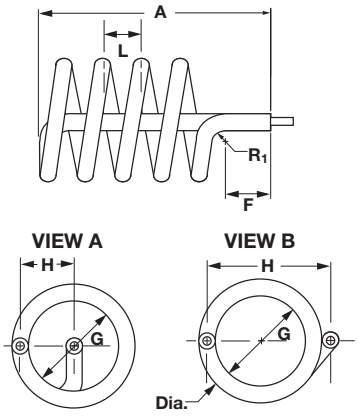
SL = [(G + Dia.) (3.14) (Number of 360°'s)] + 2F
(For pricing, contact Watlow)

Figure 35



SL = [(G + Dia.) (3.14) (Number of 360°'s)] +
2F
(For pricing, contact Watlow)

Figure 36

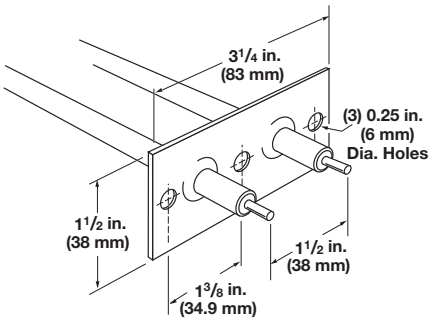


SL = [(G + Dia.) (3.14) (Number of 360°'s)]
+ (G ÷ 2) + A + F
(For pricing, contact Watlow)

WATROD Single/Double-Ended Heaters

Mounting Methods

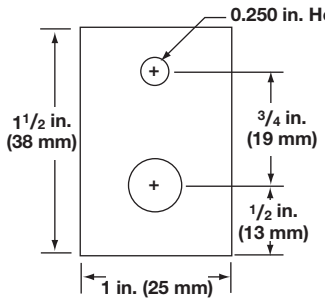
Brackets



A 0.065 in. (1.7 mm) thick stainless steel bracket provides element mounting in non-pressurized applications. Attached to the heater sheath, these brackets are not suited for liquid-tight mountings. The bracket is located ½ in. (13 mm) from the sheath's end, unless otherwise specified.

To order, specify **mounting bracket**.

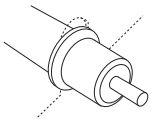
Single Leg Bracket



A 1½ in. (38 mm) x 1 in. (25 mm) wide x 16 gauge stainless steel bracket with one element hole and one mounting hole ½ in. (13 mm) from end.

To order, specify **single leg bracket**.

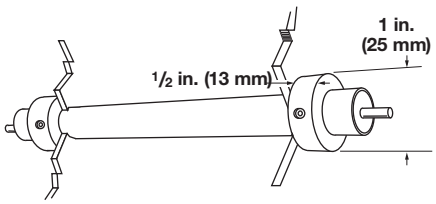
Locator Washers



Stainless steel locator washers retain the heated area of the sheath in the work zone, while allowing for expansion and contraction during cycling.

To order, specify **locator washer**, along with dimension from the heater's end.

Mounting Collars



Plated steel mounting collars secure the heater sheath with set screws to serve as adjustable stops for through-the-wall mounting. Collars are shipped in bulk.

To order, specify **mounting collars**.

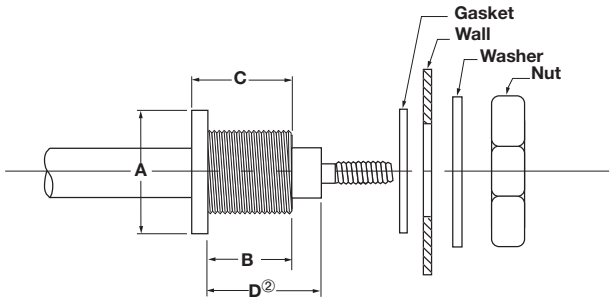
WATROD Single/Double-Ended Heaters

Mounting Methods *(Continued)*

Threaded Bulkheads

A threaded bushing with flange on the heater sheath provides rigid, leak-proof mounting through the walls of tanks. A gasket, plated steel washer and hex nut are included. The threaded end of the bushing is flush with the sheath's end unless otherwise specified. Threaded bulkheads are available in brass, steel or stainless steel as indicated in the table.

To order, specify **threaded bulkheads** and the specifications from the table.



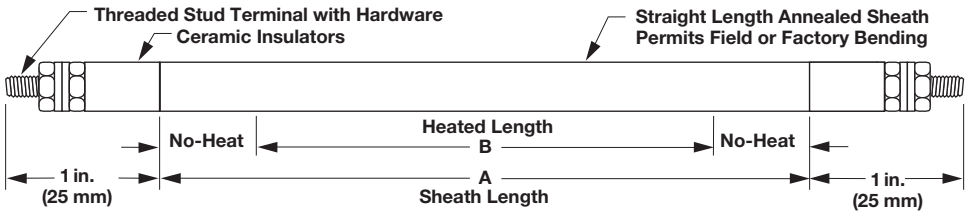
Threaded Bulkhead Specifications

Element Diameter in.	(mm)	Material	Thread Size	A① Flange Size/Style in.	(mm)	B Threaded Length in.	(mm)	C Overall Length in.	(mm)
0.260	(6.6)	Brass	½ - 20 UNF	¾ Round	(19.0)	⅝	(15.9)	¾	(19.0)
0.260	(6.6)	Steel	½ - 20 UNF	¾ Hex	(19.0)	⅝	(15.9)	¾	(19.0)
0.260	(6.6)	SS	½ - 20 UNF	¾ Round	(19.0)	⅝	(15.9)	¾	(19.0)
0.315	(8.0)	Brass	½ - 20 UNF	¾ Round	(19.0)	⅝	(15.9)	¾	(19.0)
0.315	(8.0)	Steel	½ - 20 UNF	¾ Hex	(19.0)	¾	(19.0)	15⁄16	(23.8)
0.315	(8.0)	SS	½ - 20 UNF	¾ Round	(19.0)	¾	(19.0)	27⁄32	(21.4)
0.375	(9.5)	Brass	½ - 20 UNF	¾ Round	(19.0)	⅝	(15.9)	¾	(19.0)
0.375	(9.5)	Steel	½ - 20 UNF	¾ Hex	(19.0)	¾	(19.0)	15⁄16	(23.8)
0.375	(9.5)	SS	½ - 20 UNF	¾ Round	(19.0)	¾	(19.0)	27⁄32	(21.4)
0.430	(10.9)	Brass	⅝ - 18 UNF	⅞ Hex	(22.2)	¾	(19.0)	15⁄16	(23.8)
0.430	(10.9)	Steel	⅝ - 18 UNF	⅞ Round	(22.2)	¾	(19.0)	15⁄16	(23.8)
0.430	(10.9)	SS	⅝ - 18 UNF	1 Round	(25.0)	¾	(19.0)	15⁄16	(23.8)
0.475	(12.1)	Brass	⅝ - 18 UNF	⅞ Round	(22.2)	¾	(19.0)	15⁄16	(23.8)
0.475	(12.1)	Steel	⅝ - 18 UNF	1 Round	(25.0)	1	(25.0)	1⅛	(28.6)
0.475	(12.1)	SS	⅝ - 18 UNF	1 Round	(25.0)	¾	(19.0)	15⁄16	(23.8)
0.490	(12.5)	Brass	¾ - 16 UNF	1 Round	(25.0)	¾	(19.0)	1	(25.0)
0.490	(12.5)	Steel	¾ - 16 UNF	1 Hex	(25.0)	¾	(19.0)	1	(25.0)
0.490	(12.5)	SS	¾ - 16 UNF	1 Round	(25.0)	¾	(19.0)	1	(25.0)
0.625	(15.9)	SS	⅞ - 14 UNF	1 Round	(25.0)	¾	(19.0)	1	(25.0)

① Designates the dimension across flats for hex flange style and outside diameter for round flange style.
② Equal to "B" Dimension unless otherwise specified.

WATROD Single/Double-Ended Heaters

Double-Ended WATROD



WATROD Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number			Est. Net Wt.	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	480V~(ac)	lbs	(kg)
Applications: Medium-Weight, Non-Circulating Oil, Heat-Transfer Oil										
15 W/in²	29⅞	(758.8)	22⅜	(568.4)	500		**RGSS29R10S**		1.0	(0.5)
0.475 in. Dia.	38⅜	(974.7)	29⅞	(758.8)	667		**RGSS38G10S**	**RGSS38G11S**	1.3	(0.6)
Steel	44¾	(1137.0)	37¼	(946.0)	833		**RGSS44G10S**	**RGSS44G11S**	1.7	(0.8)
(2.3 W/cm²)	53⅜	(1355.7)	44¾	(1137.0)	1000		**RGSS53G10S**	**RGSS53G11S**	1.9	(0.9)
(12 mm)	68⅜	(1736.7)	59⅝	(1514.4)	1333		**RGSS68G10S**	**RGSS68G11S**	2.1	(1.0)
	83⅜	(2117.7)	74½	(1892.0)	1667		**RGSS83G10S**	**RGSS83G11S**	2.5	(1.1)
	98⅜	(2498.7)	89½	(2273.0)	2000		**RGSS98G10S**	**RGSS98G11S**	3.0	(1.4)
	120⅜	(3057.5)	111⅞	(2841.6)	2500		**RGSS120G10S**	**RGSS120G11S**	3.9	(1.8)
	142⅞	(3629.1)	134¼	(3410.0)	3000		**RGSS142R10S**	**RGSS142R11S**	4.1	(1.9)
Application: Air Heating										
20 W/in²	48¾	(1238.0)	38¾	(984.0)	1000		**RCN48N10S**	**RCN48N11S**	1.0	(0.5)
0.430 in. Dia.	58¾	(1492.0)	48¾	(1238.0)	1250		**RCN58N10S**	**RCN58N11S**	1.1	(0.5)
Incoloy®	73¾	(1873.0)	63¾	(1619.0)	1667			**RCN73N11S**	1.4	(0.7)
(3.1 W/cm²)	91¾	(2330.0)	81¾	(2076.0)	2083			**RCN91N11S**	1.7	(0.8)
(10.9 mm)										
Applications: Caustic Solutions, Air Heating										
23 W/in²	29	(737.0)	22	(559.0)	500	**RBN291S**			0.4	(0.2)
Incoloy®	40	(1016.0)	33	(839.0)	750	**RBN401S**			0.5	(0.3)
0.315 in. Dia.	51	(1296.0)	44	(1118.0)	1000	**RBN511S**			0.7	(0.4)
(3.6 W/cm²)										
(8 mm)										
23 W/in²	39	(991.0)	27	(686.0)	1000	**RGNA391S**	**RGNA3910S**	**RGNA3911S**	1.2	(0.6)
0.475 in. Dia.	54	(1372.0)	42	(1067.0)	1500		**RGNA5410S**	**RGNA5411S**	1.6	(0.8)
Incoloy®	69	(1753.0)	57	(1448.0)	2000		**RGNA6910S**	**RGNA6911S**	2.1	(1.0)
(3.6 W/cm²)	84	(2134.0)	72	(1829.0)	2500		**RGNA8410S**	**RGNA8411S**	2.5	(1.2)
(12 mm)	99	(2515.0)	87	(2210.0)	3000		**RGNA9910S**	**RGNA9911S**	3.0	(1.4)
	106	(2692.0)	94	(2388.0)	2778			**RGNA10611S**	3.2	(1.5)
	132	(3353.0)	120	(3048.0)	4167		**RGNA13210S**	**RGNA13211S**	4.0	(1.8)
	157	(3988.0)	145	(3683.0)	5000		**RGNA15710S**	**RGNA15711S**	4.7	(2.2)
Applications: Light Oils, Greases, Heat-Transfer Oils										
23 W/in²	16	(406.0)	12	(305.0)	250	**RBS161S**	**RBS1610S**		0.2	(0.1)
0.315 in. Dia.	18	(457.0)	14	(356.0)	250	**RBS181S**			0.3	(0.2)
Steel	21	(533.0)	17	(432.0)	350	**RBS211S**	**RBS2110S**		0.3	(0.2)
(3.6 W/cm²)	23⅜	(593.7)	19⅜	(492.1)	375	**RBS23G1S**			0.3	(0.2)
(8 mm)	28⅞	(733.4)	24⅞	(631.8)	500	**RBS28R1S**			0.4	(0.2)
	29	(737.0)	24	(610.0)	500	**RBS291S**	**RBS2910S**		0.4	(0.2)
	42	(1067.0)	37	(940.0)	750	**RBS421S**	**RBS4210S**		0.6	(0.3)
	54	(1372.0)	49	(1245.0)	1000	**RBS541S**	**RBS5410S**		0.7	(0.4)
	77	(1956.0)	72	(1829.0)	1500	**RBS771S**	**RBS7710S**		1.0	(0.5)

CONTINUED

RAPID SHIP

- Available on all elements unless otherwise noted
- Same day shipment up to 15 pieces

Truck Shipment only

WATROD Single/Double-Ended Heaters

Double-Ended WATROD *(Continued)*

WATROD Description	Sheath A Dimension in.	(mm)	Heated B Dimension in.	(mm)	Watts	Code Number 120V~(ac)	240V~(ac)	480V~(ac)	Est. Net Wt. lbs	(kg)
Applications: Light Oils, Greases, Heat-Transfer Oils										
23 W/in²	23	(584)	14	(356)	500	**RGS231S**	**RGS2310S**		0.7	(0.4)
0.475 in. Dia.	31	(787)	22	(559)	750	**RGS311S**	**RGS3110S**		1.0	(0.5)
Steel	39	(991)	27	(686)	1000	**RGS391S**	**RGS3910S**	**RGS3911S**	1.2	(0.6)
(3.6 W/cm²)	45	(1143)	36	(914)	1250	**RGS451S**	**RGS4510S**		1.4	(0.7)
(12 mm)	54	(1372)	42	(1067)	1500	**RGS541S**	**RGS5410S**	**RGS5411S**	1.6	(0.8)
	69	(1753)	57	(1448)	2000	**RGS691S**	**RGS6910S**	**RGS6911S**	2.1	(1.0)
	84	(2134)	72	(1829)	2500	**RGS841S**	**RGS8410S**	**RGS8411S**	2.5	(1.2)
	99	(2515)	87	(2210)	3000		**RGS9910S**	**RGS9911S**	3.0	(1.4)
	106	(2692)	90	(2286)	2778			**RGS10611S**	3.2	(1.5)
	132	(3353)	120	(3048)	4167		**RGS13210S**	**RGS13211S**	4.0	(1.8)
	144	(3658)	128	(3251)	3889			**RGS14411S**	4.3	(2.0)
	157	(3988)	145	(3683)	5000		**RGS15710S**	**RGS15711S**	4.7	(2.2)
Application: Air Heating										
30 W/in²	20	(508)	15	(381)	400		**RAN2010S**		0.2	(0.1)
0.260 in. Dia.	25	(635)	20	(508)	500		**RAN2510S**		0.3	(0.2)
Incoloy®	30	(762)	25	(635)	600		**RAN3010S**		0.3	(0.2)
(4.7 W/cm²)	35	(889)	30	(762)	800		**RAN3510S**		0.4	(0.2)
(6.6 mm)	40	(1016)	35	(889)	900		**RAN4010S**		0.4	(0.2)
	45	(1143)	40	(1016)	1000		**RAN4510S**		0.5	(0.3)
	50	(1270)	45	(1143)	1200		**RAN5010S**		0.5	(0.3)
	55	(1397)	50	(1270)	1200		**RAN5510S**		0.6	(0.3)
	60	(1524)	55	(1397)	1400		**RAN6010S**		0.6	(0.3)
	65	(1651)	60	(1524)	1600		**RAN6510S**		0.7	(0.4)
	70	(1778)	65	(1651)	1800		**RAN7010S**		0.7	(0.4)
	75	(1905)	70	(1778)	1800		**RAN7510S**		0.8	(0.4)
	80	(2032)	75	(1905)	2000		**RAN8010S**		0.8	(0.4)
30 W/in²	15	(381)	10	(254)	300		**RBN1510S**		0.2	(0.1)
0.315 in. Dia.	20	(508)	15	(381)	400		**RBN2010S**		0.3	(0.2)
Incoloy®	25	(635)	20	(508)	600		**RBN2510S**		0.4	(0.2)
(4.7 W/cm²)	30	(762)	25	(635)	800		**RBN3010S**		0.4	(0.2)
(8 mm)	35	(889)	30	(762)	900		**RBN3510S**		0.5	(0.3)
	40	(1016)	35	(889)	1000		**RBN4010S**		0.5	(0.3)
	45	(1143)	40	(1016)	1200		**RBN4510S**		0.6	(0.3)
	50	(1270)	45	(1143)	1400		**RBN5010S**		0.7	(0.4)
	55	(1397)	50	(1270)	1600		**RBN5510S**		0.7	(0.4)
	60	(1524)	55	(1397)	1800		**RBN6010S**		0.8	(0.4)
	65	(1651)	60	(1524)	1800		**RBN6510S**		0.8	(0.4)
	70	(1778)	65	(1651)	2000		**RBN7010S**		0.9	(0.5)
	75	(1905)	70	(1778)	2200		**RBN7510S**		1.0	(0.5)
	80	(2032)	75	(1905)	2400		**RBN8010S**		1.0	(0.5)
	90	(2286)	85	(2159)	2600		**RBN9010S**		1.2	(0.6)
	100	(2540)	95	(2413)	3000		**RBN10010S**		1.3	(0.6)

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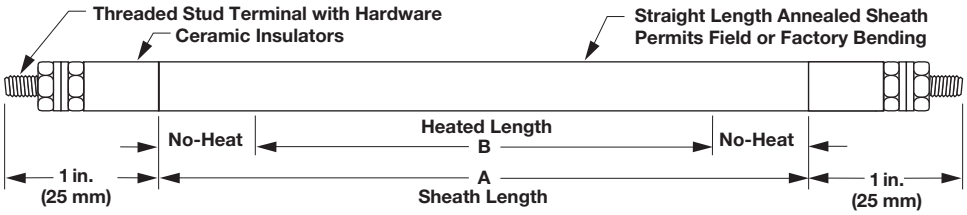
RAPID SHIP

- Available on all elements unless otherwise noted
- Same day shipment up to 15 pieces

Truck Shipment only

WATROD Single/Double-Ended Heaters

Double-Ended WATROD (Continued)



WATROD Description	Sheath A Dimension in.	Sheath A Dimension (mm)	Heated B Dimension in.	Heated B Dimension (mm)	Watts	Code Number 120V~(ac)	Code Number 240V~(ac)	Code Number 480V~(ac)	Est. Net Wt. lbs	Est. Net Wt. (kg)
Application: Air Heating										
30 W/in² 0.430 in. Dia. Incoloy® (4.7 W/cm²) (10.9 mm)	15	(381.0)	10	(254.0)	400		**RCN1510S**		0.3	(0.2)
	20	(508.0)	15	(381.0)	600		**RCN2010S**		0.4	(0.2)
	25	(635.0)	20	(508.0)	800		**RCN2510S**		0.5	(0.3)
	30	(762.0)	25	(635.0)	1000		**RCN3010S**		0.6	(0.3)
	35	(889.0)	30	(762.0)	1200		**RCN3510S**		0.7	(0.4)
	40	(1016.0)	35	(889.0)	1400		**RCN4010S**		0.8	(0.4)
	48¾	(1238.0)	38¾	(984.0)	1500		**RCNX48N10S**	**RCNX48N11S**	1.0	(0.5)
	45	(1143.0)	40	(1016.0)	1600		**RCN4510S**		0.9	(0.5)
	50	(1270.0)	45	(1143.0)	1800		**RCN5010S**		1.0	(0.5)
	58¾	(1492.0)	48¾	(1238.0)	1917		**RCNX58N10S**	**RCNX58N11S**	1.1	(0.5)
	55	(1397.0)	50	(1270.0)	2000		**RCN5510S**		1.0	(0.5)
	60	(1524.0)	55	(1397.0)	2200		**RCN6010S**		1.1	(0.5)
	65	(1651.0)	60	(1524.0)	2400		**RCN6510S**		1.2	(0.6)
	73¾	(1873.0)	63¾	(1619.0)	2500			**RCNX73N11S**	1.4	(0.7)
	70	(1778.0)	65	(1651.0)	2600		**RCN7010S**		1.3	(0.6)
	75	(1905.0)	70	(1778.0)	2800		**RCN7510S**		1.4	(0.7)
	80	(2032.0)	75	(1905.0)	3000		**RCN8010S**		1.5	(0.7)
	91¾	(2331.0)	81¾	(2077.0)	3167			**RCNX91N11S**	1.7	(0.8)
	90	(2286.0)	85	(2159.0)	3500		**RCN9010S**		1.7	(0.8)
	100	(2540.0)	95	(2413.0)	4000		**RCN10010S**		1.9	(0.9)
	110	(2794.0)	105	(2667.0)	4500		**RCN11010S**		2.1	(1.0)
	120	(3048.0)	115	(2921.0)	5000		**RCN12010S**		2.3	(1.1)
Application: Radiant Heating										
40 W/in² 0.375 in. Dia. Incoloy® (6.2 W/cm²) (9.5 mm)	10¼	(260.0)	7¼	(184.0)	400	**RDN10E1S**			0.2	(0.1)
	16⅝	(422.1)	13⅜	(346.1)	650	**RDN16L1S**			0.3	(0.2)
	21 1⁄16	(535.0)	16 13⁄16	(427.0)	800	**RDN21B1S**	**RDN21B10S**		0.4	(0.2)
	27⅛	(689.0)	22⅞	(581.0)	1100	**RDN27C1S**	**RDN27C10S**		0.5	(0.3)
	32⅛	(816.0)	27⅞	(708.0)	1300		**RDN32C10S**	**RDN32C11S**	0.6	(0.3)
	42⅞	(1089.0)	38⅝	(981.1)	1800		**RDN42R10S**	**RDN42R11S**	0.8	(0.4)
	57½	(1461.0)	53¼	(1353.0)	2500		**RDN57J10S**	**RDN57J11S**	1.1	(0.5)
	69¼	(1759.0)	65	(1651.0)	3000		**RDN69E10S**	**RDN69E11S**	1.3	(0.6)
	81¼	(2064.0)	77	(1956.0)	3600		**RDN81E10S**	**RDN81E11S**	1.6	(0.8)
	109¼	(2775.0)	105	(2667.0)	4000		**RDN109E10S①**		2.1	(1.0)
	134½	(3416.0)	127¾	(3245.0)	5000		**RDN134J10S①**		2.6	(1.2)
	153⅜	(3895.7)	145⅛	(3705.2)	5500		**RDN153R10S①**		2.9	(1.4)
	179¼	(4553.0)	171¼	(4350.0)	6500		**RDN179E10S①**		3.4	(1.6)

CONTINUED

RAPID SHIP

- Available on all elements unless otherwise noted
- Same day shipment up to 15 pieces

① Standard: Straight length, 7 working days; formed with options, 10 working days

Truck Shipment only

WATROD Single/Double-Ended Heaters

Double-Ended WATROD *(Continued)*

Special 208V~(ac) and 277V~(ac) Voltages

WATROD Description	Sheath A Dimension in.	Sheath A Dimension (mm)	Heated B Dimension in.	Heated B Dimension (mm)	Watts	Code Number 208V~(ac)	Code Number 277V~(ac)	Est. Net Wt. lbs	Est. Net Wt. (kg)
Application: Radiant Heating									
40 W/in²	21 1/16	(535)	16 13/16	(427)	800	**RDN21B2S①**	**RDN21B4S①**	0.4	(0.2)
0.375 in. Dia.	27 1/8	(689)	22 7/8	(581)	1100	**RDN27C2S①**	**RDN27C4S①**	0.5	(0.3)
Incoloy®	42 7/8	(1089)	38 5/8	(981)	1800	**RDN42R2S①**	**RDN42R4S①**	0.8	(0.4)
(6.2 W/cm²)	57 1/2	(1461)	53 1/4	(1353)	2500	**RDN57J2S①**	**RDN57J4S①**	1.1	(0.5)
(9.5 mm)	69 1/4	(1759)	65	(1651)	3000	**RDN69E2S①**	**RDN69E4S①**	1.3	(0.6)
	81 1/4	(2064)	77	(1956)	3600	**RDN81E2S①**	**RDN81E4S①**	1.6	(0.8)

WATROD Description	Sheath A Dimension in.	Sheath A Dimension (mm)	Heated B Dimension in.	Heated B Dimension (mm)	Watts	Code Number 120V~(ac)	Code Number 240V~(ac)	Code Number 480V~(ac)	Est. Net Wt. lbs	Est. Net Wt. (kg)
Application: Process Water										
48 W/in²	23	(584)	14	(356)	1000	**RGN231S**	**RGN2310S**	**RGN2311S**	0.7	(0.4)
0.475 in. Dia.	30	(762)	21	(533)	1500	**RGN301S**	**RGN3010S**	**RGN3011S**	0.9	(0.5)
Incoloy®	39	(991)	27	(686)	2000	**RGN391S**	**RGN3910S**	**RGN3911S**	1.2	(0.6)
(7.4 W/cm²)	44	(1118)	35	(889)	2500	**RGN441S**	**RGN4410S**	**RGN4411S**	1.3	(0.6)
(12 mm)	54	(1372)	42	(1067)	3000		**RGN5410S**	**RGN5411S**	1.6	(0.8)
	69	(1753)	57	(1448)	4000		**RGN6910S**	**RGN6911S**	2.1	(1.0)
	84	(2134)	72	(1829)	5000		**RGN8410S**	**RGN8411S**	2.5	(1.2)
	92	(2337)	76	(1930)	5556			**RGN9211S**	2.8	(1.3)
	99	(2515)	87	(2210)	6000		**RGN9910S**	**RGN9911S**	3.0	(1.4)
	149	(3785)	133	(3378)	9722			**RGN14911S**	4.5	(2.1)
Application: Hot Runner Molds (Manifolds)										
60 W/in²	35	(889)	25	(635)	1500		**RBR3510S**		0.2	(0.1)
0.315 in. Dia.	44	(1118)	34	(864)	2000		**RBR4410S**		0.3	(0.2)
316 SS	52	(1321)	42	(1067)	2500		**RBR5210S**		0.3	(0.2)
(9.3 W/cm²)	60	(1524)	50	(1270)	3000		**RBR6010S**		0.4	(0.2)
(8 mm)	69	(1753)	59	(1499)	3500		**RBR6910S**		0.4	(0.2)
	77	(1956)	67	(1702)	4000		**RBR7710S**		0.5	(0.3)
	85	(2159)	75	(1905)	4500		**RBR8510S**		0.6	(0.3)
Applications: Deionized Water, Demineralized Water										
60 W/in²	20	(508)	11	(279)	1000	**RGR201S**	**RGR2010S**	**RGR2011S**	0.6	(0.3)
0.475 in. Dia.	26	(660)	17	(432)	1500	**RGR261S**	**RGR2610S**	**RGR2611S**	0.8	(0.4)
316 SS	34	(864)	22	(559)	2000		**RGR3410S**	**RGR3411S**	1.0	(0.5)
(9.3 W/cm²)	40	(1016)	28	(711)	2500		**RGR4010S**	**RGR4011S**	1.2	(0.6)
(12 mm)	47	(1194)	31	(787)	2778			**RGR4711S**	1.4	(0.7)
	46	(1168)	34	(864)	3000		**RGR4610S**	**RGR4611S**	1.4	(0.7)
	57	(1448)	45	(1143)	4000		**RGR5710S**	**RGR5711S**	1.7	(0.8)
	68	(1727)	56	(1422)	5000		**RGR6810S**	**RGR6811S**	2.1	(1.0)
	79	(2007)	67	(1702)	6000		**RGR7910S**	**RGR7911S**	2.4	(1.1)
	105	(2667)	93	(2362)	8333			**RGR10511S**	3.2	(1.5)

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RAPID SHIP

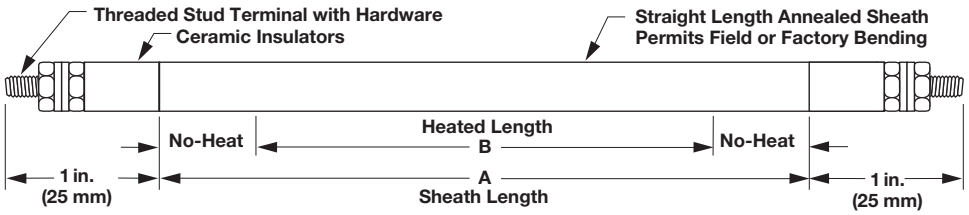
- Available on all elements unless otherwise noted
- Same day shipment up to 15 pieces

① Standard: Straight length, 7 working days; formed with options, 10 working days

Truck Shipment only

WATROD Single/Double-Ended Heaters

Double-Ended WATROD *(Continued)*



WATROD Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number			Est. Net Wt.	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	480V~(ac)	lbs	(kg)
Application: Clean Water										
60 W/in²	12	(305)	8	(203)	500	**RBC121S**	**RBC1210S**		0.2	(0.1)
0.315 in. Dia.	16	(406)	12	(305)	750	**RBC161S**	**RBC1610S**		0.2	(0.1)
Copper	19⅞	(504.8)	12⅞	(327)	750	**RBC19R1S**			0.3	(0.2)
(9.3 W/cm²)	20	(508)	16	(406)	1000	**RBC201S**	**RBC2010S**		0.3	(0.2)
(8 mm)	23¾	(603)	16¾	(426)	1000	**RBC23N1S**			0.3	(0.2)
	24	(610)	20	(508)	1250	**RBC241S**	**RBC2410S**		0.3	(0.2)
	27¾	(705)	20¾	(527)	1250	**RBC27N1S**			0.4	(0.2)
	33	(838)	26	(660)	1500	**RBC331S**	**RBC3310S**		0.5	(0.3)
	41	(1041)	34	(864)	2000	**RBC411S**	**RBC4110S**		0.6	(0.3)
	50	(1270)	43	(1092)	2500	**RBC501S**②	**RBC5010S**②		0.7	(0.4)
	58	(1473)	51	(1295)	3000	**RBC581S**②	**RBC5810S**②		0.8	(0.4)
	74	(1880)	67	(1702)	4000		**RBC7410S**②		1.0	(0.5)
60 W/in²	20	(508)	11	(279)	1000	**RGC201S**	**RGC2010S**		0.6	(0.3)
0.475 in. Dia.	26	(660)	17	(432)	1500	**RGC261S**	**RGC2610S**	**RGC2611S**	0.8	(0.4)
Copper	34	(864)	22	(559)	2000	**RGC341S**	**RGC3410S**	**RGC3411S**	1.0	(0.5)
(9.3 W/cm²)	40	(1016)	28	(711)	2500	**RGC401S**	**RGC4010S**	**RGC4011S**	1.2	(0.6)
(12 mm)	46	(1169)	34	(864)	3000		**RGC4610S**②	**RGC4611S**②	1.4	(0.7)
	47	(1194)	31	(787)	2778			**RGC4711S**②	1.4	(0.7)
	57	(1448)	45	(1143)	4000		**RGC5710S**②	**RGC5711S**②	1.7	(0.8)
	68	(1727)	56	(1422)	5000		**RGC6810S**②	**RGC6811S**②	2.1	(1.0)
	78	(1981)	62	(1575)	5556			**RGC7811S**②	2.4	(1.1)
	79	(2007)	67	(1702)	6000		**RGC7910S**②	**RGC7911S**②	2.4	(1.1)
	105	(2661)	93	(2362)	8333			**RGC10511S**②	3.2	(1.5)

RAPID SHIP

- Available on all elements unless otherwise noted
- Same day shipment up to 15 pieces

② Stocked unannealed. Allow one day for annealing. Specify **DO NOT ANNEAL** if annealed WATROD not required

Truck Shipment only

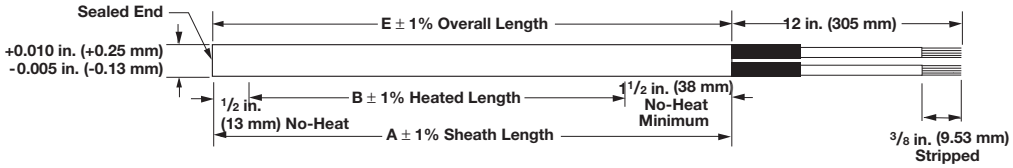
WATROD Single/Double-Ended Heaters

Single-Ended WATROD

Application Hints

The single-ended WATROD heater's construction limits its usefulness in some applications. The following are some guides to follow when considering a single-ended WATROD.

- When single-ended termination simplifies application wiring.
- Your application requires lower wattage or a smaller package.
- Do not locate the end of the heated length within a bend, unless the radius is 3 in. (75 mm) or more. Field bending is not recommended.
- Bending is limited to bend Figures 1, 6, 22 and 28 (see pages 78 to 84 for details).
- Ensure termination temperatures do not exceed 390°F (200°C) or the seal's maximum rating.
- Keep terminations clean, dry and tight.



How to Order

Watlow can provide a made-to-order unit. Please specify:

- Description of application, including heated material, operating temperature and flow rate, etc.
- Volts/watts
- Sheath material/diameter
- Sheath length
- Single or double-ended
- Heated length
- No-heat length at each end
- Terminal pin length or termination options
- Moisture seal type
- Bend configuration, dimensions and critical tolerances (send drawing, if available)
- Options, including external finish and mounting method
- Quantity

Availability

Double-Ended WATROD

Straight Length Element

Stock: Same day shipment
Modified Stock①: Three to five working days
Standard: 10 working days
Made-to-Order: Three weeks

Formed Element

Modified Stock①: Five to seven working days
Standard: Three weeks
Made-to-Order: Four to five weeks

Single-Ended WATROD

Straight Length Element

Made-to-Order: Three weeks

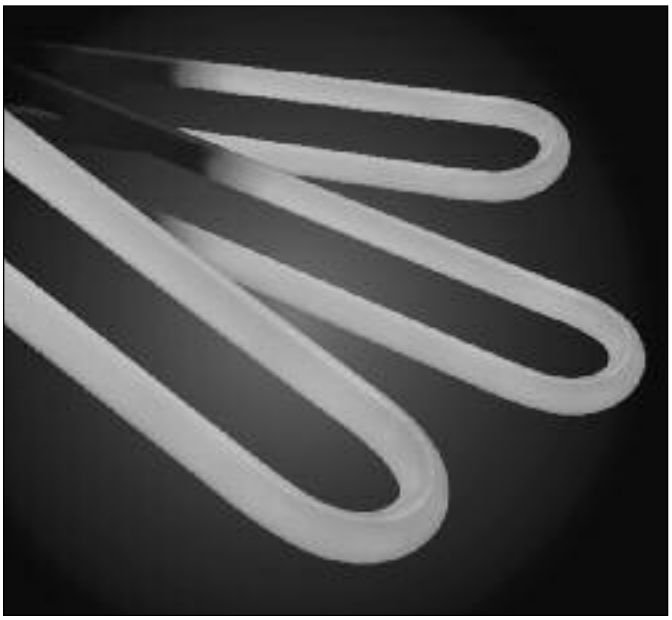
Formed Element

Made-to-Order: Four to five weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

WATROD Single/Double-Ended Heaters

High-Temperature Tubular Heaters



Watlow® manufactures high temperature tubular heaters to bridge the gap between standard tubular heaters and Watlow MULTICELL heaters. This tubular is well suited for process air heating applications in excess of 1300˚F (704˚C), resulting in a maximum sheath temperature of 1800˚F (983˚C). Controlled lab testing between the new design and current tubular designs show an increase in life of approximately 50 percent.

The high temperature tubular consists of an engineered tubing with an outer sheath of Inconel® 600 and a special internal construction. The outer sheath offers high temperature capabilities, reduced oxidation, as well as corrosion resistance.

The tubular offering is available in 0.430 and 0.375 inch diameters that are configurable either as formed tubulars or process heaters. The heaters can also be welded to flanges and plates for mounting purposes. Maximum sheath length available is 275 inches for the 0.430 inch and 0.375 inch diameters. The factory should be contacted for longer sheath lengths.

Features and Benefits

Inconel® 600 sheath material and a special internal construction

- Assures high temperature performance and corrosion protection in tough applications

0.375 and 0.430 inch diameters

- Allows heater to be configured to existing tubular designs that may be experiencing short life

Dual-ended termination

- Can be installed into flanges and screw plugs similarly to standard product configurations

Bendable in standard formations

- Makes the heater easy to apply in a wide variety of applications

Applications

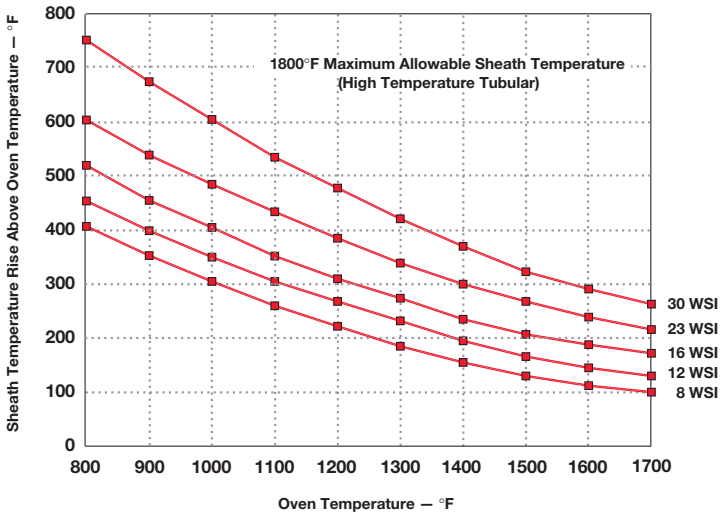
- High temperature ovens and furnaces
- Radiant heating
- Drying
- Environmental—VOC abatement
- Process air heating: duct heaters, circulation heaters
- Vacuum applications
- Flue gas cleaning (desulphurization)
- Fluidized beds

WATROD Single/Double-Ended Heaters

High-Temperature Tubular Heaters

Sheath Temperature Versus Oven Temperature at Various Watt Density

This chart is used to verify the correct watt density for an oven application assuming no air flow. To use the chart, first select the oven process temperature on the X axis, using the chosen watt density read the sheath temperature rise above oven temperature from the Y axis. This number should then be added to oven temperature. If this number is greater than 1800˚F (982°C), a lower watt density should be chosen.

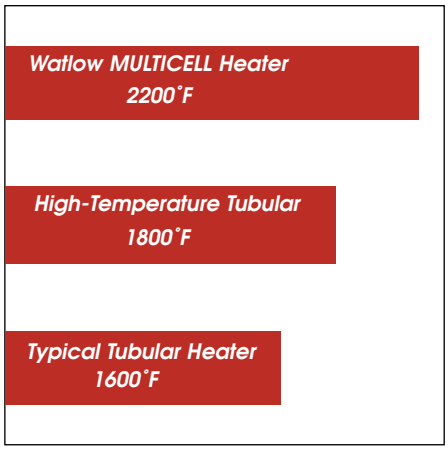


Heater Life Estimate Service

Watlow now provides an industry first service with the offering of the high temperature tubular. By providing operating parameters Watlow can provide customers with the estimated life of the heater. To get this information the following information should be provided:

- Heater voltage
- Heater wattage
- Heater diameter (0.430 or 0.375 in.)
- Heated length
- Bend configuration and dimensions (number of bends and radius)
- Application including process temperature
- Power switching device and cycle time (SCR, etc.)

High Temperature Heater Comparisons



*Assuming normal design practices.

How to Order

To order please specify:

- Volts
- Watts
- Heater diameter (0.430 in. or 0.375 in.)
- Termination type or style (studs, lead wire)
- Heated length
- Cold end length
- Overall sheath length
- Formation
- Mounting option (bulkheads, brackets, etc.)

WATROD Single/Double-Ended Heaters

MULTICOIL Tubular Heaters

The tubular element with multiple coils and/or thermocouples inside one sheath from Watlow® answers the need for a versatile, innovative tubular heater. Watlow's patent-pending method of packaging a thermocouple inside of a heater with one or more resistance coils, gives the ability to sense a heaters' internal temperature accurately, every time.

Moreover, this is the first tubular heater in the industry with three-phase capability. The three coil, three-phase heater will offer a lower amperage solution while delivering the full power required in a compact heater package. Previously three separate heaters would have been required to do the same job; therefore Watlow's MULTICOIL heater capabilities save money.

Watlow has the capability to put up to two coils in a 0.375 or 0.430 inch diameter heater and up to three coils in a 0.475 or 0.490 inch diameter heater. Any one or more of these coils can be a resistance wire or a thermocouple. The bending formations and mounting options are similar to other Watlow tubular heaters. The three-phase MULTICOIL heaters can be single ended with three leads for three-phase wye hook up. Watlow recommends using an epoxy moisture seal or silicone-based seal.

Watlow's MULTICOIL heaters are available in all standard materials such as Incoloy®, 304 and 316 stainless steel, and can be formed into many configurations. The six thermocouple and/or coil options for MULTICOIL tubular configurations will meet most requirements; however, we are always interested in discussing the use of different materials or changing the number of coils and thermocouples.

Features and Benefits

Three-phase capability
- Results in one element versus three, lower amperage, reduced installation time and lower overall cost

Internal thermocouple
- Allows responsive and accurate, internal, high-limit sensing and reduced assembly costs

Single-ended
- Allows for mounting in a ½ inch NPT or ¾ inch NPT fitting with three-phase capability

Multiple coil operations
- Reduces inventory by allowing dual voltage capability



Versatile forming capabilities
- Can be formed into many configurations

Internal construction
- Allows space savings because drilling and tapping of flange is unnecessary; plus, the interior thermocouple eliminates contamination buildup around the external sensing tip, reducing the possibility of false readings

Applications

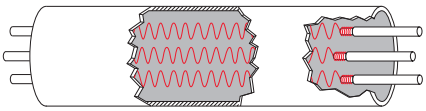
- Foodservice
- Process
- Medical
- Milled groove
- Plastics
- Plating
- Oven heating
- Semiconductor

WATROD Single/Double-Ended Heaters

MULTICOIL Tubular Heaters

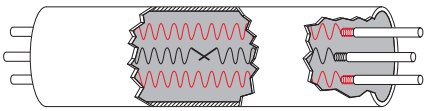
Options

Option A



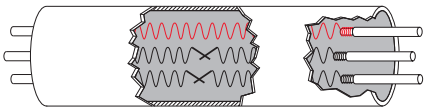
3-phase tubular, 0.475 and 0.490 inch diameter.

Option B



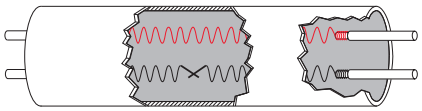
1-phase tubular with two resistance wires and one thermocouple, 0.475 and 0.490 inch diameter.

Option C



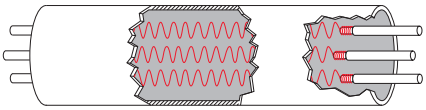
1-phase tubular with one resistance wire and two thermocouples, 0.475 and 0.490 inch diameter.

Option D



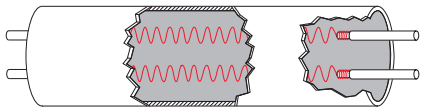
1-phase tubular with one resistance coil and one thermocouple, 0.375, 0.430, 0.475 and 0.490 inch diameter.

Option E



1-phase tubular with three different one phase circuits, 0.475 and 0.490 inch diameter.

Option F



1-phase tubular with two resistance coils, 0.375, 0.430, 0.475 and 0.490 inch diameter.

Specifications

Termination Styles

- Currently limited to lead wires 392°F (200°C) Sil-A-Blend™ or 482°F (250°C) GGS.

Moisture Seals

Moisture seals are required, options include:

- Standard epoxy with temperature rating to 356°F (180°C). Typical applications include water/oil immersion.
- Lavacone with temperature rating to 221°F (105°C). Typical application includes air heating.
- High-temperature ceramic rated to 2800°F (1537.8°C).
- Contact your Watlow representative for other moisture seal options.

Mounting options

- Mounting brackets
- Locator washers
- Mounting collars
- Water-tight bulkheads

Maximum trim length

- 237 in. (6020 mm), heater designs with trim length greater than 120 in. (3048 mm) must be reviewed with your Watlow representative.

Sheath materials

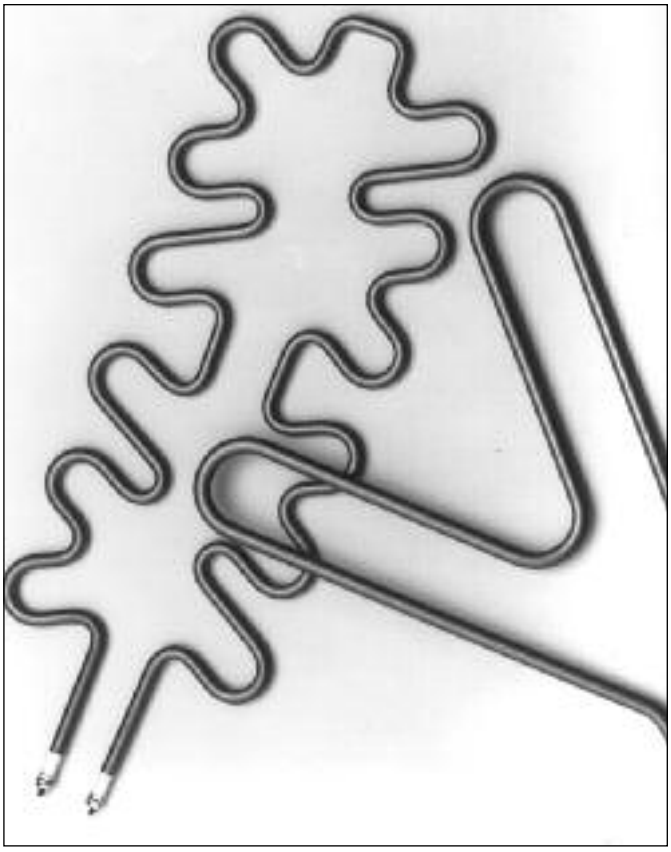
- Incoloy®, 304 and 316 stainless steel, contact your Watlow representative for other sheath material options.

Internal thermocouple options

- Type K is used, contact your Watlow representative for Type J thermocouple options.

WATROD Single/Double-Ended Heaters

Milled Groove Tubular Heaters



WATROD milled groove heaters are precision-formed and customized to your hot runner mold application. Even tight radius bends of 0.250 inch maintaining tolerances of ±0.062 to ±0.002 inch are possible. This capability not only allows you freedom to design for the optimum uniform heating pattern for your plastics process, but also guarantees quick and easy installation.

Simply send your groove dimensions in a detailed drawing or on CAD file. Depending on your heater formation requirements, the resulting CAD design will be transferred to either our CNC bending equipment or a highly skilled bending operator.

A variety of sheath materials are available including Incoloy®, 304 stainless steel and 316 stainless steel; each offering unique advantages of long life in high temperature molds, rigidity to maintain shape during shipment and corrosion resistance.

Watlow not only delivers the heat fast to your process with efficient heat transfer, but guarantees the heater's fast delivery, too. While Watlow guarantees standard delivery within three to four weeks, tough delivery schedules are Watlow's specialty.

Features and Benefits

Precise conformity to customer specifications
- Ensures easy installation—bending tolerances as low as ± 0.002 in.

Common element diameters
- Includes 0.260, 0.315, 0.332, 0.375 and 0.430 in. (6.6, 8, 8.5, 9.5 and 10.9 mm) diameters

Incoloy® sheath material
- Corrosion resistant, capable in high temperature environments

304 stainless steel
- Excellent pliability, best choice for small bend radii

Superior resistance coil design
- Produces even heating

Threaded stud or lead wire termination as required
- Robust options for challenging environments

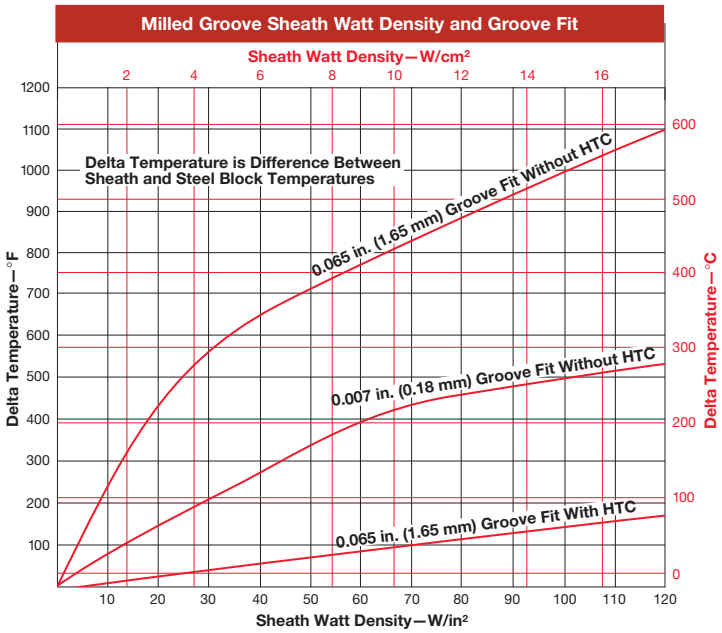
Applications

- Hot runner molds
- Precise heat uniformity

WATROD Single/Double-Ended Heaters

Milled Groove Tubular Heaters

Use the *Milled Groove Sheath Watt Density and Groove Fit* chart to find the recommended watt density or tightest groove fit. Optimum groove fit, without heat transfer cement, can be determined by plotting the intersect point between the required sheath watt density and the Delta temperature (T). If the Delta T is not known, simply subtract the mold temperature from the maximum 1000°F (540°C) sheath temperature. Any combination of watt density and groove fit which results in a Delta T below the recommended maximum will maximize heater life. Conversely, if the Delta T is greater, less heater life can be expected.



- Recommended maximum watt density = 40 to 70 W/in² (6.2 to 10.9 W/cm²)
- Recommended groove = 0.065 inch (1.65 mm) larger in diameter than sheath diameter and use heat transfer cement.
- Recommended heater sheath diameter = 0.315 in. (8 mm)
- Recommended maximum Delta T = 400°F (205°C)
- Maximum sheath temperature = 1000°F (540°C)
- Recommended sheath material = Incoloy®

How to Order

All milled groove heaters are made-to-order. Due to precision forming requirements, please provide a detailed drawing or CAD file. Contact your Watlow representative for price and shipment details. To help the ordering process, provide the following information:

- Operating temperature
- Volts/watts
- Sheath diameter and material
- No-heat section
- Electrical terminations
- Bend configurations and dimensions
- Groove cross section dimensions
- Quantity

Replacement Heaters

To order a replacement for an existing milled groove heater, specify original Watlow code number, or provide dimensions of the competitive heater, or the groove dimensions from the manifold.

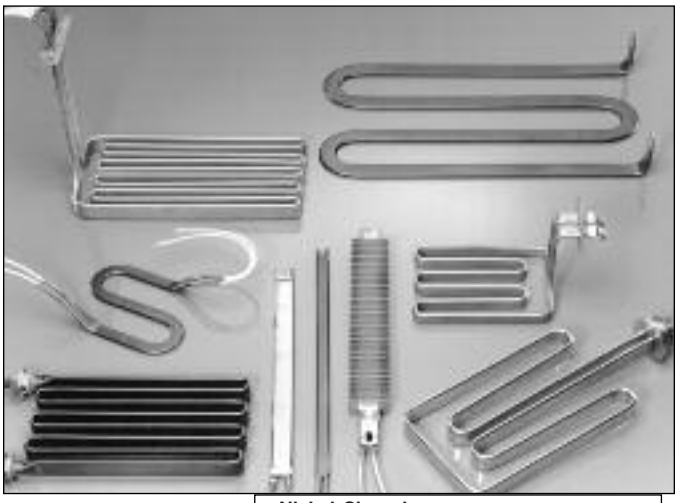
FIREBAR® Single/Double-Ended Heaters

FIREBAR® heating elements provide added heating performance over standard round tubular heating elements—especially for immersion applications in petroleum based liquids that require high kilowatts. The FIREBAR's unique flat surface geometry packs more power in shorter elements and assemblies, along with a host of other performance improvements. These include:

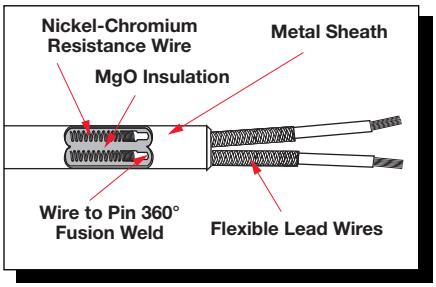
- Minimizing coking and fluid degrading
- Enhancing the flow of fluid past the element's surface to carry heat from the sheath
- Improving heat transfer with a significantly larger boundary layer that allows much more liquid to flow up and across the sheath's surface

FIREBAR elements are available in single- and double-ended constructions with one inch or ⅝ inch heights. These two configuration variables make it possible to use FIREBAR elements instead of round tubular elements in virtually all applications.

FINBAR is a special version of the one inch, single-ended FIREBAR. FINBAR is specially modified with fins to further increase surface area for air and gas heating applications. Details are contained in the *FINBAR* section, starting on page 119.



One Inch Double-Ended FIREBAR Element and Lead Configurations



⅝ Inch Double-Ended FIREBAR Element and Lead Configurations

Double-Ended Performance Capabilities

One Inch

- Watt densities to 120 W/in² (18.6 W/cm²)
- Incoloy® sheath temperatures to 1400°F (760°C)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Voltages to 480V~(ac)
- Amperages to 48 amperes per heater or 16 amperes per coil

⅝ Inch

- Watt densities to 90 W/in² (13.9 W/cm²)
- Incoloy® sheath temperatures to 1400°F (760°C)
- Voltages to 480V~(ac)
- Amperages to 32 amperes per heater or 16 amperes per coil

Single-Ended Performance Capabilities

One Inch

- Watt densities to 60 W/in² (9.3 W/cm²)
- Incoloy® sheath temperatures to 1400°F (760°C)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Voltages to 480V~(ac)
- Amperages to 48 amperes per heater or 16 amperes per coil

⅝ Inch

- Watt densities to 80 W/in² (12.4 W/cm²)
- Incoloy® sheath temperatures to 1400°F (760°C)
- Voltages to 480V~(ac)
- Amperages to 16 amperes per heater

FIREBAR Double-Ended Heaters

Specifications



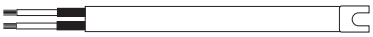


	One Inch FIREBAR	⅝ Inch FIREBAR
Applications	Direct immersion; water, oils, etc. Clamp-on; hoppers, griddles Forced air heating (Also see FINBAR, page 119) Radiant heating	Direct immersion; water, oils, etc. Clamp-on; hoppers, griddles Forced air heating Radiant heating
Watt Density W/in² (W/cm²)	Stock: up to 90 (13.9) Made-to-Order (M-t-O): up to 120 (18.6)	Stock: up to 90 (13.9) Made-to-Order (M-t-O) up to 90 (13.9)
Surface Area Per Linear In. (cm)	2.3 in² (14.8 cm²)	1.52 in² (9.80 cm²)
Cross Section Height ± 0.015/0.010 in. (0.381/0.254 mm) Thickness ± 0.005/0.001 in. (0.127/0.025 mm)	 1.010 (25.7) 0.235 (5.9)	 0.650 (16.5) 0.235 (5.9)
Sheath Material—Max. Operating temperature	Stock: Incoloy® 1400°F (760°C) M-t-O: Incoloy® 1400°F (760°C) 304 SS 1200°F (650°C)	Stock: Incoloy® 1400°F (760°C) M-t-O: Incoloy® 1400°F (760°C) 304 SS 1200°F (650°C)
Sheath Length in. (mm)	Stock: 15 to 114 (381 to 2896) M-t-O: 11 to 180 (280 to 4572)	Stock: 15 to 51 (381 to 1295) M-t-O: 11 to 115 (280 to 2920)
Straightness Tolerance Major axis in./ft (cm/m): Minor axis in./ft (cm/m):	 0.062 (0.52) 0.062 (0.52)	 0.062 (0.52) 0.062 (0.52)
No-Heat Length (Refer to page 113)	1 in. min., 12 in. max. (25/305 mm)	1 in. min., 12 in. max. (25/305 mm)
Max. Voltage—Amperage **Max. Hipotential** **Max. Current Leakage Per Coil (cold)** **Max. Amperage Per Coil** **Phase(s)** **Resistance Coils**	480V~(ac)—48A 1960V~(ac) 3mA 16A 1-ph parallel/series, 3-ph delta/wye 3 or 2	480V~(ac)—32A 1960V~(ac) 3mA 16A 1-ph parallel/series 2
Ohms/In./Unit① **Ohms/In./Coil**①	0.270Ω min.—2.833Ω max. 0.080Ω min.—8.500Ω max. per coil	0.040Ω min.—4.250Ω max. 0.080Ω min.—8.500Ω max. per coil
Terminations	Flexible lead wires Quick connect (spade) Screw lug (plate) Threaded stud	Flexible lead wires Quick connect (spade) Screw lug (plate) Threaded stud
Seals	Stock: Lavacone 390°F (200°C) M-t-O: Ceramic base 2800°F (1535°C) Silicone rubber 500°F (260°C) Lavacone 390°F (200°C) Epoxy resin 266/356°F (130/180°C)	Stock: Lavacone 390°F (200°C) M-t-O: Ceramic base 2800°F (1535°C) Silicone rubber 500°F (260°C) Lavacone 390°F (200°C) Epoxy resin 266/356°F (130/180°C)
Min. Axis Bending Radius in. (mm) (Do not field bend)	Major: 1 (25) Minor: ½ (13) 90° bend Minor: 5/32 (4) 180° bend	Major: ¾ (19) Minor: ½ (13) 90° bend Minor: 5/32 (4) 180° bend
Mounting Options	Brackets (Type 1, 2 and 3) Threaded bulkhead or fitting	Brackets (Type 1, 2 and 3) Threaded bulkhead or fitting
Surface Finish Options	Bright anneal, passivation	Bright anneal, passivation
Optional Internal Thermocouple	ASTM Type K	—
Agency Recognition	UL® Component recognition to 480V~(ac) (File # E52951) CSA Component recognition to 480V~(ac) (File # 31388)	UL® Component recognition to 480V~(ac) (File # E52951) CSA Component recognition to 480V~(ac) (File # 31388)

① Resistance values valid for three coil 1 in. (25 mm) FIREBAR only.

FIREBAR Single-Ended Heaters

Specifications (Continued)

	One Inch Single-Ended FIREBAR 	⅝ Inch Single-Ended FIREBAR 
Applications	Clamp-on; hoppers, griddles Forced or convection air heating (Also see FINBAR, page 119)	Clamp-on; hoppers, griddles Forced or convection air heating
Watt Density W/in² (W/cm²)	Stock: up to 40 (6.2) M-t-O: up to 60 (9.3)	Stock: up to 20 (3.1) M-t-O: up to 60 (12.4)
Surface Area Per Linear In. (cm)	2.3 in² (14.8 cm²)	1.52 in² (9.80 cm²)
Cross Section Height ± 0.015/0.010 in. (0.381/0.254 mm) Thickness ± 0.005/0.001 in. (0.127/0.025 mm)	 1.010 (25.7) 0.235 (5.9)	 0.650 (16.5) 0.235 (5.9)
Sheath Material—Max. Operating temperature	Stock: 304 SS 1200°F (650°C) M-t-O: Incoloy® 1400°F (760°C) 304 SS 1200°F (650°C)	Stock: Incoloy® 1400°F (760°C) M-t-O: Incoloy® 1400°F (760°C) 304 SS 1200°F (650°C)
Sheath Length in. (mm)	Stock: 11 to 46¼ (280 to 1175) M-t-O: 11 to 120 (280 to 3048)	Stock: 11½ to 52 (280 to 1321) M-t-O: 11 to 116 (280 to 2946)
Straightness Tolerance Major axis in./foot (cm/m): Minor axis in./foot (cm/m):	 0.062 (0.52) 0.062 (0.52)	 0.062 (0.52) 0.062 (0.52)
No-Heat Length (Refer to page 113) Top Cold End Bottom (blunt end) Cold End	 1 in. min., 12 in. max. (25/305 mm) 1 ph- 0.5 min., 2 in. max. (13/51 mm) 3 ph- 0.75 min., 2 in. max. (19/51 mm)	 1 in. min., 12 in. max. (25/305 mm) Only available at 1.25 in. N/A
Max. Voltage—Amperage **Max. Hipotential** **Max. Current Leakage (cold)** **Max. Amperage Per Coil** **Phase(s)** **Resistance Coils**	480V~(ac)—48A 1960V~(ac) 3mA 16A 1-ph, 3-ph wye 3 or 1	480V~(ac)—16A 1960V~(ac) 3mA 16A 1-ph 1
Ohms/In./Unit	0.200Ω min.—14.00Ω max.①	0.200Ω min.—14.00Ω max.①
Terminations	Flexible lead wires Threaded stud Quick connect (spade) Screw lug (plate)	Flexible lead wires Quick connect (spade) Screw lug (plate)
Seals	Stock: Lavacone 392°F (200°C) M-t-O: Ceramic base 2800°F (1535°C) Silicone rubber 500°F (260°C) Lavacone 390°F (200°C) Epoxy resin 266/356°F (130/180°C)	Stock: Lavacone 392°F (200°C) M-t-O: Ceramic base 2800°F (1535°C) Silicone rubber 500°F (260°C) Lavacone 390°F (200°C) Epoxy resin 266/356°F (130/180°C)
Min. Axis Bending Radius in. (mm) (Do Not Field Bend)	Major: 1 (25) Minor: ½ (13) 90° bend Minor: 5/32 (4) 180° bend	Major: ¾ (19) Minor: ½ (13) 90° bend Minor: 5/32 (4) 180° bend
Mounting Options	Bracket (Type 2) Threaded bulkhead	Bracket (Type 2) Threaded bulkhead
Surface Finish Options	Bright anneal	Bright anneal
Optional Internal Thermocouple	—	—
Single-end Configuration	Stock: Slotted M-t-O: Slotted, sealed or welded	Stock: Slotted M-t-O: Slotted, sealed or welded
Agency Recognition	UL® Component recognition to 480V~(ac) (File # E52951) CSA Component recognition to 480V~(ac) (File # 31388)	UL® Component recognition to 480V~(ac) (File # E52951) CSA Component recognition to 480V~(ac) (File # 31388)

① Based on 1-phase, single voltage heater.

FIREBAR Single/Double-Ended Heaters

Features and Benefits

One Inch Features and Benefits

Double-Ended

Streamline, 0.235 x 1.010 in. (5.9 x 25.6 mm) normal to flow dimension
- Reduces drag

70 percent greater surface area per linear inch compared to a 0.430 in. (11 mm) diameter round tubular heater
- Reduces watt density or packs more kilowatts in smaller bundles

Compacted MgO insulation
- Maximizes thermal conductivity and dielectric strength

Nickel-chromium resistance wires
- Precision wound

0.040 in. (1 mm) thick MgO walls
- Transfers heat more efficiently away from the resistance wire to the sheath and media—conducts heat out of the element faster

Three resistance coil design
- Configurable to either one- or three-phase power, readily adapts to a variety of electrical sources and wattage outputs

Lavacone seals
- Provides protection against humid storage conditions, moisture retardant to 392°F (200°C)

Single-Ended

Single-ended termination
- Simplifies wiring and installation

Streamline, 0.235 x 1.010 in. (5.9 x 25.6 mm) normal to flow dimension
- Reduces drag

70 percent greater surface area per linear inch
- Reduces watt density from that of the 0.430 in. (11 mm) diameter round tubular

Slotted end
- Provides installation ease in clamp-on applications

Lavacone seals
- Provides protection against humid storage conditions, moisture retardant to 392°F (200°C)

⅝ inch Features and Benefits

Double-Ended

Special sheath dimensions, 0.235 x 0.650 in. (5.9 x 16.5 mm)
- Results in a lower profile heater

10 percent greater surface area per linear inch
- Reduces watt density from that of the 0.430 in. (11 mm) diameter round tubular heater

0.040 in. (1 mm) thick MgO walls
- Transfers heat efficiently away from the resistance wire to the heated media—conducts heat out of the element faster

Lavacone seals
- Provides protection against humid storage conditions, moisture retardant to 392°F (200°C)

Single-Ended

Single-ended termination
- Simplifies wiring and installation

Special sheath dimensions, 0.235 x 0.650 in. (5.9 x 16.5 mm)
- Results in a lower profile heater for more wattage in a smaller package

Slotted end
- Provides installation ease in clamp-on applications

Lavacone seals
- Provides protection against humid storage conditions, moisture retardant to 392°F (200°C)

FIREBAR Single/Double-Ended Heaters

Performance Features

FIREBAR's flat tubular element geometry produces performance features and benefits not possible with traditional round tubular technology. The following describes how and why the FIREBAR is functionally superior for many applications—especially those requiring large wattage with low watt density.

By using the FIREBAR element you can:

- Lower the element's watt density
- Reduce element size and keep the same watt density
- Increase element life by reducing sheath temperature

Flat Shape Produces Lower Sheath Temperature

The FIREBAR element operates at a lower sheath temperature than a round tubular element of equal watt density because of three factors.

1. Flat Surface Geometry

FIREBAR's flat, vertical geometry is streamline. The liquid's flow past the heating element's surface is not impaired by back eddies inherent in the round tubular shape. The FIREBAR's streamline shape results in fluids flowing more freely with more heat carried away from the sheath.



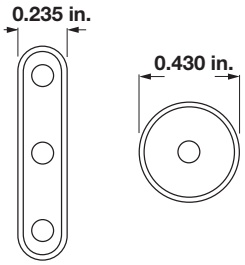
2. Normal to the Flow

The element's width (thickness) of both 1 inch and ⅝ inch FIREBAR elements is just 0.235 in. (5.9 mm). Compared to a 0.430 in. (11 mm) round tubular element, this relative thinness further reduces drag on liquids or gases flowing past the heater.

3. Buoyancy Force

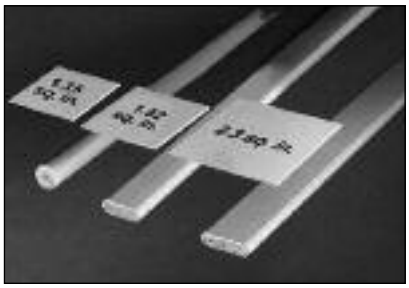
The FIREBAR element's boundary layer, or vertical side, is greater than virtually all round tubular elements. This is 1.010 and 0.650 in. (25.6 and 16.5 mm) for the one inch and ⅝ in. FIREBARs respectively, compared to a 0.430 in. (11 mm) diameter on a round tubular element. The FIREBAR element's increased height, relative to flow, increases the buoyancy force in viscous liquids. This buoyancy force can be as much as 10 times greater depending on the FIREBAR element and liquid used.

Comparative Widths



Watt Density and Surface Area Advantages

The surface area per linear inch of a 1 in. FIREBAR is 70 percent greater than the 0.430 in. (11 mm) diameter round tubular element. The ⅝ in. FIREBAR is nearly 10 percent greater.



Element Type	Surface Area Per Linear inch (cm) in²	(cm²)
1 in. FIREBAR	2.30 in²	(5.84 cm²)
⅝ in. FIREBAR	1.52 in²	(3.86 cm²)
0.430 in. Round	1.35 in²	(3.43 cm²)

Flat vs. Round Geometry Comparisons

The unique flat surface geometry of the FIREBAR element offers more versatility in solving heater problems than the conventional round tubular element. The following comparisons show how the FIREBAR element consistently outperforms round tubular heaters. FIREBAR elements can:

- Reduce coking and fluid degrading
- Increase heater power within application space parameters
- Provide superior heat transfer in clamp-on applications resulting from greater surface area contact
- Lower watt density

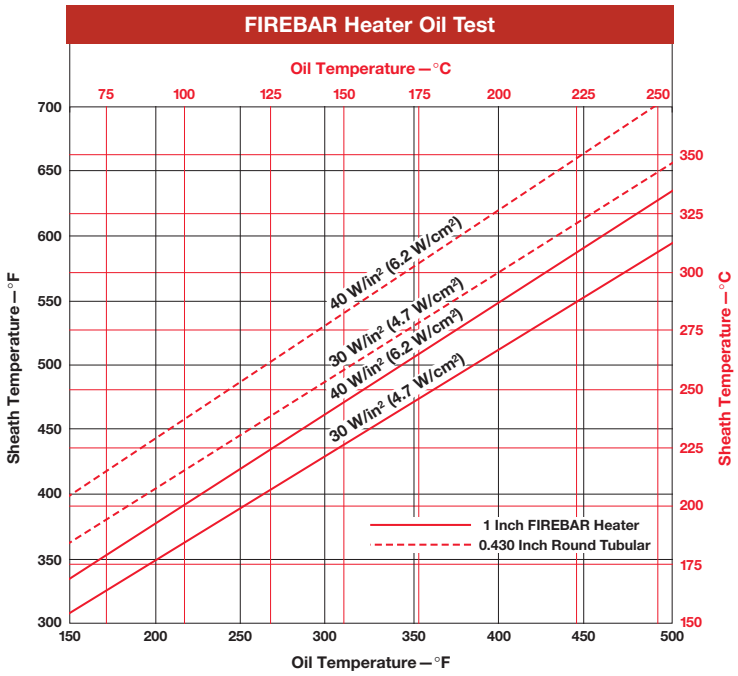
Reducing watt density or sheath temperature extends life. The FIREBAR element allows you to do either, without sacrificing equipment performance … as is proven by the accompanying *Heater Oil Test, Air Flow and Watt Density vs. Sheath Temperature* graphs.

FIREBAR Single/Double-Ended Heaters

Technical Data

The *FIREBAR Heater Oil Test* graph compares sheath temperatures of 40 W/in² (6.7 W/cm²) flat and round tubular elements. The FIREBAR element consistently operates at a lower sheath temperature than the round tubular element, even when light oils are tested at different temperatures. This reduces the chance that coking and fluid degradation will occur.

In fact, the FIREBAR element's sheath temperature at 40 W/in² (6.7 W/cm²) is lower than a 30 W/in² (4.6 W/cm²) round tubular element.



Heater Size and Power

The *Heater Size Comparison* chart shows, at the same wattage and watt density, the FIREBAR element is 38 percent shorter than a 0.430 in. (11 mm) round tubular element. The FIREBAR element requires less space in application and equipment designs.

Heater Size Comparison

Element	Heated Length in.	(mm)	Wattage	W/in²	(W/cm²)
1 in. FIREBAR Element	19⅞	(504.8)	1000	23	(3.6)
0.430 in. Round Tubular Element	32¼	(819.0)	1000	23	(3.6)

The *Heater Power Comparison* chart demonstrates equal watt density, element length and increased total wattage for the FIREBAR element. The power in the FIREBAR element is 70 percent greater.

Heater Power Comparison

Element	Heated Length in.	(mm)	Wattage	W/in²	(W/cm²)
1 in. FIREBAR Element	32¼	(819.0)	1700	23	(3.6)
0.430 in. Round Tubular Element	32¼	(819.0)	1000	23	(3.6)

FIREBAR Single/Double-Ended Heaters

Technical Data *(Continued)*

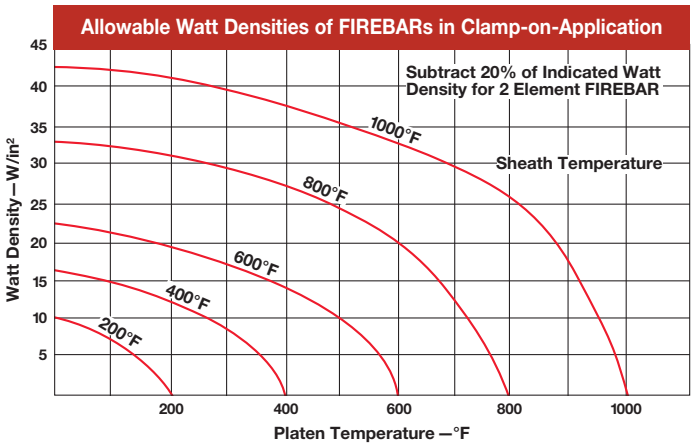
Clamp-On Applications

Direct immersion in the liquid may not always be practical. In these instances the FIREBAR element can be clamped to a tank wall. Heat from the FIREBAR is conducted to the tank wall and into the media.

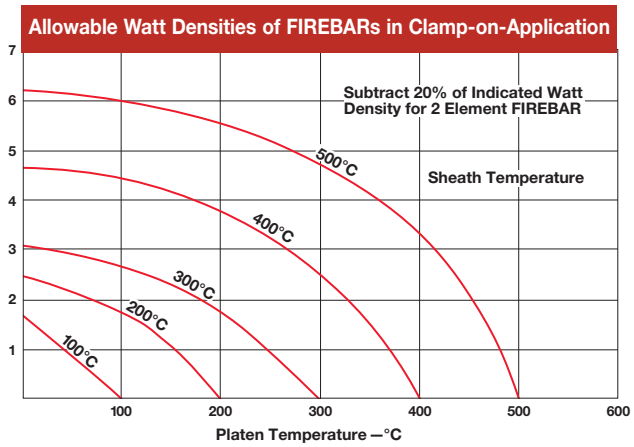
FIREBAR elements are also economical platen heaters. The *Platen Heating* graph shows FIREBAR's large, flat surface area allows it to operate at twice the watt density of round tubular elements … without sacrificing heater life.

Clamps should be placed approximately 6 in. (150 mm) apart and torqued down with 60 in-lbs (6.8 Newton meters).

Platen Heating (˚F)

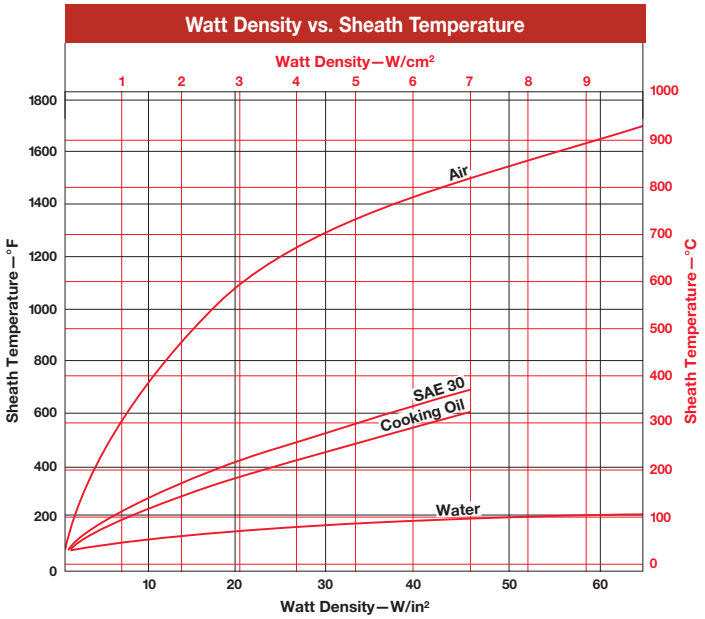


Platen Heating (˚C)



Watt Density vs. Sheath Temperature

The *Watt Density vs. Sheath Temperature* graph features sheath temperature curves for commonly heated substances. A FIREBAR element's watt density will result in the sheath temperature shown at the intersecting point of its vertical watt density line and substance curve.



FIREBAR Single/Double-Ended Heaters

Technical Data *(Continued)*

Air Heating

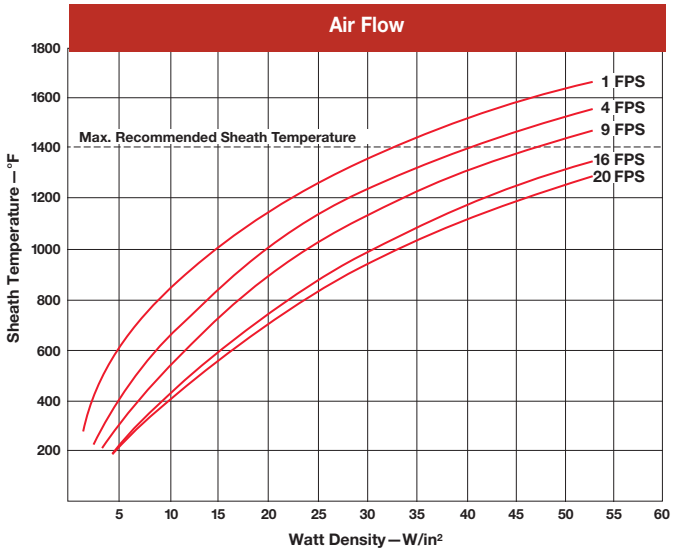
The Air *Flow/Watt Density/Sheath Temperature* graph shows the relationship between air flow, watt density and sheath temperature. Keep in mind that lower sheath temperature yields longer heater life.

To use the *Air Flow* graph,determine the air flow in feet per second (or meters per second). Then follow the curve to find the recommended sheath temperature and watt density.

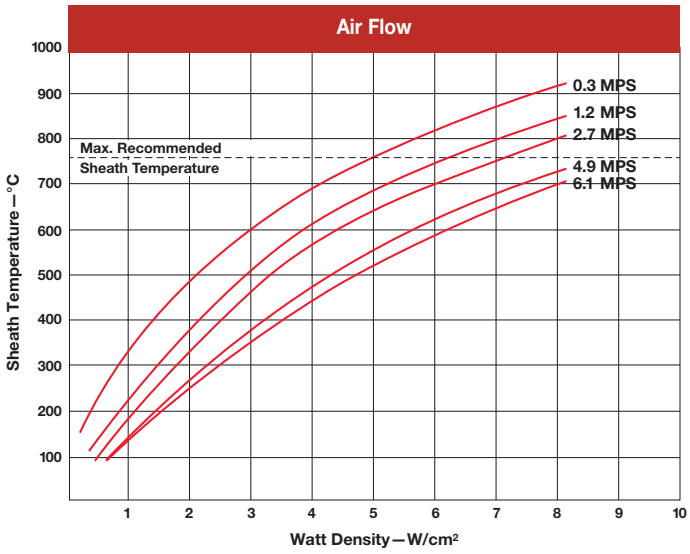


Air Flow Normal to Sheath Geometry

Air Flow/Watt Density/Sheath Temperature (°F)



Air Flow/Watt Density/Sheath Temperature (°C)



Moisture Resistant Seals

A standard epoxy seal is provided to prevent moisture and contaminants from entering the heater. Upon request, optional silicone rubber (RTV) and epoxy resin seals may be ordered.

Silicone Rubber (RTV) Seal

Silicone rubber RTV seals are ⅛ in. (3.2 mm) moisture barriers surrounding the terminal pins at the end of the sheath. Silicone rubber is effective to 500°F (260°C).

Epoxy Resin Seal

Epoxy resin seals are ⅛ in. (3.2 mm) moisture barriers surrounding the terminal pins at the end of the sheath. Epoxy resin is effective to 266°F (130°C) or 356°F (180°C), and recommended for water heating applications.

Application Hints

- Choose a FIREBAR heating element instead of an assembly, when your application requires lower wattages or smaller system packages.
- Keep terminations clean, dry and tight.
- Extend the heated section completely into the media being heated at all times to maximize heat transfer and heater life.
- Do not locate the end of the heated length within a bend, unless the radius is 3 in. (76 mm) or larger.
- Ensure termination temperatures do not exceed 392°F (200°C) or the maximum temperature rating of the end seal, whichever is lower.

FIREBAR Single/Double-Ended Heaters

Technical Data *(Continued)*

All FIREBAR heaters are available with a variety of termination options. Contact your Watlow representative for availability.

Terminations

Code Number*	Termination	Phase	Wiring	1 in. FIREBAR		5/8 in. FIREBAR	
				Dual-Ended	S. End/FINBAR	Dual-Ended	Single-Ended
A1	Sil-A-Blend™ 200°C lead wire	1	Parallel	Yes	Yes	Yes	Yes
A2	Sil-A-Blend™ 200°C lead wire	1	Series	Yes	No	Yes	No
A3	Sil-A-Blend™ 200°C lead wire	3	Delta	Yes	No	No	No
A4	Sil-A-Blend™ 200°C lead wire	3	Wye	Yes	Yes	No	No
B1	TGGT 250°C lead wire	1	Parallel	Yes	Yes	Yes	Yes
B2	TGGT 250°C lead wire	1	Series	Yes	No	Yes	No
B3	TGGT 250°C lead wire	3	Delta	Yes	No	No	No
B4	TGGT 250°C lead wire	3	Wye	Yes	Yes	No	No
C1	¼ in. quick connect (spade)	1	Parallel	Yes	Yes	Yes	Yes
C2	¼ in. quick connect (spade)	1	Series	Yes	No	No	No
D1	Screw lug (plate) terminal	1	Parallel	Yes	Yes	Yes	Yes
D2	Screw lug (plate) terminal	1	Series	Yes	No	No	No
D3	Screw lug (plate) terminal	3	Delta	Yes	No	No	No
E1	#10-32 stud terminal	1	Parallel	Yes	Yes	Yes	Yes
E2	#10-32 stud terminal	1	Series	Yes	No	No	No
E3	#10-32 stud terminal	3	Delta	Yes	No	No	No

Termination Code Number Legend*

A = Silicone rubber insulation (Sil-A-Blend™) with fiberglass oversleeves. Rated to 392°F (200°C).
B = High-temperature TGGT insulation with fiberglass oversleeves. Rated to 480°F (250°C).
C = Nickel-plated steel quick connect.
D = Nickel-plated steel screw lug with ceramic insulator and plated steel screw
E = #10-32 nickel-plated steel threaded stud with plated steel nuts and washers.

Electrical Configuration

1 = 1-phase parallel, 2 = 1-phase series, 3 = 3-phase delta, 4 = 3-phase wye

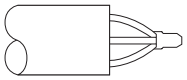
Double-End FIREBAR

Flexible Lead Wire ① A, B



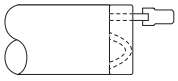
- Double-End 1 in. FIREBAR
- Single-End 1 in. FIREBAR
- FINBAR

Quick Connect (Spade) C1



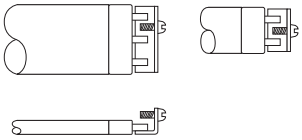
- Double-End 1 in. FIREBAR

Quick Connect (Spade) C2



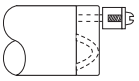
- Double-End 1 in. FIREBAR

Screw Lug (Plate) D1



- Double-End 1 & ⅝ in. FIREBAR

Screw Lug (Plate) D2



- Double-End 1 in. FIREBAR

Screw Lug (Plate) D3

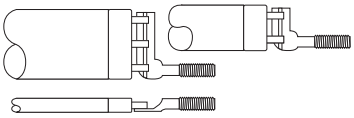


- Double-End 1 in. FIREBAR

3-phase delta wiring example

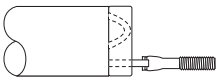


Threaded Stud E1



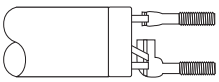
- Double-End 1 & ⅝ in. FIREBAR

Threaded Stud E2



- Double-End 1 in. FIREBAR

Threaded Stud E3



- Double-End 1 in. FIREBAR

3-phase delta wiring example



① Flexible lead wires are 12 in. (305 mm) long unless otherwise specified.

Single-End FIREBAR

Flexible Lead Wire ① A, B



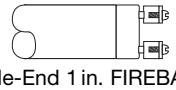
- Single-End 1 in. FIREBAR
- Double-End ⅝ in. FIREBAR
- Single-End ⅝ in. FIREBAR
- FINBAR

Quick Connect (Spade) C3

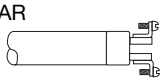


- Single-End 1 FIREBAR
- FINBAR
- Double-End ⅝ in. FIREBAR
- Single-End ⅝ in. FIREBAR

Screw Lug (Plate) D4

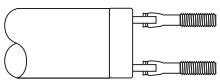


- Single-End 1 in. FIREBAR
- FINBAR



- Double-End ⅝ in. FIREBAR
- Single-End ⅝ in. FIREBAR

Threaded Stud E4



- Single-End 1 in. FIREBAR
- FINBAR

① Flexible lead wires are 12 in. (305 mm) long unless otherwise specified.

FIREBAR Single/Double-Ended Heaters

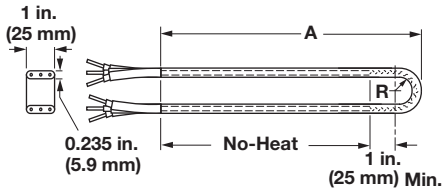
Bending

Major and Minor Axis Bending Parameters

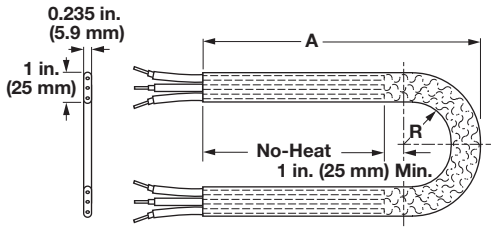
The following illustrations detail the recommended major and minor axis bend parameters for FIREBAR elements. These illustrations show the relationship between the type of bend and the location of heat and no-heat sections. See the next two pages for the 15 common bend formations.

Note: Watlow does not recommend field bending FIREBAR elements. If the element must be bent in the field, please contact your Watlow representative for assistance.

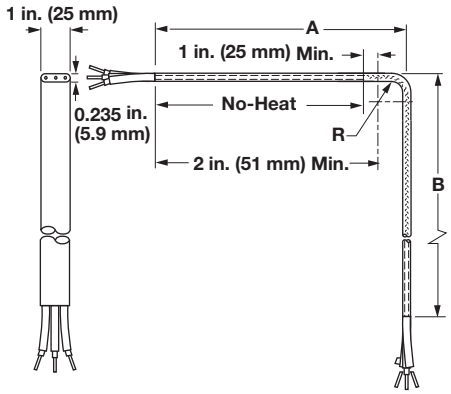
180° Minor Axis Heated Bend



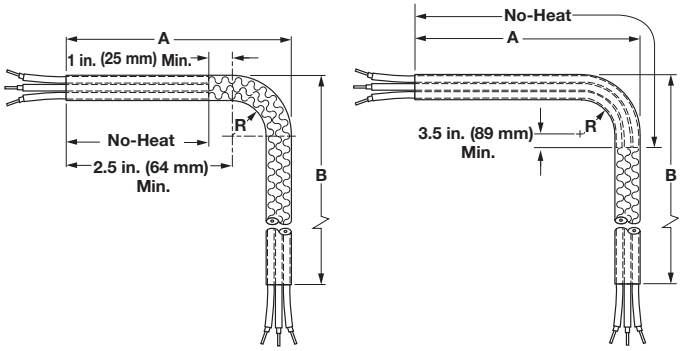
180° Major Axis Heated Bend



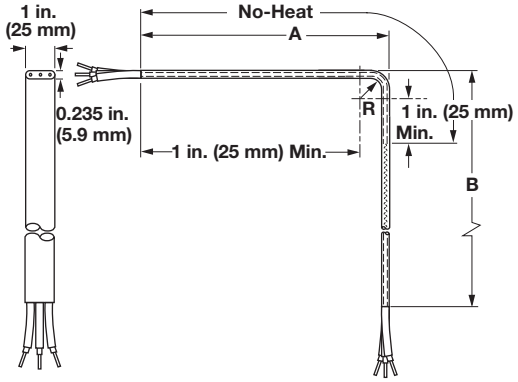
90° Minor Axis Heated Bend



90° Major Axis Heated Bend



90° Minor Axis Un-Heated Bend



180° Major Axis Bends

FIREBAR Size		Radius		Arc Length
in.	(mm)	in.	(mm)	
⅝	(15.9)	¾	(19.0)	3.125
⅝	(15.9)	1	(25.0)	3.900
⅝	(15.9)	1¼	(32.0)	4.620
⅝	(15.9)	1½	(38.0)	5.600
1	(25.0)	1	(25.0)	4.335
1	(25.0)	1¼	(32.0)	5.121
1	(25.0)	1½	(38.0)	5.906

FIREBAR Single/Double-Ended Heaters

Bend Formations

FIREBAR elements can be formed into spirals, compounds, multi-axis and multi-plane configurations from 15 common bends. Custom bending with tighter tolerances can be made to meet specific application needs.

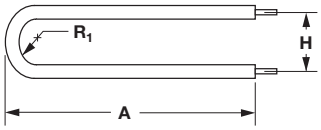
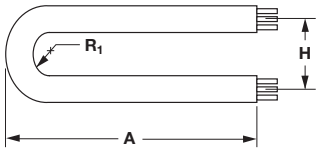
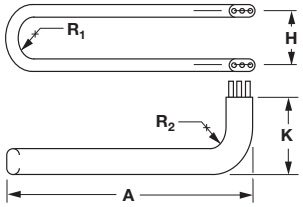
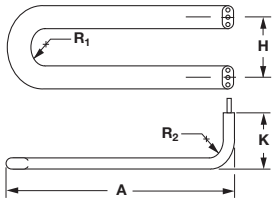
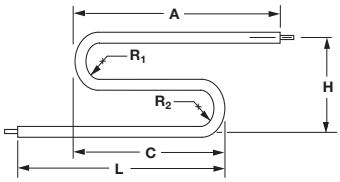
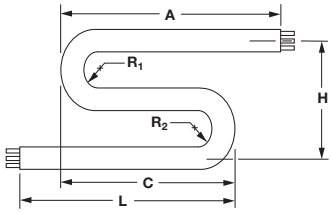
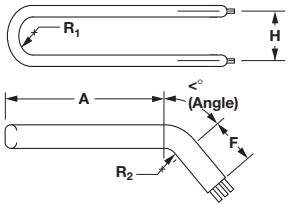
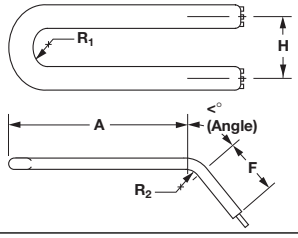
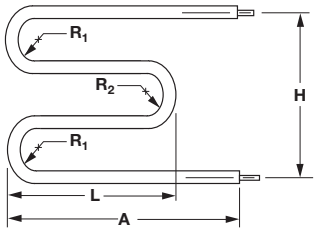
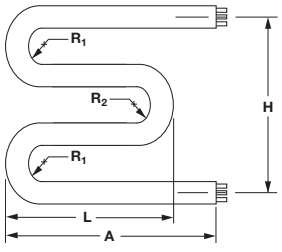
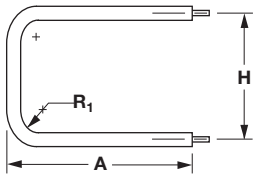
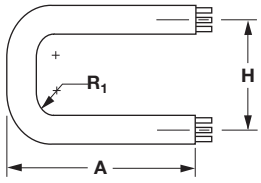
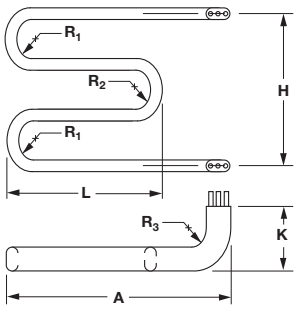
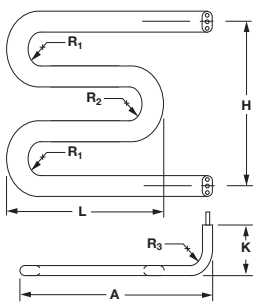
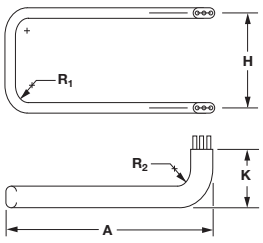
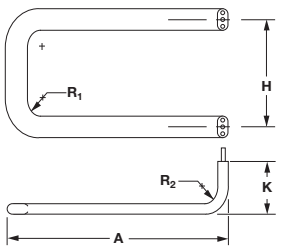
Formation is limited by bending parameters specified in the illustrations of major and minor axis bends on the previous page. On these illustrations, please note the no-heat end location.

The no-heat end junction must be located a minimum of 1 in. (25 mm) from any bend. If these parameters are not followed, the heater may fail prematurely.

Illustrated on pages 109 to 110 are the 15 common bends that can be ordered for all in-stock and **made-to-order** FIREBAR heating elements.

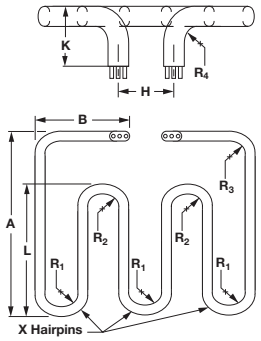
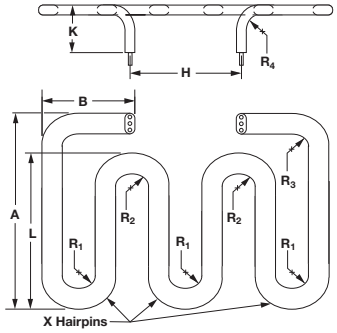
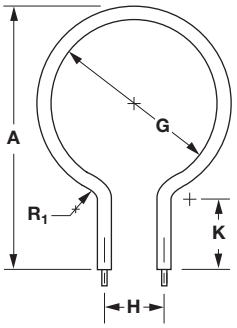
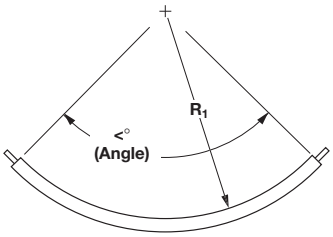
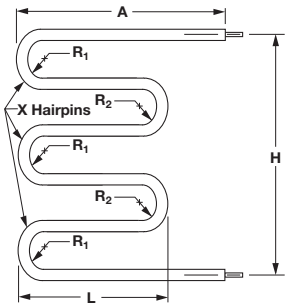
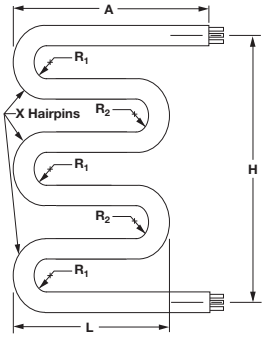
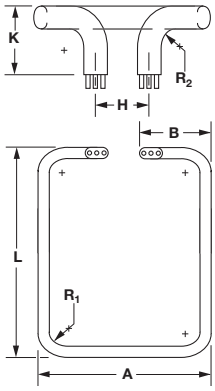
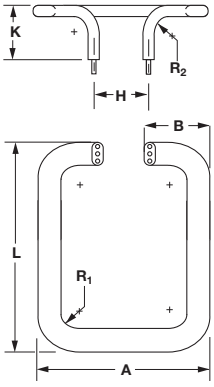
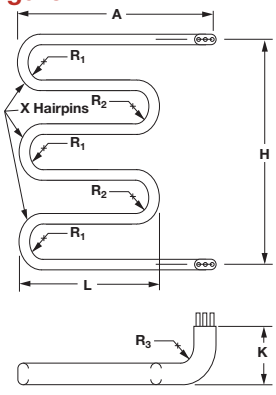
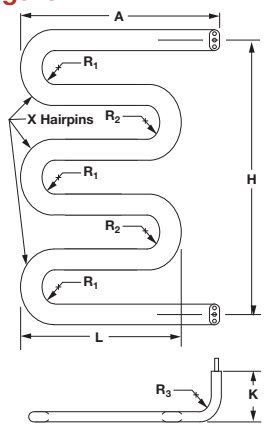
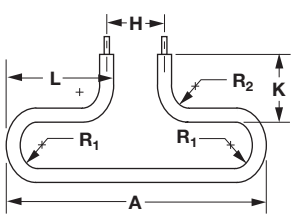
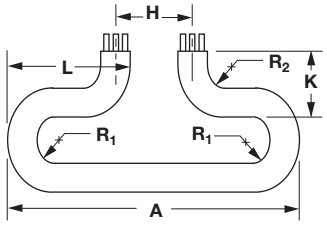
To order a common bend, specify the **figure number** and **critical dimensions**.

Note: The alpha characters and symbols are used to designate specific dimensions within each illustration.

Minor Axis	Major Axis	Minor Axis	Major Axis
Figure 1A	**Figure 1B**	**Figure 2A**	**Figure 2B**
			
Figure 3A	**Figure 3B**	**Figure 4A**	**Figure 4B**
			
Figure 5A	**Figure 5B**	**Figure 6A**	**Figure 6B**
			
Figure 7A	**Figure 7B**	**Figure 8A**	**Figure 8B**
			

FIREBAR Single/Double-Ended Heaters

Bend Formation (Continued)

Minor Axis	Major Axis	Minor Axis	Major Axis
Figure 9A 	**Figure 9B** 	**Figure 10A** 	Bend Figure 10B Not Available On Major Axis
Figure 11A 	Bend Figure 11B Not Available On Major Axis	**Figure 12A** 	**Figure 12B** 
Figure 13A 	**Figure 13B** 	**Figure 14A** 	**Figure 14B** 
Figure 15A 	**Figure 15B** 		

FIREBAR Single/Double-Ended Heaters

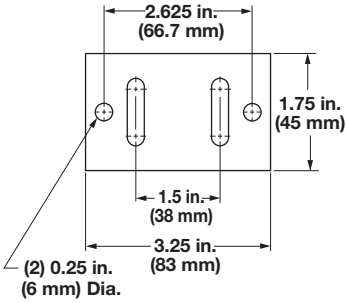
Mounting Brackets

Steel brackets provide element mounting in non-pressurized applications. In air heating applications, an 18 gauge aluminized steel bracket is press fitted to the element. A ¼ in. (6 mm) thick steel bracket is brazed or welded liquid-tight to the element for liquid heating. Upon request, stainless steel brackets can be provided. Special sizes also available.

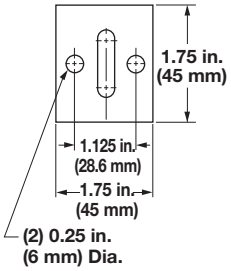
The bracket is located ½ in. (13 mm) from the sheath's end, 1/16 in. (1.6 mm) if welded. Available on ⅝ in. (15.9 mm) FIREBAR as **made-to-order** only.

To order, specify **mounting bracket** as well as type, location, material and size.

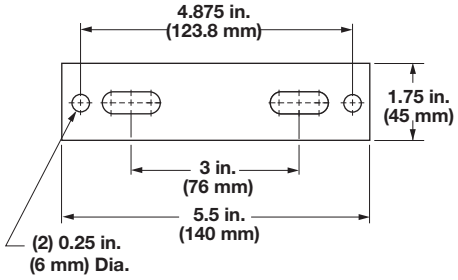
Type 1



Type 2



Type 3



Threaded Bulkheads

A threaded stainless steel bushing with flange on the heater sheath provides rigid, leak-proof mounting through tank walls. A gasket, plated steel washer and hex nut are included (brazed only, available).

To order, specify **threaded bulkheads**.

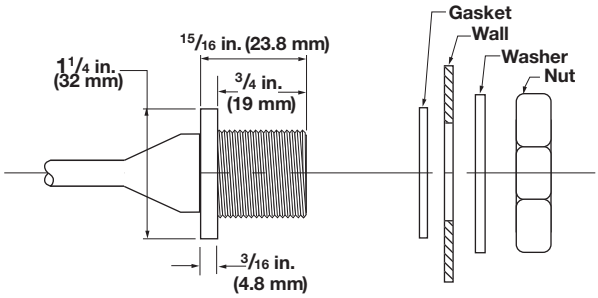


Illustration for 1 inch FIREBAR

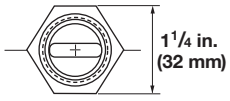


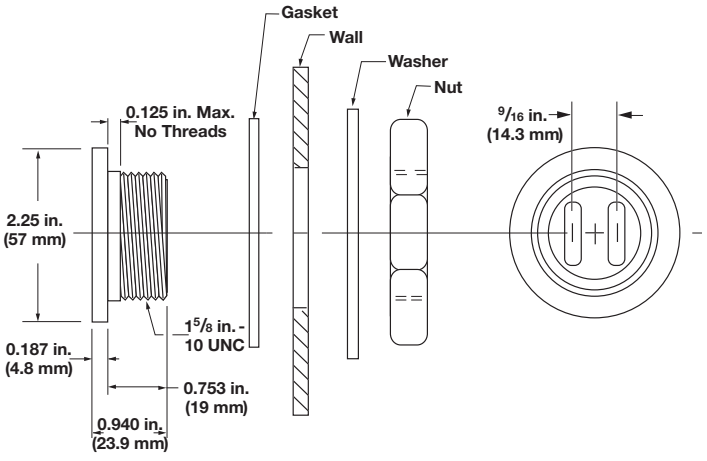
Illustration for ⅝ inch FIREBAR

Heater Size in.	(mm)	Thread Size
⅝	(15.9)	⅞-14 UNF-2A
1	(25.0)	1¼-16 UNF-2A

Water-Tight Double-Leg Threaded Fitting

A threaded 1⅝ in.-10 UNC stainless steel fitting with flange on the heater sheath provides rigid, leak-proof mounting through tank walls. This fitting allows both legs of the heater to pass through the same opening. A gasket, plated steel washer and hex nut are included. The threaded end of the bulkhead is mounted flush with the sheath's end, unless otherwise specified. Available on **1 in. FIREBAR only (brazed only, available)**.

To order, specify **water-tight double-leg threaded fitting**.



FIREBAR Single/Double-Ended Heaters

Surface Finish

Bright Annealing

Bright annealing is a process that produces a smooth, metallic finish. It is a special annealed finish created in a non-oxidizing atmosphere. This finish is popular in the pharmaceutical and foodservice/beverage markets.

To order, specify **bright annealing**.

Passivation

During manufacturing, particles of iron or tool steel may be embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode and produce rust spots. For critical sheath applications, passivation will remove free iron from the sheath.

To order, specify **passivation**.

Internal Thermocouples

To provide protection against element over-temperature conditions, 1 in. (25 mm) double-ended FIREBAR elements can be ordered with ASTM **Type K** thermocouples. This is accomplished by eliminating the center resistance coil and embedding the thermocouple junction inside the sheath. Thus, thermocouples are available only on two resistance coil, 1 in. (25 mm) FIREBAR elements.

To order, specify:

- **Type K** thermocouple
- Distance the junction is to be located from the element's end
- Lead length

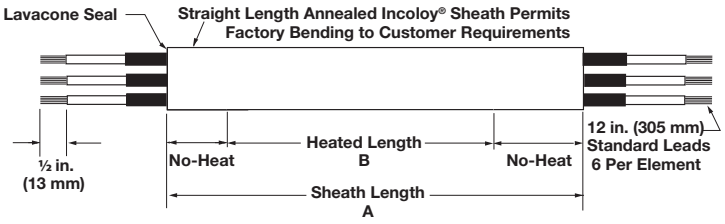
Thermocouple Types

ASTM Type	Conductor Positive	Characteristics Negative	Recommended Temperature Range °F	(°C)
K	Chromel® (Non-magnetic)	Alumel® (Magnetic)	0 to 2000	(-20 to 1100)

① **Type K** thermocouples are rated 32 to 2282°F (0 to 1250°C). Watlow does not recommend exceeding the temperature range shown on this chart.

FIREBAR Single/Double-Ended Heaters

One Inch, Double-Ended FIREBAR



FIREBAR Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number			Est. Net Wt.	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	480V~(ac)	lbs	(kg)
Applications: Asphalt, Paraffin (Solid), Bunker Oil, Clamp-On										
6 W/in²	35	(889)	25	(635)	310	**FBN351WD**			1.3	(0.6)
Incoloy®	41	(1041)	31	(787)	410	**FBN411WD**			1.5	(0.7)
(1 W/cm²)	51	(1295)	41	(1041)	530	**FBN511WD**	**FBN5110WD**		1.9	(0.9)
	62	(1574)	52	(1320)	650	**FBN621WD**	**FBN6210WD**		2.3	(1.1)
	72	(1828)	62	(1574)	800	**FBN721WD**	**FBN7210WD**		2.6	(1.2)
	93	(2362)	83	(2108)	1,060	**FBN931WD**	**FBN9310WD**		3.4	(1.6)
	114	(2895)	104	(2641)	1,350	**FBN1141WD**	**FBN11410WD**		4.2	(1.9)
Applications: Griddles, Fuel Oil, Clamp-On										
10 W/in²	25	(635)	22	(558)	500	**FBN251WL**			0.9	(0.4)
Incoloy®	35	(889)	32	(812)	750	**FBN351WL**	**FBN3510WL**		1.3	(0.6)
(1.6 W/cm²)	47	(1193)	43	(1092)	1,000	**FBN471WL**	**FBN4710WL**		1.7	(0.8)
	69	(1752)	65	(1651)	1,500	**FBN691WL**	**FBN6910WL**		2.5	(1.2)
	90	(2286)	86	(2184)	2,000	**FBN901WL**	**FBN9010WL**		3.3	(1.5)
Applications: Clamp-On, Medium Weight Oils, Liquid Paraffin, Low Temperature Ovens 400°F (205°C)										
15 W/in²②	29	(736)	19	(482)	670		**FBN2910WE**		1.1	(0.5)
Incoloy®	34	(863)	24	(609)	830		**FBN3410WE**		1.3	(0.6)
(2.3 W/cm²)	39	(990)	29	(736)	1,000		**FBN3910WE**		1.4	(0.7)
	48	(1219)	38	(965)	1,330		**FBN4810WE**	**FBN4811WE**	1.8	(0.9)
	58	(1473)	48	(1219)	1,670		**FBN5810WE**	**FBN5811WE**	2.1	(1.0)
	68	(1727)	58	(1473)	2,000		**FBN6810WE**	**FBN6811WE**	2.5	(1.2)
	87	(2209)	77	(1955)	2,670		**FBN8710WE**	**FBN8711WE**	3.2	(1.5)
	106	(2692)	96	(2438)	3,330		**FBN10610WE**	**FBN10611WE**	3.9	(1.8)
Applications: Radiant, Platens, Dies, Low Temperature Ovens 300°F (150°C)										
20 W/in²	15	(381)	11	(279)	500	**FBN151WM**			0.6	(0.3)
Incoloy®	20	(508)	16	(406)	750	**FBN201WM**			0.8	(0.4)
(3.1 W/cm²)	26	(660)	22	(558)	1,000	**FBN261WM**	**FBN2610WM**		1.0	(0.5)
	36	(914)	32	(812)	1,500	**FBN361WM**	**FBN3610WM**		1.3	(0.6)
	48	(1219)	43	(1092)	2,000	**FBN481WM**	**FBN4810WM**		1.8	(0.9)
	70	(1778)	65	(1651)	3,000		**FBN7010WM**	**FBN7011WM**	2.6	(1.2)
	91	(2311)	85	(2159)	4,000		**FBN9110WM**	**FBN9111WM**	3.3	(1.5)
Applications: Degreasing Solutions, Heat Transfer Oils										
23 W/in²	35	(889)	25	(635)	1,250	**FBN351WT**	**FBN3510WT**		1.3	(0.6)
Incoloy®	41	(1041)	31	(787)	1,625	**FBN411WT**	**FBN4110WT**		1.5	(0.7)
(3.6 W/cm²)	51	(1295)	41	(1041)	2,125	**FBN511WT**	**FBN5110WT**	**FBN5111WT**	1.9	(0.9)
	62	(1574)	52	(1320)	2,625	**FBN621WT**	**FBN6210WT**	**FBN6211WT**	2.3	(1.1)
	72	(1828)	62	(1574)	3,200	**FBN721WT**	**FBN7210WT**	**FBN7211WT**	2.6	(1.2)
	93	(2362)	83	(2108)	4,250	**FBN931WT**	**FBN9310WT**	**FBN9311WT**	3.4	(1.6)
	114	(2895)	104	(2641)	5,400	**FBN1141WT**	**FBN11410WT**	**FBN11411WT**	4.2	(1.9)

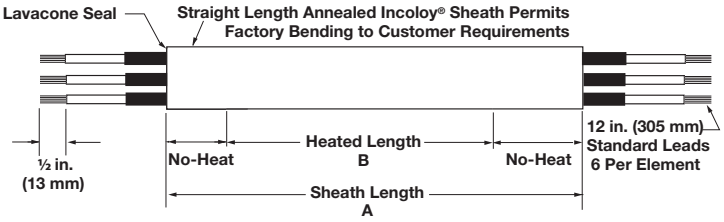
CONTINUED

All heating elements are Stock units unless otherwise noted.
Availability
Stock: Same day shipment
Standard: 10 working days

② Standard
Truck Shipment only

FIREBAR Single/Double-Ended Heaters

One Inch, Double-Ended FIREBAR (Continued)



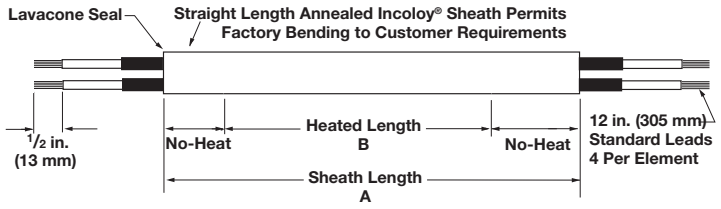
FIREBAR Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number			Est. Net Wt.	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	480V~(ac)	lbs	(kg)
Applications: Cooking Oils, Mild Caustic Solution, Ethylene Glycol (100%)										
30 W/in² Incoloy® (4.7 W/cm²)	16	(406)	10	(254)	750	**FBN161WH**			0.6	(0.3)
	20	(508)	14	(355)	1000	**FBN201WH**			0.8	(0.4)
	27	(685)	21	(533)	1500	**FBN271WH**	**FBN2710WH**		1.0	(0.5)
	34	(863)	28	(711)	2000	**FBN341WH**	**FBN3410WH**		1.3	(0.6)
	50	(1270)	43	(1092)	3000		**FBN5010WH**	**FBN5011WH**	1.8	(0.9)
	64	(1625)	57	(1447)	4000		**FBN6410WH**	**FBN6411WH**	2.4	(1.1)
	80	(2032)	72	(1828)	5000		**FBN8010WH**	**FBN8011WH**	2.9	(1.4)
Applications: Process Water, Ethylene Glycol (50%)										
40 W/in² Incoloy® (6.2 W/cm²)	25	(635)	22	(558)	2000		**FBN2510WK**		0.9	(0.4)
	35	(889)	32	(812)	3000		**FBN3510WK**	**FBN3511WK**	1.3	(0.6)
	47	(1193)	43	(1092)	4000		**FBN4710WK**	**FBN4711WK**	1.7	(0.8)
	69	(1752)	65	(1651)	6000		**FBN6910WK**	**FBN6911WK**	2.5	(1.2)
	90	(2286)	86	(2184)	8000		**FBN9010WK**	**FBN9011WK**	3.3	(1.5)
45 W/in² Incoloy® (7 W/cm²)	29	(736)	19	(482)	2000		**FBN2910WP**		1.1	(0.5)
	34	(863)	24	(609)	2500		**FBN3410WP**		1.3	(0.6)
	39	(990)	29	(736)	3000		**FBN3910WP**		1.4	(0.7)
	48	(1219)	38	(965)	4000		**FBN4810WP**	**FBN4811WP**	1.8	(0.9)
	58	(1473)	48	(1219)	5000		**FBN5810WP**	**FBN5811WP**	2.1	(1.0)
	68	(1727)	58	(1473)	6000		**FBN6810WP**	**FBN6811WP**	2.5	(1.2)
	87	(2209)	77	(1955)	8000		**FBN8710WP**	**FBN8711WP**	3.2	(1.5)
	106	(2692)	96	(2438)	10,000		**FBN10610WP**	**FBN10611WP**	3.9	(1.8)
Applications: Clean and Potable Water										
80 W/in² Incoloy® (12.4 W/cm²)	15	(381)	11	(279)	2000		**FBN1510WJ**		0.6	(0.3)
	20	(508)	16	(406)	3000		**FBN2010WJ**		0.8	(0.4)
	26	(660)	22	(558)	4000		**FBN2610WJ**	**FBN2611WJ**	1.0	(0.5)
	36	(914)	32	(812)	6000		**FBN3610WJ**	**FBN3611WJ**	1.3	(0.6)
	48	(1219)	43	(1092)	8000		**FBN4810WJ**	**FBN4811WJ**	1.8	(0.9)
	70	(1778)	65	(1651)	12,000			**FBN7011WJ**	2.6	(1.2)
	91	(2311)	85	(2159)	16,000			**FBN9111WJ**	3.3	(1.5)
90 W/in² Incoloy® (14 W/cm²)	35	(889)	25	(635)	5000	**FBN351WG**	**FBN3510WG**	**FBN3511WG**	1.3	(0.6)
	41	(1041)	31	(787)	6500	**FBN411WG**①	**FBN4110WG**	**FBN4111WG**	1.5	(0.7)
	51	(1295)	41	(1041)	8500		**FBN5110WG**	**FBN5111WG**	1.9	(0.9)
	62	(1574)	52	(1320)	10,500		**FBN6210WG**	**FBN6211WG**	2.3	(1.1)
	72	(1828)	62	(1574)	12,750		**FBN7210WG**	**FBN7211WG**	2.6	(1.2)
	93	(2362)	83	(2108)	17,000			**FBN931WG**	3.4	(1.6)
	114	(2895)	104	(2641)	21,500			**FBN11411WG**	3.4	(1.6)

All heating elements are Stock units unless otherwise noted.
Availability
Stock: Same day shipment
Standard: 10 working days

① Standard
Truck Shipment only

FIREBAR Single/Double-Ended Heaters

⅝ Inch Double-Ended FIREBAR



FIREBAR Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number			Est. Net Wt.	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	480V~(ac)	lbs	(kg)
Applications: Degreasing Fluids, Heat Transfer Oils										
23 W/in² ②	19	(483)	11	(279)	375	**FAN191WT**			0.5	(0.3)
Incoloy®	22	(559)	14	(356)	500	**FAN221WT**	**FAN2210WT**		0.5	(0.3)
(3.6 W/cm²)	26	(660)	18	(457)	625	**FAN261WT**	**FAN2610WT**		0.6	(0.3)
	30	(762)	22	(559)	750	**FAN301WT**	**FAN3010WT**		0.7	(0.4)
	37	(940)	29	(737)	1000	**FAN371WT**	**FAN3710WT**		0.9	(0.5)
	44	(1118)	36	(914)	1250	**FAN441WT**	**FAN4410WT**		1.0	(0.5)
	51	(1295)	43	(1092)	1500	**FAN511WT**	**FAN5110WT**		1.2	(0.6)
Applications: Clean and Potable Water										
90 W/in²	15	(381)	7	(178)	1000	**FAN151WG②**	**FAN1510WG**		0.4	(0.2)
Incoloy®	19	(483)	11	(279)	1500	**FAN191WG**	**FAN1910WG②**	**FAN1911WG**	0.5	(0.3)
(14 W/cm²)	22	(559)	14	(356)	2000	**FAN221WG**	**FAN2210WG②**	**FAN2211WG**	0.5	(0.3)
	26	(660)	18	(457)	2500	**FAN261WG**	**FAN2610WG②**	**FAN2611WG**	0.6	(0.3)
	30	(762)	22	(559)	3000	**FAN301WG②**	**FAN3010WG②**	**FAN3011WG**	0.7	(0.4)
	37	(940)	29	(737)	4000		**FAN3710WG②**	**FAN3711WG**	0.9	(0.5)
	44	(1118)	36	(914)	5000		**FAN4410WG②**	**FAN4411WG**	1.0	(0.5)
	51	(1295)	43	(1092)	6000		**FAN5110WG②**	**FAN5111WG**	1.2	(0.6)

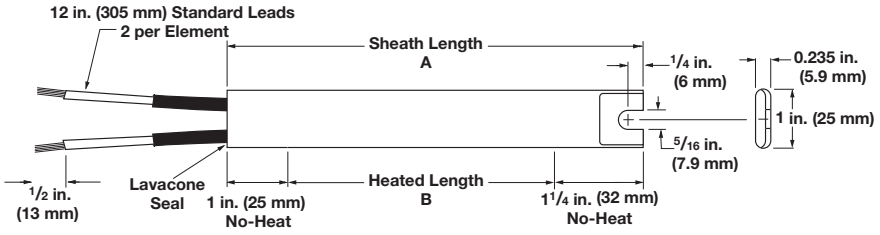
All heating elements are Stock units.

② Standard

Availability
Stock: Same day shipment
Standard: 10 working days

FIREBAR Single/Double-Ended Heaters

One Inch, Single-Ended FIREBAR

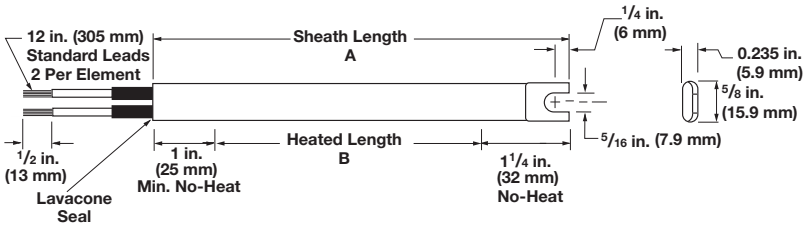


FIREBAR Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number		Est. Net Wt.	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	lbs	(kg)
Applications: Radiant, Platens, Dies, Low Temperature Ovens 300°F (150°C)									
20 W/in²	8¾	(222.0)	6½	(165.0)	300	**FSP91WM**		0.4	(0.2)
304 SS	10¼	(260.0)	7½	(203.0)	375	**FSP101WM**		0.4	(0.2)
(3.1 W/cm²)	12¼	(311.0)	10	(254.0)	450	**FSP121WM**		0.5	(0.3)
	13½	(343.0)	11¼	(286.0)	500	**FSP141WM**		0.5	(0.3)
	16⅛	(408.6)	13⅜	(352.4)	650	**FSP161WM**	**FSP1610WM**	0.6	(0.3)
	17¾	(451.0)	15½	(393.0)	725	**FSP181WM**	**FSP1810WM**	0.7	(0.4)
	19¼	(489.0)	17	(431.0)	800	**FSP191WM**	**FSP1910WM**	0.7	(0.4)
	22	(558.0)	19¾	(502.0)	900	**FSP221WM**	**FSP2210WM**	0.8	(0.4)
	23¾	(603.0)	21½	(546.0)	1,000	**FSP241WM**	**FSP2410WM**	0.9	(0.4)
	25	(635.0)	22¾	(578.0)	1,050	**FSP251WM**	**FSP2510WM**	0.9	(0.4)
	28⅝	(727.1)	26⅜	(670.0)	1,250	**FSP291WM**	**FSP2910WM**	1.1	(0.5)
	31⅝	(803.3)	29⅜	(746.1)	1,350	**FSP321WM**	**FSP3210WM**	1.2	(0.6)
	34⅛	(866.8)	31⅞	(809.6)	1,500		**FSP3410WM**	1.3	(0.6)
	36⅞	(936.6)	34⅝	(879.5)	1,600		**FSP3710WM**	1.4	(0.7)
	40⅝	(1031.9)	38⅜	(974.7)	1,800		**FSP4110WM**	1.5	(0.7)
	46¼	(1175.0)	44	(1117.0)	2,000		**FSP4610WM**	1.7	(0.8)
Applications: Process Water, Ethylene Glycol (50%)									
40 W/in²	8¾	(222.0)	6½	(165.0)	600	**FSP91WK**		0.4	(0.2)
304 SS	10¼	(260.0)	7½	(203.0)	750	**FSP101WK**		0.4	(0.2)
(6.2 W/cm²)	12¼	(311.0)	10	(254.0)	900	**FSP121WK**	**FSP1210WK**	0.5	(0.3)
	13½	(343.0)	11¼	(286.0)	1,000	**FSP131WK**	**FSP1310WK**	0.5	(0.3)
	16¼	(413.0)	13⅜	(352.4)	1,300	**FSP161WK**	**FSP1610WK**	0.6	(0.3)
	17¾	(451.0)	15½	(393.0)	1,450	**FSP181WK**	**FSP1810WK**	0.7	(0.4)
	19¼	(489.0)	17	(431.0)	1,600		**FSP1910WK**	0.7	(0.4)
	22	(558.0)	19¾	(502.0)	1,800		**FSP2210WK**	0.8	(0.4)
	23¾	(603.0)	21½	(546.0)	2,000		**FSP2410WK**	0.9	(0.4)
	25	(635.0)	22¾	(578.0)	2,100		**FSP2510WK**	0.9	(0.4)
	28⅝	(727.1)	26⅜	(669.9)	2,500		**FSP2910WK**	1.1	(0.5)
	31⅝	(803.2)	29⅜	(746.1)	2,700		**FSP3210WK**	1.2	(0.6)
	34⅛	(866.8)	31⅞	(809.6)	3,000		**FSP3410WK**	1.3	(0.6)
	36⅞	(936.6)	34⅝	(879.5)	3,200		**FSP3710WK**	1.4	(0.7)
	40⅝	(1031.9)	38⅜	(974.7)	3,600		**FSP4110WK**	1.5	(0.7)
	46¼	(1175.0)	44	(1117.0)	4,000		**FSP4610WK**	1.7	(0.8)

All heating elements are Stock units.
Availability
Stock: Same day shipment

FIREBAR Single/Double-Ended Heaters

⅝ Inch Single-Ended FIREBAR



FIREBAR Description	Sheath A Dimension		Heated B Dimension		Watts	Code Number		Est. Net Weight	
	in.	(mm)	in.	(mm)		120V~(ac)	240V~(ac)	lbs	(kg)
Applications: Radiant, Platens, Dies, Low Temperature Ovens 300°F (150°C)									
20 W/in² Incoloy® (3.1 W/cm²)	11½	(292)	8	(203)	250	**FSA121WM①**		0.3	(0.2)
	15½	(394)	12	(304)	375	**FSA161WM**	**FSA1610WM**	0.4	(0.2)
	19½	(495)	16	(406)	500	**FSA201WM**	**FSA2010WM①**	0.5	(0.3)
	28	(711)	24	(609)	750	**FSA281WM①**	**FSA2810WM①**	0.6	(0.3)
	36	(914)	32	(812)	1,000	**FSA361WM**	**FSA3610WM**	0.8	(0.4)
	52	(1321)	48	(1219)	1,500	**FSA521WM**	**FSA5210WM①**	1.2	(0.6)

Availability
Stock: Same day shipment
Standard: 10 working days
① Stock

How to Order

To order a stock FIREBAR heating element, specify:

- Watlow code number
- Size (1 or ⅝ in.)
- Type (single- or double-ended)
- Volts/watts
- Termination options
- Options
- Quantity

If our stock units do not meet your application needs, Watlow can provide a **made-to-order** unit, please specify:

- Type of application, including heated material, operating temperature, etc.
- Size (1 or ⅝ in.)
- Type (single- or double-ended)
- Volts/watts
- Sheath length and material
- Heated length
- No-heat length
- Terminal pin length or termination options
- Moisture seal
- Bend configuration—including dimensions, critical tolerances, major and minor axis bends (please send drawing, if available)
- Options, including external finish and mounting method
- Quantity

Availability

One and ⅝ Inch Double-Ended

Straight Length Element

Stock: Same day shipment
Modified Stock①: Three to five working days
Standard: Three weeks
Made-to-Order: Four to five weeks

Formed Element

Modified Stock①: Five to seven working days
Standard: Three weeks
Made-to-Order: Four to five weeks

One and ⅝ Inch Single-Ended

Straight Length Element

Stock: Same day shipment
Modified Stock①: Three working days
Made-to-Order: Four to five weeks

Formed Element

Modified Stock①: Three working days
Made-to-Order: Four to five weeks

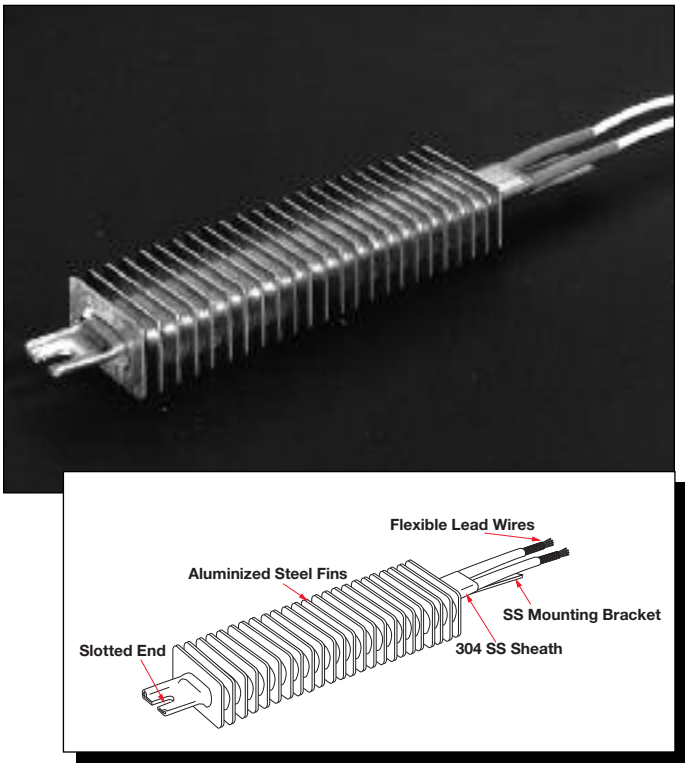
Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

FINBAR Single/Double-Ended Heaters

Composed of aluminized steel fins press fitted to a one inch single-ended FIREBAR® element. The FINBAR is designed to improve heat transfer to the air and permits putting more power in tighter spaces—like forced air ducts, dryers, ovens and load bank resistors.

Heat transfer, lower sheath temperature and element life are all maximized by its finned construction.

Installation is simplified by terminations exiting at one end and mounting accommodations on both ends.



Performance Capabilities

- Watt densities to 50 W/in² (7.7 W/cm²)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Voltages to 480V~(ac)
- Amperages to 48 amperes per heater or 16 amperes per coil

Features and Benefits

Rugged aluminized steel fins

- Effectively increase surface area to approximately 16 square inches for every linear inch of element length. Fins press fitted to the heating element improve heat transfer to the air

Single-ended termination

- Simplifies wiring and installation

Stainless steel mounting bracket, welded to the terminal end, supplied with a slotted end

- Allows ease of installation

Lavacone seals

- Provides protection against humid storage conditions, moisture retardant to 392°F (200°C)

Applications

- Forced air heating for dryers, ovens, ducts
- Still air heating for ovens, comfort heating
- Incubators
- Ink drying
- Load bank resistors

Construction Features

Construction features are detailed for assembly stock products only. Optional materials, sizes, terminations and ratings may be available at additional cost. For availability and ordering information on options, see page 122.

Watt Density: Stock; up to 40 W/in² (6.2 W/cm²), made-to-order; up to 50 W/in² (7.7 W/cm²)

Fin Surface Area: 16 in²/linear in. (40.5 cm²/linear cm)

Fin Cross Section: 2 x 1 in. (50 x 25 mm)

Maximum Operating Temperature: Sheath material: 304 SS, 1200°F (650°C), Fin material; aluminized steel; 1100°F (600°C)

Heater Length: Stock; 10 to 48 in. (260 to 1210 mm), made-to-order; 6 to 120 in. (150 to 3050 mm)

No-Heat Length: 1 in. minimum, 12 in. maximum (25/305 mm)

Voltages: Up to 480V~(ac)

Phase: Stock; 1-phase parallel made-to-order; 1-phase parallel or 3-phase wye

Resistance Coils: Stock; 1 made-to-order 1 or 3

Terminations: Flexible lead wires, quick connect (spade), screw lug (plate) and threaded stud

Seal Material: Lavacone, rated to 392°F (200°C)

Single-End Configuration: Stock: slotted, made-to-order; slotted, no-slot or sealed

Agency Recognition: refer to FIREBAR UL® File # E52951 and CSA File # 31388 under Agency Recognition on page 681.

FINBAR Single/Double-Ended Heaters

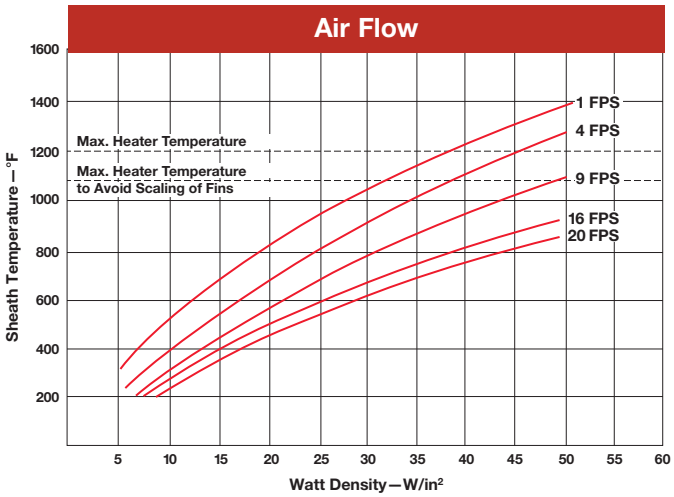
Air Heating

The *Watt Density, Air Flow and Sheath Temperature* graph shows the relationship between watt density, air flow velocity and sheath temperature, along with a recommended temperature to avoid deteriorating the fins. Be aware that **lower sheath temperature yields longer heater life**.

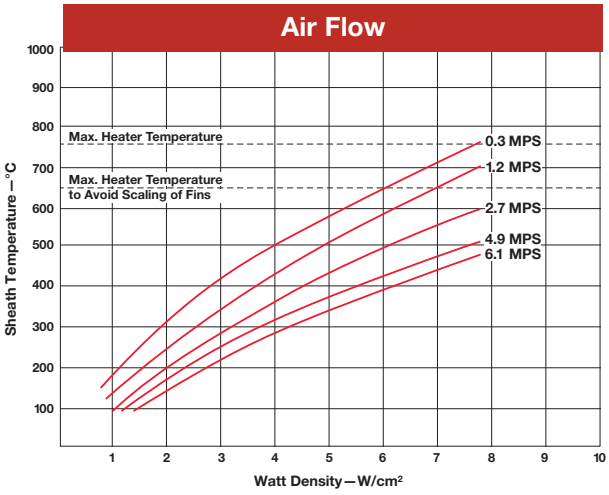
The graphic representation is based on a single-ended FINBAR, various air velocities (at 68°F/20°C inlet temperature) and different watt densities.

To determine, from the graph, the operating temperature of the FINBAR's sheath, identify the air velocity curve that approximates your application in feet per second (meters per second). Then look at the vertical line that most closely approximates the FINBAR's watt density. From the intersecting point, read over to the temperature column to determine the sheath's operating temperature.

Watt Density, Air Flow and Sheath Temperature (°F)



Watt Density, Air Flow and Sheath Temperature (°C)



Dual Ended FINBAR

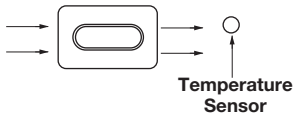
FINBAR elements are typically terminated at one end. Upon request, however, dual-ended FINBAR heaters can be ordered. To order, specify **dual-ended FINBAR** and lead length.

Application Hints

- Avoid deteriorating the fins by not exceeding the recommended maximum fin temperature of 1100°F (600°C).
- Ensure proper air flow to prevent premature heater failure.
- Locate the temperature sensor downstream from heater(s) for process temperature sensing.

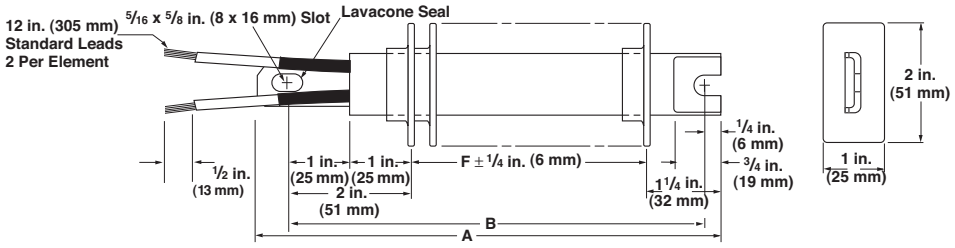
The following mounting parameters are recommended:

- Air flow over element must be parallel with the flat side.
- Element center line to element center line spacing must be a minimum of 1½ in. (38 mm).



Proper air flow relative to the heater's sheath is parallel with the longer cross sectional axis.

FINBAR Single/Double-Ended Heaters



FINBAR Description	Overall A Dimension in.	(mm)	Overall F Dimension in.	(mm)	Mounting B Dimension in.	(mm)	Watts	Code Number 120V~(ac)	Code Number 240V~(ac)	Est. Net Wt. lbs	(kg)
Application: Forced Air											
20 W/in²	10¼	(260.0)	6½	(158.0)	9½	(241.0)	300	**FSP91WMF**		1.4	(0.7)
304 SS	11¾	(298.0)	8	(203.0)	11	(279.0)	375	**FSP101WMF**		1.4	(0.7)
(3.1 W/cm²)	13¾	(349.0)	10	(254.0)	13	(330.0)	450	**FSP121WMF**		1.5	(0.7)
	15	(381.0)	11¼	(285.0)	14¼	(362.0)	500	**FSP141WMF**		1.5	(0.7)
	17⅝	(447.7)	13⅞	(352.4)	16⅞	(428.6)	650	**FSP161WMF**	**FSP1610WMF**	1.6	(0.8)
	19¼	(489.0)	15½	(393.0)	18½	(469.0)	725	**FSP181WMF**	**FSP1810WMF**	1.7	(0.8)
	20¾	(527.0)	17	(431.0)	20	(508.0)	800	**FSP191WMF**	**FSP1910WMF**	1.7	(0.8)
	23½	(597.0)	19¾	(501.0)	22¾	(577.0)	900	**FSP221WMF**	**FSP2210WMF**	1.8	(0.9)
	25¼	(641.0)	21½	(546.0)	24½	(622.0)	1000	**FSP241WMF**	**FSP2410WMF**	1.9	(0.9)
	26½	(673.0)	22¾	(577.0)	25¾	(654.0)	1050	**FSP251WMF**	**FSP2510WMF**	1.9	(0.9)
	30⅛	(765.2)	26⅜	(669.9)	29⅜	(746.1)	1250	**FSP291WMF**	**FSP2910WMF**	2.1	(1.0)
	33⅛	(841.4)	29⅜	(746.1)	32⅜	(822.3)	1350	**FSP321WMF**	**FSP3210WMF**	2.2	(1.0)
	35⅝	(904.9)	31⅞	(809.6)	34⅞	(885.8)	1500		**FSP3410WMF**	2.3	(1.1)
	38⅜	(974.7)	34⅝	(879.5)	37⅝	(955.7)	1600		**FSP3710WMF**	2.4	(1.1)
	42⅛	(1070.0)	38⅜	(974.7)	41⅜	(1051.0)	1800		**FSP4110WMF**	2.5	(1.2)
	47¾	(1213.0)	44	(1117.0)	47	(1193.0)	2000		**FSP4610WMF**	2.7	(1.3)
40 W/in²	10¼	(260.0)	6½	(158.0)	9½	(241.0)	600	**FSP91WKF**		1.4	(0.7)
304 SS	11¾	(298.0)	8	(203.0)	11	(279.0)	750	**FSP101WKF**		1.4	(0.7)
(6.2 W/cm²)	13¾	(349.0)	10	(254.0)	13	(330.0)	900	**FSP121WKF**	**FSP1210WKF**	1.5	(0.7)
	15	(381.0)	11¼	(285.0)	14¼	(362.0)	1000	**FSP131WKF**	**FSP1310WKF**	1.5	(0.7)
	17⅝	(447.7)	13⅞	(352.4)	16⅞	(428.6)	1300	**FSP161WKF**	**FSP1610WKF**	1.6	(0.8)
	19¼	(489.0)	15½	(393.0)	18½	(469.0)	1450	**FSP181WKF**	**FSP1810WKF**	1.7	(0.8)
	20¾	(527.0)	17	(431.0)	20	(508.0)	1600		**FSP1910WKF**	1.7	(0.8)
	23½	(597.0)	19¾	(501.0)	22¾	(577.0)	1800		**FSP2210WKF**	1.8	(0.9)
	25¼	(641.0)	21½	(546.0)	24½	(622.0)	2000		**FSP2410WKF**	1.9	(0.9)
	26½	(673.0)	22¾	(577.0)	25¾	(654.0)	2100		**FSP2510WKF**	1.9	(0.9)
	30⅛	(765.2)	26⅜	(669.9)	29⅜	(746.1)	2500		**FSP2910WKF**	2.1	(1.0)
	33⅛	(841.4)	29⅜	(746.1)	32⅜	(822.3)	2700		**FSP3210WKF**	2.2	(1.0)
	35⅝	(904.9)	31⅞	(809.6)	34⅞	(885.8)	3000		**FSP3410WKF**	2.3	(1.1)
	38⅜	(974.7)	34⅝	(879.4)	37⅝	(955.7)	3200		**FSP3710WKF**	2.4	(1.1)
	42⅛	(1070.0)	38⅜	(974.7)	41⅜	(1050.9)	3600		**FSP4110WKF**	2.5	(1.2)
	47¾	(1213.0)	44	(1117.0)	47	(1193.0)	4000		**FSP4610WKF**	2.7	(1.3)

All stock units are Assembly stock.
Availability
Assembly Stock: Three working days

FINBAR Single/Double-Ended Heaters

How to Order

To order a stock FINBAR heating element, specify:

- Watlow code number
- Volts/watts
- Termination options
- Options
- Quantity

For **made-to-order** FINBAR heating elements, specify:

- Type of application, including air flow velocity, volume, etc.
- Single- or double-ended element
- Volts/watts
- Heated length
- No-heat length
- Terminal pin length or termination options, including moisture seal type
- Quantity
- Options, including thermocouple, sealed end, no mounting bracket, etc.

Availability

Assembly Stock: Three working days

Modified Stock①: Five to seven working days

Made-to-Order: Four to five weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

① Stock units with catalog options.

Immersion Heaters



Immersion Heaters

WATROD and FIREBAR®
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WATROD and FIREBAR® Screw Plug Immersion Heaters

Screw plug immersion heaters are ideal for direct immersion heating of liquids, including all types of oils and heat transfer solutions.

Available in a variety of stock and made-to-order sizes, Watlow screw plug immersion heaters feature both WATROD round and FIREBAR® flat tubular elements.

Heating elements are hairpin bent and either welded or brazed into the screw plug—depending on element sheath and plug material compatibility.

General purpose (NEMA 1) terminal enclosures are standard; with optional moisture resistant (NEMA 4), explosion resistant (NEMA 7) and explosion/moisture resistant (NEMA 7/4) enclosures available to meet specific application needs.

Optional thermostats provide convenient process temperature regulation.



Performance Capabilities

- Watt densities to 120 W/in² (18.6 W/cm²)
- Wattages to 38 kilowatts
- UL® and CSA component recognition to 480V~(ac) and 600V~(ac) respectively
- Incoloy® sheath temperatures to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures to 1200°F (650°C)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)

Features and Benefits

A variety of element sheath and screw plug materials

- Ability to meet your application needs

Integral thermowells

- Provides convenient temperature sensor insertion and replacement without draining the fluid being heated

Terminal enclosures

- Provides ability to be rotated to simplify connection with existing conduits

Welding or brazing WATROD and FIREBAR elements to the screw plug

- Provides a pressure tight seal

WATROD hairpins are repressed (recompacted)

- Maintains MgO density, dielectric strength, heat transfer and life

2½ in. (64 mm) NPT screw plug assemblies features element support(s)

- Ensures proper spacing for maximizing heater performance and life

- **Screw plug and element sizes:**

1 in. NPT	0.315 in. WATROD
1¼ in. NPT	0.315 in. WATROD 1 in. FIREBAR
2 in. NPT	0.475 in. WATROD
2½ in. NPT	0.475 in. WATROD 1 in. FIREBAR

- **Phase capability**:

1 in. NPT	1-Phase
1¼, 2, 2½ in., NPT	1- or 3-Phase

UL® and CSA component recognition under File E52951 and 31388 respectively, see pages 681 to 686 for details.

WATROD and FIREBAR Screw Plug Immersion Heaters

Applications

- Water:
  - Deionized
  - Demineralized
  - Clean
  - Potable
  - Process
- Industrial water rinse tanks
- Vapor degreasers
- Hydraulic oil, crude, asphalt
- Lubricating oils at API specified watt densities
- Air and gas flow
- Caustic solutions
- Chemical baths
- Anti-freeze (glycol) solutions
- Paraffin

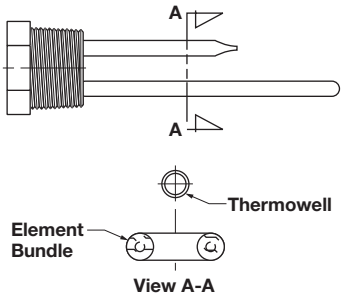
Screw Plug Orientation

Correct element/thermowell orientation assures proper process temperature sensing.

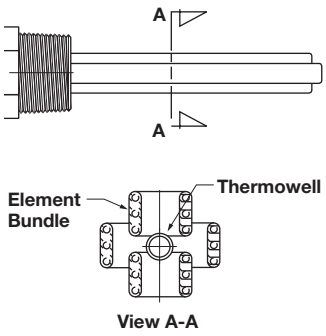
Correct horizontal mounting of WATROD and FIREBAR screw plugs is shown below. Correct orientation assures optimum performance and maximum heater life. Additional mounting information is provided in the *Installation and Maintenance Instructions*.

FIREBAR Heating Elements

1¼ in. (32 mm) NPT–One Element

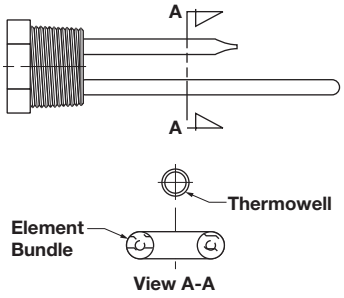


2½ in. (64 mm) NPT–Three Elements

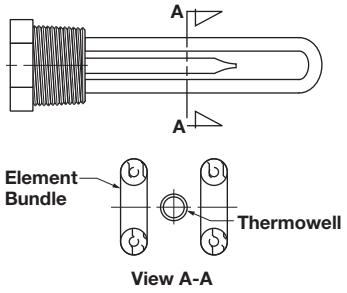


WATROD Heating Element

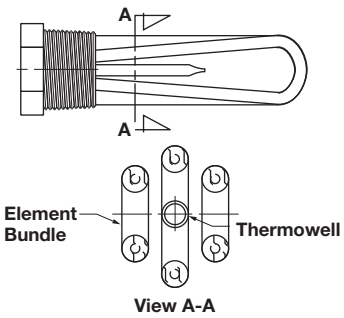
1 in. (25 mm) NPT–One Element



1¼ (32 mm) and 2 in. (51 mm) NPT–Two Elements



2 (51 mm) and 2½ in. (64 mm) NPT–Three Elements



WATROD and FIREBAR Screw Plug Immersion Heaters

Options

Terminal Enclosures

General purpose (NEMA 1) terminal enclosures, without thermostats, are standard on all screw plug immersion heaters. To meet specific application requirements, Watlow offers the following optional terminal enclosures:

- General purpose (NEMA 1) with single or double pole thermostat
- Moisture-resistant (NEMA 4) or corrosion resistant (NEMA 4X) —available with optional single or double pole thermostat
- Explosion-resistant (NEMA 7) class 1, groups C and D explosion resistant—available with optional single or double-pole thermostat. For class 1, group B enclosures, consult your Watlow representative or refer to CSA specifications on pages 681 to 686.
- Explosion and moisture-resistant (NEMA 7/4) combination—available with optional single- or double-pole thermostat
  Note: Unless otherwise stated on the accompanying illustrations, both WATROD and FIREBAR screw plugs are centered on the terminal enclosure. To order, add the suffix letter(s) to the screw plug heater's base code number. This is depicted on the *Stock* and *Options* ordering example on page 193. Also, specify class and group, if applicable.

CSA Certified Enclosures

CSA certified moisture and/or explosion-resistant terminal enclosures protect wiring in hazardous gas environments. These terminal enclosures, covered under CSA File number 61707, are available on all WATROD and FIREBAR screw plug immersion heaters. For additional information, contact your Watlow representative.

To order, specify **CSA certified enclosure**, **process temperature** (°F), maximum **working pressure** of application (psig), **media** being heated and heater **mounting orientation** (horizontal or vertical) and **screw plug size**.

Pilot Light

The optional pilot light gives the operator visual indication of heater on or off power status.

The PL10 pilot light is configured to a maximum 250V~(ac), and supplied with 6 in. (152 mm) leads.

The PL11 pilot light is rated for 480V~(ac), and supplied with 4 in. (102 mm) leads.

Pilot lights may be attached to either single or double pole thermostats with general purpose (NEMA 1) enclosure only. For moisture or explosion resistant terminal enclosures (NEMA 4 or NEMA 7), consult factory.

To order, refer to the *Build-a-Code* chart on page 193.

Thermostats

To provide process temperature control, Watlow offers optional single-pole, single-throw (SPST) and double pole, single throw (DPST) thermostats.

Unless otherwise specified, thermostats are mounted inside the terminal enclosure. For details and ordering information, refer to *Thermostats* on pages 653 to 656. Please verify that the thermostat's sensing bulb O.D. is compatible with the screw plug's thermowell I.D.



Caution:

Explosion-resistant terminal enclosures are intended to provide explosion containment in the electrical termination/wiring enclosure only. No portion of the assembly outside of this enclosure is covered under this NEMA rating. NEMA rating effectiveness may be compromised by abuse or misapplication.

WATROD and FIREBAR Screw Plug Immersion Heaters

Options *(Continued)*

Thermocouples

Type J or K thermocouples offer extremely accurate sensing of process and/or sheath temperatures. A thermocouple may be inserted into the thermowell or attached to the heater's sheath.

Thermocouples are supplied with 120 in. (3048 mm) leads (longer lead lengths available). Unless otherwise specified, thermocouples are supplied with temperature ranges detailed on the *Thermocouple Types* chart.

Using a thermocouple requires an appropriate temperature and power controller, these must be purchased separately. Watlow offers a wide variety of temperature and power controllers to meet virtually all applications. Temperature controllers can be configured to accept process variable inputs, too. Contact your Watlow representative for details.

To order, specify **Type J** or **K** thermocouple and lead length. Indicate if the thermocouple is for **process temperature sensing** or heater sheath **high-limit protection**. Please specify if the screw plug will be mounted **vertical** or **horizontal** in the tank. **If vertical, indicate if the housing is on top or bottom**.

If the screw plug heater is mounted in an in-line circulation heating application, indicate flow direction relative to the heater's enclosure.

Thermocouple Types

ASTM Type	Conductor Characteristics Positive	Conductor Characteristics Negative	Recommended ① Temperature Range °F	Recommended ① Temperature Range (°C)
J	Iron (Magnetic)	Constantan (Non-Magnetic)	0 to 1000	(-20 to 540)
K	Chromel® (non-magnetic)	Alumel® (Magnetic)	0 to 2000	(-20 to 1100)

① Type J and Type K thermocouples are rated 32 to 1382°F and 32 to 2282°F (0-750°C and 0-1250°C), respectively. Watlow does not recommend exceeding temperature ranges shown on this chart for the tubular product line.

Wattages and Voltages

Watlow routinely supplies screw plug immersion heaters with 120 to 480V~(ac) as well as wattages from 250 watts to 38kW. If required, Watlow will configure heaters with voltages and wattages outside these parameters. For more information on special voltage and wattage configurations, contact your Watlow representative.

Sheath Materials

The following sheath materials are available on WATROD and FIREBAR heating elements:

Standard Sheath Materials

WATROD	Incoloy® 316 SS Steel Copper
FIREBAR	Incoloy®

Made-to-Order Sheath Materials

WATROD	304 SS Monel®
FIREBAR	304 SS

Exotic Sheath Materials

Contact your Watlow representative for details and availability.

External Finishing

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process. For critical applications, passivation will remove free iron from the sheath. To order, specify **passivation**.

Other Finishes

Simple belt polishing and glass beading are available to meet cosmetic demands. Contact your Watlow representative for details.

Screw Plug Materials

The following screw plug materials are available:

To order, specify **screw plug size** and **material**.

Standard Screw Plug Materials

WATROD	304 SS 316 SS Steel Brass
FIREBAR	304 SS

Made-to-Order Plug Materials

For both WATROD and FIREBAR, contact your Watlow representative about details and availability.

WATROD and FIREBAR Screw Plug Immersion Heaters

Options *(Continued)*

Screw Plug Sizes

Including European

- **NPT**–1, 1¼, 2, 2½ in.
- **Gas**–G1¼, G1½, G2 in. (brass only)
- **BSP**–1½, 2 in. (stainless steel only)

Contact your Watlow representative for sizes and materials not listed.

To order, specify **size**, **style** (NPT, Gas or BSP) and material.

BSP = British Standard Pipe
Gas = Gas pipe standard

Screw Plug to Flange Adapters

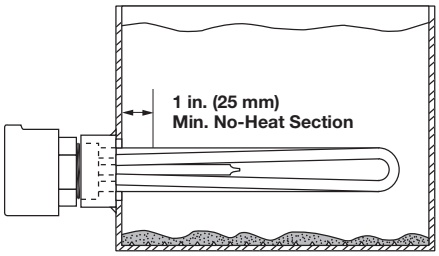
Screw plug to flange adaptors permit replacing flange heaters with screw plug heaters. To order, specify the appropriate code number.

Screw Plug to Flange Adapters

Screw Plug to Flange Adapter Sizes	Material	Estimated Shipping Wt. lbs	(kg)	Availability	Code Number
1¼ to 3 in.-150#	Steel	13	(5.9)	Stock	**125X3SA**
2½ to 3 in.-150#	Steel	11	(5.0)	Stock	**250X3SA**
2½ to 4 in.-150#	Steel	16	(7.3)	Stock	**250X4SA**
2½ to 5 in.-150#	Steel	25	(11.3)	Stock	**250X5SA**
2½ to 6 in.-150#	Steel	33	(15.0)	Stock	**250X6SA**

Application Hints

- Select the recommended sheath material and watt density for the substance being heated. Use the *Supplemental Applications Chart* on pages 671 to 678. If unable to determine the correct heater material and type, contact your Watlow representative.
- Extend the element's no-heat section completely into the fluid being heated to help prevent premature heater failure. See illustration below for proper no-heat section placement.
- Locate screw plug heater low in the tank, but above the sludge level.



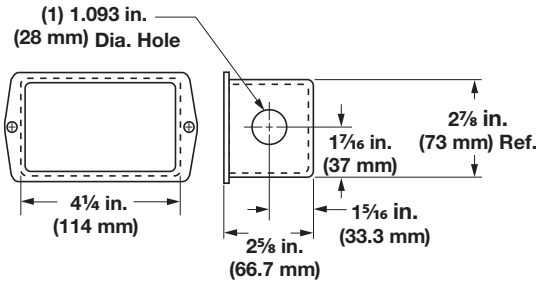
- Choose a FIREBAR element when your application requires a smaller system package or lower watt density.
- Ensure wiring integrity by making sure terminal enclosure temperature does not exceed 400°F (205°C).
- Keep electrical connections clean, dry and tight.
- Size power feeder wires in accordance with National Electrical Code guidelines and other applicable codes.
- Size power feeder wires in accordance with national electrical code guidelines and other applicable codes.
- Minimize problems associated with low liquid level conditions by using a low liquid level sensor or sheath temperature high-limit control.
- Periodically remove the screw plug assembly for inspection and clean the heating element(s). This preventive maintenance will reduce premature failure and optimize heater performance.
- Refer to the *Installation and Maintenance Instructions* for correct orientation of FIREBAR elements. Correct element orientation to flow minimizes pressure drop, increases buoyancy force and heater performance.

WATROD and FIREBAR Screw Plug Immersion Heaters

Optional Moisture Resistant Housings

Single-Pole Thermostat

1 and 1¼ inch NPT–1 WATROD Element



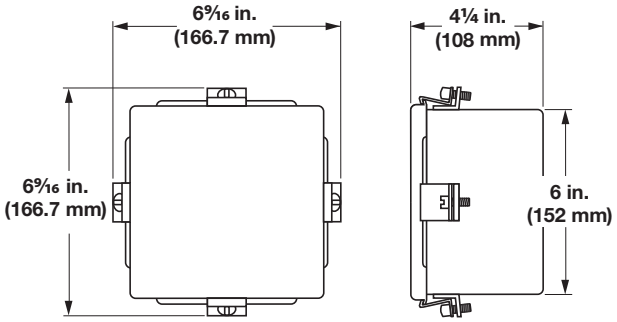
Note: The thermostat is not centered on the WATROD screw plug immersion heater.

Double-Pole Thermostat

1¼ inch NPT–2 WATROD Elements

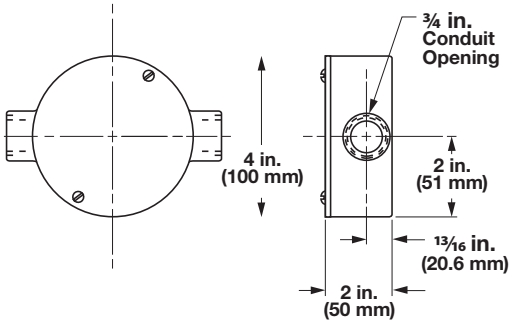
1¼ inch NPT–1 FIREBAR Element

All 2 and 2½ inch NPT screw plugs



Note: The thermostat is not centered on the screw plug immersion heater.

Without Thermostat

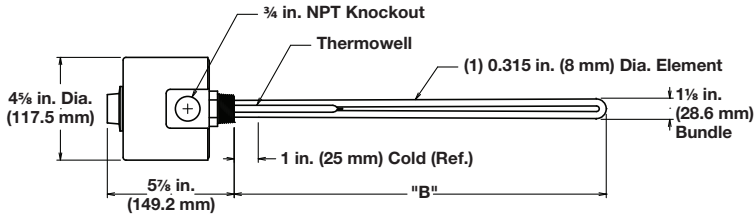


To order: Reference “W” in the *Build-a-Code* section on page 193.

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Clean Water

- 1 inch NPT screw plug
- WATROD elements
- With thermostat (SPST)
- General purpose enclosure



								Type 1 (30 to 110°F)		Type 2 (30 to 250°F)		Type 3 (175 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.	Code Number ②	Del.
								General Purpose Enclosure					
60 W/in² Brass Plug 1-Copper Element	120	0.50	1	4½	(114.0)	3	(2)	**BCC4J1S1**	RS	**BCC4J1S2**	RS	**BCC4J1S3**	RS
	240	0.50	1	4½	(114.0)	3	(2)	**BCC4J10S1**	RS	**BCC4J10S2**	RS	**BCC4J10S3**	RS
	120	0.75	1	6½	(165.0)	3	(2)	**BCC6J1S1**	RS	**BCC6J1S2**	RS	**BCC6J1S3**	RS
	240	0.75	1	6½	(165.0)	3	(2)	**BCC6J10S1**	RS	**BCC6J10S2**	RS	**BCC6J10S3**	RS
	120	1.00	1	6⅝	(168.3)	3	(2)	**BCC6L1S1**	RS	**BCC6L1S2**	RS	**BCC6L1S3**	RS
	240	1.00	1	6⅝	(168.3)	3	(2)	**BCC6L10S1**	RS	**BCC6L10S2**	RS	**BCC6L10S3**	RS
	120	1.25	1	8	(203.0)	4	(2)	**BCC8A1S1**	RS	**BCC8A1S2**	RS	**BCC8A1S3**	RS
	240	1.25	1	8	(203.0)	4	(2)	**BCC8A10S1**	RS	**BCC8A10S2**	RS	**BCC8A10S3**	RS
	120	1.50	1	10⅝	(269.9)	4	(2)	**BCC10L1S1**	RS	**BCC10L1S2**	RS	**BCC10L1S3**	RS
	240	1.50	1	10⅝	(269.9)	4	(2)	**BCC10L10S1**	RS	**BCC10L10S2**	RS	**BCC10L10S3**	RS
	120	2.00	1	12½	(318.0)	5	(3)	**BCC12J1S1**	RS	**BCC12J1S2**	RS	**BCC12J1S3**	RS
	240	2.00	1	12½	(318.0)	5	(3)	**BCC12J10S1**	RS	**BCC12J10S2**	RS	**BCC12J10S3**	RS
	120	2.50	1	14¾	(375.0)	5	(3)	**BCC14N1S1**	RS	**BCC14N1S2**	RS	**BCC14N1S3**	RS
	240	2.50	1	14¾	(375.0)	5	(3)	**BCC14N10S1**	RS	**BCC14N10S2**	RS	**BCC14N10S3**	RS
	120	3.00	1	16¾	(425.0)	6	(3)	**BCC16N1S1**	RS	**BCC16N1S2**	RS	**BCC16N1S3**	RS
	240	3.00	1	16¾	(425.0)	6	(3)	**BCC16N10S1**	RS	**BCC16N10S2**	RS	**BCC16N10S3**	RS
	240	4.00	1	21	(533.0)	6	(3)	**BCC21A10S1**	RS	**BCC21A10S2**	RS	**BCC21A10S3**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

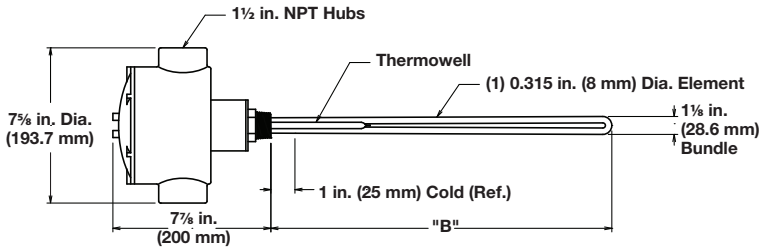
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

② UL® recognized only

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Clean Water

- 1 inch NPT screw plug
- WATROD elements
- With thermostat (SPST)
- Moisture/explosion-resistant enclosure



							Type 1 (30 to 110°F)		Type 2 (30 to 250°F)		Type 3 (175 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in. (mm)	Ship Wt. lbs (kg)		Code Number	Del.	Code Number	Del.	Code Number ⑤	Del.
							Moisture/Explosion-Resistant Enclosure					
60 W/in² Brass Plug 1-Copper Element (9.3 W/cm²)	120	0.50	1	4½	(114.0)	3 (2)	BCC4J1C1	RS	BCC4J1C2	RS	BCC4J1C3	RS
	240	0.50	1	4½	(114.0)	3 (2)	BCC4J10C1	RS	BCC4J10C2	RS	BCC4J10C3	RS
	120	0.75	1	6½	(165.0)	3 (2)	BCC6J1C1	RS	BCC6J1C2	RS	BCC6J1C3	RS
	240	0.75	1	6½	(165.0)	3 (2)	BCC6J10C1	RS	BCC6J10C2	RS	BCC6J10C3	RS
	120	1.00	1	6⅝	(168.3)	3 (2)	BCC6L1C1	RS	BCC6L1C2	RS	BCC6L1C3	RS
	240	1.00	1	6⅝	(168.3)	3 (2)	BCC6L10C1	RS	BCC6L10C2	RS	BCC6L10C3	RS
	120	1.25	1	8	(203.0)	4 (2)	BCC8A1C1	RS	BCC8A1C2	RS	BCC8A1C3	RS
	240	1.25	1	8	(203.0)	4 (2)	BCC8A10C1	RS	BCC8A10C2	RS	BCC8A10C3	RS
	120	1.50	1	10⅝	(269.9)	4 (2)	BCC10L1C1	RS	BCC10L1C2	RS	BCC10L1C3	RS
	240	1.50	1	10⅝	(269.9)	4 (2)	BCC10L10C1	RS	BCC10L10C2	RS	BCC10L10C3	RS
	120	2.00	1	12½	(318.0)	5 (3)	BCC12J1C1	RS	BCC12J1C2	RS	BCC12J1C3	RS
	240	2.00	1	12½	(318.0)	5 (3)	BCC12J10C1	RS	BCC12J10C2	RS	BCC12J10C3	RS
	120	2.50	1	14¾	(375.0)	5 (3)	BCC14N1C1	RS	BCC14N1C2	RS	BCC14N1C3	RS
	240	2.50	1	14¾	(375.0)	5 (3)	BCC14N10C1	RS	BCC14N10C2	RS	BCC14N10C3	RS
	120	3.00	1	16¾	(425.0)	6 (3)	BCC16N1C1	RS	BCC16N1C2	RS	BCC16N1C3	RS
	240	3.00	1	16¾	(425.0)	6 (3)	BCC16N10C1	RS	BCC16N10C2	RS	BCC16N10C3	RS
	240	4.00	1	21	(533.0)	6 (3)	BCC21A10C1	RS	BCC21A10C2	RS	BCC21A10C3	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

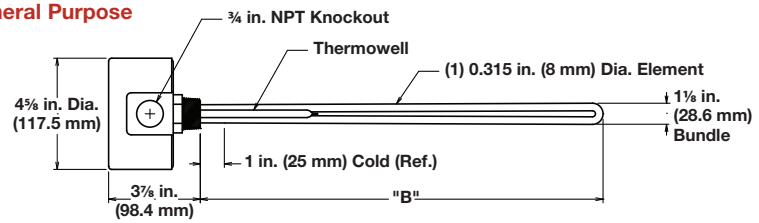
⑤ No third party recognition

WATROD and FIREBAR Screw Plug Immersion Heaters

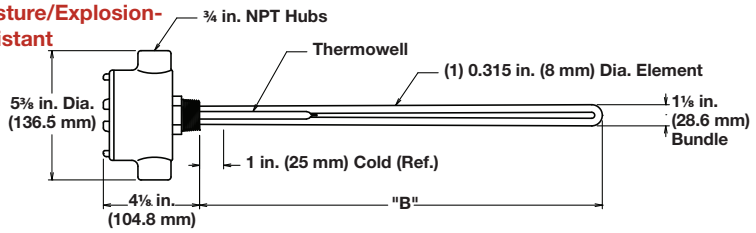
Application: Clean Water

- 1 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Del.	Ship Wt. lbs	(kg)	Code Number ⑦	Del.	Ship Wt. lbs.	(kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
60 W/in² Brass Plug 1-Copper Element (9.3 W/cm²)	120	0.50	1	4½	(114.0)	**BCC4J1S**	RS	3	(2)	**BCC4J1C**	RS	6	(3)
	240	0.50	1	4½	(114.0)	**BCC4J10S**	RS	3	(2)	**BCC4J10C**	RS	6	(3)
	120	0.75	1	6½	(165.0)	**BCC6J1S**	RS	3	(2)	**BCC6J1C**	RS	6	(3)
	240	0.75	1	6½	(165.0)	**BCC6J10S**	RS	3	(2)	**BCC6J10C**	RS	6	(3)
	120	1.00	1	6⅝	(168.3)	**BCC6L1S**	RS	3	(2)	**BCC6L1C**	RS	6	(3)
	240	1.00	1	6⅝	(168.3)	**BCC6L10S**	RS	3	(2)	**BCC6L10C**	RS	6	(3)
	120	1.25	1	8	(203.0)	**BCC8A1S**	RS	4	(2)	**BCC8A1C**	RS	7	(4)
	240	1.25	1	8	(203.0)	**BCC8A10S**	RS	4	(2)	**BCC8A10C**	RS	7	(4)
	120	1.50	1	10⅝	(269.9)	**BCC10L1S**	RS	4	(2)	**BCC10L1C**	RS	7	(4)
	240	1.50	1	10⅝	(269.9)	**BCC10L10S**	RS	4	(2)	**BCC10L10C**	RS	7	(4)
	120	2.00	1	12½	(318.0)	**BCC12J1S**	RS	5	(3)	**BCC12J1C**	RS	8	(4)
	240	2.00	1	12½	(318.0)	**BCC12J10S**	RS	5	(3)	**BCC12J10C**	RS	8	(4)
	120	2.50	1	14¾	(375.0)	**BCC14N1S**	RS	5	(3)	**BCC14N1C**	RS	8	(4)
	240	2.50	1	14¾	(375.0)	**BCC14N10S**	RS	5	(3)	**BCC14N10C**	RS	8	(4)
	120	3.00	1	16¾	(425.0)	**BCC16N1S**	RS	6	(3)	**BCC16N1C**	RS	9	(4)
	240	3.00	1	16¾	(425.0)	**BCC16N10S**	RS	6	(3)	**BCC16N10C**	RS	9	(4)
	240	4.00	1	21	(533.0)	**BCC21A10S**	RS	6	(3)	**BCC21A10C**	RS	9	(4)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

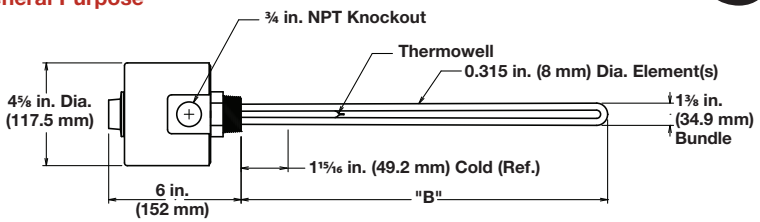
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

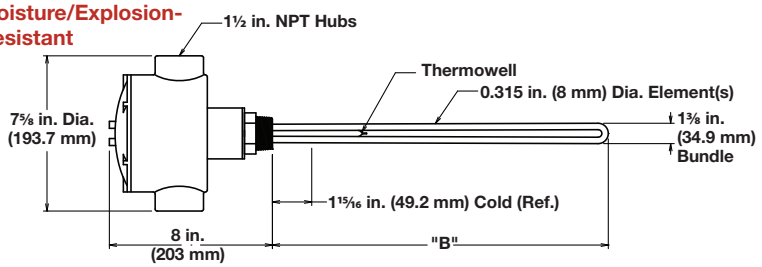
Application: Clean Water

- 1¼ inch NPT screw plug
- WATROD elements
- With thermostat (SPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Type 1 (30 to 110°F) Code Number	Type 1 Del.	Type 2 (30 to 250°F) Code Number	Type 2 Del.	Type 3 (175 to 550°F) Code Number ⑤	Type 3 Del.
								General Purpose Enclosure					
60 W/in² Brass Plug 1-Copper Element (9.3 W/cm²)	120	0.50	1	4⅜	(111.1)	3	(2)	BDC4G1S1	RS	BDC4G1S2	RS	BDC4G1S3	RS
	240	0.50	1	4⅜	(111.1)	3	(2)	BDC4G10S1	RS	BDC4G10S2	RS	BDC4G10S3	RS
	120	0.75	1	6⅜	(161.9)	3	(2)	BDC6G1S1	RS	BDC6G1S2	RS	BDC6G1S3	RS
	240	0.75	1	6⅜	(161.9)	3	(2)	BDC6G10S1	RS	BDC6G10S2	RS	BDC6G10S3	RS
60 W/in² ④ Brass Plug 2-Copper Elements (9.3 W/cm²)	120/240	1.00	1	4⅜	(111.1)	4	(2)	BEC4G6S1	RS	BEC4G6S2	RS	BEC4G6S3	RS
	120/240	1.50	1	6⅜	(161.9)	4	(2)	BEC6G6S1	RS	BEC6G6S2	RS	BEC6G6S3	RS
	120/240	2.00	1	8½	(216.0)	5	(3)	BEC8J6S1	RS	BEC8J6S2	RS	BEC8J6S3	RS
	120/240	2.50	1	10¾	(273.0)	5	(3)	BEC10N6S1	RS	BEC10N6S2	RS	BEC10N6S3	RS
	120/240	3.00	1	15	(381.0)	6	(3)	BEC15A6S1	RS	BEC15A6S2	RS	BEC15A6S3	RS
	240	4.00	1	19	(483.0)	7	(4)	BEC19A10S1	RS	BEC19A10S2	RS	BEC19A10S3	RS
	240	5.00	1	23½	(597.0)	8	(4)	BEC23J10S1	RS	BEC23J10S2	RS	BEC23J10S3	RS
	240	6.00	1	27½	(699.0)	9	(4)	BEC27J10S1	RS	BEC27J10S2	RS	BEC27J10S3	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
60 W/in² Brass Plug 1-Copper Element (9.3 W/cm²)	120	0.50	1	4⅜	(111.1)	7	(4)	BDC4G1C1	RS	BDC4G1C2	RS	BDC4G1C3	RS
	240	0.50	1	4⅜	(111.1)	7	(4)	BDC4G10C1	RS	BDC4G10C2	RS	BDC4G10C3	RS
	120	0.75	1	6⅜	(161.9)	7	(4)	BDC6G1C1	RS	BDC6G1C2	RS	BDC6G1C3	RS
	240	0.75	1	6⅜	(161.9)	7	(4)	BDC6G10C1	RS	BDC6G10C2	RS	BDC6G10C3	RS
60 W/in² ④ Brass Plug 2-Copper Elements (9.3 W/cm²)	120/240	1.00	1	4⅜	(111.1)	8	(4)	BEC4G6C1	RS	BEC4G6C2	RS	BEC4G6C3	RS
	120/240	1.50	1	6⅜	(161.9)	8	(4)	BEC6G6C1	RS	BEC6G6C2	RS	BEC6G6C3	RS
	120/240	2.00	1	8½	(216.0)	9	(4)	BEC8J6C1	RS	BEC8J6C2	RS	BEC8J6C3	RS
	120/240	2.50	1	10¾	(273.0)	9	(4)	BEC10N6C1	RS	BEC10N6C2	RS	BEC10N6C3	RS
	120/240	3.00	1	15	(381.0)	10	(5)	BEC15A6C1	RS	BEC15A6C2	RS	BEC15A6C3	RS
	240	4.00	1	19	(483.0)	11	(5)	BEC19A10C1	RS	BEC19A10C2	RS	BEC19A10C3	RS
	240	5.00	1	23½	(597.0)	12	(6)	BEC23J10C1	RS	BEC23J10C2	RS	BEC23J10C3	RS
	240	6.00	1	27½	(699.0)	13	(6)	BEC27J10C1	RS	BEC27J10C2	RS	BEC27J10C3	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

⑤ No third party recognition

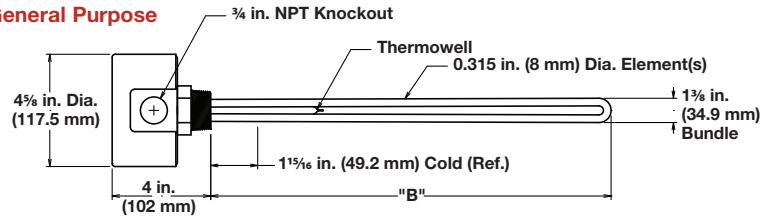
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

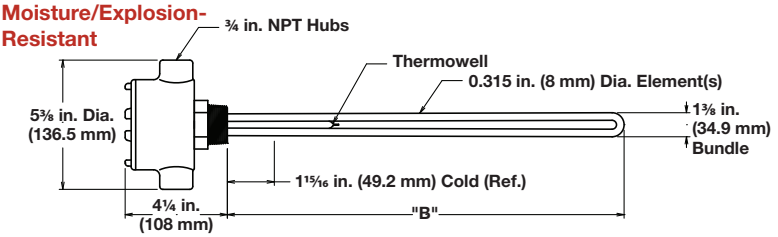
Application: Clean Water

- 1¼ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Del.	Ship Wt. lbs	(kg)	Code Number ⑦	Del.	Ship Wt. lbs	(kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
60 W/in² Brass Plug 1-Copper Element (9.3 W/cm²)	120	0.50	1	4⅜	(111.1)	**BDC4G1S**	RS	3	(2)	**BDC4G1C**	RS	6	(3)
	240	0.50	1	4⅜	(111.1)	**BDC4G10S**	RS	3	(2)	**BDC4G10C**	RS	6	(3)
	120	0.75	1	6⅜	(161.9)	**BDC6G1S**	RS	3	(2)	**BDC6G1C**	RS	6	(3)
	240	0.75	1	6⅜	(161.9)	**BDC6G10S**	RS	3	(2)	**BDC6G10C**	RS	6	(3)
60 W/in² ④ Brass Plug 2-Copper Elements (9.3 W/cm²)	120/240	1.00	1	4⅜	(111.1)	**BEC4G6S**	RS	4	(2)	**BEC4G6C**	RS	7	(4)
	120/240	1.50	1	6⅜	(161.9)	**BEC6G6S**	RS	4	(2)	**BEC6G6C**	RS	7	(4)
	120/240	2.00	1	8½	(216.0)	**BEC8J6S**	RS	5	(3)	**BEC8J6C**	RS	8	(4)
	120/240	2.50	1	10¾	(273.0)	**BEC10N6S**	RS	5	(3)	**BEC10N6C**	RS	8	(4)
	120/240	3.00	1	15	(381.0)	**BEC15A6S**	RS	6	(3)	**BEC15A6C**	RS	9	(4)
	240	4.00	1	19	(483.0)	**BEC19A10S**	RS	7	(4)	**BEC19A10C**	RS	10	(5)
	240	5.00	1	23½	(597.0)	**BEC23J10S**	RS	8	(4)	**BEC23J10C**	RS	11	(5)
	240	6.00	1	27½	(699.0)	**BEC27J10S**	RS	9	(4)	**BEC27J10C**	RS	12	(6)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

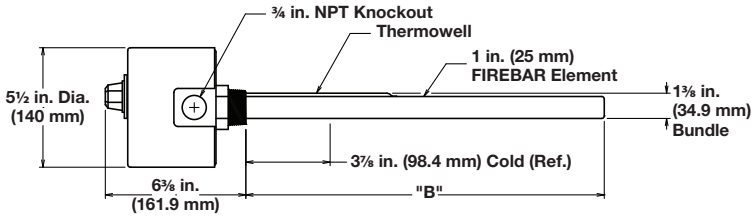
④ Wired for higher voltage

⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Clean Water

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
- General purpose enclosure



								Type 5A (60 to 250°F)		Type 7A (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure			
90 W/in² ⑧ 304 SS Plug 1-Incoloy Element (14 W/cm²)	240	1.5	1	7⅝	(193.7)	6	(3)	**BDNF7R10S5A**	RS	**BDNF7R10S7A**	RS
	480	1.5	1	7⅝	(193.7)	6	(3)	**BDNF7R11S5A**	RS	**BDNF7R11S7A**	RS
	240	3.0	1	11⅛	(282.6)	7	(4)	**BDNF11G10S5A**	RS	**BDNF11G10S7A**	RS
	480	3.0	1	11⅛	(282.6)	7	(4)	**BDNF11G11S5A**	RS	**BDNF11G11S7A**	RS
	240	5.0	3	16⅛	(409.6)	8	(4)	**BDNF16G3S5A**	RS	**BDNF16G3S7A**	RS
	480	5.0	3	16⅛	(409.6)	8	(4)	**BDNF16G5S5A**	RS	**BDNF16G5S7A**	RS
	240	6.5	3	19⅛	(485.8)	9	(4)	**BDNF19G3S5A**	RS	**BDNF19G3S7A**	RS
	480	6.5	3	19⅛	(485.8)	9	(4)	**BDNF19G5S5A**	RS	**BDNF19G5S7A**	RS
	240	8.5	3	24⅜	(619.1)	10	(5)	**BDNF24L3S5A**	RS	**BDNF24L3S7A**	RS
	480	8.5	3	24⅜	(619.1)	10	(5)	**BDNF24L5S5A**	RS	**BDNF24L5S7A**	RS
	240	10.5	3	29⅝	(752.5)	11	(5)	**BDNF29R3S5A**	RS	**BDNF29R3S7A**	RS
	480	10.5	3	29⅝	(752.5)	11	(5)	**BDNF29R5S5A**	RS	**BDNF29R5S7A**	RS
	240	12.7	3	34⅝	(879.5)	12	(6)	**BDNF34R3S5A**	RS	**BDNF34R3S7A**	RS
	480	12.7	3	34⅝	(879.5)	12	(6)	**BDNF34R5S5A**	RS	**BDNF34R5S7A**	RS
	240	17.0	3	45⅛	(1146.2)	14	(7)	**BDNF45G3S5A**	RS	**BDNF45G3S7A**	RS
	480	17.0	3	45⅛	(1146.2)	14	(7)	**BDNF45G5S5A**	RS	**BDNF45G5S7A**	RS
	480	21.5	3	55⅝	(1412.9)	16	(8)	**BDNF55R5S5A**	RS	**BDNF55R5S7A**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

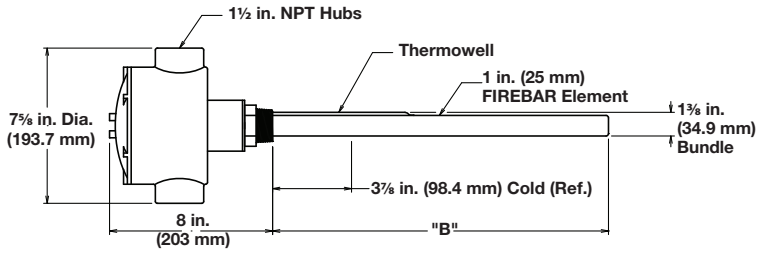
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Clean Water

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 5A (60 to 250°F)		Type 7A (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
								Moisture/Explosion-Resistant Enclosure			
90 W/in² ⑧ 304 SS Plug 1-Incoloy Element (14 W/cm²)	240	1.5	1	7⅝	(193.7)	9	(4)	**BDNF7R10C5A**	RS	**BDNF7R10C7A**	RS
	480	1.5	1	7⅝	(193.7)	9	(4)	**BDNF7R11C5A**	RS	**BDNF7R11C7A**	RS
	240	3.0	1	11⅛	(282.6)	10	(5)	**BDNF11G10C5A**	RS	**BDNF11G10C7A**	RS
	480	3.0	1	11⅛	(282.6)	10	(5)	**BDNF11G11C5A**	RS	**BDNF11G11C7A**	RS
	240	5.0	3	16⅛	(409.6)	11	(5)	**BDNF16G3C5A**	RS	**BDNF16G3C7A**	RS
	480	5.0	3	16⅛	(409.6)	11	(5)	**BDNF16G5C5A**	RS	**BDNF16G5C7A**	RS
	240	6.5	3	19⅛	(485.8)	12	(6)	**BDNF19G3C5A**	RS	**BDNF19G3C7A**	RS
	480	6.5	3	19⅛	(485.8)	12	(6)	**BDNF19G5C5A**	RS	**BDNF19G5C7A**	RS
	240	8.5	3	24⅜	(619.1)	13	(6)	**BDNF24L3C5A**	RS	**BDNF24L3C7A**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

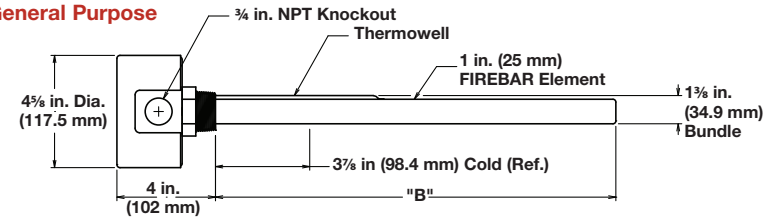
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

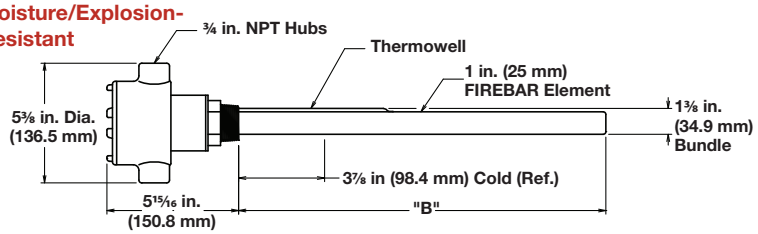
Application: Clean Water

- 1¼ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
90 W/in² ⑧ 304 SS Plug 1-Incoloy Element (9.3 W/cm²)	240	1.5	1	7⅝	(193.7)	**BDNF7R10S**	RS	5	(3)	**BDNF7R10C**	RS	8	(4)
	480	1.5	1	7⅝	(193.7)	**BDNF7R11S**	RS	5	(3)	**BDNF7R11C**	RS	8	(4)
	240	3.0	1	11⅛	(282.6)	**BDNF11G10S**	RS	6	(3)	**BDNF11G10C**	RS	9	(4)
	480	3.0	1	11⅛	(282.6)	**BDNF11G11S**	RS	6	(3)	**BDNF11G11C**	RS	9	(4)
	240	5.0	3	16⅛	(409.6)	**BDNF16G3S**	RS	7	(4)	**BDNF16G3C**	RS	10	(5)
	480	5.0	3	16⅛	(409.6)	**BDNF16G5S**	RS	7	(4)	**BDNF16G5C**	RS	10	(5)
	240	6.5	3	19⅛	(485.8)	**BDNF19G3S**	RS	8	(4)	**BDNF19G3C**	RS	11	(5)
	480	6.5	3	19⅛	(485.8)	**BDNF19G5S**	RS	8	(4)	**BDNF19G5C**	RS	11	(5)
	240	8.5	3	24⅜	(619.1)	**BDNF24L3S**	RS	9	(4)	**BDNF24L3C**	RS	12	(6)
	480	8.5	3	24⅜	(619.1)	**BDNF24L5S**	RS	9	(4)	**BDNF24L5C**	RS	12	(6)
	240	10.5	3	29⅝	(752.5)	**BDNF29R3S**	RS	10	(5)	**BDNF29R3C**	RS	13	(6)
	480	10.5	3	29⅝	(752.5)	**BDNF29R5S**	RS	10	(5)	**BDNF29R5C**	RS	13	(6)
	240	12.7	3	34⅝	(879.5)	**BDNF34R3S**	RS	11	(5)	**BDNF34R3C**	RS	14	(7)
	480	12.7	3	34⅝	(879.5)	**BDNF34R5S**	RS	11	(5)	**BDNF34R5C**	RS	14	(7)
	240	17.0	3	45⅛	(1146.2)	**BDNF45G3S**	RS	13	(6)	**BDNF45G3C**	RS	16	(8)
	480	17.0	3	45⅛	(1146.2)	**BDNF45G5S**	RS	13	(6)	**BDNF45G5C**	RS	16	(8)
	480	21.5	3	55⅝	(1412.9)	**BDNF55R5S**	RS	15	(7)	**BDNF55R5C**	RS	18	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

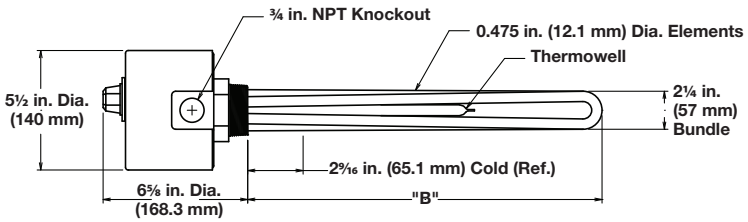
⑦ CSA certified only

⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Clean Water

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose enclosure



						Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in. (mm)	Ship Wt. lbs. (kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
						General Purpose Enclosure					
60 W/in² ④ Brass Plug 2-Copper Elements (9.3 W/cm²)	120/240	2.0	1	8⅛ (206.4)	5 (3)	**BGC78C6S4**	RS	**BGC78C6S5**	RS	**BGC78C6S7**	RS
	240/480	2.0	1	8⅛ (206.4)	5 (3)	**BGC78C7S4**	RS	**BGC78C7S5**	RS	**BGC78C7S7**	RS
	120/240	3.0	1	11⅛ (282.6)	6 (3)	**BGC711C6S4**	RS	**BGC711C6S5**	RS	**BGC711C6S7**	RS
	240/480	3.0	1	11⅛ (282.6)	6 (3)	**BGC711C7S4**	RS	**BGC711C7S5**	RS	**BGC711C7S7**	RS
	120/240	4.0	1	15⅛ (384.2)	7 (4)	**BGC715C6S4**	RS	**BGC715C6S5**	RS	**BGC715C6S7**	RS
	120/240	5.0	1	18⅛ (460.4)	7 (4)	**BGC718C6S4**	RS	**BGC718C6S5**	RS	**BGC718C6S7**	RS
60 W/in² Brass Plug 3-Copper Element (9.3 W/cm²)	240	3.0	3	8⅛ (206.4)	6 (3)	**BHC78C3S4**	RS	**BHC78C3S5**	RS	**BHC78C3S7**	RS
	480	3.0	3	8⅛ (206.4)	6 (3)	**BHC68C13S4**	RS	**BHC68C13S5**	RS	**BHC68C13S7**	RS
	240	4.5	3	11⅛ (282.6)	7 (4)	**BHC711C3S4**	RS	**BHC711C3S5**	RS	**BHC711C3S7**	RS
	480	4.5	3	11⅛ (282.6)	7 (4)	**BHC611C13S4**	RS	**BHC611C13S5**	RS	**BHC611C13S7**	RS
	240	6.0	3	15⅛ (384.2)	8 (4)	**BHC715C3S4**	RS	**BHC715C3S5**	RS	**BHC715C3S7**	RS
	480	6.0	3	15⅛ (384.2)	8 (4)	**BHC715C5S4**	RS	**BHC715C5S5**	RS	**BHC715C5S7**	RS
	240	7.5	3	18⅛ (460.4)	8 (4)	**BHC718C3S4**	RS	**BHC718C3S5**	RS	**BHC718C3S7**	RS
	240	9.0	3	21⅛ (536.6)	9 (4)	**BHC721C3S4**	RS	**BHC721C3S5**	RS	**BHC721C3S7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

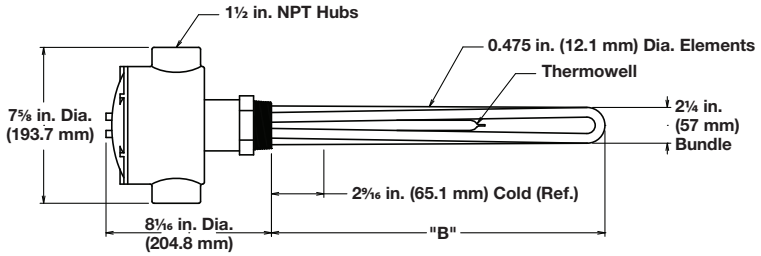
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Clean Water

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								Moisture/Explosion-Resistant Enclosure					
60 W/in² ④ Brass Plug 2-Copper Elements (9.3 W/cm²)	120/240	2.0	1	8⅛	(206.4)	8	(4)	BGC78C6C4	RS	BGC78C6C5	RS	BGC78C6C7	RS
	240/480	2.0	1	8⅛	(206.4)	8	(4)	BGC78C7C4	RS	BGC78C7C5	RS	BGC78C7C7	RS
	120/240	3.0	1	11⅛	(282.6)	9	(4)	BGC711C6C4	RS	BGC711C6C5	RS	BGC711C6C7	RS
	240/480	3.0	1	11⅛	(282.6)	9	(4)	BGC711C7C4	RS	BGC711C7C5	RS	BGC711C7C7	RS
	120/240	4.0	1	15⅛	(384.2)	10	(5)	BGC715C6C4	RS	BGC715C6C5	RS	BGC715C6C7	RS
	120/240	5.0	1	18⅛	(460.4)	10	(5)	BGC718C6C4	RS	BGC718C6C5	RS	BGC718C6C7	RS
60 W/in² Brass Plug 3-Copper Element (9.3 W/cm²)	240	3.0	3	8⅛	(206.4)	9	(4)	BHC78C3C4	RS	BHC78C3C5	RS	BHC78C3C7	RS
	480	3.0	3	8⅛	(206.4)	9	(4)	BHC68C13C4	RS	BHC68C13C5	RS	BHC68C13C7	RS
	240	4.5	3	11⅛	(282.6)	10	(5)	BHC711C3C4	RS	BHC711C3C5	RS	BHC711C3C7	RS
	480	4.5	3	11⅛	(282.6)	10	(5)	BHC611C13C4	RS	BHC611C13C5	RS	BHC611C13C7	RS
	240	6.0	3	15⅛	(384.2)	11	(5)	BHC715C3C4	RS	BHC715C3C5	RS	BHC715C3C7	RS
	480	6.0	3	15⅛	(384.2)	11	(5)	BHC715C5C4	RS	BHC715C5C5	RS	BHC715C5C7	RS
	240	7.5	3	18⅛	(460.4)	11	(5)	BHC718C3C4	RS	BHC718C3C5	RS	BHC718C3C7	RS
	240	9.0	3	21⅛	(536.6)	12	(6)	BHC721C3C4	RS	BHC721C3C5	RS	BHC721C3C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

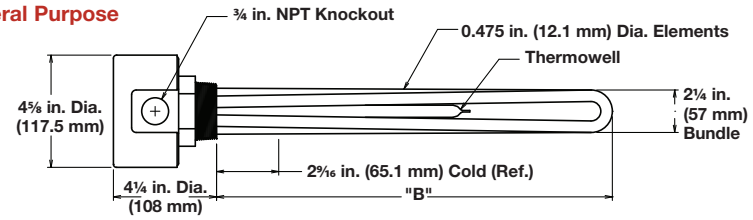
④ Wired for higher voltage

WATROD and FIREBAR Screw Plug Immersion Heaters

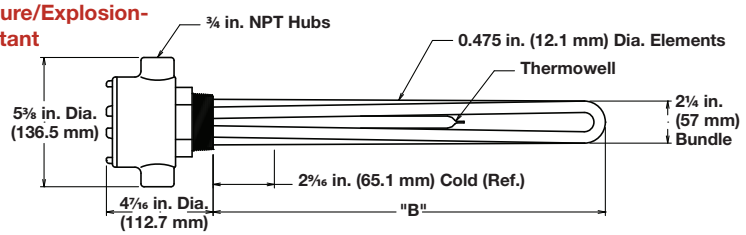
Application: Clean Water

- 2 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
60 W/in² ④ Brass Plug 2-Copper Elements (9.3 W/cm²)	120/240	2.0	1	8⅛	(206.4)	BGC78C6S	RS	4	(2)	BGC78C6C	RS	7	(4)
	240/480	2.0	1	8⅛	(206.4)	BGC78C7S	RS	4	(2)	BGC78C7C	RS	7	(4)
	120/240	3.0	1	11⅛	(282.6)	BGC711C6S	RS	5	(3)	BGC711C6C	RS	8	(4)
	240/480	3.0	1	11⅛	(282.6)	BGC711C7S	RS	5	(3)	BGC711C7C	RS	8	(4)
	120/240	4.0	1	15⅛	(384.2)	BGC715C6S	RS	6	(3)	BGC715C6C	RS	9	(4)
	240/480	4.0	1	15⅛	(384.2)	BGC715C7S	RS	6	(3)	BGC715C7C	RS	9	(4)
	120/240	5.0	1	18⅛	(460.4)	BGC718C6S	RS	6	(3)	BGC718C6C	RS	9	(4)
	240/480	5.0	1	18⅛	(460.4)	BGC718C7S	RS	6	(3)	BGC718C7C	RS	9	(4)
	240/480	6.0	1	21⅛	(536.6)	BGC721C7S	RS	7	(4)	BGC721C7C	RS	10	(5)
	240/480	8.0	1	26⅝	(676.3)	BGC726L7S	RS	7	(4)	BGC726L7C	RS	10	(5)
	240/480	10.0	1	32⅛	(816.0)	BGC732C7S	RS	8	(4)	BGC732C7C	RS	11	(5)
60 W/in² Brass Plug 3-Copper Elements (9.3 W/cm²)	120	3.0	1	8⅛	(206.4)	BHC78C1S	RS	5	(3)	BHC78C1C	RS	8	(4)
	240	3.0	3	8⅛	(206.4)	BHC78C3S	RS	5	(3)	BHC78C3C	RS	8	(4)
	480	3.0	3	8⅛	(206.4)	BHC68C13S	RS	5	(3)	BHC68C13C	RS	8	(4)
	120	4.5	1	11⅛	(282.6)	BHC711C1S	RS	6	(3)	BHC711C1C	RS	9	(4)
	240	4.5	3	11⅛	(282.6)	BHC711C3S	RS	6	(3)	BHC711C3C	RS	9	(4)
	480	4.5	3	11⅛	(282.6)	BHC611C13S	RS	6	(3)	BHC611C13C	RS	9	(4)
	240	6.0	3	15⅛	(384.2)	BHC715C3S	RS	7	(4)	BHC715C3C	RS	10	(5)
	480	6.0	3	15⅛	(384.2)	BHC715C5S	RS	7	(4)	BHC715C5C	RS	10	(5)
	240	7.5	3	18⅛	(460.4)	BHC718C3S	RS	7	(4)	BHC718C3C	RS	10	(5)
	480	7.5	3	18⅛	(460.4)	BHC718C5S	RS	7	(4)	BHC718C5C	RS	10	(5)
	240	9.0	3	21⅛	(536.6)	BHC721C3S	RS	8	(4)	BHC721C3C	RS	11	(5)
	480	9.0	3	21⅛	(536.6)	BHC721C5S	RS	8	(4)	BHC721C5C	RS	11	(5)
	240	12.0	3	26⅝	(676.3)	BHC726L3S	RS	8	(4)	BHC726L3C	RS	11	(5)
	480	12.0	3	26⅝	(676.3)	BHC726L5S	RS	8	(4)	BHC726L5C	RS	11	(5)
	240	15.0	3	32⅛	(816.0)	BHC732C3S	RS	9	(4)	BHC732C3C	RS	12	(6)
	480	15.0	3	32⅛	(816.0)	BHC732C5S	RS	9	(4)	BHC732C5C	RS	12	(6)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

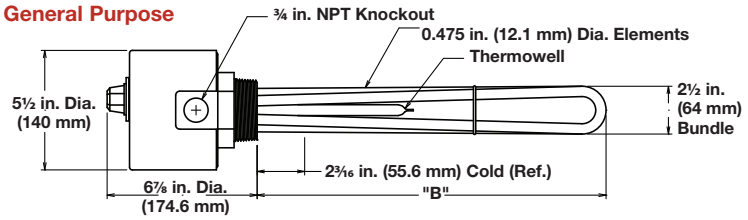
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

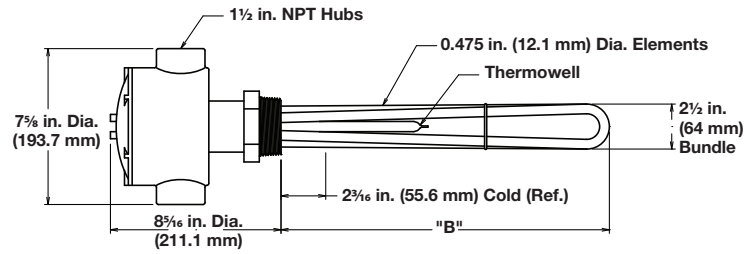
Application: Clean Water

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure					
60 W/in² Brass Plug 3-Copper Element (9.3 W/cm²)	240	3.0	3	7⅝	(193.7)	7	(4)	BLC77L3S4	RS	BLC77L3S5	RS	BLC77L3S7	RS
	480	3.0	3	7⅝	(193.7)	7	(4)	BLC77L13S4	RS	BLC77L13S5	RS	BLC77L13S7	RS
	240	4.5	3	10⅝	(269.9)	8	(4)	BLC710L3S4	RS	BLC710L3S5	RS	BLC710L3S7	RS
	480	4.5	3	10⅝	(269.9)	8	(4)	BLC610K13S4	RS	BLC610K13S5	RS	BLC610K13S7	RS
	240	6.0	3	14⅝	(371.5)	10	(5)	BLC714L3S4	RS	BLC714L3S5	RS	BLC714L3S7	RS
	480	6.0	3	14⅝	(371.5)	10	(5)	BLC714L5S4	RS	BLC714L5S5	RS	BLC714L5S7	RS
	240	7.5	3	17⅝	(447.7)	10	(5)	BLC717L3S4	RS	BLC717L3S5	RS	BLC717L3S7	RS
	240	9.0	3	20⅝	(523.9)	12	(6)	BLC720L3S4	RS	BLC720L3S5	RS	BLC720L3S7	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
60 W/in² Brass Plug 3-Copper Elements (9.3 W/cm²)	240	3.0	3	7⅝	(193.7)	10	(5)	BLC77L3C4	RS	BLC77L3C5	RS	BLC77L3C7	RS
	480	3.0	3	7⅝	(193.7)	10	(5)	BLC77L13C4	RS	BLC77L13C5	RS	BLC77L13C7	RS
	240	4.5	3	10⅝	(269.9)	11	(5)	BLC710L3C4	RS	BLC710L3C5	RS	BLC710L3C7	RS
	480	4.5	3	10⅝	(269.9)	11	(5)	BLC610K13C4	RS	BLC610K13C5	RS	BLC610K13C7	RS
	240	6.0	3	14⅝	(371.5)	13	(6)	BLC714L3C4	RS	BLC714L3C5	RS	BLC714L3C7	RS
	480	6.0	3	14⅝	(371.5)	13	(6)	BLC714L5C4	RS	BLC714L5C5	RS	BLC714L5C7	RS
	240	7.5	3	17⅝	(447.7)	13	(6)	BLC717L3C4	RS	BLC717L3C5	RS	BLC717L3C7	RS
	240	9.0	3	20⅝	(523.9)	15	(7)	BLC720L3C4	RS	BLC720L3C5	RS	BLC720L3C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

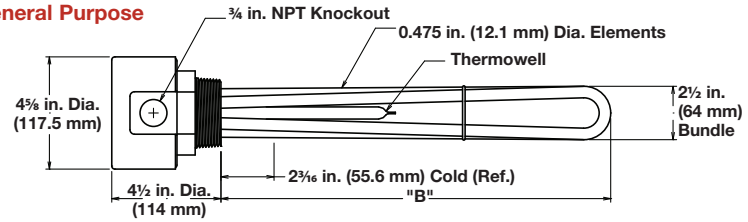
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

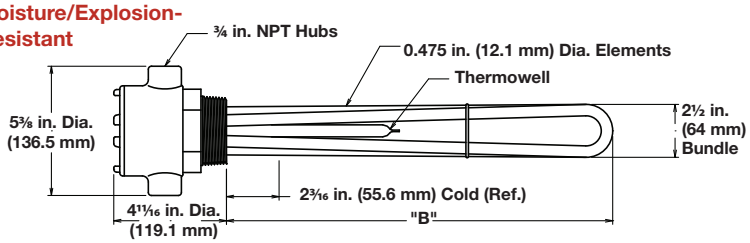
Application: Clean Water

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
60 W/in² Brass Plug 3-Copper Element (9.3 W/cm²)	120	3.0	1	7⅝	(193.7)	**BLC77L1S**	RS	6	(3)	**BLC77L1C**	RS	9	(4)
	240	3.0	3	7⅝	(193.7)	**BLC77L3S**	RS	6	(3)	**BLC77L3C**	RS	9	(4)
	480	3.0	3	7⅝	(193.7)	**BLC77L13S**	RS	6	(3)	**BLC77L13C**	RS	9	(4)
	120	4.5	1	10⅝	(269.9)	**BLC710L1S**	RS	7	(4)	**BLC710L1C**	RS	10	(5)
	240	4.5	3	10⅝	(269.9)	**BLC710L3S**	RS	7	(4)	**BLC710L3C**	RS	10	(5)
	480	4.5	3	10⅝	(269.9)	**BLC610K13S**	RS	7	(4)	**BLC610K13C**	RS	10	(5)
	240	6.0	3	14⅝	(371.5)	**BLC714L3S**	RS	9	(4)	**BLC714L3C**	RS	12	(6)
	480	6.0	3	14⅝	(371.5)	**BLC714L5S**	RS	9	(4)	**BLC714L5C**	RS	12	(6)
	240	7.5	3	17⅝	(447.7)	**BLC717L3S**	RS	9	(4)	**BLC717L3C**	RS	12	(6)
	480	7.5	3	17⅝	(447.7)	**BLC717L5S**	RS	9	(4)	**BLC717L5C**	RS	12	(6)
	240	9.0	3	20⅝	(523.9)	**BLC720L3S**	RS	11	(5)	**BLC720L3C**	RS	14	(7)
	480	9.0	3	20⅝	(523.9)	**BLC720L5S**	RS	11	(5)	**BLC720L5C**	RS	14	(7)
	240	12.0	3	26⅛	(663.6)	**BLC726C3S**	RS	12	(6)	**BLC726C3C**	RS	15	(7)
	480	12.0	3	26⅛	(663.6)	**BLC726C5S**	RS	12	(6)	**BLC726C5C**	RS	15	(7)
	240	15.0	3	31⅝	(803.3)	**BLC731L3S**	RS	14	(7)	**BLC731L3C**	RS	17	(8)
	480	15.0	3	31⅝	(803.3)	**BLC731L5S**	RS	14	(7)	**BLC731L5C**	RS	17	(8)
	240	18.0	3	37⅛	(943.0)	**BLC737C3S**	RS	15	(7)	**BLC737C3C**	RS	18	(9)
	480	18.0	3	37⅛	(943.0)	**BLC737C5S**	RS	15	(7)	**BLC737C5C**	RS	18	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

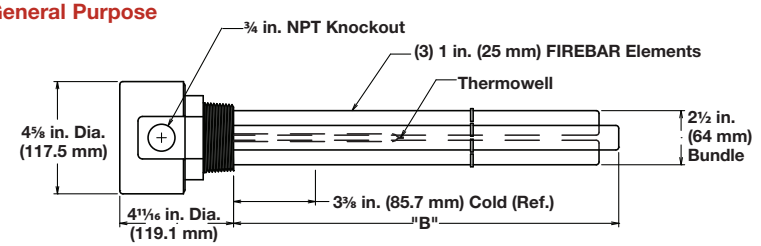
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

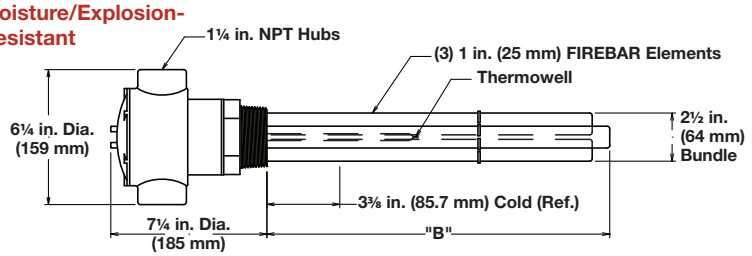
Application: Clean Water

- 2½ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
90 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (14 W/cm²)	240	15.0	3	15⅛	(384.2)	**BLNF15C3S**	RS	11	(5)	**BLNF15C3C**	RS	14	(7)
	480	15.0	3	15⅛	(384.2)	**BLNF15C5S**	RS	11	(5)	**BLNF15C5C**	RS	14	(7)
	240	20.0	3	18⅛	(460.4)	**BLNF18C3S**	RS	12	(6)	**BLNF18C3C**	RS	15	(7)
	480	20.0	3	18⅛	(460.4)	**BLNF18C5S ③**	RS	12	(6)	**BLNF18C5C ③**	RS	15	(7)
	480	25.0	3	23⅛	(587.4)	**BLNF23C5S**	RS	14	(7)	**BLNF23C5C**	RS	17	(8)
	480	32.0	3	28⅝	(727.1)	**BLNF28L5S**	RS	17	(8)	**BLNF28L5C**	RS	20	(9)
	480	38.0	3	33⅝	(854.1)	**BLNF33L5S**	RS	18	(9)	**BLNF33L5C**	RS	21	(10)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

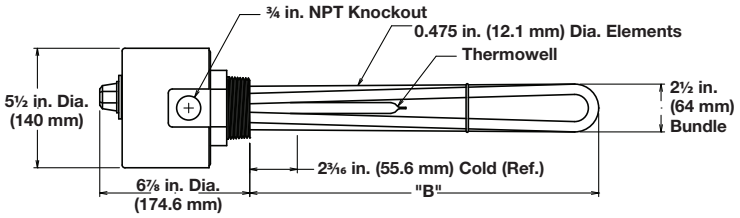
⑦ CSA certified only

⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Deionized/ Demineralized Water

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure					
60 W/in² 316 SS Plug 3-316 SS Elements (9.3 W/cm²) (Passivated)	240	3.0	3	7⅝	(193.7)	7	(4)	**BLR77L3S4**	RS	**BLR77L3S5**	RS	**BLR77L3S7**	RS
	480	3.0	3	7⅝	(193.7)	7	(4)	**BLR77L5S4**	RS	**BLR77L5S5**	RS	**BLR77L5S7**	RS
	240	4.5	3	10⅝	(269.9)	8	(4)	**BLR710L3S4**	RS	**BLR710L3S5**	RS	**BLR710L3S7**	RS
	480	4.5	3	10⅝	(269.9)	8	(4)	**BLR710L5S4**	RS	**BLR710L5S5**	RS	**BLR710L5S7**	RS
	240	6.0	3	14⅝	(371.5)	10	(5)	**BLR714L3S4**	RS	**BLR714L3S5**	RS	**BLR714L3S7**	RS
	480	6.0	3	14⅝	(371.5)	10	(5)	**BLR714L5S4**	RS	**BLR714L5S5**	RS	**BLR714L5S7**	RS
	240	7.5	3	17⅝	(447.7)	10	(5)	**BLR717L3S4**	RS	**BLR717L3S5**	RS	**BLR717L3S7**	RS
	240	9.0	3	20⅝	(523.9)	12	(6)	**BLR720L3S4**	RS	**BLR720L3S5**	RS	**BLR720L3S7**	RS

RAPID SHIP

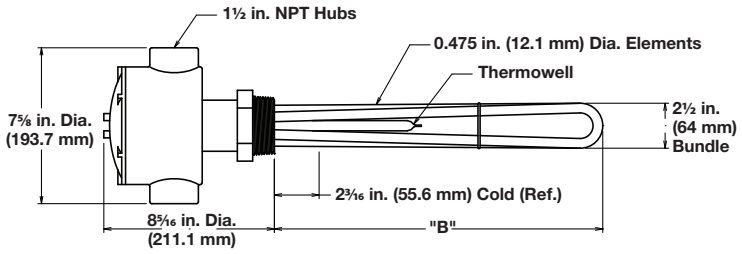
- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Deionized/ Demineralized Water

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								Moisture/Explosion-Resistant Enclosure					
60 W/in² 316 SS Plug 3-316 SS Elements (9.3 W/cm²) (Passivated)	240	3.0	3	7⅝	(193.7)	10	(5)	**BLR77L3C4**	RS	**BLR77L3C5**	RS	**BLR77L3C7**	RS
	480	3.0	3	7⅝	(193.7)	10	(5)	**BLR77L5C4**	RS	**BLR77L5C5**	RS	**BLR77L5C7**	RS
	240	4.5	3	10⅝	(269.9)	11	(5)	**BLR710L3C4**	RS	**BLR710L3C5**	RS	**BLR710L3C7**	RS
	480	4.5	3	10⅝	(269.9)	11	(5)	**BLR710L5C4**	RS	**BLR710L5C5**	RS	**BLR710L5C7**	RS
	240	6.0	3	14⅝	(371.5)	13	(6)	**BLR714L3C4**	RS	**BLR714L3C5**	RS	**BLR714L3C7**	RS
	480	6.0	3	14⅝	(371.5)	13	(6)	**BLR714L5C4**	RS	**BLR714L5C5**	RS	**BLR714L5C7**	RS
	240	7.5	3	17⅝	(447.7)	13	(6)	**BLR717L3C4**	RS	**BLR717L3C5**	RS	**BLR717L3C7**	RS
	240	9.0	3	20⅝	(523.9)	15	(7)	**BLR720L3C4**	RS	**BLR720L3C5**	RS	**BLR720L3C7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

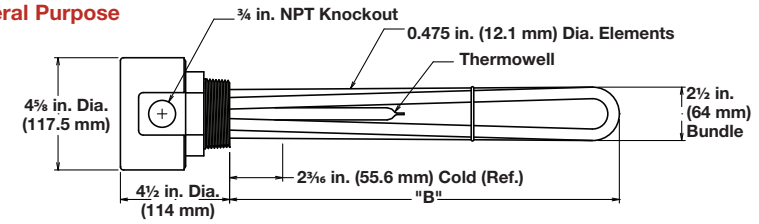
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

WATROD and FIREBAR Screw Plug Immersion Heaters

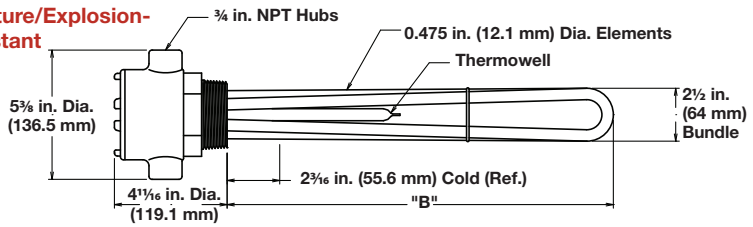
Application: Deionized/ Demineralized Water

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Del.	Ship Wt. lbs.	(kg)	Code Number ⑦	Del.	Ship Wt. lbs.	(kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
60 W/in² 316 SS Plug 3-316 SS Elements (9.3 W/cm²) (Passivated)	120	3.0	1	7⅝	(193.7)	**BLR77L1S**	RS	6	(3)	**BLR77L1C**	RS	9	(4)
	240	3.0	3	7⅝	(193.7)	**BLR77L3S**	RS	6	(3)	**BLR77L3C**	RS	9	(4)
	480	3.0	3	7⅝	(193.7)	**BLR77L5S**	RS	6	(3)	**BLR77L5C**	RS	9	(4)
	120	4.5	1	10⅝	(269.9)	**BLR710L1S**	RS	7	(4)	**BLR710L1C**	RS	10	(5)
	240	4.5	3	10⅝	(269.9)	**BLR710L3S**	RS	7	(4)	**BLR710L3C**	RS	10	(5)
	480	4.5	3	10⅝	(269.9)	**BLR710L5S**	RS	7	(4)	**BLR710L5C**	RS	10	(5)
	240	6.0	3	14⅝	(371.5)	**BLR714L3S**	RS	9	(4)	**BLR714L3C**	RS	12	(6)
	480	6.0	3	14⅝	(371.5)	**BLR714L5S**	RS	9	(4)	**BLR714L5C**	RS	12	(6)
	240	7.5	3	17⅝	(447.7)	**BLR717L3S**	RS	9	(4)	**BLR717L3C**	RS	12	(6)
	480	7.5	3	17⅝	(447.7)	**BLR717L5S**	RS	9	(4)	**BLR717L5C**	RS	12	(6)
	240	9.0	3	20⅝	(523.9)	**BLR720L3S**	RS	11	(5)	**BLR720L3C**	RS	14	(7)
	480	9.0	3	20⅝	(523.9)	**BLR720L5S**	RS	11	(5)	**BLR720L5C**	RS	14	(7)
	240	12.0	3	26⅛	(663.6)	**BLR726C3S**	RS	12	(6)	**BLR726C3C**	RS	15	(7)
	480	12.0	3	26⅛	(663.6)	**BLR726C5S**	RS	12	(6)	**BLR726C5C**	RS	15	(7)
	240	15.0	3	31⅝	(803.3)	**BLR731L3S**	RS	14	(7)	**BLR731L3C**	RS	17	(8)
	480	15.0	3	31⅝	(803.3)	**BLR731L5S**	RS	14	(7)	**BLR731L5C**	RS	17	(8)
	240	18.0	3	37⅛	(943.0)	**BLR737C3S**	RS	15	(7)	**BLR737C3C**	RS	18	(9)
	480	18.0	3	37⅛	(943.0)	**BLR737C5S**	RS	15	(7)	**BLR737C5C**	RS	18	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

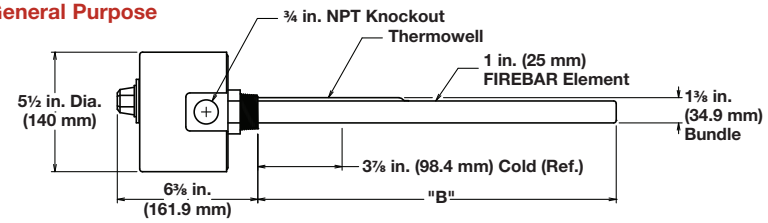
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

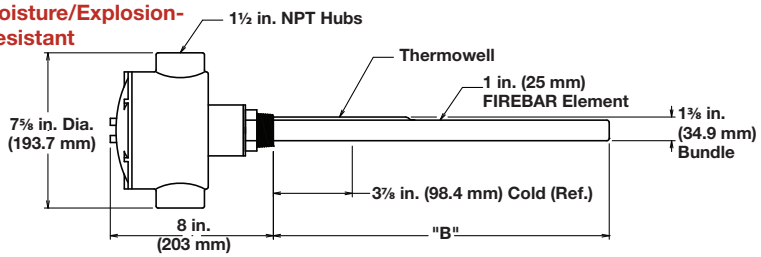
Application: Process Water

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 5A (60 to 250°F) Code Number	Type 5A Del.	Type 7A (100 to 550°F) Code Number	Type 7A Del.
								General Purpose Enclosure			
45 W/in² ⑧ 304 SS Plug 1-Incoloy Element (7 W/cm²)	240	2.0	3	13	(330)	7	(4)	**BDNF13A27S5A**	RS	**BDNF13A27S7A**	RS
	240	2.5	3	15½	(394)	8	(4)	**BDNF15J27S5A**	RS	**BDNF15J27S7A**	RS
	240	3.0	3	18	(457)	9	(4)	**BDNF18A27S5A**	RS	**BDNF18A27S7A**	RS
	240	4.0	3	22½	(572)	10	(5)	**BDNF22J27S5A**	RS	**BDNF22J27S7A**	RS
	480	4.0	3	22½	(572)	10	(5)	**BDNF22J28S5A**	RS	**BDNF22J28S7A**	RS
	240	5.0	3	27½	(699)	11	(5)	**BDNF27J27S5A**	RS	**BDNF27J27S7A**	RS
	480	5.0	3	27½	(699)	11	(5)	**BDNF27J28S5A**	RS	**BDNF27J28S7A**	RS
	240	6.0	3	32½	(826)	12	(6)	**BDNF32J27S5A**	RS	**BDNF32J27S7A**	RS
	480	6.0	3	32½	(826)	12	(6)	**BDNF32J28S5A**	RS	**BDNF32J28S7A**	RS
	240	8.0	3	42	(1067)	14	(7)	**BDNF42A27S5A**	RS	**BDNF42A27S7A**	RS
	240	10.0	3	51½	(1308)	16	(8)	**BDNF51J27S5A**	RS	**BDNF51J27S7A**	RS
								Moisture/Explosion-Resistant Enclosure ⑦			
45 W/in² ⑧ 304 SS Plug 1-Incoloy Element (7 W/cm²)	240	2.0	3	13	(330)	10	(5)	**BDNF13A27C5A**	RS	**BDNF13A27C7A**	RS
	240	2.5	3	15½	(394)	11	(5)	**BDNF15J27C5A**	RS	**BDNF15J27C7A**	RS
	240	3.0	3	18	(457)	12	(6)	**BDNF18A27C5A**	RS	**BDNF18A27C7A**	RS
	240	4.0	3	22½	(572)	13	(6)	**BDNF22J27C5A**	RS	**BDNF22J27C7A**	RS
	480	4.0	3	22½	(572)	13	(6)	**BDNF22J28C5A**	RS	**BDNF22J28C7A**	RS
	240	5.0	3	27½	(699)	14	(7)	**BDNF27J27C5A**	RS	**BDNF27J27C7A**	RS
	480	5.0	3	27½	(699)	14	(7)	**BDNF27J28C5A**	RS	**BDNF27J28C7A**	RS
	240	6.0	3	32½	(826)	15	(7)	**BDNF32J27C5A**	RS	**BDNF32J27C7A**	RS
	480	6.0	3	32½	(826)	15	(7)	**BDNF32J28C5A**	RS	**BDNF32J28C7A**	RS
	240	8.0	3	42	(1067)	17	(8)	**BDNF42A27C5A**	RS	**BDNF42A27C7A**	RS
	240	10.0	3	51½	(1308)	19	(9)	**BDNF51J27C5A**	RS	**BDNF51J27C7A**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑦ CSA certified only

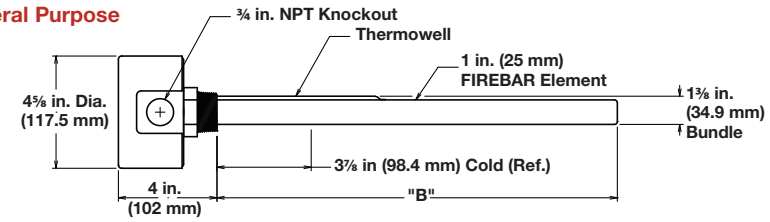
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

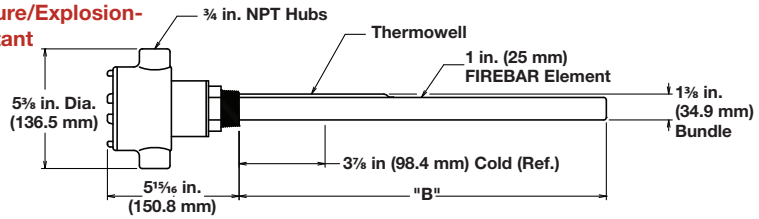
Application: Process Water

- 1¼ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosures

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Del.	Ship Wt. lbs.	(kg)	Code Number ⑦	Del.	Ship Wt. lbs.	(kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
45 W/in² ⑧ 304 SS Plug 1-Incoloy Element (7 W/cm²)	240	2.0	3	13	(330)	**BDNF13A27S**	RS	6	(3)	**BDNF13A27C**	RS	9	(4)
	240	2.5	3	15½	(394)	**BDNF15J27S**	RS	7	(4)	**BDNF15J27C**	RS	10	(5)
	240	3.0	3	18	(457)	**BDNF18A27S**	RS	8	(4)	**BDNF18A27C**	RS	11	(5)
	240	4.0	3	22½	(572)	**BDNF22J27S**	RS	9	(4)	**BDNF22J27C**	RS	12	(6)
	480	4.0	3	22½	(572)	**BDNF22J28S**	RS	9	(4)	**BDNF22J28C**	RS	12	(6)
	240	5.0	3	27½	(699)	**BDNF27J27S**	RS	10	(5)	**BDNF27J27C**	RS	13	(6)
	480	5.0	3	27½	(699)	**BDNF27J28S**	RS	10	(5)	**BDNF27J28C**	RS	13	(6)
	240	6.0	3	32½	(826)	**BDNF32J27S**	RS	11	(5)	**BDNF32J27C**	RS	14	(7)
	480	6.0	3	32½	(826)	**BDNF32J28S**	RS	11	(5)	**BDNF32J28C**	RS	14	(7)
	240	8.0	3	42	(1067)	**BDNF42A27S**	RS	13	(6)	**BDNF42A27C**	RS	16	(8)
	480	8.0	3	42	(1067)	**BDNF42A28S**	RS	13	(6)	**BDNF42A28C**	RS	16	(8)
	240	10.0	3	51½	(1308)	**BDNF51J27S**	RS	15	(7)	**BDNF51J27C**	RS	18	(9)
	480	10.0	3	51½	(1308)	**BDNF51J28S**	RS	15	(7)	**BDNF51J28C**	RS	18	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

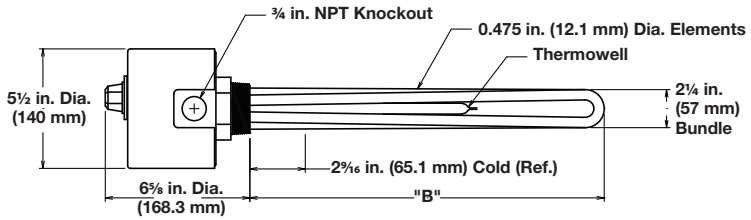
⑦ CSA certified only

⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Process Water

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure					
48 W/in² ④ 304 SS Plug 2-Incoloy Elements (7.5 W/cm²)	120/240	2.0	1	9¾	(248)	5	(3)	**BGN79N6S4**	RS	**BGN79N6S5**	RS	**BGN79N6S7**	RS
	240/480	2.0	1	9¾	(248)	5	(3)	**BGN79N7S4**	RS	**BGN79N7S5**	RS	**BGN79N7S7**	RS
	120/240	3.0	1	13¼	(337)	6	(3)	**BGN713E6S4**	RS	**BGN713E6S5**	RS	**BGN713E6S7**	RS
	240/480	3.0	1	13¼	(337)	6	(3)	**BGN713E7S4**	RS	**BGN713E7S5**	RS	**BGN713E7S7**	RS
	120/240	4.0	1	17¾	(451)	7	(4)	**BGN717N6S4**	RS	**BGN717N6S5**	RS	**BGN717N6S7**	RS
	120/240	5.0	1	20¼	(514)	8	(4)	**BGN720E6S4**	RS	**BGN720E6S5**	RS	**BGN720E6S7**	RS
48 W/in² 304 SS Plug 3-Incoloy Elements (7.5 W/cm²)	240	3.0	3	9¾	(248)	6	(3)	**BHN79N3S4**	RS	**BHN79N3S5**	RS	**BHN79N3S7**	RS
	480	3.0	3	9¾	(248)	6	(3)	**BHN79N5S4**	RS	**BHN79N5S5**	RS	**BHN79N5S7**	RS
	240	4.5	3	13¼	(337)	7	(4)	**BHN713E3S4**	RS	**BHN713E3S5**	RS	**BHN713E3S7**	RS
	480	4.5	3	13¼	(337)	7	(4)	**BHN713E5S4**	RS	**BHN713E5S5**	RS	**BHN713E5S7**	RS
	240	6.0	3	17¾	(451)	8	(4)	**BHN717N3S4**	RS	**BHN717N3S5**	RS	**BHN717N3S7**	RS
	480	6.0	3	17¾	(451)	8	(4)	**BHN717N5S4**	RS	**BHN717N5S5**	RS	**BHN717N5S7**	RS
	240	7.5	3	20¼	(514)	9	(4)	**BHN720E3S4**	RS	**BHN720E3S5**	RS	**BHN720E3S7**	RS
	240	9.0	3	25¼	(641)	10	(5)	**BHN725E3S4**	RS	**BHN725E3S5**	RS	**BHN725E3S7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

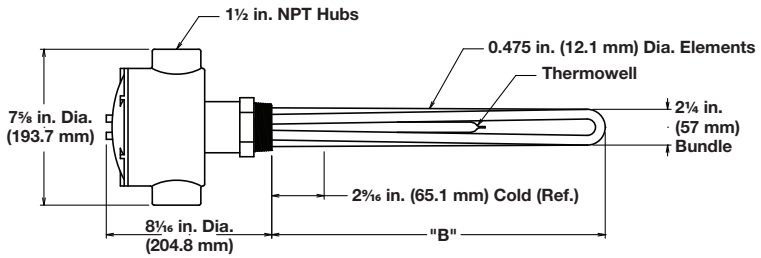
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Process Water

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								Moisture/Explosion-Resistant Enclosure					
48 W/in² ④ 304 SS Plug 2-Incoloy Elements (7.5 W/cm²)	120/240	2.0	1	9¾	(248)	8	(4)	**BGN79N6C4**	RS	**BGN79N6C5**	RS	**BGN79N6C7**	RS
	240/480	2.0	1	9¾	(248)	8	(4)	**BGN79N7C4**	RS	**BGN79N7C5**	RS	**BGN79N7C7**	RS
	120/240	3.0	1	13¼	(337)	9	(4)	**BGN713E6C4**	RS	**BGN713E6C5**	RS	**BGN713E6C7**	RS
	240/480	3.0	1	13¼	(337)	9	(4)	**BGN713E7C4**	RS	**BGN713E7C5**	RS	**BGN713E7C7**	RS
	120/240	4.0	1	17¾	(451)	10	(5)	**BGN717N6C4**	RS	**BGN717N6C5**	RS	**BGN717N6C7**	RS
	120/240	5.0	1	20¼	(514)	11	(5)	**BGN720E6C4**	RS	**BGN720E6C5**	RS	**BGN720E6C7**	RS
48 W/in² 304 SS Plug 3-Incoloy Elements (7.5 W/cm²)	240	3.0	3	9¾	(248)	9	(4)	**BHN79N3C4**	RS	**BHN79N3C5**	RS	**BHN79N3C7**	RS
	480	3.0	3	9¾	(248)	9	(4)	**BHN79N5C4**	RS	**BHN79N5C5**	RS	**BHN79N5C7**	RS
	240	4.5	3	13¼	(337)	10	(5)	**BHN713E3C4**	RS	**BHN713E3C5**	RS	**BHN713E3C7**	RS
	480	4.5	3	13¼	(337)	10	(5)	**BHN713E5C4**	RS	**BHN713E5C5**	RS	**BHN713E5C7**	RS
	240	6.0	3	17¾	(451)	11	(5)	**BHN717N3C4**	RS	**BHN717N3C5**	RS	**BHN717N3C7**	RS
	480	6.0	3	17¾	(451)	11	(5)	**BHN717N5C4**	RS	**BHN717N5C5**	RS	**BHN717N5C7**	RS
	240	7.5	3	20¼	(514)	12	(6)	**BHN720E3C4**	RS	**BHN720E3C5**	RS	**BHN720E3C7**	RS
	240	9.0	3	25¼	(641)	13	(6)	**BHN725E3C4**	RS	**BHN725E3C5**	RS	**BHN725E3C7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

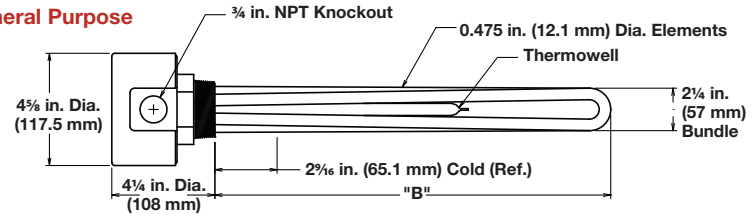
④ Wired for higher voltage

WATROD and FIREBAR Screw Plug Immersion Heaters

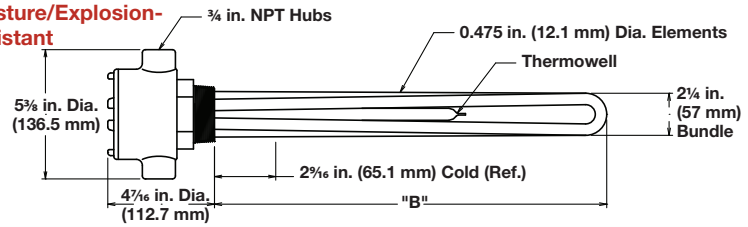
Application: Process Water

- 2 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
48 W/in² ④ 304 SS Plug 2-Incoloy Elements (7.5 W/cm²)	120/240	2.0	1	9¾	(248)	**BGN79N6S**	RS	4	(2)	**BGN79N6C**	RS	7	(4)
	240/480	2.0	1	9¾	(248)	**BGN79N7S**	RS	4	(2)	**BGN79N7C**	RS	7	(4)
	120/240	3.0	1	13¼	(337)	**BGN713E6S**	RS	5	(3)	**BGN713E6C**	RS	8	(4)
	240/480	3.0	1	13¼	(337)	**BGN713E7S**	RS	5	(3)	**BGN713E7C**	RS	8	(4)
	120/240	4.0	1	17¾	(451)	**BGN717N6S**	RS	6	(3)	**BGN717N6C**	RS	9	(4)
	240/480	4.0	1	17¾	(451)	**BGN717N7S**	RS	6	(3)	**BGN717N7C**	RS	9	(4)
	120/240	5.0	1	20¼	(514)	**BGN720E6S**	RS	7	(4)	**BGN720E6C**	RS	10	(5)
	240/480	5.0	1	20¼	(514)	**BGN720E7S**	RS	7	(4)	**BGN720E7C**	RS	10	(5)
	240/480	6.0	1	25¼	(641)	**BGN725E7S**	RS	7	(4)	**BGN725E7C**	RS	10	(5)
	240/480	8.0	1	32¾	(832)	**BGN732N7S**	RS	8	(4)	**BGN732N7C**	RS	11	(5)
	240/480	10.0	1	40¼	(1022)	**BGN740E7S**	RS	9	(4)	**BGN740E7C**	RS	12	(6)
48 W/in² 304 SS Plug 3-Incoloy Element (7.5 W/cm²)	120	3.0	1	9¾	(248)	**BHN79N1S**	RS	5	(3)	**BHN79N1C**	RS	8	(4)
	240	3.0	3	9¾	(248)	**BHN79N3S**	RS	5	(3)	**BHN79N3C**	RS	8	(4)
	480	3.0	3	9¾	(248)	**BHN79N5S**	RS	5	(3)	**BHN79N5C**	RS	8	(4)
	120	4.5	1	13¼	(337)	**BHN713E1S**	RS	6	(3)	**BHN713E1C**	RS	9	(4)
	240	4.5	3	13¼	(337)	**BHN713E3S**	RS	6	(3)	**BHN713E3C**	RS	9	(4)
	480	4.5	3	13¼	(337)	**BHN713E5S**	RS	6	(3)	**BHN713E5C**	RS	9	(4)
	240	6.0	3	17¾	(451)	**BHN717N3S**	RS	7	(4)	**BHN717N3C**	RS	10	(5)
	480	6.0	3	17¾	(451)	**BHN717N5S**	RS	7	(4)	**BHN717N5C**	RS	10	(5)
	240	7.5	3	20¼	(514)	**BHN720E3S**	RS	8	(4)	**BHN720E3C**	RS	11	(5)
	480	7.5	3	20¼	(514)	**BHN720E5S**	RS	8	(4)	**BHN720E5C**	RS	11	(5)
	240	9.0	3	25¼	(641)	**BHN725E3S**	RS	9	(4)	**BHN725E3C**	RS	12	(6)
	480	9.0	3	25¼	(641)	**BHN725E5S**	RS	9	(4)	**BHN725E5C**	RS	12	(6)
	240	12.0	3	32¾	(832)	**BHN732N3S**	RS	9	(4)	**BHN732N3C**	RS	12	(6)
	480	12.0	3	32¾	(832)	**BHN732N5S**	RS	9	(4)	**BHN732N5C**	RS	12	(6)
	240	15.0	3	40¼	(1022)	**BHN740E3S**	RS	10	(5)	**BHN740E3C**	RS	13	(6)
	480	15.0	3	40¼	(1022)	**BHN740E5S**	RS	10	(5)	**BHN740E5C**	RS	13	(6)
	240	18.0	3	47¾	(1213)	**BHN747N3S**	RS	11	(5)	**BHN747N3C**	RS	14	(7)
	480	18.0	3	47¾	(1213)	**BHN747N5S**	RS	11	(5)	**BHN747N5C**	RS	14	(7)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

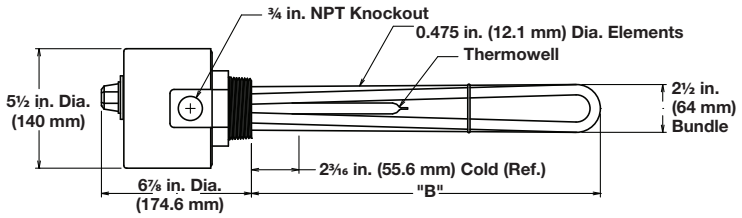
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

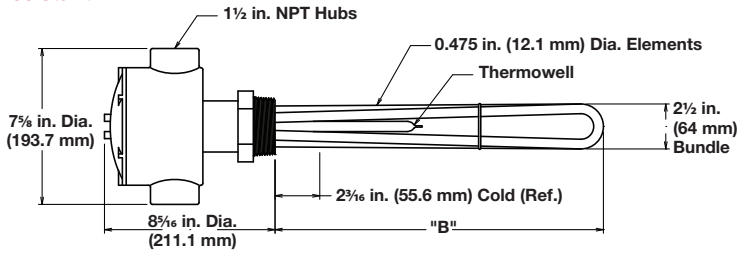
Application: Process Water

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 4 (30 to 110°F) Code Number	Type 4 Del.	Type 5 (60 to 250°F) Code Number	Type 5 Del.	Type 7 (100 to 550°F) Code Number	Type 7 Del.
								General Purpose Enclosure					
48 W/in² 304 SS Plug 3-Incoloy Elements (7.5 W/cm²)	240	3.0	3	9⅜	(238.1)	7	(4)	BLN79G3S4	RS	BLN79G3S5	RS	BLN79G3S7	RS
	480	3.0	3	9⅜	(238.1)	7	(4)	BLN79G5S4	RS	BLN79G5S5	RS	BLN79G5S7	RS
	240	4.5	3	12⅛	(327.0)	8	(4)	BLN712R3S4	RS	BLN712R3S5	RS	BLN712R3S7	RS
	480	4.5	3	12⅛	(327.0)	8	(4)	BLN712R5S4	RS	BLN712R5S5	RS	BLN712R5S7	RS
	240	6.0	3	17⅜	(441.3)	10	(5)	BLN717G3S4	RS	BLN717G3S5	RS	BLN717G3S7	RS
	480	6.0	3	17⅜	(441.3)	10	(5)	BLN717G5S4	RS	BLN717G5S5	RS	BLN717G5S7	RS
	240	7.5	3	19⅞	(504.8)	12	(6)	BLN719R3S4	RS	BLN719R3S5	RS	BLN719R3S7	RS
	240	9.0	3	24⅞	(631.8)	13	(6)	BLN724R3S4	RS	BLN724R3S5	RS	BLN724R3S7	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
48 W/in² 304 SS Plug 3-Incoloy Elements (7.5 W/cm²)	240	3.0	3	9⅜	(238.1)	10	(5)	BLN79G3C4	RS	BLN79G3C5	RS	BLN79G3C7	RS
	480	3.0	3	9⅜	(238.1)	10	(5)	BLN79G5C4	RS	BLN79G5C5	RS	BLN79G5C7	RS
	240	4.5	3	12⅛	(327.0)	11	(5)	BLN712R3C4	RS	BLN712R3C5	RS	BLN712R3C7	RS
	480	4.5	3	12⅛	(327.0)	11	(5)	BLN712R5C4	RS	BLN712R5C5	RS	BLN712R5C7	RS
	240	6.0	3	17⅜	(441.3)	13	(6)	BLN717G3C4	RS	BLN717G3C5	RS	BLN717G3C7	RS
	480	6.0	3	17⅜	(441.3)	13	(6)	BLN717G5C4	RS	BLN717G5C5	RS	BLN717G5C7	RS
	240	7.5	3	19⅞	(504.8)	15	(7)	BLN719R3C4	RS	BLN719R3C5	RS	BLN719R3C7	RS
	240	9.0	3	24⅞	(631.8)	16	(8)	BLN724R3C4	RS	BLN724R3C5	RS	BLN724R3C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

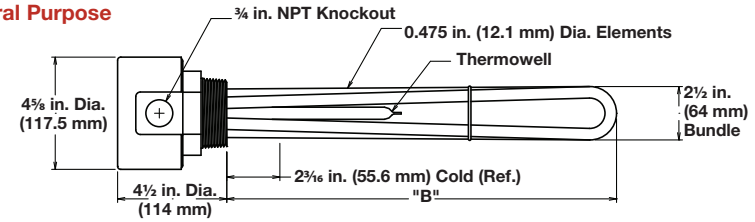
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

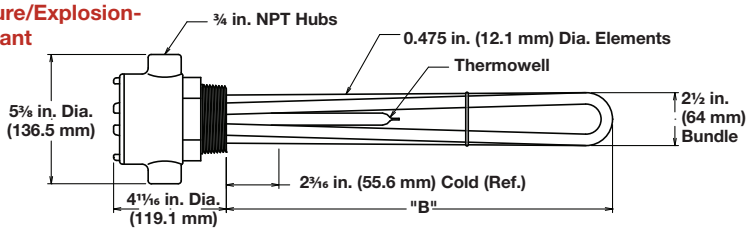
Application: Process Water

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
48 W/in² 304 SS Plug 3-Incoloy Elements (7.5 W/cm²)	120	3.0	1	9⅜	(238.1)	**BLN79G1S**	RS	6	(3)	**BLN79G1C**	RS	9	(4)
	240	3.0	3	9⅜	(238.1)	**BLN79G3S**	RS	6	(3)	**BLN79G3C**	RS	9	(4)
	480	3.0	3	9⅜	(238.1)	**BLN79G5S**	RS	6	(3)	**BLN79G5C**	RS	9	(4)
	120	4.5	1	12⅞	(327.0)	**BLN712R1S**	RS	7	(4)	**BLN712R1C**	RS	10	(5)
	240	4.5	3	12⅞	(327.0)	**BLN712R3S**	RS	7	(4)	**BLN712R3C**	RS	10	(5)
	480	4.5	3	12⅞	(327.0)	**BLN712R5S**	RS	7	(4)	**BLN712R5C**	RS	10	(5)
	240	6.0	3	17⅜	(441.3)	**BLN717G3S**	RS	9	(4)	**BLN717G3C**	RS	12	(6)
	480	6.0	3	17⅜	(441.3)	**BLN717G5S**	RS	9	(4)	**BLN717G5C**	RS	12	(6)
	240	7.5	3	19⅞	(504.8)	**BLN719R3S**	RS	11	(5)	**BLN719R3C**	RS	14	(7)
	480	7.5	3	19⅞	(504.8)	**BLN719R5S**	RS	11	(5)	**BLN719R5C**	RS	14	(7)
	240	9.0	3	24⅞	(631.8)	**BLN724R3S**	RS	12	(6)	**BLN724R3C**	RS	15	(7)
	480	9.0	3	24⅞	(631.8)	**BLN724R5S**	RS	12	(6)	**BLN724R5C**	RS	15	(7)
	240	12.0	3	32⅜	(822.3)	**BLN732G3S**	RS	14	(7)	**BLN732G3C**	RS	17	(8)
	480	12.0	3	32⅜	(822.3)	**BLN732G5S**	RS	14	(7)	**BLN732G5C**	RS	17	(8)
	240	15.0	3	39⅞	(1012.8)	**BLN739R3S**	RS	15	(7)	**BLN739R3C**	RS	18	(9)
	480	15.0	3	39⅞	(1012.8)	**BLN739R5S**	RS	15	(7)	**BLN739R5C**	RS	18	(9)
	240	18.0	3	47⅞	(1203.3)	**BLN747G3S**	RS	17	(8)	**BLN747G3C**	RS	20	(9)
	480	18.0	3	47⅞	(1203.3)	**BLN747G5S**	RS	17	(8)	**BLN747G5C**	RS	20	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

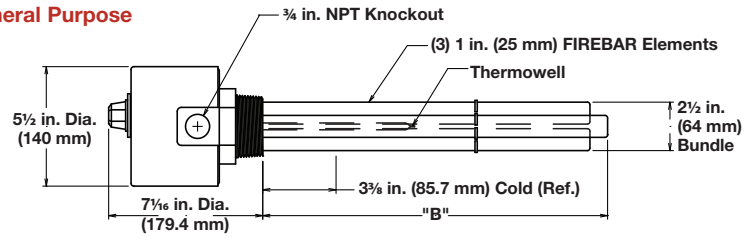
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

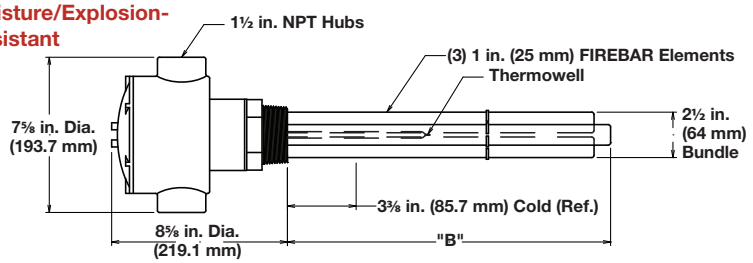
Application: Process Water

- 2½ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 5A (60 to 250°F) Code Number	Type 5A Del.	Type 7A (100 to 550°F) Code Number	Type 7A Del.
								General Purpose Enclosure			
45 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (7 W/cm²)	240	6.0	3	12	(305)	12	(6)	BLNF12A27S5A	RS	BLNF12A27S7A	RS
	240	7.5	3	14½	(368)	12	(6)	BLNF14J27S5A	RS	BLNF14J27S7A	RS
	240	9.0	3	17	(432)	13	(6)	BLNF17A27S5A	RS	BLNF17A27S7A	RS
	240	12.0	3	21½	(546)	15	(7)	BLNF21J27S5A	RS	BLNF21J27S7A	RS
								Moisture/Explosion-Resistant Enclosure ⑦			
45 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (7 W/cm²)	240	6.0	3	12	(305)	14	(7)	BLNF12A27C5A	RS	BLNF12A27C7A	RS
	240	7.5	3	14½	(368)	15	(7)	BLNF14J27C5A	RS	BLNF14J27C7A	RS
	240	9.0	3	17	(432)	16	(8)	BLNF17A27C5A	RS	BLNF17A27C7A	RS
	240	12.0	3	21½	(546)	18	(9)	BLNF21J27C5A	RS	BLNF21J27C7A	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑦ CSA certified only

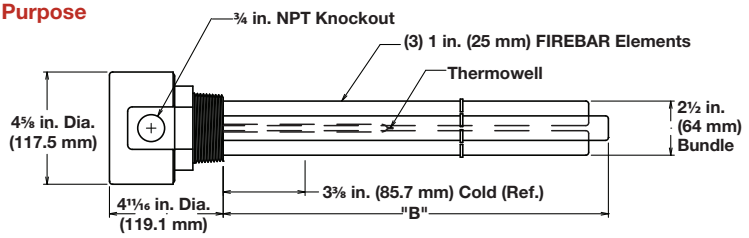
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

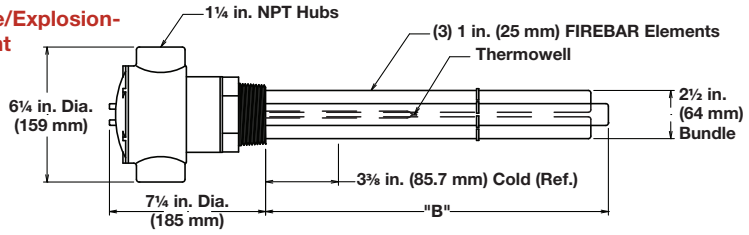
Application: Process Water

- 2½ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Del.	Ship Wt. lbs.	(kg)	Code Number ⑦	Del.	Ship Wt. lbs.	(kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
45 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (7 W/cm²)	240	6.0	3	12	(305)	**BLNF12A27S**	RS	10	(5)	**BLNF12A27C**	RS	13	(6)
	240	7.5	3	14½	(368)	**BLNF14J27S**	RS	11	(5)	**BLNF14J27C**	RS	14	(7)
	240	9.0	3	17	(432)	**BLNF17A27S**	RS	12	(6)	**BLNF17A27C**	RS	15	(7)
	240	12.0	3	21½	(546)	**BLNF21J27S**	RS	14	(7)	**BLNF21J27C**	RS	17	(8)
	480	12.0	3	21½	(546)	**BLNF21J28S**	RS	14	(7)	**BLNF21J28C**	RS	17	(8)
	240	15.0	3	26½	(673)	**BLNF26J27S**	RS	17	(8)	**BLNF26J27C**	RS	20	(9)
	480	15.0	3	26½	(673)	**BLNF26J28S**	RS	17	(8)	**BLNF26J28C**	RS	20	(9)
	240	18.0	3	31½	(800)	**BLNF31J27S**	RS	18	(9)	**BLNF31J27C**	RS	21	(10)
	480	18.0	3	31½	(800)	**BLNF31J28S**	RS	18	(9)	**BLNF31J28C**	RS	21	(10)
	480	24.0	3	41	(1041)	**BLNF41A28S**	RS	20	(9)	**BLNF41A28C**	RS	23	(11)
	480	30.0	3	50½	(1283)	**BLNF50J28S**	RS	22	(10)	**BLNF50J28C**	RS	25	(12)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑦ CSA certified only

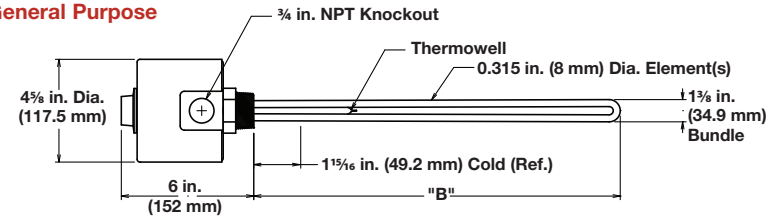
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

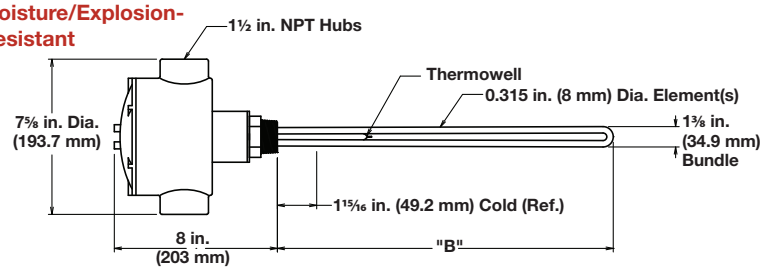
Application: Forced Air and Caustic Solutions

- 1¼ inch NPT screw plug
- WATROD elements
- With thermostat (SPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 1 (30 to 110°F)		Type 2 (30 to 250°F)		Type 3 (175 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure					
23 W/in² ④ 304 SS Plug 2-Incoloy Elements (3.6 W/cm²)	120/240	1.0	1	13⅜	(339.7)	6	(3)	BEN13G6S1	RS	BEN13G6S2	RS	BEN13G6S3	RS
	120/240	1.5	1	19	(483.0)	7	(4)	BEN19A6S1	RS	BEN19A6S2	RS	BEN19A6S3	RS
	120/240	2.0	1	24⅜	(619.1)	8	(4)	BEN24G6S1	RS	BEN24G6S2	RS	BEN24G6S3	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
23 W/in² ④ 304 SS Plug 2-Incoloy Elements (3.6 W/cm²)	120/240	1.0	1	13⅜	(339.7)	10	(5)	BEN13G6C1	RS	BEN13G6C2	RS	BEN13G6C3	RS
	120/240	1.5	1	19	(483.0)	11	(5)	BEN19A6C1	RS	BEN19A6C2	RS	BEN19A6C3	RS
	120/240	2.0	1	24⅜	(619.1)	12	(6)	BEN24G6C1	RS	BEN24G6C2	RS	BEN24G6C3	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

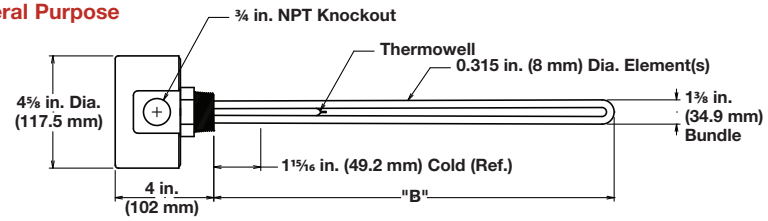
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

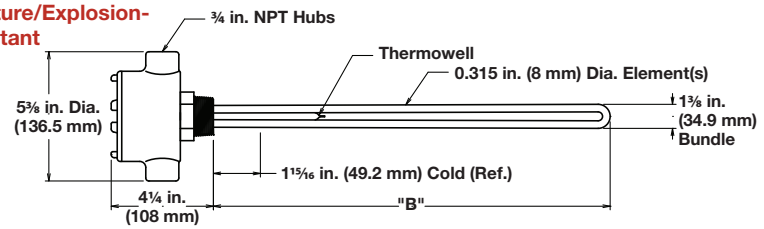
Application: Forced Air and Caustic Solutions

- 1¼ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Del.	Ship Wt. lbs.	(kg)	Code Number ⑦	Del.	Ship Wt. lbs.	(kg)
						General Purpose Enclosure				Moisture Explosion-Resistant Enclosure			
23 W/in² ④ 304 SS Plug 2-Incoloy Elements (3.6 W/cm²)	120/240	1.0	1	13⅜	(339.7)	**BEN13G6S**	RS	6	(3)	**BEN13G6C**	RS	9	(4)
	120/240	1.5	1	19	(483.0)	**BEN19A6S**	RS	7	(4)	**BEN19A6C**	RS	10	(5)
	120/240	2.0	1	24⅜	(619.1)	**BEN24G6S**	RS	8	(4)	**BEN24G6C**	RS	11	(5)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

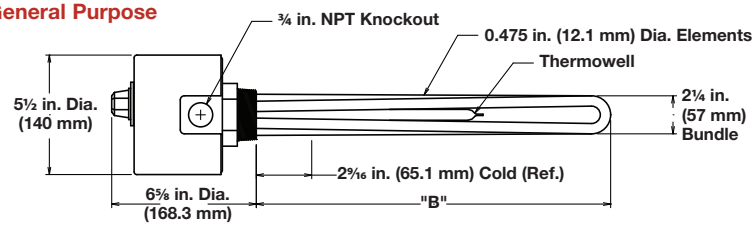
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

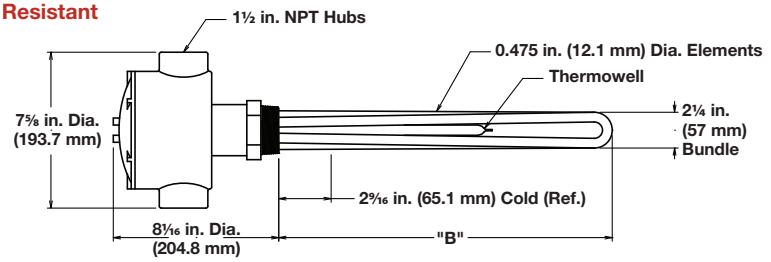
Application: Forced Air and Caustic Solutions

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. In.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 4 (30 to 110°F) Code Number	Type 4 Del.	Type 5 (60 to 250°F) Code Number	Type 5 Del.	Type 7 (100 to 550°F) Code Number	Type 7 Del.
								General Purpose Enclosure					
23 W/in² ⑥ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.0	3	17¾	(451)	8	(4)	**BHNA17N3S4**	RS	**BHNA17N3S5**	RS	**BHNA17N3S7**	RS
	480	3.0	3	17¾	(451)	8	(4)	**BHNA17N5S4**	RS	**BHNA17N5S5**	RS	**BHNA17N5S7**	RS
	240	4.5	3	25¼	(641)	10	(5)	**BHNA25E3S4**	RS	**BHNA25E3S5**	RS	**BHNA25E3S7**	RS
	480	4.5	3	25¼	(641)	10	(5)	**BHNA25E5S4**	RS	**BHNA25E5S5**	RS	**BHNA25E5S7**	RS
	240	6.0	3	32¾	(832)	10	(5)	**BHNA32N3S4**	RS	**BHNA32N3S5**	RS	**BHNA32N3S7**	RS
	480	6.0	3	32¾	(832)	10	(5)	**BHNA32N5S4**	RS	**BHNA32N5S5**	RS	**BHNA32N5S7**	RS
	240	7.5	3	40¼	(1022)	11	(5)	**BHNA40E3S4**	RS	**BHNA40E3S5**	RS	**BHNA40E3S7**	RS
	240	9.0	3	47¾	(1213)	12	(6)	**BHNA47N3S4**	RS	**BHNA47N3S5**	RS	**BHNA47N3S7**	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
23 W/in² ⑥ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.0	3	17¾	(451)	11	(5)	**BHNA17N3C4**	RS	**BHNA17N3C5**	RS	**BHNA17N3C7**	RS
	480	3.0	3	17¾	(451)	11	(5)	**BHNA17N5C4**	RS	**BHNA17N5C5**	RS	**BHNA17N5C7**	RS
	240	4.5	3	25¼	(641)	13	(6)	**BHNA25E3C4**	RS	**BHNA25E3C5**	RS	**BHNA25E3C7**	RS
	480	4.5	3	25¼	(641)	13	(6)	**BHNA25E5C4**	RS	**BHNA25E5C5**	RS	**BHNA25E5C7**	RS
	240	6.0	3	32¾	(832)	13	(6)	**BHNA32N3C4**	RS	**BHNA32N3C5**	RS	**BHNA32N3C7**	RS
	480	6.0	3	32¾	(832)	13	(6)	**BHNA32N5C4**	RS	**BHNA32N5C5**	RS	**BHNA32N5C7**	RS
	240	7.5	3	40¼	(1022)	14	(7)	**BHNA40E3C4**	RS	**BHNA40E3C5**	RS	**BHNA40E3C7**	RS
	240	9.0	3	47¾	(1213)	15	(7)	**BHNA47N3C4**	RS	**BHNA47N3C5**	RS	**BHNA47N3C7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

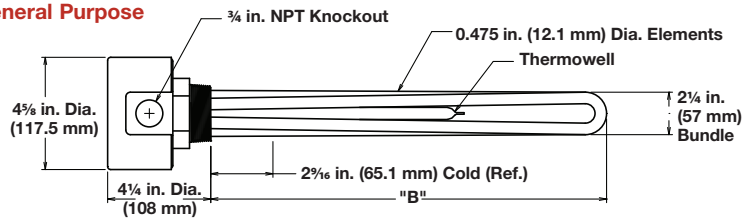
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

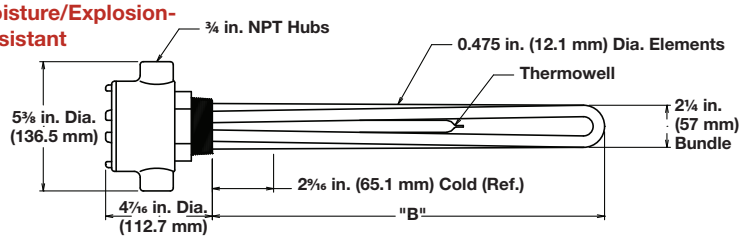
Application: Forced Air and Caustic Solutions

- 2 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
23 W/in² ⑥ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	120	3.0	1	17¾	(451)	**BHNA17N1S**	RS	7	(4)	**BHNA17N1C**	RS	10	(5)
	240	3.0	3	17¾	(451)	**BHNA17N3S**	RS	7	(4)	**BHNA17N3C**	RS	10	(5)
	480	3.0	3	17¾	(451)	**BHNA17N5S**	RS	7	(4)	**BHNA17N5C**	RS	10	(5)
	120	4.5	1	25¼	(641)	**BHNA25E1S**	RS	8	(4)	**BHNA25E1C**	RS	11	(5)
	240	4.5	3	25¼	(641)	**BHNA25E3S**	RS	8	(4)	**BHNA25E3C**	RS	11	(5)
	480	4.5	3	25¼	(641)	**BHNA25E5S**	RS	8	(4)	**BHNA25E5C**	RS	11	(5)
	240	6.0	3	32¾	(832)	**BHNA32N3S**	RS	9	(4)	**BHNA32N3C**	RS	12	(6)
	480	6.0	3	32¾	(832)	**BHNA32N5S**	RS	9	(4)	**BHNA32N5C**	RS	12	(6)
	240	7.5	3	40¼	(1022)	**BHNA40E3S**	RS	10	(5)	**BHNA40E3C**	RS	13	(6)
	480	7.5	3	40¼	(1022)	**BHNA40E5S**	RS	10	(5)	**BHNA40E5C**	RS	13	(6)
	240	9.0	3	47¾	(1213)	**BHNA47N3S**	RS	11	(5)	**BHNA47N3C**	RS	14	(7)
	480	9.0	3	47¾	(1213)	**BHNA47N5S**	RS	11	(5)	**BHNA47N5C**	RS	14	(7)
	240	12.5	3	64¼	(1632)	**BHNA64E3S**	RS	15	(7)	**BHNA64E3C**	RS	18	(9)
	480	12.5	3	64¼	(1632)	**BHNA64E5S**	RS	15	(7)	**BHNA64E5C**	RS	18	(9)
	240	15.0	3	76¾	(1950)	**BHNA76E3S**	RS	18	(9)	**BHNA76E3C**	RS	21	(10)
	480	15.0	3	76¾	(1950)	**BHNA76E5S**	RS	18	(9)	**BHNA76E5C**	RS	21	(10)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

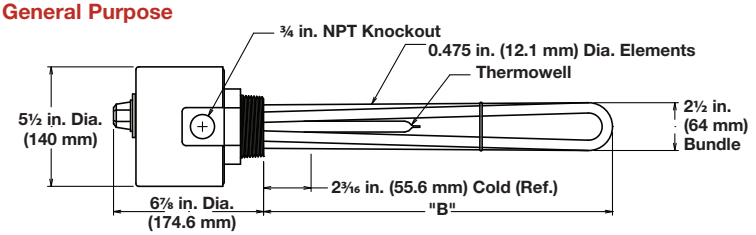
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

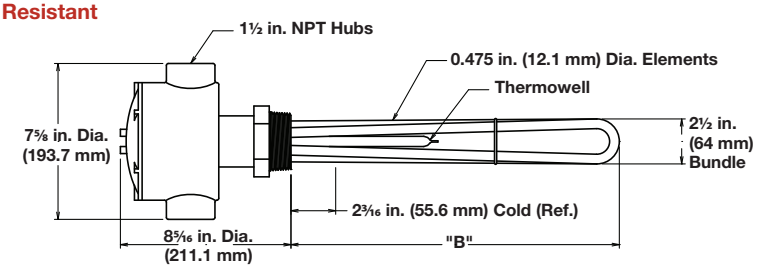
Application: Forced Air and Caustic Solutions

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 4 (30 to 110°F) Code Number	Type 4 Del.	Type 5 (60 to 250°F) Code Number	Type 5 Del.	Type 7 (100 to 550°F) Code Number	Type 7 Del.
								General Purpose Enclosure					
23 W/in² ⑥ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.0	3	17⅜	(441.3)	10	(5)	BLNA17G3S4	RS	BLNA17G3S5	RS	BLNA17G3S7	RS
	480	3.0	3	17⅜	(441.3)	10	(5)	BLNA17G5S4	RS	BLNA17G5S5	RS	BLNA17G5S7	RS
	240	4.5	3	24⅞	(631.8)	13	(6)	BLNA24R3S4	RS	BLNA24R3S5	RS	BLNA24R3S7	RS
	480	4.5	3	24⅞	(631.8)	13	(6)	BLNA24R5S4	RS	BLNA24R5S5	RS	BLNA24R5S7	RS
	240	6.0	3	32⅜	(822.3)	15	(7)	BLNA32G3S4	RS	BLNA32G3S5	RS	BLNA32G3S7	RS
	480	6.0	3	32⅜	(822.3)	15	(7)	BLNA32G5S4	RS	BLNA32G5S5	RS	BLNA32G5S7	RS
	240	7.5	3	39⅞	(1012.8)	16	(8)	BLNA39R3S4	RS	BLNA39R3S5	RS	BLNA39R3S7	RS
	240	9.0	3	47⅜	(1203.3)	18	(9)	BLNA47G3S4	RS	BLNA47G3S5	RS	BLNA47G3S7	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
23 W/in² ⑥ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.0	3	17⅜	(441.3)	13	(6)	BLNA17G3C4	RS	BLNA17G3C5	RS	BLNA17G3C7	RS
	480	3.0	3	17⅜	(441.3)	13	(6)	BLNA17G5C4	RS	BLNA17G5C5	RS	BLNA17G5C7	RS
	240	4.5	3	24⅞	(631.8)	16	(8)	BLNA24R3C4	RS	BLNA24R3C5	RS	BLNA24R3C7	RS
	480	4.5	3	24⅞	(631.8)	16	(8)	BLNA24R5C4	RS	BLNA24R5C5	RS	BLNA24R5C7	RS
	240	6.0	3	32⅜	(822.3)	18	(9)	BLNA32G3C4	RS	BLNA32G3C5	RS	BLNA32G3C7	RS
	480	6.0	3	32⅜	(822.3)	18	(9)	BLNA32G5C4	RS	BLNA32G5C5	RS	BLNA32G5C7	RS
	240	7.5	3	39⅞	(1012.8)	19	(9)	BLNA39R3C4	RS	BLNA39R3C5	RS	BLNA39R3C7	RS
	240	9.0	3	47⅜	(1203.3)	21	(10)	BLNA47G3C4	RS	BLNA47G3C5	RS	BLNA47G3C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

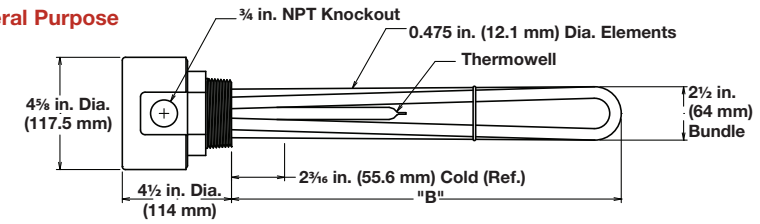
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

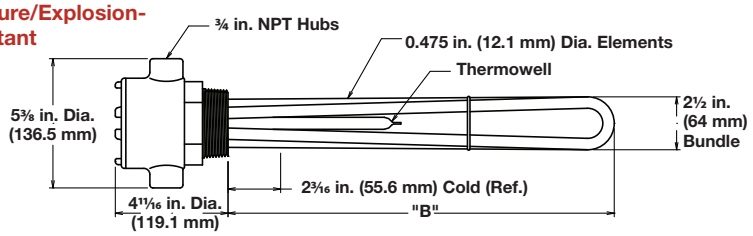
Application: Forced Air and Caustic Solutions

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
23 W/in² ⑥ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	120	3.0	1	17⅜	(441.3)	**BLNA17G1S**	RS	9	(4)	**BLNA17G1C**	RS	12	(6)
	240	3.0	3	17⅜	(441.3)	**BLNA17G3S**	RS	9	(4)	**BLNA17G3C**	RS	12	(6)
	480	3.0	3	17⅜	(441.3)	**BLNA17G5S**	RS	9	(4)	**BLNA17G5C**	RS	12	(6)
	120	4.5	1	24⅞	(631.8)	**BLNA24R1S**	RS	12	(6)	**BLNA24R1C**	RS	15	(7)
	240	4.5	3	24⅞	(631.8)	**BLNA24R3S**	RS	12	(6)	**BLNA24R3C**	RS	15	(7)
	480	4.5	3	24⅞	(631.8)	**BLNA24R5S**	RS	12	(6)	**BLNA24R5C**	RS	15	(7)
	240	6.0	3	32⅜	(822.3)	**BLNA32G3S**	RS	14	(7)	**BLNA32G3C**	RS	17	(8)
	480	6.0	3	32⅜	(822.3)	**BLNA32G5S**	RS	14	(7)	**BLNA32G5C**	RS	17	(8)
	240	7.5	3	39⅞	(1012.8)	**BLNA39R3S**	RS	15	(7)	**BLNA39R3C**	RS	18	(9)
	480	7.5	3	39⅞	(1012.8)	**BLNA39R5S**	RS	15	(7)	**BLNA39R5C**	RS	18	(9)
	240	9.0	3	47⅞	(1203.3)	**BLNA47G3S**	RS	17	(8)	**BLNA47G3C**	RS	20	(9)
	480	9.0	3	47⅞	(1203.3)	**BLNA47G5S**	RS	17	(8)	**BLNA47G5C**	RS	20	(9)
	240	12.5	3	63⅞	(1622.4)	**BLNA63R3S**	RS	20	(9)	**BLNA63R3C**	RS	23	(11)
	480	12.5	3	63⅞	(1622.4)	**BLNA63R5S**	RS	20	(9)	**BLNA63R5C**	RS	23	(11)
	240	15.0	3	76⅝	(1939.9)	**BLNA76G3S**	RS	23	(11)	**BLNA76G3C**	RS	26	(12)
	480	15.0	3	76⅝	(1939.9)	**BLNA76G5S**	RS	23	(11)	**BLNA76G5C**	RS	26	(12)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

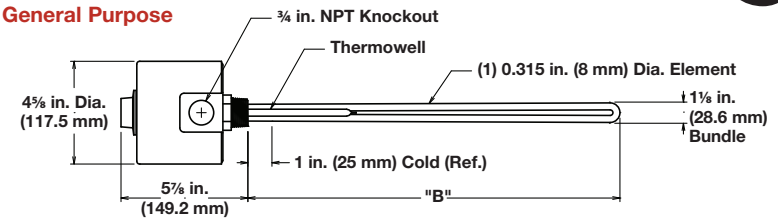
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

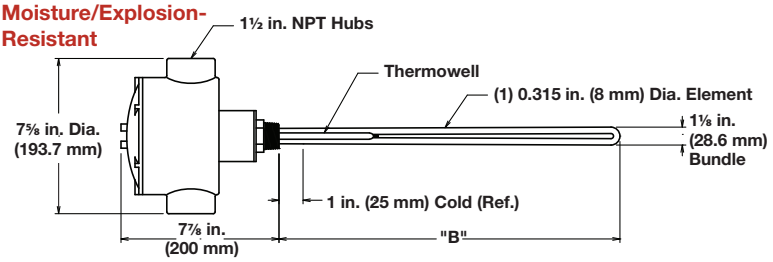
Application: Lightweight Oils and Heat Transfer Oils

- 1 inch NPT screw plug
- WATROD elements
- With thermostat (SPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 1 (30 to 110°F)		Type 2 (30 to 250°F)		Type 3 (175 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure					
23 W/in² Steel Plug 1-Steel Element	120	0.25	1	6½	(165)	3	(2)	BCS6J1S1	RS	BCS6J1S2	RS	BCS6J1S3	RS
	240	0.25	1	6½	(165)	3	(2)	BCS6J10S1	RS	BCS6J10S2	RS	BCS6J10S3	RS
	120	0.35	1	9¼	(235)	4	(2)	BCS9E1S1	RS	BCS9E1S2	RS	BCS9E1S3	RS
	240	0.35	1	9¼	(235)	4	(2)	BCS9E10S1	RS	BCS9E10S2	RS	BCS9E10S3	RS
	120	0.50	1	9⅜	(238)	4	(2)	BCS9G1S1	RS	BCS9G1S2	RS	BCS9G1S3	RS
	240	0.50	1	9⅜	(238)	4	(2)	BCS9G10S1	RS	BCS9G10S2	RS	BCS9G10S3	RS
	120	0.75	1	13½	(343)	5	(3)	BCS13J1S1	RS	BCS13J1S2	RS	BCS13J1S3	RS
	240	0.75	1	13½	(343)	5	(3)	BCS13J10S1	RS	BCS13J10S2	RS	BCS13J10S3	RS
	120	1.00	1	16¾	(426)	6	(3)	BCS16N1S1	RS	BCS16N1S2	RS	BCS16N1S3	RS
	240	1.00	1	16¾	(426)	6	(3)	BCS16N10S1	RS	BCS16N10S2	RS	BCS16N10S3	RS
	120	1.50	1	23¾	(603)	7	(4)	BCS23N1S1	RS	BCS23N1S2	RS	BCS23N1S3	RS
	240	1.50	1	23¾	(603)	7	(4)	BCS23N10S1	RS	BCS23N10S2	RS	BCS23N10S3	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
23 W/in² Steel Plug 1-Steel Element (3.6 W/cm²)	120	0.25	1	6½	(165)	3	(2)	BCS6J1C1	RS	BCS6J1C2	RS	BCS6J1C3	RS
	240	0.25	1	6½	(165)	3	(2)	BCS6J10C1	RS	BCS6J10C2	RS	BCS6J10C3	RS
	120	0.35	1	9¼	(235)	4	(2)	BCS9E1C1	RS	BCS9E1C2	RS	BCS9E1C3	RS
	240	0.35	1	9¼	(235)	4	(2)	BCS9E10C1	RS	BCS9E10C2	RS	BCS9E10C3	RS
	120	0.50	1	9⅜	(238)	4	(2)	BCS9G1C1	RS	BCS9G1C2	RS	BCS9G1C3	RS
	240	0.50	1	9⅜	(238)	4	(2)	BCS9G10C1	RS	BCS9G10C2	RS	BCS9G10C3	RS
	120	0.75	1	13½	(343)	5	(3)	BCS13J1C1	RS	BCS13J1C2	RS	BCS13J1C3	RS
	240	0.75	1	13½	(343)	5	(3)	BCS13J10C1	RS	BCS13J10C2	RS	BCS13J10C3	RS
	120	1.00	1	16¾	(426)	6	(3)	BCS16N1C1	RS	BCS16N1C2	RS	BCS16N1C3	RS
	240	1.00	1	16¾	(426)	6	(3)	BCS16N10C1	RS	BCS16N10C2	RS	BCS16N10C3	RS
	120	1.50	1	23¾	(603)	7	(4)	BCS23N1C1	RS	BCS23N1C2	RS	BCS23N1C3	RS
	240	1.50	1	23¾	(603)	7	(4)	BCS23N10C1	RS	BCS23N10C2	RS	BCS23N10C3	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

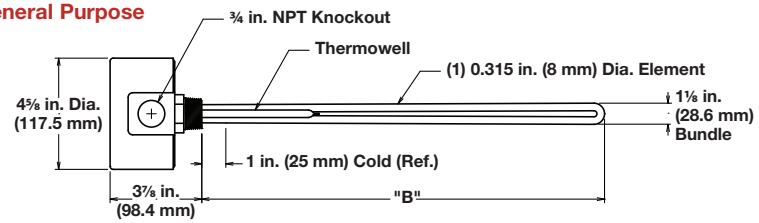
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

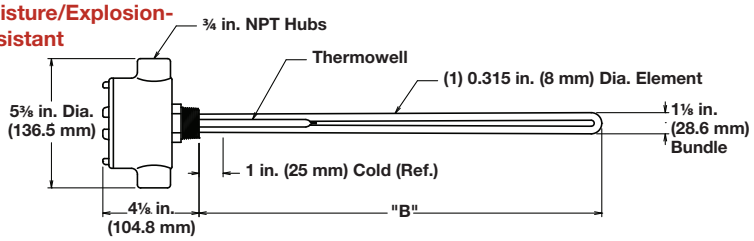
Application: Lightweight Oils and Heat Transfer Oils

- 1 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
23 W/in² Steel Plug 1-Steel Element (3.6 W/cm²)	120	0.25	1	6½	(165)	BCS6J1S	RS	3	(2)	BCS6J1C	RS	6	(3)
	240	0.25	1	6½	(165)	BCS6J10S	RS	3	(2)	BCS6J10C	RS	6	(3)
	120	0.35	1	9¼	(235)	BCS9E1S	RS	4	(2)	BCS9E1C	RS	7	(4)
	240	0.35	1	9¼	(235)	BCS9E10S	RS	4	(2)	BCS9E10C	RS	7	(4)
	120	0.50	1	9⅜	(238)	BCS9G1S	RS	4	(2)	BCS9G1C	RS	7	(4)
	240	0.50	1	9⅜	(238)	BCS9G10S	RS	4	(2)	BCS9G10C	RS	7	(4)
	120	0.75	1	13½	(343)	BCS13J1S	RS	5	(3)	BCS13J1C	RS	8	(4)
	240	0.75	1	13½	(343)	BCS13J10S	RS	5	(3)	BCS13J10C	RS	8	(4)
	120	1.00	1	16¾	(426)	BCS16N1S	RS	6	(3)	BCS16N1C	RS	9	(4)
	240	1.00	1	16¾	(426)	BCS16N10S	RS	6	(3)	BCS16N10C	RS	9	(4)
	120	1.50	1	23¾	(603)	BCS23N1S	RS	7	(4)	BCS23N1C	RS	10	(5)
	240	1.50	1	23¾	(603)	BCS23N10S	RS	7	(4)	BCS23N10C	RS	10	(5)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

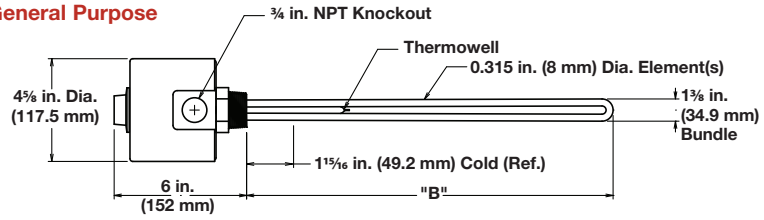
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

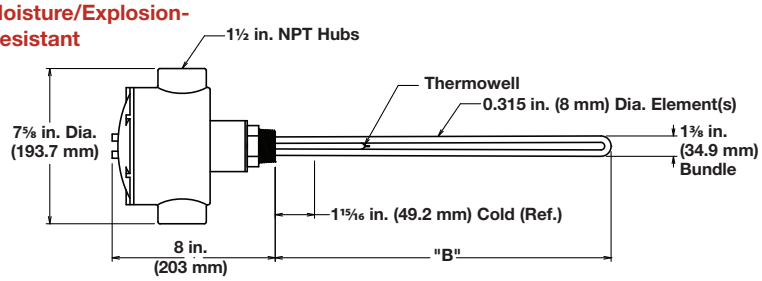
Application: Lightweight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- WATROD elements
- With thermostat (SPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 1 (30 to 110°F)		Type 2 (30 to 250°F)		Type 3 (175 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure					
23 W/in² ④ Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	0.50	1	6⅜	(161.9)	4	(2)	BES6G6S1	RS	BES6G6S2	RS	BES6G6S3	RS
	120/240	0.50	1	7⅜	(187.3)	4	(2)	BES7G6S1	RS	BES7G6S2	RS	BES7G6S3	RS
	120/240	0.70	1	8⅞	(225.4)	5	(3)	BES8R6S1	RS	BES8R6S2	RS	BES8R6S3	RS
	120/240	0.75	1	10¹⁄₁₆	(255.6)	5	(3)	BES10B6S1	RS	BES10B6S2	RS	BES10B6S3	RS
	120/240	1.00	1	12¾	(324.0)	6	(3)	BES12N6S1	RS	BES12N6S2	RS	BES12N6S3	RS
	120/240	1.50	1	19⅜	(492.1)	7	(4)	BES19G6S1	RS	BES19G6S2	RS	BES19G6S3	RS
	120/240	2.00	1	25⅜	(644.5)	8	(4)	BES25G6S1	RS	BES25G6S2	RS	BES25G6S3	RS
	120/240	3.00	1	36⅞	(936.6)	9	(4)	BES36R6S1	RS	BES36R6S2	RS	BES36R6S3	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
23 W/in² ④ Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	0.50	1	6⅜	(161.9)	8	(4)	BES6G6C1	RS	BES6G6C2	RS	BES6G6C3	RS
	120/240	0.50	1	7⅜	(187.3)	8	(4)	BES7G6C1	RS	BES7G6C2	RS	BES7G6C3	RS
	120/240	0.70	1	8⅞	(225.6)	9	(4)	BES8R6C1	RS	BES8R6C2	RS	BES8R6C3	RS
	120/240	0.75	1	10¹⁄₁₆	(256.0)	9	(4)	BES10B6C1	RS	BES10B6C2	RS	BES10B6C3	RS
	120/240	1.00	1	12¾	(324.0)	10	(5)	BES12N6C1	RS	BES12N6C2	RS	BES12N6C3	RS
	120/240	1.50	1	19⅜	(492.1)	11	(5)	BES19G6C1	RS	BES19G6C2	RS	BES19G6C3	RS
	120/240	2.00	1	25⅜	(644.5)	12	(6)	BES25G6C1	RS	BES25G6C2	RS	BES25G6C3	RS
	120/240	3.00	1	36⅞	(936.7)	13	(6)	BES36R6C1	RS	BES36R6C2	RS	BES36R6C3	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

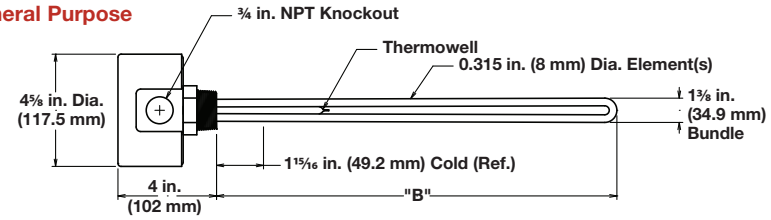
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

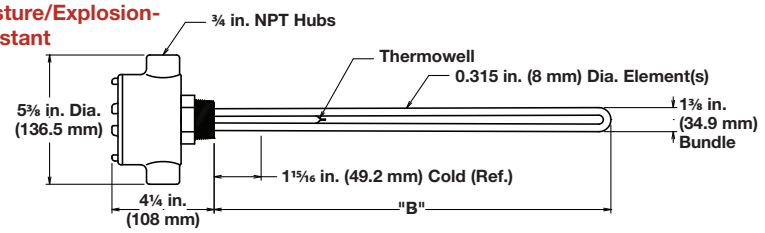
Application: Lightweight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Del.	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Del.	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
23 W/in² ④ Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	0.50	1	6⅜	(161.9)	**BES6G6S**	RS	4	(2)	**BES6G6C**	RS	7	(4)
	120/240	0.50	1	7⅜	(187.3)	**BES7G6S**	RS	4	(2)	**BES7G6C**	RS	7	(4)
	120/240	0.70	1	8⅞	(225.4)	**BES8R6S**	RS	5	(3)	**BES8R6C**	RS	8	(4)
	120/240	0.75	1	10 1⁄16	(255.6)	**BES10B6S**	RS	5	(3)	**BES10B6C**	RS	8	(4)
	120/240	1.00	1	12¾	(324.0)	**BES12N6S**	RS	6	(3)	**BES12N6C**	RS	9	(4)
	120/240	1.50	1	19⅜	(492.1)	**BES19G6S**	RS	7	(4)	**BES19G6C**	RS	10	(5)
	120/240	2.00	1	25⅜	(644.5)	**BES25G6S**	RS	8	(4)	**BES25G6C**	RS	11	(5)
	120/240	3.00	1	36⅞	(936.6)	**BES36R6S**	RS	9	(4)	**BES36R6C**	RS	12	(6)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

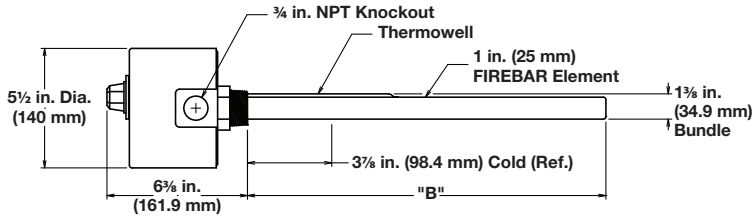
④ Wired for higher voltage

⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller, please see following pages for available heaters without thermostats
- General purpose enclosure



								Type 5A (60 to 250°F)		Type 7A (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure			
30 W/in² ③ 304 SS Plug 1-Incoloy Element (4.7 W/cm²)	240	1.70	3	16⅛	(409.6)	8	(4)	**BDNF16G12S5A**	RS	**BDNF16G12S7A**	RS
	480	1.70	3	16⅛	(409.6)	8	(4)	**BDNF16G13S5A**	RS	**BDNF16G13S7A**	RS
	240	2.20	3	19⅛	(485.8)	9	(4)	**BDNF19G12S5A**	RS	**BDNF19G12S7A**	RS
	480	2.20	3	19⅛	(485.8)	9	(4)	**BDNF19G13S5A**	RS	**BDNF19G13S7A**	RS
	240	2.80	3	24⅜	(619.1)	10	(5)	**BDNF24L12S5A**	RS	**BDNF24L12S7A**	RS
	480	2.80	3	24⅜	(619.1)	10	(5)	**BDNF24L13S5A**	RS	**BDNF24L13S7A**	RS
	240	3.50	3	29⅝	(752.5)	11	(5)	**BDNF29R12S5A**	RS	**BDNF29R12S7A**	RS
	480	3.50	3	29⅝	(752.5)	11	(5)	**BDNF29R13S5A**	RS	**BDNF29R13S7A**	RS
	240	4.25	3	34⅝	(879.5)	12	(6)	**BDNF34R12S5A**	RS	**BDNF34R12S7A**	RS
	480	4.25	3	34⅝	(879.5)	12	(6)	**BDNF34R13S5A**	RS	**BDNF34R13S7A**	RS
	240	5.70	3	45⅛	(1146.2)	14	(7)	**BDNF45G12S5A**	RS	**BDNF45G12S7A**	RS
	480	5.70	3	45⅛	(1146.2)	14	(7)	**BDNF45G13S5A**	RS	**BDNF45G13S7A**	RS
	240	7.20	3	55⅝	(1412.9)	16	(8)	**BDNF55R12S5A**	RS	**BDNF55R12S7A**	RS
23 W/in² ⑧ 304 SS Plug 1-Incoloy Element (3.6 W/cm²)	240	1.25	3	16⅛	(409.6)	8	(4)	**BDNF16G20S5A**	RS	**BDNF16G20S7A**	RS
	240	1.65	3	19⅛	(485.8)	9	(4)	**BDNF19G20S5A**	RS	**BDNF19G20S7A**	RS
	240	2.15	3	24⅜	(619.1)	10	(5)	**BDNF24L20S5A**	RS	**BDNF24L20S7A**	RS
	480	2.15	3	24⅜	(619.1)	10	(5)	**BDNF24L19S5A**	RS	**BDNF24L19S7A**	RS
	240	2.65	3	29⅝	(752.5)	11	(5)	**BDNF29R20S5A**	RS	**BDNF29R20S7A**	RS
	480	2.65	3	29⅝	(752.5)	11	(5)	**BDNF29R19S5A**	RS	**BDNF29R19S7A**	RS
	240	3.20	3	34⅝	(879.5)	12	(6)	**BDNF34R20S5A**	RS	**BDNF34R20S7A**	RS
	480	3.20	3	34⅝	(879.5)	12	(6)	**BDNF34R19S5A**	RS	**BDNF34R19S7A**	RS
	240	4.25	3	45⅛	(1146.2)	14	(7)	**BDNF45G20S5A**	RS	**BDNF45G20S7A**	RS
	480	4.25	3	45⅛	(1146.2)	14	(7)	**BDNF45G19S5A**	RS	**BDNF45G19S7A**	RS
	240	5.40	3	55⅝	(1412.9)	16	(8)	**BDNF55R20S5A**	RS	**BDNF55R20S7A**	RS
	480	5.40	3	55⅝	(1412.9)	16	(8)	**BDNF55R19S5A**	RS	**BDNF55R19S7A**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

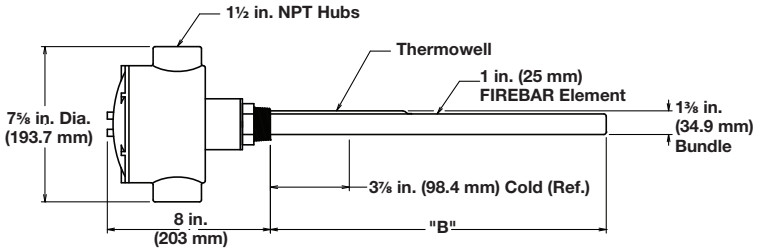
③ Wired for 3-phase operation only

⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 5A (60 to 250°F)		Type 7A (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Del.	Code Number	Del.
								Moisture/Explosion-Resistant Enclosure			
30 W/in² ③ 304 SS Plug 1-Incoloy Element (4.7 W/cm²)	240	1.70	3	16⅛	(409.6)	11	(5)	**BDNF16G12C5A**	RS	**BDNF16G12C7A**	RS
	480	1.70	3	16⅛	(409.6)	11	(5)	**BDNF16G13C5A**	RS	**BDNF16G13C7A**	RS
	240	2.20	3	19⅛	(485.8)	12	(6)	**BDNF19G12C5A**	RS	**BDNF19G12C7A**	RS
	480	2.20	3	19⅛	(485.8)	12	(6)	**BDNF19G13C5A**	RS	**BDNF19G13C7A**	RS
	240	2.80	3	24⅜	(619.1)	13	(6)	**BDNF24L12C5A**	RS	**BDNF24L12C7A**	RS
	480	2.80	3	24⅜	(619.1)	13	(6)	**BDNF24L13C5A**	RS	**BDNF24L13C7A**	RS
	240	3.50	3	29⅝	(752.5)	14	(7)	**BDNF29R12C5A**	RS	**BDNF29R12C7A**	RS
	480	3.50	3	29⅝	(752.5)	14	(7)	**BDNF29R13C5A**	RS	**BDNF29R13C7A**	RS
	240	4.25	3	34⅝	(879.5)	15	(7)	**BDNF34R12C5A**	RS	**BDNF34R12C7A**	RS
	480	4.25	3	34⅝	(879.5)	15	(7)	**BDNF34R13C5A**	RS	**BDNF34R13C7A**	RS
	240	5.70	3	45⅛	(1146.2)	17	(8)	**BDNF45G12C5A**	RS	**BDNF45G12C7A**	RS
	480	5.70	3	45⅛	(1146.2)	17	(8)	**BDNF45G13C5A**	RS	**BDNF45G13C7A**	RS
	240	7.20	3	55⅝	(1412.9)	19	(9)	**BDNF55R12C5A**	RS	**BDNF55R12C7A**	RS
23 W/in² ⑧ 304 SS Plug 1-Incoloy Element (3.6 W/cm²)	240	1.25	3	16⅛	(409.6)	11	(5)	**BDNF16G20C5A**	RS	**BDNF16G20C7A**	RS
	240	1.65	3	19⅛	(485.8)	12	(6)	**BDNF19G20C5A**	RS	**BDNF19G20C7A**	RS
	240	2.15	3	24⅜	(619.1)	13	(6)	**BDNF24L20C5A**	RS	**BDNF24L20C7A**	RS
	480	2.15	3	24⅜	(619.1)	13	(6)	**BDNF24L19C5A**	RS	**BDNF24L19C7A**	RS
	240	2.65	3	29⅝	(752.5)	14	(7)	**BDNF29R20C5A**	RS	**BDNF29R20C7A**	RS
	480	2.65	3	29⅝	(752.5)	14	(7)	**BDNF29R19C5A**	RS	**BDNF29R19C7A**	RS
	240	3.20	3	34⅝	(879.5)	15	(7)	**BDNF34R20C5A**	RS	**BDNF34R20C7A**	RS
	480	3.20	3	34⅝	(879.5)	15	(7)	**BDNF34R19C5A**	RS	**BDNF34R19C7A**	RS
	240	4.25	3	45⅛	(1146.2)	17	(8)	**BDNF45G20C5A**	RS	**BDNF45G20C7A**	RS
	480	4.25	3	45⅛	(1146.2)	17	(8)	**BDNF45G19C5A**	RS	**BDNF45G19C7A**	RS
	240	5.40	3	55⅝	(1412.9)	19	(9)	**BDNF55R20C5A**	RS	**BDNF55R20C7A**	RS
	480	5.40	3	55⅝	(1412.9)	19	(9)	**BDNF55R19C5A**	RS	**BDNF55R19C7A**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

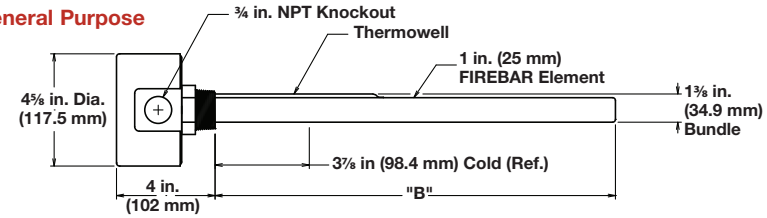
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

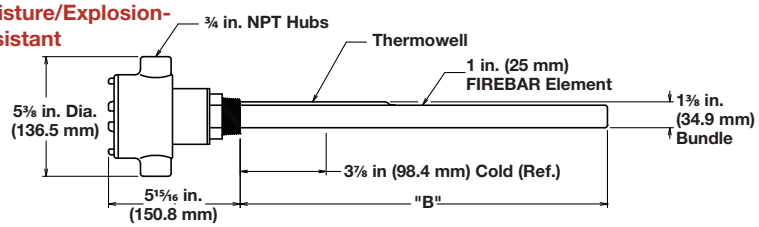
Application: Lightweight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in. (mm)	Code Number	Del.	Ship Wt. lbs. (kg)	Code Number ⑦	Del.	Ship Wt. lbs. (kg)
					General Purpose Enclosure			Moisture/Explosion-Resistant Enclosure		
30 W/in² ③ 304 SS Plug 1-Incoloy Element (4.7 W/cm²)	240	1.70	3	16⅛ (409.6)	**BDNF16G12S**	RS	7 (4)	**BDNF16G12C**	RS	10 (5)
	480	1.70	3	16⅛ (409.6)	**BDNF16G13S**	RS	7 (4)	**BDNF16G13C**	RS	10 (5)
	240	2.20	3	19⅛ (485.8)	**BDNF19G12S**	RS	8 (4)	**BDNF19G12C**	RS	11 (5)
	480	2.20	3	19⅛ (485.8)	**BDNF19G13S**	RS	8 (4)	**BDNF19G13C**	RS	11 (5)
	240	2.80	3	24⅜ (619.1)	**BDNF24L12S**	RS	9 (4)	**BDNF24L12C**	RS	12 (6)
	480	2.80	3	24⅜ (619.1)	**BDNF24L13S**	RS	9 (4)	**BDNF24L13C**	RS	12 (6)
	240	3.50	3	29⅝ (752.5)	**BDNF29R12S**	RS	10 (5)	**BDNF29R12C**	RS	13 (6)
	480	3.50	3	29⅝ (752.5)	**BDNF29R13S**	RS	10 (5)	**BDNF29R13C**	RS	13 (6)
	240	4.25	3	34⅝ (879.5)	**BDNF34R12S**	RS	11 (5)	**BDNF34R12C**	RS	14 (7)
	480	4.25	3	34⅝ (879.5)	**BDNF34R13S**	RS	11 (5)	**BDNF34R13C**	RS	14 (7)
	240	5.70	3	45⅛ (1146.2)	**BDNF45G12S**	RS	13 (6)	**BDNF45G12C**	RS	16 (8)
	480	5.70	3	45⅛ (1146.2)	**BDNF45G13S**	RS	13 (6)	**BDNF45G13C**	RS	16 (8)
	240	7.20	3	55⅝ (1412.9)	**BDNF55R12S**	RS	15 (7)	**BDNF55R12C**	RS	18 (9)
	480	7.20	3	55⅝ (1412.9)	**BDNF55R13S**	RS	15 (7)	**BDNF55R13C**	RS	18 (9)
23 W/in² ⑧ 304 SS Plug 1-Incoloy Element (3.6 W/cm²)	240	1.25	3	16⅛ (409.6)	**BDNF16G20S**	RS	7 (4)	**BDNF16G20C**	RS	10 (5)
	240	1.65	3	19⅛ (485.8)	**BDNF19G20S**	RS	8 (4)	**BDNF19G20C**	RS	11 (5)
	240	2.15	3	24⅜ (619.1)	**BDNF24L20S**	RS	9 (4)	**BDNF24L20C**	RS	12 (6)
	480	2.15	3	24⅜ (619.1)	**BDNF24L19S**	RS	9 (4)	**BDNF24L19C**	RS	12 (6)
	240	2.65	3	29⅝ (752.5)	**BDNF29R20S**	RS	10 (5)	**BDNF29R20C**	RS	13 (6)
	480	2.65	3	29⅝ (752.5)	**BDNF29R19S**	RS	10 (5)	**BDNF29R19C**	RS	13 (6)
	240	3.20	3	34⅝ (879.5)	**BDNF34R20S**	RS	11 (5)	**BDNF34R20C**	RS	14 (7)
	480	3.20	3	34⅝ (879.5)	**BDNF34R19S**	RS	11 (5)	**BDNF34R19C**	RS	14 (7)
	240	4.25	3	45⅛ (1146.2)	**BDNF45G20S**	RS	13 (6)	**BDNF45G20C**	RS	16 (8)
	480	4.25	3	45⅛ (1146.2)	**BDNF45G19S**	RS	13 (6)	**BDNF45G19C**	RS	16 (8)
	240	5.40	3	55⅝ (1412.9)	**BDNF55R20S**	RS	15 (7)	**BDNF55R20C**	RS	18 (9)
	480	5.40	3	55⅝ (1412.9)	**BDNF55R19S**	RS	15 (7)	**BDNF55R19C**	RS	18 (9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

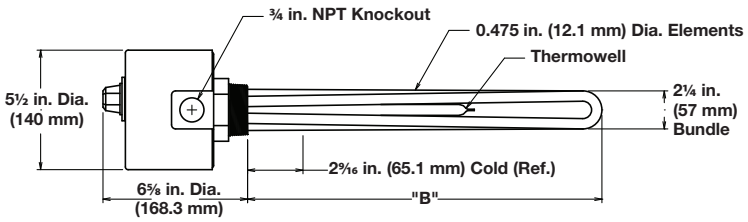
⑦ CSA certified only

⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt . lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								General Purpose Enclosure					
23 W/in² ④ Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	1.0	1	9½	(241)	5	(3)	**BGS79J6S4**	RS	**BGS79J6S5**	RS	**BGS79J6S7**	RS
	240/480	1.0	1	9½	(241)	5	(3)	**BGS79J7S4**	RS	**BGS79J7S5**	RS	**BGS79J7S7**	RS
	120/240	1.5	1	13½	(343)	6	(3)	**BGS713J6S4**	RS	**BGS713J6S5**	RS	**BGS713J6S7**	RS
	240/480	1.5	1	13½	(343)	6	(3)	**BGS713J7S4**	RS	**BGS713J7S5**	RS	**BGS713J7S7**	RS
	120/240	2.0	1	17½	(445)	7	(4)	**BGS717J6S4**	RS	**BGS717J6S5**	RS	**BGS717J6S7**	RS
	240/480	2.0	1	17½	(445)	7	(4)	**BGS717J7S4**	RS	**BGS717J7S5**	RS	**BGS717J7S7**	RS
	120/240	2.5	1	20½	(521)	8	(4)	**BGS720J6S4**	RS	**BGS720J6S5**	RS	**BGS720J6S7**	RS
	240/480	2.5	1	20½	(521)	8	(4)	**BGS720J7S4**	RS	**BGS720J7S5**	RS	**BGS720J7S7**	RS
	120/240	3.0	1	25	(635)	8	(4)	**BGS725A6S4**	RS	**BGS725A6S5**	RS	**BGS725A6S7**	RS
	240/480	3.0	1	25	(635)	8	(4)	**BGS725A7S4**	RS	**BGS725A7S5**	RS	**BGS725A7S7**	RS
	120/240	4.0	1	32½	(826)	9	(4)	**BGS732J6S4**	RS	**BGS732J6S5**	RS	**BGS732J6S7**	RS
	120/240	5.0	1	40	(1016)	10	(5)	**BGS740A6S4**	RS	**BGS740A6S5**	RS	**BGS740A6S7**	RS
23 W/in² Steel Plug 3-Steel Elements (3.6 W/cm²)	120	1.5	1	9½	(241)	6	(3)	**BHS79J1S4**	RS	**BHS79J1S5**	RS	**BHS79J1S7**	RS
	240	1.5	3	9½	(241)	6	(3)	**BHS79J3S4**	RS	**BHS79J3S5**	RS	**BHS79J3S7**	RS
	480	1.5	3	9½	(241)	6	(3)	**BHS79J13S4**	RS	**BHS79J13S5**	RS	**BHS79J13S7**	RS
	240	3.0	3	17½	(445)	8	(4)	**BHS717J3S4**	RS	**BHS717J3S5**	RS	**BHS717J3S7**	RS
	480	3.0	3	17½	(445)	8	(4)	**BHS717J5S4**	RS	**BHS717J5S5**	RS	**BHS717J5S7**	RS
	240	4.5	3	25	(635)	10	(5)	**BHS725A3S4**	RS	**BHS725A3S5**	RS	**BHS725A3S7**	RS
	480	4.5	3	25	(635)	10	(5)	**BHS725A5S4**	RS	**BHS725A5S5**	RS	**BHS725A5S7**	RS
	240	6.0	3	32½	(826)	13	(6)	**BHS732J3S4**	RS	**BHS732J3S5**	RS	**BHS732J3S7**	RS
	480	6.0	3	32½	(826)	13	(6)	**BHS732J5S4**	RS	**BHS732J5S5**	RS	**BHS732J5S7**	RS
	240	7.5	3	40	(1016)	14	(7)	**BHS740A3S4**	RS	**BHS740A3S5**	RS	**BHS740A3S7**	RS
	480	7.5	3	40	(1016)	14	(7)	**BHS740A5S4**	RS	**BHS740A5S5**	RS	**BHS740A5S7**	RS
	240	9.0	3	47½	(1207)	14	(7)	**BHS747J3S4**	RS	**BHS747J3S5**	RS	**BHS747J3S7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

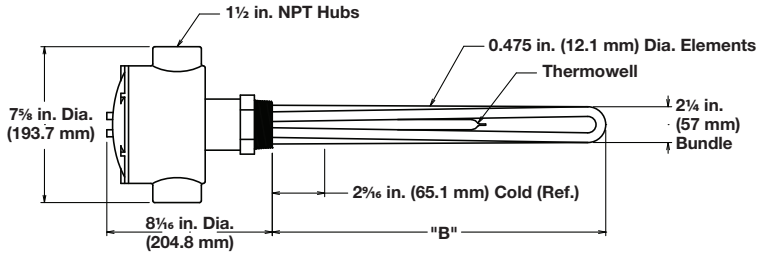
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								Moisture/Explosion-Resistant Enclosure					
23 W/in² ④ Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	1.0	1	9½	(241)	8	(4)	BGS79J6C4	RS	BGS79J6C5	RS	BGS79J6C7	RS
	240/480	1.0	1	9½	(241)	8	(4)	BGS79J7C4	RS	BGS79J7C5	RS	BGS79J7C7	RS
	120/240	1.5	1	13½	(343)	9	(4)	BGS713J6C4	RS	BGS713J6C5	RS	BGS713J6C7	RS
	240/480	1.5	1	13½	(343)	9	(4)	BGS713J7C4	RS	BGS713J7C5	RS	BGS713J7C7	RS
	120/240	2.0	1	17½	(445)	10	(5)	BGS717J6C4	RS	BGS717J6C5	RS	BGS717J6C7	RS
	240/480	2.0	1	17½	(445)	10	(5)	BGS717J7C4	RS	BGS717J7C5	RS	BGS717J7C7	RS
	120/240	2.5	1	20½	(521)	11	(5)	BGS720J6C4	RS	BGS720J6C5	RS	BGS720J6C7	RS
	240/480	2.5	1	20½	(521)	11	(5)	BGS720J7C4	RS	BGS720J7C5	RS	BGS720J7C7	RS
	120/240	3.0	1	25	(635)	11	(5)	BGS725A6C4	RS	BGS725A6C5	RS	BGS725A6C7	RS
	240/480	3.0	1	25	(635)	11	(5)	BGS725A7C4	RS	BGS725A7C5	RS	BGS725A7C7	RS
	120/240	4.0	1	32½	(826)	12	(6)	BGS732J6C4	RS	BGS732J6C5	RS	BGS732J6C7	RS
	120/240	5.0	1	40	(1016)	13	(6)	BGS740A6C4	RS	BGS740A6C5	RS	BGS740A6C7	RS
23 W/in² Steel Plug 3-Steel Elements (3.6 W/cm²)	120	1.5	1	9½	(241)	9	(4)	BHS79J1C4	RS	BHS79J1C5	RS	BHS79J1C7	RS
	240	1.5	3	9½	(241)	9	(4)	BHS79J3C4	RS	BHS79J3C5	RS	BHS79J3C7	RS
	480	1.5	3	9½	(241)	9	(4)	BHS79J13C4	RS	BHS79J13C5	RS	BHS79J13C7	RS
	240	3.0	3	17½	(445)	11	(5)	BHS717J3C4	RS	BHS717J3C5	RS	BHS717J3C7	RS
	480	3.0	3	17½	(445)	11	(5)	BHS717J5C4	RS	BHS717J5C5	RS	BHS717J5C7	RS
	240	4.5	3	25	(635)	13	(6)	BHS725A3C4	RS	BHS725A3C5	RS	BHS725A3C7	RS
	480	4.5	3	25	(635)	13	(6)	BHS725A5C4	RS	BHS725A5C5	RS	BHS725A5C7	RS
	240	6.0	3	32½	(826)	16	(8)	BHS732J3C4	RS	BHS732J3C5	RS	BHS732J3C7	RS
	480	6.0	3	32½	(826)	16	(8)	BHS732J5C4	RS	BHS732J5C5	RS	BHS732J5C7	RS
	240	7.5	3	40	(1016)	17	(8)	BHS740A3C4	RS	BHS740A3C5	RS	BHS740A3C7	RS
	480	7.5	3	40	(1016)	17	(8	BHS740A5C4	RS	BHS740A5C5	RS	BHS740A5C7	RS
	240	9.0	3	47½	(1207)	17	(8)	BHS747J3C4	RS	BHS747J3C5	RS	BHS747J3C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

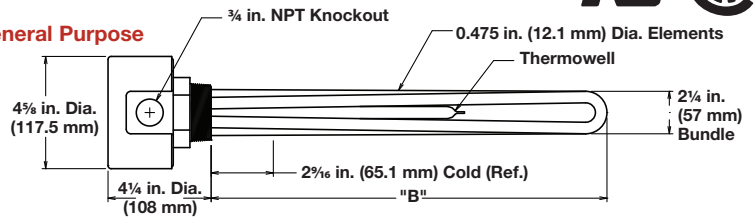
④ Wired for higher voltage

WATROD and FIREBAR Screw Plug Immersion Heaters

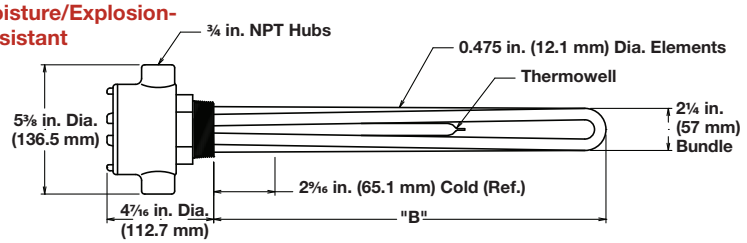
Application: Lightweight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose				Moisture/Explosion-Resistant Enclosures			
23 W/in² ④ Steel Plug 2-Steel Elements (3.6 W/cm²)	120/240	1.0	1	9½	(241)	**BGS79J6S**	RS	4	(2)	**BGS79J6C**	RS	7	(4)
	240/480	1.0	1	9½	(241)	**BGS79J7S**	RS	4	(2)	**BGS79J7C**	RS	7	(4)
	120/240	1.5	1	13½	(343)	**BGS713J6S**	RS	5	(3)	**BGS713J6C**	RS	8	(4)
	240/480	1.5	1	13½	(343)	**BGS713J7S**	RS	5	(3)	**BGS713J7C**	RS	8	(4)
	120/240	2.0	1	17½	(445)	**BGS717J6S**	RS	6	(3)	**BGS717J6C**	RS	9	(4)
	240/480	2.0	1	17½	(445)	**BGS717J7S**	RS	6	(3)	**BGS717J7C**	RS	9	(4)
	120/240	2.5	1	20½	(521)	**BGS720J6S**	RS	7	(4)	**BGS720J6C**	RS	10	(5)
	240/480	2.5	1	20½	(521)	**BGS720J7S**	RS	7	(4)	**BGS720J7C**	RS	10	(5)
	120/240	3.0	1	25	(635)	**BGS725A6S**	RS	7	(4)	**BGS725A6C**	RS	10	(5)
	240/480	3.0	1	25	(635)	**BGS725A7S**	RS	7	(4)	**BGS725A7C**	RS	10	(5)
	120/240	4.0	1	32½	(826)	**BGS732J6S**	RS	8	(4)	**BGS732J6C**	RS	11	(5)
	240/480	4.0	1	32½	(826)	**BGS732J7S**	RS	8	(4)	**BGS732J7C**	RS	11	(5)
	120/240	5.0	1	40	(1016)	**BGS740A6S**	RS	9	(4)	**BGS740A6C**	RS	12	(6)
	240/480	5.0	1	40	(1016)	**BGS740A7S**	RS	9	(4)	**BGS740A7C**	RS	12	(6)
	240/480	6.0	1	47½	(1207)	**BGS747J7S**	RS	10	(5)	**BGS747J7C**	RS	13	(6)
23 W/in² Steel Plug 3-Steel Elements (3.6 W/cm²)	120	1.5	1	9½	(241)	**BHS79J1S**	RS	5	(3)	**BHS79J1C**	RS	8	(4)
	240	1.5	3	9½	(241)	**BHS79J3S**	RS	5	(3)	**BHS79J3C**	RS	8	(4)
	480	1.5	3	9½	(241)	**BHS79J13S**	RS	5	(3)	**BHS79J13C**	RS	8	(4)
	120	3.0	1	17½	(445)	**BHS717J1S**	RS	7	(4)	**BHS717J1C**	RS	10	(5)
	240	3.0	3	17½	(445)	**BHS717J3S**	RS	7	(4)	**BHS717J3C**	RS	10	(5)
	480	3.0	3	17½	(445)	**BHS717J5S**	RS	7	(4)	**BHS717J5C**	RS	10	(5)
	120	4.5	1	25	(635)	**BHS725A1S**	RS	9	(4)	**BHS725A1C**	RS	12	(6)
	240	4.5	3	25	(635)	**BHS725A3S**	RS	9	(4)	**BHS725A3C**	RS	12	(6)
	480	4.5	3	25	(635)	**BHS725A5S**	RS	9	(4)	**BHS725A5C**	RS	12	(6)
	240	6.0	3	32½	(826)	**BHS732J3S**	RS	12	(6)	**BHS732J3C**	RS	15	(7)
	480	6.0	3	32½	(826)	**BHS732J5S**	RS	12	(6)	**BHS732J5C**	RS	15	(7)
	240	7.5	3	40	(1016)	**BHS740A3S**	RS	13	(6)	**BHS740A3C**	RS	16	(8)
	480	7.5	3	40	(1016)	**BHS740A5S**	RS	13	(6)	**BHS740A5C**	RS	16	(8)
	240	9.0	3	47½	(1207)	**BHS747J3S**	RS	13	(6)	**BHS747J3C**	RS	16	(8)
	480	9.0	3	47½	(1207)	**BHS747J5S**	RS	13	(6)	**BHS747J5C**	RS	16	(8)
	240	12.5	3	64	(1626)	**BHS764A3S**	RS	17	(8)	**BHS764A3C**	RS	20	(9)
	480	12.5	3	64	(1626)	**BHS764A5S**	RS	17	(8)	**BHS764A5C**	RS	20	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

④ Wired for higher voltage

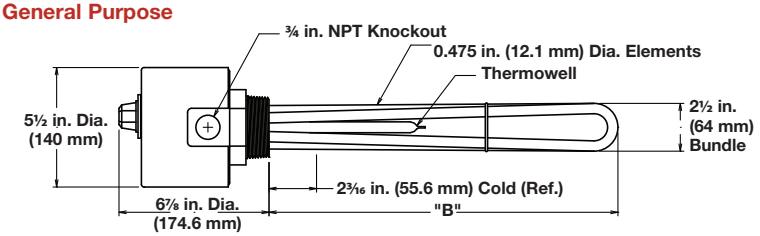
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

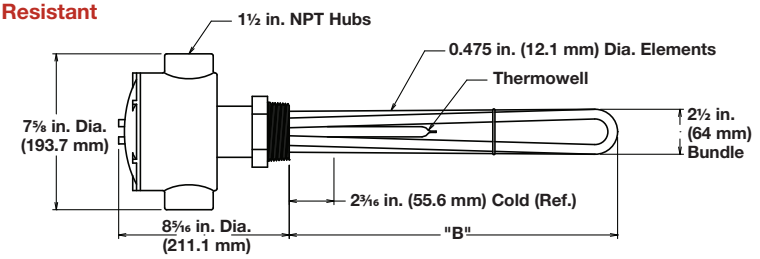
Application: Lightweight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								General Purpose Enclosure					
23 W/in² ⑥ Steel Plug 3-Steel Element (3.6 Wcm²)	240	3.0	3	17¼	(438)	10	(5)	BLS717E3S4	RS	BLS717E3S5	RS	BLS717E3S7	RS
	480	3.0	3	17¼	(438)	10	(5)	BLS717E5S4	RS	BLS717E5S5	RS	BLS717E5S7	RS
	240	4.5	3	24¾	(629)	13	(6)	BLS724N3S4	RS	BLS724N3S5	RS	BLS724N3S7	RS
	480	4.5	3	24¾	(629)	13	(6)	BLS724N5S4	RS	BLS724N5S5	RS	BLS724N5S7	RS
	240	6.0	3	32¼	(819)	15	(7)	BLS732E3S4	RS	BLS732E3S5	RS	BLS732E3S7	RS
	480	6.0	3	32¼	(819)	15	(7)	BLS732E5S4	RS	BLS732E5S5	RS	BLS732E5S7	RS
	240	7.5	3	39¾	(1010)	16	(8)	BLS739N3S4	RS	BLS739N3S5	RS	BLS739N3S7	RS
	480	7.5	3	39¾	(1010)	16	(8)	BLS739N5S4	RS	BLS739N5S5	RS	BLS739N5S7	RS
	240	9.0	3	47¼	(1200)	18	(9)	BLS747E3S4	RS	BLS747E3S5	RS	BLS747E3S7	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
23 W/in² ⑥ Steel Plug 3-Steel Element (3.6 Wcm²)	240	3.0	3	17¼	(438)	13	(6)	BLS717E3C4	RS	BLS717E3C5	RS	BLS717E3C7	RS
	480	3.0	3	17¼	(438)	13	(6)	BLS717E5C4	RS	BLS717E5C5	RS	BLS717E5C7	RS
	240	4.5	3	24¾	(629)	16	(8)	BLS724N3C4	RS	BLS724N3C5	RS	BLS724N3C7	RS
	480	4.5	3	24¾	(629)	16	(8)	BLS724N5C4	RS	BLS724N5C5	RS	BLS724N5C7	RS
	240	6.0	3	32¼	(819)	18	(9)	BLS732E3C4	RS	BLS732E3C5	RS	BLS732E3C7	RS
	480	6.0	3	32¼	(819)	18	(9)	BLS732E5C4	RS	BLS732E5C5	RS	BLS732E5C7	RS
	240	7.5	3	39¾	(1010)	19	(9)	BLS739N3C4	RS	BLS739N3C5	RS	BLS739N3C7	RS
	480	7.5	3	39¾	(1010)	19	(9)	BLS739N5C4	RS	BLS739N5C5	RS	BLS739N5C7	RS
	240	9.0	3	47¼	(1200)	21	(10)	BLS747E3C4	RS	BLS747E3C5	RS	BLS747E3C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑥ Can be rewired to produce ⅓ of original kW and watt density (3-phase only)

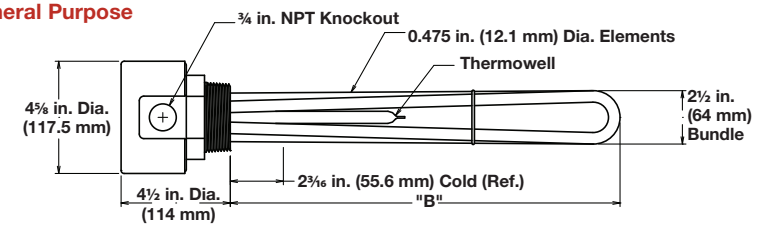
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

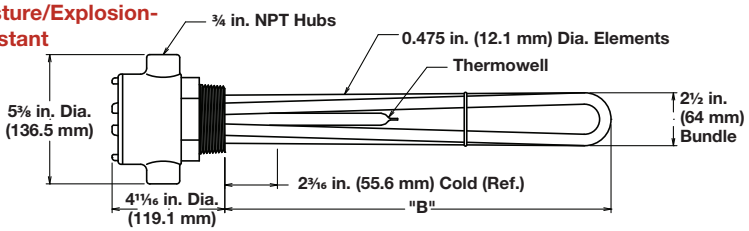
Application: Lightweight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture /Explosion-Resistant Enclosure			
23 W/in² ⑥ Steel Plug 3-Steel Element (3.6 Wcm²)	120	3.0	1	17¼	(438)	**BLS717E1S**	RS	9	(4)	**BLS717E1C**	RS	12	(6)
	240	3.0	3	17¼	(438)	**BLS717E3S**	RS	9	(4)	**BLS717E3C**	RS	12	(6)
	480	3.0	3	17¼	(438)	**BLS717E5S**	RS	9	(4)	**BLS717E5C**	RS	12	(6)
	120	4.5	1	24¾	(629)	**BLS724N1S**	RS	12	(6)	**BLS724N1C**	RS	15	(7)
	240	4.5	3	24¾	(629)	**BLS724N3S**	RS	12	(6)	**BLS724N3C**	RS	15	(7)
	480	4.5	3	24¾	(629)	**BLS724N5S**	RS	12	(6)	**BLS724N5C**	RS	15	(7)
	240	6.0	3	32¼	(819)	**BLS732E3S**	RS	14	(7)	**BLS732E3C**	RS	17	(8)
	480	6.0	3	32¼	(819)	**BLS732E5S**	RS	14	(7)	**BLS732E5C**	RS	17	(8)
	240	7.5	3	39¾	(1010)	**BLS739N3S**	RS	15	(7)	**BLS739N3C**	RS	18	(9)
	480	7.5	3	39¾	(1010)	**BLS739N5S**	RS	15	(7)	**BLS739N5C**	RS	18	(9)
	240	9.0	3	47¼	(1200)	**BLS747E3S**	RS	17	(8)	**BLS747E3C**	RS	20	(9)
	480	9.0	3	47¼	(1200)	**BLS747E5S**	RS	17	(8)	**BLS747E5C**	RS	20	(9)
	240	12.5	3	63¾	(1619)	**BLS763N3S**	RS	20	(9)	**BLS763N3C**	RS	23	(11)
	480	12.5	3	63¾	(1619)	**BLS763N5S**	RS	20	(9)	**BLS763N5C**	RS	23	(11)
	240	15.0	3	76¼	(1937)	**BLS776E3S**	RS	23	(11)	**BLS776E3C**	RS	26	(12)
	480	15.0	3	76¼	(1937)	**BLS776E5S**	RS	23	(11)	**BLS776E5C**	RS	26	(12)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

⑥ Can be rewired to produce ⅓ of original kW and watt density (3-phase only)

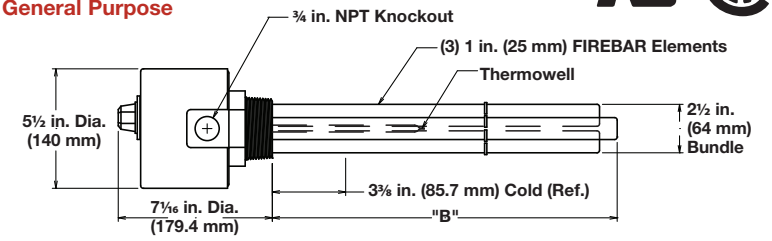
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

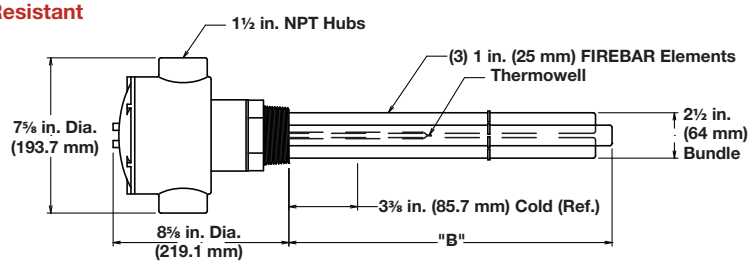
Application: Lightweight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 5A (60 to 250°F)		Type 7A (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery
								General Purpose Enclosure			
30 W/in² ③ 304 SS Plug 3-Incoloy Elements (4.7 W/cm²)	240	5.0	3	15⅛	(384.2)	12	(6)	BLNF15C12S5A	RS	BLNF15C12S7A	RS
	480	5.0	3	15⅛	(384.2)	12	(6)	BLNF15C13S5A	RS	BLNF15C13S7A	RS
	240	6.5	3	18⅛	(460.4)	13	(6)	BLNF18C12S5A	RS	BLNF18C12S7A	RS
	480	6.5	3	18⅛	(460.4)	13	(6)	BLNF18C13S5A	RS	BLNF18C13S7A	RS
	240	8.5	3	23⅛	(587.4)	15	(7)	BLNF23C12S5A	RS	BLNF23C12S7A	RS
23 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.8	3	15⅛	(384.2)	12	(6)	BLNF15C20S5A	RS	BLNF15C20S7A	RS
	240	4.9	3	18⅛	(460.4)	13	(6)	BLNF18C20S5A	RS	BLNF18C20S7A	RS
	240	6.4	3	23⅛	(587.4)	15	(7)	BLNF23C20S5A	RS	BLNF23C20S7A	RS
	480	6.4	3	23⅛	(587.4)	15	(7)	BLNF23C19S5A	RS	BLNF23C19S7A	RS
	240	7.9	3	28⅝	(727.1)	18	(9)	BLNF28L20S5A	RS	BLNF28L20S7A	RS
	240	9.6	3	33⅝	(854.1)	19	(9)	BLNF33L20S5A	RS	BLNF33L20S7A	RS
								Moisture/Explosion-Resistant Enclosure ⑦			
30 W/in² ③ 304 SS Plug 3-Incoloy Elements (4.7 W/cm²)	240	5.0	3	15⅛	(384.2)	14	(7)	BLNF15C12C5A	RS	BLNF15C12C7A	RS
	480	5.0	3	15⅛	(384.2)	14	(7)	BLNF15C13C5A	RS	BLNF15C13C7A	RS
	240	6.5	3	18⅛	(460.4)	16	(8)	BLNF18C12C5A	RS	BLNF18C12C7A	RS
	480	6.5	3	18⅛	(460.4)	16	(8)	BLNF18C13C5A	RS	BLNF18C13C7A	RS
	240	8.5	3	23⅛	(587.4)	18	(9)	BLNF23C12C5A	RS	BLNF23C12C7A	RS
23 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.8	3	15⅛	(384.2)	14	(7)	BLNF15C20C5A	RS	BLNF15C20C7A	RS
	240	4.9	3	18⅛	(460.4)	16	(8)	BLNF18C20C5A	RS	BLNF18C20C7A	RS
	240	6.4	3	23⅛	(587.4)	18	(9)	BLNF23C20C5A	RS	BLNF23C20C7A	RS
	480	6.4	3	23⅛	(587.4)	18	(9)	BLNF23C19C5A	RS	BLNF23C19C7A	RS
	240	7.9	3	28⅝	(727.1)	21	(10)	BLNF28L20C5A	RS	BLNF28L20C7A	RS
	240	9.6	3	33⅝	(854.1)	22	(10)	BLNF33L20C5A	RS	BLNF33L20C7A	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

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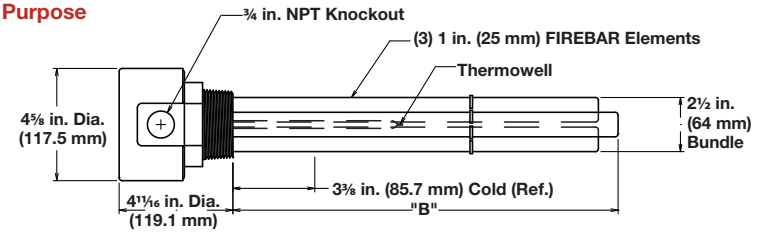
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

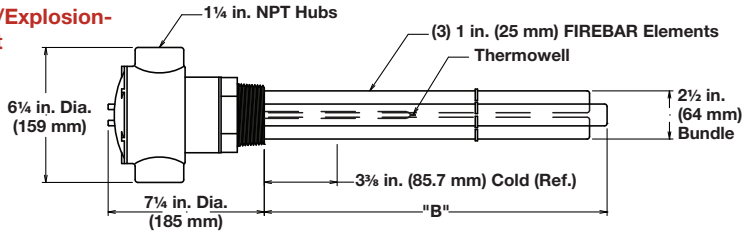
Application: Lightweight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
30 W/in² ③ 304 SS Plug 3-Incoloy Elements (4.7 W/cm²)	240	5.0	3	15⅛	(384.2)	**BLNF15C12S**	RS	11	(5)	**BLNF15C12C**	RS	14	(7)
	480	5.0	3	15⅛	(384.2)	**BLNF15C13S**	RS	11	(5)	**BLNF15C13C**	RS	14	(7)
	240	6.5	3	18⅛	(460.4)	**BLNF18C12S**	RS	12	(6)	**BLNF18C12C**	RS	15	(7)
	480	6.5	3	18⅛	(460.4)	**BLNF18C13S**	RS	12	(6)	**BLNF18C13C**	RS	15	(7)
	240	8.5	3	23⅛	(587.4)	**BLNF23C12S**	RS	14	(7)	**BLNF23C12C**	RS	17	(8)
	480	8.5	3	23⅛	(587.4)	**BLNF23C13S**	RS	14	(7)	**BLNF23C13C**	RS	17	(8)
	240	10.5	3	28⅝	(727.1)	**BLNF28L12S**	RS	17	(8)	**BLNF28L12C**	RS	20	(9)
	480	10.5	3	28⅝	(727.1)	**BLNF28L13S**	RS	17	(8)	**BLNF28L13C**	RS	20	(9)
	240	12.8	3	33⅝	(854.1)	**BLNF33L12S**	RS	18	(9)	**BLNF33L12C**	RS	21	(10)
	480	12.8	3	33⅝	(854.1)	**BLNF33L13S**	RS	18	(9)	**BLNF33L13C**	RS	21	(10)
	240	17.0	3	44⅛	(1120.8)	**BLNF44C12S**	RS	20	(9)	**BLNF44C12C**	RS	23	(11)
	480	17.0	3	44⅛	(1120.8)	**BLNF44C13S**	RS	20	(9)	**BLNF44C13C**	RS	23	(11)
	480	21.5	3	54⅝	(1387.5)	**BLNF54L13S**	RS	22	(10)	**BLNF54L13C**	RS	25	(12)
23 W/in² ⑧ 304 SS Plug 3-Incoloy Elements (3.6 W/cm²)	240	3.8	3	15⅛	(384.2)	**BLNF15C20S**	RS	11	(5)	**BLNF15C20C**	RS	14	(7)
	240	4.9	3	18⅛	(460.4)	**BLNF18C20S**	RS	12	(6)	**BLNF18C20C**	RS	15	(7)
	240	6.4	3	23⅛	(587.4)	**BLNF23C20S**	RS	14	(7)	**BLNF23C20C**	RS	17	(8)
	480	6.4	3	23⅛	(587.4)	**BLNF23C19S**	RS	14	(7)	**BLNF23C19C**	RS	17	(8)
	240	7.9	3	28⅝	(727.1)	**BLNF28L20S**	RS	17	(8)	**BLNF28L20C**	RS	20	(9)
	480	7.9	3	28⅝	(727.1)	**BLNF28L19S**	RS	17	(8)	**BLNF28L19C**	RS	20	(9)
	240	9.6	3	33⅝	(854.1)	**BLNF33L20S**	RS	18	(9)	**BLNF33L20C**	RS	21	(10)
	480	9.6	3	33⅝	(854.1)	**BLNF33L19S**	RS	18	(9)	**BLNF33L19C**	RS	21	(10)
	240	12.8	3	44⅛	(1120.8)	**BLNF44C20S**	RS	20	(9)	**BLNF44C20C**	RS	23	(11)
	480	12.8	3	44⅛	(1120.8)	**BLNF44C19S**	RS	20	(9)	**BLNF44C19C**	RS	23	(11)
	240	16.1	3	54⅝	(1387.5)	**BLNF54L20S**	RS	22	(10)	**BLNF54L20C**	RS	25	(12)
	480	16.1	3	54⅝	(1387.5)	**BLNF54L19S**	RS	22	(10)	**BLNF54L19C**	RS	25	(12)

RAPID SHIP

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Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

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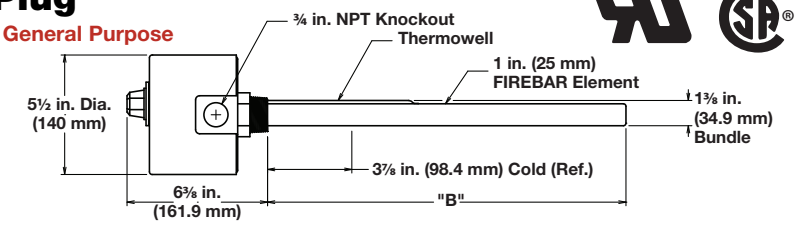
⑧ Can be wired for 1-phase operation

WATROD and FIREBAR Screw Plug Immersion Heaters

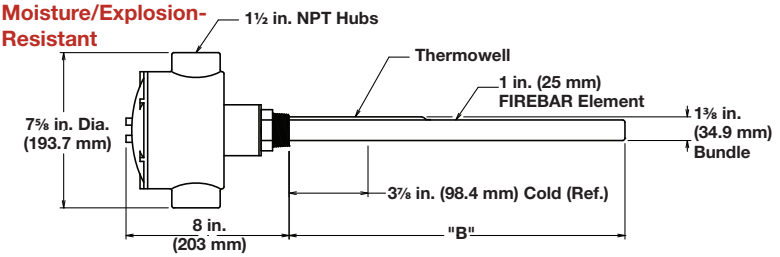
Application: Medium Weight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 5A (60 to 250°F)		Type 7A (100 to 550F°)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery
								General Purpose Enclosure			
15 W/in² ③ 304 SS Plug 1-Incoloy Element (2.3 W/cm²)	240	0.67	3	13	(330)	7	(4)	**BDNF13A29S5A**	RS	**BDNF13A29S7A**	RS
	240	0.83	3	15½	(394)	8	(4)	**BDNF15J29S5A**	RS	**BDNF15J29S7A**	RS
	240	1.00	3	18	(457)	9	(4)	**BDNF18A29S5A**	RS	**BDNF18A29S7A**	RS
	240	1.33	3	22½	(572)	10	(5)	**BDNF22J29S5A**	RS	**BDNF22J29S7A**	RS
	480	1.33	3	22½	(572)	10	(5)	**BDNF22J30S5A**	RS	**BDNF22J30S7A**	RS
	240	1.67	3	27½	(699)	11	(5)	**BDNF27J29S5A**	RS	**BDNF27J29S7A**	RS
	480	1.67	3	27½	(699)	11	(5)	**BDNF27J30S5A**	RS	**BDNF27J30S7A**	RS
	240	2.00	3	32½	(826)	12	(6)	**BDNF32J29S5A**	RS	**BDNF32J29S7A**	RS
	480	2.00	3	32½	(826)	12	(6)	**BDNF32J30S5A**	RS	**BDNF32J30S7A**	RS
	240	2.67	3	42	(1067)	14	(7)	**BDNF42A29S5A**	RS	**BDNF42A29S7A**	RS
	480	2.67	3	42	(1067)	14	(7)	**BDNF42A30S5A**	RS	**BDNF42A30S7A**	RS
	240	3.33	3	51½	(1308)	16	(8)	**BDNF51J29S5A**	RS	**BDNF51J29S7A**	RS
	480	3.33	3	51½	(1308)	16	(8)	**BDNF51J30S5A**	RS	**BDNF51J30S7A**	RS
								Moisture/Explosion-Resistant Enclosure ⑦			
15 W/in² ③ 304 SS Plug 1-Incoloy Element (2.3 W/cm²)	240	0.67	3	13	(330)	10	(5)	**BDNF13A29C5A**	RS	**BDNF13A29C7A**	RS
	240	0.83	3	15½	(394)	11	(5)	**BDNF15J29C5A**	RS	**BDNF15J29C7A**	RS
	240	1.00	3	18	(457)	12	(6)	**BDNF18A29C5A**	RS	**BDNF18A29C7A**	RS
	240	1.33	3	22½	(572)	13	(6)	**BDNF22J29C5A**	RS	**BDNF22J29C7A**	RS
	480	1.33	3	22½	(572)	13	(6)	**BDNF22J30C5A**	RS	**BDNF22J30C7A**	RS
	240	1.67	3	27½	(699)	14	(7)	**BDNF27J29C5A**	RS	**BDNF27J29C7A**	RS
	480	1.67	3	27½	(699)	14	(7)	**BDNF27J30C5A**	RS	**BDNF27J30C7A**	RS
	240	2.00	3	32½	(826)	15	(7)	**BDNF32J29C5A**	RS	**BDNF32J29C7A**	RS
	480	2.00	3	32½	(826)	15	(7)	**BDNF32J30C5A**	RS	**BDNF32J30C7A**	RS
	240	2.67	3	42	(1067)	17	(8)	**BDNF42A29C5A**	RS	**BDNF42A29C7A**	RS
	480	2.67	3	42	(1067)	17	(8)	**BDNF42A30C5A**	RS	**BDNF42A30C7A**	RS
	240	3.33	3	51½	(1308)	19	(9)	**BDNF51J29C5A**	RS	**BDNF51J29C7A**	RS
	480	3.33	3	51½	(1308)	19	(9)	**BDNF51J30C5A**	RS	**BDNF51J30C7A**	RS

RAPID SHIP

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Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

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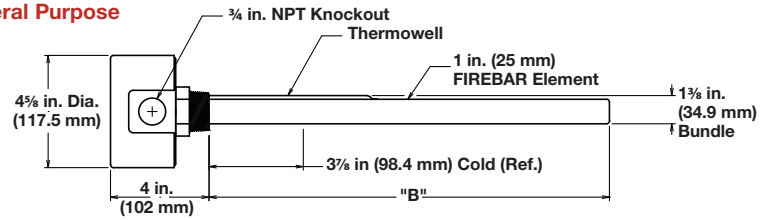
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WATROD and FIREBAR Screw Plug Immersion Heaters

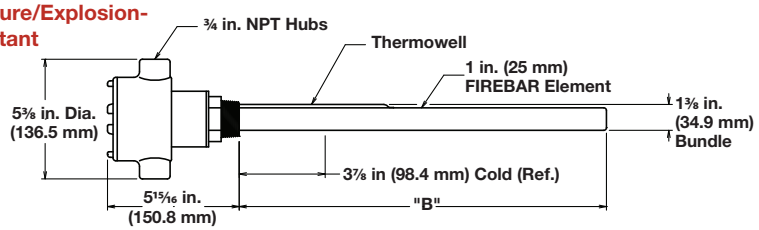
Application: Medium Weight Oils and Heat Transfer Oils

- 1¼ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
15 W/in² ③ 304 SS Plug 1-Incoloy Element (2.3 W/cm²)	240	0.67	3	13	(330)	**BDNF13A29S**	RS	6	(3)	**BDNF13A29C**	RS	9	(4)
	240	0.83	3	15½	(394)	**BDNF15J29S**	RS	7	(4)	**BDNF15J29C**	RS	10	(5)
	240	1.00	3	18	(457)	**BDNF18A29S**	RS	8	(4)	**BDNF18A29C**	RS	11	(5)
	240	1.33	3	22½	(572)	**BDNF22J29S**	RS	9	(4)	**BDNF22J29C**	RS	12	(6)
	480	1.33	3	22½	(572)	**BDNF22J30S**	RS	9	(4)	**BDNF22J30C**	RS	12	(6)
	240	1.67	3	27½	(699)	**BDNF27J29S**	RS	10	(5)	**BDNF27J29C**	RS	13	(6)
	480	1.67	3	27½	(699)	**BDNF27J30S**	RS	10	(5)	**BDNF27J30C**	RS	13	(6)
	240	2.00	3	32½	(826)	**BDNF32J29S**	RS	11	(5)	**BDNF32J29C**	RS	14	(7)
	480	2.00	3	32½	(826)	**BDNF32J30S**	RS	11	(5)	**BDNF32J30C**	RS	14	(7)
	240	2.67	3	42	(1067)	**BDNF42A29S**	RS	13	(6)	**BDNF42A29C**	RS	16	(8)
	480	2.67	3	42	(1067)	**BDNF42A30S**	RS	13	(6)	**BDNF42A30C**	RS	16	(8)
	240	3.33	3	51½	(1308)	**BDNF51J29S**	RS	15	(7)	**BDNF51J29C**	RS	18	9)
	480	3.33	3	51½	(1308)	**BDNF51J30S**	RS	15	(7)	**BDNF51J30C**	RS	18	(9)

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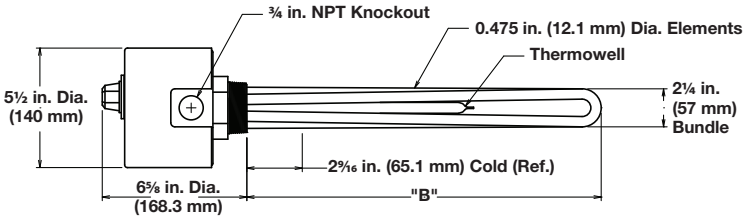
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WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose enclosure



								Type 4 (30-110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								General Purpose Enclosure					
16 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.5 W/cm²)	240	1.0	3	9¾	(248)	6	(3)	**BHN79N12S4**	RS	**BHN79N12S5**	RS	**BHN79N12S7**	RS
	480	1.0	3	9¾	(248)	6	(3)	**BHN79N13S4**	RS	**BHN79N13S5**	RS	**BHN79N13S7**	RS
	240	1.5	3	13¼	(337)	7	(4)	**BHN713E12S4**	RS	**BHN713E12S5**	RS	**BHN713E12S7**	RS
	480	1.5	3	13¼	(337)	7	(4)	**BHN713E13S4**	RS	**BHN713E13S5**	RS	**BHN713E13S7**	RS
	240	2.0	3	17¾	(451)	8	(4)	**BHN717N12S4**	RS	**BHN717N12S5**	RS	**BHN717N12S7**	RS
	480	2.0	3	17¾	(451)	8	(4)	**BHN717N13S4**	RS	**BHN717N13S5**	RS	**BHN717N13S7**	RS
	240	2.5	3	20¼	(514)	9	(4)	**BHN720E12S4**	RS	**BHN720E12S5**	RS	**BHN720E12S7**	RS
	480	2.5	3	20¼	(514)	9	(4)	**BHN720E13S4**	RS	**BHN720E13S5**	RS	**BHN720E13S7**	RS
	240	3.0	3	25¼	(641)	10	(5)	**BHN725E12S4**	RS	**BHN725E12S5**	RS	**BHN725E12S7**	RS
	480	3.0	3	25¼	(641)	10	(5)	**BHN725E13S4**	RS	**BHN725E13S5**	RS	**BHN725E13S7**	RS
	240	4.0	3	32¾	(832)	10	(5)	**BHN732N12S4**	RS	**BHN732N12S5**	RS	**BHN732N12S7**	RS
	480	4.0	3	32¾	(832)	10	(5)	**BHN732N13S4**	RS	**BHN732N13S5**	RS	**BHN732N13S7**	RS
	240	5.0	3	40¼	(1022)	11	(5)	**BHN740E12S4**	RS	**BHN740E12S5**	RS	**BHN740E12S7**	RS
	480	5.0	3	40¼	(1022)	11	(5)	**BHN740E13S4**	RS	**BHN740E13S5**	RS	**BHN740E13S7**	RS
	240	6.0	3	47¾	(1213)	12	(6)	**BHN747N12S4**	RS	**BHN747N12S5**	RS	**BHN747N12S7**	RS
	480	6.0	3	47¾	(1213)	12	(6)	**BHN747N13S4**	RS	**BHN747N13S5**	RS	**BHN747N13S7**	RS
15 W/in² Steel Plug 3-Steel Elements (2.3 W/cm²)	240	1.5	3	13¼	(337)	7	(4)	**BHSS13E3S4**	RS	**BHSS13E3S5**	RS	**BHSS13E3S7**	RS
	480	1.5	3	13¼	(337)	7	(4)	**BHSS13E13S4**	RS	**BHSS13E13S5**	RS	**BHSS13E13S7**	RS
	240	2.0	3	17½	(445)	8	(4)	**BHSS17J3S4**	RS	**BHSS17J3S5**	RS	**BHSS17J3S7**	RS
	480	2.0	3	17½	(445)	8	(4)	**BHSS17J5S4**	RS	**BHSS17J5S5**	RS	**BHSS17J5S7**	RS
	240	2.5	3	20½	(521)	9	(4)	**BHSS20J3S4**	RS	**BHSS20J3S5**	RS	**BHSS20J3S7**	RS
	480	2.5	3	20½	(521)	9	(4)	**BHSS20J5S4**	RS	**BHSS20J5S5**	RS	**BHSS20J5S7**	RS
	240	3.0	3	25	(635)	10	(5)	**BHSS25A3S4**	RS	**BHSS25A3S5**	RS	**BHSS25A3S7**	RS
	480	3.0	3	25	(635)	10	(5)	**BHSS25A5S4**	RS	**BHSS25A5S5**	RS	**BHSS25A5S7**	RS
	240	4.0	3	32½	(826)	13	(6)	**BHSS32J3S4**	RS	**BHSS32J3S5**	RS	**BHSS32J3S7**	RS
	480	4.0	3	32½	(826)	13	(6)	**BHSS32J5S4**	RS	**BHSS32J5S5**	RS	**BHSS32J5S7**	RS
	240	5.0	3	40	(1016)	14	(7)	**BHSS40A3S4**	RS	**BHSS40A3S5**	RS	**BHSS40A3S7**	RS
	480	5.0	3	40	(1016)	14	(7)	**BHSS40A5S4**	RS	**BHSS40A5S5**	RS	**BHSS40A5S7**	RS
	240	6.0	3	47½	(1207)	14	(7)	**BHSS47J3S4**	RS	**BHSS47J3S5**	RS	**BHSS47J3S7**	RS
	480	6.0	3	47½	(1207)	14	(7)	**BHSS47J5S4**	RS	**BHSS47J5S5**	RS	**BHSS47J5S7**	RS
	240	7.5	3	58½	(1486)	17	(8)	**BHSS58J3S4**	RS	**BHSS58J3S5**	RS	**BHSS58J3S7**	RS
	240	9.0	3	69¾	(1772)	21	(10)	**BHSS69N3S4**	RS	**BHSS69N3S5**	RS	**BHSS69N3S7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

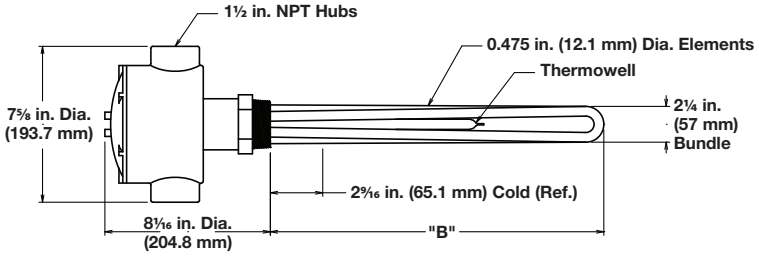
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- Moisture/explosion-resistant enclosure



								Type 4 (30 to 110°F)		Type 5 (60 to 250°F)		Type 7 (100 to 550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								Moisture/Explosion-Resistant Enclosure					
16 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.5 W/cm²)	240	1.0	3	9¾	(248)	9	(4)	**BHN79N12C4**	RS	**BHN79N12C5**	RS	**BHN79N12C7**	RS
	480	1.0	3	9¾	(248)	9	(4)	**BHN79N13C4**	RS	**BHN79N13C5**	RS	**BHN79N13C7**	RS
	240	1.5	3	13¼	(337)	10	(5)	**BHN713E12C4**	RS	**BHN713E12C5**	RS	**BHN713E12C7**	RS
	480	1.5	3	13¼	(337)	10	(5)	**BHN713E13C4**	RS	**BHN713E13C5**	RS	**BHN713E13C7**	RS
	240	2.0	3	17¾	(451)	11	(5)	**BHN717N12C4**	RS	**BHN717N12C5**	RS	**BHN717N12C7**	RS
	480	2.0	3	17¾	(451)	11	(5)	**BHN717N13C4**	RS	**BHN717N13C5**	RS	**BHN717N13C7**	RS
	240	2.5	3	20¼	(514)	12	(6)	**BHN720E12C4**	RS	**BHN720E12C5**	RS	**BHN720E12C7**	RS
	480	2.5	3	20¼	(514)	12	(6)	**BHN720E13C4**	RS	**BHN720E13C5**	RS	**BHN720E13C7**	RS
	240	3.0	3	25¼	(641)	13	(6)	**BHN725E12C4**	RS	**BHN725E12C5**	RS	**BHN725E12C7**	RS
	480	3.0	3	25¼	(641)	13	(6)	**BHN725E13C4**	RS	**BHN725E13C5**	RS	**BHN725E13C7**	RS
	240	4.0	3	32¾	(832)	13	(6)	**BHN732N12C4**	RS	**BHN732N12C5**	RS	**BHN732N12C7**	RS
	480	4.0	3	32¾	(832)	13	(6)	**BHN732N13C4**	RS	**BHN732N13C5**	RS	**BHN732N13C7**	RS
	240	5.0	3	40¼	(1022)	14	(7)	**BHN740E12C4**	RS	**BHN740E12C5**	RS	**BHN740E12C7**	RS
	480	5.0	3	40¼	(1022)	14	(7)	**BHN740E13C4**	RS	**BHN740E13C5**	RS	**BHN740E13C7**	RS
	240	6.0	3	47¾	(1213)	15	(7)	**BHN747N12C4**	RS	**BHN747N12C5**	RS	**BHN747N12C7**	RS
	480	6.0	3	47¾	(1213)	15	(7)	**BHN747N13C4**	RS	**BHN747N13C5**	RS	**BHN747N13C7**	RS
15 W/in² Steel Plug 3-Steel Elements (2.3 W/cm²)	240	1.5	3	13¼	(337)	10	(5)	**BHSS13E3C4**	RS	**BHSS13E3C5**	RS	**BHSS13E3C7**	RS
	480	1.5	3	13¼	(337)	10	(5)	**BHSS13E13C4**	RS	**BHSS13E13C5**	RS	**BHSS13E13C7**	RS
	240	2.0	3	17½	(445)	11	(5)	**BHSS17J3C4**	RS	**BHSS17J3C5**	RS	**BHSS17J3C7**	RS
	480	2.0	3	17½	(445)	11	(5)	**BHSS17J5C4**	RS	**BHSS17J5C5**	RS	**BHSS17J5C7**	RS
	240	2.5	3	20½	(521)	12	(6)	**BHSS20J3C4**	RS	**BHSS20J3C5**	RS	**BHSS20J3C7**	RS
	480	2.5	3	20½	(521)	12	(6)	**BHSS20J5C4**	RS	**BHSS20J5C5**	RS	**BHSS20J5C7**	RS
	240	3.0	3	25	(635)	13	(6)	**BHSS25A3C4**	RS	**BHSS25A3C5**	RS	**BHSS25A3C7**	RS
	480	3.0	3	25	(635)	13	(6)	**BHSS25A5C4**	RS	**BHSS25A5C5**	RS	**BHSS25A5C7**	RS
	240	4.0	3	32½	(826)	16	(8)	**BHSS32J3C4**	RS	**BHSS32J3C5**	RS	**BHSS32J3C7**	RS
	480	4.0	3	32½	(826)	16	(8)	**BHSS32J5C4**	RS	**BHSS32J5C5**	RS	**BHSS32J5C7**	RS
	240	5.0	3	40	(1016)	17	(8)	**BHSS40A3C4**	RS	**BHSS40A3C5**	RS	**BHSS40A3C7**	RS
	480	5.0	3	40	(1016)	17	(8)	**BHSS40A5C4**	RS	**BHSS40A5C5**	RS	**BHSS40A5C7**	RS
	240	6.0	3	47½	(1207)	17	(8)	**BHSS47J3C4**	RS	**BHSS47J3C5**	RS	**BHSS47J3C7**	RS
	480	6.0	3	47½	(1207)	17	(8)	**BHSS47J5C4**	RS	**BHSS47J5C5**	RS	**BHSS47J5C7**	RS
	240	7.5	3	58½	(1486)	20	(9)	**BHSS58J3C4**	RS	**BHSS58J3C5**	RS	**BHSS58J3C7**	RS
	240	9.0	3	69¾	(1772)	24	(11)	**BHSS69N3C4**	RS	**BHSS69N3C5**	RS	**BHSS69N3C7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

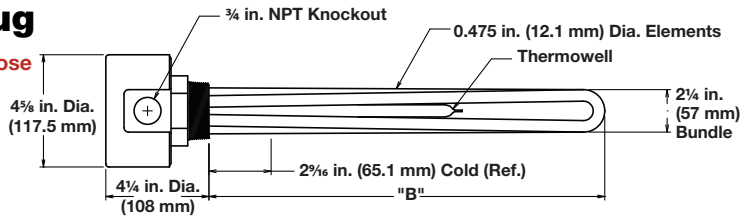
③ Wired for 3-phase operation only

WATROD and FIREBAR Screw Plug Immersion Heaters

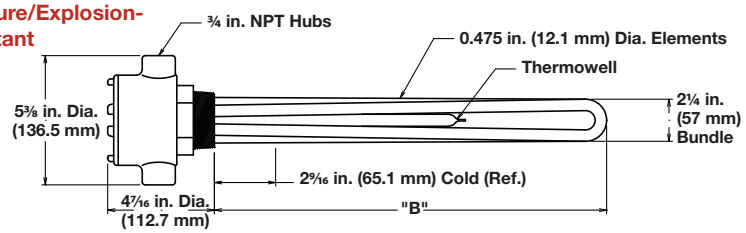
Application: Medium Weight Oils and Heat Transfer Oils

- 2 inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
16 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.5 W/cm²)	240	1.0	3	9¾	(248)	**BHN79N12S**	RS	5	(3)	**BHN79N12C**	RS	8	(4)
	480	1.0	3	9¾	(248)	**BHN79N13S**	RS	5	(3)	**BHN79N13C**	RS	8	(4)
	240	1.5	3	13¼	(337)	**BHN713E12S**	RS	6	(3)	**BHN713E12C**	RS	9	(4)
	480	1.5	3	13¼	(337)	**BHN713E13S**	RS	6	(3)	**BHN713E13C**	RS	9	(4)
	240	2.0	3	17¾	(451)	**BHN717N12S**	RS	7	(4)	**BHN717N12C**	RS	10	(5)
	480	2.0	3	17¾	(451)	**BHN717N13S**	RS	7	(4)	**BHN717N13C**	RS	10	(5)
	240	2.5	3	20¼	(514)	**BHN720E12S**	RS	8	(4)	**BHN720E12C**	RS	11	(5)
	480	2.5	3	20¼	(514)	**BHN720E13S**	RS	8	(4)	**BHN720E13C**	RS	11	(5)
	240	3.0	3	25¼	(641)	**BHN725E12S**	RS	9	(4)	**BHN725E12C**	RS	12	(6)
	480	3.0	3	25¼	(641)	**BHN725E13S**	RS	9	(4)	**BHN725E13C**	RS	12	(6)
	240	4.0	3	32¾	(832)	**BHN732N12S**	RS	9	(4)	**BHN732N12C**	RS	12	(6)
	480	4.0	3	32¾	(832)	**BHN732N13S**	RS	9	(4)	**BHN732N13C**	RS	12	(6)
	240	5.0	3	40¼	(1022)	**BHN740E12S**	RS	10	(5)	**BHN740E12C**	RS	13	(6)
	480	5.0	3	40¼	(1022)	**BHN740E13S**	RS	10	(5)	**BHN740E13C**	RS	13	(6)
	240	6.0	3	47¾	(1213)	**BHN747N12S**	RS	11	(5)	**BHN747N12C**	RS	14	(7)
	480	6.0	3	47¾	(1213)	**BHN747N13S**	RS	11	(5)	**BHN747N13C**	RS	14	(7)
15 W/in² Steel Plug 3-Steel Elements (2.3 W/cm²)	240	1.5	3	13¼	(337)	**BHSS13E3S**	RS	6	(3)	**BHSS13E3C**	RS	9	(4)
	480	1.5	3	13¼	(337)	**BHSS13E13S**	RS	6	(3)	**BHSS13E13C**	RS	9	(4)
	240	2.0	3	17½	(445)	**BHSS17J3S**	RS	7	(4)	**BHSS17J3C**	RS	10	(5)
	480	2.0	3	17½	(445)	**BHSS17J5S**	RS	7	(4)	**BHSS17J5C**	RS	10	(5)
	240	2.5	3	20½	(521)	**BHSS20J3S**	RS	8	(4)	**BHSS20J3C**	RS	11	(5)
	480	2.5	3	20½	(521)	**BHSS20J5S**	RS	8	(4)	**BHSS20J5C**	RS	11	(5)
	240	3.0	3	25	(635)	**BHSS25A3S**	RS	9	(4)	**BHSS25A3C**	RS	12	(6)
	480	3.0	3	25	(635)	**BHSS25A5S**	RS	9	(4)	**BHSS25A5C**	RS	12	(6)
	240	4.0	3	32½	(826)	**BHSS32J3S**	RS	9	(4)	**BHSS32J3C**	RS	12	(6)
	480	4.0	3	32½	(826)	**BHSS32J5S**	RS	9	(4)	**BHSS32J5C**	RS	12	(6)
	240	5.0	3	40	(1016)	**BHSS40A3S**	RS	10	(5)	**BHSS40A3C**	RS	13	(6)
	480	5.0	3	40	(1016)	**BHSS40A5S**	RS	10	(5)	**BHSS40A5C**	RS	13	(6)
	240	6.0	3	47½	(1207)	**BHSS47J3S**	RS	11	(5)	**BHSS47J3C**	RS	14	(7)
	480	6.0	3	47½	(1207)	**BHSS47J5S**	RS	11	(5)	**BHSS47J5C**	RS	14	(7)
	240	7.5	3	58½	(1486)	**BHSS58J3S**	RS	14	(7)	**BHSS58J3C**	RS	17	(8)
	480	7.5	3	58½	(1486)	**BHSS58J5S**	RS	14	(7)	**BHSS58J5C**	RS	17	(8)
	240	9.0	3	69¾	(1772)	**BHSS69N3S**	RS	16	(8)	**BHSS69N3C**	RS	19	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

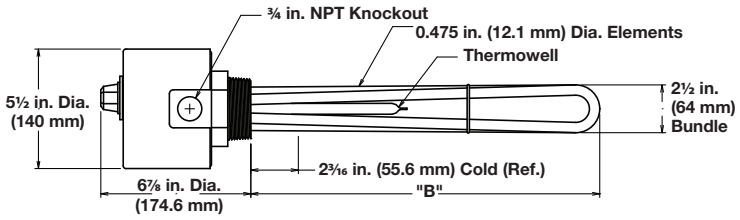
③ Wired for 3-phase operation only

⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
- General purpose enclosure



								Type 4 (30-110°F)		Type 5 (60-250°F)		Type 7 (100-550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								General Purpose Enclosure					
16 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.5 W/cm²)	240	1.0	3	9⅜	(238.1)	7	(4)	**BLN79G12S4**	RS	**BLN79G12S5**	RS	**BLN79G12S7**	RS
	480	1.0	3	9⅜	(238.1)	7	(4)	**BLN79G13S4**	RS	**BLN79G13S5**	RS	**BLN79G13S7**	RS
	240	1.5	3	12⅞	(327.0)	8	(4)	**BLN712R12S4**	RS	**BLN712R12S5**	RS	**BLN712R12S7**	RS
	480	1.5	3	12⅞	(327.0)	8	(4)	**BLN712R13S4**	RS	**BLN712R13S5**	RS	**BLN712R13S7**	RS
	240	2.0	3	17⅜	(441.3)	10	(5)	**BLN717G12S4**	RS	**BLN717G12S5**	RS	**BLN717G12S7**	RS
	480	2.0	3	17⅜	(441.3)	10	(5)	**BLN717G13S4**	RS	**BLN717G13S5**	RS	**BLN717G13S7**	RS
	240	2.5	3	19⅞	(504.8)	12	(6)	**BLN719R12S4**	RS	**BLN719R12S5**	RS	**BLN719R12S7**	RS
	480	2.5	3	19⅞	(504.8)	12	(6)	**BLN719R13S4**	RS	**BLN719R13S5**	RS	**BLN719R13S7**	RS
	240	3.0	3	24⅞	(631.8)	13	(6)	**BLN724R12S4**	RS	**BLN724R12S5**	RS	**BLN724R12S7**	RS
	480	3.0	3	24⅞	(631.8)	13	(6)	**BLN724R13S4**	RS	**BLN724R13S5**	RS	**BLN724R13S7**	RS
	240	4.0	3	32⅜	(822.3)	15	(7)	**BLN732G12S4**	RS	**BLN732G12S5**	RS	**BLN732G12S7**	RS
	480	4.0	3	32⅜	(822.3)	15	(7)	**BLN732G13S4**	RS	**BLN732G13S5**	RS	**BLN732G13S7**	RS
	240	5.0	3	39⅞	(1012.8)	16	(8)	**BLN739R12S4**	RS	**BLN739R12S5**	RS	**BLN739R12S7**	RS
	480	5.0	3	39⅞	(1012.8)	16	(8)	**BLN739R13S4**	RS	**BLN739R13S5**	RS	**BLN739R13S7**	RS
	240	6.0	3	47⅜	(1203.3)	18	(9)	**BLN747G12S4**	RS	**BLN747G12S5**	RS	**BLN747G12S7**	RS
	480	6.0	3	47⅜	(1203.3)	18	(9)	**BLN747G13S4**	RS	**BLN747G13S5**	RS	**BLN747G13S7**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

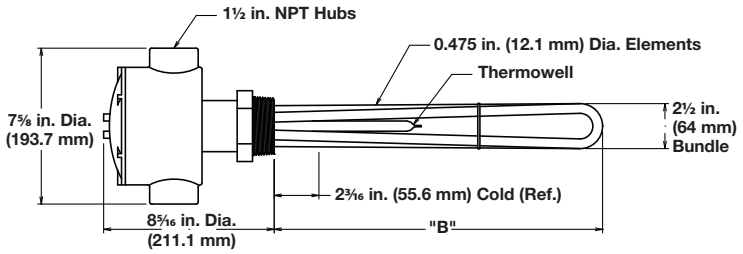
Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

WATROD and FIREBAR Screw Plug Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
- Moisture/explosion-resistant enclosure



								Type 4 (30-110°F)		Type 5 (60-250°F)		Type 7 (100-550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery	Code Number	Delivery
								Moisture/Explosion-Resistant Enclosure					
16 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.5 W/cm²)	240	1.0	3	9⅜	(238.1)	10	(5)	BLN79G12C4	RS	BLN79G12C5	RS	BLN79G12C7	RS
	480	1.0	3	9⅜	(238.1)	10	(5)	BLN79G13C4	RS	BLN79G13C5	RS	BLN79G13C7	RS
	240	1.5	3	12⅞	(327.0)	11	(5)	BLN712R12C4	RS	BLN712R12C5	RS	BLN712R12C7	RS
	480	1.5	3	12⅞	(327.0)	11	(5)	BLN712R13C4	RS	BLN712R13C5	RS	BLN712R13C7	RS
	240	2.0	3	17⅜	(441.3)	13	(6)	BLN717G12C4	RS	BLN717G12C5	RS	BLN717G12C7	RS
	480	2.0	3	17⅜	(441.3)	13	(6)	BLN717G13C4	RS	BLN717G13C5	RS	BLN717G13C7	RS
	240	2.5	3	19⅞	(504.8)	15	(7)	BLN719R12C4	RS	BLN719R12C5	RS	BLN719R12C7	RS
	480	2.5	3	19⅞	(504.8)	15	(7)	BLN719R13C4	RS	BLN719R13C5	RS	BLN719R13C7	RS
	240	3.0	3	24⅞	(631.8)	16	(8)	BLN724R12C4	RS	BLN724R12C5	RS	BLN724R12C7	RS
	480	3.0	3	24⅞	(631.8)	16	(8)	BLN724R13C4	RS	BLN724R13C5	RS	BLN724R13C7	RS
	240	4.0	3	32⅜	(822.3)	18	(9)	BLN732G12C4	RS	BLN732G12C5	RS	BLN732G12C7	RS
	480	4.0	3	32⅜	(822.3)	18	(9)	BLN732G13C4	RS	BLN732G13C5	RS	BLN732G13C7	RS
	240	5.0	3	39⅞	(1012.8)	19	(9)	BLN739R12C4	RS	BLN739R12C5	RS	BLN739R12C7	RS
	480	5.0	3	39⅞	(1012.8)	19	(9)	BLN739R13C4	RS	BLN739R13C5	RS	BLN739R13C7	RS
	240	6.0	3	47⅜	(1203.3)	21	(10)	BLN747G12C4	RS	BLN747G12C5	RS	BLN747G12C7	RS
	480	6.0	3	47⅜	(1203.3)	21	(10)	BLN747G13C4	RS	BLN747G13C5	RS	BLN747G13C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

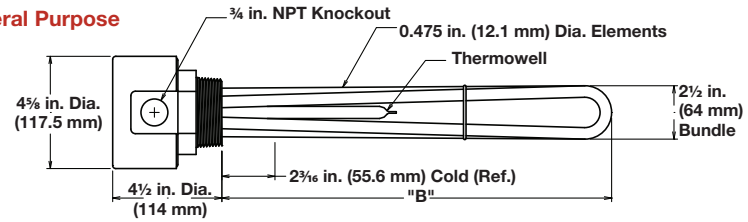
③ Wired for 3-phase operation only

WATROD and FIREBAR Screw Plug Immersion Heaters

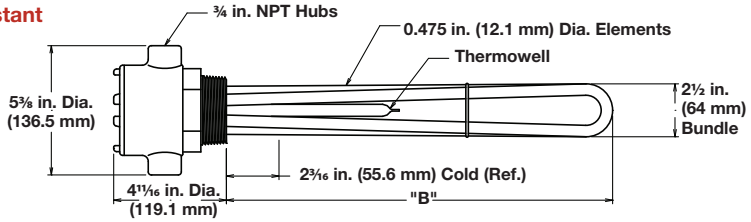
Application: Medium Weight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Code Number	Delivery	Ship Wt. lbs.	(kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	(kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
16 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.5 W/cm²)	240	1.0	1	9⅜	(238.1)	**BLN79G12S**	RS	6	(3)	**BLN79G12C**	RS	9	(4)
	480	1.0	3	9⅜	(238.1)	**BLN79G13S**	RS	6	(3)	**BLN79G13C**	RS	9	(4)
	240	1.5	3	12⅞	(327.0)	**BLN712R12S**	RS	7	(4)	**BLN712R12C**	RS	10	(5)
	480	1.5	1	12⅞	(327.0)	**BLN712R13S**	RS	7	(4)	**BLN712R13C**	RS	10	(5)
	240	2.0	3	17⅜	(441.3)	**BLN717G12S**	RS	9	(4)	**BLN717G12C**	RS	12	(6)
	480	2.0	3	17⅜	(441.3)	**BLN717G13S**	RS	9	(4)	**BLN717G13C**	RS	12	(6)
	240	2.5	3	19⅞	(504.8)	**BLN719R12S**	RS	11	(5)	**BLN719R12C**	RS	14	(7)
	480	2.5	3	19⅞	(504.8)	**BLN719R13S**	RS	11	(5)	**BLN719R13C**	RS	14	(7)
	240	3.0	3	24⅞	(631.8)	**BLN724R12S**	RS	12	(6)	**BLN724R12C**	RS	15	(7)
	480	3.0	3	24⅞	(631.8)	**BLN724R13S**	RS	12	(6)	**BLN724R13C**	RS	15	(7)
	240	4.0	3	32⅜	(822.3)	**BLN732G12S**	RS	14	(7)	**BLN732G12C**	RS	17	(8)
	480	4.0	3	32⅜	(822.3)	**BLN732G13S**	RS	14	(7)	**BLN732G13C**	RS	17	(8)
	240	5.0	3	39⅞	(1012.8)	**BLN739R12S**	RS	15	(7)	**BLN739R12C**	RS	18	(9)
	480	5.0	3	39⅞	(1012.8)	**BLN739R13S**	RS	15	(7)	**BLN739R13C**	RS	18	(9)
	240	6.0	3	47⅞	(1203.3)	**BLN747G12S**	RS	17	(8)	**BLN747G12C**	RS	20	(9)
	480	6.0	3	47⅞	(1203.3)	**BLN747G13S**	RS	17	(8)	**BLN747G13C**	RS	20	(9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

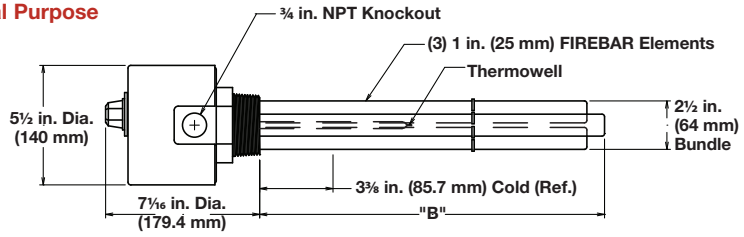
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

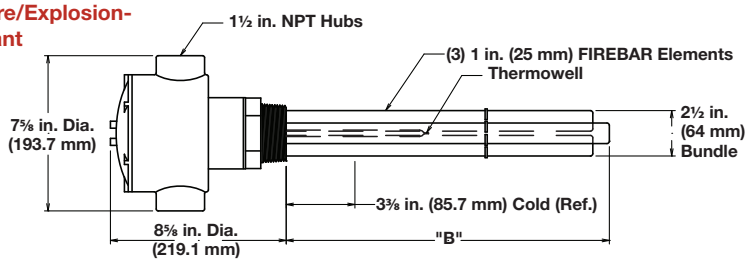
Application: Medium Weight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
  Note: Higher amperage products require a pilot duty thermostat with separate power controller. Please see following pages for available heaters without thermostats.
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 5A (60-250°F) Code Number	Type 5A Delivery	Type 7A (100-550°F) Code Number	Type 7A Delivery
								General Purpose Enclosure			
15 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.3 W/cm²)	240	2.0	3	12	(305)	11	(5)	BLNF12A29S5A	RS	BLNF12A29S7A	RS
	240	2.5	3	14½	(368)	12	(6)	BLNF14J29S5A	RS	BLNF14J29S7A	RS
	240	3.0	3	17	(432)	13	(6)	BLNF17A29S5A	RS	BLNF17A29S7A	RS
	240	4.0	3	21½	(546)	15	(7)	BLNF21J29S5A	RS	BLNF21J29S7A	RS
	480	4.0	3	21½	(546)	15	(7)	BLNF21J30S5A	RS	BLNF21J30S7A	RS
	240	5.0	3	26½	(673)	18	(9)	BLNF26J29S5A	RS	BLNF26J29S7A	RS
	480	5.0	3	26½	(673)	18	(9)	BLNF26J30S5A	RS	BLNF26J30S7A	RS
	240	6.0	3	31½	(800)	19	(9)	BLNF31J29S5A	RS	BLNF31J29S7A	RS
	480	6.0	3	31½	(800)	19	(9)	BLNF31J30S5A	RS	BLNF31J30S7A	RS
	240	8.0	3	41	(1041)	21	(10)	BLNF41A29S5A	RS	BLNF41A29S7A	RS
	240	10.0	3	50½	(1283)	23	(11)	BLNF50J29S5A	RS	BLNF50J29S7A	RS
								Moisture/Explosion-Resistant Enclosure ⑦			
15 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.3 W/cm²)	240	2.0	3	12	(305)	14	(7)	BLNF12A29C5A	RS	BLNF12A29C7A	RS
	240	2.5	3	14½	(368)	15	(7)	BLNF14J29C5A	RS	BLNF14J29C7A	RS
	240	3.0	3	17	(432)	16	(8)	BLNF17A29C5A	RS	BLNF17A29C7A	RS
	240	4.0	3	21½	(546)	18	(9)	BLNF21J29C5A	RS	BLNF21J29C7A	RS
	480	4.0	3	21½	(546)	18	(9)	BLNF21J30C5A	RS	BLNF21J30C7A	RS
	240	5.0	3	26½	(673)	21	(10)	BLNF26J29C5A	RS	BLNF26J29C7A	RS
	480	5.0	3	26½	(673)	21	(10)	BLNF26J30C5A	RS	BLNF26J30C7A	RS
	240	6.0	3	31½	(800)	22	(10)	BLNF31J29C5A	RS	BLNF31J29C7A	RS
	480	6.0	3	31½	(800)	22	(10)	BLNF31J30C5A	RS	BLNF31J30C7A	RS
	240	8.0	3	41	(1041)	24	(11)	BLNF41A29C5A	RS	BLNF41A29C7A	RS
	240	10.0	3	50½	(1283)	26	(11)	BLNF50J29C5A	RS	BLNF50J29C7A	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

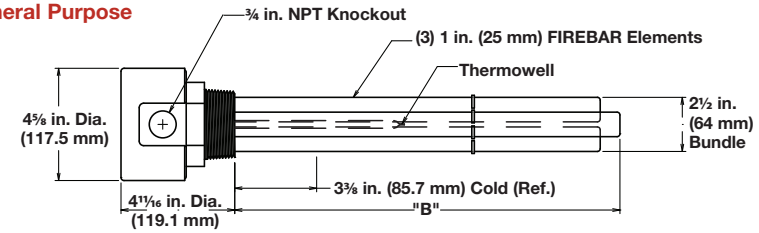
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

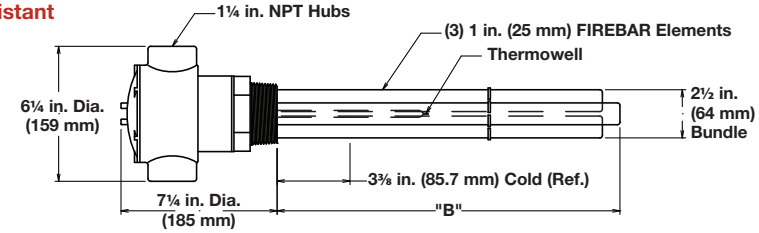
Application: Medium Weight Oils and Heat Transfer Oils

- 2½ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. In.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
15 W/in² ③ 304 SS Plug 3-Incoloy Elements (2.3 W/cm²)	240	2.0	3	12	(305)	**BLNF12A29S**	RS	10	(5)	**BLNF12A29C**	RS	13	(6)
	240	2.5	3	14½	(368)	**BLNF14J29S**	RS	11	(5)	**BLNF14J29C**	RS	14	(7)
	240	3.0	3	17	(432)	**BLNF17A29S**	RS	12	(6)	**BLNF17A29C**	RS	15	(7)
	240	4.0	3	21½	(546)	**BLNF21J29S**	RS	14	(7)	**BLNF21J29C**	RS	17	(8)
	480	4.0	3	21½	(546)	**BLNF21J30S**	RS	14	(7)	**BLNF21J30C**	RS	17	(8)
	240	5.0	3	26½	(673)	**BLNF26J29S**	RS	17	(8)	**BLNF26J29C**	RS	20	(9)
	480	5.0	3	26½	(673)	**BLNF26J30S**	RS	17	(8)	**BLNF26J30C**	RS	20	(9)
	240	6.0	3	31½	(800)	**BLNF31J29S**	RS	18	(9)	**BLNF31J29C**	RS	21	(10)
	480	6.0	3	31½	(800)	**BLNF31J30S**	RS	18	(9)	**BLNF31J30C**	RS	21	(10)
	240	8.0	3	41	(1041)	**BLNF41A29S**	RS	20	(9)	**BLNF41A29C**	RS	23	(11)
	480	8.0	3	41	(1041)	**BLNF41A30S**	RS	20	(9)	**BLNF41A30C**	RS	23	(11)
	240	10.0	3	50½	(1283)	**BLNF50J29S**	RS	22	(10)	**BLNF50J29C**	RS	25	(12)
	480	10.0	3	50½	(1283)	**BLNF50J30S**	RS	22	(10)	**BLNF50J30C**	RS	25	(12)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

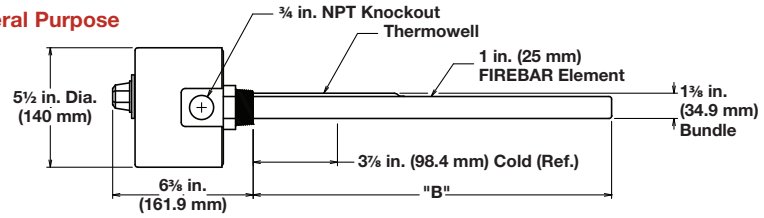
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

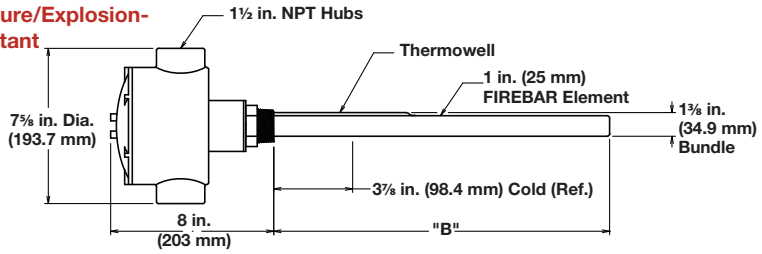
Application: Bunker C, Asphalt and #6 Fuel Oil

- 1¼ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



								Type 5A (60-250°F)		Type 7A (100-550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs.	(kg)	Code Number	Delivery	Code Number	Delivery
								General Purpose			
8 W/in² ③ 304 SS Plug 1-Incoloy Element (1.3 W/cm²)	240	0.43	3	16⅛	(409.6)	8	(4)	BDNF13A27S5A	RS	BDNF13A27S7A	RS
	240	0.55	3	19⅛	(485.8)	9	(4)	BDNF15J27S5A	RS	BDNF15J27S7A	RS
	240	0.70	3	24⅜	(619.1)	10	(5)	BDNF18A27S5A	RS	BDNF18A27S7A	RS
	480	0.70	3	24⅜	(619.1)	10	(5)	BDNF22J27S5A	RS	BDNF22J27S7A	RS
	240	0.88	3	29⅝	(752.5)	11	(5)	BDNF22J28S5A	RS	BDNF22J28S7A	RS
	480	0.88	3	29⅝	(752.5)	11	(5)	BDNF27J27S5A	RS	BDNF27J27S7A	RS
	240	1.08	3	34⅜	(879.5)	12	(6)	BDNF27J28S5A	RS	BDNF27J28S7A	RS
	480	1.08	3	34⅜	(879.5)	12	(6)	BDNF32J27S5A	RS	BDNF32J27S7A	RS
	240	1.40	3	45⅛	(1146.2)	14	(7)	BDNF32J28S5A	RS	BDNF32J28S7A	RS
	480	1.40	3	45⅛	(1146.2)	14	(7)	BDNF42A27S5A	RS	BDNF42A27S7A	RS
	240	1.80	3	55⅝	(1412.9)	16	(8)	BDNF42A28S5A	RS	BDNF42A28S7A	RS
	480	1.80	3	55⅝	(1412.9)	16	(8)	BDNF51J27S5A	RS	BDNF51J27S7A	RS
								Moisture/Explosion-Resistant Enclosure ⑦			
8 W/in² ③ 304 SS Plug 1-Incoloy Element (1.3 W/cm²)	240	0.43	3	16⅛	(409.6)	11	(5)	BDNF13A27C5A	RS	BDNF13A27C7A	RS
	240	0.55	3	19⅛	(485.8)	12	(6)	BDNF15J27C5A	RS	BDNF15J27C7A	RS
	240	0.70	3	24⅜	(619.1)	13	(6)	BDNF18A27C5A	RS	BDNF18A27C7A	RS
	480	0.70	3	24⅜	(619.1)	13	(6)	BDNF22J27C5A	RS	BDNF22J27C7A	RS
	240	0.88	3	29⅝	(752.5)	14	(7)	BDNF22J28C5A	RS	BDNF22J28C7A	RS
	480	0.88	3	29⅝	(752.5)	14	(7)	BDNF27J27C5A	RS	BDNF27J27C7A	RS
	240	1.08	3	34⅜	(879.5)	15	(7)	BDNF27J28C5A	RS	BDNF27J28C7A	RS
	480	1.08	3	34⅜	(879.5)	15	(7)	BDNF32J27C5A	RS	BDNF32J27C7A	RS
	240	1.40	3	45⅛	(1146.2)	17	(8)	BDNF32J28C5A	RS	BDNF32J28C7A	RS
	480	1.40	3	45⅛	(1146.2)	17	(8)	BDNF42A27C5A	RS	BDNF42A27C7A	RS
	240	1.80	3	55⅝	(1412.9)	19	(9)	BDNF42A28C5A	RS	BDNF42A28C7A	RS
	480	1.80	3	55⅝	(1412.9)	19	(9)	BDNF51J27C5A	RS	BDNF51J27C7A	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

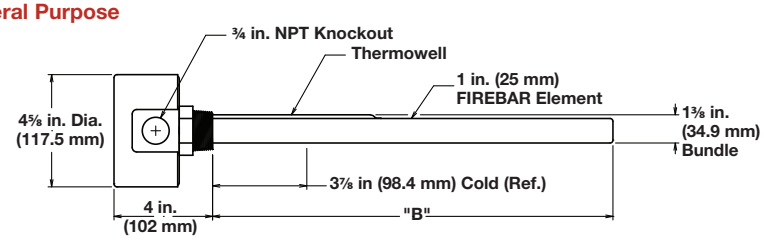
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

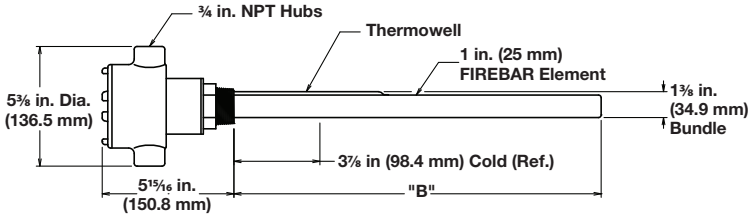
Application: Bunker C, Asphalt and #6 Fuel Oil

- 1¼ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in. (mm)	Code Number	Delivery	Ship Wt. lbs. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs. (kg)
					General Purpose Enclosure			Moisture/Explosion-Resistant Enclosure		
8 W/in² ③ 304 SS Plug 1-Incoloy Element (1.3 W/cm²)	240	0.43	3	16⅛ (409.6)	**BDNF16G22S**	RS	7 (4)	**BDNF13A27C**	RS	10 (5)
	240	0.55	3	19⅛ (485.8)	**BDNF19G22S**	RS	8 (4)	**BDNF15J27C**	RS	11 (5)
	240	0.70	3	24⅜ (619.1)	**BDNF24L22S**	RS	9 (4)	**BDNF18A27C**	RS	12 (6)
	480	0.70	3	24⅜ (619.1)	**BDNF24L21S**	RS	9 (4)	**BDNF22J27C**	RS	12 (6)
	240	0.88	3	29⅝ (752.5)	**BDNF29R22S**	RS	10 (5)	**BDNF22J28C**	RS	13 (6)
	480	0.88	3	29⅝ (752.5)	**BDNF29R21S**	RS	10 (5)	**BDNF27J27C**	RS	13 (6)
	240	1.08	3	34⅝ (879.5)	**BDNF34R22S**	RS	11 (5)	**BDNF27J28C**	RS	14 (7)
	480	1.08	3	34⅝ (879.5)	**BDNF34R21S**	RS	11 (5)	**BDNF32J27C**	RS	14 (7)
	240	1.40	3	45⅛ (1146.2)	**BDNF45G22S**	RS	13 (6)	**BDNF32J28C**	RS	16 (8)
	480	1.40	3	45⅛ (1146.2)	**BDNF45G21S**	RS	13 (6)	**BDNF42A27C**	RS	16 (8)
	240	1.80	3	55⅝ (1412.9)	**BDNF55R22S**	RS	15 (7)	**BDNF42A28C**	RS	18 (9)
	480	1.80	3	55⅝ (1412.9)	**BDNF55R21S**	RS	15 (7)	**BDNF51J27C**	RS	18 (9)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

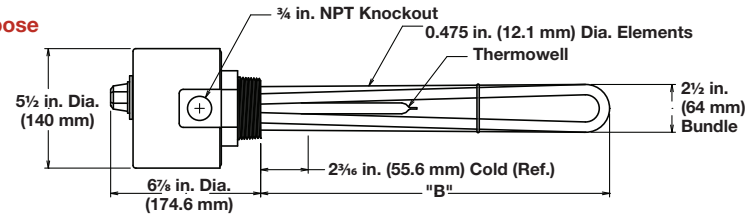
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

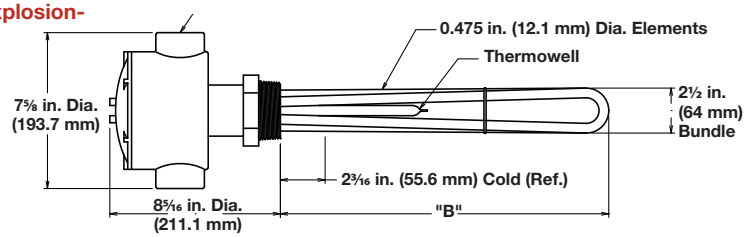
Application: Bunker C, Asphalt and #6 Fuel Oil

- 2½ inch NPT screw plug
- WATROD elements
- With thermostat (DPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs.	Ship Wt. (kg)	Type 4 (30-110°F) Code Number	Type 4 Delivery	Type 5 (60-250°F) Code Number	Type 5 Delivery	Type 7 (100-550°F) Code Number	Type 7 Delivery
								General Purpose Enclosure					
8 W/in² ③ Steel Plug 3-Steel Element (1.3 W/cm²)	240	1.0	3	17¼	(438)	10	(5)	BLS717E12S4	RS	BLS717E12S5	RS	BLS717E12S7	RS
	480	1.0	3	17¼	(438)	10	(5)	BLS717E13S4	RS	BLS717E13S5	RS	BLS717E13S7	RS
	240	1.5	3	24¾	(629)	13	(6)	BLS724N12S4	RS	BLS724N12S5	RS	BLS724N12S7	RS
	480	1.5	3	24¾	(629)	13	(6)	BLS724N13S4	RS	BLS724N13S5	RS	BLS724N13S7	RS
	240	2.0	3	32¼	(819)	15	(7)	BLS732E12S4	RS	BLS732E12S5	RS	BLS732E12S7	RS
	480	2.0	3	32¼	(819)	15	(7)	BLS732E13S4	RS	BLS732E13S5	RS	BLS732E13S7	RS
	240	2.5	3	39¾	(1010)	16	(8)	BLS739N12S4	RS	BLS739N12S5	RS	BLS739N12S7	RS
	480	2.5	3	39¾	(1010)	16	(8)	BLS739N13S4	RS	BLS739N13S5	RS	BLS739N13S7	RS
	240	3.0	3	47¼	(1200)	18	(9)	BLS747E12S4	RS	BLS747E12S5	RS	BLS747E12S7	RS
	480	3.0	3	47¼	(1200)	18	(9)	BLS747E13S4	RS	BLS747E13S5	RS	BLS747E13S7	RS
	240	4.0	3	63¾	(1619)	21	(10)	BLS763N12S4	RS	BLS763N12S5	RS	BLS763N12S7	RS
	480	4.0	3	63¾	(1619)	21	(10)	BLS763N13S4	RS	BLS763N13S5	RS	BLS763N13S7	RS
	240	5.0	3	76¼	(1937)	24	(11)	BLS776E12S4	RS	BLS776E12S5	RS	BLS776E12S7	RS
	480	5.0	3	76¼	(1937)	24	(11)	BLS776E13S4	RS	BLS776E13S5	RS	BLS776E13S7	RS
								Moisture/Explosion-Resistant Enclosure ⑦					
8 W/in² ③ Steel Plug 3-Steel Element (1.3 W/cm²)	240	1.0	3	17¼	(438)	13	(6)	BLS717E12C4	RS	BLS717E12C5	RS	BLS717E12C7	RS
	480	1.0	3	17¼	(438)	13	(6)	BLS717E13C4	RS	BLS717E13C5	RS	BLS717E13C7	RS
	240	1.5	3	24¾	(629)	16	(8)	BLS724N12C4	RS	BLS724N12C5	RS	BLS724N12C7	RS
	480	1.5	3	24¾	(629)	16	(8)	BLS724N13C4	RS	BLS724N13C5	RS	BLS724N13C7	RS
	240	2.0	3	32¼	(819)	18	(9)	BLS732E12C4	RS	BLS732E12C5	RS	BLS732E12C7	RS
	480	2.0	3	32¼	(819)	18	(9)	BLS732E13C4	RS	BLS732E13C5	RS	BLS732E13C7	RS
	240	2.5	3	39¾	(1010)	19	(9)	BLS739N12C4	RS	BLS739N12C5	RS	BLS739N12C7	RS
	480	2.5	3	39¾	(1010)	19	(9)	BLS739N13C4	RS	BLS739N13C5	RS	BLS739N13C7	RS
	240	3.0	3	47¼	(1200)	21	(10)	BLS747E12C4	RS	BLS747E12C5	RS	BLS747E12C7	RS
	480	3.0	3	47¼	(1200)	21	(10)	BLS747E13C4	RS	BLS747E13C5	RS	BLS747E13C7	RS
	240	4.0	3	63¾	(1619)	24	(11)	BLS763N12C4	RS	BLS763N12C5	RS	BLS763N12C7	RS
	480	4.0	3	63¾	(1619)	24	(11)	BLS763N13C4	RS	BLS763N13C5	RS	BLS763N13C7	RS
	240	5.0	3	76¼	(1937)	27	(13)	BLS776E12C4	RS	BLS776E12C5	RS	BLS776E12C7	RS
	480	5.0	3	76¼	(1937)	27	(13)	BLS776E13C4	RS	BLS776E13C5	RS	BLS776E13C7	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

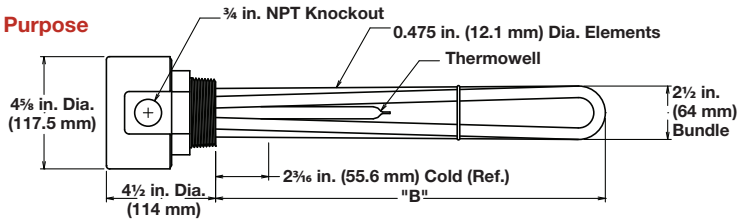
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

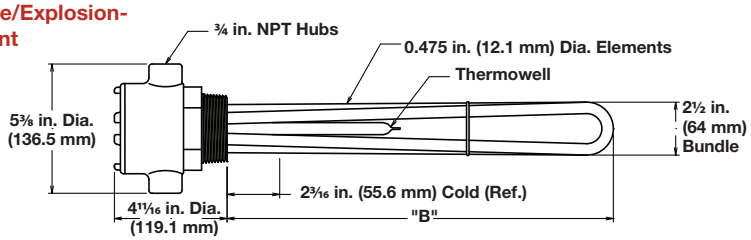
Application: Bunker C, Asphalt and #6 Fuel Oil

- 2½ inch NPT screw plug
- WATROD elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
8 W/in² ③ Steel Plug 3-Steel Element (1.3 W/cm²)	240	1.0	1	17¼	(438)	BLS717E12S	RS	9	(4)	BLS717E12C	RS	12	(6)
	480	1.0	3	17¼	(438)	BLS717E13S	RS	9	(4)	BLS717E13C	RS	12	(6)
	240	1.5	3	24¾	(629)	BLS724N12S	RS	12	(6)	BLS724N12C	RS	15	(7)
	480	1.5	1	24¾	(629)	BLS724N13S	RS	12	(6)	BLS724N13C	RS	15	(7)
	240	2.0	3	32¼	(819)	BLS732E12S	RS	14	(7)	BLS732E12C	RS	17	(8)
	480	2.0	3	32¼	(819)	BLS732E13S	RS	14	(7)	BLS732E13C	RS	17	(8)
	240	2.5	3	39¾	(1010)	BLS739N12S	RS	15	(7)	BLS739N12C	RS	18	(9)
	480	2.5	3	39¾	(1010)	BLS739N13S	RS	15	(7)	BLS739N13C	RS	18	(9)
	240	3.0	3	47¼	(1200)	BLS747E12S	RS	17	(8)	BLS747E12C	RS	20	(9)
	480	3.0	3	47¼	(1200)	BLS747E13S	RS	17	(8)	BLS747E13C	RS	20	(9)
	240	4.0	3	63¾	(1619)	BLS763N12S	RS	20	(9)	BLS763N12C	RS	23	(11)
	480	4.0	3	63¾	(1619)	BLS763N13S	RS	20	(9)	BLS763N13C	RS	23	(11)
	240	5.0	3	76¼	(1937)	BLS776E12S	RS	23	(11)	BLS776E12C	RS	26	(12)
	480	5.0	3	76¼	(1937)	BLS776E13S	RS	23	(11)	BLS776E13C	RS	26	(12)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

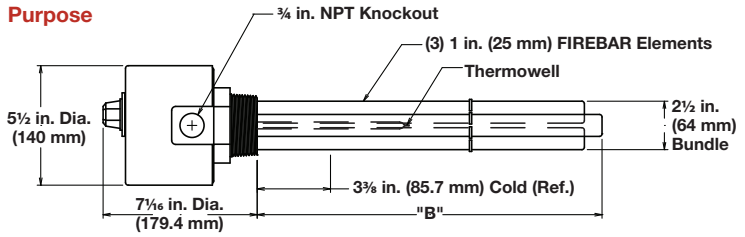
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

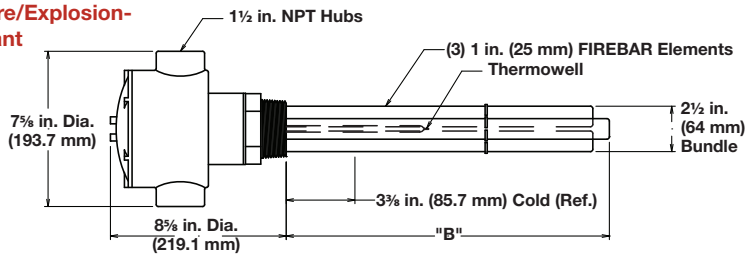
Application: Bunker C, Asphalt and #6 Fuel Oil

- 2½ inch NPT screw plug
- FIREBAR elements
- With thermostat (DPST)
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



							Type 5A (60-250°F)		Type 7A (100-550°F)	
Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs. (kg)	Code Number	Delivery	Code Number	Delivery
							General Purpose Enclosure			
8 W/in² ③ 304 SS Plug 3-Incoloy Elements (1.3 W/cm2)	240	1.25	3	15⅛	(384.2)	11 (5)	BLNF15C22S5A	RS	BLNF15C22S7A	RS
	240	1.63	3	18⅛	(460.4)	13 (6)	BLNF18C22S5A	RS	BLNF18C22S7A	RS
	240	2.13	3	23⅛	(587.4)	15 (7)	BLNF23C22S5A	RS	BLNF23C22S7A	RS
	480	2.13	3	23⅛	(587.4)	15 (7)	BLNF23C21S5A	RS	BLNF23C21S7A	RS
	240	2.63	3	28⅝	(727.1)	18 (9)	BLNF28L22S5A	RS	BLNF28L22S7A	RS
	480	2.63	3	28⅝	(727.1)	18 (9)	BLNF28L21S5A	RS	BLNF28L21S7A	RS
	240	3.19	3	33⅝	(854.1)	19 (9)	BLNF33L22S5A	RS	BLNF33L22S7A	RS
	480	3.19	3	33⅝	(854.1)	19 (9)	BLNF33L21S5A	RS	BLNF33L21S7A	RS
	240	4.25	3	44⅛	(1120.8)	21 (10)	BLNF44C22S5A	RS	BLNF44C22S7A	RS
	480	4.25	3	44⅛	(1120.8)	21 (10)	BLNF44C21S5A	RS	BLNF44C21S7A	RS
	240	5.38	3	54⅝	(1387.5)	23 (11)	BLNF54L22S5A	RS	BLNF54L22S7A	RS
	480	5.38	3	54⅝	(1387.5)	23 (11)	BLNF54L21S5A	RS	BLNF54L21S7A	RS
							Moisture/Explosion-Resistant Enclosure ⑦			
8 W/in² ③ 304 SS Plug 3-Incoloy Elements (1.3 W/cm2)	240	1.25	3	15⅛	(384.2)	14 (7)	BLNF15C22C5A	RS	BLNF15C22C7A	RS
	240	1.63	3	18⅛	(460.4)	16 (8)	BLNF18C22C5A	RS	BLNF18C22C7A	RS
	240	2.13	3	23⅛	(587.4)	18 (9)	BLNF23C22C5A	RS	BLNF23C22C7A	RS
	480	2.13	3	23⅛	(587.4)	18 (9)	BLNF23C21C5A	RS	BLNF23C21C7A	RS
	240	2.63	3	28⅝	(727.1)	21 (10)	BLNF28L22C5A	RS	BLNF28L22C7A	RS
	480	2.63	3	28⅝	(727.1)	21 (10)	BLNF28L21C5A	RS	BLNF28L21C7A	RS
	240	3.19	3	33⅝	(854.1)	22 (10)	BLNF33L22C5A	RS	BLNF33L22C7A	RS
	480	3.19	3	33⅝	(854.1)	22 (10)	BLNF33L21C5A	RS	BLNF33L21C7A	RS
	240	4.25	3	44⅛	(1120.8)	24 (11)	BLNF44C22C5A	RS	BLNF44C22C7A	RS
	480	4.25	3	44⅛	(1120.8)	24 (11)	BLNF44C21C5A	RS	BLNF44C21C7A	RS
	240	5.38	3	54⅝	(1387.5)	26 (11)	BLNF54L22C5A	RS	BLNF54L22C7A	RS
	480	5.38	3	54⅝	(1387.5)	26 (11)	BLNF54L21C5A	RS	BLNF54L21C7A	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

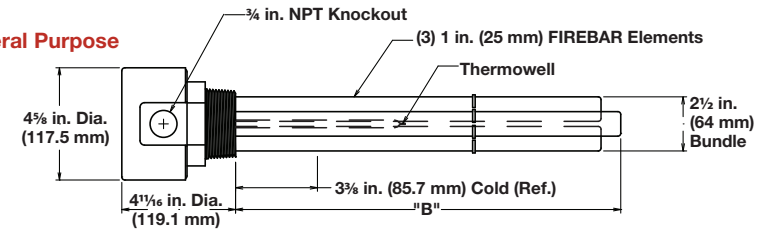
⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

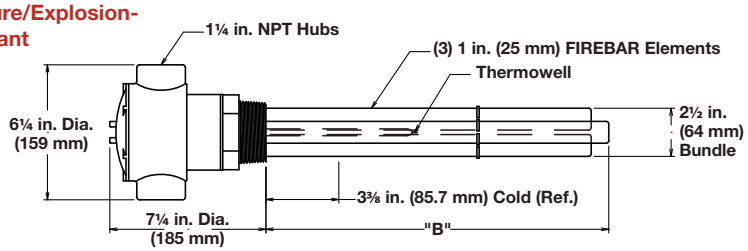
Application: Bunker C, Asphalt and #6 Fuel Oil

- 2½ inch NPT screw plug
- FIREBAR elements
- Without thermostat
- General purpose or moisture/explosion-resistant enclosure

General Purpose



Moisture/Explosion-Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Code Number	Delivery	Ship Wt. lbs.	Ship Wt. (kg)	Code Number ⑦	Delivery	Ship Wt. lbs.	Ship Wt. (kg)
						General Purpose Enclosure				Moisture/Explosion-Resistant Enclosure			
8 W/in² ③ 304 SS Plug 3-Incoloy Elements (1.3 W/cm²)	240	1.25	3	15⅛	(384.2)	**BLNF15C22S**	RS	11	(5)	**BLNF15C22C**	RS	14	(7)
	240	1.63	3	18⅛	(460.4)	**BLNF18C22S**	RS	12	(6)	**BLNF18C22C**	RS	15	(7)
	240	2.13	3	23⅛	(587.4)	**BLNF23C22S**	RS	14	(7)	**BLNF23C22C**	RS	17	(8)
	480	2.13	3	23⅛	(587.4)	**BLNF23C21S**	RS	14	(7)	**BLNF23C21C**	RS	17	(8)
	240	2.63	3	28⅝	(727.1)	**BLNF28L22S**	RS	17	(8)	**BLNF28L22C**	RS	20	(9)
	480	2.63	3	28⅝	(727.1)	**BLNF28L21S**	RS	17	(8)	**BLNF28L21C**	RS	20	(9)
	240	3.19	3	33⅝	(854.1)	**BLNF33L22S**	RS	18	(9)	**BLNF33L22C**	RS	21	(10)
	480	3.19	3	33⅝	(854.1)	**BLNF33L21S**	RS	18	(9)	**BLNF33L21C**	RS	21	(10)
	240	4.25	3	44⅛	(1120.8)	**BLNF44C22S**	RS	20	(9)	**BLNF44C22C**	RS	23	(11)
	480	4.25	3	44⅛	(1120.8)	**BLNF44C21S**	RS	20	(9)	**BLNF44C21C**	RS	23	(11)
	240	5.38	3	54⅝	(1387.5)	**BLNF54L22S**	RS	22	(10)	**BLNF54L22C**	RS	25	(12)
	480	5.38	3	54⅝	(1387.5)	**BLNF54L21S**	RS	22	(10)	**BLNF54L21C**	RS	25	(12)

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All screw plug bundles are designed to fit the inside diameter of the equivalent mating coupling. They will not fit into the equivalent pipe inside diameter.

③ Wired for 3-phase operation only

⑦ CSA certified only

WATROD and FIREBAR Screw Plug Immersion Heaters

Build-a-Code

Ordering Information

To order, complete the code number to the right with the information below:

Example: **BHC78C6** **S** **1** **HJ**

Stock Screw Plug Code Number ①

Optional Terminal Enclosures ②

S = General purpose enclosure
W = Moisture-resistant enclosure
E = Explosion-resistant enclosure
C = Moisture/explosion-resistant enclosure

Optional Process Sensor ④

1 = 30 to 110°F (-1 to 43°C), SPST
2 = 30 to 250°F (-1 to 121°C), SPST
3 = 175 to 550°F (79 to 288°C), SPST
4 = 30 to 110°F (-1 to 43°C), DPST
5 = 60 to 250°F (16 to 121°C), DPST (WATROD)
5A = 60 to 250°F (16 to 121°C), DPST (FIREBAR)
7 = 100 to 550°F (38 to 288°C), DPST (WATROD)
7A = 100 to 550°F (38 to 288°C), DPST (FIREBAR)
PJ = Type J process thermocouple in thermowell
PK = Type K process thermocouple in thermowell

Sheath Limit Sensor ③

HJ = Type J high-limit thermocouple, horizontal mount
TJ = Type J high-limit thermocouple, vertical/housing at top
BJ = Type J high-limit thermocouple, vertical/housing at bottom
HK = Type K high-limit thermocouple, horizontal mount
TK = Type K high-limit thermocouple, vertical/housing at top
BK = Type K high-limit thermocouple, vertical/housing at bottom

① Catalog part numbers include standard option enclosures and process sensors. To order optional enclosures or sensors, substitute the appropriate suffix.

② Standard catalog listings include either a general purpose enclosure or moisture/explosion-resistant enclosure. Substitute enclosure options are noted.

③ Heater orientation is critical to accurate sensing of limit conditions. Use the appropriate code to indicate heater mounting orientation.

④ Thermostat part numbers are shown in the *Thermostat Stock Chart* on page 652.

WATROD and FIREBAR Screw Plug Immersion Heaters

Screw Plug with Control Assembly

Constructed from a WATROD screw plug heater, a moisture resistant (NEMA 4) terminal enclosure and built-in temperature sensor and power control, this assembly comes pre-wired and ready for hook-up to any 120V~(ac) control circuit.

Optional sheath materials, NPT screw plug sizes and materials, wattages, voltages and terminal enclosures extend application versatility.

Performance Capabilities

- Watt densities to 60 W/in² (9.3 W/cm²)
- Wattages to 20 killowatts
- Voltages to 600V~(ac)
- Incoloy® sheath temperatures to 1600°F (870°C)

Features and Benefits

Three 0.475 in. (12 mm) diameter WATROD elements brazed to a 2 in. (51 mm) NPT brass screw plug

- Produces a pressure-tight seal

WATROD hairpins are repressed (recompacted) after bending

- Maintains MgO density, dielectric strength, heat transfer and life

Two built-in thermostats, one on-off with manual reset

- Helps ensure safe operation by automatically cycling on and off when process or sheath temperatures reach a predetermined set point selectable from 30° to 250°F (0° to 120°C)

Internal mechanical contactor

- Works on a 120V~(ac) control circuit to switch higher volts/amps to the heating elements

Hinged, moisture resistant (NEMA 4) terminal enclosure has two conduit openings

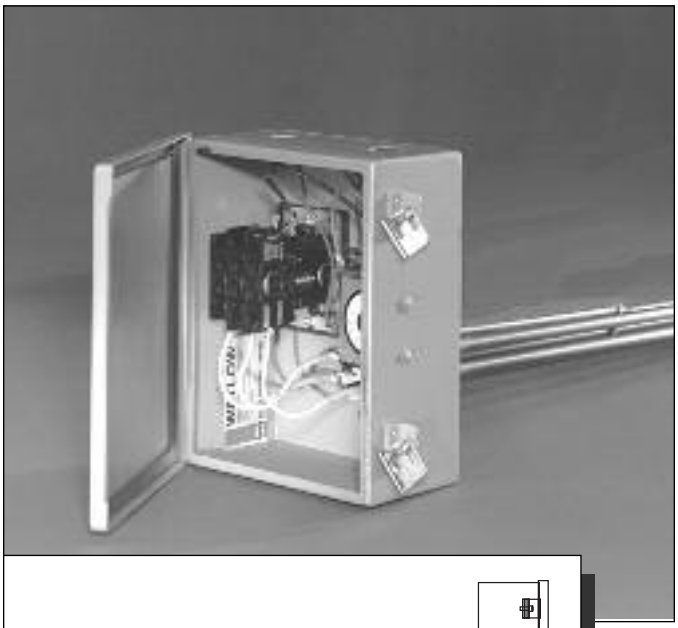
- Accomodates ¾ in. (19 mm) NPT conduit fittings

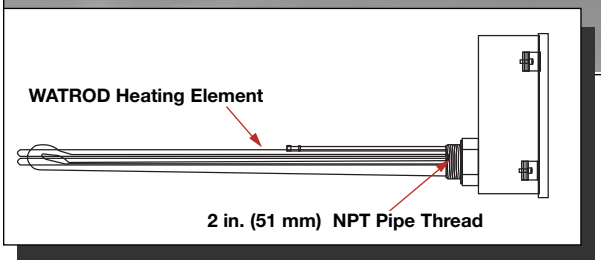
Terminal enclosures can be rotated to mate with existing conduits

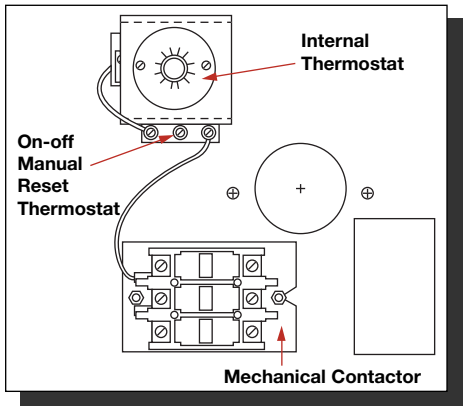
- Minimal fastener adjustment required

Thermowells allow replacing the thermostat sensing element without draining the fluid being heated

- Labor required to maintain and repair is minimized







Applications

- Water heating
- Commercial dishwashers and glass washers
- Sterilizing equipment

Application Hints

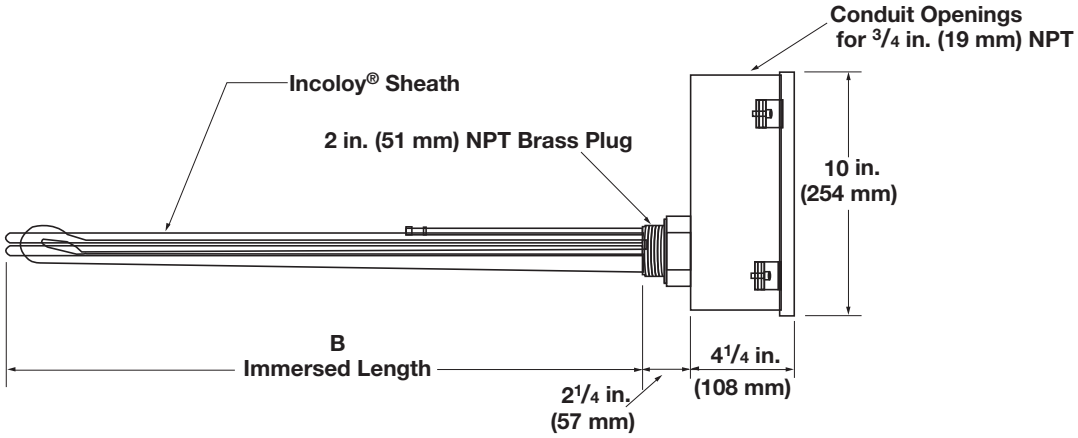
Same as *Screw Plug Immersion Heaters.* See page 129 for details.

Accessories

Clamping Nut, Gasket and Washers–for mounting to thin-wall tanks, use optional clamping nut, gasket and washers. To order, specify **NGW**.

WATROD and FIREBAR Screw Plug Immersion Heaters

Screw Plug with Control Assembly



2 in. (51 mm) NPT Brass Screw Plug With Control Box (Assembly Stock)

WATROD Desc.	kW	Immersed Length in. (mm)	Code Number 208V~(ac) 3-Phase	240V~(ac) 3-Phase	380V~(ac) 3-Phase	480V~(ac) 3-Phase	575V~(ac) 3-Phase	Est. Net Wt. lbs (kg)
50 W/in²	9	24¾ (629.0)		BHNB24N3W2C11		BHNB24N5W2C11	BHNB24N16W2C11	23 (10)
Brass Plug	12	30 (762.0)	BHNB30A2W2C11	BHNB30A3W2C11	BHNB30A8W2C11	BHNB30A5W2C11	BHNB30A16W2C11	24 (11)
3-Incoloy	16	35⅝ (904.8)	BHNB35L2W2C11	BHNB35L3W2C11	BHNB35L8W2C11	BHNB35L5W2C11	BHNB35L16W2C11	25 (11)
(7.8 W/cm²)	20	45⅝ (1158.8)		BHNB45L3W2C11	BHNB45L8W2C11	BHNB45L5W2C11	BHNB45L16W2C11	27 (12)

RAPID SHIP

- Same day shipment up to 5 pieces

How to Order

To order an Assembly Stock unit, please specify:

- Watlow code number
- Volts/watts
- Options, if applicable
- Quantity

If our assembly stock units do not meet your application needs, Watlow can provide **made-to-order** assemblies. For made-to order units, please specify:

- Volts/watts
- Phase
- Screw plug size and materials
- Number of elements
- Sheath material
- Immersed (‘B’ dimension) length
- No-heat section below the plug
- Options
- Quantity

Availability

Made-to-Order: Two to four weeks

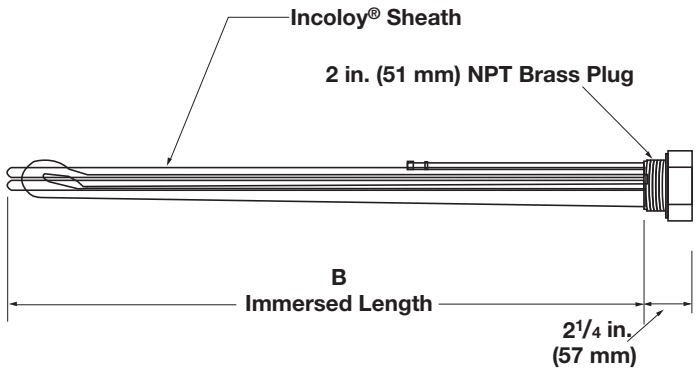
Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

Replacement Heater Only

To order a replacement screw plug heater see the information on the next page.

WATROD and FIREBAR Screw Plug Immersion Heaters

Screw Plug with Control Assembly



2 in. (51 mm) NPT Brass Screw Plug With Control Box (Replacement Heater Only)

WATROD Desc.	kW	Immersed Length in.	(mm)	Code Number 208V~(ac) 3-Phase	240V~(ac) 3-Phase	380V~(ac) 3-Phase	480V~(ac) 3-Phase	575V~(ac) 3-Phase	Est. Net Wt. lbs	(kg)
50 W/in²	9	24¾	(628.7)		BHNB24N3		BHNB24N5	BHNB24N16	21	(9)
Brass Plug	12	30	(762.0)	BHNB30A2	BHNB30A3	BHNB30A8	BHNB30A5	BHNB30A16	22	(10)
3-Incoloy	16	35⅝	(904.8)	BHNB35L2	BHNB35L3	BHNB35L8	BHNB35L5	BHNB35L16	23	(10)
(7.8 W/cm²)	20	45⅝	(1158.8)		BHNB45L3	BHNB45L8	BHNB45L5	BHNB45L16	25	(11)

RAPID SHIP

- Same day shipment up to 5 pieces

How to Order

To order an Assembly Stock unit, please specify:

- Watlow code number
- Volts/watts
- Options, if applicable
- Quantity

If our assembly stock units do not meet your application needs, Watlow can provide **made-to-order** assemblies. For made-to order units, please specify:

- Volts/watts
- Phase
- Screw plug size and materials
- Number of elements
- Sheath material
- Immersed ('B' dimension) length
- No-heat section below the plug
- Options
- Quantity

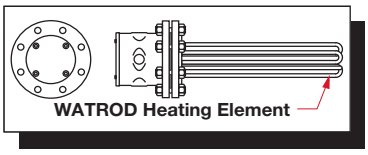
Availability

Made-to-Order: Two to four weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

WATROD and FIREBAR® ANSI Flange Immersion Heaters





Watlow flange heaters are easy to install and maintain. Designed for heating liquids and gases in tanks and pressure vessels, flange immersion heaters are ideal for applications requiring higher kilowatts.

Watlow flange heaters are made with WATROD or FIREBAR® tubular elements brazed or welded to a flange. Stock flange heaters are equipped with a general purpose (NEMA 1) terminal enclosure.

Flange heaters, with FIREBAR elements, also answer the need for liquid immersion applications requiring high kilowatts in small tanks. The FIREBAR element's unique flat surface geometry packs more power in a smaller bundle, with lower watt density, making it especially well-suited for petroleum-based liquid heating applications.

Performance Capabilities

- Watt densities to 100 W/in² (15.5 W/cm²)
- Wattages to three megawatts
- UL® and CSA component recognition to 600V~(ac)
- Incoloy® sheath temperatures to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures to 1200°F (650°C)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)
- FIREBAR flange heaters deliver more killowatts in smaller bundles
- A conventional round tubular 10 inch ANSI flange can be replaced by a 6 inch ANSI FIREBAR flange with same immersed length

Features and Benefits

ANSI and ANSI compatible 2, 2½, 3, 4, 5, 6, 8, 10, 12 and 14 inch flanges
- Provides appropriate heater size-to-application and fit

ANSI flange sizes up to 50 inches NPS
- Available on made-to-order units

Element sheath and flange materials
- Ability to meet your application needs

Integral thermowells
- Provides convenient temperature sensor insertion and replacement without draining the fluid being heated

Standard, general purpose (NEMA 1) terminal enclosure
- Offers easy access to wiring

Element support(s)
- Provides proper element spacing to maximizing heater performance and life

All units are inspected and/or tested
- Ensures element-to-flange pressure seals do not leak

Drilled and tapped eyebolt holes or lift lugs for eye bolts on 10 inch and larger flange heaters
- Facilitates lifting during installation

WATROD hairpins are repressed (recompacted)
- Provides improved heater life, insulation resistance and heat transfer

WATROD and FIREBAR ANSI Flange Immersion Heaters

Features and Benefits *(Continued)*

FIREBAR flange heaters pack more kilowatts into a smaller bundle

- A conventional round tubular 10 in. (254 mm) ANSI flange can be replaced by a 6 in. (152 mm) ANSI FIREBAR flange with the same immersed length

Branch circuits are designed for 48 amperes per circuit maximum

- Reduces risk of failure due to excessive temperatures generated by high amperage

UL® and CSA component recognition under file numbers E52951 and 31388 respectively

- Simplifies obtaining third party recognition for assembly

Applications

- Water:
  - Deionized
  - Demineralized
  - Clean
  - Potable
  - Process
- Industrial water rinse tanks
- Vapor degreasers
- Hydraulic oil, crude, asphalt
- Lubricating oils at API specified watt densities
- Air and gas flow
- Caustic solutions
- Chemical baths
- Process air equipment
- Boiler equipment
- Freeze protection of any fluid
- Anti-freeze (glycol) solutions
- Paraffin

Options

Terminal Enclosures

General purpose terminal enclosures, without thermostats, are standard on all flange immersion heaters. Optional terminal enclosures include:

- General purpose (NEMA 1) with a single or double pole thermostat.
- Moisture resistant (NEMA 4– steel). Available with or without a single or double pole thermostat.
- Corrosion resistant (NEMA 4X). Available with or without a single or double pole thermostat.
- Explosion resistant (NEMA 7) class 1 groups B, C and D. Available with or without a single or double pole thermostat.
- Explosion/moisture resistant (NEMA 7/4) combinations. Available with or without a single or double pole thermostat.

Enclosure Enhancements

- Enclosure heater to solve condensation and freeze problems.
- Power distribution blocks to facilitate power feed line wiring.

Prior to ordering, refer to the terminal enclosure dimensions on page 204. Order by adding the appropriate suffix letter(s) to the base flange heater code number, as shown on the Build-a-Code chart. Heater code numbers and suffix letters are depicted on the *Stock* and *Options* charts, pages 205 to 267. Specify class and group, if applicable.



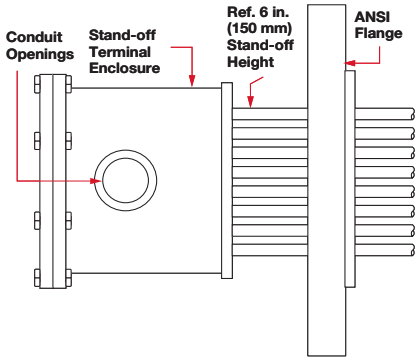
Caution

Explosion-resistant terminal enclosures are intended to provide explosion containment in the electrical termination/wiring enclosure only. No portion of the assembly outside of this enclosure is covered under this NEMA rating. NEMA rating effectiveness may be compromised by abuse or misapplication.

WATROD and FIREBAR ANSI Flange Immersion Heaters

Options *(Continued)*

Stand-off Terminal Enclosures



Stand-off terminal enclosures provide an air-insulating barrier between the flange and terminal enclosure by mounting the terminations and wiring away from the flange. Stand-off terminal enclosures are recommended whenever a process operating temperature exceeds 400°F (205°C). This helps minimize terminal enclosure temperatures.

To order, specify **stand-off terminal enclosure**.

CSA Certified Enclosures

CSA certified moisture and/or explosion resistant terminal enclosures protect wiring in hazardous gas environments. These terminal enclosures, covered under CSA file number 61707, are available on all WATROD and FIREBAR flange heaters. For additional information, see page 677 or contact your Watlow representative.

To order, specify **CSA certified enclosure**, **process temperature** (°F), maximum **working pressure** of application (psig), **media** being heated and heater **mounting orientation** (horizontal or vertical) and **flange size**.

Thermostats

To provide process temperature control, Watlow offers optional single pole, single throw (SPST) and double pole, single throw (DPST) thermostats.

Unless otherwise specified, thermostats are mounted inside the terminal enclosure. For details and ordering information, refer to *Thermostats* on pages 649 to 652. Please verify that the thermostat's sensing bulb O.D. is compatible with the flange heater's thermowell I.D.

Thermocouples

ASTM Type J or K thermocouples offer more accurate sensing of process and/or sheath temperatures. A thermocouple may be inserted into the thermowell or attached to the heater's sheath.

Thermocouples are supplied with 120 in. (3050 mm) leads (longer lead lengths available). Unless otherwise specified, thermocouples are supplied with temperature ranges detailed on the *Thermocouple Types* chart.

Using a thermocouple requires an appropriate temperature and power controller. These must be purchased separately. Watlow offers a wide variety of temperature and power controllers to meet virtually all applications. Temperature controllers can be configured to accept process variable inputs, too. Contact your Watlow representative for details.

To order, specify **Type J** or **K** thermocouple and lead length. Indicate if the thermocouple is for **process temperature sensing** or heater sheath **high-limit protection**. Please specify if the flange heater will be mounted **vertical** or **horizontal** in the tank. **If vertical, specify if the housing is on top or bottom**.

If the flange heater is part of an in-line circulation heating application, indicate flow direction relative to the heater's enclosure.

Thermocouple Types

ASTM Type	Conductor Characteristics Positive	Conductor Characteristics Negative	Recommended① Temperature Range °F	Recommended① Temperature Range (°C)
J	Iron (Magnetic)	Constantan (Non-magnetic)	0 to 1000	(-20 to 540)
K	Chromel® (Non-magnetic)	Alumel® (Magnetic)	0 to 2000	(-20 to 1100)

① Type J and Type K thermocouples are rated 32 to 1382°F and 32 to 2282°F (0-750°C and 0-1250°C), respectively. Watlow does not recommend exceeding temperature ranges shown on this chart for the tubular product line.

RTDs

If your process requires greater temperature sensing accuracy than is possible with thermocouples, Watlow can also supply RTDs in DIN or JIS calibrations. Contact your Watlow representative for details.

WATROD and FIREBAR ANSI Flange Immersion Heaters

Options *(Continued)*

Wattages and Voltages

Watlow routinely supplies flange immersion heaters with 240 to 480V~(ac) as well as wattages from 150 watts to one megawatt. If required, Watlow will make heaters with voltage up to 600V~(ac) and wattage beyond one megawatt. For more information on special voltage and wattage configurations, contact your Watlow representative.

Sheath Materials

The following sheath materials are available on WATROD and FIREBAR flange heaters:

Standard Sheath Materials

WATROD	Incoloy® 316 SS Steel Copper
FIREBAR	Incoloy®

Made-to-Order Sheath Materials

WATROD	304 SS Monel®
FIREBAR	304 SS

Exotic Sheath Materials

Contact your Watlow representative for details and availability.

External Finishing

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process. For critical sheath applications, passivation will remove free iron from the sheath. To order, specify **passivation**.

Other Finishes

Bright annealing and glass beading are available to meet cosmetic demands. Contact your Watlow representative for details.

Flanges

Flange Sizes and Styles

Standard: 2①, 2½①, 3, 4, 5, 6, 8, 10, 12 and 14 inch ANSI raised face/blind flanges.

Made-to-Order: 16, 18, 20 and 24 inch in any recognized configuration, as well as customer specified. Over 24 inch, contact Watlow.

Flange Materials

Standard	Carbon steel 316 SS 304 SS
Made-to-Order	Exotic materials to meet specific application needs②

Pressure Classes

Standard	150 lb
Made-to-Order	300 lb 600 lb Over 600 lb②

① ANSI compatible only

② Contact your Watlow representative

Gaskets

Rubber, asbestos-free and spiral wound gaskets are available for all flange sizes. Order by specifying gasket type, flange size/rating, process operating temperature and pressure.

To make the correct selection, see the *Gasket Selection* chart. It provides a recommended gasket type and effective temperature rating.

To use this chart, multiply operating temperature by the operating pressure to arrive at “Maximum PSIG x °F.” This is listed in the chart’s first column.

Gasket Selection

Maximum PSIG x °F	Gasket Temperature °F	Gasket Type
Up to 15,000	300	Rubber
Over 250,000	700	Asbestos-Free
Over 250,000	③	Spiral Wound

③ Depends on metal gasket material.

WATROD and FIREBAR ANSI Flange Immersion Heaters

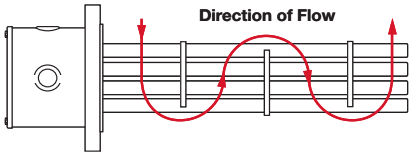
Options *(Continued)*

Baffles

For forced circulation applications, baffles can be arranged on the heating element bundle to enhance and/or modify fluid or gas flow for better heat transfer.

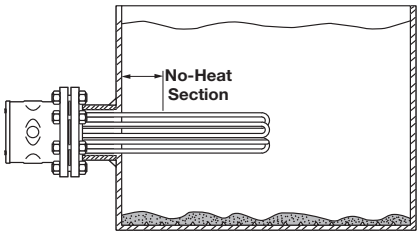
For open tank or convection heating applications, standard element supports will be supplied.

To order, specify **baffles**.



Application Hints

- Select the recommended heating element sheath material and watt density for the substance being heated. Use the *Supplemental Applications Chart* on pages 667 to 674. If unable to determine the correct heating element sheath material and type, contact your Watlow representative.
- Extend the element no-heat section completely into the fluid being heated to help prevent premature heater failure. See accompanying illustration for proper no-heat section placement.
- Locate flange heater low in the tank, but above the sludge level.
- Choose a FIREBAR element when your application requires a smaller system package or lower watt density.
- Ensure wiring integrity by keeping terminal enclosure temperature below 400°F (205°C).
- Size power feeder wires in accordance with National Electrical Code guidelines and other applicable codes.
- Keep electrical connections clean, dry and tight.
- Minimize problems associated with low liquid level conditions by using low liquid level sensor or sheath temperature high-limit control.

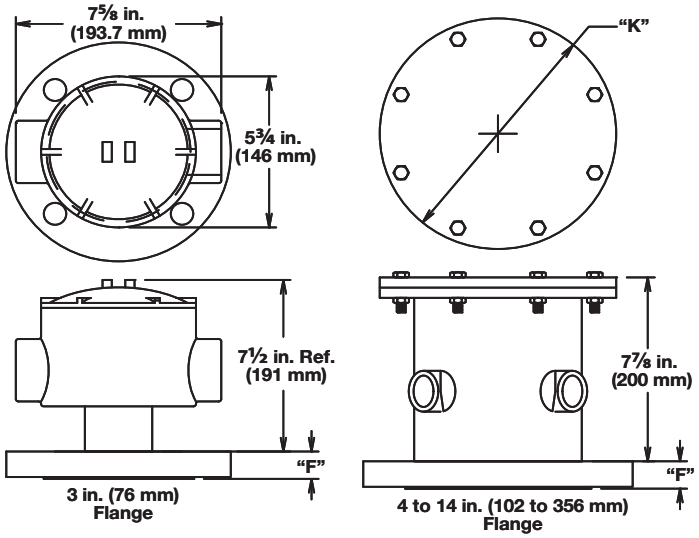


- Periodically remove the flange assembly to inspect and clean the heating element(s). This preventive maintenance will reduce premature failure and optimize heater performance.
- Refer to the *Installation and Maintenance Instructions* for correct orientation of FIREBAR elements. This is important in air applications with customer-supplied circulation tanks. Correct element orientation to flow minimizes pressure drop and increases buoyancy force and heater performance.

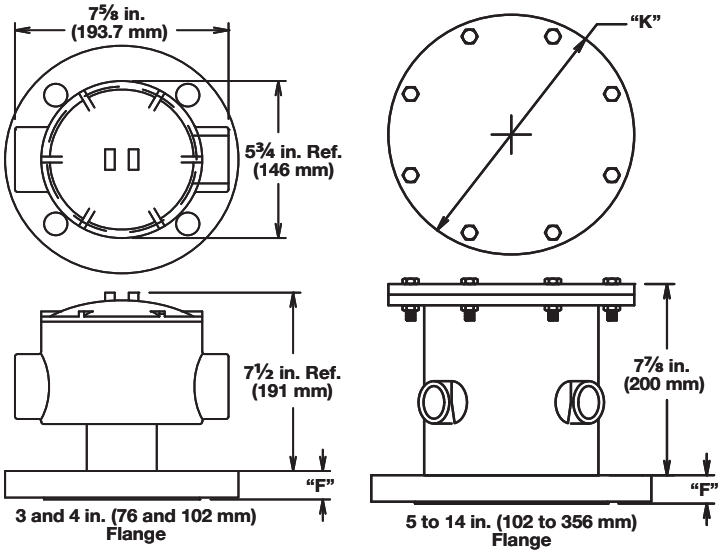
WATROD and FIREBAR ANSI Flange Immersion Heaters

Optional Moisture Resistant and Moisture/Explosion Resistant Enclosure

Without Thermostat



With Thermostat



Terminal Enclosure Dimensions

ANSI Flange Size (in.)	"F" Thickness in.	(mm)	"K" With Thermostat in.	(mm)	"K" Without Thermostat in.	(mm)
3	15/16	(23.8)	N/A		N/A	
4	15/16	(23.8)	N/A		7⅞	(200.0)
5	15/16	(23.8)	8⅞	(225.4)	8⅞	(225.4)
6	1	(25.0)	9⅞	(250.8)	9⅞	(250.8)
8	1⅛	(28.6)	12⅛	(308.0)	12⅛	(308.0)
10	1 3/16	(30.2)	14⅝	(371.5)	14⅝	(371.5)
12	1¼	(32.0)	17¼	(438.0)	17¼	(438.0)
14	1⅜	(34.9)	19⅜	(492.1)	19⅜	(492.1)

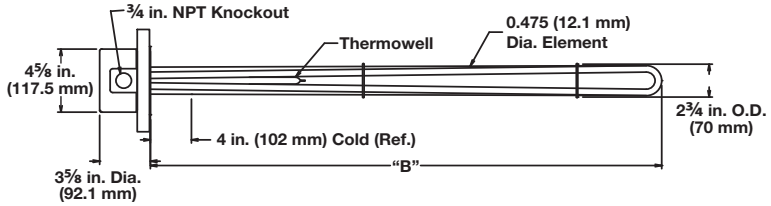
To order: Reference "W" for Moisture Resistant and "C" for Moisture/Explosion Resistant in the *Build-a-Code* section on page 268.

WATROD and FIREBAR ANSI Flange Immersion Heaters

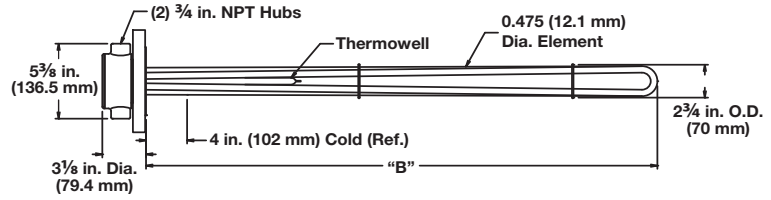
Application: Clean Water

- 3 inch - 150 lb ANSI flange.
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures
- Single circuit

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 3-Copper Elements (9.3 W/cm²)	120	6.0	1	15½	(394)	22	(10)	FMC715J10S	RS	FMC715J10W	RS
	240	6.0	3	15½	(394)	22	(10)	FMC715J3S	RS	FMC715J3W	RS
	480	6.0	1	15½	(394)	22	(10)	FMC715J11S	RS	FMC715J11W	RS
	480	6.0	3	15½	(394)	22	(10)	FMC715J5S	RS	FMC715J5W	RS
	120	9.0	1	21½	(546)	25	(12)	FMC721J10S	RS	FMC721J10W	RS
	240	9.0	3	21½	(546)	25	(12)	FMC721J3S	RS	FMC721J3W	RS
	480	9.0	1	21½	(546)	25	(12)	FMC721J11S	RS	FMC721J11W	RS
	480	9.0	3	21½	(546)	25	(12)	FMC721J5S	RS	FMC721J5W	RS
	240	12.0	3	27	(686)	27	(13)	FMC727A3S	RS	FMC727A3W	RS
	480	12.0	1	27	(686)	27	(13)	FMC727A11S	RS	FMC727A11W	RS
	480	12.0	3	27	(686)	27	(13)	FMC727A5S	RS	FMC727A5W	RS
	240	15.0	3	32½	(826)	28	(13)	FMC732J3S	RS	FMC732J3W	RS
	480	15.0	1	32½	(826)	28	(13)	FMC732J11S	RS	FMC732J11W	RS
	480	15.0	3	32½	(826)	28	(13)	FMC732J5S	RS	FMC732J5W	RS
	240	18.0	3	38	(965)	30	(14)	FMC738A3S	RS	FMC738A3W	RS
	480	18.0	1	38	(965)	30	(14)	FMC738A11S	RS	FMC738A11W	RS
	480	18.0	3	38	(965)	30	(14)	FMC738A5S	RS	FMC738A5W	RS
	480	25.0	1	51	(1295)	34	(16)	FMC751A11S	RS	FMC751A11W	RS
	480	25.0	3	51	(1295)	34	(16)	FMC751A5S	RS	FMC751A5W	RS
	480	30.0	1	60½	(1537)	36	(17)	FMC760J11S	RS	FMC760J11W	RS
	480	30.0	3	60½	(1537)	36	(17)	FMC760J5S	RS	FMC760J5W	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

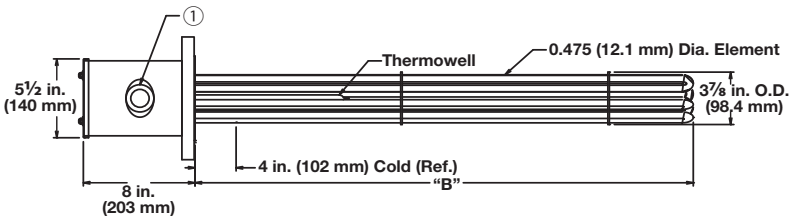
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Clean Water

- 4 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. In.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 6-Copper Elements (9.3 W/cm²)	240	12.0	1	2	15½	(394)	31	(14)	**FOC715J10S**	RS	**FOC715J10W**	RS
	240	12.0	3	1	15½	(394)	31	(14)	**FOC715J3S**	RS	**FOC715J3W**	RS
	480	12.0	1	1	15½	(394)	31	(14)	**FOC715J11S**	RS	**FOC715J11W**	RS
	480	12.0	3	1	15½	(394)	31	(14)	**FOC715J5S**	RS	**FOC715J5W**	RS
	240	18.0	1	2	21½	(546)	34	(16)	**FOC721J10S**	RS	**FOC721J10W**	RS
	240	18.0	3	1	21½	(546)	34	(16)	**FOC721J3S**	RS	**FOC721J3W**	RS
	480	18.0	1	1	21½	(546)	34	(16)	**FOC721J11S**	RS	**FOC721J11W**	RS
	480	18.0	3	1	21½	(546)	34	(16)	**FOC721J5S**	RS	**FOC721J5W**	RS
	240	24.0	1	2	27	(686)	36	(17)	**FOC727A10S**	RS	**FOC727A10W**	RS
	240	24.0	3	2	27	(686)	36	(17)	**FOC727A3S**	RS	**FOC727A3W**	RS
	480	24.0	1	1	27	(686)	36	(17)	**FOC727A11S**	RS	**FOC727A11W**	RS
	480	24.0	3	1	27	(686)	36	(17)	**FOC727A5S**	RS	**FOC727A5W**	RS
	240	30.0	3	2	32½	(826)	39	(18)	**FOC732J3S**	RS	**FOC732J3W**	RS
	480	30.0	1	2	32½	(826)	39	(18)	**FOC732J11S**	RS	**FOC732J11W**	RS
	480	30.0	3	1	32½	(826)	39	(18)	**FOC732J5S**	RS	**FOC732J5W**	RS
	240	36.0	3	2	38	(965)	43	(20)	**FOC738A3S**	RS	**FOC738A3W**	RS
	480	36.0	1	2	38	(965)	43	(20)	**FOC738A11S**	RS	**FOC738A11W**	RS
	480	36.0	3	1	38	(965)	43	(20)	**FOC738A5S**	RS	**FOC738A5W**	RS
	480	50.0	3	2	51	(1295)	48	(22)	**FOC751A5S**	RS	**FOC751A5W**	RS
	480	60.0	3	2	60½	(1537)	52	(24)	**FOC760J5S**	S	**FOC760J5W**	S

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

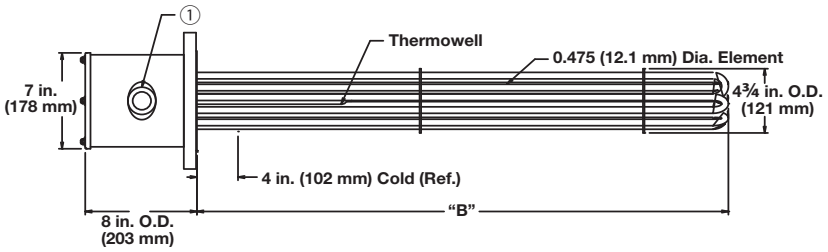
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Clean Water

- 5 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 6-Copper Elements (9.3 W/cm²)	240	12.0	1	2	15½	(394)	35	(16)	**FNC715J10S**	RS	**FNC715J10W**	RS
	240	12.0	3	1	15½	(394)	35	(16)	**FNC715J3S**	RS	**FNC715J3W**	RS
	480	12.0	1	1	15½	(394)	35	(16)	**FNC715J11S**	RS	**FNC715J11W**	RS
	480	12.0	3	1	15½	(394)	35	(16)	**FNC715J5S**	RS	**FNC715J5W**	RS
	240	18.0	1	2	21½	(546)	38	(18)	**FNC721J10S**	RS	**FNC721J10W**	RS
	240	18.0	3	1	21½	(546)	38	(18)	**FNC721J3S**	RS	**FNC721J3W**	RS
	480	18.0	1	1	21½	(546)	38	(18)	**FNC721J11S**	RS	**FNC721J11W**	RS
	480	18.0	3	1	21½	(546)	38	(18)	**FNC721J5S**	RS	**FNC721J5W**	RS
	240	24.0	1	3	27	(686)	40	(19)	**FNC727A10S**	RS	**FNC727A10W**	RS
	240	24.0	3	2	27	(686)	40	(19)	**FNC727A3S**	RS	**FNC727A3W**	RS
	480	24.0	1	3	27	(686)	40	(19)	**FNC727A11S**	RS	**FNC727A11W**	RS
	480	24.0	3	1	27	(686)	40	(19)	**FNC727A5S**	RS	**FNC727A5W**	RS
	240	30.0	3	2	32½	(826)	43	(20)	**FNC732J3S**	RS	**FNC732J3W**	RS
	480	30.0	1	2	32½	(826)	43	(20)	**FNC732J11S**	RS	**FNC732J11W**	RS
	480	30.0	3	1	32½	(826)	43	(20)	**FNC732J5S**	RS	**FNC732J5W**	RS
	240	36.0	3	2	38	(965)	47	(22)	**FNC738A3S**	RS	**FNC738A3W**	RS
	480	36.0	1	2	38	(965)	47	(22)	**FNC738A11S**	RS	**FNC738A11W**	RS
	480	36.0	3	1	38	(965)	47	(22)	**FNC738A5S**	RS	**FNC738A5W**	RS
	480	50.0	3	2	51	(1295)	52	(24)	**FNC751A5S**	RS	**FNC751A5W**	RS
	480	60.0	3	2	60½	(1537)	56	(26)	**FNC760J5S**	S	**FNC760J5W**	S

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

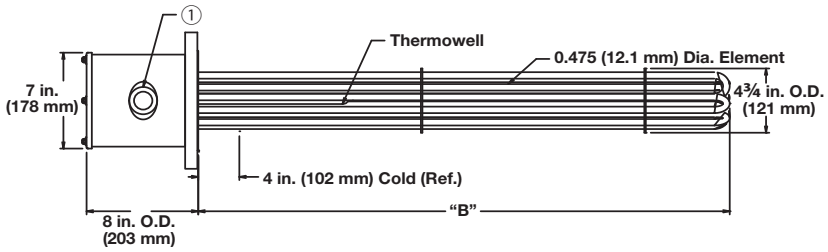
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Clean Water

- 5 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 9-Copper Elements (9.3 W/cm²)	240	18.0	1	3	15½	(394)	38	(18)	**FNC715J10XS**	RS	**FNC715J10XW**	RS
	240	18.0	3	1	15½	(394)	38	(18)	**FNC715J3XS**	RS	**FNC715J3XW**	RS
	480	18.0	1	1	15½	(394)	38	(18)	**FNC715J11XS**	RS	**FNC715J11XW**	RS
	480	18.0	3	1	15½	(394)	38	(18)	**FNC715J5XS**	RS	**FNC715J5XW**	RS
	240	27.0	1	3	21½	(546)	42	(19)	**FNC721J10XS**	RS	**FNC721J10XW**	RS
	240	27.0	3	3	21½	(546)	42	(19)	**FNC721J3XS**	RS	**FNC721J3XW**	RS
	480	27.0	1	3	21½	(546)	42	(19)	**FNC721J11XS**	RS	**FNC721J11XW**	RS
	480	27.0	3	1	21½	(546)	42	(19)	**FNC721J5XS**	RS	**FNC721J5XW**	RS
	240	36.0	3	3	27	(686)	45	(21)	**FNC727A3XS**	RS	**FNC727A3XW**	RS
	480	36.0	1	3	27	(686)	45	(21)	**FNC727A11XS**	RS	**FNC727A11XW**	RS
	480	36.0	3	1	27	(686)	45	(21)	**FNC727A5XS**	RS	**FNC727A5XW**	RS
	240	45.0	3	3	32½	(826)	48	(22)	**FNC732J3XS**	RS	**FNC732J3XW**	RS
	480	45.0	1	3	32½	(826)	48	(22)	**FNC732J11XS**	RS	**FNC732J11XW**	RS
	480	45.0	3	3	32½	(826)	48	(22)	**FNC732J5XS**	RS	**FNC732J5XW**	RS
	240	54.0	3	3	38	(965)	53	(24)	**FNC738A3XS**	RS	**FNC738A3XW**	RS
	480	54.0	1	3	38	(965)	53	(24)	**FNC738A11XS**	RS	**FNC738A11XW**	RS
	480	54.0	3	3	38	(965)	53	(24)	**FNC738A5XS**	RS	**FNC738A5XW**	RS
	480	75.0	3	3	51	(1295)	60	(28)	**FNC751A5XS**	RS	**FNC751A5XW**	RS
	480	90.0	3	3	60½	(1537)	66	(30)	**FNC760J5XS**	S	**FNC760J5XW**	S

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

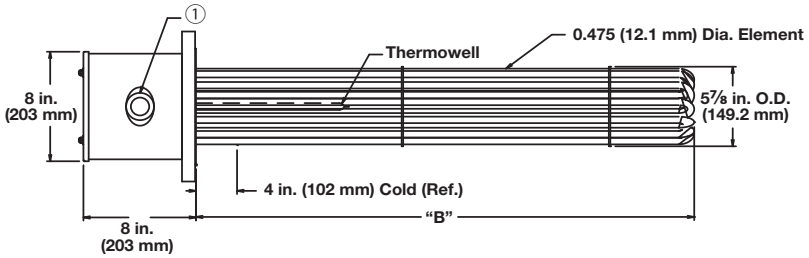
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Clean Water

- 6 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 12-Copper Elements (9.3 W/cm²)	240	24.0	1	3	15⅜	(390.5)	73	(33)	**FPC715G10S**	RS	**FPC715G10W**	RS
	240	24.0	3	2	15⅜	(390.5)	73	(33)	**FPC715G3S**	RS	**FPC715G3W**	RS
	480	24.0	1	2	15⅜	(390.5)	73	(33)	**FPC715G11S**	RS	**FPC715G11W**	RS
	480	24.0	3	1	15⅜	(390.5)	73	(33)	**FPC715G5S**	RS	**FPC715G5W**	RS
	240	36.0	1	4	21⅜	(542.9)	78	(36)	**FPC721G10S**	RS	**FPC721G10W**	RS
	240	36.0	3	2	21⅜	(542.9)	78	(36)	**FPC721G3S**	RS	**FPC721G3W**	RS
	480	36.0	1	2	21⅜	(542.9)	78	(36)	**FPC721G11S**	RS	**FPC721G11W**	RS
	480	36.0	3	1	21⅜	(542.9)	78	(36)	**FPC721G5S**	RS	**FPC721G5W**	RS
	240	48.0	3	4	26⅞	(682.6)	81	(37)	**FPC726R3S**	RS	**FPC726R3W**	RS
	480	48.0	1	3	26⅞	(682.6)	81	(37)	**FPC726R11S**	RS	**FPC726R11W**	RS
	480	48.0	3	2	26⅞	(682.6)	81	(37)	**FPC726R5S**	RS	**FPC726R5W**	RS
	240	60.0	3	4	32⅜	(822.3)	85	(39)	**FPC732G3S**	RS	**FPC732G3W**	RS
	480	60.0	1	3	32⅜	(822.3)	85	(39)	**FPC732G11S**	RS	**FPC732G11W**	RS
	480	60.0	3	2	32⅜	(822.3)	85	(39)	**FPC732G5S**	RS	**FPC732G5W**	RS
	240	72.0	3	4	37⅞	(962.0)	92	(42)	**FPC737R3S**	RS	**FPC737R3W**	RS
	480	72.0	3	2	37⅞	(962.0)	92	(42)	**FPC737R5S**	RS	**FPC737R5W**	RS
	480	100.0	3	4	50⅞	(1292.2)	100	(45)	**FPC750R5S**	RS	**FPC750R5W**	RS
	480	120.0	3	4	60⅝	(1533.5)	110	(50)	**FPC760G5S**	S	**FPC760G5W**	S

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces
- **S** - Standard, 10 day lead time

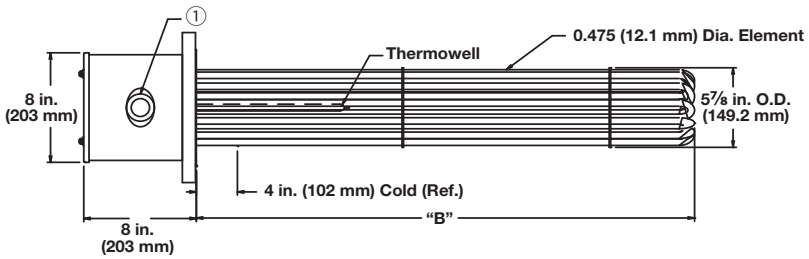
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Clean Water

- 6 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 15-Copper Elements (9.3 W/cm²)	240	30.0	1	3	15⅜	(390.5)	76	(35)	**FPC715G10XS**	RS	**FPC715G10XW**	RS
	240	30.0	3	5	15⅜	(390.5)	76	(35)	**FPC715G3XS**	RS	**FPC715G3XW**	RS
	480	30.0	1	3	15⅜	(390.5)	76	(35)	**FPC715G11XS**	RS	**FPC715G11XW**	RS
	480	30.0	3	1	15⅜	(390.5)	76	(35)	**FPC715G5XS**	RS	**FPC715G5XW**	RS
	240	45.0	1	5	21⅜	(542.9)	82	(38)	**FPC721G10XS**	RS	**FPC721G10XW**	RS
	240	45.0	3	5	21⅜	(542.9)	82	(38)	**FPC721G3XS**	RS	**FPC721G3XW**	RS
	480	45.0	1	3	21⅜	(542.9)	82	(38)	**FPC721G11XS**	RS	**FPC721G11XW**	RS
	480	45.0	3	5	21⅜	(542.9)	82	(38)	**FPC721G5XS**	RS	**FPC721G5XW**	RS
	240	60.0	3	5	26⅞	(682.6)	85	(39)	**FPC726R3XS**	RS	**FPC726R3XW**	RS
	480	60.0	1	3	26⅞	(682.6)	85	(39)	**FPC726R11XS**	RS	**FPC726R11XW**	RS
	480	60.0	3	5	26⅞	(682.6)	85	(39)	**FPC726R5XS**	RS	**FPC726R5XW**	RS
	240	75.0	3	5	32⅜	(822.3)	90	(41)	**FPC732G3XS**	RS	**FPC732G3XW**	RS
	480	75.0	1	5	32⅜	(822.3)	90	(41)	**FPC732G11XS**	RS	**FPC732G11XW**	RS
	480	75.0	3	5	32⅜	(822.3)	90	(41)	**FPC732G5XS**	RS	**FPC732G5XW**	RS
	240	90.0	3	5	37⅞	(962.0)	98	(45)	**FPC737R3XS**	RS	**FPC737R3XW**	RS
	480	90.0	3	5	37⅞	(962.0)	98	(45)	**FPC737R5XS**	RS	**FPC737R5XW**	RS
	480	125.0	3	5	50⅞	(1292.2)	108	(49)	**FPC750R5XS**	RS	**FPC750R5XW**	RS
	480	150.0	3	5	60¾	(1533.5)	120	(55)	**FPC760G5XS**	S	**FPC760G5XW**	S

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces
- **S** - Standard, 10 day lead time

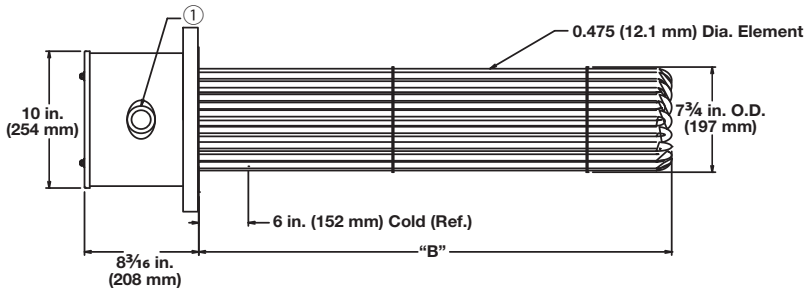
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Clean Water

- 8 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² Steel Flange 18-Copper Elements (9.3 W/cm²)	240	50.0	3	3	21¾	(553)	118	(54)	**FRC721N3S**	RS	**FRC721N3W**	RS
	480	50.0	1	3	21¾	(553)	118	(54)	**FRC721N11S**	RS	**FRC721N11W**	RS
	480	50.0	3	2	21¾	(553)	118	(54)	**FRC721N5S**	RS	**FRC721N5W**	RS
	240	75.0	3	6	29¾	(756)	126	(58)	**FRC729N3S**	RS	**FRC729N3W**	RS
	480	75.0	3	2	29¾	(756)	126	(58)	**FRC729N5S**	RS	**FRC729N5W**	RS
	240	100.0	3	6	37¼	(946)	130	(59)	**FRC737E3S**	RS	**FRC737E3W**	RS
	480	100.0	3	3	37¼	(946)	130	(59)	**FRC737E5S**	RS	**FRC737E5W**	RS
	240	125.0	3	6	45¼	(1149)	132	(60)	**FRC745E3S**	RS	**FRC745E3W**	RS
	480	125.0	3	6	45¼	(1149)	132	(60)	**FRC745E5S**	RS	**FRC745E5W**	RS
	480	150.0	3	6	52¾	(1340)	137	(63)	**FRC752N5S**	RS	**FRC752N5W**	RS
	480	175.0	3	6	60¾	(1543)	144	(66)	**FRC760N5S**	RS	**FRC760N5W**	RS
	480	200.0	3	6	68¼	(1734)	149	(68)	**FRC768E5S**	RS	**FRC768E5W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

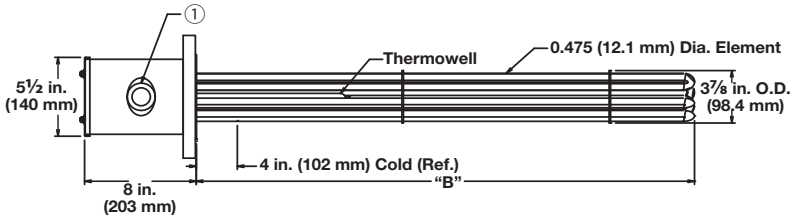
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Deionized or Demineralized Water

- 4 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² 316 SS Flange 6-316 SS Elements (9.3 W/cm²) Passivated	240	12.0	1	2	16	(406)	31	(14)	**FOR716A10S**	RS	**FOR716A10W**	RS
	240	12.0	3	1	16	(406)	31	(14)	**FOR716A3S**	RS	**FOR716A3W**	RS
	480	12.0	1	1	16	(406)	31	(14)	**FOR716A11S**	RS	**FOR716A11W**	RS
	480	12.0	3	1	16	(406)	31	(14)	**FOR716A5S**	RS	**FOR716A5W**	RS
	240	18.0	1	2	22	(559)	34	(16)	**FOR722A10S**	RS	**FOR722A10W**	RS
	240	18.0	3	1	22	(559)	34	(16)	**FOR722A3S**	RS	**FOR722A3W**	RS
	480	18.0	1	1	22	(559)	34	(16)	**FOR722A11S**	RS	**FOR722A11W**	RS
	480	18.0	3	1	22	(559)	34	(16)	**FOR722A5S**	RS	**FOR722A5W**	RS
	240	24.0	1	2	27½	(699)	36	(17)	**FOR727J10S**	RS	**FOR727J10W**	RS
	240	24.0	3	2	27½	(699)	36	(17)	**FOR727J3S**	RS	**FOR727J3W**	RS
	480	24.0	1	1	27½	(699)	36	(17)	**FOR727J11S**	RS	**FOR727J11W**	RS
	480	24.0	3	1	27½	(699)	36	(17)	**FOR727J5S**	RS	**FOR727J5W**	RS
	240	30.0	3	2	33	(838)	39	(18)	**FOR733A3S**	RS	**FOR733A3W**	RS
	480	30.0	1	2	33	(838)	39	(18)	**FOR733A11S**	RS	**FOR733A11W**	RS
	480	30.0	3	1	33	(838)	39	(18)	**FOR733A5S**	RS	**FOR733A5W**	RS
	240	36.0	3	2	38½	(978)	43	(20)	**FOR738J3S**	RS	**FOR738J3W**	RS
	480	36.0	1	2	38½	(978)	43	(20)	**FOR738J11S**	RS	**FOR738J11W**	RS
	480	36.0	3	1	38½	(978)	43	(20)	**FOR738J5S**	RS	**FOR738J5W**	RS
	480	50.0	3	2	51½	(1308)	48	(22)	**FOR751J5S**	RS	**FOR751J5W**	RS
	480	60.0	3	2	61	(1549)	52	(24)	**FOR761A5S**	RS	**FOR761A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

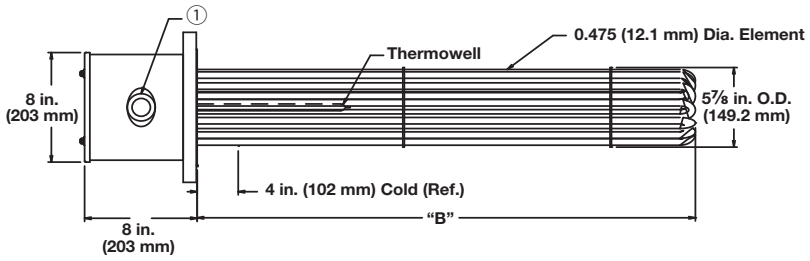
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Deionized or Demineralized Water

- 6 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² 316 SS Flange 12-316 SS Elements (9.3 W/cm²) (Passivated)	240	24.0	1	3	15¾	(400)	73	(33)	**FPR715N10S**	RS	**FPR715N10W**	RS
	240	24.0	3	2	15¾	(400)	73	(33)	**FPR715N3S**	RS	**FPR715N3W**	RS
	480	24.0	1	2	15¾	(400)	73	(33)	**FPR715N11S**	RS	**FPR715N11W**	RS
	480	24.0	3	1	15¾	(400)	73	(33)	**FPR715N5S**	RS	**FPR715N5W**	RS
	240	36.0	1	4	21¾	(552)	78	(36)	**FPR721N10S**	RS	**FPR721N10W**	RS
	240	36.0	3	2	21¾	(552)	78	(36)	**FPR721N3S**	RS	**FPR721N3W**	RS
	480	36.0	1	2	21¾	(552)	78	(36)	**FPR721N11S**	RS	**FPR721N11W**	RS
	480	36.0	3	1	21¾	(552)	78	(36)	**FPR721N5S**	RS	**FPR721N5W**	RS
	240	48.0	3	4	27¼	(692)	81	(37)	**FPR727E3S**	RS	**FPR727E3W**	RS
	480	48.0	1	3	27¼	(692)	81	(37)	**FPR727E11S**	RS	**FPR727E11W**	RS
	480	48.0	3	2	27¼	(692)	81	(37)	**FPR727E5S**	RS	**FPR727E5W**	RS
	240	60.0	3	4	32¾	(832)	85	(39)	**FPR732N3S**	RS	**FPR732N3W**	RS
	480	60.0	1	3	32¾	(832)	85	(39)	**FPR732N11S**	RS	**FPR732N11W**	RS
	480	60.0	3	2	32¾	(832)	85	(39)	**FPR732N5S**	RS	**FPR732N5W**	RS
	240	72.0	3	4	38¼	(972)	92	(42)	**FPR738E3S**	RS	**FPR738E3W**	RS
	480	72.0	3	2	38¼	(972)	92	(42)	**FPR738E5S**	RS	**FPR738E5W**	RS
	480	100.0	3	4	51¼	(1302)	100	(45)	**FPR751E5S**	RS	**FPR751E5W**	RS
	480	120.0	3	4	60¾	(1543)	110	(50)	**FPR760N5S**	RS	**FPR760N5W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

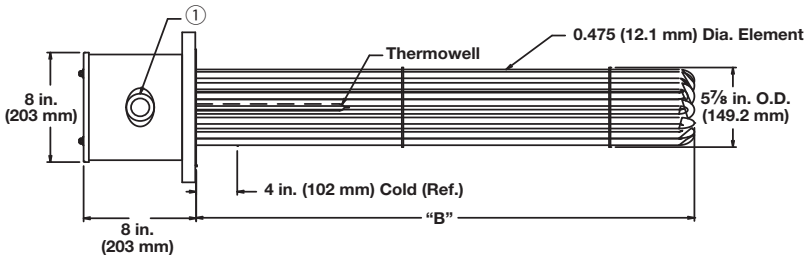
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Deionized or Demineralized Water

- 6 inch - 150 lb ANSI flange
- WATROD element
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
60 W/in² 316 SS Flange 15-316 SS Elements (9.3 W/cm²) (Passivated)	240	30.0	1	3	15¾	(400)	76	(35)	**FPR715N10XS**	RS	**FPR715N10XW**	RS
	240	30.0	3	5	15¾	(400)	76	(35)	**FPR715N3XS**	RS	**FPR715N3XW**	RS
	480	30.0	1	3	15¾	(400)	76	(35)	**FPR715N11XS**	RS	**FPR715N11XW**	RS
	480	30.0	3	1	15¾	(400)	76	(35)	**FPR715N5XS**	RS	**FPR715N5XW**	RS
	240	45.0	1	5	21¾	(552)	82	(38)	**FPR721N10XS**	RS	**FPR721N10XW**	RS
	240	45.0	3	5	21¾	(552)	82	(38)	**FPR721N3XS**	RS	**FPR721N3XW**	RS
	480	45.0	1	3	21¾	(552)	82	(38)	**FPR721N11XS**	RS	**FPR721N11XW**	RS
	480	45.0	3	5	21¾	(552)	82	(38)	**FPR721N5XS**	RS	**FPR721N5XW**	RS
	240	60.0	3	5	27¼	(692)	85	(39)	**FPR727E3XS**	RS	**FPR727E3XW**	RS
	480	60.0	1	3	27¼	(692)	85	(39)	**FPR727E11XS**	RS	**FPR727E11XW**	RS
	480	60.0	3	5	27¼	(692)	85	(39)	**FPR727E5XS**	RS	**FPR727E5XW**	RS
	240	75.0	3	5	32¾	(832)	90	(41)	**FPR732N3XS**	RS	**FPR732N3XW**	RS
	480	75.0	1	5	32¾	(832)	90	(41)	**FPR732N11XS**	RS	**FPR732N11XW**	RS
	480	75.0	3	5	32¾	(832)	90	(41)	**FPR732N5XS**	RS	**FPR732N5XW**	RS
	240	90.0	3	5	38¼	(972)	98	(45)	**FPR738E3XS**	RS	**FPR738E3XW**	RS
	480	90.0	3	5	38¼	(972)	98	(45)	**FPR738E5XS**	RS	**FPR738E5XW**	RS
	480	125.0	3	5	51¼	(1302)	108	(49)	**FPR751E5XS**	RS	**FPR751E5XW**	RS
	480	150.0	3	5	60¾	(1543)	120	(55)	**FPR760N5XS**	RS	**FPR760N5XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

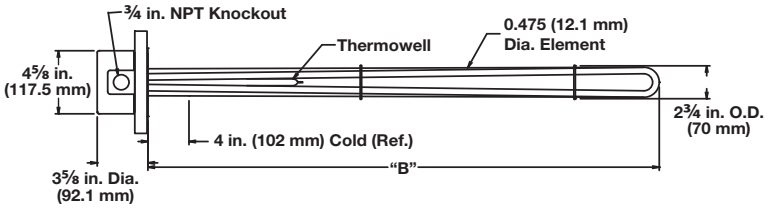
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

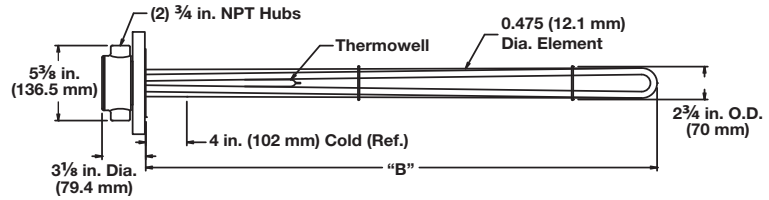
Application: Process Water

- 3 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures
- Single circuit

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² ⑥ Steel Flange 3-Incoloy Elements (7.5 W/cm²)	240	4.5	1	13½	(343)	22	(10)	**FMN713J10S**	RS	**FMN713J10W**	RS
	240	4.5	3	13½	(343)	22	(10)	**FMN713J3S**	RS	**FMN713J3W**	RS
	480	4.5	1	13½	(343)	22	(10)	**FMN713J11S**	RS	**FMN713J11W**	RS
	480	4.5	3	13½	(343)	22	(10)	**FMN713J5S**	RS	**FMN713J5W**	RS
	240	6.0	1	18	(457)	23	(11)	**FMN718A10S**	RS	**FMN718A10W**	RS
	240	6.0	3	18	(457)	23	(11)	**FMN718A3S**	RS	**FMN718A3W**	RS
	480	6.0	1	18	(457)	23	(11)	**FMN718A11S**	RS	**FMN718A11W**	RS
	480	6.0	3	18	(457)	23	(11)	**FMN718A5S**	RS	**FMN718A5W**	RS
	240	7.5	1	20½	(521)	25	(12)	**FMN720J10S**	RS	**FMN720J10W**	RS
	240	7.5	3	20½	(521)	25	(12)	**FMN720J3S**	RS	**FMN720J3W**	RS
	480	7.5	1	20½	(521)	25	(12)	**FMN720J11S**	RS	**FMN720J11W**	RS
	480	7.5	3	20½	(521)	25	(12)	**FMN720J5S**	RS	**FMN720J5W**	RS
	240	9.0	1	25½	(648)	27	(13)	**FMN725J10S**	RS	**FMN725J10W**	RS
	240	9.0	3	25½	(648)	27	(13)	**FMN725J3S**	RS	**FMN725J3W**	RS
	480	9.0	1	25½	(648)	27	(13)	**FMN725J11S**	RS	**FMN725J11W**	RS
	480	9.0	3	25½	(648)	27	(13)	**FMN725J5S**	RS	**FMN725J5W**	RS
	240	12.0	3	33	(838)	28	(13)	**FMN733A3S**	RS	**FMN733A3W**	RS
	480	12.0	1	33	(838)	28	(13)	**FMN733A11S**	RS	**FMN733A11W**	RS
	480	12.0	3	33	(838)	28	(13)	**FMN733A5S**	RS	**FMN733A5W**	RS
	240	15.0	3	40½	(1029)	30	(14)	**FMN740J3S**	RS	**FMN740J3W**	RS
	480	15.0	1	40½	(1029)	30	(14)	**FMN740J11S**	RS	**FMN740J11W**	RS
	480	15.0	3	40½	(1029)	30	(14)	**FMN740J5S**	RS	**FMN740J5W**	RS
	240	18.0	3	48	(1219)	32	(15)	**FMN748A3S**	RS	**FMN748A3W**	RS
	480	18.0	1	48	(1219)	32	(15)	**FMN748A11S**	RS	**FMN748A11W**	RS
	480	18.0	3	48	(1219)	32	(15)	**FMN748A5S**	RS	**FMN748A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

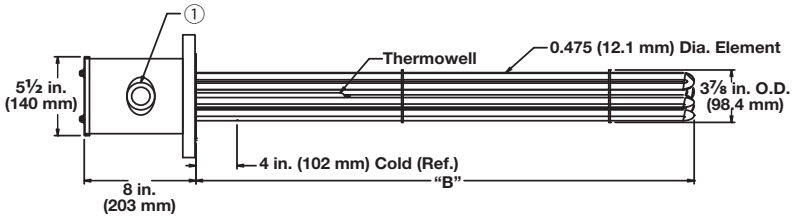
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 4 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² ⑥ Steel Flange 6-Incoloy Elements (7.5 W/cm²)	240	9.0	1	1	13½	(343)	29	(14)	**FON713J10S**	RS	**FON713J10W**	RS
	240	9.0	3	1	13½	(343)	29	(14)	**FON713J3S**	RS	**FON713J3W**	RS
	480	9.0	1	1	13½	(343)	29	(14)	**FON713J11S**	RS	**FON713J11W**	RS
	480	9.0	3	1	13½	(343)	29	(14)	**FON713J5S**	RS	**FON713J5W**	RS
	240	12.0	1	2	18	(457)	32	(15)	**FON718A10S**	RS	**FON718A10W**	RS
	240	12.0	3	1	18	(457)	32	(15)	**FON718A3S**	RS	**FON718A3W**	RS
	480	12.0	1	1	18	(457)	32	(15)	**FON718A11S**	RS	**FON718A11W**	RS
	480	12.0	3	1	18	(457)	32	(15)	**FON718A5S**	RS	**FON718A5W**	RS
	240	15.0	1	2	20½	(521)	34	(16)	**FON720J10S**	RS	**FON720J10W**	RS
	240	15.0	3	1	20½	(521)	34	(16)	**FON720J3S**	RS	**FON720J3W**	RS
	480	15.0	1	1	20½	(521)	34	(16)	**FON720J11S**	RS	**FON720J11W**	RS
	480	15.0	3	1	20½	(521)	34	(16)	**FON720J5S**	RS	**FON720J5W**	RS
	240	18.0	1	2	25½	(648)	36	(17)	**FON725J10S**	RS	**FON725J10W**	RS
	240	18.0	3	1	25½	(648)	36	(17)	**FON725J3S**	RS	**FON725J3W**	RS
	480	18.0	1	1	25½	(648)	36	(17)	**FON725J11S**	RS	**FON725J11W**	RS
	480	18.0	3	1	25½	(648)	36	(17)	**FON725J5S**	RS	**FON725J5W**	RS
	240	24.0	1	2	33	(838)	39	(18)	**FON733A10S**	RS	**FON733A10W**	RS
	240	24.0	3	2	33	(838)	39	(18)	**FON733A3S**	RS	**FON733A3W**	RS
	480	24.0	1	1	33	(838)	39	(18)	**FON733A11S**	RS	**FON733A11W**	RS
	480	24.0	3	1	33	(838)	39	(18)	**FON733A5S**	RS	**FON733A5W**	RS
	240	30.0	3	2	40½	(1029)	43	(20)	**FON740J3S**	RS	**FON740J3W**	RS
	480	30.0	1	2	40½	(1029)	43	(20)	**FON740J11S**	RS	**FON740J11W**	RS
	480	30.0	3	1	40½	(1029)	43	(20)	**FON740J5S**	RS	**FON740J5W**	RS
	240	36.0	3	2	48	(1219)	48	(22)	**FON748A3S**	RS	**FON748A3W**	RS
	480	36.0	1	2	48	(1219)	48	(22)	**FON748A11S**	RS	**FON748A11W**	RS
	480	36.0	3	1	48	(1219)	48	(22)	**FON748A5S**	RS	**FON748A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

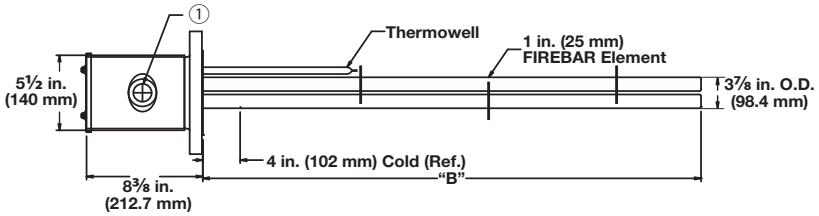
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 4 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
45 W/in² 304 SS Flange 6-Incoloy Elements (7 W/cm²)	240	12.0	3	1	13⅜	(339.7)	32	(15)	**FONF13G27S**	RS	**FONF13G27W**	RS
	240	15.0	3	1	16	(406.0)	35	(16)	**FONF16A27S**	RS	**FONF16A27W**	RS
	240	18.0	3	1	18⅜	(466.7)	38	(17)	**FONF18G27S**	RS	**FONF18G27W**	RS
	240	24.0	3	2	22⅞	(581.0)	41	(19)	**FONF22R27S**	RS	**FONF22R27W**	RS
	480	24.0	3	1	22⅞	(581.0)	41	(19)	**FONF22R28S**	RS	**FONF22R28W**	RS
	240	30.0	3	2	27⅞	(708.0)	44	(20)	**FONF27R27S**	RS	**FONF27R27W**	RS
	480	30.0	3	1	27⅞	(708.0)	44	(20)	**FONF27R28S**	RS	**FONF27R28W**	RS
	240	36.0	3	2	32⅞	(835.0)	46	(21)	**FONF32R27S**	RS	**FONF32R27W**	RS
	480	36.0	3	1	32⅞	(835.0)	46	(21)	**FONF32R28S**	RS	**FONF32R28W**	RS
	480	48.0	3	2	42⅜	(1076.3)	50	(23)	**FONF42G28S**	RS	**FONF42G28W**	RS
	480	60.0	3	2	51⅞	(1317.6)	54	(25)	**FONF51R28S**	RS	**FONF51R28W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces

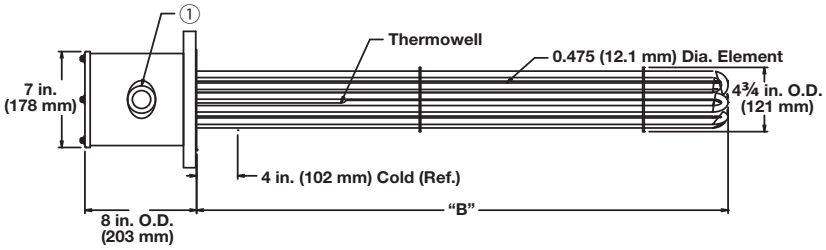
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 6-Incoloy Elements (7.5 W/cm²)	240	9.0	1	1	13½	(343)	33	(15)	**FNN713J10S**	RS	**FNN713J10W**	RS
	240	9.0	3	1	13½	(343)	33	(15)	**FNN713J3S**	RS	**FNN713J3W**	RS
	480	9.0	1	1	13½	(343)	33	(15)	**FNN713J11S**	RS	**FNN713J11W**	RS
	480	9.0	3	1	13½	(343)	33	(15)	**FNN713J5S**	RS	**FNN713J5W**	RS
	240	12.0	1	2	18	(457)	36	(17)	**FNN718A10S**	RS	**FNN718A10W**	RS
	240	12.0	3	1	18	(457)	36	(17)	**FNN718A3S**	RS	**FNN718A3W**	RS
	480	12.0	1	1	18	(457)	36	(17)	**FNN718A11S**	RS	**FNN718A11W**	RS
	480	12.0	3	1	18	(457)	36	(17)	**FNN718A5S**	RS	**FNN718A5W**	RS
	240	15.0	1	2	20½	(521)	38	(18)	**FNN720J10S**	RS	**FNN720J10W**	RS
	240	15.0	3	1	20½	(521)	38	(18)	**FNN720J3S**	RS	**FNN720J3W**	RS
	480	15.0	1	1	20½	(521)	38	(18)	**FNN720J11S**	RS	**FNN720J11W**	RS
	480	15.0	3	1	20½	(521)	38	(18)	**FNN720J5S**	RS	**FNN720J5W**	RS
	240	18.0	1	2	25½	(648)	40	(19)	**FNN725J10S**	RS	**FNN725J10W**	RS
	240	18.0	3	1	25½	(648)	40	(19)	**FNN725J3S**	RS	**FNN725J3W**	RS
	480	18.0	1	1	25½	(648)	40	(19)	**FNN725J11S**	RS	**FNN725J11W**	RS
	480	18.0	3	1	25½	(648)	40	(19)	**FNN725J5S**	RS	**FNN725J5W**	RS
	240	24.0	1	3	33	(838)	43	(20)	**FNN733A10S**	RS	**FNN733A10W**	RS
	240	24.0	3	2	33	(838)	43	(20)	**FNN733A3S**	RS	**FNN733A3W**	RS
	480	24.0	1	1	33	(838)	43	(20)	**FNN733A11S**	RS	**FNN733A11W**	RS
	480	24.0	3	1	33	(838)	43	(20)	**FNN733A5S**	RS	**FNN733A5W**	RS
	240	30.0	3	2	40½	(1029)	47	(22)	**FNN740J3S**	RS	**FNN740J3W**	RS
	480	30.0	1	2	40½	(1029)	47	(22)	**FNN740J11S**	RS	**FNN740J11W**	RS
	480	30.0	3	1	40½	(1029)	47	(22)	**FNN740J5S**	RS	**FNN740J5W**	RS
	240	36.0	3	2	48	(1219)	52	(24)	**FNN748A3S**	RS	**FNN748A3W**	RS
	480	36.0	1	2	48	(1219)	52	(24)	**FNN748A11S**	RS	**FNN748A11W**	RS
	480	36.0	3	1	48	(1219)	52	(24)	**FNN748A5S**	RS	**FNN748A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

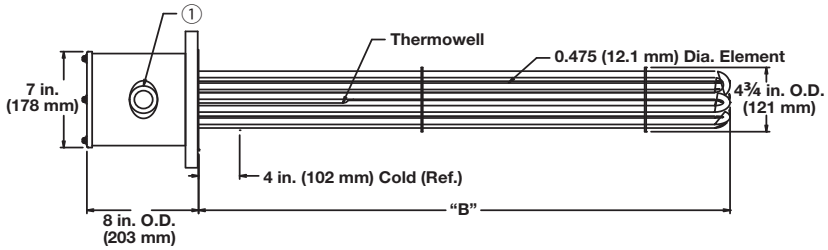
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 9-Incoloy Elements (7.5 W/cm²)	240	14.0	1	3	13½	(343)	35	(16)	**FNN713J10XS**	RS	**FNN713J10XW**	RS
	240	14.0	3	1	13½	(343)	35	(16)	**FNN713J3XS**	RS	**FNN713J3XW**	RS
	480	14.0	1	1	13½	(343)	35	(16)	**FNN713J11XS**	RS	**FNN713J11XW**	RS
	480	14.0	3	1	13½	(343)	35	(16)	**FNN713J5XS**	RS	**FNN713J5XW**	RS
	240	18.0	1	3	18	(457)	39	(18)	**FNN718A10XS**	RS	**FNN718A10XW**	RS
	240	18.0	3	1	18	(457)	39	(18)	**FNN718A3XS**	RS	**FNN718A3XW**	RS
	480	18.0	1	1	18	(457)	39	(18)	**FNN718A11XS**	RS	**FNN718A11XW**	RS
	480	18.0	3	1	18	(457)	39	(18)	**FNN718A5XS**	RS	**FNN718A5XW**	RS
	240	23.0	1	3	20½	(521)	42	(19)	**FNN720J10XS**	RS	**FNN720J10XW**	RS
	240	23.0	3	3	20½	(521)	42	(19)	**FNN720J3XS**	RS	**FNN720J3XW**	RS
	480	23.0	1	1	20½	(521)	42	(19)	**FNN720J11XS**	RS	**FNN720J11XW**	RS
	480	23.0	3	1	20½	(521)	42	(19)	**FNN720J5XS**	RS	**FNN720J5XW**	RS
	240	27.0	1	3	25½	(648)	45	(21)	**FNN725J10XS**	RS	**FNN725J10XW**	RS
	240	27.0	3	3	25½	(648)	45	(21)	**FNN725J3XS**	RS	**FNN725J3XW**	RS
	480	27.0	1	3	25½	(648)	45	(21)	**FNN725J11XS**	RS	**FNN725J11XW**	RS
	480	27.0	3	1	25½	(648)	45	(21)	**FNN725J5XS**	RS	**FNN725J5XW**	RS
	240	36.0	3	3	33	(838)	48	(22)	**FNN733A3XS**	RS	**FNN733A3XW**	RS
	480	36.0	1	3	33	(838)	48	(22)	**FNN733A11XS**	RS	**FNN733A11XW**	RS
	480	36.0	3	1	33	(838)	48	(22)	**FNN733A5XS**	RS	**FNN733A5XW**	RS
	240	45.0	3	3	40½	(1029)	53	(24)	**FNN740J3XS**	RS	**FNN740J3XW**	RS
	480	45.0	1	3	40½	(1029)	53	(24)	**FNN740J11XS**	RS	**FNN740J11XW**	RS
	480	45.0	3	3	40½	(1029)	53	(24)	**FNN740J5XS**	RS	**FNN740J5XW**	RS
	240	54.0	3	3	48	(1219)	60	(28)	**FNN748A3XS**	RS	**FNN748A3XW**	RS
	480	54.0	1	3	48	(1219)	60	(28)	**FNN748A11XS**	RS	**FNN748A11XW**	RS
	480	54.0	3	3	48	(1219)	60	(28)	**FNN748A5XS**	RS	**FNN748A5XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

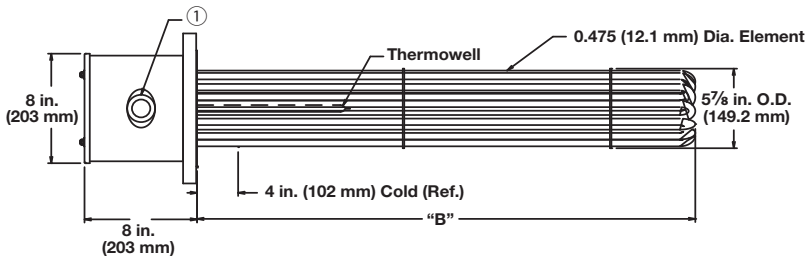
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 12-Incoloy Elements (7.5 W/cm²)	240	18.0	1	2	13⅜	(339.7)	73	(33)	**FPN713G10S**	RS	**FPN713G10W**	RS
	240	18.0	3	1	13⅜	(339.7)	73	(33)	**FPN713G3S**	RS	**FPN713G3W**	RS
	480	18.0	1	1	13⅜	(339.7)	73	(33)	**FPN713G11S**	RS	**FPN713G11W**	RS
	480	18.0	3	1	13⅜	(339.7)	73	(33)	**FPN713G5S**	RS	**FPN713G5W**	RS
	240	24.0	1	3	17⅛	(454.0)	75	(34)	**FPN717R10S**	RS	**FPN717R10W**	RS
	240	24.0	3	2	17⅛	(454.0)	75	(34)	**FPN717R3S**	RS	**FPN717R3W**	RS
	480	24.0	1	2	17⅛	(454.0)	75	(34)	**FPN717R11S**	RS	**FPN717R11W**	RS
	480	24.0	3	1	17⅛	(454.0)	75	(34)	**FPN717R5S**	RS	**FPN717R5W**	RS
	240	30.0	1	3	20⅜	(517.5)	78	(36)	**FPN720G10S**	RS	**FPN720G10W**	RS
	240	30.0	3	2	20⅜	(517.5)	78	(36)	**FPN720G3S**	RS	**FPN720G3W**	RS
	480	30.0	1	2	20⅜	(517.5)	78	(36)	**FPN720G11S**	RS	**FPN720G11W**	RS
	480	30.0	3	1	20⅜	(517.5)	78	(36)	**FPN720G5S**	RS	**FPN720G5W**	RS
	240	36.0	1	4	25⅜	(644.5)	81	(37)	**FPN725G10S**	RS	**FPN725G10W**	RS
	240	36.0	3	2	25⅜	(644.5)	81	(37)	**FPN725G3S**	RS	**FPN725G3W**	RS
	480	36.0	1	2	25⅜	(644.5)	81	(37)	**FPN725G11S**	RS	**FPN725G11W**	RS
	480	36.0	3	1	25⅜	(644.5)	81	(37)	**FPN725G5S**	RS	**FPN725G5W**	RS
	240	48.0	3	4	32⅛	(835.0)	85	(39)	**FPN732R3S**	RS	**FPN732R3W**	RS
	480	48.0	1	3	32⅛	(835.0)	85	(39)	**FPN732R11S**	RS	**FPN732R11W**	RS
	480	48.0	3	2	32⅛	(835.0)	85	(39)	**FPN732R5S**	RS	**FPN732R5W**	RS
	240	60.0	3	4	40⅜	(1025.5)	92	(42)	**FPN740G3S**	RS	**FPN740G3W**	RS
	480	60.0	1	3	40⅜	(1025.5)	92	(42)	**FPN740G11S**	RS	**FPN740G11W**	RS
	480	60.0	3	2	40⅜	(1025.5)	92	(42)	**FPN740G5S**	RS	**FPN740G5W**	RS
	240	72.0	3	4	47⅛	(1216.0)	100	(46)	**FPN747R3S**	RS	**FPN747R3W**	RS
	480	72.0	3	2	47⅛	(1216.0)	100	(46)	**FPN747R5S**	RS	**FPN747R5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

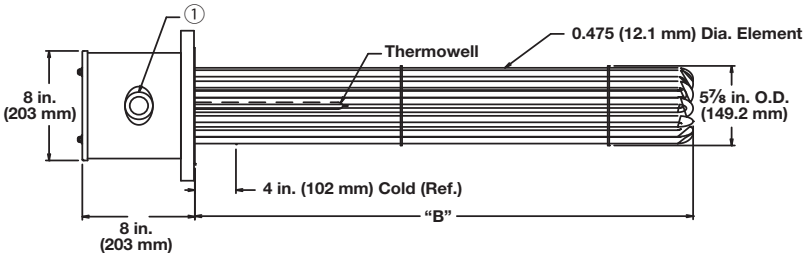
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 15-Incoloy Elements (7.5 W/cm²)	240	23.0	1	3	13⅜	(339.7)	76	(35)	**FPN713G10XS**	RS	**FPN713G10XW**	RS
	240	23.0	3	5	13⅜	(339.7)	76	(35)	**FPN713G3XS**	RS	**FPN713G3XW**	RS
	480	23.0	1	1	13⅜	(339.7)	76	(35)	**FPN713G11XS**	RS	**FPN713G11XW**	RS
	480	23.0	3	1	13⅜	(339.7)	76	(35)	**FPN713G5XS**	RS	**FPN713G5XW**	RS
	240	30.0	1	3	17⅜	(441.3)	78	(36)	**FPN717R10XS**	RS	**FPN717R10XW**	RS
	240	30.0	3	5	17⅜	(441.3)	78	(36)	**FPN717R3XS**	RS	**FPN717R3XW**	RS
	480	30.0	1	3	17⅜	(441.3)	78	(36)	**FPN717R11XS**	RS	**FPN717R11XW**	RS
	480	30.0	3	1	17⅜	(441.3)	78	(36)	**FPN717R5XS**	RS	**FPN717R5XW**	RS
	240	38.0	1	5	20⅜	(517.5)	82	(38)	**FPN720G10XS**	RS	**FPN720G10XW**	RS
	240	38.0	3	5	20⅜	(517.5)	82	(38)	**FPN720G3XS**	RS	**FPN720G3XW**	RS
	480	38.0	1	3	20⅜	(517.5)	82	(38)	**FPN720G11XS**	RS	**FPN720G11XW**	RS
	480	38.0	3	1	20⅜	(517.5)	82	(38)	**FPN720G5XS**	RS	**FPN720G5XW**	RS
	240	45.0	1	5	25⅜	(644.5)	85	(39)	**FPN725G10XS**	RS	**FPN725G10XW**	RS
	240	45.0	3	5	25⅜	(644.5)	85	(39)	**FPN725G3XS**	RS	**FPN725G3XW**	RS
	480	45.0	1	3	25⅜	(644.5)	85	(39)	**FPN725G11XS**	RS	**FPN725G11XW**	RS
	480	45.0	3	5	25⅜	(644.5)	85	(39)	**FPN725G5XS**	RS	**FPN725G5XW**	RS
	240	60.0	3	5	32⅞	(835.0)	90	(41)	**FPN732R3XS**	RS	**FPN732R3XW**	RS
	480	60.0	1	3	32⅞	(835.0)	90	(41)	**FPN732R11XS**	RS	**FPN732R11XW**	RS
	480	60.0	3	5	32⅞	(835.0)	90	(41)	**FPN732R5XS**	RS	**FPN732R5XW**	RS
	240	75.0	3	5	40⅜	(1025.5)	98	(45)	**FPN740G3XS**	RS	**FPN740G3XW**	RS
	480	75.0	1	5	40⅜	(1025.5)	98	(45)	**FPN740G11XS**	RS	**FPN740G11XW**	RS
	480	75.0	3	5	40⅜	(1025.5)	98	(45)	**FPN740G5XS**	RS	**FPN740G5XW**	RS
	240	90.0	3	5	47⅞	(1216.0)	108	(49)	**FPN747R3XS**	RS	**FPN747R3XW**	RS
	480	90.0	3	5	47⅞	(1216.0)	108	(49)	**FPN747R5XS**	RS	**FPN747R5XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

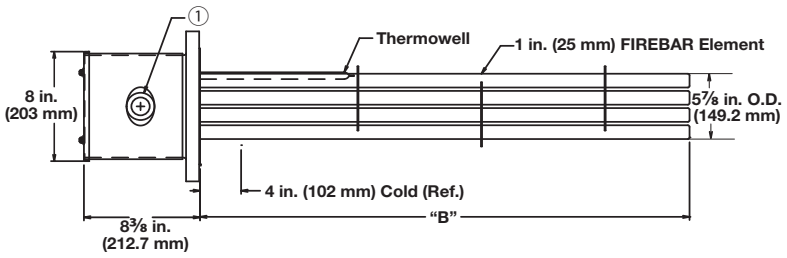
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 6 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
45 W/in² 304 SS Flange 15-Incoloy Elements (7 W/cm²)	240	30.0	3	5	13⅜	(339.7)	78	(36)	**FPNF13G27S**	RS	**FPNF13G27W**	RS
	240	37.5	3	5	16	(406.0)	81	(37)	**FPNF16A27S**	RS	**FPNF16A27W**	RS
	240	45.0	3	5	18⅜	(466.7)	84	(38)	**FPNF18G27S**	RS	**FPNF18G27W**	RS
	240	60.0	3	5	22⅞	(581.0)	87	(40)	**FPNF22R27S**	RS	**FPNF22R27W**	RS
	480	60.0	3	5	22⅞	(581.0)	87	(40)	**FPNF22R28S**	RS	**FPNF22R28W**	RS
	240	75.0	3	5	27⅞	(708.0)	91	(42)	**FPNF27R27S**	RS	**FPNF27R27W**	RS
	480	75.0	3	5	27⅞	(708.0)	91	(42)	**FPNF27R28S**	RS	**FPNF27R28W**	RS
	240	90.0	3	5	32⅞	(835.0)	95	(43)	**FPNF32R27S**	RS	**FPNF32R27W**	RS
	480	90.0	3	5	32⅞	(835.0)	95	(43)	**FPNF32R28S**	RS	**FPNF32R28W**	RS
	480	120.0	3	5	42⅜	(1076.3)	106	(48)	**FPNF42G28S**	RS	**FPNF42G28W**	RS
	480	150.0	3	5	51⅞	(1317.6)	116	(53)	**FPNF51R28S**	RS	**FPNF51R28W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

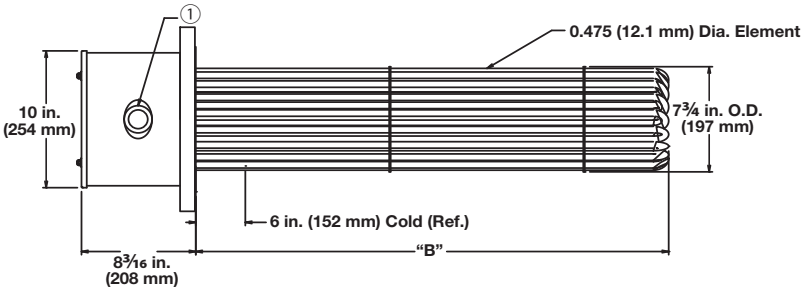
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Process Water

- 8 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 18-Incoloy Elements (7.5 W/cm²)	240	50.0	3	3	25¾	(654.0)	121	(55)	**FRN725N3S**	RS	**FRN725N3W**	RS
	480	50.0	1	3	25¾	(654.0)	121	(55)	**FRN725N11S**	RS	**FRN725N11W**	RS
	480	50.0	3	2	25¾	(654.0)	121	(55)	**FRN725N5S**	RS	**FRN725N5W**	RS
	240	75.0	3	6	35¾	(908.0)	130	(59)	**FRN735N3S**	RS	**FRN735N3W**	RS
	480	75.0	3	2	35¾	(908.0)	130	(59)	**FRN735N5S**	RS	**FRN735N5W**	RS
	240	100.0	3	6	44¼	(1124.0)	132	(60)	**FRN744E3S**	RS	**FRN744E3W**	RS
	480	100.0	3	3	44¼	(1124.0)	132	(60)	**FRN744E5S**	RS	**FRN744E5W**	RS
	240	125.0	3	6	54¹⁄₁₆	(1389.1)	140	(64)	**FRN754M3S**	RS	**FRN754M3W**	RS
	480	125.0	3	6	54¹⁄₁₆	(1389.1)	140	(64)	**FRN754M5S**	RS	**FRN754M5W**	RS
	480	150.0	3	6	63¹⁄₁₆	(1617.6)	145	(66)	**FRN763M5S**	RS	**FRN763M5W**	RS
	480	175.0	3	6	73⅜	(1859.0)	151	(69)	**FRN773D5S**	RS	**FRN773D5W**	RS
	480	200.0	3	6	82¹⁄₁₆	(2100.3)	157	(72)	**FRN782M5S**	RS	**FRN782M5W**	RS
48 W/in² Steel Flange 24-Incoloy Elements (7.5 W/cm²)	240	67.0	3	4	26⅜	(665.2)	129	(59)	**FRN726D3XS**	RS	**FRN726D3XW**	RS
	480	67.0	1	3	26⅜	(665.2)	129	(59)	**FRN726D11XS**	RS	**FRN726D11XW**	RS
	480	67.0	3	2	26⅜	(665.2)	129	(59)	**FRN726D5XS**	RS	**FRN726D5XW**	RS
	240	100.0	3	8	36⅜	(919.2)	142	(65)	**FRN736D3XS**	RS	**FRN736D3XW**	RS
	480	100.0	3	4	36⅜	(919.2)	142	(65)	**FRN736D5XS**	RS	**FRN736D5XW**	RS
	240	133.0	3	8	44¹⁄₁₆	(1135.1)	147	(67)	**FRN744M3XS**	RS	**FRN744M3XW**	RS
	480	133.0	3	4	44¹⁄₁₆	(1135.1)	147	(67)	**FRN744M5XS**	RS	**FRN744M5XW**	RS
	240	167.0	3	8	54¹⁄₁₆	(1389.1)	158	(72)	**FRN754M3XS**	RS	**FRN754M3XW**	RS
	480	167.0	3	8	54¹⁄₁₆	(1389.1)	158	(72)	**FRN754M5XS**	RS	**FRN754M5XW**	RS
	480	200.0	3	8	63¹⁄₁₆	(1617.6)	166	(76)	**FRN763M5XS**	RS	**FRN763M5XW**	RS
	480	233.0	3	8	73⅜	(1859.0)	175	(80)	**FRN773D5XS**	RS	**FRN773D5XW**	RS
	480	267.0	3	8	82¹⁄₁₆	(2100.3)	184	(84)	**FRN782M5XS**	RS	**FRN782M5XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

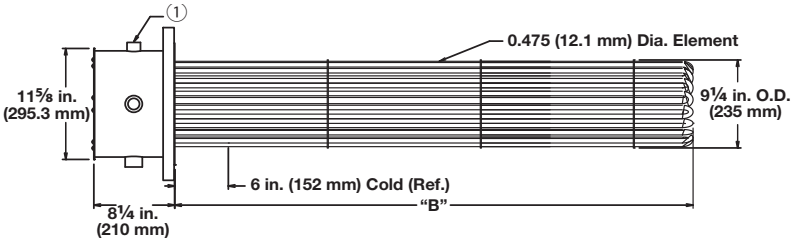
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

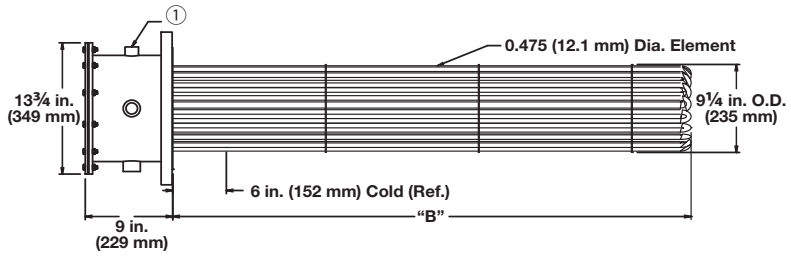
Application: Process Water

- 10 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



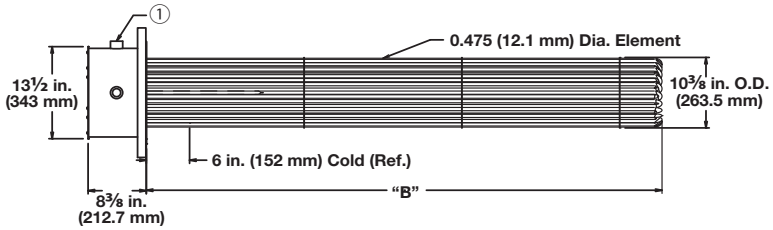
① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 27-Incoloy Elements (7.5 W/cm²)	480	190.0	3	9	54¾	(1391)	240	(109)	**FSN754N5S**	S	**FSN754N5W**	S
	480	262.0	3	9	73¼	(1861)	260	(118)	**FSN773E5S**	S	**FSN773E5W**	S

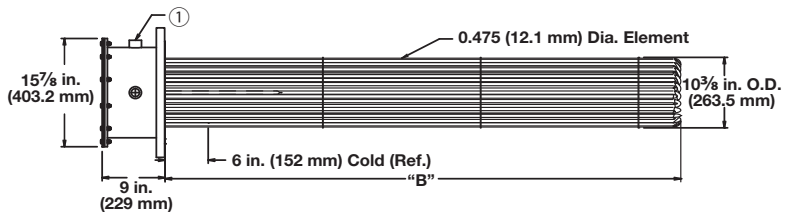
Application: Process Water

- 12 inch - 150 lb ANSI flange.
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 36-Incoloy Elements (7.5 W/cm²)	480	250.0	3	6	54⅝	(1387.5)	280	(127)	**FTN754L5S**	S	**FTN754L5W**	RS
	480	350.0	3	12	73⅛	(1857.4)	291	(132)	**FTN773C5S**	S	**FTN773C5W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 day lead time

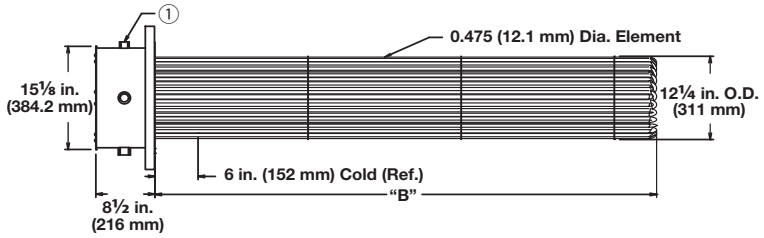
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

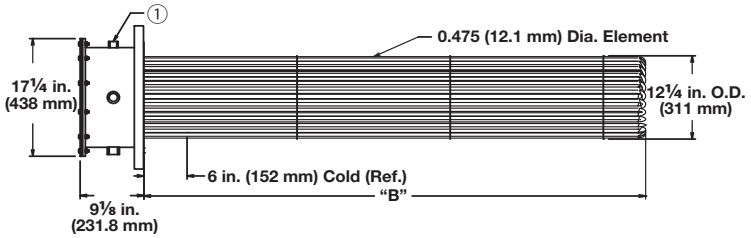
Application: Process Water

- 14 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
48 W/in² Steel Flange 45-Incoloy Elements (7.5 W/cm²)	480	315.0	3	15	54½	(1384)	300	(136)	**FWN754J5S**	S	**FWN754J5W**	S
	480	375.0	3	15	63½	(1613)	310	(141)	**FWN763J5S**	S	**FWN763J5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

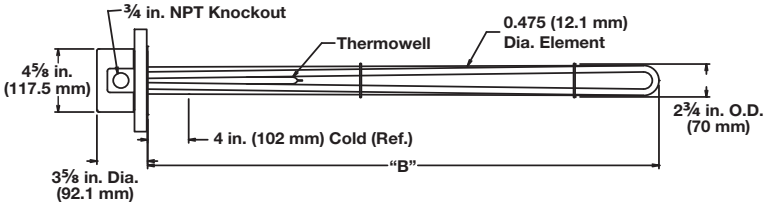
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

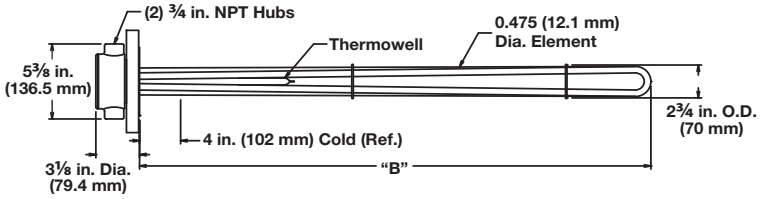
Application: Forced Air and Caustic Solutions

- 3 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures
- Single circuit

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 3-Incoloy Elements (3.6 W/cm²)	240	3.0	1	18	(457)	23	(11)	**FMNA18A10S**	RS	**FMNA18A10W**	RS
	240	3.0	3	18	(457)	23	(11)	**FMNA18A3S**	RS	**FMNA18A3W**	RS
	480	3.0	1	18	(457)	23	(11)	**FMNA18A11S**	RS	**FMNA18A11W**	RS
	480	3.0	3	18	(457)	23	(11)	**FMNA18A5S**	RS	**FMNA18A5W**	RS
	240	4.5	1	25½	(648)	27	(13)	**FMNA25J10S**	RS	**FMNA25J10W**	RS
	240	4.5	3	25½	(648)	27	(13)	**FMNA25J3S**	RS	**FMNA25J3W**	RS
	480	4.5	1	25½	(648)	27	(13)	**FMNA25J11S**	RS	**FMNA25J11W**	RS
	480	4.5	3	25½	(648)	27	(13)	**FMNA25J5S**	RS	**FMNA25J5W**	RS
	240	6.0	1	33	(838)	28	(13)	**FMNA33A10S**	RS	**FMNA33A10W**	RS
	240	6.0	3	33	(838)	28	(13)	**FMNA33A3S**	RS	**FMNA33A3W**	RS
	480	6.0	1	33	(838)	28	(13)	**FMNA33A11S**	RS	**FMNA33A11W**	RS
	480	6.0	3	33	(838)	28	(13)	**FMNA33A5S**	RS	**FMNA33A5W**	RS
	240	7.5	1	40½	(1029)	30	(14)	**FMNA40J10S**	RS	**FMNA40J10W**	RS
	240	7.5	3	40½	(1029)	30	(14)	**FMNA40J3S**	RS	**FMNA40J3W**	RS
	480	7.5	1	40½	(1029)	30	(14)	**FMNA40J11S**	RS	**FMNA40J11W**	RS
	480	7.5	3	40½	(1029)	30	(14)	**FMNA40J5S**	RS	**FMNA40J5W**	RS
	240	9.0	1	48	(1219)	32	(15)	**FMNA48A10S**	RS	**FMNA48A10W**	RS
	240	9.0	3	48	(1219)	32	(15)	**FMNA48A3S**	RS	**FMNA48A3W**	RS
	480	9.0	1	48	(1219)	32	(15)	**FMNA48A11S**	RS	**FMNA48A11W**	RS
	480	9.0	3	48	(1219)	32	(15)	**FMNA48A5S**	RS	**FMNA48A5W**	RS
	240	12.5	3	64½	(1638)	37	(17)	**FMNA64J3S**	RS	**FMNA64J3W**	RS
	480	12.5	1	64½	(1638)	37	(17)	**FMNA64J11S**	RS	**FMNA64J11W**	RS
	480	12.5	3	64½	(1638)	37	(17)	**FMNA64J5S**	RS	**FMNA64J5W**	RS
	240	15.0	3	77	(1956)	42	(19)	**FMNA77A3S**	RS	**FMNA77A3W**	RS
	480	15.0	1	77	(1956)	42	(19)	**FMNA77A11S**	RS	**FMNA77A11W**	RS
	480	15.0	3	77	(1956)	42	(19)	**FMNA77A5S**	RS	**FMNA77A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

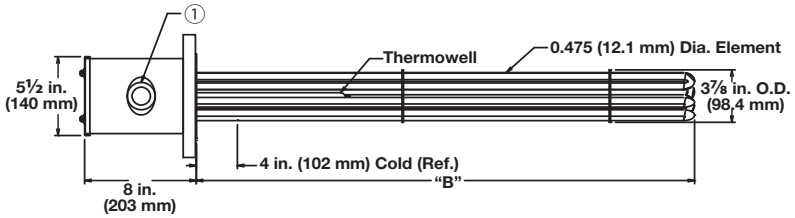
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Forced Air and Caustic Solutions

- 4 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 6-Incoloy Elements (3.6 W/cm²)	240	6.0	1	1	18	(457)	32	(15)	**FONA18A10S**	RS	**FONA18A10W**	RS
	240	6.0	3	1	18	(457)	32	(15)	**FONA18A3S**	RS	**FONA18A3W**	RS
	480	6.0	1	1	18	(457)	32	(15)	**FONA18A11S**	RS	**FONA18A11W**	RS
	480	6.0	3	1	18	(457)	32	(15)	**FONA18A5S**	RS	**FONA18A5W**	RS
	240	9.0	1	1	25½	(648)	36	(17)	**FONA25J10S**	RS	**FONA25J10W**	RS
	240	9.0	3	1	25½	(648)	36	(17)	**FONA25J3S**	RS	**FONA25J3W**	RS
	480	9.0	1	1	25½	(648)	36	(17)	**FONA25J11S**	RS	**FONA25J11W**	RS
	480	9.0	3	1	25½	(648)	36	(17)	**FONA25J5S**	RS	**FONA25J5W**	RS
	240	12.0	1	2	33	(838)	39	(18)	**FONA33A10S**	RS	**FONA33A10W**	RS
	240	12.0	3	1	33	(838)	39	(18)	**FONA33A3S**	RS	**FONA33A3W**	RS
	480	12.0	1	1	33	(838)	39	(18)	**FONA33A11S**	RS	**FONA33A11W**	RS
	480	12.0	3	1	33	(838)	39	(18)	**FONA33A5S**	RS	**FONA33A5W**	RS
	240	15.0	1	2	40½	(1029)	43	(20)	**FONA40J10S**	RS	**FONA40J10W**	RS
	240	15.0	3	1	40½	(1029)	43	(20)	**FONA40J3S**	RS	**FONA40J3W**	RS
	480	15.0	1	1	40½	(1029)	43	(20)	**FONA40J11S**	RS	**FONA40J11W**	RS
	480	15.0	3	1	40½	(1029)	43	(20)	**FONA40J5S**	RS	**FONA40J5W**	RS
	240	18.0	1	2	48	(1219)	48	(22)	**FONA48A10S**	RS	**FONA48A10W**	RS
	240	18.0	3	1	48	(1219)	48	(22)	**FONA48A3S**	RS	**FONA48A3W**	RS
	480	18.0	1	1	48	(1219)	48	(22)	**FONA48A11S**	RS	**FONA48A11W**	RS
	480	18.0	3	1	48	(1219)	48	(22)	**FONA48A5S**	RS	**FONA48A5W**	RS
	240	25.0	3	2	64½	(1638)	53	(24)	**FONA64J3S**	RS	**FONA64J3W**	RS
	480	25.0	1	2	64½	(1638)	53	(24)	**FONA64J11S**	RS	**FONA64J11W**	RS
	480	25.0	3	1	64½	(1638)	53	(24)	**FONA64J5S**	RS	**FONA64J5W**	RS
	240	30.0	3	2	77	(1956)	61	(28)	**FONA77A3S**	RS	**FONA77A3W**	RS
	480	30.0	1	2	77	(1956)	61	(28)	**FONA77A11S**	RS	**FONA77A11W**	RS
	480	30.0	3	1	77	(1956)	61	(28)	**FONA77A5S**	RS	**FONA77A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

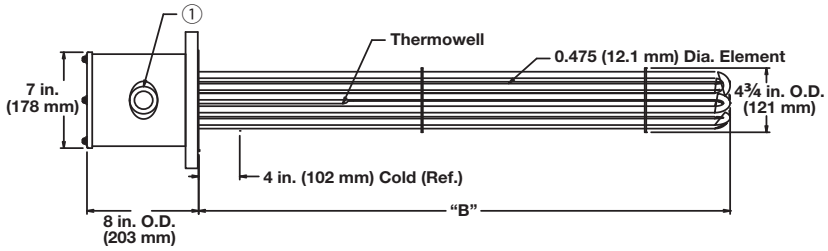
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Forced Air and Caustic Solutions

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 6-Incoloy Elements (3.6 W/cm²)	240	6.0	1	1	18	(457)	36	(17)	**FNNA18A10S**	RS	**FNNA18A10W**	RS
	240	6.0	3	1	18	(457)	36	(17)	**FNNA18A3S**	RS	**FNNA18A3W**	RS
	480	6.0	1	1	18	(457)	36	(17)	**FNNA18A11S**	RS	**FNNA18A11W**	RS
	480	6.0	3	1	18	(457)	36	(17)	**FNNA18A5S**	RS	**FNNA18A5W**	RS
	240	9.0	1	1	25½	(648)	40	(19)	**FNNA25J10S**	RS	**FNNA25J10W**	RS
	240	9.0	3	1	25½	(648)	40	(19)	**FNNA25J3S**	RS	**FNNA25J3W**	RS
	480	9.0	1	1	25½	(648)	40	(19)	**FNNA25J11S**	RS	**FNNA25J11W**	RS
	480	9.0	3	1	25½	(648)	40	(19)	**FNNA25J5S**	RS	**FNNA25J5W**	RS
	240	12.0	1	2	33	(838)	43	(20)	**FNNA33A10S**	RS	**FNNA33A10W**	RS
	240	12.0	3	1	33	(838)	43	(20)	**FNNA33A3S**	RS	**FNNA33A3W**	RS
	480	12.0	1	1	33	(838)	43	(20)	**FNNA33A11S**	RS	**FNNA33A11W**	RS
	480	12.0	3	1	33	(838)	43	(20)	**FNNA33A5S**	RS	**FNNA33A5W**	RS
	240	15.0	1	2	40½	(1029)	47	(22)	**FNNA40J10S**	RS	**FNNA40J10W**	RS
	240	15.0	3	1	40½	(1029)	47	(22)	**FNNA40J3S**	RS	**FNNA40J3W**	RS
	480	15.0	1	1	40½	(1029)	47	(22)	**FNNA40J11S**	RS	**FNNA40J11W**	RS
	480	15.0	3	1	40½	(1029)	47	(22)	**FNNA40J5S**	RS	**FNNA40J5W**	RS
	240	18.0	1	2	48	(1219)	52	(24)	**FNNA48A10S**	RS	**FNNA48A10W**	RS
	240	18.0	3	1	48	(1219)	52	(24)	**FNNA48A3S**	RS	**FNNA48A3W**	RS
	480	18.0	1	1	48	(1219)	52	(24)	**FNNA48A11S**	RS	**FNNA48A11W**	RS
	480	18.0	3	1	48	(1219)	52	(24)	**FNNA48A5S**	RS	**FNNA48A5W**	RS
	240	25.0	3	2	64½	(1638)	57	(26)	**FNNA64J3S**	RS	**FNNA64J3W**	RS
	480	25.0	1	2	64½	(1638)	57	(26)	**FNNA64J11S**	RS	**FNNA64J11W**	RS
	480	25.0	3	1	64½	(1638)	57	(26)	**FNNA64J5S**	RS	**FNNA64J5W**	RS
	240	30.0	3	2	77	(1956)	65	(30)	**FNNA77A3S**	RS	**FNNA77A3W**	RS
	480	30.0	1	2	77	(1956)	65	(30)	**FNNA77A11S**	RS	**FNNA77A11W**	RS
	480	30.0	3	1	77	(1956)	65	(30)	**FNNA77A5S**	RS	**FNNA77A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

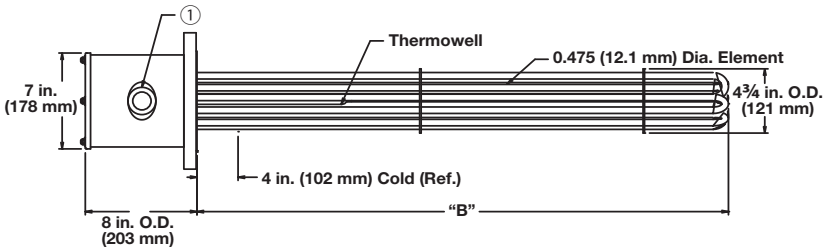
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Forced Air and Caustic Solutions

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 9-Incoloy Elements (3.6 W/cm²)	240	9.0	1	1	18	(457)	39	(18)	**FNNA18A10XS**	RS	**FNNA18A10XW**	RS
	240	9.0	3	1	18	(457)	39	(18)	**FNNA18A3XS**	RS	**FNNA18A3XW**	RS
	480	9.0	1	1	18	(457)	39	(18)	**FNNA18A11XS**	RS	**FNNA18A11XW**	RS
	480	9.0	3	1	18	(457)	39	(18)	**FNNA18A5XS**	RS	**FNNA18A5XW**	RS
	240	14.0	1	3	25½	(648)	45	(21)	**FNNA25J10XS**	RS	**FNNA25J10XW**	RS
	240	14.0	3	1	25½	(648)	45	(21)	**FNNA25J3XS**	RS	**FNNA25J3XW**	RS
	480	14.0	1	1	25½	(648)	45	(21)	**FNNA25J11XS**	RS	**FNNA25J11XW**	RS
	480	14.0	3	1	25½	(648)	45	(21)	**FNNA25J5XS**	RS	**FNNA25J5XW**	RS
	240	18.0	1	3	33	(838)	48	(22)	**FNNA33A10XS**	RS	**FNNA33A10XW**	RS
	240	18.0	3	1	33	(838)	48	(22)	**FNNA33A3XS**	RS	**FNNA33A3XW**	RS
	480	18.0	1	1	33	(838)	48	(22)	**FNNA33A11XS**	RS	**FNNA33A11XW**	RS
	480	18.0	3	1	33	(838)	48	(22)	**FNNA33A5XS**	RS	**FNNA33A5XW**	RS
	240	23.0	1	3	40½	(1029)	53	(24)	**FNNA40J10XS**	RS	**FNNA40J10XW**	RS
	240	23.0	3	3	40½	(1029)	53	(24)	**FNNA40J3XS**	RS	**FNNA40J3XW**	RS
	480	23.0	1	1	40½	(1029)	53	(24)	**FNNA40J11XS**	RS	**FNNA40J11XW**	RS
	480	23.0	3	1	40½	(1029)	53	(24)	**FNNA40J5XS**	RS	**FNNA40J5XW**	RS
	240	27.0	1	3	48	(1219)	60	(28)	**FNNA48A10XS**	RS	**FNNA48A10XW**	RS
	240	27.0	3	3	48	(1219)	60	(28)	**FNNA48A3XS**	RS	**FNNA48A3XW**	RS
	480	27.0	1	3	48	(1219)	60	(28)	**FNNA48A11XS**	RS	**FNNA48A11XW**	RS
	480	27.0	3	1	48	(1219)	60	(28)	**FNNA48A5XS**	RS	**FNNA48A5XW**	RS
	240	38.0	3	3	64½	(1638)	68	(31)	**FNNA64J3XS**	RS	**FNNA64J3XW**	RS
	480	38.0	1	3	64½	(1638)	68	(31)	**FNNA64J11XS**	RS	**FNNA64J11XW**	RS
	480	38.0	3	1	64½	(1638)	68	(31)	**FNNA64J5XS**	RS	**FNNA64J5XW**	RS
	240	45.0	3	3	77	(1956)	78	(36)	**FNNA77A3XS**	RS	**FNNA77A3XW**	RS
	480	45.0	1	3	77	(1956)	78	(36)	**FNNA77A11XS**	RS	**FNNA77A11XW**	RS
	480	45.0	3	3	77	(1956)	78	(36)	**FNNA77A5XS**	RS	**FNNA77A5XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

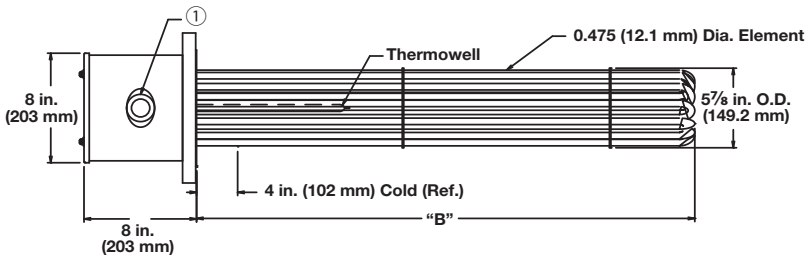
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Forced Air and Caustic Solutions

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 12-Incoloy Elements (3.6 W/cm²)	240	12.0	1	2	17⅞	(454.0)	75	(34)	**FPNA17R10S**	RS	**FPNA17R10W**	RS
	240	12.0	3	1	17⅞	(454.0)	75	(34)	**FPNA17R3S**	RS	**FPNA17R3W**	RS
	480	12.0	1	1	17⅞	(454.0)	75	(34)	**FPNA17R11S**	RS	**FPNA17R11W**	RS
	480	12.0	3	1	17⅞	(454.0)	75	(34)	**FPNA17R5S**	RS	**FPNA17R5W**	RS
	240	18.0	1	2	25⅜	(644.5)	81	(37)	**FPNA25G10S**	RS	**FPNA25G10W**	RS
	240	18.0	3	1	25⅜	(644.5)	81	(37)	**FPNA25G3S**	RS	**FPNA25G3W**	RS
	480	18.0	1	1	25⅜	(644.5)	81	(37)	**FPNA25G11S**	RS	**FPNA25G11W**	RS
	480	18.0	3	1	25⅜	(644.5)	81	(37)	**FPNA25G5S**	RS	**FPNA25G5W**	RS
	240	24.0	1	3	32⅞	(835.0)	85	(39)	**FPNA32R10S**	RS	**FPNA32R10W**	RS
	240	24.0	3	2	32⅞	(835.0)	85	(39)	**FPNA32R3S**	RS	**FPNA32R3W**	RS
	480	24.0	1	2	32⅞	(835.0)	85	(39)	**FPNA32R11S**	RS	**FPNA32R11W**	RS
	480	24.0	3	1	32⅞	(835.0)	85	(39)	**FPNA32R5S**	RS	**FPNA32R5W**	RS
	240	30.0	1	3	40⅜	(1025.5)	92	(42)	**FPNA40G10S**	RS	**FPNA40G10W**	RS
	240	30.0	3	2	40⅜	(1025.5)	92	(42)	**FPNA40G3S**	RS	**FPNA40G3W**	RS
	480	30.0	1	2	40⅜	(1025.5)	92	(42)	**FPNA40G11S**	RS	**FPNA40G11W**	RS
	480	30.0	3	1	40⅜	(1025.5)	92	(42)	**FPNA40G5S**	RS	**FPNA40G5W**	RS
	240	36.0	1	4	47⅞	(1216.0)	100	(46)	**FPNA47R10S**	RS	**FPNA47R10W**	RS
	240	36.0	3	2	47⅞	(1216.0)	100	(46)	**FPNA47R3S**	RS	**FPNA47R3W**	RS
	480	36.0	1	2	47⅞	(1216.0)	100	(46)	**FPNA47R11S**	RS	**FPNA47R11W**	RS
	480	36.0	3	1	47⅞	(1216.0)	100	(46)	**FPNA47R5S**	RS	**FPNA47R5W**	RS
	240	50.0	3	4	64⅜	(1635.1)	110	(50)	**FPNA64G3S**	RS	**FPNA64G3W**	RS
	480	50.0	1	3	64⅜	(1635.1)	110	(50)	**FPNA64G11S**	RS	**FPNA64G11W**	RS
	480	50.0	3	2	64⅜	(1635.1)	110	(50)	**FPNA64G5S**	RS	**FPNA64G5W**	RS
	240	60.0	3	4	76⅞	(1952.4)	118	(54)	**FPNA76R3S**	RS	**FPNA76R3W**	RS
	480	60.0	1	3	76⅞	(1952.4)	118	(54)	**FPNA76R11S**	RS	**FPNA76R11W**	RS
	480	60.0	3	2	76⅞	(1952.4)	118	(54)	**FPNA76R5S**	RS	**FPNA76R5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

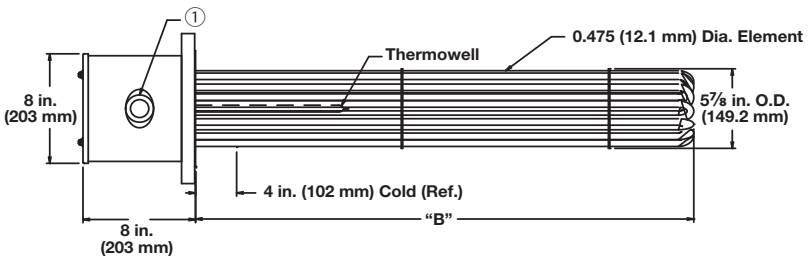
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Forced Air and Caustic Solutions

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 15-Incoloy Elements (3.6 W/cm²)	240	15.0	1	3	17⅞	(454.0)	78	(36)	**FPNA17R10XS**	RS	**FPNA17R10XW**	RS
	240	15.0	3	1	17⅞	(454.0)	78	(36)	**FPNA17R3XS**	RS	**FPNA17R3XW**	RS
	480	15.0	1	1	17⅞	(454.0)	78	(36)	**FPNA17R11XS**	RS	**FPNA17R11XW**	RS
	480	15.0	3	1	17⅞	(454.0)	78	(36)	**FPNA17R5XS**	RS	**FPNA17R5XW**	RS
	240	23.0	1	3	25⅜	(644.5)	85	(39)	**FPNA25G10XS**	RS	**FPNA25G10XW**	RS
	240	23.0	3	5	25⅜	(644.5)	85	(39)	**FPNA25G3XS**	RS	**FPNA25G3XW**	RS
	480	23.0	1	1	25⅜	(644.5)	85	(39)	**FPNA25G11XS**	RS	**FPNA25G11XW**	RS
	480	23.0	3	1	25⅜	(644.5)	85	(39)	**FPNA25G5XS**	RS	**FPNA25G5XW**	RS
	240	30.0	1	3	32⅞	(835.0)	90	(41)	**FPNA32R10XS**	RS	**FPNA32R10XW**	RS
	240	30.0	3	5	32⅞	(835.0)	90	(41)	**FPNA32R3XS**	RS	**FPNA32R3XW**	RS
	480	30.0	1	3	32⅞	(835.0)	90	(41)	**FPNA32R11XS**	RS	**FPNA32R11XW**	RS
	480	30.0	3	1	32⅞	(835.0)	90	(41)	**FPNA32R5XS**	RS	**FPNA32R5XW**	RS
	240	38.0	1	5	40⅜	(1025.5)	98	(45)	**FPNA40G10XS**	RS	**FPNA40G10XW**	RS
	240	38.0	3	5	40⅜	(1025.5)	98	(45)	**FPNA40G3XS**	RS	**FPNA40G3XW**	RS
	480	38.0	1	3	40⅜	(1025.5)	98	(45)	**FPNA40G11XS**	RS	**FPNA40G11XW**	RS
	480	38.0	3	1	40⅜	(1025.5)	98	(45)	**FPNA40G5XS**	RS	**FPNA40G5XW**	RS
	240	45.0	1	5	47⅞	(1216.0)	108	(49)	**FPNA47R10XS**	RS	**FPNA47R10XW**	RS
	240	45.0	3	5	47⅞	(1216.0)	108	(49)	**FPNA47R3XS**	RS	**FPNA47R3XW**	RS
	480	45.0	1	3	47⅞	(1216.0)	108	(49)	**FPNA47R11XS**	RS	**FPNA47R11XW**	RS
	480	45.0	3	5	47⅞	(1216.0)	108	(49)	**FPNA47R5XS**	RS	**FPNA47R5XW**	RS
	240	63.0	3	5	64⅜	(1635.1)	120	(55)	**FPNA64G3XS**	RS	**FPNA64G3XW**	RS
	480	63.0	1	3	64⅜	(1635.1)	120	(55)	**FPNA64G11XS**	RS	**FPNA64G11XW**	RS
	480	63.0	3	5	64⅜	(1635.1)	120	(55)	**FPNA64G5XS**	RS	**FPNA64G5XW**	RS
	240	75.0	3	5	76⅞	(1952.4)	131	(60)	**FPNA76R3XS**	RS	**FPNA76R3XW**	RS
	480	75.0	1	5	76⅞	(1952.4)	131	(60)	**FPNA76R11XS**	RS	**FPNA76R11XW**	RS
	480	75.0	3	5	76⅞	(1952.4)	131	(60)	**FPNA76R5XS**	RS	**FPNA76R5XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

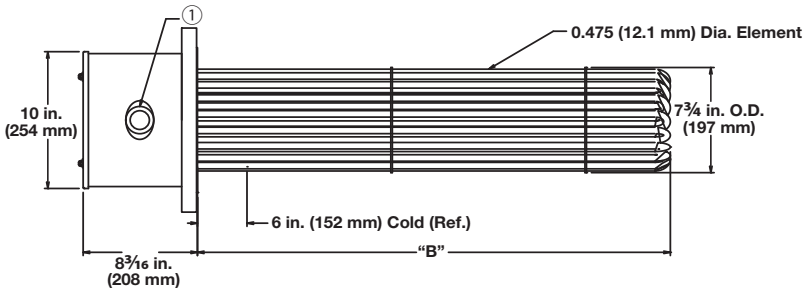
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Forced Air and Caustic Solutions

- 8 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² ⑥ Steel Flange 18-Incoloy Elements (3.6 W/cm²)	240	30.0	1	3	32¾	(832.0)	130	(59)	**FRNA32N10S**	RS	**FRNA32N10W**	RS
	240	30.0	3	2	32¾	(832.0)	130	(59)	**FRNA32N3S**	RS	**FRNA32N3W**	RS
	480	30.0	1	2	32¾	(832.0)	130	(59)	**FRNA32N11S**	RS	**FRNA32N11W**	RS
	480	30.0	3	1	32¾	(832.0)	130	(59)	**FRNA32N5S**	RS	**FRNA32N5W**	RS
	240	40.0	3	3	43¼	(1099.0)	132	(60)	**FRNA43E3S**	RS	**FRNA43E3W**	RS
	480	40.0	1	2	43¼	(1099.0)	132	(60)	**FRNA43E11S**	RS	**FRNA43E11W**	RS
	480	40.0	3	3	43¼	(1099.0)	132	(60)	**FRNA43E5S**	RS	**FRNA43E5W**	RS
	240	50.0	3	3	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRNA51M3S**	RS	**FRNA51M3W**	RS
	480	50.0	1	3	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRNA51M11S**	RS	**FRNA51M11W**	RS
	480	50.0	3	2	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRNA51M5S**	RS	**FRNA51M5W**	RS
23 W/in² ⑥ Steel Flange 24-Incoloy Elements (3.6 W/cm²)	240	40.0	1	4	33³⁄₁₆	(843.0)	142	(65)	**FRNA33D10XS**	RS	**FRNA33D10XW**	RS
	240	40.0	3	4	33³⁄₁₆	(843.0)	142	(65)	**FRNA33D3XS**	RS	**FRNA33D3XW**	RS
	480	40.0	1	2	33³⁄₁₆	(843.0)	142	(65)	**FRNA33D11XS**	RS	**FRNA33D11XW**	RS
	480	40.0	3	2	33³⁄₁₆	(843.0)	142	(65)	**FRNA33D5XS**	RS	**FRNA33D5XW**	RS
	240	53.0	3	4	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRNA43M3XS**	RS	**FRNA43M3XW**	RS
	480	53.0	1	3	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRNA43M11XS**	RS	**FRNA43M11XW**	RS
	480	53.0	3	2	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRNA43M5XS**	RS	**FRNA43M5XW**	RS
	240	67.0	3	4	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRNA51M3XS**	RS	**FRNA51M3XW**	RS
	480	67.0	1	3	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRNA51M11XS**	RS	**FRNA51M11XW**	RS
	480	67.0	3	2	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRNA51M5XS**	RS	**FRNA51M5XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

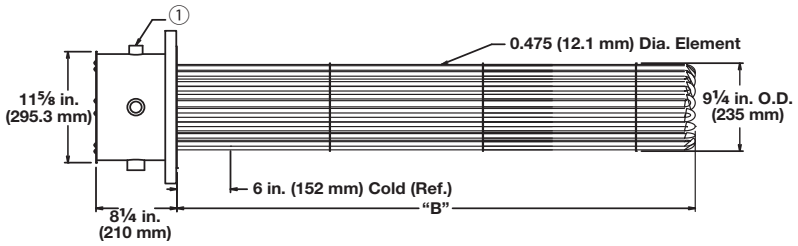
⑥ Can be rewired wye to produce ⅓ of the original kW and watt density (3-phase only)

WATROD and FIREBAR ANSI Flange Immersion Heaters

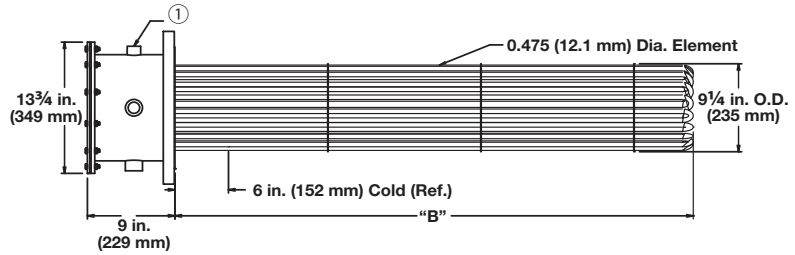
Application: Forced Air and Caustic Solutions

- 10 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 27-Incoloy Elements (3.6 W/cm²)	240	45.0	3	3	33¼	(845)	165	(75)	**FSNA33E3S**	S	**FSNA33E3W**	S
	480	45.0	3	3	33¼	(845)	165	(75)	**FSNA33E5S**	S	**FSNA33E5W**	S
	240	60.0	3	3	43¾	(1111)	195	(89)	**FSNA43N3S**	S	**FSNA43N3W**	S
	480	60.0	3	3	43¾	(1111)	195	(89)	**FSNA43N5S**	S	**FSNA43N5W**	S
	240	75.0	3	9	51¾	(1314)	230	(105)	**FSNA51N3S**	S	**FSNA51N3W**	S
	480	75.0	3	3	51¾	(1314)	230	(105)	**FSNA51N5S**	S	**FSNA51N5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

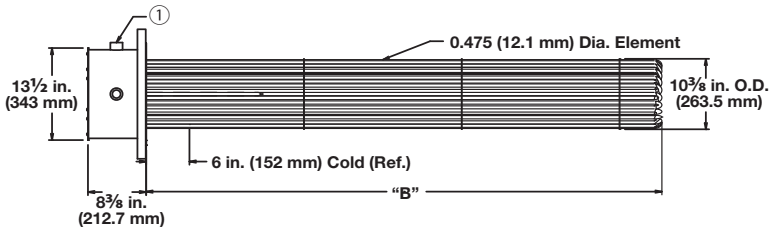
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

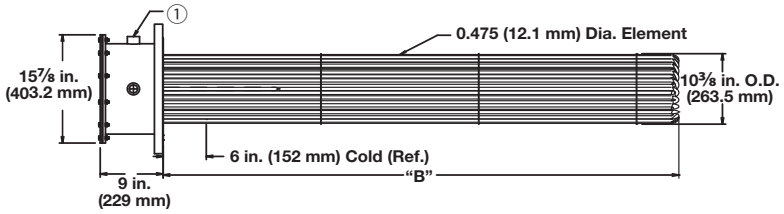
Application: Forced Air and Caustic Solutions

- 12 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in. (mm)	Ship Wt. lbs (kg)	Code Number	Del.	Code Number	Del.
							General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 36-Incoloy Elements (3.6 W/cm²)	480	60.0	3	3	33⅛ (841.4)	205 (93)	**FTNA33C5S**	S	**FTNA33C5W**	S
	480	80.0	3	3	43⅝ (1108.1)	240 (109)	**FTNA43L5S**	S	**FTNA43L5W**	S
	480	100.0	3	3	51⅝ (1311.3)	280 (127)	**FTNA51L5S**	S	**FTNA51L5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

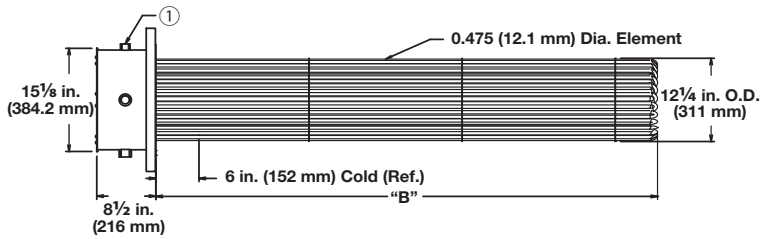
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

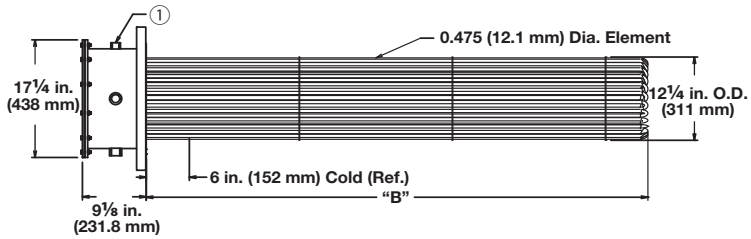
Application: Forced Air and Caustic Solutions

- 14 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 45-Incoloy Elements (3.6 W/cm²)	480	75.0	3	3	33	(838)	225	(102)	**FWNA33A5S**	S	**FWNA33A5W**	S
	480	100.0	3	3	43½	(1105)	255	(116)	**FWNA43J5S**	S	**FWNA43J5W**	S
	480	125.0	3	5	51½	(1308)	300	(136)	**FWNA51J5S**	S	**FWNA51J5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

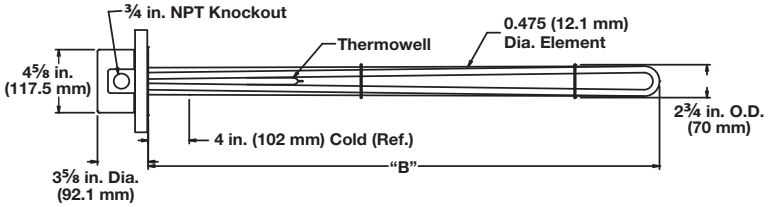
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

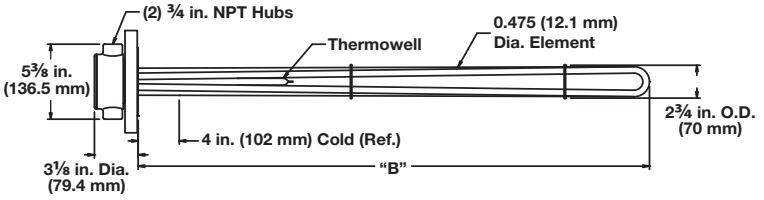
Application: Lightweight Oils and Heat Transfer Oils

- 3 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures
- Single circuit

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 3-Steel Elements (3.6 W/cm²)	240	3.0	1	18	(457)	23	(11)	**FMS718A10S**	RS	**FMS718A10W**	RS
	240	3.0	3	18	(457)	23	(11)	**FMS718A3S**	RS	**FMS718A3W**	RS
	480	3.0	1	18	(457)	23	(11)	**FMS718A11S**	RS	**FMS718A11W**	RS
	480	3.0	3	18	(457)	23	(11)	**FMS718A5S**	RS	**FMS718A5W**	RS
	240	4.5	1	25½	(648)	27	(13)	**FMS725J10S**	RS	**FMS725J10W**	RS
	240	4.5	3	25½	(648)	27	(13)	**FMS725J3S**	RS	**FMS725J3W**	RS
	480	4.5	1	25½	(648)	27	(13)	**FMS725J11S**	RS	**FMS725J11W**	RS
	480	4.5	3	25½	(648)	27	(13)	**FMS725J5S**	RS	**FMS725J5W**	RS
	240	6.0	1	33	(838)	28	(13)	**FMS733A10S**	RS	**FMS733A10W**	RS
	240	6.0	3	33	(838)	28	(13)	**FMS733A3S**	RS	**FMS733A3W**	RS
	480	6.0	1	33	(838)	28	(13)	**FMS733A11S**	RS	**FMS733A11W**	RS
	480	6.0	3	33	(838)	28	(13)	**FMS733A5S**	RS	**FMS733A5W**	RS
	240	7.5	1	40½	(1029)	30	(14)	**FMS740J10S**	RS	**FMS740J10W**	RS
	240	7.5	3	40½	(1029)	30	(14)	**FMS740J3S**	RS	**FMS740J3W**	RS
	480	7.5	1	40½	(1029)	30	(14)	**FMS740J11S**	RS	**FMS740J11W**	RS
	480	7.5	3	40½	(1029)	30	(14)	**FMS740J5S**	RS	**FMS740J5W**	RS
	240	9.0	1	48	(1219)	32	(15)	**FMS748A10S**	RS	**FMS748A10W**	RS
	240	9.0	3	48	(1219)	32	(15)	**FMS748A3S**	RS	**FMS748A3W**	RS
	480	9.0	1	48	(1219)	32	(15)	**FMS748A11S**	RS	**FMS748A11W**	RS
	480	9.0	3	48	(1219)	32	(15)	**FMS748A5S**	RS	**FMS748A5W**	RS
	240	12.5	3	64½	(1638)	37	(17)	**FMS764J3S**	RS	**FMS764J3W**	RS
	480	12.5	1	64½	(1638)	37	(17)	**FMS764J11S**	RS	**FMS764J11W**	RS
	480	12.5	3	64½	(1638)	37	(17)	**FMS764J5S**	RS	**FMS764J5W**	RS
	240	15.0	3	77	(1956)	42	(19)	**FMS777A3S**	RS	**FMS777A3W**	RS
	480	15.0	1	77	(1956)	42	(19)	**FMS777A11S**	RS	**FMS777A11W**	RS
	480	15.0	3	77	(1956)	42	(19)	**FMS777A5S**	RS	**FMS777A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

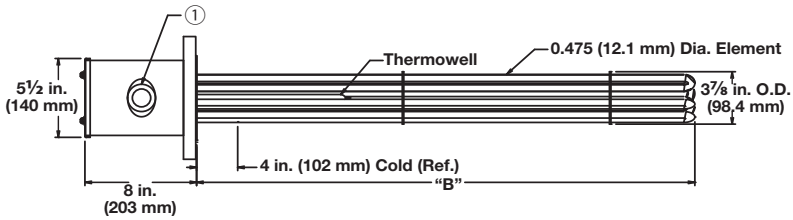
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 4 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 6-Steel Elements (3.6 W/cm²)	240	6.0	1	1	18	(457)	32	(15)	**FOS718A10S**	RS	**FOS718A10W**	RS
	240	6.0	3	1	18	(457)	32	(15)	**FOS718A3S**	RS	**FOS718A3W**	RS
	480	6.0	1	1	18	(457)	32	(15)	**FOS718A11S**	RS	**FOS718A11W**	RS
	480	6.0	3	1	18	(457)	32	(15)	**FOS718A5S**	RS	**FOS718A5W**	RS
	240	9.0	1	1	25½	(648)	36	(17)	**FOS725J10S**	RS	**FOS725J10W**	RS
	240	9.0	3	1	25½	(648)	36	(17)	**FOS725J3S**	RS	**FOS725J3W**	RS
	480	9.0	1	1	25½	(648)	36	(17)	**FOS725J11S**	RS	**FOS725J11W**	RS
	480	9.0	3	1	25½	(648)	36	(17)	**FOS725J5S**	RS	**FOS725J5W**	RS
	240	12.0	1	2	33	(838)	39	(18)	**FOS733A10S**	RS	**FOS733A10W**	RS
	240	12.0	3	1	33	(838)	39	(18)	**FOS733A3S**	RS	**FOS733A3W**	RS
	480	12.0	1	1	33	(838)	39	(18)	**FOS733A11S**	RS	**FOS733A11W**	RS
	480	12.0	3	1	33	(838)	39	(18)	**FOS733A5S**	RS	**FOS733A5W**	RS
	240	15.0	1	2	40½	(1029)	43	(20)	**FOS740J10S**	RS	**FOS740J10W**	RS
	240	15.0	3	1	40½	(1029)	43	(20)	**FOS740J3S**	RS	**FOS740J3W**	RS
	480	15.0	1	1	40½	(1029)	43	(20)	**FOS740J11S**	RS	**FOS740J11W**	RS
	480	15.0	3	1	40½	(1029)	43	(20)	**FOS740J5S**	RS	**FOS740J5W**	RS
	240	18.0	1	2	48	(1219)	48	(22)	**FOS748A10S**	RS	**FOS748A10W**	RS
	240	18.0	3	1	48	(1219)	48	(22)	**FOS748A3S**	RS	**FOS748A3W**	RS
	480	18.0	1	1	48	(1219)	48	(22)	**FOS748A11S**	RS	**FOS748A11W**	RS
	480	18.0	3	1	48	(1219)	48	(22)	**FOS748A5S**	RS	**FOS748A5W**	RS
	240	25.0	3	2	64½	(1638)	53	(24)	**FOS764J3S**	RS	**FOS764J3W**	RS
	480	25.0	1	2	64½	(1638)	53	(24)	**FOS764J11S**	RS	**FOS764J11W**	RS
	480	25.0	3	1	64½	(1638)	53	(24)	**FOS764J5S**	RS	**FOS764J5W**	RS
	240	30.0	3	2	77	(1956)	61	(28)	**FOS777A3S**	RS	**FOS777A3W**	RS
	480	30.0	1	2	77	(1956)	61	(28)	**FOS777A11S**	RS	**FOS777A11W**	RS
	480	30.0	3	1	77	(1956)	61	(28)	**FOS777A5S**	RS	**FOS777A5W**	RS

RAPID SHIP

- **RS** - Same day delivery up to 5 pieces

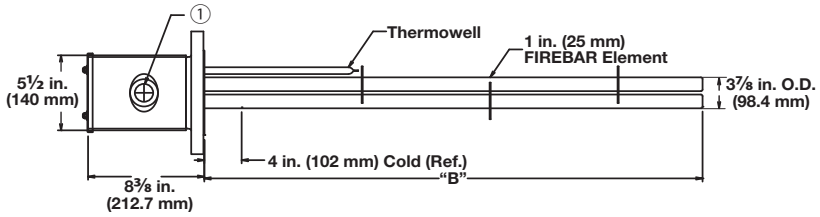
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 4 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
30 W/in² ③ 304 SS Flange 6-Incoloy Elements (4.7 W/cm²)	240	10.0	3	1	16½	(420)	35	(16)	**FONF16J12S**	RS	**FONF16J12W**	RS
	480	10.0	3	1	16½	(420)	35	(16)	**FONF16J13S**	RS	**FONF16J13W**	RS
	240	13.0	3	1	19½	(495)	38	(17)	**FONF19J12S**	RS	**FONF19J12W**	RS
	480	13.0	3	1	19½	(495)	38	(17)	**FONF19J13S**	RS	**FONF19J13W**	RS
	240	17.0	3	1	24½	(622)	41	(19)	**FONF24J12S**	RS	**FONF24J12W**	RS
	480	17.0	3	1	24½	(622)	41	(19)	**FONF24J13S**	RS	**FONF24J13W**	RS
	240	21.0	3	2	30	(762)	44	(20)	**FONF30A12S**	RS	**FONF30A12W**	RS
	480	21.0	3	1	30	(762)	44	(20)	**FONF30A13S**	RS	**FONF30A13W**	RS
	240	25.5	3	2	35	(889)	46	(21)	**FONF35A12S**	RS	**FONF35A12W**	RS
	480	25.5	3	1	35	(889)	46	(21)	**FONF35A13S**	RS	**FONF35A13W**	RS
	240	34.0	3	2	45½	(1156)	50	(23)	**FONF45J12S**	RS	**FONF45J12W**	RS
	480	34.0	3	1	45½	(1156)	50	(23)	**FONF45J13S**	RS	**FONF45J13W**	RS
	480	43.0	3	2	56	(1422)	54	(25)	**FONF56A13S**	RS	**FONF56A13W**	RS
23 W/in² ⑧ 304 SS Flange 6-Incoloy Elements (3.6 W/cm²)	240	7.5	3	1	16½	(420)	35	(16)	**FONF16J20S**	RS	**FONF16J20W**	RS
	240	10.0	3	1	19½	(495)	38	(17)	**FONF19J20S**	RS	**FONF19J20W**	RS
	240	12.8	3	1	24½	(622)	41	(19)	**FONF24J20S**	RS	**FONF24J20W**	RS
	480	12.8	3	1	24½	(622)	41	(19)	**FONF24J19S**	RS	**FONF24J19W**	RS
	240	15.8	3	1	30	(762)	44	(20)	**FONF30A20S**	RS	**FONF30A20W**	RS
	480	15.8	3	1	30	(762)	44	(20)	**FONF30A19S**	RS	**FONF30A19W**	RS
	240	19.0	3	1	35	(889)	46	(21)	**FONF35A20S**	RS	**FONF35A20W**	RS
	480	19.0	3	1	35	(889)	46	(21)	**FONF35A19S**	RS	**FONF35A19W**	RS
	240	25.0	3	2	45½	(1156)	50	(23)	**FONF45J20S**	RS	**FONF45J20W**	RS
	480	25.0	3	1	45½	(1156)	50	(23)	**FONF45J19S**	RS	**FONF45J19W**	RS
	240	32.3	3	2	56	(1422)	54	(25)	**FONF56A20S**	RS	**FONF56A20W**	RS
	480	32.3	3	1	56	(1422)	54	(25)	**FONF56A19S**	RS	**FONF56A19W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

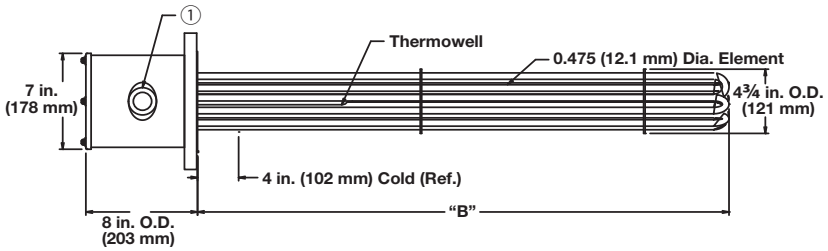
③ Wired for 3-phase operation only
⑧ Can be rewired for 1-phase

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 6-Steel Elements (3.6 W/cm²)	240	6.0	1	1	18	(457)	36	(17)	**FNS718A10S**	RS	**FNS718A10W**	RS
	240	6.0	3	1	18	(457)	36	(17)	**FNS718A3S**	RS	**FNS718A3W**	RS
	480	6.0	1	1	18	(457)	36	(17)	**FNS718A11S**	RS	**FNS718A11W**	RS
	480	6.0	3	1	18	(457)	36	(17)	**FNS718A5S**	RS	**FNS718A5W**	RS
	240	9.0	1	1	25½	(648)	40	(19)	**FNS725J10S**	RS	**FNS725J10W**	RS
	240	9.0	3	1	25½	(648)	40	(19)	**FNS725J3S**	RS	**FNS725J3W**	RS
	480	9.0	1	1	25½	(648)	40	(19)	**FNS725J11S**	RS	**FNS725J11W**	RS
	480	9.0	3	1	25½	(648)	40	(19)	**FNS725J5S**	RS	**FNS725J5W**	RS
	240	12.0	1	2	33	(838)	43	(20)	**FNS733A10S**	RS	**FNS733A10W**	RS
	240	12.0	3	1	33	(838)	43	(20)	**FNS733A3S**	RS	**FNS733A3W**	RS
	480	12.0	1	1	33	(838)	43	(20)	**FNS733A11S**	RS	**FNS733A11W**	RS
	480	12.0	3	1	33	(838)	43	(20)	**FNS733A5S**	RS	**FNS733A5W**	RS
	240	15.0	1	2	40½	(1029)	47	(22)	**FNS740J10S**	RS	**FNS740J10W**	RS
	240	15.0	3	1	40½	(1029)	47	(22)	**FNS740J3S**	RS	**FNS740J3W**	RS
	480	15.0	1	1	40½	(1029)	47	(22)	**FNS740J11S**	RS	**FNS740J11W**	RS
	480	15.0	3	1	40½	(1029)	47	(22)	**FNS740J5S**	RS	**FNS740J5W**	RS
	240	18.0	1	2	48	(1219)	52	(24)	**FNS748A10S**	RS	**FNS748A10W**	RS
	240	18.0	3	1	48	(1219)	52	(24)	**FNS748A3S**	RS	**FNS748A3W**	RS
	480	18.0	1	1	48	(1219)	52	(24)	**FNS748A11S**	RS	**FNS748A11W**	RS
	480	18.0	3	1	48	(1219)	52	(24)	**FNS748A5S**	RS	**FNS748A5W**	RS
	240	25.0	3	2	64½	(1638)	57	(26)	**FNS764J3S**	RS	**FNS764J3W**	RS
	480	25.0	1	2	64½	(1638)	57	(26)	**FNS764J11S**	RS	**FNS764J11W**	RS
	480	25.0	3	1	64½	(1638)	57	(26)	**FNS764J5S**	RS	**FNS764J5W**	RS
	240	30.0	3	2	77	(1956)	65	(30)	**FNS777A3S**	RS	**FNS777A3W**	RS
	480	30.0	1	2	77	(1956)	65	(30)	**FNS777A11S**	RS	**FNS777A11W**	RS
	480	30.0	3	1	77	(1956)	65	(30)	**FNS777A5S**	RS	**FNS777A5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

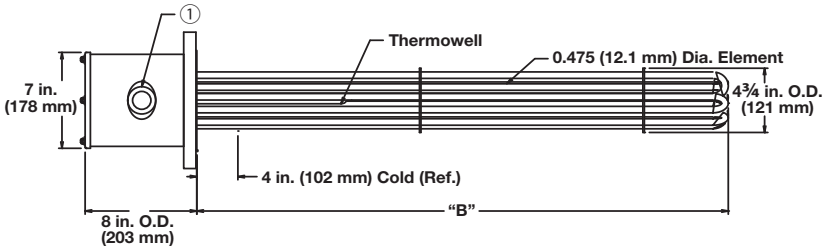
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 9-Steel Elements (3.6 W/cm²)	240	9.0	1	1	18	(457)	39	(18)	**FNS718A10XS**	RS	**FNS718A10XW**	RS
	240	9.0	3	1	18	(457)	39	(18)	**FNS718A3XS**	RS	**FNS718A3XW**	RS
	480	9.0	1	1	18	(457)	39	(18)	**FNS718A11XS**	RS	**FNS718A11XW**	RS
	480	9.0	3	1	18	(457)	39	(18)	**FNS718A5XS**	RS	**FNS718A5XW**	RS
	240	14.0	1	3	25½	(648)	45	(21)	**FNS725J10XS**	RS	**FNS725J10XW**	RS
	240	14.0	3	1	25½	(648)	45	(21)	**FNS725J3XS**	RS	**FNS725J3XW**	RS
	480	14.0	1	1	25½	(648)	45	(21)	**FNS725J11XS**	RS	**FNS725J11XW**	RS
	480	14.0	3	1	25½	(648)	45	(21)	**FNS725J5XS**	RS	**FNS725J5XW**	RS
	240	18.0	1	3	33	(838)	48	(22)	**FNS733A10XS**	RS	**FNS733A10XW**	RS
	240	18.0	3	1	33	(838)	48	(22)	**FNS733A3XS**	RS	**FNS733A3XW**	RS
	480	18.0	1	1	33	(838)	48	(22)	**FNS733A11XS**	RS	**FNS733A11XW**	RS
	480	18.0	3	1	33	(838)	48	(22)	**FNS733A5XS**	RS	**FNS733A5XW**	RS
	240	23.0	1	3	40½	(1029)	53	(24)	**FNS740J10XS**	RS	**FNS740J10XW**	RS
	240	23.0	3	3	40½	(1029)	53	(24)	**FNS740J3XS**	RS	**FNS740J3XW**	RS
	480	23.0	1	1	40½	(1029)	53	(24)	**FNS740J11XS**	RS	**FNS740J11XW**	RS
	480	23.0	3	1	40½	(1029)	53	(24)	**FNS740J5XS**	RS	**FNS740J5XW**	RS
	240	27.0	1	3	48	(1219)	60	(28)	**FNS748A10XS**	RS	**FNS748A10XW**	RS
	240	27.0	3	3	48	(1219)	60	(28)	**FNS748A3XS**	RS	**FNS748A3XW**	RS
	480	27.0	1	3	48	(1219)	60	(28)	**FNS748A11XS**	RS	**FNS748A11XW**	RS
	480	27.0	3	1	48	(1219)	60	(28)	**FNS748A5XS**	RS	**FNS748A5XW**	RS
	240	38.0	3	3	64½	(1638)	68	(31)	**FNS764J3XS**	RS	**FNS764J3XW**	RS
	480	38.0	1	3	64½	(1638)	68	(31)	**FNS764J11XS**	RS	**FNS764J11XW**	RS
	480	38.0	3	1	64½	(1638)	68	(31)	**FNS764J5XS**	RS	**FNS764J5XW**	RS
	240	45.0	3	3	77	(1956)	78	(36)	**FNS777A3XS**	RS	**FNS777A3XW**	RS
	480	45.0	1	3	77	(1956)	78	(36)	**FNS777A11XS**	RS	**FNS777A11XW**	RS
	480	45.0	3	3	77	(1956)	78	(36)	**FNS777A5XS**	RS	**FNS777A5XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

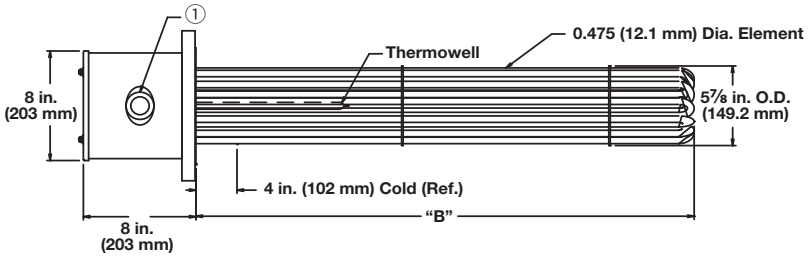
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 12-Steel Elements (3.6 W/cm²)	240	12.0	1	2	17⅞	(454.0)	75	(34)	**FPS717R10S**	RS	**FPS717R10W**	RS
	240	12.0	3	1	17⅞	(454.0)	75	(34)	**FPS717R3S**	RS	**FPS717R3W**	RS
	480	12.0	1	1	17⅞	(454.0)	75	(34)	**FPS717R11S**	RS	**FPS717R11W**	RS
	480	12.0	3	1	17⅞	(454.0)	75	(34)	**FPS717R5S**	RS	**FPS717R5W**	RS
	240	18.0	1	2	25⅝	(644.5)	81	(37)	**FPS725G10S**	RS	**FPS725G10W**	RS
	240	18.0	3	1	25⅝	(644.5)	81	(37)	**FPS725G3S**	RS	**FPS725G3W**	RS
	480	18.0	1	1	25⅝	(644.5)	81	(37)	**FPS725G11S**	RS	**FPS725G11W**	RS
	480	18.0	3	1	25⅝	(644.5)	81	(37)	**FPS725G5S**	RS	**FPS725G5W**	RS
	240	24.0	1	3	32⅞	(835.0)	85	(39)	**FPS732R10S**	RS	**FPS732R10W**	RS
	240	24.0	3	2	32⅞	(835.0)	85	(39)	**FPS732R3S**	RS	**FPS732R3W**	RS
	480	24.0	1	2	32⅞	(835.0)	85	(39)	**FPS732R11S**	RS	**FPS732R11W**	RS
	480	24.0	3	1	32⅞	(835.0)	85	(39)	**FPS732R5S**	RS	**FPS732R5W**	RS
	240	30.0	1	3	40⅜	(1025.5)	92	(42)	**FPS740G10S**	RS	**FPS740G10W**	RS
	240	30.0	3	2	40⅜	(1025.5)	92	(42)	**FPS740G3S**	RS	**FPS740G3W**	RS
	480	30.0	1	2	40⅜	(1025.5)	92	(42)	**FPS740G11S**	RS	**FPS740G11W**	RS
	480	30.0	3	1	40⅜	(1025.5)	92	(42)	**FPS740G5S**	RS	**FPS740G5W**	RS
	240	36.0	1	4	47⅞	(1216.0)	100	(46)	**FPS747R10S**	RS	**FPS747R10W**	RS
	240	36.0	3	2	47⅞	(1216.0)	100	(46)	**FPS747R3S**	RS	**FPS747R3W**	RS
	480	36.0	1	2	47⅞	(1216.0)	100	(46)	**FPS747R11S**	RS	**FPS747R11W**	RS
	480	36.0	3	1	47⅞	(1216.0)	100	(46)	**FPS747R5S**	RS	**FPS747R5W**	RS
	240	50.0	3	4	64⅜	(1635.1)	110	(50)	**FPS764G3S**	RS	**FPS764G3W**	RS
	480	50.0	1	3	64⅜	(1635.1)	110	(50)	**FPS764G11S**	RS	**FPS764G11W**	RS
	480	50.0	3	2	64⅜	(1635.1)	110	(50)	**FPS764G5S**	RS	**FPS764G5W**	RS
	240	60.0	3	4	76⅞	(1952.4)	118	(54)	**FPS776R3S**	RS	**FPS776R3W**	RS
	480	60.0	1	3	76⅞	(1952.4)	118	(54)	**FPS776R11S**	RS	**FPS776R11W**	RS
	480	60.0	3	2	76⅞	(1952.4)	118	(54)	**FPS776R5S**	RS	**FPS776R5W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

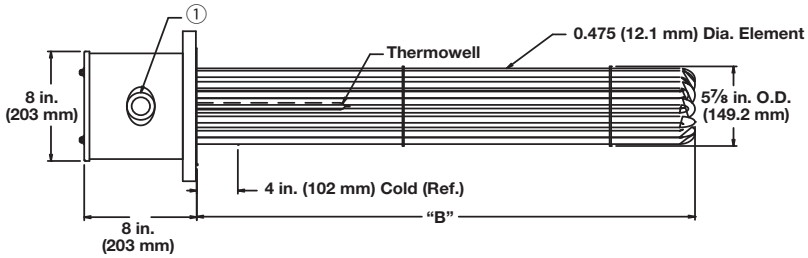
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 15-Steel Elements (3.6 W/cm²)	240	15.0	1	3	17⅞	(454.0)	78	(36)	**FPS717R10XS**	RS	**FPS717R10XW**	RS
	240	15.0	3	1	17⅞	(454.0)	78	(36)	**FPS717R3XS**	RS	**FPS717R3XW**	RS
	480	15.0	1	1	17⅞	(454.0)	78	(36)	**FPS717R11XS**	RS	**FPS717R11XW**	RS
	480	15.0	3	1	17⅞	(454.0)	78	(36)	**FPS717R5XS**	RS	**FPS717R5XW**	RS
	240	23.0	1	3	25⅜	(644.5)	85	(39)	**FPS725G10XS**	RS	**FPS725G10XW**	RS
	240	23.0	3	5	25⅜	(644.5)	85	(39)	**FPS725G3XS**	RS	**FPS725G3XW**	RS
	480	23.0	1	1	25⅜	(644.5)	85	(39)	**FPS725G11XS**	RS	**FPS725G11XW**	RS
	480	23.0	3	1	25⅜	(644.5)	85	(39)	**FPS725G5XS**	RS	**FPS725G5XW**	RS
	240	30.0	1	3	32⅞	(835.0)	90	(41)	**FPS732R10XS**	RS	**FPS732R10XW**	RS
	240	30.0	3	5	32⅞	(835.0)	90	(41)	**FPS732R3XS**	RS	**FPS732R3XW**	RS
	480	30.0	1	3	32⅞	(835.0)	90	(41)	**FPS732R11XS**	RS	**FPS732R11XW**	RS
	480	30.0	3	1	32⅞	(835.0)	90	(41)	**FPS732R5XS**	RS	**FPS732R5XW**	RS
	240	38.0	1	5	40⅜	(1025.5)	98	(45)	**FPS740G10XS**	RS	**FPS740G10XW**	RS
	240	38.0	3	5	40⅜	(1025.5)	98	(45)	**FPS740G3XS**	RS	**FPS740G3XW**	RS
	480	38.0	1	3	40⅜	(1025.5)	98	(45)	**FPS740G11XS**	RS	**FPS740G11XW**	RS
	480	38.0	3	1	40⅜	(1025.5)	98	(45)	**FPS740G5XS**	RS	**FPS740G5XW**	RS
	240	45.0	1	5	47⅞	(1216.0)	108	(49)	**FPS747R10XS**	RS	**FPS747R10XW**	RS
	240	45.0	3	5	47⅞	(1216.0)	108	(49)	**FPS747R3XS**	RS	**FPS747R3XW**	RS
	480	45.0	1	3	47⅞	(1216.0)	108	(49)	**FPS747R11XS**	RS	**FPS747R11XW**	RS
	480	45.0	3	5	47⅞	(1216.0)	108	(49)	**FPS747R5XS**	RS	**FPS747R5XW**	RS
	240	63.0	3	5	64⅜	(1635.1)	120	(55)	**FPS764G3XS**	RS	**FPS764G3XW**	RS
	480	63.0	1	3	64⅜	(1635.1)	120	(55)	**FPS764G11XS**	RS	**FPS764G11XW**	RS
	480	63.0	3	5	64⅜	(1635.1)	120	(55)	**FPS764G5XS**	RS	**FPS764G5XW**	RS
	240	75.0	3	5	76⅞	(1952.4)	131	(60)	**FPS776R3XS**	RS	**FPS776R3XW**	RS
	480	75.0	1	5	76⅞	(1952.4)	131	(60)	**FPS776R11XS**	RS	**FPS776R11XW**	RS
	480	75.0	3	5	76⅞	(1952.4)	131	(60)	**FPS776R5XS**	RS	**FPS776R5XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

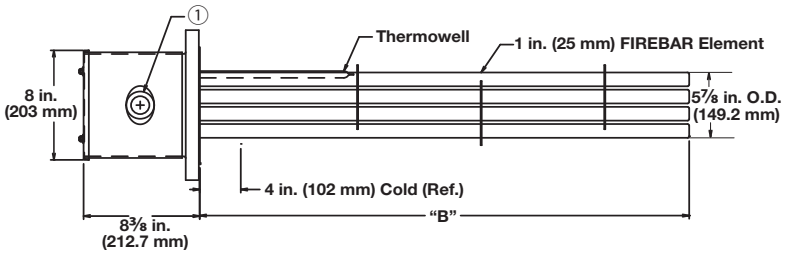
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 6 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
30 W/in² ③ 304 SS Flange 15-Incoloy Elements (4.7 W/cm²)	240	25.0	3	5	16½	(419)	81	(37)	**FPNF16J12S**	RS	**FPNF16J12W**	RS
	480	25.0	3	5	16½	(419)	81	(37)	**FPNF16J13S**	RS	**FPNF16J13W**	RS
	240	32.0	3	5	19½	(495)	84	(38)	**FPNF19J12S**	RS	**FPNF19J12W**	RS
	480	32.0	3	5	19½	(495)	84	(38)	**FPNF19J13S**	RS	**FPNF19J13W**	RS
	240	42.0	3	5	24½	(622)	87	(40)	**FPNF24J12S**	RS	**FPNF24J12W**	RS
	480	42.0	3	5	24½	(622)	87	(40)	**FPNF24J13S**	RS	**FPNF24J13W**	RS
	240	52.0	3	5	30	(762)	91	(42)	**FPNF30A12S**	RS	**FPNF30A12W**	RS
	480	52.0	3	5	30	(762)	91	(42)	**FPNF30A13S**	RS	**FPNF30A13W**	RS
	240	64.0	3	5	35	(889)	95	(43)	**FPNF35A12S**	RS	**FPNF35A12W**	RS
	480	64.0	3	5	35	(889)	95	(43)	**FPNF35A13S**	RS	**FPNF35A13W**	RS
	240	85.0	3	5	45½	(1156)	106	(48)	**FPNF45J12S**	RS	**FPNF45J12W**	RS
	480	85.0	3	5	45½	(1156)	106	(48)	**FPNF45J13S**	RS	**FPNF45J13W**	RS
	480	110.0	3	5	56	(1422)	116	(53)	**FPNF56A13S**	RS	**FPNF56A13W**	RS
23 W/in² 304 SS Flange 15-Incoloy Elements (3.6 W/cm²)	240	19.0	3	5	16½	(419)	81	(37)	**FPNF16J20S**	RS	**FPNF16J20W**	RS
	240	24.0	3	5	19½	(495)	84	(38)	**FPNF19J20S**	RS	**FPNF19J20W**	RS
	240	32.0	3	5	24½	(622)	87	(40)	**FPNF24J20S**	RS	**FPNF24J20W**	RS
	480	32.0	3	5	24½	(622)	87	(40)	**FPNF24J19S**	RS	**FPNF24J19W**	RS
	240	40.0	3	5	30	(762)	91	(42)	**FPNF30A20S**	RS	**FPNF30A20W**	RS
	480	40.0	3	5	30	(762)	91	(42)	**FPNF30A19S**	RS	**FPNF30A19W**	RS
	240	48.0	3	5	35	(889)	95	(43)	**FPNF35A20S**	RS	**FPNF35A20W**	RS
	480	48.0	3	5	35	(889)	95	(43)	**FPNF35A19S**	RS	**FPNF35A19W**	RS
	240	64.0	3	5	45½	(1156)	106	(48)	**FPNF45J20S**	RS	**FPNF45J20W**	RS
	480	64.0	3	5	45½	(1156)	106	(48)	**FPNF45J19S**	RS	**FPNF45J19W**	RS
	240	80.0	3	5	56	(1422)	116	(53)	**FPNF56A20S**	RS	**FPNF56A20W**	RS
	480	80.0	3	5	56	(1422)	116	(53)	**FPNF56A19S**	RS	**FPNF56A19W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

③ Wired for 3-phase operation only

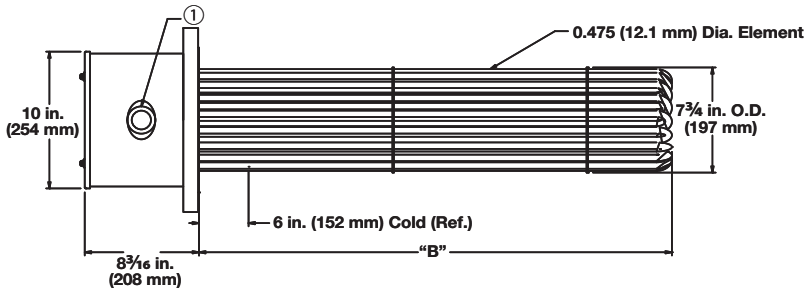
WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Lightweight Oils and Heat Transfer Oils

- 8 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

General Purpose and Moisture Resistant



Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 18-Steel Elements (3.6 W/cm²)	240	30.0	1	3	32¾	(832.0)	130	(59)	**FRS732N10S**	RS	**FRS732N10W**	RS
	240	30.0	3	2	32¾	(832.0)	130	(59)	**FRS732N3S**	RS	**FRS732N3W**	RS
	480	30.0	1	2	32¾	(832.0)	130	(59)	**FRS732N11S**	RS	**FRS732N11W**	RS
	480	30.0	3	1	32¾	(832.0)	130	(59)	**FRS732N5S**	RS	**FRS732N5W**	RS
	240	40.0	3	3	43¼	(1099.0)	132	(60)	**FRS743E3S**	RS	**FRS743E3W**	RS
	480	40.0	1	2	43¼	(1099.0)	132	(60)	**FRS743E11S**	RS	**FRS743E11W**	RS
	480	40.0	3	2	43¼	(1099.0)	132	(60)	**FRS743E5S**	RS	**FRS743E5W**	RS
	240	50.0	3	3	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRS751M3S**	RS	**FRS751M3W**	RS
	480	50.0	1	3	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRS751M11S**	RS	**FRS751M11W**	RS
	480	50.0	3	2	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRS751M5S**	RS	**FRS751M5W**	RS
	240	60.0	3	6	62⅜	(1579.6)	154	(70)	**FRS762D3S**	RS	**FRS762D3W**	RS
	480	60.0	1	3	62⅜	(1579.6)	154	(70)	**FRS762D11S**	RS	**FRS762D11W**	RS
	480	60.0	3	2	62⅜	(1579.6)	154	(70)	**FRS762D5S**	RS	**FRS762D5W**	RS
	240	70.0	3	6	70¹¹⁄₁₆	(1795.5)	160	(73)	**FRS770M3S**	RS	**FRS770M3W**	RS
	480	70.0	1	6	70¹¹⁄₁₆	(1795.5)	160	(73)	**FRS770M11S**	RS	**FRS770M11W**	RS
	480	70.0	3	2	70¹¹⁄₁₆	(1795.5)	160	(73)	**FRS770M5S**	RS	**FRS770M5W**	RS
	240	80.0	3	6	79¹¹⁄₁₆	(2024.1)	172	(78)	**FRS779M3S**	RS	**FRS779M3W**	RS
	480	80.0	3	3	79¹¹⁄₁₆	(2024.1)	172	(78)	**FRS779M5S**	RS	**FRS779M5W**	RS
23 W/in² Steel Flange 24-Steel Elements (3.6 W/cm²)	240	40.0	1	4	33⅜	(843.0)	142	(65)	**FRS733D10XS**	RS	**FRS733D10XW**	RS
	240	40.0	3	4	33⅜	(843.0)	142	(65)	**FRS733D3XS**	RS	**FRS733D3XW**	RS
	480	40.0	1	2	33⅜	(843.0)	142	(65)	**FRS733D11XS**	RS	**FRS733D11XW**	RS
	480	40.0	3	2	33⅜	(843.0)	142	(65)	**FRS733D5XS**	RS	**FRS733D5XW**	RS
	240	53.0	3	4	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRS743M3XS**	RS	**FRS743M3XW**	RS
	480	53.0	1	3	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRS743M11XS**	RS	**FRS743M11XW**	RS
	480	53.0	3	2	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRS743M5XS**	RS	**FRS743M5XW**	RS
	240	67.0	3	4	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRS751M3XS**	RS	**FRS751M3XW**	RS
	480	67.0	1	3	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRS751M11XS**	RS	**FRS751M11XW**	RS
	480	67.0	3	2	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRS751M5XS**	RS	**FRS751M5XW**	RS
	240	80.0	3	8	62⅜	(1579.6)	166	(76)	**FRS762D3XS**	RS	**FRS762D3XW**	RS
	480	80.0	1	4	62⅜	(1579.6)	166	(76)	**FRS762D11XS**	RS	**FRS762D11XW**	RS
	480	80.0	3	4	62⅜	(1579.6)	166	(76)	**FRS762D5XS**	RS	**FRS762D5XW**	RS
	240	93.0	3	8	70¹¹⁄₁₆	(1795.5)	175	(80)	**FRS770M3XS**	RS	**FRS770M3XW**	RS
	480	93.0	1	6	70¹¹⁄₁₆	(1795.5)	175	(80)	**FRS770M11XS**	RS	**FRS770M11XW**	RS
	480	93.0	3	4	70¹¹⁄₁₆	(1795.5)	175	(80)	**FRS770M5XS**	RS	**FRS770M5XW**	RS
	240	107.0	3	8	79¹¹⁄₁₆	(2024.1)	181	(82)	**FRS779M3XS**	RS	**FRS779M3XW**	RS
	480	107.0	3	4	79¹¹⁄₁₆	(2024.1)	181	(82)	**FRS779M5XS**	RS	**FRS779M5XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

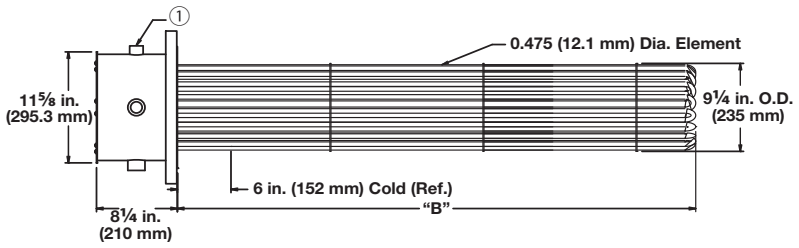
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

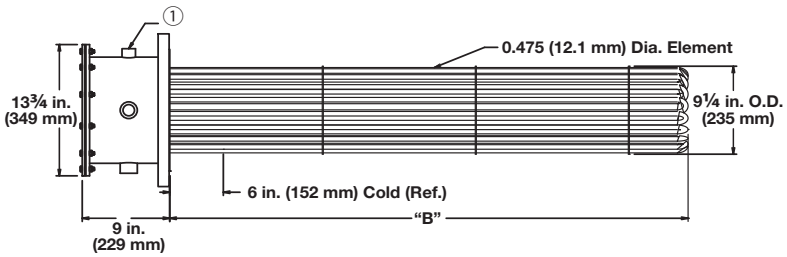
Application: Light Weight Oils and Heat Transfer Oils

- 10 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 27-Steel Elements (3.6 W/cm²)	240	45.0	3	3	33¼	(845)	165	(75)	**FSS733E3S**	S	**FSS733E3W**	S
	480	45.0	3	3	33¼	(845)	165	(75)	**FSS733E5S**	S	**FSS733E5W**	S
	240	60.0	3	3	43¾	(1111)	195	(89)	**FSS743N3S**	S	**FSS743N3W**	S
	480	60.0	3	3	43¾	(1111)	195	(89)	**FSS743N5S**	S	**FSS743N5W**	S
	240	75.0	3	9	51¾	(1314)	230	(105)	**FSS751N3S**	S	**FSS751N3W**	S
	480	75.0	3	3	51¾	(1314)	230	(105)	**FSS751N5S**	S	**FSS751N5W**	S
	480	90.0	3	3	62¼	(1581)	250	(114)	**FSS762E5S**	S	**FSS762E5W**	S
	480	105.0	3	3	70¾	(1797)	258	(117)	**FSS770N5S**	S	**FSS770N5W**	S
	480	120.0	3	3	78¾	(2000)	265	(121)	**FSS778N5S**	S	**FSS778N5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

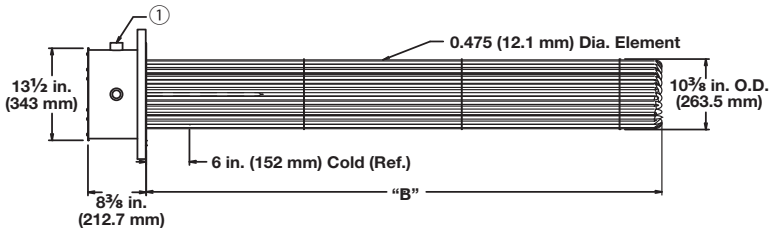
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

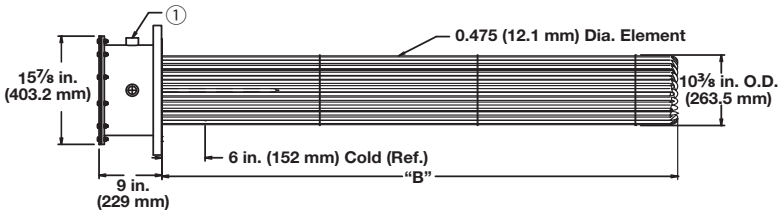
Application: Light Weight Oils and Heat Transfer Oils

- 12 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 36-Steel Elements (3.6 W/cm²)	480	60.0	3	3	33⅛	(841.4)	205	(93)	**FTS733C5S**	S	**FTS733C5W**	S
	480	80.0	3	3	43⅝	(1108.1)	240	(109)	**FTS743L5S**	S	**FTS743L5W**	S
	480	100.0	3	3	51⅝	(1311.3)	280	(127)	**FTS751L5S**	S	**FTS751L5W**	S
	480	120.0	3	3	62⅛	(1578.0)	285	(130)	**FTS762C5S**	S	**FTS762C5W**	S
	480	140.0	3	4	70⅝	(1793.9)	290	(132)	**FTS770L5S**	S	**FTS770L5W**	S
	480	160.0	3	4	78⅝	(1997.1)	300	(136)	**FTS778L5S**	S	**FTS778L5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

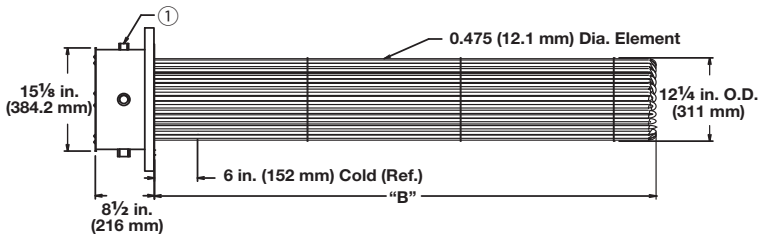
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

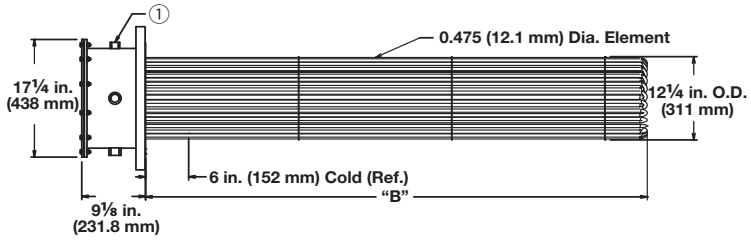
Application: Light Weight Oils and Heat Transfer Oils

- 14 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
23 W/in² Steel Flange 45-Steel Elements (3.6 W/cm²)	480	75.0	3	3	33	(838)	225	(102)	**FWS733A5S**	S	**FWS733A5W**	S
	480	100.0	3	3	43½	(1105)	255	(116)	**FWS743J5S**	S	**FWS743J5W**	S
	480	125.0	3	5	51½	(1308)	300	(136)	**FWS751J5S**	S	**FWS751J5W**	S
	480	150.0	3	5	62	(1575)	310	(141)	**FWS762A5S**	S	**FWS762A5W**	S
	480	175.0	3	5	70½	(1791)	318	(145)	**FWS770J5S**	S	**FWS770J5W**	S
	480	200.0	3	5	78½	(1994)	330	(150)	**FWS778J5S**	S	**FWS778J5W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

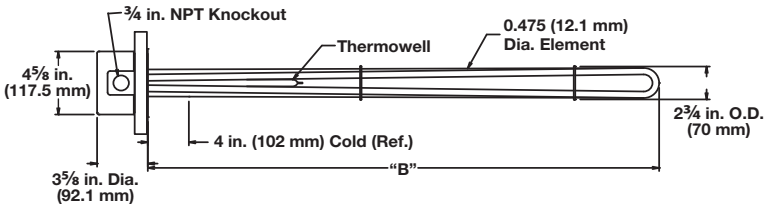
Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR ANSI Flange Immersion Heaters

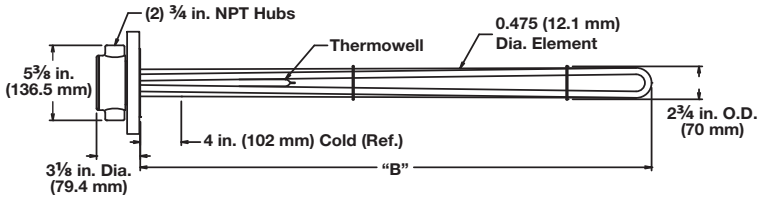
Application: Medium Weight Oils and Heat Transfer Oils

- 3 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures
- Single circuit

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 3-Incoloy Elements (2.5 W/cm²)	240	1.5	3	13½	(343)	22	(10)	**FMN713J12S**	RS	**FMN713J12W**	RS
	480	1.5	3	13½	(343)	22	(10)	**FMN713J13S**	RS	**FMN713J13W**	RS
	240	2.0	3	18	(457)	23	(11)	**FMN718A12S**	RS	**FMN718A12W**	RS
	480	2.0	3	18	(457)	23	(11)	**FMN718A13S**	RS	**FMN718A13W**	RS
	240	2.5	3	20½	(521)	25	(12)	**FMN720J12S**	RS	**FMN720J12W**	RS
	480	2.5	3	20½	(521)	25	(12)	**FMN720J13S**	RS	**FMN720J13W**	RS
	240	3.0	3	25½	(648)	27	(13)	**FMN725J12S**	RS	**FMN725J12W**	RS
	480	3.0	3	25½	(648)	27	(13)	**FMN725J13S**	RS	**FMN725J13W**	RS
	240	4.0	3	33	(838)	28	(13)	**FMN733A12S**	RS	**FMN733A12W**	RS
	480	4.0	3	33	(838)	28	(13)	**FMN733A13S**	RS	**FMN733A13W**	RS
	240	5.0	3	40½	(1029)	30	(14)	**FMN740J12S**	RS	**FMN740J12W**	RS
	480	5.0	3	40½	(1029)	30	(14)	**FMN740J13S**	RS	**FMN740J13W**	RS
	240	6.0	3	48	(1219)	32	(15)	**FMN748A12S**	RS	**FMN748A12W**	RS
	480	6.0	3	48	(1219)	32	(15)	**FMN748A13S**	RS	**FMN748A13W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

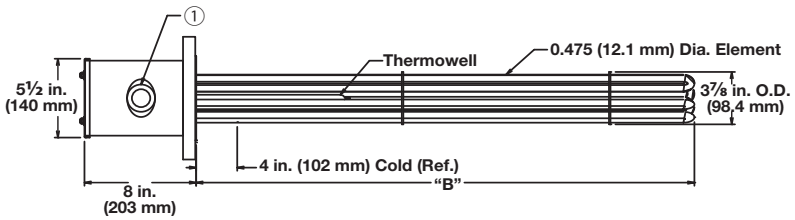
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 4 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 6-Incoloy Elements (2.5 W/cm²)	240	3.0	3	1	13½	(343)	29	(14)	**FON713J12S**	RS	**FON713J12W**	RS
	480	3.0	3	1	13½	(343)	29	(14)	**FON713J13S**	RS	**FON713J13W**	RS
	240	4.0	3	1	18	(457)	32	(15)	**FON718A12S**	RS	**FON718A12W**	RS
	480	4.0	3	1	18	(457)	32	(15)	**FON718A13S**	RS	**FON718A13W**	RS
	240	5.0	3	1	20½	(521)	34	(16)	**FON720J12S**	RS	**FON720J12W**	RS
	480	5.0	3	1	20½	(521)	34	(16)	**FON720J13S**	RS	**FON720J13W**	RS
	240	6.0	3	1	25½	(648)	36	(17)	**FON725J12S**	RS	**FON725J12W**	RS
	480	6.0	3	1	25½	(648)	36	(17)	**FON725J13S**	RS	**FON725J13W**	RS
	240	8.0	3	1	33	(838)	39	(18)	**FON733A12S**	RS	**FON733A12W**	RS
	480	8.0	3	1	33	(838)	39	(18)	**FON733A13S**	RS	**FON733A13W**	RS
	240	10.0	3	1	40½	(1029)	43	(20)	**FON740J12S**	RS	**FON740J12W**	RS
	480	10.0	3	1	40½	(1029)	43	(20)	**FON740J13S**	RS	**FON740J13W**	RS
	240	12.0	3	1	48	(1219)	48	(22)	**FON748A12S**	RS	**FON748A12W**	RS
	480	12.0	3	1	48	(1219)	48	(22)	**FON748A13S**	RS	**FON748A13W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

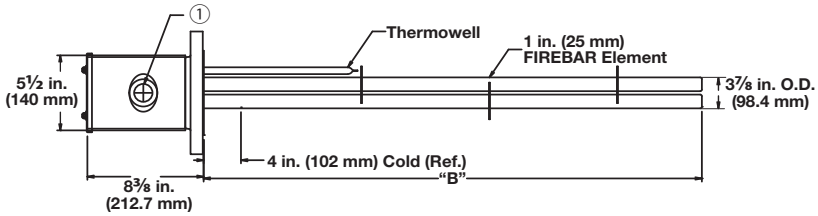
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 4 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
15 W/in² ③ 304 SS Flange 6-Incoloy Elements (2.3 W/cm²)	240	4.0	3	1	13⅜	(339.7)	32	(15)	**FONF13G29S**	RS	**FONF13G29W**	RS
	240	5.0	3	1	16	(406.0)	35	(16)	**FONF16A29S**	RS	**FONF16A29W**	RS
	240	6.0	3	1	18⅜	(466.7)	38	(17)	**FONF18G29S**	RS	**FONF18G29W**	RS
	240	8.0	3	1	22⅞	(581.0)	41	(19)	**FONF22R29S**	RS	**FONF22R29W**	RS
	480	8.0	3	1	22⅞	(581.0)	41	(19)	**FONF22R30S**	RS	**FONF22R30W**	RS
	240	10.0	3	1	27⅞	(708.0)	44	(20)	**FONF27R29S**	RS	**FONF27R29W**	RS
	480	10.0	3	1	27⅞	(708.0)	44	(20)	**FONF27R30S**	RS	**FONF27R30W**	RS
	240	12.0	3	1	32⅞	(835.0)	46	(21)	**FONF32R29S**	RS	**FONF32R29W**	RS
	480	12.0	3	1	32⅞	(835.0)	46	(21)	**FONF32R30S**	RS	**FONF32R30W**	RS
	240	16.0	3	1	42⅜	(1076.3)	50	(23)	**FONF42G29S**	RS	**FONF42G29W**	RS
	480	16.0	3	1	42⅜	(1076.3)	50	(23)	**FONF42G30S**	RS	**FONF42G30W**	RS
	240	20.0	3	1	51⅞	(1317.6)	54	(25)	**FONF51R29S**	RS	**FONF51R29W**	RS
	480	20.0	3	1	51⅞	(1317.6)	54	(25)	**FONF51R30S**	RS	**FONF51R30W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

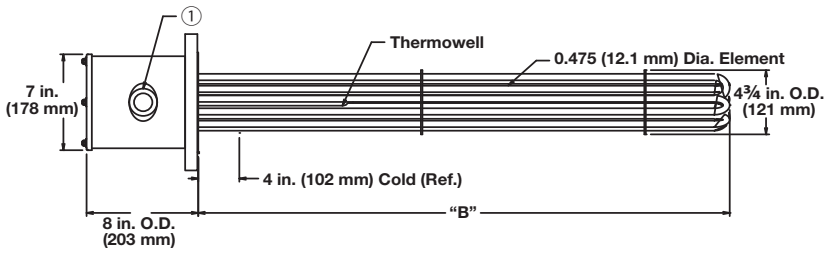
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 6-Incoloy Elements (2.5 W/cm²)	240	3.0	3	1	13½	(343)	36	(17)	**FNN713J12S**	RS	**FNN713J12W**	RS
	480	3.0	3	1	13½	(343)	36	(17)	**FNN713J13S**	RS	**FNN713J13W**	RS
	240	4.0	3	1	18	(457)	40	(19)	**FNN718A12S**	RS	**FNN718A12W**	RS
	480	4.0	3	1	18	(457)	40	(19)	**FNN718A13S**	RS	**FNN718A13W**	RS
	240	5.0	3	1	20½	(521)	43	(20)	**FNN720J12S**	RS	**FNN720J12W**	RS
	480	5.0	3	1	20½	(521)	43	(20)	**FNN720J13S**	RS	**FNN720J13W**	RS
	240	6.0	3	1	25½	(648)	47	(22)	**FNN725J12S**	RS	**FNN725J12W**	RS
	480	6.0	3	1	25½	(648)	47	(22)	**FNN725J13S**	RS	**FNN725J13W**	RS
	240	8.0	3	1	33	(838)	52	(24)	**FNN733A12S**	RS	**FNN733A12W**	RS
	480	8.0	3	1	33	(838)	52	(24)	**FNN733A13S**	RS	**FNN733A13W**	RS
	240	10.0	3	1	40½	(1029)	57	(26)	**FNN740J12S**	RS	**FNN740J12W**	RS
	480	10.0	3	1	40½	(1029)	57	(26)	**FNN740J13S**	RS	**FNN740J13W**	RS
	240	12.0	3	1	48	(1219)	65	(30)	**FNN748A12S**	RS	**FNN748A12W**	RS
	480	12.0	3	1	48	(1219)	65	(30)	**FNN748A13S**	RS	**FNN748A13W**	RS
16 W/in² ③ Steel Flange 9-Incoloy Elements (2.5 W/cm²)	240	4.5	3	1	13½	(343)	39	(18)	**FNN713J12XS**	RS	**FNN713J12XW**	RS
	480	4.5	3	1	13½	(343)	39	(18)	**FNN713J13XS**	RS	**FNN713J13XW**	RS
	240	6.0	3	1	18	(457)	45	(21)	**FNN718A12XS**	RS	**FNN718A12XW**	RS
	480	6.0	3	1	18	(457)	45	(21)	**FNN718A13XS**	RS	**FNN718A13XW**	RS
	240	7.5	3	1	20½	(521)	48	(22)	**FNN720J12XS**	RS	**FNN720J12XW**	RS
	480	7.5	3	1	20½	(521)	48	(22)	**FNN720J13XS**	RS	**FNN720J13XW**	RS
	240	9.0	3	1	25½	(648)	53	(24)	**FNN725J12XS**	RS	**FNN725J12XW**	RS
	480	9.0	3	1	25½	(648)	53	(24)	**FNN725J13XS**	RS	**FNN725J13XW**	RS
	240	12.0	3	1	33	(838)	60	(28)	**FNN733A12XS**	RS	**FNN733A12XW**	RS
	480	12.0	3	1	33	(838)	60	(28)	**FNN733A13XS**	RS	**FNN733A13XW**	RS
	240	15.0	3	1	40½	(1029)	68	(31)	**FNN740J12XS**	RS	**FNN740J12XW**	RS
	480	15.0	3	1	40½	(1029)	68	(31)	**FNN740J13XS**	RS	**FNN740J13XW**	RS
	240	18.0	3	1	48	(1219)	78	(36)	**FNN748A12XS**	RS	**FNN748A12XW**	RS
	480	18.0	3	1	48	(1219)	78	(36)	**FNN748A13XS**	RS	**FNN748A13XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

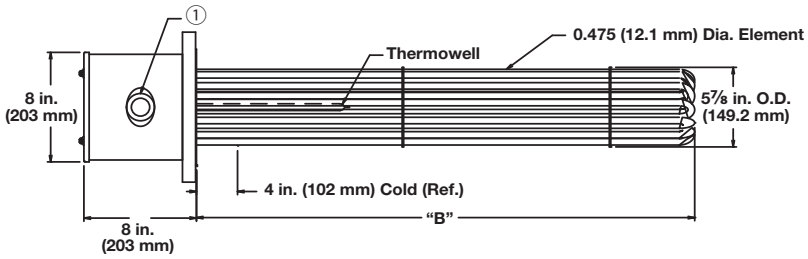
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 12-Incoloy Elements (2.5 W/cm²)	240	6.0	3	1	13⅜	(339.7)	73	(33)	**FPN713G12S**	RS	**FPN713G12W**	RS
	480	6.0	3	1	13⅜	(339.7)	73	(33)	**FPN713G13S**	RS	**FPN713G13W**	RS
	240	8.0	3	1	17⅞	(454.0)	75	(34)	**FPN717R12S**	RS	**FPN717R12W**	RS
	480	8.0	3	1	17⅞	(454.0)	75	(34)	**FPN717R13S**	RS	**FPN717R13W**	RS
	240	10.0	3	1	20⅜	(517.5)	78	(36)	**FPN720G12S**	RS	**FPN720G12W**	RS
	480	10.0	3	1	20⅜	(517.5)	78	(36)	**FPN720G13S**	RS	**FPN720G13W**	RS
	240	12.0	3	1	25⅜	(644.5)	81	(37)	**FPN725G12S**	RS	**FPN725G12W**	RS
	480	12.0	3	1	25⅜	(644.5)	81	(37)	**FPN725G13S**	RS	**FPN725G13W**	RS
	240	16.0	3	1	32⅞	(835.0)	85	(39)	**FPN732R12S**	RS	**FPN732R12W**	RS
	480	16.0	3	1	32⅞	(835.0)	85	(39)	**FPN732R13S**	RS	**FPN732R13W**	RS
	240	20.0	3	2	40⅜	(1025.5)	92	(42)	**FPN740G12S**	RS	**FPN740G12W**	RS
	480	20.0	3	1	40⅜	(1025.5)	92	(42)	**FPN740G13S**	RS	**FPN740G13W**	RS
	240	24.0	3	2	47⅞	(1216.0)	100	(46)	**FPN747R12S**	RS	**FPN747R12W**	RS
	480	24.0	3	1	47⅞	(1216.0)	100	(46)	**FPN747R13S**	RS	**FPN747R13W**	RS
16 W/in² ③ Steel Flange 15-Incoloy Elements (2.5 W/cm²)	240	7.5	3	1	13⅜	(339.7)	76	(35)	**FPN713G12XS**	RS	**FPN713G12XW**	RS
	480	7.5	3	1	13⅜	(339.7)	76	(35)	**FPN713G13XS**	RS	**FPN713G13XW**	RS
	240	10.0	3	1	17⅞	(454.0)	78	(36)	**FPN717R12XS**	RS	**FPN717R12XW**	RS
	480	10.0	3	1	17⅞	(454.0)	78	(36)	**FPN717R13XS**	RS	**FPN717R13XW**	RS
	240	12.5	3	1	20⅜	(517.5)	82	(38)	**FPN720G12XS**	RS	**FPN720G12XW**	RS
	480	12.5	3	1	20⅜	(517.5)	82	(38)	**FPN720G13XS**	RS	**FPN720G13XW**	RS
	240	15.0	3	1	25⅜	(644.5)	85	(39)	**FPN725G12XS**	RS	**FPN725G12XW**	RS
	480	15.0	3	1	25⅜	(644.5)	85	(39)	**FPN725G13XS**	RS	**FPN725G13XW**	RS
	240	20.0	3	5	32⅞	(835.0)	90	(41)	**FPN732R12XS**	RS	**FPN732R12XW**	RS
	480	20.0	3	1	32⅞	(835.0)	90	(41)	**FPN732R13XS**	RS	**FPN732R13XW**	RS
	240	25.0	3	5	40⅜	(1025.5)	98	(45)	**FPN740G12XS**	RS	**FPN740G12XW**	RS
	480	25.0	3	1	40⅜	(1025.5)	98	(45)	**FPN740G13XS**	RS	**FPN740G13XW**	RS
	240	30.0	3	5	47⅞	(1216.0)	108	(49)	**FPN747R12XS**	RS	**FPN747R12XW**	RS
	480	30.0	3	1	47⅞	(1216.0)	108	(49)	**FPN747R13XS**	RS	**FPN747R13XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

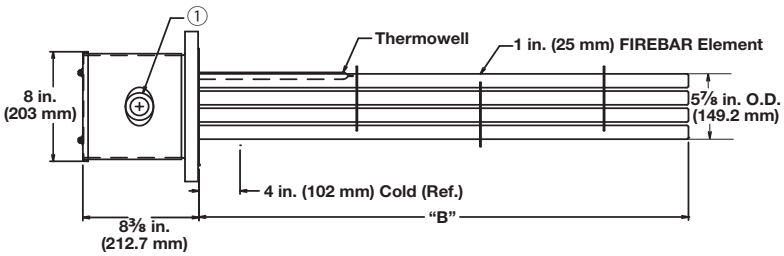
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 6 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
15 W/in² ③ 304 SS Flange 15-Incoloy Elements (2.3 W/cm²)	240	10.0	3	5	13⅜	(339.7)	78	(36)	**FPNF13G29S**	RS	**FPNF13G29W**	RS
	240	12.5	3	5	16	(406.0)	81	(37)	**FPNF16A29S**	RS	**FPNF16A29W**	RS
	240	15.0	3	5	18⅜	(466.7)	84	(38)	**FPNF18G29S**	RS	**FPNF18G29W**	RS
	240	20.0	3	5	22⅞	(581.0)	87	(40)	**FPNF22R29S**	RS	**FPNF22R29W**	RS
	480	20.0	3	5	22⅞	(581.0)	87	(40)	**FPNF22R30S**	RS	**FPNF22R30W**	RS
	240	25.0	3	5	27⅞	(708.0)	91	(42)	**FPNF27R29S**	RS	**FPNF27R29W**	RS
	480	25.0	3	5	27⅞	(708.0)	91	(42)	**FPNF27R30S**	RS	**FPNF27R30W**	RS
	240	30.0	3	5	32⅞	(835.0)	95	(43)	**FPNF32R29S**	RS	**FPNF32R29W**	RS
	480	30.0	3	5	32⅞	(835.0)	95	(43)	**FPNF32R30S**	RS	**FPNF32R30W**	RS
	240	40.0	3	5	42⅜	(1076.3)	106	(48)	**FPNF42G29S**	RS	**FPNF42G29W**	RS
	480	40.0	3	5	42⅜	(1076.3)	106	(48)	**FPNF42G30S**	RS	**FPNF42G30W**	RS
	240	50.0	3	5	51⅞	(1317.6)	116	(53)	**FPNF51R29S**	RS	**FPNF51R29W**	RS
	480	50.0	3	5	51⅞	(1317.6)	116	(53)	**FPNF51R30S**	RS	**FPNF51R30W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

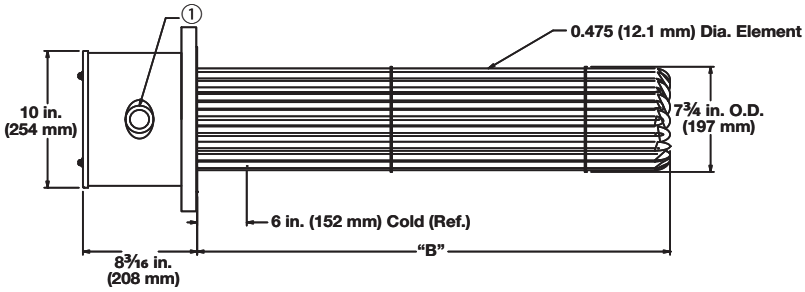
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Medium Weight Oils and Heat Transfer Oils

- 8 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 18-Incoloy Elements (2.5 W/cm²)	240	17.0	3	1	25¾	(654.0)	121	(55)	**FRN725N12S**	RS	**FRN725N12W**	RS
	480	17.0	3	1	25¾	(654.0)	121	(55)	**FRN725N13S**	RS	**FRN725N13W**	RS
	240	25.0	3	2	35¾	(908.0)	130	(59)	**FRN735N12S**	RS	**FRN735N12W**	RS
	480	25.0	3	1	35¾	(908.0)	130	(59)	**FRN735N13S**	RS	**FRN735N13W**	RS
	240	33.0	3	2	44¼	(1124.0)	132	(60)	**FRN744E12S**	RS	**FRN744E12W**	RS
	480	33.0	3	1	44¼	(1124.0)	132	(60)	**FRN744E13S**	RS	**FRN744E13W**	RS
	240	42.0	3	3	54¹¹⁄₁₆	(1389.1)	140	(64)	**FRN754M12S**	RS	**FRN754M12W**	RS
	480	42.0	3	2	54¹¹⁄₁₆	(1389.1)	140	(64)	**FRN754M13S**	RS	**FRN754M13W**	RS
	480	50.0	3	2	63¹¹⁄₁₆	(1617.6)	145	(66)	**FRN763M13S**	RS	**FRN763M13W**	RS
	480	58.0	3	2	73⅜	(1859.0)	151	(69)	**FRN773D13S**	RS	**FRN773D13W**	RS
	480	67.0	3	2	82¹⁄₁₆	(2100.3)	157	(72)	**FRN782M13S**	RS	**FRN782M13W**	RS
16 W/in² ③ Steel Flange 24-Incoloy Elements (2.5 W/cm²)	240	23.0	3	2	26⅜	(665.2)	129	(59)	**FRN726D12XS**	RS	**FRN726D12XW**	RS
	480	23.0	3	1	26⅜	(665.2)	129	(59)	**FRN726D13XS**	RS	**FRN726D13XW**	RS
	240	33.0	3	2	36⅜	(919.2)	142	(65)	**FRN736D12XS**	RS	**FRN736D12XW**	RS
	480	33.0	3	1	36⅜	(919.2)	142	(65)	**FRN736D13XS**	RS	**FRN736D13XW**	RS
	240	44.0	3	4	44¹¹⁄₁₆	(1135.1)	147	(67)	**FRN744M12XS**	RS	**FRN744M12XW**	RS
	480	44.0	3	2	44¹¹⁄₁₆	(1135.1)	147	(67)	**FRN744M13XS**	RS	**FRN744M13XW**	RS
	240	56.0	3	4	54¹¹⁄₁₆	(1389.1)	158	(72)	**FRN754M12XS**	RS	**FRN754M12XW**	RS
	480	56.0	3	2	54¹¹⁄₁₆	(1389.1)	158	(72)	**FRN754M13XS**	RS	**FRN754M13XW**	RS
	480	67.0	3	2	63¹¹⁄₁₆	(1617.6)	166	(76)	**FRN763M13XS**	RS	**FRN763M13XW**	RS
	480	77.0	3	2	73⅜	(1859.0)	175	(80)	**FRN773D13XS**	RS	**FRN773D13XW**	RS
	480	89.0	3	4	82¹⁄₁₆	(2100.3)	184	(84)	**FRN782M13XS**	RS	**FRN782M13XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

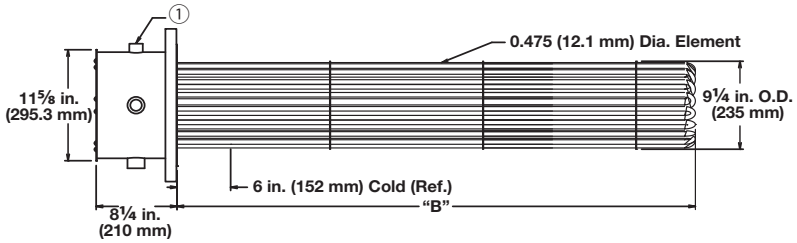
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

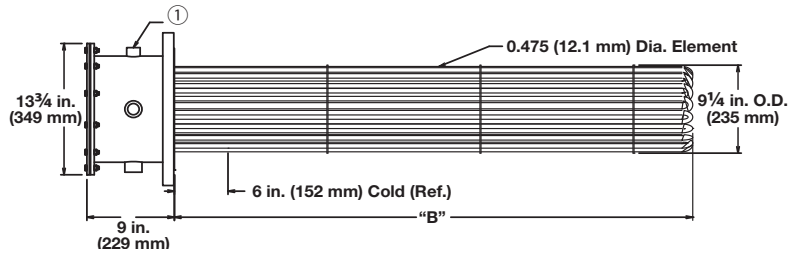
Application: Medium Weight Oils and Heat Transfer Oils

- 10 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 27-Incoloy Elements (2.5 W/cm²)	480	63.0	3	3	54¾	(1391)	240	(109)	**FSN754N13S**	S	**FSN754N13W**	S
	480	75.0	3	3	63¾	(1619)	250	(114)	**FSN763N13S**	S	**FSN763N13W**	S
	480	87.0	3	3	73¼	(1861)	260	(118)	**FSN773E13S**	S	**FSN773E13W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

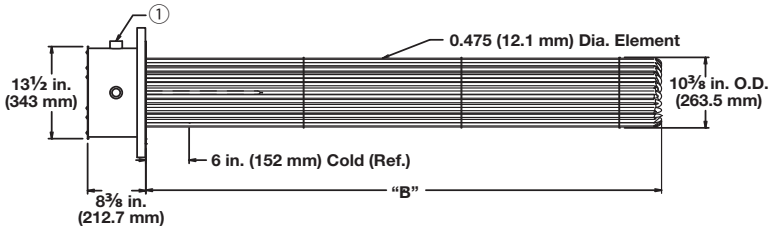
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

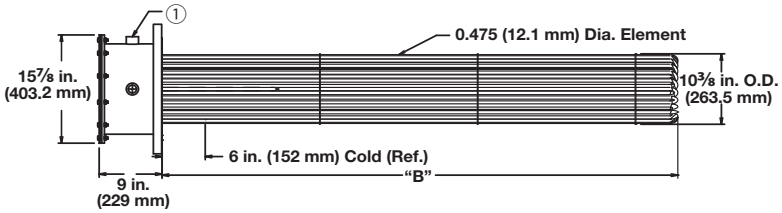
Application: Medium Weight Oils and Heat Transfer Oils

- 12 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in. (mm)	Ship Wt. lbs (kg)	Code Number	Del.	Code Number	Del.
							General Purpose Enclosure		Moisture-Resistant Enclosure	
16 W/in² ③ Steel Flange 36-Incoloy Elements (2.5 W/cm²)	480	83.0	3	3	54⅝ (1387.5)	280 (127)	**FTN754L13S**	RS	**FTN754L13W**	RS
	480	117.0	3	3	73⅛ (1857.4)	291 (132)	**FTN773C13S**	RS	**FTN773C13W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

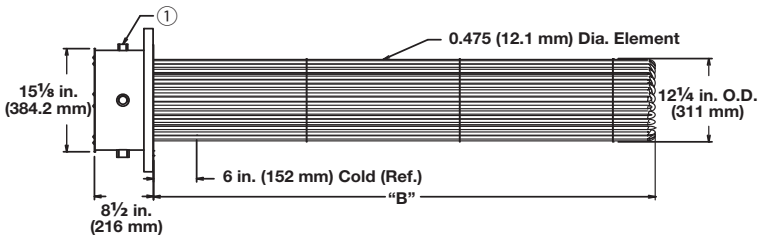
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

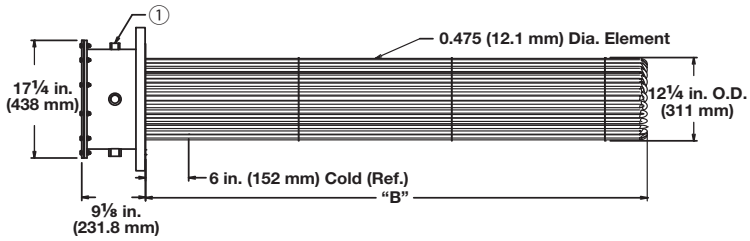
Application: Medium Weight Oils and Heat Transfer Oils

- 14 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
16 Win² ③ Steel Flange 45-Incoloy Elements (2.5 W/cm²)	480	105.0	3	3	54½	(1384)	300	(136)	**FWN754J13S**	S	**FWN754J13W**	S
	480	125.0	3	5	63½	(1613)	310	(141)	**FWN763J13S**	S	**FWN763J13W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

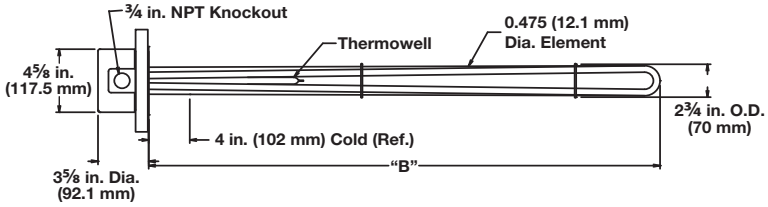
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

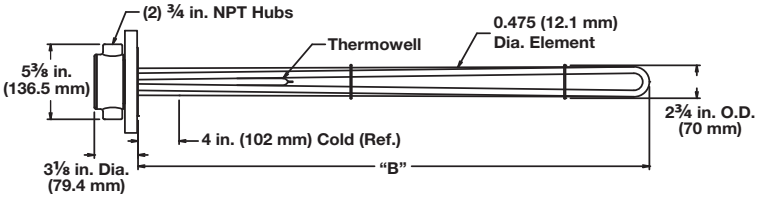
Application: Bunker C, Asphalt and #6 Fuel Oil

- 3 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures
- Single circuit

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
								General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 3-Steel Elements (1.3 W/cm²)	240	2.0	3	33	(838)	28	(13)	**FMS733A12S**	RS	**FMS733A12W**	RS
	480	2.0	3	33	(838)	28	(13)	**FMS733A13S**	RS	**FMS733A13W**	RS
	240	3.0	3	48	(1219)	32	(15)	**FMS748A12S**	RS	**FMS748A12W**	RS
	480	3.0	3	48	(1219)	32	(15)	**FMS748A13S**	RS	**FMS748A13W**	RS
	240	4.0	3	64½	(1638)	37	(17)	**FMS764J12S**	RS	**FMS764J12W**	RS
	480	4.0	3	64½	(1638)	37	(17)	**FMS764J13S**	RS	**FMS764J13W**	RS
	240	5.0	3	77	(1956)	42	(19)	**FMS777A12S**	RS	**FMS777A12W**	RS
	480	5.0	3	77	(1956)	42	(19)	**FMS777A13S**	RS	**FMS777A13W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

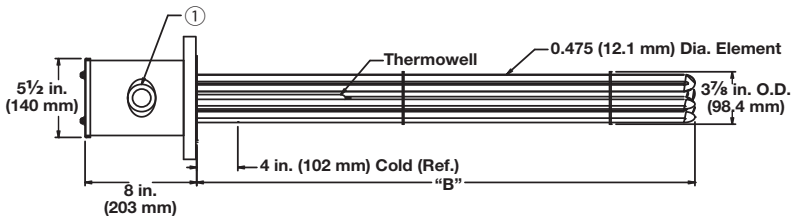
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- 4 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 6-Steel Elements (1.3 W/cm²)	240	5.0	3	1	40½	(1029)	43	(20)	**FOS740J12S**	RS	**FOS740J12W**	RS
	480	5.0	3	1	40½	(1029)	43	(20)	**FOS740J13S**	RS	**FOS740J13W**	RS
	240	6.0	3	1	48	(1219)	48	(22)	**FOS748A12S**	RS	**FOS748A12W**	RS
	480	6.0	3	1	48	(1219)	48	(22)	**FOS748A13S**	RS	**FOS748A13W**	RS
	240	8.0	3	1	64½	(1638)	53	(24)	**FOS764J12S**	RS	**FOS764J12W**	RS
	480	8.0	3	1	64½	(1638)	53	(24)	**FOS764J13S**	RS	**FOS764J13W**	RS
	240	10.0	3	1	77	(1956)	61	(28)	**FOS777A12S**	RS	**FOS777A12W**	RS
	480	10.0	3	1	77	(1956)	61	(28)	**FOS777A13S**	RS	**FOS777A13W**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

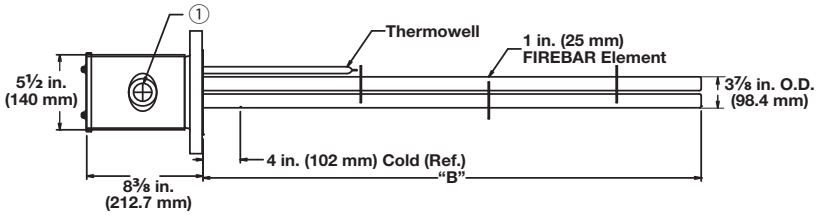
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- 4 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ 304 SS Flange 6-Incoloy Elements (1.3 W/cm²)	240	2.50	3	1	16½	(420)	35	(16)	**FONF16J22S**	RS	**FONF16J22W**	RS
	240	3.25	3	1	19½	(495)	38	(17)	**FONF19J22S**	RS	**FONF19J22W**	RS
	240	4.25	3	1	24½	(622)	41	(19)	**FONF24J22S**	RS	**FONF24J22W**	RS
	480	4.25	3	1	24½	(622)	41	(19)	**FONF24J21S**	RS	**FONF24J21W**	RS
	240	5.25	3	1	30	(762)	44	(20)	**FONF30A22S**	RS	**FONF30A22W**	RS
	480	5.25	3	1	30	(762)	44	(20)	**FONF30A21S**	RS	**FONF30A21W**	RS
	240	6.38	3	1	35	(889)	46	(21)	**FONF35A22S**	RS	**FONF35A22W**	RS
	480	6.38	3	1	35	(889)	46	(21)	**FONF35A21S**	RS	**FONF35A21W**	RS
	240	8.50	3	1	45½	(1156)	50	(23)	**FONF45J22S**	RS	**FONF45J22W**	RS
	480	8.50	3	1	45½	(1156)	50	(23)	**FONF45J21S**	RS	**FONF45J21W**	RS
	240	10.75	3	1	56	(1422)	54	(25)	**FONF56A22S**	RS	**FONF56A22W**	RS
	480	10.75	3	1	56	(1422)	54	(25)	**FONF56A21S**	RS	**FONF56A21W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

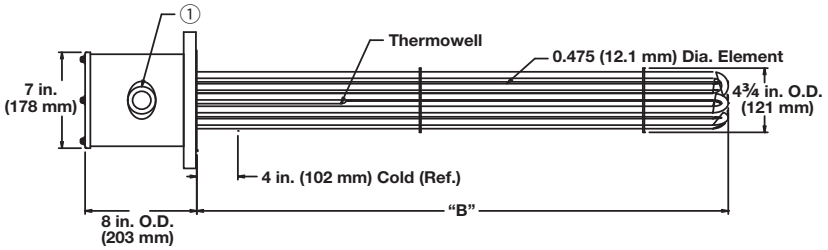
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- 5 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 6-Steel Elements (1.3 W/cm²)	240	5.0	3	1	40½	(1029)	47	(22)	**FNS740J12S**	RS	**FNS740J12W**	RS
	480	5.0	3	1	40½	(1029)	47	(22)	**FNS740J13S**	RS	**FNS740J13W**	RS
	240	6.0	3	1	48	(1219)	52	(24)	**FNS748A12S**	RS	**FNS748A12W**	RS
	480	6.0	3	1	48	(1219)	52	(24)	**FNS748A13S**	RS	**FNS748A13W**	RS
	240	8.0	3	1	64½	(1638)	57	(26)	**FNS764J12S**	RS	**FNS764J12W**	RS
	480	8.0	3	1	64½	(1638)	57	(26)	**FNS764J13S**	RS	**FNS764J13W**	RS
	240	10.0	3	1	77	(1956)	65	(28)	**FNS777A12S**	RS	**FNS777A12W**	RS
	480	10.0	3	1	77	(1956)	65	(28)	**FNS777A13S**	RS	**FNS777A13W**	RS
8 W/in² ③ Steel Flange 9-Steel Elements (1.3 W/cm²)	240	7.5	3	1	40½	(1029)	53	(24)	**FNS740J12XS**	RS	**FNS740J12XW**	RS
	480	7.5	3	1	40½	(1029)	53	(24)	**FNS740J13XS**	RS	**FNS740J13XW**	RS
	240	9.0	3	1	48	(1219)	60	(28)	**FNS748A12XS**	RS	**FNS748A12XW**	RS
	480	9.0	3	1	48	(1219)	60	(28)	**FNS748A13XS**	RS	**FNS748A13XW**	RS
	240	12.0	3	1	64½	(1638)	68	(31)	**FNS764J12XS**	RS	**FNS764J12XW**	RS
	480	12.0	3	1	64½	(1638)	68	(31)	**FNS764J13XS**	RS	**FNS764J13XW**	RS
	240	15.0	3	1	77	(1956)	78	(36)	**FNS777A12XS**	RS	**FNS777A12XW**	RS
	480	15.0	3	1	77	(1956)	78	(36)	**FNS777A13XS**	RS	**FNS777A13XW**	RS

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

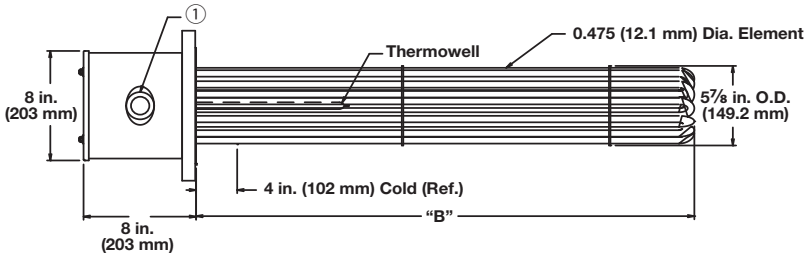
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- 6 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 12-Steel Elements (1.3 W/cm²)	240	8.0	3	1	32⅞	(835.0)	85	(39)	**FPS732R12S**	RS	**FPS732R12W**	RS
	480	8.0	3	1	32⅞	(835.0)	85	(39)	**FPS732R13S**	RS	**FPS732R13W**	RS
	240	10.0	3	1	40⅜	(1025.5)	92	(42)	**FPS740G12S**	RS	**FPS740G12W**	RS
	480	10.0	3	1	40⅜	(1025.5)	92	(42)	**FPS740G13S**	RS	**FPS740G13W**	RS
	240	12.0	3	1	47⅞	(1216.0)	100	(46)	**FPS747R12S**	RS	**FPS747R12W**	RS
	480	12.0	3	1	47⅞	(1216.0)	100	(46)	**FPS747R13S**	RS	**FPS747R13W**	RS
	240	16.5	3	1	64⅜	(1635.1)	110	(50)	**FPS764G12S**	RS	**FPS764G12W**	RS
	480	16.5	3	1	64⅜	(1635.1)	110	(50)	**FPS764G13S**	RS	**FPS764G13W**	RS
	240	20.0	3	2	76⅞	(1952.4)	118	(54)	**FPS776R12S**	RS	**FPS776R12W**	RS
	480	20.0	3	1	76⅞	(1952.4)	118	(54)	**FPS776R13S**	RS	**FPS776R13W**	RS
8 W/in² ③ Steel Flange 15-Steel Elements (1.3 W/cm²)	240	10.0	3	1	32⅞	(835.0)	90	(41)	**FPS732R12XS**	RS	**FPS732R12XW**	RS
	480	10.0	3	1	32⅞	(835.0)	90	(41)	**FPS732R13XS**	RS	**FPS732R13XW**	RS
	240	12.5	3	1	40⅜	(1025.5)	98	(45)	**FPS740G12XS**	RS	**FPS740G12XW**	RS
	480	12.5	3	1	40⅜	(1025.5)	98	(45)	**FPS740G13XS**	RS	**FPS740G13XW**	RS
	240	15.0	3	1	47⅞	(1216.0)	108	(49)	**FPS747R12XS**	RS	**FPS747R12XW**	RS
	480	15.0	3	1	47⅞	(1216.0)	108	(49)	**FPS747R13XS**	RS	**FPS747R13XW**	RS
	240	21.0	3	5	64⅜	(1635.1)	120	(55)	**FPS764G12XS**	RS	**FPS764G12XW**	RS
	480	21.0	3	1	64⅜	(1635.1)	120	(55)	**FPS764G13XS**	RS	**FPS764G13XW**	RS
	240	25.0	3	5	76⅞	(1952.4)	131	(60)	**FPS776R12XS**	RS	**FPS776R12XW**	RS
	480	25.0	3	1	76⅞	(1952.4)	131	(60)	**FPS776R13XS**	RS	**FPS776R13XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

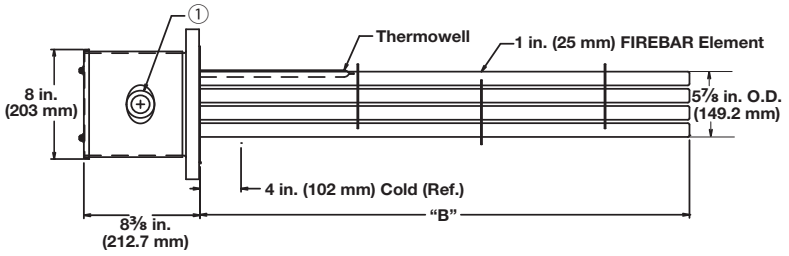
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- 6 inch - 150 lb ANSI flange
- FIREBAR elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ 304 SS Flange 15-Incoloy Elements (1.3 W/cm²)	240	6.3	3	5	16½	(419)	81	(37)	**FPNF16J22S**	RS	**FPNF16J22W**	RS
	240	8.1	3	5	19½	(495)	84	(38)	**FPNF19J22S**	RS	**FPNF19J22W**	RS
	240	10.6	3	5	24½	(622)	87	(40)	**FPNF24J22S**	RS	**FPNF24J22W**	RS
	480	10.6	3	5	24½	(622)	87	(40)	**FPNF24J21S**	RS	**FPNF24J21W**	RS
	240	13.1	3	5	30	(762)	91	(42)	**FPNF30A22S**	RS	**FPNF30A22W**	RS
	480	13.1	3	5	30	(762)	91	(42)	**FPNF30A21S**	RS	**FPNF30A21W**	RS
	240	16.0	3	5	35	(889)	95	(43)	**FPNF35A22S**	RS	**FPNF35A22W**	RS
	480	16.0	3	5	35	(889)	95	(43)	**FPNF35A21S**	RS	**FPNF35A21W**	RS
	240	21.3	3	5	45½	(1156)	106	(48)	**FPNF45J22S**	RS	**FPNF45J22W**	RS
	480	21.3	3	5	45½	(1156)	106	(48)	**FPNF45J21S**	RS	**FPNF45J21W**	RS
	240	26.0	3	5	56	(1422)	116	(53)	**FPNF56A22S**	RS	**FPNF56A22W**	RS
	480	26.0	3	5	56	(1422)	116	(53)	**FPNF56A21S**	RS	**FPNF56A21W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

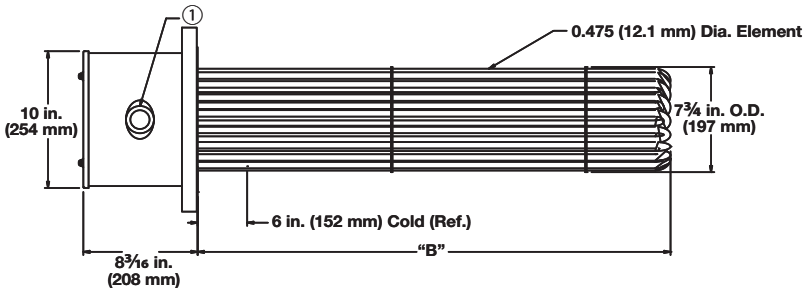
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- 8 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose and Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 18-Steel Elements (1.3 W/cm²)	240	12.5	3	1	43¼	(1099.0)	132	(60)	**FRS743E12S**	RS	**FRS743E12W**	RS
	480	12.5	3	1	43¼	(1099.0)	132	(60)	**FRS743E13S**	RS	**FRS743E13W**	RS
	240	16.5	3	1	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRS751M12S**	RS	**FRS751M12W**	RS
	480	16.5	3	1	51¹¹⁄₁₆	(1312.9)	137	(63)	**FRS751M13S**	RS	**FRS751M13W**	RS
	240	20.0	3	2	62⅜	(1579.6)	154	(70)	**FRS762D12S**	RS	**FRS762D12W**	RS
	480	20.0	3	1	62⅜	(1579.6)	154	(70)	**FRS762D13S**	RS	**FRS762D13W**	RS
	240	24.0	3	2	70¹¹⁄₁₆	(1795.5)	160	(73)	**FRS770M12S**	RS	**FRS770M12W**	RS
	480	24.0	3	1	70¹¹⁄₁₆	(1795.5)	160	(73)	**FRS770M13S**	RS	**FRS770M13W**	RS
	240	27.0	3	2	79¹¹⁄₁₆	(2024.1)	172	(78)	**FRS779M12S**	RS	**FRS779M12W**	RS
	480	27.0	3	1	79¹¹⁄₁₆	(2024.1)	172	(78)	**FRS779M13S**	RS	**FRS779M13W**	RS
8 W/in² ③ Steel Flange 24-Steel Elements (1.3 W/cm²)	240	17.0	3	1	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRS743M12XS**	RS	**FRS743M12XW**	RS
	480	17.0	3	1	43¹¹⁄₁₆	(1109.7)	147	(67)	**FRS743M13XS**	RS	**FRS743M13XW**	RS
	240	22.0	3	2	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRS751M12XS**	RS	**FRS751M12XW**	RS
	480	22.0	3	1	51¹¹⁄₁₆	(1312.9)	154	(70)	**FRS751M13XS**	RS	**FRS751M13XW**	RS
	240	27.0	3	2	62⅜	(1579.6)	166	(76)	**FRS762D12XS**	RS	**FRS762D12XW**	RS
	480	27.0	3	1	62⅜	(1579.6)	166	(76)	**FRS762D13XS**	RS	**FRS762D13XW**	RS
	240	32.0	3	2	70¹¹⁄₁₆	(1795.5)	175	(80)	**FRS770M12XS**	RS	**FRS770M12XW**	RS
	480	32.0	3	1	70¹¹⁄₁₆	(1795.5)	175	(80)	**FRS770M13XS**	RS	**FRS770M13XW**	RS
	240	36.0	3	2	79¹¹⁄₁₆	(2024.1)	181	(82)	**FRS779M12XS**	RS	**FRS779M12XW**	RS
	480	36.0	3	1	79¹¹⁄₁₆	(2024.1)	181	(82)	**FRS779M13XS**	RS	**FRS779M13XW**	RS

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

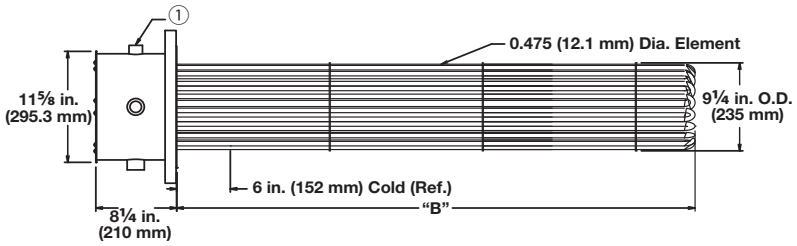
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

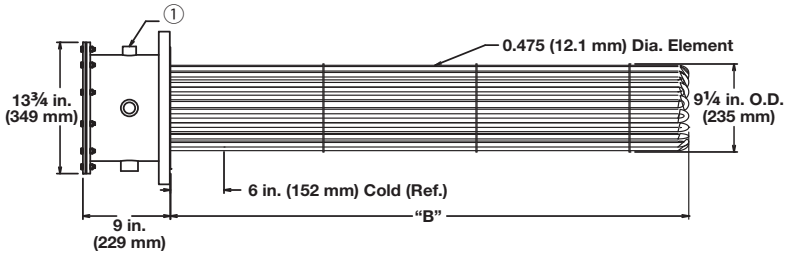
Application: Bunker C, Asphalt and #6 Fuel Oil

- 10 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 27-Steel Elements (1.3 W/cm²)	240	25.0	3	3	51¾	(1314)	230	(105)	**FSS751N12S**	S	**FSS751N12W**	S
	480	25.0	3	1	51¾	(1314)	230	(105)	**FSS751N13S**	S	**FSS751N13W**	S
	240	30.0	3	3	62¼	(1581)	250	(114)	**FSS762E12S**	S	**FSS762E12W**	S
	480	30.0	3	1	62¼	(1581)	250	(114)	**FSS762E13S**	S	**FSS762E13W**	S
	240	35.0	3	3	70¾	(1797)	258	(117)	**FSS770N12S**	S	**FSS770N12W**	S
	480	35.0	3	1	70¾	(1797)	258	(117)	**FSS770N13S**	S	**FSS770N13W**	S
	240	40.0	3	3	78¾	(2000)	265	(121)	**FSS778N12S**	S	**FSS778N12W**	S
	480	40.0	3	1	78¾	(2000)	265	(121)	**FSS778N13S**	S	**FSS778N13W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

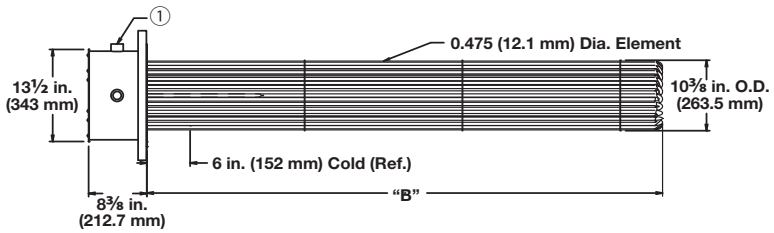
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

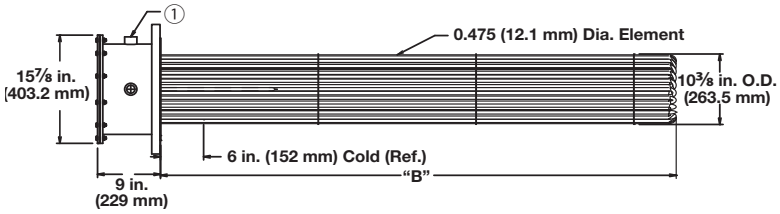
Application: Bunker C, Asphalt and #6 Fuel Oil

- 12 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 27-Steel Elements (1.3 W/cm²)	240	34.0	3	2	51⅝	(1311.3)	280	(127)	**FTS751L12S**	S	**FTS751L12W**	S
	480	34.0	3	1	51⅝	(1311.3)	280	(127)	**FTS751L13S**	S	**FTS751L13W**	S
	240	40.0	3	2	62⅛	(1578.0)	285	(130)	**FTS762C12S**	S	**FTS762C12W**	S
	480	40.0	3	1	62⅛	(1578.0)	285	(130)	**FTS762C13S**	S	**FTS762C13W**	S
	240	47.0	3	3	70⅝	(1793.9)	290	(132)	**FTS770L12S**	S	**FTS770L12W**	S
	480	47.0	3	2	70⅝	(1793.9)	290	(132)	**FTS770L13S**	S	**FTS770L13W**	S
	240	54.0	3	3	78⅝	(1997.1)	300	(136)	**FTS778L12S**	S	**FTS778L12W**	S
	480	54.0	3	2	78⅝	(1997.1)	300	(136)	**FTS778L13S**	S	**FTS778L13W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

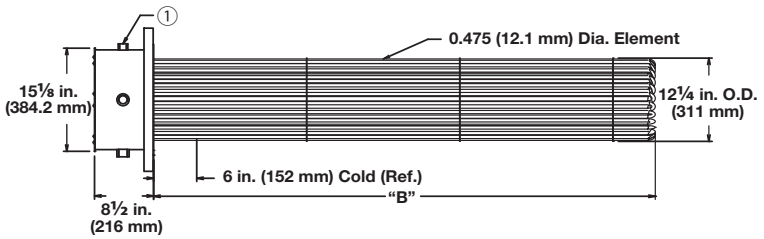
③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

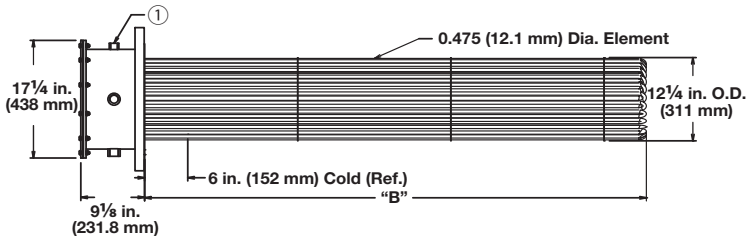
Application: Bunker C, Asphalt and #6 Fuel Oil

- 14 inch - 150 lb ANSI flange
- WATROD elements
- Without thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



① **The number and size of the conduit opening will comply with the National Electrical Code® standards.**

Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
8 W/in² ③ Steel Flange 27-Steel Elements (1.3 W/cm²)	240	42.0	3	3	51½	(1308)	300	(136)	**FWS751J12S**	S	**FWS751J12W**	S
	480	42.0	3	3	51½	(1308)	300	(136)	**FWS751J13S**	S	**FWS751J13W**	S
	240	50.0	3	3	62	(1575)	310	(141)	**FWS762A12S**	S	**FWS762A12W**	S
	480	50.0	3	3	62	(1575)	310	(141)	**FWS762A13S**	S	**FWS762A13W**	S
	240	60.0	3	3	70½	(1791)	318	(145)	**FWS770J12S**	S	**FWS770J12W**	S
	480	60.0	3	3	70½	(1791)	318	(145)	**FWS770J13S**	S	**FWS770J13W**	S
	240	67.0	3	5	78½	(1994)	330	(150)	**FWS778J12S**	S	**FWS778J12W**	S
	480	67.0	3	3	78½	(1994)	330	(150)	**FWS778J13S**	S	**FWS778J13W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

③ Wired for 3-phase operation only

WATROD and FIREBAR ANSI Flange Immersion Heaters

Build-a-Code

Ordering Information

To order, complete the code number to the right with the information below:

Example: FPS732R12 S 2 HJ

Stock ANSI Flange Code Number ①

Optional Terminal Enclosures ②

S = General purpose enclosure
W = Moisture resistant enclosure
E = Explosion resistant enclosure
C = Moisture/explosion resistant enclosure

Optional Process Sensor ④

1 = 30 to 110°F, (-1 to 43°C) SPST
2 = 30 to 250°F, (-1 to 121°C) SPST
3 = 175 to 550°F, (79 to 288°C) SPST
4 = 30 to 110°F, (-1 to 43°C) DPST
5 = 60 to 250°F, (16 to 121°C) DPST (WATROD)
5A = 60 to 250°F, (16 to 121°C) DPST (FIREBAR)
7 = 100 to 550°F, (38 to 288°C) DPST (WATROD)
7A = 100 to 550°F, (38 to 288°C) DPST (FIREBAR)
PJ = Type J process thermocouple in thermowell
PK = Type K process thermocouple in thermowell

Sheath Limit Sensor ③

HJ = Type J high-limit thermocouple, horizontal mount
TJ = Type J high-limit thermocouple, vertical/housing at top
BJ = Type J high-limit thermocouple, vertical/housing at bottom
HK = Type K high-limit thermocouple, horizontal mount
TK = Type K high-limit thermocouple, vertical/housing at top
BK = Type K high-limit thermocouple, vertical/housing at bottom

① Catalog part numbers include standard option enclosures and process sensors. To order optional enclosures or sensors, substitute the appropriate suffix.

② Standard catalog listings include either a general purpose enclosure or moisture/explosion resistant enclosure. Substitute enclosure options are noted.

③ Heater orientation is critical to accurate sensing of limit conditions. Use the appropriate code to indicate heater mounting orientation.

④ Thermostat part numbers are shown in the *Thermostat Stock Chart* on page 652.

WATROD and FIREBAR® Flange Immersion Heaters

Plate Flange Immersion Heaters



Watlow® plate flange heaters are easy to install and maintain. These products are designed for heating heat transfer fluids, medium and lightweight oils and water in tanks and pressure vessels. Plate flange heaters are ideal for applications requiring low to medium wattage requirements.

Watlow plate flange heaters are made with WATROD tubular elements that are brazed or welded to the flange. Stock plate flange heaters are supplied with general purpose or moisture-resistant terminal enclosures.

Performance Capabilities

- Watt densities to 100 W/in² (15.5 W/cm²)
- Wattages to 18 kilowatts
- Incoloy® sheath temperatures to 1600°F (870°C)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)

Features and Benefits

Rapid ship program for stock units and 10 day delivery for standard designs

- Minimizes down time

Direct replacement for many OEM mold temperature control units

- Single source supplier for many OEM applications

ANSI compatible 2 and 2½ inch flanges

- Provides appropriate heater size-to-application fit

Standard general purpose or moisture resistant terminal enclosures

- Offers easy access to wiring
- Limits accidental contact with termination
- Denies access to wiring connection in local environment

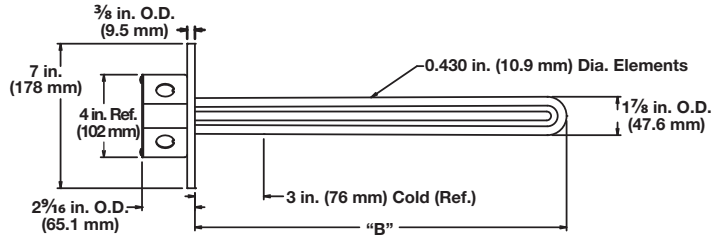
WATROD and FIREBAR Flange Immersion Heaters

Plate Flange Immersion Heaters

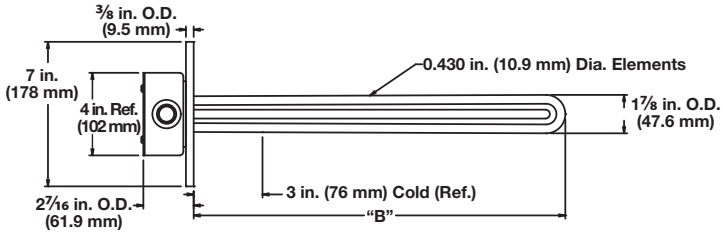
Application: Clean Water

- 2½ inch plate flange (bolt pattern matches 2½ inch - 150 lb ANSI flange)
- WATROD elements
- Not available with thermowell or thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
100 W/in² Steel Flange 3-304 SS Elements (15.5 W/cm²)	240	12.0	1	3	18	(457)	22	(10)	**FLN18A10S**	S	**FLN18A10W**	S
	240	12.0	3	1	18	(457)	22	(10)	**FLN18A3S**	S	**FLN18A3W**	S
	480	12.0	1	1	18	(457)	22	(10)	**FLN18A11S**	S	**FLN18A11W**	S
	480	12.0	3	1	18	(457)	22	(10)	**FLN18A5S**	RS	**FLN18A5W**	RS
80 W/in² Steel Flange 3-304 SS Elements (12.4 W/cm²)	240	9.0	1	1	17¾	(451)	22	(10)	**FLN17N10S**	S	**FLN17N10W**	S
	240	9.0	3	1	17¾	(451)	22	(10)	**FLN17N3S**	RS	**FLN17N3W**	RS
	480	9.0	1	1	17¾	(451)	22	(10)	**FLN17N11S**	S	**FLN17N11W**	S
	480	9.0	3	1	17¾	(451)	22	(10)	**FLN17N5S**	S	**FLN17N5W**	S
	240	18.0	1	3	30	(762)	27	(13)	**FLN30A10S**	S	**FLN30A10W**	S
	240	18.0	3	1	30	(762)	27	(13)	**FLN30A3S**	RS	**FLN30A3W**	RS
	480	18.0	1	1	30	(762)	27	(13)	**FLN30A11S**	S	**FLN30A11W**	S
	480	18.0	3	1	30	(762)	27	(13)	**FLN30A5S**	S	**FLN30A5W**	S
60 W/in² Steel Flange 3-Incoloy Elements (9.3 W/cm²)	240	4.5	1	1	12½	(318)	21	(10)	**FLN12J10S**	S	**FLN12J10W**	S
	240	4.5	3	1	12½	(318)	21	(10)	**FLN12J3S**	RS	**FLN12J3W**	RS
	480	4.5	1	1	12½	(318)	21	(10)	**FLN12J11S**	S	**FLN12J11W**	S
	480	4.5	3	1	12½	(318)	21	(10)	**FLN12J5S**	S	**FLN12J5W**	S

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

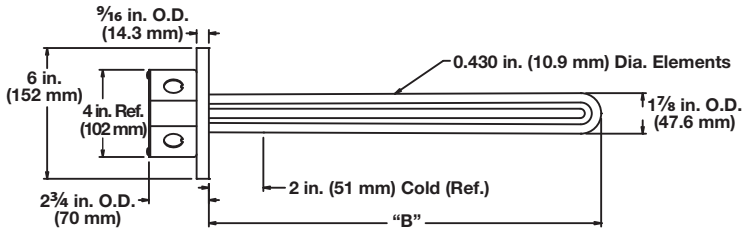
WATROD and FIREBAR Flange Immersion Heaters

Plate Flange Immersion Heaters

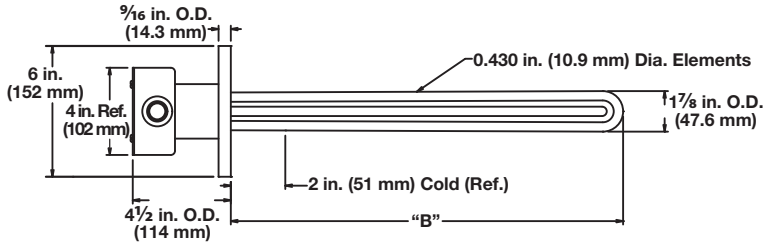
Application: Process Water

- 2 inch flange (bolt pattern matches 2 inch - 150 lb ANSI flange)
- WATROD elements
- Not available with thermowell or thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



Description	Volts	kW	PH	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
45 W/in² Steel Flange 3-Copper Elements (7 W/cm²)	240	4.5	1	1	16	(406)	22	(10)	**FKC16A10S**	S	**FKC16A10W**	S
	240	4.5	3	1	16	(406)	22	(10)	**FKC16A3S**	S	**FKC16A3W**	S
	480	4.5	1	1	16	(406)	22	(10)	**FKC16A11S**	S	**FKC16A11W**	S
	480	4.5	3	1	16	(406)	22	(10)	**FKC16A5S**	RS	**FKC16A5W**	RS
	240	9.0	1	1	29	(737)	27	(13)	**FKC19A10S**	S	**FKC19A10W**	S
	240	9.0	3	1	29	(737)	27	(13)	**FKC19A3S**	RS	**FKC19A3W**	RS
	480	9.0	1	1	29	(737)	27	(13)	**FKC19A11S**	S	**FKC19A11W**	S
	480	9.0	3	1	29	(737)	27	(13)	**FKC19A5S**	RS	**FKC19A5W**	RS
45 W/in² Steel Flange 3-Incoloy Elements (7 W/cm²)	240	9.0	1	1	28	(711)	27	(13)	**FKN28A10S**	S	**FKN28A10W**	S
	240	9.0	3	1	28	(711)	27	(13)	**FKN28A3S**	S	**FKN28A3W**	S
	480	9.0	1	1	28	(711)	27	(13)	**FKN28A11S**	S	**FKN28A11W**	S
	480	9.0	3	1	28	(711)	27	(13)	**FKN28A5S**	RS	**FKN28A5W**	RS

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

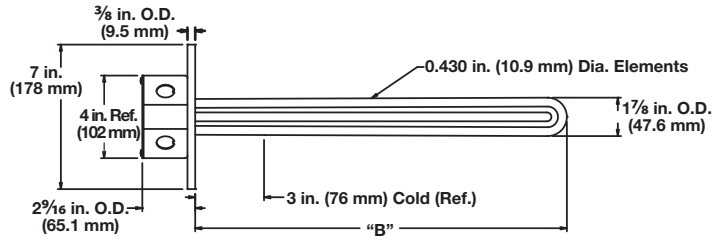
WATROD and FIREBAR Flange Immersion Heaters

Plate Flange Immersion Heaters

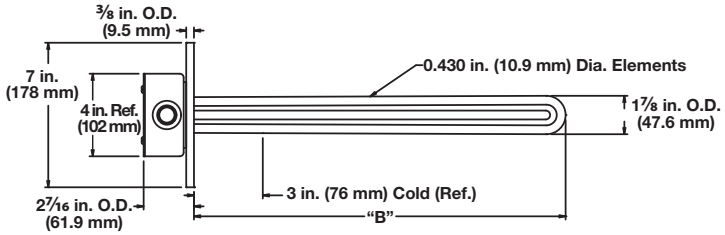
Application: Forced Air and Caustic Solutions

- 2½ inch flange (bolt pattern matches 2½ inch - 150 lb ANSI flange)
- WATROD elements
- Not available with thermowell or thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	"B" Dim. (mm)	Ship Wt. lbs	Ship Wt. (kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
30 W/in² Steel Flange 3-Incoloy Elements (4.7 W/cm²)	240	3.0	3	1	17¾	(451)	22	(10)	**FLN17N12S**	RS	**FLN17N12W**	RS
	480	3.0	3	1	17¾	(451)	22	(10)	**FLN17N13S**	RS	**FLN17N13W**	RS
	240	4.0	3	1	18	(457)	22	(10)	**FLN18A12S**	RS	**FLN18A12W**	RS
	480	4.0	3	1	18	(457)	22	(10)	**FLN18A13S**	S	**FLN18A13W**	S
	240	6.0	3	1	30	(762)	27	(13)	**FLN30A12S**	S	**FLN30A12W**	S
	480	6.0	3	1	30	(762)	27	(13)	**FLN30A13S**	S	**FLN30A13W**	S

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

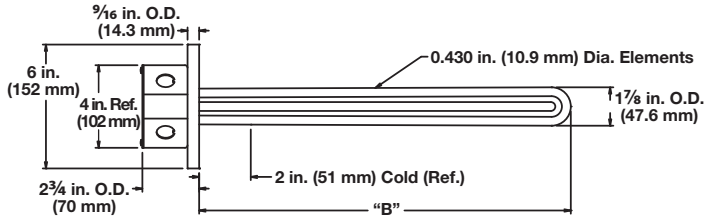
WATROD and FIREBAR Flange Immersion Heaters

Plate Flange Immersion Heaters

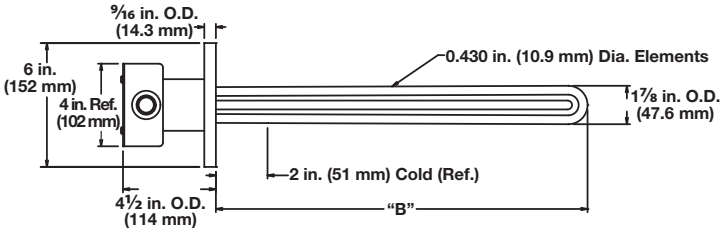
Application: Lightweight Oils and Ethylene Glycol (100%)

- 2 inch flange (bolt pattern matches 2 inch - 150 lb ANSI flange)
- WATROD elements
- Not available with thermowell or thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
30 W/in² Steel Flange 3-Steel Elements (4.7 W/cm²)	240	6.0	1	1	29	(737)	27	(13)	**FKS29A10S**	RS	**FKS29A10W**	RS
	240	6.0	3	1	29	(737)	27	(13)	**FKS29A3S**	RS	**FKS29A3W**	RS
	480	6.0	1	1	29	(737)	27	(13)	**FKS29A11S**	RS	**FKS29A11W**	RS
	480	6.0	3	1	29	(737)	27	(13)	**FKS29A5S**	S	**FKS29A5W**	S

RAPID SHIP

- **RS** - Next day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

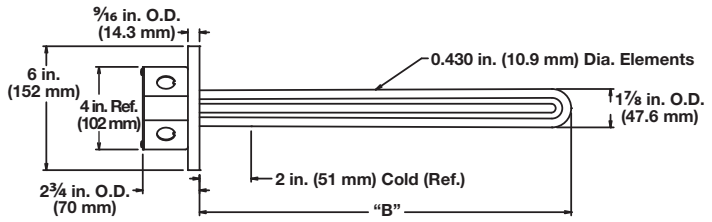
WATROD and FIREBAR Flange Immersion Heaters

Plate Flange Immersion Heaters

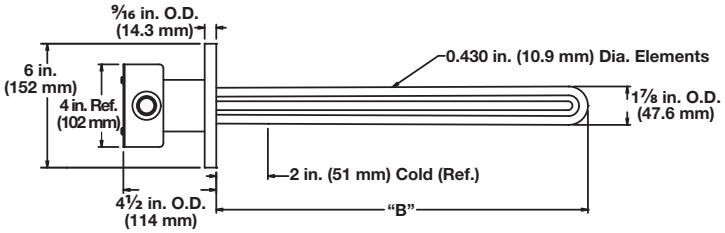
Application: Medium Weight Oils and Heat Transfer Oils

- 2 inch flange (bolt pattern matches 2 inch - 150 lb ANSI flange)
- WATROD elements
- Not available with thermowell or thermostat
- General purpose or moisture-resistant enclosures

General Purpose



Moisture Resistant



Description	Volts	kW	Ph	# Circ.	"B" Dim. in.	(mm)	Ship Wt. lbs	(kg)	Code Number	Del.	Code Number	Del.
									General Purpose Enclosure		Moisture-Resistant Enclosure	
15 W/in² Steel Flange 3-Incoloy Elements (2.3 W/cm²)	240	3.0	3	1	28	(711)	27	(13)	**FKN28A12S**	S	**FKN28A12W**	S
	480	3.0	3	1	28	(711)	27	(13)	**FKN28A13S**	S	**FKN28A13W**	S
10 W/in² Steel Flange 3-Steel Elements (1.6 W/cm²)	240	2.0	3	1	29	(737)	27	(13)	**FKS29A12S**	S	**FKS29A12W**	S
	480	2.0	3	1	29	(737)	27	(13)	**FKS29A13S**	S	**FKS29A13W**	S

RAPID SHIP

- **S** - Standard, 10 day lead time

Note: All flange bundles are designed to fit the inside diameter of the equivalent standard schedule pipe

WATROD and FIREBAR® Flange Immersion Heaters

Square Flange Immersion Heaters

Designed for use in boilers and industrial storage tanks, the square flange immersion heater from Watlow® offers an energy efficient solution to heating water, oils and degreasing solutions.

Consisting of WATROD or FIREBAR® elements brazed, staked or welded to a four- or six-bolt flange, these heaters mount directly to a mating flange that is welded to a tank wall or nozzle.

Installation and maintenance is easy. Heater change-out is also simple-unbolt the flange and replace it with another-without extensive equipment downtime.



Performance Capabilities

- Watt densities to 100 W/in² (15.5 W/cm²)
- Wattages to 24 kilowatts
- Voltages to 480V~(ac)
- Incoloy® sheath temperatures to 1600°F (870°C)

Features and Benefits

2½, 3⅛ and 4½ inch square flanges
- Easily adapts to application needs

Asbestos-free gaskets
- Come wire-tied to each flange. Spare gaskets also available

Epoxy or silicone resin seals rated to 250°F (120°C) or 390°F (200°C)
- Protects elements against moisture and other contaminants

WATROD hairpins are repressed (recompacted)
- Helps maintain MgO density, dielectric strength, heat transfer and life

UL® and CSA component recognition under file numbers E52951 and 31388
- Meets industry safety standards

Applications

- Water
- Boiler equipment
- Vapor degreasers
- Fuel oils
- Heat transfer fluids
- Caustic solutions

Flange Materials

WATROD	Steel 304 SS
FIREBAR	Steel Brass

Available on Request

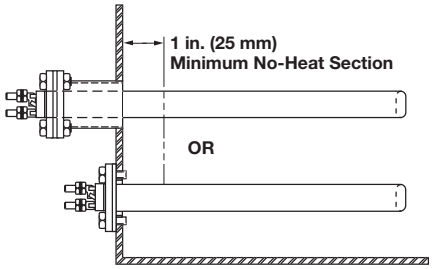
- **Sheath materials** in copper, steel, 304 and 316 stainless steel and titanium
- **Flange materials** in titanium and 316 stainless steel
- **Flange sizes** to meet specific application needs
- **External finishes** such as passivation, belt polishing and glass beading
- **Other voltage and wattage ratings**
  Contact your Watlow representative for details

WATROD and FIREBAR Flange Immersion Heaters

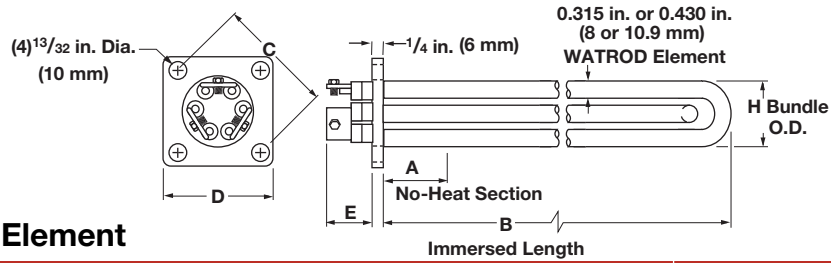
Square Flange Immersion Heaters

Application Hints

- Determine recommended sheath materials and watt densities by using the *Element and Assembly Selection Guide* on pages 667 to 674. If wattage is not known, contact your Watlow representative.
- Extend the element's no-heat section completely in the fluid at all times to prevent premature heater failure. See the accompanying illustration for proper placement of the no-heat section.
- Mount WATROD and FIREBAR square flange heaters horizontally and low in the tank, but above sludge level.
- Periodically remove heaters to inspect and clean the elements.
- Keep terminations clean, dry and tight.
- Minimize problems associated with low liquid level conditions by using a low liquid level sensor.



Heater Dimension	in.	(mm)
A	1 ½	(38)
C	2 ½	(64)
D	2 ½	(64)
E	1	(25)
H	1 ½	(38)



2½ inch Square Flange—WATROD Element

WATROD Description	kW	Immersed B Dimension in. (mm)	Code Number 240V~(ac) 1-Phase	240V~(ac) 3-Phase	480V~(ac) 1-Phase	480V~(ac) 3-Phase	Est. Ship. Wt. lbs (kg)
Applications: Clean and Potable Water							
100 W/in² Steel Flange 3-Incoloy® (15.5 W/cm²)	8.0	11 ¾ (298.0)	**FHN11N10②**	**FHN11N3②**	**FHN11N11②**	**FHN11N5**	18 (9)
Applications: Forced Air and Gases, Caustic Solutions, Degreasing Solutions							
30 W/in² 304 SS Flange 3-Incoloy® (4.7 W/cm²)	3.0 3.75	18 ½ (470.0) 23 1/16 (585.8)	**FHN18J10①** **FHN23B10①**	**FHN18J3** **FHN23B3①**	**FHN18J11②** **FHN23B11②**	**FHN18J5②** **FHN23B5②**	19 (9) 20 (9)
25 W/in² 304 SS Flange 3-Incoloy® (3.9 W/cm²)	1.5	12 (305.0)	**FHN12A10①**	**FHN12A3**	**FHN12A11②**	**FHN12A5②**	18 (8)
Applications: Bunker C and #6 Fuel Oils							
10 W/in² 304 SS Flange 3-Incoloy® (1.6 W/cm²)	1.0 1.25	18 ½ (470.0) 23 1/16 (585.8)		**FHN18J12①** **FHN23B12①**		**FHN18J13②** **FHN23B13②**	19 (9) 20 (9)
8 W/in² 304 SS Flange 3-Incoloy® (1.3 W/cm²)	0.5	12 (305.0)		**FHN12A12①**		**FHN12A13②**	18 (8)

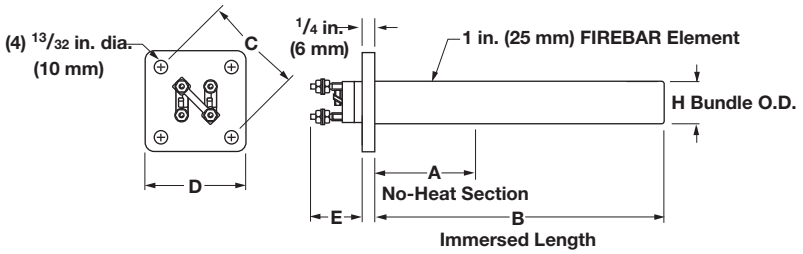
All square flange heaters are Stock unless otherwise noted.
Availability
Stock: Same day shipment
Assembly Stock: Five to seven working days
Standard: Six weeks

① Assembly Stock
② Standard

WATROD and FIREBAR Flange Immersion Heaters

Square Flange Immersion Heaters

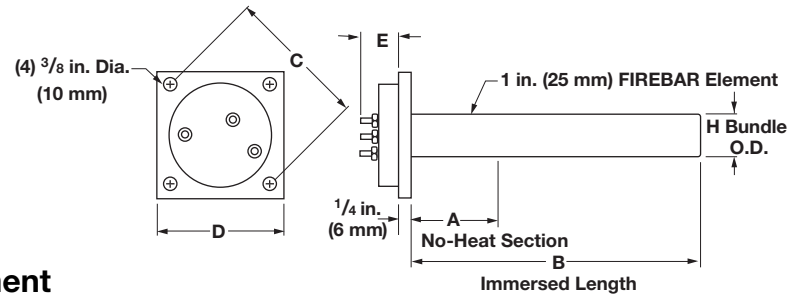
Heater Dimension	in.	(mm)
A	1½	(38)
C	2½	(64)
D	2½	(64)
E	1¾	(44)
H	1 5/16	(33)



2½ inch Square Flange—FIREBAR Element

FIREBAR Description	kW	Immersed B Dimension in. (mm)	Code Number 208V~(ac) 3-Phase	240V~(ac) 1-Phase	240V~(ac) 3-Phase	480V~(ac) 1-Phase	480V~(ac) 3-Phase	Est. Ship. Wt. lbs (kg)
Applications: Clean and Potable Water								
100 W/in² Steel Flange 1-Incoloy® (15.5 W/cm²)	5	11½ (292)	FHNFA11J26N②	FHNFA11J10N①	FHNFA11J3N①	FHNFA11J11N②	FHNFA11J5N②	5 (3)
	8	20¾ (527)	FHNFA20N26N②	FHNFA20N10N①	FHNFA20N3N①	FHNFA20N11N②	FHNFA20N5N①	7 (4)
	10	24⅜ (619)	FHNFA24G26N②	FHNFA24G10N①	FHNFA24G3N②	FHNFA24G11N②	FHNFA24G5N①	8 (4)
	15	33 15/16 (862)	FHNFA33S26N②		FHNFA33S3N②	FHNFA33S11N②	FHNFA33S5N①	9 (5)
80 W/in² Steel Flange 1-Incoloy® (12.4 W/cm²)	16	22⅜ (575)	FHNFB22L26J②	FHNFB22L10J②	FHNFB22L3J②	FHNFB22L11J②	FHNFB22L5J②	10 (5)

Heater Dimension	in.	(mm)
A	1 9/16	(39.7)
C	3 17/32	(89.7)
D	3⅛	(79.4)
E	1 9/16	(39.7)
H	2⅛	(54.0)



3⅛ inch Square Flange—FIREBAR Element

FIREBAR Description	kW	Immersed B Dimension in. (mm)	Code Number 208V~(ac) 3-Phase	240V~(ac) 3-Phase	480V~(ac) 3-Phase	Est. Ship. Wt. lbs (kg)
Applications: Clean and Potable Water						
80 W/in² Brass Flange 1-Incoloy® (12.4 W/cm²)	18	24½ (622)	FENFB24J26J①	FENFB24J3J②	FENFB24J5J①	12 (6)
Applications: Process Water, Ethylene Glycol (50%)						
40 W/in² Brass Flange 1-Incoloy® (6.2 W/cm²)	9	24½ (622)	FENFB24J26K②	FENFB24J3K②	FENFB24J5K②	12 (6)

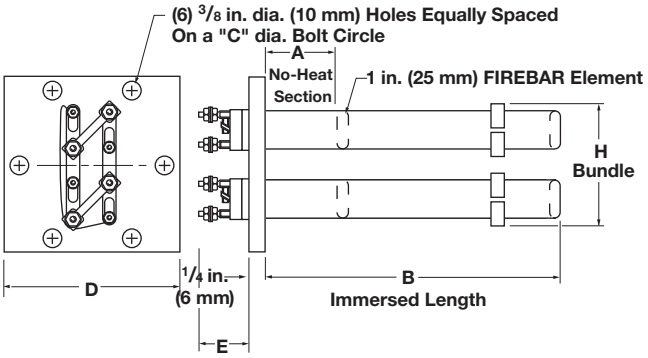
Availability
Stock: Same day shipment
Assembly Stock: Five to seven working days
Standard: Six weeks

① Stock
② Standard

WATROD and FIREBAR Flange Immersion Heaters

Square Flange Immersion Heaters

Heater Dimension	in.	(mm)
A	1	(25.0)
C	3 13/16	(96.8)
D	4 ½	(114.0)
E	2 ¼	(57.0)
H	3 1/32	(81.8)



4½ in. Square Flange—FIREBAR Element

FIREBAR Description	kW	Immersed B Dimension in. (mm)	Code Number 208V~(ac) 3-Phase	Code Number 240V~(ac) 3-Phase	Code Number 480V~(ac) 3-Phase	Est. Ship. Wt. lbs (kg)
Applications: Clean and Potable Water						
100 W/in² Steel Flange 2-Incoloy® (15.5 W/cm²)	18	10½ (267)	**FGNFB10J26N②**	**FGNFB10J3N②**	**FGNFB10J5N①**	16 (8)
70 W/in² Steel Flange 2-Incoloy® (10.9 W/cm²)	12	10½ (267)	**FGNFB10J26P①**	**FGNFB10J3P②**	**FGNFB10J5P①**	16 (8)

Availability
Stock: Same day shipment
Assembly Stock: Five to seven working days
Standard: Six weeks

① Stock
② Standard

How to Order

To order a stock unit, please specify:

- Watlow code number
- Flange size and material
- Volts/watts
- Phase
- Quantity

If our stock units do not meet your application needs, Watlow can provide a made-to-order unit. For **made-to-order** units, please specify:

- Application
- Volts/watts
- Phase
- Flange size, dimensions and material
- Sheath material and diameter
- Number of elements
- No-heat section below the flange
- Immersed ('B' dimension) length
- Maximum bundle diameter (H) or clearance hole size
- Bolt pattern, if not standard
- Options
- Quantity

Availability

Stock: Same day shipment

Assembly Stock: Five to seven working days

Modified Stock③: Five to seven working days

Standard: Three weeks

Made-to-Order: Four to six weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

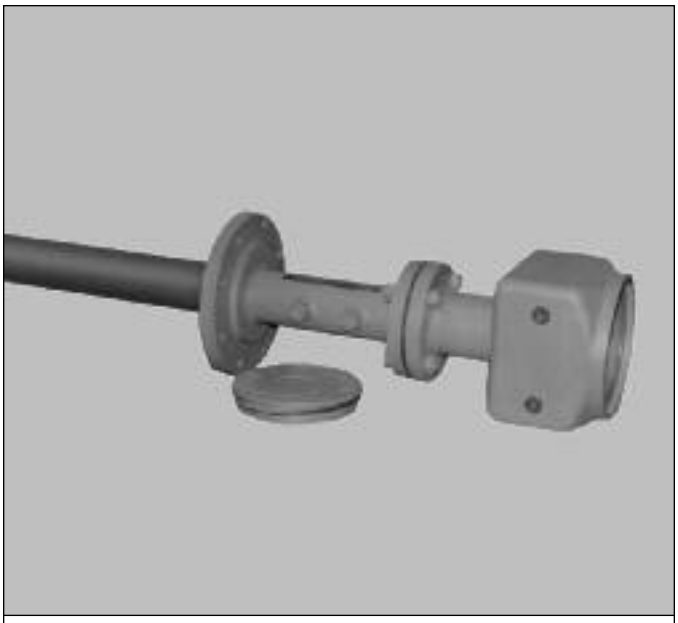
③ Stock or Assembly Stock units with catalog options

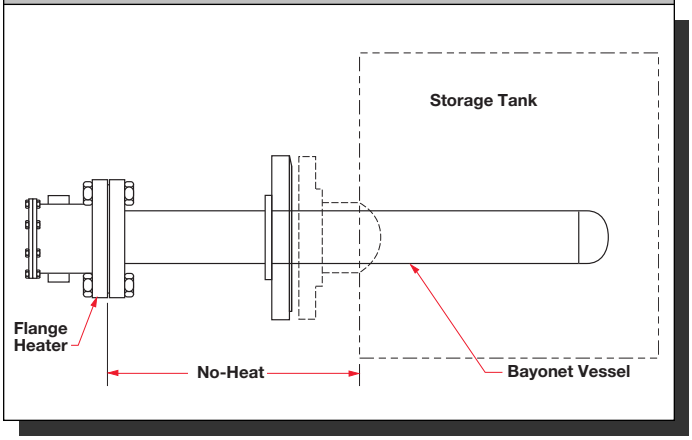
WATROD and FIREBAR® Flange Immersion Heaters

Bayonet/Pipe Insert Immersion Heaters

Bayonet/Pipe insert immersion heaters permit removing and servicing the heater bundle without draining the liquid being heated.

Heating is accomplished by mounting a flange or screw plug immersion heater inside a pressure-tight bayonet pipe vessel. The pipe vessel then mates to a flange connection on a storage tank's side. Heat transfer between element(s) and tank contents is accomplished by heating the air or heat transfer fluid inside the bayonet pipe for conduction to the tank's contents.





Performance Capabilities

- Wattages to 100 killowatts
- Voltages to 600V~(ac)
- Ratings to 600 lb pressure class
- Incoloy® sheath temperatures to 1400°F (760°C)
- Stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)

Features and Benefits

Low watt density screw plug or flange heaters mounted in the bayonet vessel

- Provides long life

Carbon steel, 304 and 316 stainless steel bayonet vessels

- Offers compatibility with a wide range of liquids

Welded flange on pipe vessel

- Ensures pressure seal

Heating elements support(s)

- Ensures proper element spacing and maximum heater performance

Applications

- Indirect heating of viscous fluids:
  - Asphalt
  - Tar
  - Molasses
  - Syrup
  - Glue
- Corrosive liquids
- Degreasing fluids

WATROD and FIREBAR Flange Immersion Heaters

Bayonet/Pipe Insert Immersion Heaters

Options

Pipe insert heaters can be supplied with a variety of options, including:

- Appropriate gasket materials
- Passivation cleaning on pipe insert
- European screw plug to flange adapters
- CSA certified terminal enclosures
- Stand-off terminal enclosures
- Thermocouple temperature sensors
- Thermostats
- Customer specified materials, sizes and pressure class ratings

For descriptions and ordering information about these options, please refer to *Flange Immersion Heaters*, pages 199 to 268, or *Screw Plug Immersion Heaters*, pages 125 to 193.

Flanges

Flanges to 24 in. (610 mm) nominal pipe size are available in materials compatible with specific application needs. For information on flange materials and ratings, consult your Watlow representative.

Bayonet Vessels

Bayonet vessels are available up to 14 in. (356 mm) nominal pipe size and 20 feet long. Vessel size is dependent upon the killowatt requirement and element watt density. For more information, contact your Watlow representative.

Application Hints

- Mount pipe insert heater horizontally
- Locate pipe insert heaters low in the tank, but above the sludge level
- Consider a low liquid level sensor to protect against low liquid level conditions
- Select a watt density that is compatible with the heat transfer media being used
- Insulate the pipe insert heater's exterior to minimize heat loss



Caution:

Do not insulate the terminal enclosure.

How to Order

All pipe insert heaters are **made-to-order**. To order, please specify:

- Application
- Volts/watts
- Phase
- Number of circuits
- Bayonet vessel material
- Storage tank mating flange size
- Maximum bayonet length beyond the storage tank mating flange
- Dimension from heater flange to inside of storage tank wall
- Terminal enclosure type
- Options
- Quantity

Availability

Made-to-Order: Four to six weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

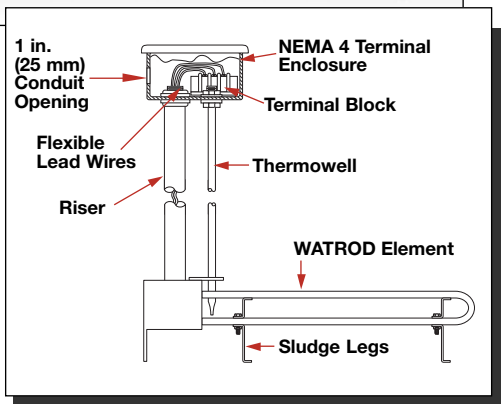
Over-the-Side Heaters

L and O Shaped Immersion Heaters

Over-the-side heaters are ideal for heating water, oils, solvents, salts and acids. Application versatility is enhanced with optional sheath materials, kilowatt ratings, terminal enclosures and mounting methods.

The L and O shaped "installed-from-the-top" heaters slide easily into tanks, with the heated portion immersed along the side or at the bottom.





L and O Shaped Performance Capabilities

- Incoloy® sheath element watt densities to 60 W/in² (9.3 W/cm²)
- Steel sheath element watt densities to 23 W/in² (3.6 W/cm²)
- Wattages to 50 killowatts
- Voltages to 600V~(ac)

Features and Benefits

Rugged, light-weight construction
- Resists damage during installation or removal

Three 0.475 in. (12 mm) diameter WATROD heating elements
- Offers one- or three-phase operation

WATROD hairpins are repressed (recompacted)
- Maintains MgO density, dielectric strength, heat transfer and heater life

Four inch (100 mm) sludge legs
- Keeps heating elements off the tank's bottom to help avoid being covered with sediment

RTV riser seal
- Prevents moisture from infiltrating electrical areas

Standardized size 1 in. (25 mm) conduit openings
- Facilitates wiring

SRG insulated flexible lead wires, rated to 390°F (200°C)
- Allows factory or field wiring for three- or one-phase operation

Riser materials are compatible with element sheath materials such as stainless steel with Incoloy® sheath and steel with steel sheath
- Meets varying application needs
- Ensures ease of use

Integral thermowells
- Provides convenient temperature sensor insertion and replacement without draining the fluid being heated

Moisture resistant (NEMA 4)
- Standardizes enclosures

UL® and CSA component recognition
- 480 and 600V~(ac) maximum under file numbers E52951 and 31388 respectively

Applications

- Water heating
- Freeze protection
- Viscous oils
- Storage tanks
- Degreasing tanks
- Solvents
- Salts
- Caustic solutions
- Paraffin

RAPID SHIP
- **RS** - Same day shipment up to 3 pieces

Over-the-Side Heaters

L and O Shaped Immersion Heaters

Options

Terminal Enclosures

Moisture resistant (NEMA 4) terminal enclosures, without thermostats, are standard on all Watlow L and O shaped over-the-side heaters. Optional terminal enclosures meet application requirements with:

- Corrosion resistant (NEMA 4X). Available with or without a single- or double-pole thermostat.
- Explosion/moisture resistant (NEMA 4/7) class 1 groups C and D. Available with or without a single- or double- pole thermostat. For class 1, group B enclosures, contact your Watlow representative.

Thermostats

Optional single- and double-pole thermostats are also available separately.

For details on thermostats, see *Thermostats*, pages 649 to 652.

Wattages and Voltages

Watlow routinely supplies over-the-side heaters with 240 to 480V~(ac) as well as wattages from 3 to 18 kilowatts. If required, Watlow can configure heaters with voltages and wattages outside these parameters.

For more information about this option, contact your Watlow representative.

Multiple Elements

Over-the-side immersion heaters are configured with three WATROD heating elements.

To achieve a specific kilowatt rating, Watlow can configure units with up to 18 heating elements.

To order, specify **multiple elements**, the **number of elements**, **volts**, **watts**, **phase** and **maximum bundle height** and **width**.

Sheath Material

Stock O and L shaped over-the-side heaters come with Incoloy® or steel sheaths. 304 or 316 stainless steel and titanium sheaths are available upon request.

To order, specify the **sheath material**.



Caution

Explosion-resistant terminal enclosures are intended to provide explosion containment in the electrical termination/wiring enclosure only. No portion of the assembly outside of this enclosure is covered under this rating. Rating effectiveness may be compromised by abuse or misapplication.

Thermocouples

ASTM Type J or K thermocouples offer more accurate sensing of process and/or sheath temperatures. A thermocouple may be inserted into the thermowell or attached to the heater's sheath.

Thermocouples are supplied with 120 in. (3050 mm) leads (longer lead lengths available). Unless otherwise specified, thermocouples are supplied with temperature ranges detailed on the *Thermocouple Types* chart.

Thermocouples require an appropriate temperature and power controller. These must be purchased separately. Watlow offers a wide variety of temperature and power controllers to meet virtually all applications. Temperature controllers can be configured to accept process variable inputs, too. Contact your Watlow representative for details.

To order, specify **Type J** or **K** thermocouple, **lead length**, and indicate if it is for measuring **process** temperature or as a **high-limit** sensing device.

Thermocouple Types

ASTM Type	Conductor Characteristics Positive	Conductor Characteristics Negative	Recommended ① Temperature Range °F	Recommended ① Temperature Range (°C)
J	Iron (Magnetic)	Constantan (Non-magnetic)	0 to 1000	(-20 to 540)
K	Chromel® (Non-magnetic)	Alumel® (Magnetic)	0 to 2000	(-20 to 1100)

① Type J and Type K thermocouples are rated 32 to 1382°F and 32 to 2282°F (0-750°C and 0-1250°C), respectively. Watlow does not recommend exceeding temperature ranges shown on this chart for the tubular product line.

Over-the-Side Heaters

L and O Shaped Immersion Heaters

Options *(Continued)*

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process.

For critical applications, passivation will remove free iron from the sheath and other wetted surfaces.

To order, specify **passivation**.

Riser

A stainless steel or steel riser is supplied to keep terminal enclosures out of the heated solution. Stock heights are 39 5/16 or 51 5/16 in. (1000 or 1320 mm). Upon request, riser height up to 60 ft (18.3 m) can be provided.

To order, specify **riser material** and **height**.

Right Angle Riser

Riser may be right angle formed to move the terminal enclosure away from over the tank.

To order, specify **right angle riser** and **dimensions**.

Sludge Legs

Four inch (100 mm) sludge legs are supplied on all stock units to keep elements above sediments. Shorter or longer sludge legs are available upon request.

To order, specify **sludge legs** and **height**.

Man Hole Cover

A man hole cover seals the tank and provides heater mounting. Man hole covers are pre-assembled to the riser. Standard man hole covers are made from steel with other materials available upon request.

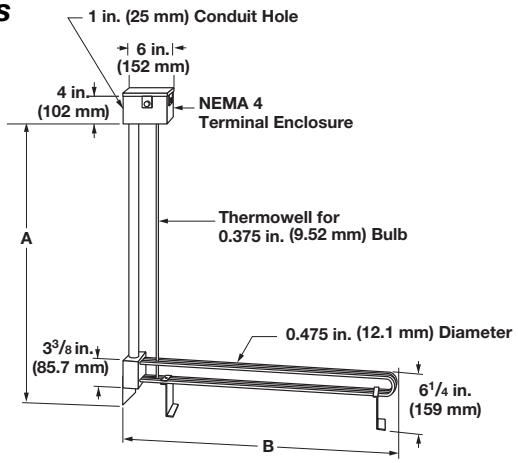
To order, specify **man hole construction**, **diameter** and **material**.

Over-the-Side Heaters

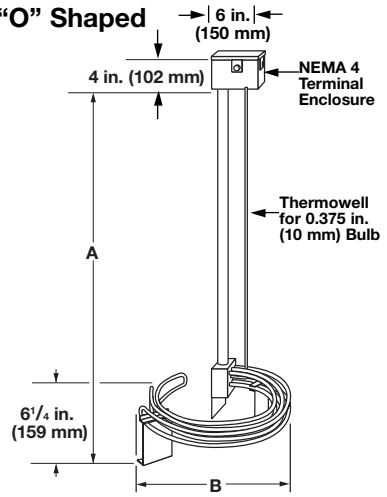
L and O Shaped Immersion Heaters

Ordering Information

"L" Shaped



"O" Shaped



"L" Shaped

WATROD Description	kW	A Dimension in.	(mm)	B Dimension in.	(mm)	Code No. 240V~(ac) 3-Phase	Code No. 480V~(ac) 3-Phase	Del.	Est. Ship. Wt. lbs	(kg)
Applications: Process Water, Mild Caustic Solutions (2% Max), Clean Water										
48 W/in²	3	39 5/16	(998.5)	14 5/8	(371.5)	**OLN714L3W**	**OLN714L13W①**	RS	30	(14)
Incoloy®	6	39 5/16	(998.5)	22 5/8	(574.7)	**OLN722L3W**	**OLN722L5W**	RS	40	(19)
(7.5 W/cm²)	9	39 5/16	(998.5)	30 1/8	(765.2)	**OLN730C3W**	**OLN730C5W**	RS	45	(21)
	12	51 5/16	(1303.3)	37 5/8	(955.7)	**OLN737L3W**	**OLN737L5W**	RS	50	(23)
	15	51 5/16	(1303.3)	45 1/8	(1146.2)	**OLN745C3W**	**OLN745C5W**	RS	65	(30)
	18	51 5/16	(1303.3)	52 5/8	(1336.7)	**OLN752L3W**	**OLN752L5W**	RS	75	(34)
Applications: Citric and Phosphoric Acid Solutions, Caustic Solutions, Water Based Solutions										
23 W/in²	3	39 5/16	(998.5)	22 5/8	(574.7)	**OLNA22L3W**	**OLNA22L5W**	RS	40	(19)
Incoloy®	6	51 5/16	(1303.3)	37 5/8	(955.7)	**OLNA37L3W**	**OLNA37L5W**	RS	50	(23)
(3.6 W/cm²)	9	51 5/16	(1303.3)	52 5/8	(1336.7)	**OLNA52L3W**	**OLNA52L5W**	RS	75	(34)
Applications: Lightweight Oils, Degreasing Solutions, Mineral Oil										
23 W/in²	3	39 5/16	(998.5)	22 5/8	(574.7)	**OLS722L3W**	**OLS722L5W**	RS	40	(19)
Steel	6	51 5/16	(1303.3)	37 5/8	(955.7)	**OLS737L3W**	**OLS737L5W**	RS	50	(23)
(3.6 W/cm²)	9	51 5/16	(1303.3)	52 5/8	(1336.7)	**OLS752L3W**	**OLS752L5W**	RS	75	(34)

"O" Shaped

WATROD Description	kW	A Dimension in.	(mm)	B Dimension in.	(mm)	Code No. 240V~(ac) 3-Phase	Code No. 480V~(ac) 3-Phase	Del.	Est. Ship. Wt. lbs	(kg)
Applications: Process Water, Mild Caustic Solutions (2% Max), Clean Water										
48 W/in²	3	39 5/16	(998.5)	10 3/4	(273)	**ORN710N3W**	**ORN710N13W①**	RS	30	(14)
Incoloy®	6	39 5/16	(998.5)	13 1/2	(343)	**ORN713J3W**	**ORN713J5W**	RS	40	(19)
(7.5 W/cm²)	9	39 5/16	(998.5)	16	(406)	**ORN716A3W**	**ORN716A5W**	RS	45	(21)
	12	51 5/16	(1303.3)	18 1/2	(470)	**ORN718J3W**	**ORN718J5W**	RS	50	(23)
	15	51 5/16	(1303.3)	21 1/2	(546)	**ORN721E3W**	**ORN721E5W**	RS	65	(30)
	18	51 5/16	(1303.3)	23 1/2	(597)	**ORN723J3W**	**ORN723J5W**	RS	75	(34)
Applications: Citric and Phosphoric Acid Solutions, Caustic Solutions, Water Based Solutions										
23 W/in²	3	39 5/16	(998.5)	13 1/2	(343)	**ORNA13J3W**	**ORNA13J5W**	RS	40	(19)
Incoloy®	6	51 5/16	(1303.3)	18 1/2	(470)	**ORNA18J3W**	**ORNA18J5W**	RS	50	(23)
(3.6 W/cm²)	9	51 5/16	(1303.3)	23 1/2	(597)	**ORNA23J3W**	**ORNA23J5W**	RS	75	(34)
Applications: Lightweight Oils, Degreasing Solutions, Mineral Oil										
23 W/in²	3	39 5/16	(998.5)	13 1/2	(343)	**ORS713J3W**	**ORS713J5W**	RS	40	(19)
Steel	6	51 5/16	(1303.3)	18 1/2	(470)	**ORS718J3W**	**ORS718J5W**	RS	50	(23)
(3.6 W/cm²)	9	51 5/16	(1303.3)	23 1/2	(597)	**ORS723J3W**	**ORS723J5W**	RS	75	(34)

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

Truck Shipment only

① Must be operated 3-phase only.

Over-the-Side Heaters

L and O Shaped Immersion Heaters

Build-a-Code

Ordering Information

To order, complete the code number to the right with the information below:

Example: OLN714L3 W 2A TK

Stock Over-the-side Code Number ①

Optional Terminal Enclosures ②

W = Moisture resistant enclosure
C = Moisture/explosion resistant enclosure

Optional Process Sensor ④

2A = 30 to 250°F, (-1 to 121°C) SPST
3A = 175 to 550°F, (79 to 288°C) SPST
10 = 300 to 700°F, (149 to 371°C) DPST
5A = 60 to 250°F, (16 to 121°C) DPST
7A = 100 to 550°F, (38 to 288°C) DPST
PJ = Type J process thermocouple in thermowell
PK = Type K process thermocouple in thermowell

Sheath Limit Sensor ③

TJ = Type J high-limit thermocouple, vertical/housing at top
TK = Type K high-limit thermocouple, vertical/housing at top

① Catalog part numbers include standard option enclosures and process sensors. To order optional enclosures or sensors, substitute the appropriate suffix.

② Standard catalog listings include moisture resistant enclosure. Substitute enclosure options are noted.

③ Heater orientation is critical to accurate sensing of limit conditions. Use the appropriate code to indicate heater mounting orientation.

④ Thermostat part numbers are shown in the *Thermostat Stock Chart* on page 652.

Over-the-Side Heaters

L and O Shaped Immersion Heaters

How to Order

To order a stock unit, please specify:

- Watlow code number
- Volts/watts
- Phase
- Options
- Quantity

If our stock units do not meet your application needs, Watlow will provide **made-to-order** units. Consult your Watlow representative and provide the following information:

- Application
- Volts/watts
- Phase
- Number of circuits
- Watt density
- Number of heating elements and sheath material
- 'A' dimension
- 'B' dimension
- Options, including terminal enclosure type
- Quantity

Availability

Assembly Stock: Five to seven working days

Modified Stock③: Five to seven working days

Made-to-Order: Five to seven weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

③ Assembly Stock units with catalog options.

Over-the-Side Heaters

Vertical Loop Immersion Heaters

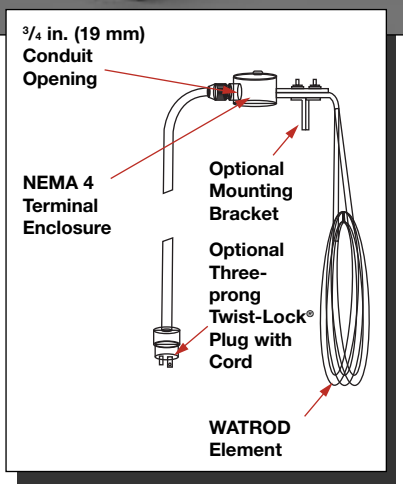
These light-weight, thin-profile vertical loop heaters are well-suited for open tank applications.

A WATROD tubular element, formed into spiral loops, hugs the tank wall to maximize tank work space.

Available with four different sheath materials, vertical loop heaters come with options to meet application requirements.

Versatility is further enhanced with optional three-prong, Twist-Lock® plug and adjustable mounting brackets.





Performance Capabilities

- Incoloy® sheath watt densities to 60 W/in² (9.3 W/cm²)
- Titanium sheath watt densities to 45 W/in² (7 W/cm²)
- Steel sheath watt densities to 23 W/in² (3.5 W/cm²)
- Wattages to 9 killowatts
- Voltages to 600V~(ac)

Features and Benefits

WATROD element

- Filled with compacted MgO insulation to maximize dielectric strength, heat transfer and life

Long no-heat ends

- Leaves only the element's looped portion submerged and heated
- Forms a right angle to move the terminal enclosure away from over the tank

Moisture resistant (NEMA 4)

- Offers easy access to terminal wiring

Terminal enclosure materials

- Cast iron used on products with Incoloy®, steel and 316 stainless steel sheath
- PVC used on products with Titanium sheath

Conduit openings

- Accepts ¾ inch conduit fittings to facilitate wiring

Screw lug terminals

- Accept customer supplied ring-type wire terminals

Ground terminals

- Supplied to facilitate equipment grounding

Adjustable mounting brackets

- Accomodates varying tank wall thicknesses
- Stainless steel mounting brackets adjust from 0 to 4¾ in. (0 to 120 mm)

Applications

- Water heating
- Lightweight oils
- Salt baths
- Mild acid baths
- Cleaning solutions
- Plating solutions

Over-the-Side Heaters

Vertical Loop Immersion Heaters

Options

Three-prong, Twist-Lock® Plug

An optional flexible cord, with three-prong, Twist-lock® plug, provides easy connection to standard 220V~(ac) outlets. The 70 in. (1780 mm) cord is rubber insulated to resist oil, ozone, grease, chemicals, acids, solvents, weather and temperature extremes to 195°F (90°C).

To order, add the suffix letter **C** to the heater's base code number.

Wattages and Voltages

Watlow supplies stock vertical loop heaters as 240V~(ac), with wattages from five to eight kilowatts. To meet specific application needs, Watlow can configure heaters with voltages and wattages outside these parameters.

For more information about this option, contact your Watlow representative.

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process.

For critical applications, passivation will remove free iron from the sheath.

To order, specify **passivation**.

Technical Information

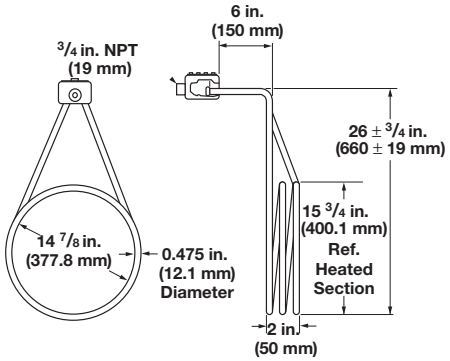
Application Hints

- Determine recommended sheath material and watt density by using the *Supplemental Applications* chart on pages 667 to 674. If unable to determine the appropriate sheath material and watt density for the fluid being heated, contact your Watlow representative.
- Ensure conduit openings and fittings are compatible with the environment around the heater enclosure.
- Use optional mounting brackets to position the heating element so there is ample space between the tank wall and the heating element.
- Ensure the liquid level stays above the heater's looped section. If not submerged, it will overheat or create a hazardous situation.
- Remove the heater periodically to inspect and clean the element. This maintenance procedure will prolong the heater's life.

Over-the-Side Heaters

Vertical Loop Immersion Heaters

Technical Information *(Continued)*



Vertical Loop Heaters

Applications	WATROD Description	kW	Code Number 240V~(ac) 1-Phase	Est. Ship. Wt. lbs (kg)
Conventional plating baths such as copper plating, cyanide type; tin plating, alkaline stannate type; brass and bronze; nickel, chrome, gold and silver plating and iron chromide, nitrites, permanganates, persulfates and dichromates	**43 W/in² Titanium (6.7 W/cm²)**	8	**VLT10W8B** ①	28 (13)
Water heating and mild acids	**40 W/in² Incoloy® (6.2 W/cm²)**	8	**VLN10W8B**	28 (13)
Mild acid baths	**40 W/in² 316 SS (6.2 W/cm²)**	8	**VLR10W8B**	28 (13)
Alkaline solutions which do not contain fluorides, fluoroborates or fluorosilicates, pyrophosphate copper, ferric chloride, iron chloride; bright dips and pickles containing nitric, phosphoric, and chromic acids	**27 W/in² Titanium (4.2 W/cm²)**	5	**VLT10W5B** ①	28 (13)
Water heating, corrosive liquids and salt baths	**23 W/in² Incoloy® (3.6 W/cm²)**	5	**VLN10W5B**	26 (12)
Citrus juices, mild acid baths and other fluids normally corrosive to steel	**23 W/in² 316 SS (3.6 W/cm²)**	5	**VLR10W5B**	26 (12)
Oil tempering baths, salt baths, alkaline cleaning solutions, cyanide cleaning solutions	**23 W/in² Steel (3.6 W/cm²)**	5 8	**VLS10W5B** **VLS10W8B**	26 (12) 26 (12)

Availability
- **RAPID SHIP** program is available for all assemblies unless otherwise noted
- Same day shipment up to 3 pieces

① Standard 25 working days

Over-the-Side Heaters

Vertical Loop Immersion Heaters

How to Order

To order a stock vertical loop heater, please specify:

- Watlow code number
- Volts/watts
- Options
- Quantity

If our stock units do not meet your application needs, Watlow will provide **made-to-order** units.

Contact your Watlow representative and provide the following information:

- Application
- Volts/watts
- Watt density
- Dimensions
- No-heat section
- Heating element diameter and sheath material
- Options
- Quantity

Availability

Stock: Same day shipment

Modified Stock ①: Five to seven working days

Standard: Three weeks

Made-to-Order: Five to seven weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

① Stock units with catalog options.

Over-the-Side Heaters

Drum Immersion Heaters



Designed for direct immersion in a standard 55 gallon steel drum, these heaters install easily through the 2 in. (50 mm) bung hole.

These one to four kilowatt WATROD heaters come prewired with a thermostat, manual reset button and pilot light in a general purpose (NEMA 1) terminal enclosure. This internal tank temperature sensing feature protects against overheating.

Performance Capabilities

- Incoloy® sheath watt densities to 60 W/in² (9.3 W/cm²)
- Wattages to 9 killowatts
- Voltages to 600V~(ac)

Features and Benefits

Light-weight, rugged construction
- Resists damage during installation or removal

Stainless steel mounting bracket
- Adjusts to varying immersion depths to keep the heating element above settled sludge

0.475 in. (12 mm) diameter Incoloy® WATROD element
- Hairpins repressed (recompacted) after bending to assure MgO density, dielectric strength, heat transfer and life

Integral, on-off, manual reset, Type 8 thermostat rated from 60 to 250°F (15 to 120°C)
- Senses process temperature and helps protect against overheating

Pilot light
- Indicates if heater is cycled on or off

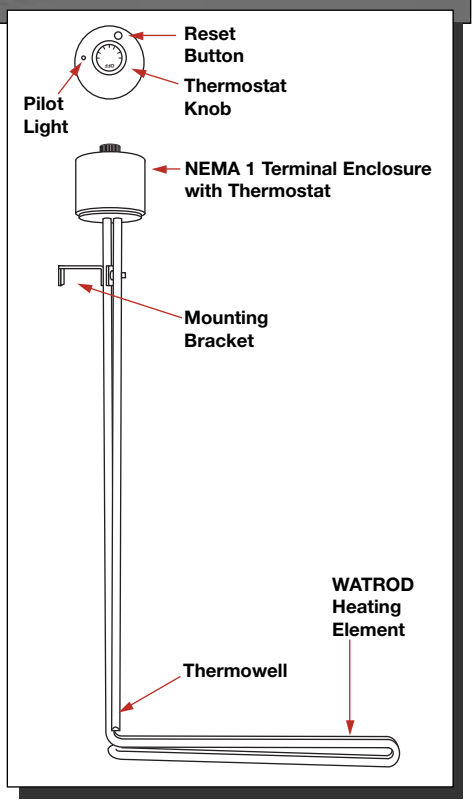
30 in. (760 mm) long no-heat ends
- Leaves only the elements heated portion submerged
- Forms the heaters riser

General purpose (NEMA 1) terminal enclosure
- One inch (25 mm) conduit openings to facilitate wiring

UL® and CSA component recognition
- 480 and 600V~(ac) maximum under file numbers E52951 and 31388 respectively

Applications

- Melting heat sensitive materials such as wax, lard, grease and coconuts oil
- Water and water-based solution heating
- Freeze protection



Over-the-Side Heaters

Drum Immersion Heaters

Options

Terminal Enclosures

A general purpose (NEMA 1) terminal enclosure, with integral thermostat, is supplied on all Watlow drum heaters. As an option, moisture resistant (NEMA 4) and explosion resistant (NEMA 7) terminal enclosures are available to protect both wiring and the thermostat.

Wattages and Voltages

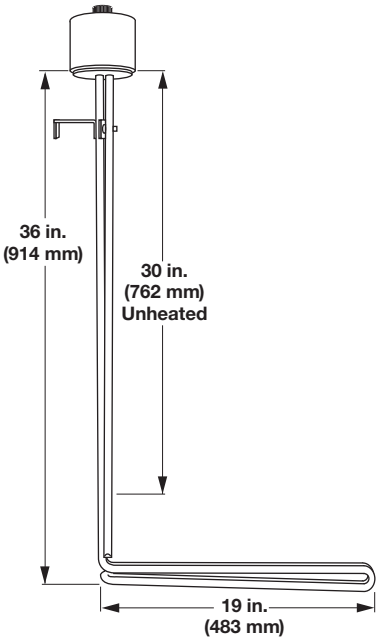
Watlow routinely supplies drum heaters in 120, 240 and 480V~(ac) in one or four kilowatt versions. Watlow will configure heaters with voltages and wattages outside these parameters.

For more information about this option, contact your Watlow representative.

Three-prong, Twist-Lock® Plug

An optional flexible cord, with three-prong, Twist-lock® plug, provides easy connection to standard 220V~(ac) outlets. The 70 in. (1780 mm) cord is rubber insulated to resist oil, ozone, grease, chemicals, acids, solvents, weather and temperature extremes to 195°F (90°C).

Technical Information



Drum Heater

WATROD Description	kW	Code Number 120V~(ac) 1-Phase	Code Number 240V~(ac) 1-Phase	Code Number 480V~(ac) 1-Phase	Est. Ship. Wt. lbs (kg)
Applications: Solvents, Water and Water Based Solutions					
32 W/in² Incoloy® (5 W/cm²)	4		**OLDN10S4**	**OLDN10S11**	35 (16)
Applications: Melting Oils, Lard, Fats, Tar					
8 W/in² Incoloy® (1.3 W/cm²)	1	**OLDN1S1**	**OLDN10S1**		35 (16)

Availability

- **RAPID SHIP** program is available for all assemblies unless otherwise noted
- Same day shipment up to 3 pieces

Over-the-Side Heaters

Drum Immersion Heaters

Application Hints

- Determine recommended sheath material and watt density by using the *Supplemental Applications* chart on pages 667 to 674. If unable to determine the correct sheath material and watt density, contact your Watlow representative.
- Ensure that the element's heated portion is fully immersed at all times. If the element is not sufficiently submerged, it will overheat and become damaged.
- Use drum heaters only in metal drums.
- Do not use the thermostat as an on-off switch. Use a disconnect switch or circuit breaker to cut power prior to servicing.
- Ensure that conduit openings and fittings are compatible with the environment around the heater enclosure.
- Use the adjustable mounting bracket to raise the heating element above the drum's sludge level.
- Periodically remove the heater to inspect and clean the element. This maintenance procedure will prolong the heater's life.

How to Order

To order a stock drum heater, please specify:

- Watlow code number
- Volts/watts
- Options
- Quantity

If stock units do not meet your application needs, Watlow will provide **made-to-order** units. Contact your Watlow representative and provide the following:

- Application
- Volts/watts
- Watt density
- Dimensions
- No-heat section
- Heating element diameter and sheath material
- Options
- Quantity

Availability

Stock: Same day shipment

Modified Stock ①: Five to seven working days

Standard: Three weeks

Made-to-Order: Five to seven weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

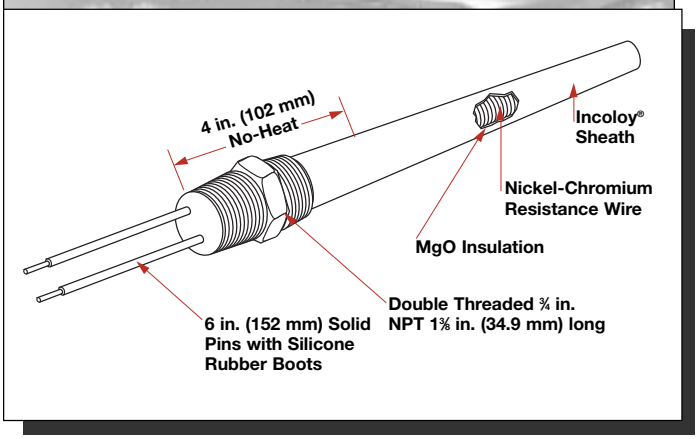
① Stock units with catalog options.

FIREROD® Immersion Heaters

FIREROD® immersion heaters package to 300 W/in² (46.5 W/cm²) in a compact unit, giving you greater versatility in designing your heating system. This design solution is ideal for replacing large screw-plug immersion heaters.

These heaters come complete with a brass ¾ inch NPT double threaded fitting, which allows you to add conduit boxes. Also, FIREROD immersion heaters are sealed at the lead end with a silicone rubber seal. Solid copper leads, with silicone rubber sleeves, are provided for unconfined wiring. These units are recommended for immersion in water or 90+ percent water soluble solutions.





Performance Capabilities

- Maximum operating temperature in water to 212°F (100°C) at atmospheric pressure
- Maximum watt density to 300 W/in² (46.5 W/cm²)
- Maximum voltage to 480V~(ac)

Features and Benefits

Nickel-chromium resistance wire precisely centered in the unit

- Ensures even, efficient distribution of heat to the sheath

MgO insulation compacted to the proper density

- Results in high dielectric strength and contributes to faster heat-up

Incoloy® sheath

- Resists corrosion from water

Metallurgically-bonded conductor pins

- Overlaps the resistance wire inside the core, ensuring trouble-free electrical continuity

Lead end with silicone rubber seal

- Protects the heater against moisture contamination

Optional stainless steel fittings

- Available for use in corrosive applications

Horizontal through the wall tank mounting

- Provides faster set-up

240 and 480V~(ac)

- Allows flexibility in wiring the heater for use in your particular application

Applications

- Plastic reclamation
- Food preparation
- Lab equipment

FIREROD Immersion Heaters

Applications and Technical Data

The small size and big capacity of FIREROD cartridge heating units make them ideal immersion heaters in cramped quarters. When heating liquids of low viscosity, FIRERODs have the high watt density to pack more heat into tight spots. For water heating applications, a rating of 150 to 300 W/in^2 is recommended. (Laboratory tests show that under certain conditions ratings as high as 700 W/in^2 are safe.) For longer life at high watt densities:

- The FIREROD unit should be in the main body of the liquid and not in a restricted space
- The FIREROD heater should be covered with liquid at all times
- The heater should not be allowed to cycle on and off too frequently
- Scale should not form on the FIREROD heater

When heating viscous liquids, such as oils, watt densities must be kept low to prevent carbonization at the heater sheath. FIREROD cartridges offer advantages for heating viscous materials where long life and high quality outweigh the usual economic considerations. As in all immersion applications, scale build-up on the sheath and sludge on the bottom of the tank must be carefully controlled to ensure long heater life.

Equipped with smaller threaded fittings than conventional immersion heaters, FIRERODs leave room for more units in the same space. Replacement of single FIREROD units in multiheater assemblies is fast and easy, and avoids discarding the complete assembly.

Moisture resistant seals are available to give protection from damp atmospheres outside the tank.

Threaded fittings are furnished in either stainless steel or brass. FIRERODs with Incoloy® sheaths are standard, but other sheath materials can be provided on made-to-order FIRERODs.

Fittings and sheath material should be appropriate for the specific liquid material being heated.

Sheath Material Compositions

Sheath Material	Chemical Composition															
	Al	C	Co	Cr	Cu	Fe	Mn	Mo	Ni	P	S	Si	Ta	Ti	V	W
Stainless Steels																
304		0.08①		18/20		Bal	2①		8/12			1①				
316		0.08①		16/18		Bal	2①	2/3	10/14			1①				
Nickel Alloys																
Incoloy® 800	0.15/0.6	0.1		19/23	0.75	Bal	1.5		30/35		0.015	1.0		0.15/0.6		

① Maximum

See application guide for additional sheath material composition.

FIREROD Immersion Heaters

Stock and Standard Heater Code Numbers

Diameter in.	Overall Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Fittings Type	Net Wt. lbs	(kg)	Availability	Code Number
⅝	6¼	(159)	120	500	127	(19.7)	Brass	0.58	(0.26)	Stock	**L6EX12A**
	6¼	(159)	120	500	127	(19.7)	SS	0.58	(0.26)	Stock	**L6EX12B**
	6¼	(159)	240	500	127	(19.7)	Brass	0.58	(0.26)	Stock	**L6EX13A**
	6¼	(159)	240	500	127	(19.7)	SS	0.58	(0.26)	Standard	**L6EX13B**
	6¼	(159)	120	750	191	(29.6)	Brass	0.58	(0.26)	Standard	**L6EX14A**
	6¼	(159)	120	750	191	(29.6)	SS	0.58	(0.26)	Stock	**L6EX14B**
	6¼	(159)	240	750	191	(29.6)	Brass	0.58	(0.26)	Standard	**L6EX15A**
	6¼	(159)	240	750	191	(29.6)	SS	0.58	(0.26)	Stock	**L6EX15B**
	6¼	(159)	120	1000	254	(39.4)	Brass	0.58	(0.26)	Standard	**L6EX16A**
	6¼	(159)	120	1000	254	(39.4)	SS	0.58	(0.26)	Stock	**L6EX16B**
	6¼	(159)	240	1000	254	(39.4)	Brass	0.58	(0.26)	Standard	**L6EX17A**
	6¼	(159)	240	1000	254	(39.4)	SS	0.58	(0.26)	Stock	**L6EX17B**
	6¾	(172)	240	1500	300	(46.5)	Brass	0.60	(0.27)	Stock	**L6NX7A**
	6¾	(172)	240	1500	300	(46.5)	SS	0.60	(0.27)	Stock	**L6NX7B**
	6¾	(172)	480	1500	300	(46.5)	Brass	0.60	(0.27)	Stock	**L6NX8A**
	6¾	(172)	480	1500	300	(46.5)	SS	0.60	(0.27)	Standard	**L6NX8B**
	7¾	(197)	240	2000	291	(45.1)	Brass	0.66	(0.30)	Standard	**L7NX5A**
	7¾	(197)	240	2000	291	(45.1)	SS	0.66	(0.30)	Stock	**L7NX5B**
	7¾	(197)	480	2000	291	(45.1)	Brass	0.66	(0.30)	Stock	**L7NX6A**
	7¾	(197)	480	2000	291	(45.1)	SS	0.66	(0.30)	Standard	**L7NX6B**
	8½	(216)	240	2500	300	(46.5)	Brass	0.68	(0.31)	Stock	**L8JX16A**
	8½	(216)	240	2500	300	(46.5)	SS	0.68	(0.31)	Stock	**L8JX16B**
	8½	(216)	480	2500	300	(46.5)	Brass	0.68	(0.31)	Stock	**L8JX17A**
	8½	(216)	480	2500	300	(46.5)	SS	0.68	(0.31)	Standard	**L8JX17B**
	9¼	(235)	240	3000	300	(46.5)	Brass	0.72	(0.33)	Stock	**L9EX11A**
	9¼	(235)	240	3000	300	(46.5)	SS	0.72	(0.33)	Stock	**L9EX11B**
	9¼	(235)	480	3000	300	(46.5)	Brass	0.72	(0.33)	Stock	**L9EX12A**
	9¼	(235)	480	3000	300	(46.5)	SS	0.72	(0.33)	Stock	**L9EX12B**
	11	(279)	240	4000	300	(46.5)	Brass	0.80	(0.36)	Stock	**L11AX59A**
	11	(279)	240	4000	300	(46.5)	SS	0.80	(0.36)	Stock	**L11AX59B**
	11	(279)	480	4000	300	(46.5)	Brass	0.80	(0.36)	Stock	**L11AX60A**
	11	(279)	480	4000	300	(46.5)	SS	0.80	(0.36)	Stock	**L11AX60B**
	12¾	(324)	240	5000	300	(46.5)	Brass	0.89	(0.41)	Stock	**L12NX4A**
	12¾	(324)	240	5000	300	(46.5)	SS	0.89	(0.41)	Stock	**L12NX4B**
	12¾	(324)	480	5000	300	(46.5)	Brass	0.89	(0.41)	Standard	**L12NX5A**
	12¾	(324)	480	5000	300	(46.5)	SS	0.89	(0.41)	Stock	**L12NX5B**
	14½	(368)	240	6000	300	(46.5)	Brass	0.95	(0.43)	Stock	**L14JX8A**
	14½	(368)	240	6000	300	(46.5)	SS	0.95	(0.43)	Stock	**L14JX8B**
	14½	(368)	480	6000	300	(46.5)	Brass	0.95	(0.43)	Stock	**L14JX9A**
	14½	(368)	480	6000	300	(46.5)	SS	0.95	(0.43)	Standard	**L14JX9B**

CONTINUED

FIREROD Immersion Heaters

Stock and Standard Heater Code Numbers *(Continued)*

Diameter in.	Overall Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx Fittings Type	Net Wt. lbs	(kg)	Availability	Code Number
⅝	18	(457)	240	8000	295	(45.7)	Brass	1.14	(0.52)	Standard	**L18AX43A**
	18	(457)	240	8000	295	(45.7)	SS	1.14	(0.52)	Stock	**L18AX43B**
	18	(457)	480	8000	295	(45.7)	Brass	1.14	(0.52)	Stock	**L18AX44A**
	18	(457)	480	8000	295	(45.7)	SS	1.14	(0.52)	Standard	**L18AX44B**
	21¼	(540)	240	10,000	300	(46.5)	Brass	1.3	(0.59)	Standard	**L21EX1A**
	21¼	(540)	240	10,000	300	(46.5)	SS	1.3	(0.59)	Stock	**L21EX1B**
	21¼	(540)	480	10,000	300	(46.5)	Brass	1.3	(0.59)	Stock	**L21EX2A**
	21¼	(540)	480	10,000	300	(46.5)	SS	1.3	(0.59)	Standard	**L21EX2B**
	24¾	(629)	480	12,000	300	(46.5)	Brass	1.5	(0.68)	Stock	**L24NX1A**
	24¾	(629)	480	12,000	300	(46.5)	SS	1.5	(0.68)	Standard	**L24NX1B**
	29¾	(756)	480	15,000	300	(46.5)	Brass	1.8	(0.82)	Stock	**L29NX5A**
	29¾	(756)	480	15,000	300	(46.5)	SS	1.8	(0.82)	Standard	**L29NX5B**
	35	(889)	480	18,000	300	(46.5)	Brass	2.0	(0.91)	Standard	**L35AX5A**
	35	(889)	480	18,000	300	(46.5)	SS	2.0	(0.91)	Stock	**L35AX5B**

How to Order

To order stock FIREROD immersion heaters, specify Watlow code number and quantity.

For **made-to-order** units, please specify:

- Diameter
- Overall length
- Immersed length
- Heated length
- Watts
- Volts
- Threaded fitting material

Ordering Example: Specify FIREROD immersion heater ⅝ inch diameter, 6 inch overall length, immersed length of 4 inch and heated length of 2 inch. The heater is to be supplied with 1200 W, 240V, ¾ inch NPT double threaded brass fitting, silicone seal and 6 inch pins, no leads.

Availability

Stock: Same day shipment

Made-to-Order: Contact your Watlow representative

Circulation Heaters



Circulation Heaters

FREEFLEX® Heaters **301**

Ultra-Pure Thick Film Quartz Heater Modules **305**

STARFLOW Heaters **311**

CAST-X 500 Circulation Heaters **313**

CAST-X 1000 Circulation Heaters **317**

CAST-X 2000 Circulation Heaters **319**

CAST-X 3000 Circulation Heaters **325**

UNIVERSAL SOLVENT Circulation Heaters **331**

WATROD and FIREBAR® Circulation Heaters **333**

Booster Heaters 379

Engine Preheaters 381

FREEFLEX® Heaters

The miniature heated polymeric tubing assemblies from Watlow® provide a flexible heat-up and transport system for moving fluids in tubing as small as 1/32 in. (0.8 mm) inside diameter. FREEFLEX® heats fluids up to 212°F (100°C) and maintains temperature during transfer from a reservoir to a point of use. In some applications, the tubing can actually serve as the reservoir for limited volumes of fluid, helping to reduce start-up times. For higher temperatures contact your Watlow representative.

Watlow's innovative design places the heating element and sensor directly in contact with the perimeter of the tubing to produce efficient, responsive heating and temperature control of the tube contents. The element is evenly wound to ensure reliable, close contact for uniform heating along a portion or the entire length of the line. A flexible, durable jacket covers the wound element and lets the tubing flex and move in a dynamic system. This allows for fluid delivery to multiple locations from a single supply source. In stationary applications, the FREEFLEX heated tubing is conveniently routed through available space or around other system components. This saves space and provides for an uncomplicated retrofit in existing systems.

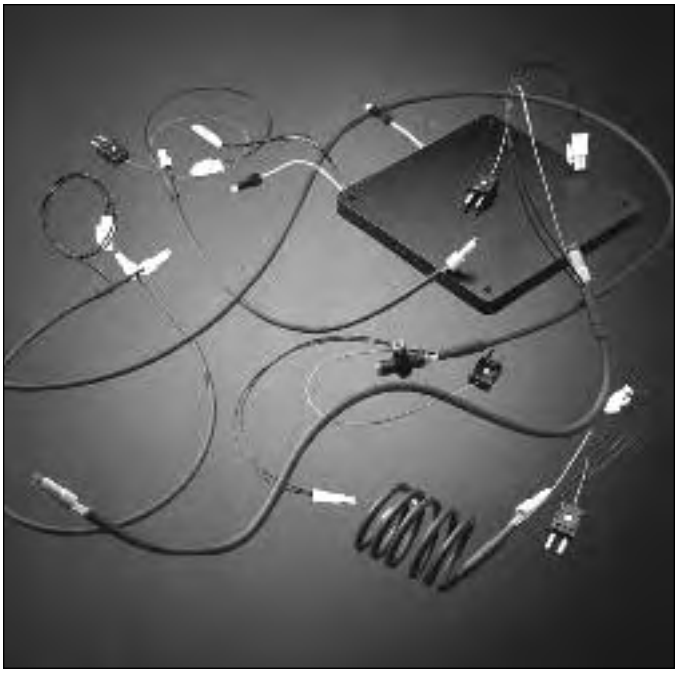
The superior construction employs an efficient heating element design with the ability to incorporate optional thermocouple, thermistor or RTD temperature sensors into the thermal package. Users can select leads to exit one or both ends of the assembly. Typical standard Teflon® tubing comes in 1/32, 1/16, 1/8 or 3/16 in. (0.8, 1.6, 3.2, 4.8 mm) inside diameters, although other sizes and materials are available.

Features and Benefits

Flexible heat-up and transport system
- Eliminates the need for heated reservoir systems in many applications

Heating element directly contacts tubing
- Provides fast, efficient more responsive heating

Available in three configurations
- FREEFLEX design - allows tubing to flex, coil or bend around system components
- Pre-formed design - allows longer tube length in smaller volume
- Molded design - provides a compact heating assembly for easy installation



Integral sensors
- Maintains close control of heater and fluid temperatures

Low voltage design
- Promotes safety

Miniature sizes as small as 1/32 in. (0.8 mm) inside diameter
- Transports and heats fluids in even the smallest spaces

Convenient retrofit
- Allows for routing flexible tubing around system components and using existing control system

UL® recognition
- Available on qualified designs by request

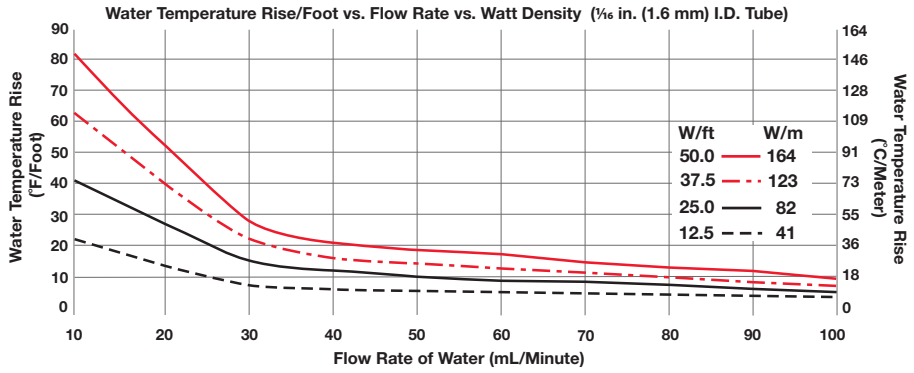
Applications

- **Medical:** automated clinical analyzers, tissue processing equipment
- **Analytical:** sample preheating for LC and HPLC systems, breathalyzers
- **Semiconductor processing:** wafer drying equipment, DI water heating
- **Printing:** Ink jet printers, rapid prototyping systems, photo lithography
- **General process:** wax/paraffin processing and non-combustible gas heating
- **Water purification systems**
- **Precision cleaning equipment**
- **Aerospace**
- **Military**

FREEFLEX Heaters

Technical Data

Water Temperature Rise/Length Versus Flow Rate Versus Watt Density



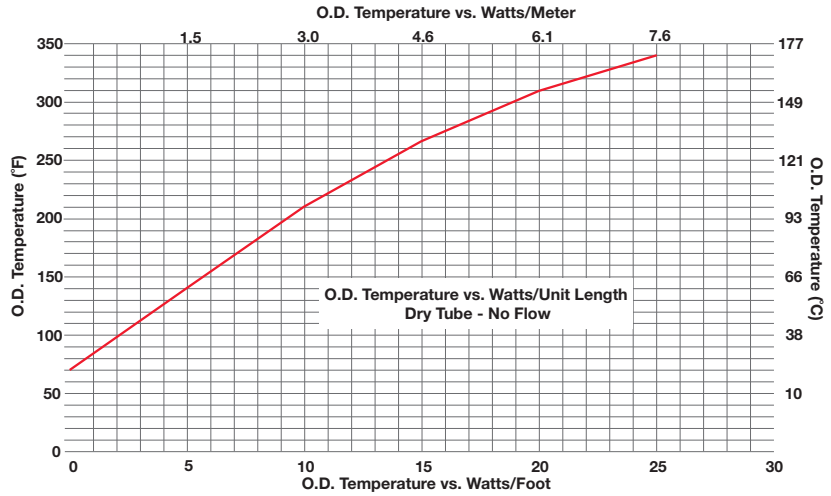
Water Temperature Rise °F/Foot

	Flow Rate (mL/minute)			
W/ft	**10**	**30**	**50**	**100**
50.0	82	29	19	10
37.5	64	22	14	7
25.0	41	16	10	5
12.5	22	8	5	3

Water Temperature Rise °C/Meter

	Flow Rate (mL/minute)			
W/m	**10**	**30**	**50**	**100**
164	149	52	35	18
123	116	40	26	13
82	75	29	18	9
41	40	15	9	5

FREEFLEX Outside Diameter Temperature Versus Watts/Length



W/ft	W/m	O.D. Temperature °C	(°F) (Ambient)
0	0	70	(21)
5	1.5	140	(60)
10	3.0	210	(99)
15	4.6	265	(129)
20	6.1	310	(154)
25	7.6	340	(171)

FREEFLEX Heaters

Ordering Information

To order, please specify:

- **Fluid Type**
- **Inlet Temperature**
- **Outlet Temperature**
- **Flow Rate**
- **Voltage** - Typically less than 36V
- **Watts/ft** - See chart on previous page for typical values
- **Maximum Allowable Outside Surface Temperature**
- **Tube Size**
  - 1/32 in. (0.8 mm) I.D. x 1/16 in. (1.6 mm) O.D.
  - 1/16 in. (1.6 mm) I.D. x 1/8 in. (3.2 mm) O.D.
  - 1/8 in. (3.2 mm) I.D. x 3/16 in. (4.8 mm) O.D.
  - 3/16 in. (4.8 mm) I.D. x 1/4 in. (6 mm) O.D.
  - Other (specify size)
- **Tube Material**
  - Teflon® (PTFE standard)
  - Silicone rubber
  - Others upon request
- **Tube Length** - 12 to 120 in. (305 to 3048 mm) typical
  - Total
  - Heated
  - Unheated (specify)
- **Tube Fittings**
  - No fittings (1 in. [25 mm] bare tubing each end)
  - Other (specify)
- **Tube Flexing**
  - Static (to route around components in system)
  - Dynamic (subject to more continuous flexing)
  - Occasional, frequent or continuous

Note: Min. recommended flexing radius

- 1/32 in. (0.8 mm) I.D. x 1/16 in. (1.6 mm) O.D. Teflon® 1 in. (25 mm)
- 1/16 in. (1.6 mm) I.D. x 1/8 in. (3.2 mm) O.D. Teflon® 1½ in. (38 mm)
- 1/8 in. (3.2 mm) I.D. x 3/16 in. (4.8 mm) O.D. Teflon® 2 in. (51 mm)
- 3/16 in. (4.8 mm) I.D. x 1/4 in. (6 mm) O.D. Teflon® 3 in. (76 mm)

- **Heater Leads**
  - One at each end
  - Both at one end
  - Standard lead insulation (UL® Style 1180 CSA white Teflon®)
  - Other insulation (specify)

Heater Lead Length

- Standard 12 in. (305 mm) w/customer end stripped/tinned ½ in. (13 mm)
- Other (specify)

Heater Lead Exit Direction

- Inboard/outboard

Temperature Sensor

- Standard thermocouple (#30 AWG Teflon® - Type J)
- Thermistor (specify) 10KΩ at 25°C (72°F) standard
- Other temperature sensors size/types (specify)
- Sense heater element or tube temperature

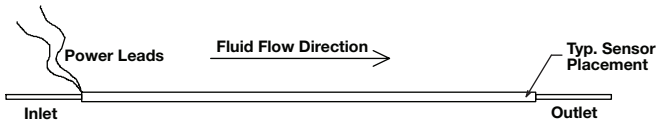
Sensor Lead Exit Direction

- Inboard/outboard

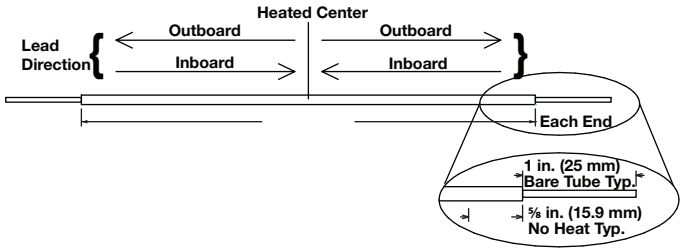
Temperature Sensor Lead Length

- Standard 12 in. (305 mm)
- Other (specify)

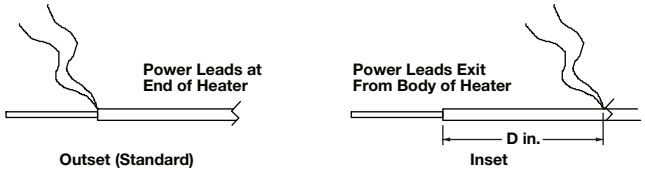
Typical FREEFLEX Layout



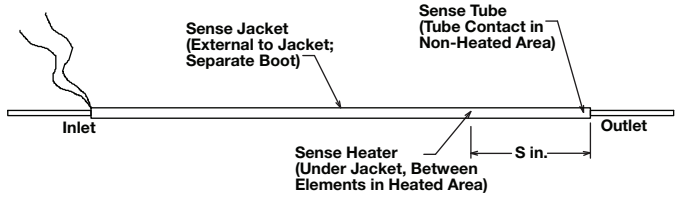
Lead Orientation



Lead Location



Sensor Location/Mounting Description



Ultra-Pure Thick Film Quartz Heater Modules

Watlow® thick film quartz heater modules are intended for use in deionized (DI) water and aggressive chemical heating applications. The heater's optimum watt density assures high reliability and long life. This quartz module provides superior performance under variable and low flow conditions.

The quartz heater modules employ Watlow's patented thick film on quartz technology to significantly advance the state-of-the-art in ultra pure process heating. The primary benefits of thick film heating include:

- Reduction in size of the heater modules over other heating technologies, therefore saving space in expensive tools, cleanrooms and wafer fabs
- Elimination of the need for clean-dry-air (CDA) purge required in most infrared (IR) heating systems
- Reduction of the possibility of quartz devitrification that can occur in high temperature IR heating systems
- Elimination of potential metal contamination associated with Teflon® (PFA) heating systems
- Reduction of preventative maintenance (PM) and increased tool uptime
- Reduced cost of ownership

These superior thick film heaters can be applied in areas where space is at a premium or where conventional heaters cannot be used because the voltage and wattage combination precludes using other types of resistive heaters. Due to the unique nature of a thick film circuit, these heaters can be designed to vary heat output across the entire surface.

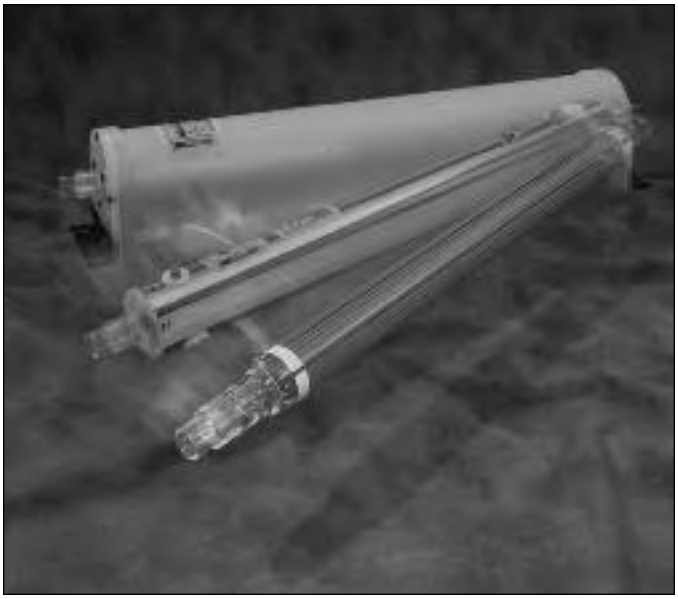
U.S. Patent # 6,037,574

Features and Benefits

Up to 100 W/in² substrate
- Extends product life
- Provides higher product reliability
- Reduces cost of ownership

High purity semiconductor grade GE 214 quartz
- Minimizes risk of metal contamination

Glassware fluid pressures up to 75 psi*
- Provides higher processing temperature
- Assures a robust design (less breakage)



Primary element over-temperature sensor available as an RTD or thermocouple
- Provides standard sensor product offering

Power ratings up to 11kW
- Assures fast recovery due to direct heater contact
- Enables fast response

Low element temperature, <842°F (450°C)
- Assures no CDA-purge required 8 gallons (30 liters) per minute, maximum flow rate and 0.25 gallons (0.95 liters) per minute, minimum flow rate
- Assures maximum efficiency in differing flow conditions
- Reduces preventative maintenance (PM) cycles

Redundant mechanical over-temperature snap switch
- Assures product safety

Single- and multi-phase power forms 120-480V~(ac)
- Works with the power you have for heaters that do not require transformers

Options including enclosure materials
- Provides extra chemical resistance

UL® recognized - thick film heater on glassware level

RoHS compliant

***Note:** Refer to Flaretek® or Flarelock® II for manufacturer's pressure vs. temperature rating charts on external fittings. Use a surge suppressor and/or pressure regulator in applications exceeding manufacturer's ratings.

Ultra-Pure Thick Film Quartz Heater Modules

Applications

- Ammonium chloride
- Deionized water (DI)
- Hydrobromic acid
- Hydrochloric acid
- Hydrogen peroxide
- Nitric acid
- Phosphoric acid
- Piranha etch (sulfuric acid + hydrogen peroxide)
- RCA standard clean 1 (SC1) (DI + ammonium hydroxide + hydrogen peroxide)
- RCA standard clean 2 (SC2) (DI + hydrochloric acid + hydrogen peroxide)
- Sulfuric acid
- TMAH (Tetra Methyl Ammonium Hydroxide)

Standard and Optional Features

Quartz heater modules can be stand-alone units or interconnected to form systems for DI water or acid applications.

Depending upon the process need, the design of the quartz module allows application requirements to drive not only the electrical and thermal solution, but also the physical size of the equipment.

Standard Features

- Single-phase voltage
- Quartz end fittings compatible with standard 0.75 in. (19 mm) Flaretek® and Flarelock® II fittings
- 6 ft (1828 mm long Teflon® lead wires within flexible Teflon® sleeve
- Redundant safety high limit - Pilot duty (dry contact mechanical switch)
- High limit sensor - Type J or K thermocouple (set limit control for 482°F (250°C)

Options

- Quartz end fitting compatible with standard 19 mm pillar-style fitting available
- 3-phase voltage
- Leak detector - Non-contact electro-optical switch (open collector)
- Teflon® (PFA) interconnects for arrays
- Kynar® 740 (PVDF) rated 266°F (130°C), recommended for acid applications other than hot phosphoric
- Semiconductor grade cleaning
- Downstream process sensor assembly
- Fitting assembly also available
- High limit sensor - 100 RTD for dry-fire condition (set limit control for 482°F (250°C)

Ultra-Pure Thick Film Quartz Heater Modules

Technical Information

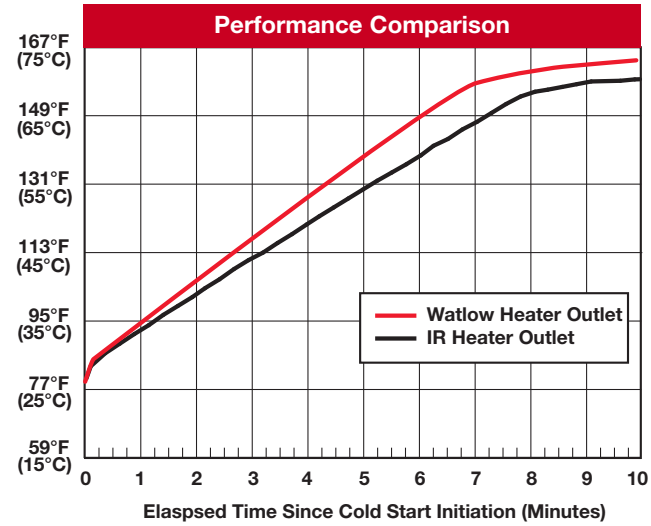
Performance Testing

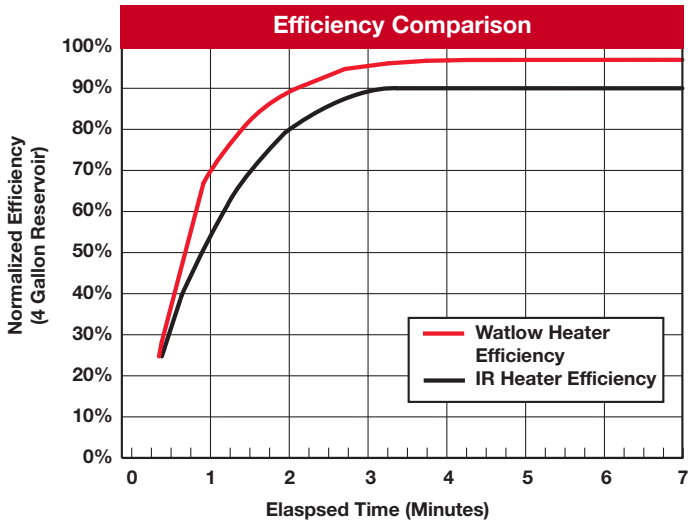
Watlow's quartz heater module was tested in direct comparison to an IR heater to provide evidence of the performance and efficiency advantages of thick film technology.

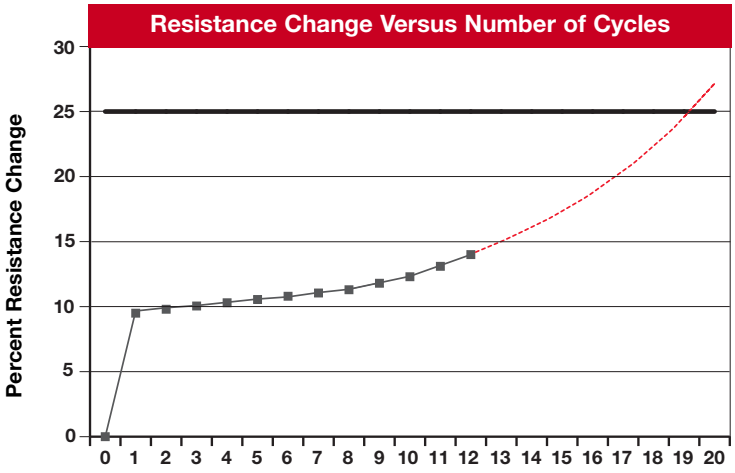
Testing was performed on a wet bench heating DI water. The normalized performance comparison graph illustrates the thermal response of the system using each heater. The thermal load consisted of 4 gallons (15.1 liters) of water circulating through a diaphragm pump, the in-line heater, a diverter valve and back to a holding tank (reservoir). Temperatures were sensed at the outlet of the in-line heater and the bulk tank. The Watlow heater provided a faster heat up time. It outperformed the IR heater by achieving the process set point of 149°F (65°C) in 6.5 minutes; whereas, the IR heater required 7.25 minutes.

This efficiency comparison was created by normalizing the nominal power outputs of the respective heaters and calculating the efficiency based upon the work performed at the reservoir. Elapsed time for the efficiency test was equal for both systems at which both were at 100 percent power.

As shown in the efficiency comparison graph the Watlow heater demonstrated a five to 10 percent improvement in efficiency.





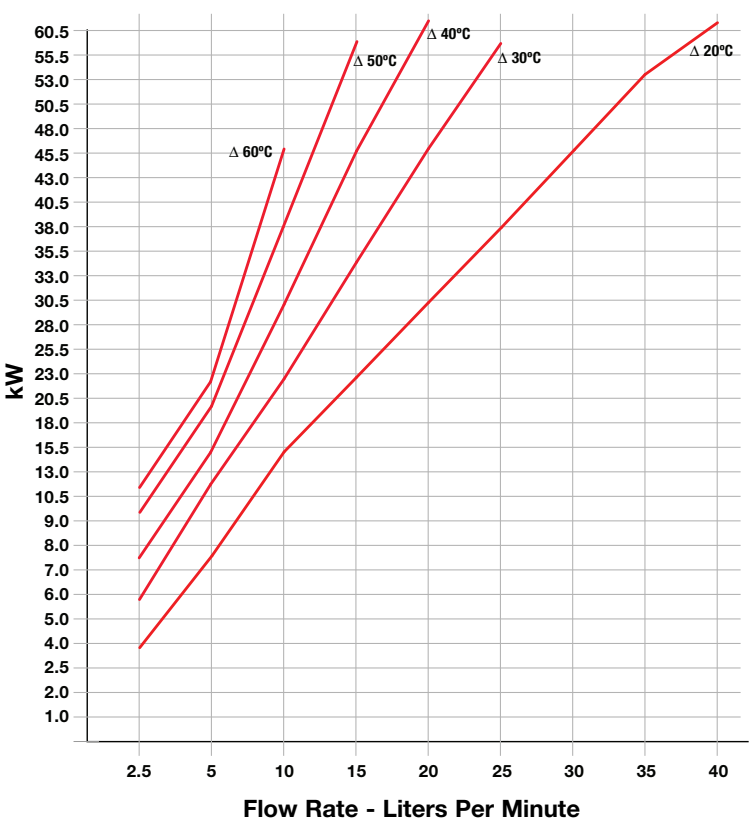


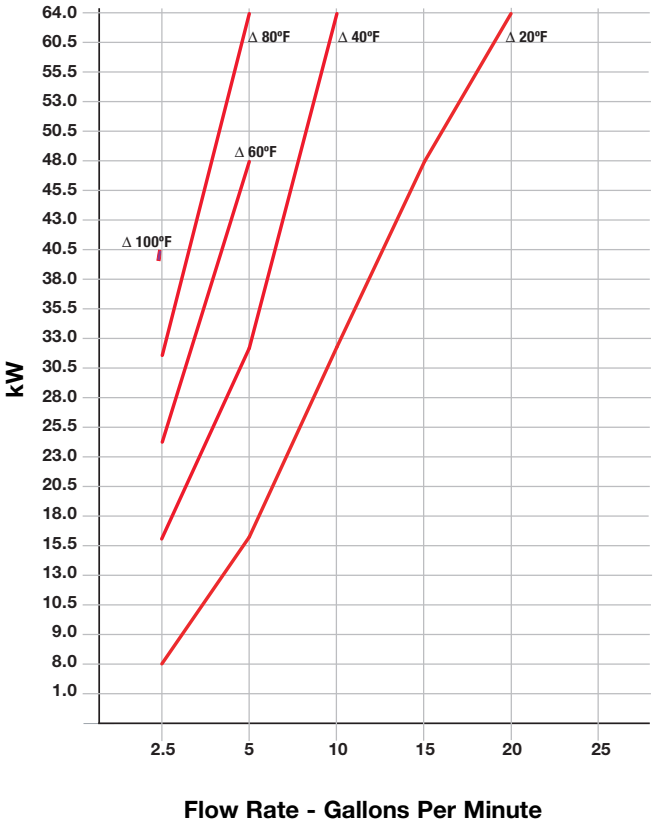
Note: Thermal cycling test conducted by Watlow using water at outlet temperature of 176°F (80°C), 10 seconds ON and 10 seconds OFF per cycle. Water back pressure at 50psi with flow rate at around 0.5 GPM failure predicted at 25 percent resistance change or approximately 1.9 million cycles.

Ultra-Pure Thick Film Quartz Heater Modules

Technical Information

Quick Estimates of Wattage Requirements (for Deionized Water)





Note: Locate the application flow rate on x-axis of the appropriate chart and follow the vertical line upward until it intersects the target temperature rise. At that point move left, horizontally, to the y-axis to capture the approximated wattage requirement.

Quick Estimates of Wattage Requirements

For heating flowing water, simply calculate:

kW = GPM x temperature rise (°F) x 0.16

or

kW = Liters/minute x temperature rise (°C) x 0.076

For heating recirculation applications heating water in baths, simply calculate:

$$kW = \frac{\text{Gallons x temperature rise (°F)}}{\text{375 x Heat up time (hours)}}$$

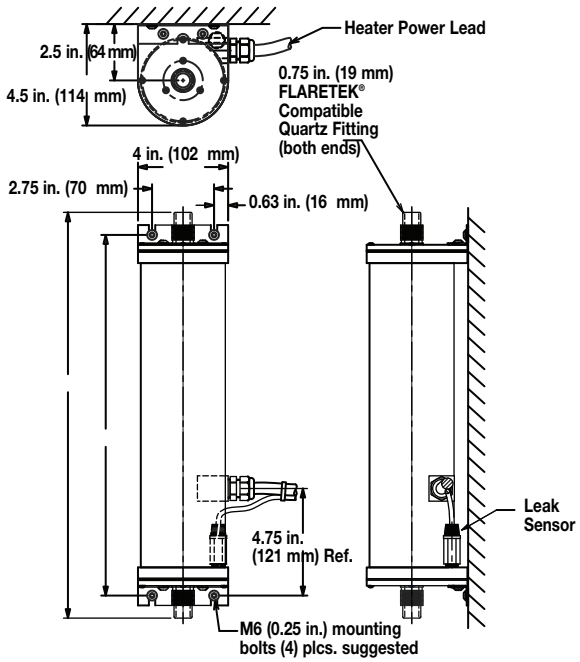
or

$$kW = \frac{\text{Liters x temperature rise (°C)}}{\text{790 x Heat up time (hours)}}$$

Ultra-Pure Thick Film Quartz Heater Modules

Technical Information

Single Tube Vertical with Flaretek®-Style Fittings



Maximum Available Power (kW)

Minimum Overall Fluid Path Length			A	
Flaretek®				
Lf in.	Lf (mm)	Power (kW)	in.	(mm)
12	(305)	2.4	10	(254)
15	(381)	3.8	13	(330)
18	(457)	5.2	16	(406)
21	(533)	6.6	19	(483)
24	(610)	8.0	22	(559)
27	(686)	9.4	25	(635)
30	(762)	10.8	28	(711)

Notes: ①Fluid path length includes a 0.75 in. (19 mm) Flaretek®- compatible all-PFA tube union.
Minimum flow rate: 0.25 GPM (0.95 LPM). Contact your Watlow representative for available voltage forms.

Thick Film Quartz In-Line Heater Modules Standard Offering

Code Number	Module Size	Wattage	Voltage	Fitting Style	Lead Length	List Price
TQ-117-43-1	18 in.	5.2kW	208, 1-ph	¾ in. Flaretek®	72 in.	Contact Watlow
TQ-117-45-1	24 in.	9.2kW	480, 3-ph wye	¾ in. Flaretek®	72 in.	Contact Watlow*
TQ-117-46-1	30 in.	6.8kW	480, 3-ph wye	¾ in. Flaretek®	72 in.	Contact Watlow*

*Includes leak detector

Circulation Heaters

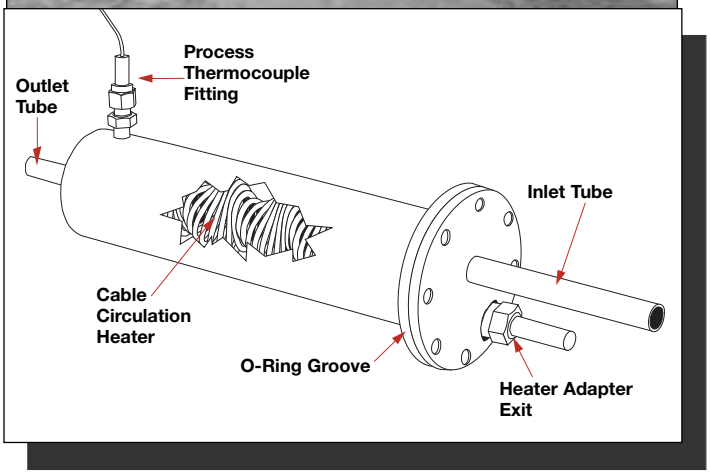
STARFLOW Heaters

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 which saves 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 to 1200°F (650°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 requiring a clean environment as well as atmospheres containing 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 time

Internal starwound element
- Provides fast, efficient heating

Sheathed element
- Provides the ability to heat in clean or impure streams

Flexibility in configurations
- Allows for adaptability to any process

316L stainless steel
- Provides a rugged and corrosion resistant construction

Electropolishing available on all wetted surface
- Reduces particulate contamination

Thermocouple Type J or K thermocouples
- Provides precise control and high-limit safety

Replaceable heater and thermocouple
- Reduces replacement cost

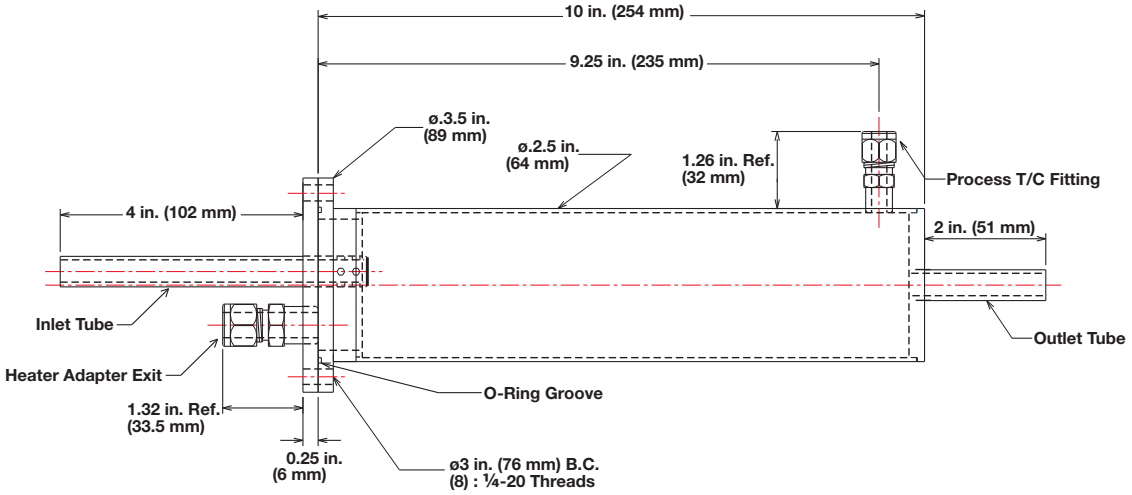
Shipment from stock
- Reduces downtime

Applications

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

Quick Ship
• One to three day shipment.

STARFLOW Heaters



Ordering Information

To order, complete the code number to the right with the information below:

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

3-4. Type of Inlet
ET = ¼ in. (6 mm) O.D. tube
JT = ½ in. (13 mm) O.D. tube

5-6. Type of Outlet
ET = ¼ in. (6 mm) O.D. tube
JT = ½ in. (13 mm) O.D. tube

7-10. Heater Wattage
0375 = 120V, 375 W
0500 = 120V, 500 W
0750 = 120V, 750 W
1500 = 240V, 1500 W
2000 = 240V, 2000 W
3000 = 240V, 3000 W

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)
M = Alloy X750® 1300°F (704°C)
T = Teflon® encapsulated Viton® 392°F (200°C)

CAST-X 500 Circulation Heaters

The CAST-X 500 heater from Watlow® is a small, lightweight circulation heater ideal for heating gas or liquids in demanding applications. Even in its compact size, the CAST-X 500 is extremely powerful with operating temperatures up to 350°F (177°C) and working fluid pressure up to 3000 psi. It is also safe and will not burn heated fluids. The CAST-X 500 heater is available in a variety of wattages and can be shipped in just a few days.

The CAST-X 500 heater is constructed of a helical coiled tube cast into an aluminum body with a replaceable cartridge heater installed in the center. The cartridge heater can be built with various wattages to suit your equipment's requirements.

The aluminum body serves as the heat transfer media between the cartridge heater and the coiled tube where the fluid is being heated. The aluminum mass acts as a "thermal flywheel" and ensures accurate temperature control of the fluid to prevent degradation.

The heater is suited for applications where fluid cleanliness is critical, because the material being heated never comes in contact with the heater. The unique, non-weld construction of the CAST-X 500 allows it to be used where thermally sensitive materials are being heated such as paints, resins and flammable materials. This is a performance requirement in foodservice, semiconductor and analytical industries.

Features and Benefits

Fluid path constructed independent from heater sheath

- Assures a safe thermal solution
- Prevents fluid contamination upon heater failure
- Heats sensitive materials safely because the material heated does not come in contact with heating elements

Robust cast-in aluminum construction

- Assures longer heater life
- Offers accurate temperature control

Non-welded construction

- Minimizes potential leakage
- Offers an economical priced package
- Provides high pressure operation to 3000 psi
- Self draining when mounted vertically



Standard stainless steel fluid path

- Assures material compatibility with many different materials

Replaceable cartridge heater

- Offers low cost of ownership due to ability to replace heater in field
- Assures faster delivery and customization from factory

Compact size

- Assures quick response to low mass (2.375 lbs)
- Saves real estate in equipment because of small footprint

Applications

- Solvent heating
- Air, CO_2 and nitrogen heating
- Deionized (DI) water heating
- Packaging sterilization
  - Hydrogen peroxide vaporization
- Analytical instrumentation
  - Sample heating
- Foodservice
  - Steam generation
  - Glycol heating for CIP systems
  - Pasteurization
- Printing ink heating
- Diesel and fuel heating

CAST-X 500 Circulation Heaters

Technical Information

Specifications

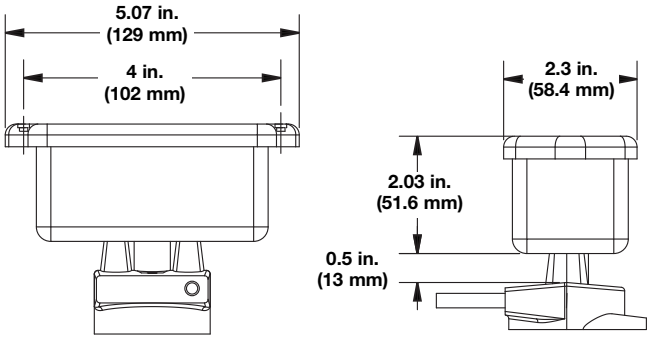
- (4) 10-32 ⅜ in. (9.5 mm) deep mounting holes
- ¼ in. (6.4 mm) 316 SS seamless tubing
- 0.028 in. (0.71 mm) wall tubing
- 84 in. (213.36 cm) long tubing
- Process temperatures to 350°F (177°C)
- Up to 1500 W

Options

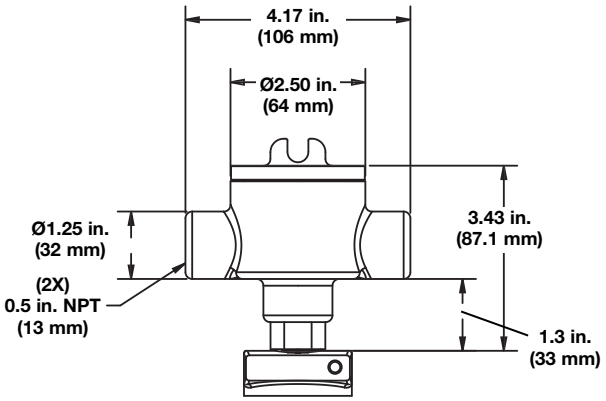
- Single-phase operation to 240V
- NEMA 1, 4 or 7 housings with and without sensors
- Passivated or electropolished wetted surfaces
- Insulated body up to 400°F (204°C) operation

Dimensions

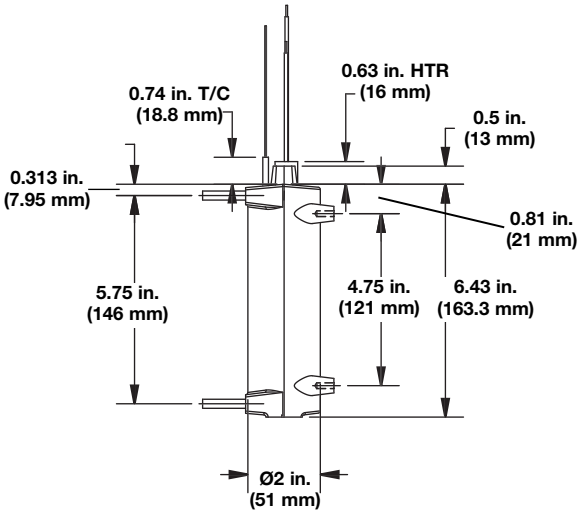
NEMA 1 and 4

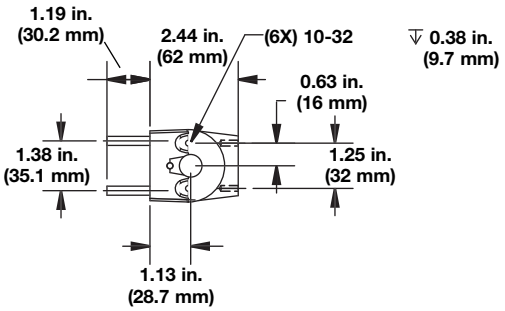


NEMA 7



No Enclosure





CAST-X 500 Circulation Heaters

Ordering Information

To order, complete the code number to the right with the information below:

W X 6 E 2 A - ____ - ___

Base Description
0.25 in. O.D. (6 mm), 0.028 in. (0.71 mm) wall, 316 SS tubing with ⅝ in. (15.9 mm) dia. cartridge heater with 36 in. (914 mm) Teflon® leads. No housing

Heater Wattage
300A = 120V, 300 W
300B = 120V, 1500 W
300C = 240V, 300 W
300D = 240V, 500 W
300E = 240V, 750 W
300F = 240V, 1000 W
300G = 240V, 1200 W
300H = 240V, 1500 W
300J = 208V, 1125 W
300K = 208V, 900 W
300L = 208V, 750 W
300M = 208V, 565 W

Enclosures and Sensors
00 = No sensor or enclosure
0J = Type J T/C in casting, no housing
0K = Type K T/C in casting, no housing
S0 = NEMA 1 housing, no sensor
SJ = NEMA 1 housing with Type J sensor in casting
SK = NEMA 1 housing with Type K sensor in casting
W0 = NEMA 4 housing, no sensor
WJ = NEMA 4 housing with Type J high-limit sensor in casting
WK = NEMA 4 housing with Type K high-limit sensor in casting
E0 = NEMA 7 housing, no thermostat, no sensor
EJ = NEMA 7 housing with Type J high-limit sensor in heater, non-standard delivery
EK = NEMA 7 housing with Type K high-limit sensor in heater, non-standard delivery

High Limits (Only available with no housing option)
00 = None
01 = Snap action high-limit set at 260°F (127°C)
02 = Snap action high-limit set at 500°F (260°C)

Accessories
Pair high pressure compression fitting - 274-55-6-1
Insulation jacket - 307-0-12-1, max. temperature 400°F (204°C)

Application Guidelines
Max. process temperature 350°F (177°C)
Max. water flow rate is 0.75 GPM
Contact your Watlow representative for gas applications

CAST-X 1000 Circulation Heaters

The CAST-X 1000 circulation heater from Watlow® consists of a helically coiled tube cast into an aluminum body with tubular elements. The aluminum body blankets the tubular elements and acts as the heat transfer media between the elements and the coiled tube circulating the heated fluid.

This innovative and cost-effective cast construction provides multiple advantages compared to traditional circulation heaters. The CAST-X 1000 circulation heater's aluminum mass maintains heat accurately and consistently, resulting in an optimum level of temperature control. The aluminum body also efficiently conducts heat away from the tubular elements, prolonging heater life.

The reliable construction of Watlow's CAST-X 1000 circulation heaters allows fluid to circulate through a coiled tube instead of in direct contact with tubular elements. This feature eliminates hot spots caused by poor flow conditions that typically result from contact between tubular elements and the heated fluid. In addition, because the unit can run dry with the thermostat without damage, there is less chance of overall heater failure and fluid leakage.

The robust, rugged design of Watlow's CAST-X 1000 circulation heaters also delivers problem-free operation in a more compact size than traditional heat exchangers.

The CAST-X 1000 circulation heater is appropriate for numerous applications and may be customized to meet specific customer needs.

Features and Benefits

Fluid path constructed independent from heater sheath

- Allows sensitive materials to be heated safely and effectively
- Assures safety because heater failure will not cause leaks or significant damage
- Provides cost effective material compatibility due to minimal material usage and non-welded construction

Operates to 1500psi with appropriate fittings

- Allows economic, high pressure operation

Integrated thermostat and enclosure

- Permits ease of installation and use
- Eliminates additional parts and wiring



Over-temperature snap action switch

- Offers cost effective, over-temperature protection

Self draining construction

- Saves time and money
- Reduces material degradation caused by trapped material

Applications

- Solvent heating
- Glycol heating for heat transfer systems
- Analytical instrumentation
- Steam generation
- Paint heating
- Food and beverage heating
- General industrial applications

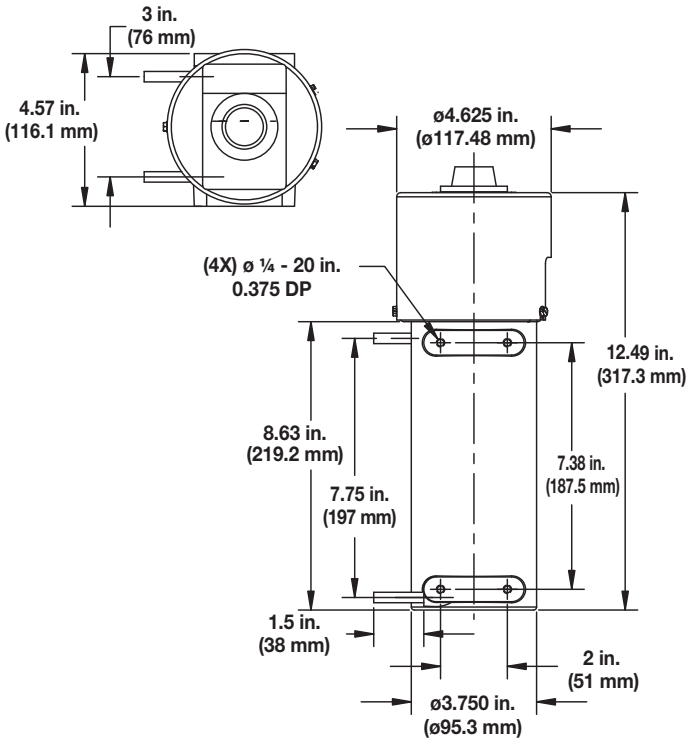
Specifications

- 120, 240 or 480V, 3kW max. single phase
- Process temperature to 250°F (121°C)
- (4) ¼ to 20 in., 0.375 in. deep mounting holes
- 5⁄16 in. (7.9 mm) O.D. inlet/outlet, 304 SS wetted surface
- NEMA 1 sheet metal enclosure
- Optional insulated body, process thermocouples and snap action high-limit thermostats

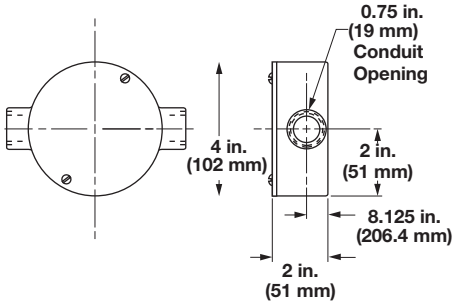
CAST-X 1000 Circulation Heaters

Technical Information

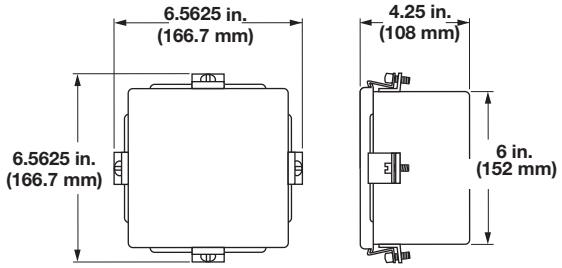
Dimensions



NEMA 4 Housing Without Thermostat



NEMA 4 Housing With Single Pole Thermostat



Non Standard Options

- NEMA 7 enclosure
- 316 SS tubing
- Passivated or electropolished wetted surfaces
- Custom fittings and sensors

Ordering Information

To order, complete the code number to the right with the information below:

B X 8 L 4 M - ___ - ___ 0 0

Base Description
5⁄16 in. (7.9 mm) O.D. inlet/outlet, 304 SS wetted surface, NEMA 1 housing

Heater Wattage
200A = 240V, 3000 W, 1-phase
200B = 480V, 3000 W, 1-phase
200C = 120V, 750 W, 1-phase
200D = 240V, 750 W, 1-phase

Enclosures and Thermostats
S2 = NEMA 1 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat
W0 = NEMA 4 housing, no thermostat
W2 = NEMA 4 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat
WJ = NEMA 4 housing, with Type J process T/C in thermowell
WK = NEMA 4 housing, with Type K process T/C in thermowell
SJ = NEMA 1 housing, with Type J process T/C in thermowell
SK = NEMA 1 housing, with Type K process T/C in thermowell

High Limit
1 = Snap action high-limit set at 260°F (127°C)

Accessories
Compression fitting - 274-55-6-4
Insulation jacket - 307-0-2-1

CAST-X 2000 Circulation Heaters

The CAST-X 2000 circulation heater from Watlow® is an ideal heating solution for demanding applications. The CAST-X 2000 heater consists of a helical coiled tube cast into an aluminum body with tubular elements. The aluminum body serves as the heat transfer media between the tubular element and the coiled tube through which the fluid being heated passes through.

The unique construction of the heater allows it to be used where thermally sensitive materials are being heated such as paints, resins and flammable materials such as fuels and solvents. The aluminum mass acts as a “thermal flywheel” and ensures accurate temperature control of the fluid to prevent degradation. The CAST-X 2000 is available with optional explosion proof enclosure for use in flammable environments.

The CAST-X 2000 is well suited to applications where fluid cleanliness is critical because the material being heated never comes in contact with the heating elements. This is a performance requirement in the foodservice equipment, semiconductor and analytical markets. The CAST-X 2000 heater comes with a heavy wall seamless stainless steel passageway that assures performance in high-pressure applications where viscous or mildly corrosive materials need to be heated.

Features and Benefits

Fluid path independent of heater sheath
- Allows sensitive materials to be heated safely
- Prevents fluid contamination

Robust cast-in aluminum construction
- Assures longer heater life
- Provides accurate temperature control

Integrated thermostat and housing
- Assures easy use and installation
- Allows heater to run dry
- Provides protection in explosive environments

Standard stainless steel fluid path
- Assures material compatibility with many different materials

Non-welded construction
- Offers economical package price
- Minimizes potential leakage
- Allows high pressure operation
- Ensures self draining when mounted vertically



Applications

- Solvent heating
- Diesel and jet fuel heating
- Glycol heating for heat transfer systems
- Sample heating - analytical instrumentation
- Steam generation
- Food and beverage heating - pasteurization
- Paint heating
- Two part urethane and foam system heating
- Air, CO_2 and nitrogen
- Deionized (DI) water heating

CAST-X 2000 Circulation Heaters

Technical Information

Wiring

- Interconnect either a single or double pole thermostat with a single-phase heater when the supply voltage does not exceed 277V~(ac) for SPST or 480V~(ac) for DPST
- Only interconnect three-phase delta heaters to DPST thermostats
- Use a single pole thermostat for pilot duty where the thermostat is not interconnected with the heater, or heater exceeds the volt/ampere rating.
- In single phase applications one, two, or three elements may be connected in parallel.
- If selected, high limit snap action thermostat should be used for pilot duty only.
- On the drawings on the next page, the dashed lines represent components or wiring supplied by the customer

Standard Options

- NEMA 1, 4 and 7 enclosures with and without process thermostats
- Snap action high-limit thermostat
- Insulated body
- Process and high-limit thermocouples

Non Standard Options

- ATEX explosion-proof enclosures
- Passivated or electropolished wetted surfaces
- Custom fittings and sensors
- Stand-off housing

Specifications

- (4) ¼ to 20, ½ in. (13 mm) deep mounting holes
- Tubing - ½ in. dia. x 0.065 in. wall (13 x 1.7 mm)
- Wetted area - 316 SS seamless tubing
- Process tube length - 150 in. (3.81 m)
- NEMA 1 metal enclosure
- Up to 6000 W, 3-phase
- Max. working fluid pressure - 5000psi (344 Bar)
- Max. working temperature range 200°F (93°C) to 350°F (177°C) depending on options
- Max. working temperature with stand-off housing is 500°F (260°C)

Note: Contact your Watlow representative for other required sizes or options.

Configurable Enclosure / Thermostat Options

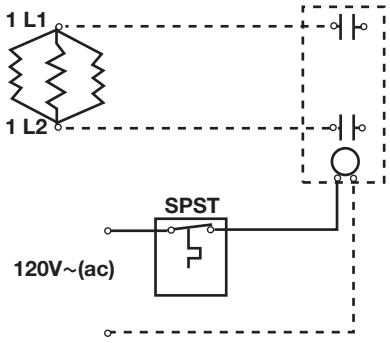
Description	S2	S5	W2	W5	E1
300A = 6000 W, 480V, 3-phase (Delta)	2	6	2	6	2
300B = 2000 W, 480V, 3-phase (Wye)	3	7	3	7	3
300C = 6000 W, 480V, 1-phase (3 elements)	1	5	1	5	1
300D = 4000 W, 480V, 1-phase (2 elements)	1	5	1	5	1
300E = 2000 W, 480V, 1-phase (1 element)	1	5	1	5	1
300F = 6000 W, 240V, 3-phase (Delta)	2	6	2	6	2
300G = 2000 W, 240V, 3-phase (Wye)	3	7	3	7	3
300H = 6000 W, 240V, 1-phase (3 elements)	1	5	1	5	1
300J = 4000 W, 240V, 1-phase (2 elements)	1	5	1	5	1
300K = 2000 W, 240V, 1-phase (1 element)	1	5	1	5	1
300L = 1500 W, 240V, 1-phase	4	5	4	5	4
300M = 1000 W, 240V, 1-phase	4	5	4	5	4
300Q = 4500 W, 208V, 3-phase (Delta)	2	6	2	6	2
300R = 1500 W, 208V, 3-phase (Wye)	3	7	3	7	3
300S = 4500 W, 208V, 1-phase	4	5	4	5	4
300T = 3000 W, 208V, 1-phase	4	5	4	5	4
300U = 1500 W, 208V, 1-phase	4	5	4	5	4
300N = 1500 W, 120V, 1-phase	4	5	4	5	4
300P = 1000 W, 120V, 1-phase	4	5	4	5	4

CAST-X 2000 Circulation Heaters

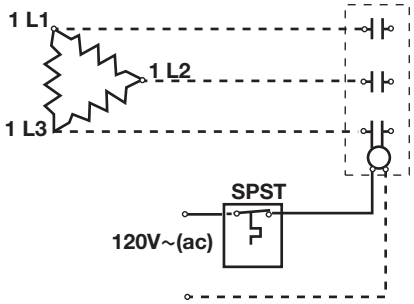
Technical Information *(Continued)*

Wiring Diagrams

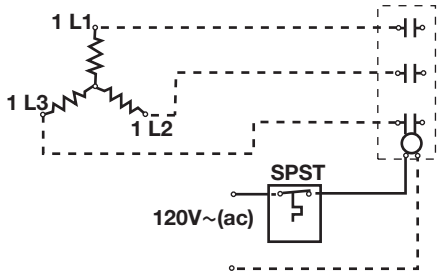
SPST, 1-Phase (1)



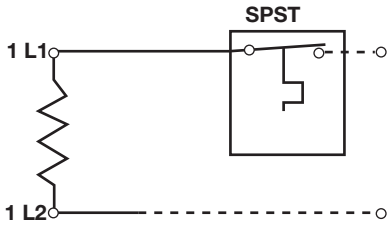
SPST, 3-Phase Delta (2)



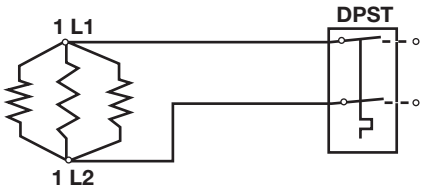
SPST, 3-Phase Wye (3)



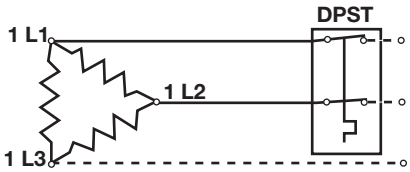
SPST, 1-Phase (4)



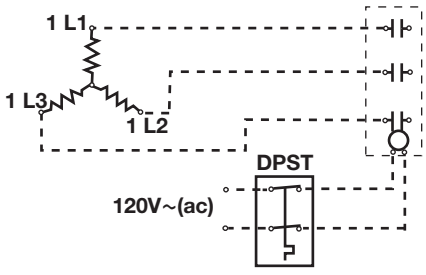
DPST, 1-Phase (5)



DPST, 3-Phase Delta (6)



DPST, 3-Phase Wye (7)



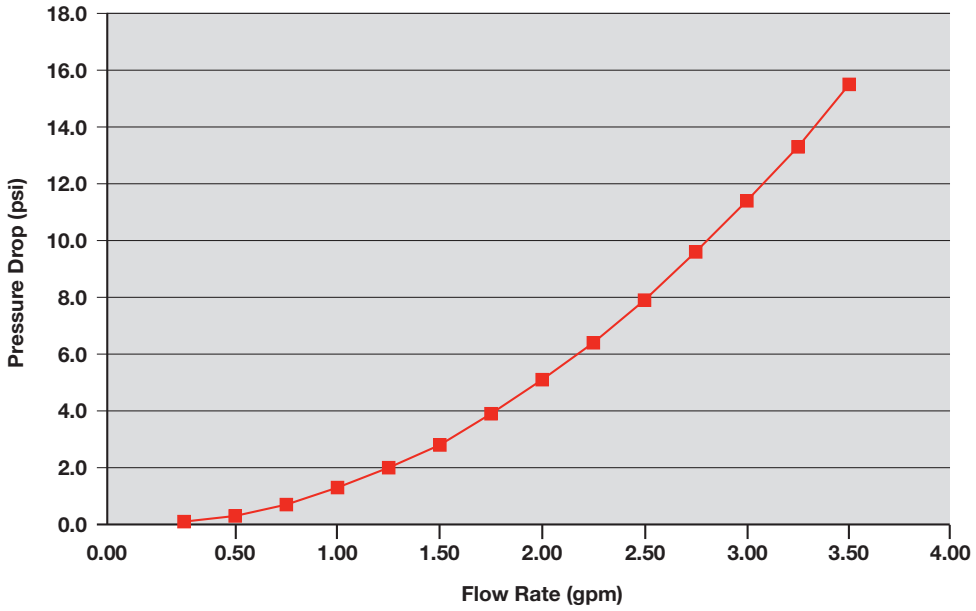
Thermostat Ampacity Ratings

Description	Ampacity			
	Line Voltage			
	120V	240V	277V	480V
Single-pole single throw for NEMA 1 and 4 housings	25	25	22	—
Double-pole single throw for NEMA 1 and 4 housings	30	30	30	21
Single pole single throw for NEMA 7 housings	30	30	25	—
High limit snap action, single pole single throw	15	10	—	—

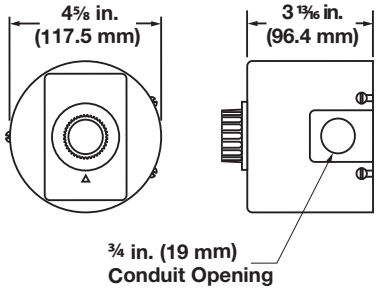
CAST-X 2000 Circulation Heaters

Technical Information *(Continued)*

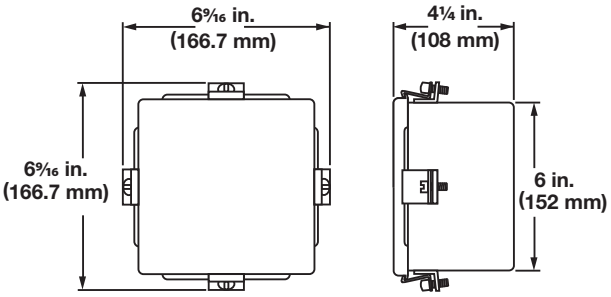
Pressure Drop-Water



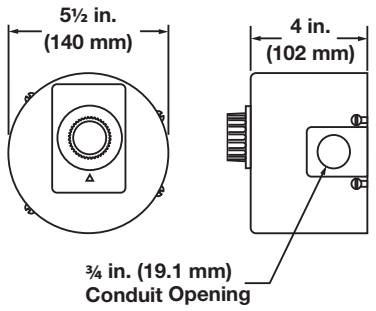
NEMA 1 Housing With Single-Pole Thermostat



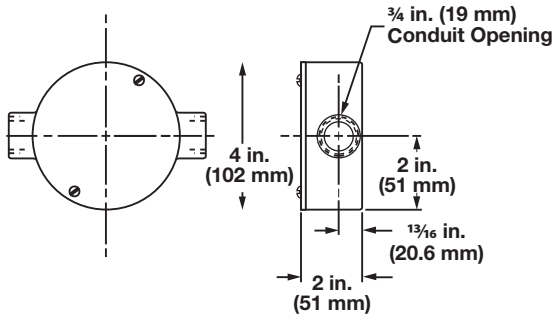
NEMA 4 Housing With Single/Double-Pole Thermostat



NEMA 1 Housing With Double-Pole Thermostat



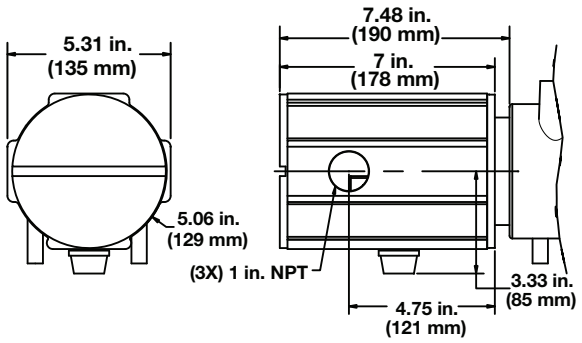
NEMA 4 Housing Without Thermostat



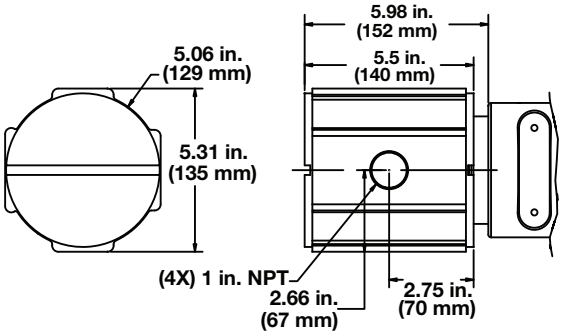
CAST-X 2000 Circulation Heaters

Technical Information *(Continued)*

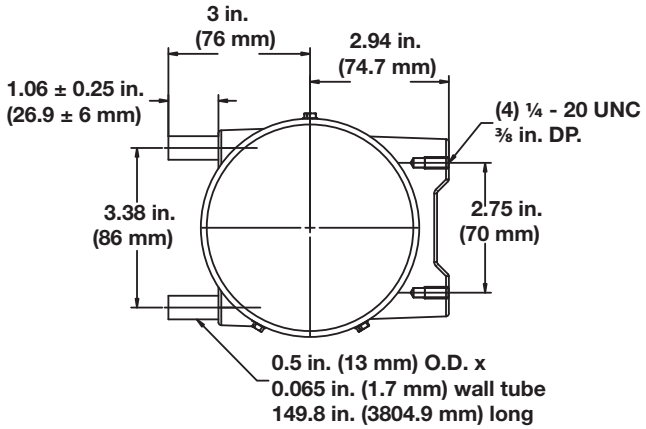
NEMA 7 Housing With Single-Pole Thermostat

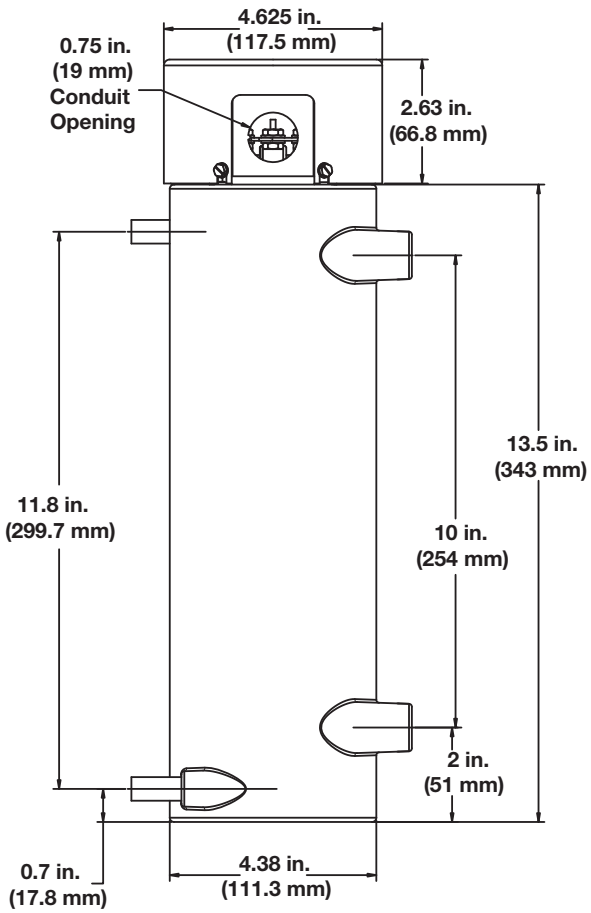


NEMA 7 Housing Without Thermostat



Dimensions — Base CAST-X 2000





CAST-X 2000 Circulation Heaters

Ordering Information

To order, complete the code number to the right with the information below:

B X 1 3 J 4 G - ____ -

Base Description
0.5 in. (13 mm) O.D. , inlet/outlet, 0.065 in. (1.7 mm) wall seamless 316 SS tubing, NEMA 1 housing

Heater Wattage
300A = 480V, 6000 W, 3-phase (Delta)
300B = 480V, 2000 W, 3-phase (Wye)
300C = 480V, 6000 W, 1-phase
300D = 480V, 4000 W, 1-phase
300E = 480V, 2000 W, 1-phase
300F = 240V, 6000 W, 3-phase (Delta)
300G = 240V, 2000 W, 3-phase (Wye)
300H = 240V, 6000W, 1-phase
300J = 240V, 4000 W, 1-phase
300K = 240V, 2000 W, 1-phase
300L = 240V, 1500 W, 1-phase
300M = 240V, 1000 W, 1-phase
300Q = 208V, 4500 W, 3-phase (Delta)
300R = 208V, 1500 W, 3-phase (Wye)
300S = 208V, 4500 W, 1-phase
300T = 208V, 3000 W, 1-phase
300N = 120V, 1500 W, 1-phase
300P = 120V, 1000 W, 1-phase

Enclosures and Thermostats
S2 = NEMA 1 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat
S5 = NEMA 1 housing with 60 to 250°F (16 to 121°C) double-pole thermostat
W0 = NEMA 4 housing, no thermostat
W2 = NEMA 4 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat
W5 = NEMA 4 housing with 60 to 250°F (16 to 121°C) double-pole thermostat
WJ = NEMA 4 housing, with Type J process T/C in thermowell
WK = NEMA 4 housing, with Type K process T/C in thermowell
SJ = NEMA 1 housing, with Type J process T/C in thermowell
SK = NEMA 1 housing, with Type K process T/C in thermowell
EJ = NEMA 7 housing, with Type J process T/C in thermowell
EK = NEMA 7 housing, with Type K process T/C in thermowell
E0 = NEMA 7 housing, with no thermostat
E1 = NEMA 7 housing, with 50 to 250°F (10 to 121°C) single-pole thermostat

High Limit (Pilot Duty Only)
1 = Snap action high-limit set at 260°F (127°C)
2 = Snap action high-limit set at 500°F (260°C)

Accessories
Compression fitting - 274-55-6-5
Insulation jacket - 307-0-11-1

CAST-X 3000 Circulation Heaters

The CAST-X 3000 circulation heater from Watlow® offers high flow volume at the required temperature through a single compact unit. The CAST-X SERIES 3000 heater consists of two helical coiled tubes and tubular elements cast into an aluminum body. The aluminum body serves as the heat transfer media between the tubular element and the process tubes.

The compact size of the heater is due to the cast-in construction which allows long heater life due to the elements being in contact with aluminum. Also, the use of heavy wall 316L seamless process tubing assures high reliability and high pressure operation.

The CAST-X 3000 is well suited to applications where indirect heating and fluid cleanliness is important. This is because the material being heated never comes in contact with the heating source. This is a critical performance requirement in many industries such as semiconductor, pharmaceutical, and food and beverage.



Features and Benefits

Dual tube construction
- Water flows to 20 GPM when run in parallel
- Capable of running one coil to heat and one to cool to maintain accurate temperature control quicker

Fluid path independent of heater sheath
- Allows sensitive materials to be heated safely
- Prevents fluid contamination

Robust cast-in aluminum construction
- Assures longer heater life
- Provides accurate temperature control

Integrated thermostat and housing
- Permits ease of installation and use
- Allows heater to run dry
- Provides protection in an explosion environment

Standard 316L stainless steel fluid path
- Compatible with different materials
- High-pressure application reliability

Non-welded construction
- Offers economical package price
- Minimizes potential leakage
- High-pressure operation
- Self-draining when mounted vertically

Applications

- Water and oil heating for food and beverage
- Steam generation and superheating for process applications
- Glycol and oil heating for heat transfer systems
- Deionized water heating for sterilization in food and beverage
- Air, CO_2 and nitrogen heating
- Fuel and oil heating for test stands

CAST-X 3000 Circulation Heaters

Technical Information

Wiring

- On the drawings below, the dashed lines represent components or wiring supplied by the customer
- Single-pole thermostats are intended for pilot duty only
- Use of a high-limit controller is highly recommended in addition to a thermostat

Figure 1

(2) Circuits, 3-Phase Delta with Optional Pilot Duty Thermostat

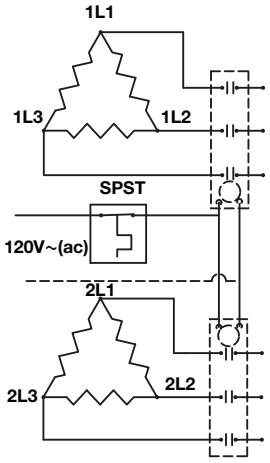


Figure 2

(1) Circuit, 3-Phase Delta with Optional Pilot Duty Thermostat

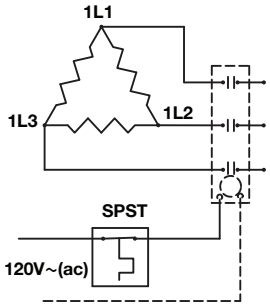


Figure 3

(1) Circuit, 6 Element, 3-Phase Wye with Optional Pilot Duty Thermostat

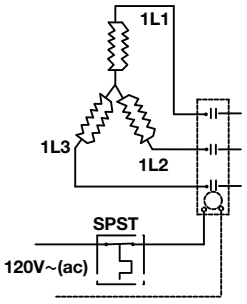


Figure 4

(1) Circuit, 6 Element, 3-Phase Delta with Optional Pilot Duty Thermostat

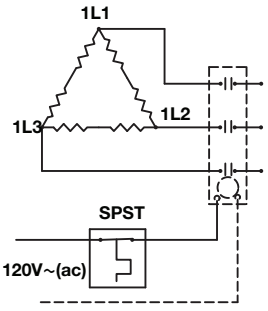


Figure 5

(1) Circuit, 1 Element, Single-Phase with Optional Pilot Duty Thermostat

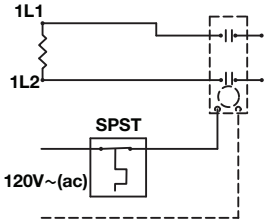
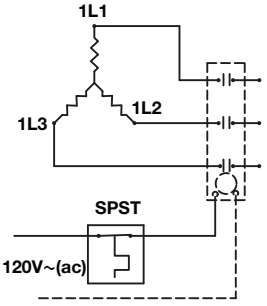


Figure 6

(1) Circuit, 3-Phase Wye with Optional Pilot Duty Thermostat



Wiring Schematics

Description				Figure Number	I (Line)
300A	25.8kW	480V	2 delta circuits	1	15.6A
300B	12.9kW	480V	3-phase delta	2	15.6A
300C	8.6kW	480V	3-phase wye parallels	3	10.4A
300D	6.4kW	480V	3-phase delta (2R)	4	7.7A
300E	4.3kW	480V	1 circuit	5	9.0A
300F	4.3kW	480V	3-phase wye	6	5.2A
300G	16.2kW	380V	2 delta circuits	1	12.3A
300H	8.1kW	380V	3-phase delta	2	12.3A
300J	5.4kW	380V	3-phase wye parallels	3	8.2A
300K	4.0kW	380V	3-phase delta (2R)	4	6.2A
300L	2.7kW	380V	1 circuit	5	7.1A
300M	2.7kW	380V	3-phase wye	6	4.1A
300N	28.4kW	240V	2 delta circuits	1	34.1A
300P	14.2kW	240V	3-phase delta	2	34.1A
300Q	9.5kW	240V	3-phase wye parallels	3	22.8A
300R	7.1kW	240V	3-phase delta (2R)	4	17.1A
300S	4.7kW	240V	1 circuit	5	19.7A
300T	4.7kW	240V	3-phase wye	6	11.4A
300U	21.3kW	208V	2 delta circuits	1	29.6A
300V	10.6kW	208V	3-phase delta	2	29.6A
300W	7.1kW	208V	3-phase wye parallels	3	19.7A
300X	5.3kW	208V	3-phase delta (2R)	4	14.8A
300Y	3.5kW	208V	1 circuit	5	17.1A
300Z	3.5kW	208V	3-phase wye	6	9.9A

Standard Options

- Single- or three-phase operation to 480V
- NEMA 4 or 7 housings with and without pilot duty process thermostat
- Process and high-limit thermocouples
- ATEX approved explosion proof housing

Non Standard Options

- Passivated or electropolished wetted surfaces
- Custom fittings and sensors

Specifications

- (4) ⅜ in. (9.5 mm) - 16 UNC x ¾ in. (19 mm) deep mounting holes
- Tubing (2) ¾ in. (19 mm) dia. x 0.065 in. (1.7 mm) wall
- Wetted area - 316L seamless SS tube
- Process tube length - 142 in. (3607 mm) per tube
- Max. working fluid pressure - 2000psi
- Max. working temperatures - 500°F (260°C)

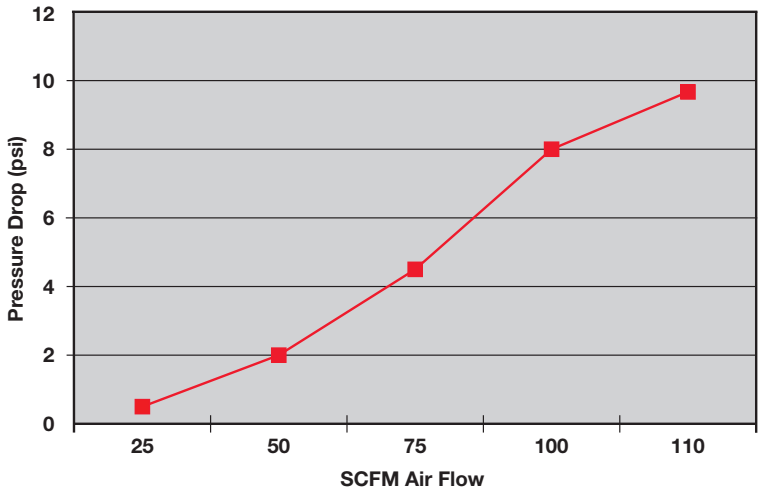
CAST-X 3000 Circulation Heaters

Technical Information *(Continued)*

Pressure Drop

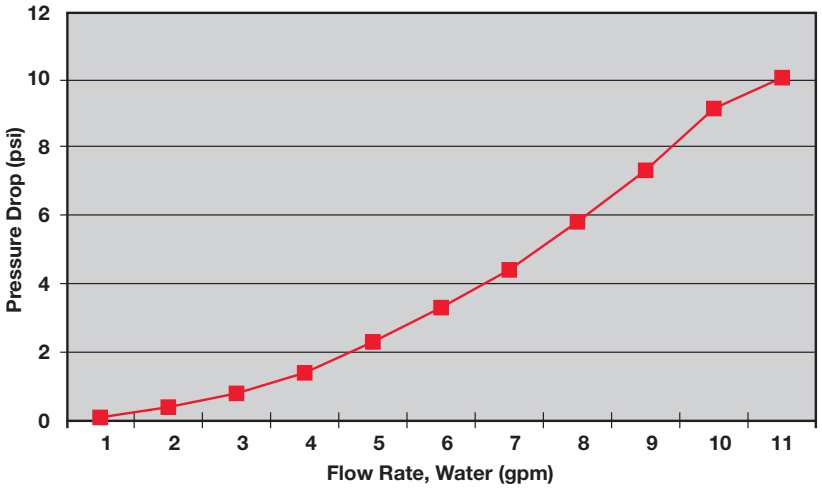
Pressure Drop - Air

- Assumes 100psi inlet pressure
- Values are for one tube only. Running tubes in parallel will have similar pressure drop and double the flow rate
- Values are approximate

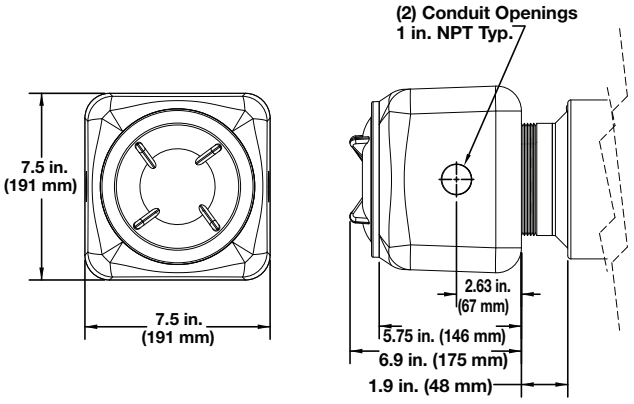


Pressure Drop - Water

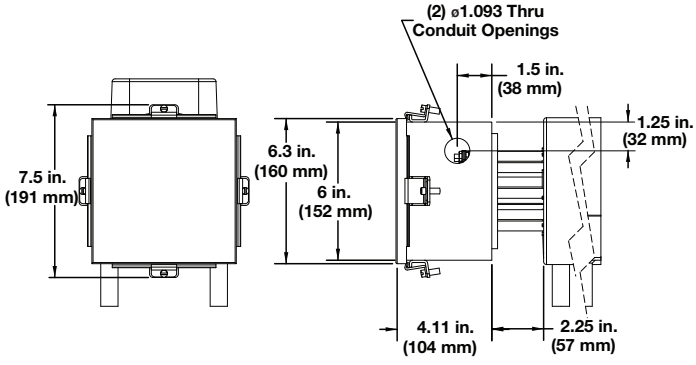
- Values are for one tube only. Running tubes in parallel will have similar pressure drop and double the flow rate
- Values are approximate



Explosion Proof Housing Without Thermostat



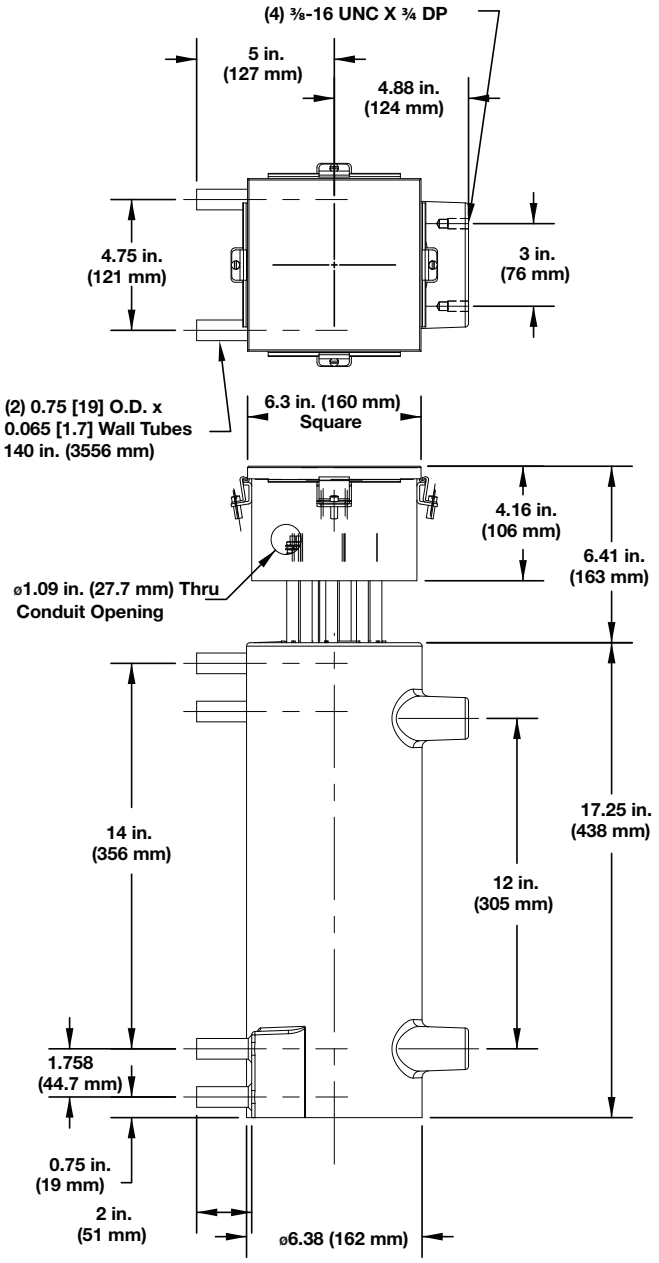
NEMA 4 Housing With and Without Thermostat



CAST-X 3000 Circulation Heaters

Technical Information *(Continued)*

Dimensions - Base CAST-X 3000



CAST-X 3000 Circulation Heaters

Ordering Information

To order, complete the code number to the right with the information below:

B X 1 7 E 6 G - ____ - __

Base Description
(2) ¾ in. (19 mm) O.D., 0.065 in. (1.7 mm) wall, seamless 316 SS tubing

Heater Wattage
300A = 25.8kW, 480V, 2 delta circuits
300B = 12.9kW, 480V, 3-phase delta
300C = 8.6kW, 480V, 3-phase wye parallels
300D = 6.4kW, 480V, 3-phase delta (2R)
300E = 4.3kW, 480V, 1 circuit
300F = 4.3kW, 480V, 3-phase wye
300G = 16.2kW, 380V, 2 delta circuits
300H = 8.1kW, 380V, 3-phase delta
300J = 5.4kW, 380V, 3-phase wye parallels
300K = 4.0kW, 380V, 3-phase delta (2R)
300L = 2.7kW, 380V, 1 circuit
300M = 2.7kW, 380V, 3-phase wye
300N = 28.4kW, 240V, 2 delta circuits
300P = 14.2kW, 240V, 3-phase delta
300Q = 9.5kW, 240V, 3-phase wye parallels
300R = 7.1kW, 240V, 3-phase delta (2R)
300S = 4.7kW, 240V, 1 circuit
300T = 4.7kW, 240V, 3-phase wye
300U = 21.3kW, 208V, 2 delta circuits
300V = 10.6kW, 208V, 3-phase delta
300W = 7.1kW, 208V, 3-phase wye parallels
300X = 5.3kW, 208V, 3-phase delta (2R)
300Y = 3.5kW, 208V, 1 circuit
300Z = 3.5kW, 208V, 3-phase wye

Enclosures and Thermostats
W00 = NEMA 4 housing, no thermostat
W20 = NEMA 4 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat
W2J = NEMA 4 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat and Type J T/C in thermowell
W2K = NEMA 4 housing with 30 to 250°F (-1 to 121°C) single-pole thermostat and Type K T/C in thermowell
W0J = NEMA 4 housing with Type J T/C in thermowell
W0K = NEMA 4 housing with Type K process T/C in thermowell
WJJ = NEMA 4 housing with Type J T/C for process and high-limit control
WKK = NEMA 4 housing with Type K T/C for process and high-limit control
E00 = NEMA 7 ATEX housing, no thermostat
E0K = NEMA 7 ATEX housing with Type K process T/C in thermowell
E0J = NEMA 7 ATEX housing with Type J process T/C in thermowell
EJJ = NEMA 7 ATEX housing with Type J for process and high-limit control
EKK = NEMA 7 ATEX housing with Type K for process and high-limit control

Accessories
High pressure compression fitting - 274-55-6-7

UNIVERSAL SOLVENT Circulation Heaters

The UNIVERSAL SOLVENT circulation heater from Watlow® consists of a cylindrical-shaped cast part with helical coiled tubes and formed tubular heating elements cast-in. Three Type J thermocouples sense the solvent inlet, solvent outlet and casting core temperatures. The UNIVERSAL SOLVENT circulation heater operates at near 100 percent efficiency while reducing the risk of solvent contamination.

The UNIVERSAL SOLVENT circulation heater provides a safe and efficient means of heating low flash point solvents. Both the heating elements and the solvent tube are cast into the aluminum. The heating elements provide heat to the aluminum mass and the mass transfers this heat to the tube carrying the solvent. The casting can also be surrounded by insulation to minimize heat loss and keep equipment cabinet temperatures low.

A secondary chilled water tube is also cast-in. This tube quickly cools the casting for routine maintenance or lowers the solvent below the flash point.

Safety features of Watlow's UNIVERSAL SOLVENT circulation heater include a NEMA 7 rated (explosion proof) enclosure box covering the electrical connections and a snap-action over temperature protection switch to provide safe shut down. The casting body is Teflon® coated to protect the aluminum in case of accidental contact with solvents.

The UNIVERSAL SOLVENT circulation heater is appropriate for numerous applications and may be customized to meet specific customer needs.

Features and Benefits

Fluid path constructed independent from heater sheath

- Allows solvent to never be in contact with heater element
- Eliminates hot spots caused by poor flow or start up conditions

Cast aluminum construction

- Allows accurate process temperature control
- Provides rugged design and durability
- Higher reliability due to fewer components and nonwelded construction
- Ensures longer heater life

Electrical enclosure constructed for hazardous environments

- Reduces risk of accidental combustion of solvent vapors



316 SS passivated and electropolished solvent tube

- Provides material compatibility with most semiconductor solvents
- Ensures contamination resistant surface for heated solvent
- Assures higher reliability and cleanliness due to seamless tubing

Operates to 1500psi or greater with appropriate fittings

- Enables economic high pressure operation

Self draining construction

- Eliminates trapped material that may add contamination to the process
- Saves on operating time

Agency ratings

- UL®/CSA recognized heater elements
- NEMA 7 Class 1, Div. 1 and 2, Groups B, C and D electrical enclosure

Applications

Semiconductor wet process OEMs

- Wafer cleaning equipment (wet bench systems)
- Post etch wet strip and photoresist removal applications
- Heating of low flash point solvents such as EKC, ACT and NMP

UNIVERSAL SOLVENT Circulation Heaters

Specifications

Operating Temperatures
- Ambient to 392°F (200°C)

Electrical
- 208 to 240V~(ac) and 6000 to 8000 W single-phase
- 208 to 480V~(ac) and 7500 W three-phase

316L SS Seamless Tubes
- 0.75 in. (19 mm) O.D., solvent tube - passivated and electropolished
- 0.25 in. (6 mm) O.D., cooling water tube

Fitting Connections
- Flaretek® or Swagelok VCR fittings on solvent tube
- National Pipe Thread (NPT) or Swagelok VCR fittings on cooling tube

Optional Features
- Insulating jacket, max. temperature 400°F (204°C)
- Contact your Watlow representative for custom inquiries

Sensors/Switches
- 2 cast-in Type J thermocouples sense solvent tube inlet and outlet temperatures
- 1 replaceable Type J thermocouple senses casting core temperature
- Mechanical snap action switches for over temperature protection

Casting Dimensions
- Height 8.5 in. (216 mm)
  Diameter 5.75 in. (146 mm)
- Dimensions above do not include tube fittings and mounting bosses

Enclosure Dimensions
- Enclosure rated for Class 1, Div. 1 and 2, Groups B, C and D
- Height 5 in. (127 mm)
  Diameter 4.75 in. (121 mm)

Teflon® Coated Casting/Anodized Electrical Enclosure
- Protects unit from accidental contact with corrosive process solvents

Ordering Information

To order, complete the code number on the right with the information below.

B X 8 J 5 N - _ _ _ - - - - -

Base Description
0.75 in. (19 mm) O.D. x 0.049 in. (1.25 mm) wall, seamless 316 SS, passivated and electropolished solvent tube. 0.25 in. (6 mm) O.D. x 0.049 in. (1.25 mm) wall, seamless 316 SS, cooling tube. NEMA 7, Class 1, Div. 1 and 2, Groups B, C and D rated electrical enclosure. Type J thermocouple sensors at casting core, solvent inlet and solvent outlet. High-limit, auto resetting snap-action switch.

Heater Voltages and Wattage
100A = 208V, 8000 W, single-phase
100B = 240V, 8000 W, single-phase
100C = 208V, 6000 W, single-phase
100D = 240V, 6000 W, single-phase
100E = 208V, 7500 W, three-phase
100F = 240V, 7500 W, three-phase
100G = 380V, 7500 W, three-phase
100H = 480V, 7500 W, three-phase

Solvent Fitting
1 = Flaretek®
2 = Swagelok VCR

Cooling Fitting
1 = 90° ¼ NPT female
2 = Swagelok VCR

High Limit Switch
1 = 212°F (100°C)
2 = 365°F (185°C)

Accessories
0 = None
1 = Insulating jacket - 307-0-6-1

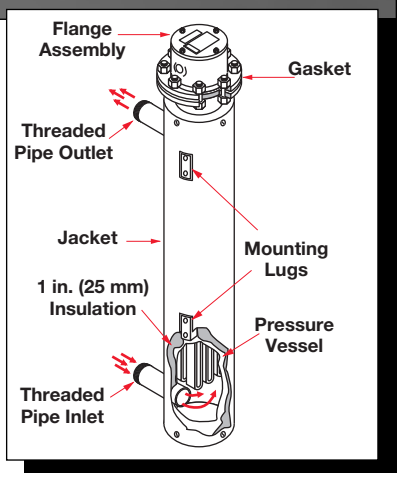
WATROD and FIREBAR® Circulation Heaters

Circulation heaters provide a ready-made means to install electric heating with a minimal amount of time and labor. This is accomplished by combining heating elements, vessel, insulation, terminal enclosure, mounting brackets and inlet and outlet connections into a complete assembly.

Made from NPT screw plug or ANSI flange heater assemblies mated with a pressure vessel (tank), circulation heaters are designed to heat forced-circulation air, gases or liquids. Ideal for either in-line or side-arm operations, these assemblies direct fluids past FIREBAR® or WATROD heating elements, to deliver fast response and even heat distribution.

Watlow® can meet virtually all your circulation heater assembly needs with made-to-order units. Made-to-order units can be made from a wide range of heating element sheath materials, wattages, vessel sizes and materials, pressure ratings, terminal enclosures and controls.





Performance Capabilities

- Watt densities to 120 W/in² (18.6 W/cm²)
- Wattages to three megawatts
- UL® and CSA component recognition to 600V~(ac)
- Ratings to ANSI Class 2500 pressure class
- Up to 3000psi design pressure
- Incoloy® sheath temperatures to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)

Features and Benefits

Standard screw plugs and flanges

- Provides a wide selection of WATROD and FIREBAR elements to meet specific application requirements

Type	Sizes (in.)
NPT Screw Plugs	1¼, 2½
ANSI flanges	3, 4, 5, 6, 8, 10, 12, 14

ANSI B16.5 Class 150 on 4 or 6 inch FIREBAR element flanges and 3 to 14 inch WATROD element flanges

- Meets recognized agency standards

FIREBAR assemblies pack more wattage in a smaller heater bundle

- Replaces larger flanges with round tubular elements, with a smaller package

Compacted MgO insulation filled elements

- Maximizes dielectric strength, heat transfer and life

One inch (25 mm) thermal insulation rated to 750°F (400°C)

- Reduces heat loss from the vessel

Heavy-guage steel jacket (shroud)

- Protects thermal insulation and heating vessel and comes with protective primer coating

RAPID SHIP

- 1¼ to 5 in. NPS assemblies will ship same day up to 5 pieces
- 4 in. NPS, 316 SS assemblies will ship next day up to 5 pieces
- 6 in. NPS assemblies will ship same day up to 2 pieces
- 6 in. NPS, 316 SS assemblies will ship next day up to 2 pieces
- 8 to 14 in. NPS assemblies will ship next day up to 2 pieces

WATROD and FIREBAR Circulation Heaters

Features and Benefits *(Continued)*

All catalog units rated to ANSI pressure Class 150

- Pressure vessels (tanks) are either carbon or 316 stainless steel

NPT or ANSI Class 150 nozzle connection

- Makes installation easy. Inlet and outlet nozzle connections are threaded MNPT on 8 in. (203 mm) and smaller tanks. Class 150 flanged connections on 10 in. (254 mm) and larger tanks

Mounting lugs are welded onto the tank wall of all 2½ in. (64 mm) NPT and larger units

- Provides mounting support

Flange mounting holes

- Straddles centerline to comply with industry standards

Standard, general purpose (NEMA 1) terminal enclosures

- Offers easy access to terminal wiring

UL® and CSA component recognition under file numbers E52951 and 31388 respectively

- Meets industry safety standards

Applications

Water:

- Deionized
- Demineralized
- Clean
- Potable
- Process
- Industrial water rinse tanks
- Hydraulic oil, crude, asphalt
- Lubricating oils at API specified watt densities
- Heat transfer oil
- Paraffin
- Caustic cleaners
- Nitrogen, hydrogen and other air/gas systems
- Superheating steam

Options

Terminal Enclosures

General purpose (NEMA 1) terminal enclosures, without thermostats, are supplied on all Watlow circulation heaters. Moisture and explosion resistant ratings are available to meet specific application needs. For screw plug terminal enclosures, refer to page 130.
For flange terminal enclosures, refer to page 204.

Stand-off Terminal Enclosures

Stand-off terminal enclosures help protect terminal enclosures against excessive temperatures. For details, refer to page 201.

CSA Certified Enclosures

To meet agency recognition requirements, CSA certified moisture and/or explosion resistant terminal enclosures are available. Contact your Watlow representative for details.

Thermostats

To provide process temperature control, Watlow offers optional single- and double-pole thermostats. Thermostats are typically mounted in the terminal enclosure. Optional side mounting on vessel also available.

See *Screw Plug Immersion Heaters,* page 130 *and Flange Immersion Heaters*, on page 204 for details.

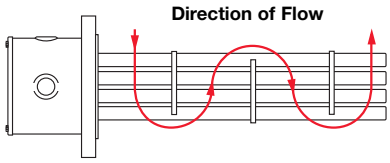
Branch Circuits

Branch circuits are designed for 48 amperes per circuit maximum. Contact your Watlow representative for circuit requirements other than those listed in the stock charts.

WATROD and FIREBAR Circulation Heaters

Options *(Continued)*

Baffles



Baffles mounted on the heating element bundle enhance and/or modify liquid or gas flow for better heat transfer.

For critical sheath temperature and low flow conditions, baffles may be required.

Contact your Watlow representative for details.

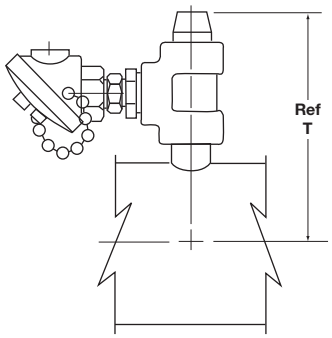
Thermocouples

To sense process or element sheath temperature, ASTM Type J or K thermocouples are available.

See *Screw Plug Immersion Heaters,* page 128 and *Flange Immersion Heaters*, on page 201 for details.

Process Thermocouple in Nozzle

(Must specify which nozzle)



Ref. Tank Size	Ref. Nozzle Size	Dimension "A"
1¼	¾ NPT	8 3/16
2½	1 NPT	8 3/16
3	1 NPT	8 3/16
4	1½ NPT	10⅜
5	2 NPT	11 1/16
6	2½ NPT	13⅜
8	2½ NPT	14⅜

For 10 in. (254 mm) and larger tanks contact your Watlow representative for dimension.

Sheath Materials

The following sheath materials are available on WATROD and FIREBAR heating elements:

Standard Sheath Materials

WATROD	Incoloy® 316 SS Steel Copper
FIREBAR	Incoloy®

Made-to-Order Sheath Materials

WATROD	304 SS Monel®
FIREBAR	304 stainless steel

Exotic Sheath Materials

Contact your Watlow representative for details and availability.

Wattages and Voltages

Watlow routinely supplies circulation heaters with 120 to 480V~(ac) as well as wattages from 500 watts to one megawatt. If required, Watlow will configure circulation heaters with voltages and wattages outside these parameters.

For more information on special voltage and wattage configurations, contact your Watlow representative.

WATROD and FIREBAR Circulation Heaters

Options *(Continued)*

Pressure Vessels

All standard pressure vessel (tank) materials are rated to 150 lb and made from:

- Carbon steel
- 316 stainless steel

All catalog pressure vessels (tanks) are steel unless otherwise noted.

316 stainless steel pressure vessels (tanks) are passivated on all wetted surfaces. Available from Assembly Stock on 2½ inch NPT and 4 or 6 inch ANSI flange circulation heaters.

Made-to-order units can be made in a variety of materials, flange sizes and pressure classes.

To order, specify **pressure vessel (tank) size, material** and **pressure class**.

Ratings to ANSI class 2500 pressure class are available for high-pressure applications.

Passivated Finish

For critical applications, passivation will remove free iron from all wetted surfaces.

Contact your Watlow representative for details.

Gaskets

Rubber, asbestos-free and spiral wound gaskets are available for all heater flange, and inlet and outlet flange sizes.

Watlow recommends ordering spares in case replacement becomes necessary.

To order, specify **gasket type, flange size/rating** and **process operating temperature**.

For details on gasket materials and temperature ratings, see page 202.

Inlet and Outlet Nozzle Connections

All inlet and outlet materials are compatible with the pressure vessel material and pressure class rating.

Vessel sizes from 1¼ to 8 inches are typically configured with MNPT (Male National Pipe Thread) nozzles. Optional NPT and flange sizes can be supplied to mate with existing piping.

10 inch and larger vessels are supplied with Class 150 inlet and outlet flanges. Optional Class 300 or Class 600 can be provided to mate with existing piping.

To order, specify **type, size** and **pressure class** rating for both inlet and outlet nozzle/flange connections.

High Temperature Thermal Insulation

To further minimize heat loss, the pressure vessel's standard one inch thermal insulation wrap may be replaced with thicker or higher temperature insulation. For more information, contact your Watlow representative.

To order, specify **insulation thickness, standard** or **high temperature insulation** and **temperature rating**.

Vessels may be supplied with a primer coating without insulation.

To order, specify **no insulation**.

Protective Steel Jacket (Shroud)

To protect circulation heaters from weather or wash-down conditions, fully welded (weatherproof) or partially welded (standard) outer protective steel jackets are available. Standard steel, or made-to-order 304 or 316 stainless steel can be supplied. Jacket diameter is dependent upon thermal insulation thickness.

To order, specify **protective steel jacket, material type** and **weatherproof**, if desired.

Support Saddles

To mate with an existing installation, customized support saddle(s) and/or mounting lugs are available.

To order, specify **mounting lugs** or **support saddles** and supply a dimensional drawing.

WATROD and FIREBAR Circulation Heaters

Technical Data

Maximum Velocities

The rate at which a gas or liquid flows through inlet and outlet pipes is critical to maintaining the desired output temperature. Pressure drop through the circulation heater must be considered to properly size blowers or pumps. The *Maximum Velocity to Avoid Excessive Pressure Drop* chart gives recommended maximum velocities, in feet per second and meters per second of gas or liquid being heated and nominal pipe size.

Maximum Velocity to Avoid Excessive Pressure Drop

Fluid	Nominal Pipe Size in.	Maximum Velocity ft/sec	(m/sec)
Gases	All	200	(61.0)
Liquid	4 and smaller	10	(3.0)
Liquid	6-8	15	(5.0)
Liquid	10-12	19	(6.0)
Liquid	14-16	21	(6.4)
Liquid	18-20	23	(7.0)
Liquid	24	24	(7.3)

Vessel Orientation Guidelines

Correctly orienting the heating vessel assures lower terminal enclosure temperatures and element immersion. Detailed instructions on vessel orientation are contained in the *Installation and Maintenance Instructions* that accompanies all circulation heaters.

The following are guidelines for vessel orientation in liquid and gas heating applications.

Liquids

Orient circulation heater:

- Horizontally with inlet and outlet pipes pointing up
- Vertically with the terminal enclosure up and the inlet pipe on the bottom

These orientations ensure the heating elements will be immersed at all times and help prevent premature failure.

Air or Gases

Orient circulation heater:

- Horizontally with the inlet nozzle closest to the terminal enclosure
- Vertically with terminal enclosure at the bottom of the tank. Use the nozzle nearest the bottom as the inlet connection

If installation constraints do not allow mounting in accordance with these guidelines, contact your Watlow representative.

WATROD and FIREBAR Circulation Heaters

Technical Data *(Continued)*

Application Hints

- Select the recommended heating element sheath material and watt density for the substance being heated. Use the *Supplemental Applications Chart* on pages 667 to 674. If unable to determine the correct heating element type and material, contact your Watlow representative.
- Assure selecting proper vessel by considering the pressure or flow rate, process temperature and corrosiveness of the media being heated. If assistance with vessel selection is required, contact your Watlow representative.
- For maintenance/replacement procedures, retain an area twice the circulation heater's overall length to permit easy removal and inspection of screw plug or flange heater assemblies.
- Choose a FIREBAR assembly when you require:
  - A smaller package
  - More kilowatts or lower watt density in an equally sized WATROD circulation tank.
- Minimize problems associated with low flow or low liquid level conditions with a low liquid level sensor and/or sheath high-limit control.
- Ensure wiring integrity by making sure terminal enclosure temperature does not exceed 400°F (205°C).
- Size power feeder wires in accordance with national electrical code guidelines and other applicable codes
- Protect against electrical shock by properly grounding the unit per NEC requirements.
- One or more circulation heaters may be connected in series to achieve the desired total kilowatt or temperature output.

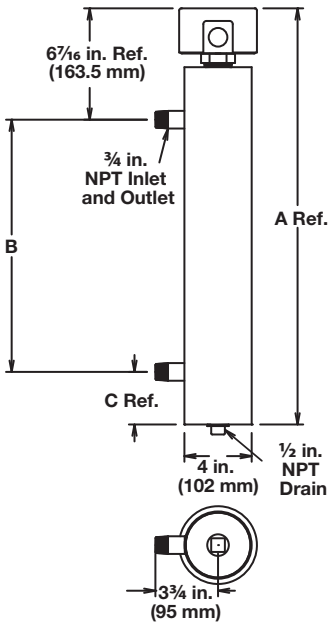
WATROD and FIREBAR Circulation Heaters

Application: Clean Water ⑤

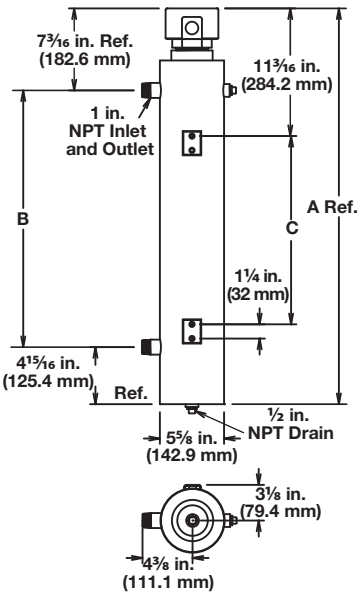
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
1¼ inch NPT Screw Plug (WATROD)										
60 W/in² ④ Steel Tank 2-Copper Elements (9.3 W/cm²)	120/240	3.0	1	1	**CBEC15A6S**	RS	23 (11)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	4.0	1	1	**CBEC19A10S**	RS	29 (14)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	5.0	1	1	**CBEC23J10S**	RS	29 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	6.0	1	1	**CBEC27J10S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
1¼ inch NPT Screw Plug (FIREBAR)										
90 W/in² Steel Tank 1-Incoloy Elements (14 W/cm²)	240	1.5	1	1	**CBDNF7R10S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	480	1.5	1	1	**CBDNF7R11S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	3.0	1	1	**CBDNF11G10S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	480	3.0	1	1	**CBDNF11G11S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	5.0	3	1	**CBDNF16G3S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	480	5.0	3	1	**CBDNF16G5S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	6.5	3	1	**CBDNF19G3S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	6.5	3	1	**CBDNF19G5S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	8.5	3	1	**CBDNF24L3S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	8.5	3	1	**CBDNF24L5S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	10.5	3	1	**CBDNF29R3S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	10.5	3	1	**CBDNF29R5S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	12.7	3	1	**CBDNF34R3S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	12.7	3	1	**CBDNF34R5S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	17.0	3	1	**CBDNF45G3S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	17.0	3	1	**CBDNF45G5S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	21.5	3	1	**CBDNF55R5S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)
2½ inch NPT Screw Plug (WATROD)										
60 W/in² Steel Tank 3-Copper Elements (9.3 W/cm²)	240	6.0	3	1	**CBLC714L3S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	6.0	3	1	**CBLC714L5S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	7.5	3	1	**CBLC717L3S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	7.5	3	1	**CBLC717L5S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	9.0	3	1	**CBLC720L3S**	RS	26 (12)	34¾ (881)	22½ (572)	16½ (419)
	480	9.0	3	1	**CBLC720L5S**	RS	26 (12)	34¾ (881)	22½ (572)	16½ (419)
	240	12.0	3	1	**CBLC726C3S**	RS	27 (13)	44¾ (1135)	32½ (1129)	26½ (673)
	480	12.0	3	1	**CBLC726C5S**	RS	27 (13)	44¾ (1135)	32½ (1129)	26½ (673)
	240	15.0	3	1	**CBLC731L3S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	480	15.0	3	1	**CBLC731L5S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	240	18.0	3	1	**CBLC737C3S**	RS	30 (14)	57¼ (1453)	45 (1143)	39 (991)
	480	18.0	3	1	**CBLC737C5S**	RS	30 (14)	57¼ (1453)	45 (1143)	39 (991)

1¼ inch NPT Screw Plug



2½ inch NPT Screw Plug



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

④ Wired for higher voltage

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

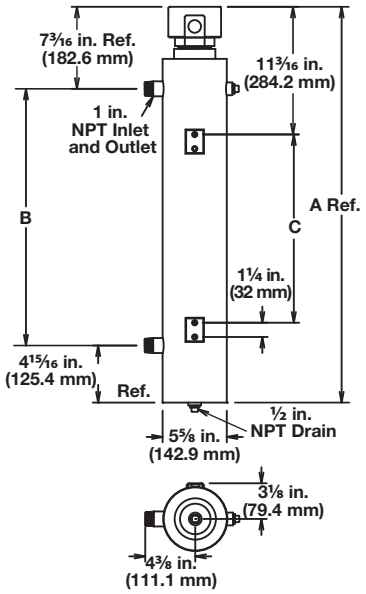
WATROD and FIREBAR Circulation Heaters

Application: Clean Water ⑤

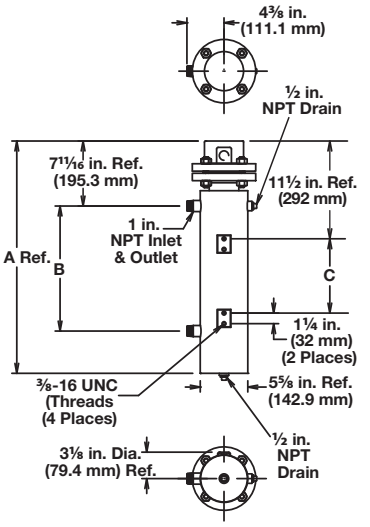
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
2½ inch NPT Screw Plug (FIREBAR)										
90 W/in² ⑧ Steel Tank 3-Incoloy Elements (14 W/cm²)	240	15.0	3	1	**CBLNF15C3S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	480	15.0	3	1	**CBLNF15C5S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	20.0	3	1	**CBLNF18C3S**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	20.0	3	1	**CBLNF18C5S ③**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	25.0	3	1	**CBLNF23C5S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	480	32.0	3	1	**CBLNF28L5S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	38.0	3	1	**CBLNF33L5S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
3 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 3-Copper Elements (9.3 W/cm²)	120	6.0	1	1	**CFMC715J10S**	RS	66 (30)	35¼ (894)	22½ (573)	16½ (419)
	240	6.0	3	1	**CFMC715J3S**	RS	66 (30)	35¼ (894)	22½ (573)	16½ (419)
	480	6.0	1	1	**CFMC715J11S**	RS	66 (30)	35¼ (894)	22½ (573)	16½ (419)
	480	6.0	3	1	**CFMC715J5S**	RS	66 (30)	35¼ (894)	22½ (573)	16½ (419)
	120	9.0	1	1	**CFMC721J10S**	RS	70 (32)	35¼ (894)	22½ (573)	16½ (419)
	240	9.0	3	1	**CFMC721J3S**	RS	70 (32)	35¼ (894)	22½ (573)	16½ (419)
	480	9.0	1	1	**CFMC721J11S**	RS	70 (32)	35¼ (894)	22½ (573)	16½ (419)
	480	9.0	3	1	**CFMC721J5S**	RS	70 (32)	35¼ (894)	22½ (573)	16½ (419)
	240	12.0	3	1	**CFMC727A3S**	RS	80 (37)	45¼ (1148)	32½ (826)	26½ (673)
	480	12.0	1	1	**CFMC727A11S**	RS	80 (37)	45¼ (1148)	32½ (826)	26½ (673)
	480	12.0	3	1	**CFMC727A5S**	RS	80 (37)	45¼ (1148)	32½ (826)	26½ (673)
	240	15.0	3	1	**CFMC732J3S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	480	15.0	1	1	**CFMC732J11S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	480	15.0	3	1	**CFMC732J5S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	240	18.0	3	1	**CFMC738A3S**	RS	98 (45)	57¾ (1465)	45 (1143)	39 (991)
	480	18.0	1	1	**CFMC738A11S**	RS	98 (45)	57¾ (1465)	45 (1143)	39 (991)
	480	18.0	3	1	**CFMC738A5S**	RS	98 (45)	57¾ (1465)	45 (1143)	39 (991)

2½ inch NPT Screw Plug



3 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

③ Wired for 3-phase operation only

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

⑧ Can be wired for 1-phase operation

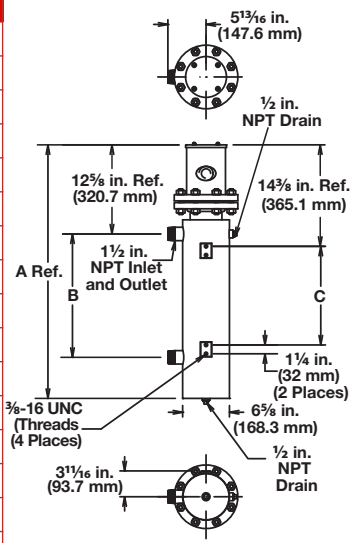
WATROD and FIREBAR Circulation Heaters

Application: Clean Water ⑤

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
4 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 6-Copper Elements (9.3 W/cm²)	240	12.0	1	2	**CFOC715J10S**	RS	124 (57)	39 (989)	20½ (521)	17 (432)
	240	12.0	3	1	**CFOC715J3S**	RS	124 (57)	39 (989)	20½ (521)	17 (432)
	480	12.0	1	1	**CFOC715J11S**	RS	124 (57)	39 (989)	20½ (521)	17 (432)
	480	12.0	3	1	**CFOC715J5S**	RS	124 (57)	39 (989)	20½ (521)	17 (432)
	240	18.0	1	2	**CFOC721J10S**	RS	127 (58)	39 (989)	20½ (521)	17 (432)
	240	18.0	3	1	**CFOC721J3S**	RS	127 (58)	39 (989)	20½ (521)	17 (432)
	480	18.0	1	1	**CFOC721J11S**	RS	127 (58)	39 (989)	20½ (521)	17 (432)
	480	18.0	3	1	**CFOC721J5S**	RS	127 (58)	39 (989)	20½ (521)	17 (432)
	240	24.0	1	2	**CFOC727A10S**	RS	160 (73)	49½ (1256)	31 (787)	27½ (699)
	240	24.0	3	2	**CFOC727A3S**	RS	160 (73)	49½ (1256)	31 (787)	27½ (699)
	480	24.0	1	1	**CFOC727A11S**	RS	160 (73)	49½ (1256)	31 (787)	27½ (699)
	480	24.0	3	1	**CFOC727A5S**	RS	160 (73)	49½ (1256)	31 (787)	27½ (699)
	240	30.0	3	2	**CFOC732J3S**	RS	163 (74)	49½ (1256)	31 (787)	27½ (699)
	480	30.0	1	2	**CFOC732J11S**	RS	163 (74)	49½ (1256)	31 (787)	27½ (699)
	480	30.0	3	1	**CFOC732J5S**	RS	163 (74)	49½ (1256)	31 (787)	27½ (699)
	240	36.0	3	2	**CFOC738A3S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	480	36.0	1	2	**CFOC738A11S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	480	36.0	3	1	**CFOC738A5S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	480	50.0	3	2	**CFOC751A5S**	RS	234 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	60.0	3	2	**CFOC760J5S**	S	297 (135)	91½ (2326)	73 (1854)	66 (1676)

4 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

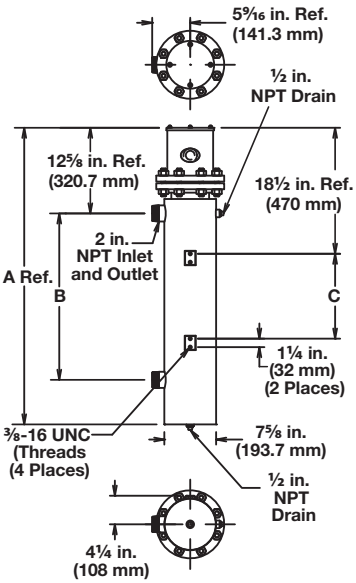
WATROD and FIREBAR Circulation Heaters

Application: Clean Water ⑤

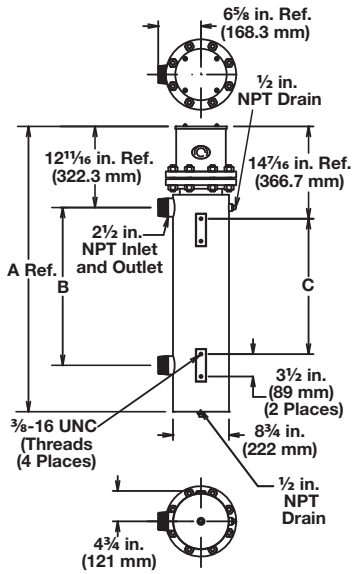
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
5 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 6-Copper Elements (9.3 W/cm²)	240	24.0	1	3	**CFNC727A10S**	RS	140 (64)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	240	24.0	3	2	**CFNC727A3S**	RS	140 (64)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	24.0	1	3	**CFNC727A11S**	RS	140 (64)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	24.0	3	1	**CFNC727A5S**	RS	140 (64)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	240	30.0	3	2	**CFNC732J3S**	RS	142 (65)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	30.0	1	2	**CFNC732J11S**	RS	142 (65)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	30.0	3	1	**CFNC732J5S**	RS	142 (65)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	240	36.0	3	2	**CFNC738A3S**	RS	160 (73)	56¼ (1427.0)	37 (940)	18⅝ (473.1)
	480	36.0	1	2	**CFNC738A11S**	RS	160 (73)	56¼ (1427.0)	37 (940)	18⅝ (473.1)
	480	36.0	3	1	**CFNC738A5S**	RS	160 (73)	56¼ (1427.0)	37 (940)	18⅝ (473.1)
	480	50.0	3	2	**CFNC751A5S**	RS	180 (82)	67¾ (1719.0)	48½ (1232)	25 (633.0)
	480	60.0	3	2	**CFNC760J5S**	S	190 (87)	81⅛ (2060.6)	61⅞ (1572)	30⅞ (784.2)
5 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 9-Copper Elements (9.3 W/cm²)	240	36.0	3	3	**CFNC727A3XS**	RS	145 (66)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	36.0	1	3	**CFNC727A11XS**	RS	145 (66)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	36.0	3	1	**CFNC727A5XS**	RS	145 (66)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	240	45.0	3	3	**CFNC732J3XS**	RS	147 (67)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	45.0	1	3	**CFNC732J11XS**	RS	147 (67)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	480	45.0	3	3	**CFNC732J5XS**	RS	147 (67)	49¼ (1249.0)	30 (762)	14⅞ (378.8)
	240	54.0	3	3	**CFNC738A3XS**	RS	166 (76)	56¼ (1427.0)	37 (940)	18⅝ (473.1)
	480	54.0	1	3	**CFNC738A11XS**	RS	166 (76)	56¼ (1427.0)	37 (940)	18⅝ (473.1)
	480	54.0	3	3	**CFNC738A5XS**	RS	166 (76)	56¼ (1427.0)	37 (940)	18⅝ (473.1)
	480	75.0	3	3	**CFNC751A5XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232)	25 (633.0)
	480	90.0	3	3	**CFNC760J5XS**	S	200 (91)	81⅛ (2060.6)	61⅞ (1572)	30⅞ (784.2)
6 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 12-Copper Elements (9.3 W/cm²)	240	24.0	1	3	**CFPC715G10S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	240	24.0	3	2	**CFPC715G3S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	480	24.0	1	2	**CFPC715G11S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	480	24.0	3	1	**CFPC715G5S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	240	36.0	1	4	**CFPC721G10S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	36.0	3	2	**CFPC721G3S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	36.0	1	2	**CFPC721G11S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	36.0	3	1	**CFPC721G5S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	48.0	3	4	**CFPC726R3S**	RS	222 (101)	51 (1294)	31 (787)	27½ (699)
	480	48.0	1	3	**CFPC726R11S**	RS	222 (101)	51 (1294)	31 (787)	27½ (699)
	480	48.0	3	2	**CFPC726R5S**	RS	222 (101)	51 (1294)	31 (787)	27½ (699)
	240	60.0	3	4	**CFPC732G3S**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	60.0	1	3	**CFPC732G11S**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	60.0	3	2	**CFPC732G5S**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	72.0	3	4	**CFPC737R3S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	72.0	3	2	**CFPC737R5S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	100.0	3	4	**CFPC750R5S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	120.0	3	4	**CFPC760G5S**	S	360 (164)	93 (2361)	73 (1854)	66 (1676)

5 inch - 150 lb ANSI Flange



6 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces
- **S** - Standard, 10 day lead time

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

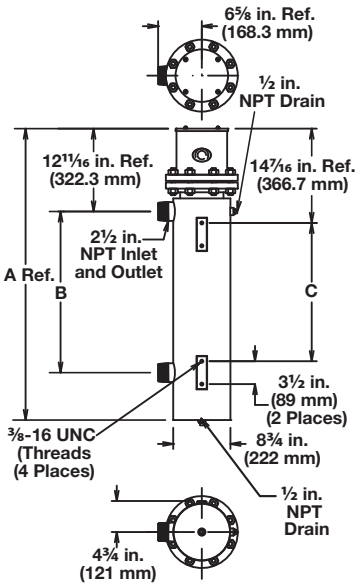
WATROD and FIREBAR Circulation Heaters

Application: Clean Water ⑤

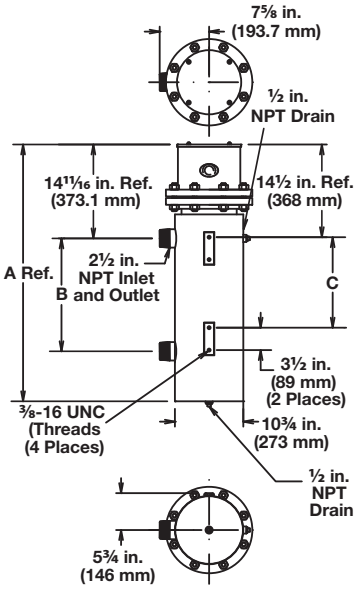
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 15-Copper Elements (9.3 W/cm²)	240	30.0	1	3	**CFPC715G10XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	240	30.0	3	5	**CFPC715G3XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	480	30.0	1	3	**CFPC715G11XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	480	30.0	3	1	**CFPC715G5XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	240	45.0	1	5	**CFPC721G10XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	45.0	3	5	**CFPC721G3XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	480	45.0	1	3	**CFPC721G11XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	480	45.0	3	5	**CFPC721G5XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	60.0	3	5	**CFPC726R3XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	60.0	1	3	**CFPC726R11XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	60.0	3	5	**CFPC726R5XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	75.0	3	5	**CFPC732G3XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	75.0	1	5	**CFPC732G11XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	75.0	3	5	**CFPC732G5XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	90.0	3	5	**CFPC737R3XS**	RS	296 (134)	72 (1827)	52 (1321)	48½ (1232)
	480	90.0	3	5	**CFPC737R5XS**	RS	296 (134)	72 (1827)	52 (1321)	48½ (1232)
	480	125.0	3	5	**CFPC750R5XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	480	150.0	3	5	**CFPC760G5XS**	S	370 (168)	93 (2361)	73 (1854)	66 (1676)
8 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² Steel Tank 18-Copper Elements (7.5 W/cm²)	240	50.0	3	3	**CFRC721N3S**	RS	340 (155)	47¼ (1199.0)	24¾ (627.0)	21¼ (538.0)
	480	50.0	1	3	**CFRC721N11S**	RS	340 (155)	47¼ (1199.0)	24¾ (627.0)	21¼ (538.0)
	480	50.0	3	2	**CFRC721N5S**	RS	340 (155)	47¼ (1199.0)	24¾ (627.0)	21¼ (538.0)
	240	75.0	3	6	**CFRC729N3S**	RS	360 (164)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	75.0	3	2	**CFRC729N5S**	RS	360 (164)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	100.0	3	6	**CFRC737E3S**	RS	385 (175)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	100.0	3	3	**CFRC737E5S**	RS	385 (175)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	125.0	3	6	**CFRC745E3S**	RS	410 (186)	69⅞ (1774.8)	47⅜ (1203.3)	43⅜ (1114.4)
	480	125.0	3	6	**CFRC745E5S**	RS	410 (186)	69⅞ (1774.8)	47⅜ (1203.3)	43⅜ (1114.4)
	480	150.0	3	6	**CFRC752N5S**	RS	440 (200)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	175.0	3	6	**CFRC760N5S**	RS	465 (211)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	200.0	3	6	**CFRC768E5S**	RS	510 (232)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)

6 inch - 150 lb ANSI Flange



8 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, (10) day lead time

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

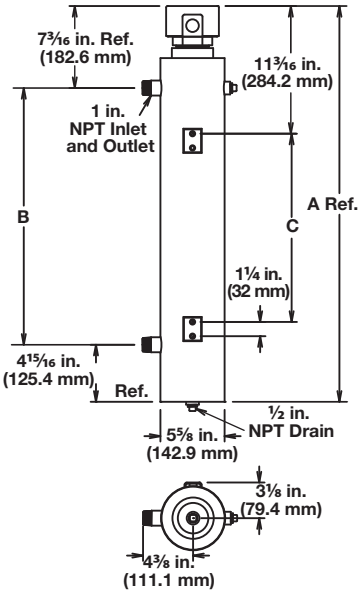
WATROD and FIREBAR Circulation Heaters

Application: Deionized or Demineralized Water

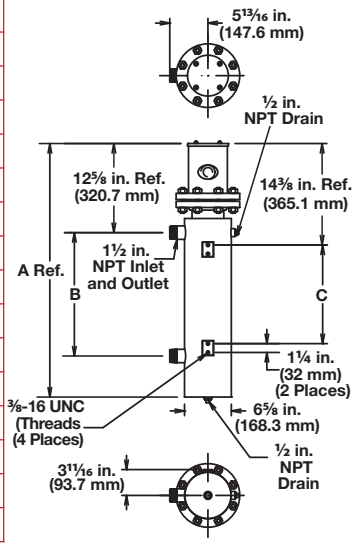
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs	(kg)	"A" Dim. in.	(mm)	"B" Dim. in.	(mm)	"C" Dim. in.	(mm)
2½ inch NPT Screw Plug (WATROD)														
60 W/in² 316 SS Tank 3-316 SS Elements (9.3 W/cm²) Passivated	240	6.0	3	1	**CBLR714L3S**	RS	24	(11)	34¾	(881)	22½	(572)	16½	(419)
	480	6.0	3	1	**CBLR714L5S**	RS	24	(11)	34¾	(881)	22½	(572)	16½	(419)
	240	7.5	3	1	**CBLR717L3S**	RS	24	(11)	34¾	(881)	22½	(572)	16½	(419)
	480	7.5	3	1	**CBLR717L5S**	RS	24	(11)	34¾	(881)	22½	(572)	16½	(419)
	240	9.0	3	1	**CBLR720L3S**	RS	26	(12)	34¾	(881)	22½	(572)	16½	(419)
	480	9.0	3	1	**CBLR720L5S**	RS	26	(12)	34¾	(881)	22½	(572)	16½	(419)
	240	12.0	3	1	**CBLR726C3S**	RS	27	(13)	44¾	(1135)	32½	(1129)	26½	(673)
	480	12.0	3	1	**CBLR726C5S**	RS	27	(13)	44¾	(1135)	32½	(1129)	26½	(673)
	240	15.0	3	1	**CBLR731L3S**	RS	29	(14)	44¾	(1135)	32½	(1129)	26½	(673)
	480	15.0	3	1	**CBLR731L5S**	RS	29	(14)	44¾	(1135)	32½	(1129)	26½	(673)
	240	18.0	3	1	**CBLR737C3S**	RS	30	(14)	57¼	(1453)	45	(1143)	39	(991)
	480	18.0	3	1	**CBLR737C5S**	RS	30	(14)	57¼	(1453)	45	(1143)	39	(991)
4 inch - 150 lb ANSI Flange (WATROD)														
60 W/in² 316 SS Tank 6-316 SS Elements (9.3 W/cm²) Passivated	240	12.0	1	2	**CFOR716A10S**	RS	124	(57)	39	(989)	20½	(521)	17	(432)
	240	12.0	3	1	**CFOR716A3S**	RS	124	(57)	39	(989)	20½	(521)	17	(432)
	480	12.0	1	1	**CFOR716A11S**	RS	124	(57)	39	(989)	20½	(521)	17	(432)
	480	12.0	3	1	**CFOR716A5S**	RS	124	(57)	39	(989)	20½	(521)	17	(432)
	240	18.0	1	2	**CFOR722A10S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	240	18.0	3	1	**CFOR722A3S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	480	18.0	1	1	**CFOR722A11S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	480	18.0	3	1	**CFOR722A5S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	240	24.0	1	2	**CFOR727J10S**	RS	160	(73)	49½	(1256)	31	(787)	27½	(699)
	240	24.0	3	2	**CFOR727J3S**	RS	160	(73)	49½	(1256)	31	(787)	27½	(699)
	480	24.0	1	1	**CFOR727J11S**	RS	160	(73)	49½	(1256)	31	(787)	27½	(699)
	480	24.0	3	1	**CFOR727J5S**	RS	160	(73)	49½	(1256)	31	(787)	27½	(699)
	240	30.0	3	2	**CFOR733A3S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	30.0	1	2	**CFOR733A11S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	30.0	3	1	**CFOR733A5S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	36.0	3	2	**CFOR738J3S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	36.0	1	2	**CFOR738J11S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	36.0	3	1	**CFOR738J5S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	50.0	3	2	**CFOR751J5S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	60.0	3	2	**CFOR761A5S**	RS	297	(135)	91½	(2326)	73	(1854)	66	(1676)

2½ inch NPT Screw Plug



4 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 5 pieces

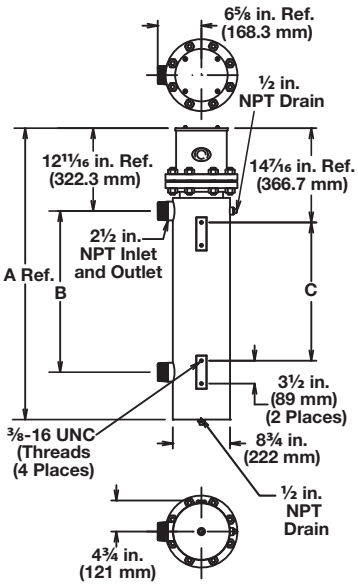
WATROD and FIREBAR Circulation Heaters

Application: Deionized or Demineralized Water

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² 316 SS Tank 12-316 SS Elements (9.3 W/cm²) Passivated	240	24.0	1	3	**CFPR715N10S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	240	24.0	3	2	**CFPR715N3S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	480	24.0	1	2	**CFPR715N11S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	480	24.0	3	1	**CFPR715N5S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	240	36.0	1	4	**CFPR721N10S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	36.0	3	2	**CFPR721N3S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	36.0	1	2	**CFPR721N11S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	36.0	3	1	**CFPR721N5S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	48.0	3	4	**CFPR727E3S**	RS	222 (101)	51 (1294)	31 (787)	27½ (699)
	480	48.0	1	3	**CFPR727E11S**	RS	222 (101)	51 (1294)	31 (787)	27½ (699)
	480	48.0	3	2	**CFPR727E5S**	RS	222 (101)	51 (1294)	31 (787)	27½ (699)
	240	60.0	3	4	**CFPR732N3S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	60.0	1	3	**CFPR732N11S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	60.0	3	2	**CFPR732N5S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	72.0	3	4	**CFPR738E3S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	72.0	3	2	**CFPR738E5S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	100.0	3	4	**CFPR751E5S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	120.0	3	4	**CFPR760N5S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
6 inch - 150 lb ANSI Flange (WATROD)										
60 W/in² 316 SS Tank 15-316 SS Elements (9.3 W/cm²) Passivated	240	30.0	1	3	**CFPR715N10XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	240	30.0	3	5	**CFPR715N3XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	480	30.0	1	3	**CFPR715N11XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	480	30.0	3	1	**CFPR715N5XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	240	45.0	1	5	**CFPR721N10XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	45.0	3	5	**CFPR721N3XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	480	45.0	1	3	**CFPR721N11XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	480	45.0	3	5	**CFPR721N5XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	60.0	3	5	**CFPR727E3XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	60.0	1	3	**CFPR727E11XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	60.0	3	5	**CFPR727E5XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	75.0	3	5	**CFPR732N3XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	75.0	1	5	**CFPR732N11XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	75.0	3	5	**CFPR732N5XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	90.0	3	5	**CFPR738E3XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	480	90.0	3	5	**CFPR738E5XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	480	125.0	3	5	**CFPR751E5XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	480	150.0	3	5	**CFPR760N5XS**	RS	370 (168)	93 (2361)	73 (1854)	66 (1676)

6 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

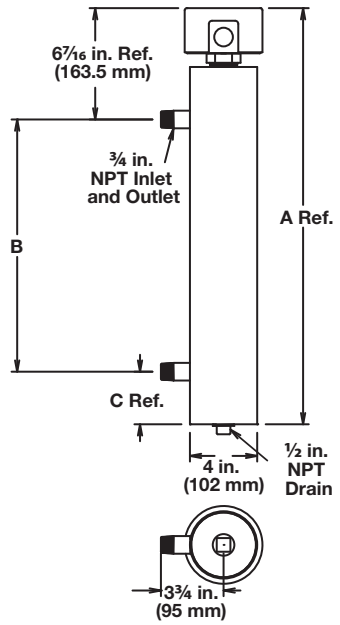
WATROD and FIREBAR Circulation Heaters

Application: Process Water ⑤

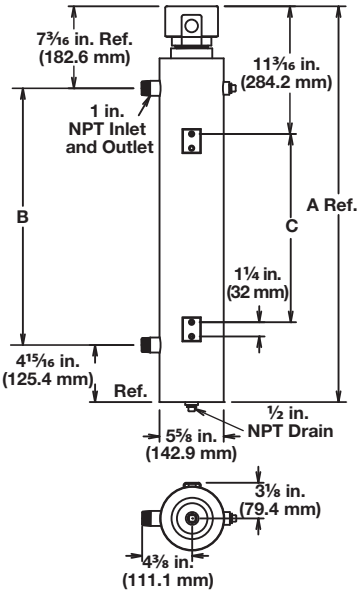
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
1¼ inch NPT Screw Plug (FIREBAR)										
45 W/in² ⑧ Steel Tank 1-Incoloy Element (7 W/cm²)	240	2.0	3	1	**CBDNF13A27S**	RS	25 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	2.5	3	1	**CBDNF15J27S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	3.0	3	1	**CBDNF18A27S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	4.0	3	1	**CBDNF22J27S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	4.0	3	1	**CBDNF22J28S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	5.0	3	1	**CBDNF27J27S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	5.0	3	1	**CBDNF27J28S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	6.0	3	1	**CBDNF32J27S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	6.0	3	1	**CBDNF32J28S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	8.0	3	1	**CBDNF42A27S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	8.0	3	1	**CBDNF42A28S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	240	10.0	3	1	**CBDNF51J27S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	10.0	3	1	**CBDNF51J28S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)
2½ inch NPT Screw Plug (WATROD)										
48 W/in² ⑧ Steel Tank 3-Incoloy Elements (7.5 W/cm²)	240	6.0	3	1	**CBLN717G3S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	6.0	3	1	**CBLN717G5S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	7.5	3	1	**CBLN719R3S**	RS	26 (12)	34¾ (881)	22½ (572)	16½ (419)
	480	7.5	3	1	**CBLN719R5S**	RS	26 (12)	34¾ (881)	22½ (572)	16½ (419)
	240	9.0	3	1	**CBLN724R3S**	RS	27 (13)	34¾ (881)	22½ (572)	16½ (419)
	480	9.0	3	1	**CBLN724R5S**	RS	27 (13)	34¾ (881)	22½ (572)	16½ (419)
	240	12.0	3	1	**CBLN732G3S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	480	12.0	3	1	**CBLN732G5S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	240	15.0	3	1	**CBLN739R3S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	480	15.0	3	1	**CBLN739R5S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	240	18.0	3	1	**CBLN747G3S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
	480	18.0	3	1	**CBLN747G5S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
2½ inch NPT Screw Plug (FIREBAR)										
45 W/in² ⑧ Steel Tank 3-Incoloy (7 W/cm²)	240	6.0	3	1	**CBLNF12A27S**	RS	21 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	7.5	3	1	**CBLNF14J27S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	9.0	3	1	**CBLNF17A27S**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	12.0	3	1	**CBLNF21J27S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	480	12.0	3	1	**CBLNF21J28S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	240	15.0	3	1	**CBLNF26J27S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	15.0	3	1	**CBLNF26J28S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	18.0	3	1	**CBLNF31J27S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	18.0	3	1	**CBLNF31J28S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	24.0	3	1	**CBLNF41A28S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	480	30.0	3	1	**CBLNF50J28S**	RS	52 (24)	63¾ (1618)	51½ (1308)	46½ (1181)

1¼ inch NPT Screw Plug



2½ inch NPT Screw Plug



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

⑧ Can be wired for 1-phase operation

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

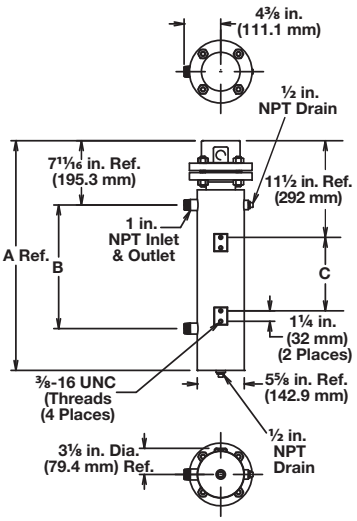
WATROD and FIREBAR Circulation Heaters

Application: Process Water ⑤

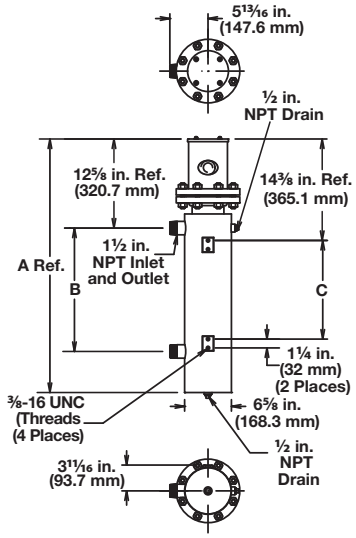
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs	(kg)	"A" Dim. in.	(mm)	"B" Dim. in.	(mm)	"C" Dim. in.	(mm)
3 inch - 150 lb ANSI Flange (WATROD)														
48 W/in² Steel Tank 3-Incoloy Elements (7.5 W/cm²)	240	6.0	1	1	**CFMN718A10S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	240	6.0	3	1	**CFMN718A3S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	480	6.0	1	1	**CFMN718A11S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	480	6.0	3	1	**CFMN718A5S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	240	7.5	1	1	**CFMN720J10S**	RS	70	(32)	35¼	(894)	22½	(573)	16½	(419)
	240	7.5	3	1	**CFMN720J3S**	RS	70	(32)	35¼	(894)	22½	(573)	16½	(419)
	480	7.5	1	1	**CFMN720J11S**	RS	70	(32)	35¼	(894)	22½	(573)	16½	(419)
	480	7.5	3	1	**CFMN720J5S**	RS	70	(32)	35¼	(894)	22½	(573)	16½	(419)
	240	9.0	1	1	**CFMN725J10S**	RS	78	(36)	45¼	(1148)	32½	(826)	26½	(673)
	240	9.0	3	1	**CFMN725J3S**	RS	78	(36)	45¼	(1148)	32½	(826)	26½	(673)
	480	9.0	1	1	**CFMN725J11S**	RS	78	(36)	45¼	(1148)	32½	(826)	26½	(673)
	480	9.0	3	1	**CFMN725J5S**	RS	78	(36)	45¼	(1148)	32½	(826)	26½	(673)
	240	12.0	3	1	**CFMN733A3S**	RS	96	(44)	45¼	(1148)	32½	(826)	26½	(673)
	480	12.0	1	1	**CFMN733A11S**	RS	96	(44)	45¼	(1148)	32½	(826)	26½	(673)
	480	12.0	3	1	**CFMN733A5S**	RS	96	(44)	45¼	(1148)	32½	826)	26½	(673)
	240	15.0	3	1	**CFMN740J3S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	480	15.0	1	1	**CFMN740J11S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	480	15.0	3	1	**CFMN740J5S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	240	18.0	3	1	**CFMN748A3S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
	480	18.0	1	1	**CFMN748A11S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
	480	18.0	3	1	**CFMN748A5S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
4 inch - 150 lb ANSI Flange (WATROD)														
48 W/in² Steel Tank 6-Incoloy Elements (7.5 W/cm²)	240	9.0	1	1	**CFON713J10S**	RS	122	(56)	39	(989)	20½	(521)	17	(432)
	240	9.0	3	1	**CFON713J3S**	RS	122	(56)	39	(989)	20½	(521)	17	(432)
	480	9.0	1	1	**CFON713J11S**	RS	122	(56)	39	(989)	20½	(521)	17	(432)
	480	9.0	3	1	**CFON713J5S**	RS	122	(56)	39	(989)	20½	(521)	17	(432)
	240	12.0	1	2	**CFON718A10S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	12.0	3	1	**CFON718A3S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	480	12.0	1	1	**CFON718A11S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	480	12.0	3	1	**CFON718A5S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	15.0	1	2	**CFON720J10S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	240	15.0	3	1	**CFON720J3S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	480	15.0	1	1	**CFON720J11S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	480	15.0	3	1	**CFON720J5S**	RS	127	(58)	39	(989)	20½	(521)	17	(432)
	240	18.0	1	2	**CFON725J10S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	240	18.0	3	1	**CFON725J3S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	480	18.0	1	1	**CFON725J11S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	480	18.0	3	1	**CFON725J5S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	240	24.0	1	2	**CFON733A10S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	24.0	3	2	**CFON733A3S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	24.0	1	1	**CFON733A11S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	24.0	3	1	**CFON733A5S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	30.0	3	2	**CFON740J3S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	30.0	1	2	**CFON740J11S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	30.0	3	1	**CFON740J5S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	240	36.0	3	2	**CFON748A3S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	36.0	1	2	**CFON748A11S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	36.0	3	1	**CFON748A5S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)

3 inch - 150 lb ANSI Flange



4 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

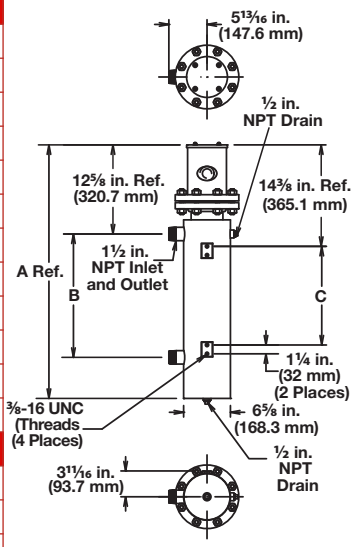
WATROD and FIREBAR Circulation Heaters

Application: Process Water ⑤

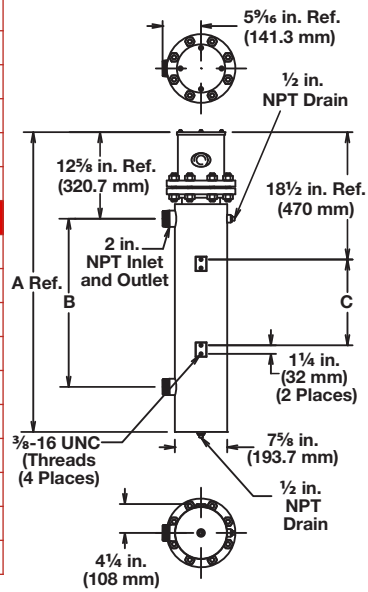
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs	(kg)	"A" Dim. in.	(mm)	"B" Dim. in.	(mm)	"C" Dim. in.	(mm)
4 inch - 150 lb ANSI Flange (FIREBAR)														
45 W/in² Steel Tank 6-Incoloy Elements (7 W/cm²)	240	12.0	3	1	**CFONF13G27S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	15.0	3	1	**CFONF16A27S**	RS	128	(58)	39	(989)	20½	(521)	17	(432)
	240	18.0	3	1	**CFONF18G27S**	RS	130	(59)	39	(989)	20½	(521)	17	(432)
	240	24.0	3	2	**CFONF22R27S**	RS	133	(61)	39	(989)	20½	(521)	17	(432)
	480	24.0	3	1	**CFONF22R28S**	RS	133	(61)	39	(989)	20½	(521)	17	(432)
	240	30.0	3	2	**CFONF27R27S**	RS	168	(77)	49½	(1256)	31	(787)	27½	(699)
	480	30.0	3	1	**CFONF27R28S**	RS	168	(77)	49½	(1256)	31	(787)	27½	(699)
	240	36.0	3	2	**CFONF32R27S**	RS	170	(78)	49½	(1256)	31	(787)	27½	(699)
	480	36.0	3	1	**CFONF32R28S**	RS	170	(78)	49½	(1256)	31	(787)	27½	(699)
	480	48.0	3	2	**CFONF42G28S**	RS	236	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	60.0	3	2	**CFONF51R28S**	RS	240	(109)	70½	(1789)	52	(1321)	48½	(1232)
5 inch - 150 lb ANSI Flange (WATROD)														
48 W/in² Steel Tank 6-Incoloy Elements (7.5 W/cm²)	240	24.0	1	3	**CFNN733A10S**	RS	145	(66)	49¼	(1249)	30	(762)	14⅞	(377.8)
	240	24.0	3	2	**CFNN733A3S**	RS	145	(66)	49¼	(1249)	30	(762)	14⅞	(377.8)
	480	24.0	1	2	**CFNN733A11S**	RS	145	(66)	49¼	(1249)	30	(762)	14⅞	(377.8)
	480	24.0	3	1	**CFNN733A5S**	RS	145	(66)	49¼	(1249)	30	(762)	14⅞	(377.8)
	240	30.0	3	2	**CFNN740J3S**	RS	167	(76)	56¼	(1427)	37	(940)	18⅝	(473.1)
	480	30.0	1	2	**CFNN740J11S**	RS	167	(76)	56¼	(1427)	37	(940)	18⅝	(473.1)
	480	30.0	3	1	**CFNN740J5S**	RS	167	(76)	56¼	(1427)	37	(940)	18⅝	(473.1)
	240	36.0	3	2	**CFNN748A3S**	RS	180	(82)	67¾	(1719)	48½	(1232)	25	(633.0)
	480	36.0	1	2	**CFNN748A11S**	RS	180	(82)	67¾	(1719)	48½	(1232)	25	(633.0)
	480	36.0	3	1	**CFNN748A5S**	RS	180	(82)	67¾	(1719)	48½	(1232)	25	(633.0)
5 inch - 150 lb ANSI Flange (WATROD)														
48 W/in² Steel Tank 9-Incoloy Elements (7.5 W/cm²)	240	36.0	3	3	**CFNN733A3XS**	RS	150	(68)	49¼	(1249)	30	(762)	14⅞	(377.8)
	480	36.0	1	3	**CFNN733A11XS**	RS	150	(68)	49¼	(1249)	30	(762)	14⅞	(377.8)
	480	36.0	3	1	**CFNN733A5XS**	RS	150	(68)	49¼	(1249)	30	(762)	14⅞	(377.8)
	240	45.0	3	3	**CFNN740J3XS**	RS	173	(79)	56¼	(1427)	37	(940)	18⅝	(473.1)
	480	45.0	1	3	**CFNN740J11XS**	RS	173	(79)	56¼	(1427)	37	(940)	18⅝	(473.1)
	480	45.0	3	3	**CFNN740J5XS**	RS	173	(79)	56¼	(1427)	37	(940)	18⅝	(473.1)
	240	54.0	3	3	**CFNN748A3XS**	RS	188	(86)	67¾	(1719)	48½	(1232)	25	(633.0)
	480	54.0	1	3	**CFNN748A11XS**	RS	188	(86)	67¾	(1719)	48½	(1232)	25	(633.0)
	480	54.0	3	3	**CFNN748A5XS**	RS	188	(86)	67¾	(1719)	48½	(1232)	25	(633.0)

4 inch - 150 lb ANSI Flange



5 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

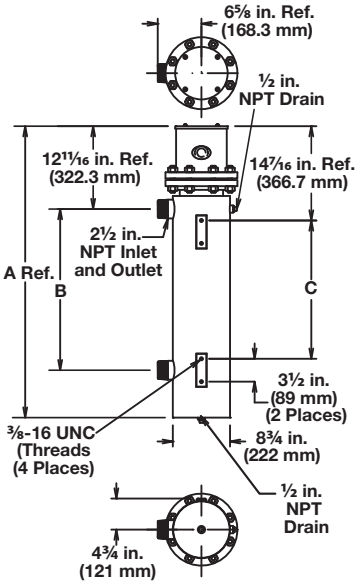
WATROD and FIREBAR Circulation Heaters

Application: Process Water ⑤

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs	(kg)	"A" Dim. in.	(mm)	"B" Dim. in.	(mm)	"C" Dim. in.	(mm)
6 inch - 150 lb ANSI Flange (WATROD)														
48 W/in² Steel Tank 12-Incoloy Elements (7.5 W/cm²)	240	18.0	1	2	**CFPN713G10S**	RS	212	(97)	40½	(1027)	20½	(521)	17	(432)
	240	18.0	3	1	**CFPN713G3S**	RS	212	(97)	40½	(1027)	20½	(521)	17	(432)
	480	18.0	1	1	**CFPN713G11S**	RS	212	(97)	40½	(1027)	20½	(521)	17	(432)
	480	18.0	3	1	**CFPN713G5S**	RS	212	(97)	40½	(1027)	20½	(521)	17	(432)
	240	24.0	1	3	**CFPN717R10S**	RS	214	(97)	40½	(1027)	20½	(521)	17	(432)
	240	24.0	3	2	**CFPN717R3S**	RS	214	(97)	40½	(1027)	20½	(521)	17	(432)
	480	24.0	1	2	**CFPN717R11S**	RS	214	(97)	40½	(1027)	20½	(521)	17	(432)
	480	24.0	3	1	**CFPN717R5S**	RS	214	(97)	40½	(1027)	20½	(521)	17	(432)
	240	30.0	1	3	**CFPN720G10S**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	240	30.0	3	2	**CFPN720G3S**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	480	30.0	1	2	**CFPN720G11S**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	480	30.0	3	1	**CFPN720G5S**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	240	36.0	1	4	**CFPN725G10S**	RS	222	(101)	40½	(1027)	20½	(521)	17	(432)
	240	36.0	3	2	**CFPN725G3S**	RS	222	(101)	40½	(1027)	20½	(521)	17	(432)
	480	36.0	1	2	**CFPN725G11S**	RS	222	(101)	40½	(1027)	20½	(521)	17	(432)
	480	36.0	3	1	**CFPN725G5S**	RS	222	(101)	40½	(1027)	20½	(521)	17	(432)
	240	48.0	3	4	**CFPN732R3S**	RS	226	(103)	51	(1294)	31	(787)	27½	(699)
	480	48.0	1	3	**CFPN732R11S**	RS	226	(103)	51	(1294)	31	(787)	27½	(699)
	480	48.0	3	2	**CFPN732R5S**	RS	226	(103)	51	(1294)	31	(787)	27½	(699)
	240	60.0	3	4	**CFPN740G3S**	RS	290	(132)	72	(1827)	52	(1321)	48½	(1232)
	480	60.0	1	3	**CFPN740G11S**	RS	290	(132)	72	(1827)	52	(1321)	48½	(1232)
	480	60.0	3	2	**CFPN740G5S**	RS	290	(132)	72	(1827)	52	(1321)	48½	(1232)
	240	72.0	3	4	**CFPN747R3S**	RS	298	(136)	72	(1827)	52	(1321)	48½	(1232)
	480	72.0	3	2	**CFPN747R5S**	RS	298	(136)	72	(1827)	52	(1321)	48½	(1232)
6 inch - 150 lb ANSI Flange (WATROD)														
48 W/in² Steel Tank 15-Incoloy Elements (7.5 W/cm²)	240	23.0	1	3	**CFPN713G10XS**	RS	215	(98)	40½	(1027)	20½	(521)	17	(432)
	240	23.0	3	5	**CFPN713G3XS**	RS	215	(98)	40½	(1027)	20½	(521)	17	(432)
	480	23.0	1	1	**CFPN713G11XS**	RS	215	(98)	40½	(1027)	20½	(521)	17	(432)
	480	23.0	3	1	**CFPN713G5XS**	RS	215	(98)	40½	(1027)	20½	(521)	17	(432)
	240	30.0	1	3	**CFPN717R10XS**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	240	30.0	3	5	**CFPN717R3XS**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	480	30.0	1	3	**CFPN717R11XS**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	480	30.0	3	1	**CFPN717R5XS**	RS	217	(99)	40½	(1027)	20½	(521)	17	(432)
	240	38.0	1	5	**CFPN720G10XS**	RS	223	(102)	40½	(1027)	20½	(521)	17	(432)
	240	38.0	3	5	**CFPN720G3XS**	RS	223	(102)	40½	(1027)	20½	(521)	17	(432)
	480	38.0	1	3	**CFPN720G11XS**	RS	223	(102)	40½	(1027)	20½	(521)	17	(432)
	480	38.0	3	1	**CFPN720G5XS**	RS	223	(102)	40½	(1027)	20½	(521)	17	(432)
	240	45.0	1	5	**CFPN725G10XS**	RS	226	(103)	40½	(1027)	20½	(521)	17	(432)
	240	45.0	3	5	**CFPN725G3XS**	RS	226	(103)	40½	(1027)	20½	(521)	17	(432)
	480	45.0	1	3	**CFPN725G11XS**	RS	226	(103)	40½	(1027)	20½	(521)	17	(432)
	480	45.0	3	5	**CFPN725G5XS**	RS	226	(103)	40½	(1027)	20½	(521)	17	(432)
	240	60.0	3	5	**CFPN732R3XS**	RS	288	(131)	51	(1294)	31	(787)	27½	(699)
	480	60.0	1	3	**CFPN732R11XS**	RS	288	(131)	51	(1294)	31	(787)	27½	(699)
	480	60.0	3	5	**CFPN732R5XS**	RS	288	(131)	51	(1294)	31	(787)	27½	(699)
	240	75.0	3	5	**CFPN740G3XS**	RS	296	(135)	72	(1827)	52	(1321)	48½	(1232)
	480	75.0	1	5	**CFPN740G11XS**	RS	296	(135)	72	(1827)	52	(1321)	48½	(1232)
	480	75.0	3	5	**CFPN740G5XS**	RS	296	(135)	72	(1827)	52	(1321)	48½	(1232)
	240	90.0	3	5	**CFPN747R3XS**	RS	306	(139)	72	(1827)	52	(1321)	48½	(1232)
	480	90.0	3	5	**CFPN747R5XS**	RS	306	(139)	72	(1827)	52	(1321)	48½	(1232)

6 inch - 150 lb ANSI Flange



RAPID SHIP • **RS** - Same day shipment up to 2 pieces

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

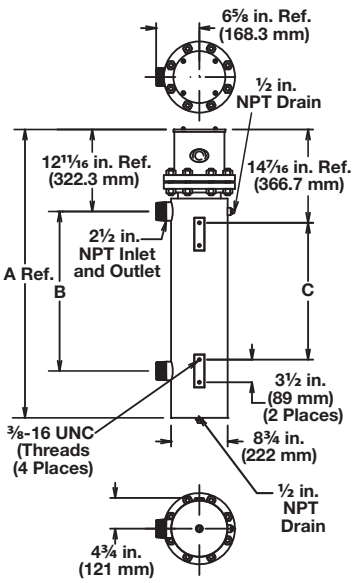
WATROD and FIREBAR Circulation Heaters

Application: Process Water ⑤

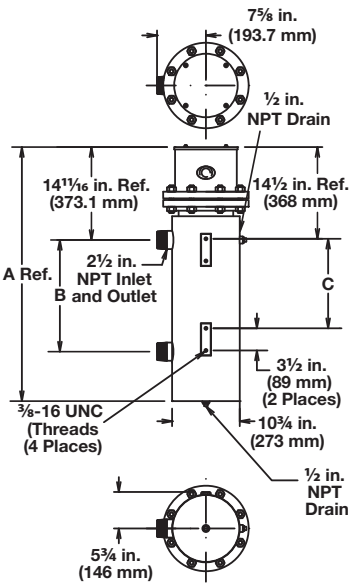
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (FIREBAR)										
45 W/in² Steel Tank 15-Incoloy Elements (7 W/cm²)	240	30.0	3	5	**CFPNF13G27S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	37.5	3	5	**CFPNF16A27S**	RS	220 (100)	40½ (1027)	20½ (521)	17 (432)
	240	45.0	3	5	**CFPNF18G27S**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	60.0	3	5	**CFPNF22R27S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	60.0	3	5	**CFPNF22R28S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	75.0	3	5	**CFPNF27R27S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	480	75.0	3	5	**CFPNF27R28S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	240	90.0	3	5	**CFPNF32R27S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	480	90.0	3	5	**CFPNF32R28S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	480	120.0	3	5	**CFPNF42G28S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	480	150.0	3	5	**CFPNF51R28S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)
8 inch - 150 lb ANSI Flange (WATROD)										
48 W/in² Steel Tank 18-Incoloy Elements (7.5 W/cm²)	240	50.0	3	3	**CFRN725N3S**	RS	350 (159)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	50.0	1	3	**CFRN725N11S**	RS	350 (159)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	50.0	3	2	**CFRN725N5S**	RS	350 (159)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	75.0	3	6	**CFRN735N3S**	RS	380 (173)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	75.0	3	2	**CFRN735N5S**	RS	380 (173)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	100.0	3	6	**CFRN744E3S**	RS	410 (186)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	100.0	3	3	**CFRN744E5S**	RS	410 (186)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	125.0	3	6	**CFRN754M3S**	RS	445 (202)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	125.0	3	6	**CFRN754M5S**	RS	445 (202)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	150.0	3	6	**CFRN763M5S**	RS	490 (223)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	175.0	3	6	**CFRN773D5S**	RS	530 (241)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	200.0	3	6	**CFRN782M5S**	RS	560 (254)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
8 inch - 150 lb ANSI Flange (WATROD)										
48 W/in² Steel Tank 24-Incoloy Elements (7.5 W/cm²)	240	67.0	3	4	**CFRN726D3XS**	RS	358 (163)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	67.0	1	3	**CFRN726D11XS**	RS	358 (163)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	67.0	3	2	**CFRN726D5XS**	RS	358 (163)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	100.0	3	8	**CFRN736D3XS**	RS	392 (178)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	100.0	3	4	**CFRN736D5XS**	RS	392 (178)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	133.0	3	8	**CFRN744M3XS**	RS	425 (193)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	133.0	3	4	**CFRN744M5XS**	RS	425 (193)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	167.0	3	8	**CFRN754M3XS**	RS	463 (210)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	167.0	3	8	**CFRN754M5XS**	RS	463 (210)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	200.0	3	8	**CFRN763M5XS**	RS	511 (232)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	233.0	3	8	**CFRN773D5XS**	RS	554 (252)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	267.0	3	8	**CFRN782M5XS**	RS	587 (267)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)

6 inch - 150 lb ANSI Flange



8 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

⑤ When steel vessel materials are used in this application, some rust may be present in the process media

WATROD and FIREBAR Circulation Heaters

Application: Process Water ⑤

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

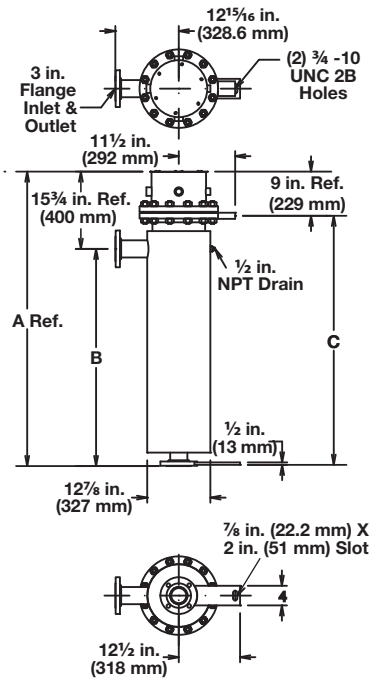
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
10 inch - 150 lb ANSI Flange (WATROD)										
48 W/in² ⑧ Steel Tank 27-Incoloy Elements (7.5 W/cm²)	480	262.0	3	9	**CFSN773E5S**	S	600 (273)	106⅝ (2708.3)	90⅞ (2308.2)	97⅝ (2479.7)
12 inch, 150 lb ANSI Flange (WATROD)										
48 W/in² Steel Tank 36-Incoloy Elements (7.5 W/cm²)	480	350.0	3	12	**CFTN773C5S**	S	650 (295)	106½ (2705)	90⅜ (2295.5)	97½ (2475)
14 inch - 150 lb ANSI Flange (WATROD)										
48 W/in² Steel Tank 45-Incoloy Elements (7.5 W/cm²)	480	315.0	3	15	**CFWN754J5S**	S	600 (273)	83¼ (2115)	67 (1700)	74 (1880)
	480	375.0	3	15	**CFWN763J5S**	S	650 (295)	90¾ (2305)	74½ (1891)	81½ (2070)

- **S** - Standard, 10 day lead time

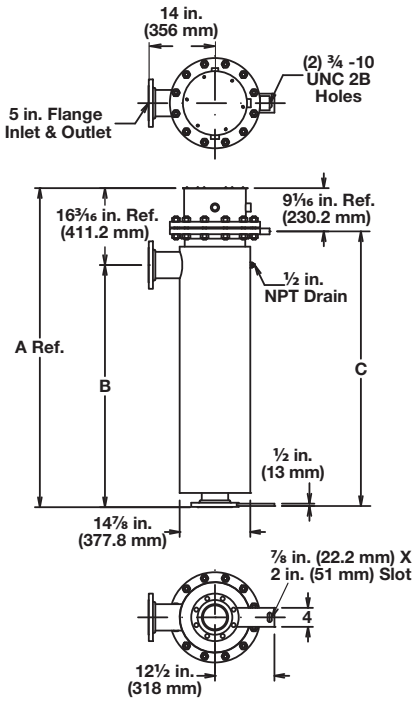
⑤ When steel vessel materials are used in this application, some rust may be present in the process media

⑧ Can be wired for 1-phase operation

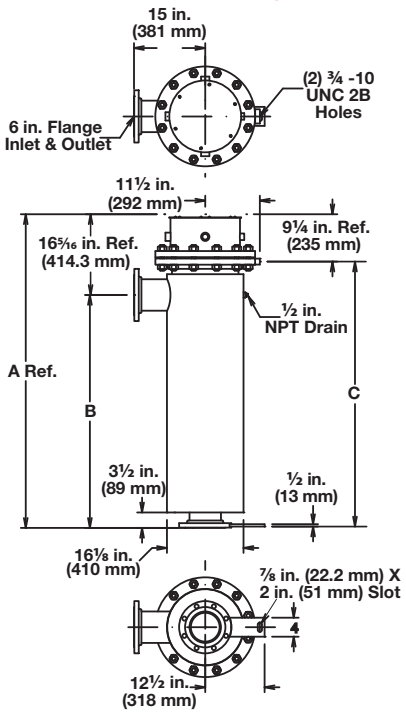
10 inch - 150 lb ANSI Flange



12 inch - 150 lb ANSI Flange



14 inch - 150 lb ANSI Flange



WATROD and FIREBAR Circulation Heaters

Application: Forced Air and Caustic Solutions

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

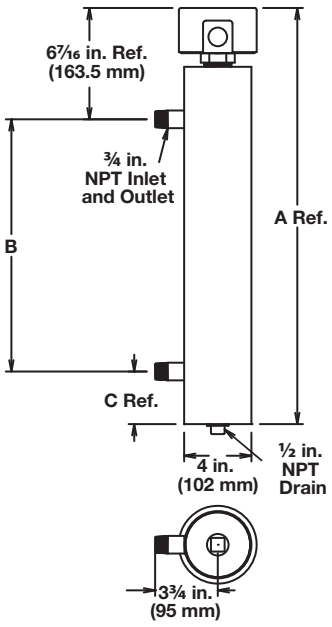
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
1¼ inch NPT Screw Plug (WATROD)										
23 W/in² ④ Steel Tank 2-Incoloy Elements (3.6 W/cm²)	120/240	1.0	1	1	**CBEN13G6S**	RS	21 (10)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	120/240	1.5	1	1	**CBEN19A6S**	RS	29 (14)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	120/240	2.0	1	1	**CBEN24G6S**	RS	29 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
2½ inch NPT Screw Plug (WATROD)										
23 W/in² Steel Tank 3-Incoloy Elements (3.6 W/cm²)	240	3.0	3	1	**CBLNA17G3S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	3.0	3	1	**CBLNA17G5S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	4.5	3	1	**CBLNA24R3S**	RS	27 (13)	44¾ (1135)	32½ (1129)	26½ (673)
	480	4.5	3	1	**CBLNA24R5S**	RS	27 (13)	44¾ (1135)	32½ (1129)	26½ (673)
	240	6.0	3	1	**CBLNA32G3S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	480	6.0	3	1	**CBLNA32G5S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	240	7.5	3	1	**CBLNA39R3S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	480	7.5	3	1	**CBLNA39R5S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	240	9.0	3	1	**CBLNA47G3S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
	480	9.0	3	1	**CBLNA47G5S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)

④ Wired for higher voltage

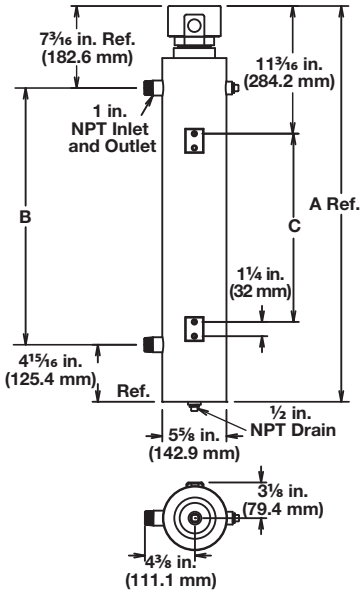
RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

1¼ inch NPT Screw Plug



2½ inch NPT Screw Plug



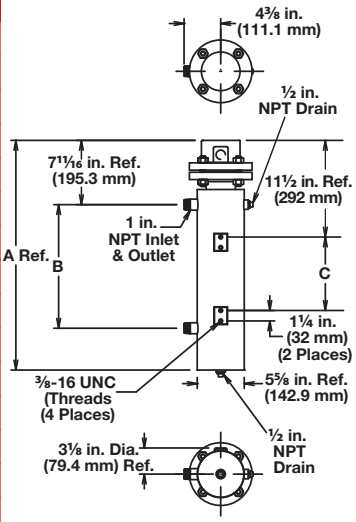
WATROD and FIREBAR Circulation Heaters

Application: Forced Air and Caustic Solutions

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
3 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 3-Incoloy Elements (3.6 W/cm²)	240	3.0	1	1	**CFMNA18A10S**	RS	68 (31)	35¼ (894)	22½ (573)	16½ (419)
	240	3.0	3	1	**CFMNA18A3S**	RS	68 (31)	35¼ (894)	22½ (573)	16½ (419)
	480	3.0	1	1	**CFMNA18A11S**	RS	68 (31)	35¼ (894)	22½ (573)	16½ (419)
	480	3.0	3	1	**CFMNA18A5S**	RS	68 (31)	35¼ (894)	22½ (573)	16½ (419)
	240	4.5	1	1	**CFMNA25J10S**	RS	78 (36)	45¼ (1148)	32½ (826)	26½ (673)
	240	4.5	3	1	**CFMNA25J3S**	RS	78 (36)	45¼ (1148)	32½ (826)	26½ (673)
	480	4.5	1	1	**CFMNA25J11S**	RS	78 (36)	45¼ (1148)	32½ (826)	26½ (673)
	480	4.5	3	1	**CFMNA25J5S**	RS	78 (36)	45¼ (1148)	32½ (826)	26½ (673)
	240	6.0	1	1	**CFMNA33A10S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	240	6.0	3	1	**CFMNA33A3S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	480	6.0	1	1	**CFMNA33A11S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	480	6.0	3	1	**CFMNA33A5S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	240	7.5	1	1	**CFMNA40J10S**	RS	100 (46)	57¾ (1465)	45 (1143)	39 (991)
	240	7.5	3	1	**CFMNA40J3S**	RS	100 (46)	57¾ (1465)	45 (1143)	39 (991)
	480	7.5	1	1	**CFMNA40J11S**	RS	100 (46)	57¾ (1465)	45 (1143)	39 (991)
	480	7.5	3	1	**CFMNA40J5S**	RS	100 (46)	57¾ (1465)	45 (1143)	39 (991)
	240	9.0	1	1	**CFMNA48A10S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)
	240	9.0	3	1	**CFMNA48A3S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)
	480	9.0	1	1	**CFMNA48A11S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)
	480	9.0	3	1	**CFMNA48A5S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)

3 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

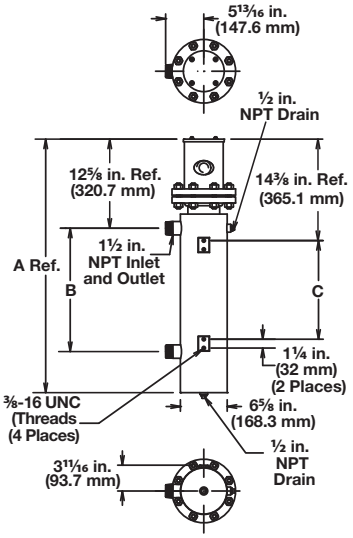
WATROD and FIREBAR Circulation Heaters

Application: Forced Air and Caustic Solutions

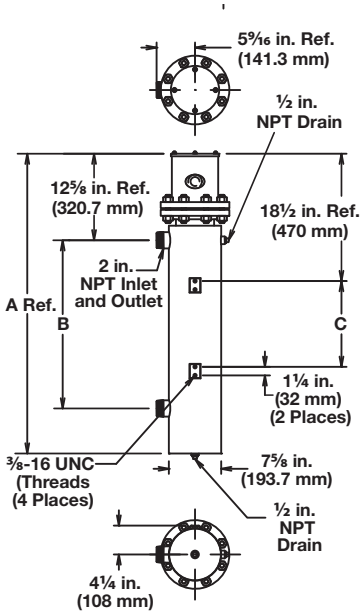
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs	(kg)	"A" Dim. in.	(mm)	"B" Dim. in.	(mm)	"C" Dim. in.	(mm)
4 inch - 150 lb ANSI Flange (WATROD)														
23 W/in² ⑥ Steel Tank 6-Incoloy Elements (3.6 W/cm²)	240	6.0	1	1	**CFONA18A10S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	6.0	3	1	**CFONA18A3S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	480	6.0	1	1	**CFONA18A11S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	480	6.0	3	1	**CFONA18A5S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	9.0	1	1	**CFONA25J10S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	240	9.0	3	1	**CFONA25J3S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	480	9.0	1	1	**CFONA25J11S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	480	9.0	3	1	**CFONA25J5S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	240	12.0	1	2	**CFONA33A10S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	12.0	3	1	**CFONA33A3S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	12.0	1	1	**CFONA33A11S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	12.0	3	1	**CFONA33A5S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	15.0	1	2	**CFONA40J10S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	240	15.0	3	1	**CFONA40J3S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	15.0	1	1	**CFONA40J11S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	15.0	3	1	**CFONA40J5S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	240	18.0	1	2	**CFONA48A10S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	240	18.0	3	1	**CFONA48A3S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	18.0	1	1	**CFONA48A11S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	18.0	3	1	**CFONA48A5S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	240	25.0	3	2	**CFONA64J3S**	RS	298	(136)	91½	(2326)	73	(1854)	66	(1676)
	480	25.0	1	2	**CFONA64J11S**	RS	298	(136)	91½	(2326)	73	(1854)	66	(1676)
	480	25.0	3	1	**CFONA64J5S**	RS	298	(136)	91½	(2326)	73	(1854)	66	(1676)
	240	30.0	3	2	**CFONA77A3S**	RS	306	(139)	91½	(2326)	73	(1854)	66	(1676)
	480	30.0	1	2	**CFONA77A11S**	RS	306	(139)	91½	(2326)	73	(1854)	66	(1676)
	480	30.0	3	1	**CFONA77A5S**	RS	306	(139)	91½	(2326)	73	(1854)	66	(1676)
5 inch - 150 lb ANSI Flange (WATROD)														
23 W/in² ⑥ Steel Tank 6-Incoloy Elements (3.6 W/cm²)	240	9.0	1	1	**CFNNA25J10S**	RS	140	(64)	49¼	(1249.0)	30	(762.0)	14⅞	(377.8)
	240	9.0	3	1	**CFNNA25J3S**	RS	140	(64)	49¼	(1249.0)	30	(762.0)	14⅞	(377.8)
	480	9.0	1	1	**CFNNA25J11S**	RS	140	(64)	49¼	(1249.0)	30	(762.0)	14⅞	(377.8)
	480	9.0	3	1	**CFNNA25J5S**	RS	140	(64)	49¼	(1249.0)	30	(762.0)	14⅞	(377.8)
	240	12.0	1	2	**CFNNA33A10S**	RS	145	(66)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	240	12.0	3	1	**CFNNA33A3S**	RS	145	(66)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	480	12.0	1	1	**CFNNA33A11S**	RS	145	(66)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	480	12.0	3	1	**CFNNA33A5S**	RS	145	(66)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	240	15.0	1	2	**CFNNA40J10S**	RS	167	(76)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	240	15.0	3	1	**CFNNA40J3S**	RS	167	(76)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	480	15.0	1	1	**CFNNA40J11S**	RS	167	(76)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	480	15.0	3	1	**CFNNA40J5S**	RS	167	(76)	56¼	(1427.0)	37	(940.0)	18⅝	(473.1)
	240	18.0	1	2	**CFNNA48A10S**	RS	180	(82)	67¾	(1719.0)	48½	(1232.0)	25	(633.0)
	240	18.0	3	1	**CFNNA48A3S**	RS	180	(82)	67¾	(1719.0)	48½	(1232.0)	25	(633.0)
	480	18.0	1	1	**CFNNA48A11S**	RS	180	(82)	67¾	(1719.0)	48½	(1232.0)	25	(633.0)
	480	18.0	3	1	**CFNNA48A5S**	RS	180	(82)	67¾	(1719.0)	48½	(1232.0)	25	(633.0)
	240	25.0	3	2	**CFNNA64J3S**	RS	195	(89)	81⅛	(2060.6)	61⅞	(1571.6)	30⅞	(784.2)
	480	25.0	1	2	**CFNNA64J11S**	RS	195	(89)	81⅛	(2060.6)	61⅞	(1571.6)	30⅞	(784.2)
	480	25.0	3	1	**CFNNA64J5S**	RS	195	(89)	81⅛	(2060.6)	61⅞	(1571.6)	30⅞	(784.2)
	240	30.0	3	2	**CFNNA77A3S**	RS	220	(100)	94⅛	(2390.8)	75	(1902.0)	38	(964.0)
	480	30.0	1	2	**CFNNA77A11S**	RS	220	(100)	94⅛	(2390.8)	75	(1902.0)	38	(964.0)
	480	30.0	3	1	**CFNNA77A5S**	RS	220	(100)	94⅛	(2390.8)	75	(1902.0)	38	(964.0)

4 inch - 150 lb ANSI Flange



5 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

⑥ Can be wired 3-phase wye to produce ⅓ of the rated kW and watt density

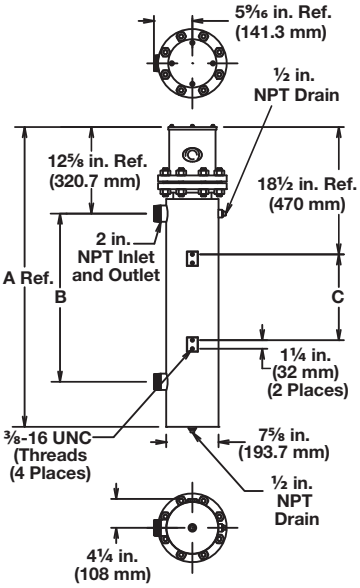
WATROD and FIREBAR Circulation Heaters

Application: Forced Air and Caustic Solutions

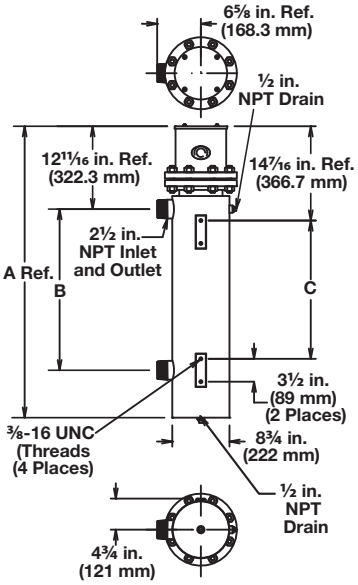
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
5 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² ⑥ Steel Tank 9-Incoloy Elements (3.6 W/cm²)	240	14.0	1	3	**CFNNA25J10XS**	RS	145 (66)	49¼ (1249.0)	30 (762.0)	14⅞ (377.8)
	240	14.0	3	1	**CFNNA25J3XS**	RS	145 (66)	49¼ (1249.0)	30 (762.0)	14⅞ (377.8)
	480	14.0	1	1	**CFNNA25J11XS**	RS	145 (66)	49¼ (1249.0)	30 (762.0)	14⅞ (377.8)
	480	14.0	3	1	**CFNNA25J5XS**	RS	145 (66)	49¼ (1249.0)	30 (762.0)	14⅞ (377.8)
	240	18.0	1	3	**CFNNA33A10XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	18.0	3	1	**CFNNA33A3XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	18.0	1	1	**CFNNA33A11XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	18.0	3	1	**CFNNA33A5XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	23.0	1	3	**CFNNA40J10XS**	RS	174 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	23.0	3	3	**CFNNA40J3XS**	RS	174 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	23.0	1	1	**CFNNA40J11XS**	RS	174 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	23.0	3	1	**CFNNA40J5XS**	RS	174 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	27.0	1	3	**CFNNA48A10XS**	RS	189 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	27.0	3	3	**CFNNA48A3XS**	RS	189 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	27.0	1	3	**CFNNA48A11XS**	RS	189 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	27.0	3	1	**CFNNA48A5XS**	RS	189 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	38.0	3	3	**CFNNA64J3XS**	RS	207 (94)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	38.0	1	3	**CFNNA64J11XS**	RS	207 (94)	81⅛ (2059.0)	61⅞ (1571.6)	30⅞ (784.2)
	480	38.0	3	1	**CFNNA64J5XS**	RS	207 (94)	81⅛ (2059.0)	61⅞ (1571.6)	30⅞ (784.2)
	240	45.0	3	3	**CFNNA77A3XS**	RS	233 (106)	94⅛ (2389.0)	75 (1902.0)	38 (964.0)
	480	45.0	1	3	**CFNNA77A11XS**	RS	233 (106)	94⅛ (2389.0)	75 (1902.0)	38 (964.0)
	480	45.0	3	3	**CFNNA77A5XS**	RS	233 (106)	94⅛ (2389.0)	75 (1902.0)	38 (964.0)
6 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² ⑥ Steel Tank 12-Incoloy Elements (3.6 W/cm²)	240	12.0	1	2	**CFPNA17R10S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	240	12.0	3	1	**CFPNA17R3S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	480	12.0	1	1	**CFPNA17R11S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	480	12.0	3	1	**CFPNA17R5S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	240	18.0	1	2	**CFPNA25G10S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	18.0	3	1	**CFPNA25G3S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	18.0	1	1	**CFPNA25G11S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	18.0	3	1	**CFPNA25G5S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	24.0	1	3	**CFPNA32R10S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	24.0	3	2	**CFPNA32R3S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	24.0	1	2	**CFPNA32R11S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	24.0	3	1	**CFPNA32R5S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	30.0	1	3	**CFPNA40G10S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	30.0	3	2	**CFPNA40G3S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	30.0	1	2	**CFPNA40G11S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	30.0	3	1	**CFPNA40G5S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	36.0	1	4	**CFPNA47R10S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	36.0	3	2	**CFPNA47R3S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	36.0	1	2	**CFPNA47R11S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	36.0	3	1	**CFPNA47R5S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	50.0	3	4	**CFPNA64G3S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	50.0	1	3	**CFPNA64G11S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	50.0	3	2	**CFPNA64G5S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	240	60.0	3	4	**CFPNA76R3S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
	480	60.0	1	3	**CFPNA76R11S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
	480	60.0	3	2	**CFPNA76R5S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)

5 inch - 150 lb ANSI Flange



6 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

⑥ Can be wired 3-phase wye to produce ⅓ of the rated kW and watt density

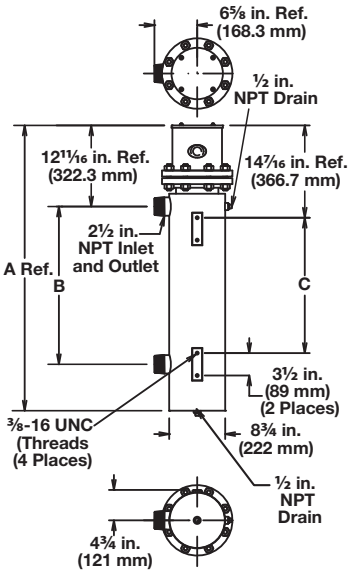
WATROD and FIREBAR Circulation Heaters

Application: Forced Air and Caustic Solutions

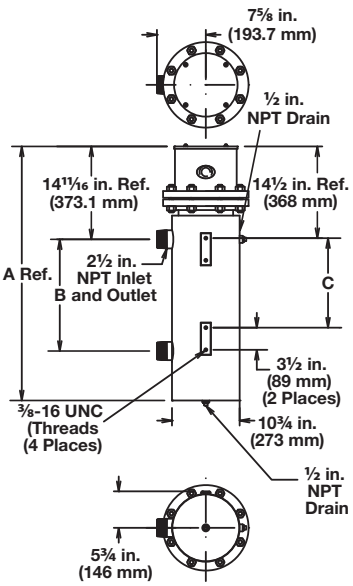
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 15-Incoloy Elements (3.6 W/cm²)	240	15.0	1	3	**CFPNA17R10XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	15.0	3	1	**CFPNA17R3XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	15.0	1	1	**CFPNA17R11XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	15.0	3	1	**CFPNA17R5XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	23.0	1	3	**CFPNA25G10XS**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	23.0	3	5	**CFPNA25G3XS**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	23.0	1	1	**CFPNA25G11XS**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	23.0	3	1	**CFPNA25G5XS**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	30.0	1	3	**CFPNA32R10XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	30.0	3	5	**CFPNA32R3XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	30.0	1	3	**CFPNA32R11XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	30.0	3	1	**CFPNA32R5XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	38.0	1	5	**CFPNA40G10XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	240	38.0	3	5	**CFPNA40G3XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	480	38.0	1	3	**CFPNA40G11XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	480	38.0	3	1	**CFPNA40G5XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	240	45.0	1	5	**CFPNA47R10XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	240	45.0	3	5	**CFPNA47R3XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	480	45.0	1	3	**CFPNA47R11XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	480	45.0	3	5	**CFPNA47R5XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	240	63.0	3	5	**CFPNA64G3XS**	RS	370 (168)	93 (2361)	73 (1854)	66 (1676)
	480	63.0	1	3	**CFPNA64G11XS**	RS	370 (168)	93 (2361)	73 (1854)	66 (1676)
	480	63.0	3	5	**CFPNA64G5XS**	RS	370 (168)	93 (2361)	73 (1854)	66 (1676)
	240	75.0	3	5	**CFPNA76R3XS**	RS	381 (173)	93 (2361)	73 (1854)	66 (1676)
	480	75.0	1	5	**CFPNA76R11XS**	RS	381 (173)	93 (2361)	73 (1854)	66 (1676)
	480	75.0	3	5	**CFPNA76R5XS**	RS	381 (173)	93 (2361)	73 (1854)	66 (1676)
8 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 18-Incoloy Elements (3.6 W/cm²)	240	30.0	1	3	**CFRNA32N10S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	30.0	3	2	**CFRNA32N3S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	30.0	1	2	**CFRNA32N11S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	30.0	3	1	**CFRNA32N5S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	40.0	3	3	**CFRNA43E3S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	40.0	1	2	**CFRNA43E11S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	40.0	3	3	**CFRNA43E5S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	50.0	3	3	**CFRNA51M3S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	50.0	1	3	**CFRNA51M11S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	50.0	3	2	**CFRNA51M5S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
8 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 24-Incoloy Elements (3.6 W/cm²)	240	40.0	1	4	**CFRNA33D10XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	40.0	3	4	**CFRNA33D3XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	40.0	1	2	**CFRNA33D11XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	40.0	3	2	**CFRNA33D5XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	53.0	3	4	**CFRNA43M3XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	53.0	1	3	**CFRNA43M11XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	53.0	3	2	**CFRNA43M5XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	67.0	3	4	**CFRNA51M3XS**	RS	457 (207)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	67.0	1	3	**CFRNA51M11XS**	RS	457 (207)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	67.0	3	2	**CFRNA51M5XS**	RS	457 (207)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)

6 inch - 150 lb ANSI Flange



8 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

WATROD and FIREBAR Circulation Heaters

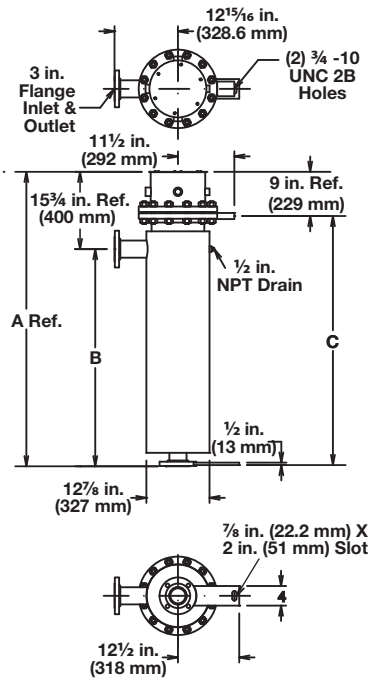
Application: Forced Air and Caustic Solutions

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

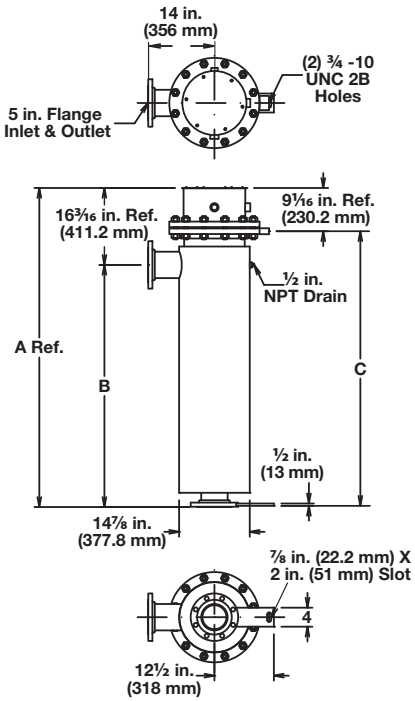
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
10 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 27-Incoloy Elements (3.6 W/cm²)	240	60.0	3	3	**CFSNA43N3S**	S	515 (234)	76⅝ (1946.3)	60⅞ (1546.2)	67⅝ (1717.7)
	480	60.0	3	3	**CFSNA43N5S**	S	515 (234)	76⅝ (1946.3)	60⅞ (1546.2)	67⅝ (1717.7)
	240	75.0	3	9	**CFSNA51N3S**	S	530 (241)	84⅛ (2136.8)	68⅜ (1736.2)	75⅛ (1908.2)
	480	75.0	3	3	**CFSNA51N5S**	S	530 (241)	84⅛ (2136.8)	68⅜ (1736.2)	75⅛ (1908.2)
12 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 36-Incoloy Elements (3.6 W/cm²)	480	80.0	3	3	**CFTNA43L5S**	S	565 (257)	76⅞ (1952.6)	60¾ (1541)	67⅞ (1724.0)
	480	100.0	3	3	**CFTNA51L5S**	S	585 (266)	84⅜ (2143.1)	68¼ (1732)	75⅜ (1914.5)
14 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 45-Incoloy Elements (3.6 W/cm²)	480	100.0	3	3	**CFWNA43J5S**	S	570 (259)	75¾ (1924)	59½ (1510)	66½ (1689)
	480	125.0	3	5	**CFWNA51J5S**	S	590 (268)	83¼ (2115)	67 (1700)	74 (1880)

- **S** - Standard, 10 day lead time

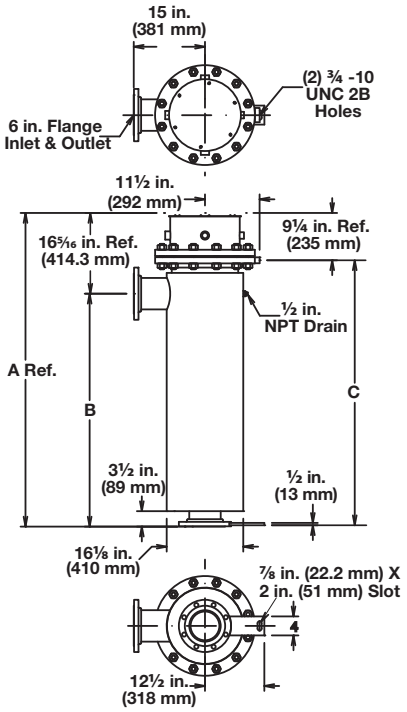
10 inch - 150 lb ANSI Flange



12 inch - 150 lb ANSI Flange



14 inch - 150 lb ANSI Flange



WATROD and FIREBAR Circulation Heaters

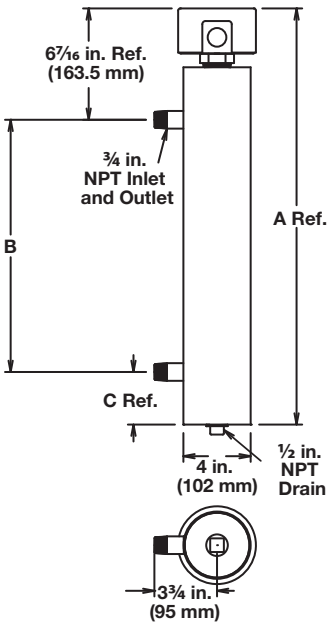
Application: Lightweight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
1¼ inch NPT Screw Plug (WATROD)										
23 W/in² ④ Steel Tank 2-Steel Element (3.6 W/cm²)	120/240	1.5	1	1	**CBES19G6S**	RS	29 (14)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	120/240	2.0	1	1	**CBES25G6S**	RS	29 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
1¼ inch NPT Screw Plug (FIREBAR)										
30 W/in² Steel Tank 1-Incoloy Elements (4.7 W/cm²)	240	1.7	3	1	**CBDNF16G12S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	480	1.7	3	1	**CBDNF16G13S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	2.2	3	1	**CBDNF19G12S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	2.2	3	1	**CBDNF19G13S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	2.8	3	1	**CBDNF24L12S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	2.8	3	1	**CBDNF24L13S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	3.5	3	1	**CBDNF29R12S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	3.5	3	1	**CBDNF29R13S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	4.3	3	1	**CBDNF34R12S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	4.3	3	1	**CBDNF34R13S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	5.7	3	1	**CBDNF45G12S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	5.7	3	1	**CBDNF45G13S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	240	7.2	3	1	**CBDNF55R12S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	7.2	3	1	**CBDNF55R13S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)
1¼ inch NPT Screw Plug (FIREBAR)										
23 W/in² Steel Tank 1-Incoloy (3.6 W/cm²)	240	1.25	3	1	**CBDNF16G20S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	1.65	3	1	**CBDNF19G20S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	2.15	3	1	**CBDNF24L20S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	2.15	3	1	**CBDNF24L19S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	2.65	3	1	**CBDNF29R20S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	2.65	3	1	**CBDNF29R19S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	3.20	3	1	**CBDNF34R20S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	3.20	3	1	**CBDNF34R19S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	4.25	3	1	**CBDNF45G20S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	4.25	3	1	**CBDNF45G19S**	RS	69 (32)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	240	5.40	3	1	**CBDNF55R20S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)
	480	5.40	3	1	**CBDNF55R19S**	RS	71 (33)	63⅝ (1616.1)	53 (1346)	4 (102.0)

④ Wired for higher voltage

1¼ inch NPT Screw Plug



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

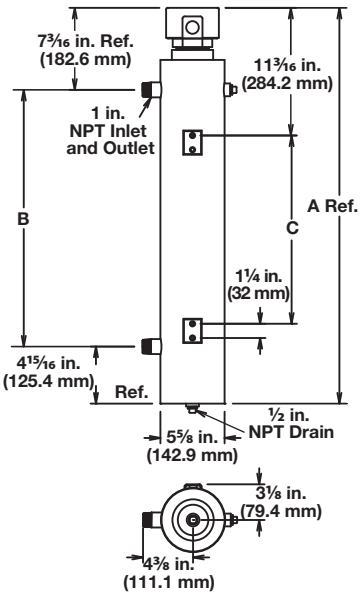
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
2½ inch NPT Screw Plug (WATROD)										
23 W/in² Steel Tank 3-Steel (3.6 W/cm²)	240	3.0	3	1	**CBLS717E3S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	3.0	3	1	**CBLS717E5S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	4.5	3	1	**CBLS724N3S**	RS	27 (13)	34¾ (881)	22½ (572)	16½ (419)
	480	4.5	3	1	**CBLS724N5S**	RS	27 (13)	34¾ (881)	22½ (572)	16½ (419)
	240	6.0	3	1	**CBLS732E3S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	480	6.0	3	1	**CBLS732E5S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	240	7.5	3	1	**CBLS739N3S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	480	7.5	3	1	**CBLS739N5S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	240	9.0	3	1	**CBLS747E3S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
	480	9.0	3	1	**CBLS747E5S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
2½ inch NPT Screw Plug (FIREBAR)										
30 W/in² ③ Steel Tank 3-Incoloy Elements (4.7 W/cm²)	240	5.0	3	1	**CBLNF15C12S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	480	5.0	3	1	**CBLNF15C13S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	6.5	3	1	**CBLNF18C12S**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	6.5	3	1	**CBLNF18C13S**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	8.5	3	1	**CBLNF23C12S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	480	8.5	3	1	**CBLNF23C13S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	240	10.5	3	1	**CBLNF28L12S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	10.5	3	1	**CBLNF28L13S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	12.8	3	1	**CBLNF33L12S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	12.8	3	1	**CBLNF33L13S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	17.0	3	1	**CBLNF44C12S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	480	17.0	3	1	**CBLNF44C13S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	480	21.5	3	1	**CBLNF54L13S**	RS	52 (24)	63¾ (1618)	51½ (1308)	6½ (1181)
2½ inch NPT Screw Plug (FIREBAR)										
23 W/in² ⑧ Steel Tank 3-Incoloy (3.6 W/cm²)	240	3.80	3	1	**CBLNF15C20S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	4.90	3	1	**CBLNF18C20S**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	6.40	3	1	**CBLNF23C20S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	480	6.40	3	1	**CBLNF23C19S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	240	7.90	3	1	**CBLNF28L20S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	7.90	3	1	**CBLNF28L19S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	9.60	3	1	**CBLNF33L20S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	9.60	3	1	**CBLNF33L19S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	12.80	3	1	**CBLNF44C20S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	480	12.80	3	1	**CBLNF44C19S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	240	16.10	3	1	**CBLNF54L20S**	RS	52 (24)	63¾ (1618)	51½ (1308)	46½ (1181)
	480	16.10	3	1	**CBLNF54L19S**	RS	52 (24)	63¾ (1618)	51½ (1308)	46½ (1181)

2½ inch NPT Screw Plug



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

③ Wired for 3-phase operation only

⑧ Can be wired for 1-phase operation

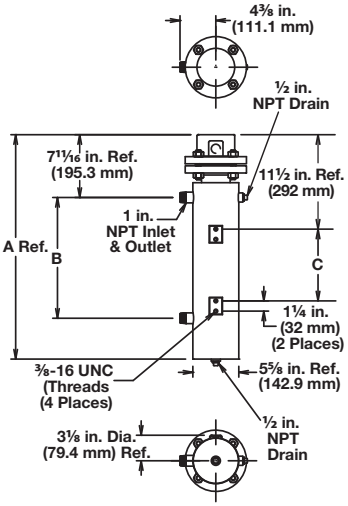
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

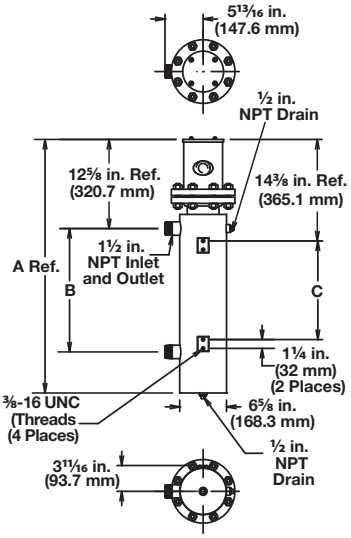
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs	(kg)	"A" Dim. in.	(mm)	"B" Dim. in.	(mm)	"C" Dim. in.	(mm)
3 inch - 150 lb ANSI Flange (WATROD)														
23 W/in² Steel Tank 3-Steel Elements (3.6 W/cm²)	240	3.0	1	1	**CFMS718A10S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	240	3.0	3	1	**CFMS718A3S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	480	3.0	1	1	**CFMS718A11S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	480	3.0	3	1	**CFMS718A5S**	RS	68	(31)	35¼	(894)	22½	(573)	16½	(419)
	240	4.5	1	1	**CFMS725J10S**	RS	78	(36)	35¼	(894)	22½	(573)	16½	(419)
	240	4.5	3	1	**CFMS725J3S**	RS	78	(36)	35¼	(894)	22½	(573)	16½	(419)
	480	4.5	1	1	**CFMS725J11S**	RS	78	(36)	35¼	(894)	22½	(573)	16½	(419)
	480	4.5	3	1	**CFMS725J5S**	RS	78	(36)	35¼	(894)	22½	(573)	16½	(419)
	240	6.0	1	2	**CFMS733A10S**	RS	96	(44)	45¼	(1148)	32½	(826)	26½	(673)
	240	6.0	3	1	**CFMS733A3S**	RS	96	(44)	45¼	(1148)	32½	(826)	26½	(673)
	480	6.0	1	1	**CFMS733A11S**		96	(44)	45¼	(1148)	32½	(826)	26½	(673)
	480	6.0	3	1	**CFMS733A5S**	RS	96	(44)	45¼	(1148)	32½	(826)	26½	(673)
	240	7.5	1	2	**CFMS740J10S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	240	7.5	3	1	**CFMS740J3S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	480	7.5	1	1	**CFMS740J11S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	480	7.5	3	1	**CFMS740J5S**	RS	100	(46)	57¾	(1465)	45	(1143)	39	(991)
	240	9.0	1	2	**CFMS748A10S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
	240	9.0	3	1	**CFMS748A3S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
	480	9.0	1	1	**CFMS748A11S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
	480	9.0	3	1	**CFMS748A5S**	RS	107	(49)	57¾	(1465)	45	(1143)	39	(991)
4 inch - 150 lb ANSI Flange (WATROD)														
23 W/in² Steel Tank 6-Incoloy Elements (3.6 W/cm²)	240	6.0	1	1	**CFOS718A10S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	6.0	3	1	**CFOS718A3S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	480	6.0	1	1	**CFOS718A11S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	480	6.0	3	1	**CFOS718A5S**	RS	125	(57)	39	(989)	20½	(521)	17	(432)
	240	9.0	1	1	**CFOS725J10S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	240	9.0	3	1	**CFOS725J3S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	480	9.0	1	1	**CFOS725J11S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	480	9.0	3	1	**CFOS725J5S**	RS	160	(73)	39	(989)	20½	(521)	17	(432)
	240	12.0	1	2	**CFOS733A10S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	12.0	3	1	**CFOS733A3S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	12.0	1	1	**CFOS733A11S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	480	12.0	3	1	**CFOS733A5S**	RS	163	(74)	49½	(1256)	31	(787)	27½	(699)
	240	15.0	1	2	**CFOS740J10S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	240	15.0	3	1	**CFOS740J3S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	15.0	1	1	**CFOS740J11S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	480	15.0	3	1	**CFOS740J5S**	RS	229	(104)	70½	(1789)	52	(1321)	48½	(1232)
	240	18.0	1	2	**CFOS748A10S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	240	18.0	3	1	**CFOS748A3S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	18.0	1	1	**CFOS748A11S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	480	18.0	3	1	**CFOS748A5S**	RS	234	(107)	70½	(1789)	52	(1321)	48½	(1232)
	240	25.0	3	2	**CFOS764J3S**	RS	298	(136)	91½	(2326)	73	(1854)	66	(1676)
	480	25.0	1	2	**CFOS764J11S**	RS	298	(136)	91½	(2326)	73	(1854)	66	(1676)
	480	25.0	3	1	**CFOS764J5S**	RS	298	(136)	91½	(2326)	73	(1854)	66	(1676)
	240	30.0	3	2	**CFOS777A3S**	RS	306	(139)	91½	(2326)	73	(1854)	66	(1676)
	480	30.0	1	2	**CFOS777A11S**	RS	306	(139)	91½	(2326)	73	(1854)	66	(1676)
	480	30.0	3	1	**CFOS777A5S**	RS	306	(139)	91½	(2326)	73	(1854)	66	(1676)

3 inch - 150 lb ANSI Flange



4 inch - 150 lb ANSI Flange



RAPID SHIP • **RS** - Same day shipment up to 5 pieces

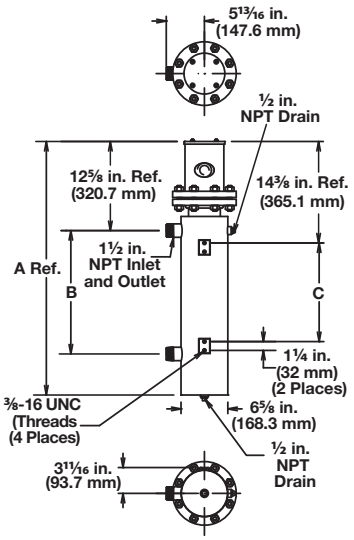
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

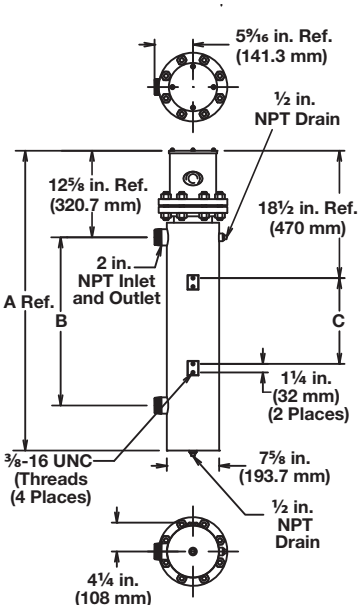
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
4 inch - 150 lb ANSI Flange (FIREBAR)										
30 W/in² Steel Tank 6-Incoloy (4.7 W/cm²)	240	10.0	3	1	**CFONF16J12S**	RS	128 (58)	39 (989)	20½ (521)	17 (432)
	480	10.0	3	1	**CFONF16J13S**	RS	128 (58)	39 (989)	20½ (521)	17 (432)
	240	13.0	3	1	**CFONF19J12S**	RS	130 (59)	39 (989)	20½ (521)	17 (432)
	480	13.0	3	1	**CFONF19J13S**	RS	130 (59)	39 (989)	20½ (521)	17 (432)
	240	17.0	3	1	**CFONF24J12S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	480	17.0	3	1	**CFONF24J13S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	240	21.0	3	2	**CFONF30A12S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	480	21.0	3	1	**CFONF30A13S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	240	25.5	3	2	**CFONF35A12S**	RS	170 (78)	49½ (1256)	31 (787)	27½ (699)
	480	25.5	3	1	**CFONF35A13S**	RS	170 (78)	49½ (1256)	31 (787)	27½ (699)
	240	34.0	3	2	**CFONF45J12S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	34.0	3	1	**CFONF45J13S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	43.0	3	2	**CFONF56A13S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)
4 inch - 150 lb ANSI Flange (FIREBAR)										
23 W/in² Steel Tank 6-Incoloy Elements (3.6 W/cm²)	240	7.5	3	1	**CFONF16J20S**	RS	128 (58)	39 (989)	20½ (521)	17 (432)
	240	10.0	3	1	**CFONF19J20S**	RS	130 (59)	39 (989)	20½ (521)	17 (432)
	240	12.8	3	1	**CFONF24J20S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	480	12.8	3	1	**CFONF24J19S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	240	15.8	3	1	**CFONF30A20S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	480	15.8	3	1	**CFONF30A19S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	240	19.0	3	1	**CFONF35A20S**	RS	170 (78)	49½ (1256)	31 (787)	27½ (699)
	480	19.0	3	1	**CFONF35A19S**	RS	170 (78)	49½ (1256)	31 (787)	27½ (699)
	240	25.0	3	2	**CFONF45J20S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	25.0	3	1	**CFONF45J19S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	240	32.3	3	2	**CFONF56A20S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)
	480	32.3	3	1	**CFONF56A19S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)
5 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 6-Steel (3.6 W/cm²)	240	12.00	1	2	**CFNS733A10S**	RS	145 (66)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	12.00	3	1	**CFNS733A3S**	RS	145 (66)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	12.00	1	1	**CFNS733A11S**	RS	145 (66)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	12.00	3	1	**CFNS733A5S**	RS	145 (66)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	15.00	1	2	**CFNS740J10S**	RS	167 (76)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	15.00	3	1	**CFNS740J3S**	RS	167 (76)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	15.00	1	1	**CFNS740J11S**	RS	167 (76)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	15.00	3	1	**CFNS740J5S**	RS	167 (76)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	18.00	1	2	**CFNS748A10S**	RS	180 (82)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	18.00	3	1	**CFNS748A3S**	RS	180 (82)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	18.00	1	1	**CFNS748A11S**	RS	180 (82)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	18.00	3	1	**CFNS748A5S**	RS	180 (82)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	25.00	3	2	**CFNS764J3S**	RS	195 (89)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	25.00	1	2	**CFNS764J11S**	RS	195 (89)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	25.00	3	1	**CFNS764J5S**	RS	195 (89)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	240	30.00	3	2	**CFNS777A3S**	RS	220 (100)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
	480	30.00	1	2	**CFNS777A11S**	RS	220 (100)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
	480	30.00	3	1	**CFNS777A5S**	RS	220 (100)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)

4 inch - 150 lb ANSI Flange



5 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

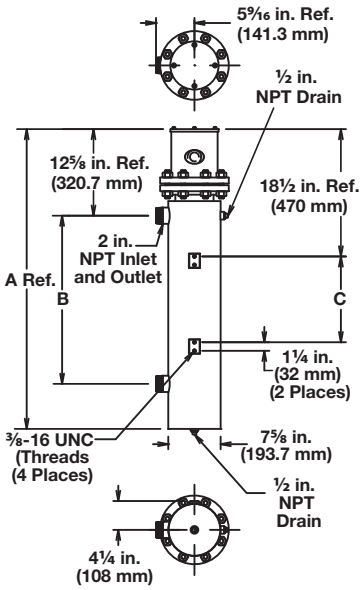
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

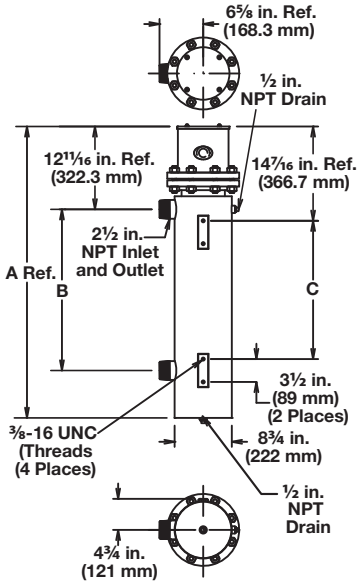
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
5 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 9-Steel Elements (3.6 W/cm²)	240	18.0	1	3	**CFNS733A10XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	240	18.0	3	1	**CFNS733A3XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	480	18.0	1	1	**CFNS733A11XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	480	18.0	3	1	**CFNS733A5XS**	RS	150 (68)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	240	23.0	1	3	**CFNS740J10XS**	RS	173 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	240	23.0	3	3	**CFNS740J3XS**	RS	173 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	480	23.0	1	1	**CFNS740J11XS**	RS	173 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	480	23.0	3	1	**CFNS740J5XS**	RS	173 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (471.1)
	240	27.0	1	3	**CFNS748A10XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	27.0	3	3	**CFNS748A3XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	27.0	1	3	**CFNS748A11XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	27.0	3	1	**CFNS748A5XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	38.0	3	3	**CFNS764J3XS**	RS	206 (94)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	38.0	1	3	**CFNS764J11XS**	RS	206 (94)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	38.0	3	1	**CFNS764J5XS**	RS	206 (94)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	240	45.0	3	3	**CFNS777A3XS**	RS	233 (106)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
	480	45.0	1	3	**CFNS777A11XS**	RS	233 (106)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
	480	45.0	3	3	**CFNS777A5XS**	RS	233 (106)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
6 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 12-Incoloy Elements (3.6 W/cm²)	240	12.0	1	2	**CFPS717R10S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	240	12.0	3	1	**CFPS717R3S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	480	12.0	1	1	**CFPS717R11S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	480	12.0	3	1	**CFPS717R5S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	240	18.0	1	2	**CFPS725G10S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	18.0	3	1	**CFPS725G3S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	18.0	1	1	**CFPS725G11S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	18.0	3	1	**CFPS725G5S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	24.0	1	3	**CFPS732R10S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	24.0	3	2	**CFPS732R3S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	24.0	1	2	**CFPS732R11S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	24.0	3	1	**CFPS732R5S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	30.0	1	3	**CFPS740G10S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	30.0	3	2	**CFPS740G3S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	30.0	1	2	**CFPS740G11S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	30.0	3	1	**CFPS740G5S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	36.0	1	4	**CFPS747R10S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	36.0	3	2	**CFPS747R3S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	36.0	1	2	**CFPS747R11S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	36.0	3	1	**CFPS747R5S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	50.0	3	4	**CFPS764G3S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	50.0	1	3	**CFPS764G11S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	50.0	3	2	**CFPS764G5S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	240	60.0	3	4	**CFPS776R3S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
	480	60.0	1	3	**CFPS776R11S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
	480	60.0	3	2	**CFPS776R5S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)

5 inch - 150 lb ANSI Flange



6 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

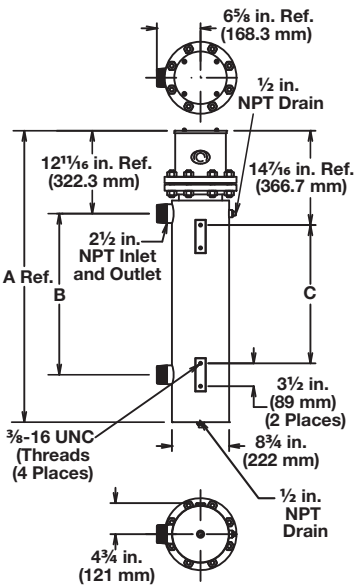
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 15-Steel Elements (3.6 W/cm²)	240	15.0	1	3	**CFPS717R10XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	15.0	3	1	**CFPS717R3XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	15.0	1	1	**CFPS717R11XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	15.0	3	1	**CFPS717R5XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	23.0	1	3	**CFPS725G10XS**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	23.0	3	5	**CFPS725G3XS**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	23.0	1	1	**CFPS725G11XS**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	23.0	3	1	**CFPS725G5XS**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	30.0	1	3	**CFPS732R10XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	30.0	3	5	**CFPS732R3XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	30.0	1	3	**CFPS732R11XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	30.0	3	1	**CFPS732R5XS**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	38.0	1	5	**CFPS740G10XS**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	38.0	3	5	**CFPS740G3XS**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	38.0	1	3	**CFPS740G11XS**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	38.0	3	1	**CFPS740G5XS**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	45.0	1	5	**CFPS747R10XS**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	45.0	3	5	**CFPS747R3XS**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	45.0	1	3	**CFPS747R11XS**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	45.0	3	5	**CFPS747R5XS**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	63.0	3	5	**CFPS764G3XS**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	63.0	1	3	**CFPS764G11XS**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	63.0	3	5	**CFPS764G5XS**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	240	75.0	3	5	**CFPS776R3XS**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
	480	75.0	1	5	**CFPS776R11XS**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
	480	75.0	3	5	**CFPS776R5XS**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
6 inch - 150 lb ANSI Flange (FIREBAR)										
30 W/in² ③ Steel Tank 15-Incoloy Elements (4.7 W/cm²)	240	25.0	3	5	**CFPNF16J12S**	RS	220 (100)	40½ (1027)	20½ (521)	17 (432)
	480	25.0	3	5	**CFPNF16J13S**	RS	220 (100)	40½ (1027)	20½ (521)	17 (432)
	240	32.0	3	5	**CFPNF19J12S**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	480	32.0	3	5	**CFPNF19J13S**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	42.0	3	5	**CFPNF24J12S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	42.0	3	5	**CFPNF24J13S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	52.0	3	5	**CFPNF30A12S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	480	52.0	3	5	**CFPNF30A13S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	240	64.0	3	5	**CFPNF35A12S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	480	64.0	3	5	**CFPNF35A13S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	240	85.0	3	5	**CFPNF45J12S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	480	85.0	3	5	**CFPNF45J13S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	480	110.0	3	5	**CFPNF56A13S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)

6 inch - 150 lb ANSI Flange



③ Wired for 3-phase operation only

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

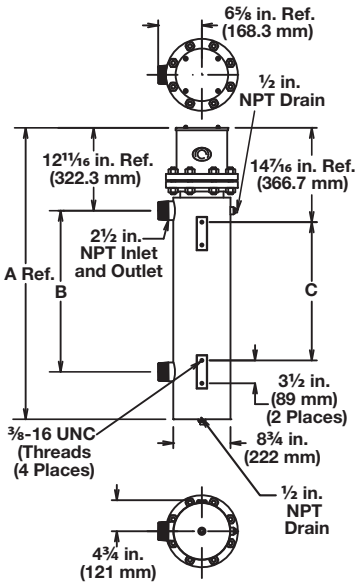
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

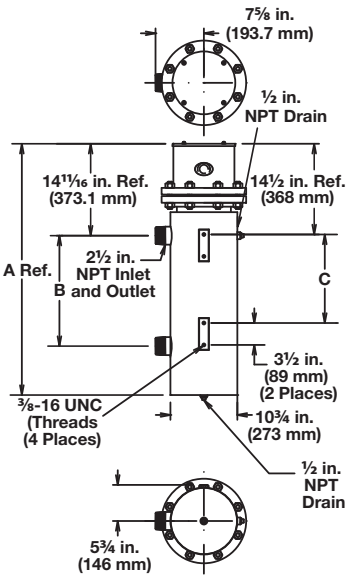
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (FIREBAR)										
23 W/in² Steel Tank 15-Incoloy (3.6 W/cm²)	240	19.0	3	5	**CFPNF16J20S**	RS	220 (100)	40½ (1027)	20½ (521)	17 (432)
	240	24.0	3	5	**CFPNF19J20S**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	32.0	3	5	**CFPNF24J20S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	32.0	3	5	**CFPNF24J19S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	40.0	3	5	**CFPNF30A20S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	480	40.0	3	5	**CFPNF30A19S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	240	48.0	3	5	**CFPNF35A20S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	480	48.0	3	5	**CFPNF35A19S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	240	64.0	3	5	**CFPNF45J20S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	480	64.0	3	5	**CFPNF45J19S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	240	80.0	3	5	**CFPNF56A20S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)
	480	80.0	3	5	**CFPNF56A19S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)
8 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 18-Steel Elements (3.6 W/cm²)	240	30.0	1	3	**CFRS732N10S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	30.0	3	2	**CFRS732N3S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	30.0	1	2	**CFRS732N11S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	30.0	3	1	**CFRS732N5S**	RS	370 (168)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	40.0	3	3	**CFRS743E3S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	40.0	1	2	**CFRS743E11S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	40.0	3	2	**CFRS743E5S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	50.0	3	3	**CFRS751M3S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	50.0	1	3	**CFRS751M11S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	50.0	3	2	**CFRS751M5S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	60.0	3	6	**CFRS762D3S**	RS	480 (218)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	60.0	1	3	**CFRS762D11S**	RS	480 (218)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	60.0	3	2	**CFRS762D5S**	RS	480 (218)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	240	70.0	3	6	**CFRS770M3S**	RS	530 (241)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	70.0	1	6	**CFRS770M11S**	RS	530 (241)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	70.0	3	2	**CFRS770M5S**	RS	530 (241)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	240	80.0	3	6	**CFRS779M3S**	RS	610 (277)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	80.0	3	3	**CFRS779M5S**	RS	610 (277)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)

6 inch - 150 lb ANSI Flange



8 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

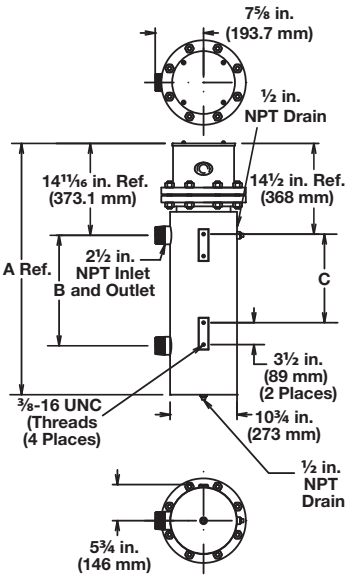
WATROD and FIREBAR Circulation Heaters

Application: Lightweight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
8 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 24-Steel (3.6 W/cm²)	240	40.0	1	4	**CFRS733D10XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	40.0	3	4	**CFRS733D3XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	40.0	1	2	**CFRS733D11XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	40.0	3	2	**CFRS733D5XS**	RS	382 (174)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	53.0	3	4	**CFRS743M3XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	53.0	1	3	**CFRS743M11XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	53.0	3	2	**CFRS743M5XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	67.0	3	4	**CFRS751M3XS**	RS	457 (208)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	67.0	1	3	**CFRS751M11XS**	RS	457 (208)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	67.0	3	2	**CFRS751M5XS**	RS	457 (208)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	80.0	3	8	**CFRS762D3XS**	RS	461 (209)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	80.0	1	4	**CFRS762D11XS**	RS	461 (209)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	80.0	3	4	**CFRS762D5XS**	RS	461 (209)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	240	93.0	3	8	**CFRS770M3XS**	RS	554 (252)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	93.0	1	6	**CFRS770M11XS**	RS	554 (252)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	93.0	3	4	**CFRS770M5XS**	RS	554 (252)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	240	107.0	3	8	**CFRS779M3XS**	RS	636 (289)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	107.0	3	4	**CFRS779M5XS**	RS	636 (289)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)

8 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

WATROD and FIREBAR Circulation Heaters

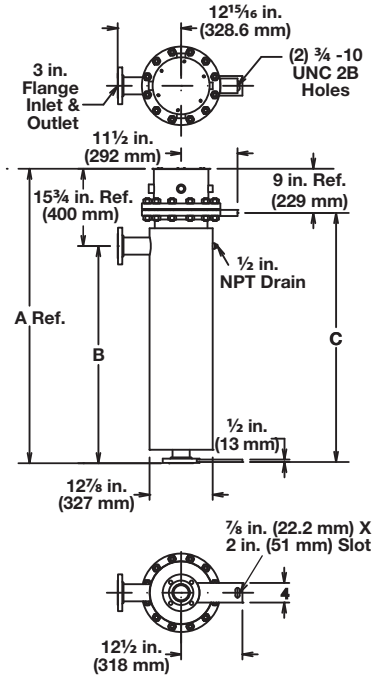
Application: Lightweight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

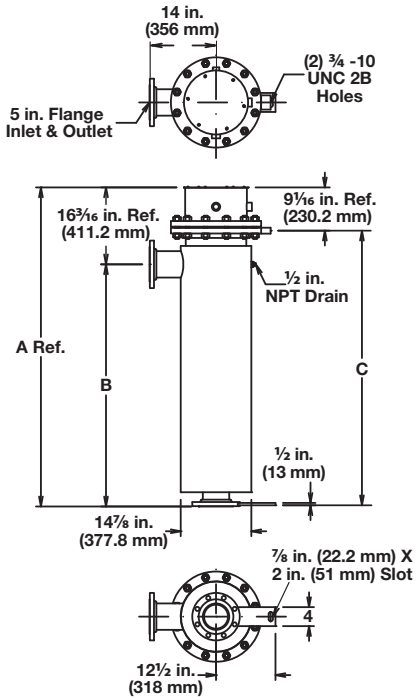
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
10 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 27-Steel Elements (3.6 W/cm²)	480	90.0	3	3	**CFSS762E5S**	S	540 (245)	91¼ (2316.0)	75½ (1916.0)	82¼ (2088.0)
	480	105.0	3	3	**CFSS770N5S**	S	600 (645)	99⅛ (2517.8)	83⅜ (2117.7)	90⅛ (2289.2)
	480	120.0	3	3	**CFSS778N5S**	S	645 (293)	106⅝ (2708.3)	90⅞ (2308.2)	97⅝ (2479.7)
12 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 36-Steel Elements (3.6 W/cm²)	480	140.0	3	4	**CFTS770L5S**	S	650 (295)	99 (2515)	82⅞ (2105.0)	90 (2284)
	480	160.0	3	4	**CFTS778L5S**	S	700 (318)	106½ (2705)	90⅜ (2295.5)	97½ (2475)
14 inch - 150 lb ANSI Flange (WATROD)										
23 W/in² Steel Tank 45-Steel Elements (3.6 W/cm²)	480	150.0	3	5	**CFWS762A5S**	S	650 (295)	90¾ (2305)	74½ (1891)	81½ (2070)
	480	175.0	3	5	**CFWS770J5S**	S	700 (318)	98¼ (2496)	82 (2081)	89 (2261)
	480	200.0	3	5	**CFWS778J5S**	S	780 (354)	105¾ (2686)	89½ (2272)	96½ (2451)

- **S** - Standard, 10 day lead time

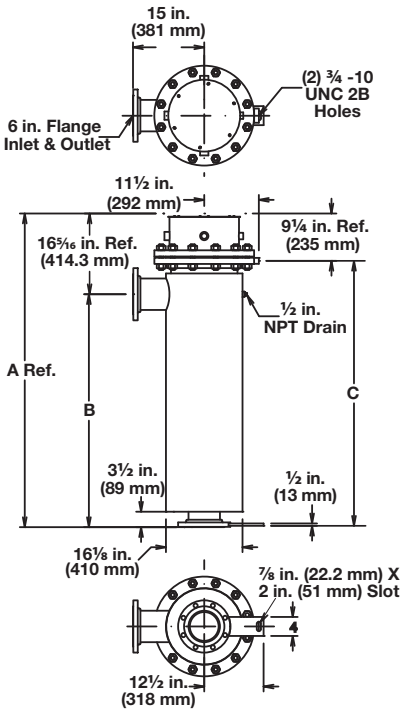
10 inch - 150 lb ANSI Flange



12 inch - 150 lb ANSI Flange



14 inch - 150 lb ANSI Flange



WATROD and FIREBAR Circulation Heaters

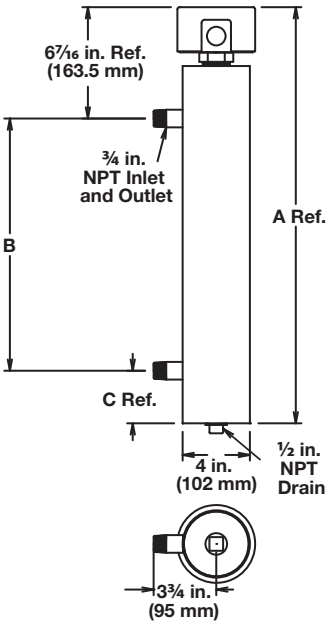
Application: Medium Weight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

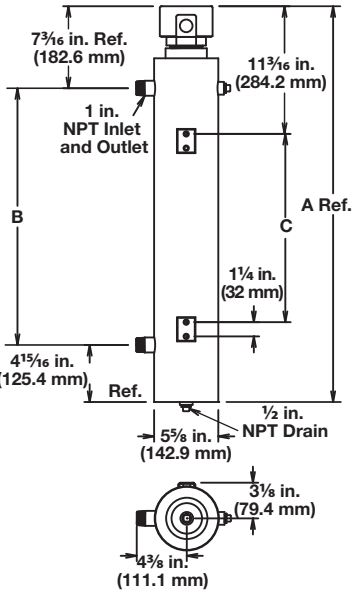
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
1¼ inch NPT Screw Plug (FIREBAR)										
15 W/in² ③ Steel Tank 1-Incoloy Element (2.3 W/cm²)	240	0.67	3	1	**CBDNF13A29S**	RS	25 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	0.83	3	1	**CBDNF15J29S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	1.00	3	1	**CBDNF18A29S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	1.33	3	1	**CBDNF22J29S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	1.33	3	1	**CBDNF22J30S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	1.67	3	1	**CBDNF27J29S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	1.67	3	1	**CBDNF27J30S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	2.00	3	1	**CBDNF32J29S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	2.00	3	1	**CBDNF32J30S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	2.67	3	1	**CBDNF42A29S**	RS	69 (32)	63⅜ (1616.1)	53 (1346)	4 (102.0)
	480	2.67	3	1	**CBDNF42A30S**	RS	69 (32)	63⅜ (1616.1)	53 (1346)	4 (102.0)
	240	3.33	3	1	**CBDNF51J29S**	RS	71 (33)	63⅜ (1616.1)	53 (1346)	4 (102.0)
	480	3.33	3	1	**CBDNF51J30S**	RS	71 (33)	63⅜ (1616.1)	53 (1346)	4 (102.0)
2½ inch NPT Screw Plug (WATROD)										
16 W/in² ③ Steel Tank 3-Incoloy Elements (2.5 W/cm²)	240	2.0	3	1	**CBLN717G12S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	480	2.0	3	1	**CBLN717G13S**	RS	24 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	2.5	3	1	**CBLN719R12S**	RS	26 (12)	34¾ (881)	22½ (572)	16½ (419)
	480	2.5	3	1	**CBLN719R13S**	RS	26 (12)	34¾ (881)	22½ (572)	16½ (419)
	240	3.0	3	1	**CBLN724R12S**	RS	27 (13)	34¾ (881)	22½ (572)	16½ (419)
	480	3.0	3	1	**CBLN724R13S**	RS	27 (13)	34¾ (881)	22½ (572)	16½ (419)
	240	4.0	3	1	**CBLN732G12S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	480	4.0	3	1	**CBLN732G13S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	240	5.0	3	1	**CBLN739R12S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	480	5.0	3	1	**CBLN739R13S**	RS	31 (14)	57¼ (1453)	45 (1143)	39 (991)
	240	6.0	3	1	**CBLN747G12S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
	480	6.0	3	1	**CBLN747G13S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
2½ inch NPT Screw Plug (FIREBAR)										
15 W/in² ③ Steel Tank 3-Incoloy (2.3 W/cm²)	240	2.00	3	1	**CBLNF12A29S**	RS	21 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	2.50	3	1	**CBLNF14J29S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	3.00	3	1	**CBLNF17A29S**	RS	23 (11)	34¾ (881)	22½ (572)	16½ (419)
	240	4.00	3	1	**CBLNF21J29S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	480	4.00	3	1	**CBLNF21J30S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	240	5.00	3	1	**CBLNF26J29S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	5.00	3	1	**CBLNF26J30S**	RS	34 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	6.00	3	1	**CBLNF31J29S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	6.00	3	1	**CBLNF31J30S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	8.00	3	1	**CBLNF41A29S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	480	8.00	3	1	**CBLNF41A30S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	240	10.00	3	1	**CBLNF50J29S**	RS	52 (24)	63¾ (1618)	51½ (1308)	46½ (1181)
	480	10.00	3		**CBLNF50J30S**	RS	52 (24)	63¾ (1618)	51½ (1308)	46½ (1181)

③ Wired for 3-phase operation only

1¼ inch NPT Screw Plug



2½ inch NPT Screw Plug



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

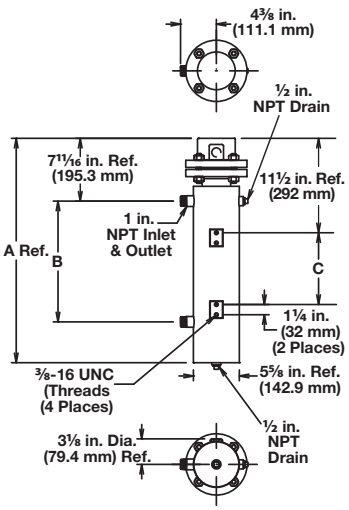
WATROD and FIREBAR Circulation Heaters

Application: Medium Weight Oils and Heat Transfer Oils

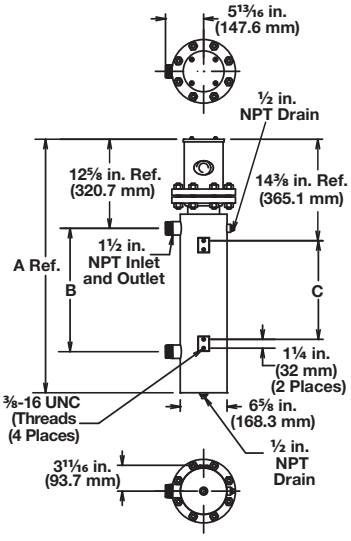
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
3 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 3-Incoloy Element (2.6 W/cm²)	240	2.00	3	1	**CFMN718A12S**	RS	68 (31)	35¼ (894)	22½ (573)	16½ (419)
	480	2.00	3	1	**CFMN718A13S**	RS	68 (31)	35¼ (894)	22½ (573)	16½ (419)
	240	2.50	3	1	**CFMN720J12S**	RS	70 (32)	35¼ (894)	22½ (573)	16½ (419)
	480	2.50	3	1	**CFMN720J13S**	RS	70 (32)	35¼ (894)	22½ (573)	16½ (419)
	240	3.00	3	1	**CFMN725J12S**	RS	78 (36)	45¼ (1148)	32½ (826)	26½ (673)
	480	3.00	3	1	**CFMN725J13S**	RS	78 (36)	45¼ (1148)	32½ (826)	26½ (673)
	240	4.00	3	1	**CFMN733A12S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	480	4.00	3	1	**CFMN733A13S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	240	5.00	3	1	**CFMN740J12S**	RS	100 (46)	57¾ (1465)	45 (1143)	39 (991)
	480	5.00	3	1	**CFMN740J13S**	RS	100 (46)	57¾ (1465)	45 (1143)	39 (991)
	240	6.00	3	1	**CFMN748A12S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)
	480	6.00	3	1	**CFMN748A13S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)
4 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 6-Incoloy Elements (2.5 W/cm²)	240	3.0	3	1	**CFON713J12S**	RS	122 (56)	39 (989)	20½ (521)	17 (432)
	480	3.0	3	1	**CFON713J13S**	RS	122 (56)	39 (989)	20½ (521)	17 (432)
	240	4.0	3	1	**CFON718A12S**	RS	125 (57)	39 (989)	20½ (521)	17 (432)
	480	4.0	3	1	**CFON718A13S**	RS	125 (57)	39 (989)	20½ (521)	17 (432)
	240	5.0	3	1	**CFON720J12S**	RS	127 (58)	39 (989)	20½ (521)	17 (432)
	480	5.0	3	1	**CFON720J13S**	RS	127 (58)	39 (989)	20½ (521)	17 (432)
	240	6.0	3	1	**CFON725J12S**	RS	160 (73)	39 (989)	20½ (521)	17 (432)
	480	6.0	3	1	**CFON725J13S**	RS	160 (73)	39 (989)	20½ (521)	17 (432)
	240	8.0	3	1	**CFON733A12S**	RS	163 (74)	49½ (1256)	31 (787)	27½ (699)
	480	8.0	3	1	**CFON733A13S**	RS	163 (74)	49½ (1256)	31 (787)	27½ (699)
	240	10.0	3	1	**CFON740J12S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	480	10.0	3	1	**CFON740J13S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	240	12.0	3	1	**CFON748A12S**	RS	234 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	12.0	3	1	**CFON748A13S**	RS	234 (107)	70½ (1789)	52 (1321)	48½ (1232)
4 inch - 150 lb ANSI Flange (FIREBAR)										
15 W/in² ③ Steel Tank 6-Incoloy (2.3 W/cm²)	240	4.00	3	1	**CFONF13G29S**	RS	125 (57)	39 (989)	20½ (521)	17 (432)
	240	5.00	3	1	**CFONF16A29S**	RS	128 (58)	39 (989)	20½ (521)	17 (432)
	240	6.00	3	1	**CFONF18G29S**	RS	130 (59)	39 (989)	20½ (521)	17 (432)
	240	8.00	3	1	**CFONF22R29S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	480	8.00	3	1	**CFONF22R30S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	240	10.00	3	1	**CFONF27R29S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	480	10.00	3	1	**CFONF27R30S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	240	12.00	3	1	**CFONF32R29S**	RS	170 (77)	49½ (1256)	31 (787)	27½ (699)
	480	12.00	3	1	**CFONF32R30S**	RS	170 (77)	49½ (1256)	31 (787)	27½ (699)
	240	16.00	3	1	**CFONF42G29S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	16.00	3	1	**CFONF42G30S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	240	20.00	3	1	**CFONF51R29S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)
	480	20.00	3	1	**CFONF51R30S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)

3 inch - 150 lb ANSI Flange



4 inch - 150 lb ANSI Flange



③ Wired for 3-phase operation only

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

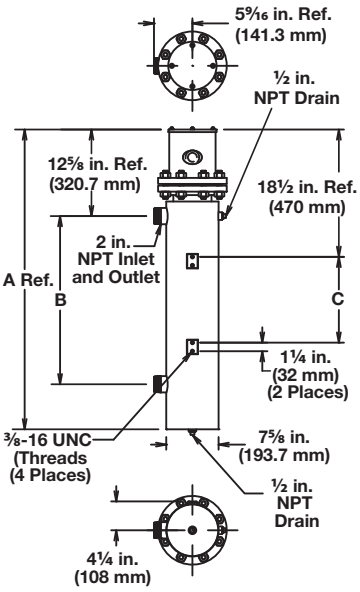
WATROD and FIREBAR Circulation Heaters

Application: Medium Weight Oils and Heat Transfer Oils

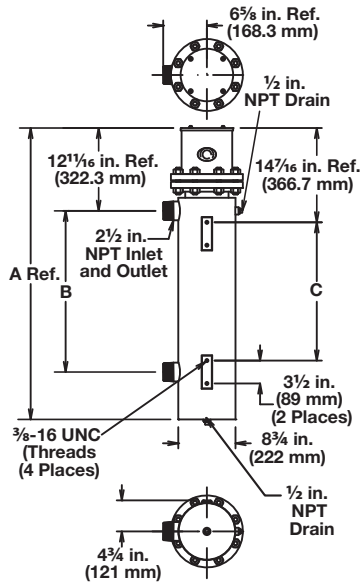
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
5 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 6-Incoloy Element (2.6 W/cm²)	240	8.0	3	1	**CFNN733A12S**	RS	145 (66)	49¼ (1249)	30 (762)	14⅞ (378.8)
	480	8.0	3	1	**CFNN733A13S**	RS	145 (66)	49¼ (1249)	30 (762)	14⅞ (378.8)
	240	10.0	3	1	**CFNN740J12S**	RS	167 (76)	56¼ (1427)	37 (940)	18⅝ (471.1)
	480	10.0	3	1	**CFNN740J13S**	RS	167 (76)	56¼ (1427)	37 (940)	18⅝ (471.1)
	240	12.0	3	1	**CFNN748A12S**	RS	180 (82)	67¾ (1719)	48½ (1232)	25 (633.0)
	480	12.0	3	1	**CFNN748A13S**	RS	180 (82)	67¾ (1719)	48½ (1232)	25 (633.0)
5 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 9-Incoloy Element (2.6 W/cm²)	240	12.0	3	1	**CFNN733A12XS**	RS	150 (68)	49¼ (1249)	30 (762)	14⅞ (378.8)
	480	12.0	3	1	**CFNN733A13XS**	RS	150 (68)	49¼ (1249)	30 (762)	14⅞ (378.8)
	240	15.0	3	1	**CFNN740J12XS**	RS	173 (79)	56¼ (1427)	37 (940)	18⅝ (473.1)
	480	15.0	3	1	**CFNN740J13XS**	RS	173 (79)	56¼ (1427)	37 (940)	18⅝ (473.1)
	240	18.0	3	1	**CFNN748A12XS**	RS	188 (86)	67¾ (1719)	48½ (1232)	25 (633.0)
	480	18.0	3	1	**CFNN748A13XS**	RS	188 (86)	67¾ (1719)	48½ (1232)	25 (633.0)
6 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 12-Incoloy Elements (2.6 W/cm²)	240	6.0	3	1	**CFPN713G12S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	480	6.0	3	1	**CFPN713G13S**	RS	212 (97)	40½ (1027)	20½ (521)	17 (432)
	240	8.0	3	1	**CFPN717R12S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	480	8.0	3	1	**CFPN717R13S**	RS	214 (97)	40½ (1027)	20½ (521)	17 (432)
	240	10.0	3	1	**CFPN720G12S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	10.0	3	1	**CFPN720G13S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	12.0	3	1	**CFPN725G12S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	480	12.0	3	1	**CFPN725G13S**	RS	222 (101)	40½ (1027)	20½ (521)	17 (432)
	240	16.0	3	1	**CFPN732R12S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	16.0	3	1	**CFPN732R13S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	20.0	3	2	**CFPN740G12S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	20.0	3	1	**CFPN740G13S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	24.0	3	2	**CFPN747R12S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	24.0	3	1	**CFPN747R13S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
6 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 15-Incoloy (2.6 W/cm²)	240	7.50	3	1	**CFPN713G12XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	480	7.50	3	1	**CFPN713G13XS**	RS	215 (98)	40½ (1027)	20½ (521)	17 (432)
	240	10.0	3	1	**CFPN717R12XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	480	10.0	3	1	**CFPN717R13XS**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	12.5	3	1	**CFPN720G12XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	480	12.5	3	1	**CFPN720G13XS**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	15.0	3	1	**CFPN725G12XS**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	15.0	3	1	**CFPN725G13XS**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	20.0	3	5	**CFPN732R12XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	20.0	3	1	**CFPN732R13XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	25.0	3	5	**CFPN740G12XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	480	25.0	3	1	**CFPN740G13XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	240	30.0	3	5	**CFPN747R12XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	480	30.0	3	1	**CFPN747R13XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)

5 inch - 150 lb ANSI Flange



6 inch - 150 lb ANSI Flange



③ Wired for 3-phase operation only

RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

WATROD and FIREBAR Circulation Heaters

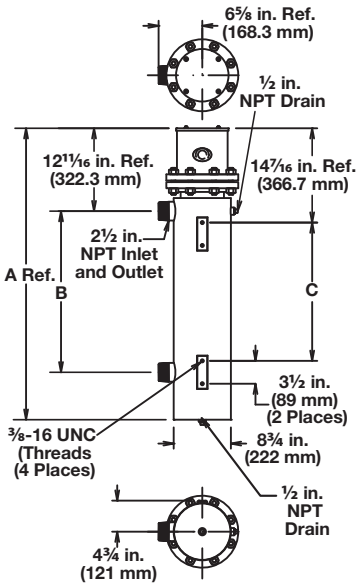
Application: Medium Weight Oils and Heat Transfer Oils

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

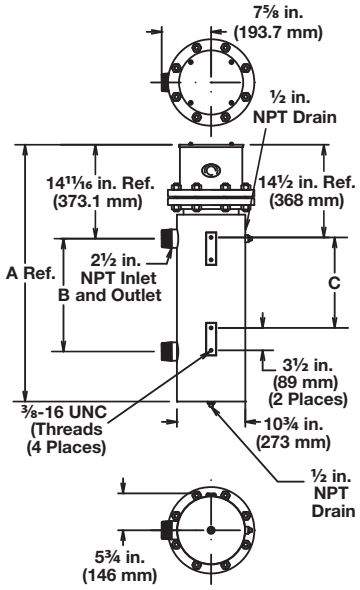
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (FIREBAR)										
15 W/in² ③ Steel Tank 15-Incoloy Element (2.3 W/cm²)	240	10.00	3	5	**CFPNF13G29S**	RS	217 (99)	40½ (1027)	20½ (521)	17 (432)
	240	12.50	3	5	**CFPNF16A29S**	RS	220 (100)	40½ (1027)	20½ (521)	17 (432)
	240	15.00	3	5	**CFPNF18G29S**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	20.00	3	5	**CFPNF22R29S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	20.00	3	5	**CFPNF22R30S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	25.00	3	5	**CFPNF27R29S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	480	25.00	3	5	**CFPNF27R30S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	240	30.00	3	5	**CFPNF32R29S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	480	30.00	3	5	**CFPNF32R30S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	240	40.00	3	5	**CFPNF42G29S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	480	40.00	3	5	**CFPNF42G30S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	240	50.00	3	5	**CFPNF51R29S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)
	480	50.00	3	5	**CFPNF51R30S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)
8 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 18-Incoloy Element (2.6 W/cm²)	240	17.00	3	1	**CFRN725N12S**	RS	350 (159)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	17.00	3	1	**CFRN725N13S**	RS	350 (159)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	25.00	3	2	**CFRN735N12S**	RS	380 (173)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	25.00	3	1	**CFRN735N13S**	RS	380 (173)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	33.00	3	2	**CFRN744E12S**	RS	410 (186)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	33.00	3	1	**CFRN744E13S**	RS	410 (186)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	42.00	3	3	**CFRN754M12S**	RS	445 (202)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	42.00	3	2	**CFRN754M13S**	RS	445 (202)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	50.00	3	2	**CFRN763M13S**	RS	490 (223)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	58.00	3	2	**CFRN773D13S**	RS	530 (241)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	67.00	3	2	**CFRN782M13S**	RS	560 (254)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
8 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 24-Incoloy Elements (2.6 W/cm²)	240	23.0	3	2	**CFRN726D12XS**	RS	358 (163)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	480	23.0	3	1	**CFRN726D13XS**	RS	358 (163)	55¼ (1402.0)	32¾ (830.0)	29¼ (741.0)
	240	33.0	3	2	**CFRN736D12XS**	RS	392 (178)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	33.0	3	1	**CFRN736D13XS**	RS	392 (178)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	44.0	3	4	**CFRN744M12XS**	RS	425 (193)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	44.0	3	2	**CFRN744M13XS**	RS	425 (193)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	56.0	3	4	**CFRN754M12XS**	RS	463 (210)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	56.0	3	2	**CFRN754M13XS**	RS	463 (210)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	67.0	3	2	**CFRN763M13XS**	RS	511 (232)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	77.0	3	2	**CFRN773D13XS**	RS	554 (252)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	89.0	3	4	**CFRN782M13XS**	RS	587 (267)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)

③ Wired for 3-phase operation only

6 inch - 150 lb ANSI Flange



8 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Next day shipment up to 2 pieces

WATROD and FIREBAR Circulation Heaters

Application: Medium Weight Oils and Heat Transfer Oils

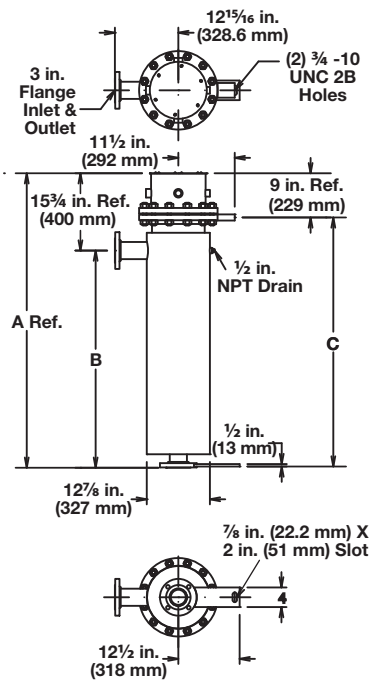
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
10 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 27-Incoloy Elements (2.6 W/cm²)	480	75.0	3	3	**CFSN763N13S**	S	540 (245)	90¾ (2305)	74½ (1891)	81½ (2070)
	480	87.0	3	3	**CFSN773E13S**	S	600 (273)	105¾ (2686)	89½ (2272)	96½ (2451)
12 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 36-Incoloy Elements (2.6 W/cm²)	480	117.0	3	3	**CFTN773C13S**	S	650 (295)	106½ (2705)	90⅜ (2295.5)	97½ (2475)
14 inch - 150 lb ANSI Flange (WATROD)										
16 W/in² ③ Steel Tank 45-Incoloy Elements (2.6 W/cm²)	480	105.0	3	3	**CFWN754J13S**	S	600 (273)	83¼ (2115)	67 (1700)	74 (1880)
	480	125.0	3	5	**CFWN763J13S**	S	650 (295)	90¾ (2305)	74½ (1891)	81½ (2070)

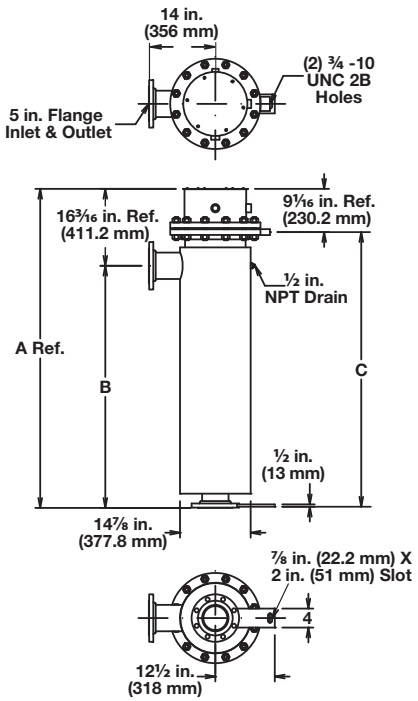
- **S** - Standard, (10) day lead time

③ Wired for 3-phase operation only

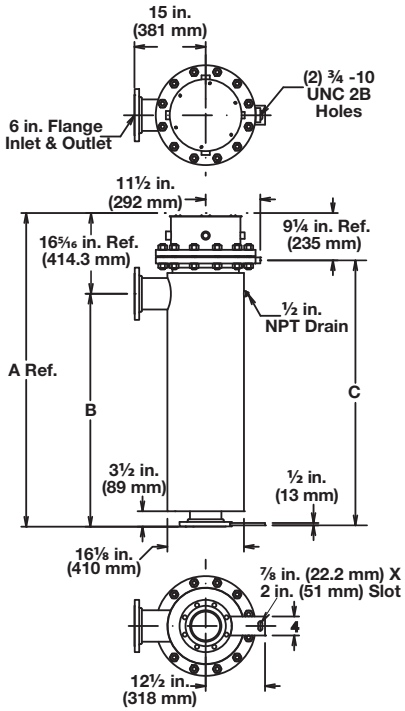
10 inch - 150 lb ANSI Flange



12 inch - 150 lb ANSI Flange



14 inch - 150 lb ANSI Flange



WATROD and FIREBAR Circulation Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

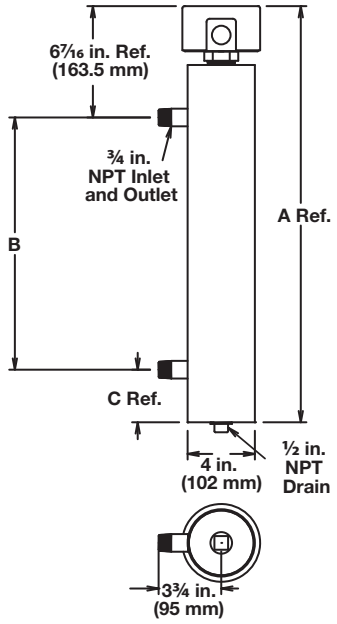
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
1¼ inch NPT Screw Plug (FIREBAR)										
8 W/in² ③ Steel Tank 1-Incoloy Elements (1.3 W/cm²)	240	0.43	3	1	**CBDNF16G22S**	RS	26 (12)	24⅝ (625.5)	15 (381)	3⅛ (79.4)
	240	0.55	3	1	**CBDNF19G22S**	RS	30 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	0.70	3	1	**CBDNF24L22S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	480	0.70	3	1	**CBDNF24L21S**	RS	31 (14)	32⅝ (828.7)	23 (584)	3 (76.0)
	240	0.88	3	1	**CBDNF29R22S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	0.88	3	1	**CBDNF29R21S**	RS	43 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	1.08	3	1	**CBDNF34R22S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	480	1.08	3	1	**CBDNF34R21S**	RS	44 (20)	42⅝ (1082.7)	32 (813)	4 (102.0)
	240	1.40	3	1	**CBDNF45G22S**	RS	69 (31)	63⅜ (1616.1)	53 (1346)	4 (102.0)
	480	1.40	3	1	**CBDNF45G21S**	RS	69 (31)	63⅜ (1616.1)	53 (1346)	4 (102.0)
	240	1.80	3	1	**CBDNF55R22S**	RS	71 (32)	63⅜ (1616.1)	53 (1346)	4 (102.0)
	480	1.80	3	1	**CBDNF55R21S**	RS	71 (32)	63⅜ (1616.1)	53 (1346)	4 (102.0)
2½ inch NPT Screw Plug (WATROD)										
8 W/in² ③ Steel Tank 3-Steel Elements (1.3 W/cm²)	240	2.0	3	1	**CBLS732E12S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	480	2.0	3	1	**CBLS732E13S**	RS	29 (14)	44¾ (1135)	32½ (1129)	26½ (673)
	240	3.0	3	1	**CBLS747E12S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)
	480	3.0	3	1	**CBLS747E13S**	RS	32 (15)	57¼ (1453)	45 (1143)	39 (991)

③ Wired for 3-phase operation only

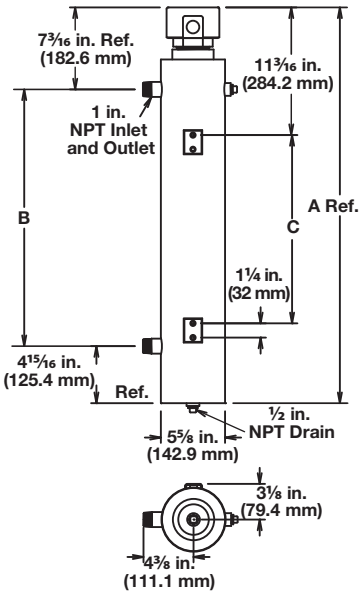
RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

1¼ inch NPT Screw Plug



2½ inch NPT Screw Plug



WATROD and FIREBAR Circulation Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

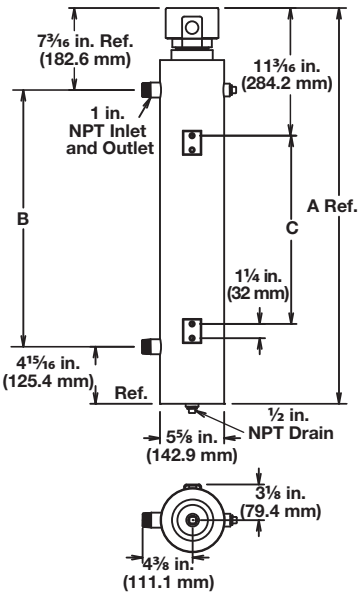
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
2½ inch NPT Screw Plug (FIREBAR)										
8 W/in² ③ Steel Tank 3-Incoloy Elements (1.3 W/cm²)	240	1.25	3	1	**CBLNF15C22S**	RS	22 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	1.63	3	1	**CBLNF18C22S**	RS	23 (10)	34¾ (881)	22½ (572)	16½ (419)
	240	2.13	3	1	**CBLNF23C22S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	480	2.13	3	1	**CBLNF23C21S**	RS	31 (14)	34¾ (881)	22½ (572)	16½ (419)
	240	2.63	3	1	**CBLNF28L22S**	RS	34 (15)	44¾ (1135)	32½ (1129)	26½ (673)
	480	2.63	3	1	**CBLNF28L21S**	RS	34 (15)	44¾ (1135)	32½ (1129)	26½ (673)
	240	3.19	3	1	**CBLNF33L22S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	480	3.19	3	1	**CBLNF33L21S**	RS	35 (16)	44¾ (1135)	32½ (1129)	26½ (673)
	240	4.25	3	1	**CBLNF44C22S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	480	4.25	3	1	**CBLNF44C21S**	RS	44 (20)	57¼ (1453)	45 (1143)	39 (991)
	240	5.38	3	1	**CBLNF54L22S**	RS	52 (24)	63¾ (1453)	51½ (1308)	46½ (1181)
	480	5.38	3	1	**CBLNF54L21S**	RS	52 (24)	63¾ (1453)	51½ (1308)	46½ (1181)
3 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 3-Steel Elements (1.3 W/cm²)	240	2.0	3	1	**CFMS733A12S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	480	2.0	3	1	**CFMS733A13S**	RS	96 (44)	45¼ (1148)	32½ (826)	26½ (673)
	240	3.0	3	1	**CFMS748A12S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)
	480	3.0	3	1	**CFMS748A13S**	RS	107 (49)	57¾ (1465)	45 (1143)	39 (991)

③ Wired for 3-phase operation only

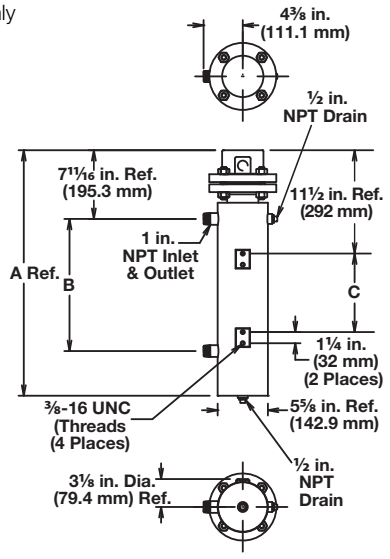
RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

2½ inch NPT Screw Plug



3 inch - 150 lb ANSI Flange



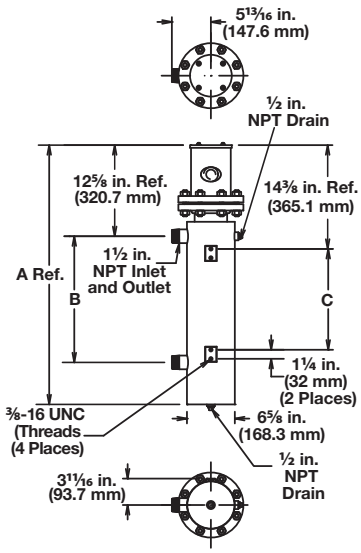
WATROD and FIREBAR Circulation Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

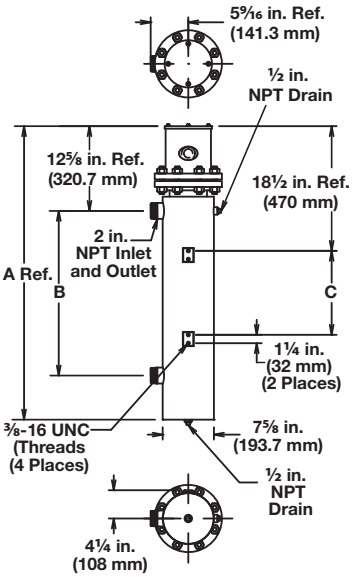
- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in (mm)	"C" Dim. in. (mm)
4 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 6-Steel Elements (1.3 W/cm²)	240	5.00	3	1	**CFOS740J12S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	480	5.00	3	1	**CFOS740J13S**	RS	229 (104)	70½ (1789)	52 (1321)	48½ (1232)
	240	6.00	3	1	**CFOS748A12S**	RS	234 (106)	70½ (1789)	52 (1321)	48½ (1232)
	480	6.00	3	1	**CFOS748A13S**	RS	234 (106)	70½ (1789)	52 (1321)	48½ (1232)
	240	8.00	3	1	**CFOS764J12S**	RS	298 (135)	91½ (2326)	73 (1854)	66 (1676)
	480	8.00	3	1	**CFOS764J13S**	RS	298 (135)	91½ (2326)	73 (1854)	66 (1676)
	240	10.00	3	1	**CFOS777A12S**	RS	306 (139)	91½ 2326)	73 (1854)	66 (1676)
	480	10.00	3	1	**CFOS777A13S**	RS	306 (139)	91½ (2326)	73 (1854)	66 (1676)
4 inch - 150 lb ANSI Flange (FIREBAR)										
8 W/in² ③ Steel Tank 6-Incoloy Elements (1.3 W/cm²)	240	2.50	3	1	**CFONF16J22S**	RS	128 (58)	39 (989)	20½ (521)	17 (432)
	240	3.25	3	1	**CFONF19J22S**	RS	130 (59)	39 (989)	20½ (521)	17 (432)
	240	4.25	3	1	**CFONF24J22S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	480	4.25	3	1	**CFONF24J21S**	RS	133 (61)	39 (989)	20½ (521)	17 (432)
	240	5.25	3	1	**CFONF30A22S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	480	5.25	3	1	**CFONF30A21S**	RS	168 (77)	49½ (1256)	31 (787)	27½ (699)
	240	6.38	3	1	**CFONF35A22S**	RS	170 (77)	49½ (1256)	31 (787)	27½ (699)
	480	6.38	3	1	**CFONF35A21S**	RS	170 (77)	49½ (1256)	31 (787)	27½ (699)
	240	8.50	3	1	**CFONF45J22S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	480	8.50	3	1	**CFONF45J21S**	RS	236 (107)	70½ (1789)	52 (1321)	48½ (1232)
	240	10.75	3	1	**CFONF56A22S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)
	480	10.75	3	1	**CFONF56A21S**	RS	240 (109)	70½ (1789)	52 (1321)	48½ (1232)
5 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 6-Steel Elements (1.3 W/cm²)	240	5.00	3	1	**CFNS740J12S**	RS	167 (76)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	5.00	3	1	**CFNS740J13S**	RS	167 (76)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	6.00	3	1	**CFNS748A12S**	RS	180 (82)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	6.00	3	1	**CFNS748A13S**	RS	180 (82)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	8.00	3	1	**CFNS764J12S**	RS	195 (89)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	8.00	3	1	**CFNS764J13S**	RS	195 (89)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	240	10.00	3	1	**CFNS777A12S**	RS	220 (100)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
	480	10.00	3	1	**CFNS777A13S**	RS	220 (100)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
5 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 9-Steel Elements (1.3 W/cm²)	240	7.5	3	1	**CFNS740J12XS**	RS	173 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	480	7.5	3	1	**CFNS740J13XS**	RS	173 (79)	56¼ (1427.0)	37 (940.0)	18⅝ (473.1)
	240	9.0	3	1	**CFNS748A12XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	480	9.0	3	1	**CFNS748A13XS**	RS	188 (86)	67¾ (1719.0)	48½ (1232.0)	25 (633.0)
	240	12.0	3	1	**CFNS764J12XS**	RS	206 (94)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	480	12.0	3	1	**CFNS764J13XS**	RS	206 (94)	81⅛ (2060.6)	61⅞ (1571.6)	30⅞ (784.2)
	240	15.0	3	1	**CFNS777A12XS**	RS	233 (106)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)
	480	15.0	3	1	**CFNS777A13XS**	RS	233 (106)	94⅛ (2390.8)	75 (1902.0)	38 (964.0)

4 inch - 150 lb ANSI Flange



5 inch - 150 lb ANSI Flange



RAPID SHIP

- **RS** - Same day shipment up to 5 pieces

③ Wired for 3-phase operation only

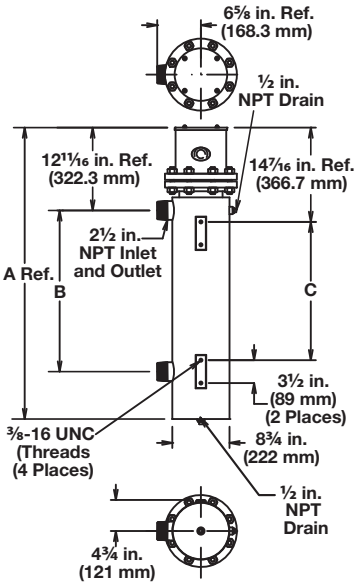
WATROD and FIREBAR Circulation Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
6 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 12-Steel Element (1.3 W/cm²)	240	8.00	3	1	**CFPS732R12S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	480	8.00	3	1	**CFPS732R13S**	RS	226 (103)	51 (1294)	31 (787)	27½ (699)
	240	10.00	3	1	**CFPS740G12S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	480	10.00	3	1	**CFPS740G13S**	RS	290 (132)	72 (1827)	52 (1321)	48½ (1232)
	240	12.00	3	1	**CFPS747R12S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	480	12.00	3	1	**CFPS747R13S**	RS	298 (136)	72 (1827)	52 (1321)	48½ (1232)
	240	16.50	3	1	**CFPS764G12S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	16.50	3	1	**CFPS764G13S**	RS	360 (164)	93 (2361)	73 (1854)	66 (1676)
	480	20.00	3	1	**CFPS776R13S**	RS	368 (167)	93 (2361)	73 (1854)	66 (1676)
6 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 15-Steel Element (1.3 W/cm²)	240	10.00	3	1	**CFPS732R12XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	480	10.00	3	1	**CFPS732R13XS**	RS	288 (131)	51 (1294)	31 (787)	27½ (699)
	240	12.50	3	1	**CFPS740G12XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	480	12.50	3	1	**CFPS740G13XS**	RS	296 (135)	72 (1827)	52 (1321)	48½ (1232)
	240	15.00	3	1	**CFPS747R12XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	480	15.00	3	1	**CFPS747R13XS**	RS	306 (139)	72 (1827)	52 (1321)	48½ (1232)
	240	21.00	3	5	**CFPS764G12XS**	RS	370 (168)	93 (2361)	73 (1854)	66 (1676)
	480	21.00	3	1	**CFPS764G13XS**	RS	370 (168)	93 (2361)	73 (1854)	66 (1676)
	240	25.00	3	5	**CFPS776R12XS**	RS	381 (173)	93 (2361)	73 (1854)	66 (1676)
	480	25.00	3	1	**CFPS776R13XS**	RS	381 (173)	93 (2361)	73 (1854)	66 (1676)
6 inch - 150 lb ANSI Flange (FIREBAR)										
8 W/in² ③ Steel Tank 15-Incoloy Elements (1.3 W/cm²)	240	6.3	3	5	**CFPNF16J22S**	RS	220 (100)	40½ (1027)	20½ (521)	17 (432)
	240	8.1	3	5	**CFPNF19J22S**	RS	223 (102)	40½ (1027)	20½ (521)	17 (432)
	240	10.6	3	5	**CFPNF24J22S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	480	10.6	3	5	**CFPNF24J21S**	RS	226 (103)	40½ (1027)	20½ (521)	17 (432)
	240	13.1	3	5	**CFPNF30A22S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	480	13.1	3	5	**CFPNF30A21S**	RS	232 (106)	51 (1294)	31 (787)	27½ (699)
	240	16.0	3	5	**CFPNF35A22S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	480	16.0	3	5	**CFPNF35A21S**	RS	236 (107)	51 (1294)	31 (787)	27½ (699)
	240	21.3	3	5	**CFPNF45J22S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	480	21.3	3	5	**CFPNF45J21S**	RS	304 (138)	72 (1827)	52 (1321)	48½ (1232)
	240	26.0	3	5	**CFPNF56A22S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)
	480	26.0	3	5	**CFPNF56A21S**	RS	314 (143)	72 (1827)	52 (1321)	48½ (1232)

6 inch - 150 lb ANSI Flange



③ Wired for 3-phase operation only

RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

WATROD and FIREBAR Circulation Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

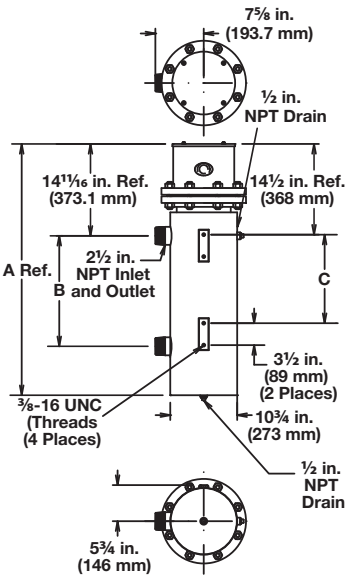
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
8 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 18-Steel Elements (1.3 W/cm²)	240	12.5	3	1	**CFRS743E12S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	12.5	3	1	**CFRS743E13S**	RS	410 (186)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	16.5	3	1	**CFRS751M12S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	16.5	3	1	**CFRS751M13S**	RS	440 (200)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	20.0	3	2	**CFRS762D12S**	RS	480 (218)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	20.0	3	1	**CFRS762D13S**	RS	480 (218)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	240	24.0	3	2	**CFRS770M12S**	RS	530 (241)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	24.0	3	1	**CFRS770M13S**	RS	530 (241)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	240	27.0	3	2	**CFRS779M12S**	RS	610 (277)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	27.0	3	1	**CFRS779M13S**	RS	610 (277)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
8 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 24-Steel Elements (1.3 W/cm²)	240	17.0	3	1	**CFRS743M12XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	480	17.0	3	1	**CFRS743M13XS**	RS	425 (193)	62¼ (1580.0)	39¾ (1008.0)	36¼ (919.0)
	240	22.0	3	2	**CFRS751M12XS**	RS	457 (208)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	480	22.0	3	1	**CFRS751M13XS**	RS	457 (208)	69⅞ (1774.8)	47⅜ (1203.3)	43⅞ (1114.4)
	240	27.0	3	2	**CFRS762D12XS**	RS	461 (209)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	480	27.0	3	1	**CFRS762D13XS**	RS	461 (209)	79⅜ (2016.1)	56⅞ (1444.6)	53⅜ (1355.7)
	240	32.0	3	2	**CFRS770M12XS**	RS	554 (252)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	480	32.0	3	1	**CFRS770M13XS**	RS	554 (252)	88⅜ (2244.7)	65⅞ (1673.2)	62⅜ (1584.3)
	240	36.0	3	2	**CFRS779M12XS**	RS	636 (289)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
	480	36.0	3	1	**CFRS779M13XS**	RS	636 (289)	98⅜ (2498.7)	75⅞ (1927.2)	72⅜ (1838.3)
10 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 27-Steel Elements (1.3 W/cm²)	240	30.0	3	3	**CFSS762E12S**	S	540 (245)	91¼ (2316.0)	75½ (1916.0)	82¼ (2088.0)
	480	30.0	3	1	**CFSS762E13S**	S	540 (245)	91¼ (2316.0)	75½ (1916.0)	82¼ (2088.0)
	240	35.0	3	3	**CFSS770N12S**	S	600 (273)	99⅛ (2517.8)	83⅜ (2117.7)	90⅛ (2289.2)
	480	35.0	3	1	**CFSS770N13S**	S	600 (273)	99⅛ (2517.8)	83⅜ (2117.7)	90⅛ (2289.2)
	240	40.0	3	3	**CFSS778N12S**	S	645 (293)	106⅝ (2708.3)	90⅞ (2308.2)	97⅝ (2479.7)
	480	40.0	3	1	**CFSS778N13S**	S	645 (293)	106⅝ (2708.3)	90⅞ (2308.2)	97⅝ (2479.7)

③ Wired for 3-phase operation only

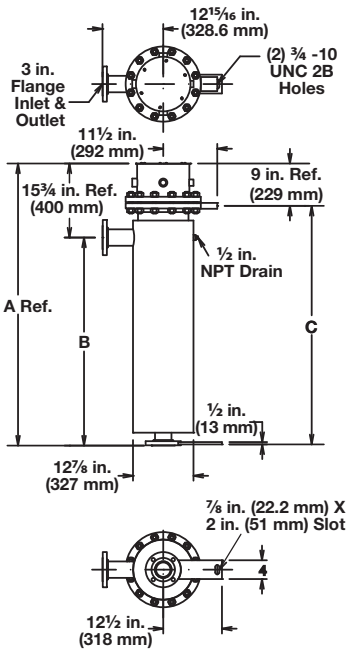
RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 day lead time

8 inch - 150 lb ANSI Flange



10 inch - 150 lb ANSI Flange



WATROD and FIREBAR Circulation Heaters

Application: Bunker C, Asphalt and #6 Fuel Oil

- WATROD or FIREBAR elements
- Without thermostat
- General purpose enclosure

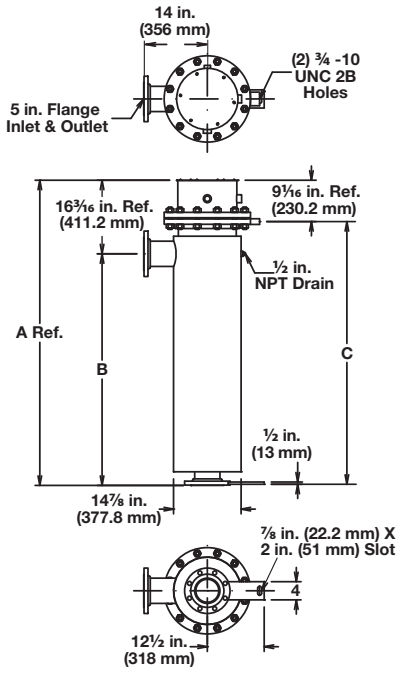
Description	Volts	kW	Ph	# Circ.	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)
12 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 36-Steel Elements (1.3 W/cm²)	240	47.0	3	3	**CFTS770L12S**	S	700 (318)	99 (2515)	82⅞ (2105.0)	90 (2284)
	480	47.0	3	2	**CFTS770L13S**	S	700 (318)	99 (2515)	82⅞ (2105.0)	90 (2284)
	240	54.0	3	3	**CFTS778L12S**	S	750 (341)	106½ (2705)	90⅜ (2295.5)	97½ (2475)
	480	54.0	3	2	**CFTS778L13S**	S	750 (341)	106½ (2705)	90⅜ (2295.5)	97½ (2475)
14 inch - 150 lb ANSI Flange (WATROD)										
8 W/in² ③ Steel Tank 45-Steel Elements (1.3 W/cm²)	240	60.0	3	3	**CFWS770J12S**	S	700 (318)	98¼ (2496)	82 (2081)	89 (2261)
	480	60.0	3	3	**CFWS770J13S**	S	700 (318)	98¼ (2496)	82 (2081)	89 (2261)
	240	67.0	3	5	**CFWS778J12S**	S	780 (354)	105¾ (2686)	89½ (2272)	96½ (2451)
	480	67.0	3	3	**CFWS778J13S**	S	780 (354)	105¾ (2686)	89½ (2272)	96½ (2451)

③ Wired for 3-phase operation only

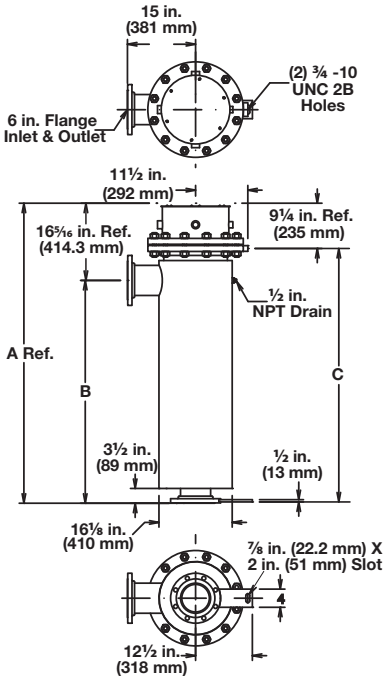
RAPID SHIP

- **S** - Standard, (10) day lead time

12 inch - 150 lb ANSI Flange



14 inch - 150 lb ANSI Flange



WATROD and FIREBAR Circulation Heaters

Build-a-Code

Ordering Information

To order, complete the code number to the right with the information below:

Example: CFONA18A10 S 5 HJ

Stock Plug or ANSI Flange Code Number ①

Optional Terminal Enclosures ②

S = General purpose enclosure
W = Moisture resistant enclosure
E = Explosion resistant enclosure
C = Moisture/explosion resistant enclosure

Optional Process Sensor ④

1 = 30 to 110°F (-1 to 43°C), SPST
2 = 30 to 250°F (-1 to 121°C), SPST
3 = 175 to 550°F (79 to 288°C), SPST
4 = 30 to 110°F (-1 to 43°C), DPST
5 = 60 to 250°F (16 to 121°C), DPST (WATROD)
5A = 60 to 250°F (16 to 121°C), DPST (FIREBAR)
7 = 100 to 550°F (38 to 288°C), DPST (WATROD)
7A = 100 to 550°F (38 to 288°C), DPST (FIREBAR)
J = Type J process thermocouple in thermowell
K = Type K process thermocouple in thermowell

Sheath Limit Sensor ③

HJ = Type J high-limit thermocouple, horizontal mount
TJ = Type J high-limit thermocouple, vertical/housing at top
BJ = Type J high-limit thermocouple, vertical/housing at bottom
HK = Type K high-limit thermocouple, horizontal mount
TK = Type K high-limit thermocouple, vertical/housing at top
BK = Type K high-limit thermocouple, vertical/housing at bottom

① Catalog part numbers include standard option enclosures and process sensors. To order optional enclosures or sensors, substitute the appropriate suffix.

② Standard catalog listings include either a general purpose enclosure or moisture/explosion resistant enclosure. Substitute enclosure options are noted.

③ Heater orientation is critical to accurate sensing of limit conditioners. Use the appropriate code to indicate heater mounting orientation.

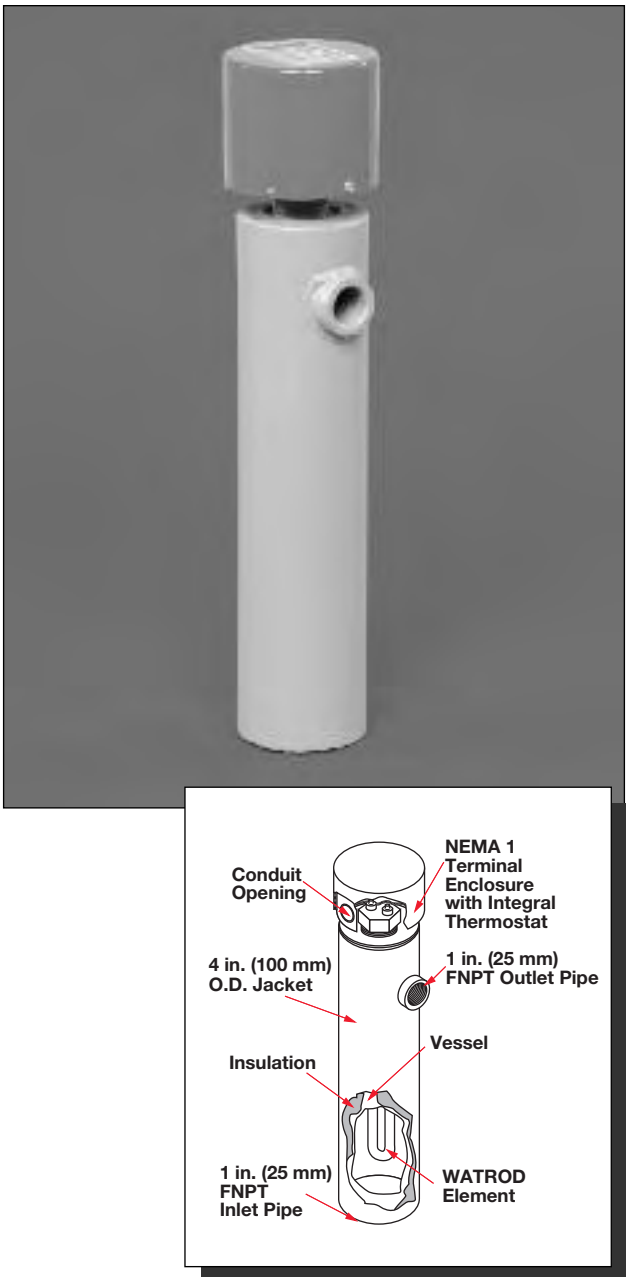
④ Thermostat part numbers are shown in the *Thermostat Stock Chart* on page 652.

WATROD and FIREBAR® Heaters

Booster Heaters

Booster heaters are ideal for circulating applications requiring less kilowatts, including engine preheating.

Booster heaters are made from a steel or brass 1¼ in. (32 mm) NPT screw plug heater and insulated pressure vessel with 1 in. (25 mm) FNPT inlet and outlet. This assembly also contains an integral thermostat.



Performance Capabilities

- Watt densities to 60 W/in² (9.3 W/cm²)
- Wattages to 3 kilowatts
- Voltages to 480V~(ac)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)

Features and Benefits

Dual voltages
- Simplifies stocking and wiring

Carbon steel, standard pipe wall vessel
- Compatible with many applications

One inch thick (25 mm) fiberglass thermal insulation rated to 750°F (400°C)
- Reduces heat loss

Steel jacket (shroud)
- Fully welded and painted to protect thermal insulation

Inlet and outlet nozzle connections
- Threaded FNPT connections meet OEM standards

General purpose (NEMA 1) terminal enclosures
- Protects terminals and thermostat

Integral thermostat controls process temperatures from: 60 to 160°F (15 to 70°C) on copper sheath elements and 175 to 550°F (80 to 290°C) on steel sheath elements
- Minimizes the amount of time that the heater operates while the engine is running

Applications

- Stand by generators
- Peak power trimming generators
- Mobile generator sets
- Earth moving equipment
- Water heaters
- Lightweight oils

WATROD and FIREBAR Heaters

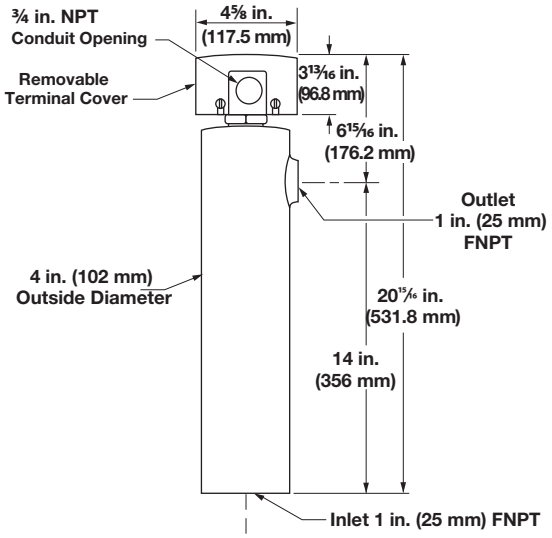
Booster Heaters

Options

Terminal Enclosure

General purpose (NEMA 1) terminal enclosures with integral thermostats are supplied on all Watlow booster heaters. Optional moisture resistant (NEMA 4) terminal enclosures protect wiring and thermostat from liquid contaminants. To order, request the **moisture resistant enclosure option**.

For explosion resistant (NEMA 7) and explosion/moisture resistant (NEMA 7/4) terminal enclosures, request the **explosion/moisture resistant option**.



Description	kW	Phase	Code Number 120/240V~(ac)	Est. Ship. Wt. lbs	(kg)
Application: Aqueous Solutions					
60 W/in²	1.50	1	**CBEC8G6**	18	(8.2)
Brass Plug	2.00	1	**CBEC10F6**	18	(8.2)
2-Copper	2.50	1	**CBEC12F6**	18	(8.2)
(9.3 W/cm²)	3.00	1	**CBEC15A6X**	18	(8.2)
Application: Lightweight Oils					
23 W/in²	0.50	1	**CBES7G6**	18	(8.2)
Steel Plug	0.75	1	**CBES10B6**	18	(8.2)
2- Steel	1.00	1	**CBES12P6**	18	(8.2)
(3.6 W/cm²)					

All units are Assembly Stock

For optional housing adders use circulation heater adders.

How to Order

To order a booster heater, please specify:

- Watlow code number
- Volts/watts
- Options
- Quantity

If the booster heater requires an optional NEMA 4 terminal enclosure, clearly state this request when placing your order.

If our assembly stock units do not meet your application needs, Watlow can provide a made-to-order unit. For **made-to-order** units, contact your Watlow representative and provide the following information:

- Application
- Volts/watts
- Watt density
- Phase
- Terminal enclosure type
- Options
- Quantity

Availability

Assembly Stock: Five to seven working days

Modified Stock①: Five to seven working days

Made-to-Order: Six to eight weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

① Assembly stock units with catalog options.

WATROD and FIREBAR® Heaters

Engine Preheaters

Watlow® engine preheaters help maintain a desired minimum engine temperature to make starting fast and easy. They also reduce engine wear caused by cold engine starting.

Engine preheaters mount conveniently on an engine or rail. The internal thermostat constantly adjusts to ambient temperature changes to keep engine coolant warm at all times.

An internal tank temperature sensor protects Watlow engine preheaters from dry fire conditions caused by low coolant levels or blocked flow.

Installation is easy with just two mounting bolts and inlet and outlet hose connections.



Performance Capabilities

- Watt densities from 45 to 90 W/in^2 (7 to 14 W/cm^2)
- Wattages to 6 kilowatts
- UL® and CSA component recognition to 480V~(ac) and 600V~(ac) respectively.
- Thermostatically controlled from 60 to 160°F (15 to 70°C)
- Incoloy® sheath temperatures to 1600°F (870°C)

Features and Benefits

Incoloy® sheath
- Minimizes the risk of premature failure in the event of a dry-fire condition

Integral, prewired adjustable thermostat mounted in a general purpose (NEMA 1) terminal enclosure
- Provides a ready to install unit

Easy installation with standard 1 in. (25 mm) diameter beaded inlet and outlet nozzles
- Rubber hose connections eliminate the need for threaded fittings and adapters

120/240V~(ac) or 240/480V~(ac) dual voltages
- Makes field wiring flexible
- Minimizes stocking multiple voltages

Mounting bracket
- Isolates harmful engine vibration

Heavy-duty welded carbon steel tank
- Resists corrosion and extends life

Optional oil pressure interconnect switch
- Disrupts power during engine operation

Integral check valve
- Assures proper coolant flow and correct thermostat operation. Check valve will not interfere with adequate thermo-siphoning
- **UL® and CSA component**
  Recognition under file numbers E52951 and 31388 respectively.

Applications

- Stand by generators
- Primary power generators
- Firepump engines

Options

Terminal Enclosure

The following terminal enclosures are available:
- Standard, general purpose (NEMA 1)
- Moisture resistant (NEMA 4)
- Explosion resistant (NEMA 7) Class 1, groups B, C and D. For Class 1, group B enclosures, contact your Watlow representative.

Threaded Nozzles

Carbon steel threaded inlets and outlets are available for installations using rigid piping or threaded adapters. Threaded nozzles are typically supplied for firepump applications. To order, specify **threaded nozzles** and **NPT size**.

WATROD and FIREBAR Heaters

Engine Preheaters

Application Hints

- Mount engine preheaters in horizontal position only (as shown in Figures 1, 2 and 3). Contact your Watlow representative if vertical mounting is unavoidable.
- Mount the heater near or below the lowest point on the engine block. Keep outlet nozzle pointed up, as indicated on the tank.
- Estimate kilowatt requirements with the following formula. First determine the engine displacement, then multiply:

English
Cubic inches X 3 = estimated wattage
Metric
Liters X 183 = estimated wattage

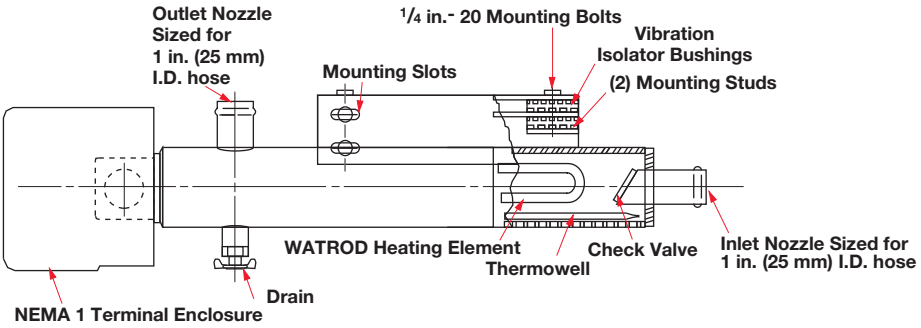
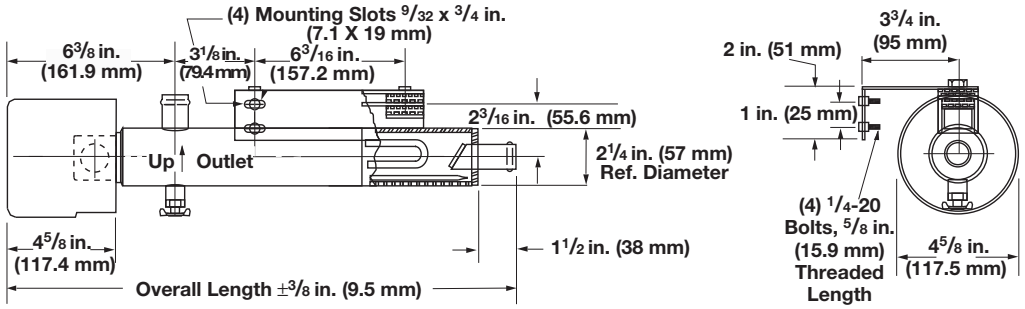


Figure 1



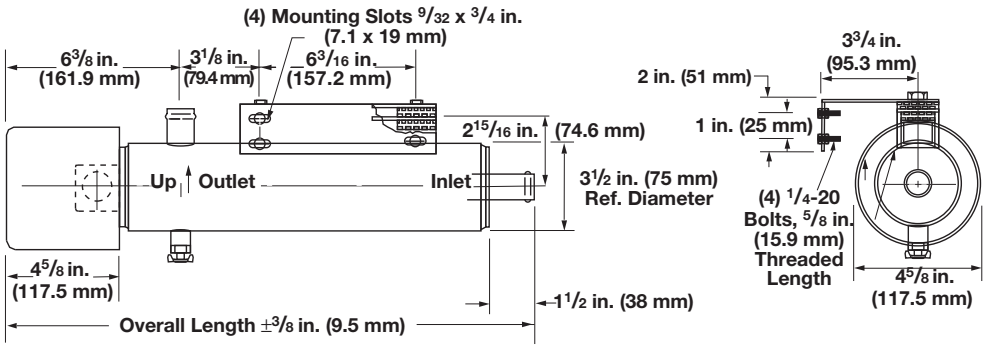
kW	Overall Length in.	(mm)	Code Number 120/240V~(ac) 1-Phase	208V~(ac) 1-Phase	240/480V~(ac) 1-Phase	Est. Ship. Wt. lbs	(kg)
Application: Ethylene Glycol/Engine Coolant							
1.13	20⅞	(530.2)		**CPBPL2S12①**		12	(6)
1.50	20⅞	(530.2)	**CPBPB6S12**	**CPBPB2S12①**		12	(6)
1.69	20⅞	(530.2)		**CPBPM2S12①**		12	(6)
1.88	20⅞	(530.2)		**CPBPN2S12①**		12	(6)
2.00	20⅞	(530.2)	**CPBPC6S12**			12	(6)
2.25	20⅞	(530.2)	**CPBPD6S12**			12	(6)
2.25	26 1/16	(677.9)		**CPBPD2S12①**		15	(7)
2.50	20⅞	(530.2)	**CPBPE6S12**			12	(6)
3.00	26 1/16	(677.9)		**CPBPF2S12①**	**CPBPF7S12**	15	(7)
3.75	26 1/16	(677.9)		**CPBPG2S12①**		15	(7)
4.00	26 1/16	(677.9)			**CPBPH7S12**	15	(7)
5.00	26 1/16	(677.9)			**CPBPJ7S12①**	15	(7)

All preheaters are Stock unless otherwise noted.
Availability
Stock: Same day shipment
Standard: Four weeks
① Standard

WATROD and FIREBAR Heaters

Engine Preheaters

Figure 2



kW	Overall Length in.	(mm)	Code Number 277V~(ac) 1-Phase	Code Number 480V~(ac) 3-Phase	Est. Ship. Wt. lbs	(kg)
Application: Ethylene Glycol/Engine Coolant						
1.50	20⅞	(530.2)	**CPCPB4S12①**	**CPCPB13S12①**	12	(6)
2.00	20⅞	(530.2)	**CPCPC4S12①**	**CPCPC13S12①**	12	(6)
2.50	20⅞	(530.2)	**CPCPE4S12①**	**CPCPE13S12①**	12	(6)
3.75	20⅞	(530.2)	**CPCPG4S12①**	**CPCPG13S12①**	12	(6)
4.00	20⅞	(530.2)	**CPCPH4S12①**	**CPCPH13S12**	12	(6)
5.00	20⅞	(530.2)	**CPCPJ4S12①**	**CPCPJ13S12**	12	(6)

All preheaters are stock unless otherwise noted.

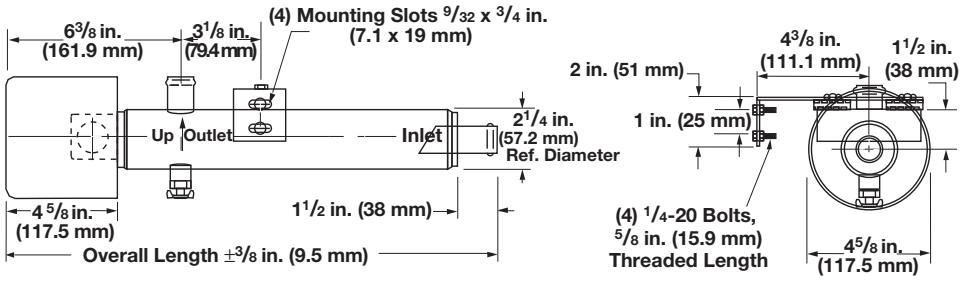
Availability

Stock: Same day shipment

Standard: Four weeks

① Standard

Figure 3



kW	Overall Length in.	(mm)	Code Number 120/240V~(ac) 1-Phase	Code Number 208V~(ac) 1-Phase	Est. Ship. Wt. lbs	(kg)
Application: Ethylene Glycol/Engine Coolant						
0.75	15⅝	(396.9)		**CPBPK2S12①**	9	(4)
1.00	15⅝	(396.9)	**CPBPA6S12①**		9	(4)

All preheaters are stock unless otherwise noted.

Availability

Stock: Same day shipment

Standard: Four weeks

① Standard

WATROD and FIREBAR Heaters

Engine Preheaters

How to Order

To order a stock, or standard engine preheater, please specify:

- Code number
- Volts/watts
- Phase
- Options
- Quantity

If our Stock units do not meet your application needs, Watlow will provide a made-to-order unit. For **made-to-order** units, provide the following information:

- Volts/watts
- Phase
- Inlet and outlet type and size
- Terminal enclosure type
- Mounting orientation
- Options
- Quantity

Availability

Stock: Same day shipment

Modified Stock②: Five to seven working days

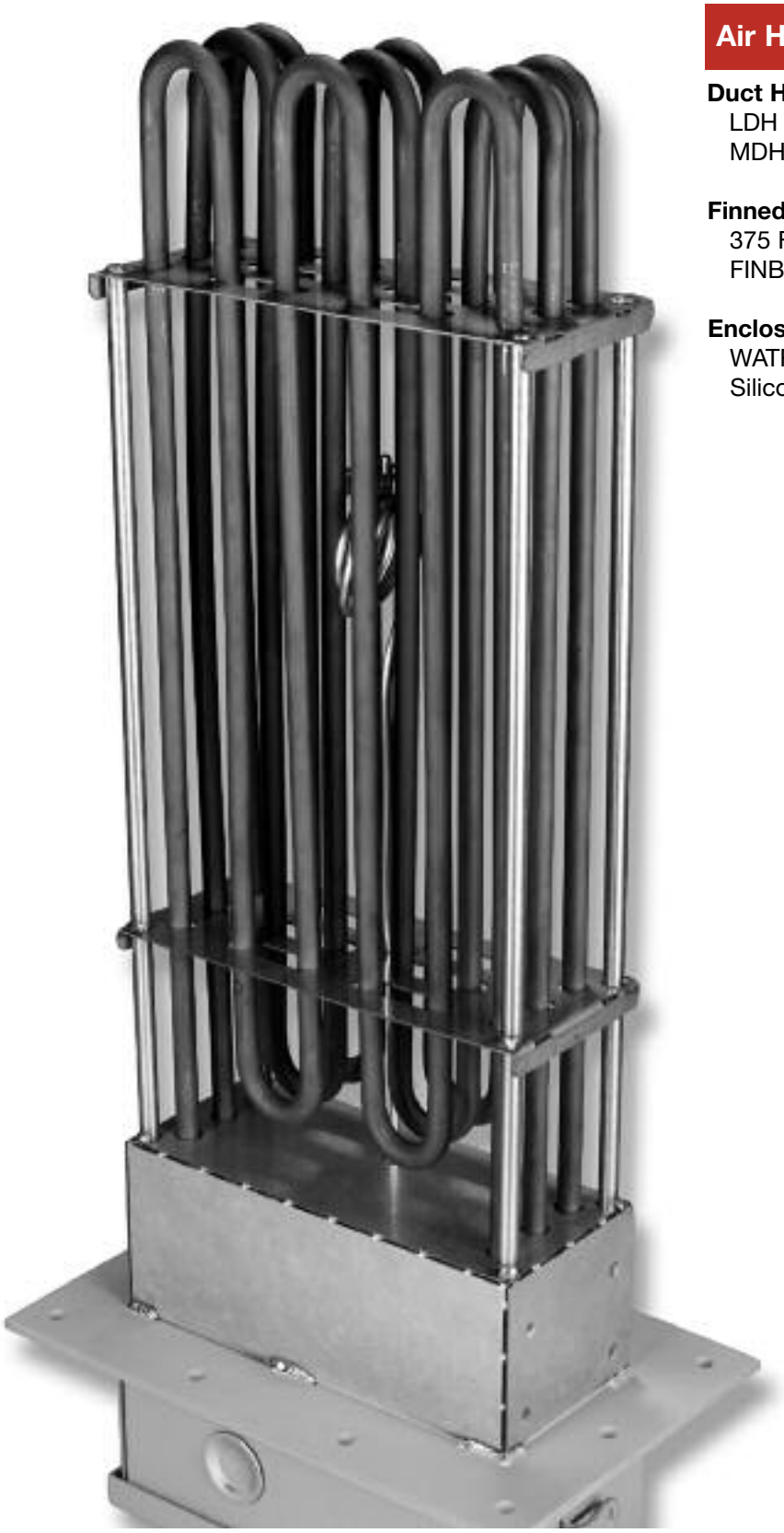
Standard: Four weeks

Made-to-Order: Six to eight weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

② Stock units with catalog options.

Air Heaters



Air Heaters

Duct Heaters **387**
LDH SERIES and D SERIES 387
MDH SERIES 401

Finned Heaters **405**
375 Finned Strip Heaters 405
FINBAR Single/Double-Ended Heaters 413

Enclosure Heaters **415**
WATROD Heaters 415
Silicone Rubber Heaters 417

Duct Heaters

LDH SERIES and D SERIES

Constructed of sturdy 0.430 in. (11 mm) diameter WATROD heating elements mounted to a ¼ in. (6 mm) thick steel flange, duct heaters are easily adapted to many non-pressurized air-heating systems.

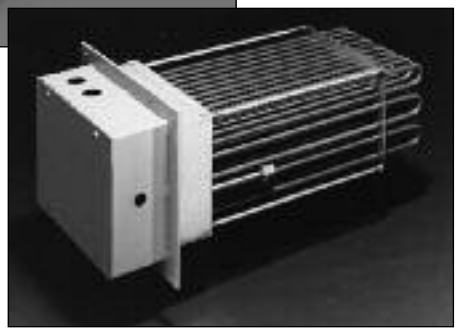
They are easily installed in applications requiring a wide range of temperature versus air flow combinations.

Watlow® duct heaters offer advantages over gas or oil fired and open coil electric units with:

- Installation flexibility—no flues or fuel lines
- 100 percent energy efficient—no energy loss up the flue
- Universal availability of electricity
- Resistance coil in Incoloy® sheath is protected from corrosive environments



LDH SERIES



D SERIES

Performance Capabilities

- Watt densities to 40 W/in² (6.2 W/cm²)
- Recommended process temperatures from -20 to 1200°F (-7 to 650°C)
- Wattages to 2.2 megawatts
- Voltages to 600V~(ac)

Features and Benefits

Long life Incoloy® sheath
- Resists corrosion/oxidation while protecting resistance coils against contamination

MgO insulation filled elements compacted to rock hard density
- Maximizes dielectric strength, heat transfer and life

Field replaceable heating elements
- Permits easy service and reduces downtime. Element change-out is made simple by a single screw clamp (D SERIES only)

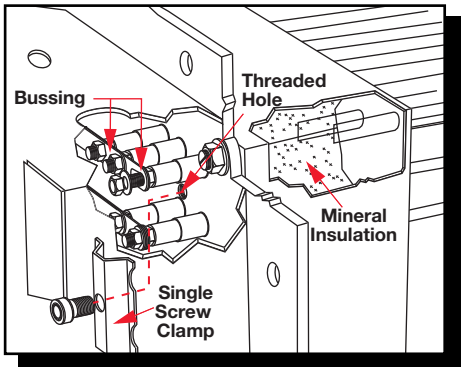
3½ in. (90 mm) thick mineral insulation
- Keeps wiring cooler and reduces heat loss

General purpose terminal enclosure
- Offers easy access to wiring

¼ in. (6 mm) inside diameter thermowell
- Accepts an optional Type J or K thermocouple for accurate sheath temperature sensing (D SERIES only)

Rigid stainless steel supports
- Prevents element sagging or deformation in various mounting positions

¼ in. (6 mm) thick steel flange with ⅜ in. (9.5 mm) diameter mounting holes
- Easily bolts to the duct wall



WATROD hairpins are repressed (recompacted) after bending to assure MgO density
- Eliminates hot spots and electrical insulation voids

Stock heaters feature from 3 to 60 elements
- Meets a wide variety of kilowatt demands

One or three phase voltages
- Meet local power supplies

Maximum 48 amperes per circuit
- Complies with National Electrical Code (NEC)

Duct heaters with general purpose enclosures meet UL® and CSA component recognition to 480 and 600V~(ac) maximum respectively—UL® and CSA file numbers are E52951 and 31388

RAPID SHIP

- *Same day shipment up to two pieces*

Duct Heaters

LDH SERIES and D SERIES

Applications

- Drying ovens
- Autoclaves
- Furnaces
- Load banks
- Heat treating
- Reheating
- HVAC
- Paint drying

Choosing a Duct Heater

The English and metric graphs, shown on the following pages will help you to select the correct duct heater. These graphs include: *Watt Density vs. Air Temperature/Velocity, Watt Density vs. Sheath Temperature and Pressure Drop vs. Air Velocity*.

These graphs, with the quick formulas on this page, along with information specific to your application, will determine the correct duct heater specifications. However, if engineering assistance is needed, contact your Watlow representative.

Required Application Information

- Desired outlet air temperature
- Inlet air temperature
- Delta T—the temperature difference between inlet and desired outlet temperature
- Air volume (CFM/CMM) measured at both inlet temperature and pressure
- Air velocity in feet per minute (FPM); meters per minute (MPM) which equals:

English

$$FPM = \frac{\text{CFM measured at standard conditions}}{\text{Duct cross section area at heater in ft}^2}$$

Metric

$$MPM = \frac{\text{CMM measured at normal conditions}}{\text{Duct cross section area at heater in m}^2}$$

- Minimum duct heater wattage (kW). This can be determined by:

English

$$kW = \frac{\text{CFM x Delta T (°F) x 1.1 (safety factor)}}{3000}$$

Metric

$$kW = \frac{\text{CMM x Delta T (°C) x 1.1 (safety factor)}}{48}$$

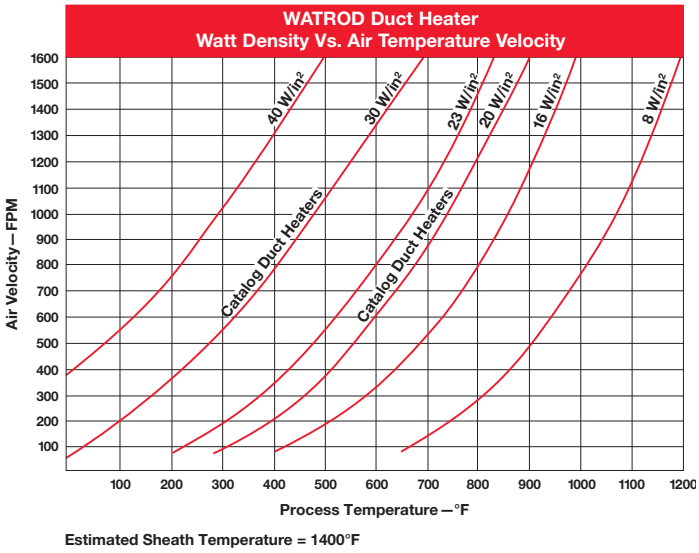
Note: The duct heater, or combination of duct heaters, used for the process should be equal to or exceed the minimum wattage calculation.

Duct Heaters

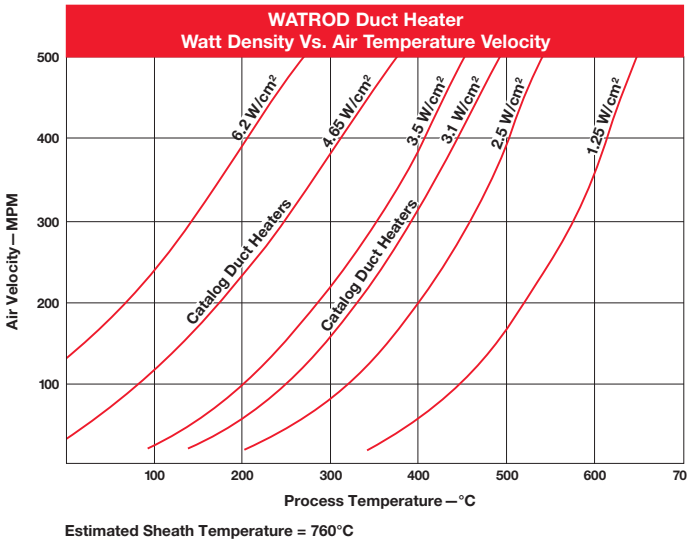
LDH SERIES and D SERIES

Watt Density vs. Air Temperature/Velocity

To decide watt density requirements, first determine the desired outlet air temperature and velocity in feet per minute. Then follow the lines on the graph for velocity and process temperature to the watt density curve's intersecting point. This shows the recommended watt density based on a maximum sheath temperature of 1400°F (760°C). **For longer heater life, lower watt densities should be chosen.**



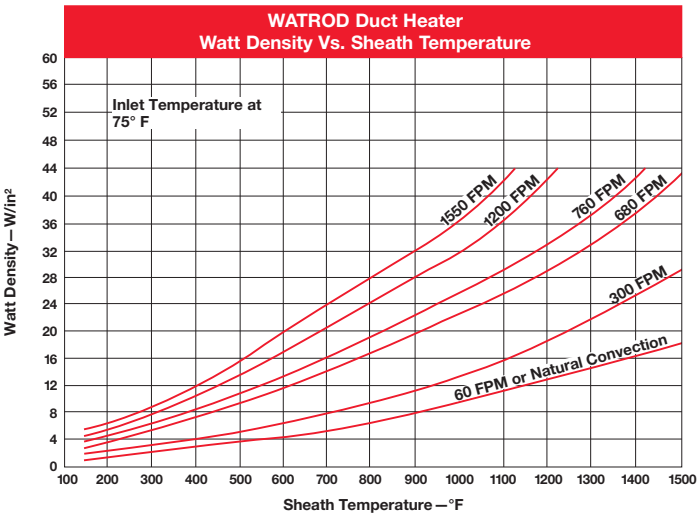
Estimated Sheath Temperature = 1400°F

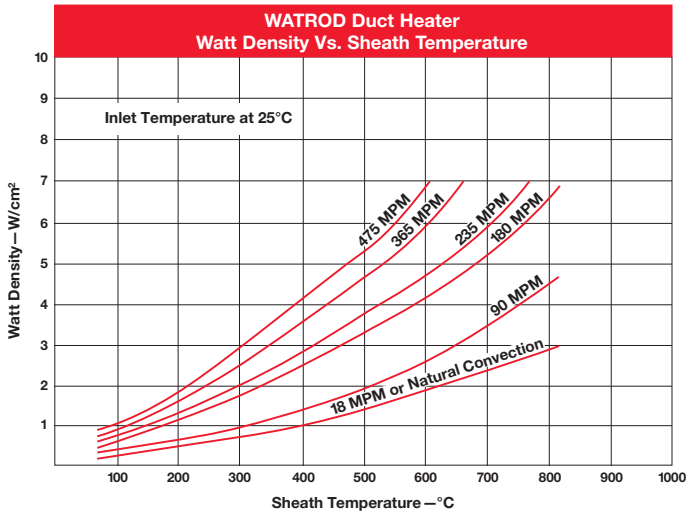


Estimated Sheath Temperature = 760°C

Watt Density vs. Sheath Temperature

The *Watt Density vs. Sheath Temperature* graph shows the air velocity (FPM or MPM) required to operate a WATROD duct heater at specific watt densities or sheath temperatures. Also depicted is the appropriate watt density vs. sheath temperature at a specified air flow.





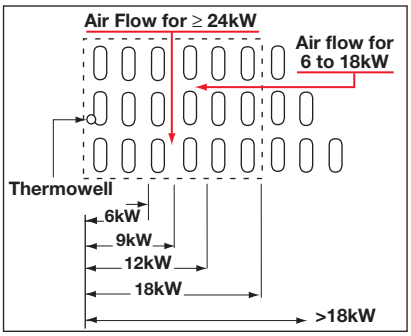
Duct Heaters

LDH SERIES and D SERIES

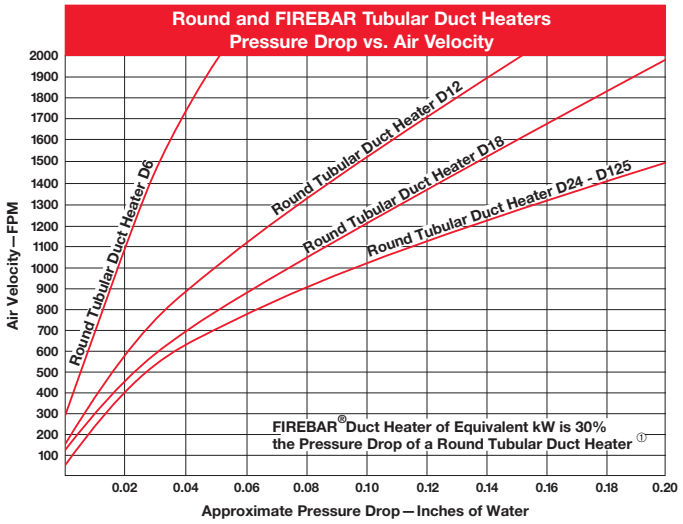
Pressure Drop vs. Air Velocity

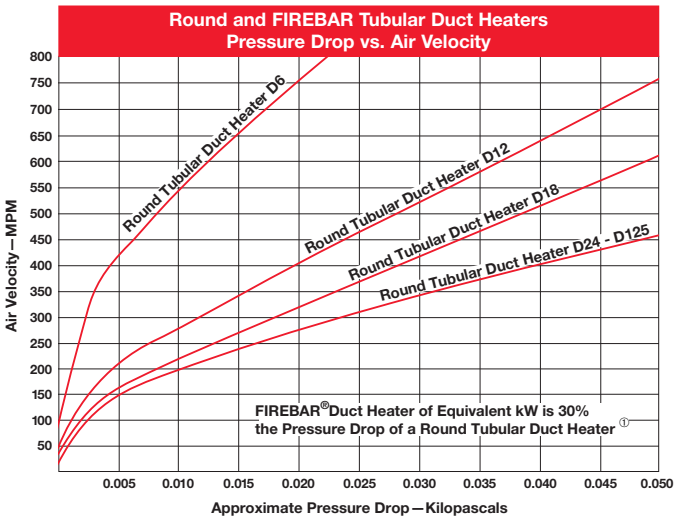
The rate at which pressure drops through the duct heater is critical for properly sizing blowers and pumps. *The Pressure Drop vs. Air Velocity* graph gives recommended maximum velocities in feet per minute and meters per minute according to the air velocity and duct heater size.

To determine the pressure drop through the duct heater, follow the air velocity (FPM or MPM) over to the appropriate curve which identifies the duct heater size. Then, take the intersecting point down to the approximate pressure drop value.



Note: Viewing from the element ends—the recommended air flow direction through element bundle changes at >18kW.





① FIREBAR® flat tubular element duct heaters can be custom designed and built when they enhance your application output or performance. Although duct heaters are not normally constructed with FIREBAR elements, we show the pressure drop reduction using FIREBAR as a distinct advantage.

Options

Sheath Material

Watlow duct heaters can be made with element sheath materials other than Incoloy®.

Contact your Watlow representative for details and availability.

Wattages/Voltages

To meet specific application needs, voltage and wattage combinations outside stock product parameters are available.

For more information about this option, contact your Watlow representative.

Duct Heaters

LDH SERIES and D SERIES

Options *(Continued)*

Terminal Enclosures

In addition to the standard, general purpose (NEMA 1) terminal enclosure, Watlow offers the following optional terminal enclosures to meet specific application requirements:

- Moisture resistant (NEMA 4)
- Stainless steel corrosion resistant (NEMA 4X—contact your Watlow representative)
- Explosion resistant (NEMA 7—contact your Watlow representative)
- Dust resistant (NEMA 12)

Thermocouples

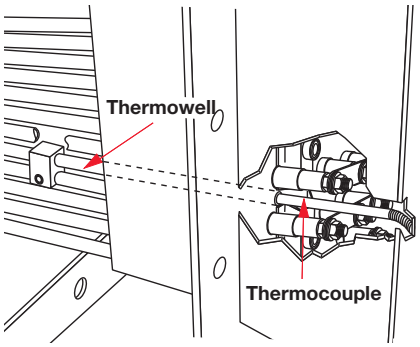
Type J or **K** thermocouples, inserted in the thermowell, accurately sense element sheath temperature for over-temperature conditions.

To sense process temperature, the sensing element should be located down stream from the duct heater. This will eliminate incorrect sensing caused by radiant heat.

Thermocouples are supplied with 120 in. (3050 mm) leads (longer lead lengths available). Unless otherwise specified, thermocouples are supplied with temperature ranges detailed on the *Thermocouple Types* chart.

Using a thermocouple requires an appropriate temperature and power controller. These must be purchased separately. Watlow offers a wide variety of temperature and power controllers to meet virtually all applications. Temperature controllers can be configured to accept process variable inputs, too. Contact your Watlow representative for details.

To order a thermocouple, add the appropriate suffix letter to the duct heater's base code number, as indicated on the *Build-a-Code* chart on page 399.



Duct heater thermowell holds thermocouple for sensing sheath temperature.

Thermocouple Types

ASTM Type	Conductor Characteristics Positive	Conductor Characteristics Negative	Recommended ① Temperature Range °F	Recommended ① Temperature Range (°C)
J	Iron (Magnetic)	Constantan (Non-magnetic)	0 to 1000	(-20 to 540)
K	Chromel® (Non-magnetic)	Alumel® (Magnetic)	0 to 2000	(-20 to 1100)

① **Type J** and **Type K** thermocouples are rated 32 to 1382°F and 32 to 2282°F (0-750°C and 0-1250°C), respectively. Watlow does not recommend exceeding temperature ranges shown on this chart for the tubular product line.

Application Hints

- Mount duct heaters horizontally to lower enclosure temperatures and promote unit life.
- Orient heating elements as per the air flow illustration on page 390.
- Promote heater life by keeping sheath temperature below the 1400°F (760°C) maximum.
- Measure process temperature in the outlet stream, away from the heater.
- Maintain wiring integrity by keeping enclosure temperature below 400°F (205°C).
- Thermal cycling can cause terminations to loosen. Periodically check and tighten all electrical connections.
- Size power feeder wires in accordance with NEC and other applicable codes.
- Protect employees against electrical shock by properly grounding the unit per NEC specifications.

Duct Heaters

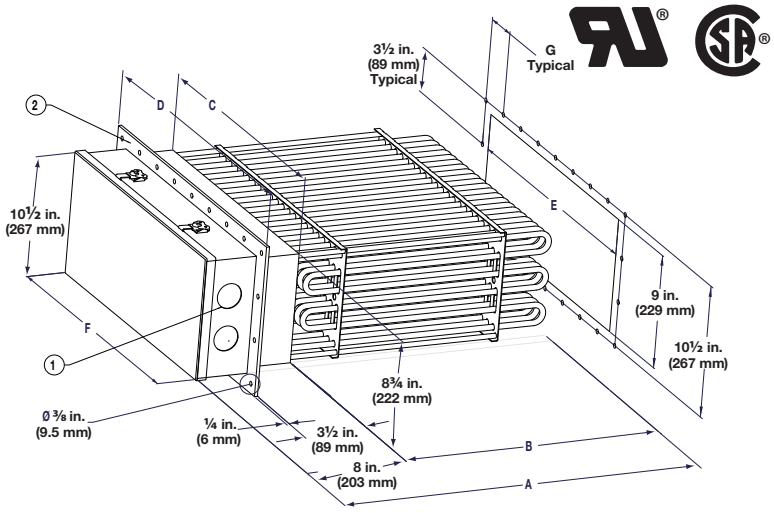
LDH SERIES

Application: High Temperature Air 800°F (427°C)

- Welded Incoloy® WATROD elements
- Without thermostat
- General purpose enclosure
- Steel flange

① 3 and 6 element heaters have (1) 1 inch NPT conduit opening; 9, 12 and 15 element heaters have (2) 1 inch NPT conduit openings; 18 element heaters have (2) 1½ inch NPT conduit openings; 21 element (B= 20¼ in.) heaters have (2) 1½ inch NPT conduit openings; remaining 21 and 24 element heaters have (3) 1½ inch NPT conduit openings.

② All flanges are 12 inches wide.



# of Elem	Volts	kW	Ph	# Circ	Code Number	Del.	Ship Wt. lbs (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)	"D" Dim. in. (mm)	"E" Dim. in. (mm)	"F" Dim. in. (mm)	"G" Dim. in. (mm)
20 W/in² (3.1 W/cm²)														
3	240	9.0	1	1	**LDH9S10S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
3	240	9.0	3	1	**LDH9S3S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
3	480	9.0	1	1	**LDH9S11S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
3	480	9.0	3	1	**LDH9S5S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
6	240	18.0	1	2	**LDH18S10S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
6	240	18.0	3	1	**LDH18S3S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
6	480	18.0	1	1	**LDH18S11S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
6	480	18.0	3	1	**LDH18S5S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
9	240	27.0	1	3	**LDH27S10S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
9	240	27.0	3	3	**LDH27S3S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
9	480	27.0	1	3	**LDH27S11S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
9	480	27.0	3	1	**LDH27S5S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
12	240	36.0	1	4	**LDH36S10S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
12	240	36.0	3	2	**LDH36S3S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
12	480	36.0	1	2	**LDH36S11S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
12	480	36.0	3	1	**LDH36S5S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
15	240	45.0	3	5	**LDH45S3S**	RS	195 (89)	28¼ (718)	20¼ (514)	15¾ (400)	19½ (495)	16 (406)	17⅞ (454.0)	3 (76)
15	480	45.0	1	5	**LDH45S11S**	RS	195 (89)	28¼ (718)	20¼ (514)	15¾ (400)	19½ (495)	16 (406)	17⅞ (454.0)	3 (76)
15	480	45.0	3	5	**LDH45S5S**	RS	195 (89)	28¼ (718)	20¼ (514)	15¾ (400)	19½ (495)	16 (406)	17⅞ (454.0)	3 (76)
18	240	54.0	3	3	**LDH54S3S**	RS	205 (93)	28¼ (718)	20¼ (514)	18¾ (476)	22½ (572)	19 (483)	20⅞ (530.2)	3 (76)
18	480	54.0	1	3	**LDH54S11S**	RS	205 (93)	28¼ (718)	20¼ (514)	18¾ (476)	22½ (572)	19 (483)	20⅞ (530.2)	3 (76)
18	480	54.0	3	2	**LDH54S5S**	RS	205 (93)	28¼ (718)	20¼ (514)	18¾ (476)	22½ (572)	19 (483)	20⅞ (530.2)	3 (76)
21	240	63.0	3	7	**LDH63S3S**	RS	235 (107)	28¼ (718)	20¼ (514)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	63.0	1	7	**LDH63S11S**	RS	235 (107)	28¼ (718)	20¼ (514)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	63.0	3	7	**LDH63S5S**	RS	235 (107)	28¼ (718)	20¼ (514)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	240	79.0	3	7	**LDH79S3S**	RS	260 (118)	33 (838)	25 (635)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	79.0	1	7	**LDH79S11S**	RS	260 (118)	33 (838)	25 (635)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	79.0	3	7	**LDH79S5S**	RS	260 (118)	33 (838)	25 (635)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	240	105.0	3	7	**LDH105S3S**	S	290 (132)	40½ (1029)	32½ (826)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	105.0	1	7	**LDH105S11S**	RS	290 (132)	40½ (1029)	32½ (826)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	105.0	3	7	**LDH105S5S**	RS	290 (132)	40½ (1029)	32½ (826)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	131.0	3	7	**LDH131S5S**	S	310 (141)	49½ (1257)	41½ (1054)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
24	480	150.0	3	4	**LDH150S5S**	S	330 (150)	49½ (1257)	41½ (1054)	24¾ (629)	28½ (724)	25 (635)	26⅞ (682.6)	3 (76)

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 days lead time

Notes:

- See *Watt Density vs. Air Temperature/Velocity* charts on page 389 to confirm suitability in the application.

Duct Heaters

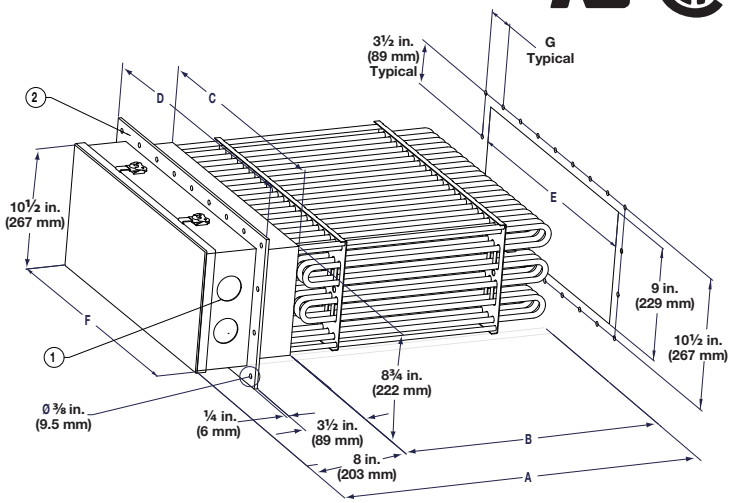
LDH SERIES

Application: Medium Temperature Air 750°F (399°C)

- Welded Incoloy® WATROD elements
- Without thermostat
- General purpose enclosure
- Steel flange

① 3 and 6 element heaters have (1) 1 inch NPT conduit opening; 9, 12 and 15 element heaters have (2) 1 inch NPT conduit openings; 18 element heaters have (2) 1½ inch NPT conduit openings; 21 element (B= 20¼ in.) heaters have (2) 1½ inch NPT conduit openings; remaining 21 and 24 element heaters have (3) 1½ inch NPT conduit openings.

② All flanges are 12 inches wide.



# of Elem	Volts	kW	Ph	# Circ	Code Number	Del.	Ship Wt. lbs. (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)	"D" Dim. in. (mm)	"E" Dim. in. (mm)	"F" Dim. in. (mm)	"G" Dim. in. (mm)
30 W/in² (4.7 W/cm²)														
3	240	14.0	1	1	**LDH14SX10S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
3	240	14.0	3	1	**LDH14SX3S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
3	480	14.0	1	1	**LDH14SX11S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
3	480	14.0	3	1	**LDH14SX5S**	RS	55 (25)	28¼ (718)	20¼ (514)	3¾ (95)	7½ (191)	4 (102)	4⅝ (117.5)	3 (76)
6	240	27.0	1	3	**LDH27SX10S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
6	240	27.0	3	1	**LDH27SX3X**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
6	480	27.0	1	1	**LDH27SX11S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
6	480	27.0	3	1	**LDH27SX5S**	RS	65 (30)	28¼ (718)	20¼ (514)	6¾ (171)	10½ (267)	7 (178)	7⅝ (193.7)	3 (76)
9	240	41.0	3	3	**LDH41SX3S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
9	480	41.0	1	3	**LDH41SX11S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
9	480	41.0	3	3	**LDH41SX5S**	RS	120 (55)	28¼ (718)	20¼ (514)	9¾ (248)	13½ (343)	10 (254)	10⅝ (269.9)	3 (76)
12	240	54.0	3	4	**LDH54SX3S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
12	480	54.0	1	4	**LDH54SX11S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
12	480	54.0	3	2	**LDH54SX5S**	RS	135 (62)	28¼ (718)	20¼ (514)	12¾ (324)	16½ (419)	13 (330)	13⅝ (346.1)	3 (76)
15	240	68.0	3	5	**LDH68SX3S**	RS	195 (89)	28¼ (718)	20¼ (514)	15¾ (400)	19½ (495)	16 (406)	17⅞ (454.0)	3 (76)
15	480	68.0	1	5	**LDH68SX11S**	RS	195 (89)	28¼ (718)	20¼ (514)	15¾ (400)	19½ (495)	16 (406)	17⅞ (454.0)	3 (76)
15	480	68.0	3	5	**LDH68SX5S**	RS	195 (89)	28¼ (718)	20¼ (514)	15¾ (400)	19½ (495)	16 (406)	17⅞ (454.0)	3 (76)
18	240	80.0	3	6	**LDH80SX3S**	RS	205 (93)	28¼ (718)	20¼ (514)	18¾ (476)	22½ (572)	19 (483)	20⅞ (530.2)	3 (76)
18	480	80.0	1	3	**LDH80SX11S**	RS	205 (93)	28¼ (718)	20¼ (514)	18¾ (476)	22½ (572)	19 (483)	20⅞ (530.2)	3 (76)
18	480	80.0	3	3	**LDH80SX5S**	RS	205 (93)	28¼ (718)	20¼ (514)	18¾ (476)	22½ (572)	19 (483)	20⅞ (530.2)	3 (76)
21	240	95.0	3	7	**LDH95SX3S**	RS	235 (107)	28¼ (718)	20¼ (514)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	95.0	1	7	**LDH95SX11S**	RS	235 (107)	28¼ (718)	20¼ (514)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	95.0	3	7	**LDH95SX5S**	RS	235 (107)	28¼ (718)	20¼ (514)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	240	120.0	3	7	**LDH120SX3S**	RS	260 (118)	33 (838)	25 (635)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	120.0	1	7	**LDH120SX11S**	RS	260 (118)	33 (838)	25 (635)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	120.0	3	7	**LDH120SX5S**	RS	260 (118)	33 (838)	25 (635)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	160.0	3	7	**LDH160SX5S**	RS	290 (132)	40½ (1029)	32½ (826)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
21	480	200.0	3	7	**LDH200SX5S**	S	310 (141)	49½ (1257)	41½ (1054)	21¾ (552)	25½ (848)	22 (559)	23⅞ (606.4)	3 (76)
24	480	225.0	3	8	**LDH225SX5S**	S	330 (150)	49½ (1257)	41½ (1054)	24¾ (629)	28½ (724)	25 (635)	26⅞ (682.6)	3 (76)

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 days lead time

Notes:

- See *Watt Density vs. Air Temperature/Velocity* charts on page 389 to confirm suitability in the application.

Duct Heaters

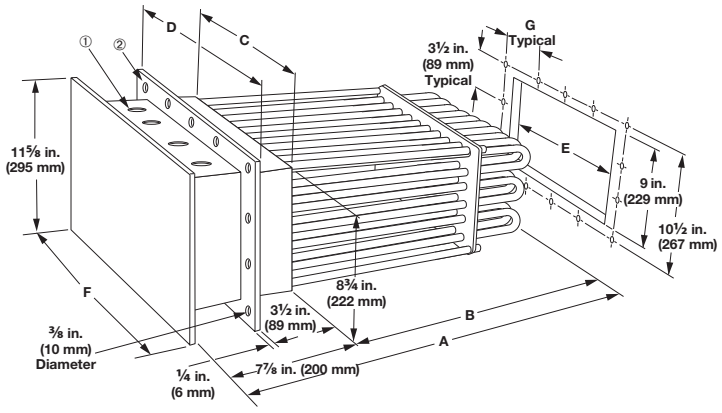
D SERIES

Application: High Temperature Air 800°F (427°C)

- Removable Incoloy® WATROD elements
- Without thermostat
- General purpose enclosure
- Steel flange

① 6 and 12 element heaters have (1) 1 inch NPT conduit opening; 18, 24, 30 and 42 element heaters have (2) 1 inch NPT conduit openings; 36, 48, 54 and 60 element heaters have (2) 1 inch NPT and (2) 1¼ inch conduit openings.

② All flanges are 12 inches wide.



# of Elem.	Volts	kW	Ph	# Circ	Code Number	Del.	Ship Wt. lbs. (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)	"D" Dim. in. (mm)	"E" Dim. in. (mm)	"F" Dim. in. (mm)	"G" Dim. in. (mm)
20 W/in² (3.1 W/cm²)														
6	240	6.0	1	1	**D6S10S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
6	240	6.0	3	1	**D6S3S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
6	480	6.0	1	1	**D6S11S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
6	480	6.0	3	1	**D6S5S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
12	240	12.0	1	1	**D12S10S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
12	240	12.0	3	1	**D12S3S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
12	480	12.0	1	1	**D12S11S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
12	480	12.0	3	1	**D12S5S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
18	240	18.0	1	2	**D18S10S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
18	240	18.0	3	1	**D18S3S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
18	480	18.0	1	1	**D18S11S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
18	480	18.0	3	1	**D18S5S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
24	240	24.0	1	2	**D24S10S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
24	240	24.0	3	2	**D24S3S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
24	480	24.0	1	1	**D24S11S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
24	480	24.0	3	1	**D24S5S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
30	240	30.0	3	2	**D30S3S**	RS	120 (55)	27⅞ (708)	20 (508)	10¾ (273)	14½ (368)	11 (279)	13¾ (349)	3¼ (83)
30	480	30.0	1	2	**D30S11S**	RS	120 (55)	27⅞ (708)	20 (508)	10¾ (273)	14½ (368)	11 (279)	13¾ (349)	3¼ (83)
30	480	30.0	3	1	**D30S5S**	RS	120 (55)	27⅞ (708)	20 (508)	10¾ (273)	14½ (368)	11 (279)	13¾ (349)	3¼ (83)

CONTINUED

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 days lead time

Notes:

- See *Watt Density vs. Air Temperature/Velocity* charts on page 389 to confirm suitability in the application.

Duct Heaters

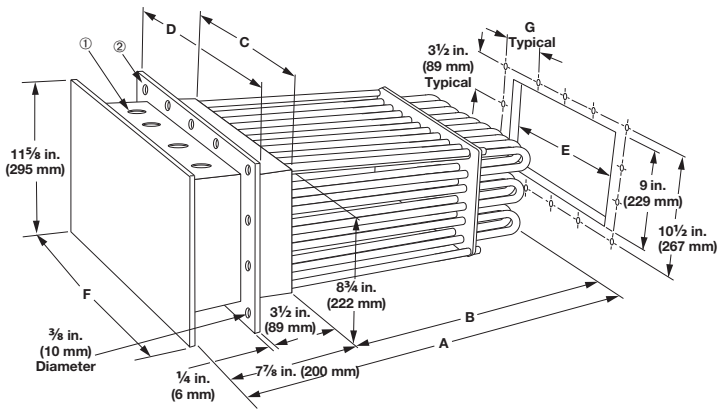
D SERIES

Application: High Temperature Air 800°F (427°C)

- Removable Incoloy® WATROD elements
- Without thermostat
- General purpose enclosure
- Steel flange

① 6 and 12 element heaters have (1) 1 inch NPT conduit opening; 18, 24, 30 and 42 element heaters have (2) 1 inch NPT conduit openings; 36, 48, 54, and 60 element heaters have (2) 1 inch NPT and (2) 1¼ inch conduit openings.

② All flanges are 12 inches wide.



# of Elem.	Volts	kW	Ph	# Circ	Code Number	Del.	Ship Wt. lbs. (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)	"D" Dim. in. (mm)	"E" Dim. in. (mm)	"F" Dim. in. (mm)	"G" Dim. in. (mm)
20 W/in² (3.1 W/cm²)														
36	240	36.0	3	2	**D36S3S**	RS	135 (62)	27⅞ (708.0)	20 (508)	12¾ (324)	16½ (419)	13 (330)	15¾ (400)	3¾ (95)
36	480	36.0	1	2	**D36S11S**	RS	135 (62)	27⅞ (708.0)	20 (508)	12¾ (324)	16½ (419)	13 (330)	15¾ (400)	3¾ (95)
36	480	36.0	3	1	**D36S5S**	RS	135 (62)	27⅞ (708.0)	20 (508)	12¾ (324)	16½ (419)	13 (330)	15¾ (400)	3¾ (95)
42	240	42.0	3	2	**D42S3S**	RS	155 (71)	27⅞ (708.0)	20 (508)	14¾ (375)	18½ (470)	15 (381)	17¾ (451)	4¼ (108)
42	480	42.0	1	2	**D42S11S**	RS	155 (71)	27⅞ (708.0)	20 (508)	14¾ (375)	18½ (470)	15 (381)	17¾ (451)	4¼ (108)
42	480	42.0	3	2	**D42S5S**	RS	155 (71)	27⅞ (708.0)	20 (508)	14¾ (375)	18½ (470)	15 (381)	17¾ (451)	4¼ (108)
48	240	48.0	3	4	**D48S3S**	RS	195 (89)	27⅞ (708.0)	20 (508)	16¾ (425)	20½ (521)	17 (432)	19¾ (502)	4¾ (121)
48	480	48.0	1	2	**D48S11S**	RS	195 (89)	27⅞ (708.0)	20 (508)	16¾ (425)	20½ (521)	17 (432)	19¾ (502)	4¾ (121)
48	480	48.0	3	2	**D48S5S**	RS	195 (89)	27⅞ (708.0)	20 (508)	16¾ (425)	20½ (521)	17 (432)	19¾ (502)	4¾ (121)
54	240	54.0	3	3	**D54S3S**	RS	205 (93)	27⅞ (708.0)	20 (508)	18¾ (476)	22½ (572)	19 (483)	21¾ (552)	5¼ (133)
54	480	54.0	1	3	**D54S11S**	RS	205 (93)	27⅞ (708.0)	20 (508)	18¾ (476)	22½ (572)	19 (483)	21¾ (552)	5¼ (133)
54	480	54.0	3	2	**D54S5S**	RS	205 (93)	27⅞ (708.0)	20 (508)	18¾ (476)	22½ (572)	19 (483)	21¾ (552)	5¼ (133)
60	240	60.0	3	4	**D60S3S**	RS	235 (107)	27⅞ (708.0)	20 (508)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	60.0	1	4	**D60S11S**	RS	235 (107)	27⅞ (708.0)	20 (508)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	60.0	3	2	**D60S5S**	RS	235 (107)	27⅞ (708.0)	20 (508)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	240	75.0	3	4	**D75S3S**	RS	260 (118)	32⅞ (835.0)	25 (635)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	75.0	1	4	**D75S11S**	RS	260 (118)	32⅞ (835.0)	25 (635)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	75.0	3	2	**D75S5S**	RS	260 (118)	32⅞ (835.0)	25 (635)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	100.0	3	4	**D100S5S**	S	290 (132)	40⅜ (1025.5)	32½ (826)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	125.0	3	4	**D125S5S**	S	310 (141)	49⅜ (1254.1)	41½ (1054)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 days lead time

Notes:

- See *Watt Density vs. Air Temperature/Velocity* charts on page 389 to confirm suitability in the application.

Duct Heaters

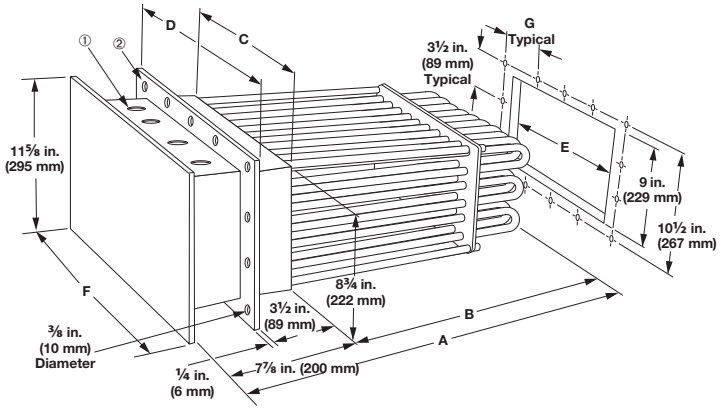
D SERIES

Application: Medium Temperature Air 750°F (399°C)

- Removable Incoloy® WATROD elements
- Without thermostat
- General purpose enclosure
- Steel flange

① 6 and 12 element heaters have (1) 1 inch NPT conduit opening; 18, 24, 30 and 42 element heaters have (2) 1 inch NPT conduit openings; 36, 48, 54, and 60 element heaters have (2) 1 inch NPT and (2) 1¼ inch conduit openings.

② All flanges are 12 inches wide.



# of Elem.	Volts	kW	Ph	# Circ	Code Number	Del.	Ship Wt. lbs. (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)	"D" Dim. in. (mm)	"E" Dim. in. (mm)	"F" Dim. in. (mm)	"G" Dim. in. (mm)
30 W/in² (4.7 W/cm²)														
6	240	9.0	1	1	**D6SX10S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
6	240	9.0	3	1	**D6SX3S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
6	480	9.0	1	1	**D6SX11S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
6	480	9.0	3	1	**D6SX5S**	RS	50 (23)	27⅞ (708)	20 (508)	2¾ (70)	6½ (165)	3 (76)	5¾ (146)	2½ (64)
12	240	18.0	1	2	**D12SX10S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
12	240	18.0	3	1	**D12SX3S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
12	480	18.0	1	1	**D12SX11S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
12	480	18.0	3	1	**D12SX5S**	RS	55 (25)	27⅞ (708)	20 (508)	4¾ (121)	8½ (215)	5 (127)	7¾ (197)	3½ (89)
18	240	27.0	1	3	**D18SX10S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
18	240	27.0	3	2	**D18SX3S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
18	480	27.0	1	2	**D18SX11S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
18	480	27.0	3	1	**D18SX5S**	RS	65 (30)	27⅞ (708)	20 (508)	6¾ (171)	10½ (267)	7 (178)	9¾ (248)	3½ (89)
24	240	36.0	1	4	**D24SX10S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
24	240	36.0	3	2	**D24SX3S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
24	480	36.0	1	2	**D24SX11S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
24	480	36.0	3	1	**D24SX5S**	RS	95 (43)	27⅞ (708)	20 (508)	8¾ (222)	12½ (318)	9 (229)	11¾ (298)	2¾ (70)
30	240	45.0	3	5	**D30SX3S**	RS	120 (55)	27⅞ (708)	20 (508)	10¾ (273)	14½ (368)	11 (279)	13¾ (349)	3¼ (83)
30	480	45.0	1	2	**D30SX11S**	RS	120 (55)	27⅞ (708)	20 (508)	10¾ (273)	14½ (368)	11 (279)	13¾ (349)	3¼ (83)
30	480	45.0	3	2	**D30SX5S**	RS	120 (55)	27⅞ (708)	20 (508)	10¾ (273)	14½ (368)	11 (279)	13¾ (349)	3¼ (83)

CONTINUED

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 days lead time

Notes:

- See *Watt Density vs. Air Temperature/Velocity* charts on page 389 to confirm suitability in the application.

Duct Heaters

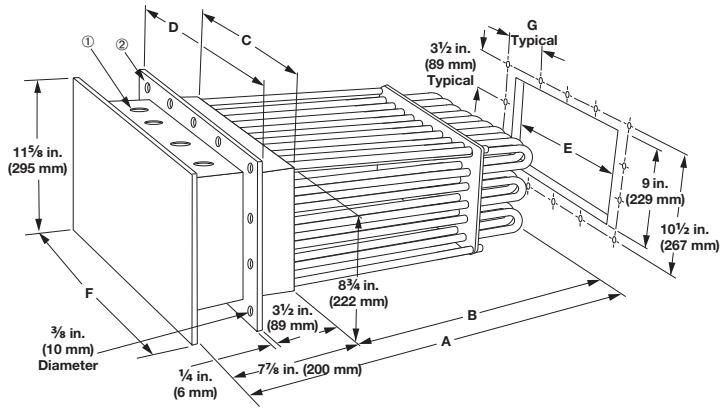
D SERIES

Application: Medium Temperature Air 750°F (399°C)

- Removable Incoloy® WATROD elements
- Without thermostat
- General purpose enclosure
- Steel flange

① 6 and 12 element heaters have (1) 1 inch NPT conduit opening; 18, 24, 30 and 42 element heaters have (2) 1 inch NPT conduit openings; 36, 48, 54, and 60 element heaters have (2) 1 inch. NPT and (2) 1¼ inch conduit openings.

② All flanges are 12 inches. wide.



# of Elem.	Volts	kW	Ph	# Circ	Code Number	Del.	Ship Wt. lbs. (kg)	"A" Dim. in. (mm)	"B" Dim. in. (mm)	"C" Dim. in. (mm)	"D" Dim. in. (mm)	"E" Dim. in. (mm)	"F" Dim. in. (mm)	"G" Dim. in. (mm)
30 W/in² (4.7 W/cm²)														
36	240	54.0	3	3	**D36SX3S**	RS	135 (62)	27⅛ (708.0)	20 (508)	12¾ (324)	16½ (419)	13 (330)	15¾ (400)	3¾ (95)
36	480	54.0	1	3	**D36SX11S**	RS	135 (62)	27⅛ (708.0)	20 (508)	12¾ (324)	16½ (419)	13 (330)	15¾ (400)	3¾ (95)
36	480	54.0	3	2	**D36SX5S**	RS	135 (62)	27⅛ (708.0)	20 (508)	12¾ (324)	16½ (419)	13 (330)	15¾ (400)	3¾ (95)
42	240	63.0	3	7	**D42SX3S**	RS	155 (71)	27⅛ (708.0)	20 (508)	14¾ (375)	18½ (470)	15 (381)	17¾ (451)	4¼ (108)
42	480	63.0	1	3	**D42SX11S**	RS	155 (71)	27⅛ (708.0)	20 (508)	14¾ (375)	18½ (470)	15 (381)	17¾ (451)	4¼ (108)
42	480	63.0	3	2	**D42SX5S**	RS	155 (71)	27⅛ (708.0)	20 (508)	14¾ (375)	18½ (470)	15 (381)	17¾ (451)	4¼ (108)
48	240	72.0	3	4	**D48SX3S**	RS	195 (89)	27⅛ (708.0)	20 (508)	16¾ (425)	20½ (521)	17 (432)	19¾ (502)	4¾ (121)
48	480	72.0	1	4	**D48SX11S**	RS	195 (89)	27⅛ (708.0)	20 (508)	16¾ (425)	20½ (521)	17 (432)	19¾ (502)	4¾ (121)
48	480	72.0	3	2	**D48SX5S**	RS	195 (89)	27⅛ (708.0)	20 (508)	16¾ (425)	20½ (521)	17 (432)	19¾ (502)	4¾ (121)
54	240	81.0	3	6	**D54SX3S**	RS	205 (93)	27⅛ (708.0)	20 (508)	18¾ (476)	22½ (572)	19 (483)	21¾ (552)	5¼ (133)
54	480	81.0	1	6	**D54SX11S**	RS	205 (93)	27⅛ (708.0)	20 (508)	18¾ (476)	22½ (572)	19 (483)	21¾ (552)	5¼ (133)
54	480	81.0	3	3	**D54SX5S**	RS	205 (93)	27⅛ (708.0)	20 (508)	18¾ (476)	22½ (572)	19 (483)	21¾ (552)	5¼ (133)
60	240	90.0	3	5	**D60SX3S**	RS	235 (107)	27⅛ (708.0)	20 (508)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	90.0	1	4	**D60SX11S**	RS	235 (107)	27⅛ (708.0)	20 (508)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	90.0	3	4	**D60SX5S**	RS	235 (107)	27⅛ (708.0)	20 (508)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	240	115.0	3	10	**D75SX3S**	RS	260 (118)	32⅛ (835.0)	25 (635)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	115.0	1	5	**D75SX11S**	RS	260 (118)	32⅛ (835.0)	25 (635)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	115.0	3	4	**D75SX5S**	RS	260 (118)	32⅛ (835.0)	25 (635)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	150.0	3	4	**D100SX5S**	RS	290 (132)	40⅜ (1025.5)	32½ (826)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)
60	480	190.0	3	5	**D125SX5S**	RS	310 (141)	49⅜ (1254.1)	41½ (1054)	20¾ (527)	24½ (622)	21 (533)	23¾ (603)	5¾ (146)

RAPID SHIP

- **RS** - Next day shipment up to 2 pieces
- **S** - Standard, 10 days lead time

Notes:

- See *Watt Density vs. Air Temperature/Velocity* charts on page 389 to confirm suitability in the application.

Duct Heaters

LDH SERIES and D SERIES

Replacement Elements

Replaceable heating elements provide easy field service and reduce downtime. Element change-out is made simple by a single screw clamp.

To order replacement elements, specify the **replacement element code number** (from the table) that corresponds to the original Watlow duct heater code number. Then specify **quantity.**

Replacement Elements

Original Duct Heater Code Numbers	Replacement Element Volts	Watts	A Dimension in.	(mm)	Replacement Element Code Number	Availability	Est. Net Wt. lbs	(kg)
20 W/in² (3.1 W/cm²)								
D6S3 to D60S3	240	1000	27⅞	(708.0)	**D6240**	Stock	1.0	(0.5)
D6S5 to D60S5	480	1000	27⅞	(708.0)	**D6480**	Stock	1.0	(0.5)
D75S3	240	1250	32⅞	(835.0)	**D75240**	Standard	1.0	(0.5)
D75S5	480	1250	32⅞	(835.0)	**D75480**	Stock	1.0	(0.5)
D100S5	480	1667	40⅜	(1025.5)	**D100480**	Stock	1.4	(0.7)
D125S5	480	2083	49⅜	(1254.1)	**D125480**	Stock	1.7	(0.8)
30 W/in² (4.7 W/cm²)								
D6SX3 to D60SX3	240	1500	27⅞	(708.0)	**D6X240**	Stock	1.0	(0.5)
D6SX5 to D60SX5	480	1500	27⅞	(708.0)	**D6X480**	Stock	1.0	(0.5)
D75SX3	240	1917	32⅞	(835.0)	**D75X240**	Standard	1.0	(0.5)
D75SX5	480	1917	32⅞	(835.0)	**D75X480**	Stock	1.0	(0.5)
D100SX5	480	2500	40⅜	(1025.5)	**D100X480**	Stock	1.4	(0.7)
D125SX5	480	3167	49⅜	(1254.1)	**D125X480**	Stock	1.7	(0.8)

Duct Heaters

LDH SERIES and D SERIES

Ordering Information

To order, complete the code number to the right with the information below:

Example: D6SX10 S J HJ

Stock Duct Code Number ①

Optional Terminal Enclosures ②
S = General purpose enclosure
W = Moisture resistant enclosure

Optional Process Sensor
PJ = Type J process thermocouple in thermowell
PK = Type K process thermocouple in thermowell

Sheath Limit Sensor
HJ = Type J high-limit thermocouple
HK = Type K high-limit thermocouple

① Catalog code numbers include standard option enclosures. To order optional enclosures or sensors, substitute the appropriate suffix.

② Standard catalog listing is a general purpose enclosure. Substitute enclosure options are noted.

How to Order

To order stock duct heaters, please specify:

- Watlow code number
- Volts/watts
- Phase
- Options
- Quantity

If our stock units do not meet your application needs, Watlow can provide a made-to-order unit. For **made-to-order** units please contact your Watlow representative and provide the following information:

- Application (inlet and outlet air temperature, CFM/CMM, duct size and mounting orientation)
- Volts/watts
- Phase
- Number of circuits
- Watt density
- Number of heating elements
- Sheath material
- Element ('B' dimension) length
- Mounting flange material and mounting hole layout
- Insulation thickness and material
- Terminal enclosure type
- Options
- Quantity

Availability

Assembly Stock: Three to five working days

Modified Stock①: Five to seven working days

Standard: 10 working days

Made-to-Order: Five to seven weeks

Replacement Elements Only

Stock: Same day shipment

Standard: 10 working days

Made-to-Order: Four weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

① Stock or Assembly stock units with catalog options.

Duct Heaters

MDH SERIES

Watlow® has developed a line of process air heaters that offer improved performance and increased versatility in medium to low temperature applications.

The duct heaters are modular and consist of two parts. The first is a 6 kilowatts heater available in either 240 or 480 volts, single- or three-phase.

The second part of the heater consists of the electrical housing that protects each module's termination area and a main flange that bolts into the user's ductwork. The heater modules are installed in the housing and main flange via rectangular slots in the main flange. The range of modules that can be accommodated in various duct heater assemblies, range from 1-10 modules. A range of 6 to 60 kilowatts, in 6 kilowatt increments is achieved.

The new design of the modular duct heater offers increased reliability. The individual modules are removable through the housing of the assembly, which eliminates the need to pull the complete heater from the ductwork. This reduces downtime and costs because the heating elements can be replaced individually.

Performance improvements include quicker response time and reduced infiltration from the air stream being heated into the electrical enclosure.

Features and Benefits

Individual modules removable through housing
- Reduces downtime for replacement of module

27 percent reduction in heat-up time as compared to traditional 0.430 inch diameter duct heater elements
- Results in faster response time

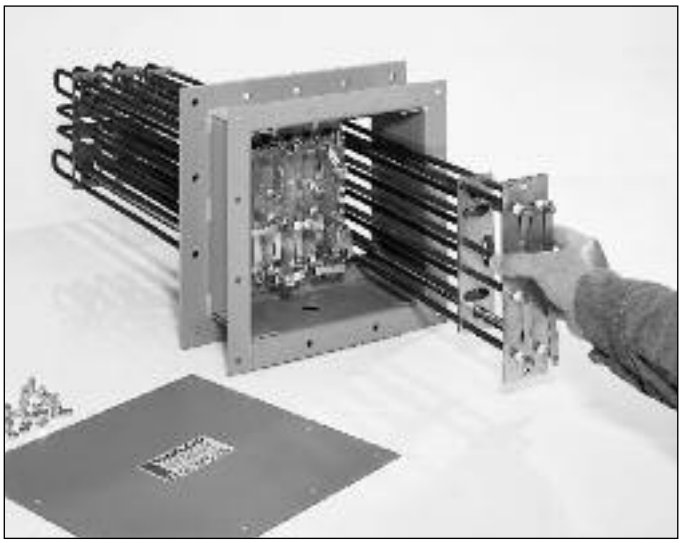
Smaller diameter elements (0.315 inch)
- Results in a 25 percent lower energy usage on initial heat-up

31 percent lighter weight than traditional tubular duct heaters
- Reduces shipping costs and increases worker safety

Greater free cross sectional area
- Results in lower pressure drop

Improved seal between element and electrical housing
- Results in lower electrical housing temperature

Flexible module wiring
- Allows user to sequentially stage modules



Applications

- Low temperature ovens
- Parts drying
- Semiconductor clean room environmental heating
- Plastic curing
- Load banks
- Heated air knives
- Food dehydration
- Heat shrink tunnels

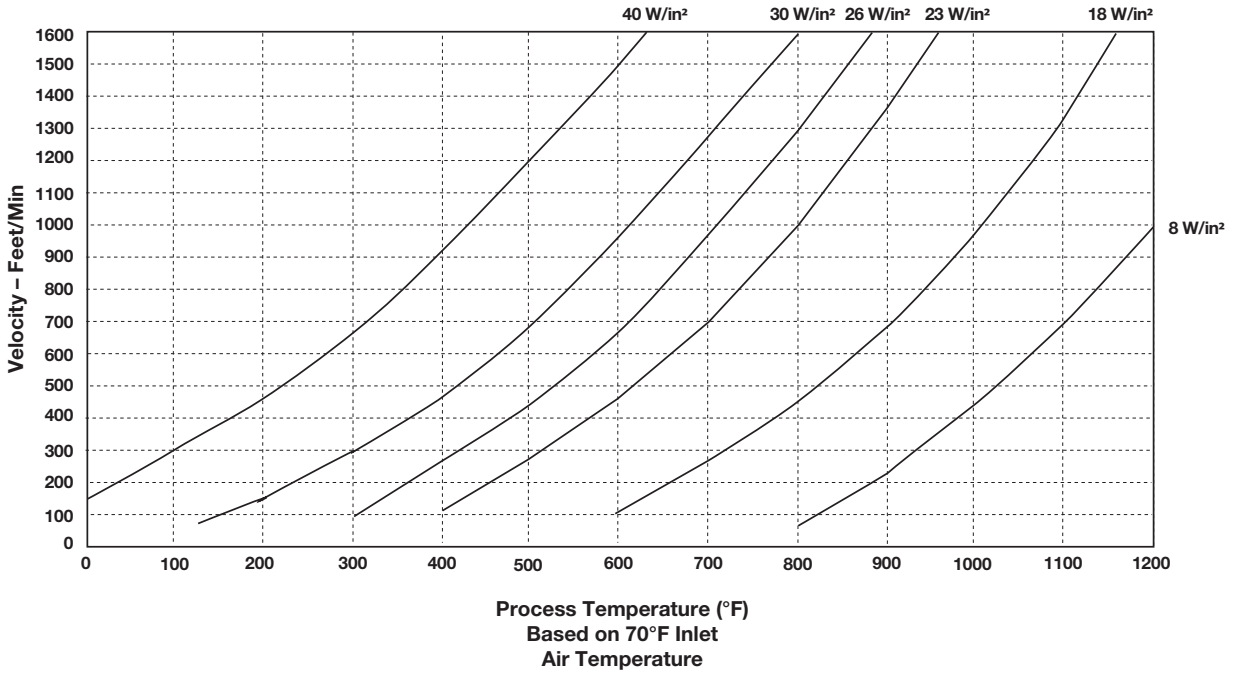
RAPID SHIP

- *Same day shipment up to two pieces*

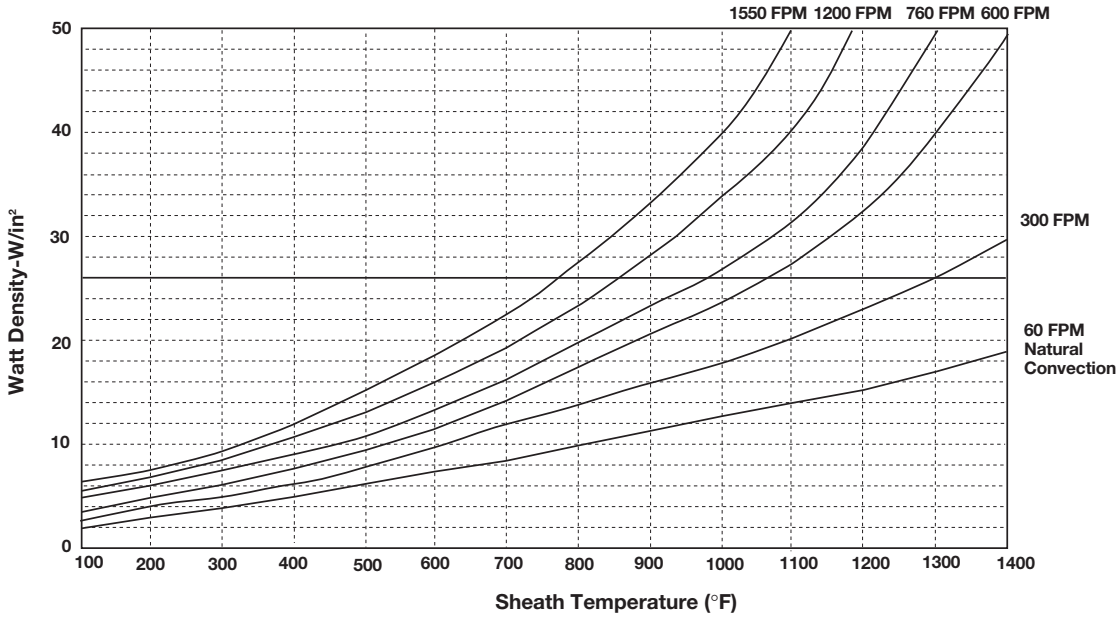
Duct Heaters

MDH SERIES

Velocity vs. Process Temperature

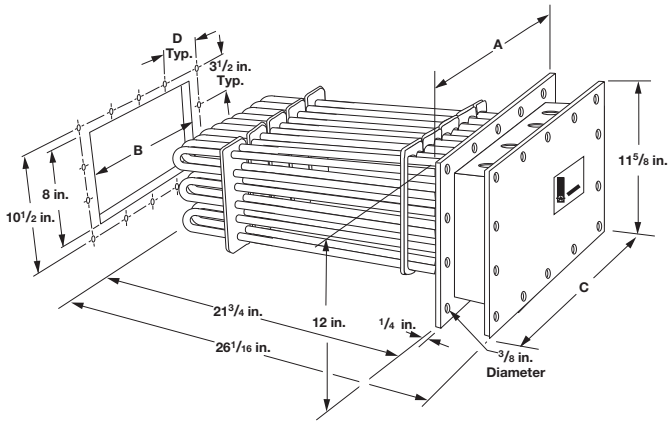


Watt Density vs. Sheath Temperature



Duct Heaters

MDH SERIES



Application: Air Heating – Maximum outlet temperature – 750°F (399°C)

Watt Density W/in²	kW	Volts	Phase	No. of Circuits	No. of Modules	Est. Shipping Wt. lbs	Del.	Code Number	Dimensions in.			
									A	B	C	D
26	6	240	1	1	1	35	RS	**MDH6SI0**	6.50	2.50	5.75	2.50
26	6	240	3	1	1	35	RS	**MDH6S3**	6.50	2.50	5.75	2.50
26	6	480	1	1	1	35	RS	**MDH6S11**	6.50	2.50	5.75	2.50
26	6	480	3	1	1	35	RS	**MDH6S5**	6.50	2.50	5.75	2.50
26	12	240	1	2	2	39	RS	**MDH12SI0**	8.50	4.75	7.75	3.50
26	12	240	3	1	2	39	RS	**MDH12S3**	8.50	4.75	7.75	3.50
26	12	480	1	1	2	39	RS	**MDH12S11**	8.50	4.75	7.75	3.50
26	12	480	3	1	2	39	RS	**MDH12S5**	8.50	4.75	7.75	3.50
26	18	240	1	3	3	46	RS	**MDH18SI0**	10.50	7.00	9.75	3.00
26	18	240	3	1	3	46	RS	**MDH18S3**	10.50	7.00	9.75	3.00
26	18	480	1	1	3	46	RS	**MDH18S11**	10.50	7.00	9.75	3.00
26	18	480	3	1	3	46	RS	**MDH18S5**	10.50	7.00	9.75	3.00
26	24	240	1	4	4	67	RS	**MDH24S10**	12.50	9.25	11.75	2.75
26	24	240	3	2	4	67	RS	**MDH24S3**	12.50	9.25	11.75	2.75
26	24	480	1	2	4	67	RS	**MDH24S11**	12.50	9.25	11.75	2.75
26	24	480	3	1	4	67	RS	**MDH24S5**	12.50	9.25	11.75	2.75
26	30	240	3	2	5	84	RS	**MDH30S3**	15.75	11.50	15.00	3.56
26	30	480	1	2	5	84	RS	**MDH30S11**	15.75	11.50	15.00	3.56
26	30	480	3	1	5	84	RS	**MDH30S5**	15.75	11.50	15.00	3.56
26	36	240	3	2	6	95	RS	**MDH36S3**	18.00	13.75	17.25	4.13
26	36	480	1	2	6	95	RS	**MDH36S11**	18.00	13.75	17.25	4.13
26	36	480	3	1	6	95	RS	**MDH36S5**	18.00	13.75	17.25	4.13
26	42	240	3	3	7	109	RS	**MDH42S3**	20.25	16.00	19.50	4.69
26	42	480	1	3	7	109	RS	**MDH42S11**	20.25	16.00	19.50	4.69
26	42	480	3	2	7	109	RS	**MDH42S5**	20.25	16.00	19.50	4.69
26	48	240	3	4	8	137	RS	**MDH48S3**	22.50	18.25	21.75	5.25
26	48	480	1	3	8	137	RS	**MDH48S11**	22.50	18.25	21.75	5.25
26	48	480	3	2	8	137	RS	**MDH48S5**	22.50	18.25	21.75	5.25
26	54	240	3	3	9	144	RS	**MDH54S3**	24.75	20.50	24.00	5.81
26	54	480	1	3	9	144	RS	**MDH54S11**	24.75	20.50	24.00	5.81
26	54	480	3	2	9	144	RS	**MDH54S5**	24.75	20.50	24.00	5.81
26	60	240	3	4	10	165	RS	**MDH60S3**	27.00	22.75	26.25	6.38
26	60	480	1	4	10	165	RS	**MDH6OS11**	27.00	22.75	26.25	6.38
26	60	480	3	2	10	165	RS	**MDH60S5**	27.00	22.75	26.25	6.38

Options include individual modules with optional NEMA 1 housing, high temperature thermocouple kit and blank flange modules.

Modular duct heaters with **1** and **2** modules have conduit openings for **one** 1 inch NPT fitting.
Modular duct heaters with **3, 4, 5,** and **7** modules have conduit openings for **two** 1 inch NPT fittings.
Modular duct heaters with **6, 8, 9,** and **10** modules have conduit openings for **two** 1¼ inch NPT and **two** 1 inch NPT fittings.

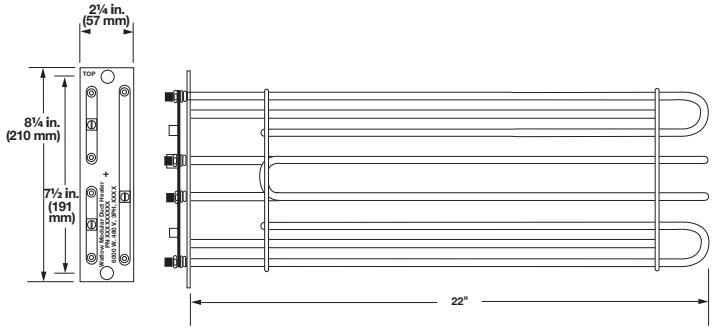
RAPID SHIP

- **RS** - Same day shipment up to 2 pieces

Duct Heaters

MDH SERIES

Individual Module Dimensions



Specifications

- Module rating - 240 or 480V~(ac), 6kW, three-phase or one-phase
- Watt Density - 26 W/in²
- Elements - 0.315 inch dia. Incoloy® elements
- High-limit thermocouple installed by drilling premarked hole in flange
- 6-60kW range when mounted in duct heater assembly

Application Information

- Maximum sheath temperature = 1200˚F (649°C)
- Maximum outlet temperature = 750˚F (399°C)

Options

Terminal Enclosures

Terminal enclosures are available in NEMA 1 and 4 configurations.

High-Limit Thermocouples

High-limit thermocouples can be supplied on specified modules or shipped as a kit. Available thermocouples are Types J and K.

Blank Module Covers

Module covers are available for covering blank slots on the main flange. This allows for adding heater module at a later time to allow higher wattage outputs.

Watlow Code Number	Description
Replacement Modules	
M63	6kW, 240V, 3 phase
M610	6kW, 240V, 1 phase
M65	6kW, 480V, 3 phase
M611	6kW, 480V, 1 phase
High Limit Thermocouple Kits	
MTCJ	Type J (0-1000°F)
MTCK	Type K (0-2000°F)
Blank Module Covers	
MBLK	Cover slots in main flange

Availability

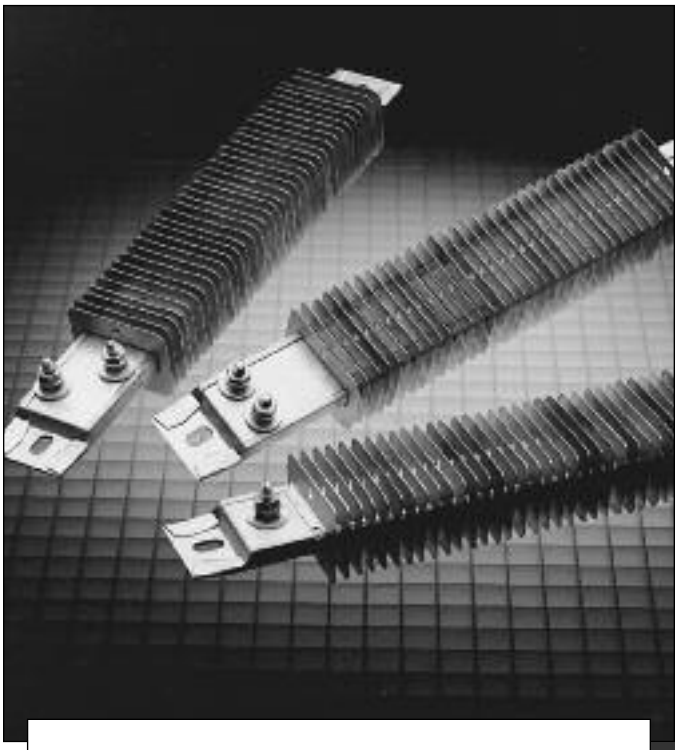
- **Assembly Stock**: Three to five working days
- **Made-to-Order**: Eight weeks

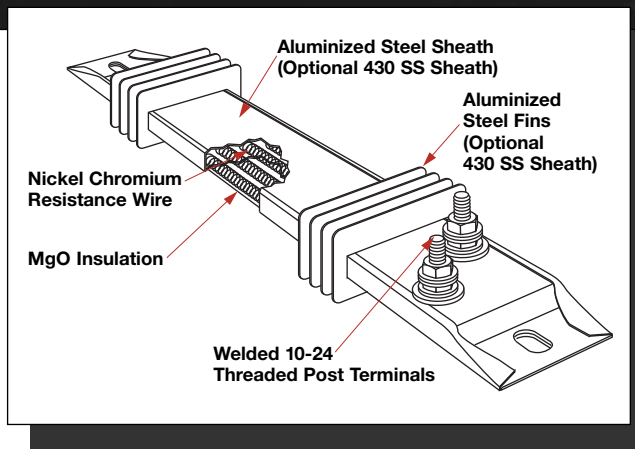
Contact your Watlow representative for more details.

Finned Heaters

375 Finned Strip Heaters

Like its 375 strip counterpart, the 375 finned strip heater is constructed of highly-compacted MgO-based insulation, which conducts heat efficiently from the nickel chromium element wire to the sheath. Two inch wide (51 mm) aluminized steel fins are attached in a way that maximizes surface contact so that heat is transferred into the air faster.





Performance Capabilities

- Aluminized steel sheath temperatures to 1100°F (595°C)
- UL® approved to 240V~(ac) (File No. E52951)
- CSA approved to 600V~(ac) (File No. LR7392)

Features and Benefits

Nickel chromium element wire is centered in the heater

- Uniformly heats the strip

Aluminized steel sheath

- Operates at higher temperatures
- Resists corrosion better than iron-sheathed heaters

Optional 430 SS sheath

- Available for more corrosive environments

Welded post terminals

- Produces strong, trouble-free connections

Available lengths from 5½ to 48 in. (140 to 1220 mm)

Applications

- Shrink tunnels
- Duct heaters
- Space heaters
- Drying ovens
- Incubators
- Air heating
- Load bank resistors
- Heat curing
- Ink drying
- Food warmers
- Moisture protection
- Enclosure heating
- Dehumidifiers
- Stress relieving ovens

Finned Heaters

375 Finned Strip Heaters

Applications and Technical Data

Calculating Watt Density

Use the graph and formulas to make certain that the maximum allowable watt density for the heater will not be exceeded in the application.

Open air watt density is calculated for total heated surface area.

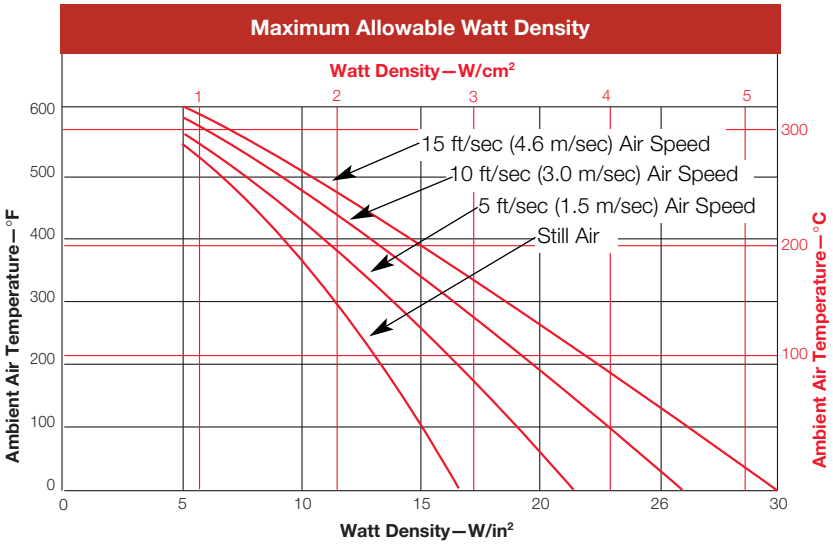
Formulas

$$\text{Watt Density} = \frac{\text{Wattage}}{\text{Heated Area}}$$

Heated Area
(Offset Terminals) = [Overall Length (A) - 4 in.]
x 3.75 in.
= [Overall Length (A) - 102 mm]
x 95.3 mm

Heated Area
(Parallel Terminals) = [Overall Length (A) - 3.12 in.]
x 3.75 in.
= [Overall Length (A) - 79.3 mm]
x 95.3 mm

Heated Area
(One-on-One Terminals) = [Overall Length (A) - 4.25 in.]
x 3.75 in.
= [Overall Length (A) - 108 mm]
x 95.3 mm



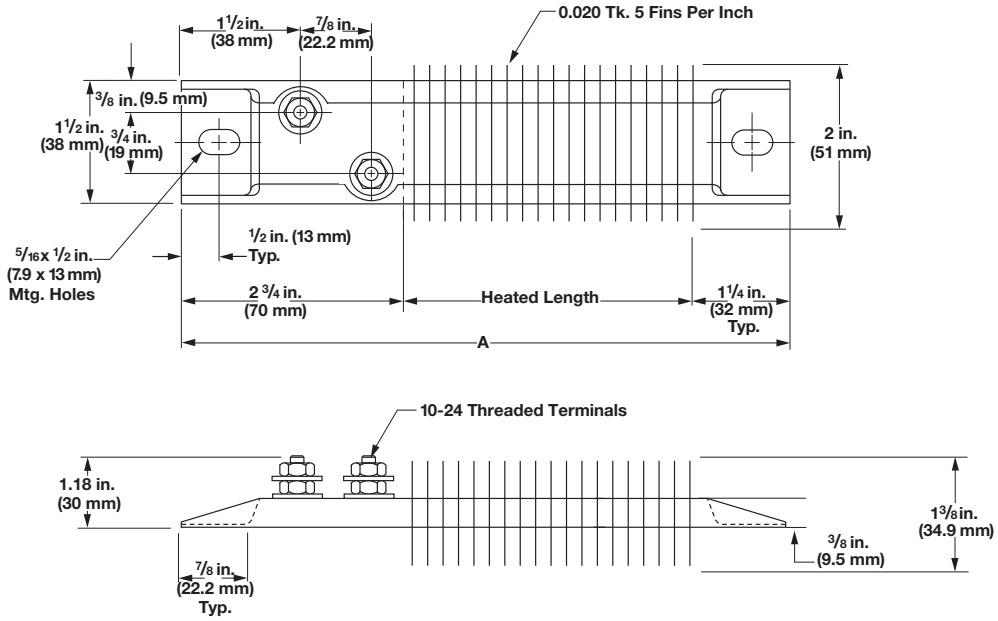
Finned Heaters

375 Finned Strip Heaters

Termination Options

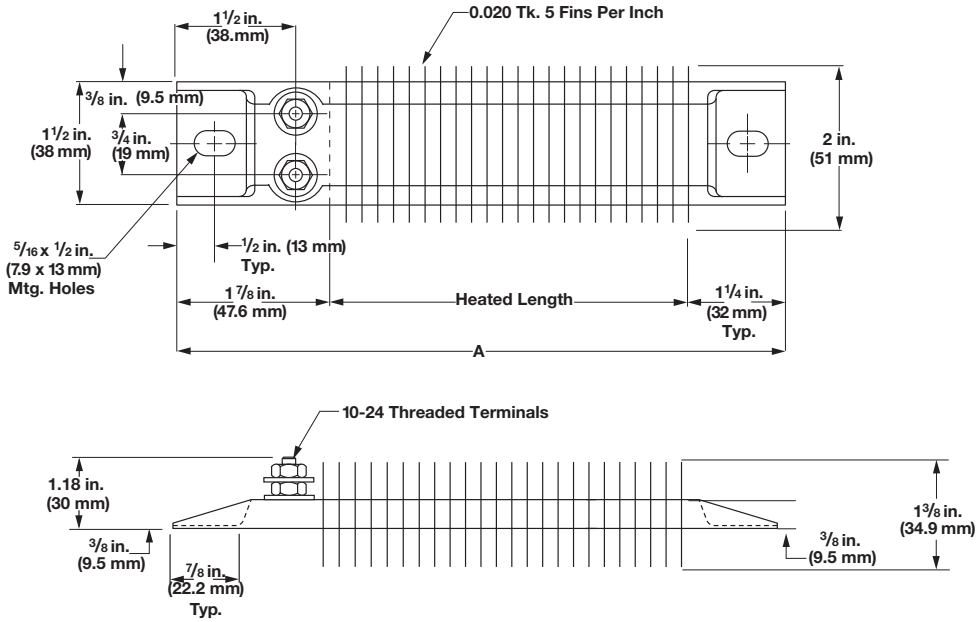
Offset Terminals

Two 10-24 threaded post terminals are offset from each other on the same end.



Parallel Terminals

Two 10-24 threaded post terminals are used; both terminals on one end.



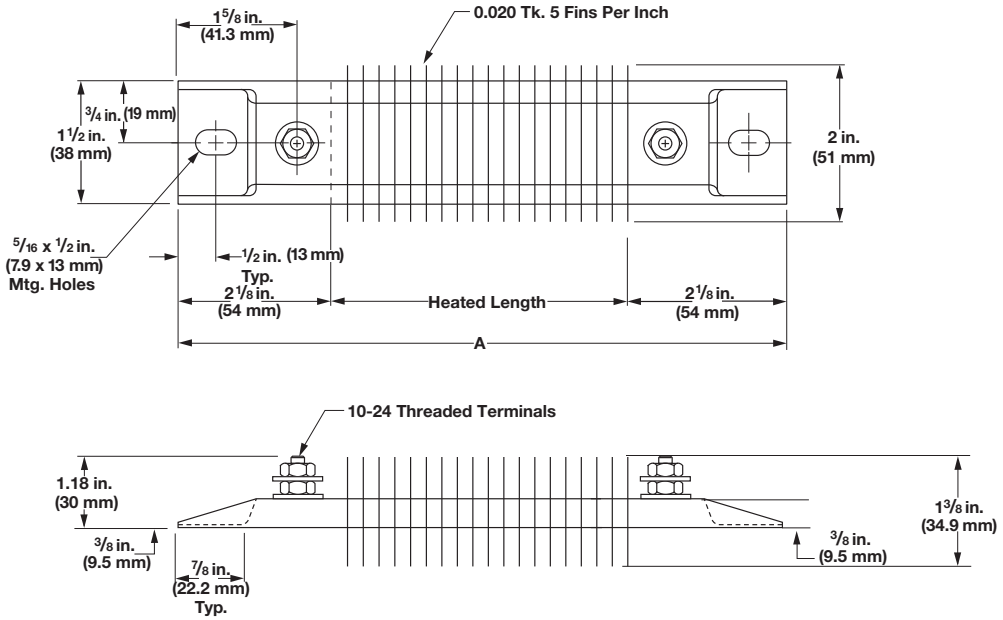
Finned Heaters

375 Finned Strip Heaters

Termination Options *(Continued)*

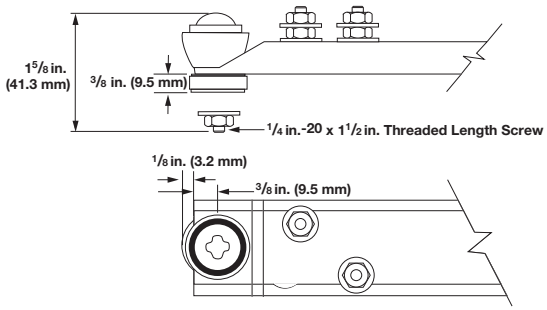
One-on-One Terminals

Two 10-24 threaded post terminals are used; one terminal on each end.



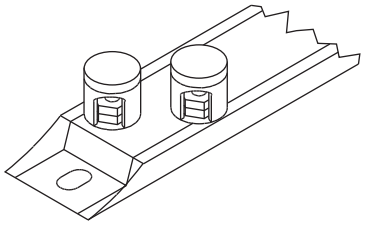
Accessories

Secondary Insulation Bushings



Insulators are suitable for use when air heating and/or voltage to ground is a concern. Secondary insulation bushing kit part number **Z5230** contains one set of bushings for one heater. To accommodate the bushings, 17/32 x 11/16 inch diameter mounting holes **must** be specified when ordering.

Ceramic Terminal Covers



A convenient and economical way to insulate post terminals. Sized for standard length posts. 10-24 screw thread size. These are supplied as an accessory item and shipped separately. Specify **Z-4918** and quantity.

Finned Heaters

375 Finned Strip Heaters

Assembly Stock and Standard Heater Code Numbers

Width in.	Width (mm)	Termination	Length in.	Length (mm)	Volts	Power (Watts)	W/in²	W/cm²	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Availability	Code Number
1½	(38)	Parallel	5½	(140)	120	125	14	(2.1)	0.5	(0.23)	Assy. Stock	**SGA1J5JY2**
		Parallel	5½	(140)	120	250	28	(4.3)	0.5	(0.23)	Assy. Stock	**SGA1J5JY3**
		Parallel	6	(152)	120	150	14	(2.1)	0.5	(0.23)	Assy. Stock	**SGA1J6AY1**
		Parallel	6	(152)	240	150	14	(2.1)	0.5	(0.23)	Assy. Stock	**SGA1J6AY2**
		Parallel	6	(152)	120	300	28	(4.3)	0.5	(0.23)	Assy. Stock	**SGA1J6AY3**
		Parallel	6	(152)	240	300	28	(4.3)	0.5	(0.23)	Assy. Stock	**SGA1J6AY4**
		Offset	7½	(191)	120	150	12	(1.8)	0.7	(0.32)	Assy. Stock	**SGA1J7JW1**
		Offset	7½	(191)	240	150	12	(1.8)	0.7	(0.32)	Standard	**SGA1J7JW2**
		Offset	7½	(191)	240	200	15	(2.3)	0.7	(0.32)	Assy. Stock	**SGA1J7JW3**
		Offset	8	(203)	120	150	10	(1.5)	0.7	(0.32)	Assy. Stock	**SGA1J8AW2**
		Offset	8	(203)	240	150	10	(1.5)	0.7	(0.32)	Assy. Stock	**SGA1J8AW3**
		Offset	8	(203)	120	175	12	(1.8)	0.7	(0.32)	Assy. Stock	**SGA1J8AW4**
		Offset	8	(203)	240	175	12	(1.8)	0.7	(0.32)	Standard	**SGA1J8AW5**
		Offset	8	(203)	120	250	17	(2.6)	0.7	(0.32)	Assy. Stock	**SGA1J8AW6**
		Offset	8	(203)	240	250	17	(2.6)	0.7	(0.32)	Assy. Stock	**SGA1J8AW7**
		Offset	8	(203)	120	400	27	(4.2)	0.7	(0.32)	Assy. Stock	**SGA1J8AW8**
		Offset	8	(203)	240	400	27	(4.2)	0.7	(0.32)	Assy. Stock	**SGA1J8AW9**
		Offset	8	(203)	120	500	33	(5.1)	0.7	(0.32)	Assy. Stock	**SGA1J8AW10**
		Offset	8	(203)	240	500	33	(5.1)	0.7	(0.32)	Assy. Stock	**SGA1J8AW11**
		Offset	10½	(267)	120	250	10	(1.5)	0.9	(0.40)	Assy. Stock	**SGA1J10JW1**
		Offset	10½	(267)	240	250	10	(1.5)	0.9	(0.40)	Assy. Stock	**SGA1J10JW2**
		Offset	10½	(267)	120	350	14	(2.1)	0.9	(0.40)	Assy. Stock	**SGA1J10JW3**
		Offset	10½	(267)	240	350	14	(2.1)	0.9	(0.40)	Assy. Stock	**SGA1J10JW4**
		Offset	10½	(267)	120	400	16	(2.5)	0.9	(0.40)	Assy. Stock	**SGA1J10JW5**
		Offset	10½	(267)	240	400	16	(2.5)	0.9	(0.40)	Assy. Stock	**SGA1J10JW6**
		Offset	12	(305)	120	250	8	(1.2)	1.0	(0.45)	Assy. Stock	**SGA1J12AW1**
		Offset	12	(305)	240	250	8	(1.2)	1.0	(0.45)	Assy. Stock	**SGA1J12AW2**
		Offset	12	(305)	120	350	12	(1.8)	1.0	(0.45)	Assy. Stock	**SGA1J12AW3**
		Offset	12	(305)	240	350	12	(1.8)	1.0	(0.45)	Assy. Stock	**SGA1J12AW4**
		Offset	12	(305)	120	500	17	(2.6)	1.0	(0.45)	Assy. Stock	**SGA1J12AW5**
		Offset	12	(305)	240	500	17	(2.6)	1.0	(0.45)	Assy. Stock	**SGA1J12AW6**
		Offset	14	(356)	120	300	8	(1.2)	1.2	(0.54)	Assy. Stock	**SGA1J14AW1**
		Offset	14	(356)	240	300	8	(1.2)	1.2	(0.54)	Assy. Stock	**SGA1J14AW2**
		Offset	14	(356)	120	500	13	(2.0)	1.2	(0.54)	Assy. Stock	**SGA1J14AW3**
		Offset	14	(356)	240	500	13	(2.0)	1.2	(0.54)	Assy. Stock	**SGA1J14AW4**
		Offset	15¼	(387)	120	325	8	(1.2)	1.4	(0.64)	Assy. Stock	**SGA1J15EW1**
		Offset	15¼	(387)	240	325	8	(1.2)	1.4	(0.64)	Assy. Stock	**SGA1J15EW2**
		Offset	15¼	(387)	240	500	12	(1.8)	1.4	(0.64)	Assy. Stock	**SGA1J15EW3**

CONTINUED

Note: 375 finned strip heaters with one-on-one terminations are available only as a manufactured item. Please contact your Watlow representative for additional information.

Note: 5⁄16 x ½ in. (7.9 x 13 mm) mounting slots are supplied on all 375 finned strip heaters. Tabs can be removed upon request.

Finned Heaters

375 Finned Strip Heaters

Assembly Stock and Standard Heater Code Numbers *(Continued)*

Width in.	Width (mm)	Termination	Length in.	Length (mm)	Volts	Power (Watts)	W/in²	W/cm²	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Availability	Code Number
1½	(38)	Offset	17⅞	(454)	120	350	8	(1.2)	1.6	(0.73)	Assy. Stock	**SGA1J17RW1**
		Offset	17⅞	(454)	240	350	8	(1.2)	1.6	(0.73)	Standard	**SGA1J17RW2**
		Offset	17⅞	(454)	120	375	9	(1.4)	1.6	(0.73)	Standard	**SGA1J17RW3**
		Offset	17⅞	(454)	240	375	9	(1.4)	1.6	(0.73)	Assy. Stock	**SGA1J17RW4**
		Offset	17⅞	(454)	120	500	12	(1.8)	1.6	(0.73)	Assy. Stock	**SGA1J17RW5**
		Offset	17⅞	(454)	240	500	12	(1.8)	1.6	(0.73)	Assy. Stock	**SGA1J17RW6**
		Offset	17⅞	(454)	120	750	18	(2.8)	1.6	(0.73)	Assy. Stock	**SGA1J17RW7**
		Offset	17⅞	(454)	240	750	18	(2.8)	1.6	(0.73)	Assy. Stock	**SGA1J17RW8**
		Offset	17⅞	(454)	120	1000	24	(3.7)	1.6	(0.73)	Assy. Stock	**SGA1J17RW9**
		Offset	17⅞	(454)	240	1000	24	(3.7)	1.6	(0.73)	Assy. Stock	**SGA1J17RW10**
		Offset	19½	(495)	240	350	6	(.9)	1.7	(0.77)	Assy. Stock	**SGA1J19JW2**
		Offset	19½	(495)	120	500	9	(1.4)	1.7	(0.77)	Standard	**SGA1J19JW3**
		Offset	19½	(495)	240	500	9	(1.4)	1.7	(0.77)	Assy. Stock	**SGA1J19JW4**
		Offset	19½	(495)	240	750	13	(2.0)	1.7	(0.77)	Assy. Stock	**SGA1J19JW5**
		Offset	19½	(495)	240	1000	17	(2.6)	1.7	(0.77)	Assy. Stock	**SGA1J19JW6**
		Offset	21	(533)	120	500	8	(1.2)	1.9	(0.86)	Standard	**SGA1J21AW3**
		Offset	21	(533)	240	500	8	(1.2)	1.9	(0.86)	Assy. Stock	**SGA1J21AW4**
		Offset	21	(533)	120	750	12	(1.8)	1.9	(0.86)	Assy. Stock	**SGA1J21AW5**
		Offset	21	(533)	240	750	12	(1.8)	1.9	(0.86)	Assy. Stock	**SGA1J21AW6**
		Offset	23¾	(603)	240	500	7	(1.0)	2.1	(0.95)	Assy. Stock	**SGA1J23NW3**
		Offset	23¾	(603)	240	750	10	(1.5)	2.1	(0.95)	Standard	**SGA1J23NW5**
		Offset	23¾	(603)	120	1000	14	(2.1)	2.1	(0.95)	Assy. Stock	**SGA1J23NW6**
		Offset	23¾	(603)	240	1000	14	(2.1)	2.1	(0.95)	Assy. Stock	**SGA1J23NW7**
		Offset	23¾	(603)	240	1500	20	(3.1)	2.1	(0.95)	Assy. Stock	**SGA1J23NW8**
		Offset	25½	(648)	120	500	6	(0.9)	2.3	(1.00)	Assy. Stock	**SGA1J25JW2**
		Offset	25½	(648)	240	500	6	(0.9)	2.3	(1.00)	Assy. Stock	**SGA1J25JW3**
		Offset	25½	(648)	120	750	9	(1.4)	2.3	(1.00)	Standard	**SGA1J25JW4**
		Offset	25½	(648)	240	750	9	(1.4)	2.3	(1.00)	Assy. Stock	**SGA1J25JW5**
		Offset	25½	(648)	240	1000	12	(1.8)	2.3	(1.00)	Assy. Stock	**SGA1J25JW6**
		Offset	26¾	(680)	240	700	8	(1.2)	2.4	(1.10)	Assy. Stock	**SGA1J26NW2**
		Offset	26¼	(680)	240	1000	12	(1.8)	2.4	(1.10)	Assy. Stock	**SGA1J26NW3**
		Offset	30½	(775)	120	750	8	(1.2)	2.7	(1.20)	Standard	**SGA1J30JW1**
		Offset	30½	(775)	240	750	8	(1.2)	2.7	(1.20)	Assy. Stock	**SGA1J30JW2**
		Offset	33½	(851)	240	750	7	(1.0)	3.0	(1.40)	Assy. Stock	**SGA1J33JW1**
		Offset	35⅞	(911)	120	1000	8	(1.2)	3.2	(1.50)	Standard	**SGA1J35RW1**
		Offset	35⅞	(911)	240	1000	8	(1.2)	3.2	(1.50)	Assy. Stock	**SGA1J35RW2**
		Offset	35⅞	(911)	240	1500	13	(2.0)	3.2	(1.50)	Assy. Stock	**SGA1J35RW3**
		Offset	38½	(978)	120	1000	8	(1.2)	3.4	(1.50)	Standard	**SGA1J38JW2**
		Offset	38½	(978)	240	1500	11	(1.7)	3.4	(1.50)	Assy. Stock	**SGA1J38JW3**
		Offset	42½	(1080)	240	1500	10	(1.5)	3.8	(1.70)	Assy. Stock	**SGA1J42JW1**
		Offset	47⅞	(1216)	240	2250	16	(2.4)	4.3	(2.00)	Assy. Stock	**SGA1J47RW2**

Note: 375 finned strip heaters with one-on-one terminations are available only as a manufactured item. Please contact your Watlow representative for additional information.

Note: 5/16 x ½ in. (7.9 x 13 mm) mounting slots are supplied on all 375 finned strip heaters. Tabs can be removed upon request.

Finned Heaters

375 Finned Strip Heaters

How to Order

To order stock 375 finned strip heater, specify:

- 375 finned strip
- Quantity
- Watlow code number
- Voltage
- Wattage
- Removal of mounting tabs, if desired

If stock units do not meet application needs, Watlow can manufacture 375 finned strip heaters to special requirements. For **made-to-order** units, please specify, in addition to above information:

- Width
- Length, including mounting tabs
- Terminal type (offset, parallel or one-on-one)

Availability

Assembly Stock: Shipment within three working days

Made-to-Order: Contact your Watlow sales representative

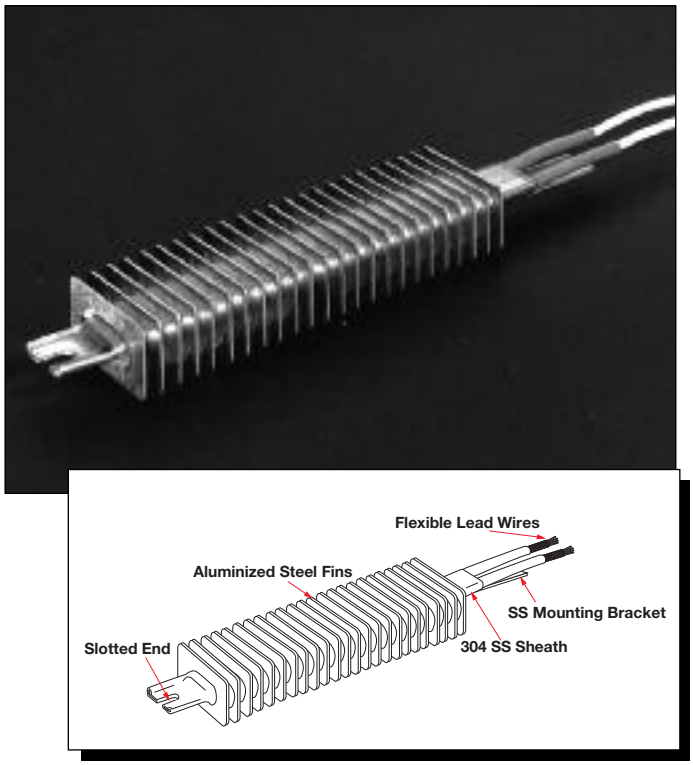
Finned Heaters

FINBAR Single/Double-Ended Heaters

Composed of aluminized steel fins press fitted to a one inch single-ended FIREBAR® element. The FINBAR is designed to improve heat transfer to the air and permits putting more power in tighter spaces—like forced air ducts, dryers, ovens and load bank resistors.

Heat transfer, lower sheath temperature and element life are all maximized by its finned construction.

Installation is simplified by terminations exiting at one end and mounting accommodations on both ends.



Features and Benefits

Rugged aluminized steel fins

- Effectively increase surface area to approximately 16 square inches for every linear inch of element length. Fins press fitted to the heating element improve heat transfer to the air

Single-ended termination

- Simplifies wiring and installation

Stainless steel mounting bracket, welded to the terminal end, supplied with a slotted end

- Allows ease of installation

Lavacone seals

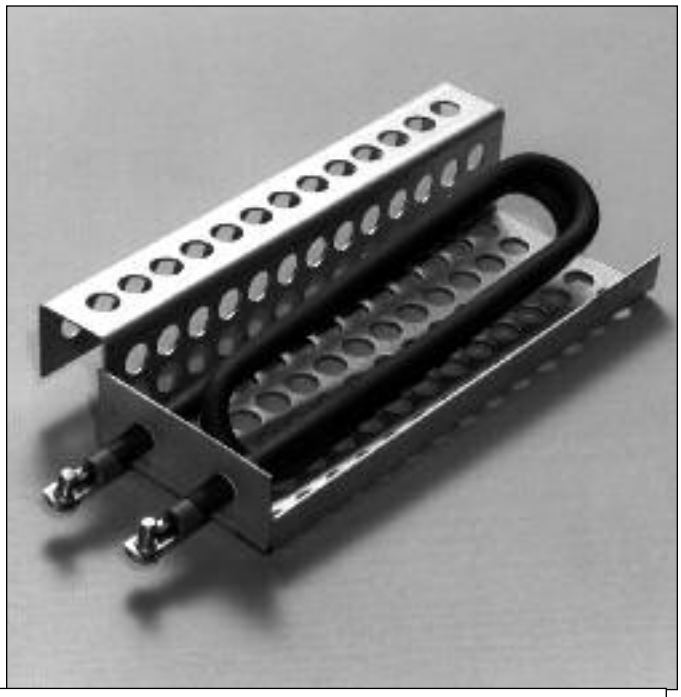
- Provides protection against humid storage conditions, moisture retardant to 392°F (200°C)

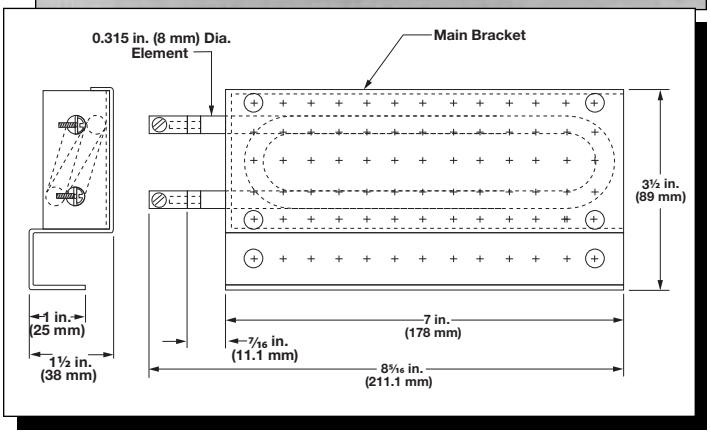
For detailed product and ordering information see the full FINBAR product section located on pages 119 through 122.

Enclosure Heaters

WATROD Heaters

Designed to prevent freezing and condensation in electrical and mechanical housings, the WATROD element is enclosed in a perforated, aluminized-steel bracket.





Performance Capabilities

- Watt densities to 15 W/in² (2.3 W/cm²)
- Wattages to 1000 watts
- UL® and CSA component recognition to 250V~(ac)

Features and Benefits

Stainless steel sheath wall

- Resists corrosion and protects the heating coil from exposure

Silicone resin seal

- Provides protection against humid storage conditions and is effective to 390°F (200°C)

Perforated aluminized-steel mounting bracket

- Eases installation and helps prevent direct contact with the heating element

Stock straight projection Type B #10-32 screw lug terminals

- Provides easy electrical connection

Made-to-order threaded stud

- Provides quick connect and flexible lead wire termination options.

Applications

- Control panels
- Traffic signal boxes
- Automated teller machines
- Switch gear
- Electronic equipment

Application Hints

- Locate heater(s) in the lowest portion of the enclosure to maximize convection heating
- Place thermostat(s) in the upper half of the enclosure, away from the heater(s)

RAPID SHIP

- *Same day shipment up to 15 pieces*

Enclosure Heaters

WATROD Heaters

Technical Information

Watts	Watt Density W/in²	Watt Density (W/cm²)	Code Number 125V~(ac)	Code Number 250V~(ac)	Availability	Est. Net Wt. lbs	Est. Net Wt. (kg)
95	4	(0.6)	**EN951**		Stock	1.5	(0.7)
100	4	(0.6)		**EN10010**	Stock	1.5	(0.7)
250	10	(1.6)	**EN2501**	**EN25010**	Stock	1.5	(0.7)
375	15	(2.3)	**EN3751**	**EN37510**	Stock	1.5	(0.7)

How to Order

To order a stock WATROD enclosure heater, please specify:

- Watlow code number
- Volts/watts
- Termination options
- Options
- Quantity

If our stock units do not meet your application, Watlow can provide **made-to-order** enclosure heaters. Please specify:

- Volts/watts
- Sheath diameter/material
- No-heat section
- A, C, H, L and R dimensions per Figure 8 bend formation shown on catalog page 79.
- Termination options
- Options
- Quantity

Availability

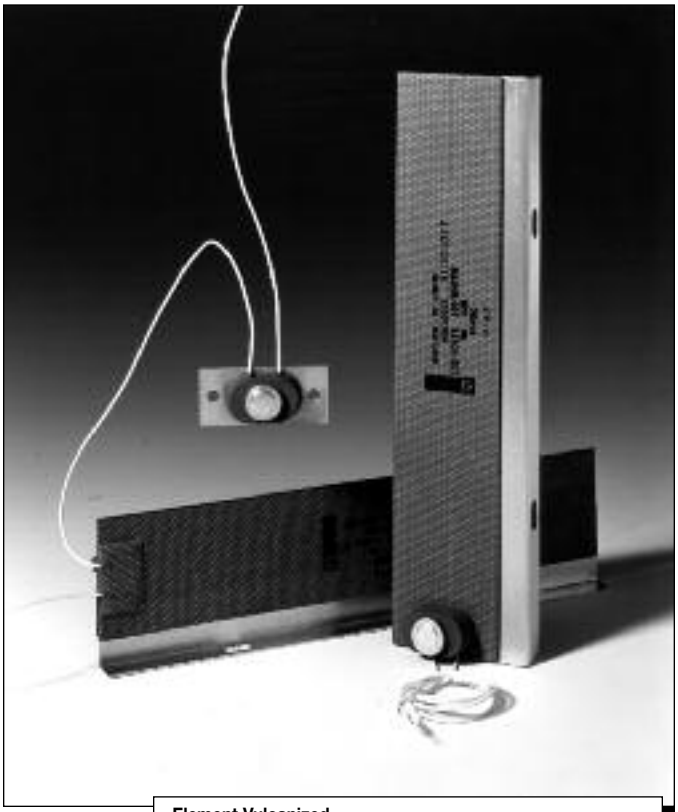
RAPID SHIP program is available for all elements unless otherwise noted.

- Same day shipment up to 15 pieces

Enclosure Heaters

Silicone Rubber Heaters

Designed for freeze and condensation protection, Watlow's enclosure heaters are rugged, reliable and safe to operate. These rectangular-shaped, wire-wound silicone rubber heaters can be ordered by themselves with adhesive or vulcanized to an aluminum mounting plate. A thermostat can be attached to the heater or mounted separately. Pictured are units with thermostat on heater in foreground and heater with remote thermostat in background.



Performance Capabilities

- Watt density rating of 5 W/in^2 (0.8 W/cm^2)
- Temperature to 150°F (66°C)

Features and Benefits

Base heaters and thermostats are stocked

- Ensures standard design cost-effectiveness
- Allows for quick delivery on standard designs

Several standard thermostat set points

- Ensures protection against freezing with minimal energy consumption

Variety of installation options

- Provides the customer the option to utilize cement installation ensuring permanent attachment of heater
- Saves assembly time choosing the pressure sensitive adhesive installation option
- Facilitates assembly and disassembly with factory installed aluminum plate mount

Remote thermostat option

- Provides optimal choice of heater location versus temperature control location

Lead options

- Allows for a variety of applications
- Allows for different lead lengths for a variety of wiring requirements

Factory pre-wired heater and thermostat

- Ensures safety and reliability due to no exposed electrical connections

Applications

Freeze or condensation prevention in housings containing electronic equipment. Examples include:

- Traffic signal boxes
- Automated teller machines
- Temperature control panels
- Gas or liquid control valve housings

Enclosure Heaters

Silicone Rubber Heaters

Applications and Technical Data

Determining Minimum Wattage Requirements For Enclosures

This chart is an excellent guide for determining total wattage requirements for both insulated and uninsulated enclosures, assuming the box is relatively airtight. For windy conditions, add an additional 50 percent to the wattage requirement listed.

Temperature Rise from Ambient °F (°C)	Total Enclosure Surface Area — Square Feet (Square Meters)													
	2 (0.2)	3 (0.3)	4 (0.4)	5 (0.5)	6 (0.6)	7.5 (0.7)	9 (0.8)	10 (0.9)	15 (1.4)	20 (1.9)	25 (2.3)	30 (2.8)	40 (3.7)	50 (4.7)
20 (11)	30	40	55	70	80	100	120	135	205	270	335	405	540	670
	10	10	15	20	20	25	30	35	50	65	80	100	130	160
40 (22)	55	80	110	135	160	200	245	270	405	540	670	805	1075	1340
	15	20	30	35	40	50	60	65	100	130	160	195	260	320
60 (33)	90	120	160	205	245	300	365	405	605	805	1005	1210	1610	2010
	20	30	55	50	60	75	90	100	145	195	240	290	385	480
80 (44)	110	160	215	270	325	400	485	540	805	1075	1340	1610	2145	2680
	30	40	55	65	80	100	115	130	195	260	320	385	515	640
100 (56)	135	200	270	335	405	500	605	670	1005	1340	1675	2010	2680	3350
	35	50	65	80	100	125	145	160	240	320	400	480	640	800
120 (67)	165	240	320	405	485	600	725	805	1210	1610	2010	2415	3220	4020
	40	60	80	100	115	150	175	195	290	385	480	580	770	960
140 (78)	190	280	375	470	565	700	845	940	1410	1880	2345	2815	3755	4690
	45	70	90	115	135	175	205	225	340	450	560	675	900	1120

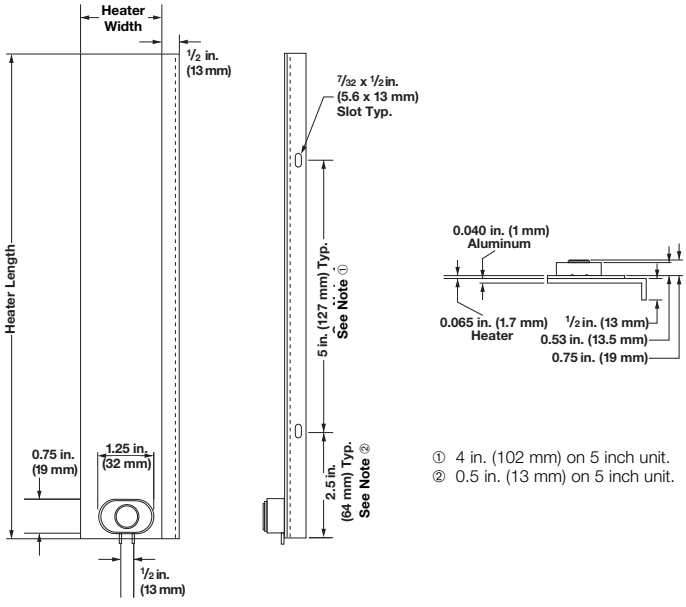
Uninsulated boxes Insulated boxes

Options

Aluminum Mounting Plate

Both vertical and horizontal mounting can be accomplished with enclosure heaters. The mounting plates are 0.040 in. (1 mm) thick, specified as #3003 H14 aluminum. The preferred orientation is vertical, with a thermostat attached at the lower end (as shown in the drawing).

For horizontal mounting, a remote thermostat is recommended. An enclosure heater can be ordered by itself, with PSAS or vulcanized to an aluminum mounting plate. See Thermostats below for more information.



① 4 in. (102 mm) on 5 inch unit.
② 0.5 in. (13 mm) on 5 inch unit.

Flexible Heaters

Flexible Heaters

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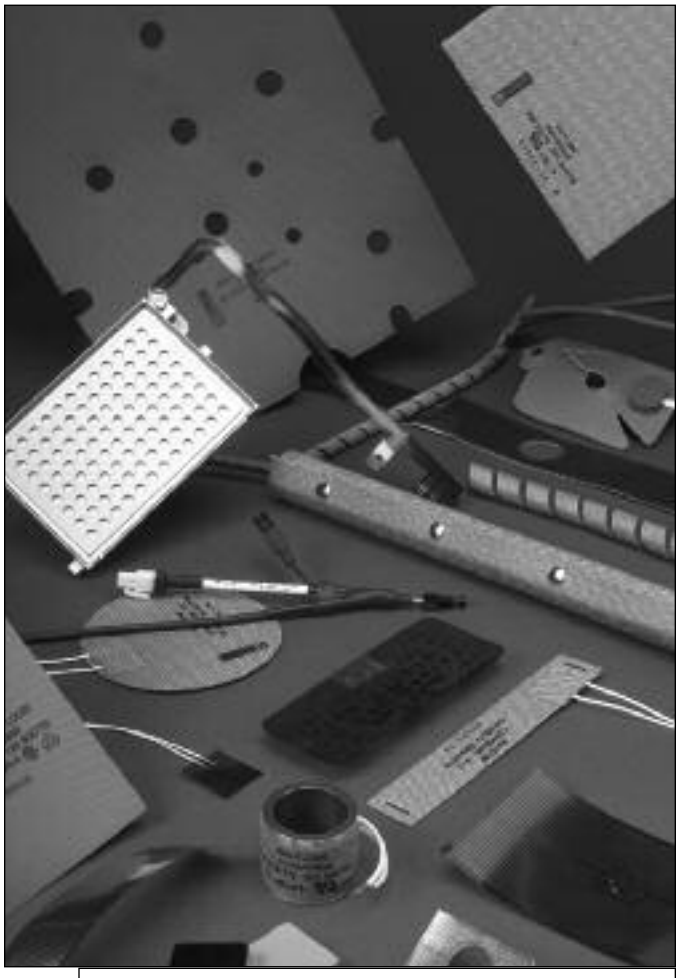


Flexible Heaters

Flexible Shapes and Geometries

Flexible heaters from Watlow® are just what the name implies: thin, bendable and shaped to fit your equipment. You can use your imagination to apply heat to the most complex shapes and geometries, without sacrificing efficiency or dependability. With Watlow's customization capabilities, you have the maximum amount of freedom when designing your equipment.

Excellent heat transfer results from the heater's thin design and its direct bonding to the application. Flexible heaters also provide fast heat up and cool down rates, uniform heat distribution and high watt densities.



Features and Benefits

Flat geometry
- Permits holes, notches and unusual shapes

Option of two material types and two element styles
- Allows for wider flexibility

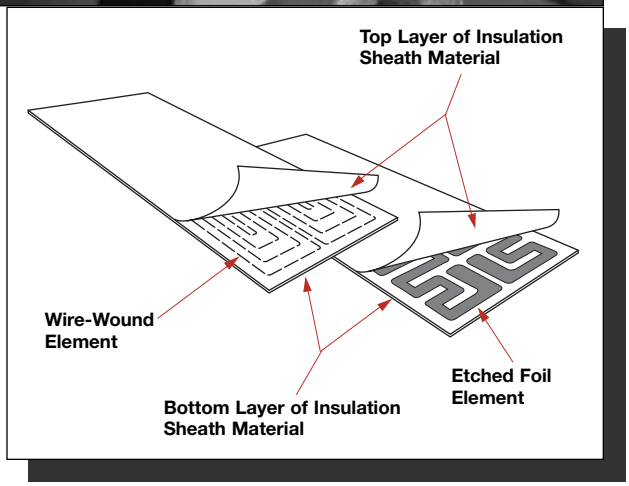
Lightweight construction and low thermal mass
- Permits use in applications that have limited space or weight requirements

Close heating elements (as close as 0.003 in. [0.08 mm])
- Creates faster heat up and cool down time

Uniformly spaced element paths
- Distributes heat more evenly

Applications

- Medical equipment such as blood analyzers, respiratory therapy units and hydrotherapy baths
- Satellite and communication equipment
- Freeze protection for military hardware, aircraft instrumentation, hydraulic equipment, etc.
- Battery heating
- Semiconductor equipment
- Foodservice equipment
- Any application requiring a flexible shape or design



Flexible Shapes and Geometries

Applications and Technical Data

Two Material Types

Silicone Rubber

This rugged, moisture- and chemical-resistant material is easily bonded or adhered to parts. Watlow silicone rubber heaters can handle temperatures up to 500°F (260°C). Many styles of these heaters are available with UR®, cUR®, VDE and CE recognition.

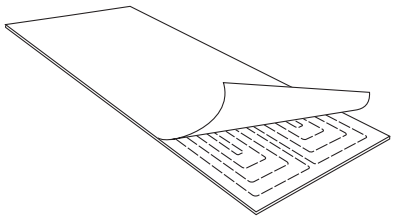
Polyimide

Polyimide is a thin, lightweight transparent material and is designed for precise heating requirements ranging from -319° to 392°F (-195° to 200°C). It is ideal for applications requiring low outgassing in a vacuum, or resistance to radiation, fungus and chemicals. Many custom heaters can be UR® and cUR® recognized.

Two Element Types

Watlow offers both wire-wound and etched foil resistance elements. These element types are available in most insulating materials, and Watlow can recommend the type best suited to your application.

Wire-Wound Elements

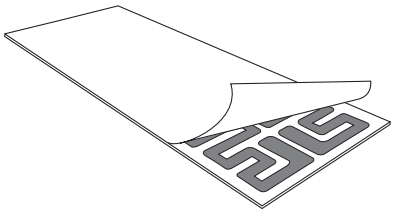


Available on silicone rubber heaters, this element style is created by spiraling fine resistance wires around a fiberglass cord. The element is then laid out in a pattern designed specifically for your application. The benefits of wire-wound elements include:

- Excellent physical strength and flexibility; repeated flexing of the heater has no harmful effects on its performance
- Conforms readily to curved surfaces, including small radius bends

Drum heaters and conduit bender heaters are typical examples of applications that use the wire-wound method. These heaters are flexed repeatedly during use, but due to their wiring, no internal damage will occur.

Etched Foil Elements



This element type, created by acid etching a circuit in nickel alloy resistance foil, is available in silicone rubber and polyimide heater types. The etched foil element is noted for its excellent circuit pattern repeatability and superior heat transfer, which results from greater area coverage of the element. Other benefits include:

- Delivers more heat and up to twice the watt density of a wire-wound element, providing longer heater life
- Can provide complex heat distribution patterns

The etched foil element style is usually recommended for applications requiring high temperatures, watt densities, or multiple zoning.

Silicone Rubber Heaters

Rugged, yet thin, lightweight and flexible—the use of Watlow® silicone rubber heaters is limited only by your imagination. With these heaters, you can put the heat where it is needed and, in the process, improve heat transfer, speed warm-ups and decrease wattage requirements.

Fiberglass-reinforced silicone rubber gives your heater dimensional stability without sacrificing flexibility. Because very little material separates the element from the part, heat transfer is rapid and efficient.



Performance Capabilities

- Operating temperatures to 500°F (260°C)
- Watt densities to 80 W/in^2 (12.5 W/cm^2) dependent upon application temperature
- 0.055 in. (1.4 mm) thick with a wire-wound element; only 0.022 in. (0.56 mm) with an etched foil element
- UR®, cUR®, VDE and CE recognitions are available on many designs up to 428°F (220°C)

Features and Benefits

Designed in the exact shape and size needed

- Conforms to your equipment

More than 80 designs available immediately from stock

- Reduces downtime

Moisture and chemical-resistant silicone rubber material

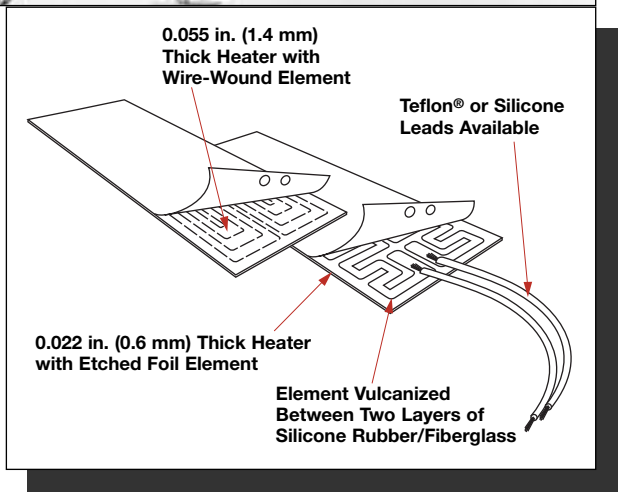
- Provides longer heater life

Vulcanizing adhesives or fasteners

- Easily bond heaters to your part

Applications

- Freeze protection and condensation prevention for many types of instrumentation and equipment
- Medical equipment such as blood analyzers, test tube heaters, etc.
- Computer peripherals such as laser printers
- Curing of plastic laminates
- Photo processing equipment
- Semiconductor processing equipment

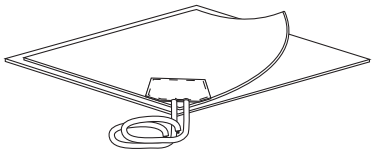


Silicone Rubber Heaters

Mounting Methods

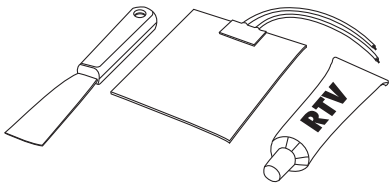
Watlow offers various attachment techniques, all designed for fast installation. These include three types of adhesives, Watlow's special factory vulcanization process and mechanical fasteners.

Pressure Sensitive Adhesive Surface (PSAS)



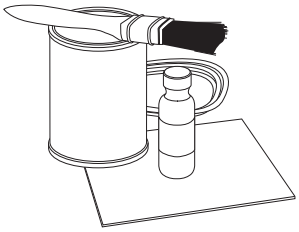
For speed, convenience and economy of installation, specify Pressure Sensitive Adhesive Surface (PSAS). Simply peel off the protective backing and roll the heater in place for an even bond to a clean, smooth surface. PSAS is not recommended for curved surfaces or for heaters rated above 10 W/in^2 (1.5 W/cm^2). It should not be used for applications exceeding 400°F (205°C) on silicone rubber and 300°F (150°C) on polyimide.
Note: PSAS has a minimum six months storage life before heater installation when stored at or below 86°F (30°C)

Field Applied Adhesive (RTV)



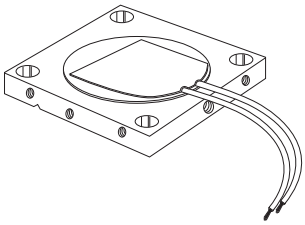
For a stronger bond, or when long storage is probable, a Room Temperature Vulcanizing (RTV) silicone adhesive is available from stock within two days. Watlow offers red RTV for temperatures up to 500°F (260°C). White RTV is available from adhesive suppliers for temperatures up to 400°F (205°C). Watlow's one-part RTV is self-priming and can be ordered in either 3 oz (90 ml) or 12 oz (355 ml) tubes. For larger heaters requiring longer adhesive working time, two-part RTV kits can be purchased from adhesive suppliers. These kits require primer on the surface prior to application of the adhesive.
Note: Not recommended for polyimide heaters.

Silicone Contact Cement Kit



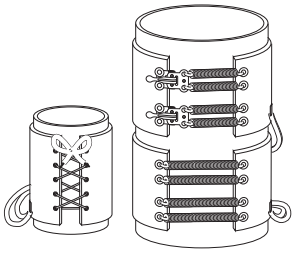
This two-part adhesive consists of a resin and catalyst that are easily mixed together and applied with a paintbrush. Recommended usage is for field cementing of silicone rubber heaters to customer parts. Available from stock, the cement kit will handle temperatures to 350°F (175°C). The resin is available in pint or quart containers. To order, specify **silicone contact cement** and container size.

Factory Bonding



This attachment technique provides a strong, void-free bond for excellent heat transfer and extended heater life. Watlow's expertise in bonding heaters to customer parts has proven extremely successful. Bonding is recommended for applications that reach maximum temperatures of 500°F (260°C) on silicone rubber and 300°F (150°C) on polyimide.

Mechanical Fasteners



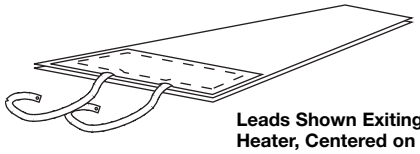
When a wire-wound flexible heater must be detachable, any type of fastener normally used with fabrics can usually be built into the sheath material of Watlow flexible heaters. The most common types are latch fasteners, boot hooks and grommets. Other styles include snap fasteners, springs, velcro style fastener strips and lacing cord. The grommets and boot hooks are commonly used with tension springs to compensate for slight variations in part size.

Silicone Rubber Heaters

Termination Styles

Watlow offers many types of leads and terminations. Leads can project from any position along the perimeter of the unit. **They will be centered on the short side width of rectangular heaters unless specified otherwise.**

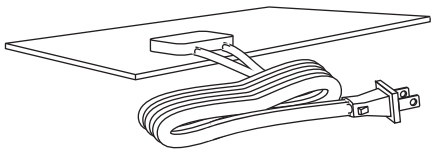
Standard Leads—Teflon® UL®1180 CSA



Leads Shown Exiting End of Heater, Centered on Short Side

Watlow's standard leads are 12 in. (305 mm) long, white, Teflon® insulated, flexible, plated copper UL® 1180 CSA wire. They are rated for 392°F (200°C)/300V. The lead connections on or at the heater are insulated with a cap of sheath material, vulcanized to the heater body.

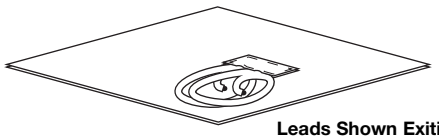
HPN Cord and Plug Set



Molded Leads are Shown Exiting Edge of Heater. Capped Leads are also Available.

For removable heaters, a 6 ft (1.8 m) HPN cord and plug set provides convenience. It is rated for 194°F (90°C)/ 300V~(ac). HPN cord without a plug is also available in any length.

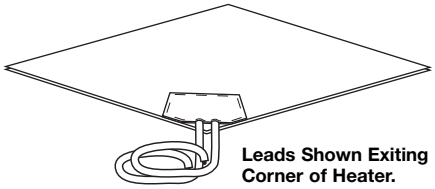
Special Teflon® Leads



Leads Shown Exiting Middle of Heater.

Teflon® Type E (MIL-W-16878) and Teflon® UL® 1199 rated for 392°F (200°C)/600V are also available.

Silicone Insulated Leads

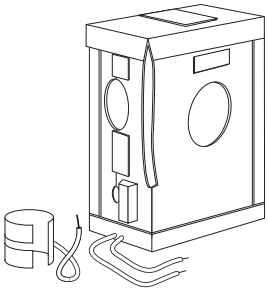


Leads Shown Exiting Corner of Heater.

For a better moisture seal, specify UL® silicone insulated lead wires. This lead type is rated for 302°F (150°C)/ 600V~(ac). Any lead length is available. Note: Silicone rubber heaters are not designed to be waterproof. Excess exposure to moisture may facilitate premature heater failure.

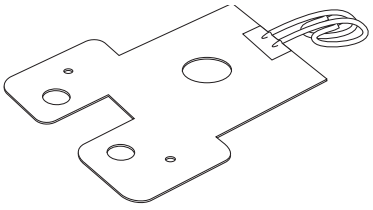
Construction

Formed Heaters



Many three-dimensional shapes, such as cylinders, cones and boxes, can be factory formed. Semi-rigid shapes can be self-gripping to the part. Special tooling may be required for some designs.

Holes, Cutouts and Notches



Watlow can provide flexible heaters with special holes, cutouts and notches in nearly any position required for your design. The resistance element can be brought to within ⅛ in. (3.2 mm) of all edges. Standard spacing is ¼ in. (6 mm) from all edges.

Silicone Rubber Heaters

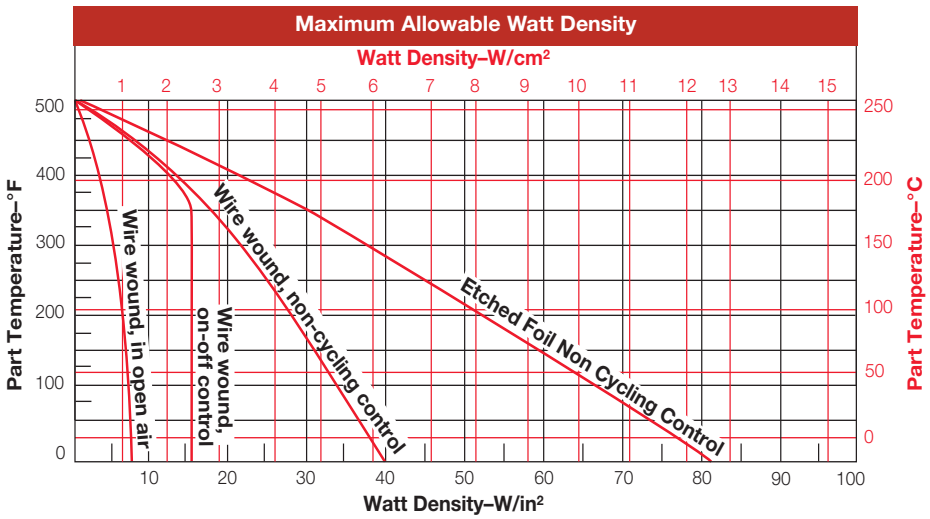
Applications and Technical Data

Determining Watt Density

The *Maximum Allowable Watt Density* graph illustrates the maximum recommended heater watt density at various metal parts or ambient air temperatures. However, it does not indicate the watt density necessary to achieve a given part temperature. See the *Surface Temperature vs. Time* graph on the next page for assistance with those calculations. When using this graph, remember:

- Part temperature is measured at the point where the heater contacts the metal part.
- Thermostats and on-off controllers are typically bimetal or capillary bulb.
- Non-cycling controllers are typically solid state, time-proportioning or SCR temperature controllers.
- Watt density values should be de-rated by one third if insulation is used.
- UL® recognition temperature limits are not detailed.
- Contact your Watlow representative before doing any of the following: selecting high watt density etched-foil elements, or operating heaters with back side insulation or non-metallic parts, which are poor thermal conductors.

Example: A wire-wound heater with non-cycling control at a part temperature of 250°F (120°C) can be rated at 24 W/in² (3.7 W/cm²) maximum. An etched foil heater under the same conditions can be rated at 45 W/in² (7 W/cm²) maximum.



Standard Silicone Rubber Specifications

Max. width x max. length

- Wire-wound: 36 x 120 in. (914 mm x 3048 mm)
- Etched foil: 20 x 30 in. (508 mm x 762 mm)

Thickness (standard)

- Wire-wound: 0.055 in. (1.4 mm)
- Etched foil: 0.022 in. (0.6 mm)

Weight (standard)

- Wire-wound: 8 oz/ft² (0.24 g/cm²)
- Etched foil: 3 oz/ft² (0.09 g/cm²)

Max. operating temperature: 500°F (260°C)

Max. temperature for UL® recognition: 428°F (220°C)

Min. ambient temperature: -80°F (-62°C)

Max. voltage: 600V~(ac)

Max. wattage: see watt density graph

Lead size: sized to load

Lead length: 12 +1½ -½ in. (305 mm +38 mm -13 mm)

Wattage tolerance

- Wire: ±5%
- Foil: +5% -10%

Dimensional tolerances

- 0 to 6 in. (0 to 152 mm): ±1/16 in. (1.59 mm)
- 6 to 18 in. (152 to 457 mm): ±⅛ in. (3.18 mm)
- 18 to 36 in. (457 mm to 914 mm): ±3/16 in. (4.76 mm)
- Over 36 in. (914 mm): ±1%

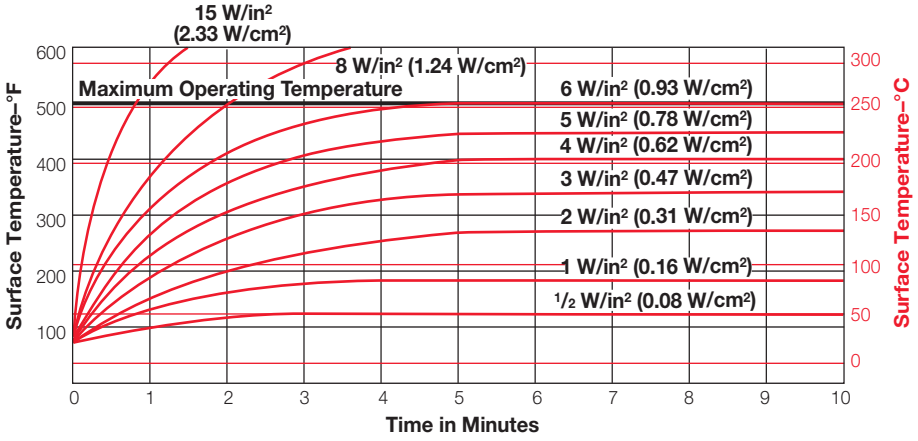
Silicone Rubber Heaters

Applications and Technical Data *(Continued)*

Surface Temperature vs. Time

This graph illustrates the surface temperature a silicone rubber heater will reach when the heater is uninsulated and is suspended vertically in 70°F (20°C) still air.

This data is based on 0.055 in. (1.4 mm) thick standard construction and is offered as a reference tool.



UR®, cUR®, VDE and CE Recognition for Silicone Rubber Heaters

Watlow frequently works with customers requiring agency approvals such as UR®, cUR®, VDE and CE. Many stock silicone rubber heaters are available with one or more of these certifications.

UL® Component Recognition (UR) of factory-bonded heaters is available up to 392°F (200°C) and for customer installed heaters up to 428°F (220°C) (UL® File No. E52951).

For Canadian recognition Watlow offers **cUR® Recognized** silicone rubber heaters under UL® File #E52951. Several constructions are available with ratings to 600V~(ac) and 428°F (220°C) maximum surface temperature. Contact your Watlow representative for further information.

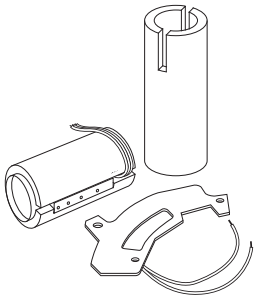
VDE Approval is available on several constructions of both wire-wound (File No. 62533) and etched foil (File No. 62535) silicone rubber heaters. The maximum ratings are 440V~(ac) and 428°F (220°C) surface temperature. Under VDE guidelines, minimum installed bend radius is ⅛ in. (3.2 mm) for etched foil and ¼ in. (6 mm) for wire wound. VDE also states that the user is responsible for the safe application, installation and wiring of the heaters. Maximum working temperature must be maintained by an appropriate temperature controller.

The **CE mark** is available on UR® and/or VDE recognized heaters.

Options

Watlow offers a variety of options such as attachment techniques, thermostats, special leads, holes and cutouts and three-dimensional shapes. These are all described in the introduction to flexible heaters section. In addition, the following option is available only on silicone rubber heaters.

Thermal Insulation



To increase the heating efficiency of your application, silicone rubber heaters can be thermally insulated with silicone sponge rubber, bonded to one side in the following thicknesses: 1/16, ⅛, ¼, ⅜ or ½ in. (1.6, 3.2, 6, 9.5 or 13 mm). Heaters with thermal insulation are still quite flexible.

An aluminized surface can be added to the back of the heater to reduce radiated heat losses. This aluminized surface, called “Low Loss Treatment,” adds very little to the unit thickness and maintains a very clean appearance.

Silicone Rubber Heaters

Wire-Wound Elements

Width in.	Width (mm)	Length in.	Length (mm)	Watts	120V~(ac) Code Number	120/240V~(ac) Code Number
1	(25)	2	(51)	10	**010020C1***	
		3	(76)	15	**010030C1***	
		4	(102)	20	**010040C1***	
		5	(127)	25	**010050C1***	
		5	(127)	6.25/25		**010050C2***
		10	(254)	50	**010100C1**	
		10	(254)	12.5/50		**010100C2***
		15	(381)	75	**010150C1**	
		15	(381)	18.75/75		**010150C2**
		20	(508)	100	**010200C1**	
		20	(508)	25/100		**010200C2**
		25	(635)	125	**010250C1**	
		30	(762)	150	**010300C1**	
		35	(889)	175	**010350C1**	
		40	(1016)	200	**010400C1**	
		80	(2032)	400	**010800C1**	
		120	(3048)	600	**010F10C1**	
2	(51)	2	(51)	20	**020020C1***	
		5	(127)	50	**020050C1**	
		5	(127)	12.5/50		**020050C2***
		10	(254)	100	**020100C1**	
		10	(254)	25/100		**020100C2**
		15	(381)	150	**020150C1**	
		15	(381)	37.5/150		**020150C2**
		20	(508)	200	**020200C1**	
		20	(508)	50/200		**020200C2**
		25	(635)	250	**020250C1**	
		30	(762)	300	**020300C1**	
		35	(889)	350	**020350C1**	
		40	(1016)	400	**020400C1**	
3	(76)	3	(76)	45	**030030C1**	
		5	(127)	75	**030050C1**	
		5	(127)	18.75/75		**030050C2**
		10	(254)	150	**030100C1**	
		10	(254)	37.5/150		**030100C2**
		15	(381)	225	**030150C1**	
		15	(381)	56.25/225		**030150C2**
		20	(508)	300	**030200C1**	
		20	(508)	75/300		**030200C2**
		25	(635)	375	**030250C1**	
		30	(762)	450	**030300C1**	
		35	(889)	525	**030350C1**	
		40	(1016)	600	**030400C1**	

CONTINUED

*** These heaters are not recommended for curved or flexing applications - high resistance density.**

Notes:

- Standard thickness 0.055 in. (1.4 mm)
- Stock heaters have standard lead length 12 in. (305 mm) UL® 1180 Teflon®
- UL® component recognition
- Silicone rubber wire-wound elements rated at 5 W/in²

Silicone Rubber Heaters

Wire-Wound Elements *(Continued)*

Width in.	Width (mm)	Length in.	Length (mm)	Watts	120V~(ac) Code Number	120/240V~(ac) Code Number
4	(102)	4	(102)	80	**040040C1**	
		5	(127)	100	**040050C1**	
		5	(127)	25/100		**040050C2**
		10	(254)	200	**040100C1**	
		10	(254)	50/200		**040100C2**
		15	(381)	300	**040150C1**	
		15	(381)	75/300		**040150C2**
		20	(508)	400	**040200C1**	
		20	(508)	100/400		**040200C2**
		25	(635)	500	**040250C1**	
		30	(762)	600	**040300C1**	
		35	(889)	700	**040350C1**	
		40	(1016)	800	**040400C1**	
5	(127)	5	(127)	125	**050050C1**	
		5	(127)	31.25/125		**050050C2**
		10	(254)	250	**050100C1**	
		10	(254)	62.5/250		**050100C2**
		15	(381)	375	**050150C1**	
		15	(381)	9.375/375		**050150C2**
		20	(508)	500	**050200C1**	
		20	(508)	125/500		**050200C2**
		25	(635)	625	**050250C1**	
		30	(762)	750	**050300C1**	
		35	(889)	875	**050350C1**	
		40	(1016)	1000	**050400C1**	
6	(152)	5	(127)	150	**060050C1**	
		5	(127)	37.5/150		**060050C2**
		10	(254)	300	**060100C1**	
		10	(254)	75/300		**060100C2**
		15	(381)	450	**060150C1**	
		15	(381)	112.5/450		**060150C2**
		20	(508)	600	**060200C1**	
		20	(508)	150/600		**060200C2**
		25	(635)	750	**060250C1**	
		30	(762)	900	**060300C1**	
		35	(889)	1050	**060350C1**	
		40	(1016)	1200	**060400C1**	

Notes:
- Standard thickness 0.055 in. (1.4 mm)
- Stock heaters have standard lead length 12 in. (305 mm) UL® 1180 Teflon®
- UL® component recognition
- Silicone rubber wire-wound elements rated at 5 W/in²

Silicone Rubber Heaters

Wire-Wound Elements (Continued)

Stock Heater Coding Configured Options

To order, complete the code number with the information below:

Wire-Wound

0_____-____

Modification Options
0 = None
A = PSAS bottom
B = PSAS Top
E = With plate, heater on side opposite flange
F = With plate, heater on flange side
G = Flaps + grommets
H = Flaps + boot hooks
J = Flaps + latch fasteners
K = PSAS and low loss
L = Low loss
M = Low loss + flaps + grommets
N = Low Loss + flaps + boot hooks
P = Low loss + flaps + latch fasteners
R = 1/16 in. sponge
S = 1/8 in. sponge
T = 1/4 in. sponge
U = 3/8 in. sponge
V = 1/2 in. sponge
W = PSAS + 1/16 in. sponge
Y = PSAS + 1/8 in. sponge
1 = PSAS + 1/4 in. sponge
2 = PSAS + 3/8 in. sponge
3 = PSAS + 1/2 in. sponge

Sensors

Type	LOC	WIR
0 = None		
L = T10	STD	STD
M = T10	STD	ALT
N = T10	ALT	STD
P = T10	ALT	ALT
R = T207	STD	STD
S = T207	STD	ALT
T = T207	ALT	STD
U = T207	ALT	ALT
V = T207E	On heater	STD
W = T207E	Remote	STD
Y = B200	STD	STD
1 = B200	STD	ALT
2 = B200	ALT	STD
3 = B200	ALT	ALT
4 = JSTD	STD	STD
6 = JALT	STD	STD
7 = KSTD	STD	STD

- For thermostats, standard location is as shown in catalog; standard wiring is integral or in series with the heater; alternate location is rotated parallel with heater width; alternate wiring is separate leads for pilot control.
- For thermocouples, Type J standard is Teflon® insulation; Type J alternate is fiberglass insulation; Type K standard is fiberglass insulation.

T10 Set °F
0 = None
A = 125
B = 150
E = 175
F = 200
G = 225
H = 250
J = 275
K = 300

T207 Set °F
0 = None
1 = 40/55
2 = 60/75
3 = 95/110
4 = 145/160

B200 Set °F
0 = None
2 = 100-500
3 = 25-330

T/C Length
0 = None
A = 8 in.
B = 12 in.
E = 18 in.
F = 24 in.
G = 30 in.
H = 36 in.
J = 40 in.
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

Lead Insulation
0 = None
1 = 1180 UL® R/C
2 = 1180 C-UL®R/C
3 = 3133 22 GA
6 = 1199 CSA
7 = HPN
8 = 6 ft HPN set
9 = Type E Teflon®
A = 1180VDE*
B = 1199VDE*
C = Silicone leads w/waterproof cap
E = SJO cord
F = 6 ft SJO set

* 1180VDE denotes a C-UL® heater plus a VDE stamp.

Lead Length*
A = 8 in.
B = 12 in.
E = 18 in.
F = 24 in.
G = 30 in.
H = 36 in.
J = 40 in.
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

* Customer specified length must be noted in inches when ordering.

Availability

Stock: Same day shipment of orders (with part number configuration -0001B) if received by 11:00 a.m. CST. All other modifications (other than -0001B) are modified stock and ship within five working days.

How to Order

To order stock silicone rubber heaters, specify the Watlow code number and the quantity. To order a heater with options, specify the code number, quantity and options desired. Contact Watlow before combining options.

Made-to-Order: contact Watlow.

For **made-to-order** units, Watlow will need the following application information from you:

- Size (dimensions)
- Voltage
- Wattage/watt density
- Operating temperature
- Options (leads, thermostats, attachment techniques, etc.)
- Will heater be subject to flexing?
- Element type, if you have a preference
- Agency approvals
- Quantity

Silicone Rubber Heaters

Etched Foil Elements

Width in.	Width (mm)	Length in.	Length (mm)	Watts	W/in²	(W/cm²)	120V~(ac) Code Number	120/240V~(ac) Code Number
1	(25)	5	(127)	25	5	(0.8)	**F010050C3**	
		5	(127)	50	10	(1.6)	**F010050C7**	
		5	(127)	12.5/50	2.5/10	(0.4/1.6)		**F010050C8**
		10	(254)	100	10	(1.6)	**F010100C7**	
		10	(254)	25/100	2.5/10	(0.4/1.6)		**F010100C8**
		15	(381)	150	10	(1.6)	**F010150C7**	
		15	(381)	37.5/150	2.5/10	(0.4/1.6)		**F010150C8**
		20	(508)	200	10	(1.6)	**F010200C7**	
		20	(508)	50/200	2.5/10	(0.4/1.6)		**F010200C8**
2	(51)	5	(127)	100	10	(1.6)	**F020050C7**	
		5	(127)	25/100	2.5 /10	(0.4/1.6)		**F020050C8**
		10	(254)	200	10	(1.6)	**F020100C7**	
		10	(254)	50/200	2.5 /10	(0.4/1.6)		**F020100C8**
		15	(381)	300	10	(1.6)	**F020150C7**	
		15	(381)	75/300	2.5/10	(0.4/1.6)		**F020150C8**
		20	(508)	400	10	(1.6)	**F020200C7**	
		20	(508)	100/400	2.5/10	(0.4/1.6)		**F020200C8**
3	(76)	5	(127)	75	5	(0.8)	**F030050C3**	
		5	(127)	150	10	(1.6)	**F030050C7**	
		5	(127))	37.5/150	2.5 /10	(0.4/1.6)		**F030050C8**
		10	(254)	300	10	(1.6)	**F030100C7**	
		10	(254)	75/300	2.5 /10	(0.4/1.6)		**F030100C8**
		15	(381)	450	10	(1.6)	**F030150C7**	
		15	(381)	112/450	2.5 /10	(0.4/1.6)		**F030150C8**
		20	(508)	600	10	(1.6)	**F030200C7**	
		20	(508)	150/600	2.5 /10	(0.4/1.6)		**F030200C8**
4	(102)	5	(127)	200	10	(1.6)	**F040050C7**	
		5	(127)	50/200	2.5 /10	(0.4/1.6)		**F040050C8**
		10	(254)	400	10	(1.6)	**F040100C7**	
		10	(254)	100/400	2.5 /10	(0.4/1.6)		**F040100C8**
		15	(381)	600	10	(1.6)	**F040150C7**	
		15	(381)	150/600	2.5/10	(0.4/1.6)		**F040150C8**
		20	(508)	800	10	(1.6)	**F040200C7**	
		20	(508)	200/800	2.5/10	(0.4/1.6)		**F040200C8**
5	(127)	5	(127)	250	10	(1.6)	**F050050C7**	
		5	(127)	62.5/250	2.5/10	(0.4/1.6)		**F050050C8**
		10	(254)	500	10	(1.6)	**F050100C7**	
		10	(254)	125/500	2.5/10	(0.4/1.6)		**F050100C8**
		15	(381)	750	10	(1.6)	**F050150C7**	
		15	(381)	187/750	2.5/10	(0.4/1.6)		**F050150C8**
		20	(508)	1000	10	(1.6)	**F050200C7**	
		20	(508)	250/1000	2.5/10	(0.4/1.6)		**F050200C8**
6	(152)	5	(127)	300	10	(1.6)	**F060050C7**	
		5	(127)	75/300	2.5/10	(0.4/1.6)		**F060050C8**
		10	(254)	600	10	(1.6)	**F060100C7**	
		10	(254)	150/600	2.5 /10	(0.4/1.6)		**F060100C8**
		15	(381)	900	10	(1.6)	**F060150C7**	
		15	(381)	225/900	2.5/10	(0.4/1.6)		**F060150C8**
		20	(508)	1200	10	(1.6)	**F060200C7**	
		20	(508)	300/1200	2.5/10	(0.4/1.6)		**F060200C8**

Notes:

- Silicone rubber etched foil elements 0.022 in. (0.56 mm) thick
- Stock heaters have standard lead length 12 in. (305 mm) UL® 1180 Teflon®
- UL® Component Recognition

Silicone Rubber Heaters

Etched Foil Elements

Stock Heater Coding Configured Options

To order, complete the code number with the information below:

Etched Foil

F0_____-____

Options
0 = None
A = PSAS bottom
B = PSAS top
K = PSAS and low loss
L = Low loss
R = 1/16 in. sponge
S = 1/8 in. sponge
T = 1/4 in. sponge
U = 3/8 in. sponge
V = 1/2 in. sponge
W = PSAS + 1/16 in. sponge
Y = PSAS + 1/8 in. sponge
1 = PSAS + 1/4 in. sponge
2 = PSAS + 3/8 in. sponge
3 = PSAS + 1/2 in. sponge

Sensors

Type	LOC	WIR
0 = None		
L = T10	STD	STD
M = T10	STD	ALT
N = T10	ALT	STD
P = T10	ALT	ALT
R = T207	STD	STD
S = T207	STD	ALT
T = T207	ALT	STD
U = T207	ALT	ALT
4 = JSTD	STD	STD
6 = JALT	STD	STD
7 = KSTD	STD	STD

- For thermostats, standard location is as shown in catalog; standard wiring is integral or in series with the heater; alternate location is rotated parallel with heater width; alternate wiring is separate leads for pilot control.
- For thermocouples, Type J standard is Teflon® insulation; Type J alternate is fiberglass insulation; Type K standard is fiberglass insulation.
- Etched foil heaters not recommended for Enclosure heaters.

T10 Set °F
0 = None
A = 125
B = 150
E = 175
F = 200
G = 225
H = 250
J = 275
K = 300

T207 Set °F
0 = None
1 = 40/55
2 = 60/75
3 = 95/110
4 = 145/160

T/C Length
0 = None
A = 8 in.
B = 12 in.
E = 18 in.
F = 24 in.
G = 30 in.
H = 36 in.
J = 40 in.
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

Lead Insulation
0 = None
1 = 1180 UL® R/C
2 = 1180 C-UL® R/C
3 = 3133 22 GA**
6 = 1199 CSA
7 = HPN
8 = 6 ft HPN set
9 = Type E Teflon®
A = 1180VDE*
B = 1199VDE*
C = Silicone leads w/waterproof cap
E = SJO cord
F = 6 ft SJO set

*1180VDE denotes a C-UL® heater plus a VDE stamp.
**Not available on composite heaters due to amperage.

Lead Length*
A = 8 in.
B = 12 in.
E = 18 in.
F = 24 in.
G = 30 in.
H = 36 in.
J = 40 in.
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

*Customer specified length must be noted in inches when ordering

Availability

Stock: Same day shipment of orders (with part number configuration -0001B) if received by 11:00 a.m. CST. All other modifications (other than -0001B) are modified stock and ship within five working days.

How to Order

To order stock silicone rubber heaters, specify the Watlow code number and the quantity. To order a heater with options, specify the code number, quantity and options desired. Contact Watlow before combining options.

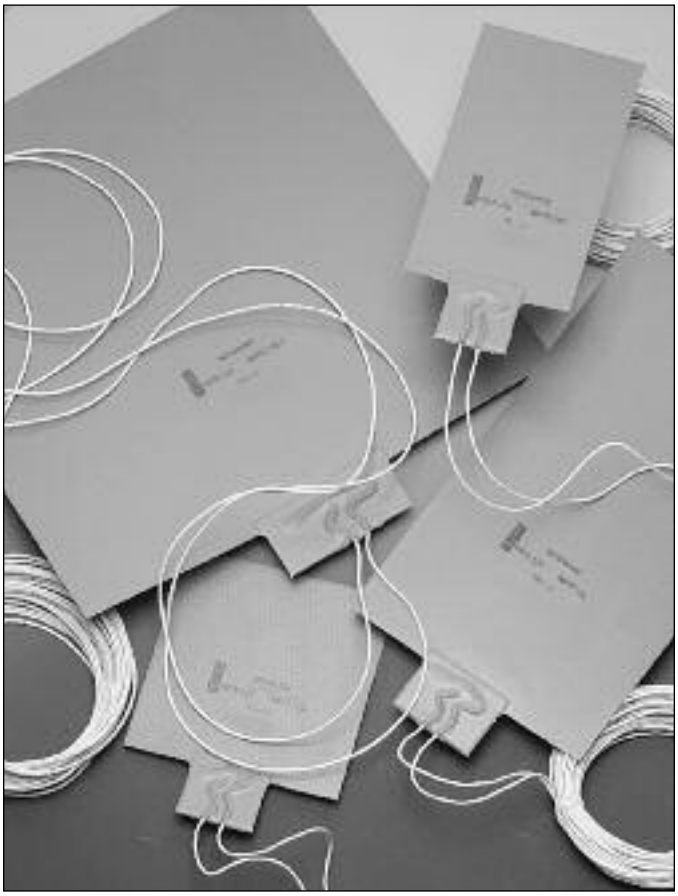
Made-to-Order: contact Watlow.

For **made-to-order** units, Watlow will need the following application information from you:

- Size (dimensions)
- Voltage
- Wattage/watt density
- Operating temperature
- Options (leads, thermostats, attachment techniques, etc.)
- Will heater be subject to flexing?
- Element type, if you have a preference
- Agency approvals
- Quantity

Silicone Rubber Heaters

Composite Flexible Stock Heaters



The composite bonding industry is a large field that is expanding into a variety of areas. One of the primary fields that utilizes flexible heaters for curing is the aerospace industry. Watlow® offers a stock list of heaters commonly used for composite bonding and curing. The design includes equal length circuits and a no-heat tab for temperature uniformity. Also, the contact surface is made of a smooth silicone to prevent composite surface imperfections. The heaters are fiberglass-reinforced to provide lasting field service durability and life.

Features and Benefits

Standard 5 W/in² (0.8 W/cm²)
- Meets composite industry specifications

120V~(ac) standard / 240V~(ac) (option) single phase
- Matches standard composite industry equipment

Customized leads
- Allows up to 40 foot of lead length

Field service ease
- Makes on-site repairs possible

Equal length circuits - min. 2 x 2 in. (51 x 51 mm) tab with radius
- Creates temperature uniformity

Smooth contact surface
- Prevents composite surface imperfections

UL® recognized
- Available on many custom designs

Applications

- Aerospace industry
  - Repair
  - Fabrication
- Composite bonding processes

Silicone Rubber Heaters

Wire-Wound Elements

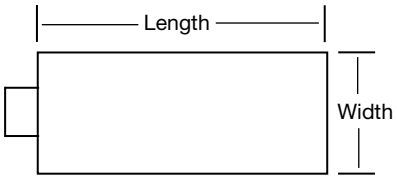
Composite Heaters "L"

Width in.	Width (mm)	Length in.	Length (mm)	Watts	120V~(ac) Code Number	120/240V~(ac) Code Number
6	(152)	6	(152)	180	**L060080C1**	
		6	(152)	180		**L060080C2**
		10	(254)	300	**L060120C1**	
		10	(254)	300		**L060120C2**
8	(203)	8	(203)	320	**L080100C1**	
		8	(203)	320		**L080100C2**
		12	(305)	480	**L080140C1**	
		12	(305)	480		**L080140C2**
10	(254)	10	(254)	500	**L100120C1**	
		10	(254)	500		**L100120C2**
		12	(305)	600	**L100140C1**	
		12	(305)	600		**L100140C2**
		18	(457)	900	**L100200C1****	
		18	(457)	900		**L100200C2**
12	(305)	12	(305)	720	**L120140C1****	
		12	(305)	720		**L120140C2**
		18	(457)	1080	**L120200C1****	
		18	(457)	1080		**L120200C2****
		24	(610)	1440	**L120260C1****	
		24	(610)	1440		**L120260C2****
16	(406)	16	(406)	1280	**L160180C1****	
		16	(406)	1280		**L160180C2****
18	(457)	18	(457)	1620	**L180200C1****	
		18	(457)	1620		**L180200C2****
20	(508)	20	(508)	2000	**L200220C1***	
		20	(508)	2000		**L200220C2****

* **Thermostat option is not available for this heater.**
** **Only T207 thermostat option is available.**

Notes:

- Standard thickness 0.055 in. (1.4 mm)
- Standard lead length 12 in. (305 mm) UL® 1180 Teflon®
- UL® component recognition
- Silicone rubber wire-wound elements rated at 5 W/in²
- Length does not include 2 in. (51 mm) tab for leads
- Material A2



Silicone Rubber Heaters

Wire-Wound Elements

Composite Heaters "L"

To order, complete the code number with the information below:

Composite Flexible Stock Heaters

L_ _ _ _ _ _ _ _ - _ _ _ _

Modification Options
0 = None
A = PSAS bottom
B = PSAS top
K = PSAS and low loss
L = Low loss
R = 1/16 in. sponge
S = 1/8 in. sponge
T = 1/4 in. sponge
U = 3/8 in. sponge
V = 1/2 in. sponge
W = PSAS + 1/16 in. sponge
Y = PSAS + 1/8 in. sponge
1 = PSAS + 1/4 in. sponge
2 = PSAS + 3/8 in. sponge
3 = PSAS + 1/2 in. sponge

Sensors

Type	LOC	WIR
0 = None		
L = T10	STD	STD
M = T10	STD	ALT
N = T10	ALT	STD
P = T10	ALT	ALT
R = T207	STD	STD
S = T207	STD	ALT
T = T207	ALT	STD
U = T207	ALT	ALT
4 = JSTD	STD	STD
6 = JALT	STD	STD
7 = KSTD	STD	STD

- For thermostats, standard location is as shown in catalog; standard wiring is integral or in series with the heater; alternate location is rotated parallel with heater width; alternate wiring is separate leads for pilot control.
- For thermocouples, Type J standard is Teflon® insulation; Type J alternate is fiberglass insulation; Type K standard is fiberglass insulation.
- Etched foil heaters not recommended for enclosure heaters.

T10 Set °F*
0 = None
A = 125
B = 150
E = 175
F = 200
G = 225
H = 250
J = 275
K = 300

T207 Set °F*
0 = None
1 = 40/55
2 = 60/75
3 = 95/110
4 = 145/160

T/C Length
0 = None
A = 8 in.
B = 12 in.
E = 18 in.
F = 24 in.
G = 30 in.
H = 36 in.
J = 40 in.
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

Lead Insulation
0 = None
1 = 1180 UL® R/C
2 = 1180 C-UL® R/C
3 = 3133 22 GA**
6 = 1199 CSA
7 = HPN
8 = 6 ft HPN set
9 = Type E Teflon®
A = 1180VDE*
B = 1199VDE*
C = Silicone leads w/waterproof cap
E = SJO cord
F = 6 ft SJO set

* 1180VDE denotes a cUR® heater plus a VDE stamp.

**Not available on composite heaters due to amperage.

Lead Length*
A = 8 in.
B = 12 in.
E = 18 in.
F = 24 in.
G = 30 in.
H = 36 in.
J = 40 in.
K = 4 ft
L = 5 ft
M = 6 ft
N = 7 ft
P = 8 ft
R = 9 ft
S = 10 ft
T = 12 ft
U = 15 ft
V = 18 ft
W = 20 ft
Y = 22 ft
1 = 25 ft
2 = 30 ft

* Customer specified length must be noted in inches when ordering.

Availability

Stock: Same day shipment of orders (with part number configuration -0001B) if received by 11:00 a.m. CST. All other modifications (other than -0001B) are modified stock and ship within five working days.

How to Order

To order stock silicone rubber heaters, specify the Watlow code number and the quantity. To order a heater with options, specify the code number, quantity and options desired. Contact Watlow before combining options.

Made-to-Order: Contact Watlow.

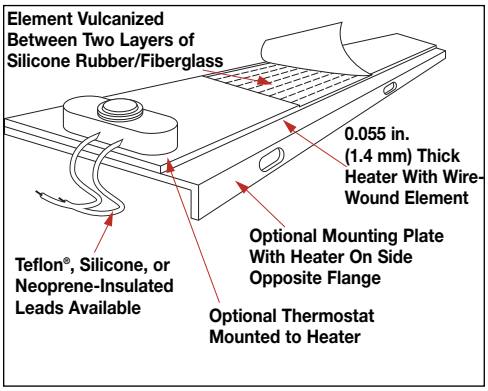
For **made-to-order** units, Watlow will need the following application information from you:

- Size (dimensions)
- Voltage
- Wattage/watt density
- Operating temperature
- Options (leads, thermostats, attachment techniques, etc.)
- Will heater be subject to flexing?
- Element type, if you have a preference
- Agency approvals
- Quantity

Silicone Rubber Heaters

Enclosure Heaters

Stock Product Offering – Wire-Wound Only





Designed for freeze and condensation protection, Watlow's enclosure heaters are rugged, reliable and safe to operate. These rectangular-shaped, wire-wound silicone rubber heaters can be ordered by themselves with adhesive or vulcanized to an aluminum mounting plate. A thermostat can be attached to the heater or mounted separately. Pictured are units with thermostat on heater in foreground and heater with remote thermostat in background.

Performance Capabilities

- Watt density rating of 5 W/in² (0.8 W/cm²)
- Temperatures to 150°F (66°C)

Features and Benefits

Pressure sensitive adhesive, mounting to aluminum plate or customer cementing

- Reduces installation time
- Creates easy installation

Quick delivery on more than 72 variations

- Simplifies operation

No exposed electrical connections

- Creates a safe and reliable operation

Custom leads

- Available in any length

Horizontal and vertical mounting

- Simplifies operation

Applications

Freeze or condensation prevention in housings containing electronic equipment. Examples include:

- Traffic signal boxes
- Automatic teller machines
- Temperature control panels
- Gas or liquid control valve housings

Applications and Technical Data

Determining Minimum Wattage Requirements for Enclosures

This chart is an excellent guide for determining total wattage requirements for both insulated and uninsulated enclosures, assuming the box is relatively airtight. For windy conditions, add an additional 50 percent to the wattage requirement listed.

Temperature Rise from Ambient °F (°C)	Total Enclosure Surface Area* — Square Feet (Square Meters)													
	2 (0.2)	3 (0.3)	4 (0.4)	5 (0.5)	6 (0.6)	7.5 (0.7)	9 (0.8)	10 (0.9)	15 (1.4)	20 (1.9)	25 (2.3)	30 (2.8)	40 (3.7)	50 (4.7)
20 (11)	30	40	55	70	80	100	120	135	205	270	335	405	540	670
	10	10	15	20	20	25	30	35	50	65	80	100	130	160
40 (22)	55	80	110	135	160	200	245	270	405	540	670	805	1075	1340
	15	20	30	35	40	50	60	65	100	130	160	195	260	320
60 (33)	90	120	160	205	245	300	365	405	605	805	1005	1210	1610	2010
	20	30	55	50	60	75	90	100	145	195	240	290	385	480
80 (44)	110	160	215	270	325	400	485	540	805	1075	1340	1610	2145	2680
	30	40	55	65	80	100	115	130	195	260	320	385	515	640
100 (56)	135	200	270	335	405	500	605	670	1005	1340	1675	2010	2680	3350
	35	50	65	80	100	125	145	160	240	320	400	480	640	800
120 (67)	165	240	320	405	485	600	725	805	1210	1610	2010	2415	3220	4020
	40	60	80	100	115	150	175	195	290	385	480	580	770	960
140 (78)	190	280	375	470	565	700	845	940	1410	1880	2345	2815	3755	4690
	45	70	90	115	135	175	205	225	340	450	560	675	900	1120

***Note:** Area = 2 X (L X W + L X H + W X H); Square feet = (square inch) divided by 144.

Uninsulated boxes Insulated boxes

Silicone Rubber Heaters

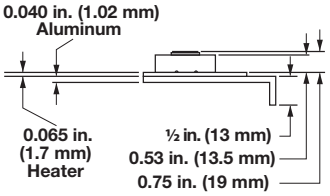
Enclosure Heaters

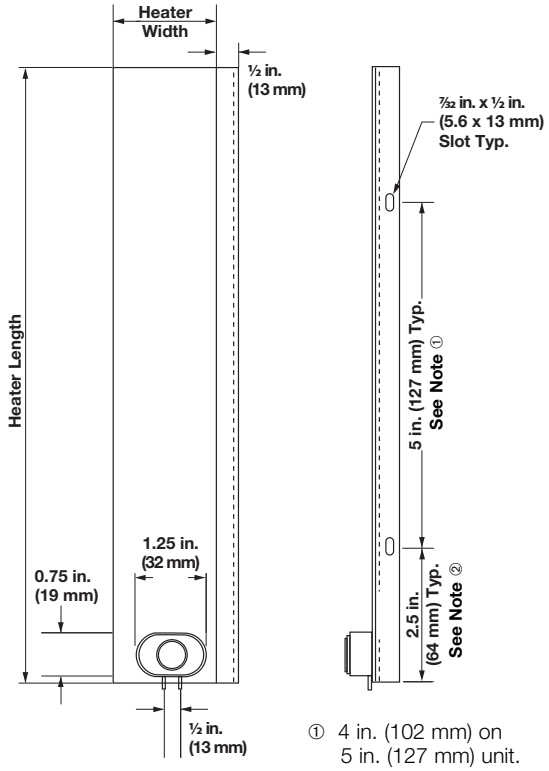
Stock Product Offering

Aluminum Mounting Plate

Both vertical and horizontal mounting can be accomplished with enclosure heaters. The mounting plates are 0.040 in. (1.02 mm) thick, specified as #3003 H14 aluminum. The preferred orientation is vertical, with a thermostat attached at the lower end (as shown in the drawing).

For horizontal mounting, a remote thermostat is recommended. An enclosure heater can be ordered by itself, with PSAS or vulcanized to an aluminum mounting plate. See *Thermostats* below for more information.





① 4 in. (102 mm) on 5 in. (127 mm) unit.
② 0.5 in. (13 mm) on 5 in. (127 mm) unit.

Thermostats

Mounted on Heater

Built-in snap action thermostats from Watlow are designed to sense air temperature. See the ordering chart on the following page for available settings.

Remote From Heater

For an air sensing thermostat separate from the heater, the ST-207E is ideal. This is a modified ST-207 mounted on a 1⁄32 in. (0.8 mm) thick G-10 circuit board with the thermostat's metal cap exposed to sense air temperature. The thermostat is placed at the midpoint of the lead length. The sensor can be preset at the temperatures listed for integral sensors.

Notes:

- On both integral and remote sensors, the thermostat's exposed metal cap is vulnerable to impact. This could defeat the thermostat's switching action and cause heater malfunction.
- T-10 thermostats are not recommended for enclosure heating applications.

Silicone Rubber Heaters

Drum Heaters

Stock Product Offering

Performance Capabilities

- Available with fixed or adjustable thermostats for temperatures up to 330°F (165°C)
- Watt density of 6 W/in^2 (1 W/cm^2)

Features and Benefits

Protects fluids stored in drums
- Prevents fluids from freezing

Quick delivery on 28 styles from stock
- Simplifies operation

Includes six-foot cord and plug set
- Allows for application convenience

Custom heaters
- Available for non-standard sizes

Applications

- Freeze protection
- Viscosity control

Application Hints

- Allow a 3 in. (76 mm) gap between heater ends when clamped around a drum.
- Heaters with thermostat settings of 40°F and 60°F (4°C and 16°C) will have open circuit readings if room temperature exceeds the thermostat settings.
- Heaters cannot be bench tested since the thermostat is located over a no-heat section of the heater. Accurate testing of the heater requires it to be placed over the drum that is to be heated.
- When a single heater is used, place the heater at the bottom of the drum to minimize stratification.

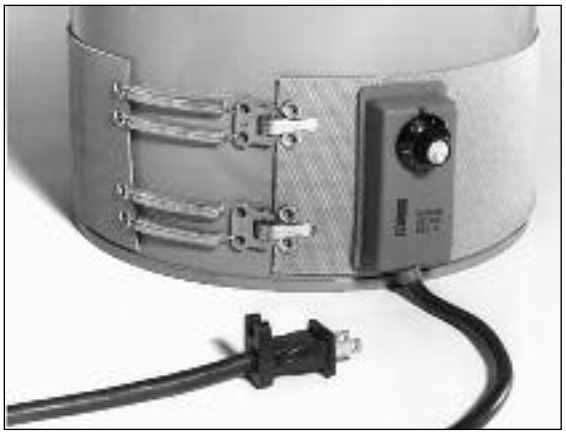
Standard Features

Watlow flexible drum heaters are designed for use on 5-, 30- and 55-gallon **metal** drums. They come with the following standard features:

- 6 ft (1.8 m) cord and plug set
- Latch fasteners and springs
- Two styles of thermostats:

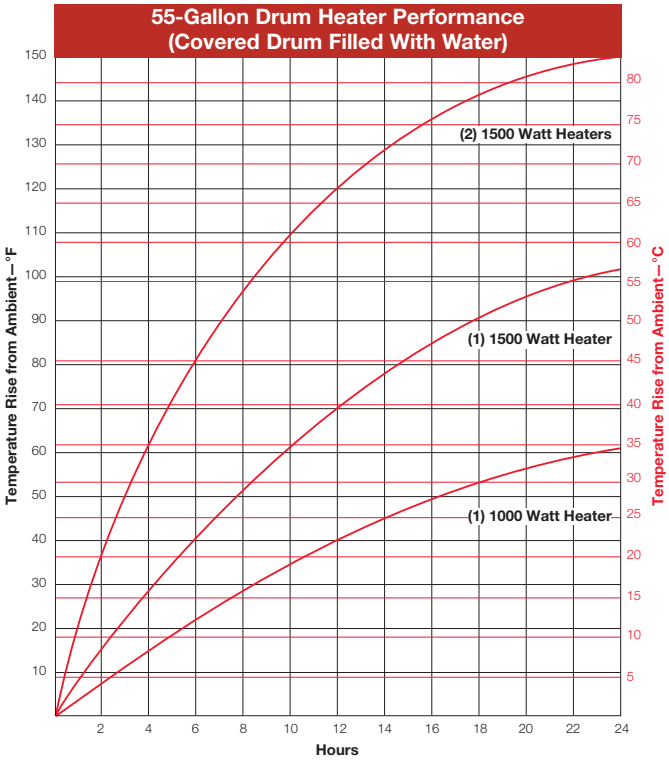
  T-207 snap action, available on all sizes

  B-200-3 adjustable, available only on 4 in. (102 mm) wide units, and mounted in a silicone rubber boot to protect it from contamination



Determining Temperature Rise From Ambient

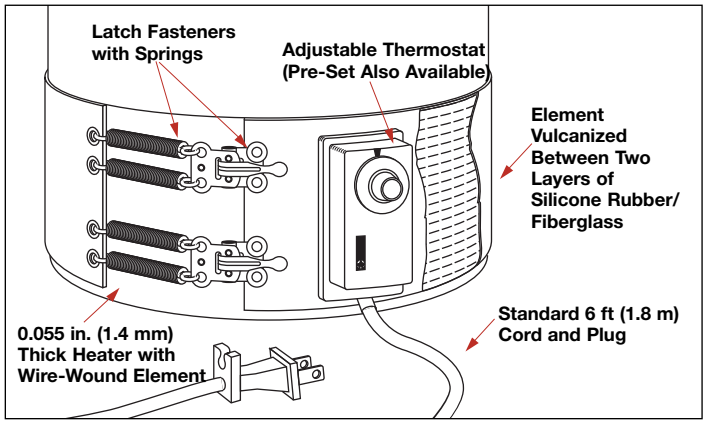
The total wattage (number of heaters and the material being heated) must be considered when estimating the actual temperature the contents of the drum will reach. The graph below shows the temperature rise from ambient conditions, not drum content temperature.



Silicone Rubber Heaters

Drum Heaters

Stock Product Offering



Drum Size	Volts	Watts	Width in. (mm)	Thermostat	Availability	Code Number
5 gal. (20 L) 11½ in. (292 mm) nom. diameter	120	650	4 (102.0)	(no thermostat)	Stock	**04031500A**
				150°F (66°C)	Modified Stock	**04031500BT**
				100°F (38°C)	Modified Stock	**04031500CT**
				40°F (4°C)	Modified Stock	**04031500DT**
				60°F (16°C)	Modified Stock	**04031500HT**
				Adj. 25°-330°F (-5°-165°C)	Stock	**04031510**
30 gal. (115 L) 18½ in. (470 mm) nom. diameter	120	750	2 11/16 (68.3)	(no thermostat)	Stock	**02655080A**
				150°F (66°C)	Modified Stock	**02655080BT**
				100°F (38°C)	Modified Stock	**02655080CT**
				40°F (4°C)	Modified Stock	**02655080DT**
				60°F (16°C)	Modified Stock	**02655080ET**
55 gal. (210 L) 22½ in. (572 mm) nom. diameter	120	1000	2 11/16 (68.3)	(no thermostat)	Stock	**02667700A**
				150°F (66°C)	Modified Stock	**02667700BT**
				100°F (38°C)	Modified Stock	**02667700CT**
				40°F (4°C)	Modified Stock	**02667700DT**
				60°F (16°C)	Modified Stock	**02667700ET**
55 gal. (210 L) 22½ in. (572 mm) nom. diameter	120	1500	4 (102.0)	(no thermostat)	Stock	**04067700A**
				150°F (66°C)	Modified Stock	**04067700BT**
				100°F (38°C)	Modified Stock	**04067700CT**
				40°F (4°C)	Modified Stock	**04067700DT**
				60°F (16°C)	Modified Stock	**04067700GT**
				Adj. 25°-330°F (-5°-165°C)	Stock	**04067710**
55 gal. (210 L) 22½ in. (572 mm) nom. diameter	240①	1500	4 (102.0)	(no thermostat)	Stock	**04067701A**
				150°F (66°C)	Modified Stock	**04067701BT**
				100°F (38°C)	Modified Stock	**04067701CT**
				40°F (4°C)	Modified Stock	**04067701DT**
				60°F (16°C)	Modified Stock	**04067701ET**
				Adj. 25°-330°F (-5°-165°C)	Stock	**04067711**

① Supplied with 6-ft (1.8 m) cord—no plug.

How to Order

After determining the drum size, volts, watts and temperature sensing requirements, specify the corresponding Watlow code number and quantity desired.

Availability

Stock: Drum heaters without thermostats and those with adjustable thermostats are available for same day shipment if order is received by 11:00 a.m. CST.

Modified Stock: Drum heaters with pre-set thermostats require two to three days lead time before being shipped.

Made-to-Order: Contact your Watlow representative.

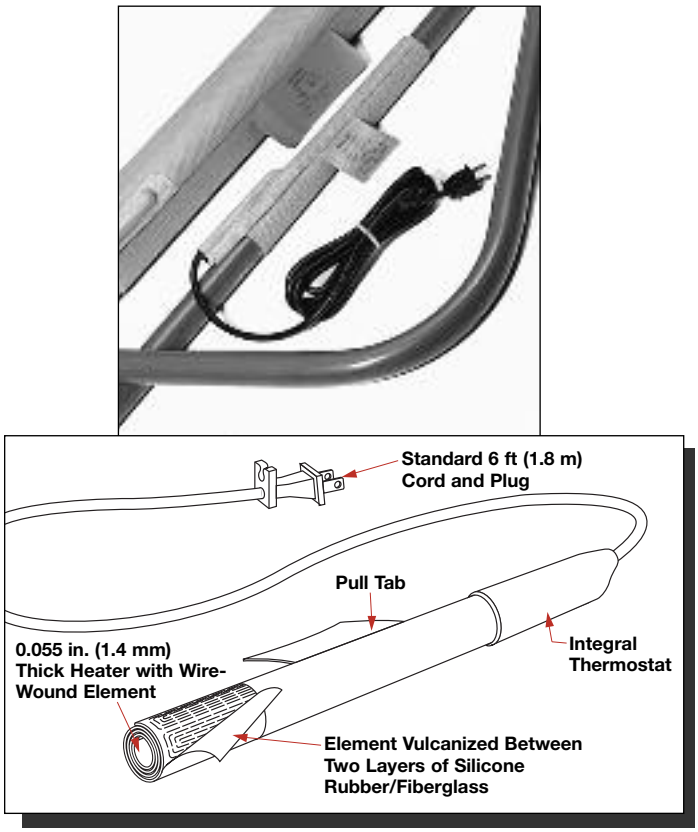
Silicone Rubber Heaters

Conduit Heaters

Stock Product Offering
PVC Wire-Wound Conduit Heaters

Watlow's conduit heater simplifies bending PVC plastic conduit to the desired shape right on the job site. Just plug it in and within four to 18 minutes, depending upon heater size, the conduit is ready to be formed by hand into the shape or radius you need.

This lightweight silicone rubber heater is easily wrapped around the conduit because of its flexible, self-conforming construction.



Performance Capabilities

- Operating temperatures to 250°F (121°C)
- Handles plastic conduits as large as 4 in. (102 mm) in diameter

Features and Benefits

Self-conforms to cylindrical shapes
- Fits snugly around the conduit

Portable design
- Makes it easy to use in the field

Included thermostat
- Prevents overheating

Pull tab
- Allows for easy removal or positioning when heater is hot

Immediate delivery
- Simplifies operation

Conduit Diameter in. (mm)	Length in. (mm)	Watts	Volts	Temp. Limit °F (°C)	Warm-up Time	Code Number
½ to 1½ (13-38)	12 (305)	180	120	250 (121)	4-10 minutes	**05712082**
2 to 4 (51-102)	25 (635)	950	120	250 (121)	7-18 minutes	**14825081**

How To Order

Choose between the two sizes available. Specify the Watlow code number and quantity desired.

Availability

Stock: Both sizes are available for immediate delivery from stock.

Made-to-Order: Contact your Watlow representative.

Line Heating

Modular Gas Line Heaters

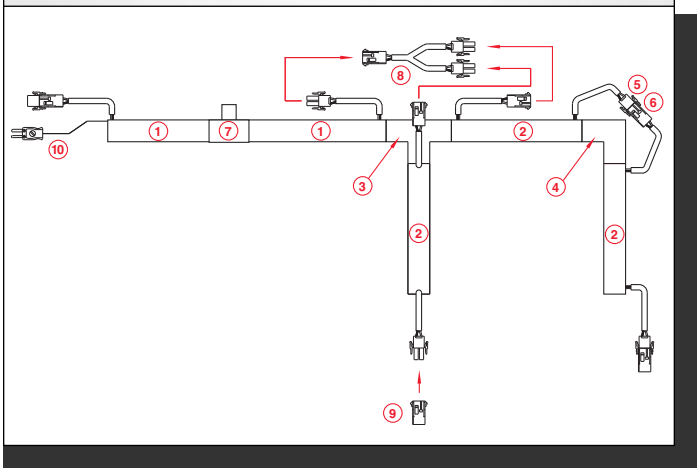
Gas Delivery

Tetraethyl orthosilicate (TEOS), Boron trichloride (BCl_3), Aluminum Chloride ($AlCl_3$), Chlorine trifluoride (ClF_3) and Dichlorosilane (DCS) are gases that condense or liquefy due to a phase shift at low temperatures. The condensation occurs in the gas line and puddles in the shower head before being injected into the vacuum chamber. A substantial number of wafer defects will occur if liquefied gases are injected into the vacuum chamber. Uniform heating of the lines will prevent condensation. TEOS lines are typically heated above 194°F (90°C) and BCl_3 above 86°F (30°C), depending on pressure and flow rate. The optimum line temperature will vary depending on the process parameters.

Specifications

- Watt density: 2.5 W/in² (0.39 W/cm²) on gas line O.D.
- UL® recognized for U.S. and Canadian safety standards
- Heaters and insulators meet UL94-HB flammability requirements
- Insulated straight fillers for 100% line coverage-elbows and tees are trim-to-fit to proper length
- I.D. available: ¼, ⅜, ½, ¾ in. (6, 9.5, 13, 19 mm)
- 120V standard, other voltages available
- Small metal snaps
- ⅜ in. (9.5 mm) wall, silicone rubber, closed cell sponge





Upstream Gas Line Heater Assembly

① 9 in. (229 mm) heater with thermocouple. Heater leads have male plug on one end and a female cap on the other end. Heater materials UL® rated to 392°F (200°C)

② 6 in. (152 mm) heater. Heater leads, see 1

③ Union tee insulator

④ 90° union elbow insulator

⑤ Male plug, Amp p/n 1-480698-0 w/sockets ampere p/n 350689-1

⑥ Female cap, Amp p/n 1-480699-0 w/pins ampere p/n 350690-1

⑦ Valve or regulator

⑧ Y Connector: one female cap on one end; two male plugs on the other end

⑨ Dead plug (sealed)

⑩ Type J thermocouple w/ male mini-plug (optional)

Line Heating

Modular Gas Line Heaters *(Continued)*

Standard Gas Line Diameter
¼ in. (6 mm) O.D. Tubing

¼ in. (6 mm) Heater I.D. x Length		Description	Volts	Watts	Amperes	Code Number		
in.	(mm)					Without T/C Stock	With Type J T/C Stock	With Type K T/C Standard
6	(152)	Heated straight	120	12	0.10	**008060C1**	**008060C1A**	**008060C1K**
9	(229)	Heated straight	120	18	0.15	**008090C1**	**008090C1A**	**008090C1K**
12	(305)	Heated straight	120	24	0.20	**008120C1**	**008120C1A**	**008120C1K**
18	(457)	Heated straight	120	36	0.30	**008180C1**	**008180C1A**	**008180C1K**
24	(610)	Heated straight	120	48	0.40	**008240C1**	**008240C1A**	**008240C1K**
36	(914)	Heated straight	120	72	0.60	**008360C1**	**008360C1A**	**008360C1K**
18	(457)	Straight insulator	N/A	Trim-to-fit	Insulator	**008180C0**		
* Elbow		90° Union Elbow insulator	N/A	Trim-to-fit	Insulator	**008020C0**		
* Tee		Union Tee insulator	N/A	Trim-to-fit	Insulator	**008030C0**		

⅜ in. (9.53 mm) O.D. Tubing

¼ in. (6 mm) Heater I.D. x Length		Description	Volts	Watts	Amperes	Code Number		
in.	(mm)					Without T/C Stock	With Type J T/C Stock	With Type K T/C Standard
6	(152)	Heated straight	120	18	0.15	**012060C1**	**012060C1A**	**012060C1K**
9	(229)	Heated straight	120	27	0.23	**012090C1**	**012090C1A**	**012090C1K**
12	(305)	Heated straight	120	36	0.30	**012120C1**	**012120C1A**	**012120C1K**
18	(457)	Heated straight	120	54	0.45	**012180C1**	**012180C1A**	**012180C1K**
24	(610)	Heated straight	120	71	0.60	**012240C1**	**012240C1A**	**012240C1K**
36	(914)	Heated straight	120	107	0.90	**012360C1**	**012360C1A**	**012360C1K**
18	(457)	Straight insulator	N/A	Trim-to-fit	Insulator	**012180C0**		
* Elbow		90° Union Elbow insulator	N/A	Trim-to-fit	Insulator	**012020C0**		
* Tee		Union Tee insulator	N/A	Trim-to-fit	Insulator	**012030C0**		

½ in. (13 mm) O.D. Tubing

¼ in. (6 mm) Heater I.D. x Length		Description	Volts	Watts	Amperes	Code Number		
in.	(mm)					Without T/C Stock	With Type K T/C Stock	With Type K T/C Standard
6	(152)	Heated straight	120	24	0.20	**016060C1**	**016060C1A**	**016060C1K**
9	(229)	Heated straight	120	36	0.30	**016090C1**	**016090C1A**	**016090C1K**
12	(305)	Heated straight	120	48	0.40	**016120C1**	**016120C1A**	**016120C1K**
18	(457)	Heated straight	120	72	0.60	**016180C1**	**016180C1A**	**016180C1K**
24	(610)	Heated straight	120	96	0.80	**016240C1**	**016240C1A**	**016240C1K**
36	(914)	Heated straight	120	144	1.20	**016360C1**	**016360C1A**	**016360C1K**
18	(457)	Straight insulator	N/A	Trim-to-fit	Insulator	**016180C0**		
* Elbow		90° Union Elbow insulator	N/A	Trim-to-fit	Insulator	**016020C0**		
* Tee		Union Tee insulator	N/A	Trim-to-fit	Insulator	**016030C0**		

* For use on Micro-Fit® weld fittings.

Notes: Stock items are ready for delivery in limited quantities.
Standard items are existing configurations and will be made to order.

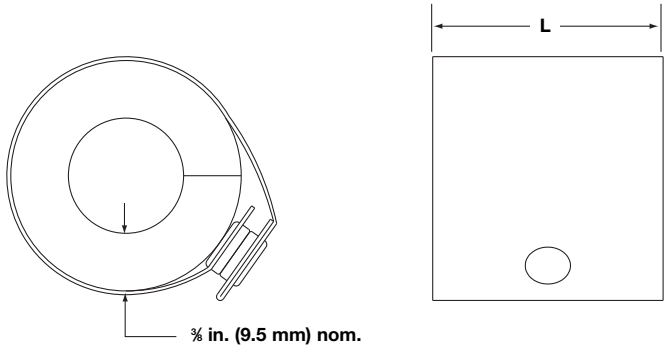
Line Heating

Modular Gas Line Heaters *(Continued)*

Standard Gas Line Diameter
¾ In. (19.1 mm) O.D. Tubing

¼ in. (6 mm) Heater I.D. x Length		Description	Volts	Watts	Amperes	Code Number		
in.	(mm)					Without T/C Stock	With Type K T/C Stock	With Type K T/C Standard
6	(152)	Heated straight	120	36	0.30	**024060C1**	**024060C1A**	**024060C1K**
9	(229)	Heated straight	120	54	0.45	**024090C1**	**024090C1A**	**024090C1K**
12	(305)	Heated straight	120	71	0.60	**024120C1**	**024120C1A**	**024120C1K**
18	(457)	Heated straight	120	107	0.90	**024180C1**	**024180C1A**	**024180C1K**
24	(610)	Heated straight	120	142	1.19	**024240C1**	**024240C1A**	**024240C1K**
36	(914)	Heated straight	120	213	1.78	**024360C1**	**024360C1A**	**024360C1K**
18	(457)	Straight insulator	N/A	Trim-to-fit	Insulator	**024180C0**		
* Elbow		90° Union Elbow insulator	N/A	Trim-to-fit	Insulator	**024020C0**		
* T		Union Tee insulator	N/A	Trim-to-fit	Insulator	**024030C0**		

Standard Designs
VCR Union Heaters/Insulators

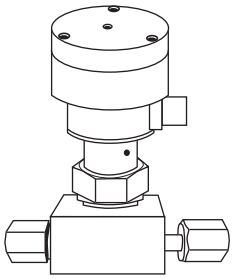


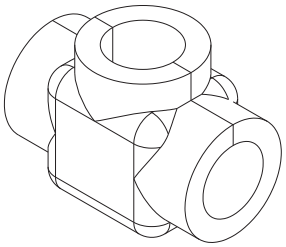
¼ in. (6 mm) Heater I.D. x Length		Description	Volts	Watts	Amperes	Code Number		
in.	(mm)					Without T/C Stock	With Type K T/C Stock	With Type K T/C Standard
⅞ x 1¾	(22.2 x 45)	¼ in. (6 mm) VCR Union heater	120	10	0.09	**01702783**	**01702783A**	**01702783K**
¾ x 1½	(19.0 x 38)	¼ in. (6 mm) VCR Union insulator	N/A	N/A	N/A	**02401580**	N/A	N/A
1¼ x 1½	(32.0 x 38)	½ in. (13 mm) VCR Union heater	120	12	0.10	**03901581**	**03901581A**	**03901581K**
1¼ x 1½	(32.0 x 38)	½ in. (13 mm) VCR Union insulator	N/A	N/A	N/A	**03901580**	N/A	N/A

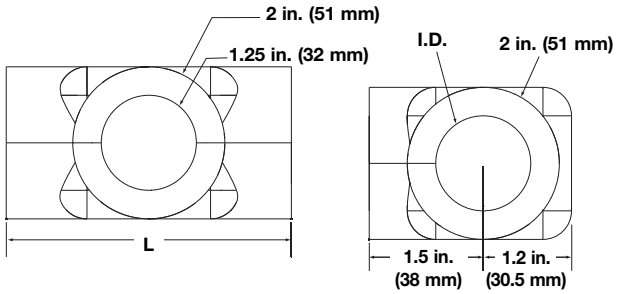
Line Heating

Modular Gas Line Heaters *(Continued)*

VCR Valve Heaters







Tube Diameter in.	(mm)	I.D. in.	(mm)	Fitting Type	Length in.	(mm)	Watts	Amperes @ 120V	Code Number
¼	(6)	⅛	(22.2)	Male VCR valve heater	3.00	(76)	18	0.15	**03104786**
¼	(6)	⅛	(22.2)	Female VCR valve heater	4.75	(121)	28	0.24	**04704893**
½	(13)	1¼	(32.0)	Male VCR valve heater	3.75	(95)	27	0.23	**03804782**
½	(13)	1¼	(32.0)	Female VCR valve heater	6.51	(165)	47	0.39	**04706690**

Note: Heaters fit Nupro® BN and BK series valves.

Accessories

Part	Description	Code Number
Y connector*	Power splitter: 1 female, 2 male	**Z5303-2**
Y connector*	Power splitter: 2 female, 1 male	**Z6333**
Female dead plug*	Insulating plug for last connector in chain	**Z5309-2**
Male dead plug*	Insulating plug for last connector in chain	**Z6332**
Type J thermocouple	12 in. (305 mm) 24 ga Type J Teflon® w/mini plug	**Z5786**
Type J thermocouple extension	10 ft (3048 mm) Type K Teflon® thermocouple with mini plug and mini jack	**Z6271**
Type K thermocouple	12 in. (305 mm) 24 ga Type K Teflon® w/mini plug	**Z5639**
Adapter*	Female to male	**Z6334**
Adapter*	Male to female	**Z6335**
Power extension*	6 in. (152 mm)	**Z6374**
Power extension*	3 ft (914 mm)	**A000136**
Power extension*	6 ft (1829 mm)	**A000137**
Power extension*	10 ft (3048 mm)	**A000138**
Strap extension	1 in. (25 mm) long pump line strap extension	**010010116**
Strap extension	2 in. (51 mm) long pump line strap extension	**010020113**
Strap extension	3 in. (76 mm) long pump line strap extension	**010030124**

*All connectors use AMP Mate-N-Lok® connectors.

- Y-adapters and dead plugs
- Sensor pocket thermocouple: 12 in. (305 mm) long, Type J or K, Teflon® insulated, #24 AWG,
- Two-prong mini-plug connector
- Interconnects with Watlow temperature control consoles

Line Heating

STRETCH-TO-LENGTH® Heaters

Condensation of many critical gases occurs due to a phase shift at low temperatures. Burning of the gases will occur if the delivery line is too hot. High or low temperature condition may result in undesirable particulates and cause costly device defects and tool maintenance.

The Watlow® STRETCH-TO-LENGTH® (S-T-L) gas line heater system was developed as an easy to assemble temperature solution with performance superior to heat tape. S-T-L's preformed construction gives engineers the ability to wrap around the delivery line with consistent heater/gas line contact for improved temperature uniformity. S-T-L's flexibility gives engineers the ability to compensate for the size of different components thus reducing the potential for hot and cold spots.

The S-T-L system includes a 2 W/in^2 S-T-L heater and silicone rubber foam insulation.

Watlow's control consoles with process and redundant high-limit protection are recommended for optimum system performance and to meet SEMI S2-93 guidelines.

Features and Benefits

Easy to install two part system

- Conveniently fits on most gas line configurations

Flexible heater design gives engineers the flexibility to easily customize the thermal profile for each gas line applications

- Standard designs and stocked product allow quick prototyping to determine energy distribution requirements for process improvements

Flexible standard system components

- Eliminate unnecessary lead times for custom designs

Applications

Gas deliver lines

- Boron trichloride, BCl_3
- Chlorine trifluoride, ClF_3
- Dichlorosilane, (DCS), SiH_2Cl_2
- Tetra ethyl orthosilicate, TEOS
- Tungsten hexafluoride, WF_3
- Process gas line qualification



Agency Certification, Recognition Compliance and Approvals

Contact factory for specific application and approvals

- Semi S2-93 compatible with a high-limit thermocouple and controller
- UL® recognized for U.S. safety standards

Specifications

- Heater and insulation jacket material reinforced silicone rubber fabric
  - Color:
    - Insulation and outer jacket – orange
    - Heater – orange
- Clean room strap fasteners
- Voltage:120 and 240V~(ac)
- Max. operating temperature: 392°F (200°C)
- Heater watt density: 2 W/in^2 (0.31W/cm^2) – Watlow recommends 80% line wrap for optimum performance
- Power lead wires: 12 in. (305 mm); #18 AWG UL® 1180 CSA, rated 10A, lead wire pair encapsulated in reinforced silicone rubber sleeving
- Heater interconnectable up to a 10A circuit
- Material rated UL® 94-HB
- Heater materials are UL® rated to 392°F (200°C)

Line Heating

STRETCH-TO-LENGTH Heaters *(Continued)*

S-T-L heaters are specified by their straight length. In actual applications the engineer can wrap the heaters to achieve optimum temperature profile. Coverage lengths of approximately 60 and 80 percent on ¼ (6 mm) and ½ in. (13 mm) diameter tubes are provided as a guide in selecting heater lengths for actual gas line dimensions. A gas line with 100 percent coverage would be approximately 2 W/in^2, 80 percent coverage 1.6 W/in^2 or 60 percent coverage 1.2 W/in^2.

S-T-L Heater Ranges - ¼ in. (6 mm) O.D. Tubing

0.25 60% Coverage	0.25 80% Coverage	120V Version Code Number	Amperes	240V Version Code Number	Amps
10.20	8.04	**005120500**	0.10	N/A	N/A
14.45	11.39	**005170500**	0.14	N/A	N/A
18.70	14.74	**005220500**	0.18	**005220501**	0.09
23.80	18.76	**005280500**	0.23	**005280501**	0.12
30.60	24.12	**005360500**	0.30	**005360501**	0.15
39.95	31.49	**005470500**	0.39	**005470501**	0.20
51.00	40.20	**005600502**	0.50	**005600503**	0.25
63.75	50.25	**005750500**	0.63	**005750501**	0.31
76.50	60.30	**005900500**	0.75	**005900501**	0.38

S-T-L Heater Ranges - ½ in. (13 mm) O.D. Tubing

0.50 60% Coverage	0.50 80% Coverage	120V Version Code Number	Amperes	240V Version Code Number	Amps
10.20	6.63	**005170501**	0.14	N/A	N/A
15.00	9.75	**005250501**	0.21	N/A	N/A
21.00	13.65	**005350502**	0.29	**005350503**	0.15
29.40	19.11	**005490502**	0.41	**005490503**	0.20
38.40	24.96	**005640502**	0.53	**005640503**	0.27
47.40	30.81	**005790502**	0.66	**005790503**	0.33
59.40	38.61	**005990502**	0.82	**005990503**	0.41
73.80	49.97	**005F103502**	1.02	**005F103503**	0.51
92.40	60.06	**005F128502**	1.28	**005F128503**	0.64

¼ in. (6 mm) O.D. Tubing Insulators

¼ in. (6.4 mm) Heater I.D. x Length	Description	Code Number
18 in. (457 mm)	Straight insulator	**012180500**
36 in. (914 mm)	Straight insulator	**012360500**
Elbow	90° union elbow insulator	**012020500**
Tee	Union tee insulator	**012030500**
	VCR fitting	**015030500**

½ in. (13 mm) O.D. Tubing Insulators

½ in. (13 mm) Heater I.D. x Length	Description	Code Number
18 in. (457 mm)	Straight insulator	**024180500**
36 in. (914 mm)	Straight insulator	**024360500**
Elbow	90° union elbow insulator	**020024500**
Tee	Union tee insulator	**024030500**
	VCR fitting	**015042500**

Line Heating

STRETCH-TO-LENGTH Heaters *(Continued)*

⅜ in. (9.5 mm) O.D. Tubing Insulators

⅜ in. (9.5 mm) Heater I.D. x Length	Description	Code Number
18 in. (457 mm)	Straight insulator	**016180500**
36 in. (914 mm)	Straight insulator	**016360500**
Elbow	90° union elbow insulator	**016020500**
Tee	Union tee insulator	**016030501**
	VCR fitting	**015042500**

Extensions

Description	Code Number
3 ft (914 mm)	**A000136**
6 ft (1829 mm)	**A000137**
10 ft (3048 mm)	**A000138**

Accessories

Description	Code Number
Power cord 6 ft 18-2 SJ	**Z5302-2**
Wiring Y connector – 1F-2M	**Z5303-2**
Wiring Y connector – 1M-2F	**Z6333**
Female termination plug	**Z5309-2**
Male termination plug	**Z6332**
12 in. 24 ga. Type J T/C w/mini plug	**Z5786**
12 in. 24 ga. Type K T/C w/mini plug	**Z5639**
Gender changer – M-F	**Z6334**
Gender changer – F-M	**Z6335**
6 in. power extension	**Z6374**
10 ft Type J T/C extension	**Z6271**

Note: All power connectors use AMP Mate-'n'-Lok®

Line Heating

Modular Pump Line Heaters

The tight contact fit of Watlow's pump line heaters provide superior, uniform heating of transfer lines.

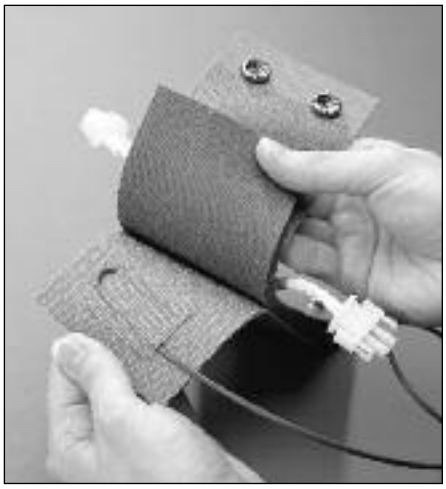
Agency Certification, Recognition Compliance, and Approvals

(Contact your Watlow representative for specific application and approvals)

- Complies with SEMI S2-93 standards
- UL® recognized for U.S. and Canadian safety standards
- CE, VDE
- National Electrical Code (NEC), Article #427-23
- UL® Listed available

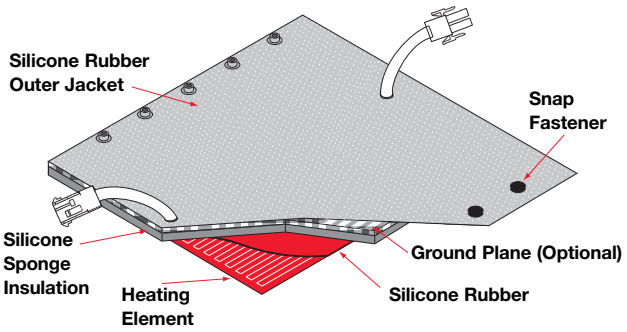
General Specifications

- Heater and jacket material: reinforced silicone rubber fabric
- Color: Insulation and outer jacket is gray, heater is red-orange



Sensor Pocket™ Built-in to all Straight Length Heaters 3 in. (76 mm) Long and Greater; One Per Heater.





- Snap type fasteners: ½ in. (13 mm) nominal diameter metal construction with nylon cover; max. operating temperature 392°F (200°C)
- Velcro® fasteners available
- 120 and 208V~(ac) standard. Contact your Watlow representative for other voltages.
- Power lead wires: 3 in. (76 mm) #18 AWG UL® 1180/CSA Teflon® insulated, rated 10A, lead wire pair encapsulated in reinforced silicone rubber sleeving
- Heaters interconnectable up to a 10A circuit
- **New low watt density:**
  1.5-2 in. (38-51 mm) diameter, 1.5 W/in² (0.23 W/cm²)
  3-4 in. (76-102 mm) diameter, 1.25 W/in² (0.19 W/cm²)

Line Heating

Modular Pump Line Heaters (Continued)

Tube O.D. in.	Tube O.D. (mm)	Length "L" in.	Length "L" (mm)	Watts	Amperes @120V	Amperes @208V	Features	Base Code Number*
1.5	(38)	2	(51)	15	0.13	0.08	—	**020050A**
1.5	(38)	2T	(51T)	8	0.07	NA	Trim-to-fit	**020050T**
1.5	(38)	3	(76)	22	0.19	0.11	Sensor Pocket	**030050A**
1.5	(38)	3T	(76T)	15	0.13	0.08	Trim-to-fit	**030050T**
1.5	(38)	4	(102)	29	0.25	0.14	Sensor Pocket	**040050A**
1.5	(38)	4T	(102T)	22	0.19	0.11	Trim-to-fit	**040050T**
1.5	(38)	5	(127)	36	0.30	0.18	Sensor Pocket	**050050A**
1.5	(38)	5T	(127T)	29	0.25	0.14	Trim-to-fit	**050050T**
1.5	(38)	6	(152)	43	0.36	0.21	Sensor Pocket	**050060A**
1.5	(38)	6T	(152T)	36	0.30	0.17	Trim-to-fit	**050060T**
1.5	(38)	7	(178)	50	0.42	0.24	Sensor Pocket	**050070A**
1.5	(38)	8	(203)	57	0.48	0.27	Sensor Pocket	**050080A**
1.5	(38)	9	(229)	64	0.53	0.31	Sensor Pocket	**050090A**
1.5	(38)	10	(254)	71	0.59	0.34	Sensor Pocket	**050100A**
1.5	(38)	12	(305)	85	0.71	0.41	Sensor Pocket	**050120A**
1.5	(38)	18	(457)	128	1.07	0.62	Sensor Pocket	**050180A**
1.5	(38)	24	(610)	170	1.42	0.82	Sensor Pocket	**050240A**
1.5	(38)	30	(762)	213	1.78	1.03	Sensor Pocket	**050300A**
1.5	(38)	36	(914)	255	2.13	1.23	Sensor Pocket	**050360A**
1.5	(38)	36	(914)	Insulator	NA	NA	—	**050360B**
2.0	(51)	2	(51)	19	0.16	0.10	—	**020066A**
2.0	(51)	2T	(51T)	10	0.09	NA	Trim-to-fit	**020066T**
2.0	(51)	3	(76)	29	0.25	0.14	Sensor Pocket	**030066A**
2.0	(51)	3T	(76T)	19	0.16	0.10	Trim-to-fit	**030066T**
2.0	(51)	4	(102)	38	0.32	0.19	Sensor Pocket	**040066A**
2.0	(51)	4T	(102T)	29	0.25	0.14	Trim-to-fit	**040066T**
2.0	(51)	5	(127)	48	0.40	0.24	Sensor Pocket	**050066A**
2.0	(51)	5T	(127T)	38	0.32	0.19	Trim-to-fit	**050066T**
2.0	(51)	6	(152)	57	0.48	0.28	Sensor Pocket	**060066A**
2.0	(51)	6T	(152T)	47	0.39	0.23	Trim-to-fit	**060066T**
2.0	(51)	7	(178)	66	0.55	0.32	Sensor Pocket	**066070A**
2.0	(51)	8	(203)	76	0.63	0.37	Sensor Pocket	**066080A**
2.0	(51)	9	(229)	85	0.71	0.41	Sensor Pocket	**066090A**
2.0	(51)	10	(254)	95	0.79	0.46	Sensor Pocket	**066100A**
2.0	(51)	12	(305)	114	0.95	0.55	Sensor Pocket	**066120A**
2.0	(51)	18	(457)	170	1.42	0.82	Sensor Pocket	**066180A**
2.0	(51)	24	(610)	227	1.90	1.10	Sensor Pocket	**066240A**
2.0	(51)	30	(762)	283	2.36	1.37	Sensor Pocket	**066300A**
2.0	(51)	36	(914)	340	2.84	1.64	Sensor Pocket	**066360A**
2.0	(51)	36	(914)	Insulator	NA	NA	—	**066360B**

CONTINUED

*To complete the code number, please reference the *Build-a-Code* chart on page 454.

Line Heating

Modular Pump Line Heaters (Continued)

Tube O.D. in.	Tube O.D. (mm)	Length "L" in.	Length "L" (mm)	Watts	Amperes @120V	Amperes @208V	Features	Base Code Number*
3	(76)	2	(51)	24	0.20	0.12	—	**020096A**
3	(76)	2T	(51T)	12	0.10	0.06	Trim-to-fit	**020096T**
3	(76)	3	(76)	36	0.30	0.18	Sensor Pocket	**030096A**
3	(76)	3T	(76T)	24	0.20	0.12	Trim-to-fit	**030096T**
3	(76)	4	(102)	48	0.40	0.24	Sensor Pocket	**040096A**
3	(76)	4T	(102T)	36	0.30	0.18	Trim-to-fit	**040096T**
3	(76)	5	(127)	59	0.50	0.29	Sensor Pocket	**050096A**
3	(76)	5T	(127T)	48	0.40	0.24	Trim-to-fit	**050096T**
3	(76)	6	(152)	71	0.60	0.35	Sensor Pocket	**060096A**
3	(76)	6T	(152T)	59	0.49	0.28	Trim-to-fit	**060096T**
3	(76)	7	(178)	83	0.69	0.4	Sensor Pocket	**070096A**
3	(76)	8	(203)	95	0.79	0.46	Sensor Pocket	**080096A**
3	(76)	9	(229)	106	0.88	0.51	Sensor Pocket	**090096A**
3	(76)	10	(254)	118	0.98	0.57	Sensor Pocket	**096100A**
3	(76)	12	(305)	142	1.19	0.69	Sensor Pocket	**096120A**
3	(76)	18	(457)	213	1.78	1.03	Sensor Pocket	**096180A**
3	(76)	24	(610)	283	2.36	1.37	Sensor Pocket	**096240A**
3	(76)	30	(762)	354	2.95	1.71	Sensor Pocket	**096300A**
3	(76)	36	(914)	425	3.55	2.05	Sensor Pocket	**096360A**
3	(76)	36	(914)	Insulator	NA	NA	—	**096360B**
4	(102)	2	(51)	32	0.27	0.16	—	**020128A**
4	(102)	2T	(51T)	16	0.14	0.08	Trim-to-fit	**020128T**
4	(102)	3	(76)	48	0.40	0.24	Sensor Pocket	**030128A**
4	(102)	3T	(76T)	32	0.27	0.16	Trim-to-fit	**030128T**
4	(102)	4	(102)	63	0.53	0.31	Sensor Pocket	**040128A**
4	(102)	4T	(102T)	48	0.40	0.24	Trim-to-fit	**040128T**
4	(102)	5	(127)	79	0.66	0.38	Sensor Pocket	**050128A**
4	(102)	5T	(127T)	63	0.53	0.31	Trim-to-fit	**050128T**
4	(102)	6	(152)	95	0.80	0.46	Sensor Pocket	**060128A**
4	(102)	6T	(152T)	79	0.66	0.38	Trim-to-fit	**060128T**
4	(102)	7	(178)	110	0.92	0.53	Sensor Pocket	**070128A**
4	(102)	8	(203)	126	1.05	0.61	Sensor Pocket	**080128A**
4	(102)	9	(229)	142	1.18	0.68	Sensor Pocket	**090128A**
4	(102)	10	(254)	157	1.31	0.75	Sensor Pocket	**100128A**
4	(102)	12	(305)	189	1.58	0.91	Sensor Pocket	**120128A**
4	(102)	18	(457)	283	2.36	1.37	Sensor Pocket	**128180A**
4	(102)	24	(610)	377	3.15	1.82	Sensor Pocket	**128240A**
4	(102)	30	(762)	472	3.94	2.27	Sensor Pocket	**128300A**
4	(102)	36	(914)	566	4.72	2.73	Sensor Pocket	**128360A**
4	(102)	36	(914)	Insulator	NA	NA	—	**128360B**

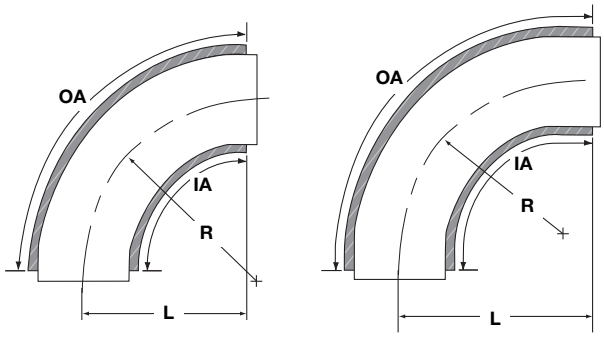
*To complete the code number, please reference the *Build-a-Code* chart on page 454.

Line Heating

Modular Pump Line Heaters *(Continued)*

90° Radius Elbow Heaters

- 0.25 in. (6 mm) or 0.5 in. (13 mm) silicone rubber sponge insulation available
- With or without tangents
- Will fit both butt-weld and flanged style tubing elbows

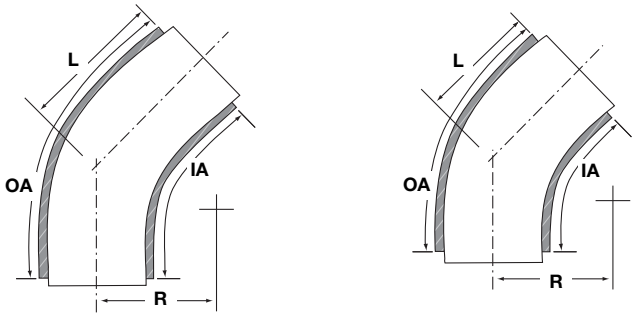


Without Tangent | With Tangent

Tube O.D. in.	(mm)	Length "L" in.	(mm)	Radius (R) in.	(mm)	Watts	Outer Arc Length (OA)	Inside Arc Length (IA)	Amperes @120V	Amperes @208V	Base Code Number*
1.5	(38)	2.00	(51)	2.25	(57)	26	4.21	1.85	0.22	0.13	**042050A**
1.5	(38)	2.68	(68.1)	2.25	(57)	36	5.58	3.22	0.30	0.18	**050055A**
2.0	(51)	2.75	(70)	3.00	(76)	45	5.78	2.64	0.38	0.22	**057066A**
2.0	(51)	3.81	(96.8)	3.00	(76)	65	7.91	4.77	0.55	0.32	**066079A**
3.0	(76)	4.00	(102)	4.50	(114)	84	8.42	3.71	0.70	0.41	**089097A**
3.0	(76)	5.81	(147.6)	4.50	(114)	127	12.05	7.33	1.06	0.62	**097125A**
4.0	(102)	5.50	(140)	6.00	(152)	149	11.56	5.28	1.25	0.72	**116128A**
4.0	(102)	7.81	(198.4)	6.00	(152)	222	16.18	9.00	1.85	1.07	**128166A**

45° Radius Elbow Heaters

- 0.25 in. (6.4 mm) or 0.5 in. (13 mm) silicone rubber sponge insulation available
- With or without tangents
- Will fit both butt-weld and flanged style tubing elbows



With Tangent | Without Tangent

Tube O.D. in.	(mm)	Length "L" in.	(mm)	Radius (R) in.	(mm)	Watts	Outer Arc Length (OA)	Inside Arc Length (IA)	Amperes @120V	Amperes @208V	Base Code Number*
1.5	(38)	0.69	(17.5)	2.25	(57)	14	1.85	0.67	0.12	NA	**018050A**
1.5	(38)	1.38	(35.1)	2.25	(57)	23	3.23	2.04	0.20	0.12	**032050A**
2.0	(51)	1.00	(25)	3.00	(76)	23	2.64	1.07	0.20	0.12	**026066A**
2.0	(51)	2.06	(52.3)	3.00	(76)	44	4.77	3.20	0.37	0.22	**047066A**
3.0	(76)	1.37	(34.8)	4.50	(114)	43	3.71	1.35	0.36	0.21	**042097A**
3.0	(76)	3.18	(80.8)	4.50	(114)	85	7.33	4.97	0.71	0.41	**078097A**
4.0	(102)	2.00	(51)	6.00	(152)	75	5.28	2.14	0.63	0.37	**057128A**
4.0	(102)	4.31	(109.5)	6.00	(152)	148	9.90	6.76	1.24	0.72	**104128A**

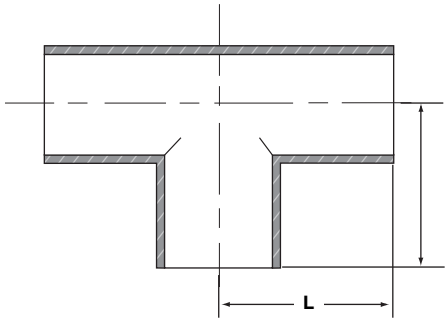
*To complete the code number, please reference the *Build-a-Code* chart on page 454.

Line Heating

Modular Pump Line Heaters *(Continued)*

Tee Section Heaters

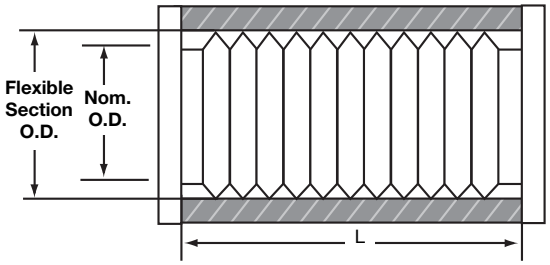
- 0.25 in. (6 mm) or 0.5 in. (13 mm) silicone rubber sponge insulation available
- Will fit both butt-weld and flanged style tee sections



Tube O.D. in.	(mm)	Length "L" in.	(mm)	Watts	Amperes @120V	Amperes @208V	Base Code Number*
1.5	(38)	2.00	(51)	38	0.32	0.19	**047064A**
2.0	(51)	2.75	(70)	69	0.58	0.34	**062081A**
3.0	(76)	3.00	(76)	89	0.75	0.43	**095120A**
4.0	(102)	3.63	(92)	140	1.17	0.69	**125155A**

Bellows Section Heaters

- 0.25 in. (6 mm) or 0.5 in. (13 mm) silicone rubber sponge insulation available
- Will fit both butt-weld and flanged style flexible sections



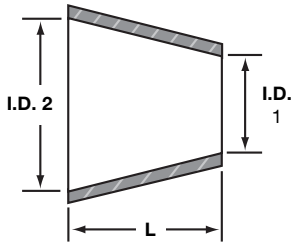
Tube O.D. in.	(mm)	Bellows Section O.D. in.	(mm)	Length "L" in.	(mm)	Watts	Amperes @120V	Amperes @208V	Base Code Number*
1.5	(38)	1.92	(48.9)	3	(76)	26	0.22	0.13	**030056A**
1.5	(38)	1.92	(48.9)	3T	(76T)	18	0.15	0.09	**030056T**
1.5	(38)	1.92	(48.9)	6	(152)	51	0.43	0.25	**056060A**
1.5	(38)	1.92	(48.9)	6T	(152T)	44	0.37	0.21	**056060T**
2.0	(51)	2.47	(62.7)	3	(76)	34	0.29	0.17	**030077A**
2.0	(51)	2.47	(62.7)	3T	(76T)	24	0.2	0.12	**030077T**
2.0	(51)	2.47	(62.7)	6	(152)	68	0.57	0.33	**060077A**
2.0	(51)	2.47	(62.7)	6T	(152T)	59	0.49	0.28	**060077T**
3.0	(76)	3.77	(95.8)	3	(76)	44	0.37	0.22	**030117A**
3.0	(76)	3.77	(95.8)	3T	(76T)	30	0.25	0.14	**030117T**
3.0	(76)	3.77	(95.8)	6	(152)	88	0.74	0.43	**060117A**
3.0	(76)	3.77	(95.8)	6T	(152T)	74	0.62	0.36	**060117T**
3.0	(76)	3.77	(95.8)	12	(305)	175	1.46	0.85	**117120A**
4.0	(102)	4.75	(121)	3	(76)	56	0.47	0.27	**030149A**
4.0	(102)	4.75	(121)	3T	(76T)	38	0.32	0.18	**030149T**
4.0	(102)	4.75	(121)	6	(152)	111	0.93	0.54	**060149A**
4.0	(102)	4.75	(121)	6T	(152T)	94	0.78	0.45	**060149T**
4.0	(102)	4.75	(121)	12	(305)	222	1.85	1.07	**120149A**

*To complete the code number, please reference the *Build-a-Code* chart on page 454.

Line Heating

Modular Pump Line Heaters *(Continued)*

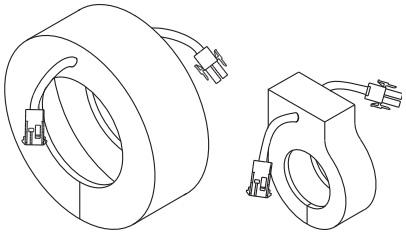
Reducers



Tube I.D. 2 to I.D. 1 in.		(mm)	Length "L" in.	(mm)	Watts	Amperes @120V	Amperes @208V	Base Code Number*
2 (51)	to	1.5 (38)	1.38	(35.1)	12	0.10	0.06	**020062A**
3 (76)	to	2.0 (51)	2.42	(61.5)	24	0.20	0.12	**034090A**
4 (102)	to	2.0 (51)	2.63	(66.8)	31	0.26	0.15	**044103A**
4 (102)	to	3.0 (76)	2.60	(66.0)	36	0.30	0.18	**040121A**

Flange Heaters

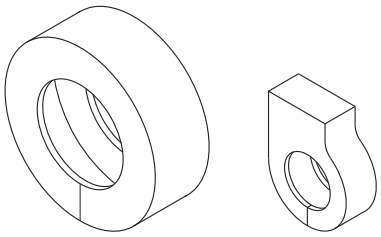
- 0.25 in. (6 mm) or 0.5 in. (13 mm) silicone rubber sponge insulation available
- For both KF screw flanges and ISO clamp flanges



Tube O.D. in.	Nominal Tube O.D. in.	(mm)	Watts @120V	Amperes @120V	Amperes @ 208V	Base Code Number*
KF-40	1.5	(38)	10	0.09	NA	**035040A**
KF-50	2.0	(51)	15	0.13	0.07	**045050A**
ISO-80	3.0	(76)	70	0.59	0.34	**020176A**
ISO-100	4.0	(102)	82	0.69	0.40	**020204A**
CF 2¾ in.	1.5	(38)	21	0.18	0.10	**016089A**

Flange Insulators

- 0.25 in. (6 mm) or 0.5 in. (13 mm) silicone rubber sponge insulation available
- For both KF screw flanges and ISO clamp flanges



Tube O.D. in.	Nominal Tube O.D. in.	(mm)	Base Code Number*
KF-40	1.50	(38)	**035040B**
KF-50	2.00	(51)	**045050B**
ISO-80	3.00	(76)	**020176B**
ISO-100	4.00	(102)	**020204B**
CF 1⅓ in.	0.75	(19)	**010044B**
CF 2¾ in.	1.50	(38)	**016089B**

*To complete the code number, please reference the *Build-a-Code* chart on page 454.

Line Heating

Modular Pump Line Heaters *(Continued)*

Ordering Information

To order, complete the code number to the right with the information below:

XXXXXXX__ -

Base Code Number

Heater Voltage
CO = Insulator
C1 = 120V
C4 = 208V

Insulation
A = 0.25 in. (6 mm) insulation w/UL®94-HB jacket
B = 0.5 in. (13 mm) insulation w/UL®94V-0 jacket
C = 0.25 in. (6 mm) insulation w/UL®94-HB jacket and ground grid
D = 0.5 in. (13 mm) insulation w/UL®94V-0 jacket and ground grid

Connectors
0 = None
A = AMP Universal MATE-N-LOK® connector
B = AMP CPC connector

Sensors
0 = None
A = Thermal fuse 378°F (192°C)
B = Type J thermocouple
C = Type K thermocouple
D = Thermal fuse + Type J thermocouple
E = Thermal fuse + Type K thermocouple

Future Options
O = None

Future Options
0 = None

Note: Not all options are available for every base code number.

Description	CE	SEMI S2-93	UL® Listing	NEC	VDE
0.25 in. (6 mm) insulation w/HOT marking	x	x	x		x
0.5 in. (13 mm) insulation	o	o	o		o
Ground grid	o	o	o	x	o
AMP MATE-N-LOK® connectors ①	x	x	x		x
AMP CPC connectors ②	o	o	o		o
Jacket w/UL®94V-0 rating	o	o	o		o
Jacket w/UL®94-HB rating	x	x	x		x
Thermal cut-off	o	x	x		o

x = Min. requirements
o = Optional features

①Male plug: AMP p/n 1-480698-0, w/sockets AMP p/n 350689-1.
Female cap: AMP p/n 1-480699-0, w/pins AMP p/n 350690-1.

②Plug: AMP p/n 206060-1, w/socket AMP p/n 66101-3.
Receptacle: AMP p/n 206153-1, w/pin AMP p/n 66099-3, w/ground pin p/n 164164-2 if ground grid option is chosen.

Polyimide Heaters

Polyimide is a thin, lightweight organic polymer film which provides excellent tensile strength, tear resistance and dimensional stability. This heater is ideal for applications requiring low outgassing in a vacuum, or resistance to radiation, fungus and chemicals. Polyimide is also solvent resistant.

Performance Capabilities

- For operating environments as low as -319°F (-195°C), heater temperature as high as 392°F (200°C)
- Watt densities to 50 W/in^2 (7.75 W/cm^2)①

Features and Benefits

Excellent physical and electrical properties

- Results in thermal stability over a wide temperature range

Transparent polyimide material

- Allows inspection of internal details

Resistance of radiation and fungus

- Allows it to be used in a wide range of applications

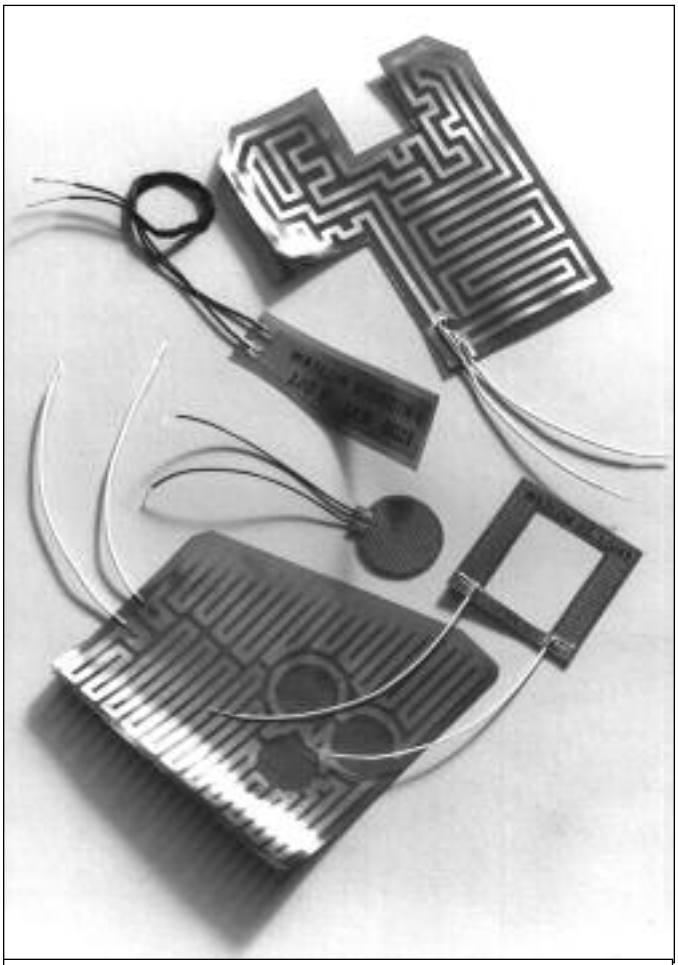
UR® and C-UR® recognitions

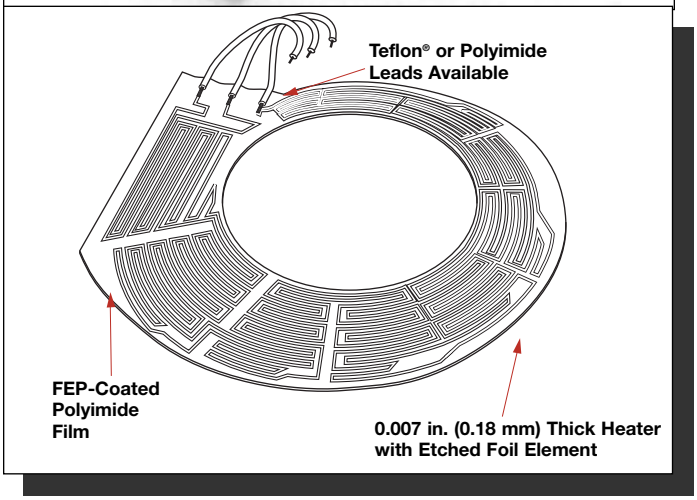
- Available on many custom designs

Applications

- Military/aerospace, where low outgassing properties are required
- Medical, where thorough cleaning or sterilization is needed
- Laboratory research
- Photographic equipment
- Optical equipment
- LCD displays
- Computer equipment

① Watt density limits are application dependent (operating temperatures, bonding method and heat sink).





Quick Ship

- *Same day shipment on stock units with orders received by 11:00 a.m. CST.*

Polyimide Heaters

Technical Data

Standard Specifications

Thickness
- 0.007 in. (0.2 mm)

Flexibility (min. radius)
- 1/32 in. (0.8 mm)

Weight
- 1.5 oz./ft² (0.05 g/cm²)

Operating temperature: ②
- Max.: 392°F (200°C)
- Min.: -319°F (-195°C)

Watt density rating on stock units
- 5 W/in² (0.8W/cm²)

Dielectric strength
- Min. V~(ac): 1000

Flammability rating
- Self-extinguishing

Heater size limitations
- 20 x 26 in. (508 mm x 660 mm)

Weight loss (outgassing):
- 0.51%

Standard lead length
- 12 in. (305 mm) Teflon® E

② We recommend maximum **part** temperature at 300°F (150°C).

Options

Standard lead length, 12 in. (305 mm) "E" Teflon®

Width in.	Width (mm)	Length in.	Length (mm)	Watts	Avail.	28 Volt Code Number	120 Volt Code Number
0.5	(13)	2	(51)	5	Stock	**K005020C5-0009B**	
1	(25)	1	(25)	5	Stock	**K010010C5-0009B**	
		3	(76)	15	Stock	**K010030C5-0009B**	
		5	(127)	25	Stock		**K010050C3-0009B**
		15	(381)	75	Stock		**K010150C3-0009B**
2	(51)	10	(254)	100	Stock		**K020100C3-0009B**
3	(76)	5	(127)	75	Stock		**K030050C3-0009B**
4	(102)	4	(102)	80	Stock		**K040040C3-0009B**
5	(127)	5	(127)	125	Stock		**K050050C3-0009B**

Stock
- Pressure Sensitive Adhesive Surface (PSAS)

Made-to-Order
- PSAS
- Factory bonding
- Holes, cutouts, notches
- Special leads

How to Order
Determine width, length, volts and watts. Specify the code number and quantity if the heater is listed in the stock list above. To specify PSAS add **A** to code number. For **made-to-order** heaters, please provide the following:
- Quantity
- Size (dimensions)
- Voltage
- Wattage/watt density
- Operating temperature
- Options, such as holes, PSAS.
- Will heater be subject to flexing?

Availability
Stock: Same day shipment of orders received by 11:00 a.m. CST.

Made-to-Order: Contact your Watlow representative.

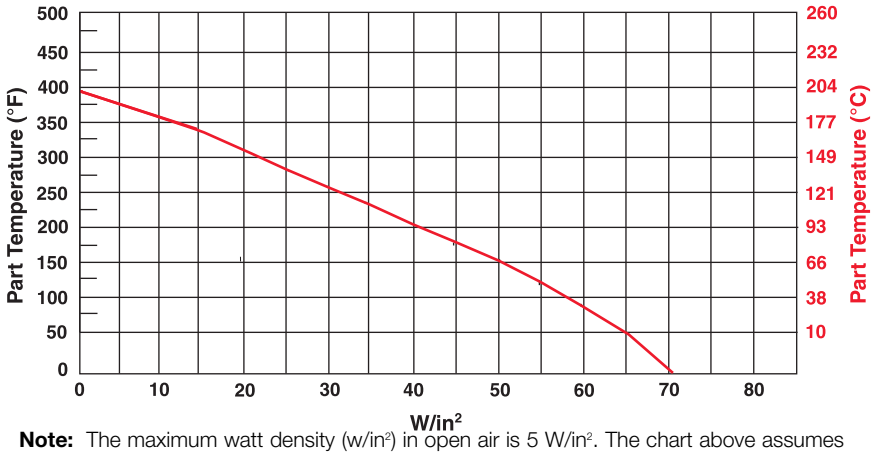
Polyimide Heaters

Options *(Continued)*

Maximum Allowable Watt Density Versus Temperature

To achieve the optimum performance with your Watlow polyimide sample heater, a proper watt density must be used on the surface of the heater.

This graph illustrates recommended watt densities for given operating temperatures with the process being controlled with a temperature controller. It does not indicate the watt density necessary to achieve a given part temperature.



Note: The maximum watt density (w/in²) in open air is 5 W/in². The chart above assumes bonding the polyimide heater to a part.

Polyimide Heaters

Special Product Offering

Code Number	Size in.	Size (mm)	Circuit	Resistance	Max. Voltage	Watts @ Max. Voltage
K05711980-A	½ x 2⅛	(13 x 54)	A	40	12	4
K05711980-B	1 x 2⅛	(25 x 54)	B	90	48	26
K05711980-C	1½ x 2⅛	(38 x 54)	C	145	75	39
K05711980-D	2 x 2⅛	(51 x 54)	D	205	105	54
K05711980-E	½ x 3⅝	(13 x 34.9)	E	80	48	29
K05711980-F	1 x 3⅝	(25 x 92.1)	F	165	90	49
K05711980-G	1½ x 3⅝	(38 x 92.1)	G	275	120	52
K05711980-H	2 x 3⅝	(51 x 92.1)	H	375	120	38
K05711980-I	½ x 5¾	(13 x 146)	I	130	60	28
K05711980-J	1 x 5¾	(25 x 146)	J	255	120	56
K05711980-K	1 x 1⅛	(25 x 28.6)	K	28	12	5
K05711980-L	½ x 1⅛	(13 x 28.6)	L	13	6	3
K05711980-M	1 in O.D.	(25)	M	32	12	5
K05711980-N	2 in O.D.	(51)	N	180	105	61
K05711980-O	4 in O.D.	(102)	O	185	120	78
K05711980-P	1 x 1⅜	(25 x 34.9)	P	45	24	13

Notes:

- To order individual heater circuits from the polyimide kit, see the matrix above.
- Leads shipped loose not soldered.

Example: To order the J heater circuit with PSAS use K05711980A-J.

To order the J heater circuit with PSAS and leads use K05711980AL-J.

Polyimide Handy Heater Kit—For Quick Heating Solutions

Watlow offers a convenient way to use polyimide heaters. The handy heater kit consists of 16 polyimide heaters—13 rectangular and three circular—in different sizes and resistances. So when you need a small flexible heater in a hurry, you can pick the one that fits your application.

Other Features

- The heater sheet can be ordered with or without Pressure Sensitive Adhesive (PSAS), depending on your needs. To specify PSAS add **A** to code number.
- The kit comes with instructions for wiring, lead attachment and selection and installation. Pre-tinned solder pads are provided for easy lead connections.
- The instructions also show you how to dial in your desired wattage using a variable voltage transformer.
- The heaters can be wired individually, in series, or parallel for hundreds of variations to satisfy your special application.

Availability

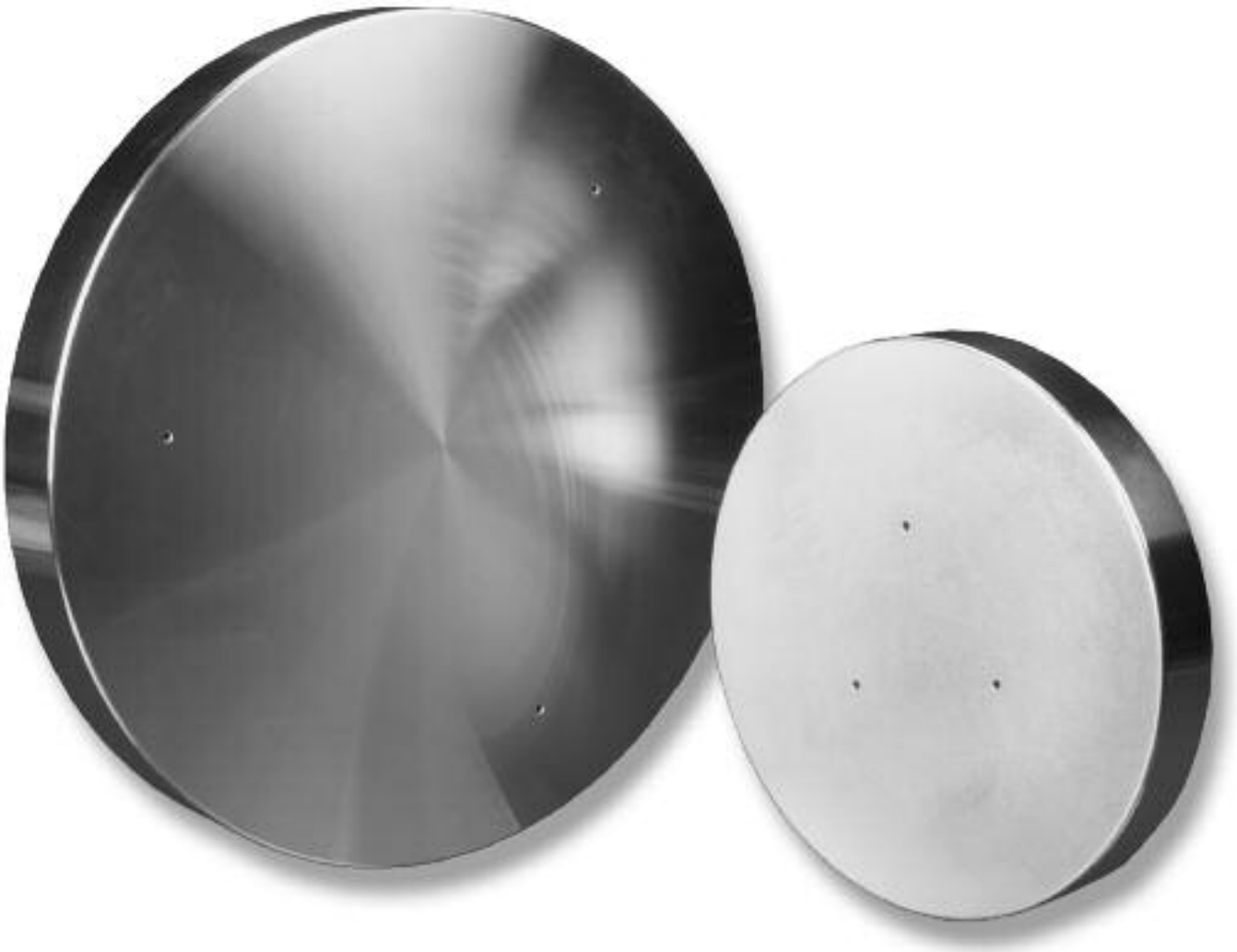
Stock: Same day shipment of orders received by 11:00 a.m. CST.

Cast-In Heaters

Cast-In Heaters

Heated Part Capabilities **461**
The Heated Part Concept 461

Standard Aluminum Platen Heaters **464**
Standard 200 and 300 Platen Heaters 464



Cast-In Heaters

Heated Part Capabilities

The Heated Part Concept

The heated part concept from Watlow® can help simplify many complex heating problems.

The heated part is much more than a heater, it is a functional component of equipment that can be designed in the exact shape and size needed.

Utilizing Watlow's heated part can alleviate time-consuming tasks such as purchasing, assembly or machining of parts. Customers can concentrate on meeting the other manufacturing challenges.

The heated part consists of a formed cable or tubular heater cast into aluminum. The part is then customized to meet specific application needs including machining, termination, coatings and assembly.

Watlow offers heated parts in a variety of materials, such as stainless steel for higher temperature applications or for those where cast aluminum cannot be used.

From state-of-the-art CNC machines to the high tech research lab, Watlow invested in the technology necessary to develop high quality custom heat solutions.

Watlow's heated parts are manufactured by Watlow's ISO 9001 registered facility in Batavia, Illinois.

Performance Capabilities

- Operating temperatures: up to 752°F (400°C) with 319 or 356 aluminum
- Operating temperatures: up to 842°F (450°C) with 99.7 pure aluminum alloy 170.1
- Operating temperatures: up to 1202°F (650°C) with non aluminum designs

Features and Benefits

Watlow's complete foundry capabilities

- Ensures precise and uniform placement of the element in the casting

UL® component recognition

- Exclusively available from Watlow

ISO 9001 registered

- Assures quality management control from product design through production and servicing

Patented pressure-casting system

- Produces castings with low porosity for better heat transfer
- Minimizes internal voids and defects by precisely controlling molten metal temperature and feed rate



Optional cast-in tubing

- Provides faster cooling or can be used to heat liquids or gasses that run through it, functioning as a circulation heater

High thermal conductivity of aluminum

- Provides extremely uniform surface temperatures to avoid damaging hot or cold spots when operating the heaters.

Reusable molds

- Provide excellent part-to-part uniformity and are economical through production and servicing.

Heated Part Capabilities

The Heated Part Concept

Applications and Technical Data

Capabilities Include:

- 3-D CAD/CAM design
- CNC equipment for precision machining and repeatable results from one order to the next
- Metallurgical expertise in foundry practice as well as machining technology
- Coordinate Measuring Machines (CMM) for in-process and final inspection with printed reports
- Assembly and termination options
- Services such as Finite Element Analysis (FEA)
- Special coatings including Teflon®, anodizing and electroless nickel plating
- X-ray techniques to check castings for quality and proper heater location
- Additional treatment of the heated part such as chemical cleaning, and packaging for cleanroom acceptance
- Specially-designed packaging

R & D Efforts

To remain at the forefront of technological advancements in the industry, Watlow's heated part facility features a full lab in which extensive product and process research is conducted.

On-going laboratory tests at the heated part facility include

- Temperature uniformity
- Heating and cooling ramp rates
- Structural characteristics
- Coating performance

Watlow has created heated parts for a variety of industries including

- Semiconductor
- Medical
- Foodservice

Properties and Characteristics of Aluminum Alloys

Alloy Number	Thermal Properties				Mechanical Properties			
	Solidus Temperature		Thermal Conductivity		Tensile		Yield	
	°C	(°F)	W/m-K	(BTU/ft*h*°F)	MPa	(ksi)	MPa	(ksi)
Casting Alloys								
319.0	515	(960)	109	(63)	235	(34)	130	(19)
356.0	555	(1035)	159	(92)	207	(30)	165	(24)
170.1	646	(1195)	234	(135)	76	(11)	28	(4)
Wrought Alloys								
1100	643	(1190)	222	(128.0)	90	(13)	34	(5)
5052	607	(1125)	91	(110.0)	193	(28)	90	(13)
5086	585	(1085)	127	(73.4)	60	(38)	115	(17)
6061	582	(1080)	180	(104.0)	310	(45)	276	(40)

Heated Part Capabilities

The Heated Part Concept

Applications and Technical Data *(Continued)*

Chemical Compositions Comparisons of Common Aluminum Alloys
(Maximum Limits)

AA#	Si	Fe	Cu	Mn	Mg	Cr	Ni	Zn	Sn	Ti	Other	% Al
Casting Alloys												
319	6.50	1.00	4.00	0.50	0.01	-	0.35	1.00	-	0.25	0.50	85.9
356	7.50	0.60	0.25	0.35	0.45	-	-	0.35	-	0.25	0.15	90.1
170.1	0.05	0.09	0.07	-	0.01	-	-	-	-	0.03	0.10	99.7
Wrought Alloys												
1100	1.00	-	0.05/0.20	0.05	-	-	-	0.10	-	-	0.15	99.0
5052	0.25	0.40	0.10	0.10	2.2/2.8	0.15/0.35	-	0.10	-	-	0.15	96.2
5086	0.40	0.50	-	0.2/0.7	3.5/4.5	-	-	0.25	-	0.15	0.15	94.1
6061	0.4/0.8	0.70	0.15/0.4	0.15	0.8/1.2	0.04/0.35	-	0.25	-	0.15	0.15	96.5

How to Order

All cast-in heaters are **made-to-order**. Please have the following information available when placing an order or requesting a quote:

- Wattage: (see either the WATROD tubular section, page 73 or cable heater section, page 579, for engineering information)
- Voltage: Maximum is 600V~(ac)
- Part design: Provide drawings with all dimensions and critical tolerances
- Heater exit locations
- Electrical termination details
- Quantity

Availability

Contact your Watlow representative for design and manufacturing time required.

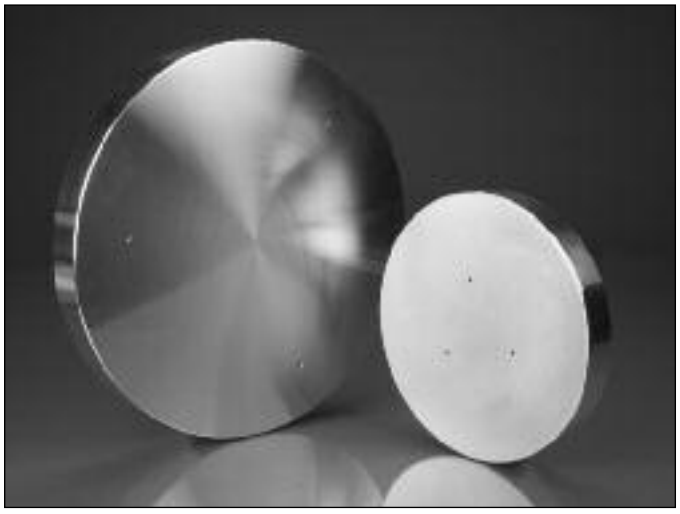
Standard Aluminum Platen Heaters

Standard 200 and 300 mm Platen Heaters

Watlow has 200 and 300 mm aluminum platen heaters in stock to quickly solve wafer fabrication needs. Customers can save thousands of dollars with off-the-shelf designs since there are no additional costs for engineering, tooling or casting mold creation.

Watlow's platen heater design is ideal for prototype machine trials or engineering experiments as well as temporary repairs until custom heaters can be manufactured. Watlow's platen heaters provide a complete turnkey solution and are available in anodized finish, or in bare machined aluminum 356 with optional add-on features.

The stock anodized cast aluminum platen heaters are complete, ready to install parts and are available for shipment within one business day.



Features and Benefits

Delivery from Stock

- WR200-2A and WR300-2A ship within one business day to reduce down time
- Assures a cost effective option for 200 and 300 mm wafer processing

World class performance

- Cast-in reliability assures long product life
- Operating temperatures up to 752°F (400°C) for a wide range of process applications
- Surface temperature uniformity of ±0.3% of set point assures wafer processing accuracy

Applications

- Semiconductor processing
- Semiconductor research and development

Standard Aluminum Platen Heaters

Standard 200 and 300 mm Platen Heaters

Specifications—Model WR200-2A (Anodized) and Model WR200-2B (Bare)

- Diameter: 9 in. (229 mm)
- Thickness: 1.25 in. (32 mm)
- (3X) Lift Pin Holes diameter 0.125 in. (3.2 mm) equally spaced 120° on 3.25 in. (83 mm) perfect circle diameter
- (1X) Thermocouple hole diameter 0.066 in. (1.7 mm) with 1/16 NPT tap for fitting
- "Cast-in" cable heater rated 1681 W at 208V (or 2241 W when operated at 240V)

WR200-2A SERIES Platen With Hardcoat Anodize Finish

- Reference drawing below
- Rating: Typical 208V, 1681 W, max. 240V, 2241 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 6-8 weeks

Item	Code Number
No thermocouple included	**WR200-2A**
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	**WR200-3A**
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	**WR200-4A**
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	**WR200-5A**
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	**WR200-6A**

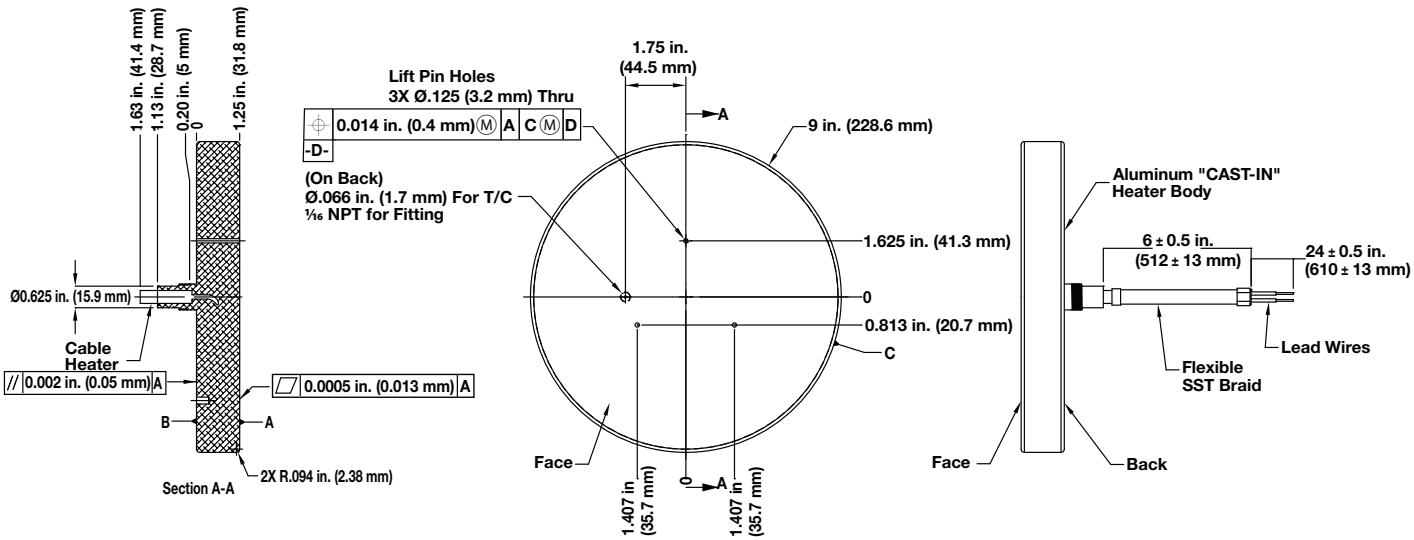
WR200-2B SERIES Platen With Bare Machined Aluminum Finish

- Reference drawing below, except no hardcoat anodize will be provided
- Rating: Typical 208V, 1681 W, max. 240V, 2241 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 4-6 weeks

Item	Code Number
No thermocouple included	**WR200-2B**
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	**WR200-3B**
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	**WR200-4B**
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	**WR200-5B**
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	**WR200-6B**

Dimensional Drawing

200 mm Standard Aluminum Platen Heater



Standard Aluminum Platen Heaters

Standard 200 and 300 mm Platen Heaters

Specifications—Model WR300-2A (Anodized) and Model WR300-2B (Bare)

- Diameter: 13.78 in. (350 mm)
- Thickness: 1.575 in. (40 mm)
- (3X) Lift Pin Holes diameter 0.125 in. (3.2 mm) equally spaced 120° on 10 in. (254 mm) perfect circle diameter
- (1X) Thermocouple hole diameter 0.128 in. (3.3 mm) with ⅛ NPT tap for fitting
- "Cast-in" cable heater rated 3350 W at 208V

WR300-2A SERIES Platen With Hardcoat Anodize Finish

- Reference drawing below
- Rating: Typical 208V, 3350 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 6-8 weeks

Item	Code Number
No thermocouple included	**WR300-2A**
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	**WR300-3A**
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	**WR300-4A**
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	**WR300-5A**
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	**WR300-6A**

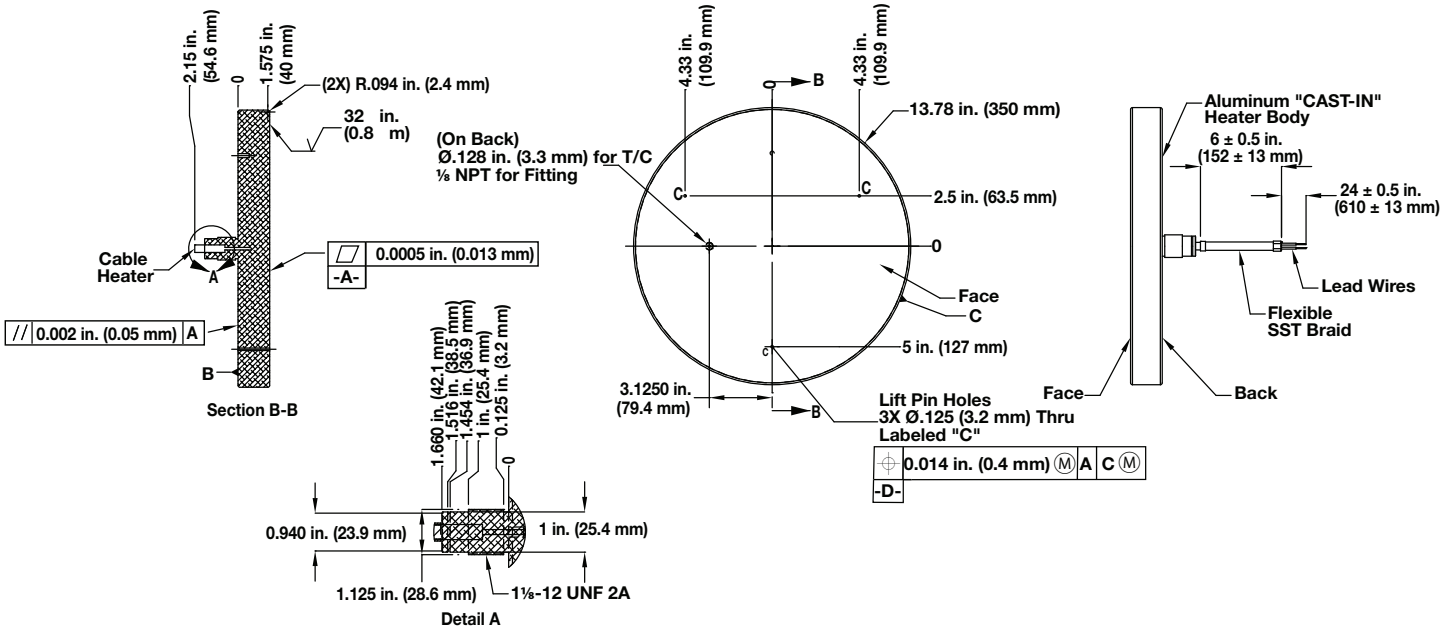
WR300-2B SERIES Platen With Bare Machined Aluminum Finish

- Reference drawing below, except no hardcoat anodize will be provided
- Rating: Typical 208V, 3350 W
- Part is ultrasonic washed followed by IPA wipe down prior to packaging
- Delivery 4-6 weeks

Item	Code Number
No thermocouple included	**WR300-2B**
RAPID SHIP thermocouple, Type K, 6 in. (152 mm) sheath + fitting	**WR300-3B**
RAPID SHIP thermocouple, Type J, 6 in. (152 mm) sheath + fitting	**WR300-4B**
RAPID SHIP thermocouple, Type K, 12 in. (305 mm) sheath + fitting	**WR300-5B**
RAPID SHIP thermocouple, Type J, 12 in. (305 mm) sheath + fitting	**WR300-6B**

Dimensional Drawing

300 mm Standard Aluminum Platen Heater



High-Temperature/High-Performance Heaters



High-Temperature/ High-Performance Heaters

ULTRAMIC® Advanced Ceramic Heaters.....469

MULTICELL Heaters.....473

High-Temperature Tubular Heaters.....475

Ceramic Fiber Heaters.....477

Mineral Insulated Band Heaters.....501

ULTRAMIC® Advanced Ceramic Heaters



The ULTRAMIC® heaters from Watlow® are designed for thermal applications where the high performance of an advanced ceramic heater is required to ensure optimal effectiveness of the equipment and process.

ULTRAMIC heaters are constructed of aluminum nitride (AIN) and incorporate a thermally matched proprietary heating element that provides maximum performance in challenging applications. AIN is especially suitable for applications requiring a clean, non-contaminating heat source. Additionally, the excellent geometric stability ensures consistent part-to-part thermal contact during heating cycles.

Watlow AIN heaters can operate up to 400°C (752°F) [600°C (1112°F) under certain conditions] with an ultra-fast ramp rate of up to 150°C (302°F) per second depending on the application, heater design and process parameters. In addition to excellent thermal characteristics, the ULTRAMIC has high electrical isolation and typically provides superior chemical resistance as compared to traditional metal heaters.

Features and Benefits

Robust AIN ceramic

- Creates a homogeneous assembly for atmospheric and vacuum applications
- Provides durable heater construction and thermal transfer necessary for high temperature and long heater life
- Permits the design of a high watt density, fast responding heater in a very small package
- Ensures geometrically stability due to low coefficient of thermal expansion (CTE)
- Provides process temperatures up to 400°C (752°F) depending on application parameters (contact your Watlow representative for applications between 400 and 600°C)

Rapid prototyping with Finite Element Analysis (FEA)

- Provides rapid 'virtual prototyping' of heater performance prior to the manufacturing process
- Allows custom prototype delivery in weeks rather than months with innovative design and manufacturing practices

Superior electrical performance

- Low leakage current
- High breakdown voltage

High thermal conductivity

- Makes for an ultra-fast temperature ramp rate of up to 150°C (270°F) per second (depending on application parameters)
- Allows for quick cool-down
- Provides extremely uniform temperatures over the heater's surface

Type K thermocouple integrated into assembly

- Ensures reliability of heater/sensor interface
- Improves accuracy with optimized temperature sensing
- Provides high response rate in ramping applications

UL® and CE agency compliance

- Meets global safety standards
- Includes RoHS compliance

ULTRAMIC Advanced Ceramic Heaters

Technical Data

Mounting Guidelines

- Temperature <200°C (392°F): bond with high-temperature epoxy adhesive
- Temperature >200°C (392°F): screw hole can be provided on custom designs (recommend insulation buffer such as mica spacer)
- Clamp using single or multiple-point fasteners

Optional Thermocouple

- Bonded Type K thermocouple for <400°C (752°F)
- Drilled hole can be provided for installing an externally supplied sheathed thermocouple

Lead Wire and Terminations

- Power terminals exit locations - extended from side edge or top face
- Teflon® insulated silver-plated copper lead extension
- Lead extension length - standard length 305 mm (12 in.)
- Optional length of ceramic bends

Note: Standard terminal temperature is 400°C (752°F), Contact your Watlow representative for applications between 400 and 600°C.

Configurations and Dimensions

Maximum Dimensions 4032 mm² (6.25 in²)				
	Length	**Width**	**Thickness**	**Aspect Ratio**
Flat Square	Min: 10 mm (0.393 in) Max: 63.5 mm (2.5 in.)		Min: 2.5 mm (0.098 in.) Max: 5 mm (0.196 in.)	1
Rectangular	Max: 100 mm (3.94 in.)	Min: 8 mm (0.157 in.)	Min: 2.5 mm (0.098 in.) Max: 5 mm (0.196 in.)	<10
	Inside Diameter I.D.	**Outside Diameter O.D.**	**Thickness**	**Ring Wall Thickness**
Ring	Min: 0	Max: O.D. 75 mm (2.95 in.)	Min: 2.5 mm (0.098 in.) Max: 5 mm (0.196 in.)	Min wall thickness: 3 mm (0.118 in.)

Surface Finish				
Flatness	**Parallelism**	**Surface Roughness (Ra)**	**Straight Groove Custom Feature**	**Hole Size Round Diameter**
<0.05 mm (0.002 in.)	<0.05 mm (0.002 in.)	<1.5 µm	Depth: 0.20 - 0.5 mm (0.019 in.) Width: 0.75 - 2 mm (0.078 in.)	Min: 1 mm (0.039 in.) Max: Outer edge 3 mm (0.118 in.)

Electrical Properties	
Voltage	**TCR**
12 to 480V	0.0015/°C

ULTRAMIC Advanced Ceramic Heaters

Technical Data

Stock Product Ordering Information

Code Number	Size	Watts	W/cm²	(W/in²)	Voltage V~(ac)
Square ①					
CER-1-01-00002	25 mm x 25 mm x 2.5 mm (0.98 in. x 0.98 in. x 0.1 in.)	967	155.04	(1000)	240
CER-1-01-00006	50 mm x 50 mm x 2.5 mm (1.97 in. x 1.97 in. x 0.1 in.)	1938	77.52	(500)	240
CER-1-01-00093	25 mm x 25 mm x 2.5 mm (0.98 in. x 0.98 in. x 0.1 in.)	150	24.00	(150)	120
CER-1-01-00097	19 mm x 19 mm x 2.5 mm (0.75 in. x 0.75 in. x 0.1 in.)	200	16.00	(100)	120
Rectangular ①					
CER-1-01-00001	25 mm x 15 mm x 2.5 mm (0.98 in. x 0.6 in. x 0.1 in.)	580	155.04	(1000)	120
CER-1-01-00003	50 mm x 10 mm x 2.5 mm (1.97 in. x 0.39 in. x 0.1 in.)	582	116.28	(750)	120
CER-1-01-00004	50 mm x 10 mm x 2.5 mm (1.97 in. x 0.39 in. x 0.1 in.)	770	155.04	(1000)	240
CER-1-01-00005	50 mm x 25 mm x 2.5 mm (1.97 in. x 0.98 in. x 0.1 in.)	1453	116.28	(750)	240
CER-1-01-00007	75 mm x 25 mm x 2.5 mm (2.95 in. x 0.98 in. x 0.1 in.)	1455	77.52	(500)	240
CER-1-01-00098	25 mm x 15 mm x 2.5 mm (0.98 in. x 0.6 in. x 0.1 in.)	180	24.00	(150)	120
CER-1-01-00105	50 mm x 25 mm x 2.5 mm (1.97 in. x 0.98 in. x 0.1 in.)	100	8.00	(50)	120
Ring ②					
CER-1-02-00001	38 mm O.D./29 mm I.D. (1.50 in. O.D./1.14 in. I.D.)	733	155.04	(1000)	120
CER-1-02-00002	77.5 mm O.D./59 mm I.D. (3.05 in. O.D./2.32 in. I.D.)	770	38.76	(250)	240

① Leads exit short side
② Leads exit top face

Stock configurations include:
- Power lead wires with Teflon® insulation 305 mm (12 in.)
- Bonded Type K thermocouple with 305 mm (12 in.) Teflon® insulated lead extension
- Surface finish (Ra) <1.5 µm (60 µ-in.)

Note: Max. temperature for stock heaters is 400°C (752°F). Lead wires are rated to 205°C (401°F). If ceramic beads are required, please contact your Watlow representative for a quote.

How to Order

To order your stock ULTRAMIC heater, please specify a Watlow code number.

If our stock units do not meet your application needs, Watlow can rapidly manufacture the ULTRAMIC to your special requirements. For made-to-order units, please contact your Watlow representative.

Availability

Stock heaters are available for shipment in seven business days or less. While normally customized for the application, these products enable a development engineer to quickly and easily acquire a test sample to determine its suitability in an application.

Custom configurations involving grooves, holes, product size or surface finishes are routinely manufactured to meet the exact requirements of the design engineer. Delivery is dependent on complexity of order. Please contact your Watlow representative

MULTICELL Heaters

The advanced design of the MULTICELL insertion heater from Watlow® offers three major advantages: extreme process temperature capability, independent zone control for precise temperature uniformity and loose fit design for easy insertion and removal.

Features and Benefits

Multiple, independently controllable zones
- Allows process temperature uniformity not possible with any other single sheathed heater

Radiant design of heater
- Allows for loose insertion in boiling holes and piping holes
- Permits easy removal and replacement with minimal down time since it will not bind or seize in the hole

Oxidized sheath
- Provides high emissivity and improves the heater's performance as oxidation increases

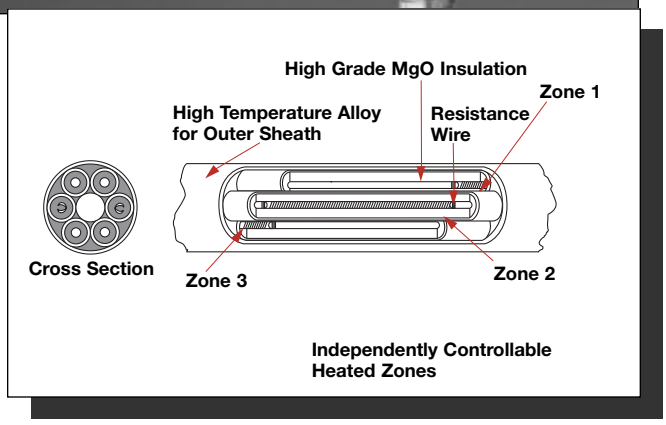
Individually metal-sheathed coils swaged into a larger, high temperature alloy other sheath
- Provides maximum protection against element burnout through the outer sheath

Quick disconnect plug and jack
- Permits fast replacement of individual elements while the press stays at operating temperature

Special bending capabilities
- Solves unusual machinery needs and keeps leads away from heated zones

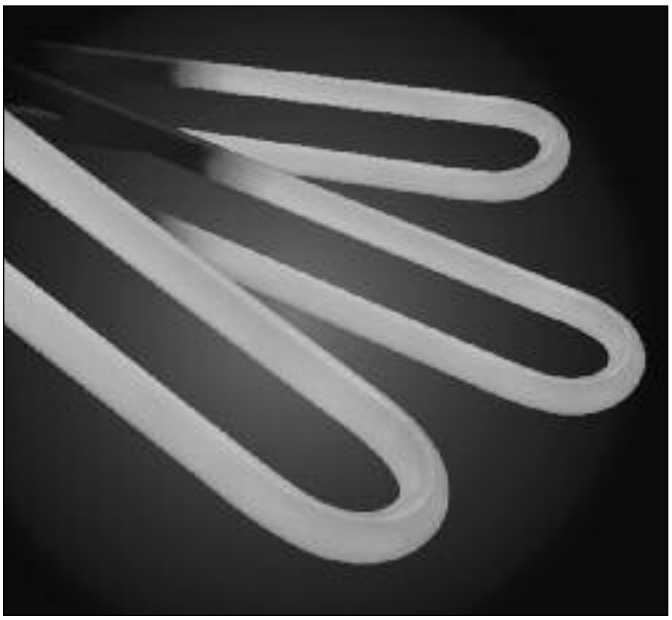
Flexible leads up to 986°F (530°C)
- Protects termination from high temperature environment





For detailed product and ordering information see the full MULTICELL product section located on pages 65 through 70.

High-Temperature Tubular Heaters



Watlow® manufactures high temperature tubular heaters to bridge the gap between standard tubular heaters and Watlow MULTICELL heaters. This tubular is well suited for process air heating applications in excess of 1300˚F (704˚C), resulting in a maximum sheath temperature of 1800˚F (983˚C). Controlled lab testing between the new design and current tubular designs show an increase in life of approximately 50 percent.

The high temperature tubular consists of an engineered tubing with an outer sheath of Inconel® 600 and a special internal construction. The outer sheath offers high temperature capabilities, reduced oxidation, as well as corrosion resistance.

The tubular offering is available in 0.430 and 0.375 inch diameters that are configurable either as formed tubulars or process heaters. The heaters can also be welded to flanges and plates for mounting purposes. Maximum sheath length available is 275 inches for the 0.430 inch and 0.375 inch diameters. The factory should be contacted for longer sheath lengths.

Features and Benefits

Inconel® 600 sheath material and a special internal construction

- Assures high temperature performance and corrosion protection in tough applications

0.375 and 0.430 inch diameters

- Allows heater to be configured to existing tubular designs that may be experiencing short life

Dual-ended termination

- Can be installed into flanges and screw plugs similarly to standard product configurations

Bendable in standard formations

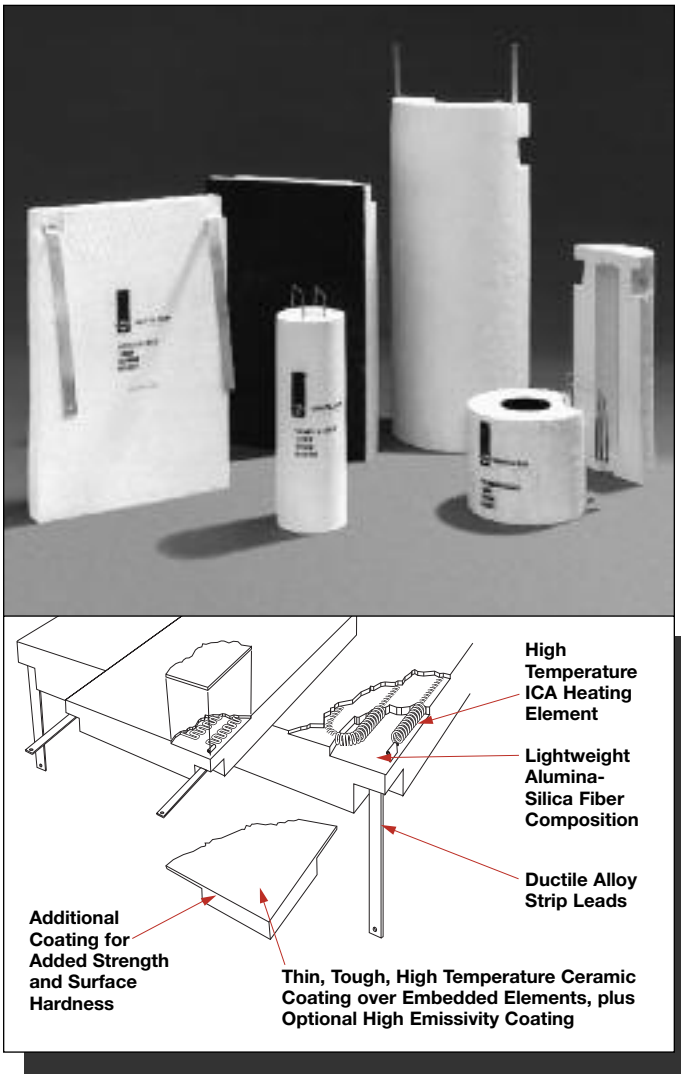
- Makes the heater easy to apply in a wide variety of applications

For detailed product and ordering information see the full High-Temperature product section located on pages 93 through 94.

Ceramic Fiber Heaters

Ceramic fiber heaters offer some of the highest temperature heating element capabilities in the Watlow® family of heaters. Ceramic fiber heaters are made by integrating an iron-chrome-aluminum (ICA) heating element and ceramic fiber insulation for heated insulation. Ceramic fiber is an insulation made of an alumina-silica composition, held together by an inorganic binder. It is commonly used as a refractory material.

Heating units constructed of ceramic fiber insulation isolate the heating chamber from the outside. Ceramic fiber heaters are extremely low mass, high insulation value units with self-supported heating elements. Many applications can benefit from the convenience of the heating element and insulation combined into one package. Its lightweight, low-density properties make it ideally suited for high temperature applications requiring low thermal mass.



Performance Capabilities

- Operating temperatures up to 2200°F (1204°C)
- Watt densities from 5 to 30 W/in^2 (0.8 to 4.6 W/cm^2)
- Uses “radiant” heat transfer exclusively

Features and Benefits

High temperature ICA resistance elements

- Bounds integrally into required position
- Allows five element configurations

Lightweight, low-density alumina-silica composition molded into shape

- Acts as an insulation to isolate the heating chamber from the outside
- Provides low shrinkage fiber and inorganic binder
- Assures a firm, thermal shock resistant, self-supporting unit at all operating temperatures

Operating temperatures up to 2200°F (1204°C)

- Provides high temperature performance not possible with many other heater types (See page 480 for detailed limits)

Low mass ceramic fiber insulation of 10 to 15 lb/ft^3 (160 to 240 kg/m^3)

- Allows the heater to reach process temperature quickly
- Allows the energy to heat the load instead of wasting energy on itself

Works directly off common power line voltages

- Eliminates the need for expensive transformers or complex power control systems
- Allows compatibility with the full range of Watlow temperature controllers and power switching devices

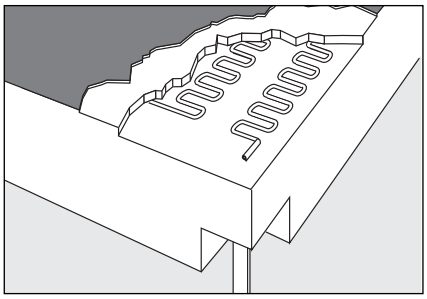
Quick Ship

- *Same or next day shipment on stock units. Limited number of shelf stock units. Standard units are non-stock.*

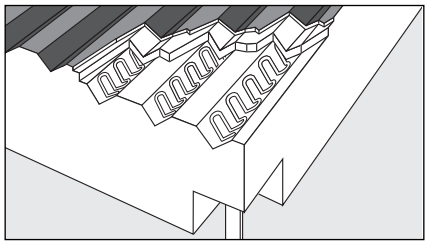
Ceramic Fiber Heaters

Options

Embedded Sinuated Elements



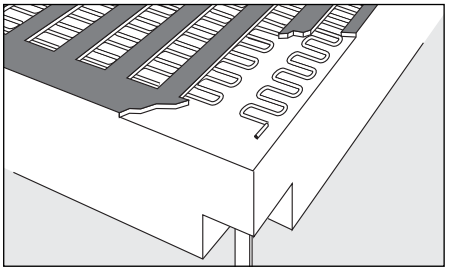
Flat Sinuated



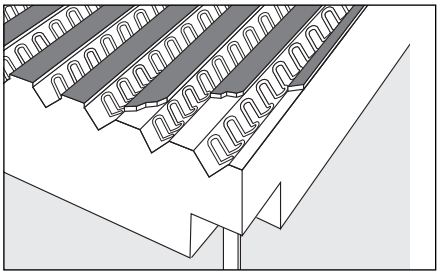
V-Sinuated

- Available in either flat or V-sinuated element configurations
- Advanced V-sinuated element configuration allows up to 27 percent additional watt density over embedded flat sinuated elements
- Performs best at medium to high temperatures at medium watt density power requirements
- Use in partially enclosed to fully enclosed applications
- Especially well suited for large, flat units; semi-cylindrical units above 5 in. (125 mm) I.D.; and full cylinders above 4 in. (100 mm) I.D.
- Offers greater effective insulation thickness than coiled element designs
- Enhances “heated insulation” concept of operational use
- Features high emissivity coating on new high watt density series units. When ordering, refer to charts on pages 496 to 498.

Exposed Sinuated Elements



Flat Sinuated



V-Sinuated

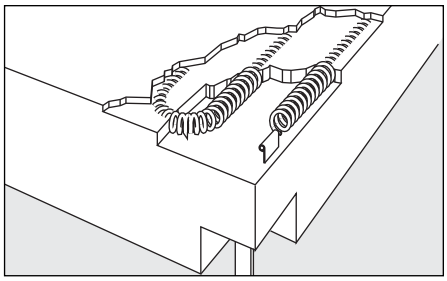
- Available in either flat or V-sinuated element configurations
- Advanced V-sinuated element configuration allows up to 20 percent additional watt density over that of exposed flat sinuated elements
- Offers the lowest possible wire-to-chamber temperature difference for maximum heater life
- Provides the optimum heat-up/cool-down and recovery times as well as maximum efficiency of operation
- Higher current handling capabilities possible
- Minimizes the number of circuits and connections in large furnaces
- Especially well suited for large, flat surface area units and large I.D. curved unit
- Exposed elements are available on special order as a variation of the embedded sinuated element normally provided on stock and standard units. When ordering, refer to charts on pages 496 to 498.

Ceramic Fiber Heaters

Application Hints

Applications

- High temperature furnaces
- Metal melting, holding and transfer
- Semiconductor processing
- Glass, ceramic and wire processing
- Analytical instrumentation
- Fluidized beds
- Laboratory and R&D
- Other high temperature process applications



Embedded Coil Elements

- Optimum performance for high temperature, enclosed furnace chambers
- Coiled elements readily conform to complex curved surfaces, especially small custom chamber shapes
- Coiled element design works best in higher voltage, lower current situations
- Use where lower watt density requirements and low duty cycle operations are expected
- Available in stock and standard units of medium watt density, rated up to 2000°F (1093°C). When ordering, refer to charts on pages 492 to 495.



- Never use ceramic fiber heaters for conduction heating applications. These heaters are designed for **radiant heat transfer only**.
- Use appropriate mounting methods such as pins, washers, clamping straps, overlapping edge clamps, interlocking edges, etc. Generally, these methods are better than cementing ceramic fiber heaters, because cementing will not accommodate the expansion and contraction caused by thermal cycling of the surrounding metal structures.
- Keep furnace loads free of oils, lubricants and other contaminants that can vaporize at high temperatures. Ceramic fiber heaters have a porosity exceeding 90 percent and cannot be sealed against contamination infiltration and possible damage to the heating element wire.
- Use low mass thermocouples that are responsive to rapidly changing radiant energy transfer conditions. Without proper temperature control, ceramic fiber heaters can generate sufficient heat for self destruction.
- Mount thermocouple junction directly above an element and within 1/16 in. (1.6 mm) of the heated surface. Embedded ceramic mounting tubes are available as an option to position 0.125 in. (3.2 mm) diameter thermocouples inside the fiber, directly behind and between the elements. Heater wire operating temperatures are the critical factor, and should be monitored at the hottest point within the application.
- Electrical connections made in heated portions of the application must be rated for the appropriate currents and anticipate ambient temperatures. To ensure good electrical connections, use compression-type connection devices located as far away from the hottest area of the application. This minimizes the possibility of electrical connection degradation caused by thermal expansion and contraction and high temperature oxidation.
- Ceramic fiber products shrink at high temperatures. During the first 24 hours of operation at temperatures between 1600 and 2200°F (870 to 1204°C) shrinkage of up to 4 percent can occur. Fill all gaps between units created by shrinkage with loose ceramic fiber insulation. Watlow offers a “pre-firing” process that pre-shrinks and dimensionally stabilizes units before shipping. Contact your Watlow representative for further details.
- Use additional back-up insulation for maximum energy efficiency and appropriate safety considerations. Use only insulation with inorganic fibers and binders to avoid corrosive fumes that could damage heater elements.
- Handle all units and leads with care. Ceramic fiber heaters are very resistant to thermal cycling and thermal shock, but are easily subjected to mechanical damage from careless handling.
- Repair of minor mechanical damage, made with unapproved or unknown cements, could cause damage to the wire elements at high temperatures. If unsure, contact your Watlow representative before making any repairs. Several accessory items are available from the factory for repair purposes.

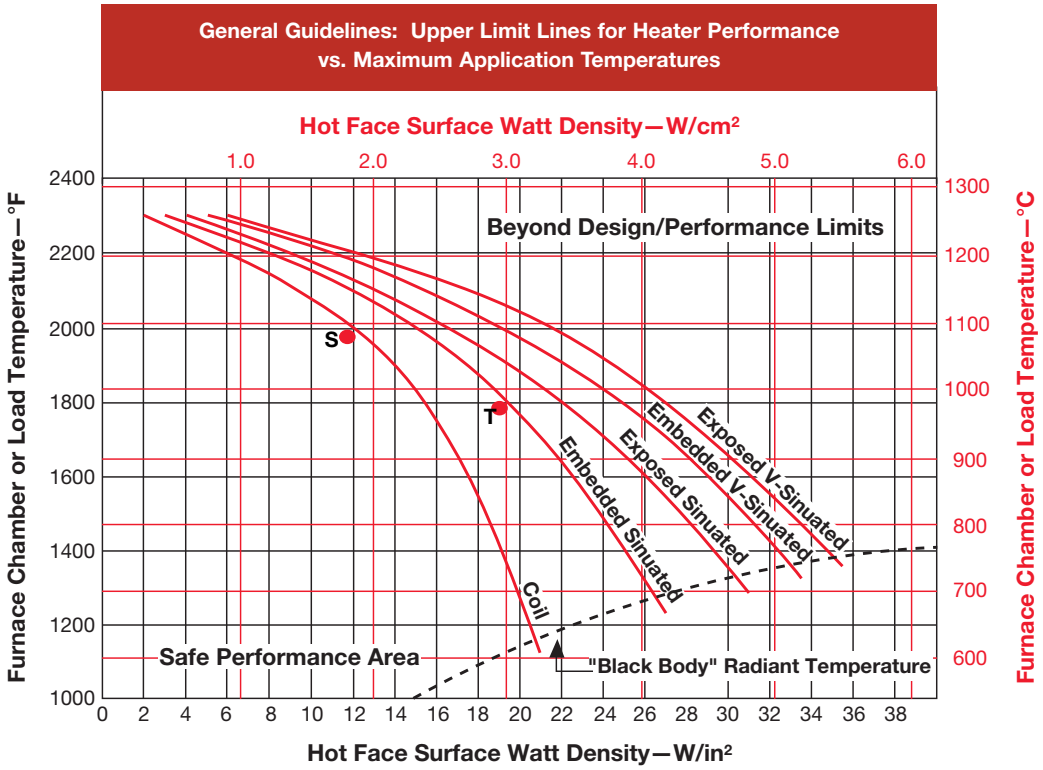
Ceramic Fiber Heaters

Performance Data

Performance Capabilities

The following *Performance* graph represents the capabilities of the five heater element configurations. The curves compare upper temperature limits versus permissible design watt densities to achieve a standard heater life expectation of 2,000 hours.

As with all Watlow heaters, the major application concern deals with the heater's surface watt density as it relates to the application temperature, such as the furnace chamber temperature or the radiant surface temperature. When evaluating an application for temperature and watt density requirements, it should fall to the left of, and below, the performance limit lines. If the application falls into this area, then it is in the safe performance area. The further into this safe performance area, the greater will be the life expectations of that heater. If an application requires temperatures or watt densities that fall into the area to the right of, and above, the lines, then the application is beyond the heater's typical design or performance limits. Using a heater required to perform in this area of the graph may result in shorter life expectancy. For information specific to an application, contact your Watlow representative.



Ceramic Fiber Heaters

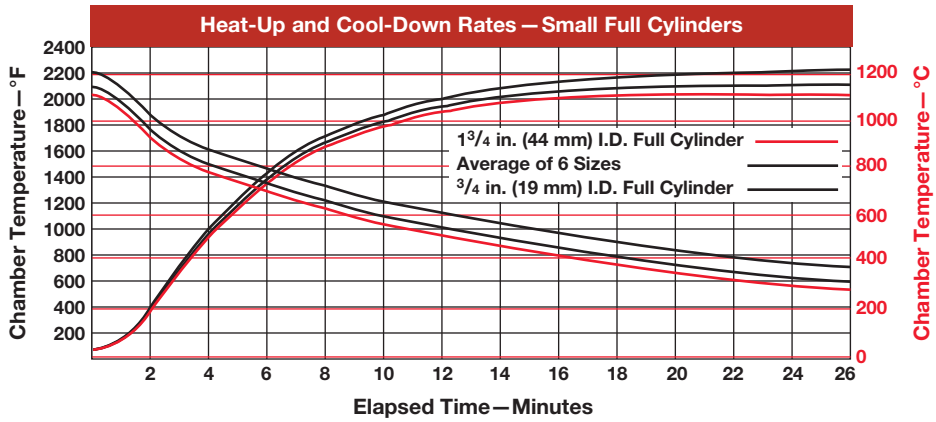
Performance Data *(Continued)*

The following graphs provide technical data to help evaluate the performance and select the correct ceramic fiber heater for an application.

These four graphs represent performance data for heat-up/cool-down rates and power requirements to maintain furnace temperature. This data is the average of test results performed for two of the most typical types of furnace chambers, and should not be used for specification purposes.

Small, Full Cylinder, Heated Chambers

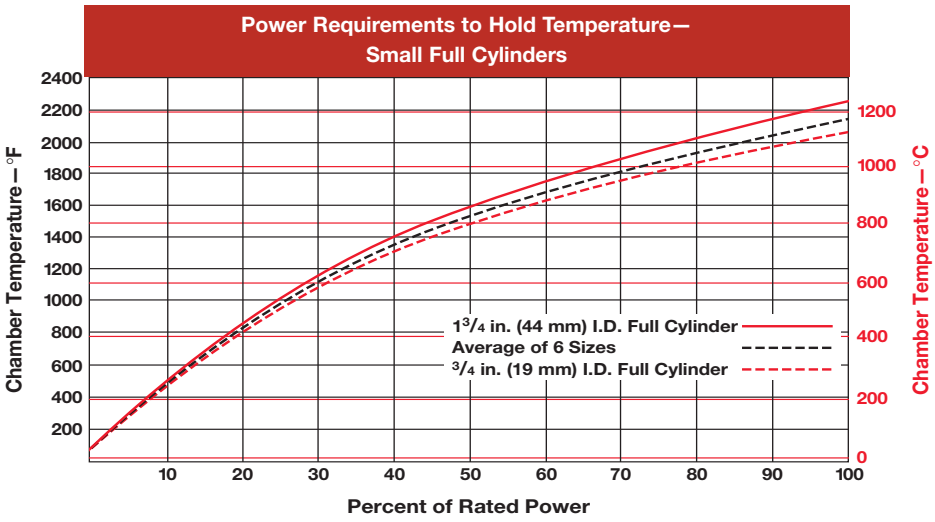
Test conditions for small, full cylinder heated chambers are typical of analytical instrumentation furnaces. Several stock sizes are represented. The units tested were 6 in. (150 mm) long, mounted in a vertical orientation. Both ends were capped with 1 in. (25 mm) of ceramic fiber insulation. No additional insulation or metal sheath was added to the outside diameter. The temperature was measured by a thermocouple located in the geometric center of the chamber.



Power Requirements

Below are the percentages of rated power needed to achieve and hold specific temperatures inside the full cylinder chambers tested.

Thus this represents the efficiency of these heaters in this mounting configuration.



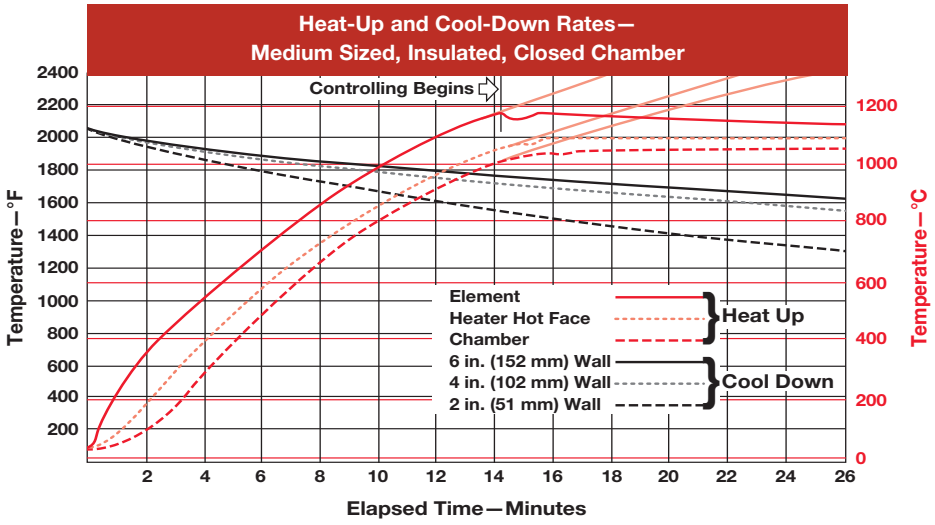
Ceramic Fiber Heaters

Performance Data *(Continued)*

Medium Sized, Insulated Closed Chambers

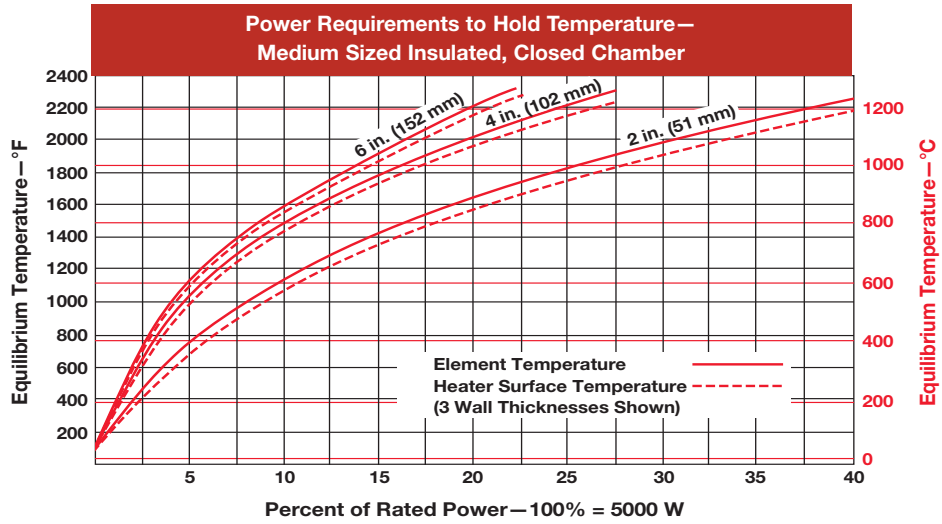
Test conditions for medium sized, insulated chambers are typical of pit and box furnaces, large tube furnaces and pipe and reactor heating. Standard embedded coil units (Watlow code number **VS412A12S**) were used, rated for 2000°F (1093°C). The test chamber size was 12 in. long and 12 in. I.D. (305 X 305 mm). The volume was approximately 0.75 ft^3 (0.02 m^3).

Temperature heat-up rates were measured by thermocouples in three places: at the element, on the heater surface and at the center-of-chamber. Data for various additional wall thicknesses is also shown. This is typical of how large flat and semi-cylindrical units would be used. The chamber was oriented vertically with top and bottom disks of ceramic fiber insulation equal to wall thickness.



Power Requirements

Below are the percentages of rated power needed to achieve and hold specific temperatures inside medium sized, insulated chambers. Thus this represents the efficiency of these heaters in this mounting configuration.

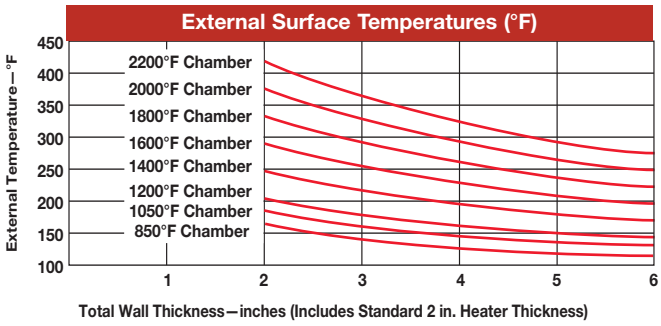


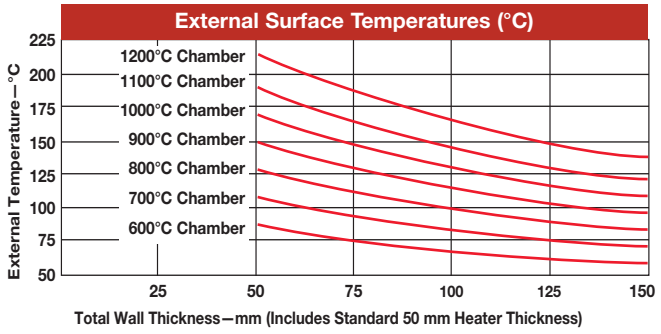
Ceramic Fiber Heaters

Performance Data *(Continued)*

Insulation Effectiveness

The graphs below demonstrate the effectiveness of adding 6 lb/ft³ (96 kg/m³) blanket insulation to the backside of standard 2 in. (50 mm) thick ceramic fiber heaters. Total wall thickness of up to 6 in. (152 mm) is shown. Data is for vertical sides, without metal sheathing. Top and bottom surfaces, and surfaces with metal sheaths over the ceramic fiber insulation will be different.

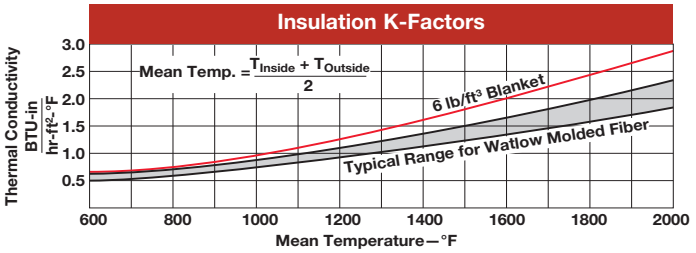


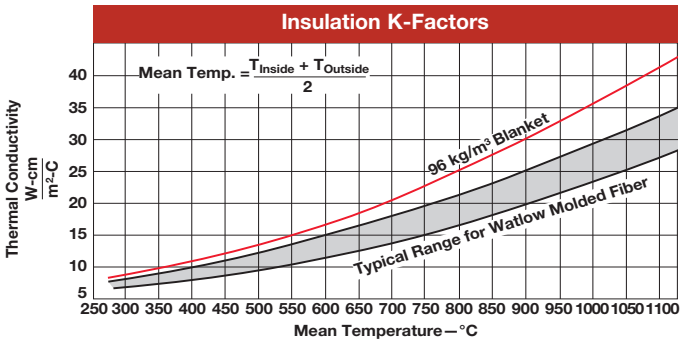


Heat Loss and Energy Transfer

For general calculations of heat loss and energy transfer, the *Insulation K-Factors* and *Emissivity* graphs are helpful.

The *K-Factors* graph is for ceramic fiber heaters and the ceramic fiber insulation blanket, which is typically used with the heaters. This blanket is offered as an accessory by Watlow.







Application Hints

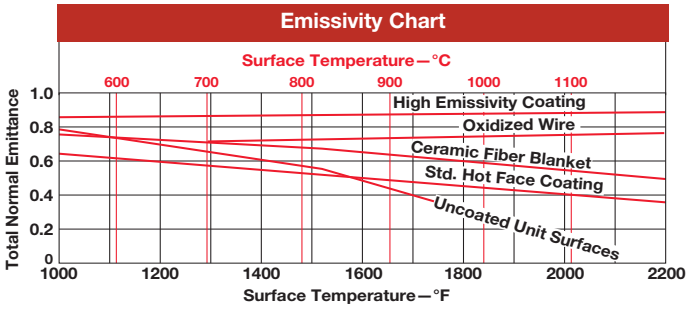
For wall thicknesses (T) in cylindrical situations use the "equivalent thickness" conversion.

$$T_{cyl.} = r_{out} \log_e \left(\frac{r_{out}}{r_{in}}\right)$$

Where r_{out} is outer radius
r_{in} is inner radius

Emissivity of Heater Surface

The *Emissivity* graph details the normalized emittance values for the four surfaces most likely to be encountered when planning Watlow ceramic fiber heater applications.



Ceramic Fiber Heaters

Termination Options

Watlow has many variations of electric leads to meet particular wiring requirements. To understand the termination options available, it's necessary to understand the different ways electrical leads can be applied.

Ceramic fiber heater electrical leads are welded to stubs – the metal parts that interface between the heating element wire and the add-on electrical leads. These stubs exit the heater at the lead pockets. Pockets are small cavities, below the cold face plane (outside surface) and generally located at or near the corners.

Watlow ceramic fiber heaters come with either strip leads or double twisted wire leads. Strip leads are the most commonly used, unless otherwise specified. The various lead styles refer to the lead's exit orientation, relative to the pocket used on a given type of heater. See illustrations for specific details.

Strip Leads

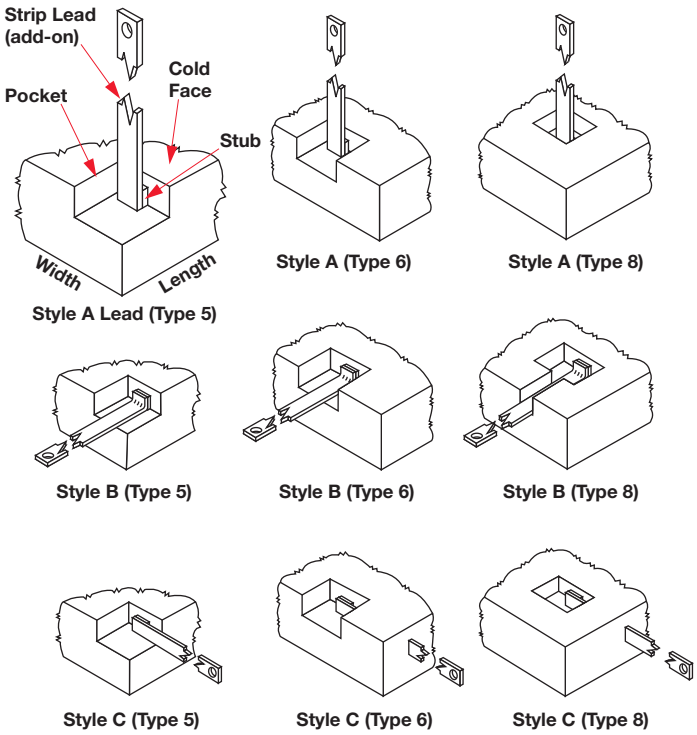
Flat and semi-cylindrical ceramic fiber heaters are available with the termination options shown here. When ordering termination options for stock units, the specific strip lead **Style** must be specified. To determine the desired style, refer to the following illustrations. Otherwise, **Style A** leads will be provided and the length will be 12 in. (305 mm). Additional lengths are possible using add-on leads which are priced per pair, per inch, for the three different widths. See ordering charts for which lead width is used on a specific heater.

Strip leads are shipped with a 13/64 in. (5 mm) hole at the end of the lead. Use #10-24 screws, nuts and washers, or other wiring connections. Caution should be exercised when making connections. Leads are susceptible to loosening due to thermal expansion and contraction as the heater cycles.

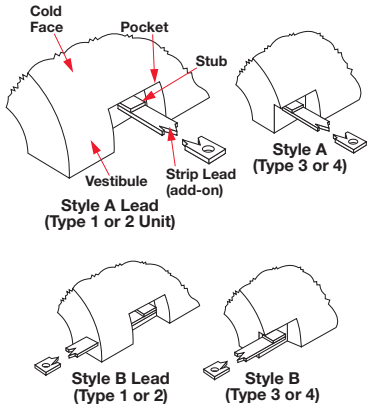
Important

Inspect the carton and its contents for damage prior to discarding packaging material. If there is any damage, contact your Watlow representative immediately for a Returned Material Authorization (RMA) number. All damaged goods are to be returned in the original packaging to reduce the possibility of further damage to the product.

Flat Units



Semi-Cylindrical Units



Ceramic Fiber Heaters

Termination Options *(Continued)*

Special Lead Orientation

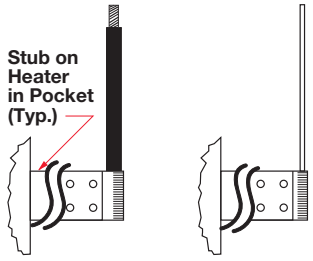
If the various standard strip lead orientations and pocket configurations are not suitable, special designs are possible. When ordering, please include drawings that show proposed locations.

Leads Bent 90 Degrees

The double twisted leads of full cylinder heaters can be bent 90 degrees to lay into slots and exit to the sides of the unit.

Special Add-On Lead Configurations

The two options illustrated can be welded onto the stub at the heater pocket, or for a better installation, welded on at the end of a specified length of the regular strip lead. The Strip lead length can vary from zero to the value necessary to get away from the hot zone. The length of the add-on lead option makes it possible to use stock/standard units to satisfy a greater range of wiring requirements. Contact your Watlow representative for technical details and price.



Flexible Stranded MGT Insulated Nickel Lead Wire (450°C Rated)

Solid NiCr Wire

Accessories

Ceramic fiber heater orders can also include the following accessory items, as detailed on this and following pages. Please specify the Watlow code number when ordering.

Rigidizer

Rigidizer is primarily used to recoat soft, cut edges of ceramic fiber heaters and ceramic fiber insulation panels. Various degrees of hardening can be achieved with additional applications. Rigidizer can be ordered by the pint (0.47 L) by specifying code number **CFRGDPT** or gallon (3.78 L), code number **CFRGDGAL**.

B.T.E. Closed-End Thermocouple Tubes

Also available is a horizontal thermocouple tube between the elements. Two sizes are available: 0.140 in. (3.6 mm) and 0.265 in. (6.7 mm), both 6 in. (152 mm) long with closed end.

Black Surface Coat

Black high emissivity coating is used to raise the emissivity closer to 1.0. The container size is 4 ounces. Order **CFBSC**.

Ceramic Tubes

Ceramic tubes are available in four nominal sizes: ⅛, ¼, ⅜ and ½ in. (3.2, 6, 9.5 and 13 mm) I.D. and lengths of 0.9 in. (22 mm) and 1.9 in. (48 mm) long. Ceramic tubes have several uses, including thermocouple mounting holes, mounting pin sleeves and lead coverings. The table below lists code numbers and exact sizes.

Inside Diameter		Length		Code Number
in.	(mm)	in.	(mm)	
0.140	(3.6)	0.90	(22)	**CC405-1**
0.265	(6.7)	0.90	(22)	**CC405-2**
0.390	(9.9)	0.74	(19)	**CC405-3**
0.515	(13.1)	0.90	(22)	**CC405-9**
0.140	(3.6)	1.90	(48)	**CC405-4**
0.265	(6.7)	1.90	(48)	**CC405-5**
0.390	(9.9)	1.60	(41)	**CC405-6**
0.515	(13.1)	1.90	(48)	**CC405-8**

Ceramic Fiber Heaters

Accessories *(Continued)*

Dry Heating Surface Mix

Dry heating surface mix is used to make the hot face of all standard heaters, including those with the high emissivity coating. It can also be used with rigidizer to make a very high temperature paste for touch ups of the hot face area. Order by the pint (0.47 L), code number **CFHTGSURMX**, or gallon (3.78 L), code number **CFHTGMXGAL**.

Patch Kit

To easily repair small breaks or cracks the patch kit contains one pint (0.47 L) of powered ceramic fiber, four ounces (0.118 L) of black surface coat. Order **CFPATCHKIT**.

Ceramic Fiber Insulation Blanket

Additional insulation value for ceramic fiber heaters is available with ceramic fiber insulation blanket. This 6 lb/ft^3 (96 kg/m^3) ceramic fiber blanket contains no organic binders. Suitable for applications up to 2300°F (1260°C). Sold in full rolls or cut by the square foot, these blankets are available in the following sizes:

Size (U.S.)	Size (metric)	Code No.
24 in. X 25 ft X ¼ in.	610 mm X 7.6 m X 6 mm	**CFBLKT1/4**①
24 in. X 25 ft X ½ in.	610 mm X 7.6 m X 13 mm	**CFBLKT1/2**①
24 in. X 25 ft X 1 in.	610 mm X 7.6 m X 25 mm	**CFBLKT-1**①

① Add ...R to end of code number for full roll.

Powdered Ceramic Fiber

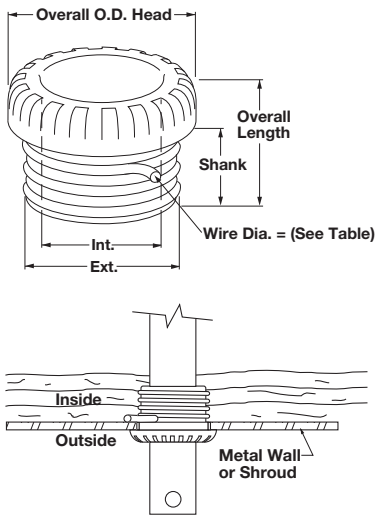
Powdered ceramic fiber is used primarily to improve surface finish in critical areas. It can also be used to repair damaged units by filling voids, cracks and broken corners. Use powdered ceramic fiber with rigidizer to make an easily applied paste. Standard container is one pint (0.47 L). Order code number **CFPDRFPT**.

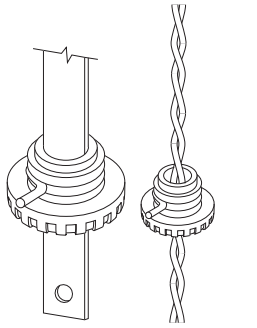
High Temperature Coating and Electrical Potting Cement

Two different high purity, high temperature cements have multiple uses: mount thermocouple tubes, provide extra surface hardening, bond ceramic fiber gaskets and affix lightweight ceramic fiber insulation blanket to panels, as well as attach edge-spacer blocks and custom vestibules. Potting cement comes in a ¼ pint (116 mL) jar, and may be ordered by specifying code number **CFPTGCMT**. The high temperature coating cement is available in pints or gallons, and can be ordered by the code numbers **CFCTGCMTPT**, **CFCTGCMTGAL**.

Strip Lead Porcelain Bushings

Strip lead porcelain bushings are primarily used to protect heater power leads when passing through the metal walls and furnace structures. Bushings are available with inside diameters, listed below, for use with double twisted leads and the three standard strip lead widths. To select the appropriate inside diameter lead bushing, see the heater selection tables on pages 492 through 498. The strip lead width for each heater is listed therein.





Porcelain Bushings Specifications

Conduit K.O. Size in.	(mm)	Shank Dia. without Wire Nut Int. in.	(mm)	Ext. in.	(mm)	Wire Nut Dia. in.	(mm)	Shank Length in.	(mm)	Overall Length in.	(mm)	Overall Head O.D. (Ref.) in.	(mm)	Use With:	Code Number
⅜	(9.5)	⅜	(9.5)	21/32	(16.7)	0.080	(2.032)	9/16	(14.3)	⅞	(22.2)	⅞	(22.2)	All double twist	**CS45-11**
½	(13.0)	7/16	(11.1)	13/16	(20.6)	0.080	(2.032)	¾	(19.0)	1⅛	(28.6)	1⅛	(28.6)	⅜ (9.5 mm) Strip	**CS45-20**
¾	(19.0)	9/16	(14.3)	1	(25.0)	0.106	(2.692)	⅞	(22.2)	1 5/16	(33.3)	1 5/16	(33.3)	½ (13.0 mm) Strip	**CS45-30**

Ceramic Fiber Heaters

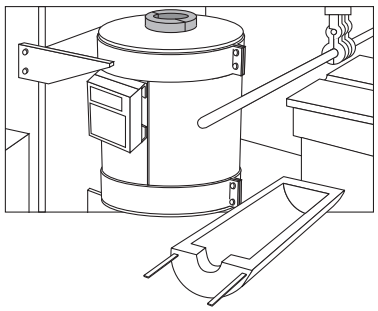
Mounting Methods

The Watlow ceramic fiber heater presents a wide range of heater shapes and configurations for solving high temperature process applications. The modularity and range of sizes and wattages provides the greatest possible flexibility when using these heaters.
At the same time, this requires many different mounting solutions. Watlow has developed or can recommend many appropriate specific and generalized mounting systems for solving your mounting problem. Watlow has arranged the ceramic fiber heaters into seven major mounting categories or heater system configurations, shown in the following illustrations. The MODULE-MOUNT® system, due to its importance, is treated in the most detail on the following pages.

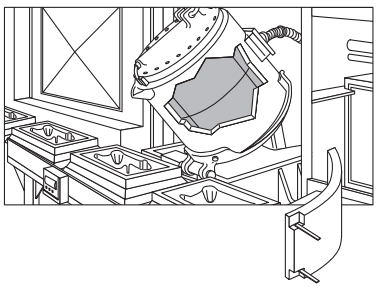
1. Full Cylinder Heaters



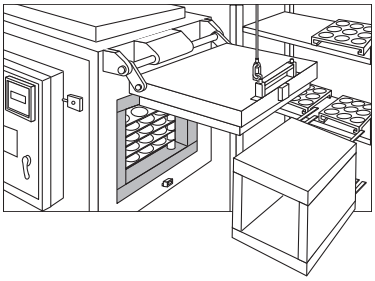
2. Semi-Cylindrical (180° section) Heaters



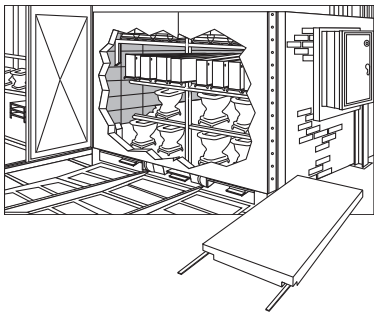
3. Arc-Section Arrays of Heaters (3 or more units of 120° or less each)



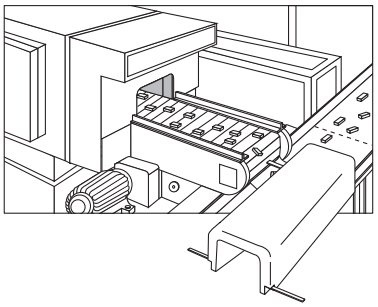
4. Flat Panels, with One Panel on Each Side



5. Flat Wall Array with Minimum Two-by-Two Units per Wall



6. Made-to-Order Molded Shapes with up to Five Sides of a Box Molded as One Piece, Including Complex Curves



Ceramic Fiber Heaters

Mounting Methods *(Continued)*

7. MODULE-MOUNT® System

The Watlow MODULE-MOUNT® system a design solution that integrates ceramic fiber heaters with a shell for mounting on an optional steel "space-frame" structure.

Combining the heaters and mounting assembly in one unique package provides ease of installation—and makes the heater more accessible for maintenance—minimizing downtime.



Performance Capabilities

- Holds ceramic fiber heaters capable of operating up to 2200°F (1205°C)
- Watt densities up to 25 W/in² (4 W/cm²)

Features and Benefits

Hot-change feature

- Allows individual heater replacement without total system shutdown or disassembly

Spaceframe structure

- Allows designs that hold from 4 to more than 18 heaters.
- Accommodates heater sizes from as small as 4 to 12 in. (102-305 mm) wide and up to 48 in. (1220 mm) tall
- Holds any heaters that conform with size, shape and electrical rating limitations

Design flexibility

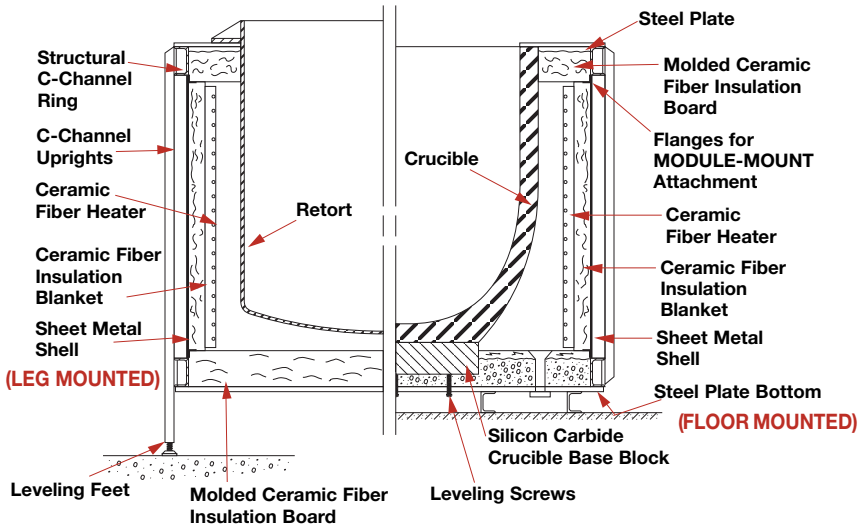
- Fits flat and curved wall heaters

Operates off power line sources from 120 to 600V~(ac), single or three-phase. NEMA 1 terminal boxes are provided as standard

- Meets safety requirements

System Designs

The MODULE-MOUNT system examples presented here are for crucible and retort furnaces. Also represented here are floor and leg mounted configurations. Together this represents an overview of how the MODULE-MOUNT system can be used in several typical applications, such as aluminum crucible furnaces, retorts, vacuum tanks, fluidized beds, lead pots and more. The cross-sectional illustration is to help visualize the MODULE-MOUNT system concept.



Ceramic Fiber Heaters

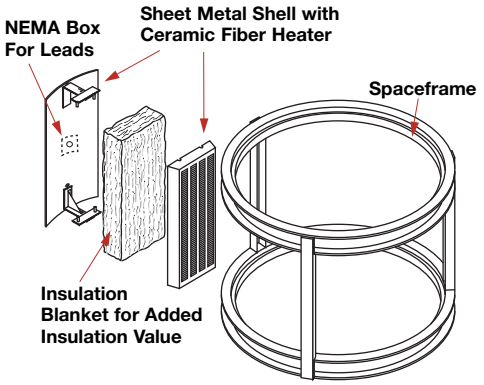
Mounting Methods *(Continued)*

MODULE-MOUNT System

Construction Details

The MODULE-MOUNT system consists of four basic components: the ceramic fiber heater, additional insulation blanket and a sheet metal shell to hold the heater and insulation blanket. The spaceframe would be made by the furnace builder to meet custom application design.

The back side of the ceramic fiber heater is slotted to accept cemented-in tubes for connecting the heater to the shell. The reusable shell can be made of the most appropriate sheet metal (aluminized steel is used as the standard) to meet operating environment conditions. Several layers of reusable ceramic fiber blanket are placed between the shell and heater, adding insulation value [typically the heater is 2 in. (51 mm) thick, with 3 in. (76 mm) of blanket.



Flat and arc-section panels, used in one-by-multiple unit arrays. This is the MODULE-MOUNT system.

Sizes and Specifications of MODULE-MOUNT System Designs

The specification chart is to help understand the range of systems possible. Basic considerations include: total size, load to be heated, heater configuration and power requirements. The MODULE-MOUNT system is very flexible in terms of both range of sizes and the types of loads that can be heated. Since the number of heaters around an object could range from four to any number, MODULE-MOUNT heaters can be assembled to meet virtually any application. Typically, MODULE-MOUNT assemblies are divisible by three to accommodate three-phase power and, if necessary for vertical zoning, can be arranged in stacked vertical rings. The MODULE-MOUNT system concept can be applied to virtually any size object for which a suitable Spaceframe can be constructed. Since almost any size object can be accommodated, there are no available standard or stock sizes in the MODULE-MOUNT system. Instead, stock and standard ceramic fiber heaters are available to adapt for use in a MODULE-MOUNT system. Watlow can also provide made-to-order ceramic fiber heaters to meet exact application requirements.

Typical MODULE-MOUNT System Designs

The chart below lists the different specifications for typical applications of the MODULE-MOUNT heating system.

Load Type	Lead Pot		Fluidized Bed		Retort		Aluminum Crucible*		Aluminum Crucible*	
Load Weight—lbs (kg)	1000	(455)	400	(180)	1100	(500)	620	(280)	2400	(1090)
Load Size Top O.D.—in. (mm)	14.0	(355)	22	(560)	28	(710)	28.25	(715)	40	(1015)
Load Size Height—in. (mm)	20	(510)	28	(710)	48	(1220)	22.75	(580)	27.5	(700)
Total System Power—kW	16		38.7		60		46.8		84	
Number of Heaters	6		9		9		12		12	
Heater Array I.D.—in. (mm)	17	(430)	28	(710)	34	(865)	34	(865)	48	(1220)
Chamber Height—in. (mm)	20	(510)	26	(660)	46	(1170)	26	(660)	30	(760)
Heater Size Width—in. (mm)	9.8	(250)	10	(255)	12.5	(315)	8.9	(225)	12.6	(320)
Heater Size Height—in. (mm)	18	(455)	24	(610)	44	(1115)	23	(585)	27	(685)
Heater Rating—Volts	139		240		277		139		277	
Heater Rating—Watts	2667		4300		6675		3900		7000	

* Watlow also offers, from stock, non-MODULE-MOUNT flat sinuated element replacement heaters for aluminum crucible furnaces used in the non-ferrous foundry and die-casting market.

Ceramic Fiber Heaters

Molded Ceramic Fiber Insulation Modules

For heating applications requiring insulation panels, Watlow makes available many shapes and sizes of stock, standard and made-to-order molded ceramic fiber insulation modules. These insulation modules are made of the same high quality, high temperature, low mass ceramic fiber material used in our heaters.

As a complement to the overall product line, these modules offer additional avenues to solve high temperature industrial insulation problems. Furthermore, without heating elements, molded ceramic fiber insulation modules can come in more complex shapes to conform to application requirements.

Molded-to-shape insulation modules also make handling and installation easier compared to other insulation methods. Since these are molded to shape, sanding, cutting and grinding of blocks to achieve the desired configuration is not required.

Highly resistant to thermal shock and chemical attack, except for hydrofluoric and phosphoric acids, and strong alkalies, insulation modules are unaffected by oil and water. If the insulation becomes wet, physical and thermal properties can be fully restored when dried.

Note: If using molded ceramic fiber insulation modules along with other Watlow ceramic fiber heaters, oil, water and other contaminants can and will negatively affect the heating element portion of the ceramic fiber heater.

Molded insulation modules are rated for up to 2300°F (1260°C) continuous duty. The inorganic binder eliminates smoke or combustion during initial heating to 300°F (150°C) and above. Vacuum molded density is 10 to 15 lbs/ft^3 (160 to 240 kg/m^3), same as the ceramic fiber heaters.

Size Limits: Maximum flat size is 34 x 52 in. (860 x 1320 mm) with a molded thickness of more than 4 in. (102 mm). Maximum inside diameter for semi-cylindrical modules is 24 in. (610 mm). For applications requiring curved insulation pieces in excess of 180 degrees, consider using multiple arc-section modules or an array system of multiple flat units.



Application and Technical Data

The same insulation performance and technical data of ceramic fiber heaters applies to molded ceramic fiber insulation modules. For specific information of insulation performance properties, see the *Heat Loss and Energy Transfer* portion of the ceramic fiber heaters section on page 483.

Accessories

Where appropriate, many of the same accessories for ceramic fiber heaters are available for use with molded ceramic fiber insulation modules. These accessories can be used to modify, provide mounting options, and effect minor repairs and maintenance.

Ordering Information

Stock and Standard: Molded ceramic fiber insulation modules are available in exactly the same sizes and shapes as the ceramic fiber heaters listed in the ordering tables. In general, the ordering code numbers of these insulation modules are derived by replacing the second alpha character in the heater code number (i.e., F, S, C, R, etc.) with **N** to designate **no-element.**

Made-to-Order: Watlow representatives can work with your customers to design and manufacture modules to meet specific insulation needs.

Ceramic Fiber Heaters

Modifications

It is possible to order certain special modifications to stock and standard units prior to shipment. Some of these are listed below, with a brief description.

Beveled and trimmed edges: The unheated edges of Type 6, 7 and 8 units can be factory modified to provide in-between overall sizes, and can also be angle cut to form regular polygon shapes around objects. Angles between zero degrees and 45 degrees can be accommodated.

Black surface coating: Improves the emissivity of the heater's hotface, see graph on page 483 for emissivity values and consult factory for pricing adders.

Leads: Besides length and orientations, see page 485 for other "Special Add-On Lead" configurations.

Thermocouple holes: Ceramic tubes on page 485 are used to make electrically isolated holes through heaters. To order, the inside **diameter** and **location** must be specified. Also, a special "behind-the-element" horizontal thermocouple tube is available, to very closely track element temperature for over-temperature protection and improved heater life.

Notches or long slots in no-heat areas of units: Rectangular and semi-circular notches can be cut into no-heat areas and vestibules on most units. Normally, a sketch or drawing that specifies exact location must be included with your order. Fax numbers to send drawings to are available.

Shortened vestibule lengths: Modified vestibule lengths require retaining at least ½ in. (13 mm) of insulation for adequate strength, or completely removed ("0" length) to make Type 1 units into left vestibule (i.e., Type 2) or right vestibule (i.e., Type 3) units.

Lead Times

Stock: Same or next working day shipment, subject to current inventory (contact your Watlow representative for latest status). No set up charges. Orders must be placed before 11:00 a.m., CST/CDT, USA.

Stock with modifications: Two to three working days shipment. Nominal set up charges only for specific modifications, not for the basic heater.

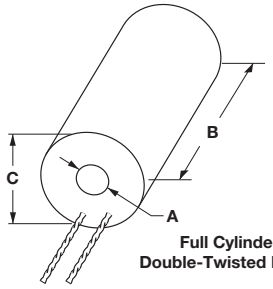
Standard: Shipment normally within three weeks, but check with factory for latest lead time status. No set up charges.



Warning

This product contains refractory ceramic fibers (RCF) which have been identified by the International Agency for Research on Cancer (IRAC) as a possible human carcinogen (class 2B). Before using the products, read the MSDS which contains the detailed precautionary measures and handling instructions.

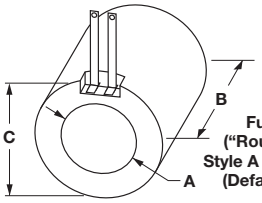
Ceramic Fiber Heaters



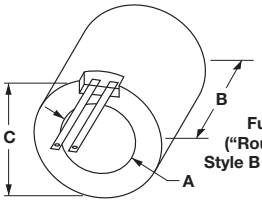
Full Cylinder
Double-Twisted Leads

Full Cylinder Units

Dimensions, in. (mm)						Electrical Ratings									
Heated Area				Overall											
I.D. (A) in. (mm) ±1/16 (±1.6)		Length (B) in. (mm) ±1/16 (±1.6)		O.D. (C) in. (mm) ±1/8 (±3.2)		Volts	Power (Watts) ±5%	Surface Loading ① W/in² (W/cm²)		Lead Width	Approx. Net Wt. oz	(kg)	Availability	Code Number ②
½	(13)	6	(152)	2	(51)	60	175	18.6	(2.9)		5	(0.14)	Stock	**VC400J06A**
½	(13)	12	(305)	2	(51)	120	350	18.6	(2.9)		10	(0.28)	Stock	**VC400J12A**
¾	(19)	6	(152)	3	(76)	60	200	14.2	(2.2)		8	(0.23)	Stock	**VC400N06A**
¾	(19)	12	(305)	3	(76)	120	400	14.2	(2.2)		13	(0.37)	Stock	**VC400N12A**
1	(25)	6	(152)	3	(76)	60	220	11.7	(1.8)		9	(0.26)	Stock	**VC401A06A**
1	(25)	12	(305)	3	(76)	120	440	11.7	(1.8)		13	(0.37)	Stock	**VC401A12A**
1¼	(32)	6	(152)	3½	(89)	60	275	11.7	(1.8)	Double	11	(0.31)	Stock	**VC401E06A**
1¼	(32)	12	(305)	3½	(89)	120	550	11.7	(1.8)	Twisted	18	(0.51)	Stock	**VC401E12A**
1½	(38)	6	(152)	3½	(89)	60	300	10.6	(1.6)	Leads	12	(0.34)	Stock	**VC401J06A**
1½	(38)	12	(305)	3½	(89)	120	600	10.6	(1.6)		20	(0.57)	Stock	**VC401J12A**
1¾	(45)	6	(152)	4	(102)	120	350	10.6	(1.6)		12	(0.34)	Stock	**VC401N06A**
1¾	(45)	12	(305)	4	(102)	120	700	10.6	(1.6)		23	(0.65)	Stock	**VC401N12A**
2	(51)	6	(152)	4	(102)	120	425	11.3	(1.8)		13	(0.37)	Stock	**VC402A06A**
2	(51)	12	(305)	4	(102)	120	850	11.3	(1.8)		25	(0.71)	Stock	**VC402A12A**



Full Cylinders
("Round Radiants")
Style A Leads Illustrated
(Default Lead Style)



Full Cylinders
("Round Radiants")
Style B Leads Illustrated

Full Cylinder Units

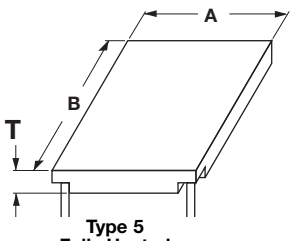
Dimensions, in. (mm)						Electrical Ratings									
Heated Area				Overall											
I.D. (A) in. (mm) ±1/16 (±1.6)		Length (B) in. (mm) ±1/16 (±1.6)		O.D. (C) in. (mm) ±1/8 (±3.2)		Volts	Power (Watts) ±5%	Surface Loading ① W/in² (W/cm²)		Lead Width in. (mm)			Approx. Net Wt. lbs	(kg)	Availability	Code Number ②
3	(76)	6	(152)	7	(178)	120	650	11.5	(1.8)	3/8	(10)		2.5	(1.1)	Stock	**VC403A06A**
4	(102)	6	(152)	8	(203)	120	900	11.9	(1.8)	½	(13)		3.1	(1.4)	Stock	**VC404A06A**
4	(102)	6	(152)	8	(203)	120	1100	14.6	(2.3)	3/8	(10)		3.1	(1.4)	Stock	**VC404A06T**
5	(127)	6	(152)	9	(229)	120	1250	13.7	(2.1)	½	(13)		3.5	(1.6)	Stock	**VC405A06A**
5	(127)	6	(152)	9	(229)	120	1400	14.9	(2.3)	3/8	(10)		3.6	(1.6)	Stock	**VC405A06T**
6½	(165)	6	(152)	10½	(267)	120	1500	12.2	(1.9)	¾	(19)		4.9	(2.2)	Stock	**VC406J06A**
6½	(165)	6	(152)	10½	(267)	120	2000	16.3	(2.5)	½	(13)		4.9	(2.2)	Stock	**VC406J06T**
8	(203)	6	(152)	12	(305)	120	1800	11.9	(1.8)	¾	(19)		5.7	(2.6)	Stock	**VC408A06A**
8	(203)	6	(152)	12	(305)	120	2600	17.2	(2.7)	¾	(19)		5.8	(2.6)	Stock	**VC408A06T**

① Units with code numbers ending in ...**0A**, watt densities between 10.6 to 14.2 W/in² (1.6 to 2.2 W/cm²), are coil designs that are suitable for use up to 2000°F (1093°C) maximum surface temperature. Units with code numbers ending in ...**T**, watt densities between 14.6 to 17.2 W/in² (2.3 to 2.7 W/cm²), are "round radiants" with sinuated element designs and the high emissivity coating, and are suitable for use to 1800°F (982°C) maximum surface temperature.

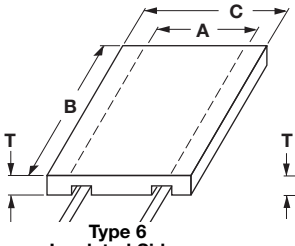
② For unheated insulation tubes, substitute **"VN"** for **"VC"** in the code number of the appropriate size unit. No heats are non-stock.

Ceramic Fiber Heaters

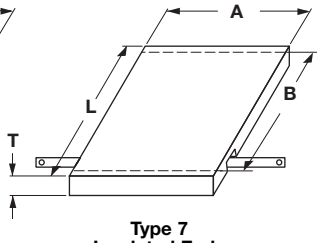
All units: **T** = 2 ±¼ inches (51 ±6 mm)



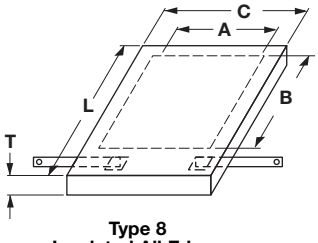
Type 5
Fully Heated
(Style A Leads Illustrated)
(Default Lead Style)



Type 6
Insulated Sides
(Style B Leads Illustrated)



Type 7
Insulated Ends
(Style C Leads Illustrated)



Type 8
Insulated All Edges
(Style C Leads Illustrated)

(Style A, B or C leads available on any type unit. Please specify.)

Flat Units — Embedded Coiled Elements (see page 479)

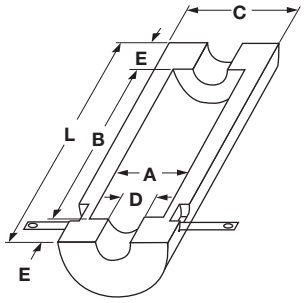
Dimensions, in. (mm)													
Type 5 Heated Size		Type 6 & 8	Type 7 & 8	Electrical Rating			Strip	Approximate Net Wt.				
Width (A) in. (mm) +⅛ - ⅛ (1.6-3.2)	Length (B) in. (mm) +⅛ - ⅛ (1.6-3.2)	Width (C) in. (mm) +⅛ - ⅛ (1.6-3.2)	Length (L) in. (mm) +⅛ - ⅛ (1.6-3.2)	Volts	Power (Watts) ±5%	Surface Loading W/in² (W/cm²)	Lead Width in. (mm)	Type 5 lbs (kg)	Type 6 & 7 lbs (kg)	Type 8 lbs (kg)	Avail.	Code Number
4 (102)	6 (152)	8 (203)	10 (254)	60	275	11.5 (1.8)	⅜ (10)	0.6 (0.3)	1.1 (0.5)	1.7 (0.8)	Stock	VF①04A06S
	12 (305)	8 (203)	16 (406)	60	550	11.5 (1.8)	½ (13)	1.2 (0.5)	2.2 (1.0)	2.8 (1.3)	Stock	VF①04A12S
	18 (457)	8 (203)	22 (559)	120	750	10.4 (1.6)	⅜ (10)	1.9 (0.9)	3.4 (1.5)	4.5 (2.0)	Standard	VF①04A18S
	24 (610)	8 (203)	28 (711)	120	1100	11.5 (1.8)	½ (13)	2.4 (1.1)	4.4 (2.0)	5.6 (2.5)	Stock	VF①04A24S
6 (152)	6 (152)	10 (254)	10 (254)	60	375	10.4 (1.6)	⅜ (10)	0.9 (0.4)	1.5 (0.7)	2.4 (1.1)	Stock	VF①06A06S
	12 (305)	10 (254)	16 (406)	120	750	10.4 (1.6)	⅜ (10)	1.8 (0.8)	2.8 (1.3)	3.7 (1.7)	Stock	VF①06A12S
	18 (457)	10 (254)	22 (559)	120	1250	11.6 (1.8)	½ (13)	3.0 (1.4)	4.1 (1.9)	5.0 (2.3)	Stock	VF①06A18S
	24 (610)	10 (254)	28 (711)	240	1500	10.4 (1.6)	⅜ (10)	3.5 (1.6)	5.3 (2.4)	6.2 (2.8)	Stock	VF①06A24S
	30 (762)	10 (254)	34 (864)	240	2000	11.2 (1.7)	½ (13)	4.5 (2.0)	6.6 (3.0)	8.4 (3.8)	Standard	VF①06A30S
	36 (914)	10 (254)	40 (1016)	240	2500	11.6 (1.8)	½ (13)	6.1 (2.8)	8.3 (3.8)	10.2 (4.6)	Standard	VF①06A36S
8 (203)	12 (305)	12 (305)	16 (406)	120	1100	11.5 (1.8)	½ (13)	2.5 (1.1)	3.2 (1.5)	4.1 (1.9)	Stock	VF①08A12S
	18 (457)	12 (305)	22 (559)	240	1500	10.4 (1.6)	⅜ (10)	3.6 (1.6)	4.7 (2.1)	5.6 (2.5)	Standard	VF①08A18S
	24 (610)	12 (305)	28 (711)	240	2200	11.5 (1.8)	½ (13)	4.8 (2.2)	6.5 (2.9)	7.4 (3.4)	Stock	VF①08A24S
	30 (762)	12 (305)	34 (864)	240	2500	10.4 (1.6)	½ (13)	6.2 (2.8)	8.0 (3.6)	9.7 (4.4)	Standard	VF①08A30S
	36 (914)	12 (305)	40 (1016)	240	3000	10.4 (1.6)	¾ (19)	7.8 (3.5)	10.0 (4.5)	11.8 (5.4)	Standard	VF①08A36S
10 (254)	12 (305)	14 (356)	16 (406)	240	1250	10.4 (1.6)	⅜ (10)	2.6 (1.2)	3.9 (1.8)	5.0 (2.3)	Stock	VF①10A12S
	18 (457)	14 (356)	22 (559)	240	1800	10.0 (1.6)	½ (13)	4.2 (1.9)	5.4 (2.4)	6.5 (2.9)	Stock	VF①10A18S
	24 (610)	14 (356)	28 (711)	240	2500	10.4 (1.6)	½ (13)	5.2 (2.4)	7.7 (3.5)	8.8 (4.0)	Standard	VF①10A24S
	30 (762)	14 (356)	34 (864)	240	3000	10.0 (1.6)	¾ (19)	7.0 (3.2)	9.5 (4.3)	11.7 (5.3)	Standard	VF①10A30S
	36 (914)	14 (356)	40 (1016)	240	3600	10.0 (1.6)	¾ (19)	9.1 (4.1)	11.5 (5.2)	13.7 (6.2)	Standard	VF①10A36S
12 (305)	12 (305)	16 (406)	16 (406)	240	1500	10.4 (1.6)	⅜ (10)	3.2 (1.5)	4.6 (2.1)	5.8 (2.6)	Stock	VF①12A12S
	18 (457)	16 (406)	22 (559)	240	2200	10.2 (1.6)	½ (13)	4.9 (2.2)	6.5 (2.9)	7.7 (3.5)	Standard	VF①12A18S
	24 (610)	16 (406)	28 (711)	240	3000	10.4 (1.6)	¾ (19)	7.5 (3.4)	9.5 (4.3)	10.7 (4.9)	Stock	VF①12A24S
	30 (762)	16 (406)	34 (864)	240	3600	10.0 (1.6)	¾ (19)	9.1 (4.1)	11.7 (5.3)	12.9 (5.9)	Standard	VF①12A30S
	36 (914)	16 (406)	40 (1016)	240	4400	10.2 (1.6)	¾ (19)	12.4 (5.6)	15.5 (7.0)	16.7 (7.6)	Standard	VF①12A36S
14 (356)	12 (305)	18 (457)	16 (406)	240	1750	10.4 (1.6)	½ (13)	4.7 (2.1)	6.1 (2.8)	7.6 (3.4)	Standard	VF①14A12S
	18 (457)	18 (457)	22 (559)	240	2550	10.6 (1.6)	½ (13)	6.8 (3.1)	8.5 (3.9)	10.0 (4.5)	Standard	VF①14A18S
	24 (610)	18 (457)	28 (711)	240	3500	10.4 (1.6)	¾ (19)	10.0 (4.5)	11.9 (5.4)	13.4 (6.1)	Standard	VF①14A24S
	30 (762)	18 (457)	34 (864)	240	4300	10.2 (1.6)	¾ (19)	12.5 (5.7)	15.0 (6.8)	16.5 (7.5)	Standard	VF①14A30S
	36 (914)	18 (457)	40 (1016)	240/240	5200	10.3 (1.6)	½ (13)	14.2 (6.4)	17.2 (7.8)	18.7 (8.5)	Standard	VF①14A36S②
16 (406)	12 (305)	20 (508)	16 (406)	240	2100	10.9 (1.7)	½ (13)	5.2 (2.4)	6.7 (3.0)	8.4 (3.8)	Standard	VF①16A12S
	18 (457)	20 (508)	22 (559)	240	3000	10.4 (1.6)	¾ (19)	8.2 (3.7)	9.9 (4.5)	11.6 (5.3)	Standard	VF①16A18S
	24 (610)	20 (508)	28 (711)	240	4200	10.9 (1.7)	¾ (19)	11.9 (5.4)	13.8 (6.3)	15.5 (7.0)	Standard	VF①16A24S
	30 (762)	20 (508)	34 (864)	240/240	5000	10.4 (1.6)	½ (13)	15.2 (6.9)	17.7 (8.0)	19.4 (8.8)	Standard	VF①16A30S②
	36 (914)	20 (508)	40 (1016)	240/240	6000	10.4 (1.6)	¾ (19)	17.9 (8.1)	20.9 (9.5)	22.6 (10.3)	Standard	VF①16A36S②

All units in this table are suitable for use up to 2000°F (1093°C) maximum surface temperature.

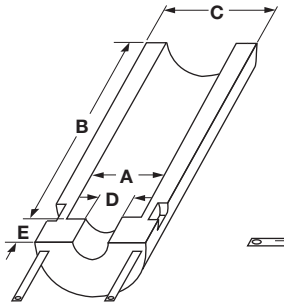
① Add Type number (Type 5 - 8) in the blank position in the code number, example: **VS704A06S**. For unheated units, see catalog page 490.

② These units have dual elements, to be used in "parallel" for 240V usage. Alternate designs are available for 480V, 277V and three-phase (internally wired). Contact your Watlow representative.

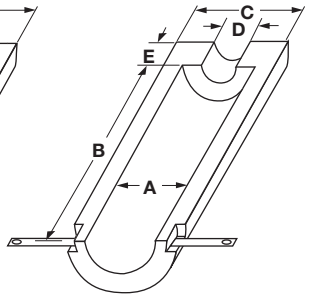
Ceramic Fiber Heaters



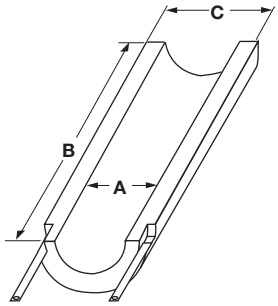
Type 1
Full Vestibule
(Style A Leads Illustrated)
(Default Lead Style)



Type 2
Left Vestibule
(Style B Leads Illustrated)



Type 3
Right Vestibule
(Style A Leads Illustrated)



Type 4
No Vestibule
(Style B Leads Illustrated)

(Style A or B leads available on any type unit. Please specify.)

Semi-Cylindrical Units — Embedded Coiled Elements (see page 479)

Dimensions, in. (mm)							Electrical Ratings			Strip Lead Width in. (mm)	Approx. Net Wt.		Avail.	Code Number
Type 4 Heater Size			Type 1, 2, & 3 Sizes											
			Vestibule Sizes											
I.D. (A) in. (mm) ±⅛ (±3.2)	Length (B) in. (mm) +1/16 -⅛ (+1.6 - 3.2)	O.D. (C) in. (mm) (Ref)	Length (L) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Dia. (D) in. (mm) ±⅛ (±3.2)	Length (E) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Volts	Power (Watts) ±5%	Surface Loading W/in² (W/cm²)		Type 1 Full Vest. lbs (kg)	Type 4 No Vest. lbs (kg)		
2 (51)	6 (152)	6 (152)	8 (203)	1 (25)	1 (25)	60	275	14.6 (2.3)	⅜ (10)	1.1 (0.5)	1.1 (0.5)	Stock	VS①02A06S
	12 (305)	6 (152)	14 (356)	1 (25)	1 (25)	120	550	14.6 (2.3)	⅜ (10)	1.8 (0.8)	1.8 (0.8)	Stock	VS①02A12S
	18 (457)	6 (152)	20 (508)	1 (25)	1 (25)	120	750	13.3 (2.1)	⅜ (10)	2.3 (1.0)	2.3 (1.0)	Stock	VS①02A18S
	24 (610)	6 (152)	26 (660)	1 (25)	1 (25)	240	1100	14.6 (2.3)	⅜ (10)	3.5 (1.6)	3.5 (1.6)	Stock	VS①02A24S
3½ (89)	6 (152)	7½ (191)	9½ (241)	2 (51)	1¾ (45)	60	450	13.6 (2.1)	½ (13)	2.0 (0.9)	1.5 (0.7)	Stock	VS①03J06S
	12 (305)	7½ (191)	15½ (394)	2 (51)	1¾ (45)	120	900	13.6 (2.1)	½ (13)	3.1 (1.4)	2.6 (1.2)	Stock	VS①03J12S
	18 (457)	7½ (191)	21½ (546)	2 (51)	1¾ (45)	120	1250	12.6 (2.0)	½ (13)	4.5 (2.0)	4.0 (1.8)	Stock	VS①03J18S
	24 (610)	7½ (191)	27½ (699)	2 (51)	1¾ (45)	240	1800	13.6 (2.1)	½ (13)	5.4 (2.4)	4.9 (2.2)	Stock	VS①03J24S
5 (127)	6 (152)	9 (229)	11 (279)	3½ (89)	2½ (64)	60	625	13.3 (2.1)	½ (13)	3.4 (1.5)	2.5 (1.1)	Stock	VS①05A06S
	12 (305)	9 (229)	17 (432)	3½ (89)	2½ (64)	120	1250	13.3 (2.1)	½ (13)	4.9 (2.2)	4.0 (1.8)	Stock	VS①05A12S
	18 (457)	9 (229)	23 (584)	3½ (89)	2½ (64)	240	1775	12.6 (2.0)	½ (13)	5.7 (2.6)	4.8 (2.2)	Stock	VS①05A18S
	24 (610)	9 (229)	29 (737)	3½ (89)	2½ (64)	240	2500	13.3 (2.1)	½ (13)	7.9 (3.6)	6.9 (3.1)	Stock	VS①05A24S
	30 (762)	9 (229)	35 (889)	3½ (89)	2½ (64)	240	3100	13.2 (2.0)	¾ (19)	10.9 (4.9)	9.2 (4.2)	Stock	VS①05A30S
	36 (914)	9 (229)	41 (1041)	3½ (89)	2½ (64)	240	3550	12.6 (2.0)	¾ (19)	13.2 (6.0)	11.5 (5.2)	Standard	VS①05A36S
6½ (165)	6 (152)	10½ (267)	12 (305)	5 (127)	3 (76)	120	750	12.2 (1.9)	⅜ (10)	3.8 (1.7)	2.6 (1.2)	Stock	VS①06J06S
	12 (305)	10½ (267)	18 (457)	5 (127)	3 (76)	240	1500	12.2 (1.9)	⅜ (10)	5.4 (2.4)	4.2 (1.9)	Stock	VS①06J12S
	18 (457)	10½ (267)	24 (610)	5 (127)	3 (76)	240	2100	11.4 (1.8)	½ (13)	7.5 (3.4)	6.2 (2.8)	Stock	VS①06J18S
	24 (610)	10½ (267)	30 (762)	5 (127)	3 (76)	240	3000	12.2 (1.9)	¾ (19)	10.9 (4.9)	8.9 (4.0)	Stock	VS①06J24S
	30 (762)	10½ (267)	36 (914)	5 (127)	3 (76)	240	3750	12.2 (1.9)	¾ (19)	13.5 (6.1)	11.4 (5.2)	Standard	VS①06J30S
	36 (914)	10½ (267)	42 (1067)	5 (127)	3 (76)	240	4200	11.4 (1.8)	¾ (19)	16.4 (7.4)	14.3 (6.5)	Standard	VS①06J36S
8 (203)	6 (152)	12 (305)	12 (305)	6½ (165)	3 (76)	120	900	11.6 (1.8)	½ (13)	5.0 (2.3)	2.8 (1.3)	Standard	VS①08A06S
	12 (305)	12 (305)	18 (457)	6½ (165)	3 (76)	240	1800	11.6 (1.8)	½ (13)	7.6 (3.4)	5.0 (2.3)	Stock	VS①08A12S
	18 (457)	12 (305)	24 (610)	6½ (165)	3 (76)	240	2500	11.1 (1.7)	½ (13)	10.5 (4.8)	8.1 (3.7)	Stock	VS①08A18S
	24 (610)	12 (305)	30 (762)	6½ (165)	3 (76)	240	3500	11.6 (1.8)	¾ (19)	13.9 (6.3)	12.4 (5.6)	Standard	VS①08A24S
	30 (762)	12 (305)	36 (914)	6½ (165)	3 (76)	240	4200	11.1 (1.7)	¾ (19)	16.6 (7.5)	14.1 (6.4)	Standard	VS①08A30S
	36 (914)	12 (305)	42 (1067)	6½ (165)	3 (76)	240/240	5000	11.1 (1.7)	½ (13)	18.0 (8.2)	15.6 (7.1)	Standard	VS①08A36S②

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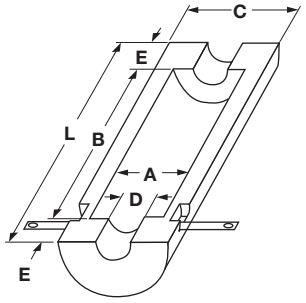
All units have 2 ±¼ inch thick walls.

All units in this table are suitable for use up to 2000°F (1093°C) maximum surface temperature.

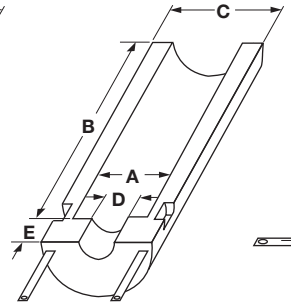
① Add Type number (Type 1 - 4) in the blank position in the code number, example: **VS102A06S**. For unheated units, see catalog page 490.
Overall length applies only to the full vestibule (Type 1) units. Types 2 and 3 are shorter by one vestibule length. Type 4 length equals **(B)**.
Type 2 (left vestibule) and Type 3 (right vestibule) style units are not stocked. They are, however, still standard units and designs are kept on file.

② These units have dual elements, to be used in "parallel" for 240V usage. Alternate designs are available for 480V, 277V and three-phase (internally wired). Contact your Watlow representative.

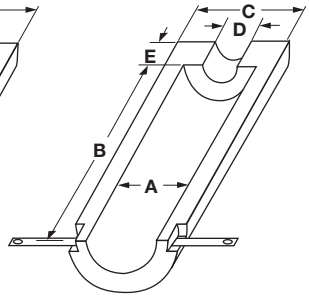
Ceramic Fiber Heaters



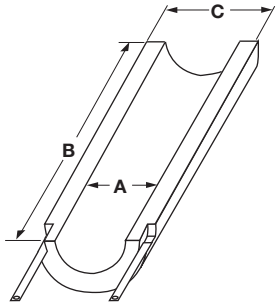
Type 1
Full Vestibule
(Style A Leads Illustrated)
(Default Lead Style)



Type 2
Left Vestibule
(Style B Leads Illustrated)



Type 3
Right Vestibule
(Style A Leads Illustrated)



Type 4
No Vestibule
(Style B Leads Illustrated)

(Style A or B leads available on any type unit. Please specify.)

Semi-Cylindrical Units — Embedded Coiled Elements (see page 479)

Dimensions, in. (mm)						Electrical Ratings			Strip Lead Width in. (mm)	Approx. Net Wt.		Avail.	Code Number
Type 4 Heater Size			Type 1, 2, & 3 Sizes										
			Vestibule Sizes										
I.D. (A) in. (mm) ±⅛ (±3.2)	Length (B) in. (mm) +1/16 -⅛ (+1.6 - 3.2)	O.D. (C) in. (mm) (Ref)	Length (L) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Dia. (D) in. (mm) ±⅛ (±3.2)	Length (E) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Volts	Power (Watts) ±5%	Surface Loading W/in² (W/cm²)		Type 1 Full Vest. lbs (kg)	Type 4 No Vest. lbs (kg)		
10 (254)	12 (305)	14 (356)	18 (457)	8 (203)	3 (76)	240	2100	11.1 (1.7)	½ (13)	9.2 (4.2)	6.5 (2.9)	Standard	VS①10A12S
	18 (457)	14 (356)	24 (610)	8 (203)	3 (76)	240	3000	10.6 (1.6)	¾ (19)	13.3 (6.0)	10.6 (4.8)	Standard	VS①10A18S
	24 (610)	14 (356)	30 (762)	8 (203)	3 (76)	240	4200	11.1 (1.7)	¾ (19)	15.5 (7.0)	12.8 (5.8)	Standard	VS①10A24S
	30 (762)	14 (356)	36 (914)	8 (203)	3 (76)	240/240	5000	10.6 (1.6)	½ (13)	18.7 (8.5)	15.4 (7.0)	Standard	VS①10A30S②
	36 (914)	14 (356)	42 (1067)	8 (203)	3 (76)	240/240	6000	10.6 (1.6)	¾ (19)	22.6 (10.3)	19.3 (8.8)	Standard	VS①10A36S②
12 (305)	12 (305)	16 (406)	18 (457)	10 (254)	3 (76)	240	2500	11.1 (1.7)	½ (13)	9.9 (4.5)	6.8 (3.1)	Stock	VS①12A12S
	18 (457)	16 (406)	24 (610)	10 (254)	3 (76)	240	3500	10.3 (1.6)	¾ (19)	13.0 (5.9)	9.9 (4.5)	Stock	VS①12A18S
	24 (610)	16 (406)	30 (762)	10 (254)	3 (76)	240	4200	9.3 (1.4)	¾ (19)	18.5 (8.4)	15.4 (7.0)	Stock	VS①12A24S
	30 (762)	16 (406)	36 (914)	10 (254)	3 (76)	240/240	6000	10.6 (1.6)	¾ (19)	22.5 (10.2)	18.6 (8.4)	Standard	VS①12A30S②
	36 (914)	16 (406)	42 (1067)	10 (254)	3 (76)	240/240	7000	10.3 (1.6)	¾ (19)	26.9 (12.2)	23.1 (10.5)	Standard	VS①12A36S②
14 (356)	12 (305)	18 (457)	18 (457)	12 (305)	3 (76)	240	3000	11.4 (1.8)	¾ (19)	12.6 (5.7)	9.0 (4.1)	Standard	VS①14A12S
	18 (457)	18 (457)	24 (610)	12 (305)	3 (76)	240	4200	10.6 (1.6)	¾ (19)	15.3 (6.9)	11.7 (5.3)	Standard	VS①14A18S
	24 (610)	18 (457)	30 (762)	12 (305)	3 (76)	240/240	6000	11.4 (1.8)	¾ (19)	18.8 (8.5)	15.2 (6.9)	Standard	VS①14A24S②
	30 (762)	18 (457)	36 (914)	12 (305)	3 (76)	240/240	7000	10.6 (1.6)	¾ (19)	26.7 (12.1)	22.2 (10.1)	Standard	VS①14A30S②
	36 (914)	18 (457)	42 (1067)	12 (305)	3 (76)	240/240	8400	10.6 (1.6)	¾ (19)	31.8 (14.4)	27.3 (12.4)	Standard	VS①14A36S②
16 (406)	12 (305)	20 (508)	18 (457)	14 (356)	3 (76)	240	3500	11.6 (1.8)	¾ (19)	14.0 (6.4)	10.2 (4.6)	Standard	VS①16A12S
	18 (457)	20 (508)	24 (610)	14 (356)	3 (76)	240	4200	9.3 (1.4)	¾ (19)	16.9 (7.7)	13.1 (5.9)	Standard	VS①16A18S
	24 (610)	20 (508)	30 (762)	14 (356)	3 (76)	240/240	7000	11.6 (1.8)	¾ (19)	20.8 (9.4)	17.0 (7.7)	Standard	VS①16A24S②
	30 (762)	20 (508)	36 (914)	14 (356)	3 (76)	240/240	7600	10.1 (1.6)	¾ (19)	30.1 (13.7)	24.2 (11.0)	Standard	VS①16A30S②
	36 (914)	20 (508)	42 (1067)	14 (356)	3 (76)	240/240	9000	9.9 (1.5)	¾ (19)	34.4 (15.6)	28.5 (12.9)	Standard	VS①16A36S②

All units in this table have 2 ±¼ inch thick walls.

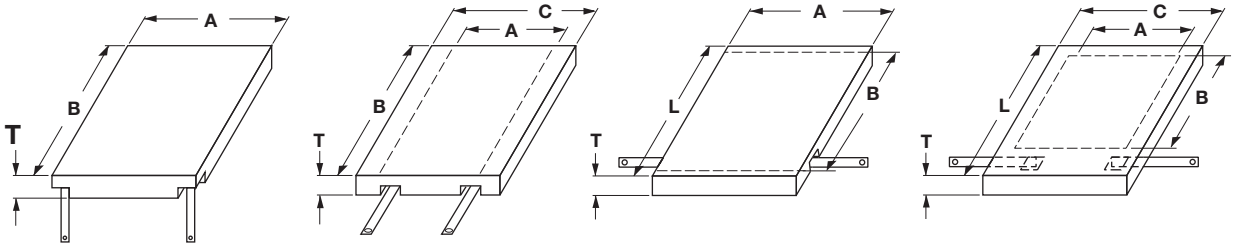
All units in this table are suitable for use up to 2000°F (1093°C) maximum surface temperature.

① Add Type number (Type 1 - 4) in the blank position in the code number, example: **VS102A06S**. For unheated units, see catalog page 490. Overall length applies only to the full vestibule (Type 1) Units. Types 2 and 3 are shorter by one vestibule length. Type 4 length equals **(B)**. Type 2 (left vestibule) and Type 3 (right vestibule) style units are not stocked. They are, however, still standard units and designs are kept on file.

② These units have dual elements, to be used in "parallel" for 240V usage. Alternate designs are available for 480V, 277V and three-phase (internally wired). Contact your Watlow representative.

Ceramic Fiber Heaters

All units: **T** = 2 ±¼ inches (51 ±6 mm)



Type 5
Fully Heated
(Style A Leads Illustrated)
(Default Lead Style)

Type 6
Insulated Sides
(Style B Leads Illustrated)

Type 7
Insulated Ends
(Style C Leads Illustrated)

Type 8
Insulated All Edges
(Style C Leads Illustrated)

(Style A, B or C leads available on any type unit. Please specify.)

Flat Units—High Watt Density Sinuated Elements (see page 478)

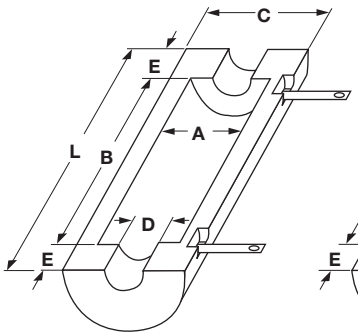
Dimensions, in. (mm)						Electrical Rating			Strip	Approximate Net Wt.				
Type 5 Heated Size				Type 6 & 8		Type 7 & 8								
Width (A) in. (mm) +⅛ -⅛ (1.6-3.2)		Length (B) in. (mm) +⅛ - ⅛ (1.6-3.2)		Width (C) in. (mm) +⅛ - ⅛ (1.6-3.2)		Length (L) in. (mm) +⅛ - ⅛ (1.6-3.2)		Volts	Power (Watts) ±5%	Surface Loading W/in² (W/cm²)	Lead Width in. (mm)	Type 5 lbs (kg)	Type 6 & 7 lbs (kg)	Type 8 lbs (kg)	Avail.	Code No.
6	(152)	12	(305)	10	(254)	16	(406)	60	1250	17.4 (2.7)	½ (13)	1.7 (0.8)	2.7 (1.6)	3.6 (1.2)	Standard	VF①06A12T
		18	(457)	10	(254)	22	(559)	120	2000	18.5 (2.9)	½ (13)	2.6 (1.2)	3.7 (2.1)	4.6 (1.7)	Standard	VF①06A18T
		24	(610)	10	(254)	28	(711)	120	2500	17.4 (2.7)	½ (13)	3.2 (1.5)	5.0 (2.7)	5.9 (2.3)	Standard	VF①06A24T
		24	(610)	10	(254)	28	(711)	240	2500	17.4 (2.7)	½ (13)	3.2 (1.5)	5.0 (2.7)	5.9 (2.3)	Stock	VF①06A24U
		30	(762)	10	(254)	34	(864)	240	3400	18.9 (2.9)	½ (13)	4.5 (2.0)	7.1 (3.6)	7.9 (3.2)	Stock	VF①06A30T
		36	(914)	10	(254)	40	(1016)	240	4000	18.5 (2.9)	½ (13)	5.5 (2.5)	8.5 (4.2)	9.3 (3.9)	Standard	VF①06A36T
8	(203)	12	(305)	12	(305)	16	(406)	60	1800	18.7 (2.9)	¾ (19)	2.3 (1.0)	3.0 (1.8)	3.9 (1.4)	Stock	VF①08A12T
		18	(457)	12	(305)	22	(559)	120	3000	20.8 (3.2)	¾ (19)	3.5 (1.6)	4.6 (2.5)	5.5 (2.1)	Stock	VF①08A18T
		24	(610)	12	(305)	28	(711)	120	3600	18.7 (2.9)	¾ (19)	4.4 (2.0)	6.1 (3.2)	7.0 (2.8)	Standard	VF①08A24T
		30	(762)	12	(305)	34	(864)	240	5000	20.8 (3.2)	½ (13)	6.1 (2.8)	8.7 (4.4)	9.7 (4.0)	Standard	VF①08A30T
		36	(914)	12	(305)	40	(1016)	240	6000	20.8 (3.2)	¾ (19)	7.0 (3.2)	10.0 (5.0)	11.0 (4.5)	Standard	VF①08A36T
10	(254)	12	(305)	14	(356)	16	(406)	120	2000	16.7 (2.6)	½ (13)	2.4 (1.1)	3.7 (2.2)	4.8 (1.7)	Standard	VF①10A12T
		18	(457)	14	(356)	22	(559)	120	3600	20.0 (3.1)	¾ (19)	4.0 (1.8)	5.2 (2.9)	6.3 (2.4)	Stock	VF①10A18T
		24	(610)	14	(356)	28	(711)	240	4500	17.9 (2.8)	¾ (19)	4.7 (2.1)	7.2 (3.8)	8.3 (3.3)	Standard	VF①10A24T
		30	(762)	14	(356)	34	(864)	240	6000	20.0 (3.1)	¾ (19)	6.7 (3.0)	9.3 (4.8)	10.5 (4.2)	Standard	VF①10A30T
		36	(914)	14	(356)	40	(1016)	240	7200	20.0 (3.1)	¾ (19)	8.5 (3.9)	11.5 (5.8)	12.7 (5.2)	Standard	VF①10A36T
12	(305)	12	(305)	16	(406)	16	(406)	120	2500	17.4 (2.7)	½ (13)	2.9 (1.3)	4.3 (2.5)	5.5 (2.0)	Stock	VF①12A12T
		12	(305)	16	(406)	16	(406)	240	2500	17.4 (2.7)	⅜ (10)	2.9 (1.3)	4.3 (2.5)	5.5 (2.0)	Stock	VF①12A12U
		18	(457)	16	(406)	22	(559)	240	4000	18.5 (2.9)	½ (13)	4.5 (2.0)	6.1 (3.3)	7.3 (2.8)	Standard	VF①12A18T
		24	(610)	16	(406)	28	(711)	240	6000	20.8 (3.2)	¾ (19)	6.6 (3.0)	8.6 (4.4)	9.8 (3.9)	Stock	VF①12A24T
		30	(762)	16	(406)	34	(864)	240	7200	20.0 (3.1)	¾ (19)	8.6 (3.9)	11.2 (5.7)	12.6 (5.1)	Standard	VF①12A30T
		36	(914)	16	(406)	40	(1016)	240/240	8400	19.4 (3.0)	¾ (19)	10.2 (4.6)	13.2 (6.6)	14.6 (6.0)	Standard	VF①12A36T②
14	(356)	12	(305)	18	(457)	16	(406)	120	3500	20.8 (3.2)	¾ (19)	4.2 (1.9)	5.3 (3.0)	6.7 (2.4)	Standard	VF①14A12T
		18	(457)	18	(457)	22	(559)	240	4900	19.4 (3.0)	½ (13)	6.1 (2.8)	7.6 (4.1)	9.1 (3.4)	Standard	VF①14A18T
		24	(610)	18	(457)	28	(711)	240	7000	20.8 (3.2)	¾ (19)	8.5 (3.9)	10.5 (5.4)	11.9 (4.8)	Standard	VF①14A24T
		30	(762)	18	(457)	34	(864)	240/240	8400	20.0 (3.1)	¾ (19)	10.7 (4.9)	13.2 (6.6)	14.6 (6.0)	Standard	VF①14A30T②
		36	(914)	18	(457)	40	(1016)	240/240	9800	19.4 (3.0)	½ (13)	12.2 (5.5)	15.2 (7.5)	16.6 (6.9)	Standard	VF①14A36T②
16	(406)	12	(305)	20	(508)	16	(406)	120	3550	18.5 (2.9)	¾ (19)	4.7 (2.1)	5.7 (3.4)	7.4 (2.6)	Standard	VF①16A12T
		18	(457)	20	(508)	22	(559)	240	5750	20.0 (3.1)	¾ (19)	7.1 (3.2)	8.6 (4.7)	10.3 (3.9)	Standard	VF①16A18T
		24	(610)	20	(508)	28	(711)	240	7100	18.5 (2.9)	¾ (19)	9.5 (4.3)	11.5 (6.0)	13.2 (5.2)	Standard	VF①16A24T
		30	(762)	20	(508)	34	(864)	240/240	9600	20.0 (3.1)	½ (13)	11.7 (5.3)	14.2 (7.2)	15.9 (6.4)	Standard	VF①16A30T②
		36	(914)	20	(508)	40	(1016)	240/240	11,500	20.0 (3.1)	¾ (19)	14.2 (6.4)	17.2 (8.6)	18.9 (7.8)	Standard	VF①16A36T②

All units in this table are suitable for use up to 1800°F (982°C) maximum surface temperature.

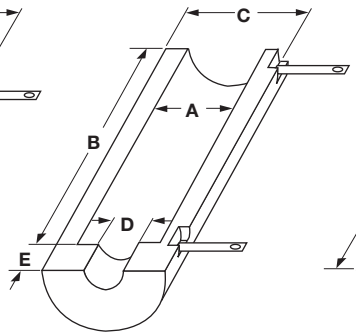
① Add Type number (Type 5 - 8) in the blank position in the code number, example: **VF806A12T**. For unheated units, see catalog page 490.
Sinuated wire, high watt density units are provided with embedded sinuated elements and high emissivity coating, unless exposed sinuated is specified when manufactured. (These are not stocked.) Contact your Watlow representative.

② These units have dual elements, to be used in "parallel" for 240V usage. Alternate designs are available for 480V, 277V and three-phase (internally wired). Contact your Watlow representative.

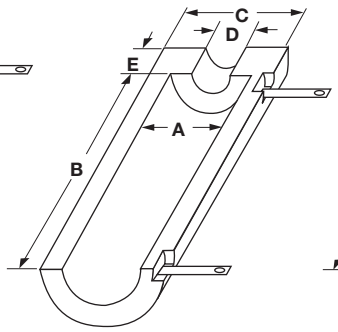
Ceramic Fiber Heaters



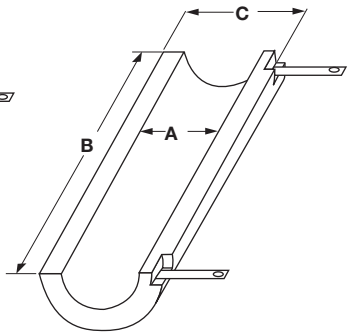
Type 1
Full Vestibule
(Style A Leads Illustrated)
(Default Lead Style)



Type 2
Left Vestibule
(Style A Leads Illustrated)



Type 3
Right Vestibule
(Style A Leads Illustrated)



Type 4
No Vestibule
(Style A Leads Illustrated)

Semi-Cylindrical Units—High Watt Density Sinuated Elements (see page 478)

Dimensions, in. (mm)						Electrical Ratings			Strip Lead Width in. (mm)	Approx. Net Wt.		Avail.	Code Number
Type 4 Heater Size			Type 1, 2, & 3 Sizes										
			Vestibule Sizes										
I.D. (A) in. (mm) ±⅛ (±3.2)	Length (B) in. (mm) +1/16 -⅛ (+1.6 - 3.2)	O.D. (C) in. (mm) (Ref)	Length (L) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Dia. (D) in. (mm) ±⅛ (±3.2)	Length (E) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Volts	Power (Watts) ±5%	Surface Loading W/in² (W/cm²)		Type 1 Full Vest. lbs (kg)	Type 4 No Vest. lbs (kg)		
5 (127)	6 (152)	9 (229)	11 (279)	3½ (89)	2½ (64)	60	750	15.9 (2.5)	⅜ (10)	3.1 (1.4)	2.3 (1.0)	Standard	VS①05A06T
	12 (305)	9 (229)	17 (432)	3½ (89)	2½ (64)	60	1400	14.9 (2.3)	¾ (19)	4.5 (2.0)	3.6 (1.6)	Standard	VS①05A12T
	18 (457)	9 (229)	23 (584)	3½ (89)	2½ (64)	120	2100	14.9 (2.3)	½ (13)	5.2 (2.4)	4.3 (2.0)	Standard	VS①05A18T
	24 (610)	9 (229)	29 (737)	3½ (89)	2½ (64)	120	2800	14.9 (2.3)	¾ (19)	6.9 (3.1)	6.0 (2.7)	Standard	VS①05A24T
	30 (762)	9 (229)	35 (889)	3½ (89)	2½ (64)	240	3500	14.9 (2.3)	½ (13)	8.3 (3.8)	7.4 (3.4)	Standard	VS①05A30T
	36 (914)	9 (229)	41 (102)	3½ (89)	2½ (64)	240	4200	14.9 (2.3)	½ (13)	9.6 (4.4)	8.7 (3.9)	Standard	VS①05A36T
6½ (165)	6 (152)	10½ (267)	12 (305)	5 (127)	3 (76)	60	1000	16.3 (2.5)	½ (13)	3.6 (1.6)	2.4 (1.1)	Standard	VS①06J06T
	12 (305)	10½ (267)	18 (457)	5 (127)	3 (76)	120	2000	16.3 (2.5)	½ (13)	5.1 (2.3)	3.9 (1.8)	Standard	VS①06J12T
	18 (457)	10½ (267)	24 (610)	5 (127)	3 (76)	120	3000	16.3 (2.5)	¾ (19)	6.8 (3.1)	5.6 (2.5)	Standard	VS①06J18T
	24 (610)	10½ (267)	30 (762)	5 (127)	3 (76)	240	4000	16.3 (2.5)	½ (13)	9.5 (4.3)	7.4 (3.4)	Standard	VS①06J24T
	30 (762)	10½ (267)	36 (914)	5 (127)	3 (76)	240	5000	16.3 (2.5)	½ (13)	11.0 (5.0)	9.3 (4.2)	Standard	VS①06J30T
	36 (914)	10½ (267)	42 (1067)	5 (127)	3 (76)	240	6000	16.3 (2.5)	¾ (19)	12.4 (5.6)	11.2 (5.1)	Standard	VS①06J36T
8 (203)	6 (152)	12 (305)	12 (305)	6½ (165)	3 (76)	60	1300	17.2 (2.7)	½ (13)	4.1 (1.9)	2.6 (1.2)	Standard	VS①08A06T
	12 (305)	12 (305)	18 (457)	6½ (165)	3 (76)	120	2600	17.2 (2.7)	½ (13)	6.9 (3.1)	5.4 (2.4)	Standard	VS①08A12T
	18 (457)	12 (305)	24 (610)	6½ (165)	3 (76)	240	3900	17.2 (2.7)	½ (13)	8.5 (3.9)	7.0 (3.2)	Standard	VS①08A18T
	24 (610)	12 (305)	30 (762)	6½ (165)	3 (76)	240	5200	17.2 (2.7)	½ (13)	12.0 (5.4)	10.5 (4.8)	Standard	VS①08A24T
	30 (762)	12 (305)	36 (914)	6½ (165)	3 (76)	240	6250	16.7 (2.6)	¾ (19)	13.8 (6.3)	12.3 (5.6)	Standard	VS①08A30T
	36 (914)	12 (305)	42 (1067)	6½ (165)	3 (76)	240/240	7800	17.2 (2.7)	¾ (19)	15.6 (7.1)	14.1 (6.4)	Standard	VS①08A36T②

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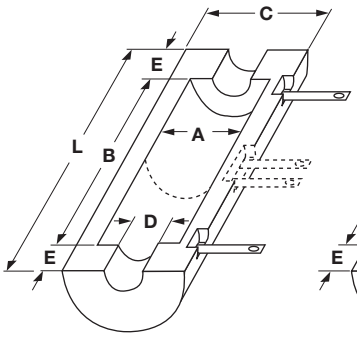
All units in this table have 2 ±¼ inch thick walls.

All units in this table are suitable for use up to 1800°F (982°C) maximum surface temperature.

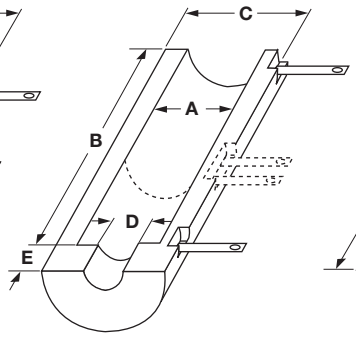
① Add Type number (Type 1 - 4) in the blank position in the code number, example: **VS1106J06T**. For unheated units, see catalog page 490.
Sinuated wire, high watt density units are provided with embedded sinuated elements and high emissivity coating, unless exposed sinuated is specified when manufactured. (These are not stocked.) Contact your Watlow representative.
Overall length applies only to the full vestibule (Type 1) units. Types 2 and 3 are shorter by one vestibule length. Type 4 length equals **(B)**.
Type 2 (left vestibule) and Type 3 (right vestibule) style units are not stocked. They are, however, still standard units and designs are kept on file.

② These units have dual elements, to be used in "parallel" for 240V usage. Alternate designs are available for 480V, 277V and three-phase (internally wired). Contact your Watlow representative.

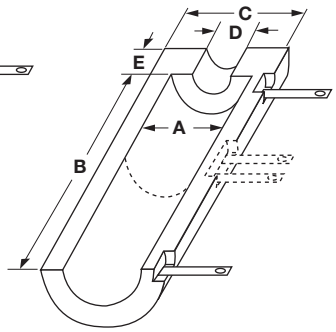
Ceramic Fiber Heaters



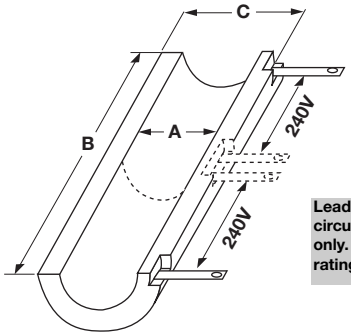
Type 1
Full Vestibule
(Style A Leads Illustrated)
(Default Lead Style)



Type 2
Left Vestibule
(Style A Leads Illustrated)



Type 3
Right Vestibule
(Style A Leads Illustrated)



Type 4
No Vestibule
(Style A Leads Illustrated)

Leads on dual circuit units only. See ratings below.

Semi-Cylindrical Units—High Watt Density Sinuated Elements (see page 478)

Dimensions, in. (mm)						Electrical Ratings			Strip Lead Width in. (mm)	Approx. Net Wt.		Avail.	Code Number
Type 4 Heater Size			Type 1, 2, & 3 Sizes										
			Vestibule Sizes										
I.D. (A) in. (mm) ±⅛ (±3.2)	Length (B) in. (mm) +1/16 -⅛ (+1.6 - 3.2)	O.D. (C) in. (mm) (Ref)	Length (L) in. (mm) +1/16 -⅛ (+1.6 - 3.2)	Dia. (D) in. (mm) ±⅛ (±3.2)	Length (E) in. (mm) +1/16 - ⅛ (+1.6 - 3.2)	Volts	Power (Watts) ±5%	Surface Loading W/in² (W/cm²)		Type 1 Full Vest. lbs (kg)	Type 4 No Vest. lbs (kg)		
10 (254)	12 (305)	14 (356)	18 (457)	8 (203)	3 (76)	240	3200	17.0 (2.6)	½ (13)	8.5 (3.9)	5.8 (2.6)	Standard	VS①10A12T
	18 (457)	14 (356)	24 (610)	8 (203)	3 (76)	240	4800	17.0 (2.6)	½ (13)	12.0 (5.4)	9.3 (4.2)	Standard	VS①10A18T
	24 (610)	14 (356)	30 (762)	8 (203)	3 (76)	240	6400	17.0 (2.6)	¾ (19)	13.8 (6.3)	11.1 (5.0)	Standard	VS①10A24T
	30 (762)	14 (356)	36 (914)	8 (203)	3 (76)	240/240	8000	17.0 (2.6)	¾ (19)	17.6 (8.0)	14.9 (6.8)	Standard	VS①10A30T②
	36 (914)	14 (356)	42 (1067)	8 (203)	3 (76)	240/240	9600	17.0 (2.6)	½ (13)	21.3 (9.7)	18.6 (8.4)	Standard	VS①10A36T②
12 (305)	12 (305)	16 (406)	18 (457)	10 (254)	3 (76)	240	3800	16.8 (2.6)	½ (13)	8.9 (4.0)	5.9 (2.7)	Standard	VS①12A12T
	18 (457)	16 (406)	24 (610)	10 (254)	3 (76)	240	5700	16.8 (2.6)	¾ (19)	11.2 (5.1)	8.1 (3.7)	Standard	VS①12A18T
	24 (610)	16 (406)	30 (762)	10 (254)	3 (76)	240	7600	16.8 (2.6)	¾ (19)	16.7 (7.6)	13.6 (6.2)	Standard	VS①12A24T
	30 (762)	16 (406)	36 (914)	10 (254)	3 (76)	240/240	9600	17.0 (2.6)	½ (13)	18.0 (8.2)	14.9 (6.8)	Standard	VS①12A30T②
	36 (914)	16 (406)	42 (1067)	10 (254)	3 (76)	240/240	11400	16.8 (2.6)	¾ (19)	19.2 (8.7)	16.1 (7.3)	Standard	VS①12A36T②
14 (356)	12 (305)	18 (457)	18 (457)	12 (305)	3 (76)	240	4400	16.7 (2.6)	½ (13)	11.4 (5.2)	7.7 (3.5)	Standard	VS①14A12T
	18 (457)	18 (457)	24 (610)	12 (305)	3 (76)	240	6600	16.7 (2.6)	¾ (19)	12.9 (5.9)	9.4 (4.3)	Standard	VS①14A18T
	24 (610)	18 (457)	30 (762)	12 (305)	3 (76)	240/240	8800	16.7 (2.6)	½ (13)	16.3 (7.4)	12.7 (5.8)	Standard	VS①14A24T②
	30 (762)	18 (457)	36 (914)	12 (305)	3 (76)	240/240	11400	17.3 (2.7)	¾ (19)	19.4 (8.8)	15.8 (7.2)	Standard	VS①14A30T②
	36 (914)	18 (457)	42 (1067)	12 (305)	3 (76)	240/240	13200	16.7 (2.6)	¾ (19)	22.4 (10.2)	18.8 (8.5)	Standard	VS①14A36T②
16 (406)	12 (305)	20 (508)	18 (457)	14 (356)	3 (76)	240	5000	16.6 (2.6)	½ (13)	11.8 (5.4)	8.0 (3.6)	Standard	VS①16A12T
	18 (457)	20 (508)	24 (610)	14 (356)	3 (76)	240/240	7500	16.6 (2.6)	¾ (19)	15.1 (6.8)	11.3 (5.1)	Standard	VS①16A18T
	24 (610)	20 (508)	30 (762)	14 (356)	3 (76)	240/240	10,000	16.6 (2.6)	½ (13)	18.1 (8.2)	14.3 (6.5)	Standard	VS①16A24T②
	30 (762)	20 (508)	36 (914)	14 (356)	3 (76)	240/240	12,800	16.8 (2.6)	¾ (19)	22.3 (10.1)	18.5 (8.4)	Standard	VS①16A30T②
	36 (914)	20 (508)	42 (1067)	14 (356)	3 (76)	240/240	15,000	16.6 (2.6)	¾ (19)	26.4 (12.0)	22.6(10.3)	Standard	VS①16A36T②

All units in this table have 2 ±¼ inch thick walls.

All units in this table are suitable for use up to 1800°F (982°C) maximum surface temperature.

① Add Type number (Type 1 through 4) in the blank position in the code number, example **VS106J06T**. For unheated units, see catalog page 490. Sinuated wire, high watt density units are provided with embedded sinuated elements and high emissivity coating, unless exposed sinuated is specified when manufactured. (These are not stocked.) Contact your Watlow representative.

Overall length applies only to the full vestibule (Type 1) units. Types 2 and 3 are shorter by one Vestibule length. Type 4 length equals **(B)**.

Type 2 (left vestibule) and Type 3 (right vestibule) style units are not stocked. They are, however, still standard units and designs are kept on file.

② These units have dual elements, to be used in "parallel" for 240V usage. Alternate designs are available for 480V, 277V and three-phase (internally wired). Contact your Watlow representative.

Ceramic Fiber Heaters

How to Order

Made-to-Order Units

Ordering Information

Quantity: When ordering, specify quantity of units desired. Semi-cylindrical units are sold as "each half." Two to make the pair are usually required. Please include the number of desired spares or extras in the total quantity.

Code number: Use code number if an exact reorder of a previously designed made-to-order unit is needed. Please reconfirm volts and watts, and lead orientation and length. Most stock and standard heaters allow selection of several stock modifications (see page 491) and also termination options (see pages 484 and 485).

Dimensions for made-to-order units: Include drawing if possible. Specify heated area, width and length, overall width/length, thickness, electrical ratings, etc.

Wattage: 6.5 to 25 W/in^2 (1.0 - 3.9 W/cm^2) on the heating surface is the recommended watt density range, for operation in the 1500 to 2200°F (815 - 1204°C) range. (Note: At the higher temperatures, lower watt densities must be employed.) Please provide operating temperatures and conditions. Contact your Watlow representative for higher watt densities at other temperatures. Generally, for higher operating temperature limits, lower watt densities will have to be used.

Voltage: 60, 120 and 240V~(ac) are provided on the stock/standard units, but up to 600 volts is possible on made-to-order units. Internally connected three-lead, three-phase units are also possible on made-to-order units (these are normally internally wye-connected). Contact your Watlow representative on special voltage requirements.

Leads: Lead length and orientation (i.e. **Style A, B or C**). Lead **Style A**, 12 in. (305 mm) long is standard.

Shipping weight: The product listing tables show net weights per unit. To estimate gross shipping weight, add another 30 percent to the total. Additional shipping/packaging charges may be incurred for certain large orders. Due to the light weight but large sizes of these heaters, dimensional box weights (DIM) weighting may occur on expedited air shipments.

Ordering Hints

Ordering ceramic fiber heaters is easy. However, it's very important to pay attention to code numbers and special modifications details.

- Always fill in the "..._..." (blank) code position with the correct Type number (see illustrations above the charts).
- Always provide the correct Lead Style letter. (See suggested illustrations above the charts, but remember, the Style A-12 will be the default lead if not otherwise specified.)
- Supply drawing or sketches whenever possible. These reduce confusion.
- When ordering Type 6, 7, 8 units, be certain of the heated area and no-heat area orientations desired.
- When planning to order the non-stocked Type 2 and/or Type 3 units (left or right vestibule), there are three options to consider, two of which could be used on the Type 1 stocked items:

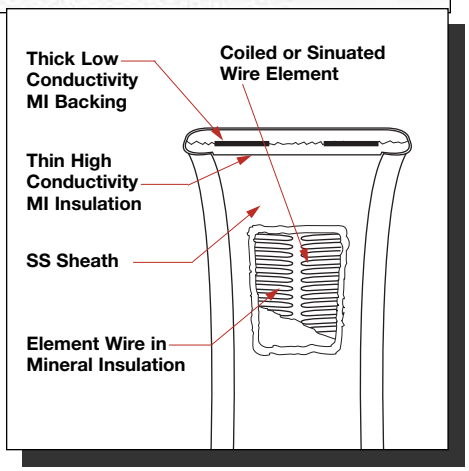
1. Order the appropriate stocked full vestibule unit and the customer carefully removes the unneeded vestibule themselves.
2. Order the stocked full vestibule unit and, prior to shipping, have Watlow remove the unneeded vestibule, as a stock modification. There is a small additional charge for this.
3. Special order the desired Type 2 or 3 unit. This requires custom manufacturing the heater and will increase delivery time, but will keep costs to a minimum.

Mineral Insulated Band Heaters

The mineral insulated (MI) band heater from Watlow® is a high-performance heater. Its performance and name are derived from Watlow's exclusive mineral insulation—a material with much higher thermal conductivity than mica and hard ceramic insulators used in conventional heaters.

A thin layer of the "high" thermal conductive MI material is used to electrically insulate the element wire from the inside diameter of the heater sheath. A thicker, "low" thermal conductivity layer backs up the element wire directing the heat inward toward the part being heated. The result is more efficient heat transfer—a performance solution lowering element wire temperatures and increasing heater life.





Features and Benefits

Operating temperatures up to 1400°F (760°C)

- Allows safe melting of resins such as PEEK®, Teflon®, Ultem® and Zytel®

Higher watt densities

- Contributes to faster heat-up and throughput for increased productivity

High thermal conductivity of MI and low mass construction

- Gives an almost instant response to temperature control
- Eliminates thermal lag and temperature overshoot associated with ceramic knuckle heaters

Stainless steel cover and side fold design

- Resists contamination from overflow of plastic or other free-flowing materials

Permanently attached clamp bars

- Eliminates cumbersome clamping straps
- Makes installation easier

For detailed product and ordering information see the full MI Band Heater product section located on pages 505 through 516.

Band/Barrel Heaters

Band/Barrel Heaters

Mineral Insulated Band Heaters 505

THINBAND® Mica Heaters 517

Special Mica Band Heaters 537

Ceramic Knuckle Band Heaters.....547

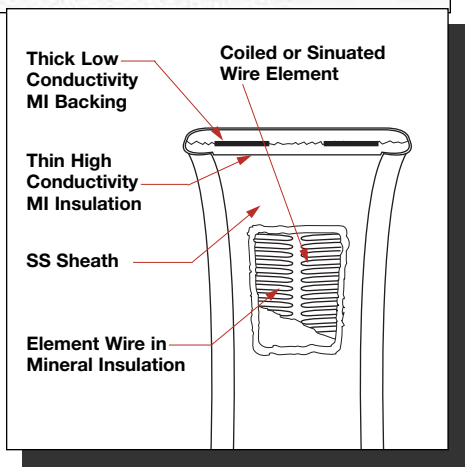


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Performance Capabilities

- Heater operating temperatures to 1400°F (760°C)
- Watt densities to 100 W/in^2 (15.5 W/cm^2) available on large diameter barrel bands

Features and Benefits

Operating temperatures up to 1400°F (760°C)

- Allows safe melting of resins such as PEEK®, Teflon®, Ultem® and Zytel®

Higher watt densities

- Contributes to faster heat-up and throughput for increased productivity

High thermal conductivity of MI and low mass construction

- Gives an almost instant response to temperature control
- Eliminates thermal lag and temperature overshoot associated with ceramic knuckle heaters

Stainless steel cover and side fold design

- Resists contamination from overflow of plastic or other free-flowing materials

Permanently attached clamp bars

- Eliminates cumbersome clamping straps, making installation easier

Applications

- Extruders
- Blown film dies
- Injection molding machines
- Other cylinder heating applications

Mineral Insulated Band Heaters

Applications and Technical Data

The *Physical Limitations of Variations* table shows you the availability of widths, inside diameters and terminations for Watlow's MI band and barrel heaters. To make sure the available terminations will meet your application needs, refer to the illustrations of termination variations in this section.

If you need to exceed limitations shown, contact your Watlow representative.

Physical Limitations of Variations

Width		I.D. Available — in. (mm)												Available Terminations
		1 pc. Construction				Expandable				2 pc. Construction				
		Min.		Max.		Min.		Max.		Min.		Max.		
in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	
1	(25.0)	1	(25)	6	(152)	3	(76)	12	(305)	3	(76)	12	(305)	All
1⅜	(34.9)	1	(25)	3	(76)	3	(76)	6	(152)	3	(76)	6	(152)	All - Except SLE
1½	(38.0)	1	(25)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
2	(51.0)	1¼	(32)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
2½	(64.0)	1¼	(32)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
3	(76.0)	1½	(38)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
3½	(89.0)	1¾	(45)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All - Except 90° "B" Leads
4	(102.0)	2	(51)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
4½	(114.0)	2¼	(57)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
5	(127.0)	2½	(64)	14	(356)	3	(76)	14	(356)	4	(102)	28	(711)	All - Except 90° "B" Leads
5½	(140.0)	2¾	(70)	14	(356)	3	(76)	14	(356)	4	(102)	28	(711)	Post Terminals, SLE only
6	(152.0)	3	(76)	14	(356)	3	(76)	14	(356)	4	(102)	28	(711)	All
7	(178.0)					4	(102)	14	(356)					Post Terminals, SLE only

General Limitations

- Maximum width of 1 in. (25 mm) diameter heater is 1½ in. (38 mm)
- Maximum heater width: 2x heater diameter
- Minimum I.D. for Type B, C, E and H leads: 1 in. (25 mm)
- Minimum I.D. for Type B—90° leads: 1⅛ in. (28.6 mm)
- Maximum lead amperes: 12.5A per pair
- SLE maximum: 17.0A
- Maximum amperes (post terminals): 30A per pair
- Minimum diameter and width for SLE: 4 in. x 1½ in. (102 mm x 38 mm) width
- 90° leads not available over 250V~(ac)
- Minimum I.D. for post terminals: 1¼ in. (32 mm)
- Actual width for 7 in. (178 mm) wide heater: 6⅞ in. (174.6 mm)

Standard Gaps

- ≤ 3 in. = ⅛ in. nominal
- 3 in. ≤ 6 in. = ¼ in. nominal ±⅛ in.
- 6 in. ≤14 in. = ⅜ in. nominal ±⅛ in.
- >14 in. = ½ in. nominal ±¼ in.

Mineral Insulated Band Heaters

Applications and Technical Data *(Continued)*

Calculating Watt Density

Watt density is the amount of wattage per square inch of heated area. To determine watt density, divide the total wattage by the heated area.

$$\text{Watt Density} = \frac{\text{Total Watts}}{\text{Heated Area}}$$

To apply this equation, we must define the term "heated area." Heated area is the total contact surface of the heater less areas of no-heat found around terminals, mounting holes, etc.

Heated Area =Total Contact Area - No-Heat Area

To calculate the heated area:

1. Locate the **no-heat factor** from the chart below that corresponds to the type of heater being considered.

Type	Factor in.
1 pc. lead unit Type B, C, H, E or 90°B	1.37
1 pc. post terminal	1.60
1 pc. expandable post term	3.18
1 pc. expandable lead unit	3.00
True 2 pc. post term	3.20
True 2 pc. leads	2.74
SLE	3.68

2. To use the formula below, insert the no-heat factors, diameter and width (in inches).

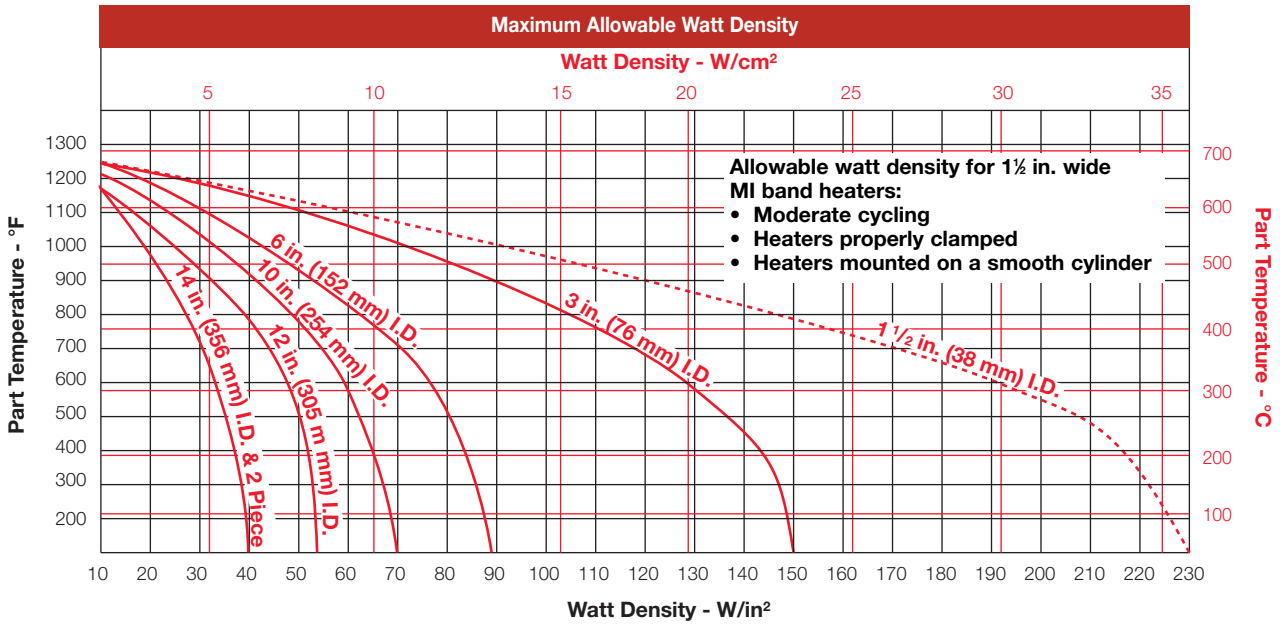
   Heated Area =
   (3.14 x Diameter - No-Heat Factor) x Width

Maximum Allowable Watt Density

The following derating factors apply to the *Maximum Allowable Watt Density* chart, which are shown in both inch base and metric for your convenience. Please review these factors and the chart to determine the correct watt density curve for your application.

Derating Factors:

- For units over 2 in. (51 mm) in width, multiply watt density by 0.80.
- In applications where unusual operating conditions are present, such as irregular mounting surfaces, contact your Watlow representative for watt density limitations.
- For two-piece units used in vertical applications, refer to *Clamping Matrix Application Guide* on page 508.
- For applications where insulating blankets are used, multiply watt density by 0.75.

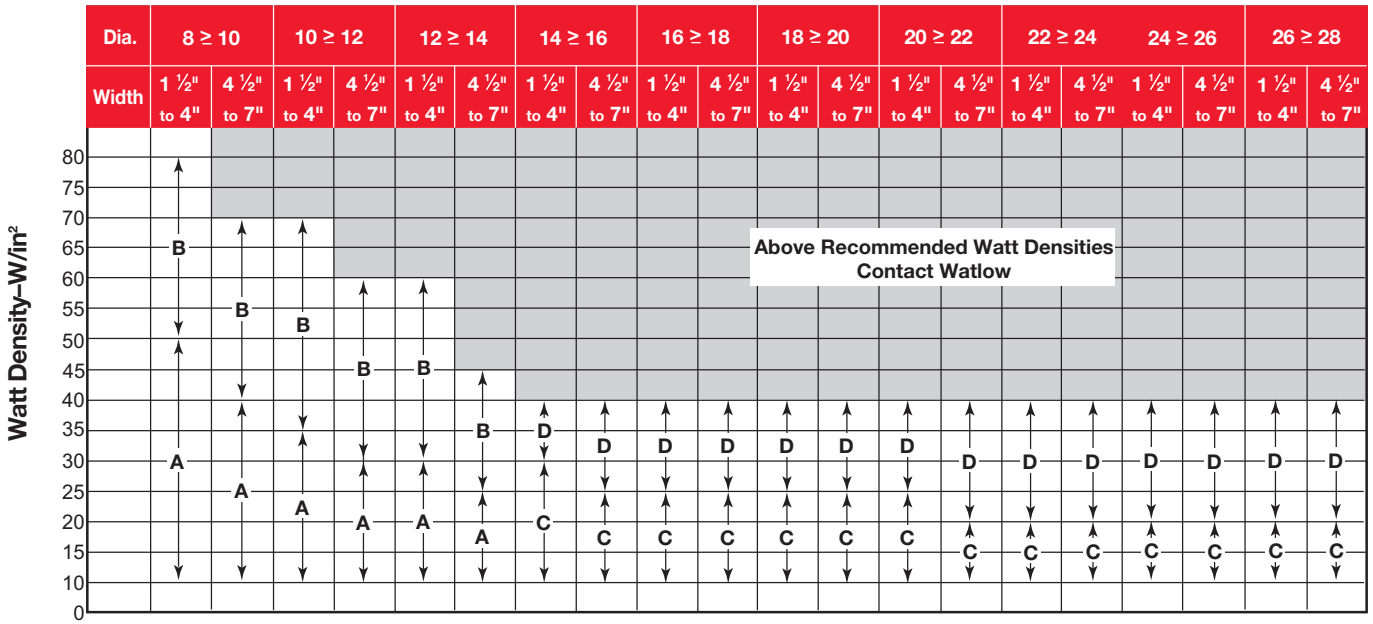


Mineral Insulated Band Heaters

Applications and Technical Data (Continued)

- Review the *Watt Density* chart to ensure the application does not exceed the maximum watt density at operating temperature after applying derating factors.
- Locate clamping guideline for unit diameter, width and watt density.
- Description of guideline letters are at the bottom of the *MI Band Clamping Matrix Application Guide.*
- **Note:** Upward arrows are up to and not including specified watt density. Downward arrows are greater than or equal to specified watt density.

MI Band Clamping Matrix Application Guide



A = Standard clamping, expandable or one piece construction
B = Spring clamps, expandable or one piece construction
C = Spring clamps, at one gap, welded barrel nuts at other gap
D = Spring clamps, spring clamps at both gaps

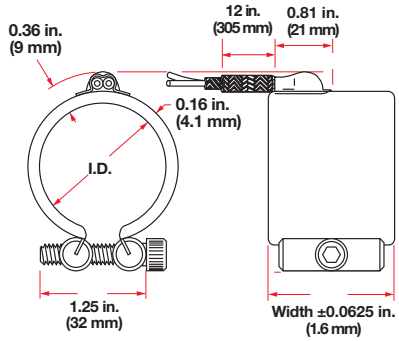
Width	Clamp Points at Each Gap
≥ 5 in. (127 mm)	3
≥ 3 in. (76 mm)	2
< 3 in. (76 mm)	1

Note: 1 in. (25 mm) wide heaters use welded barrel nuts rather than clamp bars.

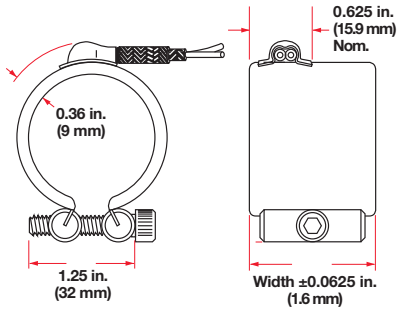
Mineral Insulated Band Heaters

Termination Variations

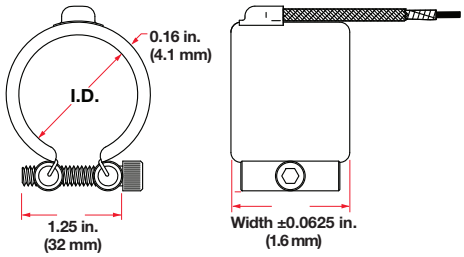
Type B
Stock



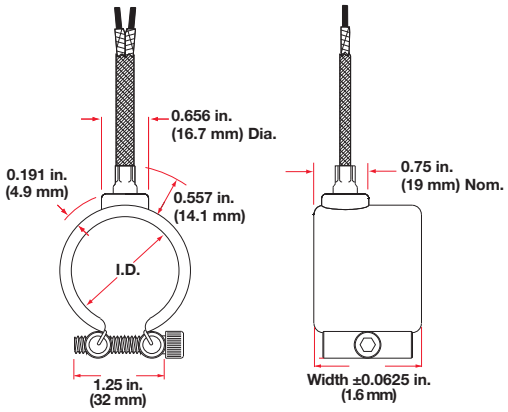
Type B - 90° Rotation
Non-Stock



Type B - 180° Rotation
Stock

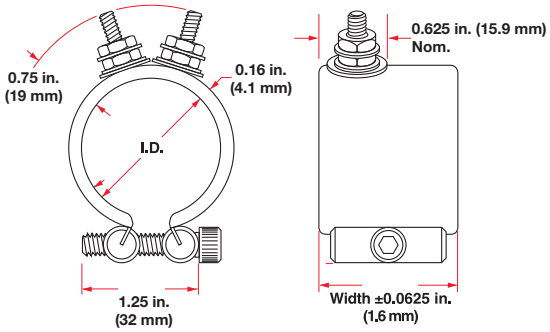


Type C
Stock



Leads Type B, Type B - 90° rotation, Type B - 180° rotation or Type C: Two fiberglass-insulated lead wires exit in a single metal braid for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **type** and **length.**

Post Terminals
Stock

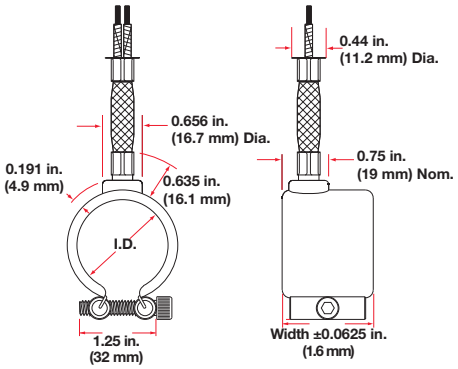


Post terminals provide optimum connections. Screw thread is 10-24. To order, specify **post terminals** (metric threads available).

Mineral Insulated Band Heaters

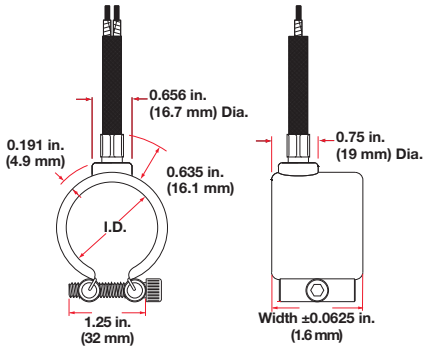
Termination Variations *(Continued)*

Type E
Stock



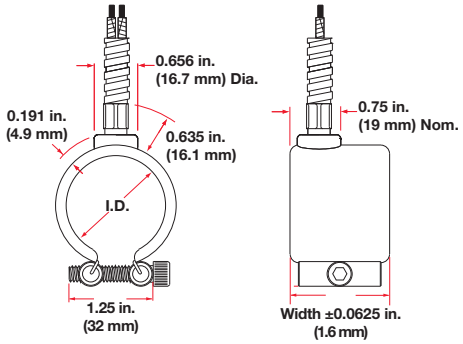
Type E: Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **Type E** and **length.**

Type F
Stock



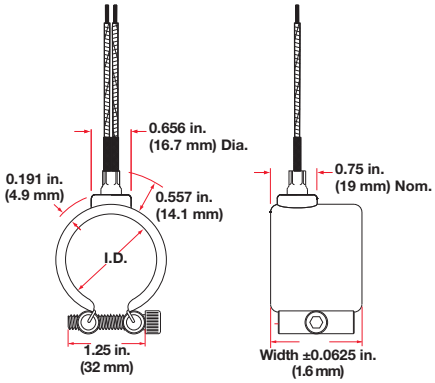
Type F: Loose fiberglass sleeving encloses two fiberglass leads for additional insulation protection where high temperature or minor abrasion is present. Leads are 2 in. (51 mm) longer than the sleeving. To order, specify **Type F** and **length**.

Type H
Stock



Type H: A flexible steel hose encloses the leads for maximum abrasion protection. Leads are 2 in. (51 mm) longer than hose. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **Type H** and **length.**

Type K
Stock

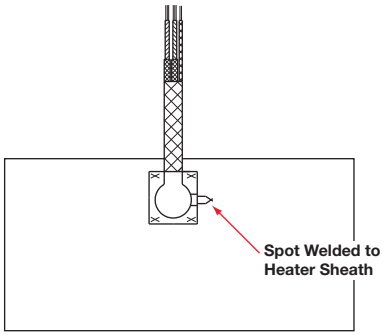


Type K: Flexible lead wires exit vertically from the heater. These leads can be bent adjacent to the heater for a quick and easy connection. To order, specify **Type K** and **length**.

Mineral Insulated Band Heaters

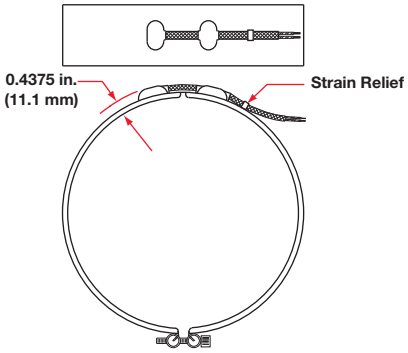
Variations

Thermocouple



ASTM Type J or K thermocouples are available on lead Type B with loose braid and fiberglass sleeving. They are also available on E, F and H leads. The thermocouple junction, spot-welded to the heater sheath, provides a signal for measuring relative heater temperature. A separate thermocouple is available.

Type SLE

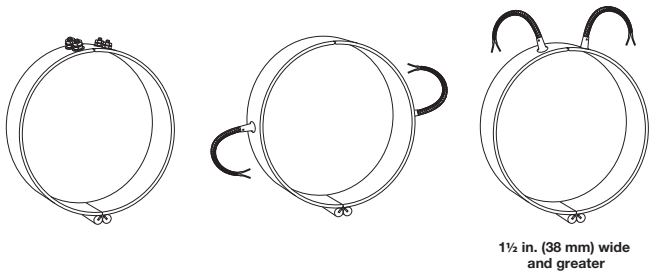


Two fiberglass lead wires exit a single, tightly woven metal braid at right angle on the expandable construction vs. two sets of leads. The minimum diameter capability is 4 in. (102 mm). Minimum width capability is 1½ in. (38 mm). To order, specify **Type SLE** and **length.**

Ground Wire

Insulated ground wire is available, contact your Watlow representative.

Expandable Heaters With Post Terminals or Leads



Expandable heaters are two-piece units with a common top metal allowing the heater to expand open to the full diameter of the barrel. On expandable bands, each half will be one half of the total wattage. Plus, on both expandable and two-piece bands, each half will be rated at full operating voltage, unless otherwise specified.

MI band heaters 1½ in. (38 mm) wide or greater will have post terminals located next to the expansion joint. Leads may be located anywhere along the circumference except near the gap and at the expansion joint. Two sets of leads required.

On 1 in. (25 mm) wide MI band heaters, post terminals will be located 90° from the expansion joint. Leads may be located anywhere along the circumference except near the gap and at the expansion joint. Two sets of leads are required. To order, specify **expandable.** Expandable heaters are designed to be opened for new installation only.

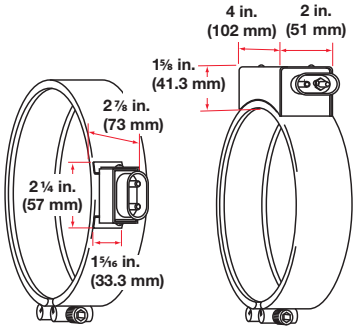
Lead Wire

Heaters rated at less than 250V~(ac) use UL® approved lead insulation for operations to 480°F (250°C) as standard. Lead insulation UL® rated for operation to 840°F (450°C) is available for high-temperature applications where the leads are shrouded or enclosed with the heater. These leads are available in any of the Type B with loose braid as well as Types E, F and H lead configurations. All heaters rated at more than 250V~(ac) use this wire. When ordering, specify **850°F (450°C) wire.**

Mineral Insulated Band Heaters

Variations *(Continued)*

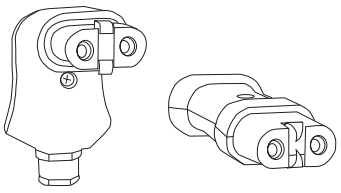
High Temperature "Quick Disconnect" European Style Plugs



Vertical **Horizontal**

They provide the simplest and safest way to apply power to band heaters. The combination of high-temperature male and female "quick disconnect" plug assemblies eliminates all live exposed terminals and electrical wiring that can be a potential hazard to employees or machine. Maximum 15 amperes at 240V~(ac), maximum 240V. To order, specify **vertical** or **horizontal** European plug.

High Temperature "Quick Disconnect" European Style Female Adapters

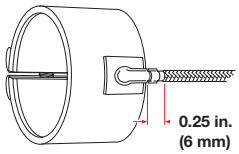


Right Angle
Code# N6027AF049

Straight
Code# N6027ZZ028

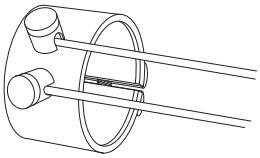
Available as an accessory item that must be used in conjunction with high-temperature "quick disconnect" European style plugs. To order, specify code number **N2027AF049** or **N6027ZZ028** and quantity.

Heavy Duty Strain Relief



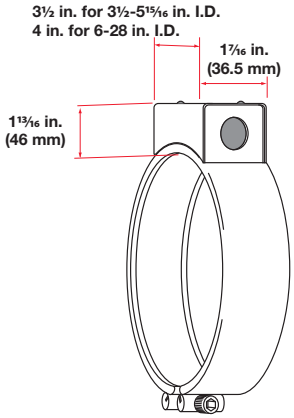
Heavy duty strain relief is recommended for applications where there is great stress or continued flexing of the leads. The strain relief is available on Type B, Type B - 90° and Type B - 180° leads only. To order, specify **heavy-duty strain relief. Note:** not available with loose braid or fiberglass sleeving.

Ceramic Terminal Cover



Ceramic covers, with openings for leads, are screwed on to post terminals, providing a convenient, economical insulator. To order, specify code number **Z-4918** and **quantity.** Ceramic terminal covers are also available in metric, specify thread. **Note:** Ceramic terminal covers will not fit on some stock expandable MI bands. Contact your Watlow representative for more information

Metallic Terminal Box



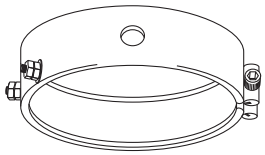
Metallic terminal boxes are available from stock on 3½ in. inside diameter x 1½ in. wide (89 mm x 38 mm) or larger heaters. Terminal boxes, which attach directly to the heater, act as a safety feature by covering the terminals. Conduit may be attached to the box through ⅞ in. (22.2 mm) diameter holes in the ends of the box. Two-piece heaters require two boxes. To order, specify **terminal box.**

Oversized terminal boxes are available on heaters 2 in. (51 mm) and wider. Contact your Watlow representative for more information.

Mineral Insulated Band Heaters

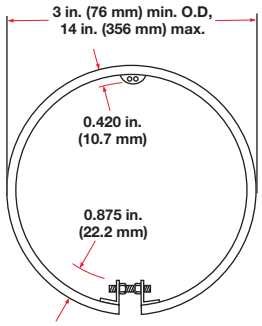
Variations *(Continued)*

MI Band Heater With Holes



MI band heaters with holes are available on all widths except 1 in. (25 mm) wide. Contact your Watlow representative for hole sizes and location restraints. To order, specify **hole size** and **location.** There is a 3 in. (76 mm) inside diameter minimum.

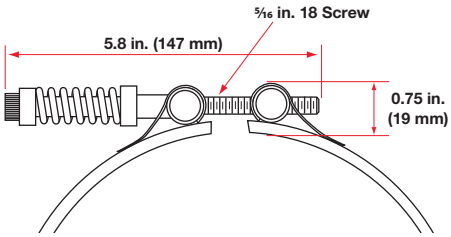
Outside Diameter Heater



Two fiberglass-insulated lead wires rated to 840°F (450°C) exit a metal braid 180° opposite from gap, Type B outside diameter designed and constructed to mate with inside diameter of cylinders. Maximum width for outside diameter heaters is 6 in. (152 mm) To order, specify **outside diameter and width** of heater.

Clamping Variations

Tig-Welded Barrel Nuts with Spring Loaded Clamping

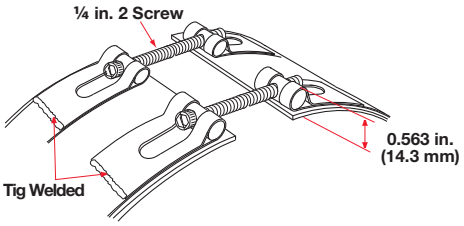


Welded barrel nuts with spring loaded clamping are used during start-up to maintain a tight heater fit on large barrels. This clamping variation is standard for all MI band heaters that are greater than 14 in. (356 mm) in diameter and 1½ in. (38 mm) or greater in width. Refer to *MI Band Clamping Matrix Application Guide*. For smaller diameter heaters, it is an option and must be ordered separately. To order, specify **spring loaded clamping.**

Low-Profile Tig-Welded Barrel Nuts

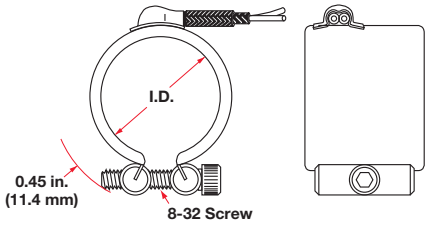
Low-profile barrel nuts are available on all widths. Low-profile barrel nuts have a clearance of 0.406 in. (10.3 mm), this will vary with heater diameter. To order, specify **low-profile tig-welded barrel nuts**.

Tig-Welded Barrel Nuts



An ideal way to provide access for instrumentation is to specify an oversized gap between the heater ends. If the clamp bar screw interferes with the positioning of the instrumentation device, welded barrel nuts are recommended (tig-welded barrel nuts are standard on 1 in. (25 mm) wide MI band heaters). To order, specify **tig-welded barrel nuts** and **gap dimension** when ordering.

Low-Profile Clamp Bars



Low-profile clamp bars are available on both 1 in. (25 mm) and 1½ in. (38 mm) wide heaters, for wider widths contact your Watlow representative. Watlow recommends not using low-profile clamping on diameters and widths greater than 3 in. (76 mm) The bars are ¼ in. (6 mm) diameter with an 8-32 screw. To order, specify **low-profile clamp bars.**

Mineral Insulated Band Heaters

Stock and Standard Heater Code Numbers

I.D. in.	I.D. (mm)	Width in.	Width (mm)	Construction	Volts	Watts	Watt Density W/in²	Watt Density (W/cm²)	Termination	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Avail.	Code Number
1	(25.0)	1	(25.0)	1 pc	120	150	92	(14.2)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN1**
		1	(25.0)	1 pc	120	100	61	(9.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN2**
		1	(25.0)	1 pc	120	200	122	(18.9)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN3**
		1	(25.0)	1 pc	240	200	122	(18.9)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN4**
		1½	(38.0)	1 pc	240	300	106	(16.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1JN1**
		1½	(38.0)	1 pc	120	300	106	(16.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1JN2**
		1½	(38.0)	1 pc	240	200	70	(10.8)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1JN3**
		1½	(38.0)	1 pc	120	200	70	(10.8)	Type B,C,E, F or H	0.1	(0.05)	Standard	**MB1A1JN4**
		1½	(38.0)	1 pc	240	400	141	(21.8)	Type B,C,E, F or H	0.1	(0.05)	Standard	**MB1A1JN5**
1¼	(32.0)	1	(25.0)	1 pc	240	250	104	(16.1)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1E1AN1**
		1	(25.0)	1 pc	120	250	104	(16.1)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1E1AN2**
		1	(25.0)	1 pc	240	300	124	(19.2)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1E1AN3**
		1½	(38.0)	1 pc	240	350	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1E1JN1**
		1½	(38.0)	1 pc	120	350	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1E1JN2**
		1½	(38.0)	1 pc	240	450	112	(17.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1E1JN3**
1½	(38.0)	1	(25.0)	1 pc	240	300	93	(14.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN1**
		1	(25.0)	1 pc	120	300	93	(14.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN2**
		1	(25.0)	1 pc	240	200	62	(9.6)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN3**
		1	(25.0)	1 pc	120	200	62	(9.6)	Type B,C,E, F or H	0.1	(0.05)	Standard	**MB1J1AN4**
		1	(25.0)	1 pc	240	400	125	(19.3)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN5**
		1½	(38.0)	1 pc	120	300	62	(9.6)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN1**
		1½	(38.0)	1 pc	240	450	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN2**
		1½	(38.0)	1 pc	240	300	62	(9.6)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN3**
		1½	(38.0)	1 pc	240	600	116	(17.9)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN4**
		1½	(38.0)	1 pc	240	300	62	(9.6)	Post	0.2	(0.09)	Standard	**MB1J1JP4**
		1½	(38.0)	1 pc	240	450	96	(14.8)	Post	0.2	(0.09)	Stock	**MB1J1JP6**
		2	(51.0)	1 pc	240	450	57	(8.8)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1J2AN1**
		2	(51.0)	1 pc	240	300	42	(6.5)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1J2AN2**
		2	(51.0)	1 pc	240	900	125	(19.3)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1J2AN3**
		3	(76.0)	1 pc	240	500	45	(7.0)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB1J3AN1**
		3	(76.0)	1 pc	240	350	31	(4.8)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB1J3AN2**
		3	(76.0)	1 pc	240	1000	104	(16.1)	Type B,C,E, F or H	0.4	(0.18)	Standard	**MB1J3AN3**
1¾	(45.0)	1⅜	(34.9)	1 pc	240	450	83	(12.9)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB1N1GX3A**
		1½	(38.0)	1 pc	240	300	47	(7.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1N1JN1**
		1½	(38.0)	1 pc	120	300	50	(7.7)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1N1JN2**
		1½	(38.0)	1 pc	240	700	110	(17.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1N1JN3**
		2	(51.0)	1 pc	240	750	86	(13.3)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1N2AN1**
2	(51.0)	1	(25.0)	1 pc	240	350	73	(11.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2A1AN1**
		1	(25.0)	1 pc	120	350	73	(11.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2A1AN2**
		1	(25.0)	1 pc	240	450	94	(14.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2A1AN3**
		1	(25.0)	1 pc	240	350	73	(10.3)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB2A1AX6B**

CONTINUED

Mineral Insulated Band Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in.	I.D. (mm)	Width in.	Width (mm)	Construction	Volts	Watts	Watt Density W/in²	Watt Density (W/cm²)	Termination	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Avail.	Code Number
2	(51.0)	1½	(38.0)	1pc	240	400	53	(8.2)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB2A1JN1**
		1½	(38.0)	1pc	240	1000	132	(20.4)	Type B,C,E, F or H	0.3	(0.14)	Standard	**MB2A1JN2**
		2	(51.0)	1pc	240	750	75	(11.6)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB2A2AN1**
		2	(51.0)	1pc	240	1200	125	(19.3)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB2A2AN2**
		2	(51.0)	1pc	240	750	75	(11.6)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB2A2AX2A**
2¼	(57.0)	2	(51.0)	1pc	240	750	63	(9.7)	120 in. 180° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB2E2AX7**
		2½	(64.0)	1 pc	240	1000	72	(11.2)	Type B,C,E, F or H	0.5	(0.23)	Stock	**MB2E2JN1**
2½	(64.0)	1	(25.0)	1 pc	240	400	63	(9.7)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2J1AN1**
		1½	(38.0)	1 pc	240	500	50	(7.7)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB2J1JN1**
3	(76.0)	1	(25.0)	1 pc	240	400	54	(8.4)	Post	0.3	(0.14)	Stock	**MB3A1AP1**
		1½	(38.0)	1 pc	240	500	40	(6.2)	Post	0.4	(0.18)	Stock	**MB3A1JP1**
		1½	(38.0)	2 pc exp	230/460	525	53	(8.2)	Post	0.4	(0.18)	Stock	**ME3A1JP10**
3½	(89.0)	2	(51.0)	1 pc	240	800	42	(6.5)	Post	0.7	(0.32)	Stock	**MB3J2AP2**
3⅝	(92.1)	1½	(38.0)	2 pc exp	230/460	650	51	(7.9)	Post	0.5	(0.23)	Stock	**ME3L1JP5**
4	(102.0)	1	(25.0)	1 pc	240	700	62	(9.6)	Post	0.4	(0.18)	Stock	**MB4A1AP1**
		1½	(38.0)	1 pc	240	800	48	(7.4)	Post	0.6	(0.27)	Stock	**MB4A1JP2**
		1½	(38.0)	2 pc exp	230/460	625	43	(6.7)	Post	0.6	(0.27)	Stock	**ME4A1JP11**
		1½	(38.0)	2 pc exp	230/460	725	50	(7.8)	Post	0.6	(0.27)	Stock	**ME4A1JP12**
4½	(114.0)	2½	(64.0)	1pc	240	1250	40	(6.2)	Post	1.0	(0.45)	Stock	**MB4J2JP1**
5	(127.0)	1½	(38.0)	2 pc exp	240/480	1000	52	(8.1)	Post	0.8	(0.36)	Stock	**ME5A1JP8**
5¼	(133.0)	1½	(38.0)	2 pc exp	240/480	1000	48	(7.4)	Post	0.8	(0.36)	Standard	**ME5E1JP1**
		1½	(38.0)	2 pc exp	230/460	600	29	(4.5)	Post	0.7	(0.32)	Stock	**ME5E1JP9**
		3	(76.0)	2 pc exp	230/460	1700	40	(6.2)	Post	1.5	(0.68)	Stock	**ME5E3AP5**
		4½	(114.0)	2 pc exp	230/460	2400	38	(5.9)	Post	2.2	(1.00)	Stock	**ME5E4JP2**
		4½	(114.0)	2 pc exp	230/460	2700	43	(6.6)	Post	2.2	(1.00)	Standard	**ME5E4JP3**
5½	(140.0)	1½	(38.0)	2 pc exp	240/480	1000	46	(7.1)	Post	0.9	(0.40)	Stock	**ME5J1JP1**
6	(152.0)	1½	(38.0)	2 pc exp	240/480	1000	41	(6.4)	Post	0.9	(0.40)	Stock	**ME6A1JP2**
6½	(165.0)	1½	(38.0)	2 pc exp	240/480	1250	47	(7.3)	Post	1.0	(0.45)	Stock	**ME6J1JP5**
6¾	(171.0)	1½	(38.0)	2 pc exp	230/460	815	29	(4.5)	Post	0.9	(0.40)	Standard	**ME6N1JP6**
		1½	(38.0)	2 pc exp	230/460	1000	36	(5.6)	Post	0.9	(0.40)	Standard	**ME6N1JP7**
		4	(102.0)	2 pc exp	230/460	2600	35	(5.4)	Post	2.5	(1.10)	Stock	**ME6N4AP2**
		5	(127.0)	2 pc exp	230/460	3700	40	(6.2)	Post	3.2	(1.50)	Standard	**ME6N5AP3**
		6	(152.0)	2 pc exp	230/460	3750	33	(5.1)	Post	3.8	(1.70)	Standard	**ME6N6AP5**
7	(178.0)	1½	(38.0)	2 pc exp	240/480	1250	43	(6.6)	Post	1.1	(0.50)	Standard	**ME7A1JP4**
7½	(191.0)	1½	(38.0)	2 pc exp	240/480	1500	47	(7.3)	Post	1.1	(0.50)	Stock	**ME7J1JP4**
7⅝	(193.7)	3	(76.0)	2 pc exp	230/460	1800	28	(4.3)	Post	2.2	(1.00)	Standard	**ME7L3AP1**
8	(203.0)	1½	(38.0)	2 pc exp	240/480	1250	37	(5.7)	Post	1.2	(0.54)	Stock	**ME8A1JP4**
9	(229.0)	1½	(38.0)	2 pc exp	240/480	1500	39	(6.0)	Post	1.4	(0.64)	Stock	**ME9A1JP1**
9½	(241.0)	3	(76.0)	2 pc exp	230/460	3000	37	(5.7)	Post	2.6	(1.20)	Stock	**ME9J3AP2**
11¼	(286.0)	3	(76.0)	2 pc exp	230/460	2400	24	(3.7)	Post	3.2	(1.50)	Standard	**ME11E3AP2**
		5	(127.0)	2 pc exp	230/460	5100	31	(4.8)	Post	5.2	(2.40)	Stock	**ME11E5AP1**

Notes:
All lead units are available with any length Type B, C, E, F or Type H leads.
Type B 90° rotation not available from stock.

Availability
Stock: Same day shipment on MI band heaters with post terminals or 12 inch Type B leads. Longer lead lengths or other terminations will ship next day.

Standard: Please contact your Watlow representative for lead times.

Mineral Insulated Band Heaters

How to Order

To order your stock MI band heater, specify:

- Quantity
- Watlow code number
- Options

Availability

Stock: Same day shipment on MI band heaters with post terminals.

Made-to-Order: If stock units do not meet application needs, Watlow can manufacture MI band heaters to special requirements. Please contact your Watlow representative.

THINBAND® Mica Heaters

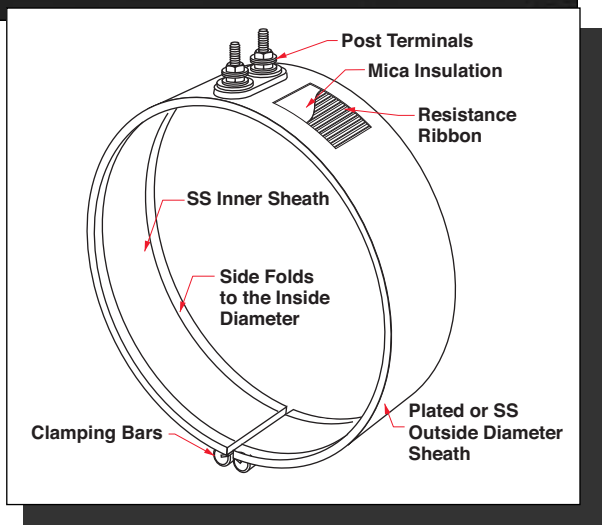
The THINBAND® heater from Watlow® is a patented redesign of the mica band. THINBAND heaters have faster delivery and install easily, keeping costs down and machines running.

Performance Capabilities

- Sheath temperatures to 900°F (480°C)
- Watt densities to 55 W/in² (8.5 W/cm²)







Features and Benefits

Flexible, one-piece design

- Makes installation easier on plastic processing equipment because it can open to full diameter of the barrel without internal damage to the heater
- Installs on a barrel without removing other band heaters already in place

Same day shipment on more than 1,000 variations available because of Watlow's Lead Adapter (LA) manufacturing method

- Reduces inventories and costly downtimes

Only one set of leads or terminals are needed

- Ends the need for two sets required by cumbersome, two-piece replacement heaters

QUICK CLAMP

- Opens to fit over barrels and snaps in place with one easy flip of its latching lever
- Eliminates the need to remove other heaters

No folds on the outside of the heater

- Resists contamination
- Provides permanently attached clamping bars

Applications

- Extruders
- Blown film dies
- Injection molding machines
- Other cylinder heating applications

THINBAND Mica Heaters

Applications and Technical Data

Operating Factors

You can use as low of a watt density rating as your application permits. A close match of the heat supplied to the actual requirements will reduce temperature overshoot, reduce cycling and increase the life of any band heater you use.

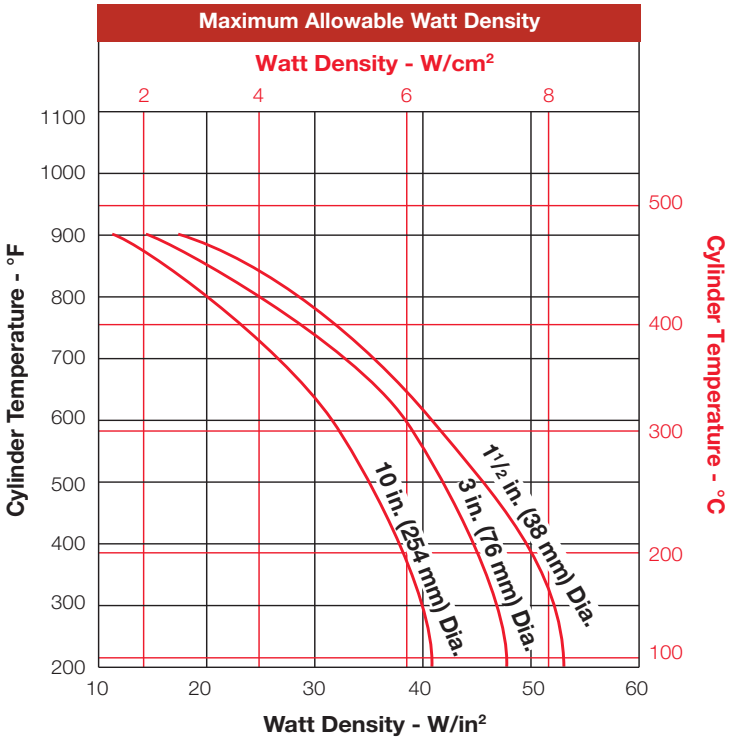
Calculate the **safe maximum wattage** for your heater using:

Heated Area x Maximum Watt Density

Calculate the **heated area** of your band heater by subtracting the no-heat area from the total area in contact with the cylinder (3.14 x I.D. x width). Subtract the no-heat area at the terminals (from table) and any additional no-heat area caused by holes, slots or oversize gaps.

Determine the maximum watt density of your heater from the *Maximum Allowable Watt Density* graph. The curves are based on narrow heaters mounted on a smooth steel cylinder. Apply the necessary correction factors:

- For heaters 2¼ in. to 5 in. (57 mm to 127 mm) wide multiply watt density by 0.8.
- For high expansion cylinders (aluminum or brass), reduce the watt density by 3 W/in² (0.46 W/cm²).
- For heaters 2¼ in. to 5 in. (57 mm to 127 mm) wide installed on a high-expansion cylinder, reduce watt density by a total of 3 W/in² (0.46 W/cm²) only.
- For regular cylinder surfaces other than smooth, machined finish, reduce watt density by 3 W/in² (0.46 W/cm²).
- For heaters that will be insulated or enclosed, contact your Watlow representative for specific watt densities.
- For units greater than 14 in. (356 mm) diameter, consult the *THINBAND Recommended Clamping Options* graph on page 520.
- For units used in vertical applications, contact your Watlow representative for application assistance.



No-Heat Area for THINBAND Barrel (All Terminations)

Heater Type	Heater Size		No-Heat Area Standard Gap ⅜ in.
	Diameter in. (mm)	Width in. (mm)	in. (mm)
One Piece	Less than 2½ (64)	Up to 7 (178)	1¼ (32) x width
Two Piece	5 (127) or more	More than 3 (76)	2½ (64) x width

THINBAND Mica Heaters

Applications and Technical Data *(Continued)*

Check the table to be certain the variations and lead arrangements you order are available on the heater size you require. If you need to exceed any limitations, please contact your Watlow representative.

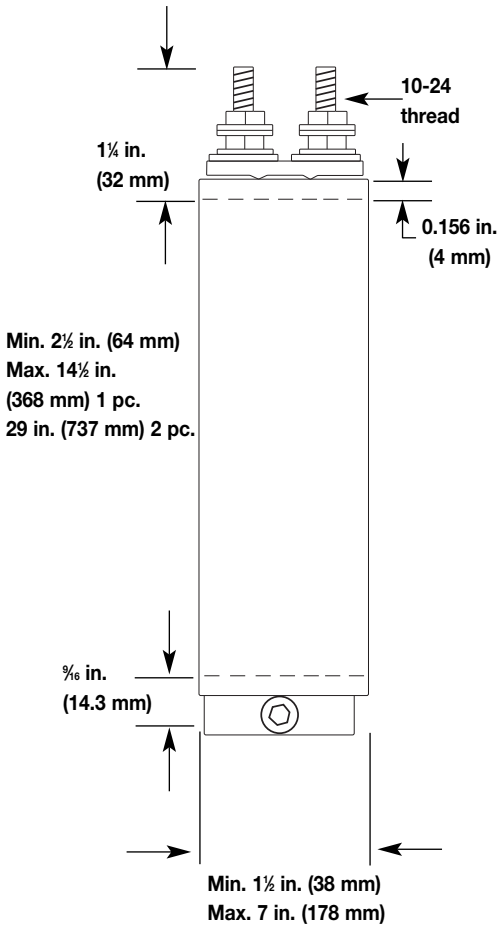
Physical Limitations of Lead Variations

Heater Type	Diameter				Width			
	Min.		Max.		Min.		Max.	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
1 pc. const.	1	(25)	14½	(368)	1½	(38)	7	(178)
2 pc. const.	5	(127)	29	(737)	1½	(38)	7	(178)
Nozzle								
Type A	1	(25)	4	(102)	1	(25)	6	(152)
Type L	1	(25)	4	(102)	1	(25)	6	(152)
Barrel								
Type T	2½	(64)			1½	(38)	7	(178)
Type H	2½	(64)			1½	(38)	7	(178)
Type F, FR	2½	(64)			1½	(38)	7	(178)
Type E	2½	(64)			1½	(38)	7	(178)
Type C, BR	2½	(64)			1½	(38)	7	(178)
Type K, KR	2½	(64)			1½	(38)	7	(178)
Terminal Box	3½	(89)			1½	(38)	7	(178)
European Plug								
1 pc. vertical	2½	(64)	14½	(368)	1½	(38)	7	(178)
1 pc. horizontal	2½	(64)	14½	(368)	1½	(38)	7	(178)
Welded Barrel Nuts								
1 pc.	2½	(64)	14½	(368)	1½	(38)	7	(178)

Note: Some combinations of maximums and minimums cannot occur on the same heater. Check the table to be certain the variations and lead arrangements you order are available on the heater size you require. If you need to exceed any limitations, please contact your Watlow representative.

Standard gap is ⅜ in. (9.5 mm) between clamp bars.

THINBAND Barrel



THINBAND Mica Heaters

QUICK CLAMP Option

With QUICK CLAMP, the THINBAND heater can be secured tightly in place in a matter of seconds. The spring-loaded clamp secures the heater tightly around the barrel with an easy flip of the lever.

Benefits of QUICK CLAMP

- THINBAND with QUICK CLAMP fits over barrels and snaps in place with easy flip of its latching lever
- Hot change-outs are completed in seconds
- Spring tensioned clamp keeps the THINBAND heater tight against barrel—will not loosen over time
- Ideal for vertical applications
- Available on selected stock and made-to-order THINBAND barrel heaters—minimum 4 in. (102 mm) diameter, 1½ in. (38 mm) width
- Standard gap is ½ in. (13 mm)

Clearance Dimensions

Width Range in. (mm)	Number of QUICK CLAMPS	Distance Between Clamps in. (mm)
1½ (38) to 2 1⁄16 (68.3)	1	NA
2¾ (70) to 3 1⁄16 (93.7)	2	½ (13)
3¾ (95) to 4 1⁄16 (119.1)	2	1 (25)
4¾ (121) to 5 1⁄16 (141.5)	3	½ (13)
5¾ (146) to 7 (178.0)	3	1 (25)

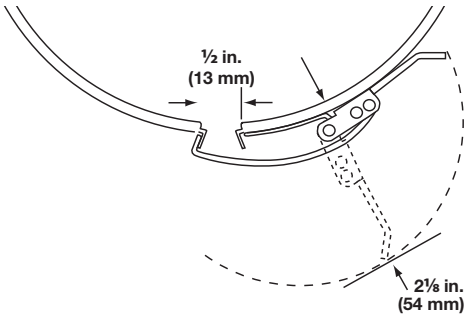
QUICK CLAMP eliminates tools, loose parts and hassle



- THINBAND opens up to fit over barrel. There is no need to remove other heaters.

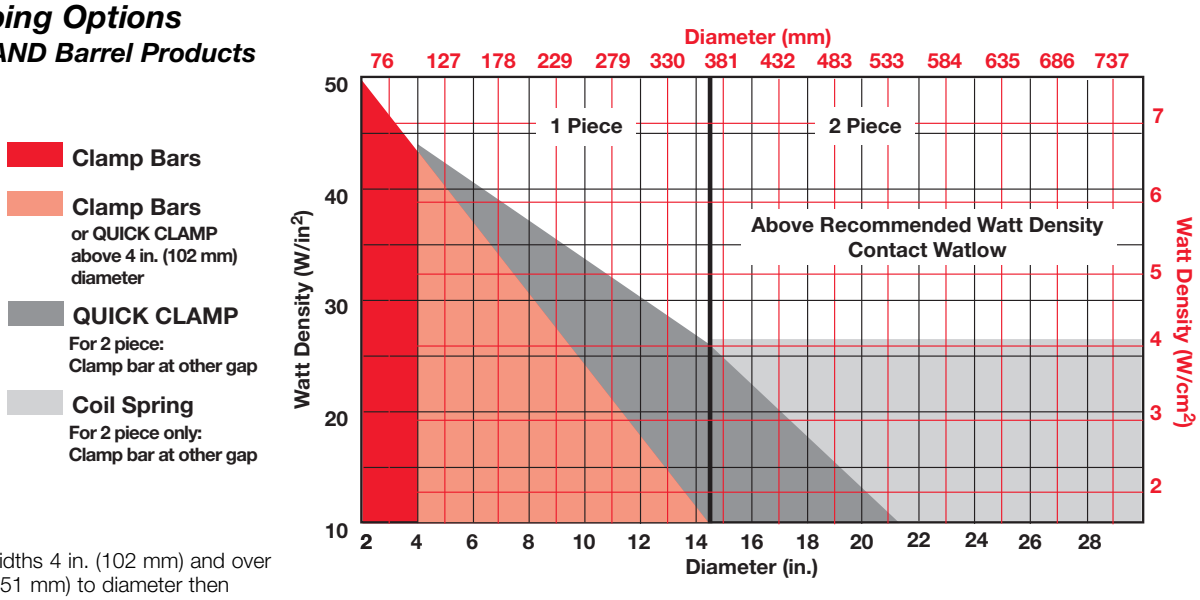


- One easy flip of the latching lever and QUICK CLAMP shuts, completing installation.



Recommended Clamping Options

THINBAND Barrel Products

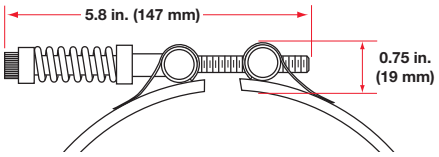


Notes: Widths 4 in. (102 mm) and over add 2 in. (51 mm) to diameter then reference chart clamp selection.

THINBAND Mica Heaters

Clamping Variations

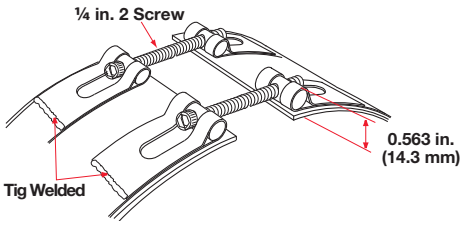
Tig-Welded Barrel Nuts with Spring-Loaded Clamping



Tig-welded barrel nuts with spring-loaded clamping are used during start-up to maintain a tight heater fit on large barrels. Stainless steel top metal is required.

Refer to the *THINBAND Recommended Clamping Options* graph on page 520. This option is mandatory on vertical applications. To order, specify **spring loaded clamping.**

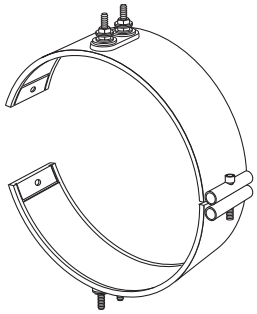
Tig-Welded Barrel Nuts



An ideal way to provide access for instrumentation is to specify an oversized gap between the heater ends. If the THINBAND clamp bar screw interferes with the positioning of the instrumentation device, tig-welded barrel nuts are recommended. Stainless steel top metal is required. Maximum gap is 1 in. (25 mm). Specify **tig-welded barrel nuts** and **gap dimension** when ordering.

Clamping Pads

Non-Stock Option



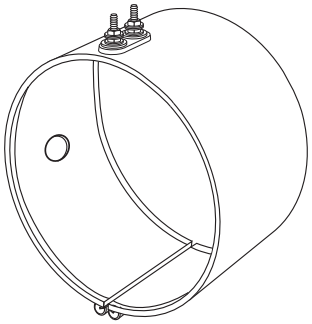
Clamping pads are used when an obstruction would prevent a standard full circumferential heater from fitting completely around a machine barrel. The clamping pads have a hole to allow easy fastening to the machine barrel. **Dimensional drawing or customer supplied sample heater is required** when ordering.

Variations

Non-Stock Option

Holes

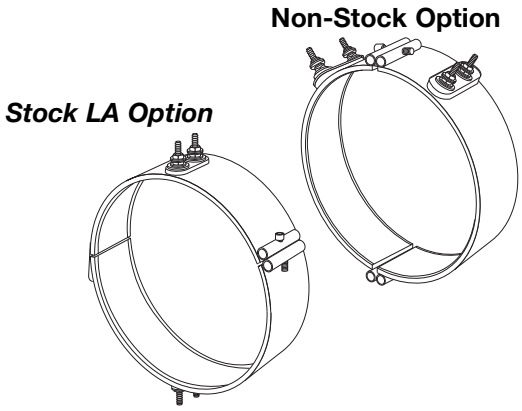
An economical way to provide access for instrumentation is to specify an oversized gap between the heater ends. A hole in the sheath should be specified only when all the cylinder surface adjacent to the hole must be heated. **When required, one hole may be provided in nearly any location as long as there is at least 1 in. (25 mm) between the hole and one side of the heater. Standard hole sizes up to 2 in. (51 mm) diameter**. Contact your Watlow representative for limitations. For proper hole location, a **dimensional drawing or custom supplied sample heater is required.**



THINBAND Mica Heaters

Variations *(Continued)*

Two-Piece Band Heaters

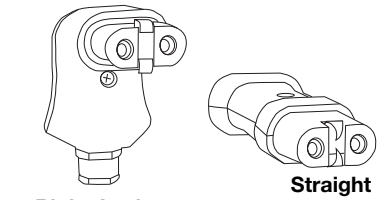


Two-piece construction is available on heaters 5 in. (127 mm) or greater in diameter. Heaters 1½ in. (38 mm) wide and greater with post terminals have the two terminals side-by-side.

Note: When ordering two-piece band heaters, specify the **volts** and **watts per half.** On two-piece units with leads, you must also specify the **power supply voltage.** Example: a two-piece band that is 240V~(ac) per half may be wired in series to a 480V~(ac) power supply. In this case the band heater lead wire insulation must be rated for 480V~(ac). Available from stock by combining two one-piece heaters to create a large diameter. Terminations will be 90° from each gap. **QUICK CLAMP** must be supplied at one gap when ordering.

High-Temperature "Quick Disconnect" European Style Female Adapters

Stock Options



Right Angle
Code # N6027AF049

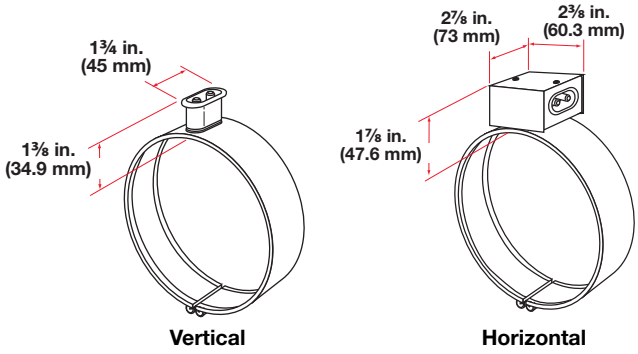
Straight
Code # N6027ZZ028

Available as an accessory item that must be used in conjunction with high-temperature "quick disconnect" European style plugs.

Specify code number **N6027AF049** or **N6027ZZ028** and quantity.

High-Temperature "Quick Disconnect" European Style Plugs

Stock Options



Vertical **Horizontal**

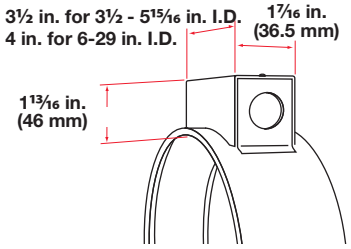
They provide the simplest and safest way to apply power to band heaters. The combination of high temperature male and female "quick disconnect" plug assemblies eliminates all live exposed terminals and electrical wiring that can be a potential hazard to employees or machine. Maximum 15 amperes at 240V~(ac), maximum 240 volts. When ordering, specify **vertical** or **horizontal** **European** plug.

THINBAND Mica Heaters

Variations *(Continued)*

Metallic Terminal Box

Stock Option



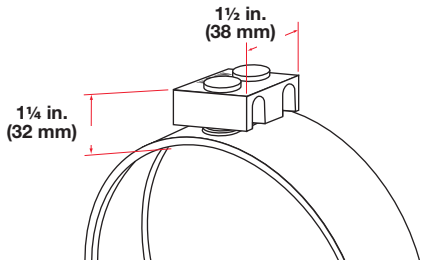
Metallic terminal boxes are available on heaters 3½ in. (89 mm) diameter or larger. Terminal boxes are attached to the heater to cover the terminals for an added safety feature. Conduit may be attached to the box through ⅞ in. (22.2 mm) diameter holes in the ends of the box. Terminal box is available on one or two-piece stock THINBAND heaters. When ordering, specify **terminal box.**

Metric Clamp Bars and Screws

Metric hardware is available on made-to-order THINBAND heaters with post terminals and clamp bars. The post terminal thread size is M5X.8. The screw for the clamp bar will be M6X1.0 socket head cap screw. When ordering, specify **metric hardware** required.

Ceramic Terminal Covers

Stock Option



Code # Z-4919

Ceramic terminal covers are a convenient and economical way to insulate post terminals. They are sized for standard length posts, 10-24 screw thread size. These are supplied as an accessory item and shipped separately. Specify code number **Z-4919** and quantity.

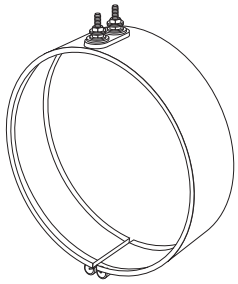
Terminations

Type T

Stock LA Option

Post terminals provide a quick connection with ring or fork connectors, or buss strips. Threaded 10-24 studs or optional metric (M5X.8) are provided with double nuts and washers. Post terminals have a threaded length of ⅜ in. (14.3 mm) and require 1¼ in. (32 mm) clearance from the cylinder. Maximum amperage for post terminals is 35 amperes and they can withstand up to 45 in.-lbs (61.0 Newton-Meter) of torque. The increased torque is possible due to the unique add-on lead cap design, which makes the cap a separate entity from the heater. This means all of the torque carrying capability is maintained within the cap design, allowing the terminal hardware to be torqued to a specific setting and tested prior to connection to the heater.

The welded electrical connection to the heater is superior to crimped or staked connections, which can loosen and oxidize during operation. To order, specify **Type T.**



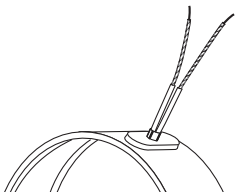
THINBAND Mica Heaters

Terminations *(Continued)*

Heaters rated at less than 250 volts use UL® approved lead insulation for operations to 482°F (250°C) as standard. Lead insulation UL® rated for operation to 850°F (450°C) may be required in high-temperature applications where the leads are shrouded or enclosed with the heater. All heaters rated at more than 250V~(ac) use this wire.

Type K

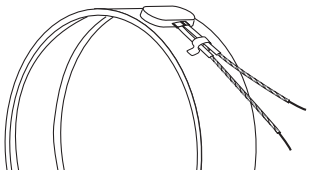
Stock LA Option



Flexible lead wires exit vertically from the heater. These leads can be bent adjacent to the heater for a quick and easy connection. To order, specify **Type K** and length.

Type KR

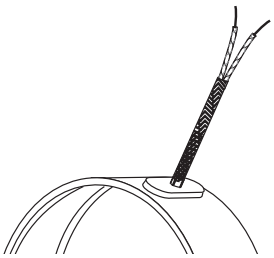
Stock LA Option



Same specifications as Type K except lead wires exit at right angle. To order, specify **Type KR** and length.

Type C

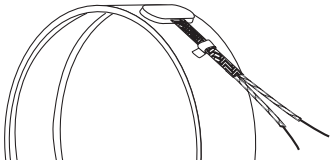
Stock LA Option



Two fiberglass lead wires exit a single tightly woven metal braid for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than the braid. To order, specify **Type C** and length.

Type BR

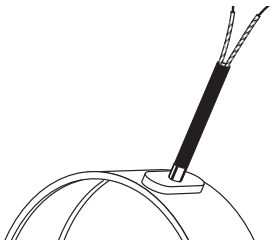
Stock LA Option



Same specifications as Type C except lead wires exit at right angle. To order, specify **Type BR** and length.

Type F

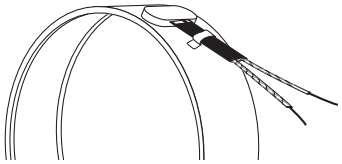
Stock LA Option



Loose fiberglass sleeving encloses two fiberglass leads for additional insulation protection where high temperature or minor abrasion is present. Leads are 2 in. (51 mm) longer than the sleeving. To order, specify **Type F** and length.

Type FR

Stock LA Option



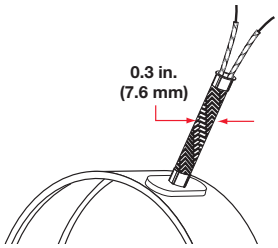
Same specifications as Type F except lead wires exit at right angle. To order, specify **Type FR** and length.

THINBAND Mica Heaters

Terminations *(Continued)*

Type E

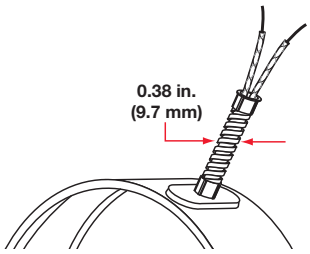
Stock LA Option



Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than the braid. To order, specify **Type E** and length.

Type H

Stock LA Option



A stainless steel, flexible conduit encloses the leads for superior mechanical protection where lead abrasion is a particular problem. Leads are 2 in. (51 mm) longer than the conduit. To order, specify **Type H** and length.

Ground Wire or Terminal Stud

Uninsulated 18 gauge ground wire is available on all lead types except post terminals and Type C leads. A 10-24 ground terminal stud has a threaded length of 1 1/16 in. (27 mm). To order, specify **uninsulated ground wire** or **terminal stud.**

THINBAND Mica Heaters

How to Utilize Watlow's Universal THINBAND Barrel Stock Program

Watlow stocks THINBAND barrel heaters ranging in diameters from 3 to 9 in. (76 to 229 mm) in ¼ in. (6 mm) increments and widths in 1½, 2 and 3 in. (38, 51 and 76 mm). Watlow can combine these sizes, creating a two-piece assembly ranging from 9 to 18 in. (229 to 457 mm) in diameter, and any combination between 3 and 18 in. (76 and 457 mm) as a two-piece assembly. This versatility should satisfy almost any requirements whether millimeter or inch size barrels.

Regarding possible slight wattage differences from your original heater to your THINBAND replacement you must keep in mind that about 80 percent of the wattage is required to bring the barrel up to temperature. The 20 percent remaining is used to offset radiation and convection heat losses. So if you have a 550 watt heater, there is no harm in using a 500 or 600 watt stock THINBAND barrel heater.

There are three approaches to receiving a THINBAND combination from stock. To illustrate below, there is a customer who needs a 10 in. (254 mm) diameter heater but, neither the size or width needed is in stock.

Solutions

1. Take two 5 in. (127 mm) diameter heaters and curve to a 10 in. (254 mm) diameter. Please note that a QUICK CLAMP has to be added to the order for the heater to fit. This heater is offered next day delivery.
2. Take two THINBAND heaters as noted in #1 but mix each diameter. For example, one 4 in. (102 mm) and one, 6 in. (152 mm) diameter or a 4¾ (121 mm) diameter with a 5¼ (133 mm) diameter equal 10 in. (254 mm). Again, a QUICK CLAMP is needed. This heater is also offered for next day delivery.
3. Take two THINBANDs as in #1 or #2 but subtract a ¼ in. (6 mm) to the diameter and supply without the QUICK CLAMP for same day delivery. For example for a 10 in. (254 mm) diameter, any combination of 9¾ in. (248 mm) should be supplied to fit the 10 in. (254 mm) diameter requirement. The selection size has to be reduced by ¼ in. (6.4 mm) to ensure a gap when tightening the clamp bars. If this is not done, the bars will touch before the heater can be tightened completely to the barrel. This is only necessary when QUICK CLAMP is not included.

Note: Various diameters and widths of Watlow's unique patented flexible THINBAND barrel heaters are available with LA terminations for shipment faster than any in the market because of Watlow's unique stocking program.

Installation Procedures

1. Install heaters over a clean surface.
2. After installing the unit, begin to tighten the clamp screw. The clamping screw is ¼ in.-20 x 1¼ in., allen head cap screw. Begin tightening the clamp bars. If the clamp bars appear not to have seated, tap the clamp bars with a small hammer to insure the bars are well seated in the angle formed by the 60° bent tab and the heater.
3. If the bar has multiple screws, alternately tighten the screws as you would the lug nuts on a car wheel to ensure even loading.
4. Torque all screws to approximately 8 ft-lbs.
5. Take a soft rubber mallet and tap gently around the circumference of the heater while tightening the screws. This will ensure the heater fit to the barrel is maximized without any air gaps.
6. When installing terminal lugs, torque the top nuts to 30 in.-lbs. The bottom nut should not be touched as it is factory torqued to 45 in.-lbs. at assembly.
7. Retighten the heater after the heater has operated for a short time. Always make adjustments when the heater and cylinder are cold.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
1 5/16 (33.3)	2 (51.0)	240	175	45 (7.0)	1	Mica Band–12 in. Type K	0.2 (0.09)	Standard	**BOS2AK1**	–
1 (25.0)	1 (25.0)	120	100	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A1**	**B1A1AN1**
	1 (25.0)	240	100	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A2**	**B1A1AN2**
	1 (25.0)	120	125	55① (8.5)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A3**	**B1A1AN3**
	1 (25.0)	240	125	55① (8.5)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A4**	**B1A1AN4**
	1½ (38.0)	120	150	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Standard	**STB1A1J1**	**B1A1JN1**
	1½ (38.0)	240	150	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1J2**	**B1A1JN2**
	1½ (38.0)	120	200	59① (9.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1J3**	**B1A1JN3**
	1½ (38.0)	240	200	59① (9.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1J4**	**B1A1JN4**
1¼ (32.0)	1⅝ (41.3)	120	100	54① (8.4)	1	Mica Band–12 in. Type A	0.2 (0.09)	Stock	**B1EOLA1**	–
	1¼ (32.0)	120	125	33 (5.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1E1E1**	**B1E1EN1**
	1¼ (32.0)	240	125	33 (5.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1E1E2**	**B1E1EN2**
	1¼ (32.0)	240	75	20 (3.1)	1	THINBAND–Type A or L	0.2 (0.09)	Standard	**STB1E1E4**	**B1E1EN3**
	1¼ (32.0)	240	250	67① (10.4)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1E1E3**	**B1E1EN4**
	3 (76.0)	240	150	16 (2.5)	1	THINBAND–Type A or L	0.5 (0.22)	Standard	**STB1E3A1**	**B1E3AN1**
	3 (76.0)	240	250	27 (4.2)	1	THINBAND–Type A or L	0.5 (0.22)	Stock	**STB1E3A2**	**B1E3AN2**
	3 (76.0)	240	300	33 (5.1)	1	THINBAND–Type A or L	0.5 (0.22)	Stock	**STB1E3A3**	**B1E3AN3**
1⅜ (34.9)	1 (25.0)	120	140	41 (6.4)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1G1A1**	**B1G1AN1**
	2 (51.0)	240	300	51① (7.9)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1G2A1**	**B1G2AK1**
	3½ (89.0)	240	200	17 (2.6)	1	THINBAND–Type A or L	0.6 (0.27)	Standard	**STB1G3J1**	**B1G3JA1**
	3½ (89.0)	240	250	21 (3.3)	1	THINBAND–Type A or L	0.6 (0.27)	Standard	**STB1G3J2**	**B1G3JA2**
1½ (38.0)	1⅞ (47.6)	240	100	31 (4.8)	1	Mica Band–Type A or L	0.2 (0.09)	Stock	**B1JORN1**	–
	1 (25.0)	120	100	26 (4.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A1**	**B1J1AN1**
	1 (25.0)	240	100	26 (4.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A2**	**B1J1AN2**
	1 (25.0)	120	150	39 (6.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A3**	**B1J1AN3**
	1 (25.0)	240	150	39 (6.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A4**	**B1J1AN4**
	1 (25.0)	120	200	52① (8.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A5**	**B1J1AN5**
	1 (25.0)	240	200	52① (8.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A6**	**B1J1AN6**
	1 (25.0)	240	150	40 (6.2)	1	Mica Band–Post Terminals Only w/Strap	0.2 (0.09)	Standard	**B1J1AP2**	–
	1¼ (32.0)	240	250	52① (8.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1E1**	**B1J1EN1**
	1½ (38.0)	120	200	35 (5.4)	1	THINBAND–Type A or L	0.3 (0.14)	Standard	**STB1J1J1**	**B1J1JN1**
	1½ (38.0)	240	200	35 (5.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J2**	**B1J1JN2**
	1½ (38.0)	120	250	43 (6.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J3**	**B1J1JN3**
	1½ (38.0)	240	250	43 (6.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J4**	**B1J1JN4**
	1½ (38.0)	120	275	48 (7.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J5**	**B1J1JN5**
	1½ (38.0)	240	275	48 (7.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J6**	**B1J1JN6**
	1½ (38.0)	240	300	52 (8.0)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J7**	**B1J1JN7**
	1½ (38.0)	240	200	36 (5.6)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1J1JP3**	–

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① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
1½ (38.0)	1½ (38.0)	240	200	43 (6.6)	1	Mica Band–36 in. Black Glass 90° from Gap	0.3 (0.14)	Stock	**B1J1JX1**	–
	1½ (38.0)	240	250	45 (7.0)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1J1JP4**	–
	1½ (38.0)	120	275	49① (7.6)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1J1JP5**	–
	1½ (38.0)	240	275	49① (7.6)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1J1JP6**	–
	2 (51.0)	240	300	39 (6.0)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J2A1**	**B1J2AN1**
	2 (51.0)	240	300	40 (6.2)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1J2AP1**	–
	2½ (64.0)	240	400	42 (6.5)	1	THINBAND–Type A or L	0.5 (0.23)	Stock	**STB1J2J1**	–
	2½ (64.0)	240	400	43 (6.7)	1	Mica Band–36 in. Type C 90° from Gap	0.5 (0.23)	Stock	**B1J2JC1**	–
	3 (76.0)	240	350	30 (4.6)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J3A1**	**B1J3AN1**
	3 (76.0)	240	500	43 (6.7)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J3A2**	**B1J3AN2**
	3 (76.0)	240	800	69① (10.7)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J3A3**	**B1J3AN3**
	4 (102.0)	240	600	39 (6.0)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J4A1**	–
1⅝ (41.3)	1¼ (32.0)	240	250	49① (7.6)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1L1EP1**	–
	1¼ (32.0)	240	300	59① (9.1)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1L1EP2**	–
	4¼ (108.0)	120	550	30 (4.6)	1	Mica Band–Post Terminals Only w/Strap	0.7 (0.32)	Standard	**B1L4ER1**	–
1¾ (45.0)	1 (25.0)	240	175	39 (6.0)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1N1AP1**	–
	1½ (38.0)	240	150	22 (3.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J1**	**B1N1JN1**
	1½ (38.0)	120	200	29 (4.5)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J2**	**B1N1JN2**
	1½ (38.0)	240	200	29 (4.5)	1	THINBAND–Type A or L	0.3 (0.14)	Standard	**STB1N1J3**	**B1N1JN3/4**
	1½ (38.0)	240	225	32 (5.0)	1	THINBAND–Type A or L	0.3 (0.14)	Standard	**STB1N1J5**	**B1N1JN5**
	1½ (38.0)	240	250	36 (5.6)	1	Thinband–Type A or L	0.3 (0.14)	Stock	**STB1N1J6**	**B1N1JN6**
	1½ (38.0)	120	300	43 (6.7)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J7**	**B1N1JN7**
	1½ (38.0)	240	300	43 (6.7)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J8**	**B1N1JN8**
	1½ (38.0)	240	200	30 (4.6)	1	Mica Band–72 in. Type C	0.3 (0.14)	Standard	**B1N1JC3**	–
	1½ (38.0)	240	300	44 (6.8)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B1N1JP5**	–
1⅞ (47.6)	1 (25.0)	240	140	28 (4.3)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1R1A1**	**B1R1AL1**
	1 (25.0)	240	200	41 (6.4)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B1R1AP1**	–
2 (51.0)	1½ (38.0)	120	300	42 (6.5)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B2A1JP1**	–
	1½ (38.0)	240	300	42 (6.5)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B2A1JP2**	–
2⅛ (54.0)	1 (25.0)	120	200	34 (5.3)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB2C1A1**	**B2C1AN1**
	2 (51.0)	240	200	17 (2.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB2C2A1**	**B2C2AN1**
2¼ (57.0)	⅞ (22.2)	120	215	43 (6.7)	1	Mica Band–Type A or L	0.3 (0.14)	Stock	**B2E0RN1**	–
	1 (25.0)	120	250	45① (7.0)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B2E1AP1**	–
	1 (25.0)	240	250	45① (7.0)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B2E1AP2**	–
	2 (51.0)	240	525	47① (7.3)	1	Mica Band–Post Terminals Only w/Strap	0.6 (0.27)	Stock	**B2E2AP1**	–
	2½ (64.0)	240	500	38 (5.9)	1	Mica Band–36 in. Type K w/sleeving	0.6 (0.27)	Stock	**B2E2JK1**	–
2⅜ (60.4)	1 (25.0)	240	100	17 (2.6)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B2G1AP1**	–
	1 (25.0)	240	250	42 (6.5)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B2G1AP2**	–
	1 (25.0)	240	275	46① (7.1)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B2G1AP3**	–

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① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
2½ (64.0)	1 (25.0)	120	300	47① (7.3)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Standard	**B2J1AP1**	**–**
	1 (25.0)	240	300	47① (7.3)	1	Mica Band–Post Terminals Only w/Strap	0.3 (0.14)	Stock	**B2J1AP2**	**–**
	1½ (38.0)	240	200	19 (2.9)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB2J1J1**	**B2J1JN1**
	1½ (38.0)	120	300	31 (4.8)	1	THINBAND–All LA Options, except A or L	0.4 (0.18)	Stock	**STB2J1J8**	**B2J1JP1**
	1½ (38.0)	240	300	31 (4.8)	1	THINBAND–All LA Options, except A or L	0.4 (0.18)	Stock	**STB2J1J9**	**B2J1JP2**
	1½ (38.0)	120	350	37 (5.7)	1	THINBAND–All LA Options, except A or L	0.4 (0.18)	Stock	**STB2J1J10**	**B2J1JP3**
	1½ (38.0)	240	350	37 (5.7)	1	THINBAND–All LA Options, except A or L	0.4 (0.18)	Stock	**STB2J1J11**	**B2J1JP4**
	2⅜ (60.3)	240	550	39 (6.0)	1	THINBAND–All LA Options, except A or L	0.6 (0.27)	Stock	**STB2J2G1**	**B2J2GP1②**
	2⅞ (73.0)	240	650	38 (5.9)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB2J2R1**	**B2J2RP1②**
	4 (102.0)	240	850	32 (5.0)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Stock	**STB2J4A2**	**B2J4AP1②**
	5 (127.0)	240	1150	35 (5.4)	1	THINBAND–All LA Options, except A or L	1.2 (0.32)	Stock	**STB2J5A3**	**B2J5AP1②**
	8 (203.0)	240	1800	33 (5.1)	1	Mica Band–Post–T/C Hole at Gap	2.0 (0.91)	Stock	**B2J8AP1**	**–**
2¾ (70.0)	1½ (38.0)	240	400	34 (5.3)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB2N1J1**	**B2N1JN1**
3 (76.0)	1 (25.0)	240	200	23 (3.6)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB3A1A2**	**B3A1AN1**
	1 (25.0)	240	250	29 (4.5)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB3A1A3**	**B3A1AN2**
	1 (25.0)	240	300	35 (5.4)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB3A1A4**	**B3A1AN3**
	1 (25.0)	240	300	38 (5.9)	1	Mica Band–Post Terminals Only w/Strap	0.4 (0.18)	Stock	**B3A1AP1**	**–**
	1 (25.0)	240	350	44 (6.8)	1	Mica Band–Post Terminals Only w/Strap	0.4 (0.18)	Stock	**B3A1AP2**	**–**
	1 (25.0)	240	400	50① (7.7)	1	Mica Band–Post Terminals Only w/Strap	0.4 (0.18)	Stock	**B3A1AP4**	**–**
	1½ (38.0)	240	400	31 (4.8)	1	THINBAND–Type A or L	0.5 (0.23)	Standard	**STB3A1J5**	**B3A1JN1**
	1½ (38.0)	120	600	47① (7.3)	1	THINBAND–Type A or L	0.5 (0.23)	Stock	**STB3A1J6**	**B3A1JN2**
	1½ (38.0)	240	400	32 (5.0)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3A1J1**	**B3A1JP1/C1**
	1½ (38.0)	240	450	36 (5.6)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3A1J2**	**B3A1JP2**
	1½ (38.0)	120	500	40 (6.2)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3A1J3**	**B3A1JP3**
	1½ (38.0)	240	500	40 (6.2)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3A1J4**	**B3A1JP4**
	2 (51.0)	240	500	30 (4.6)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB3A2A1**	**B3A2AP1**
	2 (51.0)	240	600	36 (5.6)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB3A2A2**	**B3A2AP2**
	2½ (64.0)	240	650	33 (5.1)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB3A2J7**	**B3A2JP1**
	3 (76.0)	240	750	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Stock	**STB3A3A18**	
3⅛ (79.4)	1 (25.0)	240	400	48① (7.4)	1	Mica Band–Post Terminals Only w/Strap	0.4 (0.18)	Standard	**B3C1AP1**	**–**
3¼ (83.0)	1½ (38.0)	240	400	29 (4.5)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3E1J1**	**B3E1JP1**
	2 (51.0)	240	500	27 (4.2)	1	THINBAND–All LA Options, except A or L	0.7 (0.33)	Stock	**STB3E2A41**	
	3 (76.0)	240	650	24 (3.7)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Standard	**STB3E3A10**	

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① Watt density is above Watlow recommendations at some common molding temperatures.
② Mica band post-thermocouple hole at gap, THINBAND replacement does not include thermocouple hole at gap.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
3½ (89.0)	1 (25.0)	120	300	32 (5.0)	1	Mica Band–36 in. Type C	0.5 (0.23)	Stock	**B3J1AC1**	**–**
	1½ (38.0)	120	400	27 (4.2)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3J1J1**	**B3J1JP1**
	1½ (38.0)	240	500	33 (5.1)	1	THINBAND–All LA Options, except A or L	0.5 (0.23)	Stock	**STB3J1J2**	**B3J1JP3/P2**
	2 (51.0)	240	650	33 (5.1)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB3J2A1**	**B3J2AP1**
	2½ (64.0)	240	750	30 (4.6)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB3J2J1**	**B3J2JP1**
	3 (76.0)	240	750	25 (3.9)	1	THINBAND–All LA Options, except A or L	1.1 (0.54)	Stock	**STB3J3A31**	
3¾ (95.0)	1 (25.0)	240	350	34 (5.3)	1	Mica Band–Post Terminals Only w/Strap	0.5 (0.23)	Stock	**B3N1AP1**	**–**
	1 (25.0)	120/240	350	40 (6.2)	2	Mica Band–Post Terminals Only w/Strap	0.5 (0.23)	Standard	**B3N1AP2**	**–**
	1½ (38.0)	240	700	43① (6.7)	1	THINBAND–All LA Options, except A or L	0.6 (0.27)	Stock	**STB3N1J1**	**B3N1JP1**
	2 (51.0)	240	600	28 (4.4)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB3N2A17**	
	2½ (64.0)	240	850	33 (5.1)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Stock	**STB3N2J1**	**B3N2JP1**
	3 (76.0)	240	900	28 (4.4)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Stock	**STB3N3A5**	
4 (102.0)	1 (25.0)	240	625	55① (8.5)	1	Mica Band–Post Terminals Only w/Strap	0.7 (0.32)	Stock	**B4A1AP1**	**–**
	1½ (38.0)	240	550	32 (5.0)	1	THINBAND–All LA Options, except A or L	0.6 (0.27)	Stock	**STB4A1J1**	**B4A1JP1/2**
	1½ (38.0)	240	750	43 (6.5)	1	THINBAND–All LA Options, except A or L	0.6 (0.27)	Stock	**STB4A1J2**	**B4A1JP4**
	1½ (38.0)	240	650	37 (5.7)	1	THINBAND–All LA Options, except A or L	0.6 (0.27)	Stock	**STB4A1J3**	**B4A1JP3**
	2 (51.0)	240	550	24 (3.7)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB4A2A1**	**B4A2AP1**
	2 (51.0)	240	800	35 (5.4)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB4A2A2**	**B4A2AP2**
	3 (76.0)	240	1000	29 (4.5)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Stock	**STB4A3A31**	
4¼ (108.0)	1½ (38.0)	240	550	30 (4.7)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4E1J13**	
	2 (51.0)	240	700	28 (4.4)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB4E2A20**	
	3 (76.0)	240	900	24 (3.7)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Stock	**STB4E3A9**	
4½ (114.0)	1 (25.0)	240	350	28 (4.3)	1	Mica Band–Post Terminals Only w/Strap	0.6 (0.27)	Stock	**B4J1AP1**	**–**
	1½ (38.0)	240	650	33 (5.1)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4J1J1**	**B4J1JP2/3**
	1½ (38.0)	240	400	20 (3.1)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4J1J2**	**B4J1JP1**
	2 (51.0)	240	500	19 (2.9)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB4J2A1**	**B4J2AP1**
	2½ (64.0)	240	1000	35 (5.4)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Stock	**STB4J2J1**	**B4J2JC1**
	3 (76.0)	240	1200	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Stock	**STB4J3A26**	
4¾ (121.0)	1½ (38.0)	240	600	29 (4.5)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4N1J1**	**–**
	1½ (38.0)	480	600	29 (4.5)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4N1J2**	**–**
	1½ (38.0)	240	650	31 (4.8)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4N1J3**	**B4N1JP2**
	2 (51.0)	240	800	29 (4.5)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB4N2A11**	
	2 (51.0)	480	800	29 (4.5)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB4N2A12**	
	3 (76.0)	240	1100	26 (4.1)	1	THINBAND–All LA Options, except A or L	1.4 (0.64)	Stock	**STB4N3A12**	
	3 (76.0)	480	1100	26 (4.1)	1	THINBAND–All LA Options, except A or L	1.4 (0.64)	Stock	**STB4N3A13**	

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① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
4⅞ (123.8)	1½ (38.0)	240	900	42 (6.50)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB4R1J1**	**B4R1JP1**
	2 (51.0)	240	650	23 (3.60)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB4R2A1**	**B4R2AP1**
	2 (51.0)	240/480	760	28 (4.30)	2	Mica Band–Post (2 on 1)	0.9 (0.41)	Standard	**B4R2AR1**	**–**
	2 (51.0)	240	760	27 (4.20)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB4R2A2**	**–**
	2 (51.0)	480	760	27 (4.20)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB4R2A3**	**–**
5 (127.0)	1½ (38.0)	240	700	32 (5.00)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB5A1J1**	**B5A1JP1/2**
	1½ (38.0)	240	900	41 (6.40)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB5A1J2**	**B5A1JP3**
	2 (51.0)	240	900	30 (4.65)	1	THINBAND-All LA Options, except A or L	0.9 (0.41)	Stock	**STB5A2A27**	
	2 (51.0)	480	900	30 (4.65)	1	THINBAND-All LA Options, except A or L	0.9 (0.41)	Stock	**STB5A2A28**	
	3 (76.0)	240	850	20 (3.10)	1	THINBAND–All LA Options, except A or L	1.4 (0.64)	Stock	**STB5A3A5**	**B5A3AP1**
	3¼ (83.0)	240	1250	26 (4.00)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB5A3E1**	**B5A3ER1**
5⅛ (130.2)	1½ (38.0)	240	900	42① (6.50)	1	THINBAND–All LA Options, except A or L	0.7 (0.32)	Stock	**STB5C1J2**	**B5C1JP1**
5¼ (133.0)	1 (25.0)	240	500	33 (5.10)	1	Mica Band–72 in. (Type C-180° from ⅜ in. Gap)	0.7 (0.32)	Stock	**B5E1AC1**	**–**
	1½ (38.0)	240/480	600	30 (4.60)	2	Mica Band–Post Terminals Only w/Strap	0.8 (0.36)	Standard	**B5E1JP2**	**–**
	1½ (38.0)	240	600	26 (4.00)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB5E1J1**	**B5E1JP1**
	1½ (38.0)	480	600	43① (6.70)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB5E1J5**	**–**
	1½ (38.0)	240	1000	43① (6.70)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB5E1J2**	**B5E1JP3**
	2 (51.0)	240	1000	33① (5.10)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB5E2A1**	**B5E2AP1**
	3 (76.0)	240	1200	26 (4.08)	1	THINBAND–All LA Options, except A or L	1.4 (0.64)	Stock	**STB5E3A14**	
	3 (76.0)	480	1200	26 (4.08)	1	THINBAND–All LA Options, except A or L	1.4 (0.64)	Stock	**STB5E3A15**	
5½ (140.0)	1½ (38.0)	240	800	33 (5.10)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB5J1J1**	**B5J1JP1/2**
	1½ (38.0)	240	900	37 (5.70)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB5J1J2**	**B5J1JP3**
	2 (51.0)	240	1000	30 (4.65)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB5J2A23**	
	2 (51.0)	480	1000	30 (4.65)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB5J2A24**	
	3 (76.0)	240	1500	30 (4.65)	1	THINBAND–All LA Options, except A or L	1.6 (0.72)	Stock	**STB5J3A19**	
	3 (76.0)	480	1500	30 (4.65)	1	THINBAND–All LA Options, except A or L	1.6 (0.72)	Stock	**STB5J3A20**	
5¾ (146.0)	1½ (38.0)	240	750	29 (4.50)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB5N1J17**	
	1½ (38.0)	480	750	29 (4.50)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Standard	**STB5N1J18**	
	2 (51.0)	240	1000	30 (4.65)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Stock	**STB5N2A5**	
	2 (51.0)	480	1000	30 (4.65)	1	THINBAND–All LA Options, except A or L	1.0 (0.45)	Standard	**STB5N2A6**	
	3 (76.0)	240	1500	30 (4.65)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB5N3A8**	
	3 (76.0)	480	1500	30 (4.65)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB5N3A9**	
6 (152.0)	1⅜ (34.9)	120/240	950	43① (6.70)	2	Mica Band–Post Terminals Only w/Strap	0.9 (0.41)	Standard	**B6A1GP1**	**–**
	1½ (38.0)	240	600	22 (3.40)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB6A1J1**	**B6A1JP1**
	1½ (38.0)	240	850	32 (5.00)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB6A1J2**	**B6A1JP2/3**
	1½ (38.0)	240	1000	37 (5.70)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB6A1J3**	**B6A1JP4**

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① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
6 (152.0)	2 (51.0)	240	1000	28 (4.3)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB6A2A36**	
	2 (51.0)	480	1000	28 (4.3)	1	THINBAND–All LA Options, except A or L	0.8 (0.36)	Stock	**STB6A2A37**	
	2½ (64.0)	240	1450	34 (5.3)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB6A2J3**	**B6A2JP1**
	3 (76.0)	240/480	1400	27 (4.2)	2	Mica Band–Post (2 on 1)	1.6 (0.73)	Stock	**B6A3AR1**	**–**
	3 (76.0)	240	1400	26 (4.0)	1	THINBAND–All LA Options, except A or L	1.6 (0.73)	Stock	**STB6A3A1**	**–**
	3 (76.0)	480	1400	26 (4.0)	1	THINBAND–All LA Options, except A or L	1.6 (0.73)	Stock	**STB6A3A2**	**–**
6¼ (159.0)	1½ (38.0)	240	850	30 (4.7)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Standard	**STB6E1J10**	
	1½ (38.0)	480	850	30 (4.7)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Standard	**STB6E1J11**	
	2 (51.0)	240	1000	27 (4.2)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Stock	**STB6E2A5**	
	2 (51.0)	480	1000	27 (4.2)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Standard	**STB6E2A6**	
	3 (76.0)	240/480	1500	29 (4.5)	2	Mica Band–Post (2 on 1)	1.8 (0.82)	Stock	**B6E3AR1**	**–**
	3 (76.0)	240	1500	27 (4.2)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB6E3A1**	**–**
	3 (76.0)	480	1500	27 (4.2)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB6E3A2**	**–**
6⁵⁄₁₆ (160.3)	3 (76.0)	240/480	1250	25 (3.9)	2	Mica Band–Post Terminals Only w/Strap	1.8 (0.82)	Standard	**B6F3AP1**	**–**
	3 (76.0)	240	1250	22 (3.4)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB6F3A1**	**–**
	3 (76.0)	480	1250	22 (3.4)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB6F3A2**	**–**
6½ (165.0)	1½ (38.0)	240	900	31 (4.8)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB6J1J1**	**B6J1JP1/2**
	1½ (38.0)	240	950	33 (5.1)	1	THINBAND–All LA Options, except A or L	0.9 (0.41)	Stock	**STB6J1J2**	**B6J1P3**
	2 (51.0)	240	1000	26 (3.9)	1	THINBAND–All LA Options, except A or L	1.2 (0.54)	Stock	**STB6J2A1**	**B6J2AP1**
	3 (76.0)	240	1400	24 (3.7)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB6J3A13**	
	3 (76.0)	480	1400	24 (3.7)	1	THINBAND–All LA Options, except A or L	1.8 (0.82)	Stock	**STB6J3A14**	
6⅝ (168.0)	4½ (114.0)	240	2300	26 (4.0)	1	THINBAND–All LA Options, except A or L	2.8 (1.27)	Stock	**STB6L4J1**	**B6L4JR1**
6¾ (172.0)	1½ (38.0)	240	1000	33 (5.1)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Stock	**STB6N1J1**	**B6N1JP2**
	1½ (38.0)	240	750	25 (3.9)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Stock	**STB6N1J2**	**B6N1JP1**
	1½ (38.0)	240	1150	38 (5.9)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Stock	**STB6N1J3**	**B6N1JP3**
	2 (51.0)	240	1300	32 (5.0)	1	THINBAND–All LA Options, except A or L	1.3 (0.59)	Stock	**STB6N2A1**	**B6N2AP1/2**
	3 (76.0)	240	2000	33 (5.1)	1	THINBAND–All LA Options, except A or L	2.0 (0.90)	Stock	**STB6N3A7**	
	3 (76.0)	480	2000	33 (5.1)	1	THINBAND–All LA Options, except A or L	2.0 (0.90)	Stock	**STB6N3A8**	
7 (178.0)	1½ (38.0)	240	950	30 (4.6)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Stock	**STB7A1J1**	**B7A1JP1**
	1½ (38.0)	240	1100	35 (5.4)	1	THINBAND–All LA Options, except A or L	1.0 (0.46)	Stock	**STB7A1J2**	**B7A1JP2**
	2 (51.0)	240	1100	26 (4.1)	1	THINBAND–All LA Options, except A or L	1.3 (0.59)	Stock	**STB7A2A16**	
	2 (51.0)	480	1100	26 (4.1)	1	THINBAND–All LA Options, except A or L	1.3 (0.59)	Stock	**STB7A2A17**	
	3 (76.0)	230/460	1650	28 (4.3)	2	Mica Band–Post (2 on 1)	2.0 (0.90)	Stock	**B7A3AR1**	**–**
	3 (76.0)	230	1650	26 (4.0)	1	THINBAND–All LA Options, except A or L	2.0 (0.90)	Stock	**STB7A3A1**	**–**
	3 (76.0)	460	1650	26 (4.0)	1	THINBAND–All LA Options, except A or L	2.0 (0.90)	Stock	**STB7A3A2**	**–**

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THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
7¼ (184.0)	1½ (38.0)	240	1000	30 (4.7)	1	THINBAND-All LA Options, except A or L	1.1 (0.50)	Stock	**STB7E1J9**	
	1½ (38.0)	480	1000	30 (4.7)	1	THINBAND-All LA Options, except A or L	1.1 (0.50)	Standard	**STB7E1J10**	
	2 (51.0)	240	1200	27 (4.2)	1	THINBAND-All LA Options, except A or L	1.5 (0.65)	Stock	**STB7E2A10**	
	2 (51.0)	480	1200	27 (4.2)	1	THINBAND-All LA Options, except A or L	1.5 (0.65)	Stock	**STB7E2A11**	
	3 (76.0)	240	1800	27 (4.2)	1	THINBAND-All LA Options, except A or L	2.2 (1.00)	Stock	**STB7E3A3**	
	3 (76.0)	480	1800	27 (4.2)	1	THINBAND-All LA Options, except A or L	2.2 (1.00)	Stock	**STB7E3A4**	
7½ (191.0)	1 (25.0)	120/240	700	35 (5.4)	2	Mica Band–Post Terminals Only w/Strap	1.0 (0.45)	Standard	**B7J1AP1**	–
	1½ (38.0)	240	1000	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.1 (0.50)	Stock	**STB7J1J1**	**B7J1JP1**
	1½ (38.0)	240	1200	35 (5.4)	1	THINBAND–All LA Options, except A or L	1.1 (0.50)	Stock	**STB7J1J2**	**B7J1JP2**
	2 (51.0)	240	1200	27 (4.2)	1	THINBAND–All LA Options, except A or L	2.0 (0.90)	Stock	**STB7J2A13**	
	2 (51.0)	480	1200	27 (4.2)	1	THINBAND–All LA Options, except A or L	2.0 (0.90)	Stock	**STB7J2A14**	
	3 (76.0)	240/480	1800	28 (4.3)	2	Mica Band–Post (2 on 1)	2.4 (1.08)	Standard	**B7J3AR1**	–
	3 (76.0)	240	1800	27 (4.2)	1	THINBAND–All LA Options, except A or L	2.4 (1.08)	Stock	**STB7J3A1**	–
	3 (76.0)	480	1800	27 (4.2)	1	THINBAND–All LA Options, except A or L	2.4 (1.08)	Stock	**STB7J3A2**	–
7¾ (197.0)	1½ (38.0)	240	1000	29 (4.5)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Stock	**STB7N1J10**	
	1½ (38.0)	480	1000	29 (4.5)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Stock	**STB7N1J11**	
	2 (51.0)	240	1300	28 (4.3)	1	THINBAND–All LA Options, except A or L	2.1 (0.95)	Stock	**STB7N2A2**	
	2 (51.0)	480	1300	28 (4.3)	1	THINBAND–All LA Options, except A or L	2.1 (0.95)	Stock	**STB7N2A3**	
	3 (76.0)	240	2000	29 (4.5)	1	THINBAND–All LA Options, except A or L	2.3 (1.10)	Stock	**STB7N3A22**	
	3 (76.0)	480	2000	29 (4.5)	1	THINBAND–All LA Options, except A or L	2.3 (1.10)	Stock	**STB7N3A23**	
8 (203.0)	1½ (38.0)	240	950	26 (4.0)	1	THINBAND–All LA Options, except A or L	1.1 (0.50)	Stock	**STB8A1J1**	**B8A1JP1**
	1½ (38.0)	240/480	1200	36 (5.6)	2	Mica Band–Post Terminals Only w/Strap	1.1 (0.50)	Standard	**B8A1JP3**	–
	1½ (38.0)	240	1200	33 (5.1)	1	THINBAND–All LA Options, except A or L	1.1 (0.50)	Stock	**STB8A1J2**	**B8A1JP2**
	1½ (38.0)	480	1200	33 (5.1)	1	THINBAND–All LA Options, except A or L	1.1 (0.50)	Stock	**STB8A1J3**	–
	1½ (38.0)	240	1400	39① (6.0)	1	THINBAND–All LA Options, except A or L	1.1 (0.50)	Stock	**STB8A1J4**	**B8A1JP4**
	2 (51.0)	240	1500	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.5 (0.65)	Stock	**STB8A2A20**	
	2 (51.0)	480	1500	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.5 (0.65)	Stock	**STB8A2A21**	
	3 (76.0)	240/480	2250	33 (5.1)	2	Mica Band–Post (2 on 1)	2.6 (1.18)	Stock	**B8A3AR1**	–
	3 (76.0)	240	2250	31 (4.8)	1	THINBAND–All LA Options, except A or L	2.6 (1.18)	Stock	**STB8A3A1**	–
	3 (76.0)	480	2250	31 (4.8)	1	THINBAND–All LA Options, except A or L	2.6 (1.18)	Stock	**STB8A3A2**	–
8¼ (210.0)	1½ (38.0)	240	1100	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Standard	**STB8E1J5**	
	1½ (38.0)	480	1100	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.2 (0.58)	Standard	**STB8E1J6**	
	2 (51.0)	240	1500	30 (4.7)	1	THINBAND–All LA Options, except A or L	2.3 (1.10)	Stock	**STB8E2A8**	
	2 (51.0)	480	1500	30 (4.7)	1	THINBAND–All LA Options, except A or L	2.3 (1.10)	Stock	**STB8E2A9**	
	3 (76.0)	240	2000	27 (4.2)	1	THINBAND–All LA Options, except A or L	2.6 (1.18)	Stock	**STB8E3A10**	
	3 (76.0)	480	2000	27 (4.2)	1	THINBAND–All LA Options, except A or L	2.6 (1.18)	Stock	**STB8E3A11**	
	4 (102.0)	240/480	3000	31 (4.8)	2	Mica Band–Post Terminals Only w/Strap	3.0 (1.36)	Stock	**B8E4AP1**	–
	4 (102.0)	240	3000	30 (4.7)	1	THINBAND–All LA Options, except A or L	3.0 (1.36)	Stock	**STB8E4A1**	–
	4 (102.0)	480	3000	30 (4.7)	1	THINBAND–All LA Options, except A or L	3.0 (1.36)	Stock	**STB8E4A2**	–

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① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Heaters

Stock and Standard Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
8½ (216.0)	1½ (38.0)	240	1200	31 (4.8)	1	THINBAND–All LA Options, except A or L	1.2 (0.55)	Stock	**STB8J1J1**	**B8JIJP1**
	1½ (38.0)	480	1200	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.2 (0.55)	Stock	**STB8J1J21**	
	2 (51.0)	240	1600	31 (4.8)	1	THINBAND–All LA Options, except A or L	1.6 (0.73)	Stock	**STB8J2A1**	**B8J2AP1**
	2 (51.0)	480	1600	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.6 (0.73)	Stock	**STB8J2A12**	
	3 (76.0)	240	2500	32 (5.0)	1	THINBAND-Post Terminals Only	2.4 (1.08)	Stock	**STB8J3A14**	
	3 (76.0)	480	2500	32 (5.0)	1	THINBAND–All LA Options, except A or L	2.4 (1.08)	Stock	**STB8J3A15**	
8¾ (222.0)	1½ (38.0)	240	1200	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.3 (0.61)	Stock	**STB8N1J10**	
	1½ (38.0)	480	1200	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.3 (0.61)	Stock	**STB8N1J11**	
	2 (51.0)	240	1600	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB8N2A10**	
	2 (51.0)	480	1600	30 (4.7)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB8N2A11**	
	3 (76.0)	240/480	2000	27 (4.2)	2	Mica Band–Post (2 on 1)	2.7 (1.22)	Stock	**B8N3AR1**	**–**
	3 (76.0)	240	2000	25 (3.9)	1	THINBAND–All LA Options, except A or L	2.7 (1.22)	Stock	**STB8N3A1**	**–**
	3 (76.0)	480	2000	25 (3.9)	1	THINBAND–All LA Options, except A or L	2.7 (1.22)	Stock	**STB8N3A2**	**–**
9 (229.0)	1½ (38.0)	240	1300	32 (5.0)	1	THINBAND–All LA Options, except A or L	1.3 (0.61)	Stock	**STB9A1J1**	**B9A1JP1**
	1½ (38.0)	240/480	1500	40① (6.2)	2	Mica Band–Post Terminals Only w/Strap	1.3 (0.61)	Standard	**B9A1JP3**	**–**
	1½ (38.0)	240	1500	37① (5.7)	1	THINBAND–All LA Options, except A or L	1.3 (0.61)	Stock	**STB9A1J2**	**B9A1JP2**
	1½ (38.0)	480	1500	37① (5.7)	1	THINBAND–All LA Options, except A or L	1.3 (0.61)	Stock	**STB9A1J3**	**–**
	2 (51.0)	240	1800	33 (5.1)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB9A2A1**	**B9A2AP1**
	2 (51.0)	480	1800	33 (5.1)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB9A2A20**	
	3 (76.0)	240	2500	30 (4.7)	1	THINBAND-Post Terminals Only	2.6 (1.18)	Stock	**STB9A3A18**	
	3 (76.0)	480	2500	30 (4.7)	1	THINBAND–All LA Options, except A or L	2.6 (1.18)	Stock	**STB9A3A19**	
9½ (241.0)	2 (51.0)	240	1800	32 (5.0)	1	THINBAND–All LA Options, except A or L	1.7 (0.77)	Stock	**STB9J2A1**	**B9J2AP1**
	3 (76.0)	240/480	2000	24 (3.7)	2	Mica Band–Post (2 on 1)	2.8 (1.27)	Standard	**B9J3AR1**	**–**
	3 (76.0)	240	2000	23 (3.6)	1	THINBAND–All LA Options, except A or L	2.8 (1.27)	Stock	**STB9J3A1**	**–**
	3 (76.0)	480	2000	23 (3.6)	1	THINBAND–All LA Options, except A or L	2.8 (1.27)	Stock	**STB9J3A2**	**–**
9⅝ (244.5)	3 (76.0)	240/480	3000	37 (5.7)	2	Mica Band–Post Terminals Only w/Strap	2.7 (1.22)	Stock	**B9L3AP2**	**–**
	3 (76.0)	480	3000	34 (5.3)	1	THINBAND–All LA Options, except A or L	2.8 (1.27)	Stock	**STB9L3A4**	**–**
9¾ (248.0)	2 (51.0)	240	2000	34 (5.3)	1	THINBAND–All LA Options, except A or L	1.9 (0.86)	Stock	**STB9N2A1**	**B9N2AP1**
10 (254.0)	1½ (38.0)	240	1400	31 (4.8)	1	THINBAND–All LA Options, except A or L	1.5 (0.68)	Stock	**STB10A1J1**	**B10A1JP1**
10¼ (260.0)	4 (102.0)	240/480	3000	25 (3.9)	2	Mica Band–Post Terminals Only w/Strap	3.9 (1.77)	Stock	**B10E4AP1**	**–**
11 (279.0)	1½ (38.0)	240	1600	32 (5.0)	1	THINBAND–All LA Options, except A or L	1.7 (0.77)	Stock	**STB11A1J1**	**B11A1JP1**
	2 (51.0)	240	2000	30 (4.7)	1	THINBAND–All LA Options, except A or L	2.1 (1.95)	Stock	**STB11A2A1**	**B11A2AP1**
12 (305.0)	2 (51.0)	240/480	2300	33 (5.1)	2	Mica Band–Post Terminals Only w/Strap	2.3 (1.04)	Stock	**B12A2AP2**	**–**

① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Heaters

How to Order

To order stock THINBAND or standard mica band, specify:

- Watlow code number
- Termination type(s)
- Lead lengths
- Quantity

Notes:

- Post terminals are provided unless otherwise specified.
- On Types A, L and K, 12 in. (305 mm) in lead length will be supplied unless otherwise specified.
- On Types E, C, F and H, 14 in. (356 mm) in lead length will be supplied unless otherwise specified.
- On Types A, E, C, F and H, leads will be 2 in. (51 mm) longer than the protective covering unless otherwise specified.
- All LA termination options will be 180° from the gap unless otherwise specified.
- Stock LA termination options can only be supplied with LA termination 180° from the gap.
- For THINBAND heaters higher than 8.5 amperes, contact your Watlow representative.

Availability

- **Stock:** Same day shipment
- **Made-to-Order:** If our stock units do not meet your application needs, Watlow can manufacture to your special requirements. Please contact your Watlow representative for price and delivery of made-to-order items.

Special Mica Band Heaters

For over 85 years, Watlow® has been solving complex and unique application problems with special mica band/barrel heaters. Watlow is continuously improving design and application knowledge through engineering expertise and experience with numerous OEM and end user applications.

This has resulted in the development of many specialty variations in construction resulting in the best heat solutions.



Performance Capabilities

- Sheath temperatures to 900°F (480°C)
- Watt densities to 55 W/in² (8.5 W/cm²)

Features and Benefits

UL® component recognition

- Made available for applications up to 900°F (480°C)

Patented clamping strap

- Assures efficient heat transfer

Low mass design

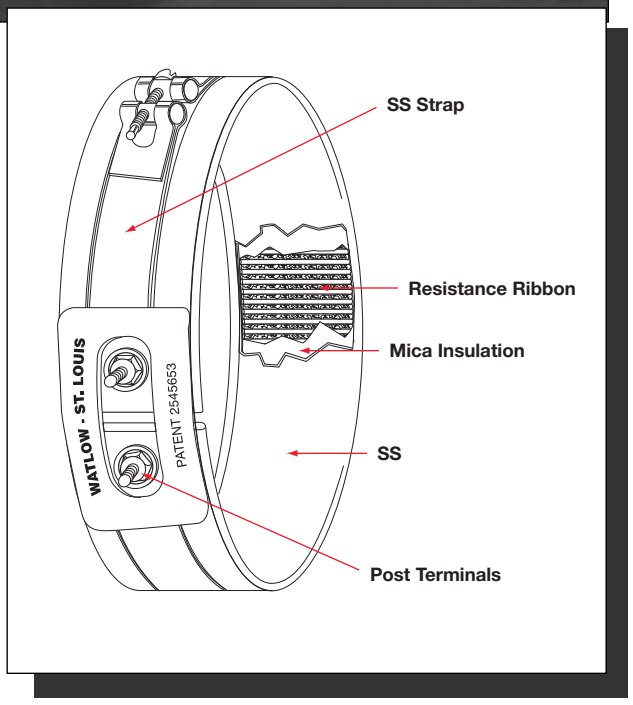
- Allows fast heat-up and quick response

Design variations

- Provides user convenience and heater protection

Applications

- Extruders
- Blown film dies
- Injection molding machines
- Other cylinder heating applications



Special Mica Band Heaters

Applications and Technical Data

Operating Factors

Use lowest watt density per the graph below. A close match of the heat supplied to the actual requirements will reduce temperature overshoot, reduce cycling and increase the life of any band heater used.

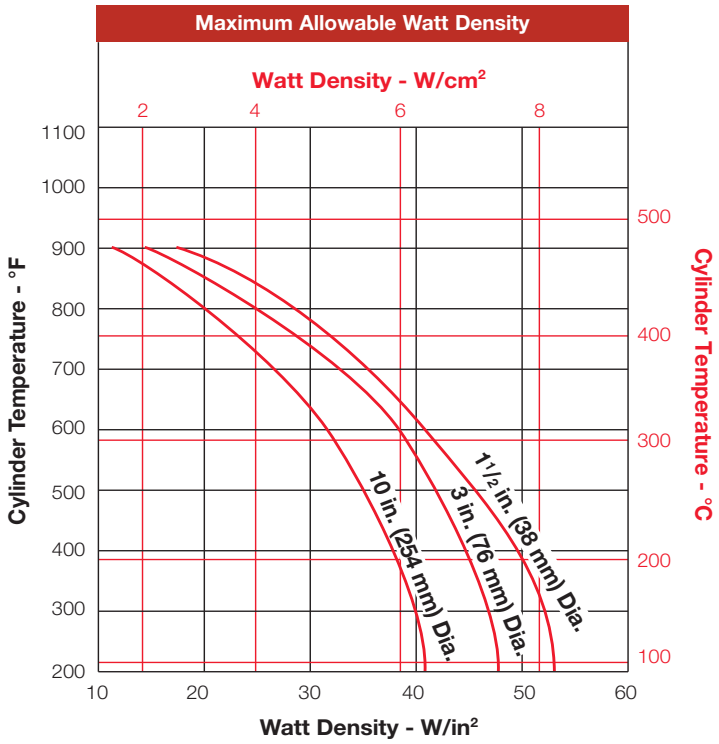
Calculate the **safe max. wattage** for the heater using:

Heated Area x Max. Watt Density

Calculate the **heated area** of the band heater by subtracting the no-heat area from the total area in contact with the cylinder (3.14 x I.D. x width). Subtract the no-heat area at the terminals (from table) and any additional no-heat area caused by holes, slots or oversize gaps.

Determine the maximum watt density of the heater from the *Maximum Allowable Watt Density* graph. The curves are based on narrow heaters mounted on a smooth steel cylinder. Apply the necessary correction factors:

- For heaters 2¼ to 5 in. wide (57 to 127 mm), multiply watt density by 0.80.
- For high expansion cylinders (aluminum or brass), reduce the watt density by 3 W/in² (0.46 W/cm²).
- For heaters 2¼ to 5 in. wide (57 to 127 mm), installed on a high expansion cylinder, reduce watt density by a total of 3 W/in² (0.46 W/cm²) only.
- For regular cylinder surfaces other than smooth, machined finish, reduce watt density by 3 W/in² (0.46 W/cm²).
- For heaters that will be insulated or enclosed, contact your Watlow representative for specific watt densities.



No-Heat Area for Special Mica Band (Post Terminals)

Heater Type	Heater Size		No-Heat Area at Terminals in. (mm)
	Diameter in. (mm)	Width in. (mm)	
One Piece	Less than 2 (51)	Up to 6 (152)	1 (25) x width
	2 (51) or more	Up to 3 (76)	1½ (38) x width
		More than 3 (76)	1 (25) x width
Two Piece	3 (76) or more	Up to 3 (76)	3 (76) x width
		More than 3 (76)	2 (51) x width

Special Mica Band Heaters

Applications and Technical Data *(Continued)*

Check the table to be certain the variations and lead arrangements being ordered are available on the heater size required. If you need to exceed any limitations, please contact your Watlow representative.

Physical Limitations of Variations

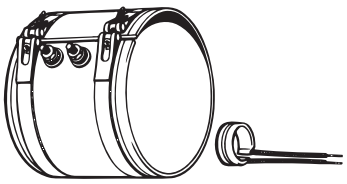
Heater Type	Diameter Min. in.	Diameter Min. (mm)	Diameter Max. in.	Diameter Max. (mm)	Width Min. in.	Width Min. (mm)	Width Max. in.	Width Max. (mm)
1 pc.	1 5/16	(33.3)	22	(559)	5/8	(15.9)	15	(381)
2 pc.	3	(76.0)	44	(1118)	5/8	(15.9)	15	(381)
Expandable:								
Narrow	1 3/4	(45.0)	—	—	1	(25.0)	3	(76)
Wide	1 3/4	(45.0)	—	—	2	(51.0)	6	(152)
O.D. heater								
1 pc.	3	(76.0)	22	(559)	1	(25.0)	6	(76)
2 pc.	3	(76.0)	44	(1118)	1	(25.0)	6	(76)
Type K leads	3/4	(19.0)	—	—	1	(25.0)	15	(381)
Type L leads	3/4	(19.0)	—	—	5/8	(15.9)	15	(381)
Type E leads	1 1/2	(38.0)	22	(559)	5/8	(15.9)	15	(381)
Type F leads	1 1/2	(38.0)	22	(559)	5/8	(15.9)	15	(381)
Type H leads	1 1/2	(38.0)	22	(559)	5/8	(15.9)	15	(381)
Type B leads	1 1/2	(38.0)	22	(559)	3/4	(19.0)	15	(381)
Post terminals	1 5/16	(33.3)	—	—	1	(25.0)	15	(381)
Type A leads	3/4	(19.0)	—	—	5/8	(15.9)	15	(381)
Type C leads	1 5/16	(33.3)	—	—	1	(25.0)	15	(381)
Terminal box	3 1/2	(89.0)	—	—	1 3/8	(34.9)	15	(381)
Plug w/bracket	3	(76.0)	—	—	3 1/2	(89.0)	15	(381)
3-phase	—	—	—	—	3	(76.0)	15	(381)
European plug								
1 pc. vertical	1 5/16	(33.3)	22	(559)	1	(25.0)	15	(381)
1 pc. horizontal	3	(76.0)	22	(559)	2	(51.0)	15	(381)
2 pc. vertical	3	(76.0)	44	(1118)	1	(25.0)	15	(381)
2 pc. horizontal	3	(76.0)	44	(1118)	2	(51.0)	15	(381)
HV Wedge-Lok	1	(25.0)	3	(76)	1	(25.0)	6	(152)
Clamping tabs	2	(51.0)	—	—	1	(25.0)	15	(381)
Welded barrel nuts								
1 pc.	2	(51.0)	22	(559)	1	(25.0)	15	(381)
2 pc.	4	(102.0)	44	(1118)	1	(25.0)	15	(381)

Note: Some combinations of max. and min. cannot occur on the same heater.

Standard gap is ¼ in. (6 mm)

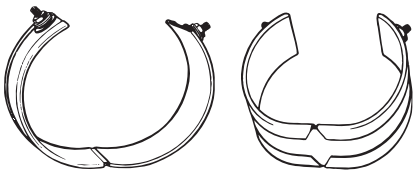
Variations

Different Widths



The 1½ in. (38 mm) wide heater is the most efficient due to maximum clamping action. Heaters are available in widths from ⅝ in. (15.9 mm) to 15 in. (381 mm). Multiple clamping straps are provided for heaters more than 3 in. (76 mm) wide.

Expandable Heaters

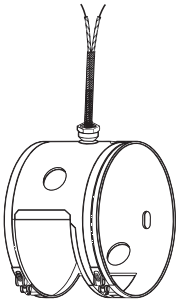


Heaters 3 in. (76 mm) wide or less are constructed with a notched sheath. Heaters wider than three inches are constructed with an expansion seam. These heaters are shipped open and should not be closed and reopened more than twice. To order, specify **expandable.**

Special Mica Band Heaters

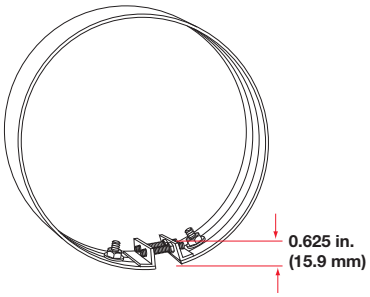
Variations *(Continued)*

Holes and Notches



An economical way to provide access for instrumentation is to specify an oversized gap between the heater ends. Holes and notches in the sheath should be specified only when all the cylinder surface adjacent to the hole or notch must be heated. Required holes may be provided in nearly any location as long as there is at least 1 in. (25 mm) between the hole and one side of the heater. Standard hole sizes up to 2 in. (51 mm) diameter. For proper hole and/or notch location, a **dimensional drawing or customer supplied sample heater is required.**

Outside Diameter



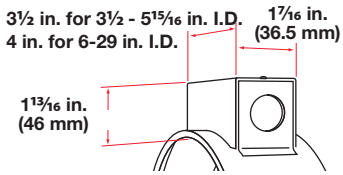
This variation is specially designed and constructed to heat the inside diameter of cylinders (i.e., large diameter blown film dies). All the terminations and mounting hardware are located on the I.D. of the heater. Contact your Watlow representative for available sizes and terminations. To order, specify **outside diameter** heater.

Two Piece Band Heaters



Two-piece construction is available on heaters 3 in. (76 mm) or greater in diameter. Heaters 3 in. (76 mm) wide or less with post terminals have one terminal on each end. Heaters over 3 in. (76 mm) wide with post terminals have the two terminals side by side on one end. On two-piece units with leads, also specify the power supply voltage. The power supply voltage is the voltage to which the heater will be wired. For example, a two-piece band that is 240V~(ac) per half may be wired in series to a 480V~(ac) power supply. In this case the band heater lead wire insulation must be rated for 480V~(ac). To order, specify **two piece band heater,** with **volts** and **watts per half** and **power supply voltage**.

Metallic Terminal Box

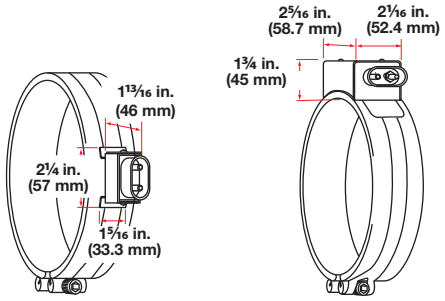


Terminal boxes are attached to the heater to cover the terminals for an added safety feature. Conduit may be attached to the box through ⅞ in. (22.2 mm) diameter holes in the ends of the box. Terminal box is available on two-piece heaters. When ordering, specify **terminal box.**

Special Mica Band Heaters

Variations *(Continued)*

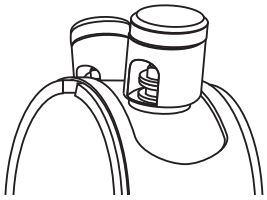
High-Temperature "Quick Disconnect" European Style Plugs



These plugs provide the simplest and safest way to apply power to band heaters. The combination of high temperature male and female "quick disconnect" plug assemblies eliminates all live exposed terminals and electrical wiring that can be a potential hazard to employees or machines. Maximum 15 amperes at 240V~(ac), maximum 240V. To order, specify a **vertical** or **horizontal** european plug.

Ceramic Terminal Covers

Stock Option

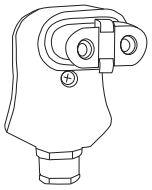


Code # Z-4918

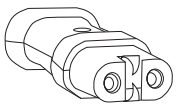
Ceramic terminal covers are a convenient and economical way to insulate post terminals and are sized for standard length posts. Ceramic terminal covers also have a 10-24 screw thread size. These are supplied as an accessory item and shipped separately. To order, specify **Z-4918** and quantity.

High-Temperature "Quick Disconnect" European Style Female Adapters

Vertical



Horizontal



Right Angle
Code # N6027AF049

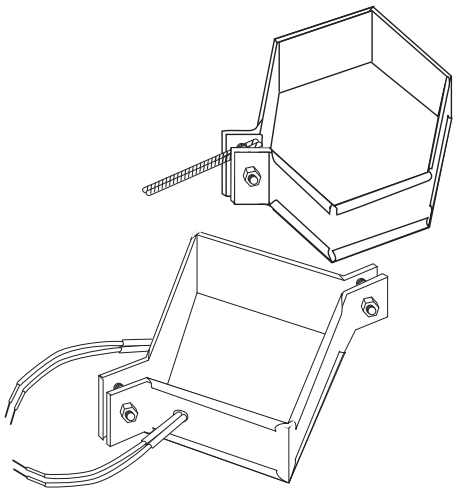
Straight
Code # N6027ZZ028

Available as an accessory item that must be used in conjunction with high-temperature, "quick disconnect" European style plugs. To order, specify code number **N6027AF049** or **N6027ZZ028** and quantity.

Special Construction Variations

Square, Rectangular and Hex Bands

Square and rectangular heaters are made in either one or two-piece construction. These units are ideal for heating dies on plastic extruders or the barrels of twin screw extruders. Hex-shaped heaters are commonly used on the hex-shaped portion of the nozzle injection molding machines. Hex-shaped heaters are made to exact customer specifications. To order, specify **square** or **rectangular** heaters. A **dimensional drawing or customer supplied sample heater is required.**



Special Mica Band Heaters

Special Construction Variations *(Continued)*

Square, Rectangular and Hex Bands *(continued)*

Clamping Styles

The preferred clamping style is illustrated in Figure 1 showing bent-up flange clamping. This clamping style applies a uniform clamping force at the corners.

Figure 2 shows bent-up flanges or built-in strapping bracket at the side.

The least preferred clamping style is shown in Figure 3. The one-piece heater does not apply a uniform clamping force.

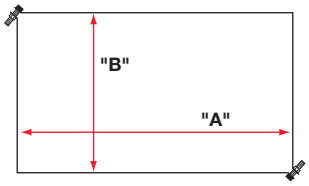


Figure 1

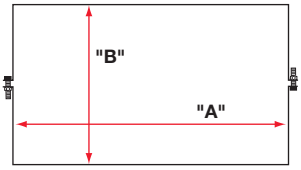


Figure 2

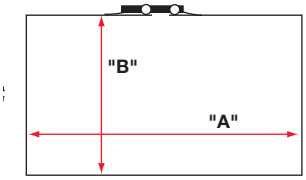
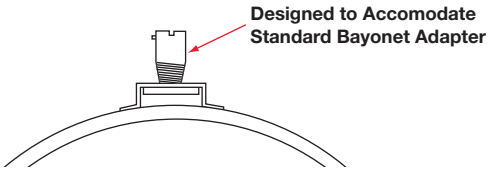


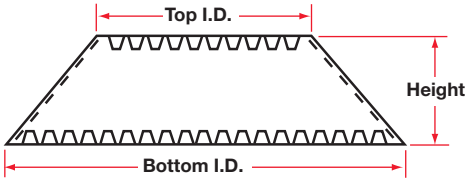
Figure 3

Thermocouple Bracket



The thermocouple bracket simplifies the installation of an external thermocouple with a bayonet adapter. The standard location for the adapter is 90° from the gap. Sizes available are ⅛ in. (3.2 mm), ¼ in. (6 mm) and ⅜ in. (9.5 mm). To order, specify a **thermocouple bracket**.

Cone Shapes



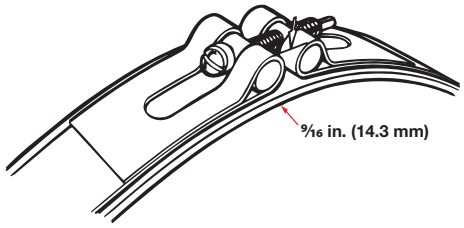
Cone shaped heaters are ideal for applications where heat is required for hoppers or funnels. The preferred method of attachment is with bent-up flange clamping. Cone shaped heaters are made to exact customer specifications. To order, specify a **cone shape adapter**. A **dimensional drawing or customer supplied sample heater is required.**

Note: Complex configurations may require design charges or minimum quantities. Use stock or standard products if possible.

Special Mica Band Heaters

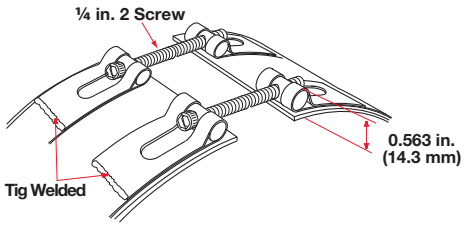
Clamping Variations

Standard and Low-Profile Clamping Strap



The standard clamping strap requires 9⁄16 in. (14.3 mm) clearance above the heated surface at the barrel nuts. When clearance is limited, smaller barrel nuts can be used and require only 3⁄8 in. (9.3 mm) clearance. The clearance required by the clamping screw depends on the screw length and the diameter of the heater. The low-profile clamping strap is standard on units less than 1 3⁄8 in. (34.9 mm) wide and utilizes a ½ in. (13 mm) wide strap. Contact your Watlow representative for more information. To order, specify a **low-profile clamping strap.**

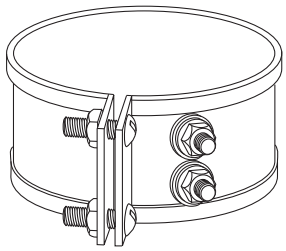
Welded Barrel Nuts



An ideal way to provide access for instrumentation is to specify an oversized gap between the heater ends. If the clamp strap interferes with the positioning of the instrumentation device, welded barrel nuts are recommended. Maximum gap is 1 in. (25 mm). To order, specify **welded barrel nuts with dimensional location** and **gap dimension** when ordering.

Clamping Tabs

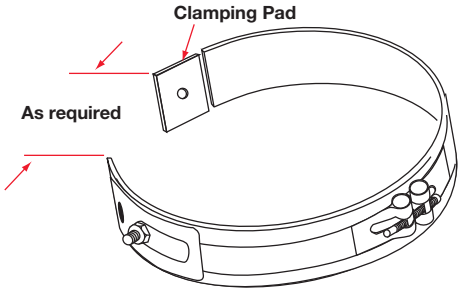
Non-Stock Options



Tabs—or lock-up flanges—are available. However, the special mica band heater and strap design provides superior clamping and improved heat transfer and should be used whenever possible. To order, specify **clamping tabs**.

Clamping Pads

Non-Stock Options



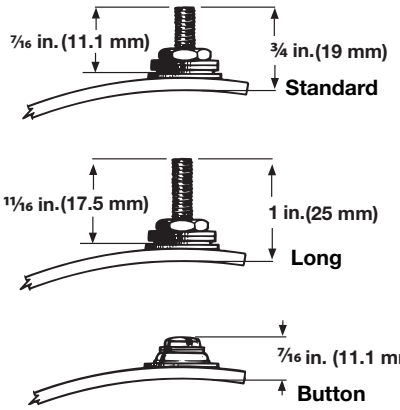
Clamping pads have a hole to allow easy fastening to machine barrel. Clamping pads are used when an obstruction hinders a standard clamping strap from fitting completely around the machine barrel. To order, specify **clamping pads** and **degrees coverage**.

Special Mica Band Heaters

Termination Variations

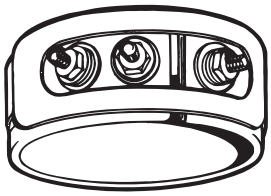
Heaters rated at less than 250V use UL® approved lead insulation for operations to 482°F (250°C) as standard. Lead insulation UL® rated for operation to 850°F (450°C) may be required in high-temperature applications where the leads are shrouded or enclosed with the heater. All heaters rated at more than 250V~(ac) use this wire.

Post Terminal Options



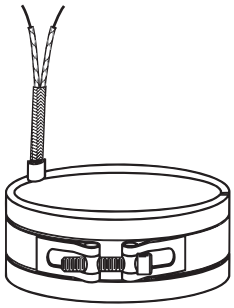
Standard post terminals have a threaded length of 7⁄16 in. (11.1 mm) and require 3⁄4 in. (19 mm) clearance from the cylinder. Terminals with 11⁄16 in. (17.5 mm) threaded lengths are available that require 1 in. (25 mm) of clearance. Button terminals require only 7⁄16 in. (11.1 mm) clearance. Maximum amperage for post terminals is 35 ampere. To order, specify **standard, long** or **button** terminals.

Three Phase or Dual Voltage



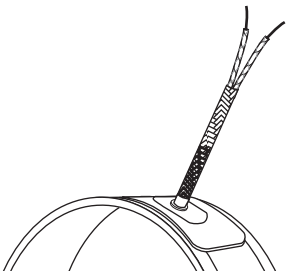
A third terminal can be added to provide dual voltage or three-phase. Standard terminal location on heaters 3 in. (76 mm) wide or less is one terminal at each end of the heater centered on the width. On heaters 3 in. (76 mm) wide or wider, the terminals are located side-by-side on one end. Special terminal locations are available. To order, specify **dual voltage** or **three-phase.**

Type B



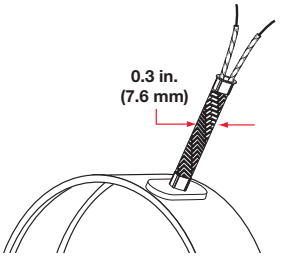
Two fiberglass-insulated lead wires exit in a single metal braid for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. To order, specify **Type B** and **length**.

Type C



Two fiberglass lead wires exit a single tightly woven metal braid for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than the braid. To order, specify **Type C** and **length**.

Type E

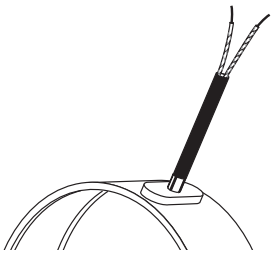


Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than the braid. To order, specify **Type E** and **length**.

Special Mica Band Heaters

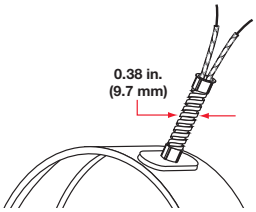
Termination Variations *(Continued)*

Type F



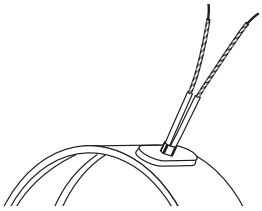
Loose fiberglass sleeving encloses two fiberglass leads for additional insulation protection where high temperature or minor abrasion is present. Leads are 2 in. (51 mm) longer than the sleeving. To order, specify **Type F** and **length**.

Type H



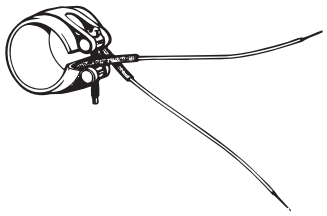
A stainless steel, flexible conduit encloses the leads for superior mechanical protection where lead abrasion is a particular problem. Leads are 2 in. (51 mm) longer than the conduit. To order, specify **Type H** and **length**.

Type K (Vertical)



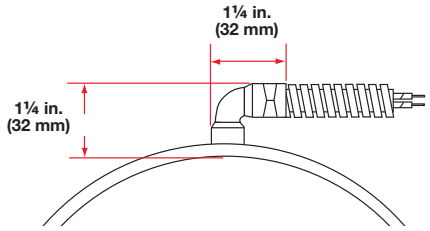
Flexible lead wires exit vertically from the heater. These leads can be bent adjacent to the heater for a quick and easy connection. To order, specify **Type K (vertical)** and **length**.

Type K (Horizontal)



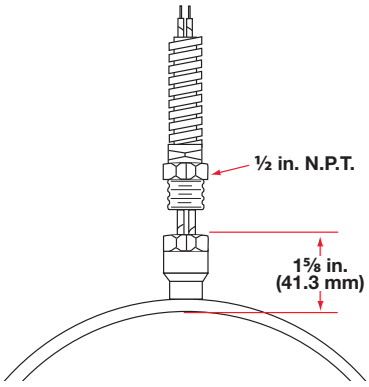
The horizontal **Type K** leads give excellent performance on small heaters when not subjected to strain or hot plastics. The leads are fiberglass insulated. To order, specify **Type K (horizontal).**

Right Angle Armor Cable



Armor cable provides superior protection to lead wires where abrasion can cause damage. The standard leads are 12 in. (305 mm) of armor cable over 14 in. (356 mm) of flexible leads. Right angle armor cable is available on any clamping or construction variation. To order, specify a **right angle armor cable**.

Removable Armor Cable



Removable armor cable is recommended on applications where removable armor is required. It is available on any clamping or construction variation. The fitting will accept the standard armor cable connector. The standard flexible leads are 14 in. (356 mm). To order, specify a **removable armor cable**.

Special Mica Band Heaters

Installation Procedures

1. Install heaters over a clean surface.
2. Install clamp straps, tightening until screw cannot be tightened additionally. On heaters with multiple straps, alternately tighten each strap until no additional tightening occurs.
3. To ensure that the heater is properly seated on the barrel, it is advisable to tap around the circumference of heater with a soft mallet. This will result in a final conforming of the heater to the cylinder. Generally after this is done, operators can get an additional turn or two on the clamp screw. Each screw should have an ultimate torque value as in below chart.
4. When installing terminal lugs, torque the top nut to 12 in.-lbs. The bottom nut should be held by a wrench when tightening the top nut.
5. After the machine has been run for its initial heat up, it is advisable to retighten the clamping bands.

   Note: This retightening must be done when the heaters are cold. If the heater becomes loose due to normal operating and cycling, the strap can be retightened; though frequent adjustments are not advisable. It is advisable to check bands for tightness every three to four months.

Clamp Strap Torque Specifications

Strap Width in.	(mm)	Strap Screw	Allen Type	Pan Head Type
⅞	(22.2)	10 - 24	60 - 75 lb/in	30 - 35 lb/in
⅝	(15.9)	10 - 24	30 - 35 lb/in	30 - 35 lb/in
½	(13.0)	6 - 32	25 lb/in	25 lb/in

Ceramic Knuckle Band Heaters

Ceramic knuckle band heaters are designed to provide high-performance barrel heating at temperatures up to 1400°F (760°C). This level of performance is achieved utilizing ceramic materials, which provide excellent insulation and long heater life. The construction of the ceramic knuckle heater includes interlocking ceramic blocks with resistance wires threaded through holes within the ceramic. This method provides superior heat distribution across the band, resulting in a uniformly heated surface. Ceramic knuckle heaters are specifically engineered and manufactured with three layers.

The aluminized steel sheath layer improves mechanical protection to the heater and resists corrosion.

The ceramic fiber layer provides thermal insulation energy conservation and minimizes heat loss.

The ceramic knuckle layer provides mechanical protection and electrical insulation to the resistance element, which increases heater life and conducts or radiates the heat to the surface.

Performance Capabilities

- 1400°F (760°C) maximum operational temperatures
- Watt densities up to 45 W/in²

Features and Benefits

Ceramic insulator

- Allows for high temperature operation
- Provides longer heater life
- Ensures accurate heating

Aluminized steel cover

- Provides excellent protection from abrasion

Radiation or conduction heat transfer

- Ensures dependable heat transfer method

Standard Construction

- Aluminized sheath
- Clamp tabs
- Post terminals

Applications

- Injection molding barrels
- Extruder barrels
- Blown film dies



Specifications

Electrical

- Resistance tolerance: -10% (+5%)
- Wattage tolerance: +10% (-5%)
- Maximum watt density: 114 W/cm² (45 W/in²)
- Maximum operating temperature: 1400°F (760°C)

Mechanical

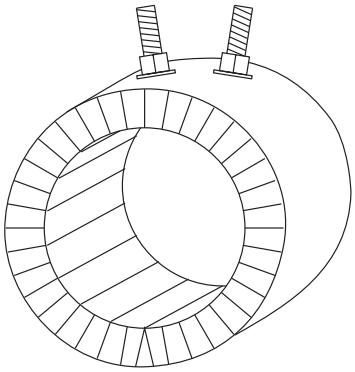
- Overall thickness: 0.5 in. (13 mm)
- Minimum width: 1.5 in (38 mm)
- Maximum width: 9.69 in. (246.1 mm)
- Minimum I.D.: 2 in. (51 mm)
- Maximum I.D.: 15 in. (381 mm)*
- Width tolerance: 0.125 in. (±3.175 mm)
- Standard gap: 0.25 in. (6.4 mm):

*One-piece construction

Ceramic Knuckle Band Heaters

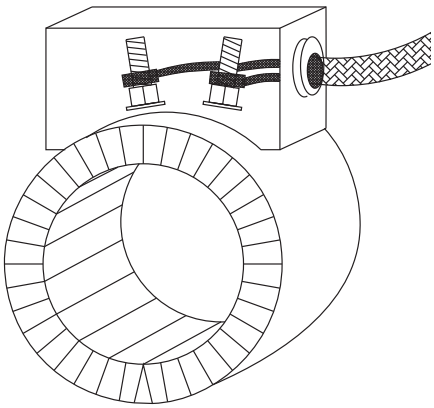
Termination Options

Post Terminals



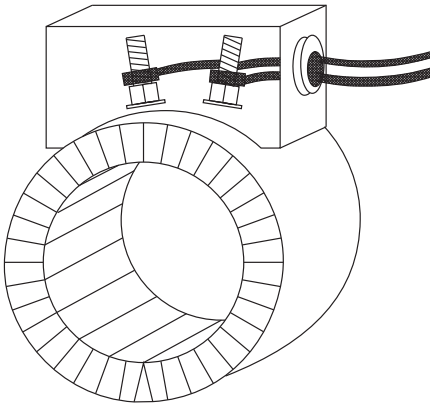
Post terminals are the standard termination, providing quick connection with ring or fork connectors or buss strips, ¼ -20 in. thread and includes double nuts and washers. Standard terminal location is 180° from gap.

Stainless Steel Braid



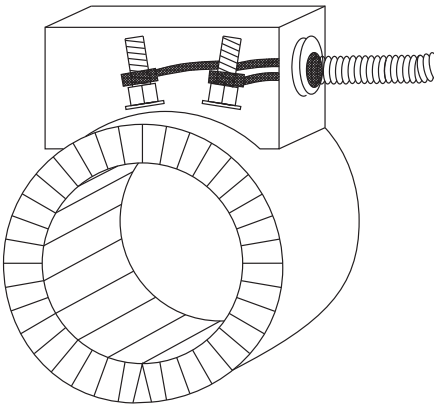
The stainless steel braid method includes a loose metal braid that is welded to the terminal box with a coupler. This provides excellent abrasion protection and flexibility. Leads are attached to posts with a ring connector.

Flexible Lead Wire



Flexible lead wire exits tangential to heater and includes leads connected to the post terminals with ring connectors. This termination method requires a terminal box.

Flexible Stainless Steel Hose

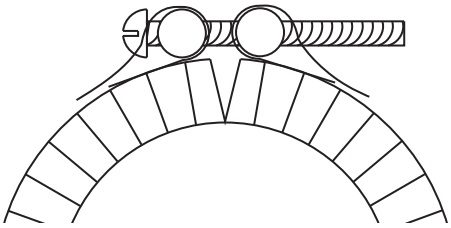


Flexible stainless steel hose is welded to the terminal box with a coupler. This terminal option provides superior mechanical protection where lead abrasion is a problem. Leads are attached to posts with a ring connectors.

Ceramic Knuckle Band Heaters

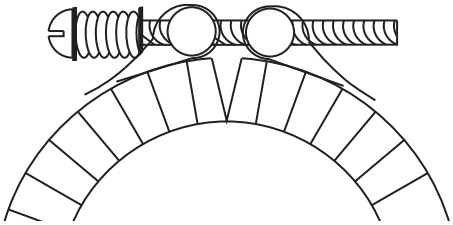
Clamping Options

Barrel Clamps



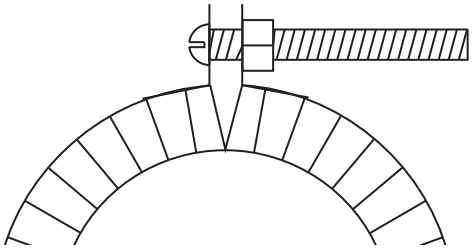
Barrel clamps are used in applications where access for instrumentation is required. It includes an oversized gap.

Spring Loaded Barrel Clamps



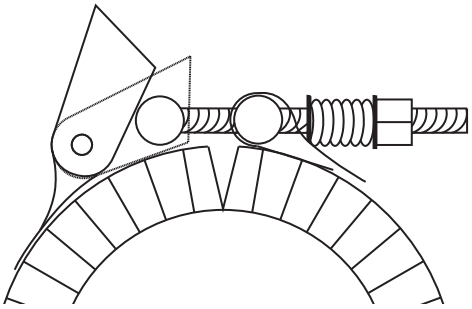
Spring loaded barrel clamps help to compensate for the thermal expansion of metals.

Clamp Tabs



Clamp tabs are a standard clamping option that offers a uniform clamping force across the heater width.

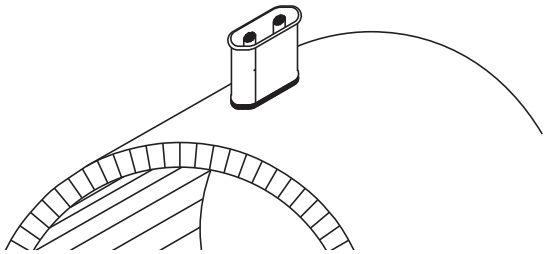
Flexible Lead Wire



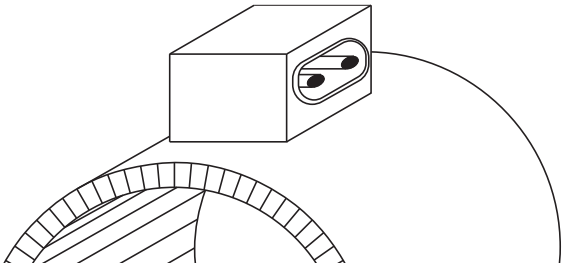
Latch and trunion clamps provide a quick clamp option. Clamping force is similar to barrel clamps and a spring is included to allow for thermal expansion of metals.

European Style Plugs

Vertical



Horizontal



European style plugs provide a simple and safe way to apply power. The combination of high temperature male and female “quick disconnect” plug assemblies eliminate all live exposed terminals and electrical wiring. When ordering, specify vertical or horizontal European plug.

Ceramic Knuckle Band Heaters

Options

Terminal box provides protection for electrical connections in hazardous environments.

Partial coverage helps heating of large pipes and covers large diameters with two or more sections, dimensional drawing required when ordering.

Thermocouple bracket ⅜ NPT necessary for instrumentation. A dimensional drawing is required when ordering.

Holes and notches necessary for instrument access, etc. Heater must be 2.5 in. (64 mm) minimum width and 2.5 in. (64 mm) minimum I.D. A dimensional drawing is required when ordering.

Ceramic terminal covers provide easy installation and protect electrical connections on each individual terminal.

Other Options

- Dual voltage (factory approval required)
- Stainless steel sheath
- Ground stud
- Ground lead
- Three-phase voltage (factory approval required)

Ceramic Band Heater Check List

- The surface where a heater will be mounted must be clean and the heater maintained. It must be free of all contaminants that might cause a short circuit in the heater (typically conductive liquids).
- To prevent overheating, Watlow recommends installing an appropriate temperature controller and checking the correct performance of the thermocouple.
- Do not use in environments containing combustible gases or vapors.
- Keep all electrical connections properly protected to avoid electrical hazards to machine operators.
- Do not over tighten clamps to the point where serrated side folds begin to collapse. Ceramic band heaters utilize radiation heating and excessive force may break ceramic insulators.

Physical Limitations

Options	I.D. (in.)		Width (in.)		Terminals	Clamp
	Min.	Max.	Min.	Max.		
One piece	2½	15	1½	10	—	—
Partial coverage	7	—	1½	9¾	—	Except clamp tabs
Clamp tabs	2½	15	1½	10		—
Barrel nuts	4	—	1½	10		—
Spring loaded barrel nuts	4	—	1½	10	—	
Latch and trunion clamps	3	—	1½	10	—	
Stud terminals	—	—	—	10		—
Flexible leads	2½	—	2½	10		—
SS hose leads	2½	—	2½	10		—
SS braided leads	2½	—	2½	10		—
Terminal box	2½	—	2½	10	—	—
Holes and notches	2½	—	2½	10	—	—
Ceramic cover	2	—	1½	10	Post	—
Terminal clamp	3	—	2½	9¾	Post with terminal box	—
European plug both vertical and horizontal	2½	—	2	10		—

— No restrictions.
Note: These are all standard clamping options, for special constructions please consult factory.

Strip/Clamp-On Heaters

Strip/Clamp-On Heaters

Mineral Insulated Strip Heaters 553

Mica Strip Heaters.....557

375 High-Temperature Strip Heaters.....567

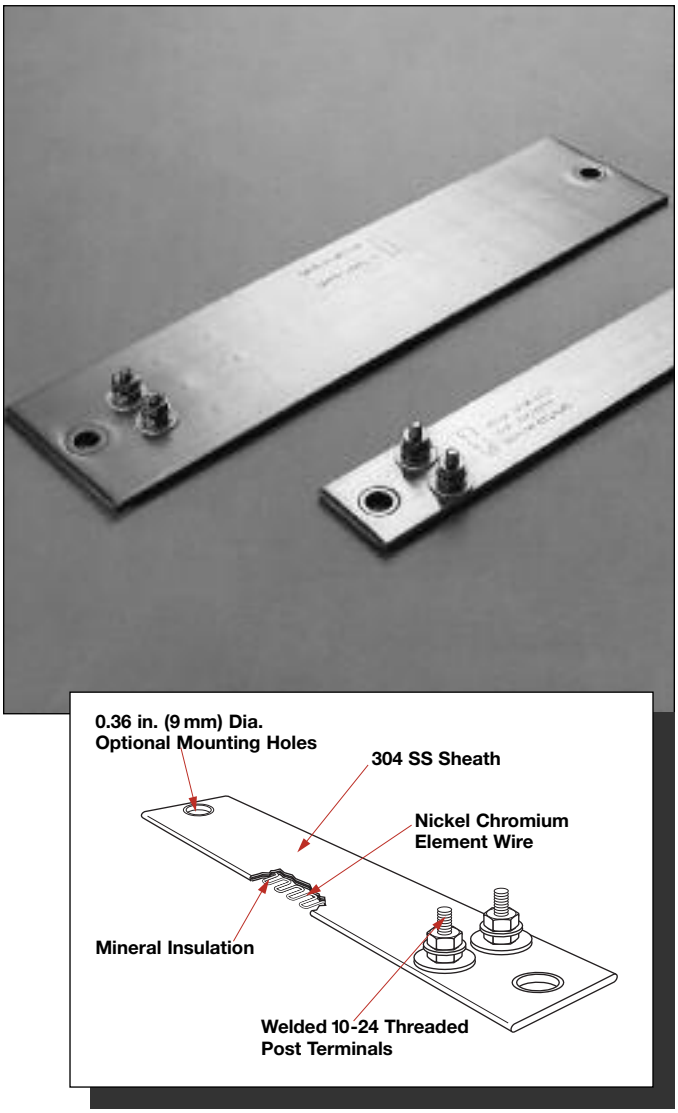
FIREBAR® Clamp-On Heaters 575

Thick Film Conduction Heaters 577



Mineral Insulated Strip Heaters

The Mineral Insulated (MI) strip is a thin, responsive heater setting unmatched standards for performance and durability. It makes use of the most advanced heater construction techniques, including embedding a nickel-chromium element wire in an exclusive mineral insulation from Watlow®. This thin layer of insulation brings the element wire closer to the heater sheath, resulting in easy heat flow from the element wire to the sheath. This allows the wire to run cooler than conventional heaters.



Performance Capabilities

- Sheath temperatures to 1400°F (760°C)
- Watt densities to 100 W/in² (15.5 W/cm²)
- Max. voltage 480V~(ac)

Features and Benefits

Higher watt densities more than any other strip heater

- Provides faster heat up

Exclusive mineral insulation

- Combines dielectric strength and superior thermal conductivity
- Transfers heat rapidly to the sheath

304 stainless steel sheath

- Maintains the high compaction of mineral insulation
- Produces a rigid heater

UL® component recognition

- Available for most 250V~(ac) or less designs
- UL® File #E52951

Applications

- Solder pots
- Zinc die-casting equipment
- Die and mold heating
- High-temperature resins
- Tank and platen heating
- Ovens
- Packaging equipment

Quick Ship

- *Same day shipment on all stock units.*

Mineral Insulated Strip Heaters

Applications and Technical Data

Calculating Watt Density

Watt density is the amount of wattage per square inch of heated area. To determine watt density, divide the total wattage by the heated area.

$$\text{Watt Density} = \frac{\text{Total Watts}}{\text{Heated Area}}$$

To apply this equation, we must define the term "heated area." Heated area is the total contact surface of the heater less areas of no-heat found around terminals, mounting holes, etc.

Heated Area = Total Contact Area - No-Heat Area

To calculate the heated area:

1. Locate the **no-heat factor** from the chart below that corresponds to the type of heater being considered.
2. To use the formula below, insert the no-heat factors, length and width (in inches).

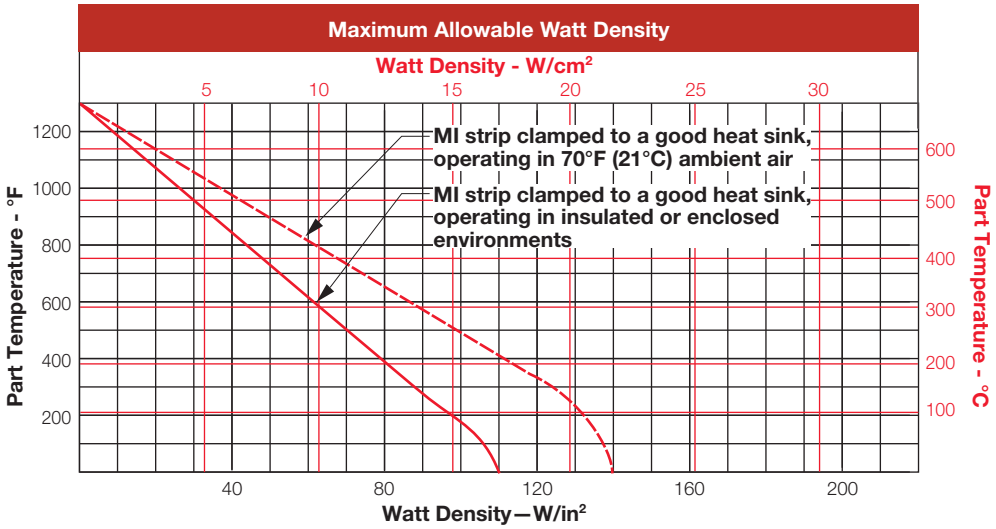
Heated Area = (Heated Length - No-Heat Factor) x Width

Type	Factor (in.)
1 in. Wide	
1 in. wide post terminal 1 on 1	1.75
1 in. wide post terminal 1 on 1 with mounting holes	3.00
1 in. wide post terminal 2 on 1	1.93
1 in. wide post terminal 2 on 1 with mounting holes	3.93
For all other widths	
2 on 1 post terminal	1.18
2 on 1 with mounting holes	3.18

Calculating Watt Density

The drawings on the next page and the graph on this page will help select the correct watt density for a particular application. First, refer to the drawings to determine the heated area of the heater. Then, use the watt density formula and graph to make sure the maximum watt density of the heater will not be exceeded in the specific application.

$$\text{Watt Density} = \frac{\text{Wattage}}{\text{Heated Area}}$$



Mineral Insulated Strip Heaters

Applications and Technical Data *(Continued)*

Specifications

Width

- 1, 1½ and 2 in. (25, 38, 51 mm), Tolerance ±1/32

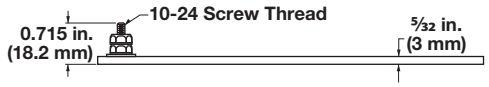
Length

- 8 to 30 in. (203 to 762 mm), Tolerance ±⅛

Terminations

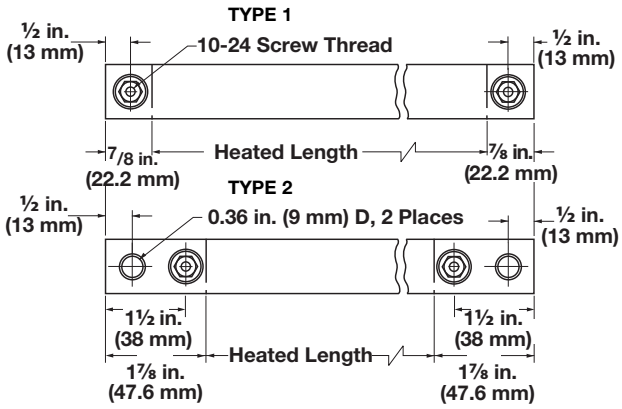
- 1 in. (25 mm) wide—post terminals one-on-one
  1½ to 2 in. (38 to 51 mm)—post terminals two-on-one

All Widths

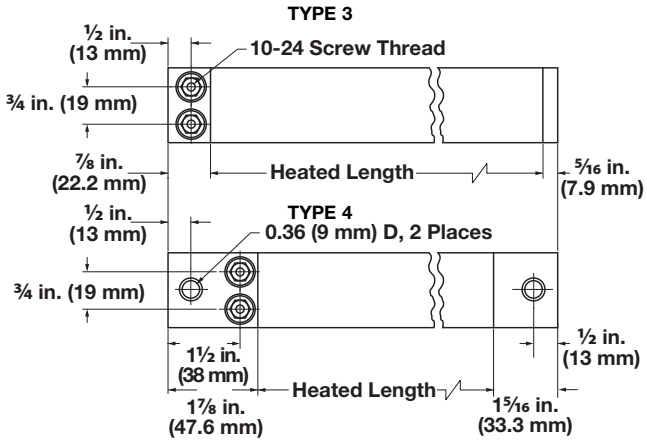


Note: In most applications mounting holes alone will not provide adequate clamping. A clamp bar should be used for each 4 in. (102 mm) of heater length.

1 in. (25 mm) Wide



1½ in.–2 in. (38 – 51 mm) Wide



Stock Heater Code Numbers (Parallel Terminals) Type 3 and 4

Width in.	Width (mm)	Length in.	Length (mm)	Volts	Power (Watts)	Watt Density W/in²	Watt Density (W/cm²)	Approx. Net Wt. lbs.	Approx. Net Wt. (kg)	Type	Code Number
1½	(38)	8	(203)	120	500	48	(7.4)	0.3	(0.15)	3	**MS1J8AS1**
1½	(38)	8	(203)	240	500	50	(7.8)	0.3	(0.15)	3	**MS1J8AS3**
1½	(38)	12	(305)	120	350	26	(4.0)	0.5	(0.2)	4	**MS1J12AV2**①
1½	(38)	12	(305)	240	350	26	(4.0)	0.5	(0.2)	4	**MS1J12AV3**①
1½	(38)	12	(305)	120	800	49	(7.6)	0.5	(0.2)	3	**MS1J12AS1**
1½	(38)	12	(305)	240	800	49	(7.6)	0.5	(0.2)	3	**MS1J12AS2**
1½	(38)	18	(457)	120	1000	40	(6.2)	0.8	(0.3)	3	**MS1J18AS1**
1½	(38)	18	(457)	240	1000	40	(6.2)	0.8	(0.3)	3	**MS1J18AS2**

① Denotes units with mounting holes. Mounting holes are 0.36 in. (9 mm) in diameter, and are intended for use with ¼ in. (6 mm) bolts. Centers of mounting holes are located ½ in. (13 mm) from the ends of the heater.
Note: Type 1 and 2 are made-to-order only.

Mineral Insulated Strip Heaters

Ordering Information

How to Order

Please specify:

- Watlow code number
- Overall dimensions: length and width
- Wattage: see *Maximum Allowable Watt Density* graph
- Termination type: parallel or one-on-one
- Mounting holes, if desired
- Quantity

If stock units do not meet specific application needs, Watlow can manufacture MI strip heaters to meet special requirements.

Availability

Stock: Same day shipment

Made-to-Order: Contact your Watlow representative

Mica Strip Heaters

The Watlow® mica strip heater is an economical and reliable source of heat for industrial equipment. A mica insulator on both sides of the resistance element provides complete electrical insulation and offers little resistance to efficient heat flow. Plus, mica withstands high voltage spikes, resists moisture and is inert to most chemicals.

Performance Capabilities

- Sheath temperatures of 900°F (480°C) on stainless steel units
- Watt densities to 45 W/in² (6.9 W/cm²)
- Maximum voltage 480V~(ac)

Features and Benefits

Low mass construction
- Heats up faster to provide quick response to control output

Flat resistance ribbon
- Generates heat over a broad area
- Puts the heat source closer to the work

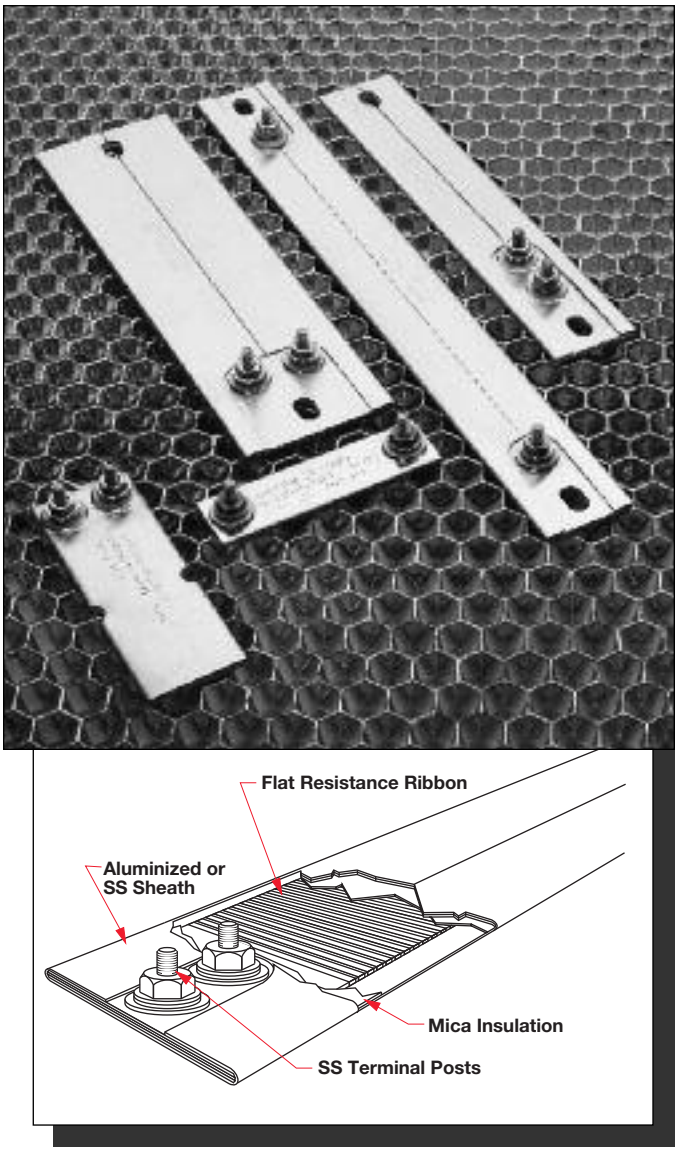
Aluminized steel or stainless steel sheath material
- Resists corrosion at high temperatures

Stainless steel terminal posts are securely riveted
- Ensures a positive, trouble-free connection to the resistance circuit

Computer-aided design engineering
- Ensures the best combination of ribbon gauge, total wattage and winding spacing
- Maximizes heat transfer and life of heater

Quality control inspection for all incoming mica
- Guarantees excellent dielectric strength

UL® component recognition
- Available for applications to 900°F (480°C) sheath temperature
- UL® File #E52951



Applications

- Vulcanizing presses
- Sealing equipment
- Hot plates
- Hot stamping
- Die and mold heating
- Thermoforming
- Tin melting
- Packaging equipment

Quick Ship

- *Same day shipment on all stock units*

Mica Strip Heaters

Applications and Technical Data

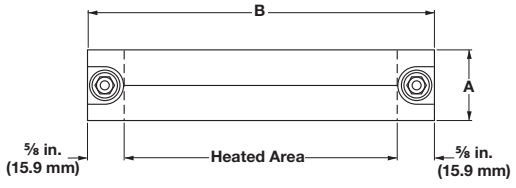
Physical Limitations of Lead Variations

Heater Type	Width				Length			
	Min.		Max.		Min.		Max.	
	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)
Post Terminal								
Type 1 - Opposite ends	⅝	(15.9)	15	(381)	2	(51)	96①	(2438)
Type 2 - Tandem	⅝	(15.9)	15	(381)	2	(51)	96①	(2438)
Type 3 - Parallel	1½	(38)	15	(381)	2	(51)	96①	(2438)
Type 4 - Opposite ends with holes	⅝	(15.9)	15	(381)	5½	(140)	96①	(2438)
Type 5 - Tandem with holes	⅝	(15.9)	15	(381)	5½	(140)	96①	(2438)
Type 6 - Parallel with holes	1½	(38)	15	(381)	5½	(140)	96①	(2438)
Leads								
Type C, E. F, H	1	(25)	15	(381)	5½	(140)	96①	(2438)
Type K								
without mounting holes	1	(25)	15	(381)	5½	(140)	96①	(2438)
with mounting holes	1½	(38)	15	(381)	5½	(140)	96①	(2438)
European Plug								
Vertical	1	(25)	15	(381)	5½	(140)	96①	(2438)
Horizontal	2½	(64)	15	(381)	6¼	(159)	96①	(2438)
Three-Phase	3	(76)	15	(381)	5½	(140)	96①	(2438)
Dual Voltage	3	(76)	15	(381)	5½	(140)	96①	(2438)
Terminal Box②								
Type 2 - Tandem	1½	(38)	15	(381)	4¼	(108)	96①	(2438)
Type 3 - Parallel	2½	(64)	15	(381)	4¼	(108)	96①	(2438)
Type 5 - Tandem with holes	1½	(38)	15	(381)	6¼	(159)	96①	(2438)
Type 6 - Parallel with holes	2½	(64)	15	(381)	6¼	(159)	96①	(2438)

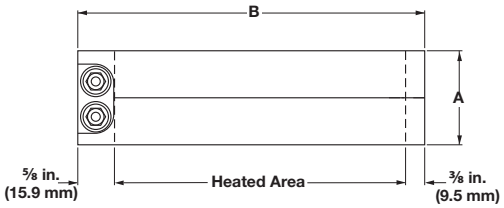
① Contact your Watlow representative if you need to exceed 96 in. (2438 mm).
② Not available on stock heaters.

Note: Some combinations of maximum and minimums cannot occur on the same heater.

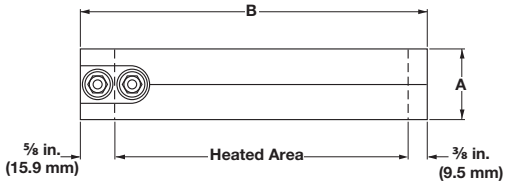
Type 1—Opposite Ends



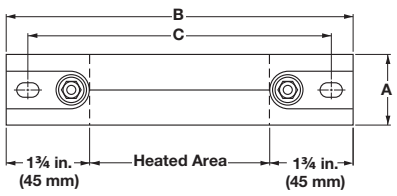
Type 3—Parallel



Type 2—Tandem



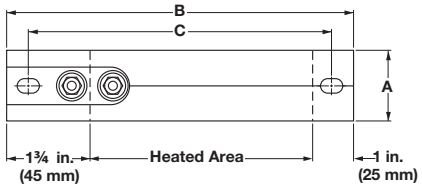
Type 4—Opposite Ends with Holes



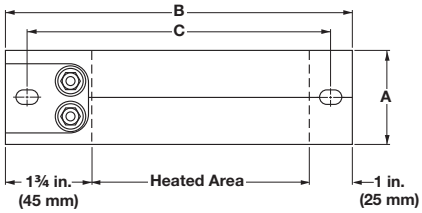
Mica Strip Heaters

Applications and Technical Data *(Continued)*

Type 5—Tandem with Holes



Type 6—Parallel with Holes



Terminations

Types 1 through 6, as illustrated, show the placement of terminals for Watlow mica strip heaters. Placement is specified in terms of length, width and center-to-center dimensions. These dimensions are as follows:

Length: tolerance ±1/16 in. (1.6 mm)
Width: tolerance ±1/16 in. (1.6 mm)
Thickness: nominal 3/16 in. (4.8 mm)

Types 4, 5 and 6 have 3/8 in. x 1/4 in. (9.5 mm x 6 mm) mounting slots. Letters A, B and C called out in the illustrations, denote the following:

A = width, B = overall length and
C = center-to-center dimensions on mounting slots

Calculating Watt Density

Watt density is the amount of wattage per square inch of heated area. To determine watt density, divide the total wattage by the heated area.

$$\text{Watt Density} = \frac{\text{Total Watts}}{\text{Heated Area}}$$

To apply this equation, we must define the term “heated area.” Heated area is the total contact surface of the heater less areas of no-heat found around terminals, mounting holes, etc.

Heated Area = Total Contact Area - No-Heat Area

To calculate the heated area:

Heated Area = (Length - No-Heat Area) x Width

Mica Strip Heaters

Applications and Technical Data *(Continued)*

Maximum Allowable Watt Density

The following derating factors are applicable to the *Maximum Allowable Watt Density* graph. Please review these factors and the graph to determine the maximum watt density for the application.

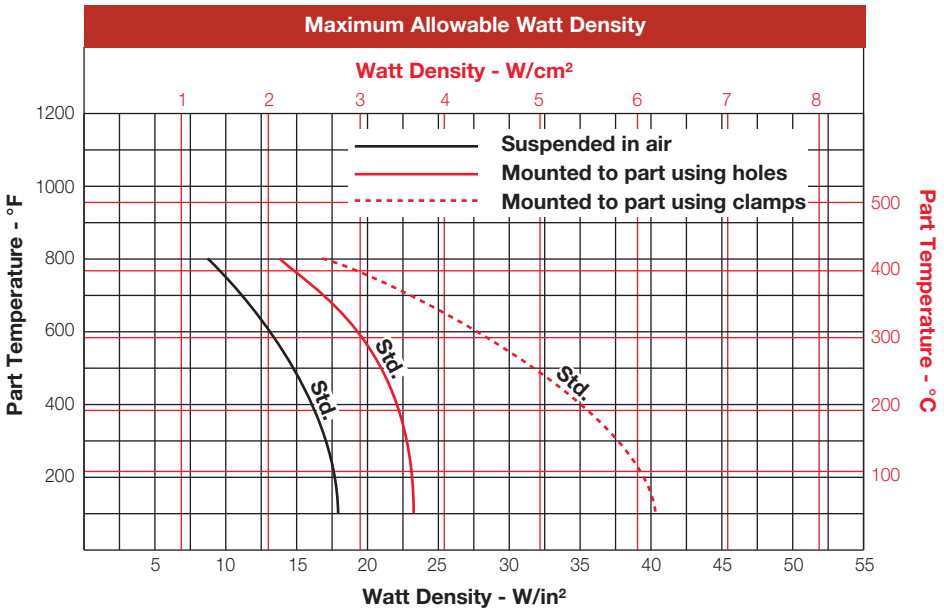
Derating Factors:

- For heaters mounted less than 1 in. (25 mm) apart on a metal part, derate by 5 percent.
- For heaters mounted within 3 in. (76 mm) of a reflective surface, derate by 10 percent.
- For heaters mounted 2 to 6 in. (51 to 152 mm) apart and radiating toward each other, derate by 10 percent.
- For heaters mounted within 1 in. (25 mm) of a reflective surface, derate by 20 percent.
- For heaters mounted less than 2 in. (51 mm) apart and radiating toward each other, derate by 20 percent.
- For termination Types 2 and 5 as well as lead Types C, E, H and K vertical (see illustrations on pages 558 to 562) that are less than 2 in. (51 mm) wide, derate as follows: aluminized steel units by 10 percent and stainless steel units by 20 percent.

Application Hints

To maximize the performance of a mica strip heater, ensure:

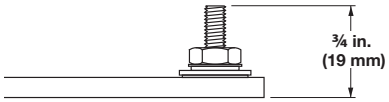
- Small heaters with 5 in² (32.3 cm²) or less of heated area are 120V~(ac). These heaters can be wired in series for a 240V~(ac) power supply.
- The surface to be heated is clean and smooth, so that heat is transferred efficiently. Even small air gaps can cause hot spotting.
- Terminal post nuts are not overly tightened. Although the posts are securely riveted to the elements, excessive torque could break the connection.



Mica Strip Heaters

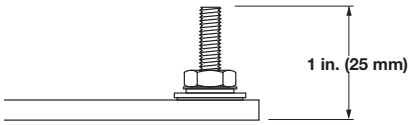
Termination Options

Post Terminals (Standard)



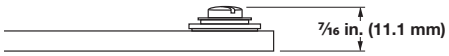
Post terminals have a threaded length of 7⁄16 in. (11.1 mm) and require approximately ¾ in. (19 mm) clearance. Specify **standard terminals** when ordering.

Long Terminals



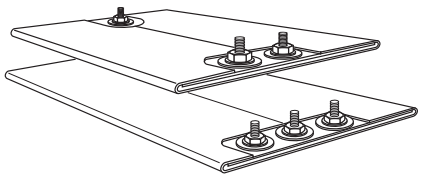
Longer terminals with 11⁄16 in. (17.5 mm) threaded lengths are available and require approximately 1 in. (25 mm) clearance. Specify **long terminals** when ordering.

Button Terminals



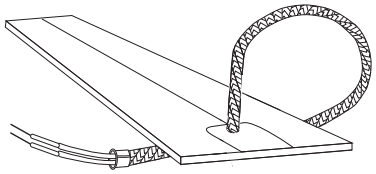
The slotted screw head terminals require only 7⁄16 in. (11.1 mm) clearance. Specify **button terminals** when ordering.

Three Terminal Construction



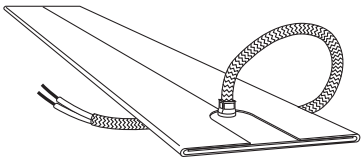
A third terminal can be added to provide dual voltage or three-heat operation. Or, it can be connected to the sheath for easy grounding. Specify **dual voltage** or **three-heat operation** when ordering.

Type E—Loose Metal Braided Leads



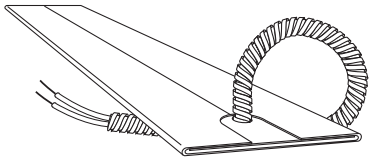
Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than the braid. To order, specify **Type E** and **length**.

Type C—Metal Overbraid Leads



Each fiberglass-insulated lead wire exits in a single metal braid from the back of the heater. This arrangement offers abrasion protection, lead flexibility and convenient wiring for a neat installation. Minimum heater length is 5½ in. (140 mm). Specify **Type C** and **length** when ordering. Leads are 2 in. (51 mm) longer than braid.

Type H—Flexible Steel Hose Leads (Vertical)



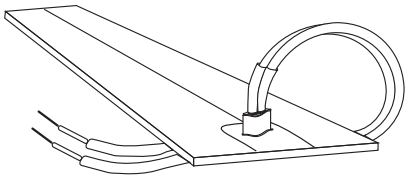
Galvanized, flexible steel hose leads give superior mechanical protection where lead abrasion is a particular problem. Minimum heater length is 5½ in. (140 mm). Specify **Type H** and **lead length** when ordering. Leads are typically 2 in. (51 mm) longer than hose.

Mica Strip Heaters

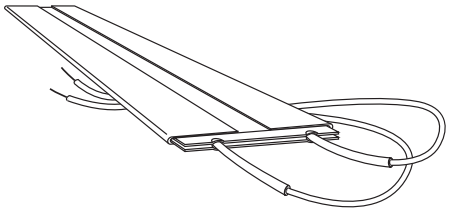
Termination Options *(Continued)*

Type K—Flexible Leads

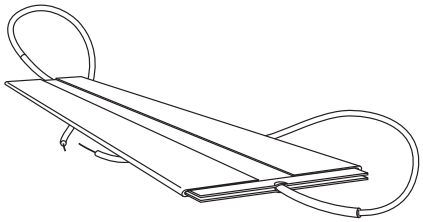
Type K has two fiberglass-insulated leads. These leads can exit one at each end or both at the same end, so please specify end termination when ordering. Type K is suitable for applications where lead abrasion is not a problem. Specify **Type K orientation** and **length** when ordering.



Two-on-One (Vertical)



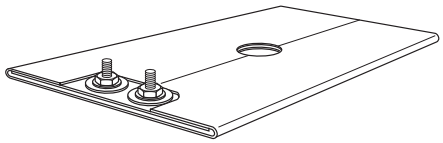
Two-on-One (Horizontal)



One-on-One (Horizontal)

Options

Holes or Slots



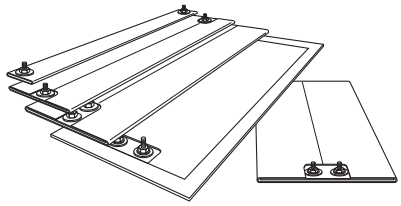
When required for instrumentation or mounting, holes or slots may be provided as a manufactured variation in nearly any location as long as there is at least 1 in. (25 mm) between the edge of the hole and one side of the heater. Dimensional drawing is required when ordering.

Distributed Wattage



A mica strip heater can be designed with varying heat profile along the length for uneven heat distribution.

Widths



The 1½ in. (38 mm) wide heater is the most efficient size due to its maximum clamping effect. Heaters are available in widths from ⅝ in. (15.9 mm) to 24 in. (610 mm).

Heaters 5 in. (127 mm) wide and greater are constructed with end folds and a reinforcement shim rather than full folds. Units less than 1⅜ in. (34.9 mm) wide have the sheath seam on the side opposite the terminals.

Open Element

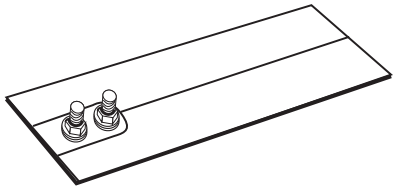


This economical heater design without the metal case is commonly used in laminating machines. The heater assembly is sandwiched between machine parts, eliminating the need for additional and expensive metal cases.

Mica Strip Heaters

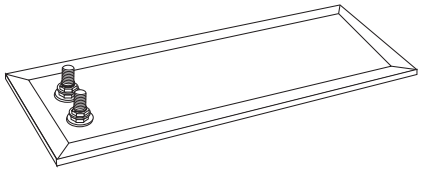
Options *(Continued)*

Butt Case



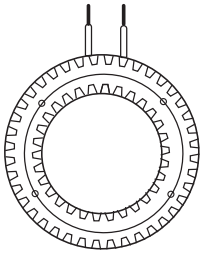
Recommended for heating applications where a strip heater will be placed in a milled slot between two steel plates. Specify **butt case** construction when ordering.

Four Sides Closed



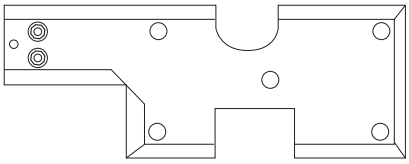
Mica strip heaters can be closed on all four sides to prevent contamination. Standard on strip heaters 5 in. (127 mm) wide and greater.

Ring Heaters



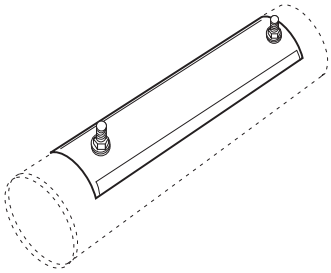
When ordering ring heaters, specify **inside** and **outside diameters**. If mounting holes are required, specify location and hole size.

Irregular Shapes



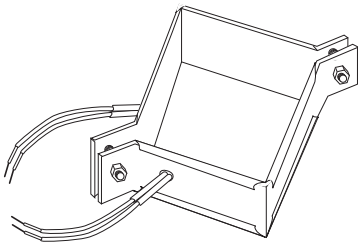
Mica strip heaters can be made into any practical shape and electrical rating. Examples include: cone, flat circular, square, rectangular and hexagon.

Cross Section Formed



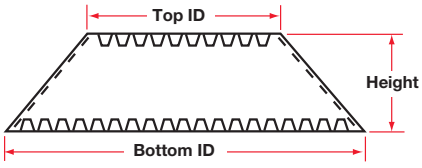
Strip heaters can be formed on a cross section for piping applications. Specify diameter of pipe on which heaters are to be mounted.

Square, Rectangular Bands



Square or rectangular heaters are normally used for heating dies on plastic extruders or the barrels of twin screw extruders. These can be made in either one- or two-piece construction (see illustration).

Cone Shapes



Cone shaped heaters are normally used for special heating applications when heat is required for hoppers or funnels. They are made strictly to customer specifications. The preferred method of attachment is with bent-up flange clamping.

Mica Strip Heaters

Options *(Continued)*

Clamping Styles

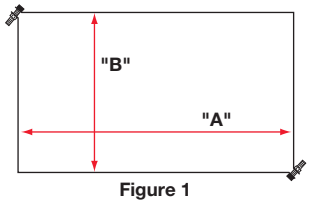


Figure 1

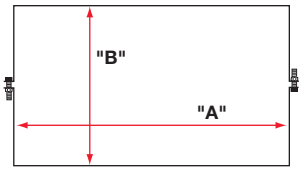


Figure 2

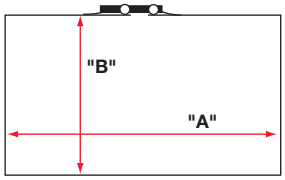
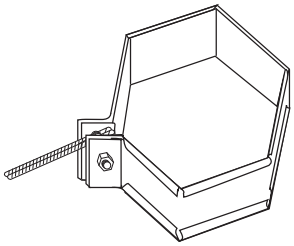


Figure 3

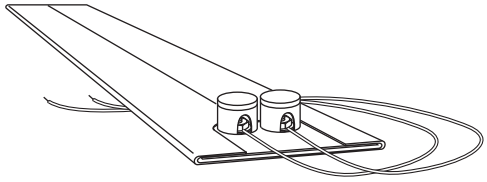
Referring to the illustrations, the preferred design is Figure 1, with bent-up flange clamping, due to the uniform applied clamping force at the corners. Next is Figure 2, with bent-up flanges or built-in strapping brackets at the sides. The least preferred design is Figure 3, one-piece heater, due to the lack of uniform applied clamping force.

Hex Bands



Hex shaped heaters are used on the hex shaped portion of the nozzle on injection molding machines. A drawing is required when ordering.

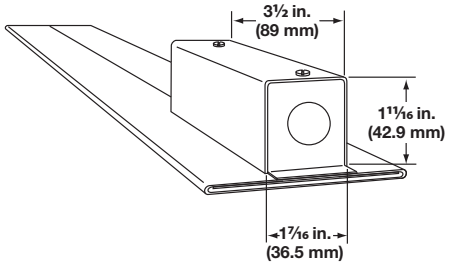
Ceramic Terminal Covers



Ceramic terminal covers are a convenient, economical way to provide safety. Covers are sized for standard 7⁄16 in. (11.1 mm) long post terminals requiring approximately ¾ in. (19 mm) clearance.

The clearance, with ceramic cover cap, is 0.91 in. (23.1 mm). Excluding the thickness of the heater, the clearance is 0.75 in. (19 mm). Screw thread size is 10-24. To order, specify Watlow code number **Z-4918** and quantity.

Metallic Terminal Box



A high quality metallic terminal box is welded to the heater sheath. Units with tandem terminals must be at least 1½ in. (38 mm) wide. Units with parallel terminals must be at least 4¼ in. (108 mm) wide. Minimum length is 4¼ in. (108 mm) without mounting holes or 6¼ in. (159 mm) with holes. When ordering specify, **terminal box.**

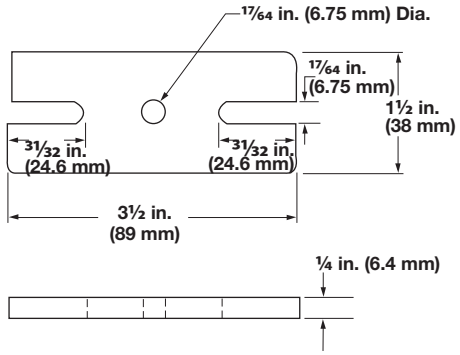
Note: Complex configurations may require design charges or minimum quantities. Use stock or standard products if possible.

Mica Strip Heaters

Accessories

Clamping Bars

For maximum life and efficient operation, strip heaters must be firmly clamped to the part being heated. Clamping bars 3½ in. (89 mm) wide can be used to clamp strips with a maximum width of 3 in. (76 mm). Watlow recommends clamping every 6 in. (152 mm). Specify code number **MB101-1** and quantity when ordering clamping bars.



Stock Heater Code Numbers

Width in. (mm)	Overall Length in. (mm)	Type	Center-to-Center Mtg Holes in. (mm)	Volts	Power (Watts)	Watt Density W/in.² (W/cm²)	Approx. Net Wt. lbs (kg)	Avail.	Code Number
1 (25)	3½ (89)	1	— —	120	50	22 (3.4)	0.09 (0.04)	Stock	**S1A3JP1**
	6 (152)	1	— —	120	100	21 (3.3)	0.17 (0.08)	Stock	**S1A6AP1**
	6 (152)	1	— —	240	100	21 (3.3)	0.17 (0.08)	Stock	**S1A6AP2**
	12 (305)	4	11 (279)	120	175	21 (3.3)	0.33 (0.15)	Stock	**S1A12AT1**
	12 (305)	4	11 (279)	240	175	21 (3.3)	0.33 (0.15)	Stock	**S1A12AT2**
	6 (152)	5	5¼ (133)	120	100	20 (3.1)	0.17 (0.08)	Stock	**S1A6AU1②**
1½ (38)	18 (457)	1	— —	120	750	30 (4.6)	0.75 (0.34)	Stock	**S1J18AP1**
	6 (152)	2	— —	120	250	33 (5.1)	0.25 (0.11)	Stock	**S1J6AR1**
	8 (203)	2	— —	120	400	37 (5.7)	0.33 (0.15)	Stock	**S1J8AR1**
	8 (203)	2	— —	240	400	37 (5.7)	0.33 (0.15)	Stock	**S1J8AR2**
	12 (305)	2	— —	120	500	30 (4.6)	0.50 (0.23)	Stock	**S1J12AR1**
	12 (305)	2	— —	240	500	30 (4.6)	0.50 (0.23)	Stock	**S1J12AR2**
	14 (356)	2	— —	120	500	25 (3.9)	0.58 (0.26)	Stock	**S1J14AR1**
	14 (356)	2	— —	240	500	25 (3.9)	0.58 (0.26)	Stock	**S1J14AR2**
	18 (457)	2	— —	120	800	31 (4.8)	0.75 (0.34)	Stock	**S1J18AR1**
	18 (457)	2	— —	240	800	31 (4.8)	0.75 (0.34)	Stock	**S1J18AR2**
	24 (610)	2	— —	120	1000	29 (4.5)	1.00 (0.45)	Stock	**S1J24AR1**
	24 (610)	2	— —	240	1000	29 (4.5)	1.00 (0.45)	Stock	**S1J24AR2**
	8 (203)	4	7 (178)	120	150	22 (3.4)	0.33 (0.15)	Stock	**S1J8AT1**
	12 (305)	4	11 (279)	120	250	20 (3.1)	0.50 (0.23)	Stock	**S1J12AT1**
	12 (305)	4	11 (279)	240	250	20 (3.1)	0.50 (0.23)	Stock	**S1J12AT2**
	18 (457)	4	17 (432)	240	500	23 (3.6)	0.75 (0.34)	Stock	**S1J18AT1**
	5½ (140)	5	4½ (114)	120	125	30 (4.6)	0.23 (0.11)	Stock	**S1J5JU1**
	7½ (191)	5	6½ (165)	120	150	21 (3.3)	0.32 (0.15)	Stock	**S1J7JU1**
	8 (203)	5	7 (178)	120	150	19 (2.9)	0.33 (0.15)	Stock	**S1J8AU1**
	8 (203)	5	7 (178)	240	150	19 (2.9)	0.33 (0.15)	Stock	**S1J8AU2**
	8 (203)	5	7 (178)	120	175	22 (3.4)	0.33 (0.15)	Stock	**S1J8AU3**
	8 (203)	5	7 (178)	240	175	22 (3.4)	0.33 (0.15)	Stock	**S1J8AU4**
	8 (203)	5	7 (178)	120	250	32 (5.0)	0.33 (0.15)	Stock	**S1J8AU5**
	8 (203)	5	7 (178)	240	250	32 (5.0)	0.33 (0.15)	Stock	**S1J8AU6**

CONTINUED

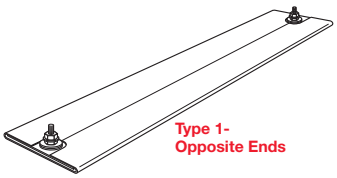
① Mounting slots on stock heaters are ½ x 5⁄16 in. (13 x 7.9 mm). On made-to-order units, mounting slots are ⅜ x ¼ in. (9.5 x 6 mm).
② This unit has ⅜ x ¼ in. (9.5 x 6 mm) mounting holes.

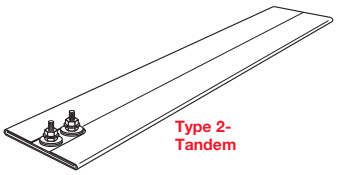
Mica Strip Heaters

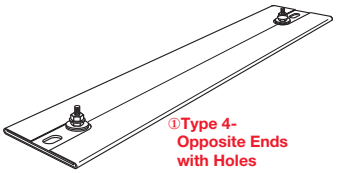
Stock Heater Code Numbers *(Continued)*

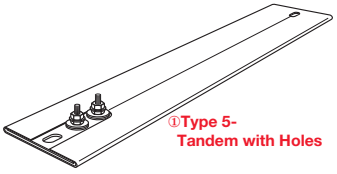
Width in.	(mm)	Overall Length in.	(mm)	Type	Center-to-Center Mtg Holes in.	(mm)	Volts	Power (Watts)	Watt Density W/in.²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Avail.	Code Number
1	(25)	10½	(267)	5	9½	(241.0)	120	250	22	(3.4)	0.42	(0.19)	Stock	**S1J10JU1**
		10½	(267)	5	9½	(241.0)	240	250	22	(3.4)	0.42	(0.19)	Stock	**S1J10JU2**
		12	(305)	5	11	(279.0)	120	250	18	(2.8)	0.50	(0.23)	Stock	**S1J12AU1**
		12	(305)	5	11	(279.0)	240	250	18	(2.8)	0.50	(0.23)	Stock	**S1J12AU2**
		12	(305)	5	—	—	120	150	11	(1.7)	0.50	(0.23)	Stock	**S1J12AU10**
		12	(305)	5	—	—	240	150	11	(1.7)	0.50	(0.23)	Stock	**S1J12AU11**
		15¼	(387)	5	14¼	(362.0)	240	500	27	(4.2)	0.63	(0.29)	Stock	**S1J15EU1**
		17⅞	(454)	5	16⅞	(428.6)	120	375	17	(2.6)	0.75	(0.34)	Stock	**S1J17RU1**
		17⅞	(454)	5	16⅞	(428.6)	120	500	22	(3.4)	0.75	(0.34)	Stock	**S1J17RU2**
		17⅞	(454)	5	16⅞	(428.6)	240	500	22	(3.4)	0.75	(0.34)	Stock	**S1J17RU3**
		21	(533)	5	20	(508.0)	240	650	24	(3.7)	0.87	(0.39)	Stock	**S1J21AU1**
		23¾	(603)	5	22¾	(578.0)	120	500	16	(2.5)	0.99	(0.45)	Stock	**S1J23NU1**
		23¾	(603)	5	22¾	(578.0)	240	500	16	(2.5)	0.99	(0.45)	Stock	**S1J23NU2**
		23¾	(603)	5	22¾	(578.0)	120	750	24	(3.7)	0.99	(0.45)	Stock	**S1J23NU3**
		23¾	(603)	5	22¾	(578.0)	240	750	24	(3.7)	0.99	(0.45)	Stock	**S1J23NU4**
		25½	(648)	5	24½	(622.0)	240	650	19	(2.9)	1.10	(0.50)	Stock	**S1J25JU1**
		30½	(775)	5	29½	(749.0)	240	800	19	(2.9)	1.30	(0.59)	Stock	**S1J30JU1**
2½	(64)	6½	(165)	6	5½	(140.0)	120	225	24	(3.7)	0.45	(0.20)	Stock	**S2J6JV1**
		6½	(165)	6	5½	(140.0)	240	225	24	(3.7)	0.45	(0.20)	Stock	**S2J6JV2**
		8½	(216)	6	7½	(191.0)	120	350	24	(3.7)	0.59	(0.27)	Stock	**S2J8JV1**
		8½	(216)	6	7½	(191.0)	240	350	24	(3.7)	0.59	(0.27)	Stock	**S2J8JV2**
		25½	(648)	6	24½	(622.0)	120	1000	18	(2.8)	1.78	(0.81)	Stock	**S2J25JV1**
		25½	(648)	6	24½	(622.0)	240	1000	18	(2.8)	1.78	(0.81)	Stock	**S2J25JV2**

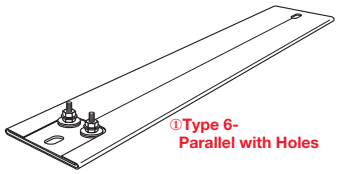
① Mounting slots on stock heaters are ½ x 5⁄16 in. (13 x 7.9 mm). On made-to-order units, mounting slots are ⅜ x ¼ in. (9.5 x 6 mm).
② This unit has ⅜ x ¼ in. (9.5 x 6 mm) mounting holes.


Type 1-
Opposite Ends


Type 2-
Tandem


①Type 4-
Opposite Ends
with Holes


①Type 5-
Tandem with Holes


①Type 6-
Parallel with Holes

How to Order

To order stock mica strip heater, specify:

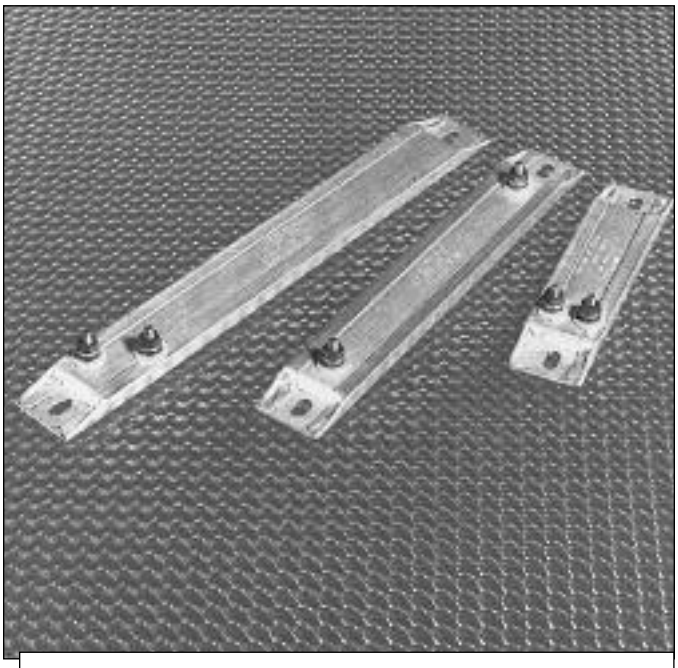
- Quantity
- Watlow code number

Availability

Stock: Same day shipment

Made-to-Order: If stock units do not meet application needs, Watlow can manufacture mica strip heaters to special requirements. Please contact your Watlow representative.

375 High-Temperature Strip Heaters



Named for its 0.375 in. (9.5 mm) thickness, the Watlow® 375 strip is a rugged heater capable of both high temperatures and high watt densities.

Its ruggedness comes from the design and use of choice materials. Watlow begins construction by accurately placing a coiled, nickel-chromium element wire in the center of the heater. The element wire is then embedded in MgO-based insulation compacted into a solid mass resulting in excellent heat conductivity and high dielectric strength. Finally, the heater is enclosed in aluminized steel sheathing.

Performance Capabilities

- Aluminized steel sheath temperatures to 1100°F (595°C)
- Stainless steel sheath temperatures to 1200°F (650°C)
- Watt densities to 120 W/in^2 (20.1 W/cm^2)
- UL® approved to 240V~(ac) (File No. E52951)
- CSA approved to 600V~(ac) (File No. LR7392)

Features and Benefits

Nickel-chromium element wire is centered in the heater
- Assures uniform heat

Aluminized steel sheath
- Operates at higher temperatures
- Resists corrosion better than iron-sheathed heaters

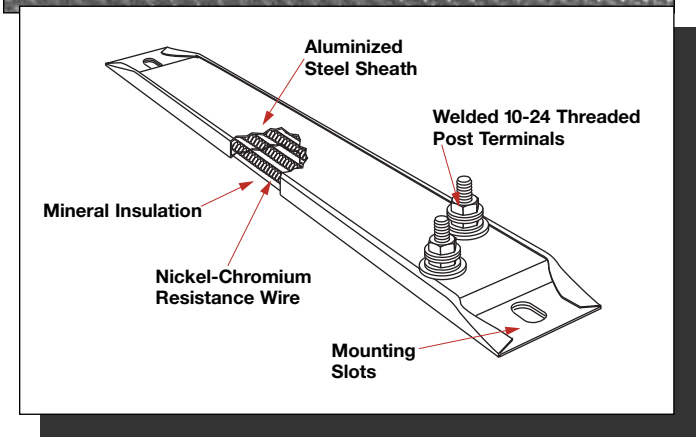
Optional 430 stainless steel sheath
- Available for applications where temperatures reach 1200°F (650°C)

Post terminals, welded to the element wire
- Produces strong, trouble-free connections

Rigid ⅜ in. (9.5 mm) thick design
- Enables the heater to fit into many existing applications

Over 100 in-stock models in popular sizes and ratings
- Allows next day shipment

Available dimensions are 1½ in. (38 mm) wide and 5½ to 48 in. (140 to 1219 mm) long
- Fits a variety of application needs



Applications

- Food warming
- Freeze and moisture protection
- Tank and platen heating
- Packaging
- Dies and mold heating
- Autoclaves
- Ovens
- Telecom

Quick Ship

• Next day shipment on all stock units.

375 High-Temperature Strip Heaters

Applications and Technical Data

Calculating Watt Density

Use the *Maximum Allowable Watt Density* graphs and formulas to ensure the allowable watt density for the heater will not be exceeded in your application. **Watt density is calculated for one side of the heater only.**

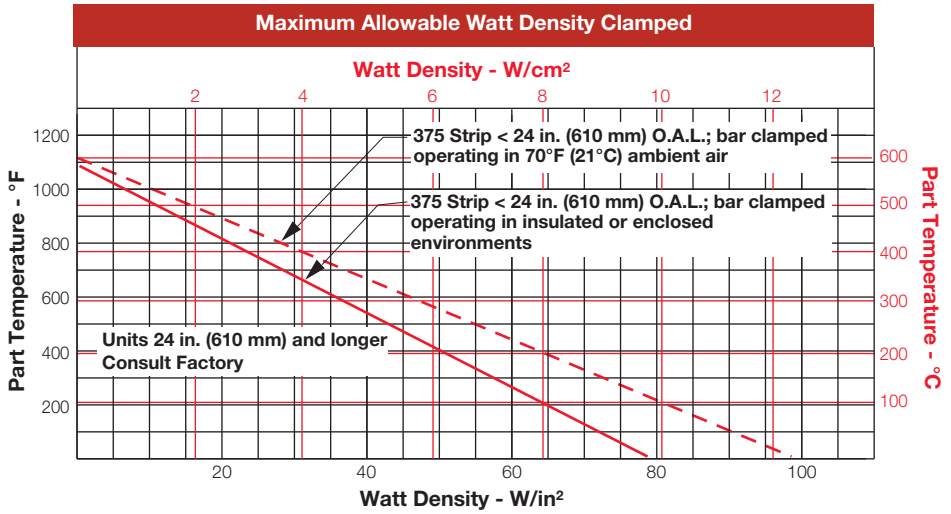
Formulas

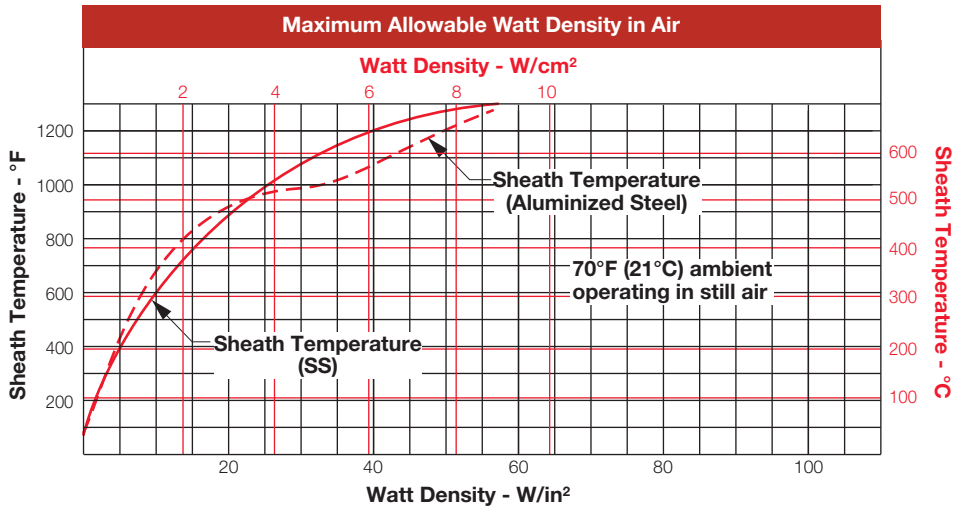
$$\text{Watt Density} = \frac{\text{Wattage}}{\text{Heated Area}}$$

Heated Area
(Offset Terminals) = [Overall Length (A) x 1.5 in] - 6 in^2
= [Overall Length (A) x 38 mm] - 38.7 cm^2

Heated Area
(Parallel Terminals) = [Overall Length (A) x 1.5 in] - 4.7 in^2
= [Overall Length (A) x 38 mm] - 30.3 cm^2

Heated Area
(One-on-One Terminals) = [Overall Length (A) x 1.5 in] - 6 in^2
= [Overall Length (A) x 38 mm] - 38.7 cm^2

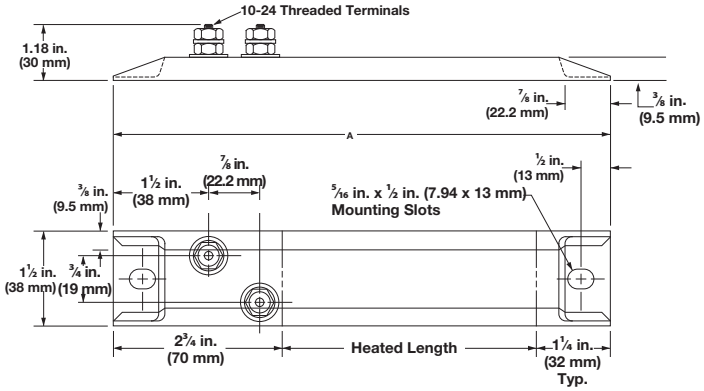




375 High-Temperature Strip Heaters

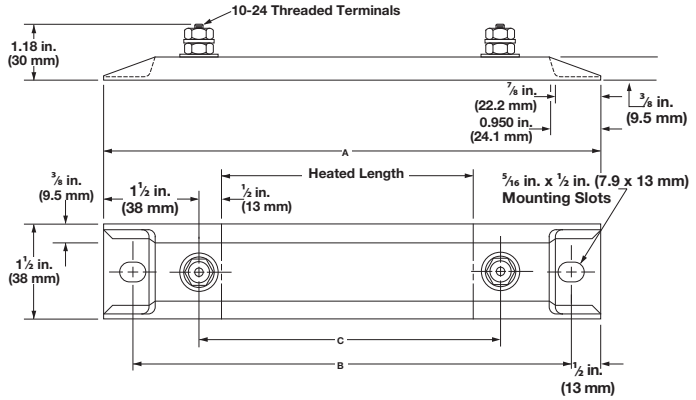
Termination Options

Offset Terminals*



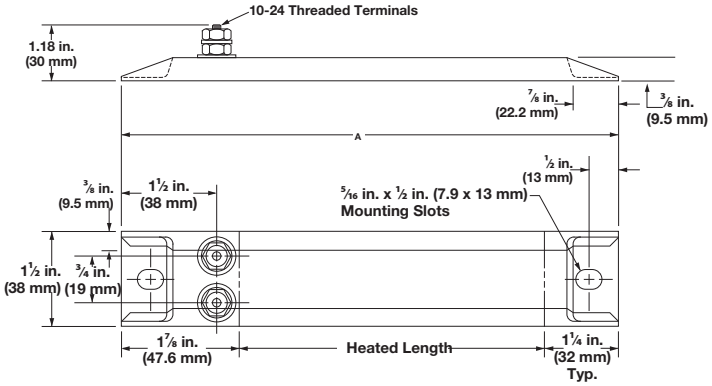
Two 10-24 threaded post terminals are offset from each other on the same end.

One-on-One Terminals*



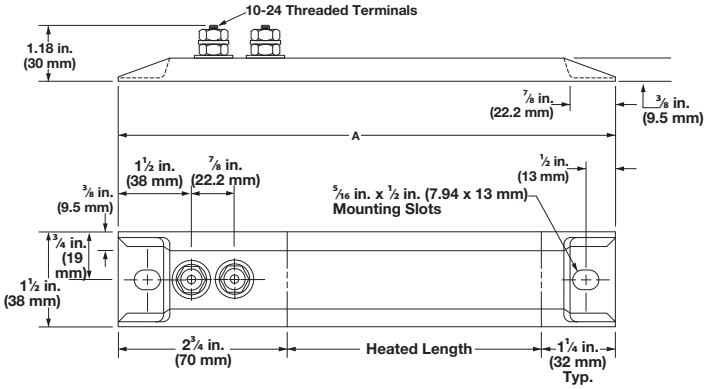
Two 10-24 threaded post terminals are placed one on each end.

Parallel Terminals*



Two 10-24 threaded post terminals are used; both terminals on one end.

In-Line Terminals*



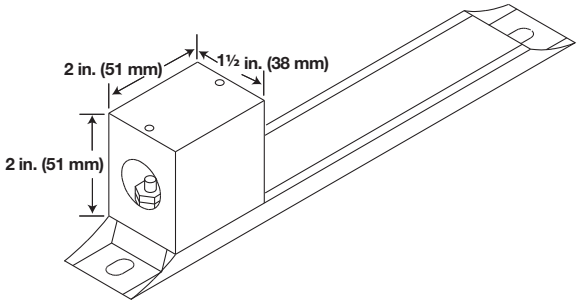
Two 10-24 threaded post terminals are in-line with each other on the same end.

* Tab removal available from stock or manufactured.
Length without tabs = Length with tabs minus 1.5 in. (38 mm)

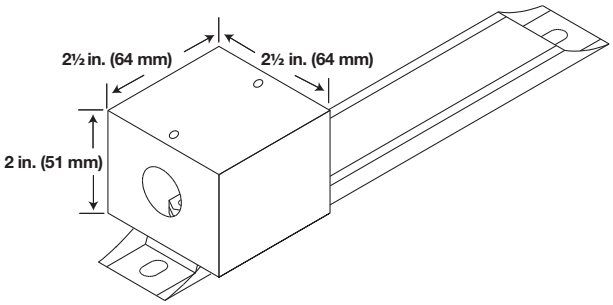
375 High-Temperature Strip Heaters

Termination Options *(Continued)*

Metallic Terminal Boxes - Variations



Available on in-line terminals only.

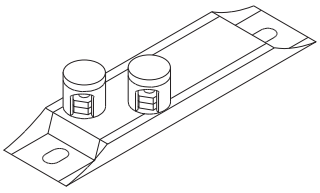


Available on offset terminals from stock and manufactured.

Metallic terminal boxes are available on offset terminals from stock. Terminal boxes act as a safety feature by covering the terminals. Conduit may be attached to the box through ⅞ in. (22.2 mm) diameter holes in the ends of the box. To order, specify **terminal box**.

Accessories

Ceramic Terminal Covers



A convenient and economic way to insulate post terminals. Sized for standard length posts. 10-24 screw thread size. These are supplied as an accessory item and shipped separately. Specify **Z-4918** and quantity.

How to Order

To order your **stock** 375 strip heater, specify:

- Quantity
- Watlow code number
- Removal of mounting tabs if desired

If stock units do not meet application needs, Watlow can manufacture 375 strip heaters to special requirements. For **made-to-order** units, please specify in addition to above information:

- Width
- Heater length, including mounting tabs
- Terminal type (offset, parallel or one-on-one)

Availability

Stock: Next day shipment

Made-to-Order: Please contact your Watlow representative.

375 High-Temperature Strip Heaters

Stock and Standard Heater Code Numbers

Width in. (mm)	Length in. (mm)	Term.	Volts	Power (Watts)	Watt Density W/in² (W/cm²)	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Chromalox® Code No. ①		Wellman® Code No. ①	
									Rust Resist. Iron Sheath	Chrome Stl. Sheath	Aluminized Steel Sheath	Chrome Stl. Sheath
1½ (38)	5½ (140)	Parallel	120	125	35 (5.4)	0.4 (0.18)	Stock	**SGA1J5JP1**	PT-512	—	—	—
	5½ (140)	Parallel	120	250	70 (10.8)	0.4 (0.18)	Stock	**SGA1J5JP2**	—	PT-502	—	—
	6 (152)	Parallel	120	150	35 (5.4)	0.4 (0.18)	Stock	**SGA1J6AP2**	PT-615	—	—	—
	6 (152)	Parallel	240	150	35 (5.4)	0.4 (0.18)	Stock	**SGA1J6AP3**	PT-615	—	—	—
	6 (152)	Parallel	120	300	70 (10.8)	0.4 (0.18)	Stock	**SGA1J6AP4**	—	PT-603	—	—
	6 (152)	Parallel	240	300	70 (10.8)	0.4 (0.18)	Stock	**SGA1J6AP5**	—	PT-603	—	—
	7½ (191)	Offset	120	150	29 (4.5)	0.5 (0.23)	Stock	**SGA1J7JO1**	OT-715	—	SS1041	—
	7½ (191)	Offset	240	150	29 (4.5)	0.5 (0.23)	Standard	**SGA1J7JO2**	OT-715	—	SS1052	—
	7½ (191)	Offset	240	200	38 (5.9)	0.5 (0.23)	Stock	**SGA1J7JO3**	—	OT-702	—	SS2052
	8 (203)	Offset	120	150	25 (3.9)	0.5 (0.23)	Stock	**SGA1J8AO1**	OT-815	—	SS1061	—
	8 (203)	Offset	240	150	25 (3.9)	0.5 (0.23)	Stock	**SGA1J8AO5**	OT-815	—	SS1072	—
	8 (203)	Offset	120	175	29 (4.5)	0.5 (0.23)	Stock	**SGA1J8AO6**	OT-817	—	SS1081	—
	8 (203)	Offset	240	175	29 (4.5)	0.5 (0.23)	Standard	**SGA1J8AO7**	OT-817	—	SS1092	—
	8 (203)	Offset	120	250	42 (6.5)	0.5 (0.23)	Stock	**SGA1J8AO2**	—	OT-802	—	SS2061
	8 (203)	Offset	240	250	42 (6.5)	0.5 (0.23)	Stock	**SGA1J8AO8**	—	OT-802	—	SS2072
	8 (203)	Offset	120	400	67 (10.4)	0.5 (0.23)	Stock	**SGA1J8AO9**	—	OT-804	—	SS2081
	8 (203)	Offset	240	400	67 (10.4)	0.5 (0.23)	Stock	**SGA1J8AO10**	—	OT-804	—	SS2092
	8 (203)	Offset	120	500	83 (12.9)	0.5 (0.23)	Stock	**SGA1J8AO3**	—	—	—	—
	8 (203)	Offset	240	500	83 (12.9)	0.5 (0.23)	Stock	**SGA1J8AO4**	—	—	—	—
	8 (203)	1-on-1	120	150	24 (3.7)	0.5 (0.23)	Stock	**SGA1J8AT1**	S-815	—	SD1021	—
	8 (203)	1-on-1	240	150	24 (3.7)	0.5 (0.23)	Standard	**SGA1J8AT2**	S-815	—	SD1032	—
	9½ (241)	1-on-1	120	200	23 (3.6)	0.6 (0.27)	Standard	**SGA1J9JT1**	S-920	—	SD1041	—
	10½ (267)	Offset	120	250	26 (4.0)	0.7 (0.32)	Stock	**SGA1J10JO1**	OT-1025	—	SS1101	—
	10½ (267)	Offset	240	250	26 (4.0)	0.7 (0.32)	Stock	**SGA1J10JO2**	OT-1025	—	SS1102	—
	10½ (267)	Offset	120	350	36 (5.6)	0.7 (0.32)	Stock	**SGA1J10JO8**	—	OT-1003	—	SS2101
	10½ (267)	Offset	240	350	36 (5.6)	0.7 (0.32)	Stock	**SGA1J10JO5**	—	OT-1003	—	SS2112
	10½ (267)	Offset	120	400	41 (6.4)	0.7 (0.32)	Stock	**SGA1J10JO6**	—	OT-1004	—	SS2131
	10½ (267)	Offset	240	400	41 (6.4)	0.7 (0.32)	Stock	**SGA1J10JO7**	—	OT-1004	—	SS2132
	12 (305)	Offset	120	250	21 (3.3)	0.8 (0.32)	Stock	**SGA1J12AO1**	OT-1225	OT-1202	SS1141	—
	12 (305)	Offset	240	250	21 (3.3)	0.8 (0.32)	Stock	**SGA1J12AO2**	OT-1225	OT-1202	SS1152	—
	12 (305)	Offset	120	350	29 (4.5)	0.8 (0.36)	Stock	**SGA1J12AO5**	—	OT-1203	—	SS2141
	12 (305)	Offset	240	350	29 (4.5)	0.8 (0.36)	Stock	**SGA1J12AO6**	—	OT-1203	—	SS2152
	12 (305)	Offset	120	500	42 (6.5)	0.8 (0.36)	Stock	**SGA1J12AO3**	—	OT-1205	—	SS2161
	12 (305)	Offset	240	500	42 (6.5)	0.8 (0.36)	Stock	**SGA1J12AO4**	—	OT-1205	—	SS2172
	12 (305)	1-on-1	120	250	20 (3.1)	0.8 (0.36)	Standard	**SGA1J12AT1**	S-1225	S-1202	SD1061	SD2071
	12 (305)	1-on-1	240	250	20 (3.1)	0.8 (0.36)	Stock	**SGA1J12AT2**	S-1225	S-1202	SD1072	SD2082
	12 (305)	1-on-1	240	500	40 (6.2)	0.8 (0.36)	Stock	**SGA1J12AT3**	—	S-1205	—	SD2122
	14 (356)	Offset	120	300	20 (3.1)	0.9 (0.41)	Stock	**SGA1J14AO2**	OT-1430	—	SS1181	—
	14 (356)	Offset	240	300	20 (3.1)	0.9 (0.41)	Stock	**SGA1J14AO1**	OT-1430	—	SS1192	—
	14 (356)	Offset	120	500	33 (5.1)	0.9 (0.41)	Stock	**SGA1J14AO3**	—	OT-1405	—	SS2181
	14 (356)	Offset	240	500	33 (5.1)	0.9 (0.41)	Stock	**SGA1J14AO4**	—	OT-1405	—	SS2192
	14 (356)	1-on-1	120	300	20 (3.1)	0.9 (0.41)	Standard	**SGA1J14AT1**	S-1430	—	SD1131	—
	15¼ (387)	Offset	120	325	19 (2.9)	1.0 (0.45)	Stock	**SGA1J15EO2**	OT-1532	—	SS1201	—
	15¼ (387)	Offset	240	325	19 (2.9)	1.0 (0.45)	Stock	**SGA1J15EO3**	OT-1532	—	SS1212	—
	15¼ (387)	Offset	240	500	30 (4.6)	1.0 (0.45)	Stock	**SGA1J15EO4**	—	OT-1505	—	SS2212
	17⅞ (454)	Offset	120	350	17 (2.6)	1.2 (0.54)	Stock	**SGA1J17RO4**	OT-1835	—	SS1221	SS2221
	17⅞ (454)	Offset	240	350	17 (2.6)	1.2 (0.54)	Standard	**SGA1J17RO5**	OT-1835	—	SS1232	SS2232
	17⅞ (454)	Offset	120	375	18 (2.8)	1.2 (0.54)	Standard	**SGA1J17RO6**	OT-1837	—SS1261	SS2241	—

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① Chromalox® and Wellman® code numbers are used as a cross reference to help you select the equivalent Watlow code number. Chromalox® sizes 27 in. (686 mm) and longer, and all Wellman® sizes, will have mounting slot center to center distances ⅛ in. (3.2 mm) less than Watlow spacing.

375 High-Temperature Strip Heaters

Stock and Standard Heater Code Numbers *(Continued)*

Width in. (mm)	Length in. (mm)	Term.	Volts	Power (Watts)	Watt Density W/in² (W/cm²)	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Chromalox® Code No. ①		Wellman® Code No. ①	
									Rust Resist. Iron Sheath	Chrome Stl. Sheath	Aluminized Steel Sheath	Chrome Stl. Sheath
1½ (38)	17⅞ (454)	Offset	240	375	18 (2.8)	1.2 (0.54)	Stock	**SGA1J17RO7**	OT-1837	—	SS1252	—
	17⅞ (454)	Offset	120	500	24 (3.7)	1.2 (0.54)	Stock	**SGA1J17RO1**	OT-1850	—	SS1261	SS2241
	17⅞ (454)	Offset	240	500	24 (3.7)	1.2 (0.54)	Stock	**SGA1J17RO2**	OT-1850	—	SS1272	SS2252
	17⅞ (454)	Offset	120	750	36 (5.6)	1.2 (0.54)	Stock	**SGA1J17RO9**	—	OT-1807	—	SS2261
	17⅞ (454)	Offset	240	750	36 (5.6)	1.2 (0.54)	Stock	**SGA1J17RO8**	—	OT-1807	—	SS2272
	17⅞ (454)	Offset	120	1000	48 (7.4)	1.2 (0.54)	Stock	**SGA1J17RO10**	—	OT-1801	—	SS2281
	17⅞ (454)	Offset	240	1000	48 (7.4)	1.2 (0.54)	Stock	**SGA1J17RO3**	—	OT-1801	—	SS2292
	17⅞ (454)	1-on-1	120	500	24 (3.7)	1.2 (0.54)	Standard	**SGA1J17RT1**	S-1850	S-1805	SD1211	SD2171
	17⅞ (454)	1-on-1	240	500	24 (3.7)	1.2 (0.54)	Stock	**SGA1J17RT2**	S-1850	S-1805	SD1222	SD2182
	17⅞ (454)	1-on-1	240	750	35 (5.4)	1.2 (0.54)	Standard	**SGA1J17RT3**	—	S-1807	—	SD2202
	17⅞ (454)	1-on-1	120	1000	47 (7.3)	1.2 (0.54)	Standard	**SGA1J17RT4**	—	S-1801	—	SD2211
	17⅞ (454)	1-on-1	240	1000	47 (7.3)	1.2 (0.54)	Standard	**SGA1J17RT5**	—	S-1801	—	SD2222
	19½ (496)	Offset	240	350	15 (2.3)	1.3 (0.59)	Stock	**SGA1J19JO6**	OT-1935	—	SS1301	—
	19½ (496)	Offset	120	500	22 (3.4)	1.3 (0.59)	Standard	**SGA1J19JO7**	OT-1950	OT-1905	—	SS2301
	19½ (496)	Offset	240	500	22 (3.4)	1.3 (0.59)	Stock	**SGA1J19JO4**	OT-1950	OT-1905	—	SS2312
	19½ (496)	Offset	240	750	32 (5.0)	1.3 (0.59)	Stock	**SGA1J19JO8**	—	OT-1907	—	—
	19½ (496)	Offset	240	1000	43 (6.7)	1.3 (0.59)	Stock	**SGA1J19JO1**	—	OT-1901	—	SS2332
	19½ (496)	1-on-1	240	750	32 (5.0)	1.3 (0.59)	Standard	**SGA1J19JT1**	—	S-1907	—	SD2262
	21 (533)	Offset	120	500	20 (3.1)	1.4 (0.64)	Standard	**SGA1J21AO1**	OT-2150	—	SS1341	—
	21 (533)	Offset	240	500	20 (3.1)	1.4 (0.64)	Stock	**SGA1J21AO2**	OT-2150	—	SS1352	—
	21 (533)	Offset	120	750	29 (4.5)	1.4 (0.64)	Stock	**SGA1J21AO3**	—	OT-2107	—	SS2341
	21 (533)	Offset	240	750	29 (4.5)	1.4 (0.64)	Stock	**SGA1J21AO4**	—	OT-2107	—	SS2352
	21 (533)	1-on-1	120	500	19 (2.9)	1.4 (0.64)	Standard	**SGA1J21AT1**	S-2050	S-2005	SD1291	SD2291
	23¾ (603)	Offset	120	500	17 (2.6)	1.5 (0.68)	Stock	**SGA1J23NO5**	OT-2450	OT-2405	SS1361	SS2361
	23¾ (603)	Offset	240	500	17 (2.6)	1.5 (0.68)	Stock	**SGA1J23NO6**	OT-2450	OT-2405	SS1372	SS2372
	23¾ (603)	Offset	120	750	25 (3.9)	1.5 (0.68)	Standard	**SGA1J23NO1**	OT-2475	OT-2407	SS1391	SS2381
	23¾ (603)	Offset	240	750	25 (3.9)	1.5 (0.68)	Stock	**SGA1J23NO2**	OT-2475	OT-2407	SS1402	SS2392
	23¾ (603)	Offset	120	1000	34 (5.3)	1.5 (0.68)	Stock	**SGA1J23NO7**	—	OT-2401	—	SS2401
	23¾ (603)	Offset	240	1000	34 (5.3)	1.5 (0.68)	Stock	**SGA1J23NO3**	—	OT-2401	—	SS2412
	23¾ (603)	Offset	240	1500	51 (7.9)	1.5 (0.68)	Stock	**SGA1J23NO4**	—	OT-2415	—	—
	23¾ (603)	1-on-1	240	250	8 (1.2)	1.5 (0.68)	Standard	**SGA1J23NT1**	S-2425	—	SD1322	—
	23¾ (603)	1-on-1	240	500	17 (2.6)	1.5 (0.68)	Stock	**SGA1J23NT3**	S-2450	S-2404	SD1342	SD2322
	23¾ (603)	1-on-1	240	750	25 (3.9)	1.5 (0.68)	Stock	**SGA1J23NT5**	—	S-2407	—	SD2352
	23¾ (603)	1-on-1	120	1000	33 (5.1)	1.5 (0.68)	Stock	**SGA1J23NT6**	—	S-2401	—	SD2361
	23¾ (603)	1-on-1	240	1000	33 (5.1)	1.5 (0.68)	Standard	**SGA1J23NT7**	—	S-2401	—	SD2372
	23¾ (603)	1-on-1	240	1500	50 (7.8)	1.5 (0.68)	Standard	**SGA1J23NT8**	—	S-2415	—	—
	25½ (648)	Offset	120	500	16 (2.5)	1.7 (0.77)	Stock	**SGA1J25JO1**	OT-2550	—	SS1421	—
	25½ (648)	Offset	240	500	16 (2.5)	1.7 (0.77)	Stock	**SGA1J25JO2**	OT-2550	—	SS1432	—
	25½ (648)	Offset	120	750	23 (3.6)	1.7 (0.77)	Standard	**SGA1J25JO3**	OT-2575	OT2507	SS1441	SS2421
	25½ (648)	Offset	240	750	23 (3.6)	1.7 (0.77)	Stock	**SGA1J25JO4**	OT-2575	OT-2507	SS1452	SS2432
	25½ (648)	Offset	240	1000	31 (4.8)	1.7 (0.77)	Stock	**SGA1J25JO5**	—	OT-2501	—	SS2452
	26¾ (680)	Offset	240	700	21 (3.3)	1.7 (0.77)	Stock	**SGA1J26NO1**	OT-2670	—	SS1472	—
	26¾ (680)	Offset	240	1000	29 (4.5)	1.7 (0.77)	Stock	**SGA1J26NO2**	—	OT-2601	—	SS2472
	30½ (775)	Offset	120	750	19 (2.9)	2.0 (0.91)	Standard	**SGA1J30JO2**	OT-3075	OT-3007	SS1481	—
	30½ (775)	Offset	240	750	19 (2.9)	2.0 (0.91)	Stock	**SGA1J30JO3**	OT-3075	OT-3007	SS1492	SS2482
	30½ (775)	1-on-1	240	750	19 (2.9)	2.0 (0.91)	Stock	**SGA1J30JT1**	S-3075	S-3007	SD1452	—

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① Chromalox® and Wellman® code numbers are used as a cross reference to help you select the equivalent Watlow code number. Chromalox® sizes 27 in. (686 mm) and longer, and all Wellman® sizes, will have mounting slot center to center distances ⅛ in. (3.2 mm) less than Watlow spacing.

375 High-Temperature Strip Heaters

Stock and Standard Heater Code Numbers *(Continued)*

Width in. (mm)	Length in. (mm)	Term.	Volts	Power (Watts)	Watt Density W/in² (W/cm²)	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Chromalox® Code No. ①		Wellman® Code No. ①	
									Rust Resist. Iron Sheath	Chrome Stl. Sheath	Aluminized Steel Sheath	Chrome Stl. Sheath
1½ (38)	33½ (851)	Offset	240	750	17 (2.6)	2.2 (1.0)	Stock	**SGA1J33J01**	OT-3375	OT-3307	SS1522	SS2522
	33½ (851)	1-on-1	240	1000	22 (3.4)	2.2 (1.0)	Standard	**SGA1J33JT1**	—	S-3301	—	SD2472
	35⅞ (911)	Offset	120	1000	21 (3.3)	2.3 (1.0)	Standard	**SGA1J35R04**	OT-3610	—	SS1531	—
	35⅞ (911)	Offset	240	1000	21 (3.3)	2.3 (1.0)	Stock	**SGA1J35R03**	OT-3610	—	SS1542	SS2532
	35⅞ (911)	Offset	240	1500	31 (4.8)	2.3 (1.0)	Stock	**SGA1J35R01**	—	OT-3601	SS2552	—
	35⅞ (911)	1-on-1	240	1000	21 (3.3)	2.3 (1.0)	Stock	**SGA1J35RT1**	S-3610	S-3601	SD1492	SD2492
	38½ (978)	Offset	120	1000	19 (2.9)	2.5 (1.1)	Standard	**SGA1J38J02**	OT-3810	OT-3801	SS1581	SS2561
	38½ (978)	Offset	240	1500	29 (4.5)	2.5 (1.1)	Stock	**SGA1J38J03**	—	OT-3815	—	—
	42½ (1080)	Offset	240	1500	26 (4.0)	2.8 (1.3)	Stock	**SGA1J42J01**	—	OT-4315	SS1632	SS2632
	47⅞ (1216)	Offset	240	2250	34 (5.3)	3.1 (1.4)	Stock	**SGA1J47R01**	—	OT-4822	—	—

Note: 5⁄16 in. x ½ in. (7.9 mm x 13 mm) mounting slots are supplied on all 375 strip heaters. Tabs can be removed upon request. Also, note Watlow code number specifies the 375 strip heater comes with an aluminized steel sheath. If you require a special sheath material, such as stainless steel, please contact your Watlow representative for material availability.

① Chromalox® and Wellman® code numbers are used as a cross reference to help you select the equivalent Watlow code number. Chromalox® sizes 27 in. (686 mm) and longer, and all Wellman® sizes, will have mounting slot center to center distances ⅛ in. (3.2 mm) less than Watlow spacing.

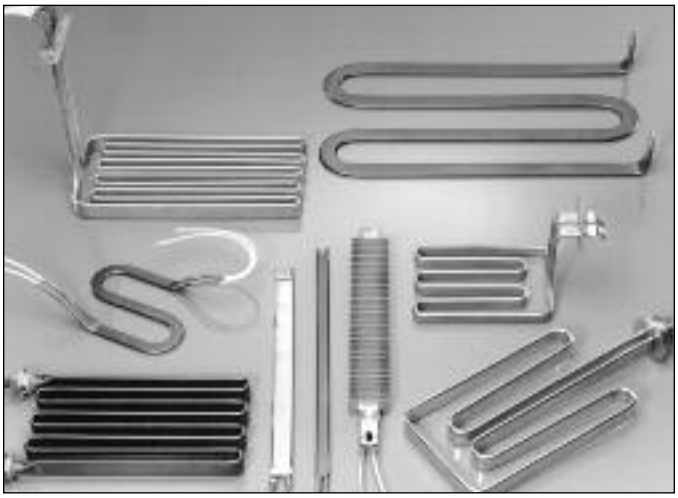
FIREBAR® Clamp-On Heaters

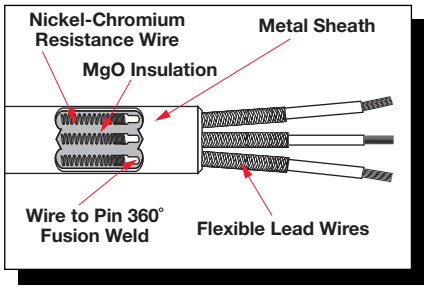
FIREBAR® heating elements provide added heating performance over standard round tubular heating elements—especially for immersion applications in petroleum based liquids that require high kilowatts. The FIREBAR's unique flat surface geometry packs more power in shorter elements and assemblies, along with a host of other performance improvements. These include:

- Minimizing coking and fluid degrading
- Enhancing the flow of fluid past the element's surface to carry heat from the sheath
- Improving heat transfer with a significantly larger boundary layer that allows much more liquid to flow up and across the sheath's surface

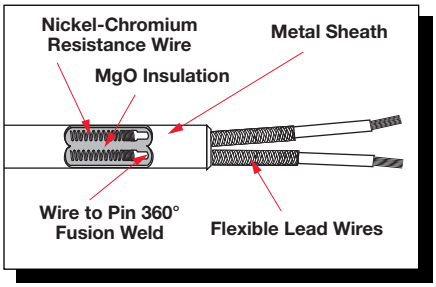
FIREBAR elements are available in single- and double-ended constructions with one inch or ⅝ inch heights. These two configuration variables make it possible to use FIREBAR elements instead of round tubular elements in virtually all applications.

FINBAR is a special version of the one inch, single-ended FIREBAR. FINBAR is specially modified with fins to further increase surface area for air and gas heating applications. Details are contained in the *FINBAR* section, starting on page 119.





One Inch Double-Ended FIREBAR Element and Lead Configurations



⅝ Inch Double-Ended FIREBAR Element and Lead Configurations

For detailed product and ordering information see the full FIREBAR product section located on pages 99 through 118.

Thick Film Conduction Heaters

The 14 gauge, 430 stainless steel thick film conduction heaters from Watlow® are ideal for use in many applications where fast response and uniformity are essential. These high performance heaters use thick film technology to provide maximum temperature response in a compact package.

A clamp-on thick film heater provides the best possible combination of heat transfer, thermal efficiency and temperature uniformity. For example, clamping the thick film conduction heater on to a 316 stainless steel pan or aluminum griddle in foodservice applications results in uniform cooking and heating.

This technology can be applied in areas where space is at a premium or where conventional heaters cannot be used because of limited voltage and wattage combinations.

Thick film conduction heaters provide a low-profile heater in a variety of shapes. These shapes include two-dimensional circular, rectangular and square forms. Due to the direct surface contact, thick film heaters ensure greater heat transfer through thermally stable substrates and precise heater patterns.

Features and Benefits

1025°F (550°C) maximum substrate temperature (dependent upon application demands and substrate material)

- Allows for higher process temperatures than most conduction heater technologies

UR® File #E52951 CSA available

- Conforms with applicable CE directives
- Contact your Watlow representative for current status of agency recognitions

High watt densities for clamp-on applications

- Allows for precise, repeatable wattage distribution and uniform temperature distribution

Threaded stud termination

- Produces strong, trouble-free connections, see Termination drawing on the next page.



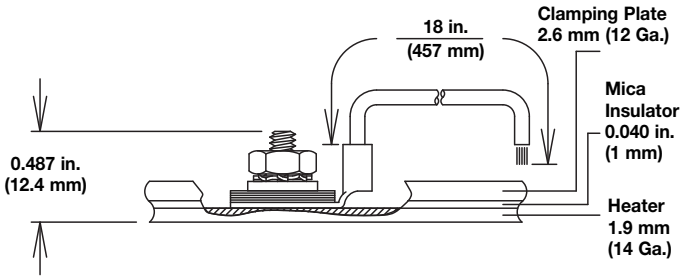
Applications

- Foodservice
- Industrial machines
- Life sciences
- Plastics
- Semiconductor

Thick Film Conduction Heaters

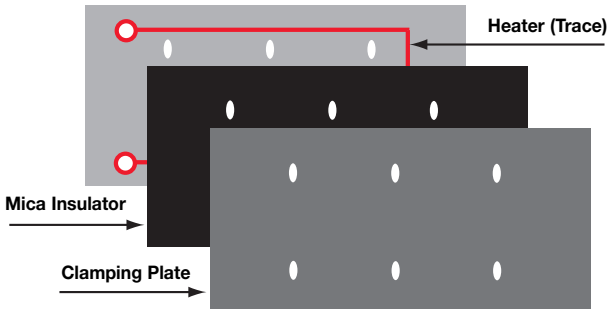
Technical Information

Termination Assembly



To install, mount the heater to the surface being heated and assemble mounting hardware. Standard measurements of assembly hardware are illustrated in the *Termination Assembly* drawing above. Please refer to the *Installation and Maintenance Manual (316-42-32-1)* that is supplied with the heater for proper mounting instructions.

Construction



Thick film conduction heaters, designed for clamp-on applications, are supplied as a multi-part assembly: heater, mica insulator, clamping plate and mounting hardware.

The mica insulator acts as a thermal barrier to more effectively force the heat into the part being heated, as well as an additional protective layer for the heater.

The clamping plate distributes the pressure loading evenly across the entire surface of the heater to promote intimate contact between the thick film heater and the part being heated.

The mounting hardware has been designed to provide the most effective means to clamp the heater to the part being heated, based on the size of the heater.

Stock Heater Code Numbers

Heater Size in.	(mm)	Voltage	Wattage①	W/in²	W/cm²	Approximate Assembly Wt. lbs	(kg)	Watlow Code Number
Round								
4.5 dia.	(114)	120	325	20.4	(3.2)	1.10	(0.50)	**TFA004JA03EL18B**
6.0 dia.	(152)	120	850	30.1	(4.7)	2.74	(1.24)	**TFA006AA08KL18C**
6.0 dia.	(152)	240	1125	39.8	(6.2)	2.74	(1.24)	**TFA006AE11EL18C**
8.0 dia.	(203)	240	2000	39.8	(6.2)	4.91	(2.23)	**TFA008AE200L18C**
10.0 dia.	(254)	240	3000	38.2	(5.9)	7.24	(3.28)	**TFA010AE300L18C**
Square								
2.25 x 2.25	(57 x 57)	120	100	19.8	(3.1)	0.27	(0.12)	**TFA2E2EA010L18B**
3.00 x 3.00	(76 x 76)	120	225	25.0	(3.9)	0.50	(0.23)	**TFA3A3AA02EL18B**
4.00 x 4.00	(102 x 102)	120	400	25.0	(3.8)	1.61	(0.73)	**TFA4A4AA040L18C**
6.00 x 6.00	(152 x 152)	120	1250	34.7	(5.4)	3.74	(1.70)	**TFA6A6AA12KL18C**
6.00 x 6.00	(152 x152)	240	1450	40.3	(6.3)	3.74	(1.70)	**TFA6A6AE14KL18C**
8.00 x 8.00	(203 x 203)	240	2500	39.1	(6.1)	6.36	(2.88)	**TFA8A8AE250L18C**
Rectangle								
2.0 X 4.0	(51 x 102)	120	240	30.0	(4.6)	0.47	(0.21)	**TFA2A4AA02HL18B**
4.0 X 6.0	(102 x 152)	120	725	30.2	(4.7)	2.46	(1.12)	**TFA4A6AA07EL18C**
6.0 X 8.0	(152 x 203)	240	1920	40.0	(6.2)	5.01	(2.27)	**TFA6A8AE19DL18C**

①Wattage output at 77°F (25°C).

Note: Size and wattage may vary with future design enhancements. Please contact your Watlow representative for current wattage information.

Coil/Cable Heaters



Coil/Cable Heaters

Standard Coil and Cable Heaters 581

Coil/Cable Heaters

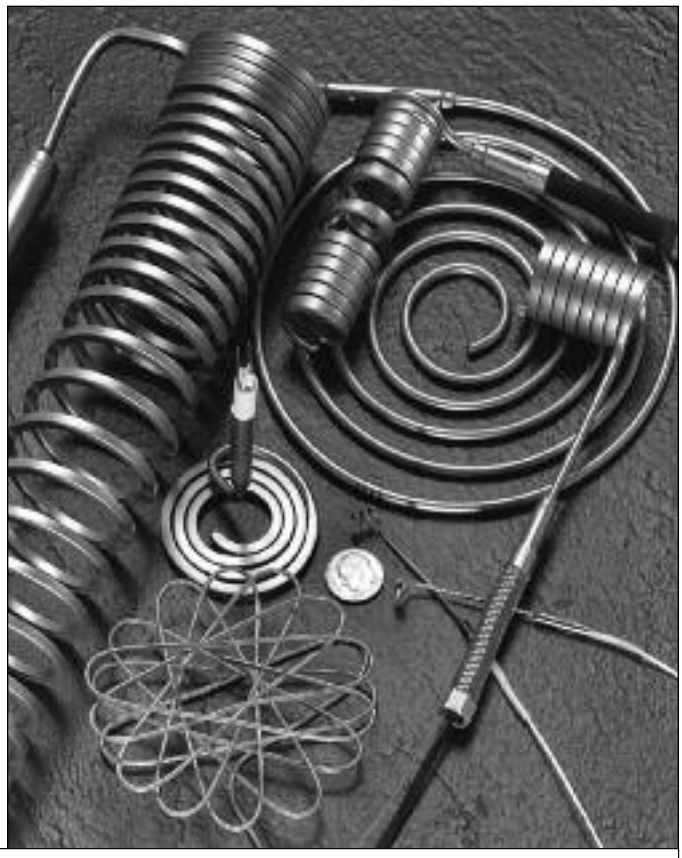
Standard Coil and Cable Heaters

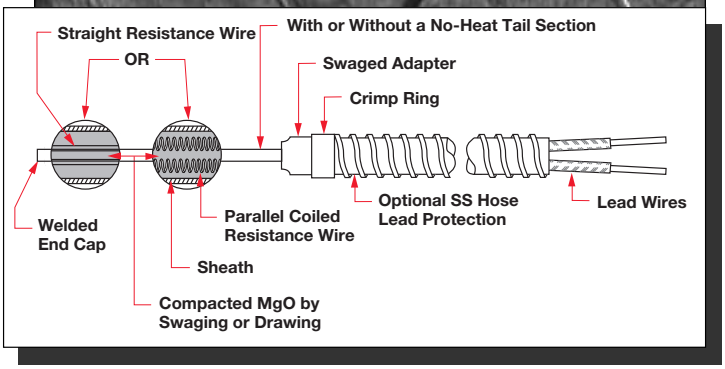
The versatile Watlow® cable and coil heater can be formed to a variety of shapes as dictated by its many applications. Cable heaters are small diameter, high-performance units, fully annealed and readily bent to a multitude of configurations.

The heater can be formed into a compact, coiled nozzle heater for use on plastic injection molding equipment supplying a full 360° 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 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 cross sectionals.

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) dependent on the 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) subject to factory approval

Features and Benefits

High ductility
- Allows the heater to be cold-formed into almost any shape

Low mass
- Allows for quick response in both heating and cooling

Constructed with no open seams
- Provides optional testing available to guarantee the integrity of all surfaces and seams

Constructed of standard 304 stainless steel or optional 316 stainless steel or Inconel® 600
- Provides high temperature corrosion and oxidation resistance along with ideal expansion properties

Heater sheath can be brazed
- Allows the permanent attachment of mounted fittings to the heater, consult factory

Ranging from 0.040 in. (1.02 mm) to 0.188 in. (4.8 mm) diameter
- Delivers a lot of heat into a tiny space

Internal construction options
- Allows for internal thermocouples and no-heat sections (not available in all sizes)

Capable of operating in unusual environments, including cryogenic and sub-freezing temperatures, high vacuum, gaseous and liquid immersion heaters

Standard Coil and Cable Heaters

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 in.	Sheath Diameter (mm)	Max. Voltage	Surface Area Per Linear Foot in.	Surface Area Per Linear Foot (cm)	Min. Bend Radius in.	Min. Bend Radius (mm)	Min. Coiled Inside Diameter in.	Min. Coiled Inside Diameter (mm)
0.040 ± 0.002	(1.016 ± 0.051)	48	1.51	(9.740)	1/16	(1.6)	1/8	(3.2)
0.062 ± 0.002	(1.575 ± 0.051)	120	2.34	(15.098)	1/8	(3.2)	1/4	(6.0)
0.058 ± 0.002	(1.473 ± 0.051)	240	2.18	(14.065)	1/8	(3.2)	1/4	(6.0)
0.094 + 0.002 - 0.003	(2.388 + 0.051 - 0.076)	240	3.54	(22.840)	3/16	(4.8)	3/8	(9.5)
0.102 square ± 0.003	(2.591 ± 0.076)	240	4.90	(31.615)	1/4	(6.0)	1/2	(13.0)
0.102 ± 0.003 x 0.156 ± 0.005 rectangular	(2.591 ± 0.076) x (3.962 ± 0.127)	240	6.19	(39.938)	1/4	(6.0)	1/2	(13.0)
0.125 ± 0.003	(3.175 ± 0.076)	240	4.71	(30.389)	1/4	(6.0)	1/2	(13.0)
0.157 ± 0.004	(3.998 ± 0.102)	240	5.92	(38.196)	5/16	(7.9)	5/8	(15.9)
0.188 + 0.003 - 0.006	(4.775 + 0.076 - 0.152)	240	7.09	(45.745)	3/8	(9.5)	3/4	(19.0)
0.128 square ± 0.003	(3.353 ± 0.076)	240	6.31	(40.712)	1/4	(6.0)	1/2	(13.0)

In most cases 30 W/in² (4.65 W/cm²) is the safe allowable limit for cable watt density. Please contact your Watlow representative before ordering >30 W/in² cables.

Standard Resistance/Wattage Tolerance ±10%.

Cable heaters can run on both ac and dc, 50 or 60Hz. Contact your Watlow representative for amperage limitations.

Coiling Tolerances

Cable Diameters	Standard Coiled Width Tolerances: Coiled Width in.	Coiled Width (mm)	Tolerances in.	Tolerances (mm)	Standard Coiled I.D. Tolerances: Coil I.D. Range in.	Coil I.D. Range (mm)	Tolerances in.	Tolerances (mm)
All Diameters	Below 6	(152)	+ 0 - 1/8	(+0.00 - 3.18)	Below 0.625	(Below 15.88)	+0.000 - 0.015	(+0 - 0.38)
	6 to 10	(152 to 254)	+ 1/8 - 3/8	(+3.18 - 9.53)	0.625 to 0.999	(15.88 to 25.38)	+0.000 - 0.030	(+0 - 0.76)
	Over 10	(Over 254)	+ 1/4 - 1/4	(+6.35 - 6.35)	1.000 to 1.999	(25 to 50.78)	+0.000 - 0.062	(+0 - 1.58)
					2.000 to 2.999	(51 to 76.18)	+0.000 - 0.125	(+0 - 3.18)
					3.000 to 3.999	(76 to 101.58)	+0.000 - 0.250	(+0 - 6.35)
					4.000 to 4.999	(102 to 126.98)	+0.000 - 0.375	(+0 - 9.53)
					5.000 and Over	(127 and Over)	+0.000 - 0.500	(+0 - 13.00)

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 contact your Watlow representative before ordering coiled cable heaters requiring other than standard tolerances.

Cable Straight Length Tolerances

Length	≤ 24 in.	>24 in. ≤ 60 in.	>60 in. ≤ 100 in.	>100 in.
Tolerance	±3/8 in.	±1/2 in.	±1 in.	±1%

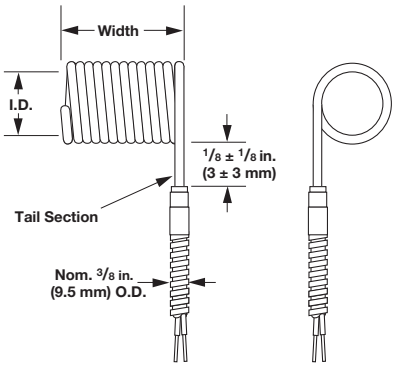
Standard Coil and Cable Heaters

Formation Options

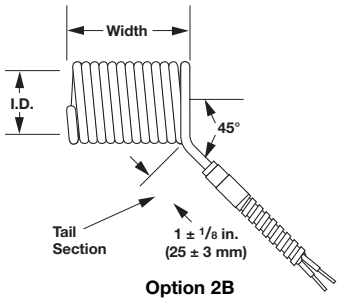
Standard Coil

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

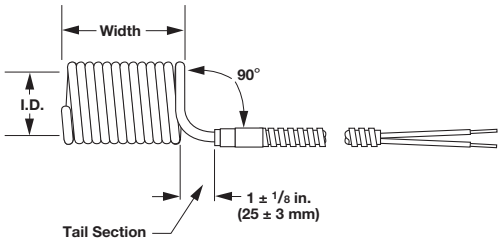
Lead Orientation Options for Coiled Cable Heaters



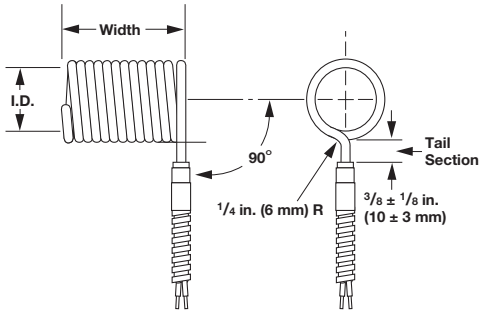
Option 2A



Option 2B

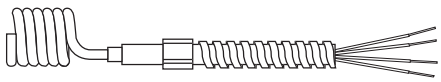


Option 2C



Option 2F

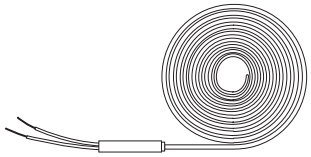
Closed Coil without Distributed Wattage



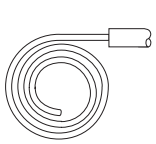
Closed Coil with Distributed Wattage



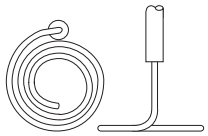
Flat Spiral



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



Flat Spiral with 2A Type Lead Orientation

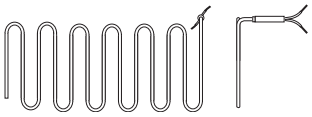


Flat Spiral with 2C Type Lead Orientation



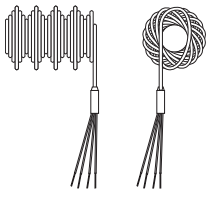
Flat Spiral with 2F Type Lead Orientation

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

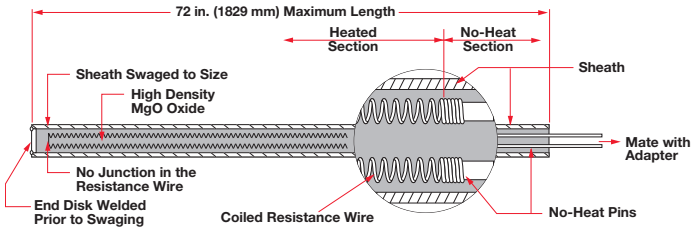


Star wound formations are usually inserted into pipes or ducts and are used to heat moving air or liquids. The offset coils increase/induce turbulent flow. This allows the flowing material to have better contact with the heater surface, resulting in a more efficient heat transfer.

Standard Coil and 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 in. (1829 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 in. (1.5 mm) round

  0.094 in. (2.4 mm) round

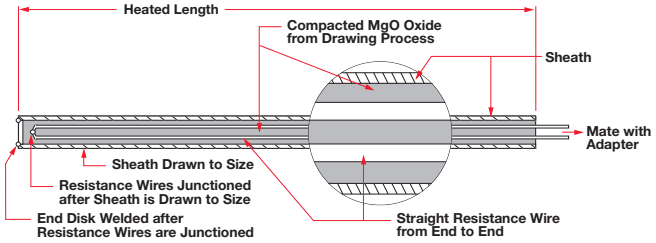
  0.125 in. (3.2 mm) round (minimum diameter with internal thermocouple)

  0.102 in. (2.6 mm) square

  0.128 in. (3.3 mm) square

  0.102 in. X 0.156 in. (2.6 mm X 4 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 in. (1.0 mm) round

  0.062 in. (1.6 mm) round

  0.094 in. (2.4 mm) round

  0.125 in. (3.2 mm) round (minimum diameter with internal thermocouple)

  0.157 in. (4.0 mm) round

  0.188 in. (4.8 mm) round

  0.128 in. (3.3 mm) square*

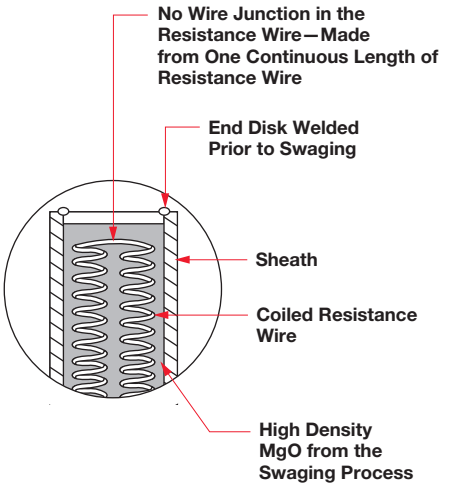
  0.102 in. X 0.156 in.* (2.6 mm X 4 mm) rectangular

  * Maximum length is 140 in. (3556 mm)

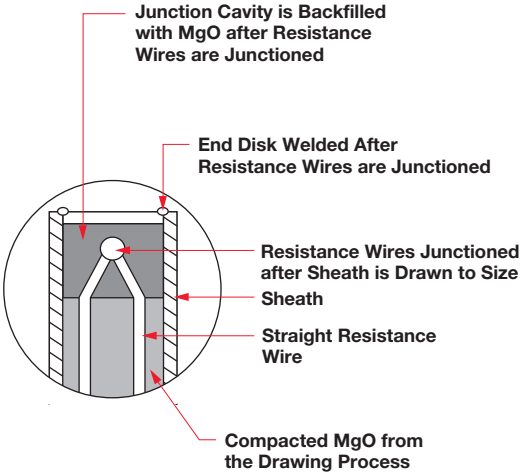
Standard Coil and Cable Heaters

Standard—Internal Construction

Disk End of Sheath



Coiled Internal Resistance Wire



Straight (Uncoiled) Resistance Wire

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° 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.

Parallel coil:

- 0.125 in. (3.2 mm) round
- 0.128 x 0.128 in. (3.3 x 3.3 mm) square
- 0.102 x 0.156 in. (2.6 x 4.0 mm) rectangular

Drawn cable:

- 0.125 in. (3.2 mm) round
- 0.157 in. (4.0 mm) round
- 0.188 in. (4.8 mm) round
- 0.128 x 0.128 in. (3.3 x 3.3 mm) square
- 0.102 x 0.156 in. (2.6 x 4.0 mm) rectangular

External thermocouples with Type J or K calibration can be brazed to the heater sheath. The sheath size must be a minimum of 0.094 in. (2.4 mm) in diameter.

Note: Other thermocouple types available, contact your Watlow representative.

Standard Coil and Cable Heaters

Options—Internal Construction *(Continued)*

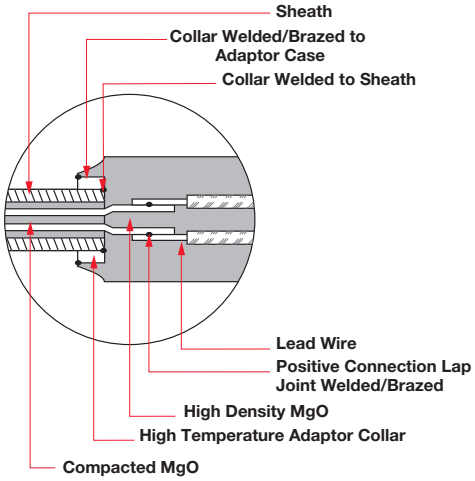
Adapters

Adapters 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 adapter 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 adapter 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.

Contact your Watlow representative for other wire options.

Lead Protection

Stainless steel hose, stainless steel braid or fiberglass braid.

Contact your Watlow representative for details.

Standard Coil and 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 wattage 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 O.D., lead orientation
- Lead wire options (required information):

  Standard - 36 in. (914 mm) swaged-in fiberglass unless otherwise noted
- Lead protection options (required information):

  Stainless steel hose - various lengths available

  Stainless steel 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, contact your Watlow representative for a quote on made-to-order units.

Availability

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

Made-to-Order: Delivery dependent on complexity of order. Contact your Watlow representative for price and delivery quotations.

Cable Heater Stock Units (Internal thermocouple not available)

Straight Cable Length in.	(mm)	Volts	Watts	Watt Density W/in²	W/cm²	No-Heat Length in.	(mm)	Lead Wire	Lead Protection	Code Number
0.062 in. (1.6 mm) Diameter Round (with ±10% wattage tolerance)										
24	(610)	120	240	51	(7.9)	0	(0)	36 in. (914 mm) swaged-in fiberglass	Lead protection is available upon request	**62H24A6X-1138**
36	(914)	120	400	57	(8.8)	0	(0)			**62H36A5X-1015**
56	(1422)	120	330	30	(4.7)	0	(0)			**62H56A4X-942**
65	(1651)	120	500	39	(6.0)	0	(0)			**62H65A3X-1111**
0.094 in. (2.4 mm) Diameter Round (with ±5% wattage tolerance)										
30	(762)	230	125	17	(2.6)	5	(127)	36 in. (914 mm) swaged-in Teflon® leads only	Lead protection not available	**94PC30A1X**
30	(762)	230	250	34	(5.3)	5	(127)			**94PC30A2X**
0.125 in. (3.2 mm) Diameter Round (with ±10% wattage tolerance)										
18	(457)	240	250	35	(5.4)	1.5	(38)	36 in. (914 mm) swaged-in fiberglass	Lead protection is available upon request	**125CH18A4X-1066**
19	(483)	120	165	21	(3.3)	1.5	(38)			**125CH19A1X-879**
24	(610)	120	275	29	(4.5)	1.5	(38)			**125CH24A1X-1049**
24	(610)	240	275	29	(4.5)	1.5	(38)			**125CH24A14X-806**
38	(965)	240	325	21	(3.3)	1.5	(38)			**125CH38A1X-631**
38	(965)	120	175	12	(1.9)	1.5	(38)	36 in. (914 mm) swaged-in fiberglass	Lead protection is available upon request	**125CH38A2X-246**
47	(1194)	240	260	14	(2.2)	1.5	(38)			**125CH47A1X-108**
47	(1194)	120	235	12	(1.9)	1.5	(38)			**125CH47A2X-182**
47	(1194)	120	375	20	(3.1)	1.5	(38)			**125CH47A3X-986**
47	(1194)	240	345	19	(2.9)	1.5	(38)			**125CH47A4X-1081**
65	(1651)	240	420	16	(2.5)	1.5	(38)	36 in. (914 mm) swaged-in fiberglass	Lead protection is available upon request	**125CH65A1X-940**
65	(1651)	240	675	27	(4.2)	1.5	(38)			**125CH65A2X-1115**
95	(2413)	240	1000	28	(4.3)	0.0	(0)			**125CH93A1X-1154**

CONTINUED

Standard Coil and Cable Heaters

Cable Heater Stock Units (Internal thermocouple not available)

Straight Cable Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	No-Heat Length in.	(mm)	Lead Wire	Lead Protection	Code Number
0.125 in. (3.2 mm) Diameter Round (with ±10% wattage tolerance)										
126	(3200)	240	1500	30	(4.7)	0	(0)	36 in. (914 mm)	Lead protection	**125H126A4A-969**
150	(3810)	240	2000	34	(5.3)	0	(0)	swaged-in	is available	**125H150A3A-1168**
223	(5664)	240	3000	34	(5.3)	0	(0)	fiberglass	upon request	**125H223A1A-1057**
0.128 in. (3.3 mm) Square Cross-Section (with ±10% wattage tolerance)										
12	(305)	120	200	36	(5.6)	1.5	(38)	36 in. (914 mm)	Lead protection	**125PS12A24A-647**
12	(305)	240	200	36	(5.6)	1.5	(38)	swaged-in	is available	**125PS12A23A-155**
20	(508)	120	300	31	(4.8)	1.5	(38)	fiberglass	upon request	**125PS20A37A-537**
20	(508)	240	300	31	(4.8)	1.5	(38)			**125PS20A38A-142**
30	(762)	120	450	30	(4.7)	1.5	(38)			**125PS30A47A-159**
30	(762)	240	450	30	(4.7)	1.5	(38)			**125PS30A48A1019**
38	(965)	240	600	31	(4.8)	1.5	(38)			**125PS38A23A-562**

Cable Heater Stock Units (Type J internal thermocouple)

Straight Cable Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	No-Heat Length in.	(mm)	Lead Wire	Lead Protection	Code Number
0.125 in. (3.2 mm) Diameter Round (with ±10% wattage tolerance), thermocouple located in center of heated section.										
24	(610)	120	275	29	(4.5)	1.5	(38)	48 in. (1219 mm)	Lead protection	**125CH24A13X**
38	(965)	120	175	12	(1.9)	1.5	(38)	swaged-in	is available	**125CH38A18X**
47	(1194)	120	235	13	(2.0)	1.5	(38)	fiberglass	upon request	**125CH47A21X**
65	(1651)	240	675	26	(4.0)	1.5	(38)			**125CH65A26X**
0.157 in. (4 mm) Diameter Round (with ±10% wattage tolerance), thermocouple located at the disk end of the cable.										
124	(3150)	240	1500	25	(3.9)	0	(0)	48 in. (1219 mm)	Lead protection	**157CH124AX**
150	(3810)	240	2000	27	(4.2)	0	(0)	swaged-in	is available	**157CH150AX**
220	(5588)	240	3000	28	(4.3)	0	(0)	fiberglass	upon request	**157CH220AX**
0.128 in. (3.3 mm) Square Cross-Section (with ±10% wattage tolerance), thermocouple located in center of heated section.										
12	(305)	240	200	36	(5.6)	1.5	(38)	48 in. (1219 mm)	Lead protection	**125PS12A22A**
20	(508)	120	300	31	(4.8)	1.5	(38)	swaged-in	is available	**125PS20A35A**
20	(508)	240	300	31	(4.8)	1.5	(38)	fiberglass	upon request	**125PS20A36A**
30	(762)	240	450	30	(4.7)	1.5	(38)			**125PS30A46A**
38	(965)	240	600	31	(4.8)	1.5	(38)			**125PS38A24A**

Nozzle/Slip-On Heaters



Nozzle/Slip-On Heaters

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THINBAND® Mica Nozzle Heaters.....599

Syringe Heaters 605

Thick Film Cylindrical Heaters 607

Pre-Coiled Cable Nozzle Heaters 609

Metric Mini K-RING® Heaters 611

Mineral Insulated Nozzle Heaters

The Mineral Insulated (MI) nozzle heater from Watlow® is a high-performance heater. Its performance and name are derived from Watlow's exclusive mineral insulation—a material that has much higher thermal conductivity than the mica and hard ceramic insulators used in conventional heaters.

A thin layer of the "high" thermal conductive MI material is used to electrically insulate the element wire from the inside diameter of the heater sheath. A thicker, "low" thermal conductivity layer backs up the element wire, directing the heat inward toward the part that is being heated. The result is more efficient heat transfer—a performance solution lowering element wire temperatures and increasing heater life.

Performance Capabilities

- Heater operating temperatures to 1400°F (760°C)
- Watt densities to 230 W/in² (35.6 W/cm²) available on small diameter nozzle nozzles

Features and Benefits

Operating temperatures to 1400°F (760°C)

- Safely melts resins such as PEEK®, Teflon®, Ultem® and Zytel®

Higher watt densities

- Contributes faster heat-up and throughput for increased productivity

High thermal conductivity of MI and low mass construction

- Gives an almost instant response to temperature control
- Eliminates thermal lag and temperature overshoot associated with ceramic knuckle heaters

Stainless steel cover and side fold design

- Resists contamination by overflow of plastic or other free-flowing materials

Permanently attached clamp bars

- Eliminates cumbersome clamping straps, making installation easier



Applications

- Extruders
- Blown film dies
- Injection molding machines
- Other cylinder heating applications

Mineral Insulated Nozzle Heaters

Applications and Technical Data

The *Physical Limitations of Variations* table shows you the availability of widths, inside diameters and terminations for Watlow's MI nozzle and barrel heaters. To make sure the available terminations will meet your application needs, refer to the illustrations of termination variations in this section.

If you need to exceed limitations shown, contact your Watlow representative.

Physical Limitations of Variations

Widths		I.D. Available — in. (mm)												Available Terminations
		1 pc. Construction				Expandable				2 pc. Construction				
		Min.		Max.		Min.		Max.		Min.		Max.		
in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	in.	(mm)	
1	(25)	1	(25)	6	(152)	3	(76)	12	(305)	3	(76)	12	(305)	All
1⅜	(34.9)	1	(25)	3	(76)	3	(76)	6	(152)	3	(76)	6	(152)	All - Except SLE
1½	(38)	1	(25)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
2	(51)	1¼	(32)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
2½	(64)	1¼	(32)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
3	(76)	1½	(38)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
3½	(89)	1¾	(45)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All - Except 90° "B" Leads
4	(102)	2	(51)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
4½	(114)	2¼	(57)	14	(356)	3	(76)	14	(356)	3	(76)	28	(711)	All
5	(127)	2½	(64)	14	(356)	3	(76)	14	(356)	4	(102)	28	(711)	All - Except 90° "B" Leads
5½	(140)	2¾	(70)	14	(356)	3	(76)	14	(356)	4	(102)	28	(711)	Post Terminals, SLE only
6	(152)	3	(76)	14	(356)	3	(76)	14	(356)	4	(102)	28	(711)	All
7	(178)					4	(102)	14	(356)					Post Terminals, SLE only

General Limitations

- Maximum width of 1 in. (25 mm) diameter heater is 1½ in. wide (38 mm).
- Maximum heater width: 2x heater diameter
- Minimum I.D. for Type B, C, E and H leads: 1 in. (25 mm)
- Minimum I.D. for Type B—90° leads: 1⅛ in. (28.6 mm)
- Maximum lead amperes: 12.5A per pair
- SLE maximum: 17.0A
- Maximum amperes (post terminals): 30A per pair
- Minimum diameter and width for SLE: 4 in. x 1½ in. (102 x 38 mm) width
- 90° leads not available over 250V~(ac)
- Minimum I.D. for post terminals: 1¼ in. (32 mm)
- Actual width for 7 in. (178 mm) wide heater: 6⅞ in. (174.6 mm)

Standard Gaps

- ≤ 3 in. = ⅛ in. nominal
- 3 in. ≤ 6 in. = ¼ in. nominal ±⅛ in.
- 6 in. ≤14 in. = ⅜ in. nominal ±⅛ in.
- >14 in. = ½ in. nominal ±¼ in.

Mineral Insulated Nozzle Heaters

Applications and Technical Data *(Continued)*

Calculating Watt Density

Watt density is the amount of wattage per square inch of heated area. To determine watt density, divide the total wattage by the heated area.

$$\text{Watt Density} = \frac{\text{Total Watts}}{\text{Heated Area}}$$

To apply this equation, we must define the term "heated area." Heated area is the total contact surface of the heater less areas of no-heat found around terminals, mounting holes, etc.

Heated Area = Total Contact Area - No-Heat Area

To calculate the heated area:

1. Locate the **no-heat factor** from the chart below that corresponds to the type of heater being considered.

Type	Factor in.
1 pc. lead unit Type B, C, H, E or 90°B	1.37
1 pc. post terminal	1.60
1 pc. expandable post term	3.18
1 pc. expandable lead unit	3.00
True 2 pc. post term	3.20
True 2 pc. leads	2.74
SLE	3.68

2. To use the formula below, insert the no-heat factors, diameter and width (in inches).

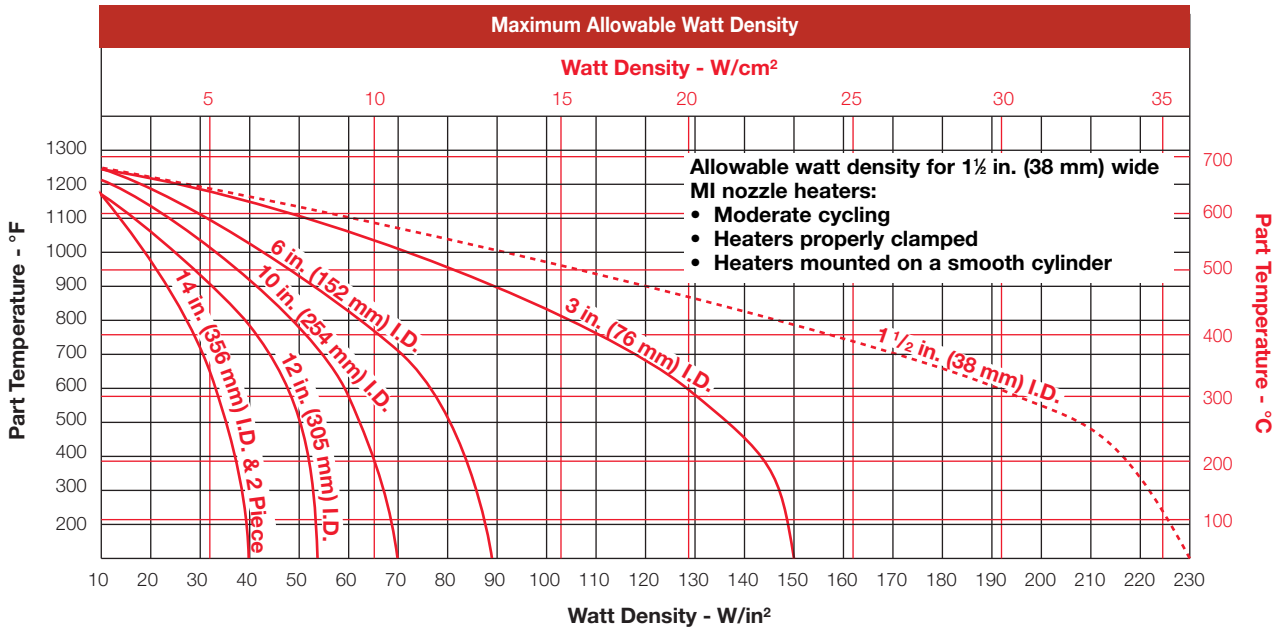
   Heated Area =
   (3.14 x Diameter - No-Heat Factor) x Width

Maximum Allowable Watt Density

The following derating factors apply to the *Maximum Allowable Watt Density* chart, which are shown in both inch base and metric for your convenience. Please review these factors and the chart to determine the correct watt density curve for your application.

Derating Factors:

- For units over 2 in. (51 mm) in width, multiply watt density by 0.80.
- In applications where unusual operating conditions are present, such as irregular mounting surfaces, contact your Watlow representative for watt density limitations.
- For two-piece units used in vertical applications, refer to *Clamping Matrix Application Guide*.
- For applications where insulating blankets are used, multiply W/in² (W/cm²) by 0.75.



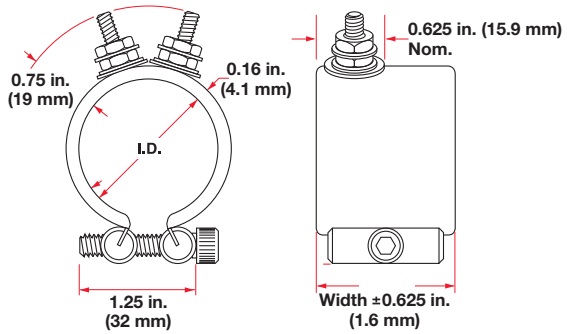
Mineral Insulated Nozzle Heaters

Termination Variations

Leads Type B, Type B - 90° rotation, Type B - 180° rotation or Type C: Two fiberglass-insulated lead wires exit in a single metal braid for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **type** and **length.**

Post Terminals

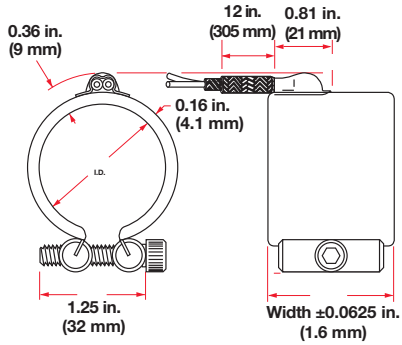
Stock



Post terminals provide optimum connections. Screw thread is 10-24. To order, specify **post terminals** (metric threads available).

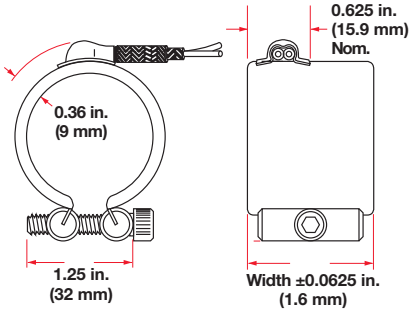
Type B

Stock



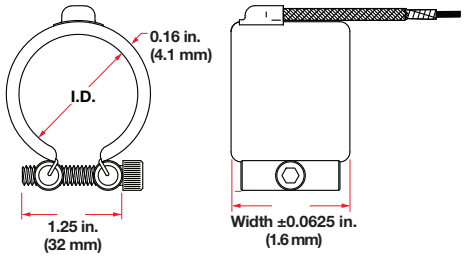
Type B—90° Rotation

Non-Stock



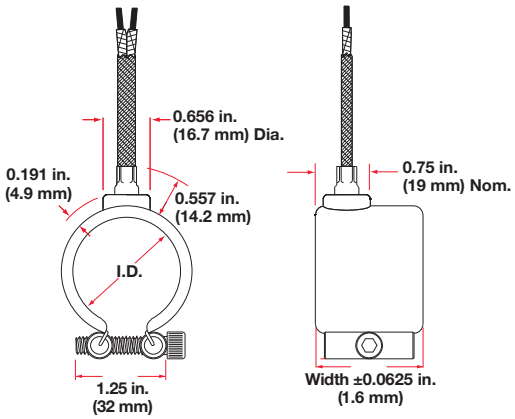
Type B - 180° Rotation

Stock



Type C

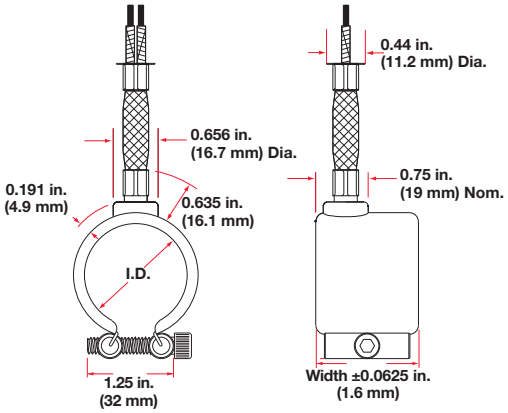
Stock



Mineral Insulated Nozzle Heaters

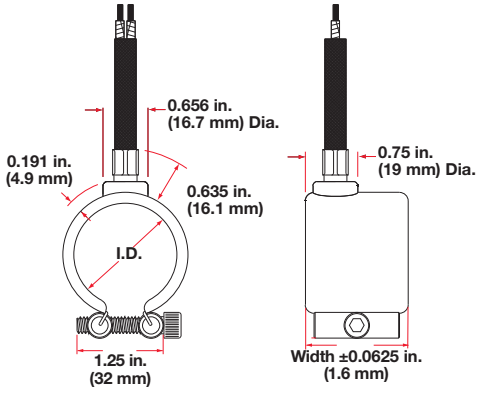
Termination Variations *(Continued)*

Type E
Stock



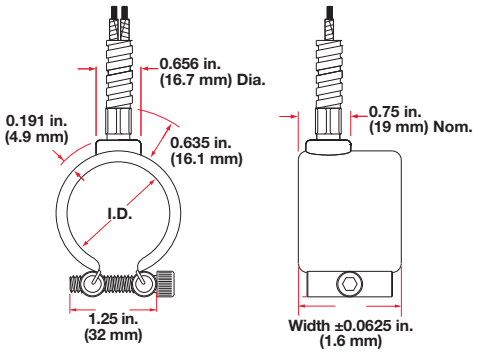
Type E: Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **Type E** and **length.**

Type F
Stock



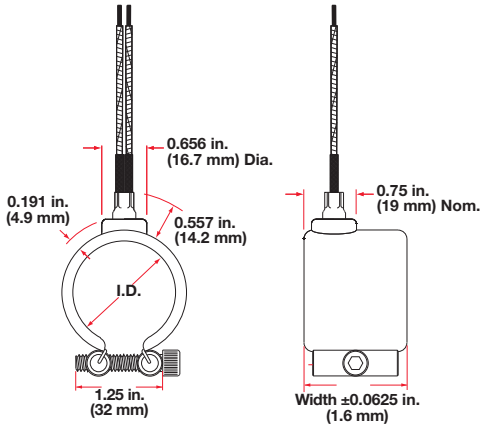
Type F: Loose fiberglass sleeving encloses two fiberglass leads for additional insulation protection where high temperature or minor abrasion is present. Leads are 2 in. (51 mm) longer than the sleeving. To order, specify **Type F** and **length**.

Type H
Stock



Type H: A flexible steel hose encloses the leads for maximum abrasion protection. Leads are 2 in. (51 mm) longer than hose. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **Type H** and **length.**

Type K
Stock

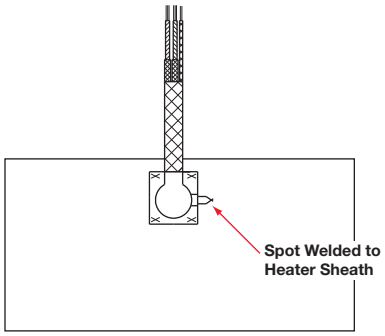


Type K: Flexible lead wires exit vertically from the heater. These leads can be bent adjacent to the heater for a quick and easy connection. To order, specify **Type K** and **length**.

Mineral Insulated Nozzle Heaters

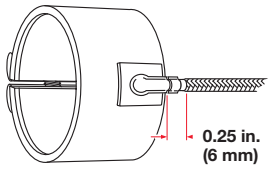
Variations

Thermocouple



ASTM Type J or K thermocouples are available on lead Type B with loose braid and fiberglass sleeving. They are also available on E, F and H leads. The thermocouple junction, spot-welded to heater sheath provides a signal for measuring relative heater temperature. A separate thermocouple is available.

Heavy Duty Strain Relief



Heavy duty strain relief is recommended for applications where there is great stress or continued flexing of the leads. The strain relief is available on Type B, Type B—90° and Type B—180° leads only. To order, specify **heavy-duty strain relief. Note:** not available with loose braid or fiberglass sleeving.

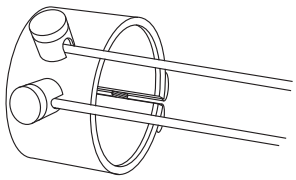
Lead Wire

Heaters rated at less than 250V~(ac) use UL® approved lead insulation for operations to 480°F (250°C) as standard. Lead insulation UL® rated for operation to 840°F (450°C) is available for high-temperature applications where the leads are shrouded or enclosed with the heater. These leads are available in any of the Type B with loose braid as well as Types E, F and H lead configurations. All heaters rated at more than 250V~(ac) use this wire. When ordering, specify **850°F (450°C) wire.**

Ground Wire

Insulated ground wire is available, contact your Watlow representative.

Ceramic Terminal Cover

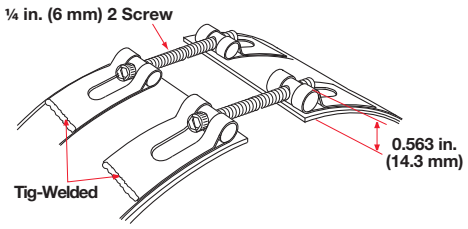


Ceramic covers, with openings for leads, are screwed on to post terminals, providing a convenient, economical insulator. To order, specify code number **Z-4918** and **quantity.** Ceramic terminal covers are also available in metric, specify thread. **Note:** Ceramic terminal covers will not fit on some stock expandable MI nozzles. Contact your Watlow representative for more information.

Mineral Insulated Nozzle Heaters

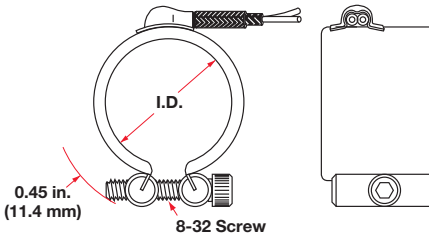
Clamping Variations

Tig-Welded Barrel Nuts



An ideal way to provide access for instrumentation is to specify an oversized gap between the heater ends. If the clamp bar screw interferes with the positioning of the instrumentation device, welded barrel nuts are recommended (tig-welded barrel nuts are standard on 1 in. (25 mm) wide MI nozzle heaters). To order, specify **tig-welded barrel nuts** and **gap dimension** when ordering.

Low-Profile Clamp Bars



Low-profile clamp bars are available on both 1 in. (25 mm) and 1½ in. (38 mm) wide heaters, for wider widths contact your Watlow representative. Watlow recommends not using low-profile clamping on diameters and widths greater than 3 in. (76 mm). The bars are ¼ in. (6 mm) diameter with an 8-32 screw. To order, specify **low-profile clamp bars.**

Low-Profile Tig Welded Barrel Nuts

Low-profile barrel nuts are available on all widths. Low-profile barrel nuts have a clearance of 0.406 in. (10.3 mm); this will vary with heater diameter. To order, specify **low-profile tig welded barrel nuts**.

Stock Heater Code Numbers

I.D. in.	I.D. (mm)	Width in.	Width (mm)	Construction	Volts	Watts	Watt Density W/in²	Watt Density (W/cm²)	Termination	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Avail.	Code Number
1	(25)	1	(25.0)	1 pc	120	150	92	(14.2)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN1**
		1	(25.0)	1 pc	120	100	61	(9.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN2**
		1	(25.0)	1 pc	120	200	122	(18.9)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN3**
		1	(25.0)	1 pc	240	200	122	(18.9)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1AN4**
		1½	(38.0)	1 pc	240	300	106	(16.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1JN1**
		1½	(38.0)	1 pc	120	300	106	(16.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1JN2**
		1½	(38.0)	1 pc	240	200	70	(10.8)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1A1JN3**
1¼	(32)	1	(25.0)	1 pc	240	250	104	(16.1)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1E1AN1**
		1	(25.0)	1 pc	120	250	104	(16.1)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1E1AN2**
		1	(25.0)	1 pc	240	300	124	(19.2)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1E1AN3**
		1½	(38.0)	1 pc	240	350	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1E1JN1**
		1½	(38.0)	1 pc	120	350	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1E1JN2**
		1½	(38.0)	1 pc	240	450	112	(17.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1E1JN3**

CONTINUED

Mineral Insulated Nozzle Heaters

Stock Heater Code Numbers *(Continued)*

I.D. in.	I.D. (mm)	Width in.	Width (mm)	Construction	Volts	Watts	Watt Density W/in²	Watt Density (W/cm²)	Termination	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Avail.	Code Number
1½	(38)	1	(25.0)	1 pc	240	300	93	(14.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN1**
		1	(25.0)	1 pc	120	300	93	(14.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN2**
		1	(25.0)	1 pc	240	200	62	(9.6)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN3**
		1	(25.0)	1 pc	240	400	125	(19.3)	Type B,C,E, F or H	0.1	(0.05)	Stock	**MB1J1AN5**
		1½	(38.0)	1 pc	120	300	58	(9.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN1**
		1½	(38.0)	1 pc	240	450	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN2**
		1½	(38.0)	1 pc	240	300	58	(9.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN3**
		1½	(38.0)	1 pc	240	600	116	(17.9)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1J1JN4**
		1½	(38.0)	1 pc	240	450	96	(14.8)	Post	0.2	(0.09)	Stock	**MB1J1JP6**
		2	(51.0)	1 pc	240	450	57	(8.8)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1J2AN1**
		2	(51.0)	1 pc	240	300	42	(6.5)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1J2AN2**
		2	(51.0)	1 pc	240	900	125	(19.3)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1J2AN3**
		3	(76.0)	1 pc	240	500	45	(7.0)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB1J3AN1**
		3	(76.0)	1 pc	240	350	31	(4.8)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB1J3AN2**
1¾	(45)	1⅜	(34.9)	1 pc	240	450	83	(12.8)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB1N1GX3A**
		1½	(38.0)	1 pc	240	300	47	(7.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1N1JN1**
		1½	(38.0)	1 pc	120	300	50	(7.7)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1N1JN2**
		1½	(38.0)	1 pc	240	700	110	(17.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB1N1JN3**
		2	(51.0)	1 pc	240	750	86	(13.3)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB1N2AN1**
2	(51)	1	(25.0)	1 pc	240	350	73	(11.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2A1AN1**
		1	(25.0)	1 pc	120	350	73	(11.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2A1AN2**
		1	(25.0)	1 pc	240	450	94	(14.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2A1AN3**
		1	(25.0)	1 pc	240	350	79	(12.2)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB2A1AX6B**
		1½	(38.0)	1 pc	240	400	53	(8.2)	Type B,C,E, F or H	0.3	(0.14)	Stock	**MB2A1JN1**
		2	(51.0)	1 pc	240	750	73	(11.3)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB2A2AN1**
		2	(51.0)	1 pc	240	1200	125	(19.3)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB2A2AN2**
		2	(51.0)	1 pc	240	750	75	(11.6)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB2A2AX2A**
2¼	(57)	2	(51.0)	1 pc	240	750	63	(9.7)	120 in. 180° Type B braid w/HD strain relief	0.2	(0.09)	Stock	**MB2E2AX7**
		2½	(64.0)	1 pc	240	1000	72	(11.2)	Type B,C,E, F or H	0.5	(0.23)	Stock	**MB2E2JN1**
2½	(64)	1	(25.0)	1 pc	240	400	63	(9.7)	Type B,C,E, F or H	0.2	(0.09)	Stock	**MB2J1AN1**
		1½	(38.0)	1 pc	240	500	50	(7.7)	Type B,C,E, F or H	0.4	(0.18)	Stock	**MB2J1JN1**

How to Order

To order your stock MI nozzle heater, specify:

- Quantity
- Watlow code number
- Options
- Lead type and length, or terminal type configuration (If code number has an "N" as the last letter in the code, you must specify termination type and lead length. The leads supplied are 12 in. (305 mm) if not otherwise specified.)

Note: Type B - 90° rotation not available.

Availability

Stock: Same day shipment on MI nozzle heaters with 12 in. (305 mm) Type B leads. Longer lead lengths or other terminations will ship next day. Type B - 90° leads are not available from stock.

Made-to-Order: If stock units do not meet application needs, Watlow can manufacture MI nozzle heaters to special requirements. Please contact your Watlow representative.

THINBAND® Mica Nozzle Heaters



The THINBAND® heater from Watlow® is a patented redesign of the mica band. THINBAND heaters have faster delivery keeping costs down and machines running.

Performance Capabilities

- Sheath temperatures to 900°F (480°C)
- Watt densities to 55 W/in^2 (8.5 W/cm^2)

Features and Benefits

Same day shipment on more than 1,000 variations available because of Watlow's Lead Adapter (LA) manufacturing method

- Reduces inventories and costly downtimes

Only one set of leads or terminals

- Ends the need for two sets required by cumbersome, two-piece replacement heaters

No folds on the outside of the heater

- Resists contamination
- Provides permanently attached clamping bars

Applications

- Extruders
- Blown film dies
- Injection molding machines
- Other cylinder heating applications

THINBAND Mica Nozzle Heaters

Applications and Technical Data

Operating Factors

You can use as low of a watt density rating as your application permits. A close match of the heat supplied to the actual requirements will reduce temperature overshoot, reduce cycling and increase the life of any band heater you use.

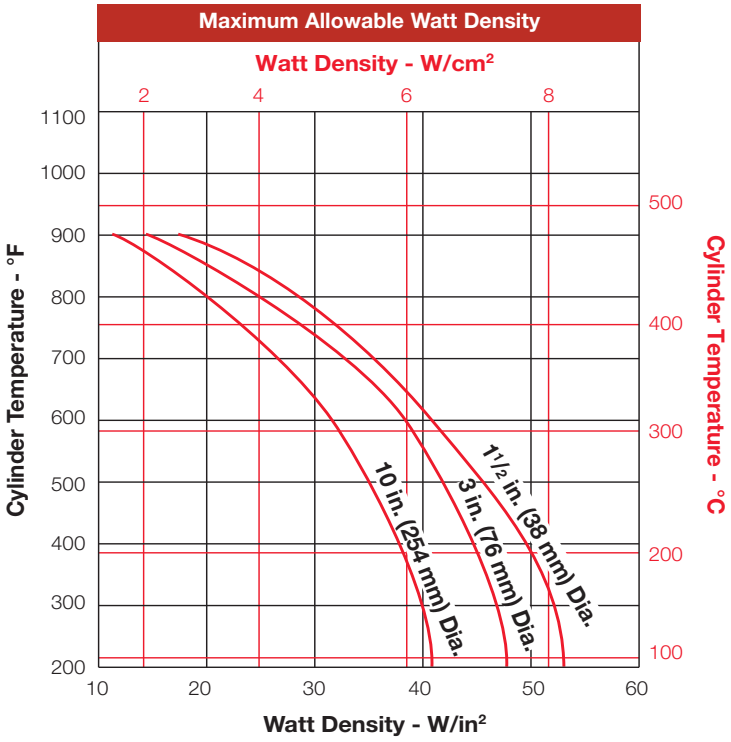
Calculate the **safe maximum wattage** for your heater using:

Heated Area x Maximum Watt Density

Calculate the **heated area** of your band heater by subtracting the no-heat area from the total area in contact with the cylinder (3.14 x I.D. x width). Subtract the no-heat area at the terminals (from table) and any additional no-heat area caused by holes, slots or oversize gaps.

Determine the maximum watt density of your heater from the *Maximum Allowable Watt Density* graph. The curves are based on narrow heaters mounted on a smooth, steel cylinder. Apply the necessary correction factors:

- For heaters 2¼ in. to 5 in. (57 mm to 127 mm) wide, multiply watt density by 0.8.
- For high expansion cylinders (aluminum or brass), reduce the watt density by 3 W/in² (0.46 W/cm²).
- For heaters 2¼ in. to 5 in. (57 mm to 127 mm) wide installed on a high-expansion cylinder, reduce watt density by a total of 3 W/in² (0.46 W/cm²) only.
- For regular cylinder surfaces other than smooth, machined finish, reduce watt density by 3 W/in² (0.46 W/cm²).
- For heaters that will be insulated or enclosed, contact your Watlow representative for specific watt densities.
- For units greater than 14 in. (356 mm) diameter, consult the *THINBAND Recommended Clamping Options* graph.
- For units used in vertical applications, contact your Watlow representative for application assistance.



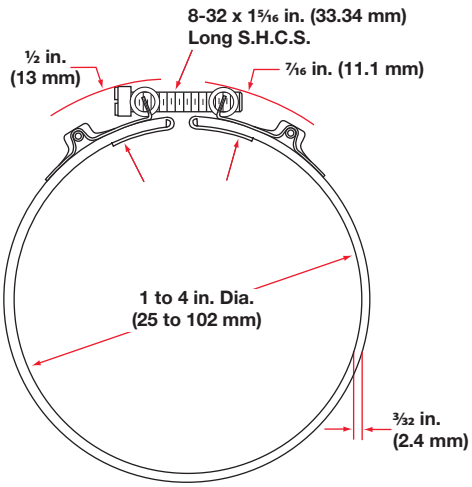
No-Heat Area for THINBAND Barrel (All Terminations)

Heater Type	Heater Size		No-Heat Area Standard Gap ⅜ in.
	Diameter in. (mm)	Width in. (mm)	in. (mm)
One Piece	Less than 2½ (64)	Up to 7 (178)	1¼ (32) x width
Two Piece	5 (127) or more	More than 3 (76)	2½ (64) x width

THINBAND Mica Nozzle Heaters

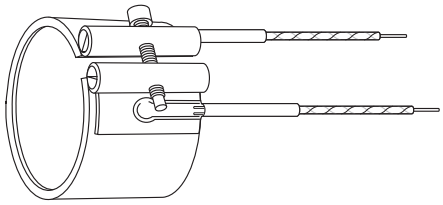
Terminations

- **1 to 4 in. (2 to 102 mm) diameter**
- **1 to 6 in. (25 to 152 mm) wide**



Type L

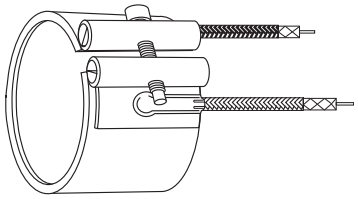
Stock Option



Flexible lead wires with fiberglass sleeves exit the nozzle heater on both sides of the gap. The heater sheath encloses the ends for protection against contamination. To order, specify **Type L.**

Type A

Stock Option



Especially designed for nozzle heaters, there is a galvanized metal braid over the fiberglass insulated leads, which provides strength and protection. The heater ends are enclosed to protect against melted plastic and contaminants. This arrangement permits 1 in. (25 mm) and wider nozzle heaters to be placed flush against a flange. Available on nozzle sizes only. To order, specify **Type A.**

THINBAND Mica Nozzle Heaters

Stock Heater Code Numbers

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
1 (25.0)	1 (25.0)	120	100	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A1**	**B1A1AN1**
	1 (25.0)	240	100	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A2**	**B1A1AN2**
	1 (25.0)	120	125	55 ① (8.5)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A3**	**B1A1AN3**
	1 (25.0)	240	125	55 ① (8.5)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1A4**	**B1A1AN4**
	1½ (38.0)	240	150	44 (6.8)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1J2**	**B1A1JN2**
	1½ (38.0)	120	200	59 ① (9.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1J3**	**B1A1JN3**
	1½ (38.0)	240	200	59 ① (9.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1A1J4**	**B1A1JN4**
1¼ (32.0)	⅝ (15.9)	120	100	54 ① (8.4)	1	Mica Band–12 in. Type A	0.2 (0.09)	Stock	**B1EOLA1**	**–**
	1¼ (32.0)	120	125	33 (5.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1E1E1**	**B1E1EN1**
	1¼ (32.0)	240	125	33 (5.1)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1E1E2**	**B1E1EN2**
	1¼ (32.0)	240	250	67 ① (10.4)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1E1E3**	**B1E1EN4**
	3 (76.0)	240	250	27 (4.2)	1	THINBAND–Type A or L	0.5 (0.22)	Stock	**STB1E3A2**	**B1E3AN2**
	3 (76.0)	240	300	33 (5.1)	1	THINBAND–Type A or L	0.5 (0.22)	Stock	**STB1E3A3**	**B1E3AN3**
1⅜ (34.9)	1 (25.0)	120	140	41 (6.4)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1G1A1**	**B1G1AN1**
	2 (51.0)	240	300	51 ① (7.9)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1G2A1**	**B1G2AK1**
1½ (38.0)	⅞ (22.2)	240	100	31 (4.8)	1	Mica Band–Type A or L	0.2 (0.09)	Stock	**B1JORN1**	**–**
	1 (25.0)	120	100	26 (4.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A1**	**B1J1AN1**
	1 (25.0)	240	100	26 (4.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A2**	**B1J1AN2**
	1 (25.0)	120	150	39 (6.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A3**	**B1J1AN3**
	1 (25.0)	240	150	39 (6.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A4**	**B1J1AN4**
	1 (25.0)	120	200	52 ① (8.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A5**	**B1J1AN5**
	1 (25.0)	240	200	52 ① (8.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1A6**	**B1J1AN6**
	1¼ (32.0)	240	250	52 ① (8.0)	1	THINBAND–Type A or L	0.2 (0.09)	Stock	**STB1J1E1**	**B1J1EN1**
	1½ (38.0)	240	200	35 (5.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J2**	**B1J1JN2**
	1½ (38.0)	120	250	43 (6.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J3**	**B1J1JN3**
	1½ (38.0)	240	250	43 (6.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J4**	**B1J1JN4**
	1½ (38.0)	120	275	48 ① (7.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J5**	**B1J1JN5**
	1½ (38.0)	240	275	48 ① (7.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J6**	**B1J1JN6**
	1½ (38.0)	240	300	52 ① (8.0)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J1J7**	**B1J1JN7**
	2 (51.0)	240	300	39 (6.0)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1J2A1**	**B1J2AN1**
	2½ (64.0)	240	400	42 (6.5)	1	THINBAND–Type A or L	0.5 (0.23)	Stock	**STB1J2J1**	**–**
	3 (76.0)	240	350	30 (4.6)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J3A1**	**B1J3AN1**
	3 (76.0)	240	500	43 (6.7)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J3A2**	**B1J3AN2**
	3 (76.0)	240	800	69 ① (10.7)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J3A3**	**B1J3AN3**
	4 (102.0)	240	600	39 (6.0)	1	THINBAND–Type A or L	0.6 (0.27)	Stock	**STB1J4A1**	**–**
1¾ (45.0)	1½ (38.0)	240	150	22 (3.4)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J1**	**B1N1JN1**
	1½ (38.0)	120	200	29 (4.5)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J2**	**B1N1JN2**
	1½ (38.0)	240	250	36 (5.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J6**	**B1N1JN6**
	1½ (38.0)	120	300	43 (6.7)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J7**	**B1N1JN7**
	1½ (38.0)	240	300	43 (6.7)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J8**	**B1N1JN8**

CONTINUED

① Watt density is above Watlow recommendations at some common molding temperatures.

THINBAND Mica Nozzle Heaters

Stock Heater Code Numbers *(Continued)*

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in² (W/cm²)	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
1¾ (45)	1½ (38.0)	120	300	43 (6.7)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J7**	**B1N1JN7**
	1½ (38.0)	240	300	43 (6.7)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1N1J8**	**B1N1JN8**
1⅞ (47.6)	1 (25.0)	240	140	28 (4.3)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB1R1A1**	**B1R1AL1**
2⅛ (54)	1 (25.0)	120	200	34 (5.3)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB2C1A1**	**B2C1AN1**
	2 (51.0)	240	200	17 (2.6)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB2C2A1**	**B2C2AN1**
2¼ (57)	⅞ (22.2)	120	215	43 (6.7)	1	Mica Band–Type A or L	0.3 (0.14)	Stock	**B2E0RN1**	**–**
2½ (64)	1½ (38.0)	240	200	19 (2.9)	1	THINBAND–Type A or L	0.3 (0.14)	Stock	**STB2J1J1**	**B2J1JN1**
2¾ (70)	1½ (38.0)	240	400	34 (5.3)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB2N1J1**	**B2N1JN1**
3 (76)	1 (25.0)	240	200	23 (3.6)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB3A1A2**	**B3A1AN1**
	1 (25.0)	240	250	29 (4.5)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB3A1A3**	**B3A1AN2**
	1 (25.0)	240	300	35 (5.4)	1	THINBAND–Type A or L	0.4 (0.18)	Stock	**STB3A1A4**	**B3A1AN3**
	1½ (38.0)	120	600	47 ① (7.3)	1	THINBAND–Type A or L	0.5 (0.23)	Stock	**STB3A1J6**	**B3A1JN2**

① Watt density is above Watlow recommendations at some common molding temperatures.
② Mica Band-Post-thermocouple hole at gap, THINBAND replacement does not include thermocouple hole at gap.

How to Order

To order stock THINBAND or standard mica band, specify:

- Watlow code number
- Termination type(s)
- Lead lengths
- Quantity

Notes:

- Post terminals are provided unless otherwise specified.
- On Types A and L 12 in. (305 mm) in lead length will be supplied unless otherwise specified.
- On Type A, leads will be 2 in. (51 mm) longer than the protective covering unless otherwise specified.

Availability

- **Stock:** Same day shipment
- **Made-to-Order:** If our stock units do not meet your application needs, Watlow can manufacture to your special requirements. Please contact your Watlow representative for price and delivery of made-to-order items.

Nozzle/Slip-On Heaters

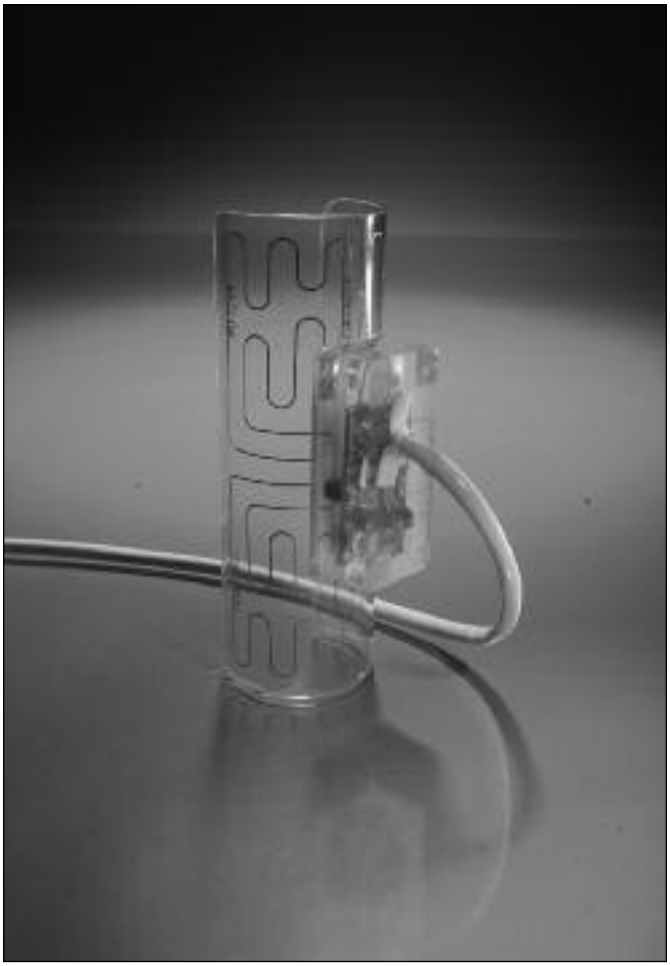
Syringe Heaters

The syringe heater from Watlow® produces consistent results by reducing temperature and viscosity variations. These heaters provide a heated fluid and drug delivery solution that maximizes patient comfort while reducing risk.

The versatile Watlow heater system was developed for the unique needs of medical injection applications. Heater configurations include silicone/wire or polycarbonate/foil configurations to deliver flexibility and convenience. Both heater forms are designed to "snap" on to the syringe with one hand and hold firmly during the procedure.

Constructed utilizing a clear polycarbonate laminate, this design allows technicians to view fluid levels and monitor for air bubbles. Smooth outer surfaces and a radius on all inside corners facilitate cleaning. The syringe heaters also house an overmold containing an electronic controller and/or sensor to deliver years of accurate, trouble free service and warm solutions to precise specifications. Redundant controller may also be incorporated if required.

Precise fluid temperatures greatly increase patients' comfort levels. Body temperature injections are more easily introduced to patients and have reduced viscosity. Heated contrast media minimizes patient risk and is particularly beneficial for patients in a frail or distressed condition.



Features and Benefits

Long operational life

- Improves system reliability
- Reduces equipment down time—minimizes the need to reschedule procedures

Two heater configurations provide flexibility and adaptability

- Provides maximum flexibility to accommodate various syringe sizes (silicon wire)
- Provides high tech look and functionality (polycarbonate/foil)

Customizable to most OEM requirements

- Allows over-mold to be modified and color matched for a seamless, integrated appearance

Optional precise, repeatable temperature sensing control

- Maximizes patient comfort
- Minimizes patient risk
- Increases the consistency of test results by eliminating temperature and viscosity variations
- Improves product life versus bimetal thermostats

Specifications

Silicone/Wire and Polycarbonate/Foil

- Length: 5 in. (127 mm) max.
- Formed heater diameter: formed to fit syringe. Typical diameter is 2 in. (50 mm) to 6 in. (150 mm)*
- Voltage: dependent on application, over 48V may impact agency approvals
- Control accuracy: 5.4°F (±3°C)
- Max. operating surface temperature: 185°F (85°C)
- Approximate control pod dimensions: 1 x 1 x 2.75 in. (25 x 25 x 70 mm)*
- Cord pull strength: Up to 20 lbs*

* Dependent on design requirements.

Thick Film Cylindrical Heaters

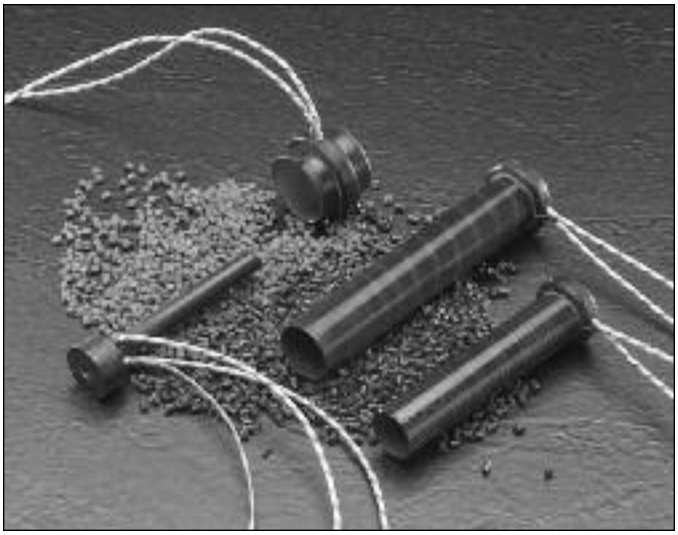
Because the hot runner nozzle is the final melt path between the hot runner manifold and the gate area, temperature uniformity is critical to avoid differences in melt viscosity. Whether it's hot spots causing thermal degradation of the plastic, or cold spots causing flow restrictions, both affect the final part quality and consistency from shot to shot. The innovative thick film heating technology from Watlow® provides the injection molding industry with a patented (U.S. patent number 5,973,296) high-performance, low profile hot runner nozzle heater. The direct surface contact of the thick film material to the cylindrical stainless steel sleeve creates optimal heat transfer while the non-porous glass film prevents moisture absorption which results in dielectric failure in cable heaters.

Unlike coiled cable heaters, the design of Watlow's thick film nozzle heater allows the thermocouple to be immersed directly into the hot runner nozzle. This provides a distinct advantage over the design of commonly used coiled cable heaters which have internal thermocouples; therefore, the actual nozzle temperature is measured, not the heater temperature.

Thick Film Heating Technology

Thick film heating technology allows you to put the heat precisely where it is needed. The heater also provides you with greater control and the ability to customize the nozzle temperature profile.

Thick film resistance heaters consist of a sandwich of several different materials. These layers include a metal substrate, a layer of glassy dielectric material, a resistor layer and a final dielectric layer.



Features and Benefits

Uniform thermal profile and ability to pattern heater layout

- Provides uniform melt temperature for equal cavity filling and improved part quality. Eliminates hot and cold spots

Low thermal mass

- Allows quicker heat up and less thermal lag between the heater and the nozzle

Extremely low radial profile

- Allows closer pitch—center-to-center distance—between nozzles for higher nozzle density and more parts per mold

Moisture-resistant non-porous glass film construction

- Eliminates need for soft starting
- Minimizes current leakage
- Reduces cost by eliminating special need for GFCI protection

Agency Approvals

- UL® recognized
- CSA certified and CE mark

Thick Film Cylindrical Heaters

Technical Information

Substrate I.D.

Standard substrate I.D.s include:

- 0.296 in. (7.52 mm)
- 0.375 in. (9.52 mm)
- 0.394 in. (10.00 mm)
- 0.454 in. (11.52 mm)
- 0.502 in. (12.75 mm)
- 0.551 in. (14.00 mm)
- 0.627 in. (15.93 mm)
- 0.752 in. (19.10 mm)
- 0.877 in. (22.28 mm)
- 1.002 in. (25.45 mm)
- 1.250 in. (31.75 mm)
- 1.539 in. (39.09 mm)
- 1.625 in. (41.27 mm)

Substrate Length

- Lengths available starting from 1 in. (25 mm). Please contact your Watlow representative for maximum length.

Voltage

- Voltages ranging from 100 to 240 volts are available for agency recognition. Higher voltages are also available.

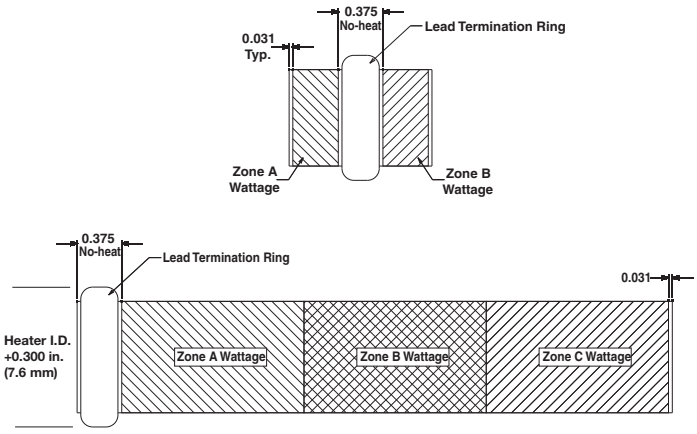
Precise Wattage Distribution

Thick film nozzle heaters rated to 932°F (500°C) provide superior temperature uniformity by putting the energy exactly where it is needed.

Watlow thick film technology heaters offer distinct competitive advantages over cable heater technology:

1. Uniform temperature profile
2. No requirement for clamping of the heater
3. High dielectric barrier with agency approvals eliminates need for soft start
4. Lower heater operating temperatures
5. Precise and repeatable wattage distribution
6. Increased controllability of system
7. Increased productivity through decreased set-up time

Distributed Wattage



Note: Specific items in stock. Contact your Watlow representative for sizes and quantities.

Installation

The thick film nozzle heaters can be designed to provide a “sliding clearance fit” with the nozzle to deliver optimal heater performance. This clearance fit allows for easy insertion and removal of the heater and excellent heat transfer without the need for clamping, anti-seize or heat sink compound. Do not use anti-seize or heat sink compound with the thick film nozzle heater.

Pre-Coiled Cable Nozzle Heaters

The Watlow® coiled nozzle heater features a 5 in. (127 mm) long, no-heat tail section. This design advantage eliminates failures in the adapter area due to overheating.

Performance Capabilities

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

Features and Benefits

Low-profile construction

- Provides easy installation in the tight environment of multiple-gate molds

No-heat tail section

- Reduces temperature at the adapter eliminating failures due to overheating

Single tail with dual lead

- Occupies less space in the wire raceway

360° circumference heat

- Provides even heating

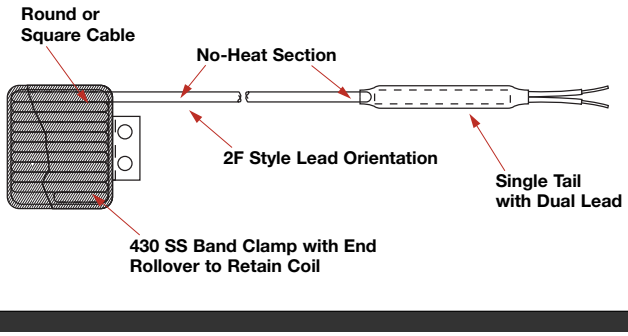
Optional externally welded thermocouple to the sheath

- Provides temperature measurement capabilities

Applications

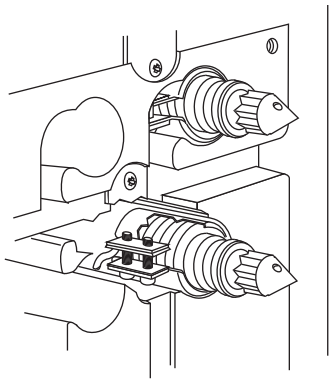
- Plastic injection molding equipment
- Hot runner molds



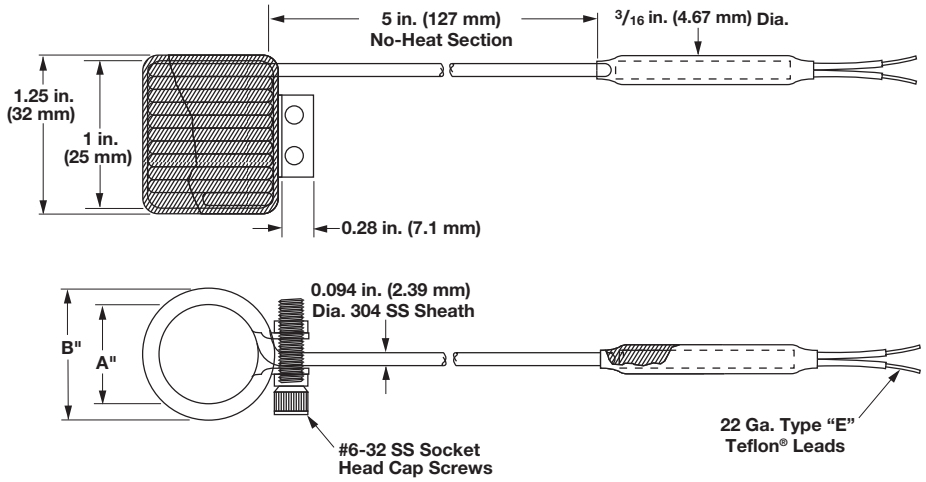


Pre-Coiled Cable Nozzle Heaters

Technical Data



Coiled Nozzle Heaters Mounted on a 64 Cavity Plastic Injection Mold



Cable Heater Standard Units* (Coiled nozzle with clamp strap)

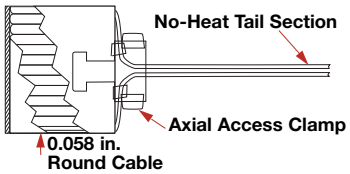
Volts	Watts	Coil I.D. in. (mm)	Clamp O.D. in. (mm)	Clamp Width in. (mm)	No-Heat	Lead Wire (Swaged-in) Teflon® Only	Code Number
0.094 in. Diameter Round (with ±5% wattage tolerance), no lead protection available.							
230	125	0.75 (19.0)	0.98 (24.9)	1.25 (32)	5 in. (127 mm)	36 in. (914 mm)	**94PC30A1A**
230	125	0.75 (19.0)	0.98 (24.9)	1.25 (32)	only	72 in. (1829 mm)	**94PC30A1D**
230	250	0.75 (19.0)	0.98 (24.9)	1.25 (32)		36 in. (914 mm)	**94PC30A2A**
230	250	0.75 (19.0)	0.98 (24.9)	1.25 (32)		72 in. (1829 mm)	**94PC30A2D**
230	250	0.75 (19.0)	0.98 (24.9)	1.25 (32)		36 in. (914 mm)	**94PC30A4A** ①
0.102 in. Square Cross-Section (with ±5% wattage tolerance), no lead protection available.							
230	125	0.75 (19.0)	1 (25.0)	1.25 (32)	5 in. (127 mm)	36 in. (914 mm)	**102PS28A2B**
230	125	0.75 (19.0)	1 (25.0)	1.25 (32)	only	72 in. (1829 mm)	**102PS28A2A**
230	250	0.75 (19.0)	1 (25.0)	1.25 (32)		36 in. (914 mm)	**102PS28A1B**
230	250	0.75 (19.0)	1 (25.0)	1.25 (32)		72 in. (1829 mm)	**102PS28A4A** ①
230	250	0.875 (22.2)	1.12 (28.5)	1.25 (32)		36 in. (914 mm)	**102PS32A1A**

*Not available from stock.

① Units have a 36 in. (914 mm) fiberglass insulated Type J thermocouple externally brazed to the heater sheath O.D.

0.058 in. Diameter Round Mini-Cable Nozzle Heater

(Coiled nozzle with axial clamp)
(with ±5% wattage tolerance)



Coil I.D. in.	(mm)	Volts	Watts	Lead Length in.	(mm)	Clamp Width in.	(mm)	Cable Type	Code No.
0.75	(19)	240	268	72	(1829)	1.25	(32)	Round	**Z5969**
0.75	(19)	240	149	72	(1829)	1.25	(32)	Round	**Z5968**

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

Metric Mini K-RING® Heaters

The mini K-RING® heater from Watlow® 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 that 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 does not require clamping bands. Precision fit, along with the excellent thermal conductivity of brass, allows 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/cm^2 (320 W/in^2)
- Maximum voltage to 240V~(ac)

Features and Benefits

Brass coating construction
- Protects heater from damage as well as maximizes transfer of heat to heated parts

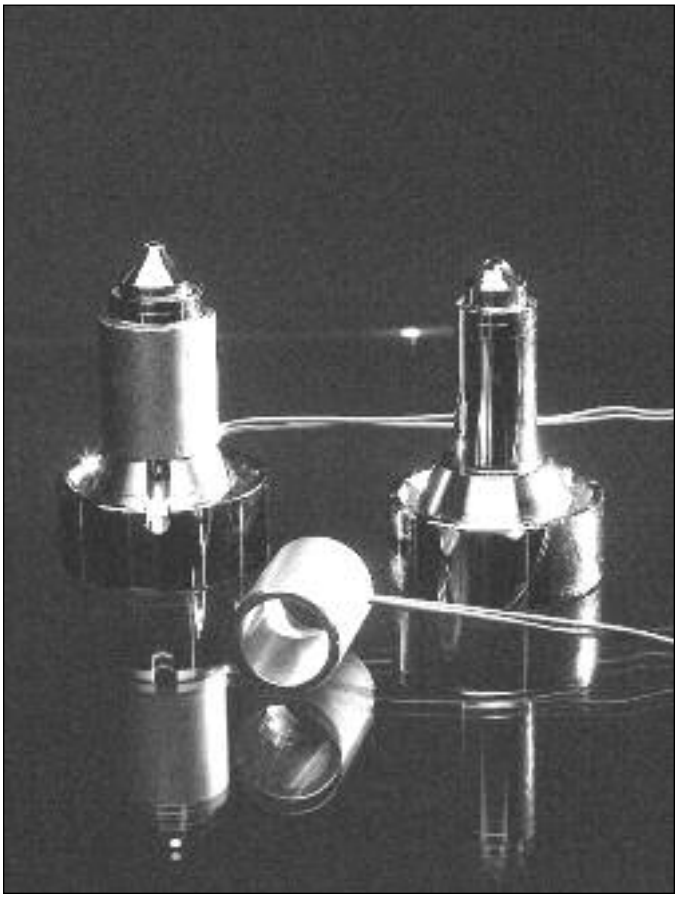
Precision machining of length and inside diameter
- Provides precision fit tolerance

Sealed construction
- 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
- Provides the ability 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 Heaters

Technical Data

K-RING and Mini K-RING Comparison Chart

Characteristic	K-RING	Mini K-RING
Max. voltage	240V	240V
Max. amperage	4.5A	2.0A
Min. outer diameter	18 mm (0.70 in.)	10 mm (0.39 in.)
Min. wall thickness	4 mm (0.16 in.)	2.5 mm (0.10 in.)
Max. element length	I.D. up to 12 mm (0.47 in.) Length = 100 mm (4 in.) I.D. 12 to 20 mm (0.47 - 0.80 in.) Length = 200 mm (8 in.) I.D. > 20 mm (0.80 in.) Length = 250 mm (10 in.)	I.D. up to 10 mm (0.39 in.) Length = 60 mm (2.40 in.) I.D. > 10 mm (0.39 in.) Length = 100 mm (4 in.)
Thermocouple	Internal Type J or K	External possible
Lead - T/C insulation	Fiberglass Teflon®	Fiberglass Teflon®
Lead protection	Fiberbraid SS braid SS hose	None
Lead adapter	Standard swaged 6.5 mm (¼ in.) diameter	Hermetic seal 3 mm (0.12 in.) diameter
Lead exit	Single ended	Dual ended
Lead exit length	Standard = 25 mm (1 in.) to adapter (longer possible upon request)	Standard = 100/150 mm (4/6 in.) staggered (longer or shorter possible upon request)
Reinforced lead exit	Yes - Diameter 7.4 mm (0.29 in.) minimum 50 mm (2 in.) 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

Radiant Heaters



Radiant Heaters

RAYMAX® Family.....615

Panel Heaters.....619

Tubular Reflector Heaters 629

Quartz Tube Panel Heaters.....635

Quartz Tube Heaters 636

Band and Strip Emitters 638

Radiant Heaters

RAYMAX® Family

The diverse RAYMAX® heater line from Watlow® allows you to solve virtually any application requiring radiant heat. Watlow's capabilities cover a wide range of needs, from contamination-resistant surfaces, to fast responding high-temperature panels, to replaceable tubular elements.

Applying radiant heaters can be complicated. However, Watlow's engineering staff has the level of training and expertise required to meet your application requirements. Providing a high degree of technical support such as conducting testing for your application at our facility, calculating your watt density and temperature requirements and recommending system components such as sensors and controllers is Watlow's speciality. With Watlow's experience in a wide range of industries, chances are Watlow has already helped someone handle a radiant heating application like yours.



Features and Benefits

Variety of styles

- Matches the ideal temperature and watt density requirements of your application

Watlow engineering and application support

- Helps projects run smoothly

Custom designs

- Adaptable for particular needs such as special wattage zoning

Watlow sensors and controllers are completely compatible with RAYMAX heaters

- Offers a single source thermal system that is reliable and designed just for your application

Applications

- Thermoforming
- Food warming
- Paint and epoxy curing
- Heat treating
- High-temperature furnaces
- Tempering and annealing processes



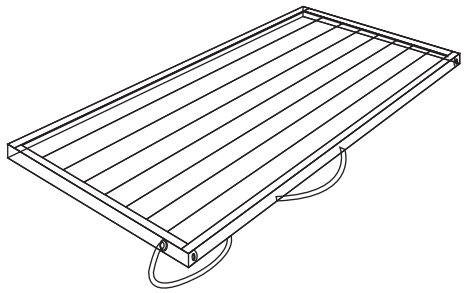
Caution: *Fire Hazard*

Radiant heaters must not be operated in the presence of flammable vapors, gases or combustible materials without proper ventilation and safety precautions. Radiant heaters must be properly wired and controlled to comply with all applicable electrical codes.

RAYMAX Family

Mounting Accessories

Low Profile

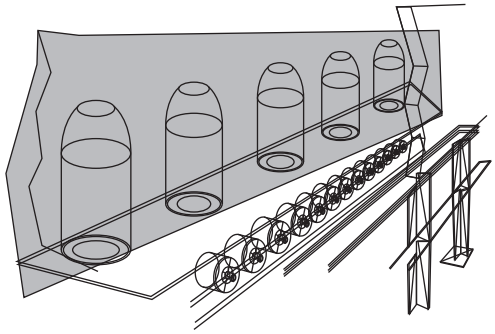


This design may be required where mounting space is limited. For example, when converting existing equipment or designs to radiant panels.

Available options may vary from the standard units when you specify a low-profile design. Contact your Watlow representative for further information.

Available with RAYMAX 1010, 1120, 1220 and 2030.

Zoning



Watt densities can be varied across the entire width of RAYMAX heaters. If desired, each zone can have an individually controlled power supply.

Zoning can be very valuable when part of the product requires more heat, or when you must compensate for heat losses at the edges. By separately turning off part of the heated width, you can adjust for various widths of material.

Available with RAYMAX 1010, 1120, 1220, 1330 and 2030.

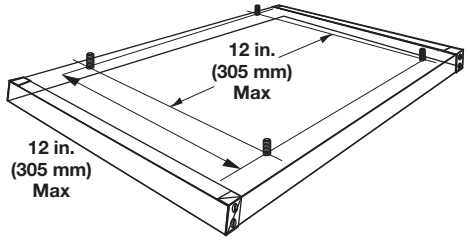
RAYMAX Family

Mounting Accessories *(Continued)*

Mounting Studs

Standard ¼-20 x 1½ in. (38 mm) or (M6-1 x 40) steel studs are welded to the case. For best support, studs should be approximately located on 12 in. (305 mm) centers. Contact your Watlow representative for exact locations on specific heaters.

Available with RAYMAX 1010, 1120, 1220, 1330 and 2030.

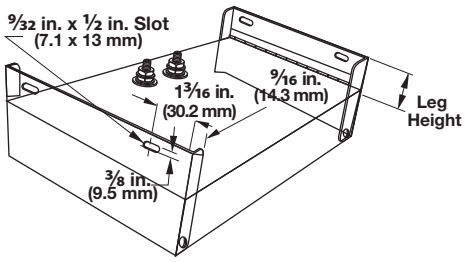


Mounting Legs

Mounting legs are extensions of the steel end caps with mounting slots for bolting directly to field support members. There is no extra charge for legs; they can be supplied in half inch increments from 0.5 in. (13 mm) to 3 in. (76 mm). No slots are provided in legs less than 1 in. (25 mm) long.

For panels over 24 in. (610 mm) long, mounting studs are recommended for the best panel support.

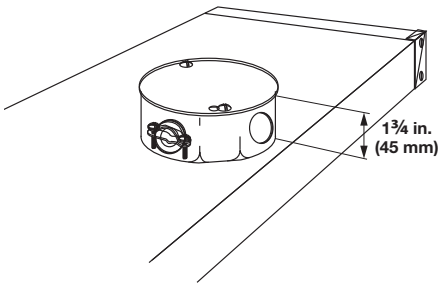
Available with RAYMAX 1120, 1220 and 2030.



Application note: Allow for some thermal expansion of the heater case during operation. An expansion of up to one percent can occur when the case reaches its normal maximum limit of 1100°F (595°C). If your equipment has mounting screws to connect to the slots in the mounting legs, allow for a small amount of extra length. If you are using mounting holes to interface with the mounting studs on the back of the RAYMAX case, make sure your holes are oversized. Also, use washers and avoid overtightening.

Terminal Accessories

Terminal Box

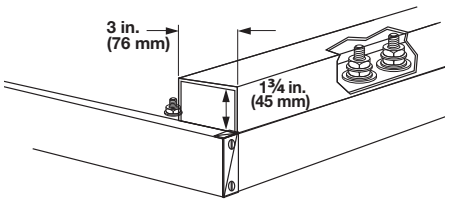


To protect electrical connections, a standard NEMA octagon terminal box is available. The standard size is 3⁹⁄₁₆ x 3⁹⁄₁₆ x 1½ in. (90.5 x 90.5 x 38 mm) with knockouts for ½ in. (13 mm) conduit. Other NEMA sizes are also available.

Care should be taken to use lead wire capable of withstanding the ambient temperatures.

Available with RAYMAX 1010, 1120, 1220, 1330 and 2030.

Wiring Raceway



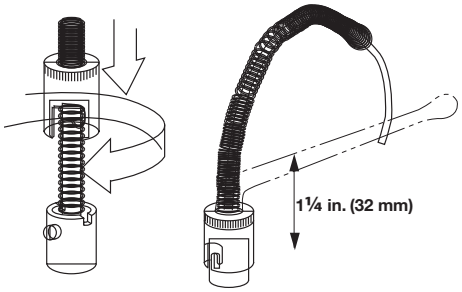
A steel raceway provides electrical and physical protection for all terminal connections. This can be particularly useful for multi-zone panels.

Available with RAYMAX 1010, 1120, 1220, 1330 and 2030.

RAYMAX Family

Temperature Control

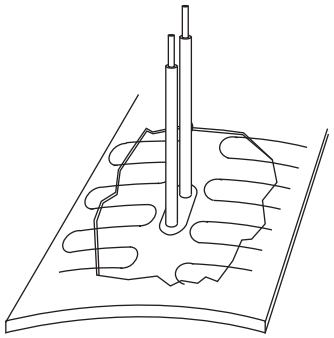
Thermowells



A thermowell allows you to use a thermocouple with a bayonet fitting to monitor heater temperature. The thermowell is located on the back of the panel to allow easy access for thermocouple replacement. Spring tension holds the tip of the thermocouple in contact for close control of the heater temperature. Thermocouple not included.

Available with RAYMAX 1010, 1120 and 1330.

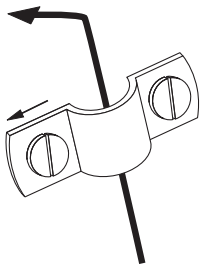
Welded Thermocouple



A thermocouple junction is welded to the emitting surface to provide optimum temperature sensing accuracy and responsiveness. This option permits the actual radiating face temperature to be precisely monitored and controlled. The standard length of the thermocouple wire is 12 in. (305 mm).

Available with RAYMAX 1010, 1120 and 1330.

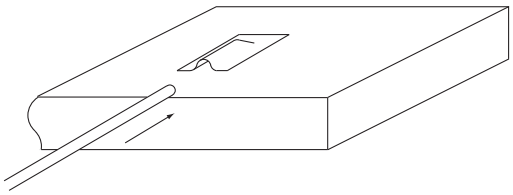
Thermocouple Clamps



A thermocouple mounting clamp can be provided on the end of the heater case. The clamp is suitable for use with ⅛ in. (3.2 mm) and ¼ in. (6 mm) O.D. sheath thermocouples, which should be bent 90° so the sensing tip is just above and lightly touching the hot face at an element location.

Available with RAYMAX 1220, 1525 [⅛ in. (3.2 mm) only], 1626 [⅛ in. (3.2 mm) only] and 2030.

Thermocouple Pocket



A thermocouple pocket is welded to the emitting surface. The pocket accepts a 0.063 in. (1.6 mm) diameter thermocouple (not included). This option provides accurate temperature sensing and easy thermocouple replacement.

Available with RAYMAX 1010, 1120 and 1330.

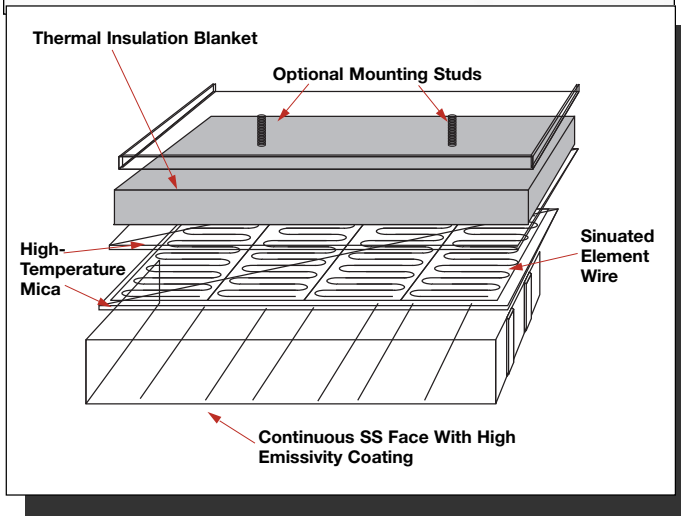
Panel Heaters

RAYMAX® 1010

Designed to resist contamination, the RAYMAX 1010 is ideal for use in screen printing, food warming and other low heat applications. The heater's "sealed face" keeps contaminants away from the heating element, and this metal surface can be easily wiped or brushed clean whenever needed.

The rugged all-metal construction results in a shock-proof, shatter-proof heater that is durable and long lasting. No fragile glass, ceramic or fiber is used.





Performance Capabilities

- Face temperature: 1000°F (540°C) maximum
- Watt densities: 10 W/in^2 (1.5 W/cm^2) maximum
- 50 amperes maximum

Features and Benefits

Uniform full surface heat source
- Provides better, more even heat

No reflectors
- Results in nothing to clean or replace

Convenient ready-to-use package
- Makes installation easier

One-inch thick backside insulation
- Reduces losses

Totally sealed version available
- Suitable for hose down applications

Repeatable temperature sensing options
- Increases accuracy

UL® component recognized versions are available

Applications

- Drying screen-printed textiles
- Curing process coatings on circuit boards
- Food warming/cooking
- Epoxy curing
- Thermoforming

Panel Heaters

RAYMAX 1010
Applications and Technical Data

Sizes and Ratings

Thickness: 1.75 in. (45 mm)

Voltage: Customer specified up to 480V.
Note: Small heaters may not be able to be built at high voltages. Contact your Watlow representative for specific application.

Watt density: Up to 10 W/in² (1.5 W/cm²), 50A max.

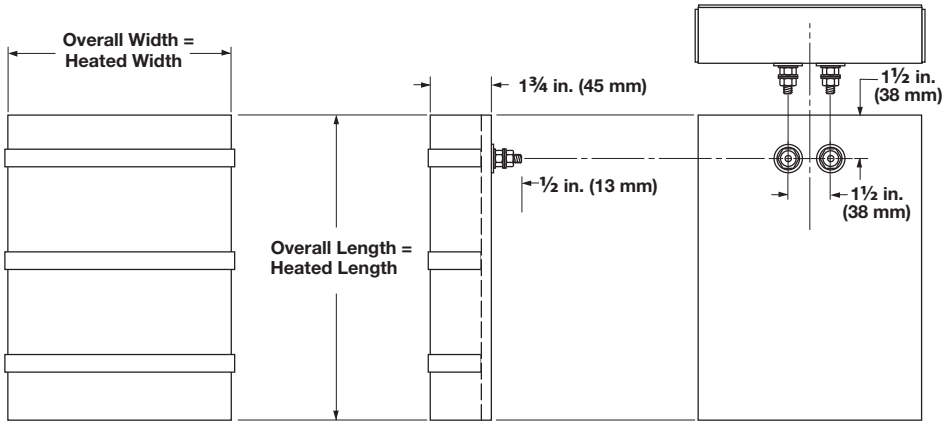
Face temperature: Up to 1000°F (540°C)

Typical peak energy wavelength: 3.5-4 microns

Specifications

Heater Dimensions	Min.	Max.	Increments
Width: in. (mm)	4 (102)	20 (508)	2 (50.8)
Length: in. (mm)	10 (254)	68 (1727)	0.06 (1.6)
Area: in² (cm²)		864 (5574)	any

Note: Less than maximum length x width may exceed maximum area.



Options

- Terminal box
- Thermowell (VAT style thermocouple required)
- Thermocouple pocket (thermocouple required)
- Thermocouple welded to hot face
- Mounting studs
- Totally sealed construction
- Food-safe surface treatment

How to Order

All units are **made-to-order**. Please specify the following information when placing an order:

- Width and length
- Total wattage
- Voltage and phase
- Mounting studs if desired
- Terminal location if non-standard
- Terminal box if desired
- Internally welded thermocouple or thermowell if desired

Availability

Please contact your Watlow representative for lead time required.

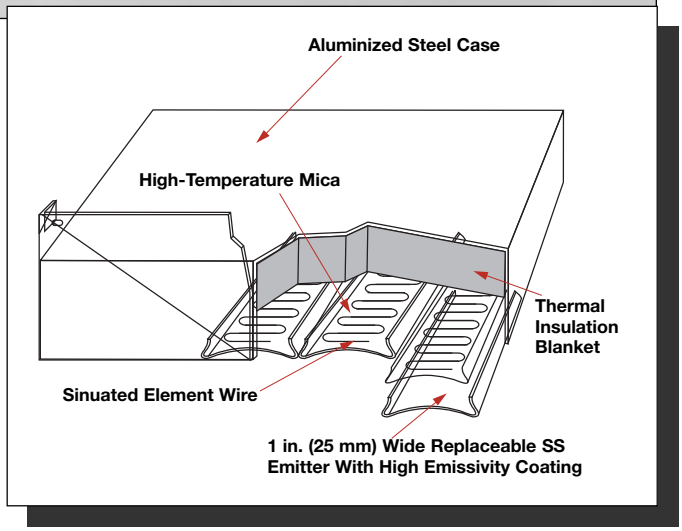
Panel Heaters

RAYMAX 1120

The RAYMAX 1120 is a lightweight, yet sturdy and durable radiant heater panel. The emitter sheath is stainless steel with a black coating, which makes it a highly efficient radiating surface. In addition, the heater's low mass allows rapid start-up and fast response to controllers.

The patented RAYMAX heater features 1 in. (25 mm) wide emitter strips that are individually replaceable for lower maintenance costs. Weighing only 5.5 lbs/ft^2 (26.8 kg/m^2), the heater is easy to mount.





Performance Capabilities

- Face temperature: 1100°F (595°C) maximum
- Watt density: 20 W/in^2 (3 W/cm^2) maximum

Features and Benefits

Replaceable emitters
- Reduces your cost

High temperature mica
- Insulates nickel chromium resistance wire, permitting longer heater life

High emissivity coating on emitter strips
- Improves radiant heating efficiency

⅞ in. (22.2 mm) thick thermal insulation
- Backs the emitter strips to reduce backside losses

Uniform full surface heat source
- Provides better, more even heat

Special requirements are easily met
- Assures availability of custom sizes and ratings

Next day shipment
- Available on stock units

Applications

- Thermoforming
- Textile drying
- Paint curing
- Powder coating fusing
- Shrink wrapping
- Circuit board soldering

Panel Heaters

RAYMAX 1120
Applications and Technical Data

Specifications

Heater Dimensions	Min.	Max.	Increments
Width: in. (mm)	1 (25)	36 (914)	1 (25.0)
Length: in. (mm)	6 (152)	94 (2388)	0.06 (1.5)
Area: in² (cm²)	6 (38.7)	864 (5574.2)	any

Note: Less than maximum length x width may exceed maximum area.

Sizes and Ratings

Face Temperature: 1100°F (595°C) max.

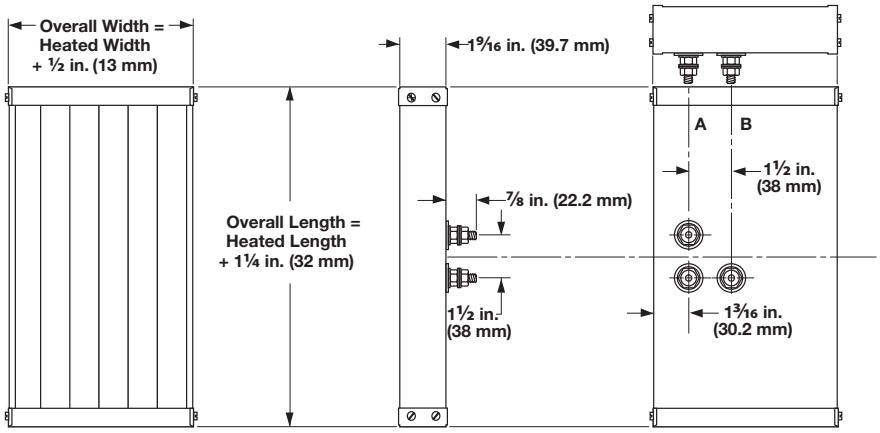
Wattage: Watt densities up to 20 W/in² (3 W/cm²)

Voltage: Customer specified up to 480V. Balanced three-phase available on unit widths divisible by three.
Note: Small heaters may not be able to be built at high voltages. Contact your Watlow representative for specific application.

Terminals: Non-standard locations are available. Please specify.

Standard Tolerance: ±1/16 in. (1.6 mm)

Typical Peak Energy Wavelength: 3-3.5 microns



Panel Overall Size in. (mm) Width		Panel Overall Size in. (mm) Length		Panel Heated Size in. (mm) Width		Panel Heated Size in. (mm) Length		Volts	Watts	Watt Density W/in²	Watt Density (W/cm²)	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Availability	Code Number
6 ½	(165)	25 ¼	(641)	6	(152)	24	(610)	240	2880	20	(3.1)	6	(2.7)	Stock	**P0624AX050**
12 ½	(318)	13 ¼	(337)	12	(305)	12	(305)	240	2880	20	(3.1)	6	(2.7)	Stock	**P1212AX030**
12 ½	(318)	25 ¼	(641)	12	(305)	24	(610)	240	5760	20	(3.1)	12	(5.4)	Stock	**P1224AX062**
12 ½	(318)	49 ¼	(1251)	12	(305)	48	(1219)	480 3-phase	11,520	20	(3.1)	24	(10.8)	Stock	**P1248AX073**

Note:
- Stock panels are equipped with terminal box, thermocouple well with bayonet adapter and mounting studs.
- Watlow stock radiant panels must be properly applied for safe operation.
- Please contact your Watlow representative with your application before ordering.

How to Order

To order your stock RAYMAX heater, specify:

- RAYMAX 1120
- Quantity
- Watlow code number

If our stock units do not meet your application needs, Watlow can manufacture RAYMAX heaters to your special requirements. For made-to-order heaters, specify the following:

- Heated width and length. Three-phase panels must have width divisible by three.
- Total wattage of each panel.
- Exact voltage and phase. A 5 percent variation in voltage at the oven will cause a 10 percent variation in power.
- Zoning - Indicate dimensions and wattage of each zone.
- Mounting legs or mounting studs, if desired. For studs, give number and location or indicate standard location.
- Terminal location if non-standard.
- Terminal box or wire raceway if required.

Supplying a drawing with an order or request for quotation can be very helpful in clarifying design information.

Availability

Stock: Next day shipment

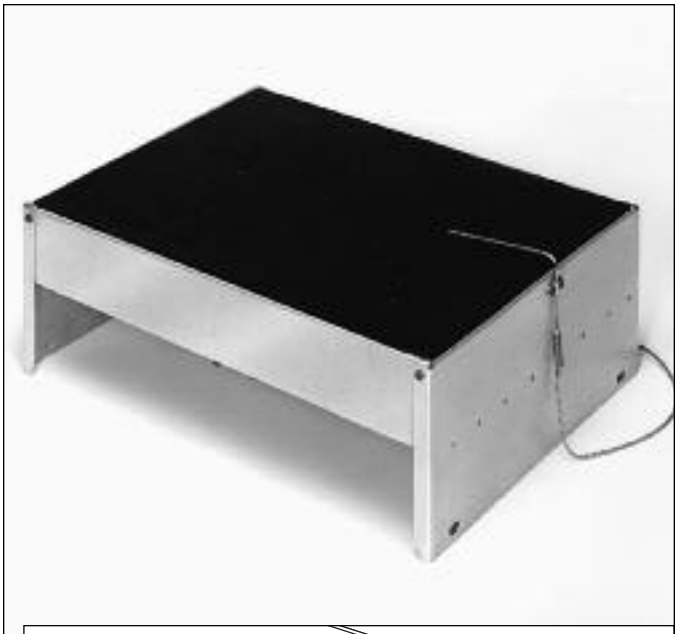
Made-to-Order: Contact your Watlow representative

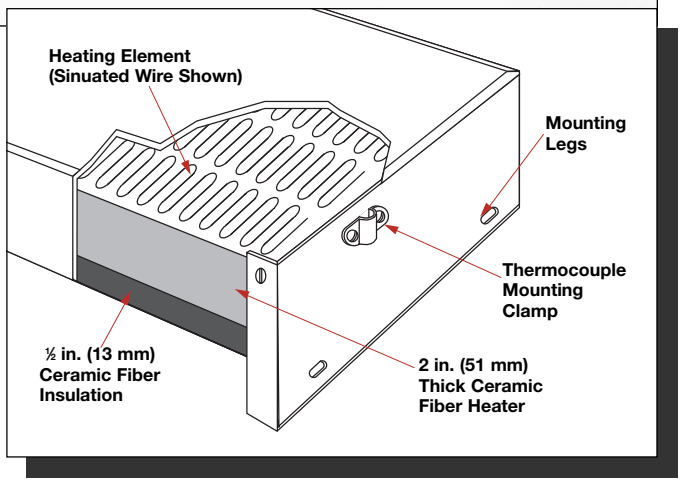
Panel Heaters

RAYMAX 1220 and 2030

Easy to install and capable of high surface temperatures, the RAYMAX 1220 and 2030 are ideal for many process heating applications requiring “hot-face” temperatures above 1000°F (540°C).

Each unit consists of a ceramic fiber heater mounted in a 2.5 in. (64 mm) deep sheet metal case providing thermal insulation. The case includes post terminals for electrical connections and provides a mounting system that can be used with virtually any flat ceramic fiber unit, whether it is a stock, standard or custom size. Since any of the flat unit heating element configurations can be used—exposed sinuated, embedded coil or foil elements—watt density and temperature capabilities can be tailored to meet a specific radiant application.





Performance Capabilities

- RAYMAX 2030 (uses sinuated or coil elements): temperatures up to 2000°F (1095°C); watt densities up to 30 W/in^2 (4.7 W/cm^2)
- RAYMAX 1220 (uses an etched foil element): temperatures up to 1200°F (650°C); watt densities up to 20 W/in^2 (3 W/cm^2)

Features and Benefits

Lightweight, low mass design

- Allows fast response to controllers

Provides high efficiency

- Self insulation with 2.5 in. (64 mm) thick mounting case

Thermocouple mounting clamp

- Makes process system control easier

Aluminized steel case

- Handles temperatures up to 1100°F (595°C)

Special hot-face heating patterns

- Provides a design specifically for an application using an etched foil RAYMAX 1220

Applications

- Conveyor furnaces
- High temperature vessel heating
- Tempering and annealing processes for glass, wire, ceramics and metals
- Coating, curing and drying of inks, paints, plastics and films

Panel Heaters

RAYMAX 1220 and 2030
Applications and Technical Data

Application Hints

A thermocouple mounting clamp will be provided on one end of the case, with holes on both ends for alternate locations. The standard clamp can be used with ⅛ in. (3.2 mm) O.D. sheath thermocouples. The standard clamp is 3⁄16 in. (4.8 mm) high, but can be removed for flush mounting*.

The maximum recommended surface temperature of the heater is based on the rating of the ceramic fiber heater module. This can vary from 2000°F (1095°C) at lower watt densities, to higher watt densities at reduced surface temperatures. Note maximum wattages cannot be achieved at the maximum temperatures simultaneously.

* ⅛ in. (3.2 mm) is standard. 3⁄16 in. (4.8 mm) and ¼ in. (6 mm) are available upon request.

Specifications

Weight: Under 6.5 lbs/ft² (31.75 kg/m²)

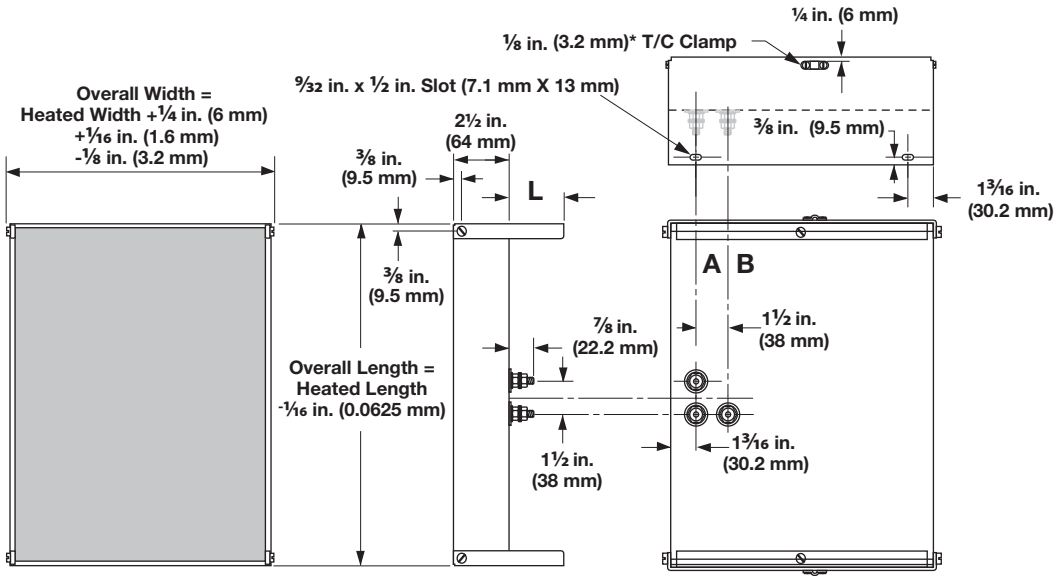
Voltage and Wattage: Ratings are based on the ceramic fiber heater module, which is mounted in the case. Up to 600V~(ac) is possible.

Terminals: Terminals are ¼-20 threaded studs. Two terminals plus ground for single-phase, and three terminals plus ground for three-phase, are standard. These are located on the center line of the length unless otherwise specified. Terminals can be located anywhere along lines A and B (see illustration below), but not closer than 2 in. (51 mm) to the case ends.

Mounting Legs: Mounting legs come in 1 in. (25 mm) standard; 3 in. (76 mm) optional from stock. For made-to-order units, mounting legs can be supplied in any incremental length **L** from ½ in. (13 mm) to 3 in. (76 mm). No slots are provided in legs less than 1 in. (25 mm) long.

Heater Dimensions	Min.	Max.	Increments
Width: in. (mm)	2 (51)	30 (762)	Any
Length: in. (mm)	6 (152)	52 (1320)	Any

Note: Units will be ¼ in. (6 mm) wider than the nominal size of the ceramic fiber heater. Overall length is equal to heater length, but thermocouple clamp not included in length.



Options

Several options are available with RAYMAX 1220 and 2030 models. From the following list, the first four are illustrated on pages 616 to 618. Contact your Watlow representative for more information on any of the options.

- Single-phase non-standard location power terminals
- Terminal box
- Zoning
- Mounting studs and legs
- Three-phase construction
- Thermocouple mounting tubes
- Alternate case materials

Panel Heaters

RAYMAX 1220

Ceramic Fiber with Foil Element

Panel Overall Size ± 1/16 in. (1.5 mm)				Panel Nominal Heated Size in. (mm)				Volts	Watts	Watt Density		Approx. Net Wt.		Availability	Code Number
Width		Length		Width		Length				W/in²	(W/cm²)	lbs	(kg)		
4 1/4	(108)	12	(305)	4	(102)	12	(305)	120	950	19.8	(3.1)	2.8	(1.3)	Assy. Stock	**VP504A12F**
4 1/4	(108)	24	(610)	4	(102)	24	(610)	240	1900	19.8	(3.1)	4.8	(2.2)	Standard	**VP504A24F**
8 1/4	(210)	12	(305)	8	(203)	12	(305)	240	1900	19.8	(3.1)	4.5	(2.1)	Assy. Stock	**VP508A12F**
8 1/4	(210)	24	(610)	8	(203)	24	(610)	240	3800	19.8	(3.1)	7.7	(3.5)	Standard	**VP508A24F**

All units in this table are suitable for use up to 1200°F (650°C) max. surface temperature.
① Thermocouple clasp is not included in the length.

RAYMAX 2030

Ceramic Fiber with Sinuated Element

Nominal Heated Width		Nominal Heated Length		Volts	Watts	Watt Density		Approx. Net Wt.		Availability	Code Number
in.	(mm)	in.	(mm)			W/in²	(W/cm²)	lbs	(kg)		
4	(102)	6	(152)	30	500	20.8	(3.2)	1.9	(0.9)	Standard	**VP504A06T**
		12	(305)	120	925	19.3	(3.0)	3.1	(1.4)	Assy. Stock	**VP504A12T**
		18	(457)	120	1400	19.4	(3.0)	4.1	(1.9)	Standard	**VP504A18T**
		24	(610)	240	1850	19.5	(3.0)	5.2	(2.4)	Assy. Stock	**VP504A24T**
		30	(762)	240	2250	19.6	(3.1)	6.3	(2.9)	Standard	**VP504A30T**
		36	(914)	240	3200	22.2	(3.4)	7.4	(3.3)	Standard	**VP504A36T**
6	(152)	6	(152)	60	650	18.1	(2.8)	2.4	(1.1)	Standard	**VP506A06T**
		12	(305)	120	1250	17.4	(2.7)	4.1	(1.9)	Standard	**VP506A12T**
		18	(457)	240	2000	18.5	(2.9)	5.8	(2.6)	Standard	**VP506A18T**
		24	(610)	120	2500	17.4	(2.7)	7.4	(3.3)	Assy. Stock	**VP506A24T**
		24	(610)	240	2500	17.4	(2.7)	7.4	(3.3)	Assy. Stock	**VP506A24U**
		30	(762)	240	3400	18.9	(2.9)	9.0	(4.1)	Assy. Stock	**VP506A30T**
		36	(914)	240	4000	18.5	(2.9)	10.6	(4.8)	Standard	**VP506A36T**
8	(203)	12	(305)	120	1800	18.8	(2.9)	4.7	(2.4)	Assy. Stock	**VP508A12T**
		18	(457)	240	3000	20.8	(3.2)	7.4	(3.3)	Assy. Stock	**VP508A18U**
		24	(610)	240	3600	18.8	(2.9)	9.5	(4.3)	Assy. Stock	**VP508A24T**
		30	(762)	240	5000	20.8	(3.2)	11.7	(5.3)	Standard	**VP508A30T**
		36	(914)	240	6000	20.8	(3.2)	13.9	(6.3)	Standard	**VP508A36T**

CONTINUED

All units in this table are suitable for use up to 1800°F (982°C) max. surface temperature.
RAYMAX 1220 or 2030 heaters are assembly stock or standard. Delivery of assembly stock products is three working days. Delivery of standard products is 15 working days.

Panel Heaters

RAYMAX 2030 *(Continued)*

Nominal Heated Width in.	(mm)	Nominal Heated Length in.	(mm)	Volts	Watts	Watt Density W/in²	(W/cm²)	Approx. Net Wt. lbs	(kg)	Availability	Code Number
10	(254)	12	(305)	120	2000	16.7	(2.6)	6.3	(2.9)	Assy. Stock	**VP510A12T**
		18	(457)	120	3600	20.0	(3.1)	9.0	(4.1)	Assy. Stock	**VP510A18T**
		24	(610)	240	4500	17.9	(2.8)	11.7	(5.3)	Assy. Stock	**VP510A24T**
		30	(762)	240	6000	20.0	(3.1)	14.4	(6.5)	Standard	**VP510A30T**
		36	(914)	240	7200	19.4	(3.0)	17.1	(7.8)	Standard	**VP510A36T**
12	(305)	12	(305)	120	2500	17.4	(2.7)	7.4	(3.3)	Assy. Stock	**VP512A12T**
		12	(305)	240	2500	17.4	(2.7)	7.4	(3.3)	Assy. Stock	**VP512A12U**
		18	(457)	240	4000	18.5	(2.9)	10.6	(4.8)	Assy. Stock	**VP512A18T**
		24	(610)	240	6000	20.8	(3.2)	13.9	(6.3)	Assy. Stock	**VP512A24T**
		30	(762)	240	7200	20.0	(3.1)	17.1	(7.8)	Standard	**VP512A30T**
		36	(914)	240	8400	19.4	(3.0)	20.3	(9.2)	Standard	**VP512A36T**
14	(356)	12	(305)	240	3500	20.8	(3.2)	8.5	(3.8)	Assy. Stock	**VP514A12T**
		18	(457)	240	4900	19.4	(3.0)	12.2	(5.5)	Standard	**VP514A18T**
		24	(610)	240	7000	20.8	(3.2)	16.0	(7.3)	Standard	**VP514A24T**
		30	(762)	240	8400	20.0	(3.1)	19.8	(9.0)	Standard	**VP514A30T**
		36	(914)	240/240	9800	19.4	(3.0)	23.6	(10.7)	Standard	**VP514A36T**
16	(406)	12	(305)	240	3600	18.8	(2.9)	9.5	(4.3)	Standard	**VP516A12T**
		18	(457)	240	5700	19.8	(3.1)	13.9	(6.3)	Standard	**VP516A18T**
		24	(610)	240	7100	18.5	(2.9)	18.2	(8.2)	Standard	**VP516A24T**
		30	(762)	240/240	9600	20.0	(3.1)	22.5	(10.2)	Standard	**VP516A30T**
		36	(914)	240/240	11500	20.0	(3.1)	26.8	(12.2)	Standard	**VP516A36T**

All units in this table are suitable for use up to 1800°F (982°C) max. surface temperature.

RAYMAX 1220 or 2030 heaters are assembly stock or standard. Delivery of assembly stock products is three working days. Delivery of standard products is 15 working days.

How to Order

To order a **stock, assembly stock,** or **standard heater,** specify:

- RAYMAX 1220 or 2030
- Quantity
- Watlow code number
- Mounting studs if desired

Note: Stock includes 1 in. (25 mm) mounting legs which are provided. 3 in. (76 mm) legs are available from stock upon request.

If stock or standard units do not meet application needs, Watlow can manufacture radiant heaters to fit special requirements.

For **made-to-order** units, please specify, in addition to previous information:

- Heated width and length, and overall size
- Total wattage
- Voltage, and phases or zones required
- Load temperature expectations
- Mounting studs, if desired
- Mounting legs and leg height, if desired (1 in. [25 mm] is provided unless otherwise specified)
- Location of terminals
- Terminal box, if desired
- Thermowell (specify size and location if standard end clamp is not sufficient)

Availability

Assembly Stock: Three working days

Standard: 15 working days

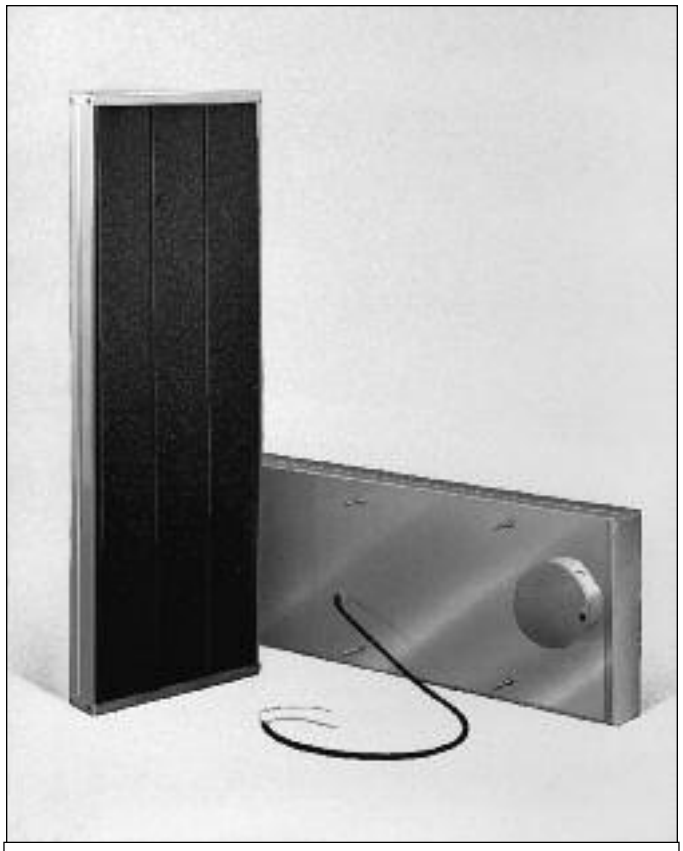
Made-to-Order: Contact your Watlow representative

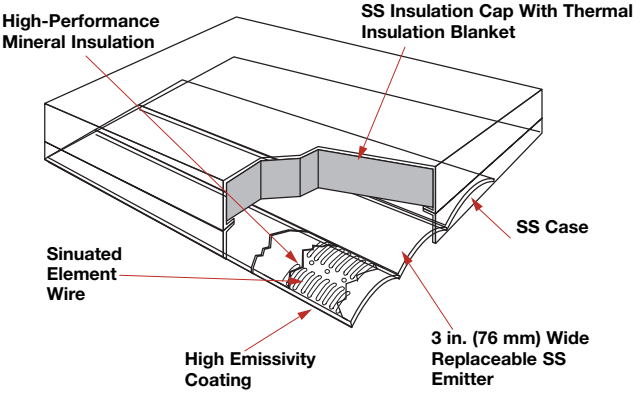
Panel Heaters

RAYMAX 1330

The RAYMAX® 1330 is the only radiant heater that features specially insulated heater emitter strips for higher performance. Watlow developed a unique compacted mineral insulation to electrically insulate the element wire, with a result of superior heat transfer and higher operating capabilities.

Because of its rugged stainless steel construction, the RAYMAX 1330 will last longer. Plus, this heater features a high emissivity black coating and a uniform, full surface heat source for better efficiency.





Performance Capabilities

- Maximum face temperature: 1300°F (700°C)
- Maximum watt density: 30 W/in² (4.7 W/cm²)
- Typical peak energy wavelength: 3-3.6 microns

Features and Benefits

Field replaceable emitter strips
- Prevents the cost of buying a whole new radiant heater

Rugged metal construction
- Protects heater from contaminants

No reflectors
- Eliminates cleaning and replacement

No fragile glass or ceramic elements
- Prevents possible safety hazards

Backside insulation
- Results in better heating efficiency

Responsive face temperature sensing options
- Increases accuracy

Applications

- Thermoforming plastics and composites
- Circuit board soldering
- Heat shrinking of plastic

Panel Heaters

RAYMAX 1330
Applications and Technical Data

Sizes and Ratings

Thickness: 2.46 in. (62.5 mm)
Voltage: Customer specified up to 480V. Balanced three-phase available on units with three or six emitters.
Note: Small heaters may not be able to be built at high voltages. Contact your Watlow representative for specific application.

Maximum Watt Density: 30 W/in² (4.7 W/cm²)

Maximum Face Temperature: 1300°F (700°C)

Typical Peak Energy Wavelength: 3 microns

Standard Tolerances: ±1/16 in. (1.6 mm)

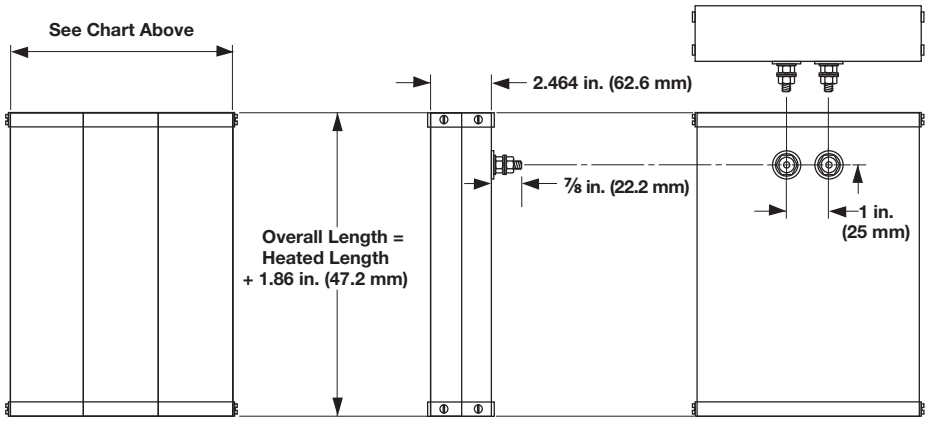
Specifications

Heater Dimensions	Min.	Max.	Increments
Length: in. (mm)	12 (305)	30.5 (775)	0.06 (1.5)

Number of Emitters	Heated Width in. (mm)	Overall Width in. (mm)
1	2.95 (74.9)	3.36 (85.3)
2	6.14 (155.9)	6.54 (166.1)
3	9.33 (236.9)	9.73 (247.1)
4	12.51 (317.8)	12.92 (328.2)
5	15.70 (398.8)	16.11 (409.2)
6	18.89 (479.8)	19.29 (489.9)
7	22.08 (560.8)	22.48 (570.9)
8	25.26 (641.6)	25.67 (652.0)

Options

- Terminal box
- Thermowell
- Thermocouple welded to hot face
- Mounting studs



How to Order

The RAYMAX 1330 is available **made-to-order** only. It is helpful to have the following information available:

- Heated width and length (or diameter for band emitters)
- Total wattage
- Voltage and phase
- Mounting studs if desired
- Mounting legs and leg height if desired
- Terminal location
- Terminal box if desired
- Thermocouple or thermowell if desired

Availability

Made-to-Order: Contact your Watlow representative

Tubular Reflector Heaters

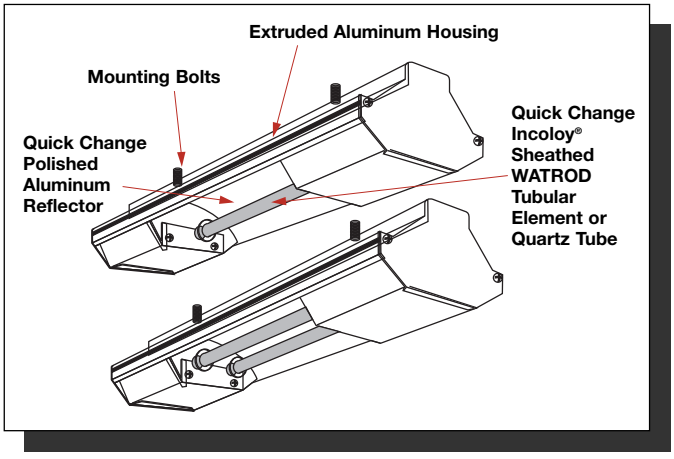
RAYMAX 1525

The RAYMAX 1525 from Watlow® is a rugged radiant heater with a unique design allowing quick removal and replacement of the element and reflectors. Instead of dismantling the heater, the parts are simply removed from the front. Replacing dirty reflectors often can improve heating efficiency by up to 30 percent.

The RAYMAX 1525 is available with either a fast responding quartz element or an Incoloy®-sheathed WATROD tubular element. Both are supported by stainless steel hardware in an extruded aluminum housing.

All stock units come with 1⅝ in. (41.3 mm) long, ⅜ in. (9.5 mm) -16 thread mounting bolts that slide along the heater's length to accommodate mounting considerations.





Performance Capabilities

- Element temperatures to 1600°F (870°C)
- Watt densities measured across the reflector area up to 25 W/in² (3.9 W/cm²)

Features and Benefits

Fast and easy replacement of tubular element and reflectors

- Provides quick servicing

Variety of element styles available

- Includes single or dual element, hairpin, liquid tight housing and quartz element

Assembly stock availability

- Provides quick three-day shipment from order receipt

Optional single end wiring available on most units

- Simplifies installation

Polished aluminum reflector

- Directs heat to the work

Applications

- Drying bulk materials
- Freeze protection
- Space heating
- Process heating
- Warming equipment

Options

Single-End Wiring

Standard units with straight elements must be wired at both ends. Single-end wiring permits power leads to be brought into only one end of the unit.

Power Leads

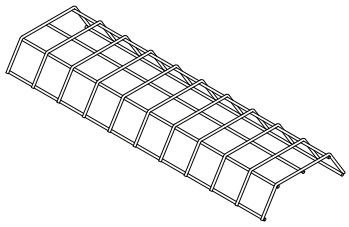
Appropriate power leads come attached to the heating element(s). To order, simply specify **length** and **flexible conduit** if required.

Tubular Reflector Heaters

RAYMAX 1525

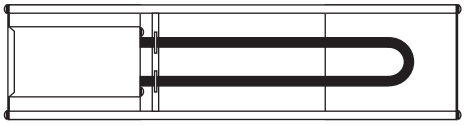
Options *(Continued)*

Protective Grill



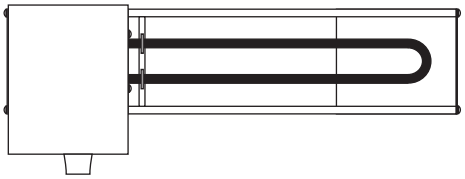
A stainless steel grill section that snaps in to reduce the possibility of personnel or product coming in contact with the heating elements.

Hairpin Element



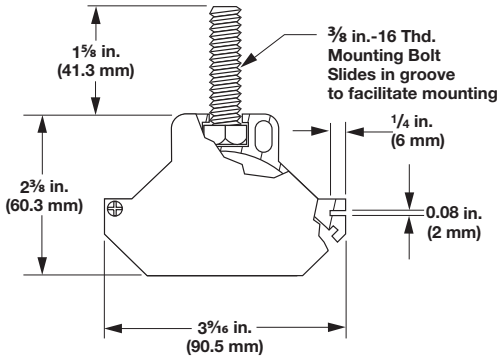
A WATROD hairpin-shaped tubular element provides the convenience of single end wiring and a reduced no-heat area on the non-terminal end.

Liquid Tight Housing

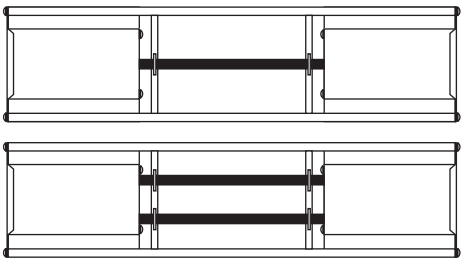


On this style, the hairpin element terminates in a liquid tight housing to permit operation in a hose down area or exposure to weather. The cast aluminum housing has a ½ in. (13 mm) NPT conduit fitting. The box is 2 13/16 in. x 3⅜ in. x 5¼ in. (71.5 x 85.7 x 133 mm) including conduit hub.

Element Styles

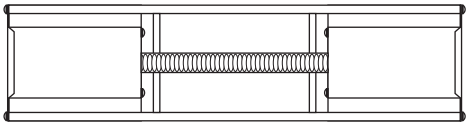


Single and Dual Elements



Straight length WATROD tubular elements come in single or dual styles. The dual style produces twice the wattage of the same length single element. Dual elements can also be jumpered to permit single end wiring and operating at twice the rated voltage up to 480V~(ac).

Quartz Tube Element



Watlow quartz elements provide the advantage of faster heat-up and cool down—important when encountering frequent line stoppages. A standard ½ in. (13 mm) diameter quartz tube provides strength and long resistance wire life.

How to Order

To order, specify:

- Watlow code number
- Watts/volts
- Options
- Quantity

If our stock units do not meet your application needs, Watlow can manufacture to meet your special requirements. For **made-to-order** units, please specify:

- Overall or heated length
- Element style
- Volts/watts
- Options
- Quantity

Availability

Assembly Stock: Three working days

Made-to-Order: Contact your Watlow representative

Tubular Reflector Heaters

RAYMAX 1525



Single Element Assembly Stock List

Overall Length in.	Overall Length (mm)	Heated Length in.	Heated Length (mm)	Volts	kW	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Base Code Number	Protective Grill Code Number	Replacement Element Code Number	Replacement Reflector Code Number
13⅜	(346.1)	7¼	(184.0)	120	0.40	1.9	(0.9)	RT1A013L00	RPT013L00	RDN10E1	RR1013L00
20⅜	(523.9)	13⅜	(346.1)	120	0.65	2.7	(1.3)	RT1A020A00	RPT020A00	RDN16L1	RR1020A00
24⅜	(619.1)	16 13/16	(427.0)	120	0.80	3.2	(1.5)	RT1A024G00	RPT024G00	RDN21B1	RR1024G00
24⅜	(619.1)	16 13/16	(427.0)	240	0.80	3.2	(1.5)	RT1G024G00	RPT024G00	RDN21B10	RR1024G00
30⅜	(777.9)	22⅞	(581.0)	120	1.10	4.0	(1.8)	RT1A030L00	RPT030L00	RDN27C1	RR1030L00
30⅜	(777.9)	22⅞	(581.0)	240	1.10	4.0	(1.8)	RT1G030L00	RPT030L00	RDN27C10	RR1030L00
35⅞	(911.2)	27⅞	(708.0)	240	1.30	4.7	(2.2)	RT1G035R00	RPT035R00	RDN32C10	RR1035R00
35⅞	(911.2)	27⅞	(708.0)	480	1.30	4.7	(2.2)	RT1P035R00	RPT035R00	RDN32C11	RR1035R00
46⅝	(1184.3)	38⅝	(981.1)	240	1.80	5.8	(2.7)	RT1G046L00	RPT046L00	RDN42R10	RR1046L00
46⅝	(1184.3)	38⅝	(981.1)	480	1.80	5.8	(2.7)	RT1P046L00	RPT046L00	RDN42R11	RR1046L00
61⅜	(1558.9)	53¼	(1353.0)	240	2.50	7.5	(3.4)	RT1G061G00	RPT061G00	RDN57J10	RR1061G00
61⅜	(1558.9)	53¼	(1353.0)	480	2.50	7.5	(3.4)	RT1P061G00	RPT061G00	RDN57J11	RR1061G00
73¾	(1873.0)	65⅝	(1666.9)	240	3.00	9.0	(4.1)	RT1G073N00	RPT073N00	RDN69E10	RR1073N00
73¾	(1873.0)	65⅝	(1666.9)	480	3.00	9.0	(4.1)	RT1P073N00	RPT073N00	RDN69E11	RR1073N00
85¾	(2178.0)	77⅞	(1971.7)	240	3.60	10.2	(4.7)	RT1G085N00	RPT085N00	RDN81E10	RR1085N00
85¾	(2178.0)	77⅞	(1971.7)	480	3.60	10.2	(4.7)	RT1P085N00	RPT085N00	RDN81E11	RR1085N00

Dual Element Assembly Stock List



13⅜	(346.1)	7¼	(184.0)	120	0.80	2.2	(1.0)	RT2A013L00	RPT013L00	RDN10E1	RR2013L00
20⅜	(523.9)	13⅜	(346.1)	120	1.30	2.9	(1.3)	RT2A020A00	RPT020A00	RDN16L1	RR2020A00
24⅜	(619.1)	16 13/16	(427.0)	120	1.60	3.4	(1.5)	RT2A024G00	RPT024G00	RDN21B1	RR2024G00
24⅜	(619.1)	16 ⅜	(427.0)	240	1.60	3.4	(1.5)	RT2G024G00	RPT024G00	RDN21B10	RR2024G00
30⅜	(777.9)	22⅞	(581.0)	120	2.20	4.1	(1.9)	RT2A030L00	RPT030L00	RDN27C1	RR2030L00
30⅜	(777.9)	22⅞	(581.0)	240	2.20	4.1	(1.9)	RT2G030L00	RPT030L00	RDN27C10	RR2030L00
35⅞	(911.2)	27⅞	(708.0)	240	2.60	4.7	(2.1)	RT2G035R00	RPT035R00	RDN32C10	RR2035R00
35⅞	(911.2)	27⅞	(708.0)	480	2.60	4.7	(2.1)	RT2P035R00	RPT035R00	RDN32C11	RR2035R00
46⅝	(1184.3)	38⅝	(981.1)	240	3.60	6.0	(2.7)	RT2G046L00	RPT046L00	RDN42R10	RR2046L00
46⅝	(1184.3)	38⅝	(981.1)	480	3.60	6.0	(2.7)	RT2P046L00	RPT046L00	RDN42R11	RR2046L00
61⅜	(1558.9)	53¼	(1353.0)	240	5.00	7.7	(3.5)	RT2G061G00	RPT061G00	RDN57J10	RR2061G00
61⅜	(1558.9)	53¼	(1353.0)	480	5.00	7.7	(3.5)	RT2P061G00	RPT061G00	RDN57J11	RR2061G00
73¾	(1873.0)	65⅝	(1666.9)	240	6.00	9.1	(4.1)	RT2G073N00	RPT073N00	RDN69E10	RR2073N00
73¾	(1873.0)	65⅝	(1666.9)	480	6.00	9.1	(4.1)	RT2P073N00	RPT073N00	RDN69E11	RR2073N00
85¾	(2178.0)	77⅞	(1971.7)	240	7.20	10.5	(4.8)	RT2G085N00	RPT085N00	RDN81E10	RR2085N00
85¾	(2178.0)	77⅞	(1971.7)	480	7.20	10.5	(4.8)	RT2P085N00	RPT085N00	RDN81E11	RR2085N00

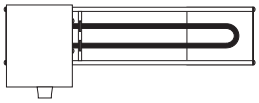
Hairpin Element Assembly Stock List



12¾	(324.0)	8⅜	(212.7)	120	0.80	2.1	(0.9)	RU1A012N00	RPU012N00	RDN21B1UAAB	RR3012N00
12¾	(324.0)	8⅜	(212.7)	240	0.80	2.1	(0.9)	RU1G012N00	RPU012N00	RDN21B10UAAA	RR3012N00
15⅞	(403.2)	11 7/16	(290.5)	120	1.10	2.4	(1.1)	RU1A015R00	RPU015R00	RDN27C1UAAA	RR3015R00
15⅞	(403.2)	11 7/16	(290.5)	240	1.10	2.4	(1.1)	RU1G015R00	RPU015R00	RDN27C10UAAC	RR3015R00
23¾	(603.0)	19 3/16	(487.4)	240	1.80	3.3	(1.5)	RU1G023N00	RPU023N00	RDN42R10UAAC	RR3023N00
23¾	(603.0)	19 3/16	(487.4)	480	1.80	3.3	(1.5)	RU1P023N00	RPU023N00	RDN42R11UAAB	RR3023N00
31¼	(794.0)	26 9/16	(674.7)	240	2.50	4.2	(1.9)	RU1G031E00	RPU031E00	RDN57J10UAAJ	RR3031E00
31¼	(794.0)	26 9/16	(674.7)	480	2.50	4.2	(1.9)	RU1P031E00	RPU031E00	RDN57J11UAAB	RR3031E00
37¼	(946.0)	32 7/16	(823.9)	240	3.00	4.9	(2.2)	RU1G037E00	RPU037E00	RDN69E10UAAB	RR3037E00
37¼	(946.0)	32 7/16	(823.9)	480	3.00	4.9	(2.2)	RU1P037E00	RPU037E00	RDN69E11UAAB	RR3037E00
43⅜	(1101.7)	38 7/16	(976.3)	240	3.60	5.6	(2.5)	RU1G043G00	RPU043G00	RDN81E10UAAB	RR3043G00
43⅜	(1101.7)	38 7/16	(976.3)	480	3.60	5.6	(2.5)	RU1P043G00	RPU043G00	RDN81E11UAAB	RR3043G00

Tubular Reflector Heaters

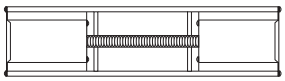
RAYMAX 1525



Hairpin Element with Liquid Tight Housing

Overall Length in.	Overall Length (mm)	Heated Length in.	Heated Length (mm)	Volts	kW	Approx. Net Wt. lbs	Approx. Net Wt. (kg)	Base Code Number	Protective Grill Code Number	Replacement Element Code Number	Replacement Reflector Code Number
12 15/16	(328.6)	8 3/8	(212.7)	120	0.80	2.5	(1.1)	**RS1A012N00**	**RPS012N00**	**RDN21B1BAAB**	**RR4012N00**
12 15/16	(328.6)	8 3/8	(212.7)	240	0.80	2.5	(1.1)	**RS1G012N00**	**RPS012N00**	**RDN21B10BAAA**	**RR4012N00**
16 1/8	(410.5)	11 7/16	(290.5)	120	1.10	2.9	(1.3)	**RS1A015R00**	**RPS015R00**	**RDN27C1BAAB**	**RR4015R00**
16 1/8	(410.5)	11 7/16	(290.5)	240	1.10	2.9	(1.3)	**RS1G015R00**	**RPS015R00**	**RDN27C10BAAA**	**RR4015R00**
24 1/16	(611.2)	19 3/16	(487.4)	240	1.80	3.8	(1.7)	**RS1G023N00**	**RPS023N00**	**RDN42R10BAAD**	**RR4023N00**
24 1/16	(611.2)	19 3/16	(487.4)	480	1.80	3.8	(1.7)	**RS1P023N00**	**RPS023N00**	**RDN42R11BAAD**	**RR4023N00**
31 11/16	(804.9)	26 9/16	(674.7)	240	2.50	4.8	(2.2)	**RS1G031E00**	**RPS031E00**	**RDN57J10BAAB**	**RR4031E00**
31 11/16	(804.9)	26 9/16	(674.7)	480	2.50	4.8	(2.2)	**RS1P031E00**	**RPS031E00**	**RDN57J11BAAA**	**RR4031E00**
37 13/16	(960.4)	32 7/16	(823.9)	240	3.00	5.5	(2.5)	**RS1G037E00**	**RPS037E00**	**RDN69E10BAAD**	**RR4037E00**
37 13/16	(960.4)	32 7/16	(823.9)	480	3.00	5.5	(2.5)	**RS1P037E00**	**RPS037E00**	**RDN69E11BAAD**	**RR4037E00**
44 1/16	(1119.2)	38 7/16	(976.3)	240	3.60	6.2	(2.8)	**RS1G043G00**	**RPS043G00**	**RDN81E10BAAB**	**RR4043G00**
44 1/16	(1119.2)	38 7/16	(976.3)	480	3.60	6.2	(2.8)	**RS1P043G00**	**RPS043G00**	**RDN81E11BAAA**	**RR4043G00**

Quartz Tube Element

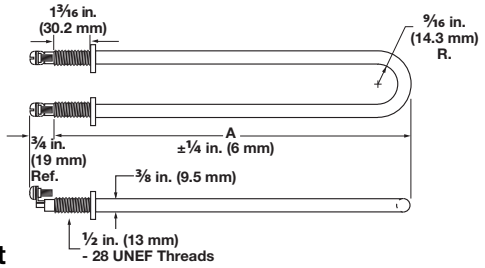


Note: Quartz tube elements must be operated in a horizontal position.

18 1/16	(458.8)	10	(254.0)	120	0.50	2.4	(1.1)	**RG1A018B00**	**RPG018B00**	**RQB12FA05001B**	**RR5018B00**
26 1/16	(662.0)	18	(457.0)	120	0.90	3.2	(1.4)	**RG1A026B00**	**RPG026B00**	**RQB20EA09001B**	**RR5026B00**
26 1/16	(662.0)	18	(457.0)	240	0.90	3.2	(1.4)	**RG1G026B00**	**RPG026B00**	**RQB20EG09001B**	**RR5026B00**
33 1/16	(839.8)	25	(635.0)	120	1.25	3.9	(1.7)	**RG1A033B00**	**RPG033B00**	**RQB27GA12001B**	**RR5033B00**
33 1/16	(839.8)	25	(635.0)	240	1.25	3.9	(1.7)	**RG1G033B00**	**RPG033B00**	**RQB27GG12001B**	**RR5033B00**
45 7/8	(1165.2)	38	(965.0)	240	1.90	5.1	(2.3)	**RG1G045S00**	**RPG045S00**	**RQB40DG19001B**	**RR5045S00**
45 7/8	(1165.2)	38	(965.0)	480	1.90	5.1	(2.3)	**RG1P045S00**	**RPG045S00**	**RQB40DP19001B**	**RR5045S00**
60 7/8	(1546.2)	53	(1346.0)	240	2.60	6.6	(3.0)	**RG1G060S00**	**RPG060S00**	**RQB55HG26001B**	**RR5060S00**
60 7/8	(1546.2)	53	(1346.0)	480	2.60	6.6	(3.0)	**RG1P060S00**	**RPG060S00**	**RQB55HP26001B**	**RR5060S00**

Tubular Replacement Elements for Reflector Style Radiant Heaters

The following tubular radiant heating elements are available for replacing popular non-Watlow radiant elements.



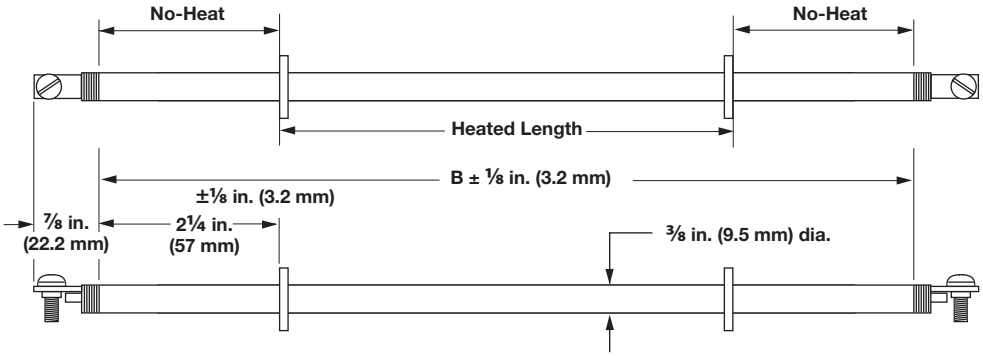
Hairpin (U-Shaped) Element With Liquid Tight Bulkheads Stock Chart

Hairpin A Dimension in.	Hairpin A Dimension (mm)	Volts	Watts	Approx. Net Wt. oz	Approx. Net Wt. (g)	Availability	Chromalox® PGN	Chromalox® Catalog Number	Watlow Code Number
10 5/16	(261.9)	120	800	6	(170)	Assy. Stock	106673	UTU-2LT	**RDN21B1B**
10 5/16	(261.9)	240	800	6	(170)	Assy. Stock	106681	UTU-2LT	**RDN21B10B**
13 5/16	(338.1)	120	1100	8	(225)	Assy. Stock	106690	UTU-3LT	**RDN27C1B**
13 5/16	(338.1)	240	1100	8	(225)	Assy. Stock	106702	UTU-3LT	**RDN27C10B**
21 3/16	(538.2)	240	1800	13	(370)	Assy. Stock	106710	UTU-4LT	**RDN42R10B**
21 3/16	(538.2)	480	1800	13	(370)	Assy. Stock	106729	UTU-4LT	**RDN42R11B**
28 1/2	(724.0)	240	2500	16	(455)	Assy. Stock	106737	UTU-5LT	**RDN57J10B**
28 1/2	(723.9)	480	2500	16	(455)	Assy. Stock	106745	UTU-5LT	**RDN57J11B**
34 3/8	(873.1)	240	3000	19	(540)	Assy. Stock	106753	UTU-6LT	**RDN69E10B**
34 3/8	(873.1)	480	3000	19	(540)	Assy. Stock	106761	UTU-6LT	**RDN69E11B**
40 3/8	(1025.5)	240	3600	22	(625)	Assy. Stock	106770	UTU-7LT	**RDN81E10B**
40 3/8	(1025.5)	480	3600	22	(625)	Assy. Stock	106788	UTU-7LT	**RDN81E11B**

Tubular Reflector Heaters

RAYMAX 1525

Tubular Replacement Elements for Reflector Style Radiant Heaters



Straight Element Stock Chart

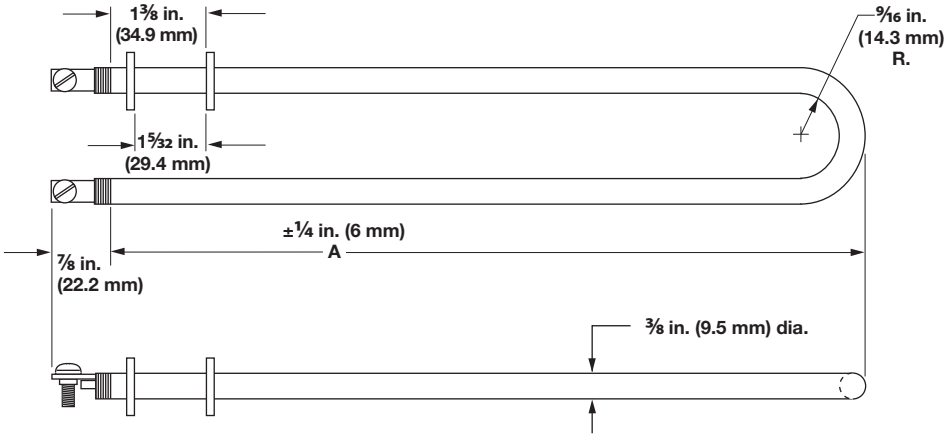
Sheath B Dimension in.	(mm)	Heated Length in.	(mm)	No-Heat Length in.	(mm)	Volts	Watts	Approx. Net Wt. oz	(g)	Availability	Chromalox® PCN	Chromalox® Catalog Number	Watlow Code Number
10 ¼	(260.0)	7 ¼	(184.0)	1 ½	(38.0)	120	400	3	(85)	Assy. Stock	147766	RTU-2063AX35	**RDN10E1**
16 ⅝	(422.3)	13 ⅝	(346.1)	1 ½	(38.0)	120	650	5	(140)	Assy. Stock	147774	RTU-2063AX29	**RDN16L1**
21 1/16	(535.0)	16 13/16	(427.0)	2 ⅛	(54.0)	120	800	6	(170)	Assy. Stock	106112	RTU-2083A	**RDN21B1**
21 1/16	(535.0)	16 13/16	(427.0)	2 ⅛	(54.0)	208	800	6	(170)	Standard	106120	RTU-2083AV	**RDN21B2**
21 1/16	(535.0)	16 13/16	(427.0)	2 ⅛	(54.0)	240	800	6	(170)	Assy. Stock	106139	RTU-2083A	**RDN21B10**
21 1/16	(535.0)	16 13/16	(427.0)	2 ⅛	(54.0)	277	800	6	(170)	Standard	106147	RTU-2083AV	**RDN21B4**
27 ⅛	(689.0)	22 ⅞	(581.0)	2 ⅛	(54.0)	120	1100	8	(225)	Assy. Stock	106155	RTU-3113A	**RDN27C1**
27 ⅛	(689.0)	22 ⅞	(581.0)	2 ⅛	(54.0)	208	1100	8	(225)	Standard	106163	RTU-3113AV	**RDN27C2**
27 ⅛	(689.0)	22 ⅞	(581.0)	2 ⅛	(54.0)	240	1100	8	(225)	Assy. Stock	106171	RTU-3113A	**RDN27C10**
27 ⅛	(689.0)	22 ⅞	(581.0)	2 ⅛	(54.0)	277	1100	8	(225)	Standard	106180	RTU-3113AV	**RDN27C4**
32 ⅛	(816.0)	27 ⅞	(581.0)	2 ⅛	(54.0)	240	1300	9	(255)	Assy. Stock	108409	RTU-3133A	**RDN32C10**
32 ⅛	(816.0)	27 ⅞	(581.0)	2 ⅛	(54.0)	480	1300	9	(255)	Assy. Stock	108396	RTU-3133A	**RDN32C11**
42 ⅞	(1089.0)	38 ⅝	(981.1)	2 ⅛	(54.0)	208	1800	13	(370)	Standard	106198	RTU-4183AV	**RDN42R2**
42 ⅞	(1089.0)	38 ⅝	(981.1)	2 ⅛	(54.0)	240	1800	13	(370)	Assy. Stock	106200	RTU-4183A	**RDN42R10**
42 ⅞	(1089.0)	38 ⅝	(981.1)	2 ⅛	(54.0)	277	1800	13	(370)	Standard	106219	RTU-3133AV	**RDN42R4**
42 ⅞	(1089.0)	38 ⅝	(981.1)	2 ⅛	(54.0)	480	1800	13	(370)	Assy. Stock	106227	RTU-3133A	**RDN42R11**
57 ½	(1460.0)	53 ¼	(1353.0)	2 ⅛	(54.0)	208	2500	16	(455)	Standard	106235	RTU-5253AV	**RDN57J2**
57 ½	(1460.0)	53 ¼	(1353.0)	2 ⅛	(54.0)	240	2500	16	(455)	Assy. Stock	106243	RTU-5253A	**RDN57J10**
57 ½	(1460.0)	53 ¼	(1353.0)	2 ⅛	(54.0)	277	2500	16	(455)	Standard	106251	RTU-5253AV	**RDN57J4**
57 ½	(1460.0)	53 ¼	(1353.0)	2 ⅛	(54.0)	480	2500	16	(455)	Assy. Stock	106260	RTU-5253A	**RDN57J11**
69 ¼	(1759.0)	65	(1651.0)	2 ⅛	(54.0)	208	3000	19	(540)	Standard	106278	RTU-6303AV	**RDN69E2**
69 ¼	(1759.0)	65	(1651.0)	2 ⅛	(54.0)	240	3000	19	(540)	Assy. Stock	106286	RTU-6303A	**RDN69E10**
69 ¼	(1759.0)	65	(1651.0)	2 ⅛	(54.0)	277	3000	19	(540)	Standard	106294	RTU-6303AV	**RDN69E4**
69 ¼	(1759.0)	65	(1651.0)	2 ⅛	(54.0)	480	3000	19	(540)	Assy. Stock	106307	RTU-6303A	**RDN69E11**
81 ¼	(2064.0)	77	(1956.0)	2 ⅛	(54.0)	208	3600	22	(625)	Standard	106315	RTU-7363AV	**RDN81E2**
81 ¼	(2064.0)	77	(1956.0)	2 ⅛	(54.0)	240	3600	22	(625)	Assy. Stock	106323	RTU-7363A	**RDN81E10**
81 ¼	(2064.0)	77	(1956.0)	2 ⅛	(54.0)	277	3600	22	(625)	Standard	106331	RTU-7363AV	**RDN81E4**
81 ¼	(2064.0)	77	(1956.0)	2 ⅛	(54.0)	480	3600	22	(625)	Assy. Stock	106340	RTU-7363A	**RDN81E11**
109 ¼	(2775.0)	105	(2665.0)	2 ⅛	(54.0)	240	4000	32	(905)	Standard	106358	RTU-7303AX10	**RDN109E10①**
134 ½	(3416.0)	127 ¾	(3245.0)	3 ⅜	(85.7)	240	5000	37	(1050)	Standard	106366	RTU-7303AX13	**RDN134J10①**
153 ⅜	(3895.7)	145 ⅛	(3705.2)	4	(102.0)	240	5500	40	(1135)	Standard	106374	RTU-7303AX9A	**RDN153R10①**
179 ¼	(4553.0)	171 ¼	(4350.0)	4	(102.0)	240	6500	51	(1445)	Standard	106382	RTU-7363AX38	**RDN179E10①**

① Assembly Stock with catalog options.

Tubular Reflector Heaters

RAYMAX 1525

Tubular Replacement Elements for Reflector Style Radiant Heaters



Hairpin (U-Shaped) Element Stock Chart

Hairpin A Dimension in.	(mm)	Volts	Watts	Approx. Net Wt. oz	(g)	Availability	Chromalox® PCN	Chromalox® Catalog Number	Watlow Code Number
10 ½	(267.0)	120	800	6	(170)	Assy. Stock	106438	UTU-2	**RDN21B1U**
10 ½	(267.0)	240	800	6	(170)	Assy. Stock	106454	UTU-2	**RDN21B10U**
10 ½	(267.0)	277	800	6	(170)	Standard	106462	UTU-2V	**RDN21B4U**
13 9⁄16	(344.5)	120	1100	8	(225)	Assy. Stock	106470	UTU-3	**RDN27C1U**
13 9⁄16	(344.5)	240	1100	8	(225)	Assy. Stock	106497	UTU-3	**RDN27C10U**
13 9⁄16	(344.5)	277	1100	8	(225)	Standard	106500	UTU-3V	**RDN27C4U**
21 5⁄16	(541.3)	208	1800	13	(370)	Standard	106518	UTU-4V	**RDN42R2U**
21 5⁄16	(541.3)	240	1800	13	(370)	Assy. Stock	106526	UTU-4	**RDN42R10U**
21 5⁄16	(541.3)	480	1800	13	(370)	Assy. Stock	106542	UTU-4	**RDN42R11U**
28 11⁄16	(728.7)	208	2500	16	(455)	Standard	106550	UTU-5V	**RDN57J2U**
28 11⁄16	(728.7)	240	2500	16	(455)	Assy. Stock	106569	UTU-5	**RDN57J10U**
28 11⁄16	(728.7)	277	2500	16	(455)	Standard	106577	UTU-5V	**RDN57J4U**
28 11⁄16	(728.7)	480	2500	16	(455)	Assy. Stock	106585	UTU-5	**RDN57J11U**
34 9⁄16	(877.9)	240	3000	19	(540)	Assy. Stock	106606	UTU-6	**RDN69E10U**
34 9⁄16	(877.9)	480	3000	19	(540)	Assy. Stock	106622	UTU-6	**RDN69E11U**
40 9⁄16	(1030.3)	240	3600	22	(625)	Assy. Stock	106649	UTU-7	**RDN81E10U**
40 9⁄16	(1030.3)	277	3600	22	(625)	Standard	106657	UTU-7V	**RDN81E4U**
40 9⁄16	(1030.3)	480	3600	22	(625)	Assy. Stock	106665	UTU-7	**RDN81E11U**

How to Order

For units listed in the stock charts, please specify:

- Watlow code number
- Volts/watts
- Style (straight length, hairpin or hairpin with bulkheads)
- Quantity

If our stock elements do not meet your needs, Watlow can provide a **made-to-order** unit. For **made-to-order** units, please specify:

- Volts/watts
- Sheath material and diameter
- Sheath length and no-heat length
- Terminations or terminal pin length
- Bend configuration if applicable
- Mounting method
- Quantity

Availability

Assembly Stock: Three to five days

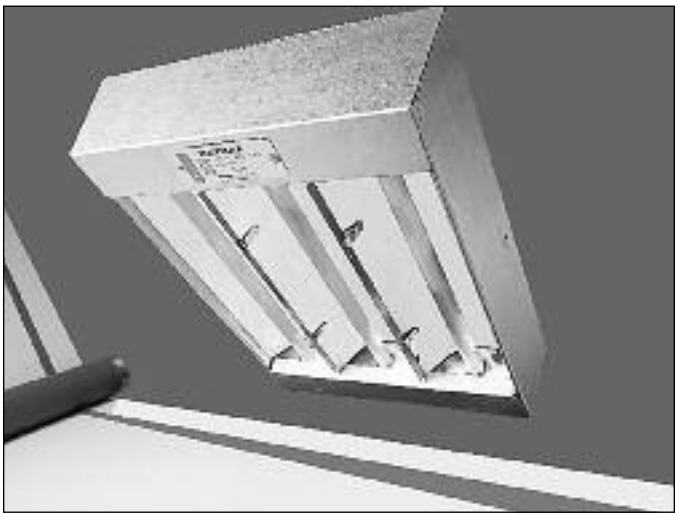
Standard: 10 working days

Modified Stock①: Five to seven working days

Made-to-Order: Four to six weeks

Quartz Tube Panel Heaters

RAYMAX 1626



The RAYMAX 1626 quartz tube panel from Watlow® is a fast responding and very efficient source of radiant thermal energy. Most designs reach full output in 30 to 60 seconds and typically cool down to 50 percent output in under 15 seconds. The quartz heater is ideal for use in operations where frequent line stoppages are anticipated or immediate heat-up and cool-down is necessary. Custom sizes are available up to 27 in. (686 mm) wide in 3 in. (76 mm) increments and 70 in. (1778 mm) long.

Performance Capabilities

- Watt densities to 20 W/in² (3.1 W/cm²) measured across the reflector area
- Element temperatures to 1700°F (930°C)

Features and Benefits

Quartz tubes and reflectors are easy to replace from front of heater

- Provides less downtime waiting for parts

Polished parabolic aluminum reflectors

- Directs radiant energy for efficient heating

Little residual heat

- Reduces possibility of product damage during line stoppage

Fast heat-up, cool down

- Allows heater turn off during gaps in production for more energy savings

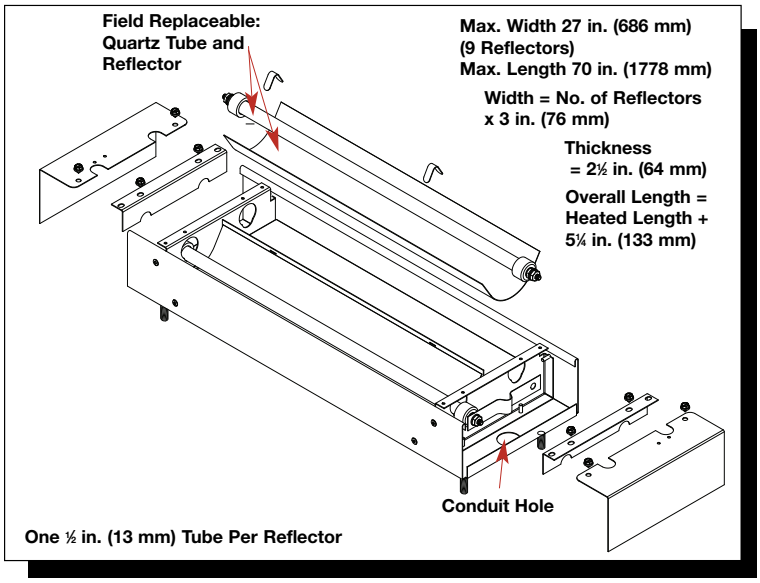
Applications

- Heating plastic films
- Ink drying
- Coating curing
- Fusing powder coating
- Activating adhesives

How to Order

The RAYMAX 1626 is **made-to-order** only. It is helpful to have the following information available:

- Heated width (3 in. [76 mm] increments) and length
- Total wattage
- Voltage and phase (balanced three phase on three, six and nine tube units only)
- Mounting studs if desired



Options

A **thermocouple clamp** is located on the end cap. The clamp is used to hold a ⅛ in. (3.2 mm) diameter thermocouple (not included) in front of the reflector to intercept the radiated energy to provide a control temperature. The thermocouple should be painted with a high-temperature black paint to improve absorption.

Availability

Made-to-Order: Contact your Watlow representative
Note: Horizontal operation only

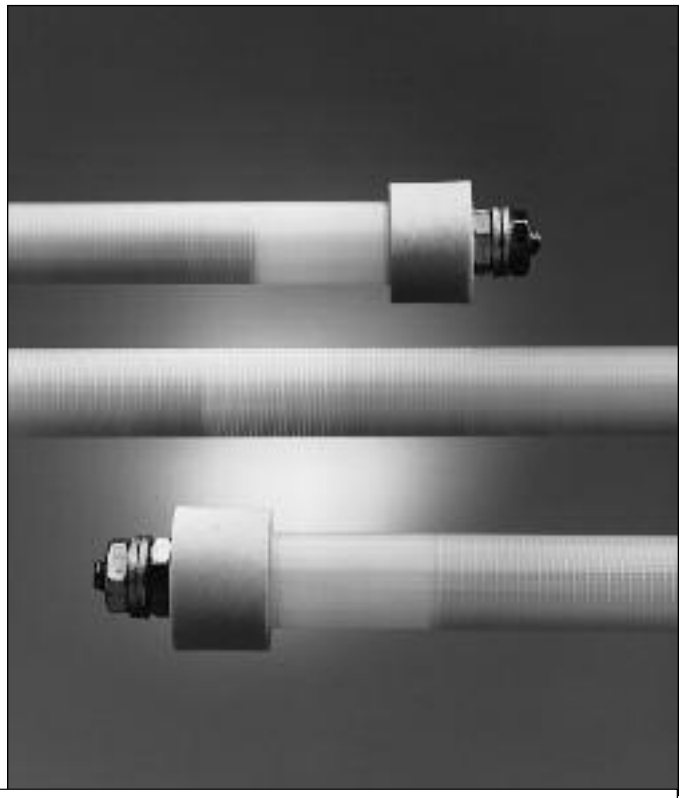
Specifications

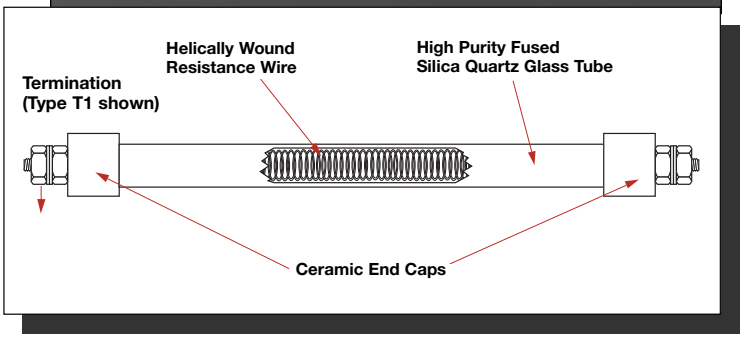
Overall Dim.	Min.	Max.	Inc.
Width in. (mm)	3 (76.0)	27 (686.0)	3 (76.0)
Length in. (mm)	12 (305.0)	70 (1778.0)	0.06 (1.5)

Quartz Tube Heaters

The Watlow® quartz tube radiant heater provides medium wave infrared energy and fast heat up and cool down. With element temperatures around 1700°F (930°C) the heater produces infrared radiation with a peak energy wavelength of 2.5 microns. Lower operating temperatures produce longer wave lengths. The majority of the energy is transmitted through the translucent quartz tube without being absorbed.

Most designs reach full output in 30 to 60 seconds and typically cool down to 50 percent output in under 15 seconds. The quartz tube heater is ideal for applications where frequent line stoppages are anticipated or quick heat-up or cool down is necessary. Heaters can be turned off between production runs to save energy. Unique control schemes are possible that adjust the wattage output of the heaters during the heating cycle.





Note: Horizontal operation only

Performance Capabilities

- Element temperatures up to 1700°F (930°C)
- Tube watt densities up to 60 watts per linear inch of heated length (23.6 watts per linear cm of heated length)

Features and Benefits

Termination styles
- Provides compatibility to virtually every enclosure on the market

Ceramic end caps bonded to the quartz tubing ends
- Provides a rigid support for terminations

Quick heat-up and cool down
- Assures higher productivity and better efficiency

Low emission in the visible spectrum
- Assures no objectionable glare is created

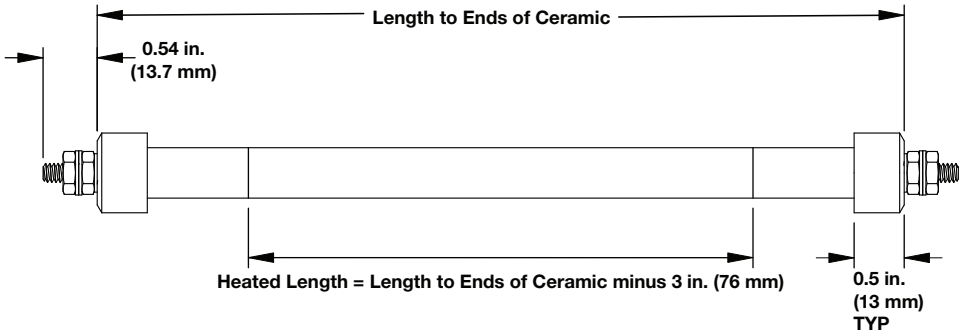
Clean thermal energy source
- Assures no process contamination occurs

Applications

- Shrink packaging
- Laminating
- Thermoforming
- Fusing processes
- Vulcanizing and curing rubber
- Sterilizing
- Sealing
- Electrostatic copy equipment
- Drying processes: photos, textiles, coatings and sand core castings

Quartz Tube Heaters

Applications and Technical Data

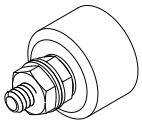


Specifications

Nominal Tube O.D. in.	Actual Tube O.D. in. (mm)	Ceramic End Cap O.D. in. (mm)	Available Tube Lengths in.
⅜	0.374 (9.5)	0.646 (16.41)	8 to 64 ± ⅛
½	0.500 (13.0)	0.796 (20.22)	8 to 64 ± ⅛
⅝	0.626 (15.9)	0.918 (23.32)	8 to 69 ± ⅛

Standard Terminations

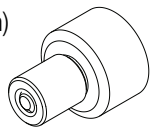
Type T1



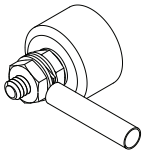
Standard termination: 10-24 stainless steel screw thread terminals.

Type T2

Quick disconnect fuse style: 7/16 in. (11.1 mm) dia. x ½ in. (13 mm) long terminals.

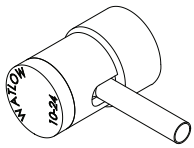


Type T4



Flexible lead termination: 12 in. (305 mm) flexible leads; if longer leads are required, please specify.

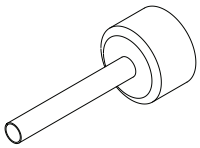
Type T5



Flexible lead termination: 10-24 SS screw thread terminals insulated with ceramic terminal covers. Terminals are pre-wired with 12 in. (305 mm) flexible lead wire. If longer leads are required, please specify.

Type T6

12 in. (305 mm) flexible leads exit the ceramic cap. There are no post terminals. Please specify if longer leads are required.



Mounting Frames for Watlow Quartz Heaters

See RAYMAX 1626

Band and Strip Emitters

Constructed using Watlow's exclusive mineral insulation, rugged stainless steel sheath and high emissivity coating, these heaters can operate at temperatures to 1300°F (700°C), and 30 W/in² (4.7 W/cm²).

Sizes

Strip Emitters

Width: 2 in. (51 mm), 3 in. (76 mm)

Length: 6 in. (152 mm) minimum, 31 in. (787 mm) maximum

Band Emitters

Width: 1 in. (25 mm), 2 in. (51 mm), 3 in. (76 mm) maximum

- Segment Length: 6 in. (152 mm) minimum to 42 in. (1067 mm) maximum
- Partial arcs to full 360° coverage, contact your Watlow representative.
- High emissivity coating on inside standard. For high emissivity coating on outside, contact your Watlow representative.
- Post terminals standard; high temperature leads available on bands only.

Options

- Mounting studs
- Mounting clips for 3 in. (76 mm) wide emitter strips, part #MM6063
- Thermocouple welded to sheath
- Thermocouple pocket welded to sheath
- Bayonet fitting for VAT style thermocouple

Applications

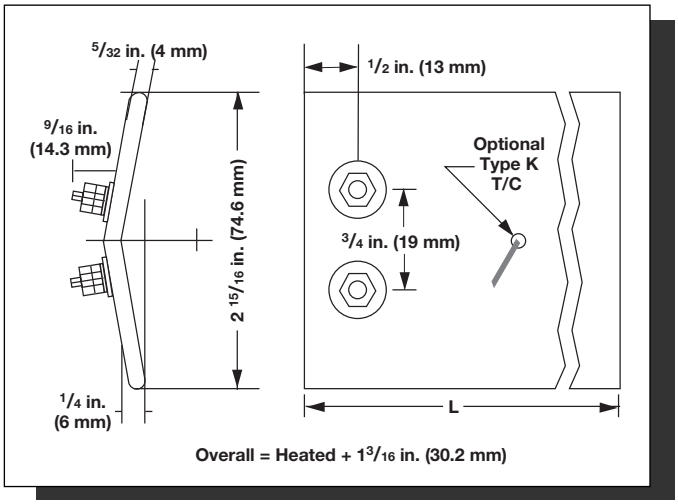
- Heating rotating drums and rollers
- Tube ovens
- Small spot heating
- Heat shrinking and curing wire coatings
- Heat laminating wheels

How to Order

The radiant band/strip emitters are available **made-to-order** only. It is helpful to have the following information available:

- Overall width and length (or diameter for band emitters)
- Total wattage
- Voltage, single phase only
- Mounting studs if desired
- Thermocouple or thermowell or thermocouple pocket if desired

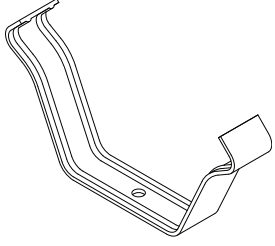




Availability

Made-to-Order: Contact your Watlow representative

Mounting Clip (Part # MM6063)
(For 3 in. (76 mm) wide strip heater)



Thermostats and Accessories

Thermostats and Accessories

SERIES EHG® 641

SERIES EHG SL10 643

ST10 and ST207 647

Bulb and Capillary 649

Low Liquid Level Sensors 653

Protective Wells 654



SERIES EHG®

Many applications requiring a fixed temperature set point have relied on mechanical thermostat devices (thermostats) for thermal control. But, thermostats are inadequate for many applications because of the long-term reliability issues such as 100,000 cycle rating and poor temperature control.

The SERIES EHG® thermal solution includes a compact temperature control, thermocouple sensor and power switching device that are integrated into the heater's power cord. The SERIES EHG reduces system costs and substantially extends the life over conventional thermostat solutions.

The evolution of miniature microprocessor technology and Watlow switching technology allowed the development of a small versatile temperature control and thermocouple sensor that can be integrated with Watlow silicone rubber heater products. This device senses the temperature via input from a thermocouple strategically placed on the heater mat. The microprocessor is programmed prior to shipment with the customer's application specific set point. This results in quick delivery of a custom integrated system.

The small mass of the thermocouple provides superior response to changes in process temperature and allows for higher watt density silicone rubber heater designs. Depending on the specific application, Watlow's power switching design can extend life up to 40 times greater than thermostats. These features result in an integrated custom set point temperature control product with superior life span, faster heat-up rates and improved accuracy. The SERIES EHG system has been tested to over four million cycles at rated amperage.

Features and Benefits

Long operational life
- Improves system reliability

Tight temperature control
- Assures process accuracy

Small sensor footprint
- Fits with almost any heater
- Responds quickly to temperature changes
- Controls high watt densities in low mass applications

Reduced system cost
- A single EHG control can be configured with multiple heaters to reduce system cost

Pre-wired, in line control
- Simplifies installation
- Two wire power connection



Durable housing with built-in strain relief
- Protects electronics
- Low risk of mechanical damage

Manufactured with proven Watlow components
- Assures reliable system performance

Applications

- Aerospace composite repair
- Foodservice equipment
- Freeze protection
- Life sciences
- Semiconductor
- Telecommunications

SERIES EHG

Technical Information

Specifications

Operational

- SERIES EHG silicone rubber heater UL® recognized to 428°F (220°C) operating temperature
- Factory programmed fixed set point
- On-off control with 6°F (3°C) switching hysteresis
- Temperature band LED indicator ON between -68 and +68°F (–20 and +20°C) of set point

Electrical

- Voltage rating: 120 or 240V~(ac) – 30/+10%, 50/60Hz
- Silicone rubber heater watt densities up to 80 W/in^2 (12.5 W/cm^2) dependent on application temperature
- SERIES EHG system UL® recognized to 10A max.

Sensor

- Type K thermocouple

Mechanical

- Control dimensions 3.75 in. (95 mm) long by 1.75 in. (45 mm) diameter
- Heater per silicone rubber heater specifications

Agencies

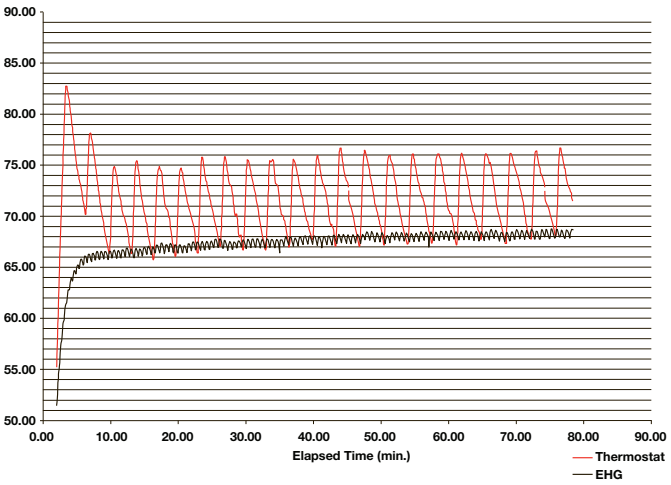
- Silicone rubber heater: UL® recognized File #E52951
- SERIES EHG control: TUV File DE 3-3068 to EN 61010-1:2001, UL® File E43684 to UL® 873 temperature indicating and regulating equipment

Environmental

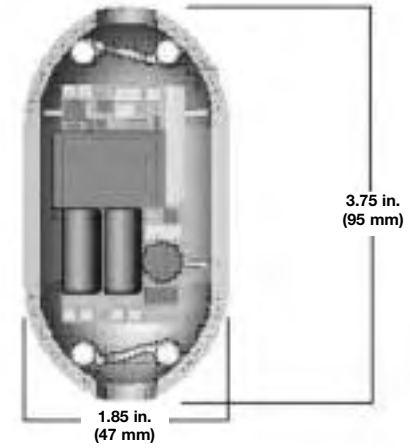
- Control operating temperature range 32 to 128˚F (0 to 70˚C)
- Control storage temperature range -40 to 158˚F (–40 to 70˚C)

Contact your Watlow representative for custom configurations.

SERIES EHG Versus Thermostat (typical application)



Dimensions



Integrated SERIES EHG System Versus Integrated Thermostat System

	Integrated EHG System	Integrated Thermostat System	SERIES EHG Benefit
Life comparison at rated amperage 10A load	Tested to greater than 4,000,000 cycles with	Rated 100,000 cycles high reliability in application	Longer product life of SERIES EHG system and
Switch hysteresis	6°F (3°C)	15°F (8°C)	SERIES EHG system will provide superior process control
Improved response time reduces overshoot on start-up	6°F (3°C) typical	25°F (14°C) typical	SERIES EHG system will respond changes in temperature faster than thermostat
Warranty	2 years on material and workmanship	1 year on material and workmanship	Warranty can be extended because of superior SERIES EHG life
Zero Cross Switching	SERIES EHG has zero cross switching	Random switching during sign wave cycle	Reduces possibility of electrical mechanical interference (EMI)

SERIES EHG® SL10

The EHG® SL10 is a key component in a powerful system that integrates a heater, an adjustable set point temperature controller, high/low temperature alert, power switching device and a high temperature safety limit. This agency recognized controller/safety limit meets UL® 1998 and CE 60730 requirements. The optional display/communications module can be easily upgraded and added in the field to provide digital display indication, adjustment of set point, RS485 Modbus® communications and other Human Machine Interface (HMI) features. This system allows you to purchase only what is needed for your application.

The easy to install, compact design, inherent reliability and integrated limit functions make this controller a tremendous value. The controller is designed for easy integration with Watlow® heaters simplifying engineering, reducing component count on new equipment and decreasing cost of ownership. For original equipment manufacturers (OEMs), CE, Semi-S2 compliance and UL® recognition will reduce time and costs necessary for global agency testing and validation.



Features and Benefits

Process controller and safety limit in one package
- Meets UL® 1998 and CE 60730 requirements
- Eliminates the need for a thermal fuse on a heater
- Eliminates replacement of heater when fuse fails

Optional display/communications module
- Allows easy upgrade on to base device
- Offer low cost field upgrade
- Provide easy, snap-on installation

Accurate and flexible temperature process controller
- Replaces problematic bi-metal thermostats with accurate electronic temperature process controller
- Allows easy change of process parameters

Ambient operating temperature range 32 to 158°F (0 to 70°C)
- Increases reliability when mounting in harsh temperature environments or in close proximity to heaters

Integrated high/low temperature alert signal relay
- Provides dry contact output to activate external alarm or process function
- Signals control status with three integrated LEDs
- Allows a signal of up to two amperes 30V≂(ac/dc), Form A to alert if process temperature is out of range limits

Health check diagnostics
- Monitors maximum heater process temperature, maximum ambient temperature and thermocouple operation
- Provides health check signal to inform operator that the process is working correctly

Universal power supply
- Allows an input of 85 to 264V~(ac), 50/60Hz
- Provides safe control of up to 2400 watts with 10 amperes switching in both controller and safety limit

Can be switched from on-off and PID algorithm
- Increases product life (on-off control is default)
- Offers selectable PID control algorithm for tighter temperature uniformity

Universal ⅛ turn mounting bracket
- Allows mounting to most surfaces
- Provides flexible mounting—either horizontally or vertically

Applications

Foodservice equipment
- Warming and serving equipment
- Food holding cabinets

Life sciences
- Laboratory equipment
- Medical equipment

Packaging
- Heat sealing bars
- Hot glue application equipment

Semiconductor processing
- Gas delivery lines

SERIES EHG SL10

Technical Information

Specifications

Operational

- Two, Type K thermocouple inputs - process temperature control and safety limit
- Process temperature output - 10A NO-ARC relay
- Safety limit alarm - 10A relay
- High/low temperature alert - 2A 30V≂(ac/dc), Form A (single pole, normally open contact)
- On-off temperature controller algorithm, upgraded via communications to PID algorithm (min. cycle time 30 seconds)

Standard Molex connectors

- Controllers are integral to the heater and are supplied by Watlow

Power

- Isolated universal power supply 85 to 264V~(ac), 50/60Hz
- Up to 2400 W with 10A switching capability

NO-ARC Relay

- 10A switching
- 4.5 million cycles

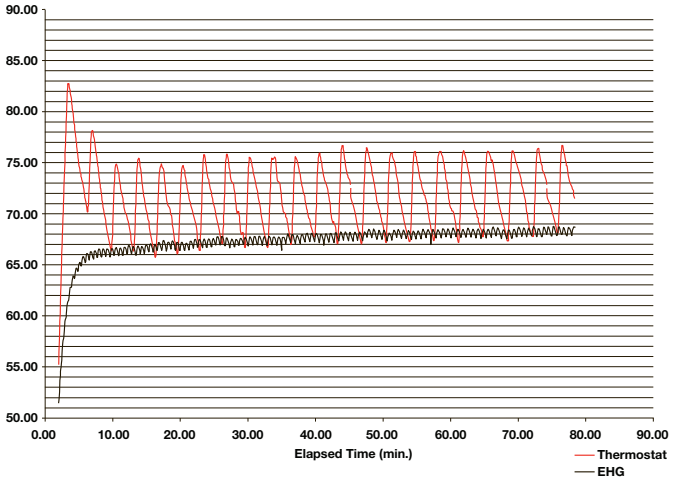
Environmental

- Ambient operating temperature range 32 to 158°F (0 to 70°C)

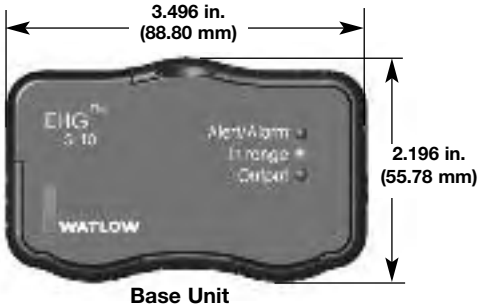
Agency Approvals

- UL® 1998/ C-UL®
- CE 60730
- Semi-S2

SERIES EHG Versus Thermostat (typical application)



Dimensions



Base Unit



Without Optional Module



With Optional Module

Switching Device Comparison Chart

	T-Stat	Solid State Relay	Watlow NO-ARC Relay
Amperage at 77°F (25°C)	10A	10A	10A
Amperage at 158°F (70°C)	10A	De-rate significantly and add heat sink and air cooling	10A
Output device life at 10A	Rated 100,000 at 158°F (70°C)	Greater than 10 million cycles at 77°F (25°C)	Greater than 4.5 million cycles at 158°F (70°C)

SERIES EHG SL10

Technical Information *(Continued)*

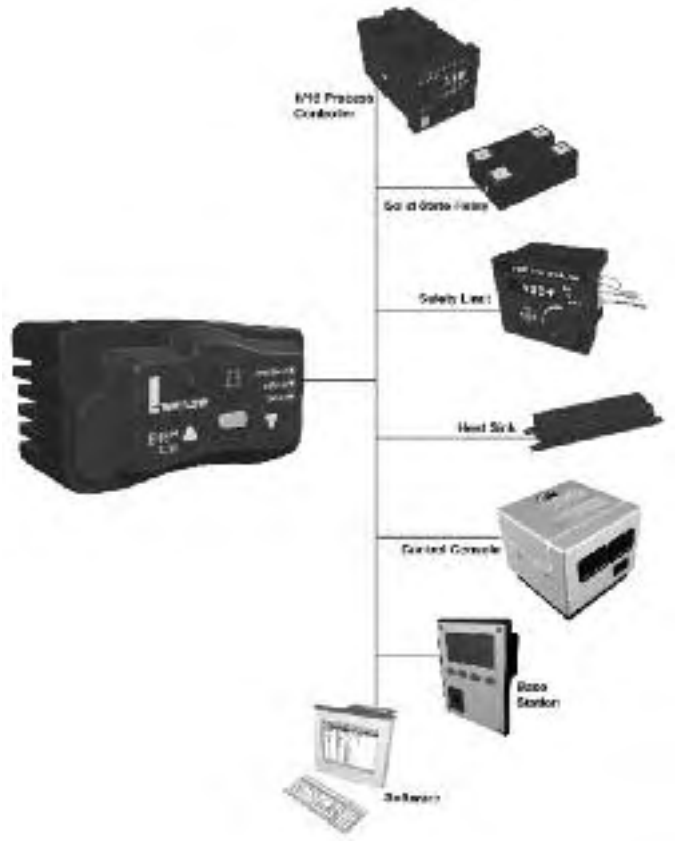
EHG SL10 Software

With the addition of an optional communication module, the EHG SL10 can be managed, monitored and manipulated via software. Change set points, label devices, change tuning parameters, check health status and much more all with the click of a key.

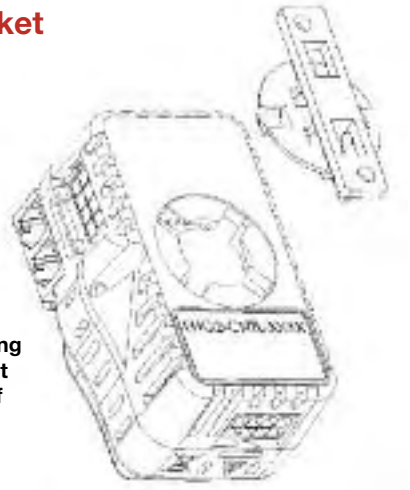




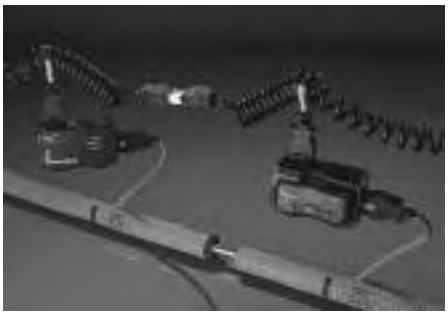
Reduces System Complexity and Cost



Mounting Bracket



The EHG SL10 mounting bracket lets you mount the controller in any of four angles.



The EHG SL10 can be "daisy-chained" for gas line and other assemblies.

SERIES EHG SL10

Technical Information *(Continued)*

Optional Upgrade Modules

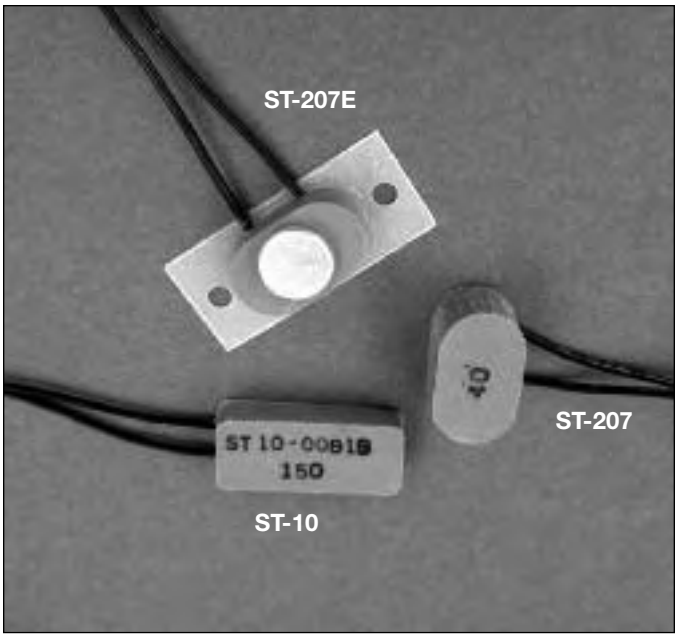
These upgrade modules are easy to install because there is no need to reconfigure, rewire or reorder the base unit. No technician is needed for the installation, which creates a seamless, cost-efficient system that can be upgraded.

	Diagnostics Memory Control Parameters	Ability to Change Temperature Parameters	Field Adjustable Set Point	3-Digit 7-Segment LED Display Illuminated	Diagnostic LED's	User Interface Software	Modbus® RTU Communication	RS 485
Base Unit 	✓	✓			✓			
Optional Display Module 	✓	✓	✓	✓	✓			
Optional Communication Module 	✓	✓	✓		✓	✓	✓	✓
Optional Display and Communication Module 	✓	✓	✓	✓	✓	✓	✓	✓

ST10 and ST207

Temperature Sensors

Watlow® offers several styles of sensors for use with flexible heaters. These sensors are available as preset or adjustable thermostats, thermocouples, thermistors, RTDs or thermal fuses. They can be integrally mounted (encapsulated in silicone rubber) to sense the temperature of either the part or the heater sheath. The thermostats can also be ordered separate from the heater, allowing direct control of your process temperature, if desired.

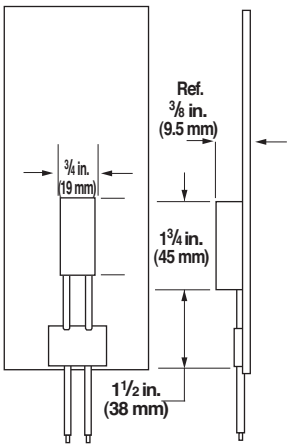


Pre-Set Thermostats

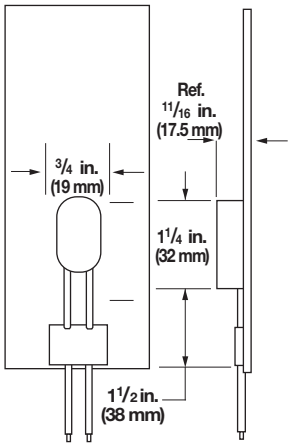
Several styles of non-adjustable, pre-set thermostats are available from Watlow. Thermostats separate from the heater are encapsulated in silicone rubber, and are available with standard 12 in. (305 mm) leads unless otherwise specified.

Thermocouples, thermistors, RTDs and thermal fuses are usually mounted to the heater under a vulcanized protective cap of silicone rubber sheath material. This drawing shows a typical mounting style for a thermocouple.

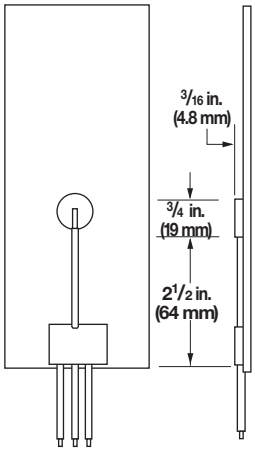
Note: Precise part temperature control with preset thermostats requires prototyping and field testing.



T-10



T-207



Thermocouple

Pre-Set Thermostats (Non-Adjustable)

Thermostat Model	Maximum Watts	Volts AC	Temperature Settings Available °F (°C)	Agency Approvals		
				UR	cUR	VDE
T-10	600/960	120/240	125-300±10 (50-149±5)	yes	yes	yes
T-207	1500	120/240	40/55±8 (4/13±4.4)	yes	yes	yes
	1500	120/240	60/75±8 (16/24±4.4)	yes	yes	yes
	1500	120/240	95/110±8 (35/43±4.4)	yes	yes	yes
	1500	120/240	145/160±8 (63/71±4.4)	yes	yes	yes

Notes:

- When ordering a pre-set thermostat separate from the heater, simply add the prefix **S** to the model number. (Example: ST-10) See next page.
- Snap action preset temperatures on the T-207 are close/open settings.
- T-10 thermostats are manufactured for specific preset temperatures. Available in 25°F increments.
- Other temperature ranges and voltages are available on special order. Minimum quantities apply, contact your Watlow representative before ordering.

ST10 and ST207

Temperature Sensors *(Continued)*

Adjustable Thermostats

The B-200 thermostat features a maximum rating of 1500 watts at 120/240V~(ac). The following temperature ranges are available:

- Model B-200-2: 100 to 500°F (40 to 260°C)
- Model B-200-3: 25 to 330°F (-5 to 165°C)

The B-200 thermostat can be integrally mounted to the heater with a bonded protective cap of silicone rubber sheath material.

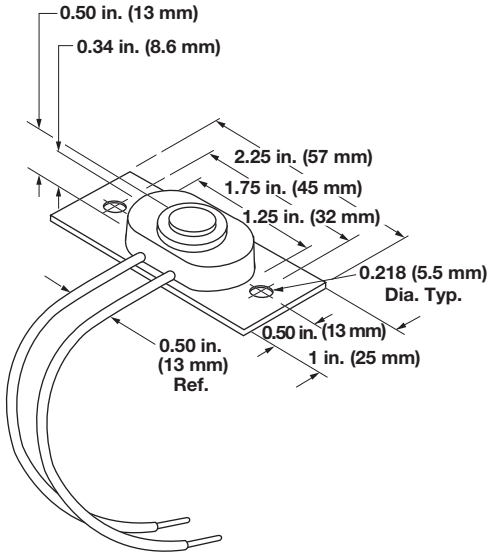
Separate Heater Accessories Available From Stock

Pre-Set Thermostats Separate From Heater

These are offered to allow direct control of your process temperature, so you're not limited to controlling only the heater temperature when using stock heaters. Pre-set thermostats are encapsulated in silicone rubber with standard 12 inch leads.

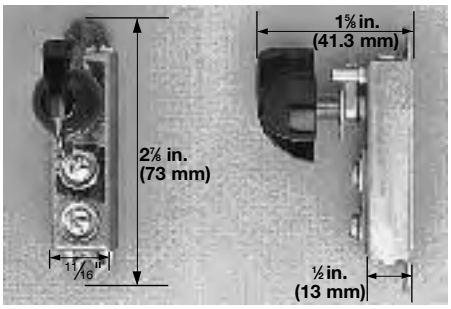
The same temperature ranges, ratings and sizes are available on these thermostats. When ordering, add "S" prefix to the model number to indicate "separate" item. (Examples: ST-10 and ST-207)

Standard leads are 12 in. (305 mm) 18 gauge UL®1180 black leads.



Note: For direct control of air temperature as is required in enclosure heating applications, specify thermostat model number ST-207E. This is a modified ST-207 mounted on 1/32 inch thick G-10 circuit board with the thermostat's metal cap exposed to sense air temperature.

Adjustable Thermostats Separate From Heater



B-200

The Model B-200 adjustable thermostat can be ordered as a separate item. The same model numbers and temperature ranges indicated under *Adjustable Thermostats* are available. When ordering, simply note that you want the **B-200 separate** from the heater.

Bulb and Capillary

Thermostats regulate temperature in non-critical applications. They sense temperature, within a preset range and cycle heaters on and off to maintain the set point.

Thermostats may be mounted inside a terminal enclosure or remote mounted (separate from the heater assembly). If using a remote mounted thermostat, be sure to order the sufficient capillary tube length to permit installation.

All Watlow® thermostats are normally closed circuit and either single-pole, single-throw (SPST) or double pole, single-throw (DPST). They can be used with or without an enclosure.

Thermostat selection should be based on temperature range, capillary tube length and sensor bulb size (diameter/length).

Remote Mount Thermostat Assemblies

Remote mounted thermostat assemblies can be supplied with the following enclosures:

- General purpose (NEMA 1)
- Moisture resistant (NEMA 4)
- Explosion resistant (NEMA 7)
- Explosion/moisture resistant (NEMA 7/4)
- Dust resistant (NEMA 12)

Pilot Light

An optional pilot light gives visual indication whether the power supplied to the heating element(s) is on or off.

To order, please specify suffix code **PL11**.

Thermostat Conversion Kits

Kits are available to convert a heater's general purpose (NEMA 1) terminal enclosure to accept either a single- or double-pole thermostat. The kit contains all the necessary parts to change out the existing terminal enclosure cover and mount the thermostat inside. These are **hardware and wiring kits** only.

Single-pole conversion kit covers 1, 1¼ , 2 and 2½ inch NPT screw plugs. To order, specify code **K492-000-35-(thermostat type)**.

Double-pole conversion kit covers 2 and 2½ inch NPT screw plugs. To order, specify code **K492-000-34-(thermostat type)**.

Celsius Dial Scale

Thermostats are shipped with Fahrenheit (°F) dial scales. If your application requires a Celsius (°C) scale, order the optional dial face.

To order, specify code **CD**. Scale will match thermostat temperature range.



Warning

Do not use thermostats for high-limit sheath protection. Thermostats fail in a closed circuit mode and will not cut power to the heaters. Limit control should be provided by an isolated, redundant sensor and control system of the appropriate type, design and installation.

Thermostats are precalibrated at the factory. No adjustment, other than selecting the desired operating temperature, is required. All wiring should be performed by qualified personnel and comply with the National Electrical Code and other applicable state and local codes.

To help assure you select the correct thermostat, as well as install and wire it properly, we have put together a few helpful hints. Schematics are provided for interconnecting thermostats to single- and three-phase heaters.

Bulb and Capillary

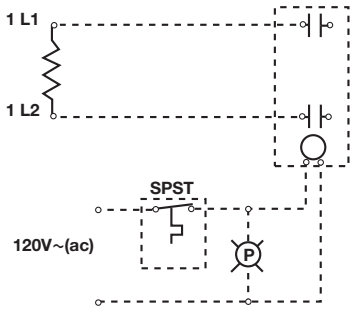
Technical Information

Application Hints

- Locate the thermostat where ambient temperatures do not exceed 150°F (65°C).
- Mount the thermostat in an enclosure that is compatible with the surrounding environment.
- Immerse the entire sensing bulb in the media being heated.
- Make sure the sensing bulb is mounted away from the heating element(s) to negate any undue influence on the sensing bulb's temperature "reading."
- Keep the capillary tube insulated from electrical connections.
- Do not use a thermostat for high-accuracy temperature sensing. Use an appropriate thermocouple, RTD or thermistor and temperature control.
- Do not use thermostats as a primary power switching device. Use a disconnect switch or circuit breaker to cut power when servicing.
- Interconnect the thermostat to the heater only if:
  - The heater has one circuit
  - The heater's ampere draw is lower than the thermostat's rated ampacity at prescribed voltage.
- Interconnect either a single- or double-pole thermostat with a single-phase heater when the supply voltage does not exceed 277V~(ac) for SPST or 480V~(ac) for DPST.
- Only interconnect three-phase delta heaters to DPST thermostats.
- Use a single-pole thermostat for pilot duty where the thermostat is not interconnected with the heater, or heater exceeds the volt/amp rating.

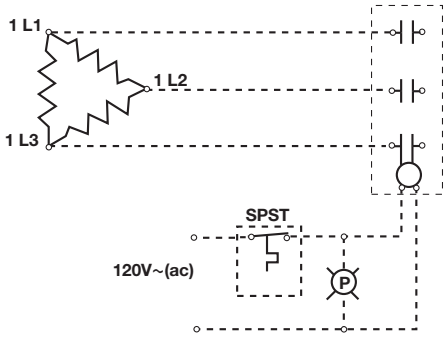
Pilot Duty Wiring

SPST, 1-phase

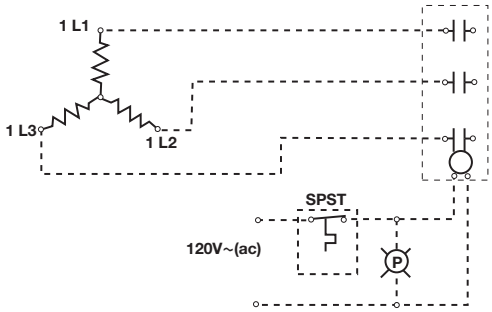


Pilot Duty Wiring *(Continued)*

SPST, 3-phase delta

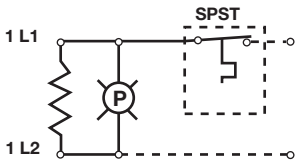


SPST, 3-phase wye

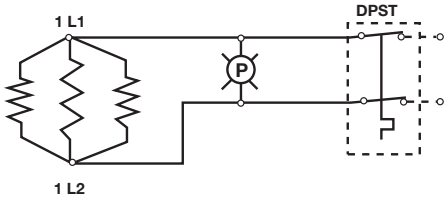


Interconnected Wiring

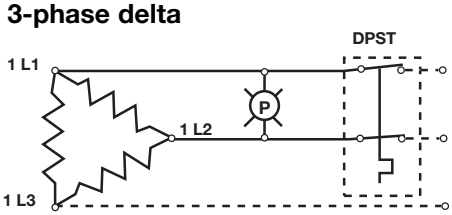
SPST, 1-phase



DPST, 1-phase



DPST, 3-phase delta

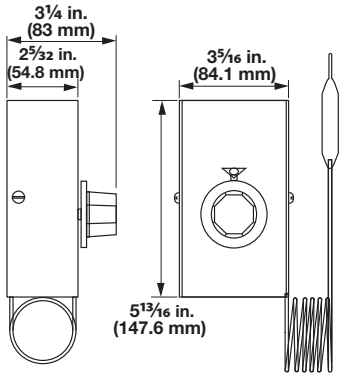


Bulb and Capillary

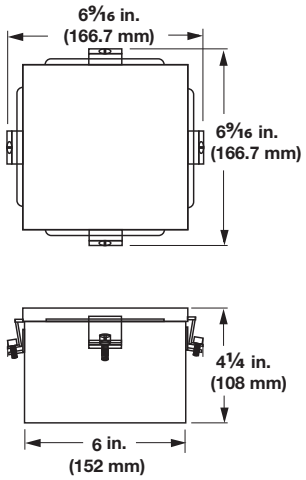
Technical Information *(Continued)*

Thermostats with Enclosures

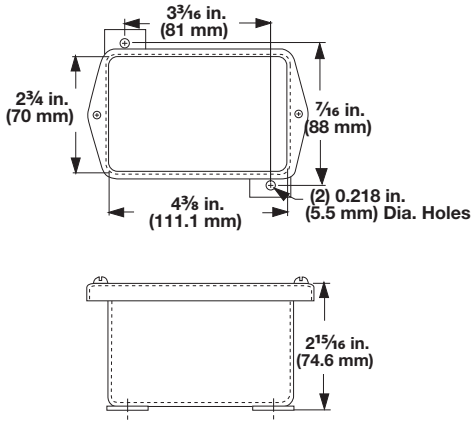
NEMA 1 Single- and Double-Pole



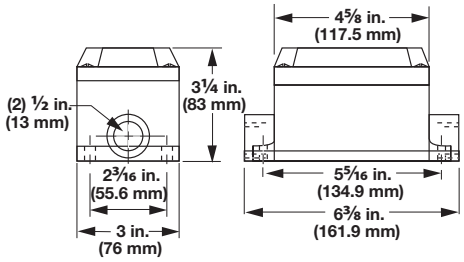
NEMA 4 and 12 Double-Pole



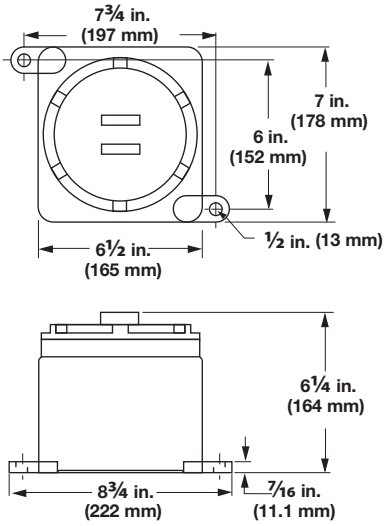
NEMA 4 and 12 Single-Pole



NEMA 7 Single-Pole



NEMA 7 Double-Pole



Cross-Reference For Replacement Thermostat	Order With This Number
202-0-21-1 (small knob)	**1**
202-0-21-2 (small knob)	**202-0-21-2MB**
202-0-21-4	**2**
202-0-21-5	**2A**
202-0-21-3	**3**
202-0-21-8 (small knob)	**202-0-21-8M**
202-0-21-6	**3A**
202-0-4-2	**4**
202-0-4-6	**5**
202-0-4-17	**5A**
202-0-4-5	**7**
202-0-4-16	**7A**
202-0-3-1	**8**
202-0-3-3	**9**
202-0-1-13	**10**
202-0-29-2	**11**
202-0-41-2 (small knob)	**12A**

If you only have the thermostat code number use this cross-reference chart.

Bulb and Capillary

Technical Information (Continued)

Thermostat

Control Mode	Type	Temperature Range °F	(°C)	Differential °F	(°C)	Ampacity @ Line Voltage 120	240	277	480	Bulb Diameter in.	(mm)	Bulb Length in.	(mm)	Capillary Length in.	(mm)	Terminal Type	Code No.	Est. Net Wt. lbs	(kg)
On-off Temp Control	Single-Pole Single-Throw (SPST)	30-110	(0-40)	8	(0)	25	25	22	—	0.250	(6)	4¾	(121)	18	(455)		**1**	1	(0.4)
		30-250	(0-120)	15	(8)	25	25	22	—	0.250	(6)	3¼	(85)	18	(455)	#12 AWG	**2**	1	(0.4)
		30-250	(0-120)	15	(8)	25	25	22	—	0.250	(6)	3¼	(85)	84	(2135)	Stranded	**2A**	1	(0.4)
		175-550	(80-290)	26	(14)	25	25	22	—	0.250	(6)	3⅜	(85)	18	(455)	Leads	**3** ①	1	(0.4)
		175-550	(80-290)	26	(14)	25	25	22	—	0.250	(6)	2¾	(70)	84	(2135)		**3A** ①	1	(0.4)
		300-700	(150-350)	12	(7)	25	25	—	—	0.375	(10)	3¾	(95)	60	(1525)		**10**	1	(0.4)
		60-160	(15-70)	19	(10)	30	30	30	20	0.250	(6)	4⅜	(110)	14	(355)	#8-32	**12A**	1	(0.4)
	Double-Pole Single-Throw (DPST)	30-110	(0-40)	12	(7)	30	30	30	10	0.375	(10)	6¼	(160)	36	(915)		**4**	2	(0.9)
		60-250	(15-120)	12	(7)	30	30	30	10	0.375	(10)	4½	(115)	48	(1220)	#10-32	**5**	2	(0.9)
		60-250	(15-120)	12	(7)	30	30	30	10	0.250	(6)	6½	(165)	48	(1220)	Screw Lug	**5A**	2	(0.9)
		100-550	(40-290)	22	(12)	30	30	30	10	0.375	(10)	3⅜	(100)	48	(1220)		**7**	2	(0.9)
		100-550	(40-290)	22	(12)	30	30	30	10	0.250	(6)	7 1/16	(179)	48	(1220)		**7A**	2	(0.9)
On-off with Manual Reset	(DPST)	60-250	(15-120)	12	(7)	30	30	30	—	0.250	(6)	6½	(165)	48	(1220)	#10-32	**8**	2	(0.9)
		100-550	(40-290)	22	(12)	30	30	30	—	0.188	(8)	12	(305)	48	(1220)	Screw Lug	**9**	2	(0.9)
	(SPST)	350 ⑨	(180)	—		30	30	20	—	0.250	(6)	3½	(90)	36	(915)	#10-32 Screw Lug	**11**	1	(0.4)

RAPID SHIP

- **RS** - Same day shipment up to 15 pieces

① UL® recognized only
⑨ Fixed temperature setting

Ordering Information

To order, complete the code number to the right with the information below:

Example: 2 W LTB

Thermostat Code Number
See stock chart above

Enclosure (Remote Mount Only)
S = General purpose (NEMA 1)
W = Moisture resistant (NEMA 4)
E = Explosion resistant (NEMA 7)
E/W = Explosion/moisture resistant (NEMA 7/4)
D = Dust resistant (NEMA 12)

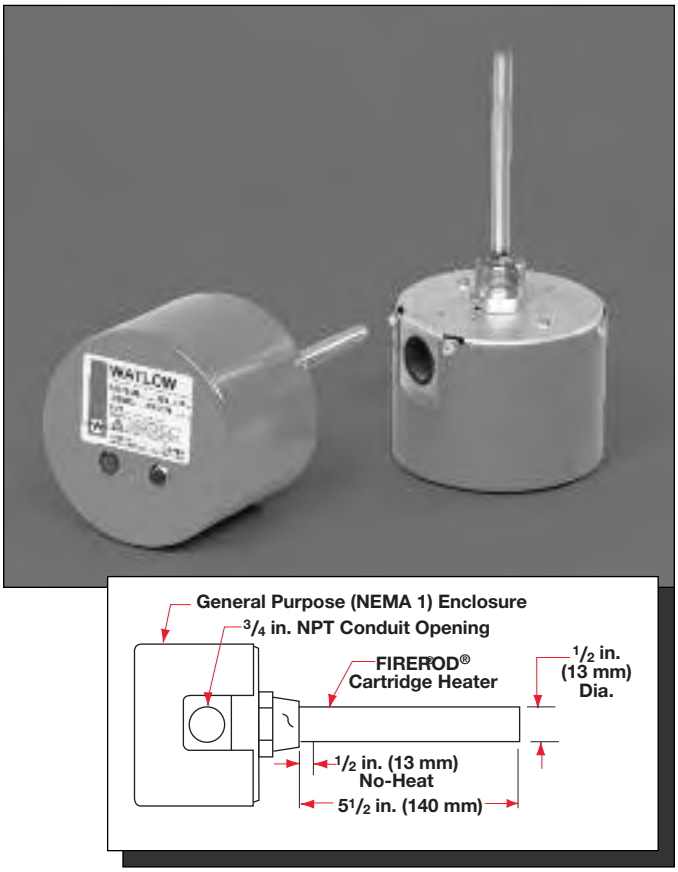
Options
CD = Celsius dial scale
CB = Chrome bezel
LTB = Liquid-tight brass fitting (⅜ in. - 18 NPT)
PL11 = Pilot light

Low Liquid Level Sensors

The Watlow® low liquid level sensor can protect a heating system by sensing when a liquid drops below a predetermined level. This is accomplished by locating the sensor at the minimum desired liquid level in the tank or vessel. The sensor's ASTM Type J thermocouple output can be connected to a variety of controls, alarms and limit protection devices.

To provide an additional margin of protection, the Type J thermocouple makes this low liquid level sensor respond considerably faster than conventional capillary bulb thermostats.

To order, specify code number **BCN5J1SJ**.



Application Hints

- Only use sensor in **non-flammable** liquids that are compatible with the Incoloy® sheath and 304 stainless steel screw plug.
- Application should tolerate sheath temperature at limit set point.
- The time delay between the low liquid level condition on-set, and the sensor's ability to signal the control device should be adequate to protect the heater(s). See *Installation and Maintenance Instructions* for details.

Controller Recommendation

- Use Watlow Safety Limit Temperature Controller SERIES 142 (Code number **142A-3605-1300**). This controller features compact sub-panel mounting and is sealed against ambient environment. UL® recognized for limit protection (UL 991, "Tests For Safety-Related Controls Employing Solid State Devices").

Specifications

Screw plug: 1 in. (25 mm) NPT

Plug material: 304 stainless steel

Sheath material: Incoloy®

Watt density: 13 W/in² (2 W/cm²)

Watts: 100

Volts: 120V~(ac)

Immersed length: 5½ in. (140 mm)

Thermocouple: ASTM Type J

Est. ship. wt.: 2 lbs (1 kg)

Availability

Stock: Same day shipment

Modified Stock①: Five to seven working days

Made-to-Order: Four to six weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

① Stock units with catalog options.

Protective Wells

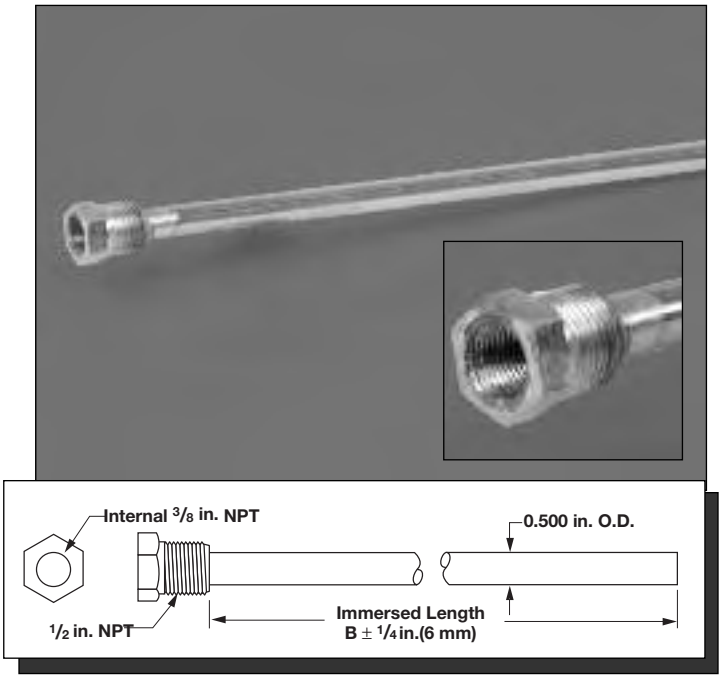
Protective wells isolate and protect thermostat bulbs and other temperature sensors (thermocouples, RTDs or thermistors). They allow inserting the sensing element sufficiently into the media being heated without being damaged.

Steel or stainless steel protective wells are available in three lengths. They are supplied with ½ inch NPT mounting and ⅜ inch-18 NPT internal thread for mating to a liquid-tight bushing (LTB).

All units are stock. To order, specify the appropriate code number from the stock table.

Protective Wells

Plug and Thermowell Material	Immersed B Dimension in.	(mm)	Code Number	Est. Ship. Wt. lb	(kg)
Steel	12	(305)	**PWS12**	1	(0.5)
	24	(610)	**PWS24**	2	(1.0)
	36	(915)	**PWS36**	2	(1.0)
Stainless Steel	12	(305)	**PWSS12**	1	(0.5)
	24	(610)	**PWSS24**	2	(1.0)
	36	(915)	**PWSS36**	2	(1.0)



Availability

Stock: Same day shipment

Modified Stock①: Five to seven working days

Made-to-Order: Three weeks

Options, complexity and quantity may affect availability and lead times. Contact your Watlow representative.

① Stock units with catalog options.

Reference Data

Reference Data

Power Calculations 657

Equations 663

Wattage Requirements 665

Tubular Elements and Assembly Selection Guide.....667

Power Calculations

Calculations for Required Heat Energy

The total heat energy (kWH or BTU) required to satisfy the system needs will be either of the two values shown below depending on which calculated result is larger.

A. Heat required for start up

B. Heat required to maintain the desired temperature

The power required (kW) will be the heat energy value (kWH) divided by the required start up or working cycle time. The kW rating of the heater will be the greater of these values plus a safety factor.

The calculation of start up and operating requirements consist of several distinct parts that are best handled separately. However, a short method can also be used for a quick estimate of heat energy required. Both methods are defined and then evaluated using the following formulas and methods:

Short Method

Start-up watts = A + C + ⅔L + safety factor

Operating watts = B + D + L + safety factor

Safety factor is normally 10 to 35% based on application.

A = Watts required to raise the temperature of material and equipment to the operating point, within the time desired

B = Watts required to maintain temperature of the material during the working cycle

C = Watts required to melt or vaporize load material during start-up period

D = Watts required to melt or vaporize load material during working cycle

L = Watts lost from surfaces by:

- Conduction-use equation to the right
- Radiation-use heat loss curves
- Convection-use heat loss curves

Equation for A and B
(Absorbed watts-raising temperature)

$$\frac{\text{lbs} \times (\text{BTU}/[\text{lb} \times °\text{F}]) \times °\text{F}}{\text{hrs} \times 3.412}$$

- lbs = weight of material
- (BTU/[lb x °F]) = specific heat of material
- °F = temperature rise
- hrs = start-up or cycle time

Equation for C and D
(Absorbed watts-melting or vaporizing)

$$\frac{\text{lbs} \times \text{BTU/lb}}{\text{hrs} \times 3.412}$$

- lbs = weight of material
- BTU/lb = heat of fusion or vaporization
- hrs = start-up or cycle time

Equation for L
(Lost conducted watts)

$$\frac{\left(\frac{\text{BTU} \times \text{in.}}{\text{ft}^2 \times °\text{F} \times \text{hr}}\right) \times \text{ft}^2 \times °\text{F}}{\text{in} \times 3.412}$$

- BTU x in. over ft^2 x °F x hr = thermal conductivity of material or insulation
- ft^2 = surface area
- °F = temperature differential to ambient

Power Calculations

Conduction and Convection Heating

Absorbed Energy, Heat Required to Raise the Temperature of a Material

Because substances all heat differently, different amounts of heat are required in making a temperature change. The specific heat capacity of a substance is the quantity of heat needed to raise the temperature of a unit quantity of the substance by one degree. Calling the amount of heat added **Q**, which will cause a change in temperature Δ**T** to a weight of substance **W**, at a specific heat of material $\mathbf{C_p}$, then $Q = w \times C_p \times \Delta T$.

Since all calculations are in watts, an additional conversion of 3.412 BTU = 1 Wh is introduced yielding:

Equation 1

$$Q_A \text{ or } Q_B = \frac{w \times C_p \times \Delta T}{3.412}$$

Q_A = heat required to raise temperature of materials during heat-up (Wh)

Q_B = heat required to raise temperature of materials processed in working cycle (Wh)

w = weight of material (lb)

C_p = specific heat of material (BTU/lb x °F)

ΔT = temperature rise of material ($T_{Final} - T_{Initial}$)(°F)

This equation should be applied to all materials absorbing heat in the application. Heated media, work being processed, vessels, racks, belts and ventilation air should be included.

Example: How much heat energy is needed to change the temperature of 50 lbs of copper from 10 to 70°F?

$$Q = w \times C_p \times \Delta T$$

$$= \frac{(50 \text{ lbs}) \times (0.10 \text{ BTU/[lb x °F]}) \times (60°F)}{3.412} = 88 \text{ (Wh)}$$

Heat Required to Melt or Vaporize a Material

In considering adding heat to a substance, it is also necessary to anticipate changes in state that might occur during this heating such as melting and vaporizing. The heat needed to melt a material is known as the latent heat of fusion and represented by $\mathbf{H_f}$. Another state change is involved in vaporization and condensation. The latent heat of vaporization $\mathbf{H_v}$ of the substance is the energy required to change a substance from a liquid to a vapor. This same amount of energy is released as the vapor condenses back to a liquid.

Equation 2

$$Q_C \text{ or } Q_D = \frac{w \times H_f}{3.412} \quad \text{OR} \quad \frac{w \times H_v}{3.412}$$

Q_C = heat required to melt/vaporize materials during heat-up (Wh)

Q_D = heat required to melt/vaporize materials processed in working cycle (Wh)

w = weight of material (lb)

H_f = latent heat of fusion (BTU/lb)

H_v = latent heat of vaporization (BTU/lb)

Example: How much energy is required to melt 50 lbs of lead?

$$Q = w \times H_f$$

$$= \frac{(50 \text{ lbs}) \times (9.8 \text{ BTU/lb})}{3.412 \text{ BTU/(Wh)}} = 144 \text{ (Wh)}$$

Changing state (melting and vaporizing) is a constant temperature process. The $\mathbf{C_p}$ value (from Equation 1) of a material also changes with a change in state. Separate calculations are thus required using Equation 1 for the material below and above the phase change temperature.

Power Calculations

Conduction and Convection Heating

Conduction Heat Losses

Heat transfer by conduction is the contact exchange of heat from one body at a higher temperature to another body at a lower temperature, or between portions of the same body at different temperatures.

Equation 3A—Heat Required to Replace Conduction Losses

$$Q_{L1} = \frac{k \times A \times \Delta T \times t_e}{3.412 \times L}$$

Q_{L1} = conduction heat losses (Wh)

k = thermal conductivity (BTU x in./[ft² x °F x hour])

A = heat transfer surface area (ft²)

L = thickness of material (in.)

ΔT = temperature difference across material (T_2-T_1) °F

t_e = exposure time (hr)

This expression can be used to calculate losses through insulated walls of containers or other plane surfaces where the temperature of both surfaces can be determined or estimated.

Convection Heat Losses

Convection is a special case of conduction. Convection is defined as the transfer of heat from a high temperature region in a gas or liquid as a result of movement of the masses of the fluid.

Equation 3B—Convection Losses

$$Q_{L2} = A \times F_{SL} \times C_F$$

Q_{L2} = convection heat losses (Wh)

A = surface area (in²)

F_{SL} = vertical surface convection loss factor (W/in²) evaluated at surface temperature

C_F = surface orientation factor

heated surface faces up horizontally = 1.29
vertical = 1.00
heated surface faces down horizontally = 0.63

Radiation Heat Losses

Radiation losses are not dependent on orientation of the surface. Emissivity is used to adjust for a material's ability to radiate heat energy.

Equation 3C—Radiation Losses

$$Q_{L3} = A \times F_{SL} \times e$$

Q_{L3} = radiation heat losses (Wh)

A = surface area (in²)

F_{SL} = blackbody radiation loss factor at surface temperature (W/in²)

e = emissivity correction factor of material surface

Example:

We find that a blackbody radiator (perfect radiator) at 500°F, has heat losses of 2.5 W/in². Polished aluminum, in contrast, (e = 0.09) only has heat losses of 0.22 W/in² at the same temperature (2.5 W/in² • 0.09 = 0.22 W/in²).

Combined Convection and Radiation Heat Losses

Some curves combine both radiation and convection losses. This saves you from having to use both Equations 3B and 3C. If only the convection component is required, then the radiation component must be determined separately and subtracted from the combined curve.

Equation 3D—Combined Convection and Radiation Heat Losses

$$Q_{L4} = A \times F_{SL}$$

Q_{L4} = surface heat losses combined convection and radiation (Wh)

A = surface area (in²)

F_{SL} = combined surface loss factor at surface temperature (W/in²)

This equation assumes a constant surface temperature.

Power Calculations

Conduction and Convection Heating

Total Heat Losses

The total conduction, convection and radiation heat losses are summed together to allow for all losses in the power equations. Depending on the application, heat losses may make up only a small fraction of total power required or it may be the largest portion of the total. Therefore, do not ignore heat losses unless previous experience tells you it is alright to do.

Equation 3E—Total Losses

$Q_L = Q_{L1} + Q_{L2} + Q_{L3}$ If convection and radiation losses are calculated separately. (Surfaces are not uniformly insulated and losses must be calculated separately.)

OR

$Q_L = Q_{L1} + Q_{L4}$ If combined radiation and convection curves are used. (Pipes, ducts, uniformly insulated bodies.)

Start-Up and Operating Power Required

Both of these equations estimate required energy and convert it to power. Since power (watts) specifies an energy rate, we can use power to select electric heater requirements. Both the start-up power and the operating power must be analyzed before heater selection can take place.

Equation 4—Start-Up Power (Watts)

$$P_s = \left[\frac{Q_A + Q_C}{t_s} \frac{2}{3} (Q_L)\right] \times (1 + S.F.)$$

Q_A = heat absorbed by materials during heat-up (Wh)

Q_C = latent heat absorbed during heat-up (Wh)

Q_L = conduction, convection, radiation losses (Wh)

S.F. = safety factor

t_s = start-up (heat-up) time required (hr)

During start up of a system the losses are zero, and rise to 100% at process temperature. A good approximation of actual losses is obtained when heat losses (Q_L) are multiplied by ⅔ .

Equation 5—Operating Power (Watts)

$$P_o = \left[\frac{Q_B + Q_D}{t_c} + (Q_L)\right] \times (1 + S.F.)$$

Q_B = heat absorbed by processed materials in working cycle (Wh)

Q_D = latent heat absorbed by materials heated in working cycle (Wh)

Q_L = conduction, convection, radiation losses (Wh)

S.F. = safety factor

t_c = cycle time required (hr)

Power Calculations

Conduction and Convection Heating

Radiant Heating

When the primary mode of heat transfer is radiation, we add a step after Equation 5.

Equation 6 is used to calculate the net radiant heat transfer between two bodies. We use this to calculate either the radiant heater temperature required or (if we know the heater temperature, but not the power required) the maximum power which can be transfered to the load.

Equation 6—Radiation Heat Transfer Between Infinite Size Parallel Surfaces

$$\frac{P_R}{A} = \frac{S \quad (T^4_1 - T^4_2) \quad \left(\frac{1}{e_f}\right) \quad F}{(144\ in^2/ft^2) \quad (3.412\ BTU/Wh)}$$

P_R = power absorbed by the load (watts) - from equation 4 or 5

A = area of heater (in^2) - known or assumed

S = Stephan Boltzman constant
= $0.1714 \cdot 10^{-8}$ (BTU/hr. sq. ft. °R^4)

T_1(°R) = emitter temperature (°F + 460)

T_2(°R) = load temperature (°F + 460)

e_f = emissivity correction factor - see Emissivity Correction Factor information to the right

F = shape factor (0 to 1.0) - see Shape Factor for Radiant Application graph to the right

Emissivity Correction Factor (e_f)

$$e_f = \frac{1}{e_S} + \frac{1}{e_L} - 1$$ plane surfaces

$$e_f = \frac{1}{e_S} + \frac{D_S}{D_L}\left(\frac{1}{e_L} - 1\right)$$ concentric cylinders inner radiating outward

$$e_f = \frac{1}{e_S} + \left(\frac{D_S}{D_L} \times \frac{1}{e_L}\right) - 1$$ concentric cylinders outer radiating inward

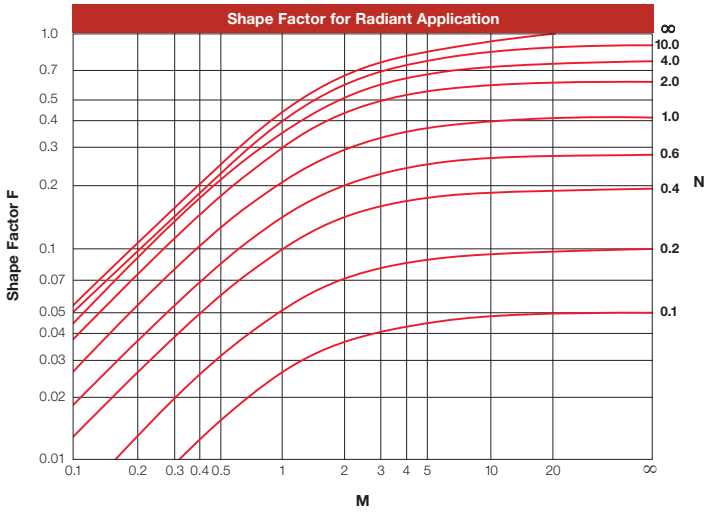
e_S = heater emissivity (from material emissivity tables)

e_L = load emissivity (from material emissivity tables)

D_S = heater diameter

D_L = load diameter

Shape Factor for Radiant Application



For Two Facing Panels:

$$\mathbf{N} = \left(\frac{\text{Heated Length}}{\text{Distance to Material}}\right)$$

$$\mathbf{M} = \left(\frac{\text{Heated Width}}{\text{Distance to Material}}\right)$$

Power Calculations

Conduction and Convection Heating

Power Evaluation

After calculating the start up and operating power requirements, a comparison must be made and various options evaluated.

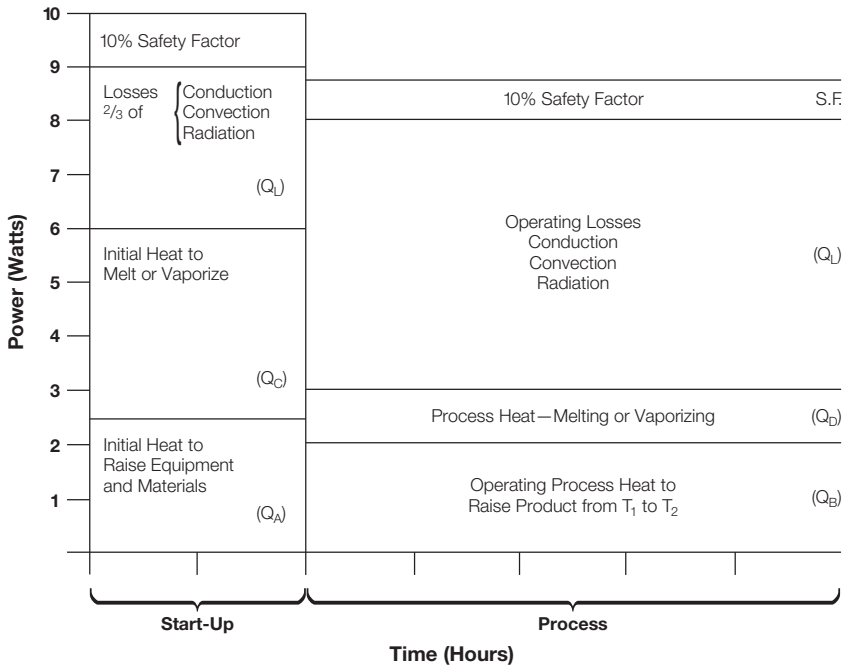
Shown in the graph below are the start up and operating watts displayed in a graphic format to help you see how power requirements add up.

With this graphic aid in mind, the following evaluations are possible:

- Compare start up watts to operating watts.
- Evaluate effects of lengthening start-up time such that start-up watts equals operating watts (use timer to start system before shift).
- Recognize that more heating capacity exists than is being utilized. (A short start-up time requirement needs more wattage than the process in wattage.)
- Identify where most energy is going and redesign or add insulation to reduce wattage requirements.

Having considered the entire system, a reevaluation of start-up time, production capacity and insulating methods should be made.

Comparison of Start Up and Operating Power Requirements



Equations

Ohm's Law

Volts

Volts = $\sqrt{\text{Watts x Ohms}}$

Volts = $\frac{\text{Watts}}{\text{Amperes}}$

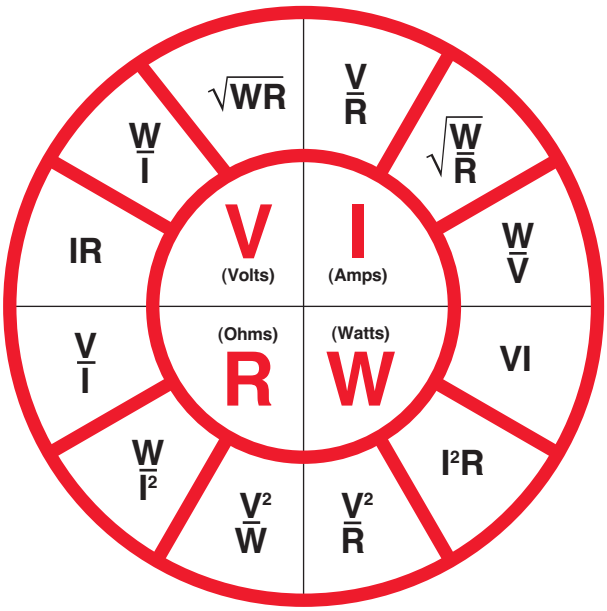
Volts = Amperes x Ohms

Ohms

Ohms = $\frac{\text{Volts}}{\text{Amperes}}$

Ohms = $\frac{\text{Volts}^2}{\text{Watts}}$

Ohms = $\frac{\text{Watts}}{\text{Amperes}^2}$



Amperes

Amperes = $\frac{\text{Volts}}{\text{Ohms}}$

Amperes = $\frac{\text{Watts}}{\text{Volts}}$

Amperes = $\sqrt{\frac{\text{Watts}}{\text{Ohms}}}$

Watts

Watts = $\frac{\text{Volts}^2}{\text{Ohms}}$

Watts = Amperes^2 x Ohms

Watts = Volts x Amperes

Wattage varies directly as ratio of voltages squared

$$W_2 = W_1 \times \left(\frac{V_2}{V_1}\right)^2$$

3 Phase Amperes = $\frac{\text{Total Watts}}{\text{Volts x 1.732}}$

Equations

Typical 3-Phase Wiring Diagrams and Equations for Resistive Heaters

Definitions

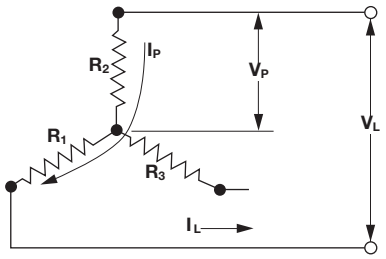
For Both Wye and Delta (Balanced Loads)

V_P = Phase voltage
V_L = Line voltage
I_P = Phase current
I_L = Line current
R = $R_1 = R_2 = R_3$ = Resistance of each branch
W = Wattage

Wye and Delta Equivalents

$W_{DELTA} = 3\ W_{WYE}$
$W_{ODELTA} = \frac{2}{3}\ W_{DELTA}$
$W_{OWYE} = \frac{1}{2}\ W_{WYE}$

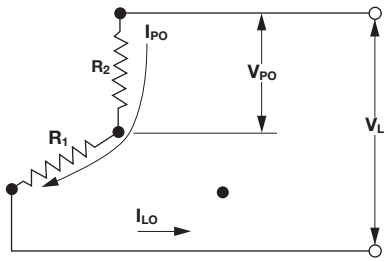
3-Phase Wye (Balanced Load)



Equations For Wye Only

$I_P = I_L$
$V_P = V_L/1.73$
$W_{WYE} = V_L^2/R = 3(V_P^2)/R$
$W_{WYE} = 1.73\ V_L I_L$

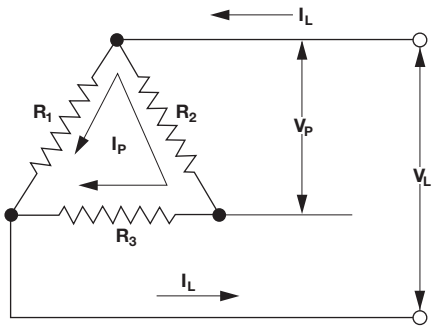
3-Phase Open Wye (No Neutral)



Equations For Open Wye Only

$I_{PO} = I_{LO}$
$V_{PO} = V_L/2$
$W_{0WYE} = {}^1/_2\ (V_L^2/R)$
$W_{0WYE} = 2\ (V_{PO}^2/R)$
$W_{0WYE} = V_L I_{LO}$

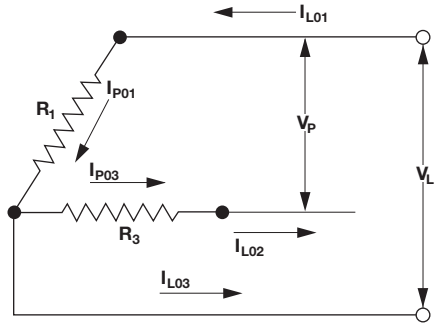
3-Phase Delta (Balanced Load)



Equations For Delta Only

$I_P = I_L/1.73$
$V_P = V_L$
$W_{DELTA} = 3(V_L^2)/R$
$W_{DELTA} = 1.73\ V_L I_L$

3-Phase Open Delta



Equations For Open Delta Only

$V_P = V_L$
$I_{PO1} = I_{PO3} = I_{LO2}$
$I_{LO3} = 1.73\ I_{PO1}$
$W_{0DELTA} = 2\ (V_L^2/R)$

Wattage Requirements

The following equations can be used to make quick estimates of wattage requirements.

For Steel

Use equation:

$$kW = \frac{\text{kilograms} \times \text{temperature rise (°C)}}{5040 \times \text{heat-up time (hrs.)}}$$

OR

$$kW = \frac{\text{pounds} \times \text{temperature rise (°F)}}{20{,}000 \times \text{heat-up time (hrs.)}}$$

For Heating Water in Tanks

Use equation:

$$kW = \frac{\text{gallons} \times \text{temperature rise (°F)}}{375 \times \text{heat-up time (hrs)}}$$

OR

$$kW = \frac{\text{liters} \times \text{temperature rise (°C)}}{790 \times \text{heat-up time (hrs)}}$$

1 cu. ft. = 7.49 gallons

For Air

Use equation:

$$kW = \frac{\text{CFM}^{**①} \times \text{temperature rise (°F)}}{3000}$$

OR

$$kW = \frac{\text{cubic meters/min}^{①} \times \text{temperature rise (°C)}}{47}$$

For Oil

Use equation:

$$kW = \frac{\text{gallons} \times \text{temperature rise (°F)}}{800 \times \text{heat-up time (hrs.)}}$$

OR

$$kW = \frac{\text{liters} \times \text{temperature rise (°C)}}{1680 \times \text{heat-up time (hrs.)}}$$

1 cu. ft. = 7.49 gallons

For Heating Flowing Water

Use equation:

$$kW = GPM^{*} \times \text{temperature rise (°F)} \times 0.16$$

OR

$$kW = \text{liters/min.} \times \text{temperature rise (°C)} \times 0.076$$

For Compressed Air

Use equation:

$$kW = \frac{\text{CFM}^{**②} \times \text{density}^{②} \times \text{temperature rise (°F)}}{228}$$

OR

$$kW = \frac{\text{cubic meters/min}^{②} \times \text{temperature rise (°C)} \times \text{density (kg/m}^{3})^{②}}{57.5}$$

* Gallons per minute
** Cubic feet per minute
① Measured at normal temperature and pressure
② Measured at heater system inlet temperature and pressure

Wattage Requirements

Kilowatt-Hours to Superheat Steam

1. Plot points on lines **P**, **Q** and **S**. **P** represents the inlet temperature (and saturation pressure) of the system.

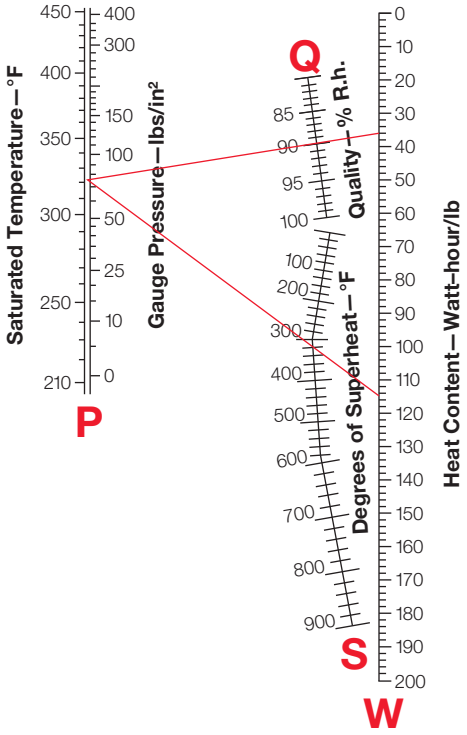
   Q represents the liquid content of the water vapor.

   S indicates the outlet temperature minus the saturated temperature.

   W indicates the heat content of the water vapor.
2. Draw a straight line from **P** through **Q** to **W**. Read W_1.
3. Draw a straight line from **P** through **S** to **W**. Read W_2.
4. Required watts = Weight (lbs.) of steam/hour x (W_2-W_1)

Watt density is critical. Review temperature and velocity prior to heater selection.

Reference is 80 percent quality at 20 psig.



Tubular Elements and Assembly Selection Guide

Watlow® tubular elements and assemblies are primarily used for direct immersion in water, oils, viscous materials, solvents, process solutions and molten materials as well as air and gases.

Additionally, round and flat surface tubular elements (WATROD and FIREBAR® heaters respectively) can be used for surface heating.

WATROD and FIREBAR heating elements may be purchased separately, or fabricated into process heating assemblies, including:

- Screw plug
- Flange
- Circulation
- Booster
- Engine preheater
- Over-the-side
- Vertical loop
- Drum
- Duct

Both elements and assemblies are available from stock. They can be configured with a variety of watt and volt ratings, terminations, sheath materials and mounting options to satisfy the most demanding applications.

If our stock products do not meet your application needs, Watlow can custom engineer the optimum heater.

Performance Capabilities

- Sheath temperatures up to 1800°F (983°C)
- Assembly wattages to 3 megawatts
- Process assembly ratings up to 3000psi
- Watt densities up to 120 W/in^2 (18.6 W/cm^2)
- Enhanced performance beyond these specifications is available upon request
- Watlow can design thermal systems to meet specific performance criteria. Contact your local Watlow representative for assistance.



Features and Benefits

36 standard bend formations

- Enables designing of the heating element around available space to maximize heating efficiency

FIREBAR flat surface geometry

- Enhances heat transfer in both immersion and air applications and also surface heating
- Increases surface area per linear inch allowing heaters to run cooler in viscous materials

Wattages from 95 watts to 3 megawatts (on individual elements and assemblies respectively)

- Makes tubular heaters one of the most versatile electric heating sources available

Applications

- Liquids
- Air
- Gases
- Molten materials
- Contact surface heating
- Radiant surface heating

Tubular Elements and Assembly Selection Guide

The following two charts will help you select an appropriate heater based on your application and watt density restrictions. These charts are application driven. The total wattage required by your application should be known before selecting a specific heater type(s) from the stock tables. If your required wattage is not known, please contact your Watlow representative.

Once the heater type has been identified, turn to the appropriate product section for information on the element or assembly.

Element and Assembly Selection Guide

To identify the tubular heater type best suited to your application, consult the *Element and Assembly Selection Guide*.

In most cases Watlow recommends using single tubular heating elements for low kilowatt applications.

Assemblies are better suited for large kilowatt applications to heat liquids, air or gases.

When selecting a heater according to watt density, be sure to consider the following:

- Liquid viscosity at start up and at process temperature
- Operating temperature
- Chemical composition

Under the "**Heating Method**" column in the *Element and Assembly Selection Guide* locate the method that applies to your application to find the recommended "Heater Type."

After identifying the heater type(s) suitable for your application, refer to the *Supplemental Applications Chart* for further application data. This chart will assist you in selecting the appropriate watt density and sheath material for your specific application. It also presents the performance characteristics for both WATROD and FIREBAR elements.

Element and Assembly Selection Guide

Application	Heating Method	Heater Type
Liquids:		
Acids	Direct immersion (circulating/non-circulating)	FIREBAR, WATROD, screw plug, flange, over-the-side, vertical loop, and pipe insert
Caustic soda 12% concentrate 10% concentrate 75% concentrate	Direct immersion (circulating/non-circulating)	WATROD, screw plug, square flange, flange, over-the-side, vertical loop, circulation, and pipe insert
Degreasing solutions	Direct immersion (circulating/non-circulating)	FIREBAR, WATROD, screw plug, square flange, flange, over-the-side, and pipe insert
Electroplating	Direct immersion (circulating/non-circulating)	FIREBAR, WATROD, screw plug, square flange, flange, over-the-side, drum, vertical loop and pipe insert
Ethylene glycol 50% concentrate 100% concentrate	Direct immersion (circulating/non-circulating)	FIREBAR, WATROD, screw plug, flange, over-the-side, circulation, booster, and engine preheater
Oils Asphalt Fuel oils Light grades 1 and 2 Medium grades 4 and 5 Heavy grade 6 and Bunker C Heat transfer Lubricating SAE 10, 20, 30 SAE 40, 50 API STD 614 Vegetable (cooking)	Direct immersion (circulating/non-circulating)	FIREBAR, WATROD, screw plug, square flange, flange, over-the-side, drum, vertical loop, circulation, booster, and pipe insert
Paraffin or wax	Direct immersion (circulating/non-circulating)	FIREBAR, WATROD, screw plug, square flange, flange, over-the-side, drum, and pipe insert

CONTINUED

Tubular Elements and Assembly Selection Guide

Element and Assembly Selection Guide *(Continued)*

Application	Heating Method	Heater Type
Water Clean Deionized Demineralized Potable Process	Direct immersion (circulating/non-circulating)	FIREBAR (non-process water only) WATROD, screw plug, screw plug with control assembly, square flange, flange, over-the-side, drum, vertical loop, circulation, booster, engine preheater and pipe insert
Air:	Direct (forced or natural convection)	FIREBAR, WATROD, FINBAR, WATROD enclosure heater, screw plug, flange, circulation, and duct
Gas: Hydrocarbons, Nitrogen, Oxygen Ozone, Steam	Direct (forced)	FIREBAR, WATROD, screw plug, flange, and circulation
Molten Materials: Aluminum Lead Salt Solder	 Indirect (radiant) Direct (non-circulating) Direct (non-circulating) Direct (non-circulating)	 WATROD FIREBAR and WATROD FIREBAR and WATROD FIREBAR and WATROD
Surface Heating: Dies, griddles, molds, platens	 Direct	 FIREBAR and WATROD

Supplemental Applications Chart

This *Supplemental Applications Chart* is provided in addition to the *Element and Assembly Selection Guide*. This chart will help you select watt density and sheath materials for either WATROD or FIREBAR heating elements according to the specific media being heated.

For example, if you're heating vegetable oil, either WATROD or FIREBAR elements at 30 and 40 W/in^2 respectively (4.6 and 6.2 W/cm^2) with 304 stainless steel, sheath can be used.

Supplemental Applications Chart

Heated Material	Max. Operating Temperature °F	(°C)	WATROD Element: Max. Watt Density W/in^2	(W/cm^2)	WATROD Element: Sheath Material	FIREBAR Element: Max. Watt Density W/in^2	(W/cm^2)	FIREBAR Element: Sheath Material
Acid Solutions (Mild)								
Acetic	180	(82)	40	(6.2)	316 SS	40	(6.2)	Incoloy® 800
Boric (30% max.)	257	(125)	40	(6.2)	Titanium	40	(6.2)	304 SS
Carbonic	180	(82)	40	(6.2)	Inconel® 600	40	(6.2)	304 SS
Chromic	180	(82)	40	(6.2)	Titanium	N/A	N/A	N/A
Citric	180	(82)	23	(3.6)	Incoloy®	30	(4.6)	Incoloy® 800
Fatty Acids	150	(65)	20	(3.1)	316 SS	30	(4.6)	Incoloy® 800
Lactic	122	(50)	10	(1.6)	316 SS	N/A	N/A	N/A
Levulinic	180	(82)	40	(6.2)	Inconel® 600	40	(6.2)	304 SS
Malic	122	(50)	10	(1.6)	316 SS	16	(2.5)	Incoloy® 800
Nitric (30% max.)	167	(75)	20	(3.1)	316 SS	30	(4.6)	Incoloy® 800
Phenol—2-4 Disulfonic	180	(82)	40	(6.2)	316 SS	40	(6.2)	Incoloy® 800
Phosphoric	180	(82)	23	(3.6)	Incoloy®	30	(4.6)	Incoloy® 800
Phosphoric (Aerated)	180	(82)	23	(3.6)	304 SS	30	(4.6)	304 SS

CONTINUED

Tubular Elements and Assembly Selection Guide

Supplemental Applications Chart *(Continued)*

Heated Material	Max. Operating Temperature °F	(°C)	WATROD Element: Max. Watt Density W/in²	(W/cm²)	WATROD Element: Sheath Material	FIREBAR Element: Max. Watt Density W/in²	(W/cm²)	FIREBAR Element: Sheath Material
Proponic (10% max.)	180	(82)	40	(6.2)	Copper	40	(6.2)	304 SS
Tannic	167/180	(75/82)	23/40	(3.6/6.2)	Steel/304 SS	40	(6.2)	304 SS
Tartaric	180	(82)	40	(6.2)	316 SS	40	(6.2)	Incoloy® 800
Acetaldehyde	180	(82)	10	(1.6)	Copper	16	(2.4)	Incoloy® 800
Acetone	130	(54)	10	(1.6)	304 SS	16	(2.4)	304 SS
Air	①	①	①	①	Incoloy®	①	①	Incoloy® 800
Alcyl alcohol	200	(93)	10	(1.6)	Copper	16	(2.4)	Incoloy® 800
Alkaline solutions	212	(100)	40	(6.2)	Steel	48	(7.4)	304 SS
Aluminum acetate	122	(50)	10	(1.6)	316 SS	16	(2.5)	Incoloy® 800
Aluminum potassium sulfate	212	(100)	40	(6.2)	Copper	N/A	N/A	N/A
Ammonia gas	①	①	①	①	Steel	①	①	304 SS
Ammonium acetate	167	(75)	23	(3.6)	Incoloy®	30	(4.6)	Incoloy® 800
Amyl acetate	240	(115)	23	(3.6)	Incoloy®	30	(4.6)	Incoloy® 800
Amyl alcohol	212	(100)	20	(3.1)	304 SS	30	(4.6)	304 SS
Aniline	350	(176)	23	(3.6)	304 SS	30	(4.6)	304 SS
Asphalt	200-500	(93-260)	4-10	(0.6 - 1.6)	Steel	6-12	(0.9 - 1.8)	304 SS
Barium hydroxide	212	(100)	40	(6.2)	316 SS	40	(6.2)	Incoloy® 800
Benzene, liquid	150	(65)	10	(1.6)	Copper	16	(2.5)	304 SS
Butyl acetate	225	(107)	10	(1.6)	316 SS	16	(2.5)	Incoloy® 800
Calcium bisulfate	400	(204)	20	(3.1)	316 SS	N/A	N/A	N/A
Calcium chloride	200	(93)	5-8	(0.8 - 1.2)	Inconel® 600	N/A	N/A	N/A
Carbon monoxide	—	—	①	①	Incoloy®	①	①	Incoloy®
Carbon tetrachloride	160	(71)	23	(3.6)	Incoloy®	30	(4.6)	Incoloy®
Caustic soda:								
2%	210	(98)	48	(7.4)	Incoloy®	—	—	Contact Watlow
10% concentrate	210	(98)	23	(3.6)	Incoloy®	—	—	Contact Watlow
75%	180	(82)	23	(3.6)	Incoloy®	—	—	Contact Watlow
Citric juices	185	(85)	23	(3.6)	Incoloy®	30	(4.6)	Incoloy®
Degreasing solution	275	(135)	23	(3.6)	Steel	30	(4.6)	304 SS
Dextrose	212	(100)	20	(3.1)	304 SS	30	(4.6)	304 SS
Dyes and pigments	212	(100)	23	(3.6)	304 SS	30	(4.6)	304 SS
Electroplating Baths:								
Cadmium	180	(82)	40	(6.2)	304 SS	40	(6.2)	304 SS
Copper	180	(82)	40	(6.2)	316 SS	N/A	N/A	N/A
Dilute cyanide	180	(82)	40	(6.2)	316 SS	N/A	N/A	N/A
Rochelle cyanide	180	(82)	40	(6.2)	316 SS	N/A	N/A	N/A
Sodium cyanide	180	(82)	40	(6.2)	316 SS	N/A	N/A	N/A
Potassium cyanide	180	(82)	40	(6.2)	316 SS	40	(6.2)	304 SS
Ethylene glycol	300	(148)	30	(4.6)	Steel	40	(6.2)	304 SS
Formaldehyde	180	(82)	10	(1.6)	304 SS	16	(2.5)	304 SS
Freon® gas	300	(148)	2-5	(0.3 - 0.8)	Steel	①	①	304 SS
Gasoline	300	(148)	23	(3.6)	Steel	30	(4.6)	304 SS

CONTINUED

① Contact your Watlow representative.

Tubular Elements and Assembly Selection Guide

Supplemental Applications Chart *(Continued)*

Heated Material	Max. Operating Temperature °F	(°C)	WATROD Element: Max. Watt Density W/in²	(W/cm²)	WATROD Element: Sheath Material	FIREBAR Element: Max. Watt Density W/in²	(W/cm²)	FIREBAR Element: Sheath Material
Gelatin liquid	150	(65)	23	(3.6)	304 SS	30	(4.6)	304 SS
Gelatin solid	150	(65)	5	(0.8)	304 SS	7	(1.0)	304 SS
Glycerin	500	(260)	10	(1.6)	Incoloy®	12	(1.9)	304 SS
Glycerol	212	(100)	23	(3.6)	Incoloy®	30	(4.6)	304 SS
Grease:								
Liquid	—	—	23	(3.6)	Steel	30	(4.6)	304 SS
Solid	—	—	5	(0.8)	Steel	7	(1.0)	304 SS
Hydrazine	212	(100)	16	(2.5)	304 SS	20	(3.1)	304 SS
Hydrogen	①	①	—	—	Incoloy®	①	①	Incoloy® 800
Hydrogen chloride	①	①	—	—	Inconel® 600	①	①	N/A
Hydrogen sulfide	①	①	—	—	316 SS (heavy wall)	①	①	N/A
Magnesium chloride	212	(100)	40	(6.2)	Inconel® 600	40	(6.2)	Incoloy® 800
Magnesium sulfate	212	(100)	40	(6.2)	304 SS	40	(6.2)	304 SS
Magnesium sulfate	212	(100)	40	(6.2)	316 SS	40	(6.2)	304 SS
Methanol gas	①	①	—	—	304 SS	①	①	304 SS
Methylamine	180	(82)	20	(3.1)	Inconel® 600	30	(4.6)	304 SS
Methychloride	180	(82)	20	(3.1)	Copper	N/A	N/A	N/A
Molasses	100	(37)	4-5	(0.6 - 0.8)	304 SS	5-8	(0.8 - 1.2)	304 SS
Molten salt bath	800-900	(426-482)	25-30	(3.8 - 4.6)	Monel®	N/A	N/A	N/A
Naphtha	212	(100)	10	(1.6)	Steel	16	(2.5)	304 SS
Oils								
Fuel oils:								
Grades 1 and 2 (distillate)	200	(93)	23	(3.6)	Steel	30	(4.6)	304 SS
Grades 4 and 5 (residual)	200	(93)	13	(2.0)	Steel	16	(2.5)	304 SS
Grades 6 and Bunker C (residual)	160	(71)	8	(1.2)	Steel	10	(1.6)	304 SS
Heat transfer oils: ②								
Static	500	(260)	16	(2.5)	Steel	23	(3.6)	304 SS
	600	(315)	10	(1.6)	Steel	16	(2.5)	304 SS
Circulating	500	(260)	23	(3.6)	Steel	30	(4.6)	304 SS
	600	(315)	15	(2.3)	Steel	20	(3.1)	304 SS
Lubrication oils:								
SAE 10, 90-100 SSU @ 130°F	250	(121)	23	(3.6)	Steel	30	(4.6)	304 SS
SAE 20, 120-185 SSU @ 130°F	250	(121)	23	(3.6)	Steel	30	(4.6)	304 SS
SAE 30, 185-255 SSU @ 130°F	250	(121)	23	(3.6)	Steel	30	(4.6)	304 SS
SAE 40, -80 SSU @ 210°F	250	(121)	13	(2.0)	Steel	18	(2.7)	304 SS
SAE 50, 80-105 SSU @ 210°F	250	(121)	13	(2.0)	Steel	18	(2.7)	304 SS

CONTINUED

① Contact your Watlow representative.
② Maximum operating temperatures and watt densities are detailed in *Heat Transfer Oil* charts on page 674.

Tubular Elements and Assembly Selection Guide

Supplemental Applications Chart *(Continued)*

Heated Material	Max. Operating Temperature °F	(°C)	WATROD Element: Max. Watt Density W/in²	(W/cm²)	WATROD Element: Sheath Material	FIREBAR Element: Max. Watt Density W/in²	(W/cm²)	FIREBAR Element: Sheath Material
Miscellaneous oils:								
Draw bath	600	(315)	23	(3.6)	Steel	30	(4.6)	304 SS
Hydraulic	—	—	15③	(2.3)	Steel	15③	(2.3)	304 SS
Linseed	150	(65)	50	(7.7)	Steel	60	(9.3)	304 SS
Mineral	200	(93)	23	(3.6)	Steel	30	(4.6)	304 SS
	400	(204)	16	(2.5)	Steel	23	(3.6)	304 SS
Vegetable/shortening	400	(204)	30	(4.6)	304 SS	40	(6.2)	304 SS
Paraffin or wax (liquid)	150	(65)	16	(2.4)	Steel	20	(3.1)	304 SS
Perchloroethylene	200	(93)	23	(3.6)	Steel	30	(4.6)	304 SS
Potassium chlorate	212	(100)	40	(6.2)	316 SS	N/A	N/A	N/A
Potassium chloride	212	(100)	40	(6.2)	316 SS	N/A	N/A	N/A
Potassium hydroxide	160	(71)	23	(3.6)	Monel®	N/A	N/A	N/A
Soap, liquid	212	(100)	20	(3.1)	304 SS	30	(4.6)	304 SS
Sodium acetate	212	(100)	40	(6.2)	Steel	50	(7.7)	304 SS
Sodium cyanide	140	(60)	40	(6.2)	Incoloy®	50	(7.7)	Incoloy® 800
Sodium hydride	720	(382)	28	(4.3)	Incoloy®	36	(5.5)	Incoloy® 800
Sodium hydroxide	—	—	—	—	See Caustic Soda	—	—	—
Sodium phosphate	212	(100)	40	(6.2)	Copper	50	(7.7)	304 SS
Steam, flowing	300	(148)	10	(1.6)	Incoloy®	①	①	Incoloy® 800
	500	(260)	5-10	(0.8-1.6)	Incoloy®	①	①	Incoloy® 800
	700	(371)	5	(0.8)	Incoloy®	①	①	Incoloy® 800
Sulfur, molten	600	(315)	10	(1.6)	Incoloy®	12	(1.8)	Incoloy® 800
Toluene	212	(100)	23	(3.6)	Steel	30	(4.6)	304 SS
Trichlorethylene	150	(65)	23	(3.6)	Steel	30	(4.6)	304 SS
Turpentine	300	(148)	20	(3.1)	304 SS	25	(3.8)	304 SS
Water								
Clean	212	(100)	60	(9.3)	Incoloy®	45	(7)	Incoloy® 800
Deionized	212	(100)	60	(9.3)	316 SS (passivated)	90	(14)	Incoloy® 800
Demineralized	212	(100)	60	(9.3)	316 SS (passivated)	90	(14)	Incoloy® 800
Potable	212	(100)	60	(9.3)	Incoloy®	45	(7)	Incoloy® 800
Process	212	(100)	48	(9.3)	Incoloy®			Contact Watlow

① Contact your Watlow representative.
③ Per API standards.

Tubular Elements and Assembly Selection Guide

Free Cross Sectional Area of WATROD and FIREBAR Circulation Heaters

Free cross sectional areas from the chart are in square feet. Calculations are based on:

- Flange 12 inches and under, pipes are schedule 40
- Flanges 14 inches and above, pipes are standard wall thickness 0.375 in. (9.5 mm)
- All WATROD heating elements are 0.475 in. (12 mm) diameter

Circulation Heater Size in.	Free Cross Sectional Area in Square Feet (Number of Elements in Parenthesis)					
WATROD						
2½ NPT	0.044	(3)				
3 Flange	0.044	(3)	0.037	(6)		
4 Flange	0.074	(6)				
5 Flange	0.124	(6)	0.117	(9)		
6 Flange	0.172	(12)	0.164	(15)		
8 Flange	0.303	(18)	0.296	(21)	0.288	(24)
10 Flange	0.481	(27)	0.460	(36)		
12 Flange	0.697	(36)	0.652	(54)		
14 Flange	0.848	(45)	0.781	(72)		
16 Flange	1.091	(72)	1.054	(87)	1.017	(102)
18 Flange	1.372	(102)	1.357	(108)	1.342	(114)
20 Flange	1.748	(108)	1.733	(114)	1.704	(126)
FIREBAR						
2½ NPT	0.0417	(3)				
4 Flange	0.0692	(6)				
6 Flange	0.1540	(15)				

Tubular Elements and Assembly Selection Guide

Heat Transfer Oil Chart

Heat Transfer Fluid	Recommended Max. Temperature °F (°C)				Flammability Data °F (°C)						Min. Velocity Thru Heater in Feet/second at W/in² (M/second at W/cm²)							
	Process		Sheath		Flash Point		Fire Point		Autoignition		8	(1.2)	16	(2.8)	23	(3.6)	30	(4.7)
	F	(°C)	°F	(°C)	°F	(°C)	°F	(°C)	°F	(°C)	W/in²	(W/cm²)	W/in²	(W/cm²)	W/in²	(W/cm²)	W/in²	(W/cm²)
Calflo HTF	600	(316)	650	(343)	414	(212)	462	(239)	670	(354)	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Calflo AF	550	(288)	600	(316)	400	(204)	437	(225)	650	(343)	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Dow therm® A	750	(399)	835	(446)	255	(124)	275	(135)	1150	(621)	0.5	(0.15)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)
Dow therm® G	700	(371)	775	(413)	305	(152)	315	(157)	1150	(621)	0.7	(0.2)	1.5	(0.5)	2.5	(0.75)	3.5	(1.1)
Dow therm® J	575	(302)	650	(343)	145	(63)	155	(68)	806	(430)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)	4.5	(1.37)
Dow therm® LF	600	(316)	675	(357)	260	(127)	280	(138)	1020	(549)	0.7	(0.2)	1.5	(0.5)	2.5	(1.75)	3.5	(1.1)
Dow therm® HT	650	(343)	700	(371)	no data	no data	no data	no data	no data	no data	1.5	(0.5)	2.5	(0.75)	3.5	(1.1)	5.0	(1.52)
Dow therm® Q	625	(329)	700	(371)	no data	no data	no data	no data	773	(412)	0.7	(0.2)	1.5	(0.5)	2.5	(0.75)	3.5	(1.1)
Marlotherm S	662	(350)	698	(370)	374	(190)	no data	no data	932	(500)	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Mobiltherm 603	590	(310)	625	(329)	380	(193)	no data	no data	no data	no data	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Multitherm IG-2	600	(316)	650	(343)	440	(227)	500	(260)	700	(371)	0.8	(0.24)	1.7	(0.52)	2.3	(0.7)	3.0	(0.9)
Multitherm PG-1	600	(316)	640	(338)	340	(171)	385	(196)	690	(368)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)	4.0	(1.22)
Para Cymene	600	(316)	650	(343)	117	(47)	152	(72)	817	(438)	0.7	(0.2)	1.5	(0.5)	2.5	(0.75)	3.5	(1.1)
Syltherm 800	750	(399)	800	(427)	350	(177)	380	(193)	725	(385)	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Syltherm XLT	500	(260)	550	(288)	116	(47)	130	(54)	662	(350)	1.5	(0.5)	2.5	(0.75)	4.0	(1.22)	5.0	(1.52)
Texatherm	600	(316)	640	(338)	430	(221)	no data	no data	no data	no data	2.0	(0.61)	4.0	(1.22)	6.0	(1.83)	8.0	(2.4)
Thermia 33	600	(316)	650	(343)	455	(235)	495	(257)	no data	no data	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Therminol 44	400	(204)	475	(246)	405	(207)	438	(228)	705	(374)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)	4.0	(1.22)
Therminol 55	550	(288)	605	(318)	350	(177)	410	(210)	675	(357)	1.5	(0.5)	2.5	(0.75)	3.5	(1.1)	5.0	(1.52)
Therminol 59	600	(316)	650	(343)	302	(150)	335	(168)	770	(410)	1.5	(0.5)	2.5	(0.75)	3.5	(1.1)	5.0	(1.52)
Therminol 60	620	(327)	655	(346)	310	(154)	320	(160)	835	(448)	1.5	(0.5)	3.0	(0.9)	5.0	(1.52)	7.0	(2.1)
Therminol 68	650	(343)	705	(374)	350	(177)	380	(183)	705	(374)	1.5	(0.5)	2.5	(0.75)	3.0	(0.9)	4.5	(1.37)
Therminol 75	750	(399)	805	(429)	390	(199)	440	(227)	1000	(538)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)	4.0	(1.22)
Therminol LT	600	(316)	650	(343)	134	(57)	150	(66)	805	(429)	1.5	(0.5)	2.5	(0.75)	4.0	(1.22)	5.0	(1.52)
Therminol VP-1	750	(399)	800	(427)	255	(124)	280	(127)	1150	(621)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)	4.0	(1.22)
U-Con 500	500	(260)	550	(288)	540	(282)	600	(316)	750	(399)	1.0	(0.3)	2.0	(0.61)	3.0	(0.9)	4.0	(1.22)

Agency Certifications, Recognition and Approvals

Agency Certifications, Recognition and Approvals

WATROD and FIREBAR® Element and Assemblies 677

WATROD and FIREBAR® Element and Assemblies

Agency Recognition

UL® and CSA recognition information charts are provided to ensure:

- Safety parameters in relationship to stated voltage and amperage
- Approved sheath materials, end seals and assembly electrical enclosures

Watlow believes that UL® and CSA recognition information is necessary to confirm the reliability of our heating products in relationship to your application. As such, the accompanying *Agency Recognition* charts illustrate the extent of coverage each heater type provides. Specific end use application information is required for each agency marking. Some products carry U.S. and Canada approvals.

UL® Recognition and Listing

File Number E52951 (UL® 499) — Component Recognition

All information for UL® File #E52951 can be found in the UL® Directory, Volume 2 under "Heaters Miscellaneous" (Classification KSOT2).

Elements (Volume 2, Section 1)

WATROD Diameter in.	(mm)	Code Number Designation		Max. Volts	Max. Amps	Max. Watt Density W/in²	W/cm²	Min. Bend Radius in.	(mm)	Allowable Sheath Materials	End Seal Types
0.210	(6.0)	**RK** series	**U0-xx**	250	15	N/A	N/A	1/16	(1.6)	Aluminum,	Epoxy resin,
0.260	(6.6)	**RA** series	**U1-xx**	250	15	N/A	N/A	1/16	(1.6)	Copper,	Lavacone,
0.315	(8.0)	**RB** series	**U3-xx**	480	30	N/A	N/A	1/16	(1.6)	Incoloy®,	Silicone resin,
0.332	(8.5)		**UE-xx**	480	30	N/A	N/A	3/16	(4.8)	Inconel®,	Silicone rubber,
0.375	(9.5)	**RD**, **RS** series	**U5-xx**	480	30	N/A	N/A	3/16	(4.8)	SS,	Glass,
0.430	(10.9)	**RC** series	**U6-xx**	600	40[1]	N/A	N/A	5/32	(4.0)	Steel,	ULTRAGARD,
0.475	(12.0)	**RG** series	**U7-xx**	600	40	N/A	N/A	3/16	(4.8)	Titanium,	SF 99,
0.490	(12.4)	**RJ** series	**U8-xx**	600	40	N/A	N/A	3/16	(4.8)	Special Request	Ceramic potting
0.625	(15.9)	**RF** series	**U9-xx**	600	40	N/A	N/A	7/16	(11.1)		

[1] 45 in water applications only.

Note: All sheath materials and end seal types apply to all diameter heaters.

Elements (Volume 2, Section 6)

MULTICOIL Diameter in.	(mm)	Code Number Designation	Max. Volts	Max. Amps	Max. Watt Density[2] W/in²	W/cm²	Min. Bend Radius in.	(mm)	Allowable Sheath Materials	End Seal Types
0.430	(10.9)	**U6M** series	480[3]	N/A	N/A	N/A	1/2	(13.0)	Incoloy®,	Epoxy resin,
0.475	(12.0)	**U7M** series	480	N/A	N/A	N/A	5/8	(15.9)	Inconel®,	Silicone resin,
0.490	(12.4)	**U8M** series	480	N/A	N/A	N/A	5/8	(15.9)	SS,	Silicone rubber,
0.625	(15.9)	**U9M** series	480	N/A	N/A	N/A	3/4	(19.0)	Steel,	Lavacone,
									Titanium	SF-99
										Ceramic potting

[2] Maximum sheath temperatures apply, contact your Watlow representative

[3] U6M2 series up to 250V

Note: All sheath materials and end seal types apply to all diameter heaters

WATROD and FIREBAR Element and Assemblies

UL® Recognition and Listing *(Continued)*

Elements (Volume 2, Section 4)

FIREBAR® Height in. (mm)	Code Number Designation	Max. Volts	Max. Amps	Max. Watt Density W/in² (W/cm²)	Min. Bend Radius Major Axis in. (mm)	Min. Bend Radius Minor Axis in. (mm)	Allowable Sheath Materials	End Seal Types
Air or Immersion Heating								
⅝ (15.9) 1 (25.0)	**FA, FS** series **A-xx** **FB, FS** series	480 480	N/A N/A	50 (5.1) 50 (5.1)	1 (25) 1 (25)	½ (13)[3] ½ (13)[3]	Incoloy®, SS, Titanium,	Epoxy resin, Lavacone, Silicone resin, Silicone rubber, ULTRAGARD, SF-99, Ceramic potting
Liquid Immersion Heating Only								
⅝ (16) 1 (25)	**FA, FS** series **U-xx** **FB, FS** series	480 480	N/A N/A	160 (24.7) 160 (24.7)	1 (25) 1 (25)	1/16 (1.6) 1/16 (1.6)	Incoloy®, SS, Titanium,	Epoxy resin, Lavacone, Silicone resin, Silicone rubber, ULTRAGARD, SF-99, Ceramic potting

[3]1 if >33 W/in².

Notes: UL® and CSA must be requested at the time the order is placed. All sheath materials and end seal types apply to all diameter heaters.

Assemblies

Refer to applicable WATROD and FIREBAR elements for maximum voltage, watt density and sheath materials.

Heater Type	Code Number Designations	Electrical Enclosure Options
Screw Plug	All catalog models **B** Series **U1** to **U9**	General purpose with or without thermostat
Flange	All catalog models **FE**, **FG**, **FH**, **FK**, **FL**, **FM**, **FN**, **FO**, **FP** **FR**, **FS**, **FT**, **FW**—Series **U1** to **U9**	General purpose with or without thermostat
Circulation	All catalog models **CB**, **CF**, **CP** Series **U1** to **U9**	General purpose with or without thermostat
Over-the-Side	All catalog models **OL**, **OR** and **VL** Series **U1** to **U9**, *except* **U2** and **U4**	Moisture resistant with or without thermostat
Duct	All catalog models **D6** to **D125**, **MDH6** to **MDH60**, **LDH9** to **LDH225** Series **U1** to **U9** and **U0, UE**	General purpose enclosure only

WATROD and FIREBAR Element and Assemblies

File Number E56488 (UL® 1030)—Water Immersion Only (Classification UBJY2). — Component Recognition

Elements

WATROD Diameter in.	(mm)	Code Number Designation	Max. Volts	Max. Amps	Max. Watt Density W/in²	(W/cm²)	Min. Bend Radius in.	(mm)	Allowable Sheath Materials	End Seal Types
0.315	(8.0)		480	7	18.5	(120)	⅛	(3.2)	Copper,	Epoxy,
0.315	(9.5)		480	7	18.5	(120)	⅛	(3.2)	Incoloy®,	Silicone rubber resin,
0.430	(10.9)	**T** series	575	7	18.5	(120)	5⁄16	(7.9)	SS	Silicone resin
0.475	(12.0)	Example: **T085CN3S**	575	7	18.5	(120)	5⁄16	(7.9)		
0.490	(12.4)		575	7	18.5	(120)	5⁄16	(7.9)		
0.625	(15.9)		575	7	18.5	(120)	5⁄16	(7.9)		

FIREBAR® Height in.	(mm)	Code Number Designation	Max. Volts	Max. Amps	Max. Watt Density W/in²	(W/cm²)	Min. Bend Major Axis in.	(mm)	Min. Bend Minor Axis in.	(mm)	Allowable Sheath Materials	End Seal Types
1	(25)	**T** series Example: **T085HN3W**	250	N/A	80	(12.4)	1	(25)	5⁄32	(4)	Incoloy®, SS	Epoxy, Silicone rubber resin, Silicone resin

Note: All sheath materials and end seal types apply to all diameter heaters.

Assemblies

Refer to applicable WATROD and FIREBAR elements for maximum voltage, watt density and sheath materials.

Heater Type	Code Number Designations	Electrical Enclosure Options
Screw Plug	Models **T3**, **T5**, **T6**, **T7**, **T8**, **T9** Example: **T336xxxx**	General purpose without thermostat
Flange	Models **T3**, **T5**, **T6**, **T7**, **T8**, **T9** Example: **T621xxxx**	General purpose without thermostat

Note: UL® and CSA must be requested at the time the order is placed.

File Number MH26554 (UL® 574)—Electric Oil Heaters (Classification MDST2). — Component Recognition or Listing (Consult factory if UL® Listed marking is desired)

Elements

For reference only, marking applies only to assemblies noted below.

WATROD Diameter in.	(mm)	Code Number Designation	Max. Volts	Max Amps	Max. Watt Density W/in²	(W/cm²)	Min. Bend Radius in.	(mm)	Allowable Sheath Materials	End Seal Types
0.260	(6.6)	Series 1-xx	250	15	23	(3.56)	1⁄16	(1.6)	Steel,	Epoxy resin,
0.315	(8.0)	Series 3-xx	480	30	23	(3.56)	1⁄16	(1.6)	Inconel®,	Silicone resin,
0.375	(9.5)	Series 5-xx	480	30	23	(3.56)	3⁄16	(4.8)	SS,	Silicone rubber,
0.430	(10.9)	Series 6-xx	600	40	23	(3.56)	5⁄32	(4.0)	Incoloy®,	Lavacone,
0.475	(12.0)	Series 7-xx	600	40	23	(3.56)	3⁄16	(4.8)	Monel®,	ULTRAGARD
0.490	(12.4)	Series 8-xx	600	40	23	(3.56)	3⁄16	(4.8)	Hastelloy®,	
0.625	(15.8)	Series 9-xx	600	40	23	(3.56)	7⁄16	(11.1)	Titanium	

Note: All sheath materials and end seal types apply to all diameter heaters.

Assemblies

Refer to applicable WATROD elements for maximum voltage, watt density and sheath materials.

Heater Type	Code Number Designations	Electrical Enclosure Options
Screw Plug	Models **BCS** and **BGS** Series **1-xx** thru **9-xx**, excluding series **2-xx** and **4-xx**	Enclosure Types 1 or 4, with or without thermostat. Thermostat shall be Watlow Type 4, 12 or 12A

Note: UL® and CSA must be requested at the time the order is placed.

WATROD and FIREBAR Element and Assemblies

Declaration of Conformity

The Low Voltage Directive (LVD) (73/23/EEC) states that electrical and electronic equipment placed on the market in the European Union (EU) must be safe. The CE Marketing Directive (93/68/EEC) for the LVD came into force on January 1, 1995, subject to a two-year transition period. All heaters operating on a supply voltage of between 50 and 1000V~(ac) and between 75 and 1500⎓(dc) fall within the scope of the LVD.

The Self Declaration of Conformity shown on the right, backed by our risk assessment and technical file, assure that the product series shown on the Declaration meet the EU requirements. The declaration is not applicable to any of our heaters intended for use in an explosive atmosphere, or for radiological and medical purposes. For heaters intended for use in an explosive environment, see the *ATEX section* of page 682.



CE

Declaration of Conformity

Watlow Industries
6 Industrial Loop Road
Hannibal, MO 63401
USA

Declares that the following product(s):

Product(s) Code Number(s):	Description
Series R*, may be followed by additional letters and numbers	WATROD Element
Series F*, may be followed by additional letters and numbers	FIREBAR Element
Series H*, may be followed by additional letters and numbers	Screw Plug
Series D*, may be followed by additional letters and numbers	Duct Heater
Series CIR*, may be followed by additional letters and numbers	CIRC Duct Heater
Series M*, may be followed by additional letters and numbers	Modular Duct Heater
Series T*, may be followed by additional letters and numbers	Flange Heater
Cartridge Series B and L	Cartridge Heater
Series C and V, may be followed by additional letters	Over-the-Side Heater
Misc. Catalog Numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 & 0 may be followed by a series of numbers, zeroes and/or letters. May be preceded by "U".	Miscellaneous

* Series D and H Heaters not to be used in water or liquid applications

RATED VOLTAGE: up to 480 VAC
RATED FREQUENCY: 50/60 Hz

Meets the essential requirements of the following European Union Directive(s) using the relative section(s) of the normalized standards and related documents shown:

2006/95/EC Low Voltage Directive

	Safety of household and similar electrical appliances
BS EN 60335-2-30	Part 2: Particular requirements for room heaters
BS EN 60335-2-63	Part 2: Particular requirements for commercial electric water boilers and liquid heaters

Reference Watlow Technical File No. D1007061G1

Watlow Industries
6 Industrial Loop Road
Hannibal, Missouri, USA 63401

Place of Issue: **Hannibal, MO, USA**

Name of Authorized Representative: **Rob Gilmore**

Date of Issue: **26 March 2008**

Title of Authorized Representative: **Product Manager**

Signature of Authorized Representative:

WATROD and FIREBAR Element and Assemblies

CSA Certification

File Number LR 31388

All information for CSA file LR 31388 can be found in the CSA *List of Certified Electrical Equipment* catalog, Volume II, under Heaters—Miscellaneous.

Elements

Heater Type—Diameter/Height in.	(mm)	Code Number Designation	Max. Volts	Max. Watt Density W/in²	(W/cm²)	Allowable Sheath Materials[4]	End Seal Type (All Diameters)
WATROD:							
0.260	(6.6)	**All catalog models, 1-xx**	250	120	(18.5)	Copper, Incoloy®, SS, Steel, Titanium, Special request	Epoxy resin, Lavacone, Silicone resin, Silicone rubber, ULTRAGARD
0.315	(8.0)	**All catalog models, 3-xx**	480	120	(18.5)		
0.375	(9.5)	**All catalog models, 5-xx**	600	120	(18.5)		
0.430	(10.9)	**All catalog models, 6-xx**	600	120	(18.5)		
0.475	(12.0)	**All catalog models, 7-xx**	600	120	(18.5)		
0.490	(12.4)	**All catalog models, 8-xx**	600	120	(18.5)		
0.625	(15.9)	**All catalog models, 9-xx**	600	120	(18.5)		
FIREBAR:							
⅝	(15.9)	**FA**, **FS** models, **4-xx**	480	120	(18.5)	Incoloy®, SS, Titanium	Epoxy resin, Lavacone, Silicone resin, Silicone rubber
1	(25.0)	**FB**, **FS** models, **2-xx**	480	120	(18.5)		
MULTICELL:		**Contact Watlow**					

[4]Some sheath materials not available on all diameters. Contact your Watlow representative.
Note: Heating elements are certified only for use in equipment where the acceptability of the construction combination is determined by the Canadian Standards Association.
Note: All sheath materials and end seal types apply to all diameter heaters.

Assemblies

Heater Type	Code Number Designations	Electrical Enclosure Options
Screw Plug	All catalog models **BC, BD, BE, BG, BH, BL** Series **1-xx** to **9-xx**	General purpose with or without thermostat Enclosure 4 with or without thermostat
Flange	All catalog models **FM**, **FN**, **FO**, **FP**, **FR**, **FS**, **FT**, **FW** Series **1-xx** to **9-xx**	General purpose with or without thermostat Enclosure 4 with or without thermostat[5]
Circulation	All catalog models **CBD**, **CBE**, **CBL**, **CFM**, **CFN**, **CFO**, **CFP**, **CFR**, **CFS**, **CFT**, **CFW** —Series **1-10** to **9-10**	General purpose with or without thermostat Enclosure 4 with or without thermostat[5]
Over-the-Side	All catalog models **OL** and **OR** Series **1-30** to **9-30**	Enclosure 4 with or without thermostat
Duct	All catalog models **D, LDH** and **MDH** Series **1-1** to **9-1**	General purpose enclosure only

[5]4, 5, 6 and 8 inch flange size only.

File Number LR 61707—Heater Assemblies–Miscellaneous–For Hazardous Locations

Heater Type	Code Number Designations	Electrical Enclosure Options
Screw Plug	All catalog models **BA, BC, BD, BE, BG, BH, BL** Series **1-xx** to **9-xx**	Class 1, Groups B, C and D Enclosure 4 with or without thermostat
Flange	All catalog models **FM**, **FN**, **FO**, **FP**, **FR**, **FS**, **FT**, **FW** Series **1-xx** to **9-xx, 700, 701, 702, 703, 704, 713, 714**	Class 1, Groups B, C and D and Enclosure 4 with or without thermostat
Circulation	All catalog models **CFM**, **CFN**, **CFO**, **CFP**, **CFR**, **CFS**, **CFT**, **CFW** Series **1-10** to **9-10**	Class 1, Groups B, C and D and Enclosure 4 with or without thermostat

Note: UL® and CSA must be requested at the time the order is placed.

WATROD and FIREBAR Element and Assemblies

ATEX Certification

Certificate Number KEMA 07ATEX0172X

Assemblies

Heater Type	Code Number Designation	Electrical Enclosure Options
Flange	Series FX	EX II 2G Ex d IIB + H_2 T6....T1

Note: ATEX must be requested at the time that the order is placed.

Terms and Conditions of Sale

Quantity and Weights:
Products purchased and sold hereunder shall be those for which Buyer submits an Order which is accepted by Watlow. Watlow's quantities shall govern unless proved to be in error. On Orders for Products carried in stock, Watlow will deliver the ordered quantity specified. However, in the manufacture of Products it is agreed that Watlow will be allowed production losses. Watlow shall have the right to manufacture, deliver and invoice for partial deliveries of Products as stated below:

Quantity Ordered	Delivery Variation
1-4	No variation
5-24	± 1 unit
25-74	± 2 units
75-99	± 3 units
100+	± 3 percent
SERV-RITE® Insulated Wire and Cable	± 10 percent
XACTPAK® Sheathed Wire	± 10 percent

Note: Watlow will deliver exact quantities on Products with a net price of $100.00 or more. If Buyer expressly requests no variation in delivered quantity of Products with a total net price under $100.00, a ten percent (10%) surcharge will be added to the net billing on the invoice for such Order.

Delivery:
F.O.B. Watlow's Plant. Risk of loss shall pass to Buyer on delivery at the F.O.B. point. Watlow shall prepay freight, assure the shipment and select the means of transportation unless Buyer provides specific written instructions otherwise with Buyer's order. Watlow shall not be bound to tender delivery of any quantities for which Buyer has not given shipping instructions. Watlow shall be entitled to designate from time to time the locations from which Buyer may receive or pick up Products.

Payment Terms:
Terms are net 30 days from date of invoice with approved credit. Prices and discounts are subject to change without notice. All quotations are valid for 30 days unless otherwise stated.

Restocking Charges:
Stock heaters, controls, sensors and accessories which have not been used or modified may be returned to the relevant Watlow Plant for a twenty percent (20%) restocking charge. For Watlow's Hannibal Plant Products only, modified-stock Products may be returned if not permanently modified, for a minimum thirty percent (30%) restocking charge. All stock and modified-stock Products require Watlow's prior authorization to be returned and must be returned within one hundred twenty (120) days from the date of delivery. Controls may not be returned if the packaging seal is broken. Non-stock (custom) heaters, controls, sensors and accessories are not returnable.

Price Revision:
Prices are subject to change without advance notice. If Watlow desires to revise the discounts, prices, points of delivery, service allowances or terms of payment but is restricted to any extent against so doing by reason of any governmental request, law, regulation, order or action, or if the discounts, prices, points of delivery, service allowances or terms of payment then in effect are altered by reason of governmental request, law, regulation, order or action, Watlow shall have the right (i) to terminate this Order by notice to Buyer, (ii) to suspend deliveries for the duration of such restriction or alteration or (iii) to have applied to this Order (as of the effective date of such restriction or alteration) any discounts, prices, points of delivery, service allowances or terms of payment governmentally acceptable. Any delivery suspended under this Section may be canceled without liability.

Return Policy:
Prior approval must be obtained from the relevant Watlow Plant to return any Product. Watlow will assign a return authorization number and record the reason for the return. Watlow will examine returned Product to determine the actual cause, if any, leading to Buyer's return. If Product has a manufacturing defect, Watlow, in its sole discretion, may issue a credit for the returned Product or repair or replace with like Product. If returned Product is not subject to Watlow's warranty, Buyer will be notified of the estimated cost of repair, if possible. Thereafter, Buyer must advise Watlow whether or not Buyer chooses to have Product repaired at Buyer's expense.

Order Changes:
Buyer must notify Watlow in writing of requested changes in the quantity, drawings, designs or specifications for Products which are ordered but not yet in the process of manufacture. After receipt of such notice, Watlow will inform Buyer of any adjustments to be made in price, delivery schedules, etc. resulting from Buyer's requested changes prior to incorporating requested changes into manufactured Products. Control Products require written notice of requested changes not less than sixty (60) days prior to last scheduled shipping date.

Freight and Taxes:
Prices do not include prepaid freight, federal, state or local taxes. Any increase in freight rates paid by Watlow on deliveries covered by this Order and hereafter becoming effective and any tax or governmental charge or increase in same (excluding any franchise or income tax or other tax or charge based on income) (i) increasing the cost to Watlow of producing, selling or delivering Products or of procuring Products used therein or, (ii) payable by Watlow because of the production, sale or delivery of Products, such as Sales Tax, Use Tax, Retailer's Occupational Tax, Gross Receipts Tax, Value Added Tax, and Ways Fees may, at Watlow's option, be added to the prices herein specified and be added to invoices.

Engineering Charge:
On complex Products, systems or control software modifications, an engineering charge shall be applied or included in the price of Prototypes. This charge is not subject to discounts.

Tooling:
All tooling and fixtures are the property of Watlow. Watlow will accept Buyer's special tooling if sent freight prepaid. Watlow will maintain this tooling, exercising reasonable care, in order to produce Buyer's Products. Permanent molds for aluminum cast-in and Polymer Products shall be the property and responsibility of Buyer.

Cancellation Charges:
There will be no cancellation charge for non-modified stock Products. Non-stock and modified-stock Products may be subject to a cancellation charge to be determined by Watlow depending upon the portion of Product completed at the time of such cancellation.

Terms and Conditions of Sale

Excuse of Performance:
(A) Deliveries may be suspended by either party in the event of: Act of God, war, riot, fire, explosion, accident, flood, sabotage; lack of adequate fuel, power, raw materials, labor, containers or transportation facilities; compliance with Governmental Requirements (as hereinafter defined); breakage or failure of machinery or apparatus; national defense requirements or any other event, whether or not of the class or kind enumerated herein, beyond the reasonable control of such party; or in the event of labor trouble, strike, lockout or injunction (provided that neither party shall be required to settle a labor dispute against its own best judgment); which event makes impracticable the manufacture, transportation, sale, purchase, acceptance, use or resale of Products or a material upon which the manufacture of Products is dependent.
(B) If Watlow determines that its ability to supply the total demand for Products, or obtain any or a sufficient quantity of any material used directly or indirectly in the manufacture of Products, is hindered, limited or made impracticable, Watlow may allocate its available supply of Products or such material (without obligation to acquire other supplies of any such Products or material) among itself and its purchasers on such basis as Watlow determines to be equitable without liability for any failure of performance which may result therefrom.
(C) Deliveries suspended or not made by reason of this Section shall be canceled without liability, but this agreement and/or Order shall otherwise remain unaffected.

Prototypes:
If Buyer orders and/or Watlow delivers a Product designated as a "Prototype", no guarantees, warranties or representations as to fitness for a particular purpose or merchantability are made with respect to such Prototype. Buyer shall have the duty and sole responsibility to test a Prototype prior to acceptance and/or incorporation into end-use applications. Further, a production Product based on a Prototype design may differ in assembly methods and materials from the Prototype. Buyer, therefore, shall have the duty and sole responsibility for testing and acceptance of production Products which are based on Prototype designs.

Warranty and Limitation of Liability:
Watlow warrants its Products against defects in material and workmanship for at least one (1) year (three (3) years on some controls) from the date of delivery, provided such Product is properly applied, used and maintained. Refer to the express written warranty time period for each individual Product or contact the relevant Watlow plant for such warranty time period information. Watlow does not warrant any Product against damage from corrosion, contamination, misapplication, improper specification or wear and tear and operational conditions beyond Watlow's control. The terms of this Warranty are the exclusive terms available to Buyer and to any other person or entity to whom Products are transferred during the period of this Warranty. No person has authority to bind Watlow to a representation or warranty other than this express Warranty. Watlow shall not be liable for incidental or consequential damages resulting from the use of Products whether a claim for such damages is based upon warranty, contract, negligence or other cause of action. Should any Product fail while subject to this Warranty, such Product shall be repaired or a substitute Product shall be provided, at Watlow's option, at no charge to Buyer or to any other person or entity to whom Product is transferred during the period of this Warranty. Watlow must be notified of the alleged failure of Product within thirty (30) days of such event and advanced authorization for repair or replacement must be obtained in writing from Watlow. **THIS WARRANTY IS MADE EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION, ANY WARRANTY ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE, AND ALL OTHER SUCH WARRANTIES ARE SPECIFICALLY EXCLUDED. THE CORRECTION OF ANY DEFECT IN OR FAILURE OF PRODUCTS BY REPAIR OR REPLACEMENT TO THE EXTENT SET FORTH ABOVE, SHALL BE WATLOW'S LIMIT OF LIABILITY AND THE EXCLUSIVE REMEDY FOR ANY AND ALL LOSSES, DELAYS OR DAMAGES RESULTING FROM THE PURCHASE OR USE OF THE PRODUCTS. IN NO EVENT SHALL WATLOW BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES. WATLOW SHALL NOT BE LIABLE FOR, AND BUYER AND ANY OTHER PERSON OR ENTITY TO WHOM PRODUCTS ARE TRANSFERRED DURING THE PERIOD OF THIS WARRANTY ASSUMES RESPONSIBILITY FOR, ALL PERSONAL INJURY AND PROPERTY DAMAGE RESULTING FROM OR RELATED TO THE HANDLING, POSSESSION OR USE OF PRODUCTS AND PRODUCTS MANUFACTURED AND SOLD BY WATLOW HEREUNDER.**

Miscellaneous:
THE VALIDITY, INTERPRETATION AND PERFORMANCE OF THIS AGREEMENT AND/OR ORDER AND ANY DISPUTE CONNECTED HEREWITH SHALL BE GOVERNED AND CONSTRUED IN ACCORDANCE WITH THE LAWS OF THE STATE OF MISSOURI. These Terms and Conditions constitute the full understanding of the parties, a complete allocation of risks between them and a complete and exclusive statement of the terms and conditions of their agreement and/or Order relating to the subject matter herein. Except as otherwise expressly provided herein, no conditions, usage of trade, course of dealing or performance, understanding or agreement and/or Order purporting to modify, vary, explain or supplement the terms or conditions of this agreement and/or Order shall be binding unless hereafter made in writing and signed by the party to be bound, and no modification shall be effected by the acknowledgment or acceptance of any purchase order or shipping instruction forms containing terms or conditions at variance with or in addition to those set forth herein. No waiver by either party with respect to any breach or default or of any right or remedy and no course of dealing or performance shall be deemed to constitute a continuing waiver of any other breach or default or of any other right or remedy, unless such waiver be expressed in writing signed by the party to be bound. If any term, condition or provision of this agreement and/or Order or the application thereof is judicially or otherwise determined to be invalid or unenforceable, or if the parties mutually agree in writing to any revision of this agreement and/or Order, the remainder of this agreement and/or Order and the application thereof shall not be affected, and this agreement and/or Order shall otherwise remain in full force and effect.

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