

Cartridge/Insertion Heaters

FIREROD® Cartridge Heaters

The Watlow® FIREROD® cartridge heater incorporates engineering excellence and is supported by almost 60 years of solid industry performance across a broad range of simple and complex applications. As the premier choice in swaged cartridge heating, thousands of industrial manufacturers continue to choose Watlow as their trusted thermal partner and certified cartridge heater supplier.

Built using premium materials and tight manufacturing controls, the FIREROD heater provides superior heat transfer, uniform temperatures, resistance to oxidation and corrosion and a long life even at high temperatures. Every system component that leaves our manufacturing facilities meets our strict quality assurance specifications, in addition to those set forth by leading standards and regulating industries.

To meet our customer's individual needs, there are many delivery options available for FIREROD heaters.

Performance Capabilities

- Part temperatures up to 1400°F (760°C) on alloy 800 sheath
- Watt densities up to 400 W/in² (62 W/cm²)
- Maximum voltage up to 480V

Features and Benefits

Nickel-chromium resistance wire

- Ensures even and efficient distribution of heat to the sheath

Conductor pins

- Provide a metallurgical bond to the resistance wire
- Ensure a trouble-free electrical connection

Magnesium oxide insulation of specific grain and purity

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

Alloy 800 sheath

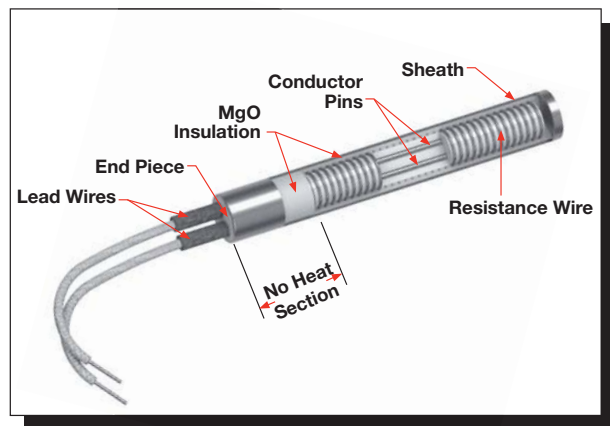
- Resists oxidation and corrosion from heat, many chemicals and atmospheres

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

International Organization for Standardization (ISO) 9001 certified

- Provides confidence that quality and reliability expectations are met



UL® and CSA approved flexible stranded wires

- Lead insulation rated to temperatures up to 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

Typical Applications

- Semiconductor chamber heating
- Semiconductor wire and die bonding
- Freeze protection and deicing of equipment in cold climates or applications
- Humidity control
- Patient comfort heating used in medical devices
- Mold die and platen heating
- Seal bars used in packaging equipment
- Test sample heating in gas chromatography equipment

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Applications and Technical Data

Tolerances

Diameter

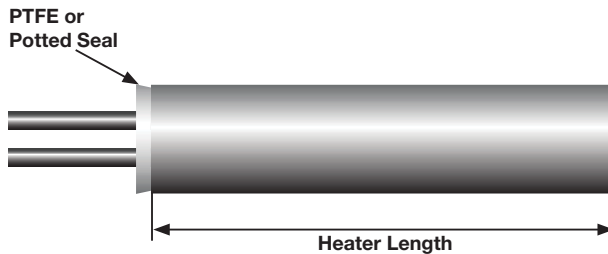
- 1 in. (25 mm) units: ± 0.003 in. (± 0.08 mm)
- All other units: ± 0.002 in. (± 0.05 mm)

Sheath Length

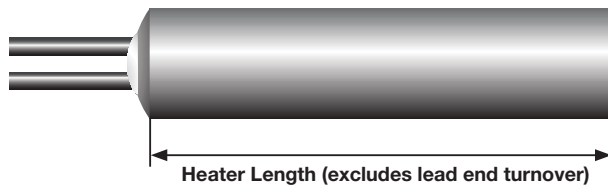
- All units up to 4¹/₂ in. (114 mm) long: ± 3 /₃₂ in. (± 2.4 mm)
- 1/8 in. diameter units over 4¹/₂ in. (114 mm) long: $\pm 3\%$
- All other units over 4¹/₂ in. (114 mm) long: $\pm 2\%$

Length Measurements

Pin Style and Potted FIRERODs



PTFE - Swaged-in Leads FIRERODs



Wattage

- 1/8 in. units: +10%, -15%
- All other units: +5%, -10%

Resistance

- 1/8 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.

Note: Resistance and wattage values are approximate depending on application conditions.

Component Recognition File Numbers

- UL[®] component rated to 240VAC (file number E52951)
- CSA component rated to 240VAC (file number LR7392)
- VDE component rated to 240VAC (file number 10062-4911-0006)

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

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Applications and Technical Data

Dimensional Data

This table shows minimum/maximum sheath lengths for available FIREROD diameters.

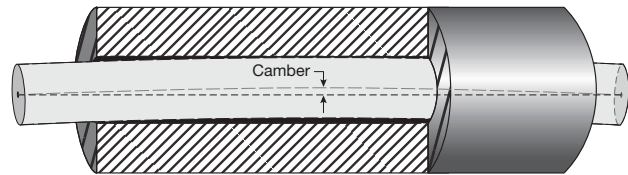
FIREROD Diameter		Length			
Nominal in.	Actual in. (mm)	Min. in. (mm)	Max. in. (mm)		
1/8	0.122 (3.1)	7/8 (22.2)	12 (305)		
1/4	0.246 (6.3)	7/8 (22.2)	36 (915)		
3/8	0.371 (9.4)	7/8 (22.2)	48 (1220)		
1/2	0.496 (12.6)	7/8 (22.2)	60 (1520)		
5/8	0.621 (15.8)	1 (25.0)	72 (1830)		
3/4	0.746 (18.9)	1 (25.0)	72 (1830)		
1	0.996 (25.3)	1 1/4 (32.0)	72 (1830)		

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

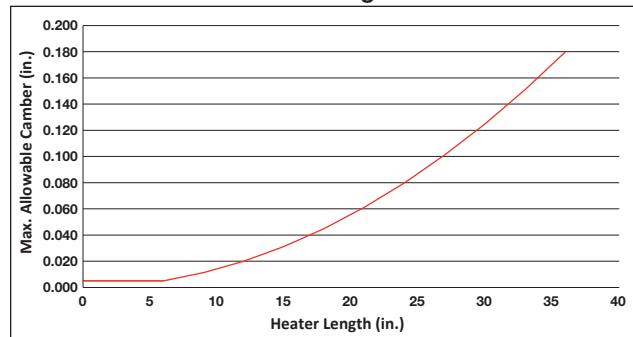
Camber

Camber is defined as the maximum deviation of the heater's centerline from straight. FIREROD camber within allowable tolerances is verified via passage through a cylindrical gauge of specified length and diameter. Normally, slight camber does not present a problem since the heater will flex enough to fit into a straight, close-fit hole.

Camber Measurement



Allowable Camber Versus Length



Max. camber = 0.020 in. x (length in feet)² or 0.005 in., whichever is greater.

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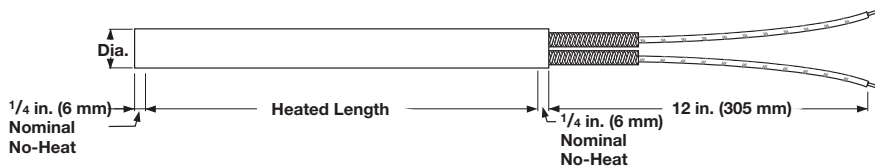
FIREROD Cartridge Heaters

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. If your application exceeds the limitations shown, contact your Watlow representative.



FIREROD Diameter in.	Volts Max.	Ampere Max. ①	Min. Watts @ 120V ③			Max. Watts				
			Heater Length			120V 1-phase	240V 1-phase	480V 1-phase	240V 3-phase	480V 3-phase
			1 in. (25 mm)	1 1/2 in. (38 mm)	2 in. (50 mm)					
1/8	240	3.1	—	8	5	360	720	—	—	—
1/4	240	4.4 ^②	100	55	40	525	1050	—	—	—
3/8	240	6.7	65	35	25	800	1600	—	—	—
1/2	240	9.7	40	25	20	1160	2320	—	—	—
5/8	480	23.0	35	20	15	2760	5520	11,000	⑤	⑤
3/4	480	23.0	30	15	10	2760 ^④	5520	11,000	9550	19,100
1 ^⑦	480	23.0	—	15	10	2760 ^④	5520	11,000	9550 ^④	19,100 ^④

Number Of Circuits ⑥		
Diameter in.	1-phase	3-phase
3/4	3	1
1	5	2

- ① Determined by the current carrying capacity of internal parts and lead wire. Alternate material may be available.
- ② For 1/4 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 240VAC 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 3/4 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.
- ⑦ A minimum charge per line item applies.

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Maximum Allowable Watt Density

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

Correction Factors

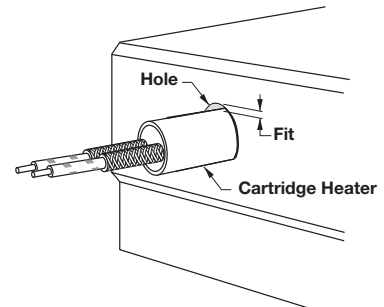
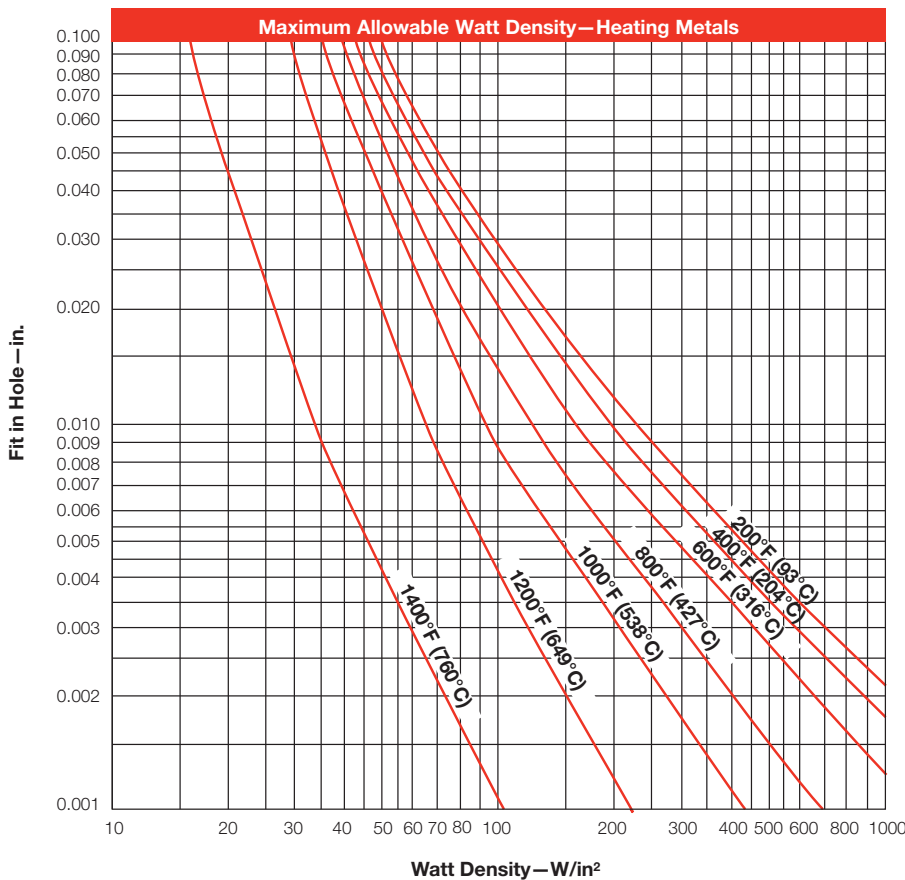
These graphs depict FIRERODs used in steel parts, therefore, for stainless steel, aluminum or brass, refer to applicable correction factors:

1. For stainless steel, enter the graph with a fit 0.0015 in. (0.04 mm) larger than actual fit.
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 display 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/in^2 . 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 can be easily determined. Subtract the minimum diameter of the FIREROD (nominal diameter minus tolerance) from the maximum hole diameter. For example, the hole fit is 0.006 in. (0.15 mm) for a hole diameter of 0.500 in. (13 mm) minus a heater diameter of 0.496 in. (12.6 mm) ± 0.002 in. (0.05 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.

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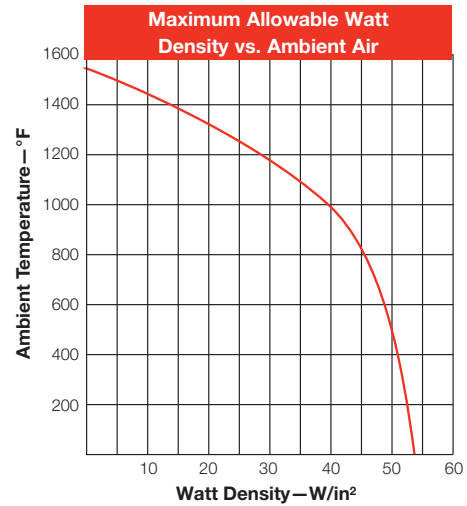
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Maximum Allowable Watt Density (Continued)

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 the 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.

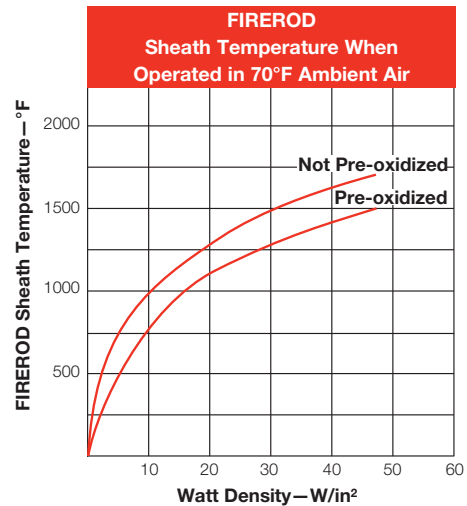


Sheath Temperature in Ambient Air

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 is 1450°F (784°C). At this temperature, a one-year life is expected if cycling is not too frequent.

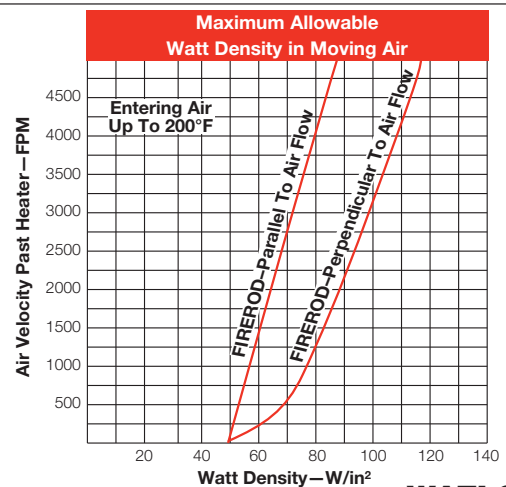
Higher temperatures result in reduced heater life.



Watt Density in Moving Air

The *Watt Density in Moving Air* graph shows 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.



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Lead and Diameter Information

Standard Lead Specifications

Heater Diameter in. (mm)	Max. Voltage	Standard Lead Gauge Fiberglass	Size Tolerance Fiberglass	Standard Lead Gauge PTFE	Size Tolerance PTFE	Stainless Steel Hose I.D.	Stainless Steel Braid I.D.
1/8 (3)	300	24	0.044 - 0.058	24 solid	0.036 - 0.044	1/8	1/8
1/4 (6)	300	22	0.066 - 0.078	22	0.050 - 0.058	5/32	1/8
3/8 (10)	300	22	0.076 - 0.088	20	0.056 - 0.064	7/32	3/16
1/2 (13)	300	18	0.089 - 0.101	20	0.074 - 0.084	9/32	1/4
5/8 (16)	600	18	0.108 - 0.124	18	0.097 - 0.113	7/16	3/8
3/4 (19)	600	18	0.108 - 0.124	14	0.097 - 0.113	7/16	3/8
1 (25)ⓐ	600	18	0.095 - 0.109	14	0.087 - 0.101	N/A	N/A

Lead length tolerances:

1 to 36 in. (25 to 914 mm) = -1/2 in. (13 mm), +1 1/2 in. (38 mm)

> 36 to 72 in. (914 to 1829 mm) = -1, +3 in. (-25 + 76 mm) ⓐ

Stainless steel hose and braid tolerances: same as lead wire.

Units constructed with 480V require MGT or PTFE 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)
PTFE, 600V, 392°F (200°C)
Silicone rubber, 600V, 302°F (150°C)

ⓐ A minimum charge per line item applies.

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

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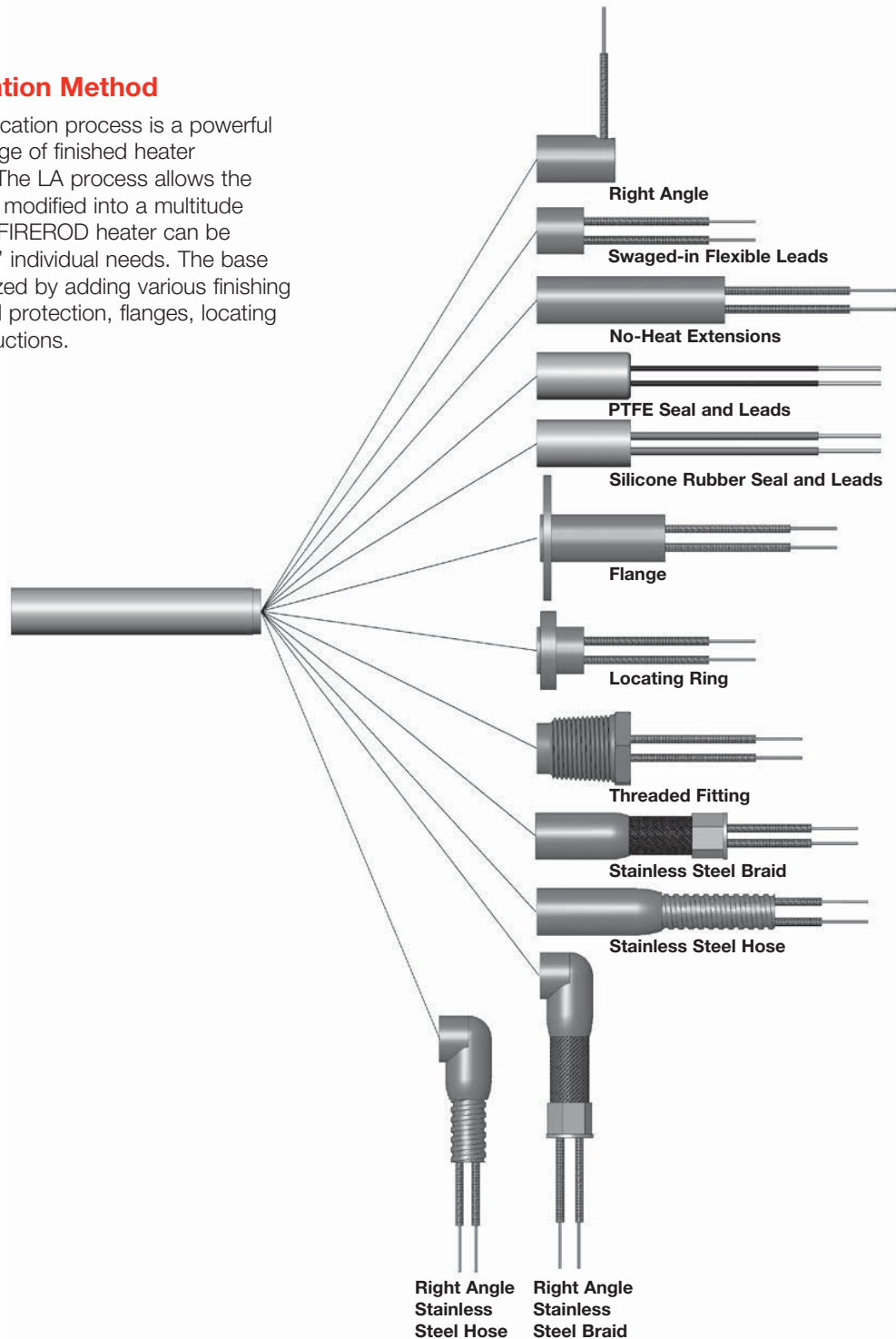
FIREROD Cartridge Heaters

Lead Adapter (LA)

Options

Patented LA Modification Method

The lead adapter (LA) modification process is a powerful tool for providing a wide range of finished heater configurations very quickly. The LA process allows the base FIREROD heater to be modified into a multitude of configurations. The base FIREROD heater can be selected to meet customers' individual needs. The base heater can then be customized by adding various finishing options like lead length, lead protection, flanges, locating rings and right-angle constructions.



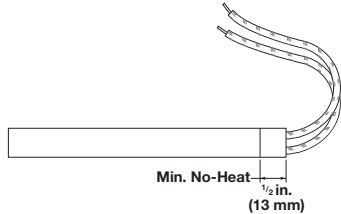
Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

LA

Termination Options

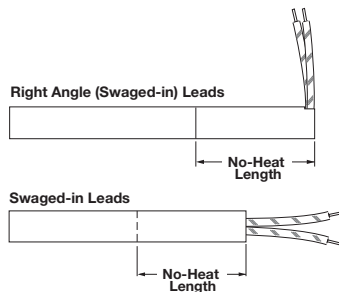
LA Swaged-in Flexible Leads



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 1/4 in. (6 mm). To order, specify **length adder code E** bringing the total lead end no-heat to 1/2 in. (13 mm).

This LA option is not available on 1/8 in. (3 mm) diameter FIRERODs. On 1/8 in. (3 mm) diameter FIRERODs, leads are connected externally using a solid conductor lead wire. If stranded wire is desired on 1/8 in. (3 mm) diameter units, contact your Watlow representative.

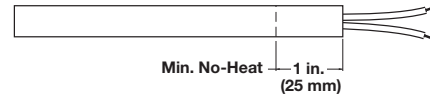
No-Heat Extensions



No-heat extensions are recommended in applications where leads may be exposed to excessive heat and require a cooler lead end. They are also used when heat is not required along the entire length of the FIREROD.

No-heat extensions are available for most LA options in diameters of 3/8, 1/2, 5/8 and 3/4 in. (10, 13, 16 and 19 mm). These extensions are designed to provide a total no-heat length of 1, 1 1/2, 2 or 2 1/2 in. (25, 38, 51 or 65 mm) at the lead end of FIRERODs only. Contact your Watlow representative for available LA options.

LA PTFE Seal and Leads



The LA PTFE 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 392°F (200°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 required is 1 in. (25 mm). The LA cap adds 3/4 in. (19 mm) to the overall length of the heater. To order, specify **option code T**.

LA Silicone Rubber Seal and Leads



The LA silicone rubber seal and leads protect the heater against moisture and contamination from lubricating oil, cleaning solvents, plastic material, fumes and organic tapes. This seal is effective to 302°F (150°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 required is 1 in. (25 mm). The LA cap adds 3/4 in. (19 mm) to the overall length. To order, specify **option code P**.

Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

LA

Termination Options *(Continued)*

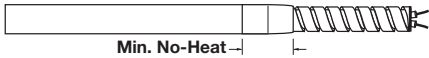
LA Straight Stainless Steel Hose



An 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 a 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than the hose but, longer leads are available.

The minimum lead end no-heat required is $\frac{3}{4}$ in. (19 mm). This option adds $\frac{1}{2}$ in. (13 mm) to the overall length. To order, specify **option code H**.

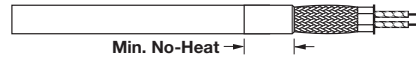
LA Straight Stainless Steel Hose with PTFE Leads and Seal



An LA straight stainless steel hose with PTFE leads and seal is the ultimate combination for providing abrasion protection and a moisture resistant seal. Unless specified, a standard 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than the hose, but longer leads are available. This seal is effective up to 392°F (200°C) under continuous operation.

The minimum lead end no-heat required is 1 in. (25 mm). This option adds $\frac{3}{4}$ in. (19 mm) to the overall length. To order, specify **option code G**.

LA Straight Stainless Steel Braid

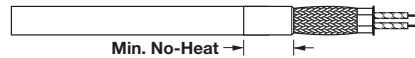


The LA straight stainless steel braid is designed to protect leads from abrasion against sharp edges. It is the most flexible Watlow protective lead arrangement.

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

The minimum lead end no-heat required is $\frac{3}{4}$ in. (19 mm). This option adds $\frac{1}{2}$ in. (13 mm) to the overall length. To order, specify **option code C**.

LA Straight Stainless Steel Braid with PTFE Leads and Seal



The LA straight stainless steel braid with PTFE leads and seal is Watlow's most flexible lead protection with a moisture resistant seal. Unless specified, a 12 in. (305 mm) braid is supplied. Leads are 2 in. (51 mm) longer than the braid, but longer leads are available. This seal is effective up to 392°F (200°C) under continuous operation.

The minimum lead end no-heat required is 1 in. (25 mm). This option adds $\frac{3}{4}$ in. (19 mm) to the overall length. To order, specify **option code F**.

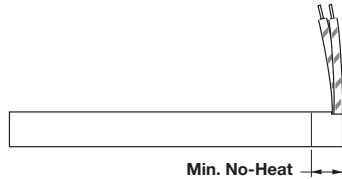
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LA

Right Angle Options

LA Right Angle Leads



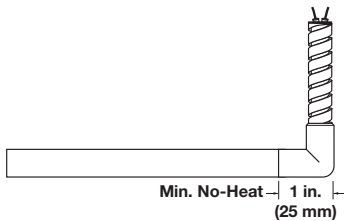
LA right angle leads are used in applications with a high degree of flexing and when space limitations are critical. Stranded lead wires are connected internally (swaged-in) and exit at a 90 degree angle at the end of the heater.

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

Minimum No-Heat Required in. (mm)					
Dia.	1/4	3/8	1/2	5/8	3/4
In. (mm)	13/16 (21)	3/4 (19)	13/16 (21)	13/16 (21)	13/16 (21)

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

LA Right Angle Stainless Steel Hose



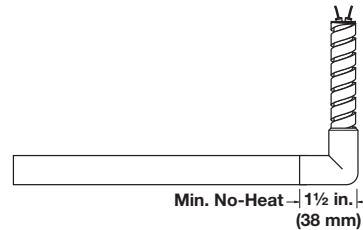
An LA right angle stainless steel hose is provided for wiring convenience. Like the LA straight stainless steel hose, it protects leads from abrasion against sharp edges. Unless specified, a 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than the hose, but longer leads are available.

Diameter	3/8	1/2	5/8	3/4
Adder length in. (mm)	3/4 (19)	3/4 (19)	3/4 (19)	7/8 (22)
Min. no-heat in. (mm)	1 (25)	1 (25)	1 (25)	1 1/8 (29)

To order specify **option code W**.

Note: This option is not available on 1/4 in. (6 mm) diameter.

LA Right Angle Stainless Steel Hose with PTFE Leads and Seal



An LA right angle stainless steel hose with PTFE leads and a seal is the ultimate combination for providing abrasion protection and a moisture resistant seal with wiring convenience. Unless specified, a 12 in. (305 mm) hose is supplied. Leads are 2 in. (51 mm) longer than the hose but longer leads are available. This seal is effective to 392°F (200°C) under continuous operation.

The minimum lead end no-heat required is 1 1/2 in. (38 mm). This option adds 1 1/4 in. (32 mm) to overall length on stock units.

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

Note: This option is not available on 1/4 in. (6 mm) diameter.

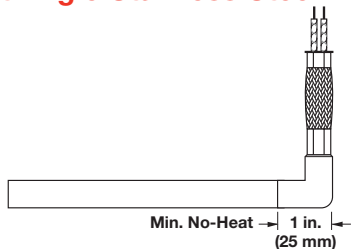
Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

LA

Right Angle Options *(Continued)*

LA Right Angle Stainless Steel Braid



An LA right angle stainless steel braid is provided for wiring convenience. It protects leads from abrasion against sharp edges.

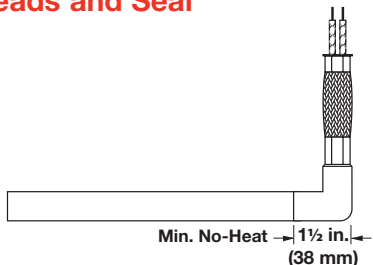
Unless specified, a 12 in. (305 mm) braid is supplied. Leads are 2 in. (51 mm) longer than the braid, but longer leads are available.

Diameter	3/8	1/2	5/8	3/4
Adder length in. (mm)	3/4 (19)	3/4 (19)	3/4 (19)	7/8 (22)
Min. no-heat in. (mm)	1 (25)	1 (25)	1 (25)	1 1/8 (3)

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

Note: This option is not available on 1/4 in. (6 mm) diameter.

LA Right Angle Stainless Steel Braid with PTFE Leads and Seal



The LA right angle stainless steel braid with PTFE leads and seal is Watlow's most flexible lead protection with a moisture resistant PTFE seal and wiring convenience. Unless specified, a 12 in. (305 mm) braid is supplied. Leads are 2 in. (51 mm) longer than the braid, but longer leads are available. This seal is effective up to 392°F (200°C) under continuous operation.

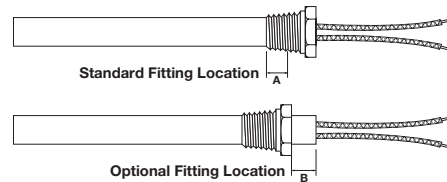
The minimum lead end no-heat required is 1 1/2 in. (38 mm). This option adds 1 1/4 in. (32 mm) to the overall length on stock units.

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

Note: This option is not available on 1/4 in. (6 mm) diameter.

Mounting Options

LA Stainless Steel Threaded Fittings



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

Threaded fittings allow fast, water-tight installation of the heater into a threaded hole. These fittings are 304 stainless steel, other stainless steel alloys are available upon request. Double threaded fittings are also available. Please see page 33 for threaded fitting specifications. Provide the location of the fittings if no-heat extension option is requested. Specify the location for option B.

Lead Arrangement	Standard Fitting ^① Location Dimension A in. (mm)
Crimped Leads	1/4 (6)
Swaged-in Leads	5/16 ^{②④} (8)
STR SS Hose	1/2 ^③ (13)
STR SS Braid	1/2 (13)
PTFE Seal & Leads	7/8 (22)
Silicone Seal & Leads	7/8 (22)

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

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

② On 1/4 in. diameter FIREROD only "A" dimension is 7/16 in. (11.1 mm).

③ On 1/4 in. diameter FIREROD only "A" dimension is 5/8 in. (15.9 mm).

④ On 5/8 in. and 3/4 in. the fitting is located at 7/8 in. from the lead end using a 3/4 in. no-heat extension. In order to locate at 5/16 in., the fitting must be epoxied.

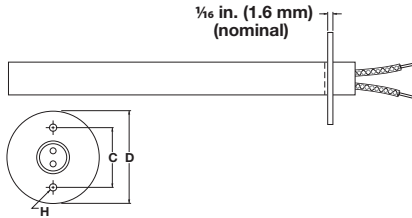
Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

LA

Mounting Options

Flanges



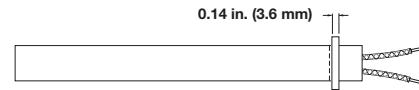
Stainless steel flanges are a convenient mounting method to position a heater within an application. The flange is staked on and located $\frac{1}{16}$ in. (6 mm) from the lead end. The flange can be located up to $2\frac{1}{4}$ in. (57 mm) from the lead end if it is over a no-heat section. Use this option in combination with most LA configurations.

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

Flange Specifications

FIREROD Diameter in.	Flange Size	in. (mm)		
		D	C	H
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$	FS	1 (25)	$\frac{3}{4}$ (19)	0.144 (4)
$\frac{1}{4}$, $\frac{3}{8}$, $\frac{1}{2}$ $\frac{5}{8}$, $\frac{3}{4}$	FM	$1\frac{1}{2}$ (38)	$1\frac{1}{8}$ (29)	0.156 (4)
$\frac{5}{8}$, $\frac{3}{4}$	FL	2 (51)	$1\frac{1}{2}$ (38)	0.201 (5)

Locating Ring



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

For LA, specify the location if the no-heat extension option is requested. On FIRERODs with crimped on leads without the LA option, the locating ring will be located on the last $\frac{1}{4}$ in. (6 mm).

To order, specify **locating ring**.

Locating Ring Specifications

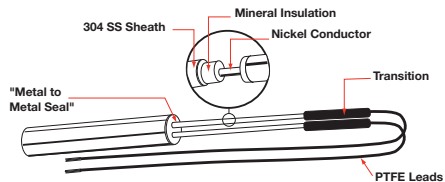
Diameter	$\frac{1}{4}$	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{3}{4}$
Ring O.D. in. (mm)	$\frac{1}{2}$ (13)	$\frac{5}{8}$ (16)	$\frac{3}{4}$ (19)	$\frac{7}{8}$ (22)	1 (25)

Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

LA

Mineral Insulated (MI) Leads



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

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, 6 in. (152 mm) of MI cable and 12 in. (305 mm) of PTFE leads will be supplied. To order, specify **option code J**.

Note: A minimum charge per line item applies.

Benefits

- Increases heater life
- Minimizes down time
- Resists moisture contamination
- Allows a cartridge heater to be used where it was not previously possible
- Resists abrasion and vibration
- Forms and bends to fit the contours of wiring raceways
- Protects against high temperatures without additional insulation

Typical Applications

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

Technical Data

Max. temp. of cable: 1500°F (815°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

PTFE 392°F (200°C) – T

Heater Diameter in.	Max. Current Amperes	Conductor Diameter in.	Cable Diameter in.	Transition Diameter in.	Cable Length		Min. Bend Radius	Max. Voltage in.	Length Adder
					Min. in.	Max. in.			
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)

This information pertains to standard FIREROD heaters.

Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

LA Options

Option	Minimum Length Adders Per Diameter Per Option in. (mm)					Option Code
	1/4 (6)	3/8 (9.5)	1/2 (13)	5/8 (15.9)	3/4 (19)	
Heater Diameter	1/4 (6)	3/8 (9.5)	1/2 (13)	5/8 (15.9)	3/4 (19)	
Swaged-in leads	E 1/4 (6)	E 1/4 (6)	E 1/4 (6)	E 1/4 (6)	E 1/4 (6)	None
Right angle leads	K 9/16 (14)	J 1/2 (13)	K 9/16 (14)	K 9/16 (14)	K 9/16 (14)	R
PTFE seal and leads	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	T
Right angle PTFE seal and leads	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	B
Silicone seal and leads	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	P
Straight hose	J 1/2 (13)	J 1/2 (13)	J 1/2 (13)	J 1/2 (13)	J 1/2 (13)	H
Right angle hose	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	R 7/8 (22.2)	W
Straight hose with PTFE seal and leads	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	G
Straight braid	J 1/2 (13)	J 1/2 (13)	J 1/2 (13)	J 1/2 (13)	J 1/2 (13)	C
Right angle braid	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	R 7/8 (22)	Y
Right angle braid with PTFE seal and leads	— —	1E 1 1/4 (32)	1E 1 1/4 (32)	1E 1 1/4 (32)	1E 1 1/4 (32)	A
Straight braid with PTFE seal and leads	— —	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	N 3/4 (19)	F
Right angle hose with PTFE seal and leads	— —	1E 1 1/4 (32)	1E 1 1/4 (32)	1E 1 1/4 (32)	1E 1 1/4 (32)	M

LA options are available for all FIRERODs, except the 1/8 in. diameter size. To order any of these options, please build the order number by specifying the Watlow part number, length adder code, option code and lead length.

Ordering Example: The order number **J12A89-N72W74** indicates an order for 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 12 3/4 in. (324 mm).

Note: No-heat extensions are available for most LA options in diameters of 3/8, 1/2, 5/8 and 3/4 in. Contact your Watlow representative for available LA options.

To order any of these dimensions, please specify the applicable length adder code shown.

Lead Type Codes

Type	Maximum Temperature	Option Code
GGs	482°F (250°C)	None
MGT	842°F (450°C)	H
PTFE	392°F (200°C)	T

Note: Available for LA fiberglass leads.

No-Heat Length Adder Codes

No-Heat Option in. (mm)	Length Adder Code
3/4 (19)	N
1 1/4 (32)	1E
1 3/4 (44)	1N
2 1/4 (56)	2E

Modifying Basic FIRERODs Using the LA Process for Swaged-in Leads

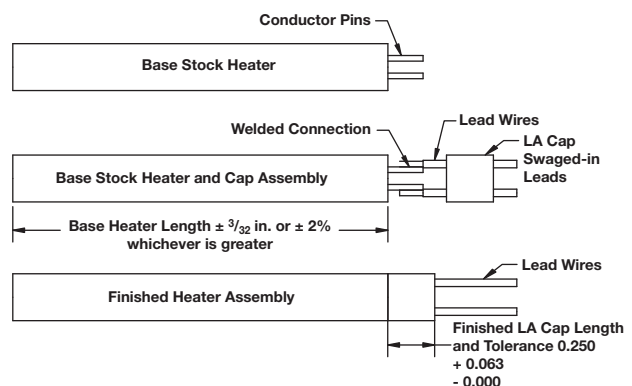
Watlow:

- Shortens conductor pins
- Welds lead wires to pins
- Places an LA cap over the lead end of the heater
- Reduces the diameter of the LA cap over the lead end of the base unit to produce a rugged integrated heater assembly

Notes:

- **Other LA construction options use a similar modification process**
- **Maximum temperature of LA cap is 1000°F (538°C)**

Length Tolerance for Stock Heaters With LA Options



Cartridge/Insertion Heaters

FIREROD Cartridge Heaters

Non-Lead Adapter (LA)

Modification Coding

Watlow offers heaters in various diameters, lengths and volt-wattage combinations that are ready for shipping. Basic modifications can be made and heaters are shipped the same day. Modifications include flanges, threaded fittings, locating rings, ceramic beads and crimped on leads. Following is a list of all available non-LA mounting and pin option codes.

Mounting Option Codes

- BA - Small flange FS (available on 1/4, 3/8 and 1/2 in.)
- BB - Medium flange FM (available on 1/4, 3/8, 1/2, 5/8 and 3/4 in.)
- BC - Large flange FL (available on 5/8 and 3/4 in.)
- BD - Locating ring (available on 1/4, 3/8, 1/2, 5/8 and 3/4 in.)
- BG - Single stainless steel fitting
- BH - Double stainless steel fitting
- BY - Stainless steel reversed

Pin Option Codes

- AA - Short pins 3/8 in. (10 mm)
- AB - Medium pins 5/8 in. (16 mm)
- AC - Long pins 1 3/4 in. (45 mm)
- AD - Stagger pins
- AE - Ceramic beads 1/2 in. (13 mm)
- AF - Ceramic beads 3/4 in. (19 mm)
- AG - Ceramic beads 1 in. (25 mm)
- AH - Ceramic beads 1 1/4 in. (32 mm)
- AJ - Ceramic beads 1 1/2 in. (38 mm)

