

## Revolutionizing the Heater Industry



The Watlow® FIREROD® cartridge heater incorporates engineering excellence and is supported by over 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/in<sup>2</sup> (62 W/cm<sup>2</sup>)
- Maximum voltage up to 480V

### Features and Benefits

#### Nickel-chromium resistance wire

- Ensures even and efficient distribution of heat to the sheath

#### Metalurgically-bonded conductor pins

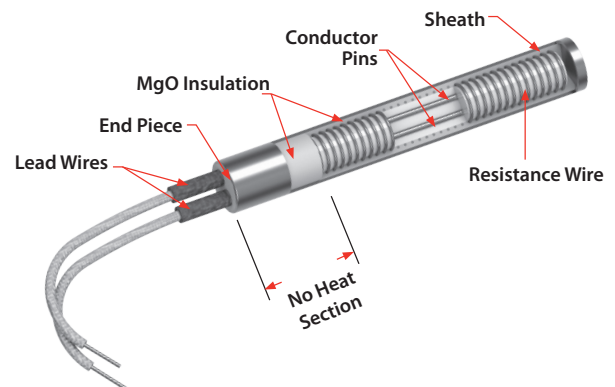
- Ensure a trouble-free electrical connection

#### 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



### Features and Benefits (con't)

#### 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 840°F (450°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
- High temperature glass forming equipment

## Applications and Technical Data

### Tolerances

#### Diameter

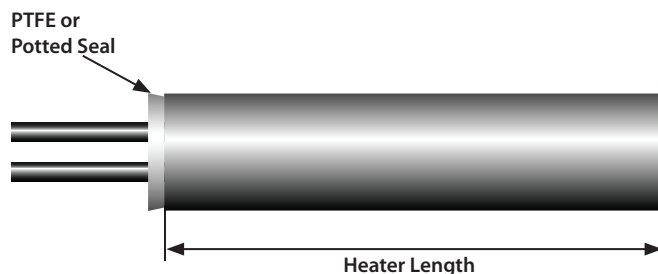
- 1 in. (25 mm) units:  $\pm 0.003$  in. ( $\pm 0.08$  mm)
- All other units:  $\pm 0.002$  in. ( $\pm 0.05$  mm)

#### Sheath Length

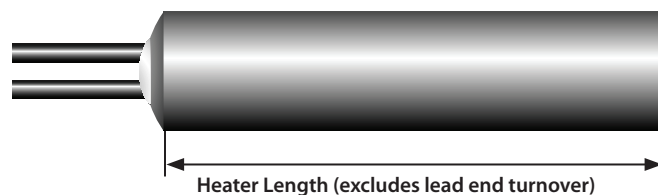
- All units to  $4\frac{1}{2}$  in. (114 mm) long:  $\pm \frac{3}{32}$  in. ( $\pm 2.4$  mm)
- $\frac{1}{8}$  in. diameter units over  $4\frac{1}{2}$  in. (114 mm) long:  $\pm 3\%$
- All other units over  $4\frac{1}{2}$  in. (114 mm) long:  $\pm 2\%$

## Length Measurements

### Pin Style and Potted FIRERODs



### PTFE - Swaged-in Leads FIRERODs



### Wattage

- $\frac{1}{8}$  in. units: +10%, -15%
- All other units: +5%, -10%

### Resistance

- $\frac{1}{8}$  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

## 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 1164800-4911-0009) (file number 1164800-4911-0004)

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

## Dimensional Data

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

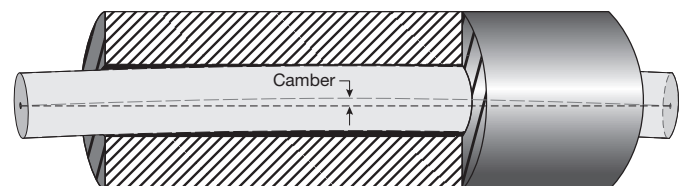
FIREROD Diameter			Length	
Nominal in.	Actual in.	(mm)	Min. in. (mm)	Max. in. (mm)
$\frac{1}{8}$	0.122	(3.1)	$\frac{7}{8}$ (22.2)	12 (305)
$\frac{1}{4}$	0.246	(6.3)	$\frac{7}{8}$ (22.2)	36 (915)
$\frac{3}{8}$	0.371	(9.4)	$\frac{7}{8}$ (22.2)	48 (1220)
$\frac{1}{2}$	0.496	(12.6)	$\frac{7}{8}$ (22.2)	60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

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

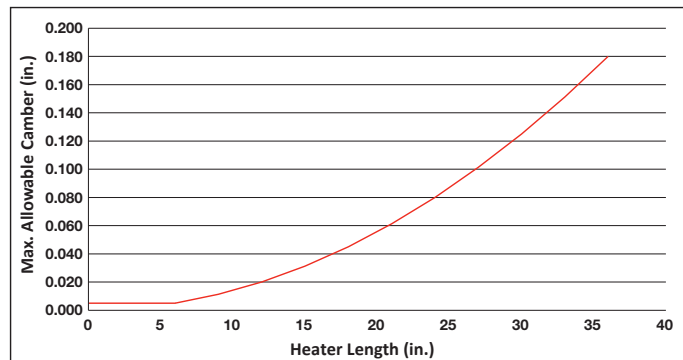
## Camber

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

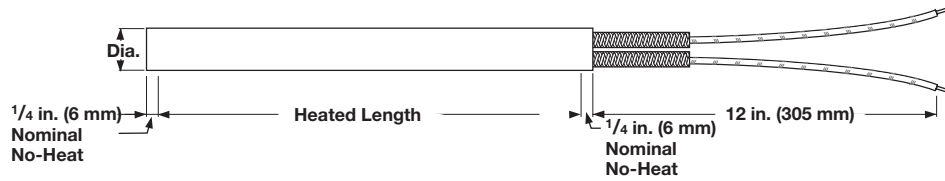


Max. camber =  $0.020 \text{ in.} \times (\text{length in feet})^2$  or 0.005 in., whichever is greater.

## 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. <sup>①</sup>	Min. Watts @ 120V <sup>③</sup> Heater Length			Max. Watts				
			1 in. (25 mm)	1 1/2 in. (38 mm)	2 in. (50 mm)	120V 1-phase	240V 1-phase	480V 1-phase	240V 3-phase	480V 3-phase
1/8	240	3.1	—	8	5	360	720	—	—	—
1/4	240	4.4 <sup>②</sup>	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 <sup>④</sup>	5520	11,000	9550	19,100
1 <sup>⑦</sup>	480	23.0	—	15	10	2760 <sup>④</sup>	5520	11,000	9550 <sup>④</sup>	19,100 <sup>④</sup>

Number Of Circuits <sup>⑥</sup>		
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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