

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/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

Metalurgically-bonded conductor pins

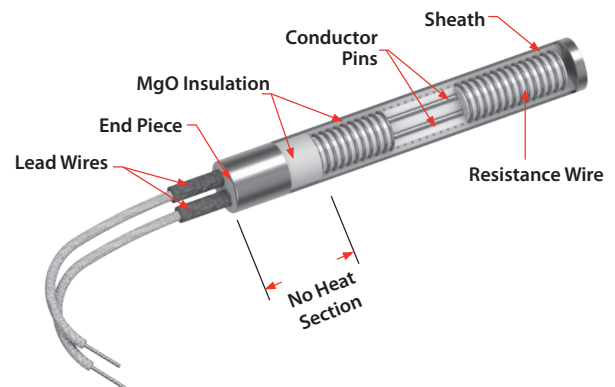
- Ensure a trouble-free electrical connection

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

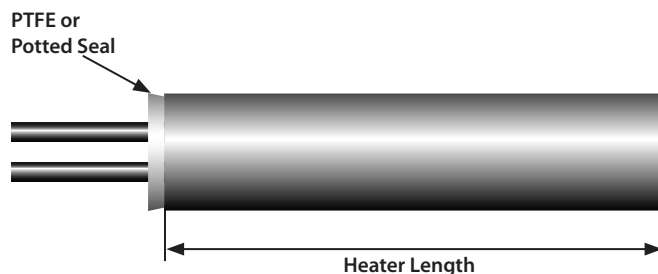
- 1 in. (25 mm) units: ± 0.003 in. (± 0.08 mm)
- All other units: ± 0.002 in. (± 0.05 mm)

Sheath Length

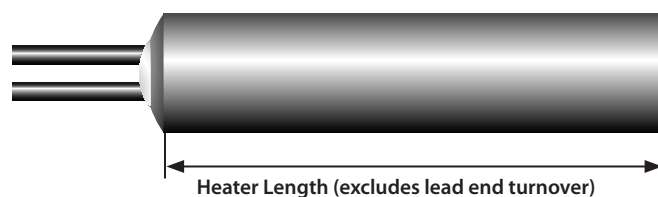
- All units to $4\frac{1}{2}$ in. (114 mm) long: $\pm \frac{3}{32}$ in. (± 2.4 mm)
- $\frac{1}{8}$ in. diameter units over $4\frac{1}{2}$ in. (114 mm) long: $\pm 3\%$
- All other units over $4\frac{1}{2}$ in. (114 mm) long: $\pm 2\%$

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 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 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.

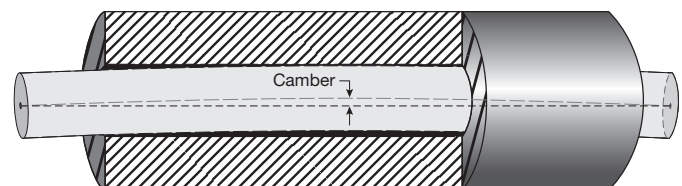
FIREROD Diameter			Length	
Nominal in.	Actual in.	(mm)	Min. in. (mm)	Max. in. (mm)
$\frac{1}{8}$	0.122	(3.1)	$\frac{7}{8}$ (22.2)	12 (305)
$\frac{1}{4}$	0.246	(6.3)	$\frac{7}{8}$ (22.2)	36 (915)
$\frac{3}{8}$	0.371	(9.4)	$\frac{7}{8}$ (22.2)	48 (1220)
$\frac{1}{2}$	0.496	(12.6)	$\frac{7}{8}$ (22.2)	60 (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.

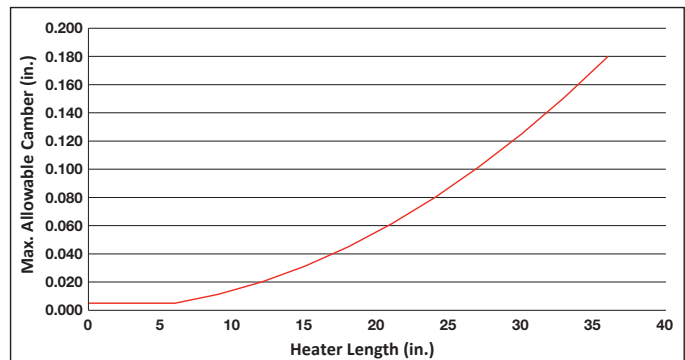
Camber

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

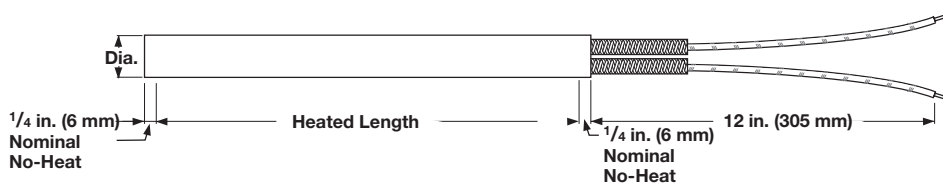


Max. camber = $0.020 \text{ in.} \times (\text{length in feet})^2$ or 0.005 in., whichever is greater.

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. ^①	Min. Watts @ 120V ^③ 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 ^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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UL® is a registered trademark of Underwriter's Laboratories, Inc.

Powered by Possibility

To be automatically connected to the nearest North American Technical Sales Office:

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Taiwan	+886 7 288 5168
UK	+44 115 964 0777

Cartridge/Insertion Heaters



FIREROD Cartridge Heaters

Heater Part Numbers

Diameter in.	Sheath Length in. (mm)	Volts	Watts	Watt Density W/in ² (W/cm ²)	Approx. Net Wt. lbs (kg)	Part Number
5/8	1 1/4 (32.0)	120	50	34 (5)	0.10 (0.045)	L1E26
	1 1/4 (32.0)	120	200	137 (21)	0.10 (0.045)	L1E24
	1 1/4 (32.0)	120	250	171 (27)	0.10 (0.045)	L1E27
	1 1/2 (38.0)	120	250	128 (20)	0.11 (0.050)	L1J23
	1 1/2 (38.0)	240	250	128 (20)	0.11 (0.050)	L1J24
	2 (51.0)	120	100	34 (5)	0.13 (0.059)	L2A48
	2 (51.0)	120	200	68 (11)	0.13 (0.059)	L2A49
	2 (51.0)	240	500	170 (26)	0.13 (0.059)	L2A54
	2 1/4 (57.0)	120	100	29 (4)	0.14 (0.064)	L2E49
	2 1/4 (57.0)	120	250	73 (11)	0.14 (0.064)	L2E50
	2 1/4 (57.0)	240	250	73 (11)	0.14 (0.064)	L2E12
	2 1/4 (57.0)	120	350	103 (16)	0.14 (0.064)	L2E40
	2 1/4 (57.0)	240	350	103 (16)	0.14 (0.064)	L2E51
	3 (76.0)	120	150	31 (5)	0.20 (0.091)	L3A81
	3 (76.0)	120	250	51 (8)	0.20 (0.091)	L3A82
	3 (76.0)	240	250	51 (8)	0.20 (0.091)	L3A9
	3 (76.0)	120	400	81 (13)	0.20 (0.091)	L3A94
	3 (76.0)	120	500	102 (16)	0.20 (0.091)	L3A113
	3 (76.0)	240	500	103 (16)	0.20 (0.091)	L3A33
	3 (76.0)	240	750	154 (24)	0.20 (0.091)	L3A71
	3 3/4 (95.0)	120	525	82 (13)	0.24 (0.109)	L3N12
	3 3/4 (95.0)	240	525	82 (13)	0.24 (0.109)	L3N1
	4 (102.0)	120	250	37 (6)	0.26 (0.118)	L4A99
	4 (102.0)	240	250	37 (6)	0.26 (0.118)	L4A104
	4 (102.0)	240	400	58 (9)	0.26 (0.118)	L4A47
	4 (102.0)	240	500	73 (11)	0.26 (0.118)	L4A53
	4 (102.0)	240	600	88 (14)	0.26 (0.118)	L4A44
	4 (102.0)	240	750	110 (17)	0.26 (0.118)	L4A100
	4 (102.0)	240	1000	146 (23)	0.26 (0.118)	L4A71
	5 (127.0)	120	250	28 (4)	0.29 (0.132)	L5A76
	5 (127.0)	240	250	28 (4)	0.29 (0.132)	L5A107
	5 (127.0)	240	500	57 (9)	0.29 (0.132)	L5A24
	5 (127.0)	240	750	86 (13)	0.29 (0.132)	L5A31
	5 (127.0)	240	1000	114 (18)	0.29 (0.132)	L5A77
	6 (152.0)	120	300	28 (4)	0.34 (0.154)	L6A28
	6 (152.0)	240	300	28 (4)	0.34 (0.154)	L6A64
	6 (152.0)	240	500	47 (7)	0.34 (0.154)	L6A73
	6 (152.0)	240	750	70 (11)	0.34 (0.154)	L6A70
	6 (152.0)	240	1000	93 (14)	0.34 (0.154)	L6A71
	6 (152.0)	120	1500	139 (22)	0.34 (0.154)	L6A163
	6 (152.0)	240	1500	140 (22)	0.34 (0.154)	L6A94
	6 1/2 (165.0)	120	500	43 (7)	0.38 (0.172)	L6J43
	6 1/2 (165.0)	240	500	43 (7)	0.38 (0.172)	L6J55
	7 (178.0)	120	500	39 (6)	0.40 (0.181)	L7A42
	7 (178.0)	240	500	39 (6)	0.40 (0.181)	L7A15
	7 (178.0)	240	1000	79 (12)	0.40 (0.181)	L7A37
	7 (178.0)	240	1500	118 (18)	0.40 (0.181)	L7A12

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Heaters are manufactured to standard specifications. 12 inch crimped on GGS leads supplied unless otherwise specified.

Cartridge/Insertion Heaters



FIREROD Cartridge Heaters

Heater Part Numbers

Diameter in.	Sheath Length in. (mm)	Volts	Watts	Watt Density W/in ² (W/cm ²)		Approx. Net Wt. lbs (kg)		Part Number
5/8	8 (203.0)	120	500	34	(5)	0.47	(0.213)	L8A96
	8 (203.0)	240	500	34	(5)	0.47	(0.213)	L8A46
	8 (203.0)	240	850	58	(9)	0.47	(0.213)	L8A115
	8 (203.0)	240	1000	68	(10)	0.47	(0.213)	L8A10
	8 (203.0)	240	1500	102	(16)	0.47	(0.213)	L8A37
	8 (203.0)	240	2000	137	(21)	0.47	(0.213)	L8A80
	10 (254.0)	120	500	27	(4)	0.53	(0.240)	L10A51
	10 (254.0)	240	500	27	(4)	0.53	(0.240)	L10A40
	10 (254.0)	240	750	40	(6)	0.53	(0.240)	L10A69
	10 (254.0)	240	1000	54	(8)	0.53	(0.240)	L10A52
	10 (254.0)	480	1000	54	(8)	0.53	(0.240)	L10A193
	10 (254.0)	240	1500	81	(13)	0.53	(0.240)	L10A8
	10 (254.0)	240	2000	108	(17)	0.53	(0.240)	L10A50
	12 (305.0)	120	500	22	(3)	0.66	(0.300)	L12A81
	12 (305.0)	240	500	22	(3)	0.66	(0.300)	L12A80
	12 (305.0)	240	900	40	(6)	0.66	(0.300)	L12A102
	12 (305.0)	120	1000	45	(7)	0.66	(0.300)	L12A82
	12 (305.0)	240	1000	45	(7)	0.66	(0.300)	L12A34
	12 (305.0)	120	1500	66	(10)	0.66	(0.300)	L12A147
	12 (305.0)	240	1500	67	(10)	0.66	(0.300)	L12A39
	12 (305.0)	240	2000	89	(14)	0.66	(0.300)	L12A63
	14 (356.0)	240	3700	140	(22)	0.79	(0.358)	L14A21
	15 (381.0)	240	750	27	(4)	0.84	(0.381)	L15A35
	15 (381.0)	240	2400	84	(13)	0.84	(0.381)	L15A20
	15 (381.0)	480	2500	88	(14)	0.84	(0.381)	L15A88
	15 (381.0)	240	4000	141	(22)	0.84	(0.381)	L15A41
	16 (406.0)	240	2500	82	(13)	0.91	(0.412)	L16A33
	16 (406.0)	240	4500	148	(23)	0.91	(0.412)	L16A40
	18 (457.0)	240	1500	44	(7)	1.03	(0.467)	L18A32
	18 (457.0)	240	3000	87	(13)	1.03	(0.467)	L18A34
	18 (457.0)	240	4700	137	(21)	1.03	(0.467)	L18A36
	20 (508.0)	240	1500	40	(6)	1.25	(0.567)	L20A19
	20 (508.0)	240	3500	92	(14)	1.25	(0.567)	L20A13
	20 (508.0)	480	3500	92	(14)	1.25	(0.567)	L20A96
	20 (508.0)	240	4700	123	(19)	1.25	(0.567)	L20A14
	24 (610.0)	240	2000	44	(7)	1.47	(0.667)	L24A19
	24 (610.0)	240	4700	102	(15)	1.47	(0.667)	L24A14
	36 (914.0)	240	3000	43	(7)	2.30	(1.04)	L36A8

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