Nozzle Heaters

Nozzle Heaters	Sheath Materials	Max. Operating Temperatures °F	°C	Typical Max. Watt Densities W/in²	W/cm²	Page
Mineral Insulated (MI)	Stainless steel	1400	760	230	35.6	**543**
Thick Film Cylindrical	430 stainless steel	842	450	75	11.6	**551**
Pre-Coiled Cable	Stainless steel	1200	650	152	23.5	**553**

Nozzle Heaters

Mineral Insulated (MI) Nozzle Heaters

The MI nozzle heater from Watlow® is a high-performance heater. Its performance and name are derived from Watlow's exclusive mineral insulation—a material with a 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 heated part. 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
- Maximum voltage to 240V

Features and Benefits

Operating temperatures to 1400°F (760°C)

- Melts resins such as PEEK®, Teflon®, Ultem® and Zytel® safely

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

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

Typical Applications

- Extruders
- Blown film dies
- Injection molding machines
- Other cylinder heating applications

Mineral Insulated (MI) Nozzle Heaters

Applications and Technical Data

The *Physical Limitations of Variations* table shows the availability of widths, inside diameters and terminations for Watlow's MI nozzle and barrel heaters. To make sure the available terminations will meet the applications needs, refer to the illustrations of termination variations in this section.

If the application needs a heater exceeding 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	(25.0)	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. 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 250VAC
- Minimum I.D. for post terminals: 1¼ in. (32 mm)
- Actual width for 7 in. (178 mm) wide heater: 6⅞ in. (174.6 mm)

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 (MI) 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, the term "heated area." must be defined. 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 corresponding 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).

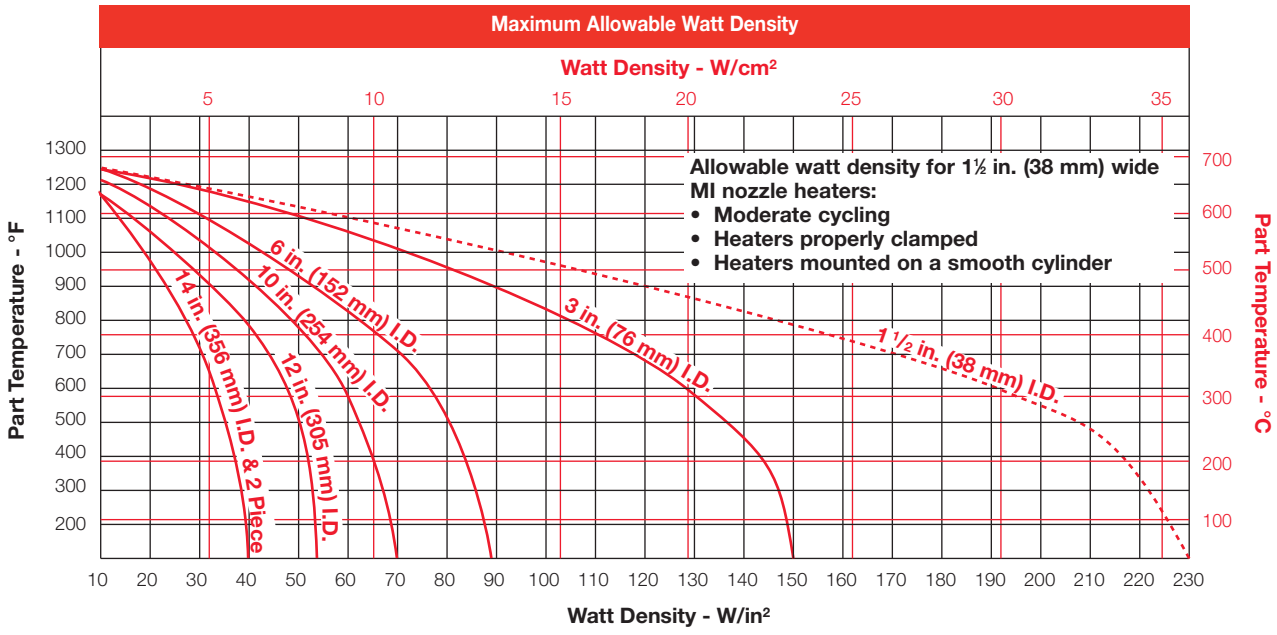
   Heated Area =
   (3.14 x Diameter - No-Heat Factor) x Width

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 the 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.



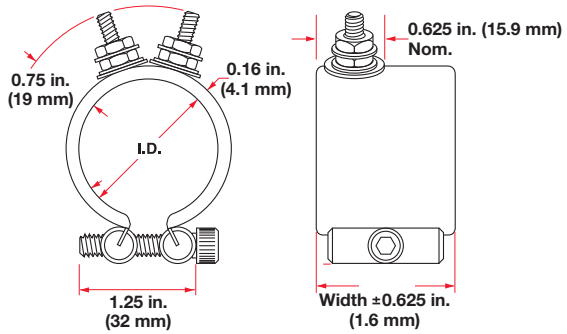
Mineral Insulated (MI) Nozzle Heaters

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

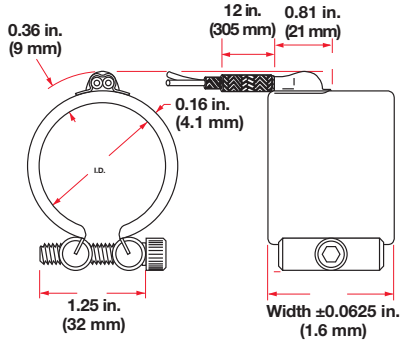
Stock



Post terminals provide optimum connections. Screw thread is 10-24. To order, specify **post terminals** (metric threads available).

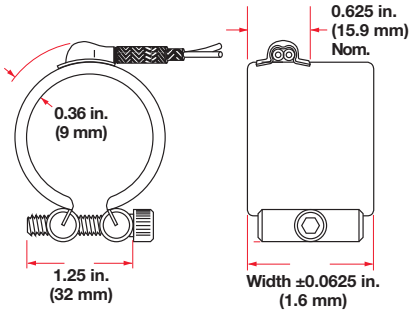
Type B

Stock



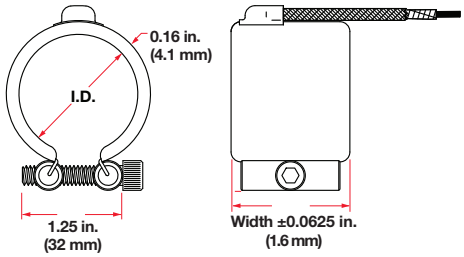
Type B—90° Rotation

Non-Stock

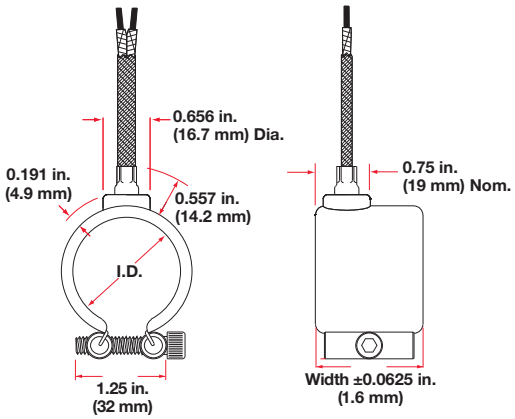


Type B - 180° Rotation

Stock



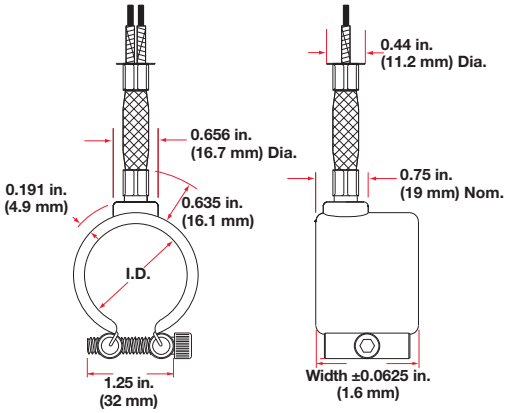
Type C



Mineral Insulated (MI) Nozzle Heaters

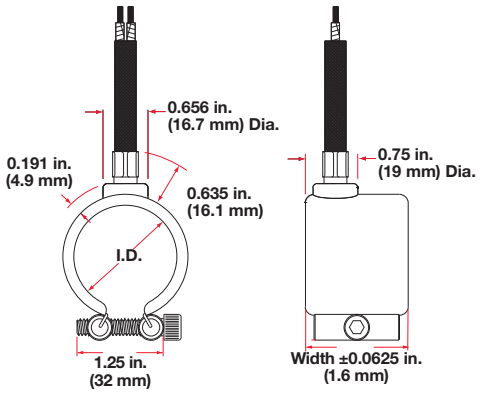
Termination Variations *(Continued)*

Type E
Stock



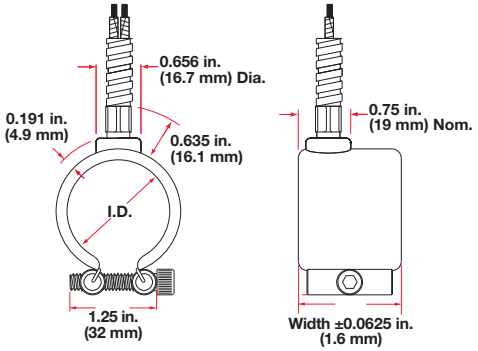
Type E: Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **Type E** and **length.**

Type F
Stock



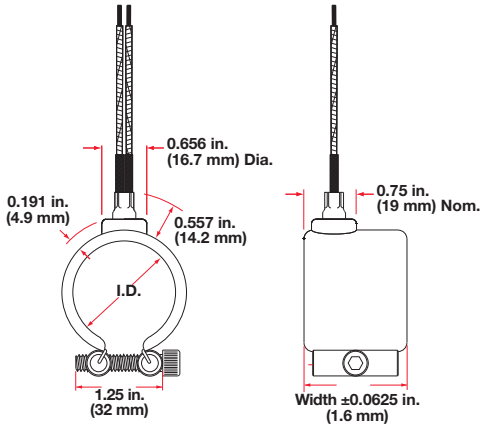
Type F: Loose fiberglass sleeving encloses two fiberglass leads for additional insulation protection where high temperature or minor abrasion is present. Leads are 2 in. (51 mm) longer than the sleeving. To order, specify **Type F** and **length**.

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

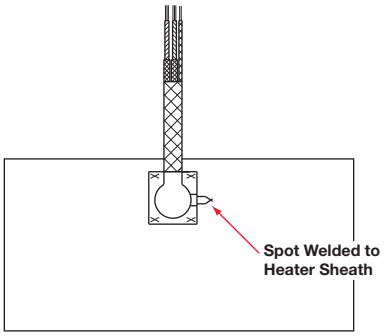


Type K: Flexible lead wires exit vertically from the heater. These leads can be bent adjacent to the heater for a quick and easy connection. To order, specify **Type K** and **length**.

Mineral Insulated (MI) Nozzle Heaters

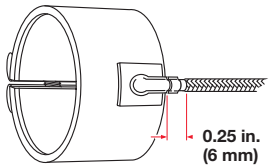
Variations

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.

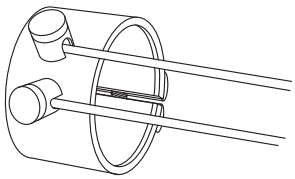
Lead Wire

Heaters rated at less than 250VAC 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 250VAC 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

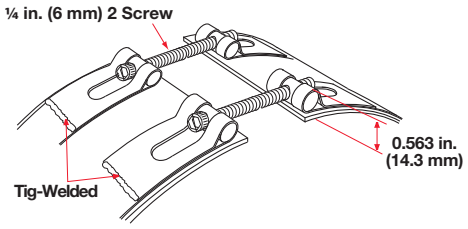


Ceramic covers, with openings for leads, are screwed on to post terminals, providing a convenient, economical insulator. To order, specify code number **Z-4918** and **quantity.** Ceramic terminal covers are also available in metric, specify thread. **Note:** Ceramic terminal covers will not fit on some stock expandable MI nozzles. Contact your Watlow representative for more information.

Mineral Insulated (MI) Nozzle Heaters

Clamping Variations

Tig-Welded Barrel Nuts

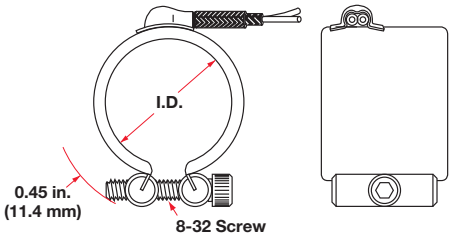


An ideal way to provide access for instrumentation is to specify an oversized gap between the heater ends. If the clamp bar screw interferes with the positioning of the instrumentation device, welded barrel nuts are recommended (tig-welded barrel nuts are standard on 1 in. [25 mm] wide MI nozzle heaters). To order, specify **tig-welded barrel nuts** and **gap dimension** when ordering.

Low-Profile Tig-Welded Barrel Nuts

Low-profile barrel nuts are available on all widths. Low-profile barrel nuts also 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**.

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 (MI) Nozzle Heaters

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)	Delivery	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**
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**

• Stock delivery, same day

Nozzle Heaters

EXTENDED CAPABILITY

Extended Capabilities For Thick Film Cylindrical Heaters

The innovative thick film heating technology from Watlow provides the injection molding industry with a patented 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 coiled heaters.

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. Thick film heaters can be designed to put the heat precisely where it is needed. The heater also provides greater control over standard coiled cable heaters. The heater can have a customized nozzle temperature profile.

Unlike coiled cable heaters, 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 because the actual nozzle temperature is measured, not the internal heater temperature.

US Patent Number 5,973,296

Performance Capabilities

- 430 stainless steel sheath temperatures up to 842°F (450°C)
- Watt densities up to 75 W/in^2 (11.6 W/cm^2)
- Voltages ranging from 100 to 240V are available for agency recognition

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 high nozzle density and more parts per mold

Moisture-resistant, non-porous glass film construction

- Eliminates need for soft starting
- Minimizes current leakage

Agency Approvals

- UL® recognized
- CSA certified and CE mark

Typical Applications

- Hot runner nozzle

EXTENDED CAPABILITY

Extended Capabilities For 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 240V are available for agency recognition. Higher voltages are also available.

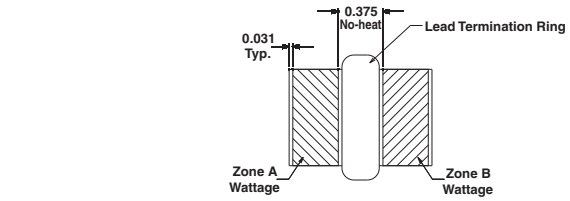
Precise Wattage Distribution

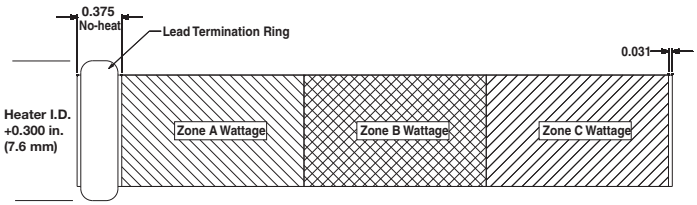
Thick film nozzle heaters rated up to 842˚F (450˚C) provide superior temperature uniformity by putting the energy exactly where it is needed.

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





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 pre-coiled, cable nozzle heater has been formed into a compact, tightly wound coil to supply 360 degrees of heat. This heater features a 5 in. (127 mm) long, no-heat tail section, which eliminates failures in the adapter area due to overheating.

This cable nozzle heater is manufactured with Watlow's swaged compaction process. This process provides a greater compaction of the MgO insulation than the competitor's rolling process. Compacting MgO insulation into a solid mass results in excellent heat conductivity and high dielectric strength.

Performance Capabilities

- Watt density up to 100 W/in^2 (15.5 W/cm^2)
- Possible operating temperature to 1200°F (650°C) (Dependent on type of element wire used)
- 230 and 240V constructions

Features and Benefits

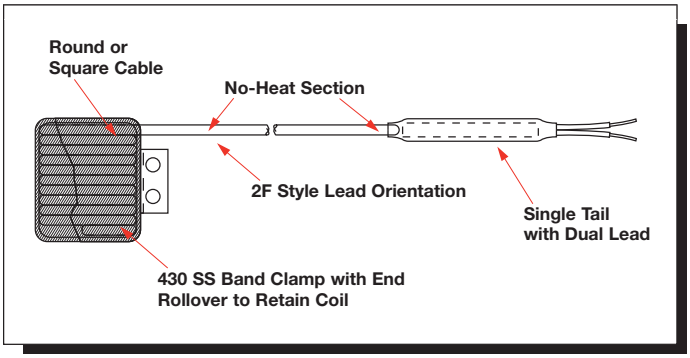
Low-profile construction
- Provides easy installation in the tight environment of multiple-gate molds

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

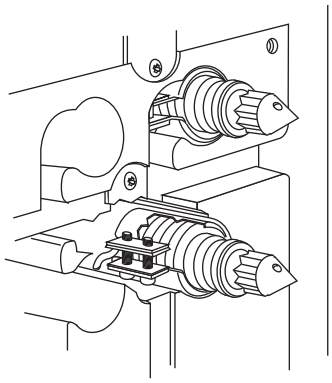


Typical Applications

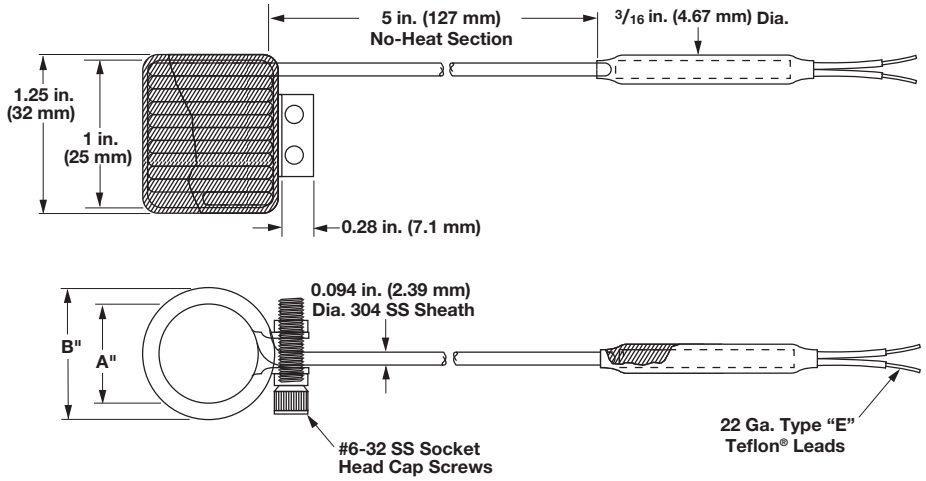
- Plastic injection molding equipment
- Hot runner molds

Pre-Coiled Cable Nozzle Heaters

Technical Data



Coiled Nozzle Heaters Mounted on a 64 Cavity Plastic Injection Mold



Cable Heater Units (Coiled nozzle with clamp strap)

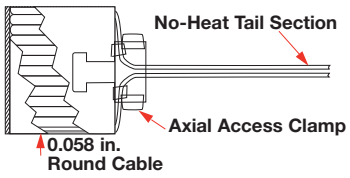
Volts	Watts	Coil I.D. in. (mm)	Clamp O.D. in. (mm)	Clamp Width in. (mm)	No-Heat	Lead Wire (Swaged-in) Teflon® Only	Code Number
0.094 in. Diameter Round (with ±5% wattage tolerance), no lead protection available.							
230	125	0.75 (19.0)	0.98 (24.9)	1.25 (32)	5 in. (127 mm) only	36 in. (914 mm)	**94PC30A1A**
230	125	0.75 (19.0)	0.98 (24.9)	1.25 (32)		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) only	36 in. (914 mm)	**102PS28A2B**
230	125	0.75 (19.0)	1 (25.0)	1.25 (32)		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**

- Delivery, 1 to 3 working days

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.	Coil I.D. (mm)	Volts	Watts	Lead Length in.	Lead Length (mm)	Clamp Width in.	Clamp Width (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**

- Delivery, 1 to 3 working days

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