

# Nozzle/Slip-On Heaters

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# Nozzle/Slip-On Heaters

## 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/in<sup>2</sup> (35.6 W/cm<sup>2</sup>) 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

# Nozzle/Slip-On Heaters

## 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 in. (mm)	I.D. Available — in. (mm)								Available Terminations
	1 pc. Construction Min. Max.		Expandable Min. Max.		2 pc. Construction Min. Max.				
	in. (mm)	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)	3 (76)	12 (305)	All
1½ (34.9)	1 (25)	3 (76)	3 (76)	6 (152)	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)	3 (76)	28 (711)	All
2 (51)	1½ (32)	14 (356)	3 (76)	14 (356)	3 (76)	28 (711)	3 (76)	28 (711)	All
2½ (64)	1½ (32)	14 (356)	3 (76)	14 (356)	3 (76)	28 (711)	3 (76)	28 (711)	All
3 (76)	1½ (38)	14 (356)	3 (76)	14 (356)	3 (76)	28 (711)	3 (76)	28 (711)	All
3½ (89)	1½ (45)	14 (356)	3 (76)	14 (356)	3 (76)	28 (711)	3 (76)	28 (711)	All - Except 90° "B" Leads
4 (102)	2 (51)	14 (356)	3 (76)	14 (356)	3 (76)	28 (711)	3 (76)	28 (711)	All
4½ (114)	2½ (57)	14 (356)	3 (76)	14 (356)	3 (76)	28 (711)	3 (76)	28 (711)	All
5 (127)	2½ (64)	14 (356)	3 (76)	14 (356)	4 (102)	28 (711)	4 (102)	28 (711)	All - Except 90° "B" Leads
5½ (140)	2½ (70)	14 (356)	3 (76)	14 (356)	4 (102)	28 (711)	4 (102)	28 (711)	Post Terminals, SLE only
6 (152)	3 (76)	14 (356)	3 (76)	14 (356)	4 (102)	28 (711)	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: 1½ 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: 1½ 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.

# Nozzle/Slip-On Heaters

## 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**

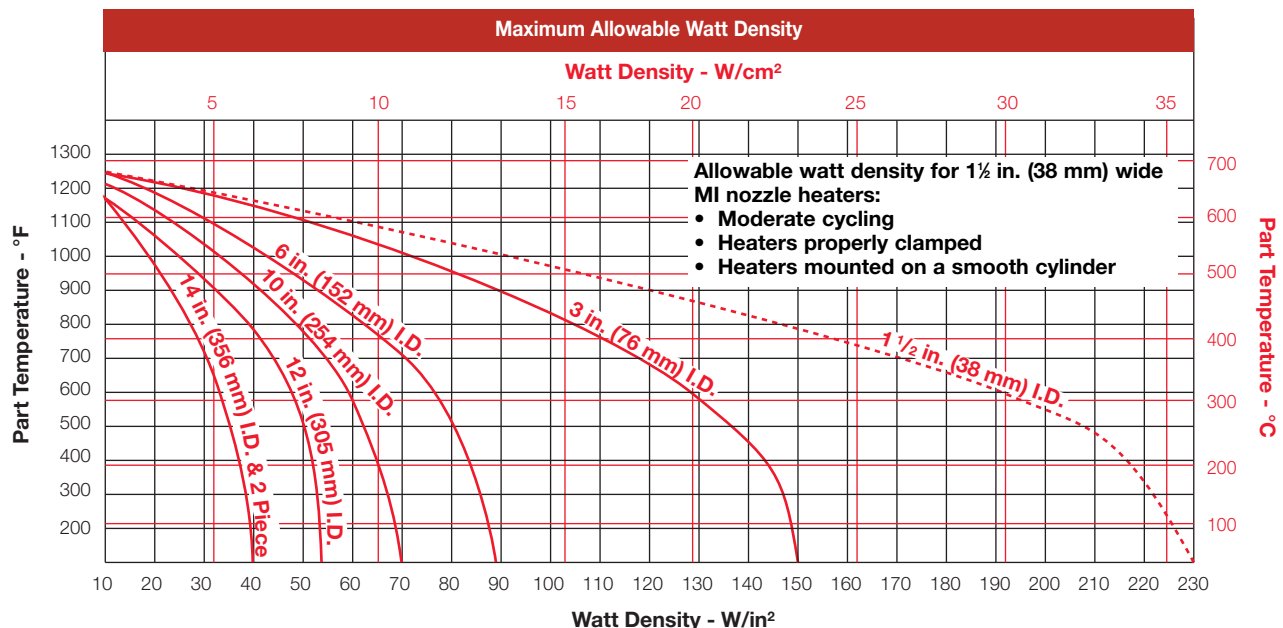
### Maximum Allowable Watt Density

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/in<sup>2</sup> (W/cm<sup>2</sup>) by 0.75.



# Nozzle/Slip-On Heaters

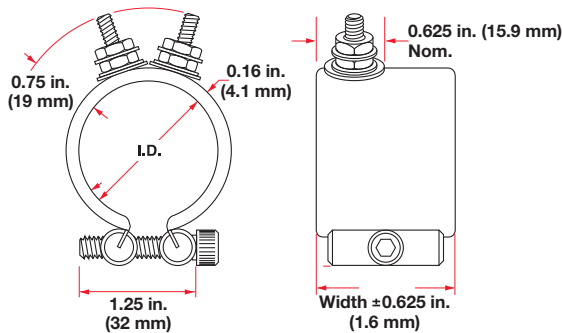
## Mineral Insulated Nozzle Heaters

### 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

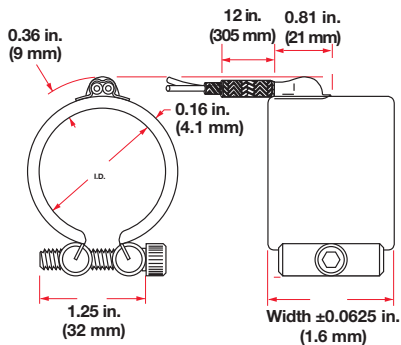
Stock



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

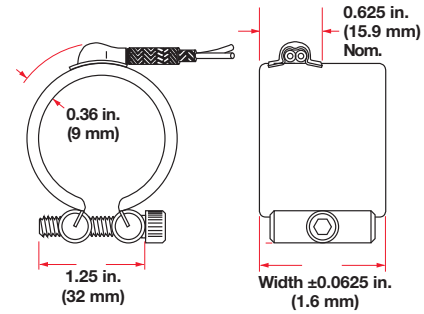
### Type B

Stock



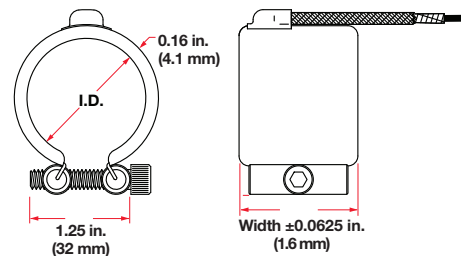
### Type B—90° Rotation

Non-Stock



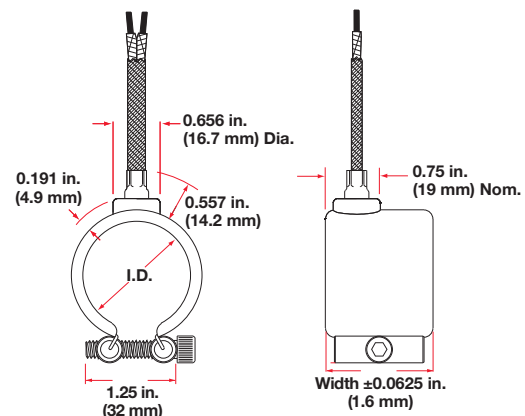
### Type B - 180° Rotation

Stock



### Type C

Stock

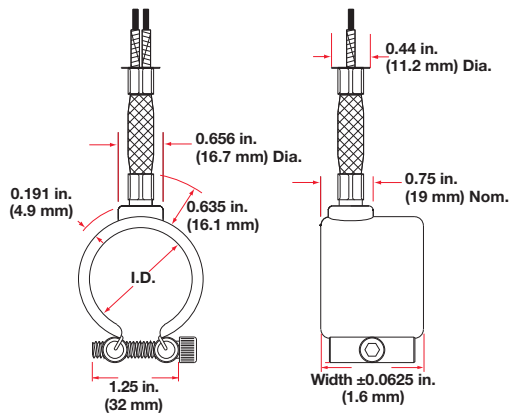


# Nozzle/Slip-On Heaters

## Mineral Insulated Nozzle Heaters

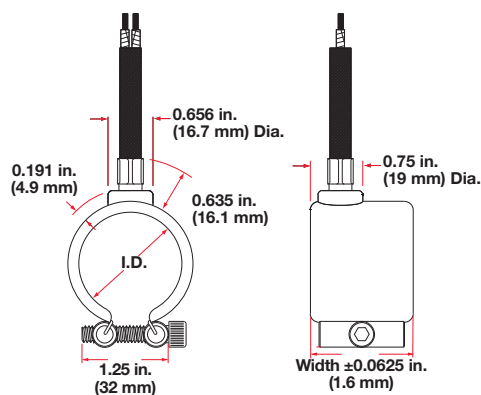
### Termination Variations (Continued)

#### Type E Stock



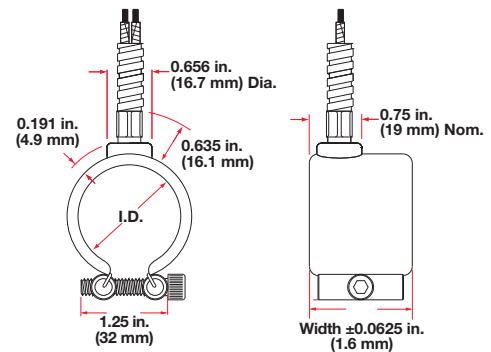
Type E: Loose metal braid encloses two fiberglass leads for good abrasion protection, lead flexibility and wiring convenience. Leads are 2 in. (51 mm) longer than braid. Shipped with 12 in. (305 mm) leads, unless longer length is specified. To order, specify **Type E** and **length**.

#### Type F Stock



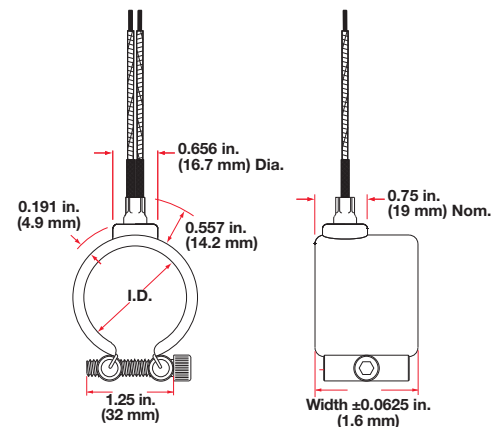
Type F: Loose fiberglass sleeving encloses two fiberglass leads for additional insulation protection where high temperature or minor abrasion is present. Leads are 2 in. (51 mm) longer than the sleeving. To order, specify **Type F** and **length**.

#### 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



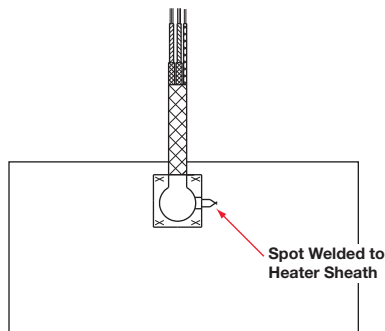
Type K: Flexible lead wires exit vertically from the heater. These leads can be bent adjacent to the heater for a quick and easy connection. To order, specify **Type K** and **length**.

# Nozzle/Slip-On Heaters

## 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.

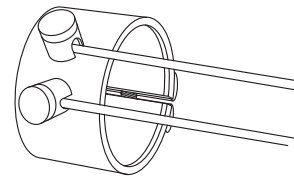
#### Lead Wire

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

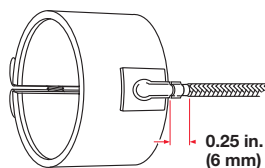
Insulated ground wire is available, contact your Watlow representative.

#### 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.

#### Heavy Duty Strain Relief



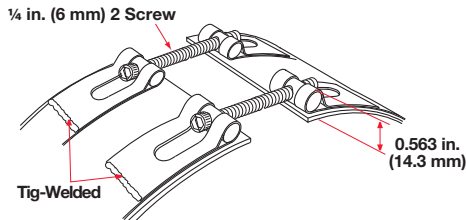
Heavy duty strain relief is recommended for applications where there is great stress or continued flexing of the leads. The strain relief is available on Type B, Type B—90° and Type B—180° leads only. To order, specify **heavy-duty strain relief**. **Note:** not available with loose braid or fiberglass sleeving.

# Nozzle/Slip-On Heaters

## Mineral Insulated Nozzle Heaters

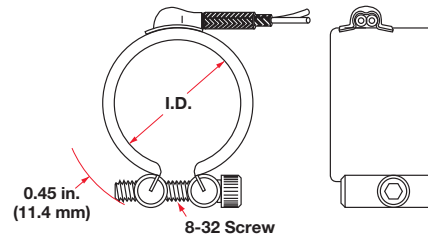
### Clamping Variations

#### 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. (mm)	Width in. (mm)	Construction	Volts	Watts	Watt Density		Termination	Approx. Net Wt.		Avail.	Code Number
					W/in <sup>2</sup>	(W/cm <sup>2</sup> )		lbs	(kg)		
1 (25)	1 (25.0)	1 pc	120	150	92	(14.2)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1AN1</b>
	1 (25.0)	1 pc	120	100	61	(9.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1AN2</b>
	1 (25.0)	1 pc	120	200	122	(18.9)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1AN3</b>
	1 (25.0)	1 pc	240	200	122	(18.9)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1AN4</b>
	1½ (38.0)	1 pc	240	300	106	(16.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1JN1</b>
	1½ (38.0)	1 pc	120	300	106	(16.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1JN2</b>
	1½ (38.0)	1 pc	240	200	70	(10.8)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1A1JN3</b>
1½ (32)	1 (25.0)	1 pc	240	250	104	(16.1)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1E1AN1</b>
	1 (25.0)	1 pc	120	250	104	(16.1)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1E1AN2</b>
	1 (25.0)	1 pc	240	300	124	(19.2)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1E1AN3</b>
	1½ (38.0)	1 pc	240	350	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1E1JN1</b>
	1½ (38.0)	1 pc	120	350	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1E1JN2</b>
	1½ (38.0)	1 pc	240	450	112	(17.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1E1JN3</b>

CONTINUED

# Nozzle/Slip-On Heaters

## Mineral Insulated Nozzle Heaters

### Stock Heater Code Numbers (Continued)

I.D. in. (mm)	Width in. (mm)	Construction	Volts	Watts	Watt Density		Termination	Approx. Net Wt.		Avail.	Code Number	
					W/in <sup>2</sup>	(W/cm <sup>2</sup> )		lbs	(kg)			
1½ (38)	1 (25.0)	1 pc	240	300	93	(14.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1J1AN1</b>	
		1 pc	120	300	93	(14.4)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1J1AN2</b>	
		1 pc	240	200	62	(9.6)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1J1AN3</b>	
		1 pc	240	400	125	(19.3)	Type B,C,E, F or H	0.1	(0.05)	Stock	<b>MB1J1AN5</b>	
	1½ (38.0)	1 pc	120	300	58	(9.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1J1JN1</b>	
		1 pc	240	450	87	(13.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1J1JN2</b>	
		1 pc	240	300	58	(9.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1J1JN3</b>	
		1 pc	240	600	116	(17.9)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1J1JN4</b>	
		1 pc	240	450	96	(14.8)	Post	0.2	(0.09)	Stock	<b>MB1J1JP6</b>	
		2 (51.0)	1 pc	240	450	57	(8.8)	Type B,C,E, F or H	0.3	(0.14)	Stock	<b>MB1J2AN1</b>
		2 (51.0)	1 pc	240	300	42	(6.5)	Type B,C,E, F or H	0.3	(0.14)	Stock	<b>MB1J2AN2</b>
	2 (51.0)	1 pc	240	900	125	(19.3)	Type B,C,E, F or H	0.3	(0.14)	Stock	<b>MB1J2AN3</b>	
		3 (76.0)	1 pc	240	500	45	(7.0)	Type B,C,E, F or H	0.4	(0.18)	Stock	<b>MB1J3AN1</b>
	3 (76.0)	1 pc	240	350	31	(4.8)	Type B,C,E, F or H	0.4	(0.18)	Stock	<b>MB1J3AN2</b>	
1¼ (45)		1 pc	240	450	83	(12.8)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	<b>MB1N1GX3A</b>	
	1½ (38.0)	1 pc	240	300	47	(7.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1N1JN1</b>	
	1½ (38.0)	1 pc	120	300	50	(7.7)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1N1JN2</b>	
	1½ (38.0)	1 pc	240	700	110	(17.0)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB1N1JN3</b>	
	2 (51.0)	1 pc	240	750	86	(13.3)	Type B,C,E, F or H	0.3	(0.14)	Stock	<b>MB1N2AN1</b>	
2 (51)	1 (25.0)	1 pc	240	350	73	(11.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB2A1AN1</b>	
		1 pc	120	350	73	(11.3)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB2A1AN2</b>	
		1 pc	240	450	94	(14.5)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB2A1AN3</b>	
		1 pc	240	350	79	(12.2)	36 in. 90° Type B braid w/HD strain relief	0.2	(0.09)	Stock	<b>MB2A1AX6B</b>	
	1½ (38.0)	1 pc	240	400	53	(8.2)	Type B,C,E, F or H	0.3	(0.14)	Stock	<b>MB2A1JN1</b>	
		2 (51.0)	1 pc	240	750	73	(11.3)	Type B,C,E, F or H	0.4	(0.18)	Stock	<b>MB2A2AN1</b>
		2 (51.0)	1 pc	240	1200	125	(19.3)	Type B,C,E, F or H	0.4	(0.18)	Stock	<b>MB2A2AN2</b>
		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	<b>MB2A2AX2A</b>
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	<b>MB2E2AX7</b>	
	2½ (64.0)	1 pc	240	1000	72	(11.2)	Type B,C,E, F or H	0.5	(0.23)	Stock	<b>MB2E2JN1</b>	
2½ (64)	1 (25.0)	1 pc	240	400	63	(9.7)	Type B,C,E, F or H	0.2	(0.09)	Stock	<b>MB2J1AN1</b>	
	1½ (38.0)	1 pc	240	500	50	(7.7)	Type B,C,E, F or H	0.4	(0.18)	Stock	<b>MB2J1JN1</b>	

### 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.

# Nozzle/Slip-On Heaters

## 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<sup>2</sup> (8.5 W/cm<sup>2</sup>)

### 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



# Nozzle/Slip-On Heaters

## 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.

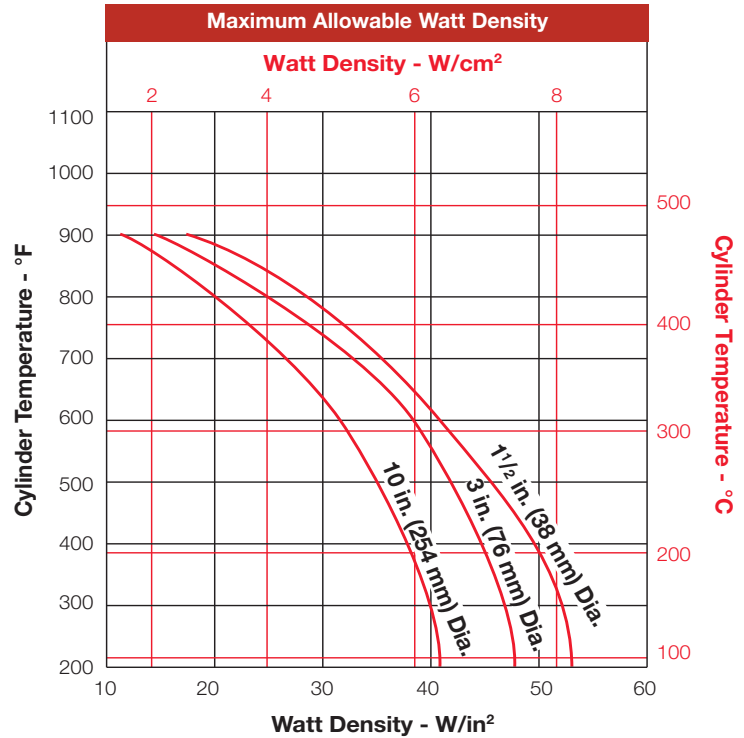
Calculate the **safe maximum wattage** for your heater using:

#### 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/in<sup>2</sup> (0.46 W/cm<sup>2</sup>).
- 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/in<sup>2</sup> (0.46 W/cm<sup>2</sup>) only.
- For regular cylinder surfaces other than smooth, machined finish, reduce watt density by 3 W/in<sup>2</sup> (0.46 W/cm<sup>2</sup>).
- 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)

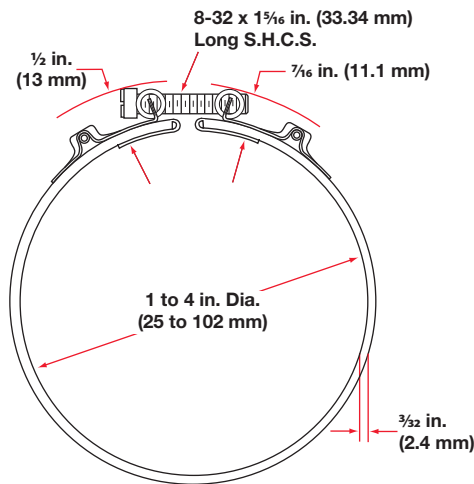
Heater Type	Heater Size		No-Heat Area Standard Gap ¼ in. (mm)
	Diameter in. (mm)	Width in. (mm)	
One Piece	Less than 2½ (64)	Up to 7 (178)	1¼ (32) x width
Two Piece	5 (127) or more	More than 3 (76)	2½ (64) x width

# Nozzle/Slip-On Heaters

## THINBAND Mica Nozzle Heaters

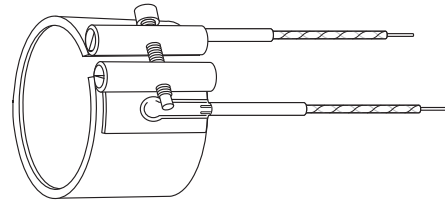
### Terminations

- 1 to 4 in. (2 to 102 mm) diameter
- 1 to 6 in. (25 to 152 mm) wide



### Type L

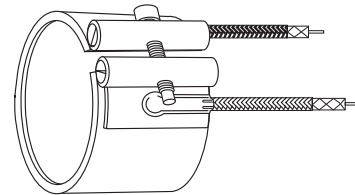
#### Stock Option



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**.

# Nozzle/Slip-On Heaters

## THINBAND Mica Nozzle Heaters

### Stock Heater Code Numbers

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in <sup>2</sup> (W/cm <sup>2</sup> )	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 <sup>①</sup> (8.5)	1	THINBAND—Type A or L	0.2 (0.09)	Stock	STB1A1A3	B1A1AN3
	1 (25.0)	240	125	55 <sup>①</sup> (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 <sup>①</sup> (9.1)	1	THINBAND—Type A or L	0.2 (0.09)	Stock	STB1A1J3	B1A1JN3
	1½ (38.0)	240	200	59 <sup>①</sup> (9.1)	1	THINBAND—Type A or L	0.2 (0.09)	Stock	STB1A1J4	B1A1JN4
1¼ (32.0)	¾ (15.9)	120	100	54 <sup>①</sup> (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 <sup>①</sup> (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
1½ (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 <sup>①</sup> (7.9)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	STB1G2A1	B1G2AK1
1½ (38.0)	¾ (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 <sup>①</sup> (8.0)	1	THINBAND—Type A or L	0.2 (0.09)	Stock	STB1J1A5	B1J1AN5
	1 (25.0)	240	200	52 <sup>①</sup> (8.0)	1	THINBAND—Type A or L	0.2 (0.09)	Stock	STB1J1A6	B1J1AN6
	1¼ (32.0)	240	250	52 <sup>①</sup> (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 <sup>①</sup> (7.4)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	STB1J1J5	B1J1JN5
	1½ (38.0)	240	275	48 <sup>①</sup> (7.4)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	STB1J1J6	B1J1JN6
	1½ (38.0)	240	300	52 <sup>①</sup> (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 <sup>①</sup> (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.

# Nozzle/Slip-On Heaters

## THINBAND Mica Nozzle Heaters

### Stock Heater Code Numbers (Continued)

I.D. in. (mm)	Width in. (mm)	Volts	Watts	Watt Density W/in <sup>2</sup> (W/cm <sup>2</sup> )	1 pc. or 2 pc.	Terminals, Leads and Special Features	Approx. Net Wt. lbs (kg)	Avail.	Code Number	Former Code Number
1½ (45)	1½ (38.0)	120	300	43 (6.7)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	<b>STB1N1J7</b>	<b>B1N1JN7</b>
	1½ (38.0)	240	300	43 (6.7)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	<b>STB1N1J8</b>	<b>B1N1JN8</b>
1½ (47.6)	1 (25.0)	240	140	28 (4.3)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	<b>STB1R1A1</b>	<b>B1R1AL1</b>
2½ (54)	1 (25.0)	120	200	34 (5.3)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	<b>STB2C1A1</b>	<b>B2C1AN1</b>
	2 (51.0)	240	200	17 (2.6)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	<b>STB2C2A1</b>	<b>B2C2AN1</b>
2½ (57)	¾ (22.2)	120	215	43 (6.7)	1	Mica Band—Type A or L	0.3 (0.14)	Stock	<b>B2E0RN1</b>	—
2½ (64)	1½ (38.0)	240	200	19 (2.9)	1	THINBAND—Type A or L	0.3 (0.14)	Stock	<b>STB2J1J1</b>	<b>B2J1JN1</b>
2¾ (70)	1½ (38.0)	240	400	34 (5.3)	1	THINBAND—Type A or L	0.4 (0.18)	Stock	<b>STB2N1J1</b>	<b>B2N1JN1</b>
3 (76)	1 (25.0)	240	200	23 (3.6)	1	THINBAND—Type A or L	0.4 (0.18)	Stock	<b>STB3A1A2</b>	<b>B3A1AN1</b>
	1 (25.0)	240	250	29 (4.5)	1	THINBAND—Type A or L	0.4 (0.18)	Stock	<b>STB3A1A3</b>	<b>B3A1AN2</b>
	1 (25.0)	240	300	35 (5.4)	1	THINBAND—Type A or L	0.4 (0.18)	Stock	<b>STB3A1A4</b>	<b>B3A1AN3</b>
	1½ (38.0)	120	600	47 <sup>①</sup> (7.3)	1	THINBAND—Type A or L	0.5 (0.23)	Stock	<b>STB3A1J6</b>	<b>B3A1JN2</b>

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

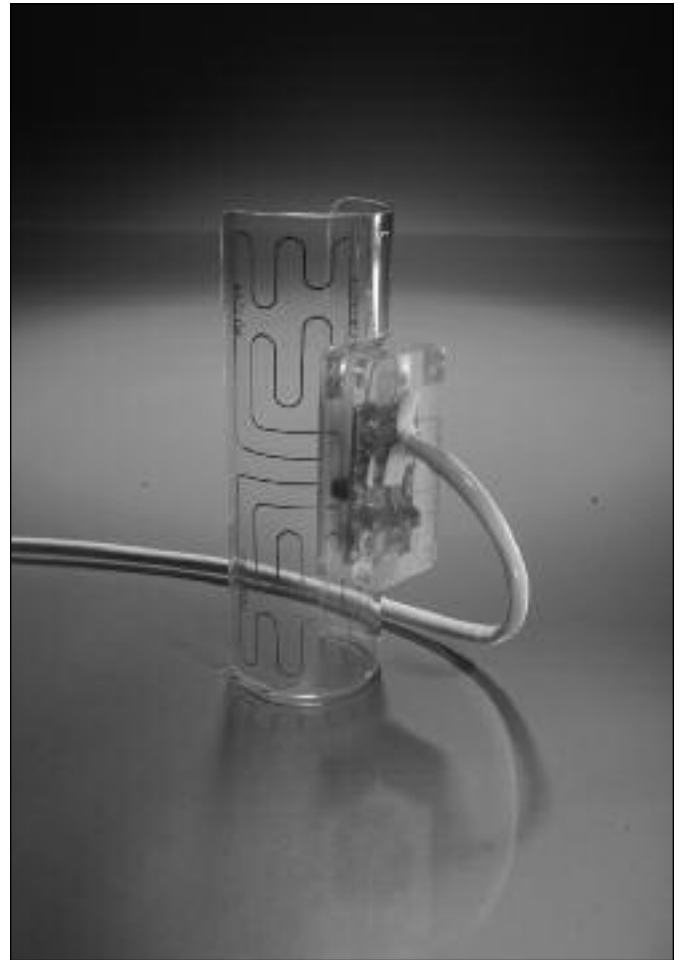
- Provides maximum flexibility to accommodate various syringe sizes (silicon wire)
- Provides high tech look and functionality (polycarbonate/foil)

#### 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

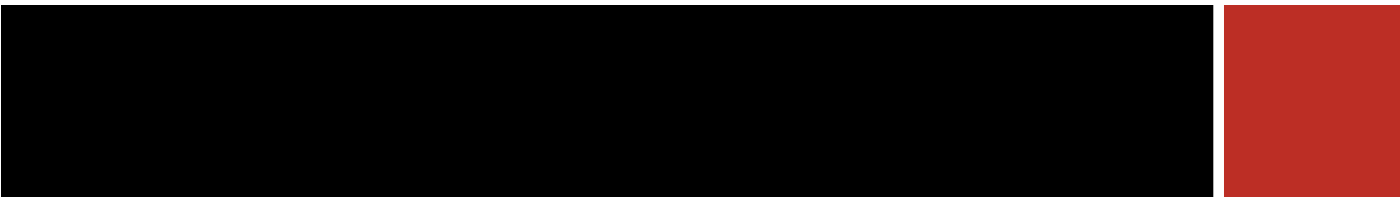


### Specifications

#### 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.



# Nozzle/Slip-On Heaters

## Thick Film Cylindrical Heaters

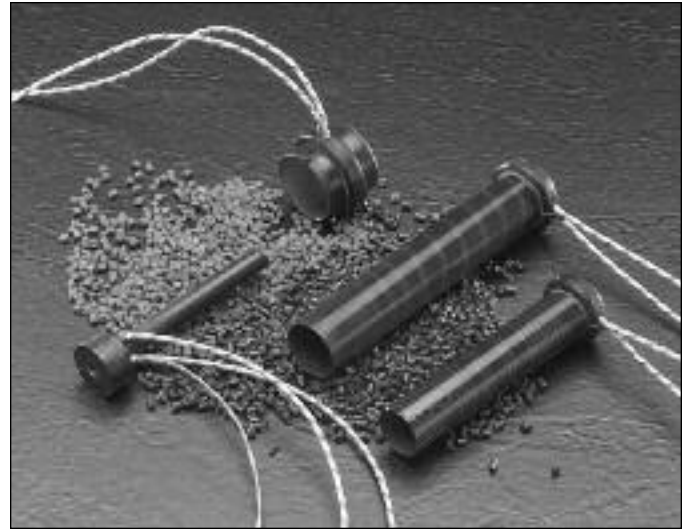
Because the hot runner nozzle is the final melt path between the hot runner manifold and the gate area, temperature uniformity is critical to avoid differences in melt viscosity. Whether it's hot spots causing thermal degradation of the plastic, or cold spots causing flow restrictions, both affect the 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

# Nozzle/Slip-On Heaters

## 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.

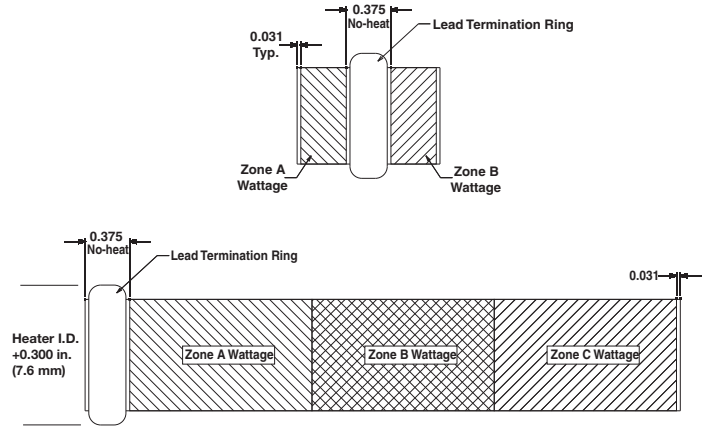
#### Precise Wattage Distribution

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.

# Nozzle/Slip-On Heaters

## 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

- $\pm 5\%$  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

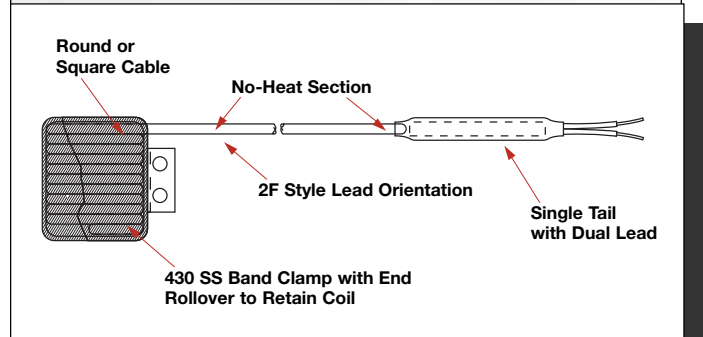
- Provides even heating

#### Optional externally welded thermocouple to the sheath

- Provides temperature measurement capabilities

### Applications

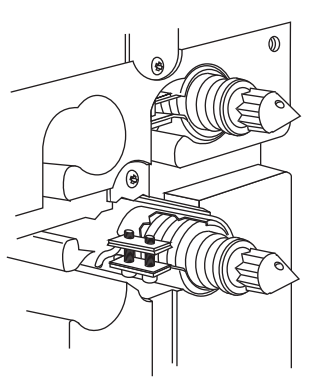
- Plastic injection molding equipment
- Hot runner molds



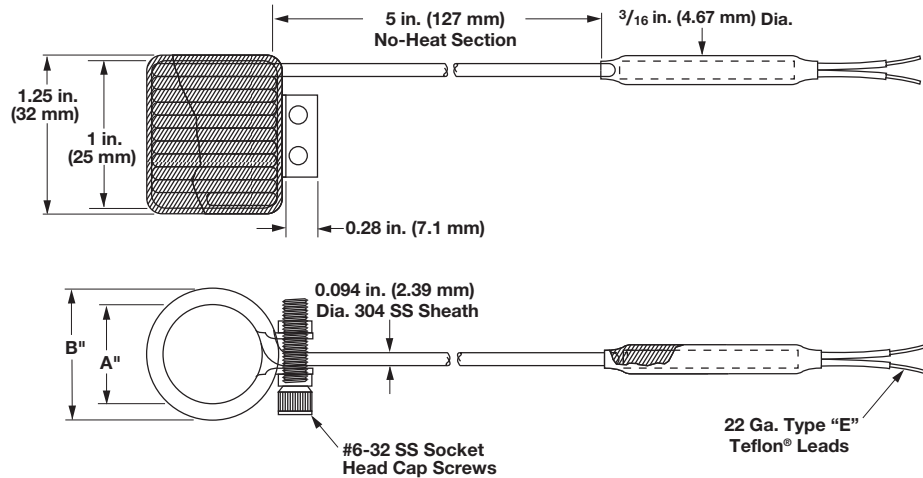
# Nozzle/Slip-On Heaters

## 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
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#### 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)	<b>94PC30A1A</b>
230	125	0.75 (19.0)	0.98 (24.9)	1.25 (32)	only	72 in. (1829 mm)	<b>94PC30A1D</b>
230	250	0.75 (19.0)	0.98 (24.9)	1.25 (32)		36 in. (914 mm)	<b>94PC30A2A</b>
230	250	0.75 (19.0)	0.98 (24.9)	1.25 (32)		72 in. (1829 mm)	<b>94PC30A2D</b>
230	250	0.75 (19.0)	0.98 (24.9)	1.25 (32)		36 in. (914 mm)	<b>94PC30A4A</b> <sup>Ⓟ</sup>

#### 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)	<b>102PS28A2B</b>
230	125	0.75 (19.0)	1 (25.0)	1.25 (32)	only	72 in. (1829 mm)	<b>102PS28A2A</b>
230	250	0.75 (19.0)	1 (25.0)	1.25 (32)		36 in. (914 mm)	<b>102PS28A1B</b>
230	250	0.75 (19.0)	1 (25.0)	1.25 (32)		72 in. (1829 mm)	<b>102PS28A4A</b> <sup>Ⓟ</sup>
230	250	0.875 (22.2)	1.12 (28.5)	1.25 (32)		36 in. (914 mm)	<b>102PS32A1A</b>

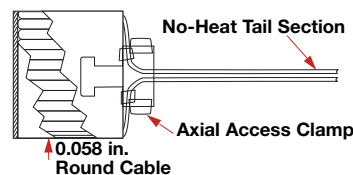
\*Not available from stock.

<sup>Ⓟ</sup> 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	<b>Z5969</b>
0.75 (19)	240	149	72 (1829)	1.25 (32)	Round	<b>Z5968</b>

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

# Nozzle/Slip-On Heaters

## 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<sup>2</sup> (320 W/in<sup>2</sup>)
- 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

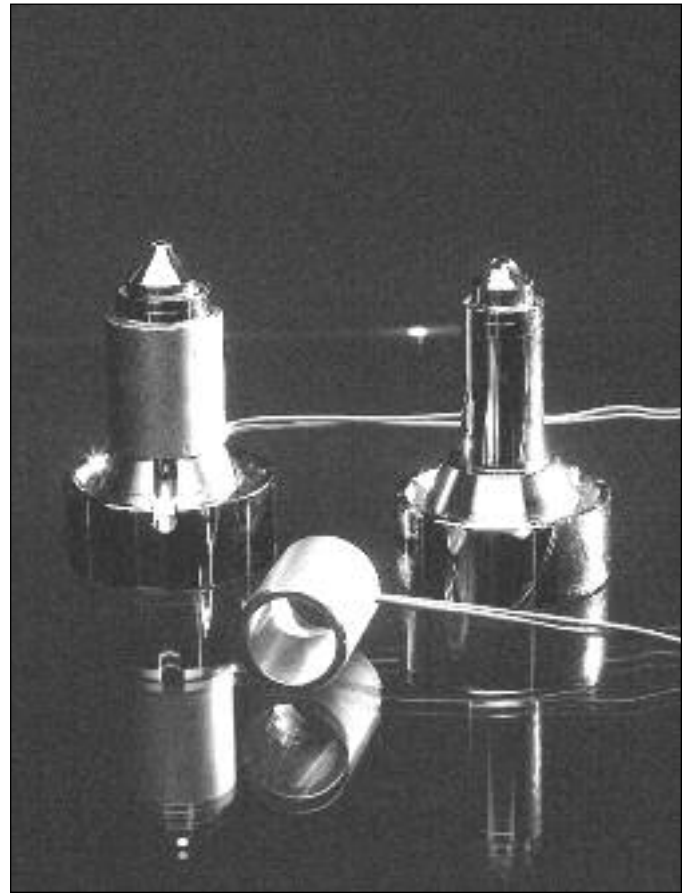
- Protects the brass heater body and acts as an insulator

#### 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

# Nozzle/Slip-On Heaters

## 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