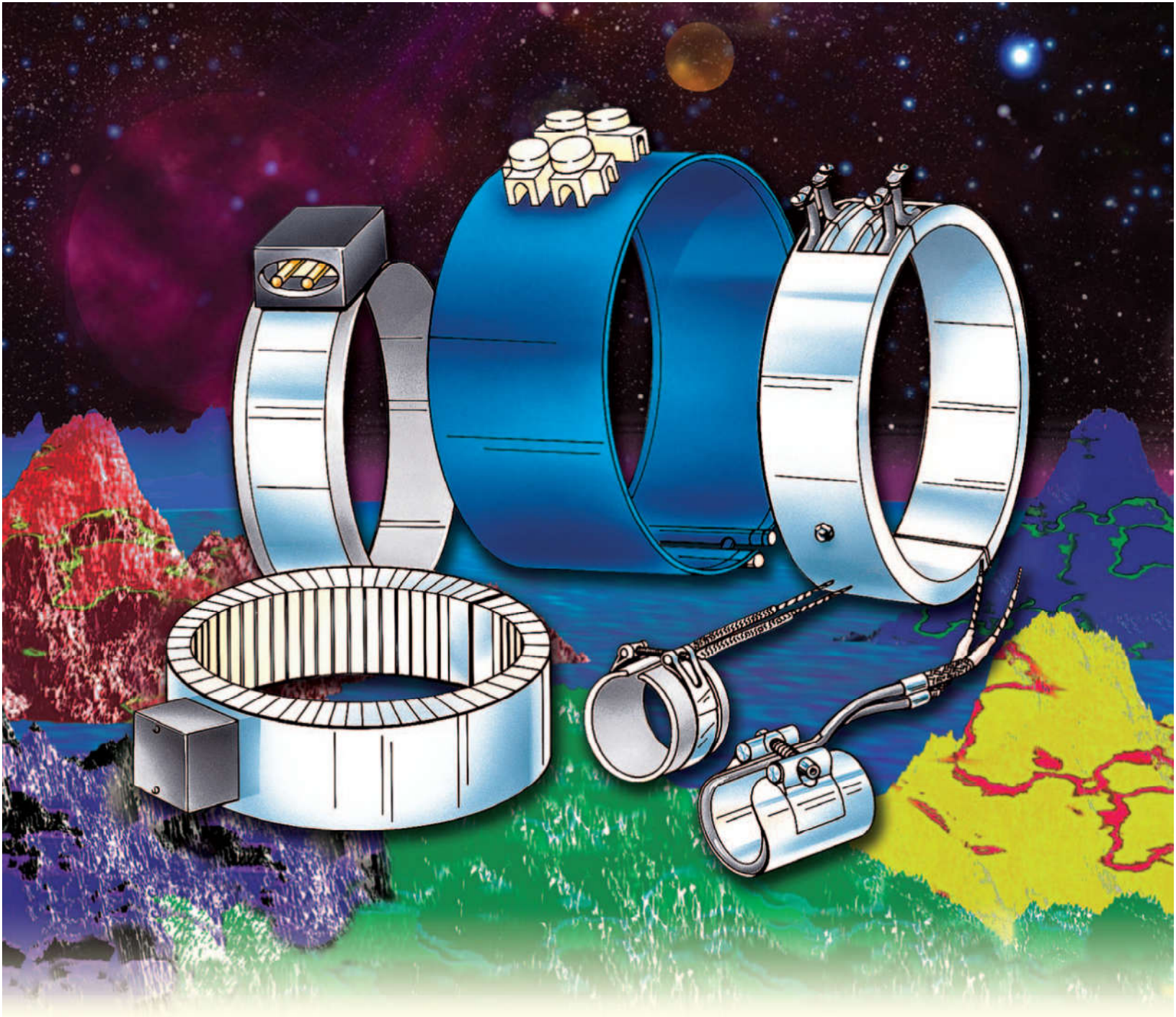


Table Of Contents

section 1

Band Heaters

Mi-Plus®

Mineral Insulated Band Heater

A High Performance Band Heater With Outstanding Design Features (Temperature Capabilities To 1400°F/760°C)

Mi-Plus® Construction Characteristics

The *Mi-Plus* is the solution for applications that require high watt densities (W/in²) and/or high operating temperatures. *Mi-Plus* band heaters are capable of temperatures up to 1400°F (760°C) and watt densities up to 150W/in² (23.25W/cm²). The recommended maximum watt density for a specific application will depend on the heater size and its operating temperature.

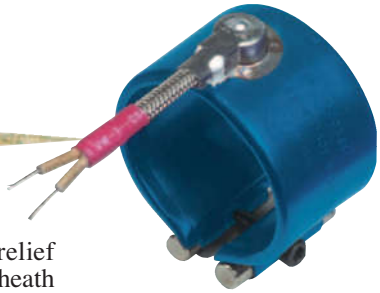
Specially formulated mineral insulated tape providing excellent thermal conductivity and dielectric strength is used to insulate the nickel chrome resistance wire from the stainless steel sheath. The heater assembly is formed under pressure to a precise diameter with a thin low-mass cross section, assuring fast heat-up rates and reduced cycle times.

UNBREAKABLE Power Screw Terminals

Only Mi-Plus offers this unique screw terminal design…
The stainless steel power screw terminals are resistant to over-torquing.
For complete selection of screw terminal arrangements, see pages 1-14 and 1-15.

SUPERIOR Clamping Mechanism

The clamping brackets are formed from the outer sheath of the heater, providing a unique one-piece built-in construction strap. The clamping power is generated through barrel nuts and socket head screws, which as an integral part of the built-in strap, provide superior clamping force for maximum performance and optimal heater life.
For details, see pages 1-12 and 1-13.



INNOVATIVE Lead Terminations

Smaller size *Mi-Plus* band heaters are powered-up by means of lead wire terminations. To insure a resilient connection that will withstand abrasion, mechanical abuse and keep contaminants out of the transition area, a specspecially designed stainless steel transition cap with a built-in strain relief was developed. The cap is welded to the sheath and the cavity is filled with insulating cement, sealing the band heater from contaminants.
For details, see pages 1-16 through 1-19.

UNIQUE Igloo™ Ceramic Covers

To eliminate exposed wiring/screw terminals on band heater installations, single and double port ceramic caps were designed. These unique and exclusive Igloo ceramic terminal insulators fit over the entire terminal and lug, leaving no exposed wiring. ***For additional details on Igloo insulators, see page 1-15.***

Made in USA

Mi-Plus® Standard Specifications and Tolerances

PERFORMANCE RATINGS

Maximum Temperature: 1400°F (760°C)

Nominal Watt Density:
Nozzle Bands — under 3" diameter:
30-100 W/in² (4.7-15.5 W/cm²)

Barrel bands—3" and greater in diameter:
20-70 W/in² (3.1-10.9 W/cm²)

Maximum Watt Density: 150 W/in² (23 W/cm²) Dependent on heater size, operating temperature and termination.

ELECTRICAL RATINGS

Maximum Voltage: 480VAC per termination

Dual Voltage: Available depending on heater configuration

Maximum Amperage: lead wire termination: 12.5A
screw terminations: 8-32UNF—20A
10-32UNF—25A

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

PHYSICAL SIZE CONSTRUCTION LIMITATIONS

Nominal Gap—Built-In Bracket:

less than 1-3/4" dia. . . . . 1/4"
1-3/4" to 2" dia. . . . . 5/16"
2" to 5" dia. . . . . 3/8"
5" to 18" dia. . . . . 1/2"
greater than 18" dia. . . . . 3/4"

If a larger gap is required for probes or thermocouples, specify when ordering.

Maximum Inside Diameters:

One-Piece . . . . . *14" (355.6 mm)
One-Piece Expandable . . *14" (355.6 mm)
Two-Piece . . . . . 25" (635.0 mm)
Over 25" (635.0 mm) will require multiple segments. Consult TEMPCO.

* *Tempco recommends two-piece construction for heaters 10" ID and greater*

Standard Widths: 1" to 8" (25.4 mm to 203.2 mm)

Width Tolerance: ±3/32" (2.4 mm)

If non-standard widths or tighter tolerances are required, consult Tempco.

Diameter/Width Limitations

Width		One-Piece Construction Inside Diameter		Expandable Construction Inside Diameter		Two-Piece Construction Inside Diameter	
in	mm	in	mm	in	mm	in	mm
1	25.4	1 to 10	25.4 to 254.0	N/A	N/A	3 to 25	76.2 to 635.0
1½	38.1	1 to 14	25.4 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
2	50.8	1½ to 14	38.1 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
2½	63.5	1½ to 14	38.1 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
3	76.2	1½ to 14	38.1 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
3½	88.9	1¾ to 14	44.5 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
4	101.6	2 to 14	50.8 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
4½	114.3	2¼ to 14	57.2 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
5	127.0	2½ to 14	63.5 to 355.6	2½ to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
5½	139.7	2¾ to 14	69.9 to 355.6	3 to 14	63.5 to 355.6	3 to 25	76.2 to 635.0
6	152.4	3 to 14	76.2 to 355.6	3 to 14	76.2 to 355.6	3 to 25	76.2 to 635.0
6½	165.1	3¼ to 14	82.6 to 355.6	3¼ to 14	82.6 to 355.6	3¼ to 25	82.6 to 635.0
7	177.8	3½ to 14	88.9 to 355.6	3½ to 14	88.9 to 355.6	3½ to 25	88.9 to 635.0
7½	190.5	3¾ to 14	95.3 to 355.6	3¾ to 14	95.3 to 355.6	3¾ to 25	95.3 to 635.0
8	203.2	4 to 14	101.6 to 355.6	4 to 14	101.6 to 355.6	4 to 25	101.6 to 635.0

Additional Limitations

- For heaters less than 4" in diameter, the maximum width is twice the diameter.
- Heaters with standard brackets are available from 1" to 8" wide, while heaters with low profile brackets are available from 1" to 6" wide.
- 1" diameter heaters are only available in 1" and 1-1/2" widths.
- For heaters from 10" diameter up to 25" diameter, Tempco recommends using 2-piece construction for superior clamping. Over 25" diameter, 3 or 4 segments are recommended.
- Combinations of some minimum and maximum variations may not be available. Consult Tempco with your special requirements.
- Post terminals are only available on heaters greater than 2-1/2" in diameter and 1-1/2" in width.

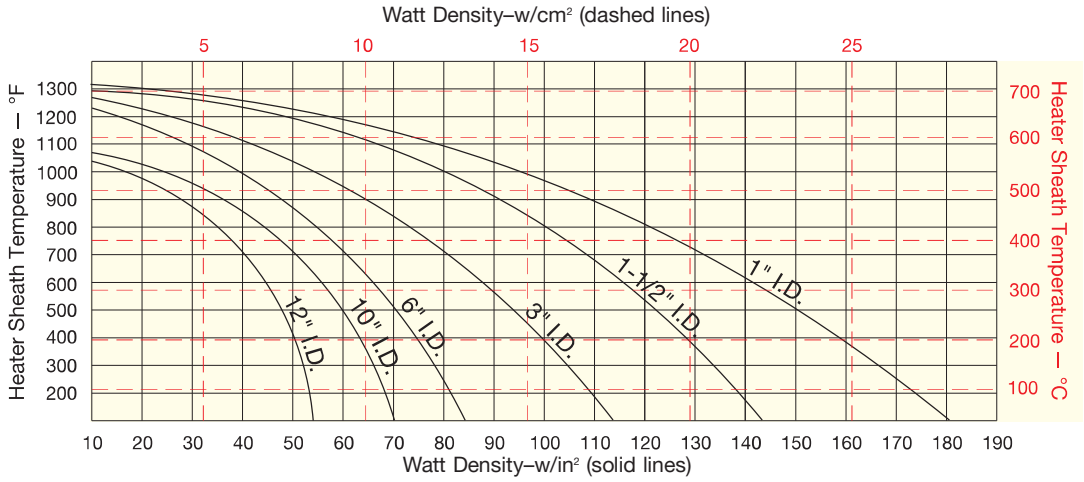
Mi-Plus® Maximum Watt Densities

MAXIMUM ALLOWABLE WATT DENSITY

The chart displays the maximum Watt Density curves for various diameter heaters. Use this chart when determining the appropriate wattage value for your chosen heater.

Be aware that certain factors will require you to derate the watt density (W/in²) of your heater selection.

CAUTION Failure to adhere to the maximum allowable watt density per heater size will result in poor operating life.



CALCULATING MAXIMUM WATT DENSITY

Factors to be taken into consideration:

A. Type of controls

B. Voltage variations

C. Machine cycling rate

D. Type of resin being processed

E. Coefficient of thermal expansion and conductivity of the cylinder.

F. Designing a heater that closely matches the wattage requirement will decrease the frequency of cycling and temperature overshoot, thereby increasing the life of the heater.

Once these factors have been established, proceed with the following steps:

1. Determine the maximum operating temperature.
2. Calculate the total wattage required to obtain the maximum operating temperature.
3. Determine the quantity and size of the heater bands to be used. Due to clamping concerns, 2" through 3" wide band heaters have long proven to be the most efficient and reliable in most cylindrical heating applications.
4. Determine individual band heater wattage by dividing the total required wattage by the quantity of band heaters selected.
5. Determine the band heater's heated area by subtracting unheated (cold) areas created by screw terminals, gaps, holes, and cutouts.

Nominal Unheated Areas

Construction Style	Cold Area to Subtract
One-piece band	1" × width
One-piece expandable band	1½" × width
Two-piece band	2" × width

For each hole or cutout add to the cold area from the Table the (Hole size + ½") × heater width. This is total cold area to use in the following formula to calculate the heater watt density.

Watt Density Formula

$$\text{Watt Density } (W/in^2) = \frac{\text{Wattage}}{(3.14 \times \text{Band ID} \times \text{Band Width}) - (\text{Cold Area})}$$

6. Check in the above graph that the calculated watt density does not exceed the maximum recommended watt density. Locate the maximum cylinder temperature required on the left-hand side of the graph, follow the horizontal line until it intersects with the line of the band heater being used, and read directly down to obtain the maximum recommended watt density (watts/in²).
7. If the calculated watt density is higher than the recommended value, it must be corrected or it will cause poor heater life. This can be accomplished by using more band heaters or lowering the heater wattage.
8. Should you have a problem in selecting the proper band heater or establishing watt density for your application, consult Tempco.

CORRECTION FACTORS

For heaters wider than 3" (76.2 mm), reduce maximum allowable watt density from chart by 20%.

For applications using insulating shroud, reduce maximum allowable watt density from chart by 25%.

CAUTION Do not use insulating blankets if heater temperatures are above 1200°F (649°C). Failure to adhere will result in premature heater failure.

Made in USA

Mi-Plus® Terminator Program

Mi-Plus Nozzle Band Heaters Available From Stock Within 48 Hours

6
Terminations To Choose From

Type W1
Straight wire braid leads; for complete details refer to page 1-16

Type W2
Right-angle wire braid leads, parallel to heater; for complete details refer to page 1-16

Type W5
Right-angle wire braid leads, 90 degrees to heater; for complete details refer to page 1-17

Type L1
Plain wire leads; for complete details refer to page 1-19

Type R1
Straight armor cable; for complete details refer to page 1-17

Type R2
Right-angle armor cable; for complete details refer to page 1-18

Mi-Plus® Band Heater Terminator Program

These Mi-Plus Band Heaters are in-stock, semi-finished (substrates), offering the option to finish them by choosing from the 6 program-qualified lead end terminations listed above.

Mi-Plus Terminator Band Heaters will be ready for shipment within 48 hours.

View Product Inventory @ www.tempco.com

Stock Mi-Plus® Nozzle Band Heaters Available Through the Terminator Program

Part Numbers listed are for Heaters with Type W2 Termination – Right-Angle Wire Braid Leads (12" leads, 10" SS braid). Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information below).

ID		Width			Watt Density		Clamping/	Part Number	
in	mm	in	mm	Wattage	W/in²	W/cm²	Construction	120V	240V
1	25.4	1	25.4	150	70	10.9	WB	MPP50101	—
1	25.4	1	25.4	225	105	16.3	WB	—	MPP50206
1	25.4	1-1/2	38.1	200	62	9.7	WB	MPP50301	MPP50401
1	25.4	1-1/2	38.1	250	78	12.1	WB	—	MPP50601
1	25.4	1-1/2	38.1	300	93	14.5	WB	MPP50701	MPP50801
1-1/4	31.8	1	25.4	250	85	13.2	WB	MPP51101	MPP51202
1-1/4	31.8	1	25.4	275	94	14.6	WB	—	MPP51401
1-1/4	31.8	1-1/2	38.1	350	80	12.4	LB	MPP51701	—
1-1/4	31.8	1-1/2	38.1	350	80	12.4	WB	—	MPP51801
1-1/2	38.1	1	25.4	200	54	8.4	OB	MPP51901	MPP52001
1-1/2	38.1	1	25.4	225	61	9.5	OB	MPP02836	MPP02837
1-1/2	38.1	1	25.4	300	81	12.5	OB	MPP52301	MPP52402
1-1/2	38.1	1-1/2	38.1	300	54	8.4	LB	MPP52501	MPP52602
1-1/2	38.1	1-1/2	38.1	350	63	9.8	LB	MPP02352	MPP02353
1-1/2	38.1	1-1/2	38.1	450	81	12.5	LB	—	MPP52903
1-1/2	38.1	2	50.8	300	40	6.3	LB	—	MPP53001
1-1/2	38.1	2	50.8	400	55	8.5	LB	MPP02838	MPP00494
1-1/2	38.1	2	50.8	450	61	9.4	LB	—	MPP53202
1-1/2	38.1	3	76.2	350	31	4.9	LB	—	MPP53401
1-1/2	38.1	3	76.2	500	45	7.0	LB	—	MPP53501
1-3/4	44.5	1-1/2	38.1	300	44	6.9	LB	MPP53801	MPP53901
1-3/4	44.5	2	50.8	750	83	12.9	LB	—	MPP54301
1-3/4	44.5	2-1/2	63.5	550	49	7.6	LB	—	MPP54401
1-3/4	44.5	3	76.2	1000	74	11.5	LB	—	MPP54601
2	50.8	1	25.4	350	66	10.3	OB	MPP54701	MPP54801
2	50.8	1-1/2	38.1	400	50	7.8	LB	—	MPP54901
2	50.8	1-1/2	38.1	425	54	8.4	LB	MPP02839	MPP02840
2	50.8	2	50.8	750	71	11	LB	MPP55051	MPP55101
2-1/4	57.2	1	25.4	350	58	8.9	OB	—	MPP55401
2-1/4	57.2	2-1/2	63.5	1000	66	10.2	LB	—	MPP55801
2-1/2	63.5	1	25.4	400	58	9.0	OB	—	MPP56001
2-1/2	63.5	1-1/2	38.1	500	49	7.5	LB	—	MPP56101
2-1/2	63.5	1-1/2	38.1	525	51	7.9	LB	MPP02841	MPP00227

Ordering Information

Order by Part Number for stock Mi-Plus heaters with Type W2 termination. Call Tempco for part numbers for stock heaters with other Terminator Program (see page 1-6) terminations and options.

Custom Engineered/Manufactured

Mi-Plus Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

Standard Sizes and Ratings

Made in USA

Stock and Standard (Non-Stock) Mi-Plus Barrel Band Heaters

Part Numbers listed are for Heaters with Screw Terminal Terminations – Type T2 or T3X.
Part numbers for heaters with other terminations will be assigned at time of order.

Stock Items Are Shown In RED

ID		Width				Watt Density					
in	mm	in	mm	Wattage	Voltage	W/in²	W/cm²	Style	Clamping/ Construction	Terminal	Part Number
3	76.2	1-1/2	38.1	500	240	41	6.3	1 pc	NB	T2	MPP00230
3	76.2	1-1/2	38.1	525	240	43	6.6	1 pc	NB	T2	MPP00231
3-1/4	82.6	2-1/2	63.5	1100	120	48	7.4	1 pc	NB	T3X	MPP00232
3-1/4	82.6	2-1/2	63.5	1400	240	61	9.4	1 pc	NB	T3X	MPP00233
3-1/2	88.9	2	50.8	800	240	40	6.2	1 pc	NB	T3X	**MPP00234**
3-5/8	92.1	1-1/2	38.1	650	240/480	52	8	Exp	NE	T2	MPP00235
4	101.6	1-1/2	38.1	625	240/480	44	6.8	Exp	NE	T2	MPP00236
4	101.6	1-1/2	38.1	725	240/480	51	7.8	Exp	NE	T2	MPP00237
4	101.6	1-1/2	38.1	800	240	47	7.3	1 pc	NB	T2	**MPP00238**
4-1/2	114.3	2-1/2	63.5	1250	240	38	5.9	1 pc	NB	T3X	**MPP00186**
5	127	1-1/2	38.1	1000	240/480	52	8.1	Exp	NE	T2	**MPP00239**
5-1/4	133.4	1-1/2	38.1	600	240/480	30	4.6	Exp	NE	T2	MPP00240
5-1/4	133.4	1-1/2	38.1	1000	240/480	49	7.7	Exp	NE	T2	MPP00241
5-1/4	133.4	3	76.2	1700	240/480	39	6.1	Exp	NE	T3X	MPP00187
5-1/4	133.4	4-1/2	114.3	2400	240/480	37	5.7	Exp	NE	T3X	MPP00242
5-1/4	133.4	4-1/2	114.3	2700	240/480	41	6.4	Exp	NE	T3X	MPP00243
5-1/2	139.7	1-1/2	38.1	1000	240/480	47	7.2	Exp	NE	T2	MPP00244
5-1/2	139.7	1-1/2	38.1	1300	240/480	61	9.4	Exp	NE	T2	MPP00245
6	152.4	1-1/2	38.1	1000	240/480	42	6.5	Exp	NE	T2	**MPP00246**
6	152.4	1-1/2	38.1	1400	240/480	59	9.1	Exp	NE	T2	**MPP00247**
6-1/2	165.1	1-1/2	38.1	1250	240/480	48	7.4	Exp	NE	T2	**MPP00248**
6-3/4	171.5	1-1/2	38.1	815	240/480	30	4.6	Exp	NE	T2	MPP00249
6-3/4	171.5	1-1/2	38.1	1000	240/480	37	5.7	Exp	NE	T2	MPP00250
6-3/4	171.5	4	101.6	2600	240/480	34	5.2	Exp	NE	T3X	MPP00188
6-3/4	171.5	5	127	3700	240/480	39	6	Exp	NE	T3X	MPP00251
6-3/4	171.5	6	152.4	3750	240/480	33	5	Exp	NE	T3X	MPP00189
7	177.8	1-1/2	38.1	1250	240/480	44	6.8	Exp	NE	T2	MPP00252
7	177.8	1-1/2	38.1	1500	240/480	53	8.2	Exp	NE	T2	MPP00253
7-1/2	190.5	1-1/2	38.1	1500	240/480	49	7.5	Exp	NE	T2	MPP00254
7-5/8	193.7	3	76.2	1800	240/480	27	4.2	Exp	NE	T3X	MPP00255
7-5/8	193.7	4-1/2	114.3	3150	240/480	32	4.9	Exp	NE	T3X	MPP00190
8	203.2	1-1/2	38.1	1250	240/480	38	5.8	Exp	NE	T2	MPP00256
8	203.2	1-1/2	38.1	1600	240/480	48	7.5	Exp	NE	T2	MPP00257
9	228.6	1-1/2	38.1	1500	240/480	40	6.1	Exp	NE	T2	MPP00258
9	228.6	1-1/2	38.1	1750	240/480	46	7.2	Exp	NE	T2	MPP00259
9-1/2	241.3	3	76.2	3000	240/480	36	5.6	Exp	NE	T3X	MPP00191
11-1/4	285.8	3	76.2	2400	240/480	24	3.7	Exp	NE	T3X	MPP00260
11-1/4	285.8	5	127	5100	240/480	31	4.7	Exp	NE	T3X	MPP00261

Stock Mi-Plus Barrel Band Heaters are ready for immediate shipment with Screw Terminals.

Complete termination details are on pages 1-14 and 1-15.

Ordering Information

Stock Heaters

Select a Mi-Plus Barrel Band Heater from the list above.

Stock heaters can be modified to the following terminations:

- Type C—Outlet terminal box.
- Type P2—Low profile high temperature quick disconnect.
- Type C6, C7 and C8—Igloo™ ceramic terminal covers.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes not listed **TEMPCO** will design and manufacture a Mi-Plus Barrel Heater to meet your requirements. ***Standard lead time is 5 weeks.***

Please Specify the following:

- ❑ Inside Diameter
- ❑ Width
- ❑ Wattage
- ❑ Voltage
- ❑ Quantity
- ❑ Termination (see pages 1-14 through 1-21)
- ❑ Lead Cable/Braid Length
- ❑ Construction Style (see pages 1-10 and 1-11)
- ❑ Clamping Variation (see pages 1-12 and 1-13)
- ❑ Features/Options (see page 1-22)

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Special and Unique Mi-Plus® Band Heater Designs

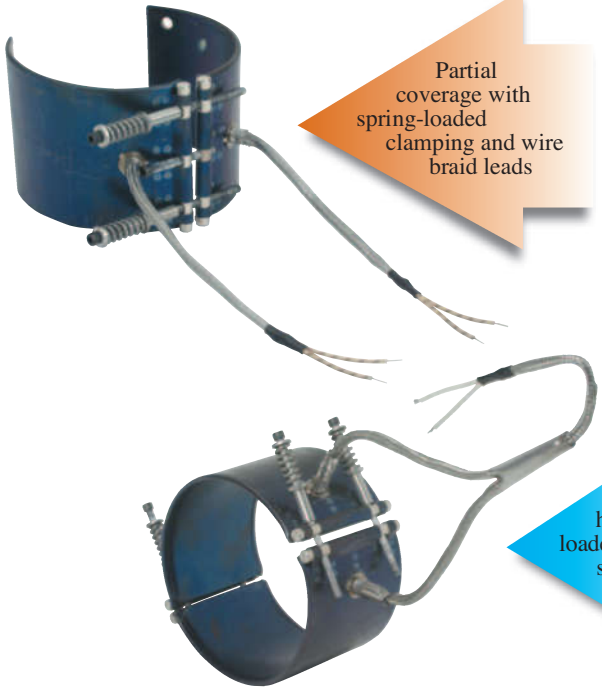
Throughout our catalog we show Tempco's standard specifications and most popular designs. However, as a custom heating element manufacturer, we recognize that many applications require non-standard and unique designs.

At Tempco, we are constantly challenged by our customers to solve their heating applications. We have the experience, technical knowledge and manufacturing capability to solve all your heating problems with unique heater designs. Use Tempco's talent and capabilities to your benefit to solve your specific heating problem in an expeditious and cost-effective manner.

The following pictures show some of the heater designs that we have developed for special applications. Next time, when you have a special application and you want someone to work with you and "think outside the box" to solve your specific heating application, call Tempco.

We haven't seen all heating applications, but most likely our experienced staff has seen and solved more heating problems than you have seen.

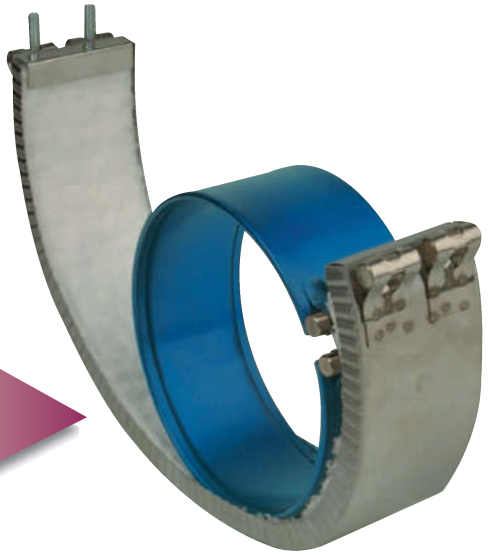
Put our knowledge and experience to work for you. Challenge us! You will be glad you did.



Partial coverage with spring-loaded clamping and wire braid leads

Two independent electrical circuits in a single heater with dual wattage and dual voltage option and thermocouple clearance hole

Two-piece heater with spring-loaded clamping and single leads for easy wiring



Heater with separate strap designed for three-phase operation, with ground terminal and thermocouple clearance hole

Heater with insulating shroud to minimize energy losses

Nozzle heater for magnesium machine

Four-piece heater with spring loaded clamping and independent electrical circuits on each segment

Made in USA

Mi-Plus® Construction Styles

CAUTION Do not open Non-Expandable One-Piece Mi-Plus Band Heaters during installation. Opening this construction style will cause internal damage.

Mi-Plus Band Heaters...

Note: Refer to page 1-4 for complete Limitations on Physical Size Construction.

Shown with Type NB Built-In Strap

Non-Expandable One-Piece Band Construction

One-piece heaters are the most efficient construction, as they provide the most heated surface area. This style can only be used where the entire heater can be slipped over the end of the barrel. One-piece heaters have built-in, full-width clamping bars.

Shown with Type NS Built-In Strap

Two-Piece Band Construction

Two-piece construction satisfies the need for a heater that can be placed anywhere along the machine barrel with a minimum of time and labor. Two-piece construction is recommended for larger diameter heaters because two-piece construction employs two sets of built-in clamps that deliver maximum clamping force.

The two-piece construction style also provides dual voltage capability. The heater halves may be wired together either in series or parallel, providing two voltage options. Two-piece heaters are rated at full voltage and 1/2 the total wattage for each half. On very large custom applications, Tempco may suggest going to multiple Mi-Plus heater segments with spring-loaded clamping.

CAUTION It is not recommended to open a One-Piece Expandable Band Heater more than two times.

Shown with Type NE Built-In Strap

One-Piece Expandable Band Construction

The expandable construction style allows the heater to be opened up and placed anywhere along the machine barrel, as well as minimizes the unheated area as compared to a two-piece heater.

With two heater circuits in a common case this heater naturally lends itself to a dual voltage system, a 240/480 volt package being the most common. When wired in parallel these heaters can run at 240 volts, and when wired in series, at 480 volts.

Expandable heaters are rated for each circuit at full voltage and one half of the total wattage.

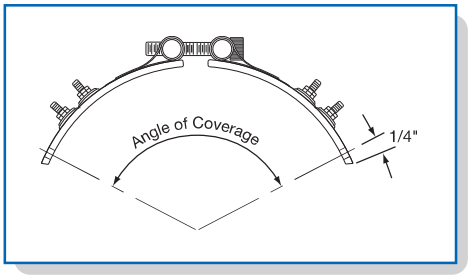
Mi-Plus® Construction Styles — Special Variations

Partial Coverage Band
2-Piece with Built-In Brackets

Partial coverage band heaters are required when an obstruction on the barrel would interfere with a full coverage band.

The preferred method of construction is the 2-piece Band Heater with Built-In Brackets as illustrated below. The heater is bolted down to the cylinder at the ends and the built-in low thermal expansion strap pulls the heater tightly against the cylinder being heated. The standard center of hole to edge of heater dimension is 1/4".

When ordering, specify the angle of coverage from center to center of the mounting screw holes as shown.

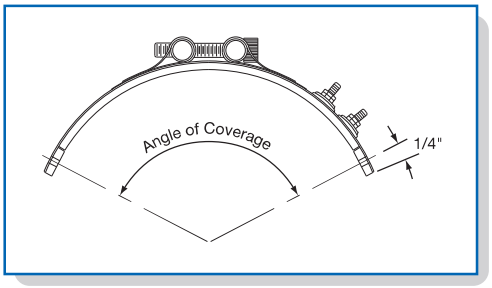


Partial Coverage Band
1-Piece with Separate Strap

The alternate method of partial coverage construction is the 1-piece Band Heater with a separate 2-piece strap.

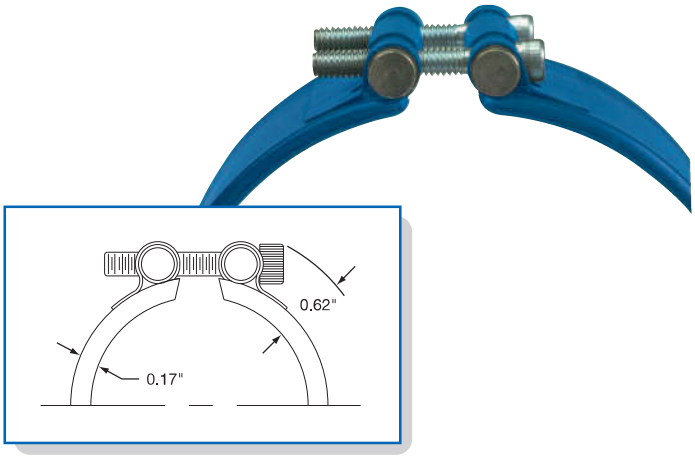
The 2-piece strap itself is bolted at the padded ends, allowing the heater to float between the pads as illustrated below. When tightening the strap, it will pull the heater against the cylinder being heated. The standard center of hole to edge of heater dimension is 1/4".

When ordering, specify the angle of coverage from center to center of the mounting screw holes as shown.



Mi-Plus® Standard Built-In Clamping Strap

The clamping brackets of the Mi-Plus Heater are formed from its outer sheath, producing a unique Built-In Strap. Clamping power is generated through barrel nuts and socket head cap screws, which are an integral part of the Built-In Strap.



High operating temperatures require superior clamping force to maintain ultimate contact between the inside diameter of the band heater and the barrel, which is essential for maximum heater operating life. Only Tempco's Mi-Plus offers you this unique Built-In Strap feature.

TOUGH IN EXTREME CONDITIONS

Even under the most extreme conditions, the Built-In Strap Clamping will remain functional for the life of your Mi-Plus band heater. The steel clamping bars are the full width of the heater to distribute the forces evenly for superior heater contact. Tempco uses 1/4-20 alloy steel socket head cap screws to maximize the clamping power.

Standard on all Mi-Plus heaters 3" in diameter & larger

Limitations **Minimum Width:** 1-1/2" (38.1 mm)
Minimum Diameter: 3" (76.2 mm)

Type NB — One-Piece Band
Type NS — Two-Piece Band
Type NE — One-Piece Expandable Band

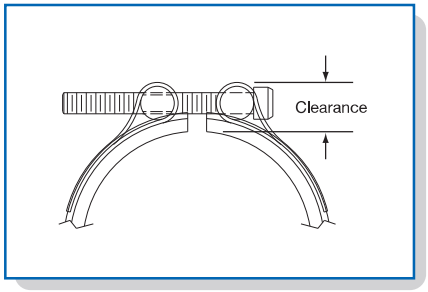
Consult Tempco for multiple segment heaters.

Mi-Plus Separate Clamping Straps

The Mi-Plus is available without built-in brackets. This option uses a separate strap to properly clamp the heater. A separate strap is useful when clearance is limited or there is an obstruction. Separate straps are made strictly to customer specifications. Consult Tempco with your requirements.

Bolt Size	Clearance	Suggested Diameter Range
8-32	.50"	1" – 3"
10-32	.56"	2" – 6"
1/4-20	.62"	> 3"

Note: The number of straps is dependent on heater width. Tempco recommends the use of the largest bolt size that clearance allows.



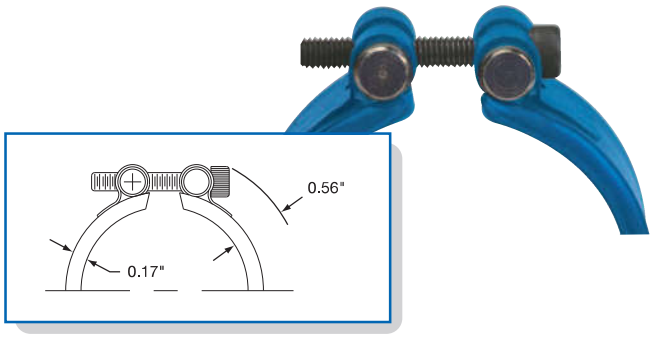
Type SB — One-Piece Band
Type SS — Two-Piece Band
(Requires Minimum Heater Diameter of 3")
Type SE — One-Piece Expandable Band
(Requires Minimum Heater Diameter of 3")

Consult Tempco for multiple segment heaters.

Mi-Plus® Built-In Clamping Strap Variations

Mi-Plus Low Profile Built-In Clamping Strap

When space is limited use Tempco's low profile clamping, a design that doesn't sacrifice strength for size. This compact design uses 10-32 alloy socket head cap screws.



Standard on all Mi-Plus heaters less than 3" in diameter

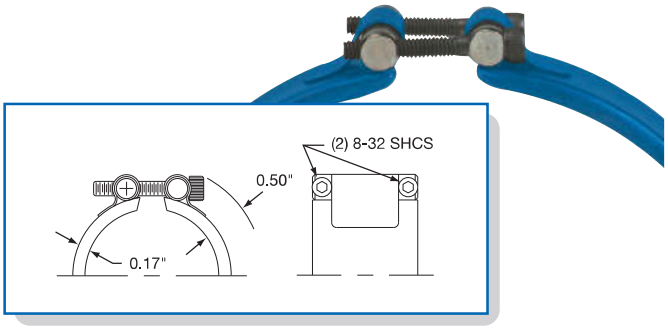
Limitations **Minimum Width:** 1-1/2" (38.1 mm)
Minimum Diameter: 1-3/8" (34.9 mm)

Type LB — One-Piece Band
Type LS — Two-Piece Band
Type LE — One-Piece Expandable Band

Consult Tempco for multiple segment heaters.

Mi-Plus Outrigger Built-In Clamping Strap

This design is unique to 1" wide heaters from 1-3/8" diameter and greater. Two 8-32 alloy socket head cap screws are used to give 1" wide heaters the required clamping power.



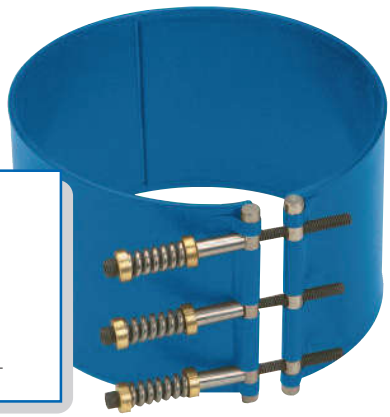
Standard on Mi-Plus heaters 1" wide and 1-3/8" in diameter and greater.

Type OB — One-Piece Band **Type OS** — Two-Piece Band

Consult Tempco for multiple segment heaters.

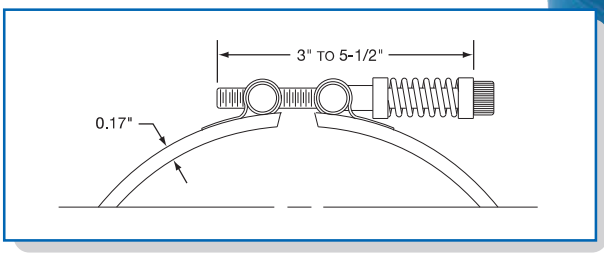
Mi-Plus Spring Loaded Built-In Clamping Strap

Spring loaded clamping with alloy steel socket head cap screws is standard on heaters over 8" in diameter and offered as an option on any heater with standard brackets. The extra heavy duty compression springs serve to combat thermal expansion of the heater by self adjustment, thereby ensuring excellent contact of the heater surface with the machine barrel or die. This type of clamping is also useful on heaters that are mounted vertically.



Limitations

Minimum Width: 1-1/2" (38.1 mm)
Minimum Diameter: 3-1/2" (88.9 mm)



Type SL — One-Piece Band
Type NSL — Two-Piece Band
Type NEL — One-Piece Expandable Band

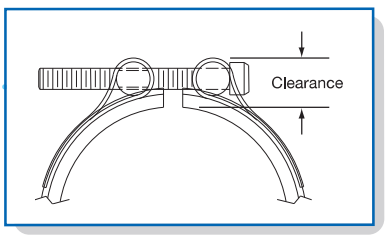
Consult Tempco for multiple segment heaters.

Mi-Plus Weld-On Bracket

The Mi-Plus is available without built-in brackets. For this option, brackets are welded onto the heater plate at user-specified locations. A weld-on bracket is useful when clearance is limited or there is an obstruction for using separate straps. Consult Tempco with your requirements.

Bolt Size	Clearance
8-32	.50"
10-32	.56"
1/4-20	.62"

Limitations **Minimum Width:** 1" (25.4 mm)
Minimum Diameter: 1" (25.4 mm)



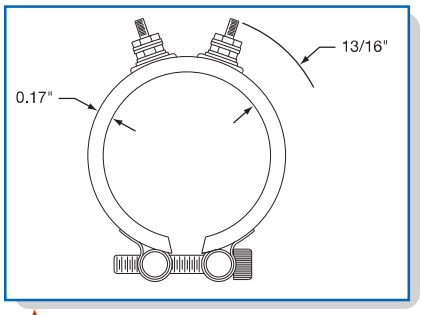
Type WB — One-Piece Band
Type WS — Two-Piece Band
Type WE — One-Piece Expandable Band

Note: The number of weld-on brackets is dependent on heater width. Tempco recommends the use of the largest bolt size that clearance allows.

Made in USA

Screw Terminals: Type T2, Type T3X & Type T3Y

The specially designed Stainless Steel Power Terminals are internally connected to the heater and are resistant to over-torquing. The screw terminals are virtually unbreakable. Secure tightening of the electrical connections is essential for safety and long heater life.



Only Tempco's Mi-Plus has these unique Torque-Resistant Power Terminals.

Mi-Plus Type T2 — Screw Terminals

One-Piece Band

***Standard* Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Post Terminals:** 10-32 or 8-32
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 25A (10-32) or 20A (8-32)

Two-Piece Band

***Standard* Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Post Terminals:** 10-32 or 8-32
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half

One-Piece Expandable Band

***Standard* Termination Location:**
two sets of terminals opposite the gap; center of the width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Post Terminals:** 10-32 or 8-32
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half

Mi-Plus Type T3X — Screw Terminals

One-Piece Band

***Standard* Termination Location:**
opposite the gap; across center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:**
  with 10-32 Post Terminals — 2-1/2" (63.5 mm)
  with 8-32 Post Terminals — 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half

Two-Piece Band

***Standard* Termination Location:**
center of each half; across center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:**
  w/ 10-32 Post Terminals — 2-1/2" (63.5 mm)
  w/ 8-32 Post Terminals — 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half

One-Piece Expandable Band

***Standard* Termination Location:**
two sets of terminals opposite the gap; across center of width

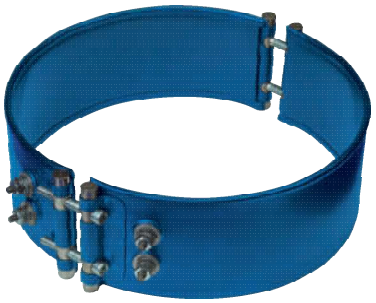
- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:**
  w/ 10-32 Post Terminals — 2-1/2" (63.5 mm)
  w/ 8-32 Post Terminals — 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half

Type T3Y — Screw Terminals, Next To Gap

Two-Piece Band

Standard **Termination Location:**
next to same gap on each half; across center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** with 8-32 Post Terminals — 2" (50.8 mm)
  with 10-32 Post Terminals — 2-1/2" (63.5 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 25A (10-32) or 20A (8-32) each half



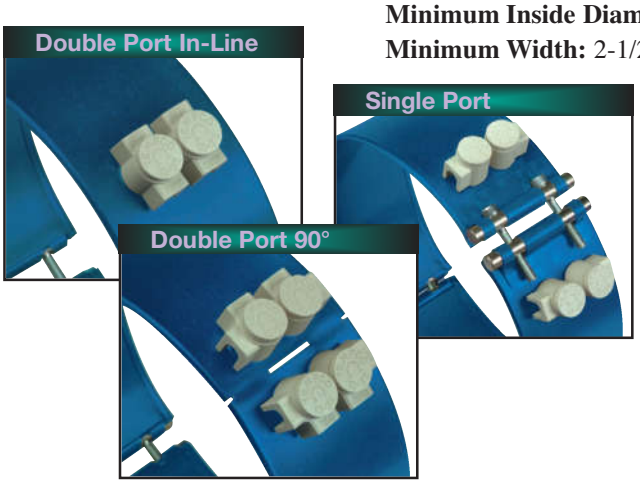
Note: **Type T3Y** is not available on One-Piece or One-Piece Expandable Mi-Plus Band Heaters

Optional Igloo™ Ceramic Covers for Heaters with Screw Terminals

Igloo™ ceramic terminal covers consist of two individual ceramic parts. With a tight-fitting cap and a solid base, an Igloo will fully insulate any standard #8 or #10 terminal lug used for electrical wiring hookups. Igloos can be assembled onto any standard Mi-Plus Band with 8-32 or 10-32 screw terminals. Igloo Double Port 90° are recommended on expandable heaters with Type T3X Termination. Igloo Double Port In-Line will not fit on expandable heaters with Type T3X termination.

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Minimum Inside Diameter: 2-1/2" (63.5 mm)
Minimum Width: 2-1/2" (63.5 mm)



Three types of Igloo™ bases are available:

Type C6 —
Double Port In-Line P/N CER-101-104
Type C7 —
Double Port 90° P/N CER-101-106
Type C8 —
Single Port P/N CER-101-107

Igloo™ caps are available in the three crew terminal sizes:

10-32 — P/N CER-102-101
10-24 — P/N CER-102-104
8-32 — P/N CER-102-105

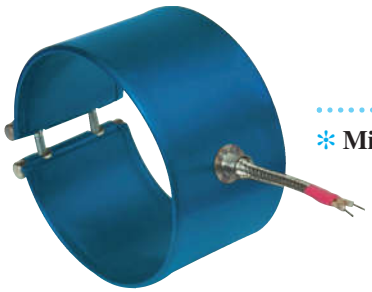
When ordering, specify the type of Igloo and the screw terminal size.

Selection TERMINATION Guide

Mi-Plus® Type W1 — Abrasion Resistant Straight Wire Braid Leads

The lead wires exit straight out through a stainless steel eyelet. Flexible stainless steel wire braid leads are highly recommended for improved abrasion resistance. Wire braid leads offer sharp bending not possible with armor cable.

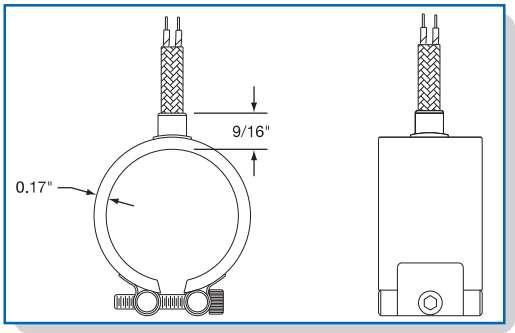
This stainless steel braid is loosely wrapped around two mica insulated lead wires rated for 842°F (450°C). The standard leads are 10" of stainless steel loose wire braid over 12" of flexible leads. ***If longer leads are required, specify when ordering.***



One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

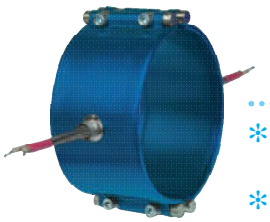
- **Minimum Inside Diameter:** 1" (25.4 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC.
- **Maximum Amps:** 12.5



CONTINUED

Mi-Plus® Type W1 — Abrasion Resistant Straight Wire Braid Leads

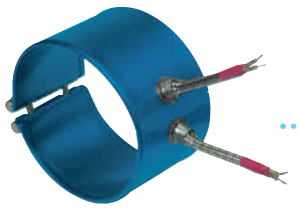
Continued from previous page…



Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5 each half



One-Piece Expandable Band

Standard **Termination Location:**
two sets of leads opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

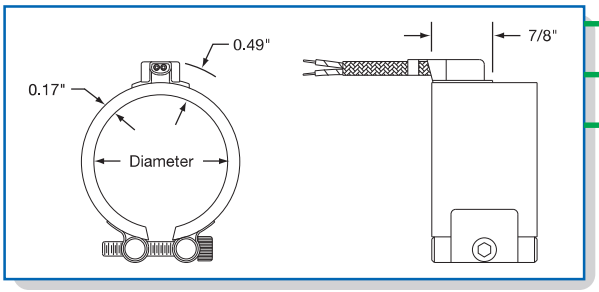
Mi-Plus Type W2 — Right-Angle Wire Braid Leads, 90 Degrees to Heater Diameter

This style of wiring is the most prevalent for nozzle band heaters, as it contributes to the most flexible and space saving installation.

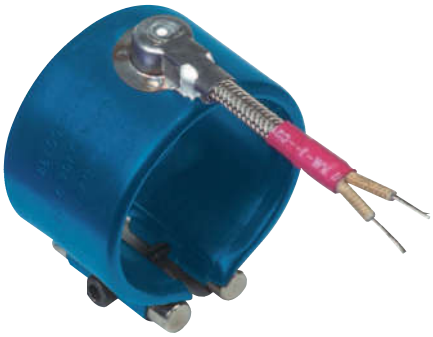
Mica insulated lead wires rated for 842°F (450°C) with tightly wrapped stainless steel overbraid are used, providing protection in abrasive environments. The stainless steel braid exits parallel to the heater centerline through a low profile stainless steel cap. This cap also acts as a strain relief, guarding against excessive flexing or pulling of the lead wire.

This termination style is located 180° from the gap for one-piece heaters and 90° from the gap for two-piece heaters and exits the heater near the edge. By keeping the lead wires away from the heater, less damage from high temperature contact is likely to occur.

The standard leads are 10" of stainless steel wire braid over 12" of flexible leads. ***If longer leads are required, specify when ordering.***



- ***Low Profile***
- ***Abrasion Resistant***
- ***Lead Terminations***



One-Piece Band

Standard **Termination Location:**
opposite the gap; near edge of width

- **Minimum Inside Diameter:** 1" (25.4 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5

Two-Piece Band

Standard **Termination Location:**
center of each half; near edge of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

One-Piece Expandable Band

Standard **Termination Location:**
two sets of leads opposite the gap; center of width

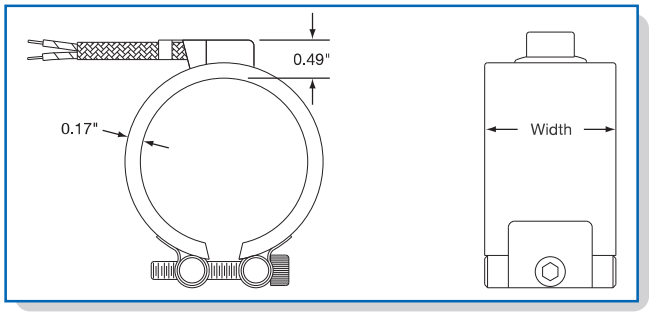
- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

Mi-Plus® Type W5 — Right-Angle Wire Braid Leads, 90 Degrees to Heater Width

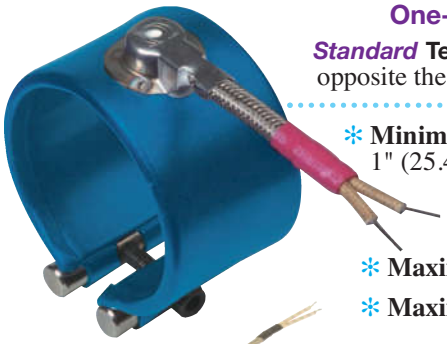
The stainless steel braid exits parallel to the heater surface through a low profile stainless steel cap, which also acts as a strain relief guarding against excessive flexing or pulling of the lead wire. Mica insulated lead wires rated for 842°F (450°C) with tightly wrapped stainless steel over-braid are used, providing protection in abrasive environments.

This low-profile termination is convenient where space limitations are a concern.

The standard leads are 10" of stainless steel wire braid over 12" of flexible leads. ***If longer leads are required, specify when ordering.***



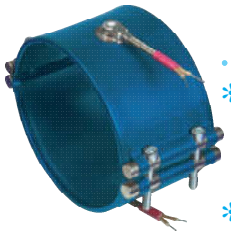
One-Piece Band



Standard **Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 1" (25.4 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5

Two-Piece Band



Standard **Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5 each half

One-Piece Expandable Band

Standard **Termination Location:** two sets of leads opposite the gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

Selection TERMINATION Guide

Mi-Plus Type R1 — Abrasion Resistant Straight Armor Cable

Stainless steel armor cable provides vastly superior lead wire protection in cases where abrasion is a constant problem. The lead wires are mica insulated and rated for 842°F (450°C).

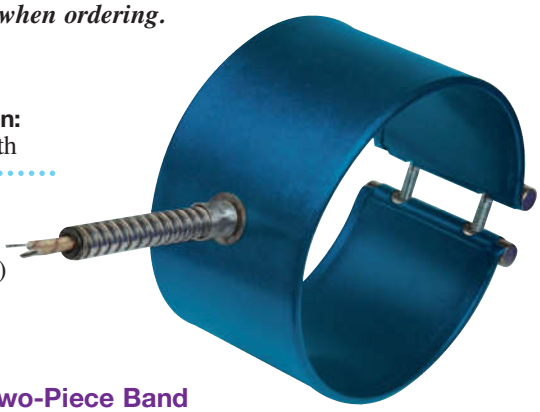
The standard leads are 10" of stainless steel armor cable over 12" lead wire.

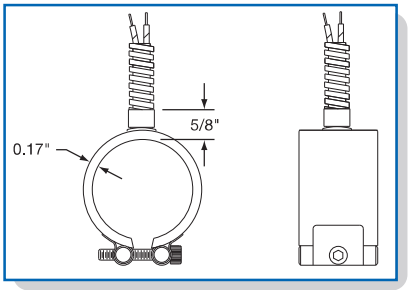
If longer leads are required, specify when ordering.

One-Piece Band

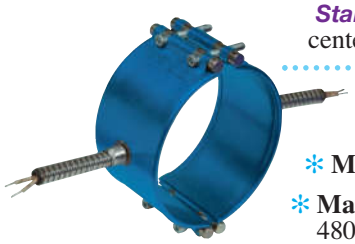
Standard **Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 1" (25.4 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5





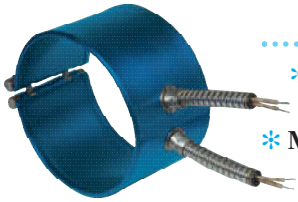
Two-Piece Band



Standard **Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

One-Piece Expandable Band



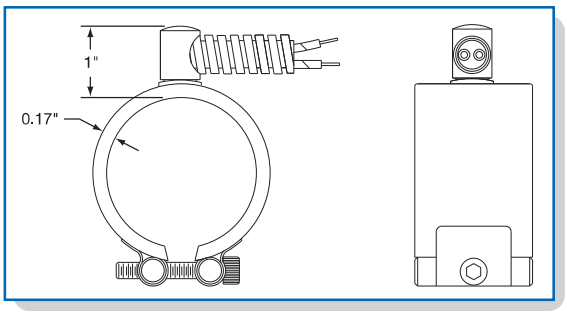
Standard **Termination Location:** two sets of leads opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

Terminations

Made in USA

Mi-Plus® Type R2B — Abrasion Resistant Right-Angle Armor Cable



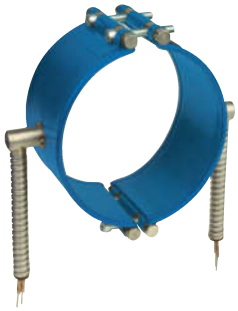
One-Piece Band

Standard **Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 1" (25.4 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Stainless Steel Right-Angle Armor Cable will provide excellent lead wire protection. This space saving termination will give long-term abrasion protection. The lead wires are mica insulated and rated for 842°F (450°C).

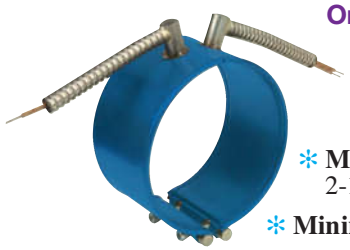
The standard leads are 10" of stainless steel armor cable over 12" of lead wire. ***If longer leads are required, specify when ordering.***



Two-Piece Band

Standard **Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

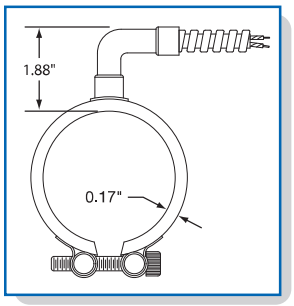


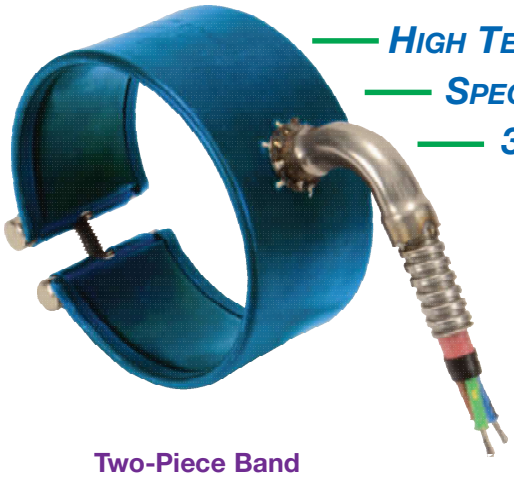
One-Piece Expandable Band

Standard **Termination Location:** two sets of leads opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

Mi-Plus Type R2H — Abrasion Resistant Right-Angle Armor Cable for Type HTL Lead Wire





— ***High Temperature Termination: 1022°F (550°C)***

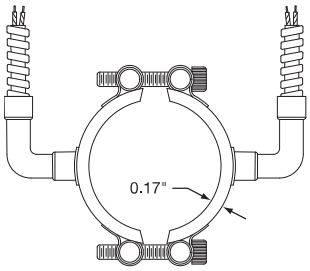
— ***Special SS Right-Angle Fitting***

— ***3-Conductor Wire***

One-Piece Band

Standard **Termination Location:** opposite the gap; center of width

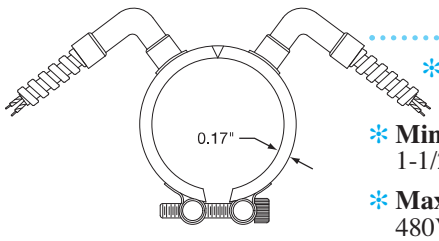
- **Minimum Inside Diameter:** 1-1/2" (38.1 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A



Two-Piece Band

Standard **Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** two sets of leads opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

View Product Inventory @ www.tempco.com

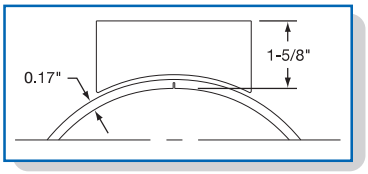
Mi-Plus® Type C — General Purpose Terminal Box

General purpose terminal boxes are a simple & economical way to protect employees from electric shock or prevent electric shorts that can result from exposed wiring on band heater electrical installations.

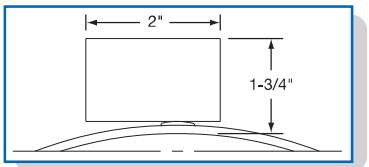
The Heavy Duty Stainless Steel Terminal Box has a 1/2" trade size knockout (actual diameter 7/8") that will accept standard armor cable connectors. To simplify installation, Mi-Plus band heaters with terminal boxes can be pre-wired.

Type CA – Box only ***(shown)***
Type CD – Box with prewired SS wire braid
Type CC – Box with prewired SS armor cable
Type CE – Box with prewired plain leads

The standard abrasive protection leads are 10" of protection over 12" of flexible leads. The standard lead length for plain leads is 10" long.
If longer leads are required, specify when ordering.



Box: One-Piece Expandable Construction



Box: One-Piece & Two-Piece Construction

One-Piece Band

Standard **Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/25A

Two-Piece Band

Standard **Termination Location:** center of each half; center of width

- **Minimum ID:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/25A each half

One-Piece Expandable Band

Standard **Termination Location:** opposite the gap; center of width

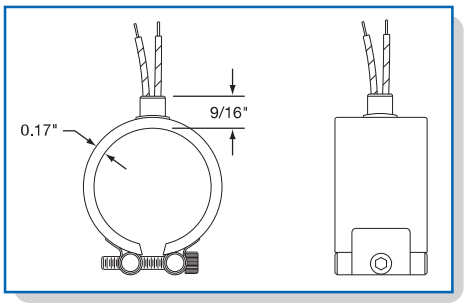
- **Minimum ID:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/25A each half

Selection TERMINATION Guide

Mi-Plus Type L1 — Plain Wire Leads

Plain wire leads are available on all construction styles. The lead wires exit straight out through a stainless steel eyelet. High-temperature 842°F (450°C) mica insulated lead wire is standard.

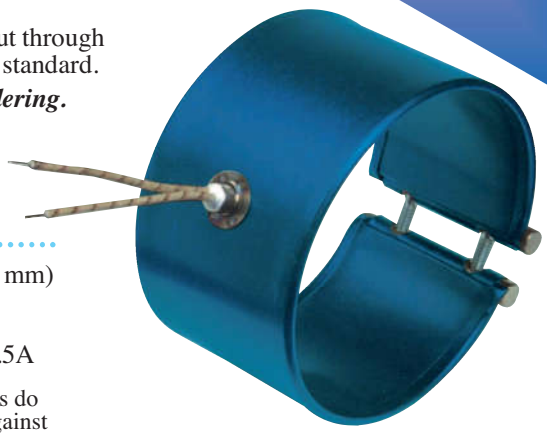
The standard lead length is 10" long. ***If longer leads are required, specify when ordering.***



One-Piece Band

Standard **Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 1" (25.4 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

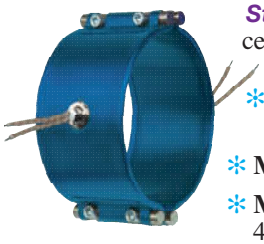


Note: Plain wire leads do not offer protection against contamination or abrasion.

Two-Piece Band

Standard **Termination Location:** center of each half; center of width

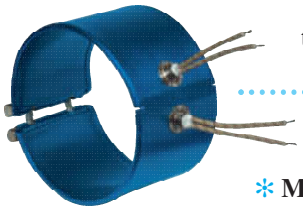
- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half



One-Piece Expandable Band

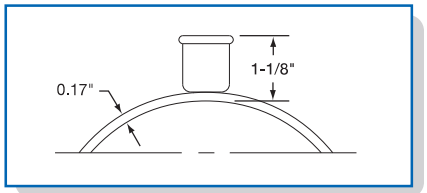
Standard **Termination Location:** two sets of leads opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

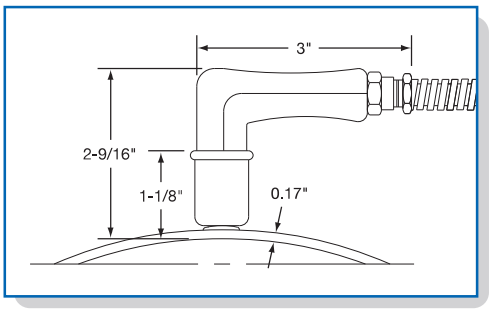


Made in USA

Mi-Plus® Type P1 — Quick Disconnect Plugs



Cup Assembly Only



Cup Assembly with 90° Plug

High Temperature Quick Disconnects are a simple, safe and quick way to apply power to a band heater installation. The combination of plug and cup assembly along with stainless steel armor cable or stainless steel wire braid eliminates all live exposed terminals or wiring that can be a potential hazard.

The assembly is available with a straight or right-angle plug. To simplify installation, Mi-Plus band heaters with Quick Disconnects can be pre-wired with stainless steel armor or stainless steel wire braid.

P1A — Cup Assembly only

P1B — Cup Assembly with straight plug

P1C — Cup Assembly with 90° plug

P1E — Cup Assembly with straight plug and stainless steel armor cable

P1F — Cup Assembly with straight plug and stainless steel wire braid

P1H — Cup Assembly with 90° plug and stainless steel armor cable

P1J — Cup Assembly with 90° plug and stainless steel wire braid

The standard abrasive protection leads are 10" of protection over 12" of flexible leads. ***If longer leads, armor cable or braid are required, specify when ordering.***

Type P1A Shown

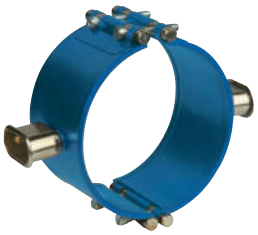
One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts:** 250VAC
- **Maximum Amps:** 16
- **Maximum Temperature:** 392°F (200°C)

Type P1H Shown

Type P1A Shown



Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts:** 250VAC each half
- **Maximum Amps:** 16 each half
- **Maximum Temperature:** 392°F (200°C)

Type P1H Shown

Note: **Type P1** is not available on One-Piece Expandable Mi-Plus Band Heaters

Mi-Plus® Type P2 — Terminal Box and Quick Disconnect Straight Plug

This lower profile terminal box and high temperature quick disconnect plug assembly offers a solution where clearance is a problem. The combination of plug and cup assembly along with stainless steel armor cable or stainless steel wire braid eliminates all live exposed terminals or wiring that can be a potential hazard.

The assembly is available with straight plug only. To simplify installation, Mi-Plus band heaters with Quick Disconnects can be pre-wired with stainless steel armor or stainless steel wire braid.

P2A — Box and Cup only

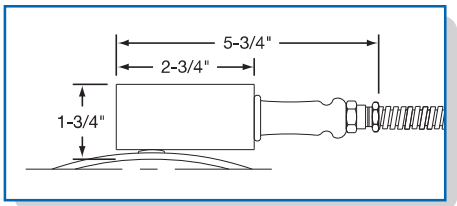
P2B — Box and Cup with straight plug

P2D — Box and Cup with straight plug and stainless steel armor cable

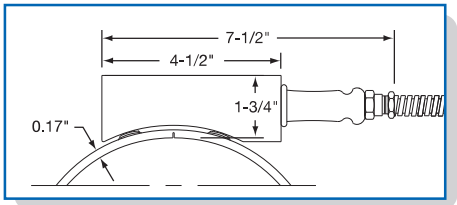
P2E — Box and Cup with straight plug and stainless steel wire braid

The standard abrasive protection leads are 10" of protection over 12" of flexible leads.

If longer leads, armor cable or braid are required, specify when ordering.



Box – One- & Two-Piece Construction

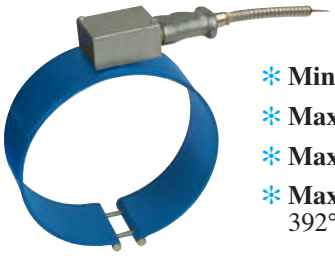


Box – One-Piece Expandable Construction

One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

Type P2D Shown



Type P2A Shown

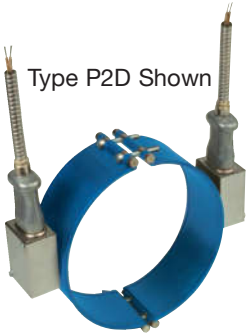
- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts:** 250VAC
- **Maximum Amps:** 16
- **Maximum Temperature:** 392°F (200°C)

Selection TERMINATION Guide

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

Type P2D Shown



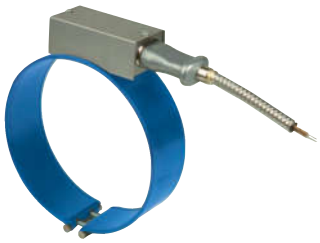
Type P2A Shown

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts:** 250VAC each half
- **Maximum Amps:** 16 each half
- **Maximum Temperature:** 392°F (200°C)

One-Piece Band Expandable

Standard **Termination Location:**
opposite the gap; center of width

Type P2D Shown



Type P2A Shown

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts:** 250VAC each half
- **Maximum Amps:** 16 each half
- **Maximum Temperature:** 392°F (200°C)

Made in USA

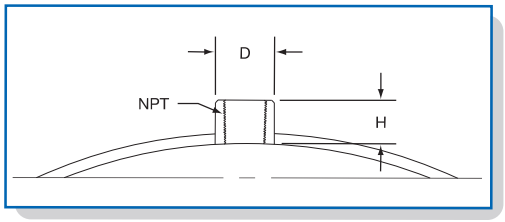
Features/Options

Thermocouple Coupling

The Thermocouple Coupling facilitates the installation of an external thermocouple with a threaded fitting. The standard location for the coupling is 90° from the gap at the center of the width. Specify without through hole for heater sensing or with through hole for load sensing.

The bushing sizes available are:

Thread	D	H
1/8-27 NPT	9/16"	5/8"
1/4-20 NPT	3/4"	11/16"
3/8-18 NPT	7/8"	5/8"
M12-1.75mm	3/4"	1/2"

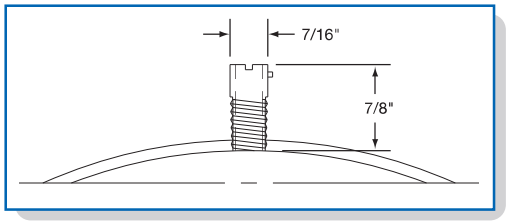


Note: The minimum heater width with a coupling is 1-1/2". If heater width is smaller than 1-1/2", heater gap will be used for coupling location.

Thermocouple Bayonet Adapter

A standard Bayonet Adapter facilitates the installation of an external thermocouple with a standard bayonet cap. The standard location for the adapter is 90° from the gap.

Refer to pages 14-3 and 14-4 for a complete selection of thermocouples available from stock.

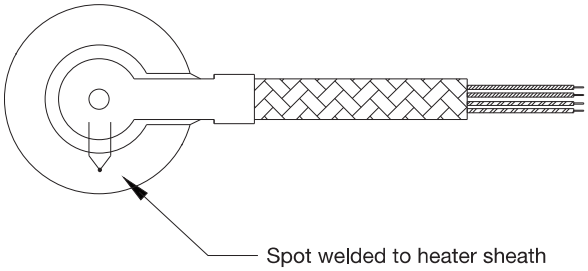


Note: The minimum heater width with a T/C adapter is 1-1/2". If heater width is smaller than 1-1/2", heater gap will be used for T/C location.

Built-In Thermocouple

A built-in thermocouple can be factory installed on Mi-Plus band heaters. ANSI type J or K thermocouples are available on Type L1, R,1 R2, W1, W2 and W5 lead wire terminations. Thermocouple junction is located inside the exit termination stamping, providing a relative heater temperature.

Thermocouple can be located in various positions on the heater. Consult Tempco with your requirements.



Stock Heavy Duty Quick Disconnect Plugs and Connectors

Heaters with pre-wired plugs allow quick and easy installation of the heater. These plugs can be attached to armor cable or stainless steel wire braid.

For other types of plugs, consult Tempco or specify the manufacturer's part number when ordering.

See page 15-15 for additional Twist-Lock electrical plugs.

"P2"

"P3"

"P4"

"P5"

"P6"

Reference	NEMA P or R	Amps	Volts	Plug Part No.	Connectors (Female) Part No.
P1 twist lock	L1-15	15A	125V	EHD-102-102	EHD-103-101
P2 twist lock	N/A	10A 15A	250V 125V	EHD-102-107	EHD-103-103
P3 straight	5-15	15A	125V	EHD-102-103	EHD-103-102
P4 twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-104
P5 twist lock	L6-15	15A	250V	EHD-102-121	EHD-103-107
P6 twist lock	L6-20	20A	250V	EHD-102-122	EHD-103-150

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Since 1972

Installation RECOMMENDATIONS

1. Disconnect electric power to the machine and/or heaters prior to installing or replacing heaters.
2. Do not install heaters in areas where combustible gases, vapor, or dust is present.
3. Use a heater that closely matches the wattage requirements. This will decrease the frequency of cycling and temperature overshoot, thereby increasing the life of the heater.
4. Make certain that all barrel surfaces are clean and have a smooth finish. Any contaminants or imperfections on the surface can cause premature heater failure.
5. Tempco expandable type Mi-Plus Band Heaters may be opened once at the gap, to fit on the barrel. Do not open these heaters beyond their specified heater diameter.

CAUTION *Do not open Tempco One-Piece Non-Expandable Type Mi-Plus Band Heaters. Opening of these heaters can cause internal damage*

6. Position heater bands on the barrel.
7. Securely tighten heater bands around the barrel. Clamping force must be equally distributed on heaters with more than one set of clamping brackets.

Recommended Clamping Bolt Torque: 10 ft./lbs. (13.6 Newton/meters)

8. For heaters with screw terminals, remove the top nut and flat washers from the power screw terminals. Do not loosen or remove the bottom nut on the screw terminals. The bottom nut is tightened to 60 inch/lbs. at our factory. A loose bottom nut can cause internal elements to shift and will result in premature heater failure.

Installation Accessories Available

IMMEDIATE DELIVERY!

- ✶ *High Temperature Terminal Lugs*
- ✶ *Igloo Ceramic Insulating Covers*
- ✶ *UL Listed Plugs*
- ✶ *High Temperature Lead Wire 842°F (450°C)*
- ✶ *Armor Cable*
- ✶ *Stainless Steel Braid*
- ✶ *High Temperature Sleeving*
- ✶ *High Temperature Mica Insulated Wiring Harnesses 842°F (450°C)*
- ✶ *High Temperature Mica Insulated Wiring Harnesses 1022°F (550°C)*
- ✶ *Thermocouples*
- ✶ *Temperature Controllers*
- ✶ *High Temperature Fiberglass Tape*

All Items Available from Stock

9. All electrical wiring of heater bands should be done by a qualified electrician using proper, dry, personal protective equipment.
   - **a.** Use only Stainless Steel or other high temperature lugs to prevent material degradation when exposed to high temperatures over a prolonged period of time.

     CAUTION *DO NOT USE COPPER OR PLATED COPPER LUGS.*

   - **b.** Heaters must be wired using the proper gauge wire with a minimum temperature rating of 842°F (450°C). All Mi-Plus Heaters supplied with lead wire terminations or factory pre-wired screw terminals use mica insulated lead wires rated to 842°F (450°C). ***Never allow lead wires to lie directly on the heater surface. This can cause degradation of the lead wires and cause a short circuit.***
   - **c.** When connecting power leads to screw terminals make certain that barrels of terminal lugs are not facing down toward the heater case, which will create a short circuit.

     Recommended Screw Terminal Torque: 30 in./lbs. (3.4 Newton/meters)

   - **d.** Make certain power lead wires do not make contact with hot heater surfaces to avoid degradation of lead wire, as this can cause electrical short circuits.
   - **e.** Ensure that leads are not kinked or sharply bent around other obstructions.
   - **f.** Make sure the voltage input to the heater bands does not exceed the voltage rating that is stamped on the heater bands.
   - **g.** It is recommended that an amperage reading is taken for each heater to verify proper wiring. (Amps = Watts/Volts)
10. Insulate all live electrical wires per applicable safety standards.
11. Begin heater band re-tightening procedure. Be sure to wear protective gloves.
    - **a.** Energize heater bands and allow the heater sheath to reach 400°F (usually 3–5 minutes).
    - **b.** Turn power off and immediately re-tighten the Mi-Plus Bands to 10 ft./lbs. Turn power on.
12. Install shrouds around the machine to meet applicable safety requirements.
13. Once installed, check surroundings to make sure that contaminants won't get on the heater while the unit is in operation. Accumulation of contaminants on heaters can cause premature heater failure.
14. Insulating blanket installations must have band heater retightening sequence (#12) completed before blanket installation. Lead wires must exit the insulation blanket as soon as possible; do not entrap lead wires between heater sheath and insulation blanket.

CAUTION It is imperative that upon start-up of new machines at customer facilities, all of the aforementioned parameters are double checked by qualified field service personnel.

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Made in USA

DURABAND* with BUILT-IN STRAP

A General purpose terminal box can be attached on Duraband diameters of 2-1/2" or larger. It offers excellent protection to exposed terminals. To simplify wiring, the box has a 1/2" trade size knockout (actual diameter 7/8") that will accept standard conduit or flexible armor cable connectors. It can be field assembled on most band heaters with screw terminals having a center distance of 7/8".

B Flexible armor cable for lead protection is available where abrasion is a problem.

C For maximum surface contact, the torque resistant and virtually unbreakable stainless steel screw terminals are securely fastened to a connecting jumper, assuring positive contact with the windings and providing maximum amperage carrying capacity. For other terminal or lead arrangements, see pages 1-36 through 1-41.

D Specially designed mounting brackets with 1/4"-20 socket cap screws are used to draw the Built-In Strap to a high degree of tension. This tension exerts the great amount of drawing power required to pull the heating element assembly against the cylinder evenly and tightly across its entire width, thus eliminating all air gaps that can cause premature heater failure. The number of bracket assemblies used increases as the width of a Duraband heater increases.

E Specially treated rust-resistant steel sheath casing provides the best combination of physical strength, high emissivity and good thermal conductivity to heated cylindrical parts, good for sheath temperatures up to 900°F (480°C).

F Specially selected grade and thickness of mica sheet is used to insulate the windings, providing excellent thermal conductivity and dielectric strength.

G The gauge of nickel-chrome resistance ribbon wire is selected to achieve the lowest internal element temperatures possible, resulting in maximum heater life. The ribbon wire is wound evenly spaced on a specially selected mica strip, providing even heat distribution and thus eliminating hot spotting that can cause premature heater failure.

H Duraband's Built-In Strap is a unique design feature developed and patented by Tempco. A Low Thermal Expansion alloy sheath is used for the outer sheath, covering the entire width of the band heater.

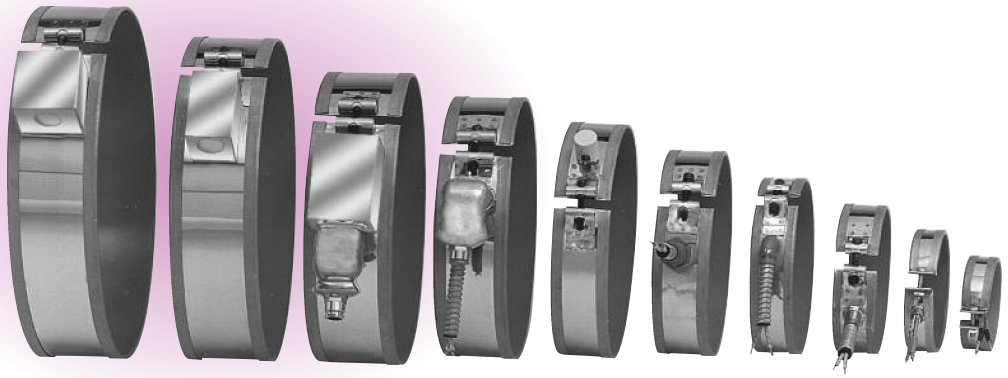
ANOTHER Tempco ORIGINAL

*U.S. Patent #3829657

makes handling and installation easier!

Typical Applications

- *Plastic Injection Molding Machines*
- *Plastic Extruders*
- *Oil Reclamation Equipment*
- *Food and Candy Extruders*
- *Drum Heating*
- *Extrusion Dies*
- *Holding Tanks*
- *Blow Molding Machines*
- *Vending Machines*
- *Barrels & Heads*
- *Food Service Warming*
- *Autoclaves & Sterilizers*
- *Metallurgical Analyzers*
- *Fluidized Beds*
- *Hot Runner Molds*
- *Pulp and Paper Processing Equipment*



Designed For Trouble-Free Service

Tempco's Duraband heater design is the result of many years of research, development and testing for a reliable mica insulated band heater that can perform at the higher operating temperatures [up to 900°F (480°C)] essential to process high temperature resins, providing long, efficient service necessary for today's high productivity of plastic extruders, injection and blow molding machines.

Duraband is a proven heater design for good life efficiency and dependability. It assures maintaining the lowest winding temperatures possible, keeping a low-mass heating element assembly for fast heat-up and quick thermal response to controls. It incorporates the Low Thermal Expansion Built-In Strap, a unique design feature originally developed and patented by Tempco.

Advantages and Variations

Duraband mica insulated heaters are widely used on operations involving heating of cylindrical surfaces and are manufactured in a full range of standard construction variations, physical dimensions, electrical ratings, and a complete arrangement of screw terminals and lead terminations. (See pages 1-36 through 1-41).

However, these standard Duraband heater variations and terminations do not represent the full extent of our capabilities. Tempco's engineering staff, with many years of experience in heat processing and temperature control applications, can assist you in designing the right Duraband heater for your specific application.

Construction Characteristics & Features

- *Built-in bracket for superior clamping*
- *Unbreakable and torque-resistant screw terminals*
- *Temperatures up to 900°F (480°C)*
- *Full width stainless steel built-in strap*
- *Flexibility to incorporate holes and cutouts*
- *Available two-piece and expandable designs*
- *Best mica insulated heater on the market*
- *Faster delivery than any other type of heater band*
- *Most economical among various heater bands*
- *Most versatile and commonly used heater band*

Duraband Specifications

Made in USA

Duraband® Standard Specifications and Tolerances

PERFORMANCE RATINGS

Maximum Temperature: Standard Sheath: 900°F (482°C)

Nominal Watt Density: 20-45 W/in² (3-7 W/cm²)

Maximum Watt Density: Dependent on heater size and operating temperature.

ELECTRICAL RATINGS

Maximum Voltage: 480 VAC

Dual Voltage or 3-Phase:
Available depending on heater design

Maximum Amperage: lead wire termination: 12.5 amp
screw terminations: 8-32UNF—20 amp; 10-32UNF—25 amp

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

CAUTION

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

PHYSICAL SIZE CONSTRUCTION LIMITATIONS

Minimum Width: 3/4" (19.1 mm)

Width Tolerance: ±1/16" (1.59 mm)

Minimum Inside Diameter: 7/8" (22.1 mm)

Nominal Gap: 3/8" (9.5 mm)—If a larger gap is required for probes or thermocouples, specify when ordering.

BUILT-IN BRACKETS

Heater Width	Number of Brackets
1-1/2" to 3" (38-76 mm)	1
3-1/8" to 5" (79-127 mm)	2
5-1/8" to 6-7/8" (130-145 mm)	3
7" to 10" (178-254 mm)	4
10-1/8" to 15" (257-381 mm)	5

If tighter tolerances are required, consult Tempco.

Minimum ID and Width for Construction/Clamping Styles

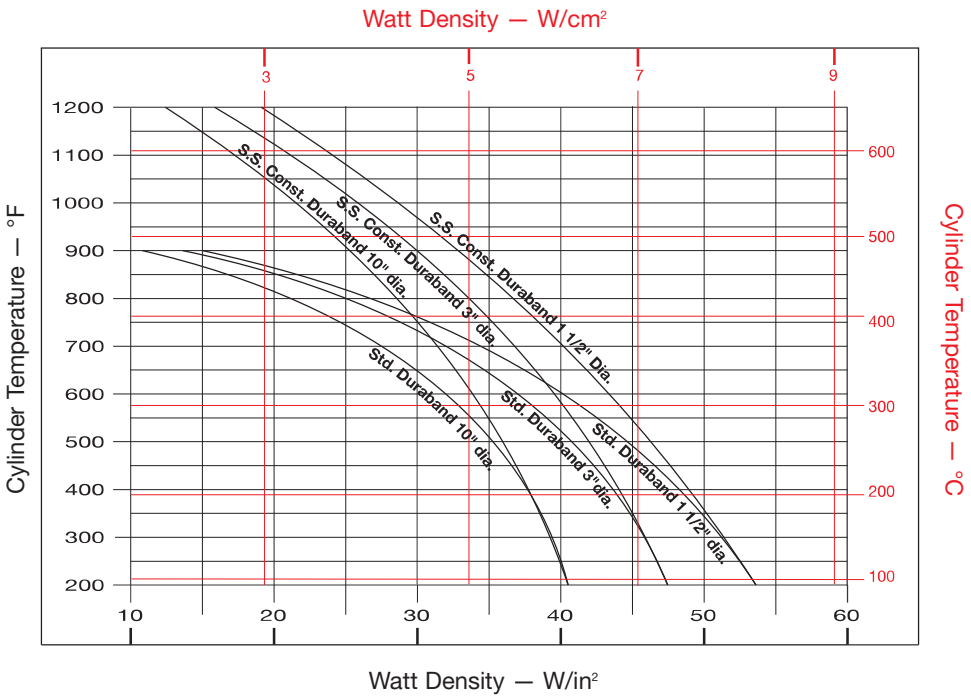
Style	Min. ID in	Min. ID mm	Min. Width in	Min. Width mm
NB	2	50.8	1-1/4	31.8
NS	3	76.2	1-1/4	31.8
NE	2-1/2	63.5	1-1/4	31.8
SB	7/8	22.1	3/4	19.1
SS	2	50.8	3/4	19.1
SE	2-1/2	63.5	1-1/4	31.8
FB	1	25.4	3/4	19.1
FS	2	50.8	3/4	19.1
FE	2-1/2	63.5	1-1/4	31.8
SL	4	101.6	1-1/4	31.8
NSL	4	101.6	1-1/4	31.8
NEL	4	101.6	1-1/4	31.8
LT	7	177.8	1-1/2	38.1
LS	7	177.8	1-1/2	38.1
LE	7	177.8	1-1/2	38.1
TWL	1	25.4	1	25.4
RNB	5-1/2	134.7	1	25.4
RNS	10	254	1	25.4

Recommended Segments by Inner Diameter

Number of Segments	ID Range in	ID Range mm
1	15-1/2" & Smaller	393.7mm & Smaller
2	15 1/2" to 28"	393.7mm to 711.2mm
3	15 1/2" to 45"	393.7mm to 1143mm
4	15 1/2" to 56"	393.7mm to 1422.4mm
6	15 1/2" to 86"	393.7mm to 2184.4mm
8	25" to 96"	393.7mm to 2438.4mm

Note: Refer to individual descriptions for further information. Actual heater minimums will be determined by the combination of termination and construction/strap styles.

Duraband® Maximum Watt Densities



MAXIMUM ALLOWABLE WATT DENSITY

The chart displays the maximum Watt Density curves for various diameter heaters. Use this chart when determining the appropriate wattage value for your chosen heater.

Be aware that certain factors will require you to derate the watt density (W/in²) of your heater selection.

CAUTION Failure to adhere to the maximum allowable watt density per heater size will result in poor operating life.

CORRECTION FACTORS

For heaters wider than 3" (76.2 mm), reduce maximum recommended watt density from chart by 20%.

For applications using insulating shroud, reduce maximum recommended watt density from chart by 25%.

CALCULATING MAXIMUM WATT DENSITY

Factors to be taken into consideration

A. Type of controls
B. Voltage variations
C. Machine cycling rate
D. Type of resin being processed
E. Coefficient of thermal expansion and conductivity of the cylinder
F. Designing a heater that closely matches the wattage requirement will decrease the frequency of cycling and temperature overshoot, thereby increasing the life of the heater.

Once these factors have been established, proceed with the following steps:

1. Determine the maximum operating temperature.
2. Calculate the total wattage required to obtain the maximum operating temperature. (See engineering section.)
3. Determine the quantity and size of the heater bands to be used. 1-1/2" through 3" wide band heaters have proven to be the most efficient and reliable in most cylindrical heating applications.
4. Determine individual band heater wattage by dividing the total required wattage by the quantity of band heaters selected.
5. Determine the band heater watt density by subtracting unheated areas from the band heater diameter created by screw terminals, gaps, holes, and cutouts (see formula below).
6. Determine if the required watt density previously calculated exceeds the maximum recommended watt density. Note the maximum cylinder temperature required on the left-hand side of the graph, follow the horizontal line until it intersects with the line of the band heater being used, and read directly down to obtain the maximum recommended watt density (W/in²).
7. If the calculated watt density is higher than the recommended value, it must be corrected or it will cause poor heater life.This can be accomplished by using more band heaters, lowering the heater wattage, or using a different construction type or a different type of band heater.
8. Should you have a problem in selecting the proper band heater or establishing watt density for your application, consult with one of the qualified engineers at Tempco.

Nominal Unheated Areas

Construction Style	Unheated Area to Subtract
One-piece band	1" × width
Two-piece band	2" × width
Holes and cutouts	Size + 1/2" × width

Watt Density Formula

$$\text{Watt Density (W/in}^2\text{)} = \frac{\text{Wattage}}{(3.14 \times (\text{Band ID}) - \text{Gap-1-3/8}) \times \text{Band Width} - \text{Unheated Area (see table)}}$$

Unheated Area (See Table) = Unheated area for construction style + unheated area for any holes or cutouts

Made in USA

Duraband® Construction Styles

3 CONSTRUCTION TYPES

One-Piece Band

The one-piece construction is available on any screw or lead termination and clamping variation. It can be used where band heaters can be slipped over the end of the cylinder.

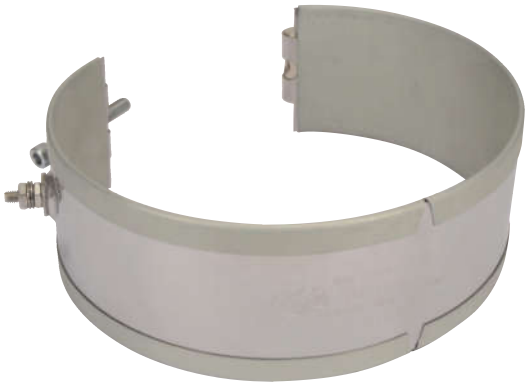
Shown with Type NB Built-In Strap

Two-Piece Band

The Two-Piece construction is available on any screw or lead and clamping variation. The Duraband two-piece design provides a ***built-in hinge,*** making handling and installation easier. It is used on large cylinders or where the heater cannot be slipped over the end of the cylinder. Two-piece band heaters are rated at watts and volts per each half when ordering.

NOTE: Multiple segment designs are recommended on larger diameter (typically larger than 15") heaters to improve the clamping force and

Shown with Type NS Built-In Strap



Shown with Type NE Built-In Strap

One-Piece Expandable Band

The one-piece expandable construction is available on any screw or lead and clamping variation. It can be used where a one-piece band heater would have to be expanded to fit over the barrel during installation, rather than slipped over the end of the barrel.

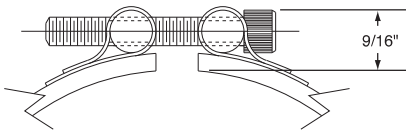
Note: The One-Piece Expandable Band should not be opened and closed more than twice.

Duraband® Construction/Clamping Variations

Standard Built-In Strap Clamping (Low Thermal Expansion)

The Built-In Strap is available with any screw or lead termination and construction variation. The Built-In Strap eliminates the use of awkward-to-handle separate straps, providing more drawing power than any other type of clamping system. The Duraband with Built-In Strap is standard on many designs.

Consult Tempco for multiple segment heaters.



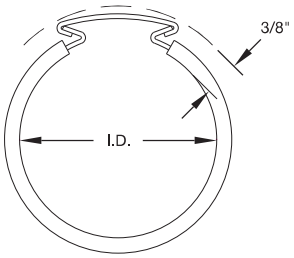
Type NB Shown

Type NB—One-Piece Band
Min. ID: 2" (50.8 mm)
Min. Width: 1-1/4" (31.8 mm)

Type NS—Two-Piece Band
Min. ID: 3" (76.2 mm)
Min. Width: 1-1/4" (31.8 mm)

Type NE—One-Piece Expandable Band
Min. ID: 2-1/2" (63.5 mm)
Min. Width: 1-1/4" (31.8 mm)

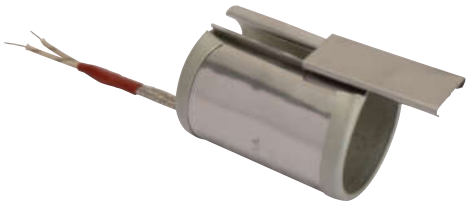
Duraband® Construction/Clamping Variations



Wedge Lock

Wedge Lock clamping is designed for applications where mounting space is severely limited. It lends itself mainly to small diameter nozzle heaters.

Type TWL—One-Piece Band
Min. ID: 1" (25.4 mm)
Min. Width: 1" (25.4 mm)
Max. Width: 3-1/2" (88.9 mm)



Separate Straps

The Separate Strap clamping is available with any screw or lead termination and construction variation. It is strongly recommended that the Duraband with Built-In Strap design be used whenever possible because it provides more drawing power than any other type of clamping system.

Consult Tempco for multiple segment heaters.

Type SB Shown

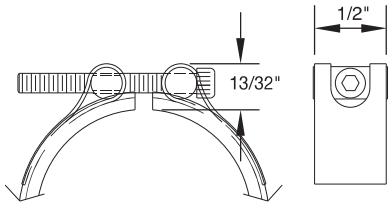
Type SB—One-Piece Band
Min. ID: 7/8" (22.2 mm)
Min. Width: 3/4" (19.1 mm)

Type SS—Two-Piece Band
Min. ID: 2" (50.8 mm)
Min. Width: 3/4" (19.1 mm)

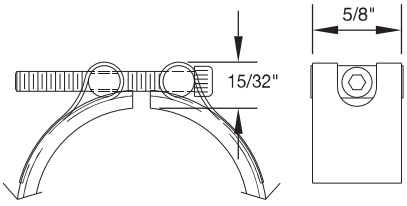
Type SE—One-Piece Expandable Band
Min. ID: 2-1/2" (63.5 mm)
Min. Width: 1-1/4" (31.8 mm)

Clearance Dimensions for Separate Strap Clamping

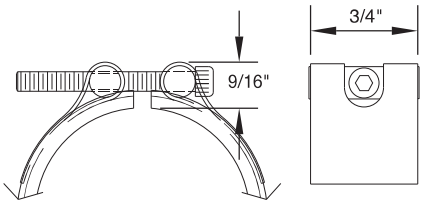
Separate strap clearance dimensions are dependent on heater ID. The strap dimensions are shown below.



< 2" ID — 6-32 Screw

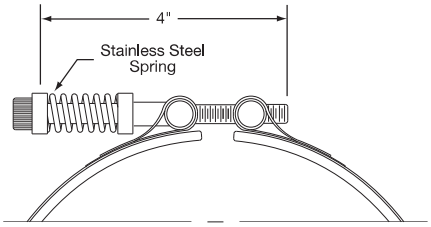


2 to 3-1/2" ID — 8-32 Screw



> 3-1/2" ID — 1/4-20 Screw

Spring Loaded with Built-In Bracket



The Heavy Duty Stainless Steel Spring with Built-In Bracket is a variation on the basic Duraband design. It is available with any screw or lead termination and construction variation. It is recommended for heaters over 12" in diameter, and for any diameter heater used in the vertical position, to prevent the heater from slipping off the machine. The springs provide constant tension, therefore maintaining optimum surface contact against the cylinder being heated.

Consult Tempco for multiple segment heaters.

Type SL—One-Piece Band
Min. ID: 4" (101.6 mm)
Min. Width: 1-1/4" (31.8 mm)

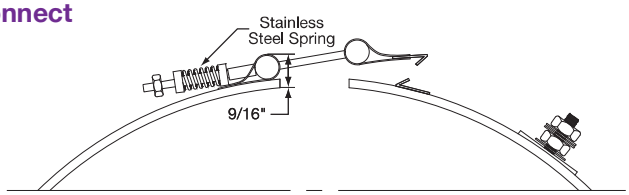
Type NSL—Two-Piece Band
Min. ID: 4" (101.6 mm)
Min. Width: 1-1/4" (31.8 mm)

Type NEL—One-Piece Expandable Band
Min. ID: 4" (101.6 mm)
Min. Width: 1-1/4" (31.8 mm)

Made in USA

Duraband® Construction/Clamping Variations

Spring Loaded Quick Disconnect



This construction style is a hybrid between the Spring Loaded Clamp with Built-In Bracket and the Latch and Trunnion style clamping. Utilizing a built in bracket and heavy duty flanges, this clamping style is durable and easy to work with in the field. The spring provides relief for thermal expansion and provides strong clamping for the band. This clamping style is available with either lead or screw terminal type terminations.

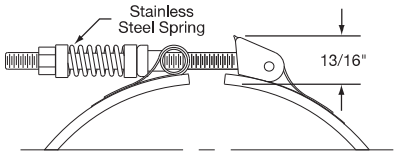
Consult Tempco for multiple segment heaters.

Type SLQD
One-Piece Band
Min. ID: 3.5" (88.9 mm)
Min. Width: 1.25" (31.75 mm)

Type NSLQD
Two-Piece Band
Min. ID: 4" (101.6 mm)
Min. Width: 1.25" (31.75 mm)

Type NELQD
One-Piece Expandable Band
Min. ID: 3.5" (88.9 mm)
Min. Width: 1.25" (31.75 mm)

Latch and Trunnion



The Latch and Trunnion Clamping System is available with any screw or lead termination and construction variation. It is ideal in absorbing thermal expansion due to the spring loading on the screws. The latch fully opens, facilitating installation on large diameter cylinders. The outer sheath is made from a Low Thermal Expansion alloy.

Consult Tempco for multiple segment heaters.

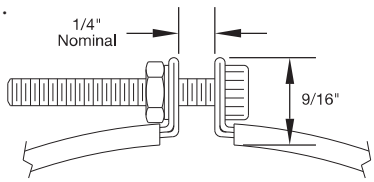
Type LT—One-Piece Band
Min. ID: 7" (177.8 mm)
Min. Width: 1-1/2" (38.1 mm)

Type LS—Two-Piece Band
Min. ID: 7" (177.8 mm)
Min. Width: 1-1/2" (38.1 mm)

Type LE—One-Piece Expandable Band
Min. ID: 7" (177.8 mm)
Min. Width: 1-1/2" (38.1 mm)

Bent-Up Flange (Ears)

The Bent-Up Flange clamping is available with any screw or lead termination and construction variation. The outer sheath is made from a Low Thermal Expansion alloy. The Bent-Up Flange design is best suited for narrow band heaters with small diameters.



Note: The Bent-Up flange design should only be used when other clamping methods are not suitable for a specific application. Tempco recommends Built-In Strap Clamping be used whenever possible, especially on large diameter heaters, because it provides superior clamping power.

Type FB—One-Piece Band
Min. ID: 1" (25.4 mm)
Min. Width: 3/4" (19.1 mm)

Type FS—Two-Piece Band
Min. ID: 2" (50.8 mm)
Min. Width: 3/4" (19.1 mm)

Type FE—One-Piece Expandable Band
Min. ID: 2-1/2" (63.5 mm)
Min. Width: 1-1/4" (31.8 mm)

Duraband® Internal Reverse Bands

Type RN□—Internal Reverse Band (with bracket clamping)

This construction style is used to heat cylindrical surfaces from the inside on heaters 5-1/2" diameter and larger.

Type RNB—Reverse 1-Piece Construction

ID: 5-1/2" (139.7 mm) to 10" (254.0 mm)
Width: 1" (25.4 mm) to 3-1/2" (88.9 mm)
Maximum Voltage: 240VAC

Type RNS—Reverse 2-Piece Construction

ID: 10" (254.0 mm) to 20" (508.0 mm)
Width: 1" (25.4 mm) to 3-1/2" (88.9 mm)
Maximum Voltage: 240VAC

For IDs greater than 20", consult Tempco with your requirements.

Type RTWL—Internal Reverse Band (with wedge lock clamping)

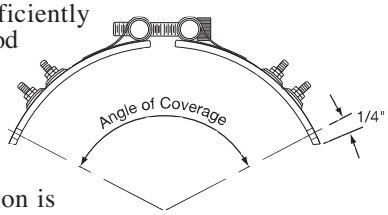
This construction style is used to heat cylindrical surfaces from the inside on heaters less than 5" outside diameter.

ID: Less than 5-1/2" (139.7 mm)
Width: 1" to 3-1/2" (25.4 - 88.9 mm)

Duraband Partial Coverage

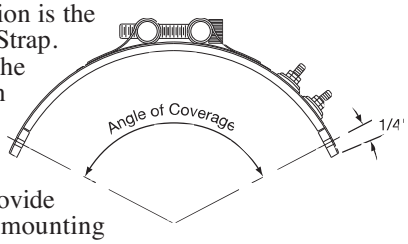
Type NS — 2-Piece With Built-In Brackets

Partial coverage band heaters are normally required when holes and cutouts will not allow the heater to sufficiently clear the machine obstructions. The preferred method of construction is the Two-Piece Band Heater with Built-In Brackets as illustrated. The heater is screwed down to the cylinder at the ends and the built-in Low Thermal Expansion Strap pulls the heater tightly against the cylinder being heated. The standard center of hole to edge of heater dimension is 1/4". When ordering, please provide the angle of coverage from center to center of the mounting screw holes as shown.



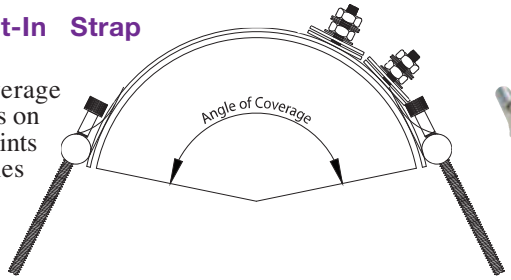
Type PS — One-Piece with Two-Piece Separate Strap with Padded Ends

The alternate method of partial coverage construction is the One-Piece Band Heater with a separate Two-Piece Strap. The two-piece strap itself is screwed down at the padded ends, allowing the heater to float between the pads as illustrated. When the strap is tightened, it will pull the heater against the cylinder being heated. The standard center of hole to edge of heater dimension is 1/4". When ordering, please provide the angle of coverage from center to center of the mounting screw holes as shown.



Type NB — One-Piece with Built-In Strap Clamping

Another alternate method of partial coverage construction. The one piece with clamp screws on both sides allows it to be secured to anchor points on either side of a barrel without drilling holes into the barrel.



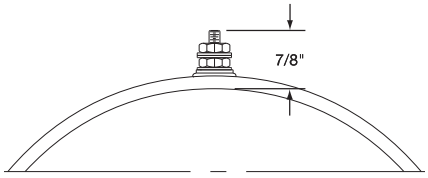
Terminations

Stainless Steel Power Terminals: Type T1, Type T2 & Type T3

Available on any clamping or construction variation, the specially designed Stainless Steel Power Terminals are internally connected to the heater and are resistant to over-torquing. The screw terminals are virtually unbreakable. Secure tightening of the electrical connections is essential for safety and long heater life.

Duraband® Type T1 – Screw Terminals

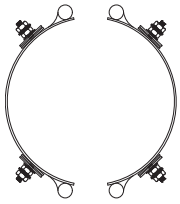
Considered standard on most band heaters unless otherwise specified.



One-Piece Band

Standard **Termination Location:**
each side of gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 7/8" (22.2 mm)
- **Post Terminals:** 10-32 standard except 8-32 on < 1" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32)



Two-Piece Band

Standard **Termination Location:**
next to gaps on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 7/8" (22.2 mm)
- **Post Terminals:** 10-32 standard except 8-32 on < 1" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half

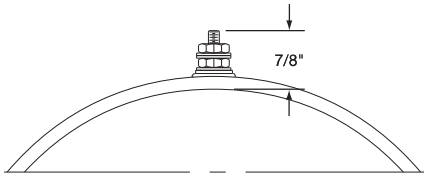
One-Piece Expandable Band

Standard **Termination Location:**
each side of gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Post Terminals:** 10-32 standard except 8-32 on heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32)

Duraband Type T2 – Screw Terminals

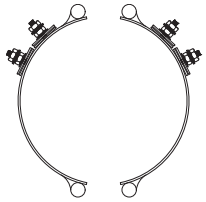
Recommended for narrow band heaters where screw terminals are preferred or the C2 terminal box protection is required.



One-Piece Band

Standard **Termination Location:**
next to gap; center of width

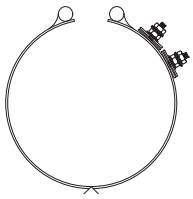
- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 7/8" (22.2 mm)
- **Post Terminals:** 10-32 standard except 8-32 on < 1" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32)



Two-Piece Band

Standard **Termination Location:**
next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 7/8" (22.2 mm)
- **Post Terminals:** 10-32 standard except 8-32 on < 1" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32) each half



One-Piece Expandable Band

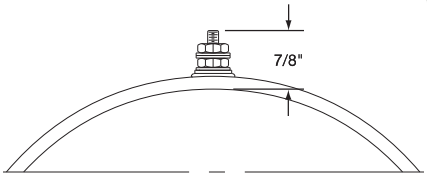
Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Post Terminals:** 10-32 standard except 8-32 on heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/ 25A (10-32) or 20A (8-32)

View Product Inventory @ www.tempco.com

Duraband® Type T3 – Screw Terminals

The preferred design on band heaters over 3" (76.2 mm) wide or when C3 terminal box is required.

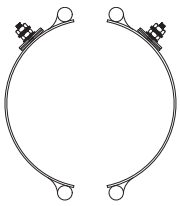


One-Piece Band

***Standard* Termination Location:**
next to gap; across center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Post Terminals:** 10-32 standard except 8-32 on 2" to 2-1/2" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/25A (10-32) or 20A (8-32)

Two-Piece Band



***Standard* Termination Location:**
next to same gap on each half; across center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Post Terminals:** 10-32 standard except 8-32 on 2" to 2-1/2" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/25A (10-32) or 20A (8-32) each half

One-Piece Expandable Band

***Standard* Termination Location:**
next to gap; across center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Post Terminals:** 10-32 standard except 8-32 on 2" to 2-1/2" wide heaters & heaters with ID < 3"
- **Max. Volts/Amps:** 480VAC/25A (10-32) or 20A (8-32)

Selection TERMINATION Guide

Optional Igloo™ Ceramic Covers for Heaters with Screw Terminals

Igloo™ Ceramic Terminal Covers consist of two individual ceramic parts. Unlike conventional ceramic caps, Igloo fully insulates any standard #8 or #10 terminal lugs used for electrical hook-ups.

Limitations

To assemble Igloo covers, terminals should be at least 7/8" apart.

Min. ID: 2" (50.8 mm) **Min. Width:** 1-1/4" (31.7 mm)

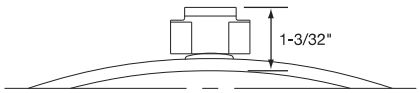
Three types of Igloo™ bases are available:

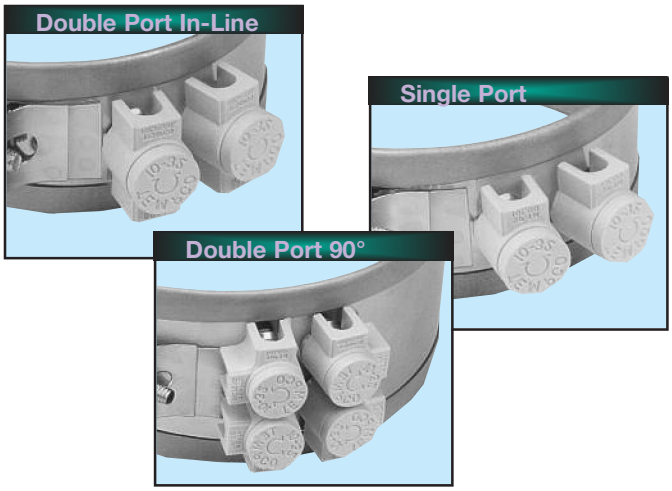
Type C6 – Double Port In-Line P/N CER-101-104
Type C7 – Double Port 90° P/N CER-101-106
Type C8 – Single Port P/N CER-101-107

Igloo™ caps are available in the following three screw terminal sizes:

10-32 – P/N CER-102-101
10-24 – P/N CER-102-104
8-32 – P/N CER-102-105

When ordering, specify the type of Igloo and the screw terminal size.





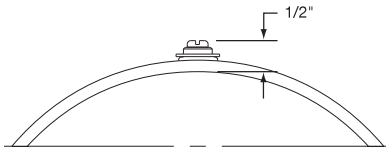
Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Made in USA

Low-Profile Button Terminals: Type B1, Type B2 & Type B3

Available on any clamping or construction variation, the specially designed Stainless Steel Button Terminals are internally connected to the heater and are resistant to over-torquing while offering a low profile for tight spaces. They are virtually unbreakable. Secure tightening of the electrical connections is essential for safety and long heater life.

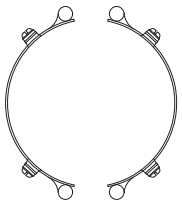
Duraband® Type B1 – Button Terminals



One-Piece Band

***Standard* Termination Location:**
each side of gap; center of width

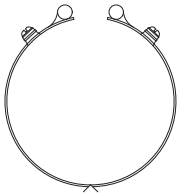
- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 25A (10-32) or 20A (6-32)



Two-Piece Band

***Standard* Termination Location:**
next to gaps on each half;
center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (6-32) each half

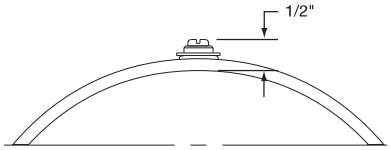


One-Piece Expandable Band

***Standard* Termination Location:**
each side of gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (6-32)

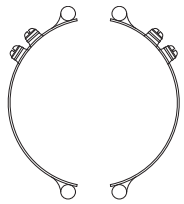
Duraband Type B2 – Button Terminals



One-Piece Band

***Standard* Termination Location:**
next to gap; center of width

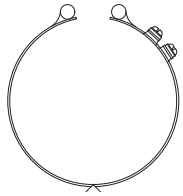
- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 25A (10-32) or 20A (6-32)



Two-Piece Band

***Standard* Termination Location:**
next to same gap on each half;
center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (6-32) each half

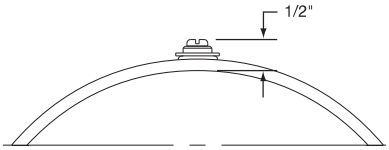


One-Piece Expandable Band

***Standard* Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (6-32)

Duraband® Type B3 – Button Terminals

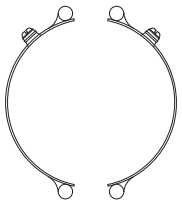


One-Piece Band

Standard **Termination Location:**
next to gap; across center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2-3/8" (60.3 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 25A (10-32) or 20A (6-32)

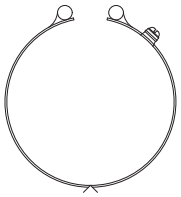
Two-Piece Band



Standard **Termination Location:**
next to same gap on each half;
across center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2-3/8" (60.3 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (6-32) each half

One-Piece Expandable Band



Standard **Termination Location:**
next to gap; across center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 2-3/8" (60.3 mm)
- **Screw Size:** 10-32 standard except 6-32 on IDs < 5"
- **Maximum Volts/Amps:** 480VAC/ 25A (10-32) or 20A (6-32)

Selection TERMINATION Guide

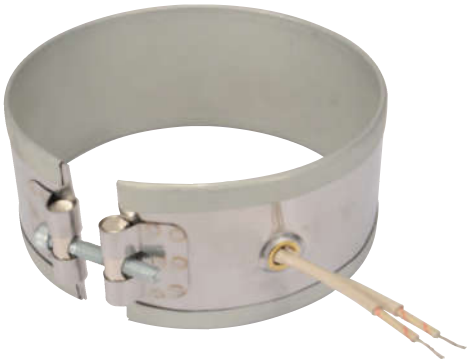
Plain Lead Wire Terminations: Type L1, Type L2 & Type L4

Available on any clamping or construction variation.

Duraband Type L1 – Straight Lead Wires

The lead wires exit through a brass eyelet. The standard flexible leads are 10" long with 3" of fiberglass sleeving.

If longer leads are required, specify when ordering.

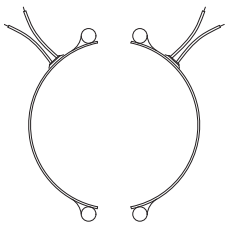


One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

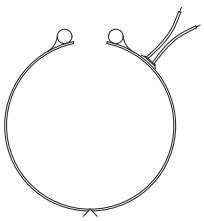
Two-Piece Band



Standard **Termination Location:**
next to same gap on each half;
center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480V each half
- **Maximum Amps:** 12.5A each half

One-Piece Expandable Band



Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480V
- **Maximum Amps:** 12.5A

CONTINUED

Duraband® Type L2 – Lead Wires

Continued from previous page…

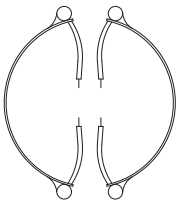
L2 is the preferred termination on all small diameter and small width band heaters. The standard flexible leads are 10" long with 3" of fiberglass sleeving.

If longer leads are required, specify when ordering.

One-Piece Band

Standard **Termination Location:**
each side of gap; edge of width

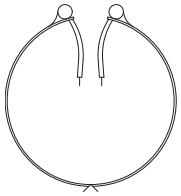
- **Minimum Inside Diameter:** 7/8" (22.2 mm)
- **Minimum Width:** 3/4" (19.1 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:**
each side of each gap;
edge of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 3/4" (19.1 mm)
- **Maximum Volts:** 480V each half
- **Maximum Amps:** 12.5A each half



One-Piece Expandable Band

Standard **Termination Location:**
each side of gap;
edge of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480V
- **Maximum Amps:** 12.5A

Duraband Type L4 – Lead Wires

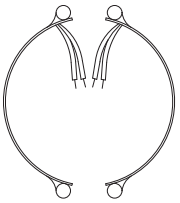
L4 is a suitable lead termination for small band heaters. The standard flexible leads are 10" long with 3" of fiberglass sleeving.

If longer leads are required, specify when ordering.

One-Piece Band

Standard **Termination Location:**
same side of gap; edge of width

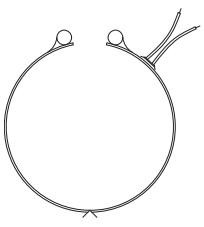
- **Minimum Inside Diameter:** 7/8" (22.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:**
each side of same gap;
center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480V each half
- **Maximum Amps:** 12.5A each half



One-Piece Expandable Band

Standard **Termination Location:**
same side of gap; edge of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

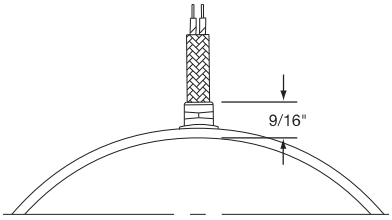
Abrasion Resistant Lead Terminations:
Type W1, Type W2, Type W2M, Type W3, Type W4 & Type W5M

Available on any clamping or construction variation.
Wire braid leads offer sharp bending not possible with armor cable.

Duraband® Type W1 & W1T – Straight Wire Braid Leads

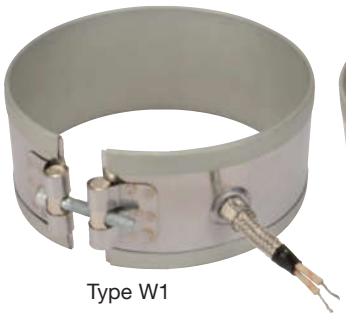
Type W1 — Braided lead wire crimped in place for heaters under 2-1/2" I.D. and/or under 1-1/4" width.

Type W1T — Braided lead wire attached with a threaded fitting for heaters over/equal 2-1/2" I.D. and over/equal 1-1/4" width.



The standard leads are 10" of wire braid over 12" of flexible leads.

If longer leads are required, specify when ordering.

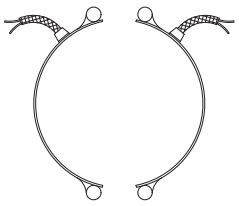

Type W1


Type W1T

One-Piece Band

Standard **Termination Location:** next to gap; center of width

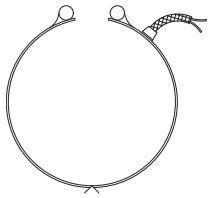
- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:** next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

Duraband Type W2 – Wire Braid Leads

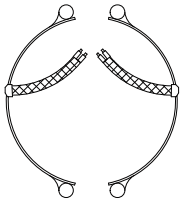
The W2 wire braid exits at the middle of the segment on 1 and 2 piece designs and offset 1" from the middle of the segmet for expandable designs. Sleeving is used for additional protection. The standard leads are 10" of wire braid over 12" of flexible leads with 3" of fiberglass sleeving.

If longer leads are required, specify when ordering.

One-Piece Band

Standard **Termination Location:** opposite the gap; edge of width

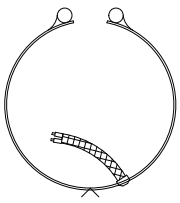
- **Minimum Inside Diameter:** 7/8" (22.2 mm)
- **Minimum Width:** 1-1/8" (28.6 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:** center of each half; edge of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/8" (28.6 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** opposite the gap offset 1"; edge of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/8" (28.6 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

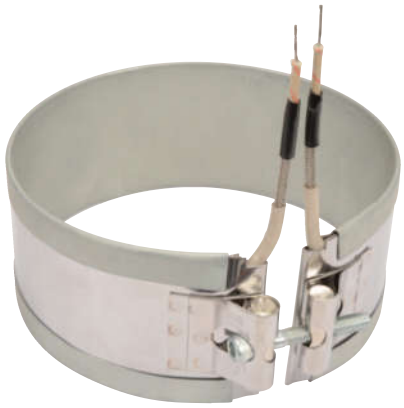
CONTINUED

Duraband® Type W3 – Single Wire Braid Leads

Continued from previous page…

Highly recommended for nozzle heating applications. The standard leads are 10" of wire braid over 12" of flexible leads with 3" of fiberglass sleeving.

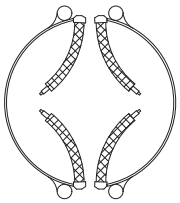
If longer leads are required, specify when ordering.



One-Piece Band

Standard **Termination Location:**
each side of gap; edge of width

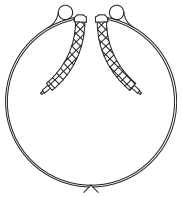
- **Minimum Inside Diameter:** 3/4" (19.1 mm)
- **Minimum Width:** 7/8" (22.2 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:**
each side of each gap; edge of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 3/4" (19.1 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5A each half



One-Piece Expandable Band

Standard **Termination Location:**
each side of gap; edge of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

Duraband Type W4 – Wire Braid Leads On One Side

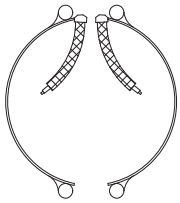
A suitable termination for nozzle heating applications. The standard leads are 10" of wire braid over 12" of flexible leads.

If longer leads are required, specify when ordering.

One-Piece Band

Standard **Termination Location:**
next to gap; edge of width

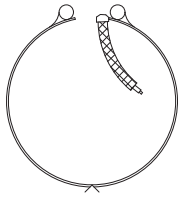
- **Minimum Inside Diameter:** 7/8" (22.2 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:**
next to same gap on each half; edge of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5A each half



One-Piece Expandable Band

Standard **Termination Location:**
next to gap; edge of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

Duraband® Type W2M – Right-Angle Wire Braid Leads, 90° to Heater

Stainless Steel Wire Braid exits perpendicular to the heater centerline through a low profile stainless steel cap. This cap acts as a strain relief which protects against excessive flexing or pulling of the lead wire. The standard leads are 10" of wire braid over 12" of flexible leads.

If longer leads are required, specify when ordering.

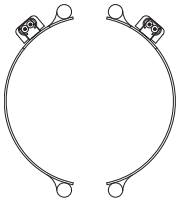
Note: Stainless steel construction may be required for widths of 7/8" (22.2 mm) to 1-5/8" (41.3 mm).

One-Piece Band

Standard **Termination Location:** opposite of gap; center of width

- **Minimum Inside Diameter:** 1-1/2" (38.1 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

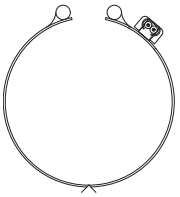
Two-Piece Band



Standard **Termination Location:** next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5A each half

One-Piece Expandable Band



Standard **Termination Location:** next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

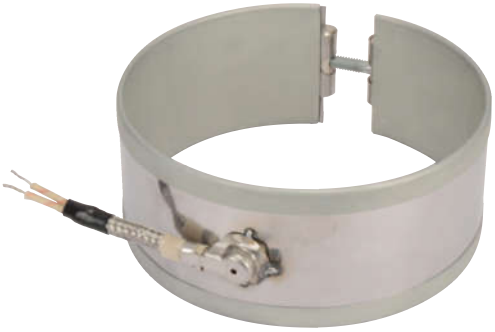
Duraband Type W5M – Right-Angle Wire Braid Leads, Parallel to Heater

Selection TERMINATION Guide

Stainless Steel Wire Braid exits parallel to the heater centerline through a low profile stainless steel cap. This cap acts as a strain relief which protects against excessive flexing or pulling of the lead wire. The standard leads are 10" of wire braid over 12" of flexible leads.

If longer leads are required, specify when ordering.

Note: Stainless steel construction may be required for widths of 7/8" (22.2 mm) to 1-5/8" (41.3 mm).

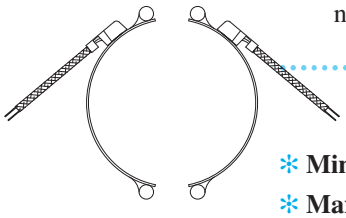


One-Piece Band

Standard **Termination Location:** opposite of gap; center of width

- **Minimum Inside Diameter:** 1-1/2" (38.1 mm))
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

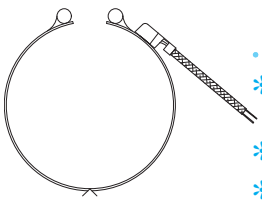
Two-Piece Band



Standard **Termination Location:** next to same gap on each side; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC each half
- **Maximum Amps:** 12.5A each half

One-Piece Expandable Band



Standard **Termination Location:** next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A

Made in USA

Armor Cable Terminations: Type R1, Type R2 & Type R3

Available on any clamping or construction variation. Armor cable provides far superior protection to lead wires where abrasion is a constant problem. The standard leads are 10" of armor cable over 12" of flexible leads.

If longer leads are required, specify when ordering.

Duraband® Type R1 – Straight Armor Cable

Type R1A — Galvanized armor cable crimped in place for heaters under 2-1/2" I.D. and/or under 1-1/4" width.

Type R1AT — Galvanized armor cable attached with a threaded fitting for heaters over/equal 2-1/2" I.D. and over/equal 1-1/4" width.

Type R1B — Stainless Steel armor cable crimped in place for heaters under 2-1/2" I.D. and/or under 1-1/4" width.

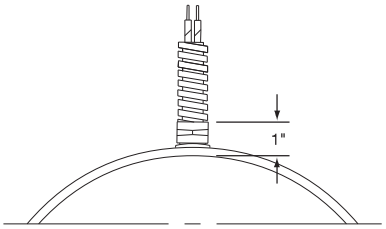
Type R1BT — Stainless Steel armor cable attached with a threaded fitting for heaters over/equal 2-1/2" I.D. and over/equal 1-1/4" width.

Type R1C – Galvanized armor cable, tack welded

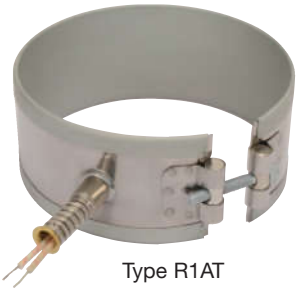
Type R1D – SS armor cable, tack welded

Type R1E – Galvanized armor cable, full silver brazing

Type R1F – SS armor cable, full silver brazing



Type R1A

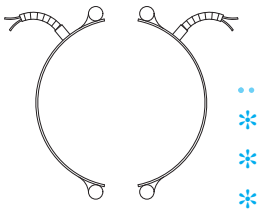


Type R1AT

One-Piece Band

Standard **Termination Location:** next to gap; center of width

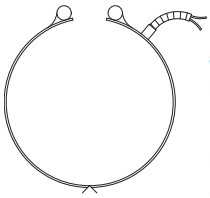
- **Minimum Inside Diameter:** 1-1/2" (38.1 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:** next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** next to gap; center of width

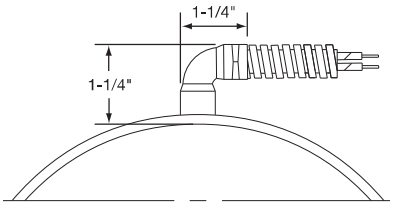
- **Minimum Inside Diameter:** 2-1/2" (65.3 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

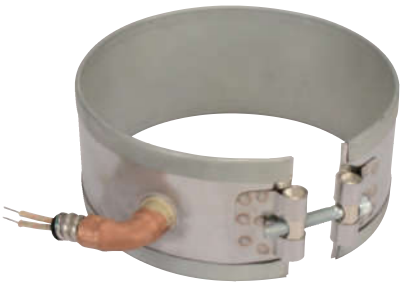
Duraband Type R2 – Right-Angle Armor Cable

Type R2A – Galvanized armor cable, crimped

Type R2B – SS armor cable, crimped

Type R2C – Plain leads, no cable

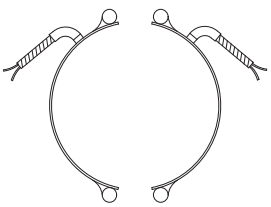




One-Piece Band

Standard **Termination Location:** next to gap; center of width

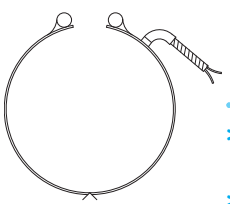
- **Minimum Inside Diameter:** 1-1/2" (38.1 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:** next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

View Product Inventory @ www.tempco.com

Duraband® Type R3 – Removable Armor Cable

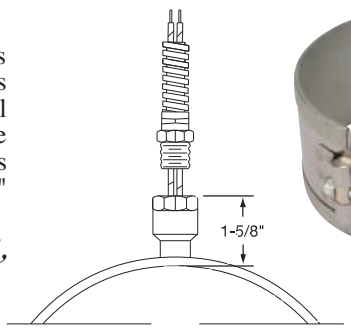
Type R3A – Plain Leads & Female Fitting

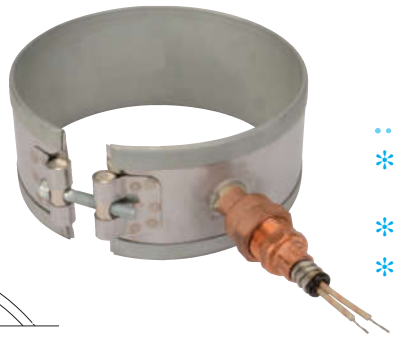
Type R3B – Leads, Male Adapter & Galvanized Armor

Type R3C – Leads, Male Adapter & SS Armor

Recommended on applications where removable armor is required. The fitting will accept the standard armor cable connector. The standard leads are 10" of armor cable over 12" of flexible leads.

If longer leads are required, specify when ordering.

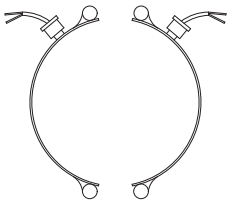




One-Piece Band

Standard **Termination Location:** next to gap; center of width

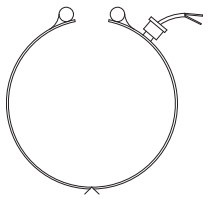
- **Minimum Inside Diameter:** 1-1/2" (38.1 mm)
- **Minimum Width:** 1-1/4" (31.7 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A



Two-Piece Band

Standard **Termination Location:** next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/4" (31.7 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Duraband Type S1 – Lead Wire Spring Strain Relief

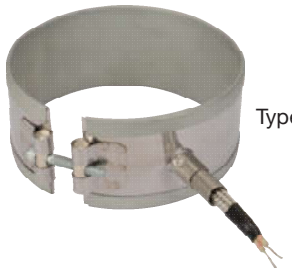
A strain relief spring is attached to the heater at the termination exit to reduce strain on leads subjected to excessive flexing. The spring is 2-1/8" long. The flexible standard leads are 10" long with 3" of fiberglass sleeving. ***If longer leads are required, specify when ordering.***

Type S1A – Plain Leads and Strain Relief Spring crimped in place for heaters under 2-1/2" I.D. and/or under 1-1/4" width.

Type S1AT – Plain Leads and Strain Relief Spring attached with a threaded fitting for heaters over/equal 2-1/2" I.D. and over/equal 1-1/4" width.

Type S1B – Stainless Steel Wire Braided Leads and Strain Relief Spring crimped in place for heaters under 2-1/2" I.D. and/or under 1-1/4" width 10" of braid over 12" of flexible leads is standard.

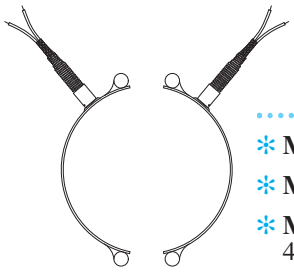
Type S1BT – Stainless Steel Wire Braided Leads and Strain Relief Spring attached with a threaded fitting for heaters over/equal 2-1/2" I.D. and over/equal 1-1/4" width. 10" of braid over 12" of flexible leads is standard.



One-Piece Band

Standard **Termination Location:** next to gap; center of width

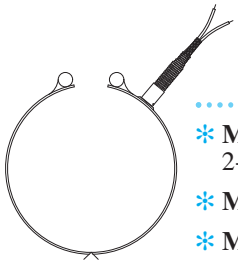
- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/4" (31.8 mm)
- **Maximum Volts:** 480VAC
- **Maximum Amps:** 12.5A



Two-Piece Band

Standard **Termination Location:** next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/4" (31.75 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half



One-Piece Expandable Band

Standard **Termination Location:** next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/4" (31.75 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Made in USA

General Purpose Terminal Boxes: Type C2 and Type C5

Available with any construction or clamping variation. They are a simple & economical way to protect employees from electric shock or prevent electric shorts that can result from exposed wiring on band heater electrical installations.

The Heavy Duty Terminal Boxes have 1/2" knockouts that will accept standard armor cable connectors. They can be field assembled on band heaters that have a center distance between terminal screws of 7/8". Boxes can be pre-wired with galvanized armor, stainless steel armor, wire braid or plain leads. If a Low Profile Box with cable or leads is required, it is strongly recommended to order it pre-wired by the factory.

The standard leads are 10" of cable or wire braid over 12" of flexible leads. ***If longer leads are required, specify when ordering.***

Duraband® Type C2 – Standard Terminal Boxes

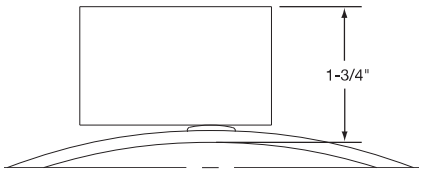
One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1" (25.4 mm)Heater widths between 1" and 2-1/2" require a minimum ID of 5-1/2" or greater.
- **Maximum Volts/Amps:** 480VAC/25A

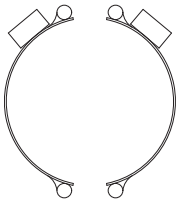
Type C2□—Standard Box

C2A – Box only
C2B – w/galvanized armor
C2C – w/stainless steel armor
C2D – w/wire braid



Two-Piece Band

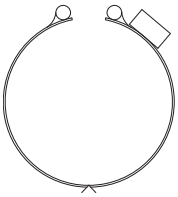
Standard **Termination Location:**
next to same gap on each half; center of width



- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
  Heater widths between 1" and 2-1/2" require a minimum ID of 5-1/2" or greater.
- **Max. Volts/Amps:** 480VAC/25A each half

One-Piece Expandable Band

Standard **Termination Location:**
next to gap; center of width



- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1" (25.4 mm)
  Heater widths between 1" and 2-1/2" require a minimum ID of 5-1/2" or greater.
- **Maximum Volts/Amps:** 480VAC/25A

Duraband Type C5 – Low Profile Terminal Boxes

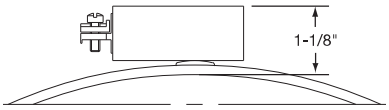
One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1" (25.4 mm)
  Heater widths between 1" and 2-1/2" require a minimum ID of 5-1/2" or greater.
- **Maximum Volts/Amps:** 480VAC/25A

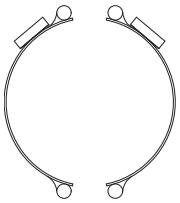
Type C5□—Low Profile Box

C5A – box only
C5B – w/galvanized armor
C5C – w/SS armor
C5D – w/wire braid
C5J – w/plain leads



Two-Piece Band

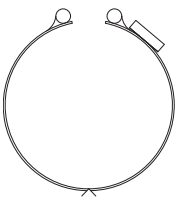
Standard **Termination Location:**
next to same gap on each half; center of width



- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1" (25.4 mm)
  Heater widths between 1" and 2-1/2" require a minimum ID of 5-1/2" or greater.
- **Max. Volts/Amps:** 480VAC/25A each half

One-Piece Expandable Band

Standard **Termination Location:**
next to gap; center of width



- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1" (25.4 mm)
  Heater widths between 1" and 2-1/2" require a minimum ID of 5-1/2" or greater
- **Maximum Volts/Amps:** 480VAC/25A

View Product Inventory @ www.tempco.com

Quick Disconnect Plugs: Type P1, Type P2, Type P3 and Type P4

Available on any construction or clamping variation. These plug assemblies are highly recommended & should be used whenever possible. The combination of plug & cup assembly along with armor cable covered leads eliminates all live exposed terminals or wiring that can be a potential hazard to employees or machinery.

Type P1 and P3 assemblies are available with a straight or right-angle plug. Type P2 and P4 plug assemblies have a lower profile and are available with a straight plug only.

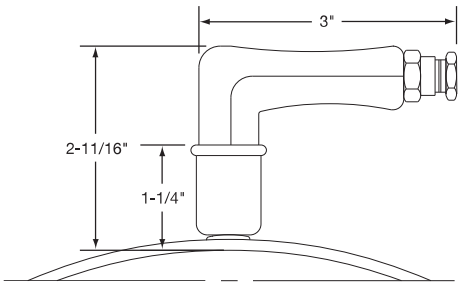
To simplify installation, band heaters with these assemblies can be supplied pre-wired, using high temperature lead wires.

The standard leads are 10" of armor cable over 12" of flexible leads. ***If longer leads are required, specify when ordering.***

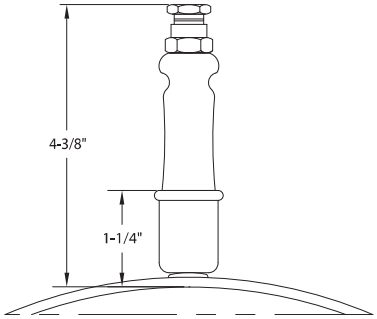
Duraband® Type P1 – Quick Disconnect Plugs

Type P1 ☐

P1K – Cup assembly only
P1L – w/straight plug only
P1M – w/90° plug only
P1N – w/str. plug & galvanized cable
P1O – w/str. plug & SS cable
P1P – w/str. plug & wire braid
P1Q – w/90° plug & galvanized cable
P1R – w/90° plug & SS cable
P1S – w/90° plug & wire braid



Type P1M



Type P1L

Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)

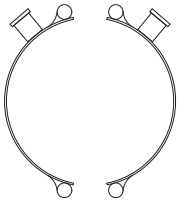
Type P1Q shown

One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
  If width is between 1-1/2" and 2", minimum diameter is 5-1/2".
  If width is greater than 2", minimum diameter is 2".

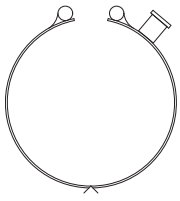
Selection TERMINATION Guide



Two-Piece Band

Standard **Termination Location:**
next to same gap on each half; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1)
  If width is between 1-1/2" and 2", minimum diameter is 5-1/2".
  If width is greater than 2", minimum diameter is 2".



One-Piece Expandable Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
  If width is between 1-1/2" and 2", minimum diameter is 5-1/2".
  If width is greater than 2", minimum diameter is 2".

CONTINUED

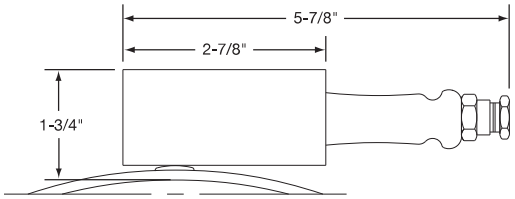
Made in USA

Duraband® Type P2 – Quick Disconnect Plugs

Continued from previous page…

Type P2□—Low Profile Assembly

P2F – Low profile assembly only
P2G – w/straight plug only
P2H – w/str. plug and galvanized cable
P2J – w/str. plug and SS cable
P2K – w/str. plug and wire braid



Type P2G Shown

Type P2H shown

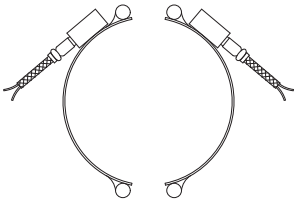
One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

Plug Electrical Ratings

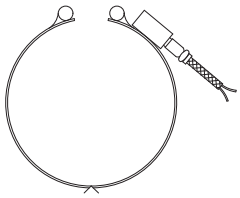
- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)



Two-Piece Band

Standard **Termination Location:**
next to same gap on each half;
center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)



One-Piece Expandable Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

Duraband Type P3 – DIN 49458 A/B Quick Disconnect Plugs

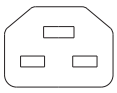
One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)

Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)

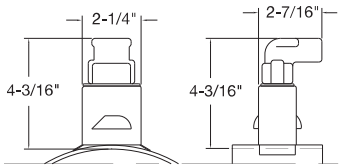


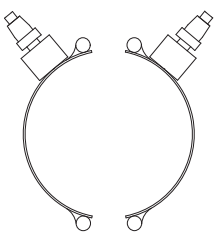
Standard Pin Orientation

Type P3C Shown

Type P3□—Vertical Box Assembly

P3A – Box assembly only
P3B – Box assembly w/straight plug
P3C – Box assembly w/right-angle plug only

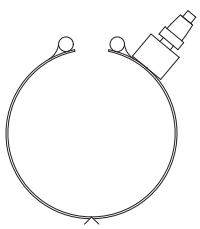




Two-Piece Band

Standard **Termination Location:**
next to same gap on each half;
center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)



One-Piece Expandable Band

Standard **Termination Location:**
next to gap; center of width

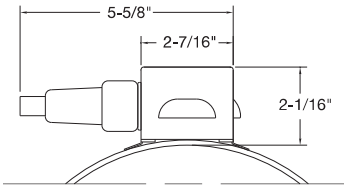
- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)

View Product Inventory @ www.tempco.com

Duraband® Type P4 – DIN 49458 A/B Quick Disconnect Plugs

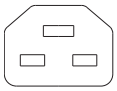
Type P4□—Horizontal Box Assembly

P4A – Box assembly only
P4B – Box assembly with straight plug



Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)



Standard Pin Orientation

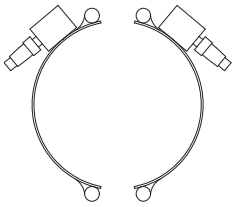
Type P4C shown

One-Piece Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

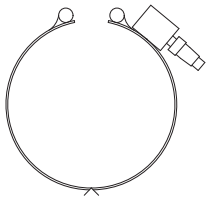
Selection TERMINATION Guide



Two-Piece Band

Standard **Termination Location:**
next to same gap on each half;
center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

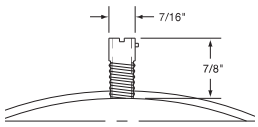


One-Piece Expandable Band

Standard **Termination Location:**
next to gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

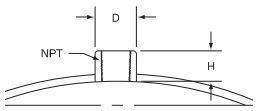
Special Duraband® Construction Options



Thermocouple Bayonet Adapter

A standard Bayonet Adapter facilitates the installation of an external thermocouple with a standard bayonet cap. The standard location for the adapter is 90° from the gap. Specify without through hole for heater sensing or with through hole for load sensing. For heaters less than 1" wide order separate strap clamping and utilize the gap for the thermocouple.

Refer to pages 14-3 and 14-4 for a complete selection of thermocouples available from stock.



Thermocouple Coupling

The Thermocouple Coupling facilitates the installation of an external thermocouple with a threaded fitting to sense the temperature of the band. The standard location for the coupling is 90° from the gap. Specify without through hole for heater sensing or with through hole for load sensing.

Available Bushing Sizes:

Thread	D	H
1/8-27 NPT	9/16"	5/8"
1/4-18 NPT	3/4"	11/16"
3/8-18 NPT	7/8"	5/8"
M12–1.75 mm	3/4"	1/2"

Holes and Cutouts

Holes and cutouts are normally required in band heaters for clearance for thermocouple probes or holding bolts. An oversize gap can in many cases serve the same purpose, saving the expense of the hole.

Using the center of the gap as a starting point, specify the location of the center-point of the hole or cutout in terms of degrees and the distance from the edge of the heater. In addition, state the size of the hole or cutout.

For critical hole and cutout locations, a detailed drawing will be required.

Note: A minimum of 1/2" is required from the hole to the edge of the heater.

Hinged Two-Piece Band

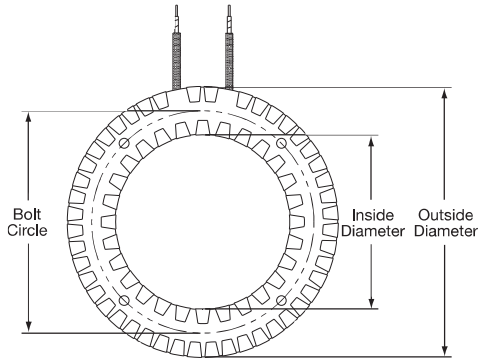
The Hinged Two-Piece Band Heater is connected with a continuous hinge for easy installation and removal. This heater can be opened and closed as often as is necessary. The preferred method of clamping is latch and trunnion. It is available with any screw or lead variation. When ordering, specify watts and volts each half.

Minimum Width: 1-3/8" (34.9 mm)

Special Mica Insulated Heater Construction Variations

Ring Heaters

When ordering Ring Heaters, specify inside and outside diameters. If mounting holes are required, specify location and hole size. For critical hole and cutout locations, a detailed drawing will be required.

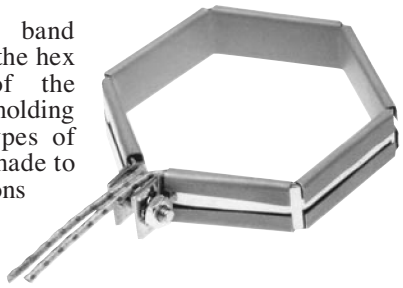


Special Mica Insulated Heater Construction Variations (continued)

Square, Rectangular, or Hexagon Bands

Square or Rectangular band heaters are normally used for heating dies on plastic extruders, or the barrels of twin screw extruders. They can be made in either one- or two-piece construction but two-piece construction with **Style 1** Clamping (***see below***) is recommended.

Hexagon shaped band heaters are used on the hex shaped portion of the nozzle on injection molding machines. These types of heaters are strictly made to customer specifications with bent-up flange clamping only.

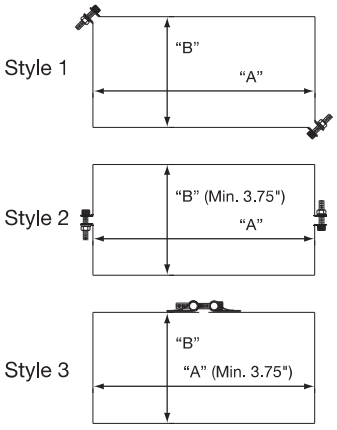


Clamping Styles – Three clamping styles are used on square and rectangular band heaters:

Style 1 for 2-piece heaters: bent-up flange clamping at the corners provides the most uniform clamping force and should be used whenever possible.
Maximum Recommended Watt Density: 25 w/in²

Style 2 for 2-piece heaters: bent-up flange clamping or built-in strap brackets at the sides requires a minimum "B" dimension of 3.75" (95.3 mm).
Maximum Recommended Watt Density: 20 w/in²

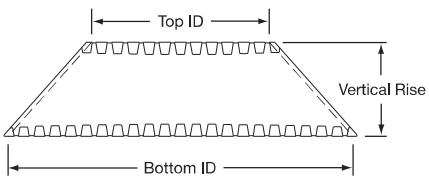
Style 3 for 1-piece heaters: bent-up flange clamping or built-in strap brackets at the sides requires a minimum "A" dimension of 3.75" (95.3 mm).
Maximum Recommended Watt Density: 25 w/in²



Ordering Information

- ❒ Square, Rectangular or Hex
- ❒ Select Clamping Style 1, 2 or 3
- ❒ Specify inside dimensions – Square or Rectangular:"A" and "B"
  Hexagon: Specify internal dimension across flats
- ❒ Width: Minimum 3/4" (19.1 mm)
- ❒ Wattage: per half on two-piece heaters
- ❒ Voltage: per half on two-piece heaters
- ❒ Termination (see pages 1-32 through 1-45)
- ❒ Lead Cable/Braid Length
- ❒ Special Features (see page 1-46)
- ❒ Provide drawing or sample part when possible

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.



Cone Shapes

Cone Shaped Heaters are normally used for special heating applications when heat is required for hoppers or funnels. They are made strictly to customer specifications. The preferred method of attachment is with built-in bracket clamping. When ordering or for quoting purposes, supply a detailed drawing or sample part. Include the top ID, bottom ID, and the vertical rise or heater width.

Duraband Features

Made in USA

Additional Duraband® Heater Features

Electrical Variations

Three-Phase On very high wattage band heaters it would be advantageous to set up the wiring three-phase to reduce the current load across a single conductor. Three-Phase wiring is available on select clamping/construction or termination variation (termination location is subject to engineering approval).

Min. ID: 3" (76.2 mm), **Min. Width:** 2" (50.8 mm)

Dual Voltage Band heaters can be designed using 3-wire series/parallel circuits for dual voltage applications. Whether the heater is run on the higher or lower voltage, the wattage will be the same. Dual Voltage wiring is available on any clamping/construction or termination variation.

Ground Terminal or Lead For those applications requiring a separate ground terminal or lead attached to the heater sheath. A Ground Terminal or Lead is available on any clamping/construction or termination variation.

Single Phase/Three Phase Duraband Heaters can be designed with multiple circuits to operate single or three-phase.

CONSULT TEMPCO WITH YOUR REQUIREMENTS — WE HAVE THE RIGHT SOLUTIONS

Built-In Thermocouples

Heaters can be manufactured with a Built-In Thermocouple to closely control the temperature of the heater.

Type J or K thermocouples are available with fiberglass, wire braid or any other required insulation.

Consult Tempco with your requirements.

Construction Variations

All Stainless Steel Construction Mica band heaters can be constructed with the external sheath made entirely from stainless steel. This allows the Duraband to reach the maximum temperature of 1200°F (650°C). All Stainless Steel Construction is available on any clamping/construction or termination variation.

Other Sheath Materials Other sheath materials, such as rust-resistant steel, Monel®, aluminum, or copper are also available for unique applications.

Lead Variations

Electrical Plugs Industry standard NEMA Twist-Lock® electrical plugs are available. The plugs can be attached to fiberglass leads, armor cable or wire braid. Electrical Plugs can be added to any clamping/construction or termination variation.

See page 15-15 for additional Twist-Lock electrical plugs.

Terminal Lugs Various types of crimp terminals can be attached to the heater leads to make wiring into applications quick and easy. High temperature 1200°F (649°C) ring terminals and nylon or PVC insulated terminals are available. Spade, ring, and right-angle or straight quick disconnect type terminals can be attached to the leads.

"P4"

"P5"

"P9"

Reference	NEMA P or R	Amps	Volts	Plug Part Number	Connectors (Female) Part Number
P4 twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-104
P5 twist lock	L6-15	15A	250V	EHD-102-121	EHD-103-107
P9 twist lock	L2-20	20A	250V	EHD-102-104	N/A

Ordering Information

Stock Heaters

Order by Part number for stock heaters listed on pages 1-52 through 1-59.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes not listed **TEMPCO** will design and manufacture a Duraband Heater to meet your requirements. ***Standard lead time is 2 weeks.***

Please Specify the following:

- ❑ Inside Diameter
- ❑ Width
- ❑ Wattage
- ❑ Voltage
- ❑ Quantity
- ❑ Termination (see pages 1-32 through 1-45)
- ❑ Lead Cable/Braid Length
- ❑ Construction style (see pages 1-28, 1-46 and 1-47)
- ❑ Clamping variation (see pages 1-29 through 1-31)
- ❑ Special Features

Duraband® and Mica Insulated Heater Special Custom Designs

Variety and Versatility in Mica Insulated Heaters. No other heater band has the design and manufacturing flexibility of mica insulated heaters. Tempco's flexible CNC sheet metal fabricating machines, custom developed engineering programs with built-in intelligence, and experienced and talented engineering staff allow us to push the limits on band heater designs.

Throughout our catalog we show Tempco's standard specifications and most popular designs. However, as a custom heating element manufacturer, we recognize that many applications require non-standard and unique designs.

At Tempco, we are constantly challenged by our customers to solve their heating applications. We have the experience, technical knowledge and manufacturing capability to solve all your heating problems with unique heater designs. You should use Tempco's talent and capabilities to your benefit to solve your specific heating problem in an expeditious and cost effective manner.

The following pictures show some of the heater designs that we have developed for special applications. Next time, when you have a special application and you want someone to work with you and "think outside the box" to solve your specific heating application, call Tempco.

We haven't seen all heating applications, but most likely our experienced staff has seen and solved more heating problems than you have seen.

Use our knowledge and experience to work for you.
Challenge us! You will be glad you did.
We Welcome Your Inquiries.

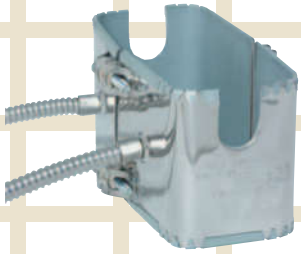
Ring Heater with clearance hole

Heater with large cutout at gap and clearance holes

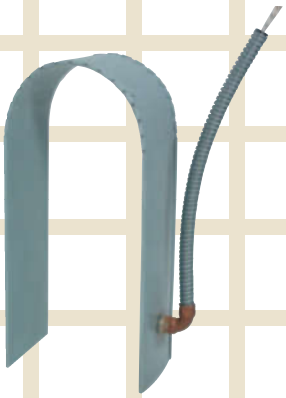
Boat shaped two-piece heater

Dual circuit unit has two heaters in one envelope

Two-piece rectangular heater with corner radius and cutouts



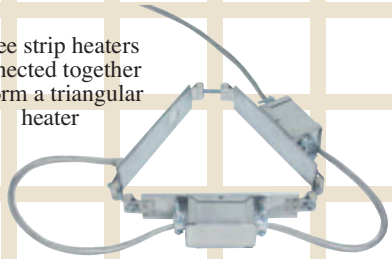
Fully flexible tapered two-piece heater.



Arch shaped heater for a special die. A two-piece heater will cover an obround die.

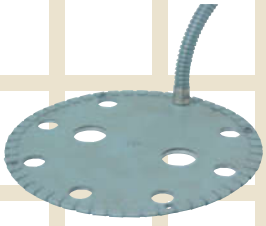
Heater with miniature outlet box and clearance hole

Three strip heaters connected together to form a triangular heater



Long conical two-piece heater

Fully flexible one-piece heater with varying width



Disc Heater

Sinuated Element

Made in USA

"Sinuated" Element Construction for Commercial OEM Applications

An alternative to wound ribbon core heaters is the sinuated heater element. In this type of construction, the heating element resistance wire is sinuated, or "formed" back and forth without a middle core layer of mica insulation. The heating element is then sandwiched between two layers of specially selected mica insulation to provide excellent thermal conductivity and dielectric strength.

The sinuated formed element lends itself to lower temperature and watt density applications where high watt density construction is not required.

Typical Applications (Cylindrical Surfaces)

- *Food and Candy Extruders*
- *Vending Machines*
- *Commercial Food Equipment*
- *Food Service Warming Items*
- *Laboratory and Scientific Apparatus*
- *Photographic Equipment*
- *Incubators*

The Solution for Low to Medium Temperature Cylindrical and Flat Surface Heating Applications

Typical Applications (Flat Surfaces)

- *Laminating*
- *Food Service Warming Items*
- *Radiant Heating*
- *Incubators*

This design is widely used in food service and the farming industry. By careful selection of economical materials used for these low temperature applications, significant cost savings can be realized compared to standard mica heaters.

Contact Tempco for Complete Product Details.

Installation RECOMMENDATIONS

1. Disconnect electric power to the machine and/or heaters prior to installing or replacing heaters.
2. Do not install heaters in areas where combustible gases, vapor or dust is present.
3. Use as many narrow band heaters as the application will permit. 1-1/2" through 3" wide heaters are recommended.
4. Using a heater that closely matches the wattage requirements will decrease the frequency of cycling and temperature overshoot, thereby increasing the life of the heater.
5. Make certain that all barrel surfaces are clean and have a smooth finish. Any contaminants or imperfections on the surface can cause premature heater failure.
6. Tempco expandable type Mica Band Heaters may be opened once at the gap to fit on the barrel. Do not open these heaters beyond their specified heater diameter.

CAUTION *Do not open Tempco One-Piece Non-Expandable Type mica band Heaters. Opening of these heaters can damage Mica Insulation and will create electrical short circuits.*

7. Position heater bands on the barrel.
8. Securely tighten heater bands around the barrel. Clamping force must be equally distributed on heaters with more than one set of clamping brackets.

Recommended clamping bolt torque is 10 ft./lbs.

9. For heaters with screw terminals, remove the top nut and flat washers from the power screw terminals. Do not remove or loosen the bottom nut on the power screw terminals. The bottom nut is tightened to 60 in./lbs. at the factory. A loose bottom nut may cause premature heater failure.

Installation Accessories Available

IMMEDIATE DELIVERY!

- *High Temperature Terminal Lugs*
- *Igloo™ Ceramic Terminal Covers*
- *UL Listed Plugs*
- *High Temperature Lead Wire 842°F (450°C)*
- *Armor Cable*
- *Stainless Steel Braid*
- *High Temperature Sleeving*
- *High Temperature Mica Insulated Wiring Harnesses 842°F (450°C)*
- *Thermocouples*
- *Temperature Controllers*
- *High Temperature Fiberglass Tape*

10. All electrical wiring of heater bands should be done by a qualified electrician.
    a. Use only Stainless Steel or other high temperature lugs to prevent material degradation when exposed to high temperatures over a prolonged period of time.

CAUTION *DO NOT USE COPPER OR PLATED COPPER LUGS.*

    b. Use only lead wire with high temperature insulation and proper gauge size.
    c. When connecting power leads to screw terminals make certain that barrels of terminal lugs are not facing down toward the heater case, which will create a short circuit.

Tighten the top nut to 30 in/lbs.

    d. Make certain power lead wires do not make contact with hot heater surface to avoid degradation of lead wire, as this can cause electrical short circuits.
    e. Make sure the voltage input to the heater bands does not exceed the voltage rating that is stamped on the heater band.
    f. It is recommended that an amperage reading is taken for each heater to verify proper wiring. (Amps = Watts/Volts)
11. Insulate all live electrical wires per applicable safety standards.
12. Begin heater band re-tightening procedure. Be sure to wear protective gloves.
    a. Energize heater bands and allow the heater to reach 300°F (149°C). This usually takes between 3 and 5 minutes.
    b. Turn off power and immediately re-tighten the heater bands to 10 ft./lbs. Turn power back on.
13. Install shrouds around the machine to meet applicable safety requirements.
14. Once installed, check surroundings to make sure that contaminants won't get on the heater while the unit is in operation. Accumulation of contaminants on heaters can cause premature heater failure.
15. Insulating blanket installations must have band heater retightening sequence (#12) completed before blanket installation. Lead wires must exit the insulation blanket as soon as possible; do not entrap lead wires between heater sheath and insulation blanket.

CAUTION It is imperative that upon start-up of new machines at customer facilities, all of the aforementioned parameters are double checked by qualified field service personnel.

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Made in USA

Duraband Nozzle Band Heaters

STOCK *Replacement Band Heaters for Plastic Injection Molding Machines*

COST EFFECTIVE WITHOUT COMPROMISING QUALITY

NHL *Mica Insulated Nozzle Heater*

ID in	Width in	Watts	Watt Density W/in²	Part Number 120V	Part Number 240V
⅞	1	85	49	NHL00130	NHL00131
1	1	100	47	NHL00100	NHL00101
1	1	125	58	NHL00132	NHL00133
1	1½	150	47	NHL00102	NHL00103
1	1½	200	62	NHL00104	NHL00105
1	2	250	58	NHL00106	NHL00107
1¼	⅝	100	55	NHL00154	NHL00155
1¼	1	175	60	NHL00108	NHL00109
1¼	1¼	125	34	NHL00156	NHL00157
1¼	1¼	250	68	NHL00158	NHL00159
1¼	1½	250	57	NHL00110	NHL00111
1½	⅞	100	31	NHL00160	NHL00161
1½	1	100	27	NHL00162	NHL00163
1½	1	150	40	NHL00112	NHL00113
1½	1	200	54	NHL00114	NHL00115
1½	1¼	250	54	NHL00164	NHL00165
1½	1½	150	27	NHL00134	NHL00135
1½	1½	200	36	NHL00116	NHL00117
1½	1½	250	45	NHL00136	NHL00137
1½	1½	275	49	NHL00118	NHL00119
1½	1½	300	54	NHL00138	NHL00139
1½	2	300	40	NHL00120	NHL00121
1½	2½	350	38	NHL00122	NHL00123
1½	2½	400	43	NHL00166	NHL00167
1½	3	350	31	NHL00168	NHL00169
1½	3	400	36	NHL00124	NHL00125
1½	3	500	45	NHL00170	NHL00171
1¾	1	175	39	NHL00172	NHL00173
1¾	1½	200	30	NHL00174	NHL00175
1¾	1½	225	33	NHL00140	NHL00141
1¾	1½	250	37	NHL00176	NHL00177
1¾	1½	300	44	NHL00178	NHL00179
1¾	3	500	37	NHL00180	NHL00181
2	1	200	38	NHL00182	NHL00183
2	1½	300	38	NHL00142	NHL00143
2	2	400	38	NHL00144	NHL00145
2⅛	1	100	18	NHL00126	NHL00127
2⅛	2	200	18	NHL00128	NHL00129
2¼	1	225	37	NHL00146	NHL00147
2⅜	1	250	39	NHL00148	NHL00149
2½	1	300	44	NHL00150	NHL00151
2½	1½	200	19	NHL00152	NHL00153
2½	1½	350	34	NHL00186	NHL00187

Note: For normal plastic processing Tempco recommends Watt Densities under 55 W/in².

In Stock!

- *Economically Priced*
- *Type NHL with 12" leads and 2" of protective sleeving*
- *Supplied with low profile clamping strap*

All Items Available from Stock

View Product Inventory @ www.tempco.com

STOCK Replacement Band Heaters for Plastic Injection Molding Machines

COST EFFECTIVE WITHOUT COMPROMISING QUALITY

NHW Mica Insulated Nozzle Heater

ID in	Width in	Watts	Watt Density W/in²	Part Number 120V	Part Number 240V
⅞	1	85	49	NHW00130	NHW00131
1	1	100	47	NHW00100	NHW00101
1	1	125	58	NHW00132	NHW00133
1	1½	150	47	NHW00102	NHW00103
1	1½	200	62	NHW00104	NHW00105
1	2	250	58	NHW00106	NHW00107
1¼	1	175	60	NHW00108	NHW00109
1¼	1¼	125	34	NHW00156	NHW00157
1¼	1¼	250	68	NHW00158	NHW00159
1¼	1½	250	57	NHW00110	NHW00111
1½	⅞	100	31	NHW00160	NHW00161
1½	1	100	27	NHW00162	NHW00163
1½	1	150	40	NHW00112	NHW00113
1½	1	200	54	NHW00114	NHW00115
1½	1¼	250	54	NHW00164	NHW00165
1½	1½	150	27	NHW00134	NHW00135
1½	1½	200	36	NHW00116	NHW00117
1½	1½	250	45	NHW00136	NHW00137
1½	1½	275	49	NHW00118	NHW00119
1½	1½	300	54	NHW00138	NHW00139
1½	2	300	40	NHW00120	NHW00121
1½	2½	350	38	NHW00122	NHW00123
1½	2½	400	43	NHW00166	NHW00167
1½	3	400	36	NHW00124	NHW00125
1½	3	500	45	NHW00170	NHW00171
1¾	1½	200	30	NHW00174	NHW00175
1¾	1½	225	33	NHW00140	NHW00141
1¾	1½	250	37	NHW00176	NHW00177
1¾	1½	300	44	NHW00178	NHW00179
2	1½	300	38	NHW00142	NHW00143
2	2	400	38	NHW00144	NHW00145
2⅛	1	100	18	NHW00126	NHW00127
2⅛	1	200	35	NHW00184	NHW00185
2⅛	2	200	18	NHW00128	NHW00129
2¼	1	225	37	NHW00146	NHW00147
2⅜	1	250	39	NHW00148	NHW00149
2½	1	300	44	NHW00150	NHW00151
2½	1½	200	19	NHW00152	NHW00153
2½	1½	350	34	NHW00186	NHW00187
2¾	1½	400	35	NHW00188	NHW00189

In Stock!

- *Economically Priced*
- *Type NHW with 12" leads and 10" SS wire braid*
- *Supplied with low profile clamping strap*

All Items Available from Stock

Note: For normal plastic processing Tempco recommends Watt Densities under 55 W/in².

Ordering Information
See page 1-48

Duraband Nozzle Band Heaters

Made in USA

Stock and Standard (Non-Stock) Replacement Mica Insulated Band Heaters for Plastic Injection Molding Machines

Fig. A

Stock Items Are Shown In RED

ID in	ID mm	Width in	Width mm	Wattage	Fig.	Tempco Part Number 120V	Tempco Part Number 240V
1¼	31.8	1³⁄₁₆	30.2	125	A	—	MBH00033
1½	38.1	1	25.4	150	A	MBH00031	MBH00035
1½	38.1	1	25.4	150	A	—	MBH00036 ①
2⁵⁄₁₆	58.7	1⁷⁄₁₆	36.5	300	A	—	MBH00038
2⁵⁄₁₆	58.7	1⁷⁄₁₆	36.5	300	A	—	MBH00039 ①

① Heaters have built-in Type J Thermocouple

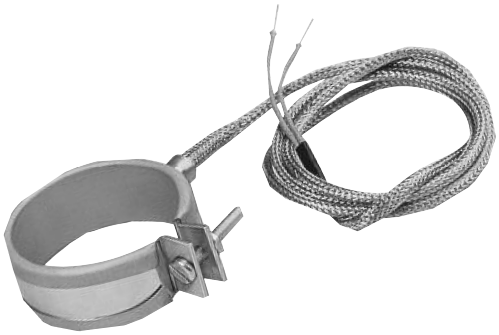


Fig. B

Stock Items Are Shown In RED

ID in	ID mm	Width in	Width mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Fig.	Part Number 120 Volts	Part Number 240 Volts
1½	38.1	1	25.4	150	40	6.3	B	MBH00030	MBH00034
1¾	44.5	1	25.4	175	39	6.0	B	MBH00003	MBH00012
2	50.8	1	25.4	200	38	5.9	B	MBH00004	MBH00013
2¼	57.2	1	25.4	175	29	4.5	B	MBH00005	—
2¼	57.2	1½	38.1	300	33	5.1	B	—	MBH00037
2½	63.5	1	25.4	250	36	5.7	B	MBH00006	MBH00014
3	76.2	1	25.4	200	24	3.7	B	MBH00007	MBH00015
3½	88.9	1	25.4	300	30	4.7	B	MBH00009	MBH00016

Fig. C

Stock Items Are Shown In RED

ID in	ID mm	Width in	Width mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Fig.	Part Number 240 V
1½	38.1	1½	38.1	275	49	7.7	C	MBH00019
1½	38.1	1¾	44.5	250	38	6.0	C	MBH00020
1½	38.1	2½	63.5	400	43	6.7	C	MBH00021
1½	38.1	3	76.2	450	40	6.3	C	MBH00022
1½	38.1	4½	114.3	600	36	5.6	C	MBH00023
1¾	44.5	6	152.4	800	30	4.6	C	MBH00024
2⅛	54.0	¹⁵⁄₁₆	23.8	215	40	6.3	C	MBH00025
2⅝	58.7	¹⁵⁄₁₆	23.8	260	44	6.9	C	MBH00026
2⅝	58.7	1⅜	34.9	240	28	4.3	C	MBH00027
2¾	69.9	1½	38.1	260	23	3.5	C	MBH00028

Design Features:

✶ *All heaters have 24" high temperature leads with 22" stainless steel overbraid*

Ordering Information

See page 1-48

Stock and Standard (Non-Stock) Mica Insulated Band Heaters for Plastic Injection Molding Machines

Design Features:

- *All heaters have 24" high temperature leads with 22" stainless steel overbraid — Type W3*
- *Heaters less than 1-1/2" wide have separate straps — Type SE*
- *Designed as one-piece expandable type, enables you to open up the heater to the diameter of the barrel for easy installation.*

Stock Items Are Shown In RED

ID		Width			Watt Density			Part Number		
in	mm	in	mm	Wattage	W/in²	W/cm²	Style	120V	240V	480V
2¾	69.9	3½	88.9	600	22	3.5	NE	MBH00040	—	—
3	76.2	1	25.4	200	24	3.7	SE	MBH00041	MBH00054	—
3	76.2	1	25.4	250	30	4.7	SE	MBH00042	MBH00055	—
3	76.2	1	25.4	300	36	5.6	SE	MBH00043	MBH00056	—
3	76.2	1	25.4	400	48	7.4	SE	MBH00044	MBH00057	—
3	76.2	1½	38.1	500	40	6.1	NE	MBH00045	MBH00058	—
3	76.2	2½	63.5	300	14	2.2	NE	—	MBH00059	—
3½	88.9	⅝	15.9	200	32	5.0	SE	MBH00046	MBH00060	—
3½	88.9	1	25.4	200	20	3.1	SE	MBH00047	—	—
3½	88.9	1½	38.1	500	33	5.2	NE	—	MBH00061	—
4	101.6	2	50.8	625	27	4.2	NE	MBH00048	MBH00062	MBH00066
4	101.6	3	76.2	500	14	2.2	NE	MBH00049	—	—
4	101.6	4	101.6	1250	27	4.2	NE	MBH00050	MBH00063	MBH00067
4½	114.3	1	25.4	300	23	3.5	SE	MBH00051	—	—
4½	114.3	2	50.8	700	27	4.1	NE	—	MBH00064	MBH00068
4½	114.3	4	101.6	700	13	2.1	NE	MBH00052	—	—
4½	114.3	4	101.6	1400	27	4.1	NE	MBH00053	MBH00065	MBH00069

Design Features:

- *All heaters have 24" high temperature leads — Type L2*
- *Heaters less than 1-1/2" wide have separate straps — Type SE*
- *Designed as one-piece expandable type, enables you to open up the heater to the diameter of the barrel for easy installation.*

Stock Items Are Shown In RED

ID		Width			Watt Density			Part Number		
in	mm	in	mm	Wattage	W/in²	W/cm²	Style	120V	240V	480V
3	76.2	1	25.4	200	24	3.7	SE	MBH00070	MBH00078	—
3	76.2	1	25.4	250	30	4.6	SE	MBH00071	MBH00079	—
3	76.2	1	25.4	300	36	5.5	SE	MBH00072	MBH00080	—
3	76.2	1	25.4	400	47	7.4	SE	MBH00073	MBH00081	—
3	76.2	1½	38.1	400	32	4.9	NE	MBH00074	MBH00082	—
3	76.2	1½	38.1	450	36	5.5	NE	MBH00075	MBH00083	—
3	76.2	1½	38.1	500	40	6.1	NE	MBH00076	MBH00084	—
3	76.2	2	50.8	500	30	4.6	NE	MBH00077	MBH00085	—
3½	88.9	1	25.4	400	40	6.2	SE	—	MBH00086	—
3½	88.9	1½	38.1	250	17	2.6	NE	—	MBH00087	MBH00093
3½	88.9	2	50.8	650	33	5.0	NE	—	MBH00088	—
4 15/16	125.4	2½	63.5	720	20	3.1	NE	—	MBH00089	MBH00094
5½	139.7	2½	63.5	950	23	3.6	NE	—	MBH00090	MBH00095
5⅞	149.2	1½	38.1	675	26	4.0	NE	—	MBH00091	MBH00096
7½	190.5	1½	38.1	1000	30	4.6	NE	—	MBH00092	MBH00097

Duraband Barrel Band Heaters

Made in USA

Stock and Standard (Non-Stock) Mica Insulated Band Heaters for Plastic Injection Molding Machines

Design Features:

- *All heaters have 24" high temperature leads with 22" stainless steel overbraid — Type W1*
- *Heaters less than 1-1/2" wide have separate straps — Type SE*
- *Designed as one-piece expandable type, enables you to open up the heater to the diameter of the barrel for easy installation.*

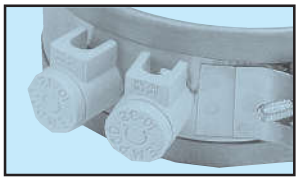
Stock Items Are Shown In RED

ID		Width			Watt Density			Part Number	
in	mm	in	mm	Wattage	W/in²	W/cm²	Style	120V	240V
2½	63.5	1½	38.1	300	29	4.5	NE	MBH00098	—
3	76.2	1	25.4	300	36	5.6	SE	**MBH00099**	**MBH00108**
3	76.2	1½	38.1	500	40	6.2	NE	**MBH00100**	**MBH00109**
3	76.2	2	50.8	500	30	4.6	NE	**MBH00101**	**MBH00110**
3⅛	79.4	2	50.8	450	26	4.0	NE	—	**MBH00111**
3¼	82.6	2	50.8	400	22	3.4	NE	—	**MBH00112**
3½	88.9	1½	38.1	550	37	5.7	NE	—	**MBH00113**
3½	88.9	2	50.8	600	30	4.7	NE	—	**MBH00114**
3½	88.9	3	76.2	300	10	1.6	NE	—	**MBH00115**
3½	88.9	3	76.2	625	21	3.2	NE	—	**MBH00116**
3¾	95.3	1½	38.1	600	37	5.8	NE	MBH00102	**MBH00117**
3¾	95.3	2½	63.5	850	32	4.9	NE	MBH00103	**MBH00118**
4	101.6	1	25.4	550	48	7.4	SE	—	MBH00119
4	101.6	1½	38.1	550	32	4.9	NE	—	**MBH00120**
4⅛	104.8	1	25.4	400	33	5.2	SE	**MBH00104**	—
4½	114.3	1	25.4	550	42	6.5	SE	—	**MBH00121**
4½	114.3	2	50.8	800	30	4.7	NE	—	**MBH00122**
4¾	120.7	¾	19.1	150	14	2.2	SE	—	MBH00123
4⅞	123.8	1½	38.1	900	42	6.5	NE	—	MBH00124
5	127.0	1½	38.1	700	32	4.9	NE	—	**MBH00125**
5	127.0	1¾	44.5	600	23	3.6	NE	—	**MBH00126**
5	127.0	2	50.8	950	32	5.0	NE	—	MBH00127
5	127.0	2½	63.5	1000	27	4.2	NE	—	MBH00128
5½	139.7	1	25.4	550	34	5.2	SE	—	**MBH00129**
5½	139.7	1½	38.1	500	20	3.2	NE	—	MBH00130
5½	139.7	1½	38.1	900	37	5.7	NE	—	MBH00131
5½	139.7	2	50.8	500	15	2.4	NE	—	MBH00132
5½	139.7	2¾	69.9	620	14	2.1	NE	—	**MBH00133**
5½	139.7	3	76.2	1750	36	5.6	NE	—	**MBH00134**
6	152.4	1	25.4	300	17	2.6	SE	MBH00105	—
6	152.4	1½	38.1	500	19	2.9	NE	—	**MBH00135**
6	152.4	1½	38.1	850	32	4.9	NE	—	**MBH00136**
6⅛	155.6	1	25.4	600	33	5.1	SE	**MBH00106**	—
6¼	158.8	2	50.8	500	13	2.1	NE	—	**MBH00137**
6½	165.1	1½	38.1	750	26	4.0	NE	—	MBH00138
7	177.8	1	25.4	550	26	4.1	SE	—	**MBH00139**
7½	190.5	2	50.8	1500	36	5.6	NE	—	MBH00140
8⅛	206.4	2	50.8	1200	38	5.9	NE	MBH00107	—
10	254.0	2	50.8	2000	41	6.4	NE	—	**MBH00141**

Ordering Information

See page 1-48

Stock and Standard (Non-Stock) Mica Insulated Band Heaters for Plastic Injection Molding Machines



Optional Igloo™ ceramic covers can fully insulate any standard #8 or #10 terminal lugs used for electrical hook-ups. See page 1-33.

Design Features:

- *Features unbreakable 10-32 screw terminals.*
- *Larger heaters (dia. 2-1/2" or greater) are designed as one-piece expandable type, enabling you to open up the heater to the diameter of the barrel for easy installation.*
- *Heaters less than 1-1/2" wide have separate straps — Type SE*

Stock Items Are Shown In RED

ID		Width			Watt Density				Part Number		
in	mm	in	mm	Wattage	W/in²	W/cm²	Style	Term.	120V	240V	480V
1½	38.1	1	25.4	150	40	6.3	SB	T2	—	MBH00170	—
1½	38.1	1½	38.1	250	45	7.0	NB	T2	—	MBH00171	—
1½	38.1	2	50.8	300	40	6.3	NB	T2	—	MBH00172	—
1¾	44.5	1	25.4	175	39	6.0	SB	T2	—	MBH00173	—
1¾	44.5	1½	38.1	250	37	5.7	NB	T2	—	MBH00174	—
1¾	44.5	1½	38.1	300	44	6.9	NB	T2	—	MBH00175	—
1⅞	47.6	1	25.4	200	41	6.3	SB	T2	—	MBH00176	—
2	50.8	1½	38.1	300	38	5.9	NB	T2	MBH00142	MBH00177	—
2¼	57.2	1	25.4	250	41	6.4	SB	T2	MBH00143	MBH00178	—
2¼	57.2	2	50.8	525	43	6.7	NB	T2	—	MBH00179	—
2⅜	60.3	1	25.4	100	15	2.4	SB	T2	—	MBH00180	—
2⅜	60.3	1	25.4	250	39	6.0	SB	T2	—	MBH00181	—
2⅜	60.3	2½	63.5	450	28	4.3	NB	T3	MBH00144	—	—
2½	63.5	1	25.4	225	33	5.1	SE	T2	—	MBH00182	—
2½	63.5	1	25.4	250	36	5.7	SE	T2	—	MBH00183	—
2½	63.5	1	25.4	275	40	6.2	SE	T2	—	MBH00184	—
2½	63.5	1½	38.1	300	29	4.5	NE	T2	MBH00145	MBH00185	—
2½	63.5	1½	38.1	350	34	5.3	NE	T2	MBH00146	MBH00186	—
2½	63.5	2⅜	60.3	550	34	5.2	NE	T2	—	MBH00187	—
2½	63.5	2⅞	73.0	650	33	5.1	NE	T3	—	MBH00188	—
2½	63.5	4	101.6	850	31	4.8	NE	T3	—	MBH00189	—
3	76.2	1	25.4	200	24	3.7	SE	T2	MBH00147	MBH00190	—
3	76.2	1	25.4	250	30	4.6	SE	T2	MBH00148	MBH00191	—
3	76.2	1	25.4	300	36	5.5	SE	T2	—	MBH00192	—
3	76.2	1	25.4	350	42	6.4	SE	T2	—	MBH00193	—
3	76.2	1	25.4	400	47	7.4	SE	T2	MBH00149	MBH00194	MBH00348
3	76.2	1½	38.1	400	32	4.9	NE	T2	MBH00150	MBH00195	—
3	76.2	1½	38.1	450	36	5.5	NE	T2	—	MBH00196	—
3	76.2	1½	38.1	500	40	6.1	NE	T2	MBH00151	MBH00197	—
3	76.2	2	50.8	450	27	4.1	NE	T2	—	MBH00198	—
3	76.2	2	50.8	500	30	4.6	NE	T2	—	MBH00199	—
3	76.2	2½	63.5	650	31	4.8	NE	T3	—	MBH00200	—
3⅛	79.4	1	25.4	300	34	5.3	SE	T2	—	MBH00201	—
3⅛	79.4	1	25.4	400	45	7.0	SE	T2	MBH00152	MBH00202	—
3⅛	79.4	1½	38.1	400	30	4.7	NE	T2	—	MBH00203	—
3¼	82.6	1½	38.1	400	29	4.5	NE	T2	MBH00153	MBH00204	—
3½	88.9	1	25.4	300	30	4.7	SE	T2	MBH00154	MBH00205	—
3½	88.9	1½	38.1	325	22	3.4	NE	T2	—	MBH00206	—
3½	88.9	1½	38.1	400	27	4.1	NE	T2	MBH00155	—	—
3½	88.9	1½	38.1	500	33	5.2	NE	T2	MBH00156	MBH00207	—
3½	88.9	2	50.8	325	16	2.5	NE	T2	—	MBH00208	—
3½	88.9	2	50.8	500	25	3.9	NE	T2	MBH00157	—	—
3½	88.9	2	50.8	650	33	5.0	NE	T2	—	MBH00209	—
3½	88.9	2½	63.5	750	30	4.7	NE	T3	—	MBH00210	—
3½	88.9	3	76.2	1000	33	5.2	NE	T3	—	MBH00211	—
3 9/16	90.5	2⅜	60.3	685	28	4.4	NE	T2	—	MBH00212	—
3⅝	92.2	1½	38.1	625	40	6.2	NE	T2	—	MBH00213	—
3¾	95.3	1	25.4	350	32	5.0	SE	T2	MBH00158	MBH00214	—
3¾	95.3	1½	38.1	500	31	4.8	NE	T2	—	MBH00215	—
3¾	95.3	1½	38.1	700	43	6.7	NE	T2	—	MBH00216	—
3¾	95.3	2½	63.5	850	32	4.9	NE	T3	MBH00159	MBH00217	—
3⅞	98.4	1½	38.1	550	33	5.1	NE	T2	—	MBH00218	—

CONTINUED

Duraband Barrel Band Heaters

Made in USA

Stock and Standard (Non-Stock) Mica Insulated Band Heaters for Plastic Injection Molding Machines

Continued from previous page…

ID in	ID mm	Width in	Width mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Style	Term.	Part Number 120V	Part Number 240V	Part Number 480V
3⅞	98.4	2	50.8	750	34	5.2	NE	T2	—	**MBH00219**	—
3 15/16	100.0	2	50.8	600	26	4.1	NE	T2	—	**MBH00220**	—
4	101.6	1	25.4	400	35	5.4	SE	T2	**MBH00160**	MBH00221	—
4	101.6	1½	38.1	400	23	3.6	NE	T2	—	MBH00222	—
4	101.6	1½	38.1	550	32	4.9	NE	T2	—	**MBH00223**	—
4	101.6	1½	38.1	625	36	5.6	NE	T2	—	**MBH00224**	MBH00349
4	101.6	1½	38.1	750	43	6.7	NE	T2	—	MBH00225	—
4	101.6	2	50.8	550	24	3.7	NE	T2	**MBH00161**	**MBH00226**	—
4	101.6	2	50.8	800	35	5.4	NE	T2	—	**MBH00227**	—
4	101.6	2¼	57.2	900	35	5.4	NE	T2	—	MBH00228	—
4	101.6	2½	63.5	1000	35	5.4	NE	T3	—	**MBH00229**	—
4	101.6	4	101.6	1250	27	4.2	NE	T3	—	**MBH00230**	—
4 5/16	109.5	3½	88.9	1210	28	4.3	NE	T3	—	MBH00231	—
4½	114.3	1	25.4	350	27	4.1	SE	T2	**MBH00162**	MBH00232	—
4½	114.3	1½	38.1	350	18	2.8	NE	T2	—	**MBH00233**	—
4½	114.3	1½	38.1	400	20	3.1	NE	T2	—	MBH00235	—
4½	114.3	1½	38.1	650	33	5.1	NE	T2	—	**MBH00236**	—
4½	114.3	2	50.8	500	19	2.9	NE	T2	MBH00163	**MBH00237**	—
4½	114.3	2	50.8	700	27	4.1	NE	T2	MBH00164	MBH00238	—
4½	114.3	2½	63.5	1000	30	4.7	NE	T3	**MBH00165**	MBH00239	—
4¾	120.7	1½	38.1	600	29	4.5	NE	T2	—	MBH00242	**MBH00350**
4¾	120.7	1½	38.1	650	31	4.8	NE	T2	—	**MBH00243**	—
4¾	120.7	3	76.2	1100	26	4.1	NE	T3	—	**MBH00244**	**MBH00351**
4⅞	123.8	1½	38.1	900	42	6.5	NE	T2	—	**MBH00245**	—
4⅞	123.8	2	50.8	650	23	3.5	NE	T2	—	**MBH00246**	—
4⅞	123.8	2	50.8	760	27	4.1	NE	T2	—	**MBH00247**	MBH00352
4⅞	123.8	3	76.2	900	21	3.2	NE	T3	—	**MBH00248**	—
4 15/16	125.4	3	76.2	1200	28	4.3	NE	T3	—	**MBH00249**	—
5	127.0	1	25.4	400	27	4.2	SE	T2	—	**MBH00250**	—
5	127.0	1½	38.1	350	16	2.5	NE	T2	—	—	MBH00353
5	127.0	1½	38.1	700	32	4.9	NE	T2	—	MBH00251	—
5	127.0	1½	38.1	800	36	5.6	NE	T2	—	MBH00252	—
5	127.0	2	50.8	1000	34	5.3	NE	T2	—	**MBH00253**	—
5	127.0	2½	63.5	1000	27	4.2	NE	T3	—	**MBH00254**	—
5	127.0	3	76.2	1200	27	4.2	NE	T3	—	MBH00255	**MBH00354**
5	127.0	3¼	82.6	800	17	2.6	NE	T3	—	—	MBH00355
5	127.0	3¼	82.6	1250	26	4.1	NE	T3	—	MBH00256	—
5	127.0	4	101.6	1500	25	4.0	NE	T3	—	**MBH00257**	—
5⅛	130.2	1½	38.1	900	40	6.2	NE	T2	—	MBH00258	—
5⅛	130.3	1½	38.1	600	26	4.1	NE	T2	—	**MBH00259**	—
5¼	133.4	1	25.4	500	32	5.0	SE	T2	—	MBH00260	—
5¼	133.4	1	25.4	600	39	6.0	SE	T2	—	**MBH00261**	**MBH00356**
5¼	133.4	1½	38.1	600	26	4.0	NE	T2	—	MBH00262	**MBH00357**
5¼	133.4	1½	38.1	1000	43	6.7	NE	T2	—	MBH00263	—
5¼	133.4	2	50.8	1000	32	5.0	NE	T2	—	**MBH00264**	—
5¼	133.4	2¼	57.2	1300	37	5.8	NE	T2	—	—	MBH00358
5¼	133.4	2½	63.5	1300	34	5.2	NE	T3	—	**MBH00265**	—
5¼	133.4	3	76.2	1700	37	5.7	NE	T3	—	**MBH00266**	—
5½	139.7	1½	38.1	800	33	5.1	NE	T2	—	MBH00267	—
5¾	146.1	1½	38.1	600	23	3.6	NE	T2	—	**MBH00268**	—
5⅞	149.2	3	76.2	1000	19	3.0	NE	T3	—	**MBH00269**	—
5 15/16	150.8	1½	38.1	1000	38	5.9	NE	T2	—	**MBH00270**	—
6	152.4	1	25.4	500	28	4.3	SE	T2	—	**MBH00271**	—
6	152.4	1⅜	34.9	950	39	6.0	SE	T2	MBH00166	—	—
6	152.4	1½	38.1	600	22	3.5	NE	T2	—	MBH00272	—
6	152.4	1½	38.1	850	32	4.9	NE	T2	**MBH00167**	**MBH00273**	—
6	152.4	1½	38.1	900	34	5.2	NE	T2	—	**MBH00274**	—
6	152.4	1½	38.1	1000	40	6.2	NE	T2	—	**MBH00275**	—
6	152.4	2	50.8	1200	34	5.2	NE	T2	—	MBH00276	—
6	152.4	2½	63.5	1450	32	5.0	NE	T3	—	**MBH00277**	—
6	152.4	3	76.2	1400	26	4.1	NE	T3	—	MBH00278	**MBH00359**
6⅛	155.6	1½	38.1	1000	37	5.7	NE	T2	—	MBH00279	—
6¼	158.8	3	76.2	1500	27	4.2	NE	T3	—	**MBH00280**	MBH00360
6 5/16	160.3	3	76.2	1250	22	3.4	NE	T3	—	**MBH00281**	MBH00361
6 15/32	164.3	2	50.8	800	21	3.2	NE	T2	—	**MBH00282**	—
6 15/32	164.3	2	50.8	1200	33	5.1	NE	T2	—	**MBH00283**	—

Stock Items Are Shown In RED

Order Info.
See page 1-48

Stock and Standard (Non-Stock) Mica Insulated Band Heaters for Plastic Injection Molding Machines

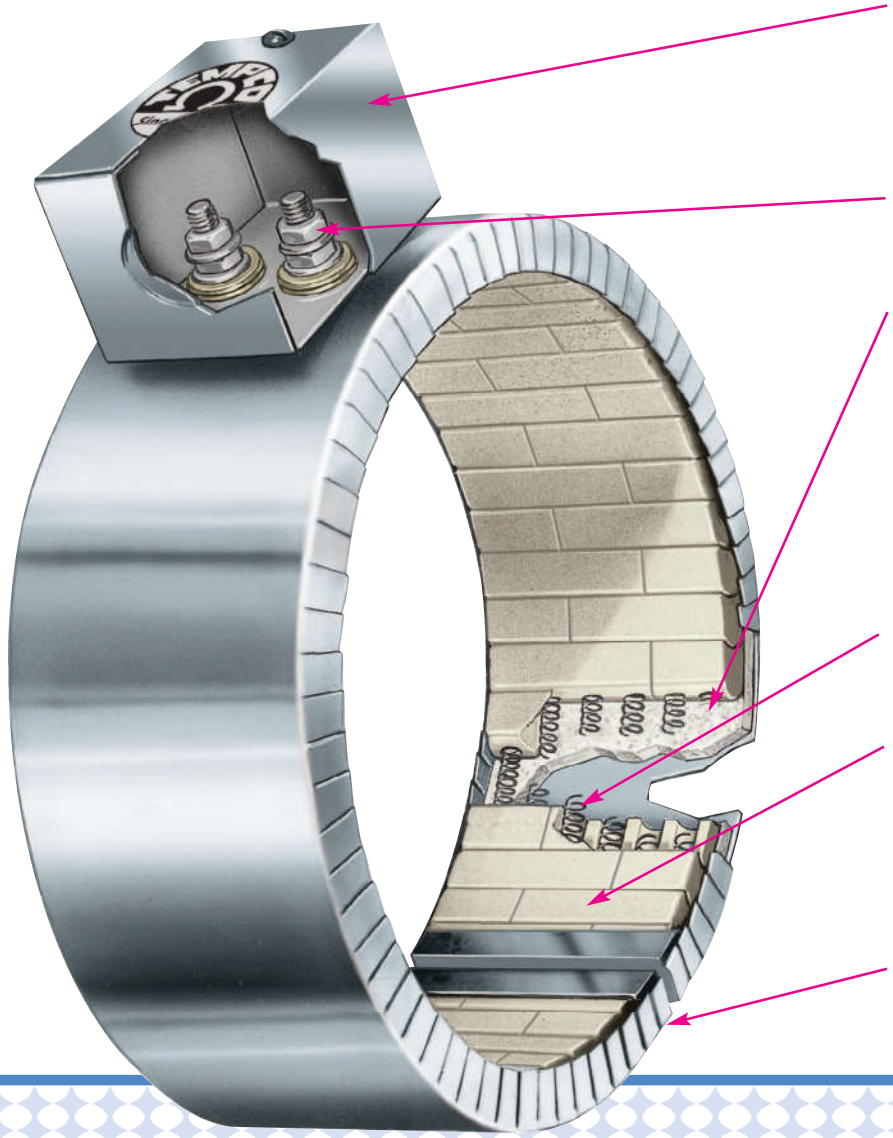
Stock Items Are Shown In RED

ID in	ID mm	Width in	Width mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Style	Term.	Part Number 120V	Part Number 240V	Part Number 480V
6½	165.1	1½	38.1	750	26	4.0	NE	T2	—	MBH00284	—
6½	165.1	1½	38.1	900	31	4.8	NE	T2	—	MBH00285	—
6½	165.1	1½	38.1	1200	41	6.4	NE	T2	—	MBH00286	—
6½	165.1	2	50.8	1000	26	4.0	NE	T2	—	**MBH00287**	—
6½	165.1	2½	63.5	1200	25	3.8	NE	T3	—	MBH00288	**MBH00362**
6⅝	168.4	1½	38.1	815	27	4.2	NE	T2	—	**MBH00289**	—
6⅝	168.4	1½	38.1	1150	39	6.0	NE	T2	—	MBH00290	—
6¾	171.5	1½	38.1	600	20	3.1	NE	T2	—	**MBH00291**	—
6¾	171.5	1½	38.1	815	27	4.2	NE	T2	—	**MBH00292**	—
6¾	171.5	1½	38.1	1000	33	5.1	NE	T2	—	MBH00293	—
6¾	171.5	1½	38.1	1150	38	5.9	NE	T2	—	MBH00294	—
6¾	171.5	2	50.8	1300	32	5.0	NE	T2	—	MBH00295	—
6¾	171.5	4	101.6	2600	32	5.0	NE	T3	—	**MBH00296**	—
7	177.8	1	25.4	750	36	5.5	SE	T2	—	**MBH00297**	—
7	177.8	1½	38.1	950	30	4.7	NE	T2	—	MBH00298	—
7	177.8	1½	38.1	1000	32	4.9	NE	T2	—	**MBH00299**	—
7	177.8	2½	63.5	1000	19	3.0	NE	T3	—	MBH00300	—
7	177.8	3	76.2	1650	26	4.1	NE	T3	—	MBH00301	**MBH00363**
7 3/32	180.2	3½	88.9	1200	16	2.5	NE	T3	—	**MBH00302**	**MBH00364**
7 3/32	180.2	3½	88.9	1650	22	3.4	NE	T3	—	**MBH00303**	**MBH00365**
7⅛	181.0	1½	38.1	1200	37	5.8	NE	T2	—	**MBH00304**	—
7⅛	181.0	3½	88.9	1650	22	3.4	NE	T3	—	**MBH00305**	—
7¼	184.2	2	50.8	900	21	3.2	NE	T2	—	**MBH00306**	—
7½	190.5	1	25.4	700	31	4.8	SE	T2	MBH00168	—	—
7½	190.5	1½	38.1	800	24	3.7	NE	T2	—	**MBH00307**	—
7½	190.5	1½	38.1	1000	30	4.6	NE	T2	—	**MBH00308**	—
7½	190.5	2	50.8	1500	36	5.2	NE	T2	—	**MBH00309**	—
7½	190.5	3	76.2	1800	27	4.1	NE	T2	—	**MBH00310**	**MBH00366**
7⅝	193.7	1½	38.1	1000	29	4.5	NE	T2	—	**MBH00311**	—
7⅝	193.7	3	76.2	2000	29	4.5	NE	T2	—	MBH00312	—
7¾	196.9	1½	38.1	1000	29	4.4	NE	T2	—	**MBH00313**	—
7⅞	200.0	1½	38.1	750	21	3.3	NE	T2	—	MBH00314	—
7⅞	200.0	1½	38.1	1000	28	4.4	NE	T2	—	**MBH00315**	—
7⅞	200.0	3	76.2	2000	28	4.4	NE	T3	—	**MBH00316**	—
8	203.2	1	25.4	850	35	5.5	SE	T2	—	**MBH00317**	—
8	203.2	1½	38.1	950	26	4.1	NE	T2	—	MBH00318	—
8	203.2	1½	38.1	1200	33	5.1	NE	T2	—	**MBH00319**	MBH00367
8	203.2	1½	38.1	1400	39	6.0	NE	T2	—	MBH00320	—
8	203.2	2	50.8	1500	31	4.8	NE	T2	—	**MBH00321**	**MBH00368**
8	203.2	3	76.2	2250	31	4.8	NE	T3	—	**MBH00322**	**MBH00369**
8¼	209.6	2	50.8	1800	36	5.6	NE	T2	—	MBH00323	**MBH00370**
8¼	209.6	4	101.6	3000	30	4.7	NE	T3	—	MBH00324	**MBH00371**
8½	215.9	1½	38.1	1200	31	4.8	NE	T2	—	**MBH00325**	—
8½	215.9	2	50.8	1600	31	4.8	NE	T2	—	**MBH00326**	—
8¾	222.3	3	76.2	2000	25	3.9	NE	T3	—	**MBH00327**	MBH00372
9	228.6	1½	38.1	1300	32	4.9	NE	T2	—	MBH00328	—
9	228.6	1½	38.1	1500	37	5.7	NE	T2	—	MBH00329	MBH00373
9	228.6	2	50.8	1800	33	5.1	NE	T2	—	**MBH00330**	—
9½	241.3	1½	38.1	1600	40	5.7	NE	T2	—	**MBH00331**	—
9½	241.3	2	50.8	1800	31	4.8	NE	T2	—	MBH00332	—
9½	241.3	3	76.2	2000	23	3.6	NE	T3	—	**MBH00333**	**MBH00374**
9⅝	244.5	3	76.2	2000	23	3.5	NE	T3	—	MBH00334	**MBH00375**
9⅝	244.5	3	76.2	3000	34	5.3	NE	T3	—	MBH00335	**MBH00376**
9¾	247.7	2	50.8	2000	34	5.2	NE	T2	—	**MBH00336**	—
10	254.0	1½	38.1	1400	31	4.8	NE	T2	—	**MBH00337**	—
10¼	260.4	3	76.2	2400	26	4.0	NE	T3	—	**MBH00338**	MBH00377
10¼	260.4	4	101.6	3000	24	3.7	NE	T3	—	**MBH00339**	**MBH00378**
10½	266.7	1½	38.1	1500	31	4.8	NE	T2	—	MBH00340	—
10½	266.7	3	76.2	2400	25	3.9	NE	T3	—	MBH00341	**MBH00379**
11	279.4	1½	38.1	1600	32	4.9	NE	T2	—	MBH00342	—
11	279.4	2	50.8	2000	30	4.6	NE	T2	—	**MBH00343**	—
11¼	285.8	3	76.2	2400	23	3.6	NE	T3	—	MBH00344	—
11½	292.1	1½	38.1	800	15	2.4	NE	T2	**MBH00169**	—	—
11½	292.1	1½	38.1	1800	34	5.3	NE	T2	—	**MBH00345**	—
12	304.8	1½	38.1	2000	36	5.6	NE	T2	—	**MBH00346**	—
12	304.8	2	50.8	2300	31	4.9	NE	T2	—	MBH00347	MBH00380

Order Info.
See page 1-48

Made in USA

Ceramic Insulated Band Heaters



A General purpose terminal box offers excellent protection to exposed terminals. To simplify electrical wiring, the box has a 1/2" trade size knockout (actual dia. 7/8") that will accept standard conduit or flexible armor cable connectors.

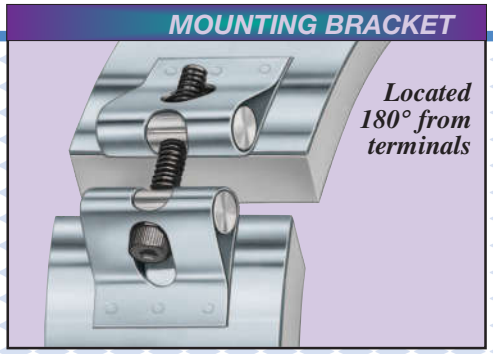
B Stainless steel screw terminals connected to stranded nickel wire designed to provide maximum amperage carrying capacity.

C Built-In ceramic fiber insulation 1/4" thick standard on all Ceramic Bands will reduce power consumption by 25 to 30 percent. Further reduction can be obtained with optional 1/2" thick insulation. Specially designed mounting brackets with 1/4"-20 socket cap screws are used to securely draw the heating element assembly against the cylinder evenly and tightly across its entire width. Brackets are located 180° from the screw terminals.

D Helically wound nickel-chrome resistance wire strung through specially designed ceramic insulating bricks.

E Tempco's ceramic insulating bricks provide excellent dielectric strength at high temperatures and high voltages. Interlocking ceramic brick construction is used where applicable to allow for additional heater widths and to improve the rigidity of the heater.

F Stainless steel housing with serrated edges provides maximum flexibility for ease of installation.



REDUCE HEAT LOSS

CONSERVE ENERGY

MAXIMIZE OPERATOR COMFORT

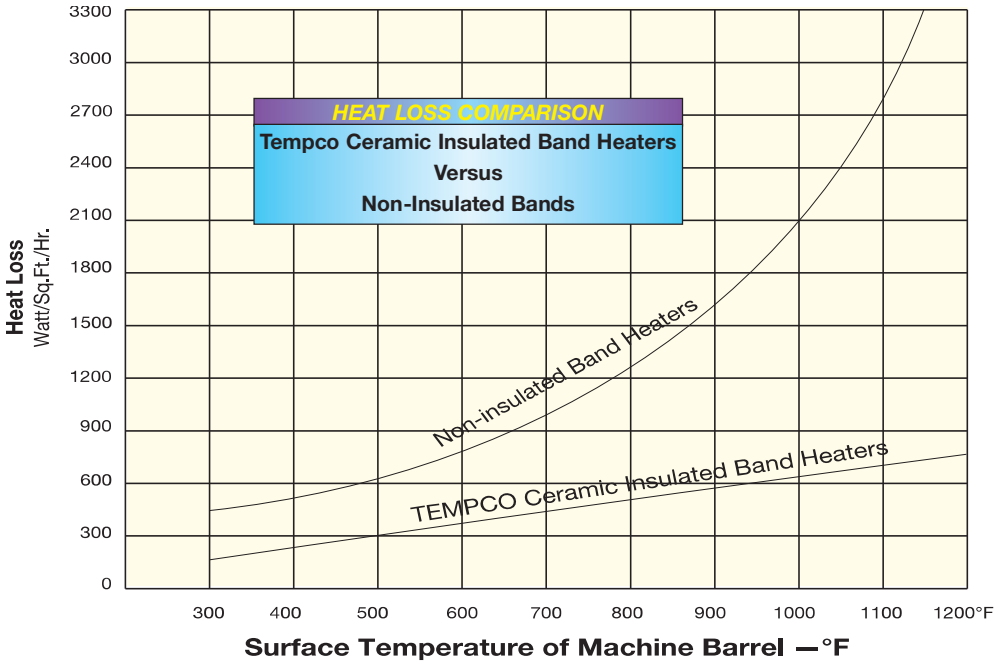
REDUCE OVERALL OPERATION COST

View Product Inventory @ www.tempco.com

Ceramic Band Heaters Are Designed To Conserve Energy and Improve Operation Efficiency

Design Features

- *Built-In Thermal Insulation*
- *Conserves Electrical Energy*
- *Minimum Heat Loss*
- *Fully Flexible For Easy Installation*
- *Good Temperature Uniformity*
- *Longer Heater Life*
- *Various Constructions & Terminations*
- *Heats Through Conduction and Radiation*
- *Designed to Your Specifications*



Tempco Ceramic Insulated Band Heaters are specifically designed and engineered to meet the ever increasing demand for energy conservation and to improve operation efficiency. The Ceramic Band Heaters are capable of generating the higher temperatures essential to process today's high temperature resins. Electrical energy savings are achieved by using a 1/4" thick ceramic fiber insulating blanket, reducing power consumption by 25 to 30 percent. Because of the low thermal conductivity of the ceramic fiber insulation, the external surface temperature of the Ceramic Band Heater is approximately 400°F while running the inside surface temperature at 1200°F.

Ceramic Band Heaters transmit heat through both conduction and radiation. The element winding is designed to run at maximum temperature and heat the ceramic blocks to the point at which they radiate energy into the barrel as well as conduct energy by being in contact with the barrel. Therefore, the fit is not as critical as in other types of bands.

Tempco Ceramic Band Heaters have become extremely popular among Original Equipment Manufacturers as the standard heaters for the barrels of Plastic Injection Molding Machines, Extruders, and Blow Molding Equipment.

Variations and Advantages

Ceramic Band Heaters are manufactured in a full range of standard construction variations, physical dimensions, electrical ratings, and a complete arrangement of screw terminals and lead terminations.

However, these standard Ceramic Band Heater variations and terminations do not represent the extent of our capabilities. Tempco's engineering staff, with many years of experience in heat processing and temperature control applications, can assist you in designing the right Ceramic Band Heater for your specific application.

Construction Characteristics

Standard

The basic Tempco Ceramic Band Heater design consists of a helically wound resistance coil made from nickel-chrome wire, evenly stretched and precisely strung through specially designed ceramic insulating bricks, forming a flexible heating mat. The ceramic heating mat along with 1/4" thick ceramic fiber insulation is installed in a stainless steel housing made with serrated edges, providing maximum flexibility for ease of installation. This allows the use of wider band heaters, eliminating the need for numerous narrow width and two-piece band heaters.

Double Insulated

For situations requiring additional insulation for lower external temperatures and increased electrical energy savings, Tempco offers Double Insulated Ceramic Bands with a full 1/2" thick ceramic fiber insulation. This will decrease power consumption by 35 to 37 percent when compared to uninsulated band heaters.

Rib Cage (Type R) Ceramic Band Heater

When Ceramic Band Heaters are used on extruder barrels that require both heating and cooling, Tempco manufactures the ***Rib Cage (Type R)*** Air-Cooled Ceramic Band Heater in two watt density styles. See page 1-75 for details.

Made in USA

Ceramic Band Standard Specifications and Tolerances

PERFORMANCE RATINGS

Maximum Temperature: 1400°F (760°C)
Nominal Watt Density: 20-45 W/in² (3-7 W/cm²)
Maximum Watt Density: 45 W/in² (7 W/cm²)

ELECTRICAL RATINGS

Maximum Voltage: 480 VAC per termination
Dual Voltage: Available depending on heater configuration
Maximum Amperage per circuit:
lead wire termination: 12.5 amp
screw terminations: 25 amp
Resistance Tolerance: +10%, –5%
Wattage Tolerance: +5%, –10%

CAUTION

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

PHYSICAL SIZE CONSTRUCTION LIMITATIONS

Sheath Material: Stainless Steel
Insulation Material: Ceramic Fiber Blanket
Standard Thickness: 1/4" (6.4 mm)
Double Thickness: 1/2" (12.7 mm)

Overall Thickness:

Insulation Type	Dia. less than 4"	Dia. 4" or greater	
	Standard	Standard	Optional
Standard	1/2" (12.7 mm)	5/8" (15.9 mm)	1/2" (12.7 mm)
Double	11/16" (17.5 mm)	3/4" (19.1 mm)	11/16" (17.5 mm)
Ribcage (Uninsulated)	11/32" (8.7 mm)	1/2" (12.7 mm)	11/32" (8.7 mm)

Minimum Width: 1" (25.4 mm)
Standard Width Increments: 1/8" (3.2 mm)
Consult Tempco for non-standard widths.
Maximum Width:
One-Piece & Two-Piece:
Dependent upon the ratio of diameter to width
Maximum Width to Diameter Ratio is 3:1
Maximum Width for 5" or greater ID is 15"
Reverse Band: 4" (101.6 mm)
Width Tolerance:
1" (25.4 mm) to 3-1/2" (88.9 mm): ±1/16" (±1.6 mm)
4" (101.8 mm) to 6-1/2" (165.1 mm): ±1/8" (±3.2 mm)
Over 6-1/2" (165.1 mm): ±1/4" (6.4 mm)
Minimum Diameter:
One-Piece: 2" (50.8 mm)
Two-Piece: 4" (101.6 mm)
Reverse Band: 5-1/2" (139.7 mm)
Maximum Diameter
One-Piece: 21" (533.4 mm)
Two-Piece & Reverse Band: 44" (1,117.6 mm)
Nominal Gap: 3/8" (9.5 mm) — If a larger gap is required for probes or thermocouples, specify when ordering.

If tighter tolerances are required consult Tempco.

Construction / Clamp	Min. ID in	Min. ID mm	Min. Width in	Min. Width mm	Max. ID in	Max. ID mm
One-Piece	2	50.8	1	25.4	21	533.4
Two-Piece	4	101.6	1	25.4	44	1117.6
Reverse Band	5.5	139.7	1	25.4	44	1117.6
Standard Insulation	2	50.8	1	25.4	N/A	
Double Insulation	2	50.8	1	38.1	N/A	
Rib Cage (RCC)	3	76.2	1	114.3	N/A	
Built-In Bracket	2	50.8	1	25.4	N/A	
Built-In Bracket Spring Loaded	2	50.8	1	25.4	N/A	
Latch and Trunnion	4	101.6	1	25.4	N/A	
Bent-Up Flange	2	50.8	1	25.4	N/A	
Shell Overlap	3	76.2	1	38.1	20	508.0

Note: Refer to individual construction and termination descriptions on pages 1-66 through 1-74 for further information. Actual heater minimums and maximums will depend upon the combination of construction/clamp, termination styles and electrical ratings.

TEMPCO Since 1972

Ceramic Band

Standard (Non-Stock) Ceramic Bands

ID		Width			Watt Density			Part Number			
in	mm	in	mm	Wattage	W/in²	W/cm²	Terminal	120V	240V	480V	240/480V
2⅜	60.3	1½	38.1	250	26	4.0	T2	—	BCH00017	—	—
2⅜	60.3	6	152.4	1000	26	4.0	T3	—	BCH00018	—	—
2½	63.5	1	25.4	375	55	8.5	R2A	—	BCH00019	—	—
3	76.2	1	25.4	400	47	7.4	T2	—	BCH00020	—	—
3	76.2	1	25.4	500	59	9.2	R2A	—	BCH00021	—	—
3	76.2	1½	38.1	500	40	6.1	T2	BCH00001	BCH00022	—	—
3	76.2	2½	63.5	1000	47	7.4	T3	BCH00002	—	—	—
3	76.2	3	76.2	1100	44	6.7	T3	—	BCH00023	—	—
3	76.2	4	101.6	450	13	2.1	C2A	—	BCH00024	—	—
3	76.2	4	101.6	1500	45	6.9	T3	—	BCH00025	—	—
3	76.2	6	152.4	1500	30	4.6	T3	BCH00003	BCH00026	—	—
3	76.2	6	152.4	1500	30	4.6	C2A	—	BCH00027	—	—
3½	88.9	2	50.8	650	33	5.0	T3	—	—	—	BCH00163
3½	88.9	2	50.8	700	35	5.4	W1	—	BCH00028	—	—
3½	88.9	2	50.8	850	43	6.6	T3	—	BCH00029	—	—
3½	88.9	3	76.2	875	29	4.5	T3	—	BCH00030	—	—
3½	88.9	3	76.2	1000	33	5.2	T3	—	BCH00031	—	—
3½	88.9	4	101.6	1200	30	4.7	T3	BCH00004	BCH00032	—	—
3½	88.9	4½	114.3	1200	27	4.1	C2A	—	BCH00033	—	—
3½	88.9	5	127.0	2300	46	7.1	T3	—	BCH00034	—	—
3½	88.9	6	152.4	2970	50	7.7	T3	—	BCH00035	—	—
3¾	95.3	1½	38.1	460	28	4.4	T2	—	BCH00036	—	—
3 15/16	100.0	4	101.6	1140	25	3.9	T3	—	BCH00037	—	—
4	101.6	2	50.8	460	20	3.1	T3	—	BCH00038	—	—
4	101.6	2	50.8	1000	43	6.7	T2	—	—	BCH00120	—
4	101.6	2½	63.5	600	21	3.2	C2A	—	—	BCH00121	—
4	101.6	3	76.2	950	27	4.2	T3	—	—	—	BCH00164
4	101.6	3	76.2	1200	35	5.4	T3	BCH00005	BCH00039	—	—
4	101.6	4	101.6	1200	26	4.0	C2A	—	BCH00040	—	—
4	101.6	10	254.0	4500	39	6.0	T3	—	BCH00041	—	—
4	101.6	11	279.4	5000	39	6.1	T3	—	BCH00042	—	—
4¼	108.0	2½	63.5	950	31	4.8	C5E	—	—	BCH00122	—
4½	114.3	2	50.8	1100	42	6.5	T3	BCH00006	BCH00043	—	—
4½	114.3	3	76.2	900	23	3.5	T3	BCH00007	BCH00044	—	—
4½	114.3	4	101.6	2300	44	6.8	T3	—	BCH00045	—	—
4½	114.3	4½	114.3	1400	24	3.7	C5E	—	—	—	BCH00165
4½	114.3	6	152.4	2000	25	3.9	T3	BCH00008	BCH00046	—	—
4⅞	123.8	4	101.6	2000	35	5.4	T3	—	BCH00047	—	—
4 15/16	125.4	2	50.8	1000	34	5.3	L1	—	—	BCH00123	—
4 15/16	125.4	2½	63.5	1650	45	7.0	T3	—	—	BCH00124	—
4 15/16	125.4	4	101.6	2000	34	5.3	T3	—	—	BCH00125	—
5	127.0	1½	38.1	800	36	5.6	T2	—	BCH00048	BCH00126	—
5	127.0	2	50.8	1200	41	6.3	T3	—	BCH00049	—	—
5	127.0	3	76.2	1200	27	4.2	T2	—	BCH00050	—	—
5	127.0	3½	88.9	2200	43	6.6	T3	—	BCH00051	—	—
5	127.0	4	101.6	1500	25	4.0	C5E	—	BCH00052	—	—
5	127.0	4	101.6	2200	37	5.8	T3	—	BCH00053	—	—
5	127.0	6	152.4	3000	34	5.3	T3	—	BCH00054	—	—
5¼	133.4	3	76.2	1500	32	5.0	T3	—	BCH00055	—	—
5½	139.7	1½	38.1	770	32	4.9	T3	—	—	BCH00127	—
5½	139.7	2	50.8	1000	31	4.8	T3	—	BCH00056	—	—
5½	139.7	2½	63.5	1800	44	6.9	C2A	—	BCH00057	—	—
5½	139.7	3	76.2	1200	25	3.8	T2	—	BCH00058	—	—
5½	139.7	4	101.6	1500	23	3.6	T3	—	—	—	BCH00166
5½	139.7	4	101.6	2000	31	4.8	T3	—	BCH00059	—	—
5½	139.7	5	127.0	2000	25	3.8	T3	BCH00009	BCH00060	—	—
5⅞	149.2	5	127.0	2350	27	4.2	T3	—	—	BCH00128	—
5 15/16	150.8	5	127.0	2350	27	4.1	T3		BCH00061	—	—

Ordering Information
See page 1-65

CONTINUED

Made in USA

Standard (Non-Stock) Ceramic Bands

Continued from previous page…

ID		Width			Watt Density			Part Number			
in	mm	in	mm	Wattage	W/in²	W/cm²	Terminal	120V	240V	480V	240/480V
6	152.4	1½	38.1	950	35	5.5	T2	BCH00010	BCH00062	—	—
6	152.4	2	50.8	1900	53	8.2	T3	—	BCH00063	BCH00129	—
6	152.4	2½	63.5	1600	36	5.6	C2A	—	BCH00064	BCH00130	—
6	152.4	3	76.2	1400	26	4.1	T3	—	—	—	BCH00167
6	152.4	4	101.6	1300	18	2.8	T3	BCH00011	BCH00065	—	—
6	152.4	5	127.0	1600	18	2.8	C5E	—	—	—	BCH00168
6	152.4	5½	139.7	2000	20	3.2	T3	—	—	—	BCH00169
6	152.4	6	152.4	2000	19	2.9	T3	—	—	—	BCH00170
6	152.4	6	152.4	3000	28	4.3	T3	—	BCH00066	—	—
6	152.4	6	152.4	4000	37	5.8	T3	—	BCH00067	—	—
6¼	158.8	4	101.6	2430	33	5.1	T3	—	BCH00068	—	—
6¼	158.8	6	152.4	4600	41	6.4	T3	—	—	BCH00131	—
6½	165.1	1½	38.1	1000	34	5.3	T2	—	BCH00069	—	—
6½	165.1	2	50.8	1600	41	6.4	T3	—	BCH00070	—	—
6½	165.1	3½	88.9	1800	26	4.1	T3	BCH00012	BCH00071	—	—
6½	165.1	5	127.0	2500	26	4.0	T3	—	BCH00072	—	—
6½	165.1	5½	139.7	4200	39	6.1	T3	—	—	BCH00132	—
6½	165.1	6	152.4	2000	17	2.7	C5E	—	—	—	BCH00171
6½	165.1	6½	165.1	3700	29	4.5	T3	—	BCH00073	—	—
6⅝	168.3	4½	114.3	3300	37	5.7	T3	—	—	BCH00133	—
6¾	171.5	1½	38.1	1000	33	5.1	T2	BCH00013	BCH00074	—	—
6¾	171.5	5	127.0	2500	25	3.8	C5E	—	BCH00075	—	—
7	177.8	2	50.8	1400	33	5.2	C2A	—	—	BCH00134	—
7	177.8	3	76.2	1650	26	4.1	T3	—	BCH00076	—	—
7	177.8	3½	88.9	1300	18	2.7	T3	BCH00014	BCH00077	—	—
7	177.8	4	101.6	3500	42	6.5	T3	—	BCH00078	BCH00135	—
7	177.8	5½	139.7	2000	17	2.7	C5E	—	BCH00079	—	BCH00172
7	177.8	6	152.4	5400	43	6.6	T3	—	BCH00080	—	—
7½	190.5	2	50.8	1900	42	6.5	T3	—	BCH00081	—	—
7½	190.5	3	76.2	1800	27	4.1	T3	—	BCH00082	BCH00136	—
7½	190.5	4½	114.3	2000	20	3.1	T3	—	—	—	BCH00173
7½	190.5	4½	114.3	2000	20	3.1	T3	BCH00015	BCH00083	—	—
7½	190.5	5	127.0	2500	22	3.4	C2A	—	BCH00084	—	—
7½	190.5	5½	139.7	2500	20	3.1	T3	BCH00016	—	—	BCH00174
7½	190.5	7	177.8	6500	41	6.4	T3	—	—	—	BCH00175
7½	190.5	9	228.6	5710	28	4.4	T3	—	—	BCH00137	—
8	203.2	1½	38.1	770	21	3.3	T2	—	BCH00085	BCH00138	—
8	203.2	1½	38.1	1000	28	4.3	T2	—	—	BCH00139	—
8	203.2	2	50.8	2000	41	6.4	T3	—	BCH00086	—	—
8	203.2	2½	63.5	1000	17	2.6	T2	—	—	BCH00140	—
8	203.2	3	76.2	1900	26	4.1	T3	—	—	—	BCH00176
8	203.2	4	101.6	3000	31	4.8	T3	—	BCH00087	—	—
8	203.2	6	152.4	3500	24	3.7	T3	—	BCH00088	—	—
8	203.2	6	152.4	4500	31	4.8	T3	—	—	BCH00141	—
8	203.2	6½	165.1	2600	17	2.6	C5E	—	—	—	BCH00177
8⅛	204.8	4	101.6	2100	22	3.3	T3	—	—	BCH00142	—
8⅛	204.8	4	101.6	2800	29	4.5	T3	—	—	BCH00143	—
8⅛	204.8	9	228.6	4900	22	3.5	T3	—	—	BCH00144	—
8¼	209.6	3	76.2	2300	31	4.8	C5E	—	BCH00089	—	—
8¼	209.6	7½	190.5	3100	17	2.6	C5E	—	—	—	BCH00178
8⅜	214.3	3	76.2	3000	39	6.1	T3	—	—	BCH00145	—
8⅜	214.3	3½	88.9	2800	31	4.9	T3	—	BCH00090	BCH00146	—
8⅜	214.3	3½	88.9	3255	36	5.7	T3	—	—	BCH00147	—
8⅜	214.3	4	101.6	3400	33	5.2	T3	—	BCH00091	BCH00148	—
8⅜	214.3	5½	139.7	3800	27	4.2	T3	—	—	BCH00149	—
8½	215.9	1½	38.1	1250	32	5.0	C2A	—	BCH00092	—	—
8½	215.9	4½	114.3	3890	34	5.2	T3	—	BCH00093	—	—
8¾	222.3	9	228.6	4100	17	2.7	C5E	—	—	—	BCH00179
9	228.6	1½	38.1	1100	27	4.2	T2	—	—	BCH00150	—
9	228.6	2	50.8	2300	42	6.5	T3	—	BCH00094	—	—
9	228.6	2½	63.5	2800	41	6.4	T3	—	BCH00095	—	—
9	228.6	3	76.2	2200	27	4.2	T3	—	—	—	BCH00180
9	228.6	5	127.0	2500	18	2.8	T3	—	—	—	BCH00181
9	228.6	5½	139.7	3000	20	3.1	T3	—	BCH00096	—	BCH00182
9	228.6	8½	215.9	3900	17	2.6	C5E	—	—	—	BCH00183

Standard (Non-Stock) Ceramic Bands

Continued from previous page…

ID		Width		Wattage	Watt Density		Terminal	Part Number			
in	mm	in	mm		W/in²	W/cm²		120V	240V	480V	240/480V
9 7/16	239.7	3	76.2	2500	29	4.5	T3	—	BCH00097	BCH00151	—
9½	241.3	1½	38.1	1200	28	4.3	T2	—	—	BCH00152	—
9½	241.3	3	76.2	2200	25	3.9	T3	—	—	—	BCH00184
9¾	247.7	10	254.0	5200	18	2.7	C5E	—	—	—	BCH00185
10	254.0	1½	38.1	600	13	2.0	T2	—	BCH00098	—	—
10	254.0	2	50.8	1800	30	4.6	C2A	—	BCH00099	—	—
10	254.0	3	76.2	2400	26	4.1	T3	—	—	—	BCH00186
10	254.0	4	101.6	1500	12	1.9	C2A	—	BCH00100	—	—
10	254.0	5	127.0	2800	18	2.9	C5E	—	—	—	BCH00187
10	254.0	5½	139.7	2500	15	2.3	T3	—	BCH00101	—	—
10	254.0	6	152.4	3000	16	2.5	C2A	—	BCH00102	—	—
10½	266.7	4½	114.3	5000	35	5.4	C2A	—	BCH00103	—	—
11	279.4	3	76.2	2600	26	4.0	T3	—	—	—	BCH00188
11	279.4	5	127.0	4000	24	3.7	T3	—	—	—	BCH00189
11 1/16	281.0	4	101.6	4000	30	4.6	T3	—	—	BCH00153	—
12	304.8	2	50.8	2000	27	4.2	C2A	—	BCH00104	—	—
12	304.8	3	76.2	2000	18	2.8	C2A	—	—	—	BCH00190
12	304.8	6	152.4	4000	18	2.8	T3	—	—	—	BCH00191
12	304.8	12	304.8	2000	5	0.7	T3	—	BCH00105	—	—
12½	317.5	4	101.6	1950	13	2.0	C2A	—	BCH00106	—	—
12½	317.5	4	101.6	2600	17	2.6	T3	—	BCH00107	—	—
13	330.2	2	50.8	2000	25	3.9	C5E	—	BCH00108	—	—
13	330.2	3	76.2	4200	35	5.4	T3	—	—	—	BCH00192
13	330.2	6	152.4	4000	17	2.6	T3	—	BCH00109	—	—
14½	368.3	3	76.2	2300	17	2.7	T3	—	—	BCH00154	—
15¼	387.4	2	50.8	3000	32	5.0	C2A	—	BCH00110	—	—
16	406.4	2	50.8	1500	15	2.4	C2A	—	BCH00111	—	—
16	406.4	3	76.2	5000	34	5.2	C2A	—	BCH00112	—	—
16½	419.1	2	50.8	3000	30	4.6	C2A	—	BCH00113	—	—
16½	419.1	3	76.2	5400	35	5.5	C2A	—	BCH00114	—	—
16½	419.1	3½	88.9	1800	10	1.6	C2A	—		BCH00155	—
16½	419.1	3½	88.9	2500	14	2.2	T3	—	BCH00115	—	—
16½	419.1	4	101.6	3500	17	2.7	C2A	—	BCH00116	—	—
16½	419.1	5	127.0	4350	17	2.7	T3	—	BCH00117	—	—
17½	444.5	1½	38.1	825	10	1.6	C2A	—	BCH00118	—	—
19¼	489.0	2½	63.5	5000	34	5.2	C2A	—	BCH00119	—	—
21	533.4	4½	114.3	5039	17	2.7	C2A	—	—	BCH00156	—
21	533.4	6	152.4	5600	14	2.2	T3	—	—	BCH00157	—
21½	546.1	3½	88.9	3000	13	2.0	T3	—	—	BCH00158	—
26	660.4	5	127.0	6800	17	2.6	C2A	—	—	BCH00159	—
28	711.2	4½	114.3	6600	17	2.6	T3	—	—	BCH00160	—
28	711.2	5	127.0	5750	13	2.0	T3	—	—	BCH00161	—
32½	825.5	3½	88.9	3000	8	1.3	C2A	—	—	BCH00162	—

Ordering Information

Standard Heaters

Select a Ceramic Insulated Band Heater from pages 1-63 through 1-65. Each heater's Termination Type is indicated.

Type L1 has 10" long leads.

Type W1 has 12" long leads with 10" wire braid.

Type R2A has 12" long leads with 10" galvanized steel armor cable.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed **TEMPCO** will design and manufacture a Ceramic Insulated Band Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Inside Diameter
- ❑ Width
- ❑ Wattage
- ❑ Voltage
- ❑ Termination (see pages 1-68 through 1-74)
- ❑ Lead Cable/Braid Length
- ❑ Construction style (see page 1-66)
- ❑ Clamping variation (see page 1-67)

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Ceramic Band Construction

Made in USA

How To Specify A Ceramic Band Heater

Ceramic band heaters offer several variations in construction, clamping and electrical terminations. For ease of ordering, make a selection from options listed in each of the boxes below.

☑ Construction

(See below)
One-piece
Two-piece
Multiple Sections
(Specify number of sections required.)
Type T – Reverse Heater Band

☑ Insulation

(See page 1-67)
Standard 1/4" insulation **(S)**
Double 1/2" insulation **(D)**
Uninsulated **(R)** (1-75)

☑ Clamping

(See page 1-67)
Type B – Built-in bracket (Standard)
Type S – Built-in bracket with spring loaded screw
Type L – Latch and trunnion
Type F – Bent-up flange (Ears)

☑ Shell Overlap

(See page 1-67)
Provides T/C hole.
(Specify if required.)

☑ Termination

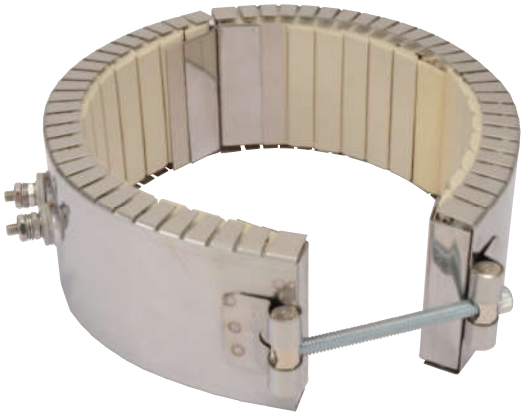
Select termination type from pages 1-68 through 1-74

Ceramic Band Construction Styles

One-Piece Band

The One-Piece Ceramic Band Heater is the basic design most often specified by OEMs and processors. It is available with all types of insulation, construction styles, clamping or termination variations.

Min. ID: 2" (50.8 mm)
Min. Width: 1" (25.4 mm)
Max. ID: 21" (533.4 mm)



Two-Piece Band

The Two-Piece Ceramic Band Heater is commonly used on sizes larger than 21" diameter or when it would be inconvenient to use a one-piece heater. It is available with all types of insulation, construction styles, clamping or termination variations.

Min. ID: 4" (101.6 mm)
Min. Width: 1" (25.4 mm)
Max. ID: 44" (1118 mm)

Larger sizes are manufactured in multiple sections. Watts and volts are specified per each section when ordering.

Ceramic Band Construction Variation

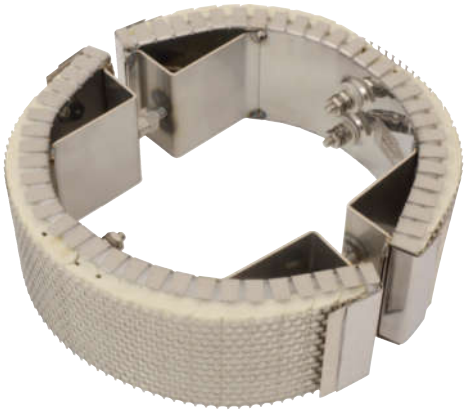
Type T: Reverse Band

Reverse Ceramic Band Heaters are intended for the outer surface of the band to heat the inner surface of a cylinder. These heaters use the same built-in insulation as normal ceramic bands and therefor can either reduce the power needed to heat an application to the desired temperature or offer some thermal protection to anything else that might also be inside the cylinder.

The specially designed internal brackets exert outward pressure to ensure good contact with the application surface. To aid in holding the internal components together during installation, reverse ceramic bands are supplied with a perforated stainless steel outer liner.

The outer diameter is the distinguishing characteristic and should match the inner diameter of the cylinder to be heated.

If airflow is needed for cooling, Tempco's Type R Uninsulated Ceramic Band with a perforated sheath is also available. This is also the same robust construction that can reach higher temperatures than other heater bands.



Min. ID: 5-1/2" (139.7 mm)
Min. Width: 1" (25.4 mm)
Max. ID: 44" (1117.6 mm)
Max. Width: 4" (101.6 mm)

View Product Inventory @ www.tempco.com

Ceramic Band Insulation Options

Standard Insulation (S): 1/4"

Built-In ceramic fiber insulation ¼" thick standard on all Ceramic Bands will reduce power consumption by 25 to 30 percent, and lower external temperatures.

Standard Insulation
Cross Section

Optional Double Insulation (D): 1/2"

For situations requiring additional insulation for lower external temperatures and increased electrical energy savings, Tempco offers Double Insulated Ceramic Bands with a full 1/2" thick ceramic fiber insulation. This will decrease power consumption by 35 to 37 percent when compared to uninsulated band heaters.

Double Insulation
Cross Section

Note: Not available for Reverse Construction

Ceramic Band Clamping Variations

Type B – Built-In Bracket (Standard)

The Built-In Bracket is the basic design most often specified by OEMs and processors. The standard screw used is 1/4-20. It is available with all types of insulation, construction styles, and termination variations.

Type S – Built-In Bracket with Spring-Loaded Screw

The Built-In Bracket can also be supplied with a spring- loaded screw. The spring-loaded clamp aids in absorbing thermal expansion.

Limitations –

One-Piece Bands
Min. ID: 2" (50.8 mm)
Min. Width: 1" (25.4 mm)

Two-Piece Bands
Min. ID: 4" (101.6 mm)
Min. Width: 1" (25.4 mm)

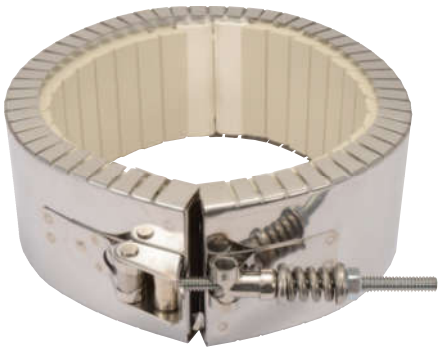
Type F – Bent-Up Flange (Ears)

The Bent-Up Flange (Ears) design is available with all types of insulation, construction styles, and termination variations.

Limitations –

One-Piece Bands
Min. ID: 2" (50.8 mm)
Min. Width: 1" (25.4 mm)

Two-Piece Bands
Min. ID: 4" (101.6 mm)
Min. Width: 2.5" (63.5 mm)



Type L – Latch and Trunnion

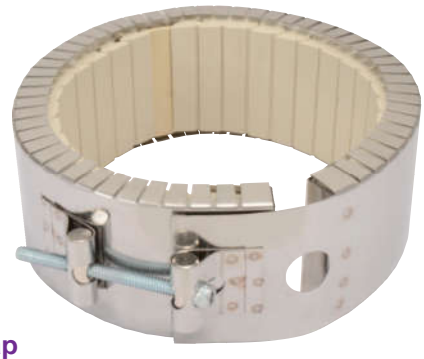
The spring-loaded Latch and Trunnion clamping system is ideal for bands over 12" in diameter to absorb thermal expansion and facilitate installation on large bands.

The Latch and Trunnion clamping system is available with all types of insulation, construction styles, and termination variations.

Limitations –

One-Piece Bands
Min. ID: 4" (101.6 mm)
Min. Width: 1" (25.4 mm)

Two-Piece Bands
Min. ID: 4" (101.6 mm)
Min. Width: 2" (50.8 mm)



Shell Overlap

The Shell Overlap design is the preferred method of providing a thermocouple mounting hole in a ceramic band heater. It is available with all types of insulation, construction styles, clamping and termination variations.

Limitations –

One-Piece Bands
Min. ID: 3" (76.2 mm)
Min. Width: 1-1/2" (38.1 mm)
Standard Hole: 3/4" (19.1 mm)

Two-Piece Bands
Min. ID: 4" (101.6 mm)
Min. Width: 2" (50.8 mm)
Standard Hole: 3/4" (19.1 mm)

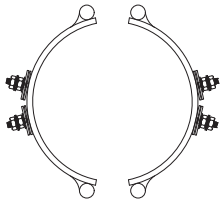
Ceramic Band Type T2 – Screw Terminals

Type T2 Screw Terminals are available with all types of insulation, construction styles, and clamping variations. They are considered to be standard on most band heaters under 2" in width unless otherwise specified. 10-32 post terminals are standard.

One-Piece Band

***Standard* Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/25A



Two-Piece Band

***Standard* Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/25A each half

Note: Not available for Reverse Construction

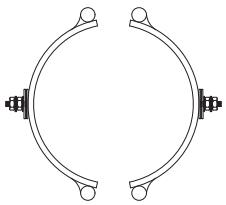
Ceramic Band Type T3 – Screw Terminals

Type T3 Screw Terminals are available with all types of insulation, construction styles, and clamping variations. They are considered to be standard on most band heaters unless otherwise specified. For use with leads, crimp terminals, or bus bars.

One-Piece Band

***Standard* Termination Location:**
opposite the gap; across center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/25A



Two-Piece Band

***Standard* Termination Location:**
center of each half; across center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 2" (50.8 mm)
- **Maximum Volts/Amps:** 480VAC/25A each half

***Available on* Reverse Band**

- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

Optional Igloo™ Ceramic Covers for Heaters with Screw Terminals

Igloo™ Ceramic Terminal Covers consist of two individual ceramic parts. They are available with all types of insulation, construction styles, and clamping variations. Unlike conventional ceramic caps, Igloo fully insulates any standard #10 terminal lugs used for electrical hook-ups.

Limitations

One-Piece Band with Type T2 or Type T3 Screw Terminals
Min. ID: 2" (50.8 mm) **Min. Width:** 1" (25.4 mm)

Two-Piece Band with Type T2 or Type T3 Screw Terminals
Min. ID: 4" (101.6 mm) **Min. Width:** 1" (25.4 mm)

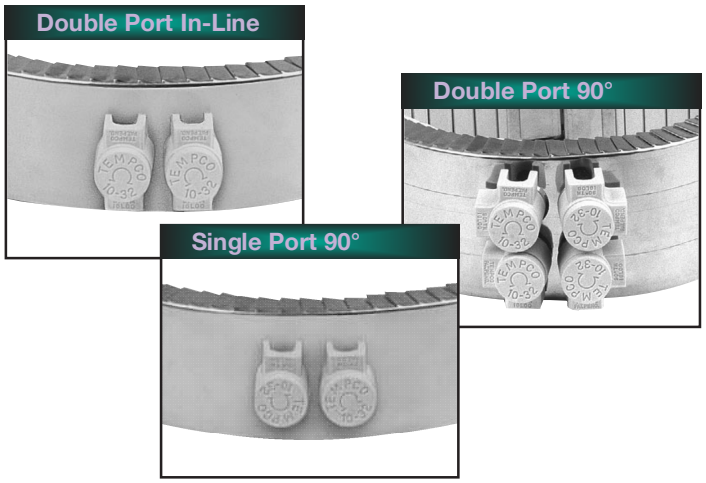
Reverse Band with Type T3 Screw Terminals
Min. ID: 5-1/2" (139.7 mm)

Three types of Igloo™ bases are available:

Type C6 — Double Port In-Line P/N CER-101-104
Type C7 — Double Port 90° P/N CER-101-106
Type C8 — Single Port P/N CER-101-107

Igloo™ caps are available in the following screw terminal size:

10-32 — P/N CER-102-101

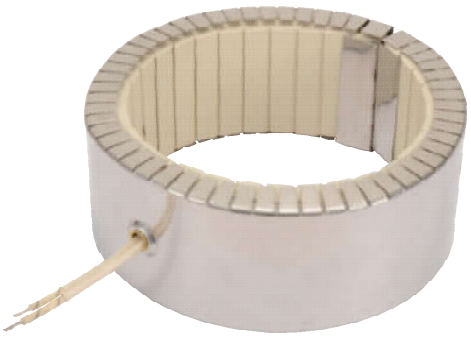


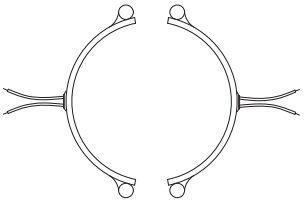
Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Ceramic Band Type L1 – Straight Lead Wires

Type L1 Straight Lead Wires are available with all types of insulation, construction styles, and clamping variations. They are used primarily on small diameter bands where clearance is limited. If applicable, screw terminals should always be specified due to the high heat generated by ceramic bands. The standard flexible leads are 10" long.

If longer leads are required, specify when ordering.





One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each

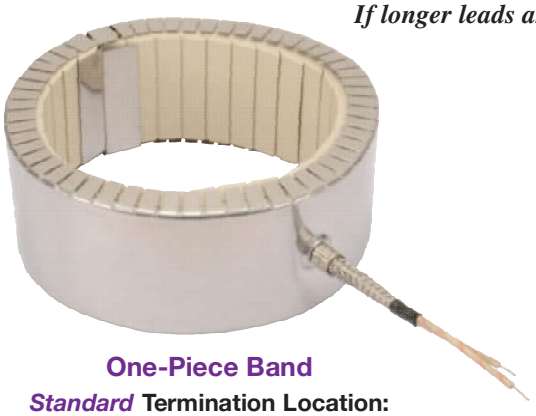
Available on **Reverse Band**

- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

Ceramic Band Type W1 – Abrasion Resistant Straight Wire Braid Leads

Straight Wire Braid Leads are available with all types of insulation, construction styles, and clamping variations. Wire braid leads offer sharp bending not possible with armor cable. If applicable, screw terminals should always be specified due to the high heat generated by ceramic bands. The standard leads are 10" of wire braid over 12" of flexible leads.

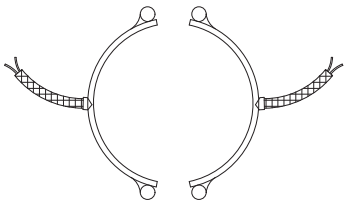
If longer leads are required, specify when ordering.



One-Piece Band

***Standard* Termination Location:**
opposite the gap; center of width

- ✻ **Minimum Inside Diameter:** 2" (50.8 mm)
- ✻ **Minimum Width:** 1" (25.4 mm)
- ✻ **Maximum Volts/Amps:** 480VAC/12.5A



Two-Piece Band

***Standard* Termination Location:**
center of each half; center of width

- ✻ **Minimum Inside Diameter:** 4" (101.6 mm)
- ✻ **Minimum Width:** 1" (25.4 mm)
- ✻ **Maximum Volts/Amps:** 480VAC/12.5A each half

***Available on* Reverse Band**

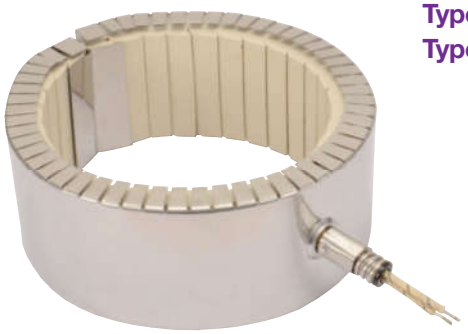
- ✻ **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

Ceramic Band Type R1 – Abrasion Resistant Straight Armor Cable

Straight Armor Cable is available with all types of insulation, construction styles, and clamping variations. Armor cable provides far superior protection to lead wires where abrasion is a constant problem. If applicable, screw terminals should always be specified due to the high heat generated by ceramic bands. The standard leads are 10" of armor cable over 12" of flexible leads.

If longer leads or electrical connectors are required, specify when ordering.

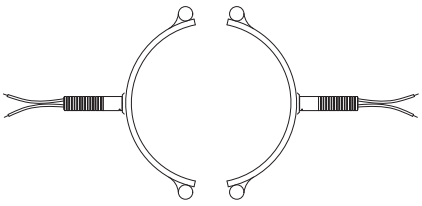
Type R1A – Galvanized Steel Armor Cable
Type R1B – Stainless Steel Armor Cable



One-Piece Band

***Standard* Termination Location:**
opposite the gap; center of width

- ✻ **Minimum Inside Diameter:** 2" (50.8 mm)
- ✻ **Minimum Width:** 1" (25.4 mm)
- ✻ **Maximum Volts/Amps:** 480VAC/12.5A



Two-Piece Band

***Standard* Termination Location:**
center of each half; center of width

- ✻ **Minimum Inside Diameter:** 4" (101.6 mm)
- ✻ **Minimum Width:** 1" (25.4 mm)
- ✻ **Maximum Volts/Amps:** 480VAC/12.5A each half

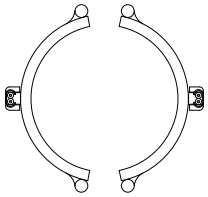
***Available on* Reverse Band**

- ✻ **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

Ceramic Band Type W2M – Right-Angle Wire Braid Leads, 90° to Heater

Stainless Steel Wire Braid exits perpendicular to the heater centerline through a low profile stainless steel cap. This cap acts as a strain relief which protects against excessive flexing or pulling of the lead wire. The standard leads are 10" of wire braid over 12" of flexible leads.

If longer leads are required, specify when ordering.



One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

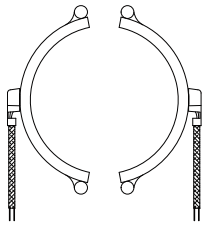
Available on **Reverse Band**

- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

Ceramic Band Type W5M – Right-Angle Wire Braid Leads, Parallel to Heater

Stainless Steel Wire Braid exits parallel to the heater centerline through a low profile stainless steel cap. This cap acts as a strain relief which protects against excessive flexing or pulling of the lead wire. The standard leads are 10" of wire braid over 12" of flexible leads.

If longer leads are required, specify when ordering.



One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

Available on **Reverse Band**

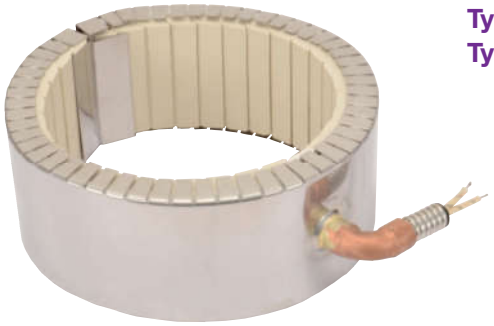
- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

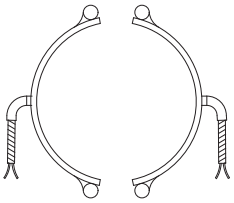
Ceramic Band Type R2 – Abrasion Resistant Right-Angle Armor Cable

Right-Angle Armor Cable is available with all types of insulation, construction styles, and clamping variations. It is used where space is limited and abrasion is a constant problem. If applicable, screw terminals should always be specified due to the high heat generated by ceramic bands. The standard leads are 10" of armor cable over 12" of flexible leads.

If longer leads or electrical connectors are required, specify when ordering.

Type R2A – Galvanized Steel Armor Cable
Type R2B – Stainless Steel Armor Cable





One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

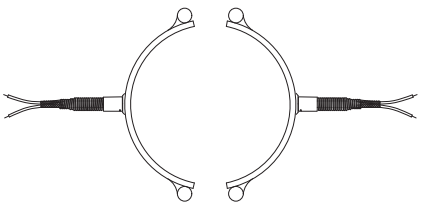
Available on **Reverse Band**

- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

A strain relief spring is attached to the heater at the termination exit to reduce strain on leads subjected to excessive flexing. The spring is 2-5/8" long. The flexible standard leads are 10" long with 2-1/2" of fiberglass sleeving.

If longer leads are required, specify when ordering.

Type S1A – Plain Leads and Strain Relief Spring
Type S1B – Stainless Steel Wire Braided Leads and Strain Relief Spring



One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1" (25.4 mm)
- **Maximum Volts/Amps:** 480VAC/12.5A each half

Available on **Reverse Band**

- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

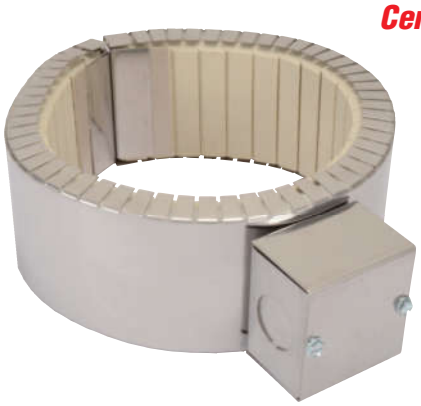
Made in USA

General Purpose Terminal Boxes: Type C2 & Type C5

Terminal Boxes are available with all types of insulation, construction styles, or clamping variations. It is a simple and economical way to protect employees from electric shock or prevent electric shorts that can result from exposed wiring on band heater electrical installations.

The Heavy Duty Terminal Boxes have a 1/2" trade size knockout (actual diameter 7/8") that will accept standard armor cable connectors. The boxes can be field assembled on band heaters that have a center distance between screws of 7/8". To simplify installation the boxes can be pre-wired with galvanized armor, stainless steel armor, or wire braid.

Ceramic Band Type C2 – Standard Terminal Box



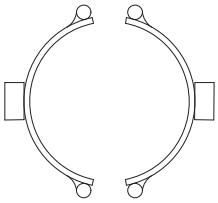
Type C2☐ Standard Box

C2A—Box only
C2B—with galvanized armor
C2C—with stainless steel armor
C2D—with wire braid

Box Size: 1-1/2"H × 1-1/2"W × 2-1/2"L for bands 1-1/2" to 2" wide

Box Size: 1-1/2"H × 2-1/8"W × 2-1/8"L for bands greater than 2" wide

NOTE: Heater dimensions will determine terminal configuration.



One-Piece Band

***Standard* Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/25A

Available on Reverse Band

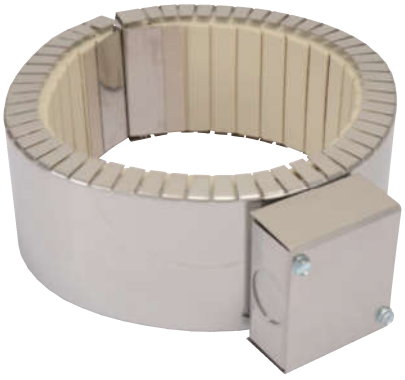
- **Minimum Inside Diameter:** 15" (381 mm)

Two-Piece Band

***Standard* Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/25A each half

Ceramic Band Type C5 – Low-Profile Terminal Box



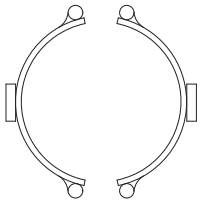
Type C5☐ Low Profile Box

C5A—Box only
C5B—with galvanized armor
C5C—with stainless steel armor
C5D—with wire braid
C5J—Box with lead wire

Box Size: 1"H × 1-1/4"W × 3"L for bands 1-1/2" to 2" wide

Box Size : 1"H × 2-1/4"W × 2"L for bands greater than 2" wide

NOTE: Heater dimensions will determine terminal configuration.



One-Piece Band

***Standard* Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/25A

Available on Reverse Band

- **Minimum Inside Diameter:** 15" (381 mm)

Two-Piece Band

***Standard* Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 1-1/2" (38.1 mm)
- **Maximum Volts/Amps:** 480VAC/25A each half

Note: If a Low Profile Box with cable or leads is required, it is strongly recommended to order it pre-wired by the factory.

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Quick Disconnect Plugs: Type P1, Type P2, Type P3 & Type P4

Quick Disconnect Plugs are available on any construction or clamping variation. These quick disconnect plug assemblies are highly recommended and should be used whenever possible. The combination of plug and cup assembly along with armor cable covered leads eliminates all live exposed terminals or wiring that can be a potential hazard to employees or machinery.

Type P1 and P3 assemblies are available with a straight or right-angle plug. Type P2 and P4 plug assemblies have a lower profile and are available with a straight plug only.

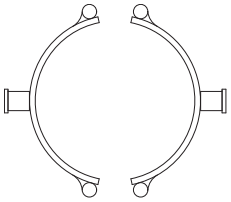
To simplify installation, band heaters with these assemblies can be supplied pre-wired using high temperature lead wire protected with armor cable. ***If longer leads are required, specify when ordering.***

Ceramic Band Type P1 – Quick Disconnect Plugs

Type P1Q shown

Type P1☐—Standard Cup Assembly

P1K—Cup Assembly only
P1L—w/straight plug only
P1M—w/90° plug only
P1N—w/straight plug & galvanized armor cable
P1O—w/straight plug & stainless steel armor cable
P1P—w/straight plug & wire braid
P1Q—w/90° plug & galvanized armor cable
P1R—w/90° plug & stainless steel armor cable
P1S—w/90° plug & wire braid



Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)

One-Piece Band

***Standard* Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2" (50.8 mm) depending on termination orientation

Available on Reverse Band

- **Minimum Inside Diameter:** 5-1/2" (139.7 mm)

Two-Piece Band

***Standard* Termination Location:** center of each half; center of width

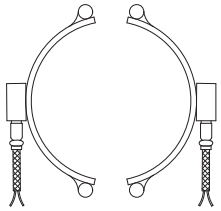
- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 2" (50.8 mm) depending on termination orientation

Ceramic Band Type P2 – Quick Disconnect Plugs

Type P2H shown

Type P2☐—Low Profile Assembly

P2F—Low profile assembly only
P2G—w/straight plug only
P2H—w/straight plug and galvanized armor cable
P2J—w/straight plug and stainless steel armor cable
P2K—w/straight plug and wire braid



Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)

One-Piece Band

***Standard* Termination Location:** opposite the gap; center of width

- **Minimum Inside Diameter:** 2" (50.8 mm)
- **Minimum Width:** 2" (50.8 mm)

Available on Reverse Band

Consult Tempco with your requirements.

Two-Piece Band

***Standard* Termination Location:** center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 2" (50.8 mm)

CONTINUED

Made in USA

Ceramic Band Type P3 – DIN 49458 A/B Quick Disconnect Plugs

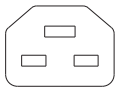
Continued from previous page…

Type P3☐—Vertical Box Assembly

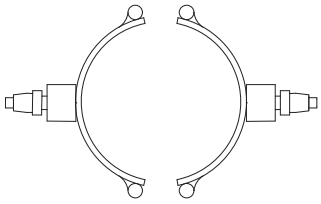
P3A—Box assembly only
P3B—Box assembly w/straight plug
P3C—Box assembly w/right-angle plug

Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)



Standard Pin Orientation



One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 3" (76.2 mm)
- **Minimum Width:** 2" (50.8 mm)

***Available on* Reverse Band**

Consult Tempco with your requirements.

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 2" (50.8 mm)

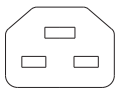
Ceramic Band Type P4 – DIN 49458 A/B Quick Disconnect Plugs

Type P4☐—Horizontal Box Assembly

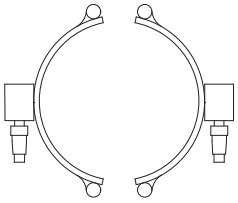
P4A—Box assembly only
P4B—Box assembly w/straight plug

Plug Electrical Ratings

- **2-Pole 3-Wire Grounding**
- **Maximum Volts:** 250 VAC
- **Maximum Amps:** 16A
- **Maximum Temperature:** 392°F (200°C)



Standard Pin Orientation



One-Piece Band

Standard **Termination Location:**
opposite the gap; center of width

- **Minimum Inside Diameter:** 2-1/2" (63.5 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

***Available on* Reverse Band**

Consult Tempco with your requirements.

Two-Piece Band

Standard **Termination Location:**
center of each half; center of width

- **Minimum Inside Diameter:** 4" (101.6 mm)
- **Minimum Width:** 2-1/2" (63.5 mm)

Ceramic Band Heaters — Cool TO-THE Touch Shroud Systems

Type R Uninsulated Ceramic Band Heaters

This system was developed to provide another means of heating and cooling high temperature extrusion processes. Typically cast-in bronze or brass units are used in applications in which heater temperatures can be in excess of 700°F (371°C). Cast-in bronze or brass heaters are expensive and since they weigh approximately three times their aluminum counterparts they are difficult to install.

In response to this challenge, Tempco's engineers have developed a low mass, non-thermally insulated ceramic band heater to work in tandem with a highly efficient stainless steel sheet metal shroud for high temperature heating and cooling extrusion processes.

Forced air blowers are used for cooling. The ambient air-flow enters the shroud, circulates around the ceramic heater and barrel, removes the heat from the heater and the process and exits the shroud opposite the entrance port.

Type R Uninsulated Ceramic Band Heater

Cool TO-THE Touch™ Shroud System with Type RCC

Construction Characteristics

Type R construction is an uninsulated ceramic band heater with a perforated Stainless Steel outer shell for more efficient cooling. It is typically used in multiple quantities with forced air cooling systems.

Consult Tempco with your requirements.

Type RCC (Ribcage) Heating Mounting Configuration

Tempco's **Type RCC** (Rib Cage) Air Cooled System uses multiple Type R Ceramic Band Heaters under one air cooled shroud. Type R heaters are typically arranged with spaces between the heaters to enhance the cooling of the barrel when external heat is no longer required.

The Cool TO-THE Touch dual layer shroud uses an inner stainless steel solid layer thermally isolated from the heater, providing a path for the forced cooling air. An outer Stainless Steel perforated layer provides optimal venting and heat dissipation while providing personnel safety.

See catalog page 3-29 for shroud assembly details.

Complete Information on Shrouds Systems can be found in Section 3, pages 3-26 through 3-47

PERFORMANCE RATINGS FOR HEATER BAND

Maximum Watt Density: 50 W/in² (8 W/cm²)

Maximum Temperature: 900°F (482°C)

MECHANICAL

Standard Width Increments: 1/8" (3.2 cm)

Maximum Width: depends on ratio of diameter to width

Minimum Width: 1" (25.4 mm)

Standard Gap: 3/8" ±1/8" (9.5 ±3.2 mm)

ELECTRICAL RATINGS

Resistance tolerance: +10%, –5%

Wattage tolerance: +5%, –10%

Maximum Voltage: 480 single or 3-phase (when applicable)

Maximum Amperage: Screw Terminals: 25 Amps per circuit
Lead Wire: 10 Amps per circuit

Made in USA

Additional Features

Electrical VARIATIONS

Three-Phase — On very high wattage band heaters it would be advantageous to set up the wiring three-phase to reduce the current load across a single conductor. Three-phase wiring is available with all types of insulation, construction styles, and clamping variations.

Limitations
Minimum width: 3" (76.2 mm)

Dual Voltage — Band heaters can be designed using 3-wire series/parallel circuits for dual voltage applications. Whether the heater is run on the high or low voltage, the wattage will be the same. Dual Voltage wiring is available with all types of insulation, construction styles, or clamping variations.

Limitations
Minimum width: 2" (50.8 mm)

Single-Phase/Three-Phase — Ceramic Band Heaters can be designed with multiple circuits to operate single or three-phase.

Lead VARIATIONS

Electrical Plugs — Industry standard NEMA twist lock electrical connectors are available. The plugs can be attached to fiberglass leads, armor cable or wire braid. Electrical Plugs can be added to any termination variation. See Section 15 page 15-15.

Terminal Lugs — Various types of crimp terminals can be attached to the heater leads to make wiring into applications quick and easy. High temperature [1200°F (649°C)] ring terminals and nylon or PVC insulated terminals are available. Spade, ring, and right-angle or straight quick disconnect type terminals can be attached to the leads. See Section 15 page 15-18.

High Temperature Lead Wire — When required, high temperature lead wire can be used. The wire is insulated with mica tapes over the stranded nickel conductors and then treated fiberglass overbraid. See Section 15 page 15-2.

Maximum temperature: 450°C (842°F)

Ground Terminal or Lead — For those applications requiring a separate ground terminal or lead attached to the heater sheath. A Ground Terminal or Lead is available on any construction or termination variation.

Other VARIATIONS

Oversize Gap — The nominal gap is 3/8". If a larger gap is required for probes or thermocouples, specify when ordering.

Installation Accessories Available for Immediate Delivery

- *High Temperature Terminal Lugs*
- *Igloo™ Ceramic Insulating Covers*
- *UL Listed Plugs*
- *High Temperature Lead Wire 842°F (450°C)*
- *Armor Cable*
- *Stainless Steel Braid*
- *High Temperature Sleeving*
- *High Temperature Mica Insulated Wiring Harnesses 842°F (450°C)*
- *Thermocouples*
- *Temperature Controllers*
- *High Temperature Fiberglass Tape*

All Items Available from Stock

Installation RECOMMENDATIONS

1. Disconnect electric power to the machine and/or heaters prior to installing or replacing heaters.

2. Do not install heaters in areas where combustible gases, vapor or dust is presentt.

3. Reduce the number of narrow or two-piece bands used on the barrel. Ceramic bands are very flexible and can be made in large widths and one-piece construction for easy installation. This eliminates heat losses between narrow bands and sharply reduces costly installation labor.

4. Use a heater that closely matches the wattage requirements. This will decrease the frequency of cycling and temperature overshoot, thereby increasing the life of the heater.

5. When replacing any other type of non-insulated band heater with Tempco ceramic band heaters using standard or double insulation, you can decrease your total operating wattage by approximately 15 to 20 percent.

6. To prevent overheating and heater failure, adequate temperature controls should be installed. The thermocouples must be kept free of contaminants and checked for good response to temperature changes. A faulty thermocouple can cause the destruction of an entire heating zone due to overheating. Tempco offers a wide variety of temperature controls and thermocouples from stock for immediate delivery. Consult the index of this catalog for appropriate pages.

7. Make certain that all barrel surfaces are clean and free of contaminants. During operation, the band heaters and cylinder surface must be kept free of all contaminants that might liquefy under heat and find their way into the heater windings, carbonizing and becoming conductive. The smallest amount of contamination can cause electrical shorts, resulting in heater failure.

8. Position heater bands on the barrel.

9. Take up all the slack by tightening the outer housing until the serrated edges come firmly in direct contact with the cylinder. Do not overtighten to the point where the serrated edges begin to collapse and thrust outward. At this point you are compressing the ceramic insulation and decreasing its insulating value. Unlike all other types of band heaters, ceramic bands heat by radiation as well as conduction and they do not require the same clamping force that is essential with all other types of band heaters. The proper torque is approximately 8 ft/lbs.

10. For heaters with screw terminals, remove the top nut and flat washers from the power screw terminals. Do not remove or loosen the bottom nut on the power screw terminals.

11. All electrical wiring of heater bands should be done by a qualified electrician using proper, dry personal protective equipment.

12. Use only lead wire with high temperature insulation and proper gauge size. See page 15-2 in the accessories section.

13. When connecting power leads to screw terminals make certain that barrels of terminal lugs are not facing down toward the heater case, which will create a short circuit.

14. Ensure leads are not kinked or sharply bent around other obstructions.

15. Make sure the voltage input to the heater bands does not exceed the voltage rating that is stamped on the heater band

16. It is recommended that an amperage reading is taken for each heater to verify proper wiring. (Amps = Watts ÷ Volts).

17. Insulate all live electrical connections per applicable safety standards.

18. Install shrouds around the machine to meet applicable safety requirementse.

19. Once installed, check surroundings to make sure that contaminants won't get on the heater while the unit is in operation. Accumulation of contaminants on heaters can cause premature heater failure.

It is imperative that upon start-up of new machines at customer facilities, all of the aforementioned parameters are double checked by qualified field service personnel.

Exposed electrical wiring on band heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Made in USA

Tubular Construction Barrel & Nozzle Band Heaters

Design Features

- *Contamination-Proof*
- *Higher Watt Densities*
- *Temperatures Up to 1000°F (540°C)*
- *Rugged Durable Construction*
- *Greater Reliability*
- *Various Lead Terminations*
- *Optional Monel® Shroud*

Designed to Perform Under Adverse Conditions

Tempco Tubular Band Heater design stands apart from all other similar type band heaters. This band heater is capable of performing under the most adverse conditions. Highly recommended for heating applications where premature nozzle band heater burn-out on plastic injection molding machines is a constant problem due to contamination from plastic overflow or other contaminants. Proven to be very effective for processing Teflon® and high temperature engineering resins, providing long, trouble-free service.

Standard Specifications and Tolerances of Tubular Band Heaters. If tighter tolerances are required consult Tempco.

PERFORMANCE RATINGS

Maximum Temperature: 1000°F (540°C)
Maximum Watt Density: 40 W/in^2 (7 W/cm^2)

ELECTRICAL RATINGS

Resistance Tolerance: +10%, –5%
Wattage Tolerance: +5%, –10%
Maximum Volts: 277 Volts
Maximum Watts: Depends on diameter
Maximum Amps: 30 Amps

MECHANICAL

Minimum Width: 1-1/2" (38.1 mm)
Minimum Inside Diameter: 1-1/2" (38.1 mm)
Standard Gap: 3/8"
Holes: Can be accommodated. Consult Tempco with your requirements.

Construction Characteristics

Incoloy® 840 sheath .315 diameter tubular heating elements are used as heat source. The tubular element is formed to the specified inside diameter to produce a snug slip-on fit.

A low thermal expansion alloy is used to make the strap that houses the tubular heating element. The strap edges are rolled over the element to prevent the strap from separating from the tubular heater. Specially designed mounting brackets are spot welded to the strap, providing the clamping force required to tightly draw the tubular heater against the cylinder.

Advantages and Variations

The straight section of the tubular heater is fully annealed, remaining ductile for field bending. Normally done to guide the leads away from machine obstructions.

If bending is required—

A. Secure the tubular band heater to the cylinder in the position required.

B. Draw the strap as tight as possible.

C. Using a piece of 1/2" water pipe, insert the leads and tubular element into the pipe up to the point where you need the bend.

Proceed to bend with a generous radius.

CAUTION *Don't Make a Sharp Bend As You Will Crack the Heating Element.*

Ordering Information

Standard — Select a Tubular Band heater from the table. All Tubular Band Heaters listed are supplied with Type W3 termination, 24" long.

Custom Engineered/Manufactured — An electric heater can be very application specific; for sizes and ratings not listed **TEMPCO** will design and manufacture a Tubular Band Heater to meet your requirements.

Standard lead time is 3 weeks.

Please Specify the following:

- ❑ Inside Diameter
- ❑ Lead Cable/Braid Length
- ❑ Width
- ❑ Voltage and Wattage
- ❑ Termination

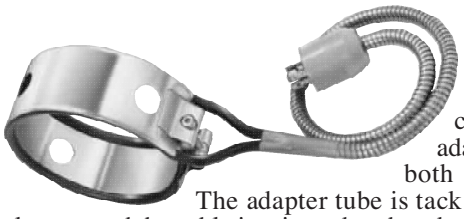
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Standard (Non-Stock) Tubular Band Heaters

Tubular band heaters listed have Type W3 termination, 24" long.

ID in	Width in	Wattage	Watt Density	Part Number 120V	240V
1½	1	200	42	TNB01001	—
1½	1½	200	28	TNB01003	—
1½	2	300	31	TNB01005	—
1½	2½	300	25	TNB01007	—
1¾	1	200	36	TNB01009	—
1¾	1½	300	36	TNB01011	TNB01012
1¾	2	400	36	TNB01013	TNB01014
1¾	2½	400	29	TNB01015	TNB01016
2	1	250	39	TNB01017	TNB01018
2	1½	250	26	TNB01019	—
2	2	350	27	TNB01020	—
2	2½	450	28	TNB01021	—
2¼	1	250	35	TNB01022	TNB01023
2¼	1½	350	33	TNB01024	—
2¼	2	350	24	—	TNB01025
2¼	2½	450	25	—	TNB01026
2½	1	300	38	TNB01027	TNB01028
2½	1½	350	29		TNB01029
2½	1½	400	33	TNB01030	—
2½	1½	750	62	—	TNB01031
2½	2	450	28	—	TNB01032
2½	2½	450	22	—	TNB01033
2¾	1	300	34	TNB01034	TNB01035
2¾	1½	350	27	TNB01036	—
2¾	2	450	26	—	TNB01037
2¾	2½	600	27	—	TNB01038
3	1	300	31	TNB01039	TNB01040
3	1½	450	31	—	TNB01041
3	2	600	31	—	TNB01042
3	2½	600	25	—	TNB01043
3¼	1½	450	29	—	TNB01044
3¼	2	600	29	—	TNB01045
3¼	1½	300	18	—	TNB01046
3¼	3	700	21	—	TNB01047
3½	1½	200	38	TNB01048	—
3¾	1⅞	465	21	TNB01049	—
5	1½	600	25	—	TNB01050
5	2	600	19	TNB01051	—
5	2	2000	63	—	TNB01052
5	2¼	1150	32	—	TNB01053
5¼	2¼	900	24	—	TNB01054
5¼	3	300	6	—	TNB01055
5½	2	600	17	TNB01056	TNB01057
6	2	600	15	TNB01058	TNB01059

Type C3—Single Armor Cable Out Top



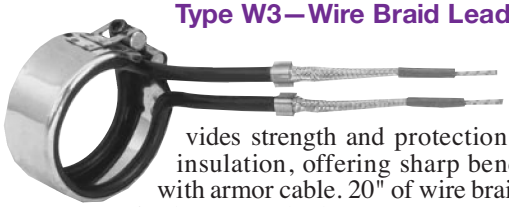
Armor Cable provides excellent protection against abrasion and contaminants. The cable exits through an adapter that encapsulates both tubular heater ends. The adapter tube is tack welded to the heating element and the cable is crimped to the adapter for maximum security and seal protection. for maximum security and seal protection. 20" of cable and 24" flexible leads are standard.

Type C3A—Galvanized Armor Cable
Type C3B—Stainless Steel Armor Cable

Options:

✳ Male or female plugs attached to leads.
For plug selection, see Accessory Section, page 15-15.

Type W3—Wire Braid Leads *(Standard Termination)*

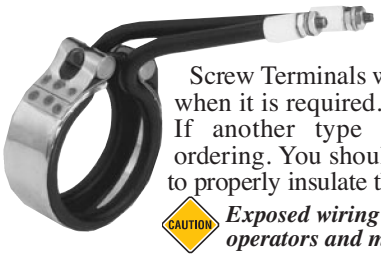


Wire Braid provides strength and protection to the lead wire insulation, offering sharp bending not possible with armor cable. 20" of wire braid and 24" flexible leads are standard.

Options:

✳ Longer leads or braid
✳ Male or female plugs attached to leads. For plug selection, see Accessory Section, page 15-15.

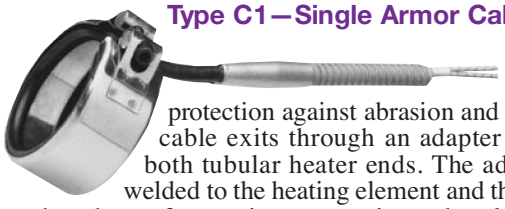
Type T1—Screw Terminals



Screw Terminals will provide a rigid connection when it is required. Standard thread size is 8-32. If another type is required, specify when ordering. You should make special arrangements to properly insulate the electrical connections.

CAUTION ***Exposed wiring is a potential hazard to operators and machine.***

Type C1—Single Armor Cable



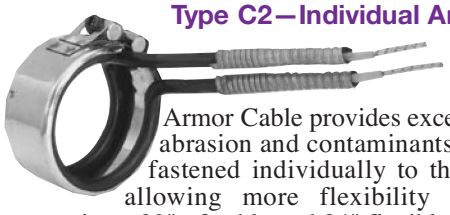
Armor Cable provides excellent protection against abrasion and contaminants. The cable exits through an adapter that encapsulates both tubular heater ends. The adapter tube is tack welded to the heating element and the cable is crimped to the adapter for maximum security and seal protection. 20" of cable and 24" flexible leads are standard.

Type C1A—Galvanized Armor Cable
Type C1B—Stainless Steel Armor Cable

Options:

✳ Male or female plugs attached to leads.
For plug selection, see Accessory Section, page 15-15.

Type C2—Individual Armor Cable

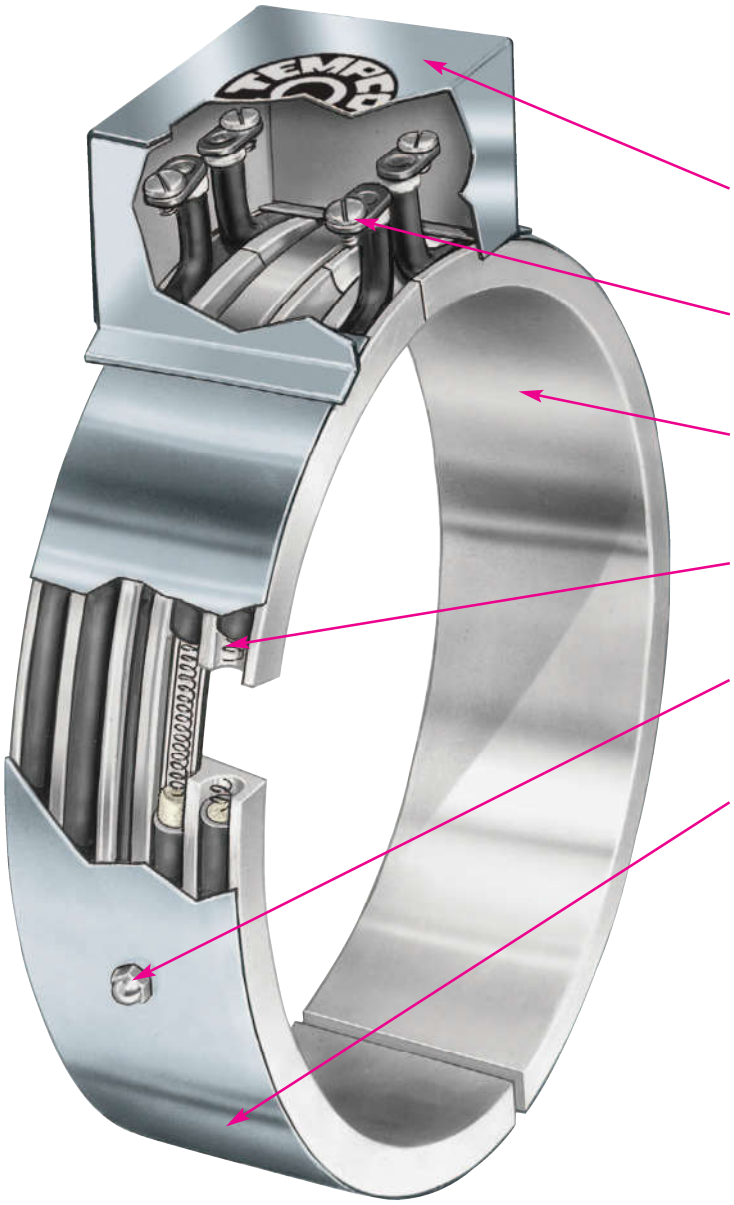


Armor Cable provides excellent protection against abrasion and contaminants. The cable is securely fastened individually to the tubular heater ends, allowing more flexibility for electrical wiring connections. 20" of cable and 24" flexible leads are standard.

Type C2A—Galvanized Armor Cable
Type C2B—Stainless Steel Armor Cable

Maxiband Heaters

Made in USA



Maxiband®

The Most Sought After Band Heater

A General purpose terminal box offers excellent protection to the exposed terminals. To simplify electrical wiring, the box has two 1/2" trade size knockouts that will accept standard conduit or flexible armor cable connectors.

B Right-angle terminal lugs with 10-32 binding head screws provide ease of electrical wiring.

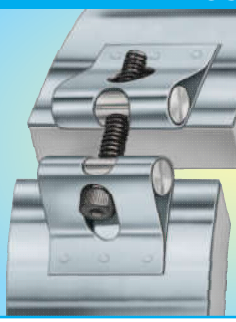
C The channels in the specially designed extruded aluminum track have been precisely sized to accept a .315 diameter tubular heating element, and provide an excellent heat sink for rapid heat transfer and good temperature uniformity.

D Ruggedly constructed .315 diameter tubular heating elements are the heat source for Maxiband Heaters, providing excellent life and long, trouble-free service.

E Crown nuts are located at 90° from the ends that fasten the clamping strap to the aluminum track, keeping the entire assembly together, providing ease of installation.

F The strap is made from a Low Thermal Expansion Alloy. It hinges at the terminal end to allow for easy installation. Specially designed mounting brackets with 1/4"-20 socket cap screws, located 180° from the terminal end, provide the clamping force required to tightly draw the heater assembly to the cylinder being heated.

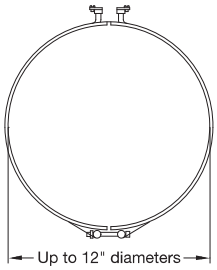
MOUNTING BRACKETS

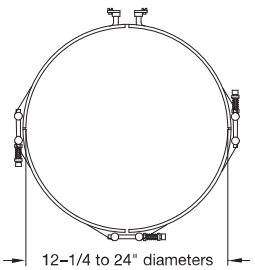


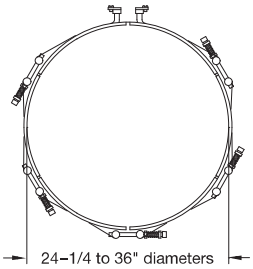
The number of brackets used is dependent on the Maxiband diameter.

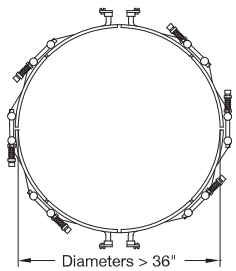
When there is only one bracket it is located 180° from the terminals.

Typical Maxiband Clamping









Maxiband® Heaters

Design Features

- ✳ *Quick Installation*
- ✳ *Rugged, Durable Construction*
- ✳ *Contamination Proof*
- ✳ *Various Lead Terminations*
- ✳ *Exceptionally Long Life*
- ✳ *Excellent Heat Transfer*
- ✳ *Excellent Temperature Uniformity*

Heat and Liquid Cool Maxibands *(MXB)*

Stainless steel tubing for liquid cooling is placed in the additional channels of the aluminum track next to the tubular heater. The overall low mass construction and high thermal conductivity of the aluminum provides extremely uniform surface temperatures and rapid cooling cycles.

Cool Only Maxibands *(MXC)*

Stainless steel tubing for liquid cooling is placed in the aluminum track.

Designed for Durability and Trouble-Free Service

Tempco has been manufacturing Maxiband heaters since 1975. The Maxiband is a high quality, durable band heater providing more efficient heating and cooling as well as a longer life compared to other types of band heaters. Due to the rugged construction characteristics of this type of band heater, Maxiband has proven to be extremely valuable and has become the most sought after band heater of its type for plastic injection molding machines, extruders, and blow molding equipment. The initial cost is easily absorbed by the sharp reduction in downtime and labor costs involved in replacing burned-out, less efficient band heaters.

Construction Characteristics

Maxiband heaters are manufactured in five standard widths: 3/4", 1-1/2", 2-1/2", 3", and 4". They are available in a full range of standard diameters; construction variations for heating only, heat and cool, and cooling only; electrical ratings and a complete arrangement of various types of terminations to accommodate your specific application. For heating only standard sizes and ratings, see pages 1-82 through 1-86.

Maxiband MXB heaters, with heat and liquid cooling capabilities, incorporate stainless steel tubing placed in the additional channels of the aluminum track next to the tubular heater. The overall low mass construction and high thermal conductivity of the aluminum provides extremely uniform surface temperatures and rapid cooling cycles.

The low thermal expansion strap securely fastened to the aluminum track segments provides a built-in hinge, keeping both halves together at all times, making handling and installation easier. Specially designed integral mounting brackets are welded to the strap, providing the clamping force required to draw the heater assembly evenly and tightly to the cylinder.

The straps are equipped with clamping brackets with 1/4"-20 socket head cap screws. On Maxibands exceeding 12" in diameter, spring-loaded screws provide the essential clamping force required in large diameter Maxibands to maintain positive contact with the cylinder being heated. On very large diameter Maxibands, the tubular element required becomes excessively long; therefore, two elements per half are used, each tubular element heating a 90° section of a Maxiband heater. In this case, two terminal boxes are required. A typical application for this type of Maxiband construction is heating the die heads of plastic blown film processing machines.

Maxiband heaters are constructed as sets. Each half consists of one tubular heating element and one aluminum track segment. The tubular heaters are always rated at half the total wattage of the set and full rated voltage. For better configuration on larger diameter cylinders, Maxibands exceeding 12" in diameter have the aluminum track segments in quadrants (see page 1-80 for details).

PERFORMANCE RATINGS

Maximum Temperature: 650°F (350°C)
Nominal Watt Density: 35 W/in² (5.4 W/cm²)

ELECTRICAL RATINGS

Maximum Voltage: 277VAC per half
Maximum Wattage: Depends on diameter and number of elements used
Maximum Amperage: 30 amps per circuit
Resistance Tolerance: +10%, –5%
Wattage Tolerance: +5%, –10%

STANDARD GAP

Up to 11" ID—1/4" gap. As the diameter increases, the gap will also increase accordingly in order to accommodate the thermal expansion of the aluminum track.

HEATER THICKNESS — 1/2"

PHYSICAL SIZE CONSTRUCTION LIMITATIONS

Minimum Inside Diameter: 3-1/2" (Due to manufacturing constraints, some wattages/voltages may not be available in smaller heater sizes.)

Available Heater Widths

Maxiband Type	3/4"	1-1/2"	2-1/2"	3"	4"
Heating Only	•	•	•	•	•
Heat and Cool	N/A	N/A	•	•	•
Cooling Only	•	•	•	•	•

Cooling Tube Specifications

Heater Width	3/4"	1-1/2"	2-1/2"	3"	4"
Cooling Tube Diameter	3/8"	3/8"	3/8"	3/8"	3/8"
Cooling Tube Extension	4"	4"	4"	4"	4"
Cooling Tube Material	Stainless Steel				

Holes

Heater Width	3/4"	1-1/2"	2-1/2"	3"	4"
Maximum Size Hole	N/A	7/16"	7/16"	9/16"	9/16"

Hole is located in center of heater width; see page 8-17 for mounting hole location guidelines. For special hole arrangements, supply Tempco with a detailed drawing of your requirements.

Stock and Standard (Non-Stock) Maxibands (Heat Only) — 0.75 in (19.1 mm) Width

Stock Items Are Shown In RED

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 60V	Part Number 120V	Part Number 240V
3½	88.9	310	41	6.4	MXH00100	—	—
4	101.6	325	37	5.8	MXH00101	—	—
4½	114.3	370	38	5.8	MXH00102	—	—
5½	139.7	455	37	5.8	—	MXH00103	—
6	152.4	500	37	5.8	—	MXH00104	—
6¼	158.8	600	43	6.7	—	**MXH00105**	—
7	177.8	600	38	5.9	—	MXH00107	—
8	203.2	660	36	5.7	—	MXH00108	—
10	254.0	850	37	5.8	—	—	MXH00109
10½	266.7	900	38	5.8	—	—	MXH00110
12	304.8	700	25	3.9	—	—	MXH00111
13	330.2	1000	33	5.2	—	—	MXH00112
20	508.0	1570	34	5.2	—	—	MXH00113
22	558.8	1240	24	3.8	—	—	MXH00114
25	635.0	1450	25	3.9	—	—	MXH00115
28	711.2	1100	17	2.6	—	—	MXH00116
28	711.2	2100	32	5.0	—	—	MXH00117

Stock and Standard (Non-Stock) Maxibands (Heat Only) — 1.5 in (38.1 mm) Width

Stock Items Are Shown In RED

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3½	88.9	300	22	3.4	MXH00643	—
3½	88.9	315	23	3.6	MXH01140	—
3½	88.9	475	35	5.5	MXH01141	MXH00121
3½	88.9	500	37	5.7	MXH01142	—
3½	88.9	550	41	6.3	MXH01143	—
3¾	95.3	600	41	6.3	MXH01144	MXH00124
3¾	95.3	700	48	7.4	MXH01145	—
4	101.6	550	35	5.4	—	MXH00126
4	101.6	625	39	6.1	—	MXH00127
4	101.6	700	44	6.8	—	MXH00128
4	101.6	750	47	7.3	—	MXH00129
4	101.6	875	55	8.6	—	**MXH00130**
4¼	108.0	675	40	6.1	—	MXH00131
4¼	108.0	780	46	7.1	—	**MXH00132**
4⅜	111.1	675	38	5.9	—	MXH00133
4⁷⁄₁₆	112.7	725	40	6.3	—	MXH00134
4½	114.3	500	27	4.3	—	MXH00136
4½	114.3	600	33	5.1	—	MXH00137
4½	114.3	650	36	5.5	—	MXH00138
4½	114.3	725	40	6.2	—	MXH00139
4½	114.3	810	44	6.9	—	MXH00140
4½	114.3	850	47	7.2	—	MXH00141
4¾	120.7	650	34	5.2	—	MXH00142
4¾	120.7	750	39	6.0	—	MXH00143
5	127.0	580	28	4.4	—	MXH00144
5	127.0	800	39	6.0	—	**MXH00145**
5	127.0	925	45	7.0	—	MXH00146
5	127.0	1400	68	10.6	—	MXH00147

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
5⅛	130.2	800	38	5.9	MXH00148
5¼	133.4	600	28	4.3	**MXH00149**
5¼	133.4	970	45	6.9	MXH00150
5¼	133.4	975	45	7.0	MXH00151
5¼	133.4	1000	46	7.1	MXH00152
5½	139.7	875	38	5.9	MXH00153
5½	139.7	950	41	6.4	MXH00154
5½	139.7	1015	44	6.9	MXH00155
5¾	146.1	900	37	5.8	MXH00156
5¾	146.1	950	39	6.1	MXH00157
6	152.4	710	28	4.4	MXH00159
6	152.4	750	30	4.6	MXH00160
6	152.4	950	38	5.8	MXH00161
6	152.4	1100	44	6.7	MXH00162
6¼	158.8	1000	38	5.9	MXH00163
6½	165.1	500	18	2.8	MXH00164
6½	165.1	750	27	4.2	MXH00165
6½	165.1	900	33	5.0	**MXH00166**
6½	165.1	950	34	5.3	MXH00167
6½	165.1	1000	36	5.6	MXH00168
6½	165.1	1050	38	5.9	MXH00169
6½	165.1	1200	43	6.7	MXH00170
6¹¹⁄₁₆	169.8	1000	35	5.4	MXH00171
6¾	171.5	1125	39	6.1	MXH00172
7	177.8	500	17	2.6	MXH00173
7	177.8	850	28	4.4	MXH00174
7	177.8	1000	33	5.2	MXH00175

Note: Part Numbers shown are for Maxiband Heaters with type "S" termination. For details see page 1-87.

TEMPCO Since 1972

Maxiband®

Stock and Standard (Non-Stock) Maxibands (Heat Only) — 1.5 in (38.1 mm) Width

Stock Items Are Shown In RED

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
7	177.8	1100	37	5.7	MXH00176
7	177.8	1300	43	6.7	**MXH00177**
7¼	184.2	1175	38	5.8	MXH00178
7½	190.5	900	28	4.3	MXH00179
7½	190.5	1200	37	5.8	MXH00180
7⅝	193.7	1200	36	5.6	MXH00181
7¾	196.9	1250	37	5.8	MXH00182
8	203.2	550	16	2.5	MXH00183
8	203.2	800	23	3.6	MXH00184
8	203.2	1100	32	4.9	MXH00185
8	203.2	1200	35	5.4	MXH00186
8	203.2	1300	37	5.8	MXH00187
8	203.2	1475	43	6.6	MXH00188
8½	215.9	1175	32	4.9	MXH00189
8½	215.9	1200	32	5.0	MXH00190
8½	215.9	1375	37	5.8	**MXH00191**
8½	215.9	1400	38	5.9	MXH00192
8½	215.9	1500	40	6.3	MXH00193
8¾	222.3	1000	26	4.1	MXH00194
8¾	222.3	1400	37	5.7	MXH00195
9	228.6	1100	28	4.3	MXH00196
9	228.6	1390	35	5.5	MXH00197
9	228.6	1475	37	5.8	MXH00198
9	228.6	1550	39	6.1	MXH00199
9	228.6	1675	43	6.6	**MXH00200**
9¼	235.0	1450	36	5.5	MXH00201
9¼	235.0	1500	37	5.7	MXH00202
9½	241.3	1300	31	4.8	MXH00203
9½	241.3	1325	32	4.9	MXH00204
9½	241.3	1550	37	5.8	MXH00205
9½	241.3	1765	42	6.5	MXH00206
9¾	247.7	1810	42	6.5	MXH00207
10	254.0	1150	26	4.0	MXH00208
10	254.0	1350	31	4.7	MXH00209
10	254.0	1625	37	5.7	MXH00210
10¼	260.4	1425	31	4.9	MXH00211
10½	266.7	1450	31	4.8	MXH00212
10½	266.7	1700	37	5.7	MXH00213
11	279.4	1000	20	3.2	MXH00214
11	279.4	1300	27	4.1	MXH00215
11	279.4	1500	31	4.8	MXH00216
11	279.4	1775	36	5.6	MXH00217
11	279.4	2000	41	6.3	MXH00218
11¼	285.8	1825	36	5.7	MXH00219
11¼	285.8	2075	41	6.4	MXH00220
11½	292.1	1875	37	5.7	MXH00221
11⅝	295.3	1875	36	5.6	MXH00222
11¾	298.5	1000	19	3.0	MXH00223
12	304.8	840	16	2.4	MXH00224
12	304.8	1250	23	3.6	MXH00225
12	304.8	1400	26	4.1	MXH00226
12	304.8	1950	36	5.6	MXH00227

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
12	304.8	2000	37	5.8	MXH00228
12	304.8	2500	47	7.2	MXH00229
12½	317.5	2100	38	5.8	MXH00230
12¾	323.9	2100	37	5.7	MXH00231
13	330.2	1400	24	3.7	MXH00232
13	330.2	1500	26	4.0	MXH00233
13	330.2	1525	26	4.1	MXH00234
13	330.2	1800	31	4.8	MXH00235
13	330.2	2150	37	5.7	MXH00236
13¾	349.3	2265	37	5.7	MXH00237
13 15/16	354.0	2125	34	5.3	**MXH00238**
14	355.6	1200	19	3.0	MXH00239
14	355.6	1600	25	3.9	MXH00240
14	355.6	2275	36	5.6	MXH00241
14	355.6	2500	40	6.2	MXH00242
14	355.6	2600	41	6.4	MXH00243
14½	368.3	3100	47	7.4	MXH00244
15	381.0	1000	15	2.3	MXH00245
15	381.0	1450	21	3.3	MXH00246
15	381.0	1600	24	3.7	MXH00247
15	381.0	2100	31	4.8	MXH00248
15	381.0	2500	37	5.7	MXH00249
15	381.0	2750	41	6.3	MXH00250
15	381.0	2800	41	6.4	MXH00251
15½	393.7	2200	31	4.9	MXH00252
15½	393.7	3000	43	6.6	MXH00253
15¾	400.1	2500	35	5.4	MXH00254
15¾	400.1	2600	37	5.7	MXH00255
16	406.4	2200	30	4.7	MXH00256
16	406.4	4000	55	8.6	MXH00257
16½	419.1	2700	36	5.6	MXH00258
17	431.8	2400	31	4.8	MXH00259
18	457.2	2960	36	5.6	MXH00260
19	482.6	2200	25	3.9	**MXH00261**
20	508.0	2350	26	4.0	**MXH00262**
20	508.0	4000	44	6.8	MXH00263
21	533.4	2450	26	4.0	MXH00264
21¼	539.8	3500	36	5.6	MXH00265
21½	546.1	3500	36	5.5	MXH00266
22	558.8	2500	25	3.8	MXH00267
22½	571.5	3600	35	5.4	**MXH00268**
23⅜	593.7	3850	36	5.6	MXH00269
24	609.6	3500	32	4.9	MXH00270
24½	622.3	3000	27	4.1	**MXH00271**
26	660.4	3000	25	3.9	MXH00272
28	711.2	3300	26	4.0	MXH00273
28	711.2	4220	33	5.1	MXH00274
30	762.0	3500	25	3.9	MXH00275
31	787.4	2900	20	3.1	MXH00276
33	838.2	3600	24	3.7	MXH00277
34	863.6	4800	31	4.7	MXH00278
35	889.0	4500	28	4.3	MXH00279
36	914.4	4200	25	3.9	MXH00280
37	939.8	5000	29	4.5	MXH00281
39	990.6	4400	24	3.8	MXH00282
45	1143.0	9000	43	6.7	MXH00283

Note: Part Numbers shown are for Maxiband Heaters with type "S" termination. For details see page 1-87.

Ordering Information

See page 1-86

Made in USA

Stock and Standard (Non-Stock) Maxibands (Heat Only) — 2.5 in (63.5 mm) Width

Stock Items Are Shown In RED

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V
3½	88.9	350	16	2.4	**MXH00286**
3½	88.9	650	29	4.5	MXH00287
3½	88.9	775	34	5.3	MXH00288

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
3½	88.9	975	43	6.7	MXH00289
3½	88.9	1300	58	9.0	MXH00290
3¾	95.3	975	40	6.2	MXH00291
4	101.6	900	34	5.3	**MXH00292**
4	101.6	1050	40	6.2	MXH00293
4¼	108.0	1125	40	6.1	MXH00294
4½	114.3	1025	34	5.2	MXH00295
4½	114.3	1200	40	6.1	**MXH00296**
4½	114.3	1500	49	7.7	MXH00297
5	127.0	1150	34	5.2	MXH00298
5	127.0	1325	39	6.0	MXH00299
5	127.0	1500	44	6.8	MXH00300
5¼	133.4	1200	33	5.1	MXH00301
5¼	133.4	1400	39	6.0	MXH00302
5½	139.7	1250	33	5.1	MXH00303
5½	139.7	1475	39	6.0	MXH00304
5½	139.7	2000	52	8.1	MXH00305
5⁹⁄₁₆	141.3	1100	28	4.4	MXH00306
6	152.4	800	19	2.9	**MXH00307**
6	152.4	1150	27	4.2	MXH00308
6	152.4	1375	33	5.1	MXH00309
6	152.4	1600	38	5.9	MXH00310
6½	165.1	1750	38	5.9	MXH00311
6½	165.1	1800	39	6.1	MXH00312
6¾	171.5	1300	27	4.2	**MXH00313**
6⅞	174.6	1300	27	4.1	**MXH00314**
7	177.8	1870	37	5.8	MXH00315
7	177.8	1974	39	6.1	MXH00316
7¼	184.2	2500	48	7.5	MXH00317
7½	190.5	1140	21	3.3	**MXH00318**
7½	190.5	1725	32	5.0	MXH00319
7½	190.5	2025	38	5.8	MXH00320
7⅞	193.7	1875	34	5.3	MXH00321
7⅞	200.0	1500	26	4.1	MXH00322
8	203.2	1850	32	5.0	MXH00323
8	203.2	2150	37	5.8	MXH00324
8¼	209.6	1300	22	3.4	MXH00325
8¼	209.6	1900	32	4.9	MXH00326
8½	215.9	1975	32	5.0	MXH00327
8½	215.9	2300	37	5.8	MXH00328
8¾	222.3	2000	31	4.9	MXH00329
8¾	222.3	2025	32	4.9	MXH00330
9	228.6	2425	37	5.7	**MXH00331**
9¼	235.0	2150	32	4.9	MXH00332
9⁷⁄₁₆	239.7	2200	32	4.9	MXH00333
9½	241.3	2100	30	4.7	MXH00334
9½	241.3	2375	34	5.3	MXH00335
9½	241.3	2575	37	5.7	MXH00336
9¾	247.7	2250	31	4.9	MXH00337
9¾	247.7	2625	37	5.7	MXH00338
9⅞	250.8	1500	21	3.2	**MXH00339**
10	254.0	1350	18	2.8	MXH00340

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
10	254.0	2325	32	4.9	MXH00341
10	254.0	2700	37	5.7	MXH00342
10¼	260.4	2375	31	4.9	**MXH00343**
10½	266.7	2850	37	5.7	MXH00344
11	279.4	2125	26	4.0	**MXH00345**
11	279.4	2550	31	4.9	MXH00346
11	279.4	2975	37	5.7	MXH00347
11⁷⁄₁₆	290.5	3050	36	5.6	**MXH00348**
11½	292.1	3050	36	5.5	MXH00349
12	304.8	1875	21	3.3	MXH00350
12	304.8	2250	25	3.9	MXH00351
12	304.8	2800	31	4.9	MXH00352
12	304.8	3250	36	5.6	MXH00353
12⁹⁄₁₆	309.5	3370	37	5.8	**MXH00354**
12½	317.5	1450	16	2.4	**MXH00355**
12½	317.5	3000	32	5.0	MXH00356
12½	317.5	3425	37	5.7	MXH00357
12⅝	319.1	1600	17	2.6	**MXH00358**
12⅝	320.7	2375	25	3.9	**MXH00359**
12⅝	320.7	3000	32	4.9	**MXH00360**
13	330.2	3200	33	5.1	MXH00361
13	330.2	3575	37	5.7	**MXH00362**
13	330.2	4300	44	6.9	MXH00363
13⁹⁄₁₆	334.9	3275	33	5.1	**MXH00364**
13½	342.9	3710	37	5.7	MXH00365
13¾	349.3	3775	37	5.7	MXH00366
14	355.6	1500	14	2.2	MXH00367
14	355.6	1900	18	2.8	MXH00368
14	355.6	2200	21	3.2	MXH00369
14	355.6	3000	29	4.4	**MXH00370**
14	355.6	3500	33	5.2	MXH00371
14	355.6	3850	37	5.7	MXH00372
14	355.6	5000	48	7.4	MXH00373
14¹⁵⁄₁₆	379.4	2725	24	3.8	**MXH00374**
14¹⁵⁄₁₆	379.4	3725	33	5.1	**MXH00375**
15	381.0	3540	31	4.9	MXH00376
15	381.0	4800	43	6.6	MXH00377
15⅜	385.7	2300	20	3.1	**MXH00378**
15¹⁵⁄₁₆	404.8	3125	26	4.0	MXH00379
16	406.4	4000	33	5.1	MXH00380
16	406.4	5000	41	6.4	MXH00381
18	457.2	4250	31	4.8	MXH00382
18	457.2	4600	34	5.2	MXH00383
18	457.2	5200	38	5.9	MXH00384
19	482.6	5200	36	5.6	MXH00385
20	508.0	5000	33	5.1	MXH00386
20	508.0	5500	36	5.6	MXH00387
21	533.4	4950	31	4.8	MXH00388
21	533.4	7000	44	6.8	MXH00389
36	914.4	7000	25	3.9	MXH00390

Note: Part Numbers shown are for Maxiband Heaters with type "S" termination. For details see page 1-87.

Stock and Standard (Non-Stock) Maxibands (Heat Only) — 3 in (76.2 mm) Width

Stock Items Are Shown In RED

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
3½	88.9	500	19	2.9	MXH00391
3½	88.9	600	22	3.4	MXH00392
4½	114.3	1500	41	6.4	MXH00393
5	127.0	1390	34	5.2	MXH00394
5	127.0	1800	44	6.8	MXH00395
5¼	133.4	1475	34	5.3	MXH00396
5½	139.7	1560	34	5.3	MXH00397
5¾	146.1	1625	34	5.2	MXH00398
6	152.4	1100	22	3.4	MXH00399
6	152.4	1500	30	4.6	MXH00400
6	152.4	1720	34	5.3	MXH00401
6¼	158.8	1770	33	5.2	MXH00402
6½	165.1	1820	33	5.1	MXH00403
6¾	171.5	1900	33	5.1	MXH00404
7	177.8	1200	20	3.1	MXH00405
7	177.8	2000	33	5.2	MXH00406
7¼	184.2	2050	33	5.1	MXH00407
7½	190.5	2120	33	5.1	MXH00408
7¾	196.9	2200	33	5.1	MXH00409
8	203.2	2270	33	5.1	MXH00410
8¼	209.6	1800	25	3.9	MXH00411
8¼	209.6	2325	32	5.0	MXH00412
8½	215.9	2410	33	5.0	MXH00413
8¾	222.3	2475	32	5.0	MXH00414
9	228.6	1800	23	3.5	MXH00415
9	228.6	2200	28	4.3	MXH00416
9	228.6	2300	29	4.5	MXH00417
9	228.6	2600	33	5.1	MXH00418
9	228.6	2700	34	5.3	MXH00419
9¼	235.0	2600	32	5.0	MXH00420
9½	241.3	2675	32	5.0	MXH00421
9¾	247.7	2750	32	5.0	MXH00422
10	254.0	2000	23	3.5	MXH00423
10	254.0	2820	32	5.0	MXH00424
10¼	260.4	2900	32	5.0	MXH00425
10½	266.7	2975	32	5.0	MXH00426

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
10¾	273.1	3025	32	4.9	MXH00427
11	279.4	2000	20	3.2	MXH00428
11	279.4	3100	32	4.9	MXH00429
11¼	285.8	2500	25	3.9	MXH00430
11¼	285.8	3175	32	4.9	MXH00431
11½	292.1	2000	20	3.0	MXH00432
11½	292.1	2710	26	4.1	MXH00433
11½	292.1	3250	32	4.9	MXH00434
11¾	298.5	3325	32	4.9	MXH00435
12	304.8	2000	19	2.9	MXH00436
12	304.8	2830	26	4.1	MXH00437
12	304.8	3400	32	4.9	MXH00438
12¼	311.2	3475	32	4.9	MXH00439
12½	317.5	2400	21	3.3	MXH00440
12½	317.5	3000	27	4.2	MXH00441
12½	317.5	3525	32	4.9	MXH00442
12¾	323.9	3600	32	4.9	MXH00443
13	330.2	3670	31	4.9	MXH00444
13¼	336.6	3750	32	4.9	MXH00445
13½	342.9	3280	27	4.2	MXH00446
13½	342.9	3800	31	4.9	MXH00447
13¾	349.3	3870	31	4.9	MXH00448
14	355.6	3760	30	4.6	MXH00449
14	355.6	3950	31	4.9	MXH00450
15	381.0	3535	26	4.0	MXH00451
15½	393.7	4000	29	4.4	MXH00452
19	482.6	5400	31	4.8	MXH00453
19½	495.3	5500	31	4.8	MXH00454
22	558.8	8000	40	6.2	MXH00455
26	660.4	8000	33	5.2	MXH00456
29	736.6	9000	34	5.2	MXH00457
30	762.0	7500	27	4.2	MXH00458
30	762.0	9500	34	5.3	MXH00459

Note: Part Numbers shown are for Maxiband Heaters with type "S" termination. For details see page 1-87.

Ordering Information
See page 1-86

CONTINUED

Standard Sizes and Ratings

Made in USA

Standard (Non-Stock) Maxibands (Heat Only) — 4 in (101.6 mm) Width

Continued from previous page…

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
5	127.0	1870	34	5.3	MXH00460
5¼	133.4	1970	34	5.3	MXH00461
5½	139.7	1025	17	2.6	MXH00462
5½	139.7	1800	29	4.6	MXH00463
5½	139.7	2075	34	5.3	MXH00464
5½	139.7	2500	41	6.3	MXH00465
5¾	146.1	2175	34	5.2	MXH00466
6	152.4	2285	34	5.3	MXH00467
6¼	158.8	2370	34	5.2	MXH00468
6½	165.1	2475	34	5.2	MXH00469
6¾	171.5	2575	34	5.2	MXH00470
7	177.8	2675	33	5.2	MXH00471
7¼	184.2	2750	33	5.1	MXH00472
7½	190.5	2845	33	5.1	MXH00473
7¾	196.9	2950	33	5.1	MXH00474
8	203.2	2250	24	3.8	MXH00475
8	203.2	3050	33	5.1	MXH00476
8¼	209.6	3050	32	4.9	MXH00477
8½	215.9	3545	36	5.6	MXH00478
8¾	222.3	3350	33	5.1	MXH00479
9¼	235.0	3545	33	5.1	MXH00480
11¾	298.5	3000	21	3.3	MXH00481
14	355.6	5500	33	5.1	MXH00482
14¼	362.0	5150	30	4.7	MXH00483
15	381.0	6000	33	5.2	MXH00484
16½	419.1	6500	33	5.1	MXH00485
20	508.0	4000	16	2.5	MXH00486
20	508.0	5500	23	3.5	MXH00487

Note: Part Numbers shown are for Maxiband Heaters with type "S" termination. For details see page 1-87.

Ordering Information

Stock Heaters

Select a Stock Maxiband Heater (identified by a **RED** part number) from the Standard Sizes and Ratings Lists on Pages 1-82 through 1-86. Part Numbers shown are for Maxiband Heaters with type "S" termination.

Stock heaters can be modified to the following terminations:

Type **C**—Outlet terminal box
Type **P2**—Low profile high temp. quick disconnect
Type **W3**—Wire braid leads
Type **TS**—Contamination seal

A Part Number will be issued at time of order.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed **TEMPCO** will design and manufacture a Maxiband Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

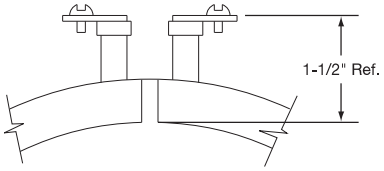
- ❑ Inside Diameter
- ❑ Width
- ❑ Total Wattage
- ❑ Voltage per half
- ❑ Lead Cable/Braid Length
- ❑ Termination
- ❑ Construction
- ❑ Clamping
- ❑ Special Features
- ❑ Quantity

Maxiband Terminal Lug Termination

Type S—Standard Terminal Lugs

Terminal Lugs with 10-32 binding head screws.

Note: Standard on all Maxiband heaters unless otherwise specified.

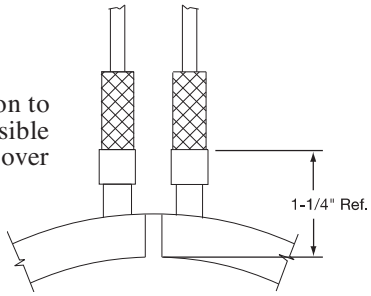


Abrasion Resistant Lead Terminations

Type W3—Wire Braid Leads

Stainless Steel Wire Braid provides strength and protection to the lead wire's insulation and offers sharp bending not possible with armor cable. The standard leads are 20" of wire braid over 24" of flexible leads.

If longer leads are required, specify when ordering.



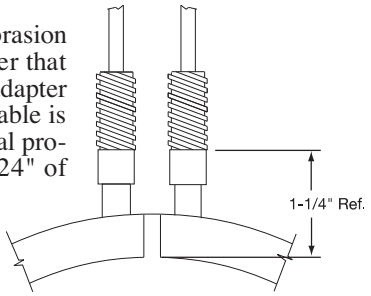
Type R1□—Armor Cable Leads

Armor Cable provides excellent protection against abrasion and contaminants. The cable exits through an adapter that encapsulates both elements' ends on each half. The adapter tube is tack welded to the heating element and the cable is crimped to the adapter for maximum security and seal protection. The standard leads are 20" of cable over 24" of flexible leads.

If longer leads are required, specify when ordering.

Type R1A — Galvanized Armor Cable

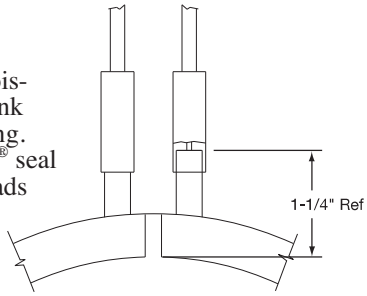
Type R1B — Stainless Steel Armor Cable



Type TS—Leads with Contamination Seal

Teflon® shrinkdown sleeving provides a good moisture and contamination seal. The sleeving is shrunk down on the element ends and is about 3-1/2" long. The maximum temperature allowed at the Teflon® seal sleeve is 500°F (260°C). The standard flexible leads are 24" in length.

If longer leads are required, specify when ordering.



CONTINUED

Made in USA

Maxiband Terminal Protection Terminations

Continued from previous page...

Type EP—Explosion and Moisture Resistant Box

Maxiband heaters can be made with an explosion/moisture resistant box brazed on to the heater.

CAUTION

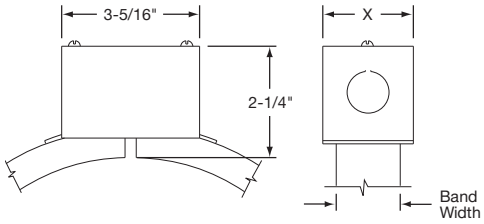
Explosion resistant terminal housings are intended to provide containment of an explosion in the enclosure only. No portion of the heater assembly outside the enclosure is covered under this NEMA rating. Abnormal use of a heater which results in excessive temperature can create hazardous conditions such as a fire. Never perform any type of service nor remove the housing cover prior to disconnecting all electrical power to the heater.

Type C3□—General Purpose Terminal Boxes

Terminal Boxes provide a simple and economical way to eliminate all live exposed terminals and electrical wiring that can be a potential hazard. The boxes have a 1/2" trade size knockout (actual diameter 7/8") for standard connectors. The standard termination is Type S, Terminal Lugs. Heaters can be factory prewired with high temperature lead wire, armor cable or stainless steel wire braid.

C3A—Standard box only
C3B—w/galvanized armor
C3C—w/stainless steel armor
C3D—w/wire braid

Band Width	"X"
1-1/2"	1-7/8"
2-1/2"	2-7/8"
3"	3-3/8"
4"	4-3/8"

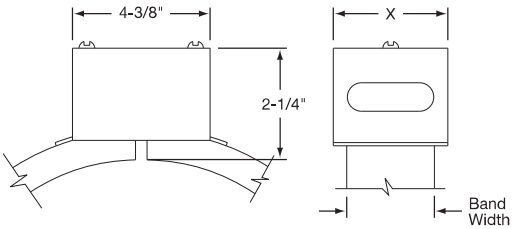


Type P2□—Quick Disconnect High Temperature Plug

Quick Disconnect Plug assemblies are highly recommended to provide the simplest and safest way to apply power to band heater installations.

P2A—Box and cup only
P2B—w/straight plug
P2C—w/str. plug and galvanized cable
P2D—w/str. plug and SS cable
P2E—w/str. plug and wire braid

Band Width	"X"
1-1/2"	1-7/8"
2-1/2"	2-7/8"
3"	3-3/8"
4"	4-3/8"



Plug Electrical Ratings

2-Pole 3-Wire Grounding
Max. Amps: 16
Max. Volts: 250 VAC
Max. Temperature: 572°F (300°C)

Maxiband Special Construction Variations

Type EC—Insulated Shroud

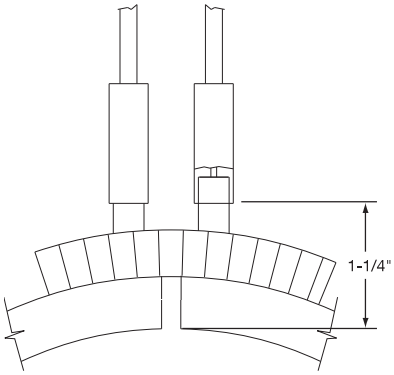
Insulated Shroud provides energy savings.

Available on all Maxiband widths except 3/4".

The shrouds are a separate component part and fit over the Maxiband heater.

Insulated shrouds to cover entire heat zones are available and are made to customer specifications.

When ordering or for quoting, supply Tempco with a detailed drawing outlining your requirements.

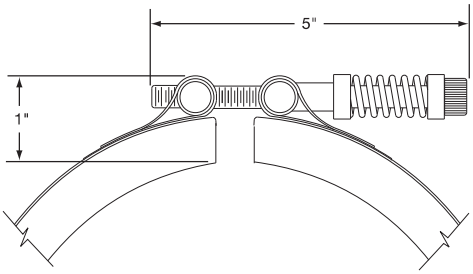


Type SL—Spring-Loaded Clamping

On Maxiband heaters over 12" in diameter, the aluminum tracks are in segments for better configuration, and the straps are equipped with two or more Spring-Loaded Clamping Brackets.

For excessively large diameters, four tubular heaters will be used, each heating a 90° section of the total diameter. When terminal boxes are required, two boxes will be used.

NOTE: See page 1-80 for clamping quantity and location details.



Type RC—Reverse Construction

Reverse Maxibands lend themselves to heating cylindrical surfaces from the inside out.

The specially designed internal brackets exert pressure to both heater halves to assure good contact against the inside diameter of the part being heated. Reverse HLC Maxiband minimum OD is 5-1/2".

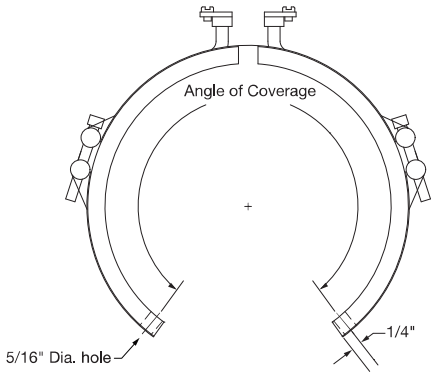
Made strictly to customer specifications.

Due to size/construction restrictions, some termination styles are not possible.

Consult Tempco with your requirements.

Made in USA

Maxiband Special Construction Variations



Partial Coverage

Partial coverage band heaters are normally required when holes and cutouts will not allow the heater to sufficiently clear the machine obstructions. The preferred method of construction is the 2-Piece Maxiband Heater with Built-In Brackets. The heater is screwed down to the cylinder at the ends and the Built-In Brackets pull the heater tightly against the cylinder being heated. It is available with all types of construction and termination variations. When ordering provide the angle of coverage from center to center of the mounting screw holes as shown.

Additional Maxiband Heater Optional Features

Electrical Variations

Dual Voltage — Maxiband heaters can be designed using series/parallel circuits for dual voltage applications. Whether the heater is run on the higher or lower voltage, the wattage will be the same. Dual Voltage is available on all Maxiband heater widths except 3/4".

Ground Terminal or Lead — For those applications requiring a separate ground terminal or lead attached to the heater. A Ground Terminal or Lead is available on any construction or termination variation.

Lead Variations

Electrical Plugs — Industry standard NEMA twist lock electrical connectors are available. The plugs can be attached to fiberglass leads, armor cable or wire braid. Electrical Plugs can be added to any clamping, construction or termination variation.

Terminal Lugs — Various types of crimp terminals can be attached to the heater leads to make wiring into applications quick and easy. High temperature 1200°F (649°C) ring terminals and nylon or PVC insulated terminals are available. Spade, ring, and right-angle or straight quick disconnect type terminals can be attached to the leads.

Extra Cooling Tube Length — The standard cooling tube length is 4". Longer lengths can be provided; please specify when ordering.

Type SC—Square or Rectangular

Square or Rectangular heaters, normally used for heating dies on plastic extruders, are made in a two-piece construction for better clamping and to provide good surface contact. Made strictly to customer specifications. When ordering or for quotation purposes, supply a detailed drawing or sample part.

Consult Tempco with your requirements.

Maxiband "MXB" Heat & Cool *with* Built-In Cooling Tubes

Maxiband heaters have an exceptionally long operating heater life when compared to other types of band heaters. Highly recommended whenever applicable as an economical alternative to more expensive cast-in aluminum heat and cool band heaters. Available in three different widths: 2-1/2", 3", and 4".

Minimum Inside Diameter: 5".
Consult Tempco if smaller ID is required.

For ***complete specifications and terminations*** see pages 1-87 through 1-90.

For ***cooling tube fittings,*** see page 3-52 in the Cast-In Band Heater Section.

Design Features

- ***Rugged Durable Construction***
- ***Withstands Vibration***
- ***Excellent Temperature Uniformity***
- ***Excellent Heat Transfer***
- ***Contamination Resistant***

Standard (Non-Stock) HLC Maxibands (Heat & Cool) — 3 in (76.2 mm) Width with 3/8" Diameter Cooling Tube

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
5	127.0	1050	26	4.0	MXB00001
5	127.0	1390	34	5.2	MXB00002
5	127.0	1800	44	6.8	MXB00003
5¼	133.4	1475	34	5.3	MXB00004
5½	139.7	1175	26	4.0	MXB00005
5½	139.7	1560	34	5.3	MXB00006
5¾	146.1	1625	34	5.2	MXB00007
6	152.4	800	16	2.5	MXB00008
6	152.4	1100	22	3.4	MXB00009
6	152.4	1275	25	3.9	MXB00010
6	152.4	1500	30	4.6	MXB00011
6	152.4	1720	34	5.3	MXB00012
6¼	158.8	1300	25	3.8	MXB00013
6¼	158.8	1770	33	5.2	MXB00014
6¼	158.8	1300	25	3.8	MXB00015
6½	165.1	1375	25	3.9	MXB00016
6½	165.1	1820	33	5.1	MXB00017
6¾	171.5	1900	33	5.1	MXB00018
7	177.8	1200	20	3.1	MXB00019
7	177.8	1500	25	3.9	MXB00020
7	177.8	2000	33	5.2	MXB00021
7¼	184.2	2050	33	5.1	MXB00022
7½	190.5	1600	25	3.8	MXB00023
7½	190.5	2120	33	5.1	MXB00024
7¾	196.9	2200	33	5.1	MXB00025
8	203.2	1700	24	3.8	MXB00026
8	203.2	2270	33	5.1	MXB00027
8¼	209.6	2325	32	5.0	MXB00028
8½	215.9	1800	24	3.8	MXB00029
8½	215.9	2410	33	5.0	MXB00030
8¾	222.3	2475	32	5.0	MXB00031
9	228.6	1800	23	3.5	MXB00032
9	228.6	1900	24	3.7	MXB00033
9	228.6	2300	29	4.5	MXB00034
9	228.6	2600	33	5.1	MXB00035
9¼	235.0	1950	24	3.7	MXB00036
9¼	235.0	2600	32	5.0	MXB00037
9½	241.3	2000	24	3.7	MXB00038
9½	241.3	2675	32	5.0	MXB00039
9¾	247.7	2050	24	3.7	MXB00040
9¾	247.7	2750	32	5.0	MXB00041
10	254.0	2000	23	3.5	MXB00042
10	254.0	2820	32	5.0	MXB00043
10¼	260.4	2900	32	5.0	MXB00044
10½	266.7	2250	24	3.8	MXB00045
10½	266.7	2975	32	5.0	MXB00046
10¾	273.1	3025	32	4.9	MXB00047
11	279.4	2000	20	3.2	MXB00048
11	279.4	3100	32	4.9	MXB00049
11¼	285.8	3175	32	4.9	MXB00050
11½	292.1	2000	20	3.0	MXB00051
11½	292.1	2450	24	3.7	MXB00052
11½	292.1	3250	32	4.9	MXB00053
11½	292.1	3500	34	5.3	MXB00054
11¾	298.5	3325	32	4.9	MXB00055
12	304.8	2000	19	2.9	MXB00056
12	304.8	2550	24	3.7	MXB00057
12	304.8	3400	32	4.9	MXB00058
12¼	311.2	3475	32	4.9	MXB00059
12½	317.5	2400	21	3.3	MXB00060
12½	317.5	2900	26	4.0	MXB00061
12½	317.5	3000	27	4.2	MXB00062
12½	317.5	3525	32	4.9	MXB00063
12¾	323.9	3600	32	4.9	MXB00064
13	330.2	3670	31	4.9	MXB00065
13½	342.9	3280	27	4.2	MXB00066
13½	342.9	3800	31	4.9	MXB00067
14	355.6	3950	31	4.9	MXB00068
15½	393.7	4000	29	4.4	MXB00069
19	482.6	5400	31	4.8	MXB00070
26	660.4	8000	33	5.2	MXB00071
29	736.6	9000	34	5.2	MXB00072
30	762.0	9500	34	5.3	MXB00073

CONTINUED

Standard Sizes and Ratings

Made in USA

Standard (Non-Stock) HLC (Heat & Cool) Maxibands
4 in (101.6 mm) Width with 3/8" Diameter Cooling Tube

Continued from previous page…

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
5	127.0	1870	34	5.3	MXB00074
5¼	133.4	1970	34	5.3	MXB00075
5½	139.7	1025	17	2.6	MXB00076
5½	139.7	1500	25	3.8	MXB00077
5½	139.7	1800	29	4.6	MXB00078
5½	139.7	2075	34	5.3	MXB00079
5½	139.7	2500	41	6.3	MXB00080
5¾	146.1	2175	34	5.2	MXB00081
6	152.4	2285	34	5.3	MXB00082
6¼	158.8	2370	34	5.2	MXB00083
6½	165.1	2475	34	5.2	MXB00084
6¾	171.5	2575	34	5.2	MXB00085
7	177.8	2675	33	5.2	MXB00086
7¼	184.2	2750	33	5.1	MXB00087
7½	190.5	2845	33	5.1	MXB00088
7¾	196.9	2950	33	5.1	MXB00089
8	203.2	2250	24	3.8	MXB00090
8	203.2	3050	33	5.1	MXB00091
8½	215.9	3255	33	5.1	MXB00092
8¾	222.3	3350	33	5.1	MXB00093

ID in	ID mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
9	228.6	3450	33	5.1	MXB00094
9¼	235.0	3545	33	5.1	MXB00095
9½	241.3	3620	33	5.0	MXB00096
9¾	247.7	3725	33	5.0	MXB00097
10	254.0	3820	32	5.0	MXB00098
10½	266.7	4030	33	5.0	MXB00099
11	279.4	4230	32	5.0	MXB00100
11¼	285.8	4325	32	5.0	MXB00101
11½	292.1	4420	32	5.0	MXB00102
11¾	298.5	4500	32	5.0	MXB00103
12	304.8	4600	32	5.0	MXB00104
12½	317.5	4800	32	5.0	MXB00105
12¾	323.9	4900	32	5.0	MXB00106
13½	342.9	5250	32	5.0	MXB00107
14	355.6	5500	33	5.1	MXB00108
15	381.0	6000	33	5.2	MXB00109
20	508.0	7700	32	4.9	MXB00110

Ordering Information

Standard Heaters

Select a Maxiband MXB from the Standard Sizes and Ratings List on pages 1-91 and 1-92.

If not otherwise specified, MXB heaters are supplied with type "S" termination and 4" long plain cooling tubes.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed **TEMPCO** will design and manufacture a Maxiband Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Inside Diameter
- ❑ Width
- ❑ Total Wattage
- ❑ Voltage per half
- ❑ Lead Cable/Braid Length
- ❑ Termination
- ❑ Construction
- ❑ Clamping
- ❑ Special Features
- ❑ Quantity

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Maxiband "MXC" Cool Only *with* Built-In Cooling Tubes

Maxiband MXC Bands are made for cooling only and are available in five standard widths: 3/4", 1-1/2", 2-1/2", 3", and 4". For 3/4" and 1-1/2" wide MXC bands the ends of the stainless steel cooling tubes exit 180° apart. Complete Maxiband specifications can be found on page 1-81.

Minimum Inside Diameter: 5".
Consult Tempco if smaller ID is required.

For ***optional cooling tube fittings,*** see page 3-52 in the Cast-In Band Heater Section.

Cooling Tube Specifications

Band Width	3/4"	1-1/2"	2-1/2"	3"	4"
Cooling Tube Diameter	3/8"	3/8"	3/8"	3/8"	3/8"
Cooling Tube Extension	4"	4"	4"	4"	4"
Cooling Tube Material	Stainless Steel				

Optional Reverse Construction

Reverse MXC Maxibands lend themselves to cooling cylindrical surfaces from the inside out.

The specially designed internal brackets exert pressure to both heater halves to assure good contact against the inside diameter of the part being cooled. Reverse MXC Maxiband minimum OD is 8". Consult Tempco if smaller OD is required.

Made strictly to customer specifications.

Consult Tempco with your requirements.

Standard (Non-Stock) MXC (Cool Only) Maxibands — with 3/8" Diameter Cooling Tube

0.75 in (19.1 mm) Width

Width in	Width mm	ID in	ID mm	Part Number
¾	19.1	6	152.4	MXC00001
¾	19.1	6½	165.1	MXC00002
¾	19.1	7	177.8	MXC00003
¾	19.1	7½	190.5	MXC00004
¾	19.1	8	203.2	MXC00005
¾	19.1	8½	215.9	MXC00006
¾	19.1	9	228.6	MXC00007
¾	19.1	9½	241.3	MXC00008
¾	19.1	10	254.0	MXC00009
¾	19.1	10½	266.7	MXC00010
¾	19.1	11	279.4	MXC00011

1.5 in (38.1 mm) Width

Width in	Width mm	ID in	ID mm	Part Number
1½	38.1	6	152.4	MXC00012
1½	38.1	6½	165.1	MXC00013
1½	38.1	7	177.8	MXC00014
1½	38.1	7½	190.5	MXC00015
1½	38.1	8	203.2	MXC00016
1½	38.1	8½	215.9	MXC00017
1½	38.1	9	228.6	MXC00018
1½	38.1	9½	241.3	MXC00019
1½	38.1	10	254.0	MXC00020
1½	38.1	10½	266.7	MXC00021
1½	38.1	11	279.4	MXC00022

Ordering Information
See page 1-94

CONTINUED

Maxiband

Made in USA

Standard (Non-Stock) MXC (Cool Only) Maxibands — with 3/8" Diameter Cooling Tube

Continued from previous page...

2.5 in (63.5 mm) Width

Width in	Width mm	ID in	ID mm	Part Number
2½	63.5	6	152.4	MXC00025
2½	63.5	6½	165.1	MXC00026
2½	63.5	7	177.8	MXC00027
2½	63.5	7½	190.5	MXC00028
2½	63.5	8	203.2	MXC00029
2½	63.5	8½	215.9	MXC00030
2½	63.5	9	228.6	MXC00031
2½	63.5	9½	241.3	MXC00032
2½	63.5	10	254.0	MXC00033
2½	63.5	10½	266.7	MXC00034
2½	63.5	11	279.4	MXC00035

3 in (76.2 mm) Width

Width in	Width mm	ID in	ID mm	Part Number
3	76.2	6	152.4	MXC00037
3	76.2	6½	165.1	MXC00038
3	76.2	7	177.8	MXC00039
3	76.2	7½	190.5	MXC00040
3	76.2	8	203.2	MXC00041
3	76.2	8½	215.9	MXC00042
3	76.2	9	228.6	MXC00043
3	76.2	9½	241.3	MXC00044
3	76.2	10	254.0	MXC00045
3	76.2	10½	266.7	MXC00046
3	76.2	11	279.4	MXC00047
3	76.2	11½	292.1	MXC00048
3	76.2	12	304.8	MXC00049
3	76.2	12½	317.5	MXC00050
3	76.2	13	330.2	MXC00051
3	76.2	13½	342.9	MXC00052
3	76.2	14	355.6	MXC00053

4 in (101.6 mm) Width

Width in	Width mm	ID in	ID mm	Part Number
4	101.6	6	152.4	MXC00055
4	101.6	6½	165.1	MXC00056
4	101.6	7	177.8	MXC00057
4	101.6	7½	190.5	MXC00058
4	101.6	8	203.2	MXC00059
4	101.6	8½	215.9	MXC00060
4	101.6	9	228.6	MXC00061
4	101.6	9½	241.3	MXC00062
4	101.6	10	254.0	MXC00063
4	101.6	10½	266.7	MXC00064
4	101.6	11	279.4	MXC00065
4	101.6	11½	292.1	MXC00066
4	101.6	12	304.8	MXC00067
4	101.6	12½	317.5	MXC00068
4	101.6	13	330.2	MXC00069
4	101.6	13½	342.9	MXC00070
4	101.6	14	355.6	MXC00071

Ordering Information

Standard

Select a Maxiband MXC from the Standard Sizes listed on pages 1-93 and 1-94.

If not otherwise specified, MXC bands are supplied with 4" long plain cooling tubes.

Custom Engineered/Manufactured Bands

Understanding that a cooling band can be very application specific, for sizes not listed **TEMPCO** will design and manufacture a Maxiband Cool Only to meet your requirements. ***Standard lead time is 2 weeks.***

Please Specify the following:

- ❑ Inside Diameter
- ❑ Width
- ❑ Special Features
- ❑ Clamping
- ❑ Construction
- ❑ Quantity

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Table Of Contents

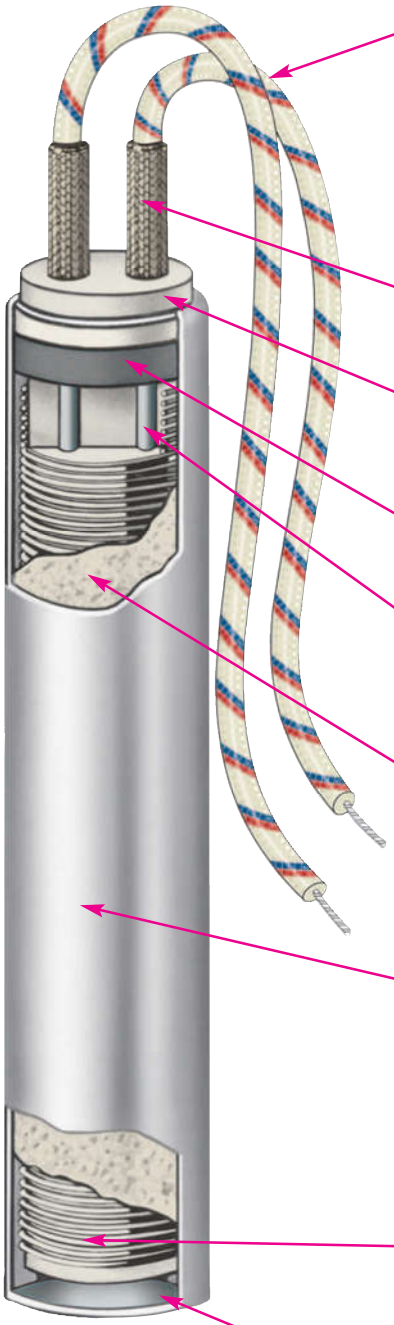
2 section

Cartridge Heaters

Made in USA

HI-Density

CARTRIDGE HEATER FEATURES



A The standard termination for Hi-Density Cartridge Heaters is Type N, 10" (254 mm) long nickel conductor lead wires externally connected to 1-1/4"(32 mm) solid conductor terminal pins. The lead wires have fiberglass insulation and are UL approved for temperatures up to 482°F (250°C). Mica insulated UL approved wires for temperatures up to 842°F (450°C) are optional.

Note: To meet the requirements of your application we offer over 40 standard termination styles to select from that will solve many of the most common application problems. See pages 2-39 through 2-60.

B High temperature fiberglass sleeve provides maximum electrical insulation to the crimp connector used to splice the nickel conductors to the flexible leads.

C Ceramic end cap prevents nickel conductors from shorting out against sheath when sharp bending of the leads is required. The ceramic cap may be eliminated in some cases to optimize the heater watt density.

D Ceramic end cap and swaged-in lava plug protect the internal cartridge from outer contamination. Other types of seals can also be provided.

E Solid conductor terminal pins are used to ensure a good electrical connection between the nickel conductor lead wires and the resistance wire. They are sized for the maximum current rating of the heater.

F A high purity Magnesium Oxide (MgO) powder consisting of custom grain sizes is used to fill all remaining space inside the sheath. Heater is then swaged, which compacts the magnesium oxide grains into a solid mass, thereby increasing thermal conductivity and dielectric strength.

G Standard sheath material is 321 Stainless Steel. It provides high temperature strength up to 1200°F (650°C), good thermal conductivity, and resistance to corrosion and scaling. Alloy 321 is a Nickel-Chromium Stainless Steel modified with the addition of Titanium. For higher operating temperatures up to 1400°F (760°C) or corrosive immersion heating applications, Incoloy® 800 is available. Consult Tempco for other sheath materials.

H Grade "A" Nickel-Chrome resistance wire precisely wound on a high purity magnesium oxide core places the resistance wire as close to the inside of the sheath as possible while maintaining dielectric strength. This provides excellent heat transfer and long heater life with the highest possible watt densities.

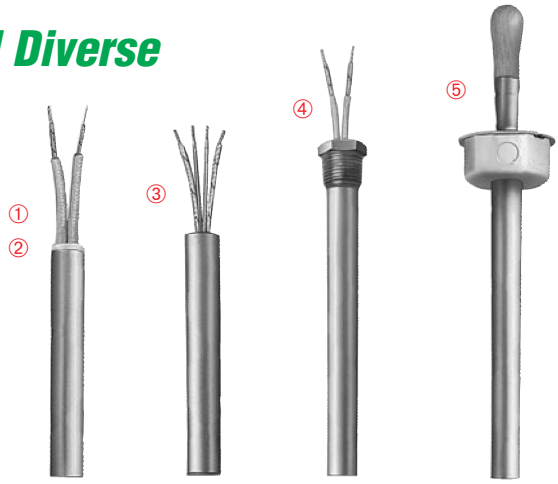
I Welded end disc made from the same material as the sheath provides a positive seal against moisture and other contaminants.

Agency Approvals

Hi-Density Cartridge Heaters are UL recognized and CSA certified in many design variations under UL File Number E65652 and CSA File Number 043099.

If you require UL and/or CSA Agency Approval, please specify when ordering.

TEMPCO *Offers the Most Comprehensive and Diverse Selection in Hi-Density Cartridge Heaters*



Since Their Introduction in 1972, Hi-Density Cartridge Heaters Have Evolved and Today Offer a Multitude of Diverse Product Options:

1. **(HDC)** A Hi-Density cartridge heater in US sizes (see page 2-4).
2. **(HDM)** A Hi-Density cartridge heater in Metric sizes (see page 2-28).
3. **(HDP)** Pennybottom™, A Hi-Density cartridge heater with a Built-in Thermocouple and Flat Copper end disc. (see page 2-24).
4. **(HDL)** A Hi-Density cartridge heater designed with NPT Fittings for Immersion heating (see page 2-23).
5. **(HDB)** Bolt Heater, A Hi-Density cartridge heater designed for assisting in the assembly of large machinery (see page 2-61).

Hi-Density Cartridge Heaters provide maximum processing temperature capability

- Higher watt densities permit smaller heaters to be used without sacrificing life expectancy. This results in up-front as well as long-term cost savings.
- Swaged construction provides maximum support for the resistance wire and excellent heat transfer characteristics, improving the overall life expectancy of the cartridge heater.
- Termination styles and special features allow customization to any application.
- Applications up to 1400°F (760°C)

Typical Applications

- *Plastic Extruders*
- *Hot Runner Molds*
- *Hot Stamping*
- *Medical Equipment*
- *Packaging Equipment*
- *Molds*
- *Aerospace*
- *Sealing Bags*
- *Semi-Conductor*
- *Plastic Molding*
- *Shoe Machinery*
- *Food Processing*
- *Heating Gases and Liquids*
- *Glue Guns*
- *Laminating Presses*
- *Platens*
- *Scientific Equipment*
- *Food Service Equipment*

Hi-Density Cartridge Heaters are Classified in Two Distinct Categories

Multi-Purpose Use

The Multi-Purpose Use Cartridge Heaters represent Tempco's commitment to value-added customer service as we maintain in Stock over 65,000 Semi-Finished Hi-Density Cartridge Heater Substrates, offering a combination of over 1000 sizes in industry standard diameters and lengths ranging from 1" (25.4 mm) to 36" (914.4 mm) in a complete spectrum of wattages and operating voltages. Multi-Purpose Use Cartridge Heaters are the solution for a multitude of original equipment manufacturers (OEMs) or maintenance (MRO) applications.

Available through the Terminator Program. Complete details are found on pages 2-12 through 2-21.

Highly Engineered Specific Purpose Use

Tempco has been at the forefront of addressing the challenges of Original Equipment Manufacturers (OEMs) in a broad segment of diversified industries. As a company we are uniquely qualified and committed to providing value-added expertise in engineering and manufacturing capabilities that span over three decades of acquired knowledge, assisting customers in developing highly engineered specific use cartridge heaters for dependable and reliable performance. Let us provide the optimal solution to your thermal loop system and cartridge heater design challenges. Engineering assistance can be found on pages 2-5 through 2-7.

Consult Us With Your Requirements. We Welcome Your Inquiries.

Ordering Information

Custom Manufactured

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Hi-Density Cartridge Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Diameter
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination types (see pages 2-39 through 2-60)
- ❑ Lead Length
- ❑ Cable/Braid length
- ❑ Special Features
- ❑ Application Type
- ❑ Operating Temperature

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Standard Specifications

Made in USA

Hi-Density Cartridge Heater Specifications

PERFORMANCE RATINGS

Max. Temperature: ❖1400°F (760°C)

Max. Watt Density: 100-300 W/in² (15.5-46.5 W/cm²) depending on heater size & operating temperature.

NOTE: The maximum operating temperature and the life expectancy of a cartridge heater is dependent on two main factors:
1. The maximum recommended sheath temperature (**❖1200°F for a standard heater**)
2. The maximum ambient temperature for the termination selected.

Consult Tempco if you require a recommendation for your application.

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	1/8" in (mm)	1/4" in (mm)	5/16" in (mm)	3/8" in (mm)	1/2 in (mm)	5/8" in (mm)	3/4" in (mm)	1" in (mm)
Actual Diameter	.122 (3.10)	.246 (6.25)	.308 (7.82)	.371 (9.42)	.496 (12.60)	.621 (15.77)	.746 (18.95)	.996 (25.30)
Diameter Tolerance	±.002 (.051)	±.002 (.051)	±.002 (.051)	±.002 (.051)	±.002 (.051)	±.002 (.051)	±.003 (.076)	±.003 (.076)
Minimum Length	1.25 (31.8)	1 (25.40)	1 (25.40)	1 (25.40)	1 (25.40)	1 (25.40)	1-1/4 (31.75)	1-3/4 (44.45)
Maximum Length	12 (305)	36 (914)	36 (914)	48 (1219)	60 (1524)	72 (1829)	72 (1829)	72 (1829)
Length Tolerance	±3/32 (2.4) Heaters up to 3.5" (89 mm)	±3/32 (2.4)	±3/32 (2.4)	±3/32 (2.4)	±3/32 (2.4)	±3/32 (2.4)	±1/8 (3.2)	±1/8 (3.2)
	±3% of Sheath Length Heaters over 3.5" (89 mm)	±2% of Sheath Length Heaters over 5" (127 mm)						
Camber Tolerance Heaters to 12" (305 mm) long	—	0.010" (.254 mm) per foot of length						
Camber Tolerance Heaters over 12" (305 mm) long	—	0.020" (.508 mm) per foot of length						

A certain amount of Camber is unavoidable. With a slight force, Hi-Density Cartridge Heaters will flex enough to fit into a straight reamed hole.

ELECTRICAL SPECIFICATIONS

Nominal Diameter	1/8"	1/4"	5/16"	3/8"	1/2"	5/8"	3/4"	1"
Maximum Voltage	240	240	240	240	240	480*	480*	480*
Maximum Amperage (see next line for exceptions)	3.0	4.4	4.5	6.7	10.5	23	23	23
†Maximum Amperage for Types C1C, C1D, C2C, C2D, CS, F, M3, R1B, S1, S2, SA, W & W3 Terminations	—	3.0	3.0	5.5	7.6	9.7	9.7	9.7
Minimum Wattage at 120V on a 1" long Heater	—	50	45	45	50	50	—	—
Minimum Wattage at 120V on a 2" long Heater	5	20	20	20	20	20	20	20
Maximum Wattage at 120V	360	525	540	800	1260	2760	2760	2760
Maximum Wattage at 240V	720	1050	1080	1600	2520	5520	5520	5520
Maximum Wattage at 480V	—	—	—	—	—	11,000	11,000	11,000
Wattage Tolerance	+10,-15%	Plus 5%, Minus 10%						
Resistance Tolerance	+15,-10%	Plus 10%, Minus 5%						

†Current carrying capacities are for ambient temperatures up to 482°F (250°C) with mica insulated lead wires.
*480V when applicable. Consult Tempco.

LENGTH TOLERANCE FOR:
– LEAD WIRES
– WIRE BRAID LEADS
– ARMOR CABLE LEADS

Up to 36": -1/2", +1" (-12.7 mm, +25.4 mm)
36" to 72": -1", +2" (25.4 mm, +50.8 mm)
Above 72": ±4" (101.6 mm)

Note: Specifications detailed on this page are standard. Consult Tempco if your application requires tighter tolerances or has other special requirements.

TEMPERATURE COEFFICIENT OF RESISTANCE

The electrical resistance (ohms) of the heater resistance wire increases with temperature rise.

Tempco standard Hi-Density Cartridge Heaters are manufactured with ohms (cold ohms) 3.3% lower than the actual calculated ohms (hot ohms) to compensate for this increase.

AVAILABLE ELECTRICAL FEATURES

Diameter	Dual Volts	3-Phase	Dual Circuits	Multiple Heat Zones (maximum 3 zones)
1/8"	No	No	No	No
1/4"	No	No	No	No
5/16"	No	No	No	No
3/8"	Yes*	No	No	Yes*
1/2"	Yes*	Yes	Yes	Yes*
5/8"	Yes	Yes	Yes	Yes
3/4"	Yes	Yes	Yes	Yes
1"	Yes	Yes	Yes	Yes

Consult factory for maximum wattages and voltages.
*** Heaters may require a larger diameter transition area at lead end.**

View Product Inventory @ www.tempco.com

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

Tempco Hi-Density Cartridge Heaters have been widely used in many demanding and diverse applications since 1972. The commonly used basic applications are platen, plastic mold and die heating, liquid immersion and air heating.

Note: Selection of the wrong termination for a particular application is the primary reason for all heater failures. However, failure to consider other important criteria can also have a negative effect on the life of the heater. To get the best performance and assure long life, it is important to carefully evaluate the following factors.

Operating Temperature

Operating temperature of a heater is a major factor in determining the life expectancy of a heating element. The heater life depends on the actual temperature of the resistance wire within the heater and not on the process operating temperature. The graph in Fig. 1 demonstrates the proper relationship between operating temperature and watt density; the higher the operating temperature, the lower the maximum recommended watt density.

Heater Watt Density

Cartridge heater watt density is defined as the wattage dissipated per square inch of the heated sheath surface. For a particular application a heater's watt density governs internal resistance wire temperature, which determines the outer sheath temperature. These factors are critical to the proper heating of the application and to the life expectancy of the heater. Special construction features that promote excellent heat transfer permit Hi-Density Cartridge Heaters to operate at higher watt densities while maintaining the lowest possible resistance wire temperatures of any style cartridge heater.

Heater watt density (w/in^2) is calculated using the following formula:

$$\text{Watt Density} = \frac{\text{Heater wattage}}{\text{Heated length} \times \text{Heater diameter} \times 3.1416}$$

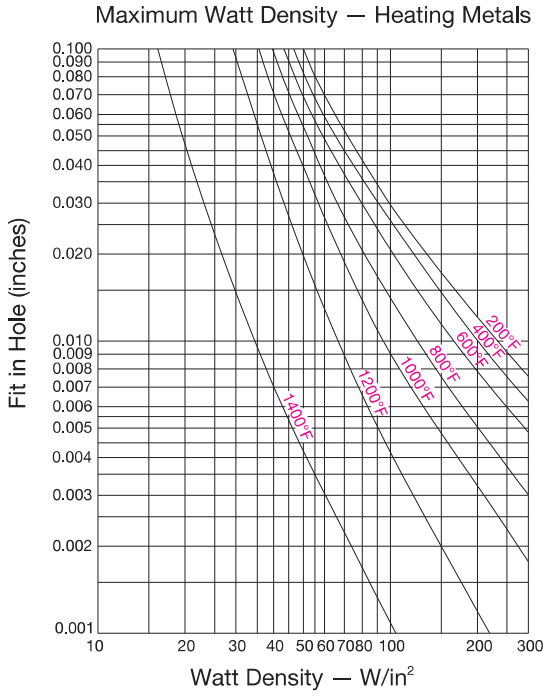
Heated length is the overall length of the heater minus any unheated (cold) sections. Standard Type N, Hi-Density cartridge heaters have 3/8" at the lead end and 1/4" at the disc end unheated. This would mean a 6" long heater would have 5-3/8" effective heated length. Unheated sections vary with type of heater termination. For descriptions of terminations and options, see pages 2-39 through 2-60.

The graph in Fig. 1 shows the maximum recommended watt density for Hi-Density Cartridge Heaters when used in a steel platen. Watt density limitations for various materials are given in the engineering section of this catalog. For liquid immersion heaters the maximum watt density depends on the type of liquid being heated. The more viscous, or thicker the liquid, the lower the maximum watt density. Higher watt density can cause the liquid to carbonize and accumulate on the heater sheath, which will cause premature heater failure. It is advisable to use heaters that have watt densities below the maximum recommended watt density to get the longest heater life. If the actual heater watt density is close to the maximum recommended watt density, you can correct the problem by:

1. Increasing the number, diameter and length of heaters.
2. Lowering the total wattage; however, this may increase the heat-up time.
3. Obtaining tighter fit (see Fig. 2 — Determining Fit).

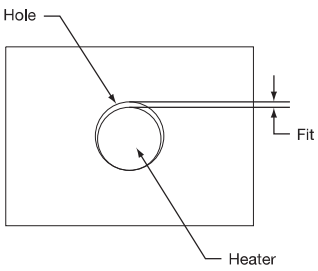
A Hi-Density cartridge heater designed at the maximum recommended watt density allows the smallest heater to be used to obtain the required wattage with good service life. All things being equal, using a lower watt density heater will typically provide optimized service life.

Fig. 1 Recommended Watt Density for Heating Metal Parts



The graph shows the recommended maximum watt density for Tempco Hi-Density cartridge heaters at different operating temperatures and fit, when the heater is installed in an oxidized mild steel block. The thermocouple is located 1/2" from the heater. When heating other materials, the data needs to be extrapolated based on the thermal conductivity of the material. Consult Tempco with your requirements.

Fig. 2 Determining Fit



CONTINUED

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

Continued from previous page...

Determining Fit

When heating a platen, mold, die or hot runner probe with Hi-Density Cartridge Heaters inserted into drilled holes, fit is an important factor in determining the life expectancy of the heater. Fit is the difference between the minimum diameter of the cartridge heater and the maximum diameter of the hole. Unheated sections on a Hi-Density cartridge may be smaller in diameter due to swaging. To determine fit, use the smallest diameter on the heated length only.

Example: A 3/8" nominal OD Hi-Density cartridge heater has an actual diameter of .371" ±.002, which translates to a minimum diameter of .369". If used in a .376" ±.002 hole, the fit would be .009" (.378" – .369" = .009").

When medium watt density heaters (less than 60 watts per square inch) are used in low temperature applications (less than 600°F [315°C]) general purpose drills are commonly used to drill holes. The typical hole size may be .003" to .008" over the drill size. For higher watt density and/or higher temperature applications, we recommend that the holes are drilled and reamed for the tightest possible fit. In applications where precise temperature control and heat transfer properties are required, Hi-Density cartridge heaters can be centerless ground to ±.0005".

Although a tighter fit is desirable to efficiently transfer heat and to get long heater life, a looser fit will aid in installing and removing heaters, especially long heaters. We recommend that you apply Tempco's BNS anti-seize cartridge heater coating as it will improve heat transfer and will make the removal of heaters easier.

The graph in Fig 1. (page 2-5) shows the effect of fit in determining the maximum recommended watt density on a steel platen. As it is indicated in the graph, the tighter the fit, the higher the maximum recommended watt density.

Temperature Control and Location of Temperature Sensing Device

In order to better control the heater temperature and hence the resistance wire temperature, use of an appropriate temperature control and the proximity of the heater to the sensor is very important. The graph in Fig. 1 (page 2-5) shows the effect of operating temperature in determining the maximum recommended watt density on a steel platen where the sensor is located 1/2" from the heater. Higher watt density heaters can generate heat faster than the surrounding area's ability to dissipate heat. This creates a thermal lag between the heater and the sensor. The closer the sensor to the heater, the better you can control the heater temperature. By keeping the sensor further from the heater, temperature gradients of several hundred degrees can be observed in many applications, especially during initial start-up and heavy thermal cycling. Although the set operating temperature may be low, the heater may be running at a very high temperature. This is a common cause of heater failure. This can be minimized using time proportional and PID functions of the temperature controllers. See Section 13 for temperature controllers and Section 14 for thermocouples and sensors.

Power Control

Power control methods affect the life expectancy of heating elements. In general, although economical, on-off controls increase thermal fatigue and oxidation rate on heating elements by causing wide temperature swings of the internal heating element. Silicon Controlled Rectifiers (SCRs), Mercury Relays and Solid State Power Controls can increase the life expectancy of heating elements by reducing the temperature swings of the internal heating element. See Section 13 for power controls.

Common Causes of Cartridge Heater Failures

Contamination

Contamination is a major cause of heater failure. Moisture, hydraulic oils, and melted plastic are the most common contaminants that are seen on failed heaters. Since the magnesium oxide insulation in a Hi-Density heater is hygroscopic in nature, moisture is easily absorbed into the heater and typically results in premature heater failure. Moisture absorption during machine washdown or cleanup also is a frequent problem. These contaminants, which are electrically conductive, will short out the heater. Most probably, the failures will be at the lead end of the heater and in some cases can split or blow a hole on the heater sheath. The disc end of a Hi-Density cartridge heater is welded shut with a stainless steel disc.

Generally, contaminants enter the heater through the lead end of the heater. The high temperature lead wires used on Hi-Density heaters have fiberglass or mica insulation. Oil and moisture can wick through the insulation on the lead wire into the heater. Tempco offers a wide variety of terminations to avoid this problem, including epoxy seals, Teflon® seals, convoluted cables, welded end discs, Teflon® insulated lead wires and SJO cable. However, there are temperature limitations on many of these terminations.

Note: If you should encounter premature cartridge heater failure, consult Tempco. Our team of professionals will have the solution to your problem.

Excessive Flexing of Leads

Tempco Hi-Density heaters use flexible grade A nickel stranded lead wires with fiberglass or mica insulation. On certain terminations the lead wires are connected externally to solid nickel conductor pins. In applications where there is excessive movement or vibration, the solid pins could break due to fatigue. A simple solution is to give enough slack on the leads to minimize the stress on the solid pins or provide an internal lead wire connection within the heater. Tempco also offers strain relief brackets and springs to prevent this problem.

Where heater leads can wear out by abrasion due to excessive flexing of the leads, Tempco offers several abrasion resistant terminations. See pages 2-41 through 2-47.

Lack of Heat Sink

Hi-Density heaters are designed with minimum unheated (cold) sections. If the heated sections project from the platen or mold, these sections will get extremely hot due to lack of heat transfer. This will lead to premature heater failure. Tempco can manufacture heaters with cold sections anywhere along the length of the heater to prevent overheating of the heater sheath.

When a Hi-Density heater is used as a liquid immersion heater, make sure the heater's sheath length is completely immersed in the liquid. The heater lead end should not be immersed in liquid, since most of the lead end seals are only moisture resistant, not moisture proof.

Recommendations for Improving the Life of Hi-Density Cartridge Heaters

High Operating Temperature

Tempco Hi-Density heaters are designed to operate at sheath temperatures up to 1400°F (760°C). When process temperatures approach the maximum heater sheath temperature, make sure the sheath temperature doesn't exceed its limitations. Location of the thermocouple and the type of temperature and power controls are factors that affect sheath temperature and potential overshoot conditions.

Although the heater is designed to run at temperatures up to 1400°F (760°C), heater lead wires and terminations are rated for much lower temperatures. Care should be taken to make sure that the heater lead end temperatures do not exceed their limitations. Heaters can be made longer with unheated sections at the lead end to bring the lead end out of the high temperature area. Tempco can also provide you with a high temperature wiring harness, which can withstand temperatures up to 1400°F (760°C). See page 15-5 in the accessories section for details.

High Wattage Rating

Heaters with very high wattage ratings can create temperature overshoots, uneven temperature distribution and high heater sheath temperatures, causing premature heater failure.

For liquid immersion heaters, maximum watt density depends on the type of liquid being heated. The heavier or thicker the liquid, the lower the maximum watt density. Higher watt density can cause the liquid to carbonize and accumulate on the heater sheath, which will cause premature heater failure.

Scale and Sludge Buildup

In liquid immersion applications, periodic cleaning of the heater sheath is necessary to remove any scale buildup on the sheath. Scale can accumulate on the sheath and cause the heater to overheat and fail. When used to heat liquid in a tank, be sure to clean any sludge from the bottom of the tank. A heater sheath covered with sludge will overheat and fail.

Note: As explained in the above paragraphs, the single major cause for cartridge heater failure is the selection of the wrong type of heater lead end termination for the specific application. To assist you in selecting the right termination type, pages 2-39 through 2-57 give detailed descriptions of over 40 terminations designed to solve many of the common application problems. If you need further assistance, consult Tempco.

Important Installation Considerations

1. For closest fit and best heat transfer, use reamed holes.
2. When possible, drill holes through the object being heated. This will make heater removal easier.
3. When using an anti-seize coating like Tempco's BNS spray or paste, **do not apply** over lead wires or any other current carrying conductors.
4. When using insulated tape or sleeving, check to make sure it is rated for the temperature of the application. Lower temperature rated materials can contain an adhesive or binder that can carbonize and become electrically conductive.
5. When using heaters near their maximum recommended watt density, it is recommended that the temperature sensing probes be at maximum 1/2" from the heater sheath.
6. Lead wires should not be located in the hole containing the cartridge heater during operation. This may cause the lead wires to be exposed to temperatures above their rated temperature.
7. When used in a vacuum application, make sure the lead end of the heater is outside the vacuum. If the lead has to be in the vacuum, consult Tempco for specific recommendations.
8. Many applications will subject a heater's electrical terminations to one or more of the following potentially damaging conditions:
   - Moisture
   - Oil and other contaminants
   - Flexing
   - Abrasion
   - High temperature

Note: To protect the heater from damage in these harsh environments, Tempco has a wide selection of terminations and options available. See pages 2-39 through 2-60 for details.

BNS Anti-Seize Cartridge Heater Coating

This high temperature, electrically insulating and thermally conductive coating will minimize oxidation and improve heat transfer from heater to the object being heated.

Brush a thin layer of paste or spray lightly over the cartridge heater prior to inserting the heater into a hole.

CAUTION — Do not apply over lead wires or other bare current carrying conductors, since the water in the paste and spray can cause an electrical short circuit.

13 oz.
Aerosol spray can
Part Number:
CML00010

- Temperature Range 1562°F (850°C)
- High Heat Transfer

4 oz.
Paste w/brush applicator top
Part Number: CML00020

- Temperature Range 1562°F (850°C)
- High Heat Transfer

All Items Available from Stock

Note: Formulated to assist in the removal of cartridge heaters.

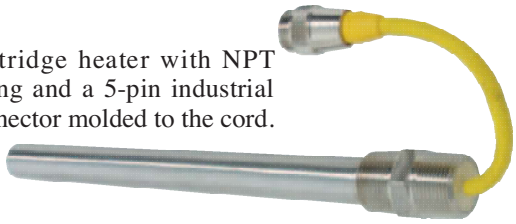
Made in USA

Highly Engineered Custom Manufactured Specific Use Cartridge Heaters

Meeting the Challenges of Original Equipment Manufacturers with Custom Engineering

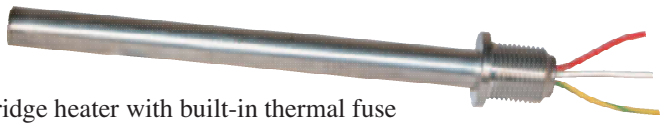
Tempco has been at the forefront of addressing the challenges of original equipment manufacturers (OEMs) in diversified industries, when dependable and reliable performance of custom engineered cartridge heaters is crucial to the overall operating efficiency and quality of their equipment and machinery.

Tempco is a company uniquely qualified and committed to providing value-added expertise in engineering and manufacturing that spans over four decades of acquired knowledge, assisting customers in developing highly engineered specific use cartridge heaters for equipment and/or machinery systems.

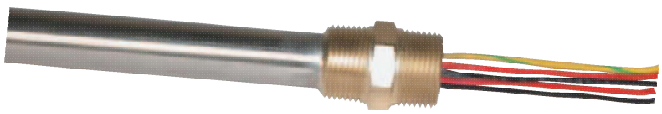


Cartridge heater with NPT fitting and a 5-pin industrial connector molded to the cord.

Cartridge heater for continuous air heating application with Incoloy® sheath, custom machined fitting and silicone rubber moisture barrier.



Cartridge heater with built-in thermal fuse and ground wire for X-Ray processing equipment.



Cartridge heater with built-in thermostat, pipe fitting and ground leads for oil heating in waste handling equipment.

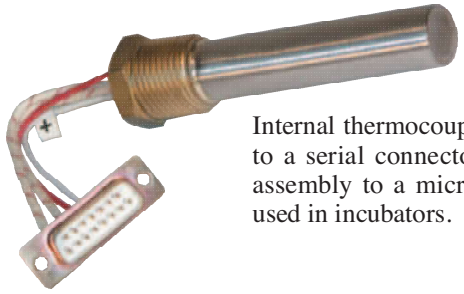
Finned Cartridge Oil Immersion Heater with a liquid-tight electrical termination.

Complete a New Project on Time, Improve Efficiencies and Reduce Cost

Consult Tempco, your strategic partner, in the early stages of a new project requiring cartridge heaters, or to improve a troublesome existing application. By doing so you allow Tempco to place at your disposal our team of professionals, offering you our vast knowledge in product design and manufacturing expertise. We can provide you with the optimal solution to your thermal loop system and cartridge heater design challenges.

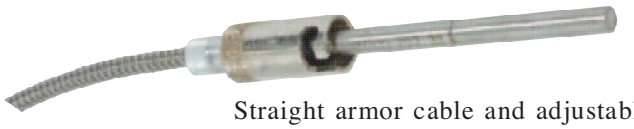
Tempco offers you the perfect balance in quality and service with value-added technology. These pictures depict a small sampling of the cartridge heaters we have developed for special applications. Put our knowledge and experience to work for you.

Our capabilities are limited only by your imagination.
Consult us with your requirements.
We welcome your inquiries.

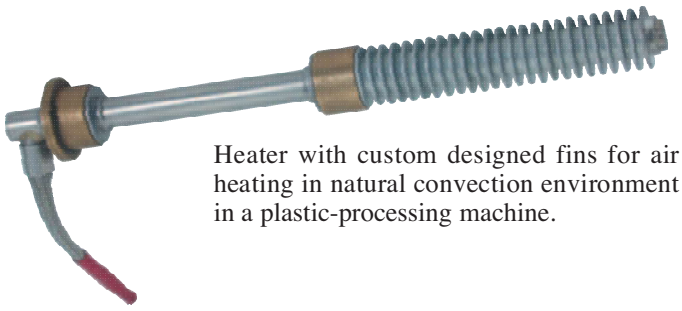


Internal thermocouple is wired to a serial connector for easy assembly to a microprocessor used in incubators.

Incoloy® fitting and seamless Incoloy® 800 sheath material used in an aviation application.



Straight armor cable and adjustable bayonet cap for easy assembly.

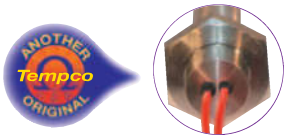


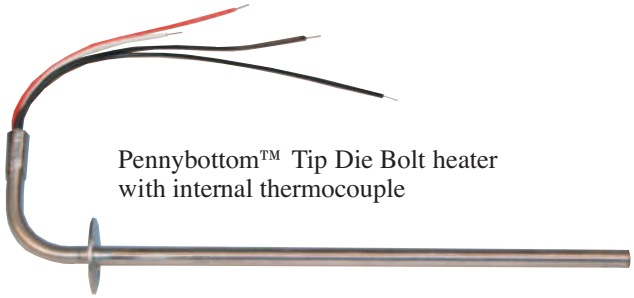
Heater with custom designed fins for air heating in natural convection environment in a plastic-processing machine.

View Product Inventory @ www.tempco.com

Highly Engineered Custom Manufactured Specific Use Cartridge Heaters

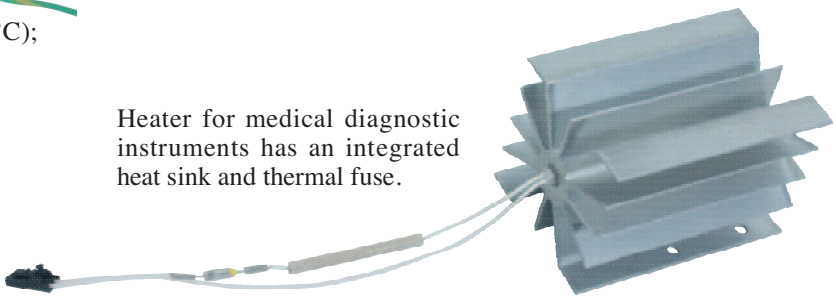
The heater has a header cap as an integral part of the fitting. Leads exit through small holes that are sealed with epoxy for moisture protection.





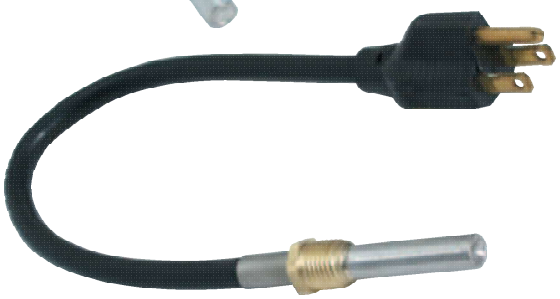
Pennybottom™ Tip Die Bolt heater with internal thermocouple

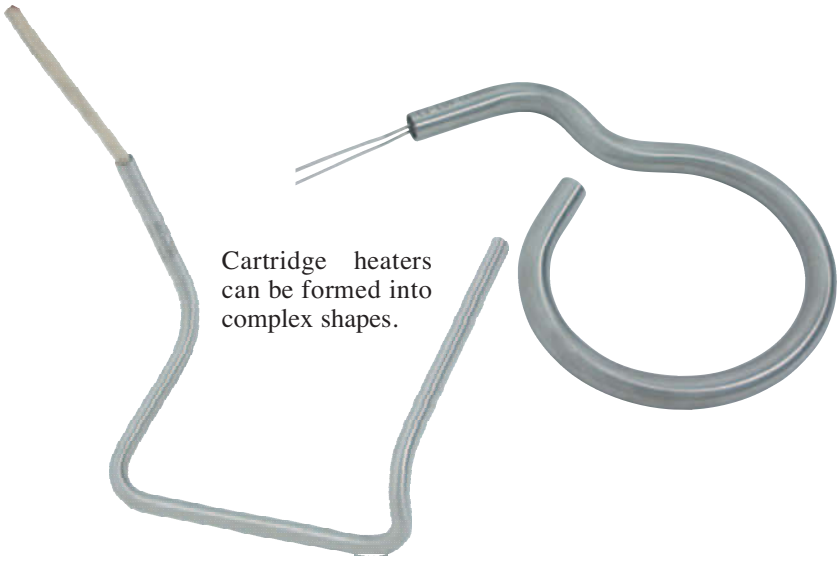
Heater designed to run continuously at 1202°F (650°C); built-in isolated thermocouple and ground wire.



Heater for medical diagnostic instruments has an integrated heat sink and thermal fuse.

SJO cord and molded plug for automotive air conditioning recharging units.





Cartridge heaters can be formed into complex shapes.

Optional Inspection Services and Test Reports

Die Penetrant Test

This non-destructive testing can detect imperfections in weld joints. For critical applications, each individual heater's weld joints by end cap and fittings can be tested. Certified test reports will be sent with each shipment.

Hydrostatic Pressure Test

Cartridge heaters with attached pipe fittings can be pressure tested to your specifications at Tempco. Our in-house testing capabilities can ensure that your products meet your exact specifications.

Electrical Tests

Our state of the art test meter can perform AC/DC dielectric withstand test (Hypot) up to 5000 volts while measuring leakage current in micro amps. It can also measure Insulation resistance (IR) and heater element resistance. Heaters can be serialized and test reports can be sent with each shipment if required.

Consult Tempco with Your Requirements.
We Welcome Your Inquiries.

Made in USA

Hi-Density 1/8" Diameter Miniature Cartridge Heaters

PERFORMANCE RATINGS

Max. Temperature: 1200°F (649°C)

Max. Watt Density: 100-200 W/in² (15.5-31 W/cm²) depending on operating temperature.

NOTE: The maximum operating temperature and the life expectancy of a cartridge heater is dependent on two main factors:

1. The maximum recommended sheath temperature
2. The maximum ambient temperature for the termination selected

Consult Tempco if you require a recommendation for your application.

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	1/8" in	(mm)
Actual Diameter	.122	(3.10)
Diameter Tolerance	±.002	(.051)
Minimum Length	1.25	(31.8)
Maximum Length	12	(305)
Length Tolerance Heaters up to 3.5" (89 mm) long	±3/32	(2.4)
Length Tolerance Heaters over 3.5" (89 mm) long	±3% of Sheath Length	

SHEATH MATERIAL

Standard: Type 304 Stainless Steel

Optional: Inconel 600

ELECTRICAL SPECIFICATIONS

Nominal Diameter	1/8"
Maximum Voltage	240
Maximum Amperage	3.0
Maximum Wattage at 120V	360
Maximum Wattage at 240V	720
Wattage Tolerance	+10,-15%
Resistance Tolerance	+15,-10%

1/8" Actual .122" (3.10 mm) Diameter Hi-Density Cartridge Heaters with Type N Termination (10" leads)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1¼	31.8	25	90	14	HDC19100	—
1¼	31.8	35	126	20	HDC19101	—
1¼	31.8	50	180	28	HDC19102	—
1½	38.1	30	80	12	HDC19103	—
1½	38.1	60	160	25	HDC19104	—
2	50.8	40	70	11	HDC19105	—
2	50.8	50	87	13	HDC19106	HDC19112
2	50.8	100	175	27	HDC19107	HDC19113
2½	63.5	50	68	11	HDC19108	—
3	76.2	60	64	10	HDC19109	—
3½	88.9	70	62	10	HDC19110	—
4	101.6	80	60	9	HDC19111	HDC19114

Note: 1/8" Diameter Hi-Density Cartridge Heaters are ***made-to-order only.***
Standard lead time is 3 weeks.

Custom Manufactured

Custom Engineered/Manufactured 1/8" Hi-Density Cartridge Heaters

(Refer to pages 2-2 through 2-9)

Because cartridge heaters can be very application specific, consult Tempco with your special requirements. For sizes, electrical ratings and any other design features required but not listed in the catalog, Tempco will custom engineer and manufacture to your specifications.

Consult Us with Your Requirements. We Welcome Your Inquiries.

1/8" Diameter Cartridge Heaters Termination Types

Type N External Pins with Leads
(Standard Termination)

- Minimum 1/4" cold section at lead end is required
- 24 ga ultralead leads temperature rating: 482°F (250°C)
- Leads externally crimped to nickel pins
- **Standard** 10" (254 mm) leads. Specify longer leads.

Type F Internally Connected Flexible Leads

- Minimum 1/2" cold section at lead end is required
- High temperature fiberglass leads temperature rating: 842°F (450°C)
- Maximum Voltage: 120V
- **Standard** 10" (254 mm) leads. Specify longer leads.

Type M3 Teflon® End Plug Seal with Teflon® Leads

- Minimum 1/2" cold section at lead end is required
- 24 ga Teflon® insulated leads temperature rating: 392°F (200°C)
- Moisture resistant swaged Teflon® seal
- **Standard** 10" (254 mm) leads. Specify longer leads.

Type C1B SS Cable, Mechanically Fastened

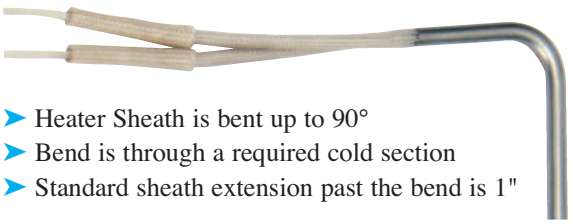
- Minimum 1/4" cold section is required
- Provides maximum protection for abrasive environment
- Maximum Voltage: 120V
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.

Type W SS Braid, Mechanically Fastened

- Minimum 1/4" cold section is required
- Offers sharp bending and abrasion protection
- Maximum Voltage: 120V
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.

1/8" Diameter Cartridge Heaters Mounting Options

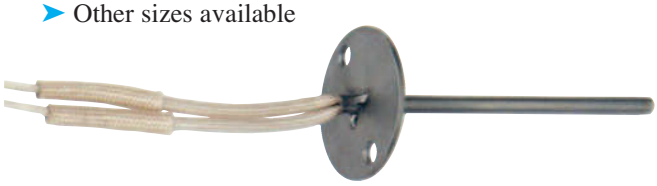
Type R4 Bent Cartridge



- Heater Sheath is bent up to 90°
- Bend is through a required cold section
- Standard sheath extension past the bend is 1"

Type MFR Mounting Flange

- 1" diameter; 2 × 9/64" mounting holes are standard
- Other sizes available



Custom Terminated Multi-Purpose Use Cartridge Heaters from the Terminator Program

Tempco stocks over 1000 different Semi-Finished Hi-Density Cartridge Heaters in diameters 1/4", 5/16", 3/8", 1/2", 5/8" and 3/4".

These cartridge heaters are semi-finished (substrates), offering you the option to finish them by choosing from 19 program-qualified lead end terminations and options. Cartridge heaters will be ready for shipment within 1 to 3 days, depending on the termination/option selected.

Ordering Information — Follow These Simple Steps

1. Select an available 1/4" through 3/4" Hi-Density cartridge heater from the stock lists on pages 2-14 through 2-21. The Part Numbers in the tables are for heaters with termination Type N (10" long externally connected lead wires). ***Call Tempco for part numbers for stock heaters with other Terminator Program terminations.***
2. Refer to the Program-Qualified Lead Terminations Reference Photos below and on page 2-13 to select the cartridge heater termination type best suited for your application.

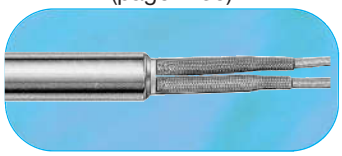
NOTE: Type "N" (10" long externally connected plain lead wires) is the most common termination applied in the Terminator program. ***If a termination other than Type N is selected, a new permanent part number will be assigned when your order is placed.***

3. Specify your lead requirements in the event that the standard supplied lengths for Plain Leads (10"), Braid or Armor Cable (10" over 12" leads) are not suited for your application.
4. Specify the Quantity.

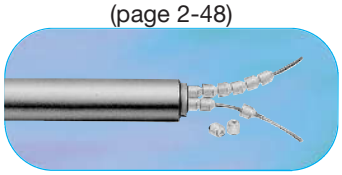
These Program-Qualified Lead Terminations and Options for Stock Cartridge Heater Substrates will ship Same or Next Day when ordered before 2PM (CST).

Terminations

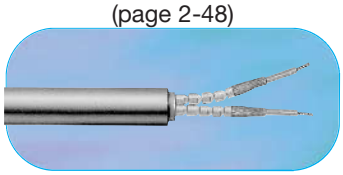
***Type* N**
Standard Leads
(page 2-39)



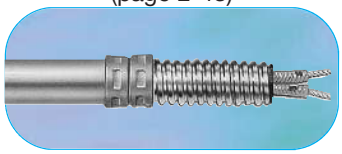
***Type* B**
Ceramic Bead Insulation
(page 2-48)



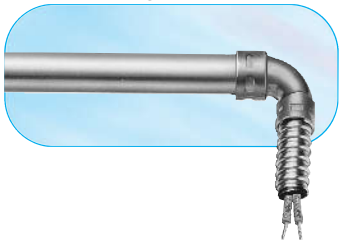
***Type* BL**
Ceramic Bead and Leads
(page 2-48)



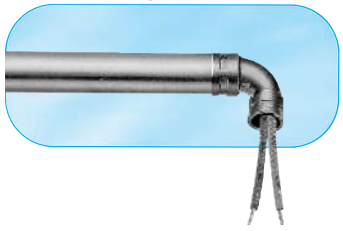
***Type* C1A & C1B** *only*
Straight Armor Cable
(page 2-43)



***Type* C2A & C2B**
Right-Angle Armor
Cable with Copper Elbow
(page 2-47)

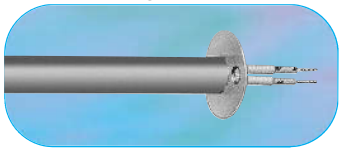


***Type* R1A**
Right-Angle Leads with
Copper Elbow
(page 2-44)

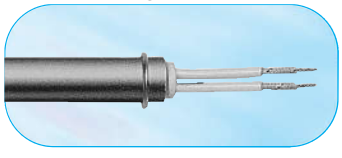


Options

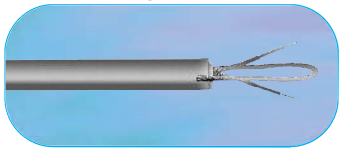
***Type* MFR**
Mounting Flange Round
(page 2-52)



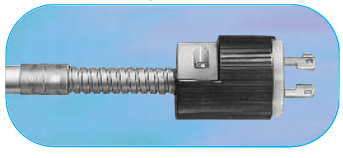
***Type* LR**
Locating Ring
(page 2-52)



***Type* PS**
Pull Strap
(page 2-52)



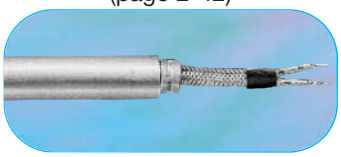
***Type* P**
Quick Disconnect Plug
(page 2-56)



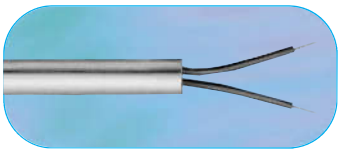
These Program-Qualified Lead Terminations and Options for Stock Cartridge Heater Substrates will ship 2nd or 3rd Day when ordered before 2PM (CST).

Terminations

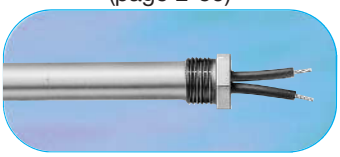
***Type* W**
Straight Wire Braided Leads
(page 2-42)



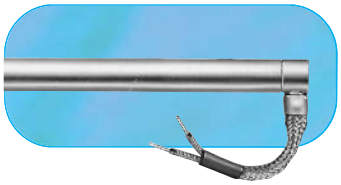
***Type* M2A & M2E**
Potted Lead End Seal
(Cement Only)
(page 2-40)



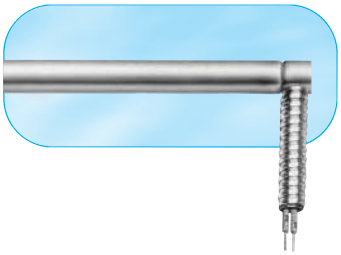
***Type* CMB & CMP**
Single Threaded Fitting
(page 2-50)



***Type* W1A & W1B**
Right-Angle Wire
Braided Leads
(page 2-46)



***Type* C3A, C3B, C3C & C3D**
Right-Angle Armor Cable
(page 2-47)



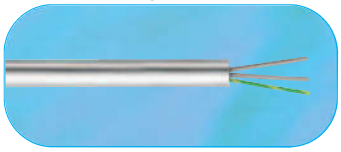
***Type* R2A & R2B**
Right-Angle Leads
(page 2-45)

Options

***Type* R3**
Angled Sheath Extension
(Cement Potting Only)
(page 2-53)

***Type* E1**
General Purpose Box
(page 2-54)

***Type* GL**
Ground Lead Sheath
(page 2-59)



Complete specifications and details on these terminations can be found on the specified catalog page numbers.

Custom Manufactured

Custom Engineered/Manufactured Hi-Density Cartridge Heaters

(Refer to pages 2-2 through 2-9)

Because cartridge heaters can be very application specific, consult Tempco with your special requirements. For sizes, electrical ratings and any other design features required but not listed in the catalog, Tempco will custom engineer and manufacture to your specifications.

Consult Us with Your Requirements. We Welcome Your Inquiries.

Made in USA

Hi-Density

STOCK — *Immediate Delivery through the TERMINATOR Lead Conversion Program*

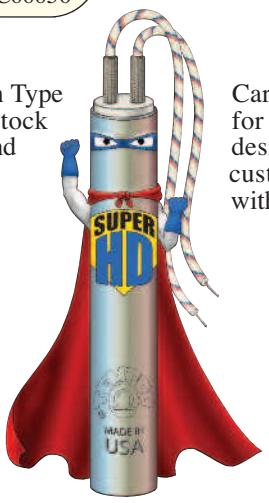
1/4" Actual .246" (6.25 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1	25.4	50	127	20	HDC00001	—
1	25.4	80	204	32	HDC00002	—
1	25.4	100	255	40	HDC00003	HDC00004
1	25.4	150	382	59	HDC00005	—
1⅛	28.6	100	204	32	HDC00006	—
1¼	31.8	50	85	13	HDC00007	—
1¼	31.8	75	127	20	HDC00008	—
1¼	31.8	100	170	26	HDC00009	—
1¼	31.8	125	212	33	HDC00010	—
1¼	31.8	150	255	40	HDC00011	HDC00012
1¼	31.8	200	340	53	—	HDC00013
1¼	31.8	225	382	59	—	HDC00014
1½	38.1	50	64	10	HDC00015	—
1½	38.1	75	92	14	HDC08691	—
1½	38.1	100	127	20	HDC00016	HDC00017
1½	38.1	150	191	30	HDC00018	HDC00019
1½	38.1	175	223	35	HDC00020	HDC00021
1½	38.1	200	255	40	HDC00022	HDC00023
1½	38.1	250	318	49	—	HDC00024
1¾	44.5	75	76	12	HDC00025	—
1¾	44.5	150	153	24	HDC00026	—
1¾	44.5	300	306	47	—	HDC00027
2	50.8	50	42	7	HDC00028	—
2	50.8	80	68	11	HDC00029	—
2	50.8	100	85	13	HDC00030	HDC00031
2	50.8	125	106	17	HDC00032	HDC00033
2	50.8	150	127	20	HDC00034	HDC00035
2	50.8	200	170	26	HDC00036	HDC00037
2	50.8	250	212	33	HDC00038	HDC00039
2	50.8	300	255	40	—	HDC00040
2¼	57.2	200	146	23	HDC10139	HDC00041
2½	63.5	150	95	15	—	HDC00042
2½	63.5	200	127	20	HDC00043	HDC00044
2½	63.5	250	159	25	HDC00045	HDC00046
2¾	69.9	200	113	18	—	HDC00048
3	76.2	75	38	6	HDC00049	—
3	76.2	100	51	8	HDC00050	HDC00051
3	76.2	125	64	10	—	HDC00052
3	76.2	150	76	12	HDC00053	HDC00054
3	76.2	200	102	16	HDC00055	HDC00056
3	76.2	250	127	20	HDC00057	HDC00058
3	76.2	300	153	24	HDC00059	HDC00060
3	76.2	350	178	28	—	HDC00061
3½	88.9	200	85	13	—	HDC00062
3½	88.9	300	127	20	HDC00063	HDC00064
3¾	95.3	300	118	18	—	HDC00065
4	101.6	100	36	6	HDC00066	—
4	101.6	150	55	9	HDC00067	—
4	101.6	175	64	10	HDC00068	HDC00069
4	101.6	200	73	11	HDC00070	HDC00071
4	101.6	250	91	14	HDC00072	HDC00073
4	101.6	300	109	17	HDC00074	HDC00075
4	101.6	400	146	23	—	HDC00076
4½	114.3	125	40	6	HDC00077	—
4½	114.3	200	64	10	HDC00078	—
4½	114.3	500	159	25	—	HDC00079
5	127.0	200	57	9	—	HDC00080
5	127.0	250	71	11	—	HDC00081
5	127.0	300	87	14	HDC22940	—
5	127.0	350	99	15	HDC00082	HDC00083
5	127.0	400	113	18	HDC00084	HDC00085
5¾	146.1	350	85	13	HDC00086	HDC00087
6	152.4	150	35	5	HDC00088	—
6	152.4	200	46	7	—	HDC00089
6	152.4	300	69	11	HDC00090	HDC00091
6	152.4	400	93	14	HDC00092	HDC00093
6	152.4	450	104	16	HDC00094	HDC00095
6	152.4	600	139	22	—	HDC00096
6½	165.1	500	106	17	HDC00097	HDC00098
7	177.8	500	98	15	HDC20502	—
7	177.8	600	118	18	—	HDC00099
7½	190.5	525	95	15	HDC00100	—
8	203.2	300	51	8	HDC00101	—
8	203.2	600	102	16	—	HDC00102
9	228.6	675	101	16	—	HDC00103
9½	241.3	525	74	12	HDC00104	—
10	254.0	750	101	16	—	HDC00105
11	279.4	600	73	11	—	HDC00106
13	330.2	725	74	12	—	HDC00107

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).



Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

View Product Inventory @ www.tempco.com

TEMPCO Since 1972

STOCK — *Immediate Delivery through the* TERMINATOR *Lead Conversion Program*

5/16" Actual .308" (7.82 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
2	50.8	150	102	16	HDC00108	—
2½	63.5	150	76	12	HDC00109	—
2½	63.5	200	102	16	HDC00110	HDC00111
3	76.2	225	92	14	HDC00112	HDC00113
3⅜	85.7	160	57	9	HDC00114	—
3½	88.9	250	85	13	HDC00115	—

3/8" Actual .371" (9.42 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1	25.4	50	85	13	HDC00125	—
1	25.4	100	170	26	HDC00127	—
1	25.4	150	255	40	HDC00128	HDC00129
1	25.4	200	340	53	—	HDC00130
1¼	31.8	100	113	18	HDC00133	—
1¼	31.8	150	170	26	HDC00135	HDC00136
1¼	31.8	200	226	35	HDC00137	HDC00138
1⅝	33.3	100	104	16	HDC00139	HDC00140
1⅝	33.3	150	157	24	HDC00141	—
1⅜	34.9	150	146	23	HDC00142	HDC00143
1⅞	36.5	100	91	14	HDC00144	—
1½	38.1	30	25	4	HDC00146	—
1½	38.1	50	42	7	HDC00147	HDC00148
1½	38.1	75	64	10	HDC00149	—
1½	38.1	100	85	13	HDC00150	HDC00151
1½	38.1	125	106	17	—	HDC00152
1½	38.1	150	127	20	HDC00153	HDC00154
1½	38.1	200	170	26	HDC00155	HDC00156
1½	38.1	250	212	33	HDC00157	HDC00158
1¾	44.5	150	102	16	HDC00160	HDC00161
1¾	44.5	200	136	21	—	HDC00163
1¾	44.5	250	170	26	HDC00164	HDC00165
1 13/16	46.0	150	97	15	—	HDC00166
1 13/16	46.0	200	129	20	HDC00167	—
1⅞	47.6	250	154	24	HDC00169	—
2	50.8	50	28	4	HDC00170	—
2	50.8	75	42	7	HDC00171	—
2	50.8	100	57	9	HDC00172	HDC00173
2	50.8	125	71	11	HDC00174	—
2	50.8	150	85	13	HDC00175	HDC00176
2	50.8	200	113	18	HDC00177	HDC00178
2	50.8	250	141	22	HDC00179	HDC00180
2	50.8	300	170	26	HDC00181	HDC00182
2	50.8	350	198	31	—	HDC00183
2	50.8	400	226	35	HDC00184	HDC00185
2	50.8	500	283	44	HDC00186	HDC00187
2¼	57.2	75	36	6	HDC00189	—
2¼	57.2	100	49	8	HDC00190	—
2¼	57.2	125	61	9	HDC00191	HDC00192
2¼	57.2	150	73	11	—	HDC00193
2¼	57.2	175	85	13	HDC00194	—
2¼	57.2	200	97	15	—	HDC00196
2¼	57.2	250	125	19	HDC00197	
2¼	57.2	300	146	23	HDC00199	HDC00200
2¼	57.2	350	170	26	HDC00201	HDC00202
2¼	57.2	400	194	30	—	HDC00204
2¼	57.2	500	243	38	—	HDC00205
2⅜	60.3	75	34	5	HDC00206	—
2⅜	60.3	165	75	12	—	HDC00207
2⅜	60.3	300	136	21	—	HDC00210
2½	63.5	100	42	7	HDC00213	HDC00214
2½	63.5	125	53	8	HDC00215	—
2½	63.5	150	64	10	—	HDC00216
2½	63.5	200	85	13	HDC00217	HDC00218
2½	63.5	250	106	17	HDC00219	HDC00220
2½	63.5	300	127	20	HDC00221	HDC00222
2½	63.5	350	149	23	—	HDC00223
2½	63.5	400	174	27	HDC00224	—
2½	63.5	500	212	33	HDC00227	HDC00228
2¾	69.9	400	151	23	—	HDC00231
2 13/16	71.4	300	110	17	—	HDC00235
3	76.2	100	34	5	HDC00236	HDC00237
3	76.2	125	42	7	HDC00238	—
3	76.2	150	51	8	HDC00239	—
3	76.2	200	68	11	HDC00240	HDC00241
3	76.2	250	85	13	HDC00242	HDC00243
3	76.2	300	102	16	HDC00244	HDC00245
3	76.2	375	127	20	HDC00247	—
3	76.2	400	136	21	HDC00249	HDC00250
3	76.2	500	170	26	HDC00251	HDC00252
3	76.2	600	204	32	—	HDC00253
3	76.2	750	255	40	—	HDC00254
3⅝	84.1	500	151	23	HDC00255	—
3½	88.9	125	35	6	HDC00256	—
3½	88.9	200	57	9	—	HDC00257
3½	88.9	225	64	10	—	HDC00258
3½	88.9	250	71	11	HDC00259	HDC00260
3½	88.9	300	85	13	HDC00261	HDC00262
3½	88.9	350	99	15	HDC00263	HDC00264
3½	88.9	400	113	18	—	HDC00265
3½	88.9	500	141	22	HDC00266	HDC00267
3 13/16	96.8	150	38	6	HDC00269	—
3 13/16	96.8	500	128	20	—	HDC00270
4	101.6	100	24	4	HDC00272	—
4	101.6	125	30	5	HDC00273	HDC00274
4	101.6	150	36	6	HDC00275	—
4	101.6	175	42	7	HDC00276	—
4	101.6	200	49	8	HDC00277	HDC00278

Made in USA

Hi-Density

STOCK — *Immediate Delivery through the* TERMINATOR *Lead Conversion Program*

Continued from previous page...

3/8" Actual .371" (9.42 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
4	101.6	250	61	9	HDC00279	HDC00280
4	101.6	300	73	11	HDC00281	HDC00282
4	101.6	350	85	13	HDC00283	HDC00284
4	101.6	400	97	15	HDC00285	HDC00286
4	101.6	450	109	17	—	HDC00288
4	101.6	500	121	19	HDC00289	HDC00290
4	101.6	600	146	23	—	HDC00292
4	101.6	700	170	26	—	HDC00293
4	101.6	750	182	28	—	HDC00294
4¼	108.0	300	68	11	—	HDC00295
4¼	108.0	750	170	26	—	HDC00296
4½	114.3	250	53	8	—	HDC00297
4½	114.3	300	64	10	HDC00298	HDC00299
4½	114.3	450	95	15	HDC00302	HDC00303
4½	114.3	500	106	17	HDC00304	HDC00305
4¾	120.7	300	60	9	—	HDC00307
4 13⁄16	122.2	300	59	9	—	HDC00308
4 13⁄16	122.2	500	98	15	—	HDC00309
5	127.0	150	28	4	HDC00312	HDC00313
5	127.0	200	38	6	HDC00314	HDC00315
5	127.0	250	47	7	HDC00316	—
5	127.0	300	57	9	HDC00317	HDC00318
5	127.0	350	66	10	—	HDC00319
5	127.0	400	75	12	HDC00320	HDC00321
5	127.0	500	94	15	HDC00323	HDC00324
5	127.0	600	113	18	—	HDC00327
5	127.0	700	132	21	—	HDC00328
5	127.0	750	141	22	—	HDC00329
5	127.0	800	151	23	—	HDC00330
5	127.0	1000	189	29	—	HDC00331
5¼	133.3	200	36	6	—	HDC00332
5½	139.7	250	42	7	HDC00334	HDC00335
5½	139.7	550	93	15	—	HDC00338
5½	139.7	600	102	16	—	HDC00339
5½	139.7	1000	170	26	—	HDC00340
5¾	146.1	400	65	10	—	HDC00341
5¾	146.1	600	97	15	HDC00342	HDC00343
6	152.4	200	31	5	HDC00344	—
6	152.4	250	39	6	HDC00345	HDC00346
6	152.4	300	46	7	HDC00347	HDC00348
6	152.4	400	62	10	HDC00349	HDC00350
6	152.4	500	77	12	HDC00351	HDC00352
6	152.4	600	93	14	HDC00353	HDC00354
6	152.4	675	104	16	—	HDC00355
6	152.4	750	116	18	HDC00356	HDC00357
6	152.4	800	123	19	—	HDC00358
6	152.4	900	139	22	—	HDC00359
6	152.4	1000	154	24	—	HDC00360
6½	165.1	600	85	13	—	HDC00361
6½	165.1	1000	141	22	—	HDC00362
7	177.8	250	33	5	HDC00365	HDC00366
7	177.8	350	46	7	—	HDC00367
7	177.8	400	52	8	HDC00368	—
7	177.8	500	65	10	—	HDC00369
7	177.8	600	78	12	HDC00370	HDC00371
7	177.8	750	98	15	—	HDC00373
7	177.8	775	101	16	—	HDC00374
7	177.8	1000	131	20	—	HDC00375
7½	190.5	600	73	11	—	HDC00377
7½	190.5	725	88	14	—	HDC00378
7½	190.5	850	103	16	—	HDC00379
7½	190.5	1000	121	19	—	HDC00380
7 13⁄16	198.4	750	87	14	—	HDC00381
8	203.2	250	30	5	HDC07944	—
8	203.2	300	34	5	HDC00382	HDC00383
8	203.2	400	45	7	HDC00384	—
8	203.2	450	51	8	HDC00385	—
8	203.2	500	57	9	HDC00386	HDC00387
8	203.2	600	68	11	HDC00388	HDC00389
8	203.2	700	79	12	—	HDC00390
8	203.2	750	85	13	—	HDC00391
8	203.2	900	102	16	—	HDC00392
8	203.2	1000	113	18	—	HDC00393
8⅝	219.1	500	52	8	—	HDC00395
9	228.6	200	20	3	HDC00396	HDC00397
9	228.6	500	50	8	—	HDC00398
9	228.6	885	88	14	—	HDC00399
9	228.6	1000	100	16	—	HDC00400
9½	241.3	200	19	3	HDC00401	—
9½	241.3	600	57	9	—	HDC00402
9½	241.3	1000	94	15	—	HDC00403
10	254.0	400	36	5	HDC00405	—
10	254.0	500	45	7	—	HDC00407
10	254.0	600	54	8	HDC00408	HDC00409
10	254.0	700	63	10	—	HDC00410
10	254.0	750	67	10	—	HDC00411
10	254.0	1000	89	14	—	HDC00413
10	254.0	1500	134	21	—	HDC00415
10 13⁄16	274.6	375	31	5	—	HDC00416
12	304.8	400	30	5	HDC00417	—
12	304.8	500	37	6	—	HDC00418
12	304.8	600	44	7	HDC00419	HDC00420
12	304.8	750	57	9	—	HDC14222
12	304.8	1000	74	11	—	HDC00421
12	304.8	1500	113	18	—	HDC06225
12 13⁄16	325.4	1000	69	11	—	HDC00422
13	330.2	1000	70	11	—	HDC07200
14	355.6	600	39	6	—	HDC22941
14	355.6	750	47	7	—	HDC00423
16	406.4	600	34	5	—	HDC22942
16	406.4	1200	66	10	—	HDC00424
18	457.2	1000	58	9	—	HDC22943
20	508.0	1000	53	8	—	HDC09305
24	609.6	1000	38	6	—	HDC10234

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

View Product Inventory @ www.tempco.com

STOCK — *Immediate Delivery through the TERMINATOR Lead Conversion Program*

1/2" Actual .496" (12.60 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1	25.4	50	64	10	HDC00426	—
1	25.4	150	191	30	HDC00427	—
1	25.4	200	255	40	—	HDC00428
1¼	31.8	50	42	7	HDC00429	—
1¼	31.8	125	106	17	HDC00430	HDC00431
1¼	31.8	180	153	24	—	HDC00432
1¼	31.8	200	170	26	—	HDC00433
1¼	31.8	250	212	33	—	HDC00434
1½	38.1	50	32	5	HDC00435	—
1½	38.1	150	95	15	HDC00436	HDC00437
1½	38.1	200	127	20	HDC00438	HDC00439
1¾	44.5	100	51	8	HDC00440	—
1¾	44.5	200	102	16	—	HDC00441
1¾	44.5	250	127	20	HDC00442	—
1¾	44.5	400	204	32	—	HDC00443
2	50.8	75	32	5	HDC00444	—
2	50.8	100	52	8	—	HDC22944
2	50.8	150	64	10	HDC00445	—
2	50.8	175	74	12	HDC00446	—
2	50.8	200	85	13	HDC00447	HDC00448
2	50.8	250	106	17	HDC00449	HDC00450
2	50.8	300	127	20	HDC00451	HDC00452
2	50.8	400	170	26	HDC00453	HDC00454
2	50.8	500	212	33	HDC00455	—
2	50.8	600	255	40	—	HDC00456
2	50.8	700	297	46	—	HDC00457
2¼	57.2	75	27	4	HDC00458	—
2¼	57.2	100	36	6	HDC00459	—
2¼	57.2	125	45	7	HDC00460	—
2¼	57.2	150	55	9	HDC00461	—
2¼	57.2	250	91	14	HDC00462	HDC00463
2¼	57.2	300	109	17	—	HDC00464
2¼	57.2	400	146	23	HDC00465	HDC00466
2¼	57.2	500	182	28	HDC00467	HDC00468
2⅜	60.3	100	34	5	HDC00470	HDC00471
2⅜	60.3	125	42	7	HDC00472	—
2⅜	60.3	250	85	13	HDC00473	HDC00474
2⅜	60.3	400	136	21	—	HDC00475
2⅜	60.3	500	170	26	HDC00476	HDC00477
2½	63.5	100	32	5	HDC00478	HDC00479
2½	63.5	125	40	6	HDC00480	—
2½	63.5	150	48	7	—	HDC00481
2½	63.5	200	64	10	HDC00482	HDC00483
2½	63.5	250	80	12	HDC00484	HDC00485
2½	63.5	300	95	15	HDC00486	HDC00487
2½	63.5	400	127	20	HDC00489	HDC00490
2½	63.5	500	159	25	HDC00491	HDC00492
2⁹⁄₁₆	65.1	300	93	14	—	HDC00493
2⁹⁄₁₆	65.1	350	108	17	HDC00494	—
2¾	69.9	250	71	11	HDC00495	—
2¾	69.9	400	113	18	HDC00496	HDC00497
3	76.2	125	32	5	HDC00498	HDC00499
3	76.2	150	38	6	HDC00500	HDC00501
3	76.2	200	51	8	—	HDC00502
3	76.2	250	64	10	HDC00503	HDC00504
3	76.2	300	76	12	HDC00505	HDC00506
3	76.2	350	89	14	HDC00507	—
3	76.2	400	102	16	HDC00508	HDC00509
3	76.2	500	127	20	HDC00510	HDC00511
3	76.2	600	153	24	HDC00512	HDC00513
3	76.2	750	191	30	HDC00514	HDC00515
3	76.2	1000	255	40	HDC00516	—
3½	88.9	250	53	8	HDC00517	HDC00518
3½	88.9	300	64	10	—	HDC00519
3½	88.9	350	74	12	—	HDC00520
3½	88.9	400	95	15	—	HDC08472
3½	88.9	500	106	17	HDC00522	HDC00523
3½	88.9	750	159	25	—	HDC00524
3½	88.9	1000	212	33	—	HDC00525
3¾	95.3	500	98	15	—	HDC00526
3¹³⁄₁₆	96.8	250	48	8	—	HDC00527
3¹³⁄₁₆	96.8	500	96	15	HDC00528	—
4	101.6	150	27	4	HDC00529	HDC00530
4	101.6	200	40	6	—	HDC07555
4	101.6	250	45	7	HDC00531	HDC00532
4	101.6	300	55	9	HDC00533	HDC00534
4	101.6	350	64	10	HDC00536	HDC00537
4	101.6	400	73	11	HDC00538	HDC00539
4	101.6	500	91	14	HDC00540	HDC00541
4	101.6	550	100	16	HDC00542	HDC00543
4	101.6	600	109	17	—	HDC00544
4	101.6	750	136	21	HDC00545	HDC00546
4	101.6	1000	182	28	—	HDC00547
4	101.6	1200	218	34	—	HDC00548
4⁵⁄₁₆	109.5	550	92	14	HDC00550	—
4½	114.3	250	40	6	HDC00551	—
4½	114.3	350	56	9	—	HDC00552
4½	114.3	500	80	12	HDC00553	HDC00554
4½	114.3	650	103	16	HDC00555	HDC00556
4½	114.3	750	119	19	HDC00557	HDC00558
4½	114.3	1000	159	25	—	HDC00559
4¾	120.7	200	30	5	—	HDC00560
4¹³⁄₁₆	122.2	250	37	6	HDC00561	—
4¹³⁄₁₆	122.2	300	44	7	—	HDC00562
4¹³⁄₁₆	122.2	1000	148	23	—	HDC00563
5	127.0	200	28	4	HDC00565	HDC00566
5	127.0	250	35	6	HDC00567	—
5	127.0	300	42	7	—	HDC00568
5	127.0	350	50	8	HDC00569	HDC00570
5	127.0	400	57	9	HDC00571	HDC00572
5	127.0	500	71	11	HDC00573	HDC00574
5	127.0	550	78	12	—	HDC00575
5	127.0	600	85	13	—	HDC00576
5	127.0	625	88	14	—	HDC00577
5	127.0	750	106	17	HDC00578	HDC00579
5	127.0	800	113	18	—	HDC00580
5	127.0	1000	141	22	—	HDC00581
5¼	133.4	250	34	5	HDC00582	HDC00583
5¼	133.4	1000	134	21	—	HDC00584
5½	139.7	200	25	4	—	HDC00585
5½	139.7	500	64	10	HDC00586	HDC00587
5½	139.7	650	83	13	—	HDC00588
5½	139.7	750	95	15	HDC00589	HDC00590
5¾	146.1	350	42	7	—	HDC00591
5¾	146.1	700	85	13	HDC00592	HDC00593
5¹³⁄₁₆	147.6	300	36	6	—	HDC00594

Made in USA

Hi-Density

STOCK — *Immediate Delivery through the TERMINATOR Lead Conversion Program*

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1/2" Actual .496" (12.60 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
6	152.4	200	23	4	—	HDC00595
6	152.4	250	29	5	HDC00596	HDC00597
6	152.4	300	35	5	HDC00598	HDC00599
6	152.4	350	41	6	HDC00600	HDC00601
6	152.4	450	52	8	—	HDC00602
6	152.4	500	58	9	HDC00603	HDC00604
6	152.4	600	69	11	—	HDC00605
6	152.4	750	87	14	HDC00606	HDC00607
6	152.4	850	98	15	HDC00609	HDC00610
6	152.4	875	101	16	—	HDC00611
6	152.4	1000	116	18	HDC00612	HDC00613
6	152.4	1200	139	22	—	HDC00614
6	152.4	1500	183	28	—	HDC16228
6⅜	161.9	1000	108	17	—	HDC00615
6½	165.1	500	53	8	HDC00616	HDC00617
6½	165.1	1000	106	17	—	HDC00618
6¾	171.5	500	51	8	HDC00619	HDC00620
7	177.8	250	24	4	HDC00621	—
7	177.8	340	33	5	—	HDC00622
7	177.8	400	39	6	—	HDC00623
7	177.8	500	49	8	HDC00624	HDC00625
7	177.8	600	59	9	HDC00626	HDC00627
7	177.8	700	69	11	—	HDC00628
7	177.8	750	73	11	HDC00629	HDC00630
7	177.8	1000	98	15	HDC00631	HDC00632
7	177.8	1500	147	23	—	HDC00633
7½	190.5	500	45	7	HDC00634	HDC00635
7½	190.5	1000	91	14	—	HDC00636
7¾	196.9	1000	88	14	—	HDC00637
8	203.2	200	17	3	—	HDC00639
8	203.2	300	25	4	HDC00640	HDC00641
8	203.2	500	42	7	HDC00642	HDC00643
8	203.2	600	51	8	—	HDC00644
8	203.2	750	64	10	HDC00645	HDC00646
8	203.2	800	68	11	HDC00647	HDC00648
8	203.2	1000	85	13	HDC00650	HDC00651
8	203.2	1200	102	16	—	HDC00653
8	203.2	1500	127	20	—	HDC00654
8	203.2	2000	170	26	—	HDC00655
8½	215.9	300	24	4	—	HDC00656
8½	215.9	500	40	6	—	HDC00657
8½	215.9	1000	80	12	HDC00658	HDC00659
8¾	222.3	1000	77	12	—	HDC00660
9	228.6	500	37	6	—	HDC00661
9	228.6	750	56	9	—	HDC00662
9	228.6	1000	75	12	HDC00663	HDC00664
9	228.6	1325	99	15	—	HDC00665
9	228.6	1500	112	17	—	HDC00666
9½	241.3	500	35	6	—	HDC00667
9½	241.3	800	57	9	—	HDC00668
9½	241.3	1000	71	11	—	HDC00669
10	254.0	500	34	5	HDC00670	HDC00671
10	254.0	750	50	8	—	HDC00672
10	254.0	800	54	8	—	HDC00673
10	254.0	1000	67	10	HDC00674	HDC00675
10	254.0	1250	84	13	—	HDC00677
10	254.0	1500	101	16	—	HDC00678
10	254.0	2000	134	21	—	HDC00679
10½	266.7	1500	95	15	—	HDC00680
11	279.4	500	30	5	HDC00681	—
11	279.4	1000	61	9	—	HDC00682
11	279.4	1500	91	14	—	HDC00683
11	279.4	2000	121	19	—	HDC00684
11½	292.1	1525	88	14	—	HDC00685
12	304.8	500	28	4	HDC00686	HDC00687
12	304.8	600	33	5	HDC00688	HDC00689
12	304.8	1000	55	9	HDC00690	HDC00691
12	304.8	1100	61	9	—	HDC00692
12	304.8	1500	83	13	—	HDC00693
12	304.8	2000	111	17	—	HDC00694
12½	317.5	1675	89	14	—	HDC00695
13½	342.9	500	24	4	—	HDC00696
14	355.6	1000	47	7	—	HDC00697
14	355.6	1700	80	12	—	HDC00698
14	355.6	2300	108	17	—	HDC00699
15	381.0	800	35	5	—	HDC00700
15	381.0	1000	44	7	—	HDC00701
15	381.0	1500	66	10	—	HDC00702
15	381.0	2000	88	14	—	HDC00703
16	406.4	800	33	5	—	HDC00704
16	406.4	1000	41	6	—	HDC00705
16	406.4	2000	84	13	—	HDC17207
16½	419.1	2200	88	14	—	HDC00706
17	431.8	1000	39	6	—	HDC00707
18	457.2	750	27	4	—	HDC00708
18	457.2	1000	36	6	—	HDC00709
18	457.2	1500	55	9	—	HDC00710
18	457.2	1700	62	10	—	HDC00711
18	457.2	2000	73	11	—	HDC00712
20	508.0	1000	34	5	—	HDC11652
24	609.6	1000	28	4	—	HDC14867

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

STOCK — *Immediate Delivery through the* TERMINATOR *Lead Conversion Program*

5/8" Actual .621" (15.77 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1¼	31.8	50	34	5	HDC00713	—
1¼	31.8	200	136	21	HDC00714	HDC00715
1¼	31.8	250	170	26	HDC00716	HDC00717
1½	38.1	250	127	20	HDC00719	HDC00720
2	50.8	100	34	5	HDC00721	—
2	50.8	125	42	7	HDC00722	—
2	50.8	200	68	11	HDC00723	HDC00724
2	50.8	250	85	13	HDC00725	HDC00726
2	50.8	300	102	16	—	HDC00727
2	50.8	400	136	21	—	HDC00728
2	50.8	500	170	26	—	HDC00729
2	50.8	750	255	40	—	HDC00730
2¼	57.2	100	29	5	HDC00731	—
2¼	57.2	125	36	6	HDC00732	—
2¼	57.2	250	73	11	HDC00733	HDC00734
2¼	57.2	350	102	16	HDC00735	HDC00736
2⅜	60.3	280	76	12	HDC00739	HDC00740
2½	63.5	180	46	7	HDC00742	—
2½	63.5	275	70	11	HDC00743	HDC00744
2½	63.5	400	102	16	HDC00745	HDC00746
2½	63.5	720	183	28	—	HDC00747
3	76.2	150	31	5	HDC00748	—
3	76.2	180	37	6	HDC00749	—
3	76.2	250	51	8	HDC00750	HDC00751
3	76.2	350	71	11	HDC00752	HDC00753
3	76.2	400	81	13	HDC00754	—
3	76.2	500	102	16	HDC00755	HDC00756
3	76.2	600	122	19	—	HDC00757
3	76.2	720	147	23	—	HDC00758
3	76.2	750	153	24	—	HDC00759
3¼	82.6	200	37	6	HDC00760	—
3¼	82.6	800	148	23	—	HDC00761
3½	88.9	525	89	14	—	HDC00762
3¾	95.3	525	82	13	HDC00763	HDC00764
4	101.6	250	36	6	HDC00766	HDC00767
4	101.6	300	44	7	—	HDC00768
4	101.6	350	51	8	HDC00769	—
4	101.6	400	58	9	—	HDC00770
4	101.6	500	73	11	HDC00771	HDC00772
4	101.6	550	80	12	—	HDC00773
4	101.6	600	87	14	—	HDC00774
4	101.6	750	109	17	HDC00775	HDC00776
4	101.6	1000	146	23	—	HDC00777
4½	114.3	500	64	10	—	HDC00780
4½	114.3	750	95	15	HDC00783	HDC00784
4½	114.3	1000	127	20	—	HDC00785
4¾	120.7	750	90	14	—	HDC00787
5	127.0	250	28	4	HDC00788	HDC00789
5	127.0	500	57	9	—	HDC00790
5	127.0	750	85	13	HDC00791	HDC00792
5	127.0	875	99	15	—	HDC00793
5	127.0	1000	113	18	HDC00794	HDC00795
5⅜	136.5	800	84	13	HDC00796	HDC00797
5½	139.7	800	81	13	—	HDC00800
5¾	146.1	500	49	8	—	HDC00801
5¾	146.1	1500	146	23	—	HDC00802
6	152.4	300	28	4	HDC00804	HDC00805
6	152.4	500	46	7	HDC00806	HDC00807
6	152.4	750	69	11	—	HDC00808
6	152.4	1000	93	14	HDC00809	HDC00810
6	152.4	1200	111	17	—	HDC00811
6	152.4	1500	139	22	HDC00812	HDC00813
6½	165.1	350	30	5	HDC00814	HDC00815
6½	165.1	500	42	7	HDC00816	HDC00817
6½	165.1	900	76	12	—	HDC00818
6½	165.1	1400	119	18	—	HDC00819
6¾	171.5	500	41	6	—	HDC00820
6¾	171.5	1000	81	13	—	HDC00821
7	177.8	500	39	6	HDC00822	HDC00823
7	177.8	750	59	9	—	HDC00824
7	177.8	1000	78	12	HDC00825	HDC00826
7	177.8	1500	118	18	—	HDC00827
7½	190.5	325	24	4	HDC00828	—
7½	190.5	1300	95	15	—	HDC00829
7¾	196.9	400	28	4	—	HDC00830
7¾	196.9	1000	70	11	—	HDC00831
8	203.2	400	27	4	—	HDC00832
8	203.2	500	34	5	HDC00833	HDC00834
8	203.2	750	51	8	—	HDC00835
8	203.2	850	58	9	—	HDC00836
8	203.2	1000	68	11	HDC00837	HDC00838
8	203.2	1200	81	13	HDC00839	HDC00840
8	203.2	1500	102	16	HDC00841	HDC00842
8	203.2	2000	136	21	—	HDC00843
8¾	222.3	450	28	4	HDC00845	—
8¾	222.3	1800	111	17	—	HDC00846
9	228.6	500	30	5	—	HDC00847
9	228.6	750	45	7	—	HDC00848
9	228.6	1000	60	9	—	HDC00849
9	228.6	1500	90	14	—	HDC00850
9½	241.3	975	55	9	—	HDC00851
10	254.0	500	27	4	HDC00852	HDC00853
10	254.0	650	35	5	HDC00855	—
10	254.0	750	40	6	—	HDC00856
10	254.0	800	43	7	—	HDC00857
10	254.0	1000	54	8	HDC00858	HDC00859
10	254.0	1500	80	13	HDC00860	HDC00861
10	254.0	2000	107	17	—	HDC00862
11	279.4	1000	49	8	—	HDC00863
11	279.4	1400	68	11	—	HDC00864
11	279.4	2000	97	15	—	HDC00865
12	304.8	500	22	3	HDC00866	HDC00867
12	304.8	600	27	4	HDC00868	—
12	304.8	775	34	5	—	HDC00869
12	304.8	900	40	6	—	HDC00870
12	304.8	1000	44	7	HDC00871	HDC00872
12	304.8	1500	66	10	HDC00873	HDC00874
12	304.8	2000	89	14	—	HDC00875
13	330.2	1000	41	6	—	HDC00876
13	330.2	1500	61	10	—	HDC00877
14	355.6	925	35	5	HDC00878	—
14	355.6	1000	38	6	—	HDC00879

Made in USA

Hi-Density

STOCK — *Immediate Delivery through the TERMINATOR Lead Conversion Program*

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5/8" Actual .621" (15.77 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
14	355.6	1500	57	9	—	HDC00880
14	355.6	3700	140	22	—	HDC00881
15	381.0	750	26	4	—	HDC00882
15	381.0	1000	35	5	—	HDC00883
15	381.0	2400	84	13	—	HDC00884
15	381.0	4000	140	22	—	HDC00885
16	406.4	1000	33	5	—	HDC00886
16	406.4	2500	82	13	—	HDC00887
16	406.4	4500	148	23	—	HDC00888
17	431.8	1000	31	5	—	HDC00889
18	457.2	900	26	4	—	HDC00890
18	457.2	1000	29	5	—	HDC00891
18	457.2	1500	44	7	—	HDC00892

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
18	457.2	3000	87	14	—	HDC00893
18	457.2	4700	137	21	—	HDC00894
19	482.6	1000	28	4	—	HDC00895
20	508.0	1000	26	4	—	HDC00896
20	508.0	1500	39	6	—	HDC00897
20	508.0	3500	91	14	—	HDC00898
20	508.0	4700	123	19	—	HDC00899
24	609.6	1000	22	3	—	HDC00900
24	609.6	2000	43	7	—	HDC00901
24	609.6	4700	102	16	—	HDC00902
25¼	641.4	1500	31	5	—	HDC00903
30	762.0	2800	48	8	—	HDC00904
36	914.4	3000	43	7	—	HDC00905

3/4" Actual .746" (18.95 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
2	50.8	200	57	9	HDC00906	—
2	50.8	800	226	35	—	HDC00907
2¼	57.2	200	49	8	HDC00908	—
2¼	57.2	800	194	30	—	HDC00909
3	76.2	250	42	7	HDC00910	—
3	76.2	500	85	13	HDC00911	HDC00912
3	76.2	600	102	16	HDC00913	HDC00914
3	76.2	1000	170	26	—	HDC00915
3½	88.9	250	35	6	HDC00916	HDC00917
3½	88.9	350	50	8	—	HDC00918
3½	88.9	500	71	11	HDC00919	—
3½	88.9	1000	141	22	—	HDC00920
3¾	95.3	250	33	5	HDC00921	—
3¾	95.3	500	65	10	—	HDC00922
3¾	95.3	1000	131	20	—	HDC00923
4	101.6	250	30	5	HDC00924	—
4	101.6	500	61	9	HDC00926	HDC00927
4	101.6	750	91	14	—	HDC00928
4	101.6	1000	121	19	HDC00929	HDC00930
4½	114.3	350	37	6	HDC00931	—
4½	114.3	875	93	14	HDC00932	HDC00933
4½	114.3	1400	149	23	—	HDC00934
4¾	120.7	750	75	12	—	HDC00935
5	127.0	300	28	4	HDC00936	HDC00937

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
5	127.0	500	47	7	—	HDC00938
5	127.0	750	71	11	—	HDC00939
5	127.0	1000	94	15	HDC00940	HDC00941
5	127.0	1200	113	18	—	HDC00942
5¾	146.1	1000	81	13	—	HDC00943
6	152.4	500	39	6	HDC00944	HDC00945
6	152.4	750	58	9	—	HDC00946
6	152.4	1000	77	12	HDC00947	HDC00948
6	152.4	1200	93	14	—	HDC00949
6	152.4	1500	116	18	—	HDC00950
6	152.4	2000	154	24	—	HDC00951
7	177.8	500	33	5	HDC00952	HDC00953
7	177.8	1000	65	10	HDC00954	HDC00955
7	177.8	1500	98	15	HDC00956	HDC00957
7	177.8	2000	131	20	—	HDC00958
7⅝	193.7	450	27	4	—	HDC00959
8	203.2	350	20	3	—	HDC00961
8	203.2	500	28	4	HDC00962	HDC00963
8	203.2	700	40	6	—	HDC00964
8	203.2	1000	57	9	—	HDC00965
8	203.2	1350	76	12	—	HDC00966
8	203.2	2000	113	18	HDC00967	HDC00968
9	228.6	350	17	3	—	HDC00969
9	228.6	500	25	4	—	HDC00970

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

Since 1972

STOCK — *Immediate Delivery through the TERMINATOR Lead Conversion Program*

3/4" Actual .746" (18.95 mm) Diameter Hi-Density Cartridge Heaters

Part Numbers listed are for stock Cartridge Heaters terminated with 10 inch long leads (Type N Termination).
Other Terminator Program terminations and options can also be applied to stock heaters (see Ordering Information).

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
9	228.6	1000	53	8	—	HDC22945
9	228.6	1200	60	9	—	HDC00971
9	228.6	1800	90	14	—	HDC00973
9¾	247.7	2000	92	14	—	HDC00974
10	254.0	600	27	4	—	HDC00975
10	254.0	1000	45	7	—	HDC00976
10	254.0	1200	54	8	—	HDC00977
10	254.0	1500	70	11	—	HDC22946
10	254.0	2000	89	14	HDC00978	HDC00979
10½	266.7	550	23	4	—	HDC00980
11	279.4	1000	40	6	—	HDC00981
11¾	298.5	2000	75	12	—	HDC00983
12	304.8	800	30	5	—	HDC00984
12	304.8	1000	37	6	—	HDC00985
12	304.8	1200	44	7	—	HDC00986
12	304.8	1500	55	9	—	HDC00987
12	304.8	2000	74	11	HDC00988	HDC00989
12	304.8	2500	92	14	—	HDC00990
12	304.8	4000	148	23	—	HDC00991
13	330.2	1000	34	5	—	HDC00992
14	355.6	800	25	4	—	HDC00993
14	355.6	1000	31	5	—	HDC00994
14	355.6	1125	35	6	HDC00995	—
14	355.6	1250	39	6	—	HDC00996
14	355.6	1400	44	7	—	HDC00997
14	355.6	2500	79	12	—	HDC00998
14	355.6	4500	141	22	—	HDC00999
14¾	374.7	1500	45	7	—	HDC01000

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
15	381.0	1000	29	5	—	HDC01001
15	381.0	1500	44	7	—	HDC01002
16	406.4	1000	27	4	—	HDC01003
16	406.4	1175	32	5	HDC01004	—
16	406.4	1500	41	6	—	HDC01005
16	406.4	1800	49	8	—	HDC01006
16	406.4	3000	82	13	—	HDC01007
16	406.4	4700	129	20	—	HDC01008
17	431.8	1000	26	4	—	HDC01009
17¾	450.9	850	21	3	—	HDC01010
18	457.2	1000	24	4	—	HDC01011
18	457.2	1250	30	5	HDC01012	—
18	457.2	1450	35	6	—	HDC01013
18	457.2	2000	49	8	—	HDC01014
18	457.2	3250	79	12	—	HDC01015
18	457.2	5000	121	19	—	HDC01016
19	482.6	1000	23	4	—	HDC01017
20	508.0	1000	22	4	—	HDC01018
20	508.0	1150	25	4	—	HDC01019
20	508.0	2050	45	7	—	HDC01020
20	508.0	2250	49	8	—	HDC01021
20	508.0	5250	114	18	—	HDC01022
24	609.6	1000	18	3	—	HDC01023
24	609.6	1375	25	4	—	HDC01024
24	609.6	2000	36	6	—	HDC01025
24	609.6	2750	50	8	—	HDC01026
24	609.6	5500	99	15	—	HDC01027
36	914.4	2500	30	5	—	HDC01028

Ordering Information

Order by Part Number for stock Cartridge heaters with Type N termination. Call Tempco for part numbers for stock heaters with other Terminator Program terminations and options (see pages 2-12 & 2-13).

Custom Engineered/Manufactured

Cartridge Heaters can be application specific; therefore for sizes, electrical ratings, terminations and any other design features not listed in this catalog **TEMPCO** will custom manufacture to your specifications. Consult us with your requirements.

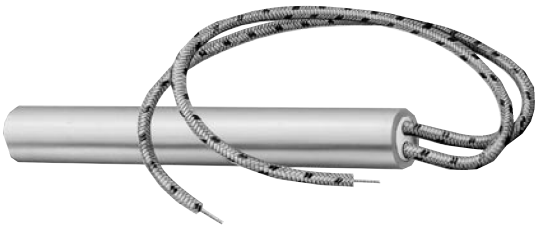
1" Dia. Actual .996" (25.30 mm) Hi-Density Cartridge Heaters with Type N termination 10" leads

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3	76.2	750	101	16	—	HDC02662
3½	88.9	565	63	10	—	HDC02663
5	127.0	1000	73	11	—	HDC02664
7⅞	200.0	500	22	3	HDC02665	HDC02666
8	203.2	1500	65	10	—	HDC02667
8¾	222.3	875	34	5	—	HDC02668
11½	292.1	1000	29	5	HDC02669	—
13	330.2	1000	26	4	HDC02670	—
14	355.6	2700	64	10	—	HDC02671
15	381.0	1000	22	3	HDC02672	—

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
16	406.4	1800	37	6	—	HDC02673
17⅜	441.3	2400	46	7	—	HDC02674
20	508.0	1000	16	3	—	HDC02675
20	508.0	2800	46	7	—	HDC02676
25	635.0	1725	23	3	HDC02677	HDC02678
40	1016.0	4400	36	6	—	HDC02679
49	1244.6	3725	25	4	—	HDC02680
50½	1282.7	945	6	1	—	HDC02681
57	1447.8	2800	16	3	—	HDC02682
60	1524.0	1500	8	1	—	HDC02683

Note: 1" Dia. Hi-Density Cartridge Heaters are made-to-order only. Refer to ordering information on page 2-3.
Standard lead time is 3 weeks.

STOCK *Cartridge Heaters with Type F Flexible Lead Termination*



Type F Internally Connected Flexible Leads 10" Long

This lead termination provides flexibility; the lead wires are internally connected to the terminal pins. The lead wires can be sharply bent as they exit the ceramic insulating cap without exposing the bare wire.

1/4" *Diameter Actual .246" (6.25 mm)*

Sheath Length in	Sheath Length mm	Watts	Volts	Watt Density W/in²	Watt Density W/cm²	Part Number
1	25.4	80	120	204	32	HDC05603
1½	38.1	50	120	64	10	HDC06151
1½	38.1	200	120	255	40	HDC10869
2	50.8	200	240	170	26	HDC01989
2	50.8	250	240	212	33	HDC05179
2	50.8	300	240	255	40	HDC04556
2½	63.5	300	240	191	30	HDC07119
3	76.2	75	120	38	6	HDC10412
3	76.2	300	240	153	24	HDC04490
4	101.6	400	240	146	23	HDC04200
5¾	146.1	350	120	94	15	HDC04732

3/8" *Diameter Actual .371" (9.42 mm)*

Sheath Length in	Sheath Length mm	Watts	Volts	Watt Density W/in²	Watt Density W/cm²	Part Number
1¼	31.8	150	240	170	26	HDC06254
1¼	31.8	200	240	226	35	HDC04349
1½	31.8	250	120	212	33	HDC04402
2	50.8	250	240	141	22	HDC04291
2	50.8	350	240	198	31	HDC11345
2½	63.5	250	240	106	16	HDC07496
2½	63.5	350	240	149	23	HDC04759
2½	63.5	500	240	212	33	HDC05359
3	76.2	300	240	102	16	HDC02094
3	76.2	375	240	127	20	HDC06779
3½	88.9	350	240	99	15	HDC04861
4	101.6	400	120	97	15	HDC04560
4	101.6	500	240	121	19	HDC04552
5½	139.7	1000	240	170	26	HDC05431
7	177.8	350	240	46	7	HDC05303
12	304.8	1000	240	74	11	HDC05833

1/2" *Diameter Actual .496" (12.60 mm)*

Sheath Length in	Sheath Length mm	Watts	Volts	Watt Density W/in²	Watt Density W/cm²	Part Number
2	50.8	300	240	127	20	HDC03872
3⅛	79.4	500	240	121	19	HDC11162
3 13/16	96.8	250	240	48	7	HDC10330
4	101.6	500	240	91	14	HDC04676
4	101.6	600	240	109	17	HDC03878
5	127	500	240	71	11	HDC04701
6	152.4	500	240	58	9	HDC04677
6	152.4	750	240	87	14	HDC04352
6	152.4	1000	240	116	18	HDC03887
7	177.8	750	240	73	11	HDC03893
8	203.2	500	240	42	7	HDC02265
8	203.2	1000	240	85	13	HDC02263
10	254	1000	240	67	10	HDC04220

5/8" *Diameter Actual .621" (15.77 mm)*

Sheath Length in	Sheath Length mm	Watts	Volts	Watt Density W/in²	Watt Density W/cm²	Part Number
3	76.2	750	240	153	24	HDC04483
6	152.4	600	240	56	9	HDC11240
6	152.4	1000	240	93	14	HDC07353

All Items Available from Stock

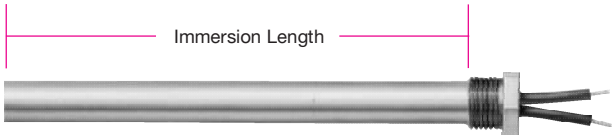
Note: Custom Engineered/Manufactured Hi-Density Cartridge Heaters with Type F Flexible Lead Termination

Refer to ordering information on page 2-3.

Standard Size Stock Type CM 1/2" & 3/4 NPT Screw Plug Hi-Density Cartridge Immersion Heaters

Hi-Density Cartridge Immersion Heaters are designed for heating water and other liquids. The high watt density capability of this heater permits greater heat dissipation in a given area than would a tubular immersion heater.

However, it is important to note that allowable watt density depends on the material being heated. For water heating, watt densities of several hundred watts per square inch are possible; oil heating may be limited to 5 to 20 watts per square inch.



Design Features

- *Passivated Incoloy® Sheath*
- *10" long Teflon® Insulated Lead Wires*
- *Brass Fitting*
- *Epoxy Seal at Lead End 266°F (130°C) Standard UL Rating 194°F (90°C)*

Note: See pages 2-50 & 2-51 for other fitting options

Diameter	Heater Immersion Length in	mm	Watts	Watt Density W/in²	W/cm²	Part Number 120V	240V	480V
5/8" Incoloy® Sheath 1/2 NPT Fitting	1½	38.1	100	41	6	HDL00001	—	—
	1½	38.1	400	163	25	—	HDL00002	—
	3½	88.9	250	39	6	HDL00003	HDL00004	—
	3½	88.9	1000	157	24	—	HDL00005	HDL00006
	7⅞	200.0	500	33	5	HDL00007	HDL00008	—
	7⅞	200.0	2000	134	21	—	HDL00009	HDL00010
	12	304.8	750	33	5	HDL00011	HDL00012	—
	12	304.8	3000	130	20	—	HDL00013	HDL00014
3/4" Incoloy® Sheath 3/4 NPT Fitting	4¼	108.0	500	53	8	HDL00015	HDL00016	—
	4¼	108.0	750	80	12	HDL00017	HDL00018	—
	4¼	108.0	1000	106	16	HDL00019	HDL00020	—
	4⅝	117.5	300	29	5	HDL00021	HDL00022	—
	4⅝	117.5	1200	116	18	—	HDL00023	HDL00024
	4¾	120.7	375	35	5	HDL00025	HDL00026	—
	4¾	120.7	1500	141	22	—	HDL00027	HDL00028
	5¾	146.1	500	39	6	HDL00029	HDL00030	—
	5¾	146.1	2000	154	24	—	HDL00031	HDL00032
	6¼	158.8	500	35	5	HDL00033	HDL00034	—
	6¼	158.8	2000	141	22	—	HDL00035	HDL00036
	6½	165.1	625	42	7	HDL00037	HDL00038	—
	6½	165.1	2500	170	26	—	HDL00039	HDL00040
	7¼	184.2	750	45	7	HDL00041	HDL00042	—
	7¼	184.2	3000	182	28	—	HDL00043	HDL00044
	9	228.6	1000	49	8	HDL00045	HDL00046	—
	9	228.6	4000	194	30	—	HDL00047	HDL00048
	10½	266.7	750	31	5	HDL00049	HDL00050	—
	10½	266.7	3000	124	19	—	HDL00051	HDL00052
	10¾	273.1	1250	51	8	HDL00053	HDL00054	—
	10¾	273.1	5000	202	31	—	HDL00055	HDL00056
	12½	317.5	1500	52	8	—	HDL00057	—
	12½	317.5	6000	208	32	—	—	HDL00058
	13⅜	346.1	1000	32	5	HDL00059	HDL00060	—
	13⅜	346.1	4000	127	20	—	HDL00061	HDL00062
	16	406.4	2000	54	8	—	HDL00063	—
	16	406.4	8000	216	33	—	—	HDL00064
	19¼	489.0	2500	56	9	—	HDL00065	—
	19¼	489.0	10000	223	35	—	—	HDL00066

Ordering Information

Stock Heaters

Part Numbers listed above are for 1/2" and 3/4" NPT Brass Screw Plug Cartridge Immersion Heaters with Type CM termination and 10" long leads. ***Standard lead time is 72 hours.***

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Cartridge Immersion Heater to meet your requirements. ***Standard lead time is 3 weeks.***

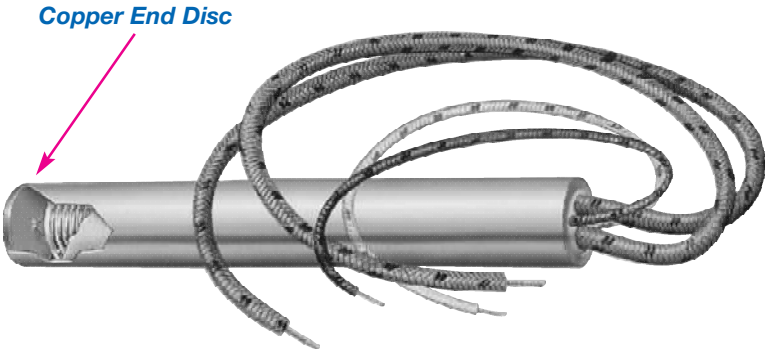
Please Specify the following:

- ❑ Screw Plug NPT Size
- ❑ Screw Plug material (Brass or SS)
- ❑ Sheath material (Incoloy®, 321 SS)
- ❑ Element Watt Density
- ❑ Immersion Length
- ❑ Heated Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination types
- ❑ Lead Length

Made in USA

Hi-Density Pennybottom™ Cartridge Heaters with Built-In Thermocouple

Designed for Trouble-Free Performance and Improved Efficiency



The unique feature of the Pennybottom™ cartridge heater is the use of a flat copper end disc to maximize heat transfer and improve temperature sensing. It has been proved through extensive field testing that heat at the tip can be increased by up to 30°F. The Pennybottom™ cartridge heater also includes a Type J thermocouple at the end disc. The junction is grounded to the flat copper end disc, providing excellent temperature control at the gating area, eliminating freeze-ups or drool, thus producing quality molded parts.

Additional features of Pennybottom™ heaters include minimum cold sections and computer designed distributed wattage. Pennybottom™ heaters are manufactured under the same design specifications and rigid quality control workmanship as the Hi-Density cartridge heater line. The swaging operation during the manufacturing process produces a rugged and durable cartridge heater for greater reliability and exceptionally long operating life.

Design Features

- *Pennybottom™ Copper Flat End Disc*
- *Hi-Density Swaged Construction*
- *Grounded Type J Thermocouple at the Copper End Disc*
- *36" High Temperature Leads for both Heater and Thermocouple*
- *Minimum Cold Sections*
- *OEM Replacements Available From Stock for Runnerless Molding Systems*

Note: The cartridge heaters listed in this section include Pennybottom™ and Hi-Density cartridge heaters configured for specific tasks in the plastic injection molding environment with extra long leads, Teflon® or fiberglass insulation, with and without thermocouples, grounded at the end disc or in the middle of the heater.

PENNYBOTTOM™ HEATER SPECIFICATIONS

Nominal Diameter	1/4"		3/8"		1/2"	
	in	(mm)	in	(mm)	in	(mm)
Actual Diameter	.246	(6.30)	.371	(9.42)	.496	(12.60)
Diameter Tolerance	±.002	(.051)	±.002	(.051)	±.002	(.051)
Minimum Length	1	(25.40)	1	(25.40)	1-1/4	(31.75)
Maximum Length	36	(914)	48	(1219)	60	(1524)
Length Tolerance Heaters up to 5"(127 mm) long	±3/32	(2.4)	±3/32	(2.4)	±3/32	(2.4)
Length Tolerance Heaters over 5"(127 mm) long	±2% of Sheath Length					
Camber Tolerance Heaters to 12"(305 mm) long	.010" (.254 mm) per Foot of Length					
Camber Tolerance Heaters over 12"(305 mm) long	.020" (.508 mm) per Foot of Length					

STOCK *Hi-Density Pennybottom™ Cartridge Heaters with Built-In Type J Thermocouple*

Cartridge Heater Diameter	Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V Tempco	Part Number 240V DME	Part Number 240V Incoe	Part Number Tempco
1/4" Actual .248	1½	38.1	200	255	39	—	—	—	HDP00001
	1¾	44.5	200	204	32	HDP00002	—	—	—
	2	50.8	200	170	26	HDP00003	—	—	HDP00004
	2½	63.5	200	127	20	HDP00005	—	—	HDP00006
	3	76.2	200	102	16	HDP00007	—	—	HDP00008
	3½	88.9	250	106	16	—	—	—	HDP00009
	4	101.6	250	91	14	—	—	—	HDP00010
	5	127.0	250	71	11	—	—	—	HDP00011
3/8" Actual .371	1¾	44.5	200	136	21	—	TCH0001	TJ38017	HDP00012
	2	50.8	250	141	22	—	TCH0002	TJ38020	HDP00013
	2½	63.5	250	106	16	—	TCH0003	TJ38025	HDP00014
	3	76.2	260	88	14	—	TCH0004	TJ38030	HDP00015
	3½	88.9	320	91	14	—	TCH0005	TJ38035	HDP00016
	4	101.6	370	90	14	—	TCH0006	TJ38040	HDP00017
	4½	114.3	420	89	14	—	TCH0007	TJ38045	HDP00018
	5	127.0	470	89	14	—	TCH0008	TJ38050	HDP00019
	5½	139.7	525	89	14	—	TCH0009	TJ38055	HDP00020
	6	152.4	575	89	14	—	TCH0010	TJ38060	HDP00021
	6½	165.1	625	88	14	—	TCH0011	TJ38065	HDP00022
	7	177.8	675	88	14	—	TCH0012	TJ38070	HDP00023
	7½	190.5	725	88	14	—	TCH0013	TJ38075	HDP00024
	8	203.2	775	88	14	—	TCH0014	TJ38080	HDP00025
	9	228.6	885	88	14	—	—	TJ38090	HDP00026
	9½	241.3	940	89	14	—	—	TJ38095	HDP00027
	10	254.0	990	88	14	—	—	TJ38100	HDP00028
	10½	266.7	1045	89	14	—	—	TJ38105	HDP00029
	11½	292.1	1500	116	18	—	—	TJ38115	HDP00030
1/2" Actual .496	2½	63.5	280	89	14	—	—	TJ12025	HDP00031
	3½	88.9	420	89	14	—	TCH0015	TJ12035	HDP00032
	4	101.6	490	89	14	—	TCH0016	TJ12040	HDP00033
	4½	114.3	550	88	14	—	TCH0017	TJ12045	HDP00034
	5	127.0	625	88	14	—	TCH0018	TJ12050	HDP00035
	5½	139.7	700	89	14	—	TCH0019	TJ12055	HDP00036
	6	152.4	775	90	14	—	TCH0020	TJ12060	HDP00037
	6½	165.1	850	90	14	—	TCH0021	TJ12065	HDP00038
	7	177.8	900	88	14	—		TJ12070	HDP00039
	7½	190.5	975	89	14	—	TCH0022	TJ12075	HDP00040
	8	203.2	1050	89	14	—	—	TJ12080	HDP00041
	8½	215.9	1100	88	14	—	—	TJ12085	HDP00042
	9	228.6	1200	90	14	—	—	TJ12090	HDP00043
	9½	241.3	1250	88	14	—	—	TJ12095	HDP00044
	10	254.0	1325	89	14	—	—	TJ12100	HDP00045
	10½	266.7	1400	89	14	—	—	TJ12105	HDP00046
	11	279.4	1470	89	14	—	—	TJ12110	HDP00047
	12½	317.5	1675	89	14	—	—	TJ12125	HDP00048
	13½	342.9	1800	88	14	—	—	TJ12135	HDP00049

All Items Available from Stock

Ordering Information

Stock Heaters

Order by Catalog Part Number from the Stock Sizes and Ratings List above. Note that Part Numbers shown are for heaters with 36" Heater and T/C Leads. Thermocouple Type J grounded at disc end.

Custom Engineered/Manufactured Heaters

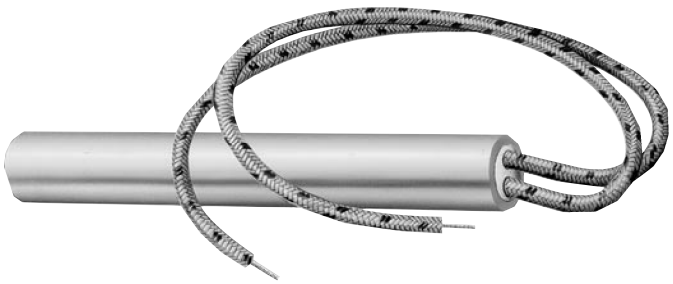
Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Pennybottom™ Cartridge Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Diameter
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Lead and Thermocouple Lengths
- ❑ Special Features

Made in USA

STOCK *OEM Replacement Cartridge Heaters for Runnerless Molding Hot Tip Bushings*



Non-Thermocouple Type F Heaters — 240V

Design Features

- *Pennybottom™ Copper Flat End Disc*
- *Hi-Density Swaged Construction*
- *36" High Temperature Heater Flexible Leads*
- *Computer Designed Distributed Wattage*
- *Designed for 240VAC*

Non-Thermocouple Type F Heaters — 240V

Cartridge Heater Diameter	Sheath Length in	Watts	Part Number Incoe	Part Number TEMPCO
3/8" Actual .371	1¾	200	H-38017	HDP00050
	2½	250	H-38025	HDP00051
	3	260	H-38030	HDP00052
	4	370	H-38040	HDP00053
	4½	420	H-38045	HDP00054
	5	470	H-38050	HDP00055
	5½	525	H-38055	HDP00056
	6	575	H-38060	HDP00057
	6½	625	H-38065	HDP00058
	7	675	H-38070	HDP00059
	7½	725	H-38075	HDP00060
	8	775	H-38080	HDP00061
	8½	835	H-38085	HDP00062
	9	885	H-38090	HDP00063
	9½	940	H-38095	HDP00064
	10	990	H-38100	HDP00065
	10½	1045	H-38105	HDP00066
	11½	1150	H-38115	HDP00067
	13	1300	H-38130	HDP00068
	13½	1350	H-38135	HDP00069
1/2" Actual .496	3½	420	H-12035	HDP00070
	4	490	H-12040	HDP00071
	4½	550	H-12045	HDP00072
	5	625	H-12050	HDP00073
	5½	700	H-12055	HDP00074
	6	775	H-12060	HDP00075
	6½	850	H-12065	HDP00076
	7	900	H-12070	HDP00077
	7½	975	H-12075	HDP00078
	8	1050	H-12080	HDP00079
	8½	1100	H-12085	HDP00080
	9	1200	H-12090	HDP00081
	9½	1250	H-12095	HDP00082
	10	1325	H-12100	HDP00083
	10½	1400	H-12105	HDP00084
	11	1470	H-12110	HDP00085
	11½	1525	H-12115	HDP00086
	12½	1675	H-12125	HDP00087
	13½	1800	H-12135	HDP00088
	14½	1950	H-12145	HDP00089
	15½	2100	H-12155	HDP00090
	16½	2200	H-12165	HDP00091
	17½	2300	H-12175	HDP00092
	18½	2500	H-12185	HDP00093
	19½	2875	H-12195	HDP00094

All Items Available from Stock

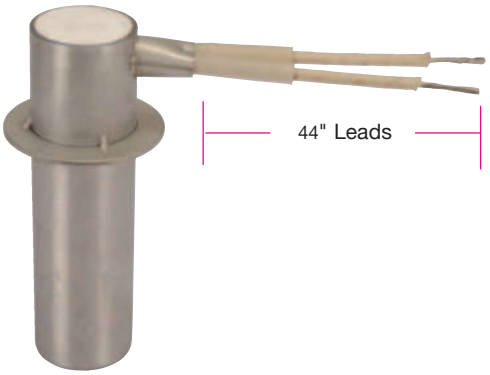
View Product Inventory @ www.tempco.com

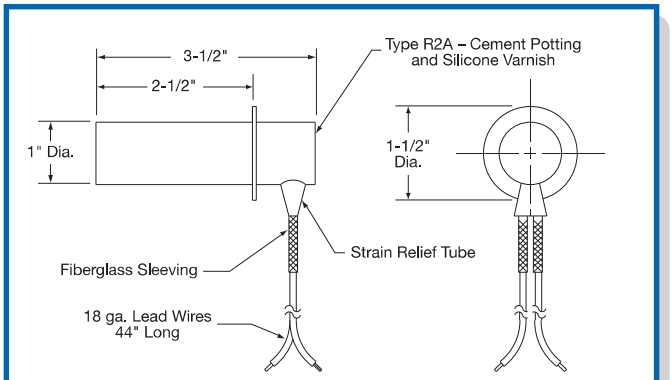
STOCK OEM Replacement Hi-Density Cartridge Heaters — Underwater Pelletizer Die Heater

Design Features

- *Hi-Density Swaged Construction*
- *44" mica insulated 842°F (450°C) Lead Wires*
- *1" Diameter Heater Sheath*
- *Incoloy Sheath Standard, SS Optional*
- *16 Gauge Stainless Steel Mounting Flange*
- *Ground Lead Optional*
- *Other Options Available (wattage, voltage, lead length etc.)*

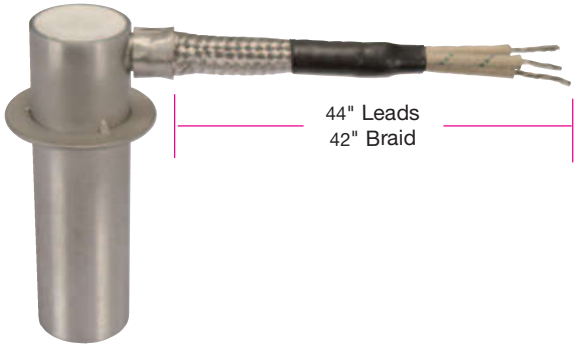
Type R2A Cement potting and silicone varnish



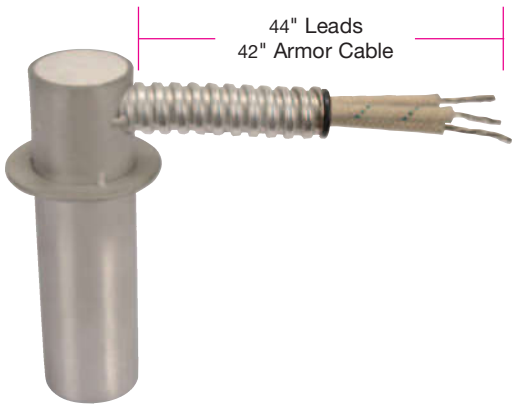


Type R2A 600W, 240V — Part Number HDC02661

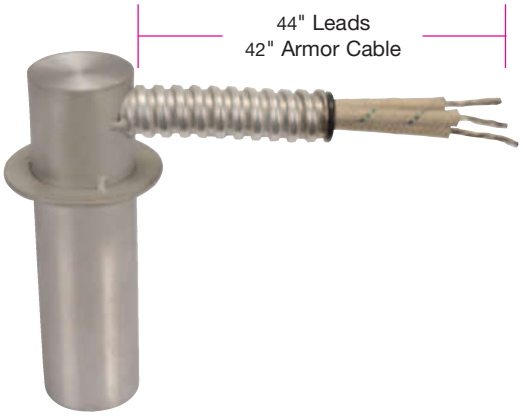
Type W1A Cement potting and silicone varnish



Type C3B Cement potting & silicone varnish, with stainless steel cable



Type C3D Welded lead end disc, with stainless steel cable



Made in USA

METRIC SIZES

HI-Density CARTRIDGE HEATERS

Standard Specifications and Tolerances of Hi-Density Cartridge Heaters in ***Metric*** sizes. If tighter tolerances are required consult Tempco.

LEAD LENGTH TOLERANCE

Up to 1000 mm: -15/+40 mm
1000 mm to 2000 mm: -25/+50 mm
Above 2000 mm: ±100 mm

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	6.5		8		10		12.5		16		20	
	mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)	mm	(in)
Actual Diameter	6.43	(.253)	7.92	(.312)	9.93	(.391)	12.42	(.489)	15.93	(.627)	19.91	(.784)
Actual Diameter Tolerance	±.05 mm (±.002")											
Minimum Length	25.4	(1)	25.4	(1)	25.4	(1)	25.4	(1)	25.4	(1)	31.75	(1-1/4)
Maximum Length	914	(36)	914	(36)	1219	(48)	1524	(60)	1829	(72)	1829	(72)
Length Tolerance Heaters up to 127 mm (5") long	±2.4	(3/32)	±2.4	(3/32)	±2.4	(3/32)	±2.4	(3/32)	±2.4	(3/32)	±3.2	(1/8)
Length Tolerance Heaters over 127 mm (5") long	±2% of Sheath Length											
Camber Tolerance Heaters to 305 mm (12") long	.25 mm (.010") per 305 mm (12") of length											
Camber Tolerance Heaters over 305 mm (12") long	.50 mm (.020") per 305 mm (12") of length											

With some force, Tempco Hi-Density Cartridge Heaters will normally flex enough to fit into a straight reamed hole.

ELECTRICAL SPECIFICATIONS

Nominal Diameter	6.5	8	10	12.5	16	20
Maximum Voltage	260	260	260	380	480*	480*
Maximum Amperage (see next line for exceptions)	4.4	4.4	6.7	10.5	23	23
†Maximum Amperage for Types C1C, C1D, C2C, C2D, CS, F, M3, R1B, S1B, S2B, SA, W, & W3 & Terminations	3.0	3.0	5.5	7.6	9.7	9.7
Maximum Wattage at 260V	1140	1150	1740	2730	5980	5980
Maximum Wattage at 380V	—	—	—	3990	8740	8740
Maximum Wattage at 480V	—	—	—	—	10,580	10,580
Wattage Tolerance	Plus 5%, Minus 10%					
Resistance Tolerance	Plus 10%, Minus 5%					

*480V when applicable. Consult Tempco.

†Current carrying capacities are for ambient temperatures up to 482°F (250°C) with mica insulated lead wires.

Recommendations for Improving the Life of Tempco Hi-Density Metric Cartridge Heaters

Tempco Hi-Density Metric Cartridge Heaters have been widely used in many demanding and diverse applications since 1972. The commonly used basic applications are platen, plastic mold and die heating, liquid immersion and air heating.

Note: Selection of the wrong termination for the particular application is the major reason for all heater failures. However, failure to consider other important criteria can also have a negative effect on the life of the heater. To get the best performance and assure long life, it is important to carefully evaluate the following factors.

Operating Temperature

Operating temperature of a heater is a major factor in determining the life expectancy of a heating element. The heater life depends on the actual temperature of the resistance wire within the heater and not on the process operating temperature. The graph in Fig. 1 demonstrates the proper relationship between operating temperature and watt density; the higher the operating temperature, the lower the maximum recommended watt density.

Heater Watt Density

Cartridge heater watt density is defined as the wattage dissipated per square centimeter of the heated sheath surface. For a particular application a heater's watt density governs internal resistance wire temperature, which determines the outer sheath temperature. These factors are critical to the proper heating of the application and to the life expectancy of the heater. Special construction features that promote excellent heat transfer permit Hi-Density cartridge heaters to operate at higher watt densities while maintaining the lowest possible resistance wire temperatures of any style cartridge heater.

Heater watt density (w/cm^2) is calculated using the following formula:

$$\text{Watt Density} = \frac{\text{Heater wattage}}{\text{Heated length} \times \text{Heater diameter} \times 3.1416}$$

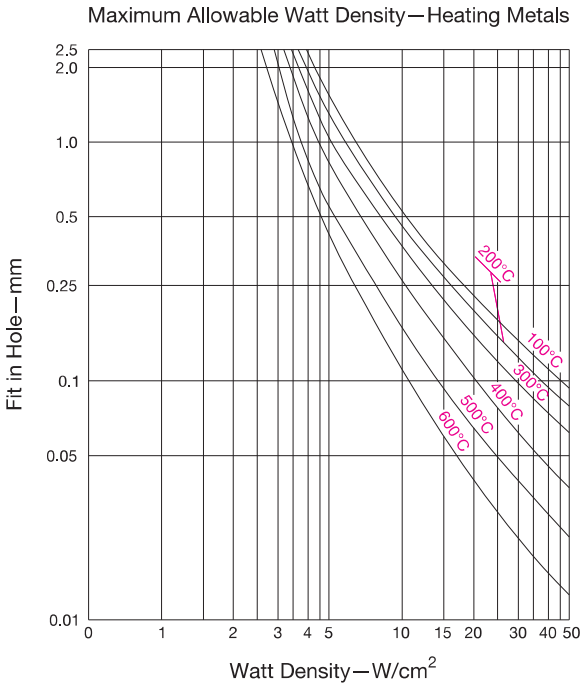
Heated length is the overall length of the heater minus any unheated (cold) sections. Standard Type N, Hi-Density Metric Cartridge Heaters have 9.5 mm at the lead end and 6.4 mm at the disc end unheated. This would mean a 100 mm long heater would have 84.1 mm effective heated length. Unheated sections vary with type of heater termination. For descriptions of terminations and options, see pages 2-39 through 2-60.

The graph in Fig. 1 shows the maximum recommended watt density for Hi-Density Metric Cartridge Heaters when used in a steel platen. Watt density limitations for various materials are given in the engineering section of this catalog. For liquid immersion heaters the maximum watt density depends on the type of liquid being heated. The more viscous, or thicker the liquid, the lower the maximum watt density. Higher watt density can cause the liquid to carbonize and accumulate on the heater sheath, which will cause premature heater failure. It is advisable to use heaters that have watt densities below the maximum recommended watt density to get the longest heater life. If the actual heater watt density is close to the maximum recommended watt density, you can correct the problem by:

1. Increasing the number, diameter and length of heaters.
2. Lowering the total wattage; however, this may increase the heat-up time.
3. Obtaining tighter fit (see Fig. 2 — Determining Fit).

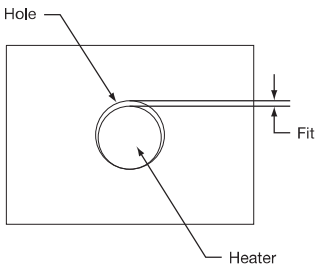
A Hi-Density cartridge heater designed at the maximum recommended watt density allows the smallest heater to be used to obtain the required wattage with good service life. All things being equal, using a lower watt density heater will typically provide optimized service life.

Fig. 1 Recommended Watt Density for Heating Metal Parts



The graph shows the recommended maximum watt density for Tempco Hi-Density Metric Cartridge Heaters at different operating temperatures and fit, when the heater is installed in an oxidized mild steel block. The thermocouple is located 12.5 mm from the heater. When heating other materials, the data needs to be extrapolated based on the thermal conductivity of the material. Consult Tempco with your requirements.

Fig. 2 Determining Fit



CONTINUED

Recommendations for Improving the Life of Tempco Hi-Density Metric Cartridge Heaters

Continued from previous page...

Determining Fit

When heating a platen, mold, die or hot runner probe with Hi-Density Metric Cartridge Heaters inserted into drilled holes, fit is an important factor in determining the life expectancy of the heater. Fit is the difference between the minimum diameter of the cartridge heater and the maximum diameter of the hole. Unheated sections on a Hi-Density cartridge may be smaller in diameter due to swaging. To determine fit, use the smallest diameter on the heated length only.

Example: A 10 mm nominal OD Hi-Density cartridge heater has an actual diameter of 9.95 ±.03 mm, which translates to a minimum diameter of 9.92 mm. If used in a 10.01 mm ±.02 mm hole, the fit would be .11 mm (10.03 mm – 9.92 mm = 0.11 mm).

When medium watt density heaters (less than 9.30 watts per square centimeter) are used in low temperature applications (less than 600°F [315°C]) general purpose drills are commonly used to drill holes. The typical hole size may be 0.07 mm to 0.20 mm over the drill size. For higher watt density and/or higher temperature applications, we recommend that the holes are drilled and reamed for the tightest possible fit. In applications where precise temperature control and heat transfer properties are required, Hi-Density cartridge heaters can be centerless ground to ±0.01 mm.

Although a tighter fit is desirable to efficiently transfer heat and to get long heater life, a looser fit will aid in installing and removing heaters, especially long heaters. We recommend that you apply Tempco's BNS anti-seize cartridge heater coating as it will improve heat transfer and will make the removal of heaters easier.

The graph in Fig 1. (page 2-29) shows the effect of fit in determining the maximum recommended watt density on a steel platen. As it is indicated in the graph, the tighter the fit, the higher the maximum recommended watt density.

Temperature Control and Location of Temperature Sensing Device

In order to better control the heater temperature and hence the resistance wire temperature, use of an appropriate temperature control and the proximity of the heater to the sensor is very important. The graph in Fig 1. (page 2-29) shows the effect of operating temperature in determining the maximum recommended watt density on a steel platen where the sensor is located 12.5 mm from the heater. Higher watt density heaters can generate heat faster than the surrounding area's ability to dissipate heat. This creates a thermal lag between the heater and the sensor. The closer the sensor to the heater, the better you can control the heater temperature. By keeping the sensor further from the heater, temperature gradients of several hundred degrees can be observed in many applications, especially during initial start-up and heavy thermal cycling. Although the set operating temperature may be low, the heater may be running at a very high temperature. This is a common cause of heater failure. This can be minimized using time proportional and PID functions of the temperature controllers. See Section 13 for temperature controllers and Section 14 for thermocouples and sensors.

Power Control

Power control methods affect the life expectancy of heating elements. In general, although economical, on-off controls increase thermal fatigue and oxidation rate on heating elements by causing wide temperature swings of the internal heating element. Silicon Controlled Rectifiers (SCRs), Mercury Relays and Solid State Power Controls can increase the life expectancy of heating elements by reducing the temperature swings of the internal heating element. See Section 13 for power controls.

Important Installation Considerations

1. For closest fit and best heat transfer, use reamed holes.
2. When possible, drill holes through the object being heated. This will make heater removal easier.
3. When using an anti-seize coating like Tempco's BNS spray or paste, **do not apply** over lead wires or any other current carrying conductors.
4. When using insulated tape or sleeving, check to make sure it is rated for the temperature of the application. Lower temperature rated materials can contain an adhesive or binder that can carbonize and become electrically conductive.
5. When using heaters near their maximum recommended watt density, it is recommended that the temperature sensing probes be located approximately 12.5 mm from the heater sheath.
6. Lead wires should not be located in the hole containing the cartridge heater during operation. This may cause the lead wires to be exposed to temperatures above their rated temperature.
7. When used in a vacuum application, make sure the lead end of the heater is outside the vacuum. If the lead has to be in the vacuum, consult Tempco for specific recommendations.
8. Many applications will subject a heater's electrical terminations to one or more of the following potentially damaging conditions:
   - Moisture
   - Oil and other contaminants
   - Flexing
   - Abrasion
   - High temperature

Note: To protect the heater from damage in these harsh environments, Tempco has a wide selection of terminations and options available. See pages 2-39 through 2-60 for details.

CALCULATING WATTAGE REQUIREMENTS

Formulas and related data to calculate wattage requirements are detailed in the Engineering Section located at the back of this catalog. For new applications it is recommended that testing under actual operating conditions be performed to confirm wattage and watt density calculations.

An excellent evaluation method is to power up a heater with the calculated wattage and watt density through a variable voltage transformer. By changing the voltage and therefore the heater output, thermocouples sensing heater and process temperature can verify the design.

Standard (Non-Stock) Hi-Density Metric Cartridge Heaters

6.5 mm Diameter Actual 6.45 mm (.253")

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
40	50	9	HDM00001
40	75	13	HDM00002
40	100	18	HDM00003
40	125	22	HDM00004
40	150	27	HDM00005
60	50	5	HDM00006
60	100	10	HDM00007
60	150	15	HDM00008
60	200	21	HDM00009
60	250	26	HDM00010

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
80	100	7	HDM00011
80	150	11	HDM00012
80	200	15	HDM00013
80	300	22	HDM00014
80	400	29	HDM00015
100	100	6	HDM00016
100	200	11	HDM00017
100	300	17	HDM00018
100	400	22	HDM00019
100	500	28	HDM00020
130	100	4	HDM00021
130	250	10	HDM00022
130	400	17	HDM00023
130	500	21	HDM00024
130	600	25	HDM00025

8 mm Diameter Actual 7.95 mm (.312")

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
40	50	7	HDM00026
40	75	11	HDM00027
40	100	14	HDM00028
40	150	22	HDM00029
40	200	29	HDM00030
60	75	6	HDM00031
60	150	13	HDM00032
60	200	17	HDM00033
60	250	21	HDM00034
60	300	25	HDM00035
80	100	6	HDM00036
80	200	12	HDM00037
80	300	18	HDM00038
80	400	24	HDM00039
80	500	29	HDM00040
100	100	5	HDM00041
100	250	11	HDM00042
100	400	18	HDM00043
100	500	23	HDM00044
100	600	27	HDM00045

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
130	200	7	HDM00046
130	350	12	HDM00047
130	500	17	HDM00048
130	600	20	HDM00049
130	700	24	HDM00050
160	200	5	HDM00051
160	400	11	HDM00052
160	600	16	HDM00053
160	700	19	HDM00054
160	900	24	HDM00055
200	300	6	HDM00056
200	500	11	HDM00057
200	700	15	HDM00058
200	900	19	HDM00059

Note: Part Numbers above are for Hi-Density Cartridge Heaters terminated with Type N leads, 250 mm (10") long. See pages 2-39 through 2-57 for other terminations.

Metric Size Cartridge Heaters are made-to-order only. *Standard lead time is 3 weeks.*

Custom Engineered/Manufactured Hi-Density Metric Cartridge Heaters

Refer to ordering information on page 2-33.

Made in USA

Standard (Non-Stock) Hi-Density Metric Cartridge Heaters

10 mm Diameter Actual 9.95 mm (.391")

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
40	50	6	HDM00060
40	100	12	HDM00061
40	150	17	HDM00062
40	200	23	HDM00063
40	250	29	HDM00064
60	100	7	HDM00065
60	150	10	HDM00066
60	200	13	HDM00067
60	300	20	HDM00068
60	400	27	HDM00069
80	100	5	HDM00070
80	200	9	HDM00071
80	300	14	HDM00072
80	400	19	HDM00073
80	600	28	HDM00074
100	200	7	HDM00075
100	300	11	HDM00076
100	400	15	HDM00077
100	500	18	HDM00078
100	700	25	HDM00079
130	200	5	HDM00080
130	400	11	HDM00081
130	600	16	HDM00082

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
130	800	22	HDM00083
130	1000	27	HDM00084
160	200	4	HDM00085
160	500	11	HDM00086
160	800	17	HDM00087
160	1000	22	HDM00088
160	1200	26	HDM00089
200	300	5	HDM00090
200	600	10	HDM00091
200	1000	17	HDM00092
200	1200	20	HDM00093
200	1400	24	HDM00094
250	400	5	HDM00095
250	700	9	HDM00096
250	1000	13	HDM00097
250	1400	20	HDM00098
300	500	6	HDM00099
300	1000	11	HDM00100
300	1500	17	HDM00101

12.5 mm Diameter Actual 12.45 mm (.489")

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
60	100	6	HDM00102
60	200	12	HDM00103
60	300	17	HDM00104
60	400	23	HDM00105
60	500	29	HDM00106
80	150	6	HDM00107
80	300	12	HDM00108
80	400	16	HDM00109
80	500	20	HDM00110
80	700	28	HDM00111
100	200	6	HDM00112
100	400	12	HDM00113
100	600	18	HDM00114
100	800	24	HDM00115
100	1000	30	HDM00116
130	250	6	HDM00117

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
130	500	11	HDM00118
130	800	18	HDM00119
130	1000	22	HDM00120
130	1400	31	HDM00121
160	300	5	HDM00122
160	600	11	HDM00123
160	1000	18	HDM00124
160	1400	25	HDM00125
160	1700	30	HDM00126
200	400	6	HDM00127
200	700	10	HDM00128
200	1000	14	HDM00129
200	1500	21	HDM00130
200	2000	28	HDM00131
250	500	5	HDM00132
250	1000	11	HDM00133
250	1500	16	HDM00134
250	2000	22	HDM00135
300	600	5	HDM00136
300	1500	13	HDM00137
300	2000	18	HDM00138

Note: Part Numbers above are for Hi-Density Cartridge Heaters terminated with Type N leads, 250 mm (10") long. See pages 2-39 through 2-57 for other terminations.

Metric Size Cartridge Heaters are made-to-order only. *Standard lead time is 3 weeks.*

Custom Engineered/Manufactured Hi-Density Metric Cartridge Heaters

Refer to ordering information on page 2-33.

Standard (Non-Stock) Hi-Density Metric Cartridge Heaters

16 mm Diameter Actual 15.95 mm (.627")

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
60	100	5	HDM00139
60	300	14	HDM00140
60	400	18	HDM00141
60	500	23	HDM00142
60	700	32	HDM00143
80	200	6	HDM00144
80	400	12	HDM00145
80	600	19	HDM00146
80	800	25	HDM00147
80	1000	31	HDM00148
100	300	7	HDM00149
100	500	12	HDM00150
100	700	17	HDM00151
100	1000	24	HDM00152
100	1300	31	HDM00153
130	400	7	HDM00154

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
130	600	10	HDM00155
130	800	14	HDM00156
130	1200	21	HDM00157
130	1600	28	HDM00158
160	500	7	HDM00159
160	700	10	HDM00160
160	1000	14	HDM00161
160	1500	21	HDM00162
160	2000	28	HDM00163
200	600	6	HDM00164
200	1000	11	HDM00165
200	1500	16	HDM00166
200	2000	22	HDM00167
250	700	6	HDM00168
250	1500	13	HDM00169
250	2000	17	HDM00170
300	1000	7	HDM00171
300	1500	11	HDM00172
300	2000	14	HDM00173

20 mm Diameter Actual 19.95 mm (.784")

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
60	250	8	HDM00174
60	400	13	HDM00175
60	300	10	HDM00176
60	500	17	HDM00177
80	500	12	HDM00178
80	800	19	HDM00179
100	650	12	HDM00180
100	1000	18	HDM00181
130	300	4	HDM00182
130	800	11	HDM00183
130	1250	17	HDM00184
160	800	9	HDM00185

Sheath Length (mm)	Watts	Watt Density (W/cm²)	Part Number 220V
160	1000	11	HDM00186
160	1250	13	HDM00187
200	1000	8	HDM00188
200	1200	10	HDM00189
200	1600	14	HDM00190
250	1250	8	HDM00191
250	1750	12	HDM00192
250	2000	13	HDM00193
300	1600	9	HDM00194
300	2200	12	HDM00195

Note: Part Numbers above are for Hi-Density Cartridge Heaters terminated with Type N leads, 250 mm (10") long. See pages 2-39 through 2-57 for other terminations.

Ordering Information

Catalog Heaters

Order by Catalog Part Number from the Standard Sizes and Ratings List on the preceding pages. Note that Part Numbers shown are for heaters with Type N Termination (250 mm leads).

Available Terminations and Optional Features can be found on pages 2-39 through 2-60.

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Hi-Density Metric Cartridge Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

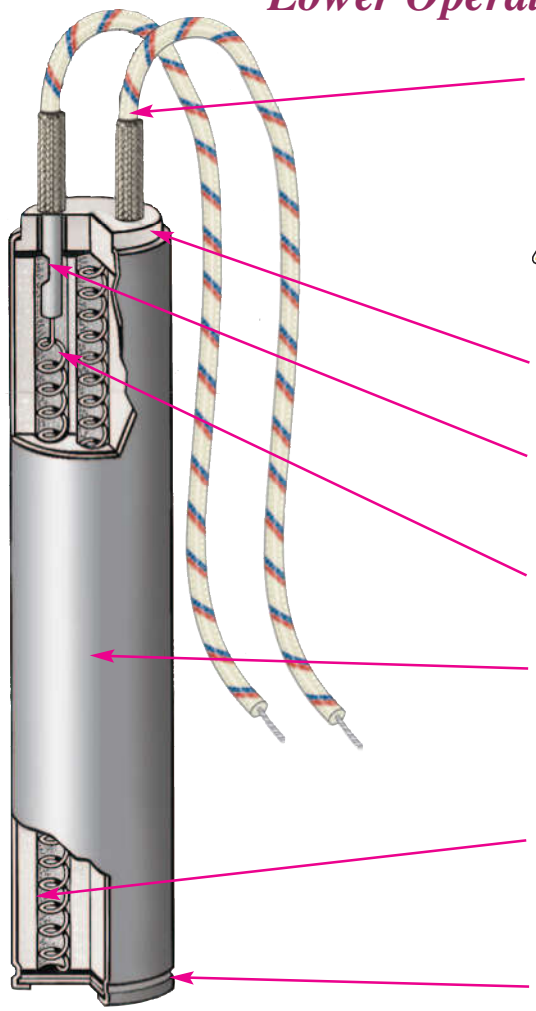
- ❑ Diameter
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination types (see pages 2-39 through 2-51)
- ❑ Options/Special Features (see pages 2-52 through 2-60)
- ❑ Lead Length
- ❑ Cable/Braid length
- ❑ Application Type
- ❑ Operating Temperature

Made in USA

CARTRIDGE HEATER FEATURES

Low-Density

An Economical and Reliable Cartridge Heater, Used in Applications Requiring Lower Operating Temperatures and Watt Densities



A The standard termination for Low-Density Cartridge Heaters is Type F, consisting of 10" (254 mm) internally connected flexible lead wires with high temperature insulation, UL approved for 300 Volt or 600 Volt service and temperature rated to 482°F (250°C).

Note: To meet the requirements of your application we offer over 40 standard termination styles to select from that will solve many of the most common application problems. See pages 2-39 through 2-60.

B Ceramic end cap protects the cartridge internally from outside contamination.

C Resistance wire and lead wires are mechanically spliced with heavy wall nickel connectors for a positive electrical connection.

D Helically wound Nickel-Chrome resistance wire is evenly stretched and strung through ceramic insulators.

E Alloy 304 Stainless Steel is used to provide high temperature strength, good thermal conductivity and resistance to oxidation up to 1200°F (650°C). Alloy 304 is a Nickel-Chromium Stainless Steel. For immersion heating of corrosive solutions consult Tempco.

F Specially selected grain size high purity Magnesium Oxide (MgO) is used to fill all remaining space inside the ceramic insulator, thus increasing thermal conductivity, dielectric strength and heater life.

G Sheath is roll crimped over a 304 Stainless Steel end disc. A mica spacer electrically insulates the heater core from the end disc. This style end seal is not moisture proof.

Agency Approvals

Low Density Cartridge Heaters are UL recognized and CSA certified in many design variations under UL File Number E65652 and CSA File Number 043099.

If you require UL and/or CSA Agency Approval, please specify when ordering.

Tempco Low-Density Cartridge Heaters are an excellent, cost effective choice without compromising quality for Original Equipment Manufacturers (OEMs) consuming large quantities of cartridge heaters for their equipment.

Typical Applications

- *Heat Sealing Equipment*
- *Laminating Equipment*
- *Packaging Equipment*
- *Labeling Machines*
- *Molds and Dies*
- *Food Processing*
- *Refrigeration*
- *Shoe Machinery*
- *Glue Guns*
- *Wax Pots*
- *Heating Liquids*
- *Heating Gases*

View Product Inventory @ www.tempco.com

Low-Density Cartridge Heater Specifications

Standard Specifications and Tolerances of Low Density Cartridge Heaters. If tighter tolerances are required consult Tempco.

PERFORMANCE RATINGS

Maximum Temperature: 1200°F (650°C)

Maximum Watt Density: 20-45 W/in² (3.1-7.0 W/cm²) depending on heater size and operating temperature.

DIMENSIONAL SPECIFICATIONS

Nominal Diameter	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4
Actual Diameter– in.	.185	.247	.372	.496	.621	.745	.870	.995	1.250
Actual Diameter–(mm)	(4.70)	(6.27)	(9.45)	(12.60)	(15.77)	(18.92)	(22.10)	(25.27)	(31.75)
Diameter Tolerance	±.002 (.051 mm)					±.003 (.076 mm)			±.005 (.127 mm)
Length Tolerance	±1/16 (1.59 mm) up to 6" (152.4 mm) long; ±1/8" (3.18 mm) over 6" long								
Camber Tolerance	.010" (.254 mm) per foot of length								

ELECTRICAL SPECIFICATIONS

Nominal Diameter	3/16	1/4	3/8	1/2	5/8	3/4	7/8	1	1-1/4
Maximum Voltage	240	240	240	240	480*	480*	480*	480*	480*
Maximum Amperage	1.5	3.5	6	8	10	15	15	25	30
Maximum Wattage	Consult Tempco								
Wattage Tolerance	Plus 5%, Minus 10%								
Resistance Tolerance	Plus 10%, Minus 5%								

*480V when applicable. Consult Tempco.

Standard (Non-Stock) Low-Density Cartridge Heaters

3/16" Diameter Actual .185" (4.70 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1	25.4	15	34	5.3	LDC00001	—
1½	38.1	20	30	4.7	LDC00002	—
2	50.8	30	31	4.9	LDC00003	—
2½	63.5	40	32	5.0	LDC00004	—
3	76.2	45	29	4.5	LDC00005	—
4	101.6	65	31	4.7	LDC00006	—
5	127.0	80	29	4.6	LDC00007	—
6	152.4	100	30	4.7	LDC00008	—
7	177.8	125	32	5.0	LDC00009	—
8	203.2	150	33	5.2	LDC00010	—
10	254.0	170	30	4.7	LDC00011	—

1/4" Diameter Actual .247" (6.27 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1	25.4	20	34	5.3	LDC00012	—
1½	38.1	20	23	3.5	LDC00014	—
2	50.8	32	27	4.2	LDC00015	—
2	50.8	40	34	5.3	LDC00016	—
2	50.8	50	42	6.6	LDC00017	—
2½	63.5	30	19	3.0	LDC00018	—
3	76.2	32	16	2.5	LDC00019	—
3	76.2	50	25	3.9	LDC00020	—
3½	88.9	80	34	5.3	LDC00021	—
4	101.6	100	36	5.6	LDC00022	LDC00023
5	127.0	125	35	5.5	LDC00024	—
6	152.4	150	35	5.4	LDC00025	LDC00026
7	177.8	100	20	3.0	LDC00027	LDC00028
8	203.2	200	34	5.3	LDC00029	LDC00030
10	254.0	250	34	5.2	LDC00031	LDC00032

Note: Part Numbers above are for Low Density Cartridge Heaters terminated with Type F flexible leads, 10" long. See pages 2-39 through 2-57 for other terminations.

Low-Density Cartridge Heaters are made-to-order only. *Standard lead time is 3 weeks.*

Custom Engineered/Manufactured Low-Density Cartridge Heaters

Refer to ordering information on page 2-38.

Made in USA

Standard (Non-Stock) Low-Density Cartridge Heaters

3/8" Diameter Actual .372" (9.45 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1½	38.1	15	13	2.0	LDC00033	—
1½	38.1	40	34	5.3	LDC00034	—
2	50.8	50	28	4.4	LDC00035	—
2½	63.5	75	32	4.9	LDC00036	—
2½	63.5	100	42	6.6	LDC00037	—
3	76.2	100	34	5.3	LDC00038	—
3½	88.9	120	34	5.3	LDC00039	LDC00040
4	101.6	75	18	2.8	LDC00041	LDC00042
4	101.6	130	32	4.9	LDC00043	LDC00044
4	101.6	150	36	5.6	LDC00045	LDC00046
4	101.6	180	44	6.8	LDC00047	LDC00048
4½	114.3	75	16	2.5	LDC00049	LDC00050
4½	114.3	150	32	4.9	LDC00051	LDC00052
5	127.0	150	28	4.4	LDC00053	LDC00054
5	127.0	200	38	5.8	LDC00055	LDC00056
5½	139.7	200	34	5.3	LDC00057	LDC00058
6	152.4	225	35	5.4	LDC00059	LDC00060
6	152.4	250	39	6.0	LDC00061	LDC00062
7	177.8	200	26	4.0	LDC00063	LDC00064
7	177.8	265	35	5.4	LDC00065	LDC00066
8	203.2	300	34	5.3	LDC00067	LDC00068
9	228.6	350	35	5.4	LDC00069	LDC00070
9½	241.3	300	28	4.4	LDC00071	LDC00072
10	254.0	375	34	5.2	LDC00073	LDC00074
12	304.8	425	31	4.9	LDC00075	LDC00076
12	304.8	450	33	5.1	LDC00077	LDC00078
12	304.8	475	35	5.4	LDC00079	LDC00080
12	304.8	500	37	5.7	LDC00081	LDC00082
14	355.6	500	31	4.9	LDC00083	LDC00084
16	406.4	550	30	4.7	LDC00085	LDC00086
20	508.0	200	9	1.3	LDC00087	LDC00088
20	508.0	650	28	4.4	LDC00089	LDC00090
22	558.8	800	32	4.9	—	LDC00091
24	609.6	750	27	4.2	—	LDC00092

1/2" Diameter Actual .496" (12.60 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1½	38.1	60	38	5.9	LDC00093	—
2	50.8	75	32	4.9	LDC00094	—
2½	63.5	40	13	2.0	LDC00095	—
2½	63.5	125	40	6.2	LDC00096	—
3	76.2	150	38	5.9	LDC00097	LDC00098
3½	88.9	150	32	4.9	LDC00099	LDC00100
3⅞	98.4	90	17	2.6	LDC00101	LDC00102
4	101.6	180	33	5.1	LDC00103	LDC00104
4½	114.3	200	32	4.9	LDC00105	—
5	127.0	200	28	4.4	LDC00106	LDC00107
5½	139.7	300	38	5.9	LDC00108	LDC00109
6	152.4	150	17	2.7	LDC00110	LDC00111
6	152.4	250	29	4.5	LDC00112	LDC00113
6	152.4	300	35	5.4	LDC00114	LDC00115
6½	165.1	300	32	4.9	LDC00116	LDC00117
7	177.8	275	27	4.2	LDC00118	LDC00119
7	177.8	350	34	5.3	LDC00120	LDC00121
7½	190.5	350	32	4.9	LDC00122	LDC00123
8	203.2	400	34	5.3	LDC00124	LDC00125
8	203.2	425	36	5.6	LDC00126	LDC00127
8½	215.9	400	32	4.9	LDC00128	LDC00129
9	228.6	450	34	5.2	LDC00130	LDC00131
10	254.0	500	34	5.2	LDC00132	LDC00133
10½	266.7	500	32	4.9	LDC00134	LDC00135
11	279.4	550	33	5.2	LDC00136	LDC00137
12	304.8	500	28	4.3	LDC00138	LDC00139
12	304.8	600	33	5.1	LDC00140	LDC00141
14	355.6	600	28	4.4	LDC00142	LDC00143
15	381.0	650	29	4.4	LDC00144	LDC00145
15	381.0	750	33	5.1	LDC00146	LDC00147
16	406.4	500	21	3.2	LDC00148	LDC00149
16	406.4	675	28	4.3	LDC00150	LDC00151
18	457.2	725	26	4.1	LDC00152	LDC00153
18	457.2	800	29	4.5	—	LDC00154
20	508.0	750	24	3.8	LDC00155	LDC00156
21	533.4	750	23	3.6	LDC00157	LDC00158
24	609.6	500	14	2.1	LDC00159	LDC00160
24	609.6	1000	27	4.2	—	LDC00161
25	635.0	1100	29	4.4	—	LDC00162

Note: Part Numbers above are for Low Density Cartridge Heaters terminated with Type F flexible leads, 10" long. See pages 2-39 through 2-57 for other terminations.

Low-Density Cartridge Heaters are made-to-order only. ***Standard lead time is 3 weeks.***

Custom Engineered/Manufactured Low-Density Cartridge Heaters
Refer to ordering information on page 2-38.

Standard (Non-Stock) Low-Density Cartridge Heaters

5/8" Diameter Actual .621" (15.77 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1½	38.1	100	51	7.9	LDC00163	LDC00164
2	50.8	100	34	5.3	LDC00165	LDC00166
2½	63.5	80	20	3.2	LDC00167	LDC00168
2½	63.5	150	38	5.9	LDC00169	LDC00170
3	76.2	175	36	5.5	LDC00171	LDC00172
3½	88.9	190	32	5.0	LDC00173	LDC00174
4	101.6	200	29	4.5	LDC00175	LDC00176
4½	114.3	240	31	4.7	LDC00177	LDC00178
4½	114.3	275	35	5.4	LDC00179	LDC00180
5	127.0	200	23	3.5	LDC00181	LDC00182
5	127.0	250	28	4.4	LDC00183	LDC00184
5	127.0	375	42	6.6	LDC00185	LDC00186
5½	139.7	200	20	3.2	LDC00187	LDC00188
5½	139.7	285	29	4.5	LDC00189	LDC00190
5½	139.7	510	52	8.1	LDC00191	—
5⅞	149.2	350	33	5.1	LDC00192	LDC00193
6	152.4	200	19	2.9	LDC00194	LDC00195
6	152.4	300	28	4.3	LDC00196	LDC00197
6	152.4	350	32	5.0	LDC00198	LDC00199
6½	165.1	350	30	4.6	LDC00200	LDC00201
7	177.8	375	29	4.6	LDC00202	LDC00203
8	203.2	400	27	4.2	LDC00204	LDC00205
8½	215.9	425	27	4.2	LDC00206	LDC00207
9	228.6	450	27	4.2	LDC00208	LDC00209
9½	241.3	475	27	4.2	LDC00210	LDC00211
10	254.0	500	27	4.2	LDC00212	LDC00213
11	279.4	550	27	4.1	LDC00214	LDC00215
12	304.8	250	11	1.7	LDC00216	LDC00217
12	304.8	500	22	3.4	LDC00218	LDC00219
12	304.8	600	27	4.1	LDC00220	LDC00221
12	304.8	700	31	4.8	LDC00222	LDC00223
12⅜	314.3	450	19	3.0	LDC00224	LDC00225
14	355.6	700	26	4.1	LDC00226	LDC00227
15	381.0	750	26	4.1	LDC00228	LDC00229
16	406.4	800	26	4.1	LDC00230	LDC00231
17	431.8	1000	31	4.8	LDC00232	LDC00233
18	457.2	725	21	3.3	LDC00234	LDC00235
18	457.2	800	23	3.6	LDC00236	LDC00237
20	508.0	900	24	3.6	LDC00238	LDC00239
21	533.4	1000	25	3.9	—	LDC00240
22	558.8	2000	47	7.3	—	LDC00241
24	609.6	2000	43	6.7	—	LDC00242
25	635.0	768	16	2.5	LDC00243	—
25	635.0	1100	23	3.5	—	LDC00244
25	635.0	1500	31	4.8	LDC00245	LDC00246
27	685.8	1200	23	3.6	LDC00247	—
28	711.2	2000	37	5.7	—	LDC00248
30	762.0	2000	35	5.4	—	LDC00249
31	787.4	2000	33	5.2	—	LDC00250
34	863.6	2000	30	4.7	—	LDC00251
36	914.4	2000	29	4.4	—	LDC00252
38	965.2	2000	27	4.2	—	LDC00253
38⁹⁄₁₆	979.5	1200	16	2.5	LDC00254	—

3/4" Diameter Actual .745" (18.92 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3	76.2	225	38	5.9	LDC00255	LDC00256
3½	88.9	225	32	4.9	LDC00257	LDC00258
3½	88.9	250	35	5.5	LDC00259	LDC00260
4	101.6	300	36	5.6	LDC00261	LDC00262
5	127.0	350	33	5.1	LDC00263	LDC00264
6	152.4	170	13	2.0	LDC00265	LDC00266
6	152.4	350	27	4.2	LDC00267	LDC00268
6	152.4	400	31	4.8	LDC00269	LDC00270
7	177.8	350	23	3.5	LDC00271	LDC00272
7	177.8	450	29	4.6	LDC00273	LDC00274
7	177.8	535	35	5.4	LDC00275	LDC00276
8	203.2	350	20	3.1	LDC00277	LDC00278
8	203.2	500	28	4.4	LDC00279	LDC00280
8	203.2	600	34	5.3	LDC00281	LDC00282
8½	215.9	675	36	5.6	LDC00283	LDC00284
9	228.6	350	17	2.7	LDC00285	LDC00286
9	228.6	550	27	4.3	LDC00287	LDC00288
9½	241.3	575	27	4.2	LDC00289	LDC00290
10	254.0	600	27	4.2	LDC00291	LDC00292
10	254.0	800	36	5.5	LDC00293	LDC00294
11	279.4	675	27	4.2	LDC00295	LDC00296
12	304.8	750	28	4.3	LDC00297	LDC00298
12	304.8	1000	37	5.7	LDC00299	LDC00300
13½	342.9	600	20	3.0	LDC00301	LDC00302
14	355.6	1000	31	4.9	LDC00303	LDC00304
16	406.4	950	26	4.0	LDC00305	LDC00306
18	457.2	950	23	3.6	LDC00307	LDC00308
18	457.2	1100	27	4.1	—	LDC00309
20	508.0	1000	22	3.4	LDC00310	LDC00311
21	533.4	1150	24	3.7	LDC00312	LDC00313
30	762.0	1800	26	4.0	—	LDC00314
31	787.4	1800	25	3.9	—	LDC00315

Note: Part Numbers above are for Low Density Cartridge Heaters terminated with Type F flexible leads, 10" long. See pages 2-39 through 2-57 for other terminations.

Low-Density Cartridge Heaters are made-to-order only. *Standard lead time is 3 weeks.*

Custom Engineered/Manufactured Low-Density Cartridge Heaters
Refer to ordering information on page 2-38.

Made in USA

Standard (Non-Stock) Low-Density Cartridge Heaters

7/8" Diameter Actual .870" (22.10 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3½	88.9	250	30	4.7	LDC00316	LDC00317
4	101.6	300	31	4.8	LDC00318	LDC00319
5	127.0	400	32	5.0	LDC00320	LDC00321
6	152.4	475	31	4.9	LDC00322	LDC00323
7	177.8	525	29	4.6	LDC00324	LDC00325
8	203.2	550	27	4.1	LDC00326	LDC00327
10	254.0	600	23	3.6	LDC00328	LDC00329
11	279.4	600	21	3.2	LDC00330	LDC00331
11	279.4	700	24	3.8	LDC00332	LDC00333
12	304.8	850	27	4.2	LDC00334	LDC00335
13	330.2	900	26	4.1	LDC00336	LDC00337
15	381.0	950	24	3.7	LDC00338	LDC00339
18	457.2	1000	21	3.2	LDC00340	LDC00341
21½	546.1	1000	17	2.7	—	LDC00342

1" Diameter Actual .995" (25.27 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3	76.2	250	32	4.9	LDC00373	LDC00374
4	101.6	300	27	4.2	LDC00375	LDC00376
5	127.0	375	27	4.1	LDC00377	LDC00378
6	152.4	500	29	4.5	LDC00379	LDC00380
8	203.2	600	25	3.9	LDC00381	LDC00382
9	228.6	700	26	4.1	LDC00383	LDC00384
10	254.0	800	27	4.2	LDC00385	LDC00386
10¾	273.1	600	19	2.9	LDC00387	LDC00388
10¾	273.1	850	26	4.1	LDC00389	LDC00390
12	304.8	1000	28	4.3	LDC00391	LDC00392
14	355.6	1100	26	4.0	LDC00393	LDC00394
18	457.2	1250	23	3.5	LDC00395	LDC00396
22¼	565.2	1000	15	2.3	LDC00397	LDC00398
23	584.2	1000	14	2.2	LDC00399	LDC00400
23½	596.9	1500	21	3.2	—	LDC00401
24	609.6	1500	20	3.1	—	LDC00402

1-1/4" Diameter Actual 1.250" (31.75 mm)

Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3¼	82.6	400	37	5.7	LDC00403	LDC00404
5	127.0	450	25	3.9	LDC00405	LDC00406
6	152.4	500	23	3.6	LDC00407	LDC00408
6	152.4	800	37	5.7	LDC00409	LDC00410
7	177.8	550	22	3.3	LDC00411	LDC00412
7	177.8	1000	39	6.1	LDC00413	LDC00414
9	228.6	675	20	3.1	LDC00415	LDC00416
10	254.0	1000	27	4.2	LDC00417	LDC00418
12	304.8	1000	22	3.4	LDC00419	LDC00420
14	355.6	2000	38	5.8	—	LDC00421
15	381.0	1250	22	3.4	—	LDC00422
16½	419.1	1000	16	2.5	LDC00423	LDC00424
22½	571.5	2200	25	3.9	—	LDC00425
24	609.6	2400	26	4.0	—	LDC00426

Note: Part Numbers above are for Low-Density Cartridge Heaters terminated with Type F flexible leads, 10" long.

Low-Density Cartridge Heaters are made-to-order only. ***Standard lead time is 3 weeks.***

See pages 2-39 through 2-57 for other terminations.

Ordering Information

Catalog Heaters

Order by Catalog Part Number from the Standard Sizes and Ratings List on the preceding pages. Note that Part Numbers shown are for heaters with Type F Termination (10" leads).

Available Terminations and Optional Features can be found on pages 2-39 through 2-60.

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Low-Density Cartridge Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Diameter
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination types (see pages 2-39 through 2-51)
- ❑ Options/Special Features (see pages 2-52 through 2-60)
- ❑ Lead Length
- ❑ Cable/Braid length
- ❑ Application Type
- ❑ Operating Temperature

Tempco Offers Innovative Cartridge Heater Terminations Focused on Providing Maximum Performance Under a Diverse Segment of Demanding Applications

Cartridge Heater Terminations Can be Elusive to Define and Are Often Overlooked

To ensure maximum efficiency and reliable cartridge heater service, evaluate your existing operating conditions and proceed to select the best suited termination(s) for your application.

Failure to evaluate the operating conditions and the environment of a cartridge heater application and/or improper termination selection will compromise the operating reliability and functional life of the cartridge heater, resulting in costly machine downtime and loss of revenue due to lack of productivity.

The synergy between the cartridge heater termination and the application will result in reduced operating cost, increased productivity, optimized performance and improved customer satisfaction.

Take Advantage of Tempco's Innovative Cartridge Heater Terminations.

We offer a selection of over 40 standard terminations specifically designed to address the operating requirements of a multitude of diverse applications requiring protection against the following conditions:

- ***Abrasion***
- ***Contamination***
- ***Flexing***
- ***Moisture Resistance***
- ***High Temperatures***

In addition, there are many cartridge heater adaptations to facilitate their use:

- ***Double-End Powerleads***
- ***Mounting Flanges***
- ***Locating Ring or Bushings***
- ***Pull Straps***
- ***NPT or Bulkhead Fittings***
- ***Built-In Thermocouples & Thermostats***
- ***Electrical Boxes***

Refer to pages 2-39 through 2-60 for complete specifications and details on all available terminations and options.

A Wise Man Once Said . . .
"A Cartridge Heater is Only As Good as the Termination that Powers It."

Standard Termination — HDC and HDM Hi-Density Cartridge Heaters

Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

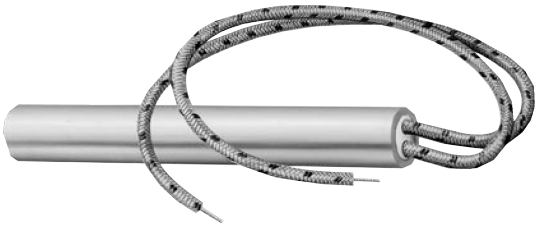
Type N External Pins with Leads

Available on HDC and HDM cartridge heaters

Flexible stranded lead wires have fiberglass insulation and are connected to 1-1/4" (32 mm) long solid conductors. Silicone rubber coated fiberglass sleeving insulates the pin/lead wire connection.

- Nominal 3/8" unheated section at the lead end is required.
- Standard lead wire temperature rating: 482°F (250°C)
- **Standard** 10" (254 mm) leads. Specify longer leads.

Standard Termination — LDC Low-Density Cartridge Heaters



Type F Internally Connected Flexible Leads

Available on HDC, HDM and LDC Cartridge Heaters

The fiberglass lead wires are internally connected to the terminal pins. This lead termination provides flexibility, permitting the lead wires to be sharply bent as they exit the heater.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard lead wire temperature rating for HDC and HDM cartridge heaters is 842°F (450°C)
- Standard lead wire temperature rating for LDC cartridge heaters is 482°F (250°C)
- **Standard** 10" (254 mm) leads. Specify longer leads. For HDC & HDM heaters, leads longer than 60" require a splice.

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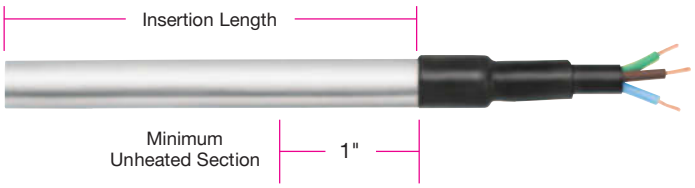
Cartridge Heater — Moisture Resistant Terminations



Type M1 Polyolefin Liquid Barrier

Available on HDC, HDM, and LDC cartridge heaters

A liquid barrier used for low temperature applications primarily in refrigeration or food service applications. The seal bonds to both the heater and the leads.

- Minimum 1" unheated section at the lead end is required.
- Three conductor SJO type cord.
- Available only in certain diameters. Heaters smaller than 1/2" diameter require an adapter.
- **Standard** 10" (254 mm) leads. Specify longer leads.

Type M2 ☐ Potted End Seal

Available on HDC, HDM and LDC cartridge heaters

Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bottom end disc seal is welded in.

***TYPE* M2A**

M2A Cement potting with silicone varnish. Fiberglass lead wires externally connected.
- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

M2B Silicone rubber potting. Silicone rubber lead wires internally connected.
- Silicone rubber potting temperature rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2C High temperature epoxy potting. Teflon® lead wires internally connected.
- High temp. epoxy potting temp. rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

***TYPE* M2B, M2C, M2D and M2E**

M2D Low temperature epoxy potting. Teflon® lead wires internally connected.
- Low temp. epoxy potting temp. rating: 266°F (130°C), UL rated to 194°F (90°C)
- Standard lead wire temperature rating: 392°F (200°C)

M2E Cement potting with silicone varnish. Fiberglass lead wires internally connected.
- Cement potting temperature rating: 1000°F (548°C)
- Standard lead wire temperature rating: 482°F (250°C)

- Minimum of 3/8" up to 1" unheated section at the lead end is required.
- **Standard** 10" (254 mm) leads. Specify longer leads.

M2A and M2E are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Type M3 Teflon® End Plug Seal

Available on HDC and HDM cartridge heaters

A moisture resistant Teflon® seal that is swaged in during the manufacturing process with Teflon® insulated lead wire.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Teflon® seal temperature rating: 392°F (200°C)
- Standard lead wire temperature rating: 392°F (200°C)
- **Standard** 10" (254 mm) leads. Specify longer leads. Leads longer than 60" require a splice.

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Cartridge Heater — Moisture Resistant Terminations

Type SA Sealed Corrugated Armor Cable

Available on 1/2" Diameter and Larger HDC, HDM and LDC cartridge heaters

A liquid-proof stainless steel corrugated metal hose is silver brazed to the end of the cartridge heater. The end disc of the heater is also welded or brazed. This termination provides a positive seal against moisture and contamination entering the heater.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.

Cartridge Heater — Flexible Spring Abrasion Resistant Terminations

Type S1 ☐ Flexible Spring

Available on HDC, HDM, and LDC cartridge heaters.

The leads are reinforced with a steel spring for applications with extreme flexing. The spring is mechanically fastened or silver brazed.

S1A Mechanically fastened spring.

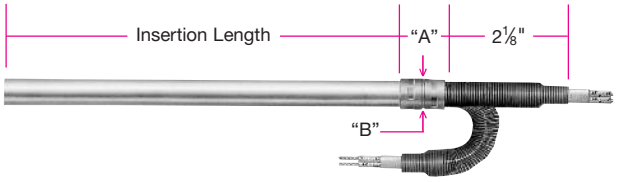
S1B Silver brazed spring.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) leads. Specify longer leads.

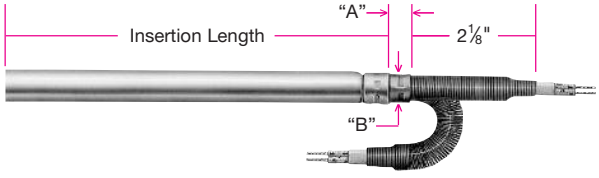
Dimensions for Type S1

	Diameter in	Diameter mm	Fig.	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm
Hi-Density Cartridge Heaters	1/4	6.35	1	11/16	17.46	5/16	7.94
	5/16	7.94	1	11/16	17.46	7/16	11.11
	3/8	9.53	1	11/16	17.46	7/16	11.11
	1/2	12.70	1	13/16	20.64	9/16	14.29
	5/8	15.88	1	1	25.40	3/4	19.05
	3/4	19.05	1	1-1/4	31.75	7/8	22.23
	1	25.40	2	5/8	15.88	5/8	15.88
Low-Density Cartridge Heaters	3/16	4.76	—	—	—	—	—
	1/4	6.35	1	11/16	17.46	5/16	7.94
	3/8	9.53	1	11/16	17.46	7/16	11.11
	1/2	12.70	1	13/16	20.64	9/16	14.29
	5/8	15.88	2	7/16	11.11	9/16	14.29
	3/4	19.05	2	1/2	12.70	9/16	14.29
	7/8	22.23	2	5/8	15.88	9/16	14.29
	1	25.40	2	5/8	15.88	5/8	15.88
	1-1/4	31.75	2	5/8	15.88	5/8	15.88

TYPE **S1** Fig. 1



TYPE **S1** Fig. 2



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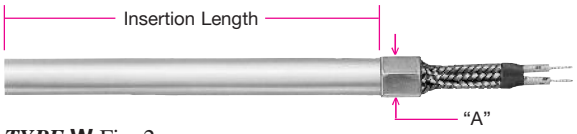
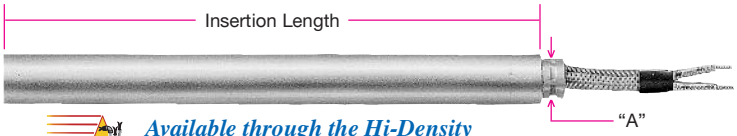
Abrasion Resistant Terminations

Cartridge Heater — Flexible Braid Abrasion Resistant Terminations

***TYPE* W** Fig. 1



***TYPE* W** Fig. 2



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Diameter in	Diameter mm	Fig.	"A" Dim./HD in	"A" Dim./HD mm	"A" Dim./LD in	"A" Dim./LD mm
3/16	4.76	1	—	—	1/4	6.35
1/4	6.35	1	5/16	7.94	5/16	7.94
5/16	7.94	1	3/8	9.53	—	—
3/8	9.53	2	3/8	9.53	3/8	9.53
1/2	12.70	2	7/16	11.11	7/16	11.11
5/8	15.88	2	9/16	14.29	9/16	14.29
3/4	19.05	2	9/16	14.29	9/16	14.29
7/8	22.23	2	—	—	9/16	14.29
1	25.40	2	9/16	14.29	9/16	14.29
1-1/4	31.75	2	—	—	9/16	14.29

Type W Wire Braided Leads

Available on HDC, HDM, and LDC cartridge heaters

Stainless steel braid over fiberglass leads offers sharp bending not possible with armor cable, as well as abrasion protection.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) braid over 12" (305 mm) leads. Specify longer braid/leads.

Type W2 □ Embedded Wire Braided Leads

Available on HDC, HDM and LDC cartridge heaters

Stainless Steel braid embedded into seal offers moisture resistance and abrasion protection.

W2A Fiberglass Leads with Cement Potting

- Cement potting temperature rating: 1000°F (538°C)
- Standard lead wire temperature rating: 482°F (250°C)

W2B Teflon® Leads with High Temperature Epoxy

- High temperature epoxy temp. rating: 450°F (232°C)
- Standard lead wire temperature rating: 392°F (200°C)

W2C Teflon® Leads with Low Temperature Epoxy

- Low temperature epoxy temp. rating: 266°F (130°C) UL rated to 194°F (90°C)
- Standard lead wire temperature rating: 392°F (200°C)

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- **Standard** 10" (254 mm) braid over 12" (305 mm) leads. Specify longer braid/leads.

Type W3 Swaged-In Wire Braided Leads

Available on HDC and HDM cartridge heaters

Stainless steel braid over fiberglass leads offers sharp bending not possible with armor cable, as well as abrasion protection. In addition, Type W3 offers contamination resistance due to the Teflon® seal required for holding the wire braid.

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Teflon® Seal temperature rating: 392°F (200°C)
- Standard lead wire temperature rating: 842°F (450°C)
- **Standard** 10" (254 mm) braid over 12" (305 mm) leads. Specify longer braid/leads.

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Cartridge Heater — Armor Cable Abrasion Resistant Terminations

Type CS ☐ Straight Armor Cable Directly Attached to Sheath

Available on HDC, HDM, and LDC cartridge heaters

The armor cable is directly attached to the cartridge heater, eliminating the coupling, to maintain an overall diameter equal to or smaller than the cartridge diameter.

CSA Galvanized armor cable – minimum diameter: 5/16"

CSB Stainless steel armor cable – minimum diameter: 5/16"

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Heaters with an OD of 3/4" or larger require reducing diameter washer
- Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.

Type C1 ☐ Straight Armor Cable with Coupling

Available on HDC, HDM, or LDC cartridge heaters

Armor cable provides the maximum in protection for abrasive, jagged environments. The coupling between the cartridge and the armor cable is mechanically fastened or silver brazed.

C1A Galvanized armor cable, mechanically fastened

C1B Stainless steel armor cable, mechanically fastened

- Standard fiberglass lead wire temperature rating 482°F (250°C)

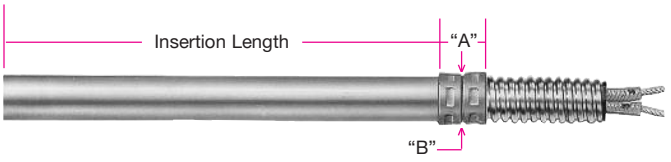
C1C Galvanized armor cable, silver brazed

C1D Stainless steel armor cable, silver brazed

- Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer leads or cable.

***TYPE* C1** Fig. 1

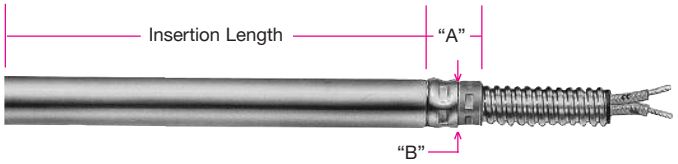


C1A and C1B are available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Dimensions for Type C1

	Diameter in	Diameter mm	Fig.	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Cable Dia.
Hi-Density Cartridge Heaters	1/4	6.35	1	11/16	17.46	5/16	7.94	1/4
	5/16	7.94	1	11/16	17.46	7/16	11.11	1/4
	3/8	9.53	1	11/16	17.46	7/16	11.11	3/8
	1/2	12.70	1	13/16	20.64	9/16	14.29	1/2
	5/8	15.88	1	1	25.40	3/4	19.05	1/2
	3/4	19.05	1	1-1/4	31.75	7/8	22.23	1/2
	1	25.40	2	5/8	15.88	5/8	15.88	1/2
Low-Density Cartridge Heaters	3/16	4.76	—	—	—	—	—	—
	1/4	6.35	1	11/16	17.46	5/16	7.94	1/4
	3/8	9.53	1	11/16	17.46	7/16	11.11	3/8
	1/2	12.70	1	13/16	20.64	9/16	14.29	1/2
	5/8	15.88	2	7/16	11.11	9/16	14.29	1/2
	3/4	19.05	2	1/2	12.70	9/16	14.29	1/2
	7/8	22.23	2	5/8	15.88	9/16	14.29	1/2
	1	25.40	2	5/8	15.88	5/8	15.88	1/2

***TYPE* C1** Fig. 2



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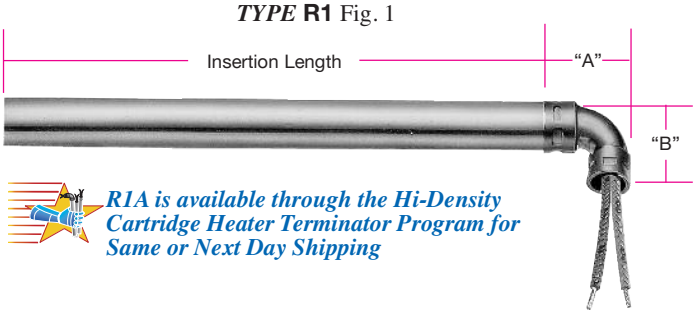
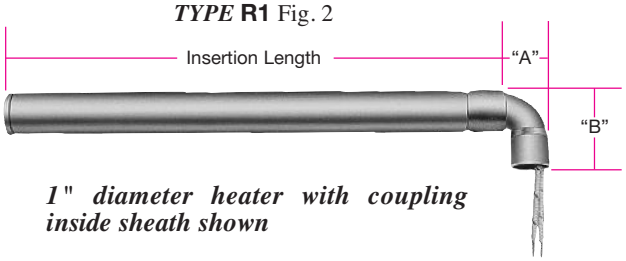
Cartridge Heater — Plain Leads Right-Angle Terminations

TYPE **R1** Fig. 1



R1A is available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

TYPE **R1** Fig. 2



1" diameter heater with coupling inside sheath shown

Type R1 ☐ Right-Angle Leads with Copper Elbow

Available on HDC, HDM, and LDC cartridge heaters

This termination is used when space is limited. The copper elbow is mechanically fastened or silver brazed.

R1A Mechanically fastened

R1B Silver brazed

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) leads. Specify longer leads.

Dimensions for Type R1

	Diameter in	Diameter mm	Fig.	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm
Hi-Density Cartridge Heater	1/4	6.35	1	3/4	19.05	3/4	19.05
	5/16	7.94	1	15/16	23.81	15/16	23.81
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	1	1-1/4	31.75	1-1/4	31.75
	3/4	19.05	1	1-3/4	44.45	1-1/4	31.75
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
Low Density Cartridge Heater	3/16	4.76	—	—	—	—	—
	1/4	6.35	1	3/4	19.05	3/4	19.05
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	2	11/16	17.46	1-1/4	31.75
	3/4	19.05	2	3/4	19.05	1-1/4	31.75
	7/8	22.23	2	3/4	19.05	1-3/8	34.93
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
	1-1/4	31.75	2	1-1/8	28.58	1-3/8	34.93

Note: For Right-Angle Sheath Options, see page 2-53.

Cartridge Heater — Flexible Spring Abrasion Resistant Right-Angle Terminations

Type R2 ☐ Right-Angle Leads

Available on HDC, HDM, and LDC cartridge heaters

This termination is used when space is limited. Not suitable for abrasive environments. Same as C3 and W1 except plain leads. Various lead end finishes are available as listed below:

R2A Cement potting, no lead end disc
- ➤Cement potting temperature rating: 1000°F (538°C)
- ➤Standard fiberglass lead wire temperature rating: 482°F (250°C)

R2B Cement potting, welded lead end disc
- ➤Cement potting temperature rating: 1000°F (538°C)
- ➤Standard fiberglass lead wire temperature rating: 482°F (250°C)

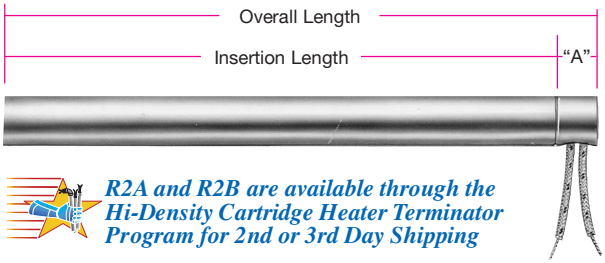
R2C Silicone rubber potting, welded lead end disc
- ➤Silicone Rubber potting temperature rating: 450°F (232°C)
- ➤Standard silicone rubber lead wire temperature rating: 392°F (200°C)

R2D High temperature epoxy potting, welded lead end disc
- ➤High Temperature epoxy potting temperature rating: 450°F (232°C)
- ➤Standard Teflon® lead wire temperature rating: 392°F (200°C)

R2E Low temperature epoxy potting, welded lead end disc
- ➤Low Temperature epoxy potting temperature rating: 266°F (130°C)
- ➤Standard Teflon® lead wire temperature rating: 392°F (200°C)

➤ Minimum 3/8" up to 1" unheated section at the lead end is required.

➤ **Standard** 10" (254 mm) leads. Specify other lead lengths.



R2A and R2B are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Dimensions for types R2

Diameter in	Diameter mm	Availability HD	Availability LD	"A" Dim. in	"A" Dim. mm
3/16	4.76	No	No	—	—
1/4	6.35	Yes	Yes	5/16	7.94
5/16	7.94	Yes	No	5/16	7.94
3/8	9.53	Yes	Yes	7/16	11.11
1/2	12.70	Yes	Yes	9/16	14.29
5/8	15.88	Yes	Yes	9/16	14.29
3/4	19.05	Yes	Yes	9/16	14.29
7/8	22.23	No	Yes	5/8	15.88
1	25.40	Yes	Yes	5/8	15.88
1-1/4	31.75	No	Yes	5/8	15.88

Type S2 ☐ Right-Angle Spring

Available on HDC, HDM, and LDC cartridge heaters

The leads are reinforced with a steel spring for applications with extreme flexing. The spring is mechanically fastened or silver brazed.

S2A Mechanically fastened spring

S2B Silver brazed spring

➤ Minimum 3/8" up to 1" unheated section at the lead end is required.

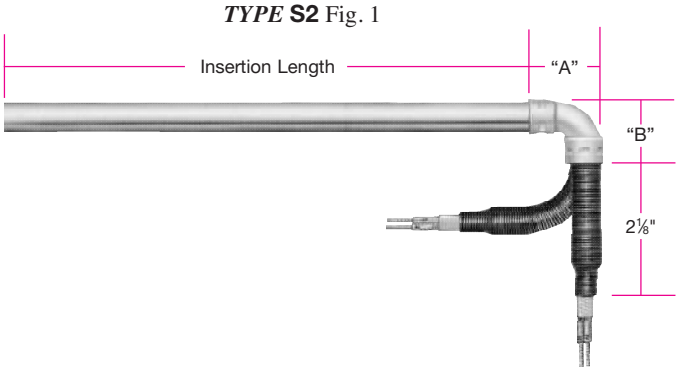
➤ Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)

➤ **Standard** 10" (254 mm) leads. Specify longer leads.

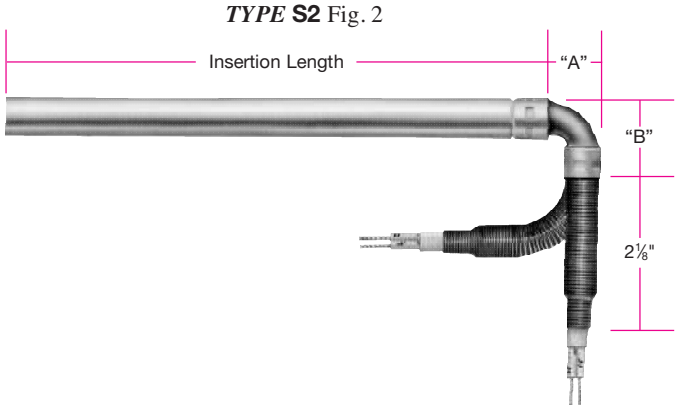
Dimensions for Type S2

	Diameter in	Diameter mm	Fig.	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm
Hi-Density Cartridge Heaters	1/4	6.35	1	3/4	19.05	3/4	19.05
	5/16	7.94	1	15/16	23.81	15/16	23.81
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	1	1-1/4	31.75	1-1/4	31.75
	3/4	19.05	1	1-3/4	44.45	1-1/4	31.75
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
Low-Density Cartridge Heaters	3/16	4.76	—	—	—	—	—
	1/4	6.35	1	3/4	19.05	3/4	19.05
	3/8	9.53	1	15/16	23.81	15/16	23.81
	1/2	12.70	1	1-1/4	31.75	1-1/4	31.75
	5/8	15.88	2	11/16	17.46	1-1/4	31.75
	3/4	19.05	2	3/4	19.05	1-1/4	31.75
	7/8	22.23	2	3/4	19.05	1-3/8	34.93
	1	25.40	2	1-1/8	28.58	1-3/8	34.93
	1-1/4	31.75	2	1-1/8	28.58	1-3/8	34.93

***TYPE* S2** Fig. 1



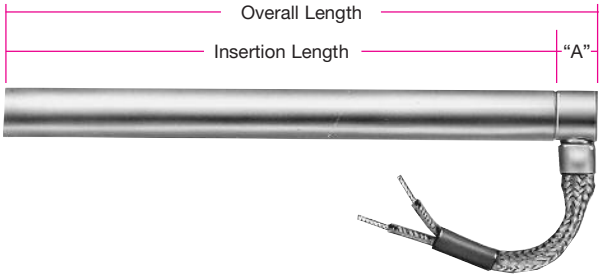
***TYPE* S2** Fig. 2



Made in USA

Right-Angle Terminations

Cartridge Heater — Flexible Braid Abrasion Resistant Right-Angle Terminations



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Type W1 ☐ Right-Angle Wire Braided Leads

Available on HDC, HDM, and LDC cartridge heaters

Stainless steel braid over fiberglass leads for abrasion protection, mechanically crimped to the cartridge sheath at 90°. Wire braid offers extreme flexibility not possible with armor cable. Various lead end finishes are available as listed below.

W1A Cement potting and silicone varnish, no lead end disc.
- ➤ Cement potting temperature rating: 1000°F (538°C)
- ➤ Standard lead wire temperature rating: 482°F (250°C)

W1B Welded lead end disc.
- ➤ Cement potting temperature rating: 1000°F (538°C)
- ➤ Standard lead wire temperature rating: 482°F (250°C)

➤ Minimum 3/8" up to 1" unheated section at the lead end is required.

➤ **Standard** 10" (254 mm) braid over 12" (305 mm) leads. Specify longer braid or leads.

Dimensions for Type W1

Diameter		Availability		"A" Dim.	
in	mm	HD	LD	in	mm
3/16	4.76	No	No	—	—
1/4	6.35	Yes	Yes	5/16	7.94
5/16	7.94	Yes	No	5/16	7.94
3/8	9.53	Yes	Yes	7/16	11.11
1/2	12.70	Yes	Yes	9/16	14.29
5/8	15.88	Yes	Yes	9/16	14.29
3/4	19.05	Yes	Yes	9/16	14.29
7/8	22.23	No	Yes	5/8	15.88
1	25.40	Yes	Yes	5/8	15.88
1-1/4	31.75	No	Yes	5/8	15.88

Note: For Right-Angle Sheath Options, see page 2-53.

Cartridge Heater — Armor Cable Abrasion Resistant Right-Angle Terminations

Type C2 ☐ Right-Angle Armor Cable with Copper Elbow

Available on HDC, HDM, and LDC cartridge heaters

Armor cable provides the maximum in protection for abrasive, jagged environments. The copper elbow between the cartridge and the armor cable is mechanically fastened or silver brazed.

C2A Galvanized armor cable, mechanically fastened

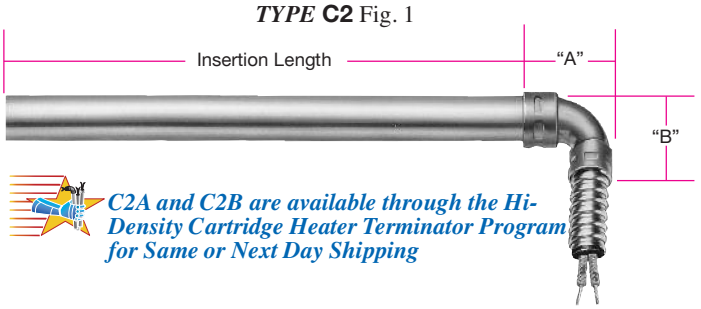
C2B Stainless steel armor cable, mechanically fastened

C2C Galvanized armor cable, silver brazed

C2D Stainless steel armor cable, silver brazed

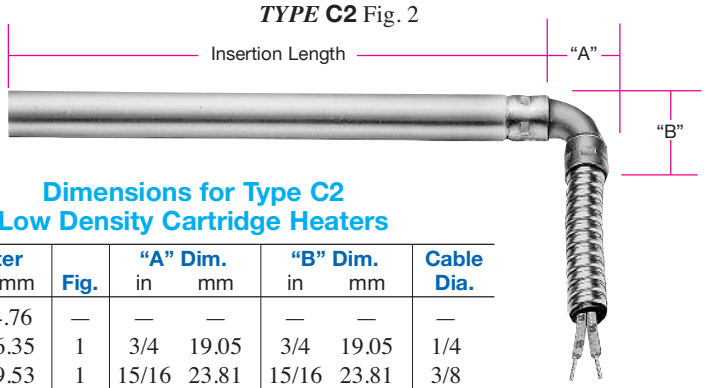
- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Standard fiberglass lead wire temperature rating HDC and HDM: 842°F (450°C), LDC: 482°F (250°C)
- **Standard** 10" (254 mm) cable over 12" (305 mm) leads. Specify longer cable or leads.

TYPE **C2** Fig. 1



C2A and C2B are available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

TYPE **C2** Fig. 2



Dimensions for Type C2 Hi-Density Cartridge Heaters

Diameter in	Diameter mm	Fig.	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Cable Dia.
1/4	6.35	1	3/4	19.05	3/4	19.05	1/4
5/16	7.94	1	15/16	23.81	15/16	23.81	1/4
3/8	9.53	1	15/16	23.81	15/16	23.81	3/8
1/2	12.70	1	1-1/4	31.75	1-1/4	31.75	1/2
5/8	15.88	1	1-1/4	31.75	1-1/4	31.75	1/2
3/4	19.05	1	1-3/4	44.45	1-1/4	31.75	1/2
1	25.40	2	1-1/8	28.58	1-3/8	34.93	1/2

Dimensions for Type C2 Low Density Cartridge Heaters

Diameter in	Diameter mm	Fig.	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Cable Dia.
3/16	4.76	—	—	—	—	—	—
1/4	6.35	1	3/4	19.05	3/4	19.05	1/4
3/8	9.53	1	15/16	23.81	15/16	23.81	3/8
1/2	12.70	1	1-1/4	31.75	1-1/4	31.75	1/2
5/8	15.88	2	11/16	17.46	1-1/4	31.75	1/2
3/4	19.05	2	3/4	19.05	1-1/4	31.75	1/2
7/8	22.23	2	3/4	19.05	1-3/8	34.93	1/2
1	25.40	2	1-1/8	28.58	1-3/8	34.93	1/2
1-1/4	31.75	2	1-1/8	28.58	1-3/8	34.93	1/2

Type C3 ☐ Right-Angle Armor Cable

Available on HDC, HDM, and LDC cartridge heaters

Use this termination when space is limited and maximum protection is required. The armor cable is tack welded or silver brazed to the cartridge sheath at 90°. The sheath extension is potted with cement. Various lead end finishes are available as listed below.

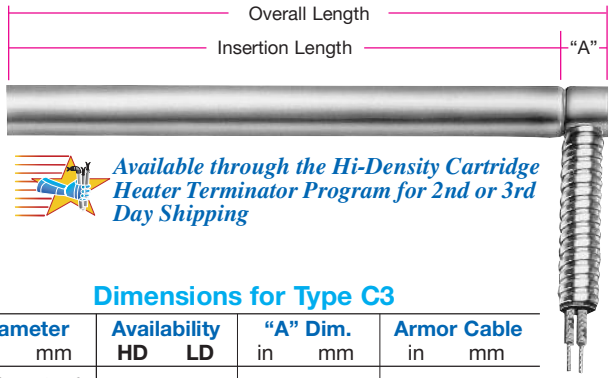
C3A Cement potting and silicone varnish with no lead end disc, galvanized cable

C3B Cement potting and silicone varnish with no lead end disc, stainless steel cable

C3C Welded lead end disc, with galvanized cable

C3D Welded lead end disc, with stainless steel cable

- Minimum 3/8" up to 1" unheated section at the lead end is required.
- Cement potting temperature rating: 1000°F (538°C) Standard fiberglass lead wire temperature rating: 482°F (250°C)
- **Standard** 10" (254 mm) armor cable over 12" (305 mm) leads. Specify longer cable or leads.



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

Dimensions for Type C3

Diameter in	Diameter mm	Availability HD	Availability LD	"A" Dim. in	"A" Dim. mm	Armor Cable in	Armor Cable mm
3/16	4.76	No	No	—	—	—	—
1/4	6.35	Yes	Yes	5/16	7.94	1/4	6.35
5/16	7.94	Yes	No	5/16	7.94	1/4	6.35
3/8	9.53	Yes	Yes	7/16	11.11	3/8	9.53
1/2	12.70	Yes	Yes	9/16	14.29	1/2	12.70
5/8	15.88	Yes	Yes	9/16	14.29	1/2	12.70
3/4	19.05	Yes	Yes	9/16	14.29	1/2	12.70
7/8	22.23	No	Yes	5/8	15.88	1/2	12.70
1	25.40	Yes	Yes	5/8	15.88	1/2	12.70
1-1/4	31.75	No	Yes	5/8	15.88	1/2	12.70

Cartridge Heater — Screw Terminations

Type T1 Screw Terminals

Available on LDC type cartridge heaters only

For use with leads, crimp terminals, or bus bars. Includes washers and nuts.

- Minimum 1/2" unheated section at the lead end is required.
- Diameters available: 3/4", 7/8", 1", and 1-1/4".
- **Standard:** screw #6-32 × 3/4" long

Diameter	in	3/4	7/8	1	1-1/4
	mm	19.05	22.23	25.40	31.75
"A" Dimension	in	3/8	7/16	1/2	1/2
	mm	9.53	11.11	12.70	12.70

Type T2 Screw Terminals

Available on HDC and HDM type cartridge heaters only

For use with leads, crimp terminals, or bus bars. Includes washers and nuts.

- Minimum 1/2" unheated section at the lead end is required.
- Diameters available: HD — 5/8", 3/4", 1"
  HDM — 16 mm and 20 mm
- **Standard:** screw #8-32

Cartridge Heater — High Temperature Termination

Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type B Heat Resistant Ceramic Bead Insulation

Available on HDC, HDM, and LDC cartridge heaters.

The ultimate in high temperature lead protection. Allows for the attachment of flexible leads to the heater away from the high heat area. Used when the ambient temperature exceeds 842°F (450°C).

- **Standard** 10" (254 mm) solid nickel pins insulated with ball and socket construction type ceramic beads

Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type BL Heat Resistant Ceramic Bead Insulation with Leads

Available on HDC, HDM, and LDC cartridge heaters.

High temperature flexible leads are connected away from the high heat area.

- **Standard** 6" (254 mm) solid nickel pins insulated with ball and socket construction type ceramic beads and 10" (254 mm) fiberglass leads rated at 842°F (450°C). Specify longer leads.

Cartridge Heater — Double End Terminations

Type T4 ☐ Double End Terminal Pin

Available on HDC, HDM, and LDC cartridge heaters

For those applications in which wiring from both ends is an advantage. Various seals are available:

T4A Cement potting seal with silicone varnish
- ➤ Cement potting temperature rating: 1000°F (538°C)

T4B High temp. moisture resistant epoxy seal
- ➤ High temp. epoxy temp. rating: 450°F (232°C)

T4C Low temp. moisture resistant epoxy seal
- ➤ Low temp. epoxy temp. rating: 266°F (130°C)

➤ Minimum 1" unheated section at each end is required.

➤ **Standard** terminal pin length is 2".

Type F1 ☐ Double End Flexible Leads

Available on HDC, HDM, and LDC cartridge heaters

For applications in which it is an advantage to wire from both ends. The leads are internally connected and can be bent sharply as they exit the potted ends. Various seals are available:

F1A Fiberglass leads with cement potting seal and silicone varnish
- ➤ Cement potting temperature rating: 1000°F (532°C)
- ➤ Standard lead wire temperature rating: 482°F (250°C)

F1B Teflon® leads with high temp. moisture resistant epoxy seal
- ➤ High temp. epoxy temperature rating: 450°F (232°C)
- ➤ Standard lead wire temperature rating: 392°F (200°C)

F1C Teflon® leads with low temp. moisture resistant epoxy seal
- ➤ Low temp. epoxy temperature rating: 266°F (130°C)
- ➤ Standard lead wire temperature rating: 392°F (200°C)

➤ Minimum 1" unheated section at each end is required.

➤ **Standard** 10" leads. Specify longer leads. Leads longer than 60" require a splice.

Type T3 Double End Screw Terminals

Available on HDC, HDM, and LDC cartridge heaters from 1/2" to 1-1/4" diameter

A double ended heater with quick change wiring screw terminals. Includes zinc plated washers and nuts.

➤ Minimum 1/2" unheated section at each end is required.

Standard screw sizes:

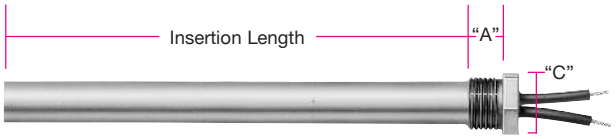
➤ 1/2" diameter — #8-32 × 3/4" screws

➤ 5/8" to 1-1/4" diameter — #10-32 × 3/4" screws

Made in USA

Cartridge Heater Termination — Single Ended National Pipe Thread (NPT) Fitting

TYPE **CM** Fig. 1 – Fitting Flush with Lead End of Sheath



CMB & CMP are available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping

NOTE: Stainless steel fittings are available through the Terminator program for heaters 1/2" diameter and larger.

Note: Fitting can be offset from end of sheath. See Figure 2, Single Threaded Mounting Options CMV and CMW below.

Standard NPT Bushing Dimensions (Fig. 1 & Fig. 2)

Heater Diameter (in)	NPT Size	"A"	"B"	"C"
1/4	⅛-27	3/8	3/16	7/16
3/8	¼-18	1/2	3/16	9/16
1/2	⅜-18	9/16	1/4	11/16
5/8	½-14	5/8	1/4	7/8
3/4	¾-14	3/4	1/4	1-1/8
7/8	1-11½	3/4	1/4	1-3/8
1	1-11½	3/4	1/4	1-3/8
1-1/4	1¼-11½	7/8	5/16	1-3/4

Type CM ☐ Single Threaded Fitting Mounting Termination Fitting Flush with Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

A single threaded pipe fitting is attached to the end of a cartridge heater to allow for installation into a threaded hole. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded. Available with the potting seals listed in the table.

Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bushing cavity can be sealed with various materials such as:

CMA/CMN **Low temperature epoxy potting** — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

CMB/CMP **Hi-temp cement potting with silicone varnish** — 1000°F (538°C)
Fiberglass leads internally connected, rated 482°F (250°C).

CMC/CMQ **Silicone rubber potting** — 450°F (232°C)
Silicone rubber leads internally connected, rated 392°F (200°C).

CMD/CMR **High temperature epoxy potting** — 450°F (232°C)
Teflon® leads internally connected, rated 392°F (200°C).

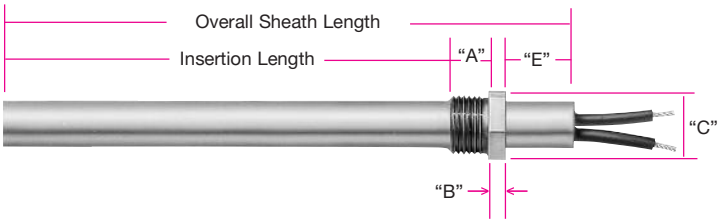
- A minimum of 1/4" unheated section below the bushing is required.
- **Standard** 10" (254 mm) leads. Specify longer leads.

Type Codes for Single Threaded Fittings

Potting Seal Type	Fitting Material: Brass	Fitting Material: Stainless Steel
Low Temp Epoxy	CMA	CMN
Hi-Temp Cement	CMB	CMP
Silicone Rubber	CMC	CMQ
Hi-Temp Epoxy	CMD	CMR

Single Ended National Pipe Thread (NPT) Fitting Option

TYPE **CM** Fig. 2 – Fitting Offset from Lead End of Sheath



Type CM ☐ Single Threaded Fitting Mounting Option Fitting Offset from Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

This mounting option available with many terminations attaches a fitting offset from the lead end of the sheath. This option is useful when the lead wires need to be kept away from the heated area. Brass fittings are silver brazed and stainless steel fittings are offset heli-arc welded.

CMV Brass Fitting

CMW Stainless Steel Fitting

- Specify offset dimension "E" when ordering.
- A termination must be specified separately.

Hi-Density Cartridge Immersion Heater Specifically Designed for Heating Water & Other Liquids

See Page 2-23.

Cartridge Heater — Double Ended National Pipe Thread (NPT)

Type CN ☐ Double Threaded Fitting Mounting Termination
Fitting Flush with Lead End of Sheath

Available on HDC, HDM, and LDC cartridge heaters

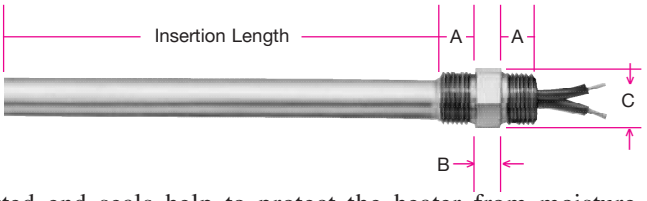
A double threaded pipe fitting is attached to the end of a cartridge heater to allow for installation into a threaded hole. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded.

Standard NPT Bushing Dimensions

Heater Diameter (in)	NPT Size	"A"	"B"	"C"
1/4	⅛-27	3/8	1/4	7/16
3/8	¼-18	1/2	1/4	9/16
1/2	⅜-18	9/16	1/4	11/16
5/8	½-14	5/8	5/16	7/8
3/4	¾-14	3/4	3/8	1-1/8
7/8	1-11½	3/4	3/8	1-3/8
1	1-11½	3/4	3/8	1-3/8
1-1/4	1¼-11½	7/8	1/2	1-3/4

Type Codes for Double Threaded Fittings

Potting Seal Type	Fitting Material: Brass	Fitting Material: Stainless Steel
Low Temp Epoxy	CNA	CNN
Hi-Temp Cement	CNB	CNP
Silicone Rubber	CNC	CNQ
Hi-Temp Epoxy	CND	CNR



Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The bushing cavity can be sealed with various materials such as:

CNA/CNN **Low temperature epoxy potting** — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

CNB/CNP **Hi-temp cement potting w/ silicone varnish** — 1000°F (538°C)
Fiberglass leads internally connected, rated 482°F (250°C).

CNC/CNQ **Silicone rubber potting** — 450°F (232°C)
Silicone rubber leads internally connected, rated 392°F (200°C).

CND/CNR **High temperature epoxy potting** — 450°F (232°C)
Teflon® leads internally connected, rated 392°F (200°C).

➤ A minimum of 1/4" unheated section below the bushing is required.

➤ **Standard** 10" (254 mm) leads. Specify longer leads.

Cartridge Heater Immersion Heater Top Hat Screw Plug Termination

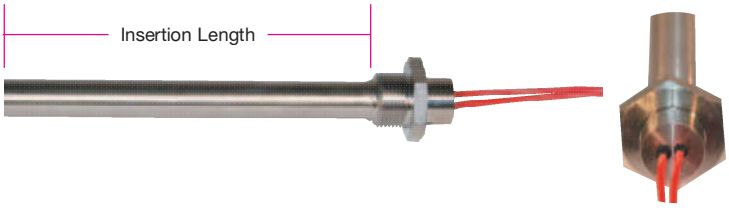
Type TH Top Hat Screw Plug

Available on HDC (except 1/8") and HDM cartridge heaters

This heater has a header cap as an integral part of the fitting. Leads exit through small holes which are sealed with epoxy for moisture protection.

Low temperature epoxy potting — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

➤ **Standard** 10" (254 mm) leads. Specify longer leads.



Cartridge Heater — Bulkhead Fitting Termination

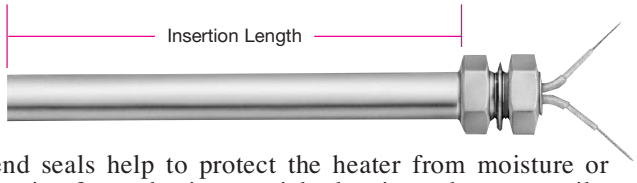
Type BF ☐ Bulkhead Fitting

Available on HDC and LDC 1/2" and 5/8" cartridge heaters

A 5/8-18 UNF fitting is attached to the end of the cartridge heater to allow for mounting the heater to the wall of a tank or enclosure. Brass fittings are silver brazed and stainless steel fittings are heli-arc welded. Includes a copper washer and jam nut. The lead wires are internally connected. Available with the potting seals listed in the table.

Type Codes for Bulkhead Fittings

Potting Seal Type	Fitting Material: Brass	Fitting Material: Stainless Steel
Low Temp Epoxy	BFA	BFJ
Silicone Rubber	BFB	BFK
Hi-Temp Epoxy	BFC	BFL



Potted end seals help to protect the heater from moisture or contamination from plastic material, cleaning solvents, or oils. The fitting cavity can be sealed with various materials such as:

BFA/BFJ **Low temperature epoxy potting** — 266°F (130°C), UL rated to 194°F (90°C)
Teflon® leads internally connected, rated 392°F (200°C).

BFB/BFK **Silicone rubber potting** — 450°F (232°C)
Silicone rubber leads internally connected, rated 392°F (200°C).

BFC/BFL **High temperature epoxy potting** — 450°F (232°C)
Teflon® leads internally connected, rated 392°F (200°C).

➤ A minimum of 1/4" unheated section below the bushing is required.

➤ **Standard** 10" (254 mm) leads. Specify longer leads.

Made in USA

Cartridge Heater Mounting Flange Options

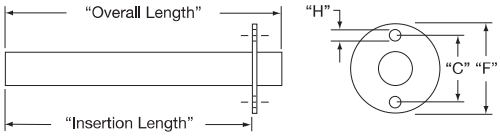
Type MFR Mounting Flange — Round

Available on HDC, HDM, and LDC cartridge heaters

Recommended for applications where excessive vibration exists and may cause the heater to back out of its mounting hole. The 16 ga. 304 SS flange is used as a means of securing the cartridge heater in place.

The default position of the flange is flush with the lead end. Specify the position of the flange when ordering.

Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping with flush flange only



Standard Round Mounting Flanges

Heater Diameter in (mm)	"F" in	"F" mm	"C" in	"C" mm	"H" in	"H" mm
1/4 (6.35), 5/16 (7.94), 3/8 (9.53), 1/2 (12.70), 5/8 (15.88), 3/4 (19.05)	1-1/2	38.10	1-1/8	28.57	.156	3.97
7/8 (22.23), 1 (25.40), 1-1/4 (31.80)	2	50.80	1-5/8	41.28	.203	5.16

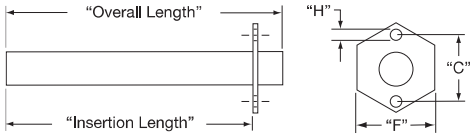
Note: 5/16" dia. cartridge heater can only be HDC; 7/8" and 1-1/4" can only be LDC.

Type MFH Mounting Flange — Hex

Available on HDC, HDM, and LDC cartridge heaters

A hex shape allows the possibility of using a wrench when removal is tight. The 16 ga. 304 SS flange is used as a means of securing the cartridge heater in place.

The default position of the flange is flush with the lead end. Specify the position of the flange when ordering.



Standard Hex Mounting Flanges

Heater Diameter in	Heater Diameter mm	"F" in	"F" mm	"C" in	"C" mm	"H" in	"H" mm
1/4	6.35	1	25.40	3/4	19.05	.144	3.66
5/16	7.94	1	25.40	3/4	19.05	.144	3.66
3/8	9.53	1	25.40	3/4	19.05	.144	3.66
1/2	12.70	1-3/8	34.93	1-5/32	29.37	.187	4.76
5/8	15.88	1-3/8	34.93	1-5/32	29.37	.187	4.76
3/4	19.05	1-3/8	34.93	1-5/32	29.37	.187	4.76
7/8	22.26	1-7/8	47.63	1-9/16	39.69	.203	5.16
1	25.40	1-7/8	47.63	1-9/16	39.69	.203	5.16
1-1/4	31.80	1-7/8	47.63	1-11/16	42.86	.203	5.16

Custom Mounting Flanges available upon request. Consult Tempco with your requirements.

Cartridge Heater Lead Wire with Strain Relief Options

Type S3 Lead Wire Strain Relief

Available on HDC, HDM, and LDC cartridge heaters

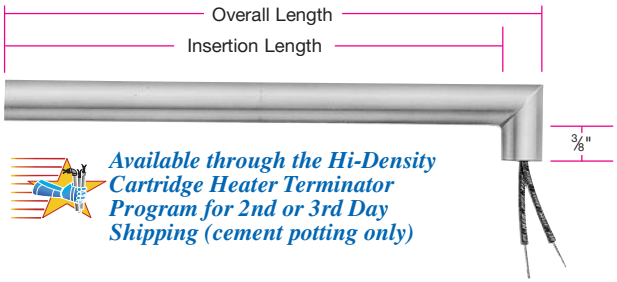
Strain relief clip for leads subject to tension and stress. A "T" type strain relief is silver brazed to the sheath.

Type S4 Right-Angle Lead Wire Strain Relief

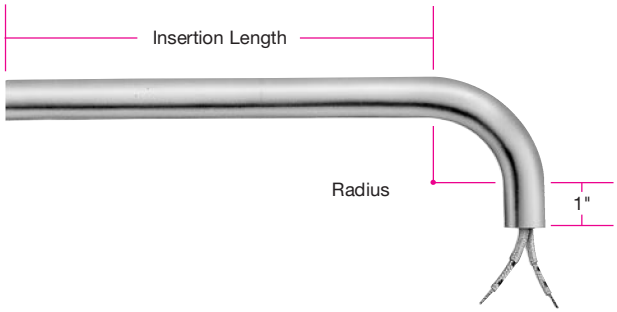
Available on HDC, HDM, and LDC cartridge heaters

Strain relief clip for leads subject to tension and stress. A "T" type strain relief is silver brazed to the sheath and bent at a 90° angle.

Cartridge Heater Option — Angled Sheath



Available through the Hi-Density Cartridge Heater Terminator Program for 2nd or 3rd Day Shipping (cement potting only)



Type R3 Angled Sheath Extension

Available on HDC, HDM, and LDC cartridge heaters

The sheath extension is silver brazed to the cartridge at a 90° angle. The leads are internally connected. The standard sheath extension is 3/8" long. Specify when ordering if a longer sheath extension is required. If abrasion resistance is required, armor cable or stainless steel wire braid can be attached to the sheath extension. Available with various lead wire types and potted end seals.

Type R4 Bent Cartridge

Available on HDC and HDM cartridge heaters

The heater sheath itself is bent to 90°. The bend is through a required cold section. The standard sheath extension past the bend is 1". Specify when ordering if a longer sheath is required.

Cartridge Dia.	in	1/4	3/8	1/2	5/8	3/4	1
	mm	6.35	9.53	12.70	15.88	19.05	25.40
Bend Radius	in	1/2	1/2	3/4	1	1-1/4	1-1/2
	mm	12.70	12.70	19.05	25.40	31.75	38.10

Type R5 Square Block with Tube Extension

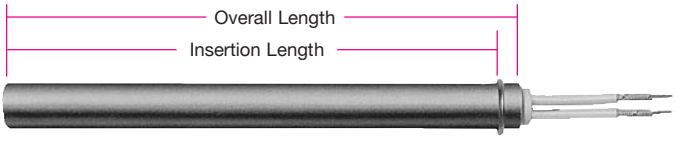
Available on HDC, HDM, and LDC cartridge heaters

The tube extension is silver brazed or tack welded to a square S/S block. The standard tube length is 1", but different lengths can be specified. Available with various lead wire types, abrasion resistant options or potted end seals.

Heater Diameter		"A"		"B"	
in	mm	in	mm	in	mm
1/4	6.35	7/16	11.11	5/16	7.94
3/8	9.53	1/2	12.70	3/8	9.52
1/2	12.70	5/8	15.87	1/2	12.70
5/8	15.88	3/4	19.05	5/8	15.87
3/4	19.05	1	25.40	11/16	17.46

Other Sheath Options

Cartridge Heater Locating Ring



Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type LR Locating Ring

Available on HDC, HDM, and LDC cartridge heaters

A locating ring can be attached to the heater to aid in positioning the heater for the application.

The default position of the ring is 1/4" from the lead end. Specify the position of the ring when ordering.

Cartridge Heater Pull Strap

Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

Type PS Pull Strap

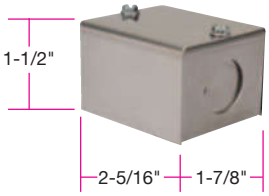
Available on HDC, HDM, and LDC cartridge heaters

A nickel wire rope is silver brazed to the lead end of the cartridge heater sheath to assist in removing the heater.

Made in USA

Cartridge Heater Terminal Box Options

Available through the Hi-Density Cartridge Heater Terminator Program For 2nd or 3rd Day Shipping

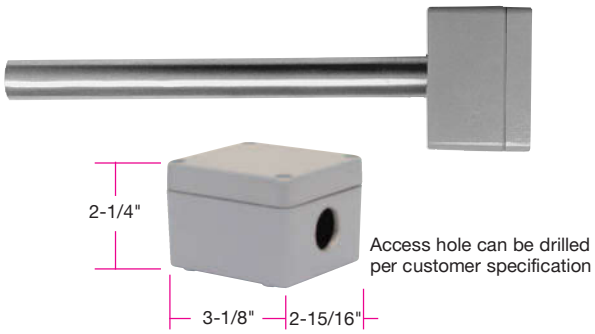


Type E1 General Purpose Terminal Box

Available on HDC, HDM, and LDC cartridge heaters

General purpose Stainless Steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The boxes have a 5/8" conduit knockout and are welded or brazed to the cartridge sheath.

➤ A termination must be specified separately.



Type E2 Moisture Proof Terminal Box

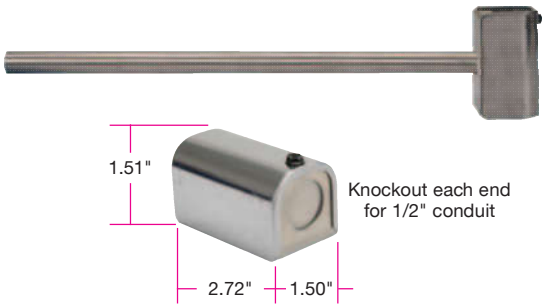
Available on HDC, HDM, and LDC cartridge heaters

NEMA 4 aluminum electrical enclosures provide protection from splashing or hose directed water, external condensation and water seepage. The box is mechanically attached to the cartridge sheath.

➤ A single 5/8" access hole is standard.

➤ A termination must be specified separately.

NOTE: Potted End Seal M2C (high temperature epoxy) or M2D (low temperature epoxy) is recommended.

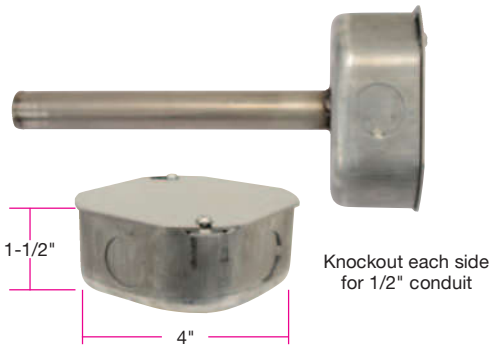


Type E4 General Purpose Terminal Box *(mailbox style)*

Available on HDC, HDM, and LDC cartridge heaters

General purpose Stainless Steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The box is welded or brazed to the cartridge sheath.

➤ A termination must be specified separately.



Type E5 Octagon Terminal Box

Available on HDC, HDM, and LDC cartridge heaters

General purpose steel NEMA 1 electrical enclosure designed to provide protection from electrical shock. The box is welded to the cartridge sheath.

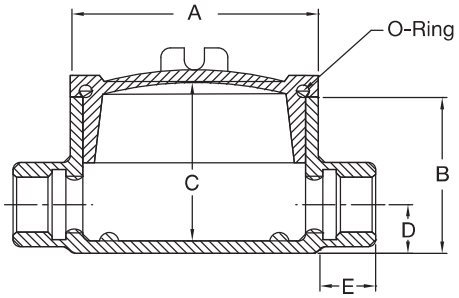
➤ A termination must be specified separately.

Type E3 ☐ Explosion Resistant Terminal Box Options

Available on HDC and HDM cartridge heaters 1/2" diameter and larger.

NEMA 4/7 electrical enclosures provide protection from contaminants, moisture, and hazardous conditions. These housings are screwed onto a heater with a single or double ended Brass or Stainless Steel fitting.

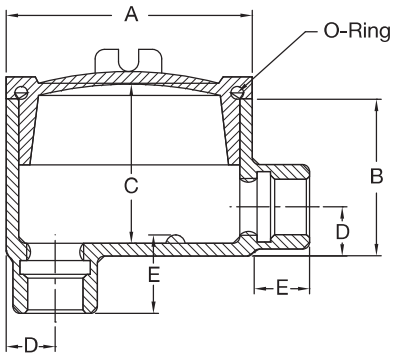
- A threaded fitting mounting termination must be specified. See pages 2-50 and 2-51.
- Other terminal box configurations available upon request.



Style **E3C**

Housing E3C Dimensions

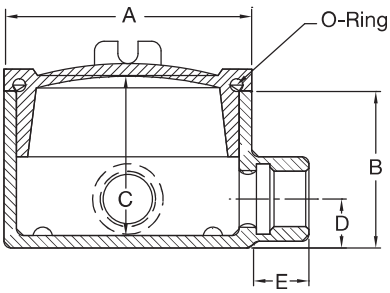
Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2	2	3/4	7/8
1	1-11½	3-1/2	2-5/16	2-3/16	7/8	1



Style **E3D**

Housing E3D Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2-1/2	2-7/16	3/4	7/8
1	1-11½	3-1/2	2-5/16	2-3/16	7/8	1



Style **E3L**

Housing E3L Dimensions

Heater Diameter(s)	Hub Size NPT	"A" (in)	"B" (in)	"C" (in)	"D" (in)	"E" (in)
1/2 & 5/8	1/2-14	2-1/2	2-1/4	2-3/16	5/8	7/8
3/4	3/4-14	2-1/2	2-1/2	2-7/16	3/4	7/8
1	1-11½	3-1/2	2-5/16	2-3/16	7/8	1

CAUTION

Explosion resistant terminal housings are intended to provide containment of an explosion in the enclosure only. No portion of the heater assembly outside the enclosure is covered under this NEMA rating. Abnormal use of a heater which results in excessive temperature can create hazardous conditions such as a fire. Never perform any type of service nor remove the housing cover prior to disconnecting all electrical power to the heater.

Made in USA

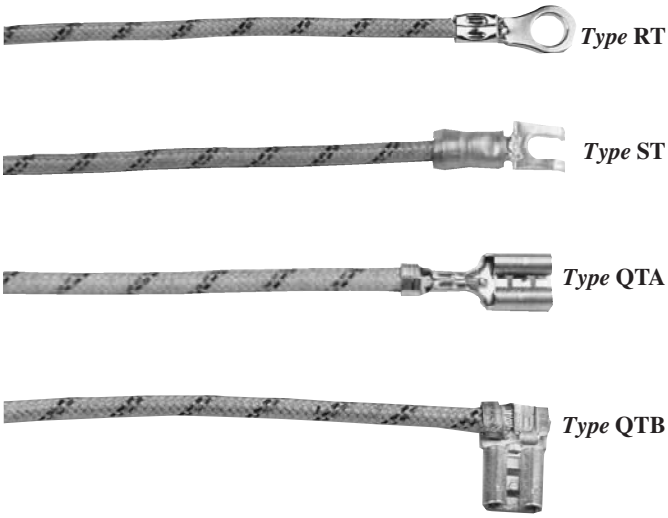
Cartridge Heater Options — Lead End Connections

Type RT Ring Terminal
Type ST Spade Terminal
Type QTA 1/4" Female Straight Quick Disconnect
Type QTB 1/4" Female Right-Angle Quick Disconnect

Available on HDC, HDM and LDC cartridge heaters

Various types of crimp terminals can be attached to the heater leads to make wiring into applications quick and easy. Non-insulated and insulated with nylon (221°F/105°C) or PVC (194°F/90°C).

Note: Specify insulation type and ring size (#6, #8, or #10) when ordering. Standard is a non-insulated #10 terminal. Consult Tempco with your requirements.

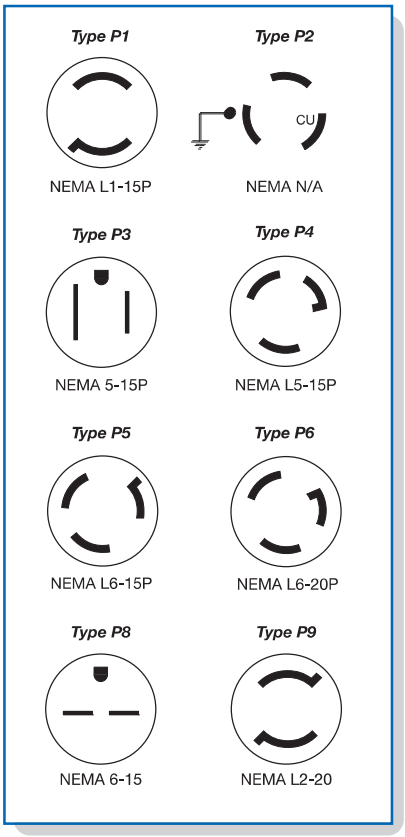


Type P☐ Quick Disconnect Plugs

Available on HDC, HDM, and LDC cartridge heaters

Allows for the quick and easy replacement of the heater. The plug can be attached to galvanized armor cable, stainless steel armor cable, or wire braid.

Plug Type	*Description*
1	2-pole/2-wire twist locking plug, 15 amp 125 volt NEMA L1-15P (Part Number EHD-102-102)
2	2-pole/3-wire twist locking plug, 15 amp 125 volt or 10 amp 250 volt NEMA N/A. (Part Number EHD-102-107) **NOTE:** This plug is not listed by UL, and is recommended for replacement use only.
3	2-pole/3-wire straight blade plug, 15 amp 125 volt NEMA 5-15P (Part Number EHD-102-103)
4	2-pole/3-wire twist locking plug, 15 amp 125 volt NEMA L5-15P (Part Number EHD-102-113)
5	2-pole/3-wire twist locking plug, 15 amp 250 volt NEMA L6-15P (Part Number EHD-102-121)
6	2-pole/3-wire twist locking plug, 20 amp 250 volt NEMA L6-20P (Part Number EHD-102-122)
8	2-pole/3-wire straight blade plug, 15 amp 250 volt NEMA 6-15P (Part Number EHD-102-114)
9	2-pole/3-wire twist locking plug, 20 amp 250 volt NEMA L2-20P (Part Number EHD-102-104) **NOTE:** For other types of plugs, consult Tempco or specify the manufacturer's part number when ordering. See page 15-15 for additional information.



CAUTION **Caution!** Voltage and Amperage ratings of heater and plug must match.

Available through the Hi-Density Cartridge Heater Terminator Program for Same or Next Day Shipping

View Product Inventory @ www.tempco.com

Cartridge Heater Lead Wire Options

Type MIL High Temperature Lead Wire

Available on HDC, HDM and LDC cartridge heaters

When required, high temperature lead wire can be used on most cartridge heaters. The stranded wire is insulated with mica tapes and then a treated fiberglass overbraid.

- Maximum temperature rating: 450°C (842°F)

Type TL Teflon® Leads

Available on HDC and HDM cartridge heaters

- Maximum temperature rating: 200°C (392°F)

Type HA Heat Shrink Covered Armor Cables

Available on HDC, HDM and LDC cartridge heaters

- Either the galvanized or stainless steel armor cable can be covered with moisture proof heat shrink PVC tubing.

Type HTL Very High Temperature Lead Wire

Available on HDC, HDM and LDC cartridge heaters

When required, high temperature lead wire can be used on most cartridge heaters. The stranded wire is insulated with mica composite and then a treated fiberglass overbraid.

- Available wire gauge sizes: 10-18
- Maximum temperature rating: 550°C (1022°F)

Type SR ☐ Silicone Rubber Coated Fiberglass Sleeving

Available on HDC, HDM and LDC cartridge heaters

For added protection, strength, and resistance to various chemicals, the lead wires can be covered with silicone rubber sleeving.

SRA Silicone rubber coated fiberglass sleeving on each lead separately

SRB Silicone rubber coated fiberglass sleeving on both leads together

- Specify length when ordering.
- Maximum temperature rating: 200°C (392°F)

Consult Tempco with your requirements.
We welcome your inquiries.

Cartridge Heater Options — Sheath Surface and Sheath Material

Type IS Incoloy® Sheath

Available on HDC and HDM cartridge heaters.

The standard sheath material for all Hi-Density Cartridge Heaters except 1" diameter is 321 stainless steel; standard for 1" diameter is 304 stainless steel. The incoloy sheath option is available on all diameters except 1/8", 5/16", 8 mm and 20 mm.

To assist you in selecting the proper sheath material, corrosion resistant ratings and chemical properties of various heater sheath materials are given in Section 16, Engineering Data, in the back of this catalog.

Type DSM Other Special Sheath Materials

If your application requires a specific alloy sheath material other than described in Type IS above, consult Tempco with your requirements.

Type PAS Passivation

Available on HDC, HDM, and LDC cartridge heaters.

Passivating is a chemical process accomplished by dipping the heater in a solution of nitric acid. The process removes surface contamination, usually iron, so that the optimum corrosion resistance of the stainless steel is maintained.

Type OAL Special Length Tolerance

Available on HDC, HDM, and LDC cartridge heaters.

If a special length tolerance different than the standard length tolerance specified on page 2-4 is required, consult Tempco with your requirements.

Type ELP Electro-Polish

Available on HDC, HDM, and LDC cartridge heaters.

Electro-Polishing is an electro-chemical process that removes surface imperfections and contaminants, enhancing the corrosion resisting ability of the heater sheath.

Type CG Centerless Grinding

Available on HDC and HDM cartridge heaters.

For applications requiring high precision fit and tolerance, the sheath can be centerless ground.

Tolerance: ±0.0005 inches (0.013 mm)

Specify diameter when ordering.

Type SDA End Disc Seals Silver Brazed
Type SDB End Disc Seals Heli-Arc Welded

Available on LDC cartridge heaters.

End discs on HDC and HDM cartridge heaters are heli-arc welded as standard.

The normally mechanically attached end discs on LD cartridge heaters can be silver brazed or heli-arc welded if desired.

Made in USA

Cartridge Heater With Built-In Internal Thermocouples

Built-in Internal Thermocouples are available on all HDC, HDM, and LDC cartridge heater diameters except for 3/16", 5/16" and 8 mm.

Notes: Type TJ4 and TK4 are not available on 1/4" and 6.5 mm diameter cartridges.

Minimum sheath length: 3" for 1/4", 3/8" and 1/2" diameter. 4" for 5/8" and 3/4" diameter.

10" leads are standard for both heater and thermocouple. Leads are internally connected. Specify longer leads.

ANSI Code	Conductor Characteristics Positive	Conductor Characteristics Negative	Temperature Range °F	Temperature Range °C
J	Iron (Magnetic)	Constantan (Non-Magnetic)	0 to 1400	–17 to 760
K	Chromel (Non-Magnetic)	Alumel (Magnetic)	0 to 2300	–17 to 1260

For other thermocouple types consult Tempco.

Type **TJ1 and TK1**

Type TJ1 and TK1 Grounded at Disc End

The thermocouple junction is grounded to the sheath at the disc end and packed with MgO. The concave end disc is filled with silver solder and ground flat. When inserted into a flat end blind hole, it will provide fast responsive temperature readings. Widely used in Hot Runner mold probes.

TJ1 Type J thermocouple; **TK1** Type K thermocouple

Type **TJ2 and TK2**

Type TJ2 and TK2 Ungrounded at Disc End

The thermocouple junction is ungrounded, located at the end of the heater section, 1/8" behind the end disc and packed with MgO. Only provides reference temperature reading of the part being heated – slower response.

TJ2 Type J thermocouple; **TK2** Type K thermocouple

Type **TJ3 and TK3**

Type TJ3 and TK3 Ungrounded at Center

The thermocouple junction is ungrounded and is located in the center of the length and diameter of the cartridge heater. It provides internal temperature readings of the heater core. Generally used for research applications and is not recommended for controlling process temperatures.

TJ3 Type J thermocouple; **TK3** Type K thermocouple

Type **TJ4 and TK4**

Type TJ4 and TK4 Grounded at Center

The thermocouple junction is grounded to the sheath in a 1/2" unheated section located in the center of the cartridge length unless otherwise specified. It provides good temperature readings with quick response.

TJ4 Type J thermocouple; **TK4** Type K thermocouple

Type **TJ5 and TK5**

Type TJ5 and TK5 Grounded at Lead End

The thermocouple junction is grounded to the sheath at the lead end. A minimum of 3/8" of cold section is required. It provides good temperature readings with quick response.

TJ5 Type J thermocouple; **TK5** Type K thermocouple

Note: For a complete selection of standard Hi-Density Pennybottom™ Cartridge Heaters, with built-in Type J thermocouple for Hot Runner plastic molds, see pages 2-24 through 2-26.

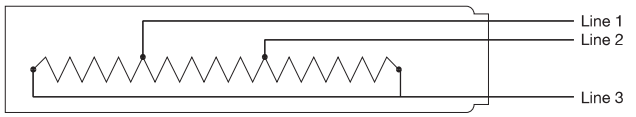
Available from stock.

Cartridge Heater Options — Internal Power Variations

Type DW Distributed Wattage

Available on HDC and HDM cartridge heaters

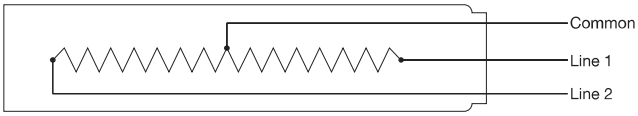
Cartridge heaters can be designed to vary the wattage along the length of the heater. Specify number of zones and the required watts and length per zone starting from the disk end. Leads can be connected externally or internally. Picture shows a heater with Type N externally connected leads. Heaters with other terminations may require a longer cold section at the lead end.



Type 3PH Three Phase

Available on HDC, HDM, and LDC cartridge heaters
1/2" diameter and larger (See page 2-4)

In order to minimize the gauge of the wiring on high wattage cartridge heaters, 3-phase elements can be designed.



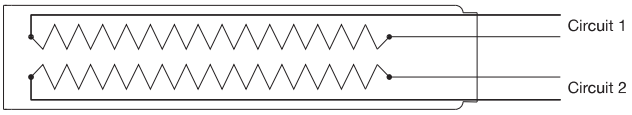
Type DV ☐ Dual Voltage

Available on HDC, HDM, and LDC cartridge heaters
3/8" diameter and larger (See page 2-4)

3/8" and 1/2" diameter heaters may require a larger diameter transition area at lead end.

Cartridge heaters can be designed using 3-wire series/parallel circuits for dual voltage applications. Whether the heater is run on the high or low voltage, the wattage will be the same.

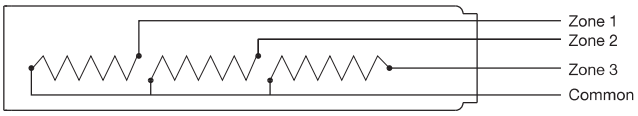
DV1 120/240 volts **DV2** 240/480 volts



Type DWV Dual Circuits

Available on HDC, HDM, and LDC cartridge heaters
1/2" diameter and larger (See page 2-4)

Independent resistance elements can be designed in a single cartridge heater for added versatility.

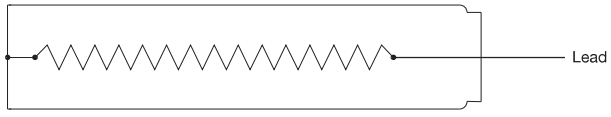


Type MHZ Multiple Heat Zones (3-Zones Maximum)

Available on HDC and HDM cartridge heaters
3/8" diameter and larger (See page 2-4)

3/8" and 1/2" diameter heaters may require a larger diameter transition area at lead end.

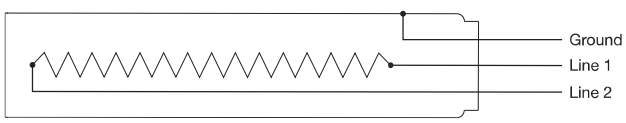
Multiple independently operated sections of the heater with a common wiring connection can be designed for increased flexibility.



Type GJ Grounded Element Winding

Available on HDC, HDM, and LDC cartridge heaters

For DC applications where the electrical circuit is negative grounded, the cartridge heater can be designed with one side of the element winding grounded to the sheath and a single lead wire exiting the cartridge heater.



Type GL Ground Lead/Sheath

Available on HDC, HDM, and LDC cartridge heaters

For those applications requiring a separate ground lead attached to the cartridge heater sheath.

Standard ground lead wire is a 10" long insulated stranded conductor. Optional insulated and color coded leads are available.

Available through the Hi-Density Cartridge Heater Terminator Program for 2nd Day Delivery

Made in USA

Cartridge Heater Internal Sensor and Control Options

Type TF Thermal Fuses

Available on HDC, HDM, and LDC cartridge heaters 1/2" diameter and larger

Thermal fuses can be built into cartridge heaters to act as a high limit for the heater in applications where the temperature must be limited to avoid dangerous situations. When the trigger point is reached, the thermal fuse will open, cutting the electrical current to the cartridge heater. Once the thermal fuse opens, it cannot be reset. Many different trigger temperatures are available.

Type TS Thermostat

Available on HDC, HDM, and LDC cartridge heaters 5/8" diameter or larger

Cartridge heaters with built-in thermostats are very efficient and economical for heating and controlling temperatures. Available with NPT or special type mounting fittings, they provide a self-contained heater mainly recommended for immersion applications. They can also be used as over-temperature safety devices. The thermostats are factory preset for the trip temperature; therefore, prototyping and testing is required to determine the exact fixed setpoint. Maximum temperature—302°F (150°C). Maximum Amps—8@120 Volts.

A minimum 2-1/2" cold section is required to house the thermostat. Consult Tempco with your requirements.

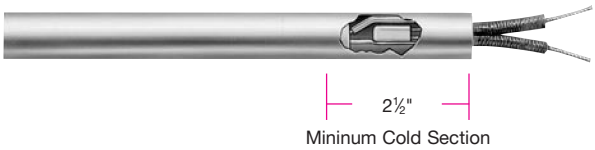
Type TM Thermistor
Type RD RTD Temperature Sensors

Available on HDC, HDM, and LDC cartridge heaters

Tempco has the ability to custom design cartridge heaters with built-in temperature sensors such as thermistors and RTDs. For specific applications that have a limited or single set point range, thermistors or RTDs in conjunction with simple electronic controllers can be an economical choice.

NOTE: For thermocouples see page 2-58.

Type **TS**



Cartridge Heater Option — Inspection Services and Test Reports

Standard Electrical Tests and Optional Test Reports

1. Resistance test — measures ohms at room temperature.
2. IR (insulation resistance) test — measures the insulation resistance to the flow of current. Standard test is done at 500VDC.
3. Hipot (high potential) test — a high voltage is applied between a product's current carrying conductors and its metallic enclosure to verify that the insulation is sufficient to protect the operator from electrical shock.
4. Leakage current test — measures the current that flows from any conductive part to ground.
5. Heaters can be serialized and test reports can be sent with each shipment if required. Contact Tempco with your requirements.

Optional Die Penetrant Test

This non-destructive testing can detect imperfections in weld joints. For critical applications, each individual heater's weld joints by end cap and fittings can be tested. Certified test reports will be sent with each shipment. Consult Tempco for details.

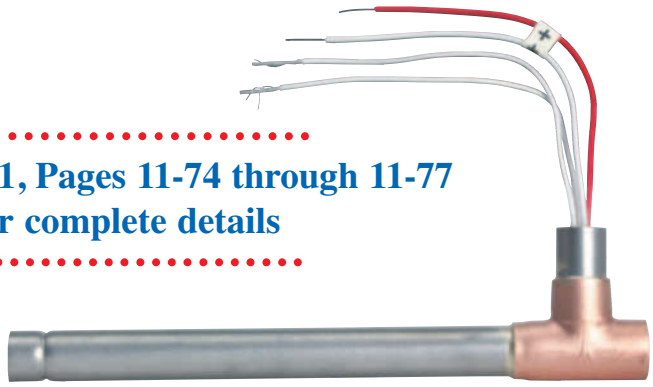
Optional Hydrostatic Pressure Test

Cartridge heaters with attached pipe fittings can be pressure tested to your specifications at Tempco. Our in-house testing capabilities can ensure that your products meet your exact specifications. Contact Tempco with your requirements.

LDA and HAC Forced Air In-Line Process Cartridge Heaters

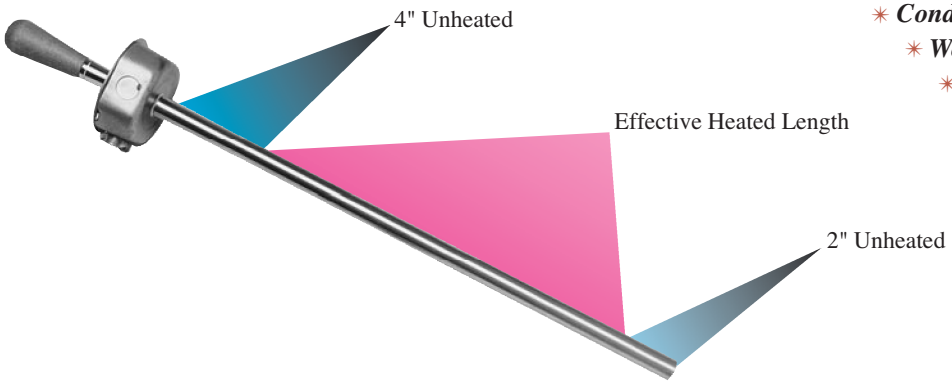
TEMPCO manufactures a variety of Air Process Cartridge Heaters. They can be standard units or designed to the customer's specifications. The following diameter sizes are available: 3/8", 1/2", 5/8" and 3/4".

These diameters can be adapted with various types of fittings and made into any practical length.



See Section 11, Pages 11-74 through 11-77 for complete details

BOLT HEATERS



Design Features

- *Hi-Density Construction*
- *Conduit Box with Knockouts*
- *Wooden Handle*
- *High Temperature Lead Wires—250°C (482°F)*
- *Optional SJO Cord or Post Terminals*
- *Optional Quick Disconnect Plugs*

TEMPCO Bolt Heaters are used as an aid to tighten large bolts in heavy machinery and equipment. Heaters are sized for easy insertion into a hollow bolt. The rapid heating of the bolt expands it, allowing further tightening of the nut. The heater is then de-energized and removed. As the bolt cools, its contraction back to original size provides a tight fit.

Tempco Bolt Heaters are constructed with one of the industry's most efficient and highest quality heating elements—Tempco Hi-Density (swaged) Cartridge Heaters; with close tolerance fits, watt densities of 100 watts per square inch are obtainable—65% higher than standard cartridge or tubular heating elements can deliver. The higher wattage on Hi-Density Bolt Heaters means quicker heat-up time and minimum heat loss to the area surrounding the bolt.

Typical Industries

- *Power Plants*
- *Shipyards*
- *Large Machine and Die Manufacturers*
- *Construction*
- *Boiler Manufacturers*

Typical Applications

- *Large Compressors*
- *Turbines*
- *Die Blocks*
- *Large Cylinders*
- *Engine Heads*
- *Pressure Vessels*

Bolt Heaters Standard Specifications and Tolerances

DIMENSIONAL SPECIFICATIONS

Actual Diameter (in)	.438	.496	.553	.580	.621	.660	.710	.745	.813	.993
Actual Diameter (mm)	11.1	12.6	14.0	14.7	15.8	16.8	18.0	18.9	20.7	25.2

Diameter Tolerance: ±.005 (.127 mm)
Length Tolerance: ±2% of sheath length
Camber Tolerance: .020" (0.38 mm) per foot of length

ELECTRICAL SPECIFICATIONS

Diameter (in)	.438	.496	.553	.580	.621	.660	.710	.745	.813	.993
Maximum Voltage	240	240	240	240	480	480	480	480	480	480
Maximum Amperage	6.7	10.5	10.5	23	25	25	25	25	25	25

If tighter tolerances are required, consult Tempco.

CONTINUED

Made in USA

Standard (Non-Stock) Bolt Heaters

Continued from previous page...

Heater Diameter in (mm)	Inserted Length in	Inserted Length mm	Heated Length in	Heated Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Part Number 240V
.438 (11.1)	18	457	12	305	1000	60.6	9.4	HDB00001
	24	610	18	457	1500	60.6	9.4	HDB00002
.496 (12.6)	18	457	12	305	1900	101.6	15.8	HDB00003
	24	610	18	457	2300	82.0	12.7	HDB00004
	30	762	24	610	2300	61.5	9.5	HDB00005
	36	914	30	762	2300	49.2	7.6	HDB00006
.553 (14.0)	18	457	12	305	1200	57.6	8.9	HDB00007
	24	610	18	457	1700	54.4	8.4	HDB00008
	30	762	24	610	2500	60.0	9.3	HDB00009
	36	914	30	762	3200	61.4	9.5	HDB00010
.580 (14.7)	18	457	12	305	2200	100.6	15.6	HDB00011
	24	610	18	457	3300	100.6	15.6	HDB00012
	30	762	24	610	4350	99.5	15.4	HDB00013
	36	914	30	762	5450	99.7	15.5	HDB00014
.621 (15.8)	18	457	12	305	2350	100.4	15.6	HDB00015
	24	610	18	457	3500	99.7	15.4	HDB00016
	30	762	24	610	4700	100.4	15.6	HDB00017
	36	914	30	762	5500	94.0	14.6	HDB00018
.660 (16.8)	18	457	12	305	1200	48.2	7.5	HDB00019
	24	610	18	457	1700	45.5	7.1	HDB00020
	30	762	24	610	2300	46.2	7.2	HDB00021
	36	914	30	762	2800	45.0	7.0	HDB00022
.710 (18.0)	18	457	12	305	2700	100.9	15.6	HDB00023
	24	610	18	457	4000	99.7	15.4	HDB00024
	30	762	24	610	5350	100.0	15.5	HDB00025
	36	914	30	762	5500	82.2	12.7	HDB00026
.745 (18.9)	18	457	12	305	2800	99.7	15.5	HDB00027
	24	610	18	457	4200	99.7	15.5	HDB00028
	30	762	24	610	5500	97.9	15.2	HDB00029
	36	914	30	762	5500	78.3	12.1	HDB00030
.813 (20.7)	18	457	12	305	1800	58.7	9.1	HDB00031
	24	610	18	457	2500	54.4	8.4	HDB00032
	30	762	24	610	3500	57.1	8.6	HDB00033
	36	914	30	762	4200	54.8	8.5	HDB00034
.993 (25.2)	18	457	12	305	3750	100.2	15.5	HDB00035
	24	610	18	457	5500	97.9	15.2	HDB00036
	30	762	24	610	5500	73.5	11.4	HDB00037
	36	914	30	762	5500	58.8	9.1	HDB00038

Note: Part Numbers shown are for heaters with standard 10" long leads and a conduit box with wooden handle.

Hi-Density Bolt Heaters are made-to-order only.

Ordering Information

Catalog Heaters

Order by Catalog Part Number from the Standard Sizes and Ratings List.

Note that Part Numbers shown are for heaters with 10" long, 428°F (250°C) stranded flexible lead wires inside the conduit box.

Standard lead time is 3 weeks.

Custom Engineered/Manufactured Heaters

Because an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Bolt Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Diameter
- ❑ Insertion Length
- ❑ Cold Section (top and bottom)
- ❑ Wattage
- ❑ Voltage
- ❑ Lead Length or Post Terminals
- ❑ Optional Cord or Plug
- ❑ Special Features

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

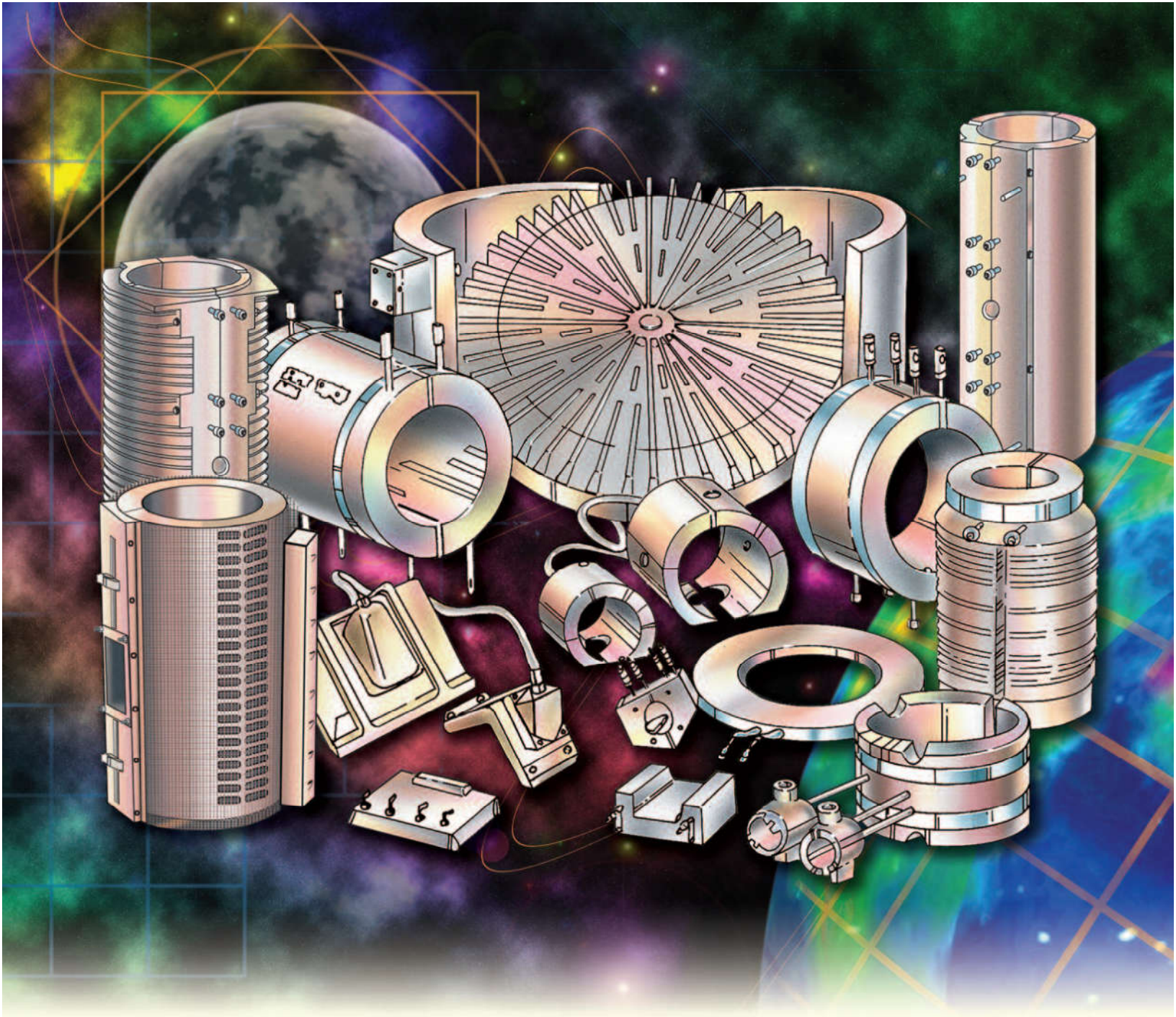


Table Of Contents

3 section

Cast-In Heaters

Delivering Cutting Edge Solutions with Highly Customized/Engineered Cast-In Thermal Components

Developing Solutions Through Product Innovation

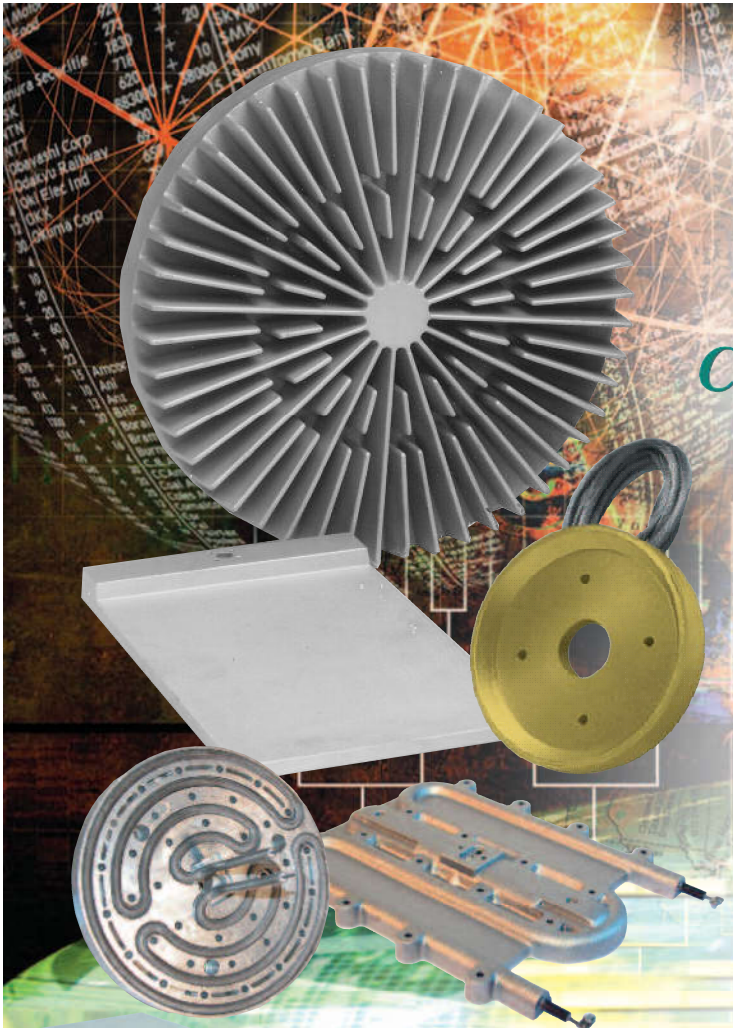
Tempco is a name synonymous with state-of-the-art technology and a strong commitment to providing practical, cost effective, quality thermal component solutions. We are a widely recognized industry-leading authority in the design, engineering and manufacturing of cast-in heaters and cast-in thermo cooling components.

Tempco's expertise and flexible manufacturing capabilities allow cast-in thermal components to be designed in virtually any imaginable size and shape, including complex and challenging geometries. Casting alloys used are aluminum, brass, and bronze.

Supporting A Diversified Segment of Industries

Tempco has a proven track record of successfully assisting our customers in solving or improving complex and challenging applications with cast-in thermal component technology, whether for heating or cooling functions. We consistently deliver on our commitment to exceed our customers' expectations in a diverse segment of industries from Original Equipment Manufacturers (OEMs), to Research and Development, Life Science, and Maintenance (MRO) Applications.

Consult Us with Your Requirements
We Welcome Your Inquiries



Supporting Diversified & Demanding Industrial, Life Science, Commercial & Scientific Applications

Vertically Integrated Manufacturing Capabilities

Tempco is a company uniquely qualified and committed to taking full ownership and responsibility of your Cast-In thermal component challenges. Consult Tempco at the early stages of your application requirements; we can provide you with the ultimate solution that will achieve cost savings and reliability with both functional and aesthetic quality.

Tempco's in-house manufacturing capabilities to produce Cast-In Thermal Components include:

- ***Custom designing and engineering utilizing 3-D and CAD/CAM solid modeling technology***
- ***Tubular and Cable Heating Element manufacturing***
- ***Full service foundry facility processing Aluminum, Brass, and Bronze Alloys***
- ***Foundry tooling fabrication — Steel or Cast Iron Permanent Molds,Wood or Plastic Patterns***
- ***Machining — Full service State-of-the-Art CNC machine shop capabilities including Coordinate Measuring Machine***
- ***Lab services — computerized infrared heating profiles, life cycle testing, X-ray examination, 3-D solidification modeling***

Experience our Passion for Excellence in the Design & Manufacturing of Cast-In Thermal Components

One Source Providing Extensive Engineering/Manufacturing Capabilities

Casting Process: Low Pressure

Used for large volume quantities. Specifically suited for intricate and challenging geometric shapes, producing quality castings with consistent dimensional accuracy and superior surface finish.

Alloy: Aluminum (only)
Tooling: Requires a Steel or Cast Iron Permanent Mold
Machining: Minimum to no machining
Weight Capacity: Up to 150 pounds depending on shape

Casting Process: Tilt-Pour Gravity Feed

Used extensively for medium to high volume quantities. Will accommodate simple to some irregular shape castings, producing good dimensional accuracy and surface finish.

Alloy: Aluminum (only)
Tooling: Requires a Steel or Cast Iron Permanent Mold
Machining: Moderate to Extensive
Weight Capacity: Up to 150 pounds depending on shape

Casting Process: No-Bake Sand Molds

Used for lower volume quantities, prototypes, very large irregular shapes and thermal platens.

Alloys: Aluminum, Brass, Bronze and Iron
Tooling: Requires a Wood or Plastic Pattern
Machining: Extensive
Weight Capacity: Up to 600 pounds

Melting Capabilities

Electric Reverb and Induction furnaces are used to minimize gas inclusion into the molten metal, thereby producing a denser, higher quality casting.

CNC Machining

There are certain dimensional and/or finish tolerances or geometry that cannot be produced as cast and must be machined. Tempco offers a full service state-of-the-art machine shop featuring various types of CNC machine tools to perform all of the precision machining required—from simple to complex contour geometrics, including turning and/or boring, with repeatable accuracy from one machined casting to the next. Machinists also build and maintain permanent mold tooling for the low pressure and tilt-pour gravity feed casting processes.

CMM Inspection

Coordinate Measuring Machine provides precise measurement of complex parts in process or at final inspection.

Pattern Shop

Tempco has an in-house Pattern Shop to build and maintain the wood or plastic patterns required to produce castings with no-bake sand molds.

No one can do it better than Tempco –

LET US PROVE IT!

Experience Our Value-Added Services that are Second to None

Casting Alloys

Casting Alloy	Aluminum	Copper	Silicone	Zinc	Lead	Maximum Iron	Tin	Other
Aluminum 319	85.8 - 91.58%	3.0 - 4.0%	5.50 - 6.50%	≤ 1.0%	—	≤ 1.0%	—	≤1.7%
Aluminum 356	90.1 - 93.3 %	≤0.25%	6.50 - 7.50%	≤0.35%	—	≤0.60%	—	≤1.125%
Bronze	9.0 - 11.0%	≥ 86.0%	—	—	—	0.80 - 1.50%	—	≤1%
Yellow Brass	≤0.55%	58.0 - 64.0%	≤0.05%	32.0 - 40.0%	0.80 - 1.50%	≤0.70%	0.50 - 1.50%	≤1%

Material Properties

Material	Classification	Max. Surface Temperature °F (°C)	Density (lb/in^3)	Coefficient of Linear Thermal Expansion (in/in/°F x 10^{-6})	Specific Heat Capacity (BTU/lb-°F)	Thermal Conductivity (BTU-in/hr-ft^2-°F)	Melting Point (°F)
Aluminum 319	Aluminum 319.0	700 (371)	0.101	12.7 @ 68° – 572°F	0.23	754	960 – 1120
Aluminum 356	Aluminum 356.0	750 (399)	0.0968	12.9 @ 68° – 572°F	0.23	1160	1030 – 1140
Bronze	UNS C95300	1350 (732)	0.272	9 @ 68° – 572°F	0.0896	437	1900 – 1913
Yellow Brass	UNS C85700	1200 (649)	0.304	12.2 @68° – 500°F	0.0899	582	1660 – 1690

Linear Thermal Expansion Formula: $\Delta L = Li \times \alpha \times (T_f - T_i) \times 10^{-6}$

ΔL = Change in Length
Li = Initial Length
α = Coefficient of Linear Thermal Expansion
T_f = Final Temperature
T_i = Initial Temperature

Minimum Casting Thickness vs. Heating Element and/or Cooling Tube Diameters

Casting Thickness	Maximum Available Element Diameter Heat Only	Maximum Available Cooling Tube Diameter Cool Only	Maximum Element and Cooling Tube Combination Heat and Cool
5/8" (15.9 mm)	.260	1/4	—
3/4" (19.1 mm)	.375	3/8	—
1" (25.4 mm)	.430	1/2	—
1-1/4" (31.8 mm)	.430	1/2	.260 and 3/8
1-3/8" (34.9 mm)	.430	1/2	.315 and 1/2
1-1/2" (38.1 mm)	.430	1/2	.430 and 1/2
1-5/8" (41.3 mm)	.430	1/2	.430 and 1/2
1-3/4" (44.5 mm)	.430	1/2	.430 and 1/2
Finned Casting			
3/4" (19.1 mm)	.375	—	—
7/8" (22.2 mm)	.430	—	—
1" (25.4 mm)	.430	—	—
1-3/4" (44.5 mm)	.430	—	—

Casting Size & Weight Limitations

	Cylindrical	Platen
Minimum Inside Diameter:	1" (25.4 mm)	—
Maximum Inside Diameter:	48" (1219 mm)	—
Minimum Width:	—	1-1/2" (38.1 mm)
Maximum Width:	—	60" (1524 mm)
Minimum Length:	1-3/4" (44.5 mm)	4" (102 mm)
Maximum Length:	40" (1016 mm)	72" (1829 mm)
Finish:	125 RMS Standard or to customer spec.	

Gap (two-piece cylindrical cast-in band heaters)**:** 1/4" (6.4 mm) top and bottom or to customer specification

Maximum Weight: Aluminum— 600 pounds
Bronze & Brass— 300 pounds

NOTES: Cylindrical heaters are made with two half-round heaters. Cast-In thermal components can be made in any practical size, weight and geometric shape.

Heating Element Electrical Specifications

Tubular Heater Diameter	.260"	.315"	.375"	.430"
Maximum Volts	240	277	480	600
Maximum Amps **Per Element**	15	30	40	40

Maximum Watt Density: Aluminum Alloy—35 W/in^2 on the element
Bronze or Brass—45 W/in^2 on the element

Resistance Tolerance: +10%, –5% **Wattage Tolerance:** +5%, –10%

Three Phase available depending on casting size.
Ground Studs can be added to most cast-ins.

Note: Tempco-Pak mineral insulated cable heaters can be used in place of tubular heating elements to fit physical constraints not possible with conventional heating elements. See catalog Section 5 for more details.

Cooling Tube Materials for Castings with Liquid Cooling

Tube Material	Tube OD and Wall Thickness
Stainless Steel (Standard)	1/4" O.D. × .028 wall
Stainless Steel (Standard)	3/8" O.D. × .035 wall
Stainless Steel (Standard)	1/2" O.D. × .049 wall
Stainless Steel (Optional)	5/8" O.D. × .049 wall
Incoloy® 840 (Optional)	1/2" O.D. × .049 wall

Tubing with heavier wall thickness is available upon request.

Options for Cast-In Thermal Components

Casting Surface Treatments

Special surface finishes are required in some applications:

- Electroless Nickel Plating
- Anodizing
- Teflon®
- Hard-Coat Anodizing
- Magnaplate

Lab Services

- Computerized Infrared Heating Profiles
- Life Cycle Testing
- X-Rays to confirm heating element location and casting density
- Heating Ramp Rate Testing

Agency c UL us ***Approvals***

Cast-In Heater Elements are UL recognized under UL File Number E90771.
If you require UL Agency Approval, please specify when ordering.

Cast-In Heaters – Complex Geometrics for Diversified Industries

Cast Iron Manifold Heater for Aluminum Low Pressure Casting Machine

Delivering Cutting-Edge Engineered Cast-In Thermal Component Solutions

Today's fast-paced and high-tech industries demand products that are high quality, unique, reliable, and diverse. Tempco is passionate about meeting those expectations and putting our customers' needs first by providing quality service and products with superior capabilities. Tempco specializes in engineering and manufacturing customized cast-in thermal component solutions to service and support virtually all major industries. The following pages illustrate a sampling of cast-in thermal components we have produced for original equipment manufacturers (OEMs) and maintenance (MRO) applications that enjoy the advantages and benefits our products offer.

High Performance Cast-In Thermal Components are not Just a Challenge — They Are Our Bread & Butter. Please Consult Us with Your Requirements. We Welcome Your Inquiries.

Aluminum Cast-In Heater for Plastic Extrusion

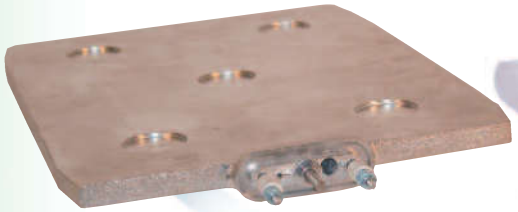
Rectangular Manifold Cast-In Heater

Aluminum Cast-In Heater Used in the Carpet Mill Industry

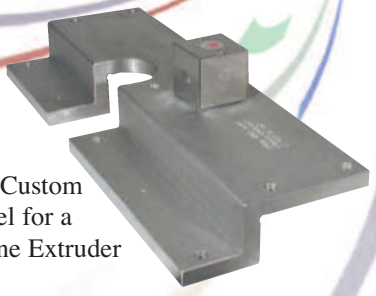
Oil Pre-Heater for Industrial Process Equipment

Heating Elements & Aluminum Cast Over Steel Transfer Feed Pipe

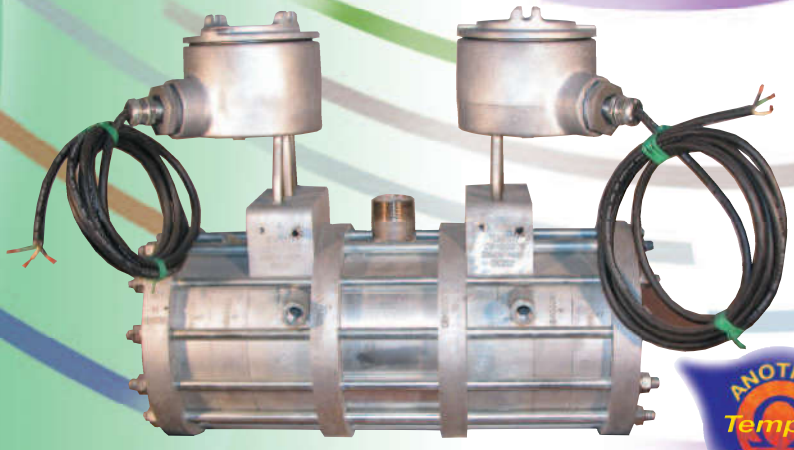
Barrel Adapter for Polymer Extruder Equipment



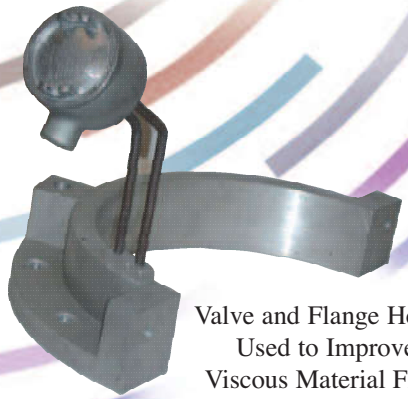
Autoclave Aluminum Cast-In Heater Electroless Nickel-Plated for Sterilizing Dental Instruments



Heater used on a Custom Rectangular Barrel for a Monofilament Line Extruder



System for Pre-Heating and Mixing Chemicals for Sand Cores

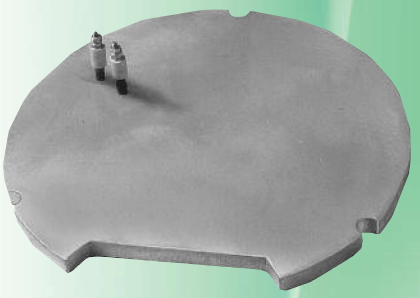


Valve and Flange Heater Used to Improve Viscous Material Flow

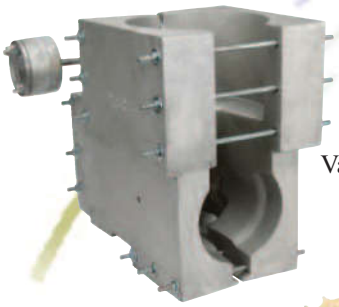
Cast-In Heaters – Complex Geometrics for Diversified Industries

Heating & Cooling Cylinder used in Lab Testing Equipment

Cast-In Heater Used to Decrease Viscosity in Glue Processing

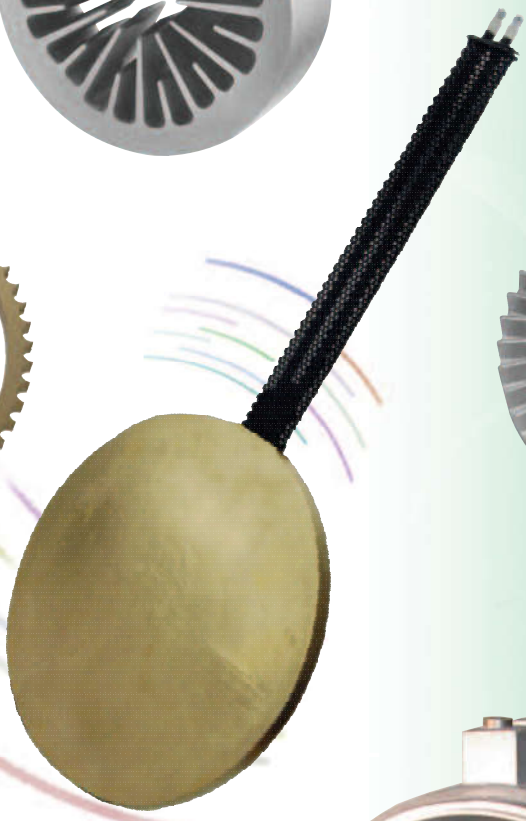


Waste Treatment Sanitation Equipment Heater



Manifold Valve Assembly

Bronze Cast-In Heater for Package Sealing Machine



Used as a Resistor for Thermal Dynamic Braking of Large Electric Motors

Cast-In Platen used for Heating a Custom Rectangular Extruder Barrel

Bronze Cast-In Heater for Pre-Heating Salt Baths

In-Line System for Pre-Heating Water to Induce Humidity in Baking Ovens

Bronze Cast-In Heater for a Laminating Press

ANOTHER Tempco ORIGINAL

Cast Aluminum Motor Housing and Base with Integral Liquid Cool Capabilities used for Medium to Large Horsepower Electric Motors

Can be made for any size motor.

Developed and Patented by Tempco

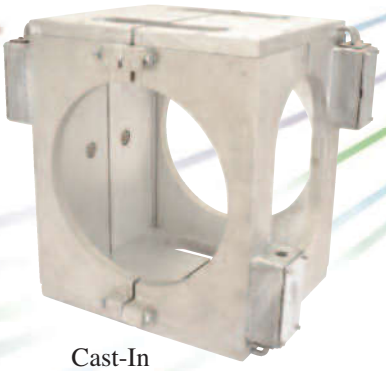
U.S. Patents: # 6222289 & #5939808

CONTINUED

Cast-In Heaters – Complex Geometrics for Diversified Industries

Continued from previous page...

Used in the Packaging Industry for Adhering Tax Stamps to Cigarette Packs



Cast-In Heater for Melt Pump

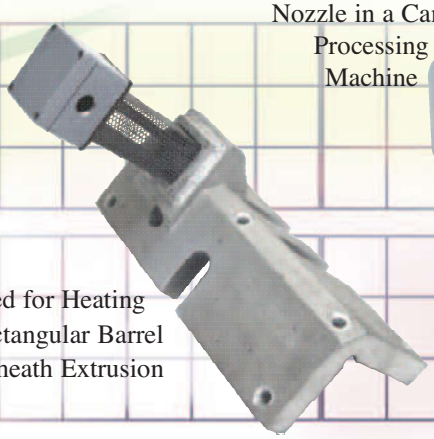
Brass Casting Used in Industrial Processing Machinery

Used in a Thermoforming Mold

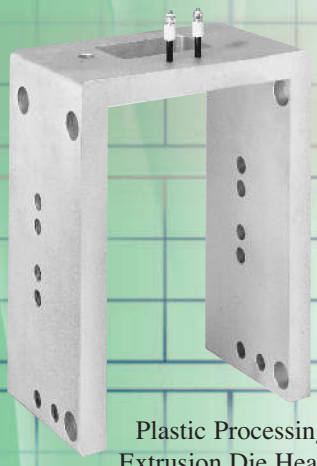
Bronze Electroless Nickel-Plated Cast-In Heater Used in Equipment that Tests Nuclear Hazardous Waste

Used as Part of a Feed Nozzle in a Candy Processing Machine

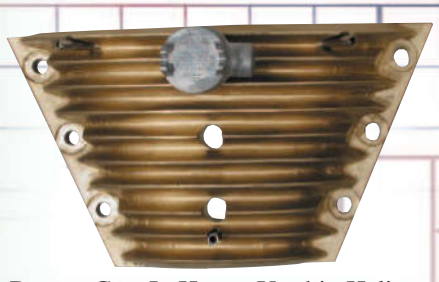
Bronze Cast-In heater used to maintain Hydraulic Oil Temperature



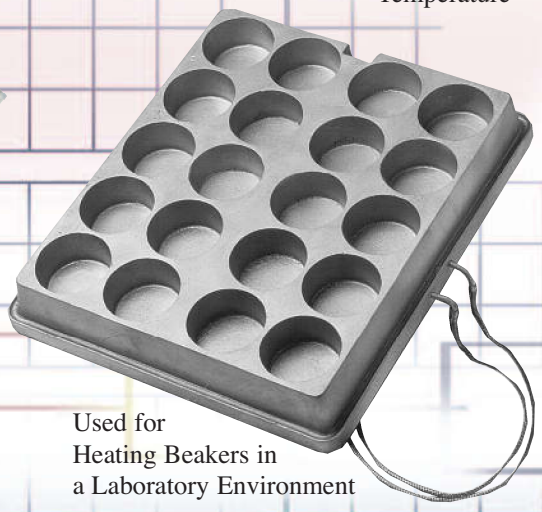
Used for Heating a Rectangular Barrel for Sheath Extrusion



Plastic Processing Extrusion Die Heater



Bronze Cast-In Heater Used in Helicone Mixture to Heat High Viscosity Material



Used for Heating Beakers in a Laboratory Environment

Additional Applications Where Tempco Cast-In Heaters Are Used

- Chemical Processing
- Extrusion Die Heaters
- Food Service Equipment
- Glue Pots
- Heat Sealing Equipment
- Heat Treating Equipment
- Hot Melt Dispensing Equipment
- Hot Stamping Machinery
- Laboratory Equipment
- Laminating Equipment
- Life Science Equipment
- Packaging Machinery
- Plastics Machinery
- Research and Development
- Silk-Screening Equipment
- Solvent Reclaim Equipment
- Steam Cleaning Equipment
- Textile Manufacturing
- Vacuum Forming

Note: The cast-in thermal components shown on pages 3-6 through 3-14 are merely a sampling of our capabilities.

Let the endless possibilities spark your imagination!

Put our knowledge and experience to work for you.

Challenge us! You will be glad you did.

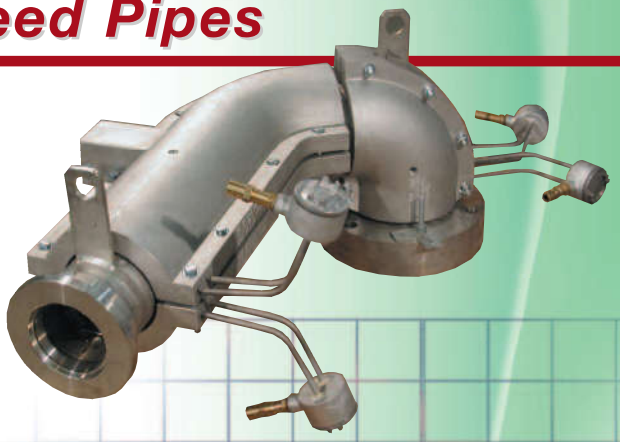
We Welcome Your Inquiries

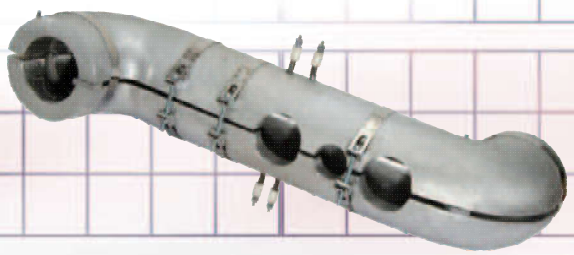
Cast-In Heaters for Transfer/Feed Pipes

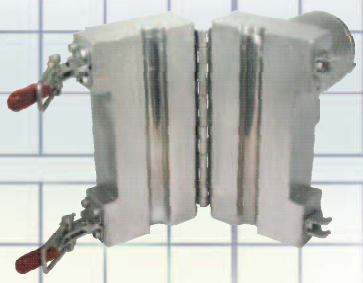
Tempco offers the perfect solution to heat Complex Transfer/Feed Pipes

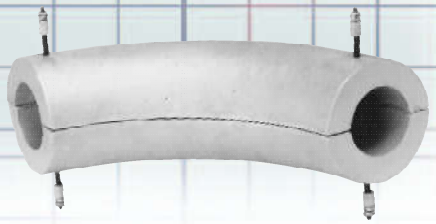
Transfer pipes used in large-scale extrusion lines are difficult to heat because of their irregular geometry. They are not machined cylinders so proper contact and heat transfer are difficult to achieve.

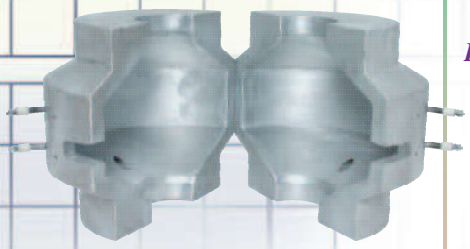
Consequently, a special Cast-In Heater must be engineered for each pipe to accommodate its individual characteristics. Typically, this entails the customer sending the pipe to Tempco and our Engineering staff designing a Cast-In Heater System that will optimally fit the pipe. The quality of the process will be improved because hot spots and/or unevenly heated surfaces can be eliminated. In some cases, we cast the heater directly onto the pipe.











Let Tempco's Creative Team of Professionals Tackle Your Next Cast-In Thermal Component Project. We Have the Technology, Infrastructure & Commitment to Exceed Our Customers' Expectations.

Special Cast-In Process for Unusual and Complex Applications

In the event that a cast-in heater cannot be made the conventional way for assembly into a machine part, Tempco has the expertise to directly attach a tubular heating element or a tube for cooling purposes to a customer supplied part.

By making a wood pattern with the required shape we can create a sand mold to encapsulate the entire assembly and pour the molten aluminum or bronze over the part.

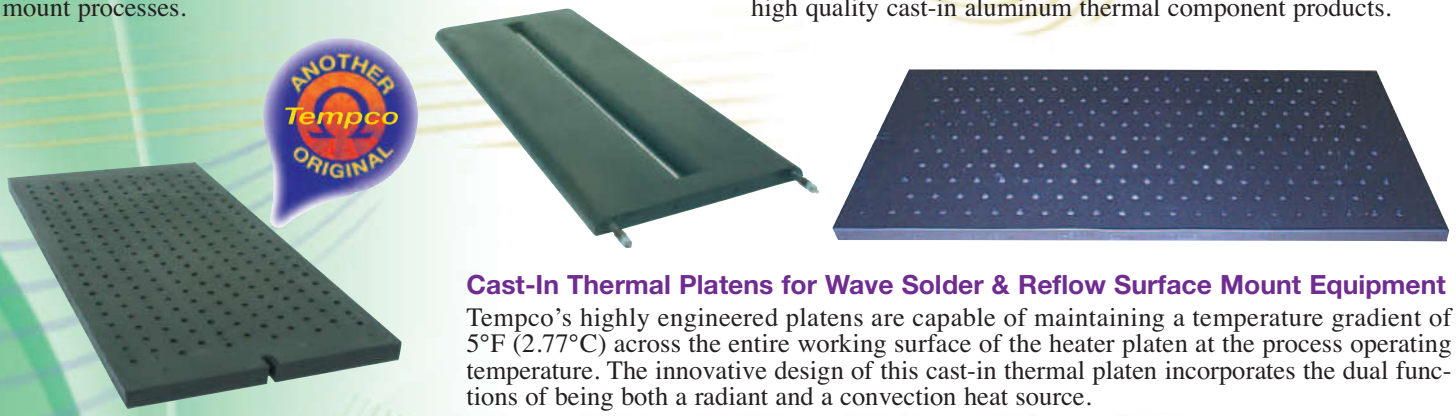
The sample depicted in this picture represents the typical process. In this case, a tubular heating element is attached to a steel roller and is then placed in a sand mold prior to casting. After casting, the roller OD is machined per customer specifications — in addition, the aluminum roller will be vulcanized with rubber. The finished heated roller will be used in a laminating web press.

Cast-In Heaters for Semiconductor Manufacturing

Cast-In Heaters for the Semiconductor Processing Industry

Tempco has been at the forefront of the industry, addressing the challenges of stringent operating parameters and high quality requirements faced by original equipment manufacturers specializing in the semiconductor, wave solder and reflow surface mount processes.

By employing state-of-the-art technologies and by utilizing our acquired knowledge as a company, we have met the challenges by offering and delivering excellence in the design, engineering and manufacturing of a complete selection of innovative, reliable and high quality cast-in aluminum thermal component products.



Cast-In Thermal Platens for Wave Solder & Reflow Surface Mount Equipment

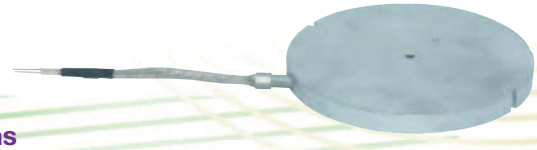
Tempco's highly engineered platens are capable of maintaining a temperature gradient of 5°F (2.77°C) across the entire working surface of the heater platen at the process operating temperature. The innovative design of this cast-in thermal platen incorporates the dual functions of being both a radiant and a convection heat source.

Cast-In Heaters for Wafer Processing

Tempo offers a complete selection of highly customized semi-conductor process heaters which include ***Pedestal Heaters, Pedestal Heaters with Integrated Cooling Capabilities, Bake Platen Heaters, High-Temperature Platen Heaters with Interference Press Fit Tubular or Cable Heating Elements***. For this type of platen heater construction the available base alloys are ***Aluminum, Brass or Bronze.***

In order to satisfy the stringent requirements of the industry, these products are manufactured under rigid quality control standards. Specific attention is directed to the heating element design and the casting processes.

Our metallurgical knowledge and foundry expertise are the catalyst for producing cast-in heaters with the precise heat profiles and temperature gradient required for the process. Tempco's state-of-the-art CNC machining capabilities will ensure that the working surface requirements of the part are precisely machined to customer requirements, including extremely flat surfaces, to within 0.0005 in (0.0127 mm) for optimizing the performance of the application.



Design Features & Options

- ***Casting Maximum Surface Temperature***
  Aluminum Alloy 319: 700°F (371°C)
  Aluminum Alloy 356: 750°F (399°C)
- ***Interference Press Fit Construction – maximum surface temperature depends on base alloy used***
- ***Surface Finish – Hard-Coat Anodized***
- ***Built-in Temperature Sensors***
- ***Selection of heating element and cooling tube terminations***

Note: **Cast-In heaters for semiconductor processing are made to customer specifications.** For technical assistance, engineering data and available options please refer to pages 3-4 and 3-5. When ordering, please provide detailed design drawings including dimensions, critical tolerances, watts, volts, and any other features or special requirements.

Please Consult Us With Your Requirements. We Welcome Your Inquiries.

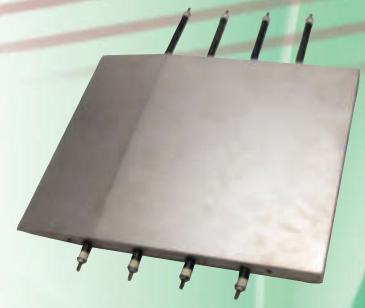
Cast-In Heaters for the Food Service Industry

Offering a Multitude of Eye-Opening Options

Tempco's cast-in heater products are an excellent choice to satisfy the food service industry's demanding requirements. Tempco demonstrates its value-added supplier capabilities with Food Service OEMs through our remarkable versatility and engineering expertise. Tempco offers the equipment manufacturers the option of manufacturing an existing design at a superior value, or evaluating the current heating design requirements and proposing a Cast-In Heater that offers great functionality, reliability and value.

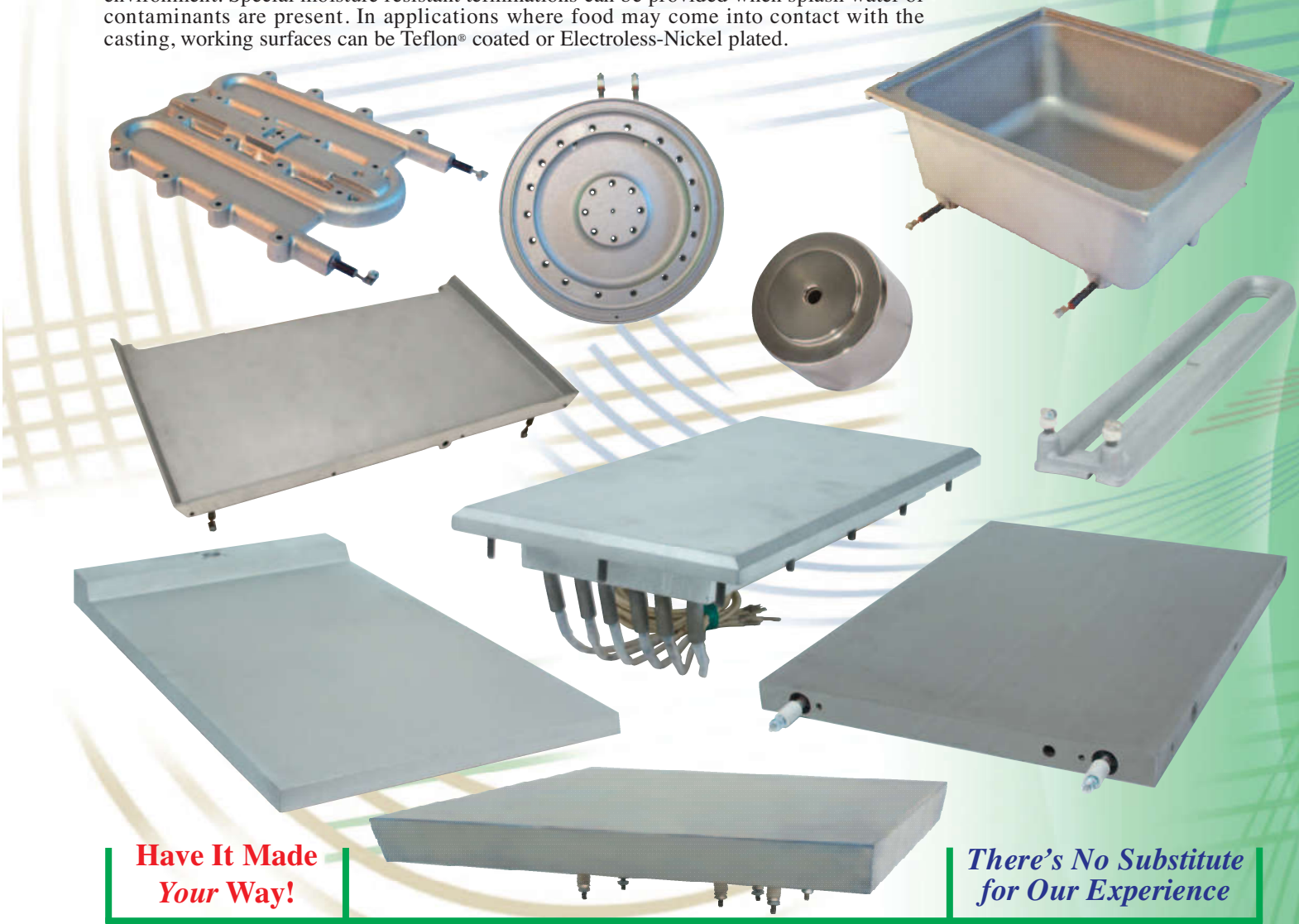
Exceptional Performance and Reliability for Use on Food Service Equipment

Equipment manufacturers must assure their customers in the food service equipment market that their product will be reliable and trouble-free. Tempco Cast-In Heaters are a sure step toward achieving this mandate. Cast-In Heaters assure long life and exceptional performance because of their unique design characteristics. They feature a tubular heating element cast into a highly thermal conductive aluminum alloy, yielding exceptional uniform heat profiles unattainable with strip heaters or tubular heating elements that are sometimes clamped to a working surface.



Special Features to Improve Functionality

Tempco excels by incorporating unique modifications to our Cast-In heaters designed to benefit the functionality of our customers' processes. Threaded studs are cast into the aluminum body to readily accommodate mounting in the equipment. Heaters featuring cast flanges with machined grooves and "O" Rings can be made to isolate the terminal area in a wash-down environment. Special moisture resistant terminations can be provided when splash water or contaminants are present. In applications where food may come into contact with the casting, working surfaces can be Teflon® coated or Electroless-Nickel plated.

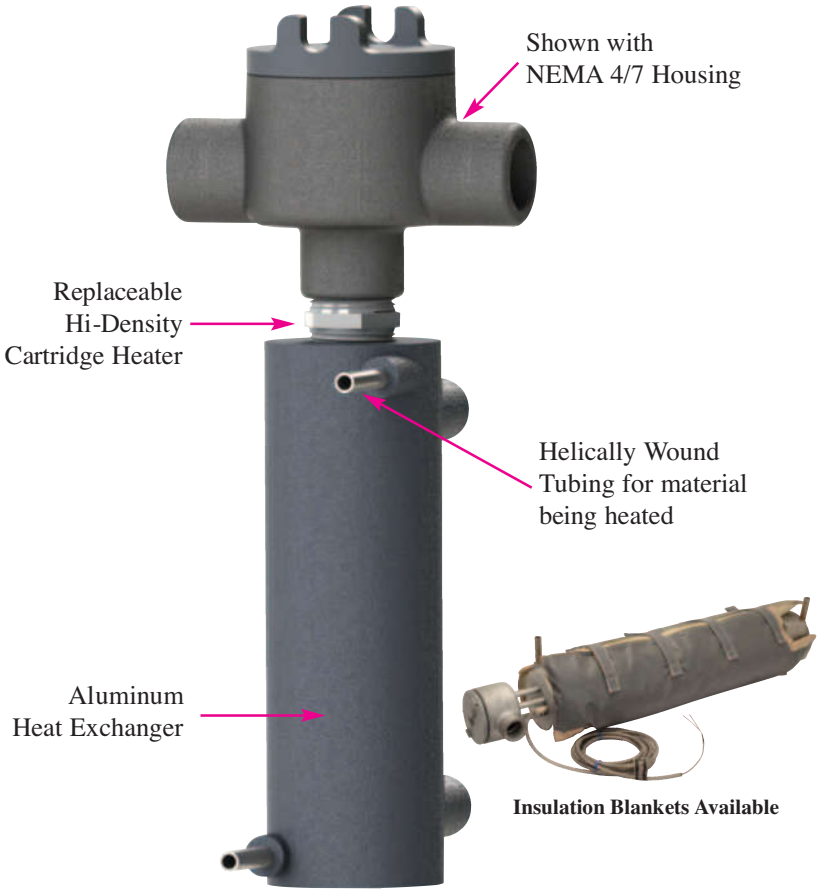


Have It Made *Your* Way!

There's No Substitute for Our Experience

Made in USA

CHX-100 Series Circulation Heater



Insulation Blankets Available

Standard Design Features

- *Seamless 316 SS Tubing for fluid flow*
- *Replaceable 5/8" diameter Hi-Density Cartridge Heater*
- *Cast Aluminum heat exchanger body*
- *Operating pressure up to 3000 PSI*
- *Operating temperature up to 350°F (177°C)*
- *NEMA 4/7 enclosure with standoff standard*

Optional Design Features

- *Process Thermocouple*
- *Overtemperature Thermocouple*
- *High Limit Thermostat*

Typical Applications

- *Solvent heating (MEK, NMP, ACT, EKC, others)*
- *Heating of Air, CO2, Nitrogen and similar gases*
- *Heating of non-flammable gases*
- *De-ionized water heating*
- *Steam generation*
- *Glycol heating*
- *Heating ink in printing*
- *Diesel and Fuel heating*
- *Packaging sterilization*
- *Analytical instrumentation*
- *Food and beverage heating*
- *Coating and Paint heating*

Construction

The CHX-100 circulation heater is a compact lightweight unit used for heating gases or liquids. The material being heated is pumped through the coiled seamless 316 SS tubing which has been cast into an aluminum body that acts as the heat exchanger. A replaceable Hi-Density cartridge set into a hole bored into the aluminum is the heat source. The material being heated never comes into contact with the HD cartridge heater.

Standard (Non-Stock) Sizes and Ratings

Heater Length (in)	Watts	Volts	Terminal Box Type	Tube Fitting Type	Thermocouple				Thermostat	Part Number
					Calibration Type	Style	Termination Type	Lead Length (in)		
6.5	300	120	Nema 4/7	—	J	Spring Adjustable	Std. Plug	60	—	CHX10010
6.5	300	208	—	—	—	—	—	—	Yes	CHX10070
6.5	300	240	Nema 4	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX10085
6.5	500	240	Nema 4	—	J	Spring Adjustable	Spade Lugs	48	—	CHX10135
6.5	500	208	Nema 4/7	—	—	—	—	—	Yes	CHX10148
6.5	750	208	—	—	J	Spring Adjustable	Spade Lugs	36	—	CHX10165
6.5	750	240	Nema 4	—	K	Armor Cable Adjustable	Std. Plug	60	—	CHX10182
12.5	900	240	Nema 4/7	HS	—	—	—	—	Yes	CHX10210
12.5	1000	240	Nema 4/7	—	K	Armor Cable Adjustable	Std. Plug	60	—	CHX10220
12.5	1200	240	Nema 4/7	HS	J	Spring Adjustable	Spade Lugs	36	—	CHX10235
12.5	1500	240	Nema 4/7	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX10242
12.5	1500	120	Nema 4/7	HS	K	Armor Cable Adjustable	Std. Plug	60	—	CHX10248

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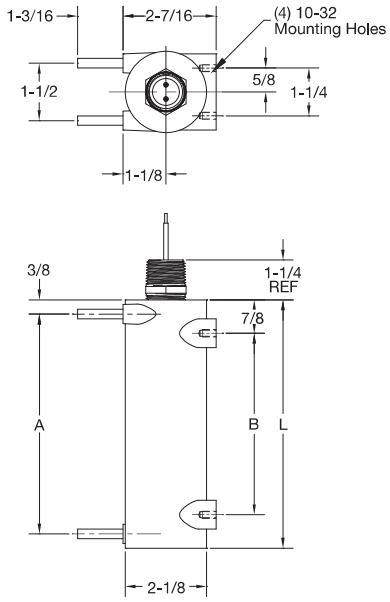
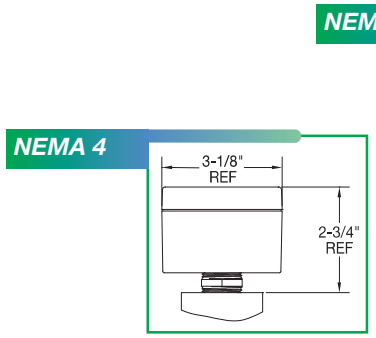
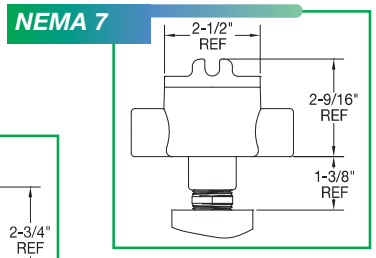
CHX-100 Series Circulation Heater







Ordering Information

To process your order or quotation, please specify the following information.

Length "L"	Inlet-to-Outlet Centerline "A"	Mounting Holes "B"	Flow Tube OD	Flow Tube Material	Used with Insulation Blanket
6.5	5.75	4.75	1/4	316 SS Seamless	BLK50001
12.5	11.75	10.75			BLK50002

Heater Specifications:

Dimensions — Length "L": ❒ 6.5" ❒ 12.5" ❒ Custom _____

Electrical Specifications — Watts _____ (3,000W Max.) Volts _____ (240V Max., Single Phase only)

Termination Type — ☑ Type CN – NPT Fitting with 10" Leads

Terminal Protection Box — ❒ NEMA 4 ❒ NEMA 7

Flow Tube Fittings — ❒ None ❒ "FF" Flared Seal Fitting ❒ "HS" Hi-Seal Fitting
(See page 3-52 for complete details.)

Optional Temperature Sensor Specifications:

Calibration — ❒ Type J ❒ Type K

Bayonet Style T/C — ❒ None ❒ "Style 1" Spring Adjustable ❒ "Style 2" Armor Cable Adjustable
(See page 14-3 for complete details.)

Termination — ❒ "Style B" 2-1/2" Split Leads ❒ "Style S" Spade Lugs ❒ "Style P" Standard Plug
(See page 14-9 for details.)

Length — ❒ 36" ❒ 48" ❒ 60" ❒ 72" ❒ 96" ❒ 120" ❒ 144"

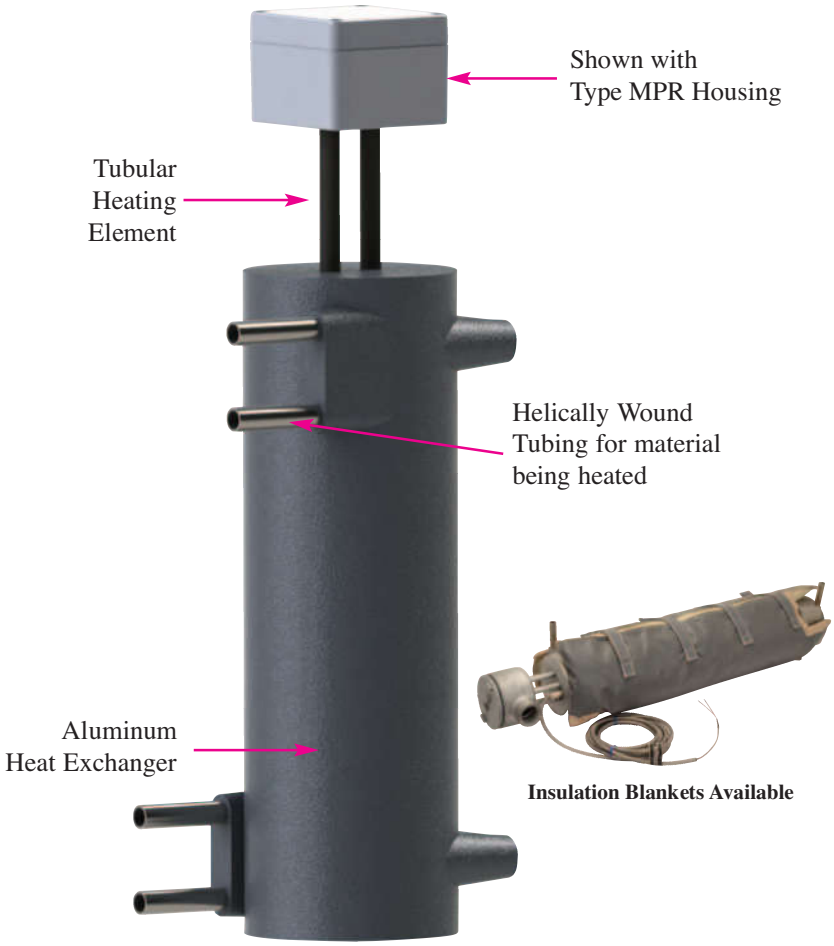
Optional Thermostat:

Thermostat — ❒ High Limit Manual Reset (Standard) ❒ High Limit Automatic Reset (Optional)
(See page 13-55 & 13-66 for details.)

Circulation Heaters

Made in USA

CHX-200 Series Circulation Heater



Insulation Blankets Available

Standard Design Features

- *Seamless 316 SS Tubing for fluid flow*
- *Cast-In Tubular Heater*
- *Cast Aluminum heat exchanger body*
- *Operating pressure up to 3000 PSI*
- *Operating temperature up to 392°F (200°C)*
- *Type C2 (General Purpose) housing with standoff*

Optional Design Features

- *Process Thermocouple*
- *Overtemperature Thermocouple*
- *Type MPR (Moisture Resistant) or Type EP (Explosion Resistant) Housings*

Typical Applications

- *Solvent heating (MEK, NMP, ACT, EKC, others)*
- *Heating of Air, CO2, Nitrogen and similar gases*
- *Heating of non-flammable gases*
- *De-ionized water heating*
- *Steam generation*
- *Glycol heating*
- *Heating ink in printing*
- *Diesel and Fuel heating*
- *Packaging sterilization*
- *Analytical instrumentation*
- *Food and beverage heating*
- *Coating and Paint heating*

Construction

The CHX-200 circulation heater is a compact lightweight unit used for heating gases or liquids. The material being heated is pumped through the coiled seamless 316 SS tubing which has been cast into an aluminum body that acts as the heat exchanger. A tubular heating element is the heat source. The material being heated never comes into contact with the heating element.

Standard (Non-Stock) Sizes and Ratings

Heater Length (in)	Watts	Volts	Phase	Termination Type	Terminal Box Type	Tube Config.	Tube Fitting Type	Thermocouple				T-Stat	Part Number
								Calibration Type	Style	Termination Type	Lead Length (in)		
13.5	1500	240	1	T7	Type EP	Single	—	J	Spring Adjustable	Std. Plug	48	—	CHX20015
13.5	1500	480	1	T7	—	Single	—	—	—	—	—	—	CHX20022
13.5	2250	240	1	T	Type C2	Single	—	K	Armor Cable Adjustable	Std. Plug	60	—	CHX20037
13.5	1500	208	1	T	Type C2	Single	—	J	Spring Adjustable	Spade Lugs	48	—	CHX20042
13.5	3000	240	1	T7	Type MPR	Single	—	—	—	—	—	—	CHX20065
19.5	3000	240	1	T7	—	Single	—	J	Spring Adjustable	Spade Lugs	60	—	CHX20072
19.5	3000	208	1	T	Type C2	Single	—	K	Armor Cable Adjustable	Std. Plug	48	Yes	CHX20084
19.5	4500	240	3	T7	Type MPR	Single	HS	—	—	—	—	—	CHX20086
19.5	3000	240	1	T	Type C2	Dual	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX20094
19.5	4500	240	1	T	Type C2	Single	HS	J	Spring Adjustable	Spade Lugs	60	Yes	CHX20098
25.5	6000	480	1	T7	Type MPR	Dual	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX20105
25.5	7500	480	1	T7	Type MPR	Single	HS	K	Armor Cable Adjustable	Std. Plug	60	—	CHX20112
25.5	9000	240	3	T7	Type EP	Dual	—	K	Armor Cable Adjustable	Std. Plug	60	—	CHX20118
25.5	12000	240	3	T7	Type EP	Dual	—	K	Spring Adjustable	Std. Plug	60	—	CHX20122
25.5	12000	480	3	T7	Type EP	Single	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX20132

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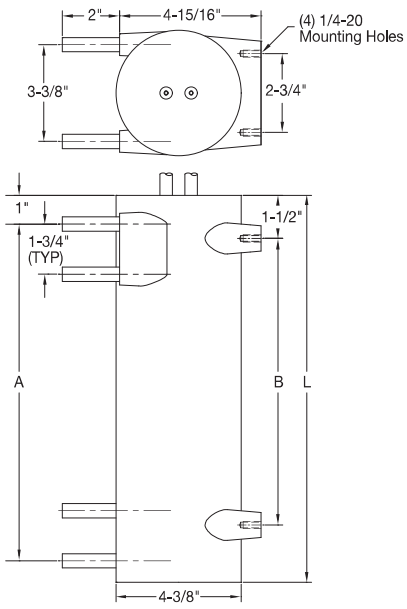
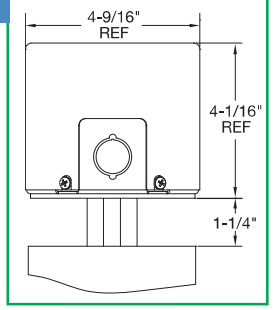
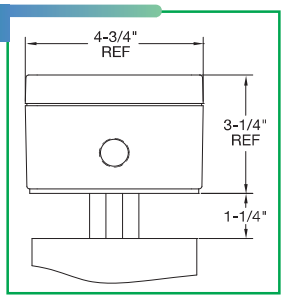
CHX-200 Series Circulation Heater



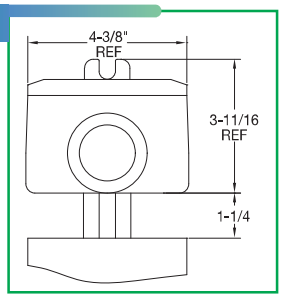
Type C2



Type MPR



Type EP



Length "L"	Inlet-to-Outlet Centerline "A"	Mounting Holes "B"	Flow Tube OD	Flow Tube Material	Used with Insulation Blanket
13.5	11.75	10	1/2	316 SS Seamless	BLK50003
19.5	17.75	16			BLK50004
25.5	23.75	22			BLK50005

Ordering Information

To process your order or quotation, please specify the following information.

Heater Specifications:

Dimensions — Length "L": ❒ 13.5" ❒ 19.5" ❒ 25.5" ❒ Custom _____

Electrical Specifications — Watts _____ (12,000W Max.) Volts _____ (480V Max.)
❒ Single-Phase ❒ Three-Phase

Termination Type — ❒ Type "T" ❒ Type "T7" (See page 3-54 for details.)

Terminal Protection Box — ❒ Type C2 ❒ Type MPR ❒ Type EP (See pages 3-56 & 3-57 for details)

Flow Tube Configuration — ❒ Single ❒ Dual

Flow Tube Fittings — ❒ None ❒ "FF" Flared Seal Fitting ❒ "HS" Hi-Seal Fitting
(See page 3-52 for details.)

Optional Temperature Sensor Specifications:

Calibration — ❒ Type J ❒ Type K

Bayonet Style T/C — ❒ None ❒ "Style 1" Spring Adjustable ❒ "Style 2" Armor Cable Adjustable
(See page 14-3 for complete details.)

Termination — ❒ "Style B" 2-1/2" Split Leads ❒ "Style S" Spade Lugs ❒ "Style P" Standard Plug
(See page 14-9 for details.)

Length — ❒ 36" ❒ 48" ❒ 60" ❒ 72" ❒ 96" ❒ 120" ❒ 144"

Optional Thermostat:

Thermostat — ❒ SPST ❒ DPST
NOTE: DPST requires larger Type C2 enclosure. Specify when ordering.
(See page 13-63 for details.)

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Circulation Heaters

Made in USA

CHX-300 Series Circulation Heater

Insulation Blankets Available

Standard Design Features

- *Seamless 316 SS Tubing for fluid flow*
- *Cast-In Tubular Heater*
- *Cast Aluminum heat exchanger body*
- *Operating pressure up to 3000 PSI*
- *Operating temperature up to 392°F (200°C)*
- *Type C2 (General Purpose) housing with standoff*

Optional Design Features

- *Process Thermocouple*
- *Overtemperature Thermocouple*
- *Type MPR (Moisture Resistant) or Type EP (Explosion Resistant) Housings*

Typical Applications

- *Solvent heating (MEK, NMP, ACT, EKC, others)*
- *Heating of Air, CO2, Nitrogen and similar gases*
- *Heating of non-flammable gases*
- *De-ionized water heating*
- *Steam generation*
- *Glycol heating*
- *Heating ink in printing*
- *Diesel and Fuel heating*
- *Packaging sterilization*
- *Analytical instrumentation*
- *Food and beverage heating*
- *Coating and Paint heating*

Construction

The CHX-300 circulation heater is a compact lightweight unit used for heating gases or liquids. The material being heated is pumped through the coiled seamless 316 SS tubing which has been cast into an aluminum body that acts as the heat exchanger. A tubular heating element is the heat source. The material being heated never comes into contact with the heating element.

Standard (Non-Stock) Sizes and Ratings

Heater Length (in)	Watts	Volts	Phase	Termination Type	Terminal Box Type	Tube Config.	Tube Fitting Type	Thermocouple				T-Stat	Part Number
								Calibration Type	Style	Termination Type	Length (in)		
13.5	3000	240	1	T7	Type EP	Single	—	J	Spring Adjustable	Std. Plug	48	—	CHX30012
13.5	3000	480	1	T7	—	Single	—	—	—	—	—	—	CHX30016
13.5	4500	240	1	T	Type C2	Single	—	K	Armor Cable Adjustable	Std. Plug	36	—	CHX30022
13.5	3000	208	1	T	Type C2	Single	—	J	Spring Adjustable	Spade Lugs	48	—	CHX30028
13.5	4500	240	1	T7	Type MPR	Single	HS	—	—	—	—	Yes	CHX30036
19.5	6000	240	1	T7	—	Single	—	J	Armor Cable Adjustable	Spade Lugs	60	—	CHX30044
19.5	6000	480	1	T	Type C2	Dual	—	K	Spring Adjustable	Std. Plug	48	Yes	CHX30048
19.5	7500	240	3	T7	Type MPR	Single	HS	—	—	—	—	—	CHX30054
19.5	7500	480	3	T	Type C2	Dual	—	K	Armor Cable Adjustable	Std. Plug	60	—	CHX30056
19.5	9000	480	3	T	Type C2	Single	HS	J	Spring Adjustable	Spade Lugs	48	—	CHX30062
25.5	12000	480	3	T7	Type MPR	Dual	—	K	Armor Cable Adjustable	Std. Plug	36	—	CHX30068
25.5	12000	480	3	T7	Type MPR	Dual	HS	K	Spring Adjustable	Std. Plug	60	—	CHX30071
25.5	12000	240	3	T7	Type EP	Dual	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX30075
25.5	18000	240	3	T7	Type EP	Dual	—	K	Spring Adjustable	Std. Plug	60	—	CHX30078
25.5	18000	480	3	T7	Type EP	Dual	—	K	Armor Cable Adjustable	Std. Plug	48	—	CHX30084

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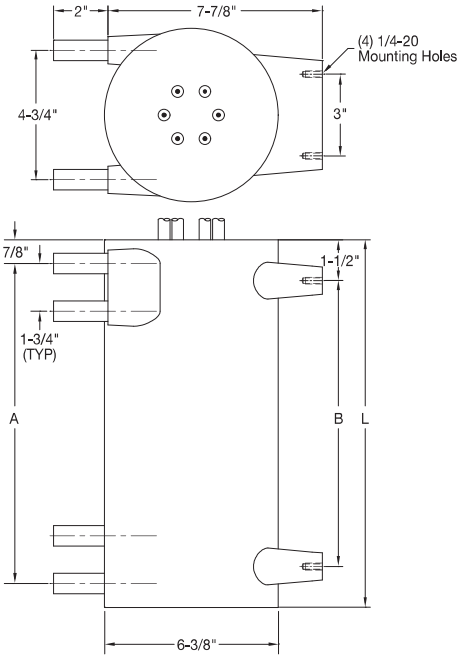
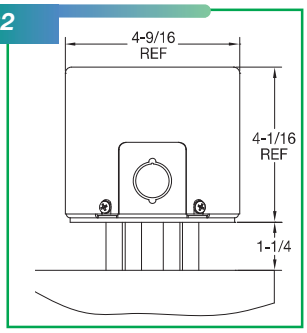
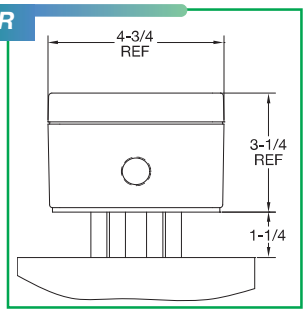
CHX-300 Series Circulation Heater



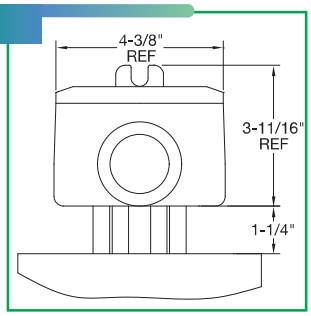
Type C2



Type MPR



Type EP



Length "L"	Inlet-to-Outlet Centerline "A"	Mounting Holes "B"	Flow Tube OD	Flow Tube Material	Used with Insulation Blanket
13.5	11.75	10	3/4	316 SS Seamless	BLK50006
19.5	17.75	16			BLK50007
25.5	23.75	22			BLK50008

Ordering Information

To process your order or quotation, please specify the following information.

Heater Specifications:

Dimensions — Length "L": ❒ 13.5" ❒ 19.5" ❒ 25.5" ❒ Custom _____

Electrical Specifications — Watts _____ (30,000W Max.) Volts _____ (480V Max.)
❒ Single-Phase ❒ Three-Phase

Termination Type — ❒ Type "T" ❒ Type "T7" (See page 3-54 for details.)

Terminal Protection Box — ❒ Type C2 ❒ Type MPR ❒ Type EP (See pages 3-56 & 3-57 for details)

Flow Tube Configuration — ❒ Single ❒ Dual

Flow Tube Fittings — ❒ None ❒ "FF" Flared Seal Fitting ❒ "HS" Hi-Seal Fitting (See page 3-52 for details.)

Optional Temperature Sensor Specifications:

Calibration — ❒ Type J ❒ Type K

Bayonet Style T/C — ❒ None ❒ "Style 1" Spring Adjustable ❒ "Style 2" Armor Cable Adjustable
(See page 14-3 for complete details.)

Termination — ❒ "Style B" 2-1/2" Split Leads ❒ "Style S" Spade Lugs ❒ "Style P" Standard Plug
(See page 14-9 for details.)

Length — ❒ 36" ❒ 48" ❒ 60" ❒ 72" ❒ 96" ❒ 120" ❒ 144"

Optional Thermostat:

Thermostat — ❒ SPST ❒ DPST
NOTE: DPST requires larger Type C2 enclosure. Specify when ordering.
(See page 13-63 for details.)

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Cast-In Heaters – Large Thermo-Platens

Engineered Solutions With Advanced Technology in Cast-In Thermo-Platens

Tempco specializes in innovative engineering and manufacturing of thermal components. Coupled with our diverse foundry and machine shop capabilities, this expertise provides the know-how behind our product line offering of large electrically heated platens that are manufactured by using our cast-in heater technology.

This casting process incorporates the heat source (tubular heating element) as an integral component of the platen. This process provides a more cost-effective and reliable approach than drilling holes for cartridge heaters or clamping inefficient and cumbersome-to-use strip heaters to the back surface of a platen.

Tempco's thermo-platens are made from aluminum, bronze and brass alloys. These materials provide excellent thermal conductivity for rapid heat transfer with uniform temperature gradients. To further enhance heat profiles, the formation and the location of the tubular heaters within the casting are precisely engineered using the latest computer design techniques.

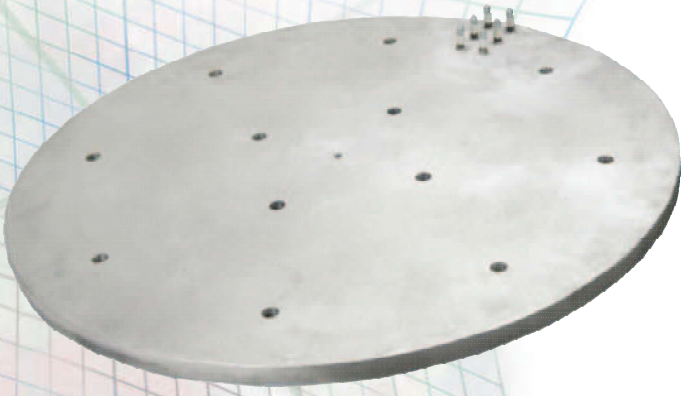
When the process requires heating and cooling cycles, thermo-platens can be manufactured with the addition of stainless steel tubing to provide liquid cooling capabilities.

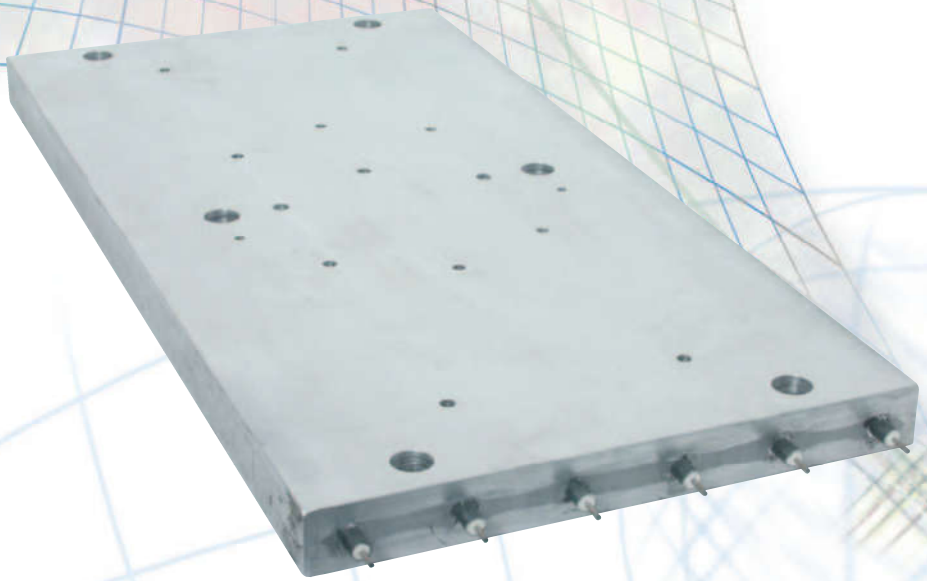
The working surfaces and/or contours of the thermo-platen can be machined to your specifications up to and including blanchard ground for extremely flat surface requirements.

Our capabilities for manufacturing large thermo-platens offer you the freedom to think big in your design requirements.

We offer complete engineering services and support, working with you every step of the way from prototype to production to ensure customer satisfaction.

There is no substitute for our acquired knowledge.

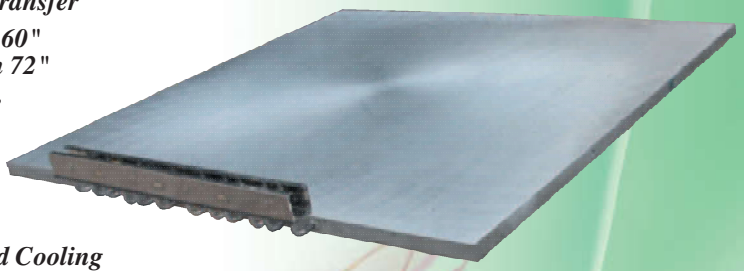




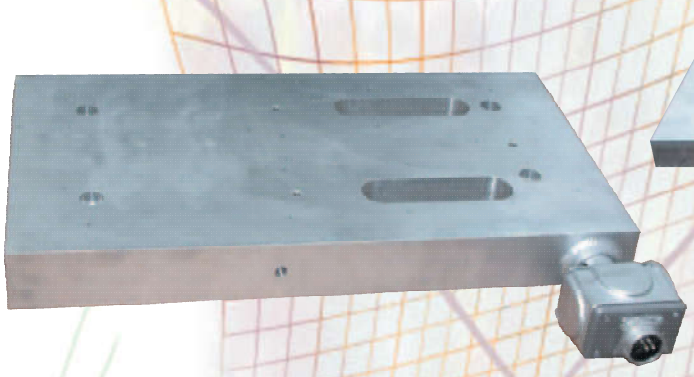
Cast-In Heaters – Large Thermo-Platens

Design Features & Options

- *Castings:*
  - *Aluminum up to 600 lbs.*
  - *Bronze & Brass up to 300 lbs. (Recommended for high operating pressures and temperatures)*
- *Exceptionally Long Operating Life*
- *Single- or Three-Phase Circuit*
- *Surface Finishes: Electroless Nickel-Plated, Teflon®, Hard-Coat Anodizing, Magnaplate*
- *Thermowells for Temperature Sensors*
- *Excellent Heat Transfer*
- *Maximum width 60" Maximum length 72"*
- *Uniform Surface Temperatures*
- *Machined to Customer Specifications*
- *Heating & Liquid Cooling Functions*
- *Various Heater & Cooling Tube Terminations*



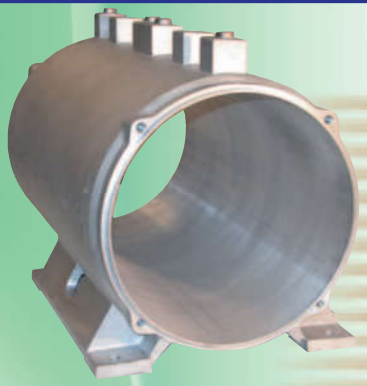
Note: **Cast-In Thermo-Platens are made to customer specifications.** For technical assistance, engineering data and available options please refer to pages 3-4 & 3-5. When ordering please provide detailed design drawings, including dimensions, critical tolerances, electrical ratings, watts, volts, single- or three-phase, and any other feature or special requirements.



When Your Needs Call for LARGER Than BIG Cast-In Thermal Platens & You Need Them NOW – Look No Further Than Tempco!

We Can Do It – We Have the Technology!

Cast-In Thermal Components – Liquid Cool



Cast Aluminum Motor Housing & Base with Integral Liquid Cool Capabilities
U.S. Patents: # 6222289 & #5939808

Engineered Solutions With State-Of-The-Art Technology in Liquid Cool Aluminum Cast-In Thermal Components

You can count on Tempco to continue our tradition of leadership by providing cutting edge solutions as we address the needs and challenges of specialized segments of industries that depend on cooling for the operating efficiency and performance of their equipment.

As a result of market demand for such products, Tempco introduces our capabilities of producing a complete selection of made-to-order liquid cool aluminum cast-in thermal components, available in both complex geometrics or simple platens.

The thermodynamic relationship between the liquid heat transfer media circulating through the precisely formed and configured stainless steel cooling tube and the aluminum alloy casting maximizes heat removal efficiency. Tempco's liquid cool cast-in thermal component technology is a novel approach to clean, efficient and reliable process cooling of difficult and complex applications.

Consult Tempco with your challenging applications. Our capabilities for manufacturing these complex liquid cool thermal components offer you the advantage to think outside the box. Let the endless possibilities spark your imagination, allowing you the freedom to customize your design.

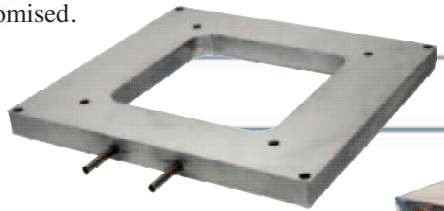
Let Tempco's Creative Team of Professionals Tackle Your Next Cast-In Liquid Cool Thermal Component Project. We Have the Technology, Infrastructure & Commitment to Exceed Our Customers' Expectations.

Thermo-Platens for Liquid Cooling of High Density Electronic Systems & Other Applications Requiring Flat Surface Cooling

In a world of compact designs with increased power densities, more heat is being generated than can be properly dissipated by conventional air blowers. For applications that have high-watt densities such as lasers, high-powered electronics, telecommunications, and semiconductor processing, liquid-cooled cold plates are the ideal high-performance heat transfer solution.

Mounting the components on an aluminum platen with internal liquid cooling tubes replaces forced air cooling to achieve and maintain lower electronic cabinet temperatures, thus increasing the operating service life of the individual components and the system.

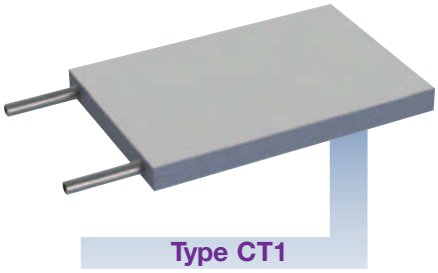
When drilling and/or tapping is required for the cold plate application, Tempco will perform the machining to ensure that the product's integrity is not compromised.



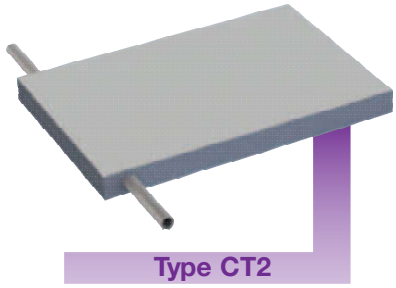
Now You Can Give Your Electronics a Chill!

Thermo-Platen Specifications

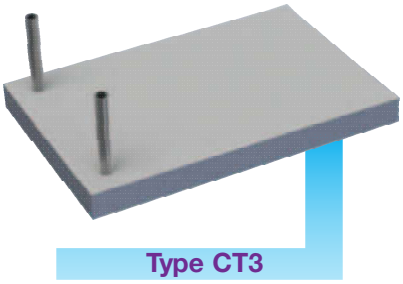
Typical Cooling Tube Exit Locations For Cast-In Thermo-Platens



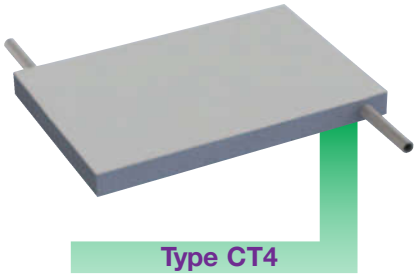
Cooling tubes exiting through the thickness toward the ends of the width or length.



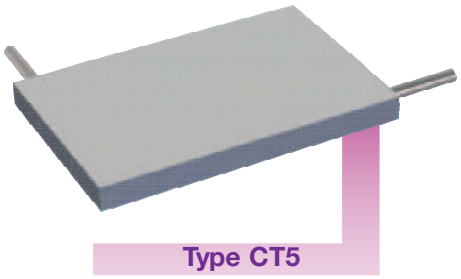
Cooling tubes exiting through the thickness opposite of each other toward the ends of the width or length.



Cooling tubes exiting at the ends of the width or length through the top surface.



Cooling tubes exiting through the thickness at opposite ends of each other toward the ends of the width or length.



Cooling tubes exiting through the thickness at opposite ends of each other with one in the width and one in the length.

Complex Geometrics

Note: Cooling Tube Exit Locations for Complex Geometric Liquid Cool Thermal Components can be at any practical location for the shape and size of the individual thermal component.

For Cooling Tube Termination Optional Fittings and Accessories See pages 3-52 and 3-53.

Standard Cooling Tube Fittings For Cast-In Thermo-Platens

Type FF Flared Seal Fittings

Brass flared seal fittings are well adapted for low to medium pressure and resistant to mechanical pullout. Available for 3/8" and 1/2" diameter tubing with SAE 45° flare.

Diameter Tubing	Thread	Part Number
3/8"	5/8"-18	FTG-124-101
1/2"	3/4"-16	FTG-124-104

Type HS Hi-Seal Fittings

Hi-seal brass fittings are highly dependable under the most adverse conditions. For reliable and trouble-free service with ease of installation, we strongly recommend hi-seal fittings. Available for 3/8" and 1/2" diameter tubing. Male thread is 1/2" NPT for 1/2" tube and 3/8" tube.

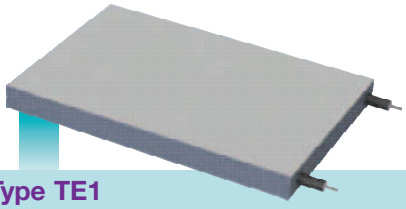
Diameter Tubing	Part Number
3/8"	FTG-118-124
1/2"	FTG-118-116

CONTINUED

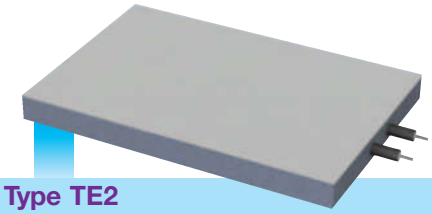
Continued from previous page...

Thermo-Platen Specifications

Typical Tubular Heating Element Exit Locations

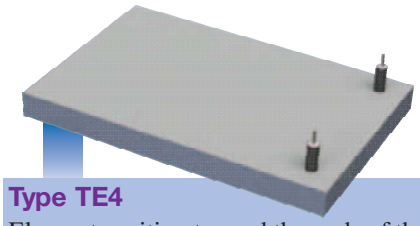


Type TE1
Elements exiting through the thickness toward the ends of the width or length.

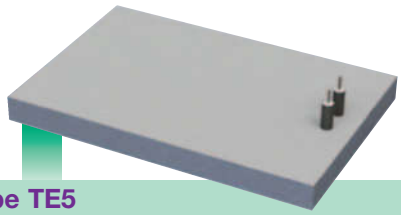


Type TE2
Elements exiting through the thickness toward the center of the width or length.

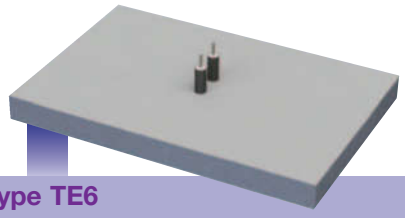
Type TE3
Elements exiting through the thickness & recessed to protect the screw terminals from mechanical damage. Can be located toward the end or center.



Type TE4
Elements exiting toward the ends of the width or length through the top surface.



Type TE5
Elements exiting at the end & toward the center of the width or length through the top surface.

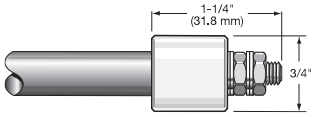


Type TE6
Elements exiting toward the center of the length & width & through the top surface.

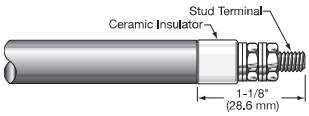
Most common thermo-platen terminations listed below; for additional terminations and complete details, see pages 3-54 and 3-55.

Standard Tubular Heater Terminations for Thermo-Platens

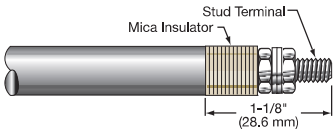
Type S – Heavy Duty Ceramic Insulators (Standard Unless Otherwise Specified)



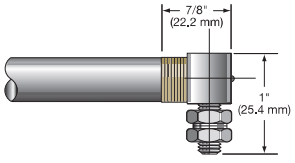
Type T7– Ceramic Insulator: same diameter as heating element



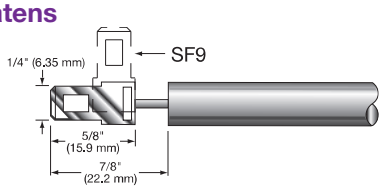
Type T – Mica Insulator: same diameter as heating element



Type R – Mica Washers with 90° Blockhead Screw Terminal



Type SF & SF9 – Quick-disconnect Spade Tabs

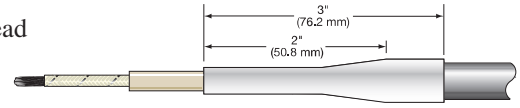


Type F – Flexible Leads with Fiberglass Sleeve

Type R1 – Flexible Stainless Steel Armor Cable

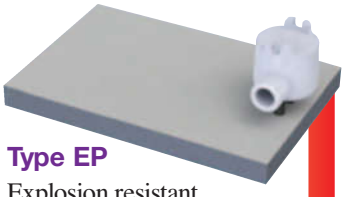
Type R1A – Stainless Steel Wire Overbraid

Type TS – Flexible Lead with Shrink-Down Teflon® Sleeve

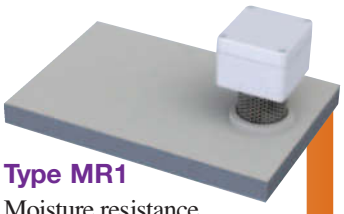


Typical Terminal Box Options and Locations

Type C2
Sheet metal terminal box w/ standard 1/2" knockouts or optional 5/8" or 7/8" knockouts.



Type EP
Explosion resistant and/or moisture resistant box.



Type MR1
Moisture resistance box with perforated shield.

Type P2
Quick-disconnect cup assembly in a sheet metal box. Rated 250 Volt max., 16 Amp max.

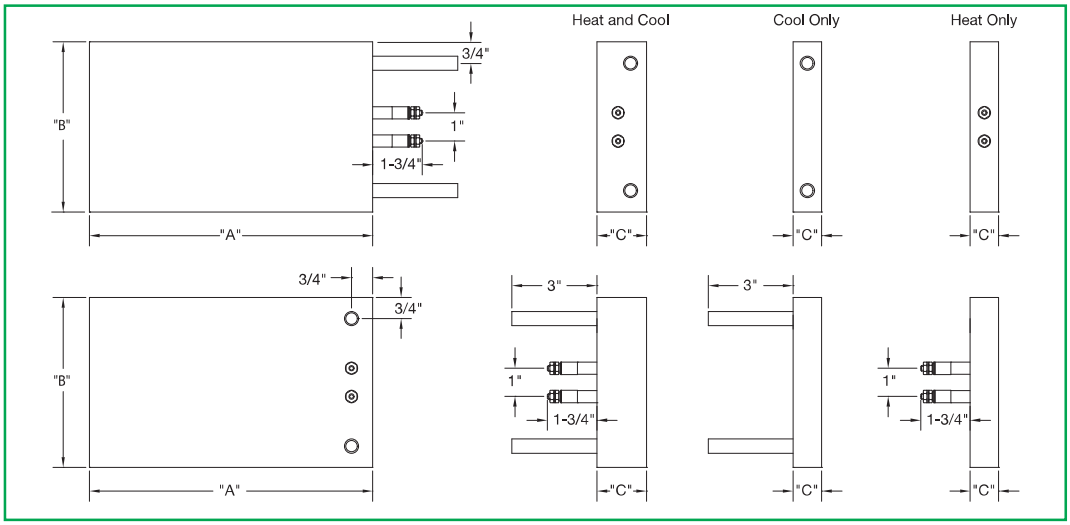
Thermo-Platen Quote Request Form

Ordering Information

To process your order or quotation, please specify the following information.

Note: **Cast-In Thermo-Platens are made to customer specifications.** For technical assistance and engineering data, please refer to pages 3-4 & 3-5.

For available options, please refer to pages 3-21 & 3-22.
When ordering, please provide detailed drawings including dimensions, critical tolerances and any other feature or special requirements.



Thermo-Platen Type ❒ Heat Only ❒ Cool Only ❒ Heat and Cool

Dimensions Length "A"_____ Width "B"_____ Thickness "C"_____

Material Specifications ❒ Aluminum ❒ Bronze ❒ Brass

Electrical Specifications Watts each element _____ Volts each element _____ Phase _____

Element Exit Location
❒ "TE1" ❒ "TE2" ❒ "TE3" ❒ "TE4" ❒ "TE5" ❒ "TE6" (see page 3-22)
❒ Other, Specify _____ (provide detailed drawing)

Termination Style
❒ "S" Post Terminals ❒ "T7" Post Terminals ❒ "T" Post Terminals
❒ "R" 90° Blockhead ❒ "SF" Quick-disconnect Spade Tab
❒ "SF9" 90° Quick-disconnect Spade Tab ❒ "F" Plain Leads
❒ "R1" Armor Cable Leads ❒ "R1A" SS Wire Overbraid ❒ "TS" Leads and Shrink Sleeve
❒ "P1" Quick-Disconnect Cup assembly ❒ Other, Specify _____ (See page 3-22)

Terminal Protection Box
❒ None ❒ "C2" Standard ❒ "EP" Explosion Resistant ❒ "MR1" Moisture Resistant
❒ "P2" Quick-Disconnect Cup assembly

Cooling Tube Exit Locations ❒ Type CT1 ❒ Type CT2 ❒ Type CT3 ❒ Type CT4 ❒ Type CT5
(See page 3-21 for details)

Cooling Tube Specifications
❒ 1/4" O.D. SS ❒ 3/8" O.D. SS ❒ 1/2" O.D. SS
❒ 3/8" O.D. Incoloy® ❒ 1/2" O.D. Incoloy® ❒ Dual Cooling Tubes
❒ Standard Wall Thickness ❒ Other Wall Thickness, Specify _____
(See page 3-5 for Standard Wall Thickness Information)

Cooling Tube Fittings
❒ "FF" Flared Seal ❒ "HS" Hi-Seal Fittings
❒ Other, Specify _____ (See page 3-52)

Surface Finish Machined or As-Cast. ***Indicate surfaces to be machined.***

Special Cast-In Features Holes, Cutouts, Slots, Bevels, Mounting Studs, Stand-Offs and Taper Angles.
For special features, a detailed drawing is required.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

TEMPCO Offers the Largest Selection of Quality Cast-In Heaters for Plastics Processing

Over *15,000* Existing Designs on File and Growing

Single Source Advantage – From Beginning to End

Tempco has set industry standards as the leading manufacturer of Aluminum, Brass and Bronze Cast-In Heaters in a variety of standard designs and styles for the plastics processing industry.

However, we realize not every Cast-In Heater application can be solved by one of our standard products. Our solutions help our customers and create new opportunities for Tempco. It is our engineering talents and vast application knowledge that provide a winning combination for solving specific application problems with custom designed and manufactured Cast-In Heaters.

The design, engineering and manufacturing of Tempco Cast-In Heaters is done under one roof—administered by a team of experienced professionals with a vast knowledge in product design and proven foundry expertise, producing the best quality Cast-In Heaters money can buy.

Computer Designed Tubular Heaters manufactured under our rigid quality control standards are the heat source for the Cast-In Heater. They can be formed into endless configurations to accommodate any practical Cast-In Heater shape.

Wood Pattern Shop A full-service in-house wood pattern shop builds, modifies and maintains patterns.

Foundry Capabilities Tempco's modern foundry produces Low Pressure Permanent Mold, Tilt Pour Permanent Mold, and No-Bake Mold Sand Castings. Our team of professionals with years of practical experience provides the knowledge essential for producing quality cast-in heaters for the plastics processing industry.

Tempco's Exclusive Cool TO-THE Touch™ Heating & Air Cooling Shroud Systems for Extrusion Processing Can be found on pages 3-26 through 3-32

Cast-In Heaters are produced in-house by a team of experts for unparalleled quality!

SATISFACTION GUARANTEED!

Consult us with your requirements. No one can do it better than Tempco — Let us prove it!

Plastics Extrusion Processing

Our Cast-In Band Heaters have proven to be the most effective method for heating and cooling the barrels of extruders used in the plastics processing industry.

Tempco offers Cast-In Band Heaters with liquid or air cooling. Liquid cooling incorporates tubing cast in as part of the heater assembly, allowing water or heat transfer solutions to remove excess heat. Air cooling uses fins cast to the Outer Diameter surface of the band heater; blowers and specially designed shrouds aid in heat removal.

Aluminum is the predominant alloy used for the Cast-In Heater. Copper-based alloys (Bronze and Brass) are used when the required operating temperatures exceed the maximum for Aluminum. Bronze or Brass are recommended for heated platens in molding presses as they can withstand a greater force of pressure per square inch than Aluminum.

Typical Plastics Processing Applications For Tempco's Cast-In Heaters

- *Extruders*
- *Blow Molding*
- *Injection Molding*
- *Extrusion Die Heads*
- *Silk-Screening*
- *Laminating Equipment*
- *Heat Sealers*
- *Vacuum Forming*
- *Compression Molding*
- *Polymer Compounding*

When your needs call for Cast-In Heaters for Plastics Processing & you need them NOW!
Look no further than Tempco – we have an extensive inventory.
Custom manufactured with the best lead times in the Industry!

Experience Our Value-Added Services that are Second to None

Minimum Casting Thickness vs. Heating Element and/or Cooling Tube Diameters

Casting Thickness	Maximum Available Element Diameter Heat Only	Maximum Available Cooling Tube Diameter Cool Only	Maximum Element and Cooling Tube Combination Heat and Cool
5/8" (15.9 mm)	.260	1/4	—
3/4" (19.1 mm)	.375	3/8	—
1" (25.4 mm)	.430	1/2	—
1-1/4" (31.8 mm)	.430	1/2	.260 and 3/8
1-3/8" (34.9 mm)	.430	1/2	.315 and 1/2
1-1/2" (38.1 mm)	.430	1/2	.430 and 1/2
1-5/8" (41.3 mm)	.430	1/2	.430 and 1/2
1-3/4" (44.5 mm)	.430	1/2	.430 and 1/2
Finned Casting			
3/4" (19.1 mm)	.375	—	—
7/8" (22.2 mm)	.430	—	—
1" (25.4 mm)	.430	—	—
1-3/4" (44.5 mm)	.430	—	—

Heating Element Electrical Specifications

Tubular Heater Diameter	.260"	.315"	.375"	.430"
Maximum Volts	240	277	480	600
Maximum Amps Per Element	15	30	40	40

Maximum Watt Density: Aluminum Alloy—35 W/in² on the element
Bronze or Brass—45 W/in² on the element

Resistance Tolerance: +10%, –5% **Wattage Tolerance:** +5%, –10%

Three Phase available depending on casting size.
Ground Studs can be added to most cast-ins.

Note: Tempco-Pak mineral insulated cable heaters can be used in place of tubular heating elements to fit physical constraints not possible with conventional heating elements. See catalog Section 5 for more details.

Maximum Alloy Surface Temperatures

Material	Max. Surface Temperature °F (°C)
Aluminum 319	700 (371)
Aluminum 356	750 (399)
Bronze	1350 (732)
Yellow Brass	1200 (649)

Casting Size & Weight Limitations

	Cylindrical	Platen
Minimum Inside Diameter:	1" (25.4 mm)	—
Maximum Inside Diameter:	48" (1219 mm)	—
Minimum Width:	—	1-1/2" (38.1 mm)
Maximum Width:	—	60" (1524 mm)
Minimum Length:	1-3/4" (44.5 mm)	4" (102 mm)
Maximum Length:	40" (1016 mm)	72" (1829 mm)
Finish:	125 RMS Standard or to customer spec.	

Gap (two-piece cylindrical cast-in band heaters)**:** 1/4" (6.4 mm) top and bottom or to customer specification

Maximum Weight: Aluminum— 600 pounds
Bronze & Brass— 300 pounds

NOTES: Cylindrical heaters are made with two half-round heaters. Cast-In thermal components can be made in any practical size, weight and geometric shape.

Cooling Tube Materials for Castings with Liquid Cooling

Tube Material	Tube OD and Wall Thickness
Stainless Steel (Standard)	1/4" O.D. × .028 wall
Stainless Steel (Standard)	3/8" O.D. × .035 wall
Stainless Steel (Standard)	1/2" O.D. × .049 wall
Stainless Steel (Optional)	5/8" O.D. × .049 wall
Incoloy® 840 (Optional)	1/2" O.D. × .049 wall
Tubing with heavier wall thickness is available upon request.	

CNC Machining

There are certain dimensional and/or finish tolerances or geometry that cannot be produced as cast and must be machined. Tempco offers a full service state-of-the-art machine shop featuring various types of CNC machine tools to perform all of the precision machining required—from simple to complex contour geometrics, including turning and/or boring, with repeatable accuracy from one machined casting to the next. Machinists also build and maintain permanent mold tooling for the low pressure and tilt-pour gravity feed casting processes.

Agency Approvals

Cast-In Heater Elements are UL recognized under UL File Number E90771 and CSA File 043099.
If you require UL Agency Approval, please specify when ordering.

Made in USA

Are You Operating Your Extruders with Liquid Cooling?

If You Answer Yes –

Then You Are SO Ready for a

TEMPCO

EXTREME MAKEOVER

A 4–Zone Cool TO-THE Touch Shroud System

With Our Exclusive

Cool TO-THE Touch™ Shroud Systems

Let Tempco's state-of-the-art technology convert your extruder's existing heating and cooling system from antiquated, inefficient and costly to modern, highly efficient, and cost-effective.

We invite you to energize your extrusion business with Cool TO-THE Touch. It can take your profits to the next level.

The Challenge

We understand that choosing to make a change can be challenging and full of "What-If's?" Not to worry – Tempco warranties the performance of our systems. Our expert team will be with you every step of the conversion to help you select the ideal system for your extrusion lines.

Cool TO-THE Touch is a fully integrated system that offers powerful functionality, user–friendly installation and operation, customizable features and other benefits you simply will not find in any existing extruder heating and cooling system.

These highly engineered products are designed for durability and trouble-free operating performance.

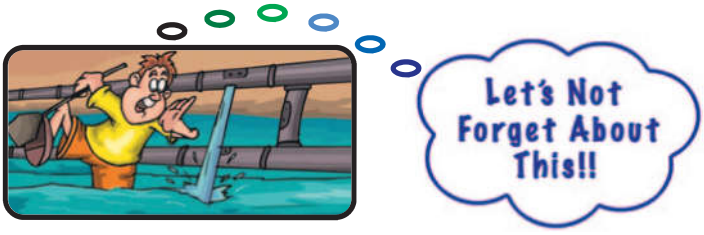
It can very well be the most important step you take when you purchase a new extruder or rebuild existing equipment.

Experience the benefits and advantages offered by upgrading to Cool TO-THE Touch Shroud Systems.

Take your extrusion operation to the next level of technology with Tempco at your side.

There is nothing to lose, except. . .

The entire closed loop recirculating system which includes: chiller, heat exchanger, heat transfer fluid, and all associated piping and electrical components.



Think about all the great changes ahead for your business – when you no longer have to babysit your unreliable, maintenance nightmare on your extruder heating and cooling system.

View Product Inventory @ www.tempco.com

It's a Reality – Extreme Makeover for Extruders Is Finally Here!

Take Advantage of It If You Are . . .

Purchasing a New Extruder

Specify to your machine builder to install one of Tempco's exclusive high-efficiency Cool TO-THE Touch heating and air cooling systems.

SMALL INVESTMENT

BIG RETURN

Retrofitting

Outdated air cooled systems can be retrofitted with Tempco's efficient air cooled shroud designs without replacing your existing heaters.

Add Value to Your Extrusion Process

Rebuilding

An outdated, high maintenance, low efficiency liquid cooled system can be rebuilt with one of Tempco's turnkey Cool TO-THE Touch heating and air cooling systems.

Improve Your Bottom Line

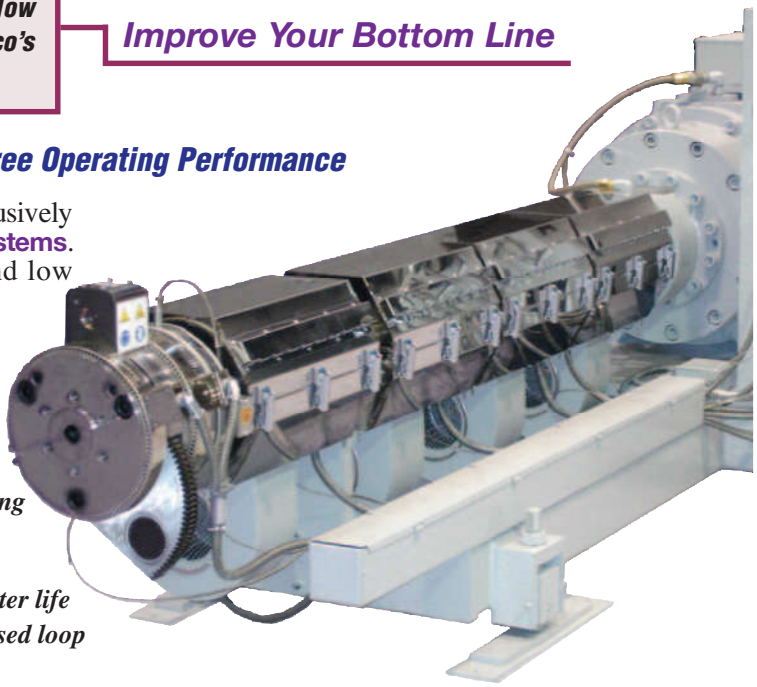
Designed for Durability and Trouble-Free Operating Performance

Tempco's Finned Cast-In Heaters with bolt clamping are exclusively designed to work with **Tempco's Cool TO-THE Touch Shroud Systems**. They are manufactured with special high-efficiency fins and low overall mass cross-section for maximizing thermodynamics.

Unmatched Quality Shroud System & Finned Cast-In Heater

Design Features

- *Reduced operating costs*
- *Quick, easy installation*
- *Greater Reliability*
- *Thermally efficient heating & cooling characteristics*
- *Reduces costly downtime*
- *Exceptional Cast-In Heater life*
- *Eliminates expensive closed loop liquid cooling systems*
- *Rugged, Durable & Appealing Design*



Liquid Cooling Cast-In Band Heaters vs. Cool TO-THE Touch Air Cooling Shroud Systems

Liquid Cooling

Up to now Liquid Cooling Cast-In Band Heaters have been the predominant method of controlling the melt temperature of extrusion barrels. Although effective in removing heat from the extrusion process, there are a number of drawbacks that are primarily maintenance related.

Extruders using liquid cooled Cast-In Heaters can be subject to unpredictable and untimely failures of the cooling tube assemblies, resulting in extremely costly downtime to the processor. Inherent maintenance problems include stress corrosion cracks, linear thermal expansion of the heater body, and clogging of the tubes due to accumulation of mineral deposits. Additionally, Liquid Cooled Cast-In Heaters require an expensive cooling tower or heat exchange system, extensive plumbing systems and labor for installation.

A Change Is In The Air

Tempco-designed air cooled systems have evolved considerably and become more thermally efficient as a result of geometric changes and implementation of sophisticated shrouding and air flow techniques. Optimized direction and ducting of airflow, coupled with selection of the proper blower CFM, are important to ensuring that the air cooling technique removes the proper amount of heat from the extrusion barrel. Air Cooled Cast-In Heaters are virtually maintenance free and therefore, when properly installed and applied, have the capability to far outlast and perform their liquid cooled counterparts.

Consult Tempco With Your Requirements. We Welcome Your Inquiries.

(800) 323-6859 • Email: sales@tempco.com

Made in USA

3 Turnkey State-Of-The-Art Systems to Improve Operating Efficiencies in Plastic Extrusion Equipment

Designed for Durability, Ease of Installation and Trouble-Free Service . . .

These highly engineered heating and cooling systems are an innovative concept in product design, offering a very efficient means to heat and cool the barrels of plastic extruders. They provide cooling efficiencies equal to or better than conventional liquid cooled cast-in aluminum band heaters.

These shroud designs are made with stainless steel sheet metal, cast aluminum construction.

These systems are self-contained and can be supplied as turnkey ready-to-go, requiring minimum labor and installation cost, and drastically reducing downtime and maintenance upkeep compared to conventional liquid cooling and heating cast-in band heaters.

Experience all the advantages offered by Tempco's exclusive Cool TO-THE Touch High-Efficiency shroud and aluminum finned cast-in band heater designed system.

The engineering of these two components is perfectly matched to work in tandem, offering thermally efficient heating and air cooling characteristics and eliminating the shortcomings of liquid cool cast-in aluminum band heaters

Improve Efficiencies in Extrusion Processing

Need Assistance Selecting a System? We Welcome Your Inquiries.

If you have a special application requiring a custom manufactured system or need assistance selecting one of our standard systems for a new or existing installation, consult Tempco with your requirements. We offer complete engineering services and support, working with you every step of the way to ensure customer satisfaction.

Selection Guide — Plastic Extruder Heating and Cooling Shroud Design Systems

	Shroud Style Construction	Recommended Heater Types	Barrel Diameter Range Min.	Barrel Diameter Range Max.	Zone Length Range Min.	Zone Length Range Max.
 1	**Cool TO-THE Touch™, Page 3-26** Inner Stainless Steel Solid Layer; Outer Stainless Steel Perforated Layer	Tempco Finned Cast Aluminum Heaters, Vented Ceramic Band or Maxiband Heaters	3" 76 mm	16" 406 mm	5" 127mm	36" 915 mm
 2	**Multi-Versal, Page 3-33** Single Stainless Steel Solid Layer	Tempco Finned Cast Aluminum Heaters, Vented Ceramic Band or Maxiband Heaters	3" 76 mm	16" 406 mm	3-3/4" 95 mm	36" 915 mm
 3	**Arctic Cast®, Page 3-37** Single Cast Aluminum Solid Layer	Tempco Finned Cast Aluminum Heaters	4" 102 mm	16" 406 mm	6-1/2" 165 mm	30-1/2" 775 mm

Cool TO-THE Touch Extruder Heat/Cool System

Tempco's Cool TO-THE Touch extruder heat/cool systems are custom engineered to provide optimal heating and cooling while providing personnel safety with a Cool Touch perforated outer layer. These systems are designed with finned cast-in heaters that optimize overall system efficiency.

The reflective inner layer of the shroud decreases the heat-up cycle, reducing energy consumption. The "maxi-flow" unrestricted blower port directs inlet air to the hottest part of the casting and distributes it evenly over the entire cross section of the zone.

1 – Cool TO-THE Touch Construction

Cool TO-THE Touch

Dual Layer Shroud with Inner Stainless Steel Solid Layer (thermally isolated from heater) and Outer, Cool to the Touch, Perforated Stainless Steel Layer for Maximum Venting and Heat Dissipation

Usage Requirements

The Cool TO-THE Touch Construction Style achieves best results when built for Tempco's High-Efficiency Finned Cast-In Heaters.

Cool TO-THE Touch shown with optional dual blowers mounted vertically with knockouts for heater termination(s) and top vertical air outlet

Cool TO-THE Touch Construction Details

Dual Layer Shroud

- *Inner Stainless Steel solid layer – radiation shield that directs the cooling air flow over the heater*
- *Outer Stainless Steel perforated layer – isolates hot surfaces from contact (cool touch)*

Shroud Assembly Features

- *Two Mounting Styles are available:*
  - *Hinge with Barrel Clamps – designed for ease of installation*
  - *Two Individual Halves with Barrel Clamps (Two-Piece) – used where installation space is tight or mounting is difficult*
- *Internal Support Straps or Support U-Bolt on blower mount half of shroud permits shroud to be opened for servicing without removing unit from barrel*
- *Anti-Rotate Tabs – used only with Finned Cast-In Heaters to prevent shroud from radial and axial movement around the barrel*
  - *Tabs are cast as part of the heater (may require a Terminal Box)*
- *Blower Options – See page 3-41 through 3-43 for Complete Details*
  - *Single or Dual Tempco Recommended Blowers available from 148 CFM up to 1210 CFM at 115V or 230V, or 480V 3-Phase*
  - *Customer Specified blower*
  - *Blower not required for Heat-Only Shrouds*
- *Blower Location*
  - *Horizontal or Vertical Orientation*
  - *Extension Housings Available*
- *Standard separate top Air Outlet*
- *Optional Air Outlet Features Include:*
  - *Air Outlet Shield deflects air flow out of shroud and shields shroud from external solid contamination*
  - *Air Outlet combined with Terminal Box*
  - *Alternate Radial Air Outlet locations available*
- *Air-Inlet Baffle Optional*
- *Vent Hole(s) Optional*

Heater Type and Components

- *Recommended Heater Types – Finned Cast-In Heaters with standard 1/4" gap between heater halves, Ceramic Band and Maxiband Heaters*
- *Power Input Terminal Box with 7/8" dia. K.O. for 1/2" conduit:*
  - *Standard 10-32 stud termination with ceramic or mica insulator*
  - *With Louvered Cover – used when terminal box is separate from air-outlet*
  - *Stainless Steel Screen – used when terminal box is combined with air outlet*
- *Power Input through Blower Mount – input wiring through knockouts in blower mount eliminates terminal box and facilitates ease of heater service*

Sensing and Controlling

- *Existing Zone Control Probe – Shroud System can be designed per customer specifications*
- *Tempco supplied Zone Control Probe*
- *Tempco customized Power Control Panel designed to complete Your Thermal Loop System*

Ordering Information

See Page 3-36 for complete Ordering Information.

Cool TO-THE Touch™ Shroud System

Made in USA

Existing Cool TO-THE Touch Extruder Heat/Cool Systems

Horizontal and Vertical Blower Motor Mount Design Specifications

The following partial listings are part numbers and specifications for shroud designs that Tempco has engineered and manufactured. Each item listed below can be modified to fit customer requirements. Zone Control Probes are placed per customer specifications. See page 3-29 for complete details.

Barrel OD (Shroud ID)	Shroud Width	Shroud OD (in)	Blower Location (in)	Air Outlet Location (°)	Terminal Box Location (°)	Blower CFM (°)	Maximum Heater OD	Heater Part Number (in)	Wattage Per Shroud	Heater Voltage	Ref. Drawing Number	Shroud Part Number
4.25	9.25	10.06	270	90	0	273	7.75	CBH14315	3000	240	7	ASJ00421
4.5	10.06	9.81	180	0	45	358	7.5	CBH14322	3600	230	2	ASJ00423
5	9	10.56	180	0	0	273	8.25	CBH13803	4000	240	1	ASJ00367
5	13	10.81	180	0	0	358	8.5	CBH13011	6000	230	1	ASJ00281
5	13	11.56	180	0	45	458	9.25	CBH05677	4000	230	2	ASJ00381
5	13.63	10.81	180	0	0	358	8.5	CBH13387	6600	230	1	ASJ00315
5	14	10.31	180	0	45	458	8	CBH14316	6000	230	2	ASJ00422
5	18	10.56	180	0	0	550	8.25	(2)CBH13803	8000	240	1	ASJ00366
5.12	12	10.94	270	0	0	358	8.63	CBH13659	5600	400	5	ASJ00350
5.5	18.5	11.81	180	0	90	N/A	9	CBH13012	7000	200-3PH	3	ASJ00279
6	10.5	11.81	270	90	90	550	9.5	CBH12250	4000	220	8	ASJ00238
6.25	13.63	11.56	180	0	0	485	9.25	CBH13664	6000	230	1	ASJ00346
6.25	15	11.56	180	0	0	550	9.25	CBH14306	8250	240	1	ASJ00417
6.38	8	12.19	270	90	0	273	9.88	CBH13572	4000	240	7	ASJ00333
6.38	16	12.19	270	90	0	358	9.88	CBH13573	7000	240	7	ASJ00332
6.5	11	12.81	180	0	90	265	9.75	CBH12061	4600	240	3	ASJ00223
6.5	15.63	12.06	180	0	0	550	9.75	CBH13388	10000	240	1	ASJ00316
6.5	18	11.81	270	0	0	550	9.5	N/A	N/A	N/A	5	ASJ00341
6.5	18	12.81	180	0	90	550	9.75	CBH12060	7600	240	3	ASJ00222
6.5	21	11.81	270	0	0	550	9.5	CBH14189	8800	230	5	ASJ00403
6.63	17.25	12.94	270	0	0	1200	10.38	CBH13936	8800	240	5	ASJ00378
6.63	17.5	12.19	270	0	0	550	9.88	CBH13659	7500	230	5	ASJ00344
6.64	17.63	12.45	270	0	0	550	10.14	CBH13806	8720	240	5	ASJ00371
7	19	13.06	270	90	90	1200	10.75	CBH14114	7200	480	8	ASJ00396
7	21.5	14.06	180	0	N/A	550	11.25	CBH12045	4700	480	4	ASJ00220
7.5	12	12.81	270	0	0	485	10.5	CBH13701	6500	240	5	ASJ00351
7.5	17.5	13.56	180	0	90	1200	10.75	CBH12000	7500	240	3	ASJ00213
7.5	18.5	12.69	270	0	0	550	10.38	CBH13852	9000	230-3PH	5	ASJ00372
7.5	18.5	13.31	270	0	0	1200	11	CBH14099	9000	575-3PH	5	ASJ00394
7.5	19.5	13.82	270	0	0	797	11	CBH12232	11250	240	5	ASJ00228
7.5	20	12.81	180	0	0	550	10.5	CBH13010	9500	230	1	ASJ00280
7.5	20.5	12.81	180	0	0	1200	10.38	CBH13495	10000	240-3PH	1	ASJ00323
7.5	22.5	13.31	180	0	90	797	10.5	(2)CBH13219	8600	208	3	ASJ00293
7.5	23.5	12.81	180	0	0	1200	10.5	CBH13652	10000	240-3PH	1	ASJ00342
7.5	24	12.81	270	0	0	550	10.5	CBH13700	12500	240	5	ASJ00352
7.63	12	12.95	270	0	0	358	10.63	CBH13762	5350	230	5	ASJ00362
7.63	13.5	12.95	270	0	0	358	10.63	CBH13714	3480	230	5	ASJ00359
7.63	14.38	13.44	270	0	0	550	11.125	CBH14329	7000	230	5	ASJ00426

Note: Reference Drawings can be found on page 3-32.

CONTINUED

These Energy Conserving Units Out-Perform All Other Plastic Extruder Barrel Heating & Cooling Products.

Existing Cool TO-THE Touch Extruder Heat/Cool Systems

Horizontal and Vertical Blower Motor Mount Design Specifications (continued)

The following partial listings are part numbers and specifications for shroud designs that Tempco has engineered and manufactured. Each item listed below can be modified to fit customer requirements. Zone Control Probes are placed per customer specifications. See page 3-29 for complete details.

Barrel OD (Shroud ID)	Shroud Width	Shroud OD (in)	Blower Location (in)	Air Outlet Location (°)	Terminal Box Location (°)	Blower CFM (°)	Maximum Heater OD	Heater Part Number (in)	Wattage Per Shroud	Heater Voltage	Ref. Drawing Number	Shroud Part Number
7.63	14.5	12.95	270	0	0	550	10.63	CBH13713	7200	230	5	ASJ00373
7.63	15	12.95	270	0	0	550	10.63	CBH13713	7200	230	5	ASJ00358
7.63	18	12.95	270	0	0	550	10.63	CBH13712	9600	230	5	ASJ00357
7.63	21.25	13.06	270	90	90	550	10.75	CBH13364	7500	240-3PH	8	ASJ00314
8	20	13.81	270	90	0	550	11.5	CBH13571	12400	240	7	ASJ00330
8	22.5	14.06	270	90	0	550	11.75	CBH13677	11000	480	7	ASJ00347
8.25	12.5	14.06	270	0	180	550	11.75	CBH14072	5500	460-3PH	6	ASJ00390
8.25	14.5	14.06	270	0	180	550	11.75	CBH14071	7000	460-3PH	6	ASJ00391
8.5	18	14.56	270	90	90	1200	12.25	CBH12944	10800	240-3PH	8	ASJ00285
9.25	23.375	15.06	180	0	0	1200	12.75	CBH13562	15000	480-3PH	1	ASJ00327
9.31	23.25	15.2	270	0	0	(2) 550	12.88	CBH12703	15000	230-3PH	5	ASJ00264
9.5	12.5	14.81	270	0	0	485	12.5	CBH13699	8500	240	5	ASJ00353
9.5	19.5	15.56	180	0	0	1200	13.25	CBH14175	16000	240	1	ASJ00402
9.5	24	14.81	270	0	0	1200	12.5	CBH13698	15900	240-3PH	5	ASJ00354
9.5	24	14.81	270	0	0	(2) 459	12.5	CBH13327	16500	240-3PH	5	ASJ00308
9.5	24.5	15.31	180	0	90	(2) 550	12.5	CBH11891	14600	240-3PH	3	ASJ00205
9.5	24.875	15.31	270	0	0	(2) 550	13	CBH14352	20000	240 -3PH	5	ASJ00429
9.5	27	15.56	270	90	90	(2) 1200	13.25	CBH13123	20000	240-3PH	8	ASJ00289
9.5	27.38	15.56	180	0	0	(2) 550	13.25	CBH13389	2400	240	1	ASJ00317
9.5	27.75	15.56	180	0	0	(2) 550	13.25	CBH13922	20000	480-3PH	1	ASJ00375
9.75	16.5	14	270	0	0	550	13.25	CBH14126	12600	240	5	ASJ00399
9.75	19	15.81	270	0	0	1200	13.5	CBH14300	13500	480	5	ASJ00415
9.75	23.375	15.56	180	0	0	1200	13.25	CBH14419	15000	480	1	ASJ00435
9.75	24	14	270	0	0	(2) 550	13.25	CBH14125	18370	240	5	ASJ00398
9.75	24	15.31	180	0	0	1200	13	(2)CBH13801	7000	240-3PH	1	ASJ00370
9.76	12.5	15.82	270	0	0	550	13.5	CBH13799	10000	240-3PH	5	ASJ00365
9.88	15.5	16.06	270	90	0	550	13.38	CBH13319	9550	240-3PH	7	ASJ00307
9.88	24.5	16.06	270	90	0	(2) 550	13.38	CBH13318	14600	240-3PH	7	ASJ00306
9.94	18	16.31	180	0	90	1200	13.44	CBH12495	16000	440	3	ASJ00249
9.94	23	16.31	180	0	90	1200	13.44	CBH12496	18000	440	3	ASJ00250
10	28	16.06	270	90	90	(2) 550	13.75	CBH14193	11000	240	8	ASJ00404
10.75	7.5	16.56	270	0	0	485	14.25	CBH14203	7500	480	5	ASJ00406
12.5	34.5	18.81	180	0	0	(2) 1200	16.5	(2)CBH13888	35000	460-3PH	1	ASJ00374
13.5	12	19.56	180	0	90	550	17.25	CBH13359	9000	460	3	ASJ00313
13.5	17.5	19.56	180	0	90	550	17.25	(2)CBH13358	14000	460	3	ASJ00312
13.5	23	19.56	180	0	90	(2) 550	17.25	(2)CBH13359	18000	460	3	ASJ00311

Note: Reference Drawings can be found on page 3-32.

Ordering Information

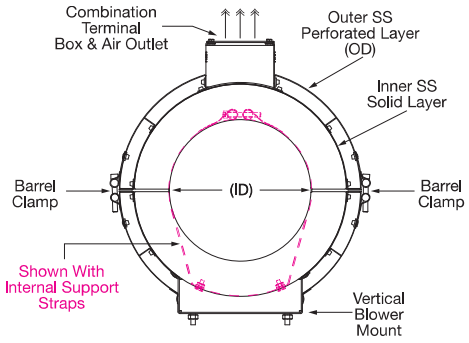
If you cannot find an existing shroud design that meets your requirements precisely, please use the ordering form on page 3-36 to process your quote request.

Tempco's engineering professionals will custom design a shroud system to meet your extruder process challenges.

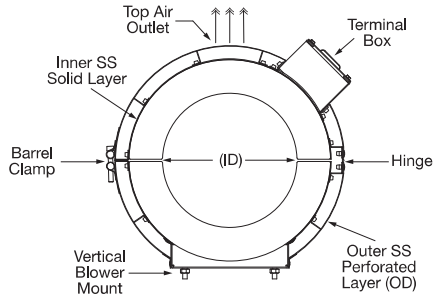
Cool TO-THE Touch™ Shroud System

Made in USA

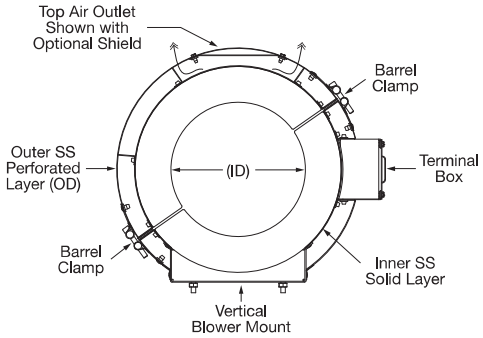
Existing Cool TO-THE Touch Extruder Heat/Cool System Reference Shroud Drawings



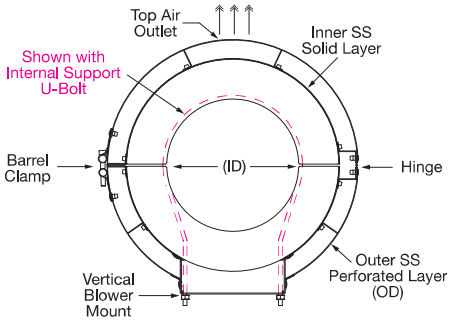
Drawing 1



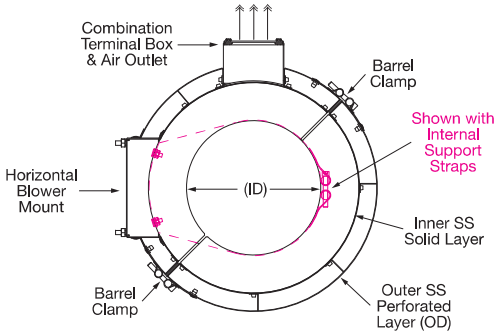
Drawing 2



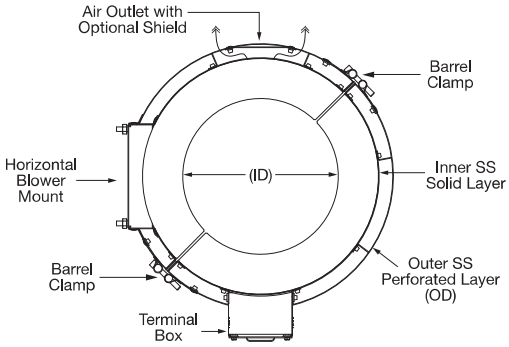
Drawing 3



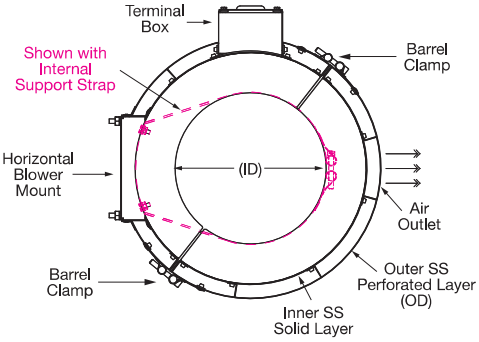
Drawing 4



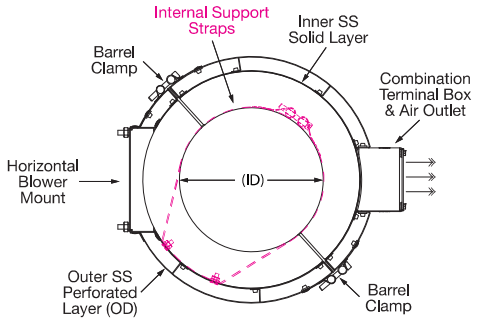
Drawing 5



Drawing 6



Drawing 7



Drawing 8

Multi-Versal Extruder Heat/Cool System

Tempco's Multi-Versal extruder heat/cool systems are designed for efficient heating and cooling. The shroud systems can be used with many styles of band heaters. Due to the single layer design, the Multi-Versal shroud system has a low profile OD.

The reflective interior of the shroud decreases the heat-up cycle, reducing energy consumption. The unrestricted blower port directs inlet air to the hottest part of the heater and distributes it evenly over the entire cross section of the zone.

2 – Multi–Versal Construction

Multi-Versal Extruder

Solid, Stainless Steel Single Layer Shroud

Usage Requirements

A highly adaptable single layer shroud, suited for retrofit and/or new applications regardless of the type of barrel band heater being used.

Multi-Versal Construction Details

Single Layer Shroud

- *Solid Stainless Steel Layer – radiation shield that directs the cooling air flow over the heater*

Shroud Assembly Features

- *Two Mounting Styles are available:*
  - *Hinge with Barrel Clamps – designed for ease of installation*
  - *Two Individual Halves with Barrel Clamps (Two-Piece) – used where installation space is tight or mounting is difficult*
- *Internal Support Straps or Support U-Bolt on blower mount half of shroud permits shroud to be opened for servicing without removing unit from barrel*
- *Anti-Rotate Tabs – used only with Finned Cast-In Heaters to prevent shroud from radial and axial movement around the barrel*
  - *Tabs are cast as part of the heater and may require a Terminal Box*
- *Blower Options – See page 3-41 through 3-43 for Complete Details*
  - *Single or Dual Tempco Recommended Blowers available from 148 CFM up to 1210 CFM at 115V or 230V, or 480V 3-Phase*
  - *Customer Specified blower*
  - *Blower not required for Heat-Only Shrouds*
- *Blower Location*
  - *Horizontal or Vertical Orientation*
  - *Extension Housings Available*
- *Standard separate top Screened Air Outlet*
- *Optional Screened Air Outlet Features Include:*
  - *Air Outlet combined with Terminal Box*
  - *Alternate Radial Air Outlet locations available*
- *Shroud Air-Inlet Baffle Optional*
- *Vent Hole(s) Optional*

Multi-Versal shown with horizontally mounted blower & vertical combination terminal box & air outlet

Heater Type and Components

- *Recommended Heater Types – Finned Cast-In Heaters with standard 1/4" gap between heater halves, Ceramic Band and Maxiband Heaters*
- *Power Input Terminal Box with 7/8" dia. K.O. for 1/2" conduit:*
  - *Standard 10-32 stud termination with ceramic or mica insulator*
  - *With Louvered Cover – used when terminal box is separate from air-outlet*
  - *Stainless Steel Screen – used when terminal box is combined with air outlet*
- *Power Input through Blower Mount – input wiring through knockouts in blower mount eliminates terminal box and facilitates ease of heater service*

Sensing and Controlling

- *Existing Zone Control Probe – Shroud System can be designed per customer specifications*
- *Tempco supplied Zone Control Probe*
- *Tempco customized Power Control Panel designed to complete Your Thermal Loop System*

Ordering Information

See Page 3-36 for complete Ordering Information.

Made in USA

Multi-Versal Extruder Heat/Cool System

Horizontal and Vertical Blower Motor Mount Design Specifications

The following partial listings are part numbers and specifications for shroud designs that Tempco has engineered and manufactured. Each item listed below can be modified to fit customer requirements. Zone Control Probes are placed per customer specifications. See page 3-33 for complete details.

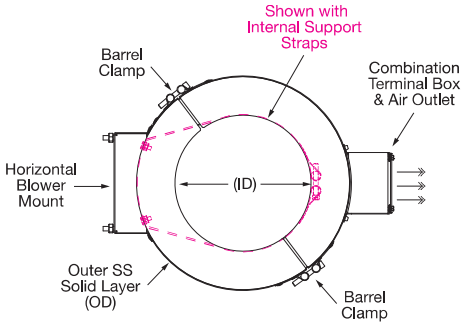
Barrel OD (Shroud ID)	Shroud Width	Shroud OD (in)	Blower Location (in)	Air Outlet Location (°)	Terminal Box Location (°)	Blower CFM (°)	Maximum Heater OD	Heater Part Number (in)	Wattage Per Shroud	Heater Voltage	Ref. Drawing Number	Shroud Part Number
5.5	13	9.5	180	0	0	273	8.75	CBH07945	5600	600	3	ASJ00041
5.9	16	10.97	270	0	0	550	9.875	CBH14346	8000	240-3PH	5	ASJ00427
6.25	13.5	10.82	180	0	0	550	10	BCH06668	6000	240	3	ASJ00292
6.25	14	10.5	180	0	0	550	9.75	CBH14356	6800	240	3	ASJ00431
6.25	18.5	10.25	180	0	0	550	9.5	CBH11500	8800	460	3	ASJ00177
6.5	13	10.32	180	0	0	358	9.5	CBH13473	7500	240	3	ASJ00321
6.5	15.5	10.75	180	0	0	358	10	CBH11428	8000	575	3	ASJ00167
6.625	18.5	10.625	180	0	0	550	9.875	CBH07947	8800	460	3	ASJ00042
6.63	17.5	11.2	270	0	0	485	10.38	CBH14069	9250	480	5	ASJ00389
7.5	14.25	11.25	180	0	0	550	10.5	CBH13306	7000	240	3	ASJ00304
7.5	18	11.25	180	0	0	550	10.5	CBH13305	10600	240	3	ASJ00303
7.5	20.5	11.75	90	270	270	797	11	(2)BCH07244	6000	480	1	ASJ00380
7.5	29	11.25	180		0	(2) 550	10.5	(2)CBH13307	16200	240	3	ASJ00302
8.5	10.25	12.5	270	0	0	485	11.75	BCH07114	2200	240	5	ASJ00363
8.5	15.25	13	90	0	NONE	1200	12.25	CBH13467	6000	230	2	ASJ00320
9.5	27.5	14	180	0	0	(2) 732	13.25	(2)CBH13149	12000	230	3	ASJ00290
9.5	27.75	14	180	0	0	(2) 550	13.25	CBH14088	24000	480-3PH	3	ASJ00393
9.75	11.5	13.75	180	0	0	358	13	CBH09965	9000	230	3	ASJ00078
9.75	11.5	13.75	180	0	NONE	358	13	CBH09965	9000	230	4	ASJ00131
9.75	19.5	15	180	0	NONE	1200	14.25	CBH12313	12600	240	4	ASJ00076
9.75	23.5	13.5	180	0	0	(2) 485	12.75	CBH10719	16000	240	3	ASJ00112
9.88	22	14.13	180	0	NONE	1200	13.38	CBH13711	10500	220	4	ASJ00355
10.75	11	15	180	0	0	550	14.25	CBH14235	8800	230	3	ASJ00408
11.5	15.38	16	180	0	0	797	15.25	CBH13295	11000	460	3	ASJ00301
12.25	17.75	16.75	180	0	0	1200	16	CBH13347	16500	230-3PH	3	ASJ00310

Ordering Information

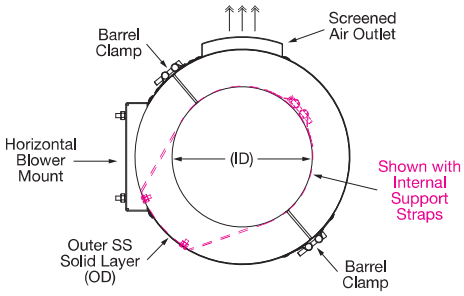
If you cannot find an existing shroud design that meets your requirements precisely, please use the ordering form on page 3-36 to process your quote request.

Tempco's engineering professionals will custom design a shroud system to meet your extruder process challenges.

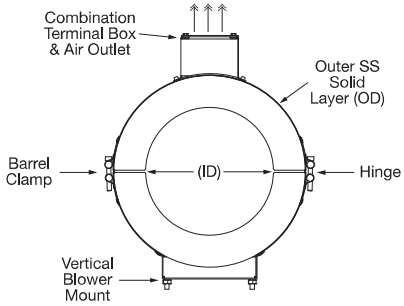
Existing Multi-Versal Extruder Heat/Cool System Reference Shroud Drawings



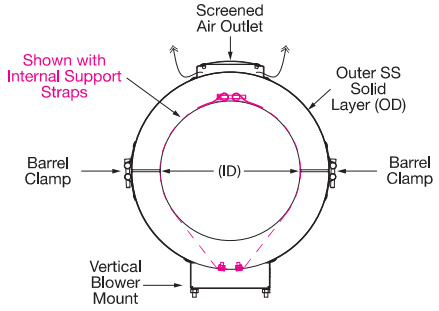
Drawing 1



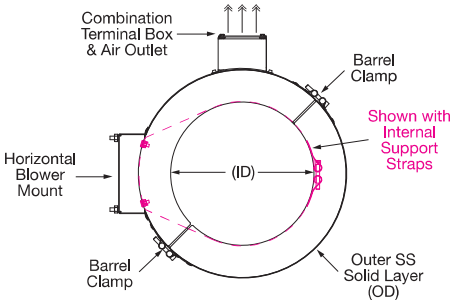
Drawing 2



Drawing 3



Drawing 4



Drawing 5

Cast-In Heaters

Stainless Steel Shroud Systems

Made in USA

Made-To-Order Quote Request Form — Copy and Fax Us (630-350-0232) Your Requirements

Customer Information

Name: _____ Company: _____ City: _____ State: _____

Phone: _____ Fax: _____ Email: _____

Extruder Barrel Manufacturer: _____ Model Number: _____

Resin Type: _____ Process Temperature: _____

When submitting this form, please be sure to include an extruder barrel sketch or drawing that includes the following:

✳ Extruder Barrel Support(s) ✳ Number of Heating Zones ✳ Vent Location(s) ✳ Zone Probe Location(s)

✳ Input Feed Location ✳ Pressure Tap Location(s) ✳ Zone Length(s) ✳ Additional Restriction(s)

Note: To assist Tempco in designing a shroud system, please provide digital images (in .jpg format) of the extruder barrel.

Shroud Specifications

(For replacement of existing Tempco Shroud(s), please contact your Tempco Factory or Sales Representative.)

Shroud Style: ❒ Cool TO-THE Touch™ ❒ Multi-Versal Quantity Required: _____

Shroud Dimensions

Shroud Width / Zone Length: _____ Extruder Barrel OD / Shroud ID: _____

Maximum Shroud OD: _____ (determined by Engineering unless specified by customer)

Existing Heater OD (including terminations): _____ (determined by Engineering when new Tempco Heater is purchased)

Internal Shroud Support Required: ❒ Yes ❒ No

Shroud Components and Component Locations

Component Options (see pages 3-29 or 3-33 for shroud component details)

1. Blower Mount:
   ❒ Horizontal ❒ Vertical
2. Air Outlet:
   ❒ Separate from Terminal Box ❒ Combined w/ Terminal Box
3. Terminal Box:
   ❒ None ❒ Louvered (Separated from Air Outlet)
   ❒ Screened (Combined with Air Outlet)
4. Clamping Method at Shroud Opening:
   ❒ Barrel Clamps with Hinge ❒ Barrel Clamps (no Hinge)
   ❒ Adjustable Clamps with Hinge ❒ Adjustable Clamps (no Hinge)
5. Zone T/C Probe(s) - Customer Specified:
   Quantity: _____ Clearance Hole Diameter(s): _____

Please indicate Component Radial Locations:

1 _____ Blower Mount

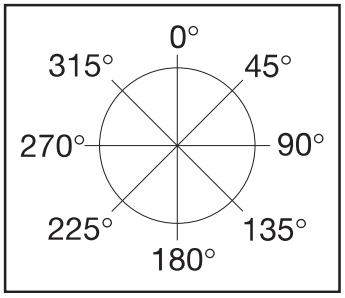
2 _____ Air outlet

3 _____ Terminal Box

4 _____ Clamps

_____ Hinge (if applicable)

5 _____ Zone T/C Probe(s)



Blower Specifications (see page 3-43 for standard Tempco blowers & configuration details)

Configuration: ❒ Single ❒ Dual ❒ Customer Supplied ***(*see below)***

❒ Stock Tempco Blower (Engineering will determine specifications if none specified)

P/N: _____ ***or*** CFM: _____ Volts: _____ Operating Frequency: _____Hz

Optional Blower Extension: ❒ Horizontal ❒ Vertical ❒ Custom (Consult Tempco.)

❒ *Customer Supplied Blower **(Please attach mounting information when submitting this form.)**

Manufacturer: _____ P/N: _____ CFM: _____ Volts: _____ Operating Frequency: _____Hz

Heater Specifications

Existing Tempco Heater: P/N: _____ ❒ Replace Existing Heater ❒ Cover Existing Heater

If purchasing new Tempco Heater(s), please provide the following information if known:

Type and Quantity Required:

Qty. Cast-In(s) ____ Qty. Ceramic Bands ____ Qty. Maxibands ____

Inner Diameter: _____ Width(s): _____ Wattage per Shroud: _____ Voltage: _____

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Arctic Cast® Extruder Heat/Cool System

Tempco's Arctic Cast Shroud System was our pioneer shroud design for the air-cooling of extruders. The cooling efficiency of the Arctic Cast shroud system meets or exceeds that of water-cooled systems when used with our field proven high-capacity blowers.

The Arctic Cast shroud features a vented 1/4" thick cast aluminum layer for durability. The cast-in heaters are designed with a large fin surface area to maximize cooling efficiency. The blower port directs inlet air to the hottest part of the heater, distributing it evenly over the entire cross section of the zone.

3 – Arctic Cast Construction

Arctic Cast Extruder

Single Layer Shroud – Vented Cast Aluminum layer bolted directly onto Tempco's Specially Designed Finned Cast-In Aluminum Band Heater

Usage Requirements

This rugged shroud design is recommended for installations where the shroud system could be exposed to physical damage, such as instances where the extruder barrel is low to the ground. It is suited to work with Tempco's Specially Designed Finned Cast-In Aluminum Heater and cannot be used on any existing finned cast-in heaters.

Arctic Cast shown with Vertical Mount Option

Arctic Cast Construction Details

Single Layer Shroud

- *Vented 1/4" thick Cast Aluminum layer – directs the cooling air flow over the heater*

Shroud Assembly Features

- *Two Individual Halves bolted together (Two-Piece) and clamped around finned cast heater*
- *Blower Options – See Pages 3-41 through 3-43 for complete details*
  - *Single or Dual Tempco Recommended Blowers available from 148 CFM up to 1210 CFM at 115V or 230V, or 480V 3-Phase*
  - *Customer Specified blower*
- *Blower Location*
  - *Vertical Orientation – at the bottom of the shroud*
  - *Custom location achieved only by rotating entire shroud system*
- *Standard top Air Outlet*
  - *Custom location achieved only by rotating entire shroud system*
- *Shroud Air-Inlet Baffle with built-in air deflector that breaks up incoming airflow, distributing it across the cast-in heater(s)*

Heater Type and Components

- *Recommended Heater Types – Tempco Finned Cast-In Heaters with standard 1/4" gap between heater halves and bolt and nut clamping*
- *Heater Strap Clamping is available*
- *Power Input with Standard 10-32 stud termination with ceramic or mica insulator*
  - *Bus Wiring between halves is optional*

Sensing and Controlling

- *Existing Zone Control Probe – Shroud System can be designed per customer specifications*
- *Tempco supplied Zone Control Probe*
- *Tempco customized Power Control Panel designed to complete Your Thermal Loop System*

Ordering Information

See Page 3-40 for complete Ordering Information.

Standard (Non-Stock) Arctic-Cast® Cast-In Heaters (319 Aluminum) and Shrouds

Heater I.D. in	Heater O.D. in	Heater Length in	Watts Each Half	Volts Each Half	Phase	Termination Type	Clamping Type	Cast-In Heater Part Number	Shroud Dimensions I.D. in	Length "L" in	"G" in	"H" in	Shroud Style	Shroud Part Number
3	7	5.5	650	240	1	R	Bolt	CBH13085	7	4.375	3.7	3.22	A	ASF01218
3	7	7	1000	240	1	E	Bolt	CBH13537	7	7	1.5	4.125	A	ASF01221
3.75	7.75	13	2300	240	1	E	Bolt	CBH09406	7.75	13	6	5	A	ASF01160
4.25	7.5	13	2910	230	3	E	Strap	CBH08563	7.5	13	3.5	2.5	B	ASF01138
4.5	9	10.75	1620	230	1	E	Strap	CBH02937	9	10.75	5	6	A	ASF01006
4.5	7.75	12.25	1500	230	1	E	Strap	CBH05676	7.75	12.25	4.406	4.375	C	ASF01052
4.5	8.25	12.5	2500	240	1	C4	Bolt	CBH14435	8.25	12.5	6	5	A	ASF01232
5	9	12.438	2000	230	1	E	Strap	CBH05677	9	12.438	4.406	4.375	C	ASF01053
5.25	8.5	13.5	3750	190	3	E	Strap	CBH08561	8.5	13.5	3.5	2.5	B	ASF01136
5.5	10	11	2100	230	1	E	Strap	CBH02803	10	11	5	6	A	ASF01002
5.5	10	15.5	4000	240	1	E	Bolt	CBH10185	10	15.5	6.25	7.25	A	ASF01183
5.5	9.5	18	1200	277	1	E	Strap	CBH10258	9.5	18	8.813	2.188	A	ASF01186
6	10	11	3300	230	1	S	Strap	CBH04243	10	11	5	6	A	ASF01002
6	10	18	5000	240	1	E	Bolt	CBH09383	10	18	6.25	7.25	A	ASF01158
6	10	16	4000	240	1	E	Bolt	CBH11316	10	16	6.25	7.25	A	ASF01199
6	10	10	3750	240	3	T	Bolt	CBH12072	10	10	4.875	4.375	A	ASF01211
6	9.75	18	5000	240	1	S	Bolt	CBH14604	9.75	18	7.75	4	A	ASF01236
6.25	10.5	15	4800	230	1	E	Strap	CBH07349	10.5	15	4.875	4.375	A	ASF01095
6.5	11	17.5	3600	230	1	E	Strap	CBH02802	11	17.5	5	6	A	ASF01003
6.5	10	10.75	2280	240	1	E	Strap	CBH06509	10	10.75	4.875	2.375	A	ASF01076
6.5	11	17.5	3600	230	1	E	Strap	CBH07372	11	17.5	4.625	5.625	A	ASF01098
6.5	10.5	13	4000	240	1	E	Strap	CBH09413	10.5	13	4.875	4.375	A	ASF01161
6.5	10.5	16	4000	240	3	E	Strap	CBH09414	10.5	16	4.875	4.375	A	ASF01162
6.635	11	17.5	4360	240	1	S	Bolt	CBH06070	11	17.5	4.86	4.37	A	ASF01008
7	11	13.5	2400	230	1	E	Strap	CBH05871	11	13.5	4.406	4.375	C	ASF01057
7	10.25	18	6000	230	3	E	Strap	CBH08425	10.25	18	4.438	4.375	C	ASF01134
7	11	17.5	6000	240	1	S	Strap	CBH08635	11	17.5	4.375	4.875	A	ASF01143
7	11	19	6000	240	3	E	Bolt	CBH09362	11	19	6.5	7.25	A	ASF01157
7.5	12	18	3500	230	1	E	Strap	CBH05574	12	18	5	5	A	ASF01048
7.5	12	17	3000	480	1	E	Strap	CBH06561	12	17	3.5	3.5	A	ASF01035
7.5	11.5	18	6000	240	3	E	Strap	CBH08685	11.5	18	4.875	2.375	A	ASF01066
7.5	10.75	19	7500	190	3	C4	Bolt	CBH14386	10.75	19	8.75	4	A	ASF01227
7.5	10.75	19	7500	240	3	C4	Bolt	CBH15013	10.75	19	8.75	4	A	ASF01227
8	12	14	3250	230	1	E	Strap	CBH03738	12	14	5	5	A	ASF01013
8	12	18	5000	480	3	C4	Bolt	CBH06432	12	18	3.875	3.875	A	ASF01069
8	11.25	16	2750	230	1	E	Bolt	CBH13777	11.25	16	8.813	4.375	A	ASF01224
8.25	12.25	13	3850	230	1	S	Strap	CBH03994	12.25	13	5	4.875	A	ASF01019
8.5	11.75	10	4425	230	3	E	Strap	CBH08562	11.75	10	4.406	4.375	C	ASF01137
8.5	12	17	5900	240	1	E	Strap	CBH10213	12	17	6	5	A	ASF01185
9	13	18.75	5000	230	1	E	Strap	CBH08278	13	18.75	4.375	5.5	C	ASF01126
9.5	13.25	13	3000	240	0	E	Bolt	CBH13600	13.25	13	4.96	5.94	A	ASF01222
9.75	13.75	19	7500	480	3	S	Bolt	CBH05684	13.75	19	3.875	3.875	A	ASF01054
9.75	13.75	22	6000	230	1	E	Bolt	CBH08024	13.75	22	6.452	6.452	A	ASF01119
9.75	13.75	19	6000	230	1	E	Bolt	CBH08025	13.75	19	5	6	B	ASF01120
9.75	13.75	22	11000	200	3	F	Bolt	CBH10086	13.75	22	6.452	6.452	A	ASF01181
10	9	12	6480	230	3	S	Strap	CBH05102	9	12	5	6	A	ASF01006
10	13.5	24	11000	600	3	R1A	Bolt	CBH07294	13.5	24	6.25	6.25	A	ASF01094
10	14	12	6480	230	1	E	Strap	CBH07404	14	25	6	5	B	ASF01101
10	13.25	12	6480	230	3	E	Strap	CBH08424	13.25	12	4.406	4.375	C	ASF01129
10	14	12	6480	480	1	E	Strap	CBH14775	14	12	6	5	B	ASF01101
12	16	14.5	4250	240	3	E	Strap	CBH09876	16	14.5	5.504	5.504	A	ASF01172
12	16	23	6500	480	1	E	Bolt	CBH11446	16	23	6.5	4	C	ASF01203
13	16.25	13.75	6750	190	3	E	Strap	CBH09878	16.25	13.75	4.406	4.375	C	ASF01173

The typical Arctic Cast System consists of

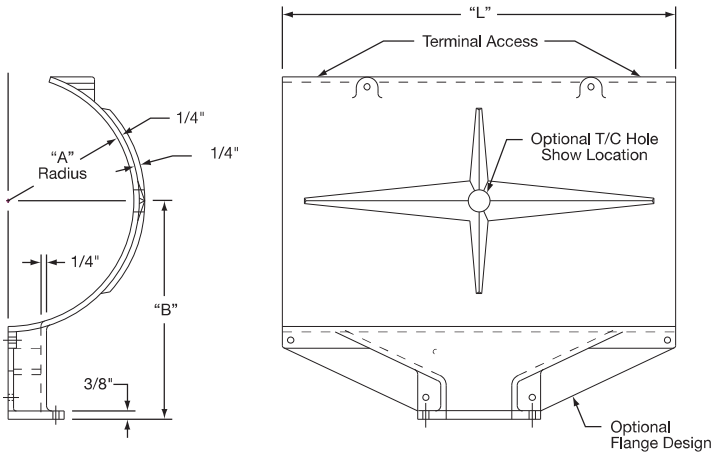
- ***A Cast-In Aluminum Finned Band Heater***
- ***A Cast Aluminum Shroud***
- ***An appropriately rated Forced Air Blower***

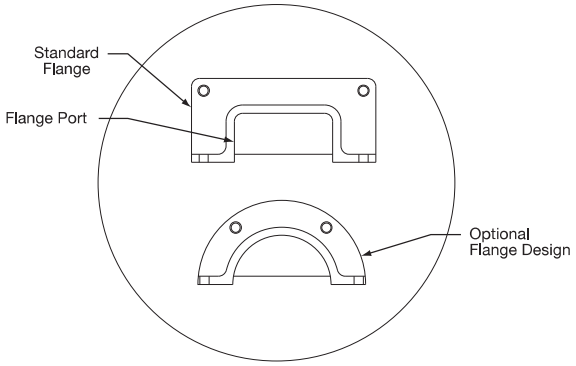
Page 3-37 illustrates the complete system as well as the components that make up each assembly. Envelope dimensions for the shrouds shown on page 3-39 are also provided. Pages 3-41 through 3-43 display different forced air blower styles and specifications.

Note: For additional information on sizing and selecting Cast-In Band Heaters for your application, see page 3-39. To order an Arctic-Cast system not shown in our Standard Sizes and Ratings, consult Tempco or send us your specifications and/or drawing.

Selection of Arctic Cast® Shroud Design Styles

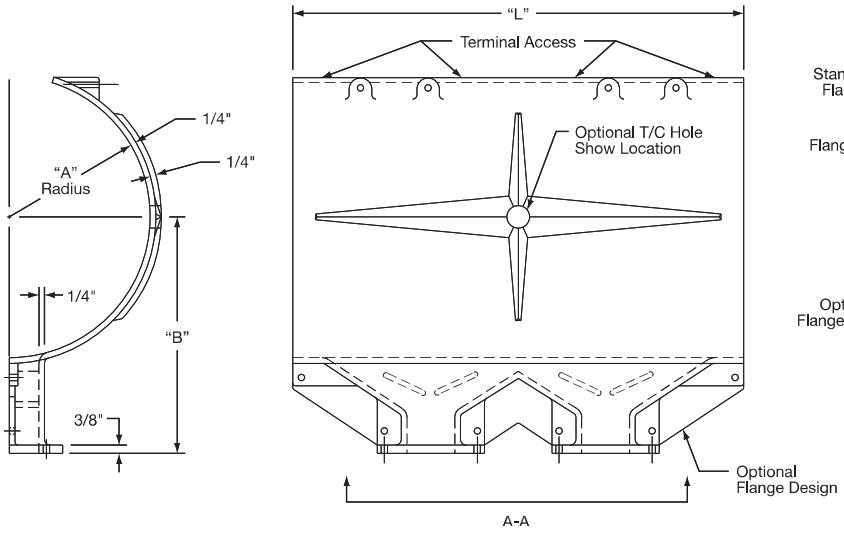
Shroud Style A

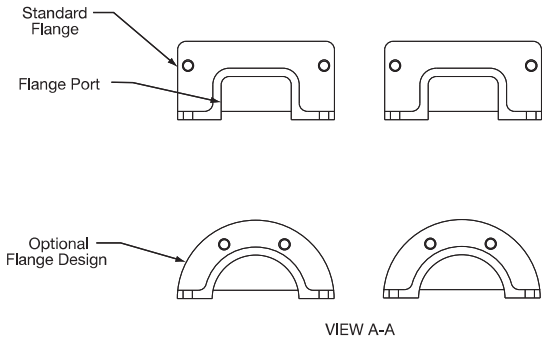




Please provide mounting hole specifications if using other than Tempco standard.

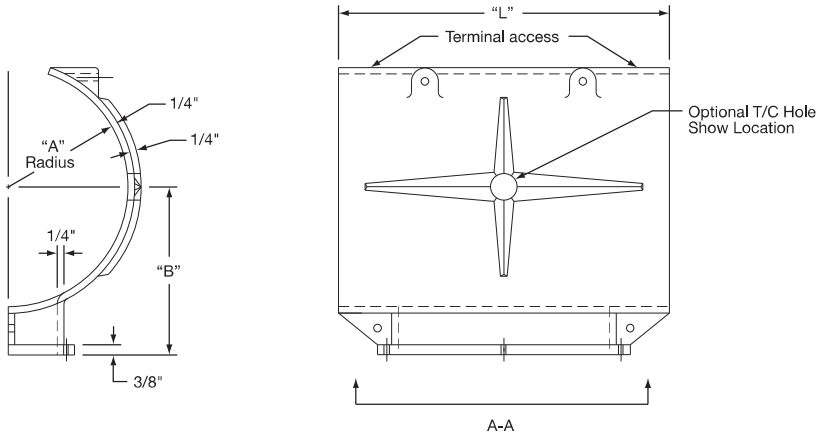
Shroud Style B

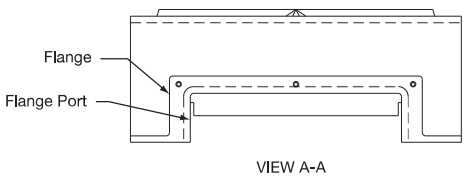




Please provide mounting hole specifications if using other than Tempco standard.

Shroud Style C





Please provide mounting hole specifications if using other than Tempco standard.

Cast-In Heaters

Arctic Cast® Shroud System

Made in USA

Made-To-Order Quote Request Form — Copy and Fax Us (630-350-0232) Your Requirements

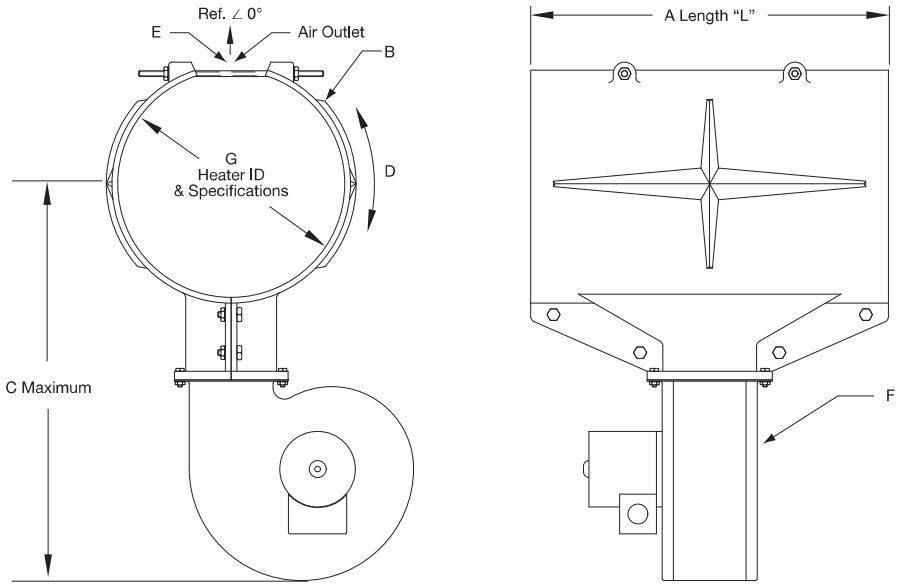
Customer Information

Name: _____ Company: _____ City: _____ State: _____
Phone: _____ Fax: _____ Email: _____
Extruder Barrel Manufacturer: _____ Model Number: _____
Resin Type: _____ Process Temperature: _____

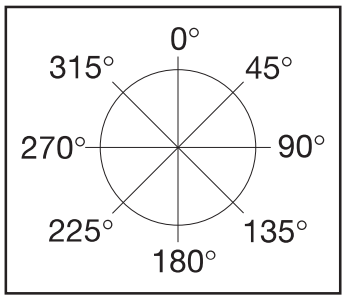
When submitting this form, please be sure to include an extruder barrel sketch or drawing that includes the following:

- ✳ Extruder Barrel Support(s)
- ✳ Number of Heating Zones
- ✳ Vent Location(s)
- ✳ Zone Probe Location(s)
- ✳ Input Feed Location
- ✳ Pressure Tap Location(s)
- ✳ Zone Length(s)
- ✳ Additional Restriction(s)

Note: To assist Tempco in designing a shroud system, please provide digital images (in .jpg format) of the extruder barrel.



Drawing Reference Angle



Shroud Specifications

(For replacement of existing Tempco Shroud(s), please contact your Tempco Factory or Sales Representative.)

A. Shroud Width / Zone Length "L": _____
B. Maximum Shroud OD: _____ (determined by Engineering unless specified by customer)

Shroud Component Specifications

C. Maximum Blower Clearance: _____
D. Standard Shroud Assembly Orientation Shown: Air Outlet at 0°, Blower at 180°
For alternate orientations, rotate shroud and heater assembly on extruder barrel.
E. Zone T/C Probe(s): Quantity: _____ Clearance Hole Diameter: _____
Location: ❒ Centered at Top (standard) ❒ Custom: _____ (Indicate Clockwise from Drawing Reference Angle)

Blower Specifications

F. Configuration: ❒ Single ❒ Dual ❒ Customer Supplied ***(*see below)***
❒ Stock Tempco Blower (Engineering will determine specifications if none specified)
P/N: _____ ***or*** CFM: _____ Volts: _____ Operating Frequency: _____Hz
❒ Optional Inlet Guard (available for most stock blowers)
Optional Blower Extension: ❒ Horizontal ❒ Vertical ❒ Custom (Consult Tempco.)
Mounting Dimensions: Length _____ Width _____
❒ *Customer Supplied Blower **(Please attach mounting information when submitting this form.)**
Manufacturer: _____ P/N: _____ CFM: _____ Volts: _____ Operating Frequency: _____Hz

Heater Specifications

G. Extruder Barrel OD/Heater ID: _____ Wattage per Half: _____ Voltage per Half: _____

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

View Product Inventory @ www.tempco.com

Forced-Air Blowers for Air-Cooled Heating Systems

A variety of sizes and styles of forced-air centrifugal blowers are used on Tempco's air-cooled extrusion systems. Tempco Forced-Air Blowers are available in a large range of CFM ratings to fit any new or existing application. All blowers include air inlet guards for your safety.

Standard Single Phase Centrifugal Blowers

Tempco standard blowers feature corrosion protected sheet metal housings and impeller wheels. The quiet operation and quick response coupled with high volume unrestricted output results in a field-proven efficient cooling means for extrusion processes. Standard blowers are readily available for single phase 115V or 230V and represent the shortest delivery times.

Single Port Blowers

Part Number	"D"	"F"	"G"	"H"	"N"	"P"	"R"	"S"	Outlet "L" × "W"	CFM	Volts	Full Load Amps	Replacement Guard PN
MTR-102-101	3.50	4.60	3.96	2.88	6.91	6.26	5.32	5.70	2.18 × 3.25	146	115	0.75	GRD-101-102
MTR-102-102	5.00	5.51	4.86	4.37	8.21	7.56	8.88	9.90	3.62 × 4.13	273	115	0.77	GRD-101-103
MTR-102-103	5.00	5.51	4.86	4.37	8.21	7.56	8.88	9.90	3.62 × 4.13	273	230	0.43	GRD-101-103
MTR-102-104	5.63	5.08	4.50	5.00	8.09	7.48	10.44	11.16	4.25 × 3.81	358	230	0.54	GRD-101-104
MTR-102-105	5.63	5.08	4.50	5.00	8.09	7.48	10.40	11.20	4.25 × 3.81	485	115	1.35	GRD-101-104
MTR-102-106	5.63	6.63	6.00	5.00	9.59	8.92	10.42	11.16	4.25 × 5.25	550	115	2.05	GRD-101-104
MTR-102-107	5.63	6.63	6.00	5.00	9.59	8.92	10.40	11.20	4.25 × 5.25	550	230	0.98	GRD-101-104
MTR-102-108	6.37	8.75	8.00	5.00	11.56	11.56	13.13	14.88	5.56 × 7.19	1202	115/230	7.30/3.70	GRD-101-108
MTR-102-113	6.37	7.75	7.00	5.00	10.31	10.31	13.13	14.88	5.56 × 6.19	794	115/230	2.75/1.45	GRD-101-108

NOTE: See Blower Drawing 1 on page 3-43

Single Port Large Volume Blowers

Part Number	"D"	"F"	"G"	"H"	"N"	"R"	"S"	Outlet "L" × "W"	CFM	Volts	Full Load Amps	Replacement Guard PN
MTR-102-109	5.00	9.69	4.41	4.38	9.25	8.81	9.88	3.69 × 8.06	458	115	1.28	GRD-101-103
MTR-102-110	5.00	9.69	4.41	4.38	9.45	8.81	9.88	3.69 × 8.06	458	230	0.65	GRD-101-103
MTR-102-111	5.63	9.31	4.38	5.00	10.75	10.31	11.13	4.19 × 8.69	797/549	115	3.20/2.20	GRD-101-104

NOTE: See Blower Drawing 2 on page 3-43

Double Port Blowers

Part Number	"D"	"F"	"G"	"H"	"M"	"N"	"P"	"R"	"S"	Outlet "L" × "W"	CFM	Volts	Full Load Amps	Replacement Guard PN
MTR-102-112	4.75	4.75	4.13	1.47	7.50	12.20	10.90	8.06	7.89	2.94 × 3.31	312	115	0.77	GRD-101-103

NOTE: See Blower Drawing 3 on page 3-43

Low-Profile Single Phase Centrifugal Blowers

Tempco low-profile 115/230V single phase blowers offer a narrower footprint than the standard blowers. The motor is integrated with the impeller so that the motor housing protrudes only slightly from the blower housing. Low-profile blowers are made of die-cast aluminum and galvanized sheet steel and are perfect for applications where space is a concern.

Single Port Blowers

Part Number	"D"	"F"	"G"	"H"	"N"	"P"	"R"	"S"	Outlet "L" × "W"	CFM	Volts	Full Load Amps	Replacement Guard PN	Replacement Capacitor PN
MTR-103-101	2.68	3.00	2.60	2.28	3.44	3.15	4.65	4.50	2.19 × 1.66	56	115	0.24	GRD-101-101	TEC-114-101
MTR-103-102	2.68	3.00	2.60	2.28	3.44	3.15	4.65	4.50	2.19 × 1.66	56	230	0.13	GRD-101-101	TEC-114-102
MTR-103-103	4.72	5.12	4.53	4.13	5.12	3.94	8.90	9.72	3.62 × 3.70	283	230	0.89	GRD-101-103	TEC-114-101
MTR-103-104	7.40	6.96	5.00	6.00	5.27	4.96	11.28	14.04	4.79 × 5.27	500	230	0.78	GRD-101-106	TEC-114-101

NOTE: See Blower Drawing 1 on page 3-45

Made in USA

Forced-Air Blowers for Air-Cooled Heating Systems

Universal Three-Phase Centrifugal Blowers

Tempco high-end blowers use heavy duty construction for a long service life. They are available with universal three-phase motors for 50/60 HZ operation on voltages from 202 up to 530V. They meet Cenelec standards and are IP41 or IP54 rated with class B or F insulation systems. These low noise, continuous duty rated blowers operate efficiently under higher static pressure loads than our standard blowers. Optional attachments are available for transferring high temperature air up to 200-300° C and inlet filters for dusty environments.

Single Port Blowers — 3-Phase 60 Hz (202-306V 3-Ph. Delta, 350-530V 3-Ph. Y)

Part Number	"D"	"F"	"G"	"H"	"N"	"P"	"R"	"S"	Outlet "L" × "W"	CFM	Volts	Full Load Amps
MTR-104-101	3.85	4.41	3.74	3.15	9.17	8.62	7.75	3.00	2.56 × 3.11	253-300	240/480	0.51/0.29
MTR-104-102	5.11	5.51	4.72	4.33	11.85	11.06	8.81	8.97	3.54 × 3.66	459-556	240/480	1.15/0.65
MTR-104-103	5.51	5.91	5.19	4.72	13.62	13.00	9.49	10.43	3.90 × 4.29	732-853	240/480	2.30/1.35
MTR-104-104	6.14	6.61	5.94	4.96	15.02	14.25	10.51	11.73	4.41 × 4.88	1130-1200	240/480	4.00/2.30

NOTE: See Blower Drawing 1 on page 3-43

Double Port Blowers — 3-Phase 60 Hz (202-306V 3-Ph. Delta, 350-530V 3-Ph. Y)

Part Number	"D"	"F"	"G"	"H"	"M"	"N"	"P"	"R"	"S"	Outlet "L" × "W"	CFM	Volts	Full Load Amps
MTR-104-105	5.19	5.51	4.72	4.33	9.74	15.25	13.68	8.82	8.98	3.54 × 3.66	550-665	240/480	1.10/0.65

NOTE: See Blower Drawing 3 on page 3-43

Extensions for Forced-Air Blowers

Blower extensions are available for applications where space restrictions do not allow the blower to be mounted directly to the shroud assembly.

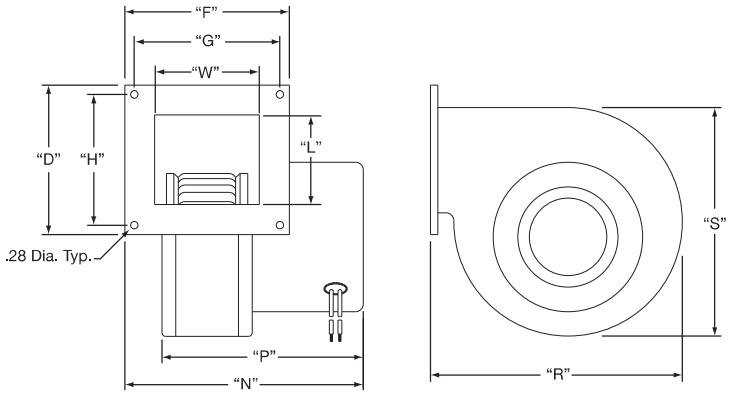
Horizontal Blower Extension allows blower to be mounted perpendicular to the shroud. A baffle inside the blower extension smoothly guides air flow into the shroud.

Vertical Blower Extension allows blower to be vertically offset at a distance below the shroud as specified by the customer. Especially useful in retrofit applications.

Vertical Blower Extension with 90° adapter plate allows blower to be vertically offset from the shroud. Blower can be rotated at 90° intervals relative to the extension.

Inlet Guards for Single Inlet Centrifugal Blowers

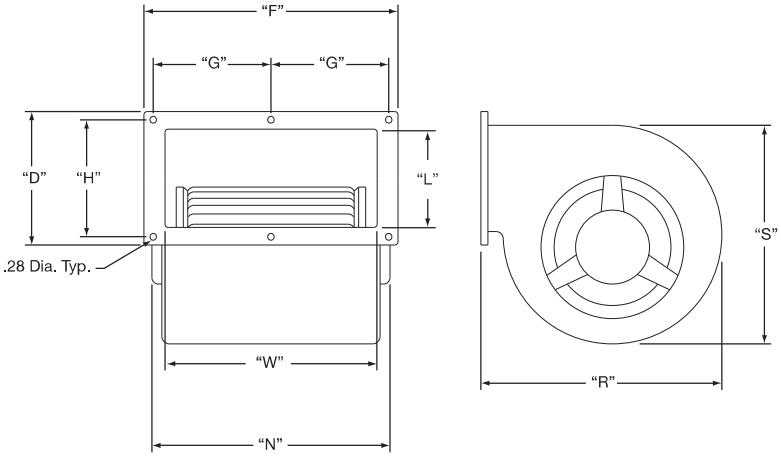
Single Port Blower: Drawing 1



Special cast housing narrow blowers for small extruders or short barrel zone widths are available from 23 up to 350 CFM.

Single port blowers can be obtained up to 1210 CFM for use in large extruder installations. Consult Tempco with your requirements.

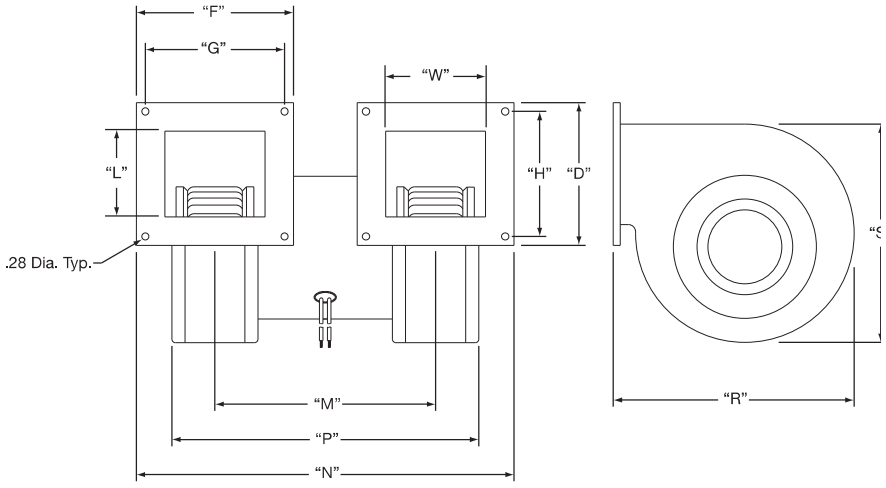
Single Port Large Volume Blower: Drawing 2



Note: Blower's wheel and motor assembly is mounted within the sheet metal housing, allowing air in from both ends.
Additional sizes of two-speed blowers rated 435/296 are also available. A full range of special dual inlet sizes from 120 CFM up to 1200 CFM can be supplied for extruder zone widths of 6" and longer. Consult Tempco with your requirements.

All CFM Values are with free inlet and discharge and 0" Static Pressure. All Dimensions are in inches.

Double Port Blower: Drawing 3



Note: A smaller 157 CFM version is also available. Special cast housing blowers rated 500 to 600 CFM for use on larger extruders can be obtained. Consult Tempco with your requirements.

Made in USA

Standard Cast-In Finned Heater Designs for Air-Cooled Extruder Systems

Aluminum Finned Cast-In Band Heaters are used as an alternative to Liquid Cooled Cast-In Band Heaters for heating and cooling the barrels of plastic extruders.

As a standard, Finned Cast-In Band Heaters are manufactured in aluminum alloys because this material provides very good thermal conductive properties. For applications requiring higher operating temperatures and/or higher watt densities, bronze or brass alloys can be used.

Precision machining of the inside diameter yields superior heat transfer between the heater and the machine barrel, thereby ensuring uniform heating and cooling of the extrusion process. The heaters are secured to the barrel either by Stainless Steel Clamp Bands or by means of Bolt Clamping the heater halves together.

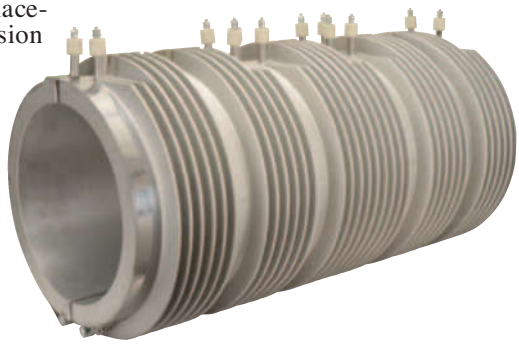
Finned Cast-In Band Heaters can be designed to meet the mechanical and physical constraints of existing extruder shroud systems. They are manufactured for Original Equipment Manufacturers (OEM) and maintenance (MRO) applications to customer specifications.

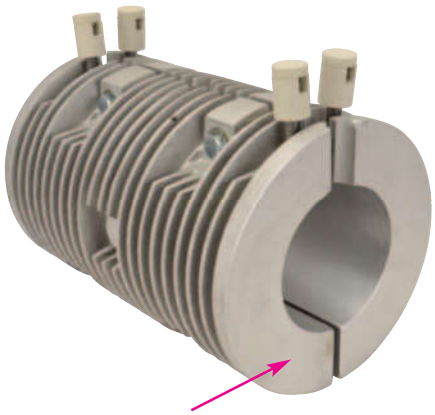
Finned Cast-In Heater End Types

Type FS1 — Finned Cast-In Heater without Side Flanges

These cast-in band heaters are normally made to be used in conjunction with the Cool to-the Touch and Multi-Versal Shroud Systems. They can also be used as stand alone replacements for other heating and cooling extrusion systems.

The standard mounting method for these designs is bolt clamping. An alternative mounting method is to use stainless steel straps. Type "T" screw terminals are the standard termination. For other termination styles see pages 3-54 and 3-55.





Type FS2 — Finned Cast-In Heater with Side Flanges

These cast-in band heaters are normally made to be used in conjunction with the Arctic Cast Shroud System. They can also be used as stand alone replacements for other heating and air cooling extrusion systems.

The standard mounting method for these designs is bolt clamping. An alternative mounting method is to use stainless steel straps. Type "E" screw terminals are the standard termination. For other termination styles see pages 3-54 and 3-55.

Ordering Information

See Page 3-47 for complete Ordering Information.

Stock and Standard (Non-Stock) Finned Aluminum Cast-In Band Heaters for Extrusion Processing

- *Standard Sizes and Ratings Listed by Extruder Size*
- *These Sizes and Ratings are among the most commonly used. They will provide the shortest delivery times.*

Stock Items Are Shown In RED

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Clamping Type	Heater End Type (pg 3-44)	Cast-In Heater Part Number
2.25	4	5.5	Bronze	600	230	1	R	Bolt	FS2	CBH12388
3	4.75	7.5	Bronze	1000	230	1	R	Bolt	FS2	CBH12387
3.75	8	9.875	Alum 319	1350	207	1	S	Bolt	FS2	CBH10404
4	8	8.75	Alum 443	2000	230	1	S	Strap	FS1	CBH09461
4	8	9	Alum 319	1500	230	1	S	Strap	FS1	CBH08712
4	8	11	Alum 319	1850	230	1	S	Strap	FS1	CBH08713
4.375	8.25	12.25	Alum 319	2000	230	1	R	Strap	FS1	**CBH01139**
4.5	8.25	12.5	Alum 319	2500	190	1	C4	Bolt	FS2	CBH14634
4.5	8.5	12	Alum 319	2750	240	1	R	Bolt	FS2	CBH06640
4.5	8.5	12	Alum 319	2750	200	1	R	Bolt	FS2	CBH08651
4.5	9	11.5	Alum 319	2000	230	1	S	Strap	FS1	CBH05533
4.921	8.421	9	Bronze	2500	480	3	C4	Strap	FS1	CBH08576
4.922	7.5	5.906	Alum 319	1630	230	1	T7	Bolt	FS2	CBH10044
4.922	7.5	7.087	Alum 319	2180	230	1	T7	Bolt	FS2	CBH10045
5	7.75	12.75	Alum 319	2625	200	1	R	Bolt	FS2	CBH11859
5	9	13	Alum 319	2750	240	1	S	Strap	FS1	CBH12840
5.002	9.25	12.25	Alum 319	2000	240	1	T	Strap	FS1	CBH03319
5.5	8.75	12.5	Alum 319	2800	600	1	S	Bolt	FS1	CBH07945
5.5	8.75	12.5	Alum 319	2800	460	1	S	Bolt	FS1	CBH07952
5.5	8.75	12.5	Alum 319	2800	240	1	S	Bolt	FS1	CBH10362
5.5	9.5	12	Alum 319	2300	240	1	S	Strap	FS1	CBH06724
5.5	9.5	12.5	Alum 319	2800	240	1	S	Bolt	FS2	CBH04982
5.5	9.5	12.5	Alum 319	2800	415	1	S	Bolt	FS2	CBH12906
6	10.5	11.5	Alum 319	2700	230	1	S	Strap	FS1	CBH02588
6	10.5	14.5	Alum 319	3500	230	1	T7	Strap	FS1	CBH02432
6.25	10.25	6.25	Alum 319	1400	200	1	S	Bolt	FS2	CBH08653
6.25	10.25	6.25	Alum 319	1700	240	1	R	Bolt	FS2	CBH06373
6.25	10.25	13.688	Alum 319	3000	230	1	R	Strap	FS2	**CBH01406**
6.25	10.25	17.75	Alum 319	5800	240	1	R	Bolt	FS2	CBH06623
6.25	11.25	15.875	Alum 319	5000	230	1	S	Bolt	FS1	CBH03365
6.3	9.55	15.75	Alum 319	5000	240	1	C4	Strap	FS1	CBH03793
6.3	9.55	15.75	Alum 319	5000	380	1	S	Strap	FS1	CBH11795
6.3	10.05	15.75	Alum 319	5000	380	1	S	Bolt	FS1	CBH12907
6.3	10.05	15.75	Alum 319	5000	415	1	S	Bolt	FS1	CBH12908
6.3	10.05	15.75	Alum 319	5000	440	1	S	Bolt	FS1	CBH12668
6.5	9.5	15	Alum 319	3250	230	1	T7	Bolt	FS1	CBH14207
6.5	9.5	17.5	Alum 356	3400	230	1	T	Bolt	FS2	CBH07553
6.5	10.5	13	Alum 319	4300	230	1	E	Bolt	FS2	CBH09631
6.5	10.5	13	Alum 319	4300	190	1	E	Bolt	FS2	CBH09424
6.6	10.625	14.75	Alum 319	3250	240	1	S	Strap	FS1	CBH07649
6.625	9.875	18	Alum 319	4400	600	1	S	Bolt	FS1	CBH07946
7	10.25	18	Alum 319	6000	290	3	E	Strap	FS2	CBH09420
7.5	11	16.5	Bronze	5100	230	1	R	Strap	FS2	CBH11105
7.5	11.25	19	Alum 319	8000	380	1	S	Bolt	FS1	CBH12447

Key for Abbreviations found under the Termination Column

- **C4** = Screw Terminal with Ceramic Cover
- **E** = Right-Angle Lug
- **F** = Flexible Lead Wire
- **R** = 90° Blockhead Screw Terminal
- **R1** = Flexible Armor Cable
- **R1A** = Stainless Steel Wire Overbraid
- **R2** = Blockhead Screw Terminal
- **S** = Screw Terminal with Heavy Duty Ceramic Insulator
- **T** = Screw Terminal with Mica Insulator
- **T7** = Screw Terminal with Ceramic Insulator

CONTINUED

Made in USA

Standard (Non-Stock) Finned Aluminum Cast-In Band Heaters for Extrusion Processing

Continued from previous page…

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Clamping Type	Heater End Type (pg 3-44)	Cast-In Heater Part Number
7.5	11.5	19.5	Alum 319	6000	240	1	C4	Strap	FS1	CBH10129
7.5	12	18	Alum 319	4500	230	1	S	Strap	FS2	CBH07058
7.625	11.625	14.438	Alum 319	3500	230	1	R	Strap	FS2	CBH01401
7.68	12	8.46	Alum 319	4000	230	1	R1A	Bolt	FS2	CBH10371
7.68	13.43	8.46	Alum 319	4000	230	1	R1A	Bolt	FS2	CBH07906
7.68	13.43	8.46	Alum 319	4000	230	1	C4	Bolt	FS2	CBH09690
8	12	8	Alum 319	2500	240	1	S	Bolt	FS2	CBH06574
8	12	8	Alum 319	2500	300	1	S	Bolt	FS2	CBH06144
8	12	8	Alum 319	2850	240	1	S	Bolt	FS2	CBH06642
8	12	10	Alum 319	3550	240	1	R	Bolt	FS2	CBH06643
8	12	17.5	Alum 319	4600	575	3	S	Bolt	FS1	CBH08418
8	12	20	Alum 319	5600	240	1	S	Bolt	FS2	CBH11002
8	12.01	12.625	Alum 319	2875	240	1	R	Bolt	FS2	CBH13795
8.25	12.25	16	Alum 319	7000	230	3	E	Bolt	FS2	CBH10653
8.25	12.25	16	Alum 319	10000	200	3	R1	Bolt	FS2	CBH11081
8.268	11.504	21.457	Alum 319	7500	240	3	C4	Strap	FS1	CBH04167
8.5	11	12.75	Alum 319	4500	460	3	S	Bolt	FS1	CBH12389
8.5	11.5	20.5	Alum 319	6300	240	3	T	Bolt	FS1	CBH10923
8.5	11.75	10	Alum 319	4425	190	3	E	Strap	FS2	CBH14903
8.5	12	8.5	Alum 319	2750	230	1	S	Strap	FS1	CBH05417
8.5	12.25	6	Alum 356	2250	230	1	S	Bolt	FS1	CBH13082
8.502	13.5	12.75	Alum 319	4500	415	3	S	Bolt	FS1	CBH09902
8.502	13.5	12.75	Alum 319	4500	480	3	S	Bolt	FS1	CBH07212
9.5	12.5	27.25	Alum 319	12000	230	3	T	Bolt	FS1	CBH09759
9.5	13	5	Alum 319	2250	480	1	R2	Bolt	FS2	CBH14691
9.5	13.25	25.5	Alum 319	15000	380	1	S	Bolt	FS1	CBH12448
9.5	13.75	20.5	Alum 319	6000	575	3	E	Bolt	FS1	CBH10947
9.502	14.5	13	Alum 319	5250	480	3	T7	Bolt	FS2	CBH07231
9.75	13.25	21.25	Alum 319	7500	480	3	T	Bolt	FS1	CBH14419
9.75	13.25	25	Alum 319	9000	230	3	T	Bolt	FS1	CBH10138
9.75	13.75	17.75	Alum 319	7500	230	1	S	Bolt	FS1	CBH07658
9.75	13.75	22	Alum 319	7000	230	1	C4	Bolt	FS2	CBH10177
9.75	13.75	22	Alum 319	11000	200	3	F	Bolt	FS2	CBH11080
9.75	13.875	23.875	Alum 319	6000	230	1	R	Strap	FS2	CBH02945
9.75	14	19.438	Alum 319	6000	230	1	R	Strap	FS2	CBH01262
9.84	14.156	6.06	Alum 319	4000	230	1	R1A	Bolt	FS2	CBH10372
9.875	13.875	8.5	Alum 319	3500	240	1	R	Bolt	FS2	CBH06644
10	13	8	Alum 319	4600	240	1	T	Bolt	FS2	CBH06570
10.039	13.289	12.992	Alum 319	6000	230	3	C4	Strap	FS1	CBH04738
10.623	13.625	13.75	Alum 319	3000	480	1	T	Strap	FS1	CBH11140
12.25	18.5	11.563	Alum 356	5500	460	1	R1A	Bolt	FS1	CBH11575
13	17	7	Alum 319	3450	190	1	R	Bolt	FS2	CBH09810
13	17	7	Alum 319	3450	240	1	R	Bolt	FS2	CBH06583
15.75	20.875	3.25	Alum 319	2000	282	1	F	Bolt	FS2	CBH10084
18.897	24.02	3.346	Alum 319	2250	266	1	F	Bolt	FS2	CBH10224

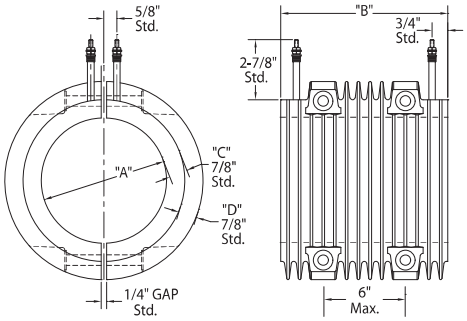
Key for Abbreviations found under the Termination Column

- **C4** = Screw Terminal with Ceramic Cover
- **E** = Right-Angle Lug
- **F** = Flexible Lead Wire
- **R** = 90° Blockhead Screw Terminal
- **R1** = Flexible Armor Cable
- **R1A** = Stainless Steel Wire Overbraid
- **R2** = Blockhead Screw Terminal
- **S** = Screw Terminal with Heavy Duty Ceramic Insulator
- **T** = Screw Terminal with Mica Insulator
- **T7** = Screw Terminal with Ceramic Insulator

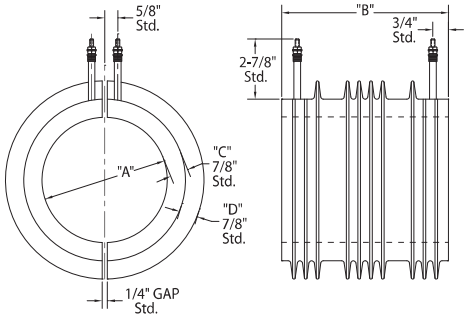
Note: For Sizes and Ratings not listed, Tempco will manufacture a Cast-In Heater to your specifications. See page 3-47 for how to order.

Cast-In Finned Band Heaters Quote Request Form

Finned Cast-In Band Heater Bolt Clamping



Finned Cast-In Band Heater Strap Clamping



Recommended dimensions shown.

Ordering Information

To process your order or quotation, please specify the following information.

Dimensions
Inside Dia. "A" _____ Length "B" _____
Thickness "C" _____ Fin Height "D" _____

Material Specifications
❒ Aluminum ❒ Bronze ❒ Brass

Heater End Type
❒ Type FS1 ❒ Type FS2
(See page 3-44 for details.)

Clamping Style
❒ Straps ❒ Bolt Clamp

Electrical Specifications
Watts each half _____ Volts each half _____ Phase _____

Terminal Style
❒ "S" Post Terminals ❒ "T" Mica Washers ❒ "T7" Post Terminals
❒ "F" Plain Leads ❒ "TS" Leads and Shrink Sleeve
❒ "C4" Ceramic Cover ❒ "R1" Armor Cable Leads
❒ "E" Right-Angle Lugs ❒ Other: See pages 3-54 and 3-55 for additional terminations

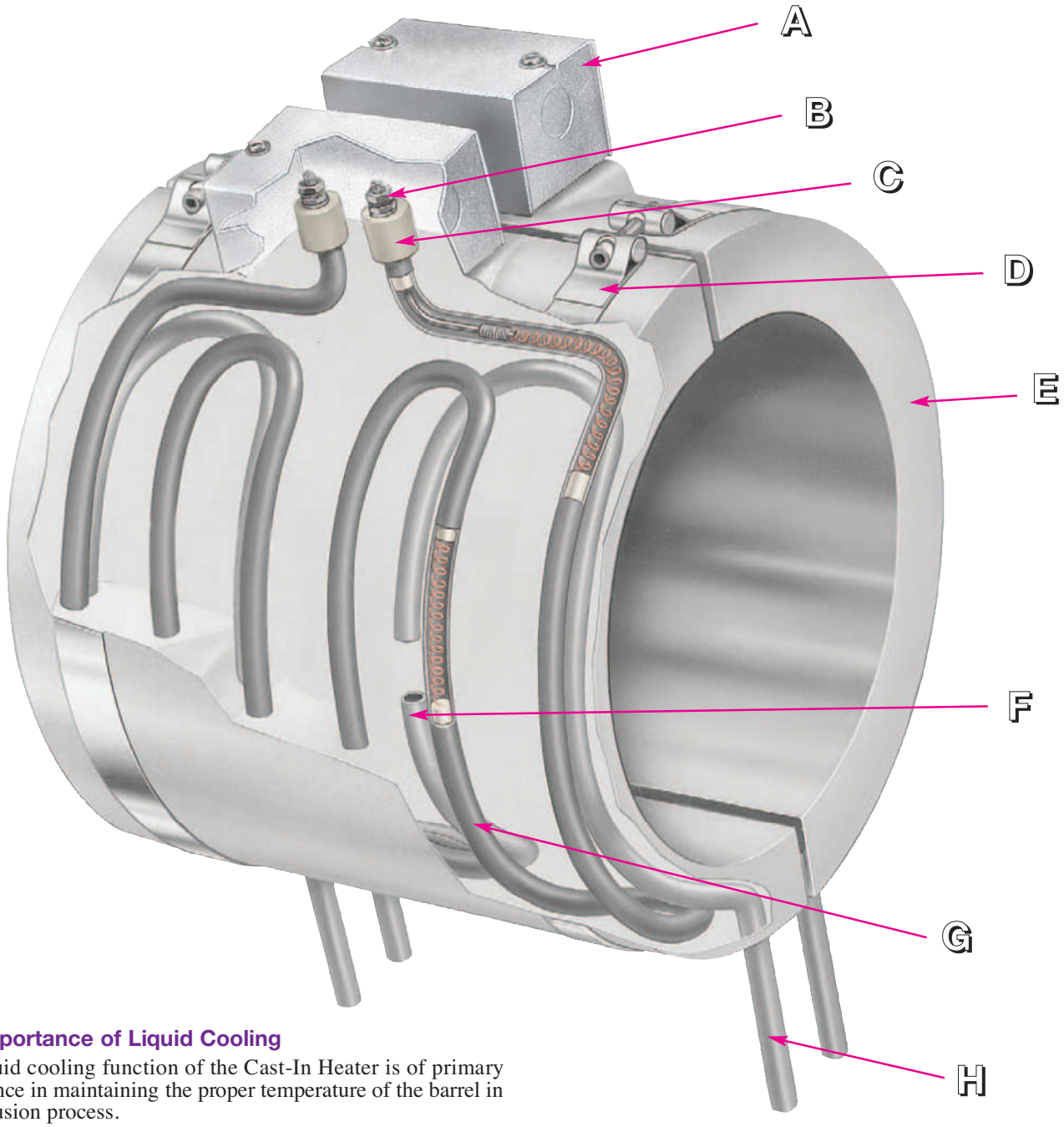
Surface Finish
125 RMS Standard or to Customer Specifications

Special Cast-In Features
Holes, Cutouts, Slots, Bevels, Mounting Studs, Stand-Offs and Taper Angles
For special features a detailed drawing is required.

Note: For additional cooling, fin castings can be designed with cooling tubes. Consult Tempco with your requirements.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Reasons Why OEMs Specify Tempco's Quality Liquid-Cool Cast-In Aluminum Heaters



The Importance of Liquid Cooling

The liquid cooling function of the Cast-In Heater is of primary importance in maintaining the proper temperature of the barrel in the extrusion process.

Tempco offers many different liquid cooling variations, styles and terminations. The following pages will assist you in selecting the liquid cooling system best suited to your application. See page 3-63 for complete details on how to order.

THE PERFORMANCE FACTS

A General purpose stainless steel terminal boxes provide a simple and economical way to eliminate exposure to live electrical terminals. To simplify electrical wiring, the box has two knockouts for standard 1/2" BX cable connectors. Boxes can be supplied factory prewired with high temperature lead wire protected with armor cable or wire braid. Other boxes are available to accommodate your requirements. See pages 3-56 and 3-57.

B Threaded post terminals with 10-32 threads are securely fastened to the tubular heating element cold pin, assuring positive electrical contact for maximum amperage carrying capacity. Other terminations are available to accommodate your requirements. See pages 3-54 and 3-55.

C The standard Type "S" terminal has specially designed ceramic insulators that provide support to the screw terminals. The tubular heater is recessed into the insulator to help prevent the screw terminals from bending or breaking from mechanical abuse. Other specially designed ceramic insulators are available for the screw terminals and the connecting wire. See page 3-54.

D Specially designed, low expansion 430 stainless steel clamping straps with 1/4"-20 socket head cap screws and barrel nuts, in either 3/4" or 1-1/4" widths, are supplied as our standard method for securing the casting to the barrel. The number and width of the straps is determined by the length and weight of the heater. For optional bolt and nut clamping design see page 3-50.

E Having an in-house foundry gives us the flexibility to apply sound foundry techniques to control the quality of each casting. Specially designed steel and cast iron molds are used in our Permanent Mold Casting Process, producing a dense casting, free of internal voids with smoother as-cast surfaces. When casting small quantities, the No-Bake Sand Mold process is used. This process produces a better quality casting than other sand processes. The inside diameter of all Cast-In Band Heaters is machine finished to customer specifications.

Processing aluminum castings using a Permanent Mold.

F A critical consideration in the design of a heat and liquid cooled Cast-In Heater is the cooling tube itself, since cooling tube failures usually occur before heating element failures. Tempco has devoted many years of research and testing to select alloy tubes that are resistant to corrosion, and that will also withstand the continuous stress that is placed on the cooling tube. Our testing also included developing the proper tube forming techniques to limit the effects of thermal shock from repetitive heat/cool cycling that can produce stress cracking, especially at the point the cooling tube exits the casting.

Processing aluminum castings using a Sand Mold.

G To maintain lower watt densities important for good heater life, the largest possible diameter steel sheath tubular heater is used. Tempco most commonly uses a .430 diameter element with 1/8" diameter cold pins. This pin size allows installation of larger and stronger screw terminal connections, providing additional strength to prevent broken terminals due to mechanical abuse.

H Cooling tube extensions can be cut to your specified length, with various types of tube fittings factory installed. The casting can also be supplied with non-exposed cooling tube fittings, which reduce cooling tube failure due to stress corrosion cracking. For a complete selection of cooling tube terminations see page 3-52.

Made in USA

Liquid-Cooled Cast-In Band Heaters for Extrusion Processing

Single Set of Cooling Tubes—The Industry Standard

The single set cooling tube design features 1/4", 3/8" or 1/2" diameter tubing precisely formed into a serpentine or any other suitable shape and cast into the body of the Cast-In Heater. This is the most widely used method for providing a means of cooling in liquid-cooled Cast-In Heaters.

From this basic design, the user can choose to factory equip the cooling tubes with any of the cooling tube termination options shown on page 3-52. Electrical termination options are shown on pages 3-54 and 3-55. The two most common clamping variations are shown below.

Type CW—Single Cooling Tube with Strap Clamping

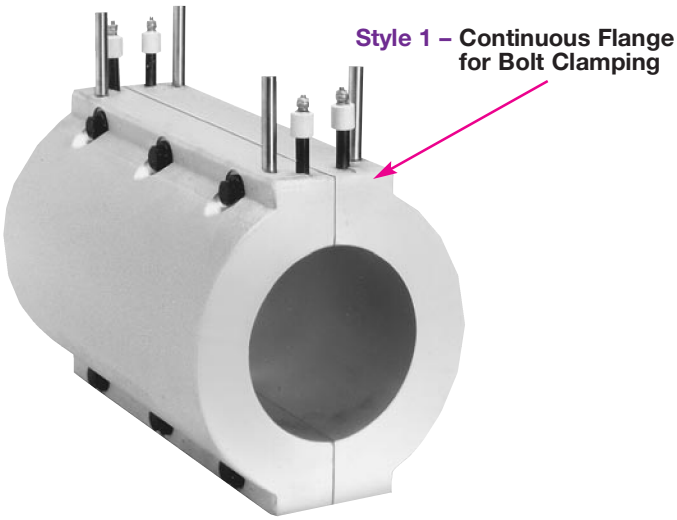
Type CW Cast-In Band Heaters consist of liquid cooled and/or heating functions, and are secured to the extruder barrel with 3/4" or 1-1/4" wide low expansion stainless steel clamping straps with 1/4"-20 socket head cap screws and barrel nuts.

If not otherwise specified, supplied with Type S electrical screw termination, 3" long cooling tube extensions and straps for clamping. For a wide selection of electrical and cooling tube termination options, see pages 3-52 through 3-55. See page 3-63 for complete details on how to order.

Type CWB—Single Cooling Tube with Bolt Clamping

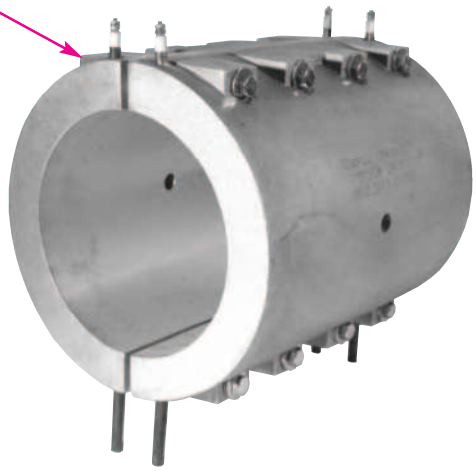
Type CWB Cast-In Band Heaters consist of liquid cooled and/or heating functions, and are secured to the barrel by bolts clamping the two halves together around the barrel. A variety of bolt clamping designs and hardware is available. Consult Tempco with your specific requirements.

If not otherwise specified, cast-in band heaters are supplied with Type S electrical screw termination and 3" long cooling tube extensions. For a wide selection of electrical and cooling tube termination options, see pages 3-52 through 3-55. See page 3-63 for complete details on how to order.



Style 1 – Continuous Flange for Bolt Clamping

Style 2 – Segmented Pads for Bolt Clamping



Liquid-Cooled Cast-In Band Heaters for Extrusion Processing

Type CWW — Dual Set of Cooling Tubes within the Same Cast-In Heater

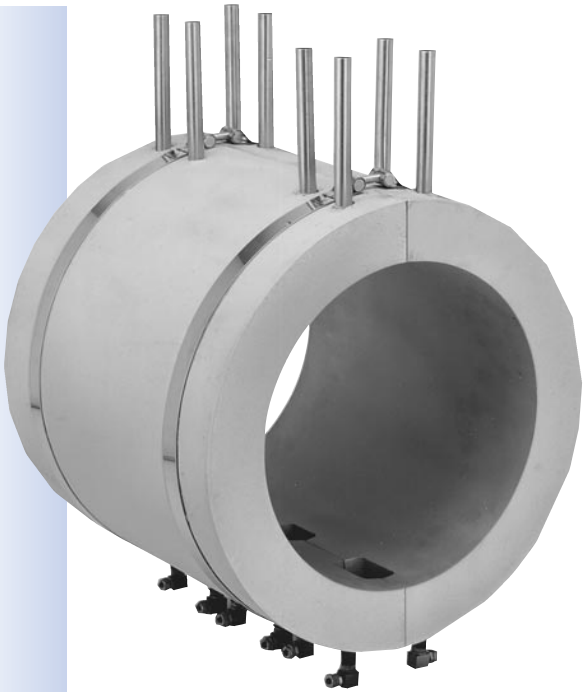
The Dual cooling tube design incorporates two sets of 3/8" or 1/2" diameter tubing formed into a serpentine or any other suitable shape within the same Cast-In Heater. Dual cooling tubes will actually double the operating life of a Cast-In Heater with liquid-cool function, since cooling tube failures usually occur before heating element failures.

There are two main causes for failure on liquid-cooled Cast-In Heaters: Stress corrosion cracking at the exiting point of the tube extensions and clogged lines due to scale build-up that reduces flow, decreasing cooling capacity and finally completely blocking the tube. Once the first set of cooling tubes has failed, reconnect to the spare set and you are back in operation, thus eliminating costly downtime and additional labor for heater replacement. Dual cooling tubes are also used when additional cooling capacity is required.

Cooling tube extensions can be factory equipped with your choice of fittings. Clamping styles are low thermal expansion alloy straps or bolt clamping. If not otherwise specified, supplied with Type S electrical screw termination, 3" long cooling tube extensions and straps for clamping. For a wide selection of electrical and cooling tube termination options, see pages 3-52 through 3-55. See page 3-63 for complete details on how to order.

Design Features

- *Double operating life*
- *Greater reliability*
- *Reduces costly downtime*
- *Better cooling capacity*
- *Reduces heater replacement inventory*
- *Various heater terminations*
- *Available in Bolt Clamping and Strap Clamping*
- *Made to customer specifications*



Type RC — Non-Exposed Cooling Tubes Recessed NPT Fittings

The recessed cooling tube design incorporates 3/8" or 1/2" diameter tubing formed into a serpentine or any other suitable shape with specially designed stainless steel NPT fittings that are welded to the tube ends and cast below the surface of the Cast-In Heater, thus eliminating the troublesome, commonly used tube extensions as they exit the casting for connection to the coolant lines.

Non-exposed fittings will drastically increase the operating life of a Cast-In Heater with liquid cool function, as this feature eliminates broken and/or damaged cooling tube extensions which are a major factor in premature heater failure. Type RC fittings are available in two female NPT thread sizes, 3/8"-18 and 1/2"-14. Standard clamping styles for Cast-In Band Heater sets are low thermal expansion alloy straps or bolt clamping. Specify fitting thread size and clamping style when ordering. If not otherwise specified, supplied with Type S electrical screw termination and straps for clamping. For fittings with special thread size, consult Tempco with your requirements. See page 3-63 for complete details on how to order.

Design Features

- *Quick and easy installation*
- *Exceptionally longer Cast-In Heater life*
- *Reduces costly downtime*
- *Greater reliability*
- *Rugged, durable construction*
- *Available on all cooling tube sizes*
- *Available in Bolt Clamping and Strap Clamping*
- *Made to customer specifications*

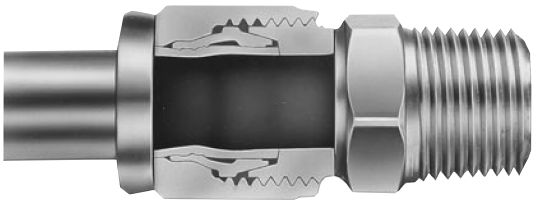
Made in USA

Cooling Tube Termination Options for Liquid-Cooled Cast-In Band Heaters

Type FF Flared Seal Fittings

Brass flared seal fittings are well adapted for low to medium pressure and resistant to mechanical pullout. Available for 3/8" and 1/2" diameter tubing with SAE 45° flare.

Diameter Tubing	Thread	Part Number
3/8"	5/8"-18	FTG-124-101
1/2"	3/4"-16	FTG-124-104



Type HS Hi-Seal Fittings

Hi-seal brass fittings are highly dependable under the most adverse conditions. For reliable and trouble-free service with ease of installation, we strongly recommend hi-seal fittings. Available for 3/8" and 1/2" diameter tubing. Male thread is 1/2" NPT for 1/2" tube and 3/8" tube.

Diameter Tubing	Part Number
3/8"	FTG-118-124
1/2"	FTG-118-116

Type RA 90° Copper Elbow

90° copper elbow is brazed to the Cast-In Heater cooling tube extension with additional tube extension for connecting cooling lines with compression and/or flared fittings. Available for 3/8" and 1/2" diameter tubing. If required, specify.

Diameter Tubing	Part Number
3/8"	FTG-127-102
1/2"	FTG-127-103

Type RT Cast Brass 90° Threaded Elbow

90° threaded elbow is brazed to the cooling tube extension, providing an easy and quick method for connecting cooling lines. Recommended to be factory installed to assure good braze seals. Available for 3/8" and 1/2" NPT internal threads. If required, specify.

Diameter Tubing	NPT	Part Number
1/2"	3/8"	FTG-125-101
1/2"	1/2"	FTG-125-102

Type R3 Straight Threaded Copper Fitting

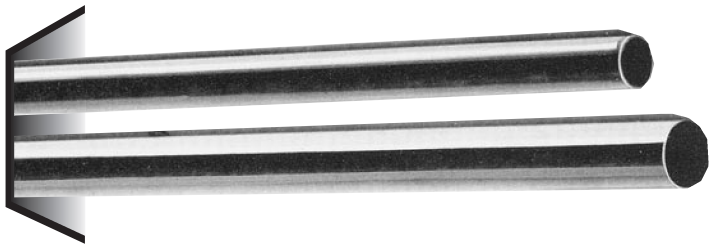
Straight threaded fitting is brazed to the cooling tube extensions, providing an easy and quick method for connecting cooling lines. Recommended to be factory installed to assure good braze seals. Available for 3/8" and 1/2" diameter tubing with internal threads. If required, specify.

Diameter Tubing	NPT	Part Number
3/8"	3/8"	FTG-131-103
1/2"	3/8"	FTG-131-102
1/2"	1/2"	FTG-131-101

Installation Accessories for Liquid-Cooled Cast-In Band Heaters

Stock Tubing for Cooling Lines

Cooling Line Tubing can be used to connect the Tempco Cast-In heat/cool bands to the plumbing system of your extruder. Tubing is available in 6'8" lengths for U.P.S. shipments and up to 20' lengths for truck shipments. Barlow's formula below was used to calculate Working Pressure in the table.



$$\text{Maximum Working Pressure (PSIG)} = \frac{2 \times \text{Material Strength (PSI at Room Temperature)} \times \text{Wall Thickness of Tube (in)}}{\text{OD of Tube (in)} \times \text{SF (Safety Factor of 1.5 to 10 depending on application)}}$$

Tubing Diameter (in)	Material	Wall Thickness (in)	Burst Pressure (PSI)	Working Pressure (Safety Factor 4) (PSI)	Material Strength (PSI)	Volume (in^3/ft)	Part Number
1/4	304 SS	0.028	11200	2800	75000	0.3547	TUB-101-130
3/8	304 SS	0.035	14000	3500	75000	0.8767	TUB-101-108
1/2	304 SS	0.049	14700	3675	75000	1.5231	TUB-101-110
1/2	304 SS	0.065	19500	4875	75000	1.2903	TUB-101-122
1/2	Incoloy	0.049	17052	4263	87000	1.5231	TUB-111-108

Flexible Teflon® Wire Braided Hose

Flexible Teflon® Wire Braided Hose provides an excellent means of connecting Cast-In Heaters to the extruder plumbing system. This style of hose meets the demands of medium to tight bending radius requirements. The stainless steel braid protects the Teflon® hose from any harsh mechanical conditions that may be present.

A variety of brass male and female threaded fittings can be incorporated onto the hose, making it a practical choice for use in conjunction with Tempco's Style RC Non-Exposed Fittings and other available fittings.

Rigid brass adapter fittings as listed below are used to mate the base hose assembly to your existing installation. This allows for the installation of the rigid NPT coupling into the plumbing system and then attaching the swivel fitting on the hose, making assembly relatively easy. Remember to use Teflon® tape or equivalent.

Standard Hose: Size 8 (1/2") .405" I.D., .549" O.D.

Operating Pressure: 2000 PSI

Burst Pressure: 8000 PSI

Ordering Information

The standard hose assemblies are supplied with 1/2" female 37° SAE flare swivel style crimped-on fittings. The hose assemblies can be ordered in 6" increments starting at 18" minimum. Fitting material is Brass.

Part Number*

WHT05 ☐☐☐

*Complete the Part Number with length of hose in 6" increments starting at 18" (018).

Standard lead time is 2 weeks or less.

Adapter Fittings for Flexible Teflon® Wire Braid Hose

Rigid brass adapter fittings are used to mate the base hose assembly to your existing installation.

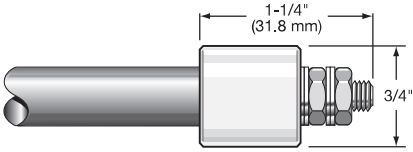
T1	T2	Part Number
½" male 37° SAE flare	½"-14 NPT male	FTG-161-103
½" male 37° SAE flare	½"-14 NPT female	FTG-161-102
½" male 37° SAE flare	⅜"-18 NPT male	FTG-161-104
½" male 37° SAE flare	⅜"-18 NPT female	FTG-161-105

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

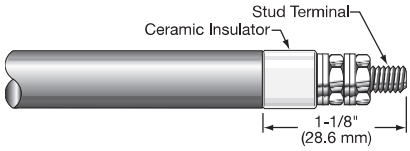
Standard Tubular Heater Terminations for Cast-In Heaters

Select the termination style that meets your requirements for space, accessibility and reliability.



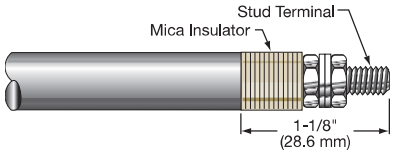
Type S Standard Unless Otherwise Specified

Heavy Duty Ceramic Insulators.
.315" diameter heater has 8-32 screw terminals.
.430" diameter heater has 10-32 screw terminals.



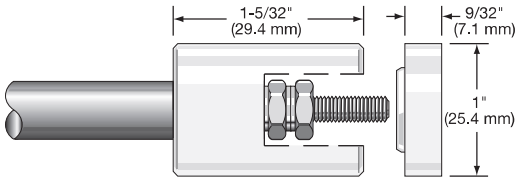
Type T7

Ceramic insulator is the same diameter as the heating element.
.260" diameter heater has 6-32 screw terminals.
.315" diameter heater has 8-32 screw terminals.
.430" diameter heater has 10-32 screw terminals.



Type T

Mica insulator is the same diameter as the heating element.
.260" diameter heater has 6-32 screw terminals.
.315" diameter heater has 8-32 screw terminals.
.430" diameter heater has 10-32 screw terminals.



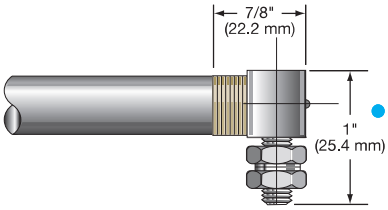
Type C4

Heavy duty ceramic insulator with terminal cover.
.315" diameter heater has 10-32 screw terminals.
.430" diameter heater has 10-32 screw terminals.

TYPE P—Plain Pin

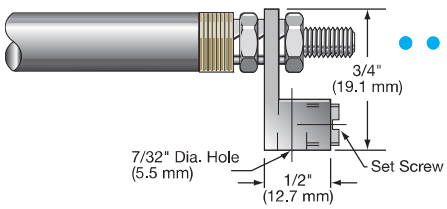
Plain terminal pin. Specify Length "L." Standard 1/2" (12.7 mm) pin length.

Element Diameter		Nominal Pin Diameter	
in	mm	in	mm
.260	6.6	.091	2.3
.315	8.0	.100	2.5
.430	10.9	.120	3.0



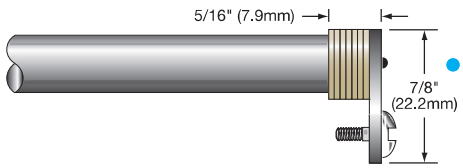
Type R

Mica washers with 90° blockhead screw terminal with 10-32 screw threads. Available for .315" and .430" diameter heaters.



Type R2

Mica washers with blockhead and through hole for lead wire connection. Eliminates the use of ring terminals. Available for .315" and .430" diameter heaters. Accepts 6-14 gauge wire.



Type E

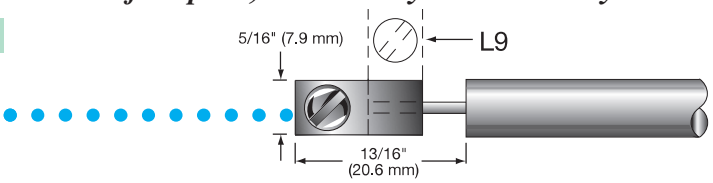
Right-angle lug welded to pin with mica washer insulators and 10-32 binding head screw. Available for .260", .315" and .430" diameter heaters.

Standard Tubular Heater Terminations for Cast-In Heaters

Select the termination style that meets your requirements for space, accessibility and reliability.

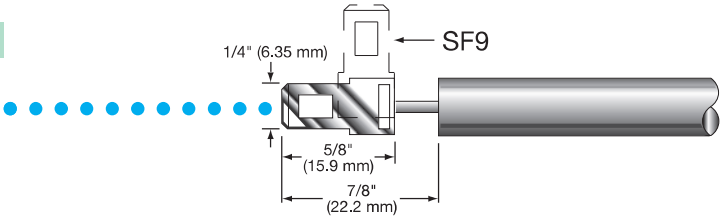
Type L & L9

Terminal lug spot welded to pin with 10-32 binding head screw. Available for .260", .315" and .430" diameter heaters. Type L represents straight; Type L9 represents 90° to pin. Specify lug orientation.



Type SF & SF9

Quick-disconnect spade tabs spot welded to pin. Available for .260", .315" and .430" diameter heaters. Type SF represents straight. Type SF9 represents 90° to pin. Specify tab orientation.



Type F

Flexible lead: insulated stranded wire crimped to cold pin. Crimp connection is insulated with fiberglass sleeving. Available for .260", .315" and .430" diameter heaters. Wire insulation rated to 250°C, 450°C optional. Specify lead length.

Type R1

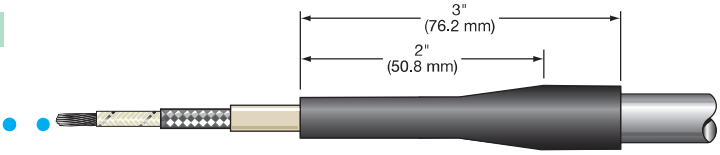
Flexible Armor Cable provides excellent protection to lead wires against abrasion and contaminants. Available for .260", .315" and .430" diameter heaters. Specify cable length and lead length. Style may vary from depiction depending on heater diameter and cable diameter used.

Type R1A

Stainless Steel Wire Overbraid provides flexibility and excellent protection to lead wires against abrasion. Available for .260", .315" and .430" diameter heaters. Specify stainless steel wire overbraid length and lead length. Style may vary from depiction depending on heater diameter and braid diameter used.

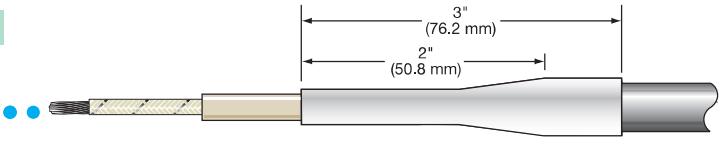
Type MR

Moisture resistant shrink strain relief and lead wire with or without stainless steel overbraid. Available for .260", .315" and .430" diameter heaters. Specify lead wire and overbraid length. Maximum operating temperature is 350°F (177°C).



Type TS

Contamination seal shrink-down Teflon® sleeving over the heater and lead wire splice. Provides a good moisture resistant seal. Maximum operating temperature 500°F (260°C). Available for .260", .315" and .430" and diameter heaters. Specify lead length.



Type P1

Quick -disconnect plug, either mounted directly on casting or on elements ends offset a specified distance from casting. Rating: 16A-250VAC.

General Purpose Terminal Protection Boxes For Cast-In Heaters

Standard Box Type C2

Terminal Boxes provide a simple and economical means to eliminate exposed heater terminals and live electrical wiring, protecting employees from potential electrical shock. They also eliminate electrical shorts that can result from exposed wiring on Cast-In Heater installations.

Type C2 is an individual terminal box for protecting the terminals on each Cast-In Band Heater half. It is also used on many other Cast-In Heater designs with one set of heater terminals. The C2 box design requires a flat pad on half-round castings or a flat surface on other casting designs for mounting. It is made from heavy gauge, rust-resistant sheet metal. The cover is removable for easy access to terminals. The box has two 7/8" diameter knockouts opposite each other for standard 1/2" BX connectors.

To simplify installation, Cast-In Heaters fitted with boxes can be factory prewired with high temperature lead wire that can be protected with armor cable. If one of these options is required, ***specify terminal box type, lead wire and cable length.*** Satisfies NEMA 1 requirements.

Standard C2 box size: L = 4" W = 2-1/2" H = 2-1/8"

Terminal Protection for Both Heater Halves Type C7

Type C7 terminal boxes are made from rust-resistant sheet metal. The C7 base is fixed to the clamping straps. The box has two 7/8" diameter knockouts opposite each other for standard 1/2" BX connectors. The cover is removable, providing easy access to the screw terminals for electrical wiring.

To simplify installation, Cast-In Heaters fitted with boxes can be factory prewired with high temperature lead wire, protected with armor cable. If either one of these options is required, ***specify terminal box type, lead wire and cable length.*** Satisfies NEMA 1 requirements.

C7 Terminal Box Size varies with dimensions of casting.

Quick-Disconnect High Temperature Cup and Box Assembly Type P2

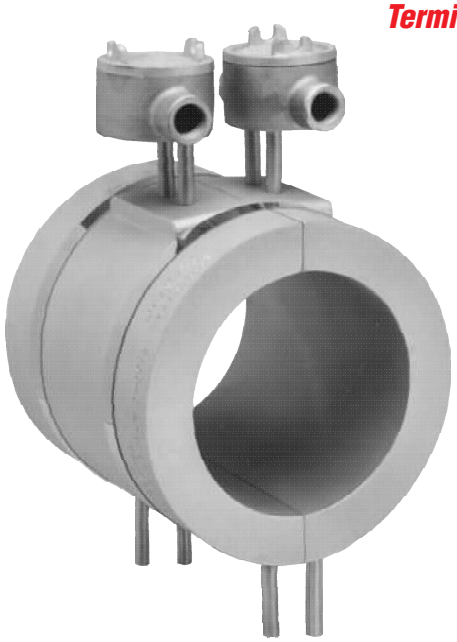
Quick-Disconnect Cup assemblies provide the simplest and safest means for applying power to any type of Cast-In Heater installation. The box extends over the screw terminals on both Cast-In Band Heater halves. The combination of prewired cup and box assembly, along with factory prewired high temperature lead wire protected with armor cable, eliminates live exposed heater terminals and electrical wiring, protecting employees from electrical shock and the possibility of electrical shorts due to exposed wiring.

If prewired plugs are required, ***specify length of lead wire and cable.***

Rated 250V maximum, 15 Amp maximum

Terminal Box Size varies with dimensions of casting.

Terminal Protection Boxes for Cast-In Heaters



Type EP Explosion and Moisture Resistant Box

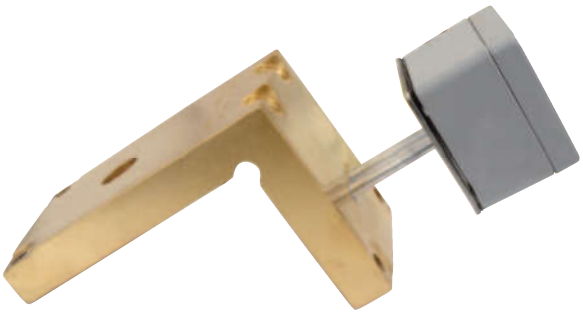
Cast iron explosion and moisture resistant boxes should be used in areas where the surrounding air may become contaminated with combustible gases or a high humidity level may exist. Installation requires one box per Cast-In Heater half and they are brazed to the tubular heater. The standard box has one 1/2" NPT hub.

Optional: Two hubs per box available. Cast-In Heater fitted with boxes can be factory prewired with high temperature lead wire, protected with special armor cable. If either of these options is required, please specify the following:

❒ Number of hubs ❒ Cable type ❒ Lead wire length ❒ Cable length

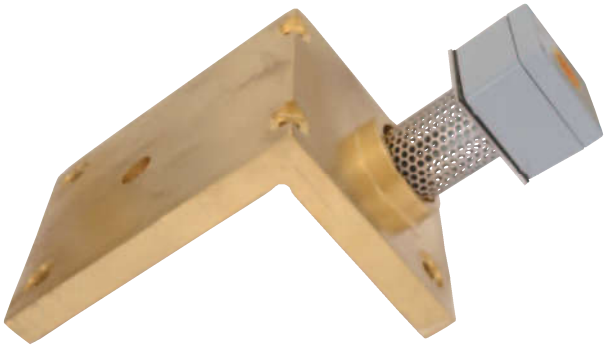
Type MPR Moisture Resistant Box

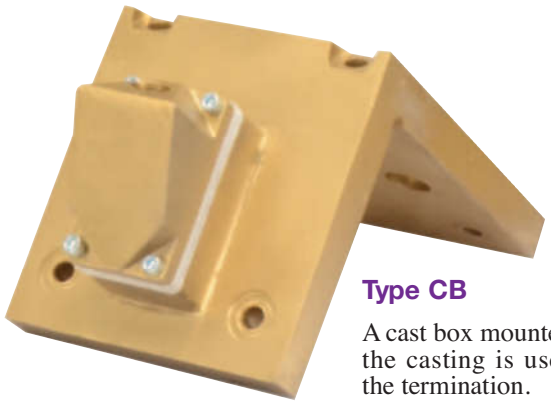
This design has a moisture resistant die cast aluminum box with a non-removable polyurethane gasket in the lid. Lid is secured with captive stainless steel screws. Body and lid are painted in basic industrial gray; interior contains copper ground screw. Box is mounted to a plate that is brazed to the element. Available in a wide variety of sizes.



Type MR1 Moisture Resistant Box with Perforated Shield

This design incorporates the MPR housing style along with a perforated tube shielding unheated extensions of the tubular heating elements. This feature provides mechanical strength to the element extension and prevents overheating of the terminals, reducing possible premature failure from corrosion and oxidation.





Type CB

A cast box mounted directly on the casting is used to protect the termination.

Exposed electrical wiring on cast-in heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Cast-In Band Heater Selection for Plastics Extrusion & Downstream Equipment

The Cast-In Band Heater listings on the following pages constitute a small segment of the thousands of Cast-In Band Heaters we have produced for plastics processing equipment. So that we may assist you in selecting the exact heater replacement for your machine, adhere to the following instructions:

1. Measure the O.D. of your barrel, which in turn will be the I.D. of the heater.
2. Measure the width of your heater.
3. Check the wattage and voltage rating per half or per segment. This information is normally stamped on the heater.
4. Establish heater cooling function, if any. If water cooled, measure length and diameter of cooling tube extensions. Cooling tube extensions are 3" long, and 1/2" × .049 O.D. wall thickness unless otherwise specified. If air cooled, Cast-In Band will have fins.
5. Check for special features such as: thermocouple clearance holes, drill and tapped holes, vent cutouts and terminal boxes.
6. There are two methods for securing a Cast-In Band Heater to a barrel: separate clamping straps or nut and bolt clamping.
7. Once you have established this information, proceed to match your heater description with one of our standard Cast-In Band Heaters. Starting with the I.D., read across the chart until you have a perfect match. Wattage can vary up to 15% either way with little or no effect to your process.

Stock and Standard (Non-Stock) Cast-In Band Heaters for Plastics Extrusion

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Terminal Box Type	Cooling Tube	Cooling Termination	Clamping	Cast-In Heater Part Number
2.25	4	17	Bronze	2000	480	1	R1	None	None	None	Strap	CBH08136
2.25	4.25	5	Bronze	1200	480	1	R1A	None	None	None	Strap	CBH08421
2.375	4.375	22	Brass	500	240	1	T7	EP	None	None	Bolt	CBH14001
2.5	4	6.25	Alum 319	750	208	1	F	None	None	None	Strap	CBH09711
2.75	4.75	2	Bronze	450	230	1	R2	None	None	None	Strap	CBH09227
3	4.5	2.5	Brass	350	120	1	E	None	None	None	Strap	CBH08847
3	4.75	4.5	Bronze	500	120	1	T7	None	None	None	Bolt	CBH05210
3	5	5.5	Alum 319	1000	230	1	T	None	None	None	Strap	CBH03097
3	5	5.5	Bronze	1000	230	1	T	None	None	None	Strap	CBH06726
3.125	4.625	3	Alum 319	400	220	1	R1	None	None	None	Strap	CBH06992
3.15	4.25	2	Brass	250	110	1	R1A	None	None	None	Strap	CBH08696
3.25	6.25	10	Alum 319	750	115	1	S	None	Single	None	Strap	CBH09445
3.5	6	17	Bronze	1250	208	1	R1	None	None	None	Strap	CBH04875
3.5	6.5	7.375	Alum 319	1500	230	1	S	None	Single	None	Strap	CBH10460
3.51	5.5	3.5	Alum 319	250	120	1	C4	None	None	None	Strap	CBH13189
3.8	6.55	3.75	Brass	1000	460	1	T7	EP	Single	HS	Strap	CBH12488

Key for Abbreviations found under the Termination Type Column

- C4 = Screw Terminal with Ceramic Cover
- E = Right-Angle Lug
- F = Flexible Lead Wire
- R = 90° Blockhead Screw Terminal
- R1 = Flexible Armor Cable
- R1A = Stainless Steel Wire Overbraid
- R2 = Blockhead Screw Terminal
- S = Screw Terminal with Heavy Duty Ceramic Insulator
- T = Screw Terminal with Mica Insulator
- T7 = Screw Terminal with Ceramic Insulator

Key for Abbreviations found under the Terminal Box Type Column

- C2 = Standard Box
- C7 = Single Box over both Heater Halves
- CB1 = Cast Aluminum Box
- EP = Explosion and Moisture Resistant
- MR1 = Moisture Proof with Perforated Shield

Key for Abbreviations found under the Cooling Termination Column

- HS = Hi-Seal Fittings
- RC = Non-Exposed Cooling Tubes/Recessed NPT Fittings

Stock and Standard (Non-Stock) Cast-In Band Heaters for Plastics Extrusion

Stock Items Are Shown In RED

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Terminal Box Type	Cooling Tube	Cooling Termination	Clamping	Cast-In Heater Part Number
3.99	5.25	4.312	Brass	600	240	1	R1	None	None	None	Strap	CBH04768
4	7	7.5	Alum 319	1000	115	1	T7	None	Single	None	Strap	CBH08859
4	7.5	7.5	Alum 319	1500	190	3	S	None	Single	RC	Strap	CBH06278
4.33	8.33	6.89	Bronze	600	230	1	C4	None	None	None	Bolt	CBH10533
4.331	5.831	6.89	Alum 319	600	230	1	C4	None	None	None	Bolt	CBH08244
4.331	8.331	6.89	Bronze	1300	230	1	C4	None	None	None	Bolt	CBH11210
4.5	6	9	Alum 356	1700	230	1	T7	None	None	None	Strap	CBH08756
4.5	7	4.375	Alum 319	810	240	1	E	None	Single	None	Strap	CBH01320
4.502	7	4.375	Bronze	810	190	1	R	None	Single	None	Strap	CBH06735
4.625	7.5	4	Bronze	1000	230	1	R1A	None	Single	None	Strap	CBH07254
4.75	6	24.25	Alum 319	N/A	N/A	N/A	N/A	None	Single	None	Strap	CBH09388
5.249	8.749	13.5	Alum 319	3750	230	3	S	None	Single	None	Strap	CBH05105
5.5	6.875	13.5	Alum 356	2250	230	1	T	None	None	None	Strap	CBH08088
5.5	6.875	18	Alum 356	3000	230	1	T	None	None	None	Strap	CBH08089
5.5	7.5	3.375	Bronze	1700	240	1	S	None	None	None	Strap	CBH04614
5.5	8	4	Alum 356	750	230	1	T	None	Single	None	Strap	CBH09056
5.5	8	8	Alum 356	1500	230	1	T	None	Single	None	Strap	CBH09278
5.5	8	13.5	Alum 319	2500	240	1	T	None	Single	None	Strap	CBH07489
5.5	8.75	5.5	Bronze	1050	200	1	R	None	Single	None	Strap	CBH06201
5.5	8.75	5.5	Alum 319	1050	230	1	R	None	Single	None	Strap	**CBH01023**
5.5	8.75	5.5	Bronze	1400	200	1	R	None	Single	None	Strap	CBH06202
5.5	9	10.5	Alum 319	3000	200	3	C4	None	Single	RC	Strap	CBH13928
6	8.5	6	Alum 356	2000	240	1	T7	C2	Single	None	Bolt	CBH14096
6.25	9.75	13.625	Alum 319	3000	230	1	R	None	Single	None	Strap	**CBH01266**
6.25	10	15.875	Alum 319	5000	230	1	S	None	Single	None	Bolt	**CBH01726**
6.299	9.45	2.56	Bronze	1250	240	1	T	MR1	Single	None	Bolt	CBH10318
6.3	8.656	14.563	Brass	5000	220	1	C4	None	None	None	Bolt	CBH06407
6.3	8.656	18.5	Brass	4500	220	1	C4	None	None	None	Bolt	CBH06409
6.3	9.813	15.75	Alum 319	5000	240	1	C4	None	Single	RC	Strap	CBH03737
6.5	8.5	4	Alum 319	900	230	1	S	None	Single	None	Strap	CBH03964
6.5	8.5	9	Alum 356	2000	230	1	T	None	Single	None	Strap	CBH09152
6.5	9	4	Alum 356	900	230	1	T	None	Single	None	Strap	CBH09049
6.5	9	8	Alum 356	1700	230	1	T	None	Single	None	Strap	CBH09050
6.5	9	11	Alum 356	2300	240	1	T	None	Single	None	Strap	CBH09129
6.5	9	18	Alum 356	3800	240	1	T	None	Single	None	Strap	CBH07310
6.5	9.75	7.75	Bronze	1800	190	1	R	None	Single	None	Strap	CBH05840
6.5	9.75	7.75	Alum 319	1800	230	1	R	None	Single	None	Strap	**CBH01066**
6.5	9.75	7.75	Bronze	2200	190	1	R	None	Single	None	Strap	CBH10749
6.5	9.75	7.75	Alum 319	2500	230	1	R	None	Single	None	Strap	CBH04401
6.5	10	8.5	Alum 319	1300	240	1	T7	None	Single	RC	Strap	CBH13353
6.5	10	11	Alum 319	1685	240	1	T7	None	Single	RC	Strap	CBH13396
6.5	10	11	Alum 356	2300	240	1	T7	None	Single	None	Bolt	CBH10742
6.5	10	18	Alum 319	2755	240	1	T7	None	Single	RC	Strap	CBH13341
6.5	10	18	Alum 356	3800	240	1	T7	None	Single	None	Bolt	CBH10741
6.5	10.5	3.281	Alum 319	1000	240	1	T7	EP	None	None	Bolt	CBH11254
6.625	10.125	6	Alum 319	1550	230	1	R	None	Single	None	Strap	CBH02138
6.625	10.125	8.5	Alum 319	2200	240	1	T	None	Single	None	Strap	CBH04393
6.635	9.875	17.5	Alum 319	4360	240	1	S	None	Single	None	Bolt	CBH06070

CONTINUED

Note: **Made-to-Order Manufacturing:**

For sizes, ratings, terminations and/or features not listed, Tempco will manufacture a Cast-In Heater to your specifications. State quantity, watts, volts and full heater description with all the appropriate specifications and features required. See Ordering Information on page 3-63.

Customer Assistance:

If you have a special application requiring a custom manufactured Cast-In Band Heater or need assistance selecting one of our standard heaters for a new or existing installation, consult Tempco with your requirements. We offer complete engineering services and support, working with you every step of the way to ensure customer satisfaction.

Made in USA

Stock and Standard (Non-Stock) Cast-In Band Heaters for Plastics Extrusion

Continued from previous page…

Stock Items Are Shown In RED

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Terminal Box Type	Cooling Tube	Cooling Termination	Clamping	Cast-In Heater Part Number
6.999	10.499	18	Alum 319	6000	230	3	S	None	Single	None	Strap	CBH05138
6.999	10.499	18	Alum 319	8000	230	3	S	None	Single	None	Strap	CBH09529
7.283	8.779	8.228	Alum 319	1300	230	1	C4	None	None	None	Bolt	CBH08232
7.283	9.659	8.228	Bronze	3700	230	1	C4	None	None	None	Bolt	CBH09953
7.5	10	4	Alum 356	900	230	1	T	None	Single	None	Strap	CBH09074
7.5	10	8	Alum 356	1700	230	1	T	None	Single	None	Strap	CBH09048
7.5	10	10	Alum 319	2150	240	1	T	None	Single	None	Strap	CBH07595
7.5	10	10	Alum 356	3225	240	1	T	None	Single	None	Strap	CBH09142
7.5	10	17.5	Alum 319	3750	240	1	T	None	Single	None	Strap	CBH12380
7.5	10	17.5	Alum 356	3750	240	1	T	None	Single	None	Strap	CBH09052
7.5	10	17.5	Alum 319	5625	240	1	T	None	Single	None	Strap	CBH12089
7.5	10	17.5	Alum 356	5625	240	1	T	None	Single	None	Strap	CBH09141
7.5	10.5	6	Alum 319	1500	230	1	C4	None	Single	None	Strap	CBH04607
7.5	10.5	10.25	Bronze	2085	200	1	S	C2	Single	None	Strap	CBH09904
7.5	10.5	10.25	Alum 319	2085	230	1	S	C2	Single	None	Strap	**CBH01079**
7.5	10.5	10.25	Alum 319	2085	230	1	S	C2	Dual	None	Strap	CBH02414
7.5	10.5	10.25	Bronze	3000	200	1	S	C2	Single	None	Strap	CBH09906
7.5	10.5	10.25	Alum 319	3000	230	1	S	C2	Single	None	Strap	**CBH03778**
7.5	11	10	Alum 319	1550	240	1	T7	None	Single	RC	Strap	CBH13274
7.5	11	10	Alum 356	2150	240	1	T7	None	Single	None	Bolt	CBH10743
7.5	11	10	Alum 356	3225	240	1	T7	None	Single	None	Bolt	CBH10768
7.5	11	16.5	Alum 319	5100	230	1	R	None	Single	None	Strap	CBH02351
7.5	11	16.5	Alum 319	5100	230	1	R	None	Single	None	Strap	CBH02878
7.5	11	16.5	Alum 319	5100	230	1	R	None	Single	RC	Strap	CBH06763
7.5	11	17.5	Alum 319	2650	240	1	T7	None	Single	RC	Strap	CBH13273
7.5	11	17.5	Alum 319	3750	240	1	R	C2	Single	None	Bolt	CBH10510
7.5	11	17.5	Alum 356	3750	240	1	T7	None	Single	None	Bolt	CBH10744
7.5	11	17.5	Alum 356	5625	240	1	S	None	Single	None	Bolt	CBH10686
7.5	11	18	Alum 319	5000	230	1	S	None	Single	None	Strap	CBH07153
7.56	11	22	Alum 319	6500	230	1	S	None	Single	None	Strap	CBH06168
7.56	11.125	18	Alum 319	4950	230	1	S	None	Single	None	Strap	**CBH02240**
7.625	11.125	12	Alum 319	2000	240	1	S	None	Single	None	Strap	CBH09378
7.625	11.125	14.375	Alum 319	3500	230	1	R	None	Single	None	Strap	**CBH01026**
7.625	11.125	14.375	Alum 319	3500	240	1	R	None	Single	None	Strap	**CBH01094**
7.625	11.125	14.375	Alum 319	3500	460	1	R	None	Single	None	Strap	CBH01206
7.625	11.125	18	Alum 319	3500	230	1	R	None	Single	None	Strap	**CBH01140**
7.625	11.125	18	Alum 319	3500	230	1	R	None	Single	None	Strap	**CBH01143**
7.625	11.125	18	Alum 319	3500	230	1	R	None	Dual	None	Strap	CBH07322
7.71	11.25	15	Alum 319	4600	220	1	S	None	Single	None	Bolt	CBH09595
8	11	11.5	Alum 319	2000	240	1	S	None	Single	RC	Strap	CBH06630
8	11	12.75	Alum 319	2875	240	1	S	None	Single	RC	Strap	CBH06647
8	11.5	9	Alum 319	1500	240	1	R	C2	Single	RC	Bolt	CBH08236
8.005	11.5	24.375	Alum 319	4500	480	1	C4	None	Single	HS	Strap	CBH09729
8.125	11.625	9	Alum 319	1500	240	1	T7	None	Single	RC	Strap	CBH13243
8.125	11.625	14	Alum 356	3275	240	3	T7	None	Single	None	Bolt	CBH10682
8.125	11.625	20	Alum 356	4675	240	3	T7	None	Single	None	Bolt	CBH10683
8.25	11.75	13	Alum 319	5500	460	1	R	None	Single	None	Strap	CBH02460
8.25	11.75	15.75	Alum 319	7000	460	1	R	None	Single	None	Strap	CBH02245

Key for Abbreviations found under the Termination Type Column

- **C4** = Screw Terminal with Ceramic Cover
- **E** = Right-Angle Lug
- **F** = Flexible Lead Wire
- **R** = 90° Blockhead Screw Terminal
- **R1** = Flexible Armor Cable
- **R1A** = Stainless Steel Wire Overbraid
- **R2** = Blockhead Screw Terminal
- **S** = Screw Terminal with Heavy Duty Ceramic Insulator
- **T** = Screw Terminal with Mica Insulator
- **T7** = Screw Terminal with Ceramic Insulator

Key for Abbreviations found under the Terminal Box Type Column

- **C2** = Standard Box
- **C7** = Single Box over both Heater Halves
- **CB1** = Cast Aluminum Box
- **EP** = Explosion and Moisture Resistant
- **MR1** = Moisture Proof with Perforated Shield

Key for Abbreviations found under the Cooling Termination Column

- **HS** = Hi-Seal Fittings
- **RC** = Non-Exposed Cooling Tubes/Recessed NPT Fittings

Stock and Standard (Non-Stock) Cast-In Band Heaters for Plastics Extrusion

Stock Items Are Shown In RED

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Terminal Box Type	Cooling Tube	Cooling Termination	Clamping	Cast-In Heater Part Number
8.268	11.768	21.457	Alum 319	7500	220	3	C4	None	Single	RC	Strap	CBH03794
8.5	12	8.75	Alum 319	2900	460	1	T7	None	Single	None	Strap	CBH07043
8.5	12	8.75	Alum 319	3000	230	1	R	None	Single	None	Strap	CBH01444
8.51	11.75	18.25	Alum 319	5900	240	3	S	None	Single	None	Bolt	CBH06068
8.661	12.244	11.024	Alum 319	3400	230	1	R1A	None	Single	RC	Bolt	CBH11606
8.666	12.25	11.625	Alum 319	3400	240	1	R1A	None	Single	RC	Bolt	CBH07586
9	12.5	12.5	Alum 319	3750	240	1	C4	None	Single	RC	Bolt	CBH09779
9.05	12.55	15.98	Alum 319	5600	230	1	R1A	None	Single	RC	Bolt	CBH08396
9.055	12.563	16	Alum 319	5750	220	1	S	None	Single	None	Bolt	CBH09999
9.312	12.625	11	Alum 319	3750	230	1	C4	None	Dual	RC	Strap	CBH07949
9.312	12.625	11	Alum 319	3750	230	1	S	C2	Single	None	Strap	**CBH01108**
9.313	12.625	11	Alum 319	3750	230	1	R	None	Single	None	Strap	CBH01273
9.313	12.625	11	Alum 319	4950	230	1	S	C2	Single	None	Strap	**CBH01133**
9.5	12	12	Alum 319	3900	230	1	T7	None	Single	None	Strap	CBH12118
9.5	12	12	Alum 356	3900	230	1	T	None	Single	None	Strap	CBH09221
9.5	12	12	Bronze	3900	230	1	T	None	Single	None	Strap	CBH11491
9.5	12	16	Alum 356	5150	240	1	T	None	Single	None	Strap	CBH09126
9.5	12	24.5	Alum 356	7850	240	1	T	None	Single	None	Strap	CBH09127
9.5	12	24.5	Brass	11750	240	1	T7	None	Single	RC	Strap	CBH08350
9.5	13	8.5	Alum 319	4000	288	1	R	None	Single	RC	Bolt	CBH12533
9.5	13	11.5	Alum 319	2575	240	1	T7	None	Single	RC	Strap	CBH13354
9.5	13	13	Alum 319	5250	460	3	S	None	Single	None	Bolt	CBH08749
9.5	13	16	Alum 319	3580	240	1	T7	None	Single	RC	Strap	CBH13342
9.5	13	16	Alum 356	5150	240	3	T7	None	Single	None	Bolt	CBH10746
9.5	13	16	Alum 356	5150	240	1	T7	None	Single	None	Bolt	CBH10767
9.5	13	16	Alum 356	7750	240	1	T7	None	Single	None	Bolt	CBH10688
9.5	13	20.25	Alum 319	7500	240	1	C4	None	Single	RC	Bolt	CBH12958
9.5	13	24.5	Alum 319	5485	240	1	T7	None	Single	RC	Strap	CBH13371
9.5	13	24.5	Alum 356	7850	240	1	T7	None	Single	None	Bolt	CBH10689
9.5	13	24.5	Alum 356	7850	240	3	T7	None	Single	None	Bolt	CBH10745
9.5	13	24.5	Alum 356	11750	240	1	T7	None	Single	None	Bolt	CBH10690
9.5	13	27.75	Alum 319	12000	230	3	S	None	Single	None	Bolt	**CBH01528**
9.5	13	27.75	Alum 319	12000	230	3	S	None	Dual	None	Strap	CBH08104
9.75	12.75	24	Alum 319	9185	240	1	S	None	Single	None	Strap	**CBH02183**
9.75	13.25	9	Alum 319	3100	230	1	R	None	Single	None	Strap	CBH01532
9.75	13.25	11	Alum 319	3500	230	1	R	None	Single	None	Strap	CBH02461
9.75	13.25	11	Alum 319	3500	250	1	R	None	Single	None	Strap	CBH02692
9.75	13.25	11	Alum 319	4500	230	1	R	None	Single	RC	Strap	**CBH03873**
9.75	13.25	12	Alum 319	4500	230	1	R	None	Single	None	Strap	CBH01453
9.75	13.375	19.438	Alum 319	6000	230	1	R	None	Single	None	Strap	**CBH01144**
9.75	13.375	19.438	Alum 319	6000	230	1	S	None	Single	None	Strap	CBH01221
9.75	13.375	23.875	Alum 319	6000	230	1	R	None	Single	None	Strap	**CBH01077**
9.76	13	12.25	Alum 319	5000	240	3	S	None	Single	None	Bolt	**CBH06069**
9.842	12.188	13.375	Brass	3500	220	1	C4	None	None	None	Bolt	CBH06408
9.875	13	8.5	Alum 319	2000	240	1	E	None	Single	RC	Strap	CBH06648
9.875	13	12.25	Alum 319	4500	240	1	S	None	Single	RC	Strap	CBH06094
9.875	13.375	8.5	Alum 319	2000	240	1	R	C2	Single	RC	Bolt	CBH08955
10	13.5	12	Alum 319	6480	230	3	S	None	Single	None	Strap	CBH05102

CONTINUED

Made-to-Order Manufacturing

For sizes, ratings, terminations and/or features not listed, Tempco will manufacture a Cast-In Heater to your specifications. State quantity, watts, volts and full heater description with all the appropriate specifications and features required. See Ordering Information on page 3-63.

Customer Assistance

If you have a special application requiring a custom manufactured Cast-In Band Heater or need assistance selecting one of our standard heaters for a new or existing installation, consult Tempco with your requirements. We offer complete engineering services and support, working with you every step of the way to ensure customer satisfaction.

Made in USA

Stock and Standard (Non-Stock) Cast-In Band Heaters for Plastics Extrusion

Continued from previous page...

Stock Items Are Shown In RED

I.D. in	O.D. in	Length in	Material	Watts Each Half	Volts Each Half	Phase	Termination Type	Terminal Box Type	Cooling Tube	Cooling Termination	Clamping	Cast-In Heater Part Number
10	13.5	12	Bronze	6480	230	3	S	None	Single	None	Strap	CBH08755
10	13.5	12	Alum 319	6480	240	3	S	None	Dual	RC	Strap	CBH07168
10	13.5	12	Alum 319	6480	290	3	S	None	Single	None	Strap	CBH05120
10.03	13.53	24.9	Alum 319	6000	480	1	C4	None	Single	RC	Strap	CBH06260
10.039	13.535	13	Alum 319	6000	220	3	C4	None	Single	RC	Strap	CBH04378
10.236	11.438	6.313	Alum 319	N/A	N/A	N/A	N/A	None	Single	None	Strap	CBH09288
10.5	14	10	Alum 319	2900	240	1	T7	None	Single	RC	Strap	CBH13499
10.5	14	21	Alum 356	11500	240	3	T7	None	Single	None	Bolt	CBH10685
10.625	12.625	10.5	Bronze	7000	480	3	T7	Rose	None	None	Strap	CBH07880
11.024	14.606	13.976	Alum 319	6050	230	1	R1A	None	Single	RC	Bolt	CBH08121
11.024	14.606	14.252	Alum 319	6250	230	1	R1A	None	Single	RC	Bolt	CBH11237
11.41	14.92	7.48	Alum 319	3313	230	1	R1A	None	Single	RC	Bolt	CBH08394
11.41	14.92	12.28	Alum 319	5425	230	1	R1A	None	Single	RC	Bolt	CBH08395
11.5	14.75	11.625	Alum 319	4700	230	1	S	C2	Single	None	Strap	**CBH01136**
12	15.5	11.5	Alum 319	4500	240	1	C4	None	Single	RC	Bolt	CBH09363
12.25	16.5	12.25	Alum 319	5500	230	1	S	None	Dual	None	Bolt	CBH06827
12.25	16.5	12.25	Alum 319	5500	230	1	S	None	Dual	RC	Bolt	CBH12665
12.5	16	11	Alum 319	7500	460	1	T7	C2	Single	RC	Strap	CBH10490
12.5	16	14	Alum 319	7500	460	1	T7	C2	Single	RC	Strap	CBH10489
12.5	16	14	Bronze	10000	460	1	S	None	Single	None	Strap	CBH02869
12.5	16	15	Alum 319	8750	240	1	R	None	Single	None	Strap	CBH01731
12.5	16	28	Alum 319	15000	480	3	S	None	Single	RC	Bolt	CBH07693
12.598	13.85	9.449	Alum 319	N/A	N/A	N/A	N/A	None	Single	None	Strap	CBH09287
12.598	16.181	16.653	Alum 319	8400	230	1	R1A	None	Single	RC	Bolt	CBH08122
12.996	16.5	13.75	Alum 319	6750	460	1	R	None	Single	None	Strap	CBH10840
13.5	17.25	26.5	Alum 319	10000	460	1	R	None	Single	HS	Strap	CBH01685
14	17.5	13.75	Alum 319	6250	240	1	C4	None	Single	RC	Bolt	CBH14211
14.567	18.189	17.874	Alum 319	10500	460	3	T7	Rose	Single	RC	Bolt	CBH10043
15	18.5	10	Alum 319	5500	240	1	S	None	Dual	None	Strap	CBH03477
15.354	17.354	4	Bronze	3000	240	1	R1A	CB1	None	None	Bolt	CBH08619
15.354	17.354	6	Bronze	3500	240	1	R1A	CB1	None	None	Bolt	CBH08618
15.75	17.75	2.5	Bronze	2800	240	1	T7	EP	None	None	Strap	CBH09753
16.142	18.142	7.875	Alum 319	6875	480	3	R1A	None	None	None	Strap	CBH10563
20.669	22.669	2	Alum 319	2500	220	1	S	C7	None	None	Strap	CBH04057
27	30	4	Alum 319	5000	480	1	E	Rose	None	None	Strap	CBH06807

Made-to-Order Manufacturing

For sizes, ratings, terminations and/or features not listed, Tempco will manufacture a Cast-In Heater to your specifications. State quantity, watts, volts and full heater description with all the appropriate specifications and features required. See Ordering Information on page 3-63.

Customer Assistance

If you have a special application requiring a custom manufactured Cast-In Band Heater or need assistance selecting one of our standard heaters for a new or existing installation, consult Tempco with your requirements. We offer complete engineering services and support, working with you every step of the way to ensure customer satisfaction.

Key for Abbreviations found under the Termination Type Column

- C4 = Screw Terminal with Ceramic Cover
- E = Right-Angle Lug
- F = Flexible Lead Wire
- R = 90° Blockhead Screw Terminal
- R1 = Flexible Armor Cable
- R1A = Stainless Steel Wire Overbraid
- R2 = Blockhead Screw Terminal
- S = Screw Terminal with Heavy Duty Ceramic Insulator
- T = Screw Terminal with Mica Insulator
- T7 = Screw Terminal with Ceramic Insulator

Key for Abbreviations found under the Terminal Box Type Column

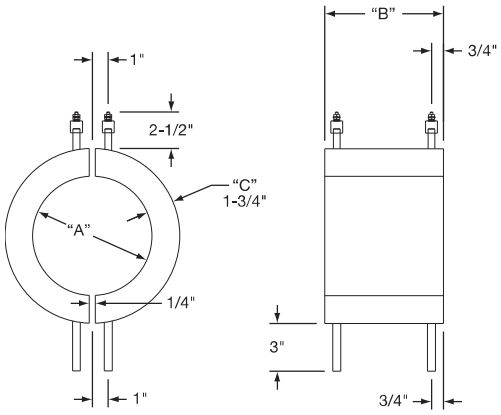
- C2 = Standard Box
- C7 = Single Box over both Heater Halves
- CB1 = Cast Aluminum Box
- EP = Explosion and Moisture Resistant
- MR1 = Moisture Proof with Perforated Shield

Key for Abbreviations found under the Cooling Termination Column

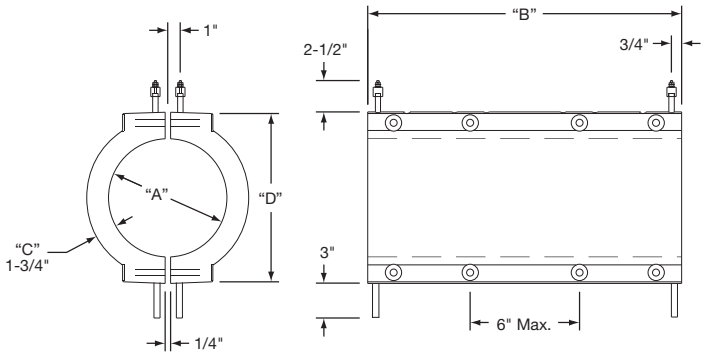
- HS = Hi-Seal Fittings
- RC = Non-Exposed Cooling Tubes/Recessed NPT Fittings

Cast-In Band Heater Ordering Information

Cast-In Band Heater Strap Clamping



Cast-In Band Heater Bolt Clamping



Recommended dimensions shown.

Ordering Information

To process your order or quotation, please specify the following information.

Variable Dimensions — Inside Diameter "A"_____ Length "B"_____ Thickness "C"_____ "D"_____

Material Specifications — ❒ Aluminum ❒ Bronze ❒ Brass

Electrical Specifications — Watts each half _____ Volts each half _____ Phase _____

Terminal Style

❒ "S" Post Terminals ❒ "C4" Ceramic Cover ❒ "F" Plain Leads
❒ "R" 90° Blockhead ❒ "T7" Post Terminals ❒ "MR" Moisture Resistant
❒ "E" Right-Angle Lugs ❒ "T" Post Terminals ❒ "TS" Leads and Shrink Sleeve
❒ "R1" Armor Cable Leads ❒ "R1A" SS Wire Overbraid
❒ "R2" Blockhead and Through Hole ❒ See Pages 3-54 and 3-55 for additional Terminations

Terminal Protection Box

❒ None ❒ "C2" Standard ❒ "C7" 1 Box for both halves ❒ "EP" Explosion Resistant
❒ "P2" High Temperature Quick-Disconnect ❒ "MPR" Moisture Resistant Box
❒ "MR1" Rigid Moisture Resistant Box ❒ "CB1" Cast Aluminum Box

Clamping Style — ❒ Straps ❒ Bolt Clamp

Cooling Tube Specifications

❒ 1/4" O.D. SS ❒ 3/8" O.D. SS ❒ 1/2" O.D. SS
❒ 3/8" O.D. Incoloy® ❒ 1/2" O.D. Incoloy® ❒ Dual Cooling Tubes
❒ Standard Wall Thickness ❒ Other Wall Thickness, Specify _____
(See page 3-5 for Standard Wall Thickness Information)

Cooling Tube Fittings

❒ Non-exposed 3/8" NPTF ❒ "HS" Hi-Seal Fitting ❒ "RA" 90° Copper Elbow
❒ Non-exposed 1/2" NPTF ❒ "RT" 90° Threaded Elbow
❒ "FF" Flared Seal ❒ "R3" Straight Threaded

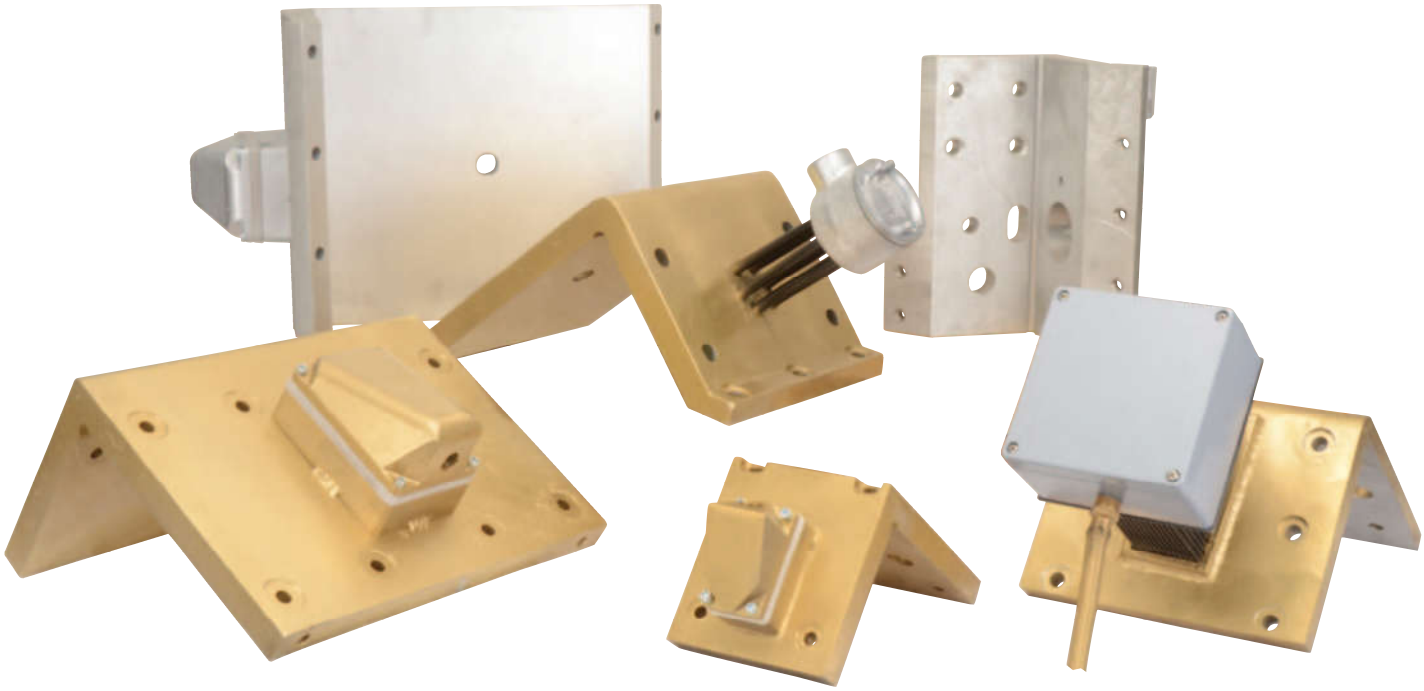
Surface Finish — 125 RMS Standard or to Customer Specifications

Special Cast-In Features — Holes, Cutouts, Slots, Bevels, Mounting Studs, Stand-Offs and Taper Angles
For special features a detailed drawing is required.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

"L" Shaped Bronze, Brass or Aluminum Cast-In Heaters for Square and Rectangular Extruder Barrels



Cast-In Heaters That Provide High Temperature and Maximum Processing Capabilities

The "L" Shaped Cast-In Heaters are typically used on square and rectangular twin screw extruder barrels in compounding and plastic resin manufacturing applications. Due to high shear rates, which are common in this process, extreme operating temperatures and high watt densities are frequently encountered. For these reasons Tempco manufactures "L" shaped heaters in bronze or brass alloys, which are capable of withstanding high temperatures at higher watt densities.

In the case of applications requiring lower temperatures and lower watt densities, aluminum alloys can be used. Aluminum castings are desirable as they have greater thermal conductivity and weigh substantially less than their bronze or brass counterparts, allowing for greater ease of installation.

For mounting purposes, the heaters can be designed with 45° flanged ear extensions that are bolted and drawn together, or can be made with through holes machined into the casting body to bolt directly onto the barrel itself. Thermocouple and transducer holes or other special features can be accommodated as well.

To enhance cooling capabilities, or to be used in place of integral feed screw cooling, "L" shaped heaters can be manufactured with cast-in cooling tubes to satisfy liquid cooling requirements. This feature allows processors the ease of changing a single unit at a time, thus representing a far less time-consuming and less expensive alternative should a cooling line become clogged or severely restricted.

Enhanced Features

To aid processors in reducing maintenance downtime, Tempco has introduced several optional construction features to the basic "L" shaped design.

- *Cast-In Aluminum Alloys for applications requiring lower temperatures and less watt density*
- *3/8" or 1/2" O.D. cooling tubes for liquid cooling*
- *Non-Exposed cooling tubes (Type RC—See page 3-51). Eliminates cracked and broken cooling tubes.*

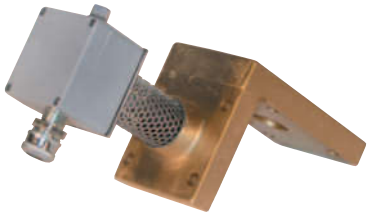
Standard "L" Shaped Cast-In Heaters

Design Features

- *Cast-In Bronze or Brass Alloys for high temperature, high shear applications*
- *Flange bolt clamping arrangement or through holes in the heater body, allowing bolt mounting directly to the barrel*
- *High precision machining of the inner contact surface of the heater, yielding exceptional heat transfer to the process*
- *Choice of terminal protection housings*
- *Moisture resistant terminal housing which is available in a variety of different styles and mounting arrangements*
- *Elevated temperature terminations and enclosures. Prevents premature heater failure due to accelerated corrosion or oxidation of terminals caused by high heater surface temperature. See page 3-66 and 3-67 for details on how to order.*

Note: All of the options listed above are design enhancements that will provide value-added benefits to the basic "L" shape configuration, thereby extending the life and performance of your Cast-In Heaters.

Standard (Non-Stock) "L" Shaped Cast-In Heaters




"L" Shaped Bronze, Brass or Aluminum Cast-In Heaters are sold as individual units. They are normally supplied with a moisture resistant junction box. Also available with explosion resistant or cast-on junction box, fitted with convoluted wire braided hose and high temperature lead wire. If required, specify. For additional terminations, see pages 3-54 and 3-55.

The sizes and ratings listed are among the most commonly used. They will provide the shortest lead times.

Long Leg (in)	Short Leg (in)	Width in	Thickness in	Watts	Volts	Special Features	Part Number
3.500	2.500	3.500	0.875	500	240	Cast terminal box, (3) .397" dia. holes, (1) ⅝" dia. cutout, Bronze	CBH05817
3.500	2.500	3.500	0.875	500	240	Cast terminal box, (3) .397" dia. holes, Bronze	CBH05818
3.500	2.500	7.000	0.875	1000	240	Cast terminal box, (6) .397" dia. holes, Bronze	CBH05819
2.500	1.550	1.750	0.500	300	120	(1) ½" long slot, R1, Hubbell® plug, Aluminum	CBH04036
2.500	1.550	1.750	0.500	300	120	(1) ⅛" NPT hole, (1) ½" long slot, Bronze	CBH04103
3.460	2.680	4.330	1.181	500	220	MPR terminal box, (1) 25 mm dia. hole, (4) 9 mm dia. holes, Aluminum	CBH04926
3.460	2.680	4.330	1.181	500	220	MPR terminal box, (1) 25 mm dia. hole, (4) 9 mm dia. holes, Aluminum	CBH04922
3.460	2.760	4.330	1.181	500	220	MPR terminal, (1) 25 mm dia. hole, (8) 9 mm dia. holes, Aluminum	CBH04929
3.937	3.465	4.331	1.181	500	230	MPR terminal, ⅜" NPT RA elbow C/T, Brass	CBH04045
4.173	3.071	4.310	1.000	900	240	Cast terminal box, (2) ½" dia. holes, (2) ½" dia. cutouts, Bronze	CBH01617
4.173	3.346	4.921	1.575	2000	230	MPR, (1) 25 mm dia. hole, Brass	CBH04295
4.724	3.248	4.921	1.575	1500	230	MPR terminal box, (1) 25 mm dia. hole, Brass	CBH04290
4.823	3.346	4.921	1.575	2000	230	MPR terminal box, (1) 25 mm dia. hole, Brass	CBH04294
6.000	4.449	6.417	1.000	2000	240	Cast terminal box, (4) ½" dia. holes, (2) 1" long cutouts, Bronze	CBH01618
6.140	4.311	7.480	0.750	2500	240	Cast terminal box, (5) ½" dia. holes, (2) ½" dia. cutouts, Bronze	CBH01971
6.180	4.215	6.690	1.000	3000	240	Cast terminal box, (5) 9/16" dia. holes, (2) 1" dia. cutouts, Bronze	CBH02140
6.188	4.313	1.000	1.000	1500	240	Cast terminal box, (1) 1" dia. hole, (4) ¼" dia. holes, Bronze	CBH01619
7.756	11.693	14.961	1.970	4500	460	MPR terminal box, (6) .394" dia. holes, Aluminum	CBH05011
7.813	5.188	10.625	1.000	5250	480	Cast terminal box, (8) 9/16" dia. holes, Bronze	CBH03042
7.830	5.220	10.63	0.980	3500	480	Cast terminal box, (8) 9/16" dia. holes, Bronze	CBH02114
7.874	6.102	10.394	1.000	4200	480	Cast terminal box, (6) 9/16" dia. holes, Bronze	CBH01692
7.874	6.102	10.394	1.000	4200	480	Cast terminal box, (6) 9/16" dia. holes, Bronze	CBH01839
8.500	6.140	2.750	0.750	1200	240	Cast terminal cover, (1) 1" dia. hole, (2) ½" dia. holes, Bronze	CBH01725
8.500	6.140	7.480	0.750	5250	240	Cast terminal box, (6) ½" dia. holes, (2) ⅞" dia. holes, Bronze	CBH02124
8.890	5.945	6.420	1.000	3000	240	Cast terminal box, (6) ½" dia. holes, (1) 1" dia. hole, Bronze	CBH01550
9.055	4.684	2.362	0.591	750	240	13" Cable, 18" leads, (5) .413" dia. holes, Aluminum	CBH04591
9.134	6.000	7.480	1.000	3500	240	Cast terminal box, (4) ½" dia. holes, Bronze	CBH05352
9.173	6.181	10.630	1.772	5000	230	MPR terminal box, (8) .472" dia. holes, (1) 1" dia. hole, Brass	CBH03940
9.449	7.756	14.330	1.102	6800	277	Cast terminal box, 3-Ph, (8) 9/16" dia. holes, Bronze	CBH01667
9.449	7.756	14.330	1.102	6800	575	Cast terminal box, 3-Ph, (4) ½" dia. holes, (4) 9/16" dia. holes, Bronze	CBH01709
10.563	7.813	10.625	1.000	8800	480	Cast terminal box, 3-Ph, (8) 9/16" dia. holes, Bronze	CBH03041
10.590	7.830	10.630	1.000	5500	480	Cast terminal box, 3-Ph, (8) 9/16" dia. holes, Bronze	CBH02113
10.830	4.684	2.362	0.591	870	240	MPR terminal box, (5) .413" dia. holes, Aluminum	CBH04594
11.690	7.756	14.960	1.969	9000	460	MPR term. box, (8) .393" & (1) .984" dia holes, Al., Heat & Cool	CBH05012
11.690	7.756	14.960	1.968	N/A	N/A	(12) .393" dia. holes, (1) .984" dia. hole, Aluminum	CBH05013
11.690	7.760	14.960	1.969	9000	460	MPR terminal box, (10) .393" dia. holes, Aluminum	CBH05014
12.188	7.875	10.375	1.000	8100	480	Cast terminal box, (6) 9/16" dia. holes, Bronze	CBH04408
12.205	7.875	4.134	1.000	3000	240	Cast terminal box, (4) 9/16" dia. holes, (1) ⅞" dia. cutout, Bronze	CBH01756
12.205	7.875	10.394	1.000	6260	480	Cast terminal box, (6) 9/16" dia. holes, Bronze	CBH02144
15.712	13.000	9.250	1.250	5500	220	(6) ½" dia. holes, (1) ⅞" hole, Bronze	CBH05037
18.110	9.169	4.530	0.591	3030	240	(10) .493" dia. holes, 20" cable, 27" leads, Aluminum	CBH04593
18.110	9.169	4.530	0.591	3030	240	MPR terminal box, (10) .430" dia. holes, Aluminum	CBH04596

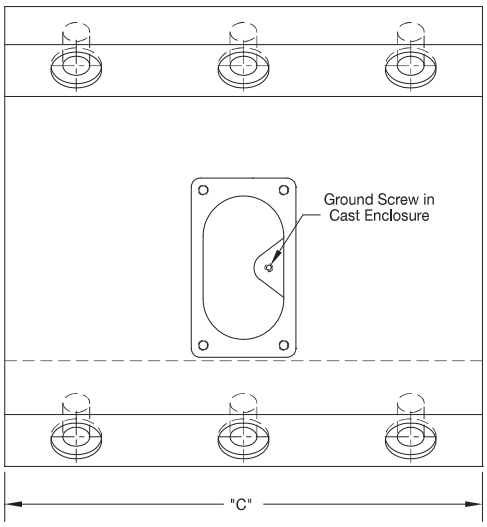
Key for Abbreviations found under the Features Column

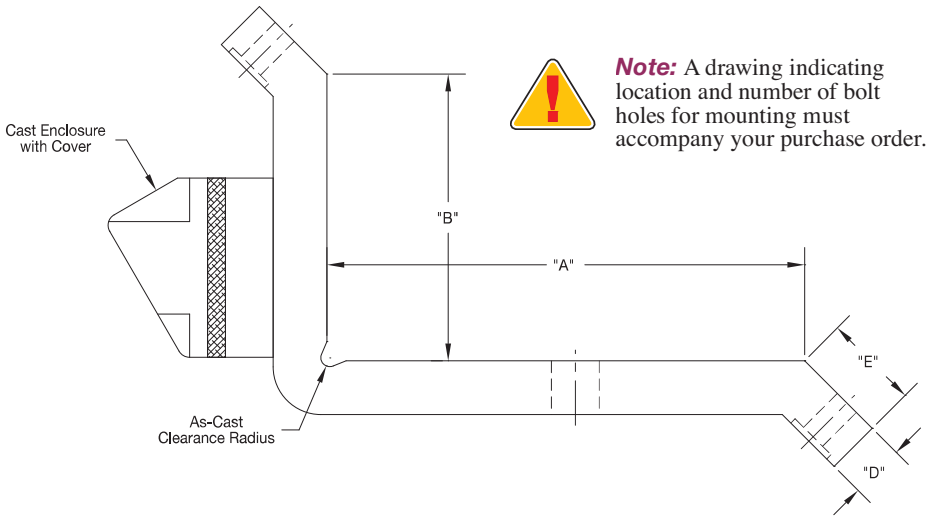
- **E/H** = Each Half
- **EP** = Explosion Resistant Terminal Housing
- **MR** = Moisture Resistant Terminal Housing
- **MPR** = Moisture Proof Die Cast Aluminum Box
- **C/T** = Cooling Tubes
- **CW** = Single Set of Cooling Tubes
- **CWW** = Dual Set of Cooling Tubes
- **RC** = Non-Exposed Cooling Tubes/Recessed NPT Fittings

Ordering Information

Made in USA

"L" Shaped Cast-In Heaters – 45° Flange Mount Style Ordering Information





Note: A drawing indicating location and number of bolt holes for mounting must accompany your purchase order.

"L" Shaped Cast-In Heaters — 45° Flange Mount Style

Ordering Information

To process your order or quotation, please specify the following information.

Dimensions
"A"_____ "B"_____ "C"_____
"D"_____ "E"_____

Material Specifications
❒ Aluminum ❒ Bronze ❒ Brass

Electrical Specifications
Watts each piece _____ Volts each piece _____ Phase _____

Termination Style
❒ "S" Post Terminals ❒ "T7" Post Terminals ❒ "T" Post Terminals
❒ "R1" Armor Cable Leads ❒ "E" Right Angle Lugs

Terminal Protection Box
❒ None ❒ "C2" Standard ❒ Cast on box as shown
❒ "EP" Explosion Resistant ❒ "MR1" Rigid Moisture Resistant Box
❒ "MPR" Moisture Resistant Box ❒ "P2" High Temperature Quick Disconnect

Clamping Style
❒ Bolt Clamp ❒ Other

Cooling Tube Specifications
❒ 1/4" O.D. SS ❒ 3/8" O.D. SS ❒ 1/2" O.D. SS
❒ 3/8" O.D. Incoloy® ❒ 1/2" O.D. Incoloy® ❒ Dual Cooling Tubes
❒ Standard Wall Thickness ❒ Other Wall Thickness, Specify _____
(See page 3-5 for Standard Wall Thickness Information)

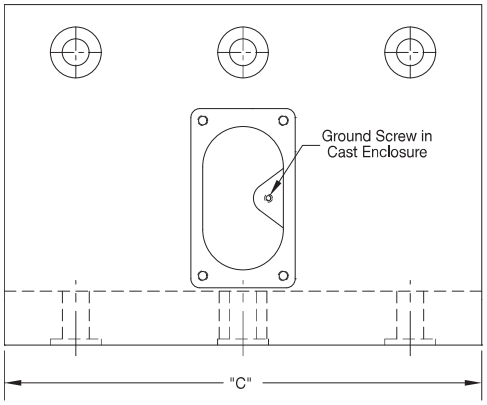
Cooling Tube Fittings
❒ Non-exposed 3/8" NPTF ❒ "HS" Hi-Seal Fitting ❒ "RA" 90° Copper Elbow
❒ Non-exposed 1/2" NPTF ❒ "RT" 90° Threaded Elbow
❒ "FF" Flared Seal ❒ "R3" Straight Threaded

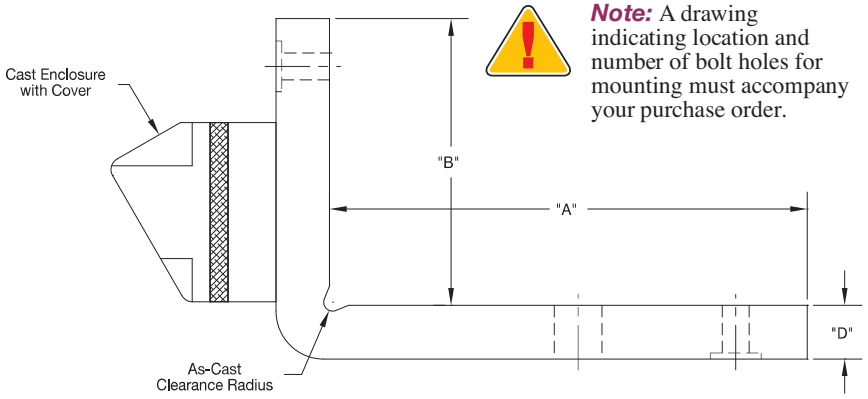
Surface Finish
125 RMS Standard or to Customer Specifications

Special Cast-In Features
Holes, Cutouts, Slots, Bevels, Mounting Studs, Stand-Offs and Taper Angles.
For special features a detailed drawing is required.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

"L" Shaped Cast-In Heaters Bolt Direct to Barrel Style Ordering Information





Note: A drawing indicating location and number of bolt holes for mounting must accompany your purchase order.

"L" Shaped Cast-In Heaters Bolt Direct to Barrel Style

Ordering Information

To process your order or quotation, please specify the following information.

Dimensions
"A"_____ "B"_____ "C"_____
"D"_____

Material Specifications
❒ Aluminum ❒ Bronze ❒ Brass

Electrical Specifications
Watts each piece _____ Volts each piece _____ Phase _____

Termination Style
❒ "S" Post Terminals ❒ "T7" Post Terminals ❒ "T" Mica Washers
❒ "R1" Armor Cable Leads ❒ "E" Right-Angle Lugs

Terminal Protection Box
❒ None ❒ "C2" Standard ❒ Cast on box as shown
❒ "EP" Explosion Resistant ❒ "MR1" Rigid Moisture Resistant Box
❒ "MPR" Moisture Resistant Box ❒ "P2" High Temperature Quick Disconnect

Clamping Style
❒ Bolt Clamp ❒ Other

Cooling Tube Specifications
❒ 1/4" O.D. SS ❒ 3/8" O.D. SS ❒ 1/2" O.D. SS
❒ 3/8" O.D. Incoloy® ❒ 1/2" O.D. Incoloy® ❒ Dual Cooling Tubes
❒ Standard Wall Thickness ❒ Other Wall Thickness, Specify _____
(See page 3-5 for Standard Wall Thickness Information)

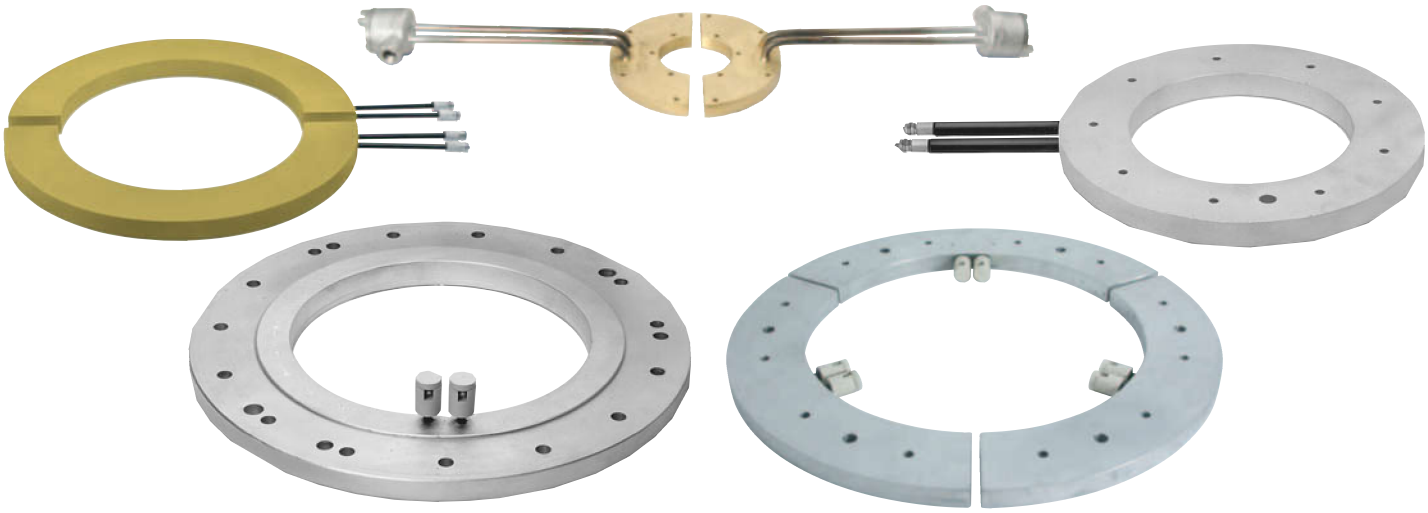
Cooling Tube Fittings
❒ Non-exposed 3/8" NPTF ❒ "HS" Hi-Seal Fitting ❒ "RA" 90° Copper Elbow
❒ Non-exposed 1/2" NPTF ❒ "RT" 90° Threaded Elbow
❒ "FF" Flared Seal ❒ "R3" Straight Threaded

Surface Finish
125 RMS Standard or to Customer Specifications

Special Cast-In Features
Holes, Cutouts, Slots, Bevels, Mounting Studs, Stand-Offs and Taper Angles.
For special features a detailed drawing is required.

Made in USA

Cast-In Aluminum or Bronze Ring Heaters for Plastics Processing Equipment



Designed to Heat Limited Access Locations

Tempco Cast-In Ring Heaters provide an excellent means of applying extremely uniform heat to limited access application areas. Cast-In Ring Heaters are frequently used in Blown Film Die, Extrusion Die, Screen Changer and Extruder Barrel Adapter applications where long life and minimal maintenance concerns are prevalent.

The design scope of this product line makes it possible to cast large or small diameter disc shaped rings with nominal thicknesses of 5/8" to 1". These units are an excellent choice for heating the top or bottom of a cylindrical die.

As a standard, Cast-In Ring Heaters are generally manufactured in aluminum because of its superior thermal conductivity. For higher temperature or high watt density requirements, bronze or brass alloys can be used. A variety of standard terminations shown on pages 3-54 and 3-55 are available. The units can be fully machined to include through holes for mounting, thermocouple holes and surface machining.

Standard Cast-In Ring Heaters Design Features and Options:

- ✳ *Computer designed, precisely formed tubular heating element optimizing the heat transfer pattern*
- ✳ *Variety of termination options including terminal enclosure housings*
- ✳ *Variety of shapes and sizes*
- ✳ *Through holes, tapped holes or cutouts to facilitate mounting or obstructions*
- ✳ *Precision machining of one or all surfaces of casting – specify your individual requirements.*

CUSTOM Manufactured

For sizes and ratings not listed, **TEMPCO** will design and manufacture a Cast-In Ring Heater to meet your requirements. ***Specify the following:***

- ❑ Inside Diameter
- ❑ Outside Diameter
- ❑ Thickness
- ❑ Wattage and Voltage
- ❑ Number of Segments
- ❑ Termination Type (see pages 3-54 and 3-55)
- ❑ Alloy (Aluminum or Bronze)
- ❑ Special Features
- ❑ Machining Specifications
- ❑ Detailed Drawing

Stock and Standard (Non-Stock) Cast-In Ring Heaters

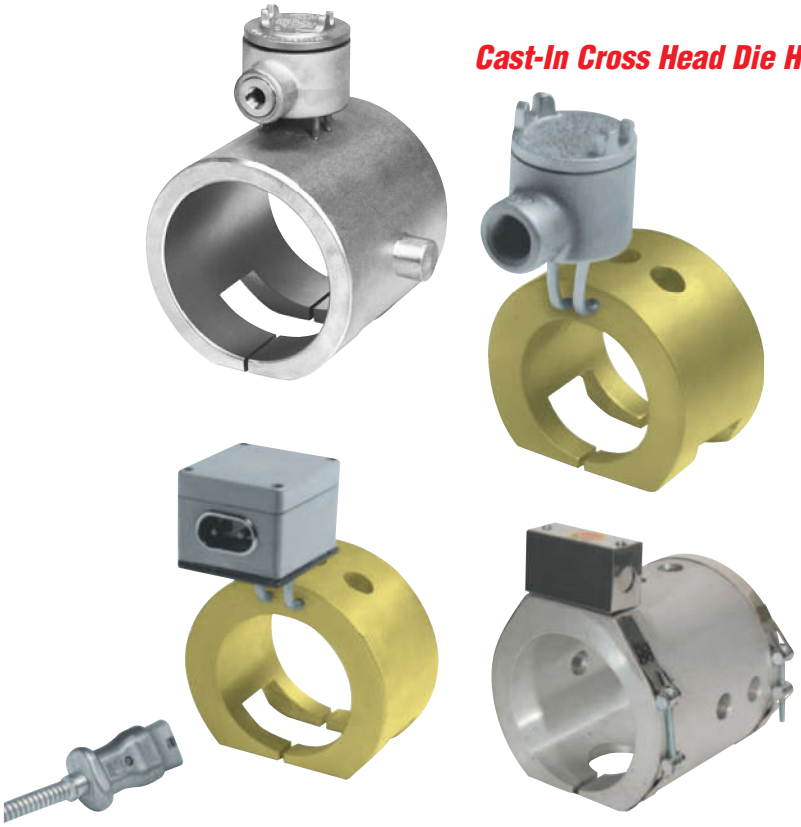
Stock Items Are Shown In RED

I.D. in	O.D. in	Thickness in	Watts	Volts	Special Features	Part Number
5.500	14.000	1.000	2250	230	(8) 25/32" dia. holes	CBH02625
6.750	11.750	1.000	1250	480	(4) 9/16" dia. holes E/H	CBH05499
7.000	11.500	0.875	3200	240	(9) 25/32" dia. holes	CBH01084
7.000	11.500	0.875	3200	460	(9) 5/16" dia. holes, (1) 1/2" dia. hole	CBH05415
8.500	13.000	1.000	3000	230	(8) 25/32" dia. holes	CBH01101
10.000	14.500	0.875	4000	230	(8) 25/32" dia. hole, (8) 13/32" c'bore	CBH01196
10.000	14.500	0.875	1000	230	(2) 90° Segments	**CBH01085**
12.000	16.250	0.875	2125	230	Bronze	**CBH01261**
12.000	16.250	0.875	2125	230	Bronze	CBH04776
13.000	20.000	1.120	2025	460	(4) 9/16" dia. holes E/H, (2) 1/2"-13 taps	CBH04836
16.250	20.500	1.000	1500	480	(6) 9/16" dia. holes	CBH04943
17.000	20.000	1.500	1250	230	(4) 90° Segments	CBH04990
19.750	34.000	1.130	4000	460	(12) 9/16" dia. holes, (2) 1/2"-13 taps	CBH04837
23.000	29.000	1.000	2000	480	(8) 17/32" dia. holes, (1) 5/8" dia. hole	CBH04220
32.500	40.000	1.125	9000	460	(24) 3/8" dia. holes	CBH02235
43.250	56.250	1.125	4333	290	(16) 9/16" dia. holes	CBH02811

Note: Part numbers are for aluminum heaters unless otherwise specified.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

View Product Inventory @ www.tempco.com



Cast-In Cross Head Die Heaters for Plastics Extrusion Processing Equipment

Maximize Service Life on Difficult Extrusion Die Applications

Extrusion Cross Head and related extrusion dies present extremely challenging operating parameters to most conventional heating elements. This is primarily due to the presence of excessive contamination, high watt densities and high temperature as well as unusual physical and dimensional requirements.

Many processors continue to use ceramic and mica band heaters on this application, with frequently marginal results. In these instances, Cast-In Aluminum or Bronze heaters are recommended to substantially improve heater life expectancy and performance.

Cast-In Heaters are less susceptible to contamination problems, and can operate at higher temperatures with higher watt densities. In addition, the design is structurally better suited to accommodate holes and cutouts without compromising the heater's electrical and mechanical integrity.

As a standard, Cross Head Die Heaters are typically designed in aluminum as a one-piece band with a single slot that can be slid over the die and clamped with stainless steel clamping straps. For higher temperature or high watt density requirements, bronze or brass alloys can be used.

Standard Cross Head Die Heaters Design Features and Options:

- ✳ *Computer designed, precisely formed tubular heating element, optimizing the heat transfer pattern.*
- ✳ *Variety of termination options, including terminal enclosure housings.*
- ✳ *Optional 1/4", 3/8" or 1/2" cooling tubes cast into the cross head die body for liquid cool function.*
- ✳ *Variety of shapes and sizes.*
- ✳ *Aluminum and bronze alloys.*
- ✳ *Through holes, tap holes or cutouts to facilitate mounting or obstructions.*
- ✳ *Precision machining of one or all surfaces of casting – specify your individual requirements.*

Note: Part numbers are for aluminum heaters unless otherwise specified.

CUSTOM Manufactured

For sizes and ratings not listed, **TEMPCO** will design and manufacture a Cross Head Die Heater to meet your requirements.
Specify the following:

- ❑ Inside Diameter
- ❑ Outside Diameter
- ❑ Thickness
- ❑ Wattage and Voltage
- ❑ Termination Type (see pages 3-54 and 3-55)
- ❑ Alloy (Aluminum or Bronze)
- ❑ Special Features
- ❑ Machining Specifications
- ❑ Detailed Drawing

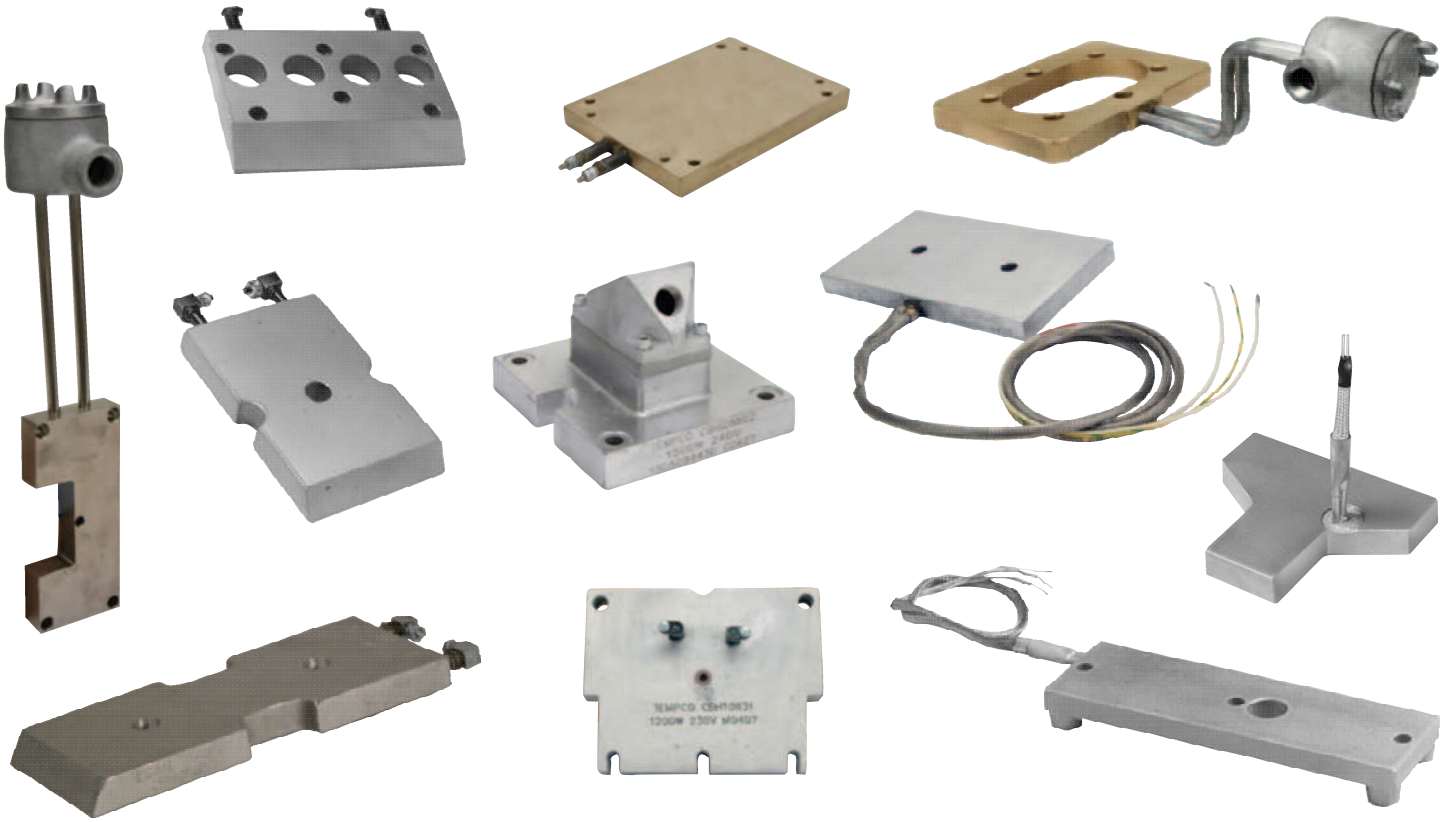
Stock and Standard (Non-Stock) Cross Head Die Cast-In Heaters (Stock Items Are Shown In RED)

I.D. in	O.D. in	Length in	Thickness in	Watts	Volts	Special Features	Part Number
2.500	4.000	2.625	0.750	750	240	Bronze, (3) ⅝" dia. holes, C7 terminal box	CBH01913
3.000	4.500	4.000	0.750	1200	240	Bronze, (3) ¾" dia. holes, 2" dia. cutout, R1 cable 70", 72" leads	CBH02634
3.248	5.248	3.000	1.000	750	230	(3) ¾" dia. holes, P2 plug, 92" cable, 102" leads	**CBH05491**
3.248	5.25	3.000	1.000	750	230	(3) ¾" dia. holes, EP box	CBH03741
3.248	5.25	3.000	1.000	750	230	(3) ¾" dia. holes, EP box, 72" cable, 78" leads	CBH09274
3.250	5.250	3.000	1.000	1000	240	Bronze, (2) ⅝" and (1) ⅞" dia. hole, (1) 1¼" Lg. cutout EP box	CBH04153
3.250	5.25	5.625	1.000	1200	230	(2) ¾" & (2) ⅞" dia holes, 1" slot, EP box, 72" cable, 84" leads	CBH09275
4.000	6.000	3.100	1.000	1200	240	EP Terminal box, (3) ¾" dia. holes	CBH03979
5.000	6.500	2.250	0.750	700	240	Bronze, bolt clamp, (4) ¾" dia. holes	CBH03753
5.000	6.500	5.875	0.750	2400	240	Bronze, (1) 2½" dia. hole, (2) ⅞" dia. holes	**CBH01382**
5.000	7.000	6.500	1.000	3000	460	Brass, CT, EP box, 2.125 × 1.688 cutout	CBH09123
5.687	7.750	8.500	1.031	3000	230	Bronze, CT, EP box, 2.375 × 1.562 cutout	CBH09150
5.998	8.000	4.313	1.000	2400	230	Brass, EP box, (1) ¾" dia. hole, 2.125 × 1.688 cutout	CBH09180
6.000	8.000	4.313	1.000	2400	240	C2 box, (2) ¾" dia holes	CBH06161
6.000	8.000	4.313	1.000	2400	460	EP Terminal box, (1) 2⅛" Lg. cutout, (2) ¾" dia. holes	CBH04030
7.500	9.500	8.875	1.000	4000	460	Brass, CT, EP box, 2.750 × 1.875 cutout	CBH09124

Platen Die Heaters

Made in USA

Cast-In Aluminum and Bronze Platen Die Heaters for Plastics Processing Equipment



Tempco Cast-In Platen Heaters are widely accepted as the industry standard for heating critical, temperature-sensitive plastics processing downstream equipment.

Typically, plastic die applications are highly temperature sensitive and require extreme heater uniformity and reliability.

Tempco Cast-In Aluminum Platen Heaters are a logical choice to satisfy these critical application parameters, as the aluminum alloy has excellent thermal conductivity and a highly reliable, computer designed heating element which provides good contamination resistance. Optional cooling tubes can be cast-in to more precisely regulate the temperature of your process. The result is a highly efficient, uniform heater which, if used properly, can be expected to provide years of trouble-free service.

Cast-In Platen Heaters are generally manufactured in aluminum but can also be made in bronze or brass alloys to meet higher temperature processing requirements. For high volume requirements, the permanent mold process can be used to achieve the most effective economies of scale as well as yielding the best cosmetic appeal. To service customers with lower volume orders, Tempco's high quality no-bake sand mold process will be used, which assures excellent part quality and employs economical tooling.

Standard Cast-In Platen Heaters Design Features and Options

- ***Computer designed, precisely formed tubular heating element, optimizing the heat transfer pattern***
- ***A variety of termination options including terminal enclosure housings***
- ***Optional 1/4", 3/8", or 1/2" cooling tubes cast into the platen for liquid cool function***
- ***A variety of shapes and sizes made to your specifications***
- ***Through-holes, tapped holes or cutouts to facilitate mounting or obstructions***
- ***Precision machining of one or all surfaces of casting—specify your individual requirements.***

Typical Applications for Tempco's Cast-In Platen Die Heaters:

- *Sheet dies*
- *Plastic molds*
- *Plastic welding equipment*
- *Cast film dies*
- *Calendaring dies*
- *Screen changer equipment*

Note: Cast-In Platen Heaters are made to customer specifications. Please review our "Standard Sizes and Ratings" data along with our "How To Order" information to determine the heater best suited to your needs. Tempco also offers numerous sizes and styles off the shelf for immediate delivery.

For further information on large platen heaters see pages 3-18 through 3-23.

Stock and Standard (Non-Stock) Platen Die Heaters For Plastics Processing Equipment

The sizes and ratings listed are among the most commonly used. They will provide the shortest lead times.

Length in	Width in	Thickness in	Wattage	Volts	Notes	Part Number
4.000	3.000	0.750	400	230	(1) 5/8" dia. hole	CBH02755
4.500	3.500	0.750	600	230	(1) 5/8" dia. hole	**CBH03065**
3.875	3.500	0.750	500	230	(1) 5/8" dia. hole	**CBH03468**
3.875	3.500	0.750	500	230	(1) 5/8" dia. hole	CBH03147
4.000	4.000	0.750	600	240	60" Leads, 58" armor cable (1) 9/16" dia. hole	CBH05665
4.750	4.500	0.750	800	220	144" Leads, 120" braid, (1) 5/8" dia. hole	CBH04845
5.000	5.000	0.750	900	220	(4) 5/16" dia. holes, (1) 1/8" NPT, C2 box	CBH01045
5.500	3.500	0.750	600	240	66" Leads, 64" braid, (1) 9/16" dia. hole	CBH03869
5.500	4.500	0.750	900	230	48" Leads, 36" braid, (1) 9/16" dia. hole	CBH02698
5.875	3.875	0.750	750	230	(1) 5/8" dia. hole, 30° at front	**CBH02255**
5.875	3.875	0.750	750	230	(1) 5/8" dia. hole, 30° at front, has ground screw	CBH04170
6.000	3.500	0.750	800	230	(1) 5/8" dia. hole, (1) #10-32 tap	CBH05693
6.000	4.500	0.750	800	460	(2) 5/8" dia. holes	CBH04104
6.250	5.469	1.938	1000	230	(2) 3/8-16 tap, (2) 5/16-18 tap	CBH01090
7.000	4.000	0.625	800	240	P1 cup, (4) 5/16" dia. holes, (1) 1/2" dia. hole	CBH08409
7.500	3.000	1.000	1000	110	52" Leads & 48" Wire braid, (2) 9/16" dia. holes	CBH03453
7.500	5.500	1.000	1350	230	208" Leads, 180" braid, (1) 5/8" dia. hole	CBH04234
8.000	6.250	1.000	1200	230	(2) 13/32" dia. holes, (1) 1/8" NPT tap, (3) 13/32" slots	CBH01091
8.660	7.874	0.433	1250	220	24" Leads, 10" braid, (3) .213" dia. holes,(2) .234" dia. holes	**CBH04086**
9.500	6.250	1.000	1700	230	(3) 13/32" dia. holes, (3) 13/32" slots, (1) 1/8" NPT tap	CBH01088
11.500	3.375	0.750	1900	240	C2 box, (8) bolt holes, (1) 5/8" dia. hole	CBH07511
23.875	11.875	0.750	4300	240	(226) 1/4" dia. holes	CBH05195
13.250	11.625	1.000	3450	230	(7) 13/32" dia. holes, (3) 13/32" slots, (1) 1/8" NPT tap	CBH01089
21.653	7.480	0.866	4500	280	P1 cup, (6) bolt holes	CBH05054
22.000	10.750	0.625	5000	240	(2) elements	CBH06970
22.750	18.000	0.750	10000	480	30" Leads, 3-phase, (403) 1/4" dia. holes	**CBH06162**
22.750	18.000	0.750	10000	240	30" Leads, 3-phase, (403) 1/4" dia. holes	**CBH06225**
22.750	22.000	0.750	12200	480	31" Leads, 3-phase, (344) 1/4" dia. holes	CBH07475
23.875	11.875	0.750	4300	240	S: 8-32, Dual element, (226) 1/4" dia. holes	CBH06947
23.875	11.875	0.750	8000	240	S: 8-32, Dual element, (226) 1/4" dia. holes	**CBH06948**
26.000	22.750	0.750	13200	480	16" Leads, 3-phase, (305) 1/4" dia. holes	CBH07477
26.500	3.375	0.750	4000	240	(18) bolt holes, (1) 5/8" dia. hole, C2 box	CBH07594

Note: Part numbers are for aluminum heaters unless otherwise specified.

CUSTOM
Manufactured

For sizes and ratings not listed, **TEMPCO** will design and manufacture a Platen Heater to meet your requirements.
Specify the following:

- ❑ Length
- ❑ Width
- ❑ Thickness
- ❑ Wattage and Voltage
- ❑ Termination type (see pages 3-54 & 3-55)
- ❑ Alloy (Aluminum or Bronze)
- ❑ Special Features
- ❑ Machining Specifications
- ❑ Detailed Drawing

Note: **Customer Assistance**
If you have a special application requiring a custom manufactured Cast-In Aluminum or Bronze Platen Die Heater or need assistance selecting one of our standard die heaters, consult Tempco with your requirements. We offer complete engineering services and support, working with you every step of the way to ensure customer satisfaction.

Made in USA

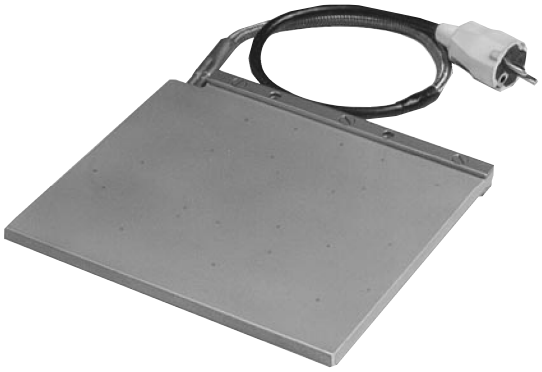
Special Shapes

Specialty Cast-In Aluminum and Bronze Heaters Used in Plastics Processing Equipment

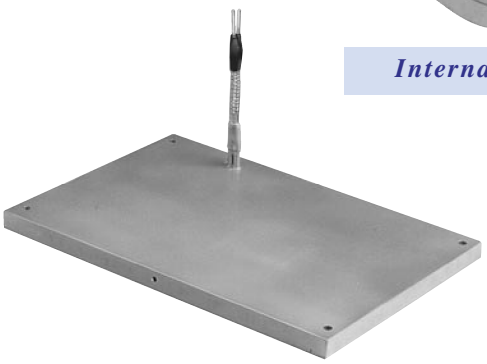
Plastics Processing Equipment utilizes numerous types of specially designed Cast-In Aluminum and/or Bronze Heaters. In addition to the typical and commonly used cylindrical cast-in heaters, complex geometric shapes are used extensively as well.

The following two pages provide you with a small overview of our manufacturing capabilities by illustrating some popular cast-in heater shapes and how they are used. Special designs can be made to your specifications. Consult Tempco with your requirements.

Internal Ring Heater

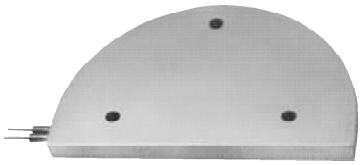


Platen for Plastic Welding Equipment

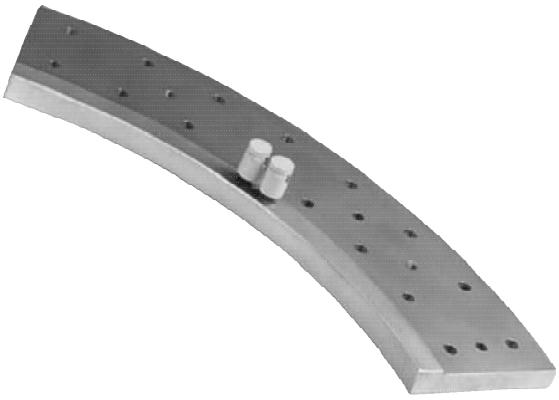


Flat Platen Heater

"U" Shaped Heater

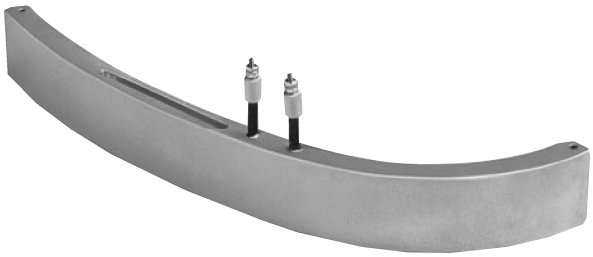


Semicircular Shaped Heater



Segmented Ring Heater

Internal Ring Heater



Laminating Radial Edge Heater

"L" Shape with Vent Clearance Hole

Specialty Cast-In Aluminum and Bronze Heaters Used in Plastics Processing Equipment

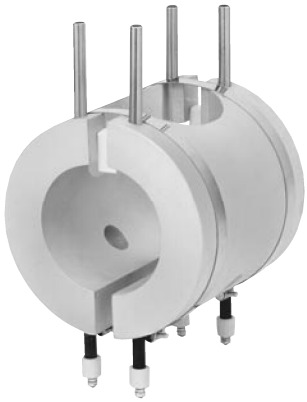
Cast Bronze Nozzle Heater Bushings For Runnerless Molding

Vented Barrel Heater

Ring Heaters

"L" Shaped Heater

Hopper Feed Cooler



Large Holes for Vented Barrels

Feed Throat Cooler

Feed Throat Cooler

Rugged Electrical Terminal Housings With Meltric® Receptacles

Made in USA

Installation Recommendations for Cast-In Thermal Components

Tempco Cast-In Heaters will provide long life and dependable, trouble-free service if properly installed, operated, and maintained as per the following recommendations:

Installation

1. Allow sufficient space for thermal expansion. The amount of space required depends upon the Cast-In Heater size, operating temperature and alloy.
2. Surface being heated must be free of any foreign materials and have a smooth finish.
3. Make sure that the casting is properly seated. The clamping devices used should be tightened down to the correct recommended torque. After initial heat-up, retighten fasteners to the correct recommended torque.

Recommended Torque:
10 ft-lb for 1/4–5/16 bolts, 20 ft-lb for 7/16–5/8 bolts

5. Thermal insulation can be used to reduce heat losses.
6. Avoid mounting heaters in an atmosphere containing combustible gases and vapors unless specifically manufactured for use in such conditions.
7. Liquid Cooled Cast-In Heater fittings must be securely tightened to prevent leaks.
8. To prevent overheating and heater failure, adequate temperature controls should be installed. For assistance in selecting temperature controls and thermocouples, see Tempco's (in-stock) complete line of Plug-In type Proportional Temperature Controls for heating and cooling applications in Section 13. Also see the listing on standard and hot melt thermocouples in Section 14.

Wiring

1. For connections at the heater terminals, use high temperature nickel conductor or nickel clad copper lead wire or alloy bus bar. Keep all electrical connections properly protected to eliminate electric shock to machine operators.
2. Heaters of equal wattage and voltage can be connected in series for higher voltage.
3. Heater installations must be properly grounded to eliminate electric shock hazard, and wiring must comply with electrical codes.
4. Always have a qualified electrician perform all wiring and connection of heaters and control components. Terminals must be tightened to the correct torque (2.5 ft/lb for terminal connections).

CAUTION: Castings are not designed to be lifted or carried by the terminations or leads.

Exposed electrical wiring on cast-in heater installations is a violation of Electrical Safety Codes including O.S.H.A.

Note: See page 16-11 for Wiring Diagrams and page 15-2 for lead wire selection

Operation

1. It is recommended to slow start the process during first use.
2. Do not operate above rated voltage. Excess voltage will result in heater failure.
3. Do not operate Cast-In Heaters above recommended temperatures. Heater temperature must be monitored and controlled. Use of over-temperature T/C is strongly recommended for higher temperature applications. Excess temperatures will result in heater failure and/or melting.
4. Electrical terminals must be kept free of contaminants, as spillage of plastic, water, oils, and their vapors can cause electric shorts, resulting in heater failure.
5. Liquid Cooled Cast-In Heaters must not be cycled to operate simultaneously. Thermal stresses may result in shorter heater life.
6. The water used on Liquid Cooled Cast-In Heaters must be properly treated. Hard water contains corrosive media that will contaminate the tubing, producing stress corrosion cracks and resulting in shorter heater life. Presence of minerals in water can cause clogged tubes that can result in poor heat transfer and eventually heater failure.

Maintenance

1. Never perform any type of service on heaters prior to disconnecting all electrical power.
2. To ensure good surface contact, periodically check clamping. Retighten clamping to the correct torque when required.
3. Repeat cycling of temperature controls can indicate poor surface contact or a burned-out heater.
4. Heater terminals must be kept free of plastics, oil, water, and any other foreign matter. As these materials carbonize, they create electrical shorts.
5. Heater terminal electrical connections must be kept tight. Loose connections can overheat and eventual destroy the connection or the heater terminal.
6. Water lines must be periodically checked for leaks. Water on heater terminals can be detrimental to the entire heating system.
7. Thermocouples must be kept free of contaminants and be checked for good response to temperature changes. Our recommendation is to change them periodically, as a bad thermocouple can be the cause of destroying an entire heating zone.

Complete Your Installation With Accessories Available From Stock

Accessory	*Catalog Section*
✳ *Stainless Steel Tubing and Fittings For Cooling Lines*	*3*
✳ *Pressure Transducers and Rupture Disks*	*12*
✳ *Temperature Controllers*	*13*
✳ *Temperature Sensors, Thermocouple Wire, Jacks & Plugs*	*14*
✳ *High Temperature Lead Wire & Fiberglass Tape, Ceramic Terminal Covers and Electric Plugs*	*15*

View Product Inventory @ www.tempco.com

Table Of Contents

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section

Ceramic Fiber Heaters

Ceramic Fiber Heaters

Introduction

Made in USA

High Temperature Ceramic Fiber Heaters

Design Features

- *Standard Heaters to 1100°C (2012°F)*
- *High Temperature Version to 1200°C (2192°F)*
- *Low Thermally Conductive Built-In Insulation*
- *Standard Flat Panel, Full Cylindrical and Semicylindrical Shapes*
- *Fe-Cr-Al Alloy Resistance Wire Elements*
- *Standard 9" long double-twisted bare wire leads*
- *100% Inorganic; free of Organics & Asbestos*
- *Thermal Shock Immunity*
- *Excellent Resistance to Chemical Attack*

Industrial Uses

Industry	Application
Aerospace	*Crystal Growth, R & D*
Dental	*Manufacture of Crowns and Bridges*
Metals	*Heat Treat and Temper*
Plastics	*Sealers and Formers*
Automotive	*Metal Heat Treating and Paint Curing*
Chemical	*Remove By-Products & Catalyst Materials*
Crystals	*Preheat & Manufacturing of Optical and Gemstone Crystals*
Glass	*Annealing Process & Preheat of Glass Manufacturing*
Ceramic	*Extrusion Dies*
Semiconductor	*Diffusion Furnaces & Annealing Wafers*

Designed For High Temperatures and Efficiency

Tempco Ceramic Fiber Insulated Heaters combine a heat source with superior high temperature insulation—an ideal solution for an unlimited number of industrial heating applications. Tempco Ceramic Fiber Insulated Heaters produce fast, efficient, and reliable uniform heat to temperatures of 1100°C (2012°F). Higher temperature ratings, up to 1200°C (2192°F), are available with a limited number of designs.

Flat Panel, Full Cylindrical and Semi-Cylindrical Shaped Ceramic Fiber Insulated Heaters — *Tempco Standard*

These heaters are comprised of high-quality helically wound Fe-Cr-Al alloy resistance wire elements embedded in a rigid body of vacuum-formed high temperature refractory fiber. This ceramic fiber insulation has very low weight, thermal mass and thermal conductivity and thus can handle extremely rapid cycling.

All Tempco Ceramic Fiber Insulated Heaters are organic free and will not smoke or outgas.

The elements are typically mounted flush with the heated surface. The diameter of the helically wound element coil is kept to a minimum, reducing the difference between the element and chamber temperature, thus ensuring long heater life. This feature enables the design and manufacture of responsive heating systems and significantly reduces the risk of overheating the element.

- Standard 9" long double-twisted bare wire leads.
- Custom shapes are available on request.

MAXIMUM TEMPERATURE

The maximum temperature attainable is totally dependent on the application. To reach the maximum temperature stated, the application must be well insulated and sealed to trap the heat (like an oven) and allow the temperature to build. For example, to use a ceramic fiber cylindrical heater at its maximum temperature, the ends must be closed off with unheated insulated discs to minimize heat loss and allow the temperature to build.

Ceramic Fiber Heater Features and Options

Construction Characteristics

Tempco's standard Ceramic Fiber Heaters are designed for a maximum temperature of 1100°C (2012°F). The resistance wire is wound in a helical coil and embedded flush to the heater surface.

Tempco's High Temperature Ceramic Fiber Heaters are designed for a maximum temperature of 1200°C (2192°F). The resistance ribbon wire is helically wound and mounted at the heater surface using a method that exposes three sides of the coil.

The availability of High Temperature (1200°C) Ceramic Fiber Heaters is very limited. Consult Tempco with your requirements.

Unheated Molded Ceramic Fiber Panels and Cylinders

Tempco can manufacture unheated ceramic fiber panels, full and semi-cylinders for applications that require additional insulation. For example, flat circles can be made to cover the top or bottom of a cylindrical shaped heater to produce a small furnace. The unheated insulation components are made from a similar material as the heaters, so the specifications are the same.

To order, consult Tempco with your requirements.

Thermowells

Quartz glass thermowell tubes can be inserted perpendicular to the heater, usually all the way through, for use with temperature probes to sense the interior temperature. The sensor probes are ordered separately. For a typical thermocouple sensor probe, see page 14-14, MTA1.

For .125" diameter sensor probes, specify a 4mm ID thermowell tube.
For .187" diameter sensor probes, specify a 6mm ID thermowell tube.
For .250" diameter sensor probes, specify an 8mm ID thermowell tube.

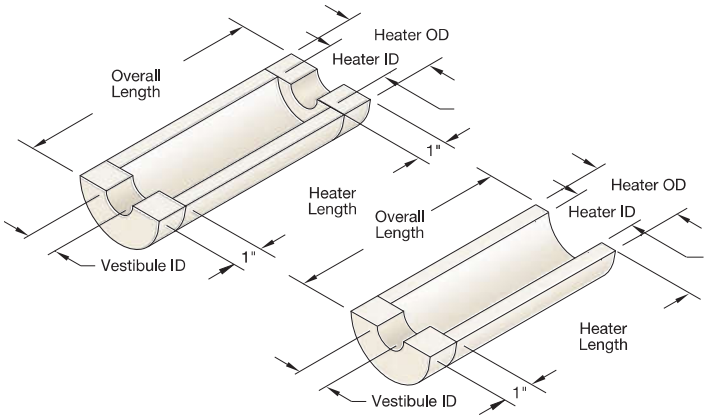
Optional Vestibules on Full and Semi-Cylindrical Heaters

Vestibules are used to support full or semi-cylindrical heaters around a pipe to heat the material flowing through the pipe. The vestibule is made from 1" ceramic fiber board cut to the correct OD and ID and then cemented to one or both ends of standard size full or semi-cylindrical heaters. The overall length for standard vestibules would be the original heater plus 2" for a vestibule on both ends or 1" for a vestibule on one end. It is recommended that for maximum temperatures, a vestibule width of 1.5" to 2" be specified.

Full cylindrical heaters with (two) vestibules are available with Type 1, 4, or 5 leads.

Semi cylindrical heaters with (two) vestibules are available with Type 1 or 3 leads.

To order, consult Tempco with your requirements.



Mounting / Repair Accessories

Rigidizer

The external surface of ceramic fiber heaters is treated with a chemical rigidizer to give the heater the hardened shell typical of this type of heater. When the ceramic heater is cut in the field prior to installation for any purpose, or repairs are required, rigidizer should be used to recoat the surface.

Part Number: CFR00010 **Quantity:** 1 Gal.

Ceramic Fiber Cement

The cement has many general purposes, such as bonding ceramic fiber heaters together or adding additional external insulation.

Part Number: CFR00020 **Quantity:** 1 Gal.

Ceramic Putty

Made from high purity Asbestos-Free Aluminum Oxide-based ceramics with a melting point in excess of 3200°F (1760°C) and formulated with special ceramic binders that, on drying, produce a strong ceramic body.

- ✓ **Resistant** to molten metals, most chemicals, oxidizing and reducing atmospheres.
- ✓ **Use for installation repairs** to brick, mortar, burner blocks, insulation, furnace holders, thermocouples, etc.
- ✓ **Applications include** molding and bonding ceramic fiber components, high temp. insulation, insulation of pipes, supports, burners, turbines, etc.

Size: 4 oz. Squeeze Tube **Part Number:** CFR00030
Size: 11 oz. Caulking Tube **Part Number:** CFR00032

SPECIFICATIONS

Melting Point	3200°F (1760°C)
Continuous Service	2300°F (1260°C)
Base Material	Al_2O_3
Density	40-50 lbs./cu. ft.
Specific Heat	0.25 BTU/# °F
Dielectric Constant at 10^8 cps	1.61
Loss Factor	0.017
Dielectric Strength	100 Volts/mm
Thermal Conductivity at 500°F (260°C)	0.65

DISCONTINUED

Characteristics and Properties

Composition of Insulation
Al_2O_3 (Alumina) 38%
SiO_2 (Silica) 62%
Organics 0%

Bond . . . . . Silica

Bulk Density
gm/cm³, (lb/cu. ft.) 0.28 (18)

Thermal Conductivity
W/m°K (Btu/hr°F ft.²/in.)
400°C (752°F) 0.10 (0.8)
1100°C (2012°F) 0.22 (1.5)

Flexural Strength MPa (Psi)
As received 0.17 (25)
After 24 hrs. at 1000°C 0.354 (51.34)

Compressive Strength MPa (Psi)
10% Deflection 0.054 (7.83)

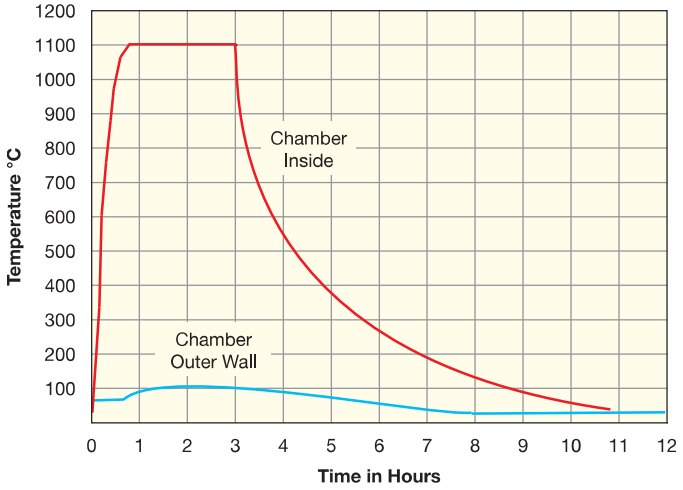
Stability—Linear Shrinkage
24 hrs. at temperature
800°C (1472°F) 0.3%
1000°C (1832°F) 1.8%
1200°C (2192°F) 2.5%

Performance Characteristics

Performance of a Typical Round Ceramic Fiber Heater

The performance data represented in the chart was obtained by combining a Fiber Insulated Heater with 3" discs of insulation top and bottom. This assembly, which can be representative of many industrial and laboratory heating applications, was cycled with no load. Cool down rates were determined by turning the power off. Assembly was left intact. The "outside wall" temperature was measured on the external surface of the sidewall.

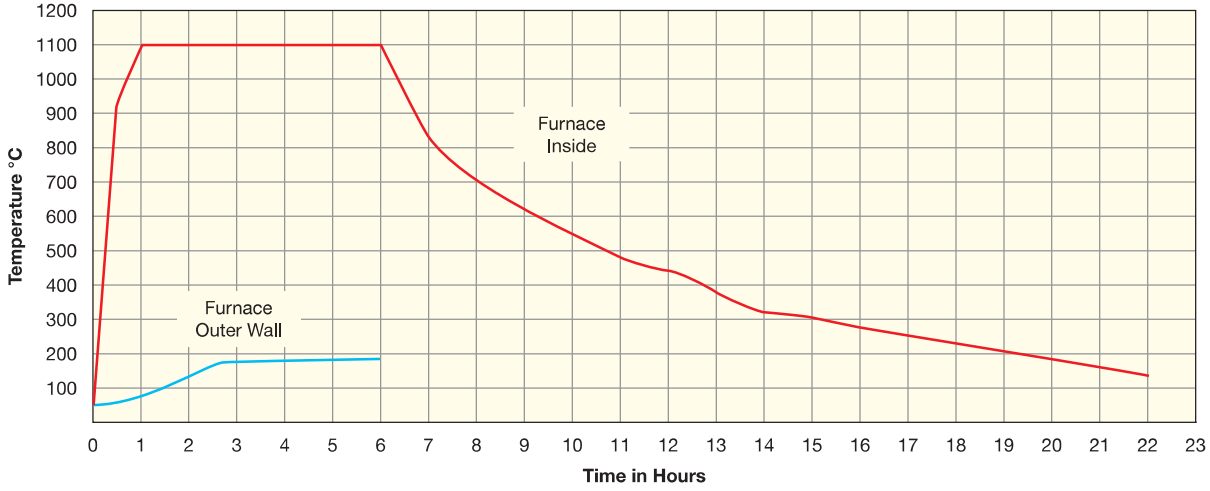
Time vs. Temperature of a Typical Full Round High Temperature Ceramic Fiber Heater 5.5" I.D. × 12" H × 11" O.D.



Performance of a Typical Rectangular Furnace

Test chamber left and right walls fabricated from Standard Fiber Insulated Heaters (24" × 36" × 5") and insulation boards. This size chamber, approximately 10 cubic feet, was chosen to best reflect performance characteristics of flat panel heaters as used in a broad section of industrial applications. Chamber walls, roof and floor are 5" thick insulation. Cool down rate was plotted with data generated after element power was turned off. Chamber door remained closed. Chamber contained no load.

Time vs. Temperature of an (approx.) 10 cubic foot furnace chamber incorporating Tempco's Ceramic Fiber Heaters.



Application Guidelines

1. High Temperature Ceramic Fiber heaters are ***designed for radiant heat transfer*** only. They are not intended for contact heating. They do not have the physical strength found in band, cartridge, strip or cast-in heaters.
2. ***Mounting methods*** such as washers, pins, screws, overlapping edge clamps, and interlocking edges work well with Ceramic Fiber heaters. Cementing is not recommended because it will not allow expansion or contraction.
3. The ***maximum temperature attainable is totally dependent on the application***. To reach the maximum temperature stated, the application must be well sealed (like an oven) to trap the heat generated by the heater core and allow the temperature to build. If the heaters are used in an open environment the maximum temperatures will not be reached. For example, to use a ceramic fiber cylindrical heater at its maximum temperature, the ends must be closed off with un-heated insulated discs to minimize heat loss and allow the temperature to build.
4. Ceramic Fiber Heaters have a ***very high porosity factor*** and cannot be sealed against contamination and possible damage to the heating element. Keep the furnace free of contaminants that can vaporize at high temperatures.
5. The ***temperature for most applications*** needs to be controlled at a specific temperature. This can be most readily accomplished thru the use of fast responding electronic PID temperature controls. See Section 13 for single loop controls and Complete Control Systems.
6. ***Thermocouple temperature probes*** are used to sense the temperature of the application and provide feedback to the Temperature Control System. Typically, Type K thermocouples with an operating range up to 1260°C/2300°F are commonly used. Alloy 600 sheath material, good up to 1177°C/2150°F should be specified. Mineral insulated probes such as Tempco's MTA1 on catalog page 14-14 are highly recommended.
7. ***Be careful with any electrical connections*** made in the heated portion of the application. The connections must be rated for the expected operating temperature and current flow.
8. ***Use only inorganic fibers and binders*** to avoid corrosive fumes that could damage the heater.
9. Ceramic Fiber Heaters are easily damaged from ***careless mechanical handling***, so handle the units and leads carefully.

Dimensional Tolerances

Flat Panels

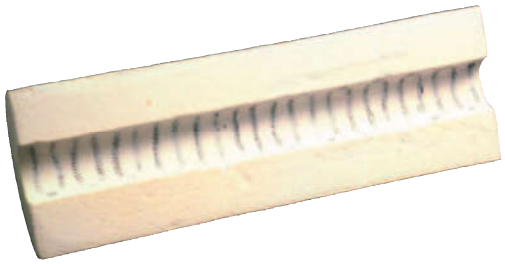
Width:	4", 6", 8"	± ⅛"
	10" through 32"	± ¼"
Length:	6"	± ⅛"
	12" through 44"	± ¼"
Thickness:	1"	± ⅛"
	2" through 4"	± ¼"

Full Cylindrical

I.D.:	1.5" through 4"	± ⅛"
	5" through 18"	± ¼"
O.D.:	3.5"	± ⅛"
	5" through 24"	± ¼"
Length:	6"	± ⅛"
	12" and 18"	± ¼"

Semi-Cylindrical

I.D.:	2" and 3.5"	± ⅛"
	5" through 18"	± ¼"
O.D.:	6" through 22"	± ¼"
Length:	6"	± ⅛"
	12" through 36"	± ¼"



Standard Temperature (1100°C) Semi-Cylindrical Heater

2" I.D. × 6" O.D. × 18" Long
1130W, 240V

Note: Temperature ratings of 1200°C (2192°F) are available on a limited number of designs. Consult Tempco.

High Temperature (1200°C) Flat Panel Heater

12" Square × 2" Thick
1100W, 120V

High Temperature (1200°C) Semi-Cylindrical Heater

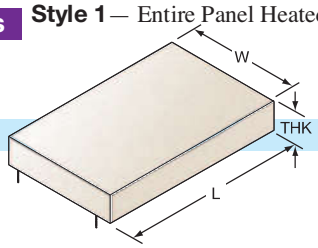
7" I.D. × 11" O.D. × 12" Long
1600W, 240V

Made in USA

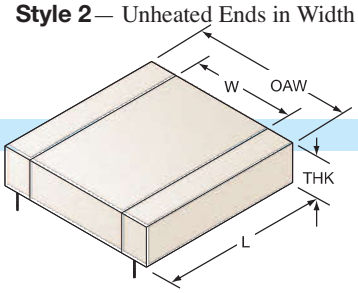
Ceramic Fiber Flat Panel Heaters

Panel Styles
Type 1 Leads Shown

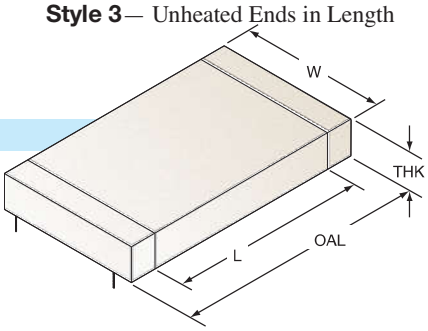
Style 1— Entire Panel Heated



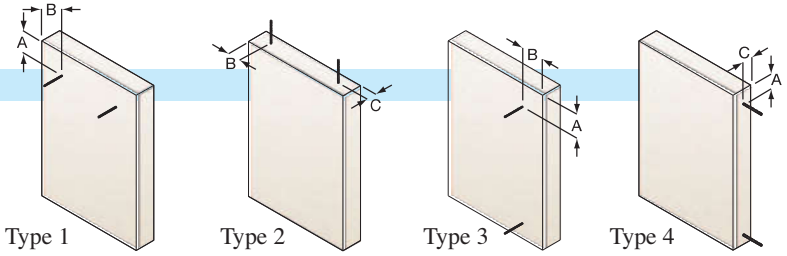
Style 2— Unheated Ends in Width

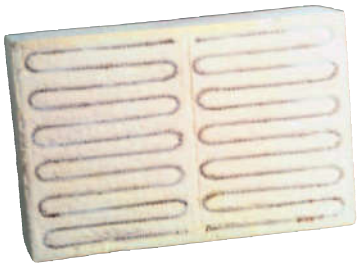


Style 3— Unheated Ends in Length



Lead Locations





Standard Panel Heater
18" W × 24" L × 3" Thick

Ordering Information

Standard Units

Select a **Flat Panel Heater** by size, electrical rating and style from the table below. To complete the part number, add the required lead location number.

For example

CFR1001[2] has Type 2 Leads.

Standard leads are double twist 9" long high-temperature bare wire.

Custom Designed/Manufactured Flat Panel Heaters

Custom manufactured Flat Panel Ceramic Fiber Heaters are available; consult **Tempco** with your requirements. ***Standard lead time is 4 weeks.***

Please Specify the following:

- ❑ 1100°C or 1200°C Construction Style
- ❑ Length
- ❑ Width
- ❑ Voltage and Wattage
- ❑ Lead Location and Type
- ❑ Special Features

Note: See page 4-2 for maximum temperature guidelines

WARNING: Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

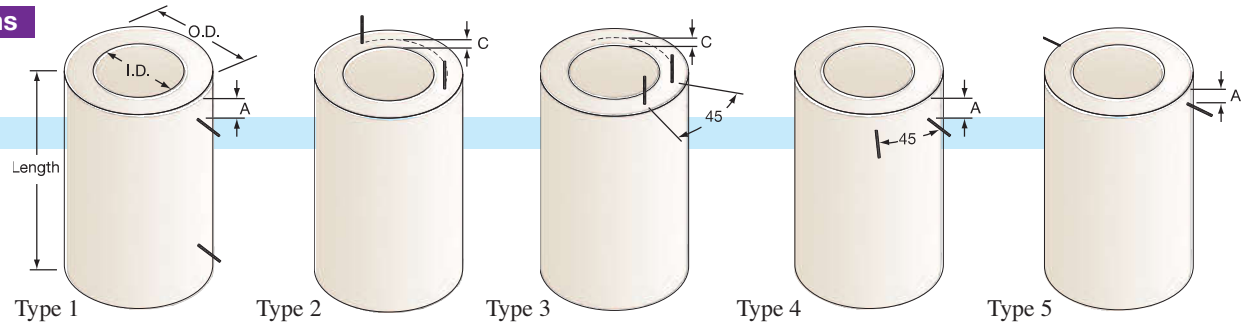
Standard (Non-Stock) Flat Panel High Temperature Ceramic Fiber Heaters (1100°C Construction Style)

All Dimensions are in inches. Lead Locations A, B and C are approximate. Complete the part number by adding the required lead location number.

Heated					Style 1				Style 2					Style 3				
					Part	Lead Location			Part		Lead Location			Part		Lead Location		
W	L	Thk	Watts	Volts	Number	A	B	C	Number	OAW	A	B	C	Number	OAL	A	B	C
4	6	1	250	60	CFR1001❑	1.0	1.0	0.5	CFR1019❑	6	1.0	2.0	0.5	CFR1037❑	8	2.0	1.0	0.5
4	12	1	500	60	CFR1002❑	1.0	1.0	0.5	CFR1020❑	6	1.0	2.0	0.5	CFR1038❑	14	2.0	1.0	0.5
6	6	2	375	60	CFR1003❑	1.5	1.5	1.0	CFR1021❑	10	1.5	3.5	1.0	CFR1039❑	10	3.5	1.5	1.0
6	12	2	750	120	CFR1004❑	1.5	1.5	1.0	CFR1022❑	10	1.5	3.5	1.0	CFR1040❑	16	3.5	1.5	1.0
6	18	2	1125	120	CFR1005❑	1.5	1.5	1.0	CFR1023❑	10	1.5	3.5	1.0	CFR1041❑	22	3.5	1.5	1.0
6	24	2	1500	120	CFR1006❑	1.5	1.5	1.0	CFR1024❑	10	1.5	3.5	1.0	CFR1042❑	28	3.5	1.5	1.0
8	12	2	1000	120	CFR1007❑	2.0	2.0	1.0	CFR1025❑	12	2.0	4.0	1.0	CFR1043❑	16	4.0	2.0	1.0
8	18	2	1500	120	CFR1008❑	2.0	2.0	1.0	CFR1026❑	12	2.0	4.0	1.0	CFR1044❑	22	4.0	2.0	1.0
8	24	2	2000	120	CFR1009❑	2.0	2.0	1.0	CFR1027❑	12	2.0	4.0	1.0	CFR1045❑	28	4.0	2.0	1.0
12	12	2	1500	120	CFR1010❑	2.0	2.0	1.0	CFR1028❑	16	2.0	4.0	1.0	CFR1046❑	16	4.0	2.0	1.0
12	18	2	2250	120	CFR1011❑	2.0	2.0	1.0	CFR1029❑	16	2.0	4.0	1.0	CFR1047❑	22	4.0	2.0	1.0
12	24	2	3000	240	CFR1012❑	2.0	2.0	1.0	CFR1030❑	16	2.0	4.0	1.0	CFR1048❑	28	4.0	2.0	1.0
12	36	2	4500	240	CFR1013❑	2.0	2.0	1.0	CFR1031❑	16	2.0	4.0	1.0	CFR1049❑	40	4.0	2.0	1.0
18	18	3	3375	240	CFR1014❑	2.5	2.5	1.5	CFR1032❑	24	2.5	5.5	1.5	CFR1050❑	24	5.5	2.5	1.5
18	24	3	4500	240	CFR1015❑	2.5	2.5	1.5	CFR1033❑	24	2.5	5.5	1.5	CFR1051❑	30	5.5	2.5	1.5
18	36	3	6750	480	CFR1016❑	2.5	2.5	1.5	CFR1034❑	24	2.5	5.5	1.5					
24	24	4	6000	480	CFR1017❑	3.0	3.0	2.0	CFR1035❑	32	3.0	7.0	2.0	CFR1053❑	32	7.0	3.0	2.0
24	36	4	9000	480	CFR1018❑	3.0	3.0	2.0	CFR1036❑	32	3.0	7.0	2.0					

Ceramic Fiber Cylindrical Heaters

Lead Locations



Standard (Non-Stock) Full Cylindrical Shaped High-Temperature Ceramic Fiber Heaters (1100°C Construction Style)

All Dimensions are in inches. Lead Locations A and C are approximate.
Complete the part number by adding the required lead location number.

I.D.	O.D.	Length	Watts	Volts	Lead Location A	Lead Location C	Part Number
1.5	3.5	12.0	600	120	1.5	0.5	CFR3004☐
2.0	5.0	6.0	400	60	1.0	0.8	CFR3005☐
2.0	5.0	12.0	800	120	1.5	0.8	CFR3006☐
3.0	6.0	6.0	600	120	1.0	0.8	CFR3007☐
3.0	6.0	12.0	1200	120	1.5	0.8	CFR3008☐
4.0	8.0	6.0	800	120	1.0	1.0	CFR3009☐
4.0	8.0	12.0	1600	120	1.5	1.0	CFR3010☐
5.0	9.0	6.0	1000	120	1.0	1.0	CFR3011☐
5.0	9.0	12.0	2000	120	1.5	1.0	CFR3012☐
6.0	10.0	6.0	1200	120	1.0	1.0	CFR3013☐
6.0	10.0	12.0	2400	120	1.5	1.0	CFR3014☐
6.0	10.0	18.0	3500	240	2.0	1.0	CFR3015☐
8.0	12.0	6.0	1600	120	1.0	1.0	CFR3016☐
8.0	12.0	12.0	3100	240	1.5	1.0	CFR3017☐
10.0	16.0	6.0	2000	120	1.0	1.5	CFR3019☐
10.0	16.0	12.0	3900	240	1.5	1.5	CFR3020☐
10.0	16.0	18.0	5900	240	2.0	1.5	CFR3021☐
12.0	18.0	12.0	4700	240	1.5	1.5	CFR3023☐
12.0	18.0	18.0	7100	240	2.0	1.5	CFR3024☐
14.0	20.0	18.0	8200	240	2.0	1.5	CFR3026☐
18.0	24.0	12.0	7100	240	1.5	2.0	CFR3028☐

Note: See page 4-2 for maximum temperature guidelines

Standard Full Cylindrical Shaped Heater
8" I.D. × 12" O.D. × 6" Long

Ordering Information

Standard Units

Select a **Full Cylindrical Shaped Heater** by size and electrical rating from the table above. To complete the part number add the required lead location number.

For example

CFR3004[2] has Type 2 Leads.

Standard leads are double twist 9" long high-temperature bare wire.

Custom Designed/Manufactured Full Cylindrical Shaped Heaters

Custom manufactured Full Cylindrical Shaped Ceramic Fiber Heaters are available; consult **Tempco** with your requirements. ***Standard lead time is 4 weeks.***

Please Specify the following:

- ❑ 1100°C or 1200°C Construction Style
- ❑ Length
- ❑ Inner Diameter
- ❑ Outer Diameter
- ❑ Wattage
- ❑ Voltage
- ❑ Lead Location and Type

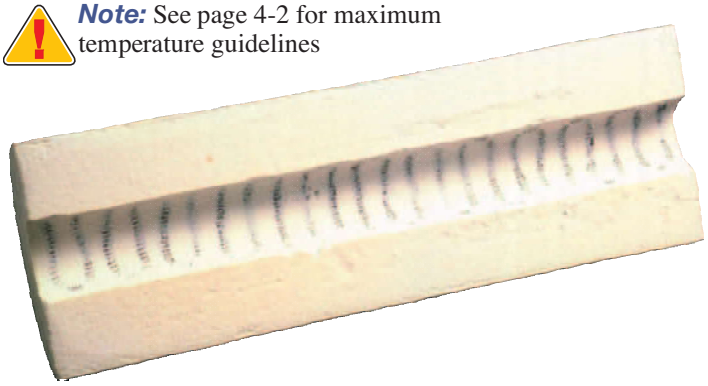
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Ceramic Fiber Semi-Cylindrical Heaters

Standard (Non-Stock) Semi-Cylindrical Shaped High-Temperature Ceramic Fiber Heaters (1100°C Construction Style)

Note: See page 4-2 for maximum temperature guidelines

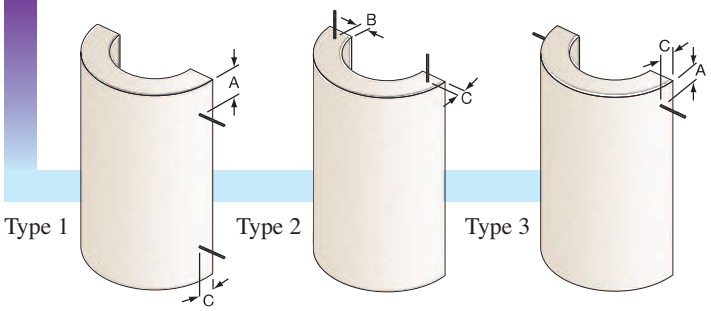


Standard Semi-Cylindrical Shaped Heater
2" I.D. × 6" O.D. × 18" Long

All Dimensions are in inches. Lead Locations A, B and C are approximate. Complete the part number by adding the required lead location number.

I.D.	O.D.	L	Watts	Volts	Lead Location A	B	C	Part Number
2.0	6.0	6.0	200	60	1.0	1.0	1.0	CFR5003☐
2.0	6.0	12.0	400	120	1.5	1.0	1.0	CFR5004☐
2.0	6.0	18.0	600	120	2.0	1.0	1.0	CFR5005☐
2.0	6.0	24.0	800	240	2.0	1.0	1.0	CFR5006☐
3.5	7.5	6.0	350	60	1.0	1.5	1.0	CFR5007☐
3.5	7.5	12.0	700	120	1.5	1.5	1.0	CFR5008☐
5.0	9.0	6.0	500	60	1.0	1.5	1.0	CFR5011☐
5.0	9.0	12.0	1000	120	1.5	1.5	1.0	CFR5012☐
5.0	9.0	18.0	1500	240	2.0	1.5	1.0	CFR5013☐
5.0	9.0	24.0	2000	240	2.0	1.5	1.0	CFR5014☐
5.0	9.0	30.0	2500	240	2.5	1.5	1.0	CFR5015☐
5.0	9.0	36.0	3000	240	2.5	1.5	1.0	CFR5016☐
6.5	10.5	6.0	650	120	1.0	2.0	1.0	CFR5017☐
6.5	10.5	12.0	1300	240	1.5	2.0	1.0	CFR5018☐
6.5	10.5	18.0	1950	240	2.0	2.0	1.0	CFR5019☐
6.5	10.5	24.0	2600	240	2.0	2.0	1.0	CFR5020☐
8.0	12.0	12.0	1600	240	1.5	2.0	1.0	CFR5023☐
8.0	12.0	18.0	2400	240	2.0	2.0	1.0	CFR5024☐
8.0	12.0	24.0	3200	240	2.0	2.0	1.0	CFR5025☐
8.0	12.0	36.0	4800	240	2.5	2.0	1.0	CFR5027☐
10.0	14.0	12.0	2000	240	1.5	2.0	1.0	CFR5028☐
10.0	14.0	18.0	3000	240	2.0	2.0	1.0	CFR5029☐
10.0	14.0	24.0	4000	240	2.0	2.0	1.0	CFR5030☐
12.0	16.0	12.0	2400	240	1.5	2.0	1.0	CFR5033☐
12.0	16.0	18.0	3600	240	2.0	2.0	1.0	CFR5034☐
12.0	16.0	24.0	4800	240	2.0	2.0	1.0	CFR5035☐
15.0	19.0	12.0	3000	240	1.5	2.0	1.0	CFR5038☐
15.0	19.0	18.0	4500	240	2.0	2.0	1.0	CFR5039☐
15.0	19.0	24.0	6000	240	2.0	2.0	1.0	CFR5040☐
15.0	19.0	30.0	7500	240	2.5	2.0	1.0	CFR5041☐
15.0	19.0	36.0	9000	240	2.5	2.0	1.0	CFR5042☐

Lead Locations



Note: Semi-Cylindrical Heaters are produced individually, but made to fit together in a full circle without a gap.

Ordering Information

Standard Units

Select a **Semi-Cylindrical Shaped Heater** by size and electrical rating from the table above. To complete the part number add the required lead location type by number.

For example

CFR5003☐2 has Type 2 Leads.

Standard leads are double twist 9" long high-temperature bare wire.

Custom Designed/Manufactured Semi-Cylindrical Shaped Heaters

Custom manufactured Semi-Cylindrical Shaped Ceramic Fiber Heaters are available; consult **Tempco** with your requirements.

Standard lead time is 4 weeks.

Please Specify the following:

- ❑ 1100°C or 1200°C Construction Style
- ❑ Length
- ❑ Inner Diameter
- ❑ Outer Diameter
- ❑ Wattage
- ❑ Voltage
- ❑ Lead Location and Type

Table Of Contents

Cartridge Heaters for Runnerless Molding can be found in Section 2

Tubular Heaters for Runnerless Molding can be found in Section 10

Coil & Cable Heaters

5 section

Made in USA

Mightyband™ Coil Heaters

The Superior Coil Heater Design with a Built-In Thermocouple

U.S. Patents #4150281 and #4253011

Design Features

- *Temperatures up to 1800°F (982°C)*
- *Precise temperature control*
- *Choice of lead orientation*
- *Built-in type J or K Thermocouple*
- *Round, square and rectangular cable*
- *Rugged, durable construction*
- *Unheated straight section*
- *Fast response time*
- *Choice of lead protection*
- *Longer heater life*
- *Higher watt densities*
- *Made to customer specifications*

Tempco Mightyband heaters have opened new frontiers and revolutionized the plastic injection runnerless molding industry since their introduction by Tempco in 1977. They provided the manufacturers of this type of equipment with a new and more effective heating element concept, thus allowing them to design and manufacture new, improved, and more efficient runnerless molding systems, with the capabilities required to meet the ever-increasing demand for processing engineering resins and high production output requirements of today's industrial and consumer markets.

A REVOLUTIONARY CONCEPT IN HEATER DESIGN

One specific way to improve the Mightyband heater design is to use a square or rectangular mineral insulated cable, which has a flat surface contact, allowing better heat conduction and a faster start-up time.

Applications

Tempco offers from stock a large selection of standard Mightyband coil heaters for plastic injection runnerless molding bushings and for internally heated injection machine nozzles. The inside diameter of a coiled heater is wound undersized for a screw-on fit. Therefore, hold- down straps are not usually required.

Construction Characteristics

Tempco's dedication to quality and product improvement has led us to the development of a second generation of Mightyband heaters.

Manufactured for trouble-free performance in operations involving heating of cylindrical-shaped surfaces where precise temperature control is essential. Especially adapted as an alternate heat source for demanding and high temperature applications where other types of heaters have failed.

The design and manufacturing concept incorporates a built-in thermocouple, with a grounded junction terminating at the end of the cable opposite to the lead end. In some heaters, the thermocouple junction can be terminated anywhere within the coil section. Consult Tempco for the availability of this option on your specific heater.

The built-in thermocouple and the overall low mass construction provide quick response for positive temperature control. Incorporating the thermocouple into the heater construction eliminates the need for separate thermocouples, which have proven to be expensive, fragile and impractical.

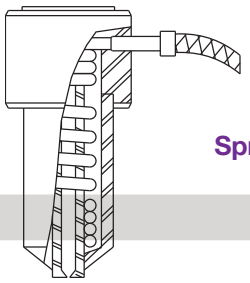
Standard Type J thermocouple with 304 stainless steel heater sheath is recommended for temperatures up to 1500°F (815°C). An optional Type K thermocouple with Inconel® 600 heater sheath for temperatures up to 1800°F (982°C) is available upon request. In some applications, the built-in thermocouple may not be required. In this case, it can be omitted from the heater cable.

The heating source for the Mightyband heater is a resistance wire in straight form or wound into a miniature helical coil. Selecting the best-suited resistance wire configuration is predetermined by an engineering formula applied to the specific heater design.

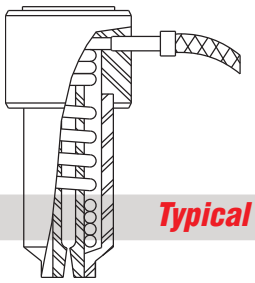
On Mightyband heaters where wire wound resistance coils are used, the tail end of the heater cable is usually unheated. Optional unheated or cooler tail sections are available on straight resistance wire heater designs. Consult Tempco with your specific requirements.

The swaging and drawing process involved in manufacturing the heater cable for Mightyband heaters compacts the ceramic insulators that house the heating element and thermocouple wire into a solid mass, producing a rugged and durable heater cable, providing excellent thermal conductivity, dielectric strength and quick thermocouple response.

Mightyband™ Coil Heater Specifications

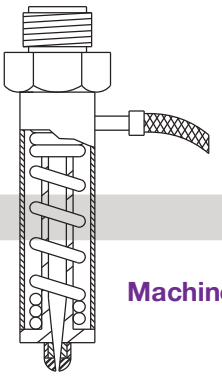


Sprue Bushing



Sprue Bushing

Typical Applications



Machine Nozzle

Specifications

Electrical

Resistance Tolerance: . . . . . ±10%

Wattage Tolerance: . . . . . ±10%

Maximum Amperage: . . . . . 20 Amps

Standard Voltage: . . . . . 120 or 240 Volts

Higher or lower voltages applicable for specific heater designs; consult Tempco with your requirements.

Dimensional

Standard square cable: . . . . . .0.125", 0.134" square

Standard rectangular cable: . . . . . .0.110" × 0.160"

Standard round cable diameters: . . . . . .0.115", 0.120", 0.125"
0.132", 0.153", 0.163"
Others available upon request.

Cable diameter tolerance: . . . . . ±0.005

Standard potting adapter: . . . . . 5/16" Diameter
Used with heater only and heater with T/C leads, 20 gauge and under.

. . . . . 1/2" Diameter
Used with heater only and heater with T/C leads, 18 gauge to 10 gauge.

Standard potting adapter length: . . . . . 1-1/2"
Other lengths available.

Standard coil I.D.: . . . . . From 3/8" up to 2-1/2" in any increments.
Applicable Coil I.D. is subject to cable diameter.

Coil I.D. Tolerance: . . . . . 3/8" to 3/4", +0.000", –0.020"
. . . . . 7/8" to 1-1/4", +0.000", –0.030"
1-1/2" to 2-1/2", +0.000", –0.060"

Coil Width (length): . . . . . Up to 12" on 3/8" to 3/4" I.D.
Up to 16" on 7/8" to 1-1/4" I.D.
Up to 18" on 1-1/2" to 2-1/2"

Coil Width Tolerance: . . . . . 0 to 6": +0, –1/8"
6 to 12": +1/8", –1/4"
12 to 18": ±1/4"

Standard Sheath Material: . . . . . 304 stainless steel
For temperatures up to 1500°F (815°C)

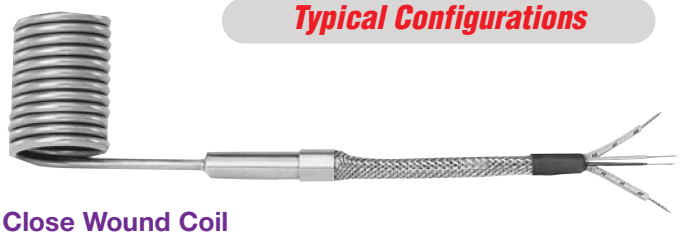
Optional Sheath Material: . . . . . Inconel® 600
For temperatures up to 1800°F (982°C)

Standard Thermocouple: . . . . . ANSI Type J

Optional Thermocouple: . . . . . ANSI Type K

Minimum Bending Radius: . . . . . Two times the sheath diameter

Typical Configurations



Close Wound Coil

Distributed Wattage

By specifically arranging a coiling pattern on the heater cable, heat distribution can be concentrated where it is needed. Useful to compensate for heat losses along the edges of the part being heated. Specify concentration.

Clamping Straps

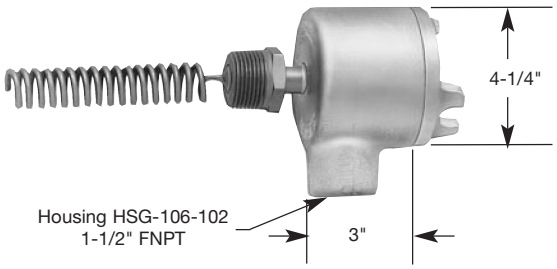
Mightybands normally do not require clamping straps as the inside diameter of the coil is wound undersize for a screw fit. At times because of differences in the expansion and contraction in materials a clamping strap may be required to ensure circumferential clamping forces. Clamping straps also provide additional protection of the heater coils from accidental damage. If optional clamping strap is required, specify.

Made in USA

Special Coil Heater Configurations

Star Wound Coil

Star wound formations are usually inserted into pipes or ducts and are used to heat moving air or liquids. The offset coils create a turbulent flow. This allows the flowing material to have better contact with the heater surface, resulting in more efficient heat transfer.



Explosion or Moisture Resistant Box

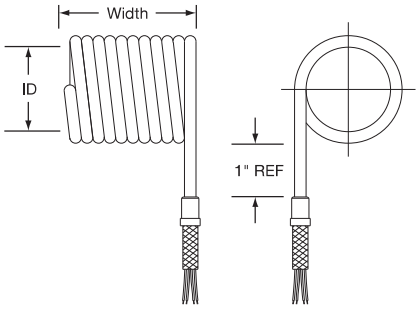
Mightyband coil heaters can be used for immersion heating and/or in-line heating of liquids, gases or air. The built-in thermocouple provides a self-contained heating unit, eliminating the need for separate thermowells, and is available with standard NPT or special fittings. The outside diameter (O.D.) of the coil must be smaller than the fitting being used for proper fit to the mating part. The wiring can be protected from hazardous environments by attaching explosion or moisture-proof boxes. Consult Tempco with your requirements.

NPT Pipe Fittings

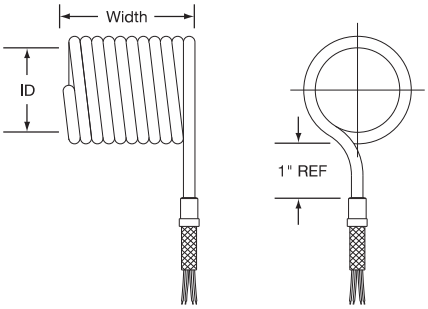
Mightyband coil heaters can be used for immersion heating and/or in-line heating of liquids, gases or air. The built-in thermocouple provides a self-contained heating unit, eliminating the need for separate thermowells. Available with standard NPT fittings or special fittings. The outside diameter (O.D.) of the coil must be smaller than the fitting being used for proper fit to the mating part. Consult Tempco with your requirements.

Lead Orientations

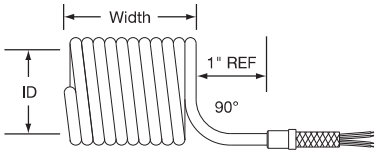
LO1 Standard



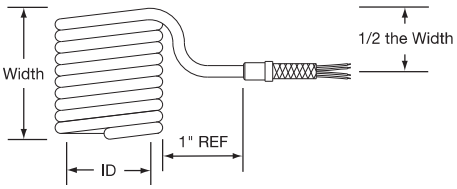
LO2



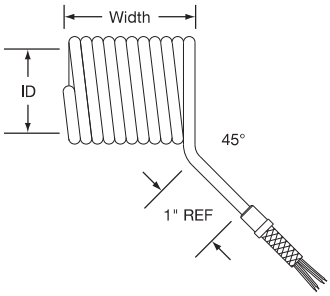
LO3



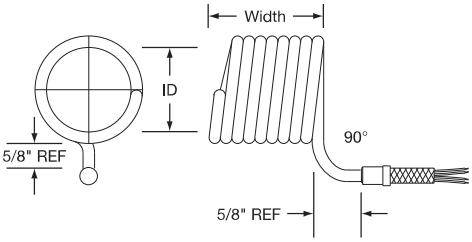
LO4



LO5



LO6

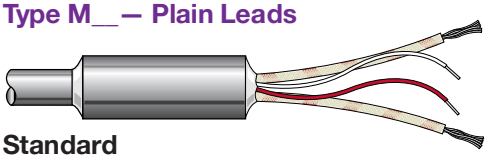


Note: Lead orientations can be custom formed. Consult Tempco with your requirements. We welcome your inquiries.

Potting Adapter Lead Terminations

- The heating element wire to lead wire transition is done within the potting adapter. Potting adapter sizes are 5/16" O.D. × 1-1/2" long for heater cable diameters 0.188" and smaller and 1/2" × 1-1/2" long for diameters above 0.188". Other diameters and lengths are available, depending on design parameters.
- When the 1/2" × 1-1/2" long potting adapter is used for high temperature applications, a special heat sink collar is also used to help keep the transition from overheating.
- All transitions use 1150°F (621°C) braze joint between the heating element wire and the flexible lead wire.
- Normally the lead wire construction is a fiberglass braided insulation rated to 482°F (250°C). For high temperature applications an MGT (mica, fiberglass, Teflon® impregnation) insulation rated to 842°F (450°C) is used. All thermocouple leads use a fiberglass insulation rated to 900°F (482°C). Lead wires are selected to meet the amperage and temperature requirements of each specific heater.

Type M__— Plain Leads



Standard
M1 — High temperature cement potting with TGGT (Teflon® tape, fiberglass, Teflon® treated fiberglass overbraid) insulated lead wire for 482°F (250°C) and silicone sealed is standard.

Optional
M2 — High temperature epoxy potting rated 450°F (232°C) with PTFE Teflon® lead wire for a better moisture seal.

Optional
M3 — High temperature cement potting with MGT (mica tape, Teflon® treated fiberglass overbraid) insulated lead wire for 842°F (450°C) and silicone sealed.

Note: Temperature at potting adapter should not exceed the specified limits.

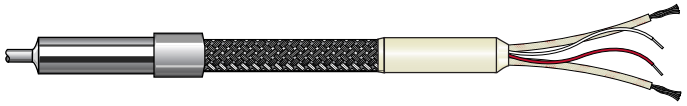
Lead Wire Abrasion Protection Terminations

Type A__— Stainless Steel Armor Cable

Type A1 — Rated to 482°F (250°C) – TGGT Fiberglass Wire
Type A2 — Rated to 450°F (232°C) – Teflon® Wire
Type A3 — Rated to 842°F (450°C) – MGT Fiberglass Wire

Flexible SS armor cable protects the leads against abrasion and contamination. Special plugs can be attached to heater leads and thermocouple leads.

Type B__— Stainless Steel Overbraid



Type B1 — Rated to 482°F (250°C) – TGGT Fiberglass Wire
Type B2 — Rated to 450°F (232°C) – Teflon® Wire
Type B3 — Rated to 842°F (450°C) – MGT Fiberglass Wire

SS overbraid protects the leads against abrasion and allows more aggressive bending, which is not possible with armor cable. Special plugs can be attached to heater and thermocouple leads.

Type C__— Galvanized Armor Cable

Type C1 — Rated to 482°F (250°C) – TGGT Fiberglass Wire
Type C2 — Rated to 450°F (232°C) – Teflon® Wire
Type C3 — Rated to 842°F (450°C) – MGT Fiberglass Wire

Flexible galvanized armor cable protects the leads against abrasion and contamination. Special plugs can be attached to heater leads and thermocouple leads.

Type S__— Fiberglass Sleeve

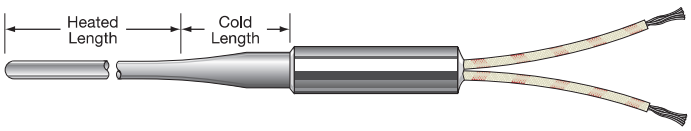
Type S1 — Rated to 482°F (250°C) – TGGT Fiberglass Wire
Type S2 — Rated to 450°F (232°C) – Teflon® Wire
Type S3 — Rated to 842°F (450°C) – MGT Fiberglass Wire

Fiberglass sleeve protects the leads against abrasion and allows more flexibility of lead wires. Special plugs can be attached to heater and thermocouple leads.

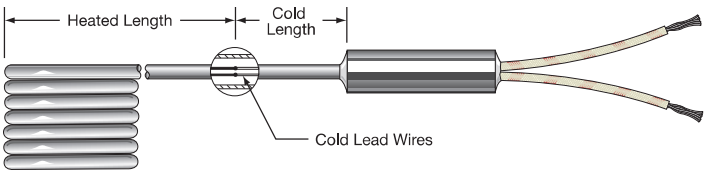
Optional Heater Cable Cold End

The availability of Tempco-Pak heaters with optional cold heater cable end depends on the electrical ratings and materials used for each heater design. Consult Tempco for the availability of these options.

Type ND— Neck Down



Type NW— Built-in Cold Wire



Made in USA

Mightyband™ Coil Heaters

Heater shown with
Lead Protection Type B and
Lead Orientation LO1.

Standard (Non-Stock) Round Cable Heaters

Standard Cable Heaters have 304 Stainless Steel Sheath

Inside Diameter in	Inside Diameter mm	Outside Diameter in	Outside Diameter mm	Width in	Width mm	Watts	Volts	Distributed Wattage	Close Wound	Lead Protection	Lead Orientation	Part Number
½	12.7	0.808	20.5	2	50.8	340	240	yes		C1	LO2	MHC00001
½	12.7	0.808	20.5	2½	63.5	340	240	yes		C1	LO2	MHC00002
½	12.7	0.808	20.5	3	76.2	340	240	yes		C1	LO2	MHC00003
½	12.7	0.808	20.5	3½	88.9	340	240	yes		C1	LO2	MHC00004
½	12.7	0.808	20.5	3	76.2	380	240	yes		C1	LO2	MHC00005
½	12.7	0.808	20.5	3½	88.9	380	240	yes		C1	LO2	MHC00006
½	12.7	0.730	18.5	2½	63.5	450	240		yes	C1	LO1	MHC00007
½	12.7	0.764	19.4	4½	114.3	400	240	yes		C1	LO2	MHC00008
½	12.7	0.750	19.1	5½	139.7	400	240	yes		C1	LO2	MHC00009
½	12.7	0.750	19.1	6½	165.1	400	240	yes		C1	LO2	MHC00010
½	12.7	0.750	19.1	4⅝	117.5	300	240		yes	C1	LO1	MHC00011
½	12.7	0.712	18.1	2	50.8	340	120		yes	C1	LO2	MHC00012
½	12.7	0.764	19.4	2½	63.5	340	120	yes		C1	LO2	MHC00013
½	12.7	0.764	19.4	3	76.2	380	120	yes		C1	LO2	MHC00014
½	12.7	0.764	19.4	3½	88.9	380	120	yes		C1	LO2	MHC00015
½	12.7	0.744	18.9	4½	114.3	400	120	yes		C1	LO2	MHC00016
½	12.7	0.744	18.9	5½	139.7	400	120	yes		C1	LO2	MHC00017
½	12.7	0.744	18.9	6½	165.1	400	120	yes		C1	LO2	MHC00018
½	12.7	0.750	19.1	4⅝	117.5	300	120		yes	C1	LO1	MHC00019
❖ ⅝	15.9	0.931	23.6	2	50.8	300	240	yes		C1	LO2	MHC00020
❖ ⅝	15.9	0.931	23.6	2½	63.5	325	240	yes		C1	LO2	MHC00021
⅝	15.9	0.891	22.6	2	50.8	330	120		yes	B1	LO2	MHC00022
⅝	15.9	0.875	22.2	2	50.8	330	240		yes	B1	LO2	MHC00023
⅝	15.9	0.875	22.2	2½	63.5	330	240	yes		B1	LO2	MHC00024
⅝	15.9	0.875	22.2	3	76.2	330	240	yes		B1	LO2	MHC00025
⅝	15.9	0.875	22.2	3	76.2	380	240	yes		C1	LO2	MHC00026
⅝	15.9	0.875	22.2	3	76.2	360	240		yes	B1	LO2	MHC00027
⅝	15.9	0.875	22.2	4	101.6	360	240	yes		B1	LO2	MHC00028
⅝	15.9	0.875	22.2	4	101.6	500	240		yes	B1	LO2	MHC00029
⅝	15.9	0.875	22.2	5	127.0	500	240	yes		C1	LO2	MHC00030
❖ ⅝	15.9	0.875	22.2	6	152.4	550	240	yes		C1	LO2	MHC00031
¾	19.1	1.056	26.8	1¼	31.8	250	230		yes	M†	LO1	MHC00032
¾	19.1	1.056	26.8	1¼	31.8	125	230		yes	M†	LO1	MHC00033
¾	19.1	1.056	26.8	1¼	31.8	400	120		yes	B1	LO1	MHC00034
¾	19.1	1.000	25.4	2	50.8	365	120		yes	B1	LO1	MHC00035
¾	19.1	1.056	26.8	2	50.8	135	240		yes	B1	LO1	MHC00036
¾	19.1	1.000	25.4	3	76.2	750	240		yes	B1	LO1	MHC00037
¾	19.1	0.972	24.7	5	127.0	600	240		yes	B1	LO1	MHC00038
¾	19.1	0.992	25.2	8½	215.9	1300	240		yes	B1	LO1	MHC00039
⅞	22.2	1.181	30.0	1	25.4	400	120		yes	B1	LO1	MHC00040
⅞	22.2	1.181	30.0	1¼	31.8	250	240		yes	M†	LO2	MHC00041
❖ ⅞	22.2	1.181	30.0	2	50.8	400	240	yes		C1	LO2	MHC00042
⅞	22.2	1.181	30.0	2⅝	66.7	480	240	yes		C1	LO2	MHC00043
⅞	22.2	1.181	30.0	3⅛	79.4	480	240	yes		C1	LO2	MHC00044

Note: ❖ Denotes the Thermocouple Junction is located between third and fourth coil from the tip end, isolated from the sheath. See page 5-5 for Lead Protection and page 5-4 for Lead Orientation descriptions.

† Cement Potted Teflon® insulated SPC wire

Mightyband™ Coil Heaters

Standard (Non-Stock) Round Cable Heaters

Standard Cable Heaters have 304 Stainless Steel Sheath

Inside Diameter in	Inside Diameter mm	Outside Diameter in	Outside Diameter mm	Width in	Width mm	Watts	Volts	Distributed Wattage	Close Wound	Lead Protection	Lead Orientation	Part Number
⅞	22.2	1.115	28.3	2	50.8	670	120		yes	B3	LO2	MHC00045
⅞	22.2	1.125	28.6	2	50.8	670	240		yes	B1	LO2	MHC00046
⅞	22.2	1.125	28.6	2½	63.5	670	240	yes		B1	LO2	MHC00047
⅞	22.2	1.125	28.6	3⅛	79.4	670	240	yes		B1	LO2	MHC00048
❖ ⅞	22.2	1.181	30.0	2½	63.5	450	240	yes		C1	LO2	MHC00049
⅞	22.2	1.181	30.0	3⅜	92.1	550	240	yes		C1	LO2	MHC00050
⅞	22.2	1.181	30.0	4 5/16	109.5	550	240	yes		C1	LO2	MHC00051
⅞	22.2	1.181	30.0	5 5/16	134.9	650	240	yes		C1	LO2	MHC00052
⅞	22.2	1.181	30.0	6 5/16	160.3	650	240	yes		C1	LO2	MHC00053
⅞	22.2	1.181	30.0	7 5/16	185.7	650	240	yes		C1	LO2	MHC00054
❖ ⅞	22.2	1.125	28.6	3	76.2	680	240	yes		C1	LO2	MHC00055
❖ ⅞	22.2	1.125	28.6	3½	88.9	700	240	yes		C1	LO2	MHC00056
⅞	22.2	1.125	28.6	3⅜	92.1	770	240	yes		B1	LO2	MHC00057
⅞	22.2	1.125	28.6	4 5/16	109.5	770	240	yes		B1	LO2	MHC00058
⅞	22.2	1.125	28.6	5 5/16	134.9	770	240	yes		B1	LO2	MHC00059
⅞	22.2	1.125	28.6	4	101.6	775	240	yes		C1	LO2	MHC00060
⅞	22.2	1.125	28.6	6 5/16	160.3	730	240	yes		B1	LO2	MHC00061
⅞	22.2	1.125	28.6	7 5/16	185.7	730	240	yes		B1	LO2	MHC00062
❖ ⅞	22.2	1.125	28.6	5	127.0	900	240	yes		C1	LO2	MHC00063
⅞	22.2	1.105	28.1	8 5/16	211.1	730	240	yes		C1	LO2	MHC00064
⅞	22.2	1.105	28.1	9 5/16	236.5	730	240	yes		C1	LO2	MHC00065
⅞	22.2	1.105	28.1	10 5/16	261.9	730	240	yes		C1	LO2	MHC00066
❖ ⅞	22.2	1.125	28.6	6	152.4	1000	240	yes		C1	LO2	MHC00067
⅞	22.2	1.105	28.1	11 5/16	287.3	850	240	yes		C1	LO2	MHC00068
⅞	22.2	1.105	28.1	12 5/16	312.7	850	240	yes		C1	LO2	MHC00069
⅞	22.2	1.105	28.1	13 5/16	338.1	850	240	yes		C1	LO2	MHC00070
⅞	22.2	1.105	28.1	14 5/16	363.5	850	240	yes		C1	LO2	MHC00071
⅞	22.2	1.105	28.6	7	177.8	1100	240	yes		C1	LO2	MHC00072
1	25.4	1.250	31.8	1½	38.1	375	120		yes	B1	LO1	MHC00073
1	25.4	1.306	33.2	1½	38.1	375	240		yes	B1	LO1	MHC00074
1	25.4	1.240	31.5	2	50.8	400	120		yes	B1	LO1	MHC00075
1	25.4	1.266	32.2	2½	63.5	450	120		yes	B1	LO1	MHC00076
1	25.4	1.250	31.8	8	203.2	1250	240		yes	B3	LO1	MHC00077
1¼	31.8	1.556	39.5	1	25.4	340	240		yes	B1	LO1	MHC00078
1¼	31.8	1.556	39.5	1¼	31.8	375	120		yes	B1	LO1	MHC00079
1¼	31.8	1.480	37.6	1½	38.1	400	120		yes	B1	LO1	MHC00080
1¼	31.8	1.492	37.9	2	50.8	475	120		yes	B1	LO1	MHC00081
1¼	31.8	1.480	37.6	2½	63.5	750	240		yes	C1	LO2	MHC00082
1¼	31.8	1.514	38.5	4½	114.3	1250	240		yes	C3	LO2	MHC00083
1¼	31.8	1.534	39.0	6½	165.1	1800	240		yes	C3	LO2	MHC00084
1¼	31.8	1.548	39.3	7	177.8	2000	240		yes	B3	LO1	MHC00085
1¼	31.8	1.594	40.5	8½	215.9	2335	240		yes	C3	LO2	MHC00086
1¼	31.8	1.626	41.3	10½	266.7	2500	240		yes	C1	LO2	MHC00087

Note: ❖ Denotes the Thermocouple Junction is located between third and fourth coil from the tip end, isolated from the sheath. See page 5-5 for Lead Protection and page 5-4 for Lead Orientation descriptions.

Ordering Information

See page 5-9

CONTINUED

Mightyband™ Coil Heaters

Continued from previous page...

Heater shown with Lead Protection B and Lead Orientation LO1.

Standard (Non-Stock) Round Cable Heaters

Standard Cable Heaters have 304 Stainless Steel Sheath

Inside Diameter in	Inside Diameter mm	Outside Diameter in	Outside Diameter mm	Width in	Width mm	Watts	Volts	Distributed Wattage	Close Wound	Lead Protection	Lead Orientation	Part Number
		1.806	45.9	1	25.4	400	120		yes	B1	LO1	MHC00088
		1.730	43.9	1¼	31.8	425	120		yes	B1	LO1	MHC00089
		1.742	44.2	1½	38.1	525	120		yes	B1	LO1	MHC00090
		1.742	44.2	2	50.8	475	120		yes	B1	LO1	MHC00091
		1.752	44.5	2	50.8	475	240		yes	B1	LO1	MHC00092
		1.754	44.6	2	50.8	550	240		yes	B1	LO1	MHC00093
		1.742	44.2	2½	63.5	600	120		yes	B3	LO1	MHC00094
		1.766	44.9	2½	63.5	600	240		yes	B3	LO1	MHC00095
		1.742	44.2	3	76.2	475	120		yes	B1	LO1	MHC00096
		1.732	44.0	3	76.2	875	240		yes	B1	LO2	MHC00097
1½	38.1	1.750	44.5	4⅛	104.8	1000	240	yes		C3	LO2	MHC00098
		1.732	44.0	4	101.6	1000	240		yes	B3	LO2	MHC00099
		1.750	44.5	5⅛	130.2	1000	240	yes		C3	LO2	MHC00100
		1.742	44.2	5	127.0	1200	240		yes	B3	LO1	MHC00101
		1.766	44.9	6⅛	155.6	1200	240	yes		B3	LO2	MHC00102
		1.750	44.5	7⅛	181.0	1100	240	yes		C1	LO2	MHC00103
		1.806	45.9	6	152.4	675	120		yes	B3	LO1	MHC00104
		1.750	44.5	6	152.4	1200	240		yes	B3	LO2	MHC00105
		1.766	44.8	8⅛	206.4	1250	240	yes		B3	LO2	MHC00106
		1.796	45.6	9⅛	231.8	1400	240	yes		B3	LO2	MHC00107
		1.826	46.4	10⅛	257.2	1800	240	yes		B3	LO2	MHC00108
		1.982	50.3	1	25.4	475	120		yes	B1	LO1	MHC00109
		2.000	50.8	1½	38.1	625	240		yes	B1	LO1	MHC00110
1¾	44.5	2.000	50.8	2	50.8	675	240		yes	B1	LO1	MHC00111
		1.982	50.3	2½	63.5	725	240		yes	B1	LO1	MHC00112
		2.056	52.2	7	177.8	2000	240		yes	B3	LO2	MHC00113
2	50.8	2.250	57.2	1⅜	34.9	450	240		yes	B1	LO1	MHC00114
		2.326	59.1	6½	165.1	2400	240		yes	B3	LO1	MHC00115

Note: See page 5-5 for Lead Protection and page 5-4 for Lead Orientation descriptions.

Standard (Non-Stock) Tempco Replacement Coil Heaters for OEM Hot Runner Bushings

Standard Cable Heaters have 304 Stainless Steel Sheath

Inside Diameter in	Inside Diameter mm	Outside Diameter in	Outside Diameter mm	Width in	Width mm	Watts	Volts	Distributed Wattage	Close Wound	OEM Part Number	TEMPCO Part Number
½	12.7	0.808	20.5	3	76.2	380	240	yes		KH-52030	MHC00005
		0.808	20.5	3½	88.9	380	240	yes		KH-52035	MHC00006
		0.764	19.4	4½	114.3	400	240	yes		KH-53045	MHC00008
		0.750	19.1	5½	139.7	400	240	yes		KH-53555	MHC00009
		0.750	19.1	6½	165.1	400	240	yes		KH-53565	MHC00010
		0.764	19.4	2	50.8	340	120		yes	KH-520	MHC00012
		0.764	19.4	2½	63.5	340	120	yes		KH-52025	MHC00013
		0.764	19.4	3	76.2	380	120	yes		KH-52030	MHC00014
		0.764	19.4	3½	88.9	380	120	yes		KH-52035	MHC00015
		0.744	18.9	4½	114.3	400	120	yes		KH-53045	MHC00016
		0.744	18.9	5½	139.7	400	120	yes		KH-53055	MHC00017
		0.744	18.9	6½	165.1	400	120	yes		KH-53065	MHC00018
⅞	22.2	1.181	30.0	2⅜	66.7	480	240	yes		KH-826	MHC00043
		1.181	30.0	3⅛	28.6	480	240	yes		KH-82630	MHC00044
		1.181	30.0	3⅜	92.1	550	240	yes		KH-82636	MHC00050
		1.181	30.0	4⅜6	109.5	550	240	yes		KH-82640	MHC00051
		1.181	30.0	5⅜6	134.9	650	240	yes		KH-82650	MHC00052
		1.181	30.0	6⅜6	160.3	650	240	yes		KH-82660	MHC00053
		1.181	30.0	7⅜6	185.7	650	240	yes		KH-82670	MHC00054
		1.105	28.1	8⅜6	211.1	730	240	yes		KH-84380	MHC00064
		1.105	28.1	9⅜6	236.5	730	240	yes		KH-84390	MHC00065
		1.105	28.1	10⅜6	261.9	850	240	yes		KH-84310	MHC00066
		1.105	28.1	11⅜6	287.3	850	240	yes		KH-85311	MHC00068
		1.105	28.1	12⅜6	312.7	850	240	yes		KH-85312	MHC00069
		1.105	28.1	13⅜6	338.1	850	240	yes		KH-85313	MHC00070
		1.105	28.1	14⅜6	363.5	850	240	yes		KH-85314	MHC00071
1¼	31.8	1.480	37.6	2½	63.5	750	240		yes	KH-1225	MHC00082
		1.514	38.5	4½	114.3	1250	240		yes	KH-1245	MHC00083
		1.534	39.0	6½	165.1	1800	240		yes	KH-1265	MHC00084
		1.594	40.5	8½	215.9	2335	240		yes	KH-1285	MHC00086
		1.626	41.3	10½	266.7	2500	240		yes	KH-12105	MHC00087

Note: All OEM Replacement Heaters have round cable, Type "C" galvanized armor cable lead wire protection and LO2 lead orientation (see page 5-4).

Ordering Information

Standard Heaters

Order by Part Number for standard heaters listed in Tables on pages 5-6 through 5-9.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes, ratings and terminations not listed, **TEMPCO** will design and manufacture a Mightyband heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Watts
- ❑ Volts
- ❑ Coil I.D.
- ❑ Coil width (length)
- ❑ Distributed wattage if required
- ❑ Sheath material— 304 stainless steel or Incoloy® 600
- ❑ Sheath Diameter if necessary
- ❑ Length of internal nickel cold, or if a neck down design, length of cold section. See page 5-5.
- ❑ Thermocouple if required— Type J or K
- ❑ Thermocouple Junction—Grounded or Ungrounded. If ungrounded, specify location.
- ❑ Transition type: M1, M2, M3, A1, A2, A3, B1, B2, B3, C1, C2, C3, S1, S2 or S3. See page 5-5.
- ❑ Lead orientation: LO1, LO2, LO3, LO4, LO5, or LO6. See page 5-4.
- ❑ Lead length if other than 24"
- ❑ Supply a sketch or drawing.

Mightyband™ (Square Cable)

Made in USA

Mightyband™ Coil Heaters with Square/Rectangular MI Cable

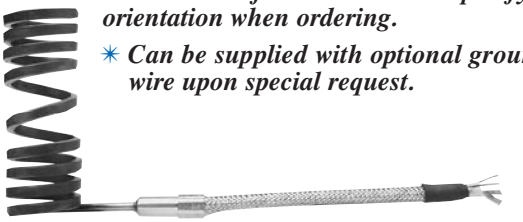
TEMPCO offers a square sheathed, mineral insulated, coiled nozzle heater with a built-in-thermocouple. The unique feature of the 1/8" square sheath is a larger sheath contact area as compared to its round sheathed counterpart, allowing for faster start-up cycles. The ANSI Type J standard or optional Type K thermocouple normally has a grounded junction. However, an optional ungrounded junction is available. Heaters can be formed into a compact coiled nozzle heater supplying a full 360° of heat to the distributed wattage coil. The low mass of the heater allows quick response to both heating and cooling.

Specifications

Resistance tolerance: . . . . . ±10%
Wattage tolerance: . . . . . ±10%
Maximum Wattage: . . . . . 720 watts *(for 240 volt heaters)*
300 watts *(for 120 volt heaters)*
Maximum operating temperature: 1500ºF (816ºC)
Maximum Watt density: . . . . . 134 watts/in² applied to nozzle
Physical Dimensions: . . . . . 1/8" square
(except non-heated tail section, which is 1/8" round)
Length of non-heated section: . . . . . 1" to 6" *(specify when ordering)*
Potting Adapter: . . . . . 5/16" O.D. × 1-1/2" long
Standard Lead Length as specified in table below (if other than standard, specify)

Standard Features

- ***Standard lead wire construction is a fiberglass braided insulation with stainless steel overbraid suitable for 482°F (250°C). Optional constructions using Teflon® insulation or armor cable are available on request.***
- ***The standard wire to M.I. cable transition area (potting adapter) is temperature rated to 450°F (232°C). High temperature 842°F (450°C) is optional.***
- ***The ANSI Type J standard or optional Type K thermocouple junction can be grounded at the tip (the end farthest from transition area) or ungrounded anywhere along the length of the heater.***
- ***Heaters can be supplied with optional stainless steel clamping straps, which provide additional circumferential clamping forces and protection of the heater coils from accidental damage.***
- ***All Mightyband coil heaters are available with one (1) of six (6) different lead orientations (LO) as shown on Page 5-4. Other custom lead orientations can be manufactured to suit. Specify lead orientation when ordering.***
- ***Can be supplied with optional grounding wire upon special request.***



Standard (Non-Stock) 1/8" Square Tempco-Pak Cable Heaters *(Non-heated tail section is 1/8" round)*

Standard Cable Heaters have 304 Stainless Steel Sheath

Coil I.D. in	Coil I.D. mm	Closed Coil Width in	Closed Coil Width mm	Stretched Width in	Stretched Width mm	Built-In T/C	Voltage	Wattage	Standard Lead Length in	Standard Lead Length mm	Lead Protection	Lead Orientation	Part Number
.500	12.7	2.00	50.8	2.5	63.5	yes	240	450	40	1016	C†	L01	MHC00116
.500	12.7	2.50	63.5	4.6	116.8	yes	240	300	48	1219	A†	L05	MHC00117
.750	19.1	1.25	31.8	—	—	yes	230	125	48	914	M†	L04	MHC00118
.750	19.1	1.25	31.8	—	—	yes	230	250	48	914	M†	L04	MHC00119
.750	19.1	1.25	31.8	1.5	38.1	yes	240	300	48	1219	S2	L05	MHC00120
.750	19.1	0.95	24.1	—	—	yes	240	250	72	1829	M1	L01	MHC00121
.968	24.6	0.95	24.1	—	—	yes	240	250	72	1829	M2	L01	MHC00122
.968	24.6	1.58	40.1	—	—	yes	240	300	72	1829	M2	L01	MHC00123

† Cement Potted Teflon® insulated SPC wire

Ordering Information

Standard Heaters

Order by Part number for standard heaters listed above for runnerless plastic injection molding, hot sprue bushings and nozzles.

If not otherwise specified, all Mightyband heaters are supplied with close wound coiling pattern, Type L01 lead orientation (see page 5-4), 24" of leads and 20" of stainless steel overbraid with Type J thermocouple. If longer leads are required, please specify.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes, ratings and terminations not listed, **TEMPCO** will design and manufacture a Mightyband heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

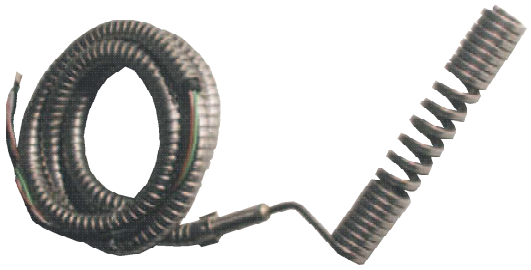
- ❑ Inside Diameter
- ❑ Width (Length)
- ❑ Specify width as closed or stretched
- ❑ Wattage
- ❑ Voltage
- ❑ Length of non-heated tail section
- ❑ Lead length
- ❑ Lead Orientation (see page 5-4)
- ❑ Lead Transition (see page 5-5)
- ❑ Lead protection (see page 5-5)
- ❑ Thermocouple Type—if required

Tempco Direct Replacement Heaters for OEM Hot Runner Systems

Square & Rectangular Cable

Design Features

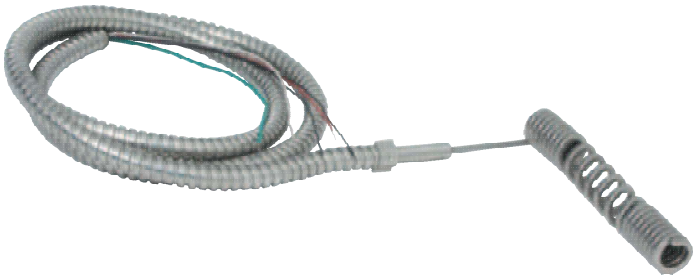
- *1/8" square 304 Stainless Steel M.I. cable*
- *Type J ungrounded thermocouple junction in the midsection of the coil heater*
- *48" of leads and 44" of SS armored cable*



Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.500	12.7	4.625	117.5	300	120	SSTC-31	MHC00124
.500	12.7	4.625	117.5	300	240	SSTC-32	MHC00125
.500	12.7	2.500	63.5	450	240	SSTC-42	MHC00126

Design Features

- *1/8" square 304 Stainless Steel M.I. cable*
- *Type J ungrounded thermocouple junction in the midsection of the coil heater*
- *48" of leads and 44" of SS armored cable*

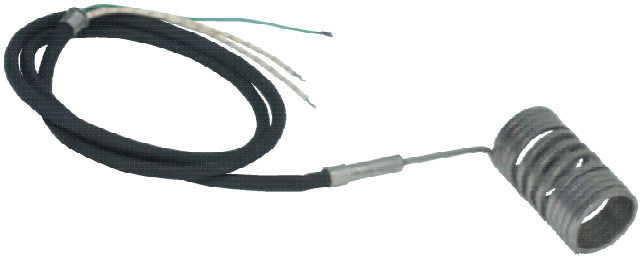


Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.500	12.7	4.625	117.5	300	120	SSTC-31-90	MHC00127
.500	12.7	4.625	117.5	300	240	SSTC-32-90	MHC00128
.500	12.7	2.500	63.5	450	240	SSTC-42-90	MHC00129

Gated, Flow-Through Hot Sprue Bushing Heaters

Design Features

- *.110" × .160" rectangular or 1/8" square 304 Stainless Steel M.I. cable*
- *No thermocouple*
- *42" of leads and 38" of high temperature fiberglass sleeving*

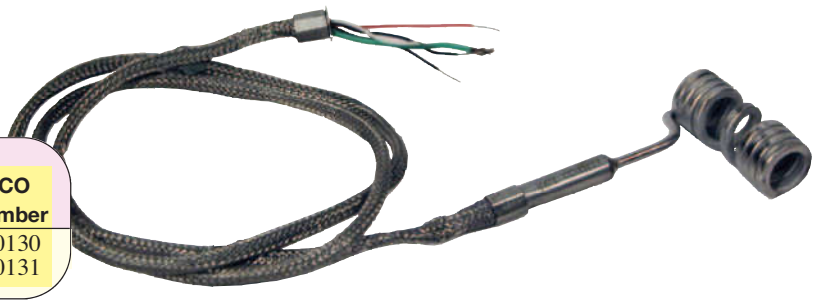


Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
1.250	31.8	2.625	66.7	800	240	SCH0001	HHC00001
1.250	31.8	1.750	44.5	600	240	SCH0002	HHC00002
.625	15.9	1.000	25.4	225	240	SCH0003	HHC00003
.750	19.1	1.750	44.5	315	240	SCH3142	HHC00004
.750	19.1	2.625	66.7	315	240	SCH3242	HHC00005

Heated Nozzle Locator Heaters

Design Features

- *1/8" square 304 Stainless Steel M.I. cable*
- *Type J ungrounded thermocouple junction at tip of coil heater*
- *36" of leads and 34" SS wire braid*



Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.500	12.7	1.450	36.8	250	240	SSTC-62-90	MHC00130
.500	12.7	1.950	49.5	250	240	SSTC-72-90	MHC00131

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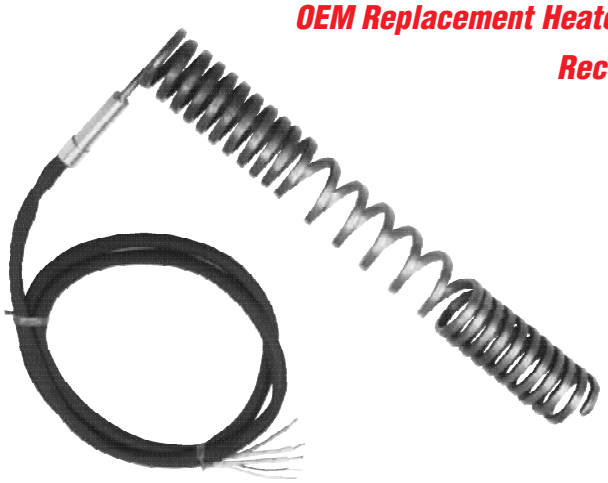
OEM Replacement Heaters for Externally Heated Manifold Systems

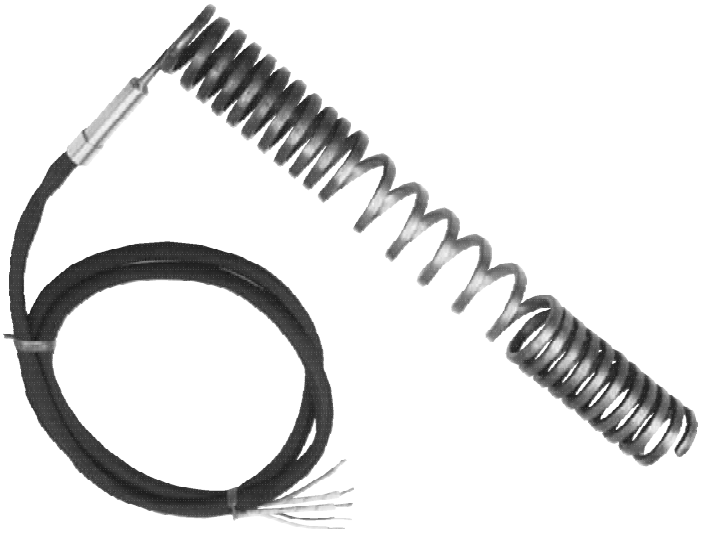
Rectangular Cable Heaters



Design Features

- *Systems with .250" diameter flow path nozzle assemblies*
- *Rectangular (0.110" × 0.160") 304 Stainless Steel M.I. cable*
- *Ungrounded Type J thermocouple*
- *36" of leads and 34" of high temperature fiberglass sleeving*

Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.625	15.9	2.000	50.8	300	240	SCH0081	MHC00132
		2.500	63.5	350	240	SCH0082	MHC00133
		3.000	76.2	400	240	SCH0083	MHC00134
		3.500	88.9	425	240	SCH0084	MHC00135
		4.000	101.6	500	240	SCH0085	MHC00136
		5.000	127.0	500	240	SCH0086	MHC00137
		6.000	152.4	550	240	SCH0087	MHC00138

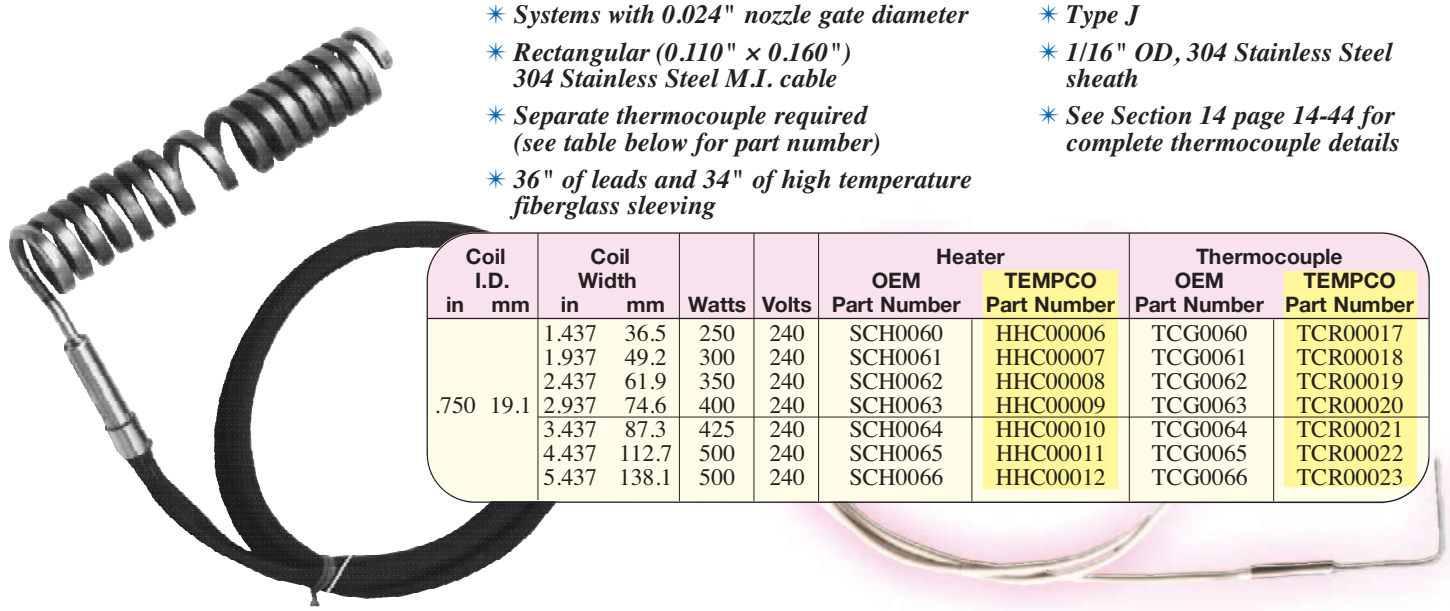


Design Features

- *Systems with .375" diameter flow path nozzle assemblies*
- *Rectangular (0.110" × 0.160") 304 Stainless Steel M.I. cable*
- *Ungrounded Type J thermocouple*
- *36" of leads and 34" of high temperature fiberglass sleeving*

Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.875	22.2	2.125	54.0	400	240	SCH0088	MHC00139
		2.625	66.7	450	240	SCH0089	MHC00140
		3.125	79.4	550	240	SCH0090	MHC00141
		3.625	92.1	700	240	SCH0091	MHC00142
		4.125	104.8	800	240	SCH0092	MHC00143
		5.125	130.2	900	240	SCH0093	MHC00144
		6.125	155.6	1000	240	SCH0094	MHC00145
		7.125	181.0	1100	240	SCH0095	MHC00146

Tempco Replacement Heaters and Thermocouples for OEM Hot Runner Nozzles



Design Features: Heater

- *Systems with 0.024" nozzle gate diameter*
- *Rectangular (0.110" × 0.160") 304 Stainless Steel M.I. cable*
- *Separate thermocouple required (see table below for part number)*
- *36" of leads and 34" of high temperature fiberglass sleeving*

Design Features: Thermocouple

- *Type J*
- *1/16" OD, 304 Stainless Steel sheath*
- *See Section 14 page 14-44 for complete thermocouple details*

Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	Heater OEM Part Number	Heater TEMPCO Part Number	Thermocouple OEM Part Number	Thermocouple TEMPCO Part Number
.750	19.1	1.437	36.5	250	240	SCH0060	HHC00006	TCG0060	TCR00017
		1.937	49.2	300	240	SCH0061	HHC00007	TCG0061	TCR00018
		2.437	61.9	350	240	SCH0062	HHC00008	TCG0062	TCR00019
		2.937	74.6	400	240	SCH0063	HHC00009	TCG0063	TCR00020
		3.437	87.3	425	240	SCH0064	HHC00010	TCG0064	TCR00021
		4.437	112.7	500	240	SCH0065	HHC00011	TCG0065	TCR00022
		5.437	138.1	500	240	SCH0066	HHC00012	TCG0066	TCR00023

Tempco Replacement Heaters for OEM Hot Runner Systems

Rectangular Cable Heaters

Sprue Bushing Heaters

Design Features

- *5/8" ID Coil*
- *Rectangular (0.110" × 0.160") 304 Stainless Steel M.I. cable*
- *36" of leads and 32" of sleeving*

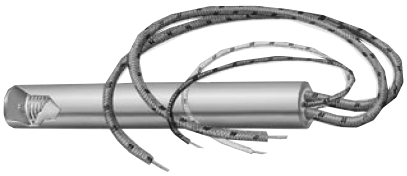
Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.625	15.9	2.000	50.8	300	240	SF-620	MHC00267
		2.500	63.5	350	240	SF-625	MHC00268
		3.000	76.2	400	240	SF-630	MHC00269
		3.500	88.9	400	240	SF-635	MHC00270
		4.000	101.6	460	240	SF-640	MHC00271
		5.000	127.0	610	240	SF-650	MHC00273
		6.000	152.4	690	240	SF-660	MHC00274

Design Features

- *7/8" ID Coil*
- *Rectangular (0.110" × 0.160") 304 Stainless Steel M.I. cable*
- *48" of leads and 44" of sleeving*

Coil I.D. in	Coil I.D. mm	Coil Width in	Coil Width mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
.875	22.2	2.000	50.8	400	240	SF-820	MHC00275
		2.500	63.5	460	240	SF-825	MHC00276
		3.000	76.2	610	240	SF-830	MHC00277
		3.500	88.9	610	240	SF-835	MHC00278
		4.000	101.6	610	240	SF-840	MHC00279
		4.500	114.3	690	240	SF-845	MHC00280
		5.000	127.0	690	240	SF-850	MHC00281
		6.000	152.4	725	240	SF-860	MHC00282
		7.000	177.8	725	240	SF-870	MHC00283

Runnerless Mold Cartridge Heaters



OEM Replacement Runnerless Molding Pennybottom Cartridge Heaters

See Section 2 pages 2-24 through 2-26

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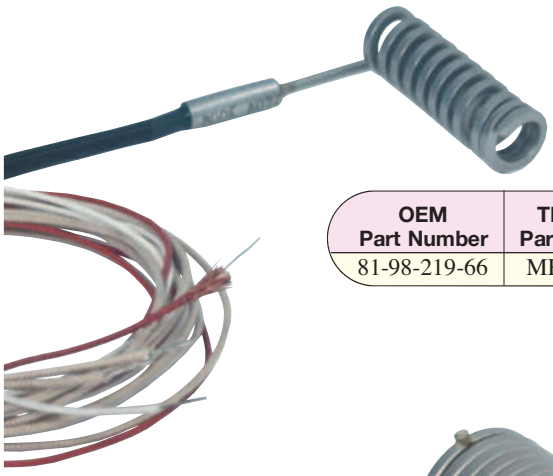
Tempco Replacement Heaters for OEM Hot Runner Systems

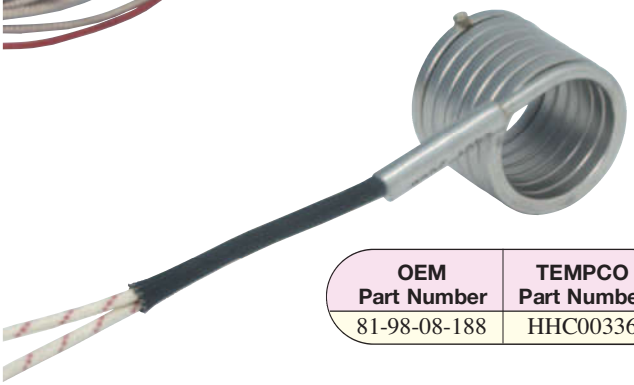
Square Cable Heaters



OEM Part Number	TEMPCO Part Number
81-98-219-66	MHC00457

Design Features

- *300 Watts, 240 Volts*
- *.100" square 304 Stainless Steel M.I. cable*
- *3/8" ID × 2" stretched width*
- *Termination Type S1*
- *Lead Orientation LO1 with 3/4" reference cold length*
- *48" of leads and 6" fiberglass sleeve*
- *Built-in Type J ungrounded thermocouple junction at tip of the heater*
- *Adapter Size: 1/4" O.D. × 7/8" long*



OEM Part Number	TEMPCO Part Number
81-98-08-188	HHC00336

Design Features

- *300 Watts, 240 Volts*
- *.132" square 304 Stainless Steel M.I. cable*
- *.997" ID × 1.12" nominal closed width*
- *Termination Type S1*
- *Lead Orientation LO1 with zero reference length and 1" cold tail length*
- *10 feet of leads and 2" fiberglass sleeve*
- *Adapter Size: 1/4" O.D. × 1" long*

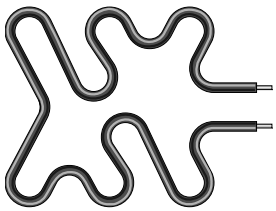
OEM Part Number	TEMPCO Part Number
81-98-06-182	HHC00337

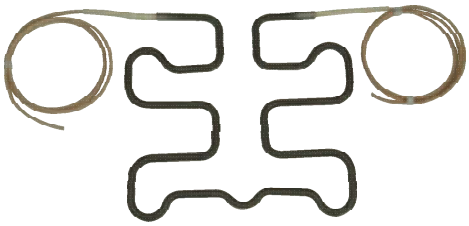
Design Features

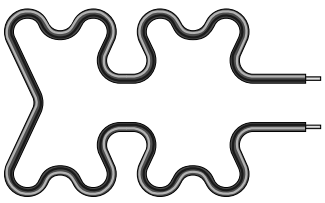
- *200 Watts, 240 Volts*
- *.132" square 304 Stainless Steel M.I. cable*
- *.747" ID × 1" nominal closed width*
- *Termination Type S1*
- *Lead Orientation LO1 with zero reference length and 1" cold tail length*
- *10 feet of leads and 2" fiberglass sleeve*
- *Adapter Size: 1/4" O.D. × 1" long*

Tubular Hot Runner Mold Heaters

SEE PAGE 10-13 IN THE TUBULAR HEATER SECTION.





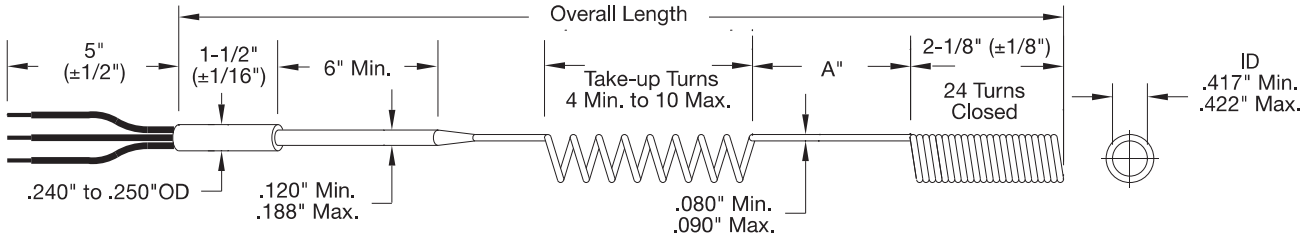


OEM Replacement Oxygen Analyzer Heaters

Oxygen Analyzer Heaters (Westinghouse Probes)

Design Features

- *Inconel® 600 Seamless Nickel Alloy Sheath Material for Process temperatures up to 1400°F (760°C)*
- *Minimum 99.4% purity compacted MgO Insulation Material*
- *300 Series Stainless Steel Potting Adapter filled with Stycast epoxy for 500°F continuous use*
- *Standard heater lengths are 13", 18", 36" and 72" long. Longer length heaters such as 108" and 144" are also available.*



"OA" Length in	"OA" Length mm	"A" Length in	"A" Length mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
13.0	330	0	0	340	115	263C303HO-6	HHF00009*
18.5	470	4	102	340	115	263C303HO-1	HHF00004
36.5	927	4	102	340	115	263C303HO-2	HHF00005
72.5	1842	4	102	340	115	263C303HO-3	HHF00006

Lead Wires: Teflon® insulated 600 Volt 18 ga. Nickel or Silver Plated Copper Wire (Stranded with Black or Brown)

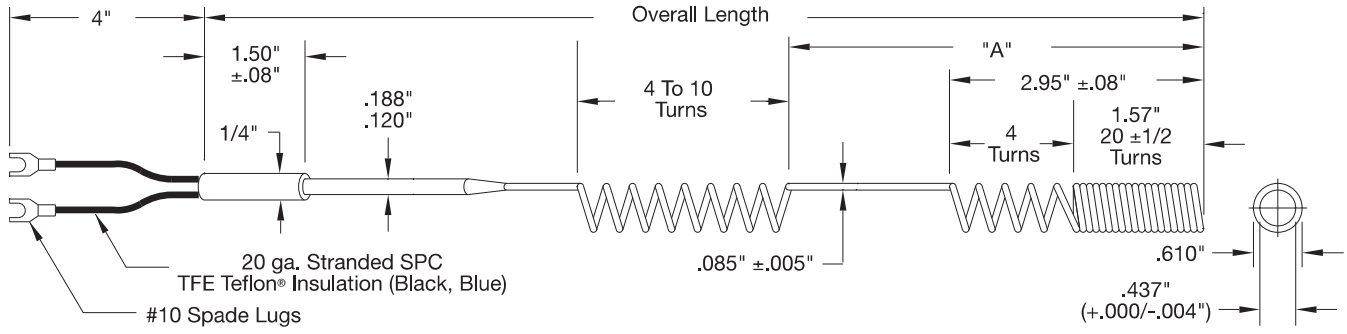
Grounding Wire: 18 ga. Nickel or Silver Plated Copper, Stranded with Green or Purple Teflon® insulation/600 Volt Rated

Note: *Part Number HHF00009 does not have a straight length section"A." The .080"/.090" diameter heater cable is coiled to .417"/.422" ID all the way to the neck down and stretched except for the front 24 turns of coils.

Oxygen Analyzer Heaters (Enotec Probes)

Design Features

- *Inconel® 600 Seamless Nickel Alloy Sheath Material for Process temperatures up to 1400°F (760°C)*
- *Minimum 99.4% purity compacted MgO Insulation Material*
- *300 Series Stainless Steel Potting Adapter filled with Stycast epoxy for 500°F continuous use*
- *Standard heater lengths are 13", 18", 36" and 72" long.*



"OA" Length in	"OA" Length mm	"A" Length in	"A" Length mm	Watts	Volts	OEM Part Number	TEMPCO Part Number
13.15	334	4.23	107	340	115	HEI-132X	HHC00304
18.27	464	8.07	205	340	115	HEI-2001	HHC00199
36.50	927	8.07	205	340	115	HEI-2002	HHC00200
72.80	1849	8.07	205	340	115	HEI-2003	HHC00303

Lead Wires: Teflon® insulated 20 ga. Stranded Silver Plated Copper Wire (color coded one black and one blue)

Termination: #10 Uninsulated Spade Lug

Oxygen Analyzer Heaters with .153" Diameter Cable

Tempco can also supply oxygen analyzer heaters for 240V, 520W with 0.153" diameter Inconel® 600 sheath, 0.394" ID x 2.75" coil width, with overall lengths of 6.29", 13.18", 17.12", 23.41", 32.86", 43.10", 62.39" and 80.11". ***Consult Tempco with your requirements – we welcome your inquiries.***

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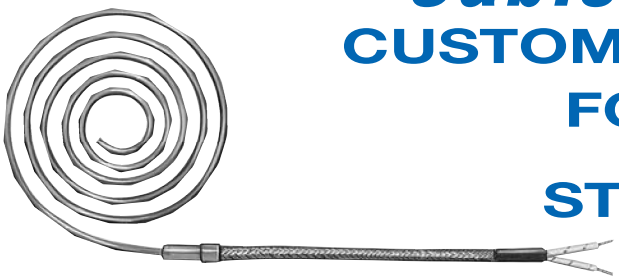
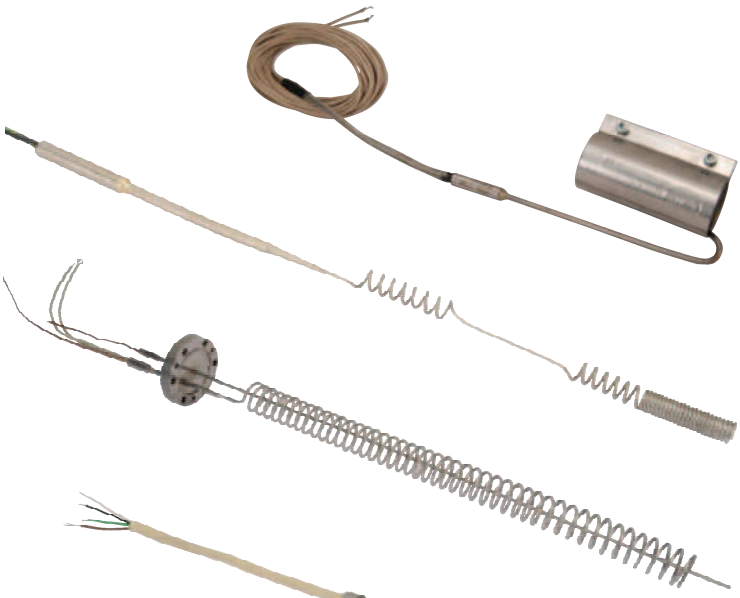
Cable HEATERS

CUSTOM ENGINEERED FORMED & STRAIGHT

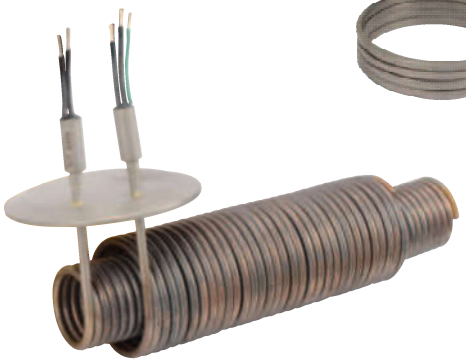


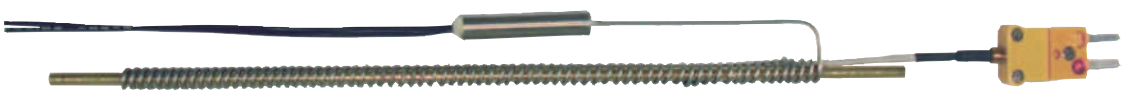
Spiral-wound Tempco-Pak heater cables are low profile and capable of generating high operating temperatures in restricted areas. The built-in thermocouple eliminates the need for a separate thermocouple. Works especially well as an alternative heat source for flat surface heating applications where other types of heaters cannot be used due to space restrictions. Consult Tempco with your requirements.

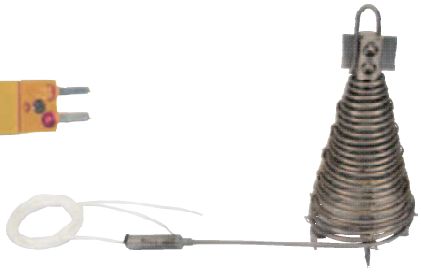


Compression fittings are available on straight cable heaters of various diameters (1/8", 3/16", 1/4", 5/16" and 3/8"). This fitting enables adjustment of the insertion length during installation. Compression fittings are available in Brass or Stainless Steel with standard male NPT threads. When ordering, specify heater sheath material, NPT size and material for compression fittings, insertion length, thermocouple type and type of junction (grounded or ungrounded), thermocouple and heater lead lengths, watts and volts. Optional—thermocouple location and cooler or unheated cable lengths. Consult Tempco with your requirements.

Sinuated (formed) Tempco-Pak heater cables are low profile and capable of generating high operating temperatures in restricted areas. The built-in thermocouple eliminates the need for a separate thermocouple. Works especially well as an alternative heat source for flat surface heating applications where other types of heaters cannot be used due to space restrictions. The sinuated cable can also be formed to conform to a cylindrical inside or outside surface. Consult Tempco with your requirements.

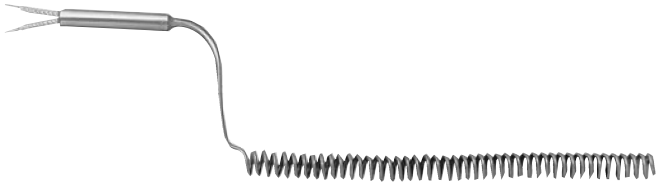






Lab Equipment: Gas Analyzer Heaters

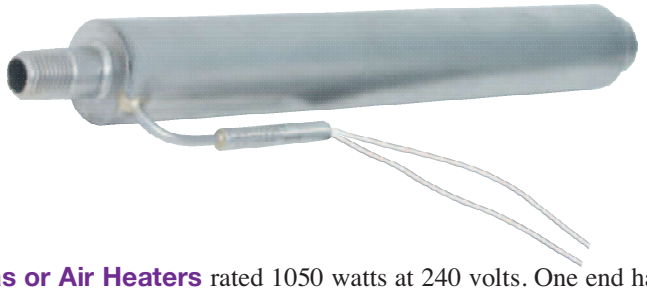
This heater heats gas analyzer samples quickly and uniformly. Low mass construction allows for a fast cool down, increasing cycle times. Adding a T/C or RTD to an assembly is not a problem. Straight lengths are also available for manual custom bending requirements.

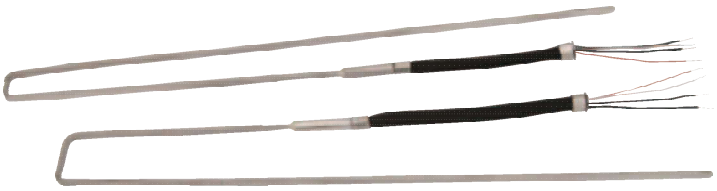


Miniature-Coil heaters are made for special applications. Cable diameter is less than .100". They work especially well as an alternative heat source for demanding and high temperature applications where other types of heaters have failed. Available with cooler or unheated cable section toward lead end. Consult Tempco with your requirements.

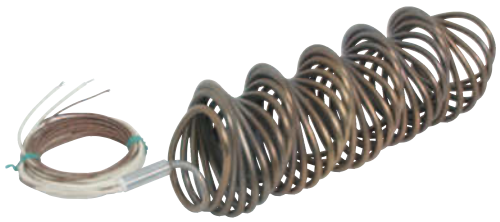
Stainless steel mounting flange is 1" diameter × .060" thick with two 1/4" holes on a 3/4" bolt circle. When ordering, specify location of mounting flange, cable diameter, length, sheath material, thermocouple type and type of junction (grounded or ungrounded), thermocouple and heater lead lengths, watts and volts—optional: thermocouple location and cooler or unheated cable lengths. Consult Tempco with your requirements.

NOTE: Mounting flange to be located over a cold or cooler section.





Gas or Air Heaters rated 1050 watts at 240 volts. One end has 1/4" MNPT and the other end has 1/4" FNPT so that you can have a series of the heaters for higher wattage requirements. It has 1-1/8" OD × 8" long stainless steel tubing body with 9-3/8" overall length.



Star-Wound Coil

Star wound formations are usually inserted into pipes or ducts and are used to heat moving air or liquids. The offset coils create a turbulent flow. This allows the flowing material to have better contact with the heater surface resulting in more efficient heat transfer.

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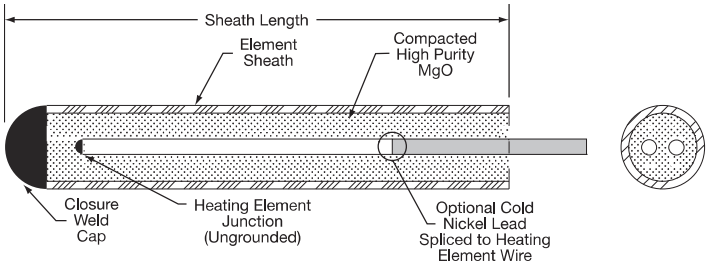
Tempco-Pak Heaters — Design Constructions

Tempco-Pak Heaters with Straight Wire



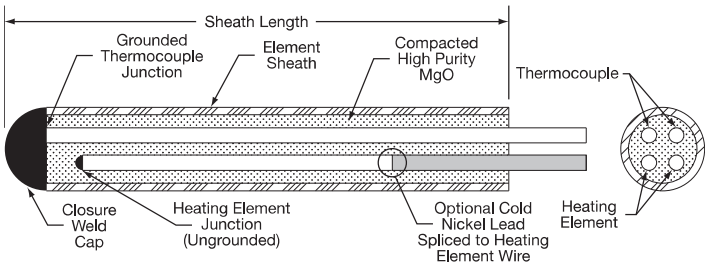
Tempco-Pak heaters are made from M.I. cable having 2 straight heating element wires insulated from the sheath by high purity MgO.

Available in nominal sheath diameters from 0.040" to 0.375" (1mm to 9.5mm) in 304 stainless steel and Inconel® 600 for Tempco-Pak heaters with straight wire. Optional cold nickel lead spliced to heating element wire is available in 0.125" diameter or larger depending on conductor material.

Nominal Sheath O.D.		Maximum Heater Length		Nominal Sheath O.D.		Maximum Heater Length	
in	mm	ft	meters	in	mm	ft	meters
.040	1.00	25	7.6	.188	4.77	100	30.5
.063	1.60	70	21.0	.250	6.35	59	18.0
.125	3.18	120	36.5	.312	7.93	38	11.5
.163	4.14	130	39.6	.375	9.53	26	8.0

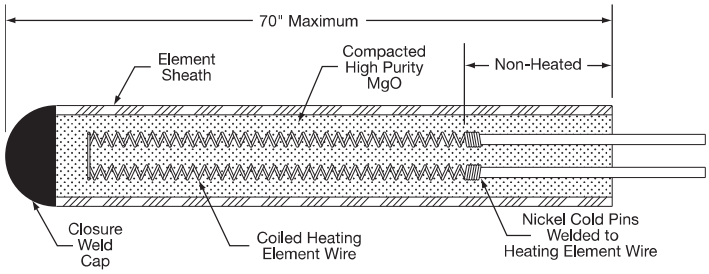
Note: Consult Tempco for diameters other than those listed above.

Tempco-Pak Heaters with Straight Wire and Built-In Thermocouple



Tempco-Pak heaters with 0.125" or larger diameter are also made from M.I. cable having 2 straight heating element wires and 2 straight thermocouple wires insulated from the sheath by high purity MgO. Optional cold nickel lead spliced to heating element wire is available in 0.125" diameter or larger depending on conductor material.

Tempco-Pak Heaters with Helically Coiled Wire



Hi-Density Tempco-Pak heaters are manufactured from sheathed M.I. cable having 2 coiled heating element wires or 2 coiled heating element wires and 2 straight thermocouple wires. The non-heated portion has the largest possible diameter solid nickel cold pins attached to the heating element wires, providing maximum current carrying capacity within the same continuous sheath.

Available in nominal sheath diameters from 0.120" to 0.153" (3.05 mm to 3.9 mm) including 0.125" O.D., 0.132" O.D. and 0.143" O.D. Tempco also manufactures 0.110" × 0.160" rectangular cable as well as 0.125" square cable.

Maximum sheath length including non-heated section is 70 inches (1778 mm).

Optional Built-in Thermocouple is ANSI Type J or Type K grounded at tip (end farthest from cold end) or ungrounded anywhere along heater length for .125" diameter and larger.

Tempco–Pak Cable Heaters

The densely compacted MgO insulation used in Tempco-Pak heaters produces excellent high temperature insulation resistance and dielectric strength. Heaters can be manufactured with the optional cold nickel leads internally spliced to the heating element wires within the same continuous sheath.

Generally speaking, there is very little temperature difference between the sheath and heater wires. Tempco recommends not exceeding 150 watts per square inch of sheath surface area with the sheath operating temperature at 1000°F (537°C) or less. As temperature increases above 1000°F, the maximum watt density should be decreased.

The maximum recommended operating temperature is 1800°F (982°C) with Inconel® 600 sheath and ANSI Type K thermocouple if required. Heater life in any specific situation or application is impossible to predict. However, heater life generally decreases as temperature and/or the number of thermal cycles increases.

Tempco-Pak heaters are flexible and can be readily formed or bent by hand or production machinery, with the minimum bend radius equal to twice the sheath diameter. The heater sheath can be welded, brazed or soldered without changing its electrical characteristics.

Performance Ratings

Watt Density: . . . . . 75 watts per square inch of sheath surface area maximum with factory approval

Maximum temperature: . . . . 1500°F (815°C) *for 304 stainless steel sheath*
1800°F (982°C) *for Inconel® 600 sheath*

Specifications

Electrical

Resistance: . . . . . ±10% *unless otherwise specified*

Voltage: . . . . . 120V and 240V *standard*

Thermocouples: . . . . . ANSI Type J to 1500°F (815°C)
Type K to 1800°F (982°C)

All thermocouples and their junctions are internal to the heater sheath. A grounded junction at the heater tip is standard. An ungrounded junction anywhere along the heater's length is optional. Available in sheath diameters .125" and larger.

Dimensional

Heater cable diameters: . . . . . 0.040", 0.062", 0.115", 0.120", 0.125", 0.132", 0.153", 0.163", 0.174", 0.188", 0.220", 0.250".
Others available upon request.

Cable diameter tolerance: . . . . . ±.005

Heater length tolerance: . . . . 0 to 6" (+1/8", –0), 6 to 18" (+1/4", –0) 18 to 24" (+3/8", –0), 24 to 120" (+3/4", –0) 120 to 300" (±1")

Transition and Termination Construction Specifications

Transition (potting) adapters: 5/16" O.D. × 1-1/2" long for heater cable 0.163" diameter and smaller. 1/2" O.D. × 1-1/2" long for heater cable diameters above 0.163"

Transition Temperature Rating: Standard transition is rated to 482°F (250°C).

Optional High Temperature Transition is rated to 842°F (450°C).

Standard heater lead wire insulation is TGGT (Teflon®, double fiberglass, Teflon® impregnation), which is rated to 482°F (250°C).

Optional high temperature insulation is MGT (mica, fiberglass, Teflon® impregnation) which is rated to 842°F (450°C).

Thermocouple: Standard leads use a fiberglass insulation rated to 900°F (482°C). Teflon® insulation is available upon request.

Optional lead protection: Stainless steel overbraid or galvanized armor cable.

Ordering Information

Standard Heaters

Order by Part Number for standard heaters listed in Tables on pages 5-21 through 5-23.

Part Numbers are for heaters with standard lead length of 24" unless otherwise specified. Longer lead length as well as stainless steel wire braid protection or armored cable protection are available upon request.

Heaters under 72" (1829 mm) will be shipped straight; longer heaters will be shipped in coils a minimum of 24" (610 mm) in diameter.

Custom Engineered/Manufactured Heaters

For sizes, ratings and terminations not listed, **TEMPCO** will design and manufacture a Tempco-Pak heater to meet your requirements. ***Standard lead time is 3-4 weeks.***

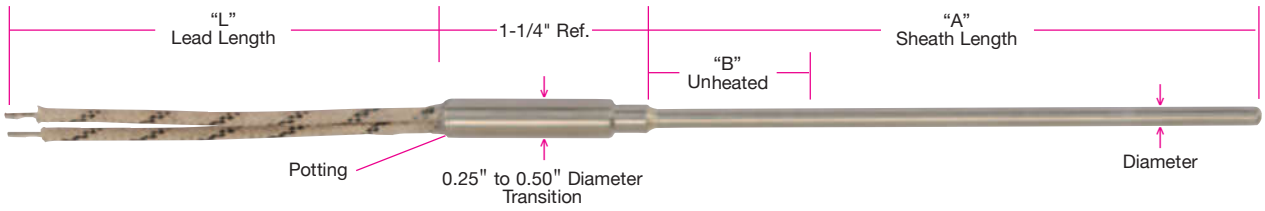
Please Specify the following:

- ❑ Wattage and Voltage
- ❑ Sheath Diameter
- ❑ Heater length
- ❑ Sheath material— 304 stainless steel or Inconel® 600
- ❑ Length of internal nickel cold, or if a neck down design, length of cold section. See page 5-5.
- ❑ Thermocouple if required— Type J or K
- ❑ Thermocouple Junction— Grounded or Ungrounded. If ungrounded, specify location (.115" and larger).
- ❑ Transition type: M1, M2, M3, A1, A2, A3, B1, B2, B3, C1, C2, C3, S1, S2 or S3. See page 5-5.
- ❑ Lead length if other than 24"
- ❑ Supply a sketch or drawing.

Tempco-Pak Heaters

Made in USA

.125 & .153 Diameter Cable Heaters With and Without Thermocouples



Design Features

- ✶ *For temperatures up to 1500°F (815°C) with 304 SS sheath or 1800°F (982°C) with Inconel 600 sheath.*
- ✶ *Heater can be formed into almost any shape.*
- ✶ *Available with optional type J or K thermocouples.*
- ✶ *Watt densities up to 40 watts /square inch and as high as 75 watts/square inch in certain applications.*

Ordering Code:

1			2	3	4	5	6		7	8	9		10	11			12	13	14
	H	S																	

Heater Type *BOX 1*
M = With thermocouple
H = Without thermocouple

Diameter *BOX 2*
F = .125"
G = .153"

Thermocouple Type *BOX 3*
0 = No Thermocouple
J = Type J Thermocouple
K = Type K Thermocouple

Thermocouple Junction *BOX 4*
0 = No Thermocouple
G = Grounded at Tip
U = Ungrounded at Tip
M = Ungrounded in the Middle

Sheath Material *BOX 5*
B = 304 SS
A = Inconel® 600

"A" Dimension (Heater Length) *BOX 6*
Whole inches
00 to **99**

"A" Dimension (Heater Length) *BOX 7*
Fractional inches
0 = 0" **4** = 1/2"

"B" Dimension (Unheated Length) *BOX 8*
Whole inches
0 to **9**

Wattage *BOX 9*
Examples: Enter **090** for 90 watts
Enter **250** for 250 watts

Voltage *BOX 10*
1 = 120 Volts
2 = 240 Volts

"L" Dimension *BOX 11*
Whole inches
001 to **999**

Lead Insulation *BOX 12*
M = Plain Leads
B = Stainless Steel Overbraid
C = Galvanized Armor Cable
A = Stainless Steel Armor Cable
S = Fiberglass Sleeve

Transition Temperature Rating *BOX 13*
1 = 482°F (250°C) — TGGT Wire with High Temperature Cement Potting
2 = 392°F (200°C) — TFE Wire with Epoxy Potting
3 = 842°F (450°C) — MGT Wire with High Temperature Cement Potting

Special Requirement *BOX 14*
X = Specify
0 = None

Ordering Information

Cable Heaters are offered with the options listed in the worksheet. Create an ordering code by filling in the boxes with the appropriate number and/or letter designation for your requirements, and a part number will be assigned.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Standard (Non-Stock) Round Straight Tempco-Pak Cable Heaters

Part numbers are for 304 SS sheath heaters (except HHS00003 with Inconel® 600) with 24" plain leads, and a type J thermocouple junction grounded at the tip of the cable, except those marked with a ✣ (0.062" cable).

Cable Diameter	Sheath Length in	Sheath Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Volts	Part Number
✣ .062" (1.57 mm)	34	863.6	400	60	9.30	120	HHS00001
	42	1066.8	400	49	7.59	120	HHS00002
	60	1524.0	200	19	2.94	120	HHS00003
	88	2235.2	450	26	4.03	120	HHS00004
.115" (2.92 mm)	49	1244.6	425	24	3.72	120	MHS00002
	73	1854.2	450	17	2.63	120	MHS00003
	87	2209.8	750	24	3.72	240	MHS00004
.125" (3.18 mm)	30	762.0	300	30	4.65	120	MHS00005
	35	889.0	330	24	3.72	240	MHS00006
	41	1041.4	365	23	3.56	120	MHS00007
	52	1320.8	400	20	3.10	240	MHS00008
	62	1574.8	780	32	4.96	240	MHS00009
	68	1727.2	300	11	1.70	120	MHS00010
	68	1727.2	300	11	1.70	240	MHS00011
	84	2133.6	780	24	3.72	120	MHS00012
	90	2286.0	660	19	2.94	120	MHS00013
.153" (3.89 mm)	17	431.8	200	24	3.72	240	MHS00014
	17	431.8	375	46	7.13	240	MHS00015
	18	457.2	250	29	4.49	240	MHS00016
	20	508.0	125	13	2.01	230	MHS00017
	20	508.0	250	26	4.03	230	MHS00018
	22	558.8	250	24	3.72	240	MHS00019
	25	635.0	380	32	4.96	240	MHS00020
	34	863.6	480	29	4.49	240	MHS00021
	40	1016.0	550	29	4.49	240	MHS00022
	51	1295.4	650	27	4.18	240	MHS00023
.174" (4.42 mm)	88	2235.2	1800	37	5.73	220	MHS00024
	93	2362.2	1700	33	5.11	220	MHS00025
	109	2768.6	1500	25	3.87	220	MHS00026
	166	4216.4	3350	37	5.73	220	MHS00027
	220	5588.0	2850	24	3.72	220	MHS00028
.188" (4.78 mm)	77	1955.8	1700	34	5.27	220	MHS00029①
	90	2286.0	2000	37	5.73	220	MHS00030
	105	2667.0	1800	29	4.49	220	MHS00031
	180	4572.0	3900	37	5.73	220	MHS00032
	191	4851.4	1000	9	1.39	220	MHS00033
	198	5029.2	3600	31	4.80	220	MHS00034
.203" (5.16 mm)	146	3708.4	2850	31	4.80	380	MHS00035
	182	4622.8	3900	34	5.27	480	MHS00036
	200	5080.0	4300	34	5.27	220	MHS00037
	223	5664.2	4000	28	4.34	220	MHS00038
.220" (5.59 mm)	107	2717.8	2500	32	4.96	220	MHS00039
	123	3124.2	2100	31	4.80	220	MHS00040
	205	5207.0	4800	34	5.27	220	MHS00041
	217	5511.8	3800	25	3.87	220	MHS00042
.232" (5.89 mm)	109	2768.6	2700	34	5.27	220	MHS00043
	119	3022.6	2550	29	4.49	220	MHS00044
	204	5181.6	4500	30	4.65	480	MHS00045
	211	5359.4	5000	32	4.96	220	MHS00046
	222	5638.8	4800	30	4.65	220	MHS00047
.250" (6.35 mm)	89	2260.6	2600	37	5.73	220	MHS00048
	100	2540.0	2200	38	5.89	220	MHS00049
	103	2616.2	2750	34	5.27	220	MHS00050
	105	2667.0	2100	25	3.87	220	MHS00051
	115	2921.0	2450	27	4.18	220	MHS00052
	118	2997.2	2600	28	4.34	220	MHS00053
	123	3124.2	2700	28	4.34	220	MHS00054
	130	3302.0	2600	25	3.87	220	MHS00055
	138	3505.2	2300	21	3.25	220	MHS00056
	205	5207.0	4200	30	4.65	220	MHS00057
	215	5461.0	4000	28	4.34	220	MHS00058
	240	6096.0	5500	26	4.03	220	MHS00059
	281	7137.4	4700	19	2.94	220	MHS00060

NOTE: ① Maximum Operating Temperature 500°C.

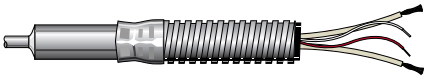
Longer lead length as well as optional stainless steel wire braid (B), fiberglass sleeve (S), stainless steel armored cable (A), or galvanized armored cable (C) protection is available upon request. See ordering code worksheet below for lead wire protection and lead length desired.

NOTE: Complete termination descriptions are on page 5-5.

Type A__— Stainless Steel Armor Cable

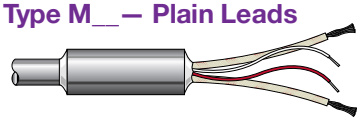
Type B__— Stainless Steel Overbraid

Type C__— Galvanized Armor Cable



Type S__— Fiberglass Sleeve

Type M__— Plain Leads



Potting Adapter Size without Crimping

5/16" O.D. × 1-1/2" long for 0.062" to 0.163" dia. cable
1/2" O.D. × 1-1/2" long for 0.174" to 0.250" dia. cable

Ordering Information

Standard Straight Tempco-Pak heaters are offered with plain lead wires. Use the part numbers at the left for 24" plain lead wires. If you need other than standard 24" leads and/or wire protection use the following ordering codes and a part number will be assigned.

Ordering Code:

L [1] [1] [2] [3] [3]

Lead Length *BOX 1*
Whole inches **000** to **999**

Termination Type *BOX 2*
A = Stn. Stl. Cable
B = Stn. Stl. Wire Braid
C = Galvanized Cable
S = Fiberglass Sleeve
M = Plain Leads (Do not fill Box 3)

Length of Protection *BOX 3*
Whole inches **000** to **999**

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Standard (Non-Stock) Square Straight Tempco-Pak Cable Heaters

Part Numbers are for heaters with 48" plain leads.

Longer lead length as well as optional stainless steel wire braid (B), fiberglass sleeve (S), stainless steel armored cable (A) or galvanized armored cable (C) protection is available upon request. See ordering code worksheet below for lead wire protection and lead length desired.

Standard Tempco-Pak Heaters are made with 304 Stainless Steel Sheath.

Cable Cross Section	Sheath Length in	Sheath Length mm	Cold Length in	Cold Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Volts	"J" T/C Junction	Part Number
.125" x .125" (Square)	14⅛	359	2	51	250	41.2	6.39	240	UG-T	MHS00128
	18¼	464	1¾	44	250	30.3	4.70	240	UG-T	MHS00129
	22⅞	581	2⅛	54	250	24.0	3.72	240	GRD	MHS00121
	23¼	591	1½	38	450	41.3	6.40	240	UG-M	MHS00122
	26	660	4	101	300	27.2	4.22	240	GRD	MHS00123
	29	737	1½	38	450	32.7	5.06	240	UG-N	MHS00124
	36⅞	936	2	51	300	17.2	2.66	240	GRD	MHS00125
	41⅛	1045	1⅞	47	300	15.2	2.35	240	UG-M	MHS00126
	43⅝	1108	1⅞	47	300	14.3	2.21	240	UG-M	MHS00127
	20	508	2½	64	315	36.0	5.58	240	N/A	HHS00167
	31½	800	2½	64	315	21.7	3.36	240	N/A	HHS00168
	31¾	806	2½	64	600	41.0	6.36	240	N/A	HHS00169

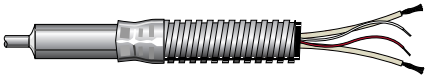
(UG-M) — Ungrounded T/C junction is at the middle of the hot section
(UG-T) — Ungrounded T/C junction is at the tip
(UG-N) — Ungrounded T/C junction is 7" from the tip

Lead Wire Abrasion Protection Terminations

Type A__— Stainless Steel Armor Cable

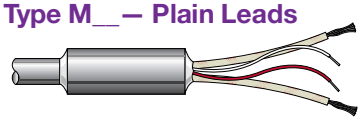
Type B__— Stainless Steel Overbraid

Type C__— Galvanized Armor Cable



Type S__— Fiberglass Sleeve

Type M__— Plain Leads



Potting Adapter Size without Crimping

5/16" O.D. × 1-1/2" long

NOTE: Complete termination descriptions are on page 5-5.

Ordering Code:

L | 1 | 2 | 3

Ordering Information

Part Numbers above are for Square Rectangular Tempco-Pak heaters with 48" plain lead wires. If you need other than standard 48" leads and/or wire protection use the ordering codes at the right and a part number will be assigned.

Lead Length *BOX 1*
Whole inches **000** to **999**

Termination Type *BOX 2*
A = Stn. Stl. Cable
B = Stn. Stl. Wire Braid
C = Galvanized Cable
S = Fiberglass Sleeve
M = Plain Leads (Do not fill Box 3)

Length of Protection *BOX 3*
Whole inches **000** to **999**

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Standard (Non-Stock) Rectangular Straight Tempco-Pak Cable Heaters

Part Numbers are for heaters with 48" plain leads.

Longer lead length as well as optional stainless steel wire braid (B), fiberglass sleeve (S), stainless steel armored cable (A) or galvanized armored cable (C) protection is available upon request.
See ordering code worksheet below for lead wire protection and lead length desired.

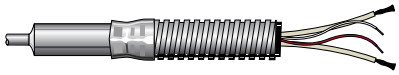
Standard Tempco-Pak Heaters are made with 304 Stainless Steel Sheath.

Cable Cross Section	Sheath Length in	Sheath Length mm	Cold Length in	Cold Length mm	Watts	Watt Density W/in²	Watt Density W/cm²	Volts	"J" T/C Junction	Part Number
.110" x .160" (Rectangular)	21⅛	537	1⅝	41	300	28.5	4.41	240	UG-M	MHS00107
	27½	698	1⅝	41	350	25.0	3.87	240	UG-M	MHS00108
	30¾	781	1⅞	48	400	25.6	3.97	240	UG-M	MHS00109
	32¼	819	1⅝	41	400	24.2	3.74	240	UG-M	MHS00110
	35¼	895	1¾	44	450	24.8	3.86	240	UG-M	MHS00111
	35⅞	911	1⅝	41	425	23.0	3.56	240	UG-M	MHS00112
	40¼	1022	1¼	32	550	26.0	4.03	240	UG-M	MHS00113
	44¼	1124	1⅝	41	500	21.7	3.36	240	UG-M	MHS00114
	44¾	1137	1¼	32	700	29.8	4.62	240	UG-M	MHS00115
	53½	1359	1⅝	41	800	28.8	4.46	240	UG-M	MHS00116
	57	1448	1⅝	41	500	16.7	2.58	240	UG-M	MHS00117
	57⅝	1464	1⅝	41	550	18.1	2.81	240	UG-M	MHS00118
	62¾	1594	1⅝	41	900	27.2	4.22	240	UG-M	MHS00119
	72	1829	1⅝	41	1000	26.3	4.07	240	UG-M	MHS00120
	13¾	349	1⅞	48	225	35.0	5.42	240	No T/C	HHS00159
	20½	521	1⅝	41	250	24.5	3.79	240	No T/C	HHS00160
	24⅜	619	1⅝	41	300	24.4	3.78	240	No T/C	HHS00161
	32⅜	822	1⅝	41	350	21.0	3.25	240	No T/C	HHS00162
	40¼	1022	1⅝	41	400	19.1	2.96	240	No T/C	HHS00163
	48¼	1226	1⅝	41	425	16.8	2.60	240	No T/C	HHS00164
	53½	1359	1⅝	41	800	28.5	4.41	240	No T/C	HHS00165
	64⅛	1629	1⅝	41	500	14.8	2.29	240	No T/C	HHS00166

UG-M: — Ungrounded T/C junction is 8" to 11" from the tip

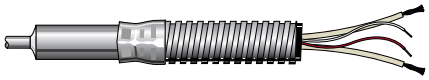
Lead Wire Abrasion Protection Terminations

Type A__— Stainless Steel Armor Cable



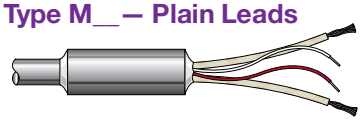
Type B__— Stainless Steel Overbraid

Type C__— Galvanized Armor Cable



Type S__— Fiberglass Sleeve

Type M__— Plain Leads



NOTE: Complete termination descriptions are on page 5-5.

Potting Adapter Size without Crimping

5/16" O.D. × 1-1/2" long

Ordering Code:

Lead Length *BOX 1*
Whole inches **000** to **999**

Termination Type *BOX 2*
A = Stn. Stl. Cable
B = Stn. Stl. Wire Braid
C = Galvanized Cable
S = Fiberglass Sleeve
M = Plain Leads (Do not fill Box 3)

Length of Protection *BOX 3*
Whole inches **000** to **999**

Ordering Information

Part Numbers above are for Standard Rectangular Tempco-Pak heaters with 48" plain lead wires. If you need other than standard 48" leads and/or wire protection use the ordering codes at the right and a part number will be assigned.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Bulk Round Heater Cable

Typical Applications

- *Blown Film Die Heaters*
- *Heat Tracing*
- *De-icing Car Wash Door Rails*
- *De-icing Outside Stairways*

Design and Construction Specifications

Terminations

See page 5-5 for potted lead transitions. There are two choices of potting compounds. Either cement potting for a high temperature application or high temperature epoxy for 450°F (232°C) maximum temperature. Also, there are three major choices of lead wires:

M1 — TGGT (Teflon® tape, fiberglass, Teflon® treated fiberglass overbraid) insulated lead wire for 482°F (250°C).

M2 — Teflon® insulated lead wire, which is normally potted with a high temperature epoxy rated 450°F (232°C)

M3 — MGT (mica tape, Teflon® treated fiberglass overbraid) insulated lead wire for 842°F (450°C).

Minimum Bending Radius

Minimum bending radius for all mineral insulated cable heaters is two times the sheath diameter.

Power Calculation

The required wattage can be calculated using the following formula:

$$\text{Wattage} = \frac{(\text{Voltage})^2}{\text{Cable length (in feet)} \times \text{Ohms/foot (from table)}}$$

Standard Single Conductor Heater Cable

Sheath OD		Resistance (+/-10%)		Maximum Length		Sheath Material	Maximum Current Allowed	Part Number
in	mm	ohms/ft.	ohms/mtr.	feet	meters		(Amps)	
.125	3.17	0.67	2.2	250	75	Inconel® 600	13.3	CAS01125
.125	3.17	0.72	2.4	250	75	Inconel® 600	12.5	CAS02125
.125	3.17	0.78	2.6	250	75	Inconel® 600	12.0	CAS03125

Standard Double Conductor (Duplex) Heater Cable

Sheath OD		Resistance (+/-10%)		Maximum Length		Sheath Material	Maximum Current Allowed	Part Number
in	mm	ohms/ft.	ohms/mtr.	feet	meters		(Amps)	
.040	1.00	37.0	122.0	500	152	Inconel® 600	1.5	CAW00040
.055	1.39	16.4	54.1	500	152	Inconel® 600	2.3	CAW00055
.062	1.59	13.7	45.2	400	121	Inconel® 600	2.9	CAW00062
.062	1.59	13.2	43.6	400	121	304 SS	3.0	CAW01062
.062	1.59	8.1	26.7	400	121	304 SS	4.0	CAW02062
.062	1.59	7.9	26.1	400	121	304 SS	4.1	CAW03062
.062	1.59	4.6	15.1	400	121	304 SS	5.8	CAW05062
.064	1.62	6.5	21.4	400	121	304 SS	4.7	CAW04064
.125	3.18	7.0	23.1	250	75	304 SS	4.7	CAC53125
.125	3.18	3.4	11.2	250	75	Inconel® 600	7.3	CAW00125
.147	3.73	4.8	15.8	200	60	304 SS	5.9	CAC53147
.147	3.73	2.5	8.2	200	60	Inconel® 600	9.0	CAW00147
.153	3.88	4.5	14.8	150	45	304 SS	6.0	CAC53153
.153	3.88	2.3	7.6	150	45	Inconel® 600	9.2	CAW00153
.153	3.88	1.9	6.3	150	45	304 SS	9.7	CAW01153
.153	3.88	1.6	5.3	150	45	304 SS	11.5	CAW02153
.153	3.88	1.4	4.6	150	45	304 SS	13.0	CAW03153
.163	4.14	4.0	13.2	130	39	304 SS	6.5	CAC53163
.163	4.14	2.1	6.9	130	39	Inconel® 600	9.6	CAW00163
.163	4.14	1.7	5.6	130	39	304 SS	10.5	CAW01163
.163	4.14	1.5	4.9	130	39	304 SS	12.5	CAW02163
.163	4.14	1.2	3.9	130	39	304 SS	14.0	CAW03163
.188	4.77	3.0	9.9	100	30	304 SS	7.0	CAC53188
.188	4.77	1.5	5.0	100	30	Inconel® 600	12.0	CAW00188
.188	4.77	1.3	4.3	100	30	304 SS	13.3	CAW01188
.188	4.77	1.06	3.5	100	30	304 SS	15.5	CAW02188
.188	4.77	0.86	2.8	100	30	304 SS	17.0	CAW03188
.210	5.33	1.18	3.9	80	24	Inconel® 600	15.4	CAW00210
.210	5.33	1.17	3.8	80	24	304 SS	15.5	CAW01210
.210	5.33	0.84	2.7	80	24	304 SS	18.3	CAW02210
.210	5.33	0.75	2.5	80	24	304 SS	20.0	CAW03210
.220	5.59	2.17	7.1	75	22	304 SS	9.5	CAC53220
.220	5.59	0.98	3.2	75	22	304 SS	16.5	CAW01220
.220	5.59	0.76	2.5	75	22	304 SS	19.5	CAW02220
.250	6.35	1.8	5.9	58	17	304 SS	11.3	CAC53250
.250	6.35	0.9	2.9	58	17	Inconel® 600	18.3	CAW00250
.250	6.35	0.87	2.9	58	17	304 SS	20.0	CAW01250
.250	6.35	0.59	1.9	58	17	304 SS	23.0	CAW02250
.250	6.35	0.48	1.6	58	17	304 SS	25.0	CAW03250

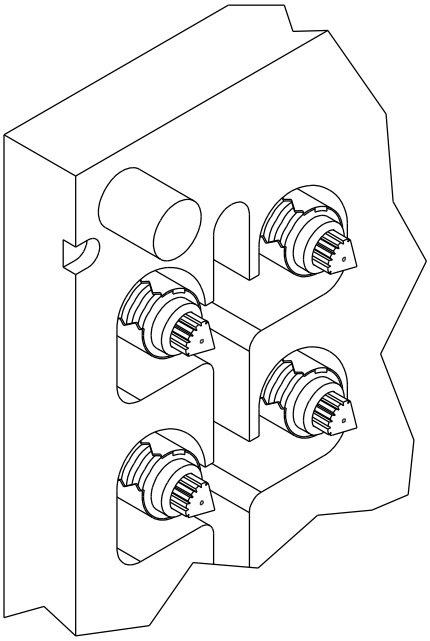
Note: Maximum lengths shown are manufactured lengths. Cable is shipped in random lengths unless specific lengths are ordered.

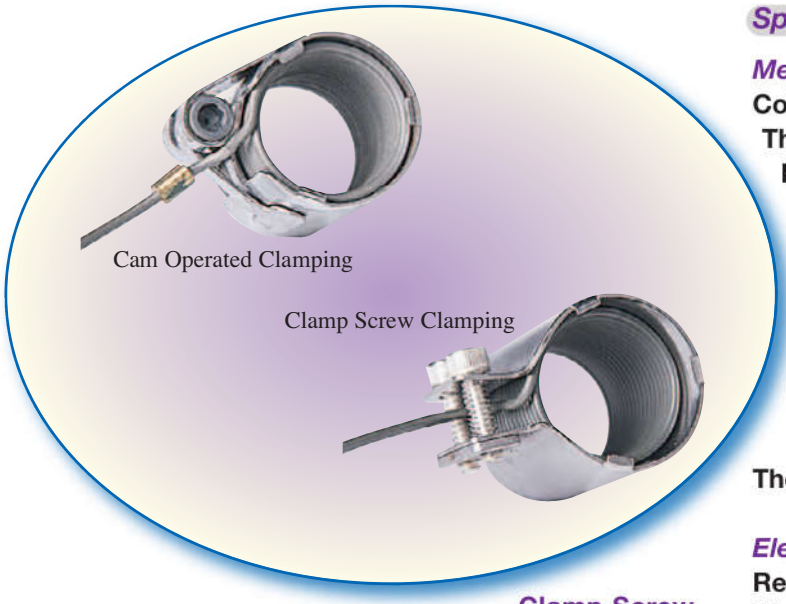
Made in USA

Tempco Replacement Mini-Coil Heaters (Round Cable) for OEM Hot Runner Systems

Tempco's Mini-Coil Band Heaters are designed and manufactured under the tightest tolerances so that they may be used in hot runner/runnerless injection mold tooling with complete confidence on maintaining the manufacturer's original balanced heating when using a minimum of thermocouples and temperature control zones.

- ±2% Resistance Tolerance
- 5" and 7" Staggered Cold Lead Length
- 72" Insulated Lead Wire Length
  White/Black for 250W and White/Red for 125W





Clamp Screw

Clamping

Screw operated clamping for the traditional style.

Cam Operated Clamping

Cam operated axial clamping allows tool room personnel to replace the heating element or the thermocouple of the gate bushing without having to remove the bushing from the mold. This can even be done in emergencies while the mold is still in the press, saving hours of downtime. The hex head cam is accessed from the front, parallel to the bushing's shaft.

Specifications

Mechanical

Coil Heater Diameter: . . . . . 0.055", ±0.002"
Thermocouple: . . . . . Type J, 0.055" dia., ±0.002"
Inner Diameter: . . . . . ±0.002"
Width/Length: . . . . . ±0.020"
Axial Clamp Hex: . . . . . Tempered 416 series SS
Hex size: 1/8"
Rotation: 150 degrees
Clamp Screw: . . . . . (2) 6-32 × 1/2", SS,
Hex size 7/64"
Heater Leads: . . . . . 18 ga. silver coated copper, Teflon® insulation, 200°C/392°F
Staggered 5" and 7"
Thermocouple Leads: . . . . . Fiberglass insulation, 1000°F

Electrical

Resistance Tolerance: . . . . . ±2%
Wattage Tolerance: . . . . . ±2%
Voltage: . . . . . Standard voltages are 120 and 240VAC; other voltages can be designed.
Consult Tempco with your requirements.

Tempco Replacement Mini-Coil Heaters (Round Cable) for OEM Hot Runner Systems

Stock and Standard (Non-Stock) Cam Operated Clamping Round Cable with Thermocouple

Stock Items Are Shown In RED

Clamp Style	ID in	ID mm	Length in	Length mm	Watts	Volts	Part Number Heater Only	Part Number With Type J T/C
Axial	.750	19.0	1.20	30.5	① 149	240	HRN00100	HRY00110
	.750	19.0	1.20	30.5	② 268	240	HRN00101	HRY00111
	.750	19.0	1.75	44.4	268	240	HRN00102	HRY00112
	.750	19.0	2.00	50.8	323	240	HRN00103	HRY00113
	.875	22.2	1.75	44.4	268	240	HRN00104	HRY00114
	1.000	25.4	1.20	30.5	300	240	HRN00105	HRY00115
	1.000	25.4	2.00	25.4	318	240	HRN00106	HRY00116
	1.000	25.4	1.20	30.5	350	240	HRN00107	HRY00117
	1.000	25.4	2.00	50.8	440	240	HRN00108	HRY00118
	.500	12.7	1.20	31.7	120	240	HRN00109	HRY00119

Stock and Standard (Non-Stock) Screw Operated Clamping Round Cable with Thermocouple

Stock Items Are Shown In RED

Clamp Style	ID in	ID mm	Length in	Length mm	Watts	Volts	Part Number Heater Only	Part Number With Type J T/C
Screw	.750	19.0	1.20	30.5	① 149	240	HRN01100	HRY01113
	.750	19.0	1.20	30.5	② 268	240	HRN01101	HRY01114
	.750	19.0	2.50	63.5	323	240	HRN01102	HRY01115
	.875	22.2	1.20	30.5	② 268	240	HRN01103	HRY01116
	.875	22.2	2.00	50.8	300	240	HRN01104	HRY01117
	.875	22.2	1.75	44.4	350	240	HRN01105	HRY01118
	.750	19.0	1.20	30.5	400	240	HRN01106	HRY01119
	.750	19.0	2.00	50.8	272	240	HRN01107	HRY01120
	.750	19.0	2.00	50.8	400	240	HRN01108	HRY01121
	.750	19.0	1.20	30.5	186	240	HRN01109	HRY01122
	1.500	38.1	2.50	63.5	675	240	HRN01110	HRY01123
	1.750	44.4	1.75	44.4	450	240	HRN01111	HRY01124
	2.500	63.5	1.50	38.1	380	240	HRN01112	HRY01125

Notes: ① It is the hot runner industry practice to refer to this heater as 125W even though the actual wattage will be dependent on the applied voltage. The resistance is 386.58 ohms.

Notes: ② It is the hot runner industry practice to refer to this heater as 250W even though the actual wattage will be dependent on the applied voltage. The resistance is 214.98 ohms.

Industry Cross Reference Part Numbers

Tempco Part Number	OEM Part Number	Rosemount Part Number
HRN00100	534234	904FE101
HRN01100	520156	904EJ101, 904EN101, 904FB101

Tempco Part Number	OEM Part Number	Rosemount Part Number
HRN00101	534233	904FE131
HRN01101	521334	904EJ131, 904EN131, 904FB131
HRN01103		904EJ141, 904EN141, 904FB141

Ordering Information

Stock Heaters

Select a Mini-Coil Heater from the standard sizes and ratings list.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes, ratings and terminations not listed, **TEMPCO** will design and manufacture a Mini-Coil heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Inner Diameter
- ❑ Width/Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination Type
- ❑ Cable/Braid Length
- ❑ Clamp Style
- ❑ Special Features

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Cast Bronze Nozzle Heater Bushings

Typical Applications

- *Hot Runner Systems*
- *Sprue Bushings*
- *Hot Melt Adhesive Systems*

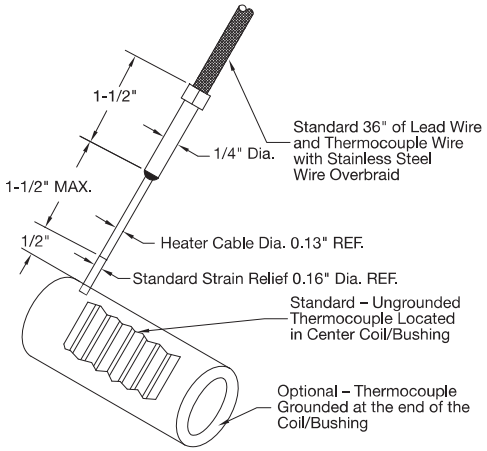
Typical Applications

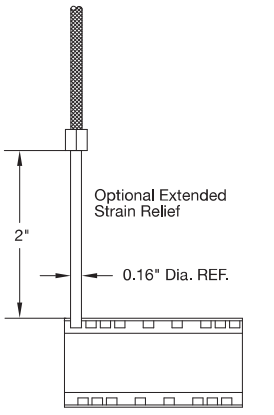
- *Plastic Injection Nozzles*
- *Medical, Laboratory and Pharmaceutical Equipment*

Design Features

- *Bronze Cast construction for excellent heat transfer and long life*
- *Operating Temperature to 1200°F (650°C)*
- *Built-in Type J or K Thermocouple for accurate temperature control*
- *Distributed wattage for even heat transfer*
- *Precision machining of the inside diameter*
- *Choice of leads and lead protection*

Custom Engineered/Manufactured to meet customer specifications — we welcome your inquiries.





Typical Distribution of Heater Coil

Construction Characteristics

Tempco's cast bronze nozzle heater bushings offer the latest in state-of-the-art technology to these innovative designs. They eliminate uneven temperature profiles and short heater life; their precision machining also eliminates poor fit and the need for clamping bands, while providing maximum heat transfer.

The casting is protected by a stainless steel tube. The maximum operating temperature for the bronze casting is 1200°F (650°C); the optional aluminum casting has a maximum operating temperature of 600°F (315°C). The built-in thermocouple in either Type J or K gives exceptional temperature control when connected to a Tempco TEC controller. The thermocouple has as standard an ungrounded junction located in the center of the width, which helps eliminate stray EMFs caused by the heater. A grounded junction at the end is optional.

The heater and thermocouple have a standard termination of 36- inch fiberglass leads with a stainless steel overbraid. Options include Teflon® insulated leads and armor cable. All terminations are available with the optional 2-inch-long extended strain relief.

Standard (Non-Stock) Bronze Heater Bushings

ID		OD		Width		Volts	Watts	Part Number
in	mm	in	mm	in	mm			
½	13	1	25	2	51	240	300	NHB00002
⅝	16	1⅛	29	2	51	240	300	NHB00003
⅝	16	1⅛	29	3	76	240	500	NHB00004
⅝	16	1⅛	29	4	102	240	750	NHB00005
¾	19	1¼	32	1	25	240	250	NHB00006
¾	19	1¼	32	2	51	240	350	NHB00007
⅞	22	1⅜	35	2	51	240	500	NHB00008
⅞	22	1⅜	35	3	76	240	750	NHB00009
⅞	22	1⅜	35	4	102	240	1000	NHB00010

Note: Inside Diameter machined to a tolerance of ± 0.001". Width tolerance to 4" ± 0.02". Wattage and Resistance are ± 10%.

Tabletop Point-of-Use Temperature Control Console Systems

See Section 13, Page 13-52

Custom Engineered/Manufactured Heater Bushings

Ordering Code:

NHB – [1] [2] [3] [4] [5] [6] [7] [8] [9] [10] [11] [12] [13]

Inside Diameter *BOX 1*
A = .375"
B = .500"
C = .563"
D = .625"
E = .750"
F = .875"
G = Other (Specify)

Nominal Outside Diameter *BOX 2*
A = 1"
B = 1-1/8"
C = 1-1/4"
D = 1-3/8"
E = Other (Specify)

Width (Length) *BOX 3*
A = 1"
B = 2"
C = 3"
D = 4"
X = Other (Specify)

Volts *BOX 4*
A = 240 Standard
B = 120 Optional

Wattage *BOX 5*
X = (Specify)

Lead Length *BOX 6*
Whole inches
01 to **999**
36" Standard (036)

Lead Construction *BOX 7*
A = Fiberglass, Heater and T/C with SS overbraid – Standard
B = Fiberglass, Heater and T/C
C = Teflon® Insulated, Heater and T/C
D = Teflon® Insulated with SS overbraid (no T/C)
E = Fiberglass Insulated with SS armor cable (no T/C)
F = Teflon® Insulated with SS armor cable (no T/C)
NOTE: For A, D, E and F the cable or braid length will be 2" shorter than the lead wire length unless otherwise specified.

Extended Strain Relief (2" long) *BOX 8*
1 = Yes
2 = No

Thermocouple Type *BOX 9*
J = Type J Iron/Constantan
K = Type K Chromel/Alumel
0 = None Required

T/C Junction Location *BOX 10*
A = Ungrounded (Standard)
B = Grounded (Optional)
0 = None Required

Casting Construction *BOX 11*
B = Bronze (Standard) 1200°F (650°C)
A = Aluminum (Optional) 600°F (315°C)

Cold Length *BOX 12*
Whole inches
02 to **18**
2" Standard (02)

Special Requirements *BOX 13*
X = Specify
0 = None
Example: Set screws in bushing available upon request.

Ordering Information

Standard (Non-Stock) Heaters

Order standard Heater Bushings by part number from the table on page 5-28.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes, ratings and terminations not listed, **TEMPCO** will design and manufacture a Heater Bushing to meet your requirements. ***Standard lead time is 4 weeks.***

To order a custom Heater Bushing ***create an order code number*** by filling in the boxes with the appropriate number and/or letter designation for your requirements. A product part number will be assigned at time of order.

Made in USA

Gamma Series Dual Sleeve Mini-Coil Heater

NOTE: Caps Sold Separately

Design Features

- *ID Tolerance: ± .0005"*
- *Wall Thickness: 0.130"*
- *Lead Wires: 72" long Teflon® insulated*
- *Cold leads: 5" and 7" standard*
- *Resistance Tolerance: ± 2%*
- *Watt Density: Over 100 w/sq.in. possible*

Gamma Series mini-coil heaters for hot runner tooling are constructed with the heating element tightly sandwiched between a nickel plated copper inner sleeve and a stainless steel outer sleeve. The differences in heat transfer characteristics of the sleeves direct the heat generated by the coil inward, toward the nozzle, increasing overall efficiency. The inner diameter of the assembly is very tightly controlled, allowing for a slip fit with no clamping required.

For replacement threaded caps order Part Number HRN94999 (19.05 mm, 0.75" dia.).

Stock and Standard (Non-Stock) Sizes and Ratings

Stock Items Are Shown In RED

ID	Length mm	Length in	Watts	Volts	OEM Part Number	Tempco Part Number
19.05 mm (3/4")	30	1.181	220	240	534975	HRN40001
	40	1.575	220	240	534976	HRN40002
	50	1.969	220	240	534977	**HRN40003**
	60	2.362	220	240	534978	**HRN40004**
	70	2.756	220	240	534979	HRN40005
	80	3.150	220	240	534980	HRN40006
	90	3.543	220	240	534981	HRN40007
	100	3.937	220	240	534982	HRN40008
	110	4.331	220	240	534983	HRN40009
	30	1.181	350	240	—	HRN40010
	40	1.575	350	240	—	HRN40011
	50	1.969	350	240	—	HRN40012
	60	2.362	400	240	—	HRN40013
	70	2.756	400	240	—	HRN40014
	80	3.150	400	240	—	HRN40015
	90	3.543	400	240	—	HRN40016
	100	3.937	450	240	—	HRN40017
	110	4.331	400	240	—	HRN40018

Ordering Information

Stock Heaters

Select a Mini-Coil Heater from the standard sizes and ratings list.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes, ratings and terminations not listed, **TEMPCO** will design and manufacture a Mini-Coil heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Inner Diameter
- ❑ Width/Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination Type
- ❑ Cable/Braid Length
- ❑ Clamp Style
- ❑ Special Features

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Table Of Contents

section 6

Heat Trace Cable

Made in USA

Introduction to Heat Trace Cable Systems

Tempco's Heat Trace Cables are used to counteract the effects of heat dissipation from process pipe and equipment through its insulation (if any). This heat loss allows a drop in temperature, bringing about unacceptable consequences such as frozen pipes, reduced fluid viscosity, etc.

The use of heat trace cable replaces the heat lost, maintaining the desired temperature through the application of the required wattage.

There are two general categories of Electrical Heat Trace Cable:
Constant Wattage and
Self-Limiting, or **Self-Regulating** cable
Each style of heat trace cable serves different applications.

The Most Commonly Asked Questions About Heat Trace Cables

Which cable do I need?

Selecting the proper cable depends on many different variables. The pipe size, exposure temperatures, ambient conditions, insulation type and thickness, maintenance temperatures, heat-up rate, flow rate, and type of material involved all play a part in determining which cable is best for your application.

Consult pages 6-2 through 6-14 and/or contact **Tempco** to assist you in making the correct choice.

What are the requirements for metal overbraid and outer jackets?

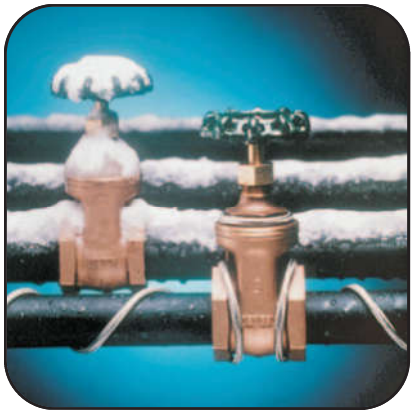
Metal overbraid is required on all heat trace cabling to meet NEC code for grounding. The braid provides mechanical protection, as well as a low-resistance grounding path.

On SL self-limiting cable, in addition to the standard metal overbraid, an optional thermoplastic elastomer or fluoropolymer outer jacket is recommended when exposure to organic chemicals or corrosives is expected.

Can the cable be cut in the field without changing the resistance?

Tempco's Constant Wattage and Self-Limiting style cable is designed to be a certain wattage per foot within a certain circuit length. All Constant Wattage cables have modules cut out of the bus wire jacket, exposing the bare wire at alternating points at predetermined lengths. The cable is designed to be a certain wattage within this circuit length. These circuits run the length of the spool, similar to short runs of cable run in series to make one long cable. If a circuit is interrupted (cut), the cable will be unheated up until the next complete circuit.

Types of Heat Trace Cable



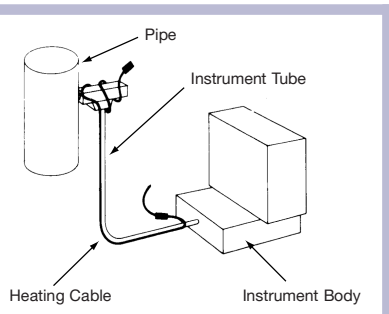
Constant Wattage Cable This style of heat trace cable is designed to put out a certain amount of wattage per linear foot at a particular voltage. It is always putting out the designed watts per foot, no matter what the surface or ambient temperature is. This means that in most situations the heating cable is continually pumping heat into the vessel or pipe being maintained or heated. If the heat trace cable is not attached to some kind of control device, it has the potential to overheat itself and burn out. This would not only ruin the cable, but could cause damage to whatever it is being used on. Therefore, constant wattage cable must be controlled by some means.

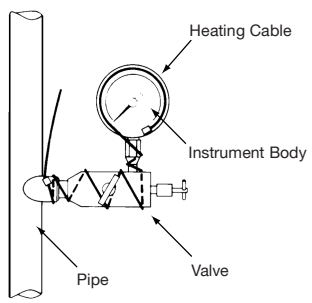
Self-Limiting, or Self-Regulating Cable This cable will self-adjust its power output in relation to the surface temperature as well as ambient conditions. In other words, the hotter the conditions get, the lower the wattage output becomes. This characteristic allows this type of cable to be used without a control device. However, if a particular temperature is required, then a control device must be used.

Note: Both cables are used by all types of industry. It is the user's requirements that dictate which design to use. Higher temperature maintenance applications will use the constant wattage cables due to the higher maximum exposure temperatures that they allow. Lower temperature maintenance applications, such as freeze protection, can use the self-limiting cable, although constant wattage cable can be used just as effectively as long as it is controlled properly.

Heat Trace Cable Application/Installation Examples

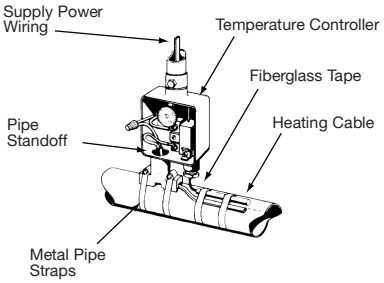
Installation of Heating Cable on a Pressure Sense Line

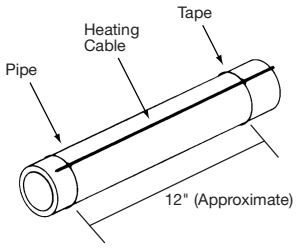




Installation of Heating Cable on a Pressure Indicator

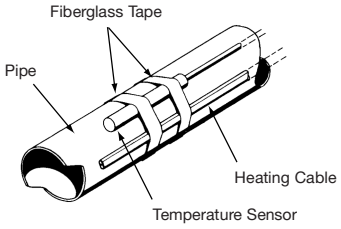
Installation of Heating Cable System in Non-Hazardous Area

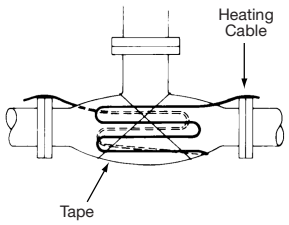




Installation of Heating Cable on a Straight Pipe Run

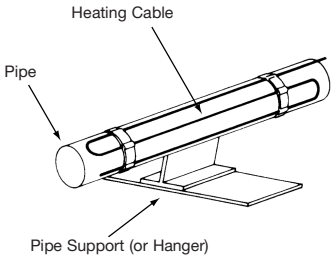
Installation of Temperature Sensor

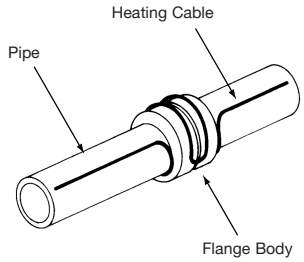




Installation of Heating Cable at a Blind Tee

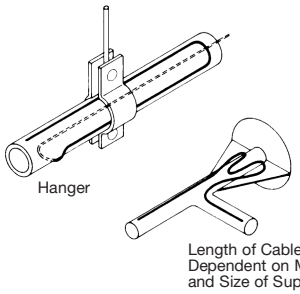
Installation of Heating Cable at a Pipe Support

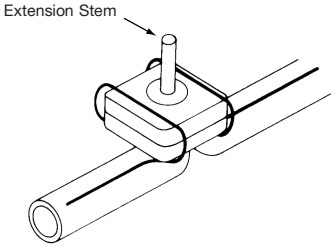




Installation of Heating Cable at a Flange Body

Typical Installation of Heating Cable for Supports





Installation of Heater on Diaphragm Valve (when surface area is sufficient)

How to Determine Heat Trace Cable Requirements

Heat Loss

Heat loss is the amount of heat given up to the surrounding atmosphere through a combination of conduction, convection, and radiation. The parameters required to determine total heat losses on an application may include several of the following:

- Temperature to be maintained
- Lowest expected ambient temperature
- Type, size, and run-length of pipe or tubing
- Type and thickness of thermal insulation to be used
- Losses through the vessel wall and the insulation
- Flow rate

Calculating Heat Loss from Insulated Pipe

1. Calculate the ΔT, or temperature difference. Subtract the lowest ambient temperature from the operating temperature.
2. Using the ΔT calculated in step 1, and the insulation thickness, refer to **Tables 1-A through 1-E—Heat Loss for Pipes (pages 6-5 and 6-6)**, to determine the heat loss in watts per linear foot of pipe.
3. Depending on the type of insulation used in the application, multiply result from step 2 by the appropriate factor from **Table 2—Insulation Factor (page 6-6)**. The resulting number is the heat loss expressed in watts per linear foot of pipe to be made up by the heat tracer.

Determine the Correct Heat Trace Cable

Determine the cable most appropriate for your system based on the temperature to be maintained, environment, length of the run, and the voltages available. There are Tempco heating cables available for most heat tracing applications.

If the watts per foot rating of the cable selected is more than the heat loss per foot, then a straight run may be used.

If the watts per foot rating of the cable selected is less than the heat loss per foot, your options are:

a. Use a higher wattage cable.

b. Use multiple straight runs.

c. Spiral wrap the cable on the pipe.

d. Use insulation with a higher insulation factor or thickness.

Calculating Heat Loss for Valves and Supports

To determine the heat loss multiplication factor for valves, refer to **Table 4—Heat Loss Multiplication Factors for Valves (page 6-7)**. The heat loss factor is based on a typical gate valve with insulation coverage to include the body, flange, and bonnet of the valve.

To determine adjusted multiplication factors for other types of valves and supports, use the following conversion factors:

To determine adjusted multiplication factors for other types of valves and supports, use the following conversion factors:

Gate valve	1.0	**Ball valve**	0.7
Globe valve	0.95	**Butterfly valve**	0.60
Pipe supports	0.50		

Determine the Total Amount of Heat Trace Required

Add the length of cable required for each valve and support to the length of cable required for the total pipe within your system.

Sample Calculation

Engineering Example Specifications

Operating Temperature: 55°F

Minimum Ambient Temperature: -20°F

Pipe Size: 4" steel pipe

Pipe Length: 200 ft.

Valve: 1 Gate Valve

Insulation Thickness and Type: 1" of Calcium Silicate

Voltage: 120 or 240 volts

PROCEDURE

1. Determine the heat loss.

a. Difference between low ambient and operating temperature: 55°F – (-20°F) = ΔT
ΔT = 75°F

b. Determine the heat loss by referring to **Table 1-A - Heat Loss for Pipes**. For ΔT = 75°F, a 4" diameter pipe with 1" thick insulation will have a Heat Loss Factor of 7.6 W/ft.

2. Determine the adjusted heat loss for calcium silicate insulation (heat loss chart is based on fiberglass) by referring to **Table 2 - Insulation Factor** (page 6-6). Adjustment = 7.6 W × 1.47 = 11.17 W/ft. Adjusted Heat Loss

3. Select correct heating cable (by voltage and wattage) required to replace a heat loss of 11.17 W/ft. Use one straight run of 12 W/ft. or three straight runs of 4 W/ft.

4. Determine the heat loss of the valve gate and supports.

Refer to **Table 4 - Heat Loss Multiplication Factors for Valves** (page 6-7). For a 4" diameter pipe, the heat loss multiplication factor is 2.92.

Valve heat loss factor = 11.17 W/ft. × 2.92 = 32.62 W

5. Determine the cable requirements for the valve.

Divide valve heat loss by W/ft. of selected cable. Length of cable required for valve:

32.62 W/ft. ÷ 12 W = 2.72 ft.

6. Determine total cable requirements.

a. Cable required for pipe:
1 run x 200 ft. = 200 ft.

b. Cable required for valve = 2.72 ft.

c. Total: 200 ft. + 2.72 ft. = 203 ft.
Round this number (203) up to the nearest number evenly divisible by the module (module length = 4 ft.), i.e. 204 ft.

d. Add module length (4 ft.) for cold leads for termination:
204 ft. + 4 ft. = 208 ft.

Total feet of cable required = 208 ft. of 12 W/ft. heating cable.

Heat Loss Tables

Table 1-A Heat Loss for Pipes *(Watts Per Foot)* Insulation Thickness 1"

	NPS Pipe Size																		
ΔT	0.25	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12	14	16	18	20	24	30
25	0.6	0.7	0.8	1.0	1.2	1.5	1.7	2.0	2.4	3.3	4.2	5.2	6.0	6.6	7.5	8.4	9.2	11.0	13.6
50	1.2	1.5	1.7	2.0	2.5	3.0	3.4	4.0	4.9	7.0	8.7	10.6	12.4	13.5	15.3	17.1	18.9	22.5	28.0
75	1.8	2.3	2.6	3.0	3.9	4.6	5.3	6.2	7.6	10.6	13.3	16.3	19.1	20.8	23.6	26.3	29.1	34.7	43.0
100	2.5	3.2	3.6	4.2	5.3	6.3	7.2	8.4	10.4	14.4	18.2	22.2	26.0	28.4	32.2	36.0	39.8	47.3	58.7
125	3.2	4.0	4.6	5.3	6.8	8.0	9.3	10.8	13.3	18.5	23.3	28.5	33.3	36.4	41.2	46.0	50.9	60.6	75.1
150	3.9	5.0	5.7	6.5	8.4	9.8	11.4	13.3	16.3	22.7	28.6	35.0	40.9	44.6	50.6	56.5	62.5	74.4	92.2
175	4.7	5.9	6.8	7.8	10.0	11.7	13.6	15.8	19.4	27.0	34.2	41.7	48.8	53.3	60.4	67.5	74.6	88.7	110.0
200	5.5	6.9	7.9	9.1	11.7	13.7	15.9	18.5	22.7	31.6	39.9	48.7	57.0	62.2	70.5	78.8	87.1	103.7	128.5
225	6.3	8.0	9.1	10.5	13.4	15.8	18.2	21.2	26.1	36.3	45.9	56.0	65.5	71.5	81.0	90.6	100.1	119.1	147.7
250	7.1	9.0	10.3	11.9	15.2	17.9	20.7	24.1	29.6	41.2	52.0	63.5	74.3	81.1	91.9	102.7	113.5	135.2	167.6
275	8.0	10.1	11.6	13.3	17.1	20.1	23.2	27.1	33.2	46.2	58.4	71.3	83.5	91.1	103.2	115.3	127.5	151.7	188.1
300	8.9	11.3	12.9	14.9	19.0	22.4	25.8	30.1	37.0	51.5	65.0	79.4	92.9	101.3	114.8	128.4	141.9	168.9	209.4
325	9.8	12.5	14.2	16.4	21.0	24.7	28.6	33.3	40.8	56.8	71.8	87.7	102.6	111.9	126.9	141.8	156.7	186.5	231.3
350	10.8	13.7	15.6	18.0	23.1	27.1	31.3	36.5	44.8	62.4	78.8	96.2	112.6	122.9	139.3	155.7	172.0	204.8	253.9
375	11.8	15.0	17.1	19.7	25.2	29.6	34.2	39.9	48.9	68.1	86.1	105.1	123.0	134.2	152.0	169.9	187.8	223.5	277.1
400	12.8	16.3	18.5	21.4	27.4	32.2	37.2	43.3	53.2	74.0	93.5	114.2	133.6	145.8	165.2	184.6	204.0	242.9	301.1

Table 1-B Heat Loss for Pipes *(Watts Per Foot)* Insulation Thickness 1.5"

	NPS Pipe Size																		
ΔT	0.25	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12	14	16	18	20	24	30
25	0.5	0.6	0.7	0.8	0.9	1.1	1.3	1.4	1.7	2.4	3.0	3.6	4.2	4.6	5.2	5.8	6.4	7.5	9.3
50	1.0	1.2	1.4	1.6	1.9	2.2	2.6	3.0	3.6	4.9	6.1	7.4	8.6	9.4	10.6	11.8	13.0	15.5	19.1
75	1.5	1.9	2.1	2.4	3.0	3.5	3.9	4.5	5.5	7.5	9.4	11.4	13.3	14.1	16.3	18.2	20.0	23.8	29.4
100	2.1	2.5	2.9	3.3	4.1	4.7	5.4	6.2	7.5	10.3	12.8	15.5	18.1	19.7	22.2	24.8	27.3	32.4	40.1
125	2.6	3.3	3.7	4.2	5.2	6.0	6.9	7.9	9.6	13.1	16.4	19.9	23.2	25.2	28.5	31.7	35.0	41.5	51.3
150	3.2	4.0	4.5	5.1	6.4	7.4	8.5	9.7	11.8	16.1	20.1	24.4	28.4	30.9	34.9	38.9	42.9	50.9	62.9
175	3.9	4.8	5.4	6.1	7.6	8.8	10.1	11.6	14.1	19.2	24.0	29.1	33.9	36.9	41.6	46.4	51.2	60.7	75.0
200	4.5	5.6	6.3	7.1	8.9	10.3	11.8	13.6	16.4	22.4	28.0	34.0	39.6	43.0	48.6	54.2	59.7	70.9	87.6
225	5.2	6.4	7.2	8.2	10.2	11.8	13.5	15.6	18.9	25.8	32.2	39.0	45.4	49.4	55.8	62.2	68.6	81.4	100.6
250	5.9	7.2	8.1	9.3	11.6	13.4	15.3	17.7	21.4	29.2	36.5	44.3	51.5	56.1	63.3	70.6	77.8	92.3	114.1
275	6.6	8.1	9.1	10.4	13.0	15.1	17.2	19.8	24.0	32.8	41.0	49.7	57.8	62.9	71.1	79.2	87.3	103.6	128.0
300	7.3	9.0	10.2	11.6	14.5	16.8	19.2	22.1	26.7	36.5	45.6	55.3	64.3	70.0	79.1	88.1	97.2	115.3	142.4
325	8.1	10.0	11.2	12.8	16.0	18.5	21.2	24.4	29.5	40.3	50.4	61.0	71.0	77.3	87.3	97.3	107.3	127.3	157.2
350	8.9	11.0	12.3	14.0	17.5	20.3	23.2	26.7	32.4	44.2	55.3	67.0	78.0	84.8	95.8	106.8	117.7	139.7	172.6
375	9.7	12.0	13.5	15.3	19.1	22.2	25.3	29.2	35.3	48.3	60.3	73.1	85.1	92.6	104.6	116.5	128.5	152.4	188.3
400	10.5	13.0	14.6	16.6	20.8	24.1	27.5	31.7	38.4	52.4	65.5	79.4	92.4	100.5	113.6	126.6	139.6	165.6	204.5

Table 1-C Heat Loss for Pipes *(Watts Per Foot)* Insulation Thickness 2"

	NPS Pipe Size																		
ΔT	0.25	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12	14	16	18	20	24	30
25	0.4	0.5	0.6	0.6	0.8	0.9	1.0	1.2	1.4	1.9	2.4	2.8	3.3	3.6	4.0	4.5	4.9	5.8	7.1
50	0.9	1.1	1.2	1.3	1.6	1.9	2.1	2.4	2.9	3.9	4.8	5.8	6.7	7.3	8.2	9.1	10.1	11.9	14.6
75	1.3	1.6	1.8	2.0	2.5	2.9	3.3	3.7	4.4	6.0	7.4	8.9	10.3	11.2	12.6	14.0	15.5	18.3	22.5
100	1.8	2.2	2.5	2.8	3.4	3.9	4.4	5.1	6.1	8.2	10.1	12.2	14.1	15.3	17.2	19.2	21.1	24.9	30.7
125	2.3	2.8	3.2	3.6	4.4	5.0	5.7	6.5	7.8	10.4	12.9	15.6	18.0	19.6	22.1	24.5	27.0	31.9	39.3
150	2.9	3.5	3.9	4.4	5.4	6.2	7.0	8.0	9.5	12.8	15.9	19.1	22.1	24.0	27.1	30.1	33.1	39.2	48.2
175	3.4	4.1	4.6	5.2	6.4	7.3	8.3	9.5	11.4	15.3	18.9	22.8	26.4	28.7	32.3	35.9	39.5	46.7	57.5
200	4.0	4.8	5.4	6.1	7.5	8.6	9.7	11.1	13.3	17.9	22.1	26.6	30.8	33.5	37.7	41.9	46.1	54.5	67.1
225	4.6	5.6	6.2	7.0	8.6	9.9	11.2	12.7	15.2	20.5	25.4	30.6	35.4	38.5	43.3	48.1	53.0	62.6	77.1
250	5.2	6.3	7.0	7.9	9.7	11.2	12.6	14.4	17.3	23.3	28.8	34.7	40.2	43.6	49.1	54.6	60.1	71.1	87.5
275	5.8	7.1	7.9	8.9	10.9	12.5	14.2	16.2	19.4	26.1	32.3	38.9	45.1	49.0	55.1	61.3	67.4	79.7	98.2
300	6.5	7.9	8.8	9.9	12.2	14.0	15.8	18.0	21.6	29.1	36.0	43.3	50.2	54.5	61.3	68.2	75.0	88.7	109.2
325	7.2	8.7	9.7	10.9	13.4	15.4	17.5	19.9	23.9	32.1	39.8	47.8	55.4	60.2	67.7	75.3	82.9	98.0	120.7
350	7.9	9.6	10.7	12.0	14.7	16.9	19.2	21.9	26.2	35.2	43.6	52.5	60.8	66.0	74.4	82.7	91.0	107.6	132.4
375	8.6	10.4	11.6	13.1	16.1	18.5	20.9	23.9	28.6	38.5	47.6	57.3	66.4	72.1	81.2	90.2	99.3	117.4	144.5
400	9.3	11.3	12.6	14.2	17.5	20.1	22.7	25.9	31.0	41.8	51.7	62.2	72.1	78.3	88.2	98.0	107.8	127.5	157.0

CONTINUED

Heat Loss Tables

Continued from previous page…

Table 1-D Heat Loss for Pipes *(Watts Per Foot)* Insulation Thickness 2.5"

ΔT	NPS Pipe Size 0.25	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12	14	16	18	20	24	30
25	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.6	2.0	2.4	2.7	2.9	3.3	3.7	4.0	4.7	5.8
50	0.8	1.0	1.1	1.2	1.4	1.6	1.8	2.1	2.5	3.3	4.0	4.8	5.6	6.0	6.8	7.5	8.2	9.7	11.9
75	1.2	1.5	1.6	1.8	2.2	2.5	2.8	3.2	3.8	5.0	6.2	7.4	8.5	9.2	10.4	11.5	12.6	14.9	18.3
100	1.7	2.0	2.2	2.5	3.0	3.4	3.8	4.4	5.2	6.9	8.4	10.1	11.6	12.6	14.2	15.7	17.3	20.3	25.0
125	2.1	2.6	2.8	3.2	3.8	4.4	4.9	5.6	6.6	8.8	10.8	12.9	14.9	16.1	18.1	20.1	22.1	26.0	31.9
150	2.6	3.1	3.5	3.9	4.7	5.4	6.0	6.8	8.1	10.8	13.2	15.8	18.3	19.8	22.2	24.6	27.1	31.9	39.2
175	3.1	3.7	4.1	4.6	5.6	6.4	7.2	8.1	9.7	12.8	15.8	18.9	21.8	23.6	26.5	29.4	32.3	38.0	46.7
200	3.6	4.4	4.8	5.4	6.6	7.5	8.4	9.5	11.3	15.0	18.4	22.0	25.4	27.5	30.9	34.3	37.7	44.4	54.5
225	4.2	5.0	5.6	6.2	7.5	8.6	9.6	10.9	13.0	17.2	21.1	25.3	29.2	31.6	35.5	39.4	43.2	51.0	62.6
250	4.7	5.7	6.3	7.0	8.5	9.7	10.9	12.4	14.7	19.5	24.0	28.7	33.1	35.8	40.2	44.6	49.0	57.8	70.9
275	5.3	6.4	7.1	7.9	9.6	10.9	12.3	13.9	16.5	21.9	26.9	32.2	37.1	40.2	45.2	50.1	55.0	64.9	79.6
300	5.9	7.1	7.9	8.8	10.7	12.1	13.6	15.5	18.3	24.4	29.9	35.8	41.3	44.7	50.2	55.7	61.2	72.1	88.5
325	6.5	7.8	8.7	9.7	11.8	13.4	15.1	17.1	20.2	26.9	33.0	39.5	45.6	49.4	55.5	61.5	67.6	79.6	97.7
350	7.2	8.6	9.5	10.6	12.9	14.7	16.5	18.7	22.2	29.5	36.3	43.4	50.0	54.2	60.9	67.5	74.1	87.4	107.2
375	7.8	9.4	10.4	11.6	14.1	16.0	18.0	20.4	24.2	32.2	39.6	47.3	54.6	59.1	66.4	73.6	80.9	95.4	117.0
400	8.5	10.2	11.3	12.6	15.3	17.4	19.6	22.2	26.3	35.0	43.0	51.4	59.3	64.2	72.1	80.0	87.8	103.5	127.1

Table 1-E Heat Loss for Pipes *(Watts Per Foot)* Insulation Thickness 3"

ΔT	NPS Pipe Size 0.25	0.5	0.75	1	1.5	2	2.5	3	4	6	8	10	12	14	16	18	20	24	30
25	0.4	0.4	0.5	0.5	0.6	0.7	0.8	0.9	1.1	1.4	1.7	2.0	2.3	2.5	2.8	3.1	3.4	4.0	4.9
50	0.7	0.9	1.0	1.1	1.3	1.5	1.6	1.9	2.2	2.9	3.5	4.2	4.8	5.2	5.8	6.4	7.0	8.3	10.1
75	1.1	1.4	1.5	1.7	2.0	2.3	2.5	2.8	3.3	4.4	5.4	6.4	7.3	7.9	8.9	9.8	10.8	12.7	15.5
100	1.6	1.9	2.0	2.3	2.7	3.1	3.4	3.9	4.6	6.0	7.3	8.7	10.0	10.8	12.1	13.4	14.7	17.3	21.2
125	2.0	2.4	2.6	2.9	3.5	3.9	4.4	5.0	5.8	7.7	9.4	11.1	12.8	13.8	15.5	17.2	18.8	22.1	27.1
150	2.4	2.9	3.2	3.6	4.3	4.8	5.4	6.1	7.2	9.4	11.5	13.7	15.7	17.0	19.0	21.1	23.1	27.1	33.2
175	2.9	3.5	3.8	4.2	5.1	5.8	6.4	7.3	8.5	11.2	13.7	16.3	18.7	20.2	22.7	25.1	27.5	32.3	39.6
200	3.4	4.0	4.5	4.9	5.9	6.7	7.5	8.5	10.0	13.1	16.0	19.0	21.9	23.6	26.5	29.3	32.1	37.8	46.2
225	3.9	4.6	5.1	5.7	6.8	7.7	8.6	9.7	11.5	15.0	18.4	21.8	25.1	27.1	30.4	33.6	36.9	43.4	53.1
250	4.4	5.3	5.8	6.4	7.7	8.8	9.8	11.0	13.0	17.1	20.8	24.8	28.5	30.8	34.5	38.1	41.8	49.2	60.2
275	5.0	5.9	6.5	7.2	8.7	9.8	11.0	12.4	14.6	19.1	23.4	27.8	31.9	34.5	38.7	42.8	46.9	55.2	67.5
300	5.5	6.6	7.2	8.0	9.7	10.9	12.2	13.8	16.2	21.3	26.0	30.9	35.5	38.4	43.0	47.6	52.2	61.4	75.1
325	6.1	7.3	8.0	8.9	10.7	12.1	13.5	15.2	17.9	23.5	28.7	34.1	39.2	42.4	47.5	52.6	57.6	67.7	82.9
350	6.7	8.0	8.8	9.7	11.7	13.2	14.8	16.7	19.6	25.8	31.5	37.5	43.1	46.5	52.1	57.7	63.2	74.3	91.0
375	7.3	8.7	9.6	10.6	12.8	14.5	16.2	18.2	21.4	28.2	34.4	40.9	47.0	50.8	56.9	62.9	69.0	81.1	99.3
400	7.9	9.4	10.4	11.6	13.9	15.7	17.5	19.8	23.3	30.6	37.3	44.4	51.0	55.2	61.8	68.4	74.9	88.1	107.8

Table 2 Insulation Factor

Insulation Material	Temperature (°F) to be Maintained 50	100	150	200	250	300	400	500	600
Fiberglass	1	1	1	1	1	1	1	1	1
Cellular Glass	1.53	1.50	1.48	1.44	1.42	1.40	1.36	1.34	1.32
Calcium Silicate	1.47	1.47	1.45	1.44	1.41	1.39	1.34	1.32	1.30
Polyurethane	0.60	0.60	0.58	0.57	*	*	*	*	*

* Temperature (°F) exceeds the recommended values for foam.

Note: All insulation factors were determined based on leading insulation manufacturers' specifications.

Heat Loss Tables

Table 3 Spiral Pitch *(Feet of Heat Trace Cable Per Foot of Pipe)*

Pitch	NPS Pipe Size																	
	0.50	0.75	1.00	1.50	2.00	2.5	3	4	6	8	10	12	14	16	18	20	24	30
2"	1.98	2.27	2.66	3.52	4.25	5.01	5.97	7.52	10.85	13.98	17.30	20.43	22.39	25.53	28.67	31.81	38.09	47.50
3"	1.52	1.69	1.92	2.46	2.93	3.43	4.05	5.07	7.27	9.35	11.56	13.64	14.95	17.04	19.13	21.22	25.40	31.68
4"	1.32	1.43	1.59	1.96	2.29	2.65	3.11	3.86	5.49	7.04	8.69	10.25	11.23	12.80	14.36	15.93	19.06	23.77
5"	1.21	1.29	1.40	1.68	1.93	2.21	2.56	3.15	4.43	5.67	6.98	8.23	9.00	10.25	11.50	12.76	15.26	19.02
6"	1.15	1.21	1.29	1.51	1.70	1.92	2.20	2.68	3.74	4.75	5.84	6.88	7.52	8.56	9.60	10.64	12.73	15.86
7"	1.11	1.16	1.22	1.39	1.55	1.72	1.96	2.35	3.24	4.11	5.03	5.92	6.47	7.36	8.25	9.14	10.92	13.61
8"	1.09	1.12	1.17	1.31	1.44	1.58	1.78	2.12	2.88	3.63	4.43	5.20	5.68	6.46	7.23	8.01	9.57	11.92
9"	1.07	1.10	1.14	1.25	1.36	1.48	1.65	1.94	2.60	3.26	3.97	4.64	5.07	5.76	6.45	7.14	8.52	10.60
10"	1.06	1.08	1.11	1.21	1.30	1.40	1.54	1.80	2.38	2.96	3.60	4.20	4.58	5.20	5.82	6.44	7.68	9.55
11"	1.05	1.07	1.10	1.17	1.25	1.34	1.46	1.68	2.20	2.72	3.30	3.84	4.19	4.75	5.30	5.87	6.99	8.69
12"	SR	1.06	1.08	1.15	1.21	1.29	1.40	1.60	2.06	2.53	3.05	3.55	3.86	4.37	4.88	5.39	6.42	7.98
14"	SR	SR	1.06	1.11	1.16	1.22	1.31	1.46	1.84	2.23	2.66	3.08	3.35	3.78	4.21	4.65	5.53	6.86
16"	SR	SR	1.05	1.09	1.13	1.17	1.24	1.37	1.68	2.01	2.38	2.74	2.97	3.34	3.72	4.10	4.86	6.02
18"	SR	SR	SR	1.07	1.10	1.14	1.19	1.30	1.56	1.84	2.16	2.48	2.68	3.01	3.34	3.67	4.35	5.37
24"	SR	SR	SR	SR	1.06	1.08	1.11	1.18	1.35	1.53	1.75	1.97	2.12	2.35	2.59	2.83	3.33	4.08
30"	SR	SR	SR	SR	SR	1.05	1.07	1.12	1.23	1.37	1.52	1.69	1.80	1.97	2.16	2.34	2.73	3.32
36"	SR	SR	SR	SR	SR	SR	1.05	1.08	1.17	1.26	1.39	1.51	1.60	1.73	1.88	2.03	2.34	2.82
42"	SR	SR	SR	SR	SR	SR	SR	1.06	1.12	1.20	1.29	1.39	1.46	1.57	1.69	1.81	2.07	2.47
48"	SR	SR	SR	SR	SR	SR	SR	1.05	1.10	1.16	1.23	1.31	1.37	1.46	1.56	1.66	1.88	2.22
60"	SR	SR	SR	SR	SR	SR	SR	SR	1.05	1.10	1.15	1.21	1.25	1.31	1.38	1.46	1.62	1.87
72"	SR	SR	SR	SR	SR	SR	SR	SR	SR	1.07	1.11	1.15	1.18	1.23	1.28	1.33	1.46	1.66

SR = Straight Run

Table 4 Heat Loss Multiplication Factors for Valves

NPS Pipe Size	Multi. Factor	NPS Pipe Size	Multi. Factor	NPS Pipe Size	Multi. Factor	NPS Pipe Size	Multi. Factor
0.5	0.52	2	1.92	6	3.84	16	7.91
0.75	0.78	2.5	2.00	8	4.66	18	8.84
1	1.00	3	2.40	10	5.51	20	9.57
1.25	1.33	3.5	2.62	12	6.25	24	11.09
1.5	1.70	4	2.92	14	7.07		

Constant Wattage Heating Cable

Made in USA

Constant Wattage Heat Trace Cable

Tempco's Constant Wattage Heating Cables are all parallel resistance, low watt density electrical heaters designed to be cut to the desired lengths in the field, eliminating the need for prefabrications and reducing or eliminating many design and installation costs. No special training is required.

All Tempco Heating Cables are parallel circuit designed. The multi-stranded bus wires are covered in a high dielectric insulation. Spirally wrapped resistance wire maintains circuit continuity by connecting short, alternately spaced sections of exposed conductor bus wire. Cables feature moisture and chemical resistance and are classed for hazardous locations when properly cut and spliced using the correct lead termination kit.

Metal Overbraid is provided on all heat tracing as standard to meet NEC code for grounding. The braid provides mechanical protection as well as a low resistance grounding path.

Tempco constant wattage heating cables are designed for a full range of applications. Whether your need is freeze protection or process temperature control of pipelines, water lines, oil lines or asphalt lines, Tempco has the cable for your special needs.

KE Style Heating Cables **Maximum Temperature:** 500°F (260°C)

The KE Style cable heating element is tension wrapped and covered with two layers of Kapton® film applied in reverse directions, then heat fused for moisture protection. A tinned copper overbraid is then added for additional abrasion protection and for a ground return path. The overbraid is further enclosed in a covering of 20 mm extruded Teflon® PFA for additional chemical and abrasion resistance.

Design Features

- *Temperature exposure rating 500°F (260°C)*
- *Continuous electrical ground*
- *Excellent moisture and chemical resistance*
- *Hazardous location rating*
- *FM approved*

Agency Approvals

- **IEEE Std 515**
- **Factory Mutual**
  Ordinary Locations
  Hazardous Locations:
  Class I, Division 2, Groups B, C & D
  Class II, Division 2
  Class III, Division 2

Typical Applications

- *Oil Refineries*
- *Asphalt Plants*
- *Severe Arctic Cold*
- *Mines*
- *Pulp and Paper Mills*
- *Corrosive Environments*
- *Explosive Environments*

Specifications

Voltages Available: 120, 208, 240, 480

Wattages: 4, 8, 12 (W/ft.)

Outside Dimensions: Nom. .330" × .225"

Exposure Rating: 500°F (260°C)

De-Energized: 550°F (302°C)

Standard Metal Overbraid: Tinned Copper

Extruded Jacket: Teflon®

Moisture and Chemical Resistance: Excellent

Flame Resistance: Outstanding

Radiation Resistance: Fair to Good

Ordering Information

Tempco's KE Constant Wattage Heat Trace Cable is sold by part number and length. The cable part number is put together as follows:

H T P 0 1

Wattage—watts/ft.
4 W/ft. = 4
8 W/ft. = 8
12 W/ft. = 2

Voltage
120 VAC = 1
240 VAC = 2
208 VAC = 3
480 VAC = 4

Outer Layer
0 = Standard Tinned Copper Braid

Note: Due to code requirements, KE cable has a metal overbraid.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Constant Wattage Heat Trace Cable

FE Style Heating Cable **Maximum Temperature:** 400°F (204°C)

The FE Style cable heating element is tension wrapped and covered with a fluorocarbon film and enclosed in a minimum 20 mm Teflon® FEP abrasion resistant extruded jacket. This tough outer cover provides moisture and dielectric protection as well as resistance to abrasion. A layer of tinned copper braid is then applied to meet NEC code and to provide mechanical protection as well as a low resistance to ground.

Design Features

- *Temperature Exposure Rating 400°F (204°C)*
- *Ease of installation—cut to length at the job site*
- *Moisture and chemical resistant*
- *Stands up to repeated handling and flexing*
- *Field proven industrial grade construction*
- *Single end power connection*

Agency Approvals

- **Factory Mutual**
  Ordinary Locations
  Hazardous Locations:
  Class I, Division 2, Groups B, C & D
  Class II, Division 2, Groups E, F & G
  Class III, Division 2
- **CSA (120 and 240 VAC only)**
  Ordinary Locations
  Hazardous Locations:
  Class I, Division 2, Groups B, C & D
  Class II, Division 2, Groups F & G
  Class III, Division 2

Typical Applications

- *Mid-Temperature Control*
- *Food Processing Plants*
- *Freeze Protection*
- *Chemical Processing Plants*
- *Hazardous Locations*
- *Water Lines/Condensate Return Lines*

Specifications

Voltages Available: 120, 208, 240, 480V

Wattages: 3, 5, 8, 12 (W/ft.)

Outside Dimensions: Nom. .300" × .200"

Exposure Rating: 400°F (204°C)

De-Energized: 450°F (232°C)

Standard Metal Overbraid: Tinned Copper (Optional Stainless Steel)

Moisture and Chemical Resistance: Excellent

Flame Resistance: Outstanding

Radiation Resistance: Fair to Good

Ordering Information

Tempco's FE Constant Wattage Heat Trace Cable is sold by part number and length. The cable part number is put together as follows:

H T P 0 2

Wattage—watts/ft.
3 W/ft. = 3
5 W/ft. = 5
8 W/ft. = 8
12 W/ft. = 2

Voltage
120 VAC = 1
240 VAC = 2
208 VAC = 3
480 VAC = 4

Outer Layer
0 = Standard Tinned Copper Braid
3 = Stainless Steel Braid

Note: Due to code requirements, FE cable has a metal overbraid.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Lead Termination and Cable Kits for Constant Wattage Cables

In order to maintain the integrity of the insulation, termination kits must be used to add leads or splice the heating cables. **Both ends must be terminated to use the heat trace cable properly.** The termination kits are designed to fully seal using a general purpose silicone RTV sealant, such as GE RTV108, on the final connections.

Termination Kit Type	"KE" Cable	"FE" Cable
Universal Connection/ Termination Kit	HTP90001	HTP90006
Lead and End Kit	HTP90002	HTP90007
Single Lead Term.	HTP90003	HTP90008
Single End Term.	HTP90004	HTP90009
Cable Splice Kit	HTP90005	HTP90010

The **Universal Kit** is mainly used to terminate the heat trace cable for pipe trace heating when the heating cable needs to terminate in an NPT pipe standoff for attaching a wiring junction box. The kit includes the 1" NPT pipe standoff and materials to make one power input connection, and two end terminations or one power input splice. The junction box is ordered separately; see page 6-13. These assemblies are watertight and suitable for use in Division II hazardous locations.

The **Lead and End Kit**, **Single Lead Termination Kit** and **Single End Termination Kits** are used when only simple cold power leads are required. The lead wire is customer supplied. The non-lead end must also be terminated and sealed.

The **Lead and End Kit** contains enough material for 5 lead and 5 end terminations.

The **Single Termination Lead Kit** and the **Single End Termination Kit** contain enough material for 1 lead or 1 end termination.

The **Splice Kit** is used to create one in-line splice or one "T" splice between two heat cables. May require pipe standoff, straps, junction box, and RTV (ordered separately, see page 6-13).

Self-Limiting Heat Trace Cable

Tempco's Self-Limiting Heating Cables are all parallel resistance, low watt density electrical heaters designed to be cut to the desired lengths in the field, eliminating the need for prefabrications and reducing or eliminating many design and installation costs. No special training is required.

Self-limiting heating cables are designed and built to regulate their output. As the process temperature drops, the cable's output increases; conversely, as the temperature rises, the cable's output decreases.

The self-limiting core is in essence an infinite number of parallel resistors that permit the cable to be cut to any length without creating cold sections. Because it is self-regulating and infinitely parallel, the output varies along the length of the cable, depending upon local process temperature.

Metal overbraid is provided on all heat trace cabling to meet NEC code for grounding. The braid provides mechanical protection, as well as a low resistance grounding path.

On SL self-limiting cable, in addition to the standard metal overbraid, an optional thermoplastic elastomer or fluoropolymer outer jacket is recommended when exposure to organic chemicals or corrosives is expected.

Self-limiting heating cable provides safe, reliable heat tracing for process temperature maintenance and freeze protection of pipes, valves and similar applications.

Design Features

- ***Efficient, Safe, Easy to Install***
- ***Maintenance Temperatures up to 150°F (65°C)***
- ***Can Be Overlapped***
- ***Cut to Length at the Job Site***

Typical Applications

- ***Pipelines***
- ***Drains***
- ***Water Lines***
- ***Safety Showers***
- ***Sprinkler Systems***

Specifications

Voltages Available: 120, 240

Wattages: 3, 5, 8, 10 (W/ft.) @ 50°F ambient

Outside Dimensions: Nom. .450" × .130"

Exposure Rating: 150°F (65°C)

De-Energized: 185°F (85°C)

Standard Metal Overbraid: Tinned Copper or optional Stainless Steel

Moisture Resistance: Excellent

Chemical Resistance: Good

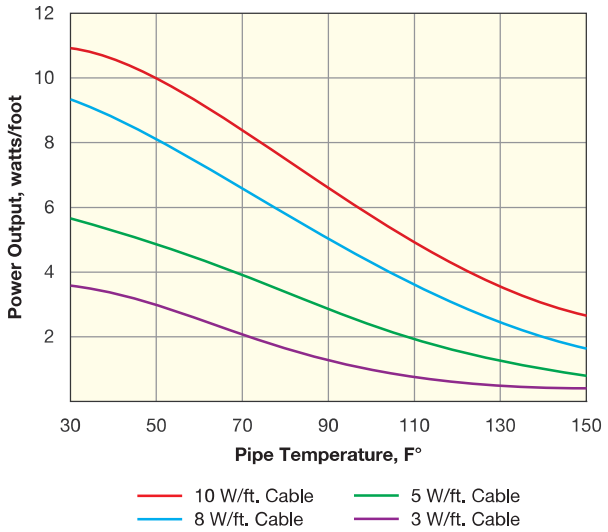
Flame Resistance: Good

Radiation Resistance: Fair

Agency Approvals

- **CSA**
- **IEEE Std 515 RU**
- **Factory Mutual**
  Ordinary Locations
  Hazardous Locations:
  Class I, Division 2, Groups B, C & D
  Class II, Division 2, Groups F & D
  Class III, Division 1 and Division 2

Actual Wattage Output vs. Temperature



SL Style Heating Cable

The SL Style cable heating element is a low watt density parallel circuit electrical heater. The multi-stranded bus wires are extruded in an irradiated self-regulating conductive polyolefin that increases and decreases its heat output with changes in the ambient temperature. A flame retardant thermoplastic elastomer jacket is added for abrasion and impact resistance.

A metal braided shield is then applied to meet NEC code for grounding. Metal overbraid heaters are FM approved for use in hazardous areas.

An optional fluoropolymer outer jacket is also available. This outer jacket should be specified when the metal braided cable is installed in corrosive environments.

CONTINUED

Made in USA

Self-Limiting Heat Trace Cable

Continued from previous page…

Ordering Information

Tempco's Self-Limiting Heat Trace Cable is sold by part number and length. The cable part number is put together as follows:

H T P

Cable Style
SL Style = 03

Wattage—watts/ft.
3 W/ft. = 3
5 W/ft. = 5
8 W/ft. = 8
10 W/ft. = 1

Voltage
120 VAC = 1
240 VAC = 2

Outer Layer
0 = Standard tinned copper braid
1 = Tinned copper braid and thermoplastic jacket
2 = Tinned copper braid and fluoropolymer jacket
3 = Stainless Steel overbraid

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Lead Termination and Cable Kits for Self-Limiting Cable

In order to maintain the integrity of the insulation, termination kits must be used to add leads or splice the heating cables. **Both ends must be terminated to use the heat trace cable properly.** The termination kits are designed to fully seal using a general purpose silicone RTV sealant, such as GE RTV108, on the final connections.

Termination Kit Type	"SL" Cable
Universal Connection/ Termination Kit	HTP90021
Splice or Lead End Kit	HTP90022
End Seal Kit	HTP90023

The **Universal Kit** is mainly used to terminate the heat trace cable for pipe trace heating when the heating cable needs to terminate in an NPT pipe standoff for attaching a wiring junction box. The SL kit includes the 1" NPT pipe standoff and materials to make one power input connection, and two end terminations or one power input splice. The junction box is ordered separately; see page 6-13. These assemblies are watertight and suitable for use in Division II hazardous locations.

The **Splice or Lead End Kit** is used for tee splices or cold lead end terminations. Enough material is supplied for 10 tee splices or 10 cold lead end terminations.

The **End Seal Kit** is used to cap off and seal the end of the cable where the bus wires are exposed. Enough material is supplied for 10 end seal terminations.

Temperature Controls and Accessories for Heat Trace Cables

Choosing the proper control depends first on the system requirements and second on the desired features and cost. Since Tempco's heat trace products are used primarily for freeze protection and to offset system heat loss, PID controls are generally not required.

The most economical is the pipe-mounted direct acting preset thermostat. Tempco offers a normally open/normally closed three wire model.

Where greater accuracy, faster response and larger ranges with adjustment capability are required, a bulb and capillary style thermostat fills the need. Tempco offers two types with NEMA 3R for general purpose and NEMA 4X where a fully sealed housing is required.

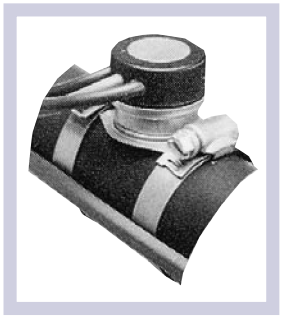
If the heat trace is used for process control and very accurate control is needed along with additional features, a thermocouple-based electronic PID controller is required.

See Section 13 – "Temperature Controllers" for more information.

Heating Cable Accessories

Part Number	Accessory	Usage
HTP90028	Junction Box	For use with NPT pipe standoff Single hub - 1" NPT
HTP90029	Reducer	Adapts .75" NPT male to 1" NPT female
HTP90030	Aluminum Adhesive Tape 2" x 180 ft. 350°F/176°C	Helps to isolate the cable from insulation and aids in securing the cable to pipes and tanks.
HTP90031	Aluminum Adhesive Tape 2" x 180 ft. 550°F/288°C	Same as above

Action		
Closes	Opens	Part No.
35°F (2°C)	50°F (10°C)	HTP90104
45°F (7°C)	60°F (16°C)	HTP90105
60°F (16°C)	75°F (24°C)	HTP90106
90°F (32°C)	105°F (41°C)	HTP90107
185°F (85°C)	200°F (93°C)	HTP90108



This control is a preset, epoxy-sealed thermostat containing a hermetically sealed single pole, double throw switch with normally open and normally closed connections

Specifications

Voltage: Up to 277 VAC

Current: FM approved to 240 VAC at 25 amps

Leads: 36" long, 600 VAC 14 ga., 105°C PVC insulation

This control is an adjustable Stainless Steel bulb and capillary thermostat. It is enclosed in a NEMA 4X enclosure with a clear cover.

Specifications

Voltage: 120 or 240 VAC

Contacts: 120V SPST, 240V DPST

Current: 50 amps at either voltage

Leads: Hard wired directly to terminals

Dimensions: 6"H × 6"L × 5.87"W

Range		Part No.	
°F	°C	120V	240V
0 - 150	–18 - 66	HTP90113	HTP90116
50 - 300	10 - 149	HTP90114	HTP90117
150 - 650	66 - 343	HTP90115	HTP90118

Range		
°F	°C	Part No.
0 - 150	–18 - 66	HTP90109
100 - 250	38 - 121	HTP90110
200 - 350	93 - 177	HTP90111

This control is an adjustable bulb and capillary thermostat with single pole double throw contacts with NO and NC connections. It is enclosed in a NEMA 3R general purpose enclosure.

Specifications

Voltage: Up to 277 VAC

Current: 277 VAC at 22 amps

Leads: Hard wired directly to terminals

Dimensions: 3.30"H × 4.08"L × 4.08"W

Made in USA

Closed Cell Elastomeric Thermal Insulation

Design Features

- *Cost Effective*
- *Easy to install*
- *Suitable for wide variety of environments, such as outdoor use and food service*
- *Temperatures to 257°F (125°C)*
- *UV resistant*
- *Fiber Free*

Specifications

Material: 3/4" (19mm) thick closed-cell and lightweight EPDM based elastomeric material

Exposure Temperature Range: -297°F through 257°F

R-value: 3

Density: 3 to 6 Lbs/ft^3

Water vapor permeability: 0.10 perm-in (0.15 x 10^{-12})

Water absorption (weight %): Less than 5%

Flammability: UL-94 5 V-A. V-O

Sheet Width in (mm)	Sheet Length ft (m)	Description .	Part Number
11 (279)	50 (15.2)	Installs around 2.5" O.D. Pipes and smaller	HTP90050
15 (381)	50 (15.2)	Installs around 4" O.D. Pipes and smaller	HTP90051
48 (1219)	25 (7.6)	Installs around vessels and large diameter pipes	HTP90052

FOIL TAPE

Adhesive aluminum tape for extra environmental protection.
Up to 300°F (149°C).

Description	Part Number
3" (76mm) x 180 ft. (55m) roll. To protect insulation from environmental damage.	HTP90055

SEAM-SEALING TAPE

Adhesive tape required for sealing seams.
Up to 180°F (82°C).

Description in (mm)	Part Number
2" (51mm) x 82 ft. (25m) roll. Ideal for pipes and small vessels.	HTP90053
3" (76mm) x 82 ft. (25m) roll. Ideal for large vessels.	HTP90054

Since 1972

INSUL-LOCK® DS Flexible Closed Cell Pipe Insulation

Design Features

- *Easy to install with precise fit*
- *Double Seal Technology*
  - *Built-in presure sensitive adhesive*
  - *Built-in PVC overlap tape with acrylic adhesive*
- *Scrim reinforcement on the seam surface*
- *Non-porous, fiber-free, and resistant to mold growth*
- *Resistant to moisture vapor flow*
- *Compatible with heating cable and tapes*

Specifications

Material: Environmentally-friendly, CFC-free, flexible elastomeric thermal insulation

Operating Temperature Range: -70°F (-57°C) through 220°F (104°C)

R-value: 3

Color: Black

Length: 6.0 feet (1.8 meter)

Thickness: 0.5" (1.3 cm)

Density: 3 to 6 Lbs/ft^3

Water vapor permeability:
Dry cup (Elastomeric insulation) 0.03 perm-in
Wet cup (Glued seam with overlap) 0.12 perm-in

Water absorption % (Volume change): 0

Flammability: UL-94 5 V-A. V-O

FM APPROVED · RoHS Compliant · c UL us · c UL us LISTED

Typical Applications

- *Freeze Protection*
- *Prevent condensation on refrigerant lines, cold water plumbing, roof drains, and chilled water systems*
- *Many other outdoor and indoor applications*

Standard Closed Cell Pipe Insulation

Preformed pipe insulations are 1/2 inch thick, 6 foot long with overlap flap with Pressure Sensitive Adhesive (PSA).

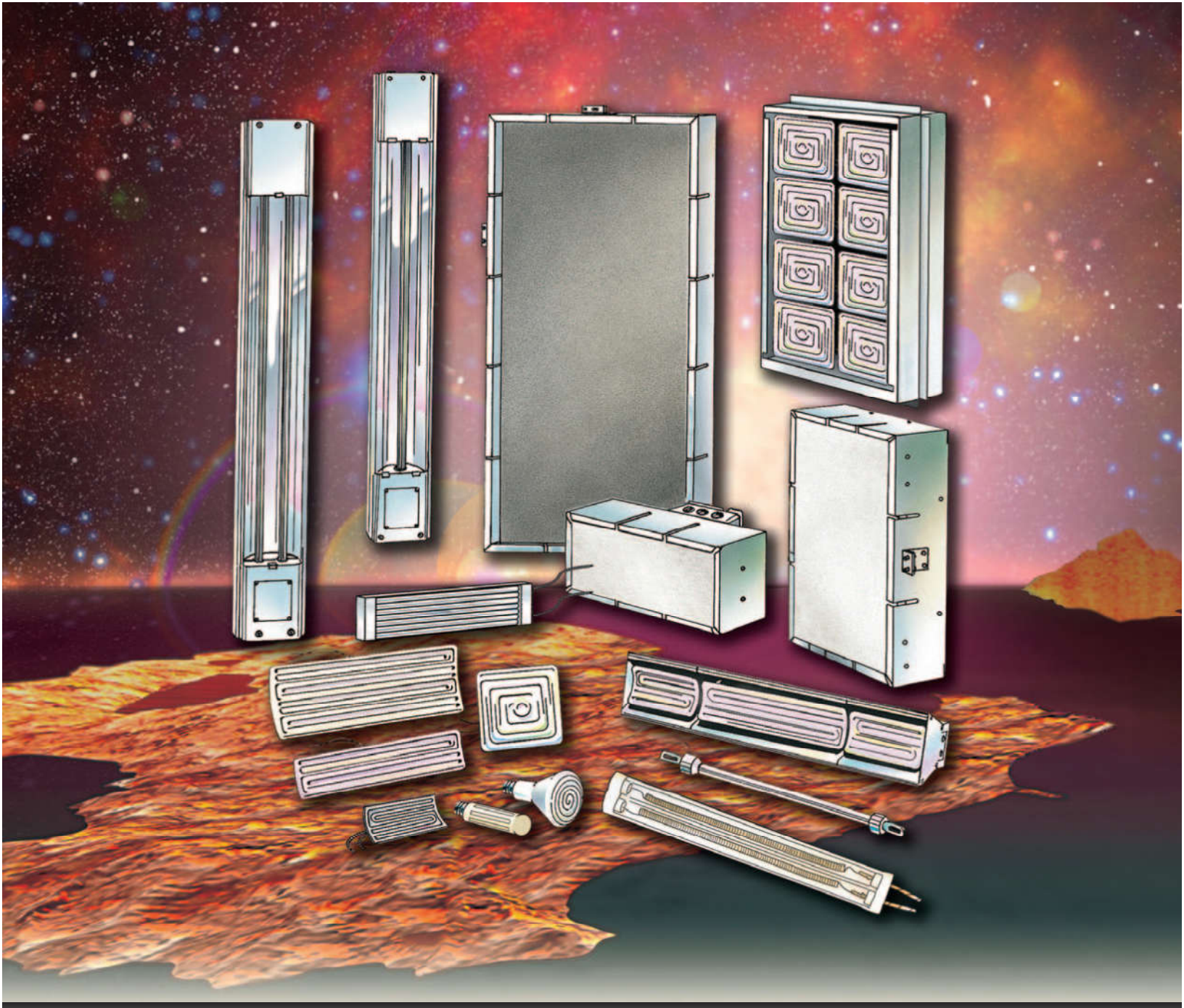
Nominal ID	Nominal OD	Recommended for Pipe OD	Part Number
7/8"	2-1/8"	3/4"	HTP90060
1-1/8"	2-3/8"	1"	HTP90061
1-3/8"	2-5/8"	1-1/4"	HTP90062
1-5/8"	2-7/8"	1-1/2"	HTP90063
2"	3-1/8"	none	HTP90064
2-3/8"	3-1/2"	none	HTP90065
2-5/8"	4"	none	HTP90066
2-7/8"	4-1/8"	none	HTP90067
3-1/8"	4-1/2"	none	HTP90068
3-1/2"	5"	none	HTP90069

SEAM-SEALING TAPE

Seals spaces between multiple pieces of insulation and prevents heat loss.

.75" (51mm) x 180" (4.5 m) roll.

Part Number: HTP90058



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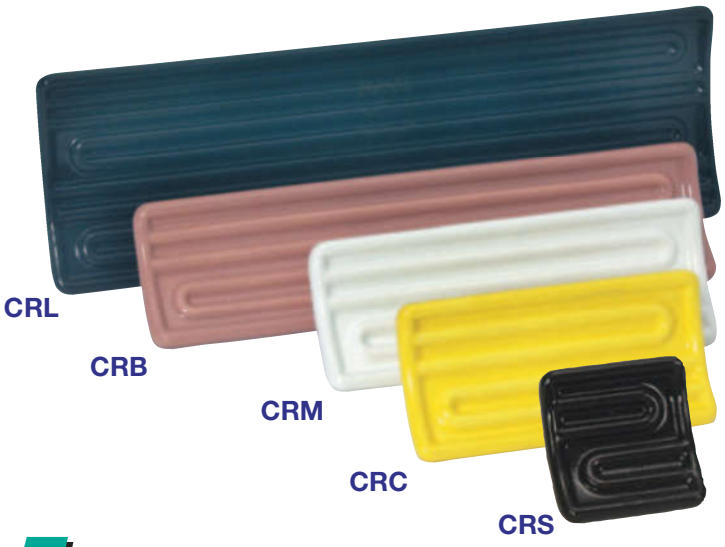
Radiant Heaters

7 section

Made in USA

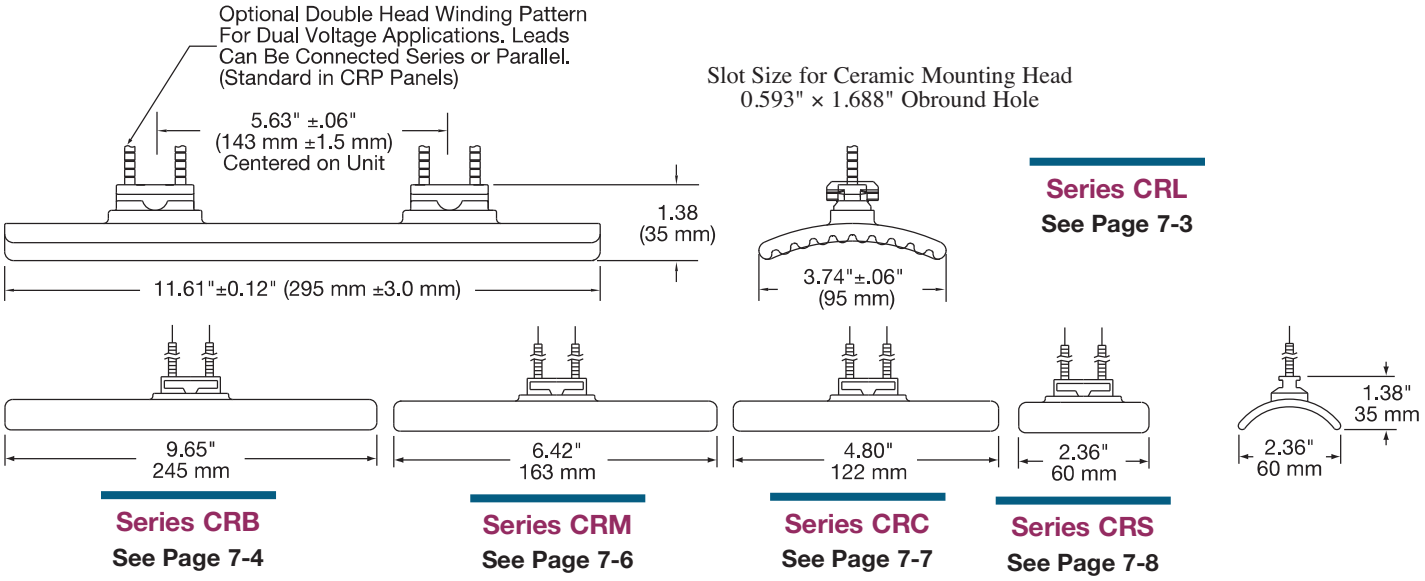
Series CRL, CRB, CRM, CRC and CRS Curved Face Ceramic E-Mitters



Design Features

- *Universal mount designed to be dropped into existing systems regardless of manufacturer.*
- *Standard colors are metamorphing rose (cold) to grey (hot), and traditional white. Optional colors are metamorphing yellow (cold) to orange (hot), and black.*
- *Standard stocked voltage: 120 or 220/240V as noted; other voltages are available.*
- *Available with built-in type K thermocouple. Type J thermocouple is also available. Low noise options are also available.*
- *Long operating life—over 10,000-plus hours of continuous operation under normal conditions*
- *Performance is unaffected by vibration or adverse atmospheric conditions.*
- *2.5 to 6µm infrared radiation wavelength*

5 *Standard Solid Curved Face sizes to accommodate a wide range of new or existing applications*



Series CRL
See Page 7-3

Series CRB
See Page 7-4

Series CRM
See Page 7-6

Series CRC
See Page 7-7

Series CRS
See Page 7-8

Ordering Information

Standard Heaters

Order by Part Number for Standard (Non-Stock) heaters.

Semi-Finished Stock CRB and CRC heaters ship in five business days. A Part Number will be assigned at time of order.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a Ceramic E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

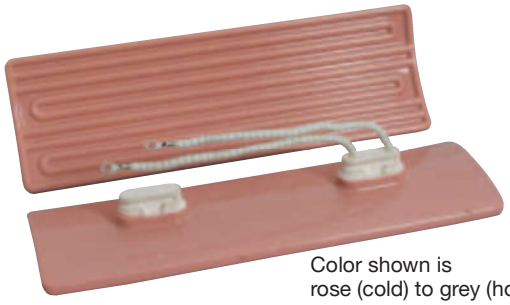
Please Specify the following:

- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 43w/in² (6.7w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K (Type J optional) or Low Noise Type K (Type J optional)
- ❑ **Additional Options:** Start on page 7-20

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

View Product Inventory @ www.tempco.com

Series CRL Curved Face Ceramic E-Mitters – Size: 95 mm × 295 mm (3.74" × 11.61")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRL E-Mitters

E-Mitters listed have 6" ceramic bead insulated leads, #8-10 spade terminals, and one-piece spring clips for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Peak Emitted Wavelength***	Part Number: Without Thermocouple	Part Number: Standard Type K Thermocouple	Part Number: Low Noise Type K Thermocouple
500	120	Yellow to Orange	11.9	1.9	796	424	4.15	CRL20021	—	CRL20022
500	220-240	Rose to Grey	11.9	1.9	796	424	4.15	CRL10009	CRL10010	—
500	220-240	White	11.9	1.9	796	424	4.15	CRL00009	CRL00010	—
500	240/480	Yellow to Orange	11.9	1.9	796	424	4.15	CRL20023	—	CRL20024
750	120/240	Yellow to Orange	17.9	2.8	956	513	3.68	CRL20025	—	CRL20026
750	220-240	Rose to Grey	17.9	2.8	956	513	3.68	CRL10011	CRL10012	—
750	220-240	White	17.9	2.8	956	513	3.68	CRL00011	CRL00012	—
750	240/480	Yellow to Orange	17.9	2.8	956	513	3.68	CRL20027	—	CRL20028
950	220-240	Rose to Grey	22.7	3.5	1053	567	3.45	CRL10001	CRL10002	—
950	220-240	White	22.7	3.5	1053	567	3.45	CRL00001	CRL00002	—
1000	220-240	Rose to Grey	23.9	3.7	1076	580	3.40	CRL10013	CRL10014	—
1000	220-240	White	23.9	3.7	1076	580	3.40	CRL00013	CRL00014	—
1000	240/480	Yellow to Orange	23.9	3.7	1076	580	3.40	CRL20029	—	CRL20030
1150	220-240	Rose to Grey	27.5	4.3	1145	618	3.25	CRL10003	CRL10004	
1150	220-240	White	27.5	4.3	1145	618	3.25	CRL00003	CRL00004	—
1250	240/480	Yellow to Orange	29.9	4.6	1191	644	3.16	CRL20031	—	CRL20032
1400	480	Rose to Grey	33.5	5.2	1262	683	3.03	CRL10015	CRL10016	—
1400	480	White	33.5	5.2	1262	683	3.03	CRL00015	CRL00016	—
1500	240/480	Yellow to Orange	35.9	5.6	1308	709	2.95	CRL20033	—	CRL20034
1600	480	Rose to Grey	38.2	5.9	1351	733	2.88	CRL10017	CRL10018	—
1600	480	White	38.2	5.9	1351	733	2.88	CRL00017	CRL00018	—
1800	480	Rose to Grey	43.0	6.7	1418	770	2.78	CRL10019	CRL10020	—
1800	480	White	43.0	6.7	1418	770	2.78	CRL00019	CRL00020	—

NOTES: All dual voltage heaters have two windings (parallel connected for the lower voltage & series connected for the higher voltage). Single voltage heaters are single winding designs.

Units with an internal "low noise" style thermocouple have 12" leads (see page 7-14). Standard type "K" T/C units also available.

Heaters with yellow to orange color are exact replacements for heaters in CRP Modular 12 × 12 CRP Radiant Panels on page 7-24.

*** Watt density** calculated using heater face surface area.

**** E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

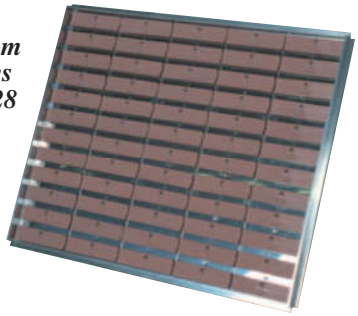
***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm).

Custom Heater Assemblies & Power Control Panels

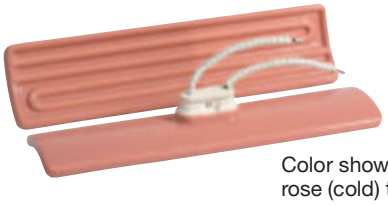
Type CRA Custom Linear Arrays start on page 7-18

Array Power/Temperature Control Panels (see page 7-37)

Type ARA Custom Structural Arrays start on page 7-28



Series CRB Curved Face Ceramic E-Mitters – Size: 60 mm × 245 mm (2.36" × 9.65")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRB E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
150	220/240	Rose to Grey	6.48	1.00	560	293	CRB10216	CRB10217
150	220/240	White	6.48	1.00	560	293	CRB00216	CRB00217
250	220/240	Rose to Grey	10.80	1.67	756	402	CRB10006	CRB10008
250	220/240	White	10.80	1.67	756	402	CRB00006	CRB00008
400	220/240	Rose to Grey	17.27	2.68	942	506	CRB10014	CRB10016
400	220/240	White	17.27	2.68	942	506	CRB00014	CRB00016
650	120	Rose to Grey	28.07	4.35	1156	624	CRB10020	CRB10022
650	120	White	28.07	4.35	1156	624	CRB00020	CRB00022
650	220/240	Rose to Grey	28.07	4.35	1156	624	CRB10023	CRB10025
650	220/240	White	28.07	4.35	1156	624	CRB00023	CRB00025
650	480	Rose to Grey	28.07	4.35	1156	624	CRB10088	CRB10165
650	480	White	28.07	4.35	1156	624	CRB00088	CRB00165
1000	120	Rose to Grey	43.18	6.69	1420	771	CRB10028	CRB10030
1000	120	White	43.18	6.69	1420	771	CRB00028	CRB00030
1000	220/240	Rose to Grey	43.18	6.69	1420	771	CRB10031	CRB10033
1000	220/240	White	43.18	6.69	1420	771	CRB00031	CRB00033
1000	480	Rose to Grey	43.18	6.69	1420	771	CRB10089	CRB10045
1000	480	White	43.18	6.69	1420	771	CRB00089	CRB00045

Semi-Finished Stock CRB E-Mitters (Five Business Day Manufacturing)

Semi-Finished Series CRB E-Mitters listed below are stocked ready for color glazing. Colors available are metamorphing rose (cold) to grey (hot), traditional white, metamorphing yellow (cold) to orange (hot), and black.

They can be terminated with beaded leads up to 6" long with spliced-on lead wire for lengths beyond 6" and straight, ring, or spade terminals. Some are available with a thermocouple (any length).

A part number will be assigned at time of order.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body** Temperature (Typical) °F	Heater Body** Temperature (Typical) °C	Optional Thermocouple (Any Length)
400	230	17.27	2.68	942	506	N/A
650	230	28.07	4.35	1156	624	Type K
650	480	28.07	4.35	1156	624	N/A
1000	230	43.18	6.69	1420	771	Type K
1000	480	43.18	6.69	1420	771	Type J or K

CRB Ordering Information (See page 7-2)

Series CRB Curved Face Ceramic E-Mitter Specifications

Series CRB – Size: 60 mm × 245 mm (2.36" × 9.65")

Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (µm)
100	4.32	357	429	5.87
125	5.40	426	498	5.45
150	6.48	488	560	5.11
163	7.04	518	590	4.97
200	8.64	596	668	4.63
250	10.80	684	756	4.29
300	12.95	756	828	4.05
325	14.03	788	860	3.95
350	15.11	817	889	3.87
400	17.27	870	942	3.72
500	21.59	960	1032	3.50
600	25.91	1043	1115	3.31
650	28.07	1084	1156	3.23
700	30.23	1126	1198	3.15
750	32.39	1169	1241	3.07
800	34.55	1211	1283	2.99
875	37.78	1271	1343	2.89
900	38.86	1290	1362	2.86
1000	43.18	1348	1420	2.78

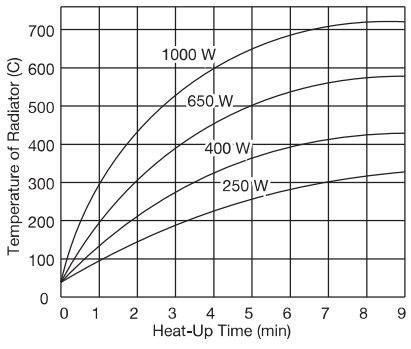
*** Watt density** calculated using heater face surface area.

**** E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

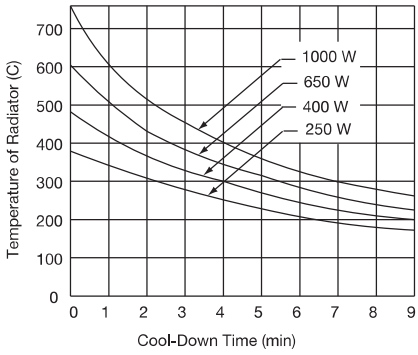
***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (µm).

Typical Heating and Cooling Behavior of CRB Ceramic E-Mitters

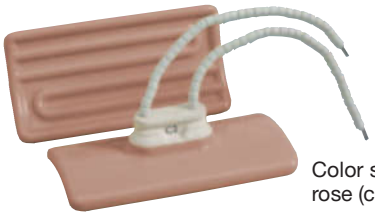
Warm-Up Time Graph



Cool-Down Time Graph



Series CRM Curved Face Ceramic E-Mitters – Size: 60 mm × 163 mm (2.36" × 6.42")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRM E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
425	120	Rose to Grey	27.44	4.25	1144	618	CRM10008	CRM10011
425	120	White	27.44	4.25	1144	618	CRM00008	CRM00011
500	120	Rose to Grey	32.28	5.00	1239	671	CRM10009	CRM10012
500	120	White	32.28	5.00	1239	671	CRM00009	CRM00012
600	220/240	Rose to Grey	38.74	6.00	1360	738	CRM10010	CRM10013
600	220/240	White	38.74	6.00	1360	738	CRM00010	CRM00013

Series CRM Curved Face Ceramic E-Mitter Specifications

Series CRM – Size: 60 mm × 163 mm (2.36" × 6.42")

Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (µm)
100	6.46	487	559	5.12
150	9.68	641	713	4.45
200	12.91	755	827	4.05
250	16.14	843	915	3.79
300	19.37	915	987	3.60
350	22.60	979	1051	3.45
400	25.82	1041	1113	3.32
450	29.05	1103	1175	3.19
500	32.28	1167	1239	3.07
550	35.51	1230	1302	2.96
600	38.74	1288	1360	2.87
650	41.96	1335	1407	2.79

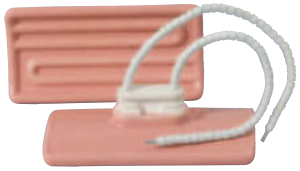
*** Watt density** calculated using heater face surface area.

**** E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (µm).

CRM Ordering Information (See page 7-2)

Series CRC Curved Face Ceramic E-Mitters – Size: 60 mm × 122 mm (2.36" × 4.80")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRC E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
125	220/240	Rose to Grey	10.80	1.67	756	402	CRC10005	CRC10007
125	220/240	White	10.80	1.67	756	402	CRC00005	CRC00007
200	220/240	Rose to Grey	17.27	2.68	942	506	CRC10013	CRC10015
200	220/240	White	17.27	2.68	942	506	CRC00013	CRC00015
325	120	Rose to Grey	28.07	4.35	1156	624	CRC10018	CRC10020
325	120	White	28.07	4.35	1156	624	CRC00018	CRC00020
325	220/240	Rose to Grey	28.07	4.35	1156	624	CRC10021	CRC10023
325	220/240	White	28.07	4.35	1156	624	CRC00021	CRC00023
325	480	Rose to Grey	28.07	4.35	1156	624	CRC10064	CRC10140
325	480	White	28.07	4.35	1156	624	CRC00064	CRC00140
500	120	Rose to Grey	43.18	6.69	1420	771	CRC10024	CRC10026
500	120	White	43.18	6.69	1420	771	CRC00024	CRC00026
500	220/240	Rose to Grey	43.18	6.69	1420	771	CRC10027	CRC10029
500	220/240	White	43.18	6.69	1420	771	CRC00027	CRC00029
500	480	Rose to Grey	43.18	6.69	1420	771	CRC10066	CRC10141

Semi-Finished Stock CRC E-Mitters (Five Business Day Manufacturing)

Semi-Finished Series CRC E-Mitters listed below are stocked ready for color glazing. Colors available are metamorphing rose (cold) to grey (hot), traditional white, metamorphing yellow (cold) to orange (hot), and black.

They can be terminated with beaded leads up to 6" long with spliced-on lead wire for lengths beyond 6" and straight, ring, or spade terminals. Some are available with a thermocouple (any length).

A part number will be assigned at time of order.

Wattage	Voltage	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body** Temperature (Typical) °F	Heater Body** Temperature (Typical) °C	Optional Thermocouple (Any Length)
200	230	17.27	2.68	942	506	Type K
325	230	28.07	4.35	1156	624	Type K
325	480	28.07	4.35	1156	624	N/A
500	230	43.18	6.69	1420	771	Type K
500	480	43.18	6.69	1420	771	N/A

CRC Ordering Information (See page 7-2)

CONTINUED

Series CRC Curved Face Ceramic E-Mitter Specifications

Continued from previous page…

Series CRC Curved Face Ceramic E-Mitters – Size: 60 mm × 122 mm (2.36" × 4.80")

Watts/Square Inch vs. Temperature Data

Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (µm)
100	8.64	596	668	4.63
125	10.80	684	756	4.29
150	12.95	756	828	4.05
163	14.08	789	861	3.95
200	17.27	870	942	3.72
250	21.59	960	1032	3.50
300	25.91	1043	1115	3.31
325	28.07	1084	1156	3.23
350	30.23	1126	1198	3.15
375	32.39	1169	1241	3.07
400	34.55	1211	1283	2.99
500	43.18	1348	1420	2.78

Series CRS Curved Face Ceramic E-Mitters – Size: 60 mm × 60 mm (2.36" × 2.36")

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

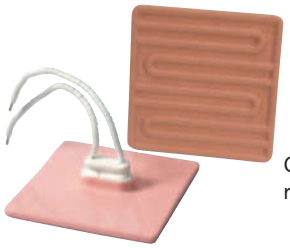
Standard (Non-Stock) CRS E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Part Number Without Thermocouple	Part Number With Type K Thermocouple
162	120	White	28.07	4.35	CRS00002	CRS00009
162	220/240	White	28.07	4.35	CRS00005	CRS00012
250	120	White	43.18	6.69	CRS00003	CRS00010
250	220/240	White	43.18	6.69	CRS00006	CRS00013

CRS Ordering Information (See page 7-2)

Series CRG Flat Face Ceramic E-Mitters – Size: 122 mm (4.80") square



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRG E-Mitters

E-Mitters listed have 3-1/2" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting in 20 or 22 gauge sheet metal.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	Rose to Grey	10.9	1.7	758	403	CRG10026	CRG10027
250	220/240	White	10.9	1.7	758	403	CRG00026	CRG00027
325	220/240	Rose to Grey	14.1	2.2	862	461	CRG10028	CRG10029
325	220/240	White	14.1	2.2	862	461	CRG00028	CRG00029
400	220/240	Rose to Grey	17.4	2.7	944	507	CRG10030	CRG10031
400	220/240	White	17.4	2.7	944	507	CRG00030	CRG00031
650	220/240	Rose to Grey	28.2	4.4	1159	626	CRG10032	CRG10033
650	220/240	White	28.2	4.4	1159	626	CRG00032	CRG00033
800	220/240	Rose to Grey	34.7	5.4	1287	697	CRG10034	CRG10035
800	220/240	White	34.7	5.4	1287	697	CRG00034	CRG00035
1000	220/240	Rose to Grey	43.4	6.7	1422	772	CRG10036	CRG10037
1000	220/240	White	43.4	6.7	1422	772	CRG00036	CRG00037

Series CRG Flat Face Ceramic E-Mitter Specifications

Watts/Square Inch vs. Temperature Data

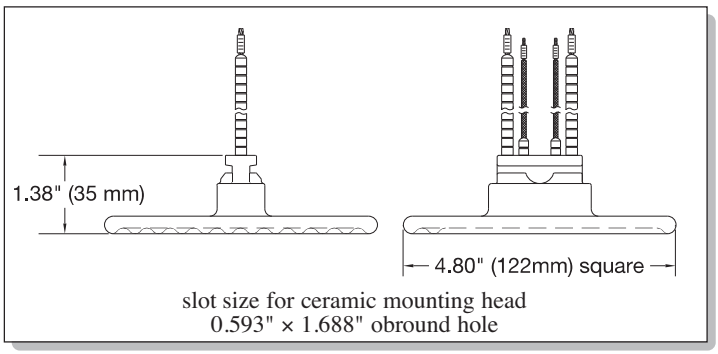
Watts	Surface W/in²*	Heater Body °F Rise	Heater Body Temp @ 72°F**	Primary Emitted Wavelength*** (μ)
250	10.9	686	758	4.28
325	14.1	790	862	3.95
400	17.4	872	944	3.72
650	28.2	1087	1159	3.22
800	34.7	1215	1287	2.99
1000	43.4	1350	1422	2.77

*** Watt density** calculated using heater face surface area.

**** E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

***** Peak infrared radiation wavelength** as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm).

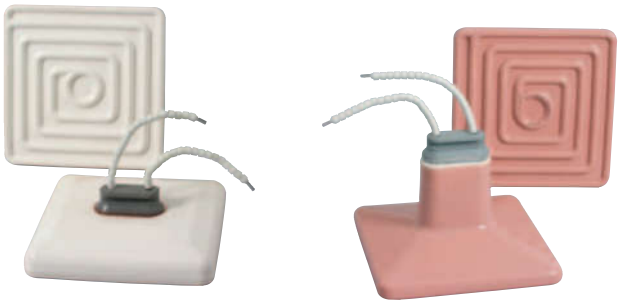
Series CRG Dimensions



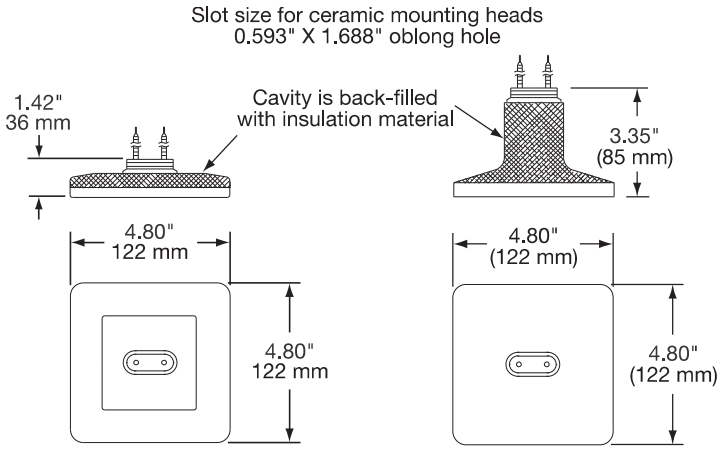
slot size for ceramic mounting head
0.593" × 1.688" obround hole

CRG Ordering Information
See page 7-2

Insulated Flat Face Short Neck Series CRH and Long Neck Series CRD Ceramic E-Mitters



CRH shown in white and CRD in metamorphing rose (cold) to grey (hot)



Series CRH Dimensions | **Series CRD Dimensions**

CRH and CRD E-Mitter Construction

1. **LESS MASS.** A special manufacturing process allows construction with thin walls that withstand larger temperature gradients. The embedded resistance coils heat up the low mass body at a faster rate, providing considerable energy savings.
2. **SUPERIOR INSULATING MATERIAL.** The hollow inner area is filled with low-mass ceramic fiber to further insulate the contact region from the e-mitter surface, resulting in an improved operating life.

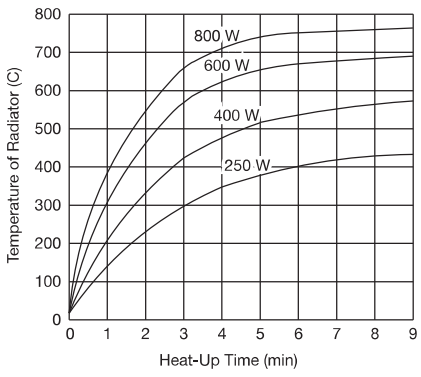
Design Features

- ***Universal mount designed to be dropped into existing systems regardless of manufacturer***
- ***Standard colors are metamorphing rose (cold) to grey (hot), and traditional white. Optional colors are metamorphing yellow (cold) to orange (hot), and black***
- ***Standard stocked voltage: 120 or 220/240V as noted; other voltages are available***
- ***Available with built-in type K thermocouple. Optional type J thermocouple is also available.***
- ***Long operating life – over 10,000-plus hours of continuous operation under normal conditions***
- ***Performance is unaffected by vibration or adverse atmospheric conditions***
- ***2.5 to 6µm infrared radiation wavelength***

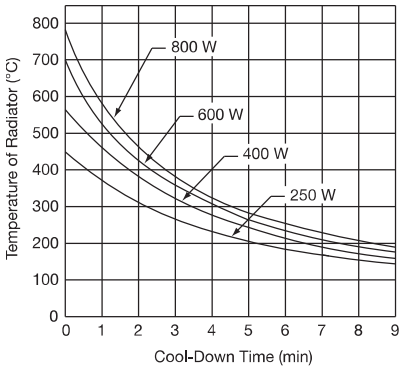
Optional Features

- ***Additional Power or Thermocouple Lead Lengths (page 7-23)***
- ***Two-Piece Wave Mounting Clip (page 7-14)***
- ***Reflectors and Other Accessories (pages 7-20 through 7-23)***
- ***Arrays and Power/Temperature Control Panels (start on page 7-15)***

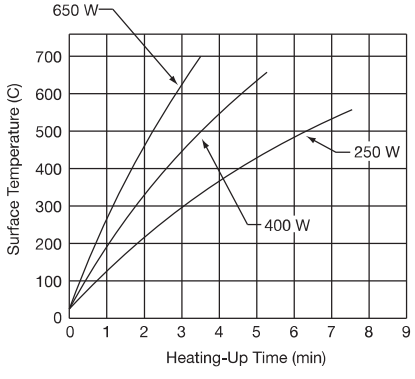
Warm-up Curve CRH Short Shaft



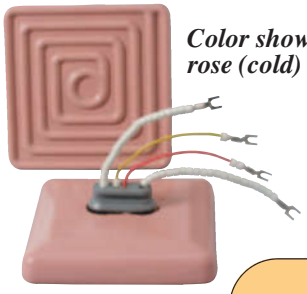
Cool-Down Curve CRH Short Shaft



Warm-up Curve CRD Long Shaft



Series CRH E-Mitters – Size: 122 mm (4.80") square



Color shown is rose (cold) to grey (hot)

Optional Features

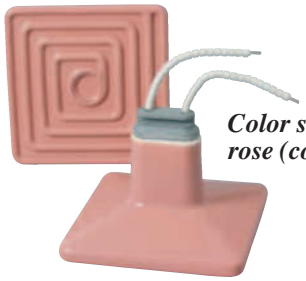
- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRH E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	Rose to Grey	10.84	1.68	757	403	CRH10029	CRH10030
250	220/240	White	10.84	1.68	757	403	CRH00029	CRH00030
400	220/240	Rose to Grey	17.34	2.69	943	506	CRH10018	CRH10005
400	220/240	White	17.34	2.69	943	506	CRH00018	CRH00005
600	220/240	Rose to Grey	26.01	4.03	1117	603	CRH10010	CRH10011
600	220/240	White	26.01	4.03	1117	603	CRH00010	CRH00011
800	220/240	Rose to Grey	34.68	5.38	1286	697	CRH10001	CRH10019
800	220/240	White	34.68	5.38	1286	697	CRH00001	CRH00019

Series CRD E-Mitters – Size: 122 mm (4.80") square



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRD E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	Rose to Grey	10.84	1.68	757	403	CRD10001	CRD10005
250	220/240	White	10.84	1.68	757	403	CRD00001	CRD00005
400	220/240	Rose to Grey	17.34	2.69	943	506	CRD10002	CRD10006
400	220/240	White	17.34	2.69	943	506	CRD00002	CRD00006
650	220/240	Rose to Grey	28.18	4.37	1158	626	CRD10004	CRD10008
650	220/240	White	28.18	4.37	1158	626	CRD00004	CRD00008

* **Watt density** calculated using heater face surface area.

** **E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

Ordering Information

Standard Heaters

Order by Part Number for Standard (Non-Stock) heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRH or CRD E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

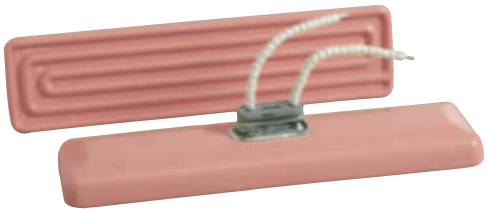
Please Specify the following:

- ❑ **Size: CRH or CRD**
- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 35w/in² (5.4w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K or optional Type J
- ❑ **Additional Options:** Start on page 7-20
- ❑ **Description of Process & Temperature**

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

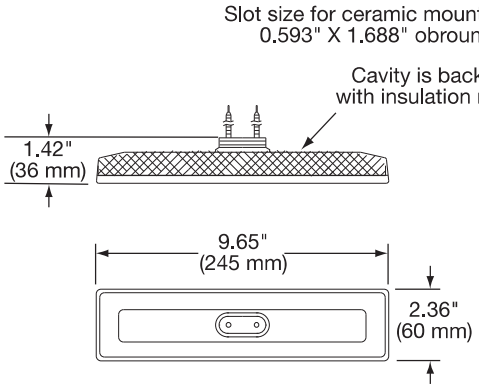
Insulated Flat Face Short Neck Series CRN and CRZ Ceramic E-Mitters



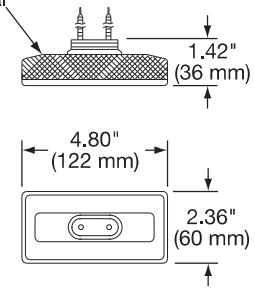
Design Features

- *Universal mount designed to be dropped into existing systems regardless of manufacturer.*
- *Standard colors are metamorphing rose (cold) to grey (hot), and traditional white. Optional colors are metamorphing yellow (cold) to orange (hot), and black.*
- *Standard stocked voltage: 120 or 220/240V as noted; other voltages are available.*
- *Available with built-in type K thermocouple. Optional type J thermocouple is also available.*
- *Long operating life—over 10,000-plus hours of continuous operation under normal conditions*
- *Performance is unaffected under adverse atmospheric conditions.*
- *2.5 to 6µm infrared radiation wavelength*

Series CRN Dimensions



Series CRZ Dimensions



CRN and CRZ E-Mitter Construction

1. **LESS MASS.** A special manufacturing process allows construction with thin walls that withstand larger temperature gradients. The embedded resistance coils heat up the low mass body at a faster rate, providing energy savings.
2. **SUPERIOR INSULATING MATERIAL.** The hollow inner area is filled with low-mass ceramic fiber to further insulate the contact region from the e-mitter surface, resulting in an improved operating life.

Ordering Information

Standard Heaters

Order by Part Number for Standard (Non-Stock) heaters.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRN or CRZ E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Size: CRN or CRZ**
- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Wattage:** Up to 35w/in² (5.4w/cm²)
- ❑ **Voltage:** 120, 208, 240, 277, 480 and others (dependent on design)
- ❑ **Thermocouple:** Standard Type K or optional Type J
- ❑ **Additional Options:** Start on page 7-20

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

CRN E-Mitters – Size: 60 mm × 245 mm (2.36" × 9.65")

Optional Features

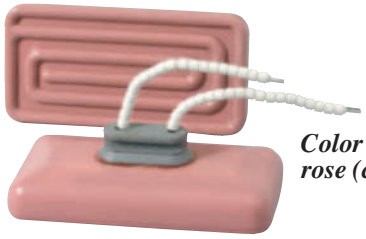
- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRN E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
250	220/240	Rose to Grey	10.97	1.70	762	406	CRN10001	CRN10005
250	220/240	White	10.97	1.70	762	406	CRN00001	CRN00005
400	220/240	Rose to Grey	17.56	2.72	948	509	CRN10002	CRN10006
400	220/240	White	17.56	2.72	948	509	CRN00002	CRN00006
600	220/240	Rose to Grey	26.33	4.08	1123	606	CRN10003	CRN10007
600	220/240	White	26.33	4.08	1123	606	CRN00003	CRN00007
800	220/240	Rose to Grey	35.11	5.44	1294	701	CRN10004	CRN10008
800	220/240	White	35.11	5.44	1294	701	CRN00004	CRN00008

CRZ E-Mitters – Size: 60 mm × 122 mm (2.36" × 4.80")



Color shown is rose (cold) to grey (hot)

Optional Features

- *Additional Power or Thermocouple Lead Lengths (page 7-23)*
- *Two-Piece Wave Mounting Clip (page 7-14)*
- *Reflectors and Other Accessories (pages 7-20 through 7-23)*
- *Arrays and Power/Temperature Control Panels (start on page 7-15)*

Standard (Non-Stock) CRZ E-Mitters

E-Mitters listed have 3.50" ceramic bead insulated leads, #8-10 spade terminals, and a one-piece spring clip for mounting.

Wattage	Voltage	Color	Watt Density* (W/in²)	Watt Density* (W/cm²)	Heater Body Temp.** (Typical Operating) °F	Heater Body Temp.** (Typical Operating) °C	Part Number Without Thermocouple	Part Number With Type K Thermocouple
125	220/240	Rose to Grey	10.93	1.69	761	405	CRZ10001	CRZ10005
125	220/240	White	10.93	1.69	761	405	CRZ00001	CRZ00005
200	220/240	Rose to Grey	17.48	2.71	947	508	CRZ10002	CRZ10006
200	220/240	White	17.48	2.71	947	508	CRZ00002	CRZ00006
300	220/240	Rose to Grey	26.23	4.07	1121	605	CRZ10003	CRZ10007
300	220/240	White	26.23	4.07	1121	605	CRZ00003	CRZ00007
400	220/240	Rose to Grey	34.97	5.42	1291	699	CRZ10004	CRZ10008
400	220/240	White	34.97	5.42	1291	699	CRZ00004	CRZ00008
400	480	White	34.97	5.42	1291	699	CRZ00013	CRZ00014

* **Watt density** calculated using heater face surface area.

** **E-Mitter heater body temperature** as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F (22°C) room ambient.

Mounting Accessories and Low Noise Thermocouple Option

One-Piece Mounting Clip (Standard)

Designed for heater mounting with 22 ga (.028") to 20 ga (.037") sheet metal.

Part Number SPR-103-102

Thinner or thicker materials require the Two-Piece Mounting Clip.

Standard mounting spring clip shipped with heaters

Two-Piece Wave Mounting Clip (Optional)

The two-piece wave spring clip and holding clip assembly is used for mounting heaters in materials thicker than 20 ga (.037") or thinner than 22 ga (.028")

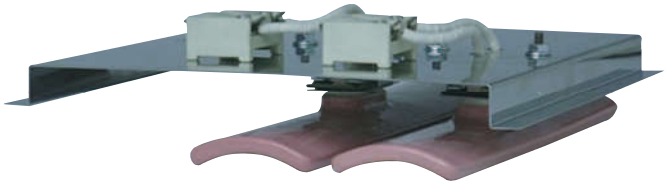
Part Number: CRK00008

All Items Available from Stock

Single Element Mounting Bracket

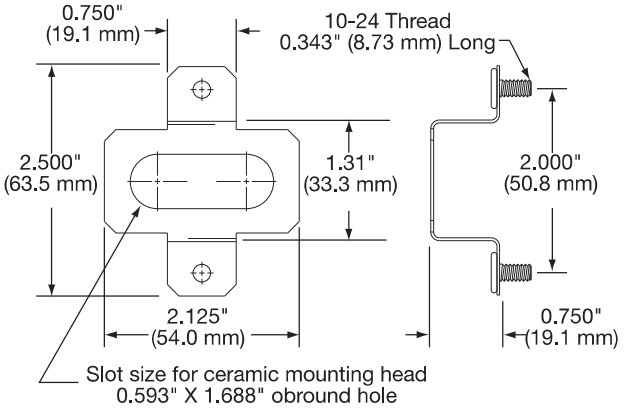
A convenient method for mounting individual E-Mitters to a flat surface or panel for spot heating applications

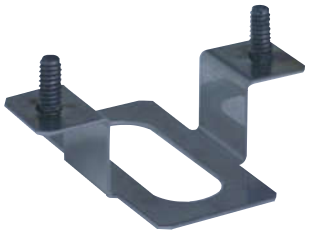
Part Number: CRK00018



The picture shows how the single element mounting bracket can be used to develop a panel array using Series CRB or CRC Ceramic E-Mitters or others with the same mounting head design.

High Temperature Ceramic Terminal Blocks (Part Number EHD-108-101) are used to connect power to the heater leads and can also be used for making thermocouple connections.





Part Number: CRK00018

Designed for use in the CRB, CRC, CRL, CRG and CRM solid curved and flat face style heaters. Low noise thermocouples can only be factory installed and must be specified at time of ordering.

Low Noise Thermocouple Option

Generally the standard thermocouple is acceptable for the majority of applications. Most instrumentation inputs have noise rejection sufficient to filter out unwanted 60 hz AC noise that the thermocouple picks up from being mounted close to the coil element for ideal temperature sensing.

For those applications where emf generated noise is a problem for the instrument, Tempco offers a low noise thermocouple solution. The low noise thermocouple option is designed to minimize the induced AC noise by using stainless steel overbraid on the high temperature fiberglass color-coded 24 GA solid leads as a ground shield and a ceramic insulator at the thermocouple junction.

Thermocouple Type	Termination	Lead Length (in)
K	Straight Pigtails	8
K	Straight Pigtails	12
K	Straight Pigtails	24
K	Straight Pigtails	48
J	Straight Pigtails	12
J	Straight Pigtails	48

View Product Inventory @ www.tempco.com

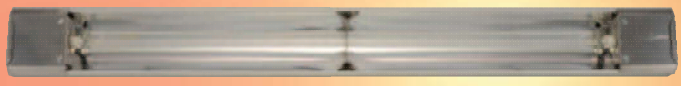
Infrared Radiant Heating Array Systems

Modular Components Simplify Construction of Large Infrared Heating Systems

CRA Linear Array for Ceramic E-Miters (page 7-16)

CRA Linear Array for KTE and KTG E-Mitters (page 7-47)

QRH Quartz — Universal 2000 Housing (page 7-56)



CRA Linear Array for Gemini Medium Wave (page 7-68)

KRH Quartz — Universal 2000 Housing (page 7-72)

Series TRH — Tubular Element in Universal 2000 Housing (page 7-74)

Type ARA Array for Ceramic E-Mitters (page 7-28)

Type ARV Array for KTE & KTG E-Mitters (page 7-48)

Type ARG Gemini Medium Wave Arrays (page 7-69)

Type ARK Quartz Tube Arrays (page 7-70)

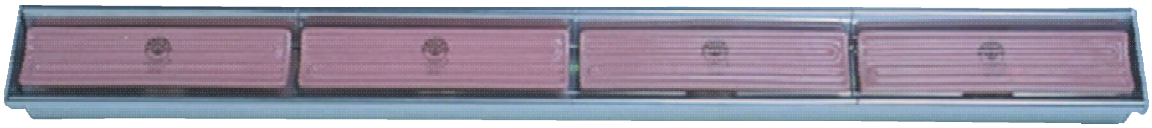
Type ARC Channel Strip Heater Arrays (page 8-10)

Type ART Tubular Heater Arrays (page 10-17)

***TEMPCO** will design & manufacture a panel array system, including a power and temperature control panel that meets your needs.*

Made in USA

CRA Linear Heater Assemblies



Design Features

- *220/240V CRB or CRC E-Mitters*
- *Extruded aluminum housing*
- *E-Mitters pre-wired to terminal blocks*
- *METAMORPHING Rose to Grey colored E-Mitters*
- *Reflectors*
- *Fully assembled, ready to install, with mounting hardware*
- *1/2" trade size wiring entrance at both ends*
- *40" 1000 Watt CRA10025 shown above*

Standard (Non-Stock) and Stock Sizes and Electrical Ratings

Assemblies with a Thermocouple have One E-Mitter with a Built-In Type K Thermocouple.

Stock Items Are Shown In RED

Nominal Housing Length	Total Assembly Wattage	E-Mitter Wattage	Number of E-Mitters	Part Number Assembly with no T/C	Part Number Assembly with K T/C	Replacement E-Mitters with no T/C	Replacement E-Mitters with K T/C
10"	250	250	1	**CRA10001**	CRA10048	CRB10006	CRB10008
	400	400	1	**CRA10002**	CRA10049	CRB10014	CRB10016
	650	650	1	**CRA10003**	CRA10050	CRB10023	CRB10025
	1000	1000	1	**CRA10004**	CRA10051	CRB10031	CRB10033
	250	125	2	CRA10005	CRA10052	CRC10005	CRC10007
	400	200	2	CRA10006	CRA10053	CRC10013	CRC10015
	650	325	2	CRA10007	CRA10054	CRC10021	CRC10023
	1000	500	2	CRA10008	CRA10055	CRC10027	CRC10029
20"	500	250	2	**CRA10009**	CRA10056	CRB10006	CRB10008
	800	400	2	**CRA10010**	CRA10057	CRB10014	CRB10016
	1300	650	2	**CRA10011**	CRA10058	CRB10023	CRB10025
	2000	1000	2	**CRA10012**	CRA10059	CRB10031	CRB10033
	500	125	4	CRA10013	CRA10060	CRC10005	CRC10007
	800	200	4	CRA10014	CRA10061	CRC10013	CRC10015
	1300	325	4	CRA10015	CRA10062	CRC10021	CRC10023
	2000	500	4	CRA10016	CRA10063	CRC10027	CRC10029
30"	750	250	3	**CRA10017**	CRA10064	CRB10006	CRB10008
	1200	400	3	**CRA10018**	CRA10065	CRB10014	CRB10016
	1950	650	3	**CRA10019**	CRA10066	CRB10023	CRB10025
	3000	1000	3	**CRA10020**	CRA10046	CRB10031	CRB10033
	750	125	6	CRA10021	CRA10067	CRC10005	CRC10007
	1200	200	6	CRA10022	CRA10068	CRC10013	CRC10015
	1950	325	6	CRA10023	CRA10069	CRC10021	CRC10023
	3000	500	6	CRA10024	CRA10070	CRC10027	CRC10029
40"	1000	250	4	**CRA10025**	CRA10071	CRB10006	CRB10008
	1600	400	4	**CRA10026**	CRA10072	CRB10014	CRB10016
	2600	650	4	**CRA10027**	CRA10073	CRB10023	CRB10025
	4000	1000	4	**CRA10028**	CRA10047	CRB10031	CRB10033
	1000	125	8	CRA10029	CRA10074	CRC10005	CRC10007
	1600	200	8	CRA10030	CRA10075	CRC10013	CRC10015
	2600	325	8	CRA10031	CRA10076	CRC10021	CRC10023
	4000	500	8	CRA10032	CRA10077	CRC10027	CRC10029
50"	1250	250	5	**CRA10131**	CRA10118	CRB10006	CRB10008
	2000	400	5	**CRA10255**	CRA10301	CRB10014	CRB10016
	3250	650	5	**CRA10226**	CRA10103	CRB10023	CRB10025
	5000	1000	5	**CRA10152**	CRA10302	CRB10031	CRB10033

CAUTION

DANGER: Hazard of Fire. These heaters are not for use in atmospheres where flammable vapors, gases or liquids are present as defined in the National Electrical Code. Where solvents, water, etc. are being evaporated from the process it is necessary to provide substantial quantities of ventilating air to carry away all resulting vapors.

WARNING: Hazard of Electric Shock. Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.

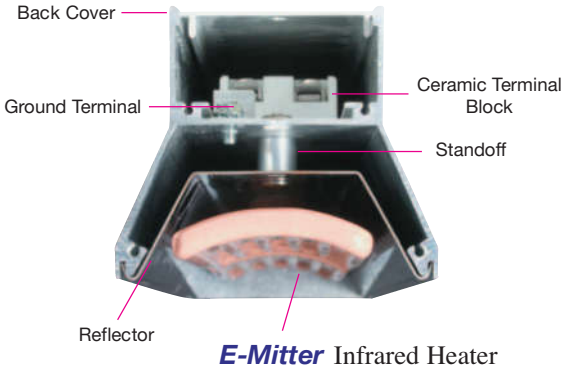
WARNING: Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of nickel plated or nickel clad insulated copper wire is recommended. Wire insulation rating must be suitable for the ambient temperature of the wiring installation.

View Product Inventory @ www.tempco.com

CRA Linear Heater Assemblies — Construction

Easiest Replacement of Heaters in the Industry

E-Mitters are easily replaced by removing the top cover. Wiring entrance side covers are not affected. The heater lead wires are insulated with ceramic beads and connected to ceramic terminal blocks. Heaters can be wired to function individually or grouped into heating zones.



E-Mitter Infrared Heater

Design Features

- ***Designed for use with E-Mitters CRB, CRC, CRN and CRZ***
- ***Lightweight extruded aluminum housing with 5/16-18 mounting bolts for use up to 250°C (482°F) extrusion temperature***
- ***E-Mitters are easily replaced by removing the top cover***
- ***Internal mounting hole pattern simplifies mixing and matching E-Mitter sizes and ratings***
- ***Space between reflector and housing wall offers a good thermal barrier to protect the wiring area***
- ***This CRA structural housing can be used with any manufacturer's standard 60 × 245 mm -or- 60 × 122 mm heaters***
- ***Wiring entrance 7/8" Diameter at both ends, for 1/2" trade size electrical fittings***

Wiring Options

Prewired with Plain Leads, Armor Cable or Wire Braid
(includes ground wire)

Stainless steel armor cable — 18" armor cable over 24" leads
Galvanized armor cable — 18" armor cable over 24" leads
Stainless steel wire braid — 18" wire braid over 24" leads
Fiberglass leads (450°C rating) — 12" long plain leads
If longer leads and/or longer armor cable are required, specify when ordering.

Prewired with 24" SJO Cable
(includes ground wire)

- 16 ga. cable (Up to 15 Amps)
- 14 ga. cable (Up to 22 Amps Max.)
- 12 ga. cable (Up to 28 Amps Max.)
- Max. terminal box temperature 194°F (90°C)
- If longer cable is required, specify when ordering.

Stock Heavy Duty Quick Disconnect Plugs and Connectors

Reference	NEMA P or R	Max. Amps	Volts	Plug Part Number	Connectors (Female) Part Number
P8 straight	6-15	15A	250V	EHD-102-114	EHD-103-139
P3 straight	5-15	15A	125V	EHD-102-103	EHD-103-102
P4 twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-104
P5 twist lock	L6-15	15A	250V	EHD-102-121	EHD-103-107


P8


P3


P4


P5

Optional Electrical Plugs listed can be attached to armor cable, HPN cord or plain leads described under wiring Options.
Connectors listed are cable mount matching units for the plugs listed and are ordered separately. See page 15-15 for additional plugs and connectors.

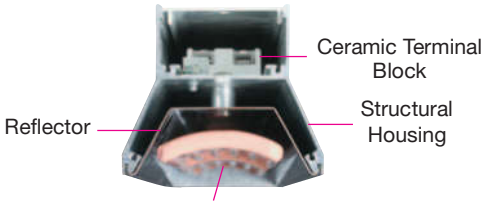
Made in USA

Custom CRA Linear Heater Assemblies Using Standard Components

Do It Yourself or let Tempco build an array to your exact specifications using standard components.

Consult Tempco for arrays using custom designed components.

Components Required To Build A Custom CRA Linear Heater using Standard Items



E-Mitter Infrared Heater

Example

Steps to Design a Custom CRA E-Mitter Linear Assembly from Standard Components

Designing a 40-inch-long CRA assembly using a stock housing length.

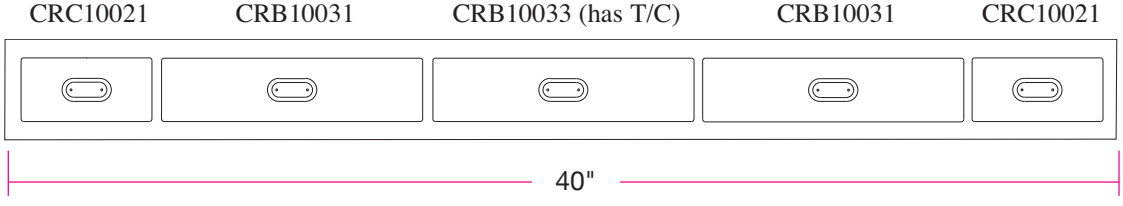
Step 1) **Select the Housing.** This application can use the standard CRK00004 housing from the Standard CRK Housing Lengths Table on page 7-19. Note the Maximum Power Rating of the housing when making your selection.

Step 2) **Select the E-Mitters Series.** The CRK Housing Lengths Table gives the various possible E-Mitter configurations that will fit the housing selected. A combination of CRBs and CRCs will be used for this application. CRB E-Mitters were selected for the inside three heaters to limit the number of unheated gaps that would be present if all CRC E-Mitters were used. The middle CRB E-Mitter has a thermocouple for temperature control. The outer two heaters ***in this example*** are CRC E-Mitters at a different w/in^2 than the CRBs because the heat required at the edges is not the same as the center. The heater color selected is Metamorphing Rose.

CRB E-Mitters can be found on page 7-4.
CRC E-Mitters can be found on page 7-7.

Step 3) **Select the Reflectors.** Select E-Mitter Reflectors to match the Style and Quantity of E-Mitters you selected. Three Part Number CRK00007 Reflectors are required for the CRB E-Mitters and Two Part Number CRK00006 Reflectors are required for the CRC E-Mitters. Note: Reflectors are complete with mounting hardware to attach to housing (page 7-20).

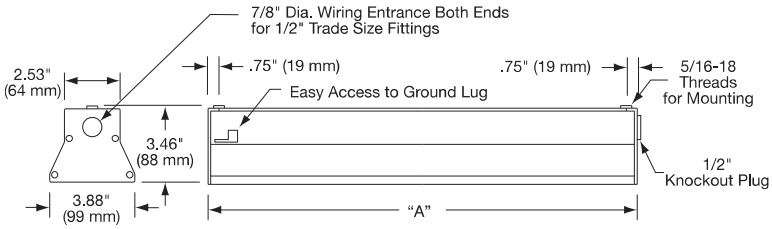
Step 4) **Select the Terminal Blocks.** Select the number of terminal blocks required for wiring. This would typically be one for each heater for the power leads and one for each thermocouple (page 7-21 and 7-22). A total of six terminal Blocks, Part Number EHD-108-101, are required. One for the power leads of each E-Mitter and one for the thermocouple on CRB10033.



Standard CRK Linear Housings

CRK housings include the following components: housing body, end plates, 5/16-18 mounting bolts, cover and ground lug.

NOTE: These housings do not include the reflectors needed for mounting the heaters (see page 7-20) or the terminal block (Part Number EHD-108-101) required for wiring each heater (see page 7-21).



Standard (Non-Stock) Housing Lengths Table

Nominal Housing Length in	"A" Dim. in	"A" Dim. mm	Housing Part Number	Examples of Possible E-Mitter Configurations	Maximum Power
5	5.19	131.8	CRK00024	1 CRC or 1 CRZ	.5KW
10	10.13	257.2	CRK00001	1 CRB or 1 CRN, 2 CRCs or 2 CRZs	1KW
15	15.06	382.6	CRK00023	3 CRCs or 3 CRZs (1 CRB and 1 CRC) or (1 CRN and 1 CRZ)	1.5KW
20	20.00	508.0	CRK00002	2 CRBs or 2 CRNs, 4 CRCs or 4 CRZs (1 CRB and 2 CRCs) or (1 CRN and 2 CRZs)	2KW
25	24.94	633.4	CRK00022	5 CRCs or 5 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	2.5KW
30	29.88	758.8	CRK00003	3 CRBs or 3 CRNs, 6 CRCs or 6 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	3KW
35	34.81	884.2	CRK00019	7 CRCs or 7 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	3.5KW
40	39.75	1009.7	CRK00004	4 CRBs or 4 CRNs, 8 CRCs or 8 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	4KW
50	49.63	1260.5	CRK00021	5 CRBs or 5 CRNs, 10 CRCs or 10 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	5KW
60	59.50	1511.3	CRK00027	6 CRBs or 6 CRNs, 12 CRCs or 12 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	6KW
70	69.38	1762.1	CRK00029	7 CRBs or 7 CRNs, 14 CRCs or 14 CRZs a combination of (CRBs and CRCs) or (CRNs and CRZs)	7KW

Standard housings are available from as-assembled stock in 10", 20", 30", 40" and 50" lengths. Other housing lengths can be made to your requirements.

Ordering Information

Standard Assemblies

Order by Part Number on page 7-16. Delivery is Stock to 3 days.

Custom Engineered/Manufactured CRA Heater Assembly

Understanding that a CRA linear structural housing can be very application specific, **TEMPCO** will design and manufacture a CRA heater assembly to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Housing Length
- ❑ E-Mitter Color
- ❑ E-Mitter Size, Electrical Ratings or Part Number
- ❑ E-Mitter with Built-In Type K T/C, Size, Electrical Ratings or Part Number

If you should encounter any problems or need technical support in the design of the CRA system consult Tempco. Our team of professionals will provide you with the right solution for your application.

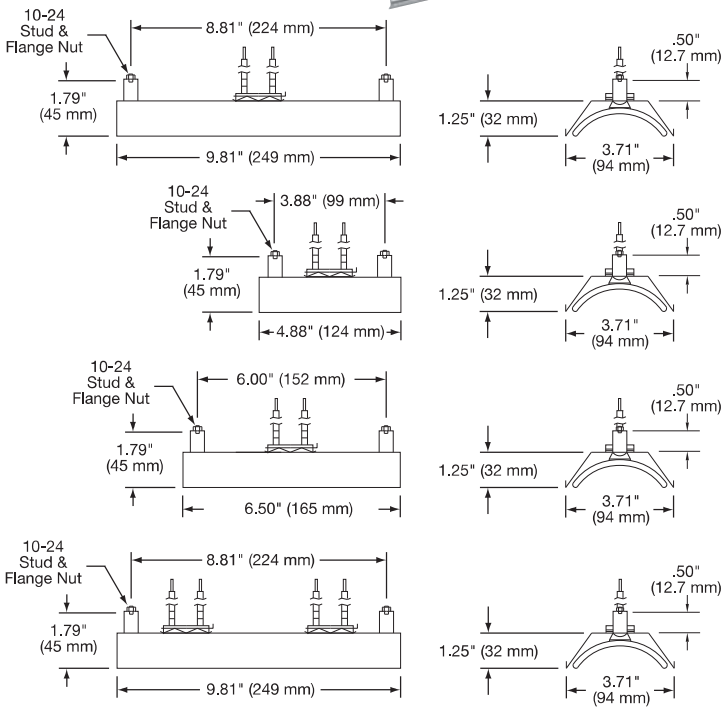
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Stock Reflectors for CRB, CRN, CRC, CRZ and CRL E-Mitters

Reflectors for Ceramic E-Mitters

- *Designed to withstand bending and heat distortion.*
- *Made from highly polished chrome steel or optional aluminized steel for extreme temperatures and harsh environments.*
- *Will withstand high operating temperatures.*
- *Available in three standard sizes; includes standoffs and hardware.*
- *Easy installation into CRA linear structural housing assemblies (except CRK00032).*



For One CRB E-Mitter or One CRN E-Mitter

Part Number: CRK00007 (Chrome Steel)
Part Number: CRK00049 (Aluminized Steel)

For One CRC E-Mitter or One CRZ E-Mitter

Part Number: CRK00006 (Chrome Steel)
Part Number: CRK00035 (Aluminized Steel)

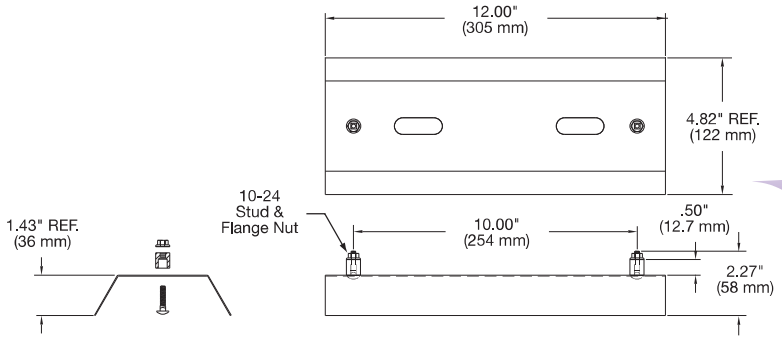
For One CRM E-Mitter

Part Number: CRK00030 (Chrome Steel)
Part Number: CRK00074 (Aluminized Steel)

For Two CRC E-Mitters or Two CRZ E-Mitters

Part Number: CRK00020 (Chrome Steel)
Part Number: CRK00043 (Aluminized Steel)

Note: Reflectors in drawings are shown with curved heater(s) for reference only.



For One CRL E-Mitter

Part Number: CRK00032 (Aluminized Steel)

All Items Available from Stock

Ceramic Twist-Loc Wire Connectors

Porcelain Material, Maximum Temperature Rating 1200°F (645°C), 300V Maximum

Agency Approvals: UL and CSA for EHD-114-102, EHD-114-103 and EHD-114-104 (UL File E9809)

Stock Number	MFR Part Number	Wire Range (Solid or Stranded Wire)		Skirt Length	Opening ID	Outer Diameter
EHD-114-102	10-401	2#22	1#18 + 1#16	.687"	.250"	.406"
EHD-114-103	10-405	2#20	2#16	.750"	.312"	.484"
EHD-114-104	10-407	2#18	2#14	.843"	.406"	.531"
EHD-114-105	–	1#16 + 1#14	1#14 + 2#12	1.00"	.468"	.703"

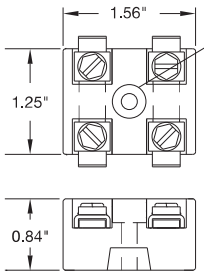
View Product Inventory @ www.tempco.com

Standard Ceramic Terminal Blocks for Internal Wiring

Used for internal connections within CRA linear structural housings and ARA arrays.

Design Features

- **Maximum Voltage:** 600 VAC
- **Maximum Current:** 20 Amps
- **Maximum Temperature:** 450°C/842°F
- **AWG:** 20-12 ga. wire
- **Hardware:** Stainless Steel
- **Terminals:** #8 Screw
- **Body Material:** Steatite

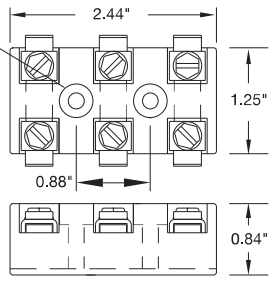


0.40" Counterbore
.19" Dia. Through Hole
(for mounting screws)

Mounting Hardware Supplied per Mounting Hole

Part Number SCW-102-109
#8 x 7/8 Pan Head Sheet Metal Screw

Part Number WAS-119-106
#8 External Tooth Lockwasher



Part Number: EHD-108-101

Part Number: EHD-108-121

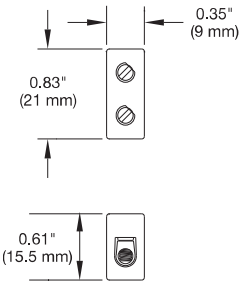
Ceramic Terminal Blocks (Enclosed Terminals)

Used for wiring of heater power and thermocouple wiring in high temperature locations.

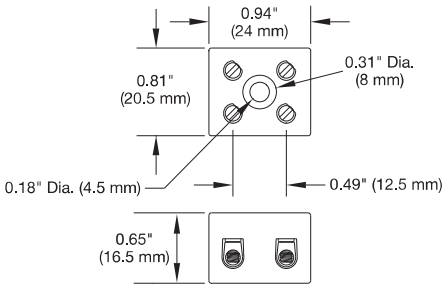
Design Features

- **Maximum Voltage:** 380 VAC
- **Maximum Current:** 30 Amps
- **Maximum Temperature:** 240°C/464°F
- **AWG:** 26-12 stranded, 26-14 solid
- **Screw:** M3, zinc plated steel
- **Terminal Body:** Nickel plated brass
- **Body Material:** Porcelain
- **Rating:** CE, VDE

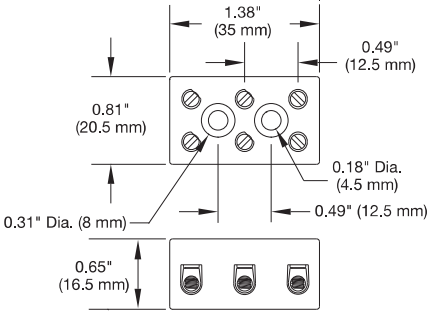
Part Number: EHD-108-116



Part Number: EHD-108-117

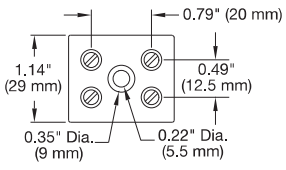


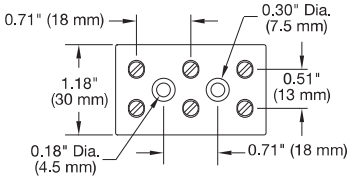
Part Number: EHD-108-118

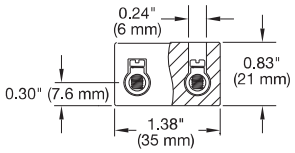


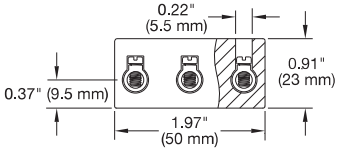
Design Features

- **Maximum Voltage:** 600 VAC
- **Maximum Current:** 50 Amps
- **Maximum Temperature:** 200°C/392°F
- **AWG:** 14-8 ga wire
- **Screw:** M4, zinc plated steel
- **Terminal Body:** Nickel plated brass
- **Body Material:** Porcelain
- **Agency Approval:** UL, File # E69841









Stock Number: EHD-108-114
MFR Part Number: 4010-B

Stock Number: EHD-108-115
MFR Part Number: 4011-B

CONTINUED

Stock Ceramic Terminal Blocks

Made in USA

Heavy Duty High Temperature Ceramic Line Wiring Blocks (Exposed Terminals)

Used for interfacing heater assemblies, CRA housings and ARA arrays to external line wiring.

Design Features

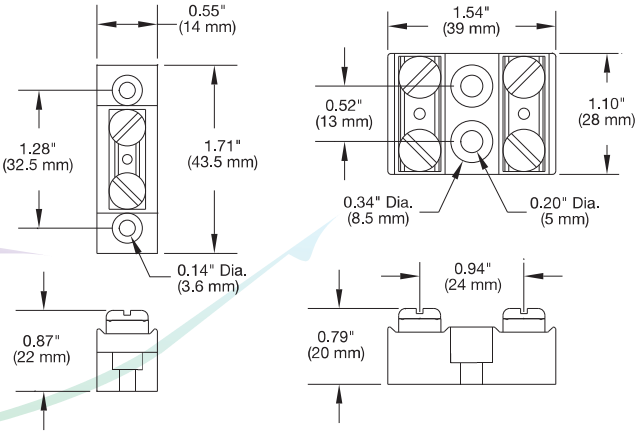
- ✳ **Maximum Voltage:** 500 VAC
- ✳ **Maximum Current:** 44 Amps @ 104°F ambient
- ✳ **Maximum Temperature:** 240°C/464°F
- ✳ **Wire Gauge:** 18 to 8 ga.
- ✳ **Terminal Screw:** M4, zinc-plated steel
- ✳ **Body Material:** Steatite
- ✳ **Agency Approvals:** None

Optional Terminal Hardware

Stainless Steel Flat Washer — Part Number: WAS-109-101

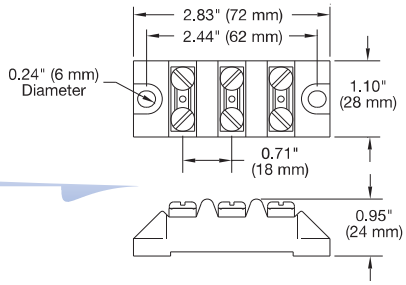
Spring Lock Washers — Part Number: WAS-118-108

Part Number: EHD-108-106

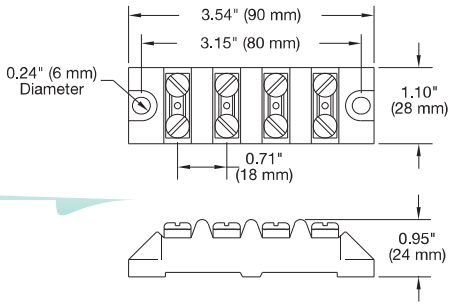


Part Number: EHD-108-107

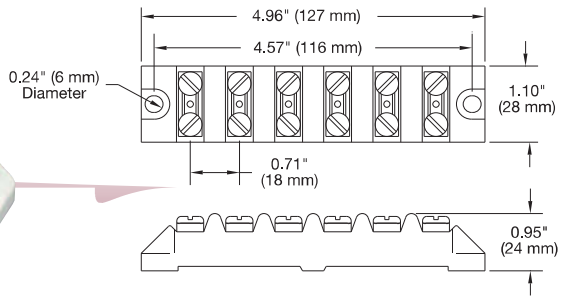
Part Number: EHD-108-108



Part Number: EHD-108-109



Part Number: EHD-108-105



All Items Available from Stock

View Product Inventory @ www.tempco.com

Stock Hi-Temp (900°F) Nickel Plated Steel Uninsulated Terminals

The following optional terminals are available for use with Ceramic E-Mitter heaters and for assembly wiring. (Ceramic E-Mitters come standard with Part Number TER-115-112 #8-10 Ni Plated Steel spade terminals.)

Terminal Type	Description	Usage	Part Number
Ring	#10 stud, 22-18 ga. wire	Heater leads	TER-110-117
	#10 stud, 16-14 ga. wire	Misc.	TER-110-106
	#10 stud, 16-14 ga. wire	Misc. (Monel material)	TER-110-104
	#10 stud, 12-10 ga. wire	Line Wiring of Assy.	TER-110-111
	#8 stud, 22-18 ga. wire	Heater leads	TER-109-110*
	#8 stud, 16-14 ga. wire	Heater leads	TER-109-104
	#8 stud, 12-10 ga. wire	Line wiring of Assy.	TER-109-106
Spade	#10 stud, 22-18 ga. wire	Misc.	TER-115-111
	#8-10 stud, 22-18 ga. wire	Heater leads (Standard)	TER-115-112*
	#8 stud, 16-14 ga. wire	Internal CRA & ARA wiring	TER-115-113*
Straight	1/4" long Ni 200 Barrel Crimp	T/C or Heater leads	CON-101-101

All Items Available from Stock

* Standard sizes for heater leads to internal ceramic terminal blocks used in CRA housings and radiant arrays. Must be used with EHD-108-101 (2-pole) or EHD-108-121 (3-pole) standard terminal blocks.

Stock High Temperature Stranded Lead Wire

The following insulated lead wires are available for internal bussing and the line input wiring of CRA Linear Housing Assemblies and AR_ Radiant Panels.

Temperature Rating	Size & Conductor	Maximum Amperage	100 Foot Spool	250 Foot Spool	500 Foot Spool	Usage
450°C, 600V	18 ga. NCC	12.3 @ 300°C (572°F)	LDWR-1088	LDWR-1098	LDWR-1142	Heater lead modifications
450°C, 600V	16 ga. NCC	18.0 @ 300°C (572°F)	LDWR-1089	LDWR-1099	LDWR-1143	Miscellaneous
450°C, 600V	14 ga. NCC	21.2 @ 300°C (572°F)	LDWR-1090	LDWR-1100	LDWR-1144	Standard for internal wiring of factory wired units
450°C, 600V	12 ga. NCC	26.2 @ 300°C (572°F)	LDWR-1091	LDWR-1101	LDWR-1145	Panel zones & line input
450°C, 600V	10 ga. NCC	35.6 @ 300°C (572°F)	LDWR-1092	LDWR-1102	LDWR-1146	Panel zones & line input
250°C, 600V	18 ga. NPC	9.0 @ 200°C (392°F)	LDWR-1093	LDWR-1103	LDWR-1147	Heater lead modifications
250°C, 600V	16 ga. NPC	14.2 @ 200°C (392°F)	LDWR-1094	LDWR-1104	LDWR-1148	Miscellaneous
250°C, 600V	14 ga. NPC	21.1 @ 200°C (392°F)	LDWR-1095	LDWR-1105	LDWR-1149	Internal panel wiring
250°C, 600V	12 ga. NPC	29.5 @ 200°C (392°F)	LDWR-1096	LDWR-1106	LDWR-1150	Panel zones & line input
250°C, 600V	10 ga. NPC	37.6 @ 200°C (392°F)	LDWR-1097	LDWR-1107	LDWR-1151	Panel zones & line input

NCC = Nickel Clad Copper, 27% Nickel by weight. NPC = Nickel Plated Copper, 2% Nickel by weight.

The 450°C (842°F) rated wires amperage is derated over 300°C (572°F). Maximum ambient is 400°C (752°F).

The 250°C (482°F) rated wires amperage is derated over 200°C (392°F). Maximum ambient is 225°C (437°F).

See page 15-2 for additional specifications.

See amperage tables in Engineering Section 16 for more details on current carrying capacity of Tempco's high temperature lead wire. For bare wire consult Tempco, for ceramic beads see page 15-13.

Stock High Temperature Thermocouple Wire

The following insulated thermocouple wires are available for internal bussing and wiring of CRA Linear Housing Assemblies and AR_ Radiant Panels to external control systems.

These duplex thermocouple wires have color coded fiberglass insulation over each lead within an overall fiberglass insulation jacket.

Type	Wire Style	100 Foot Spool	250 Foot Spool
K	20 ga. solid	TCWR-1025	TCWR-1029
K	20 ga. stranded	TCWR-1034	TCWR-1036
J	20 ga. solid	TCWR-1028	TCWR-1032
J	20 ga. stranded	TCWR-1033	TCWR-1035
With Stainless Steel Overbraid			
K	20 ga. stranded	TCWR-1049	TCWR-1053
J	20 ga. stranded	TCWR-1047	TCWR-1051

See page 14-107 and 15-4 for additional thermocouple wire and specifications.

For bare wire and sleeving consult Tempco.

Made in USA

CRP 12" × 12" Modular Panels – METAMORPHING Yellow to Orange

New Cost Effective and Self-Contained Ceramic Infrared Panel Heater Offers Ease of Installation and Trouble-Free Performance

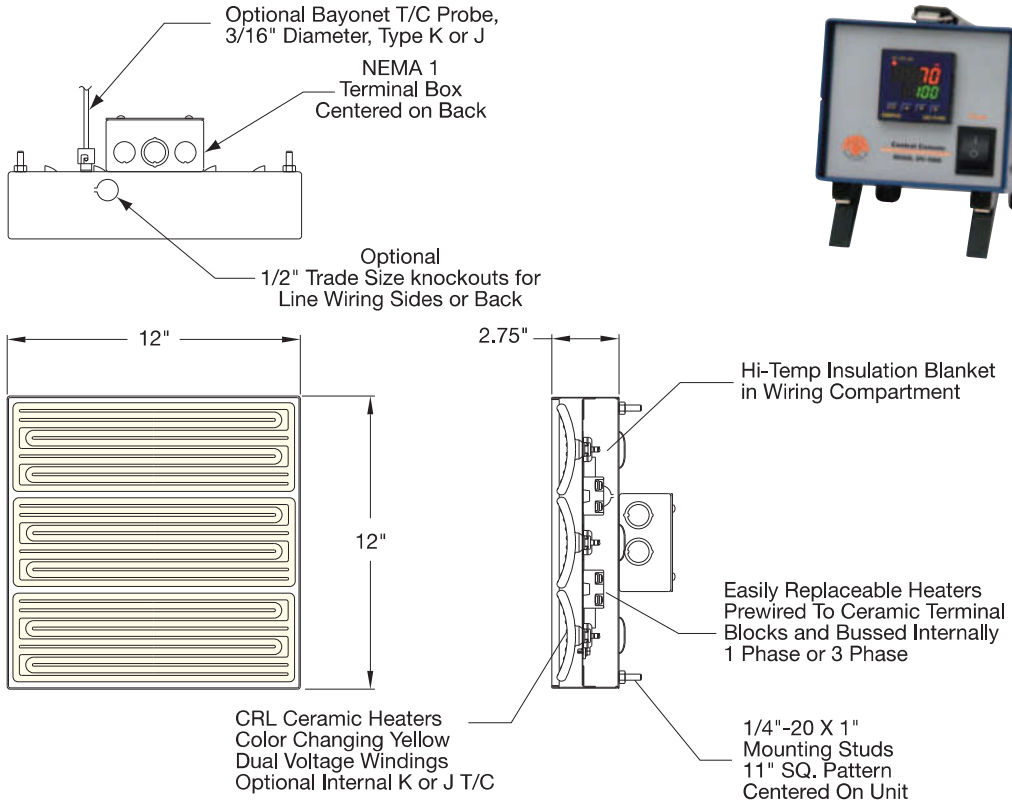
Three CRL E-Mitter heaters in one panel. See page 7-26 for CRP Modular Panel with an additional emitting glass face.

Design Features

- *Standard colors are metamorphing yellow (cold) to orange (hot), and traditional white. Optional colors are metamorphing rose (cold) to grey (hot) and black.*
- *Low profile 20 ga. aluminized steel or stainless steel housing.*
- *Standard stocked voltage: 120, 220-240V or 480V as noted; other voltages are available.*
- *Low noise type K thermocouple mounted internally in center heater. Optional type J thermocouple is also available.*
- *Watt density range: from 11w/in² to 35w/in²*
- *Standard operating temp range: 750°F to 1300°F*
- *Best when used at radiation distances of 4-10" from application.*
- *Performance is unaffected by vibration or adverse atmospheric conditions.*
- *3 to 6µm infrared radiation wavelength.*
- *Made to order.*

Tabletop Point-of-Use Temperature Control Console Systems

See Section 13, page 13-52



Standard Ratings of Modular 12" × 12" CRP Radiant Panels – METAMORPHING Yellow to Orange

Aluminized Steel Housing with NEMA 1 Terminal Box (4" square by 2-1/8" deep)

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20001	CRP20002	CRP20003	CRP20004	CRP20005	CRP20006	CRP20007	CRP20008	CRP20009	CRP20010
2.25	17.4	CRP20011	CRP20012	CRP20013	CRP20014	CRP20015	CRP20016	CRP20017	CRP20018	CRP20019	CRP20020
3.00	23.0	—	—	CRP20021	CRP20022	CRP20023	CRP20024	CRP20025	CRP20026	CRP20027	CRP20028
3.75	29.0	—	—	CRP20029	CRP20030	CRP20031	CRP20032	CRP20033	CRP20034	CRP20035	CRP20036
4.50	35.0	—	—	CRP20037	CRP20038	CRP20039	CRP20040	CRP20041	CRP20042	CRP20043	CRP20044

NOTE: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Stainless Steel Housing with NEMA 1 Terminal Box (Medical or Food Applications)

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20045	CRP20046	CRP20047	CRP20048	CRP20049	CRP20050	CRP20051	CRP20052	CRP20053	CRP20054
2.25	17.4	CRP20055	CRP20056	CRP20057	CRP20058	CRP20059	CRP20060	CRP20061	CRP20062	CRP20063	CRP20064
3.00	23.0	—	—	CRP20065	CRP20066	CRP20067	CRP20068	CRP20069	CRP20070	CRP20071	CRP20072
3.75	29.0	—	—	CRP20073	CRP20074	CRP20075	CRP20076	CRP20077	CRP20078	CRP20079	CRP20080
4.50	35.0	—	—	CRP20081	CRP20082	CRP20083	CRP20084	CRP20085	CRP20086	CRP20087	CRP20088

NOTE: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Replacement Heaters for Standard Modular 12" × 12" CRP Radiant Panels

Panel KW	Heater Watts	Part Number 120V No T/C	120V K T/C	120V-240V No T/C	120V-240V K T/C	240V-480V No T/C	240V-480V K T/C
1.50	500	CRL20021	CRL20022			CRL20023	CRL20024
2.25	750	—	—	CRL20025	CRL20026	CRL20027	CRL20028
3.00	1000	—	—			CRL20029	CRL20030
3.75	1250	—	—			CRL20031	CRL20032
4.50	1500	—	—			CRL20033	CRL20034

NOTES: All dual voltage heaters have two windings (parallel connected for the lower voltage & series connected for the higher voltage).

120V heaters are single winding designs.

K T/C units have an internal "low noise" style thermocouple with 12" leads.

Standard Panel Specifications

KW	Panel Watt Density***	Typical Operating Temperature** °F	°C	Primary Emitted Wavelength*
1.50	12.0	796	424	4.2
2.25	18.0	956	513	3.7
3.00	24.0	1076	580	3.4
3.75	30.0	1191	644	3.2
4.50	36.0	1308	709	3.0

*Peak infrared radiation wavelength as calculated from Wien's Law, for operating temperature shown. Expressed in microns (μm). Operating temperature based on room ambient testing @ 72°F.

**E-Mitter heater body temperature as measured with internal thermocouple when mounted facedown in stock CRK reflector and operating in 72°F/22°C room ambient.

***Watt density calculated using total heater face surface area within panel.

DANGER: Hazard of Fire. These heaters are not for use in atmospheres where flammable vapors, gases or liquids are present as defined in the National Electrical Code. Where solvents, water, etc. are being evaporated from the process it is necessary to provide substantial quantities of ventilating air to carry away all resulting vapors.

WARNING: Hazard of Electric Shock. Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.

WARNING: Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of nickel plated or nickel clad insulated copper wire is recommended. Wire insulation rating must be suitable for the ambient temperature of the wiring installation.

Installation: ***Do not mount CRP Panel Heaters closer than 6 inches to any structural material that does not have at least a 200°C (392°F) continuous temperature rating.***

CONTINUED

CRP Panel Heater with Glass Face

Made in USA

CRP 12" × 12" Modular Glass Face Panels Standard Ratings

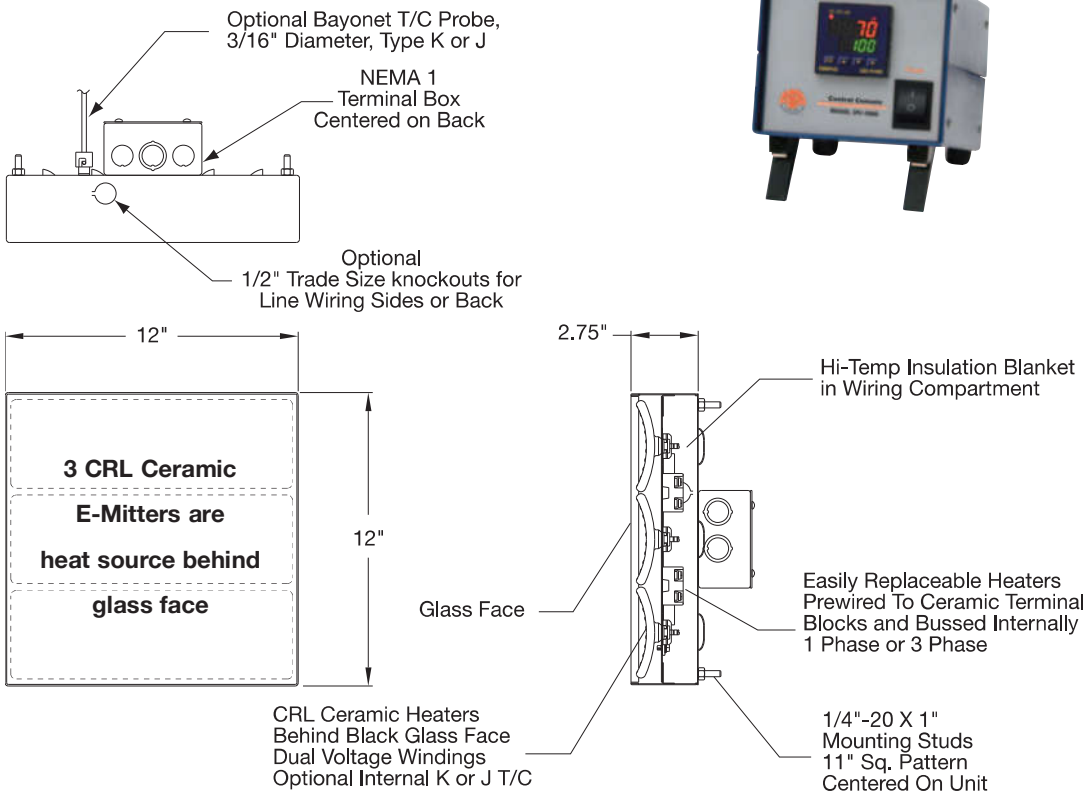
Three CRL E-Mitter heaters behind an emitting dark red glass face

Design Features

- *Dark red face glass is standard. Glass provides for ease of cleaning.*
- *Low profile 20 gauge aluminized steel or stainless steel housing*
- *Standard stocked voltage: 120, 220-240V or 480V as noted; other voltages are available.*
- *Low noise type K thermocouple mounted internally in center heater. Optional type J thermocouple is also available.*
- *Watt density range: from 11w/in² to 35w/in²*
- *Standard operating temp range: 750°F to 1300°F*
- *Best when used at radiation distances of 4-10" from application.*
- *Performance is unaffected by vibration or adverse atmospheric conditions.*
- *3 to 6µm infrared radiation wavelength.*
- *Optional clear face glass is available. If required, please specify when ordering.*
- *Made to order.*

Tabletop Point-of-Use Temperature Control Console Systems

See Section 13, page 13-52



Standard Ratings of Modular 12" × 12" CRP Glass Faced Radiant Panels

Aluminized Steel Housing with NEMA 1 Terminal Box (4" square by 2.13" deep)

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20089	CRP20090	CRP20091	CRP20092	CRP20093	CRP20094	CRP20095	CRP20096	CRP20097	CRP20098
2.25	17.4	CRP20099	CRP20100	CRP20101	CRP20102	CRP20103	CRP20104	CRP20105	CRP20106	CRP20107	CRP20108
3.00	23.0	—	—	CRP20109	CRP20110	CRP20111	CRP20112	CRP20113	CRP20114	CRP20115	CRP20116
3.75	29.0	—	—	CRP20117	CRP20118	CRP20119	CRP20120	CRP20121	CRP20122	CRP20123	CRP20124
4.50	35.0	—	—	CRP20125	CRP20126	CRP20127	CRP20128	CRP20129	CRP20130	CRP20131	CRP20132

NOTE: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Stainless Steel Housing with NEMA 1 Terminal Box (4" square by 2.13" deep)

KW	Watt Density (W/in²)	Part Number 120V No T/C	120V K T/C	240V-1Ph No T/C	240V-1Ph K T/C	240V-3Ph No T/C	240V-3Ph K T/C	480V-1Ph No T/C	480V-1Ph K T/C	480V-3Ph No T/C	480V-3Ph K T/C
1.50	11.6	CRP20133	CRP20134	CRP20135	CRP20136	CRP20137	CRP20138	CRP20139	CRP20140	CRP20141	CRP20142
2.25	17.4	CRP20143	CRP20144	CRP20145	CRP20146	CRP20147	CRP20148	CRP20149	CRP20150	CRP20151	CRP20152
3.00	23.0	—	—	CRP20153	CRP20154	CRP20155	CRP20156	CRP20157	CRP20158	CRP20159	CRP20160
3.75	29.0	—	—	CRP20161	CRP20162	CRP20163	CRP20164	CRP20165	CRP20166	CRP20167	CRP20168
4.50	35.0	—	—	CRP20169	CRP20170	CRP20171	CRP20172	CRP20173	CRP2074	CRP20175	CRP20176

NOTE: K T/C panels have one low noise internal T/C in center heater with extension wires routed into rear terminal box.

Replacement Heaters for Standard Modular 12" × 12" CRP Radiant Panels

Panel KW	Heater Watts	Part Number 120V No T/C	120V K T/C	240V-480V No T/C	240V-480V K T/C
1.50	500	CRL20021	CRL20022	CRL20023	CRL20024
2.25	750	CRL20025	CRL20026	CRL20027	CRL20028
3.00	1000	—	—	CRL20029	CRL20030
3.75	1250	—	—	CRL20031	CRL20032
4.50	1500	—	—	CRL20033	CRL20034

NOTE: All 240/480V heaters have two windings for dual voltage use (Parallel connected for 240V & series connected for 480V)

120V heaters are single winding designs.

K T/C units have an internal "low noise" style thermocouple with 12" leads.

CRP Replacement Glass

Color	Part Number
Dark Red	GLS-101-101
Clear	GLS-101-102

DANGER: Hazard of Fire. These heaters are not for use in atmospheres where flammable vapors, gases or liquids are present as defined in the National Electrical Code. Where solvents, water, etc. are being evaporated from the process it is necessary to provide substantial quantities of ventilating air to carry away all resulting vapors.

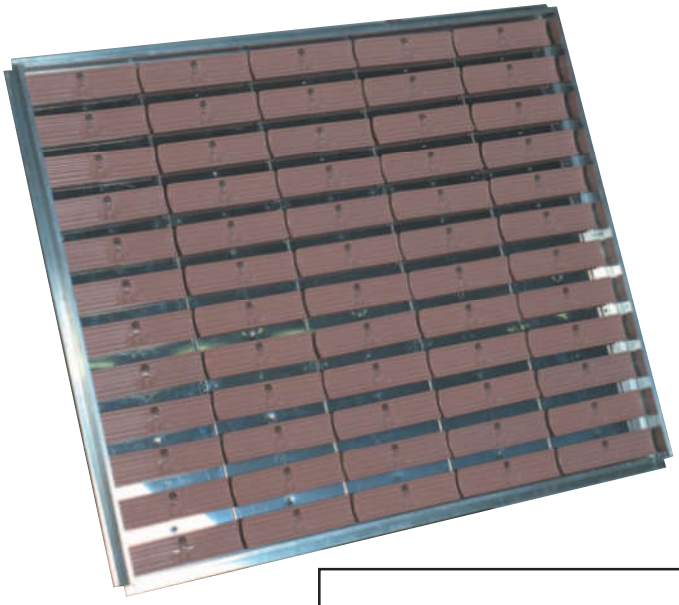
WARNING: Hazard of Electric Shock. Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.

WARNING: Do not use Copper Wire to make connections inside this heater. High temperatures will oxidize copper. Use of nickel plated or nickel clad insulated copper wire is recommended. Wire insulation rating must be suitable for the ambient temperature of the wiring installation.

Installation: ***Do not mount CRP Panel Heaters closer than 6 inches to any structural material that does not have at least a 200°C (392°F) continuous temperature rating.***

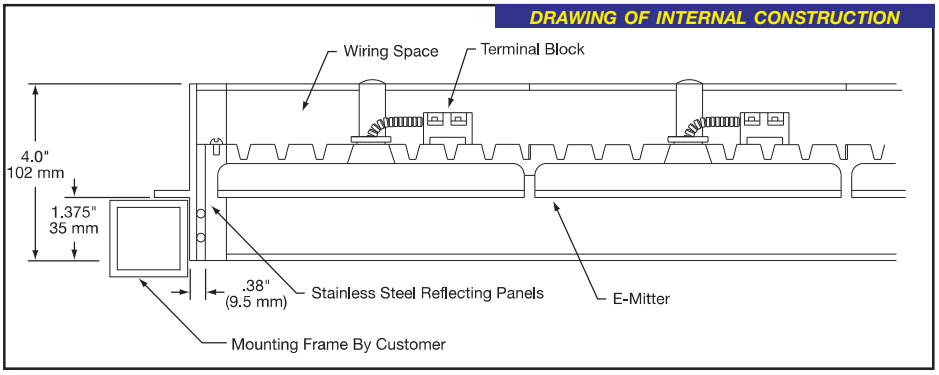
Made in USA

ARA Array Assemblies for CRB, CRN, CRM, CRC, CRZ, CRL, CRH and CRG E-Mitters®



Design Features

- *Custom Engineered/Manufactured*
- *Lightweight extruded aluminum outer housing*
- *Each heater's power leads are connected to an individual ceramic terminal block*
- *NCC or Nickel wire with heat resistant insulation is used for wiring between terminal blocks (see pages 7-21 through 7-23)*
- *Zones with different radiant heat levels can be achieved by using different wattage heaters (each zone would have a heater with built-in thermocouple for temperature control)*
- *Shipped fully assembled*
- *Optional factory wiring and power control panels*
- *Optional ceramic fiber insulation in wiring space*
- *Optional entrances in rear cover or sides to customer specs*



Steps to Design a Custom ARA E-Mitter Array for your application

1.) Select a panel array size for the Style E-Mitter:
CRB and CRN E-Mitter panel sizes can be found on page 7-29.
CRM E-Mitter panel size can be found on page 7-30.
CRC and CRZ E-Mitter panel sizes can be found on page 7-31.
CRL E-Mitter panel sizes can be found on page 7-32.
CRH and CRG E-Mitter panel sizes can be found on page 7-33.
CRD E-Mitter panel sizes can be found on page 7-35.

2.) Determine any special heat zoning.

3.) Specify any E-Mitters that will have thermocouples.

There is No Substitute for Our Experience

SATISFACTION GUARANTEED!

Ordering Information

Refer to the worksheet on page 7-36

CAUTION

DANGER: Hazard of Fire. These heaters are not for use in atmospheres where flammable vapors, gases or liquids are present as defined in the National Electrical Code. Where solvents, water, etc. are being evaporated from the process it is necessary to provide substantial quantities of ventilating air to carry away all resulting vapors.

Do not mount heater closer than 6 inches to any structural material that does not have at least a 200°C continuous temperature rating.

WARNING: Hazard of Electric Shock. Installation must be grounded to earth to avoid shock hazard. Disconnect power to installation before servicing or installing heater.

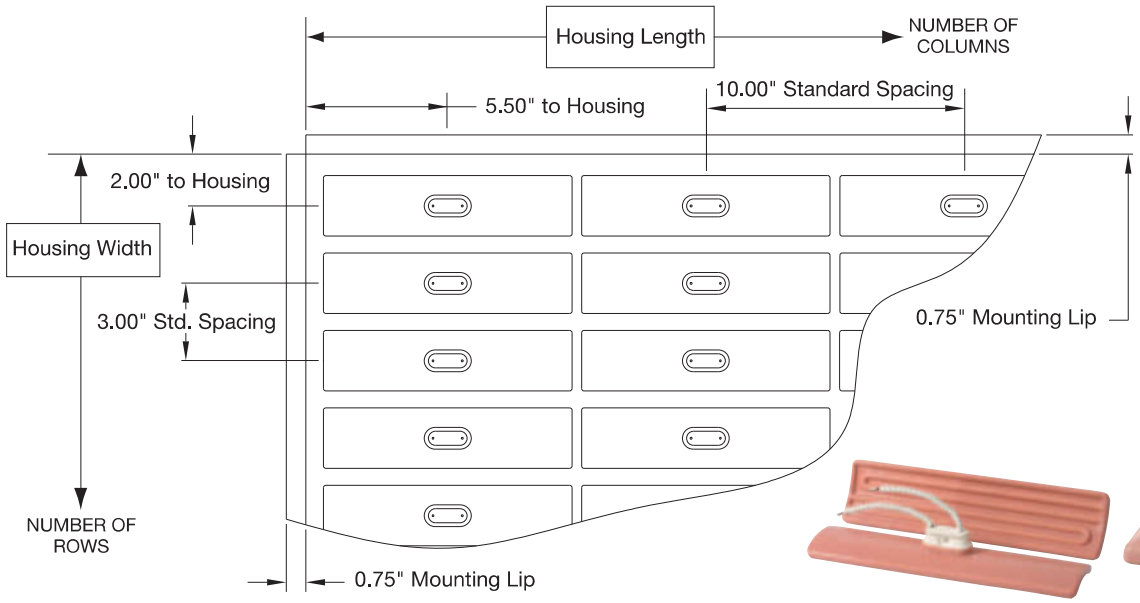
Series CRB and CRN E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L
1	4 × 11	4 × 21	4 × 31	4 × 41	4 × 51	4 × 61
2	7 × 11	7 × 21	7 × 31	7 × 41	7 × 51	7 × 61
3	10 × 11	10 × 21	10 × 31	10 × 41	10 × 51	10 × 61
4	13 × 11	13 × 21	13 × 31	13 × 41	13 × 51	13 × 61
5	16 × 11	16 × 21	16 × 31	16 × 41	16 × 51	16 × 61
6	19 × 11	19 × 21	19 × 31	19 × 41	19 × 51	19 × 61
7	22 × 11	22 × 21	22 × 31	22 × 41	22 × 51	22 × 61
8	25 × 11	25 × 21	25 × 31	25 × 41	25 × 51	25 × 61
9	28 × 11	28 × 21	28 × 31	28 × 41	28 × 51	—
10	31 × 11	31 × 21	31 × 31	31 × 41	—	—
11	34 × 11	34 × 21	34 × 31	34 × 41	—	—
12	37 × 11	37 × 21	37 × 31	37 × 41	—	—
13	40 × 11	40 × 21	40 × 31			
14	43 × 11	43 × 21	43 × 31			
15	46 × 11	46 × 21	46 × 31	—	—	—
16	49 × 11	49 × 21	—	—	—	—
17	52 × 11	52 × 21	—	—	—	—
18	55 × 11	55 × 21	—	—	—	—

Dimensions are in inches

Note: Structural Housing Dimensions (width × length) are in inches. For overall dimensions add 0.75" per side for the mounting lip.



CRB & CRN E-Mitters (60 x 245 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRB and CRN heaters is 2.50" × 10.00".
- Special narrow panels having a maximum 40 rows × 1 or 2 columns, & up to 8 rows × 12 columns can be made on special order (max. housing size 121" × 25").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

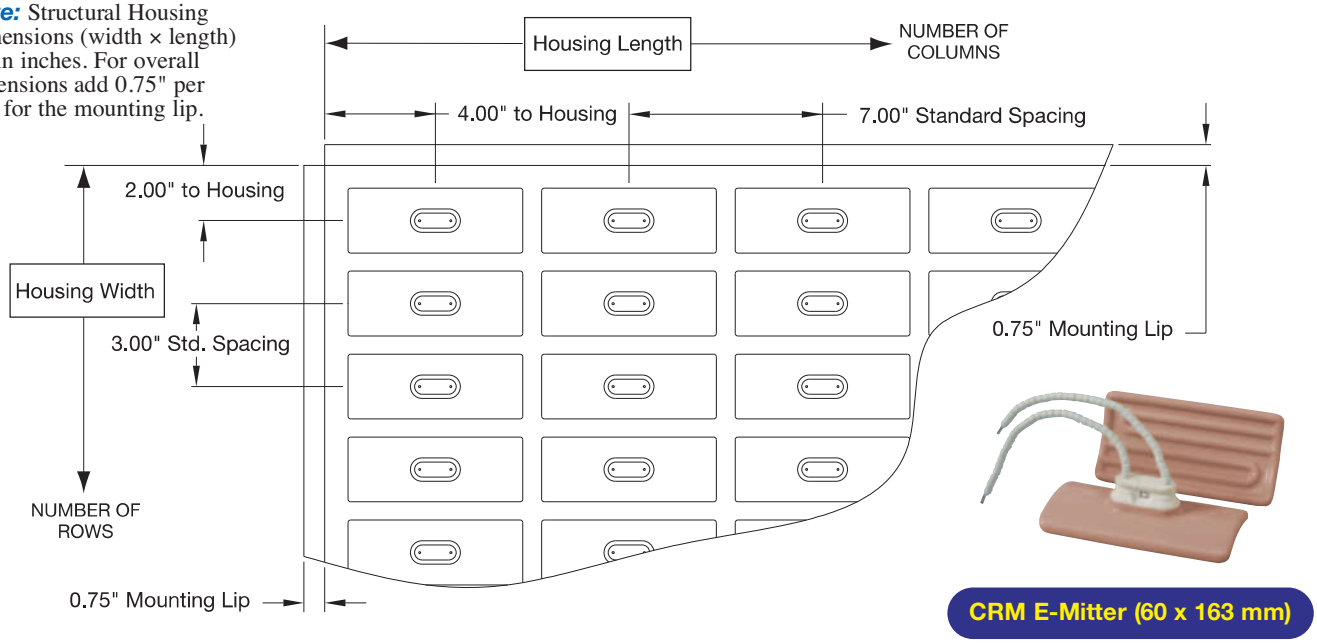
Series CRM E-Mitter Panel Arrays

Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L
1	4 × 8	4 × 15	4 × 22	4 × 29	4 × 36	4 × 43	4 × 50	4 × 57	4 × 64
2	7 × 8	7 × 15	7 × 22	7 × 29	7 × 36	7 × 43	7 × 50	7 × 57	7 × 64
3	10 × 8	10 × 15	10 × 22	10 × 29	10 × 36	10 × 43	10 × 50	10 × 57	10 × 64
4	13 × 8	13 × 15	13 × 22	13 × 29	13 × 36	13 × 43	13 × 50	13 × 57	13 × 64
5	16 × 8	16 × 15	16 × 22	16 × 29	16 × 36	16 × 43	16 × 50	16 × 57	16 × 64
6	19 × 8	19 × 15	19 × 22	19 × 29	19 × 36	19 × 43	19 × 50	19 × 57	19 × 64
7	22 × 8	22 × 15	22 × 22	22 × 29	22 × 36	22 × 43	22 × 50	22 × 57	22 × 64
8	25 × 8	25 × 15	25 × 22	25 × 29	25 × 36	25 × 43	25 × 50	25 × 57	25 × 64
9	28 × 8	28 × 15	28 × 22	28 × 29	28 × 36	28 × 43	28 × 50	—	—
10	31 × 8	31 × 15	31 × 22	31 × 29	31 × 36	31 × 43	31 × 50	—	—
11	34 × 8	34 × 15	34 × 22	34 × 29	34 × 36	34 × 43	—	—	—
12	37 × 8	37 × 15	37 × 22	37 × 29	37 × 36	37 × 43	—	—	—
13	40 × 8	40 × 15	40 × 22	40 × 29	40 × 36	—	Dimensions are in inches		
14	43 × 8	43 × 15	43 × 22	43 × 29	—	—			
15	46 × 8	46 × 15	46 × 22	46 × 29	—	—	—	—	—
16	49 × 8	49 × 15	49 × 22	—	—	—	—	—	—
17	52 × 8	52 × 15	52 × 22	—	—	—	—	—	—
18	55 × 8	55 × 15	55 × 22	—	—	—	—	—	—

Note: Structural Housing Dimensions (width × length) are in inches. For overall dimensions add 0.75" per side for the mounting lip.



CRM E-Mitter (60 x 163 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRM heaters is 2.50" × 7.00".
- Special narrow panels having a maximum 40 rows × 1, 2, or 3 columns, & up to 8 rows × 18 columns can be made on special order (max. housing size 127" × 25").

Consult us with your requirements.
There is no substitute for our experience.

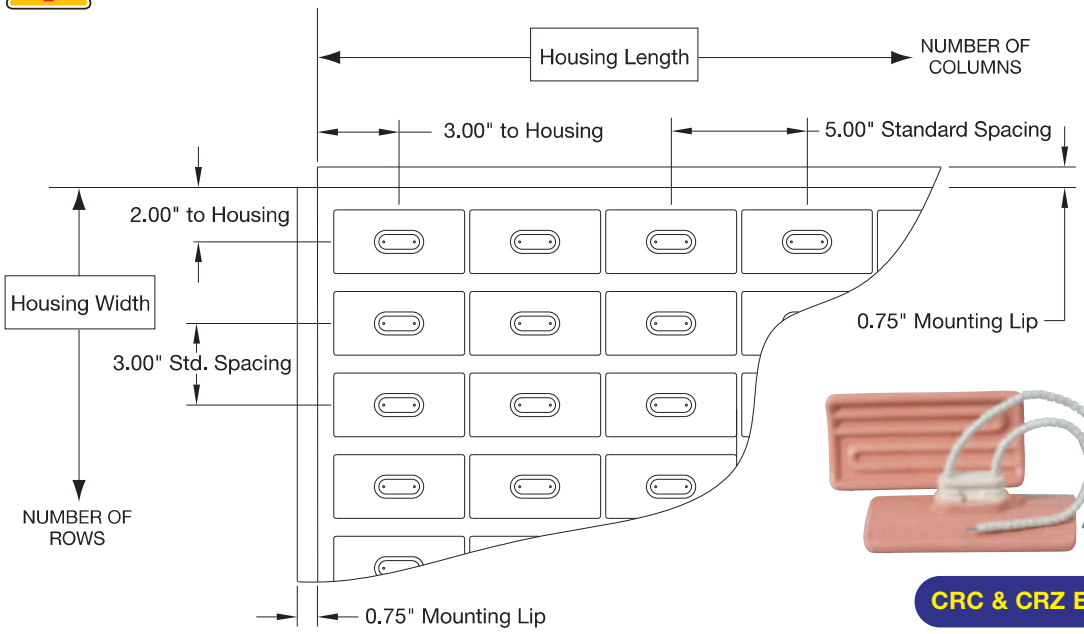
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Series CRC and CRZ E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	4 × 6	4 × 11	4 × 16	4 × 21	4 × 26	4 × 31	4 × 36	4 × 41	4 × 46	4 × 51	4 × 56	4 × 61
2	7 × 6	7 × 11	7 × 16	7 × 21	7 × 26	7 × 31	7 × 36	7 × 41	7 × 46	7 × 51	7 × 56	7 × 61
3	10 × 6	10 × 11	10 × 16	10 × 21	10 × 26	10 × 31	10 × 36	10 × 41	10 × 46	10 × 51	10 × 56	10 × 61
4	13 × 6	13 × 11	13 × 16	13 × 21	13 × 26	13 × 31	13 × 36	13 × 41	13 × 46	13 × 51	13 × 56	13 × 61
5	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
6	19 × 6	19 × 11	19 × 16	19 × 21	19 × 26	19 × 31	19 × 36	19 × 41	19 × 46	19 × 51	19 × 56	19 × 61
7	22 × 6	22 × 11	22 × 16	22 × 21	22 × 26	22 × 31	22 × 36	22 × 41	22 × 46	22 × 51	22 × 56	22 × 61
8	25 × 6	25 × 11	25 × 16	25 × 21	25 × 26	25 × 31	25 × 36	25 × 41	25 × 46	25 × 51	25 × 56	25 × 61
9	28 × 6	28 × 11	28 × 16	28 × 21	28 × 26	28 × 31	28 × 36	28 × 41	28 × 46	28 × 51	—	—
10	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	—	—	—	—
11	34 × 6	34 × 11	34 × 16	34 × 21	34 × 26	34 × 31	34 × 36	34 × 41	—	—	—	—
12	37 × 6	37 × 11	37 × 16	37 × 21	37 × 26	37 × 31	37 × 36	37 × 41	—	—	—	—
13	40 × 6	40 × 11	40 × 16	40 × 21	40 × 26	40 × 31	—	—	Dimensions are in inches			—
14	43 × 6	43 × 11	43 × 16	43 × 21	43 × 26	43 × 31	—	—				—
15	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	—	—	—	—	—	—
16	49 × 6	49 × 11	49 × 16	49 × 21	—	—	—	—	—	—	—	—
17	52 × 6	52 × 11	52 × 16	52 × 21	—	—	—	—	—	—	—	—
18	55 × 6	55 × 11	55 × 16	55 × 21	—	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width × length) are in inches.
For overall dimensions add 0.75" per side for the mounting lip.



CRC & CRZ E-Mitters (60 x 122 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRC and CRZ heaters is 2.50" × 5.00".
- Special narrow panels having a maximum 40 rows × 1, 2, 3 or 4 columns, & up to 8 rows × 12 columns can be made on special order (max. housing size 121" × 25").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Series CRL E-Mitter Panel Arrays

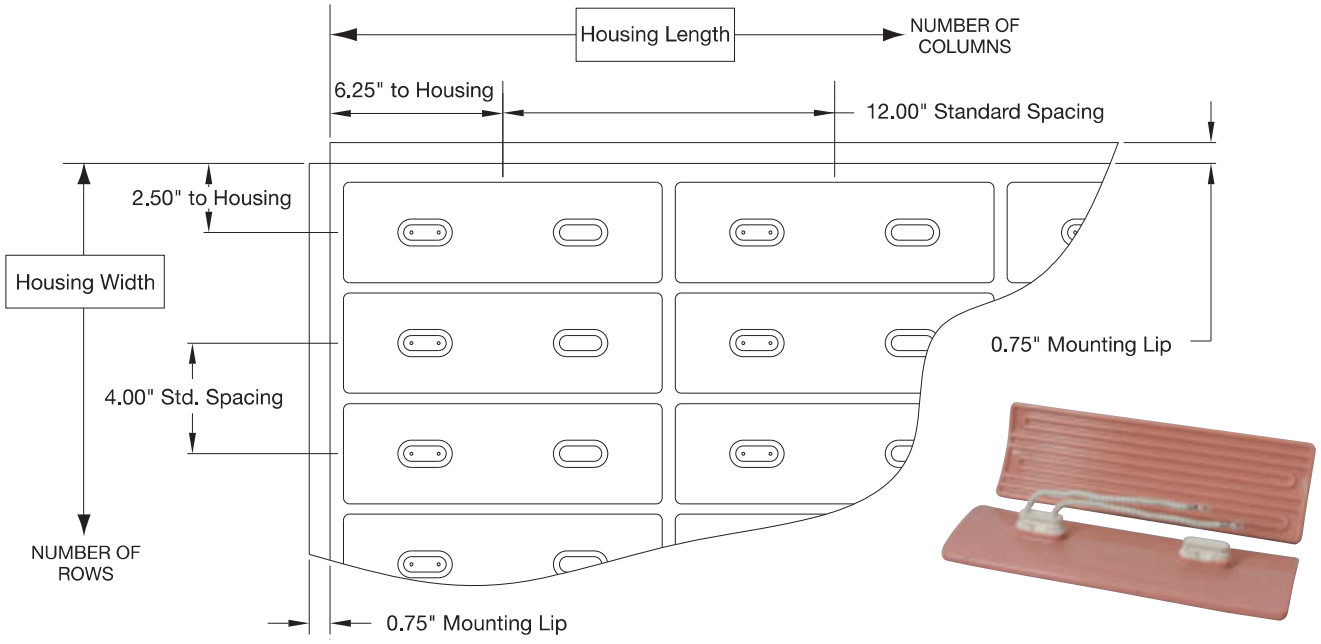
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L
1	5 × 12.5	5 × 24.5	5 × 36.5	5 × 48.5	5 × 60.5
2	9 × 12.5	9 × 24.5	9 × 36.5	9 × 48.5	9 × 60.5
3	13 ×12.5	13 × 24.5	13 × 36.5	13 × 48.5	13 × 60.5
4	17 × 12.5	17 × 24.5	17 × 36.5	17 × 48.5	17 × 60.5
5	21 × 12.5	21 × 24.5	21 × 36.5	21 × 48.5	21 × 60.5
6	25 × 12.5	25 × 24.5	25 × 36.5	25 × 48.5	25 × 60.5
7	29 × 12.5	29 × 24.5	29 × 36.5	29 × 48.5	—
8	33 × 12.5	33 × 24.5	33 × 36.5	—	—
9	37 × 12.5	37 × 24.5	37 × 36.5	—	—
10	41 × 12.5	41 × 24.5	41 × 36.5	—	—
11	45 × 12.5	45 × 24.5	45 × 36.5	—	—
12	49 × 12.5	49 × 24.5	—	—	—
13	53 × 12.5	53 × 24.5			
14	57 × 12.5	57 × 24.5			
15	61 × 12.5	61 × 24.5	—	—	—

Dimensions are in inches

Note: Structural Housing Dimensions (width × length) are in inches. For overall dimensions add 0.75" per side for the mounting lip.



CRL E-Mitter (95 x 295 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRL heaters is 4.00" × 12.00".
- Special narrow panels having a maximum 30 rows × 1 or 2 columns, & up to 6 rows × 9 columns can be made on special order (max. housing size 121" × 25").

Consult us with your requirements
There is no substitute for our experience.

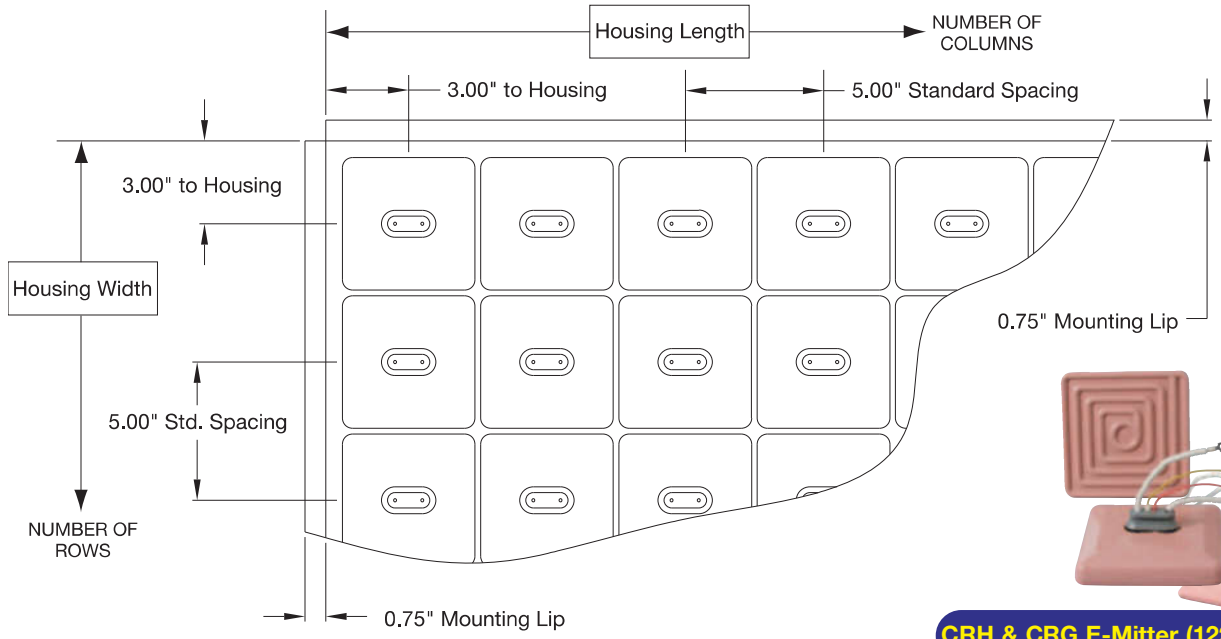
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

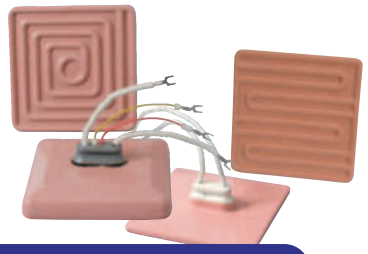
Series CRH and CRG E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	6 × 6	6 × 11	6 × 16	6 × 21	6 × 26	6 × 31	6 × 36	6 × 41	6 × 46	6 × 51	6 × 56	6 × 61
2	11 × 6	11 × 11	11 × 16	11 × 21	11 × 26	11 × 31	11 × 36	11 × 41	11 × 46	11 × 51	11 × 56	11 × 61
3	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
4	21 × 6	21 × 11	21 × 16	21 × 21	21 × 26	21 × 31	21 × 36	21 × 41	21 × 46	21 × 51	21 × 56	21 × 61
5	26 × 6	26 × 11	26 × 16	26 × 21	26 × 26	26 × 31	26 × 36	26 × 41	26 × 46	26 × 51	26 × 56	26 × 61
6	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	31 × 46	31 × 51	—	—
7	36 × 6	36 × 11	36 × 16	36 × 21	36 × 26	36 × 31	36 × 36	36 × 41	36 × 46	—	—	—
8	41 × 6	41 × 11	41 × 16	41 × 21	41 × 26	41 × 31	41 × 36	41 × 41	—	—	—	—
9	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	46 × 36	—	—	Dimensions are in inches		
10	51 × 6	51 × 11	51 × 16	51 × 21	51 × 26	51 × 31	—	—	—			
11	56 × 6	56 × 11	56 × 16	56 × 21	56 × 26	—	—	—	—	—	—	—
12	61 × 6	61 × 11	61 × 16	61 × 21	61 × 26	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width × length) are in inches.
For overall dimensions add 0.75" per side for the mounting lip.





CRH & CRG E-Mitter (122 x 122 mm)

Custom Engineered/Manufactured Panels

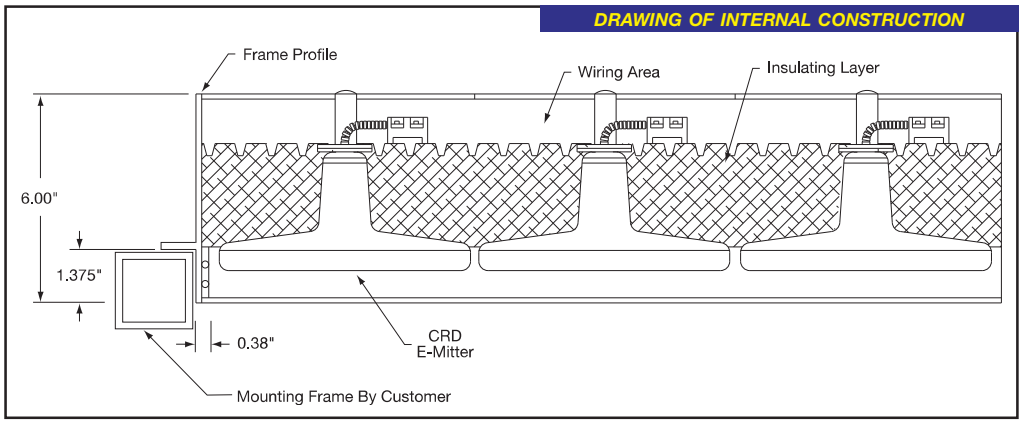
- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRH and CRG heaters is 5.00" × 5.00".
- Special narrow panels having a maximum 25 rows × 1 or 2 columns, & up to 8 rows × 9 columns can be made on special order (max. housing size 121" × 26").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

ARA Array Assemblies for CRD E-Mitters

Design Features

- *Lightweight extruded aluminum outer housing.*
- *All metal interior components are stainless steel.*
- *Designed for use with Style CRD E-Mitters, pages 7-10 and 7-11.*
- *Each heater's power leads are connected to an individual ceramic Terminal Block.*
- *NCC or Nickel wire with heat resistant insulation is used for wiring between terminal blocks.*
- *Zones with different radiant heat levels can be achieved by using different wattage heaters (each zone would have a heater with built-in thermocouple for temperature control).*
- *Shipped fully assembled.*
- *Optional factory wiring and power control panels.*
- *Optional ceramic fiber insulation in wiring space.*
- *Optional entrances in rear cover or sides to customer specs.*



The housing for the CRD heaters is the same construction as all ARA arrays except for the extra height needed for the long shaft of the CRD heaters. This space is then filled with ceramic fiber insulation with foil backing to keep the wiring and terminal area much cooler.

Ordering Information

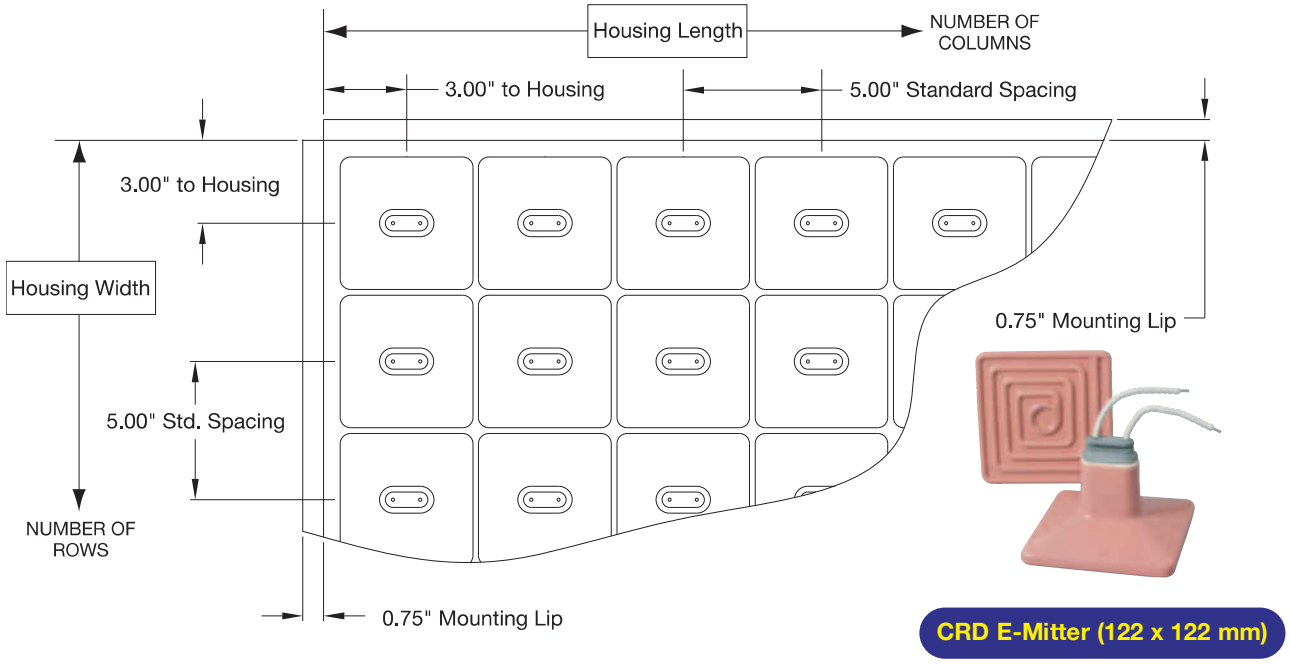
Refer to the worksheet on page 7-36

Series CRD E-Mitter Panel Arrays
Standard Style ARA Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	6 × 6	6 × 11	6 × 16	6 × 21	6 × 26	6 × 31	6 × 36	6 × 41	6 × 46	6 × 51	6 × 56	6 × 61
2	11 × 6	11 × 11	11 × 16	11 × 21	11 × 26	11 × 31	11 × 36	11 × 41	11 × 46	11 × 51	11 × 56	11 × 61
3	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
4	21 × 6	21 × 11	21 × 16	21 × 21	21 × 26	21 × 31	21 × 36	21 × 41	21 × 46	21 × 51	21 × 56	21 × 61
5	26 × 6	26 × 11	26 × 16	26 × 21	26 × 26	26 × 31	26 × 36	26 × 41	26 × 46	26 × 51	26 × 56	26 × 61
6	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	31 × 46	31 × 51	—	—
7	36 × 6	36 × 11	36 × 16	36 × 21	36 × 26	36 × 31	36 × 36	36 × 41	36 × 46	—	—	—
8	41 × 6	41 × 11	41 × 16	41 × 21	41 × 26	41 × 31	41 × 36	41 × 41	—	—	—	—
9	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	46 × 36	—	—	Dimensions are in inches		
10	51 × 6	51 × 11	51 × 16	51 × 21	51 × 26	51 × 31	—	—	—			
11	56 × 6	56 × 11	56 × 16	56 × 21	56 × 26	—	—	—	—	—	—	—
12	61 × 6	61 × 11	61 × 16	61 × 21	61 × 26	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width × length) are in inches.
For overall dimensions add 0.75" per side for the mounting lip.



CRD E-Mitter (122 x 122 mm)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays.
- Consult factory for larger panels not shown in table or custom panels with other spacings. Minimum spacing for CRD heaters is 5.00" × 5.00".
- Special narrow panels having a maximum 25 rows × 1 or 2 columns, & up to 8 rows × 9 columns can be made on special order (max. housing size 121" × 26").

We welcome your inquiries.
Take advantage of Tempco's economical approach to manufacturing panels.

Made in USA

ARA Array Panel Design Worksheet for Ceramic E-Mitters

Ordering Information

To process your order or quotation, please specify the following information.

1.) Supply panel layout or sketch showing:

- Outside panel dimensions (allow for 0.75" wide mounting lip on all sides of ARA structural array housing)
- Heater type and orientation of long (or short) heater dimension
- Layout of rows and columns with number of heaters
- Spacing of rows and columns (Tempco will use standard spacing unless specified by customer)
- Zones and/or number of heaters per zone
- Locations of input wiring
- Locations of heaters with thermocouples (if used)

2.) Electrical requirements:

- Total panel KW _____
- Zone KWs (or # of heaters in zones)

_____

- Line voltage to panel, # of circuits & 1 or 3 phase operation

_____

- If 480V, can series-parallel wiring and 240V heaters be used?

_____

- Type of heater control to be used

_____

3.) Heater specifications:

- E-Mitter Style ❒ CRB ❒ CRC ❒ CRG ❒ CRN ❒ CRZ ❒ CRD ❒ CRH ❒ CRL ❒ CRM
- Catalog Part Number _____ or Watts _____ Volts _____ Color for all heaters (T/C & non-T/C types)

_____

- Standard K thermocouple or optional J _____ Quantity _____
- Heater lead configuration (Standard is 3.5" ceramic beads with spade terminals if factory wired)

  Special terminals if required _____

4.) Panel wiring & control options:

❒ Standard unit wiring is heaters to terminal blocks only

❒ Factory wired per customer specs and wiring diagram

❒ Tempco Engineering to design internal wiring and determine line input requirements

❒ Tempco to supply turnkey power control panel(s)

5.) Any special features required? _____

_____

_____

6.) Application data:

- Type of application and physical properties of processed materials _____

_____

_____

ARA Array Housing Assemblies for Any Style Ceramic E-Mitter

17.5 KW 380V 4-Zone
CRH E-Mitters

9 KW 480V 3-Zone
3 × 3 CRB E-Mitters

4 Rows CRH E-Mitters
4 Rows CRZ E-Mitters (at ends)

There Is No Substitute For Our Experience

Complete, made-to-order infrared heating systems – including the power and process temperature control panel – are available. Our team of professionals will assist you from concept to design/manufacturing. We Welcome Your Inquiries.

Assembly and Wiring of a Custom E-Mitter Panel

Power/Temperature Control Panels

Design Features

- *Solid state or mechanical load switching*
- *Temperature control*
- *Over-temperature control — A second thermocouple senses for over-temperature, shutting down the system while activating a signal light or optional alarm horn. Solid State controls and mechanical contactors can fail in the on position so it is very important to have this safety backup feature.*
- *Control circuit transformer with primary and secondary fusing*
- *NEMA 12 enclosure — NEMA 1 construction*
- *Manual disconnect switch with interlocking operating mechanism so power must be off in order to open cabinet*
- *Cooling fan and filter for solid state units*
- *Wiring diagram, parts list and operating instructions*

Note: See pages 13-56 through 13-63 for more information on Power and Temperature Control Panels.

Made in USA

Type CRE & CRR Edison Screw-In Bulb E-Mitters

Typical Applications

- *Plastic Thermoforming and vacuum forming*
- *Curing adhesives*
- *Curing dental composite material*
- *Heating laboratory samples and specimens*
- *Comfort heat for agricultural, zoological and reptilian pet applications*
- *Preventing moisture accumulation and freezing in electrical control boxes*
- *Preventing moisture accumulation, mildew and freezing in clothes lockers*
- *Resistor Banks*
- *Agricultural*
- *Agency Approval:* c UL us

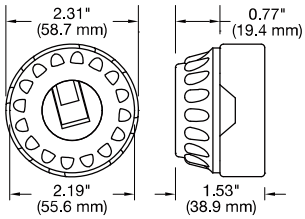
Design Features

- ✳ *Provides safe, clean, radiant heat anywhere*
- ✳ *Easy installation*
- ✳ *Not affected by vibration— high mechanical strength*
- ✳ *Good resistance to atmospheric contamination*
- ✳ *Does not generate visible light— only heat*
- ✳ *Reversible color change feature*
- ✳ *3.5 to 7µm infrared radiation peak wavelength*

Screw-In Base

Ceramic receptacle for use with screw-in bulb E-Mitters

Part Number: CRK00016



Type CRE & CRR E-Mitters

Edison Screw-In Bulb E-Mitters

The CRE and CRR Style E-Mitters are hollow ceramic heaters with a unique thin wall construction and geometrical shape to facilitate fast heating and cooling rates.

The resistance coil is embedded into the specially designed circular ceramic E-mitter surface, providing extremely uniform heat transmission with low element surface temperatures.

Because of the convenient Edison Screw-In style termination, CRE & CRR E-Mitters are recognized as a tremendously versatile source for localized spot heating. They can be used virtually anywhere quickly and easily by simply installing the CRE E-Mitter into common porcelain/ceramic insulated bulb sockets—like any ordinary light bulb.

CRR E-Mitters being loaded into firing furnace.

Ordering Information

Catalog Heaters

For shipment directly from Stock, choose the Ceramic Infrared Radiant Heater from the stock list that fills your requirements.

Optional metamorphing yellow or straight black can be manufactured to order to meet your requirements. A part number will be assigned when an order is placed.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a CRE & CRR Bulb Style Ceramic Infrared Heater to meet your requirements. ***Standard lead time is 3 weeks.***

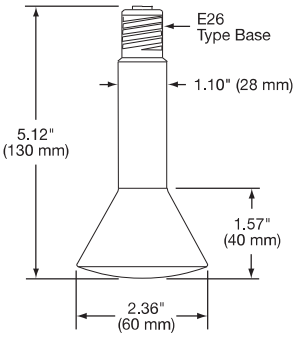
Please Specify the following:

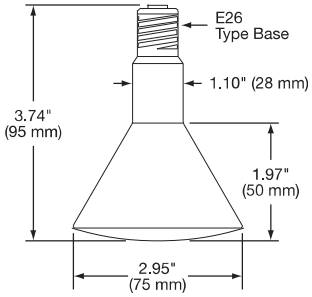
- ❑ **Size:** Overall dimensions or Series Code
- ❑ **Colors:** Standard colors are metamorphing rose and white; optional colors are metamorphing yellow and straight black
- ❑ **Wattage:** Description of process and temperature required

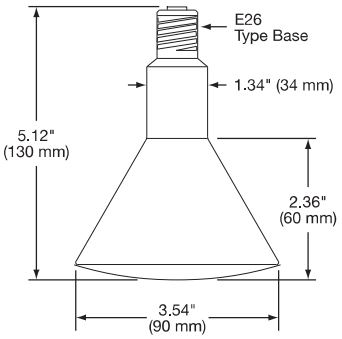
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

View Product Inventory @ www.tempco.com

Type CRE Edison Screw-In Bulb E-Mitters



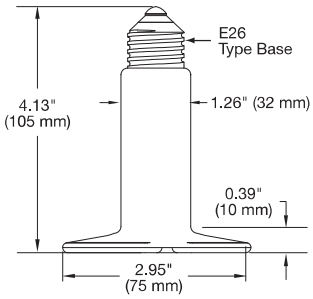


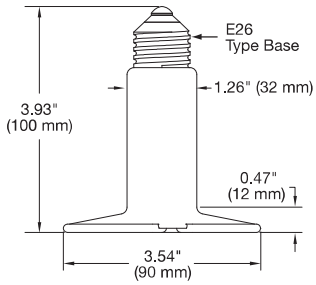


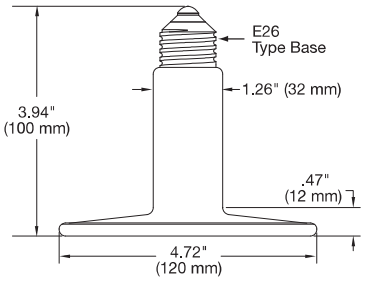
Standard (Non-Stock) CRE E-Mitters

Diameter	Wattage	Voltage	Color	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	*Surface Temperature (Typical) °C	Part Number
60mm	60	120	Rose to Grey	13.26	6.45	842	450	CRE10014
	60	120	White	13.26	6.45	842	450	CRE00014
	100	120	Rose to Grey	22.60	10.76	887	477	CRE10015
	100	120	White	22.60	10.76	887	477	CRE00015
75mm	60	120	Rose to Grey	8.49	1.32	662	350	CRE10012
	60	120	White	8.49	1.32	662	350	CRE00012
	100	120	Rose to Grey	14.15	2.19	788	420	CRE10013
	100	120	White	14.15	2.19	788	420	CRE00013
90mm	150	120	Rose to Grey	15.59	2.41	842	450	CRE10008
	150	120	White	15.59	2.41	842	450	CRE00008
	250	120	Rose to Grey	22.98	4.02	986	530	CRE10002
	250	120	White	22.98	4.02	986	530	CRE00002

Type CRR Edison Screw-In Bulb E-Mitters







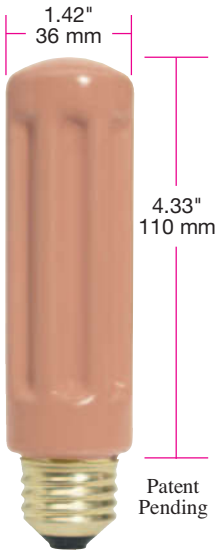
Standard (Non-Stock) CRR E-Mitters (Color — White)

Diameter	Wattage	Watt Density (W/in²)	Watt Density (W/cm²)	*Surface Temperature (Typical) °F	*Surface Temperature (Typical) °C	Part Number 120V
75mm	60	8.77	1.36	640	338	CRR00005
	100	14.62	2.26	710	377	CRR00006
90mm	100	10.16	1.57	655	346	CRR00003
	150	15.24	2.36	760	404	CRR00004
	200	20.32	3.14	950	510	CRR00007
120mm	100	5.71	0.88	400	204	CRR00008
	150	8.57	1.33	485	252	CRR00009
	200	14.29	2.21	670	354	CRR00010

*E-Mitter (operating in 72°F/22°C ambient) face temperature measured with internal thermocouple.

Made in USA

Stock CRT E-Mitters



Series CRT — Tube Shaped E-Mitter

Tempco's Edison Screw-In Bulb Series CRT E-Mitter is a hollow, tube-shaped ceramic heater ideally suited for wide area heating.

Standard colors are metamorphing rose and straight white; optional are metamorphing yellow and straight black.

Typical Applications

- *Preventing moisture accumulation and freezing in electrical control boxes*
- *Preventing moisture accumulation, mildew and freezing in clothes lockers*
- *Resistor Banks*
- *Incubators*

Standard (Non-Stock) and Stock CRT E-Mitters (Color — METAMORPHING Rose to Grey)

Stock Items Are Shown In RED

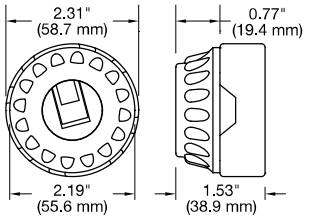
Wattage	*Surface Temperature (Typical) °F	°C	Part Number 120V	240V
50	464	240	CRT10100	—
75	567	297	CRT10101	CRT10106
100	671	355	CRT10102	CRT10107
150	824	440	CRT10103	CRT10108
200	937	503	CRT10104	CRT10109
250	1049	565	CRT10105	CRT10110

*E-Mitter (operating in 72°F/22°C ambient) surface temperature measured with a thermocouple.

Screw-In Base

Ceramic receptacle for use with screw-in bulb E-Mitters

Part Number: CRK00016



Ordering Information

Standard Heaters

Order by Part Number for Stock heaters.

Custom Engineered/Manufactured Heaters

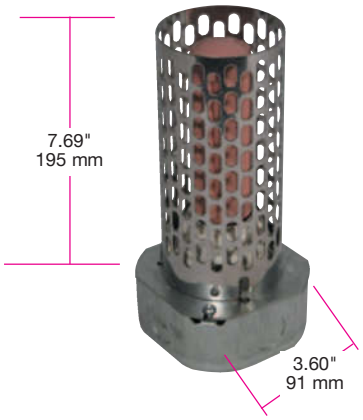
Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** can manufacture a CRT E-Mitter to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ **Colors:** Standard are metamorphing rose and straight white, optional are metamorphing yellow and straight black
- ❑ **Housing:** NEMA 1 (if required)
- ❑ **Voltage:** 120 or 240
- ❑ **Wattage:** 250W maximum

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

EHC Ceramic E-Mitter Enclosure Heaters



Typical Applications

- *Traffic Signal Control Boxes*
- *Automatic Teller Machines (ATMs)*
- *Outdoor Electrical Power Enclosures*
- *Control Panels*
- *Control Valve Housings*
- *Switch Gear*
- *Clothing Lockers*

Tempco enclosure heaters are the answer to all your enclosure heater needs. Our heaters are designed to help electric, electronic, pneumatic, hydraulic and mechanical equipment perform at top capacity by protecting them against low temperatures, condensation and corrosion. Tempco offers many different styles of heaters that can be used in enclosure heating applications. Our most popular styles are displayed below.

EHC Enclosure Heaters with NEMA 1 Housing

Watts	Volts	Color	Part Number	Replacement Heater Bulb
50	120	Rose to Grey	EHC10100	CRT10100
75	120	Rose to Grey	EHC10101	CRT10101
75	240	Rose to Grey	EHC10106	CRT10106
100	120	Rose to Grey	EHC10102	CRT10102
100	240	Rose to Grey	EHC10107	CRT10107
150	120	Rose to Grey	EHC10103	CRT10103
150	240	Rose to Grey	EHC10108	CRT10108
200	120	Rose to Grey	EHC10104	CRT10104
200	240	Rose to Grey	EHC10109	CRT10109
250	120	Rose to Grey	EHC10105	CRT10105
250	240	Rose to Grey	EHC10110	CRT10110

See page 11-114 for help in sizing and determining the best enclosure heater for your application.

EHA — Remote Thermostats for Enclosure Heaters

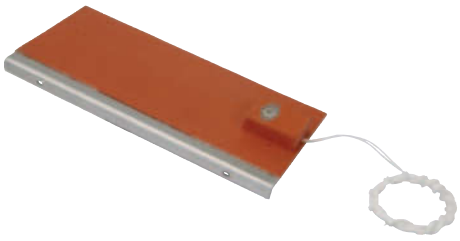
See Page 9-18 for details

Stock EHA Remote Thermostats

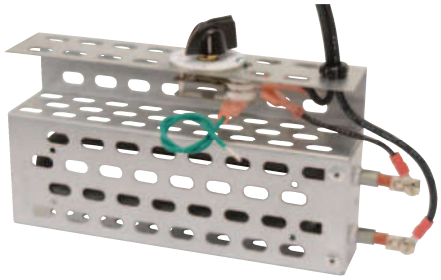
Opens °F	Closes °F	Part Number
60±5	40±7	EHA00001
140±5	110±10	EHA00002
180±5	150±10	EHA00003

Other Types of Enclosure Heaters

Finned Strip Heater
See Page 8-14



Silicone Rubber Heater
See Page 9-18



Tubular Heater
See Page 11-115

Made in USA

High Intensity Medium Wave Quartz Mini-Tube Infrared Heaters
KTE (Translucent Tubes) & KTG (Clear Tubes with Gold Coated Ceramic Backing)

Series KTE — Translucent Tubes

Series KTG — Clear Tubes with Gold Coated Ceramic Backing

Up to 95% reflective efficiency using gold coated ceramic backing

Design Features

- ✳ *Standard industry sizes and ratings up to 60 w/in² (interchangeable with CRC, CRB, CRN and CRZ ceramic heaters).*
- ✳ *Highly reflective rugged aluminized steel housing construction.*
- ✳ *Rapid response — 2.5 to 7.5 deg F / sec. heat-up / cool-down rates, depending on unit watt density.*
- ✳ *Medium wavelength output (2.5 – 6 microns).*
- ✳ *Standard winding pattern gives uniform heating over entire face of heater. (Consult factory for custom or high intensity winding patterns and/or sizes.)*
- ✳ *Optional built-in type K or J T/C available in center of unit face.*
- ✳ *Ideal for systems requiring small area zoning and close control of process.*
- ✳ *Best when used at radiation distances of 4 – 10" from work.*
- ✳ *Suitable for horizontal or vertical operation with tubes in horizontal plane.*
- ✳ *Designed for use in CRA linear structural housings and ARV array assemblies. See pages 7-48 through 7-51.*
- ✳ *120, 208, 240, 277 or 480V design (consult factory for 575V units)*

Typical Applications

- ➵ *Ideal for drying, adhesive and epoxy bonding/curing*
- ➵ *Laminating*
- ➵ *Shrink packaging*
- ➵ *Thermoforming plastics*
- ➵ *Other processes requiring fast penetration of heat into metals, wood, synthetic fabrics, and plastics*

Ordering Information

Standard Heaters

Order by Part Number for Standard heaters.

Custom Engineered/Manufactured KTE Heaters

An electric heater can be very application specific; for sizes not listed, **TEMPCO** will design and manufacture a KTE or KTG E-Mitter or complete system to meet your requirements.

Standard lead time is 3 weeks.

Please Specify the following:

- ❑ **Housing Length**
- ❑ **Housing Width**
- ❑ **Mounting Style (S, C)**
- ❑ **Wattage**
- ❑ **Voltage**
- ❑ **KTE Translucent Quartz or KTG Clear Tubes with Gold Coated Ceramic Backing**
- ❑ **Beaded Lead Length:** Standard 6"
- ❑ **Thermocouple:** Optional Type K (Standard 6")
- ❑ **Options and Accessories:** See pages 7-20 through 7-23

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

6 Standard KTE & KTG Housing Sizes Available

Series KTE1 & KTG1
9.75" × 2.46" (247.7 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE1)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG1)

Series KTE2 & KTG2
4.88" × 2.46" (123.8 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE2)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG2)

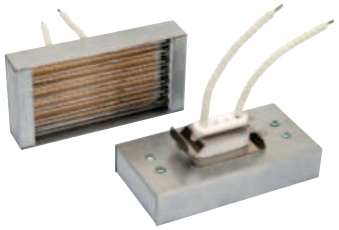
Series KTE3 & KTG3
7.31" × 2.46" (185.7 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE3)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG3)

Series KTE4 & KTG4
14.63" × 2.46" (371.5 × 62.5 mm)
Available in Two Constructions
— Translucent Tubes (KTE4)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG4)

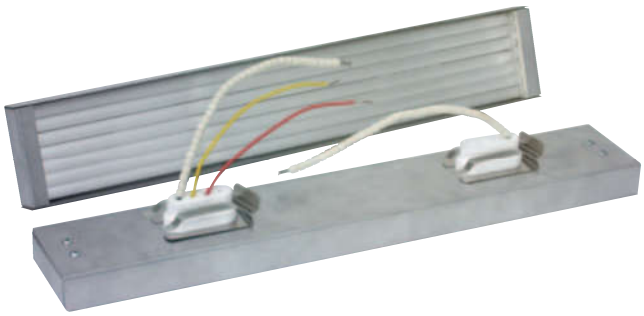
Series KTE5
19.50" × 2.46" (495.3 × 62.5 mm)
Available with Translucent Tubes only

Series KTE6 & KTG6
4.88" Square (123.8 mm)
— Translucent Tubes (KTE6)
— Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing (KTG6)

2 Universal Mounting Styles (C & S) Available



Style C – Single Ceramic Header with Leads
(Shown with Clear Tubes with Hi-Efficiency Gold Coated Ceramic Backing)

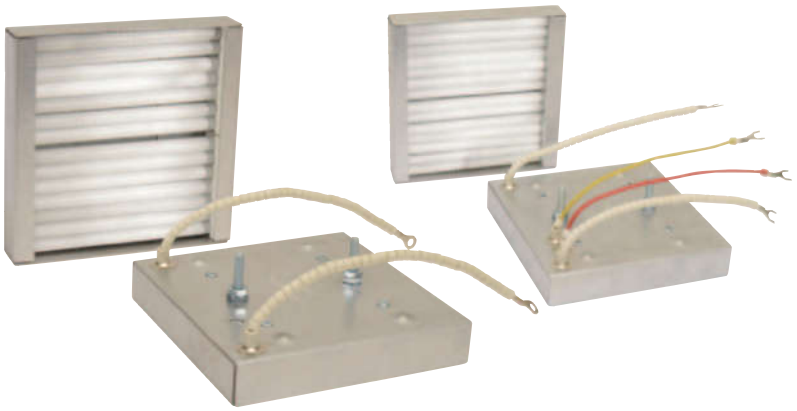


Style C – Two Ceramic Headers with Leads
(Shown with Translucent Tubes and T/C)

INTERCHANGEABLE MOUNTING DESIGN

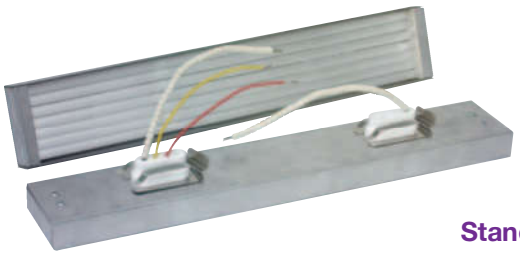
Style C KTE and KTG E-Mitters have a Standard Ceramic Mounting Head and are interchangeable with CRC, CRB, CRN and CRZ Ceramic E-Mitters.

Style S – Two 10-32 Studs × 1" on centerline
(Shown with Translucent Tubes and T/C)



Made in USA

KTE & KTG Series Style C



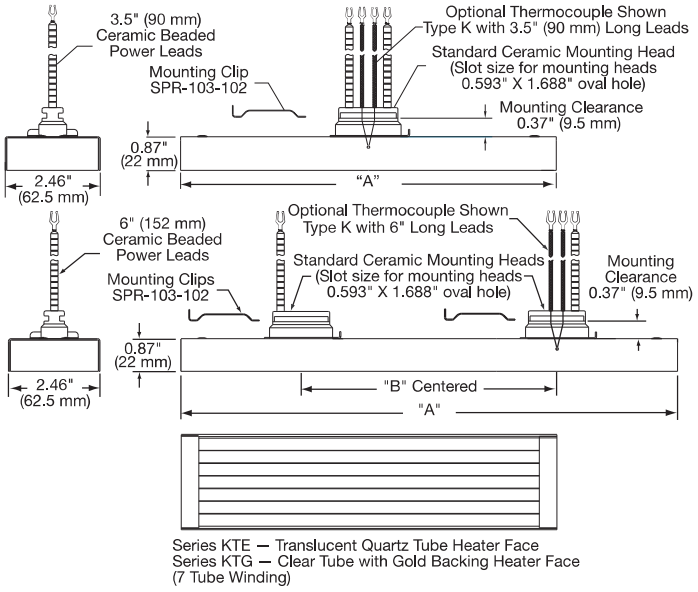
Series Style C (Ceramic Header with Leads)
High Intensity Quartz Mini-Tube Infrared Heaters
KTE (Translucent Tubes)
& KTG (Clear Tubes with Gold Coated Ceramic Backing)

Standard (Non-Stock) Sizes and Ratings

Heaters listed have ceramic bead insulated leads (single head 3.5", dual head 6"), #8-10 spade terminals, and one-piece spring clips for mounting in 20 or 22 gauge sheet metal.

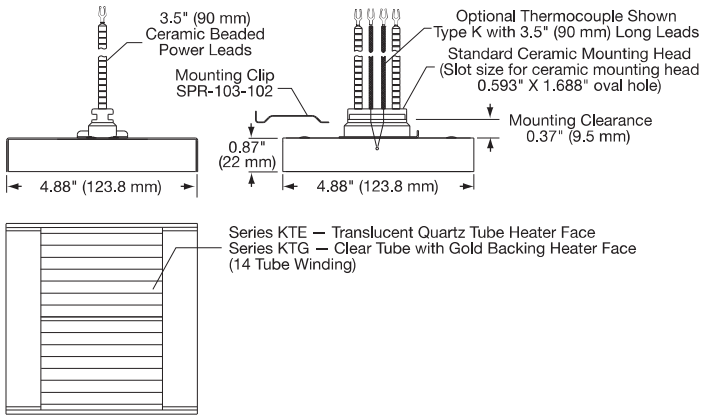
Wattage	Volts	Drawing	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Translucent Tubes: Part Number without Thermocouple	Translucent Tubes: Part Number with Optional Type K Thermocouple	Gold Coated Ceramic Backing: Part Number without Thermocouple	Gold Coated Ceramic Backing: Part Number with Optional Type K Thermocouple
125	220/240	C1 (Single Head)					KTE20015	KTE20016	KTG20011	KTG20012
200	220/240	C1 (Single Head)					KTE20017	KTE20018	KTG20013	KTG20014
250	220/240	C1 (Single Head)	4.88	123.8	N/A	N/A	KTE20019	KTE20020	KTG20015	KTG20016
325	220/240	C1 (Single Head)					KTE20021	KTE20022	KTG20017	KTG20018
500	220/240	C1 (Single Head)					KTE20023	KTE20024	KTG20019	KTG20020
185	220/240	C1 (Single Head)					KTE30011	KTE30012	KTG30011	KTG30012
300	220/240	C1 (Single Head)					KTE30013	KTE30014	KTG30013	KTG30014
375	220/240	C1 (Single Head)	7.31	185.7	N/A	N/A	KTE30015	KTE30016	KTG30015	KTG30016
500	220/240	C1 (Single Head)					KTE30017	KTE30018	KTG30017	KTG30018
750	220/240	C1 (Single Head)					KTE30019	KTE30020	KTG30019	KTG30020
250	220/240	C1 (Single Head)					KTE10023	KTE10024	KTG10012	KTG10013
400	220/240	C1 (Single Head)					KTE10025	KTE10026	KTG10014	KTG10015
500	220/240	C1 (Single Head)	9.75	247.7	N/A	N/A	KTE10027	KTE10028	KTG10016	KTG10017
650	220/240	C1 (Single Head)					KTE10029	KTE10030	KTG10018	KTG10019
1000	220/240	C1 (Single Head)					KTE10031	KTE10032	KTG10020	KTG10021
375	220/240	C1 (Double Head)					KTE40011	KTE40012	KTG40011	KTG40012
600	220/240	C1 (Double Head)					KTE40013	KTE40014	KTE40013	KTE40014
750	220/240	C1 (Double Head)	14.63	371.5	7.40	188.1	KTE40015	KTE40016	KTG40015	KTG40016
1000	220/240	C1 (Double Head)					KTE40017	KTE40018	KTG40017	KTG40018
1500	220/240	C1 (Double Head)					KTE40019	KTE40020	KTG40019	KTG40020
500	220/240	C1 (Double Head)					KTE50011	KTE50012	—	—
800	220/240	C1 (Double Head)					KTE50013	KTE50014	—	—
1000	220/240	C1 (Double Head)	19.50	495.3	9.88	250.8	KTE50015	KTE50016	—	—
1500	220/240	C1 (Double Head)					KTE50017	KTE50018	—	—
2000	220/240	C1 (Double Head)					KTE50019	KTE50020	—	—
250	220/240	C2					KTE60011	KTE60012	KTG60011	KTG60012
400	220/240	C2					KTE60013	KTE60014	KTG60013	KTG60014
500	220/240	C2	See Drawing				KTE60015	KTE60016	KTG60015	KTG60016
650	220/240	C2					KTE60017	KTE60018	KTG60017	KTG60018
1000	220/240	C2					KTE60019	KTE60020	KTG60019	KTG60020

Drawing C1 – Single and Double Head Rectangular Heater



Series KTE — Translucent Quartz Tube Heater Face
Series KTG — Clear Tube with Gold Backing Heater Face
(7 Tube Winding)

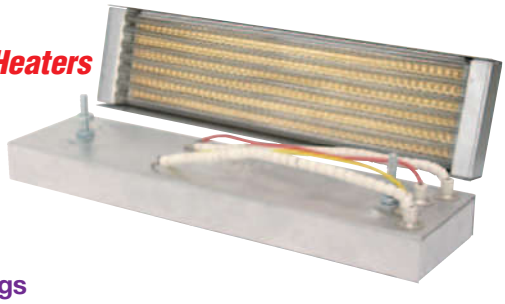
Drawing C2 – Single Head Square Heater



Series KTE — Translucent Quartz Tube Heater Face
Series KTG — Clear Tube with Gold Backing Heater Face
(14 Tube Winding)

View Product Inventory @ www.tempco.com

Series Style S (Mounting Studs)
High Intensity Quartz Mini-Tube Infrared Heaters
KTE (Translucent Tubes)
& KTG (Clear Tubes with Gold Coated Ceramic Backing)

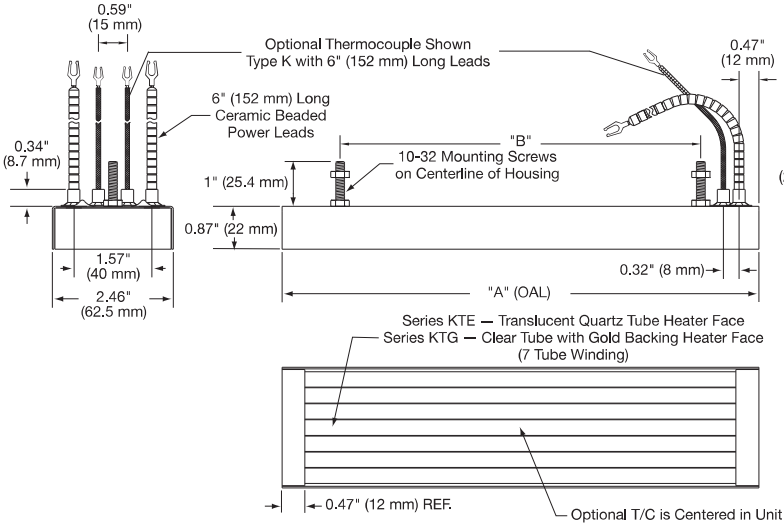


Standard (Non-Stock) Sizes and Ratings

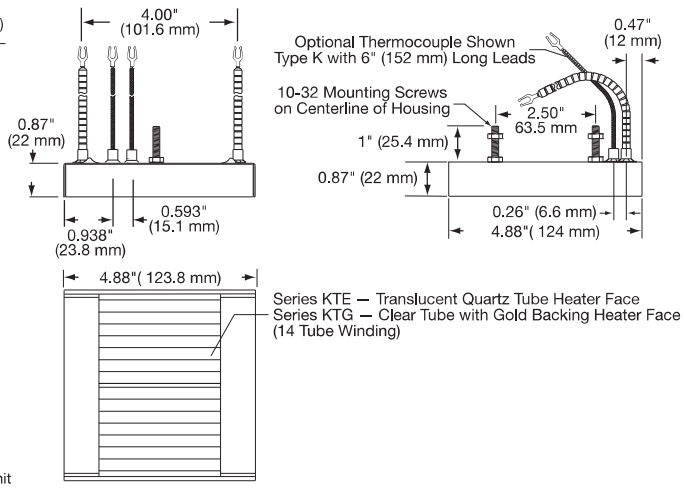
Heaters listed have 6" ceramic bead insulated leads with #8-10 spade terminals.

Wattage	Volts	Drawing	"A" Dim. in	"A" Dim. mm	"B" Dim. in	"B" Dim. mm	Translucent Tubes: Part Number without Thermocouple	Translucent Tubes: Part Number with Optional Type K Thermocouple	Gold Coated Ceramic Backing: Part Number without Thermocouple	Gold Coated Ceramic Backing: Part Number with Optional Type K Thermocouple
125	220/240	S1	4.88	123.8	2.50	63.5	KTE20001	KTE20002	KTG20001	KTG20002
200	220/240	S1					KTE20003	KTE20004	KTG20003	KTG20004
250	220/240	S1					KTE20005	KTE20006	KTG20005	KTG20006
325	220/240	S1					KTE20007	KTE20008	KTG20007	KTG20008
500	220/240	S1					KTE20009	KTE20010	KTG20009	KTG20010
185	220/240	S1	7.31	185.7	4.94	125.4	KTE30001	KTE30002	KTG30001	KTG30002
300	220/240	S1					KTE30003	KTE30004	KTG30003	KTG30004
375	220/240	S1					KTE30005	KTE30006	KTG30005	KTG30006
500	220/240	S1					KTE30007	KTE30008	KTG30007	KTG30008
750	220/240	S1					KTE30009	KTE30010	KTG30009	KTG30010
250	220/240	S1	9.75	247.7	7.38	187.3	KTE10001	KTE10002	KTG10002	KTG10003
400	220/240	S1					KTE10003	KTE10004	KTG10004	KTG10005
500	220/240	S1					KTE10005	KTE10006	KTG10006	KTG10007
650	220/240	S1					KTE10007	KTE10008	KTG10008	KTG10009
1000	220/240	S1					KTE10009	KTE10010	KTG10010	KTG10011
375	220/240	S1	14.63	371.5	12.25	311.2	KTE40001	KTE40002	KTG40001	KTG40002
600	220/240	S1					KTE40003	KTE40004	KTE40003	KTE40004
750	220/240	S1					KTE40005	KTE40006	KTG40005	KTG40006
1000	220/240	S1					KTE40007	KTE40008	KTG40007	KTG40008
1500	220/240	S1					KTE40009	KTE40010	KTG40009	KTG40010
500	220/240	S1	19.50	495.3	17.13	435.0	KTE50001	KTE50002	—	—
800	220/240	S1					KTE50003	KTE50004	—	—
1000	220/240	S1					KTE50005	KTE50006	—	—
1500	220/240	S1					KTE50007	KTE50008	—	—
2000	220/240	S1					KTE50009	KTE50010	—	—
250	220/240	S2	See Drawing				KTE60001	KTE60002	KTG60001	KTG60002
400	220/240	S2					KTE60003	KTE60004	KTG60003	KTG60004
500	220/240	S2					KTE60005	KTE60006	KTG60005	KTG60006
650	220/240	S2					KTE60007	KTE60008	KTG60007	KTG60008
1000	220/240	S2					KTE60009	KTE60010	KTG60009	KTG60010

Drawing S1 – Rectangular Heater



Drawing S2 – Square Heater



Made in USA

KTE Heater Specifications

KTE1 Series – 9.75" × 2.46" Housing
KTE6 Series – 4.88" Square Housing
Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
150	8.30	7.12	608	554	4.89	5.14
163	9.02	7.73	638	583	4.75	5.00
200	11.07	9.49	714	656	4.44	4.67
250	13.84	11.86	798	740	4.15	4.35
300	16.60	14.23	868	809	3.93	4.11
325	17.99	15.42	898	839	3.84	4.01
350	19.37	16.60	926	868	3.76	3.93
400	22.14	18.98	978	918	3.63	3.78
500	27.67	23.72	1070	1006	3.41	3.56
600	33.20	28.46	1154	1083	3.23	3.38
650	35.97	30.83	1194	1119	3.15	3.30
700	38.74	33.21	1232	1154	3.08	3.23
750	41.51	35.58	1269	1188	3.02	3.16
800	44.27	37.95	1303	1222	2.96	3.10
875	48.42	41.51	1349	1269	2.88	3.02
900	49.81	42.69	1363	1284	2.86	2.99
1000	55.34	47.44	1411	1339	2.79	2.90

KTE2 Series – 4.88" × 2.46" Housing
Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
100	12.29	10.53	753	695	4.30	4.52
125	15.36	13.16	838	779	4.02	4.21
150	18.43	15.79	907	848	3.82	3.99
163	20.02	17.16	939	880	3.73	3.89
200	24.57	21.05	1020	959	3.52	3.68
250	30.71	26.32	1117	1049	3.31	3.46
300	36.86	31.58	1206	1130	3.13	3.28
325	39.93	34.21	1248	1169	3.05	3.20
350	43.00	36.84	1287	1206	2.99	3.13
400	49.14	42.11	1356	1276	2.87	3.00
500	61.43	52.63	1451	1389	2.73	2.82

KTE3 Series – 7.31" × 2.46" Housing
Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
100	7.63	6.54	578	526	5.02	5.29
125	9.54	8.18	658	602	4.66	4.91
150	11.45	9.81	726	669	4.40	4.62
163	12.44	10.66	758	700	4.28	4.50
200	15.27	13.08	836	777	4.03	4.22
250	19.08	16.35	921	862	3.78	3.95
300	22.90	19.62	992	931	3.59	3.75
325	24.81	21.26	1024	962	3.51	3.67
350	26.72	22.89	1055	992	3.44	3.59
400	30.53	26.16	1114	1046	3.31	3.46
500	38.17	32.70	1224	1147	3.10	3.25
600	45.80	39.24	1321	1239	2.93	3.07
650	49.62	42.51	1361	1281	2.86	3.00
700	53.44	45.78	1396	1320	2.81	2.93
750	57.25	49.05	1425	1355	2.77	2.87

KTE4 Series – 14.63" × 2.46" Housing
Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
200	7.63	6.54	578	526	5.02	5.29
250	9.54	8.18	658	602	4.66	4.91
300	11.45	9.81	726	669	4.40	4.62
375	14.31	12.26	811	752	4.10	4.30
400	15.27	13.08	836	777	4.03	4.22
500	19.08	16.35	921	862	3.78	3.95
600	22.90	19.62	992	931	3.59	3.75
750	28.63	24.53	1085	1019	3.38	3.53
800	30.53	26.16	1114	1046	3.31	3.46
900	34.35	29.43	1171	1098	3.20	3.35
1000	38.17	32.70	1224	1147	3.10	3.25
1250	47.71	40.88	1341	1261	2.90	3.03
1500	57.25	49.05	1425	1355	2.77	2.87

KTE5 Series – 19.50" × 2.46" Housing

Watts/Square Inch vs. Temperature Data

Heater Wattage	Heater Face Watt Density*		Heater Body Temp @ 72°F**		Peak Emitted Wavelength*** (microns)	
	Style S	Style C	Style S	Style C	Style S	Style C
250	7.16	6.13	556	505	5.14	5.41
300	8.59	7.36	620	565	4.83	5.09
375	10.73	9.20	702	645	4.49	4.72
400	11.45	9.81	726	669	4.40	4.62
500	14.31	12.26	811	752	4.10	4.30
600	17.17	14.71	880	822	3.89	4.07
750	21.47	18.39	966	907	3.66	3.82
800	22.90	19.62	992	931	3.59	3.75
900	25.76	22.07	1040	977	3.48	3.63
1000	28.62	24.52	1085	1019	3.38	3.53
1250	35.78	30.65	1191	1116	3.16	3.31
1500	42.93	36.78	1287	1205	2.99	3.13
1650	47.22	40.46	1336	1255	2.90	3.04
1700	48.65	41.69	1351	1271	2.88	3.01
1750	50.09	42.91	1366	1286	2.86	2.99
1800	51.52	44.14	1379	1301	2.84	2.96
1900	54.38	46.59	1403	1329	2.80	2.92
2000	57.24	49.04	1425	1355	2.77	2.87

***Heater Face Watt Density**

Watt density calculation is based on heater face surface area, which is a relative constant value used to relate different sizes of heaters. The 6 tube KTE (Style S) has a surface area 85.7% of a 7 tube unit and will operate at a temperature 16.6% higher than the 7 tube (Style C) unit. This relationship has been confirmed through laboratory testing on various sizes of KTE heaters.

****Heater Body Temp @ 72°F**

Heater face temperature as measured with a type K thermocouple mounted directly on the heater face. Temperatures are for a single heater facing down with target re-radiation from an oxidized SS surface 3" from heater face. Operating temperatures (and emitted wavelength) will vary with application conditions such as higher ambient, target absorption properties, moving/stationary systems, and distance to target. The tabulated temperatures are averages compiled from standardized lab tests on different ratings and sizes of KTE heaters. Translucent tube testing showed that various reflector materials and surface conditions (bright, oxidized, etc.) had little or no effect on test results. Lower heater temperatures will occur if radiation is allowed to dissipate freely from the surface without target re-radiation (about 20-25% lower when facing up in open air).

*****Peak Emitted Wavelength**

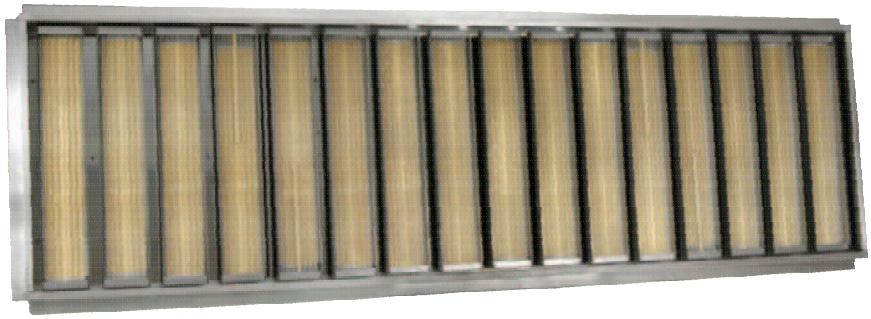
Peak infrared radiation wavelength as calculated from Wien's Displacement Law, for the operating temperature shown, expressed in microns (μm). The emissivity of KTE quartz heaters is close to the ideal blackbody value of 1.0 (range is from .88 to .92). This has been confirmed by testing using a thermal infrared camera.

Custom CRA Linear Heater Assemblies for KTE and KTG E-Mitters Using Standard Components

Do It Yourself or let Tempco build an array to your exact specifications.

The CRK Linear Housings assembly (page 7-19) and other components on pages 7-16 through 7-23 for Ceramic E-Mitters are also used with KTE and KTG E-Mitters.

Custom ARV Array Housing Assemblies for KTE and KTG E-Mitters (see pages 7-48 through 7-51)



Series KTE1 E-Mitter Panel Arrays

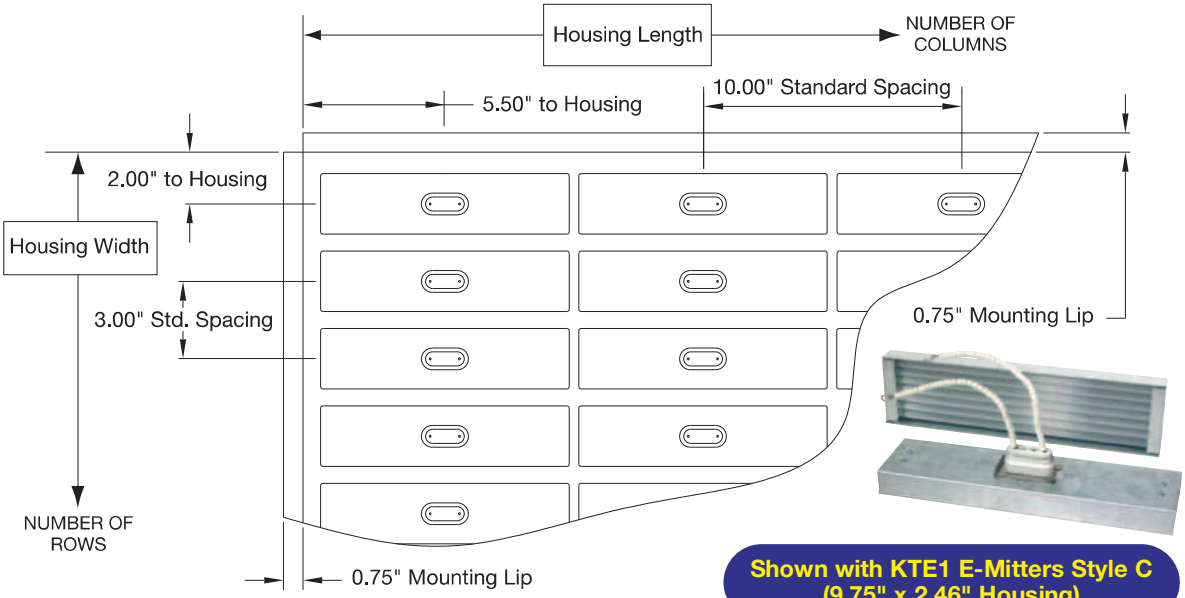
Standard Style ARV Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Note: Structural Housing Dimensions (width × length) are in inches. For overall dimensions add 0.75" per side for the mounting lip.

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L
1	4 × 11	4 × 21	4 × 31	4 × 41	4 × 51	4 × 61
1	4 × 11	4 × 21	4 × 31	4 × 41	4 × 51	4 × 61
2	7 × 11	7 × 21	7 × 31	7 × 41	7 × 51	7 × 61
3	10 × 11	10 × 21	10 × 31	10 × 41	10 × 51	10 × 61
4	13 × 11	13 × 21	13 × 31	13 × 41	13 × 51	13 × 61
5	16 × 11	16 × 21	16 × 31	16 × 41	16 × 51	16 × 61
6	19 × 11	19 × 21	19 × 31	19 × 41	19 × 51	19 × 61
7	22 × 11	22 × 21	22 × 31	22 × 41	22 × 51	22 × 61
8	25 × 11	25 × 21	25 × 31	25 × 41	25 × 51	25 × 61
9	28 × 11	28 × 21	28 × 31	28 × 41	28 × 51	—
10	31 × 11	31 × 21	31 × 31	31 × 41	—	—
11	34 × 11	34 × 21	34 × 31	34 × 41	—	—
12	37 × 11	37 × 21	37 × 31	37 × 41	—	—
13	40 × 11	40 × 21	40 × 31			
14	43 × 11	43 × 21	43 × 31			
15	46 × 11	46 × 21	46 × 31	—	—	—
16	49 × 11	49 × 21	—	—	—	—
17	52 × 11	52 × 21	—	—	—	—
18	55 × 11	55 × 21	—	—	—	—

Dimensions are in inches



Shown with KTE1 E-Mitters Style C (9.75" x 2.46" Housing)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays. Custom panels with other spacings are available.
- Minimum spacing for KTE1 heaters is 3.00" × 10.00". Special narrow panels having a maximum 40 rows × 1 or 2 columns, and up to 8 rows × 12 columns can be made on special order (max. housing size 121" × 25").
- Consult factory for larger panels not shown in table. Array panels can be adapted for either the 10-32 stud mount or ceramic heater style heaters. Specify heater mounting type when ordering (C or S style).

Consult us with your requirements.
There is no substitute for experience.

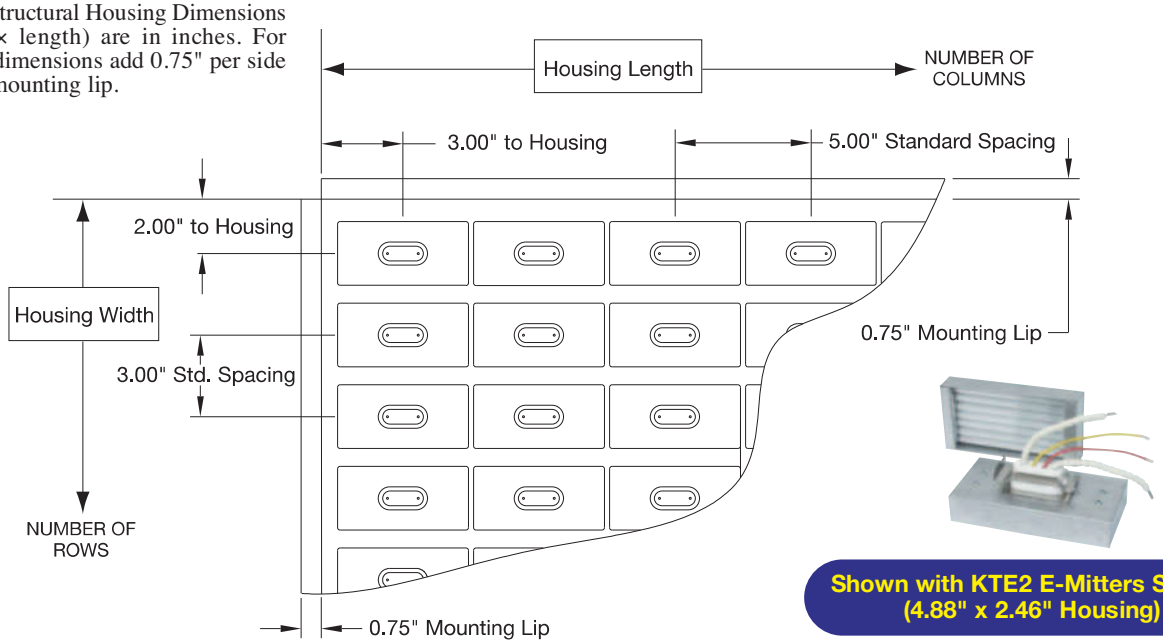
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Series KTE2 E-Mitter Panel Arrays
Standard Style ARV Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	4 × 6	4 × 11	4 × 16	4 × 21	4 × 26	4 × 31	4 × 36	4 × 41	4 × 46	4 × 51	4 × 56	4 × 61
2	7 × 6	7 × 11	7 × 16	7 × 21	7 × 26	7 × 31	7 × 36	7 × 41	7 × 46	7 × 51	7 × 56	7 × 61
3	10 × 6	10 × 11	10 × 16	10 × 21	10 × 26	10 × 31	10 × 36	10 × 41	10 × 46	10 × 51	10 × 56	10 × 61
4	13 × 6	13 × 11	13 × 16	13 × 21	13 × 26	13 × 31	13 × 36	13 × 41	13 × 46	13 × 51	13 × 56	13 × 61
5	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
6	19 × 6	19 × 11	19 × 16	19 × 21	19 × 26	19 × 31	19 × 36	19 × 41	19 × 46	19 × 51	19 × 56	19 × 61
7	22 × 6	22 × 11	22 × 16	22 × 21	22 × 26	22 × 31	22 × 36	22 × 41	22 × 46	22 × 51	22 × 56	22 × 61
8	25 × 6	25 × 11	25 × 16	25 × 21	25 × 26	25 × 31	25 × 36	25 × 41	25 × 46	25 × 51	25 × 56	25 × 61
9	28 × 6	28 × 11	28 × 16	28 × 21	28 × 26	28 × 31	28 × 36	28 × 41	28 × 46	28 × 51	—	—
10	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	—	—	—	—
11	34 × 6	34 × 11	34 × 16	34 × 21	34 × 26	34 × 31	34 × 36	34 × 41	—	—	—	—
12	37 × 6	37 × 11	37 × 16	37 × 21	37 × 26	37 × 31	37 × 36	37 × 41	—	—	—	—
13	40 × 6	40 × 11	40 × 16	40 × 21	40 × 26	40 × 31	—	—	—	—	—	—
14	43 × 6	43 × 11	43 × 16	43 × 21	43 × 26	43 × 31	—	—	Dimensions are in inches			—
15	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	—	—				—
16	49 × 6	49 × 11	49 × 16	49 × 21	—	—	—	—	—	—	—	—
17	52 × 6	52 × 11	52 × 16	52 × 21	—	—	—	—	—	—	—	—
18	55 × 6	55 × 11	55 × 16	55 × 21	—	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width × length) are in inches. For overall dimensions add 0.75" per side for the mounting lip.



Shown with KTE2 E-Mitters Style C (4.88" x 2.46" Housing)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays. Standard single panel construction is not offered beyond limits shown. Custom panels with other spacings are available.
- Minimum spacing for KTE2 heaters is 3.00" × 5.00". Special narrow panels having a maximum 40 rows × 1, 2, 3, or 4 columns, and up to 8 rows × 24 columns can be made on special order (max. housing size 121" × 25").
- Consult factory for larger panels not shown in table. Array panels can be adapted for either the 10-32 stud mount or ceramic heater style heaters. Specify heater mounting type when ordering (C or S style).

Consult us with your requirements.
There is no substitute for experience.

ARV Custom Structural Panel Arrays

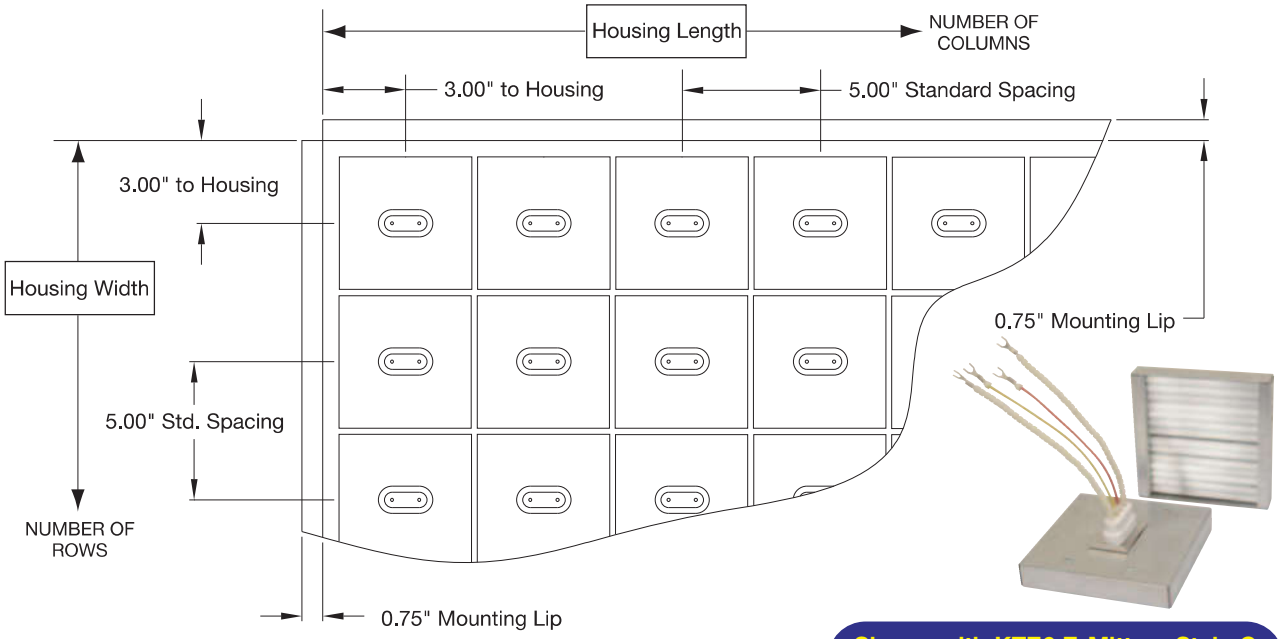
Made in USA

Series KTE6 and KTG6 E-Mitter Panel Arrays
Standard Style ARV Structural Housing Dimensions

A) The Number of Rows will determine the Housing Width. For overall width add 1.50" (for the mounting lips).
B) The Number of Columns will determine the Housing Length. For overall length add 1.50" (for the mounting lips).

Number of Rows	Number of Columns 1 W x L	2 W x L	3 W x L	4 W x L	5 W x L	6 W x L	7 W x L	8 W x L	9 W x L	10 W x L	11 W x L	12 W x L
1	6 × 6	6 × 11	6 × 16	6 × 21	6 × 26	6 × 31	6 × 36	6 × 41	6 × 46	6 × 51	6 × 56	6 × 61
2	11 × 6	11 × 11	11 × 16	11 × 21	11 × 26	11 × 31	11 × 36	11 × 41	11 × 46	11 × 51	11 × 56	11 × 61
3	16 × 6	16 × 11	16 × 16	16 × 21	16 × 26	16 × 31	16 × 36	16 × 41	16 × 46	16 × 51	16 × 56	16 × 61
4	21 × 6	21 × 11	21 × 16	21 × 21	21 × 26	21 × 31	21 × 36	21 × 41	21 × 46	21 × 51	21 × 56	21 × 61
5	26 × 6	26 × 11	26 × 16	26 × 21	26 × 26	26 × 31	26 × 36	26 × 41	26 × 46	26 × 51	26 × 56	26 × 61
6	31 × 6	31 × 11	31 × 16	31 × 21	31 × 26	31 × 31	31 × 36	31 × 41	31 × 46	31 × 51	—	—
7	36 × 6	36 × 11	36 × 16	36 × 21	36 × 26	36 × 31	36 × 36	36 × 41	36 × 46	—	—	—
8	41 × 6	41 × 11	41 × 16	41 × 21	41 × 26	41 × 31	41 × 36	41 × 41	—	—	—	—
9	46 × 6	46 × 11	46 × 16	46 × 21	46 × 26	46 × 31	46 × 36	—	—	Dimensions are in inches		
10	51 × 6	51 × 11	51 × 16	51 × 21	51 × 26	51 × 31	—	—	—			
11	56 × 6	56 × 11	56 × 16	56 × 21	56 × 26	—	—	—	—	—	—	—
12	61 × 6	61 × 11	61 × 16	61 × 21	61 × 26	—	—	—	—	—	—	—

Note: Structural Housing Dimensions (width × length) are in inches.
For overall dimensions add 0.75" per side for the mounting lip.



Shown with KTE6 E-Mitters Style C (4.88" x 4.88" Housing)

Custom Engineered/Manufactured Panels

- Multiple panels are used for larger arrays. Standard single panel construction is not offered beyond limits shown. Custom panels with other spacings are available.
- Minimum spacing for KTE6 heaters is 5.00" × 5.00". Special narrow panels having a maximum 25 rows × 1, or 2 columns, and up to 8 rows × 9 columns can be made on special order (max. housing size 121" × 25").
- Consult factory for larger panels not shown in table. Array panels can be adapted for either the 10-32 stud mount or ceramic heater style heaters. Specify heater mounting type when ordering (C or S style).

Consult us with your requirements.
There is no substitute for experience.

ARV Array Panel Design Worksheet for Quartz Mini-Tube E-Mitters

Ordering Information

To process your order
please specify the following information.

1.) Supply panel layout or sketch showing:

- Outside panel dimensions (allow for 0.75" wide mounting lip on all sides of ARA structural array housing)
- Heater type and orientation of long (or short) heater dimension
- Layout of rows and columns with number of heaters
- Spacing of rows and columns (Tempco will use standard spacing unless specified by customer)
- Zones and/or number of heaters per zone
- Locations of input wiring
- Locations of heaters with thermocouples (if used)

2.) Electrical requirements:

- Total panel KW _____
- Zone KWs (or # of heaters in zones)

_____

- Line voltage to panel, # of circuits, & 1 or 3 phase operation

_____

- If 480V, can series-parallel wiring and 240V heaters be used?_____
- Type of heater control to be used

_____

3.) Heater Specifications:

- Heater Type ❒ KTE ❒ KTG
- Heater Size ❒ KTE1 (9-3/4"L) ❒ KTE2 (4-7/8"L) ❒ KTE3 (7-5/16"L) ❒ KTE4 (14-5/8"L) ❒ KTE5 (19-1/2"L) ❒ KTE6 (4-7/8" Sq.)
- Heater Mounting Style ❒ C ❒ S
- Catalog Part Number _____ or Watts _____ Volts _____
- Standard K thermocouple or optional J _____ Quantity _____
- Heater lead configuration — Standard is 3.5" or 6" with spade terminal
  Spade terminals used if factory wired (ring terminals optional)

_____

- Special marking if required

_____

4.) Panel wiring & control options:

❒ Standard unit wiring is heaters to terminal blocks only
❒ Factory wired per customer specs & wiring diagram
❒ Tempco Engineering to design internal wiring & determine line input requirements
❒ Tempco to supply turnkey power control panel(s)

5.) Any special features required? _____

_____

6.) Application Data:

- Type of application and physical properties of processed materials

_____

_____

Made in USA

Sealed IR Quartz Lamps

Design Features

- *Fast Filament Response*
- *High Power Densities possible — up to 200 watts per inch per filament*
- *Different filament temperatures available to suit different materials*
- *Optional white or gold reflective layer on lamps redirects heat towards target material*
- *Single or twin-tube construction*
- *Contour bending available*

Filament Temperature Ratings

Filament Type	Near Infrared (NIR)	Short Wave (SW)	Fast Response Medium Wave (FRMW) High Temperature	Fast Response Medium Wave (FRMW) Low Temperature
Filament Response	1 second	1 second	1-2 seconds	1-2 seconds
Filament Temperature	2900K/4800°F	2500K/4000°F	1900K/2900°F	1500K/2200°F
Approximate Peak Wavelength	1.0μm	1.2μm	1.6μm	2.0μm
Maximum watts/inch per Filament	200	200	100	100
Average Lifetime (Hours)	2000	5000	5000	5000

SPECIFICATIONS

Max. Temperature: 350°C — End Seal

900°C — Quartz Tube and optional White Ceramic Reflective Layer

800°C — Optional Gold Reflective Layer

Max. Voltage: 600 Volts depending on design

LAMP GLASS TYPES

Clear: Standard

Ruby: Reduces Glare

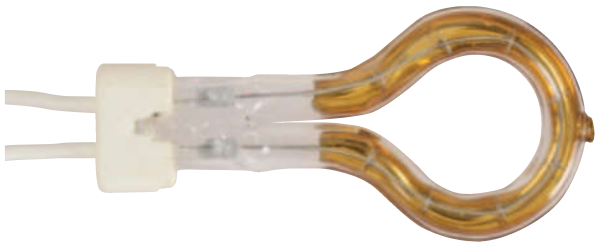
Translucent: Reduces Glare

Frosted: Reduces Glare

Gold Reflector: Redirects heat toward target for increased efficiency.

White Reflector: Redirects heat toward target for increased efficiency similar to gold, but will not degrade over time at high temperatures.

Custom Designs



Lamp Terminations

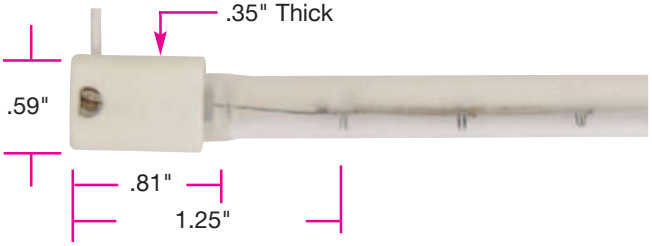
Select the termination style that meets your requirements.

Type R7s Recessed Single Contact

Type R7W R7S + Lead Wire

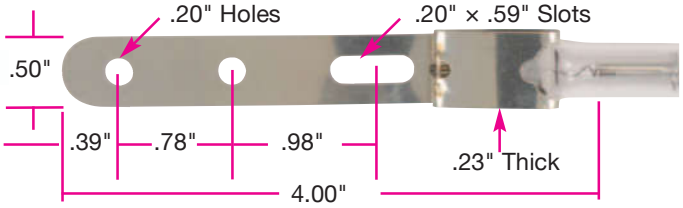
Type F Flat Ceramic + Lead Wire (No Cement)

Type FX Flat Ceramic + Lead Wire (Fixed with Cement)

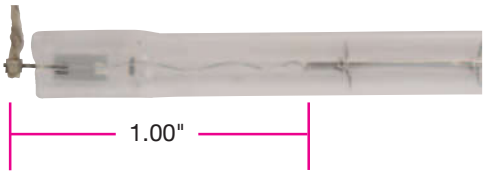


TYPE U Metal Clip + Lead Wire

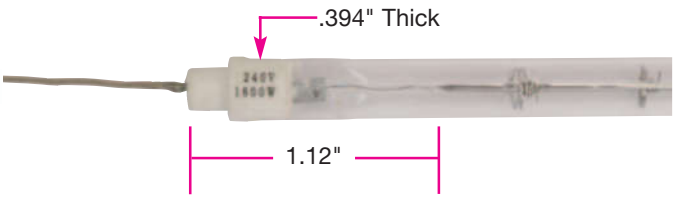
Type X Metal Tabs with Mounting Holes & Slots



Type W Lead Wire Only (Bare Wire Shown)



Type RC Round Ceramic



Sealed IR Quartz Lamps

Made in USA

Common Industry Standard (Non–Stock) Lamps

Filament color temperature is 2500K and lead wire terminations have 145 mm (5-11/16") of uninsulated wire unless otherwise noted.

Wattage	Voltage	Overall Length (in)	Overall Length (mm)	Heated Length (in)	Heated Length (mm)	Base Type	Burning	Glass Type	Special Notes	Part Number
300	120	8.46	215.0	4.17	106.0	U	V	Clear		LMP00001
300	120	8.43	214.0	4.17	106.0	U	H	Translucent		LMP00002
375	120	8.69	220.6	5.06	128.6	R7s	V	Clear		LMP00003
500	120	8.50	216.0	5.06	128.6	R7s	H	Frosted		LMP00004
500	120	8.66	220.0	5.00	127.0	R7s	H	Translucent		LMP00005
500	120	8.69	220.6	4.84	123.0	R7s	V	Clear		LMP00006
500	120	8.81	223.8	4.84	123.0	U	H	Clear		LMP00007
500	240	8.69	220.6	5.06	128.6	R7W	H	Clear		LMP00008
500	240	8.96	227.5	6.50	165.0	Fx	H	Clear	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00009
1000	208	13.63	346.2	10.06	255.5	R7s	H	Clear		LMP00010
1000	240	11.93	303.0	10.00	254.0	U	V	Clear		LMP00011
1000	240	13.63	346.2	10.06	255.5	R7s	H	Clear		LMP00012
1000	240	13.81	350.8	10.00	254.0	U	V	Clear		LMP00013
1000	240	13.82	351.0	10.71	272.0	U	H	Translucent		LMP00014
1000	235	13.98	355.0	11.02	280.0	F	V	White Reflector	Teflon® Insulated Lead Wire (with M4 Spade Terminal) Lead Length: 9in (230mm)	LMP00015
1000	240	19.09	485.0	10.71	272.0	X	H	White Reflector		LMP00016
1000	277	13.63	346.2	10.06	255.5	R7s	H	Clear		LMP00017
1200	144	8.81	223.8	6.18	157.0	U	V	Clear		LMP00018
1200	240	18.07	459.0	15.20	386.0	R7s	V	Clear		LMP00019
1350	115	12.48	317.0	10.08	256.0	RC	H	Clear	2750K Color Temperature	LMP00020
1500	240	9.13	232.0	6.89	175.0	W	H	Clear	228 mm (9") Bare Lead Wire	LMP00021
1600	208	19.65	499.0	16.02	407.0	R7s	H	Translucent		LMP00022
1600	208	19.76	502.0	16.02	407.0	RC	H	Clear		LMP00023
1600	208	19.80	503.0	16.02	407.0	U	H	Translucent		LMP00024
1600	240	19.63	498.6	16.06	407.9	R7s	H	Clear		LMP00025
1600	240	19.80	503.0	16.02	407.0	U	H	Translucent		LMP00026
1600	240	19.81	503.2	15.75	400.0	U	V	Clear		LMP00027
1600	277	19.65	499.0	16.02	407.0	R7s	V	Clear		LMP00028
1600	277	19.81	503.2	16.02	407.0	U	V	Clear		LMP00029
2000	230	21.67	550.4	19.57	497.0	R7s	H	Clear		LMP00030
2000	240	13.78	350.0	11.73	298.0	R7s	H	Clear		LMP00031
2000	240	13.82	351.0	10.00	254.0	U	H	Clear		LMP00032
2000	240	13.74	349.0	11.02	280.0	W	V	Clear	#10 Ring Terminal	LMP00033
2000	240	13.86	352.0	11.50	292.0	W	H	Clear	228 mm (9") Bare Lead Wire	LMP00034
2000	240	13.94	354.0	11.42	290.0	Fx	H	White Reflector		LMP00035
2000	240	14.06	357.0	11.02	280.0	Fx	V	White Reflector	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00036
2000	240	19.09	485.0	11.02	280.0	X	V	Clear		LMP00037
2000	400	24.53	623.0	16.14	410.0	X	V	Clear		LMP00038
2500	240	13.86	352.0	11.50	292.0	W	H	Clear	228 mm (9") Bare Lead Wire	LMP00039
2500	400	14.06	357.0	11.02	280.0	F	H	White Reflector	Teflon® Insulated Lead Wire (with #10 Spade Terminal)	LMP00040
2500	480	28.62	727.0	25.00	635.0	R7s	H	Translucent		LMP00041
2500	480	28.63	727.2	25.06	636.5	R7s	V	Clear		LMP00042
2500	480	28.78	731.0	25.00	635.0	RC	H	Clear		LMP00043
2500	480	28.81	731.8	24.87	631.8	U	V	Clear		LMP00044
2500	480	28.82	732.0	25.00	635.0	U	H	Translucent		LMP00045
2500	575	28.82	732.0	25.00	635.0	U	H	Clear		LMP00046
2500	600	28.78	731.0	25.00	635.0	RC	V	Clear		LMP00047
3000	400	35.94	913.0	27.56	700.0	X	H	Clear		LMP00048
3650	480	41.69	1059.0	37.99	965.0	U	V	Clear		LMP00049
3650	480	41.81	1062.0	37.72	958.0	RC	H	Clear		LMP00050
3800	570	41.81	1062.0	37.99	965.0	U	V	Clear		LMP00051
3800	570	41.81	1062.0	37.99	965.0	RC	V	Clear		LMP00052
3800	575	40.63	1032.0	37.06	941.3	R7s	H	Clear		LMP00053
4900	480	52.81	1341.3	49.02	1245.0	RC	V	Clear		LMP00054

Terminations Key

F — Flat ceramic (no cement)
Fx — Flat ceramic (fixed with cement)
U — Metal sleeve + wire
X — Metal tab w/holes & slot
R7s — Recessed single contact
R7W — R7s w/lead wire
RC — Round ceramic + lead wire
W — Lead wire only - no base

Burning Positions Key

H — Horizontal use only
V — Horizontal or vertical use

View Product Inventory @ www.tempco.com

Worksheet for Sealed IR Quartz Lamps

Ordering Information
To process your order
please specify the following information.

1.) Heater Specifications:

- Filament Temperature: ❒ Standard FRMW = 1500K ❒ High Temperature FRMW = 1900K
  ❒ Standard Halogen = 2500K ❒ NIR Halogen = 2900K ❒ Other _____
- Tube Cross Section: ❒ Single Round Tube ❒ Twin Bore Tube
- Tube Shape ❒ Straight ❒ Special Bend Configuration
- Tube Color: ❒ Clear (Standard) ❒ Ruby ❒ Translucent ❒ Frosted Ruby ❒ Frosted (Sandblasted) Clear
- Maximum Overall Length (Inches) _____
- Heated Length (Inches) _____
- Built-In Reflector: ❒ No Reflector ❒ White Reflector ❒ Gold Reflector

2.) Electrical requirements:

- Voltage: ❒ 120 ❒ 240 ❒ 277 ❒ 480 ❒ Other _____
- Wattage _____

3.) Termination Types:

- Single Tube Bases ❒ R7s ❒ R7W ❒ RC ❒ X ❒ F ❒ FX ❒ U ❒ Other _____
- Twin Tube Bases ❒ Ceramic with straight exit leads (Standard) ❒ Other _____
- Lead Wire Type ❒ Bare Wire (Standard) ❒ Teflon®@200°C ❒ Fiberglass@250°C ❒ Mica@450°C
- Lead Length 5.7" (Standard)_____ (Note: Type R7s and X do not have leads)
- Terminal Options ❒ None (Standard) ❒ #10 Ring Terminal ❒ #10 Spade Terminal ❒ Other _____

4.) Panel wiring & control options:

❒ Tempco to supply array panel

❒ Factory wired per customer specs & wiring diagram

❒ Tempco Engineering to design internal wiring & determine line input requirements

❒ Tempco to supply turnkey power control panel(s)

5.) Any special features required? _____

_____

6.) Application Data:

Type of application and physical properties of processed materials

_____

_____

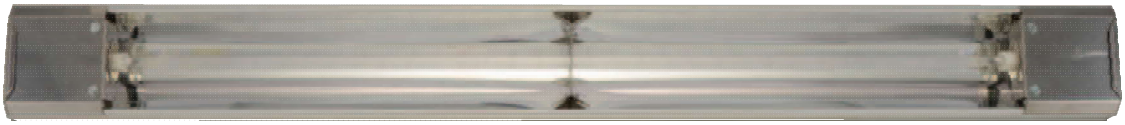
Made in USA

QRH Single Quartz Lamp Radiant Heater Assemblies

Designed for use in applications that require instant on/off response with rapid heat-up and cooldown rates. These heater assemblies are designed to operate in the short wavelength range of 2.5-1.2 microns (1600 to 4000°F peak emitter temperatures).

These Universal 2000 Modular Housing assemblies utilize T3 (10mm) LMP sealed lamps.

These rugged short wavelength units contain double ended lamps having quick connect RSC/R7s bases for easy lamp access without disassembly of housing or removing heater from installation. The Quartz IR heat lamps are mounted at the focal point of a polished aluminum reflector within the housing. These units are available in a variety of sizes and power combinations.



Design Features

- *Direct Retrofit into existing NEMA 1 applications*
- *Rugged Universal 2000 anodized aluminum housing*
- *Wattage range of 375W to 3800W in standard designs*
- *110-600V voltages available depending on heated length*
- *Power density range of 65-220 w/in available; contact Tempco*
- *RSC/R7s quick connect lamp terminations (8 amps maximum per lamp)*
- *Maximum lamp length 41 inches, minimum 8 inches*
- *Fast response, immediate on/off, 20-40 sec for full heat-up*
- *Full cooldown in less than 3-6 minutes*
- *Single end wiring option available*
- *Utilizes standard TRH removable guard designs*
- *Custom dual lamp units up to 48" OAL housing length are available*

Installation Notes:

These units are for horizontal installation only.

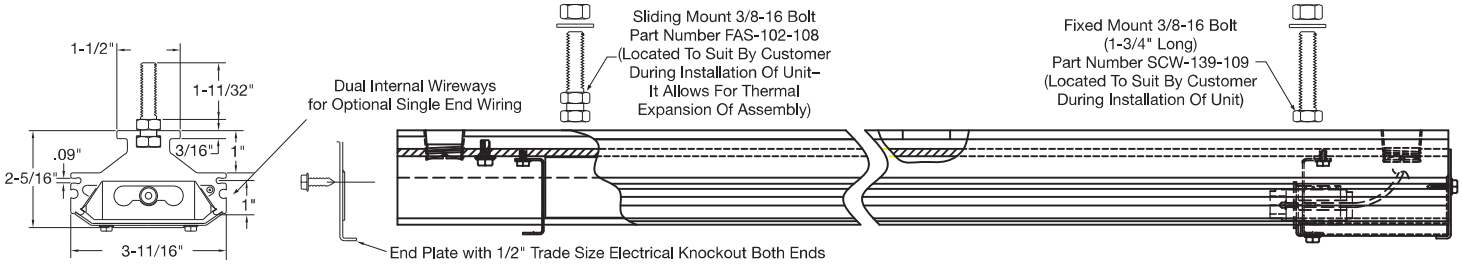
Lamp sockets are prewired in terminal enclosures with 16ga 600V rated conductors. Wires or connectors used for line connections inside junction boxes should be rated 200°C or higher, and sized per NEC/NFPA for unit voltage and amperage ratings.

Wiring used inside the internal wireways as crossover wiring must be rated 450°C or higher. Termination temperature at the exposed lamp cold ends must not exceed 650°F (343°C). Lamps should be shielded from direct visual observation due to their intense brightness when operating.

Initial inrush current will be 10 to 15 times the steady state current. Choose appropriate fuses for this heater assembly. Lamps should be operated within +/- 10% of rated voltage with minimal cycling to ensure long life. Operating outside this voltage range may cause internal degasification and discoloration of the lamp sheath, promoting premature element failure. When using copper wiring for field wiring, use only nickel plated or nickel clad conductors. Unplated or silver plated copper must not be used.

Standard Design (Non–Stock) QRH1 Series Single T3 Lamp Double End RSC Termination

Wattage	Volts	Housing Overall Length in	Housing Overall Length mm	Lamp Heated Length in	Lamp Heated Length mm	Lamp watts/inch	Part Number without Guard	Part Number with Guard	Replacement Lamp Part Number	Replacement Protective Wire Guard	Replacement Reflectors Part Number
375	115/120	16	406	5.06	128.5	74.0	QRH10001	QRH10010	LMP00003	GRD-104-125	SMPR-1111
500	115/120	16	406	5.06	128.5	98.8	QRH10002	QRH10011	LMP00006	GRD-104-125	SMPR-1111
1000	208	21	533	9.81	249.2	102.0	QRH10003	QRH10012	LMP00010	GRD-104-126	SMPR-1112
1000	220/240	21	533	9.81	249.2	102.0	QRH10004	QRH10013	LMP00012	GRD-104-126	SMPR-1112
1000	277	21	533	9.81	249.2	102.0	QRH10005	QRH10014	LMP00017	GRD-104-126	SMPR-1112
1600	220/240	27	686	16.00	406.4	100.0	QRH10006	QRH10015	LMP00025	GRD-104-127	SMPR-1113
1600	277	27	686	16.00	406.4	100.0	QRH10007	QRH10016	LMP00028	GRD-104-127	SMPR-1113
2500	460/480	36	914	25.06	636.5	99.8	QRH10008	QRH10017	LMP00042	GRD-104-107	SMPR-1122
3800	550/575	48	1219	37.00	939.8	102.7	QRH10009	QRH10018	LMP00053	GRD-104-108	SMPR-1123



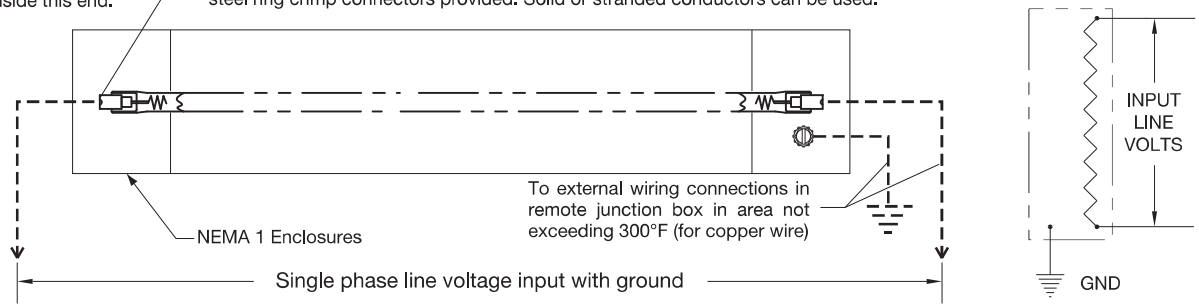
CAUTION **Danger: Hazard of Fire** Do not mount heater closer than 6" to any combustible or structural material that does not have at least a 200°C continuous temperature rating.

These heaters are not for use in atmospheres where flammable or combustible vapors, dust, gases, or liquids are present as defined in the National Electrical Code. Where solvents, water vapor or other VOCs are being evaporated from the process, it is necessary to provide substantial quantities of ventilating air to remove all resulting vapors.

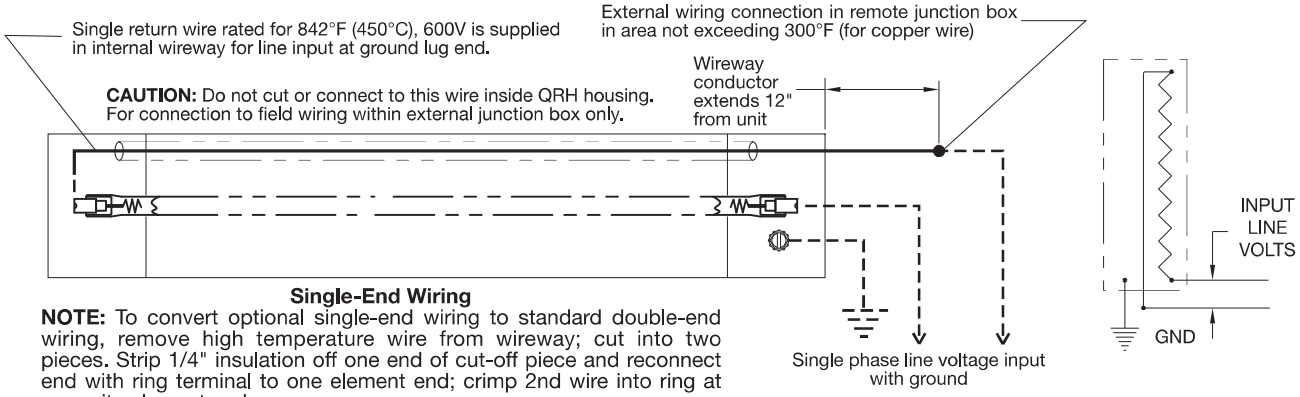
Standard Double-End Wiring

NOTE:
Allow for element movement when wiring inside this end.

Attach properly rated line input wires to both element ends using the nickel-plated steel ring crimp connectors provided. Solid or stranded conductors can be used.



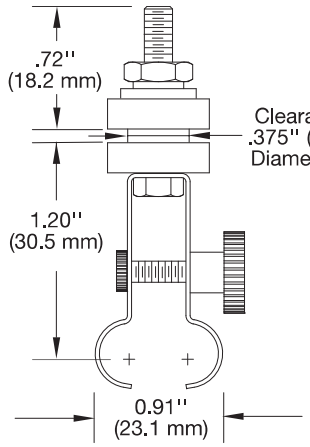
Optional Single End-Wiring



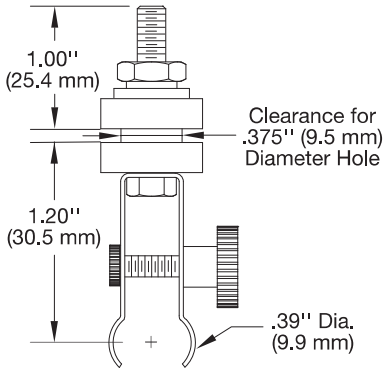
Single-End Wiring

NOTE: To convert optional single-end wiring to standard double-end wiring, remove high temperature wire from wireway; cut into two pieces. Strip 1/4" insulation off one end of cut-off piece and reconnect end with ring terminal to one element end; crimp 2nd wire into ring at opposite element end.

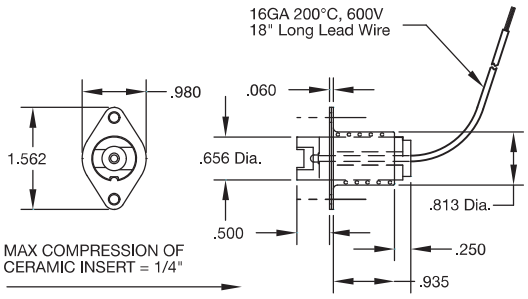
Lamp Accessories

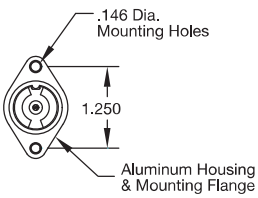


Mounting Clamp
11 mm × 23 mm
Part Number: CRK00087



Mounting Clamp
10 mm
Part Number: CRK00059



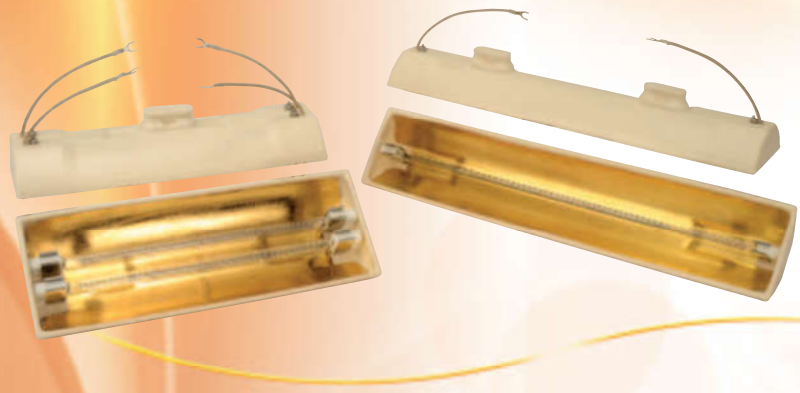


Mounting Clamp
Used for mounting & wiring lamps with R7s termination. 600 volts maximum. 350°C maximum operating temperature.
Part Number: LMP-103-101

Wiring Options

Series QRH Heaters can be prewired with plain leads, stainless steel armor cable, galvanized armor cable, stainless steel wire braid or SJO cable. For additional information See Wiring Options on page 7-17.

VIRTUAL SOLAR VS GLOW® Infrared Heaters

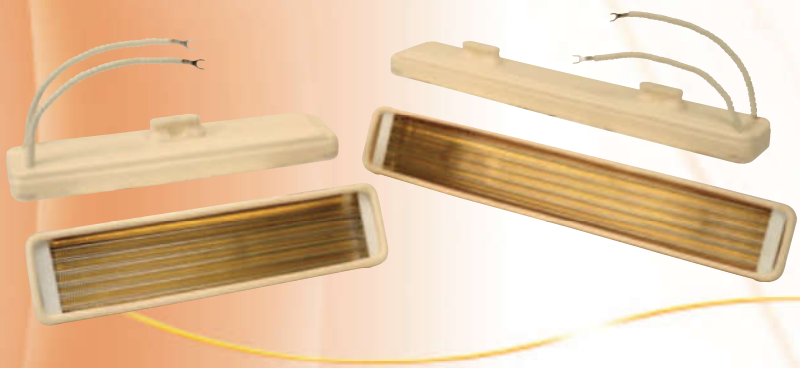


Series VSA

- *Short Wave IR*
- *2500K Filament Temperature*
- *Tungsten in Halogen-Filled Lamp*
- *150 – 2500 Watts*
- *See Page 7-59*

Series VSC

- *Medium Wave IR*
- *1500K Filament Temperature*
- *Star-Wound Tungsten in Evacuated Lamp*
- *75 – 1300 Watts*
- *See Page 7-60*



Series VSR

- *Medium Wave IR*
- *950K Wire Temperature*
- *Fe-Cr-Al Resistance Wire in Air*
- *125 – 1500 Watts*
- *See Page 7-61*

VS Glow Is the Newest and Most Technically Advanced Infrared Heater that Generates Instantaneous Heat

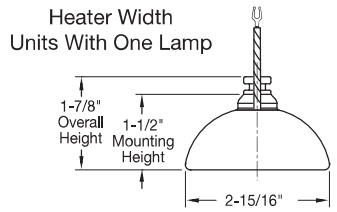
VSA Series High Density Short Wave

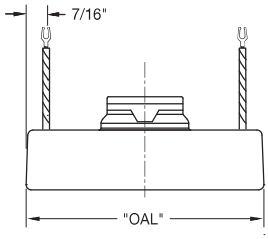
Design Features

- *Gold Coated Ceramic Reflector*
- *Short Wave Infrared Radiation up to 220 watts per linear inch*
- *Fast Response, Immediate ON/OFF, Time: 20-40 seconds for full heat-up*
- *All Ceramic Housing Construction*
- *Standard Lamp Voltages: 120 & 230/240*
- *All units are double-ended construction*

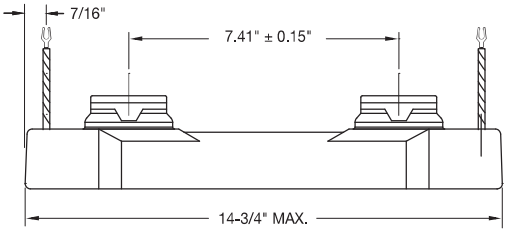
Typical Semiconductor Industry Applications

- *Etching*
- *Rapid Thermal Process*
- *Strip Removal*
- *Epitaxy*
- *Chemical Vapor Deposit*

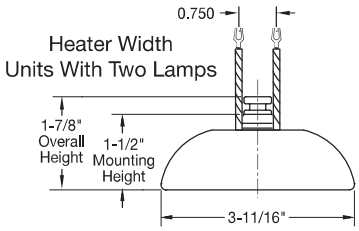




Heater Length
Series 122, 183 and 245



Heater Length
Series 367



One-Piece Mounting Clips Standard
Two-Piece Wave Mounting Clips Optional
See page 7-14 for details.

Standard (Non-Stock) VSA Series

VS Glow heaters listed have 10" mica insulated leads and a one-piece spring clip for mounting.

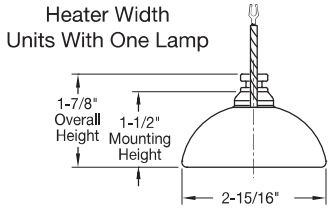
Series	Maximum Overall Length (in)	(mm)	Heated Length (in)	(mm)	Width (in)	(mm)	Wattage	Voltage	Part Number	Number of Lamps	Replacement Lamp Part Number
122	4.90	124.5	1.77	45	2.89	73.5	150	120	VSA00322	1	LMP00056
					2.89	73.5	225	120	VSA00323	1	LMP00057
					2.89	73.5	275	120	VSA00324	1	LMP00058
					3.67	93.1	450	120	VSA00325	2	LMP00057
183	7.36	187.0	4.17	106	2.89	73.5	300	120	VSA00326	1	LMP00059
					2.89	73.5	475	120	VSA00327	1	LMP00060
					2.89	73.5	600	120	VSA00328	1	LMP00061
					3.67	93.1	950	120	VSA00329	2	LMP00060
245	9.82	249.5	6.65	168	2.89	73.5	500	120	VSA00330	1	LMP00062
					2.89	73.5	750	120	VSA00331	1	LMP00063
					2.89	73.5	1000	120	VSA00332	1	LMP00064
					3.67	93.1	1500	120	VSA00333	2	LMP00063
					2.89	73.5	500	230/240	VSA00334	1	LMP00065
					2.89	73.5	750	230/240	VSA00335	1	LMP00066
					2.89	73.5	1000	230/240	VSA00336	1	LMP00067
					3.67	93.1	1500	230/240	VSA00337	2	LMP00066
367	14.74	374.5	11.38	289	2.89	73.5	800	120	VSA00338	1	LMP00068
					2.89	73.5	1250	120	VSA00339	1	LMP00069
					2.89	73.5	1500	120	VSA00340	1	LMP00070
					3.67	93.1	2500	120	VSA00341	2	LMP00069
					2.89	73.5	800	230/240	VSA00342	1	LMP00071
					2.89	73.5	1250	230/240	VSA00343	1	LMP00072
					2.89	73.5	1500	230/240	VSA00344	1	LMP00073
					3.67	93.1	2500	230/240	VSA00345	2	LMP00072

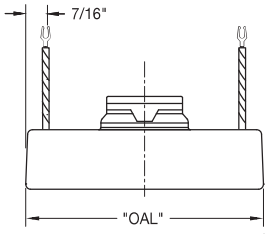
Made in USA

VSC Series High Density Medium Wave

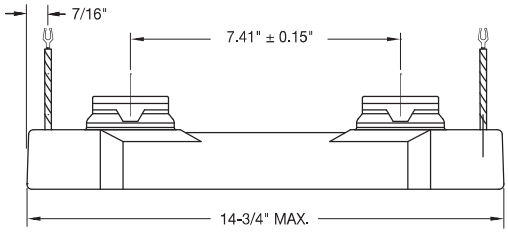
Design Features

- *Gold Coated Ceramic Reflector*
- *Medium wave Infrared Radiation up to 116 watts per linear inch*
- *Fast Response, Immediate ON/OFF, Time: 20-40 seconds for full heat-up*
- *All Ceramic Housing Construction*
- *Standard lamp voltages: 120 & 230/240*
- *All units are double-ended construction*

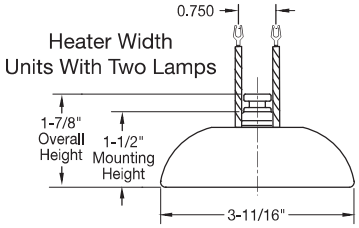




Heater Length
Series 122, 183 and 245



Heater Length
Series 367



One-Piece Mounting Clips Standard
Two-Piece Wave Mounting Clips Optional
See page 7-14 for details.

Standard (Non-Stock) VSC Series

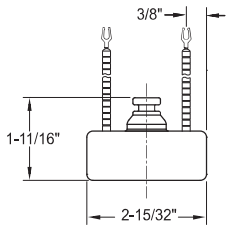
VS Glow heaters listed have 10" mica insulated leads and a one-piece spring clip for mounting.

Series	Maximum Overall Length (in)	(mm)	Heated Length (in)	(mm)	Width (in)	(mm)	Wattage	Voltage	Part Number	Number of Lamps	Replacement Lamp Part Number
122	4.90	124.5	1.77	45	3.67	93.1	250	120	VSC00138	2	LMP00075
183	7.36	187.0	4.17	106	2.89	73.5	150	120	VSC00139	1	LMP00077
					2.89	73.5	250	120	VSC00140	1	LMP00078
					2.89	73.5	300	120	VSC00141	1	LMP00079
					3.67	93.1	500	120	VSC00142	2	LMP00078
245	9.82	249.5	6.65	168	2.89	73.5	250	120	VSC00143	1	LMP00080
					2.89	73.5	400	120	VSC00144	1	LMP00081
					2.89	73.5	500	120	VSC00145	1	LMP00082
					3.67	93.1	800	120	VSC00146	2	LMP00081
					2.89	73.5	250	230/240	VSC00147	1	LMP00083
					2.89	73.5	400	230/240	VSC00148	1	LMP00084
					2.89	73.5	500	230/240	VSC00149	1	LMP00085
					3.67	93.1	800	230/240	VSC00150	2	LMP00084
367	14.74	374.5	11.38	289	2.89	73.5	400	120	VSC00151	1	LMP00086
					2.89	73.5	650	120	VSC00152	1	LMP00087
					2.89	73.5	800	120	VSC00153	1	LMP00088
					3.67	93.1	1300	120	VSC00154	2	LMP00087
					2.89	73.5	400	230/240	VSC00155	1	LMP00089
					2.89	73.5	650	230/240	VSC00156	1	LMP00090
					2.89	73.5	800	230/240	VSC00157	1	LMP00091
					3.67	93.1	1300	230/240	VSC00158	2	LMP00090

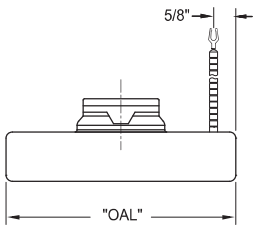
VSR Series Medium Wave

Design Features

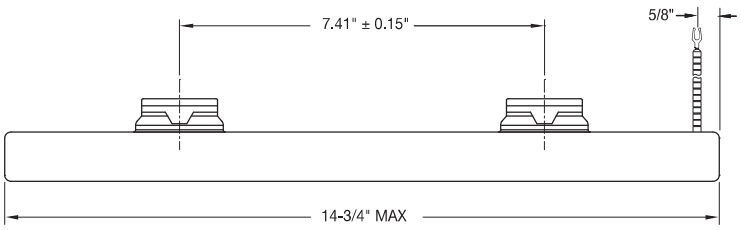
- *All Ceramic Housing Construction*
- *Capable of delivering medium and long wavelengths in any voltage from 120 to 480 volts*
- *Available in clear tubes*
- *24-K gold reflective surface*
- *Optional Type K thermocouple available*



Heater Width



Heater Length
Series 122, 183 and 245



Heater Length Series 367

One-Piece Mounting Clips Standard
Two-Piece Wave Mounting Clips Optional
See page 7-14 for details.

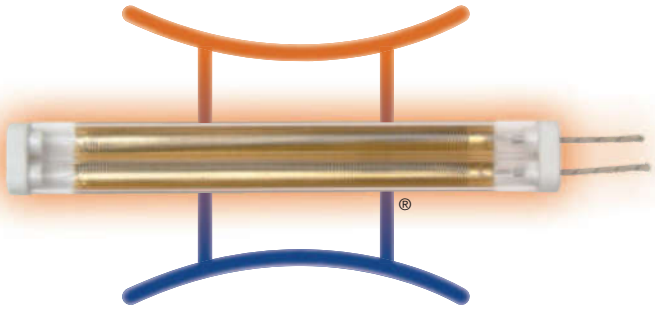
Standard (Non-Stock) VSR Series

VS Glow heaters listed have 6" ceramic bead insulated leads with #8-10 spade terminals and a one-piece spring clip for mounting.

Series	Maximum Overall Length (in)	(mm)	Wattage	Voltage	Part Number
122	4.90	124.5	125	230	VSR20001
			200	230	VSR20002
			250	230	VSR20003
			325	230	VSR20004
			500	230	VSR20005
183	7.36	187.0	185	230	VSR30001
			300	230	VSR30002
			375	230	VSR30003
			500	230	VSR30004
			750	230	VSR30005
245	9.82	249.5	250	230	VSR10001
			400	230	VSR10002
			500	230	VSR10003
			650	230	VSR10004
			1000	230	VSR10005
367	14.74	374.5	375	230	VSR40001
			600	230	VSR40002
			750	230	VSR40003
			1000	230	VSR40004
			1500	230	VSR40005

Made in USA

Gemini® Infrared Heater Technology Emulates the Efficiency of Solar Energy in a Convenient Package for Hundreds of Industrial and Commercial Applications



Gemini™ Medium Wave Heaters

Twin Bore Quartz Tube Technology

Design Features

- *Industry standard twin bore quartz tube formats with 95% heat transmittance*
- *24-karat Gold Back Coating for targeted infrared applications*
- *White Ceramic Reflective Back Coating for extreme temperature requirements*
- *High power densities: 42/51/63.5 w/in (16/20/25 w/cm)*
- *Fast heat-up rates — Less than one minute to reach steady state conditions*
- *Very long operating life — Over 10,000 hours of highly efficient and economical continuous operation*
- *Three industry standard sizes in lengths up to 118 in. (3000mm)*

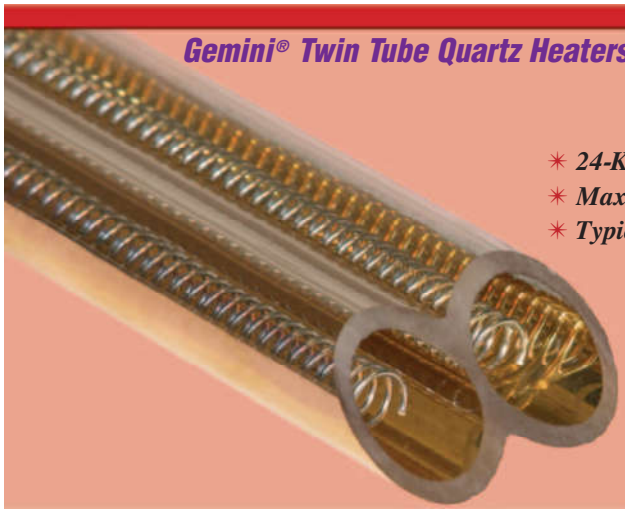
Complete Infrared Heat Technology for Every Industrial and Commercial Application Under the Sun

Gemini Series – Managing the Power of the Sun in a More Convenient Package

Medium Wave Infrared E-Mitters

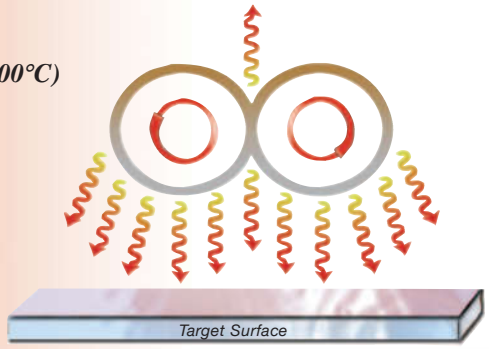
Tempco has developed specialized coatings to control the directional nature of the infrared energy emitted from the Gemini twin bore heaters. High levels of energy reflection are achieved by selectively bonding an integral high temperature coating to the half-hemisphere of the quartz tube surfaces facing away from the targeted surface. The choice of a gold or white ceramic coating depends on the maximum operating temperature required in the heating system. Also available is a clear 360° E-Mitter for use in applications that will employ external reflective or focusing surfaces around the heater.

Gemini® Twin Tube Quartz Heaters with Gold Back Coating



95% Heat Reflection toward working surface

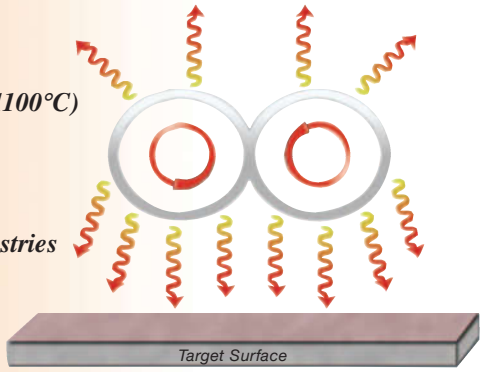
- 24-Karat Gold Back Coating
- Maximum Coil Temp 1472°F (800°C)
- Typical Applications:
  - Glass Processing Industry
  - Paper and Textile Industries
  - Plastics Industry



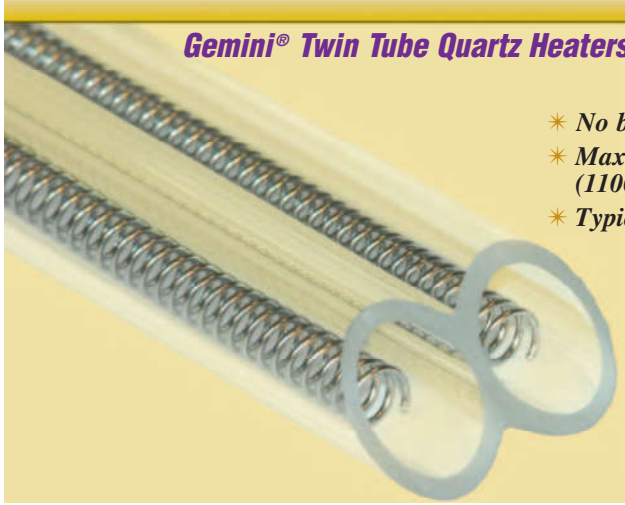
Gemini® Twin Tube Quartz Heaters with White Ceramic Back Coating

75% Heat Reflection toward working surface

- White Proprietary Formula Reflective Back Coating
- Maximum Coil Temp. 2012°F (1100°C)
- Typical Applications:
  - Stress Relieving of Metal Components
  - Drying Foils
  - Paper and Textile Industries

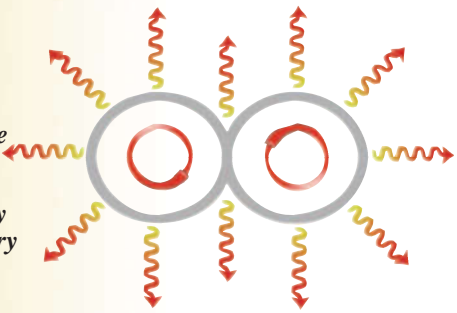


Gemini® Twin Tube Quartz Heaters Without Coating (for external reflector)



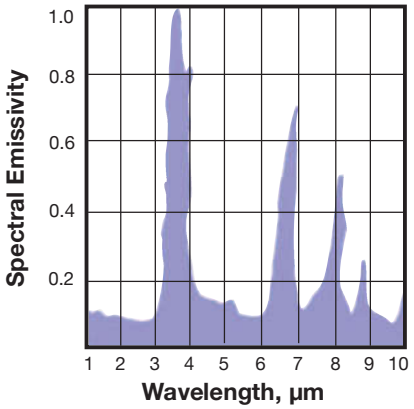
360° Heat Radiation

- No back coating
- Maximum Coil Temp. 2012°F (1100°C)
- Typical Applications:
  - PVC Panel Coating Cure
  - Curing Coating on Rubber Seals
  - Powder Coating Industry
  - Wood Processing Industry
  - Culinary Arts Industry



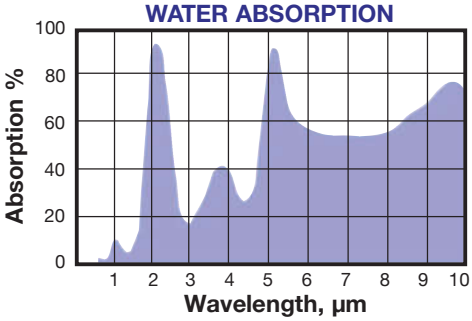
Medium Wave Infrared E-Mitters

SPECTRAL EMISSIVITY OF PET FILM



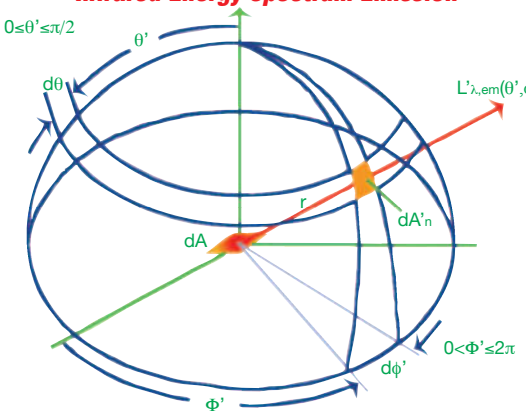
WAVELENGTH CONTROL – The very low heat transmission losses through the clear quartz material of the twin bore heaters allow Tempco's engineers to carefully design the peak emitted wavelength of these heaters to match the peak absorption wavelength for a given material or application. By modifying the temperature of the E-mitter, its peak emitted wavelength will change according to Wien's displacement law (see page 7-101). All E-mitters will emit a range of wavelengths above and below their peak value. (See spectrum graph on page 7-97.) The design of an efficient infrared heating system must consider both the spectral nature and directional properties of thermal radiation.

WATER ABSORPTION



SPECTRAL NATURE: To address this issue, heaters should be designed to emit wavelengths that closely match the absorption band of the processed material in a given application. By carefully considering the broad side-bands of the emitted radiation and absorption, it is possible to design systems that will enhance the heat transfer rates at different stages of the heating process.

Infrared Energy Spectrum Emission



Vaporization of water is best achieved in the infrared spectrum at wavelengths in the range of 3.1 and 6.1 μm (microns). After the water is removed, the infrared heating rate should match the absorption spectrum of the base material to avoid damaging it thermally. Similar approaches are used in many industries, such as automotive, glass and plastic processing, textiles, electronics and many others.

DIRECTIONAL NATURE: The directional nature of the heat distribution is dealt with by consideration of how to direct heat toward an application. The efficiency of the heating system depends strongly on the percentage of the total infrared energy generated at the resistance coil that reaches the target material. Consideration must be given to the fact that this infrared energy propagates from the E-mitter in all possible directions with a non-uniform wavelength distribution.

Design Specifications

Performance Ratings			
Reflective Backing	**Gold**	**White Ceramic**	**Clear* (no backing)**
Maximum Coil Temperature	1472ºF (800ºC)	2012ºF (1100ºC)	2012ºF (1100ºC)
Peak Emitted Wavelength Range (microns)	2.7-6.5	2.1-6.5	2.1-6.5
Radiation Pattern	180º	180º	360º
Nominal Reflected Heat Efficiency	95%	75%	0%

*Clear tubes are designed for use with external reflector.

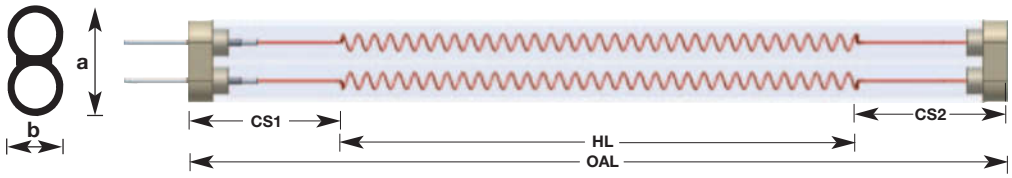
Electrical Ratings			
Twin Bore Tube Size	**18 × 8 mm**	**23 × 11 mm**	**33 × 15 mm**
Maximum Power Density (per unit length)	42 w/in (16.5 w/cm)	51 w/in (20 w/cm)	63.5 w/in (25 w/cm)
Maximum Voltage	480V	480V	600V
Maximum Amperage per circuit	9.5A	13.5A	20A

Standard wattage tolerance is +5%, -10%; closer tolerances available upon request

Medium Wave Infrared E-Mitters

Wire Leads for Standard Configuration are Stranded Lead Wire, Rated 842°F (450°C), 600V.

OAL: Overall Length
CS1: Lead End Cold Section
HL: Heated Length
CS2: Blind End Cold Section



Dimensional Specifications

Twin Tube Size Dimensions (a x b)	18 × 8 mm (.71 × .31 in)	23 × 11 mm (.91 × .43 in)	33 × 15 mm (1.30 × .59 in)
Maximum Length (OAL)	2000 mm (78.75 in)	2000 mm (78.75 in)	3000 mm (118 in)
Minimum Lead End Cold Length (Standard CS1) (both ends of double end units)	50 mm (1.96 in)	50 mm (1.96 in)	50 mm (1.96 in)
Minimum Blind End Cold Length (Standard CS2) (single ended units only)	50 mm (1.96 in)	50 mm (1.96 in)	50 mm (1.96 in)
Overall Length (OAL) Tolerance	± 2.5 mm (0.10 in)		
Heated Length (HL) Tolerance	±6.5 mm (0.26 in)		

Consult factory for closer tolerances.

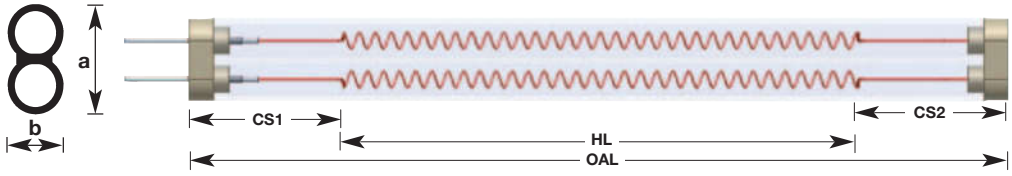
Exceptional Clear Quartz Twin Bore Material with Proven Application Results

- ***Automotive:*** Airbag assembly, headliner formation, roof rack bonding, mirror manufacturing, flux powder drying, adhesive activation on protective strips, powder coating, spot repair, friction material bonding, plastic bumper drying, forming & painting
- ***Plastics:*** PET bottle blow molding, pellet/granulate drying, polypropylene fiber fusing, plastic component extruding/bending, ink drying, and laminating
- ***Glass:*** Preheating, coating/paint curing, light bulb production
- ***Food Industry:*** Chocolate processing, cake heating/baking, food warming
- ***Paper, Electronics***
- ***Textiles,***
- ***Metals***
- ***Furniture***
- ***Semi-conductor Processing***
- ***And much more***

Standard Design (Non–Stock) Gemini Medium Wave Infrared E-Mitters

Leads for Standard Configuration are Stranded Lead Wire, Rated 842°F (450°C), 600V.

OAL: Overall Length
CS1: Lead End Cold Section
HL: Heated Length
CS2: Blind End Cold Section



Twin Bore Quartz Format Dimensions a in	a mm	b in	b mm	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Power Watts	Part Numbers @ 230 Volts Coatings Gold	White	None	Linear Power Watts per inch	Configuration Style	Lead Exit Angle
0.71	18	0.31	8	15.7	400	11.8	300	500	GEM00001	GEM10001	GEM20001	42.4	A	0°
0.91	23	0.43	11	23.6	600	19.7	500	1000	GEM00002	GEM10002	GEM20002	50.8	A	0°
1.30	33	0.59	15	35.4	900	31.5	800	2000	GEM00003	GEM10003	GEM20003	63.5	A	0°
1.30	33	0.59	15	43.3	1100	39.4	1000	2500	GEM00004	GEM10004	GEM20004	63.5	A	0°
0.91	23	0.43	11	51.2	1300	47.2	1200	2500	GEM00005	GEM10005	GEM20005	53.0	A	0°
1.30	33	0.59	15	55.9	1420	51.2	1300	3250	GEM00006	GEM10006	GEM20006	63.5	A	0°
1.30	33	0.59	15	63.0	1600	59.1	1500	3750	GEM00007	GEM10007	GEM20007	63.5	A	0°
1.30	33	0.59	15	66.9	1700	63.0	1600	4000	GEM00008	GEM10008	GEM20008	63.5	A	0°
1.30	33	0.59	15	70.9	1800	66.9	1700	4100	GEM00009	GEM10009	GEM20009	61.3	A	0°
1.30	33	0.59	15	75.6	1920	70.9	1800	4500	GEM00010	GEM10010	GEM20010	63.5	A	0°
1.30	33	0.59	15	83.5	2120	78.7	2000	5000	GEM00011	GEM10011	GEM20011	63.5	B	0°
1.30	33	0.59	15	102.4	2600	98.4	2500	6250	GEM00012	GEM10012	GEM20012	63.5	B	0°
0.71	18	0.31	8	15.7	400	11.8	300	500	GEM00013	GEM10013	GEM20013	42.4	A	90°
0.91	23	0.43	11	23.6	600	19.7	500	1000	GEM00014	GEM10014	GEM20014	50.8	A	90°
1.30	33	0.59	15	35.4	900	31.5	800	2000	GEM00015	GEM10015	GEM20015	63.5	A	90°
1.30	33	0.59	15	43.3	1100	39.4	1000	2500	GEM00016	GEM10016	GEM20016	63.5	A	90°
0.91	23	0.43	11	51.2	1300	47.2	1200	2500	GEM00017	GEM10017	GEM20017	53.0	A	90°
1.30	33	0.59	15	55.9	1420	51.2	1300	3250	GEM00018	GEM10018	GEM20018	63.5	A	90°
1.30	33	0.59	15	63.0	1600	59.1	1500	3750	GEM00019	GEM10019	GEM20019	63.5	A	90°
1.30	33	0.59	15	66.9	1700	63.0	1600	4000	GEM00020	GEM10020	GEM20020	63.5	A	90°
1.30	33	0.59	15	70.9	1800	66.9	1700	4100	GEM00021	GEM10021	GEM20021	61.3	A	90°
1.30	33	0.59	15	75.6	1920	70.9	1800	4500	GEM00022	GEM10022	GEM20022	63.5	A	90°
1.30	33	0.59	15	83.5	2120	78.7	2000	5000	GEM00023	GEM10023	GEM20023	63.5	B	90°
1.30	33	0.59	15	102.4	2600	98.4	2500	6250	GEM00024	GEM10024	GEM20024	63.5	B	90°

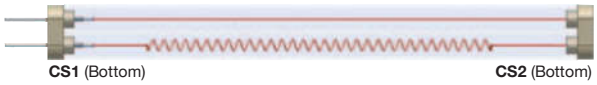
Optional Winding Patterns

Using alternate stretching configurations to achieve distributed wattage, Tempco can easily customize Gemini series heaters to fit your application. Below are various configurations with "A" Standard for Single Ended and "B" Standard for Double Ended.

Single Ended Terminations

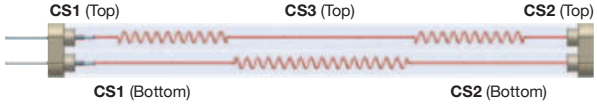
A (Standard)

C



E

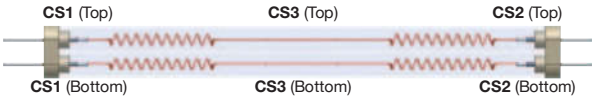
G



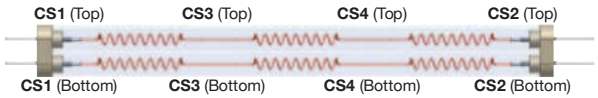
Double Ended Terminations

B (Standard)

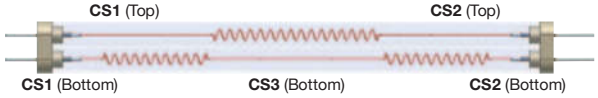
D



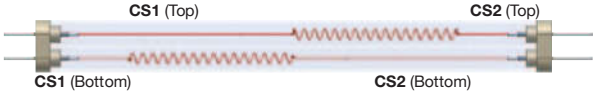
F



H



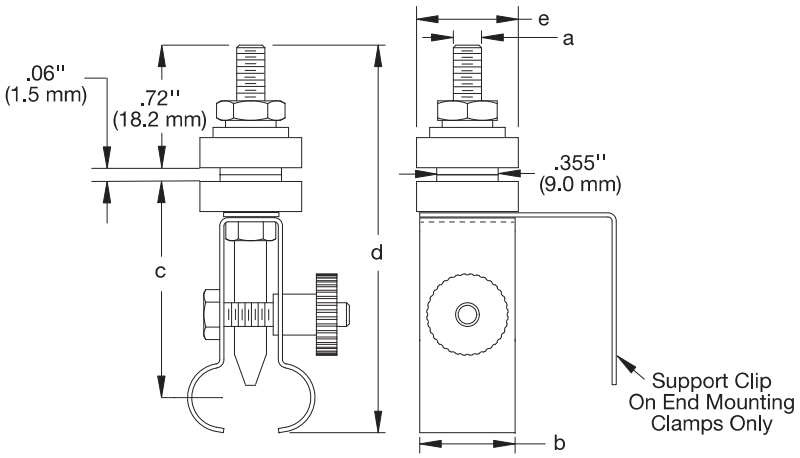
J



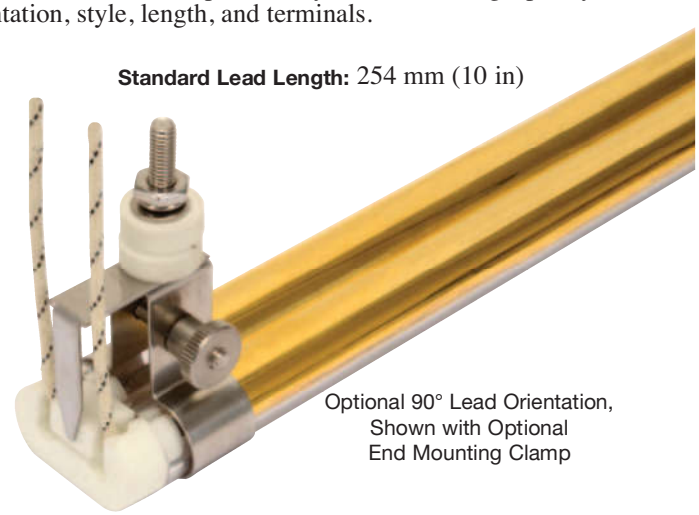
View Product Inventory @ www.tempco.com

Gemini Medium Wave Infrared E-Mitters

Lead configurations and lengths – 842°F (450°C), 600V insulated lead wire, 3/8" stripped ends standard, oriented straight out ends or at 90° to heater axis. Optional styles of high temperature insulated lead wire and un-insulated ring or spade terminals are available to suit your application. Select size and style from charts on page 7-23. Bare stranded heater leads up to 9" long may be ordered with optional ceramic bead insulators. Longer lengths are available as lead wire options only. When ordering, specify lead orientation, style, length, and terminals.



Standard Lead Length: 254 mm (10 in)



Optional 90° Lead Orientation, Shown with Optional End Mounting Clamp

Gemini Stainless Steel Clamp Specifications and Dimensions

Clamp Assembly Part Number	CRK00085	CRK00086	CRK00087	CRK00088	CRK00089	CRK00090
Fits Twin Tube Size	18 × 8 mm		23 × 11 mm		33 × 15 mm	
Clamp Location on Tube	Center	End	Center	End	Center	End
Clamps Required	OAL > 39.4" (1000 mm)	2 per heater	OAL > 59.1" (1500 mm)	2 per heater	OAL > 78.7" (2000 mm)	2 per heater
Mounting Stud Threads (a)	10-32		10-32		10-32	
Clamp Width (b)	0.40" (10.2 mm)		0.40" (10.2 mm)		0.60" (15.2 mm)	
Heater Mounting Height (c)	1.20" (30.5 mm)		1.20" (30.5 mm)		1.41" (35.8 mm)	
Overall Clamp Height (d)	2.44" (62 mm)		2.48" (63.1 mm)		2.77" (70.3 mm)	
Ceramic Insulator Diameter (e)	0.59" (15 mm)		0.59" (15 mm)		0.59" (15 mm)	
Panel Mounting Hole Diameter	0.375" (9.5 mm)		0.375" (9.5 mm)		0.375" (9.5 mm)	

Recommended mounting panel thickness range is 18-14 ga.

Ordering Information

Stock Heaters

Order by Tempco Part Number for heaters listed on page 7-66.

Custom Engineered/Manufactured Heaters

Because TEMPCO understands that an electric heater can be very application specific, for sizes not listed TEMPCO will design and manufacture a Gemini Infrared Heater or modular housing to meet your requirements. **Standard lead time is 3 weeks.**

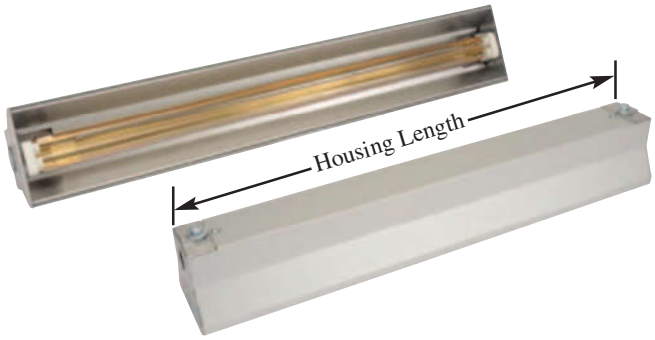
Please Specify the following:

- ❑ Reflective Coating — Gold, White Ceramic or None
- ❑ Twin Bore Tube Size (18 × 8 mm, 23 × 11 mm, or 33 × 15 mm)
- ❑ Wattage or Watts/In
- ❑ Single or Double End
- ❑ Overall Length (OAL)
- ❑ Heated Length (HL)
- ❑ Lead Orientation (0° or 90°)
- ❑ Voltage
- ❑ Quantity
- ❑ Lead Wire Terminals (page 7-23)
- ❑ Lead Wire Style/Length (Page 7-23)
- ❑ Winding Pattern (page 7-66, A-J or as required)
- ❑ Ceramic Bead Option (9" max. length)
- ❑ CRA Linear Housing Option (See page 7-68)
- ❑ Cold End Lengths (CE1 & CE2) See Winding Pattern page 7-66

Gemini Medium Wave Infrared E-Mitter Assemblies using a CRA Linear Housing

CRA Linear Modular Housing Assemblies

These compact assemblies have one 33 × 15 mm twin bore Gemini quartz heater mounted in front of an aluminized steel reflector at a power density of 63.5 w/linear inch.



Design Features

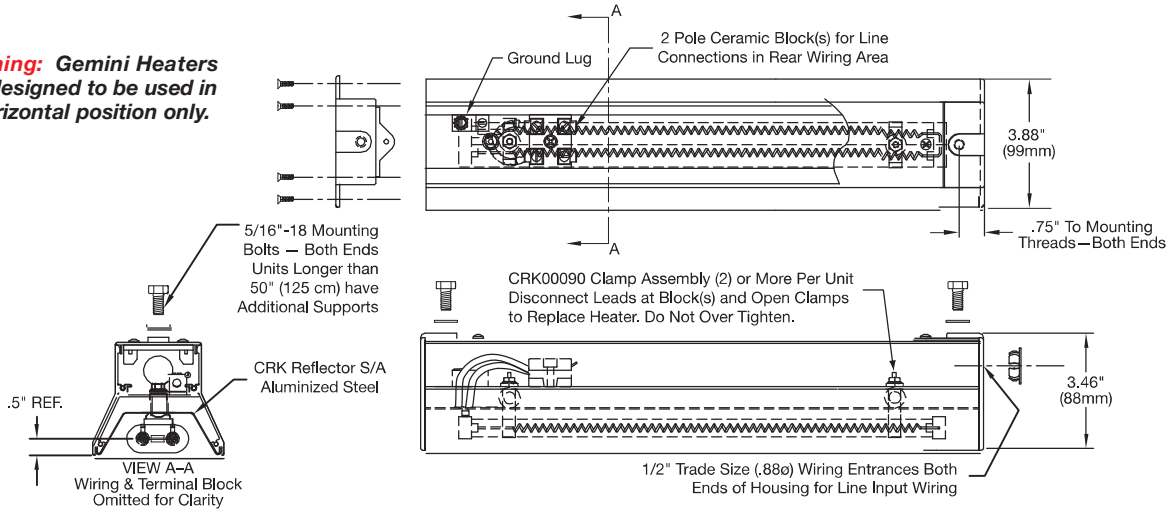
- *Rapid heat-up/cooldown and low residual heat retention*
- *Compact lightweight extruded anodized housing*
- *High efficiency aluminized steel reflector for harsh environments and high temperature applications*
- *Adaptable to all Gemini twin bore sizes*

Standard (Non-Stock) and Stock Sizes and Electrical Ratings — 230V

Stock Items Are Shown In RED

Watts	Housing Length in	Housing Length mm	Heated Length (HL) in	Heated Length (HL) mm	Housing Assembly Part Number Heater Back Coating Gold	Housing Assembly Part Number Heater Back Coating White	Housing Assembly Part Number Heater Back Coating None	Replacement Heater Part Number Heater Back Coating Gold	Replacement Heater Part Number Heater Back Coating White	Replacement Heater Part Number Heater Back Coating None	Winding Pattern See Page 7-66
2000	36.19	919	31.5	800	CRA80001	CRA80015	**CRA80024**	GEM00015	GEM10015	**GEM20015**	A
2500	44.06	1119	39.4	1000	CRA80002	CRA80016	**CRA80025**	GEM00016	GEM10016	**GEM20016**	A
3250	56.63	1438	51.2	1300	CRA80003	CRA80017	**CRA80026**	GEM00018	GEM10018	**GEM20018**	A
3750	63.75	1619	59.1	1500	CRA80004	CRA80018	**CRA80027**	GEM00019	GEM10019	**GEM20019**	A
4000	67.69	1719	63.0	1600	CRA80005	CRA80019	**CRA80028**	GEM00020	GEM10020	**GEM20020**	A
4100	71.65	1820	66.9	1700	CRA80006	CRA80020	**CRA80029**	GEM00021	GEM10021	**GEM20021**	A
4500	76.38	1940	70.9	1800	CRA80007	CRA80021	**CRA80030**	GEM00022	GEM10022	**GEM20022**	A
5000	84.25	2140	78.7	2000	CRA80008	CRA80022	**CRA80031**	GEM00023	GEM10023	**GEM20023**	B
6250	103.13	2620	98.4	2500	CRA80009	CRA80023	**CRA80032**	GEM00024	GEM10024	**GEM20024**	B

***Warning:* Gemini Heaters are designed to be used in a horizontal position only.**



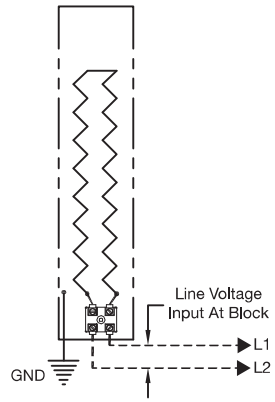
Ordering Information

Select a Part Number from the Standard Sizes and Electrical Ratings table that meets your requirement.

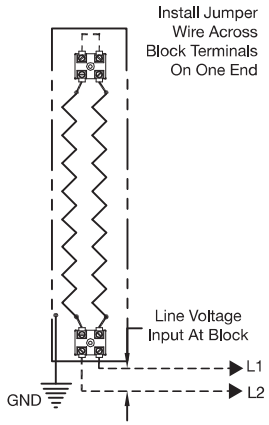
Custom housings are available for any twin tube size (18 × 8 mm, 23 × 11 mm, and 33 × 15 mm; see page 7-67) Gemini Series Heater. Specify watts, volts and heated length (or w/in) required and TEMPCO will design a unit to suit your application. Clear, gold, or white ceramic coated heaters and doubled end wiring, and chrome steel reflector options are available.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

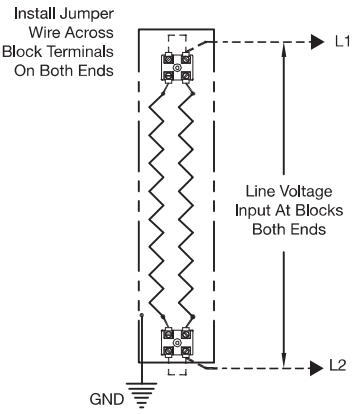
Wiring Diagrams for Gemini E-Mitter in a CRA Linear Housing



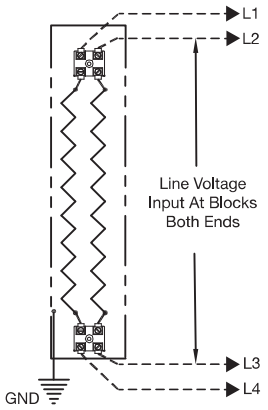
Single End Heater Wiring
Single Element



Double End Heater Wiring
Dual Element Series Wired



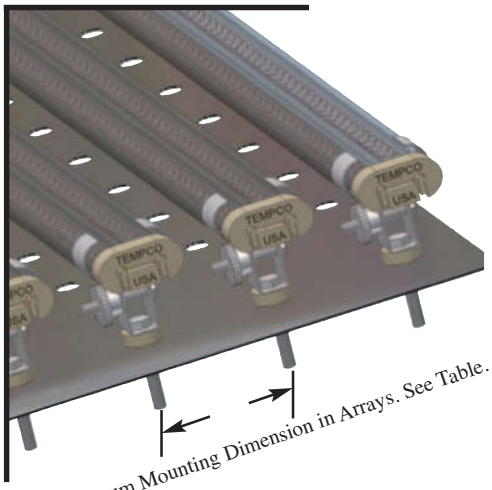
Double End Heater Wiring
Dual Element Parallel Wired



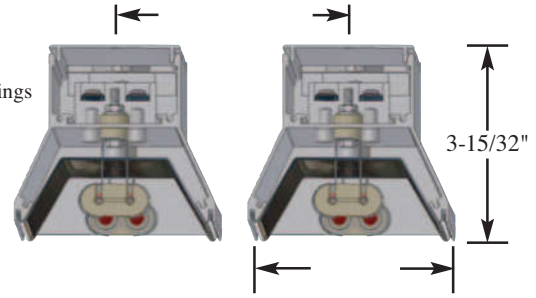
Double End Heater Wiring
Dual Circuit Individually Wired

Warning: ***Hazard of Electrical Shock. Installation must be grounded to earth. Disconnect power before installing or servicing heater.***

Minimum Spacing Between Gemini Medium Wave Heaters



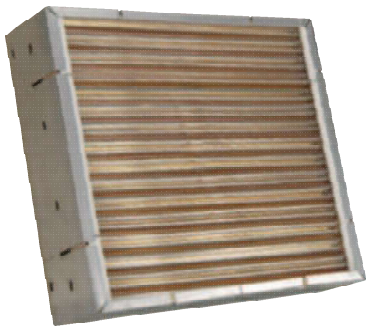
CRA Linear Housings



Minimum Spacing between Heaters in Array Assemblies ("D" Dim.) and CRA Linear Housings

Twin Bore Tube Size	18 x 8 mm	23 x 11 mm	33 x 15 mm
Minimum Center to Center Spacing of Heaters Mounted in ARG Arrays ("D Dim.")	1.43"	1.63"	2.00"
Minimum Center to Center Spacing of Heaters Mounted in CRA Linear Housings	4.00"	4.00"	4.00"

Type ARG Gemini Medium Wave Infrared E-Mitter Panel Arrays

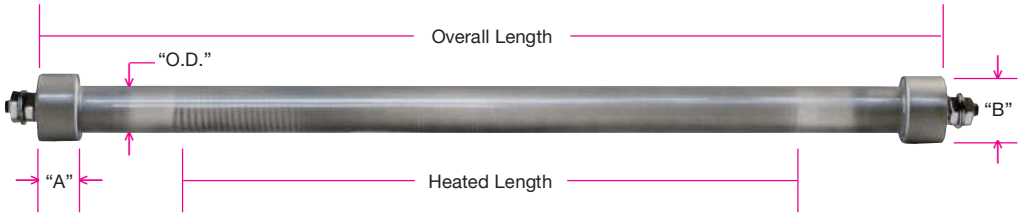


Custom panel arrays are available. Tempco will design and build to your specifications. Consult us with your requirements.

KRD Radiant Quartz Heaters

Made in USA

Vitreous Silica Quartz Tube



Quartz Heater Dimensions

Quartz Tube O.D.	"A"	"B"
3/8"	3/8"	5/8"
1/2"	1/2"	7/8"
5/8"	1/2"	7/8"

Tempco Radiant Quartz heaters are one of the most efficient sources of radiant energy. They are ideally suited for processes that require wavelengths in the medium 4.0-2.4 micron band for efficient operation. These heaters are capable of generating full heat output in 80-100 seconds with a cool-down range of 180-225 seconds depending on the mass of the resistance coil and power density level.

They offer excellent life when used in either rapid cycling or continuous radiant heating applications.To achieve the best operating life, these quartz heaters should be operated with surface watt densities in the 35-40 watts per square inch range, not exceeding the maximum power densities specified below.

Construction Features

The heater consists of a helically wound resistance wire coil enclosed in a pure vitreous silica fused quartz tube with a translucent (semi-opaque) surface. The tubing is terminated at the ends with specially designed ceramic caps securely fastened with high temperature ceramic cement providing support for the field wiring screw terminals used for power connections.

The diffusion effect of the opaque quartz tube surface broadens the emitted wavelength range without creating objectionable glare due to emissions in the visible spectrum. Optimum design provides a clear red color on the translucent tube surface when operating at full line voltage. The emitted wavelength band is almost completely absorbed by the process and considered best for most industrial radiant applications.

Typical Applications

- *Shrink Packaging Tunnels*
- *Laminating*
- *Thermoforming*
- *Plastic Forming*
- *Fusing Plastics*
- *Vulcanizing Rubber*
- *Sterilization*
- *Sealing*
- *Food Warming*
- *Thawing*
- *Electrostatic Copying Equipment*
- *Food Processing*
- *Drying Photo Film Equipment*
- *Curing Rubber*
- *Drying Textiles*
- *Drying Lacquers and Paints*
- *Drying Sand Cores*
- *Space Heaters*
- *Thermal Copying Equipment*

QUARTZ HEATER SPECIFICATIONS — DIMENSIONAL

Diameters: 3/8", 1/2" and 5/8"

Max. Length: 3/8" dia. – 50"
1/2" dia. – 100"
5/8" dia. – 100"

Length Tolerance: Up to 12" long ±1/8"
Over 12" long ±1/4"

QUARTZ HEATER SPECIFICATIONS — ELECTRICAL

Max. Volts: 480 Volts

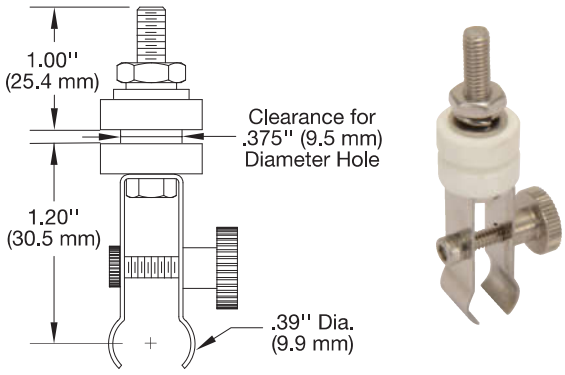
Max. Amperage: 20 Amps

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

Max Watt Density: 40 Watts/sq. in.

Mounting Clamp for 3/8 Quartz Tube OD



Mounting Clamp Part Number: CRK00059

Type ARK Vitreous Silica Quartz Tube Panel Arrays

Custom 4" high Type ARK panels with 1/2" diameter quartz elements are available. Tempco will design and build to your specifications. Consult us with your requirements.

Warning: **Quartz Heaters are designed to be used in a Horizontal Position Only**

View Product Inventory @ www.tempco.com

Vitreous Silica Quartz Tube

Standard Sizes and Electrical Ratings

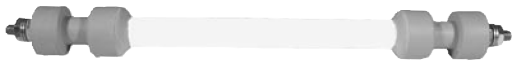
Vitreous Silica Quartz Tube heaters listed have Type T1 termination.

Quartz Tube Diameter	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Watts	Part Number 120V	Part Number 240V
3/8"	14	355.6	12½	317.5	480	KRD00001	KRD00002
	20	508.0	18½	469.9	720	KRD00003	KRD00004
	26	660.4	24½	622.3	960	KRD00005	KRD00006
	38	965.2	36½	927.1	1450	KRD00007	KRD00008
	48	1219.2	46½	1181.1	1900	—	KRD00009
1/2"	18	457.2	16½	419.1	900	KRD00010	KRD00011
	20	508.0	18½	469.9	900	KRD00012	KRD00013
	26	660.4	24½	622.3	1200	KRD00014	KRD00015
	36	914.4	34½	876.3	1800	KRD00016	KRD00017
	38	965.2	36½	927.1	1800	KRD00018	KRD00019
	42	1066.8	40½	1028.7	1580	KRD00020	KRD00021
	48	1219.2	46½	1181.1	1820	KRD00022	KRD00023
	50	1270.0	48½	1231.9	2400	—	KRD00024
	54	1371.6	52½	1333.5	2060	—	KRD00025
	60	1524.0	58½	1485.9	2300	—	KRD00026
	66	1676.4	64½	1638.3	2540	—	KRD00027
	72	1828.8	70½	1790.7	2780	—	KRD00028
5/8"	24	609.6	21	533.4	1075	KRD00029	KRD00030
	26	660.4	23	584.2	1800	KRD00031	KRD00032
	30	762.0	27	685.8	1375	KRD00033	KRD00034
	38	965.2	35	889.0	2500	—	KRD00035
	42	1066.8	39	990.6	1975	KRD00036	KRD00037
	48	1219.2	45	1143.0	2275	—	KRD00038
	50	1270.0	47	1193.8	3400	—	KRD00039
	54	1371.6	51	1295.4	2575	—	KRD00040
	60	1524.0	57	1447.8	2875	—	KRD00041
	62	1574.8	59	1498.6	4200	—	KRD00042
	66	1676.4	63	1600.2	3175	—	KRD00043
	72	1828.8	69	1752.6	3475	—	KRD00044

Terminations

Type T1 Standard Termination

10-32 thread screw terminal standard termination.



Type T2 Panel Mount Bushings

10-32 thread screw terminals with extension bushings for CRA/TRH housing assemblies.

Type ST Tabs with Slotted Holes

1/2" wide × 3/4" long, with a 9/32" × 3/8" slot. Alternate mounting method.

Type FT Quick Disconnect Fuse Type

Fuse-type connector provides ease of installation. Connectors are 3/8" OD × 1/2" long brass.

Type L1 Straight-Out Leads

10" flexible lead wire externally spliced standard. If longer leads are required, specify.

Type C4 Ceramic Caps with Leads

This termination provides 10-32 screw terminals insulated with ceramic terminal covers. Screws are prewired with 10" flexible lead wire. If longer leads are required, specify (also for T1 or T2).

Ordering Information

Catalog Heaters

Order by Part number for standard heaters listed above.

Part Numbers listed are for heaters supplied with Type 1 Termination. For other terminations a Part Number will be issued at time of order.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, **TEMPCO** will design and manufacture a Radiant Quartz Heater to meet your requirements.
Standard lead time is 3 weeks.

Please Specify the following:

- ❑ Diameter
- ❑ Overall Length
- ❑ Heated Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination Type
- ❑ Lead Length; if applicable
- ❑ Mounting Clamps (See page 7-70)

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

KRH Quartz Radiant Heaters

Quartz Sheath Medium Wave Radiant Heater Assemblies in a Universal 2000 Housing

Designed for use in applications that require rapid on/off response and fast heat-up and cooldown rates. These heater assemblies are designed to operate in the medium wavelength range of 4.0-2.4 microns (700 to 1715°F peak emitter temperatures).These Modular Housing assemblies utilize a .50 diameter translucent "milky white" vitreous quartz tube enclosing a high temperature resistance wire coil. The diffusion effect of the translucent quartz tube surface broadens the emitted infrared wavelength range obtained without objectionable glare due to low emissions in the visible spectrum. The units have either single or dual heaters mounted at the focal point of a polished aluminum reflector within the housing. These heater assemblies are available in a wide range of power densities. For housing dimensions and mounting details see page 7-76.

Design Features

- *Direct Retrofit into existing NEMA 1 applications*
- *Rugged Universal 2000 anodized aluminum housing*
- *Wattage range of 600W to 7200W in standard designs*
- *Voltages of 120-480V available depending on heated length*
- *Power densities up to 65w/in per heater (20 amps max/heater)*
- *Maximum Housing assembly length 84"; minimum 15"*
- *Fast response, 40-80 sec for full element heat-up*
- *Full cooldown in less than 4-8 minutes*
- *Single end wiring option available*
- *Multiple heat/dual voltage wiring options for dual heater units*
- *Utilizes standard TRH removable guard designs*
- *External power wiring options available*

Standard (Non–Stock) KRH1 Sizes & Ratings (55-60 w/in.) — Single Element Double End Termination

Wattage	Volts	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Part Number without Guard	Part Number with Guard	Replacement Element Part Number	Replacement Protective Wire Guard	Replacement Reflector Set Part Number
600	120 208 240 277	18	457	9.75	248	KRH10001 KRH10002 KRH10003 KRH10004	KRH10030 KRH10031 KRH10032 KRH10033	KRD00266 KRD00267 KRD00252 KRD00268	GRD-104-104	SMPR-1018
900	120 208 240 277	24	610	15.75	401	KRH10005 KRH10006 KRH10007 KRH10008	KRH10034 KRH10035 KRH10036 KRH10037	KRD00269 KRD00270 KRD00271 KRD00272	GRD-104-105	SMPR-1019
1300	120 208 240 277 480	30	762	21.75	553	KRH10009 KRH10010 KRH10011 KRH10012 KRH10013	KRH10038 KRH10039 KRH10040 KRH10041 KRH10042	KRD00273 KRD00274 KRD00275 KRD00276 KRD00277	GRD-104-106	SMPR-1020
1600	208 240 277 480	36	914	27.75	705	KRH10014 KRH10015 KRH10016 KRH10017	KRH10043 KRH10044 KRH10045 KRH10046	KRD00278 KRD00279 KRD00280 KRD00281	GRD-104-107	SMPR-1021
2400	208 240 277 480	48	1219	39.75	1010	KRH10018 KRH10019 KRH10020 KRH10021	KRH10047 KRH10048 KRH10049 KRH10050	KRD00282 KRD00283 KRD00284 KRD00285	GRD-104-108	SMPR-1022
3000	208 240 277 480	60	1524	51.75	1315	KRH10022 KRH10023 KRH10024 KRH10025	KRH10051 KRH10052 KRH10053 KRH10054	KRD00286 KRD00287 KRD00288 KRD00289	GRD-104-109	SMPR-1023
3600	208 240 277 480	72	1829	63.75	1619	KRH10026 KRH10027 KRH10028 KRH10029	KRH10055 KRH10056 KRH10057 KRH10058	KRD00290 KRD00291 KRD00292 KRD00293	GRD-104-110	SMPR-1024

NOTES: See page 7-76 for housing dimensions and mounting details.
Shipped with Instruction Sheet IDP-129-104 for installation, wiring and maintenance information.

KRH Quartz Radiant Heater Assemblies
Quartz Sheath Medium Wave Radiant Heater Assemblies in a Universal 2000 Housing

Standard (Non–Stock) KRH2 Sizes & Ratings (110-120 w/in.) — Double Element Double End Termination

Wattage	Volts	Overall Length in	Overall Length mm	Heated Length in	Heated Length mm	Part Number without Guard	Part Number with Guard	Replacement Element Part Number	Replacement Protective Wire Guard	Replacement Reflector Set Part Number
1200	120 208 240 277	18	457	9.75	248	KRH20001 KRH20002 KRH20003 KRH20004	KRH20030 KRH20031 KRH20032 KRH20033	KRD00266 KRD00267 KRD00252 KRD00268	GRD-104-104	SMPR-1018
1800	120 208 240 277	24	610	15.75	401	KRH20005 KRH20006 KRH20007 KRH20008	KRH20034 KRH20035 KRH20036 KRH20037	KRD00269 KRD00270 KRD00271 KRD00272	GRD-104-105	SMPR-1019
2600	120 208 240 277 480	30	762	21.75	553	KRH20009 KRH20010 KRH20011 KRH20012 KRH20013	KRH20038 KRH20039 KRH20040 KRH20041 KRH20042	KRD00273 KRD00274 KRD00275 KRD00276 KRD00277	GRD-104-106	SMPR-1020
3200	208 240 277 480	36	914	27.75	705	KRH20014 KRH20015 KRH20016 KRH20017	KRH20043 KRH20044 KRH20045 KRH20046	KRD00278 KRD00279 KRD00280 KRD00281	GRD-104-107	SMPR-1021
4800	208 240 277 480	48	1219	39.75	1010	KRH20018 KRH20019 KRH20020 KRH20021	KRH20047 KRH20048 KRH20049 KRH20050	KRD00282 KRD00283 KRD00284 KRD00285	GRD-104-108	SMPR-1022
6000	208 240 277 480	60	1524	51.75	1315	KRH20022 KRH20023 KRH20024 KRH20025	KRH20051 KRH20052 KRH20053 KRH20054	KRD00286 KRD00287 KRD00288 KRD00289	GRD-104-109	SMPR-1023
7200	208 240 277 480	72	1829	63.75	1619	KRH20026 KRH20027 KRH20028 KRH20029	KRH20055 KRH20056 KRH20057 KRH20058	KRD00290 KRD00291 KRD00292 KRD00293	GRD-104-110	SMPR-1024

NOTES: See page 7-77 for housing dimensions and mounting details.

The Quartz elements are supplied at the same rated voltage as the overall assembly to be wired in parallel.

120V or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series. (120/240V or 240/480V)

Shipped with Instruction Sheet IDP-129-104 for installation, wiring and maintenance information.

Installation Notes:

Series KRH units are for Horizontal mounting only. KRD elements have T2, 10-32 terminals at both ends for field wiring connections. See page 7-71 for details. Wiring used in the junction boxes must be rated 250°C or higher, sized per NEC/NFPA for unit voltage and current carrying capacity. Use only 450°C rated wiring in internal wireways for single end or multiple heat options. When using copper wire for field wiring, use only nickel plated or nickel clad conductors.

Unplated or silver plated copper must not be used. See page 7-82 & 7-83 for wiring options. Do not mount heater housing closer than 6" to any combustible or structural material that does not have at least a 200°C continuous temperature rating.

Danger: Hazard of fire. These heaters are not for use in atmospheres where flammable or combustible vapors, dust, gases, or liquids are present as defined in the National Electrical Code. Where solvents, water vapor or other VOCs are being evaporated from the process, it is necessary to provide substantial quantities of ventilating air to remove all resulting vapors.

Wiring Options

Series KRH Heaters can be prewired with plain leads, stainless steel armor cable, galvanized armor cable, stainless steel wire braid or SJO cable. For additional information See Wiring Options on page 7-17.

Made in USA

TUBULAR RADIANT HEATER ASSEMBLIES

Universal 2000 heaters are ideal for reliable service, providing great flexibility for many diverse industrial and commercial applications.

Designed for Maximum Efficiency, Ease of Installation and Trouble-Free Service...

As the product name implies, Universal 2000 radiant heaters are a direct retrofit replacement for existing and new applications, utilizing similar products regardless of make.

Their unique design offer several quality enhancements without compromising fit and function on existing applications.

Delivering Value-Added Performance

Universal 2000 heaters are ideal for reliable service, providing great flexibility for many diverse industrial and commercial applications. Manufactured with the proper options, Universal 2000 Radiant Heater Assemblies can be used outdoors or in wet locations.

Typical Applications

- *Adhesive Drying*
- *Comfort Heating*
- *Conveyorized Drying*
- *Drying Bulk Materials*
- *Drying Ceramics*
- *Food Warming*
- *Freeze Protection*
- *Heating Rubber or Steel Rolls*
- *Ink Drying*
- *Manufacturing Glass & Mirrors*
- *Moisture Evaporation*
- *Outdoor Comfort Heating*
- *Paint Drying*
- *Resin Curing*
- *Shrink Fitting*
- *Thermoforming*
- *Washdown Facilities*
- *Welding Preheating*

Universal 2000

Construction Characteristics

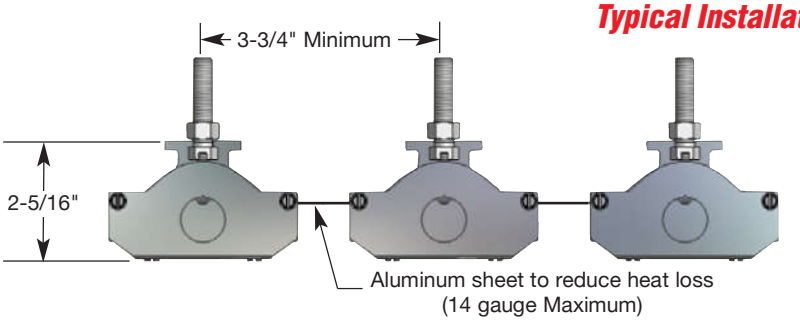
The Universal 2000 Radiant Heater stands apart from all other similar products. Its rugged construction, enhanced design features and flexibility in installation allow it to be used in applications requiring a single unit or to be used as modules creating various configurations for process radiant heating systems.

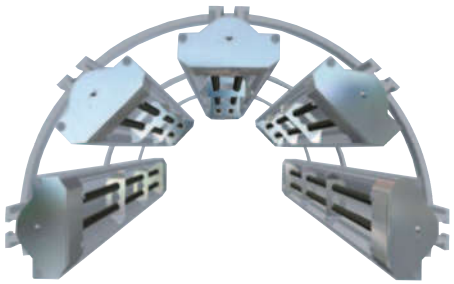
Universal 2000 Radiant Heaters are available in a full range of standard construction variations, physical dimensions and electrical ratings. They are also available in custom engineered/manufactured units up to 132" (3353 mm) for series TRH1, 4 and 6. TRH3 and 5 series units are available up to 120" (3048 mm) lengths. Special electrical ratings, single end wiring, dual voltage, multiple heat designs, and optional fast response Quartz heater options (TRH1 & 2 NEMA1 units only), along with pre-wired units using flexible/rigid conduit or SJO cord/plug can be custom designed to fit your application.

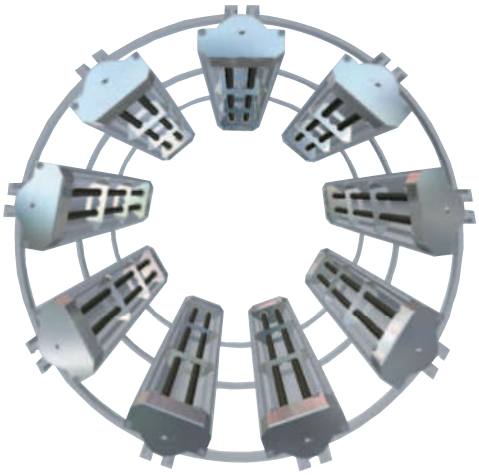
Design Features

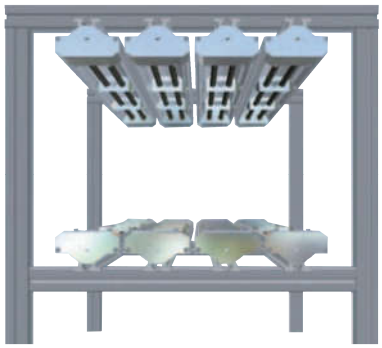
- ***Direct retrofit to existing applications***
- ***Rugged anodized extruded aluminum housing***
- ***Polished aluminum reflector (replaceable)***
- ***Incoloy® sheath tubular heaters (replaceable)***
- ***Element Support brackets (replaceable)***
- ***Sliding mounting bolts (replaceable)***
- ***Dual internal wireways for single end wiring***
- ***Ground terminal lug***
- ***Slots for heat shield on side of housing for between units***
- ***Convenient field wiring***
- ***Made to order***

Typical Installations









Ordering Information

Catalog Heaters

Part Numbers in red are in stock for immediate delivery. Non-Stock Part Numbers are standard designs.

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, Tempco can manufacture a Tubular Radiant Heater to meet your requirements. ***Standard lead time is 4 weeks.***

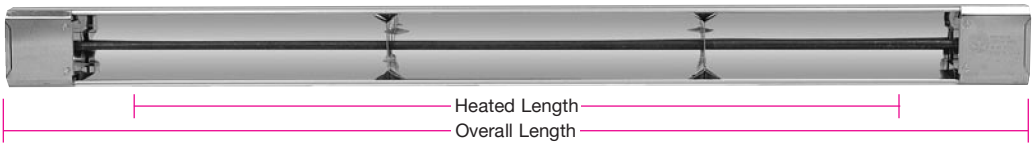
Please Specify the following:

- ❑ Overall Housing Length
- ❑ Wattage and Voltage
- ❑ Termination Features
- ❑ Wiring Options (Single or Double Ended)
- ❑ Series Construction Style

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

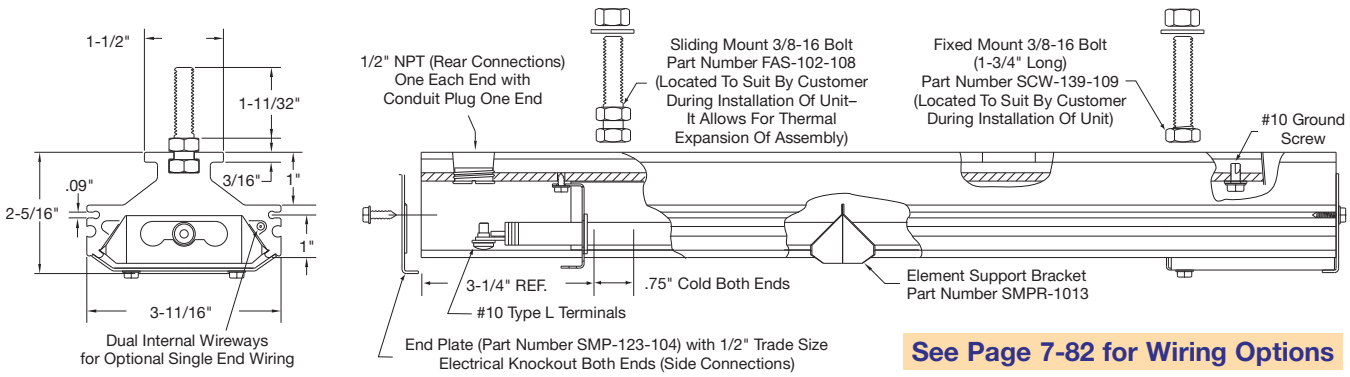
TRH1 Series — Single Straight Element Double End Termination



Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
600	120 208 240 277	18	10	TRH10001 TRH10002 TRH10003 TRH10004	TRH10040 TRH10046 TRH10047 TRH10048	THE09100 THE09101 THE09102 THE09103	GRD-104-104	SMPR-1018
800	120 208 240 277	24	16	TRH10005 TRH10006 TRH10007 TRH10008	TRH10049 TRH10050 TRH10051 TRH10052	THE09104 THE09105 THE09106 THE09107	GRD-104-105	SMPR-1019
1100	120 208 240 277 480	30	22	TRH10009 TRH10010 TRH10011 TRH10012 TRH10013	TRH10053 TRH10054 TRH10055 TRH10056 TRH10057	THE09108 THE09109 THE09110 THE09111 THE09112	GRD-104-106	SMPR-1020
1300	208 240 277 480	36	28	TRH10014 TRH10015 TRH10016 TRH10017	TRH10058 TRH10059 TRH10060 TRH10061	THE09113 THE09114 THE09115 THE09116	GRD-104-107	SMPR-1021
1800	208 240 277 480	48	40	TRH10018 TRH10019 TRH10020 TRH10021	TRH10062 TRH10063 TRH10064 TRH10065	THE09117 THE09118 THE09119 THE09120	GRD-104-108	SMPR-1022
2500	208 240 277 480	60	51	TRH10022 TRH10023 TRH10024 TRH10025	TRH10066 TRH10067 TRH10068 TRH10069	THE09121 THE09122 THE09123 THE09124	GRD-104-109	SMPR-1023
3000	208 240 277 480	72	63	TRH10026 TRH10027 TRH10028 TRH10029	TRH10070 TRH10071 TRH10072 TRH10073	THE09125 THE09126 THE09127 THE09128	GRD-104-110	SMPR-1024
3600	208 240 277 480	84	75	TRH10030 TRH10031 TRH10032 TRH10033	TRH10044 TRH10074 TRH10075 TRH10076	THE09129 THE09130 THE09131 THE09132	GRD-104-111	SMPR-1025

Optional Heating Element Protective Guard
Prevents accidental direct contact with heating element.

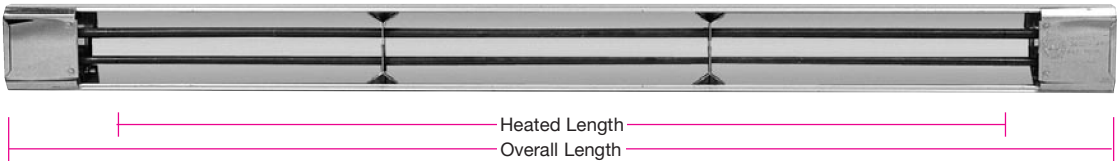


See Page 7-82 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

View Product Inventory @ www.tempco.com

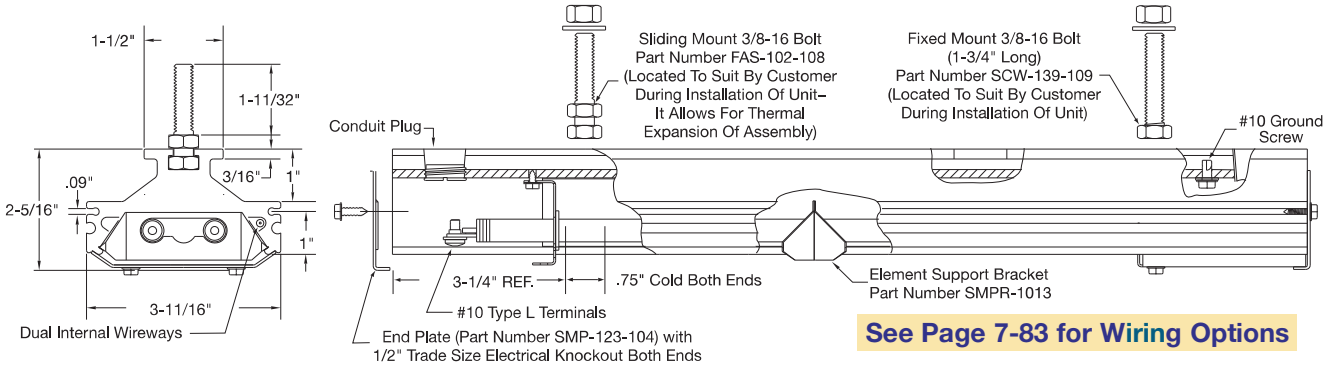
TRH2 Series — Dual Straight Element Double End Termination



Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
1200	120 208 240 277	18	10	TRH20001 TRH20002 TRH20003 TRH20004	TRH20054 TRH20055 TRH20056 TRH20057	THE09100 THE09101 THE09102 THE09103	GRD-104-104	SMPR-1018
1600	120 208 240 277	24	16	TRH20005 TRH20006 TRH20007 TRH20008	TRH20058 TRH20059 TRH20060 TRH20061	THE09104 THE09105 THE09106 THE09107	GRD-104-105	SMPR-1019
2200	120 208 240 277 480	30	22	TRH20009 TRH20010 TRH20011 TRH20012 TRH20013	TRH20062 TRH20063 TRH20064 TRH20065 TRH20066	THE09108 THE09109 THE09110 THE09111 THE09112	GRD-104-106	SMPR-1020
2600	208 240 277 480	36	28	TRH20014 TRH20015 TRH20016 TRH20017	TRH20067 TRH20068 TRH20069 TRH20070	THE09113 THE09114 THE09115 THE09116	GRD-104-107	SMPR-1021
3600	208 240 277 480	48	40	TRH20018 TRH20019 TRH20020 TRH20021	TRH20071 TRH20072 TRH20073 TRH20074	THE09117 THE09118 THE09119 THE09120	GRD-104-108	SMPR-1022
5000	208 240 277 480	60	51	TRH20022 TRH20023 TRH20024 TRH20025	TRH20075 TRH20050 TRH20076 TRH20077	THE09121 THE09122 THE09123 THE09124	GRD-104-109	SMPR-1023
6000	208 240 277 480	72	63	TRH20026 TRH20027 TRH20028 TRH20029	TRH20078 TRH20079 TRH20080 TRH20081	THE09125 THE09126 THE09127 THE09128	GRD-104-110	SMPR-1024
7200	208 240 277 480	84	75	TRH20030 TRH20031 TRH20032 TRH20033	TRH20082 TRH20083 TRH20084 TRH20085	THE09129 THE09130 THE09131 THE09132	GRD-104-111	SMPR-1025

Note: Tubular elements are supplied at the same rated voltage as the overall assembly and are wired in parallel. 120 or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series (120/240V or 240/480V).

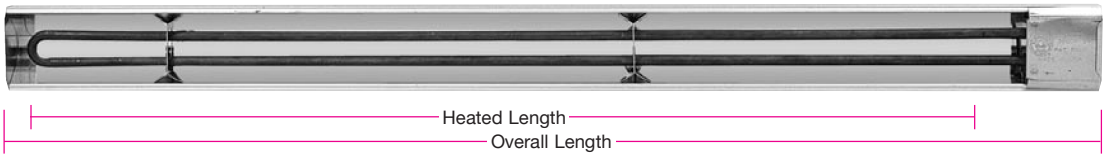


See Page 7-83 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

Made in USA

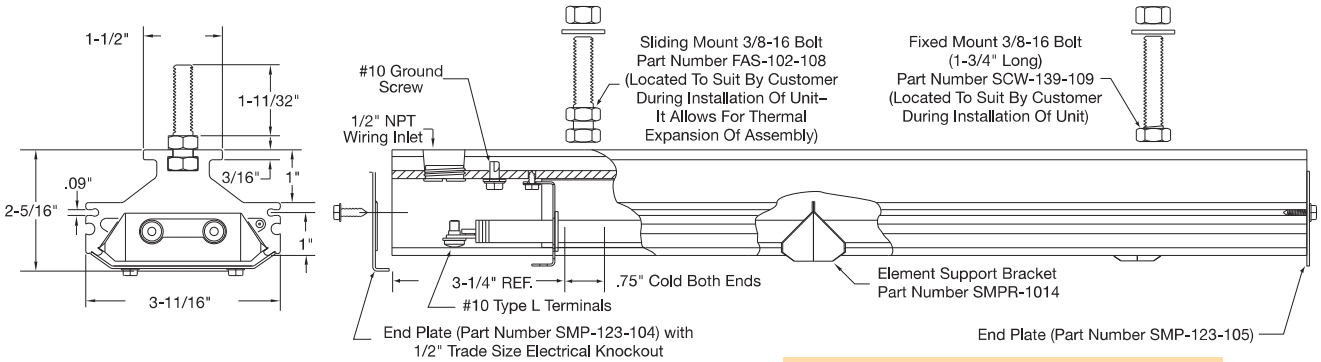
TRH3 Series — Single Hairpin Element Bend Single End Termination



Standard (Non-Stock) and Stock Sizes and Electrical Ratings

Stock Items Are Shown In RED

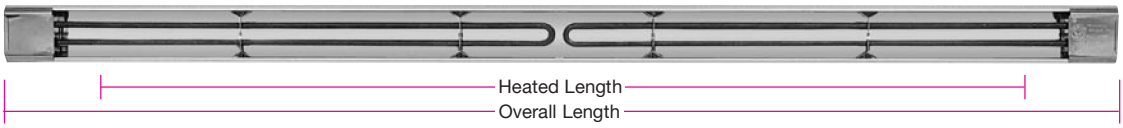
Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector
800	120 208 240 277	12	7	TRH30001 TRH30002 TRH30003 TRH30004	TRH30036 TRH30037 TRH30038 TRH30039	THE09133 THE09134 THE09135 THE09136	GRD-104-112	SMPR-1028
1200	120 208 240 277	18	13	**TRH30005** TRH30006 **TRH30007** TRH30008	**TRH30040** TRH30041 **TRH30042** TRH30043	**THE09137** THE09138 **THE09139** THE09140	GRD-104-113	SMPR-1029
1800	208 240 277 480	24	19	TRH30009 **TRH30010** TRH30011 TRH30012	TRH30044 **TRH30045** TRH30046 TRH30047	THE09141 **THE09142** THE09143 THE09144	GRD-104-114	SMPR-1030
2500	208 240 277 480	30	25	TRH30013 TRH30014 TRH30015 TRH30016	TRH30048 TRH30049 TRH30050 TRH30051	THE09145 THE09146 THE09147 THE09148	GRD-104-115	SMPR-1031
3000	208 240 277 480	36	31	TRH30017 **TRH30018** TRH30019 TRH30020	TRH30052 **TRH30053** TRH30054 TRH30035	THE09149 **THE09150** THE09151 THE09152	GRD-104-116	SMPR-1032
3600	208 240 277 480	48	43	TRH30021 **TRH30022** TRH30023 **TRH30024**	TRH30055 **TRH30056** TRH30057 **TRH30058**	THE09153 **THE09154** THE09155 **THE09156**	GRD-104-117	SMPR-1033
5000	208 240 277 480	60	55	TRH30025 **TRH30026** TRH30027 **TRH30028**	TRH30059 **TRH30060** TRH30061 TRH30062	THE09157 **THE09158** THE09159 **THE09160**	GRD-104-118	SMPR-1034
6000	208 240 277 480	72	67	TRH30030 **TRH30031** TRH30032 **TRH30033**	TRH30064 **TRH30065** TRH30066 **TRH30067**	THE10305 **THE10306** THE10307 **THE10308**	GRD-104-124	SMPR-1095



See Page 7-84 for Wiring Options

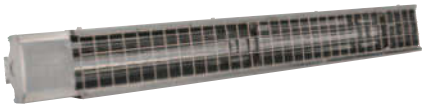
See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

TRH4 Series — Dual Hairpin Element Bend Double End Termination



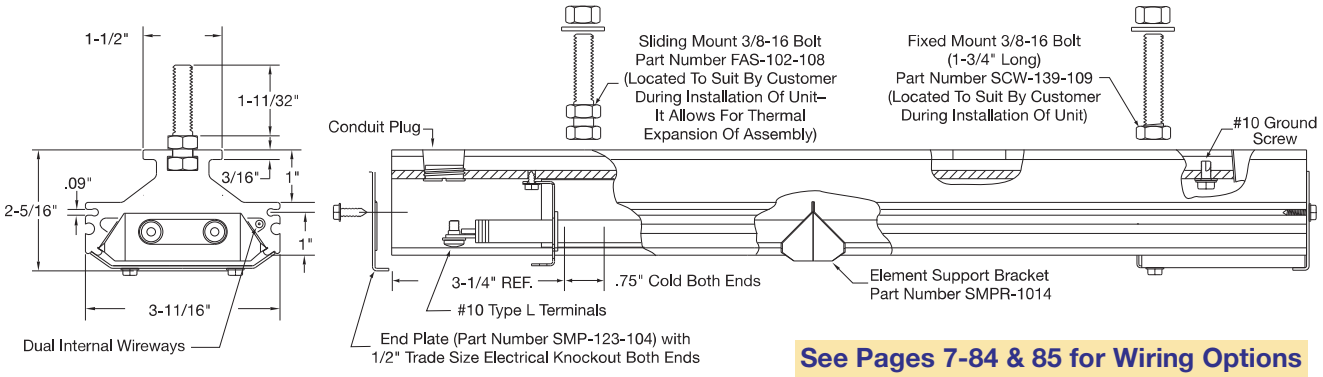
Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
6000	208 240 277 480	72	64	TRH40001 TRH40002 TRH40003 TRH40004	TRH40019 TRH40020 TRH40021 TRH40022	THE09161 THE09162 THE09163 THE09164	GRD-104-119	SMPR-1070
7200	208 240 277 480	84	76	TRH40005 TRH40006 TRH40007 TRH40008	TRH40023 TRH40024 TRH40025 TRH40026	THE09165 THE09166 THE09167 THE09168	GRD-104-120	SMPR-1069
8000	208 240 277 480	96	88	TRH40009 TRH40010 TRH40011 TRH40012	TRH40027 TRH40028 TRH40029 TRH40030	THE09169 THE09170 THE09171 THE09172	GRD-104-121	SMPR-1071
9000	208 240 277 480	108	100	TRH40013 TRH40014 TRH40015 TRH40016	TRH40031 TRH40032 TRH40033 TRH40034	THE09173 THE09174 THE09175 THE09176	GRD-104-122	SMPR-1072



Heater with Protective Guard
Helps prevent accidental direct contact with heating element.

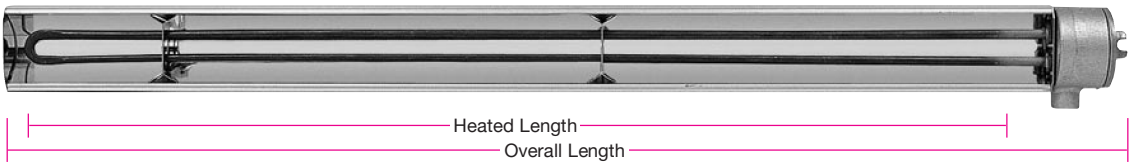
Note: Tubular elements are supplied at the same rated voltage as the overall assembly and are wired in parallel. 120 or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series (120/240V or 240/480V).



See Pages 7-84 & 85 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

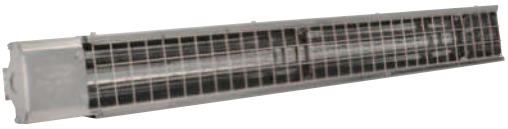
TRH5 Series — Single Hairpin Element Liquid Tight Single End Termination



Standard (Non-Stock) and Stock Sizes and Electrical Ratings

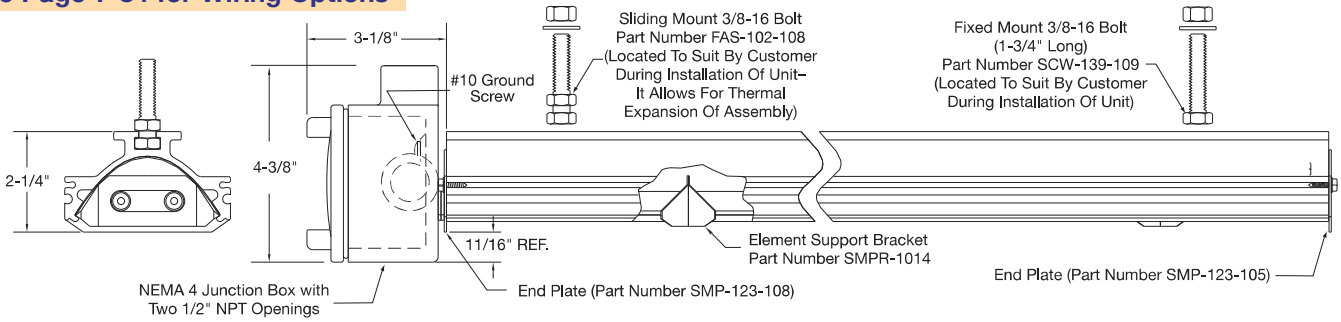
Stock Items Are Shown In RED

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
800	120 208 240 277	12	7	TRH50001 TRH50002 TRH50003 TRH50004	TRH50040 TRH50041 TRH50042 TRH50043	THE09177 THE09178 THE09179 THE09180	GRD-104-112	SMPR-1035
1200	120 208 240 277	18	13	**TRH50005** TRH50006 **TRH50007** TRH50008	**TRH50044** TRH50045 **TRH50046** TRH50047	**THE09181** THE09182 **THE09183** THE09184	GRD-104-113	SMPR-1036
1800	208 240 277 480	24	19	TRH50009 **TRH50010** TRH50011 TRH50012	TRH50048 **TRH50049** TRH50050 TRH50051	THE09185 **THE09186** THE09187 THE09188	GRD-104-114	SMPR-1037
2500	208 240 277 480	30	25	TRH50013 TRH50014 TRH50015 TRH50016	TRH50052 TRH50053 TRH50054 TRH50055	THE09189 THE09190 THE09191 THE09192	GRD-104-115	SMPR-1038
3000	208 240 277 480	36	31	TRH50017 **TRH50018** TRH50019 TRH50020	TRH50056 **TRH50057** TRH50058 TRH50038	THE09193 **THE09194** THE09195 THE09196	GRD-104-116	SMPR-1039
3600	208 240 240 480	48	43	TRH50021 **TRH50022** TRH50023 **TRH50024**	TRH50059 **TRH50060** TRH50061 **TRH50062**	THE09197 **THE09198** THE09199 **THE09200**	GRD-104-117	SMPR-1040
5000	208 240 277 480	60	55	TRH50025 **TRH50026** TRH50027 **TRH50028**	TRH50063 **TRH50064** TRH50065 **TRH50066**	THE09201 **THE09202** THE09203 **THE09204**	GRD-104-118	SMPR-1041
6000	208 240 277 480	72	67	TRH50033 **TRH50034** TRH50035 **TRH50036**	TRH50073 **TRH50074** TRH50075 **TRH50076**	THE10301 **THE10302** THE10303 **THE10304**	GRD-104-124	SMPR-1094



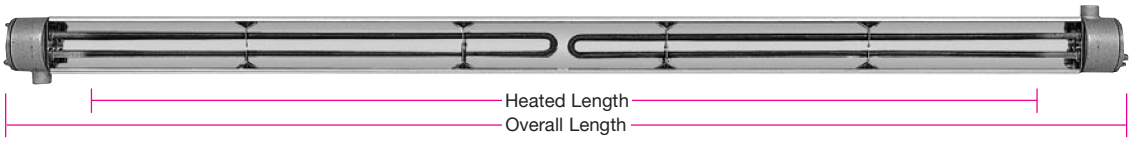
Heater with Protective Guard
Helps prevent accidental direct contact with heating element.

See Page 7-84 for Wiring Options



See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

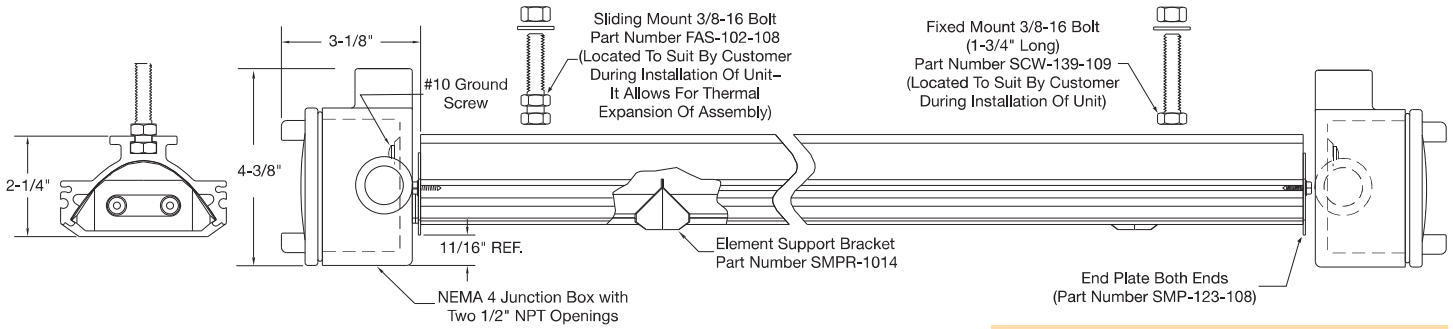
TRH6 Series — Dual Hairpin Element Liquid Tight Double End Termination



Standard (Non-Stock) Sizes and Electrical Ratings

Wattage	Volts	Overall Length in.	Heated Length in.	Part Number without Wire Guard	Part Number with Protective Wire Guard	Replacement Heating Element	Replacement Protective Wire Guard	Replacement Reflector Set
6000	208 240 277 480	72	64	TRH60001 TRH60002 TRH60003 TRH60004	TRH60020 TRH60021 TRH60022 TRH60023	THE09205 THE09206 THE09207 THE09208	GRD-104-119	SMPR-1047
7200	208 240 277 480	84	76	TRH60005 TRH60006 TRH60007 TRH60008	TRH60024 TRH60025 TRH60026 TRH60027	THE09209 THE09210 THE09211 THE09212	GRD-104-120	SMPR-1048
8000	208 240 277 480	96	88	TRH60009 TRH60010 TRH60011 TRH60012	TRH60028 TRH60029 TRH60030 TRH60031	THE09213 THE09214 THE09215 THE09216	GRD-104-121	SMPR-1049
9000	208 240 277 480	108	100	TRH60013 TRH60014 TRH60015 TRH60016	TRH60032 TRH60033 TRH60034 TRH60035	THE09217 THE09218 THE09219 THE09220	GRD-104-122	SMPR-1050

Note: Tubular elements are supplied at the same rated voltage as the overall assembly and are wired in parallel. 120 or 240V rated assemblies can be used at twice the rated voltage by wiring the elements in series (120/240V or 240/480V).



See Page 7-84 for Wiring Options

See Page 7-84 for Stock Heavy Duty Quick Disconnect Plugs and Receptacles

Installation Recommendations

Installation Recommendations

1. Sliding mounting bolts (1-3/4" long, 3/8-16 thread) slide along the length of the aluminum housing for mounting the heater to common structural framing materials, creating multiple heater installations accommodating flat, rectangular, polygonal, cylindrical or any other shape arrays.
   Minimum distance of 3-3/4" on center for heaters mounted side-by-side. Do not exceed 42" between sliding mounting bolts.
2. To reduce heat losses, heat deflector shields up to 14 gauge thick are recommended between heaters. Fiber insulation can also be placed behind the heater housing.
3. In applications where water or solvents are being evaporated, proper ventilation is required to expel vapors or fumes.
4. Standard NEMA 1 electrical enclosures located at opposite ends of the heater housing with standard 7/8" diameter knock-outs and a ½" NPT conduit threaded opening out the top of the housing facilitate single or double end wiring. Heaters with NEMA 3-4 boxes have dual 1/2" trade size hubs oriented 90° to each other. Openings accept standard electrical fittings.
5. Hold the tubular heater terminal tabs with pliers when tightening the screws to ensure secure electrical connections. Use only high temperature hook-up lead wire and nickel-plated steel or monel lugs — Available from Tempco; see page 7-23 and Section 15.

Notes: Electrical wiring should be done by a qualified electrician with full knowledge of the installation and in accordance with local codes and the National Electrical Code.

High temperature hook-up wire and terminal lugs are available from stock. See page 7-23 and Section 15.

Maintenance

1. **Never perform any type of service prior to disconnecting all electrical power to the heater installation.**
2. To maintain reflector efficiency, clean periodically with mild soap and water. Do not use alkali or other strong cleaners. They will dull the aluminum reflector finish.
3. **Replacement of elements, support brackets and reflectors.** (A) Remove terminal enclosure covers. (B) Disconnect power wires from element terminals. (C) Snap out support brackets. (D) Remove elements and old reflectors from front of unit. When replacing elements, reflectors should be replaced. Install new reflectors by snapping edges into housing grooves and reassemble other parts in reverse order.

   Replacement parts are available from stock; see pages 7-86 and 7-87.

Wiring Hints – Wire selection depends on the requirements of the installation.

Wire Temperature Rating for inside the heater housing should be 482°F (250°C) or higher depending on the installation.

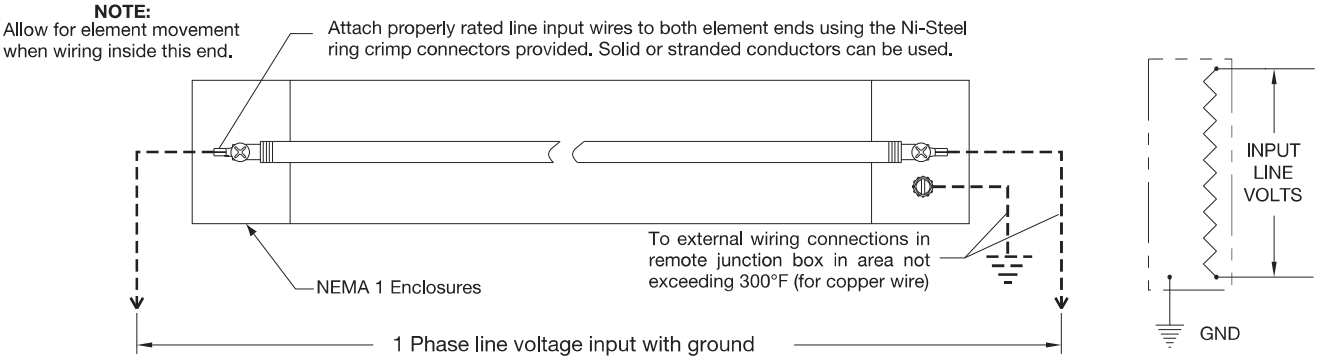
Voltage Rating should be equal to the operating voltage of the installation.

Wire Conductors should be nickel, nickel plated copper or nickel clad copper.

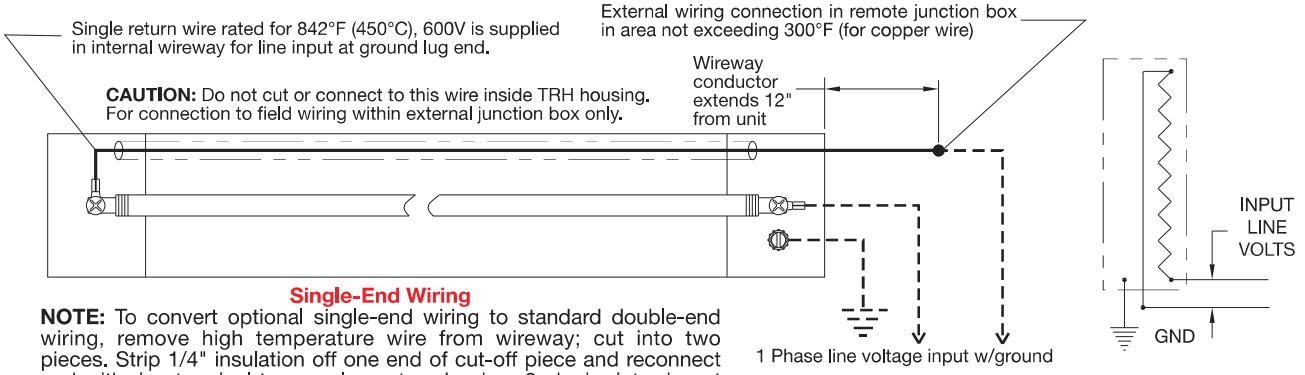
Do not use silver plated or unplated copper wire conductors.

Amperage Rating (wire gauge) should be 12 gauge for units drawing over 20 Amps of current. Use 14 gauge for units drawing under 20 Amps of current.

TRH1 (page 7-76) Standard Double-End Wiring



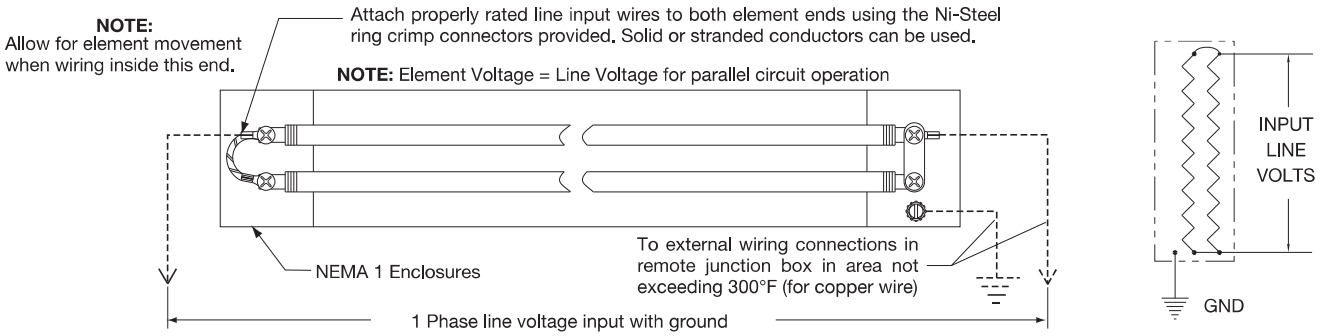
TRH1 (page 7-76) Optional Single End-Wiring



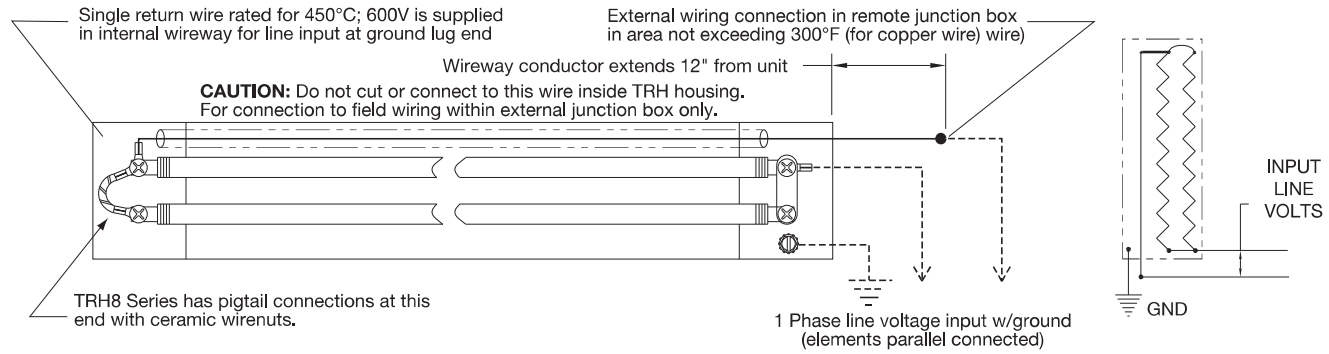
Single-End Wiring

NOTE: To convert optional single-end wiring to standard double-end wiring, remove high temperature wire from wireway; cut into two pieces. Strip 1/4" insulation off one end of cut-off piece and reconnect end with ring terminal to one element end; crimp 2nd wire into ring at opposite element end.

TRH2 (page 7-77) Standard Double-End Wiring



TRH2 (page 7-77) Optional Single-End Wiring



TRH2 (page 7-77) Multiple Heat/Dual Voltage Wiring

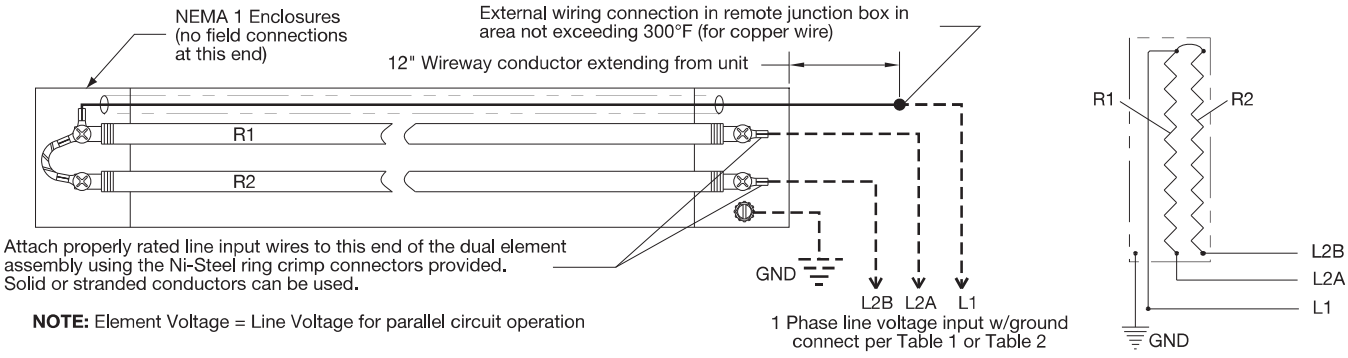


TABLE 1

Multiple Heat Connections (Single Input Voltage)

Heat Range	Line Input Wiring
Max Heat	L1 to L2A & L2B in parallel
Medium Heat	L1 to L2A or L2B only
Low Heat	L2A to L2B (L1 not used)

TABLE 2

Dual Voltage Connections (for 240/480V or 120/240V rated units)

Input Voltage	Line Input Wiring
High (480 or 240V)	L2A to L2B (L1 not used)
Low (240 or 120V)	L1 to L2A & L2B in Parallel

CAUTION

DANGER: Fire Hazard. Radiant Process Heaters with NEMA 1 electrical housings are not to be used in applications where flammable vapors, gases or liquids are present as defined in the National Electrical Code.

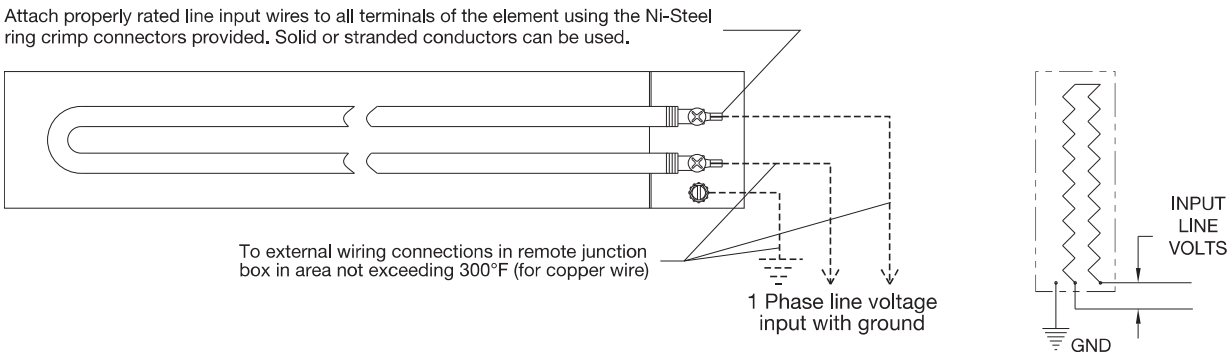
Do not mount the heater closer than 6 inches to any structural or surrounding material that does not have a minimum temperature rating of continuous operation at 395°F (200°C).

Proper ventilation is required to expel vapors or fumes away from the process and personnel.

Universal 2000 TRH Wiring Options

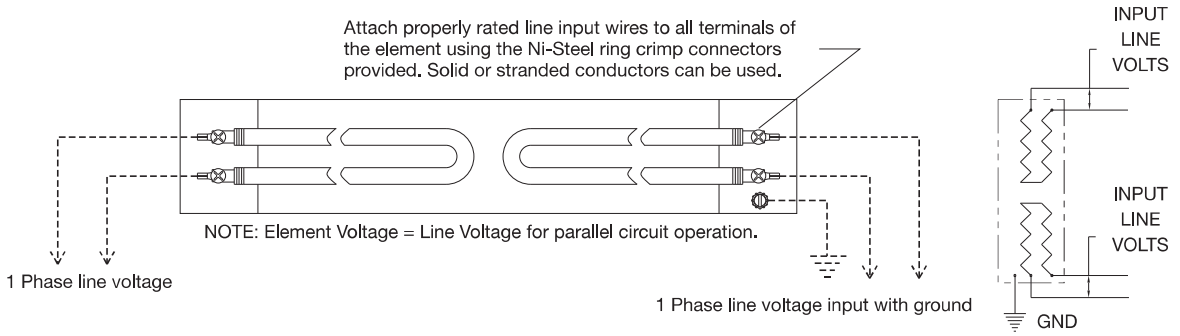
Made in USA

TRH3 (page 7-78) and TRH5 (page 7-80) Standard Single-End Wiring



TRH4 (page 7-79) and TRH6 (page 7-81) Standard Double-End Wiring

NOTE: This is the only option available for TRH 6 series.



Wiring Options

Prewired with Plain Leads, Armor Cable or Wire Braid
(includes ground wire)

Stainless steel armor cable — 18" armor cable over 24" leads
Galvanized armor cable — 18" armor cable over 24" leads
Stainless steel wire braid — 18" wire braid over 24" leads
Fiberglass leads (450°C rating) — 12" long plain leads
If longer leads and/or longer armor cable are required, specify when ordering.

Prewired with 24" SJO Cable
(includes ground wire)

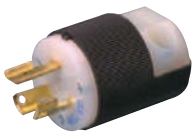
- 16 ga. cable (Up to 15 Amps)
- 14 ga. cable (Up to 22 Amps Max.)
- 12 ga. cable (Up to 28 Amps Max.)
- Max. terminal box temperature 194°F (90°C)
- If longer cable is required, specify when ordering.

Stock Heavy Duty Quick Disconnect Plugs and Connectors

Reference	NEMA P or R	Max. Amps	Volts	Plug Part Number	Connectors (Female) Part Number
P3 straight	5-15	15A	125V	EHD-102-103	EHD-103-102
P4 twist lock	L5-15	15A	125V	EHD-102-113	EHD-103-104
P6 twist lock	L6-20	20A	250V	EHD-102-122	EHD-103-105
P7 twist lock	L6-30	30A	250V	EHD-102-126	EHD-103-125

Notes: **Optional Electrical Plugs** listed can be attached to armor cable or SJO cord described under wiring options above.
Connectors listed are cable mount matching units for the plugs listed and are ordered separately.


P3

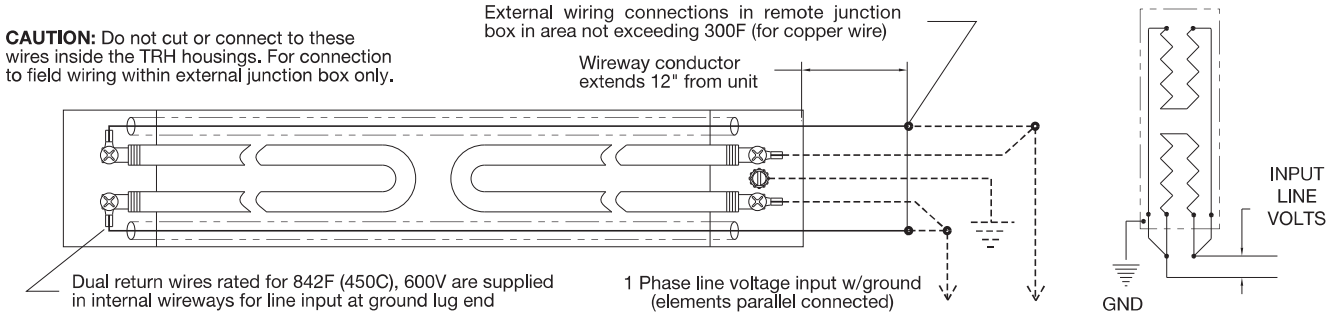

P6


P7

All Items Available from Stock

View Product Inventory @ www.tempco.com

TRH4 (page 7-79) Optional Single-End Wiring



TRH4 (page 7-79) Multiple Heat/Dual Voltage Wiring

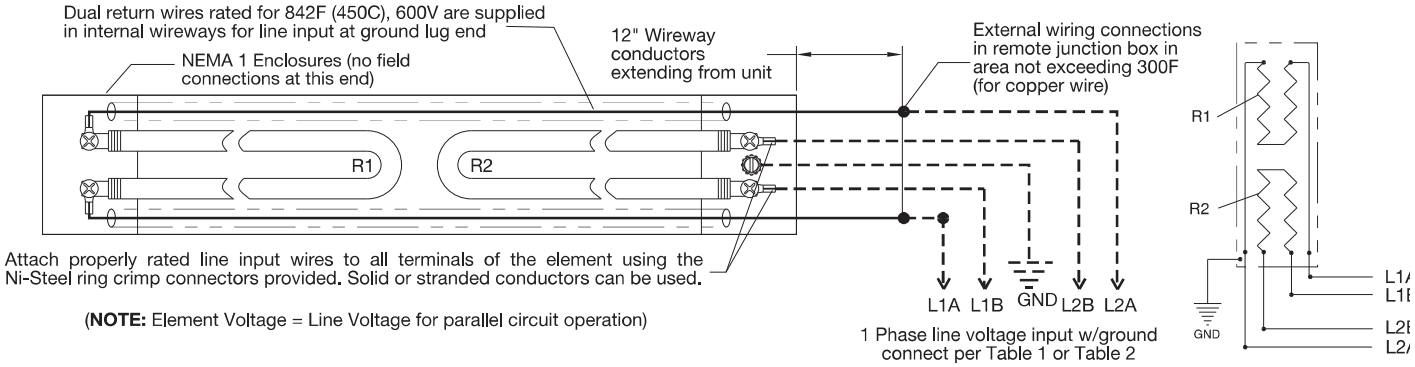


TABLE 1

Multiple Heat Connections (Single Input Voltage)

Heat Range	Line Input Wiring
Max Heat	L1A & L1B to L2A & L2B in parallel
Medium Heat	L1A to L1B or L2A to L2B only
Low Heat	L1A to L1B, input L2A to L2B

TABLE 2

Dual Voltage Connections (for 240/480V or 120/240V rated units)

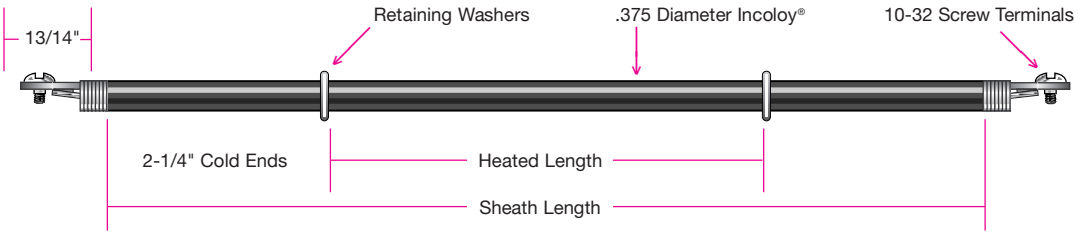
Input Voltage	Line Input Wiring
High (480 or 240V)	L1A to L1B, input L2A to L2B
Low (240 or 120V)	L1A & L1B to L2A & L2B in parallel

Type ART Tubular Radiant Heater Arrays

Tempco can design and manufacture a custom tubular heater array to your specifications. Call for details.

Made in USA

Standard Universal Heater Replacements



Straight Elements
Standard Sizes and Electrical Ratings/Universal Replacement Cross Reference

Watts	Volts	Overall Length in.	Heated Length in.	Cold Ends in.	Watlow® No.	Chromalox® Catalog No.	Chromalox® PCN	TEMPCO Part Number
400	120	10¼	7¼	1½	RDN10E1	RTU-2063AX35	147766	THE04300
650	120	16⅝	13⅜	1½	RDN16L1	RTU-2063AX29	147774	THE04301
800	120	21 1/16	16 13/16	2⅛	RDN21B1	RTU-2083A	106112	THE04302
800	208	21 1/16	16 13/16	2⅛	RDN21B2	RTU-2083AV	106120	THE04303
800	240	21 1/16	16 13/16	2⅛	RDN21B10	RTU-2083A	106139	THE04304
800	277	21 1/16	16 13/16	2⅛	RDN21B4	RTU-2083AV	106147	THE04305
1100	120	27⅛	22⅞	2⅛	RDN27C1	RTU-3113A	106155	THE04306
1100	208	27⅛	22⅞	2⅛	RDN27C2	RTU-3113AV	106163	THE04307
1100	240	27⅛	22⅞	2⅛	RDN27C10	RTU-3113A	106171	THE04308
1100	277	27⅛	22⅞	2⅛	RDN27C4	RTU-3113AV	106180	THE04309
1300	240	32⅛	27⅞	2⅛	RDN32C10	RTU-3133A	108409	THE04310
1300	480	32⅛	27⅞	2⅛	RDN32C11	RTU-3133A	108396	THE04311
1800	208	42⅞	38⅝	2⅛	RDN42R2	RTU-4183AV	106198	THE04312
1800	240	42⅞	38⅝	2⅛	RDN42R10	RTU-4183A	106200	THE04314
1800	277	42⅞	38⅝	2⅛	RDN42R4	RTU-4183AV	106219	THE04315
1800	480	42⅞	38⅝	2⅛	RDN42R11	RTU-4183A	106227	THE04316
2500	208	57½	53¼	2⅛	RDN57J2	RTU-5253AV	106235	THE04317
2500	240	57½	53¼	2⅛	RDN57J10	RTU-5253A	106243	THE04318
2500	277	57½	53¼	2⅛	RDN57J4	RTU-5253AV	106251	THE04319
2500	480	57½	53¼	2⅛	RDN57J11	RTU-5253A	106260	THE04320
3000	208	69¼	65	2⅛	RDN69E2	RTU-6303AV	106278	THE04321
3000	240	69¼	65	2⅛	RDN69E10	RTU-6303A	106286	THE04322
3000	277	69¼	65	2⅛	RDN69E4	RTU-6303AV	106294	THE04323
3000	480	69¼	65	2⅛	RDN69E11	RTU-6303A	106307	THE04324
3600	208	81¼	77	2⅛	RDN81E2	RTU-7363AV	106315	THE04325
3600	240	81¼	77	2⅛	RDN81E10	RTU-7363A	106323	THE04326
3600	277	81¼	77	2⅛	RDN81E4	RTU-7363AV	106331	THE04327
3600	480	81¼	77	2⅛	RDN81E11	RTU-7363A	106340	THE04328
4000	240	109¼	105	2⅛	RDN109E10	RTU-7303AX10	106358	THE04329
5000	240	134½	127¾	3⅜	RDN134J10	RTU-7303AX13	106366	THE04330
5500	240	153⅜	145⅞	4	RDN153R10	RTU-7303AX9A	106374	THE04331
6500	240	179¼	171¼	4	RDN179E10	RTU-7363AX38	106382	THE04332

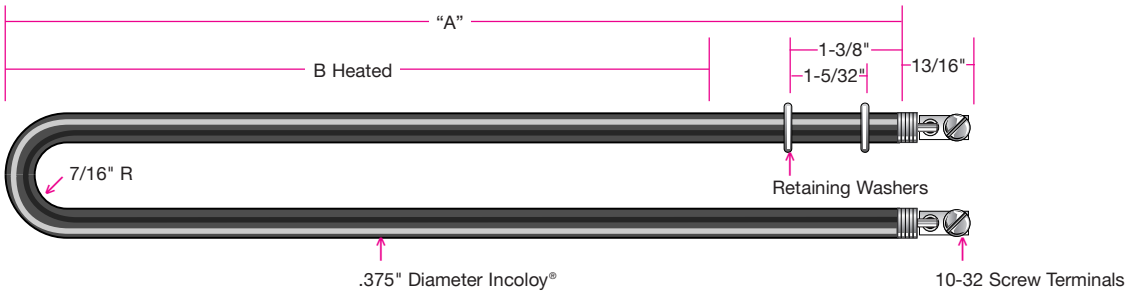
Ordering Information

Select the Part Number of the replacement Tubular Element that meets your requirement.

Standard lead time is 2 to 3 weeks.

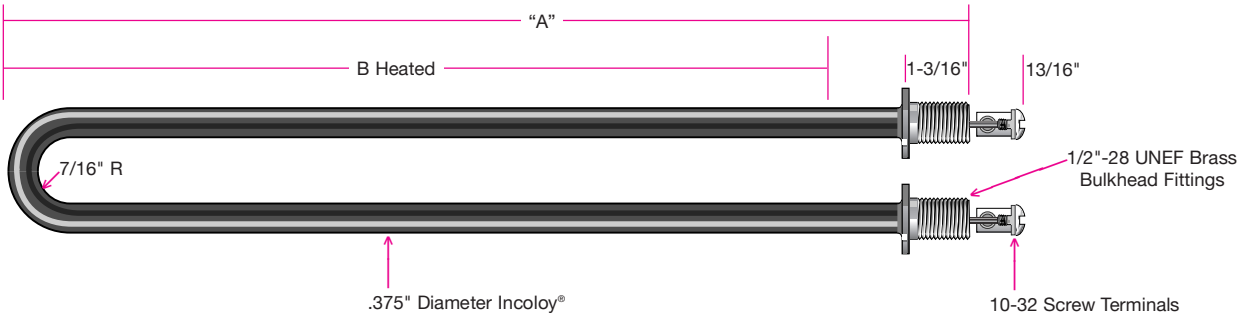
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Standard Universal Heater Replacements



Universal "U" Bend Elements Standard Sizes and Electrical Ratings Replacement Cross Reference Listing

Watts	Volts	Overall "A" Dim. in.	Heated "B" Dim. in.	Watlow® No.	Chromalox® Catalog No.	Chromalox® PCN	TEMPCO Part Number
800	120	10½	8⅜	RDN21B1U	UTU-2	106438	THE04333
800	240	10½	8⅜	RDN21B10U	UTU-2	106454	THE04334
800	277	10½	8⅜	RDN21B4U	UTU-2V	106462	THE04335
1100	120	13⅜16	11⅞16	RDN27C1U	UTU-3	106470	THE04336
1100	208	13⅜16	11⅞16	—	UTU-3V	106489	THE04350
1100	240	13⅜16	11⅞16	RDN27C10U	UTU-3	106497	THE04337
1100	277	13⅜16	11⅞16	RDN27C4U	UTU-3V	106500	THE04338
1800	208	21⅝16	19⅜16	RDN42R2U	UTU-4V	106518	THE04339
1800	240	21⅝16	19⅜16	RDN42R10U	UTU-4	106526	THE04340
1800	480	21⅝16	19⅜16	RDN42R11U	UTU-4	106542	THE04341
2500	208	28¹¹⁄16	26⅝16	RDN57J2U	UTU-5V	106550	THE04342
2500	240	28¹¹⁄16	26⅝16	—	UTU-5	106569	THE04351
2500	277	28¹¹⁄16	26⅝16	RDN57J4U	UTU-5V	106577	THE04343
2500	480	28¹¹⁄16	26⅝16	RDN57J11U	UTU-5	106585	THE04344
3000	240	34⅝16	32⅞16	RDN69E10U	UTU-6	106606	THE04345
3000	480	34⅝16	32⅞16	RDN69E11U	UTU-6	106622	THE04346
3600	208	40⅝16	38⅞16	—	UTU-7V	106630	THE04352
3600	240	40⅝16	38⅞16	RDN81E10U	UTU-7	106649	THE04347
3600	277	40⅝16	38⅞16	RDN81E4U	UTU-7V	106657	THE04348
3600	480	40⅝16	38⅞16	RDN81E11U	UTU-7	106665	THE04349



"U" Bend Elements with Liquid Tight Bulkhead Fittings Standard Sizes and Electrical Ratings Replacement Cross Reference Listing

Watts	Volts	Overall "A" Dim. in.	Heated "B" Dim. in.	Watlow® No.	Chromalox® Catalog No.	Chromalox® PCN	TEMPCO Part Number
800	120	10½	8⅜	RDN21B1B	UTU-2LT	106673	THE04353
800	240	10½	8⅜	RDN21B10B	UTU-2LT	106681	THE04354
1100	120	13⅜16	11⅜	RDN27C1B	UTU-3LT	106690	THE04355
1100	240	13⅜16	11⅜	RDN27C10B	UTU-3LT	106702	THE04356
1800	240	21⅝16	19⅛	RDN42R10B	UTU-4LT	106710	THE04357
1800	480	21⅝16	19⅛	RDN42R11B	UTU-4LT	106729	THE04358
2500	240	28¹¹⁄16	26½	RDN57J10B	UTU-5LT	106737	THE04359
2500	480	28¹¹⁄16	26½	RDN57J11B	UTU-5LT	106745	THE04360
3000	240	34⅝16	32½	RDN69E10B	UTU-6LT	106753	THE04361
3000	480	34⅝16	32½	RDN69E11B	UTU-6LT	106761	THE04362
3600	240	40⅝16	38½	RDN81E10B	UTU-7LT	106770	THE04363
3600	480	40⅝16	38½	RDN81E11B	UTU-7LT	106788	THE04364

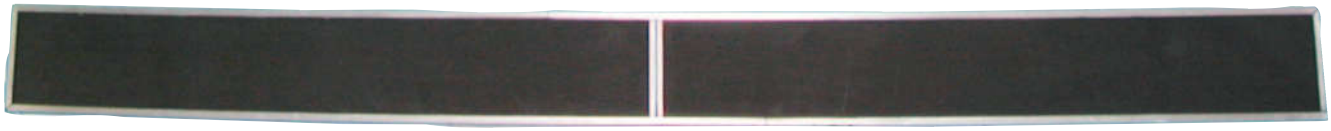
Made in USA

Infrared Medium Wave Panel Heaters

4 *EMITTER FACE CONSTRUCTION STYLES*
Will Accommodate a Diverse Selection of Process Heating Applications Requiring the Advantages of Medium Wave Infrared Heating

Energy Efficient
80% of the Radiant Energy is Transmitted to the Process

Rugged Construction
Excellent Durability
Life Expectancy of up to 25,000 Hours



Direct Retrofits for Existing Applications and Custom Design/Engineering for New Applications

Rugged Construction for Trouble Free Service

Panel Infrared Heaters are available in a complete range of standard emitter face construction styles, sizes, electrical ratings and watt densities (watts/in^2) with optional thermowell only or including a type J or K thermocouple.

Ordering information and product selection can be found on pages 7-89 through 7-95.

Experience the Tempco Advantage

Panel Infrared Heaters shown on this page are a small representation of the many Custom Engineered and Manufactured designs we have produced.

If you have a special application and need free technical assistance, consult our team of professionals with your requirements.

We Welcome Your Inquiries

Infrared Medium Wave Panel Heater Construction Styles

Style RPB Black Quartz Composite Face

High Emissivity Coating

(See page 7-90)

Style RPG Black Glass Face

Cleanable Glass Surface

(See page 7-91)

Style RPW High Temperature Ceramic Glass Face

Highest Watt Density

(See page 7-92)

Style RPM Metal Face

Cleanable Metal Surface

(See page 7-93)

Construction Characteristics

The placement of the resistance coils is carefully designed to provide uniform heat distribution.

The refractory material is backed by layers of insulation to minimize back heat loss. The standard housing is made of heavy gauge aluminized steel. Optional housing materials include 304 Stainless Steel.

The backside of the housing has a terminal box for electrical wiring with ceramic terminal bushings and stainless steel screw terminals.

Options available include: Standard quartz tube thermowell and clamp on the short side, standard Type K or J 1/8" diameter thermocouple probes and various back mounted thermowell/thermocouple combinations described on page 7-95.

DANGER: Fire Hazard

Infrared Panel Heaters are not to be used in applications where flammable vapors, gases or combustible materials are present as defined in the National Electrical Code. Do not mount the heater closer than 6 inches to any structural or surrounding material that does not have a minimum temperature rating of continuous operation at 395°F (200°C). Proper ventilation is required to expel vapors or fumes away from the process and personnel.

Design Features

- *Available in convenient standard building block sizes*
- *Standard mounting screw studs (1/4-20 × 1"L) on the back side*
- *Available in four emitter face styles*
- *Can be ordered with standard side mounted thermowell, clamp bracket and/or Type J or K thermocouple*
- *3 different back mounted thermowell/thermocouples are available*
- *Does not require external reflectors, which require maintenance*
- *Voltages available include 120, 240, 480 VAC, 1 or 3 phase, dual voltage and custom*
- *Maximum watt densities from 25 to 40 watts /in²*
- *Multiple zones and distributed wattage in the same panel heater*
- *Uniform infrared heating coverage*
- *Stainless Steel power screw terminals*

Note:
Not hermetically sealed.

Ordering Information

Catalog Heaters

To order a **Radiant Panel** from the tables on the following pages, fill in the last digit of the part number indicating built-in thermowell and thermocouple as follows:

0 = Plain, no thermowell or T/C
1 = Thermowell only
2 = Thermowell and type K T/C
3 = Thermowell and type J T/C

If a thermowell is selected, specify the type from page 7-95

Custom Engineered/Manufactured Heaters

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, Tempco can manufacture a Radiant Panel Heater to meet your requirements. ***Standard lead time is 4 weeks.***

Please Specify the following:

- ❑ Construction Style (RPB, RPG, RPW or RPM)
- ❑ Length and Width
- ❑ Watts, Volts and Phase
- ❑ Thermowell Type only
- ❑ Thermowell and Type K or J Thermocouple

Made in USA

Style RPB Panel Heater

Style RPB Black Quartz Composite Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature black quartz composite face*
- *High temperature black coating*
- *Precision wound resistance wire*
- *Heavy gauge aluminized steel enclosure box standard Optional: 304 Stainless Steel*
- *Optional: quartz thermowell tube Standard: side mount with clamp Optional-3 back mounted styles*
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs Standard: 1/4-20 × 1"L*
- *Electrical junction box, standard*

Construction Characteristics

Tempco Style RPB panel infrared heaters have a woven silica quartz composite surface that is transparent to radiant energy and is coated with a high temperature black coating for high emissivity.

The resistance wire is helically wound from a high temperature iron/chromium/aluminum alloy. A uniform pattern across the face is milled out in the high temperature ceramic fiberboard, and the resistance coil is cemented in place. Refractory blanket insulation backs up the fiberboard face assembly.

Tempco Style RPB Radiant Heaters can transmit up to 79.5% of the input energy and can be positioned as close as 2 to 4" from the material being heated.

Typical Applications

- *Thermoforming*
- *Paint Drying*
- *Ink Drying*
- *Curing of Plastic Coatings*
- *Silk Screen Painting*
- *Food Warming*
- *Laminating*

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below; custom sizes up to 30"W × 84"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

Maximum Watt Density: 25 Watts/in²

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Maximum Face Temperature: 900°C (1652°F)

Wavelength Range: Between 2.5 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Infrared / Convection Radiant Panels

RPB Radiant Panels can also be supplied for combination radiant/convection applications. Holes are drilled in a uniform pattern in the face of the panel to allow air flow from the rear plenum. A 3" hole is typically provided in the rear panel for mounting a blower or ductwork. Submit your requirements to Tempco.

Standard (Non-Stock) Sizes and Ratings of Style RPB Black Face Infrared Heaters

To complete the part numbers below, include the designated number that applies to the following options:

0 = Plain, no thermowell or T/C **1** = Thermowell only **2** = Thermowell and type K T/C **3** = Thermowell and type J T/C

Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.

For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

Width		Length		15W/in²				25W/in²			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
6	152	12	305	1080	120	1	RPB0101__	1800	240/480	1	RPB0201__
6	152	18	457	1620	240	1	RPB0102__	2700	240/480	1	RPB0202__
6	152	24	610	2160	240/480	1	RPB0103__	3600	240/480	1	RPB0203__
6	152	30	762	2700	240/480	1	RPB0104__	4500	240/480	1	RPB0204__
12	305	12	305	2160	240/480	1	RPB0107__	3600	240/480	1	RPB0207__
12	305	18	457	3240	240/480	1	RPB0108__	5400	240/480	1	RPB0208__
12	305	24	610	4320	240/480	1	RPB0109__	7200	240	3	RPB0209__
12	305	30	762	5400	240/480	1	RPB0110__	9000	240	3	RPB0210__
12	305	36	914	6480	240	3	RPB0111__	10800	480	3	RPB0211__
12	305	48	1219	8640	240	3	RPB0112__	14400	480	3	RPB0212__
18	457	18	457	4860	240/480	1	RPB0117__	8100	240	3	RPB0217__
24	610	24	610	8640	240	3	RPB0118__	14400	480	3	RPB0218__

View Product Inventory @ www.tempco.com

Style RPG High Temperature Glass Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature transparent red/black glass emitter face*
- *Precision wound resistance wire*
- *Milled ceramic fiberboard to hold resistance wire, cemented in place*
- *Heavy gauge aluminized steel enclosure box standard*
  Optional: 304 Stainless Steel
- *Optional: quartz thermowell tube*
  Standard: side mount with clamp
  Optional-3 back mounted styles
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs*
  Standard: 1/4-20 × 1"L
- *Electrical junction box, standard*

Construction Characteristics

The Tempco Style RPG Radiant Panel Heater has a red/black high temperature ceramic glass for the exterior radiant surface. The RPG Radiant Panel Heater is the ideal heater when a cleanable surface is required, such as for the bottom heaters of a thermoforming oven.

Behind the glass, a 1" thick ceramic fiberboard is milled out to support the helically wound iron/chromium/aluminum alloy based resistance element. The resistance coils are placed into the precision machined grooves in the fiberboard and cemented into place. Ceramic cloth is placed between the glass and the resistance coil.

Tempco Style RPG Radiant Heaters can transmit up to 78.5% of the input energy and can be positioned as close as 2 to 4" from the material being heated.

Typical Applications

- *Moisture Removal*
- *Paint Drying*
- *Glass Processing*
- *Curing of plastic coatings, paint, ink, etc.*
- *Thermoforming*
- *Heat Setting*
- *Film Shrinking*
- *Blister Packaging*
- *Food Processing*
- *Textile Drying*

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below; custom sizes up to 34"W × 36"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

Maximum Watt Density: 20 Watts/in²

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Maximum Face Temperature: 750°C (1382°F)

Wavelength Range: Between 2.5 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Standard (Non-Stock) Sizes and Ratings of Style RPG High Temperature Glass Infrared Heaters

To complete the part numbers below, include the designated number that applies to the following options:

0 = Plain, no thermowell or T/C **1** = Thermowell only **2** = Thermowell and type K T/C **3** = Thermowell and type J T/C

Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.

For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

Width		Length		10W/in²				15W/in²			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
6	152	12	305	720	120	1	RPG0101__	1080	120/240	1	RPG0201__
6	152	18	457	1080	120/240	1	RPG0102__	1620	240	1	RPG0202__
6	152	24	610	1440	120/240	1	RPG0103__	2160	240/480	1	RPG0203__
12	305	12	305	1440	120/240	1	RPG0104__	2160	240/480	1	RPG0204__
12	305	18	457	2160	240/480	1	RPG0105__	3240	240/480	1	RPG0205__
12	305	24	610	2880	240/480	1	RPG0106__	4320	240/480	1	RPG0206__
16	406	24	610	3840	240/480	1	RPG0107__	5760	240/480	1	RPG0207__
24	610	24	610	5760	240	1	RPG0108__	8640	480	1	RPG0208__

Made in USA

Style RPW Panel Heater

Style RPW Very High Temperature Ceramic Glass Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *High temperature white translucent glass emitter surface*
- *Precision wound resistance wire*
- *Milled ceramic fiberboard to hold resistance wire, cemented in place*
- *Heavy gauge aluminized steel enclosure box standard*
  Optional: 304 Stainless Steel
- *Optional: quartz thermowell tube*
  Standard: side mount with clamp
  Optional-3 back mounted styles
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs*
  Standard: 1/4-20 × 1"L
- *Electrical junction box, standard*

Construction Characteristics

Tempco Style RPW Radiant Panel Heaters use a very high temperature ceramic glass for the emitter surface. The RPW Radiant Panel Heater is the perfect heater when a cleanable surface is required at a higher watt density

Behind the very high temperature glass, a 1" thick ceramic fiber refractory board is milled out in a uniform pattern to accept the helically wound iron/chromium/aluminum alloy resistance element. The resistance coils are set into the precision machined grooved board and cemented into place. A ceramic cloth is placed between the very high temperature glass and the resistance coils.

Tempco Style RPW Radiant Heaters can transmit up to 78.5% of the power input as infrared energy.

Typical Applications

- *Moisture Removal*
- *Paint Drying*
- *Glass Processing*
- *Curing of plastic coatings, paint, ink, etc.*
- *Thermoforming*
- *Heat Setting*
- *Film Shrinking*
- *Blister Packaging*
- *Food Processing*
- *Toasting*
- *Textile Drying*

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below; custom sizes up to 24"W × 24"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

Maximum Watt Density: 40 Watts/in²

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Maximum Face Temperature: 800°C (1472°F)

Wavelength Range: Between 2.5 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Standard (Non-Stock) Sizes and Ratings of Style RPW Very High Temperature Glass Infrared Heaters

To complete the part numbers below, include the designated number that applies to the following options:

0 = Plain, no thermowell or T/C **1** = Thermowell only **2** = Thermowell and type K T/C **3** = Thermowell and type J T/C

Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.

For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

Width		Length		40W/in²			
in	mm	in	mm	Watts	Volts	Ph.	Part Number
4	102	10	254	1600	240	1	RPW0101__
6	152	10	254	2400	240/480	1	RPW0102__
6	152	12	305	2880	240/480	1	RPW0103__
8	203	10	254	3200	240/480	1	RPW0104__
10	254	10	254	4000	240/480	1	RPW0105__
12	305	10	254	4800	240/480	1	RPW0106__
12	305	12	305	5760	240/480	1	RPW0107__

Style RPM Metal Face Infrared Panel Heaters

Design Features

- *Panel heater can be mounted in any direction*
- *Metal emitter face Stainless steel with black finish*
- *Precision wound resistance wire*
- *Milled ceramic fiberboard to hold resistance wire, cemented in place*
- *Heavy gauge aluminized steel enclosure box standard Optional: 304 Stainless Steel*
- *Optional: quartz thermowell tube Standard: side mount with clamp Optional-3 back mounted styles*
- *Refractory blanket insulation*
- *Stainless Steel power screw terminals*
- *Mounting screw studs Standard: 1/4-20 × 1"L*
- *Electrical junction box, standard*

Construction Characteristics

Tempco Style RPM Radiant Panel Heaters have a stainless steel metal with a black finish for the emitter surface. The RPM Radiant Panel Heater is a good heater when a cleanable surface and a robust design is required.

The ceramic fiber refractory board is milled out in a uniform pattern to accept the helically wound iron/chromium/aluminum alloy resistance element. The resistance coils are set into the precision machined grooved board and cemented into place. A ceramic cloth is placed between the metal face and the resistance coils.

Tempco Style RPM Radiant Heaters can transmit up to 65.0% of the power input as infrared energy. They can be positioned as close as 2 to 4" from the material being heated.

Typical Applications

- *Thermoforming*
- *Paint Drying*
- *Ink Drying*
- *Curing of Plastic Coatings*
- *Silk Screen Painting*
- *Food Warming*
- *Heat Setting*
- *Film Shrinking*
- *Blister Packaging*

SPECIFICATIONS

Maximum Size: In addition to the standard sizes listed below, custom sizes up to 24"W × 48"L can be manufactured.

Thickness: Standard — 3", Optional — 1.5" to 5"

Maximum Watt Density: 15 Watts/in²

Maximum Voltage: Voltage can be single, dual or 3-phase up to 600 VAC (depending on heater size and wattage)

Maximum Face Temperature: 700°C (1292°F)

Wavelength Range: Between 3.0 and 6.0 microns (μm)

Distributed Wattage and Zoning: Yes, dependent on size

Standard (Non-Stock) Sizes and Ratings of Style RPM Metal Face (SS) Infrared Heaters

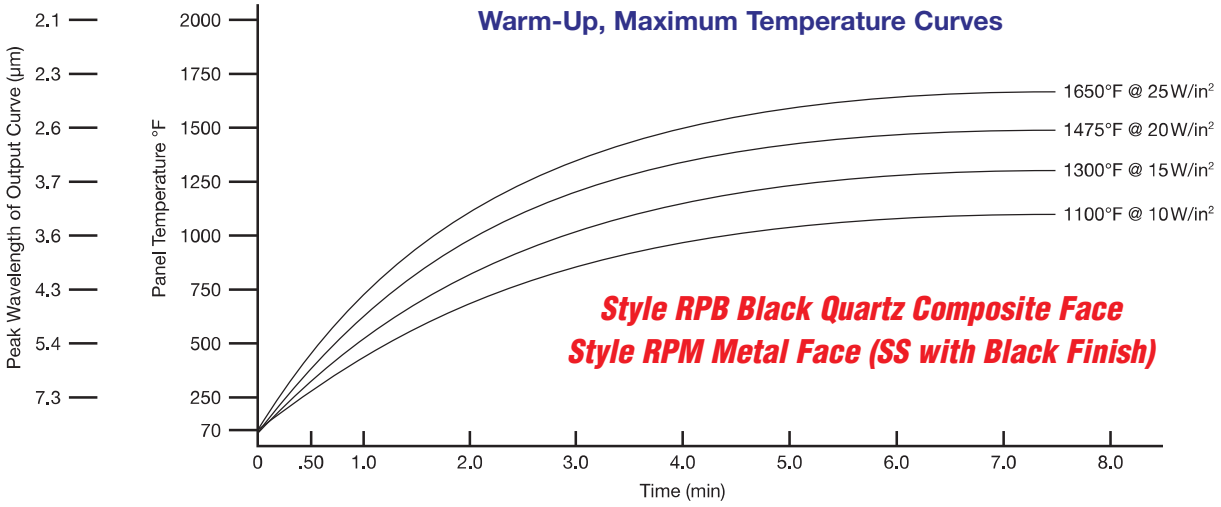
To complete the part numbers below, include the designated number that applies to the following options:
0 = Plain, no thermowell or T/C **1** = Thermowell only **2** = Thermowell and type K T/C **3** = Thermowell and type J T/C
Available Thermowell/Thermocouple types and descriptions can be found on page 7-95.
For the part numbers below, if a thermowell is specified, the standard Side Mount Thermowell with Clamp is supplied.

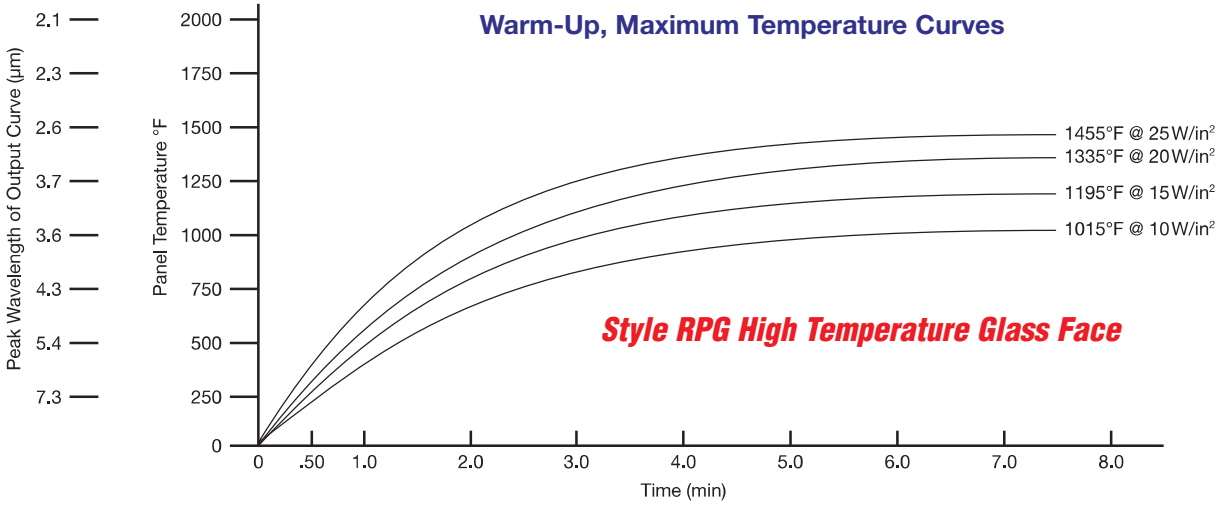
Width		Length		10W/in²				15W/in²			
in	mm	in	mm	Watts	Volts	Ph.	Part Number	Watts	Volts	Ph.	Part Number
6	152	12	305	720	120	1	RPM0101__	1080	120/240	1	RPM0201__
6	152	18	457	1080	120/240	1	RPM0102__	1620	240	1	RPM0202__
6	152	24	610	1440	120/240	1	RPM0103__	2160	240/480	1	RPM0203__
12	305	12	305	1440	120/240	1	RPM0104__	2160	240/480	1	RPM0204__
12	305	18	457	2160	240/480	1	RPM0105__	3240	240/480	1	RPM0205__
12	305	24	610	2880	240/480	1	RPM0106__	4320	240/480	1	RPM0206__
16	406	24	610	3840	240/480	1	RPM0107__	5760	240/480	1	RPM0207__
24	610	24	610	5760	240	1	RPM0108__	8640	480	1	RPM0208__

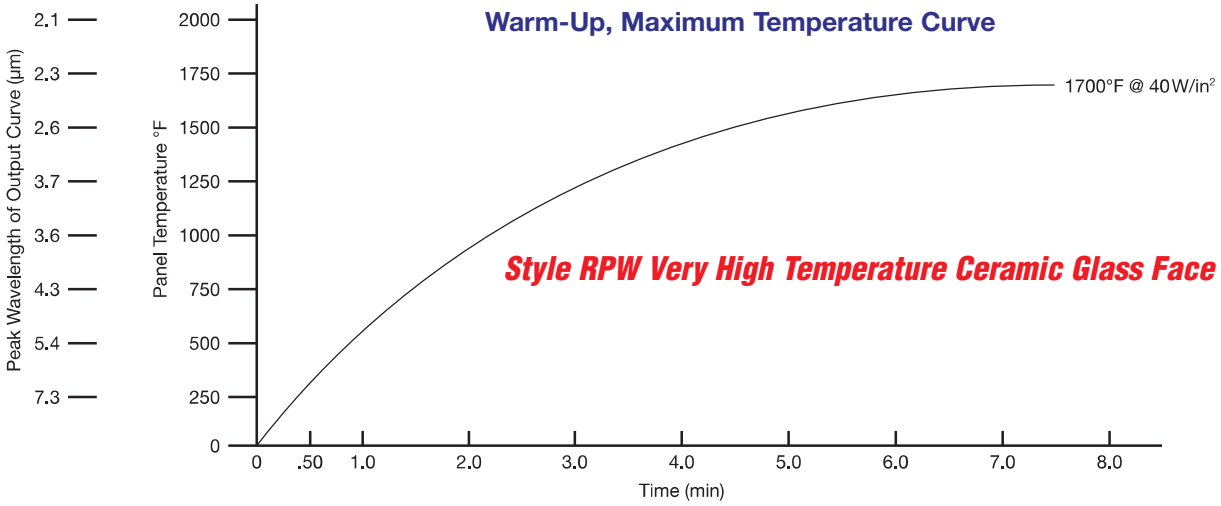
Infrared Medium Wave Panel Heater Warm-Up Curves

Warm-up curves are measured from heaters running facedown in open air. The thermocouple is located in the standard location, in the thermowell located behind the coil. The curves will change with environment and thermocouple location.

The curves are also useful in determining what the potential maximum temperature and peak wavelength are for various watt density heaters.







Infrared Panel Heater Options

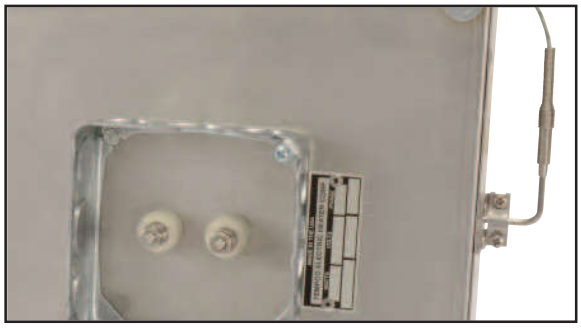
Construction Options

The standard enclosure case is aluminized steel. Aluminized steel is the optimum choice for most applications. It will reach 650°C/1200°F without discoloring or degrading.

304 Stainless Steel is available when cleanliness is of the utmost importance. (Note: 304 SS will discolor at a lower temperature than aluminized steel).

Rivets are normally used to hold the case together. In addition to the side slots, this allows for expansion/contracting of the case and minimizes potential warping. There are applications that require minimal potential particulate matter. For these applications the side slots are not put in and the metal seams can be welded closed.

Thermowell/Thermocouple Temperature Sensing Options

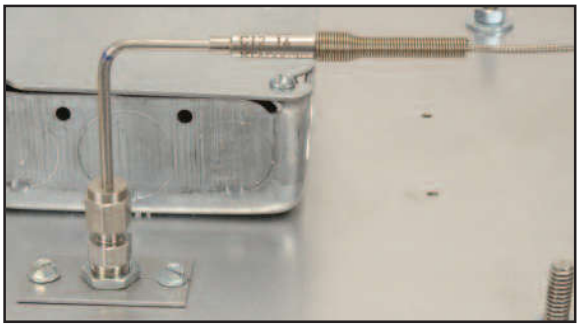


Standard Side Mount Thermowell with Clamp

The standard Side Mount Thermowell with Clamp is a 5" long, 4 mm ID quartz glass tube, installed in the short side of the panel, just behind the resistance coil. The screw pressure clamp and thermowell are designed to hold a 0.125" diameter probe.

Replacement TC Probes (with 48" leads, SS overbraid)

Type K — Part Number MTA00839
Type J — Part Number MTA00840

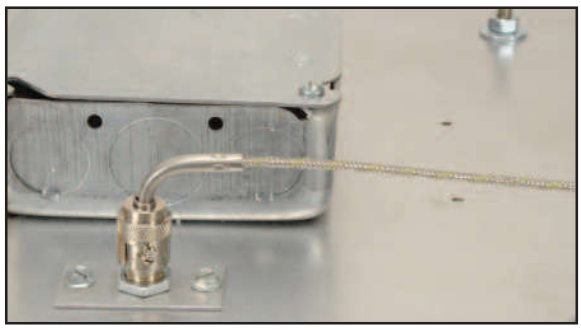


Back Mount Thermowell with Compression Fitting

The optional Back Mount Thermowell with Adjustable Compression Fitting is a short, 4 mm ID quartz glass tube, mounted perpendicular to the face with a ceramic disk at the bottom. The compression fitting and glass tube are sized for a 0.125" diameter probe.

Replacement TC Probes (with 48" leads, SS overbraid)

Type K — Part Number MTA00839
Type J — Part Number MTA00840

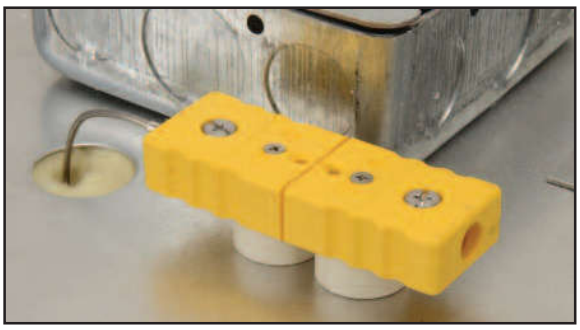


Back Mount Thermowell with Bayonet Fitting

The optional Back Mount Thermowell with Bayonet Fitting is a short, 8 mm ID quartz glass tube, mounted perpendicular to the face with a ceramic disk at the bottom. The bayonet fitting and glass tube are sized for a 0.187" diameter probe.

Replacement TC Probes (with 48" leads, SS overbraid)

Type K — Part Number TCP50270
Type J — Part Number TCP50269



Back Mount Thermowell – Parallel to Face

The optional Back Mount Thermowell (Parallel to Face) is a 5", 6 mm ID quartz glass tube with a soft 90° bend, mounted along the face, exiting in the rear. A maximum 0.063" diameter probe is required to make the bend. Screws and ceramic spacers are provided.

Replacement TC Probes (with connector set)

Type K — Part Number MTA01546
Type J — Part Number MTA01775

Infrared Radiant Heaters Are Ideal for Many Diverse Applications

Plastics and Rubber

- *Plastifying of plastic sheets and rolls for thermoforming and vacuum forming*
- *Preheating or vulcanizing rubber sheets*
- *Heating glass fiber reinforced plastic during production*
- *Curing plastisols*
- *Laminating and plastic welding*

Paper/Pulp

- *Drying of paper pulp*
- *Quick drying of gummed, sized, or lacquered paper*
- *Drying of unprocessed and printed wallpaper*
- *Heating papier-mâché before pressing*
- *Adhesive activation*

Textiles

- *Setting Nylon® and Perlon® threads*
- *Gelling PVC paste coatings on fabrics*
- *Drying washed, dyed, and finished textile fabrics*
- *Heat set synthetic fabrics*

Food

- *Baking and browning small bakery products*
- *Keeping food warm*
- *Heating processed cheeses*
- *Packaging food products*

Miscellaneous Processes

- *Drying and curing of paint and powder coatings*
- *Drying raw tobacco*
- *Evaporation of water and solvents*
- *Manufacturing shrink packaging equipment*
- *Ink drying*
- *Comfort heat for agricultural, zoological and reptilian pet applications*

Introduction to Infrared Radiation Heating Systems

Tempco's Radiant Heaters

fall into the medium wavelength range of electromagnetic infrared radiation. Infrared energy is commonly used to heat plastics, remove moisture, cure painted finishes or heat food products. This is because plastics, organic substances and water absorb infrared energy more efficiently than other materials in industrial applications.

A Straightforward Approach to Infrared Radiant Heating Technology

Radiant heating is regarded by many as a black magic technology that is complicated and difficult to work with. While radiation theory can be complicated, it is far easier to apply when given the appropriate heating devices and guidance on which device best suits your application.

In this section, Tempco will present an overview of our product offerings, their capabilities, and relevant technical data that will aid you in selecting the heating system that best serves your requirements.

No matter what the application needs, Tempco has the right product to satisfy your requirements.

The Basics

The three main modes of heat transfer are:

Conduction – When two bodies of different temperature are brought in contact with each other, heat energy flows from the hotter to the colder body.

Convection – Heat energy is transferred from a higher temperature region in a gas or liquid to a lower temperature region as a result of movement of masses within the fluid or gas.

Radiation – Infrared radiant energy is transported through space by electromagnetic waves without the need for a conductive media. Consequently, heat can be delivered in concentrated areas at very fast rates.

Electromagnetic radiation can be further broken down into four basic categories:

1. Ultraviolet
2. Infrared — (Short/Medium/Long Wavelength)
3. Microwave
4. Radio Frequency/Induction

Operating life

A ceramic infrared E-Mitter should not be immersed in or have contact with any liquids. The E-Mitter surface must be kept clean and free of any contamination. Failure to do so can compromise heater operating life.

Explosion Protection

Ceramic Infrared Heaters are not explosion-proof heaters. These heaters can only be used in atmospheres where the vapor concentration is well below the explosion limits of the processed material. Special provisions, such as forced ventilation, must be made to remove highly flammable vapors from the heater's path. Strict observance of the drying temperature is required for enamel-based materials.

The user is solely responsible for the installation of the E-Mitters and strict observance of all applicable regulations.

Ceramic Infrared E-Mitter Technical Data

Heat Transfer Theory Summary

A heat transfer mode that will naturally occur at the surface of the heater is called radiation. Its intensity does not depend on the characteristics of the surrounding fluid (it works in a vacuum too) but on the characteristics of the heater and the surrounding bodies.

Therefore, the efficiency of radiation heat transfer exchange between bodies depends on:

1. ***The emissivity values of the emitter (i.e. ceramic heaters).***
2. ***The absorption, reflection and transmission properties associated with the receiving medium.***
3. ***The relative temperature differences.***
4. ***The surface characteristics.***
5. ***Relative position and physical geometry.***

The Technical References presented here are intended to enhance your knowledge of various aspects of infrared radiant heating, enabling you to make better choices when selecting Tempco ceramic infrared E-Mitters.

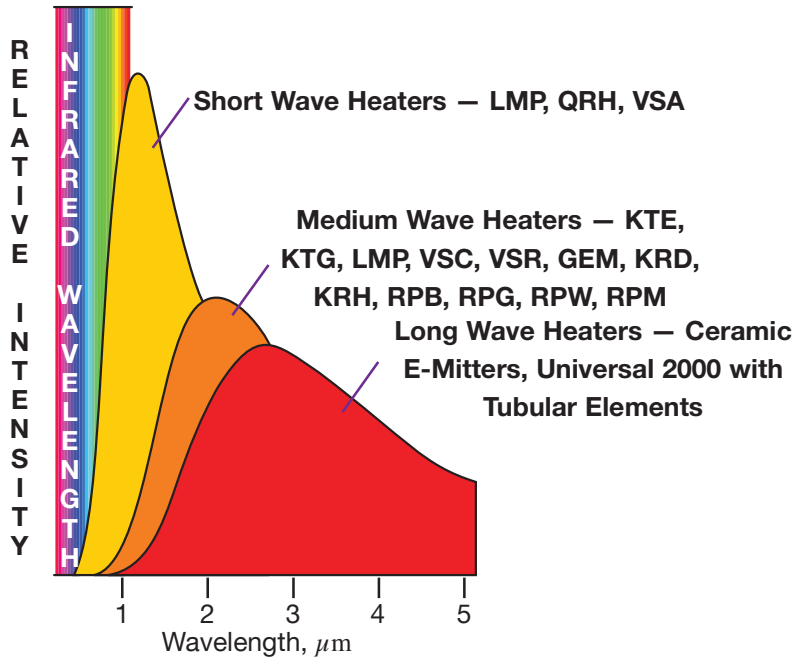
Many applications in the field are unique and present substantially different operational parameters and characteristics. This application diversity should be evaluated accordingly, and while the material presented in this section is intended to provide some background reference, it is very generalized and is not to be construed as application specific.

Note: It is highly recommended that you contact our staff of knowledgeable sales engineers with specific technical questions relating to your application.

Infrared radiant energy is transported through space by electromagnetic waves without the need of a conductive media (as opposed to conduction or convection processes). Consequently, ***heat can be delivered in concentrated areas at very fast rates***.

Understanding these important characteristics will lead to a better utilization of infrared heating technology.

Taking the Mystery Out of Infrared Energy



All matter emits radiant energy as a consequence of its finite temperature.

Only at absolute zero (–273°C), when all molecular activity ceases, does matter stop emitting radiant energy. In solids and liquids, emission of radiant energy is considered a surface phenomenon, while for gases and certain semi-transparent solids, such as glass and salt crystals (at elevated temperature), emission is considered a volumetric phenomenon.

WHY CAN'T WE SEE INFRARED RADIATION?

Electromagnetic radiation is measured in wavelength "λ" or in frequency "f." Both quantities are related by the equation:

$$\lambda = c \div f$$

"c" is the speed of light (3×10^{-8} m/s)

Infrared radiation wavelengths fall outside the visible range in the electromagnetic spectrum; see adjacent figure. One micrometer, μm, is equal to 10^{-6} meter.

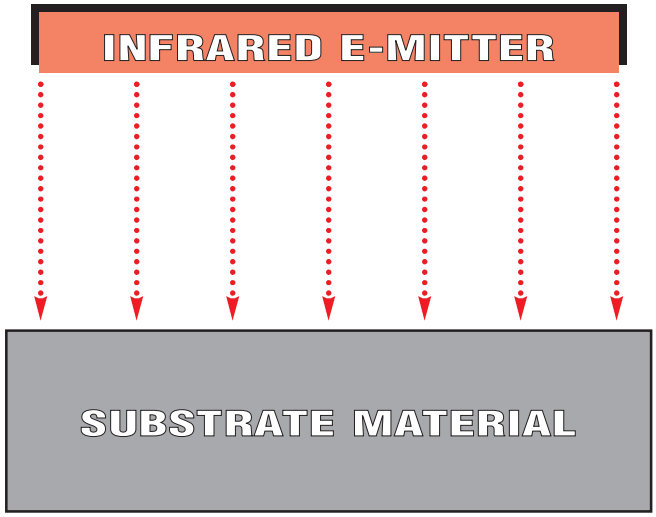
The total radiant energy "W" in watts per square centimeter emitted by an object is found with the Stefan-Boltzmann law:

$$W = \varepsilon\sigma T^4$$

"ε" is the emissivity factor
"σ" is the Stefan-Boltzmann constant (5.67×10^{-12} W/cm^{2}K^4)
"T" is the surface temperature of the object in °K (0°C equals 273°K).

Ceramic Infrared E-Mitter Technical Data

Made in USA



What Kind of Material Do You Want to Heat or Dry?

This information is used to compare the absorption spectra of the material with the emission spectra of the infrared heaters. A good match ensures that the radiant energy from the E-mitter will be effectively absorbed by the material with minimum losses due to transmittance or reflectance. The table below was prepared to help you select the best heater rating for your particular application. If you need additional information, contact **Tempco** for technical assistance.

CAUTION

In situations where the material or its released solvents/vapors are easily flammable, special protection is required. Explosion-protected types of E-Mitters are not available. You will have to take proper steps to prevent the flammable media from coming into contact with the hot heater surfaces and electrical wiring. Current regulations and electrical codes must be complied with to prevent unsafe conditions.

Examples of Common Applications

The table below presents some of the most common infrared applications encountered in several industries. The wavelength of the infrared energy was matched to the absorption characteristics of the material to be heated. Various wattages for the same application are recommended due to the absorption characteristics and variables of the application. Select the wattage according to the application requirements. Testing is strongly recommended before final selections are made.

Industry	Wattage	CRB Infrared Heater Ratings								
		150	250	300	350	400	500	650	750	1000
	Surface Watt Density	6.48	10.8	12.95	15.11	17.27	21.59	28.07	32.39	43.18
PAPER										
• Heating paper pulp and papier-mâché before pressing/molding								■		
• Quick drying of lacquered paper, gummed or glued paper and cardboard									■	■
PLASTICS & RUBBER										
• Drying/curing plastic/latex emulsion/surfacing					■	■				
• Gelling PVC paste/film on fabrics etc.					■	■				
• Preheating plastic foil/sheet/vacuum forming					■	■	■	■	■	■
• Preheating rubber sheeting prior to extrusion						■	■			
TEXTILES, SILK & FIBERS										
• Drying washed, dyed and finished textiles		■						■	■	■
• Fiberglass layup and molding; Resin curing			■	■	■					
• Silk-screen printing; Fusing metallic inks					■	■	■			■
• Stress curing ovens for synthetic fibers				■	■	■	■			
TOBACCO & FOOD INDUSTRY										
• Heating food in restaurants		■	■	■						
• Tobacco drying; Grain drying		■	■							
GENERAL										
• Activation of adhesives and surface sealing					■	■				
• Drying/baking lacquered tin components			■	■	■	■	■			
• Heat/dry/fixing adhesives (boot and shoe trade)								■	■	■
• Low temperature drying of atomized chemicals				■	■	■	■			
• Ore drying and sampling for laboratory work					■	■	■			
• Preheating large metal embossing rollers					■	■	■			
• Powder coating processes				■	■	■	■			
• Setting Nylon® and Perlon® threads, etc.			■	■	■	■				
• Water evaporation		■							■	■

How to Select a Ceramic Infrared Heater

Safe, economical and efficient infrared radiation heating systems can be designed, installed and operated by following some basic rules and guidelines.

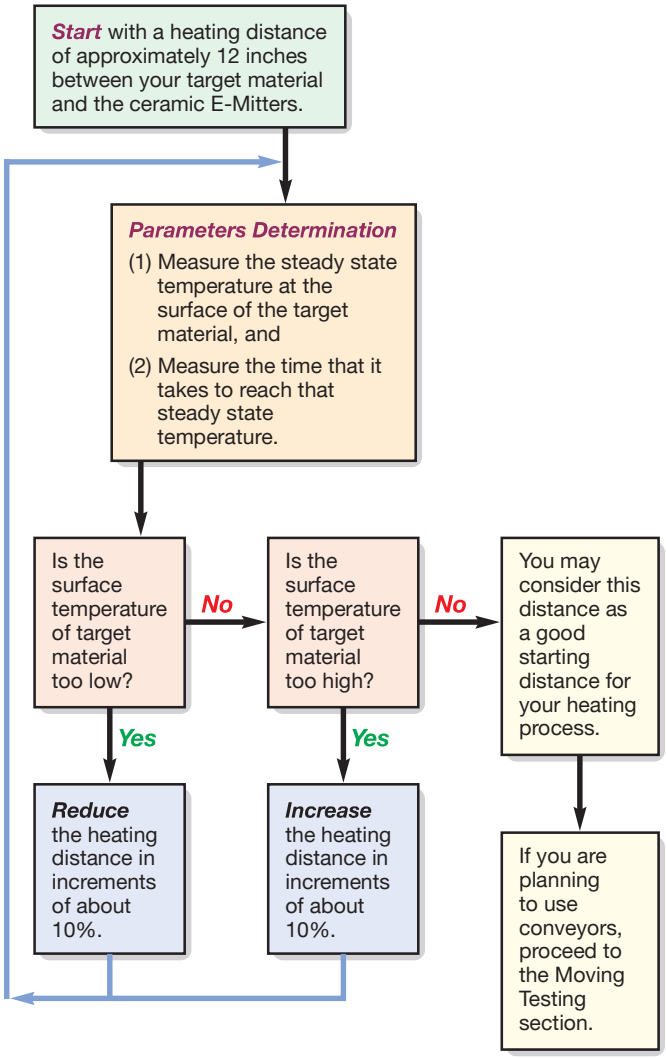
Heating Distance for Stationary and Moving Systems

The optimum heating distance cannot be accurately determined for a given application without some preliminary testing because of the many different factors that affect the radiation transfer of heat. Therefore only general guidelines can be offered here.

In any heating application, it is recommended that Stationary Testing be done first. This can be accomplished by following some simple steps.

Stationary Testing

OBJECTIVE
Determination of the heating distance



Design Guideline A — General Information

1. Use the table on page 7-98 to match your target material with its corresponding ceramic E-Mitter rating. If the table does not list your target material, consult Tempco for assistance.

2. Select and order the ceramic E-Mitter based on the wattage rating. Tempco offers a complete line of industrial ceramic infrared heaters for you to choose from. Other wattage and voltage combinations can be designed and manufactured to suit your particular application. Consult Tempco with your requirements.

3. Next, what heating process are you going to apply to your target material: Process Heating, Drying, Curing, Cooking or another process? ***Your answer will dictate the next design guideline and how to proceed for the determination of the correct heating distance.***

Design Guideline B — Process Heating

In many industrial applications, heat has to be applied to a target material before being processed further. In some cases, hot spots or large temperature gradients must be avoided. For this reason, it is highly recommended that several temperature controllers be used together with ceramic E-Mitters and integrated thermocouples. Three main processes require special attention:

1. *Plastic sheets* The fact that plastics have very low internal thermal conductivity causes localized heating if the applied heat is not uniformly distributed or if the sheets are too thick. In this situation, it is recommended that heat be applied to both sides of the sheet for the heat to be distributed throughout the material.

2. *Metallic sheets or strips* Metals are better internal conductors of heat than plastics but they absorb much less radiant energy because most of it is reflected at the surface. To overcome this problem, match the emission spectra of the radiant heater with the absorption spectra of the metal. Tempco's sales engineering staff will gladly help you in this endeavor.

3. *Granular form material* A relatively uniform heating of granulated compounds can be achieved by placing a thin layer of granules on a vibrating surface or conveyor to aerate the material while heating.

Design Guideline C — Drying, Curing & Cooking

Drying involves the release of water vapor, solvents or other materials that are vaporized during the process. In some cases, the solvents may be harmful or explosive and would require special protection. The user is solely responsible for the installation of the heating system and the strict observance of all applicable regulations.

Water vaporization, on the other hand, does not present this problem, but offers other related ones that also require special handling, such as how to remove the water vapor as it comes off the material being processed.

As for ***curing and cooking***, because of the many different applications encountered within various industries, no specific rules can be offered in this general guideline. Testing of the application is recommended to determine the process requirements. Contact Tempco's sales engineers if assistance is needed.

Ceramic Infrared E-Mitter Technical Data

Tips for Infrared Heating Systems

Infrared heating works best with materials that are thin enough for the heat to be absorbed and/or when the target material has high internal thermal conductivity. In metals, for example, heat is easily conducted from the surface to the interior of the material.

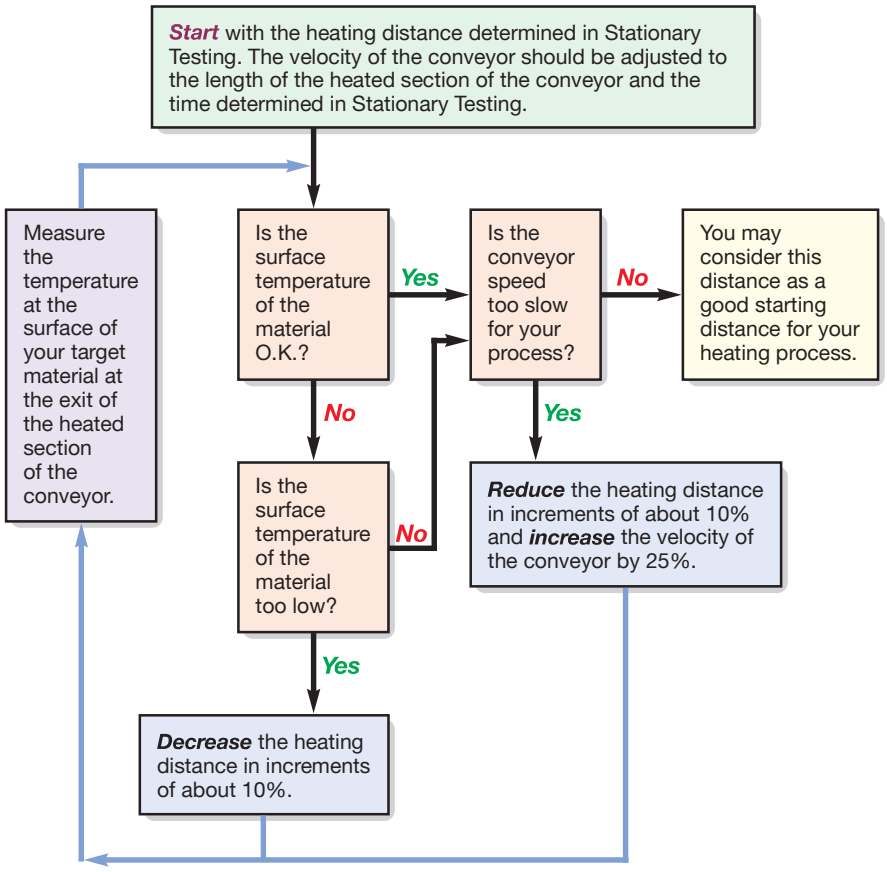
Multilayer materials present some difficulties when they are to be heated with infrared heaters. The top layer dries faster than the lower layers, causing different rates of shrinkage throughout the material. Infrared heat energy is transmitted with the speed of light from the surface of an emitter source (i.e. a ceramic heater) to the surface of the target material. Consequently, the top layer may be subjected to thermal loads that are too high for the composite target material to handle without degradation. In such cases, detection systems and/or overtemperature controls must be incorporated into the heating system to detect changes in normal operating conditions and trigger safety devices.

Higher heating rates can be achieved in moving systems that result in higher production output. This higher output can be easily accomplished without complications on properly designed, installed and maintained infrared heating systems.

Moving Testing

OBJECTIVES

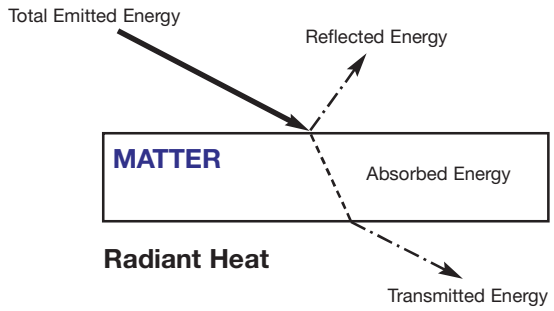
Determination of the heating distance and the velocity of the conveyor

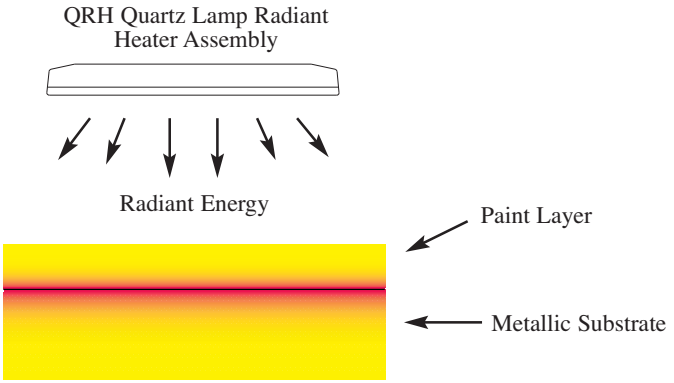


Material Thickness

The thickness of any given material is very important for most infrared heating applications. This is because many materials do not transmit the infrared energy past a few tenths of an inch; therefore, the heat is either reflected or absorbed.

The absorbed heat is conducted in all directions. In some paint processes, it is more convenient to select an infrared heater based on the absorption characteristic of the substrate and the transmittance characteristic of the paint. By doing so, the radiant energy will be transmitted farther within the material and absorbed mostly in the substrate material. The temperature in the top layer of the substrate material will rise and heat the material above, heating from the inside out. Blistering is avoided or reduced to a minimum by employing this technique.

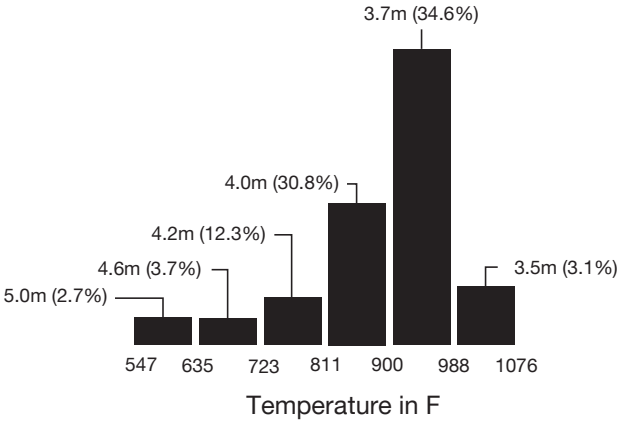




Ceramic Infrared E-Mitter Technical Data

An Example of Emissive Power

All E-Mitter ceramic infrared heaters emit infrared energy in various wavelengths depending on their surface temperature. The CRE00002 E-Mitter (bulb style, 250W, 120V, white) was tested as an example with the results shown on the right. The values associated with temperature, emitted wavelength distribution and percentages were obtained when the heater reached steady state conditions in room ambient. The value of the peak wavelength λ_{max} (3.7 microns) was calculated using Wien's displacement law for a blackbody from the peak temperature obtained in the tests. This calculation is valid since the spectral emissive power of our ceramic E-Mitter closely approximates the theoretical values in the Planck's formulation for infrared wavelength distribution.



An Example of Emissive Power

Wien's Law is expressed by the following formula:

$\lambda_{max} = 5215.6\mu m/°F \div (T + 460)$

T = Temperature °F

λ_{max} = Peak Wavelength

Example:

What is the optimum peak E-Mitter surface temperature for heating a target material that has its best absorption in the infrared wavelength range of 4.0 to 3.4 microns (μm)?

Average peak wavelength = $(4.0 + 3.4) \div 2 = 3.7\mu m$

Using Wien's law, we have:

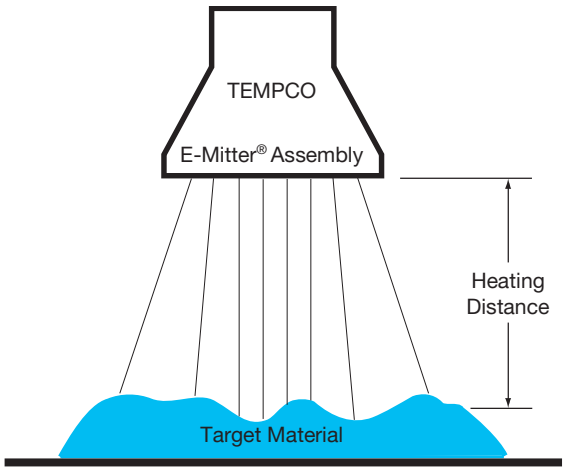
$3.7\mu m = 5215.6 \div (°F + 460)$ or $°F = (5215.6 \div 3.7) - 460 = 949.6°F$

This temperature is only a starting point and should be confirmed by testing and simulation of the exact conditions of the application. As you can see from the bar graph, this 950°F point coincides with the highest % of the radiated energy from the CRE E-Mitter that was tested. Once the heater temperature has been established, the charts included in the various individual heater sections can be used to select the proper heater wattage starting point.

Conveyor Systems

Moving heating systems generally achieve higher output per hour than is possible with static systems. The radiant heater's setpoint temperature is set higher in conveyor systems than static systems due to the limited time the product is under the heaters. Tests should be carried out to determine the optimum conveyor speed, heating distance, and E-Mitter operating temperature.

In applications such as drying pulp paper, the higher power level required can potentially create a fire hazard if there are not safety mechanisms built into the system. If a malfunction of the conveyor system slows down or stops the conveyor completely, safety mechanisms should be triggered that would shut down power to the heaters to avoid burning the material being cured or dried.



Maximum Operating Temperature

Every heater has its maximum operating temperature printed on it. This temperature was measured with a thermocouple and with the heater facing down on a highly reflective material.

In many practical situations, however, this maximum temperature is rarely reached because most of the industrial materials absorb and transmit the heat while reflecting only a fraction of the infrared energy.

Ceramic E-Mitter Infrared Radiation Images

Infrared Radiation Images of Tempco's Ceramic E-Mitters

(White, 240V, 400W)

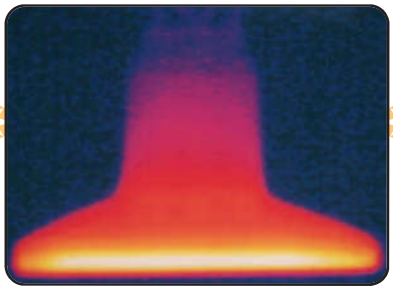
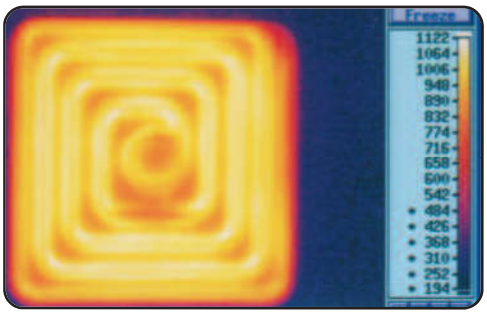


Image of Part Number CRD00002

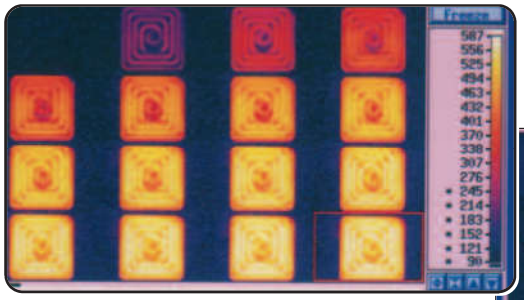
Side View The lighter color (yellow) represents the hottest area(s), while the black (background) represents the ambient temperature. The air gap and the ceramic fiber insulation produce a dramatic temperature gradient between the heating elements (yellow region), and the supporting clamps (purple region).

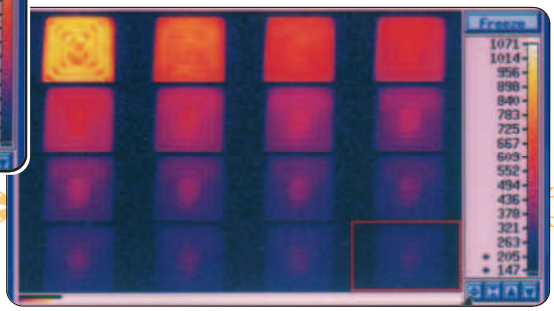


Bottom View The temperature distribution in this face is particularly homogeneous, assuring a uniform radiant heat to a given application. The convective heat losses are more noticeable at the edges of the heater. Except in vacuum conditions, convective losses must always be considered in a heating application.

Infrared Images

These infrared images were recorded at 30-second intervals. The photo sequence on the left illustrates how the elements heat up over time. The photo sequence on the right illustrates how the elements cool down.





Note: The temperature scale (°F) corresponding to each color is on the right side of the images.

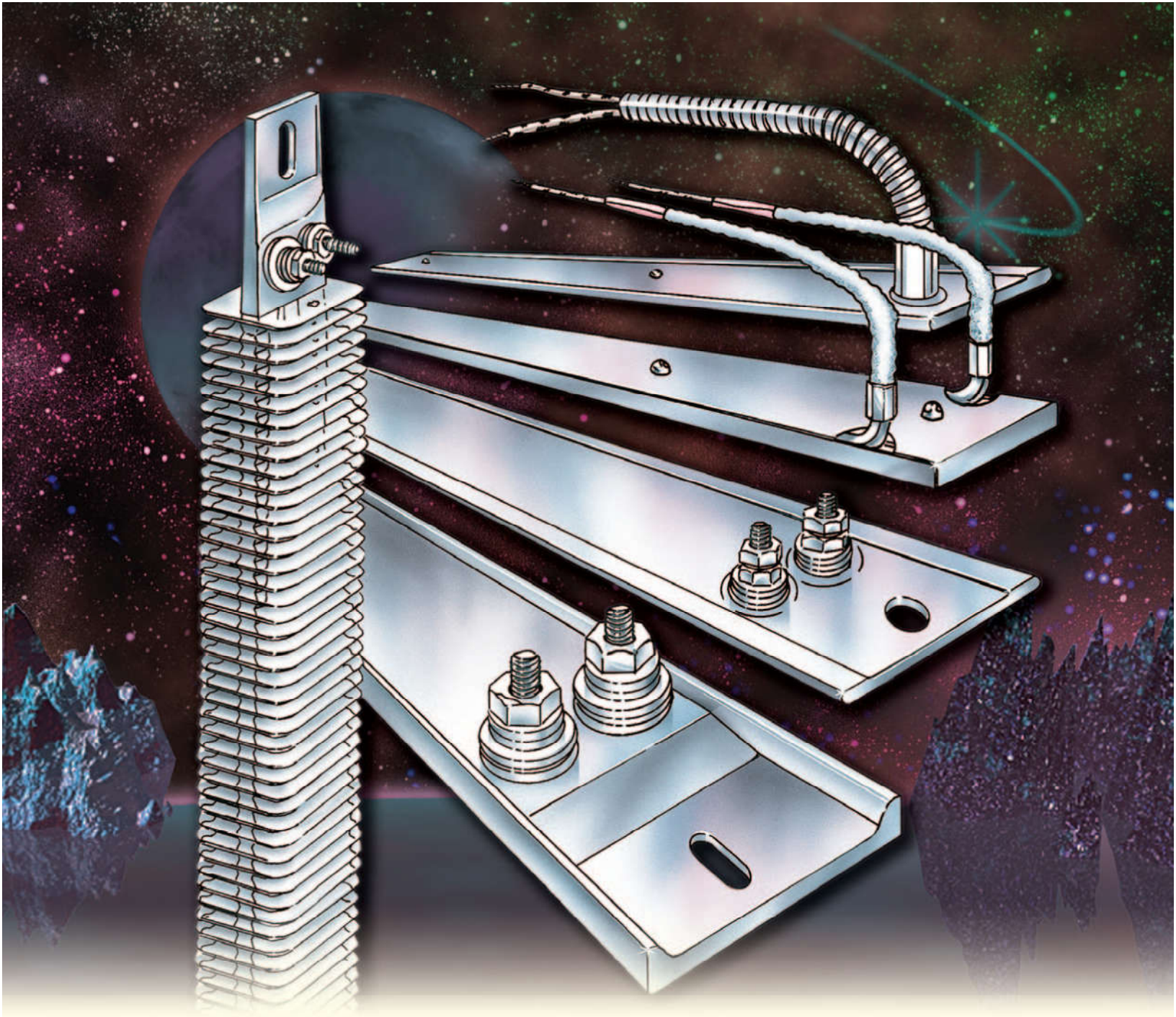


Table Of Contents

8 section

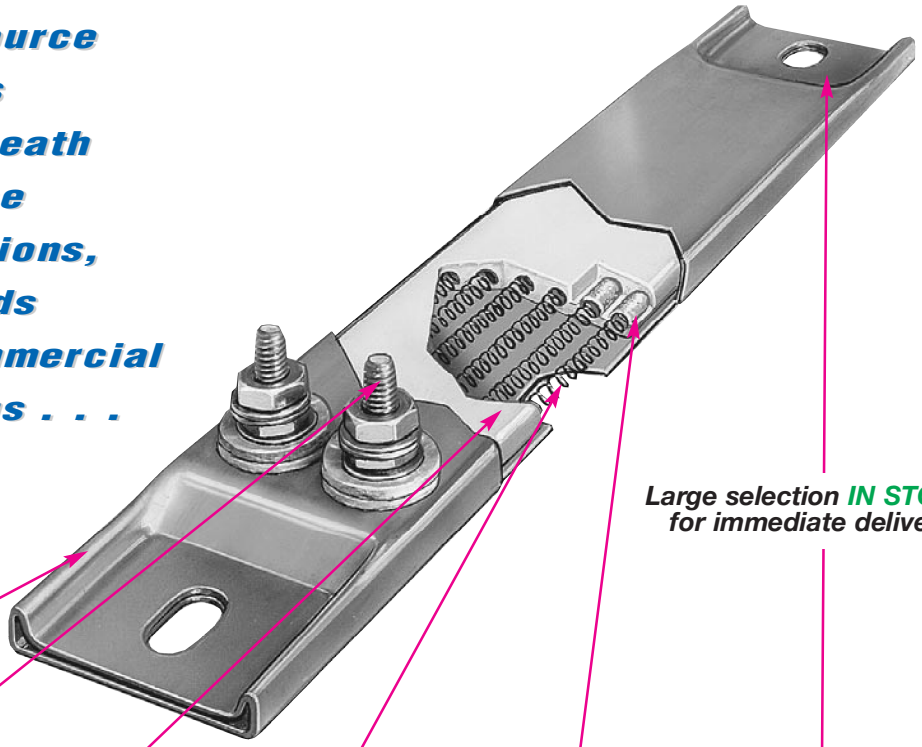
Strip Heaters

Made in USA

Ceramic Insulated

CHANNEL STRIP HEATERS

A Reliable Heat Source with Seamless Stainless Steel Sheath For Flat Surface Mounting Installations, Used in Hundreds Of Industrial and Commercial Heating Applications . . .



Large selection IN STOCK for immediate delivery

A Type 304 Stainless Steel sheath provides the best combination of physical strength and resistance to high temperatures and chemical corrosion. Dependable at sheath temperatures of up to 1200°F (650°C).

B Stainless Steel 10-32 threaded screws are standard and are securely fastened. Various termination configurations and options are available. See pages 8-4 through 8-7.

C Specially selected and designed ceramic insulator houses the resistance wire coil, insulating it from the outer sheath.

D Helically wound resistance wire coil made from nickel-chrome wire is evenly stretched and precisely strung through the ceramic insulator, providing uniform heat. Resistance wire is then mechanically connected to screw terminals or lead wires for a strong positive joint.

E A custom mixture of several high purity magnesium oxide grain sizes, chosen to increase thermal conductivity and dielectric strength, are used to fill all remaining space inside and around the ceramic insulator. Voids are densely packed.

F Channel strip heaters are available with or without mounting tabs. If without, the ends are silver soldered shut to prevent moisture and contaminants from entering the heater.

Typical Applications

- *Ovens*
- *Hot Plates*
- *Dies*
- *Molds*
- *Drying*
- *Melting*
- *Baking*
- *Incubators*
- *Platens*
- *Food Warmers*
- *Welding Preheating*
- *Air Heating*
- *Sealing Bars*
- *Thermoforming*
- *Tank Heating*

Note: Channel Strip Heaters are available with fins for air heating applications. See pages 8-12 through 8-15.

Agency c UL us *Approvals*

Channel Strip Heaters have been certified as Recognized Components by Underwriters Laboratories (File Number E65652) under CCN KSOT2/8 to meet UL standard 499 and Canadian Standard C22.2, No 72.

This file specifies the end use limitations and conditions of acceptability for the use of this type of heater. For additional information consult Tempco.

If you require UL, CSA, or other NRTL Agency Approvals, please specify when ordering.

View Product Inventory @ www.tempco.com

Ceramic Insulated Channel Strip Heaters

Channel Strip Heaters have proven to be extremely efficient and dependable as a heat source for surface heating in hundreds of industrial and commercial applications.

For surface mounting installations, Channel Strip heaters must be securely clamped along their entire length to a smooth metal surface. When supported by mounting tabs, the terminal end should be secured firmly. Opposite end should be loose to allow for thermal expansion.

TEMPCO offers Channel Strip Heaters in three rectangular sizes

1" WIDE BY 5/16" THICK

Available with or without mounting tabs. When supplied with Type L lead wire termination, mounting tabs are not available.

1-1/2" WIDE BY 5/16" THICK

Available with or without mounting tabs. When supplied with Type L lead wire termination, mounting tabs are not available.

1-1/2" WIDE BY 3/8" THICK

Available with or without mounting tabs. When supplied with Type L lead wire termination, mounting tabs are not available.
(3/8" thick heaters have radius corners)

Standard Specifications and Tolerances of Channel Strip Heaters
If tighter tolerances are required, consult Tempco.

PERFORMANCE RATINGS

Maximum Sheath Temperature: 1200°F (650°C)
Nominal Watt Density: 20 W/in² (3.1 W/cm²)
Maximum Watt Density: 45 W/in² (dependent on design parameters)

ELECTRICAL SPECIFICATIONS

Maximum Voltage: 480VAC (dependent on design parameters)
Voltage Options: Single-Phase, Three-Phase or Dual Voltage
Maximum Recommended Voltage with Leads: 480V
Maximum Amperage: Lead Wire Termination: 10 amp
Screw Terminations: 10-32UNF—25 amp
Resistance Tolerance: +10%, –5%
Wattage Tolerance: +5%, –10%

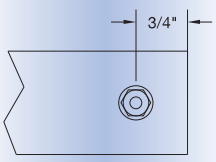
PHYSICAL SIZE CONSTRUCTION LIMITATIONS

Width
1" and 1-1/2" wide heaters ..... +.000, –.010"
Length
Up to 24" ..... ±1/16"
Over 24" ..... ±1/8"
Mounting Slot Size
Standard ..... 5/16" × 1/2"
Special Bushings ..... 1/2" × 5/8"

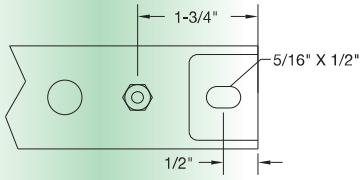
Screw Terminal Terminations

Type T1 • 10-32 Screw Terminals at each end • Available on 1" and 1-1/2" wide heaters

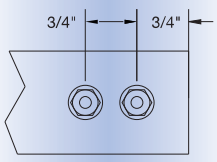
No Mounting Tabs

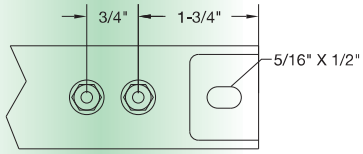


With Mounting Tabs

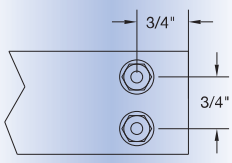


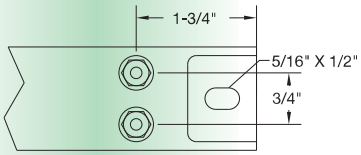
Type T2 • 10-32 Screw Terminals (Tandem) at one end • Available on 1" and 1-1/2" wide heaters



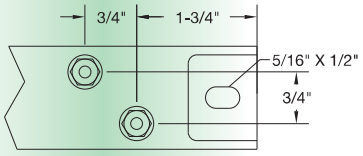


Type T3 • 10-32 Screw Terminals (Parallel) at one end • Available on 1-1/2" wide heaters only

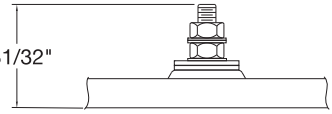




Type T4 • 10-32 Screw Terminals offset at one end • Available on 1-1/2" wide heaters only



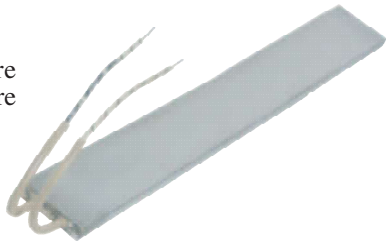
10-32 Screw Terminal Height 31/32"



Lead Wire Terminations

Type L Flexible lead wires exit from end of heater. 10" long leads standard; if longer leads are required, specify. Recommended only for tight quarters or where flexibility of the lead wire is required. Not available on heaters with tabs.

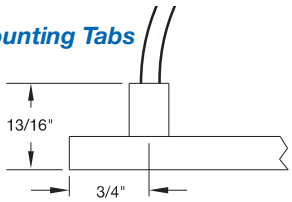
Maximum Amps: 10 at 240VAC **Maximum Volts:** 480



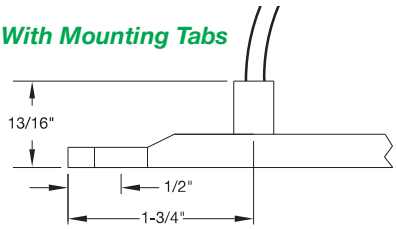
Type L1 Flexible lead wires exit from top of heater. 10" long leads standard; if longer leads are required, specify.

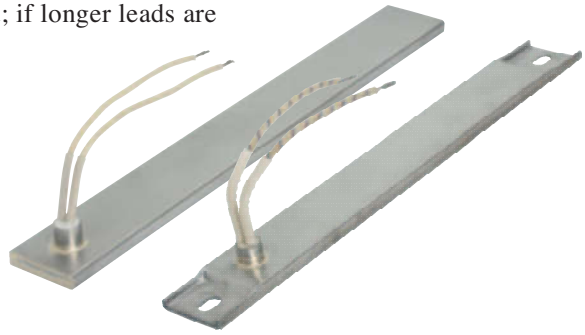
Maximum Amps: 10 at 240VAC **Maximum Volts:** 480

No Mounting Tabs



With Mounting Tabs

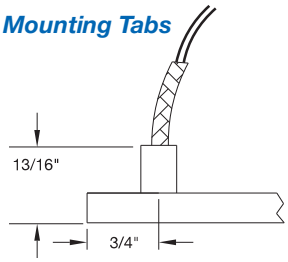




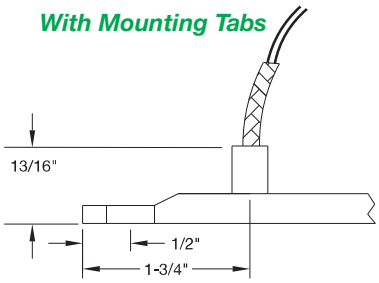
Type W1 Wire braid provides strength and protection to the lead wire insulation, offering sharp bending not possible with armor cable. 10" of wire braid over 12" long leads is standard; if longer leads or braid are required, specify.

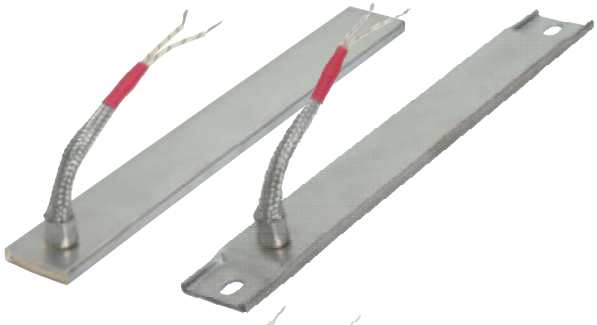
Maximum Amps: 10 at 240VAC **Maximum Volts:** 480

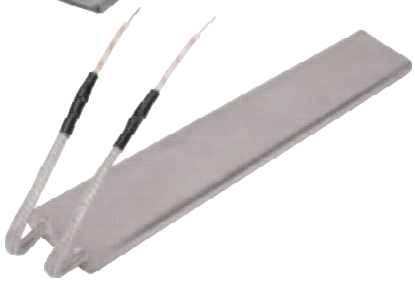
No Mounting Tabs



With Mounting Tabs







Type W2 Stainless steel braid over each lead wire offers sharp bending not possible with armor cable, as well as abrasion protection. 10" long leads standard; if longer leads are required, specify. Not available on heaters with tabs.

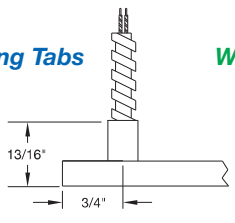
Maximum Amps: 10 at 240VAC **Maximum Volts:** 480

Type R1 Armor cable provides strength and prevents contamination from getting into the heater. 10" of armor over 12" long leads are standard; if longer leads or armor are required, please specify.

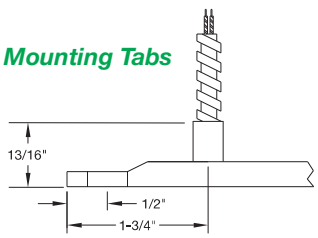
Maximum Amps: 10 at 240VAC **Maximum Volts:** 480

Type R1A: Galvanized cable **Type R1B:** Stainless steel cable

No Mounting Tabs



With Mounting Tabs



CONTINUED

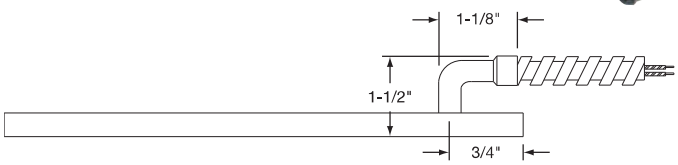
Lead Wire Terminations

Continued from previous page…

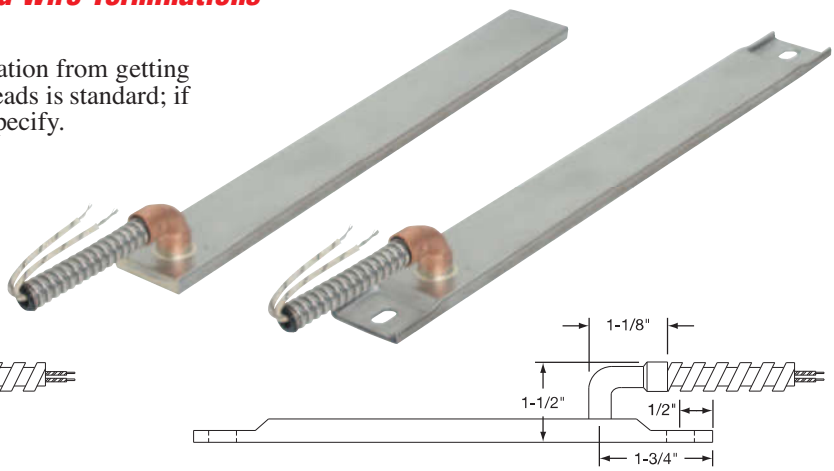
Type R2__ Right-angle armor cable prevents contamination from getting into the heater. 10" of armor over 12" long leads is standard; if longer leads or armor are required, please specify.

Maximum Amps: 10 at 240VAC **Maximum Volts:** 480

Type R2A Galvanized cable
Type R2B Stainless steel cable
Type R2C Elbow and leads only (no cable)

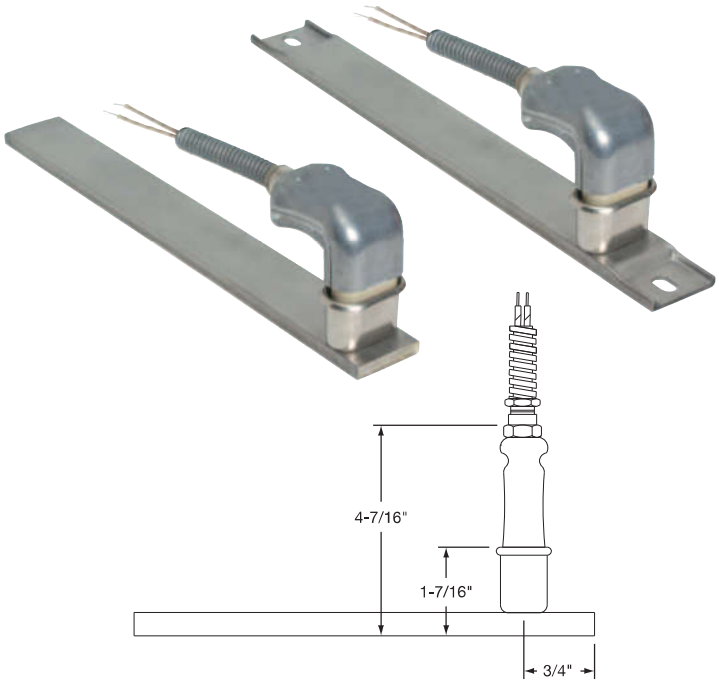


No Mounting Tabs



With Mounting Tabs

Terminal Protection

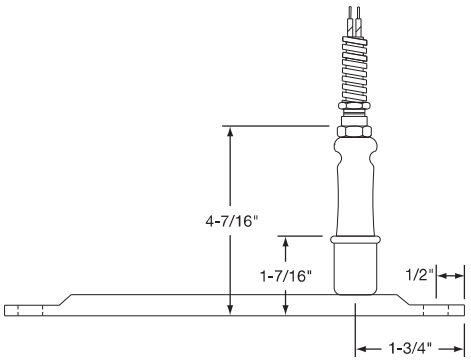


No Mounting Tabs (Type P1D Shown)

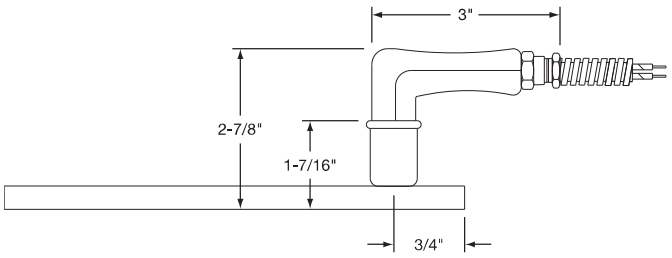
Type P__ High-Temperature Quick Disconnect Plug. If armor protected lead wires are required, specify armor and lead length. Available on 1-1/2" wide heaters only.

Maximum Amps: 10 at 240VAC **Maximum Volts:** 250

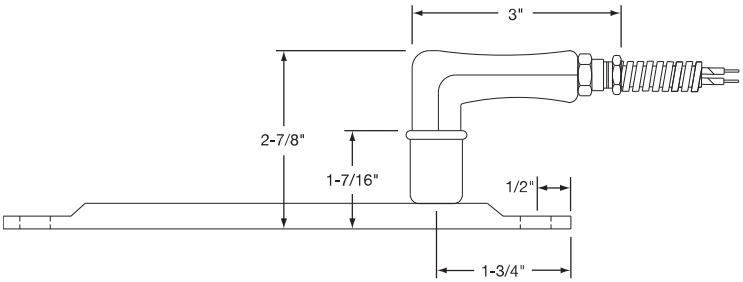
Type P1A Cup only (UT900)
Type P1B Cup and straight plug (H900)
Type P1C Cup and 90° plug (HW900)
Type P1D Cup, straight plug and galvanized cable
Type P1G Cup, 90° plug and galvanized cable



With Mounting Tabs (Type P1D Shown)



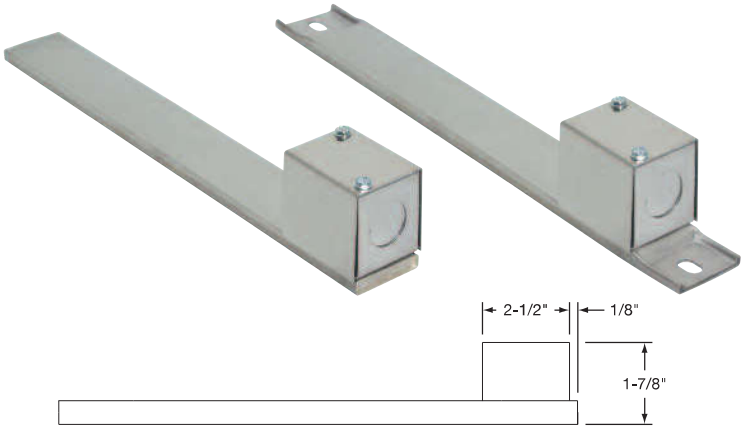
No Mounting Tabs (Type P1G Shown)



With Mounting Tabs (Type P1G Shown)

Exposed electrical wiring on Strip Heaters is a violation of electrical safety codes, including O.S.H.A.

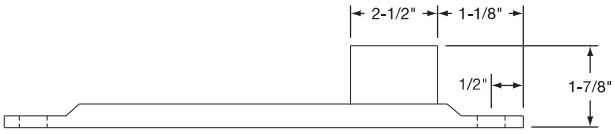
Terminal Protection



No Mounting Tabs

Type C__ Terminal box has a 1/2" trade size knockout (actual diameter 7/8"). Box provides excellent protection to exposed terminals. If armor-protected lead wires are required, specify armor and lead length. Available on 1" and 1-1/2" wide heaters.

Type CA No cable or braid
Type CB Galvanized cable
Type CC Stainless steel cable
Type CD Wire braid



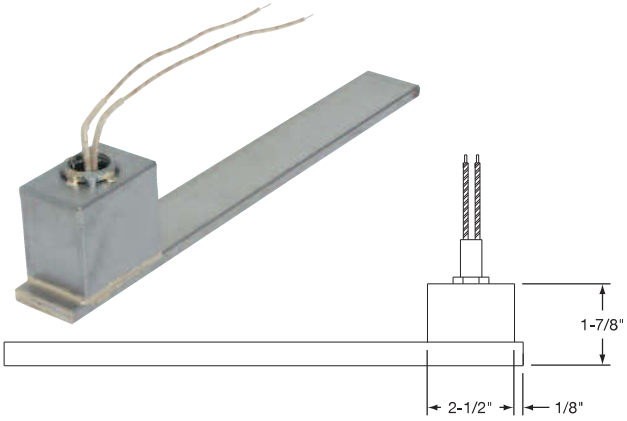
With Mounting Tabs

Type MP__ Specially designed box is welded to the Channel Strip Heater and potted with epoxy. The ends of the heater are also welded. Leads exit through a 1/2" NPT nut that can be located at the top or in the front of the box. Armor cable can be supplied with the male fitting, providing a completely sealed Channel Strip. Available on 1½" wide heaters only.

10" long leads standard; if longer leads are required, specify.

Maximum Amps: 25 **Maximum Volts:** 480

Type MPA Box only
Type MPB Box with prewired galvanized cable
Type MPC Box with prewired stainless steel cable
Type MPD Box with prewired wire braid



Ceramic Covers for Insulating Screw Terminals

Igloo™ Igloo Ceramic terminal covers consist of two individual ceramic parts. With a tight-fitting cap and a solid base, an Igloo cover will fully insulate any standard 10-32 terminal lug used for electrical wiring hookups. Igloo covers can be assembled on all Channel Strip heaters with Type T1 and Type T4 screw terminals.

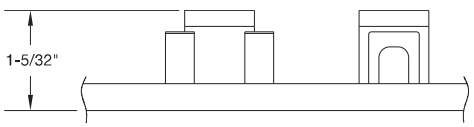
Type C6
Double Port In-Line
Part Number: CER-101-104

Type C7
Double Port 90°
Part Number: CER-101-106

Three different types of Igloo bases are available for your wiring convenience. Double Port In-Line, Double Port 90° and Single Port.

When ordering, specify the type of Igloo.

Type C8
Single Port
Part Number: CER-101-107



Ceramic Cap

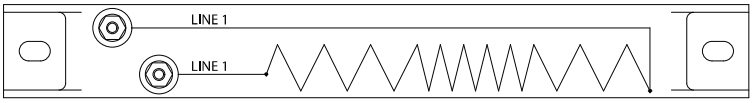
Thread	Part Number
10-32	CER-102-101

Made in USA

Channel Strip Heater Internal Power Variations

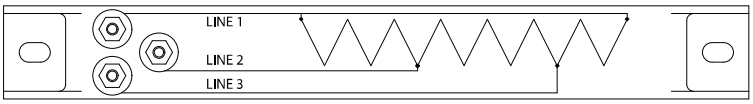
Notes: Leads can be connected externally or internally. See pages 8-4 thru 8-6 for details.
Internal power variations are also available on Tempco's Finned Channel Strip Heaters (CSF) and Tempco's Finned Enclosure Heaters (EHF).
See pages 8-12 through 8-15 for product details.

Type DW Distributed Wattage



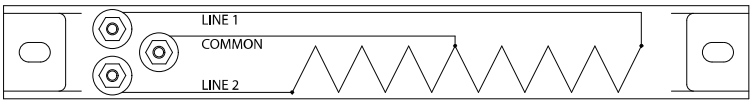
Channel strip heaters can be designed to vary the wattage along the length of the heater. Specify number of zones and the required watts and length per zone.
Shown with T4 termination.

Type 3PH Three Phase



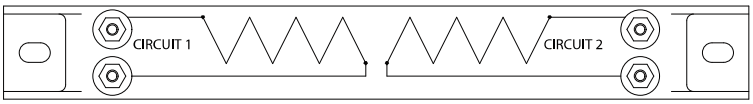
In order to minimize the gauge of the wiring on high wattage channel strip heaters, 3-phase elements can be designed.
Available on 1-½" wide heaters only.

Type DV_ Dual Voltage (1 and 2)



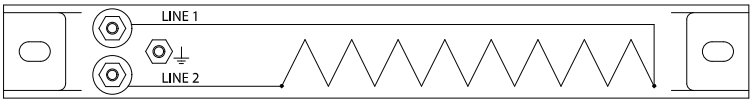
Channel strip heaters can be designed using 3-wire series/parallel circuits for dual vltage applications. Whether the heater is run on the high or low voltage, the wattage will be the same.
DV1: 120/240 volts **DV2:** 240/480 volts

Type DWV Dual Circuits



Independent resistance elements can be designed in a single channel strip heater for added versatility.

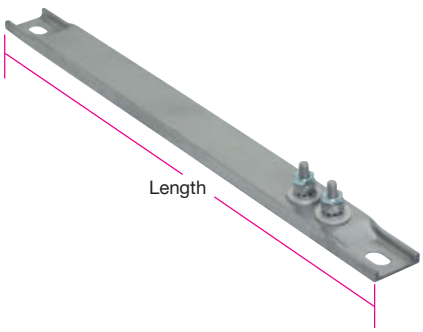
Type GL Ground Lead/Sheath

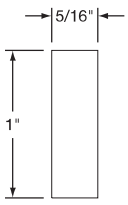


For those applications requiring a separate ground lead attached to the channel strip heater sheath.

Standard (Non-Stock) Sizes and Ratings

1" × 5/16" (25.4 × 7.94 mm) Channel Strip Heaters Channel Strip Heaters with T2 Terminals and Mounting Tabs





Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
8	203.2	250	13	2	CSH00021	—
9½	241.3	300	13	2	CSH00022	—
11	279.4	350	13	2	CSH00023	—
12	304.8	400	13	2	CSH00024	CSH00025
14	355.6	450	13	2	CSH00026	CSH00027
15¼	387.4	500	13	2	CSH00028	CSH00029
17⅞	454.0	600	13	2	CSH00030	CSH00031
19½	495.3	600	12	2	CSH00032	CSH00033
21	533.4	750	14	2	CSH00034	CSH00035
22½	571.5	750	13	2	CSH00036	CSH00037
23¾	603.3	800	13	2	CSH00038	CSH00039
25½	647.7	900	14	2	CSH00040	CSH00041
27½	698.5	900	13	2	CSH00042	CSH00043
28¾	730.3	1000	13	2	CSH00044	CSH00045
30½	774.7	1000	13	2	CSH00046	CSH00047
33½	850.9	1000	12	2	CSH00048	CSH00049
35⅞	911.2	1000	11	2	CSH00050	CSH00051
38½	977.9	1250	13	2	CSH00052	CSH00053

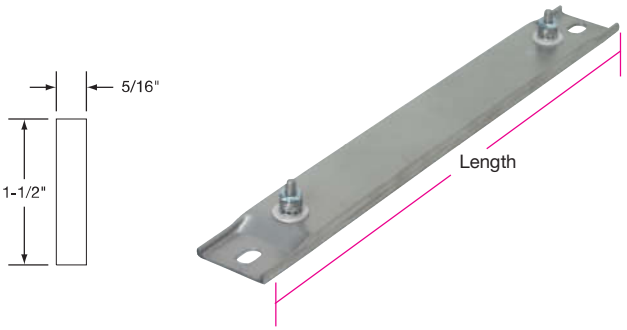
View Product Inventory @ www.tempco.com

Standard (Non-Stock) and Stock Sizes and Ratings

1-1/2" × 5/16" (38.1 × 7.94 mm) Channel Strip Heaters with T1 Terminals and Mounting Tabs

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
6	152.4	150	21	3	**CSH00316**	CSH00583
8	203.2	150	14	2	**CSH00218**	**CSH00219**
8	203.2	250	23	4	**CSH00220**	CSH00221
9½	241.3	200	12	2	CSH00222	CSH00223
9½	241.3	300	18	3	CSH00224	**CSH00225**
10½	266.7	250	13	2	CSH00226	CSH00227
12	304.8	250	10	2	CSH00228	CSH00229
12	304.8	500	20	3	CSH00230	CSH00231
12	304.8	350	12	2	**CSH00345**	CSH00528
14	355.6	300	9	1	CSH00232	CSH00233
14	355.6	500	15	2	CSH00234	**CSH00235**
15¼	387.4	325	9	1	CSH00236	CSH00237
15¼	387.4	500	13	2	CSH00238	CSH00239
17⅞	454.2	375	8	1	CSH00240	CSH00241
17⅞	454.2	500	11	2	CSH00242	CSH00243
17⅞	454.2	750	16	2	CSH00244	**CSH00245**
17⅞	454.2	1000	21	3	CSH00246	CSH00247
19½	495.3	500	10	1	CSH00248	CSH00249
19½	495.3	750	14	2	CSH00250	CSH00251
19½	495.3	1000	19	3	CSH00252	CSH00253
19½	495.3	1200	23	4	CSH00326	CSH00330
21	533.4	500	9	1	CSH00254	CSH00255
23¾	603.3	250	4	1	CSH00256	CSH00257
23¾	603.3	500	7	1	CSH00258	CSH00259
23¾	603.3	750	11	2	**CSH00260**	**CSH00261**
23¾	603.3	1000	15	2	CSH00262	CSH00263
23¾	603.3	1500	22	3	CSH00264	CSH00265
25½	647.7	750	10	2	CSH00266	CSH00267



Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
25½	647.7	1000	13	2	CSH00268	CSH00269
26¾	679.5	700	9	1	CSH00270	CSH00271
26¾	679.5	750	10	1	CSH00272	CSH00273
29¼	742.0	750	8	1	CSH00347	CSH00348
29⅞	758.8	750	8	1	CSH00274	CSH00275
30½	774.7	750	8	1	CSH00276	CSH00277
33½	850.9	750	7	1	CSH00278	CSH00279
33½	850.9	1000	10	2	CSH00280	CSH00281
34⅝	879.5	1000	9	1	CSH00282	CSH00283
35⅞	911.4	1000	9	1	CSH00284	**CSH00285**
37¼	946.2	1500	13	2	CSH00286	**CSH00287**
38½	977.9	1000	8	1	CSH00288	CSH00289
42½	1079.5	1250	9	1	CSH00290	CSH00291
42½	1079.5	1500	11	2	CSH00292	CSH00293

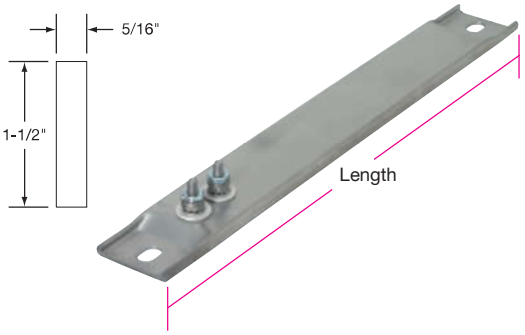
Ordering Information

See page 8-10

1-1/2" × 5/16" (38.1 × 7.94 mm) Channel Strip Heaters with T2 Terminals and Mounting Tabs

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
6	152.4	150	21	3	CSH00317	CSH00320
8	203.2	150	13	2	CSH00189	CSH00190
8	203.2	250	21	3	CSH00342	CSH00343
8	203.2	500	42	7	**CSH00322**	CSH00325
10½	266.7	250	12	2	CSH00191	CSH00192
12	304.8	350	13	2	CSH00193	CSH00194
14	355.6	500	15	2	CSH00195	CSH00196
17⅞	454.2	750	16	2	CSH00197	CSH00198
19½	495.3	1200	23	4	CSH00327	CSH00331
23¾	603.3	750	11	2	CSH00199	CSH00200
25½	647.7	500	7	1	—	CSH00201
29¼	743.0	750	8	1	CSH00202	CSH00203
33½	850.9	750	7	1	CSH00204	—
34⅝	879.5	1000	9	1	CSH00205	CSH00206
35⅞	911.2	1000	9	1	CSH00207	CSH00208
37¼	946.2	1500	13	2	CSH00209	CSH00210

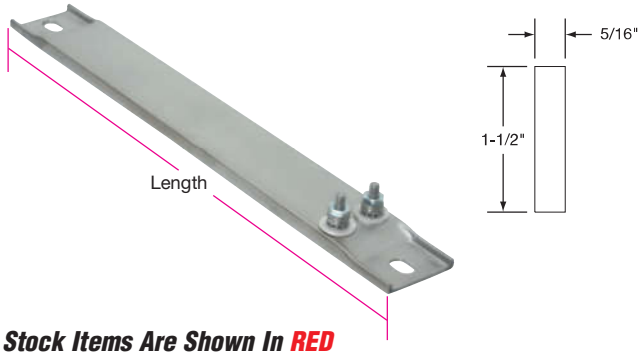


Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
38½	977.9	800	7	1	CSH00211	—
53⅜	1368.6	1500	8	1	—	CSH00212
53⅜	1368.6	2500	14	2	—	CSH00213
63⅛	1622.6	1800	8	1	—	CSH00214
63⅛	1622.6	3000	14	2	—	CSH00215
71⅛	1825.8	2000	8	1	—	CSH00216
71⅛	1825.8	3000	12	2	—	CSH00217

Standard Sizes and Ratings

Made in USA

Standard (Non-Stock) and Stock Sizes and Ratings



Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
5¼	133.4	125	20	3	CSH00336	CSH00337
5½	139.7	125	23	4	CSH00159	CSH00160
5½	139.7	250	34	5	CSH00161	CSH00162
5¾	146.1	300	47	7	CSH00163	CSH00164
6	152.4	150	17	3	CSH00165	CSH00166
6	152.4	300	41	6	CSH00167	CSH00168
8	203.2	150	10	2	CSH00169	CSH00170
8	203.2	250	17	3	CSH00344	CSH00171
8	203.2	500	34	5	CSH00323	CSH00324
10½	266.7	250	11	2	CSH00172	CSH00173
10½	266.7	400	17	3	CSH01618	CSH01433
12	304.8	250	9	1	CSH01600	CSH01601
12	304.8	350	12	2	CSH00346	CSH00174
14	355.6	300	8	1	CSH01602	CSH01603
14	355.6	500	14	2	CSH00175	CSH00176
15¼	387.4	325	8	1	CSH01604	CSH01605
17⅞	454.2	500	11	2	CSH01606	CSH01607
17⅞	454.2	750	15	2	CSH00177	CSH00178
17⅞	454.2	1000	21	3	—	CSH01257
19½	495.3	350	7	1	CSH01608	CSH01609

1-1/2" × 5/16" (38.1 × 7.94 mm) Channel Strip Heaters with T3 Terminals and Mounting Tabs

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
19½	495.3	1200	21	3	CSH00328	CSH00332
21	533.4	500	8	1	CSH01610	CSH01611
21	533.4	750	13	2	CSH01620	CSH01621
23¾	603.3	750	10	2	CSH00179	CSH00180
23¾	603.3	1000	15	2	CSH01624	CSH01625
25½	647.7	500	7	1	CSH01613	CSH01614
26¾	679.5	700	9	1	CSH01615	CSH01616
26¾	679.5	1000	13	2	CSH01655	CSH01626
29¼	743.0	750	8	1	CSH00181	CSH00182
30½	774.7	750	8	1	CSH01627	CSH01628
30½	774.7	1250	13	2		CSH01629
33½	850.9	950	9	1	CSH01630	CSH01631
34⅝	879.5	1000	9	1	CSH00183	CSH00184
35⅞	911.4	1000	9	1	CSH00185	CSH00186
35⅞	911.4	1500	13	2		CSH00462
37¼	946.2	1500	12	2	CSH00187	CSH00188
42½	1079.5	1500	11	2		CSH01632
45½	1155.7	1250	8	1		CSH01617
47⅞	1216.0	2250	14	2		CSH01230

Ordering Information

Catalog Heaters

Select a Channel Strip Heater from the Standard Sizes and Ratings lists on pages 8-8 through 8-11.

Channel Strip Heaters whose Part Numbers are in **RED** are available from Stock for immediate delivery.

Standard Non-Stock Part Numbers have a 3-week lead time.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed, **TEMPCO** will design and manufacture a Channel Strip Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Width
- ❑ Thickness
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination (see pages 8-4 through 8-7)
- ❑ Lead Cable/Braid Length
- ❑ Power Variation (see page 8-8)
- ❑ Special Features
- ❑ Quantity

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Type ARC Channel Strip Radiant Heater Arrays

Tempco can design and manufacture a custom channel strip heater array for applications requiring infrared heat. Call for details.

Other type of infrared heaters can be found in Section 7.

View Product Inventory @ www.tempco.com

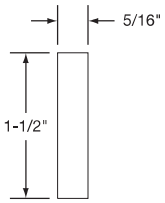
TEMPCO Since 1972

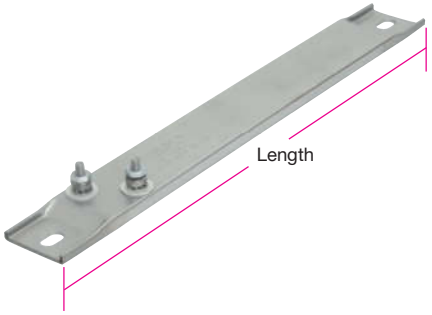
CHANNEL STRIP

Standard (Non-Stock) Sizes and Ratings

1-1/2" × 5/16" (38.1 × 7.94 mm) Channel Strip Heaters with T4 Terminals and Mounting Tabs

Stock Items Are Shown In RED



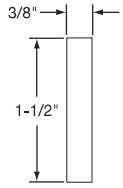


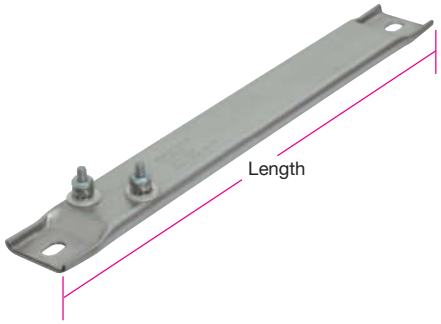
Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
5¼	133.4	125	34	5	**CSH00338**	CSH00339
5¾	146.1	300	55	8	**CSH01596**	**CSH01595**
6	152.4	150	24	4	**CSH00318**	**CSH00321**
7½	190.5	150	15	2	CSH00054	CSH00055
7½	190.5	200	20	3	CSH00056	CSH00057
8	203.2	150	13	2	**CSH00058**	**CSH00059**
8	203.2	175	15	2	CSH00060	CSH00061
8	203.2	250	21	3	**CSH00062**	**CSH00063**
8	203.2	400	31	5	CSH00064	CSH00065
8	203.2	500	42	7	**CSH00066**	**CSH00067**
10½	266.7	250	12	2	**CSH00068**	**CSH00069**
10½	266.7	350	17	3	CSH00070	CSH00071
10½	266.7	400	19	3	CSH00072	CSH00073
12	304.8	250	10	1	CSH00074	CSH00075
12	304.8	350	13	2	**CSH00076**	**CSH00077**
12	304.8	500	19	3	**CSH00078**	**CSH00079**
14	355.6	300	9	1	CSH00080	CSH00081
14	355.6	500	15	2	**CSH00082**	**CSH00083**
15¼	387.4	325	9	1	CSH00084	CSH00085
15¼	387.4	500	13	2	CSH00086	CSH00087
17⅞	454.2	350	7	1	CSH00088	CSH00089
17⅞	454.2	375	8	1	CSH00090	CSH00091
17⅞	454.2	500	11	2	CSH00092	CSH00093
17⅞	454.2	750	16	2	**CSH00094**	**CSH00095**
17⅞	454.2	1000	23	3	CSH00096	CSH00097
19½	495.3	350	7	1	CSH00098	CSH00099
19½	495.3	500	9	1	CSH00100	CSH00101
19½	495.3	750	14	2	CSH00102	CSH00103
19½	495.3	1000	19	3	CSH00104	CSH00105
19½	495.3	1200	23	4	CSH00329	**CSH00333**
21	533.4	500	8	1	CSH00106	CSH00107
21	533.4	750	13	2	CSH00108	CSH00109
23¾	603.3	500	7	1	CSH00110	CSH00111
23¾	603.3	750	11	2	**CSH00112**	**CSH00113**

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
23¾	603.3	1000	15	2	CSH00114	CSH00115
23¾	603.3	1500	22	3	CSH00116	CSH00117
25½	647.7	500	7	1	CSH00118	CSH00119
25½	647.7	750	10	2	CSH00120	CSH00121
25½	647.7	1000	13	2	CSH00122	CSH00123
26¾	679.5	700	9	1	CSH00124	CSH00125
26¾	679.5	750	9	1	CSH00126	CSH00127
26¾	679.5	1000	13	2	CSH00128	**CSH00129**
29¼	743.0	750	8	1	CSH00130	**CSH00131**
30½	774.7	750	8	1	CSH00132	CSH00133
30½	774.7	1000	11	2	CSH00134	CSH00135
30½	774.7	1250	13	2	—	CSH00136
33½	850.9	750	7	1	CSH00137	CSH00138
34⅝	879.5	1000	9	1	CSH00139	**CSH00140**
35⅞	911.4	1000	9	1	CSH00141	**CSH00142**
35⅞	911.4	1500	13	2	CSH00143	CSH00144
37¼	946.2	1500	13	2	**CSH00145**	**CSH00146**
38½	977.9	800	7	1	CSH00147	CSH00148
38½	977.9	1000	8	1	CSH00149	CSH00150
38½	977.9	1500	12	2	CSH00151	CSH00152
42½	1079.5	1250	9	1	CSH00153	CSH00154
42½	1079.5	1500	11	2	CSH00155	CSH00156
47⅞	1216.2	1350	9	1	—	CSH00157
47⅞	1216.2	2250	14	2	—	CSH00158

1-1/2" × 3/8" (38.1 × 9.53 mm) Channel Strip Heaters with T4 Terminals and Mounting Tabs





Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
7½	190.5	200	19	3	—	CSH00294
9	228.6	500	31	5	—	CSH00295
10½	266.7	250	12	2	CSH00296	—
10½	266.7	400	19	3	CSH00297	—
12	304.8	500	18	3	—	CSH00298
15¼	387.4	500	13	2	—	CSH00299
17	431.8	1000	22	3	—	CSH00300
17⅞	454.0	350	7	1	—	CSH00301
17⅞	454.0	500	10	2	—	CSH00302
18	457.2	1000	20	3	—	CSH00303
18½	469.9	500	10	2	—	CSH00304
22½	571.5	1000	15	2	—	CSH00305
24	609.6	1000	14	2	—	CSH00306
25½	647.7	1000	13	2	—	CSH00307
26	660.4	1600	20	3	—	CSH00308
26½	673.1	1500	18	3	—	CSH00309

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
30½	774.7	750	8	1	—	CSH00310
31½	800.1	800	8	1	—	CSH00311
35⅞	911.2	1000	9	1	—	CSH00312
36	914.4	1000	9	1	—	CSH00313
50	1270.0	1000	6	1	—	CSH00314
62	1574.8	1500	7	1	—	CSH00315

Made in USA

FINNED STRIP Heaters

Ceramic Insulated Finned Strip Heaters

TEMPCO Finned Strip Heaters are extremely efficient and dependable as a heat source for hundreds of industrial and commercial applications. They are used for both forced (mounted in a duct) and natural convection air heating (mounted at the bottom of cabinet type ovens).

The Finned Strip Heater's basic design consists of a helically wound resistance coil placed in a specially designed ceramic insulator. The resistance coil is mechanically connected to the screw terminal for positive connection. Stainless steel rectangular tubing is used to house the heater assembly. All remaining voids are filled with high purity magnesium oxide to increase thermal conductivity and dielectric strength.

Nickel-plated steel fins (Stainless Steel optional) are mounted to the rectangular tubing. The fins have been specially designed to provide maximum surface contact for good heat dissipation into the finned cross sections, thus resulting in rapid heat transfer to the air.

TEMPCO Finned Strip Heaters are manufactured in a full line of standard sizes, electrical ratings and terminations, or can be made to your specifications.

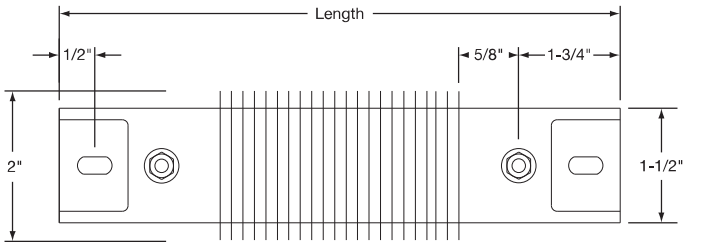
Typical Applications

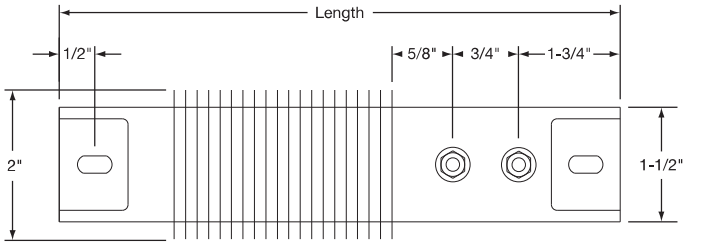
- *Duct Heating*
- *Space Heaters*
- *Drying Ovens*
- *Food Warmers*
- *Dehumidifier*
- *Shrinking Tunnels*
- *Air Heating*
- *Heat Curing*

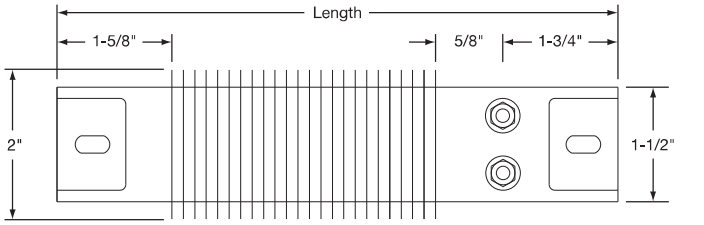
Design Features

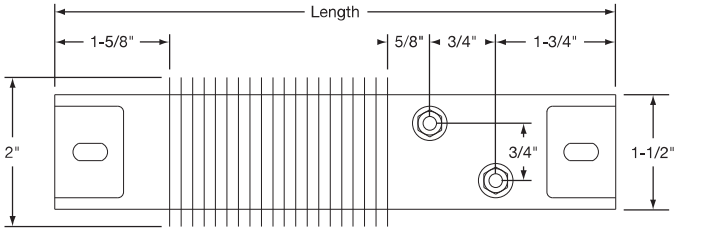
- *Rugged, Durable Construction*
- *Stainless Steel Sheath*
- *Nickel-Plated Steel Fins (Stainless Steel Optional)*
- *Various Terminations*
- *Trouble-Free Installation*
- *Various Sizes in Stock*

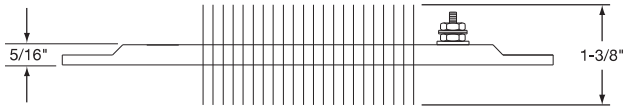
Screw Terminal Terminations

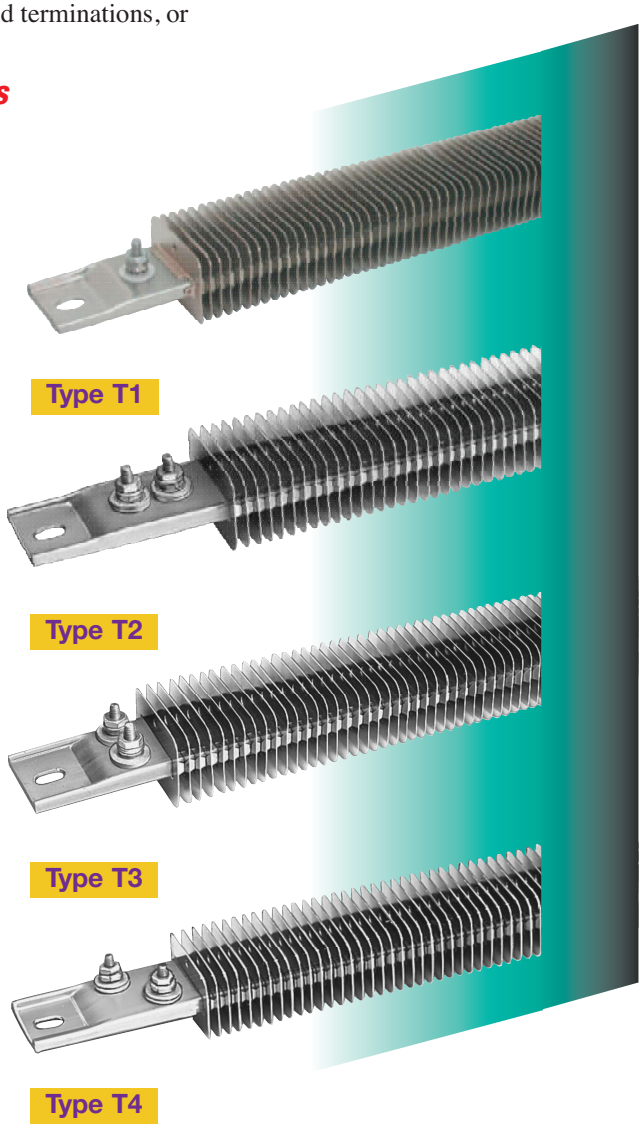












Type T1

Type T2

Type T3

Type T4

Fin Height

Large selection IN STOCK for immediate delivery

View Product Inventory @ www.tempco.com

Since 1972

FINNED STRIP

Specifications & Tolerances

Standard Specifications and Tolerances of Finned Strip Heaters If tighter tolerances are required, consult Tempco.

PERFORMANCE RATINGS

Maximum Sheath Temperature: 1200°F (650°C)

Maximum Watt Density:

Still Air	Max. W/in²	Max. W/cm²
Up to 300°F (149°C)	20	3.1
300° to 600°F (149° to 316°C)	16	2.5
600° to 800°F (316° to 427°C)	10	1.6
Moving Air	**Max. W/in²**	**Max. W/cm²**
At 600 ft./min., up to 200°F (3 m/sec., up to 93°C)	40	6.2
At 600 ft./min., up to 400°F (3 m/sec., up to 204°C)	30	4.7
At 600 ft./min., up to 600°F (3 m/sec., up to 316°C)	20	3.1

Agency cULus Approvals

Finned Channel Strip Heaters have been certified as Recognized Components by Underwriters Laboratories (File Number E65652) under CCN KSOT2/8 to meet UL standard 499 and Canadian Standard C22.2 No. 72.

This file specifies the end use limitations and conditions of acceptability for the use of this type of heater. For additional information consult Tempco.

If you require UL/CSA Agency Approval, please specify when ordering.

ELECTRICAL SPECIFICATIONS

Maximum Voltage: 480VAC (when applicable)

Maximum Amperage: 25 amps

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

MATERIAL SPECIFICATIONS & PHYSICAL SIZES

Sheath: 304 Stainless Steel

Fins: Nickel Plated Steel (Stainless Steel Optional)

Screw Terminals: Stainless Steel 10-32 UNF Threads

Width Including Fins: 2"

Height Including Fins: 1-3/8"

Length Tolerance: Up to 24" ± 1/16", over 24" ± 1/8"

Mounting Slot Size: Standard 5/16" × 1/2"

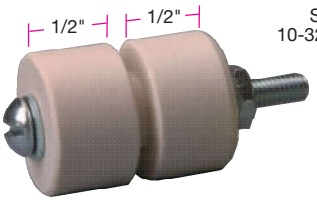
Slot Size For Secondary Insulating Bushing: 1/2" × 5/8" for 300 Volts and above

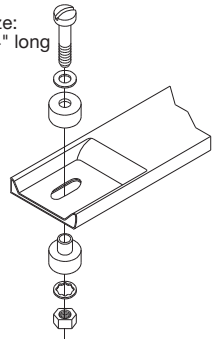
Note: For Internal Power Variations see page 8-8.

Secondary Insulating Bushings

Used to mount finned strip heaters in air heating applications. Also can be used when it is necessary to electrically isolate the heater from ground.

When Insulating Bushings are required, a 1/2" × 5/8" slot is substituted for the standard slot size (5/16" × 1/2").





CAUTION

When using secondary insulating bushings, the heater must be guarded to avoid any accidental contact. The guard must be electrically isolated from the heater and must be properly grounded.

Insulating Bushing Assembly

Part Number: CERR-1001

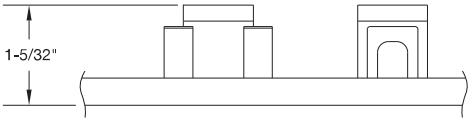
NOTE: Two assemblies are required for each heater.

Ceramic Covers for Insulating Screw Terminals

Igloo™ Ceramic Covers

Igloo Ceramic terminal covers consist of two individual ceramic parts. With a tight-fitting cap and a solid base, an Igloo cover will fully insulate any standard 10-32 terminal lug used for electrical wiring hookups.

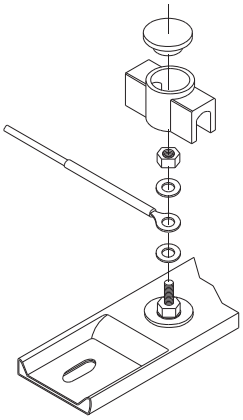
Igloo covers can be assembled on all Channel Strip and Finned Strip heaters with Type T1 and Type T4 screw terminals. Channel Strip heaters with screw terminals that have a minimum center to center distance of 7/8" can also be assembled with Igloo covers.



Type C6
Double Port In-Line
Part Number: CER-101-104

Type C7
Double Port 90°
Part Number: CER-101-106

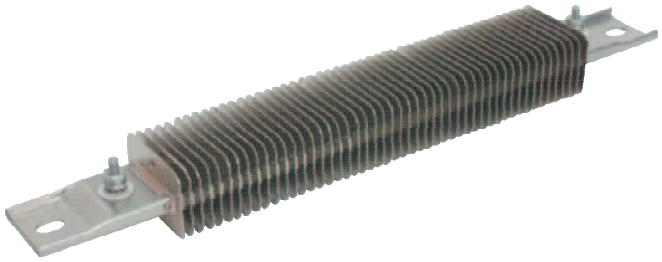
Type C8
Single Port
Part Number: CER-101-107



Ceramic Cap

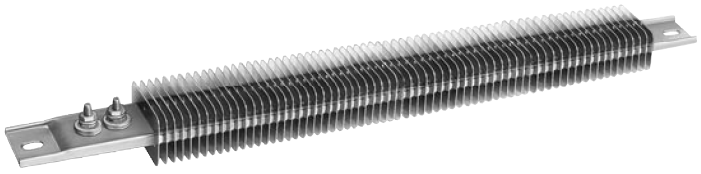
Thread	Part Number
10-32	CER-102-101

Standard (Non-Stock) and Stock Sizes and Ratings



Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
10½	266.7	350	18	3	CSF00519	CSF00520
10½	266.7	500	34	5	CSF00121	CSF00122
10½	266.7	725	45	7	CSF00123	CSF00124
12	304.8	900	40	6	CSF00131	CSF00132
14	355.6	750	28	4	CSF00232	CSF00249
14	355.6	1100	37	6	CSF00135	CSF00136
15¼	387.4	1250	37	6	CSF00139	CSF00140
17⅞	454.0	750	18	3	CSF00506	CSF00524



Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
10½	266.7	350	16	3	CSF00500	CSF00501
10½	266.7	500	21	3	CSF00001	CSF00002
10½	266.7	725	31	5	CSF00003	CSF00004
12	304.8	500	17	3	CSF00005	—
12	304.8	650	23	3	—	CSF00007
12	304.8	900	31	5	CSF00008	CSF00009
14	355.6	750	21	3	CSF00010	CSF00011
14	355.6	1100	31	5	CSF00012	CSF00013
15¼	387.4	1250	31	5	CSF00014	CSF00015
17⅞	454.0	750	16	3	CSF00505	CSF00543
17⅞	454.0	1000	21	3	CSF00539	CSF00507
17⅞	454.0	1550	31	5	CSF00016	CSF00017

Finned Strip Heaters with T1 Terminals

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
17⅞	454.0	1000	25	4	CSF00540	CSF00525
17⅞	454.0	1550	38	6	CSF00144	CSF00145
19½	495.3	1000	21	3	—	CSF00526
19½	495.3	1700	36	6	—	CSF00150
21	533.4	1900	36	6	CSF00154	CSF00155
23¾	603.3	1000	16	3	—	CSF00527
23¾	603.3	1450	24	4	CSF00529	—
23¾	603.3	2200	36	6	—	CSF00159
25½	647.7	1500	23	3	CSF00530	CSF00531
25½	647.7	2400	35	5	—	CSF00165
26¾	679.5	2500	34	5	—	CSF00167
30½	774.7	1800	21	3	—	CSF00532
30½	774.7	2800	29	5	—	CSF00176
33½	850.9	2100	21	3	—	CSF00533
33½	850.9	3150	32	5	—	CSF00178
35⅞	911.2	3450	33	5	—	CSF00181
42½	1079.5	4150	31	5	—	CSF00217
48	1219.2	2250	15	2	—	CSF00534

Finned Strip Heaters with T2 Terminals

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
10½	266.7	725	36	6	CSF00127	CSF00128
12	304.8	900	36	6	CSF00133	CSF00134
14	355.6	1100	32	5	CSF00137	CSF00138
15¼	387.4	1250	34	5	CSF00141	CSF00142
17⅞	454.0	1550	33	5	CSF00146	CSF00147
19½	495.3	1700	30	5	CSF00151	CSF00152
25½	647.7	2400	33	5	—	CSF00166
30½	774.7	2800	31	5	—	CSF00177

Finned Strip Heaters with T3 Terminals

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
19½	495.3	1000	19	3	—	CSF00508
19½	495.3	1700	31	5	CSF00018	CSF00019
21	533.4	1900	31	5	CSF00024	CSF00025
23¾	603.3	1000	15	2	—	CSF00509
23¾	603.3	1450	21	3	CSF00511	—
23¾	603.3	2200	32	5	—	CSF00026
25½	647.7	1500	21	3	CSF00513	CSF00514
25½	647.7	2400	32	5	—	CSF00027
26¾	679.5	2500	30	5	—	CSF00028
30½	774.7	1800	19	3	—	CSF00515
30½	774.7	2800	30	5	—	CSF00031
33½	850.9	2100	20	3	—	CSF00517
33½	850.9	3150	30	5	—	CSF00033
35⅞	911.2	3450	31	5	—	CSF00034
42½	1079.5	4150	31	5	—	CSF00036
48	1219.2	2250	14	2	—	CSF00037

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TEMPCO Since 1972

FINNED STRIP

Standard (Non-Stock) and Stock Sizes and Ratings

Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
8½	215.9	250	18	3	CSF00252	
10½	266.7	350	17	3		CSF00039
10½	266.7	500	24	4	CSF00129	CSF00130
10½	266.7	600	33	5	CSF00042	
10½	266.7	725	40	6	CSF00044	CSF00045
10½	266.7	850	47	7	CSF00209	
12	304.8	500	19	3	CSF00047	
12	304.8	900	34	5	CSF00053	CSF00054
14	355.6	750	23	3	CSF00056	CSF00057
14	355.6	1100	36	6	CSF00060	CSF00061
15¼	387.4	1000	27	4	CSF00065	
15¼	387.4	1250	33	5	CSF00143	CSF00067
17⅞	454.0	1000	23	3	CSF00071	
17⅞	454.0	1300	28	4	CSF00073	
17⅞	454.0	1550	30	5	CSF00148	CSF00075
19½	495.3	1250	24	4		CSF00077

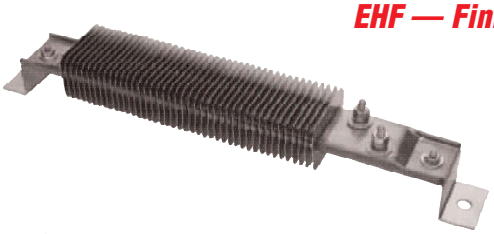
Finned Strip Heaters with T4 Terminals

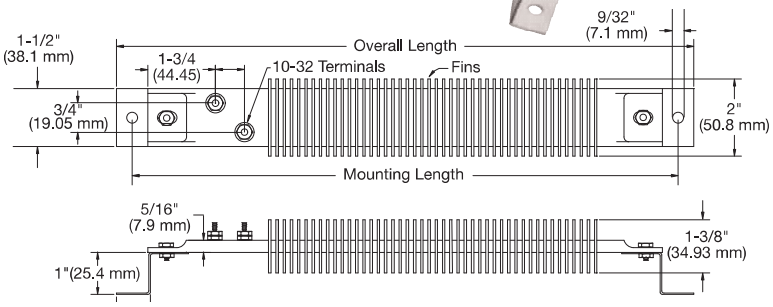
Stock Items Are Shown In RED

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
19½	495.3	1700	32	5	—	CSF00080
21	533.4	1900	33	5	CSF00158	CSF00085
23¾	603.3	1000	15	2	—	CSF00528
23¾	603.3	1450	22	3	—	CSF00088
23¾	603.3	2200	33	5	—	CSF00090
25½	647.7	2400	33	5	—	CSF00094
26¾	679.5	2500	32	5	—	CSF00100
30½	774.7	1800	20	3	—	CSF00102
30½	774.7	2800	28	4	—	CSF00104
33½	850.9	3150	31	5		CSF00180
35⅞	911.2	2000	18	3	—	CSF00350
35⅞	911.2	3450	31	5	—	CSF00110
42½	1079.5	4150	31	5	—	CSF00117

NOTE: **Type C –** Terminal Box and **Type P –** High Temperature Quick Disconnect Plug are available. See page 8-6 for details.

EHF — Finned Channel Strip Enclosure Heaters





NOTE: See page 7-41, 9-18 and 11-114 for other type enclosure heaters.

Design Features

- ✶ *10-32 offset screw terminals (T4 style) standard, other terminations available*
- ✶ *UL recognized component*
- ✶ *Stainless steel sheath and fins*
- ✶ *Easy installation with special enclosure mounting brackets*

Stock and Standard (Non-Stock) Series EHF Heaters

Stock Items Are Shown In RED

Overall Length	Mounting Dimension	Watts	Part Number 120V	Part Number 240V
12.125	11.375	200	EHF00001	EHF00002
15.625	14.875	350	EHF00003	EHF00004
19.5	18.75	450	EHF00005	EHF00006
25.375	24.625	700	EHF00007	EHF00008

Ordering Information

Catalog Heaters

Select a Finned Strip Heater from the Standard Sizes and Ratings lists on pages 8-14 and 8-15.

Finned Strip Heaters whose Part Numbers are in **RED** are available from Stock for immediate delivery.

Standard Non-Stock Part Numbers have a 3-week lead time.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed, **TEMPCO** will design and manufacture a Finned Strip Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

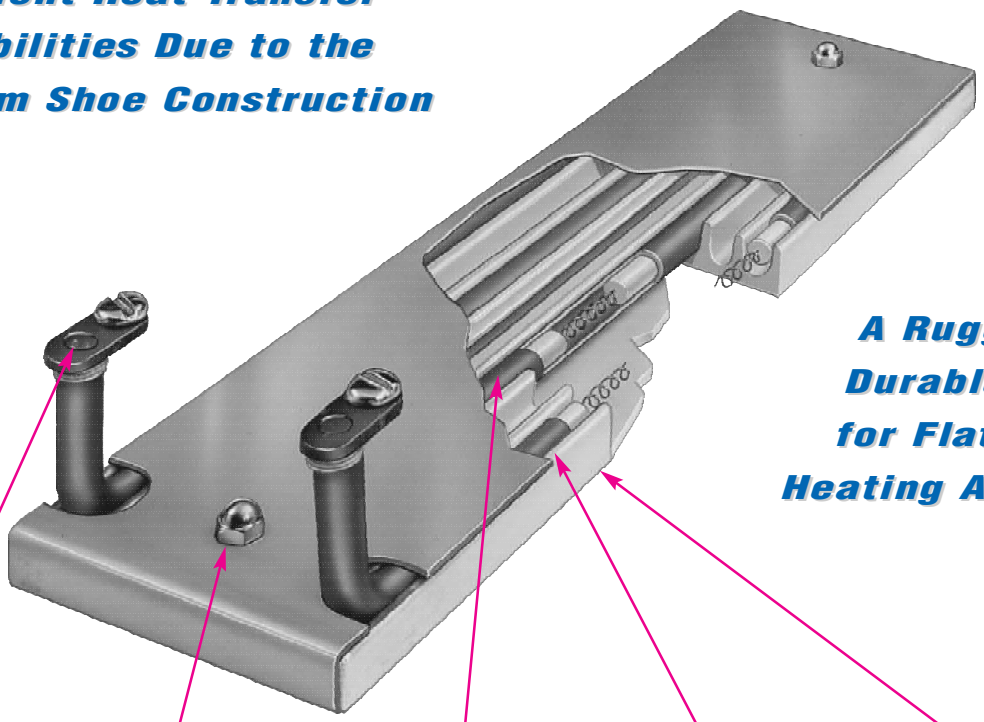
- ❑ Type of Application
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination Type
- ❑ Secondary Bushings (see page 8-13)
- ❑ Igloo™ Ceramic Terminal Covers
- ❑ Power Variation (see page 8-8)

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

TEMPCO Made in USA

MAXISTRIP®

A Reliable Heat Source with Excellent Heat Transfer Capabilities Due to the Aluminum Shoe Construction



A Rugged and Durable Heater for Flat Surface Heating Applications

A Right-angle lug terminals with 10-32 binding head screws provide ease of electrical wiring.

B Crown nuts securely fasten the cover plate to the aluminum track, keeping contaminants from coming in direct contact with the tubular heating element.

C Ruggedly constructed .315 diameter heating elements are the heat source for Maxistrip heaters, providing excellent life and long, trouble-free service.

D Specially designed aluminum track houses the tubular heating element, providing an excellent heat sink for rapid heat transfer and good temperature uniformity.

E The surface contact on Maxistrip heaters is smooth and flat, which is essential for good heat conduction. This results in exceptionally long heater life.

TEMPCO Maxistrip Heaters are specially designed and engineered for trouble-free performance and more efficient heating of flat surfaces. Due to the rugged construction characteristics of this type of strip heater, it is highly recommended for applications requiring excellent heat transfer and temperature uniformity.

Note: Mounting holes can be provided down the center. For other locations see drawings on page 8-17.

Design Features

- ✳ *Quick Installation*
- ✳ *Contamination Proof*
- ✳ *Various Lead Terminations*
- ✳ *Excellent Heat Transfer*
- ✳ *Excellent Temperature Uniformity*
- ✳ *Designed for Durability and Trouble-Free Service*

Typical Applications

- Extrusion Dies
- Molds
- Hot Plates
- Drying
- Incubators
- Platens
- Sealing Bars
- Thermoforming
- Tank Heating
- Food Warmers

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Specifications & Tolerances

Standard Specifications and Tolerances

of Maxistrip Heaters.

If tighter tolerances are required, consult Tempco.

PERFORMANCE RATINGS

Maximum Sheath Temperature: 650°F (343°C)
Maximum Watt Density: 20 W/in² (3.1 W/cm²)

ELECTRICAL SPECIFICATIONS

Maximum Voltage: 277VAC
Maximum Recommended Voltage w/ Leads: 240VAC
Maximum Watts: Dependent on width and length
Maximum Amperage: 25 Amps
Resistance Tolerance: +10%, –5%
Wattage Tolerance: +5%, –10%

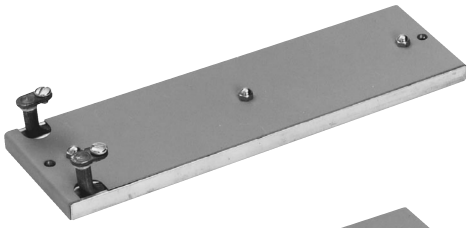
PHYSICAL CONSTRUCTION LIMITATIONS

Widths: 1-1/2" (38.1 mm), 2-1/2" (63.5 mm), 3" (76.2 mm), 4" (101.6 mm)
Thickness: 1/2" (12.7 mm)
Flatness: 0.005 per inch of the width

Screw Terminals

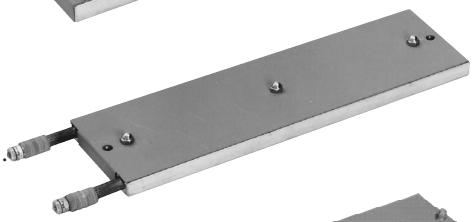
Type S
Terminal Lugs

Terminal lugs with 10-32 binding head screws are the standard termination for all Maxistrip heaters.



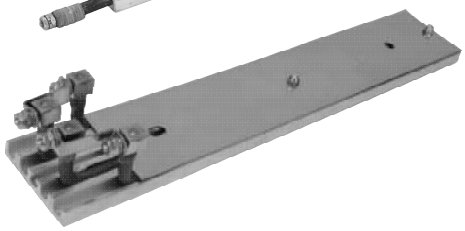
Type T1
Straight Terminals

Straight outward screw terminals with 8-32 threads.



Type R
90° Blockhead Terminals

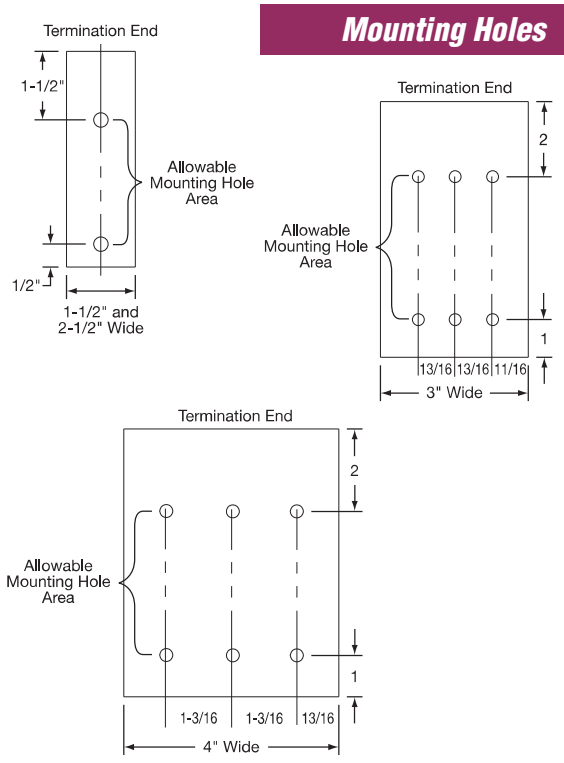
90° Blockhead Terminals with 10-32 threads. Special design can switch between 1800W and 900W at 240V.



Mounting Holes

Mounting Holes can be located only along the phantom lines between the holes shown on these drawings.

Standard Hole Diameter: 5/16"
Maximum Hole Diameter: 1/2"
(center of width only)

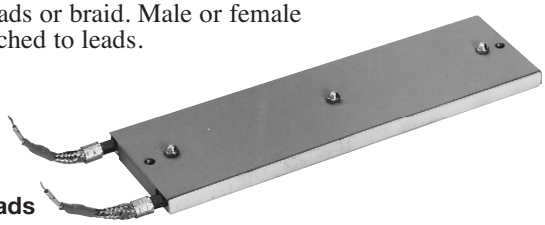


Abrasion Resistant Terminations

Wire braid provides strength and protection to the lead wire insulation, offering sharp bending not possible with armor cable. 20" of wire braid and 24" flexible leads are standard.

Options: Longer leads or braid. Male or female plugs attached to leads.

Type W1
Straight Wire Braid Leads



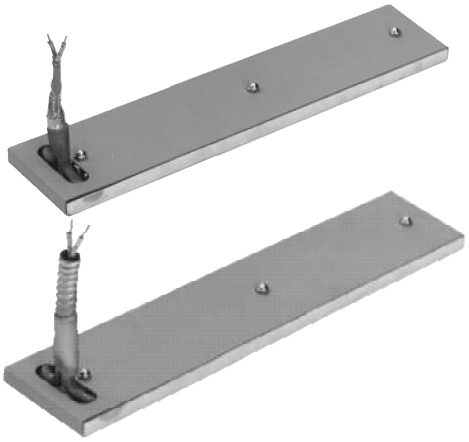
Type W2
Straight-Up Wire Braid Leads

Special Widths

By combining one or more standard width (1-1/2", 2-1/2", 3" and 4") aluminum strip heater channels, wider surface areas can be developed. Consult Tempco with your requirements.

Made in USA

Abrasion Resistant Terminations



Type W3 Single Wire Braid Leads

Wire braid provides strength and protection to the lead wire insulation, offering sharp bending not possible with armor cable. 20" of wire braid and 24" flexible leads are standard.

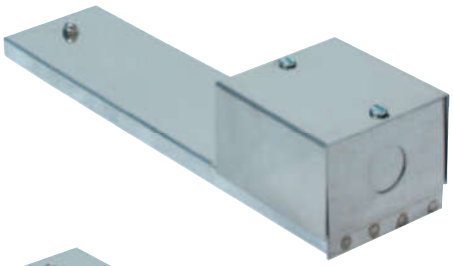
Options: Longer leads or braid. Male or female plugs attached to leads.

Type R1__ Single Armor Cable Leads

Armor Cable provides excellent protection against abrasion and contaminants. The cable exits through an adapter that encapsulates the element ends. The adapter and cable are silver soldered on for maximum security and seal protection. 20" of cable and 24" flexible leads are standard.

Type R1A Galvanized cable **Type R1B** Stainless steel cable

Options: Longer leads or cable. Male or female plugs attached to leads.



Type C__ General Purpose Stainless Steel Terminal Box

Terminal Boxes provide a simple and economical way to eliminate all live exposed terminals and electrical wiring that can be a potential hazard to employees or machines. Boxes have 1/2" trade size knockouts (actual diameter 7/8") for standard connections to simplify installation. Strip heaters fitted with boxes can be supplied factory prewired with leads, armor cable or braid.

Type CA Box only
Type CB Box with galvanized cable
Type CC Box with SS cable
Type CD Box with wire braid

Type P2__ Quick-Disconnect High Temperature Plug

Quick-Disconnect Plug assemblies are highly recommended and should be used whenever possible. They provide the simplest and safest way to apply power to strip heater installations. The combination of plug and cup assembly, along with armor cable cover leads, eliminates all live exposed terminals and electrical wiring that can be a potential hazard to employees and machines. To simplify installation, Maxistrips fitted with P2 plug assemblies can be supplied prewired, using high-temperature lead wire protected with armor cable or wire braid.

(for Type P on a 1-1/2" wide Maxistrip consult Tempco.)

Type P2A Box and cup only
Type P2C w/ straight plug and galvanized cable
Type P2D w/ straight plug and SS cable
Type P2E w/ straight plug and wire braid

Standard (Non-Stock) Sizes and Ratings

Width 1-1/2" (38.1 mm)

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3½	88.9	130	25	4	MXS00001	—
3¾	95.3	140	25	4	MXS00002	—
4	101.6	150	25	4	MXS00003	—
4¼	108.0	160	25	4	MXS00004	—
4½	114.3	170	25	4	MXS00005	—
4¾	120.7	180	25	4	MXS00006	—
5	127.0	190	25	4	MXS00007	—
5	127.0	150	20	3	MXS00008	—
5¼	133.4	200	25	4	MXS00009	—
5½	139.7	205	25	4	MXS00010	—
5¾	146.1	215	25	4	MXS00011	—
6	152.4	225	25	4	MXS00012	—
6¼	158.8	230	25	4	MXS00013	—
6½	165.1	240	25	4	MXS00014	—
6¾	171.5	250	25	4	MXS00015	—
7	177.8	260	25	4	MXS00016	—
7¼	184.2	270	25	4	MXS00017	—
7½	190.5	170	15	2	MXS00018	—
7½	190.5	225	20	3	MXS00019	—
7½	190.5	280	25	4	MXS00020	MXS00021
7¾	196.9	290	25	4	MXS00022	MXS00023
8	203.2	240	20	3	MXS00024	MXS00025
8	203.2	300	25	4	MXS00026	MXS00027
8¼	209.6	310	25	4	MXS00028	MXS00029

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
8½	215.9	320	25	4	MXS00030	MXS00031
8¾	222.3	330	25	4	MXS00032	MXS00033
9	228.6	270	25	4	MXS00034	MXS00035
9	228.6	335	25	4	MXS00036	MXS00037
9¼	235.0	345	25	4	MXS00038	MXS00039
9½	241.3	350	25	4	MXS00040	MXS00041
9¾	247.7	355	25	4	MXS00042	MXS00043
10	254.0	300	20	3	MXS00044	MXS00045
10	254.0	375	25	4	MXS00046	MXS00047
10¼	260.4	385	25	4	MXS00048	MXS00049
10½	266.7	315	20	3	MXS00050	MXS00051
10½	266.7	395	25	4	MXS00052	MXS00053
11	279.4	330	20	3	MXS00054	MXS00055
11	279.4	410	25	4	MXS00056	MXS00057
11¼	285.8	335	20	3	MXS00058	MXS00059
11½	292.1	345	20	3	MXS00060	MXS00061
12	304.8	270	15	2	MXS00062	MXS00063
12	304.8	450	25	4	MXS00064	MXS00065
12	304.8	360	20	3	MXS00066	MXS00067
12½	317.5	375	20	3	MXS00068	MXS00069
12¾	323.9	380	20	3	MXS00070	MXS00071
13	330.2	290	15	2	MXS00072	MXS00073
13	330.2	390	20	3	MXS00074	MXS00075
14	355.6	420	20	3	MXS00076	MXS00077

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Standard (Non-Stock) Sizes and Ratings

Width 2-1/2" (63.5 mm)

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
3½	88.9	175	20	3	MXS00078	—
3¾	95.3	230	25	4	MXS00079	—
4	101.6	250	25	4	MXS00080	—
4½	114.3	280	25	4	MXS00081	—
5	127.0	310	25	4	MXS00082	—
5½	139.7	340	25	4	MXS00083	—
6	152.4	375	25	4	MXS00084	—
6½	165.1	325	20	3	MXS00085	—
6¾	171.5	335	20	3	MXS00086	MXS00087
7	177.8	435	25	4	MXS00088	MXS00089
7¼	184.2	360	20	3	MXS00090	MXS00091
7½	190.5	465	25	4	MXS00092	MXS00093
7⅞	200.0	295	15	2	MXS00094	MXS00095
8	203.2	400	20	3	MXS00096	MXS00097
8	203.2	500	25	4	MXS00098	MXS00099
8¼	209.6	410	20	3	MXS00100	MXS00101
8½	215.9	530	25	4	MXS00102	MXS00103
9	228.6	560	25	4	MXS00104	MXS00105
9½	241.3	590	25	4	MXS00106	MXS00107
10	254.0	500	20	3	MXS00108	MXS00109
10	254.0	625	25	4	MXS00110	MXS00111
10½	266.7	650	25	4	MXS00112	MXS00113
11	279.4	550	25	4	MXS00114	MXS00115
11½	292.1	575	20	3	MXS00116	MXS00117
11½	292.1	715	25	4	MXS00118	MXS00119
12	304.8	600	20	3	MXS00120	MXS00121
12	304.8	750	25	4	MXS00122	MXS00123
12½	317.5	625	25	4	MXS00124	MXS00125
13	330.2	650	25	4	MXS00126	MXS00127
13½	342.9	675	25	4	MXS00128	MXS00129
14	355.6	700	20	3	MXS00130	MXS00131
14	355.6	875	25	4	MXS00132	MXS00133

Width 3" (76.2 mm)

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
6	152.4	450	25	4	MXS00134	MXS00135
6½	165.1	485	25	4	MXS00136	MXS00137
7	177.8	525	25	4	MXS00138	MXS00139
7½	190.5	560	25	4	MXS00140	MXS00141
8	203.2	600	25	4	MXS00142	MXS00143
8½	215.9	635	25	4	MXS00144	MXS00145
9	228.6	675	25	4	MXS00146	MXS00147
9½	241.3	710	25	4	MXS00148	MXS00149
10	254.0	600	20	3	MXS00150	MXS00151
10½	266.7	630	20	3	MXS00152	MXS00153
11	279.4	660	20	3	MXS00154	MXS00155
11½	292.1	690	20	3	MXS00156	MXS00157
12	304.8	720	20	3	MXS00158	MXS00159
12½	317.5	750	20	3	MXS00160	MXS00161
13	330.2	780	20	3	MXS00162	MXS00163
13½	342.9	810	20	3	MXS00164	MXS00165

Width 4" (101.6 mm)

Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
6	152.4	600	25	4	MXS00166	MXS00167
7	177.8	700	25	4	MXS00168	MXS00169
8	203.2	800	25	4	MXS00170	MXS00171
9	228.6	900	25	4	MXS00172	MXS00173
10	254.0	1000	25	4	MXS00174	MXS00175
11	279.4	880	20	3	MXS00176	MXS00177
12	304.8	960	20	3	MXS00178	MXS00179
12½	317.5	1000	20	3	MXS00180	MXS00181
13	330.2	1040	20	3	MXS00182	MXS00183
13½	342.9	1080	20	3	MXS00184	MXS00185

Ordering Information

Catalog Heaters

Select a Maxistrip Heater from the Standard Sizes and Ratings lists above. Note that Part Numbers shown are for heaters with type "S" termination. Specify Part Number and Quantity. Lead time is 3 weeks.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed, **TEMPCO** will design and manufacture a Maxistrip Heater to meet your requirements. ***Standard lead time is 3 weeks.***

Please Specify the following:

- ❑ Width
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination Types
- ❑ Lead Length
- ❑ Cable/Braid Length
- ❑ Optional Features

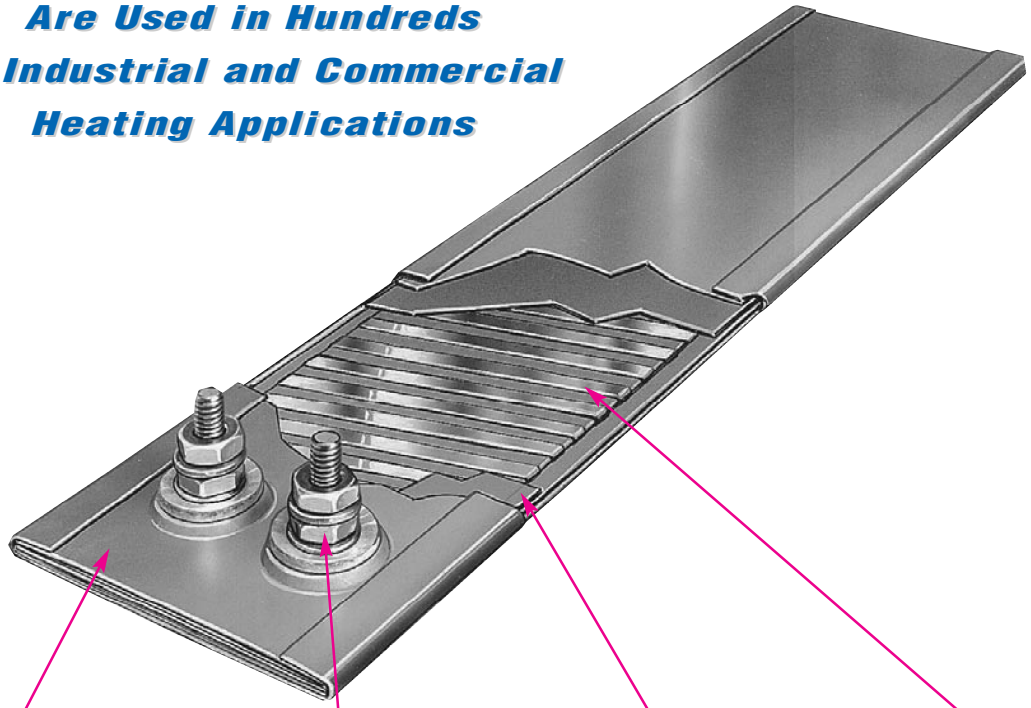
⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

MICA INSULATED

Made in USA

Mica Insulated Strip Heaters Are Used in Hundreds of Industrial and Commercial Heating Applications

AN ECONOMICAL, PRACTICAL AND RELIABLE HEAT SOURCE CAPABLE OF PROVIDING UNIFORM HEAT TRANSFER TO FLAT SURFACES



A Specially treated rust-resistant steel sheath casing provides the best combination of physical strength, high emissivity and good thermal conductivity for sheath temperatures up to 900°F (480°C). For corrosive atmospheres and/or sheath temperatures up to 1200°F (650°C), stainless steel sheath is available.

B For maximum connecting surface, the specially designed stainless steel screw terminals are securely fastened to a connecting jumper, assuring positive contact with the windings, providing maximum current carrying capacity. For other terminal or lead arrangements, see pages 8-22 and 8-23.

C Specially selected mica grade and thickness is used to insulate the windings, providing excellent thermal conductivity and dielectric strength.

D A specific nickel-chrome resistance ribbon wire size is properly engineered to achieve the best combination of wire gauge and spacing between turns, thereby providing the lowest winding temperature possible. The ribbon wire is wound on a specially selected Mica Strip, providing even heat distribution for maximum heater life.

Typical Applications

- *Food Warming Equipment*
- *Packaging Equipment*
- *Blow Molding Equipment*
- *Testing Equipment*
- *Vulcanizing Presses*
- *Vending Machines*
- *Hot Plates*
- *Ovens*
- *Molds*
- *Kettles*
- *Incubators*

Agency *Approvals*

Mica Strip heaters are UL recognized and CSA certified in many design variations. Tempco's UL file number is E65652 and CSA file number is 043099.

If you require UL, CSA, or other NRTL agency approvals, please specify when ordering.

Specifications & Tolerances

Standard Specifications and Tolerances of Mica Insulated Strip Heaters
If tighter tolerances are required consult Tempco. A heater's physical size combined with electrical ratings will determine the actual minimums and maximums.

PERFORMANCE RATINGS

Maximum Sheath Temperature: 900°F (482°C)

Nominal Watt Density: 5-45 W/in² (0.8-7.0 W/cm²)

Maximum Watt Density: Depends on operating temperature and heater size. 38 W/in² (5.9 W/cm²) Maximum when UL & CSA approval is required.

ELECTRICAL SPECIFICATIONS

Maximum Voltage: 480 Volts

Maximum Amperage: lead wire termination: 12.5 amp
screw terminations: 8-32UNF—20 amp; 10-32UNF—25 Amps

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

MATERIAL SPECIFICATIONS & PHYSICAL SIZES

Standard Sheath Material: Rust resistant steel

Optional: Stainless Steel or Aluminum

Nominal Thickness: 3/16" (4.76 mm)

Minimum Width: 5/8" (15.88 mm)
May vary depending on Termination

Width Tolerance: ±1/32" (0.79 mm)

Maximum Length: 72" (1829 mm)

Length Tolerance: Up to 24" (610 mm) ±1/16" (1.59 mm)
Over 24" (610 mm) ±1/8" (3.18 mm)

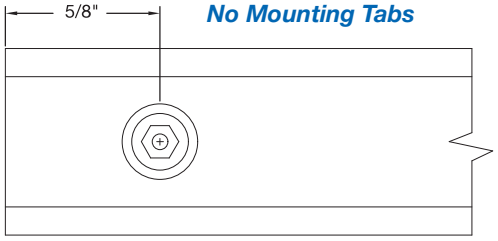
Screw Terminals
1" (25.4 mm) wide strips: 8-32 threads
Over 1" (25.4 mm) wide strips: 10-32 threads

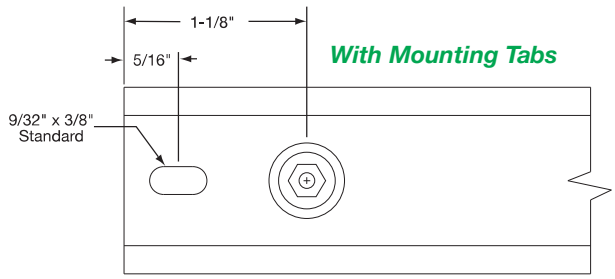
Formula for Calculating Watt Density

$$\text{Watt Density} = \frac{\text{Heater Wattage}}{(\text{Heater Width} - 3/8) \times (\text{Heater Length} - \text{Cold Area}^*)}$$

* Cold Area consists of Holes or Cutouts.

Minimum Termination Distance from Edge of Heater





Installation Instructions

1. Tempco Mica Insulated Strip Heaters are available with mounting slots at each end for surface mounting applications or without mounting slots for insertion into milled slots.
2. For surface mounting installations, Mica Strip heaters must be clamped securely along their entire length to a smooth metal surface by using metal clamps 3" to 5" apart.
3. Holes along the body of the strip heater for mounting purposes are not recommended and should only be used when there is no other means of clamping the strip heater down. These holes take up valuable winding space, increasing watt density, resulting in poor heater life.
4. When supported by mounting slots, the terminal end should be secured firmly. Opposite end should be slightly loosened to allow for linear expansion.
5. The surface being heated must be clean and smooth for efficient heat transfer. Small air gaps caused by imperfections can cause hot spots, resulting in heater failure.
6. Contaminants such as oil, plastics, and dirt should not be allowed to collect on heaters, as they will find their way into the heater windings, eventually carbonizing and causing electrical shorts.

Made in USA

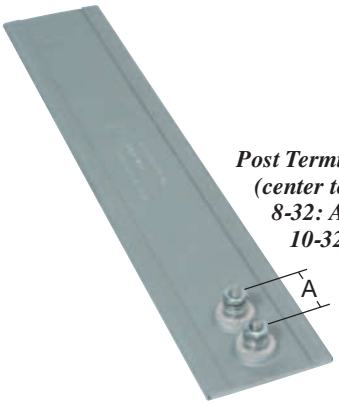
Screw Terminal Terminations

Type T1

Screw terminals at opposite ends. **Minimum Width** required is 7/8".

Type T2

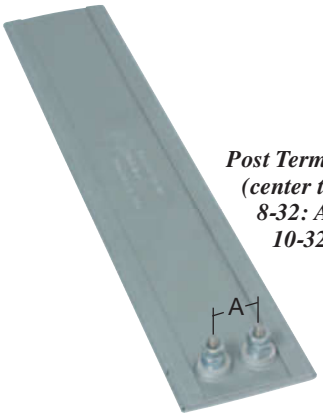
Screw terminals tandem at one end. **Minimum Width** required is 7/8".



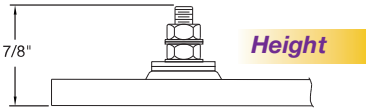
Post Terminals (center to center) 8-32: A=3/4" 10-32: A=7/8"

Type T3

Screw terminals parallel at one end. **Minimum Width** required is 2".



Post Terminals (center to center) 8-32: A=3/4" 10-32: A=7/8"



Height

Note: Typical Termination locations shown (pages 8-22, 23). Specify terminal locations when ordering.

Terminal Protection

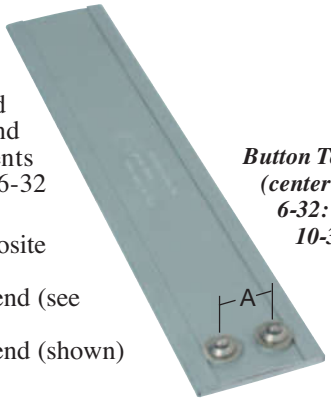
Type B__

Low-profile 10-32 button terminals with binding head screws. Same location and minimum width requirements as types T1, T2 and T3. 6-32 threads available.

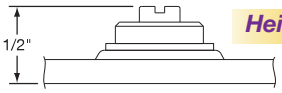
Type B1 Terminals at opposite ends (see T1)

Type B2 Terminals same end (see T2)

Type B3 Terminals same end (shown)



Button Terminals (center to center) 6-32: A= 1-1/8" 10-32: A= 7/8"



Height

Type C__

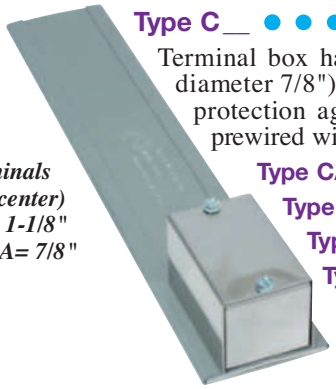
Terminal box has one 1/2" trade size knockout (actual diameter 7/8") for ease of wiring. It provides excellent protection against exposed terminals. Boxes can be prewired with armor cable or wire braid.

Type CA Box only

Type CB Box with galvanized cable

Type CC Box with Stainless Steel cable

Type CD Box with wire braid

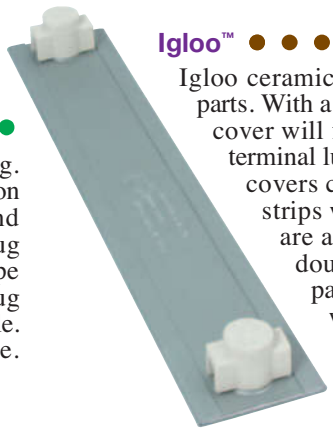


Type P1__

High-Temperature quick-disconnect plug. Available on 7/8" widths (depending on termination configuration) and wider with cup and plug assembly or just cup. Type P1Q shown with 90° plug and galvanized armor cable. Other options available. Consult Tempco.

Igloo™

Igloo ceramic terminal covers consist of two ceramic parts. With a tight-fitting cap and a solid base, an Igloo cover will fully insulate any standard 8-32 or 10-32 terminal lug used for electrical wiring hookup. Igloo covers can be assembled onto any standard mica strips with 10-32 screw terminals. Igloo covers are available in 3 different styles: single port, double port in-line and double port 90°. See page 15-13 for specific part numbers. Heater with double port in-line Igloo cover shown here.

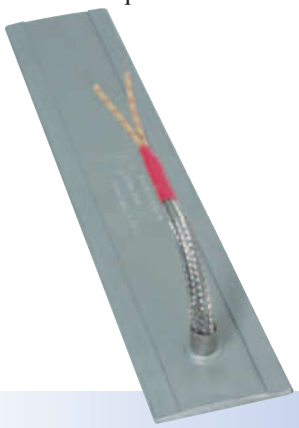


Lead Wire Terminations

Type W1

Wire braid leads offer sharp bending not possible with armor cable. 10" of wire braid over 12" leads is standard. If longer braid or leads are required, specify.

Minimum Width required is 7/8".



Type W2

Flexible stainless steel braided lead wires exiting at same end. 10" stainless steel braid over 12" leads is standard. If longer braid or leads are required, specify.

Minimum Width required is 1-1/8".

Type W3

Flexible stainless steel braided lead wires exiting at opposite ends. 10" stainless steel braid over 12" leads is standard. If longer braid or leads are required, specify.

Minimum Width required is 3/4".

Type L1

Flexible lead wire exiting from the top through a brass eyelet. 10" long leads standard; if longer leads are required, specify.

Minimum Width required is 7/8".

Type L2

Flexible lead wire exiting same end. 10" long leads standard; if longer leads are required, specify.

Minimum Width required is 1-1/8".

Type L3

Flexible lead wire exiting at opposite ends. 10" long leads standard; if longer leads are required, specify.

Minimum Width required is 3/4".

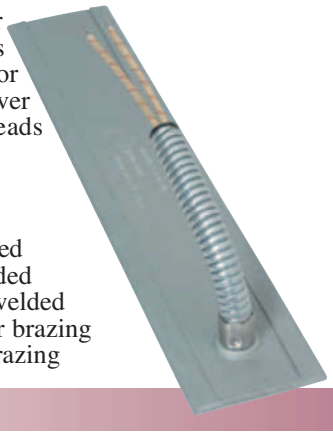
Abrasion Resistant Terminations

Type R1__

Armor cable provides far superior protection to lead wires where abrasion is a constant problem. Available with two- or three-prong plugs. 10" of armor cable over 12" leads is standard. If longer cable, leads or plugs are required, specify.

Minimum Width required is 1".

Type R1A Galvanized cable, crimped
Type R1B Stainless Steel cable, crimped
Type R1C Galvanized cable, tack welded
Type R1D Stainless Steel cable, tack welded
Type R1E Galvanized cable, full silver brazing
Type R1F Stainless Steel, full silver brazing

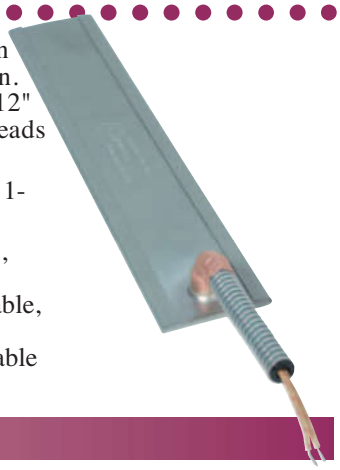


Type R2__

Right-angle armor cable can be positioned in any direction. 10" of armor cable over 12" leads is standard. If longer leads are required, specify.

Minimum Width required is 1-1/4".

Type R2A Galvanized cable, crimped
Type R2B Stainless Steel cable, crimped
Type R2C Plain leads, no cable



Standard Sizes and Ratings

Made in USA

Standard (Non-Stock) Sizes and Ratings — Heaters Without Mounting Slots

Termination **Types L1** and **L2** have 10" leads.

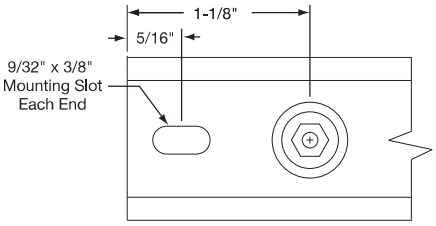
R1 and **R2** have 10" galvanized armor cable over 12" leads.

W1 and **W2** have 10" stainless steel braid over 12" leads.

Width		Length			Watt Density			Part Number	
in	mm	in	mm	Wattage	W/in²	W/cm²	Termination	120V	240V
1	25.4	6	152.4	100	32	5	L2	MSH00001	MSH00002
1	25.4	22½	571.5	525	39	6	W1	—	MSH00003
1¼	31.8	40	1016.0	750	31	5	R2	—	MSH00004
1½	38.1	5½	139.7	225	44	7	L1	—	MSH00005
1½	38.1	5½	139.7	225	44	7	L2	—	MSH00006
1½	38.1	5½	139.7	125	25	4	T2	MSH00007	—
1½	38.1	6	152.4	300	53	8	L2	MSH00008	—
1½	38.1	6	152.4	250	44	7	W1	—	MSH00009
1½	38.1	8	203.2	355	45	7	L2	—	MSH00010
1½	38.1	8	203.2	400	51	8	L2	MSH00011	MSH00012
1½	38.1	8	203.2	400	51	8	T2	MSH00013	—
1½	38.1	9½	241.3	200	21	3	L2	—	MSH00014
1½	38.1	10	254.0	450	44	7	L2	—	MSH00015
1½	38.1	10½	266.7	250	23	4	T2	MSH00016	—
1½	38.1	11	279.4	500	44	7	L1	—	MSH00017
1½	38.1	11	279.4	600	53	8	W1	—	MSH00018
1½	38.1	12	304.8	400	32	5	L2	MSH00019	—
1½	38.1	14	355.6	500	34	5	T2	MSH00020	—
1½	38.1	16	406.4	600	36	6	L2	—	MSH00021
1½	38.1	17	431.8	500	28	4	L1	—	MSH00022
1½	38.1	18	457.2	500	26	4	L2	MSH00023	—
1½	38.1	22½	571.5	775	32	5	W1	—	MSH00024
1½	38.1	24	609.6	1000	39	6	L2	—	MSH00025
1½	38.1	30	762.0	1000	31	5	L2	—	MSH00026
1½	38.1	36	914.4	1000	25	4	L2	—	MSH00027
1½	38.1	36	914.4	1000	25	4	T2	MSH00028	—
2	50.8	3	76.2	100	31	5	T2	—	MSH00029
2	50.8	4	101.6	20	4	1	T2	MSH00030	—
2	50.8	4	101.6	30	6	1	T2	MSH00031	—
2	50.8	4	101.6	40	8	1	T2	MSH00032	—
2	50.8	4	101.6	50	10	2	T2	MSH00033	—
2	50.8	4	101.6	100	21	3	T3	—	MSH00034
2	50.8	4	101.6	100	21	3	W1	—	MSH00035
2	50.8	4	101.6	150	31	5	W1	—	MSH00036
2	50.8	4	101.6	200	41	6	W1	—	MSH00037
2	50.8	8	203.2	275	24	4	L1	—	MSH00038
2	50.8	27½	698.5	1200	28	4	L2	—	MSH00039
2	50.8	43	1092.2	1400	21	3	T2	—	MSH00040
2 7/16	61.9	5½	139.7	350	38	6	T3	—	MSH00041
2½	63.5	4	101.6	150	24	4	T1	—	MSH00042
2½	63.5	6	152.4	350	33	5	R1	—	MSH00043
2½	63.5	8½	215.9	350	22	3	T3	—	MSH00044
2½	63.5	10	254.0	350	18	3	L2	MSH00045	MSH00046
2½	63.5	14	355.6	625	23	4	L2	MSH00047	—
2⅞	73.0	6	152.4	300	24	4	T3	MSH00048	—
2⅞	73.0	6	152.4	300	24	4	T3	—	MSH00049
3	76.2	7	177.8	200	13	2	L1	MSH00050	—
3	76.2	7	177.8	500	32	5	L1	MSH00051	—
3	76.2	12	304.8	180	6	1	T1	MSH00052	—
3	76.2	12½	317.5	300	10	2	T3	—	MSH00053
3	76.2	15	381.0	500	14	2	L1	MSH00054	—
3	76.2	26	660.4	600	9	1	R1	—	MSH00055
3½	88.9	4	101.6	100	11	2	W2	—	MSH00056
3½	88.9	4½	114.3	500	46	7	W1	—	MSH00057
3½	88.9	7½	190.5	500	25	4	T3	MSH00058	—
3½	88.9	10	254.0	900	32	5	W2	—	MSH00059
3½	88.9	14	355.6	450	11	2	B3	MSH00060	—
4	101.6	4	101.6	275	25	4	R2	—	MSH00061
4	101.6	8	203.2	425	17	3	T3	—	MSH00062
4	101.6	11	279.4	750	21	3	T3	—	MSH00063
4	101.6	20	508.0	1750	25	4	R1	—	MSH00064
4⅜	111.1	7 1/16	179.4	800	33	5	W2	—	MSH00065
4¾	120.7	5½	139.7	700	36	6	T2	—	MSH00066
4¾	120.7	11¼	285.8	200	4	1	T3	—	MSH00067
4⅞	123.8	11 7/16	290.5	1200	26	4	T3	—	MSH00068
5⅞	149.2	11	279.4	425	8	1	R1	MSH00069	—
6	152.4	12	304.8	1200	19	3	T3	—	MSH00070
6	152.4	15	381.0	575	7	1	T3	—	MSH00071
7	177.8	11½	292.1	625	9	1	R1	MSH00072	—
8	203.2	9¼	235.0	450	7	1	T3	—	MSH00073
8	203.2	10	254.0	450	7	1	T3	—	MSH00074
10	254.0	18	457.2	300	2	0	B3	MSH00075	—

Stock Sizes and Ratings — Heaters With Mounting Slots

Termination Type T2: Post Terminals tandem at one end.



Width in	Width mm	Length in	Length mm	Wattage	Watt Density W/in²	Watt Density W/cm²	Part Number 120V	Part Number 240V
1½	38.1	4	101.6	75	30	5	MSH02258	MSH02259
3	76.2	4	101.6	120	19	3	MSH02273	MSH02272
1½	38.1	6	152.4	100	23	4	MSH02260	MSH02261
3	76.2	6	152.4	180	17	3	MSH02274	MSH02275
1½	38.1	8	203.2	150	22	3	MSH02262	MSH02263
3	76.2	8	203.2	240	16	2	MSH02276	MSH02277
1½	38.1	10	254.0	200	23	4	MSH02264	MSH02265
3	76.2	10	254.0	300	15	2	MSH02278	MSH02279
1½	38.1	12	304.8	300	28	4	MSH02266	MSH02267
3	76.2	12	304.8	360	15	2	MSH02280	MSH02281
1½	38.1	16	406.4	400	26	4	MSH02268	MSH02269
3	76.2	16	406.4	450	14	2	MSH02282	MSH02283
1½	38.1	24	609.6	600	26	4	MSH02270	MSH02271
3	76.2	24	609.6	600	14	2	MSH02284	MSH02285

Ordering Information

Catalog Heaters

Select a Mica Strip Heater from the Standard Sizes and Ratings List on pages 8-24 and 8-25. Specify Part Number and Quantity. Lead time is 2 weeks.

Custom Engineered/Manufactured Heaters

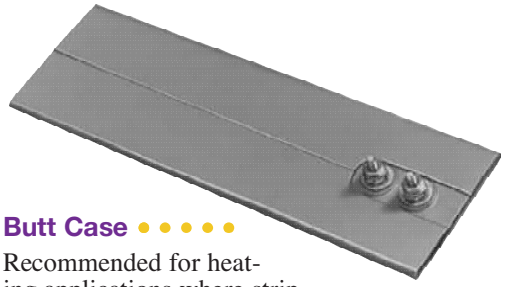
An electric heater can be very application specific; for sizes and ratings not listed, **TEMPCO** will design and manufacture a Mica Insulated Heater to meet your requirements. ***Standard lead time is 2 weeks.***

Please Specify the following:

- ❑ Width
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination Type
- ❑ Lead Length
- ❑ Cable/Braid Length
- ❑ Optional Features

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Additional Mica Strip Heater Optional Features

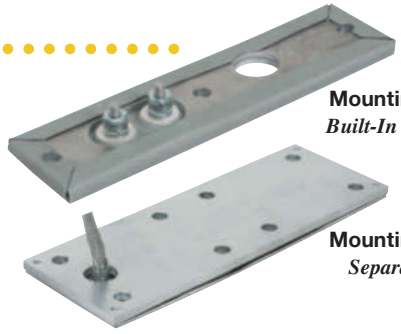


Butt Case

Recommended for heating applications where strip heater will be placed in a milled slot between two steel plates.

Pressure Plate

Strip Heaters can be made with built-in pressure plate to add rigidity and minimize warping of the heater. Standard plate thickness is 1/8". Specify plate thickness and choice of mounting method 1 or mounting method 2.



Mounting Method 1
Built-In Pressure Plate

Mounting Method 2
Separate Pressure Plate

Four Sides Closed

Mica Strip Heaters can be closed on all four sides to reduce contamination from getting inside the heater. Recommended on all strip heaters over 2-1/2" in width.

Cross-Section-Formed

Strip Heaters can be formed on their cross section for pipe heating applications. 2" minimum width required. Specify diameter of pipe on which heaters are to be mounted.

CONTINUED

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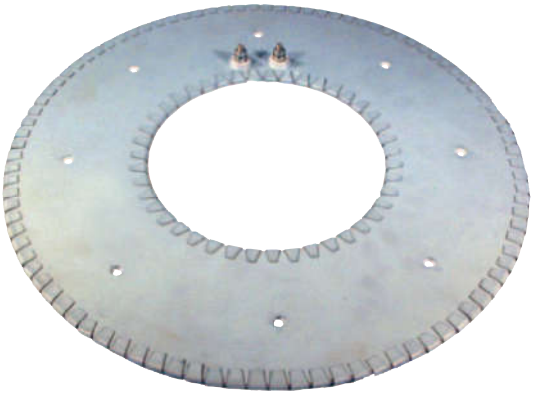
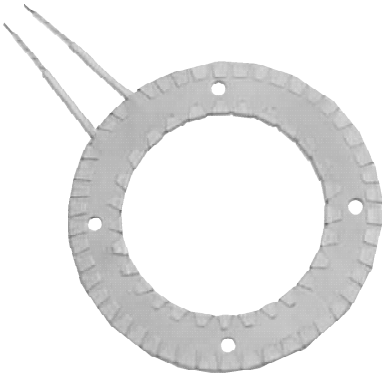
Additional Mica Strip Heater Optional Features

Continued from previous page...

Disc Heater

When ordering Disc Heaters, specify outside diameter, electrical ratings, and termination type. If mounting holes are required, specify location and hole size.

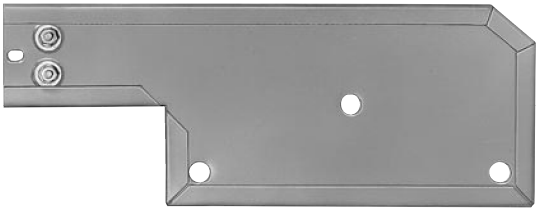




Ring Heaters

When ordering Ring Heaters, specify inside and outside diameters, electrical ratings, and termination type. If mounting holes are required, specify location and hole size.

Custom Engineered/Manufactured

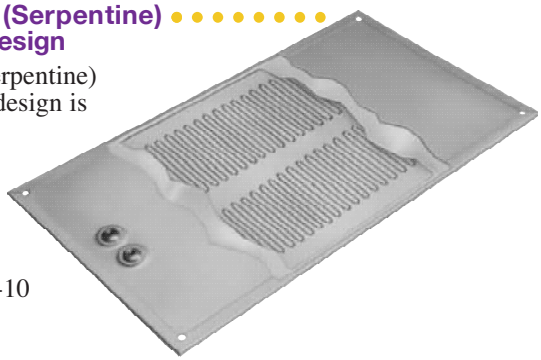


Irregular Shape

Mica Strip Heaters can be made into any practical shape and electrical rating. We welcome your inquires.

Sinuated (Serpentine) Element Design

Sinuated (Serpentine) wound coil design is used for low temperature and low watt density applications within the 3-10 amp range.



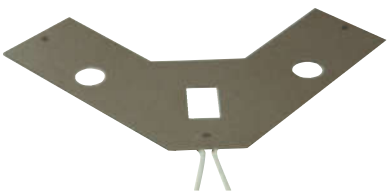
Non-Metal Sheath Custom Mica Heaters

Open Element

This economical heater design without the metal case is commonly used in laminating machines. The heater assembly can be suspended or sandwiched between non-metallic machine parts, eliminating the need for additional and expensive metal cases.

Distributed Wattage

A mica strip heater can be designed with varying heat profile along the length for uneven heat distribution.



Irregular Shape

Non-Metal Sheath Strip Heaters can be made into any practical shape and electrical rating. We welcome your inquires.

EXPERIENCE THE TEMPCO ADVANTAGE

Strip Heaters shown on this page are a small representation of the many Custom Engineered and Manufactured designs we have produced.

If you have a special application and need free technical assistance, consult our team of professionals with your requirements.

We Welcome Your Inquiries

Table Of Contents

Flexible Heaters

9 section

Made in USA

Tempco Flexible Heaters: Silicone Rubber & Kapton®
The Answer To Hundreds of Unique Heating Applications...

Designed for Trouble-Free Performance and Improved Operation Efficiency

Tempco's Flexible Heaters are capable of operating with excellent performance under many adverse conditions, including: moisture, outdoor exposure or ambient temperatures, radiation, ozone, compression set, vacuum, fungus, oils, solvents, and many other chemicals. The low thermal mass of flexible heaters allows their use in applications where the space for placing a heater is limited and weight is a concern.

Flexible Silicone Rubber and Kapton Heaters also have very good mechanical properties. They are of low mass construction and provide rapid heat-up due to direct bonding to the part— a desired requirement for applications where precise temperature control is important to the overall quality of the application. Flexible Heaters are not affected by mechanical shock, vibration or repeated flexing and will not stretch or tear over a temperature range of -70°F to +500°F (-56.6°C to +260°C).

Select a Flexible Heater for your specific application...

Tempco Flexible Heaters are a reliable and economical heat source capable of providing uniform heat transfer to irregular shaped or flat surfaces including three dimensional geometries, conforming to the part being heated. This flexibility allows you to design a heating element literally around the shape and size of the system, machine and/or component part.

Flexible heater use typically falls into the following applications:

- ✳ Process Heat
- ✳ Freeze Protection
- ✳ Condensation Protection
- ✳ Composite Bonding

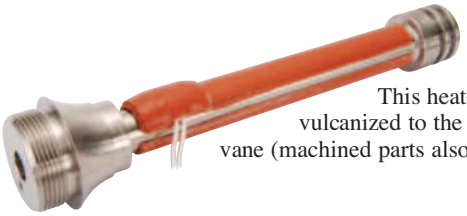
Tempco's engineering staff, with many years of experience in heat processing and temperature control, can assist you in designing the right Silicone Rubber or Kapton Flexible Heater for your application.

Tempco's Flexible Heaters offer unlimited design possibilities!

Agency c UL us ***Approvals***

Tempco SHS, DHR & EHR Silicone Rubber Heaters are UL Recognized in the USA and for Canada under UL File Number E65652 (UL499) Component Recognition Program, and CSA Recognized under CSA File Number 043099.

If you require UL/cUL and/or CSA Agency Approval, please specify when ordering.

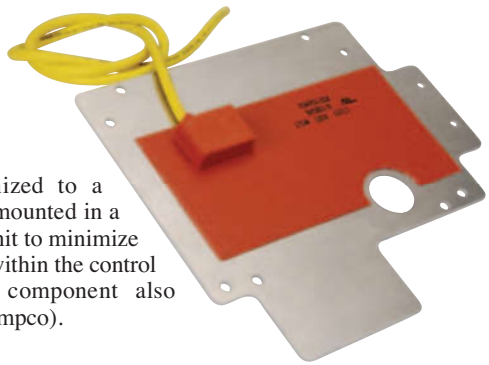


This heater, used for freeze protection, is vulcanized to the shaft in the base of a weather vane (machined parts also available from Tempco).

This formed heater is used to remove condensation on a vacuum canister.

Heater manifold 3D formed for use on a snow making machine.

Heater vulcanized to black anodized aluminum for food-prep station (metal component also supplied by Tempco).



Heater vulcanized to a metal plate is mounted in a refrigeration unit to minimize condensation within the control panel (metal component also supplied by Tempco).

Flexible Heater Construction Characteristics

The texture of the fiberglass/silicone material can be “smooth” or “rough”. Smooth silicone tends to be more flexible and stain resistant. Rough silicone has a more durable texture. Standard construction of a plain wire-wound flexible heater is made with rough silicone. Smooth silicone is standard for heaters with PSA, vulcanized to a metal plate or other options or constructions that are deemed necessary by engineering. If smooth silicone is desired, please specify when ordering.

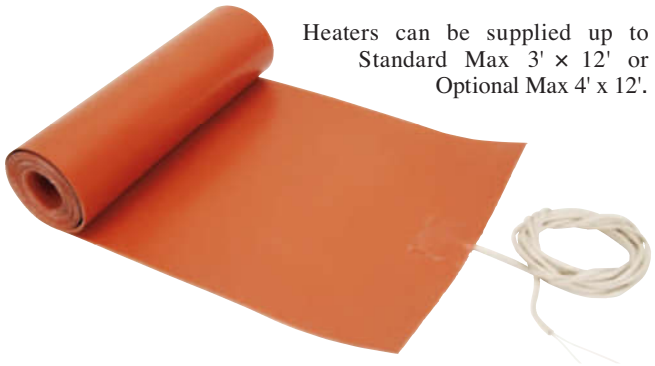
Flexible silicone rubber heaters can be produced using different material thicknesses and texture. Multiple layers can be applied for a thicker heater application. Overlapping the perimeter by 1/2" with the outer layers of a four-layer construction are more “moisture resistant” than standard two-layer construction giving that additional seal around the internal heater. Example: a 10"× 10" heater sandwiched between 11" × 11" outer layers.

The internal heat distribution pattern(s) allows for the heater element wire to be placed as close as 5/32" from the edge of the flexible heater. The heat pattern can be distributed to accommodate holes or cutouts, or to concentrate the heat in specific sections of the flexible heater as the application dictates.

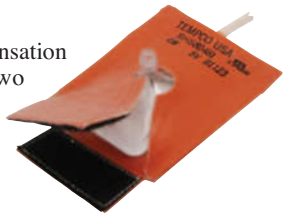
Flexible heaters are produced in two heating element choices: wire-wound elements and etched foil elements (see page 9-4).

Typical Applications

- *Aerospace*
- *Air Horns*
- *Aircraft Comfort Heaters*
- *Airplane Propeller Repair*
- *Animal Feeders*
- *ATM Machines*
- *Autoclaves*
- *Automotive*
- *Battery Heaters*
- *Computer Memory Planes*
- *Copy Machines*
- *Credit Card Scanners*
- *De-Icing*
- *Drum Heaters*
- *Food Service Equipment*
- *Graphic Arts Equipment*
- *Guidance Systems*
- *Gyroscopes*
- *Heated Presses*
- *Incubators*
- *Laboratory Equipment*
- *Laminators*
- *Liquid Reservoirs*
- *Medical Equipment*
- *Mirror Heaters*
- *Optical Equipment*
- *Outdoor Antennas*
- *Packaging Machinery*
- *Photo Processing*
- *Recovery Systems*
- *Refrigeration Equipment*
- *Security Equipment*
- *Semiconductor Equipment*
- *Shoe Machinery*
- *Turbine Propeller Repair*
- *Vacuum Chamber*
- *Vending Machines*
- *X-Ray Processing*



Heaters can be supplied up to Standard Max 3' × 12' or Optional Max 4' x 12'.



Small heater used to remove condensation in a gas filter is designed with two holes, two slits & Velcro® for easy installation while filter is in use.

An insulating heater used on a compressor pump to prevent freezing in Siberia.

Round heater with a center hole used in air horns for motorized vehicles such as Trains, Semi Trucks, or RVs where the leads need to go through the center.

Cone heater used on a soup dispenser kettle.

Formed heater with six thermocouples for six-zone control used to refurbish airplane propellers by applying heat to cure an epoxy compound that attaches a new nickel lead edge to the propeller blade.

Made in USA

Standard Flexible Heater Specifications

SHS Silicone Rubber Heater Specifications

Physical Size and Construction Limitations

Maximum Size:	*Wire:* 36" × 144" (91.4 × 366 cm) *Foil:* 10" × 22" (25.4 × 56.9 cm)
Dimensional Tolerance:	
Less than 6":	±0.030" (0.76 mm)
6" to 12":	±0.060" (1.52 mm)
12" to 18":	±0.125" (3.17 mm)
18" to 36":	±0.250" (6.35 mm)
36" to 72":	±0.500" (12.7 mm)
Every 36" after 72":	Additional ±0.250" (6.35 mm)
Nominal Thickness:	*Wire:* 0.056" (1.42 mm) *Foil:* 0.030" (0.76 mm)
Available Thickness:	0.018" to 0.112" (0.46 mm to 2.85 mm)
Weight:	7 oz./ft² (0.21g/cm²)

Performance Ratings

Maximum Operating Temperature:	500°F / 260°C Intermittent 392°F / 200°C Continuous
Minimum Operating Temperature:	-70°F / -56.6°C
Physically Resistant To:	Moisture, Ozone, Fungus, Radiation
Agency Approvals:	UL File #E65652 (wire-wound only)

Electrical Ratings

Resistance Tolerance:	*Wire:* +10%, -5%, *Foil:* +10%, -10%
Maximum Operating Voltage:	*Wire:* 600 VAC, *Foil:* 480 VAC
Dielectric Strength:	1000 VAC
Standard Leads:	10" Teflon® Insulated Stranded Wire

SHK Kapton® Heater Specifications

Physical Size and Construction Limitations

Maximum Size:	10" × 22" (25.4 × 56.9 cm)
Dimensional Tolerance:	
Less than 6":	±0.030" (0.76 mm)
6" to 12":	±0.060" (1.52 mm)
Over 12":	±0.125" (3.17 mm)
Nominal Thickness:	0.008" (0.20 mm)
Weight:	1.5 oz./ft² (0.05g/cm²)

Performance Ratings

Maximum Operating Temperature:	392°F / 200°C Continuous
Minimum Operating Temperature:	-320°F / -195°C
Physically Resistant To:	Moisture, Ozone, Fungus

Electrical Ratings

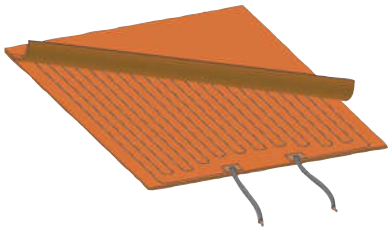
Resistance Tolerance:	+10%, -10%
Maximum Operating Voltage:	480 Vac
Dielectric Strength:	1000 Vac
Standard Leads:	10" Teflon® Insulated Stranded Wire
Maximum Resistance Density for Heaters with Etched Foil Element:	125 Ω/in²

Note: Other materials are available, such as neoprene rubber or vinyl plastic. Consult Tempco for more information.

Wire-Wound Element Construction

Tempco Silicone Rubber heaters with wire-wound elements provide excellent physical strength capable of withstanding repeated flexing without compromising the life and performance of the heater. They are also very effective for manufacturing geometrically challenged shapes, including three dimensional ones.

The wire-wound element process consists of resistance wire wound on a fiberglass cord for added support and flexibility. The wire-wound element is laid out in a special designed pattern to ensure uniform heat profile and to conform to the size and shape of the silicone rubber heater, avoiding holes and cutouts, or to concentrate the heat profile in a specific section(s) of the heater as the application dictates.



Power lead wires or cord sets are attached to the heater windings with solder and firmly secured in place through a vulcanizing process, ensuring that the assembly becomes homogenous.

The wire-wound process is recommended and preferred for small to medium size quantities, medium to large size heaters, and to produce prototypes to prove out the design parameters prior to entering into large volume production runs when using etched foil.

Etched Foil Element Construction

Etched Foil Silicone Rubber or Kapton flexible heaters are made with a thin metal foil (.001"), usually a nickel base alloy, as the resistance element. The resistance pattern to be etched is designed in CAD and transferred to the foil, which is laminated to the insulating substrate. The element/substrate is then processed through an acid spray to produce the desired resistance pattern.

The top layer is then added and vulcanized for silicone rubber or laminated for Kapton heaters. For silicone rubber heaters, lead wires are then attached to the heater and insulated with additional silicone rubber to complete the heater. For Kapton® heaters, lead wires are attached to the heater and insulated with epoxy cement to complete the heater.

The etched foil heater has exceptional heat transfer compared to wire wound elements, due to its large flat surface area. It can deliver more uniform heat profiles with higher watt densities, providing longer operating heater life. It can also be zoned with distributed wattage or separate heating circuits to compensate for load variations. The etched foil process is recommended for small size heaters in large quantities.

Flexible Heater Wattage Recommendations

Step 1 Determine the Required Wattage

Every process has a unique wattage requirement to heat that particular load up to temperature or to maintain a particular temperature.

If the required heater wattage is not known, estimate the required wattage using the thermodynamic formulas listed in chapter 16, Engineering. A safety factor of 25% additional wattage is recommended to compensate for unknown variables.

Example

To raise the temperature of an aluminum plate 6" × 12" × 0.5" (3.53 lb.) 200°F (from 70° to 270°F) in 0.5 hours:

$$\text{Watts} = \frac{3.53 \text{ lbs.} \times (0.24 \text{ Btu/lb.°F}) \times 200°\text{F}}{3.412 \text{ btu/watt hr.} \times 0.5 \text{ hrs.}} = 99 \text{ watts}$$

Add safety margin: 99 W + 25% = 124 watts

Step 2 Determine the Heater Size and Watt Density

A flexible heater should use the maximum space available for mounting and heating the process. Factors that affect heater size include the mounting method and watt density.

$$\text{Watt Density} = \frac{\text{Heater Wattage}}{\text{Area of the Heater}}$$

As a general rule, the following can be applied for silicone rubber heaters:

Low Heat-Up: 2.5 w/in²

Average Heat-Up: 5 w/in²

High Heat-Up: 7.5 w/in² and greater

Continuing the aluminum plate example, determine what size the heater should be:

Silicone Rubber Heater: 5" × 10" = 50 in²

Watt Density = 135 watts ÷ 50 in² = 2.7 watts/in²

Since the watt density falls between 2.5 and 5 w/in², the silicone rubber heater selected should work satisfactorily.

Referring to the chart below for a wire wound silicone rubber heater, pressure sensitive adhesive mounting should work well for this application at the required temperature.

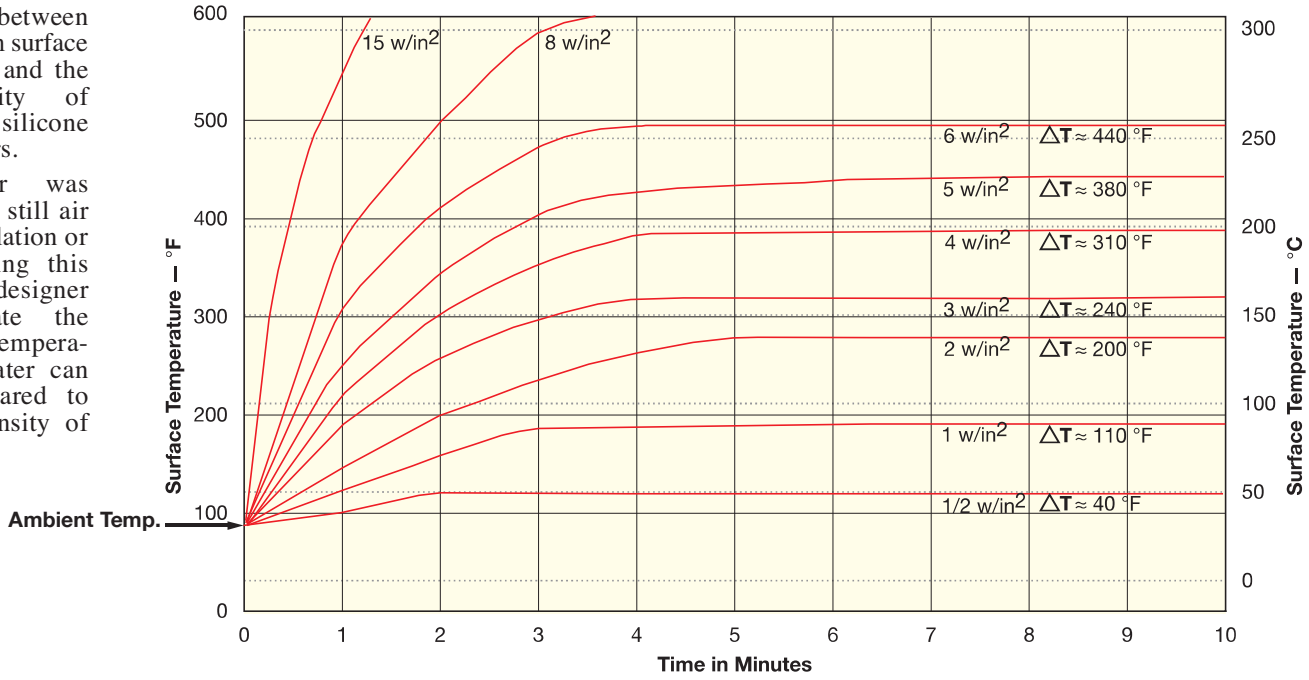
If the calculated watt density is too high, a larger heater will lower the required watt density and still produce the same wattage.

Silicone Rubber Heater Surface Temperature vs. Watt Density

Graph shows the relationship between the maximum surface temperature and the watt density of standard silicone rubber heaters.

The heater was energized in still air without insulation or a load. Using this graph the designer can estimate the maximum temperature the heater can reach compared to the watt density of the heater.

Surface Temperature vs. Time for Various Watt Densities



ΔT = Temperature Rise From Ambient at Specified Watt Densities

CONTINUED

Flexible Heater Wattage Recommendations

Continued from previous page...

Suggested Maximum Watt Density by Heater Type and Mounting Method

Watt Density w/in²	Silicone Rubber – Wire Element		Silicone Rubber – Foil Element		Kapton® – Foil Element	
	Vulcanized	PSA	Vulcanized	PSA	Acrylic PSA	Acrylic PSA with 3 mil Aluminum Foil
5	420 to 356°F (216 to 180°C)	350 to 335°F (177 to 168°C)	455 to 419°F (235 to 215°C)	350 to 320°F (177 to 160°C)	212 to 189°F (100 to 87°C)	302 to 275°F (150 to 135°C)
10	356 to 266°F (180 to 130°C)	335 to 248°F (168 to 120°C)	419 to 383°F (215 to 195°C)	320 to 293°F (160 to 145°C)	189 to 163°F (87 to 73°C)	275 to 257°F (135 to 125°C)
15	266 to 158°F (130 to 70°C)	248 to 140°F (120 to 60°C)	383 to 347°F (195 to 175°C)	293 to 266°F (145 to 130°C)	163 to 131°F (73 to 55°C)	257 to 230°F (125 to 110°C)
20	158 to 68°F (70 to 20°C)	140 to 32°F (60 to 0°C)	347 to 311°F (175 to 155°C)	266 to 239°F (130 to 115°C)	131 to -25°F (55 to -32°C)	230 to 194°F (110 to 90°C)
25	68 to -40°F (20 to -40°C)	32 to -49°F (0 to -45°C)	— —	— —	— —	194 to 167°F (90 to 75°C)
30	— —	— —	311 to 257°F (155 to 125°C)	239 to 185°F (115 to 85°C)	— —	167 to 125°F (75 to 52°C)
35	— —	— —	— —	— —	— —	125 to 86°F (52 to 30°C)
40	— —	— —	257 to 185°F (125 to 85°C)	185 to 104°F (85 to 40°C)	— —	86 to -25°F (30 to -32°C)
50	— —	— —	185 to 50°F (85 to 10°C)	104 to -40°F (40 to -40°C)	— —	— —
60	— —	— —	50 to -49°F (10 to -45°C)	-40 to -49°F (-40 to -45°C)	— —	— —

Note: Use an appropriate Temperature Controller for the application.

Silicone Rubber Standard (Non-Stock) Sizes and Ratings

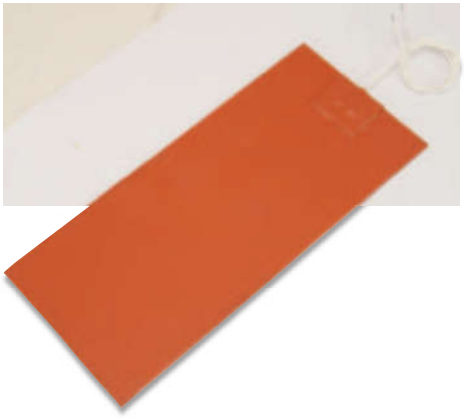
Silicone Rubber Heaters listed have 10" Teflon® Insulated Stranded Lead Wires exiting at Location L (see page 9-9).

Diameter in.	Diameter mm	Area in²	Area cm²	Watts	Wire Construction 120V	Wire Construction 240V	Foil Construction 120V	Foil Construction 240V
3.0	76	7.07	45.6	35	SHS00201	—	—	—
3.5	89	9.62	62.1	48	SHS00202	—	SHS00241	—
4.0	102	12.57	81.1	63	SHS00203	SHS00222	SHS00242	—
4.5	114	15.90	102.6	80	SHS00204	SHS00223	SHS00243	SHS00261
5.0	127	19.63	126.6	98	SHS00205	SHS00224	SHS00244	SHS00262
5.5	140	23.76	153.3	119	SHS00206	SHS00225	SHS00245	SHS00263
6.0	152	28.27	182.4	141	SHS00207	SHS00226	SHS00246	SHS00264
6.5	165	33.18	214.1	166	SHS00208	SHS00227	SHS00247	SHS00265
7.0	178	38.48	248.3	192	SHS00209	SHS00228	SHS00248	SHS00266
7.5	191	44.18	285.0	221	SHS00210	SHS00229	SHS00249	SHS00267
8.0	203	50.26	324.3	250	SHS00211	SHS00230	SHS00250	SHS00268
8.5	216	56.74	366.1	284	SHS00212	SHS00231	SHS00251	SHS00269
9.0	229	63.62	410.4	318	SHS00213	SHS00232	SHS00252	SHS00270
9.5	241	70.88	457.3	354	SHS00214	SHS00233	SHS00253	SHS00271
10.0	254	78.54	506.7	393	SHS00215	SHS00234	SHS00254	SHS00272
10.5	267	86.59	558.7	430	SHS00216	SHS00235	SHS00255	SHS00273
11.0	279	95.03	613.2	480	SHS00217	SHS00236	SHS00256	SHS00274
11.5	292	103.87	670.2	520	SHS00218	SHS00237	SHS00257	SHS00275
12.0	305	113.10	729.7	570	SHS00219	SHS00238	SHS00258	SHS00276
15.0	381	176.72	1140.2	880	SHS00220	SHS00239	SHS00259	SHS00277
20.0	508	314.16	2027.0	1570	SHS00221	SHS00240	SHS00260	SHS00278

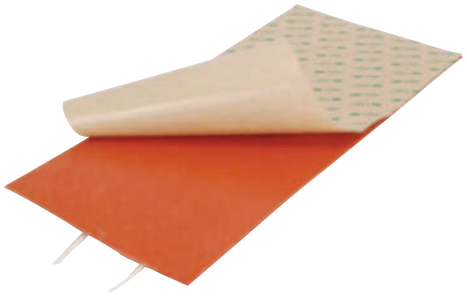
Silicone Rubber Rounds

Stock Square & Rectangular Silicone Rubber Heaters

Standard Smooth Silicone Rubber Heater
Maximum Operating Temperature: 450°F (232°C)



Heater with Pressure Sensitive Adhesive (PSA) Backing
Maximum Operating Temperature: 300°F (149°C)



Silicone Rubber
Squares and Rectangles

CAUTION Use an appropriate method of temperature control to prevent heaters from exceeding maximum operating temperature. Reference Surface Temperature vs. Watt Density graph on page 9-5.

Stock Silicone Rubber Heaters — Standard Smooth and with Pressure Sensitive Adhesive Backing (PSA)

Silicone Rubber Heaters listed are 120 Volt and have 10" Teflon® Insulated Stranded Lead Wires exiting at Location A (see page 9-9).

Width		Length			Watt Density	Part Number	
in.	mm	in.	mm	Watts	w/in²	Standard (No PSA)	With PSA Backing
2	51	2	51	10	2.5	SHS80293	SHS80294
2	51	2	51	20	5	SHS80295	SHS80296
3	76	3	76	25	2.5	SHS80297	SHS80298
3	76	3	76	45	5	SHS80299	SHS80300
3	76	3	76	90	10	SHS80301	SHS80302
6	152	6	152	90	2.5	SHS80303	SHS80304
6	152	6	152	180	5	SHS80305	SHS80306
6	152	6	152	360	10	SHS80307	SHS80308
9	229	9	229	200	2.5	SHS80309	SHS80310
9	229	9	229	400	5	SHS80311	SHS80312
9	229	9	229	800	10	SHS80313	SHS80314
10	254	10	254	250	2.5	SHS80315	SHS80316
10	254	10	254	500	5	SHS80317	SHS80318
10	254	10	254	1000	10	SHS80319	SHS80320
12	305	12	305	360	2.5	SHS80321	SHS80322
12	305	12	305	720	5	SHS80323	SHS80324
12	305	12	305	1440	10	SHS80325	SHS80326
1	25	3	76	10	2.5	SHS80327	SHS80328
1	25	3	76	15	5	SHS80329	SHS80330
1	25	3	76	30	10	SHS80331	SHS80332
1	25	6	152	15	2.5	SHS80333	SHS80334
1	25	6	152	30	5	SHS80335	SHS80336
1	25	6	152	60	10	SHS80337	SHS80338
1	25	9	229	25	2.5	SHS80339	SHS80340
1	25	9	229	50	5	SHS80341	SHS80342
1	25	9	229	90	10	SHS80343	SHS80344
1	25	12	305	30	2.5	SHS80345	SHS80346
1	25	12	305	60	5	SHS80347	SHS80348
1	25	12	305	120	10	SHS80349	SHS80350
1	25	18	457	45	2.5	SHS80351	SHS80352
1	25	18	457	90	5	SHS80353	SHS80354
1	25	18	457	180	10	SHS80355	SHS80356
1	25	24	610	60	2.5	SHS80357	SHS80358
1	25	24	610	120	5	SHS80359	SHS80360
1	25	24	610	240	10	SHS80361	SHS80362
1	25	30	762	75	2.5	SHS80363	SHS80364
1	25	30	762	150	5	SHS80365	SHS80366
1	25	30	762	300	10	SHS80367	SHS80368

Width		Length			Watt Density	Part Number	
in.	mm	in.	mm	Watts	w/in²	Standard (No PSA)	With PSA Backing
1	25	48	1219	120	2.5	SHS80369	SHS80370
1	25	48	1219	240	5	SHS80371	SHS80372
1	25	48	1219	480	10	SHS80373	SHS80374
1	25	60	1524	150	2.5	SHS80375	SHS80376
1	25	60	1524	300	5	SHS80377	SHS80378
1	25	60	1524	600	10	SHS80379	SHS80380
1	25	72	1829	180	2.5	SHS80381	SHS80382
1	25	72	1829	360	5	SHS80383	SHS80384
1	25	72	1829	720	10	SHS80385	SHS80386
2	51	6	152	30	2.5	SHS80387	SHS80388
2	51	6	152	60	5	SHS80389	SHS80390
2	51	6	152	120	10	SHS80391	SHS80392
2	51	9	229	45	2.5	SHS80393	SHS80394
2	51	9	229	90	5	SHS80395	SHS80396
2	51	9	229	180	10	SHS80397	SHS80398
2	51	12	305	60	2.5	SHS80399	SHS80400
2	51	12	305	120	5	SHS80401	SHS80402
2	51	12	305	240	10	SHS80403	SHS80404
3	76	6	152	45	2.5	SHS80405	SHS80406
3	76	6	152	90	5	SHS80407	SHS80408
3	76	6	152	180	10	SHS80409	SHS80410
3	76	9	229	70	2.5	SHS80411	SHS80412
3	76	9	229	140	5	SHS80413	SHS80414
3	76	9	229	280	10	SHS80415	SHS80416
3	76	12	305	90	2.5	SHS80417	SHS80418
3	76	12	305	180	5	SHS80419	SHS80420
3	76	12	305	360	10	SHS80421	SHS80422
6	152	12	305	180	2.5	SHS80423	SHS80424
6	152	12	305	360	5	SHS80425	SHS80426
6	152	12	305	720	10	SHS80427	SHS80428
6	152	24	610	360	2.5	SHS80429	SHS80430
6	152	24	610	720	5	SHS80431	SHS80432
6	152	24	610	1440	10	SHS80433	SHS80434
9	229	12	305	270	2.5	SHS80435	SHS80436
9	229	12	305	540	5	SHS80437	SHS80438
9	229	12	305	1080	10	SHS80439	SHS80440
12	305	24	610	720	2.5	SHS80441	SHS80442
12	305	24	610	1440	5	SHS80443	SHS80444

Standard Sizings and Ratings

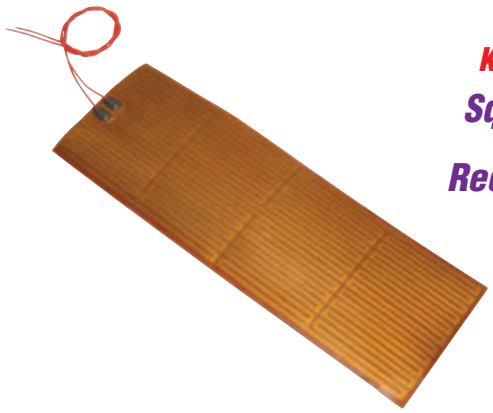
Made in USA

Kapton® Standard (Non-Stock) Sizes and Ratings

Kapton Rounds

Diameter in.	Diameter mm	Area in²	Area cm²	Watts	Part Number 120V	Part Number 240V
3.0	76	7.07	45.6	35	SHK00101	—
3.5	89	9.62	62.1	48	SHK00102	—
4.0	102	12.57	81.1	63	SHK00103	—
4.5	114	15.90	102.6	80	SHK00104	SHK00116
5.0	127	19.63	126.6	98	SHK00105	SHK00117
5.5	140	23.76	153.3	119	SHK00106	SHK00118
6.0	152	28.27	182.4	141	SHK00107	SHK00119
6.5	165	33.18	214.1	166	SHK00108	SHK00120
7.0	178	38.48	248.3	192	SHK00109	SHK00121
7.5	190	44.18	285.0	221	SHK00110	SHK00122
8.0	203	50.26	324.3	250	SHK00111	SHK00123
8.5	216	56.74	366.1	284	SHK00112	SHK00124
9.0	229	63.62	410.4	318	SHK00113	SHK00125
9.5	241	70.88	457.3	354	SHK00114	SHK00126
10.0	254	48.54	506.7	393	SHK00115	SHK00127

KAPTON FLEXIBLE HEATERS



Kapton Squares and Rectangle

Width in.	Width mm	Length in.	Length mm	Watts	Part Number 120V	Part Number 240V
1	25	8	203	40	SHK00001	—
1	25	12	305	60	SHK00002	SHK00022
2	51	2	51	20	—	SHK00023
2	51	4	102	40	SHK00004	SHK00024
2	51	8	203	80	SHK00005	SHK00025
2	51	12	305	120	SHK00006	SHK00026
3	76	4	102	60	SHK00007	SHK00027
3	76	8	203	120	SHK00008	SHK00028
3	76	12	305	180	SHK00009	SHK00029
4	102	4	102	80	SHK00010	SHK00030
4	102	8	203	160	SHK00011	SHK00031
4	102	12	305	240	SHK00012	SHK00032
5	127	6	152	150	SHK00013	SHK00033
5	127	10	254	250	SHK00014	SHK00034
5	127	12	305	300	SHK00015	SHK00035
6	152	6	152	180	SHK00016	SHK00036
6	152	10	254	300	SHK00017	SHK00037
6	152	12	305	360	SHK00018	SHK00038
8	203	8	203	320	SHK00019	SHK00039
8	203	12	305	480	SHK00020	SHK00040
10	254	10	254	500	SHK00021	SHK00041

Ordering Information

Catalog Heaters

Chose from the tables of common sizes of Silicone Rubber and Kapton in round or rectangular shapes.

The heaters listed are 5 W/in². Standard configuration includes 10" Teflon® leads, exit style A or L (see page 9-9) and no mounting option.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed, **TEMPCO** will design and manufacture a Flexible Surface Heater to meet your requirements. ***Standard lead time is 4 to 5 weeks.***

Please Specify the following:

- ❑ Diameter
- ❑ Wattage and Voltage
- ❑ Lead Type
- ❑ Sensors or Thermostats
- ❑ Special Features or Cutouts
- ❑ Lead Location

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Flexible Heater Lead End Termination Options

Tempco's standard lead termination is stripped lead ends — 1/4" (6.3mm). Any type of connector can be attached to the leads to complete the assembly and make wiring into applications quick and easy.

From simple ring crimp connectors to complex male or female crimp pins and housings such as Molex® components, Tempco does it all!

Tempco's expert designers and assemblers can also provide complete wire harnesses if required. Consult Tempco with your requirements.

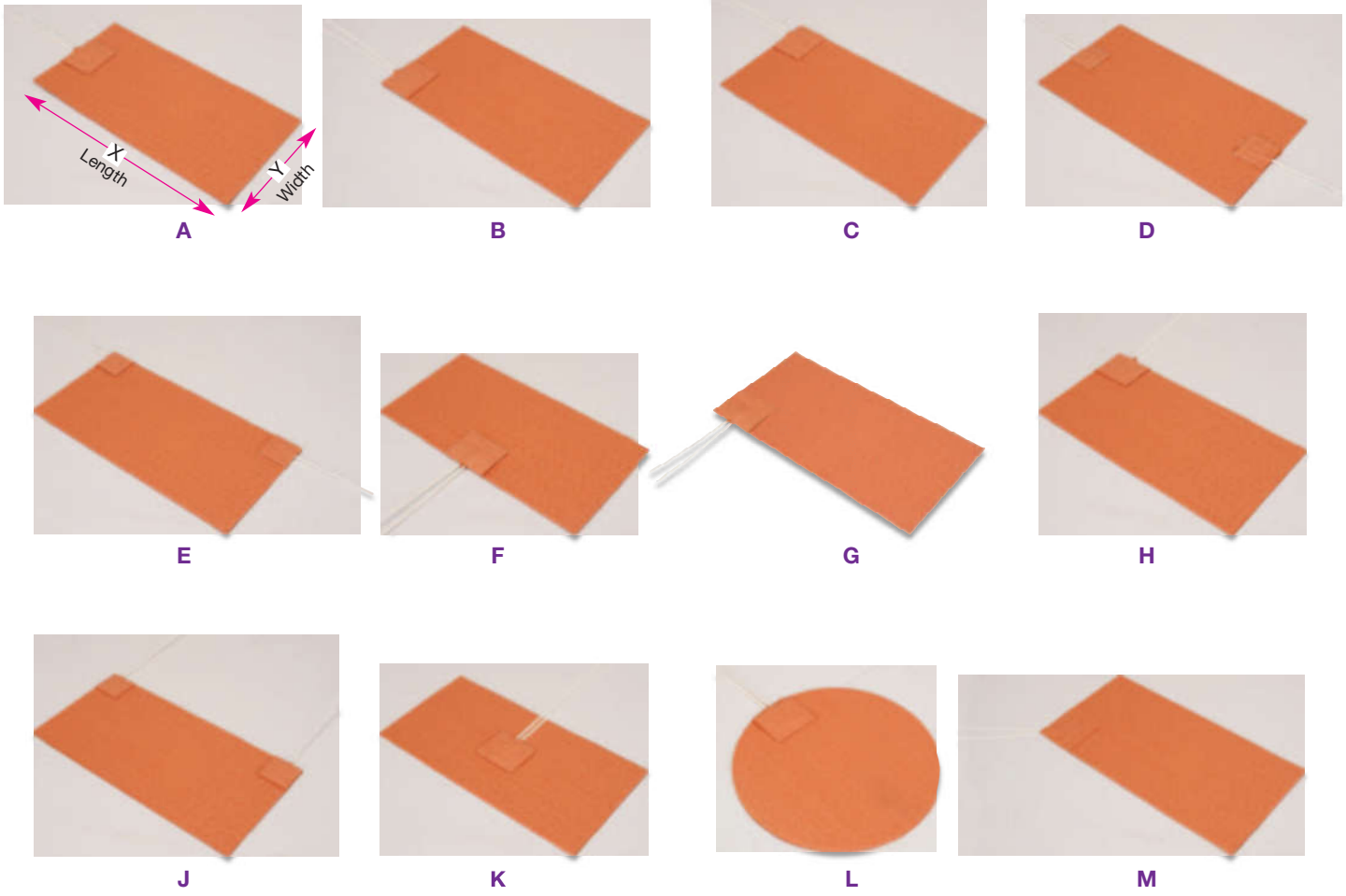
Crimp Connectors: insulated or non-insulated
- Ring Terminal
- Spade Terminal
- 1/4" Female Straight Disconnect
- 1/4" Female Right-Angle Disconnect

Miniature Connectors: example – Molex

Plugs:
- Standard 120 or 240 Vac – straight blade
- Twist locking plugs, 120 to 480 Vac
- Specify NEMA or manufacturer's part number

Special Connectors and Plugs:
- Consult Tempco with your requirements.

Flexible Heater Lead Exit Location Options



Notes: 1. Oriented so X is always greater than Y.
2. Specify lead exit location using identification letters A through M.
3. Provide a sample and/or drawing indicating power leads or cord set exit location for shapes other than those shown above.

Lead and Termination Options

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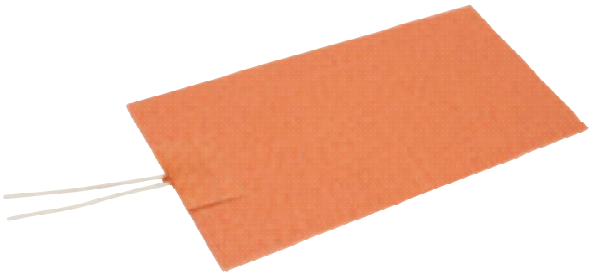
Flexible Heater Lead Options



Standard Leads — Teflon®

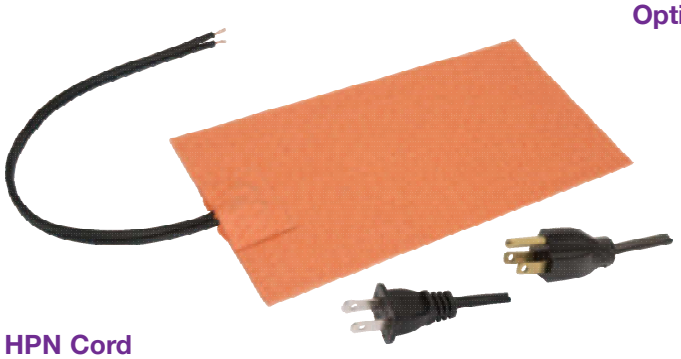
Tempco's standard leads are 10" long, Teflon® insulated, flexible, stranded, plated copper wire. Stripped: 1/4"

- UL1180 rated 300V 200°C
- UL1199 rated 600V 200°C

On silicone rubber heaters, the lead connections are insulated with vulcanized silicone rubber, which also acts as a strain relief.

For Kapton® insulated heaters, high temperature epoxy is used to insulate and reinforce the lead connection.

Optional Leads



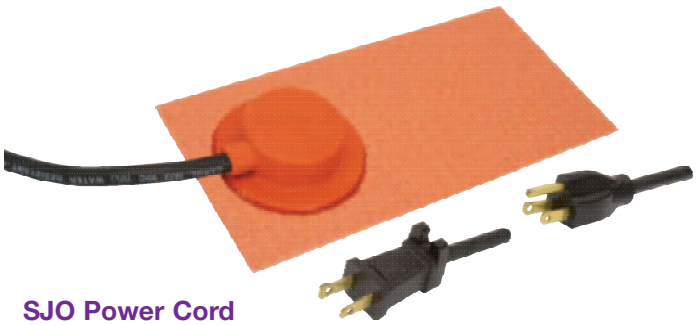
HPN Cord

For portable heaters, a two-conductor neoprene cordset can be vulcanized to the heater in any desired length.

HPN Cord and Plug Set

A two-conductor neoprene cord and plug set can be vulcanized to the heater. Standard Length: 6 ft. (1.83 M), 7 ft. (2.13M), or custom length as specified. Supplied with standard straight blade ungrounded plug, or grounded plug. 120Vac only.

- 2-Pole 2 wire non-grounding (NEMA 1-15P)
- 2-Pole 3 wire grounding (NEMA 5-15P)



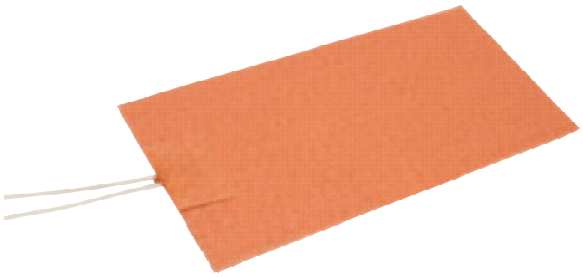
SJO Power Cord

For industrial applications, SJO heavy duty power cords can be attached to the heaters in any desired length.

SJO Power Cord and Plug Set

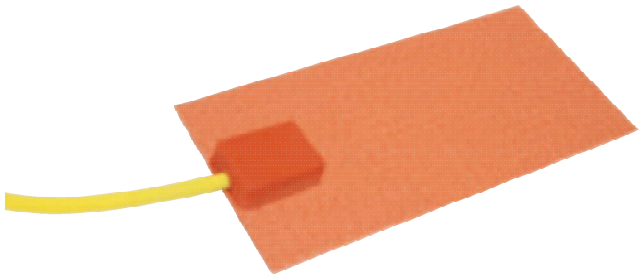
SJO heavy duty power cord and plug set can be attached to the heaters. Standard Length: 6 ft. (1.83 M), or custom length as specified. Supplied with standard straight blade ungrounded plug, or grounded plug. 120Vac only. (For 240Vac see page 15-15 for optional plugs)

- 2-Pole 2 wire non-grounding (NEMA 1-15P)
- 2-Pole 3 wire grounding (NEMA 5-1



Silicone Rubber Leads

Ensures a moisture seal on the heater. Due to the similarity in material, the heater will fuse to the leads during the vulcanization process. Silicone rubber leads are more flexible, but are not as abrasion resistant as Teflon® leads.



Built-Up Molded Lead Exit

Used to encase lead exit and optional snap action thermostat. (See page 9-15 for thermostat specifications) Shown with SJO cord rated -50°C to 105°C.

Special Lead Options

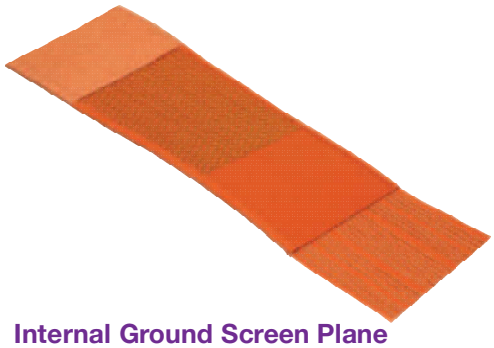
Special lead wire types and lengths in many configurations can be done. Consult Tempco.

Abrasion Protection Options

Various materials can be put over Teflon® or Silicone Rubber leads to provide mechanical or abrasion protection. The leads exit the heater as a single unit.

- **Silicone Rubber/Fiberglass Sleeving (356°F/180°C)**
- **Heat Shrink Sleeving**

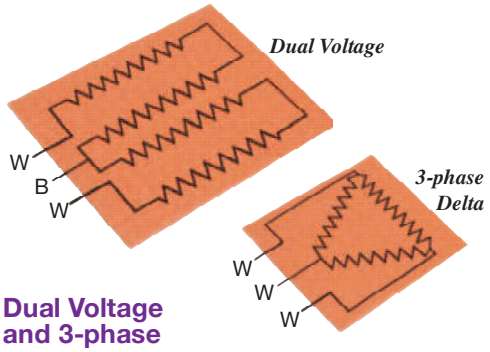
Flexible Heater Optional Design Features



Internal Ground Screen Plane

Some applications may require the heater to be grounded. Due to the fact that the heater sheath is non-conductive, this can only be done artificially. A second layer of insulating material and a conductive grid can be added to the heater. A ground wire is attached to the grid.

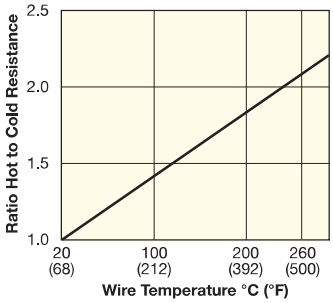
A less expensive alternative for setting up a ground wire, especially for the required ground lead of a cordset, is to have a "flying ground lead" (6" long, green) exit the lead patch for attaching to the metal load surface, effectively grounding the process.



Dual Voltage and 3-phase

Due to the flexibility in circuit design for flexible heaters, heating circuits can be designed to accommodate dual voltage. On dual voltage heaters, three leads, including a common in a different color, are provided for wiring the heater in series for the higher voltage and parallel for the lower voltage. 120/240 Vac or 240/480 Vac can be specified. (see page 16-11 for more information)

Three-phase circuits can also be designed for large high-current applications.



Self-Limiting/Self-Regulating Wire Wound Heater

The alloy used for this heater's resistance wire has a high positive temperature coefficient of resistance that allows the heater to reduce power as temperature increases. This self-regulating feature is ideal for many low temperature applications. This feature can also be beneficial when a fast start-up time is required before the heater power levels off to normal operating temperature. See Chart for Ratio of Hot to Cold Resistance of the Heater wire at various wire temperatures.

Thermal Sponge Insulation and Thermal Conductive Sponge

To increase heater efficiency, silicone sponge rubber insulation can be bonded to the top side of the heater. Available thicknesses are 1/16", 1/8", 1/4", 3/8" or 1/2".

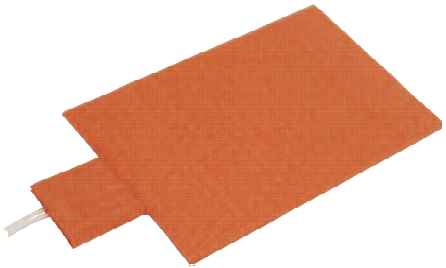
Thermal Conductive Sponge can be use to transfer heat evenly to various surfaces. Available in 1/8" thickness.

Foil Backing

Aluminum foil can be added to the back of the heater to help dissipate the heat between element runs and eliminate hot spots. Due to the foil, higher watt densities and better temperature uniformity can be attained. The foil would be applied to the back of the heater, on the mounting surface.

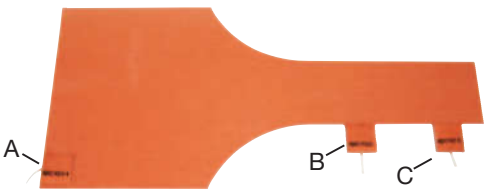
Distributed Wattage

In order to compensate for heating losses around the edges or mounting holes, the heating circuit can be designed in a distributed wattage pattern. More wattage can be added to the high loss areas to compensate for the higher losses.



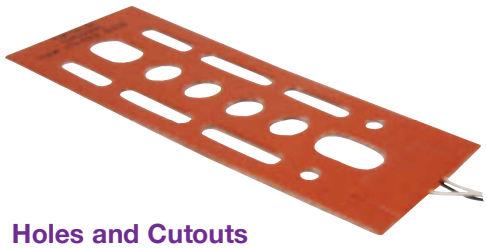
Lead Exit Tab

An unheated lead exit tab can be added to the heater for a variety of reasons such as maintaining a rectangular heater with no cold sections or when used in a compression application to remove the lead exit area from between the plates. (Standard 2" x 2")



Multiple Zones

Multiple circuit areas can be zoned to compensate for various heating effects desired. In the picture above there are three zones with separate leads (A, B, and C).



Holes and Cutouts

Holes and cutouts in the surface of a silicone rubber or Kapton® heater can generally be placed anywhere in the heater assembly. Holes and cutouts can be used to allow space for bolts, nuts, temperature sensors, brackets, etc. For most holes and cutouts, a detailed drawing will be required for quoting or ordering.

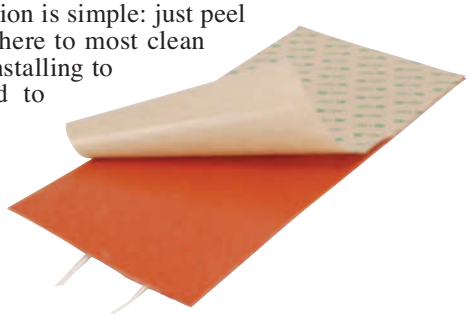
Flexible Heater Pressure Sensitive Adhesive (PSA)

PSA

For ease of attachment specify PSA. Installation is simple: just peel off the protective liner and apply. It will adhere to most clean smooth surfaces. Care must be taken when installing to attain a smooth, consistent, uniform bond to achieve maximum results.

Maximum Temperature:
Continuous – 300°F (149°C)
Intermittent – 500°F (260°C)

Recommended Watt Density:
Under 5 W/in² (0.78 W/cm²)



Note: To obtain the expected life of **Silicone Rubber** or **Kapton®** heaters, ***care must be taken to mount correctly***. Regardless of the mounting technique used, do not trap any air under the heater; this can cause hot spots and possible premature heater failure. Use a rubber roller over the heater surface to assure good adhesion.

PSA Plus

A layer of aluminum foil is vulcanized to the back of the heater for added heat dissipation prior to the application of PSA.

Flexible Heater Factory Vulcanizing to Metal Component

Factory Vulcanizing

Flexible heaters can be factory vulcanized to bare or anodized aluminum, Stainless Steel, Marble, or other hard surfaces for permanent attachment and excellent heat transfer.

The uncured silicone rubber heater is placed on the metal part and placed in the vacuum oven where the heater vulcanizes and adheres to the part in one operation. This procedure forms an extremely strong permanent bond with most metals due to the fact that the silicone rubber flows into and fills the micro structure in the surface of the metal. The metal part can be manufactured by Tempco or supplied by the customer. Consult Tempco for other materials including granite.

Flexible Heater Magnetic Mounting

Magnetic Mounting

A flexible magnetic material can be attached to the back of a silicone rubber flexible heater. Will adhere to many varieties of steel. Ideal for those situations were you need to "Slap On" some heat! Specify when requesting a quote.

Maximum Temperature: 200°F / 93°C

Maximum Watt Density: 1 W/in² (0.16 W/cm²)

Maximum Width: 24" (610 mm)

Flexible Heater Field Applied Adhesive

Field Applied Adhesive

For a field applied permanent bond, a room temperature and ambient humidity curing silicone rubber adhesive is recommended. Tempco offers two types:

Both RTV106 and RTV116 will retain physical and electrical properties up to 500°F (260°C).

When using RTV adhesive, cover the heater completely with a thin layer of RTV, position the heater in place, and use a small roller to remove air bubbles, which could cause hot spots and lead to premature failure of the heater.

RTV106 — a red, paste consistency, high-temperature resistant adhesive sealant.

Part Number: **SEA-102-109** 10.1 ounces
Part Number: **SEA-102-105** 2.8 ounces

RTV116 — a red, pourable, high-temperature resistant adhesive sealant that will flow or self-level on a surface.

Part Number: **SEA-102-102** 9.5 ounces

Flexible Heater Mechanical Fasteners

Various techniques are routinely used when flexible heaters must be detachable from cylindrical parts. The mechanical fastener options include the following:

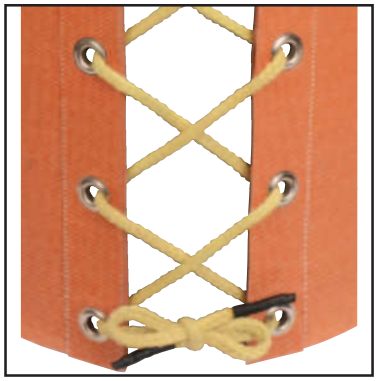
Heavy Duty D-Rings & 3-Layer Straps

Standard D-Rings & 2-Layer Straps

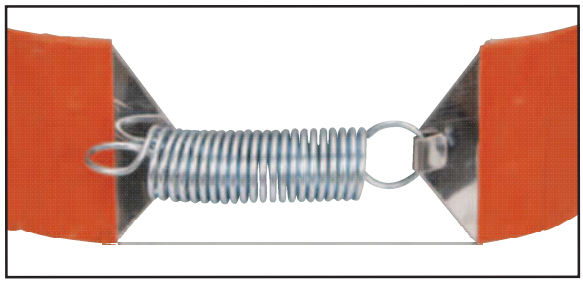
Velcro® Straps

Boot Hooks & Springs

Boot Hooks & Lacing Cord



Grommets & Lacing Cord

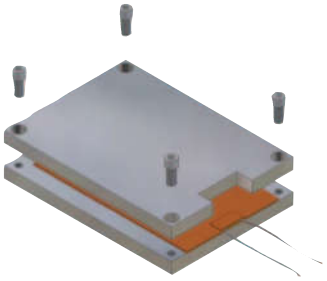


Heavy Duty Spring Clamps

Snaps

Consult Tempco for detailed specifications on the mechanical fasteners shown.

Flexible Heater Clamping



Clamping

Flexible heaters may be applied by clamping or compression between two rigid materials. The plate surfaces must be ground reasonably smooth. Care must be taken not to damage the heater or pierce the insulation. Mill out an area or cutout in the top plate for the added thickness of the lead exit area.

Recommended Maximum Pressure: 40 PSI

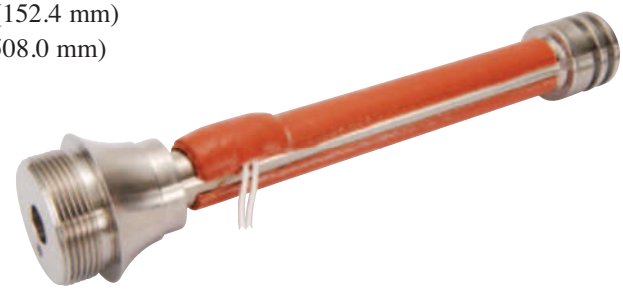
Note: For added durability, mill out the space for the heater to mount in the same thickness as the heater.

Made in USA

Outside Diameter Mounting

Tempco has developed the techniques necessary to permanently mount silicone rubber heaters to the outside diameters of pipes and medium size vessels. This technique is particularly useful for heated drums and air or gas heating.

Minimum Diameter: 0.5" (12.7 mm)
Maximum Diameter: 6" (152.4 mm)
Maximum Length: 20" (508.0 mm)



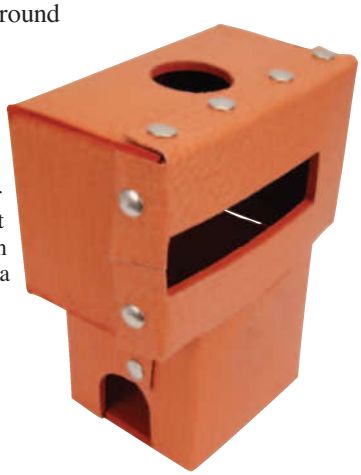
Flexible Heater Three-Dimensional Configurations

Dimensional silicone rubber heaters can be vulcanized to fit a shaped outline. This technique is particularly useful for wrapping Silicone Rubber heaters around pipes or small vessels. Custom tooling or special forms may be required.

7/8" Hexagon

Heater used to keep wax melted as it passes through a pump

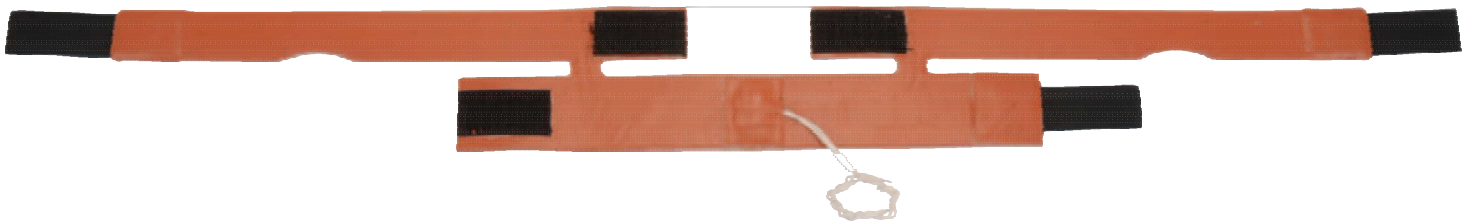
An insulating heater used on a compressor pump to prevent freezing in Siberia



One-Piece Y-Pipe Heater
(Shown on Pipe at left; Shown flat below)

Heater used to remove condensation on a vacuum canister

Heater manifold 3D formed for use on a snow making machine



Flexible Heater Built-In Temperature Sensors

Temperature Sensors

Flexible surface heaters can be manufactured with temperature sensors of various types including thermocouples, RTDs, and thermistors. Thermal fuses can also be incorporated into the design to prevent dangerous temperatures in the event of a control device failure (see page 9-17).

The sensors can be mounted on the heater to sense the temperature of the part being heated or the heater surface temperature itself. For silicone rubber heaters, temperature sensors are mounted to the surface of the heater under a vulcanized patch. For Kapton® heaters the sensor is affixed to the surface with epoxy. The leads are run on the exterior of the heater to avoid heat and mechanical interference with the resistance element inside.

Tempco offers three types of sensor mounting:

Heater Sensing: The sensor is located over heater wiring to sense the temperature of the heater surface (standard).

Indirect Load Sensing: A cold section is designed into the resistance element layout for where the sensor is to be located.

Direct Load Sensing *(silicone rubber only)*: A hole/window is cut into the bottom layer of the heater so that the sensor is mounted in the "window" under a vulcanized patch, allowing it to be in contact with the load. (Note: higher cost and subject to potential mechanical damage.)

Lead Wire Connectors

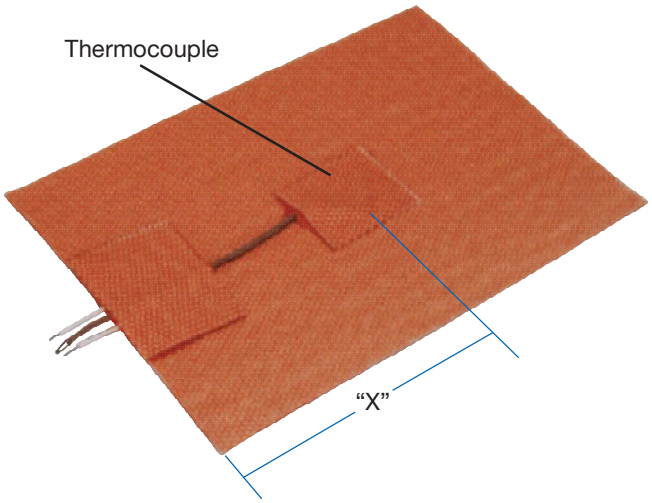
Tempco has the tooling to attach many different types of "quick connectors" that are used with sensors. Consult Tempco with your requirements.

Sensor Types

Thermocouples

Tempco can incorporate common Type J or K thermocouples almost anywhere on the heater surface. Other thermocouple types can also be used. Standard thermocouple temperature ranges apply. Specify when ordering. See page 14-90 for optional plugs.

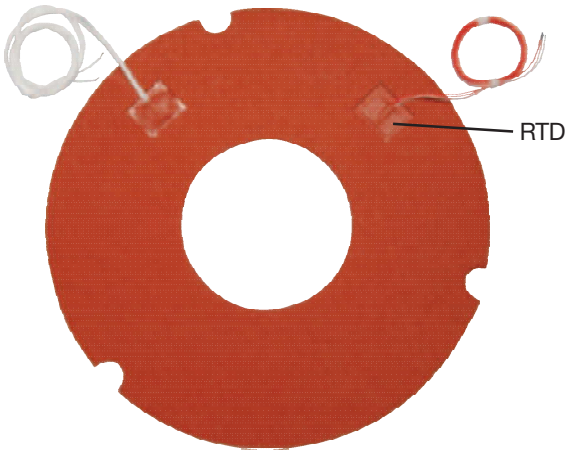
Note: Standard length is 10". Specify sensor lead wire length and the distance from where the sensor leads exit the heater to the heater edge (Dimension X) when ordering.



RTDs (2- or 3-wire)

The RTDs used are platinum thin film 100 ohm @ 100°C. The standard curve is 0.00385 TCR / DIN432760. Other common RTDs such as 1000 ohm can also be used. Specify when ordering.

The RTD's resistance increases with a rise in temperature and is considered the most accurate and stable sensor.



Thermistors

Thermistors are also a resistive-based temperature sensor. They do not generally respond in a linear style and are used in a limited temperature range or at a specific single temperature.

Small bead style thermistors can be mounted directly on the heater.

The thermistor's response is generally designed directly into the customer's electronic control system. Therefore if a thermistor is required, specify manufacturer, specific model number, type and specifications when requesting a quote. Consult Tempco for more information.

Made in USA

Flexible Heater Built-in Thermostats

Flexible Heater Pre-Set and Adjustable Built-In Thermostats

Pre-set thermostats provide a low-cost means of providing built-in control of surface heaters. The thermostat is normally wired directly into the heater. If the current draw of the heater exceeds the rating of the thermostat, the voltage is over 250V, has a Dual Voltage Design, or is 3-ph, separate leads on the thermostat will be supplied for use with a separate (remote) relay to control the heater (see pages 13-94, 95, 96).

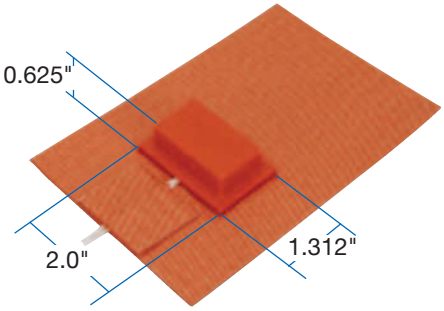
The thermostats are normally mounted over a heated section to sense the heater's temperature or optionally over a cold section to indirectly sense the temperature of the load. The thermostat is enclosed in a molded silicone rubber housing and permanently attached to the heater.

Specify type and location when ordering.

Note: If heater amps exceed thermostat electrical ratings, separate leads will be provided for use with a relay (see pages 13-94 through 13-96).

Snap Action Thermostat — Automatic Reset

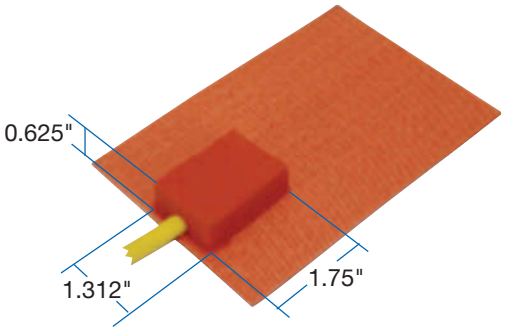
Quick cutout on rise to temperature. The contacts will open on rise when the temperature increases to the snap point of the calibrated bimetal disc.

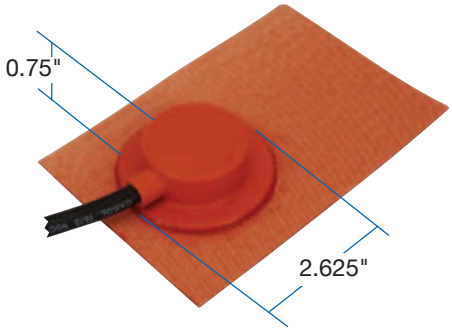


Setpoint (opens): available from 50 to 450°F in 10°F increments
most thermostats close 20 to 30°F below setpoint (see page 13-82)

Electrical Ratings: 125 Vac, 15 Amp, 1875W
250 Vac, 10 Amp, 2500W

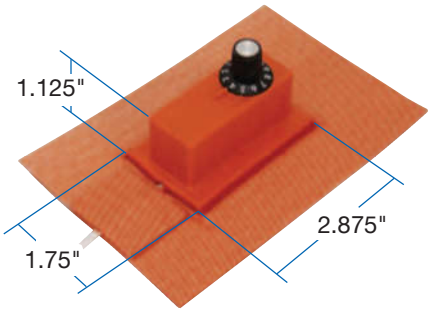
Minimum Heater Width: 1.312"





Adjustable Thermostat

Adjustable thermostats allow the user to dial-in a specific temperature and attain a desired result. The thermostat is enclosed in a molded silicone rubber housing and permanently attached to the heater. The adjustment shaft extends through a pre-formed hole. A high temperature knob is included.

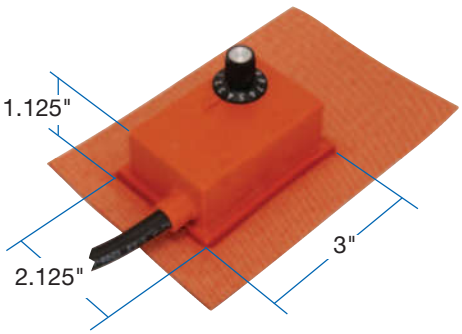


Amps: 12.5A @ 125V, 6.5 A @ 250V

Watts: 1500W @ 120V, 1560W @ 240V

Adjustment Ranges Available:
50 to 425°F (10 to 218°C)
90 to 140°F (32 to 60°C)
100 to 190°F (38 to 88°C)
70 to 190°F (21 to 88°C)
50 to 160°F (10 to 71°C)
70 to 140°F (21 to 60°C)

Minimum Heater Width: 1.75" (44.5 mm)



Flexible Heater Built-In Thermostats

Snap Action High Limit Thermostats — Manual Reset

A High Limit with a manual reset push button can also be designed in. Specify when requesting a quote.

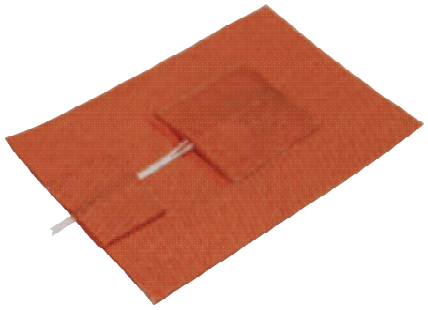
NOTE: See page 13-83 for stock temperature ratings.

Creep Action Thermostat

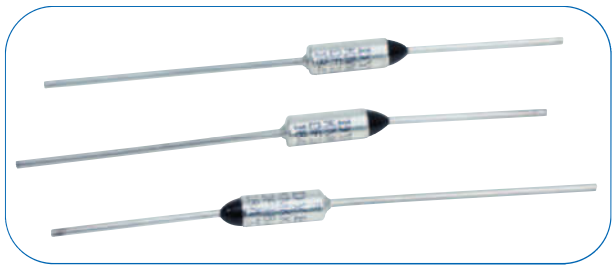
Sustained response, and a slow cutout at the trip point. The creep action thermostat has a slow make/slow break action around setpoint.

Setpoint (opens): available in a limited selection from 50 to 300°F in 10°F increments. Consult Tempco.

Electrical Ratings: 120 Vac, 12 Amp, 1440W
240 Vac, 6 Amp, 1440W



Flexible Heater Built-In Thermal Fusing



Temperature Range: 151 to 464°F (66 to 240°C)
Single temperature point only, in 10° to 20° steps. Consult Tempco with your requirements.

NOTE: See page 13-84 for stock thermal cutoff temperature ratings.

Thermal fuses / cutoffs are used as high limit protection devices to guard the object being heated from dangerous temperatures in the event of a primary control device failure.

The thermal fuse can be mounted using various methods depending on other options. If the heater does not have a thermostat, the thermal fuse would be mounted under the lead exit patch. If used in conjunction with a thermostat, it could be mounted under the thermostat cover.

Voltage: 120/240 Vac

Maximum Amperage: 10 Amps, continuous

Note: The thermal cutoff is a one-shot, non-resettable component.

PVC Pipe/Conduit Bending Heaters

Tempco's PVC Pipe/Conduit Bending Heater Assembly

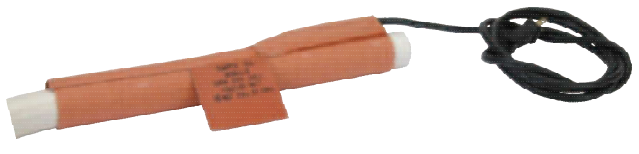
makes it easy to form PVC plastic pipe and conduit at the job site.

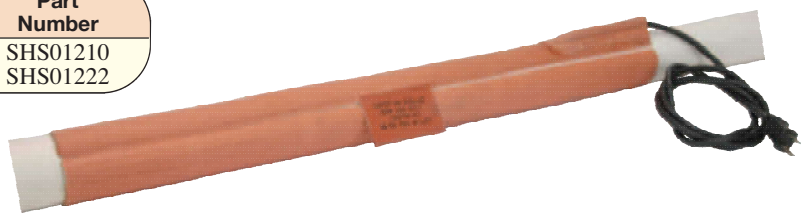
To bend the PVC pipe/conduit, just wrap the heater assembly around the pipe at the location desired and plug it in. In 4 to 18 minutes, depending on pipe size, it will be soft enough to bend by hand to the desired radius or shape.

This heavy-duty assembly, made from our proven wire-wound silicone rubber heater technology, will provide hundreds of hours of use.

Design Features

- ***Built-in thermostat limits temperature to 194°F (90°C)***
- ***Standard Voltage is 120 Vac***
- ***6-ft. plug and cordset standard***



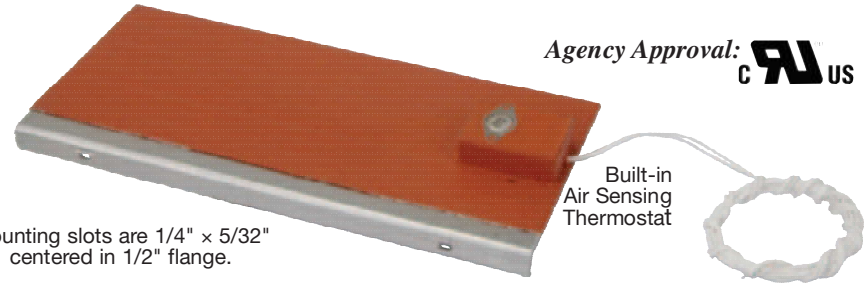


Stock PVC Pipe Bending Heaters

Pipe Diameter	Length	Watts	Volts	Warm-Up Time	Part Number
1/2" to 1-1/2"	12"	180	120	4 – 10 minutes	SHS01210
2" to 4"	20"	950	120	7 – 18 minutes	SHS01222

Made in USA

EHR — Silicone Rubber Enclosure Heater



Mounting slots are 1/4" × 5/32" centered in 1/2" flange.

Agency Approval: c UL us

Design Features

- ✳ *Available with or without an Integrated Thermostat (See EHA below for Remote Thermostats)*
- ✳ *Custom Design and Alternate Thermostat Settings Available*
- ✳ *Heater Vulcanized to an Aluminum Mounting Plate for Easy Installation*
- ✳ *120V Standard; Custom Voltages Available upon Request*
- ✳ *48" Teflon® Leads Standard*
- ✳ *Dimensions Listed are for Heater and Bracket; Actual Heater Width is 1/2" Less*
- ✳ *Safe to Operate, No Exposed Electrical Connections*

Standard (Non-Stock) Silicone Rubber Enclosure Heaters

Width	Length	Mounting Center	Watts	Volts	Lead Length	Thermostat (°F) Opens	Closes	Part Number
2½	5	3	25	120	48	—	—	EHR00001
2½	5	3	25	120	48	60	40	EHR00002
2½	5	3	35	120	48	—	—	EHR00003
2½	5	3	50	24	48	—	—	EHR00039
2½	5	3	50	120	48	—	—	EHR00004
2½	5	3	50	120	48	60	40	EHR00005
2½	6	4	60	120	48	—	—	EHR00006
2½	6	4	60	120	48	60	40	EHR00007
2½	6	4	60	120	48	140	110	EHR00008
2½	6	4	60	120	48	180	150	EHR00009
2½	10	7	70	120	48	—	—	EHR00010
2½	10	7	100	12	48	—	—	EHR00049
2½	10	7	100	120	48	—	—	EHR00011
2½	10	7	100	120	48	60	40	EHR00012
2½	10	7	100	230	48	60	40	EHR00028
2½	12	9	80	240	48	60	40	EHR00032
2½	12	9	120	120	48	—	—	EHR00013
2½	12	9	120	120	48	60	40	EHR00014
2½	12	9	120	120	48	140	110	EHR00015
2½	12	9	120	120	48	180	150	EHR00016
2½	12	9	120	240	48	60	40	EHR00034
4½	10	7	140	120	48	—	—	EHR00017
4½	10	7	250	120	48	—	—	EHR00018
4½	10	7	250	120	48	60	40	EHR00019
4½	10	7	250	240	48	140	110	EHR00044

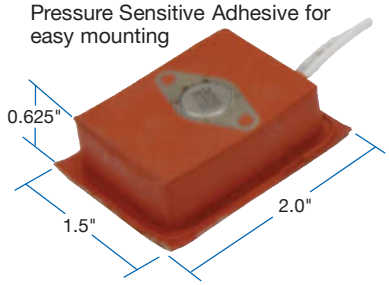
EHR — Silicone Rubber Heaters are designed for easy installation and safe operation. These rectangular shaped wire-wound Silicone Rubber Heaters are vulcanized to an aluminum mounting plate with mounting holes. They provide superior protection for enclosures of all types against condensation, humidity and freezing.

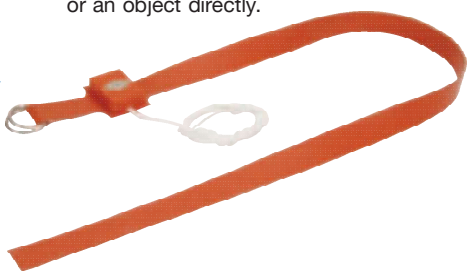
It is recommended that the enclosure heater be used with a thermostat either built in or mounted remotely to limit the maximum temperature reached and conserve energy. The suggested mounting method is at the bottom of the enclosure, mounted vertically. If a remote mounted thermostat is preferred, mount the heater on the bottom of the enclosure and the thermostat in the middle of the enclosure.

EHA — Remote Thermostats for Enclosure Heaters

Design Features

- ✳ *Standard 16ga Teflon® lead length: 48"*
- ✳ *Can easily be located anywhere in the enclosure using the pressure sensitive adhesive.*
- ✳ *Any standard thermostat can be used (see page 13-82 for available ranges)*
- ✳ *Silicone rubber base and enclosure*
- ✳ *Ratings: 10A/250 Vac, 15A/120 Vac*





Ordering Information

Select a **Remote Thermostat** from the list at right.

Custom Engineered/Manufactured Remote Thermostats

Standard lead time is 3 weeks. Please Specify the following:

- ❑ **Range:** Select from the list of thermostats on page 13-82
- ❑ **Lead Length:** Specify any special lead length you require.

Stock EHA Remote Thermostats

Opens °F	Closes °F	Part Number PSA	D-ring & Strap
60±5	40±7	EHA00001	EHA00005
140±5	110±10	EHA00002	—
180±5	150±10	EHA00003	—

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Composite Curing Flexible Heater Blankets

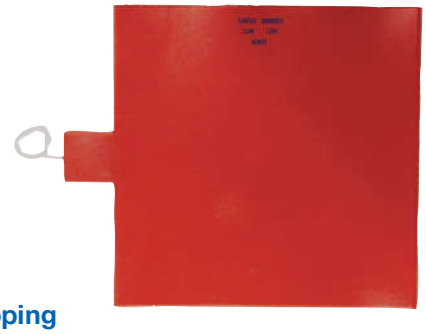
Specialized Silicone Rubber Heater Blankets are used in the composite industry to bond and cure composite structures using vacuum bagging techniques which have become standard in the industry.

Tempco's composite bonding and curing heater blankets are designed with the field technician in mind with an extra strong strain relief, and even heat distribution to produce the best possible cure or bond.

Temperature uniformity is optimized for even heating through computer designed resistance elements. Circuit spacing is maintained at 1/4" for larger heater blankets or less on smaller heaters. This technique guarantees a ±10°F (±5.5°C) temperature uniformity across the heater blanket.

The lead wires exit the heater through an unheated 2" × 2" lead exit tab. This allows the overall heater surface to be heated while maintaining a separate unheated section for the transition from resistance element to the leads and a solid strain relief.

Tempco's Composite Curing Heater Blankets emphasize strength, durability, flexibility and overall temperature uniformity.



Typical Applications

- *Aerospace/Aircraft*
  - *Repair*
  - *Manufacturing*
- *Marine/Boats*
  - *Repair*
  - *Manufacturing*
- *All composite, metal bonding, curing applications*

Design Features

- *Maximum Temperature: 500°F/260°C intermittent 392°F/200°C continuous*
- *Material: Fiberglass reinforced Silicone Rubber*
- *Smooth bottom layer for contact with the composite under cure*
- *External Lead Exit Tab, 2" × 2" maximizes heating area and uniformity*
- *Lead wire: Teflon®, 5-ft. length, 400°F/200°C, 600V*
- *Composite Industry Watt Density Standard of 5 watts/in²*
- *Available Voltage: 120 Vac or 240 Vac*
- *Meets Composite Industry uniformity standard of ±10°F*
- *Each heater blanket has a serial number for traceability*
- *Heat Mapping Certification available*
- *Made to Order:*
  Maximum Width: 36" (914mm)
  Maximum Length: 120" (3048mm)
  Maximum Diameter: 32" (813mm)
- *UL recognized*

Thermal Mapping

It is a known fact in the composite repair industry that the quality of the overall repair often relates directly to the quality of the cure. The cure in turn is directly affected by the temperature uniformity of the heat blanket.

Thermal/heat mapping certification of the heater blanket is rapidly becoming the standard operating procedure for many repair facilities to optimize the cure process.

As an added value service, Tempco can certify that the heat blanket you order follows the guidelines established by the Commercial Aircraft Composite Repair Committee (CACRC), SAE document ARP 5144 Section 7, which states specific recommendations for the "…handling, maintenance and thermal testing of heat blankets…" The heater blanket certification also meets the requirements of Boeing document D6-56 273 "Qualification of Heat Blankets for Hot Bonding Composites."

Standard (Non-Stock) Round Flexible Heater Blankets

Diameter			Voltage	
inches	mm	Watts	120	240
6	152	170	SHS89041	SHS89044
10	254	470	SHS89042	SHS89045
15	381	1055	SHS89043	SHS89046

Note: Round heaters have a higher watt density than listed rectangular sizes, and provide an additional 20% of surface heat.

Standard (Non-Stock) Flexible Heater Blankets

inches		mm			Voltage	
L	W	L	W	Watts	120	240
4	10	102	254	200	SHS89001	SHS89021
6	6	152	152	180	SHS89002	SHS89022
6	8	152	203	240	SHS89003	SHS89023
6	10	152	254	300	SHS89004	SHS89024
6	20	152	508	600	SHS89005	SHS89025
6	24	152	610	720	SHS89006	SHS89026
6	36	152	914	1080	SHS89007	SHS89027
8	8	203	203	320	SHS89008	SHS89028
8	12	203	305	480	SHS89009	SHS89029
10	10	254	254	500	SHS89010	SHS89030
10	12	254	305	600	SHS89011	SHS89031
10	18	254	457	900	SHS89012	SHS89032
12	12	305	305	720	SHS89013	SHS89033
12	18	305	457	1080	SHS89014	SHS89034
12	24	305	610	1440	SHS89015	SHS89035
15	15	381	381	1125	SHS89016	SHS89036
15	18	381	457	1350	SHS89017	SHS89037
18	18	457	457	1620	SHS89018	SHS89038
18	24	457	610	2160	SHS89019	SHS89039
24	24	610	610	2880	SHS89020	SHS89040

Silicone Rubber Drum Heaters

Made in USA

Silicone Rubber Drum and Pail Heaters

Design Features

- *Maximum operating temperature of 425°F (218°C).*
- *Power cord is 6-foot long, SJO Type 16/3 complete with three-prong plug for 120 VAC models. Plugs are not included on 240 VAC models but are available (see page 15-15).*
- *Surface grounded electrically with internal ground screen.*
- *1250 volts dielectric tested.*
- *Vulcanized silicone rubber construction resistant to moisture, ozone, fungus, and radiation.*
- *Adjustable thermostat, see page 9-16 for specifications.*

Built tough

Resistant to chemicals

Ratings for Metal and Plastic Drums and Pails

Easy to clean

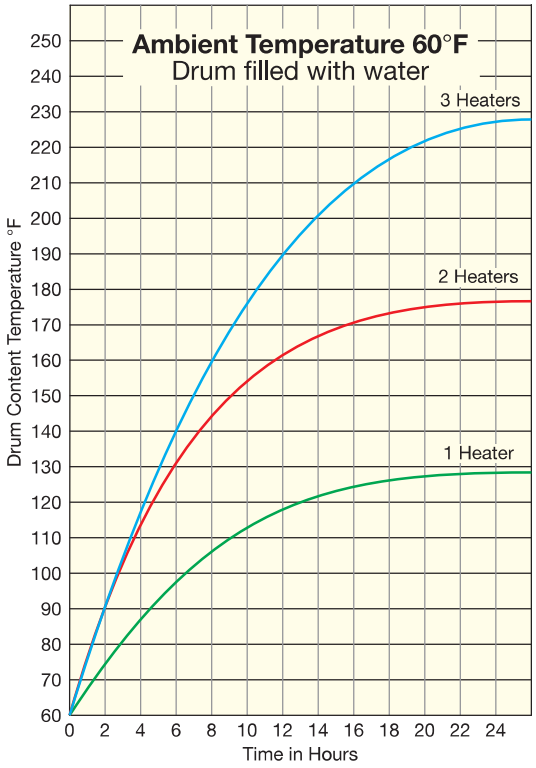
Stock to 2-week lead time

Agency Approvals:
(See page 9-2 for details)

Tempco flexible drum heaters can save time by heating stored viscous fluid to a pourable temperature.

The heater is built to be tough, long lasting, and resistant to chemicals. Because few materials stick to its silicone rubber with fiberglass reinforced construction, it is easy to clean. The heater comes with a 6-foot cord and plug (120V only). When not in use, it rolls for convenient storage.

The total wattage (number of heaters) and the material being heated inside of the drum must be considered when determining the actual temperature to which that specific material can be heated.



Note: Metal Jacketed Drum Heaters and heated Drum Dollies can be found on page 11-122, Drum Immersion Heaters on page 11-123, and Drum Blanket Heaters on page 11-124.

Standard (Non-Stock) and Stock Drum Heaters for Metal Drums

Stock Items Are Shown In RED

Drum Size	Drum Dia.	Heater Width	Heater Length	Watts	Part Number 120V	Part Number 240V	Thermostat
5 Gal.	11.5	3"	31"	300	**DHR00150**	**DHR01010**	50-425°F
15 Gal.	13.5	3"	38"	500	**DHR00110**	DHR00130	50-425°F
30 Gal.	18	3"	52"	750	**DHR00070**	DHR00090	50-425°F
55 Gal.	22.5	3"	64"	1000	**DHR00020**	**DHR00040**	50-425°F
5 Gal.	11.5	3"	31"	300	DHR00140	DHR01041	No
15 Gal.	13.5	3"	38"	500	DHR00100	DHR00120	No
30 Gal.	18	3"	52"	750	DHR00060	DHR00080	No
55 Gal.	22.5	3"	64"	1000	**DHR00010**	**DHR00030**	No
5 Gal.	11.5	4"	31"	550	DHR01014	DHR01018	50-425°F
15 Gal.	13.5	4"	38"	700	DHR01013	DHR01017	50-425°F
30 Gal.	18	4"	52"	1000	DHR01012	DHR01016	50-425°F
55 Gal.	22.5	4"	64"	1500	**DHR00050**	**DHR00055**	50-425°F
5 Gal.	11.5	9.5"	31"	1000	DHR01023	DHR01047	70-190°F
15 Gal.	13.5	9.5"	38"	1000	DHR01024	DHR01046	70-190°F
55 Gal.	22.5	9.5"	64"	1500	**DHR01025**	DHR01045	70-190°F

Standard (Non-Stock) and Stock Drum Heaters for Plastic Pails

Stock Items Are Shown In RED

Drum Size	Drum Dia.	Heater Width	Heater Length	Watts	Part Number 120V	Part Number 240V	Thermostat
5 Gal.	11.5	4"	31"	150	DHR01034	DHR01044	50-160°F
15 Gal.	13.5	4"	38"	200	DHR01035	DHR01036	50-160°F
30 Gal.	18	4"	52"	250	DHR01037	DHR01038	50-160°F
55 Gal.	22.5	4"	64"	300	**DHR01033**	**DHR01039**	50-160°F
5 Gal.	11.5	9.5"	31"	300	DHR01027	DHR01043	70-140°F
55 Gal.	22.5	9.5"	64"	750	**DHR01026**	DHR01042	70-140°F

Standard lead time is Stock to 2 weeks.

View Product Inventory @ www.tempco.com

Hazardous Area Rated Silicone Rubber Drum Heaters

Design Features

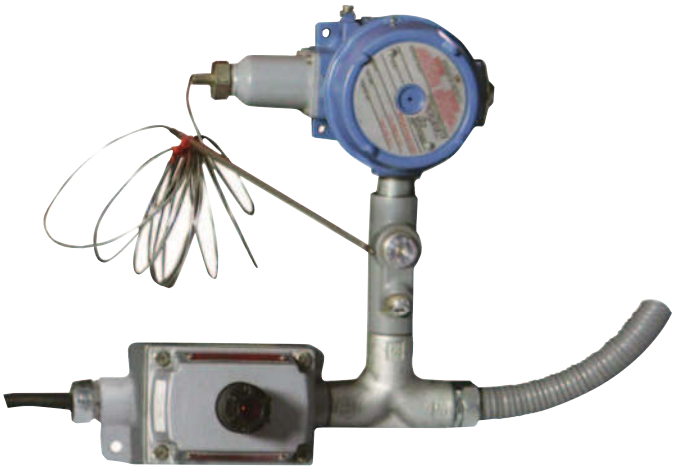
- *Dual setpoint NEMA 7 temperature controller connected to a high temperature limit indicator light*
- *Extra wide 8" coverage area*
- *Exceptional durability and flexibility*
- *Grounded heating element meets NEC 427.23*
- *Designed for metal drums*

Hazardous Area Rated

FM APPROVED

Class I Division 2:
Groups A, B, C and D

Class II Division 2:
Groups F and G



NEMA 7 Thermostat Control Assembly with High Limit Indicator Lamp

Specifications

Physical Description

Heating element is laminated between two layers of 23 mil and two layers of 25 mil fiberglass reinforced silicone rubber.

Power Density: 2.5W/sq.in.

Nominal Silicone Rubber Density: 26 oz/sq.yd.

Electrical Ratings

Wiring from Drum Heater to Controller: 6 ft. liquid-tight conduit

Line Cord from Controller Assembly: 6 ft. industrial power cord

Line Cord Termination: 120V – Hazardous area rated 5-15P plug
240V – No plug, flying leads

Thermostat

High Limit Thermostat:

- Designed to keep blanket below NEC article 500-T rating:

T Rating	NEC Temperature	Actual High Limit
T3	392°F (200°C)	292°F (145°C)
T4A	248°F (120°C)	158°F (70°C)

- High limit red indicator lamp
- Attached adjustable dual setpoint thermostat NEMA 7 temperature controller. Moisture and chemical resistant.

Thermostat Range: 25°-325°F/-4°-163°C, dual scale limited by the "T Rating"

Ordering Information

Select the part number of the hazardous area silicone rubber drum heater that matches your requirements.

Standard lead time is 4 weeks.

Standard Hazardous Area Rated Drum Heaters

Drum Size Gallons	Drum Dia. in.	Heater Width in.	Heater Length in.	Wattage	Part Number 120VAC	Part Number 240VAC	T-Rating
30	18.6	8	58.5	1000	DHX00101	DHX00201	T-3
55	22.3	8	70.0	1300	DHX00102	DHX00202	T-3
30	18.6	8	58.5	1000	DHX00103	DHX00203	T-4A
55	22.3	8	70.0	1300	DHX00104	DHX00204	T-4A

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Flexible Heater Quote Request

Made-To-Order Quote Request Form — Copy and Fax (630-350-0232) Us Your Requirements

Customer Drawing

Name _____
Company _____
Address _____
_____
_____
Phone _____ **Fax** _____
E-mail _____

Application Information

Describe in Detail _____
_____
_____
_____
Maximum Load Temperature _____
Ambient Temperature _____
Quantity _____

Specifications

Insulation Material: Silicone Rubber_____ Kapton®_____
Resistance Style: Wire_____ Foil_____ Thk. Film_____
Length_____ **Width**_____ **Diameter**_____
Watts_____ **Volts**_____
UL_____ **cUL**_____ **CSA**_____
Lead Length (10" standard) _____
Insulation (Teflon® standard) _____
Lead Location (*indicate code from page 9-9 & on sketch)*_____
Options *(holes, cutouts, etc. – describe & indicate on sketch)*
_____
_____
_____
_____
Maximum Thickness
(*if applicable, except for lead exit*) _____
_____
Notes
_____
_____
_____

Controls and Sensors

Thermostat: Pre-set Type_____
Temperature Setting (opens) _____
Adjustable (range 50-450°F) _____
Mounting: Heater Sensing (standard) _____
Load Sensing _____
Location (describe & indicate on sketch) _____
_____
_____

Thermocouple: Type (J, K or other) _____
RTD (DIN 100 ohm) _____ **Other** _____
Thermistor *(indicate manufacturer part #, calibration curve/spec & useful range)* _____
Sensor Mounting:
Heater Sensing (standard) _____
Load Sensing _____
Location (describe & indicate on sketch) _____
_____
_____
Sensor Lead Length (10" standard) _____
Sensor Insulation (Teflon® standard)____ **Fiberglass** _____
Options _____
_____

Mounting

None _____
Pressure Sensitive Adhesive (PSA) _____
Boot Hooks & Springs _____ **Quantity** _____
Eyelets/Grommets _____ **Quantity** _____
Lacing Cord _____ **Length** _____
Straps & Velcro _____ **Strap Length** _____ **Quantity** _____
Straps & D-Rings _____ **Strap Length** _____ **Quantity** _____
Factory Vulcanizing _____ **Description** _____
_____
Sponge Insulation _____ **Thickness** _____
Describe in Detail _____
_____

Made in USA

Electrical Resistance Heating Tape — Adhesive Backed

Designed For High Heat Transfer

All electrical resistance elements create heat, but some systems are better at transferring this energy. The secret to this heating tape is in its thermally conductive adhesive and its outer reflective sheath.

The adhesive surrounds the resistance wire and transfers the thermal energy directly to the surface of the load. The resistance wire itself has a back and forth kink that acts as a spring to absorb expansion and contraction.

The outer aluminum sheath spreads heat evenly over the entire surface of the tape and also reflects heat back onto the load.

The end result is a highly efficient heating source with maximum heat being transferred to the desired material.

Typical finished assembly with leads.

ADHESIVE SPECIFICATIONS

	Silicone	Acrylic
Operating Temperature Range	–100°C to 250°C –148°F to 482°F	–100°C to 180°C –148°F to 356°F
Outgassing… TML/VCM	1.047%/.322%	.264%/.000%
Adhesion to Etched Aluminum *(oz/inch width)*	28 @ +125°C 450 @ –100°C	29 @ +125°C 50 @ –100°C
Overall Thickness Applied	.025" (.63 mm)	.028" (.71 mm)
Dielectric Strength	600 Vdc	600 Vdc

Typical Applications

- *Cylinder wrap ideal for tubes, pipes or vessels.*
- *Placed directly on PVC, PTFE plastic pipe without the need for other material.*
- *Excellent for prototype engineering, placing heat exactly where it is needed.*
- *Even heating throughout the length of a heated hose for hot wax handling, food processing, hot melt and other plastic processing.*
- *De-fogging, de-icing, fuel line warming.*
- *Acrylic product approved by NASA for space flight.*
- *Acrylic low outgassing perfect for vacuum applications.*

Product Types

4 Conductor Tape 1/2" (12.7 mm) wide; has the highest watt density and the most variety of resistances. It can have leads at one end in the case of a series connection or a series/parallel connection, or leads at either end in a parallel connection.

The tightest wrap this tape can achieve is on a 1/4" (6.3 mm) O.D. surface. A smaller tube should be wrapped with 1/4" (6.3 mm) or 1/6" (4.2 mm) tape.

2 Conductor Tape 1/4" (6.3 mm) wide; has leads on one end in the series connection, and leads at both ends for parallel connections. This tape will wrap down to 1/8" (3.17 mm) O.D.

1 Conductor Tape 1/6" (4.2 mm) wide; can wrap down to .060" (1.52 mm) O.D. A lead will be present at both ends.

General Purpose Wattage Calculations for Tube and Pipe Heating

$$Tp = P \times L \times \Delta T$$

Tp = Total Watts Required

P = Watts per lineal foot of tube per °F temp. rise *(see chart below)*

L = Length of tube in feet

ΔT = Temperature rise, °F above ambient

To Find P: Look at the intersection of Tube O.D. and Insulation thickness.

Insulation Thickness	Tube Outside Diameter ¼"	½"	1"	2"
Bare	.10	.13	.21	.40
½"	.07	.09	.13	.20
1"	—	.05	.08	.11

Note: This is for estimating power requirements only. Confirmation by prototype testing is recommended.

- If the temperature rise is over 100 degrees, increase the wattage by 10%.
- For rapid start-up and to allow for colder material entering the hose, increase the wattage by 25% and use a temperature controller with a temperature sensor.

Warning !! FTP Heat Tape is essentially resistance wire in a mountable high temperature adhesive backed tape. In order to be used properly, the heater design must be done and the math worked out, following the example provided.

View Product Inventory @ www.tempco.com

Electrical Resistance Heating Tape — Adhesive Backed

Engineering Example

A 10 ft. stainless steel braided hose, 1/2" O.D., needs to be heated to 400°F from 70°F. Insulation: 1/2". The voltage is 220V.

1. **Determine the Length.** To cover the hose completely would take $\pi \times 1/2" \times 120" = 188$ sq. in. A 12" length of 1/2" tape would cover 6 sq. in. of hose; therefore, 31 ft. of 1/2" tape would completely cover the hose, spiral wrapped edge to edge.
2. **Determine the Watts.** Total Power (Tp) = P × L × ΔT
   From the chart, P = .09 for a 1/2" hose with 1/2" insulation, therefore
   Tp = .09 × 10 ft. × (400-70) = 297 Watts. For rapid start-up and to compensate for colder material flowing through the hose, increase the wattage by 25% to 400W.
3. **Calculate the Ohms per Foot.** The ohms/ft. = $E^2 \div (Tp \times L)$
   Therefore ohms/ft. = $220^2 \div (400W \times 31 ft.) = 3.9$ ohms per ft.
4. **Calculate the Watts per Foot.** The Watts per ft. = Tp ÷ L
   Therefore the watts/ft. = 400 watts ÷ 31 ft. = 12.9 watts/ft.
5. **Choose Heat Tape Material from the Table.** From the table, the FTP00035, 1/2" tape with four conductors and silicone adhesive in the parallel/series connection at 4.0 ohm/ft. would fill the requirements. The required 12.9 watts/ft. is well under the maximum rating of 62 watts/ft.

Bulk roll of Heat Tape

Heating Tape — Ohms-Per-Foot Table

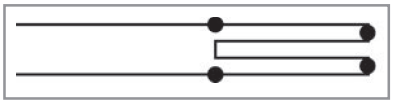
Width	⅛" (4.2 mm)		¼" (6.3 mm)			½" (12.7 mm)			
Number of Conductors	1 conductor		2 conductors			4 conductors			
Part Number 50 ft. roll	Part Number 100 ft. roll	Ohms/ft.	Max. Watts/ft.	Ohms/ft. *see notes* (1)	(2)	Max. Watts/ft.	Ohms/ft. *see notes* (1)	(3)	(2)	Max. Watts/ft.
FTP0001☐	FTP1001☐	1.9	25	.9	3.8	40	.5	1.9	7.6	70
FTP0002☐	FTP1002☐	3.2	25	1.6	6.4	40	.8	3.2	12.8	70
FTP0003☐	FTP1003☐	4.0	23	2.0	8.0	35	1.0	4.0	16.0	62
FTP0004☐	FTP1004☐	4.9	20	2.4	9.8	30	1.2	4.9	19.6	52
FTP0005☐	FTP1005☐	7.0	25	3.5	14.0	40	1.7	7.0	28.0	70
FTP0006☐	FTP1006☐	8.8	23	4.4	17.6	35	2.2	8.8	35.2	62
FTP0007☐	FTP1007☐	10.8	20	5.4	21.6	30	2.7	10.8	43.2	52
FTP0008☐	FTP1008☐	13.2	20	6.6	26.4	30	3.3	13.2	52.8	52
FTP0009☐	FTP1009☐	21.3	13	10.6	42.6	20	5.3	21.3	85.2	32
FTP0010☐	FTP1010☐	26.8	10	13.4	53.6	16	6.7	26.8	107.2	25

CHART NOTES

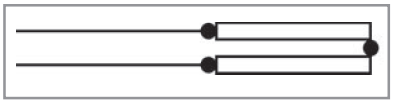
Resistance Wiring

Type 1. Ohms per foot, with all conductors in a ***Parallel Connection***.

Type 2. Ohms per foot, with all conductors in a ***Series Connection***.



Type 3. Ohms per foot, with all conductors in a ***Parallel - Series Pair Connection***.



Max. Watts/ft. in Ohms-Per-Foot Table

The maximum wattage per lineal foot is when the heat tape is applied to a metal heat sink at room temperature. Reduce these ratings linearly to zero watts output at 500°F. Adhesion to heat sink along entire length is important to prevent burnout when tape is used near maximum wattage rating.

Example: A tape that is 70W/ft. maximum watt density at 74°F, would derate to about 35W/ft. maximum watt density at 250°F.

Accessories

	16-20 Ga.	22-26 Ga.
Terminal Kit for 1-wire	FTP00911	FTP00913
2-wire	FTP00912	FTP00914
Additional solderless crimps	FTP00920	FTP00921
Aluminum/Silicone Heat Transfer Tape	3/4" × 27 ft. FTP00930	1-1/4" × 27 ft. FTP00931

Terminal kits are required to terminate the bulk tape into a finished heater assembly. To determine 1-wire or 2-wire, refer to the number of wires being terminated at the end of the heater. For example, to complete the heater in a parallel connection, two 1-wire terminal kits would be required because one lead exits from each end of the heater assembly. The "solderless crimps" are used to complete the non-lead end of the heater. The Heat Transfer Tape is used to provide additional adhesion, placed over the heating tape.

Ordering Information — Bulk Heat Tape

Heat Tape can be ordered in **bulk in 50 or 100 ft. rolls** or in custom assemblies. The part number for each item is completed by filling in the ☐ with a number from the following table to detail adhesive type and tape width:

1–silicone, 1/6" wide (1 cond.) **2**–acrylic, 1/6" wide (1 cond.) **3**–silicone, 1/4" wide (2 cond.)
4–acrylic, 1/4" wide (2 cond.) **5**–silicone, 1/2" wide (4 cond.) **6**–acrylic, 1/2" wide (4 cond.)

Custom Engineered/Manufactured Heaters

For a quote, ***Please Specify*** the following

❑ Application Information ❑ Wattage Requirements ❑ Lead Information:

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

High Temperature Heating Tape

Made in USA

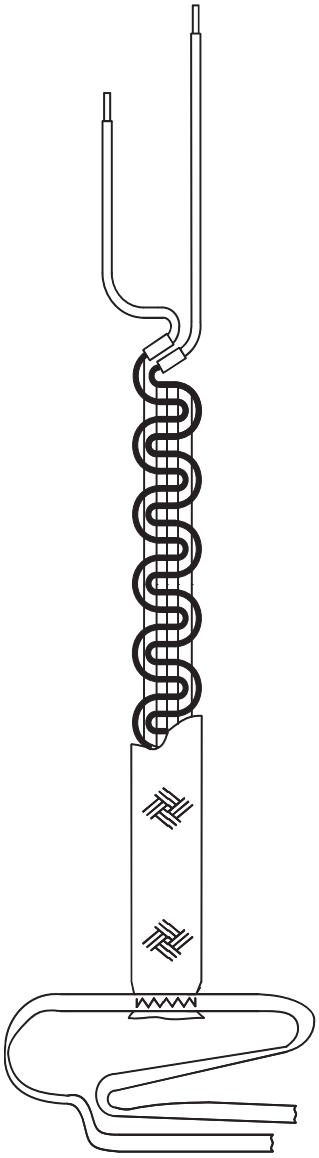
Flexible Heating Tape — Duo-Tape®

Design Features:

- *1400°F (760°C) temperature rating*
- *2 ft. (610 mm) long high temperature lead wires on one end*
- *Highly flexible & rugged, knitted design*
- *High, medium and low watt density designs*
- *Constant wattage (min. ohm change cold to hot)*

Typical Applications:

- *Laboratory, general application*
- *Research and Development*
- *Pilot plant research heaters*
- *High temperature hose heating*
- *Industrial applications, anywhere high temperature and flexibility are required (non-hazardous and dry locations only)*



Tempco Heating Tapes

We provide high temperature, flexible electric heating elements. They were developed to offer the unique convenience of wrap-on heat for tubing, laboratory apparatus or any dry environment application where flexible surface spot heat is required.

Heating tapes are offered in many standard sizes, having watt densities from 3.25 to 13 watts per square inch, and temperature ratings to 1400°F (760°C).

CONSTRUCTION

The construction begins with bundled, fine strand resistance wire, 37 to 40 gauge, covered with a minimum of 2 layers of high temperature braided AMOX yarn. The insulated resistance wire is then knitted into a serpentine configuration, forming a flat tape. Once the lead wires are attached, most tapes have an additional braided, dielectric protection layer of AMOX yarn for use on conductive (metal) surfaces.

DURABILITY FEATURE

Unlike other straight element heating wires and tapes, knitting allows for cushioning during heating and cooling. The element expands in all directions rather than one, virtually eliminating "thermal growth." In addition, knitting prevents the tape from tensile stress when stretched (a typical problem of elements applied to flexible hoses).

LOW WATT DENSITY, WELL DISTRIBUTED HEAT FEATURE

Knitting allows dense distribution of wire per unit length of tape. This feature provides longer life resulting from lower watts per inch of wire. (A typical 1 inch wide tape may contain 10 inches (25.4 cm) of wire element.)

DUO-TAPE

Duo-Tape is a breakthrough design innovation that allows two wires to be knitted side by side. The advantage is that the lead wires may be attached on the same end rather than opposite ends. The balance of the tape is constructed the same as the other single wire tapes.

OPTIONS

1. **Plug** A 120V plug can be ordered on indicated heaters only as a custom assembly.

   Since the leads of the Duo-Tape are on one end, the plug is a single molded unit.

2. **Lead Wire** Standard lead wire length is 2 ft. (61 cm)

   Note: When a plug is requested, lead wire length may be 2 ft. or shorter.

   Optional lengths may be ordered to 8 ft.

   For special length, width, watts or volts—contact **Tempco**.

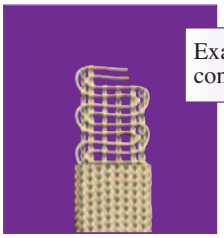
Flexible Heating Tape — Duo-Tape®

Duo-Tape Standard (Non-Stock) Sizes and Ratings

Part Numbers in table are for heaters without plugs.
Plugs are available for 120V heaters only.

Watt Density	Size	Watts	Part Number 120V	Part Number 240V
13.00 W/in² 2.0 W/cm²	½" × 2'	156	FTF00101	FTF00107
	½" × 4'	312	FTF00102	FTF00108
	½" × 6'	468	FTF00103	FTF00109
	½" × 8'	624	FTF00104	FTF00110
	½" × 10'	780	—	FTF00111
	½" × 12'	936	—	FTF00112
	½" × 16'	1248	—	FTF00113
	1" × 2'	312	FTF00105	FTF00114
	1" × 4'	624	FTF00106	FTF00115
	1" × 6'	936	—	FTF00116
	1" × 8'	1248	—	FTF00117
8.67 W/in² 1.3 W/cm²	½" × 2'	104	FTF00118	—
	½" × 4'	208	FTF00119	FTF00125
	½" × 6'	312	FTF00120	FTF00126
	½" × 8'	416	FTF00121	FTF00127
	½" × 10'	520	FTF00122	FTF00128
	½" × 12'	624	—	FTF00129
	½" × 16'	832	—	FTF00130
	1" × 2'	208	FTF00123	FTF00131
	1" × 4'	416	FTF00124	FTF00132
	1" × 6'	624	—	FTF00133
	1" × 8'	832	—	FTF00134
	1" × 10'	986	—	FTF00135
3.25 W/in² .50 W/cm²	½" × 2'	39	FTF00136	—
	½" × 4'	78	FTF00137	FTF00147
	½" × 6'	117	FTF00138	FTF00148
	½" × 8'	156	FTF00139	FTF00149
	½" × 10'	195	FTF00140	FTF00150
	½" × 12'	234	FTF00141	FTF00151
	½" × 16'	312	FTF00142	FTF00152
	1" × 2'	78	FTF00143	FTF00153
	1" × 4'	156	FTF00144	FTF00154
	1" × 6'	234	FTF00145	FTF00155
	1" × 8'	312	FTF00146	FTF00156
	1" × 10'	385	—	FTF00157
	1" × 12'	468	—	FTF00158
	1" × 16'	624	—	FTF00159

Typical Duo-Tape assembly including ties



Example of internal construction before covering

Ordering Information

Standard Heaters

Choose the Duo-Tape Heater from the above table that meets your needs. Specify Part Number.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed, **Tempco** will design and manufacture a Duo-Tape Heater to meet your requirements. ***Standard lead time is 2 to 3 weeks.***

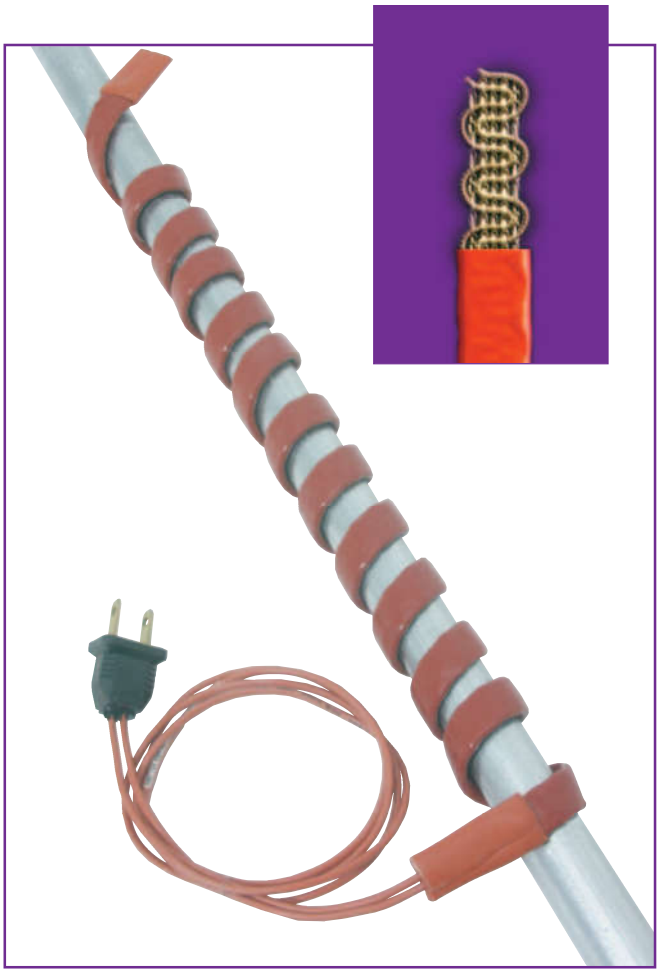
Please Specify the following:

- ❑ Application
- ❑ Length
- ❑ Wattage
- ❑ Voltage
- ❑ Termination
- ❑ Leads
- ❑ Crimp Connectors

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Made in USA

Duo-Tape® — Silicone Rubber Insulated Flexible Heating Tapes



The same proven internal design of all Duo-Tapes of knitted Amox yarn over serpentined resistance is used. The heavy silicone rubber extruded outer cover provides abrasion and dielectric protection for the heating element.

Silicone Rubber Duo-Tapes may be used on conductive surfaces, and in applications where moisture, chemical and abrasion resistance is required.

Design Features:

- *400°F (204°C) temperature rating, non-energized exposure to 500°F (260°C)*
- *2 ft. (610 mm), 16 gauge, 600 VAC silicone rubber insulated leads*
- *Vulcanized fiber reinforced silicone rubber end cap*
- *Standard low watt density of 4.3 w/inch²*
- *All standard 120 Volt units are provided with plug*
- *Multi strand wire element for maximum flexibility*
- *Highly flexible and durable design*

Standard Sizes — with 2 ft. leads, 120V only with plug

Watt Density	Size US	Size Metric(CM)	Watts	Part Number 120V	Part Number 240V
4.3 W/in²	.5" × 2 ft.	1.3 × 60	52	FTF20001	—
	.5" × 4 ft.	1.3 × 120	104	FTF20002	FTF20022
	.5" × 6 ft.	1.3 × 180	156	FTF20003	FTF20023
	.5" × 8 ft.	1.3 × 240	208	FTF20004	FTF20024
	.5" × 10 ft.	1.3 × 300	260	FTF20005	FTF20025
	.5" × 12 ft.	1.3 × 360	312	FTF20006	FTF20026
	.5" × 14 ft.	1.3 × 420	364	FTF20007	FTF20027
	.5" × 16 ft.	1.3 × 480	416	FTF20008	FTF20028
0.67 W/cm²	.5" × 18 ft.	1.3 × 540	468	FTF20009	FTF20029
	.5" × 20 ft.	1.3 × 600	520	FTF20010	FTF20030
	.5" × 24 ft.	1.3 × 720	624	FTF20011	FTF20031
	1" × 2 ft.	2.5 × 060	104	FTF20012	FTF20032
	1" × 4 ft.	2.5 × 120	208	FTF20013	FTF20033
	1" × 6 ft.	2.5 × 180	312	FTF20014	FTF20034
	1" × 8 ft.	2.5 × 240	416	FTF20015	FTF20035
	1" × 10 ft.	2.5 × 300	520	FTF20016	FTF20036
	1" × 12 ft.	2.5 × 360	624	FTF20017	FTF20037
	1" × 14 ft.	2.5 × 420	728	FTF20018	FTF20038
	1" × 16 ft.	2.5 × 480	832	FTF20019	FTF20039
	1" × 18 ft.	2.5 × 540	936	FTF20020	FTF20040
	1" × 20 ft.	2.5 × 600	1040	FTF20021	FTF20041

Silicone Rubber Heating Tapes with Thermostat or Time Percentage Control

FTF3 with Adjustable Thermostat Control

✳ *Adjustable Thermostat: 50°F to 425°F (10°C to 218°C)*

NOTE: The heat sensing plate on the bottom of the thermostat enclosure must make firm contact with the load being sensed.

FTF4 with Time Percentage Control

✳ *Easily adjust percentage of time heater is on and off: 0 to 100%*

NOTE: The time percentage control varies the length of time the heater is the on vs. off heating mode. The controller does not use a temperature sensor and therefore requires occasional supervision under changing load conditions.

Design Features:

- ✳ *Maximum exposure temperature: 450°F (232°C)*
- ✳ *Moisture and chemical resistant silicone rubber extruded outer sheath*
- ✳ *Fiberglass reinforced serpentine-wound stranded heating element*
- ✳ *Rapid heat-up and thermal response*
- ✳ *Power density: 6.0 watts/inch²*
- ✳ *6 foot (2 m) long power cord with*
  120VAC: standard 2-prong NEMA 1-15 plug
  240VAC: bare wire connection
- ✳ *Suitable for electrically conductive surfaces*

Typical Applications

- *Valves*
- *Pipes*
- *Bearings*
- *Pumps*
- *Gas Tubing*
- *Filter Housings*
- *Actuators*
- *De-icing*

Width in	Width mm	Length in	Length mm	Watts	Part Number - Thermostat 120V	Part Number - Thermostat 240V	Part Number - %Control 120V	Part Number - %Control 240V
0.5	13	24	610	72	FTF30001	FTF30021	FTF40001	FTF40021
0.5	13	48	1220	144	FTF30002	FTF30022	FTF40002	FTF40022
0.5	13	72	1830	216	FTF30003	FTF30023	FTF40003	FTF40023
0.5	13	96	2440	288	FTF30004	FTF30024	FTF40004	FTF40024
0.5	13	120	3050	360	FTF30005	FTF30025	FTF40005	FTF40025
1.0	25	24	610	144	FTF30006	FTF30026	FTF40006	FTF40026
1.0	25	48	1220	288	FTF30007	FTF30027	FTF40007	FTF40027
1.0	25	72	1830	432	FTF30008	FTF30028	FTF40008	FTF40028
1.0	25	96	2440	576	FTF30009	FTF30029	FTF40009	FTF40029
1.0	25	120	3050	720	FTF30010	FTF30030	FTF40010	FTF40030
2.0	51	24	610	288	FTF30011	FTF30031	FTF40011	FTF40031
2.0	51	48	1220	576	FTF30012	FTF30032	FTF40012	FTF40032
2.0	51	72	1830	864	FTF30013	FTF30033	FTF40013	FTF40033
2.0	51	96	2440	1152	FTF30014	FTF30034	FTF40014	FTF40034
2.0	51	120	3050	1440	FTF30015	FTF30035	FTF40015	FTF40035
3.0	76	24	610	432	FTF30016	FTF30036	FTF40016	FTF40036
3.0	76	48	1220	864	FTF30017	FTF30037	FTF40017	FTF40037
3.0	76	72	1830	1296	FTF30018	FTF30038	FTF40018	FTF40038
3.0	76	96	2440	1440*	FTF30019	FTF30039	FTF40019	FTF40039
3.0	76	120	3050	1440*	FTF30020	—	FTF40020	—
3.0	76	120	3050	1800*	—	FTF30040	—	FTF40040

*Derated watt density due to maximum current limits

The FTF3 thermostats shown have a °F temperature label. For a °C temperature label, consult Tempco.

Made in USA

Printed Thick Film Heating Elements

Tempco's flexible Thick Film Heating Elements offer a wide range of design options for OEM applications. By utilizing printed thick film technology, the heaters can more efficiently spread the heat across the surface, and are more cost effective systems when compared to etched foil or wire elements.

The ink can be designed in various patterns and densities, concentrating power exactly where it is needed. The element traces can be widened or narrowed to allow for cutouts and holes.

Construction

Conductive and resistive inks are printed on a film substrate layer, and then covered with another film layer laminated together with pressure sensitive adhesive (PSA). Typically, the film layers are .005" thick thermoplastic or thermoset polymers, like polyester (up to 105°C) or polyimide (up to 180°C), that exhibit good thermal conductivity while serving as electrical insulators.
An additional layer of PSA can be added to the bottom of the assembly so the element can be bonded directly to the surface to be heated, ensuring excellent thermal transfer.

Cooler Operating Temperature

By spreading the heat trace over a larger percentage of the surface of the element, as compared to wire wound elements, a Tempco thick film element will operate at a cooler operating temperature due to the lower watt density in a given area. The low thermal mass of the heater allows the heat to be transferred more quickly to the surface to be heated.

Controls and Sensors

More exacting control is available for the heaters as well. Thermostats and temperature sensors can be mounted directly on the heaters for direct temperature control. Thermal fuses/TCOs are available for overtemperature/runaway condition protection.

Typical Applications

- *Blanket Heaters for Battery Back up Systems*
- *Video Camera Lens Defoggers*
- *Outdoor Enclosure Warmers*
- *Fluorescent Bulb Starters*
- *Clear LCD Heaters*
- *Packaging/Sealing Bar Element*
- *Medical Equipment*
- *Food Service Equipment*
- *Mirror Heater/Defoggers*

Specifications

Overall Maximum Temperature: 900°F (482°C)

Substrate Materials — Maximum Ratings

Polyester: 221°F / 105°C
Polyethylene: 221°F / 105°C
Polyvinyl Chloride (PVC): 221°F / 105°C
Thermoset Laminate: 284°F / 140°C
Polyethylene Napthalate (PEN): 320°F / 160°C
Polyimide (Kapton®): 392°F / 200°C
Silicone Rubber: 392°F / 200°C

Pressure Sensitive Adhesive

Acrylic: 221°F / 105°C
High Temperature Acrylic: 300°F / 149°C
Silicone: 392°F / 200°C

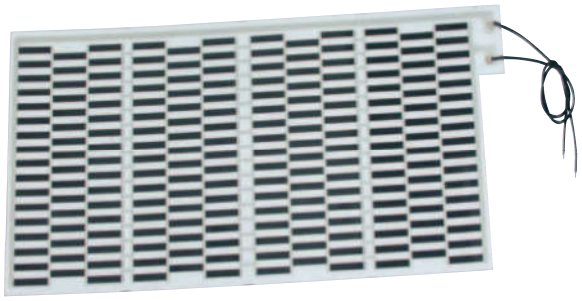
Dimensional Limits

Minimum Width: 0.25" (6mm)
Maximum Length: 30" (508mm)

Heaters can be manufactured that have a length much greater than the width. Up to 24" x 98" have been made.

Electrical

Voltage: Up to 277 VAC or VDC
Watt Density: Standard, up to 25 w/in^2.
Can go higher under certain conditions.
Consult Tempco with your requirements.
Dielectric Strength: 1500 VAC



Ordering Information

Custom Engineered / Manufactured Heaters

Understanding that an electric heater can be application specific, Tempco will design and manufacture a Thick Film Heater to meet your requirements. Copy the form on page 9-22, fill it out, and fax it to Tempco to receive a quote.

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

Table Of Contents

10 section

Tubular Heaters

Made in USA

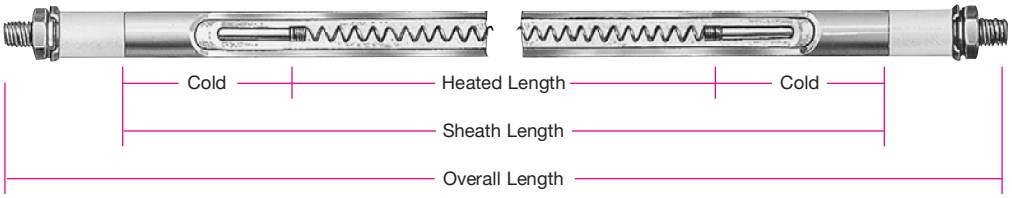
Tubular Heater Introduction

Typical Applications

- *Forced air heating*
- *Thermal forming machines*
- *Direct immersion in liquids*
- *Comfort radiant heaters*
- *Welded, brazed or clamped to tanks and pipes*
- *Hot runner molds*
- *Combination radiant and convection heater for ovens and dryers*

Construction Characteristics

Tempco Tubular Heaters are the most versatile and widely used source of electric heat for industrial, commercial and scientific applications. They can be designed in a wide range of electrical ratings, diameters, lengths, terminations, and sheath materials. Important and useful characteristics of tubular heaters are that they can be formed into virtually any shape, brazed or welded to any metal surface, and cast into metals. Carefully researched manufacturing methods and quality materials have made Tempco tubular heaters stand apart from other heating elements claiming similar performance.



The cutaway view shows the tubular heater's basic construction. A computer-designed helical coil of 80% Nickel 20% Chromium alloy resistance wire is fusion welded to the nickel-coated steel terminal cold pin. This coil assembly is precisely stretched and centered in the element metal sheath, which is then filled with Grade "A" Magnesium Oxide powder (MgO). The filled tube is then compacted by a roll reduction mill into a solid mass, permanently stabilizing the coil in the center of the tube while providing excellent heat transfer and dielectric strength between the coil and the sheath.

Design Guidelines

Resistance Tolerance

Tubular heating elements have an Industry Standard Resistance Tolerance of +10%, –5% which translates to a Wattage Tolerance of +5%, –10%. Consult Tempco if tighter tolerances are required for your application.

Watt Density

Element Watt Density is the wattage dissipated per square inch of the element sheath surface and is critical to the proper heating of the application and to the life expectancy of the heater. The Watt Density is calculated with the following formula:

$$\text{Watt Density (w/in}^2\text{)} = \frac{\text{Element Wattage}}{\pi \times \text{Element Dia.} \times \text{Element Heated Length}}$$

For a particular application element watt density will govern element sheath and internal resistance wire temperature. Factors to consider when choosing a suitable watt density are:

1. Many materials are heat sensitive and can decompose or be damaged if the element is running too hot.
2. Air and other gases that are poor conductors of heat require watt densities matched to the velocity of the gas flow to prevent element overheating.
3. When heating hard water or cleaning solutions, mineral deposits can build up on the element sheath, acting as a heat insulator and raising the internal element temperature. If these deposits cannot be periodically removed, use a lower watt density element to increase heater life expectancy.
4. When tubular heaters are used in UL recognized oil immersion heating applications the heated oil temperature cannot exceed 257°F (125°C). Steel sheath elements are limited to 60 watts/in^2. Tubular heaters with steel or stainless steel bulkhead fittings used in UL oil heating applications are not pressure rated. Contact Tempco for other application specific UL file information.
5. Page 16-12 in the Engineering Data Section of this catalog lists the maximum recommended heater watt density for many materials. For additional information and help please contact Tempco.

Tubular Heating Elements being filled with MgO insulating powder.

Agency Approvals

Tempco Tubular Heating Elements are certified as Recognized Components by Underwriters Laboratories (File Number E90771) under CCN UBJY2/8 to meet UL Standard UL1030. Tempco's equivalent CSA File Number is 043099. Tubular elements with bulkhead fittings have also been certified for oil heating (File Number MP4154) under CCN MDST2/8 to meet UL Standard 574.

If you require UL, CSA, or other NRTL agency approvals, please specify when ordering.

CAUTION

Important Note — When heating any substance it is critical to match the heater watt density, operating temperature and sheath material to the specific medium being heated. Failure to do so will result in premature heater failure and/or unsafe conditions.

View Product Inventory @ www.tempco.com

Tubular Heater Standard Specifications

Element Diameter in	Element Diameter mm	Maximum Voltage	Maximum Amperage	Resistance in Ohms per Heated Inch min	Resistance in Ohms per Heated Inch max	Sheath Length min. in	Sheath Length min. mm	Sheath Length max. in	Sheath Length max. mm
.260	6.6	250	15	.100	17	11	279	200	5080
.315	8.0	480	30	.060	21	11	279	200	5080
.375	9.5	600	30	.040	21	11	279	200	5080
.430	10.9	600	40	.040	21	11	279	255	6807
.475	12.1	600	40	.040	21	11	279	255	6807
.625	15.9	600	40	.040	17	11	279	255	6477

Table 1 Electrical Limitations and Minimum/Maximum Sheath Lengths

Length in	Length mm	Sheath Length Tolerance (±) in	Sheath Length Tolerance (±) mm	Heated Length Tolerance (±) in	Heated Length Tolerance (±) mm	Minimum Unheated Length Each End in	Minimum Unheated Length Each End mm
11-20	279-508	3/32	2.4	1/4	6	1	25
20-50	508-1270	1/8	3.2	1/2	13	1-1/4	32
50-80	1270-2032	5/32	4.0	7/8	22	1-1/2	38
80-110	2032-2794	3/16	4.8	1-1/8	29	1-5/8	42
110-140	2794-3556	7/32	5.6	1-3/8	35	1-3/4	44
140-170	3556-4318	1/4	6.4	1-5/8	41	2	51
170-200	4318-5080	3/8	9.5	1-7/8	48	2-1/4	57
200-up	5080-up	1/2	12.7	2-3/8	60	2-1/2	64

Table 2 Sheath and Heated Length Tolerance
(applicable for all diameters)

Tubular Heater Standard Sheath Materials

The selection of a sheath material should be made based on the chemical composition of the gas or liquid being heated, the characteristics of the materials entering the solution, and the processes controls. A material selection guide can be found on page 16-12.

NOTE: The best source for chemical/sheath compatibility is the supplier of the gas or liquid to be heated.

The following are the most common tubular element sheath materials. For other materials consult Tempco.

Incoloy® 840: Nickel 18-20%, Chromium 18-22%, Iron balance. Has about 10% less nickel than Incoloy 800. Used in many air heating applications, where it has exhibited superior oxidation resistance at less cost than Incoloy 800.
Maximum Sheath Temperature: 1600°F / 871°C

Incoloy® 800: Nickel 30-35%, Chromium 19-23%, Iron balance. The high nickel content of this alloy contributes to its resistance to scaling and corrosion. Used in air heating and immersion heating of potable water and other liquids.
Maximum Sheath Temperature: 1600°F / 871°C

316 Stainless Steel: Chromium 16-18%, Nickel 11-14%, Iron balance. Modified with the addition of Molybdenum (2-3%) to improve corrosion resistance in certain environments, especially those which would tend to cause pitting due to the presence of chlorides. Applications include deionized water.
Maximum Sheath Temperature: 1200°F / 649°C

304 Stainless Steel: Chromium 18-20%, Nickel 8-11%, Iron balance. Used in the food industry, medical, and chemical heating.
Maximum Sheath Temperature: 1200°F / 649°C

321 Stainless Steel: Chromium 17-20%, Nickel 9-13%, Iron balance. Modified with the addition of Titanium to prevent carbide precipitation and resulting intergranular corrosion that can take place in certain mediums when operating in the 800-1200°F (427-649°C) temperature range.
Maximum Sheath Temperature: 1200°F / 649°C

Copper: Standard Copper Alloy
A low temperature, inexpensive material used mainly for clean water heating.
Maximum Sheath Temperature: 350°F / 177°C

Steel: Low Carbon
Used for high to low viscosity oils, asphalt, tar, wax, molten salt, heat transfer liquid media and other compatible solutions.
Maximum Sheath Temperature: 750°F / 399°C

Other Sheath Materials: Available for a limited number of diameters. Consult Tempco for more information.

Inconel® 600: Iron 6-10%, Chromium 14-17%, Nickel balance
Maximum Sheath Temperature: 1800°F / 982°C

Incoloy® 825: Nickel 38-46%, Chromium 19.5-23.5%, Molybdenum 2.5-3.5%, Iron balance
Maximum Sheath Temperature: 1100°F / 593°C

CAUTION

Maximum Sheath Temperature refers to the maximum temperature of the element sheath material.
Consideration must be given to the maximum temperature that can be safely applied to the heated material.
See **Watt Density** on the previous page for additional information.

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Incoloy® and Stainless Steel Element Sheath Surface Treatments

Standard Surface Finish

The standard tubular heater element surface finish is a black chrome oxide, produced when the element is annealed prior to forming in an exothermic atmosphere furnace.

Optional Surface Finishes

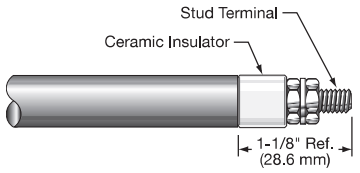
Bright Annealing is an option where the tubular heater is annealed in a dissociated ammonia atmosphere furnace. This produces a clean metallic appearance without surface-etching the sheath.

Electro-Polishing is an electrochemical process that removes surface imperfections and contaminants, enhancing the corrosion resisting ability of the sheath. The resulting surface is clean, smooth and has a bright finish; it is highly recommended for medical, food and other harsh applications.

Passivation removes surface contamination, usually iron, so that the optimum corrosion resistance of the stainless steel is maintained. Surface contamination could come from the small amount of steel that may be worn off a tool during the manufacturing process.

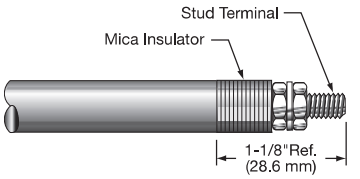
Standard Tubular Heater Terminations

Select the termination style that meets your requirements for space, accessibility and reliability.



TYPE T—STANDARD

Threaded stud terminal with ceramic insulator.



TYPE TM—Stud with Mica Insulator

Stud terminal with mica insulator.

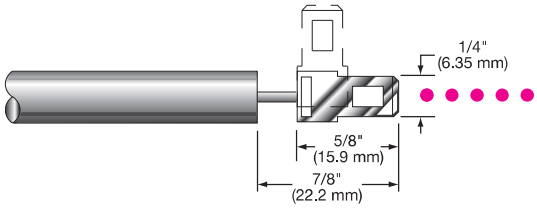
Element Diameter in	Element Diameter mm	Standard Thread Size
.260	6.6	6-32
.315	8.0	8-32
.375	9.5	8-32
.430	10.9	10-32
.475	12.0	10-32
.625	15.9	10-32

Other thread sizes and lengths are available.

TYPE P—Plain Pin

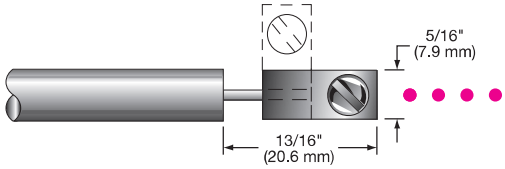
Plain terminal pin. Specify Length "L."
Standard 1/2" (12.7 mm) pin length.

Element Diameter in	Element Diameter mm	Nominal Pin Diameter in	Nominal Pin Diameter mm
.260	6.6	.091	2.3
.315	8.0	.105	2.7
.375	9.5	.105	2.7
.430	10.9	.125	3.2
.475	12.0	.125	3.2
.625	15.9	.160	4.1



TYPE SF & SF9 (90°)—Quick Connect

1/4" male (3/16" optional) quick connect (slip-on) terminals are welded to the element terminal pin. They provide quick and easy installation of lead wire with excellent holding force. Specify if an optional mica or ceramic insulator is required. Material: Nickel-Plated Steel.



TYPE L__ & L9__ (90°)—Terminal Lug

A nickel-plated steel lug is projection welded to the terminal pin straight (Type "L_") or at 90° to the sheath (Type "L9_"). Specify if an optional mica or ceramic insulator is required.

Standard LA, L9A 10-32 screw **Optional LB, L9B** 8-32 screw

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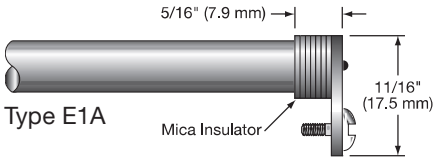
Tubular Heater Standard Terminations

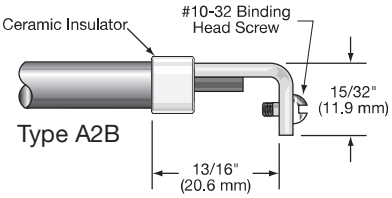
TYPE E__ __—Right-Angle Lug Terminal

Type E1A 8-32 screw with mica insulator (Standard)
Type E1B 8-32 screw with ceramic insulator
Type E2A 10-32 screw with mica insulator
Type E2B 10-32 screw with ceramic insulator



TYPE A__ __—Right-Angle Terminal (for use when space is tight)

Type A1A 8-32 screw with mica insulator
Type A1B 8-32 screw with ceramic insulator
Type A2A 10-32 screw with mica insulator
Type A2B 10-32 screw with ceramic insulator (Standard)



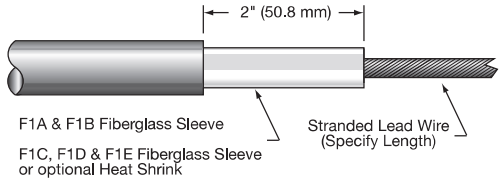
TYPE F1__—Lead Wire

When selecting a lead wire type, consideration should be given to the maximum ambient temperature the lead wire is exposed to and the environment it is in. Lead wire options Type R1 and W1 below will provide additional environmental protection to the Type F1 lead wire selected.

Type F1A 250°C (482°F) TGGT insulation
Type F1B 450°C (842°F) MGT insulation
Type F1C 200°C (392°F) Teflon® insulation
Type F1D 150°C (302°F) Silicone Rubber insulation
Type F1E 105°C (221°F) Thermoplastic (PVC) insulation

Standard 10" (254 mm) leads with fiberglass sleeve. Specify if other lead length is required.

F1C F1D & F1E available with optional heat shrink sleeving. Specify when ordering if required.



CAUTION

Lead wire gauge is determined by the ampacity of the heater with the lead wires in an ambient temperature of 40°C (104°F). Higher ambients may require heavier gauge lead wires.

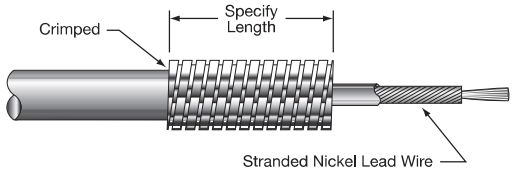
Lead Wire Termination Options

TYPE R1__—Flexible Armor Cable

Type R1A Galvanized cable
Type R1B Stainless steel cable

Provides excellent protection to lead wires in abrasive environments.

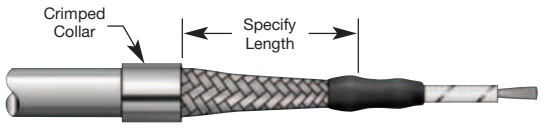
Standard 10" (254 mm) armor cable over 12" (305 mm) leads. Specify if other lead and/or cable lengths are required.



TYPE W1—Stainless Steel Wire Braid

Provides good protection to lead wires where flexibility is needed.

Standard 10" (254 mm) braid over 12" (305 mm) leads. Specify if other lead and/or cable lengths are required.



Tubular Heater Standard Mounting Methods

TYPE B — Bulkhead Fittings

Bulkhead fittings provide a leakproof method for mounting tubular heating elements through tank walls. Standard are round brass fittings crimped onto the element that are suitable for low pressure water (up to 80 psig) and non-pressure air. A brass hex nut, plated steel washer and gasket are supplied as standard.

Fittings for vacuum or high pressure gas and liquid use are silver brazed or TIG welded. Method will vary by material and application. Fittings in table are most commonly used. Special fittings can be made to meet your application requirements.

Standard fitting location is with threads flush at the end of the element sheath as shown below. For other locations specify distance from end of sheath.

CAUTION ***Do not locate the fitting over the heated section of the element.***

Specify: Material; Round (Standard) or Hex Flange; Thread Type and Length; Location on Sheath; Crimped, Brazed, or Welded Construction.

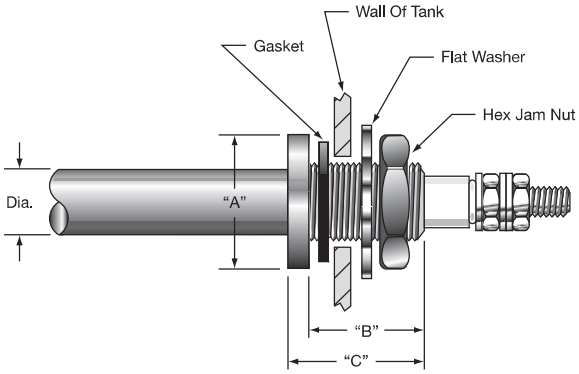
Fitting Attachment Method — General Guidelines

These are guidelines only. Consult Tempco if you require assistance in determining the method best suited to your application.

Fittings Crimped: Low pressure water (up to 80 psig) and non-pressure air applications

Fittings Brazed: Non-ferrous alloys (copper) and dissimilar non-weldable metals

Fittings Welded: High pressure liquids and gases, and high temperature applications



Standard Bulkhead Fittings For Tubular Heaters — Round Flanged Standard

Tubular Diameter in	Tubular Diameter mm	Fitting Material	Flange Type	"A" in	"A" mm	"B" in	"B" mm	"C" in	"C" mm	Thread Size (UNF)
.260	6.6	Brass	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.260	6.6	Stn. Stl.	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.315	8.0	Brass	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.315	8.0	Stn. Stl.	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.375	9.5	Brass	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.375	9.5	Stn. Stl.	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.430	10.9	Brass	Round or Hex	7/8	22	3/4	19.0	7/8	22	5/8-18
.430	10.9	Stn. Stl.	Round or Hex	7/8	22	3/4	19.0	7/8	22	5/8-18
.430	10.9	Steel	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Brass	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Stn. Stl.	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Steel	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Brass	Round	1	25	3/4	19.0	7/8	22	3/4-16
.475	12.1	Stn. Stl.	Round	1	25	3/4	19.0	7/8	22	3/4-16
.625	15.9	Stn. Stl.	Round	1-1/8	29	3/4	19.0	1	25	7/8-14

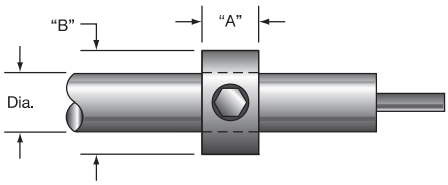
Note: Optional Larger Thread Sizes and Hex Flanged Bulkhead Fittings are available. Consult Tempco with your requirements.

Tubular Heater Standard Mounting Methods

Part Number	For Element Diameter in	For Element Diameter mm	"A" Thick in	"A" Thick mm	"B" OD in	"B" OD mm
FAS-108-102	.260	6.6	5/16	7.9	5/8	15.9
FAS-108-102	.315	8.0	5/16	7.9	5/8	15.9
FAS-108-103	.375	9.5	3/8	9.5	3/4	19.1
FAS-108-104	.430	10.9	7/16	11.1	7/8	22.2
FAS-108-106	.475	12.0	7/16	11.1	1	25.4

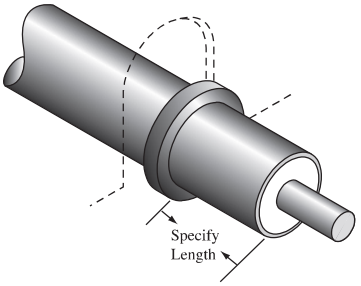
TYPE MC — Mounting Collar

Plated steel mounting collars are locked in place with a set-screw and serve as an adjustable stop for through-the-wall mounting. Collars are shipped in bulk unless otherwise specified. Mounting collars can be ordered with the heater or purchased separately.



TYPE LR — Locator Washer

Locator washers are permanently attached to the heater sheath by staking/crimping and are used to limit the movement of the heater while allowing for expansion and contraction of the heater sheath. When ordering, specify location from end of sheath.



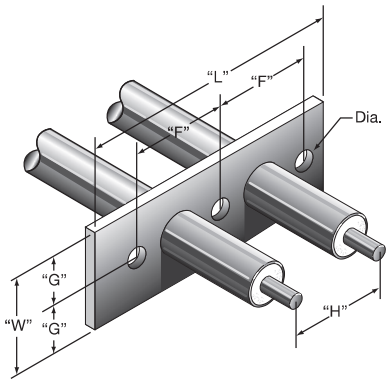
Multiple element heater assembly with a custom mounting bracket.

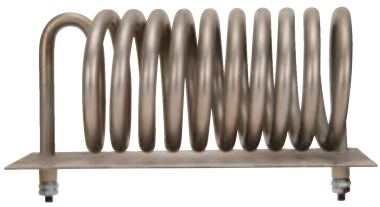
TYPE MF — Mounting Bracket

Tempco's made-to-order mounting brackets are made from 18 gauge stainless steel for strength and stiffness. It is an economical way to mount the heater in non-pressurizing, non-liquid applications. Unless otherwise specified, the bracket will be located 1/2" from the edge of the heater sheath. OEM quantity brackets are manufactured by Tempco on our own high speed precision N/C Turret Press. The standard method of attaching the tubular element to the bracket is staking or crimping.

The rectangular mounting bracket shown at right is a popular made-to-order design. Specify all dimensions shown when requesting a quote.

Custom brackets of any size, thickness or material can be supplied to meet your requirements.





Made in USA

Tubular Heater Standard Moisture Seals

Magnesium Oxide (MgO) is used as the insulating material in Tempco tubular heaters because of its excellent thermal conductivity and dielectric strength. However, MgO is hygroscopic and can absorb moisture from the atmosphere. This absorption of moisture may be detected when an Insulation Resistance (IR) test is done with a megohmmeter prior to energizing the heater circuit. In very humid environments, circuits utilizing a GFI (ground fault interrupter) for safety may experience nuisance tripping when energizing the heater.

The Tempco manufacturing process produces a dry element with an IR of several thousand megohms minimum. However, after shipment and depending on humidity levels and storage time, a heater can absorb moisture and show a decrease in IR. In many cases, depending on the supply voltage and the application, the heater can be safely energized and will dry itself out.

If a heater has absorbed moisture, a safe and effective method of drying it out prior to installation is to bake it in an oven at 300°F (149°C) until an acceptable IR reading is obtained. When possible, removing the terminal hardware will expedite this process. If this method is not practical consult factory for other recommendations.

For applications where moisture absorption would be unacceptable Tempco has several optional element end seals to retard absorption of moisture in the MgO. If a true hermetic seal is required, ceramic to metal end seals (Type H) are available. With any of these seals, the maximum recommended termination temperature in the seal area must not be exceeded.

Style SS—Silicone Resin Seal

A brushed-on coating that penetrates the MgO, offering economical moisture protection under humid storage conditions.

Maximum Usable Termination Temperature: 390°F (200°C)

UL Rated Maximum Termination Temperature: 221°F (105°C)

Type V2A: conformal coating
Type V2B: silicone oil

Style SER—RTV Seal

RTV (room temperature vulcanizing) silicone rubber adhesive sealant provides a good moisture seal.

UL Rated – Maximum Termination Temperature:

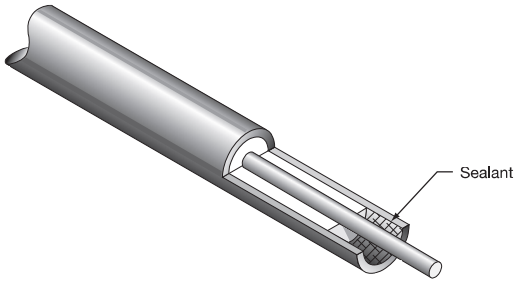
Type R: 302°F (150°C)
Type R1: 392°F (200°C)

Style SEH—Epoxy Resin Seal

Epoxy resin provides a moisture resisting barrier.

UL Rated – Maximum Termination Temperature:

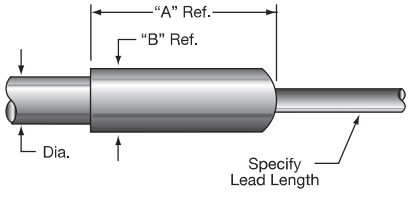
Type V: 194°F (90°C)
Type V1: 266°F (130°C)
Type V4: 392°F (200°C)



TYPE M—Self Sealing Heat Shrinkable Boot with Lead Wire

This type seal is used primarily for defrost heaters. Temperature range -67 to 300°F (-55 to 149°C). Standard 10" (254 mm) leads; specify longer leads if required.

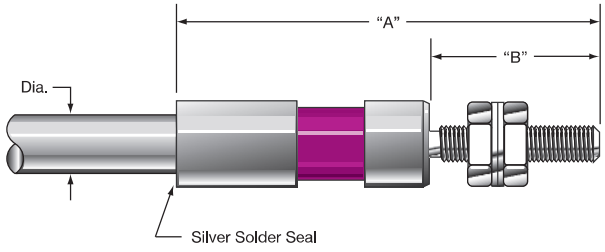
Heater Diameter		"A"		"B"	
in	mm	in	mm	in	mm
.260	6.6	2-1/8	54	7/16	11
.315	8.0	2-1/8	54	7/16	11
.430	10.9	2-1/8	54	9/16	14



TYPE H—Hermetic Seal

Ceramic to metal seals provide an airtight seal for temperatures to 500°F (260°C) in the seal area.

Heater Diameter		"A"		"B"		Thread Size
in	mm	in	mm	in	mm	
.260	6.6	1-11/16	43	13/32	10	8-32
.315	8.0	1-11/16	43	13/32	10	10-32
.430	10.9	2-1/8	54	21/32	17	1/4-28
.475	12.1	2-1/8	54	21/32	17	1/4-28



Tubular Heater Standard Bend Formations

Forming Tubular Elements

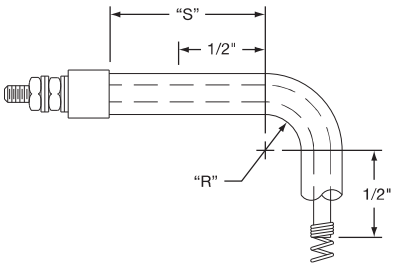
The MgO insulation used in tubular heating elements is compacted by reducing the element diameter in a roll reducing mill. The elements are then annealed in a controlled atmosphere furnace to relieve the metal stressing (work hardening) that takes place during the rolling to size reduction of the sheath. Annealing brings the metal back to a soft state, allowing the element to be bent into virtually any configuration. However, since forming also work hardens the metal, some precautions must be observed in order to prevent the sheath from breaking during bending or developing stress cracking marks.

Note: Elements with tight bends and some applications require the bends to be recompacted in special dies to restore the integrity of the insulation density and maintain dielectric strength. Large bends do not need to be recompacted.

Tubular Element Minimum Bending Radius

Element Diameter		Factory Bend Minimum R		Field Bend Minimum R		Minimum S	
in	mm	in	mm	in	mm	in	mm
.260	6.6	3/8	9.5	3/4	19.1	1/2	12.7
.315	8.0	1/2	12.7	1	25.4	1/2	12.7
.375	9.5	9/16	14.3	2	50.8	5/8	15.9
.430	10.9	3/4	19.1	2-1/2	63.5	3/4	19.1
.475	12.0	7/8	22.2	2-1/2	63.5	1	25.4

Note: Smaller inside bending radius than listed in the table can be factory accomplished. It requires special forming techniques to prevent damage to the tubular heater. Consult Tempco with your requirements.

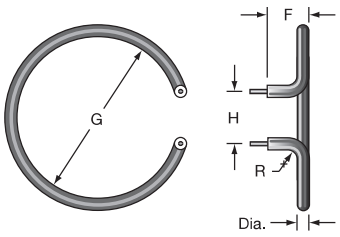


Avoid bends within a minimum of 1/2" of the terminal pin and resistance wire junctions unless the bending radius is a minimum 3"(75 mm).

Elements are being fed into a roll reducing mill to compact the MgO insulating powder. After rolling, the elements are annealed in the conveyor belt furnace seen in the background.

TYPICAL Bend Formations

We do custom formations. Contact Tempco with your requirements.



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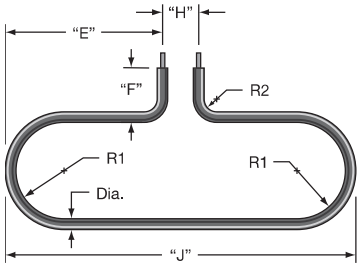

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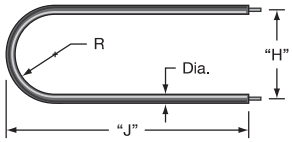

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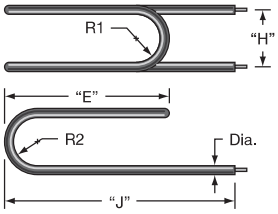

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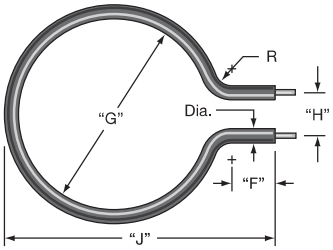

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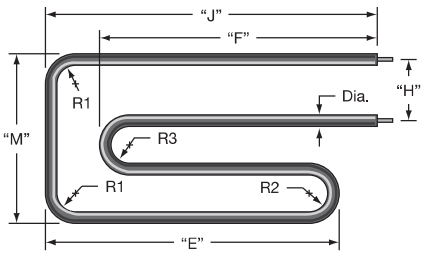
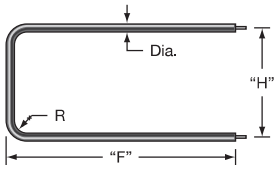


FT6

Made in USA

Bend Formations

Tubular Heater Standard Bend Formations



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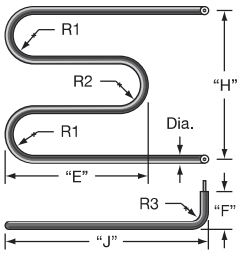

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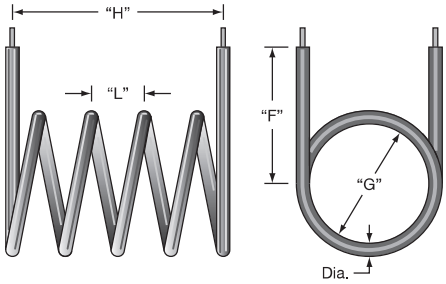

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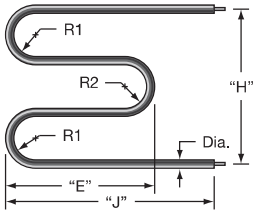

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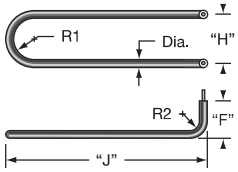

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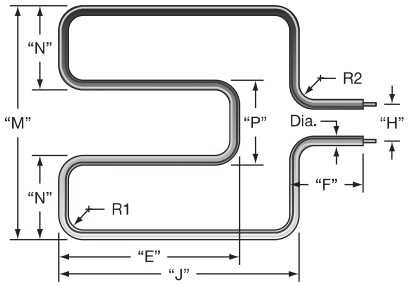

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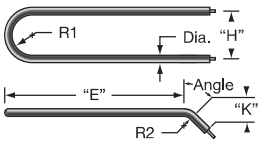

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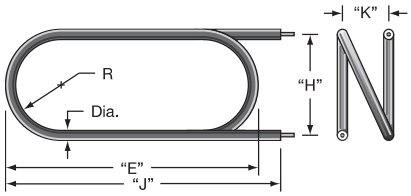

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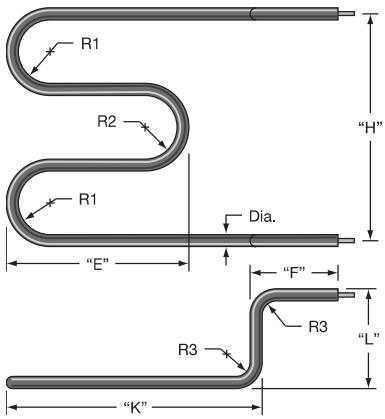

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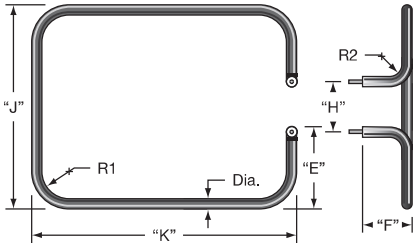

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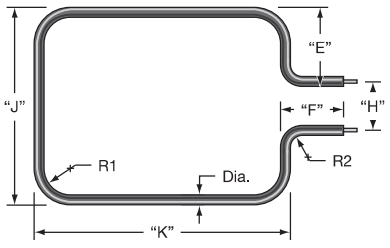

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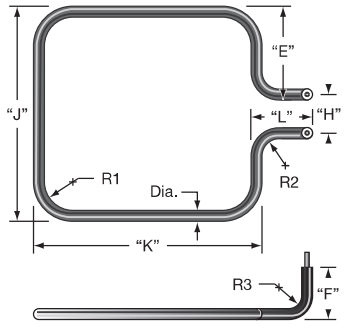
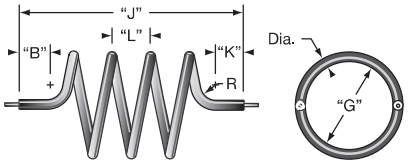


FT18

View Product Inventory @ www.tempco.com

Tubular Heater Standard Bend Formations



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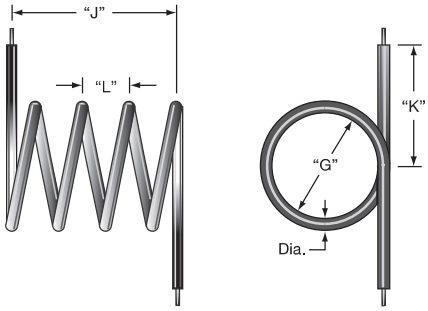

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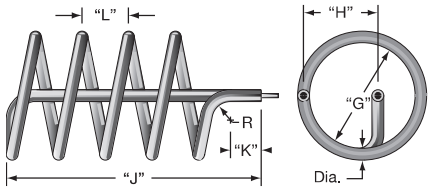
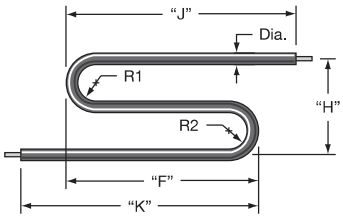


FT21

TYPICAL Bend Formations

We do custom formations. Contact Tempco with your requirements.



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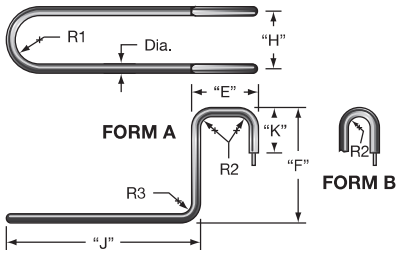

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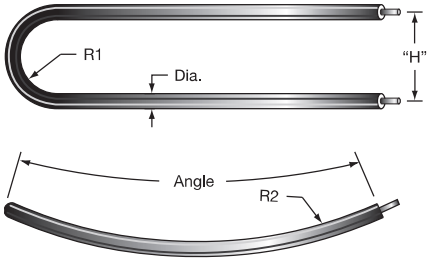

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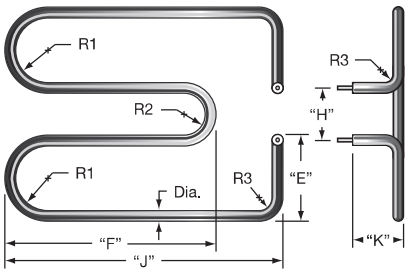

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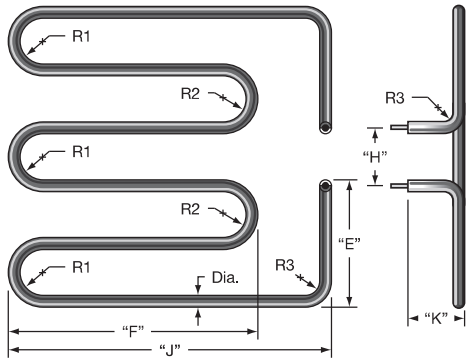

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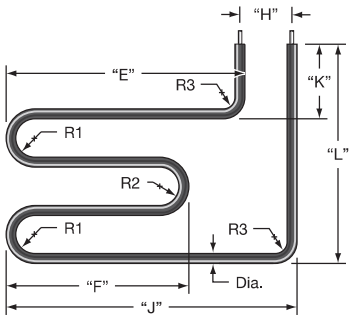
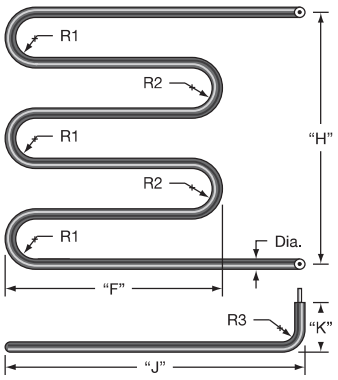


FT27

Tubular Heater Standard Bend Formations



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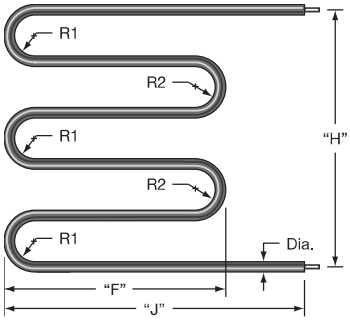

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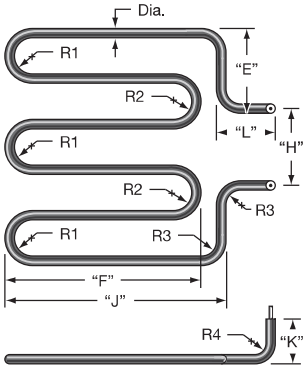

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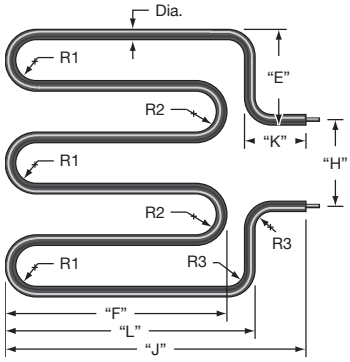

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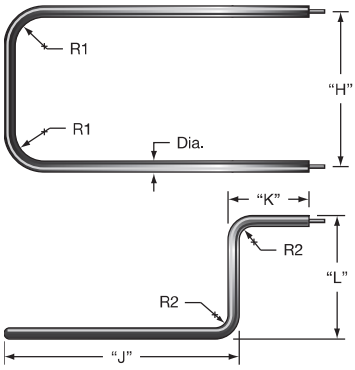

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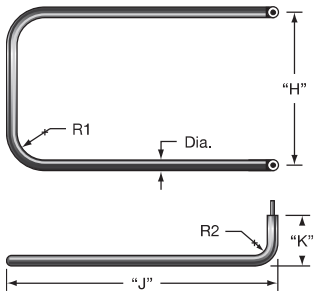

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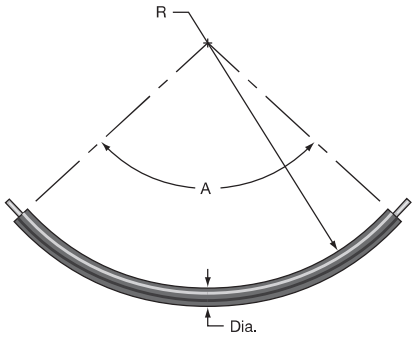

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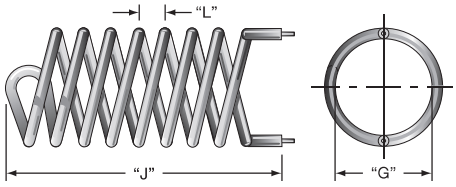

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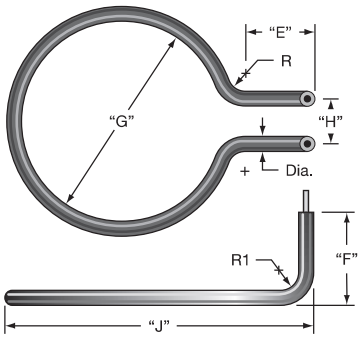

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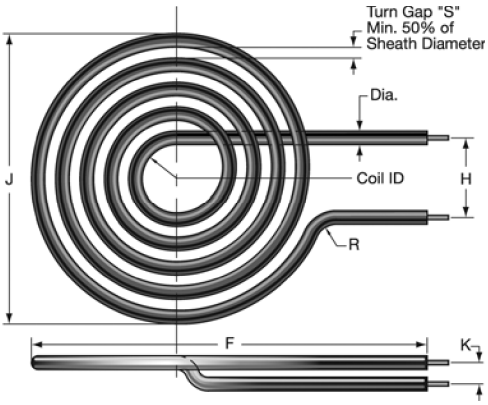
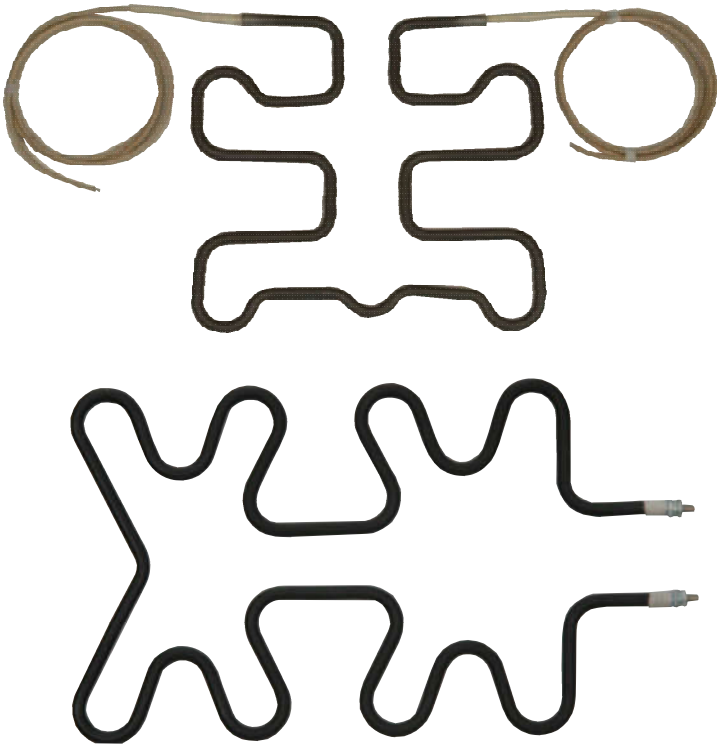


FT37

Tubular Heaters for Hot Runner Manifolds



Construction

Hot Runner Manifold Heaters are made to order using .260", .315" or .375" diameter Incoloy® tubular heating elements. Commonly specified terminations include threaded stud or wire leads.

Important Information on Forming

Precise forming of the tubular heater is required for it to seat properly into the milled slot in the manifold. To ensure this fit, we use a physical template as an inspection tool in the forming process to verify bending accuracy.

The template is a reproduction of the milled slot in the form of a plastic or aluminum plate. It can be customer supplied or manufactured by Tempco. Only through the use of a forming template is bending accuracy guaranteed.

When ordering for new applications:

Supply a drawing or forming template if available.

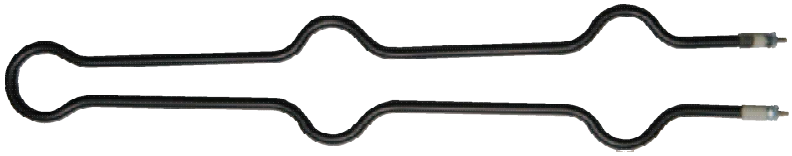
When ordering for replacement:

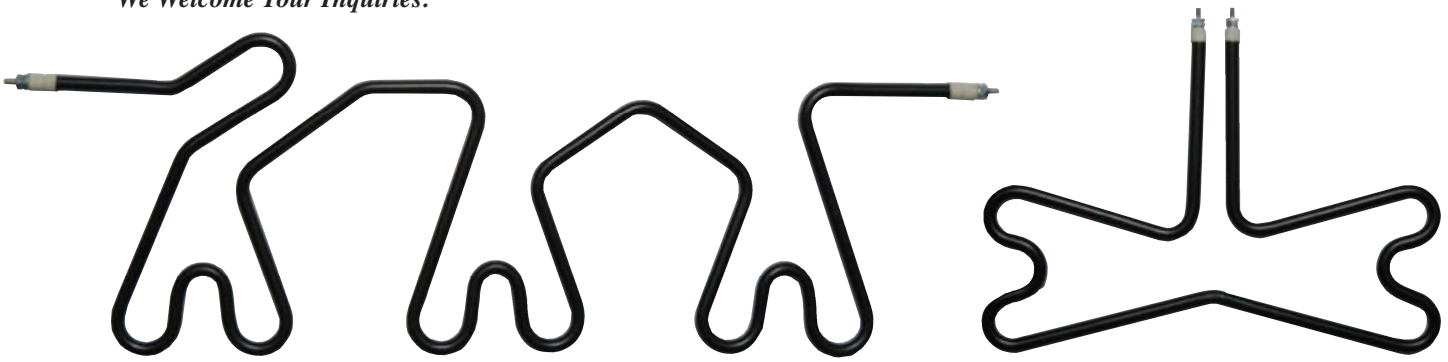
Supply a sample heater and/or a drawing of the manifold indicating the milled heater slot.

Note: For heaters originally manufactured by Tempco only the Tempco Part Number is required.

Examples of Mold Heater Formations

Consult Tempco With Your Requirements.
We Welcome Your Inquiries.





Heat Transfer Cement

When tubular heating elements are used in a milled slot any air gaps between the element and the plate can cause hot spots on the element. Heat transfer cement is used to fill these air gaps, permitting the heater to run cooler, thus maximizing its life expectancy. Cement is water soluble and can be applied with a putty knife or trowel and can be used in temperatures up to 1250°F (675°C).

Part Number **SEA-108-101 (1 Gallon)**
SEA-108-102 (1 Quart)

Ordering Information

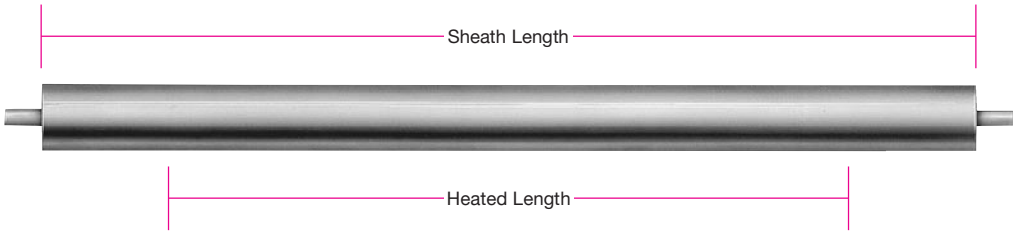
TEMPCO will design and manufacture a Tubular Hot Runner Manifold Heater to meet your requirements.

Please Specify the following:

- ❑ Wattage and Voltage
- ❑ Diameter
- ❑ Heated Length
- ❑ Unheated Length at each end
- ❑ Termination Type (see pages 10-4 and 10-5)
- ❑ Supply a Drawing or Template

Made in USA

Tubular Heater Standard (Non-Stock) and Stock Sizes and Ratings



Standard tubular heaters are fully annealed for field or factory bending. They are inventoried with plain pin extensions that allow quick installation of Termination Types T, TM, F1, A, E, SF, SF9, L and L9.

Part Numbers listed are for heaters with Type "T" termination. For other terminations a Part Number will be issued at time of order.

Standard (Non-Stock) and Stock Sizes and Ratings with Type T Termination

Stock Items Are Shown In RED

Element Description	Sheath Length in	Sheath Length mm	Heated Length in	Heated Length mm	Watts	Part Number 240V	Approximate Net Weight lbs	Approximate Net Weight kgs
23 W/in² .475 Dia. Incoloy® 840 12 mm (3.6 W/cm²)	39	991	27	686	1000	**THE04000**	1.0	.5
	54	1372	42	1067	1500	**THE04001**	1.1	.5
	69	1753	57	1448	2000	THE04002	1.3	.6
	84	2134	72	1829	2500	**THE04003**	1.4	.6
	99	2515	87	2210	3000	THE04004	1.6	.7
	132	3353	120	3048	4175	THE04005	1.7	.8
	157	3988	145	3683	5000	THE04006	1.8	.8
30 W/in² .260 Dia. Incoloy® 840 6.6 mm (4.7 W/cm²)	20	508	15	381	400	THE04007	.2	.1
	25	635	20	508	500	THE04008	.2	.1
	30	762	25	635	600	THE04009	.2	.1
	35	889	30	762	800	**THE03384**	.3	.1
	40	1016	35	889	900	**THE04010**	.3	.1
	45	1143	40	1016	1000	**THE04011**	.4	.2
	50	1270	45	1143	1200	THE04012	.4	.2
	55	1397	50	1270	1200	THE03383	.4	.2
	60	1524	55	1397	1400	**THE03373**	.5	.2
	65	1651	60	1524	1600	THE02648	.5	.2
	70	1778	65	1651	1800	THE04013	.6	.3
	75	1905	70	1778	1800	THE04014	.6	.3
	80	2032	75	1905	2000	THE04015	.6	.3
30 W/in² .315 Dia. Incoloy® 840 8.0 mm (4.7 W/cm²)	15	381	10	254	300	THE04016	.2	.1
	20	508	15	381	400	THE04017	.3	.1
	25	635	20	508	600	THE04018	.3	.1
	30	762	25	635	800	THE04019	.4	.2
	35	889	30	762	900	THE03328	.5	.2
	40	1016	35	889	1000	**THE04020**	.5	.2
	45	1143	40	1016	1200	THE04021	.6	.3
	50	1270	45	1143	1400	THE04022	.7	.3
	55	1397	50	1270	1600	**THE04023**	.7	.3
	60	1524	55	1397	1800	**THE03134**	.8	.4
	65	1651	60	1524	1800	THE04024	.9	.4
	70	1778	65	1651	2000	**THE03380**	1.0	.5
	75	1905	70	1778	2200	THE04025	1.0	.5
	80	2032	75	1905	2400	THE04026	1.1	.5
	90	2286	85	2159	2600	THE04027	1.2	.5
	100	2504	95	2413	3000	THE04028	1.3	.6

Tubular Heater Standard (Non-Stock) and Stock Sizes and Ratings

Standard (Non-Stock) and Stock Sizes and Ratings with Type T Termination

Stock Items Are Shown In RED

Element Description	Sheath Length in	Sheath Length mm	Heated Length in	Heated Length mm	Watts	Part Number 240V	Approximate Net Weight lbs	Approximate Net Weight kgs
30 W/in² .430 Dia. Incoloy® 840 10.9 mm (4.7 W/cm²)	15	381	10	254	400	THE04029	.3	.1
	20	508	15	381	600	THE04030	.5	.2
	25	635	20	508	800	THE04031	.6	.3
	30	762	25	635	1000	THE04032	.7	.3
	35	889	30	762	1200	THE04033	.8	.4
	40	1016	35	889	1400	THE04034	.9	.4
	45	1143	40	1016	1600	THE04035	1.0	.5
	50	1270	45	1143	1800	THE04036	1.1	.5
	55	1397	50	1270	2000	THE03415	1.3	.6
	60	1524	55	1397	2200	THE03376	1.4	.6
	65	1651	60	1524	2400	THE04037	1.5	.7
	70	1778	65	1651	2600	**THE04038**	1.6	.7
	75	1905	70	1778	2800	**THE04039**	1.7	.8
	80	2032	75	1905	3000	**THE04040**	1.8	.8
	90	2286	85	2159	3500	THE04041	2.0	.9
	100	2540	95	2413	4000	**THE03593**	2.3	1.0
	110	2794	105	2667	4500	**THE03067**	2.5	1.1
	120	3048	115	2921	5000	THE04042	2.7	1.2
40 W/in² .375 Dia. Incoloy® 840 9.5 mm (6.2 W/cm²)	21 1/16	535	16 13/16	427	800	THE04043	.4	.2
	27 1/8	689	22 7/8	581	1100	THE04044	.5	.2
	32 1/8	816	27 7/8	708	1300	THE04045	.6	.3
	42 7/8	1089	38 5/8	981	1800	**THE04046**	.8	.4
	57 1/2	1461	53 1/4	1353	2500	THE04047	1.1	.5
	69 1/4	1759	65	1651	3000	THE04048	1.3	.6
	81 1/4	2064	77	1956	3600	THE04049	1.5	.7
	109 1/4	2775	105	2667	4000	THE04050	2.1	1.0
	134 1/2	3416	127 3/4	3245	5000	THE04051	2.5	1.1
	153 3/8	3896	145 7/8	3705	5500	THE04052	2.9	1.3
	179 1/4	4553	171 1/4	4350	6500	THE04053	3.4	1.5
48 W/in² .475 Dia. Incoloy® 840 12 mm (7.4 W/cm²)	23	584	14	356	1000	THE04054	.6	.3
	30	762	21	533	1500	THE04055	.9	.4
	39	991	27	686	2000	THE04056	1.1	.5
	44	1118	35	889	2500	THE04057	1.3	.6
	54	1372	42	1067	3000	THE04058	1.6	.7
	69	1753	57	1448	4000	THE04059	2.0	.9
	84	2134	72	1829	5000	THE04060	2.2	1.0
	99	2515	87	2210	6000	THE04061	2.8	1.3
	149	3785	133	3378	9720	THE04062	4.0	1.8

Ordering Information

Catalog Heaters

Part Numbers in **RED** are in stock for immediate delivery with Type T termination.

Termination Types TM, F1, A, E, SF, SF9, L, and L9 can be applied to stock heaters. For these terminations the Heater Part Number will be issued at time of order.

Non-Stock Part Numbers are standard designs that are available straight in 2 weeks and formed in 4 weeks.

Custom Engineered/Manufactured Heaters

An electric heater can be very application specific; for sizes and ratings not listed, **TEMPCO** will design and manufacture a tubular heater to meet your requirements. ***Standard lead time is 4 weeks.***

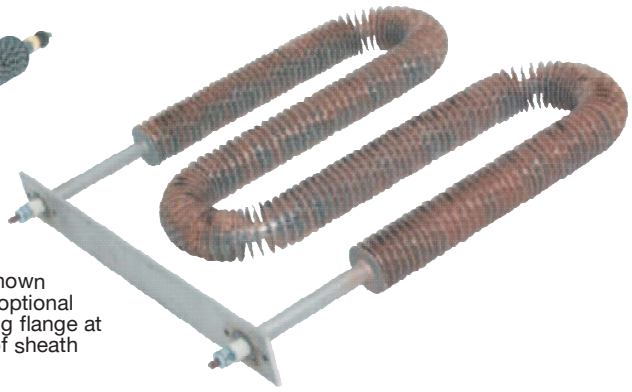
Please Specify the following:

- ❑ Type of Application
- ❑ Wattage and Voltage
- ❑ Diameter
- ❑ Heated Length
- ❑ Unheated Length at Each End
- ❑ Sheath Material
- ❑ Termination Type
- ❑ Type of Mounting, if Required
- ❑ Type of Moisture Seal, if Required
- ❑ Bending Configuration (supply Drawing and/or Sample)

Made in USA

Finned Tubular Heaters

Shown with optional bulkhead fittings



Shown with optional mounting flange at end of sheath

Design Features

- ***Copper brazed steel fins on steel sheath standard. Aluminum based protective coating available.***
- ***Stainless steel fins on stainless alloy sheath standard.***
- ***.315, .430, & .475 Sheath diameters standard. .260 & .375 diameters optional. .625 diameter is special order in limited lengths.***
- ***5/16" fins standard on .315 diameter units, 3/8" fins on .430 & .475 diameter heaters. See physical specifications for optional sizes.***
- ***Monel fins on Monel sheath available on special order only. Consult Tempco for details.***
- ***4.5-5 fins/in standard. 3.5-6 fins/in optional***
- ***Steel finned catalog heaters have brazed brass bulkheads. Welded steel or staked bulkheads available. Stainless steel welded bulkheads are standard on cataloged stainless steel finned heaters. Fittings will have UNF threads unless custom threads are specified. See page 10-16B.***
- ***Custom Mounting Brackets can be provided. See page 10-16C.***
- ***Type T Post terminals standard. .315 dia. heaters have 8-32 threads and 10-32 threads are used on .430 & .475 dia. heaters. Full selection of tubular terminations available See page 10-4.***
- ***Catalog units have V2A silicon resin seals as standard. Most all other tubular seal options available. See page 10-16C.***
- ***Numerous factory bending formations available. Supply Tempco with dimensional sketch, drawing, or photo. See page 10-9.***
- ***Bright annealed, Nickel plating, Hi-heat aluminum, or Hi-heat flat black finishes available Furnace brazed Stainless Steel fins available as an option.***
- ***U2 & M2 formations are ideal for duct heating applications***
- ***Unfinned sections in bends or straight lengths of heated area can be provided on heaters up to 32wsi sheath watt density.***
- ***Catalog listed Steel heaters are UL recognized for use up to 750°F sheath temperature & Stainless construction up to 1000°F at a maximum of 85 wsi on sheath.***

Construction Characteristics

THF finned heaters are constructed using Tempco's robust tubular element as the basis of construction. Fin material is continuously spiral wound tightly onto the element surface to increase the convective surface area for air and non-corrosive gas heating. Fin spacing and size have been tested and selected to optimize performance. Steel finned units are then furnace brazed, bonding the fins to the sheath to increase conductive efficiency. This allows higher wattage levels to be achieved in the same flow area and produces lower sheath temperatures prolonging heater life. For higher temperature or more corrosive applications, stainless steel fins securely wound on alloy sheath are available. Application conditions such as vibration and toxic/flammable media should be taken into consideration when installing heaters. Protective coatings are available for use on steel finned heaters for mildly corrosive or high humidity applications.

Finned tubular elements are safer to operate than open coil heaters as the risk of fire from combustible particles in the flow stream and electrical shock is minimized. Increased service life and less maintenance required due to the rugged finned element construction. Power loading (w/in) of finned tubulars can be matched to any open coil installation. Pressure drop when using finned elements will be slightly more than with open coil but normally not enough to matter. It varies with flow velocity ranging from .04"H_2O at 500 fpm to about .30"H_2O at 1500 fpm when elements are banked together in several rows for duct heaters.

The finned tubular elements are normally used in forced or free convective air applications at low to medium temperatures. Typical applications are for heating indoor clean air from ambient conditions up to 250/275°F for steel finned units & to 550°F for stainless fins. Steel finned heaters can be operated up to 750°F on sheath and stainless steel finned heaters used up to 1200°F (1000°F UL limit) sheath temperatures. Nominal sheath watt density and recommended operating conditions for the cataloged heaters are included in the table headings & footnotes. Lower airflows will require lower watt density ratings. Consideration should be given to using un-finned alloy sheath tubular elements for heating to higher outlet air temperatures or if operating in higher ambient air. Application conditions of flow velocity and inlet/outlet temperatures will govern sheath watt density to be used. The airflow graphs and examples presented will help with determining proper heater watt density. The cataloged designs are suitable for most low temperature applications that will be encountered.

Agency Approvals

Finned Tubular Heaters are UL recognized and CSA certified up to 85W/in² and 750°F for Steel sheath/steel finned and . 85W/in² and 1000°F for Alloy or SS sheath/SS finned. The UL File Number is E65652 (CCN KSOT2/KSOT8).

If you require UL, CSA, or other NRTL agency approvals, please specify when ordering.

Since 1972

Finned Tubular Heaters

Typical Applications

- *Convective air & gas heating in ducts*
- *Load resistor banks*
- *Moisture removal (dehumidification)*
- *Curing ovens & plastics dryers*
- *Low/medium temperature heat treating*
- *Convection ovens for food preparation*
- *Exhaust gas heating*
- *Forced air electric heaters*
- *Heat pump auxiliary systems*
- *Return air heating*
- *Inert Industrial process gas heating*
- *Organic Resins & Paint curing, baking & drying*
- *Autoclaves*
- *Film & ink drying*
- *Hopper heating*
- *Chemical processing & core drying*
- *Food Roasting & baking*
- *Textile & Varnish drying*
- *Heating for rail & marine applications*

TUBULAR ELEMENT SIZES & MATERIALS

Sheath Diameter: .315", .375", .430" and .475"

Sheath Material: Steel, 304L SS, 316L SS, Incoloy 840 and Incoloy 800

Sheath Lengths: 12" to 196" depending on sheath diameter

Sheath Material Selection

Standard steel finned heaters are ideal for use in low temperature clean air applications not containing toxic contaminants or high humidity. When coated with one of the optional coatings available they are suitable for high humidity, organic vapors, or mildly corrosive applications. Stainless steel finned heaters should be employed for higher temperature uses or if the air/gas contains vapors known to be corrosive to steel. Optional nickel plated heaters can also be provided.

PERFORMANCE RATINGS

Maximum Temperature:

Steel fins on steel sheath—750°F (400°C)

Steel fins on Incoloy or SS sheath—750°F (400°C)

Stainless Steel fins on stainless, Incoloy 840 or Incoloy 800 sheath—1200°F (650°C)

Maximum Element Power Density Limits:

.315 dia.—84 watts/linear inch
.375 dia.—100 watts/linear inch
.430 dia.—115 watts/linear inch
.475 dia.—127 watts/linear inch

These values are for heaters with 3/8" fins at 4.5-5 fins/inch. De-rate to 83% for heaters with 5/16" fins or that have less than 4.5 fins/inch.

ELECTRICAL RATINGS

Maximum Voltage: Up to 600VAC (480V for UL)

Resistance Tolerance: +10%, –5%

Wattage Tolerance: +5%, –10%

Sheath watt density range: 20-85 wsi (2-13 w/cm2), @ 4.5-5 fins/in

OPTIONAL FEATURES

Bulkhead Fittings: Brazed brass are standard. Welded or brazed Steel & SS optional. UNF threads standard, metric or special threads available.

Custom mounting brackets: (type MF or special). Dimensional sketch or drawing needed with material specs.

Locator washer: (type LC) specify location

Adjustable mounting collar**:** (type MC) w/set screw

Full selection of tubular termination options: Bulkhead fittings & type T post terminals standard.

Moisture Seals: V2A Silicon resin seal standard

SPECIFICATIONS AND PHYSICAL SIZE OF FINS

Fin Materials and Attachment Method:

Steel & 304 SS

Steel wound with copper wire between fins for oven brazing to sheath. Stainless steel is mechanically wound but can be oven brazed as an option if a bright annealing atmosphere is used.

Fin Strip Width:

5/16" on .315, .375 and .430 diameters
3/8" on .315, .375 .430 and .475 diameters

Fin Thickness:

26 Ga. (.018) for Steel and 304 SS. Optional 24 Ga. (.024) for steel only

Finned OD's:

.315" dia. with 5/16" fins—.92" OD
.315" dia. with 3/8" fins—1.05" OD
.375" dia. with 5/16" fins—.98" OD
.375" dia. with 3/8" fins—1.11" OD
.430" dia. with 5/16" fins—1.04" OD
.430" dia. with 3/8" steel fins—1.15" OD, SS fins 1.16" OD
.475" dia. with 3/8" fins—1.21" OD

Fin Pitch Standards:

5±.5 for 5/16 material, 4.5-5 for 3/8 material (up to 6 per inch maximum

SURFACE FINISHES

Oven brazed steel finned units - standard

Copper brazed stainless steel fins using inert atmosphere - special

Bright annealed steel or stainless steel finned heaters

High heat aluminum painted steel — 700°F Maximum

High heat flat black painted surface — 1000°F Maximum

Nickel plated finish — 500°F Maximum

FORMING LIMITATIONS

Minimum Element Centerline Bend Radius:

.315" dia. with 5/16" fins . . . . . 3/4"
.315" dia. with 3/8" fins . . . . . 7/8"
.375" dia. with 5/16" fins . . . . . 7/8"
.375" dia. with 3/8" fins . . . . . 1.00"
.430" dia. with 5/16" fins . . . . . 1.00"
.430" dia. with 3/8" fins . . . . . 1.00"
.475" dia. with 3/8" fins . . . . . 1.00"

The above values are for factory formed heaters. Consult Tempco for field bending limits.

Made in USA

Fitting Attachment Method — General Guidelines

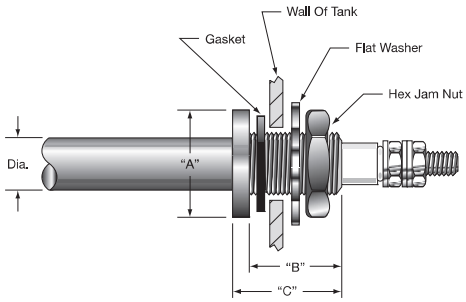
These are guidelines only. Consult Tempco if you require assistance in determining the method best suited to your application.

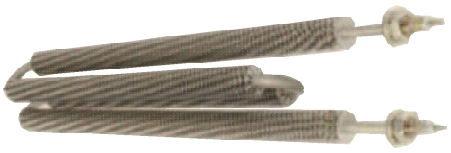
Fittings Crimped: Low pressure water (up to 80 psig) and non-pressure air applications

Fittings Brazed: Non-ferrous alloys (copper) and dissimilar non-weldable metals

Fittings Welded: High pressure liquids and gases, and high temperature applications

Standard Bulkhead Fittings For Tubular Heaters — Round Flanged Standard





Tubular Diameter in	Tubular Diameter mm	Fitting Material	Flange Type	"A" in	"A" mm	"B" in	"B" mm	"C" in	"C" mm	Thread Size (UNF)
.315	8.0	Brass	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.315	8.0	Stn. Stl.	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.375	9.5	Brass	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.375	9.5	Stn. Stl.	Round	3/4	19	1/2	12.7	5/8	16	1/2-20
.430	10.9	Brass	Round or Hex	7/8	22	3/4	19.0	7/8	22	5/8-18
.430	10.9	Stn. Stl.	Round or Hex	7/8	22	3/4	19.0	7/8	22	5/8-18
.430	10.9	Steel	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Brass	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Stn. Stl.	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Steel	Round	7/8	22	3/4	19.0	7/8	22	5/8-18
.475	12.1	Brass	Round	1	25	3/4	19.0	7/8	22	3/4-16
.475	12.1	Stn. Stl.	Round	1	25	3/4	19.0	7/8	22	3/4-16
.625	15.9	Stn. Stl.	Round	1-1/8	29	3/4	19.0	1	25	7/8-14

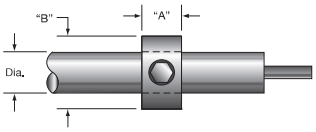
Note: Optional Larger Thread Sizes and Hex Flanged Bulkhead Fittings are available. Consult Tempco with your requirements.

Tubular Heater Standard Mounting Methods

Part Number	For Element Diameter in	For Element Diameter mm	"A" Thick in	"A" Thick mm	"B" OD in	"B" OD mm
FAS-108-102	.315	8.0	5/16	7.9	5/8	15.9
FAS-108-103	.375	9.5	3/8	9.5	3/4	19.1
FAS-108-104	.430	10.9	7/16	11.1	7/8	22.2
FAS-108-106	.475	12.0	7/16	11.1	1	25.4

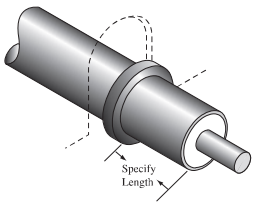
TYPE MC — Mounting Collar

Plated steel mounting collars are locked in place with a set-screw and serve as an adjustable stop for through-the-wall mounting. Collars are shipped in bulk unless otherwise specified. Mounting collars can be ordered with the heater or purchased separately.



TYPE LR — Locator Washer

Locator washers are permanently attached to the heater sheath by staking/crimping and are used to limit the movement of the heater while allowing for expansion and contraction of the heater sheath. When ordering, specify location from end of sheath.

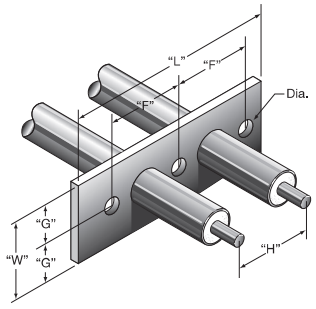


TYPE MF — Mounting Bracket

Tempco's made-to-order mounting brackets are made from 18 gauge stainless steel for strength and stiffness. It is an economical way to mount the heater in non-pressurizing, non-liquid applications. Unless otherwise specified, the bracket will be located 1/2" from the edge of the heater sheath. OEM quantity brackets are manufactured by Tempco on our own high speed precision N/C Turret Press. The standard method of attaching the tubular element to the bracket is staking or crimping.

The rectangular mounting bracket shown at right is a popular made-to-order design. Specify all dimensions shown when requesting a quote.

Custom brackets of any size, thickness or material can be supplied to meet your requirements.



Tubular Heater Standard Moisture Seals

Magnesium Oxide (MgO) is used as the insulating material in Tempco tubular heaters because of its excellent thermal conductivity and dielectric strength. However, MgO is hygroscopic and can absorb moisture from the atmosphere. This absorption of moisture may be detected when an Insulation Resistance (IR) test is done with a megohmmeter prior to energizing the heater circuit. In very humid environments, circuits utilizing a GFI (ground fault interrupter) for safety may experience nuisance tripping when energizing the heater.

The Tempco manufacturing process produces a dry element with an IR of several thousand megohms minimum. However, after shipment and depending on humidity levels and storage time, a heater can absorb moisture and show a decrease in IR. In many cases, depending on the supply voltage and the application, the heater can be safely energized and will dry itself out.

If a heater has absorbed moisture, a safe and effective method of drying it out prior to installation is to bake it in an oven at 300°F (149°C) until an acceptable IR reading is obtained. When possible, removing the terminal hardware will expedite this process. If this method is not practical consult factory for other recommendations.

For applications where moisture absorption would be unacceptable Tempco has several optional element end seals to retard absorption of moisture in the MgO. If a true hermetic seal is required, ceramic to metal end seals (Type H) are available. With any of these seals, the maximum recommended termination temperature in the seal area must not be exceeded.

Style SS—Silicone Resin Seal

A brushed-on coating that penetrates the MgO, offering economical moisture protection under humid storage conditions.

Maximum Usable Termination Temperature: 390°F (200°C)

UL Rated Maximum Termination Temperature: 221°F (105°C)

Type V2A: conformal coating
Type V2B: silicone oil

Style SER—RTV Seal

RTV (room temperature vulcanizing) silicone rubber adhesive sealant provides a good moisture seal.

UL Rated – Maximum Termination Temperature:

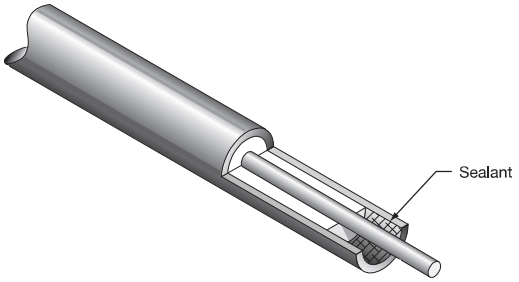
Type R: 302°F (150°C)
Type R1: 392°F (200°C)

Style SEH—Epoxy Resin Seal

Epoxy resin provides a moisture resisting barrier.

UL Rated – Maximum Termination Temperature:

Type V: 194°F (90°C)
Type V1: 266°F (130°C)
Type V4: 392°F (200°C)



Design Guidelines

The major factors that need to be considered when specifying THF finned tubular heaters are as follows:

- Minimum FPM airflow velocity at heater inlet. Is it continuous or fluctuating
- Inlet air temperature
- Outlet air temperature and temperature rise through heating elements
- Selection of element watt density to keep sheath material within its temperature limits
- Sheath material selection
- Condition of air or gas to be heated
- Mounting & airflow restrictions around elements
- KW sizing and # of circuits required (48 amp max/circuit)
- Temperature sensors & flow controls

Heater KW Sizing

Once the inlet temperature, outlet temperature, process CFM, and operating pressure are known, the KW required for the application can be determined using the following equations. If the process is heating air & operating from ambient temperature and atmospheric pressure (70°+/- 10°F & 14.7 psi), the following formula can be used;

KW = {[SCFM x (T2-T1)] ÷ 3190} + S.F.

Where:
T2 = °F outlet temperature
T1 = °F inlet temperature
SCFM = standard air flow in cu.ft./min. at atmospheric pressure and ambient temperature
S.F. = safety factor % to account for process losses

Converting CFM to SCFM

If the air heating process is pressurized or operating at an inlet temperature other than at or near ambient, the CFM at a point in the process with a known pressure & temperature must be used & converted to standard SCFM by the following formula;

SCFM = 35.4 x CFM2 x {(P2+14.7) ÷ (T2 + 460°)}

Where CFM_2 is cu.ft./min. air flow at process pressure P2.
P_2 = process pressure (psig)
T_2 = inlet °F or temperature at point of measured CFM2

Using the SCFM and the heater face flow area we can now calculate the air velocity in SFPM into the heater core as follows;
SFPM = SCFM ÷ A1
SFPM = inlet air velocity at standard conditions.
A1 = Sq.Ft. of inlet flow area at heater

An alternate method for calculating KW needed to heat air or other gas, from any inlet to outlet temperature can be done using the following general energy equation;

KW = {[60 min/hr x SCFM x Density x Sp Ht x ØT] ÷3412} + S.F.

Where:
SCFM = standard air flow in cubic feet/min (@ 70°F & 14.7 psia)
Density = Gas density in lbs/cuft at standard conditions or if pressurized process at process pressure and inlet temperature. (see table)
Sp Ht = Specific heat of gas in Btu/lb-°F at standard conditions or if pressurized process at process pressure and inlet temperature. (values for air are shown in the gas density table)
ØT = Process gas temperature rise -°F
3412 = conversion factor for Btu/hr to KW (1 KW = 3412 Btu/hr)
S.F. = safety factor % to account for process losses.

Using the inlet air velocity at the heater and the maximum outlet temperature desired the maximum sheath watt density can now be determined from the following charts for the type of heater being specified if a cataloged design is not suitable. The physical size and constraints of the application will dictate the final configuration and number of heaters required. For large installations, 3 phase circuits need to be balanced and all circuits limited no more than 48 amps per circuit. If voltages are higher than 250V, .375, .430, or .475 diameter elements are recommended.

Sheath Watt Density

The maximum sheath watt density to be specified is directly determined by the operating variables of FPM airflow velocity and inlet/outlet air/gas temperatures required. It must be selected such that sheath operating temperatures are not exceeded; 750°F for steel sheath-steel finned, or 1200°F for stainless steel/alloy sheath with stainless fins. Cataloged heaters are designed to operate within these parameters. The following charts will help guide the user in selecting proper watt density.

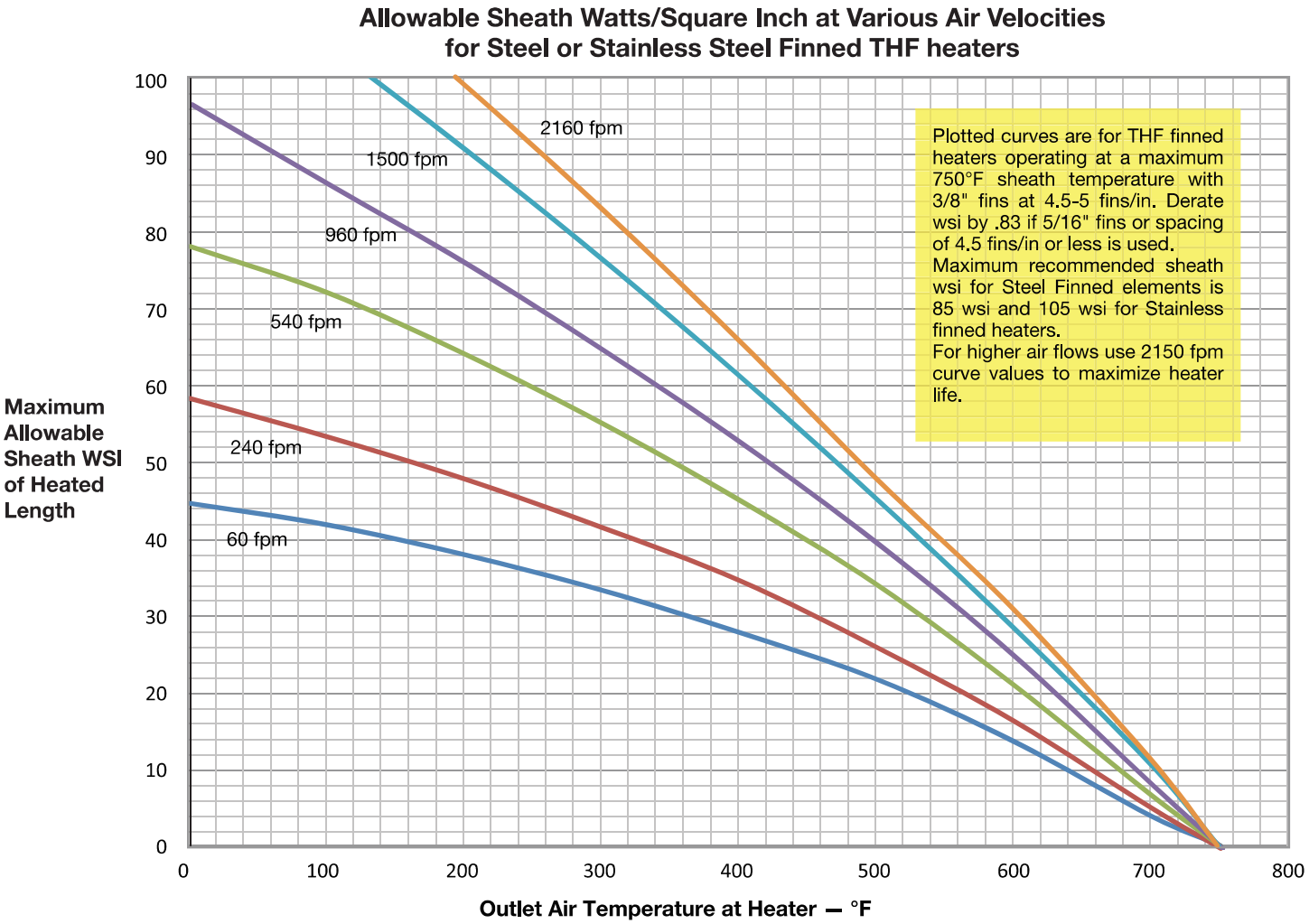


Chart 1 for steel (or SS) finned elements relates the maximum allowable sheath wsi to outlet air temperature that will be obtained at various air velocity levels.

These curves are for 750°F (or lower) sheath operating temperature.

The following Examples Illustrate the Graph's Use

Example 1

An application requires a heater to output 275°F air at an air velocity of 750 FPM. Entering the curves with 275°F, then up to 750 FPM level we find that a maximum of 62-64 wsi can be applied. Depending on voltage and space constraints either a .315 or .430 diameter catalog heater could be used.

Example 2

A curing oven needed 325°F outlet air at a minimum velocity of 1500 FPM. Entering chart at 325°F up to the 1500 FPM curve, we see that the heater could have a maximum of 70-72 sheath wsi. If a higher outlet air temperature is required, or if the airflow velocity is lower, then a reduced a sheath wsi would have to be specified.

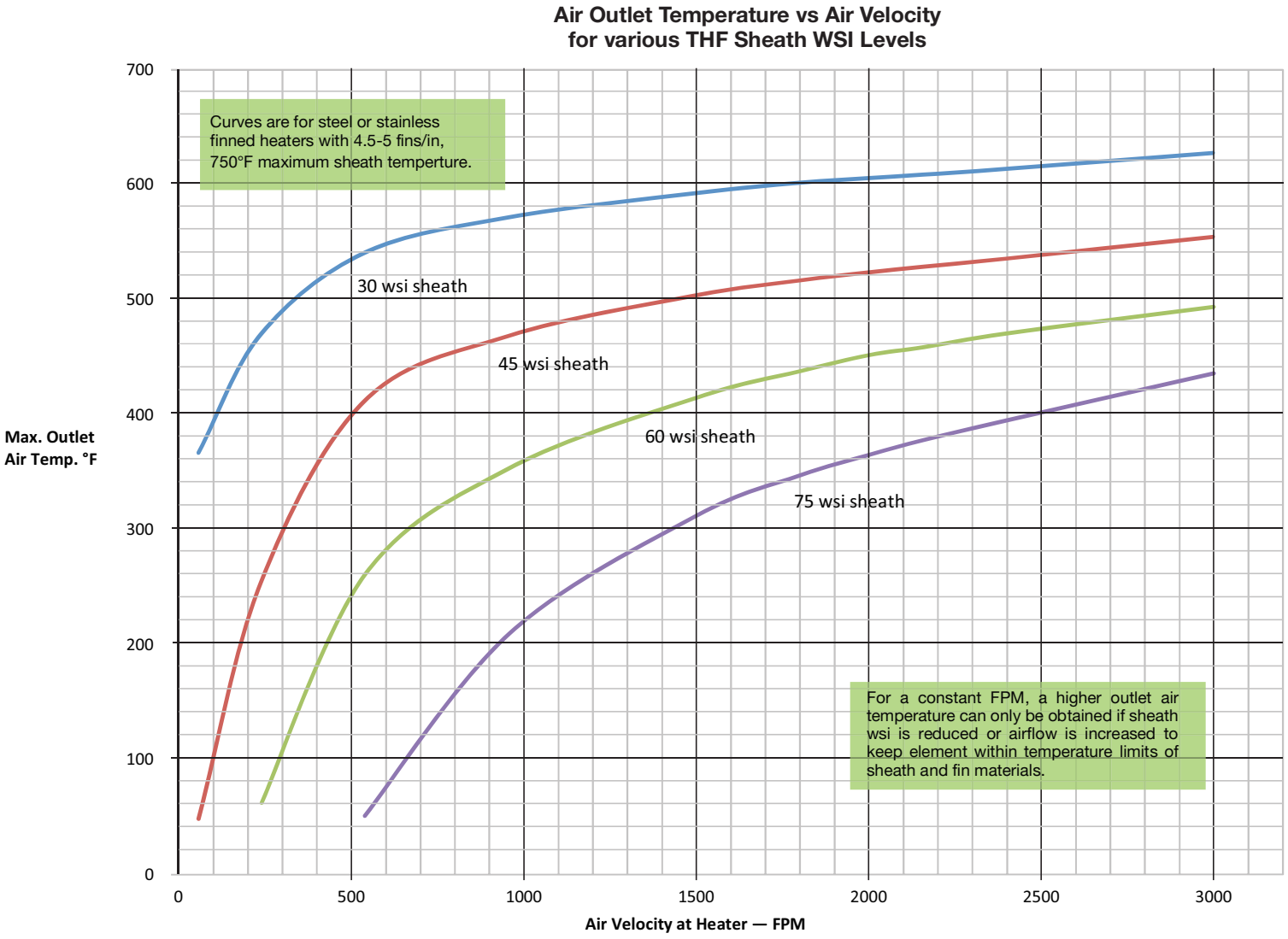


Chart 2 shows the relationship of maximum outlet air temperature obtained vs inlet air velocity at several sheath wsi levels.

This chart can be used for either steel or stainless steel finned elements operating at a maximum of 750°F and provides a way of establishing either airflow required or outlet temperature that will be obtained when sheath wsi is known for an application.

These curves show that to obtain a higher air outlet temperature at a constant FPM, the sheath wsi must be reduced to keep the element within the 750°F temperature limit of sheath & fin materials. These curves are for air entering a heater at or near ambient (60°-105°F).

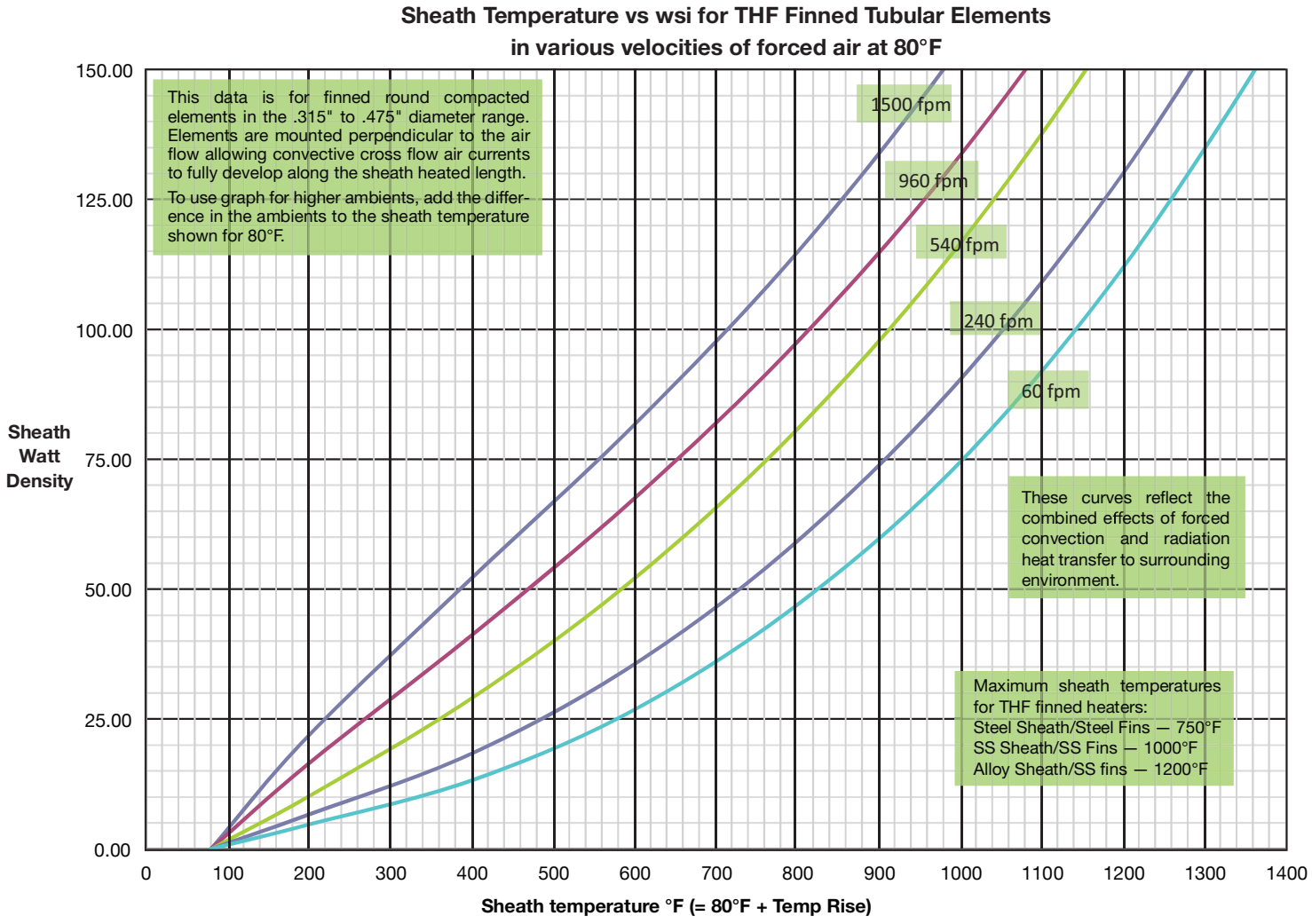


Chart 3 is a plot of sheath temperature and sheath watt density at various levels of inlet forced air at 80°F

It can be used to determine a maximum allowable sheath wsi for heating applications not restricted to the steel sheath limit of 750°. It can be used directly for most ambient air heating processes using Incoloy or Stainless Steel sheathed elements with stainless steel fins.

The following Example Illustrates the Graph's use when Operating in a Higher Ambient

Application

A recirculating process oven with organic vapors, moisture & other air contamination present, requires 500°F air at a minimum flow velocity of 900 FPM. Can a Stainless steel finned alloy sheathed heater at 80 wsi be used?

Using the Graph

Entering this chart at 900 FPM and 80 wsi, we find the sheath temperature when operating at 80°F ambient will be 700°F. The ambient temperature difference from the graph value of 80°F to the new higher 500°F ambient is 420°F (500-80). The new sheath temperature when operating in the 500°F ambient will be approximately 1120°F. (700 + 420). This is just 80° lower than the 1200°F limit for a stainless steel finned heater.

To conserve heater life it would be best to use a lower watt density & operate the heater at the lowest point possible given voltage, size, and construction constraints of the application. Consideration should be given to increasing the air velocity or using un-finned alloy sheath tubular heaters for this application. (See page 11-104)

Tech note: The reverse is true if element is operating in an ambient lower than 80°F. The sheath temperature would be reduced by the difference in the temperatures. The WSI range shown on the chart is approximately 4.25 times an unfinned tubular. The data has been confirmed by Tempco lab testing on .430 & .475 diameter finned heaters with 4.5-5 fins/in.

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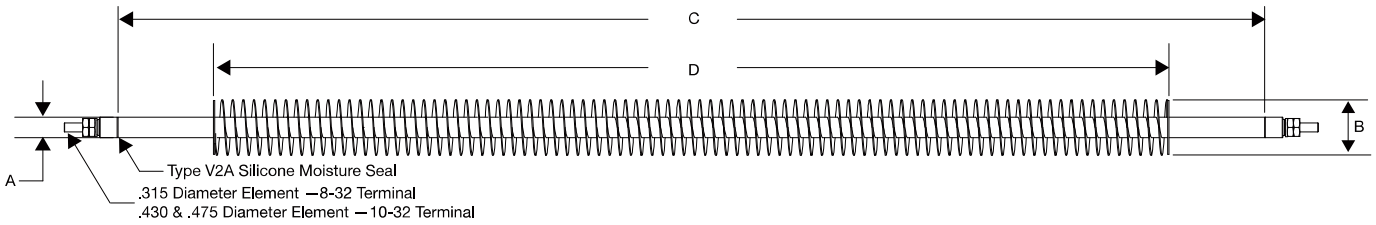


Standard (Non-Stock) Sizes and Ratings with Type T Termination

62-64 Sheath Watt Density (wsi)

Element Description	Dim. "A" inches	Dim. "B" inches	Dim. "C" inches	Dim. "D" inches	Watts	Part Number 120V	208V	240V	277V	480V
.315 Dia. Steel Element 5/16 Brazed Steel Fins 60 W/in	.315	.92	12½	8½	500	THF00321	—	—	—	—
	.315	.92	17½	13½	750	THF00322	THF00323	THF00324	—	—
	.315	.92	20½	16½	1000	THE00325	THF00326	THF00327	—	—
	.315	.92	29	25	1500	THF00328	THF00329	THF00330	—	—
	.315	.92	37	33	2000	THF00331	THF00332	THF00333	—	—
	.315	.92	54	50	3000	—	THF00334	THF00335	—	—
	.315	.92	70	66	4000	—	THF00336	THF00337	—	—
.430 Dia. Steel Element 3/8 Brazed Steel Fins 80 W/in	.430	1.15	17	13	1000	—	THF00338	THF00339	THF00340	THF00341
	.430	1.15	22¾	18¾	1500	—	THF00342	THF00343	THF00344	THF00345
	.430	1.15	29	25	2000	—	THF00346	THF00347	THF00348	THF00349
	.430	1.15	41	37	3000	—	THF00350	THF00351	THF00352	THF00353
	.430	1.15	53	49	4000	—	THF00354	THF00355	THF00356	THF00357
	.430	1.15	65	61	5000	—	THF00358	THF00359	THF00360	THF00361
	.430	1.15	77½	73½	6000	—	THF00362	THF00363	THF00364	THF00365
.475 Dia. SS Element 3/8 SS Fins 90 W/in	.475	1.21	21½	17½	1500	—	THF00366	THF00367	THF00368	THF00369
	.475	1.21	26½	22½	2000	—	THF00370	THF00371	THF00372	THF00373
	.475	1.21	37	33	3000	—	THF00374	THF00375	THF00376	THF00377
	.475	1.21	48	44	4000	—	THF00378	THF00379	THF00380	THF00381
	.475	1.21	59	55	5000	—	THF00382	THF00383	THF00384	THF00385
	.475	1.21	70	66	6000	—	THF00386	THF00387	THF00388	THF00389
	.475	1.21	81	77	7000	—	THF00390	THF00391	THF00392	THF00393
	.475	1.21	92	88	8000	—	THF00394	THF00395	THF00396	THF00397

.315 diameter elements are typically used for air heating from ambient to 250/275°F at a minimum airflow of 700 FPM.

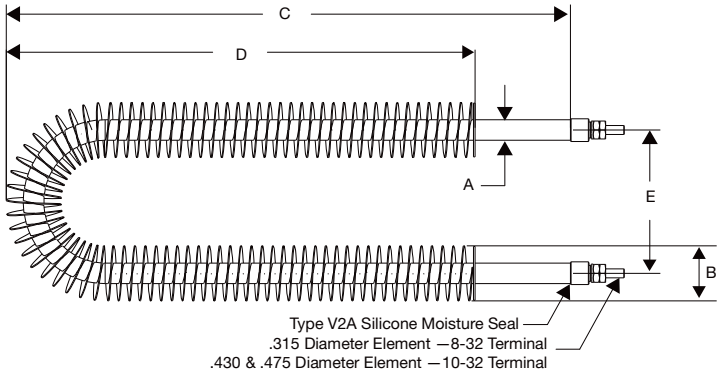
Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows

.430 diameter elements are typically used for air heating from ambient to 275/300°F at a minimum airflow of 750 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows.

.475 diameter elements are typically used for air heating from ambient to 450/500°F at a minimum airflow of 1400 FPM.

Maximum sheath temperature is 1200°F. Reduced sheath watt density (wsi) required for lower airflows.



Standard (Non-Stock) Sizes and Ratings with Type T Termination

62-64 Sheath Watt Density (wsi)

Element Description	Dim. "A" inches	Dim. "B" inches	Dim. "C" inches	Dim. "D" inches	Dim. "E" inches	Watts	Part Number 120V	208V	240V	277V	480V
.315 Dia. Steel Element 5/16 Brazed Steel Fins 60 W/in	.315	.92	8¾	6¾	2	750	THF00398	THF00399	THF00400	—	—
	.315	.92	10¾	8¾	2	1000	THF00401	THF00402	THF00403	—	—
	.315	.92	14¾	12¾	2	1500	THE00404	THF00405	THF00406	—	—
	.315	.92	18½	16½	2	2000	THF00407	THF00408	THF00409	—	—
	.315	.92	26½	24½	2	3000	THF00410	THF00411	THF00412	—	—
	.315	.92	34½	32½	2	4000	—	THF00414	THF00415	—	—
	.315	.92	43	41	2	5000	—	THF00417	THF00418	—	—
.430 Dia. Steel Element 3/8 Brazed Steel Fins 80 W/in	.430	1.15	8½	6½	2	1000	—	THF00419	THF00420	THF00421	THF00422
	.430	1.15	11½	9½	2	1500	—	THF00423	THF00424	THF00425	THF00426
	.430	1.15	14½	12½	2	2000	—	THF00427	THF00428	THF00429	THF00430
	.430	1.15	21	19	2	3000	—	THF00431	THF00432	THF00433	THF00434
	.430	1.15	27	25	2	4000	—	THF00435	THF00436	THF00437	THF00438
	.430	1.15	32½	31	2	5000	—	THF00439	THF00440	THF00441	THF00442
	.430	1.15	39½	37½	2	6000	—	THF00443	THF00444	THF00445	THF00446
.475 Dia. SS Element 3/8 SS Fins 90 W/in	.475	1.21	10½	8½	2½	1500	—	THF00447	THF00448	THF00449	THF00450
	.475	1.21	13¼	11¼	2½	2000	—	THF00451	THF00452	THF00453	THF00454
	.475	1.21	18½	16½	2½	3000	—	THF00455	THF00456	THF00457	THF00458
	.475	1.21	24	22	2½	4000	—	THF00459	THF00460	THF00461	THF00462
	.475	1.21	29½	27½	2½	5000	—	THF00463	THF00464	THF00465	THF00466
	.475	1.21	35	33	2½	6000	—	THF00467	THF00468	THF00469	THF00470
	.475	1.21	40½	38½	2½	7000	—	THF00471	THF00472	THF00473	THF00474
	.475	1.21	46	44	2½	8000	—	—	THF00475	THF00476	THF00477

.315 diameter elements are typically used for air heating from ambient to 250/275°F at a minimum airflow of 700 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows

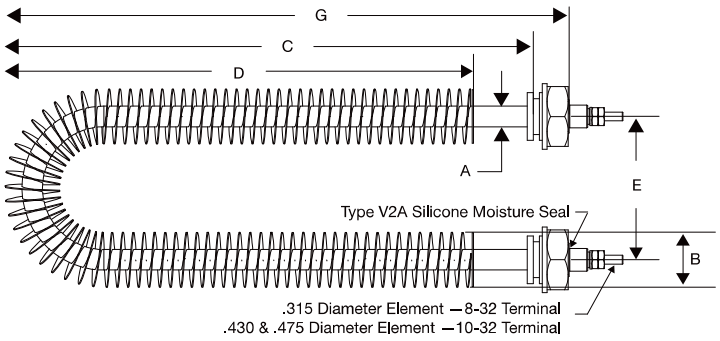
.430 diameter elements are typically used for air heating from ambient to 275/300°F at a minimum airflow of 750 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows.

.475 diameter elements are typically used for air heating from ambient to 450/500°F at a minimum airflow of 1400 FPM.

Maximum sheath temperature is 1200°F. Reduced sheath watt density (wsi) required for lower airflows.

Finned Tubular Heaters



Standard (Non-Stock) Sizes and Ratings with Type T Termination

62-64 Sheath Watt Density (wsi)

Element Description	Dim. "A" inches	Dim. "B" inches	Dim. "C" inches	Dim. "D" inches	Dim. "E" inches	Dim. "G" inches	Watts	Part Number 120V	208V	240V	277V	480V
	.315	.92	8¼	6¾	2	8¾	750	THF00478	THF00479	THF00480	—	—
.315 Dia.	.315	.92	10¼	8¾	2	10¾	1000	THF00481	THF00482	THF00483	—	—
Steel Element	.315	.92	14¼	12¾	2	14¾	1500	THE00484	THF00485	THF00486	—	—
5/16 Brazed	.315	.92	18	16½	2	18½	2000	THF00487	THF00488	THF00489	—	—
Steel Fins	.315	.92	26	24½	2	26½	3000	THF00490	THF00491	THF00492	—	—
60 W/in	.315	.92	34	32½	2	34½	4000	—	THF00493	THF00494	—	—
	.315	.92	42½	41	2	43	5000	—	THF00495	THF00496	—	—
	.430	1.15	7¾	6½	2	8½	1000	—	THF00497	THF00498	THF00499	THF00500
.430 Dia.	.430	1.15	10¾	9½	2	11½	1500	—	THF00501	THF00502	THF00503	THF00504
Steel Element	.430	1.15	13¾	12½	2	14½	2000	—	THF00505	THF00506	THF00507	THF00508
3/8 Brazed	.430	1.15	20¼	19	2	21	3000	—	THF00509	THF00510	THF00511	THF00512
Steel Fins	.430	1.15	26¼	25	2	27	4000	—	THF00513	THF00514	THF00515	THF00516
80 W/in	.430	1.15	32¼	31	2	33	5000	—	THF00517	THF00518	THF00519	THF00520
	.430	1.15	38¾	37½	2	39½	6000	—	THF00521	THF00522	THF00523	THF00524
	.475	1.21	9¾	8½	2½	10½	1500	—	THF00525	THF00526	THF00527	THF00528
	.475	1.21	12½	11¼	2½	13¼	2000	—	THF00529	THF00530	THF00531	THF00532
.475 Dia.	.475	1.21	17¾	16½	2½	18½	3000	—	THF00533	THF00534	THF00535	THF00536
SS Element	.475	1.21	23¼	22	2½	24	4000	—	THF00537	THF00538	THF00539	THF00540
3/8 SS Fins	.475	1.21	28¾	27½	2½	29½	5000	—	THF00541	THF00542	THF00543	THF00544
90 W/in	.475	1.21	34¼	33	2½	35	6000	—	THF00545	THF00546	THF00547	THF00548
	.475	1.21	39¾	38½	2½	40½	7000	—	THF00549	THF00550	THF00551	THF00552
	.475	1.21	45¼	44	2½	46	8000	—	—	THF00553	THF00554	THF00555

.315 diameter elements are typically used for air heating from ambient to 250/275°F at a minimum airflow of 700 FPM.

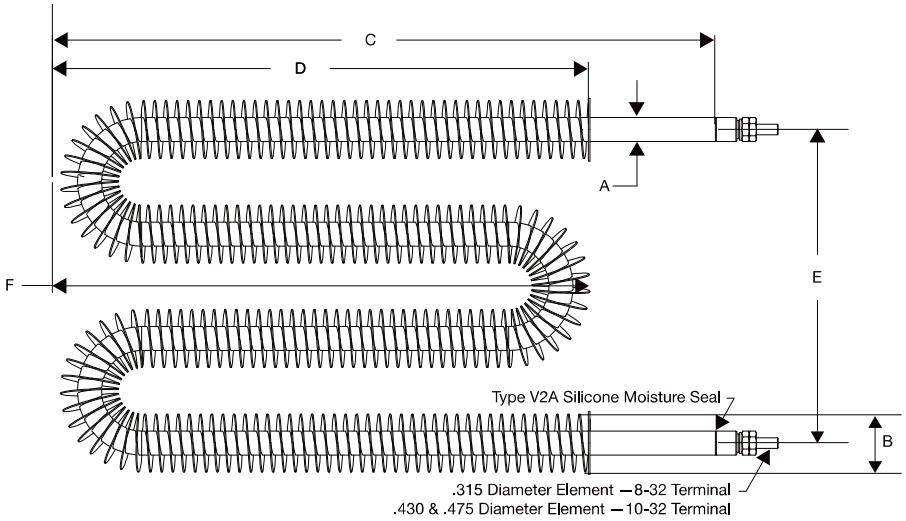
Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows

.430 diameter elements are typically used for air heating from ambient to 275/300°F at a minimum airflow of 750 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows.

.475 diameter elements are typically used for air heating from ambient to 450/500°F at a minimum airflow of 1400 FPM.

Maximum sheath temperature is 1200°F. Reduced sheath watt density (wsi) required for lower airflows.



Standard (Non-Stock) Sizes and Ratings with Type T Termination

62-64 Sheath Watt Density (wsi)

Element Description	Dim. "A" inches	Dim. "B" inches	Dim. "C" inches	Dim. "D" inches	Dim. "E" inches	Dim. "F" inches	Watts	Part Number 120V	208V	240V	277V	480V
.315 Dia. Steel Element 5/16 Brazed Steel Fins 60 W/in	.315	.92	6¼	4¼	6	4¼	1000	THF00556	THF00557	THF00558	—	—
	.315	.92	8¼	6¼	6	6¼	1500	THF00559	THF00560	THF00561	—	—
	.315	.92	10¼	8¼	6	8¼	2000	THE00562	THF00563	THF00564	—	—
	.315	.92	14¼	12¼	6	12¼	3000	THF00565	THF00466	THF00567	—	—
	.315	.92	18¼	16¼	6	16¼	4000	THF00568	THF00569	THF00570	—	—
	.315	.92	22¼	20¼	6	20¼	5000	—	THF00571	THF00572	—	—
	.315	.92	24¼	24¼	6	24¼	6000	—	THF00573	THF00574	—	—
.430 Dia. Steel Element 3/8 Brazed Steel Fins 80 W/in	.430	1.15	8	6	7.5	6	2000	—	THF00575	THF00576	THF00577	THF00578
	.430	1.15	11	9	7.5	9	3000	—	THF00579	THF00580	THF00581	THF00582
	.430	1.15	14	12	7.5	12	4000	—	THF00583	THF00584	THF00585	THF00586
	.430	1.15	17	15	7.5	15	5000	—	THF00587	THF00588	THF00589	THF00590
	.430	1.15	20	18	7.5	18	6000	—	THF00591	THF00592	THF00593	THF00594
	.430	1.15	23	21	7.5	21	7000	—	THF00595	THF00596	THF00597	THF00598
	.430	1.15	26	24	7.5	24	8000	—	—	THF00599	THF00600	THF00601
.475 Dia. SS Element 3/8 SS Fins 90 W/in	.475	1.21	7½	5½	9	5½	2000	—	THF00602	THF00603	THF00604	THF00605
	.475	1.21	10	8	9	8	3000	—	THF00606	THF00607	THF00608	THF00609
	.475	1.21	12½	10½	9	10½	4000	—	THF00610	THF00611	THF00612	THF00613
	.475	1.21	15½	13½	9	13½	5000	—	THF00614	THF00615	THF00616	THF00617
	.475	1.21	18	16	9	16	6000	—	THF00618	THF00619	THF00620	THF00621
	.475	1.21	21	19	9	19	7000	—	THF00622	THF00623	THF00624	THF00625
	.475	1.21	24	22	9	22	8000	—	—	THF00626	THF00627	THF00628

.315 diameter elements are typically used for air heating from ambient to 250/275°F at a minimum airflow of 700 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows

.430 diameter elements are typically used for air heating from ambient to 275/300°F at a minimum airflow of 750 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows.

.475 diameter elements are typically used for air heating from ambient to 450/500°F at a minimum airflow of 1400 FPM.

Maximum sheath temperature is 1200°F. Reduced sheath watt density (wsi) required for lower airflows.

Finned Tubular Heaters

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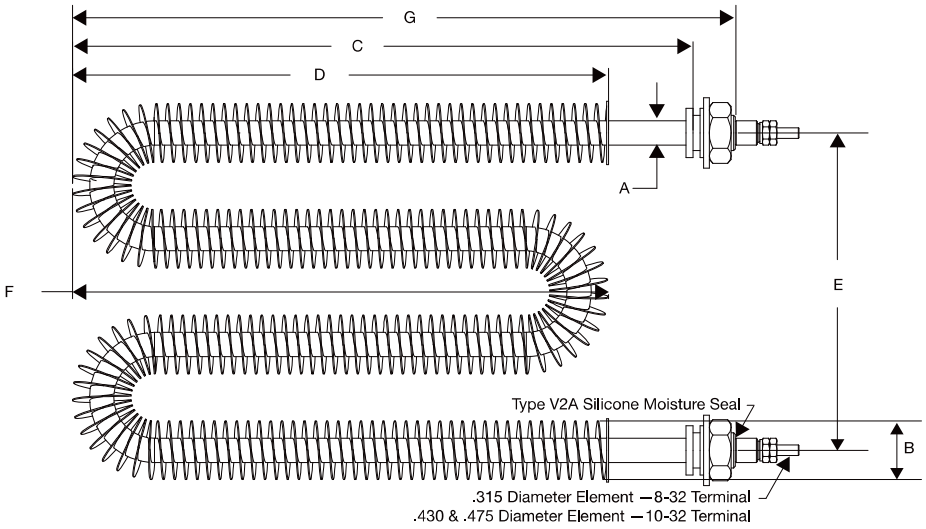


Standard (Non-Stock) Sizes and Ratings with Type T Termination

62-64 Sheath Watt Density (wsi)

Element Description	Dim. "A" inches	Dim. "B" inches	Dim. "C" inches	Dim. "D" inches	Dim. "E" inches	Dim. "F" inches	Dim. "G"	Watts	Part Number 120V	208V	240V	277V	480V
.315 Dia. Steel Element 5/16 Brazed Steel Fins 60 W/in	.315	.92	5¾	4¼	6	4¼	6¼	1000	THF00629	THF00630	THF00631	—	—
	.315	.92	7¾	6¼	6	6¼	8¼	1500	THF00632	THF00633	THF00634	—	—
	.315	.92	9¾	8¼	6	8¼	10¼	2000	THE00635	THF00636	THF00637	—	—
	.315	.92	13¾	12¼	6	12¼	14¼	3000	THF00638	THF00639	THF00640	—	—
	.315	.92	17¾	16¼	6	16¼	18¼	4000	THF00641	THF00642	THF00643	—	—
	.315	.92	21¾	20¼	6	20¼	22¼	5000	—	THF00644	THF00645	—	—
	.315	.92	25¾	24¼	6	24¼	26¼	6000	—	THF00646	THF00647	—	—
.430 Dia. Steel Element 3/8 Brazed Steel Fins 80 W/in	.430	1.15	7¼	6	7.5	6	8	2000	—	THF00648	THF00649	THF00650	THF00651
	.430	1.15	10¼	9	7.5	9	11	3000	—	THF00652	THF00653	THF00654	THF00655
	.430	1.15	13¼	12	7.5	12	14	4000	—	THF00656	THF00657	THF00658	THF00659
	.430	1.15	16¼	15	7.5	15	17	5000	—	THF00660	THF00661	THF00662	THF00663
	.430	1.15	19¼	18	7.5	18	20	6000	—	THF00664	THF00665	THF00666	THF00667
	.430	1.15	22¼	21	7.5	21	23	7000	—	THF00668	THF00669	THF00670	THF00671
	.430	1.15	25¼	24	7.5	24	26	8000	—	—	THF00672	THF00673	THF00674
.475 Dia. SS Element 3/8 SS Fins 90 W/in	.475	1.21	6¾	5½	9	5½	7½	2000	—	THF00675	THF00676	THF00677	THF00678
	.475	1.21	9¼	8	9	8	10	3000	—	THF00679	THF00680	THF00681	THF00682
	.475	1.21	11¾	10½	9	10½	12½	4000	—	THF00683	THF00684	THF00685	THF00686
	.475	1.21	14¾	13½	9	13½	15½	5000	—	THF00687	THF00688	THF00689	THF00690
	.475	1.21	17¼	16	9	16	18	6000	—	THF00691	THF00692	THF00693	THF00694
	.475	1.21	20¼	19	9	19	21	7000	—	THF00695	THF00696	THF00697	THF00698
	.475	1.21	23¼	22	9	22	24	8000	—	—	THF00699	THF00700	THF00701

.315 diameter elements are typically used for air heating from ambient to 250/275°F at a minimum airflow of 700 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows

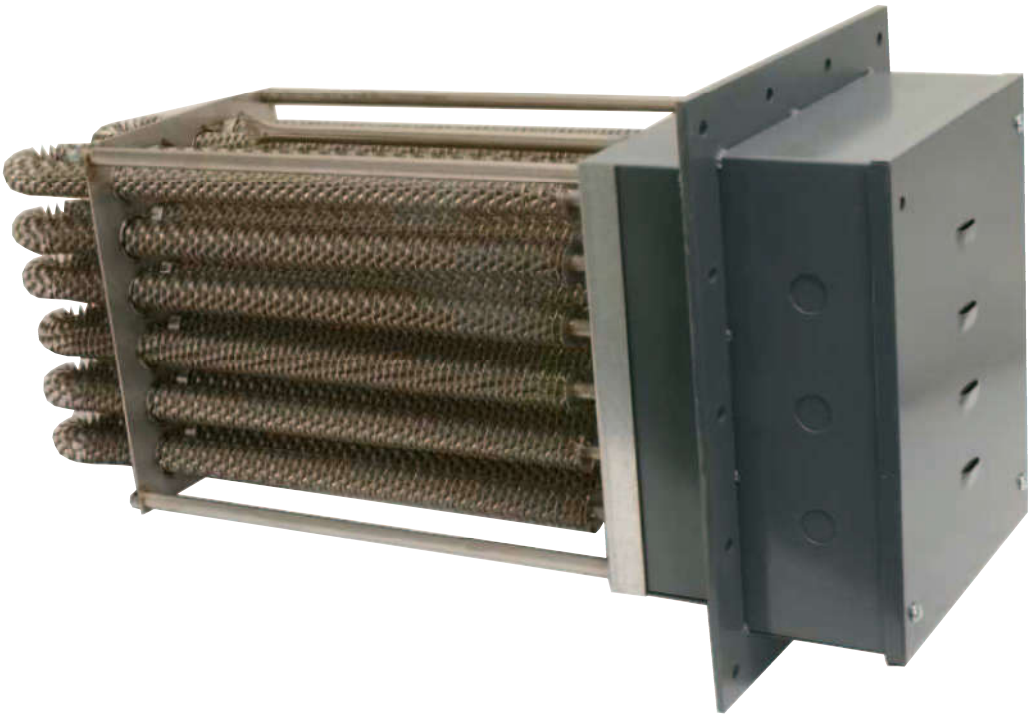
.430 diameter elements are typically used for air heating from ambient to 275/300°F at a minimum airflow of 750 FPM.

Maximum sheath temperature is 750°F. Reduced sheath watt density (wsi) required for lower airflows.

.475 diameter elements are typically used for air heating from ambient to 450/500°F at a minimum airflow of 1400 FPM.

Maximum sheath temperature is 1200°F. Reduced sheath watt density (wsi) required for lower airflows.

Finned Duct Heaters can be found on Page 11-113A and 11-113B



Made in USA

Single-Ended Tubular Heaters

The Single-Ended Tubular Heater manufacturing and design process is similar to that of the double ended tubular heater. Single ended tubular heaters are made strictly per customer request, providing an economical alternative to cartridge heater applications, simplifying wiring and installation for applications requiring localized heat. Flanges, bulkhead and NPT fittings can be attached to the sheath for mounting or immersion heating applications.

Specifications

Diameters: .315" .430" .475".490", .625"
Material: 304SS, 316SS, Monel, Steel
Min. Sheath Length: 11" **Max. Sheath Length:** 96"
Termination: Lead Wires
Max. Volts: 277 Vac **Max. Amperage:** 30 Amp

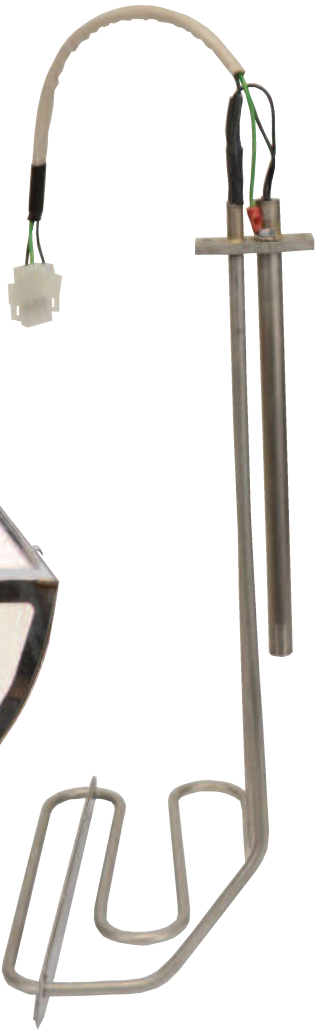
Ordering Information Single-Ended Tubular Heaters

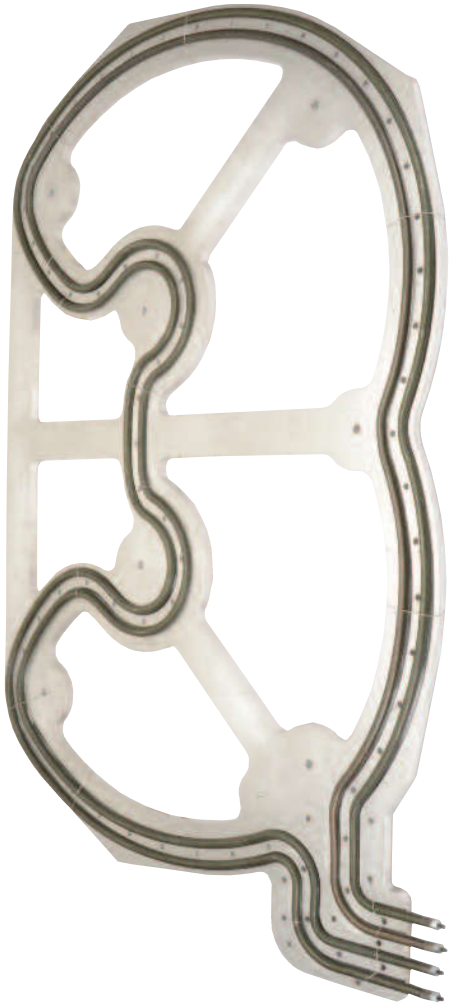
Please Specify the following:

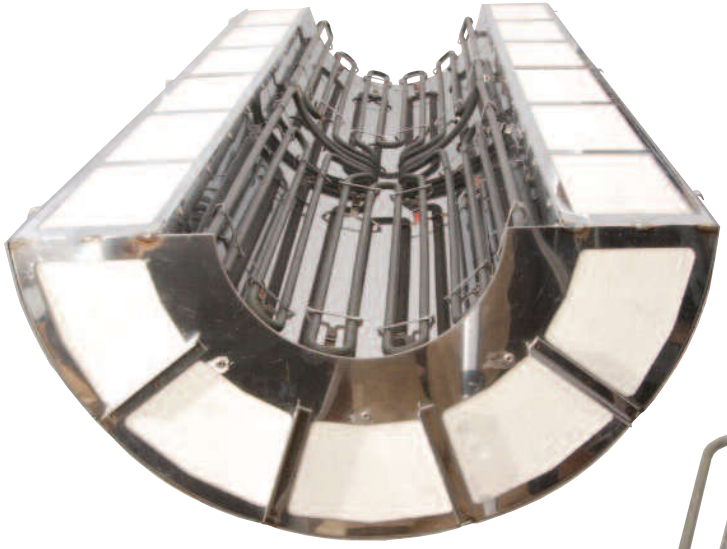
- ❑ Sheath Material and Diameter
- ❑ Heater Length and Cold Ends
- ❑ Bulkhead Fittings
- ❑ Wattage and Voltage
- ❑ Terminations and Seals
- ❑ Mounting Flange

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

The Tubular Heater — The Most Customizable Electric Heating Element







Type ART Tubular Radiant Heater Arrays

Tempco can design and manufacture a custom tubular heater array for applications requiring infrared heat. Call for details.

Other type infrared heaters can be found in Section 7.

Tubular Heaters

Quote Request

Made in USA

Tubular Heater, Finned Tubular Heater and Single Ended Tubular Heater Quote Request

Made-To-Order Quote Request Form — Copy and Fax (630-350-0232) us your requirements.

Customer Drawing

Name _____
Company _____
Address _____
_____
_____
Phone _____ **Fax** _____
Email _____

Application Information

Describe in Detail _____
_____
_____
Air or Immersion _____
Maximum Load Temperature _____
Quantity _____

Specifications

Type: Standard _____ Finned_____ Single Ended_____
Sheath Material _____
Diameter _____ **Fin Dia.** ***if applies*** _____
Overall Sheath Length _____
Cold Section: 1st end _____ 2nd end _____
Watts _____ **Volts** _____
UL _____ **cUL** _____ **CSA** _____ **CE** _____
Termination Type _____ ***(Type T – standard screw)***
_____

Standard Options

Mounting: MC ___ LR ___ Location: _____ MF ___
Bulkhead Fittings ___ Material ___ Flange Type ___
Describe if Custom
_____
_____

Moisture Seals

Moisture Seals: None ____
Optional: Style SS: Type V2A____ Type V2B____
Style SER: Type R ____ Type R1 ____
Style SEH: Type V ____ Type V1 ____
Type M ____ Type H ____
Describe if Custom _____
_____
_____

Optional Sheath Surface Treatments

(For Incoloy® and Stainless Steel Sheath Elements only)
Passivation _____ **Bright Annealing** _____
Electro-Polishing _____
Other _____
_____
_____

Bends and Shapes

Standard Formation Code _____
Specify Letters and Corresponding Dimensions Below:
__ _____ __ _____ __ _____ __ _____ __ _____ __ _____
__ _____ __ _____ __ _____ __ _____ __ _____ __ _____
__ _____ __ _____ __ _____ __ _____ __ _____ __ _____
Number of Bends ***if known***
Single/Multiple _____ Plane _____
Coils/Turns _____ Dia. _____
Circle: Full ___ Dia. ___ Partial ___ Degree ___
Describe if Custom: _____
_____
_____
_____

⚠ **WARNING:** Cancer and Reproductive Harm - www.P65Warnings.ca.gov.

View Product Inventory @ www.tempco.com

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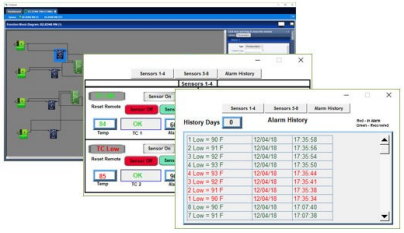
- ✓ critique OEM designs

  - efficient thermal design
  - heating element life
  - temperature sensing
  - temperature control
  - safety limit
  - power control
  - user interface
  - communications
  - environment
  - temperature uniformity
  - data logging
  - ramp/soak profile
  - process control
  - SCADA



Equation 1

$$Q_A \text{ or } Q_B = \frac{w \cdot C_p \cdot \Delta T}{3.412}$$

Q_A = Heat Required to Raise Temperature of Materials During Heat-Up (Wh)

Q_B = Heat Required to Raise Temperature of Materials Processed in Working Cycle (Wh)

w = Weight of Material (lb)

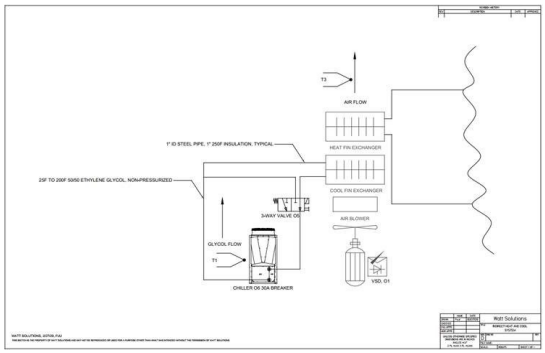
C_p = Specific Heat of Material (Btu/lb · °F)

ΔT = Temperature Rise of Material ($T_{Final} - T_{Initial}$)(°F)

This equation should be applied to all materials absorbing heat in the application. Heated media, work being processed, vessels, racks, belts, and ventilation air should be included.

Example: How much heat energy is needed to change the temperature of 50 lbs of copper from 10°F to 70°F?

$$Q = w \cdot C_p \cdot \Delta T = \frac{(50 \text{ lbs}) \cdot (0.10 \text{ Btu/lb} \cdot °F) \cdot (60°F)}{3.412} = 88 \text{ (Wh)}$$



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Please take advantage of our engineering capability & thermal systems expertise. We have the product and industry experience to provide "turn-key results" that match the needs of your application. We are experts with heaters, sensors, controllers & thermal systems and we have many years of experience so feel free to bring your technical questions directly to us and be sure to contact us if you are interested in a change for the better!

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