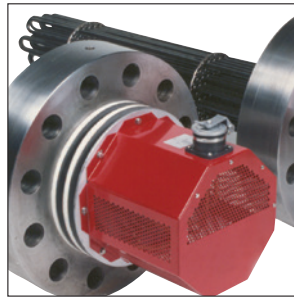
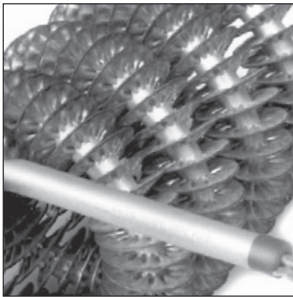


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Caloritech™

Engineered Electric Heat



Elements & Specialty Heaters

Section A

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Tubular Heaters - HX & IX

Thermon Heating Systems Inc. has one factory dedicated to the production of the highest quality tubular heating elements. We use only the best commercially available materials and we use design parameters proven to maximize element life expectancy.

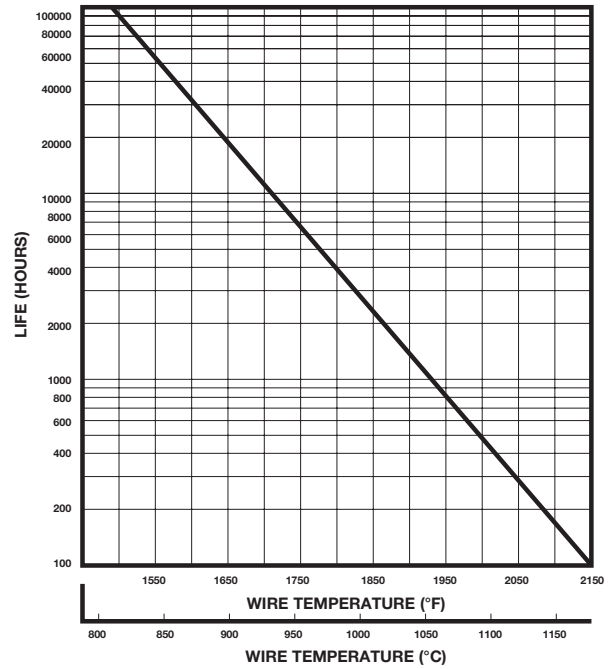


Figure 1 – Life vs. Coil Temperature (Typical)

Operating Principles

Refer to Figure 2 on page A5 for typical heating element construction. The coil and terminal pins are electrically isolated from the outer metal sheath with highly compacted magnesium oxide which also serves as a conductor for the heat generated by the coil.

When voltage is applied to the heating element terminals, an electric current passes through the heating element resistance coil. Heat is produced as wattage in accordance with Ohm's law where the wattage equals I^2R (current squared x coil resistance).

Watt Density

Watt density is defined as the watts per unit of surface area of the heated section of the heating element. The selection of the ideal watt density for a particular application is the most important parameter affecting heating element service life.

All heat generated by the element resistance coil must be transferred from its sheath so that a balance is maintained. If the transferring medium is poor, the element may reach a high temperature before a sufficient temperature gradient is developed to reach thermal balance.

Since watt density also determines the temperature gradient between the sheath and the resistance coil, it is essentially the watt density that sets the resistance coil temperature.

Life Expectancy

Normal life expectancy depends mainly on the resistance coil operating temperature (see Figure 1 on page A4) which is a function of the sheath operating temperature and the wattage per unit heated length of element.

Factors such as cycling frequency will also affect life.

Sheath Materials

Sheath material selection ranks next to watt density in importance. The sheath must withstand the corrosive and temperature effects of its environment. For instance, elements designed for operation in water will generally fail if operated in air.

Fortunately, many different sheath materials are available, making the tubular heater suitable for the vast majority of heating applications.

Sizes and Shapes

We offer a broad selection of element sizes and shapes to suit most any requirement. Larger diameter elements must be used for high voltage applications. Although practical considerations limit length, we can splice selected diameter elements to achieve continuous lengths in excess of 167' (50 m).

In most applications, the elements are formed at the factory in a series of loops or coils. Elements require furnace annealing prior to bending.

Insulation Resistance

If an unsealed element is to be installed in a damp area, the element insulation resistance to ground may decrease and, in severe cases, approach zero ohms. Elements with low insulation resistance have high leakage currents which, under certain circumstances, could be hazardous. Factory installed seals which prevent moisture from entering at the terminal ends of the element are available.

Dielectric Strength Tests

One hundred percent (100%) of the elements we manufacture are dielectric strength tested before they are released for shipment. This test, conducted at many times the intended operating voltage of the element, insures that the heater will not "short-out" during normal life.

Application

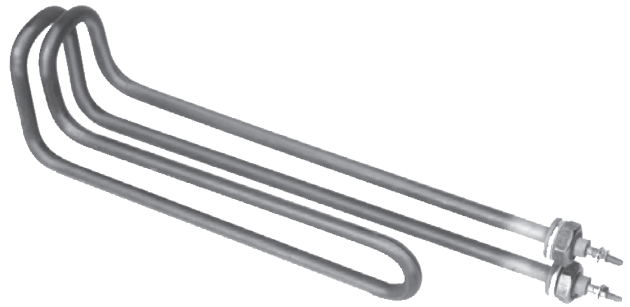
Tubular elements of proper rating, material and shape can be used in most heating applications requiring process temperatures to 1382°F (750°C).

Many of the heaters listed in this catalog utilize tubular elements as the heat source.

Tubular elements may be clamped, immersed, cast into metal or spaced away from the work as radiant heaters. Elements can also be positioned in ducts or vessels for heating air or other gases.

Features

- Easy to install
- Available in a wide variety of sheaths, diameters, and ratings
- Heat can be located exactly where required
- Can be formed to practically any shape
- Compact
- Easy to control to provide heat only when required
- Low maintenance and long life
- Excellent internal electrical insulation and heat conduction
- Electrically isolated sheath



Catalog Numbers

We assign a unique catalog number to all elements we manufacture (where practical). One of three prefixes is used to designate which type of element has been supplied as follows:

Table 1 – Catalog Numbers

Prefix	Type
HX	straight, unfinned
IX	formed unfinned
KX	any finned element

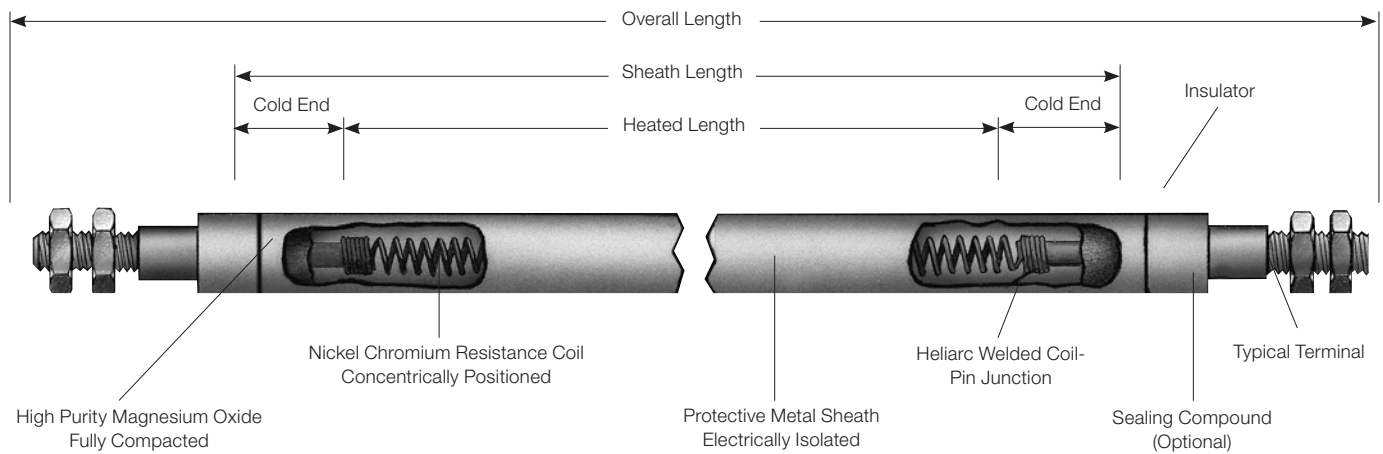


Figure 2 – Tubular Element Features and Components (Construction)

Typical Shapes

Factory Bending

Tubular heaters can be factory formed to virtually any shape. Inside bending diameters are as small as one element diameter are sometimes possible. Figures 3 to 13 illustrate some of the most commonly used element shapes. If your application can be satisfied with one of these shapes, you may wish to refer to these figures when ordering or requesting pricing information.

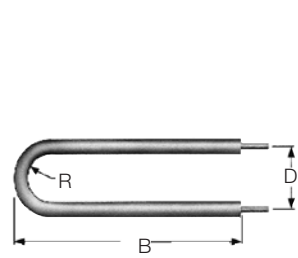


Figure 3

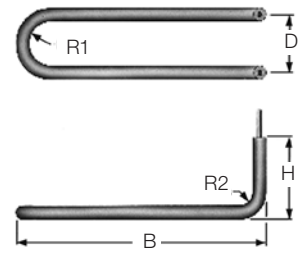


Figure 4

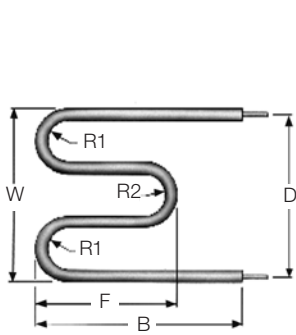


Figure 5

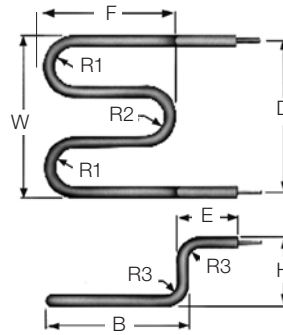


Figure 6

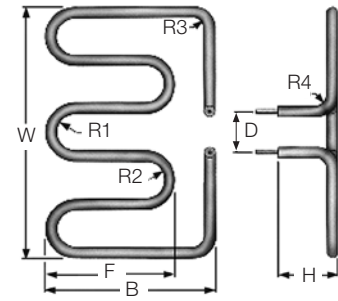


Figure 7

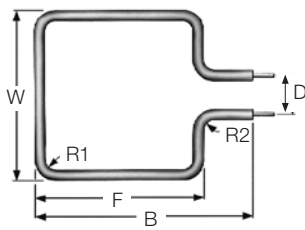


Figure 8

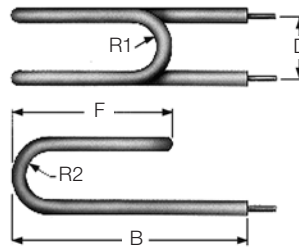


Figure 9

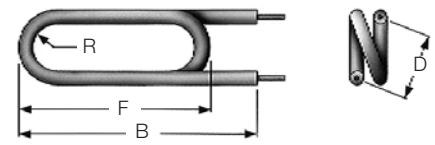


Figure 10

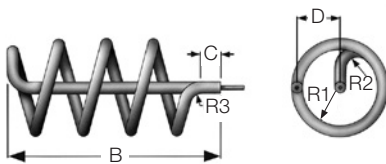


Figure 11

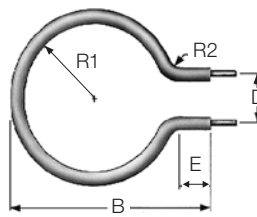


Figure 12

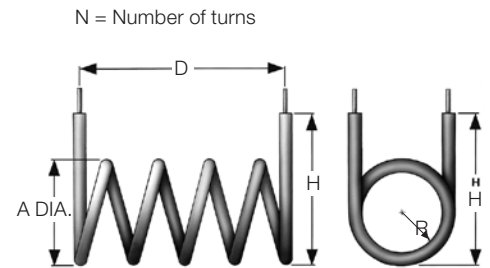


Figure 13

Typical Installations

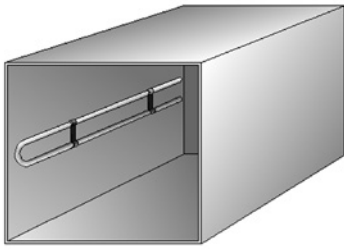


Figure 14 – In ovens or cabinets

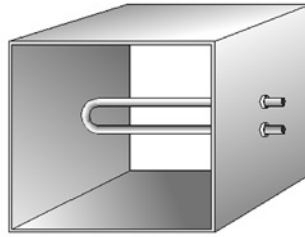


Figure 15 – In ducts

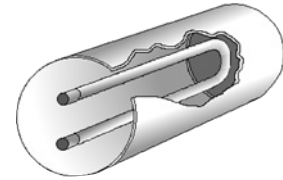


Figure 16 – In pipe wells

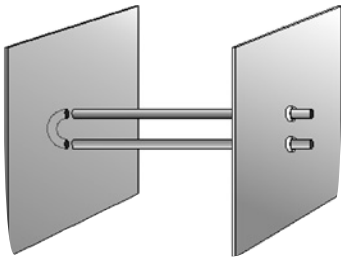


Figure 17 – Clamped to walls, hoppers and pipes

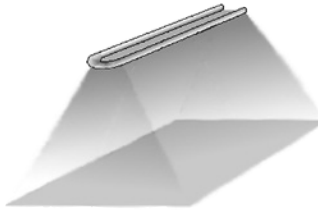


Figure 18 – To radiate heat

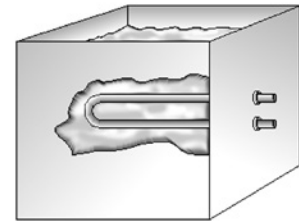


Figure 19 – Immersed in liquids

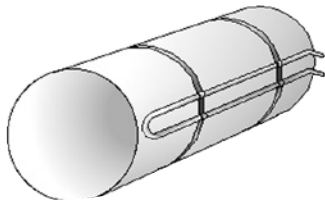


Figure 20 – Clamped to walls, hoppers and pipes

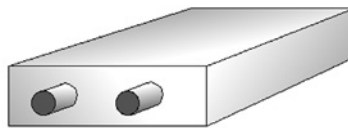


Figure 21 – In drilled holes in plates or cylinders

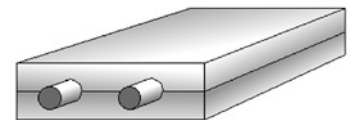


Figure 22 – Sandwiched between plates

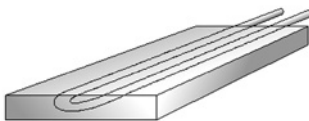


Figure 23 – Cast-in to iron, aluminum or copper

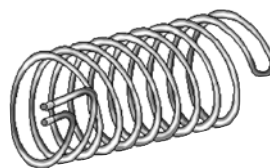


Figure 24 – Bent to conform to system geometry

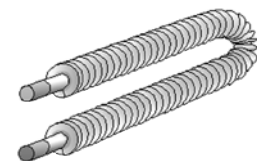


Figure 25 – In finned heater assemblies

Selection

Most tubular elements are made-to-order. The following procedure (Step 1 to Step 9) will simplify the selection of the element best suited to your needs. If you need assistance we will, without obligation, determine your kW requirements and provide design sketches.

Step 1 - Determination of wattage requirements.

Refer to Section D of the Caloritech™ catalog for technical data and sample calculations.

Step 2 - Selection of voltage rating and phase.

Remember that, for any fixed voltage, the higher the wattage rating, the higher will be the current. If you have a choice of available voltages try to specify the higher voltage, especially if the required wattage is above 6 kW.

Step 3 - Selection of sheath material.

Sheath material selection is based on the highest expected sheath temperature and also the ability of the metal to withstand corrosion.

1. Copper - For immersion heating of water and noncorrosive aqueous solutions.
2. Steel - For immersion heating of oil or paraffin or casting into iron.
3. Incoloy® - For heating air and other gases; clamping-on to tanks and platens; immersion into salt solutions, soft metals, oils, most mildly corrosive chemical solutions; for radiant heating.
4. Other Materials - Refer to the Corrosion Guide recommendations in Section D of the Caloritech™ catalog.

See Table 2 for common sheath materials and maximum allowable sheath temperatures.

Step 4 - Selection of sheath diameter

Select sheath diameter from Table 3 on page A8. Remember that smaller diameter sheaths are the most economical, but their use is restricted at the higher voltages.

Step 5 - Determination of allowable watt density.

Below is a partial listing of maximum recommended watt densities. Refer to Section D for a more complete listing encompassing most applications.

Table 2 – Sheath Materials vs. Temperature

Standard Sheaths	Maximum Allowable Temperature	
	°F	°C
Copper	350	177
Bundy®	750	400
Incoloy®	1500	815
Stainless 304, 321	1400	750
Steel	750	400
Special Sheaths	Maximum Allowable Temperature	
	°F	°C
Incoloy®	1600	870
Monel®	900	480
Stainless 316	1400	760
Titanium	1000	540

Table 3 – Sheath Diameter vs. Maximum Allowable Voltage

Standard Diameter		Max Volts	Special Diameter		Max Volts
in	mm		in	mm	
0.260	6.6	250	0.122	2.8	120
0.315	8.0	600	0.160	4.1	250
0.430	10.9	600	0.205	5.2	250
0.475	12.1	600	0.375	9.5	600
–	–	–	0.540	13.7	600

Table 4 – Maximum Watt Density Ratings

These are suggested ratings only and will differ when flow velocity, heat transfer rate, or operating temperature vary.

Material Being Heated	Maximum Watts Per Square Inch	Operation Temperature	
		°F	°C
Acid Solution	40	180	82
Alkaline Solution	40	212	100
Ammonia Plating Solution	25	50	10
Degreasing Solution, Vapor	20	275	135
Electroplating Solution	40	180	82
Fatty Acids	20	150	66
Freon	3	300	149
Gasoline	25	300	149
Glycerine	40	50	10
Lead-Stereotype Pot	35	600	316
Linseed Oil	50	150	66
Molasses	4–5	100	38
Bunker C Fuel**	8	160	71
Dowtherm A**	20	600	316
Dowtherm E**	12	400	204
Fuel Preheating**	9–14	180	82
Machine (SAE 30)**	18–24	250	121
Mineral**	20–26	200	93
	16–18	400	204
Vegetable**	30–50	400	204
Paraffin or Wax	16–22	150	66
Potassium Hydroxide	25	160	71
Water	55–80	212 (100)	

Notes

*0.315" (8 mm) diameter elements above 300V require special terminals.

**Oils

Step 6 - Determination of total required heated length.

Using the maximum allowable watt density from Step 5 and the selected diameter from Step 4 refer to Figure 26 on page A9 to determine the wattage per unit of length.

Next divide this number into the required wattage as determined in Step 1. This gives you the total heated length required.

Step 7 - Determination of the cold end length.

Ideally, the cold end should not be less than 1-1/2" (4 cm) for sheath lengths up to 80" (200 cm) and 2-1/2" (6.5 cm) for sheath lengths over 80" (200 cm). It shall not terminate within a bent section of the element. For immersion, the cold end must always terminate below the minimum liquid level. For higher temperature, "clamp-on", or air heating applications, increasing the cold length will result in lower terminal temperatures.

Step 8 - Determination of element configuration and total sheath length.

For other shapes, forward to us a hand sketch showing all critical dimensions. In selecting an element shape you may have to use more than one element to meet the following conditions:

- a. To distribute heat over a large surface or tank;
- b. If required sheath length is greater than maximum available length shown in Table 5 on page A9;
- c. If element heated length, voltage, and wattage selected are outside of minimum and maximum ohms per unit of length as shown in Table 5 on page A9.

Step 9 - Selection of element terminal and optional hardware

$$\text{Ohms/Unit Length} = \frac{\text{Volts}^2}{\text{Watts} \times \text{Heated Length}}$$

Table 5 – Sheath Diameter vs. Maximum Length and Ohms/Unit Length

Sheath Diameter		Maximum Length		Ohms Per Minimum Ohms/in (mm)	Heated Length Maximum Ohms/in (mm)
in	mm	in	cm		
0.112	2.8	55	140	0.300 (0.0118)	3.2 (0.126)
0.160	4.1	120	305	0.230 (0.0090)	9.0 (0.354)
0.205	5.2	155	394	0.170 (0.0066)	12.0 (0.472)
0.260	6.6	102	259	0.56 (0.0222)	10.0 (0.395)
0.315	8.0	151	393.5	0.035 (0.0014)	13.0 (0.512)
0.375	9.5	146	371	0.040 (0.0016)	13.0 (0.512)
0.430	10.9	285	724	0.025 (0.0010)	14.0 (0.551)
0.475	12.1	285	724	0.25 (0.0010)	14.0 (0.551)
0.540	13.7	106	270	0.25 (0.0010)	14.0 (0.551)

Notes

1. 0.260" (0.66 mm) & 0.315" (0.80 mm) Diam. elements are available in lengths up to 285" (724 cm) in low volume runs (check factory).
2. Lengths beyond maximums shown above can be increased by splicing. Check factory for limitations.

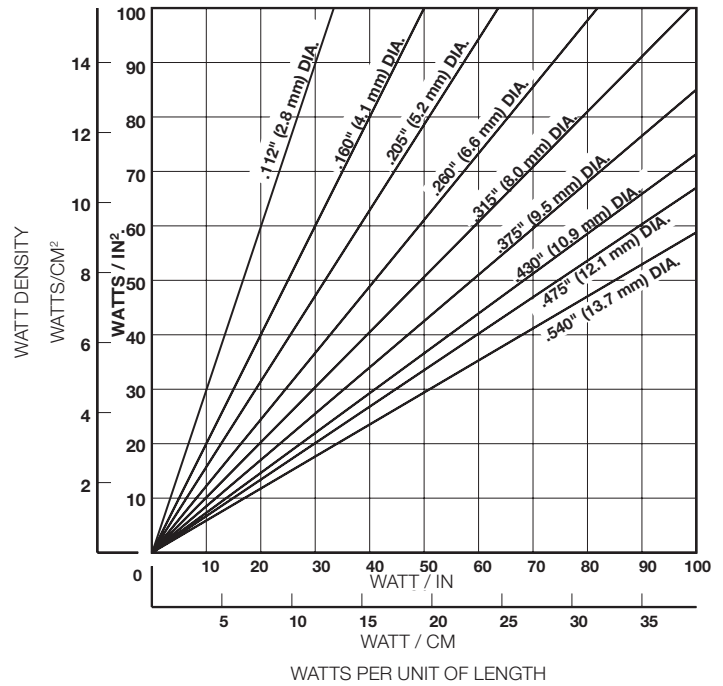


Figure 26 – Surface Watts vs Linear Watts

Refer to Table 12 continues on page A12 for optional hardware.

To Order Specify

- Number of elements
- Element voltage
- Element wattage
- Sheath diameter
- Sheath length
- Sheath material
- Length of cold ends
- Terminal type
- Optional hardware
- Forming dimensions (send sketch)

Standard Terminal Types

Allowable current for each terminal type depends, in part, on the application - check factory for details.

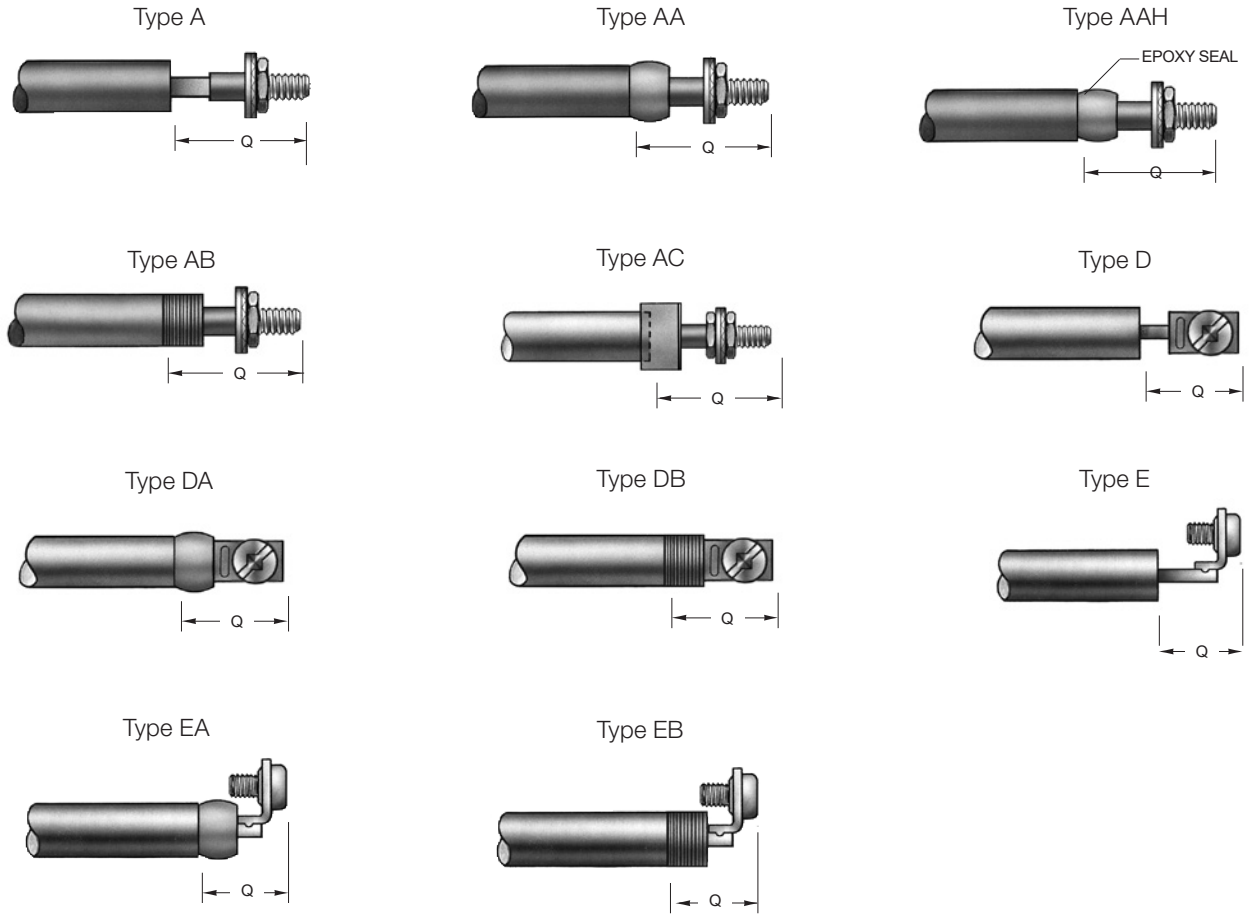


Table 6 – Terminal Type Specifications

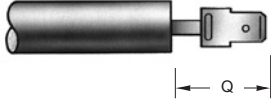
	Dim. 'Q' in (mm)	THD. Size	Max. Volts	Max. Temp. °F (°C)	Suitable For Element Diameters in (mm)								
					0.112 (2.84)	0.160 (4.06)	0.205 (5.21)	0.260 (6.60)	0.315 (8.00)	0.375 (9.53)	0.430 (10.9)	0.475 (12.1)	0.540 (13.7)
A	1 1/8 (28.6)*	#10-32*	600	752 (400)	✓	✓	✓	✓	✓	✓	✓	✓	-
AA	1 1/8 (28.6)*		600	392 (200)	-	-	-	✓	✓	✓	✓	✓	-
AAH	1 1/8 (28.6)*		600	302 (150)	-	-	-	✓	✓	✓	✓	✓	-
AB	1 1/8 (28.6)*		600	752 (400)	-	✓	✓	✓	✓	✓	✓	✓	-
AC	1 1/8 (28.6)*		600	752 (400)	-	-	-	-	-	-	✓	-	✓
D	13/16 (20.6)		250	752 (400)	✓	✓	✓	✓	✓	✓	✓	✓	-
DA	13/16 (20.6)		250	392 (200)	-	✓	✓	✓	✓	✓	✓	✓	-
DB	13/16 (20.6)		250	752 (400)	-	✓	✓	✓	✓	✓	✓	✓	-
E	11/16 (17.5)		250	752 (400)	✓	✓	✓	✓	✓	✓	✓	✓	-
EA	11/16 (17.5)		250	392 (200)	-	✓	✓	✓	✓	✓	✓	✓	-
EB	11/16 (17.5)		250	752 (400)	-	✓	✓	✓	✓	✓	✓	✓	-

Note:

*1 1/8" (28.6 mm) available as 1" (25.4 mm); #10-32 available in #8-32; type JF, Q = 2 1/4" (57.2 mm) for .375" (9.53 mm) and 2 3/4" (69.9 mm) for 0.430" (10.9 mm)

Allowable current for each terminal type depends, in part, on the application - check factory for details.

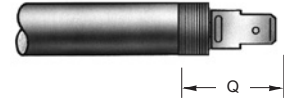
Type F



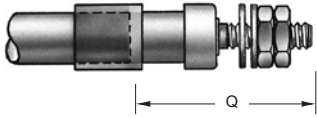
Type FA



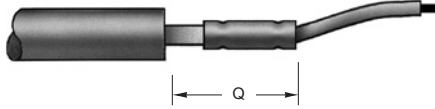
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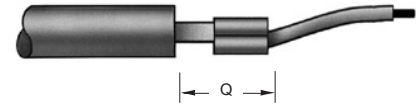
Type G



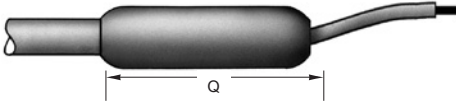
Type J1



Type J2



Type JF



	Dim. 'Q' in (mm)	THD. Size	Max. Volts	Max. Temp. °F (°C)	Suitable For Element Diameters in (mm)									
					0.112 (2.84)	0.160 (4.06)	0.205 (5.21)	0.260 (6.60)	0.315 (8.00)	0.375 (9.53)	0.430 (10.9)	0.475 (12.1)	0.540 (13.7)	
F	15/16 (23.8)	N/A	250	482 (250)	✓	✓	✓	✓	✓	✓	✓	✓	-	
FA	15/16 (23.8)	N/A	250	392 (200)	-	✓	✓	✓	✓	✓	✓	✓	-	
FB	15/16 (23.8)	N/A	250	482 (250)	-	-	-	✓	✓	✓	✓	✓	-	
G	1 1/8 (28.6)*	#8-32	250	752 (400)	-	-	-	✓	-	-	-	-	-	
G	1 3/8 (34.9)	#10-32*	250	752 (400)	-	-	-	-	✓	-	-	-	-	
G	1 3/8 (34.9)	#10-32*	250	752 (400)	-	-	-	-	-	-	-	-	-	
G	1 5/8 (41.3)	1/4"-28	250	752 (400)	-	-	-	-	-	-	✓	-	-	
J1	1 (25.4)	N/A	300	392 (200)	✓	✓	✓	✓	✓	✓	✓	✓	-	
J2	1/2 (12.7)	N/A	300	392 (200)	✓	✓	✓	✓	✓	✓	✓	-	-	
JF*	1 5/8 (41.3)	N/A	300	194 (90)	-	-	-	✓	✓	✓	✓	-	-	

Note:

*1 1/8" (28.6 mm) available as 1" (25.4 mm); #10-32 available in #8-32; type JF, Q = 2 1/4" (57.2 mm) for .375" (9.53 mm) and 2 3/4" (69.9 mm) for 0.430" (10.9 mm)

Special Features

Threaded Fitting

Threaded fittings can be factory brazed or welded to the element cold section. These fittings provide a leak tight joint in applications where the heater is installed in open tanks or vessels. Fittings are available in brass, steel or stainless (check factory).

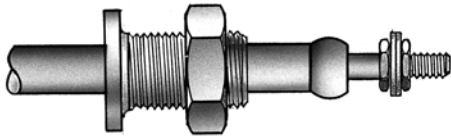


Figure 27 – Threaded Fitting

Compression Fitting

Compression fittings (in nickel plated brass) can be provided for field installation on 0.430" (10.9 mm) diameter elements only.

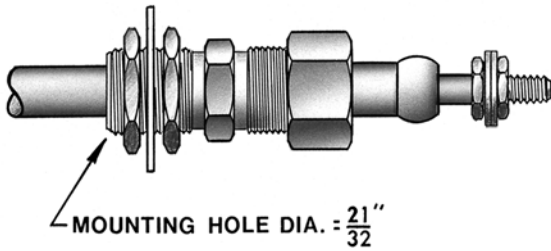


Figure 28 – Compression Fitting

Mounting Brackets

Standard mounting brackets can be factory crimped to elements to facilitate installation. Special brackets are available for high volume orders.

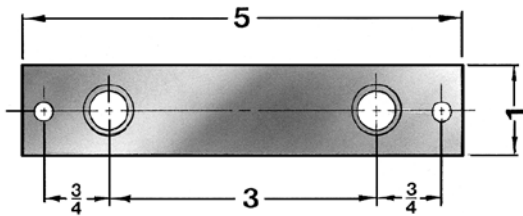


Figure 29 – Mounting Bracket

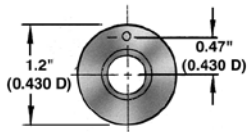


Figure 30 – Mounting Bracket

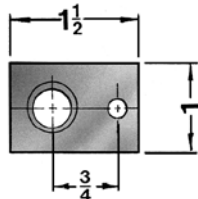


Figure 31 – Mounting Bracket

Element Clamp

These two piece stainless steel clamps can be used as element standoffs in ovens or tanks. One half of the clamp is ideal for clamp-on applications when used with a stud welded to the tank or plate. "C" dim. is available at 1 1/4" (32 mm), 1 7/16" (36.5 mm), 1 5/8" (41 mm) or 1 15/16" (49 mm).

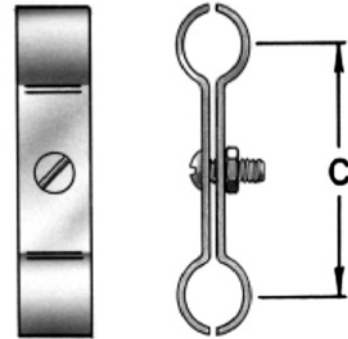


Figure 32 – Mounting Bracket

Terminal Box

Moisture resistant terminal boxes can be supplied loose or factory installed.

Boxes supplied for field installation can be provided with predrilled holes to accept the element. Note that the element will require fittings for connection to the box.



Figure 33 – Terminal Box

Table 7 – Part Numbers

Refer to these part numbers when ordering special features.

Description	Part Number
Threading Fitting	Check Factory
Compression Fitting	A11300
Bracket (Figure 36)	A10783
Bracket (Figure 37)	A50100
Bracket (Figure 38)	A10860
Element Clamp	A10619
Terminal Box (small (diameter))	XH1B2M
Terminal Box (large diameter)	XH2B1M

Finned Tubular Heaters - KX

Most of the finned tubular heaters we manufacture are custom designed to suit a particular need. This section is intended to explain the various finned heater features and the importance you should place on each of them. Refer to pages A19 and A20 for listed finned elements in the most popular shapes.

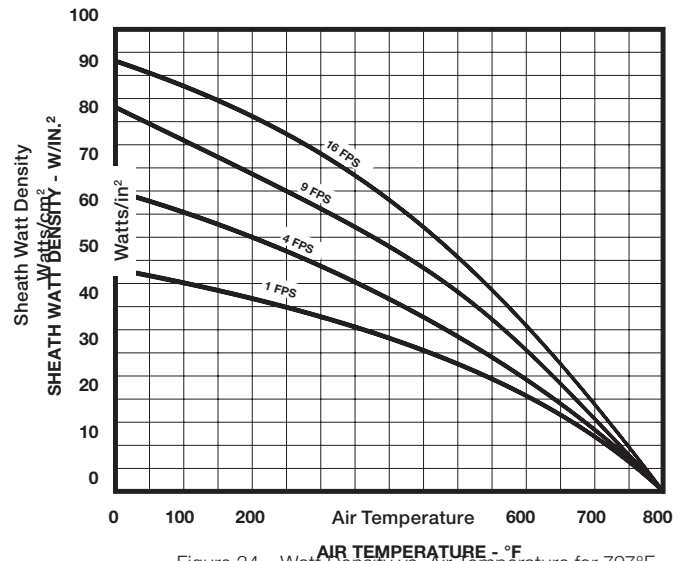
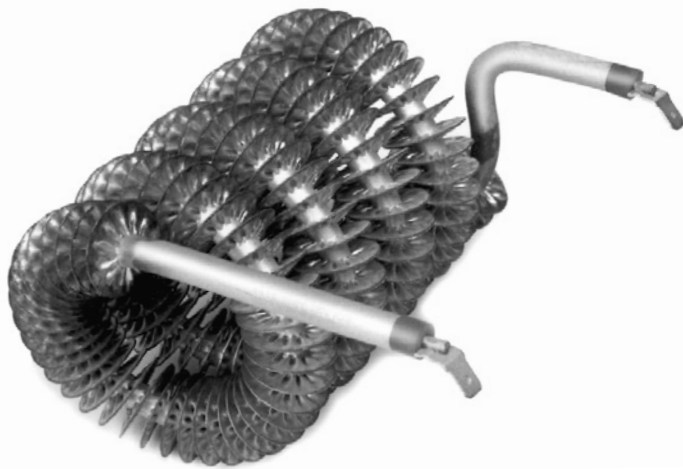


Figure 34 – Watt Density vs. Air Temperature for 797°F (425°C) Fin Temperature

Finned Heater vs. Non-Finned Heater

Finned heaters are normally used for forced convection heating with outlet air temperatures of 572°F (300°C) or less. Steel finned heaters are standard with surface temperatures limited to about 797°F (425°C) compared to 1500°F (815°C) for an alloy sheathed non-finned heater. If a high surface temperature and the high radiation heat transfer that accompanies it is not detrimental to the remaining system components, a non-finned heater may prove to be the more economical choice.

Some applications require stainless steel materials for corrosion resistance. The most efficient finned heaters are made with steel sheath and steel fins. Keep in mind that stainless heaters with stainless fins are very inefficient since the heat transfer rate of stainless is less than one quarter of that for steel.

Finned Tubulars vs. Open Coil

Finned tubular heaters are more expensive than open coil heaters and have a slower thermal response.

Other than the above, the finned tubular offers distinct advantages over the open coil:

1. It is safer to operate in that the risk of fire or electrical shock is minimized;
2. It has a much longer service life
3. It is more rugged requiring less maintenance than an open coil heater.

Open coil heaters generally have less static pressure drop, but the static pressure drop offered by a finned tubular heater is seldom high enough to matter.

Fin Efficiency

Steel fins are spirally wound over the heating element and then metallurgically bonded by furnace brazing leaving negligible thermal resistance at the joint. Brazed fins transfer heat at about double the efficiency of unbrazed designs.

Various combinations of fin thickness, width and pitch are available as shown in Table 10 on page A13. Fin combinations which give higher heat transfer areas do not necessarily transfer heat more effectively than similar elements with a bit less area. Fin efficiency is lower for wide fins, thin fins or fins made from a low conductivity metal.

Coatings

Four choices of surface finish are available (check factory for selection assistance).

1. Bare steel
2. Nickel plated
3. Aluminum painted
4. Black enamel

Temperature vs. Air Velocity

Finned element operating temperatures will vary depending on air velocity, air temperature and watts per square inch of finned element

Figure 34 shows the combination of these factors that would develop a sheath temperature of 797°F (425°C). These are approximate only since fin efficiencies and element spacing may cause the temperature to vary.

Selection

In general, specify an element with a minimum 0.375" (9.5 mm) diameter if the power supply voltage exceeds 300V. In some cases we can install special terminals on the 0.315" (8 mm) diameter elements which will also allow their use up to 600V.

Table 10 shows the standard fin sizes and pitches available from Thermon Heating Systems. We will consider other sizes on special order. Also refer to this table for information on maximum lengths and forming limitations for the various element diameters.

Figure 34 on page A13 will give the recommended sheath watt density for any combination of velocity and temperature. This recommended density when multiplied by the element surface area per lineal inch from the table will allow you to determine the recommended wattage for each heated inch of element.

It is then a simple matter to determine the number of heated inches of element that would be required for any particular wattage output. Larger wattage or three phase installations will require more than one element.

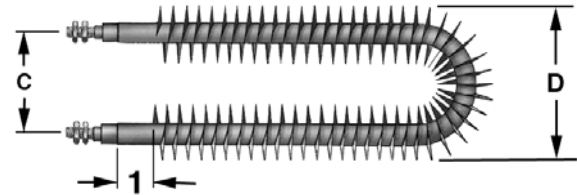
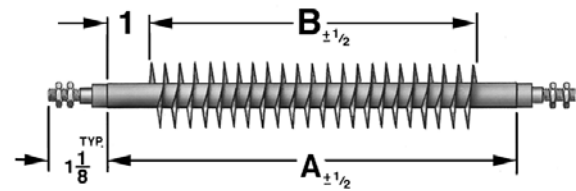


Figure 35

Factory Assistance

We invite you to phone or fax your local Thermon Heating Systems' Representative or nearest factory sales department to assist you in your selection since many factors other than those mentioned require consideration.

Table 8 – Finning Specifications - Steel Sheath with Furnace Brazed Steel Fins

	Element Diameter		Element Square Inch Surface Per Lineal in.	Fin Material Width		Fin Outside Diameter		Total Square inch Surface Per Lineal In.	Dimensions			
	in	mm		in	mm	in	mm		Max. 'A'	Max. 'B'	Min. 'C'	Min. 'D'
22-Gauge 0.20 in/0.762 mm) Fin-Material 4 Fins per inch	0.260	6.6	0.82	5/16	7.9	0.83	21.1	5.4	102*	100	1.375	2.20
	0.315	8.0	0.99	5/16	7.9	0.89	22.6	6.0	151*	149	1.500	2.40
	0.315	8.0	0.99	3/8	9.5	1.01	25.7	7.6	151*	149	1.625	2.65
	0.375	9.5	1.18	5/16	7.9	0.95	24.1	6.6	146	144	1.750	2.70
	0.375	9.5	1.18	3/8	9.5	1.07	27.2	8.2	146	144	1.875	2.90
	0.430	10.9	1.35	5/16	7.9	1.01	25.7	7.1	285	283	1.875	2.90
	0.430	10.9	1.35	3/8	9.5	1.13	28.7	8.8	285	283	2.000	3.15
	0.475	12.1	1.49	3/8	9.5	1.20	30.5	9.5	102	100	2.000	3.20
26-Gauge 0.22 in/0.559 mm) Fin-Material 5 Fins per inch	0.540	13.7	1.70	3/8	9.5	1.25	31.8	10.2	106	104	2.000	3.25
	0.260	6.6	0.82	5/16	7.9	0.85	21.6	6.9	102*	100	2.000	2.85
	0.315	8.0	0.99	5/16	7.9	0.91	23.1	7.6	151*	149	2.250	3.15
	0.375	9.5	1.18	5/16	7.9	0.97	24.6	8.3	146	144	2.500	3.50
	0.430	10.9	1.35	5/16	7.9	1.02	25.9	8.8	285	283	2.750	3.80

Note:

*Elements up to 285" (7239 mm) can be fabricated with special setup.

Applications

Listed finned tubular heaters are designed for use in forced circulation, air or gas heating systems such as ducts, fan forced electric heaters, recirculating ovens, loading resistors, etc. Heaters are available with most of the other terminal types shown.

Watt Density

Listed heaters have 10 watts/sq.inch of total heated surface area. Other watt densities are available for lower velocities or higher outlet temperatures.

Selection of a safe wattage rating depends upon air velocity over heater, temperature of outlet air and allowable sheath temperatures. The graph shown in Figure 39 on page A16 indicates air velocity necessary to avoid overheating.

Mounting

Heaters shown on this page can be installed using brazed, crimped or welded plates (see Figure 36 to 38 on page A12). Standard elements having factory installed fittings for installation are shown on Table 12 continues on page A16.

To Order Specify

- Quantity
- Wattage
- Catalog number
- Special features
- Voltage

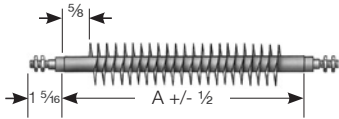


Figure 36

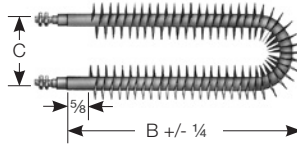


Figure 37

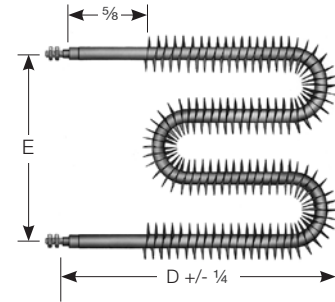


Figure 38

Table 9 – Finned Elements without Fittings

	kW	Standard Voltages	Dim. A		Catalog Number Figure 36	Dim. B		Dim. C		Catalog Number Figure 37	Dim. D		Dim. E		Catalog Number Figure 38
			in	mm		in	mm	in	mm		in	mm	in	mm	
0.540 Diameter Element 1 1/4" (32 mm) O.D. Fin 10 W/in ²	2	240 600	21.3	540	KXF502S	10.9	275	2.0	50	KXF502H	6.0	150	6.0	150	KXF502W
	3		31.3	795	KXF503S	15.9	405			KXF503H	8.5	215			KXF503W
	4		41.3	1045	KXF504S	20.9	530			KXF504H	11.0	280			KXF504W
	5		51.3	1305	KXF505S	25.9	660			KXF505H	13.5	345			KXF505W
	6		61.3	1555	KXF506S	30.9	785			KXF506H	16.0	405			KXF506W
	7		71.3	1810	KXF507S	35.9	910			KXF507H	18.5	470			KXF507W
	8		81.3	2065	KXF508S	40.9	1040			KXF508H	21.0	535			KXF508W
	9		91.3	2320	KXF509S	45.9	1165			KXF509H	23.5	595			KXF509W
	10		101.3	2575	KXF5010S	50.9	1290			KXF5010H	26.0	660			KXF5010W
	0.430 Diameter Element 1 1/8" (29 mm) O.D. Fin 10 W/in ²		2	240 480 600	26.5	675	KXF402S			13.1	330	2.0			50
3		39.0	990		KXF403S	19.4	490	KXF403H	10.4	265	KXF403W				
4		51.5	1310		KXF404S	25.6	650	KXF404H	13.5	345	KXF404W				
5		64.0	1625		KXF405S	31.9	810	KXF405H	16.6	420	KXF405W				
6		76.5	1945		KXF406S	38.1	970	KXF406H	19.8	505	KXF406W				
7		89.0	2260		KXF407S	44.4	1130	KXF407H	22.8	580	KXF407W				
8		101.5	2580		KXF408S	50.6	1285	KXF408H	26.0	660	KXF408W				
0.315 Diameter Element 1" (25 mm) O.D. Fin 10 W/in ²		1	120		18.9	480	KXF301S	8.9	225	1.5	40		KXF301H	5.5	
	2	208	34.0	865	KXF302S	16.4	415	KXF302H	9.3			235	KXF302W		
	3	240	49.0	1245	KXF303S	23.9	610	KXF303H	13.0			330	KXF303W		
	4	208 240	64.0	1625	KXF304S	31.4	800	KXF304H	16.8			425	KXF304W		
	5		78.9	2005	KXF305S	38.9	990	KXF305H	20.5			520	KXF305W		
	6		93.9	2385	KXF306S	46.4	1180	KXF306H	24.3			615	KXF306W		

KX – Finned Tubular Heaters

Special Wattage

For low air velocities and/or high outlet air temperatures, a special watt density (watts/sq.inch of heated surface area) may be required.

For example - assume an air velocity of 800 ft/min. and an outlet air temperature of 500°F (260°C). Reference to Figure 39 indicates that 6 watts/sq.in is the maximum recommended watt density. Since the listed heaters are 10 watts/sq.in, you would require special elements with 6/10 or 60% of the kW ratings shown in Table 11 and Table 12 on page A16.

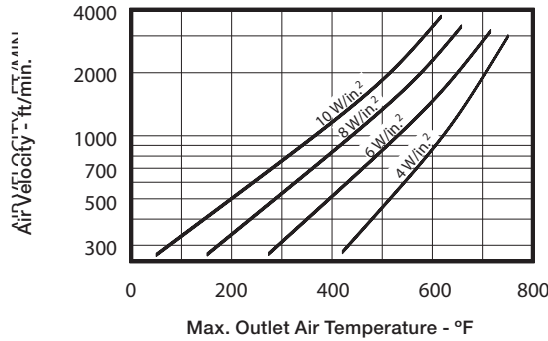


Figure 39 – Velocity vs. Air Temperature for 800°F (425°C) Fin Temperature. (Listed heaters are available in lower wattage ratings.)

To Order Specify

- Quantity
- Wattage
- Catalog number
- Special features
- Voltage

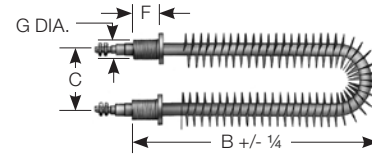


Figure 40

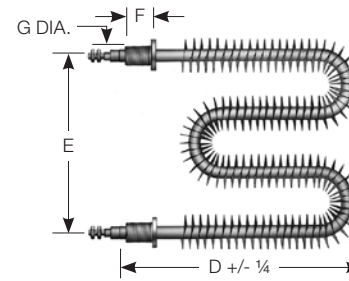


Figure 41

Table 10 – Finned Elements with Fittings

	kW	Standard Voltages	Dim. F		Dim. G		Dim. B		Dim. C		Catalog Number Figure 40	Dim. D		Dim. E		Catalog Number Figure 41
			in	mm	in	mm	in	mm	in	mm		in	mm	in	mm	
0.540 Diameter Element 1 1/4" (32 mm) O.D. Fin 10 W/in ²	2	240 600	1.1	30	0.90	23	12.3	310	2.0	50	KXF502HM	7.4	185	6.0	150	KXF502WM
	3						17.3	440			KXF503HM	9.9	250			KXF503WM
	4						22.3	565			KXF504HM	12.4	315			KXF504WM
	5						27.3	695			KXF505HM	14.9	380			KXF505WM
	6						32.3	820			KXF506HM	17.4	440			KXF506WM
	7						37.3	945			KXF507HM	19.9	505			KXF507WM
	8						42.3	1075			KXF508HM	22.4	570			KXF508WM
	9						47.3	1200			KXF509HM	24.9	630			KXF509WM
	10						52.3	1325			KXF5010HM	27.4	695			KXF5010WM
	0.430 Diameter Element 1 1/8" (29 mm) O.D. Fin 10 W/in ²						2	240 600			1.1	30	0.63			16
3		20.8	525	KXF403HM	11.8	300	KXF403WM									
4		27.0	685	KXF404HM	14.9	380	KXF404WM									
5		33.3	845	KXF405HM	18.0	455	KXF405WM									
6		39.5	1005	KXF406HM	21.2	540	KXF406WM									
7		45.8	1165	KXF407HM	24.2	615	KXF407WM									
8		52.0	1320	KXF408HM	27.4	695	KXF408WM									
0.315 Diameter Element 1" (25 mm) O.D. Fin 10 W/in ²		1	120	1.1	30	0.52	13		10.3	260				1.5	40	
	2	208	17.8					450	KXF302HM	10.7	270	KXF302WM				
	3	240	25.3					645	KXF303HM	14.4	365	KXF303WM				
	4	208	32.8					835	KXF304HM	18.2	460	KXF304WM				
	5	240	40.3					1025	KXF305HM	21.9	555	KXF305WM				
	6		47.8					1215	KXF306HM	25.7	650	KXF306WM				

Cartridge Heaters - C

Caloritech™ C Series cartridge heaters represent the highest commercial grade of heaters available anywhere. We sell only swaged heaters which provide maximum life expectancy and optimum value.

Unswaged heaters, not available from CCI Thermal, may be less expensive initially but will not provide reasonable service life in severe applications.

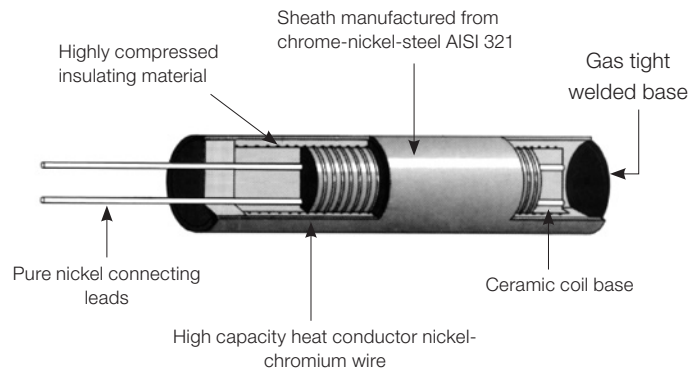
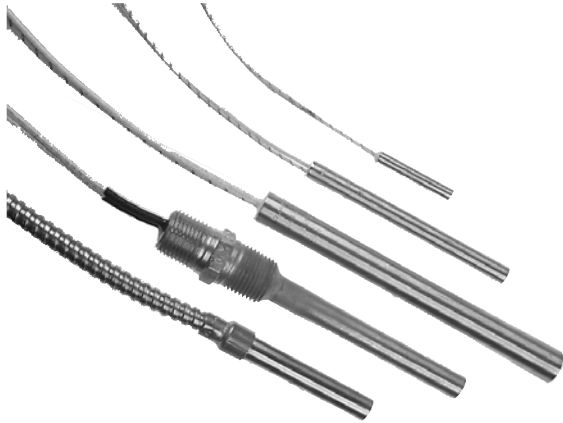


Figure 42 – Cartridge Heater Construction

Application

Cartridge heaters offer a convenient and efficient means of heating for metal dies, platens, moulds, heat sealing tools, hot plates, etc. Most heaters can be factory fitted with threaded bushings for liquid heating applications. Metal temperatures up to 1400°F (760°C) can be achieved with proper selection of materials, watt density and fit. See Figure 44.

Construction

High grade nickel chromium resistance wire is uniformly wound on a premium quality MgO core and welded to termination points. The core is then carefully centred in a stainless steel casing which is MgO filled and compacted. Stranded leads with silicon-impregnated mica glass insulation are fixed to termination points.

Installation

To install a cartridge heater it is necessary only to provide a hole in the part to be heated. The hole diameter and tolerance are determined from Figure 43. Wherever possible, it is advisable to extend the hole entirely through the part, so that the unit can be driven out readily if the necessity for removing it ever arises.

If a through hole is impractical it is best to increase the hole size a bit but not beyond the tolerances indicated by Figure 43.

To prolong life, minimize vibration and flexing of the lead wires and protect the end of the heater from contamination, especially by liquids.

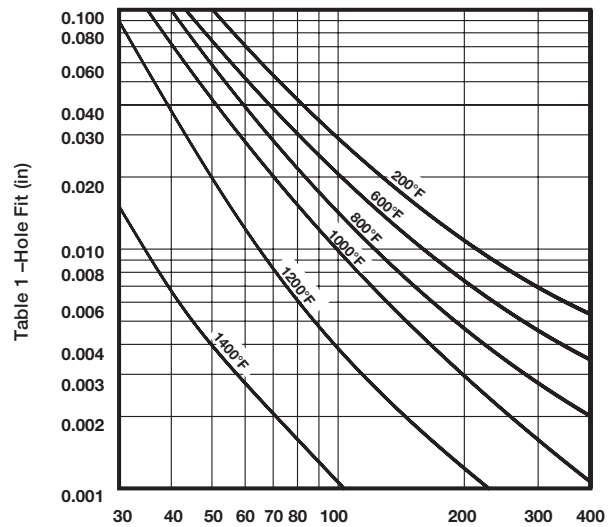


Table 1 – Watt Density - W/in²
Figure 43 – Allowable Watt Density vs Fit Tolerance and Work Temperature

Manufacturing Tolerances

- Wattage tolerance (at rated voltage) +5%, -10%
- Diameter tolerance $\pm 0.0008''$ (0.02 mm)
- Length tolerances $\pm 1/16''$ (1.6 mm) or 1.5% of length

Construction

Caloritech™ high quality C Series cartridge heaters are swaged for maximum life expectancy.

Sheath is high temperature 321 stainless steel.

Table 11 – Standard Watt Density Cartridge Heaters, C Series

(Table 12 continues on page A19)

	Sheath Length		Watt Density			Caloritech™ Catalog No.		Chromalox Catalog No.		Watlow Catalog No.	
	in	mm	Watts	W/in ²	W/cm ²	120V	240V	120V	240V	120V	240V
1/4" (6.4 mm) Hole Diameter (0.247"/6.3 mm Sheath Diameter)	1	25.4	80	208	32.2	C1025801	–	CIR10110	–	E1A51	–
			100	260	40.3	C1025101	C1025103	CIR10111	CIR10111	E1A52	E1A66
			150	390	60.5	C1025151	–	CIR10112	–	E1A53	–
	1 1/4	31.8	225	390	60.5	–	C1031223	–	CIR10121	–	E1A61
	1 1/2	38.1	125	140	21.7	C1038121	–	CIR1015	–	–	–
	1 1/2	38.1	175	228	35.3	C1038171	C1038173	CIR1019	CIR1019	–	E1J49
	1 1/2	38.1	250	325	50.4	–	C1038253	–	CIR10153	–	E1135
	2	50.8	100	87	13.5	C1050101	–	CIR1021	–	E2A55	–
			150	130	20.2	C1050151	C1050153	CIR1020	CIR1020	E2A56	E2A77
			200	173	26.8	C1050201	C1050205	CIR1023	CIR1023	E2A57	E2A50
			250	215	33.3	C1050251	C1050253	CIR1024	CIR1024	E2A72	E2A76
			300	260	40.3	–	C1050303	–	CIR10201	–	E2A83
	3	76.2	200	104	16.1	C1076201	C11076203	CIR1030	CIR1030	E3A49	E2A60
	3	76.2	300	156	24.2	C1076301	C11076303	CIR1032	CIR1032	E3A50	E2A51
4	101.6	300	111	17.2	C1101301	C1101303	CIR1040	CIR1040	E3A30	E2A6	
5	127.0	350	101	15.7	–	C1127353	–	CIR1050	–	E4A45	
6	152.4	400	94	14.6	–	C1152403	–	CIR1060	–	E2A46	
3/8" (9.5 mm) Hole Diameter (0.372"/9.4 mm Sheath Diameter)	1	25.4	55	95	14.7	C2025551	–	CIR20110	–	G1A71	–
			100	172	26.7	C2025101	–	CIR20112	–	G1A29	–
			150	259	40.1	C2025151	–	CIR20113	–	G1A38	–
			200	344	53.3	–	C2025203	–	CIR20114	–	G1A83
	1 1/4	31.8	125	144	22.3	C2031121	–	CIR20131	–	G1E74	–
	1 1/4	31.8	150	172	26.7	C2031151	C2031153	CIR2012	CIR2012	G1E92	G1E93
	1 1/2	38.1	30	32	5.0	C2038301	–	–	–	–	–
	1 1/2		50	53	8.2	C2038501	–	CIR2018	CIR2018	G1J25	–
	1 1/2		85	68	10.5	C2038851	–	CIR2016	–	G1J66	–
	1 1/2		100	86	13.3	C2038101	C2038103	CIR20151	CIR20151	G1J59	G1J110
	1 1/2		150	129	20.0	C2038151	C2038153	CIR2019	CIR2019	G1J31	G1J39
	1 1/2		200	173	26.8	C2038201	C2038203	CIR20151	CIR20151	G1J85	G1J73
	1 1/2		250	216	33.5	C2038251	C2038253	CIR20191	CIR2019	G1J86	G1J54
	1 1/2		50	29	4.5	C2050501	–	CIR20201	–	G2A53	–
	2	50.8	75	42	6.5	C2050751	C2050753	CIR20209	–	–	G2A192
			100	57	8.8	C2050101	C2050103	CIR20202	CIR20202	G2A84	G2A76
			150	86	13.3	C2050151	C2050153	CIR2021	CIR2021	G2A56	G2A81
			200	115	17.8	C2050201	C2050203	CIR20203	CIR20203	G2A127	G2A37
			250	144	22.3	C2050251	C2050253	CIR2020	CIR2020	G2A47	G2A73
			300	172	26.7	C2050301	C2050303	CIR20204	CIR20204	G2A139	G2A98
			400	230	35.7	C2050401	C2050403	CIR20206	CIR20206	G2A153	G2A146W
			500	216	33.5	C2063501	C2063503	CIR20252	CIR202052	G2J109	G2J52
	2 1/2	63.5	100	34	5.3	C2076101	C2076103	CIR2032	CIR2032	G3A55	G3A137
	3	76.2	150	52	8.1	C2076151	C2076153	CIR2033	CIR2033	G3A121	–
			200	69	10.7	C2076201	C2076203	CIR2031	CIR2031	G3A61	G3A39
			250	86	13.3	C2076251	C2076253	CIR2034	CIR2034	G3A52	G3A54
			300	104	16.1	C2076301	C2076303	CIR20301	CIR20301	G3A73	G3A92
			400	138	21.4	C2076401	C2076403	CIR20302	CIR20302	G3A44	G3A65
			500	173	26.8	C2076501	C2076503	CIR2030	CIR2030	G3A119	G3A120
	3 1/2	88.9	300	87	13.5	C2088301	C2088303	CIR2038	CIR2038	G3J87	G3J68
	3 1/2	88.9	500	144	22.3	C2088501	C2088503	CIR2035	CIR2035	G3J22	G3J63
	4	101.6	150	37	5.7	C2101151	C2101153	–	–	–	–
			250	62	9.6	C2101251	C2101253	CIR2042	CIR2042	G4A40	G4A87
			400	99	15.3	C2101401	C2101403	CIR2045	CIR2047	G4A48	G4A44
500			123	19.1	C2101501	C2101503	CIR2043	CIR2043	G4A96	G4A92	
4 1/2	114.3	300	65	10.1	C2114301	C2114303	CIR20401	CIR20401	G4J54	G4J33	
5	127.0	150	29	4.5	C2127151	C2127153	CIR2055	CIR2055	G5A68	G5A56	
		200	39	6.0	C2127201	C212203	–	–	–	–	
		500	96	14.9	C212501	C212503	CIR2053	CIR2053	G5A38	G5A71	
		750	144	22.3	–	C2127753	–	CIR2054	–	G5A67	

To Order Specify

- Quantity
- Wattage
- Catalog number
- Special features
- Voltage

Table 12 – Standard Watt Density Cartridge Heaters, C Series (cont'd)

(Table 12 continues on page A20)

	Sheath Length		Watt Density			Caloritech™ Catalog No.		Chromalox Catalog No.		Watlow Catalog No.		
	in	mm	Watts	W/in ²	W/cm ²	120V	240V	120V	240V	120V	240V	
3/8" (9.5 mm) Hole Diameter 0.372"/9.4 mm Sheath Diameter	6	152.4	200	31	4.8	C2152201	–	CIR2064	–	G6A80	–	
			250	39	6.0	C2152251	C2152253	CIR2061	CIR2061	G6A40	G6A92	
			400	63	9.8	C2152401	C2152403	CIR2065	CIR2065	G6A81	G6A82	
			600	94	14.6	C2152601	C2152603	CIR2066	CIR2066	G6A56	G6A51	
			750	117	18.1	–	C2152753	–	CIR2062	–	G6A46	–
			1000	157	24.3	–	C2152103	–	CIR2063	–	G6A83	–
	7	177.8	250	33	5.1	C2177251	C2177253	CIR2070	CIR2070	G7A40	G7A432	
	7	177.8	600	80	12.4	C2177601	C2177603	CIR2076	CIR2076	G7A41	G7A442	
	7	177.8	1000	133	20.6	–	C2177103	–	CIR2079	–	G7A43	
	8	203.2	300	34	5.3	C2203301	C2203303	CIR2081	CIR2081	G8A54	G8A47	
	8	203.2	500	58	9.0	C2203501	C2203503	CIR2085	CIR2085	G8A81	G8A32	
	8	203.2	1000	115	17.8	–	C2203103	–	CIR2089	–	G8A45	
	10	254.0	600	54	8.4	C2254601	C2254603	CIR2100	CIR2100	G10A35	G10A31	
	10	254.0	1000	91	14.1	–	C2254103	–	CIR2101	–	G10A32	
1/2" (12.7 mm) Hole Diameter 0.497"/12.6 mm Sheath Diameter	1	25.4	50	65	10.1	C3025501	–	CIR3010	–	J1A30	–	
			150	193	29.9	C3025151	–	CIR3011	–	J1A31	–	
	1 1/4	31.8	125	107	16.6	C3031121	C3031123	CIR3019	CIR3019	J1E51	J1E58	
			200	172	26.6	–	C3031203	–	CIR30121	–	J1E52	–
	1 1/2	38.1	150	97	15.0	C3038151	C3038153	CIR3015	CIR3015	J1J48	J1J96	
			200	128	19.8	C3038201	C3038203	CIR3018	CIR3018	J1J59	J1J38	
	2	50.8	200	86	13.3	C3050201	C3050203	CIR3021	CIR3021	J2A49	J2A75	
			250	108	16.7	C3050251	C3050253	CIR30202	CIR30202	J2A85	J2A71	
			300	128	19.8	C3050301	C3050303	CIR30203	CIR30203	J2A95	J2A96	
			400	171	26.5	C3050401	C3050403	CIR3020	CIR3020	J2A81	J2A82	
	2 1/4	57.2	75	28	4.3	C3057751	–	CIR30221	–	J2E86	–	
	2 1/4	57.2	125	46	7.1	C3057121	–	CIR30222	–	J2E87	–	
	2 1/4	57.2	250	92	14.3	C3057251	C3057253	CIR3022	CIR3022	J2E56	J2E69	
	2 1/4	57.2	400	147	22.8	C3057401	C3057403	CIR30223	CIR30223	J2E114	J2E115	
2 3/8	60.3	100	34	5.3	C3060101	C3060103	CIR3026	CIR3026	J2G35	J2G28		
2 3/8	60.3	250	86	13.3	C3060251	C3060253	CIR3023	CIR3023	J2G34	J2G37		
2 1/2	63.5	100	32	5.0	C3063101	C3063103	CIR30255	CIR30255	J2J67	J2J57		
2 1/2	63.5	300	96	14.9	C3063301	C3063303	CIR3028	CIR3028	J2J109	J2J110		
2 1/2	63.5	400	128	19.8	C3063401	C3063403	CIR30253	CIR30253	J2J81	J2J82		
2 1/2	63.5	500	161	25.0	C3063501	C3063503	CIR30254	CIR30254	J2J66	J2J70		
3/4" (19.0 mm) Hole Diameter 0.625"/15.8 mm Sheath Diameter	3	76.2	125	32	5.0	C3076121	C3076123	CIR30302	CIR30302	J3A108	J3A109	
			250	64	9.9	C3076251	C3076253	CIR3031	CIR3031	J3A107	J3A89	
			400	104	16.1	C3076401	C3076403	CIR3033	CIR3033	J3A132	J3A29	
			500	129	20.0	C3076501	C3076503	CIR3030	CIR3030	J3A110	J3A111	
	3 1/2	88.9	250	54	8.4	C3088251	C3088253	CIR3035	CIR3035	J3J44	J3J64	
			500	107	16.6	C3088501	C3088503	CIR3037	CIR3037	J3J45	J3J46	
			150	28	4.3	C3101151	C3101153	CIR3045	CIR3045	J4A117	J4A122	
			250	46	7.1	C3101251	C3101253	CIR30402	CIR30402	J4A118	J4A90	
	4	101.6	350	65	10.1	C3101351	C3101353	CIR3046	CIR3046	J4A1	J4A103	
			400	74	11.5	C3101401	C3101403	CIR3043	CIR3043	J4A139	J4A68	
			500	92	14.3	C3101501	C3101503	CIR3041	CIR3041	J4A16	J4A92	
			750	138	21.4	C3101751	C3101753	CIR3044	CIR3044	J4A198	J4A119	
	5	127.0	1000	184	28.5	–	C3101103	–	CIR30401	–	J4A73	–
			250	38	5.9	C3127251	C3127253	–	–	–	–	–
350			50	7.8	C3127351	C3127353	CIR3051	CIR3051	J5A86	J5A63		
400			58	9.0	C3127401	C3127403	CIR3054	CIR3054	J5A98	J5A46		
500			72	11.2	C3127501	C3127503	CIR30501	CIR30501	J5A52	J5A45		
750			108	16.7	C3127751	C3127753	CIR3050	CIR3050	J5A121	J5A72		
1000	143	22.2	–	C312703	–	CIR30502	–	J5A87	–			

C – Cartridge Heaters

Table 12 – Standard Watt Density Cartridge Heaters, C Series (cont'd)

(Table 12 continues on page A21)

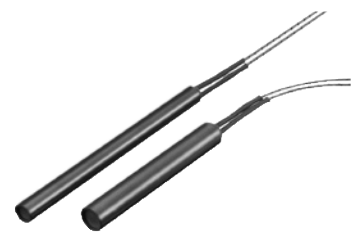
	Sheath Length		Watt Density			Caloritech™ Catalog No.		Chromalox Catalog No.		Watlow Catalog No.	
	in	mm	Watts	W/in ²	W/cm ²	120V	240V	120V	240V	120V	240V
1/2" (12.7 mm) Hole Diameter 0.497"/12.6 mm Sheath Diameter	5 1/2	139.7	500	64	9.9	C3139501	C3139503	CIR3055	CIR3055	J5J43	J5J33
	5 1/2	139.7	750	97	15.0	C3139751	C3139753	CIR3057	CIR3057	J5J44	J5J45
	6	152.4	300	35	5.4	C3152301	C3152303	CIR3061	CIR3061	–	J6A66
	6	152.4	500	59	9.1	C3152501	C3152503	CIR3062	CIR3062	J6A115	J6A94
	6	152.4	750	88	13.6	C3152751	C3152753	CIR3063	CIR3063	J6A99	J6A90
	6	152.4	1000	117	18.1	C3152101	C3152103	CIR3064	CIR3064	J6A53	J6A36
	6 1/2	165.1	1000	108	16.7	–	C3165103	–	CIR30601	–	J6J27
	7	177.8	500	50	7.8	C3177501	C3177503	CIR3071	CIR3071	J7A80	J7A57
	7	177.8	1000	99	15.3	–	C3177103	–	CIR3075	–	J7A81
	8	203.2	300	26	4.0	C3203301	C3203303	CIR3085	CIR3085	J8A71	J8A111
			500	43	6.7	C3203501	C3203503	CIR3084	CIR3084	J8A64	J8A66
			1000	86	13.3	C3203101	C3203103	CIR3080	CIR3080	J8A84	J8A60
			1500	129	20.0	–	C3203153	–	CIR3082	–	J8A100
			2000	172	26.7	–	C3203203	–	CIR3086	–	J8A101
	9	228.6	500	38	5.9	–	C3228503	–	CIR3090	–	J9A35
	9	228.6	1000	76	11.8	–	C3228103	–	CIR3091	–	J9A58
	10	254.0	500	34	5.3	C3254501	C3254503	CIR3103	CIR3103	J10A61	J10A62
	10	254.0	1000	68	10.5	C3254101	C3254103	CIR3101	CIR3101	J10A63	J10A42
	10	254.0	1500	102	15.8	–	C3254153	–	CIR3102	–	J10A33
	10	254.0	2000	136	21.1	–	C3254203	–	CIR3105	–	J10A64
12	304.8	550	30	4.7	C3304551	C3304553	CIR3121	CIR3121	J12A63	J12A76	
		1000	56	8.7	C3304101	C3304103	CIR3122	CIR3122	J12A40	J12A49	
		1500	84	13.0	–	C3304153	–	CIR3120	–	J12A37	
		2000	112	17.4	–	C3304203	–	CIR3125	–	J12A89	
14	355.6	2300	110	17.1	–	C3355233	–	CIR3142	–	J14A39	
18	457.2	1700	62	9.6	–	C3457173	–	CIR3180	–	J18A23	
5/8" (15.9 mm) Hole Diameter 0.622"/15.8 mm Sheath Diameter	1 1/4	31.8	50	34	5.3	C4031501	–	CIR4011	–	L1E26	–
	1 1/4	31.8	200	137	21.2	C4031201	–	CIR4012	–	L1E24	–
	1 1/4	31.8	250	171	26.5	C4031251	–	CIR4013	–	L1E27	–
	2	50.8	100	34	5.3	C4050101	–	CIR40201	–	L2A48	–
	2	50.8	200	68	10.5	C4050201	C4050203	CIR4020	CIR4020	L2A49	–
	2 1/4	57.2	100	29	4.9	C4057101	–	CIR4023	–	L2E49	–
	2 1/4	57.2	350	103	16.0	C4057351	C4057353	CIR4029	CIR4029	L2E40	L2E51
	2 3/8	60.3	280	77	11.9	C4060281	C4060283	CIR4024	CIR4024	L2G18	L2G19
	3	76.2	150	31	4.8	C4076151	–	CIR4035	–	L3A81	–
	3	76.2	250	51	7.9	C4076251	C4076253	CIR4031	CIR4031	L3A82	L3A9
	3	76.2	500	102	15.8	C4076501	C4076503	CIR4030	CIR4030	L3A113	L3A33
	3	76.2	750	154	23.9	–	C4076753	–	CIR4034	–	LEA71
	3 3/4	95.3	525	82	12.7	C4095521	C4095523	CIR4037	CIR4037	L3N12	L3N1
	4	101.6	250	37	5.7	C4101251	C4101253	CIR4044	CIR4044	L4A99	L4A104
			400	58	9.0	–	C4101403	–	CIR4045	–	L4A47
			500	73	11.3	C4101501	C4101503	CIR4041	CIR4041	–	L4A53
			600	88	13.6	C4101601	C4101603	–	CIR4046	–	L4A44
			750	110	17.1	C4101751	C4101753	CIR4040	CIR4040	–	L4A100
	1000	146	22.6	–	C4101103	–	CIR4042	–	L4A71		
	5	127.0	250	28	4.3	C4127251	C4127253	CIR4056	CIR4046	L5A76	L5A107
	5	127.0	500	57	8.8	C4127501	C4127503	CIR4051	CIR4051	–	L5A24
	5	127.0	750	86	13.3	C4127751	C4127753	CIR4050	CIR4050	–	L5A31
	5	127.0	1000	114	17.7	–	C4127103	–	CIR4052	–	L5A77
	5 5/8	139.7	285	32	5.0	C4139281	C4139283	–	–	–	–
	6	152.4	300	28	4.3	C4152301	C4152303	CIR4067	CIR4067	L6A28	L6A64
	6	152.4	500	47	7.3	C4152501	C4152503	CIR4061	CIR4061	–	L6A73
	6	152.4	1000	93	14.4	C4152101	C4152103	CIR4060	CIR4060	–	L6A71
	6	152.4	1500	140	21.7	C4152151	C4152153	CIR4062	CIR4062	L6A163	L6A94
7	177.8	500	39	6.0	C4177501	C4177503	CIR4072	CIR4072	L7A42	L7A15	
7	177.8	1000	79	12.2	–	C4177103	–	CIR4070	–	L7A37	
7	177.8	1500	118	18.3	–	C4177153	–	CIR4071	–	L7A12	
8	203.2	500	34	5.3	C4203501	C4203503	CIR4085	CIR4085	L8A96	L8A46	
8	203.2	850	58	9.0	–	C4203853	–	CIR4088	–	L8A115	
8	203.2	1000	68	10.5	–	C4203103	–	CIR4083	–	L8A10	
8	203.2	1500	102	15.8	–	C4203153	–	CIR4084	–	L8A37	

Table 12 – Standard Watt Density Cartridge Heaters, Type C (cont'd)

Sheath Length		Watt Density			Calorittech™ Catalog No.		Chromalox Catalog No.		Watlow Catalog No.		
		in	mm	Watts	W/in ²	W/cm ²	120V	240V	120V	240V	120V
5/8" (15.9 mm) Hole Diameter 0.622"/15.8 mm Sheath Diameter	10	254.0	500	27	4.2	C4254501	C4254503	CIR4103	CIR4103	L10A51	L10A40
			1000	54	8.4	–	C4254103	–	CIR4100	–	L10A52
			1500	81	12.6	–	C4254153	–	CIR4101	–	L10A8
			2000	108	16.7	–	C4254203	–	CIR4102	–	L10A50
	12	304.8	500	22	3.4	C4304501	C4304503	CIR4125	CIR4125	L12A81	L12A80
	12	304.8	1000	45	7.0	C4304101	C4304103	CIR4120	CIR4120	L12A82	L12A34
	12	304.8	1500	67	10.4	C4304151	C4304153	CIR4121	CIR4121	L12A14	L12A39
	14	355.6	3700	140	21.7	–	C4355373	–	CIR4140	–	L14A21
	15	381.0	2400	84	13.0	–	C4381243	–	CIR4150	–	L15A20
	18	457.2	1500	44	6.8	–	C4457153	–	CIR4180	–	L18A32
	18	457.2	3000	87	13.5	–	C4457303	–	CIR4182	–	L18A34
	18	457.2	4700	137	21.2	–	C4457473	–	CIR4184	–	L18A36
20	508.0	4700	123	19.1	–	C4508473	–	CIR4205	–	L20A14	
36	914.4	3000	43	6.7	–	C4914303	–	CIR4361	–	L36A8	
3/4" (19 mm) Hole Diameter (0.747"/18.9 mm) Sheath Diameter	2 1/4	57.2	200	49	7.6	C5057201	–	CIR5022	–	N2E8	–
	3	76.2	250	43	6.7	C5076251	–	CIR5031	–	N3A11	–
	3	76.2	500	85	13.2	C5076501	C5076503	CIR5030	CIR5030	–	N3A12
	4	101.6	500	61	9.5	–	C5101503	–	CIR5040	–	N4A17
	4	101.6	1000	122	18.9	–	C5101103	–	CIR5041	–	N4A15
	5	127.0	300	28	4.3	C5127301	–	CIR5052	–	N5A19	–
	5	127.0	500	47	7.3	–	C5127503	–	CIR5051	–	N5A12
	5	127.0	1000	95	14.7	C5127101	C5127103	CIR5050	CIR5050	–	N5A20
	6	152.4	500	39	6.0	C5152501	C5152503	CIR5065	CIR5065	N6A19	N6A20
			1000	78	12.1	–	C5152103	–	CIR5067	–	N6A21
			1500	116	18.0	–	C5152153	–	CIR5068	–	N6A82
			2000	155	24.0	–	C5152203	–	CIR5069	–	N6A22
	7	177.8	500	33	5.1	C5177501	C5177503	CIR5075	CIR5075	N7A15	N7A1
	7	177.8	1000	66	10.2	–	C5177103	–	CIR5072	–	N7A16
	8	203.2	500	28	4.3	C5203501	C5203503	CIR5085	CIR5085	N8A19	N8A20
	8	203.2	1000	57	8.8	–	C5203103	–	CIR5080	–	N8A21
	8	203.2	2000	114	17.7	–	C5203203	–	CIR5082	–	N8A22
	10	254.0	1000	45	7.0	–	C5254103	–	CIR5100	–	N10A15
	10	254.0	2000	90	14.0	–	C5254203	–	CIR5102	–	N10A14
	12	304.8	1000	37	5.7	–	C5304103	–	CIR5120	–	N12A15
	12	304.8	2000	74	11.5	–	C5304203	–	CIR5121	–	N12A24
	12	304.8	4000	148	22.9	–	C5304403	–	CIR5124	–	N12A25
	15	381.0	1500	44	6.8	–	C5381153	–	CIR5150	–	N15A26
	16	406.4	1800	49	7.6	–	C5406183	–	CIR5162	–	N16A26
	18	457.2	2000	49	7.6	–	C5457203	–	CIR5182	–	N18A13
	20	508.0	1150	25	3.9	–	C5508113	–	CIR5202	–	N20A21
	20	508.0	2250	49	7.6	–	C5508223	–	CIR5203	–	N20A22
	20	508.0	5000	115	17.8	–	C5508503	–	CIR5205	–	N20A10
24	609.6	1375	25	3.9	–	C5609133	–	CIR5243	–	N24A24	
24	609.6	2750	50	7.8	–	C5609273	–	CIR5244	–	N24A23	
36	914.4	2500	30	4.7	–	C5914253	–	CIR5362	–	N36A4	
1 19/64" (33 mm) Hole Diameter 1.293"/32.8 mm Sheath Diameter	5	127.0	600	35	5.4	C6127601	C6127603	C806	C806	–	–
	8 1/2	215.9	1000	32	5.0	C6215101	C6215103	C830	C830	–	–
	8 1/2	215.9	1200	39	6.0	C6215212	C6215123	C810	C810	–	–

To Order Specify

- Quantity
- Voltage
- Special features
- Catalog number
- Wattage



Special Designs and Modifications

Special Voltages and Wattages

Cartridge heaters can be custom manufactured to voltages and wattages other than those listed. Series connecting cartridges on line voltages above 300 volts is not recommended. For details check factory.

Special Lengths

Cartridge heaters can be custom manufactured in lengths up to 100 inches. However, drilling and reaming holes accurately in long lengths requires special equipment. If possible shorter heaters from each side are a cost effective solution. An improper fit will reduce heater life.

Special Sheath Materials

Caloritech™ cartridge heaters are manufactured from grade 321 stainless steel; which is suitable for most applications. For special requirements check factory.

Moisture-Resistant

The end cap of the Caloritech™ cartridge heater is welded to form a gas tight seal. Optional lead wire construction includes silicon potting, teflon seals and teflon leads. Check factory for application assistance.

Lead Wire Length

Fibreglass insulated nickel leads, 10" in length, are standard. Cartridge heaters can be manufactured with longer leads or extended leads can be spliced to stock units.

Protective Lead Covering

Armoured cable or wire mesh sleeving is available for additional mechanical protection over lead wires.

Thermocouple

J or K thermocouples can be built into any cartridge heater. See Section F of the Caloritech™ catalog for thermocouple information.

Ground Wire

An additional wire for ground, fixed to the sheath, can be provided for special code requirements.

Threaded Bushing

Welded single-ended and double-ended stainless steel bushings are available for immersion applications. Check factory for suitable densities.

Threaded Bushing (See Figure 45 & Figure 45)

Brass for liquid immersion heating applications under 750°F (399°C). Stainless steel available for applications over 750°F (399°C).

To Order Specify

- Quantity
- Catalog number
- Special features

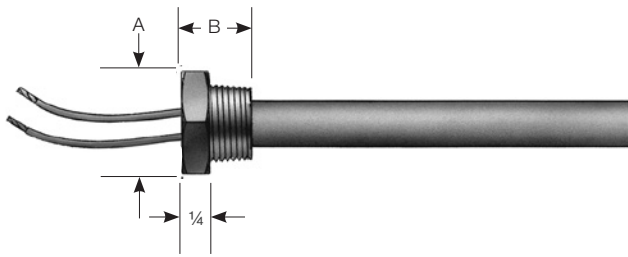


Figure 44

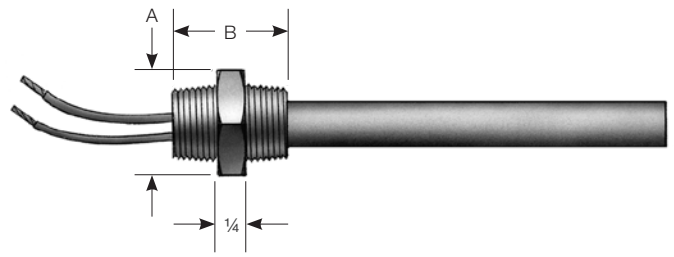


Figure 45

Table 12 – Threaded Bushing (See Figure 45)

Cartridge Diameter		'A' Dim.		'B' Dim.		Standard Taper Pipe Thread
in	mm	in	mm	in	mm	
0.25	6.0	0.47	11.9	0.60	15.2	1/8" NPT
0.38	9.5	0.62	15.7	0.68	17.2	1/4" NPT
0.50	12.0	0.68	17.2	0.85	21.7	3/8" NPT
0.63	16.0	0.89	22.5	0.95	24.2	1/2" NPT
0.75	18.0	1.06	26.8	1.04	26.5	3/4" NPT
1.30	33.0	1.75	44.5	1.37	34.9	1 1/4" NPT

Table 13 – Threaded Bushing (See Figure 46)

Cartridge Diameter		'A' Dim.		'B' Dim.		'C' Dim.		Standard Taper Pipe Thread
in	mm	in	mm	in	mm	in	mm	
0.25	6.0	0.47	11.9	0.98	24.8	0.38	9.6	1/8" NPT
0.38	9.5	0.62	15.7	1.09	27.6	0.41	10.4	1/4" NPT
0.50	12.0	0.68	17.2	1.40	35.6	0.55	13.9	3/8" NPT
0.63	16.0	0.87	22.1	1.50	38.2	0.63	16.0	1/2" NPT
0.75	18.0	1.06	26.8	1.70	43.2	0.66	16.7	3/4" NPT
1.30	33.0	1.75	44.5	2.37	60.3	1.00	25.1	1 1/4" NPT

Strip & Finned Strip Heaters - SS, SD & FS

Type SS



Type SD



Type FS



Application

Strip Heaters have many applications, including: surface heating - on platens, dies, moulds, tanks, piping and more; process air heating - both strip and finned strip heaters in drying cabinets, ovens, baking ovens and vacuum dehydrating ovens and for moisture protection for motors, etc.; resistors - as dropping resistors for line applications in railroads and load banks; winterizing - on hoppers, conveyors, ducts, car heating, thawing; original equipment - air conditioning, laboratory equipment, food packaging, ovens, presses and drying equipment.

Construction

Caloritech™ strip heaters are constructed of specially selected high quality materials, beginning with the high-temperature alloy resistance wire uniformly coiled and spaced over the width of the heated length of the strip heater. This controlled coil process and placement assures uniform heat distribution over the entire active surface of the heater.

Special care is taken to secure the stud-type terminal to the high-temperature alloy resistance contact. The coiled resistance wire is embedded in a special refractory material which possesses excellent heat transfer characteristics and superior insulation properties.

The entire heater assembly is encased in either an aluminized steel or stainless steel sheath and is compressed under high pressure. The completed assembly is heated under controlled conditions to bake and semi-vitrify the refractory material for a rigid, vibration resistant, heavy-duty heating unit.

Features

Strip heaters are available with aluminized steel or stainless steel sheath. Aluminized steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1000°F (538°C). Stainless steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1200°F (649°C).

Caloritech™ strip heaters have slotted mounting tabs which allow for lineal expansion during the initial heat up period. The flat surface of the strip heater is suitable for clamp-on applications and provides uniform heat distribution for broad surfaces.

Finned Strip Heaters

Type SS strip heaters can be finned to improve heat transfer in free or forced air heating applications. See listings for Special Features on page A30.

Benefits

- Aluminized steel sheath provides both corrosion resistance and an attractive appearance.
- Stainless steel sheath combines additional corrosion protection and excellent appearance.
- Vibration resistant - the compacted semi-vitrified refractory material with the rigid sheathed construction enable strip heaters to withstand severe vibration conditions.
- Rugged construction for long life.
- Application versatility - easy to use in a wide variety of surface and air heating applications.

Normal Limits

- Maximum Voltage (with Secondary Insulators): 600V
- Maximum Amps: 48 amps
- Overall Length Limit: 42 1/4"
- Effective Length Limit: 39"
- Approx. Weight/Inch of Length: 0.08 lbs/inch
- Maximum Allowable Sheath Temperature:
 - Aluminized Steel: 1000°F (538°C)
 - Stainless Steel: 1200°F (649°C)
- Minimum Lengthwise Factory Bending Radius (Terminals on Outside): 4" (102 mm)

Selection

Use the graphs shown on this page to assist in the selection of the strip heater or finned strip heater with the correct watt density so that the sheath temperature will not exceed 1000°F (538°C) for aluminized steel and 1200°F (649°C) for stainless steel.

Consult factory for additional assistance.

Watt Density – Temperature Data

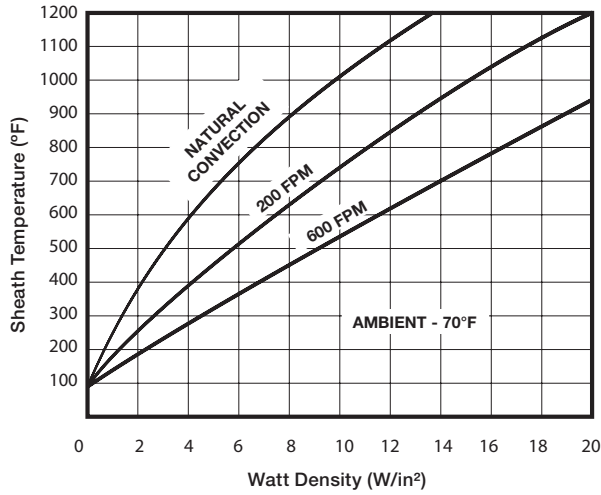


Figure 46 – Strip Heater Sheath Temperature vs. Watt Density for Air Heating Applications

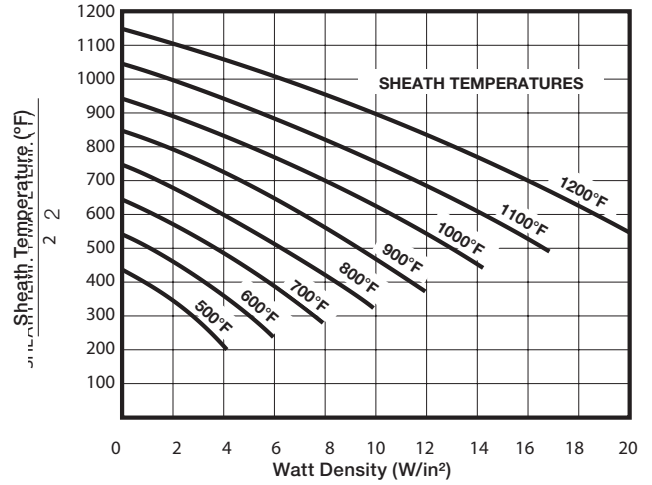


Figure 47 – Strip Heater Sheath Temperature vs. Watt Density for Clamped-on Applications

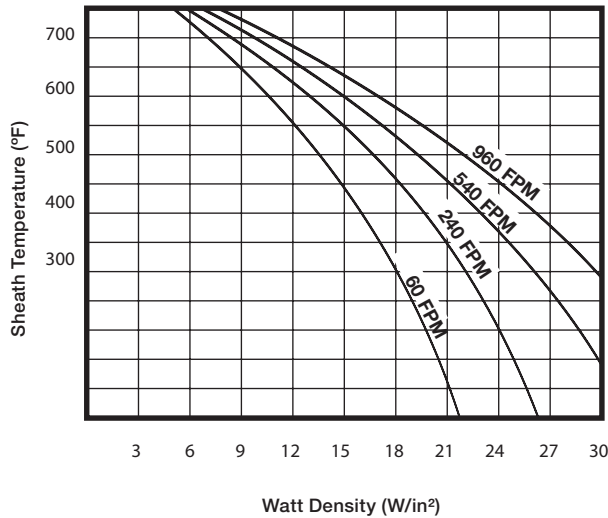


Figure 48 – Finned Strip Heater Outlet Air Temperature vs. Watt Density for 700°F to 750°F (371°C to 399°C) Sheath Operating Temperature

Strip Heater - SS Series

SS Series strip heaters have two offset bolt type terminals at one end. Table 16 lists heaters having aluminized steel sheath.



Aluminized Steel Sheath

The entire heater assembly is encased in an aluminized steel sheath and is compressed under high pressure. The sheath provides both corrosion resistance and an attractive appearance. Aluminized steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1000°F (538°C).

If higher temperatures are anticipated, use stainless steel heaters listed in Table 17 on page A25.

Installation

Standard strip heaters listed are rated at 120V and 240V. A limited selection of 287V heaters is also tabled. All strip heaters can be used on voltages lower than listed for reduced wattage, and some designs can also be used on higher voltages - check factory.

Whenever voltage to ground exceeds 300V, secondary insulators must be used. See Special Features on page A30.

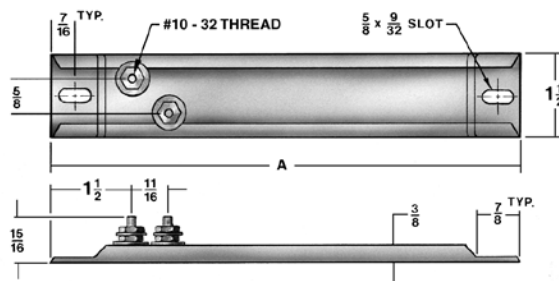


Figure 49

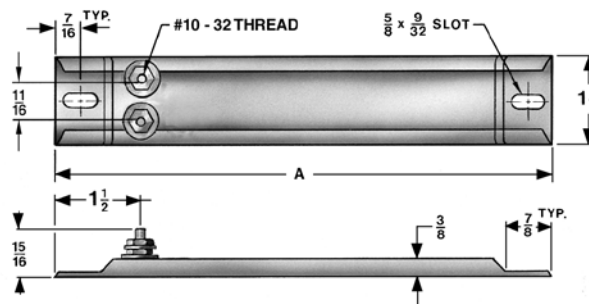


Figure 50

Table 14 – Type SS Strip Heaters: Terminals at One End/Aluminized Steel Sheath

'A' Dim.		Figure No.	Watts	Watts Per		Caloritech™ Catalog No.				Chromalox Cat. No.	
in.	mm			in ²	cm ²	120V	240V	277V	287V	120V	240V
5 1/2	140	50	125	15.7	2.4	SS1001	—	—	—	PT512	—
6	152	50	150	15.2	2.4	SS1011	SS1022	—	—	PT615	—
7 1/4	184	49	100	8.2	1.3	SS1031	—	—	—	—	—
7 1/4	184		150	12.3	1.9	SS1041	SS1052	—	—	OT715	OT715
8	203		150	10.0	1.6	SS1061	SS1072	—	—	OT815	OT815
8	203		175	11.7	1.8	SS1081	SS1092	—	—	OT817	OT817
10 1/2	267		250	10.3	1.6	SS1101	SS1112	—	—	OT1025	—
11 3/4	298		250	8.6	1.3	SS1141	SS1152	—	—	OT1225	OT122
14	356		300	8.0	1.2	SS1181	SS1192	—	—	OT1430	OT1430
15	381		325	7.9	1.2	SS1201	SS1212	—	—	OT1532	OT1532
17 3/4	451		350	6.8	1.1	SS1221	SS1232	—	—	OT1835	OT1835
17 3/4	451		375	7.3	1.1	SS1241	SS1252	—	—	OT1837	OT1837
17 3/4	451		500	9.7	1.5	SS1261	SS1272	—	—	OT1850	OT1850
17 3/4	451		250	4.8	0.7	SS1281	SS1292	—	—	—	—
19 1/2	495		350	6.0	0.9	SS1301	SS1312	—	—	—	OT1935
19 1/2	495		500	8.6	1.3	SS1321	SS1332	—	—	OT1950	OT1950
21	533		500	7.8	1.2	SS1341	SS1352	—	—	OT2150	OT2150
23 1/2	597		500	6.8	1.1	SS1361	SS1372	SS1386	—	OT2450	OT2450
23 1/2	597		750	10.3	1.6	SS1391	SS1402	—	—	OT2475	OT2475
25 1/2	648		500	6.2	1.0	SS1421	SS1432	—	—	OT2550	OT2550
25 1/2	648		750	9.3	1.4	SS1441	SS1452	—	—	OT2575	OT2575
26 3/4	679		700	8.2	1.3	SS1461	SS1472	—	—	—	OT2670
30 1/2	768	750	7.6	1.2	SS1481	SS1492	—	2A830A706	OT3075	—	
33 1/2	851	750	6.8	1.1	SS1511	SS1522	—	—	—	OT3375	
35 3/4	908	1000	8.4	1.3	SS1531	SS1542	—	2A835A703	OT3610	OT3610	
38 1/2	978	800	6.2	1.0	SS1561	SS1572	—	—	—	—	
38 1/2	978	1000	7.7	1.2	SS1581	SS1592	—	—	OT3810	—	
42 1/4	1073	1250	8.7	1.3	SS1601	SS1612	—	—	—	—	
42 1/4	1073	1500	10.5	1.6	SS1621	SS1632	—	—	—	—	

Note
BA0002 ceramic covers are not suitable for strip heaters shorter than 7" (178 cm) in overall length.

Stainless Steel Sheath

The entire heater assembly is encased in a stainless steel sheath and is compressed under high pressure. The sheath combines additional corrosion protection and excellent appearance. Stainless steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1200°F (649°C).

Heaters with high temperature stainless steel sheath are listed in Table 17 on page A26.

Installation

Standard strip heaters listed are rated at 120V and 240V. A limited selection of 287V heaters is also tabled. All strip heaters can be used on voltages lower than listed for reduced wattage, and some designs can also be used on higher voltages - check factory.

Whenever voltage to ground exceeds 300V, secondary insulators must be used. See Special Features on page A30.

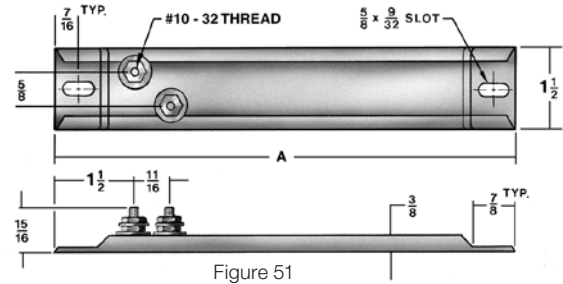


Figure 51

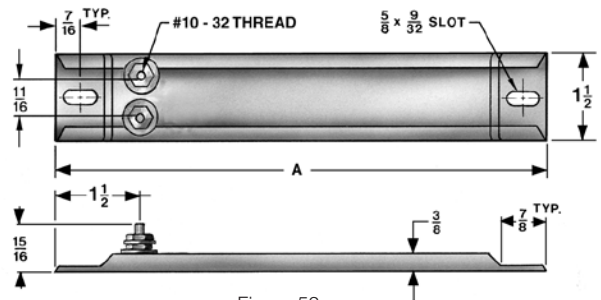


Figure 52

Table 15 – Type SS Strip Heaters: Terminals at One End/Stainless Steel Sheath

'A' Dim.		Figure No.	Watts	Watts Per		Caloritech™ Catalog No.			Chromalox Cat. No.	
in.	mm			in ²	cm ²	120V	240V	287V	120V	240V
5 1/2	140	52	250	31.4	4.9	SS2001	—	—	—	—
6	152	52	300	30.5	4.7	SS2011	SS2022	—	—	—
7 1/4	184	51	100	8.2	1.3	SS2031	—	—	—	—
7 1/4	184		200	16.4	2.5	SS2041	SS2052	—	—	OT702
8	203		250	16.7	2.6	SS2061	SS2072	—	OT802	OT802
8	203		400	26.7	4.1	SS2081	SS2092	—	OT804	OT804
10 1/2	267		350	14.4	2.2	SS2101	SS2112	—	OT1003	OT1003
10 1/2	267		400	16.4	2.5	SS2131	SS2132	—	OT1004	OT1004
11 3/4	298		350	12.0	1.9	SS2141	SS2152	—	OT1203	OT1203
11 3/4	298		500	17.2	2.7	SS2161	SS2172	—	OT1205	OT1205
14	356		500	13.3	2.1	SS2181	SS2192	—	OT1405	OT1405
15	381		500	12.1	1.9	SS2201	SS2212	—	—	OT1505
17 3/4	451		350	6.8	1.1	SS2221	SS2232	—	—	—
17 3/4	451		500	9.7	1.5	SS2241	SS2252	2A917A707	—	—
17 3/4	451		750	14.5	2.2	SS2261	SS2272	—	OT1807	OT1807
17 3/4	451		1000	19.4	3.0	SS2281	SS2292	—	OT1801	OT1801
19 1/2	495		500	8.6	1.3	SS2301	SS2312	—	OT1905	OT1905
19 1/2	495		1000	17.2	2.7	SS2321	SS2332	—	—	OT1901
21	533		750	11.8	1.8	SS2341	SS2352	—	OT2107	OT2107
23 1/2	597		500	6.8	1.1	SS2361	SS2372	—	OT2405	OT2405
23 1/2	597		750	10.3	1.6	SS2381	SS2392	2A923A703	OT2407	OT2407
23 1/2	597		1000	13.7	2.1	SS2401	SS2412	—	OT2401	OT2401
25 1/2	648	750	9.3	1.4	SS2421	SS2432	—	OT2507	OT2507	
25 1/2	648	1000	12.4	1.9	SS2441	SS2452	—	—	OT2501	
26 3/4	679	1000	11.7	1.8	SS2461	SS2472	—	—	OT2601	
30 1/4	768	750	7.6	1.2	—	SS2482	—	—	OT3007	
30 1/4	768	1000	10.2	1.6	SS2491	SS2502	2S930A701	—	—	
33 1/2	851	750	6.8	1.1	SS2511	SS2522	—	—	OT3307	
35 3/4	908	1000	8.4	1.3	—	SS2532	—	—	—	
35 3/4	908	1500	12.6	2.0	SS2541	SS2552	2A935A701	—	—	
38 1/2	978	1000	7.7	1.2	SS2561	SS2572	—	OT3801	—	
42 1/4	1073	1250	8.7	1.3	SS2601	SS2612	—	—	—	
42 1/4	1073	1500	10.5	1.6	SS2621	SS2632	—	—	OT4315	

Note

BA0002 ceramic covers are not suitable for strip heaters shorter than 7" (178 cm) in overall length.

To Order Specify

- Quantity
- Wattage
- Catalog number
- Special features
- Voltage

Strip Heater - SD Series



SD Series strip heaters have two bolt type terminals at opposite ends. Table 18 lists heaters having aluminized steel sheath.

Aluminum Steel Sheath

The entire heater assembly is encased in an aluminized steel sheath and is compressed under high pressure. The sheath provides both corrosion resistance and an attractive appearance. Aluminized steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1000°F (538°C).

If higher temperatures are anticipated use stainless steel heaters listed in Table 18.

Installation

Standard strip heaters listed are rated at 120V and 240V. All strip heaters can be used on voltages lower than listed for reduced wattage, and some designs can also be used on higher voltages - check factory.

Whenever voltage to ground exceeds 300V, secondary insulators must be used. See Special Features on page A30.

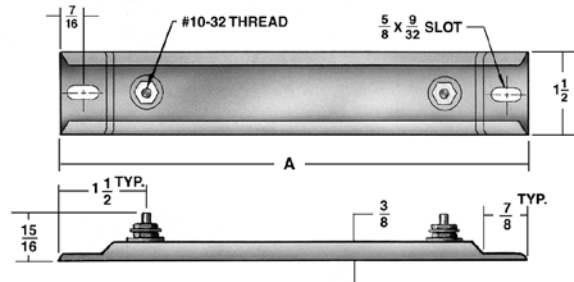


Figure 53

Table 16 – Type SD Strip Heaters: Terminals at Each End/Aluminized Steel Sheath

'A' Dim.		Watts	Watts Per		Caloritech™ Catalog No.		Chromalox Catalog No.	
in.	mm		in ²	cm ²	120V	240V	120V	240V
7 1/4	184	100	8.2	1.3	SD1001	—	—	—
7 1/4	184	150	12.3	1.9	SD1011	—	—	—
8	203	150	10	1.6	SD1021	SD1032	S815	S815
9 1/2	241	200	9.7	1.5	SD1041	SD1052	S920	—
11 3/4	298	250	8.6	1.3	SD1061	SD1072	S1225	S1225
14	356	300	8.0	1.2	SD1131	SD1142	S1430	—
15	381	325	7.9	1.2	SD1151	SD1162	—	—
17 3/4	451	350	6.8	1.1	SD1171	SD1182	—	—
17 3/4	451	375	7.3	1.1	SD1191	SD1202	—	—
17 3/4	451	500	9.7	1.5	SD1211	SD1222	S1850	S1850
19 1/2	495	500	8.6	1.3	SD1231	SD1242	—	—
21	533	500	7.8	1.2	SD1291	SD1302	S2050	—
23 1/2	597	250	3.4	0.5	SD1311	SD1322	—	S2425
23 1/2	597	500	6.8	1.1	SD1331	SD1342	S2450	S2450
25 1/2	648	750	9.3	1.4	SD1401	SD1412	—	—
26 3/4	679	700	8.2	1.3	SD1421	SD1432	—	—
30 1/4	768	750	7.6	1.2	SD1441	SD1452	—	S3075
33 1/2	851	750	6.8	1.1	SD1461	SD1472	—	—
35 3/4	908	1000	8.4	1.3	SD1481	SD1492	—	S3610
38 1/2	978	1000	7.7	1.2	SD1501	SD1512	—	—
42 1/4	1073	1250	8.7	1.3	SD1521	SD1532	—	—

Stainless Steel Sheath

The entire heater assembly is encased in a stainless steel sheath and is compressed under high pressure. The sheath combines additional corrosion protection and excellent appearance. Stainless steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1200°F (649°C).

Heaters with high temperature stainless steel sheath are listed in Table 19.

Installation

Standard strip heaters listed are rated at 120V and 240V. All strip heaters can be used on voltages lower than listed for reduced wattage, and some designs can also be used on higher voltages - check factory.

Whenever voltage to ground exceeds 300V, secondary insulators must be used. See Special Features on page A30.

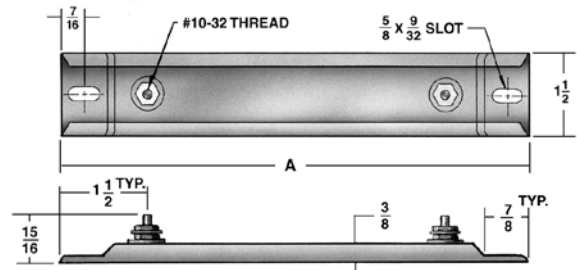


Figure 54

To Order Specify

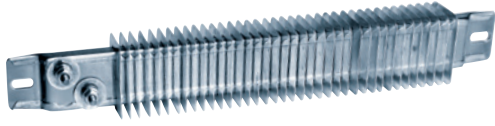
- Quantity
- Wattage
- Catalog number
- Special features
- Voltage

Table 17 – Type SD Strip Heaters - Terminals at Each End/Stainless Steel Sheath

'A' Dim.		Watts	Watts Per		Caloritech™ Catalog No.		Chromalox Catalog No.	
in.	mm		in ²	cm ²	120V	240V	120V	240V
7 ¼	184	100	8.2	1.3	SD2001	—	—	—
7 ¼	184	200	16.4	2.5	SD2011	—	—	—
8	203	250	16.7	2.6	SD2021	SD2032	—	—
9 ½	241	300	14.5	2.2	SD2041	SD2052	—	—
11 ¾	298	100	3.4	0.5	—	SD2062	—	—
11 ¾	298	250	8.6	1.3	SD2071	SD2082	S1202	S1202
11 ¾	298	350	12.0	1.9	SD2091	SD2102	—	—
11 ¾	298	500	17.2	2.7	SD2111	SD2122	—	S1205
14	356	500	13.3	2.1	SD2131	SD2142	—	—
15	381	500	12.1	1.9	SD2151	SD2162	—	—
17 ¾	451	500	9.7	1.5	SD2171	SD2182	S1805	S1805
17 ¾	451	750	14.5	2.2	SD2191	SD2202	—	S1807
17 ¾	451	1000	19.4	3.0	SD2211	SD2222	S1801	S1801
19 ½	495	500	8.6	1.3	SD2231	SD2242	—	—
19 ½	495	750	12.9	2.0	SD2251	SD2262	—	S1907
19 ½	495	1000	17.2	2.7	SD2271	SD2282	—	—
21	533	500	7.8	1.2	SD2291	SD2302	S2005	—
23 ½	597	500	6.8	1.1	SD2311	SD2322	S2405	S2404
23 ½	597	750	10.3	1.6	SD2341	SD2352	S2407	S2407
23 ½	597	1000	13.7	2.1	SD2361	SD2372	S2401	S2401
23 ½	597	1500	20.5	3.2	SD2381	SD2392	—	—
25 ½	648	1000	12.4	1.9	SD2401	SD2412	—	—
26 ¼	679	750	8.8	1.4	SD2421	SD2432	—	—
30 ¼	768	750	7.6	1.2	SD2441	SD2452	—	—
33 ½	851	1000	9.0	1.4	SD2461	SD2472	—	S3301
35 ¼	908	1000	8.4	1.3	SD2481	SD2492	—	S3601
38 ½	978	1000	7.7	1.2	SD2501	SD2512	—	—
42 ¼	1073	1500	10.5	1.6	SD2521	SD2532	—	—

Finned Strip Heater - FS Series

FS Series strip heaters have two offset bolt type terminals at one end.



Aluminum Steel Sheath

The entire heater assembly is encased in an aluminized steel sheath and is compressed under high pressure. The sheath provides both corrosion resistance and an attractive appearance. Aluminized steel strip heaters are suitable for applications where the maximum sheath temperature does not exceed 1000°F (538°C).

Fins are 0.022" (0.56 mm) thick cadmium plated steel with a nominal four fins per inch. Fins are approximately 2" (51 mm) x 1 3/8" (35 mm).

Installation

Standard strip heaters listed are rated at 120V and 240V. All strip heaters can be used on voltages lower than listed for reduced wattage, and some designs can also be used on higher voltages – check factory.

Whenever voltage to ground exceeds 300V, secondary insulators must be used. See Special Features on page A30.

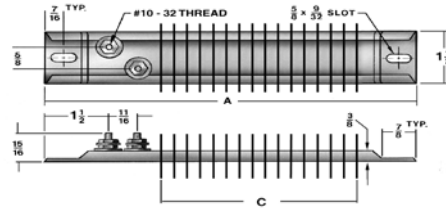


Figure 55

Table 18 – Type FS Finned Strip Heaters - Terminals at One End/Aluminized Steel Sheath

	'A' Dim.		C' Dim.		Watts	Watts Per		Caloritech™ Cat. No.		Caloritech™ Part No.		Chromalox Cat. No.	
	in.	mm	in.	mm		in ²	cm ²	120V	240V	120V	240V	120V	240V
High Watt Density	10 1/2	267	6 1/4	159	725	29.7	4.6	FS2001	FS2002	—	—	OTF-100	OTF-100
	11 3/4	298	7 1/2	191	900	31.0	4.8	FS2011	FS2012	—	—	OTF-120	OTF-120
	14	356	9 3/4	248	1100	29.3	4.5	FS2021	FS2022	—	—	OTF-140	OTF-140
	15	381	10 3/4	273	1250	30.3	4.7	FS2031	FS2032	—	—	—	OTF-150
	17 3/4	451	13 1/2	343	1550	30.1	4.7	FS2041	FS2042	—	—	—	OTF-180
	19 1/2	495	15 1/4	387	1700	29.2	4.5	FS2051	FS2052	—	—	—	OTF-190
	21	533	16 3/4	425	1900	29.8	4.6	FS2061	FS2062	—	—	—	OTF-210
	23 1/2	597	19 1/4	489	2200	30.1	4.7	FS2071	FS2072	—	—	—	OTF-240
	25 1/2	648	21 1/4	540	2400	29.8	4.6	—	FS2142	—	—	—	OTF-250
	26 3/4	679	22 1/2	572	2500	30.1	4.7	—	FS2082	—	—	—	OTF-260
	30 1/4	768	26	660	2800	28.4	4.4	—	FS2092	—	—	—	OTF-300
	33 1/2	851	29 1/4	743	3150	28.5	4.4	—	FS2102	—	—	—	OTF-330
	35 3/4	908	31 1/2	800	3450	29.0	4.5	—	FS2112	—	—	—	OTF-360
	38 1/2	978	34 1/4	870	3700	28.6	4.4	—	FS2122	—	—	—	OTF-380
42 1/4	1073	38	965	4150	28.9	4.5	—	FS2132	—	—	—	OTF-430	
Low Watt Density	7 1/4	184	3	76	150	12.3	1.9	FS1001	FS1002	*SS1041F	*SS1052F	—	—
	8	203	3 3/4	95	175	11.7	1.8	FS1011	FS1012	*SS1081F	*SS1092F	—	—
	10 1/2	267	6 1/4	159	350	14.4	2.2	FS1021	FS1022	—	—	OTF-10	OTF-10
	11 3/4	298	7 1/2	191	500	17.2	2.7	FS1031	FS1032	*SS2161F	*SS2172F	OTF-12	OTF-12
	14	356	9 3/4	248	500	13.3	2.1	FS1041	FS1042	*SS2181F	*SS2192F	—	OTF-14
	15	381	10 3/4	273	500	12.1	1.9	FS1051	FS1052	*SS2201F	*SS2212F	—	—
	17 3/4	451	13 1/2	343	1000	19.4	3.0	FS1061	FS1062	*SS2281F	*SS2292F	OTF-18	OTF-18
	19 1/2	495	15 1/4	387	1000	17.2	2.7	FS1071	FS1072	*SS2321F	*SS2332F	—	OTF-19
	21	533	16 3/4	425	1000	15.7	2.4	FS1081	FS1082	—	—	—	OTF-21
	23 1/2	597	19 1/4	489	1000	13.7	2.1	FS1091	FS1092	*SS2401F	*SS2412F	—	OTF-24
	25 1/2	648	21 1/4	540	1250	15.5	2.4	FS1151	FS1152	—	—	—	OTF-25
	26 1/2	679	22 1/2	572	1350	15.8	2.4	FS1101	FS1102	—	—	—	OTF-26
	30 1/4	768	26	660	1500	15.2	2.4	FS1111	FS1112	—	—	—	OTF-30
	33 1/2	851	29 1/4	743	1700	15.4	2.4	FS1121	FS1122	—	—	—	—
35 3/4	908	31 1/2	800	1800	15.1	2.3	FS1131	FS1132	—	—	—	OTF-36	
38 1/2	978	34 1/4	870	2000	15.5	2.4	—	FS1162	—	—	—	OTF-38	
42 1/4	1073	38	965	2100	14.6	2.3	—	FS1142	—	—	—	—	

Note
* Assembly stock (2 days)

To Order Specify

- Quantity
- Voltage
- Special features
- Catalog number
- Wattage

FS, SS & SD – Strip & Finned Strip Heaters

Special Features

Special Wattage, Voltage and Lengths

Check factory if you require a custom designed heater.

Lengthwise Bending

Consult factory if lengthwise bending is required.

Finned Strip Heater - FS Series

Type SS strip heaters (with offset terminals) can be supplied with fins on request. See Finned Strip Heater on page A29 for standard listings.

Secondary Insulators

Whenever the voltage to ground on the strip heater exceeds 300V secondary insulators must be used.

Secondary Insulators – Catalog Number SA1014

This insulator shown is for use where mounting space is limited to 1/2" (12.7 mm) longer than the strip heater. Strip heater mounting tabs must be factory punched to install insulator.

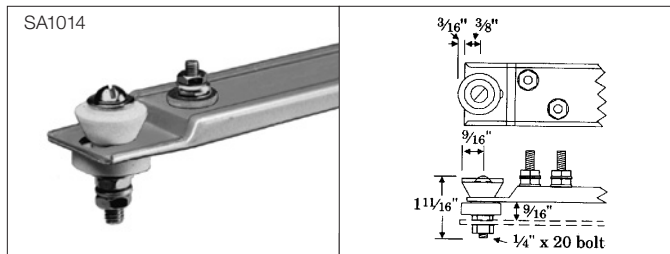


Figure 56

Secondary Insulators – Catalog Number SA1024

This secondary insulator is for use with stock strip heaters. The mounting space must be 3" (76 mm) longer than the strip heater.

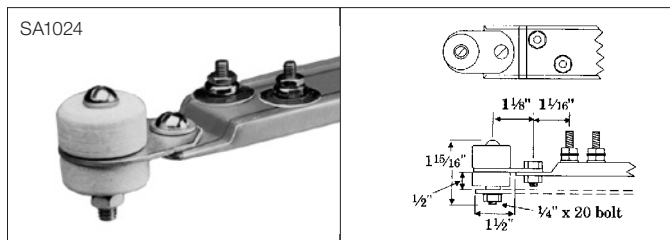


Figure 57

Ceramic Post Terminal Cover – Catalog Number BA0002

For heaters with standard 10-32 threaded terminals at both ends or with offset terminals at one end, these ceramic post terminal covers may be used with insulated wiring to provide protection against electrical shock.



Figure 58

Brass Bus Bar - Catalog Number CA1003

Perforated brass bus bar provides a sturdy conductor for connecting numerous strip heaters in series or parallel. Bus bars may be stacked for higher current-carrying capacities.

Table 19 – Brass Bus Bar

Ambient Temperature °F (°C)	Current Capacity (Amps)	
	1 Bus	2 Bus
70 (21)	36	50
250 (121)	32	45
500 (260)	26	36
750 (399)	20	28

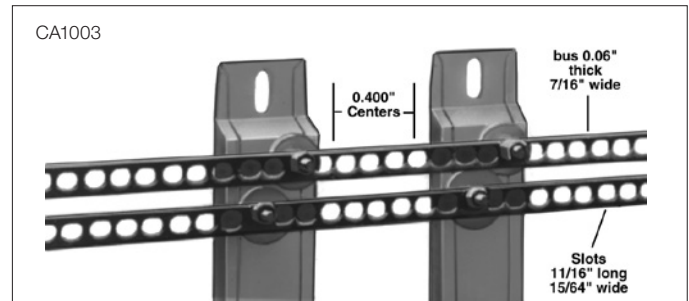


Figure 59

Terminal Box – Catalog Number SA1054

For type SS strip heaters the box is equipped with BX cable fitting and can be mounted in any of four directions.

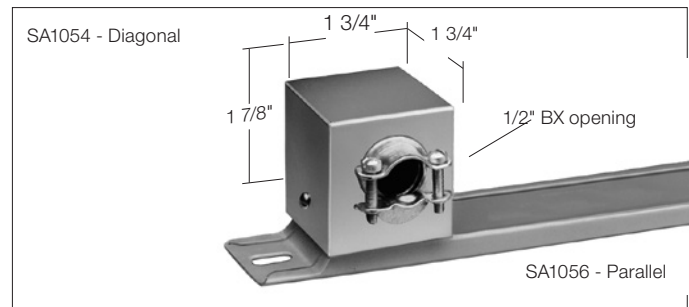


Figure 60

Surface Clamp – Catalog Number SA1044

This heavy-gauge, nickel-plated steel clamp is used to mount strip heaters securely to broad surfaces such as tank walls, platens, dies. Threaded 3/8" (9.5 mm) diameter studs must be first welded, brazed or threaded into the work surfaces.

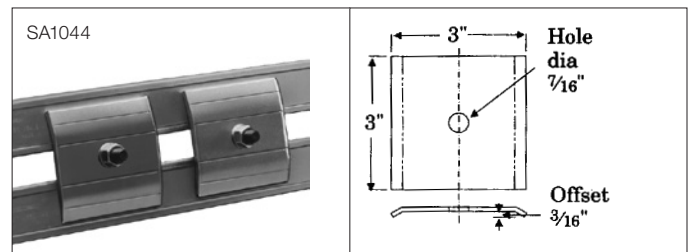


Figure 61

Band Heaters - BC

Band Heaters - BC Series

Caloritech™ band heaters are aluminized steel strip heaters formed to a semicircle and supplied in pairs. A spring at the terminal end keeps the heater halves in contact with the barrel and compensates for thermal expansion. The other end is fastened by a captive chrome plated allen screw for ease of installation.

Band heaters are used to heat the barrels of plastic injection and extrusion machines, kettles, pipes and other cylinders. Standard heaters are designed for 240V operation and insulated for 600V. Two can be connected to accommodate a 480V supply.

The selection procedure is the same as for aluminized steel strip heaters. Heaters are $1\frac{1}{2} \pm 1/64$ " (38 mm \pm .4 mm) wide and $3/8 \pm 1/64$ " (9.5 mm \pm 0.4 mm) thick. Standard diameters are from 5" to 20" (127 mm) with outputs from 580 watts to 3 kW.

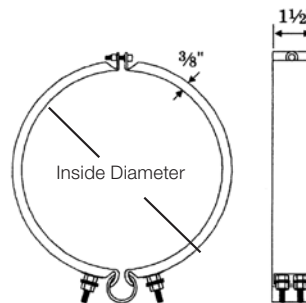


Figure 62

Table 20 – BC Series

Inside diameter		Watts	Catalog Number
in	mm		
5	127	580	BC4502
5	127	770	BC4502G100
5.5	140	600	BC4552
6.5	165	1000	BC4652
7	178	580	BC4702
7.5	191	900	BC752
8	203	800	BC4802G100
8	203	1000	BC4802
9	229	1100	BC4902G100
9	229	1400	BC4902
9.5	241	1000	BC4952
10	254	1200	BC4102
11	279	1480	BC4112
13	330	1400	BC4132
20	508	3000	BC4202

Note

Catalog numbers cover two heater halves, spring clamp, and tightening clamp.

Tubular Band Heaters - TBH & TBW

TBH and TBW Series tubular band heaters can be clamped to extruder barrels, nozzles, pipes or vessels requiring highly concentrated heating. Heaters can be mounted side-by-side and wrapped with high temperature insulation to improve efficiency.

Some installations may require high temperature wiring or bus bar. If in doubt, check factory.

Two choices of watt densities are listed for some models. To improve service life in high temperature applications greater than 800°F (425°C), select the unit with the lower watt density and consider using multiple heaters.

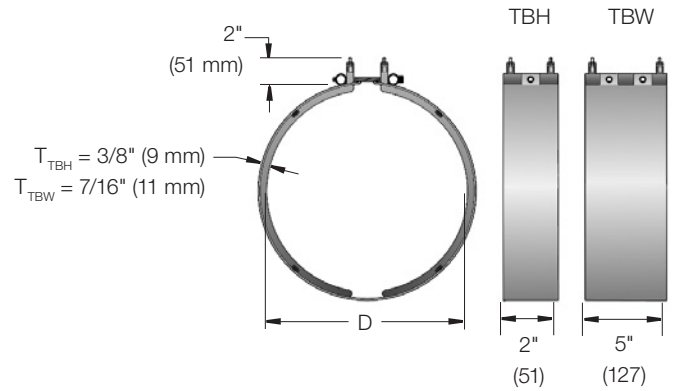


Figure 63

Construction

The band heater consists of two heating elements held in place by a stainless steel band with a threaded swivel type clamping device.

Two standard widths, 2" (51 mm) for TBH and 5" (127 mm) for TBW, are available. The TBW unit has two tension bolts and two double hairpin elements.

Incoloy® elements suitable for up to 600V are used in the larger models.

Terminal housings are available on special order.

Special Features

- Other wattages, diameters and widths are available on special order. Check factory.
- Terminal housings.

To Order Specify

- Quantity
- Voltage
- Special features
- Catalog number
- Wattage

Table 21 – TBH Band Heaters

Used On Std. Pipe Size		Inside Diameter		Diameter Tolerance		Wattage At			Watts/in² At		Catalog Number	Weight	
in	mm	in	mm	±in	mm	120V, 240V	208V	120V, 240V	208V	lbs		kg	
3	7.6	3 1/2	89	1/8	3	400	300	25	19	TBH03-040	1.6	0.7	
3	7.6	3 1/2	89			600	450	37	28	TBH03-060	1.6	0.7	
4	10.2	4 1/2	114			550	412	24	18	TBH04-055	1.8	0.8	
4	10.2	4 1/2	114			700	525	31	23	TBH04-070	1.8	0.8	
5	12.7	5 9/16	141			700	525	24	18	TBH05-070	2.0	0.9	
5	12.7	5 9/16	141			850	637	29	22	TBH05-085	2.0	0.9	
6	15.2	6 5/8	168	1/4	6	850	637	24	18	TBH06-085	2.2	1.0	
6	15.2	6 5/8	168			1000	750	28	21	TBH06-100	2.2	1.0	
8	20.3	8 5/8	219			1100	825	23	17	TBH08-110	2.4	1.1	
8	20.3	8 5/8	219			1350	1012	29	22	TBH08-135	2.4	1.1	
10	25.4	10 3/4	273			1450	1087	24	18	TBH10-145	2.5	1.2	
10	25.4	10 3/4	273			1700	1275	28	21	TBH10-170	2.5	1.2	

Table 22 – TBW Band Heaters

Used On Std. Pipe Size		Inside Diameter		Diameter Tolerance		Watts	Watts/in²	Std. Voltages	Catalog Number	Weight	
in	mm	in	mm	±in	mm					lbs	kg
6	15.2	6 5/8	168	1/8	3	1500	18	120	TBW06-150	4	2
6	15.2	6 5/8	168			TBW06-200	4		2		
8	20.3	8 5/8	219	1/4	6	1500	14		TBW08-150	4	2
8	20.3	8 5/8	219			2500	23		TBW08-250	4	2
10	25.4	10 3/4	273			2000	14		TBW10-200	5	2
10	25.4	10 3/4	273			3000	21		TBW10-300	5	2
12	30.5	12 3/4	324			2500	15	TBW12-250	6	3	
12	30.5	12 3/4	324			3500	20	TBW12-350	6	3	
14	35.6	14	356	600	3000	16	TBW14-300	7	3		
14	35.6	14	356		4000	21	TBW14-400	7	3		
16	40.6	16	406		3500	16	TBW16-350	8	4		
16	40.6	16	406		4500	20	TBW16-450	8	4		

Tubular Band Heaters – TBH & TBW

Drum Heaters - D

Application

D130 drum heaters are a portable lightweight heat source designed for a standard 45 gallon drum but versatile enough for use on any similar sized vessel where quick, adjustable heating is required. Other sizes are available as shown.

D130 drum heaters are not for use on pressure tight containers or in hazardous environments. The D130 drum heater is rated at 8.5 W/in² which is approximately 6 to 7 W/in² on the inside drum surface. Ensure the material to be heated is compatible with this watt density rating.

Features

- CSA certified
- Rust resistant aluminized steel
- Low maintenance
- Easy installation
- Thermostat
- Heavy duty cord and plug

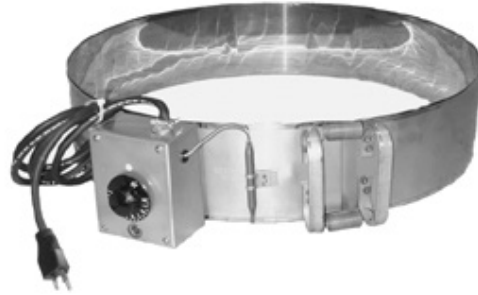


Table 23 – Drum Heaters

Drum Capacity	Volts	Watts	Dimensions		Catalog Number
			I.D.	Width	
45 IMP	120	1900	22.5"	5" (127 mm)	D130120
55 US gal	240	3000	(572 mm)		D130240
25 IMP	120	1900	18"	5" (127 mm)	D140120
30 US gal	240	2500	(572 mm)		D140240
5 IMP	120	1500	11.5"	5" (127 mm)	D135120
6 US gal	240	1500	(292 mm)		D135240

To Order Specify

- Quantity
- Voltage
- Catalog number
- Wattage

NOTE

The 120V unit is a 20 amp configuration. Ensure the power supply will handle 20 amps before connecting this model.

Bolt Heaters - IX

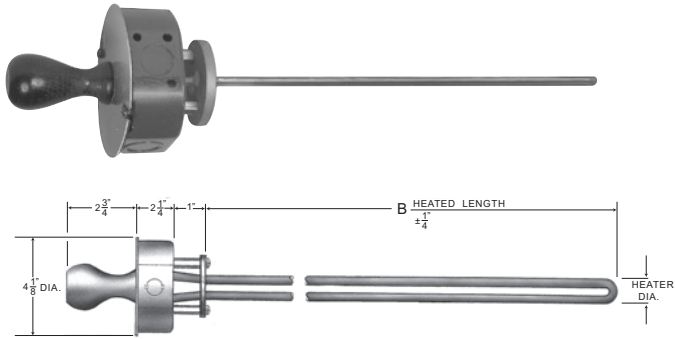


Figure 64

To Order Specify

- Quantity
- Voltage
- Catalog number
- Wattage

Application

Bolt heaters are for insertion into large hollow studs. When energized, the heater is intended to expand the length of the stud to facilitate wrench tightening of the nut.

Heaters are generally used in pairs or sets to achieve uniform bolt tension. Applications include assembly and disassembly of turbines, engine heads, dies, cylinders and large flanged connections.

Special lengths, diameters and wattages are available (check factory).

Note

Because of the elevated element sheath temperatures experienced in these applications, expect heater life to be relatively brief. Service life can be improved if the heater "on" time during a heating cycle is kept to the minimum required.

Although heaters are of premium quality *Thermon Heating Systems Inc.* does not warranty the service life of these heaters since life is essentially user dependent.

Table 24 – Bolt Heaters

Hole Diameter		Approximate Heater Diameter		'B' Heated Length		Standard Voltages	Wattage	Net Weight		Catalog Number
in	mm	in	mm	in	mm			lbs	kg	
0.500	12.7	0.490	12.4	12	305	120	850	4	2	IXS12600-01
				18	457		1250	4	2	IXS12600-02
				24	610		1700	7	3	IXS12600-03
				30	762		2100	7	3	IXS12600-04
0.563	14.3	0.550	14.0	12	305	208 240	850	4	2	IXS12600-05
				18	457		1250	4	2	IXS12600-06
				24	610		1700	7	3	IXS12600-07
				30	762		2100	7	3	IXS12600-08
0.625	15.9	0.615	15.6	12	305	208, 240	1700	7	3	IXS12600-09
				18	457		2500	7	3	IXS12600-10
				24	610		3400	9	4	IXS12600-11
				30	762		4200	9	4	IXS12600-12
0.688	17.5	0.673	17.1	12	305	120, 208, 240	1700	7	3	IXS12600-13
				18	457		2500	7	3	IXS12600-14
				24	610		3400	9	4	IXS12600-15
				30	762		4200	9	4	IXS12600-16
0.750	19.0	0.736	18.7	18	457	120, 208, 240	2500	4	2	IXS12600-17
				24	610		3400	4	2	IXS12600-18
				30	762		4200	7	3	IXS12600-19
				42	1067		5900	9	4	IXS12600-20
0.875	22.5	0.863	21.9	24	610	120, 208, 240, 480, 600	3500	7	3	IXS12600-21
				36	914		5000	7	3	IXS12600-22
				48	1219		6500	9	4	IXS12600-23
				60	1524		8000	9	4	IXS12600-24
1.000	25.4	0.984	25.0	24	610	120, 208, 240, 480, 600	3500	7	3	IXS12600-25
				36	914		5000	7	3	IXS12600-26
				48	1219		6500	9	4	IXS12600-27
				60	1524		8000	9	4	IXS12600-28

Calvane™ Heaters - FV

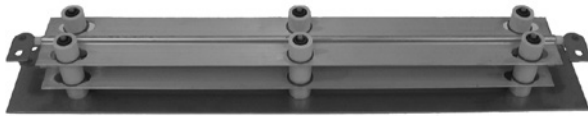
Compact and Lightweight for Space, Economy and Comfort

Calvane™ heaters combine compact size with lightweight Calrod® construction for an efficient and easily installed electrical heating source. They are designed for installations requiring size and weight control, where heater sheath temperatures below 600°F (316°C) can be maintained. The heaters are used primarily in natural and forced convection heating applications such as aircraft and transit car comfort heating.



Construction

The Calvane™ heating element, U.S. Patent No. 6,963,053, features an aluminum sheath with integrally extruded fins for an extended heat transfer surface. Nickel chromium resistance wire or ribbon and high grade magnesium oxide insulation combine to provide maximum life expectancy. With lengths up to 120" (3048 mm) and widths of 2.25" (58 mm) and 3.25" (83 mm), Calvane™ heaters are exceptionally well suited for air heating for comfort and dehumidification purposes in aircraft or transit cars. Quick connect or screw type projection welded connectors are available, and elements can be supported on studs.



Standard Product Features

- Two standard widths: 2.25" (57 mm) & 3.25" (83 mm)
- Lightweight:
 - 2.25" (57 mm) wide = 0.2 lbs/ft
 - 3.25" (83 mm) wide = 0.3 lbs/ft
- Extended heat transfer area:
 - 2.25" (57 mm) wide = 5 sq. in/in
 - 3.25" (83 mm) wide = 7 sq. in/in
- Low watt density
- Calrod® construction for long life
- Fast start-up and cool down periods
- No magnetic noise
- Low pressure drop
- Resistance to damage from shock and vibration
- Easily isolated for high voltage applications

Heater Selection

Thermal Duty

See Section D (technical data) for guidance on how to determine the appropriate total kW rating for a specific application.

Watt Density

The surface temperature of the heater must not exceed 600°F (316°C). Where there is a free flow of air through the element array, a watt density of 250 W/ft is acceptable for natural convection and low velocity, forced convection, comfort air heating. For other applications, consult Thermon Heating Systems Inc.

Mounting Arrangements

Thermon Heating Systems supplies Calvane™ heaters in three configurations:

- With plain fins for field modification to accommodate user installed hardware.
- With holes/slots in fins.
- Mounted on back plates.

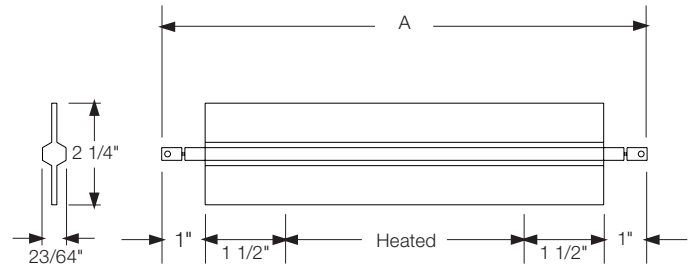


Figure 65

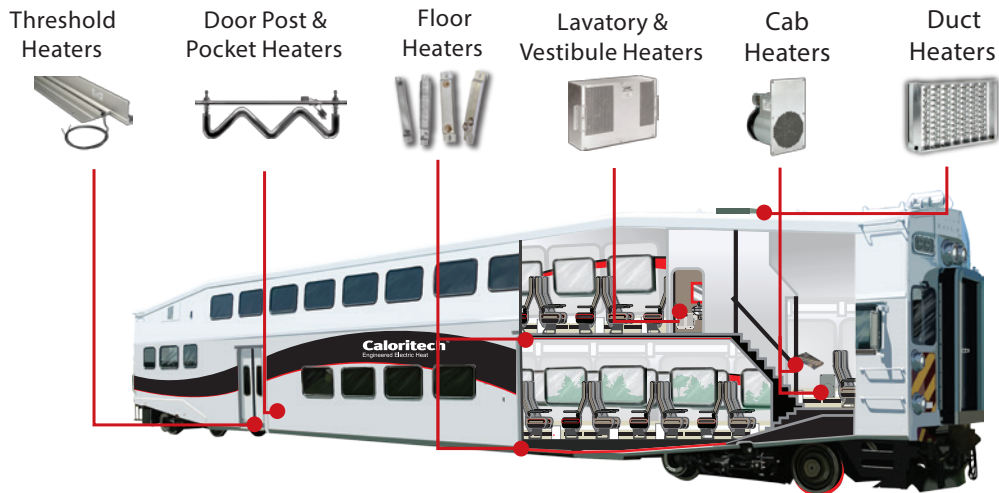
Table 25 – Standard Product Listing

'A' Dimensions		Watts	Catalog Number
in	mm		
29	737	500	FV1241
41	1041	750	FV1361
53	1346	1000	FV1481
65	1651	1250	FV1601
77	1956	1500	FV1721
89	2261	1750	FV1841

Note

- Standard heaters 120V and rated at 250 W/ft
- Custom designs available

Transit Car Floor Heaters



Transit Car Specifications

Transit car applications typically require floor heaters and even heat distribution. Heaters are normally installed in enclosures that take in air at the bottom and discharge air at the top or at the base of the window. Enclosure surfaces which can be contacted should not exceed temperatures of 125°F (52°C).

Calvane™ Heaters

Calvane™ heating elements in lengths up to 120" (3048 mm) can be purchased factory-mounted to stainless steel sub panels, ready for easy installation. These lengths reduce the number of field interconnections and allow series-connected elements to be powered at car ends or mid-car, thus minimizing assembly and wiring costs during car building. Calvane™ heaters also offer more even heat output and resultant lower casing temperatures than steel case strip heaters in similar applications. Calvane™ element weight is approximately 25% of steel case strip heater weight.

For transit car applications with supply voltages in the 600V nominal range, ceramic stand-off insulator systems are available. These insulators provide the required creepage and clearance distance for operation at over 240V. They also allow for expansion and contraction of the elements with minimal noise.

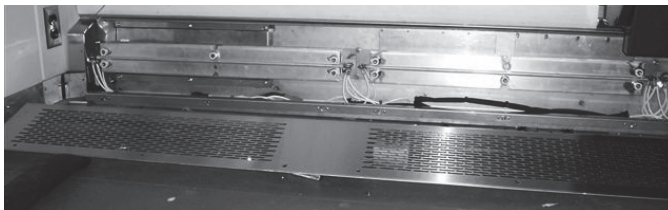


Figure 66 – Calvane™ Installation



Figure 67 – Strip Heater

Calvane™ Standard Product Features

- Two standard widths:
 - 2.25" (57 mm)
 - 3.25" (83 mm)
- Light weight:
 - 2.25" (57 mm) wide = 0.2 lbs/ft
 - 3.25" (83 mm) wide = 0.3 lbs/ft
- Low watt density
- Calrod® construction for long life
- Fast start-up and cool down periods
- No magnetic noise
- Low pressure drop
- Resistance to damage from shock and vibration
- Easily isolated for high voltage applications

Strip Heaters

Thermon Heating Systems offers steel case strip heaters in chrome, aluminized, and rust resistant steel. For more information, refer to Strip & Finned Strip Heaters - SS, SD & FS on page A23 to A29.

Typically, strip heaters designed for transit application are straight with terminal studs at each end. A high temperature nickle chromium resistance wire is uniformly spaced evenly over the width of the heater embedded in a special refractory material that possesses excellent heat transfer characteristics for demanding railcar environments.

Strip Heater Standard Product Features

- Uniform heat distribution
- Vibration resistant
- Rust resistant sheath material

Overhead HVAC & Fan-Forced Electric Heaters

Overhead HVAC Heaters

Low to high temperature open coil and finned tubular overhead heaters are designed for operation with the primary HVAC system.

Tubular Overhead HVAC Heaters

Finned or non-finned tubular elements positioned in a metal fabricated frame generally designed for removal during servicing without disturbing the heater frame. Elements are rigidly braced to minimize vibrations.

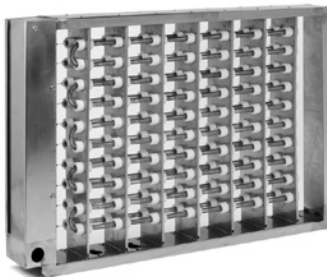


Features

- Fully protected against mechanical shock, vibration or breakage.
- Completely encased resistance wire that will not, sag, oxidize or deteriorate.
- Coiled alloy resistor wire is centered and permanently encased within highly compacted magnesium oxide surrounded by a steel sheath.

Open Coil Overhead HVAC Heaters

Helical wound high grade nickel chromium resistant wires supported by interlocking ceramic insulators with four times the creepage distance between terminal and ground.



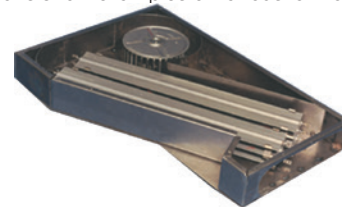
Features

- Static pressure drop through open coil is very low, reducing fan horsepower requirements.
- Low element mass yields relatively small amounts of residual heat on fan shut down, reducing heat effect on surrounding material.

Fan-Forced Electric Heaters

Caloritech™ fan-forced electric heaters provide efficient and economical comfort heating for transit car use in operator cabs, lavatories, and passenger areas.

The illustrations show examples of various fan-forced electric heaters



designed and built to meet customer specifications.

Calvane™ Cab Heater

The Calvane™ heater is lightweight 14 lb (6.35 kg) and quiet. It contains six horizontally staggered 333 watt Calvane™ heaters with a 250 c.f.m. centrifugal fan strategically placed in a brushed aluminum frame. The heater is low profile, having a depth of 60" (1520 mm). Rated 208V, 3 phase, 60 Hz, 2 kW.

Open Coil Cab Heater



The open coil cab heater has a speed-controlled fan, one 500 watt and one 1000 watt open coil element.

Tubular Element Cab Heater

The tubular element cab heater consists of a single entry axial flow fan that forces air over tubular elements. An automatic reset thermal cutout acts as the primary protector. In this design the fan and the elements operate on 480V while the controls function on a separate 120V feed.



PH Series - Enclosure Heater

The PH fan-forced heater is a light weight heater typically used in confined areas.



Features

- Available in 125 W, 200 W, 400 W and 800 W
- cCSA_{US} approved
- Light weight unit
- Low maintenance
- Aluminum alloy outer casting
- Externally adjustable thermostat 0°F to 100°F (-18°C to 38°C)
- Pilot light for "heat-on" indication
- High temperature safety protection
- Fan "ON/AUTO" switch to prolong motor life
- Terminal strip provides quick installation and accepts both standard and solid wire
- Optional DIN rail mounts available

Refer to Caloritech™ Catalog Section C, page C6 for more information on the PH Series Enclosure Heater.

Other Heaters

CALBAR™ Threshold Heater



Threshold heaters utilize the unique CALBAR™ heating element. The flat cross section of the CALBAR™ ensures maximum heat transfer to the threshold. Threshold heaters are hermetically sealed.

Customized designs and mounting hardware allow adaptation to existing thresholds. Alternatively, CALBAR™ heaters can be factory-installed in threshold extrusions.

PXFT Series Natural Convection Heater



A natural convection heater engineered to provide freeze protection inside an enclosure or wall containing water pipes or electrical instrumentation.

The PXFT uses a high surface area aluminum heat emitter to eliminate the need for a fan while providing low radiation and high convection heating to the enclosure. The thermostat rating is 25 A at 240V S.P.S.T., adjustable from 30°F to 120°F (0°C to 50°C). A movable bracket allows the heater to be floor or wall mounted with the terminal box located on the left or right side, top or bottom. Wire guards are provided standard with the PXFT-300, 400 W and 600 W heaters, and are available as an option on the PXFT-050, 125 W and 200 W units.

Refer to Caloritech™ Catalog Section C, page C7 for more information on the PXFT Series Natural Convection Heater.

CX Series Immersion Heaters



Screwplug immersion heaters are primarily used to heat water in tanks through natural convection currents. Typical heaters have standard 1" to 2 1/2" NPT tapered plugs. Other sizes or plugs are available on special order.

All thermostat equipped screwplug heaters with moisture or explosion-proof housings feature a convenient terminal block mounted to a slide out trolley.

Refer to Caloritech™ Catalog Section B, pages B6-B14, B17-B28 for more information on the CX Series Immersion Heater.

Pilot Gas Heater - PGH/PGHT

Application

The Caloritech™ Pilot Gas Heater is specifically designed to heat the pilot tube gas stream of an automatic pressure reducing valve. A large pressure reduction through the pressure reducing valve will create a temperature drop due to the Joule-Thomson effect. This temperature drop can cause moisture in the gas stream to accumulate and damage the internal seals in the valve.

The Pilot Gas Heater combines a high efficiency aluminum casting with a temperature controller to maintain the pilot tube gas stream temperature regardless of the gas flow rate. This heater is designed to prevent damage to valve seals caused by freezing of entrained moisture while maintaining a temperature low enough to prevent damage by overheating. Two different control options are available. The PGH model incorporates a digital electric thermostat, and the PGHT model uses a mechanical thermostat for temperature control.



Figure 68 – PGH Series Heater

Standard Features

- No maintenance required
- Heavy duty sheet metal casing
- Compact size
- Caloritech™ *x-Max*® anodized aluminum enclosure
- CSA Type 4 ingress protection
- Multiple conduit entries
- 304 series stainless steel heavy wall coiled tube
- Aluminum casting for efficient heat transfer
- 1500 psig operating pressure
- Replaceable heating element
- High limit protection
- 3/8" NPT inlet and outlet connections
- Standard wattages from 250 W to 750 W
- Mounting bracket (removable for uni-strut mount)

Model PGH Features

- Electronic controller for precise temperature control
- Digital indicating display of operating temperature
- Impact resistant tempered glass
- External setpoint adjustment
- Horizontal mounting only for CSA Type 4 ingress protection

Model PGHT Features

- Mechanical thermostat
- External setpoint adjustment
- Horizontal or vertical mounting

Optional Features

- Internal setpoint adjustment
- Optional voltages and wattages available
- Optional mounting brackets

Hazardous Location Ratings

- Class I, Div.1 & 2, Groups A, B, C and D;
- Class II, Div.1 & 2, Groups E, F and G;
- Class III, Div.1 & 2, Zones I & 2, Groups IIA, IIB and IIC
Temperature Code T4

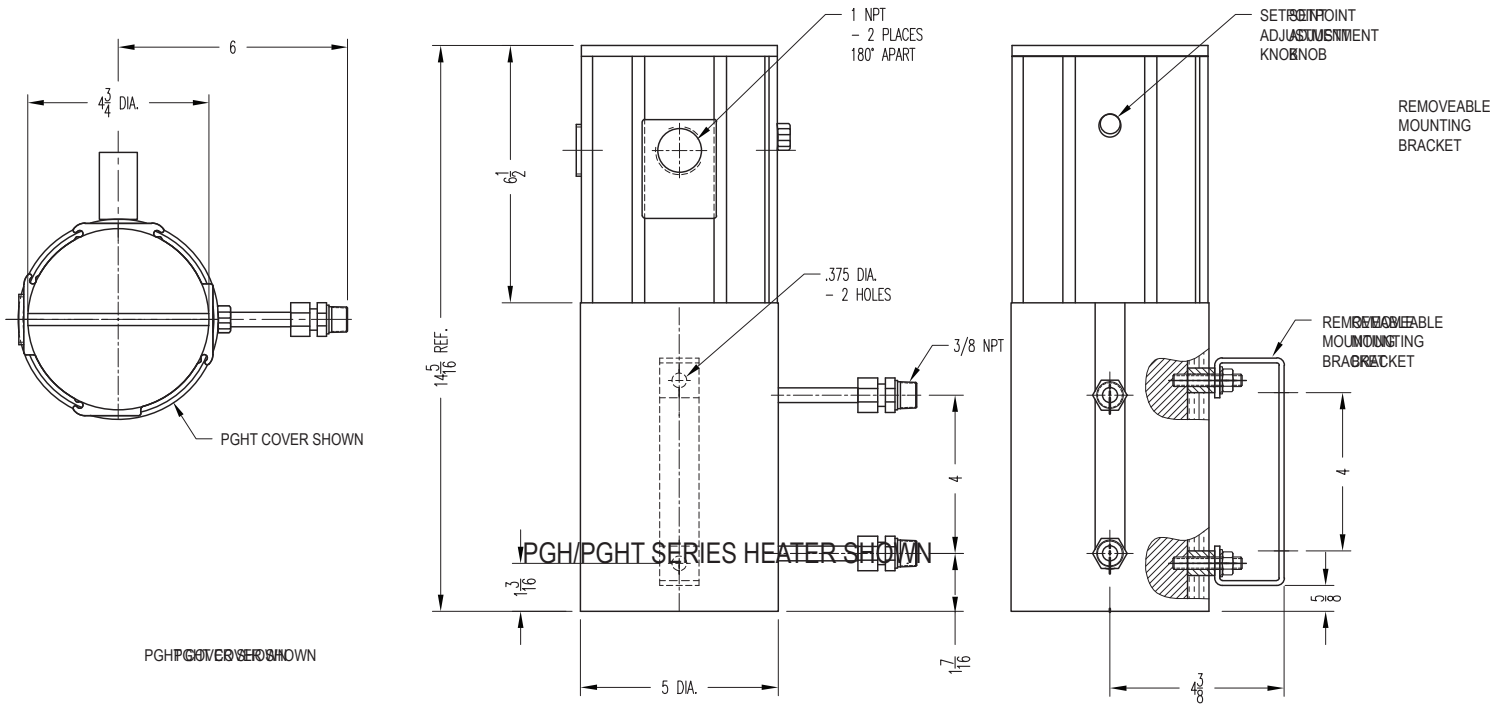


Figure 69 – PGH Series Heater Dimensions
PGH/PGHT SERIES HEATER SHOWN

Table 26 – Standard Heater Listing

Part No. with Electronic T'stat	Part No. with Mechanical T'stat	Volts	Phase	Wattage	Weight	
					lbs	kg
PGH02511	PGHT02511	120	1	250	17.5	8.0
PGH02521	PGHT02521	208		250		
PGH02531	PGHT02531	240		250		
PGH03511	PGHT03511	120		350		
PGH03521	PGHT03521	208		350		
PGH03531	PGHT03531	240		350		
PGH05011	PGHT05011	120		500		
PGH05021	PGHT05021	208		500		
PGH05031	PGHT05031	240		500		
PGH07511	PGHT07511	120		750		
PGH07521	PGHT07521	208		750		
PGH07531	PGHT07531	240		750		