

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.

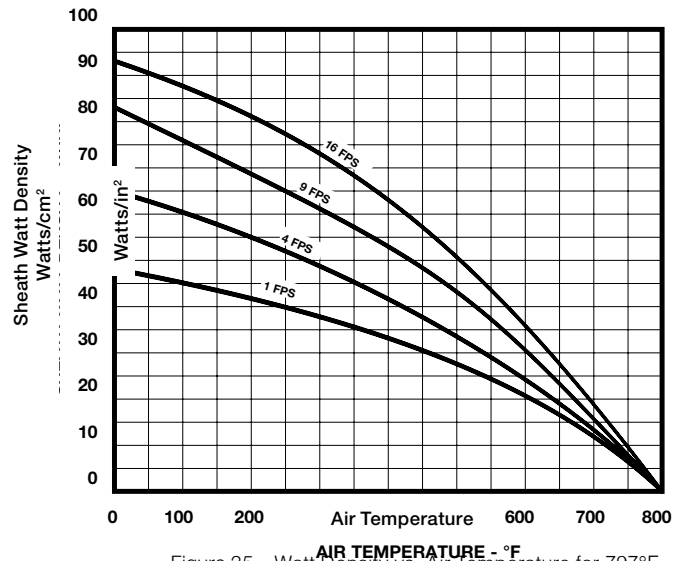
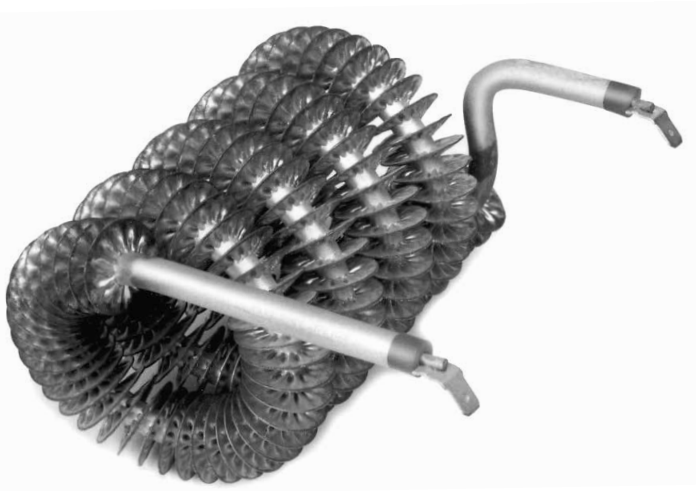


Figure 35 – Watt Density vs. Air Temperature for 797°F (425°C) Fin Temperature

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 9 on page A14. 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 35 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 9 shows the standard fin sizes and pitches available from CCI Thermal. 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 35 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.

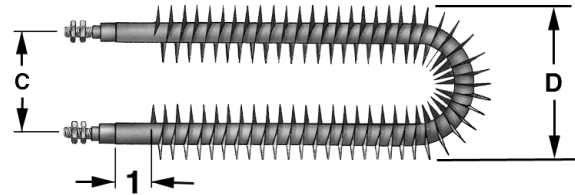
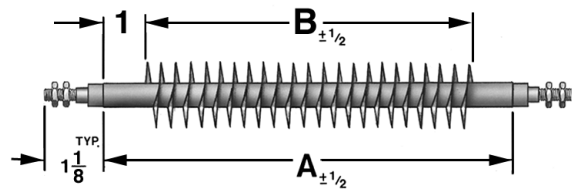


Figure 36

Factory Assistance

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

Table 9 – 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	0.260	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 40 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

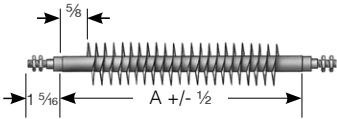


Figure 37

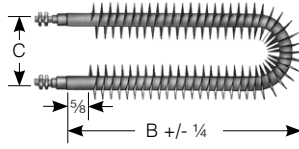


Figure 38

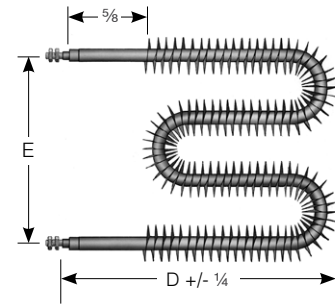


Figure 39

Table 10 – Finned Elements without Fittings

	kW	Standard Voltages	Dim. A		Catalog Number Figure 37	Dim. B		Dim. C		Catalog Number Figure 38	Dim. D		Dim. E		Catalog Number Figure 39
			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		

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 40 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 10 and Table 11 on page A16.

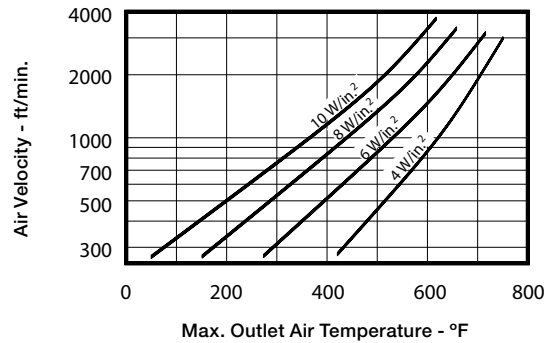


Figure 40 – Velocity vs. Air Temperature for 800°F (425°C) Fin Temperature. (Listed heaters are available in lower wattage ratings.)

To Order Specify

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

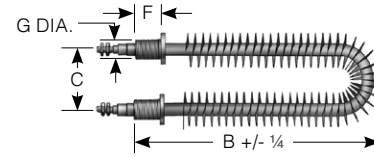


Figure 41

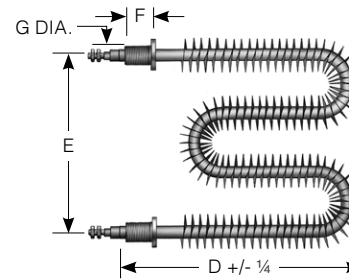


Figure 42

Table 11 – Finned Elements with Fittings

	kW	Standard Voltages	Dim. F		Dim. G		Dim. B		Dim. C		Catalog Number Figure 41	Dim. D		Dim. E		Catalog Number Figure 42
			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					