

## Tubular Heaters

### Design & Installation Guidelines



#### Design Considerations

**Sheath Material** — For resisting corrosion inherent in the process or environment and for withstanding the sheath temperature required — Standard sheath materials are INCOLOY®, steel, copper and stainless steel (type 304). Other types of stainless steel, MONEL®, titanium and INCONEL® are available.

**Job Requirements** — The calculation of total heat requirements for an application is outlined in Technical section. For assistance, contact your Local Chromalox field sales engineer who will be glad to contribute his judgement, experience and knowledge in solving your heating problem.

After the specific heater size and rating has been tentatively selected, the watt density must be checked against the curves in Technical section.

If the heater selected has a watt density higher than stipulated by the curve, consider these alternatives:

1. Use more heaters of a lower watt density to obtain the required kW capacity.
2. Reduce the kW capacity needed by reducing heat losses and/or allowing for a longer heat-up time.

**Watt Densities** — The watt density of the element, or watts per square inch of element heated area, should be low for heating asphalt, molasses and other thick substances with low heat transferability. It can be higher for heating air, metals, liquids and other heat-conducting materials. See curves in Technical section for determining allowable watt densities.

When high operating temperatures are needed, watt density must be limited in order not to exceed the maximum sheath temperature. Watt density is given in the specifications for each tubular heater.

In general, a viscous material with low thermal conductivity requires a low watt density. Higher watt densities can be used with thinner liquids and with materials of high thermal conductivity. Premature loss of the element due to excessive temperature may result if the material's heat-take-away ability is low. Also, the material may be charred, carbonized or its chemical makeup altered by overheating.

**Terminal Selection** — Stocked tubulars are shipped with standard terminals, see Terminal Options in this section. Many other terminals and terminal end seals are available made to order.

**CAUTION** — Protect terminals from possible contamination from surrounding atmospheres such as oil fumes, chemical vapors from other processes, moisture, weather, etc. MgO insulation is hygroscopic.

**Vacuums** — Tubular heaters operate at higher temperatures in a vacuum because there is no air to take away the heat. Therefore, watt densities are recommended to be 20 to 30% lower. It is recommended terminals of the element be kept outside of the vacuum.

**Code Compliance** — Chromalox manufactures the highest quality heaters and controls and, where applicable, in compliance with such codes as the Canadian Standards Association (CSA), Underwriters Laboratories Inc. (UL) and Verification of Devices for Europe Testing and Certification Institute (VDE) and CE.

#### Installation Guidelines

**Wiring** — Must be in accordance with The National Electrical Code (NEC). It is important to use the correct wire gauge to carry the amperage required. A wire not large enough can overheat, become brittle and break. The ambient temperature must also be considered in choosing the correct type of wire and insulation. *Make sure wiring to terminals is tight. Keep terminals away from heat, if possible. (For higher temperatures, contact your Local Chromalox Sales office.)*

**Mounting Methods** — Elements can be supplied with threaded fittings for mounting thru walls of tanks, ovens, etc. Compression threaded fittings are also available for easy field installation. Rings, clips, brackets and washers can also be attached to elements for mounting purposes.

**Easy Bending** — To put heat where it is needed, tubular elements can be bent to fit most requirements. See following pages for customer bending and factory bending details. Bending should be done around a smooth round object such as a piece of pipe. For minimum bending radii, see Bending Guidelines.

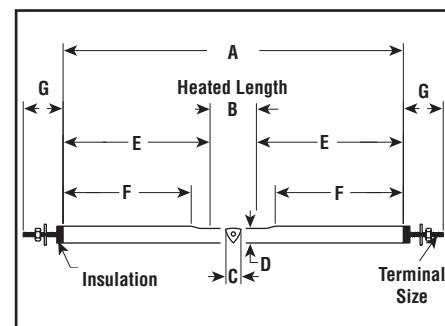
#### Triangular Cross-Section

These unique cross-sectioned elements are specially designed for high element surface temperature applications, and wherever extreme rigidity is required.

**Triangulation** — A patented extra step by Chromalox to increase insulation density and maximize heat transfer and operating life. This method of compaction increases uniformity of resistance wire spacing to help eliminate hot and cold spots. It also increases the rigidity of the element, which is an advantage in some applications.

The terminal ends of these elements are re-rounded to facilitate the use of threaded fittings or other mounting methods.

The heart shaped cross-section is recommended for certain heavy duty applications. It has added structural strength, achieved through die pressing, which resists deformation or sagging when installed in the flow of high velocity air or thick oils and compounds, or in high surface temperature air heating.



Sheath Material	Dimensions (In.)							Terminal Size
	A	B	C	D	E	F	G	
Copper	1	1	3/8	21/64	3-3/8	1-1/2	1±1/16	#10-32
Steel or INCOLOY®	1	1	3/8	21/64	3-3/8	1-1/2	1±1/16	#10-32
Copper, Steel or INCOLOY®	1	1	1/2	15/32	3-7/16	2-1/2	13/16±1/16	#8-32

1. See complete heater dimensions in table on product pages.