Tubular Heaters
Application Guidelines

- **Up to 172" Lengths (Std.)**
- **75 - 10,000 Watts (Std.)**
- **120, 240 and 480 Volt (Std.)**
- **3 - 53 W/In² (Std.)**
- **Max. Sheath Temp.**
  - **Copper — 350°F**
  - **Steel — 750°F**
  - **Stainless Steel — 1200°F**
  - **INCOLOY® — 1600°F**

Applications

Extremely Versatile Heat Source — Highly adaptable, the tubular element, in its many forms and as a component of Chromalox packaged heaters and systems, has vastly increased the scale of electric heating applications. The heaters' mechanical and electrical flexibility are important to process engineers and product designers alike, as heating requirements can be matched accurately by proper selection from a great variety of element lengths, sheaths, diameters and watt densities.

Product Uniformity — Electric tubular heating elements provide a method of applying the exact amount of heat required at a specific area. When used with appropriate temperature control, product repeatability is assured.

Increased Production — Adding heat to a process often leads to increased production. For example, drying time may be reduced by heating the air or the product being dried. Chemical and cleaning processes are often more efficient when heated and a more consistent finished product results.

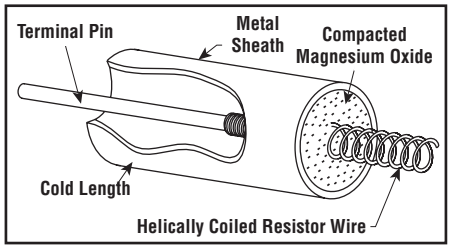
Less Down Time — Chromalox quality tubular elements with properly applied watt density and sheath material will provide long life, less down time and little or no maintenance.

Construction

Chromalox tubular elements are used for practically the entire range of electric resistance heating applications.

A metal sheath material is selected. The proper size resistance wire for the heating element is carefully selected and verified by computer calculations to ensure the longest service life possible. The high quality resistor wire is carefully tested and inspected to meet rigid specifications prior to being coiled. The resistance wire is then welded to a terminal pin to assure positive connection. The wire is centered in a metal sheath and insulated with high quality magnesium oxide which is highly compacted around it and acts as an electrical insulator. This material readily conducts the heat from the coiled resistor to the metal sheath and puts the heat where it is required, which results in maximum heater life.

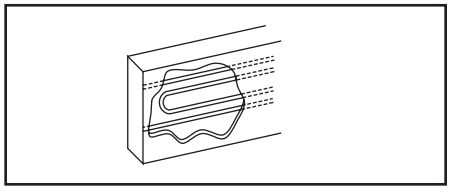
The highly compacted magnesium oxide holds the terminal pin securely allowing maximum torque of eight inch pounds when tightening terminal hardware



Typical Installations

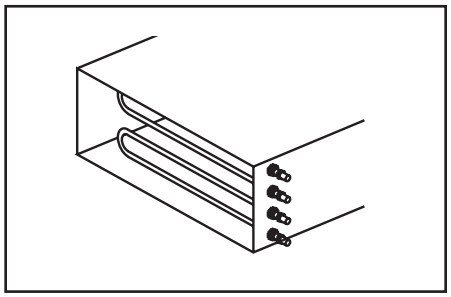
In Free Air — For applications like ovens and drying cabinets, tubular elements are compact, rugged heat sources. Their formability permits fitting around other oven components and work protrusions, concentrating heat at any point.

In Free Air



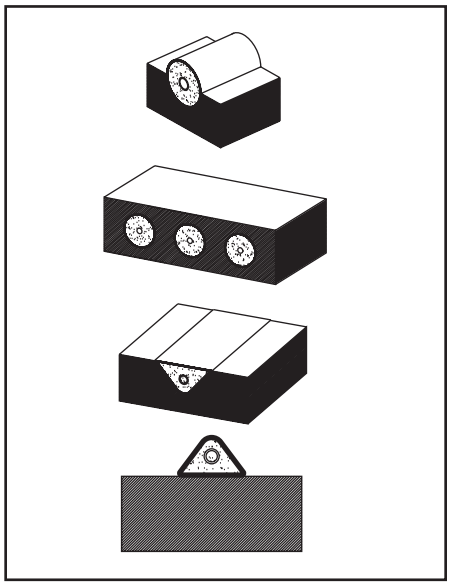
In Moving Air — Compression fittings, factory mounted fittings or brackets will mount a tubular element in a duct or air heating chamber.

In Moving Air



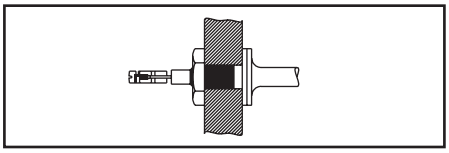
In Transferring Heat to Metal Parts - Dies, Molds, Platens — The available diameters, lengths, ratings, watt densities, cross-sections, and maximum temperatures provide the solution for a given job.

Transferring Heat to Metal



In Liquids — Tubular elements listed may be mounted through the side wall of a tank with compression fittings or by factory mounted fittings.

In Liquids



Tubular Heaters

Application Guidelines *(cont'd.)*

Liquid Heating

Direct Immersion — Water and water solutions can generally be heated to any desired temperature. If liquid is under pressure, temperatures should not exceed the maximum sheath temperature of the element minus 100°F.

Note — Heated section of element must be immersed at all times when energized. Longer cold ends can be provided, if required.

Threaded fittings are available for mounting through tank walls.

Oil Heating

Steel sheath elements can be used for heating oils, heat transfer oils and other solutions not corrosive to steel sheath.

Air & Gas Heating

Use watt densities compatible with work temperatures. Refer to Technical section of this catalog. Heaters mounted horizontally must be supported to avoid sagging at high temperatures.

Proper spacing of supports may vary with application temperature, element diameter and sheath material. Generally 12 to 18" spacing of supports is adequate.

Max. Sheath Temperatures

To assure maximum life, tubular elements should not be operated beyond the temperatures in this tabulation:

Sheath Material	Max. Allowable Sheath Temp. (°F)
Copper	350
Steel	750
MONEL®	900
Stainless Steel	1200
INCOLOY®	1600
INCONEL®	1600

Metric Diameter Equivalents

Inches (±0.005)	Millimeter
0.5	12.7
0.475	12.07
0.43	10.92
0.375	9.53
0.315	8
0.26	6.6
0.246	6.25
0.2	5.08

Where air flowing over elements permits use of higher watt densities, make sure air flow is evenly distributed.

Allow approximately 1/8" per foot of element length for expansion and contraction of elements (i.e., 24" long element could expand 1/4" when energized).

Clamp-On Heating

Use watt densities compatible with work temperatures. Refer to Application Guide for Tubular Heating of Solids, Liquids, Air & Gas or use curve G-175S in Technical section. Heaters should be clamped tightly for good heat transfer but should be allowed to expand as they heat up. Heaters clamped too tightly will bow away from the heated surface which results in poor heating efficiency and possible heater failure. It is generally best to tighten the middle clamp first to hold the element. Other clamps should be tightened enough to hold, but back off 1/2 turn to allow for expansion and contraction.

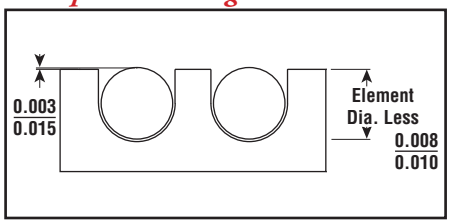
Heaters should be spaced on approximately two inch centers minimum.

Heaters are commonly installed by clamping into machined grooves for better heat transfer.

Note — Depth of groove should never exceed element diameter to assure positive clamping.

Grooves should be machined to the following tolerences:

Clamp-On Heating



WARNING — When insulation is used over elements, an air space must be provided between the elements and insulation. Insulation should never be in direct contact with heated section of elements.

Application Engineering

Is available from direct sales and engineering representatives. The largest, most experienced organization of field engineers in the country is ready to help solve any heating problem. Contact your Local Chromalox Sales office. (See back of catalog.)

Tubular Heating Application Guidelines

Product To Be Heated	Temperature Desired (°F)	Suggested Application	Sheath Material	Work Temperature (°F)	Allowable Watt Density (W/In^2)
Solids					
Molds, Platens, Dies, Pipes, Tanks	Up to 1400	Clamp-On	INCOLOY®	Up to 300 Up to 500 Up to 800 Up to 1000 Up to 1200 Up to 1400	30 20 15 10 7 2.5
Liquids					
Water, Clean	Up to 250 Up to 550	Immersion Immersion	Copper INCOLOY®	250 550	Up to 80[2] 40
Water Solutions, Mild Corrosion[1], Corrosive[1]	Up to 200 Up to 200	Immersion Immersion	304SS INCOLOY®	200 200	50 50
Oil					
Low Viscosity Med. Viscosity High Viscosity	Up to 180	Immersion	Steel	Up to 180	23 15 6.5
Air & Gases					
Moving, 9'/sec Velocity	Up to 1500	In Ducts	INCOLOY®	500 800 1000 1200 1500	40 32 25 15 2
Still	Up to 1500	Ovens	INCOLOY®	700 1000 1200 1500	30 20 10 2

1. See Corrosion Guide in Technical section. 2. VDE - 50 W/In^2 max.