

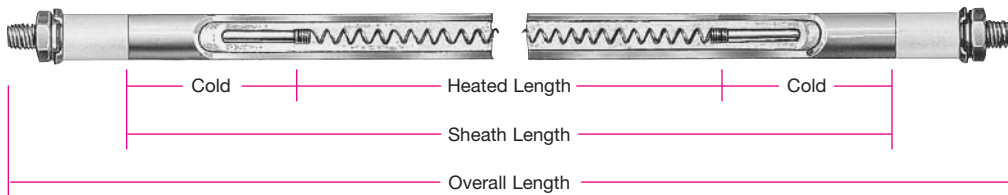


Introduction

Tubular Heater Introduction

Typical Applications

- ↔ *Forced air heating*
- ↔ *Thermal forming machines*
- ↔ *Direct immersion in liquids*
- ↔ *Comfort radiant heaters*
- ↔ *Welded, brazed or clamped to tanks and pipes*
- ↔ *Hot runner molds*
- ↔ *Combination radiant and convection heater for ovens and dryers*



Design Guidelines

Resistance Tolerance

Tubular heating elements have an Industry Standard Resistance Tolerance of +10%, -5% which translates to a Wattage Tolerance of +5%, -10%. Consult Tempco if tighter tolerances are required for your application.

Watt Density

Element Watt Density is the wattage dissipated per square inch of the element sheath surface and is critical to the proper heating of the application and to the life expectancy of the heater. The Watt Density is calculated with the following formula:

$$\text{Watt Density (w/in}^2\text{)} = \frac{\text{Element Wattage}}{\pi \times \text{Element Dia.} \times \text{Element Heated Length}}$$

For a particular application element watt density will govern element sheath and internal resistance wire temperature. Factors to consider when choosing a suitable watt density are:

1. Many materials are heat sensitive and can decompose or be damaged if the element is running too hot.
2. Air and other gases that are poor conductors of heat require watt densities matched to the velocity of the gas flow to prevent element overheating.
3. When heating hard water or cleaning solutions, mineral deposits can build up on the element sheath, acting as a heat insulator and raising the internal element temperature. If these deposits cannot be periodically removed, use a lower watt density element to increase heater life expectancy.
4. When tubular heaters are used in UL recognized oil immersion heating applications the heated oil temperature cannot exceed 257°F (125°C). Steel sheath elements are limited to 60 watts/in². Tubular heaters with steel or stainless steel bulkhead fittings used in UL oil heating applications are not pressure rated. Contact Tempco for other application specific UL file information.
5. Page 16-12 in the Engineering Data Section of this catalog lists the maximum recommended heater watt density for many materials. For additional information and help please contact Tempco.

Construction Characteristics

Tempco Tubular Heaters are the most versatile and widely used source of electric heat for industrial, commercial and scientific applications. They can be designed in a wide range of electrical ratings, diameters, lengths, terminations, and sheath materials. Important and useful characteristics of tubular heaters are that they can be formed into virtually any shape, brazed or welded to any metal surface, and cast into metals. Carefully researched manufacturing methods and quality materials have made Tempco tubular heaters stand apart from other heating elements claiming similar performance.

The cutaway view shows the tubular heater's basic construction. A computer-designed helical coil of 80% Nickel 20% Chromium alloy resistance wire is fusion welded to the nickel-coated steel terminal cold pin. This coil assembly is precisely stretched and centered in the element metal sheath, which is then filled with Grade "A" Magnesium Oxide powder (MgO). The filled tube is then compacted by a roll reduction

mill into a solid mass, permanently stabilizing the coil in the center of the tube while providing excellent heat transfer and dielectric strength between the coil and the sheath.



Tempco Tubular Heating Elements are certified as Recognized Components by Underwriters Laboratories (File Number E90771) under CCN UBJY2/8 to meet UL Standard UL1030. Tempco's equivalent CSA File Number is 043099. Tubular elements with bulkhead fittings have also been certified for oil heating (File Number MP4154) under CCN MDST2/8 to meet UL Standard 574.

If you require UL, CSA, or other NRTL agency approvals, please specify when ordering.



Important Note — When heating any substance it is critical to match the heater watt density, operating temperature and sheath material to the specific medium being heated. Failure to do so will result in premature heater failure and/or unsafe conditions.

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