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# Tubular Heaters
Tubular Heaters

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

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 cut-away 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.

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. 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.

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.

Agency Approvals

Tempco Tubular Heating Elements have been certified as Recognized Components by Underwriters Laboratories (File Number E90771) under Classification UBJY2 after testing to meet Standard UL1030. Tempco’s equivalent CSA File number is LR43099-5.

These files specify the Watt Density limitation per application type and any other limitations imposed by these agencies in the use of this type of heater. For additional information consult Tempco.

If you require UL and/or CSA approval please specify when ordering.
**Tubular Heater Standard Specifications**

<table>
<thead>
<tr>
<th>Element Diameter</th>
<th>Maximum Voltage</th>
<th>Maximum Amperage</th>
<th>Resistance in Ohms per Heated Inch</th>
<th>Sheath Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>min</td>
<td>max</td>
</tr>
<tr>
<td>.260</td>
<td>6.6</td>
<td>250</td>
<td>15</td>
<td>.100</td>
</tr>
<tr>
<td>.315</td>
<td>8.0</td>
<td>480</td>
<td>30</td>
<td>.060</td>
</tr>
<tr>
<td>.375</td>
<td>9.5</td>
<td>600</td>
<td>30</td>
<td>.040</td>
</tr>
<tr>
<td>.430</td>
<td>10.9</td>
<td>600</td>
<td>40</td>
<td>.040</td>
</tr>
<tr>
<td>.475</td>
<td>12.1</td>
<td>600</td>
<td>40</td>
<td>.040</td>
</tr>
<tr>
<td>.625</td>
<td>15.9</td>
<td>600</td>
<td>40</td>
<td>.040</td>
</tr>
</tbody>
</table>

**Table 1 Electrical Limitations and Minimum/Maximum Sheath Lengths**

<table>
<thead>
<tr>
<th>Length</th>
<th>Sheath Length</th>
<th>Heated Length</th>
<th>Minimum Unheated Length Each End</th>
</tr>
</thead>
<tbody>
<tr>
<td>in</td>
<td>mm</td>
<td>in</td>
<td>mm</td>
</tr>
<tr>
<td>11-20</td>
<td>279-508</td>
<td>1/4</td>
<td>1-3/4</td>
</tr>
<tr>
<td>20-50</td>
<td>508-1270</td>
<td>1/2</td>
<td>1-1/4</td>
</tr>
<tr>
<td>50-80</td>
<td>1270-2032</td>
<td>7/8</td>
<td>1-1/2</td>
</tr>
<tr>
<td>80-110</td>
<td>2032-2794</td>
<td>1-1/8</td>
<td>1-5/8</td>
</tr>
<tr>
<td>110-140</td>
<td>2794-3556</td>
<td>3/8</td>
<td>2-1/2</td>
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<tr>
<td>140-170</td>
<td>3556-4318</td>
<td>6/4</td>
<td>2-1/4</td>
</tr>
<tr>
<td>170-200</td>
<td>4318-5080</td>
<td>3/8</td>
<td>2-1/4</td>
</tr>
<tr>
<td>200-up</td>
<td>5080-up</td>
<td>1/2</td>
<td>2-1/2</td>
</tr>
</tbody>
</table>

**Tubular Heater Standard Sheath Materials**

The selection of a sheath material should be made based on the chemical composition of the gas or liquid being heated, the characteristics of the materials entering the solution, and the processes controls. A material selection guide can be found on page 16-12.

*The best source for chemical/sheath compatibility is the supplier of the gas or liquid to be heated.*

**Incoloy® 840:** Nickel 18-20%, Chromium 18-22%, Iron balance. Has about 10% less nickel than Incoloy 800. Used in many air heating applications where it has exhibited superior oxidation resistance at less cost than Incoloy 800.

*Maximum Sheath Temperature:* 1600°F / 871°C

**Incoloy® 800:** Nickel 30-35%, Chromium 19-23%, Iron balance. The high nickel content of this alloy contributes to its resistance to scaling and corrosion. Used in air heating and immersion heating of potable water and other liquids.

*Maximum Sheath Temperature:* 1600°F / 871°C

**316 Stainless Steel:** Chromium 16-18%, Nickel 11-14%, Iron balance. Modified with the addition of Molybdenum (2-3%) to improve corrosion resistance in certain environments, especially those which would tend to cause pitting due to the presence of chlorides. Applications include deionized water.

*Maximum Sheath Temperature:* 1200°F / 649°C

**304 Stainless Steel:** Chromium 18-20%, Nickel 8-11%, Iron balance. Used in the food industry, medical, and chemical heating.

*Maximum Sheath Temperature:* 1200°F / 649°C

**321 Stainless Steel:** Chromium 17-20%, Nickel 9-13%, Iron balance. Modified with the addition of Titanium to prevent carbide precipitation and resulting intergranular corrosion that can take place in certain mediums when operating in the 800-1200°F (427-649°C) temperature range.

*Maximum Sheath Temperature:* 1200°F / 649°C

**Copper:** Standard Copper Alloy

A low temperature, inexpensive material used mainly for clean water heating.

*Maximum Sheath Temperature:* 350°F / 177°C

**Steel:** Low Carbon

Used for high to low viscosity oils, asphalt, tar, wax, molten salt, heat transfer liquid media and other compatible solutions.

*Maximum Sheath Temperature:* 750°F / 399°C

**Other Sheath Materials:** Available for a limited number of diameters. Consult Tempco for more information.

**Inconel® 600:** Iron 6-10%, Chromium 14-17%. Nickel balance

*Maximum Sheath Temperature:* 1800°F / 982°C

**Incoloy® 825:** Nickel 38-46%, Chromium 19.5-23.5%, Molybdenum 2.5-3.5%, Iron balance

*Maximum Sheath Temperature:* 1600°F / 871°C

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**Maximum Sheath Temperature** refers to the maximum temperature of the element sheath material.

*Consideration must be given to the maximum temperature that can be safely applied to the heated material.*

See *Watt Density* on the previous page for additional information.
Standard Surface Finish
The standard tubular heater element surface finish is a black chrome oxide, produced when the element is annealed prior to forming in an exothermic atmosphere furnace.

Optional Surface Finishes
Bright Annealing is an option where the tubular heater is annealed in a dissociated ammonia atmosphere furnace. This produces a clean metallic appearance without surface etching the sheath.

Electro-Polishing is an electrochemical process that removes surface imperfections and contaminants, enhancing the corrosion resisting ability of the sheath. The resulting surface is clean, smooth and has a bright finish; it is highly recommended for medical, food and other harsh applications.

Passivation removes surface contamination, usually iron, so that the optimum corrosion resistance of the stainless steel is maintained. Surface contamination could come from the small amount of steel that may be worn off a tool during the manufacturing process.

Standard Tubular Heater Terminations
Select the termination style that meets your requirements for space, accessibility and reliability.

Note: If the listed terminations do not seem to fit your requirements, call us and let us design one that will.

TYPE T—STANDARD
Threaded stud terminal with ceramic insulator. Standard thread size is 6-32 for .260" (6.6 mm), 8-32 for .315" (8 mm), .335" (8.5 mm) and .375" (9.5 mm), and 10-32 for all other diameters. Other thread sizes and lengths are available to accommodate any electrical requirements and clearance restrictions.

TYPE TM—Stud with Mica Insulator
Stud terminal with mica insulator. Standard thread size is 6-32 for .260" (6.6 mm), 8-32 for .315" (8 mm), .335" (8.5 mm) and .375" (9.5 mm), and 10-32 for all other diameters. Other thread sizes and lengths are available to accommodate any electrical requirements and clearance restrictions.

TYPE P—Plain Pin
Plain terminal pin. Specify Length “L.”
Standard 1/2" (12.7 mm) pin length.

TYPE SF & SF9 (90°)—Quick Connect
1/4" male quick connect (slip-on) terminals are welded to the element terminal pin. They provide quick and easy installation of lead wire with excellent holding force. Material: Nickel-Plated Steel.

TYPE L__ & L9__ (90°)—Terminal Lug
A nickel-plated steel lug is projection welded to the terminal pin straight (Type “L_”) or at 90° to the sheath (Type “L9_”).
Standard LA, L9A 10-32 screw Optional LB, L9B 8-32 screw

TYPE F1__—Lead Wire
Type F1A 250°C (482°F) TGGT insulation
Type F1B 450°C (842°F) MGT insulation
Type F1C 200°C (392°F) Teflon® insulation
Type F1D 150°C (302°F) Silicone Rubber insulation
Type F1E 105°C (221°F) Thermoplastic (PVC) insulation
Standard 10" (254 mm) leads. Specify longer leads if required.
Fiberglass Sleeve Standard
F1C, F1D & F1E available with optional Heat Shrink. Specify when ordering.

Lead wire gauge is determined by the ampacity of the heater with the lead wires in an ambient temperature of 40°C (104°F). Higher ambiants may require heavier gauge lead wires.

CAUTION

Product Inventory Available for Viewing and Selection @ www.tempco.com
Tubular Heaters

Terminations and Mounting Methods

Tubular Heater Standard Terminations

TYPE E — Right-Angle Lug Terminal
A solid termination that reinforces the pin with a mica insulator.

Standard 8-32 screw

TYPE A — Right-Angle Terminal
A good screw style termination for use when space is tight.

Standard 10-32 screw

TYPE R1 — Flexible Armor Cable
Type R1A  Galvanized cable
Type R1B  Stainless steel cable

Provides excellent protection to lead wires in abrasive environments.
Specify cable length and lead wire length.
Standard 10” (254 mm) armor cable over 12” (305 mm) leads.
Specify longer leads or cable, if required.

Tubular Heater Standard Mounting Methods

TYPE MC — Mounting Collar
Plated steel mounting collars are locked in place with a set-screw and serve as an adjustable stop for through-the-wall mounting. Collars are shipped in bulk unless otherwise specified. Mounting collars can be ordered with the heater or purchased separately.

TYPE LR — Locator Washer
Locator washers are permanently attached to the heater sheath by staking/crimping and are used to limit the movement of the heater while allowing for expansion and contraction of the heater sheath. When ordering, specify location from end of sheath.

TYPE MF — Mounting Bracket
Tempco’s made-to-order mounting brackets are made from 18 gauge stainless steel for strength and stiffness. It is an economical way to mount the heater in non-pressurizing, non-liquid applications. Unless otherwise specified, the bracket will be located 1/2” from the edge of the heater sheath. OEM quantity brackets are manufactured by Tempco on our own high speed precision N/C Turret Press. The standard method of attaching the tubular element to the bracket is staking or crimping.

The rectangular mounting bracket shown at right is a popular, made-to-order design. Specify all dimensions shown when requesting a quote.
Custom brackets of any size, thickness or material can be supplied to meet your requirements.

CONTINUED
**Tubular Heaters**

**Mounting Methods**

Continued from previous page...

### TYPE B — Bulkhead Fittings

**Bulkhead fittings** provide a leak-proof method for mounting tubular heating elements through tank walls. Brass crimped fittings are used for low pressure water (up to 80 psig) or non-pressure air. Specify if stainless steel jam nut and washer are required when ordering stainless steel fittings. Brass hex nut, plated steel washer and gasket are standard.

**Fittings** for vacuum or high pressure gas and liquid use are silver brazed or TIG welded. Method will vary by material and application. Fittings in table are most commonly used. Special fittings can be made to meet your application requirements.

**Fitting Attachment Method — General Guidelines**

*These are guidelines only. Consult Tempco if you require assistance in determining the method best suited for your application.*

**Fittings Crimped:** Low pressure water (up to 80 psig) and non-pressure air applications

**Fittings Brazed:** Non-ferrous alloys (copper) and dissimilar non-weldable metals

**Fittings Welded:** High pressure liquids and gases, and high temperature applications

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**Tubular Bulkhead Fittings For Tubular Heaters — Round Flanged Standard**

<table>
<thead>
<tr>
<th>Tubular Diameter (in mm)</th>
<th>Fitting Material</th>
<th>Flange Type</th>
<th>“A” (in mm)</th>
<th>“B” (in mm)</th>
<th>“C” (in mm)</th>
<th>Thread Size (UNF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.260 6.6</td>
<td>Brass</td>
<td>Round</td>
<td>3/4</td>
<td>1/2</td>
<td>12.7</td>
<td>5/8</td>
</tr>
<tr>
<td>.260 6.6</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>3/4</td>
<td>1/2</td>
<td>12.7</td>
<td>5/8</td>
</tr>
<tr>
<td>.315 8.0</td>
<td>Brass</td>
<td>Round</td>
<td>3/4</td>
<td>1/2</td>
<td>12.7</td>
<td>5/8</td>
</tr>
<tr>
<td>.315 8.0</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>3/4</td>
<td>1/2</td>
<td>12.7</td>
<td>5/8</td>
</tr>
<tr>
<td>.375 9.5</td>
<td>Brass</td>
<td>Round</td>
<td>3/4</td>
<td>1/2</td>
<td>12.7</td>
<td>5/8</td>
</tr>
<tr>
<td>.375 9.5</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>3/4</td>
<td>1/2</td>
<td>12.7</td>
<td>5/8</td>
</tr>
<tr>
<td>.430 10.9</td>
<td>Brass</td>
<td>Round or Hex</td>
<td>7/8</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.430 10.9</td>
<td>Stainless Steel</td>
<td>Round or Hex</td>
<td>7/8</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.430 10.9</td>
<td>Steel</td>
<td>Round</td>
<td>7/8</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.475 12.1</td>
<td>Brass</td>
<td>Round</td>
<td>7/8</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.475 12.1</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>7/8</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.475 12.1</td>
<td>Steel</td>
<td>Round</td>
<td>7/8</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.475 12.1</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>1</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.475 12.1</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>1</td>
<td>3/4</td>
<td>19.0</td>
<td>7/8</td>
</tr>
<tr>
<td>.625 15.9</td>
<td>Stainless Steel</td>
<td>Round</td>
<td>1-1/8</td>
<td>3/4</td>
<td>19.0</td>
<td>1</td>
</tr>
</tbody>
</table>

Optional: Hex Flanged Bulkhead Fittings. Specify if required.
Magnesium Oxide (MgO) is used as the insulating material in Tempco tubular heaters because of its excellent thermal conductivity and dielectric strength. However, MgO is hygroscopic and can absorb moisture from the atmosphere. This absorption of moisture may be detected when an Insulation Resistance (IR) test is done with a megohmmeter prior to energizing the heater circuit. In very humid environments, circuits utilizing a GFI (ground fault interrupter) for safety may experience nuisance tripping when energizing the heater.

The Tempco manufacturing process produces a dry element with an IR of several thousand megohms minimum. However, after shipment and depending on humidity levels and storage time, a heater can absorb moisture and show a decrease in IR. In many cases, depending on the supply voltage and the application, the heater can be safely energized and will dry itself out.

If a heater has absorbed moisture, a safe and effective method of drying it out prior to installation is to bake it in an oven at 300°F (149°C) until an acceptable IR reading is obtained. When possible, removing the terminal hardware will expedite this process. If this method is not practical consult factory for other recommendations.

For applications where moisture absorption would be unacceptable Tempco has several optional element end seals to retard absorption of moisture in the MgO. If a true hermetic seal is required, ceramic to metal end seals (Type H) are available. With any of these seals, the maximum recommended operating temperature must not be exceeded.

**Style SS—Silicone Resin Seal**
A brushed-on coating that penetrates the MgO, offering economical moisture protection under humid storage conditions.

Maximum Usable Termination Temperature: 390°F (200°C)
UL Rated Maximum Termination Temperature: 221°F (105°C)
Type V2A: conformal coating
Type V2B: silicone oil

**Style SER—RTV Seal**
RTV (room temperature vulcanizing) silicon rubber adhesive sealant provides a good moisture seal.

UL Rated – Maximum Termination Temperature:
Type R: 302°F (150°C)
Type R1: 392°F (200°C)

**TYPE M—Self Sealing Heat Shrinkable Boot with Lead Wire**
This type seal is used primarily for defrost heaters. Temperature range -67 to 300°F (-55 to 149°C). Standard 10" (254 mm) leads; specify longer leads if required.

<table>
<thead>
<tr>
<th>Heater Diameter in mm</th>
<th>“A” Ref.</th>
<th>“B” Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.260</td>
<td>6.6</td>
<td>2-1/8</td>
</tr>
<tr>
<td>.315</td>
<td>8.0</td>
<td>2-1/8</td>
</tr>
<tr>
<td>.430</td>
<td>10.9</td>
<td>2-1/8</td>
</tr>
</tbody>
</table>

**TYPE H—Hermetic Seal**
Ceramic to metal seals provide an airtight seal for temperatures to 500°F (260°C) in the seal area.

<table>
<thead>
<tr>
<th>Heater Diameter in mm</th>
<th>“A” Ref.</th>
<th>“B” Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>.260</td>
<td>6.6</td>
<td>1-11/16</td>
</tr>
<tr>
<td>.315</td>
<td>8.0</td>
<td>1-11/16</td>
</tr>
<tr>
<td>.430</td>
<td>10.9</td>
<td>2-1/8</td>
</tr>
<tr>
<td>.475</td>
<td>12.1</td>
<td>2-1/8</td>
</tr>
</tbody>
</table>
Forming Tubular Elements

The MgO insulation used in tubular heating elements is compacted by reducing the element diameter in a roll reducing mill. The elements are then annealed in a controlled atmosphere furnace to relieve the metal stressing (work hardening) that takes place during the rolling to size reduction of the sheath. Annealing brings the metal back to a soft state, allowing the element to be bent into virtually any configuration. However, since forming also work hardens the metal, some precautions must be observed in order to prevent the sheath from breaking during bending or developing stress cracking marks.

Note: Elements with tight bends and some applications require the bends to be recompacted in special dies to restore the integrity of the insulation density and maintain dielectric strength. Large bends do not need to be recompacted.

Avoid bends within a minimum of 1/2" of the terminal pin and resistance wire junctions unless the bending radius is a minimum 3" (75 mm).

Note: Smaller inside bending radius than listed in the table can be factory accomplished. It requires special forming techniques to prevent damage to the tubular heater. Consult Tempco with your requirements.

Tubular Heater Standard Bend Formations

Tubular Element Minimum Bending Radius

<table>
<thead>
<tr>
<th>Element Diameter (in)</th>
<th>Factory Bend Minimum R (in)</th>
<th>Field Bend Minimum R (in)</th>
<th>Minimum S (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>.260</td>
<td>6.6</td>
<td>3/8</td>
<td>9.5</td>
</tr>
<tr>
<td>.315</td>
<td>8.0</td>
<td>1/2</td>
<td>12.7</td>
</tr>
<tr>
<td>.375</td>
<td>9.5</td>
<td>9/16</td>
<td>14.3</td>
</tr>
<tr>
<td>.430</td>
<td>10.9</td>
<td>3/4</td>
<td>19.1</td>
</tr>
<tr>
<td>.475</td>
<td>12.0</td>
<td>7/8</td>
<td>22.2</td>
</tr>
</tbody>
</table>

Note: Elements are being fed into a roll reducing mill to compact the MgO insulating powder. After rolling, the elements are annealed in the conveyor belt furnace seen in the background.

Product Inventory Available for Viewing and Selection @ www.tempco.com
Tubular Heaters

Bend Formations

Tubular Heater Standard Bend Formations

FT7

FT8

FT9

FT10

FT11

FT12

FT13

FT14

FT15

FT16

FT17

FT18

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Tubular Heaters

Bend Formations

Tubular Heater Standard Bend Formations

FT19

FT20

FT21

FT22

FT23

FT24

FT25

FT26

FT27

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Tubular Heaters

Bend Formations

Tubular Heater Standard Bend Formations

FT28

FT29

FT30

FT31

FT32

FT33

FT34

FT35

FT36
## Standard Sizes and Ratings

### Tubular Heaters

#### Standard Sizes and Ratings

<table>
<thead>
<tr>
<th>Sheath Length</th>
<th>Heated Length</th>
<th>Watts</th>
<th>Part Number</th>
<th>Approximate Net Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>23 W/in²</strong></td>
<td><strong>.475 Dia.</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incoloy® 840</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 mm</td>
<td>(3.6 W/cm²)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
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An asterisk (*) next to the Part Number guarantees in-stock availability for same-day shipping when ordered by 2 PM.

### Standard (Non-Stock) and Stock Sizes and Ratings with Type T Termination

Standard tubular heaters are fully annealed for field or factory bending. They are inventoried with plain pin extensions that allow quick installation of Termination Types T, TM, F1, A, E, SF, SF9, L and L9. Part Numbers listed are for heaters with Type “T” termination. For other terminations a Part Number will be issued at time of order.
### Tubular Heater Standard (Non-Stock) and Stock Sizes and Ratings

#### Standard (Non-Stock) and Stock Sizes and Ratings with Type T Termination

<table>
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<th>Sheath Length in mm</th>
<th>Heated Length in mm</th>
<th>Watts 240V</th>
<th>Part Number</th>
<th>Approximate Net Weight lbs kgs</th>
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#### Ordering Information

**Catalog Heaters**

Part Numbers preceded by an asterisk (*) are in stock for immediate delivery with Type T termination. Termination Types TM, F1, A, E, SF, SF9, L, and L9 can be applied to stock heaters. For these terminations the Heater Part Number will be issued at time of order.

Part Numbers with no asterisk are standard designs that are available straight in 2 weeks and formed in 4 weeks.

**Custom Engineered/Manufactured Heaters**

Understanding that an electric heater can be very application specific, for sizes and ratings not listed, TEMPCO will design and manufacture a tubular heater to meet your requirements. **Standard lead time is 4 weeks.**

**Please Specify** the following:

- Type of Application
- Wattage and Voltage
- Diameter
- Heated Length
- Unheated Length at Each End
- Sheath Material
- Termination Type
- Type of Mounting, if Required
- Type of Moisture Seal, if Required
- Bending Configuration (supply Drawing and/or Sample)
Heat Transfer Cement

When tubular heating elements are used in a milled slot any air gaps between the element and the plate can cause hot spots on the element. Heat transfer cement is used to fill these air gaps, permitting the heater to run cooler, thus maximizing its life expectancy. Cement is water soluble and can be applied with a putty knife or trowel and can be used in temperatures up to 1250°F (675°C).

Part Number

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<th>Description</th>
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<td>SEA-108-102</td>
<td>(1 Quart)</td>
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Construction

Hot Runner Manifold Heaters are made to order using .260", .315" or .375" diameter Incoloy® tubular heating elements. Commonly specified terminations include threaded stud or wire leads.

Important Information on Forming

Precise forming of the tubular heater is required for it to seat properly into the milled slot in the manifold. To ensure this fit, we use a physical template as an inspection tool in the forming process to verify bending accuracy.

The template is a reproduction of the milled slot in the form of a plastic or aluminum plate. It can be customer supplied or manufactured by Tempco. Only through the use of a forming template is bending accuracy guaranteed.

When ordering for new applications:
Supply a drawing or forming template if available.

When ordering for replacement:
Supply a sample heater and/or a drawing of the manifold indicating the milled heater slot.

Note: For heaters originally manufactured by Tempco only the Tempco Part Number is required.

Examples of Mold Heater Formations

Consult Tempco With Your Requirements. We Welcome Your Inquiries.
Tempco finned tubular heaters provide rapid heat transfer for natural convection or forced air space heating in industrial process air heating systems. Finned tubular heaters start out as a standard tubular heater with the fins being attached on a custom built finning machine.

**Standard Sizes and Materials**

304 Stainless Steel .475" diameter tubular element with 1.12" diameter fin. Copper Clad Steel .430" diameter tubular element with 1.31" diameter fin.

Other materials available for the element sheath and fins include Monel, 316 Stainless Steel and Steel with high temperature aluminum paint.

**Specifications**

- **Diameter:** .315", .430", .475"
- **Material:** 304SS, 316SS, Steel Copper Clad, Monel, Steel
- **Min. Sheath Length:** 11"
- **Max Sheath Length:** 256"

**Finned Tubular Heaters**

- **Fin Diameter:** 1.31", 1.14", 1.12", 0.84"
- **Terminations:** All Tubular Heater
- **Max. Volts:** 480 Vac
- **Max. Amperage:** 40 Amp

**Single-Ended Tubular Heaters**

The Single-Ended Tubular Heater manufacturing and design process is similar to that of the double ended tubular heater. Single ended tubular heaters are made strictly per customer request, providing an economical alternative to cartridge heater applications, simplifying wiring and installation for applications requiring localized heat. Flanges, bulkhead and NPT fittings can be attached to the sheath for mounting or immersion heating applications.

**Specifications**

- **Diameters:** .315", .430", .475", .490", .625"
- **Material:** 304SS, 316SS, Steel Copper Clad, Monel, Steel
- **Min. Sheath Length:** 11"
- **Max. Sheath Length:** 96"
- **Termination:** Lead Wires
- **Max. Volts:** 277 Vac
- **Max. Amperage:** 30 Amp

**Ordering Information, Finned Tubular Heaters**

- Please Specify the following:
  - Terminiations and Seals
  - Sheath/Fin Material
  - Sheath Diameter
  - Bend Formations and Dimensions
  - Wattage and Voltage
  - Bulkhead Fittings
  - Mounting Flange

**Ordering Information Single-Ended Tubular Heaters**

- Please Specify the following:
  - Sheath Material and Diameter
  - Heater Length and Cold Ends
  - Wattage and Voltage
  - Termination and Seals
  - Bulkhead Fittings
  - Mounting Flange

Call Toll Free: (800) 323-6859 • Fax: (630) 350-0232 • E-Mail: sales@tempco.com
**Tubular Heater, Finned Tubular Heater and Single Ended Tubular Heater Quote Request**

**Made-To-Order Quote Request Form — Copy and Fax us your requirements.**

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<th>Name</th>
<th>Company</th>
<th>Address</th>
<th>Phone</th>
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</table>

**Application Information**

Describe in Detail

Air or Immersion

Maximum Load Temperature

Quantity

---

**Specifications**

Type: Standard _____ Finned _____ Single Ended _____

Sheath Material

Diameter _____ Fin Dia. if applies ______

Overall Sheath Length

Cold Section: 1st end ______ 2nd end ______

Watts ______ Volts ______

UL _____ cUL _____ CSA _____ CE _____

Termination Type _________ (Type T – standard screw)

Standard Options

---

Mounting: MC _____ LR _____ Location: _____ MF _____

Bulkhead Fittings _____ Material _____ Flange Type _____

Describe if Custom ______

---

**Moisture Seals**

Moisture Seals: None _____

Optional: Style SS: Type V2A _____ Type V2B _____

Style SER: Type R _____ Type R1 _____

Style SEH: Type V _____ Type V1 _____

Type M _____ Type H _____

Describe if Custom ______

---

**Optional Sheath Surface Treatments**

(For Incoloy® and Stainless Steel Sheath Elements only)

Passivation _____ Bright Annealing _____

Electro-Polishing _____

Other ______

---

**Bends and Shapes**

Standard Formation Code

Specify Letters and Corresponding Dimensions Below:

---

Number of Bends if known

Single/Multiple ______ Plane ______

Coils/Turns ______ Dia. ______

Circle: Full _____ Dia. _____ Partial _____ Degree _____

Describe if Custom ______

---

Product Inventory Available for Viewing and Selection @ www.tempco.com