Heaters Designed to Heat Forced-Circulation Air, Gases or Liquids

Circulation heaters provide a ready-made means to install electric heating with a minimal amount of time and labor. This is accomplished by combining heating elements, vessel, insulation, terminal enclosure, mounting brackets and inlet and outlet connections into a complete assembly.

Made from National Pipe Thread (NPT) screw plug or ANSI flange heater assemblies mated with a pressure vessel (tank), circulation heaters are designed to heat forced-circulation air, gases or liquids. Ideal for either in-line or side-arm operations, these assemblies direct fluids past WATROD™ heating elements, to deliver fast response and even heat distribution.

Watlow® meets virtually all circulation heater assembly needs with made-to-order units. Watlow circulation heaters can be made from a wide range of heating element sheath materials, wattages, vessel sizes and materials, pressure ratings, terminal enclosures and controls.

Watlow’s circulation heaters are available through Watlow SELECT®, a program that enables you to quickly identify, configure and receive your thermal products faster and easier than ever before. With SELECT, you use a variety of tools to guide your decision, configure products for an exact fit and quickly receive your order. Visit www.watlow.com/select to learn more.

Performance Capabilities

- Watt densities up to 120W/in² (18.6 W/cm²)
- Wattages up to three megawatts
- UL® and CSA component recognition up to 690VAC
- Ratings up to ANSI Class 600 pressure class
- Alloy 800/840 sheath temperatures up to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures up to 1200°F (650°C)
- Steel sheath temperatures up to 750°F (400°C)

Features and Benefits

Catalog screw plug and flange part numbers

<table>
<thead>
<tr>
<th>Type</th>
<th>Sizes (in.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPT screw plugs</td>
<td>1¼, 2½</td>
</tr>
<tr>
<td>ANSI flanges</td>
<td>3, 4, 5, 6, 8, 10, 12, 14</td>
</tr>
</tbody>
</table>

ANSI B16.5 Class 150 on 4 or 6 inch FIREBAR element flanges and 3 to 14 inch WATROD element flanges
- Meets recognized agency standards

FIREBAR assemblies pack more wattage in a smaller heater bundle
- Replaces larger flanges with round tubular elements, with a smaller package

Compacted mgO insulation filled elements
- Maximizes dielectric strength, heat transfer and life
- 1 inch (25 mm) thermal insulation rated to 750°F (400°C)
- Reduces heat loss from the vessel

Heavy-gauge steel jacket (shroud)
- Protects thermal insulation and heating vessel and comes with protective primer coating
Features and Benefits (Continued)

All catalog units are rated to ANSI pressure Class 150
- Provides pressure vessels (tanks) that are either carbon, 304 or 316 stainless steel

Standard offering includes units rated for up to and including ANSI pressure class 600 (application review required)
- Provides pressure vessels (tanks) available in carbon steel, 304 or 316 stainless steel materials
- Includes schedule 40, standard and 80 pipe used in the pressure vessel construction

Catalog units provided with NPT or ANSI Class 150 nozzle connection
- Makes installation easy. Inlet and outlet nozzle connections are threaded MNPT on 8 in. (203 mm) and smaller tanks. Class 150 flanged connections on 10 in. (254 mm) and larger tanks
- Mounting lugs are welded onto the tank wall of all 2½ in. (64 mm) NPT and larger units
  - Provides mounting support
- General purpose, moisture resistant enclosures available
  - Offers easy access to terminal wiring
- Flange mounting holes
  - Straddles centerline to comply with industry standards

UL® and CSA component recognition under file numbers ES2951 and 31388 respectively
- Meets industry safety standards

Typical Applications
Water:
- Deionized
- Demineralized
- Clean
- Potable
- Process
- Industrial water rinse tanks
- Hydraulic oil, crude, asphalt
- Lubricating oils at API specified watt densities
- Heat transfer oil
- Paraffin
- Caustic cleaners
- Nitrogen, hydrogen and other air/gas systems
- Superheating steam

Options

Terminal Enclosures
General purpose terminal enclosures, without thermostats, are supplied on all Watlow circulation heaters. Moisture and explosion resistant ratings are available to meet specific application needs.

Stand-off Terminal Enclosures
Stand-off terminal enclosures help protect terminal enclosures against excessive temperatures.

ASME Pressure Vessel Code Welding
Flange or screw plug assemblies can be provided with an ASME Section VIII or Section I, Div. I pressure vessel stamp upon request.

Branch Circuits
Branch circuits are designed for 48 amperes per circuit maximum. Contact a Watlow representative for circuit requirements other than those listed in the stock charts.

Certified Enclosures
CSA, ATEX or IECEx certified enclosures protect wiring in hazardous gas environments. These terminal enclosures, covered under CSA file number 61707, ATEX certificate # SIRA 10ATEX 1155X or IECEx certificate # IECEx CSA 09.0010 are available on WATROD flange heaters.

For products that will be installed in hazardous locations, please provide the following information:
- Operating conditions
- Minimum and maximum ambient temperatures for the installation location
- Mounting orientation

Watlow must understand this information so that an appropriate design can be provided.

Thermostats
To provide process temperature control, Watlow offers optional single- and double-pole thermostats. Thermostats are typically mounted in the terminal enclosure. Optional side mounting on vessel also available.

Baffles
Baffles mounted on the heating element bundle enhance and/or modify liquid or gas flow for better heat transfer. For critical sheath temperature and low flow conditions, baffles may be required.

Contact a Watlow representative for details.

Thermocouples
To sense process or element sheath temperature, ASTM Type J or K thermocouples are available.
Options (Continued)

Process Thermocouple in Nozzle
(Must specify which nozzle)

Sheath Materials
The following sheath materials are available on WATROD
and FIREBAR heating elements:

WATROD

- 304 SS
- Alloy 800/840
- Steel

FIREBAR

- Alloy 800, 304 SS

Made-to-Order Sheath Materials

WATROD

- 304 SS
- Alloy 600
- Titanium
- Hastelloy® C276

Wattages and Voltages

Watlow routinely supplies circulation heaters with
120 to 690VAC as well as wattages from 500 watts
to one megawatt. If required, Watlow will configure
circulation heaters with voltages and wattages outside
these parameters.

For more information on special voltage and wattage
configurations, contact a Watlow representative.

Protective Steel Jacket (Shroud)
To protect circulation heaters from weather or wash-down
conditions, partially welded (standard) outer protective
steel jackets are available. Standard steel, or made-to-order
304 or 316 stainless steel or aluminum can be supplied.
Jacket diameter is dependent upon thermal insulation
thickness.

To order, specify protective steel jacket, material type and
weatherproof, if desired.

Passivated Finish
For critical applications, passivation will remove free iron
from all wetted surfaces.

Contact a Watlow representative for details.

Gaskets
Rubber, asbestos-free and spiral wound gaskets are available
for all heater flange, and inlet and outlet flange sizes.

Watlow recommends ordering spares in case replacement
becomes necessary.

To order, specify gasket type, flange size/rating and process
operating temperature.

Inlet and Outlet Nozzle Connections
All inlet and outlet materials are compatible with the
pressure vessel material and pressure class rating.

Vessel sizes from 1¼ to 8 inches are typically configured
with Male National Pipe Thread (MNPT) nozzles. Optional
NPT and flange sizes can be supplied to mate with existing piping.

10 inch and larger vessels are supplied with Class 150 inlet
and outlet flanges. Optional Class 300 or Class 600 can be
provided to mate with existing piping.

To order, specify type, size and pressure class rating for both
inlet and outlet nozzle/flange connections.

Support Saddles
To mate with an existing installation, customized support
saddle(s) and/or mounting lugs are available.

To order, specify mounting lugs or support saddles and
supply a dimensional drawing.

High-Temperature Thermal Insulation
To further minimize heat loss, the pressure vessel's
standard one inch thermal insulation wrap may be replaced
with thicker and/or higher temperature insulation.

For more information, contact your Watlow representative.

To order, specify insulation thickness, standard or high
temperature insulation and temperature rating.

Vessels may be supplied with a primer coating
without insulation.

To order, specify no insulation.

Pressure Vessels
All catalog pressure vessel (tank) materials consist of
standard schedule and 150# class forged fittings and are
made from one of the following materials:

- Carbon steel
- 316 stainless steel

All catalog pressure vessels (tanks) are steel unless otherwise
noted.

316 stainless steel pressure vessels (tanks) are passivated on
all wetted surfaces. Available from assembly stock on
2½ inch NPT and 4 or 6 inch ANSI flange circulation heaters.

Made-to-order units can be made in a variety of materials,
flange sizes and pressure classes. Ratings to ANSI class 2500
pressure class are available for high-pressure applications.

Rules

- Process Thermocouple in Nozzle
- Sheath Materials
- Wattages and Voltages
- Protective Steel Jacket (Shroud)
- Passivated Finish
- Gaskets
- Inlet and Outlet Nozzle Connections
- Support Saddles
- High-Temperature Thermal Insulation
- Pressure Vessels

For 10 in. (254 mm) and larger tanks contact your Watlow
representative for dimension.

Sheath Materials
The following sheath materials are available on WATROD
and FIREBAR heating elements:

<table>
<thead>
<tr>
<th>Ref. Tank Size</th>
<th>Ref. Nozzle Size</th>
<th>Dimension “A”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1¼</td>
<td>¾ NPT</td>
<td>8¹/₁₆</td>
</tr>
<tr>
<td>2½</td>
<td>1 NPT</td>
<td>8¹/₁₆</td>
</tr>
<tr>
<td>3</td>
<td>1 NPT</td>
<td>8¹/₁₆</td>
</tr>
<tr>
<td>4</td>
<td>1½ NPT</td>
<td>10¹/₈</td>
</tr>
<tr>
<td>5</td>
<td>2 NPT</td>
<td>11¹/₁₆</td>
</tr>
<tr>
<td>6</td>
<td>2½ NPT</td>
<td>13¹/₈</td>
</tr>
<tr>
<td>8</td>
<td>2½ NPT</td>
<td>14¹/₈</td>
</tr>
</tbody>
</table>

For more information, contact your Watlow representative.

Rules

- Process Thermocouple in Nozzle
- Sheath Materials
- Wattages and Voltages
- Protective Steel Jacket (Shroud)
- Passivated Finish
- Gaskets
- Inlet and Outlet Nozzle Connections
- Support Saddles
- High-Temperature Thermal Insulation
- Pressure Vessels

For 10 in. (254 mm) and larger tanks contact your Watlow
representative for dimension.

Sheath Materials
The following sheath materials are available on WATROD
and FIREBAR heating elements:

<table>
<thead>
<tr>
<th>Ref. Tank Size</th>
<th>Ref. Nozzle Size</th>
<th>Dimension “A”</th>
</tr>
</thead>
<tbody>
<tr>
<td>1¼</td>
<td>¾ NPT</td>
<td>8¹/₁₆</td>
</tr>
<tr>
<td>2½</td>
<td>1 NPT</td>
<td>8¹/₁₆</td>
</tr>
<tr>
<td>3</td>
<td>1 NPT</td>
<td>8¹/₁₆</td>
</tr>
<tr>
<td>4</td>
<td>1½ NPT</td>
<td>10¹/₈</td>
</tr>
<tr>
<td>5</td>
<td>2 NPT</td>
<td>11¹/₁₆</td>
</tr>
<tr>
<td>6</td>
<td>2½ NPT</td>
<td>13¹/₈</td>
</tr>
<tr>
<td>8</td>
<td>2½ NPT</td>
<td>14¹/₈</td>
</tr>
</tbody>
</table>

For more information, contact your Watlow representative.
Ordering Information

Part Number

1 Stock Plug or ANSI Flange Part Number
   Insert Part Number
   Note: Catalog part numbers include optional enclosures and process sensors. To order optional enclosures or sensors, substitute the appropriate suffix.

2 Optional Terminal Enclosures
   S = General purpose enclosure
   W = Moisture resistant enclosure
   E = Explosion resistant enclosure
   C = Moisture/explosion resistant enclosure
   Note: Catalog listings include either a general purpose enclosure or moisture/explosion resistant enclosure. Substitute enclosure options are noted.

3 Optional Process Sensors
   2 = 30 to 250°F (-1 to 121°C), SPST
   3 = 175 to 550°F (79 to 288°C), SPST
   4 = 40 to 110°F (-1 to 43°C), DPST
   5A = 60 to 250°F (16 to 121°C), DPST (FIREBAR)
   7A = 100 to 500°F (38 to 288°C), DPST (FIREBAR)
   J = Type J process thermocouple in thermowell
   K = Type K process thermocouple in thermowell

4 Sheath Limit Sensor
   HJ = Type J high-limit thermocouple, horizontal mount
   TJ = Type J high-limit thermocouple, vertical/housing at top
   BJ = Type J high-limit thermocouple, vertical/housing at bottom
   HK = Type K high-limit thermocouple, horizontal mount
   TK = Type K high-limit thermocouple, vertical/housing at top
   BK = Type K high-limit thermocouple, vertical/housing at bottom
   Note: Heater orientation is critical to accurate sensing of limit conditioners. Use the appropriate code to indicate heater mounting orientations.

Watlow®, Watlow SELECT® and FIREBAR® are registered trademarks of Watlow Electric Manufacturing Company.
WATROD™ is trademark of Watlow Electric Manufacturing Company.
UL® is a registered trademark of Underwriter’s Laboratories, Inc.
Hastelloy® is a registered trademark of Haynes International.