Tubular and Process Assemblies

Quick Ship

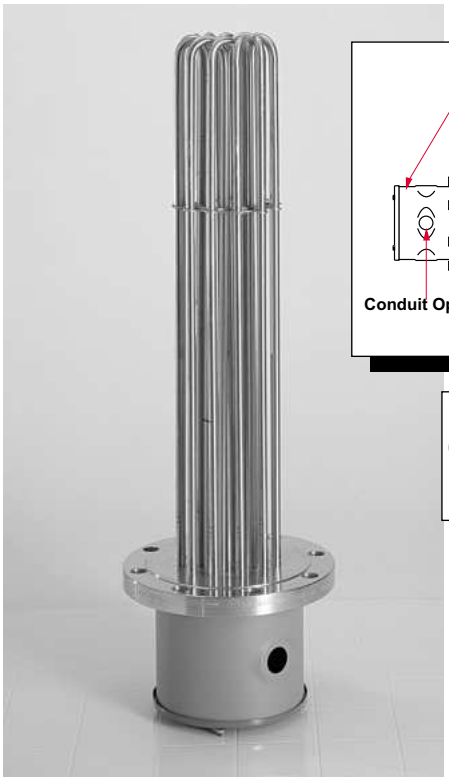
On stock chart units:
- *Three to five working days on most heaters*
- *10 working days on special voltages and/or wattages*
- *15 working days on special element lengths*

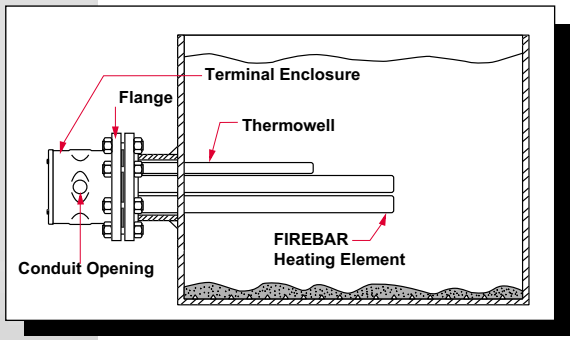
Flange Immersion Heaters

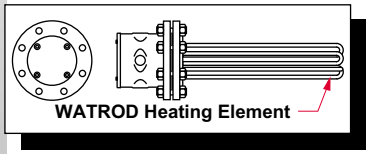
Watlow flange heaters are easy to install and maintain. Designed for heating liquids and gases in tanks and pressure vessels, flange immersion heaters are ideal for applications requiring higher kilowatts.

Watlow flange heaters are made with WATROD or FIREBAR® tubular elements brazed or welded to a flange. Stock flange heaters are equipped with a general purpose (NEMA 1) terminal enclosure.

Flange heaters, with FIREBAR elements, also answer the need for liquid immersion applications requiring high kilowatts in small tanks. The FIREBAR element's unique flat surface geometry packs more power in a smaller bundle, with lower watt density, making it especially well suited for petroleum-based liquid heating applications.







Performance Capabilities

- Watt densities to 100 W/in² (15.5 W/cm²)
- Wattages to one megawatt
- UL® and CSA component recognition to 480V~(ac) and 600V~(ac) respectively
- Incoloy® sheath temperatures to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures to 1200°F (650°C)
- 304 stainless steel sheath temperatures to 1200°F (650°C)
- Steel sheath temperatures to 750°F (400°C)
- Copper sheath temperatures to 350°F (175°C)

Features and Benefits

- **ANSI and ANSI compatible 2, 2½, 3, 4, 5, 6, 8, 10, 12 and 14 inch flanges** provide appropriate heater size-to-application and fit.
- **Flange sizes up to 24 inches** available on made-to-order units.
- **Element sheath and flange materials** to meet application needs.
- **Integral thermowells** provide convenient temperature sensor insertion and replacement without draining the fluid being heated.
- **A standard, general purpose (NEMA 1) terminal enclosure** offers easy access to wiring.
- **Element support(s)** provide proper element spacing to maximizing heater performance and life.
- **To facilitate lifting**, drilled and tapped holes come supplied for eye bolts on 10 inch and larger flange heaters.
- **All units are inspected and/or tested** to ensure element-to-flange pressure seals do not leak.
- **Four or six inch FIREBAR flange heaters** pack more kilowatts in smaller bundles—in liquid immersion applications, a conventional 10 inch round tubular element flange can be replaced with a six inch FIREBAR flange.
- **WATROD hairpins are repressed (recompacted)** to maintain MgO density, dielectric strength, heat transfer and life.
- **Branch circuits meet NEC** with 48 amps per circuit maximum.
- **UL® and CSA component recognition** under file numbers E52951 and 31388 respectively. See **pages 268-271** for details.

Tubular and Process Assemblies

Flange Immersion Heaters

Applications

- Water:
  - Deionized
  - Demineralized
  - Clean
  - Potable
  - Process
- Industrial water rinse tanks
- Vapor degreasers
- Hydraulic oil, crude, asphalt
- Lubricating oils at API specified watt densities
- Air and gas flow
- Caustic solutions
- Chemical baths
- Process air equipment
- Boiler equipment
- Freeze protection of any fluid
- Anti-freeze (glycol) solutions
- Paraffin

Options

Terminal Enclosures

General purpose terminal enclosures, without thermostats, are standard on all flange immersion heaters. Optional terminal enclosures include:

- General purpose (NEMA 1) with a single or double pole thermostat.
- Moisture resistant (NEMA 4–steel). Available with or without a single or double pole thermostat.
- Corrosion resistant (NEMA 4X). Available with or without a single or double pole thermostat.
- Explosion resistant (NEMA 7) class 1 groups C and D. Available with or without a single or double pole thermostat.
- Explosion/moisture resistant (NEMA 7/4) combinations. Available with or without a single or double pole thermostat.
- For class 1, group B enclosures, consult your Watlow representative.

Enclosure Enhancements

- Enclosure heater to solve condensation and freeze problems.
- Power distribution blocks to facilitate power feed line wiring.

Prior to ordering, refer to the terminal enclosure dimensions on **page 341**. Order by adding the appropriate suffix letter(s) to the base flange heater code number, as shown on the Build-a-Code chart. Heater code numbers and suffix letters are depicted on the *Stock* and *Options* charts, **pages 345 to 362**. Specify class and group, if applicable.

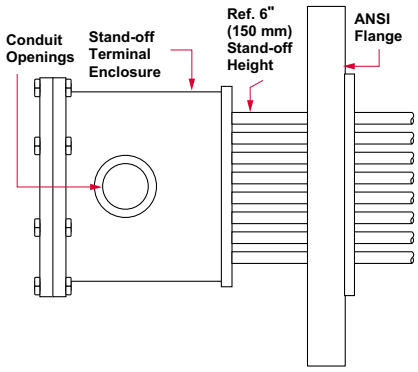
Caution

Explosion-resistant terminal enclosures are intended to provide explosion containment in the electrical termination/wiring enclosure only. No portion of the assembly outside of this enclosure is covered under this NEMA rating. NEMA rating effectiveness may be compromised by abuse or misapplication.

Stand-off Terminal Enclosures

Stand-off terminal enclosures provide an air-insulating barrier between the flange and terminal enclosure by mounting the terminations and wiring away from the flange. Stand-off terminal enclosures are recommended whenever a process operating temperature exceeds 400°F (205°C). This helps minimize terminal enclosure temperatures.

To order, specify **stand-off terminal enclosure**.



CSA Certified Enclosures

CSA certified moisture and/or explosion resistant terminal enclosures protect wiring in hazardous gas environments. These terminal enclosures, covered under CSA file number 61707, are available on all WATROD and FIREBAR flange heaters. For additional information, consult your Watlow representative.

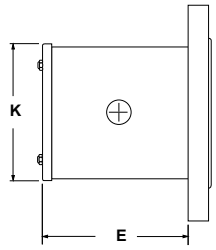
To order, specify **CSA certified enclosure**, **process temperature** (°F), maximum **working pressure** of application (psig), **media** being heated and heater **mounting orientation** (horizontal or vertical) and **flange size**.

Tubular and Process Assemblies

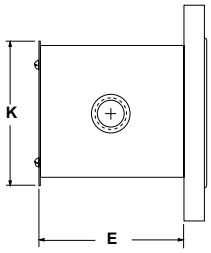
Flange Immersion Heaters

Options

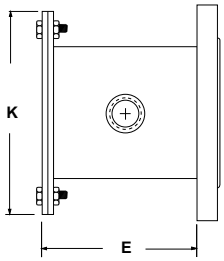
4-8 inches NEMA 1 and NEMA 4



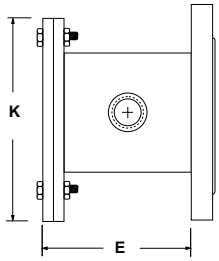
10-14 inches NEMA 1



10-14 inches NEMA 4



4-14 inches NEMA 7



Terminal Enclosure Dimensions

Enclosure Type	Flange Size inch	Without Thermostat				With Thermostat							
						Single Pole				Double Pole			
		E Dimension inch	(mm)	K Dimension inch	(mm)	E Dimension inch	(mm)	K Dimension inch	(mm)	E Dimension inch	(mm)	K Dimension inch	(mm)
General Purpose (NEMA 1)	2①	1 ½	(38)	3 ⅜	(86)	—	—	—	—	—	—	—	—
	2½①	2 ⅛	(54)	4	(102)	—	—	—	—	—	—	—	—
	3	3 13/16	(97)	4 ⅝	(117)	9 ⅜	(238)	7	(178)	9 ⅜	(238)	7	(178)
	4	9 ⅜	(238)	7	(178)	9 ⅜	(238)	7	(178)	9 ⅜	(238)	7	(178)
	5	7 1/16	(179)	7	(178)	7 1/16	(179)	7	(178)	7 1/16	(179)	7	(178)
	6	7 1/16	(179)	8	(203)	7 1/16	(179)	8	(203)	7 1/16	(179)	8	(203)
	8	7 1/16	(179)	10 1/32	(255)	7 1/16	(179)	10 1/32	(255)	7 1/16	(179)	10 1/32	(255)
	10	7 1/16	(179)	11 ⅝	(295)	7 1/16	(179)	11 ⅝	(295)	7 1/16	(179)	11 ⅝	(295)
	12	7 1/16	(179)	13 ½	(343)	7 1/16	(179)	13 ½	(343)	7 1/16	(179)	13 ½	(343)
	14	7 1/16	(179)	15 ⅛	(384)	7 1/16	(179)	15 ⅛	(384)	7 1/16	(179)	15 ⅛	(384)
Moisture Resistant (NEMA 4)	2	2 ⅝	(67)	3 ½	(89)	—	—	—	—	—	—	—	—
	2 ½	2 ⅝	(67)	3 ½	(89)	—	—	—	—	—	—	—	—
	3	2 ⅛	(54)	4	(102)	9 ⅜	(238)	7	(178)	9 ⅜	(238)	7	(178)
	4	9 ⅜	(238)	7	(178)	9 ⅜	(238)	7	(178)	9 ⅜	(238)	7	(178)
	5	7 1/16	(179)	7	(178)	7 1/16	(179)	7	(178)	7 1/16	(179)	7	(178)
	6	7 1/16	(179)	8	(203)	7 1/16	(179)	8	(203)	7 1/16	(179)	8	(203)
	8	7 1/16	(179)	10 1/32	(255)	7 1/16	(179)	10 1/32	(255)	7 1/16	(179)	10 1/32	(255)
	10	7 ¾	(197)	13 ¾	(349)	7 ¾	(197)	13 ¾	(349)	7 ¾	(197)	13 ¾	(349)
	12	7 ¾	(197)	15 ⅞	(403)	7 ¾	(197)	15 ⅞	(403)	7 ¾	(197)	15 ⅞	(403)
	14	7 ¾	(197)	17 ¼	(438)	7 ¾	(197)	17 ¼	(438)	7 ¾	(197)	17 ¼	(438)
Explosion Resistant (NEMA 7) Class 1, Groups C and D Consult Factory for Group B)	2	3 1/16	(78)	3 ¾	(95)	—	—	—	—	—	—	—	—
	2 ½	3 1/16	(78)	3 ¾	(95)	—	—	—	—	—	—	—	—
	3	7 ⅛	(181)	5 ¾	(146)	7 ⅛	(181)	5 ¾	(146)	7 ⅛	(181)	5 ¾	(146)
	4	7 ⅛	(181)	5 ¾	(146)	7 ⅛	(181)	5 ¾	(146)	7 ⅛	(181)	5 ¾	(146)
	5	7 ⅞	(200)	8 ⅞	(225)	7 ⅞	(200)	8 ⅞	(225)	7 ⅞	(200)	8 ⅞	(225)
	6	7 ⅞	(200)	9 ⅞	(251)	7 ⅞	(200)	9 ⅞	(251)	7 ⅞	(200)	9 ⅞	(251)
	8	7 ⅞	(200)	12 ⅛	(308)	7 ⅞	(200)	12 ⅛	(308)	7 ⅞	(200)	12 ⅛	(308)
	10	7 ⅞	(200)	14 ⅝	(371)	7 ⅞	(200)	14 ⅝	(371)	7 ⅞	(200)	14 ⅝	(371)
	12	7 ⅞	(200)	15 ⅞	(403)	7 ⅞	(200)	15 ⅞	(403)	7 ⅞	(200)	15 ⅞	(403)
	14	7 ⅞	(200)	19 ⅜	(492)	7 ⅞	(200)	19 ⅜	(492)	7 ⅞	(200)	19 ⅜	(492)

① Terminal enclosure is octagonal, not round.

Flange Immersion Heaters

Options

Thermostats

To provide process temperature control, Watlow offers optional single pole, single throw (SPST) and double pole, single throw (DPST) thermostats.

Unless otherwise specified, thermostats are mounted inside the terminal enclosure. For details and ordering information, refer to ***Thermostats*** on **pages 423 to 425**. Please verify that the thermostat's sensing bulb O.D. is compatible with the flange heater's thermowell I.D.

Thermocouples

ASTM Type J or K thermocouples offer more accurate sensing of process and/or sheath temperatures. A thermocouple may be inserted into the thermowell or attached to the heater's sheath.

Thermocouples are supplied with 120 inch (3050 mm) leads (longer lead lengths available). Unless otherwise specified, thermocouples are supplied with temperature ranges detailed on the *Thermocouple Types* chart.

Using a thermocouple requires an appropriate temperature and power control. These must be purchased separately. Watlow offers a wide variety of temperature and power controls to meet virtually all applications. Temperature controls can be configured to accept process variable inputs, too.

Consult your Watlow representative for details.

To order, specify **Type J** or **K** thermocouple and lead length. Indicate if the thermocouple is for **process temperature sensing** or heater sheath **high-limit protection**. Please specify if the flange heater will be mounted **vertical** or **horizontal** in the tank. **If vertical, specify if the housing is on top or bottom**.

If the flange heater is part of an in-line circulation heating application, indicate flow direction relative to the heater's enclosure.

RTDs

If your process requires greater temperature sensing accuracy than is possible with thermocouples, Watlow can also supply RTDs in DIN or JIS calibrations. Consult Watlow for details.

Thermocouple Types

ASTM Type	Conductor Characteristics Positive	Conductor Characteristics Negative	Recommended① Temperature Range °F	Recommended① Temperature Range (°C)
J	Iron (Magnetic)	Constantan (Non-magnetic)	0 to 1000	(-20 to 540)
K	Chromel® (Non-magnetic)	Alumel® (Magnetic)	0 to 2000	(-20 to 1100)

① Type J and Type K thermocouples are rated 32 to 1382°F and 32 to 2282°F (0-750°C and 0-1250°C), respectively. Watlow does not recommend exceeding temperature ranges shown on this chart for the tubular product line.

Wattages and Voltages

Watlow routinely supplies flange immersion heaters with 240 to 480V~(ac) as well as wattages from 150 watts to one megawatt. If required, Watlow will make heaters with voltage up to 600V~(ac) and wattage beyond one megawatt. For more information on special voltage and wattage configurations, consult your Watlow representative.

Branch Circuits

Branch circuits are subdivided by National Electrical Code (NEC) requirements to a maximum of 48 amps per circuit. Consult factory for circuit requirements other than those listed in the stock charts.

Tubular and Process Assemblies

Flange Immersion Heaters

Options

Sheath Materials

The following sheath materials are available on WATROD and FIREBAR flange heaters:

Standard Sheath Materials

WATROD	Incoloy® 316 stainless steel Steel Copper
FIREBAR	Incoloy®

Made-to-Order Sheath Materials

WATROD	304 stainless steel Monel®
FIREBAR	304 stainless steel

Exotic Sheath Materials

Consult your Watlow representative for details and availability.

External Finishing

Passivation

During the manufacturing process, particles of iron or tool steel may become embedded in the stainless steel or alloy sheath. If not removed, these particles may corrode, produce rust spots and/or contaminate the process. For critical sheath applications, passivation will remove free iron from the sheath. To order, specify **passivation**.

Other Finishes

Simple belt polishing and glass beading are available to meet cosmetic demands. Consult factory for details.

Flanges

Flange Sizes and Styles

Standard: 2①, 2½①, 3, 4, 5, 6, 8, 10, 12 and 14 inch ANSI raised face/blind flanges.

Made-to-Order: 16, 18, 20 and 24 inch in any recognized configuration, as well as customer specified. Over 24 inch, consult Watlow Process Systems.

Flange Materials

Standard	Carbon steel 316 stainless steel 304 stainless steel
Made-to-Order	Exotic materials to meet specific application needs②

Pressure Classes

Standard	150 lb
Made-to-Order	300 lb 600 lb Over 600 lb②

Gaskets

Rubber, asbestos-free and spiral wound gaskets are available for all flange sizes. Order by specifying gasket type, flange size/rating, process operating temperature and pressure.

To make the correct selection, see the *Gasket Selection* chart.

It provides a recommended gasket type and effective temperature rating.

To use this chart, multiply operating temperature by the operating pressure to arrive at "Maximum PSIG X °F." This is listed in the chart's first column.

Gasket Selection

Maximum PSIG X °F	Gasket Temperature °F	Gasket Type
Up to 15,000	300	Rubber
Over 250,000	700	Asbestos-Free
Over 250,000	③	Spiral Wound

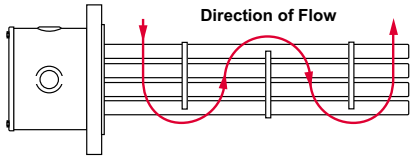
③ Depends on metal gasket material.

Baffles

For forced circulation applications, baffles can be arranged on the heating element bundle to enhance and/or modify fluid or gas flow for better heat transfer.

For open tank or convection heating applications, standard element supports will be supplied.

To order, specify **baffles**.



① ANSI compatible only.
② Consult Watlow Process Systems in Troy, Missouri.

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