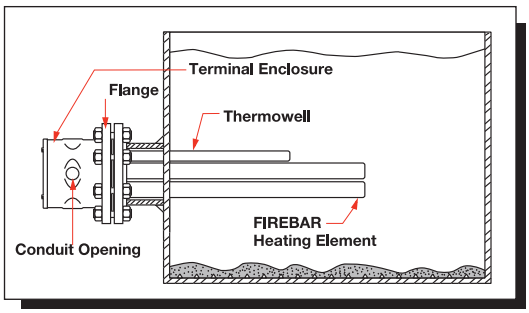
Immersion Heaters

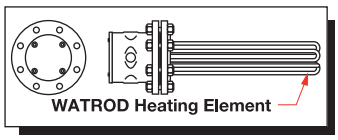
WATROD and FIREBAR ANSI Flange Immersion Heaters

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 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 up to 100 W/in^2 (15.5 W/cm^2)
- Wattages up to three megawatts
- UL® and CSA component recognition up to 600VAC
- Alloy 800/840 sheath temperatures up to 1600°F (870°C)
- Passivated 316 stainless steel sheath temperatures up to 1200°F (650°C)
- 304 stainless steel sheath temperatures up to 1200°F (650°C)
- Steel sheath temperatures up to 750°F (400°C)
- FIREBAR flange heaters deliver more kilowatts in smaller bundles
- A conventional round tubular 10-inch ANSI flange can be replaced by a 6-inch ANSI FIREBAR flange with same immersed length

Features and Benefits

ANSI and ANSI compatible 2, 2 1/2, 3 thru 48 inch flanges
- Provides appropriate heater size-to-application and fit

Element sheath and flange materials
- Meets your application needs

Integral thermowells
- Provides convenient temperature sensor insertion and replacement without draining the fluid being heated

Standard, general purpose terminal enclosure
- Offers easy access to wiring

Element support(s)
- Provides proper element spacing to maximize heater performance and life

All units are inspected and/or tested
- Ensures element-to-flange pressure seals do not leak

Drilled and tapped eyebolt holes or lift lugs for eye bolts on 10 inch and larger flange heaters
- Facilitates lifting during installation

WATROD hairpins are repressed (recompacted)
- Provides improved heater life, insulation resistance and heat transfer

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WATROD and FIREBAR ANSI Flange Immersion Heaters

Features and Benefits *(Continued)*

FIREBAR flange heaters pack more kilowatts into a smaller bundle

- Includes a conventional round tubular 10 in. (254 mm) ANSI flange which can be replaced by a 6 in. (152 mm) ANSI FIREBAR flange with the same immersed length

Branch circuits are designed for 48 amperes per circuit maximum

- Reduces risk of failure due to excessive temperatures generated by high amperage

UL® and CSA component recognition under file numbers E52951 and 31388 respectively

- Simplifies obtaining third-party recognition for assembly

Typical 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 with a single or double-pole thermostat
- Moisture resistant—available with or without a single- or double-pole thermostat
- Corrosion resistant—available with or without a single- or double-pole thermostat
- Non-certified, explosion resistant suitable for use in non-classified areas only—available with or without a single- or double-pole thermostat
- Explosion resistant Class 1, Div. 1 and 2, Groups B, C, D, T1 - T6—available with or without a single- or double-pole thermostat
- Non-certified, explosion and moisture resistant combination suitable for use in non-classified areas only—available with or without a single- or double-pole thermostat

Prior to ordering, refer to the terminal enclosure dimensions on page 243. Order by adding the appropriate suffix letter(s) to the base flange heater part number, as shown on the Ordering information chart. Heater part numbers and suffix letters are depicted on the charts, pages 244 to 305. Specify class and group, if applicable.

Caution

Certified 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 rating. Rating effectiveness may be compromised by abuse or misapplication.

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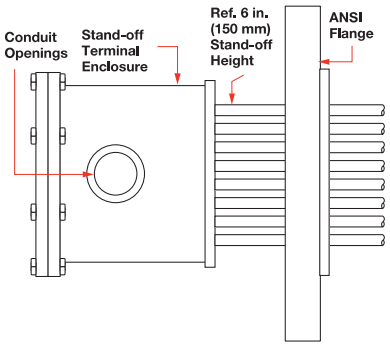
Immersion Heaters

WATROD and FIREBAR ANSI Flange Immersion Heaters

Options *(Continued)*

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 210°F (100°C). This helps minimize terminal enclosure temperatures.

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

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 10ATEX1155X or IECEx certificate # IECEx CSA 09.0010X are available on WATROD flange heaters. For additional information, see page 567 and 568 or contact your Watlow representative.

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.

ASME Pressure Vessel Code Welding

Flange assemblies can be provided with an ASME Section VIII, Div. I pressure vessel stamp upon request.

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 534 to 537. 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 in. (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 controller. These must be purchased separately. Watlow offers a wide variety of temperature and power controllers to meet virtually all applications. Temperature controllers can be configured to accept process variable inputs, too. Contact 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.

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)

①Type 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.

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WATROD and FIREBAR ANSI Flange Immersion Heaters

Options *(Continued)*

Wattages and Voltages

Watlow routinely supplies flange immersion heaters with 240 to 480VAC as well as wattages from 150 watts to one megawatt.

Sheath Materials

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

Standard Sheath Materials

WATROD	Alloy 800, 840 316 SS Steel
FIREBAR	Alloy 800

Exotic Sheath Materials

Contact 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

Bright annealing available to meet cosmetic demands.

Flanges

Flange Sizes and Styles

Standard: 2①, 2 1/2①, 3 to 48 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 48 inch ANSI flange, contact your Watlow representative.

Flange Materials

Standard	Carbon steel 316 SS 304 SS

Pressure Classes

Standard	150 lb 300 lb 600 lb

① ANSI bolt pattern only

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.

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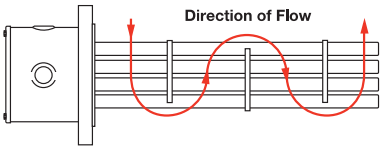
Immersion Heaters

WATROD and FIREBAR ANSI Flange Immersion Heaters

Options *(Continued)*

Baffles



For forced circulation applications, 316 stainless steel 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.

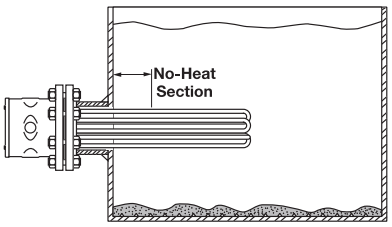
To order, specify **baffles**.

ANSI Raised Face Blind Flange, 150# Class Dimensions

Pipe Size	Outside Diameter	Flange Thickness	Diameter of Bolt Circle	Diameter of Bolt Holes	Number of Bolt Holes
3	7.50	0.94	6.00	0.75	4
4	9.00	0.94	7.50	0.75	8
5	10.00	0.94	8.50	0.88	8
6	11.00	1.00	9.50	0.88	8
8	13.50	1.12	11.75	0.88	8
10	16.00	1.19	14.25	1.00	12
12	19.00	1.25	17.00	1.00	12
14	21.00	1.38	18.75	1.12	12
16	23.50	1.44	21.25	1.12	16
18	25.00	1.56	22.75	1.25	16
20	27.50	1.69	25.00	1.25	20
24	32.00	1.88	29.50	1.38	20

Application Hints

- Select the recommended heating element sheath material and watt density for the substance being heated. Use the *Supplemental Applications Chart* on pages 555 to 560. If unable to determine the correct heating element sheath material and type, contact your Watlow representative.
- Extend the element no-heat section completely into the fluid being heated to help prevent premature heater failure. See accompanying illustration for proper no-heat section placement.
- Locate flange heater low in the tank, but above the sludge level.
- Choose a FIREBAR element when your application requires a smaller system package or lower watt density.
- Ensure wiring integrity by keeping terminal enclosure temperature below 400°F (205°C).
- Size power feeder wires in accordance with National Electrical Code guidelines and other applicable codes.
- Keep electrical connections clean, dry and tight.
- Minimize problems associated with low liquid level conditions by using low liquid level sensor or sheath temperature high-limit control.



- Periodically remove the flange assembly to inspect and clean the heating element(s). This preventive maintenance will reduce premature failure and optimize heater performance.
- Refer to the *Installation and Maintenance Instructions* for correct orientation of FIREBAR elements. This is important in air applications with customer-supplied circulation tanks. Correct element orientation to flow minimizes pressure drop and increases buoyancy force and heater performance.

Immersion Heaters

EXTENDED CAPABILITY

Extended Capabilities For WATROD and FIREBAR ANSI Flange Immersion Heaters

Options

Enclosure Enhancements

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

RTDs

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

Wattages and Voltages

If required, Watlow will make heaters with voltage up to 600VAC and wattage beyond one megawatt. For more information on special voltage and wattage configurations, contact your Watlow representative.

Sheath Materials

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

Extended Sheath Materials

WATROD	Titanium 304 and 321 SS Hastelloy C276 Alloy 400 and 600
FIREBAR	304 SS

Flanges

Flange Materials

Extended	Exotic materials to meet specific application needs ①

Pressure Classes

Extended	Over 600 lb ①

① Contact your Watlow representative

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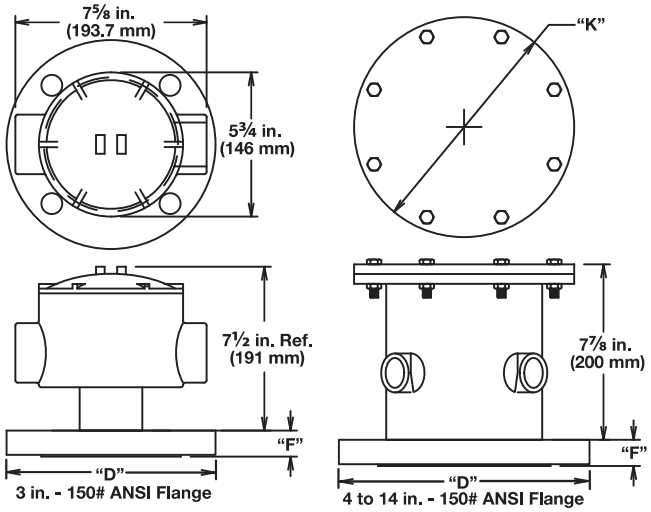
Immersion Heaters

WATROD and FIREBAR ANSI Flange Immersion Heaters

Optional Moisture/Explosion Resistant Enclosure Without Thermostat



Terminal Enclosure Dimensions

General Purpose & Moisture Resistant Enclosures

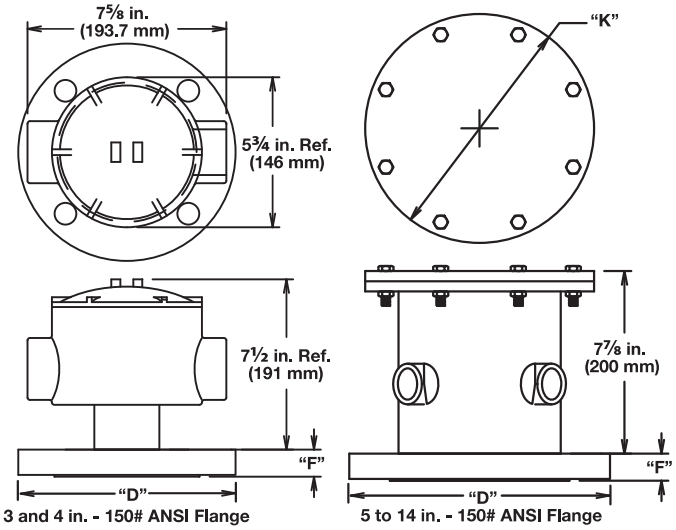
ANSI Flange Size in.	"F" Thickness in. (mm)	"K" With Thermostat	"K" Without Thermostat	"D" in. (mm)
3	15/16 (23.8)	5¾ (146)	See heater dwg.	7½ (191)
4	15/16 (23.8)	5¾ (146)	See heater dwg.	9 (229)

Note: 5 thru 12 in. (127 thru 305 mm) flange dimensions are on catalog heater drawings.

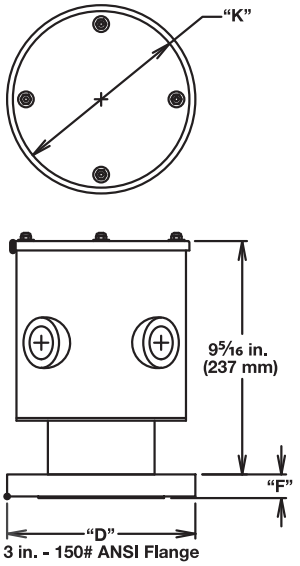
Moisture/Explosion Resistant Enclosures

ANSI Flange Size in.	"F" Thickness in. (mm)	"K" With Thermostat	"K" Without Thermostat	"D" in. (mm)
3	15/16 (23.8)	N/A	N/A	7½ (191)
4	15/16 (23.8)	N/A	7⅞ (200.0)	9 (229)
5	15/16 (23.8)	8⅞ (225.4)	8⅞ (225.4)	10 (254)
6	1 (25.0)	9⅞ (250.8)	9⅞ (250.8)	11 (280)
8	1⅛ (28.6)	12⅛ (308.0)	12⅛ (308.0)	13½ (343)
10	1 3/16 (30.2)	14⅝ (371.5)	14⅝ (371.5)	16 (407)
12	1¼ (32.0)	17¼ (438.0)	17¼ (438.0)	19 (483)
14	1⅜ (34.9)	19⅜ (492.1)	19⅜ (492.1)	21 (534)

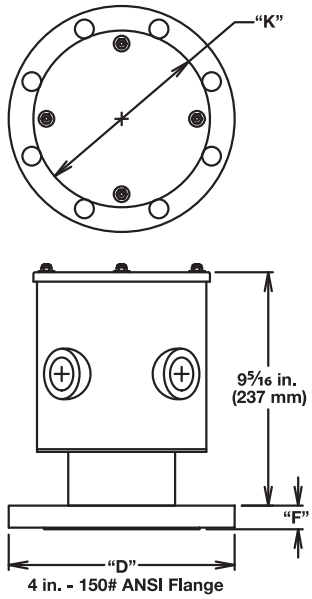
Optional Moisture/Explosion Resistant Enclosure With Thermostat



Optional General Purpose/Moisture Resistant Enclosure With Thermostat



Optional Moisture Resistant Enclosure With Thermostat



To order: Reference the *Ordering Information* on page 306

Note: Dimensions for all 5 to 14 in. flange heaters with General Purpose or Moisture Resistant Enclosure with thermostats are identical to units supplied without thermostats.

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Immersion Heaters

WATROD and FIREBAR Flange Immersion Heaters

Plate Flange Immersion Heaters

Watlow plate flange heaters are easy to install and maintain. These products are designed for heating heat transfer fluids, medium and lightweight oils and water in tanks and pressure vessels. Plate flange heaters are ideal for applications requiring low to medium wattage requirements.

Watlow plate flange heaters are made with WATROD tubular elements that are brazed or welded to the flange. Stock plate flange heaters are supplied with general purpose or moisture-resistant terminal enclosures.

Performance Capabilities

- Watt densities up to 100 W/in^2 (15.5 W/cm^2)
- Wattages up to 18 kilowatts
- Alloy 800/840 sheath temperatures up to 1600°F (870°C)
- 304 stainless steel sheath temperatures up to 1200°F (650°C)
- Steel sheath temperatures up to 750°F (400°C)

Features and Benefits

Rapid ship program
- Minimizes downtime

Direct replacement for many OEM mold temperature control units
- Provides a single source supplier for many OEM applications

ANSI compatible 2 and 2 1/2 inch flanges
- Provides appropriate heater size-to-application fit

Standard general purpose or moisture resistant terminal enclosures
- Offers easy access to wiring
- Limits accidental contact with termination
- Denies access to wiring connection in local environment

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