

# Flanged Heater Selection and Watt Density Calculation

## Selecting the proper Flanged Heater

Bees Flanged Immersion Heaters will provide long life and dependable trouble-free service provided the sheath materials, watt densities and operating temperatures are properly matched for the medium being heated.

Observe the following guidelines:

1. Match your process to the most suitable heater alloy sheath material.
2. Do not exceed the maximum allowable heater watt density (w/in<sup>2</sup>) and recommended operating temperature for the material being heated.
3. Select the proper terminal enclosure to protect the heater wiring and provide safety to personnel and equipment.
4. On large tanks, use several smaller KW rated heaters rather than one large heater for uniform heat and watt density distribution.

**Need Customer Assistance?** We take pride in our record of working with customers to develop the right heater for the job.

## Watt Density

**Element Watt Density** is the wattage dissipated per square inch of the element sheath surface and is calculated with the following formula.

$$\text{Watt Density} = \frac{\text{element wattage}}{\pi \times \text{element dia.} \times \text{element heated length}}$$

For a particular application, element watt density will govern element sheath 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. Mineral deposits when heating hard water and cleaning solutions 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.

## ***Standard Flanges Specifications***

### **Construction Characteristics**

Catalog heaters have Forged Steel or 316 Stainless Steel flanges, depending on application. Flanges are Class 150-lb Pressure-Temperature rated per ASME/ANSI Standard B16.5.

A compressed fiber ring gasket is supplied with each heater.

The following table lists the maximum operating pressure at various temperatures for these flange materials. For higher operating pressures requiring Class 300-lb and higher construction, consult Bees.

### ***Pressure-Temperature Ratings Class 150-LB***

*(Pressure in PSIG)*

<b>Flange Material</b>	<b>Temperature</b>													
	<b>°F (°C)</b>													
	-20 to 100 (-28.9 to 37.8)	200 (93.3)	300 (148.9)	400 (204.4)	500 (260.0)	600 (315.6)	650 (343.3)	700 (371.1)	750 (398.9)	800 (426.7)	850 (454.4)	900 (482.2)	950 (510.0)	1000 (537.8)
A105 Steel	285	260	230	200	170	140	125	110	95	80	—	—	—	—
316 Stainless	275	240	215	195	170	140	125	110	95	80	65	50	35	20
304 Stainless	275	235	205	180	170	140	125	110	95	80	65	50	35	20