

ELECTRIC FLANGED IMMERSION HEATERS AND CIRCULATION HEATERS

Electric heaters operate on different principles than fluid-to-fluid heat exchangers. It is important that the heater be sized such that the heat given off by the element is matched with the fluids ability to accept heat or else premature heater failure can occur. Electric heaters are selected on the basis of watt density. General guidelines for the selection of watt densities for particular applications are listed in the table below.

Design Considerations

1. Select a watt density as low as is reasonably possible for the application. Too high a watt density may cause premature heater failure and may damage the product or other related equipment. A general guide to the selection of watt density is provided below.
2. Select a long heater as opposed to a short heater with more elements and a larger flange, especially if forced circulation of the heating medium is being done.
3. A "J or K" (over-temperature protection) thermocouple attached to the sheath of one of the elements in a flanged immersion heater offers good overheat protection at reasonable cost when field connected to a suitable over-temperature controller.
4. An integral thermostat installed in a flanged immersion heater is not considered a good design. A TTW (thermocouple/thermowell) assembly with an appropriate remote mounted temperature controller is recommended. If the heating medium is stagnant the TTW assembly should be mounted immediately above the flanged immersion heater. If forced connection of the heating medium is being utilized the TTW assembly should be located as near the flanged immersion heater as possible in the outlet of the heating chamber.
5. Care should be taken in choosing the correct heater rating. Any under voltage condition reduces the heating capacity by the square of the change in voltage.



Guidelines for Watt Density Selection for Fluid Heating Using Immersion Heaters

Application	Watt Density Range
Industrial Water Heating	45-60 W/in ²
Heat Transfer Oils	20-23 W/in ²
High Temperature Air & Gas Heating	6-23 W/in ²
Lubricating Oils	12-15 W/in ²
Medium Viscosity Oils	12-15 W/in ²
#5 & #6 Fuel Oil	6-8 W/in ²
Raw Crude Oil	6-8 W/in ²
Viscous Materials	6-8 W/in ²
Asphalt	2-4 W/in ²
Extra High Temperature Air & Gas	2-4 W/in ²

