

Heaters

Optional Fittings

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& Manuals

Parr has designed standard electrical heaters for all of the reactors in our product line. Different types of heaters are used for individual reactors to best meet the operational needs, heating load, and expected operating temperatures. The standard heater type and power rating for each reactor model is listed in the reactor specification tables. The standard designs will typically be one of the following:

Clamp-on Band Heater. These are normally used for very small reactors where maximum watt densities and heat transfer are required due to the limited surface area available on the vessel.

Rigid Heating Mantles. These are quartz fabric mantles housed in aluminum shells. They are used on moderate sized reactors in designs where the heater can be moved on or off the vessel. They are light weight and easy to handle, but they are not used to support the weight of the vessel and they are generally limited to operating temperatures of 350° C or less.

Calrod-Type Sheathed Element Heaters. These are rugged heaters with Calrod-type elements held within a metal shell. They are used for medium to large reactors for operating temperatures to 350 °C. In some cases the heater shell itself forms a part of the reactor support. An advantage of Calrod heaters is that the heating elements are easily replaceable.

Ceramic Heaters. These are special purpose heaters with an electric element embedded in a shaped ceramic body which is held within an insulated metal housing. They are used for reactors designed for temperatures to 600 °C and for large multi-zone heaters.

Optional and Custom Heaters. Parr offers a variety of heater designs which can be substituted for the standard heater normally furnished with each reactor. Most of these can also be used with Parr non- stirred pressure vessels as well. The principal features and recommended applications for these heaters are described below.

Flexible Heating Mantles



Flexible Heating Mantle for 2000 mL Reactor with Windows

Flexible Heating Mantles. These can be furnished for many different applications. These are similar to the rigid type described above except they are not held in an aluminum housing. They have a flexible fabric outer case for electrical and thermal insulation. This type of mantle is particularly useful for heating vessels with irregular shapes, such as those with windows in the cylinder wall, since they are flexible and can be split and laced onto a vessel around any external protrusion. As with rigid mantles, they will produce temperatures up to 350 °C, but they are limited to watt densities of 10 watts per square inch. This type of heater can be made to cover any of the vessels offered by Parr, and they are sometimes preferred when only moderate temperatures are required. Since they are constructed of cloth, an electrical ground wire cannot be provided. **Note: These heaters are not CE approved**

Aluminum Block Heaters



600 mL Mini Aluminum Block Electric Heater with Built-in cooling.

Aluminum Block Heaters. These are available on special order for nearly all Parr reactors and pressure vessels. For the 5 gallon and 10 liter vessels they are made by casting a Calrod-type heating element into an aluminum jacket which is designed and machined to fit the outside contours of the vessel to be heated. The heater is cast in two halves which are bolted together and clamped onto the vessel. A cooling coil is cast into the block and used either for cooling with cold water or heating with steam or other liquid. For vessels of 2 gallons or less the heaters are machined from solid blocks of aluminum and heater wells are machined into the walls of the block. Cooling channels can also be machined into the walls of these heaters Aluminum block heaters have three distinct features which recommend them for many applications:

- (1.) Since the heating elements are sealed** within these housings, explosive vapors cannot reach them and the heater can be considered explosion proof, provided it is equipped with explosion proof wiring and a safety cut-out to ensure that the heater will not exceed a specified temperature limit allowed for the explosive atmosphere.
- (2.) With heat spread uniformly** throughout the aluminum block, uniform heating is applied to all surfaces of the vessel, comparable to the rapid response obtained with a steam or hot oil jacket, but without requiring costly steam generators, oil baths, circulating pumps and other accessory equipment.
- (3.) Since there is a cooling coil** in the aluminum block, this style heater can also provide external cooling for controlling an exothermic reaction without the internal clutter and cleaning problems associated with internal cooling coils. Eliminating an internal coil also permits the use of spiral, anchor or other stirrers which cannot be used with an internal coil.

Jacketed Cylinders



External Circulating Jacket
on 1000 mL Reactor

External Circulating
Jacket on 2000 mL
Reactor .

Circulation Jackets. A jacket can be welded to the outer wall of most Parr pressure vessels to provide a means for heating or cooling the vessel with a hot or cold liquids or steam. This type of heating is ideal for users who want to duplicate plant operating conditions, using a jacketed reactor comparable to jacketed equipment used in their plant. Since there are no electrical components in a jacket, and since the maximum temperature can be controlled by controlling the temperature of the heating medium, a jacketed vessel will be accepted as explosion proof and suitable for use in hazardous atmospheres. Rapid and uniform heating can be attained with a jacketed vessel since the heating medium is in direct contact with the vessel. And by controlling the temperature of the heating medium, temperature overshoots can be avoided when working with sensitive materials. Standard jackets are designed for operating pressures up to 100 psig (7 bar) within the jacket. Higher pressure jackets can be provided if required.