

# Heaters

## Standard Heaters

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.



### 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.



### 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.



### Rigid Heating Mantles

These are quartz fabric mantles housed in aluminum shells. They are used for 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.

## 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.



### Clamp-On Band Heaters

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.



### Aluminum Block Heaters

Aluminum block heaters are available as an option for vessels of two gallons or less. These heaters are machined from solid blocks of aluminum with heater wells machined into the walls

of the block. Optional cooling channels are also available.

Aluminum block heaters have distinct features that make them desirable for certain applications. When compared to a circulating jacket, they offer the convenience of direct electric heat control as well as no plumbing requirements for hot oil. The heating elements, cooling channels, and associated wiring are embedded within the machined aluminum enclosure. This allows for even heat distribution, physical isolation of the electrical connections, and rapid cooling when needed. These attributes, in combination with a surface temperature

limiting device and proper external wiring, have allowed these heaters to be used in some potentially ignitable atmospheres (Hazardous Locations). Having integral machined cooling channels, aluminum block heaters have also been used for control of some exothermic reactions when internal cooling is not available.



### Flexible Heating Mantles

These can be furnished for many different applications. These are similar to our rigid type heating mantles 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.



### 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 liquid 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 may be a good option 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. 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.