

## “MAXPAK” Square Cartridge Heaters.....versatile, high performance installation in tooling.

The Duratherm square swaged cartridge construction in combination with an appropriate mounting method will provide optimum heater life and reliability in any solid heating application. The resulting performance capabilities permit the use of 4 to 5 times the watt density of conventional square and rectangular heaters. This frequently allows reducing the size and quantity of heaters required for a given tooling application. High performance mounting methods that also permit easy heater removal for system cleaning and maintenance are described below.

### Milled Slot And Solid Cover Plate Clamping

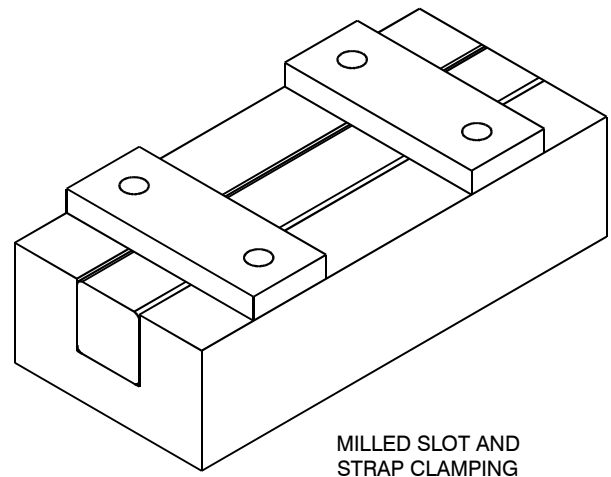
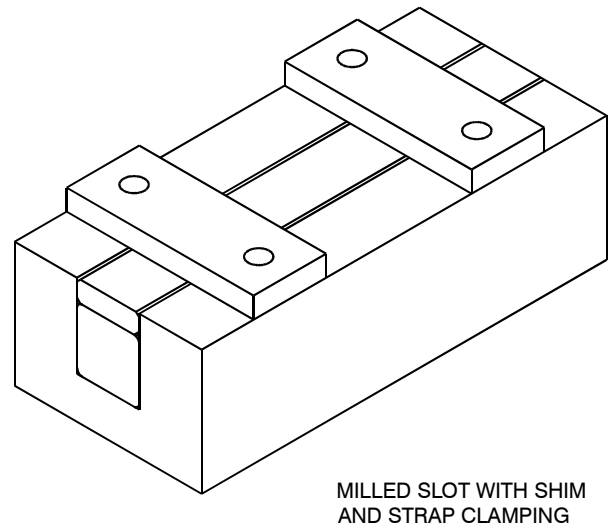
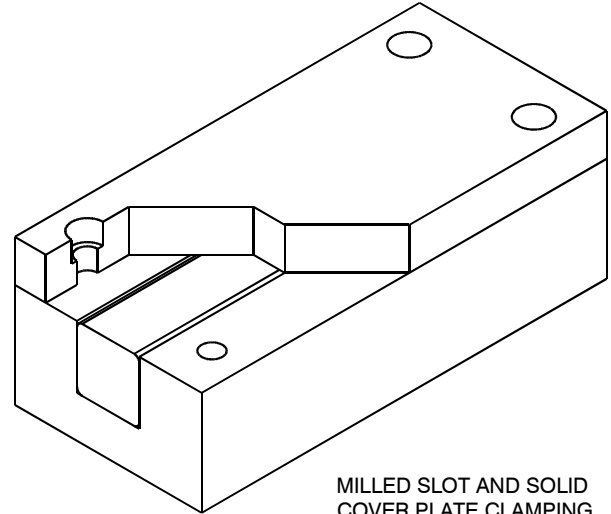
This mounting system requires milling slots in the surface of a plate or tool and clamping the heaters into the milled slot with a solid cover plate. The milled slot and cover plate clamping system provides close fits between heater and tooling and utilizes all of the heater surface to establish the highest heat transfer efficiency. This optimum heat transfer reduces the internal heater temperature which maximizes heater life and reliability. This mounting system is the ideal approach for high temperature and high watt density tooling applications.

### Milled Slot With Shim And Strap Clamping

This approach to mounting is similar to the milled slot and cover plate mounting but requires that the slots be milled deeper into the surface of the plate or tool. The heater is installed, the shim plate placed into the slot and the heater and shim assembly is clamped into position with straps, screws or other fasteners. The heaters into the milled slot with a solid cover plate. This mounting method also provides the desired close fit between heater and tooling and utilizes all of the heater surface to establish the highest heat transfer efficiency. This mounting system is suitable for all high temperature and high watt density tooling applications and is particularly useful in applications where a full mounting cover would interfere with tool or process functions.

### Milled Slot And Open Face Clamping

The open face mounting system also utilizes milled slots in the tooling surface but clamping of the heaters is accomplished with simple straps, bars or screws. This mounting method provides heat transfer to the tooling from only three faces of the cartridge leaving one face open. The close fits which can be established on three sides of the cartridge maintain a relatively high rate of heat transfer efficiency but do require that the maximum watt densities be derated by 30% from the graph of fit versus watt density. This mounting system is adequate for most medium to high tooling temperature and watt density requirements and will provide excellent heater life and reliability.



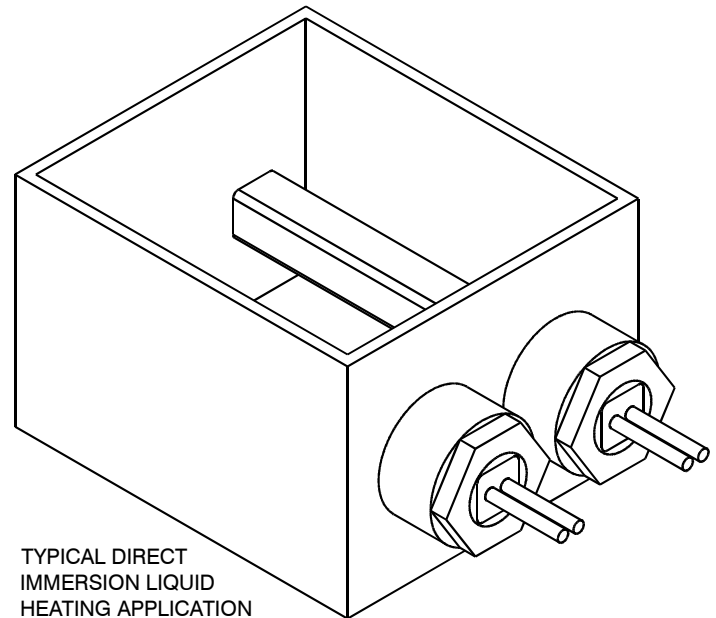
## "MAXPAK" Square Cartridge Heaters.....high performance liquid, gas and radiant heating.

The Duratherm square swaged cartridge construction is extremely versatile and can be applied to a vast range of liquid gas and radiant heating applications.

### Square Heater Installation In Liquid Heating Applications

Installation of square heaters in direct immersion liquid heating applications is accomplished using the same basic techniques applied to round cartridge heaters and tubular heaters. Common direct immersion mounting systems utilize pipe fittings, bulkhead fittings and flanges. When using any heater in liquid applications at high watt densities, it is crucial to insure that the cartridge heated area is located in an area of the container that will insure that the heater is fully immersed. Safety level sensors should always be used. The square configuration provides an additional benefit in water applications where the flat cartridge sides tend to flake off lime and mineral deposits as they expand and contract during operation.

In heating applications where the liquids accept heat very slowly and are easily degraded, a low watt density heating approach is required. In these cases the use of indirect heating methods will be necessary. The various slotted channel methods of mounting the square heaters into the surface of a container will work extremely well and in addition will allow easy removal for cleaning and maintenance.



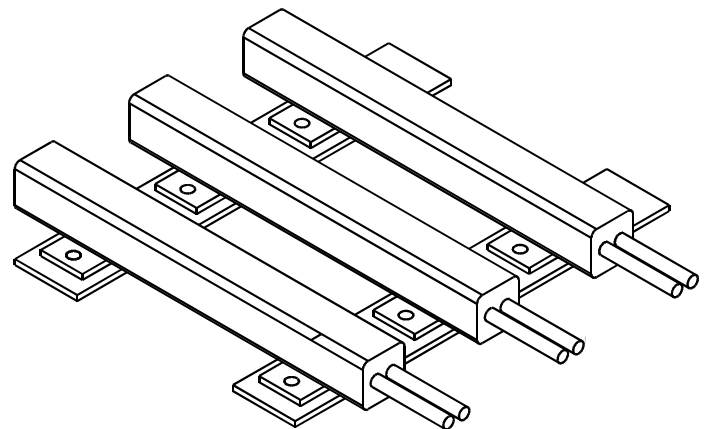
TYPICAL DIRECT IMMERSION LIQUID HEATING APPLICATION

### Square Heater Installation In Air And Gas Applications

Installation of square heaters in air and gas heating applications is typically accomplished using mounting tabs, brackets or flanges. These methods are useful in both convection and forced air applications. It is essential that the watt density limitations for the different types of gas heating applications be observed to prevent overheat. In the case of forced air or gas applications a safety flow sensor and/or an over temperature control should always be utilized.

### Square Heater Installation In Radiant Heating Applications

Installation of square heaters in radiant heating applications is similar to the mounting methods used for air heating applications. Common mounting methods include mounting tabs, brackets and flanges. The square configuration provides flat fully heated surfaces that assist in maintaining heating uniformity. While the square cartridges can be used in a wide variety of both large and small radiant heating applications it is particularly useful in small area applications. The ability to provide the required radiant energy level in a compact heater that can be operated at standard voltages is convenient in many small paint and epoxy curing processes where space is limited. The distributed wattage and sensor options are extremely valuable when the process requirements dictate uniform heating and precision control.



TYPICAL MOUNTING FOR AIR, GAS AND RADIANT HEATING APPLICATIONS