

# ULTRAMIC® Advanced Ceramic Heater Mounting Guidelines

The following information provides basic guidelines to consider when mounting ULTRAMIC® advanced ceramic heaters. Several factors can affect the performance and robustness of a mounting configuration including: application temperature, mating part material and flatness, surface finish and coefficient of thermal expansion (CTE).

## Considerations

**Coefficient of Thermal Expansion (CTE)** – The ULTRAMIC heater’s CTE is  $4.5 \times 10^{-6} / ^\circ\text{C}$ , substantially lower than the CTE offered by many common metal mating part and mounting materials. For example, aluminum’s CTE is approximately five times higher than aluminum nitride’s CTE. To minimize stress, CTE mismatch, clearance and part tolerances should be considered in design layouts.

**Flatness and Surface Finish** – For optimal heat transfer and to minimize stress, a mating part’s surface should have a flatness and surface finish better than or equal to that of the heater. The standard flatness for an ULTRAMIC heater is 0.05mm (0.002”). The standard surface finish for an ULTRAMIC heater is  $< 1.5\mu\text{m}$  (64  $\mu$  in) Ra.

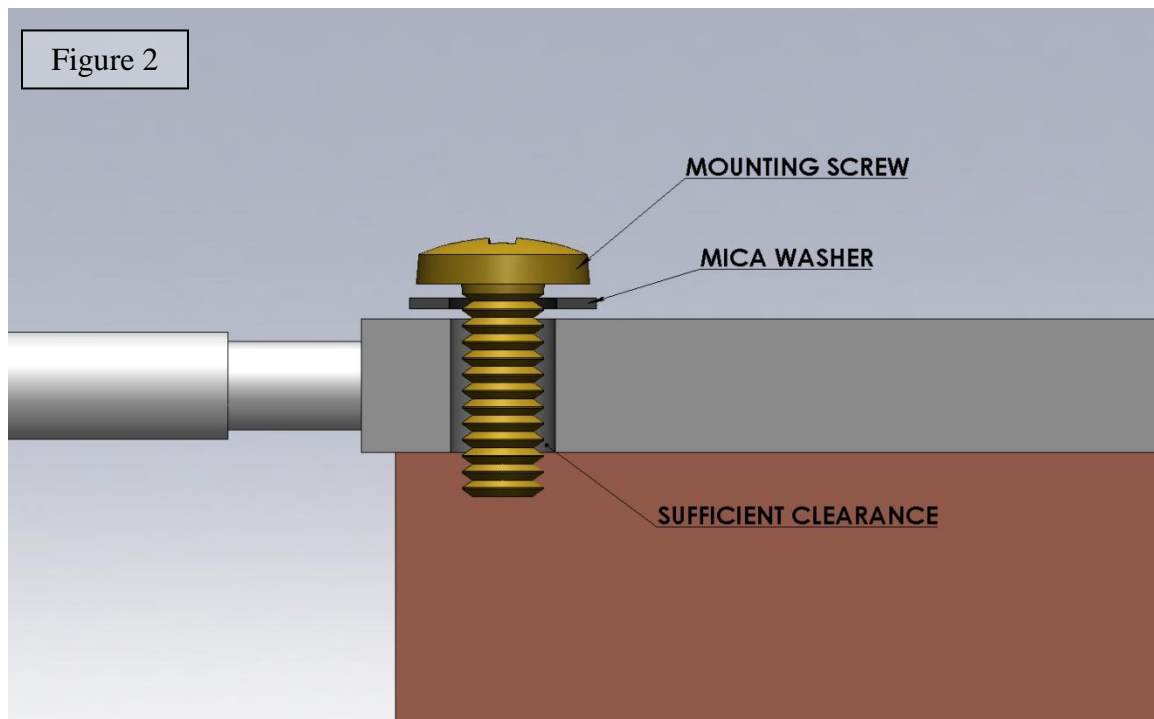
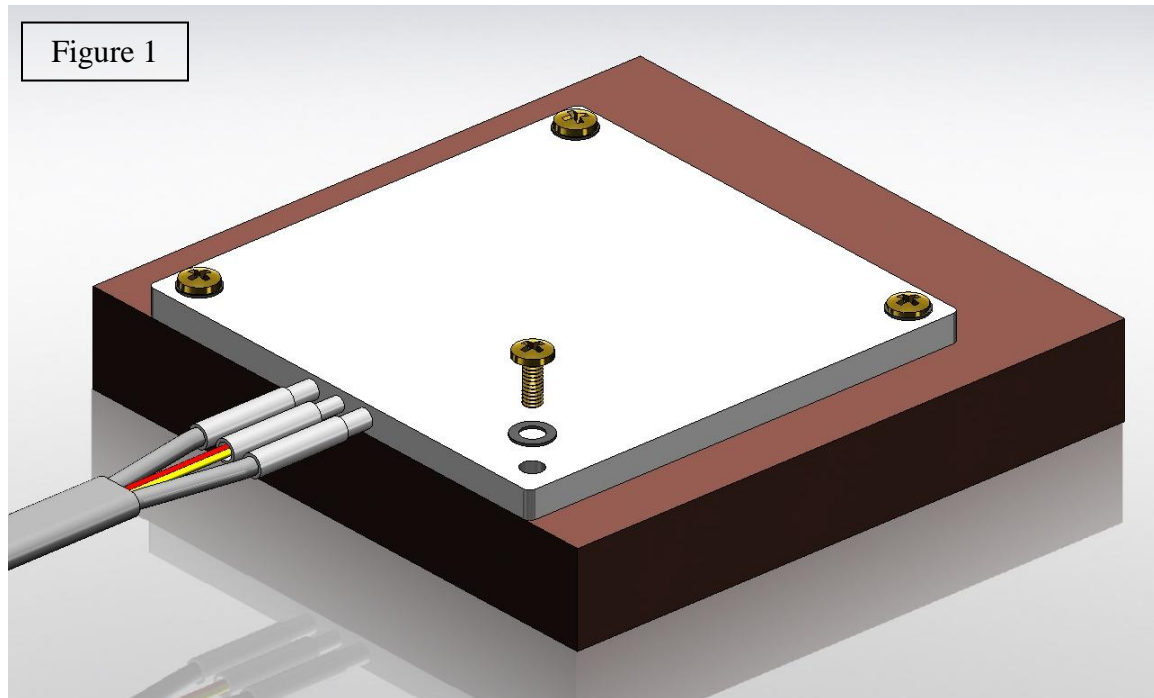
**Dielectric Strength Considerations** – The standard heater termination includes a short ceramic bead over a metal pin wire as shown in Figures 7 and 8 below. To ensure appropriate dielectric strength, consider the combination of the voltage, heater thickness, atmosphere and dielectric clearance. Suggested methods for ensuring sufficient dielectric strength include:

- Using an insulating material such as mica or epoxy between the terminals and the mating part
- Machining the part to increase dielectric spacing or designing the heaters with a perpendicular lead exit.(Figure 5)
- Extending the heater termination area beyond the mating part (as highlighted in Figures 7 and 8)

## Adhesive Bonding

A high temperature and electrically insulating epoxy adhesive, such as COTRONICS’ Duralco 4420, demonstrates good bonding strength up to 200° C (392°F). The advertised ratings of high temperature adhesives are generally considered suitable for short-term excursions, such as cycling applications. Peak and continuous use temperature, especially when adhesive is used for electrical isolation, should be factored when selecting epoxy adhesives. .

## Examples of Mounting Methods using Mechanical Fasteners



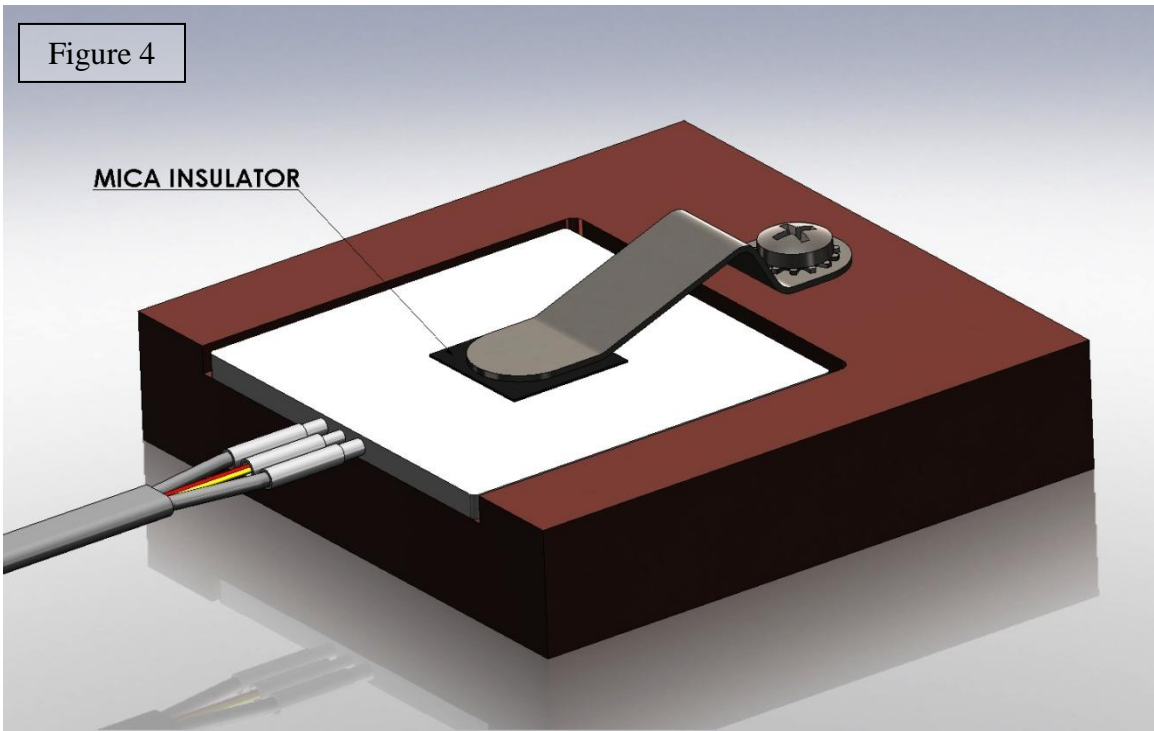
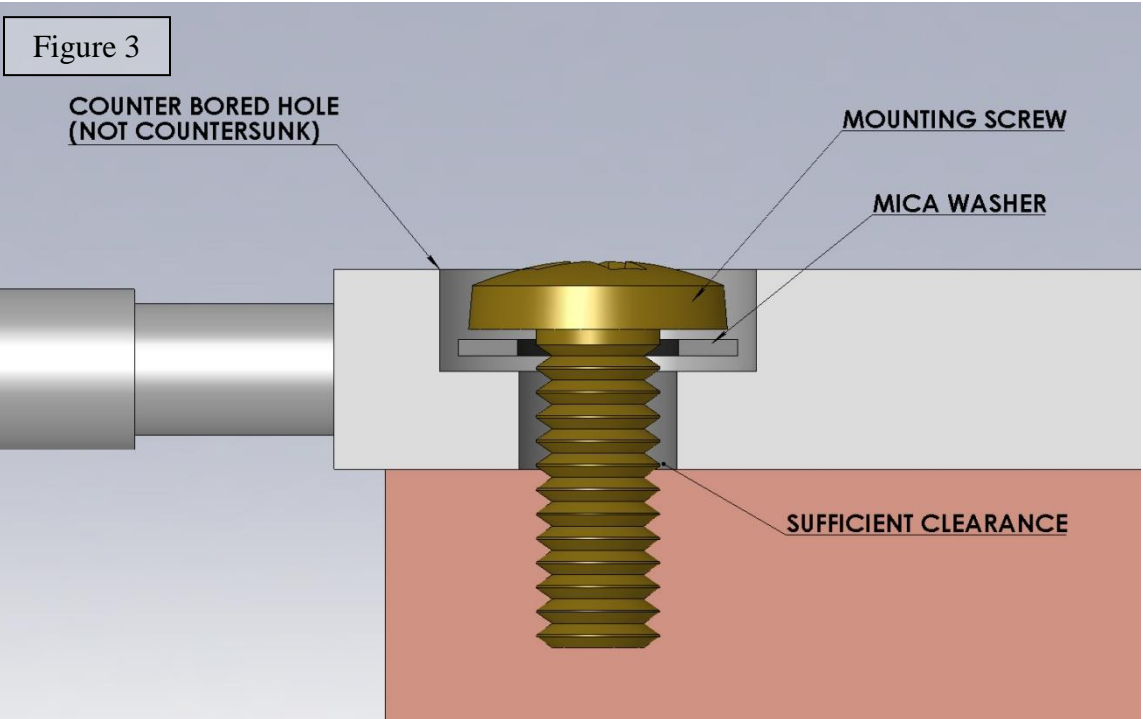


Figure 5

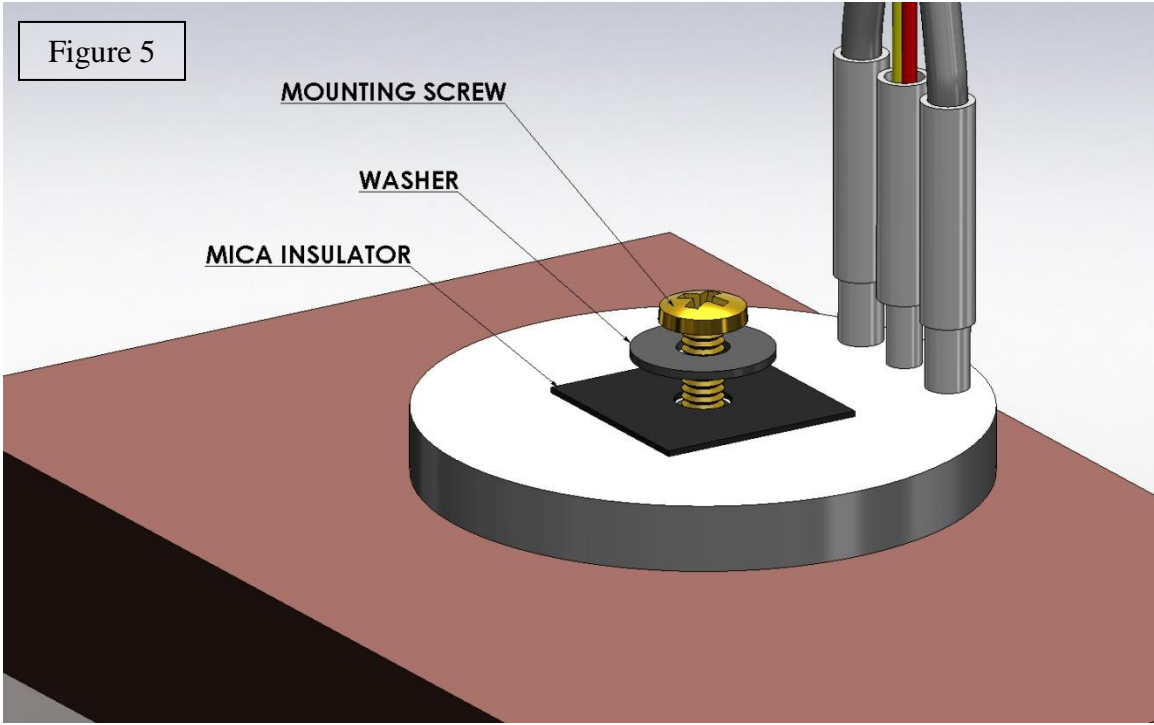


Figure 6

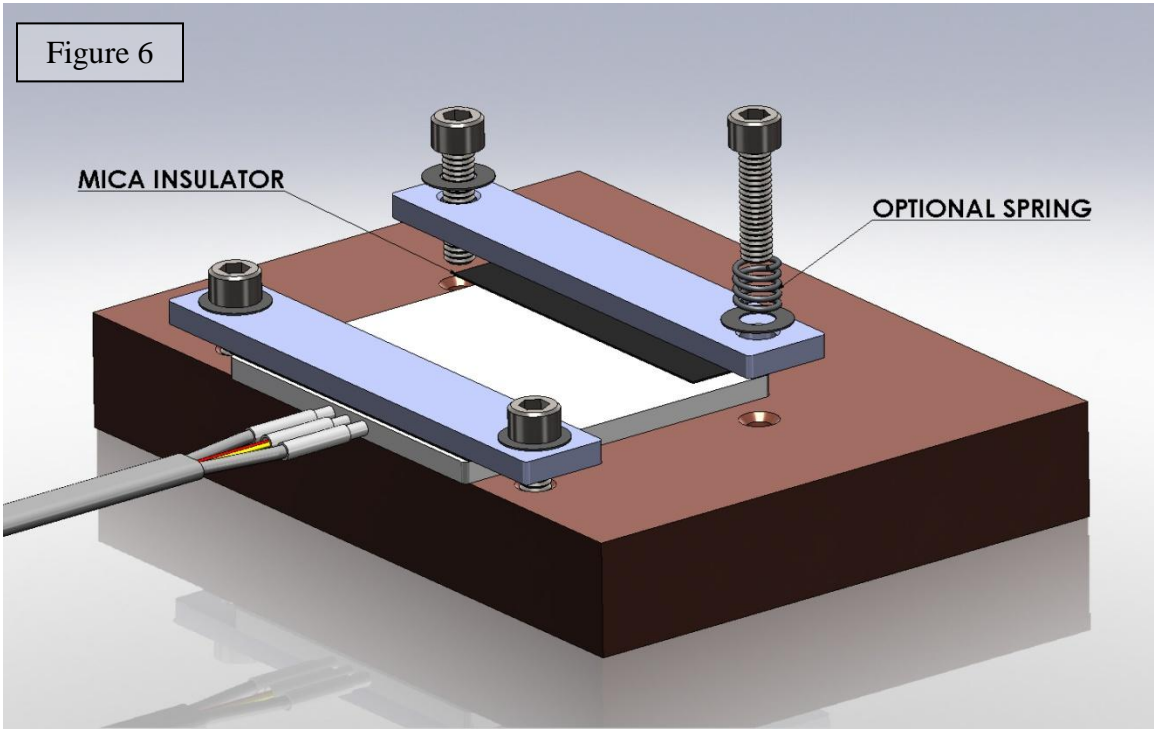


Figure 7

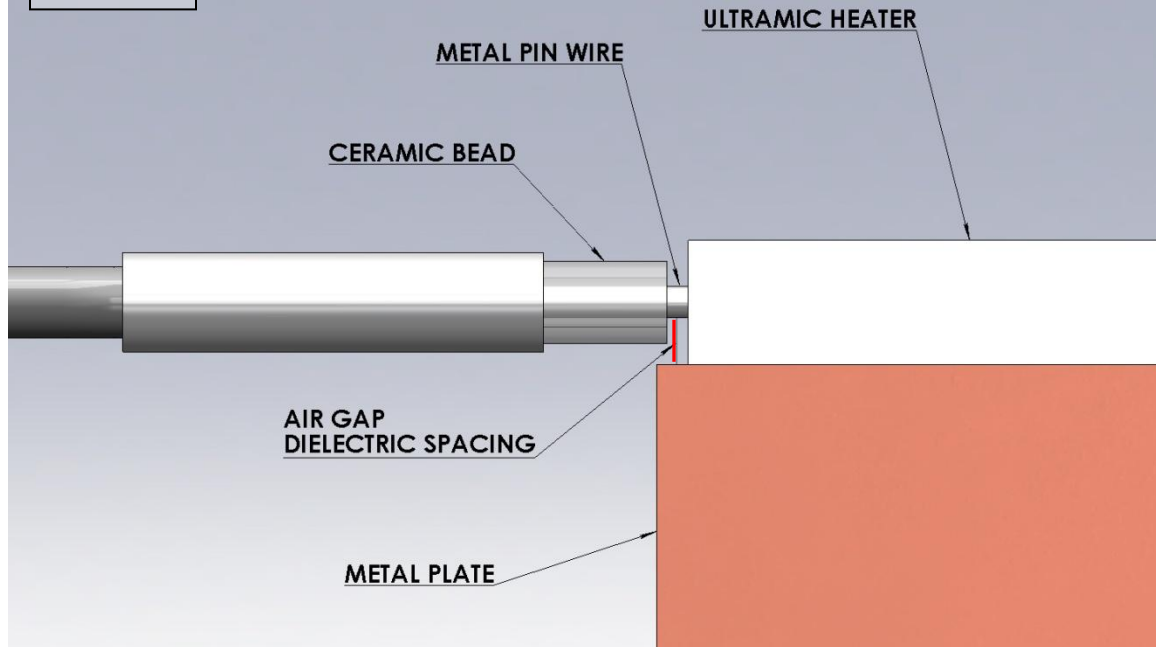


Figure 8

