CAST ALUMINUM Solutions

IFC HEATED PARTS

HEATED PARTS WITHSTAND HIGH PROCESS TEMPERATURES

Cast Aluminum Solutions IFC (Interference Fit Construction) heated parts are ideal for applications that require materials other than aluminum or exceed the temperature capabilities of cast aluminum. With FEA (Finite Element Analysis), or if time permits,by an iterative prototyping process, temperature uniformity levels equaling ±1 percent or better have been achieved.

IFC heated parts use the same design logic as cast-in heaters to achieve temperature uniformity. Some important aspects that determine temperature uniformity performance are the material used, the physical shape of the part, the heater placement within the part, and the special shaped groove that is machined into the part to accept the heater element. IFC allows the heated part to be customized to meet many specific customer needs over a wide variety of shapes and sizes.

In the past when temperature requirements have exceeded 450°C, engineers turned to milled groove or brazed heater assemblies. One of the advantages of the IFC heated part over the milled groove approach or the brazed assembly, is the improved heater life due to the intimate contact of the heater element and substrate material which reduces potentials for hot spots. To optimize temperature uniformity and to eliminate the time-consuming iterative prototyping process CAS offers FEA, which will optimize the design and allow an accurate prediction of the expected temperature uniformity for a specific part.

IFC heated parts may be customized to meet specific customer needs including a multitude of machined shapes, terminations and coating, plus special cleaning. Since CAS IFC heated parts are a finished product, no assembly is required. All joints of the IFC heated part can be welded to make it vacuum-tight for use, even in the highest vacuum process levels. CAS provides strong engineering support from concept through production, quick prototyping and wide range of design parameters.

APPLICATIONS

Semiconductor Process Equipment **Solar and Photovoltaic Equipment**
Packaging Equipment **Other Industrial Applications**

FEATURES AND BENEFITS

Wide range of shapes and sizes
Allows custom parts to meet specific customer needs

Superior thermal transfer between heater and substrate
Excellent temperature uniformity
Improved heater life

Single piece construction
Eliminates the need to assemble several components
(no brazing required)

Vacuum compatible
Very low contamination (no outgassing)

High operating temperatures
Greater than 450°C (depending on materials used and flatness requirements, consult factory for details)

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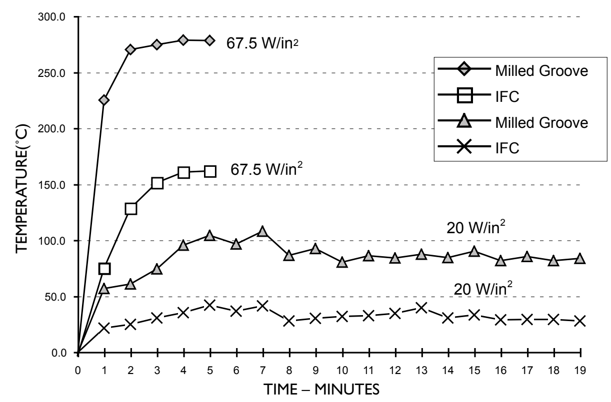
AVAILABLE MATERIALS

- Stainless steel
- Nickel
- Inconel®
- Aluminum
- Copper
- Bronze

PERFORMANCE DATA

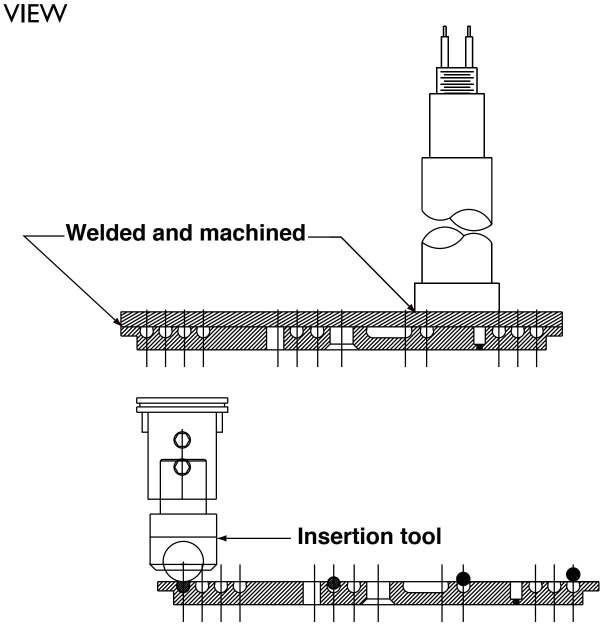
IFC heaters improve thermal performance of a heated part by optimizing thermal transfer from heater sheath to the substrate. Testing was performed on two identical platens. One with the heater installed with the IFC method and the other using a typical milled groove construction. The test demonstrated the delta that exists between the heater sheath temperature and the platen substrate temperature at different watt densities. Both heaters were powered simultaneously and allowed to ramp to the set point of 350°C at 120 volts and then again to 500°C at 220 volts. The delta value of the IFC was only 30-40°C while the delta of the milled groove part concluded with +80°C at 20 W/in2. This is even more significant at 67.5 W/in2 with the IFC delta value at a 150-160°C rating while at +270°C for the milled groove part. The graph to the right illustrates the test results.

TEMPERATURE DIFFERENCE AS A FUNCTION OF WATT DENSITY 20 W/in^2 vs 67.5 W/in^2



SECTION VIEW

IFC heaters have a proprietary-shaped groove machined into the part that accepts a tubular heater. The heater is pressed into the groove and achieves heat transfer similar to that of a cast-in design. This method increases heater life when compared to the milled groove approach. The tight contact fit of heater within the machined groove reduces sheath hot spots that could result in heater element failure.



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