Bridge Technology

JANDEL

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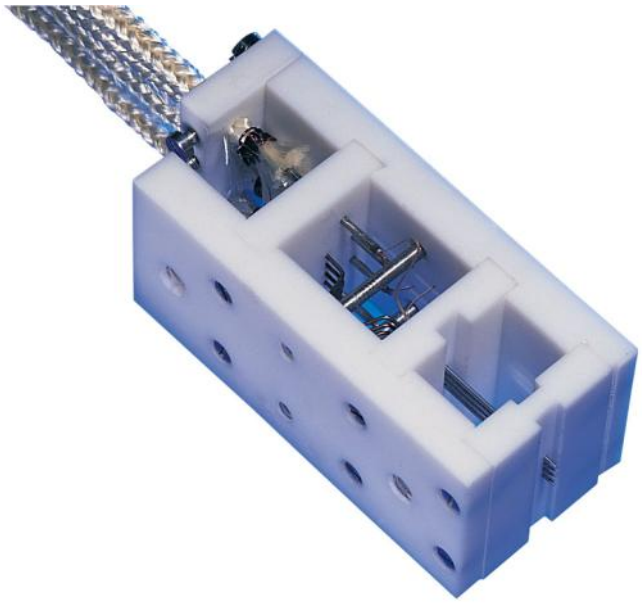
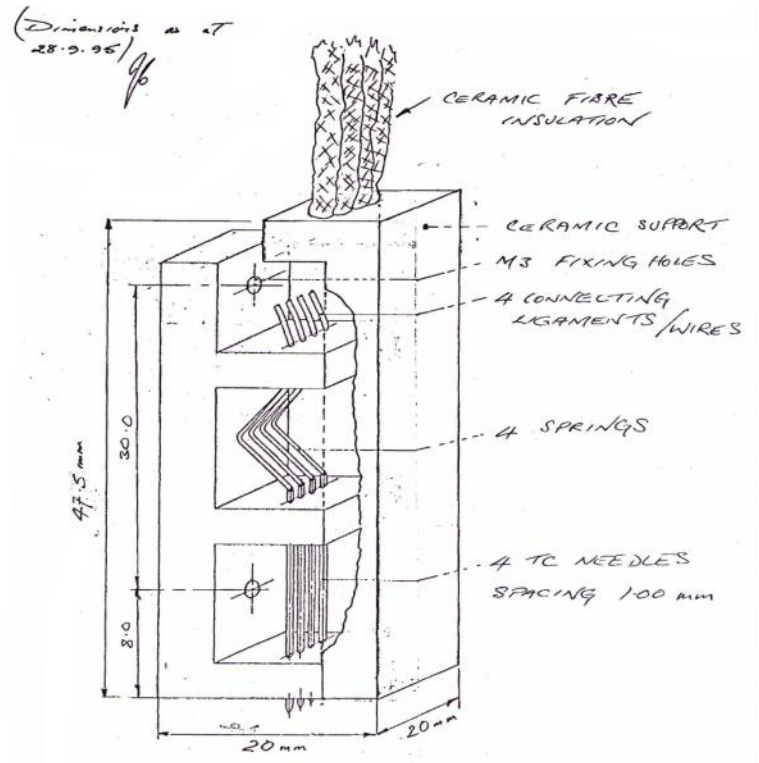
High/Low Temperature Macor/Glass Four Point Probe Head

JANDEL ENGINEERING LTD. manufactures a high/low temperature four-point probe head constructed of Macor Glass-Ceramic with ceramic fiber insulated leads. This probe is suitable for use on a hot chuck or in a high temperature chamber. Probe head dimensions are 0.8" x 0.8" x 1.9". The operating temperature range is -193 centigrade up to +300 centigrade. Tip spacing can be either 1.0mm or 1.59mm. Tip radii can be anywhere from 12.5 microns to 500 microns. Spring load is 100 grams.





Application notes regarding the Jandel Macor Probe, by John Clark, founder of Jandel Engineering:

1) Cryogenic Temperatures:
We quote 80K as the lower limit, and we know that the Macor probe can survive immersion in liquid nitrogen (77K). The probe is fitted with music wire (hardened carbon steel) springs.

Continued

2) Elevated temperatures for use in a chamber:
We quote 500K (227C) but the music wire springs should be OK up to 300C (573K). Thus these are comments on the EXPECTED limits of use IN A FURNACE where the specimen and probe head are at the extremes of temperature. The springs are the weak link - all the other materials will resist higher temperatures, but then one must consider the actual atmosphere - will it be oxidising or reducing? Perhaps it will be in Vacuum, in which case we must vent all blind holes such as screw holes to promote the most rapid outgassing. We should mention here that the ceramic fibre insulation is coated with "sizings" which may ignite or decompose when first heated. It is "Nextel 440 sleeving" from 3M's.

3) Hot Plate:
Here is a very different situation, where in general the probe head will not attain the temperature of the hot-plate, especially if the assembly is in vacuo. I do not believe that our probe can withstand 600C in a chamber, however, with a hot-plate, at 600C, it should function OK especially in a vacuum chamber.

More details:
The Macor machinable glass ceramic forms the needle guides—the accuracy of spacing is hard to assess, but it must be better than +/- 0.02 mm. The needle characteristics and loading can be as good as a standard probe when it is built, but we don't know the effects of temperature cycling.

I measured one that we have here and the biggest spacing error was 16 microns in a 1.00 mm nominal spacing. Of course one can go for a larger spacing - say 1.59 mm which could improve the % accuracy for spacing. We can't bore such small holes in the ceramic, so the result is dependent on the accuracy of drilling only. The probe tip spacing that is available is either 1.00 mm or 1.59 mm.

In the drawings, the holes used for mounting are noted as 'B' (fixing holes) and are M3 in the positions shown.