SUB MINIATURE KIEL PROBE FOR TOTAL PRESSURE MEASUREMENTS IN THREE DIMENSIONAL BOUNDARY LAYERS

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Abstract

The design, fabrication and calibration details of a sub miniature Kiel probe for three-dimensional boundary layer measurements are presented in this paper. The probe has a nominal measurement dimension of 0.3 mm and a shroud size of 0.7 mm in the boundary layer direction thus minimizing spatial and flow gradient errors. The probe is calibrated in a calibration tunnel at a velocity of 50 m/s in the yaw and pitch angle ranges of $\pm 45°$ and $\pm 25°$ at 5° interval respectively. The non-dimensional pressure measured by the probe is plotted as contours. The non-dimensional pressure has a value within $\pm$ 1% of total pressure in the yaw and pitch angle ranges of $\pm 40°$ and $\pm 15°$ respectively. The probe is used to measure total pressure at the exit of a centrifugal impeller at four volume flows. The total pressure measured is found to follow expected trends.

Keywords: Sub Miniature Kiel Probe, Total Pressure, Three Dimensional Boundary Layer