

Baseline measurements for testing of improved triple-sensor hot-wire anemometer probe in a momentum conserving turbulent round jet

F. G. Ergin^{1*}, C. M. Velte²

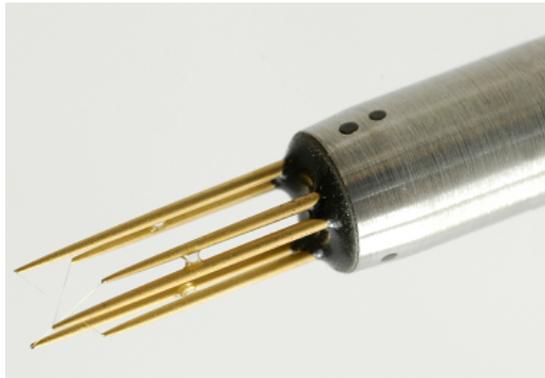
1: Product Management Dept., Dantec Dynamics, Denmark

2: Dept. of Mechanical Engineering, Technical University of Denmark, Denmark

* Corresponding author: gokhan.ergin@dantecdynamics.com

Abstract

Three-component velocity measurements have been performed in a momentum conserving turbulent round jet using a constant-temperature anemometer (CTA) system and a new triple-sensor probe featuring straight prongs. The objective is to test the reliability of the new probe in a classical canonical flow that lends itself well to testing physical quantities such as momentum flux conservation as well as comparing directly to baseline data. The probe is positioned in excess of 2500 positions in each measurement plane using a computer controlled traversing mechanism. A conventional two-step calibration is performed where the directional calibration is conducted following a velocity calibration. The calculated pitch and yaw factors are compared to expected values for similar probes reported in the literature. An error analysis is performed using the pitch / yaw - roll mechanism in order to identify the acceptance angle for the probe for the data reduction scheme. The measurements capture the main well-known characteristics of the round jet such as the jet centerline, jet half width, and virtual origin. Power spectra were measured at 30 jet exit diameters downstream of the jet exit on the jet centerline, quarter-width, half-width, three-quarters width and at full jet width, demonstrating the variations in the dynamic statistical moments.



New triple-sensor probe with straight prongs

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