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Further development of a wall-shear-stress sensor and validation in laminar and turbulent flows[1] LAURENT MYDLARSKI, PIERRE-ALAIN GUBIAN, JAMES MEDVESCEK, CRISTIAN TOMAZELA PRADO, B. RABI BALIGA, Department of Mechanical Engineering, McGill University — The present work involves the further development of a wall-shear-stress sensor, and its subsequent validation in both laminar and turbulent flows. Inspired by the works of Spazzini *et al.*, *Meas. Sci. Technol.*, 1999 and Sturzebecher *et al.*, *Exp. Fluids*, 2001, the sensor consists of a tungsten hot-wire flush-mounted over a shallow rectangular slot, which serves to reduce heat loss to the substrate and therefore improve the frequency response of the sensor – a problem that frequently plagues hot-film wall-shear-stress sensors in many applications in air. Different aspects of the design, construction, operation and validation of the sensor will be presented. Particular attention will be paid to the performance of the sensor in fully developed turbulent channel flow, where measurements of statistical moments, probability density functions, and spectra of the wall-shear stress will be considered for turbulent Reynolds numbers (based on the friction velocity and half-height, Re_τ) in the range $200 \leq Re_\tau \leq 900$. These measures will be compared with previous (experimental and numerical) work studying the wall-shear stress. The evolution of the statistics with Re_τ will also be discussed.

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