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Drift compensation in hot-wire anemometry[1] ALAIS HEWES, JAMES I MEDVESCEK, LAURENT MYDLARSKI, B RABI BALIGA, McGill University — The drift of hot-wire (or other thermal anemometry-based) sensors continues to be a concern for those using constant temperature anemometers (CTAs). Although most previous work on this subject focused on compensating for changes in fluid temperature, the current work, based on that of Hewes et al. (Meas. Sci. Tech. 2020), focuses on compensating for changes in the wire's cold resistance, which may occur as a hot-wire ages, for example. We first show that this drift may be significant, especially for certain combinations of hot-wire sensors and CTAs. We then demonstrate that this drift can be compensated, using a modified form of the relationship between the output voltage of the CTA and the fluid velocity, which takes into account the sensor resistance and other resistances involved in the Wheatstone bridge (top resistance, operating resistance, cable and probe resistances). Moreover, we show that this method can compensate for drift caused by small changes in fluid temperature, even when the temperature is not known, which is of notable practicality. Application of this method is expected to reduce the frequency of calibrations needed to maintain satisfactory degrees of accuracy and repeatability in experimental measurements of fluid flows made using CTAs.

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