

## **Fabrication of a dual sensor hot-wire anemometer to measure wind direction**

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Hot-wire anemometers are wind measuring instruments that work on the principle of convectional heat transfer that takes place from an electrically heated hot-wire. They are well popular for the reliable, error-less wind measurements. In addition, their less maintenance cost, lack of mechanical parts and taking comparably less space are some advantages over the other wind measuring instruments. Single sensor hot-wire anemometer allows only for measuring wind velocity. But, dual-sensor hot-wires anemometer allows two-dimensional airflow measurements, which will yield wind velocity and wind direction. A dual-sensor hot-wire probe (X-probe) was constructed using Nichrome (NiCr) as hot-wire material. Dual sensors were fixed to the prongs of the hot-wire anemometer, being perpendicular to each other. X-probe calibration was conducted for velocity fixed winds obtained from a wind generator. It was performed for different orientations of X-probe, facing the wind flow generated by the wind generator. Voltages across two hot-wire sensors were analyzed for different orientations of the two hot-wires of the sensor. Each pair of voltages exhibited a unique variation with different orientations of the two hot-wires sensors to different wind flows. Each set of voltages was plotted and fitted to King's law formula which contains three parameters. Parameter values were used to create a calibration curve. X-probe was tested inside the laboratory using the wind generator and it produces a very accurate value of wind direction and velocity. The look-up table method was used to extract the wind direction and wind velocity. Wind measurements in the outside environment were tested using the X-probe and it showed a fluctuation of the wind velocity and direction.

**Key words:** *Dual-sensor hot-wire anemometer, X-probe, wind direction*

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