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A spinner anemometer can be used to measure the yaw misalignment and flow inclination experienced by a wind turbine. Previous calibration methods used to calibrate a spinner anemometer for flow angle measurements were based on measurements of a spinner anemometer with default settings (arbitrary values, generally k1,d = 1 and k2,d = 1) and a reference yaw misalignment signal measured with a yaw position sensor. The yaw position sensor is normally present in wind turbines for control purposes; however, such a signal is not always available for a spinner anemometer calibration. Therefore, an additional yaw position sensor was installed prior to the spinner anemometer calibration. An innovative method to calibrate the spinner anemometer without a yaw positions sensor was then developed. It was noted that a non-calibrated spinner anemometer that overestimates (underestimates) the inflow angle will also overestimate (underestimate) the wind speed when there is a yaw misalignment. The new method leverages the non-linearity of the spinner anemometer algorithm to find the calibration factor Fα by an optimization process that minimizes the dependency of the wind speed on the yaw misalignment. The new calibration method was found to be rather robust, with Fα values within ±2.7% of the mean value for four successive tests at the same rotor position.

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