Where to Place an Anemometer for Small Wind Deployments

Measuring wind speed accurately is critical to determine the true performance of your wind turbine. The placement of the anemometer is important so that it reflects the true wind speed seen by the wind turbine. You want the airflow at the anemometer to be as free of disturbances as possible.

The most common anemometers are cup anemometers

They are designed to be very free spinning in order for rotate at a rate very close to the linear flow rate of the wind. These anemometers utilize a sensor like those on a bicycle to measure the RPM of the cups. This RPM is then translated into wind speed expressed in MPH, km/hour, or knots. Because the device needs time to translate the RPM into wind speed, there is a delay of about 1 second on professional anemometers and up to 6 seconds on lower cost anemometers. Keep in mind the anemometer will react faster to changes in the wind speed than will a wind turbine. If a gust is very strong but short-lived, the turbine may not react at all.

Anemometers are available in different accuracy grades

The best professional anemometers are designed, tested, and calibrated to be accurate to 1%. More common anemometers are accurate to 5%, and the lowest cost ones are only accurate to 10%. Most serious wind turbine owners install an anemometer with at least an accuracy of 5%. A common unit for the serious hobbyist is the Inspeed Vortex anemometer. It has a 1-second update rate and is accurate to 4% up to 50 mph. It costs under $100.
Wind turbine testing centers place the anemometer at the exact height of the turbine rotor hub and even position them to rotate as the turbine rotates on its yaw axis. The American Wind Energy Association (AWEA) standard calls for the position to be 1.5 to 6 rotor diameters upwind of the wind turbine rotor's centerline. This is not necessary for a typical user installation. A fixed position below the rotor, but outside of the disturbances of the rotor and tower is considered acceptable for a good installation. Here are the guidelines as defined by IEC Standard 61400-12-1:

**Vertical placement**

Boom at least 1 rotor diameter below the hub centerline. This is to avoid blade tip wash disturbances. Placing it 1.5 rotor diameters below is even better on turbines with rotor diameters over 3 meters.

**Horizontal placement**

At least 10 tower mast diameters out away from the tower centerline. This is to avoid disturbances from the tower itself as seen in the color diagram above.

**Vertical placement on boom**

At least 15 boom diameters above or below the boom centerline. This is to avoid disturbances caused by the boom.
Tests have shown that placing the anemometer in the position as indicated will result in wind speed readings that are between 2-6% of the actual wind speed at the hub centerline. This is pretty good and provides you with an accurate and valuable assessment of actual wind speeds experienced at your turbine.

**Conclusion**

Gathering data and understanding the wind conditions in your area will help you maximize the usefulness and enjoyment you get from your small wind installation.

The more you know, the more there is to share! Share your installation photos and experiences in the [Community Forum](http://www.windynation.com) [1]!
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