

## Climatic Wind Tunnel

As the development of wind energy is advancing into increasingly remote areas with harsh weather conditions, an optimization of measurement systems for these sites is essential. In WindGuard's climatic and icing wind tunnel we research the formation of icing on anemometers and sensors and test the instrument's heating systems.

Three good reasons to test your anemometer in our climatic wind tunnel:

- > Determine the procession of icing of anemometers and measuring sensors
- > Learn how icing effects the quality of your measurement
- > Test and optimize the heating system of your wind sensor

The climatic and icing wind tunnel is unique in Europe. It was built in 2009 and is Deutsche WindGuard's third wind tunnel. Based on tests in our climatic and icing wind tunnel, we determine the procession of icing of anemometers and measuring instruments and the effects icing has on the quality of the measurements themselves. Analyses are conducted to evaluate or optimise heating systems offered by current manufacturers.



Deutsche WindGuard's new wind tunnel is perfectly suited for these enterprises. The technical details:

- Wind speed range from 0,1 to 25 m/s
- Turbulence intensity less than 0,5%
- Temperatures between -22°C and +40°C (-7.6°F and 104°F)

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## Wind Tunnel Center Unique in Europe

### Calibration Wind Tunnel 1

Used for the calibration of anemometers as well as flow and wind direction sensors



### Calibration Wind Tunnel 2

Used by the governmental PTB to define the unit 'm/s', representing the national standard



### Acoustically-Optimised Wind Tunnel

Aerodynamic research and development at the highest level



### Climatic Wind Tunnel

Unique in Europe: Measurements at temperatures between -22°C and +40°C



## Anemometer and Wind Vane Calibration

Minimal errors in wind speed measurement lead to a significant error in all calculations based on the measurement. Anemometer calibration is the tracing back of wind measurement sensors (anemometer) to a national standard in a wind tunnel. It is used to minimize errors in wind measurements.

### Three good reasons to calibrate your anemometers in our wind tunnel:

- > **Calibration decreases uncertainties to a minimum.**
- > **It is affordable, does not take long and pays back in cash revenues!**
- > **Our wind tunnel represents the national standard for the unit m/s**

Deutsche WindGuard offers anemometer and wind vane calibration and classification services using two out of four company-owned wind tunnels.

Both calibration wind tunnels are approved by the PTB (Physikalisch-Technische Bundesanstalt) and are accepted by MEASNET (European association of measurement institutes in the field of wind energy), qualifying them for DKD (German Accreditation Body) calibrations. One of the calibration wind tunnels is actually used by the PTB to define the unit "m/s" in the field of flow measurements: a closer connection to national standards is not possible. Hence, we achieve wind speed measurement accuracies in excess of 0.05 m/s ( $k=2$ ), resulting in a clear financial advantage of your future wind farm project.

Moreover, Deutsche WindGuard's unique facilities, such as a turbulence generator, a climatic chamber and an open field testing facility, allow for the classification of anemometers. We guarantee results of unparalleled quality on a continuous basis in all areas of measurement techniques.



#### Accreditation:

- DIN EN ISO IEC 17025
- DKD (Deutscher Kalibrierdienst / German calibration office)
- PTB (Physikalisch Technische Bundesanstalt)
- MEASNET certification

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## Large Scale Wind Tunnel

In a large, acoustically optimized wind tunnel full scale models of wind turbines and blade profiles can be measured. Test campaigns from areas other than wind energy are also very welcome!

### Three good reasons to use our large scale wind tunnel:

- > **Accurately determine aerodynamic loads to assure correct design**
- > **Acquire several month's worth of data in minutes, power curves in less than a day!**
- > **Test overload / -speeding conditions in a controlled environment, design accordingly**

The large, acoustically optimized wind tunnel is the fourth and largest in the wind tunnel center of Deutsche WindGuard. Its design is specifically suited for acoustic and aerodynamic research and allows testing of large models up to full-sized blade segments.

The main features of this wind tunnel are:

- Two test sections (3/4 open, 38 m/s and closed, 80 m/s) allow a broad range of testing options
- Large testing area cross-section
- High wind speeds with low turbulence
- Low noise emissions
- Latest drive-and-control technology
- Highly flexible scheduling.

The acoustically optimized wind tunnel is specifically designed to follow requirements of wind energy utilization. Full scale components or models of wind turbines can be optimized aerodynamically as well as acoustically at high Reynolds numbers. The size and length of the test section allows for power curve measurements of small wind turbines as well as terrain simulations. Our wind tunnel center also offers ideal conditions for your individual research and development projects.



Deutsche WindGuard developed a measurement system that determines the forces and torques of aerodynamic profiles and a special measurement technique to acoustically optimize components.

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