

Sensors & Applications

Wind Turbines



More Precision



Sensors for wind turbines

Condition monitoring of wind turbines increases their performance and the service life of components and machines. Modern sensor technologies can help to prevent repairs and to optimize maintenance cycles, not only during the construction and manufacturing of wind turbine components, but also in test benches and in the wind turbine itself.

Furthermore, sensors can increase operational safety and minimize failure rates. In particular, sensors from Micro-Epsilon have proven invaluable in various applications with regards to safe operation, especially when it comes to supporting predictive maintenance regimes.

Micro-Epsilon offers a wide range of modern sensors. Irrespective of whether your application is offshore or onshore - there are numerous measuring techniques and sensor models for your specific environment.

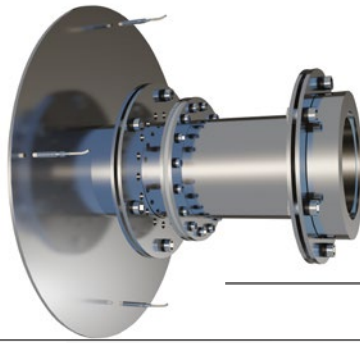


About us

Micro-Epsilon is an international company group based in Germany and a leading supplier of high precision measurement technology. The modern product portfolio includes sensors for displacement and distance measurement, IR temperature measurement, color recognition, as well as systems for dimensional measurement and defect inspection.

Gearbox temperature

The gearbox temperature is measured during operation. Heating up of gearbox components may indicate a potential problem with a component. Subsequent remedial action can be started or maintenance planned.

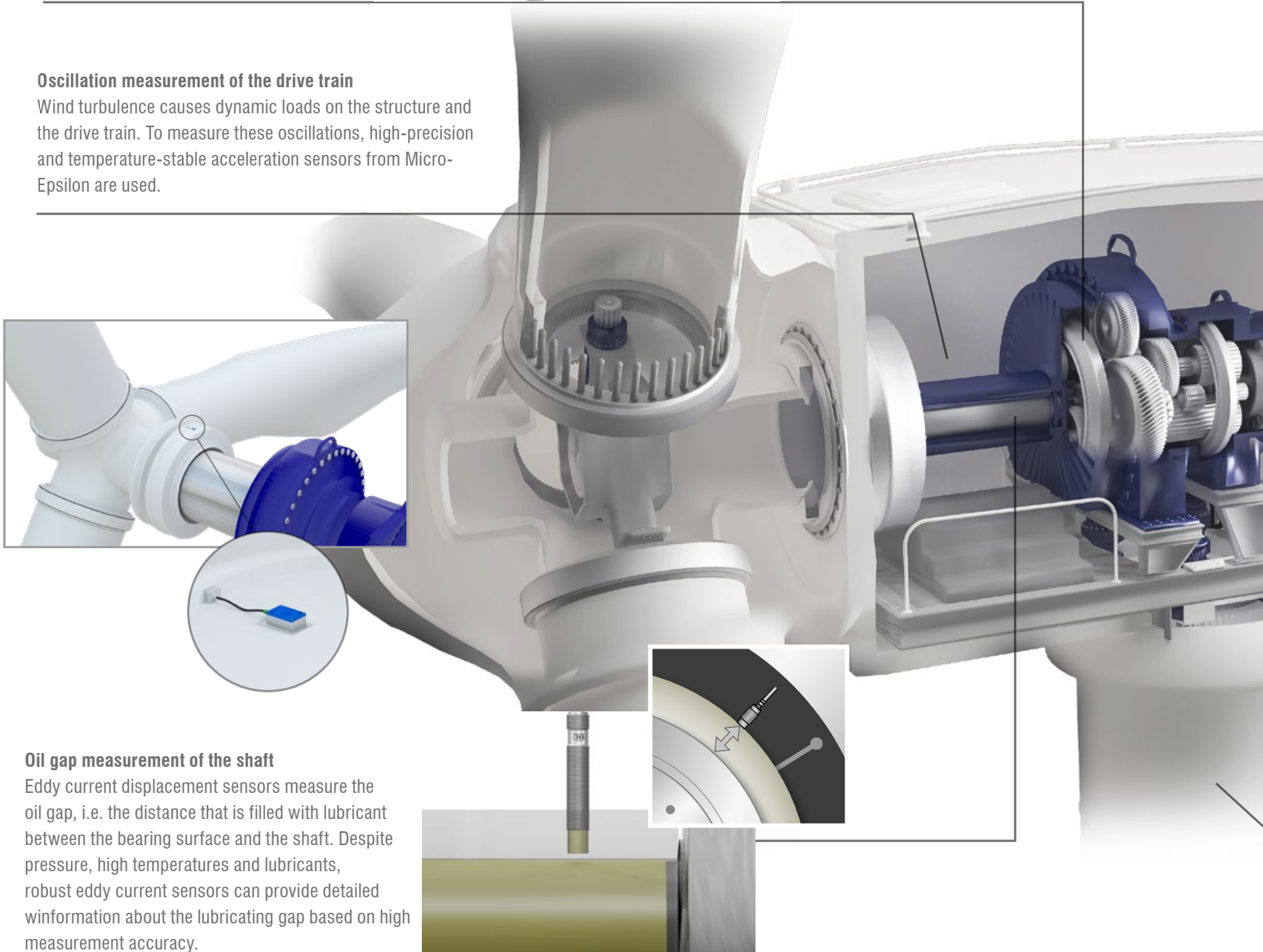


Displacement measurement of the clutch disc

Eddy current displacement sensors measure the axial, radial or tangential deflection of the clutch disc. These robust sensors are designed for harsh ambient conditions and, due to their extremely compact size, can also be integrated in restricted installation spaces.

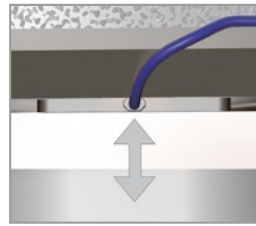
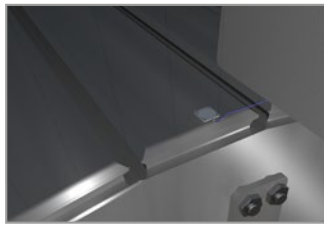
Oscillation measurement of the drive train

Wind turbulence causes dynamic loads on the structure and the drive train. To measure these oscillations, high-precision and temperature-stable acceleration sensors from Micro-Epsilon are used.



Oil gap measurement of the shaft

Eddy current displacement sensors measure the oil gap, i.e. the distance that is filled with lubricant between the bearing surface and the shaft. Despite pressure, high temperatures and lubricants, robust eddy current sensors can provide detailed information about the lubricating gap based on high measurement accuracy.

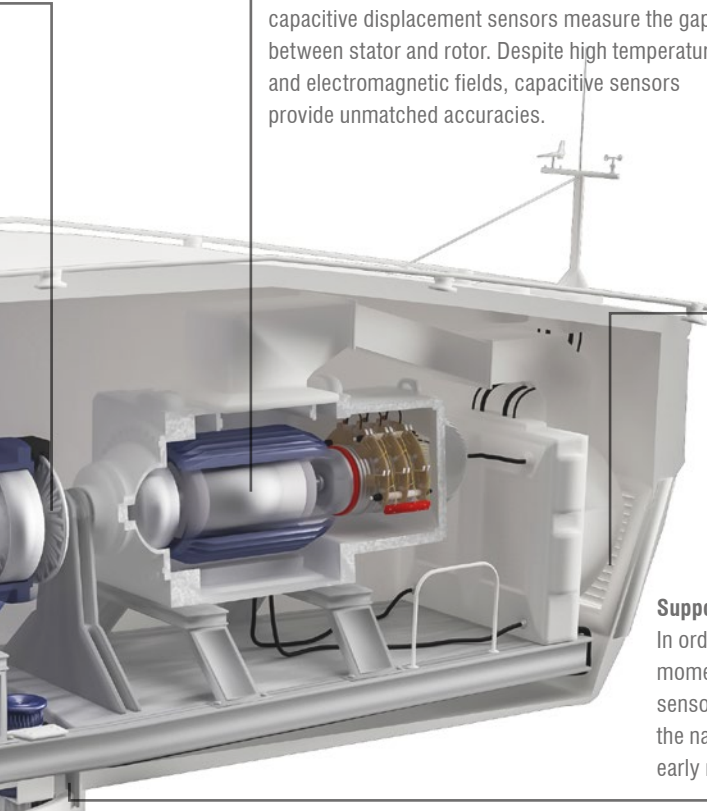


Rotor gap measurement

In order to monitor rotor behavior in the generator, capacitive displacement sensors measure the gap between stator and rotor. Despite high temperatures and electromagnetic fields, capacitive sensors provide unmatched accuracies.

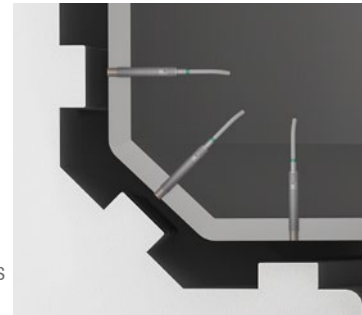
Air flap opening

In order to control air supply, the air flaps automatically open and close depending on the temperature. Draw-wire displacement sensors monitor the position of the open air flap.



Supporting moments of the nacelle

In order to monitor the supporting moments, eddy current displacement sensors measure the distance between the nacelle and the tower, which enables early recognition of any oscillations.



Monitoring the tower oscillation

Wind turbines are exposed to high stress caused by swaying. In order to avoid damage and downtimes, these tower oscillations are monitored. Inclination and acceleration sensors from Micro-Epsilon detect the tower oscillation with highest precision even with strongly fluctuating temperatures.





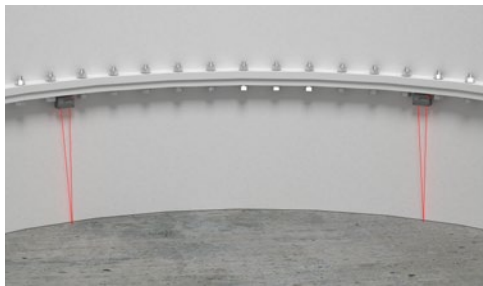
Rotor stress tests in the test bench

Test rigs have been developed for load tests on wind turbine rotor blades and simulate the real loads caused by high winds and weather. The tip of the rotor blade can be distorted by up to 10 m due to mechanical loads.

Draw-wire sensors are used on the test rig for measuring the distortion. Two sensors per traction point measure the deflection and torsion of the rotor blade. The draw-wire sensors operate with measuring ranges between 3 m and 10 m. The digital signal provided is used for further simulations.

Quality control of rotor blades

Wind turbines rotor blades are semi-shell constructions made of glass-fiber reinforced plastic (GFRP) and other lightweight materials. Following completion, different sensors inspect the rotor blades for defects, damaged areas and inclusions.



Foundation measurements

Laser triangulation sensors measure the distance between the tower and the foundation in order to detect the tower movement. High measuring rates enable the sensors to detect any changes reliably. Depending on the number of sensors installed, detailed evaluations about the vibration behavior can be made.





eddyNCDT 3001/3005

Inductive sensors (eddy current) for displacement, distance & position

Non-contact displacement and distance detection with measuring ranges from 1 to 6 mm

High frequency response for dynamic measurements

Temperature resistance for harsh ambient conditions

Pressure-resistant versions up to 2000 bar, resistant to oil, dust & dirt



inertialSENSOR

Precise inclination and acceleration sensors

Highest accuracy and resolution for precise measurements

Extremely stable measurement signal even with strongly fluctuating temperatures

High EMC resistance (robust aluminum die-cast housing)

Customer-specific designs



capaNCDT 6110

Capacitive displacement sensors for industrial measurement tasks

Non-contact displacement and distance detection with measuring ranges from 0.05 to 10 mm

Submicron accuracy

High frequency response for dynamic measurements

Ideal for long-term stable measurements



wireSENSOR

Robust draw-wire displacement sensors

Displacement and position measurements with measuring ranges up to 30 m

Analog and digital outputs

Flexible measuring wire, ideal for difficult-to-access positions

Compact design for integration into confined spaces



thermoMETER

High performance industry pyrometers for industrial series applications

Temperature ranges from -50 °C to 900 °C

First-class signal stability for highest reliability

Best temperature stability even with strongly fluctuating ambient temperatures

Individual sensor configuration via sensorTOOL Software



optoNCDT 1420

Compact laser triangulation displacement sensor for high speed, precision measurements

Non-contact displacement and distance measurements from 10 mm to 500 mm

High accuracy

High measuring rate for dynamic measurements

Compact design and easy mounting

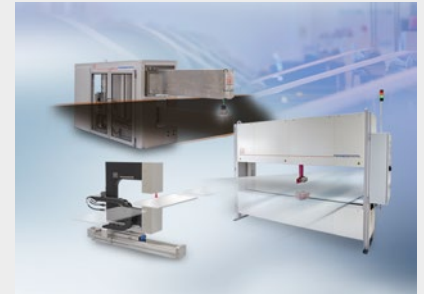
Sensors and Systems from Micro-Epsilon



Sensors and systems for displacement, distance and position



Sensors and measurement devices for non-contact temperature measurement



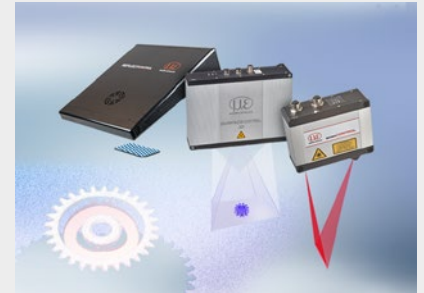
Measuring and inspection systems for metal strips, plastics and rubber



Optical micrometers and fiber optics, measuring and test amplifiers



Color recognition sensors, LED analyzers and inline color spectrometers



3D measurement technology for dimensional testing and surface inspection

More Precision

Whether it is for quality assurance, predictive maintenance, process and machine monitoring, automation or R&D – sensors from Micro-Epsilon make a vital contribution to the improvement of products and processes. High precision sensors and measuring systems solve measurement tasks in all core industries – from machine building to automated production lines and integrated OEM solutions.



www.micro-epsilon.com