

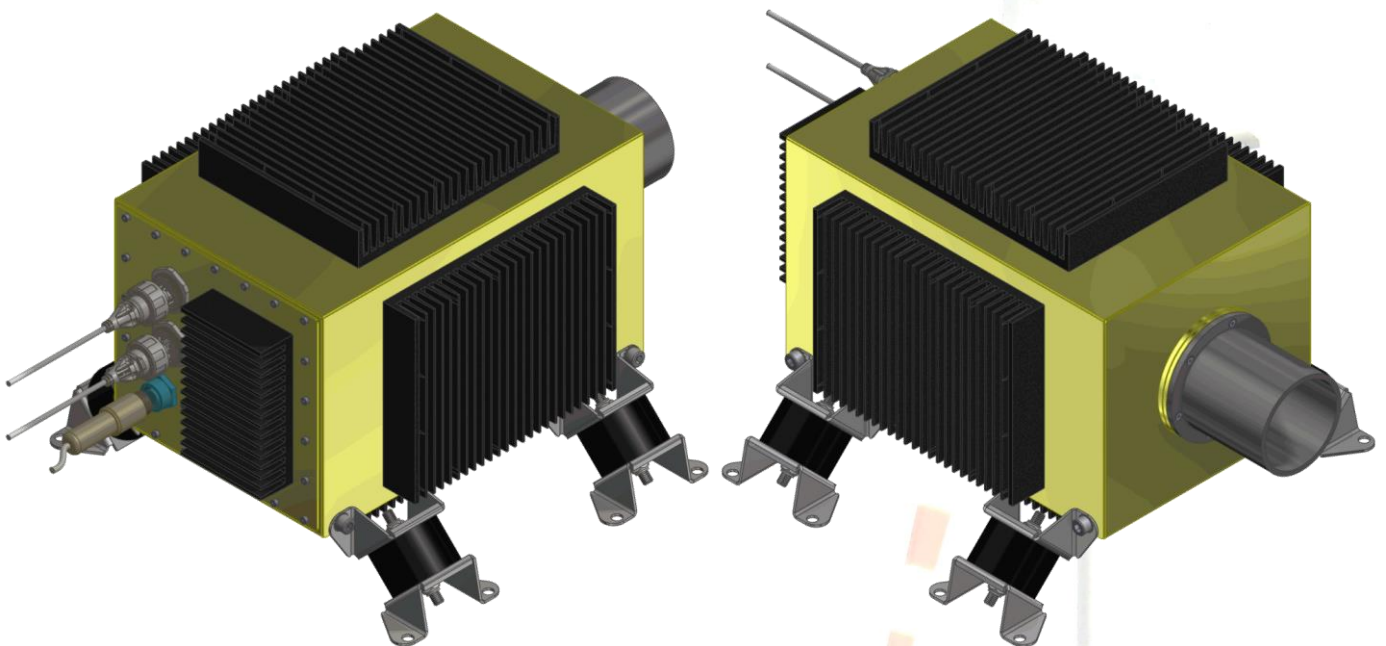
Whirlwind 1

Measuring Wind Speeds in Wind Energy Plants with Lidar

Environmental properties, among them the wind speed, can be measured remotely from great distances using *Light Detection and Ranging* (Lidar). Lidar mounted into the rotor hub or spinner of wind turbines enables wind profiles to be measured and hence, a prognosis of the wind field, before it reaches the rotor blades. The resulting data can be advantageously used for controlling the operation of wind turbines and their blade pitch.

Whirlwind 1 utilizes eye-safe infrared laser pulses of a fibre laser for measuring wind speeds of up to 85 m/s at 0.1 m/s resolution in the beam direction. Measuring points at equal distances of 15 m each can be recorded within a range of approx. 60 to 550 m (depending on atmospheric visibility). Incorporation into the rotor hub and selectable alignment allow the device to record wind fields across the whole rotor area. Installation on top of the nacelle is also feasible. The quality of data is independent of daylight and is not substantially affected by rain.

A scanning ground-based version mounted on an antenna rotor allows to assess wind resources for evaluating the profitability of new wind farm locations.



Whirlwind 1 has been designed and developed at the University of Oldenburg, Institute of Physics, **ForWind** Center for Wind Energy Research within the scope of the project LIDAR II and with financial support from the German Federal Ministry for Economic Affairs and Energy, Berlin, Germany.

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Whirlwind 1 Specifications

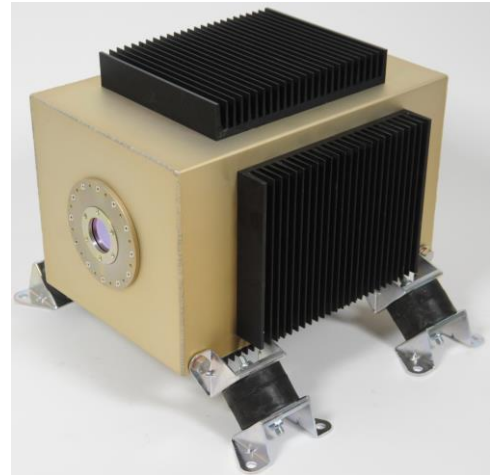
Size, weight and materials

Dimensions (L×W×H): ca. 410 × 340 × 320 mm³
without rubber bearings,
connectors and cover

Mass: approx. 17 kg
without rubber bearings

Protection classification: IP68

Housing: AlMgSi 0.5



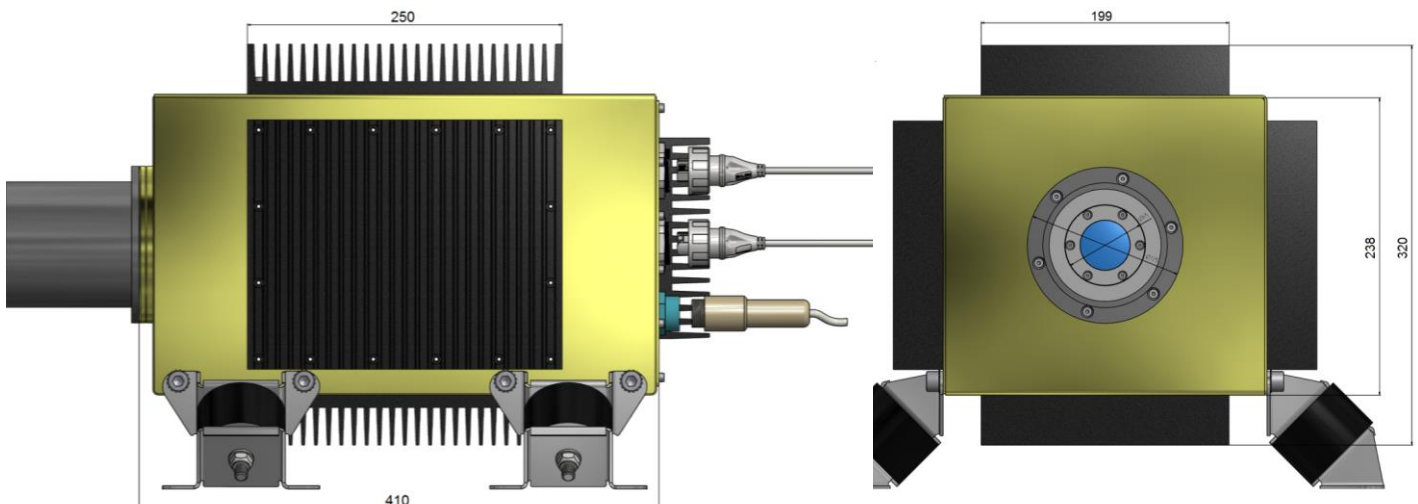
Power requirements

Voltage: 24 V DC

Input voltage variation: 18...36 V DC

Current: max. 4 A

Power consumption: max. 100 W



Environmental conditions

Operating temperature: -10°C – 50°C

Storage temperature: -40°C – 50°C

Vibration: 4 g, 25-100 Hz, amplitude 1.6 mm, max. 1 octave / minute

Electrical connectors

Power and ethernet: SubConn DBH13M Power Ethernet Circular, 13 contacts

For additional sensors: SubConn BH4M, 4 contacts

Option: Ethernet via optical fibers and bridging converters
for use in harsh electromagnetic environments

Cable

Power: 3 pole 2.5 mm² rubber cable, 30 m long

Ethernet: RJ45 patchcord rubber cable, 30 m long