# WindCube Ground-based Vertical Profiler Lidar


WindCube® is a ground-based vertical profiler Lidar that measures accurate wind data up to over 300 meters. It is equivalent to a very tall met mast, collecting wind speed, direction, vertical wind speed, and turbulence intensity data at 20 different heights with limited installation constraints and high operational safety.

**Features**

- Measurement from 40 meters to over 300 meters
- Pulsed lidar technology
- 4 inclined beams and 1 vertical beam
- 45 W nominal power
- Remote monitoring through WindCube Insights
- Multiple communication channels (wired, cellular, satellite)
- Optional autonomous power kit

Based on pulsed Doppler heterodyne laser principle, the WindCube sends a light pulse at a high frequency into the atmosphere and observes the signal backscattered by aerosols naturally present in the air. The time between the pulse and the detection of the backscattered signal is processed by the system thanks to the Doppler effect, and provides an accurate measure of the wind speed and direction.

## Pulsed laser technology

Pulsed Lidars send laser pulses at a very high frequency. To avoid confusing time delays and distance, the Doppler shift is analyzed before the next laser pulse is emitted. Therefore, the probe distance, or height, only depends on the time it takes for a pulse to be received after it has been emitted.

Multiple heights are measured simultaneously, and spatial resolution is constant throughout the entire wind profile. Also, measurement is not affected by clouds, fog, high density of dust, or obstacles.

Thanks to a vertical beam, the lidar allows a direct measurement of the vertical wind speed, and improves the turbulence intensity (TI) assessment.

## Remote monitoring

The web-based WindCube Insights platform enables remote monitoring and control of the WindCube vertical profiler. Wind speed data and carrier-to-noise ratio (CNR) are displayed live, and the platform also provides the possibility to configure measurement heights and communication with the Lidar.

## Ease of installation and operations

The Lidar is easy to handle and install. A couple of hours is enough to fully set up the lidar and start measuring. It is compatible with autonomous power solutions (power pack, solar panels), and its robustness supports operations continuity.

# Technical data

## Measurement parameters

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|---|---|
| Measurement range *(1)* | 40 ... > 300 m<br>Constant measuring probe (spatial resolution) |
| Data sampling rate | 1 Hz<br>10.000 measurement pulses accumulated every 0,8 seconds |
| Measuring distances | 20 user-defined distances simultaneously |
| Radial Wind Speed range | -23m/s to +23m/s |
| Reconstructed Wind Speed range | 0m/s to 49m/s |
| Reconstructed Wind Direction range | 0 – 360° |
| Speed accuracy *(2)* | 0.1 m/s |
| Speed uncertainty *(2)* | 40 – 80m: 1.4% to 2.6%<br>80 – 120m: 0.6% to 1.4%<br>120 – 135m: 0.6% to 0.8% |
| Direction accuracy *(2)* | 2° |
| Beam geometry | 4 inclined beams at 28° and 1 vertical beam |

1) *Height from WindCube feet. Data availability depends on environmental factors such as visibility, type of aerosols and variation of refractive index in the atmosphere*
2) *For 10-min averages, as assessed by several 3rd parties on multiple WindCube devices or in 2020 according to IEC 61400-12-1 Ed.2. Uncertainty figures are Final Accuracy Class divided by √3*

## Operating environment

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|---|---|
| Warranty | 3 years standard, extendable twice (up to 9 years) after maintenance |
| Preventive maintenance | 3 years cycle (factory or onsite maintenance) |
| Temperature range(1) | -30°C to +50°C / -22°F to 122°F (chamber conditions) |
| Maximum operation altitude | Maximum operation altitude : 3000m (2000m with provided AC-DC converter) |
| Operating humidity | 0 to 95% RH (non-condensing) |
| Environmental Protection | Designed for installation in many kinds of weather and environmental conditions<br>IP54 (Lidar Casing)<br>IP66 and IP67 (Inner sub-assemblies)<br>Radiation +1000W/m² at +45°C |
| Rain protection | Wiper |
| Marine atmosphere (Salt Atmosphere Compliance)(2) | IEC 60068-2-11 (120 hours) |
| Shocks and vibration | ISTA/FEDEX 6B |

1) *Starting the system at low temperature (lower than -20°C) will require to have the WindCube equipped with an adapted protection*
2) *For an offshore usage Offshore product version is recommended*

## Electrical and optical

| | |
|---|---|
| Input Power Supply<br>Insulation class: class I (PE connected) | 24.5-27 VDC |
| Power Supply with the transformer provided by VAISALA | 100-240 VAC 50/60 Hz |
| Power consumption *(1)* | 45W between -5°C and 30°C (23°F and 86°F)<br>110W below -5°C (23°F)<br>55W over +30°C (86°F) |
| LASER Safety Compliance | 1M Class / EN 60825-1: 2014 + A11 : 2021 |

1) *Nominal power consumption taken from an initial state of the WindCube at 15°C.*

## Data output

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|---|---|
| Output data | 1 s / 1-, 2-, 5-, 10-minute averaged (user-defined) horizontal and vertical wind speed<br>Standard deviation<br>Direction<br>CNR (carrier-to-noise ratio)<br>GPS coordinates<br>Data availability |
| Complex terrain measurements | FCR unlimited license |
| Data storage | 120 GB industrial disk (over 5 years storage of all data)<br>WindCube Insights secured cloud-based server |
| Data file format | RTD and STA (file), UTF-8 encoding |
| Communication | LAN, USB, 3G, or 4G router (router availability depends on the region/country), Modbus RTU (gateways available), Wifi |
| Time synchronization | GPS, NTP |

## Mechanical specifications

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|---|---|
| Cube dimensions (L × W × H) | 554 × 566 × 554 mm<br>(21.81 × 22.28 × 21.81 in) |
| With feet and wiper | 608 × 566 × 661 mm<br>(23.94 × 22.28 × 26.02 in) |
| Weight | 59kg (system only)<br>28kg (shipping case only)<br>91kg (total with accessories) |

## Compliance

| | |
|---|---|
| Compliance marks *(1)* | CE, FCC, IC |

1) *As verified on WindCube without Geofencing option*

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