

WindCube Ground-based vertical profiling lidar



Features

- Measurement from 40 meters to over 400 meters
- Pulsed lidar technology
- 4 inclined beams and 1 vertical beam
- 35 W nominal power
- Remote monitoring through Vaisala Compass online platform
- Multiple communication channels
- Optional autonomous power kit

WindCube® is a ground-based vertical profiler lidar that measures accurate wind data up to over 400 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.

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 accuracy 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 Vaisala Compass platform enables remote monitoring and control of the WindCube vertical profiler. Wind speed data 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

Operating environment

Warranty	5 years standard, extendable once (up to 10 years) after maintenance
Preventive maintenance	5 years cycle (factory or onsite maintenance)
Operating temperature ¹⁾	-30 °C to +55 °C / -22 °F to 131 °F (chamber conditions) Radiation +1000 W/m ² at +50 °C
Maximum operating altitude	4000 m (2000 m with provided AC-DC converter)
Operating humidity	0-100 %RH, non-condensing
Environmental protection	Designed for installation in many kinds of weather and environmental conditions IP66 (WindCube complete system) and IP67 (optical head compartment)
Pollution degree ²⁾	PD3
Rain protection	Wiper and hydrophobic window
Marine atmosphere (Salt Atmosphere Compliance) ³⁾	IEC 60068-2-11 (240 hours)
Shocks and vibration	ISTA/FEDEX 6B

1) System operation at low temperature (below -20°C) will require to operate with the Winter kit.
2) IEC 60664-1
3) For an offshore usage Offshore product version is recommended

Mechanical specifications

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

Electrical specifications

Input Power Supply DC	18-32 V DC
Insulation class:	Class III (PELV used)
Overvoltage category	OVC II
Input Power Supply AC with the transformer provided by VAISALA	100-240 V AC 50/60 Hz
Insulation class:	Class I (PE connected)
Power consumption	35 W between -5 °C and +30 °C (23 °F and 86 °F) 105 W below -5 °C (23 °F) 50 W over +30 °C (86 °F) in chamber conditions

Compliance

Compliance marks ¹⁾	CE, FCC, IC, UKCA
Laser safety compliance	1M Class / EN 60825-1: 2014 + A11: 2021

1) As verified on WindCube without Geofencing option

Measurement specifications

Measurement range ¹⁾	40 to > 400 m Constant measuring probe (spatial resolution)
Data sampling rate	1 Hz (average frequency on horizontal wind speed)
Measuring distances	20 user-defined distances simultaneously
Radial Wind Speed range	-28 ...+28 m/s
Reconstructed Wind Speed range	0-60 m/s
Reconstructed Wind Direction range	0-360°
Speed accuracy ²⁾	0.1 m/s
Speed uncertainty ²⁾	40 - 85m: 1.3% to 1.6% 90 - 130m: 0.6% to 1.2% 135 - 200m: 0.35% to 0.5% All detail available in Classification report
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 in 2024 according to IEC 61400-50-2 Ed.1. Uncertainty figures are Final Accuracy Class divided by $\sqrt{3}$

Data output

Output data	1 s / 1-, 2-, 5-, 10-minute averaged (user-defined) horizontal and vertical wind speed Standard deviation Direction CNR (carrier-to-noise ratio) Data availability
Complex terrain measurements	FCR unlimited license
Data storage	Up to 5 years storage of all output data on 2 embedded industrial disks (main and back-up) Vaisala Compass secured cloud-based server
Data file format	.rtd and .sta (TSV files), ISO-8859-1 encoding
Communication	Wifi, LAN, 4G router (router availability upon region/country), Modbus RTU, Modbus TCP
Time synchronization	GPS, NTP