



## WindCube Nacelle — PPT configuration

The WindCube® Nacelle lidar enables operators to efficiently and accurately assess and verify performance to ensure maximum power output. The lidar is IEC-compliant for contractual and operational power performance testing (PPT). Maximize your wind farm power output and project profitability with robust data and ease of use.



### Features

- Measurement ranges from 50 to 450 meters (standard version) and 50 to 700 meters (Long Range version)
- 10 configurable range gates for the standard version, 20 for the Long Range version
- 4 beams
- Pulsed lidar technology
- 1-Hz frequency
- Accurate wind speed measurements: HWS, wind direction, shear, veer, TI, REWS, and similar

### Trustworthy, superior meteorology

WindCube Nacelle enables quick and accurate PPT. Thanks to continuous wind direction alignment, it provides rapid data completion as well as reliable contractual and operational PPT according to industry best practices and the IEC standard. An optional world-class Vaisala weather sensor gives more accurate, air-density-corrected PPT while rotor-equivalent wind speed (REWS) lidar data output provides accurate rotor-averaged wind speed. The lidars are regularly designated for contractual power curve verification in Turbine Supply Agreements.

WindCube Nacelle has unrivaled accuracy. The system captures wind data simultaneously at 10 measurement distances and has an extremely high correlation with IEC met mast measurements, giving wind industry stakeholders the reliable data needed to make better decisions. It is also possible to integrate third-party calibrations against IEC met mast data to further reduce PPT uncertainties.

### Innovative lidars from a one-stop shop

WindCube Nacelle has universal compatibility and is easy to use. It is compatible with all current and future turbine types and is simple to install. It

has lightweight components, full integration capabilities, and straightforward configuration processes to ensure fast time-to-value on any wind farm.

### Manage your fleet simply and securely

WindCube Nacelle includes the WindCube Insights Fleet software which is an easy-to-use, secure, cloud-based tool that enables simple lidar configuration, remote monitoring, and data access for one system or many — for both WindCube vertical profiling lidars and WindCube Nacelle lidars.

### Easy, reliable global solution

WindCube Nacelle has outstanding support. Its reliability in the field permits a 3-year warranty period and allows for reduced OPEX by 35 % over 9 years of operation. The system's onboard diagnostics, automatic alerts, and error coding ensure rapid troubleshooting and repair.

# Technical data

## Measurement performance

Lidar type	Pulsed Lidar technology
Measurement range <sup>1)</sup>	50 ... 450 m (164 ... 1476 ft) 50 ... 700 m (164 ... 2297 ft) for the Long Range version
Probed length <sup>2)</sup>	30 m
Data sampling rate	1-Hz beam swap frequency
Measuring distance <sup>3)</sup>	Up to 10 user-defined distances Up to 20 for the Long Range version
Wind speed accuracy <sup>4) 5)</sup>	0.1 m/s (10-min averaged radial wind speed)
Wind speed uncertainty <sup>6)</sup>	< 2 % (10-min averaged horizontal wind speed, standard uncertainty)
Wind speed range	−20 ... +50 m/s (radial wind speed)
Wind direction accuracy <sup>5)</sup>	±0.5° (10-min averaged relative wind direction)
Number of beams	4 beams
Scanning angle	Horizontal opening: 15° half-angle Vertical opening: 5° half-angle
Measuring configuration	3 installation setups available: <ul style="list-style-type: none"><li>• Standard 4-beam mode (horizontal set-up: 2 beams at +5°, 2 beams at −5°)</li><li>• 2-beam modes:<ul style="list-style-type: none"><li>• Inclined up: 2 lower beams at hub height</li><li>• Inclined down: 2 upper beams at hub height</li></ul></li><li>• 1-beam mode for calibration</li></ul>

1) Weather conditions may impact data availability.  
2) Constant over measurement range.  
3) Simultaneously measured.  
4) Assuming correct Lidar mounting alignment.  
5) Generally observed against a calibrated met mast or Lidar.  
6) Following a calibration procedure established by independent experts.

## Operating environment

Operating environment	Outdoor use
Use in wet location	Yes
Operating temperature	−40 ... +60 °C (−40 ... +140 °F)
Storage temperature	−45 ... +65 °C (−49 ... +149 °F)
Operating humidity	0 ... 100 %RH
Pollution degree	2
Maximum operating altitude	3500 m (approx. 11 500 ft) 2000 m (approx. 6500 ft) with the 4G router kit
IP rating	Processing unit: IP65 Optical head: IP66 Splash water and marine environment resistant

## Inputs and outputs

Input voltage	100-240 V AC, ~50/60 Hz (waterproof connector)
Insulation	Class I (PE connected)
Optical head output from processing unit	25.2 V (internal AC/DC converter, waterproof connector)
Maximum power consumption	220 W
Overvoltage category	II

## Mechanical specifications

Lightning prevention	Surge Protection Design <sup>1)</sup>
Leveling accuracy <sup>2)</sup>	±0.1°
Alignment accuracy <sup>3)</sup>	±−0.5°
<b>Optical head</b>	
Dimensions (L × W ×H)	531 × 377 × 362 mm (20.91 × 14.84 × 14.25 in)
Weight	24.6 kg (54.23 lb)
Installation	On turbine nacelle rooftop
<b>Processing unit</b>	
Dimensions (L × W ×H)	507 × 379 × 131 mm (19.96 × 14.92 × 5.16 in)
Weight	12.8 kg (28.22 lb)
Installation	Inside turbine nacelle
<b>Cables</b>	
From optical head to processing unit	15 m (49 ft 3 in)
Processing unit power supply	3 m (9 ft 10 in), with European plug Optional: 10 m (32 ft 10 in), without plug
<b>Tripod</b>	
Maximum height	842 mm (33.15 in)
Weight	15 kg (33 lb)
Total footprint	1072 mm (42.20 in)
<b>Transport box</b>	
Dimensions (L × W ×H)	1200 × 800 × 460 mm (47.24 × 31.50 × 18.11 in)
Weight with packaged system	90 kg (198 lb)
<b>Operations</b>	
Warranty and maintenance	3-year warranty and maintenance cycle
Window cleaning	Hydrophobic window (avoiding long-term water and dust deposit)

1) Requires appropriate location and grounding.  
2) With factory-calibrated inclinometer.  
3) Using embedded alignment diodes.

## Compliance

EU directives and regulations	Radio Equipment Directive, RED (2014/53/EU) RoHS Directive (2011/65/EU) amended by 2015/863 REACH Regulation (EC 1907/2006)
EMC/EMF/Radio	IEC 61326-1, IEC 61000-4-18, IEC 62311 ETSI EN 301 489-1/-3/-19 EN 303 413 Modem option: EN 301908-1/-2, ETSI EN 301489-52 FCC 47 CFR part 15, ICES-003/NMB-003, ICES-Gen/NMB-Gen GB/T 18268.1, GB 8702
Electrical safety	IEC/EN 61010-1 GB 4793.1
Eye safety	Eye-safe in nominal operation (Class 1M) IEC 60825-1:2014 GB 7247.1
Temperature and humidity	IEC 60068-2-1/-2/-14/-30/-78 IEC 60529 ISO 9022-2/-7/-14
Salt mist	IEC 60068-2-52
Altitude	NF EN 60068-2-13
Dust and sand	IEC 60068-2-68 Lc2
Shock and vibration	Packaged system: IEC 60068-2-27/-64, ISO 4180 System: IEC 60068-2-64, NF EN 60068-2-6
Compliance marks	CE, FCC, IC, UL marking

## Software, data, and communication

Software control	Remote system control and monitoring, real-time display, data download
1-Hz data outputs	At each measurement distance: Timestamp, tilt and roll angles, radial wind speeds (RWSs), RWSs standard deviation, CNR, validity status for RWSs, and overrun status. With the PTH sensor option: air temperature, air pressure, relative humidity, and rain and hail information.
10-min averaged data outputs	At each measurement distance: Timestamp, tilt and roll angles, RWSs, hub-height horizontal wind speed (HWS), hub-height horizontal wind direction (yaw misalignment), vertical shear and veer, REWS, radial turbulence intensities (TI), hub-height TI, TI gain, measurement height for higher and lower pair of beams, HWS, horizontal wind direction and TI values above and below hub height, CNR, RWSs and HWS availabilities. With the PTH sensor option: Air pressure, air temperature, relative humidity. <sup>1)</sup>
Data storage	128 GB industrial disk (3 years for 10 ranges / 1.5 years for 20 ranges)
Data format	ASCII encoding, CSV file
Communication	Ethernet (RJ45), CAN Bus, Modbus® (TCP/RTU), peripheral (USB, HDMI), RS-232 (for PTH option), 3G/4G (using customer router or optional 4G router from Vaisala for EMEA or North America)
Time synchronization	Configurable NTP/SNTP, GPS, and local system clock
Data analysis	Compatible with optional WindCube Insights Analytics Software for power performance testing and data analysis

<sup>1)</sup> Vertical shear and veer only available in standard setup mode.

**VAISALA**

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