WindCube Nacelle

A generational leap in Power Performance Testing

WindCube® Nacelle lidar enables operators to efficiently and accurately assess and verify performance to ensure maximum power output. It 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.

DNV, in collaboration with Vaisala, has classified the WindCube Nacelle as the first nacelle lidar to comply with the IEC 61400-50-3 standard.

With a range up to 450m, this version of WindCube Nacelle is ideally suited for onshore applications. It provides a complete picture of the wind profile with accuracy and reliability as good as or better than met masts.

More than 400 WindCube Nacelle lidars are deployed worldwide, on 100+ wind turbine models onshore and offshore. The system's ease of deployment, universal compatibility, and simple structure make it non-intrusive and easy to integrate into existing wind energy operations.

To adapt to onshore and offshore range requirements while providing the most competitive solution, the WindCube Nacelle PPT portfolio includes two versions:

1. **WindCube Nacelle:** 50–450m range, ideal for onshore turbines

2. **WindCube Nacelle Long Range:** 50–700m range, ideal for offshore turbines

Key Benefits

Trustworthy, superior metrology

Enables quick and accurate PPT — WindCube Nacelle provides rapid data completion thanks to continuous wind direction alignment, 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. A Turbulence Intensity (TI) calculation method is embedded to improve TI accuracy, and is validated with industry leaders. WindCube Nacelle is regularly designated for contractual power curve verification in Turbine Supply Agreements.

Depend on 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

Universal compatibility and ease of use — Compatible with all current and future turbine types, simple installation, lightweight components, full integration capabilities, and straightforward configuration processes ensure fast time-to-value on any wind farm.

Manage your fleet simply and securely

Includes WindCube Insights — Fleet software, 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

Outstanding support — WindCube Nacelle's 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.

WindCube Nacelle at a glance

Applications

- PPT
- Warranty power curve
- Yaw misalignment correction
- Nacelle transfer function calibration

Services

Golden Lidar validation by DNV included with every new WindCube Nacelle

Key features

Precise data outputs with different installation setups available: 4-beam and 2-beam mode — allowing for accurate measurements of wind speed, relative wind direction, shear and veer, Rotor Equivalent Wind Speed (REWS), and turbulence intensity

Embedded TI algorithm for accurate Power Curve filtering

Includes WindCube Insights — Fleet cloud-based data management system

Integrates with WindCube Insights — Analytics, a powerful, secure data analytics software that includes PPT, annual energy production (AEP), and uncertainties calculations — substantially simplifying PPT analyses

Constant accuracy from 50 to 450m with 10 configurable measurement distances

Optional weather sensor provides pressure, temperature, humidity, and rain data for the state-of-the-art PPT following the IEC-50-3 standard

Straightforward installation with lightweight system parts, an embedded leveling and alignment system, and full integration capabilities

WindCube Nacelle specifications

	IEC-grade PPT
Lidar type	Pulsed lidar technology
Range	50m to 450m
Beams configuration	4 beams: Horizontal opening: 30° Vertical opening: 10°
Measuring distances	10 user-defined distances simultaneously
Output data	1s raw data 10min averaged reconstructed wind data (speed, direction, shear, veer, turbulence, yaw misalignment, REWS) Pressure, temperature, humidity, and rain data thanks to optional PTH sensor
Speed accuracy	0.1m/s (10min averaged)
Environment	Housing classification IP66 (OH)/IP65 (PU) Splash water and marine environment resistant Operating humidity 0 to 100% RH
Communication	Ethernet (RJ45), CAN Bus (DB9), Peripheral (USB, HDMI, RS232), optional 4G router
Time synchronization	NTP/SNTP, GPS, or local system clock
Temperature range	Operational range: -40°C/-40°F to +60°C/+140°F
Power consumption	200 W max
Weight and size	OH: 24.6kg/L x W x H = 53cm x 38cm x 36cm PU: 12.8kg/L x W x H = 50cm x 13cm x 38cm
Compliance	CE

WindCube® The gold standard

WindCube® is the iconic and trusted gold standard in wind lidar. The turnkey product suite offers innovative, reliable, and highly accurate solutions for thousands of customers across the globe. Borne from a passion to advance the field, WindCube continues to take wind energy ever higher through a commitment to four guiding principles:

- Trustworthy, superior metrology
- Unrivaled thought leadership
- Innovative lidars from a one-stop shop
- Easy, reliable global solution

WindCube Insights — Analytics

Robust Power Performance Testing and analysis

Engineered specifically to support WindCube Nacelle, WindCube Insights — Analytics allows operators to perform quick, simple, and transparent PPT, with IEC-compliant filtering, AEP calculation, and uncertainties reporting. By simplifying data handling activities, users are free to focus on the most essential performance analysis and optimization work.

Since PPT is a very strict process, this tool provides users with transparent validations and even lists which IEC standards are relevant while in use. It allows for the upload of WindCube Nacelle and Scada data with a simplified data synchronization process, and a variety of standardized lidar and turbine data filters are available and fully configurable to prepare the dataset.
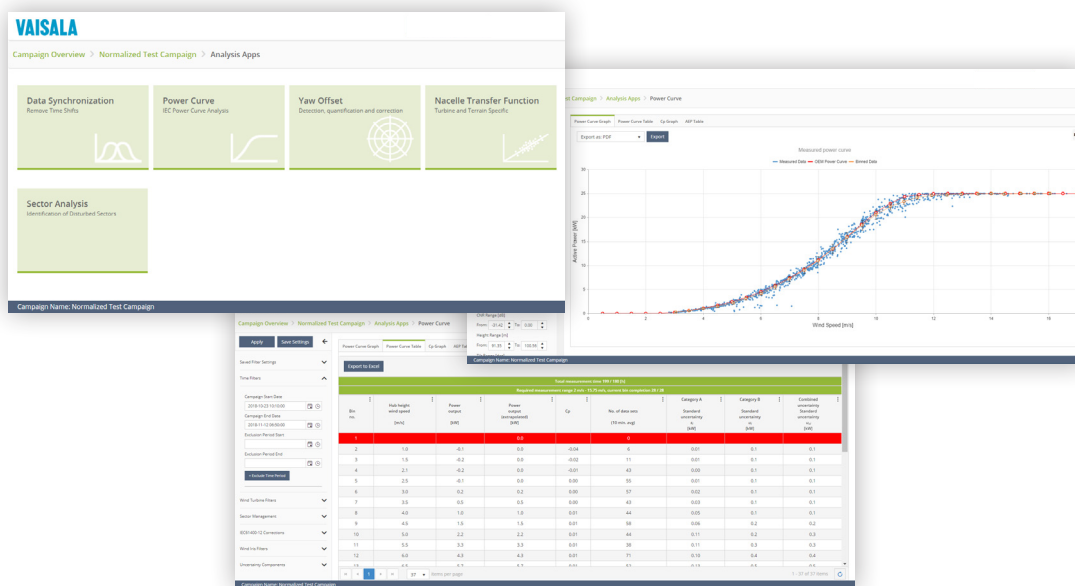
Key benefits

Easy-to-use, affordable PPT analytics

WindCube Insights — Analytics is tailored for power performance calculations and data integrations — capabilities that turbine users have traditionally needed to develop in-house, often at great cost.

Adheres to accepted industry best practices

Backed by rigorous, transparent validations, the tool proactively displays which IEC paragraph/standard it is referring to while in use.

Improved data visibility and value for the whole wind farm

With its simple interface and rigorous analyses, WindCube Insights — Analytics gives users outstanding awareness of their systems, simple exporting of report tables, data-driven decision-making, and better-functioning wind farms.

Applications

- Operational and contractual PPT
- AEP calculations
- Turbine performance validation during project development
- In-depth analysis of turbine failures and under-performances due to specific wind conditions like shear, veer, turbulences, or misalignment
- Yaw offset determination
- Nacelle transfer function calibration

Key features

Outstanding data analysis and reporting capabilities that integrate both lidar and turbine data (including time synchronization) for calculations as accurate as what can be achieved using met masts

Out-of-the-box simplicity, including standardized lidar and turbine data filters, simple configurability, and clear power curve analytics

Easy-to-use, cloud-based tool that can be installed and used quickly and easily, without the intense training usually needed to manage PPT

Why Vaisala for renewable energy?

We are innovators, scientists, and discoverers who are helping fundamentally change how the world is powered. Vaisala elevates wind and solar customers around the globe so they can meet the greatest energy challenges of our time.

Our weather and environmental monitoring solutions for renewable energy are guided by several key priorities:

- Thoughtful evolution in a time of change
- Making renewable energy smarter at every stage
- Extending our legacy of leadership

Vaisala is the only company to offer 360-degree renewable energy solutions — from sensors and systems to digital services and actionable intelligence — nearly anywhere on the planet (and even on Mars). Every Vaisala solution benefits from our 85+ years of experience, pioneering deployments in 170+ countries, and unrivaled thought leadership.

Our innovation story, like the renewable energy story, continues.

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