SEAWATCH Wind LiDAR Buoy

Wind Profile, Wave and Current Measurements

The SEAWATCH Wind LiDAR Buoy represents the next generation of multi-purpose buoys tailored for the renewable energy industry. The buoy accurately measures the speed and direction of wind across the diameter of wind turbine rotors, whilst sensors provide oceanographic parameters such as ocean waves and current profiles.

Features

- Collects data for wind resource assessments and/or for engineering design criteria
- Buoy mast wind profile measurements at 2.5 m, 4 m and 5 m
- Configurable LiDAR wind profile measurements at 10 levels from 12.5 m up to 300 m
- Configurable ocean wave measurements and sea current profiles
- Full on-board processing of all measured data
- Two-way communication link for data transfer and control
- Real-time data transfer and presentation
- Flexible configuration of sensors and data collection
- Modular hull for easy transport and local assembly
- Safe and easy handling and deployment
- Robust and reliable in all weather and temperature extremes
- Position tracker for increased safety
- The Wavescan buoy platform has a successful track record worldwide since 1985
A Unique Cost-Efficient Solution

The SEAWATCH Wind LiDAR Buoy is a cost-efficient way to measure wind data at heights of conventional offshore wind turbines for wind resource assessments and engineering design criteria.

It is the first single compact buoy capable of measuring:

- Wind profiles across the blade span of the largest offshore wind turbines
- Ocean wave height and direction
- Ocean current profiles from the surface to the seabed
- Meteorological parameters
- Other oceanographic parameters as required

The smaller SEAWATCH Wind LiDAR Buoy is a proven ocean monitoring solution and is easily deployed and relocated (by towing or lifting onboard vessels) enabling data gathering across multiple locations. This is a more cost-effective alternative to existing wind profiling solutions such as fixed met masts or larger floating buoys.
Proven Platform and Technology

The SEAWATCH Wind LiDAR Buoy is built on the SEAWATCH Wavescan platform which has been deployed for a large number of satisfied clients in the most hostile oceanographic environments since 1985.

Its well proven SEAWATCH technology includes the GENI™ controller, an intelligent power management unit and the ZephIR LiDAR.

ZephIR LiDAR

The ZephIR LiDAR was selected after years of testing and comparison of various concepts. The ZephIR 300 provides highly accurate measurements across the entire rotor diameter and beyond and can be configured to measure up to 10 different heights from 12.5 to 300 metres above the sea surface.

Low power consumption of the ZephIR 300 and intelligent power management are key to efficient operation when using a small low-cost platform.

Successful Collaboration

The SEAWATCH Wind LiDAR Buoy is the result of a successful joint industry R&D project, utilising offshore and wind technology expertise from Norwegian universities, research institutes and the energy company Statoil.

Offshore Testing / Validation

The SEAWATCH Wind LiDAR Buoy has been tested and validated at the Ijmuiden met mast in Dutch waters. The wind profile data measured by the SEAWATCH Wind LiDAR Buoy were compared with data from anemometers at 3 heights mounted on the met mast and a ZephIR LiDAR, measuring the wind profile above 90 m. An inter-comparison showed almost no bias and a squared correlation of more than 0.99. The validation test was performed in close cooperation with DNVGL.
# SEAWATCH Wind LiDAR Buoy

## Technical Specifications

### General
- **Material:** Polyethylene, Aluminium, Stainless Steel
- **Flash light:** LED based, 3-4 nautical miles range
- **Positioning:** GPS (Inmarsat-C, Iridium, Standalone Receiver)

### Buoy Dimensions
- **Weight (approx):** 1700 kg
- **Overall height:** 6.1 m
- **Diameter:** 2.8 m
- **Net buoyancy:** 2500 kg
- **Mast height (above water):** 3.5 m

### Power Supply
- **Solar panels (optional):** 180 W
- **Lead-acid battery bank (optional):** Up to 248 Ah
- **Lithium battery bank:** Up to 9792 Ah
- **Fuel cells:** Up to 25926 Ah

### Processing
- **4 GB data storage**
- **Real-time operating system (Linux)**
- **Large number of serial and analogue inputs**
- **Flexible data acquisition software**

### Data Communication
- **Short range:** GSM / GPRS
- **UHF / VHF radio (two-way)**
- **Long range:** Inmarsat-C and Iridium (two-way)

### Wind Profiler - ZephIR 300 CW LiDAR
- **Measurement height (configurable):** 10 m – 300 m
- **Probe length at 10 m:** 0.07 m
- **Probe length at 100 m:** 7.7 m
- **Number of simultaneous heights measured:** Up to 10
- **Sampling rate:** 50Hz
- **Average period (configurable):** 1 second upwards
- **Scanning cone angle:** 30°
- **Wind speed accuracy:** < 0.5%
- **Wind speed range:** < 1 m/s to 70 m/s
- **Wind direction accuracy:** < 0.5°
- **Various additional sensors are available on request, including but not limited to:**
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  - **Oceanographic Sensors**
    - Wave height and direction
    - Surface current velocity and direction
    - Water temperature
    - Conductivity / Salinity
    - Current profile
    - CTD profile
  - **Meteorological Sensors**
    - Wind speed/direction
    - Air pressure
    - Air temperature
    - Humidity
    - Precipitation
    - Solar radiation
  - **Water Quality Sensors**
    - Dissolved oxygen
    - Light attenuation
    - Chlorophyll-a
    - Hydrocarbon
    - Turbidity

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1. With fuel cells and methanol cartridges
2. All values are nominal ratings
3. The buoy consumes roughly 150 Ah per day. Exact power consumptions will be made for each case