

Windcube Buoy 2019

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[WINDCUBE BUOY USER GUIDE]



Image of Windsea buoy courtesy of Akrocean

Thank you for choosing Windcube for your wind measurement activities.

- Windcube has been designed to ensure you a reliable and easy way to measure wind profiles.
- The Windcube can be used offshore and onshore, according to your needs.
- A customized version of the WINDCUBE has been designed for harsh offshore locations like floating buoys, substations and vessels.

We wish you success in its use and hope that it will contribute to the progress of your projects.



The Windcube technology has been developed in cooperation with the Applied and Theoretical Optics Department (DOTA/SLS, ONERA, France). Your product is made in France.

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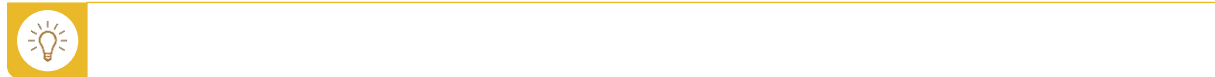
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1 GENERAL INTRODUCTION

1.1 INFORMATION ABOUT THIS USER GUIDE

This user guide aims to assist the client in using the Windcube software and describes its main features. In this guide, you will find three kinds of boxes:

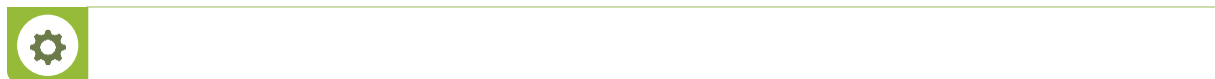
- In yellow, general comments or tips and tricks.



- In red, points of attention. Caution, risk of danger: Documentation must be consulted.




- In green, business process or technical points.



A chip is used to instruct the user to perform an action, like in the example below:

- Click on the [SUBMIT] button.

Chips are used for a list of information, like below:

- Subtitles for varied information are boxed in blue as follow: **STEP 1**
- Some information is directly supplied in Windweb, via tooltips like: 

SYMBOLS USED IN THE WINDCUBE TRAPDOOR

24.5-27V $\overline{=}$. 200W \overline{max} Power connector: provides 24,5V DC and a maximum power of 200W.



Earth ground: Conductor terminal



Protective conductor terminal (IEC 60417-5019 (2006-08) standard)



Danger symbol

1.2 GENERAL SAFETY INSTRUCTIONS

GENERALITIES

- The Windcube system is intended to be used for wind measurement purposes only.
 - The Windcube, when using onshore, is designed for outdoor use only.
 - Windcube users must be trained by the manufacturer staff or a certified third party.
 - All instructions written in this manual must be respected in order to understand the main features and controls of the system and to ensure reliable measurements. The Windcube must not be used if it is not properly set-up as described in the manual.
 - The manufacturer cannot be liable for any damage that may occur due to the operations that are not detailed in this manual.
 - Use of controls, adjustments and procedures others than specified in this manual might result in hazardous radiation exposure, system damage or voiding the warranty.
 - Never intentionally open the system casings (unless an authorization from the manufacturer has been issued), this would void the system warranty.
 - Never modify any piece or cable of the system (unless an authorization from the manufacturer has been issued), this would void the system warranty. Changes or modifications not expressly approved by Leosphere could void the user's authority to operate the equipment.
 - The device has been designed to operate on a floating structure and operate in harsh sea conditions, but the operation cannot be warranted after a chock caused by an external object (such as, but not limited to a boat) on the Windcube and/or on the buoy.
- Review this manual thoroughly before powering up and operating the Windcube.



The protection provided by the Windcube could be compromised if it is used in a manner not specified in this manual.

1.2.1 HANDLING SAFETY



2 persons are necessary to carry the system outside its shipping case.



These two persons must use handles.



- The system contains fragile optics and components. Always handle the LIDAR with care.
- We recommend transporting the Lidar for short distances.
- For moving the system on long distances, it is imperative to transport the system in its shipping case, to protect it in an optimal way.

1.2.2 LASER SAFETY

The Windcube is compliant with the IEC 60825-1 Standard for eye-safety. Labels and symbols are present on the system for your information.



- The Windcube is a class 1M Laser product.
- The laser beam emitted by Windcube is in the infrared spectrum and is not visible to the naked eye.

However, we recommend respecting the following general safety measures:

- Refrain from connecting the main power and operating the Lidar system before making sure that nothing is permanently blocking the laser beam path and that nobody is in the beam path.

- When the system is functioning, do not look into the output laser directly (through the system window and in the direction of the laser beam paths) or by using optical instruments (handheld glasses, mirrors, microscopes, binoculars, etc.).
- It is strictly forbidden to modify the optical function of the Lidar systems by adding focusing or reflecting optics on the beam path, as it can induce laser deviation
- Do not block the laser beam path with any metallic target that could reflect the laser beam.

Such exposures with or through any optical instruments can cause dazzling and eye damages. We highly recommend displaying warning signs around the system to inform the personnel that these safety measures must be respected.



- The beam is emitted through the laser aperture situated on the top of the Windcube, inside a cone of 28° angle off vertical (see fig. below).

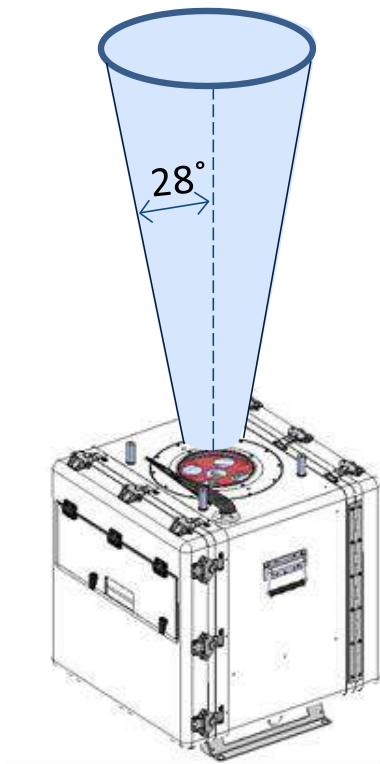


Figure: Laser aperture



- In order to avoid eye injury, do not open the optical head nor disconnect any optical fibers.
- If the equipment is used in a manner not specified in this manual, it may result in hazardous radiation exposure.

1.2.3 ELECTRICAL SAFETY



- Make sure that the power supply cable is unplugged before servicing or moving any part of the system.
- Check power supply grounding when using onshore. Poor grounding quality may result in electrical shocks and electronic components potential damage.
- In the case of a Windcube installation on a buoy, grounding is not mandatory since it could cause some interferences with the other instruments.

In case of emergency (fire, water flood risk),

- Unplug the Windcube main power supply at the cable connector level on the 25,3VDC line (Fig. below).



Figure: IP67 DC-power connector for emergency disconnection



Please, follow the instruction below to supply the product with DC:

- Use an AC/DC converter.
- Use a 3 m cable provided with Windcube. This cable should be connected to the main power supply plug in the trapdoor.
- Respect the voltage acceptance range [24.5; 27 V DC] for the input of Windcube, i.e. at the main power supply connector in the trapdoor.

Before installation, make sure that:

- The voltage and frequency of the Windcube match with the household electrical supply.
- The quality of the input power, at the entrance of the Windcube main power supply cable, corresponds to the level the system is certified for.

These electrical characteristics must match whatever is the electrical installation upstream of the Windcube (ex.: cable extension, cable terminations connection). In order to prevent any injury and damage of the machine, these characteristics mentioned above must be respected. This has to be verified by a qualified operator.

For safety reasons:

- It is highly recommended to use an UPS system between power source and the power supply cable of the system (for continuous operation even with medium short-cut). Second scale short-cut can be avoided thanks to an UPS embedded in the system.

To avoid electronic interference, do not run powering cables and/or the communication cables along any Medium and High Voltage (above 300V AC) cable or surge protector line.

The Lidar system has an Ingress Protection level of IP67. To avoid electrical failure:

- Use adequate cable connector for external connection to the system during operation (external peripherals, remote access or control). Please, contact Leosphere Customer Service for information about compatible connectors.
 - When Lidar external peripherals are not connected, make sure that all external panel connectors are covered with their fixed caps.
 - The Lidar has a protection against overvoltage – inside the AC/DC external converter and inside the rack on the DC input line with a fuse ([refer to 3.2.4 specifications](#)).
- Follow the safety instructions below in order to avoid fire, electric shock, injury and damages of the system.

The system is categorized in Class A product, according to EN55011 standard. In domestic environments this product may cause electromagnetic interference due to radiated and conducted emission, in which case the user may be required to take adequate measures.

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. Operation is subject to the following two conditions:




- (1) This device may not cause harmful interference,
- (2) This device must accept any interference received, including interference that may cause undesired operation.

INSTALLATION

- All installation operations of the Windcube have to be carried out by a minimum of two (2) trained operators.
- The installation of the Windcube should not be performed during the following weather conditions: rain, lightning, snow, or wind speeds higher than 10 m/s.

1.2.4 CAUTION LABELS

In accordance with CE requirements the Caution Labels are prominently displayed on the system enclosure. These cautions may exceed the actual level of hazard of the system itself but apply to its inner components that are individually marked with such caution labels.

	<p>CAUTION: The system in its nominal scanning operation is emitting an invisible class 1M laser beam (wavelength of 1543nm, mean power of 30mW).</p> <p>It allows a safe use under reasonably foreseeable operating conditions but may be hazardous for the eyes in case of direct view with optical instruments.</p>
	<p>CAUTION: This laser machine, independently to the beam nominal scanning operation condition, is an invisible laser of Class 3B. Its characteristics are: output mean power of 150 mW max, wavelength of 1 543 nm, and pulse duration <1 ms. It is potentially dangerous if a direct beam or specular reflection is viewed by the unprotected eye.</p> <p>If the system is not used in its nominal operation conditions, please refer to user manual for safety cautions.</p>
	<p>This "attention" symbol is on the top of the system. It means:</p> <p>Do not lean on top of the system when it is not fixed to the support or ground because it may topple on the ground.</p> <p>The wiper is a mobile element. You should never block it or put your fingers on it.</p>

1.3 STANDARD COMPLIANCE

The Windcube complies with the following standards:

CE regulation	CE compliant, at industry level
Environmental regulations	Compliant with REACH & RoHS2 directives
EMC	IEC EN 61326-1, July 2013 - <i>class A in emission</i> ETSI EN 301 489-1 : 2017 V2.2.0, ETSI EN 301 489-3 : 2017 V2.1.1, ETSI EN 301 489-19 : 2017 V2.1.0, ETSI EN 301 489-52 : 2016 V1.1.0, EN 62479 : 2010, EN 301 908-1 V 11.1.1 :2016, EN 301 908-2 V 11.1.1:2016, FCC part 15, ICES-001
Electrical Safety	IEC EN 61010-1, June 2010
LASER Radiation	IEC EN 60825-1, January 2014 Class 1M Accessible Emission Level: 8.6mW max. Pulse Duration: 165 ns Wavelength: 1543nm
Housing classification	IEC EN 60529, IP67
Temperature & humidity	IEC 60068-2-1/2-2/2-78/2-30, ISO 9022-2, ISO 9022-14
Salt resistance	IEC 60068-2-11 (500 hours), ISO 9022-4
Transport vibration	ISTA, FEDEX 6B (International Safe Transport Association)

IDENTIFICATION LABEL FOR FCC & IC DEVICES

In the case you have the 3G modem option, a label is affixed on the system to indicate FCC and IC compliance of the 3G modem (FCC and IC certificate numbers are indicated).



The content of the UE declaration of conformity is provided here after. The complete document is available on request to the technical support.

Leosphere (Manufacturer) declares under its responsibility that the radio-electrical equipment Windcube, as ground-based LIDAR, is in observance with the following directives, standards and specifications:

RED Directive (2014/53/UE) - CEM part
<ul style="list-style-type: none"> • EN 61326-1: 2013 - <i>class A in emission</i> • ETSI EN 301 489-1 : 2017 V2.2.0 • ETSI EN 301 489-3 : 2017 V2.1.1 • ETSI EN 301 489-19 : 2017 V2.1.0 • ETSI EN 301 489-52 : 2016 V1.1.0 • EN 62479 : 2010
RED Directive (2014/53/UE) - RADIO part
<ul style="list-style-type: none"> • EN 303 413 : 2017 V1.1.1 • ETSI EG 203 367 : 2016 V1.1.1 • EN 301 908-1 V 11.1.1 : 2016 • EN 301 908-2 V 11.1.1 : 2016
RED Directive (2014/53/UE) - Electrical Safety part
<ul style="list-style-type: none"> • EN/CEI 61010-1 : 2010 • IP67 • Class 1M level of the NF EN 60825-1 : 2014, eye-safe in nominal operation
RoHS2 directive (2011/65/UE)

Industry level, for Europe

2 GENERAL CONDITIONS OF USE



- Before any manipulation of the LIDAR system, it is mandatory to read the following information

2.1 SYSTEM INTEGRITY

- The entire product or its components (inside and outside parts of the LIDAR unit) and its accessories and peripherals (for example but not limited to cables, options, etc...) cannot be modified in any way without written agreement from the supplier.
- No component can be added in the WINDCUBE casing without written agreement from the supplier.
- Any modifications on the LIDAR for integration to the buoy system must be considered and validated by the supplier before being integrated.
- The power system of the buoy integrated LIDAR is part of the buoy system. The supplier is not responsible for electrical system failure arising from a power supply not complying with the electrical specifications of the product and standard CE regulations with regards to safety and stability.

2.2 SYSTEM ENVIRONNEMENT

- The system performance commitment is related to a maximum tilt and roll angle of the system of 25 degrees (no limitations on turn between 0 and 360 degrees with a direction accuracy of 5°). Given that, it is recommended that a passive damping system be used to keep maximum tilt within +/- 20 degrees with a nominal tilt of +/- 10 degrees.
- The product specifications are related to a usage of the WINDCUBE in an environment that does not disrupt the measurements (for example but not limited to: no physical blocking of the lines of sight, no magnetic perturbations). Likewise, the above specifications are inherent to the WINDCUBE LIDAR mounted on an industry standard buoy. In particular, no obstacle has to interfere with any of the four 28 degrees laser beams within the tilt window range of +/- 25 degrees.

2.2.1 System integration

- The design was made to facilitate the integration of the LIDAR on the buoy system, but the performance depends on the proper integration. LIDAR installation on a floating buoy or other dynamic environment can potentially result in a measurement bias and have effects on LIDAR

wind measurement reliability overall. Because of this, the integrator of the Lidar monitors the motion of the buoy in order to correct the data if necessary.

- The WINDCUBE works in harsh conditions, as it integrates a watertight casing structure resistant to corrosion with surface treated components, and corrosion resistant connectors.

3 WINDCUBE OVERVIEW

3.1 INTRODUCTION TO WINDCUBE LIDAR



The Windcube is a Lidar (Light Detection And Ranging) used for wind profile measurement from 40 m to 200 m.

3.1.1 LIDAR PROCESS



- The Lidar sends infrared laser pulses into the atmosphere.
- One beam, at the center, is emitted vertically and four beams are emitted successively in four cardinal directions along a 28° scanning cone angle.
- Laser pulses are backscattered by aerosol particles in the atmosphere, like dust, water droplets etc., which are moving at wind speed.
- The collected backscattered light is used for calculating Doppler shift which determines the wind speed and wind direction.
- The wind can be measured at up to 12 different range gates simultaneously.
- The backscattered light is converted into an electronic signal and digitized.
- Wind vector components are computed with a dedicated signal processing algorithm by using the measurement values of five consecutive beams (also called LOS: line of sight measurements).

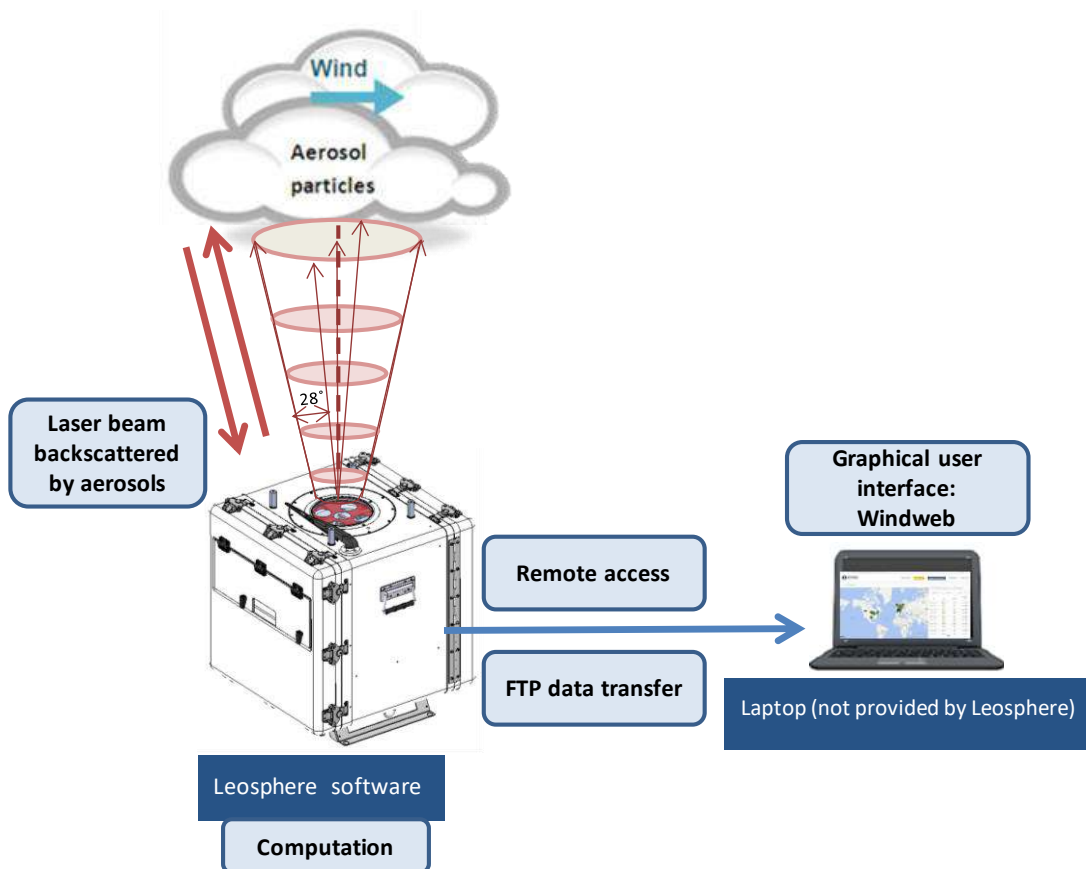


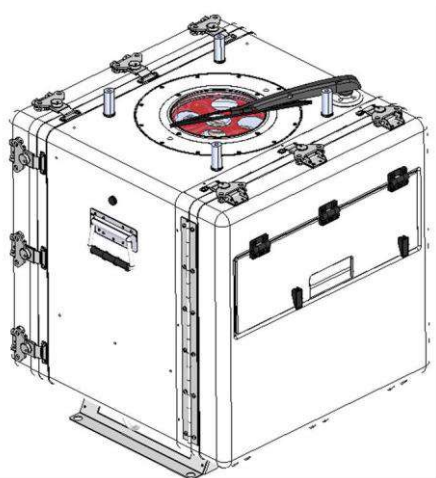
Figure: Windcube functioning scheme

- The embedded Windcube software controls the hardware, as well as processes the data.
- **Windweb**, the graphical user interface, allows the users to monitor and configure Windcube.
- Windweb can be opened on any web browser.
- Real time and statistical wind data are stored in the SSD of Windcube.
- Users can download accumulated data files using File Transfer Protocol (FTP).

3.2 WINDCUBE description

3.2.1 PACKING LIST

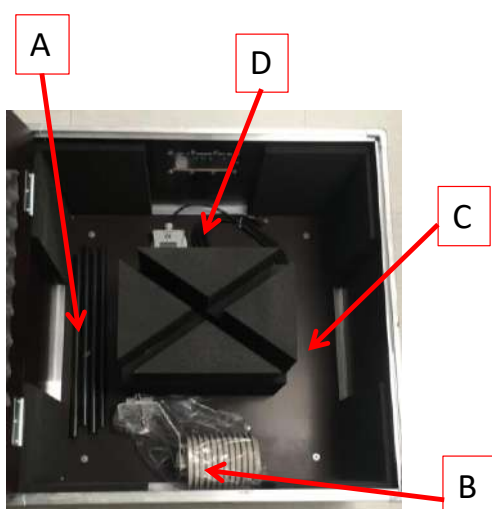
Windcube standard system parts provided to users are (**NB: Items may differ from photographs**):



Windcube Buoy system



Shipping case



Windcube Buoy annex box

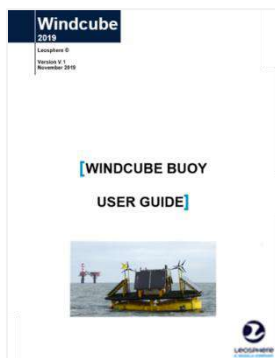
- PTH (D)
- Weather shelter (B)
- Flexible tank (A)
- Antena 3G (C)



**IP67 100-240VAC /
25,3VDC Power Converter**
Total length: 12 m



IP67 Straight Ethernet cable

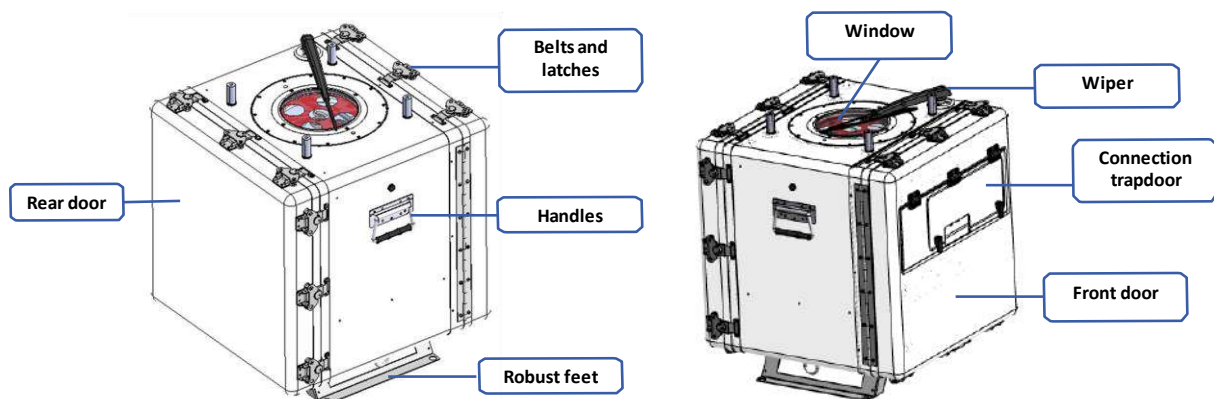


**A box containing: User guide, FTP
credentials, USB key...**

3.2.2 WINDCUBE OVERVIEW



Front door and trapdoor can be opened customers. Customers do not have an authorization to open the rear door of the system. If it is opened, the warranty is voided.



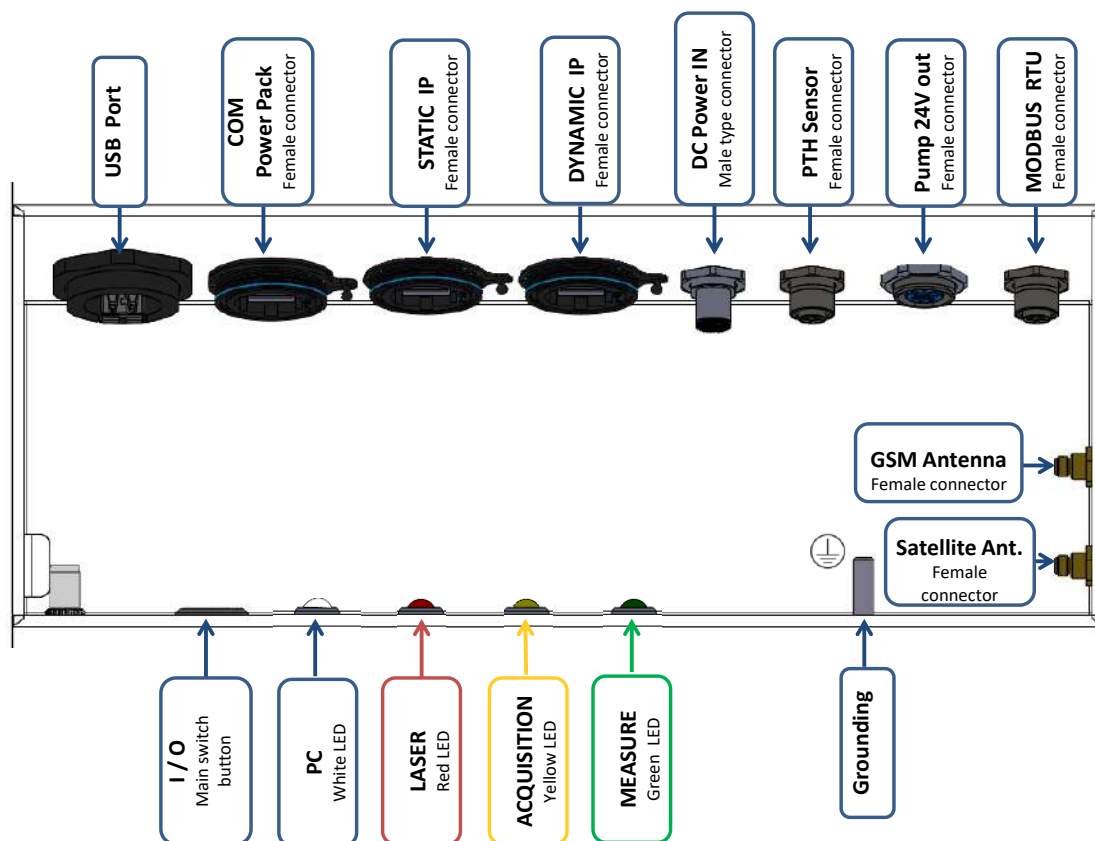


Figure: Trapdoor connections and connector types

3.2.3 DIMENSIONS

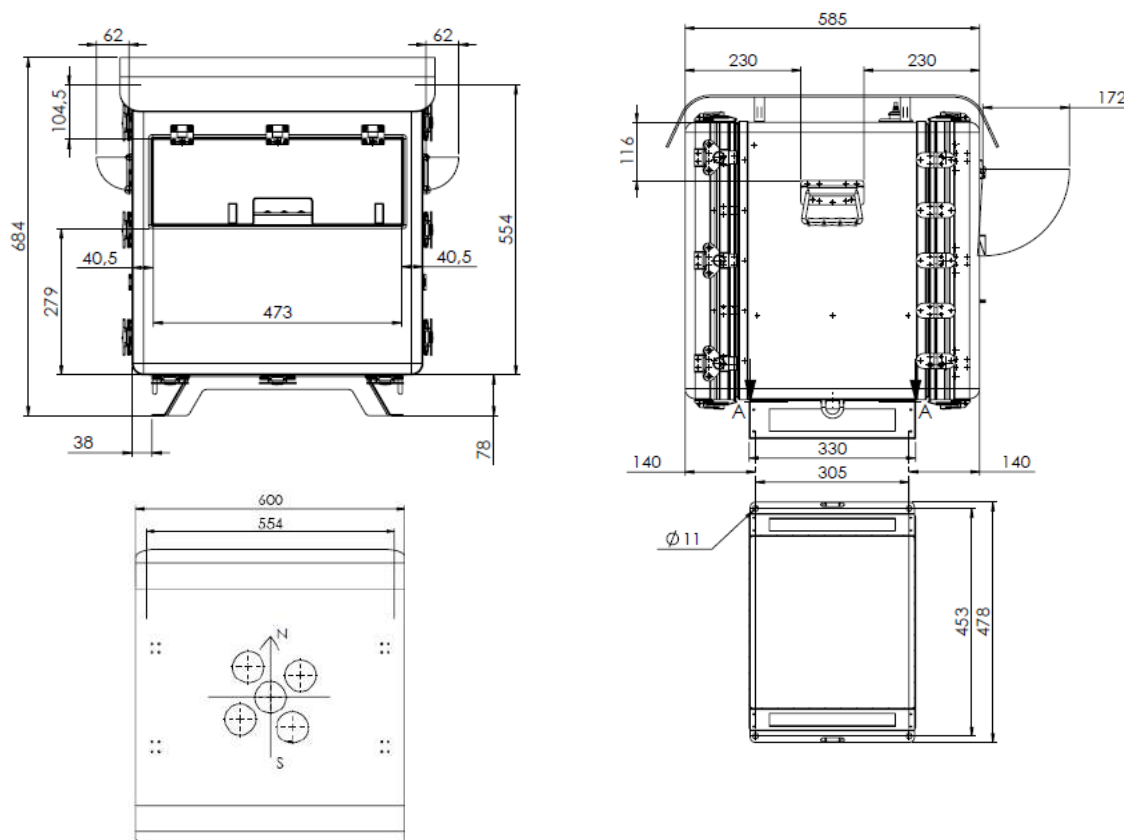


Figure: Dimension of the Windcube with sunshade (in millimeters)

3.2.4 SPECIFICATIONS

These specifications are inherent to the offshore Windcube Lidar mounted on an industry standard buoy.

Measurements	
Range ^a	40 to 200+ meters *
Data sampling rate	1 Hz
Measuring distances	12 user defined distances simultaneously
Speed accuracy (Lidar in static mode)	0.1 m/s
Speed range	0 to +60 m/s **
Direction accuracy (Lidar in static mode)	2°
Beam geometry	4 inclined beams at 28° + 1 vertical beam
Operations	

Dimensions	677 mm x 585 mm x 592 mm (height x width x depth)
Weight	52 kg
Input Power Supply	24,5 to 27 VDC
Power consumption	Between 45 and 110W
Temperature range	-20°C to +40°C (shadow temperature)
Housing classification	IP 67
Marine atmosphere	500h IEC 60068-2-11
Shocks & vibration	ISTA / FEDEX 6B
Laser safety	1M Class / EN 60825-1:2014
Compliance	CE, FCC, ICES
Data	
Output data	1Hz real-time / 1, 2, 5, 10 min averaged (user defined) horizontal and vertical wind speed
	Standard deviation
	Direction
	CNR (signal to noise ratio)
	GPS coordinates
	Data availability
Data storage	120 GB industrial disk (over 10 years storage of all data ^b)
	Windweb secured cloud-based server
Data format	.RTD and .STA. (file), UTF-8 Encoding
Communication	LAN, 3G modem, Modbus RTU (TCP gateways available), Wi-Fi
Time synchronization	GPS, NTP

a: Height from the Windcube feet

b: For 10 heights and 10 minutes mean period

* According to atmospheric conditions, higher or lower range can be reached

** Depending on the Sea state

3.3 ERGONOMICS OF WINDWEB SOFTWARE

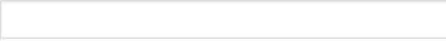


3.3.1 GENERAL OVERVIEW

NAVIGATING IN WINDWEB

In Windweb software, you can reach the different pages via tabs and links.

Inside a same page, you can find hypertext links , buttons e.g. , tooltips  and pop-up.

To seize information, you can find input boxes, for example:

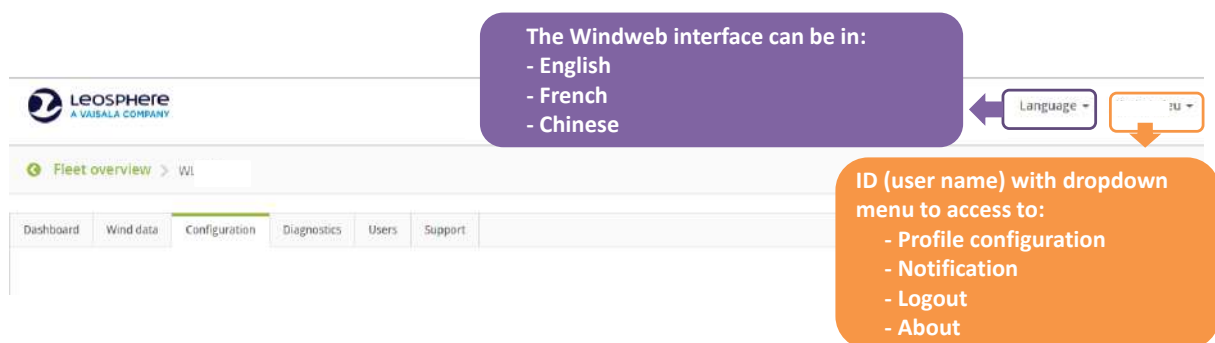
- text fields to be completed: 
- checkbox: ☐ Hide GPS location in data files.
- buttons: ☒ GPS ☐ NTP Server
- spin buttons:  5  $\pm(\text{East})/\pm(\text{West})\ 180^\circ\ \text{max}$

Header description (view for a client)

On the top right of the screen, you can choose the interface language

- Click the arrow to display the available languages.

Next to “Language” and to your “name”, you will find a little arrow from which you can access to several functions shown below.



The Windweb interface can be in:

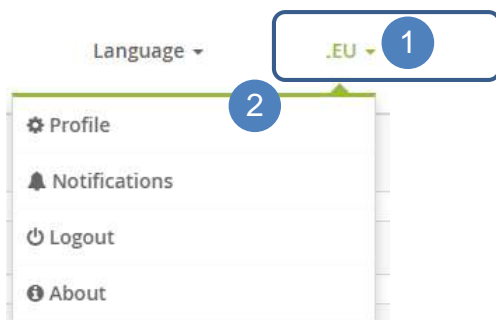
- English
- French
- Chinese

ID (user name) with dropdown menu to access to:

- Profile configuration
- Notification
- Logout
- About

- Click on the arrow next to your name **(1)**, a pop up appears **(2)**.

You can now access to “Profile”, “Notifications”, “Logout” and “About” information.



Language ▾

1 .EU ▾

2

- ⚙ Profile
- 🔔 Notifications
- 🔌 Logout
- ℹ About

PROFILE FEATURE

The profile feature allows updating all your personal information.

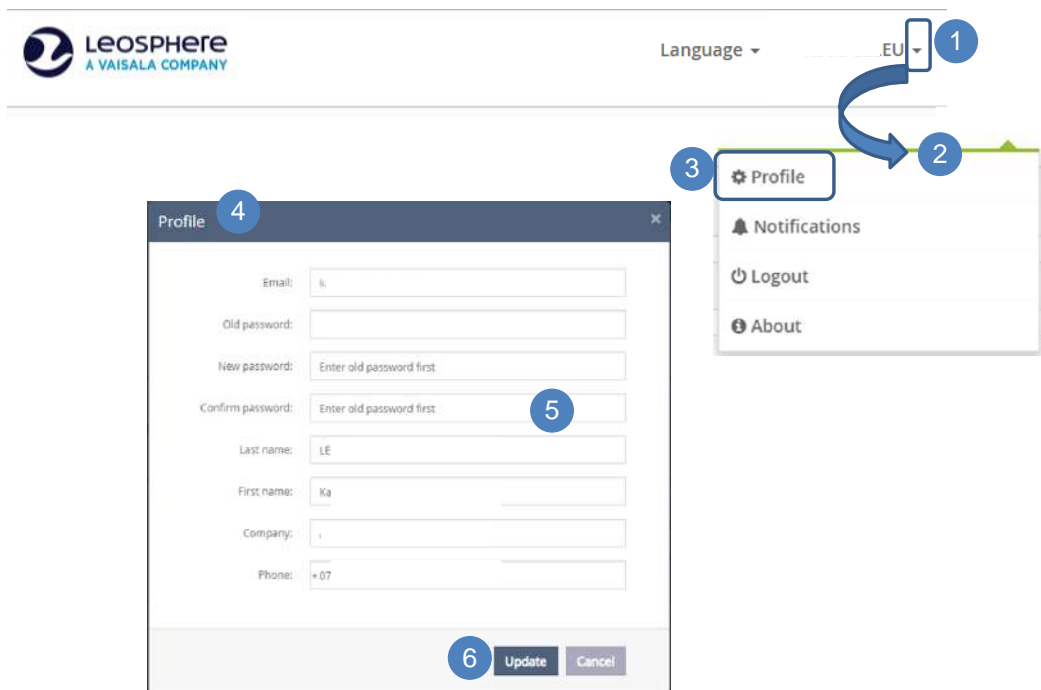
- Click on the arrow next to your name **(1)**.

A drop-down menu displays **(2)**.

- Click on Profile **(3)**

The “Profile” pop-up is opened **(4)**

- Update your profile **(5)** to manage your information such as the email address and the password to access to Windweb.
- Click on [Update] **(6)**.



From this screen, you can also change your password, [refer to 6.1.1 chapter, How to change your password](#).

NOTIFICATIONS FEATURE

You can receive notifications by email and you can manage, by yourself, the subscription.

Thanks to ‘Notifications’ feature, you can choose Lidars you will monitor.

You can subscribe to two kinds of notification. These are “**systems alerts**” and/or “**daily data files**”.

By default, users are automatically subscribed to the two kind of notification, but each user has the possibility to cancel his subscription.

For ‘daily data files’ notification, by default, you will receive only one daily data file (sta format). For more detail, please refer to [\[Wind data\] tab description 3.3.5 chapter](#).

Notifications for system alarm are sent when the following cases occur:

- Critical temperatures prevent the Windcube from working properly.
- Tilt or roll angles are over 1° and below -1°. In the case of using the Windcube buoy, if this alarm is not deactivated, you may often receive alarms.
- The EDFA is not working properly (turned off or has communication problem).
- Data are not saved correctly.
- There is a synchronization problem with the GPS or the NTP server.
- Availability lower than 30% for 80% of altitudes between 80 and 200m.

To configure your notifications,

- Click on the arrow next to your name **(1)**. In the drop-down menu,
- Click on Notifications **(2)**

The “Notifications” pop-up is displayed **(3)**

- Choose [subscribe for all] (or [unsubscribe for all]) or [case by case] **(4)**.

The same choice can be made for both notification types “system alerts” and “daily data files”.

The screenshot shows the user interface for configuring notifications. At the top, there is a 'Language' dropdown and a user profile icon labeled 'EU' with a blue circle '1' next to it. Below the profile icon is a dropdown menu with options: 'Profile', 'Notifications' (with a blue circle '2' next to it), 'Logout', and 'About'. A blue arrow points from the 'Notifications' option to a 'Notifications' pop-up window. The pop-up window has a title bar 'Notifications' with a blue circle '3' next to it. Inside the pop-up, there is a table with two rows: 'system alerts' and 'Daily data files'. Each row has a 'Current state' column and an 'Actions' column. The 'Actions' column contains two buttons: 'subscribe for all' and 'case by case'. A blue circle '4' is next to the 'subscribe for all' button in the 'system alerts' row. At the bottom right of the pop-up is a 'Close' button.

Notification type	Current state	Actions
system alerts ⓘ	You have subscribed for some Lidars in your fleet.	<div> <div>subscribe for all</div> <div>case by case</div> </div>
Daily data files ⓘ	You have not subscribed for any Lidars in your fleet.	<div> <div>subscribe for all</div> <div>case by case</div> </div>

When your choice is made, a message is displayed specifying that your options have been updated.

Notifications

You can receive some notifications by email. You can choose Lidars you will monitor this way. Please subscribe to notification flows below:

Notification type	Current state	Actions
System alerts	You have not subscribed for any Lidars in your fleet.	subscribe for all case by case
Daily data files	You have subscribed for all Lidars in your fleet.	unsubscribe for all case by case

Your options have been updated

Close

ABOUT FEATURE

From the “About” feature, you can download Leosphere’s privacy policy and terms and conditions.

- Click on the arrow next to your name **(1)**.

A drop-down menu is displayed **(2)**.

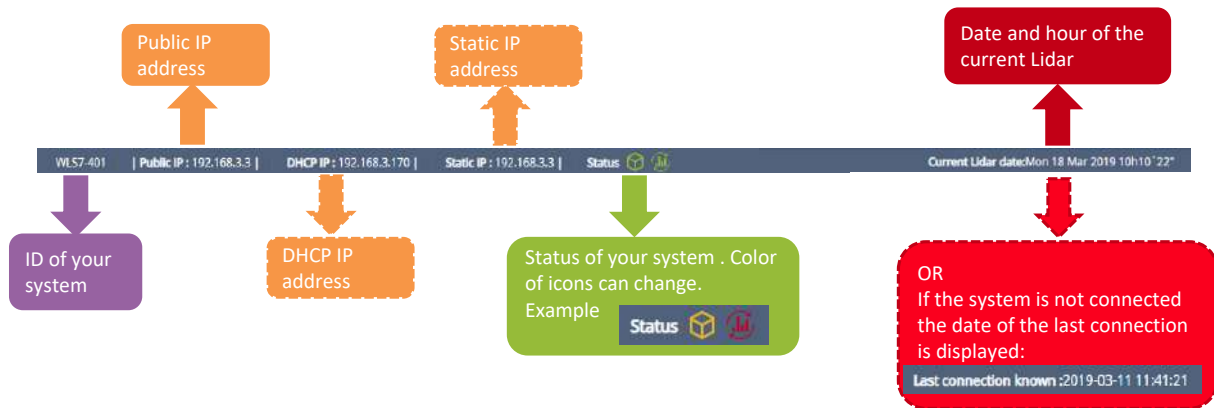
- Click on About **(3)**.

The “About” pop-up is opened **(4)**.

The screenshot shows the Leosphere user interface. At the top right, there is a 'Language' dropdown menu with 'EU' selected, marked with a blue circle (1). Below it, a drop-down menu is displayed, marked with a blue circle (2). This menu contains options: 'Profile', 'Notifications', 'Logout', and 'About'. The 'About' option is marked with a blue circle (3). Below the menu, the 'About' pop-up is opened, marked with a blue circle (4). The pop-up contains links for 'Privacy policy', 'Terms and conditions', and 'Windweb V2.0.2 Beta'. The Leosphere logo and 'A VAISALA COMPANY' text are visible at the bottom of the page.

Lower banner of Windweb

On the bottom banner, of each page of a selected system, several types of information are displayed:



DHCP IP and Static IP display as such only if they have been assigned to the system (in this case they displayed in the lower banner and also status file):

SYSTEM:
Optical head : 28.0 C, Computer rack : 27.3 C, Optical rack : 28.0 C
Space disk used(%) =50.4
IP-dhcp: None
IP-static: 192.168.3.222
Data saved correctly => Not set

WLS75 | Public IP : 185.184.6.153 | Static IP : 192.168.3.222 | Status (with icons)

3.3.2 FLEET OVERVIEW

Once connected to Windweb, the fleet overview page is displayed (for more detail on the connection, refer to [How to create a Windweb account? 6.1](#) chapter).

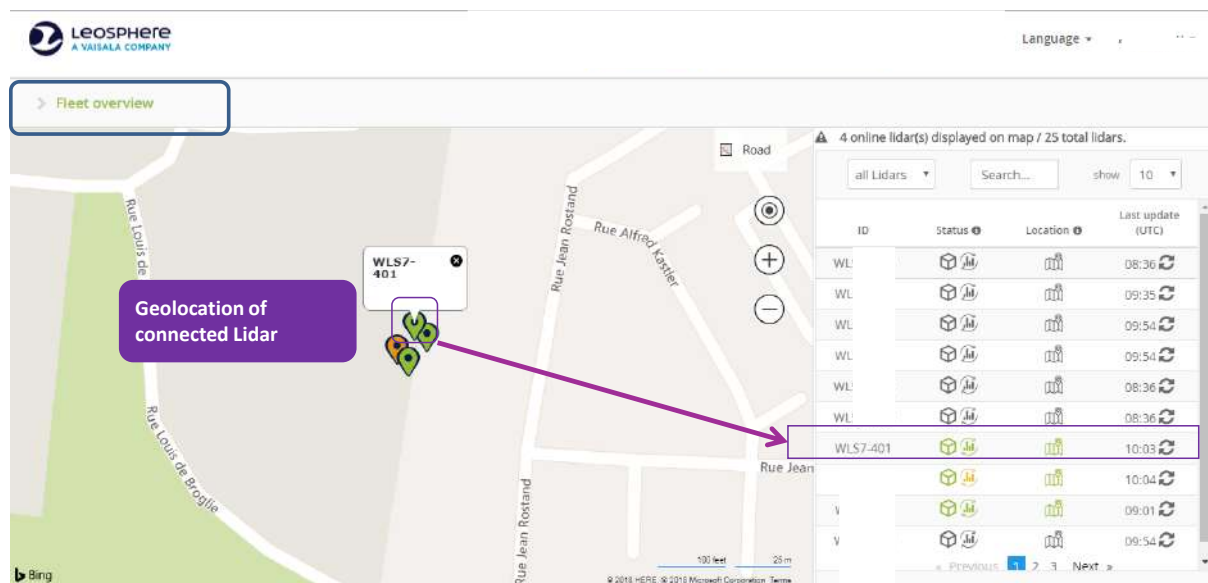


Figure: Windcube Graphical User Interface – Windweb

On the left side, your connected Lidar(s) is (are) visible, on the map. On the right side, you can see your fleet, with each Lidar and its status.

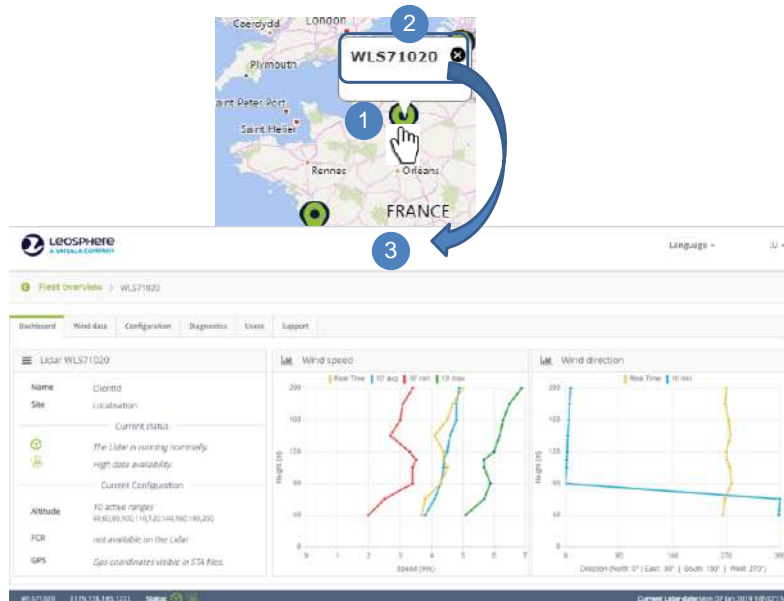
From the map, you can reach your connected Lidar. To do so:

- Click on the location icon **(1)**

The ID of your system is displayed;

- Click on it **(2)**

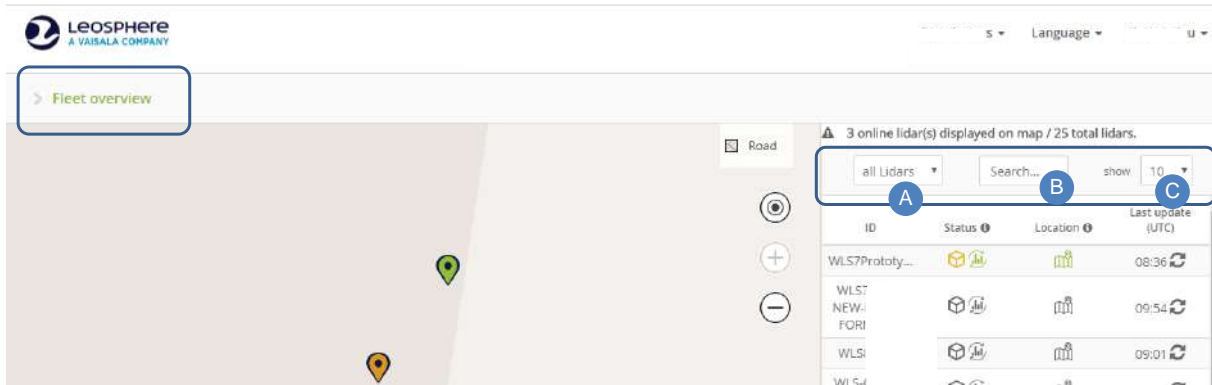
The [Dashboard] tab is opened **(3)**.



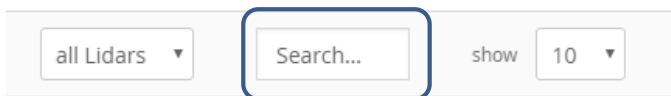
MANAGEMENT OF SYSTEMS LISTS BELONGING TO A FLEET

On the fleet overview, on the right of the screen, you can find a feature of sorting/search/pagination.

- A** By using the drop-down menu, you can sort out between “all Lidar”, “connected Lidar”, “critical Lidar status”, “warning Lidar status” or “unknown Lidar status”.
- B** You can search a system using its ID.
- C** By using the “Show” drop-down menu, you can display the number of Lidar you want, in case you have a big fleet of Lidar (between 10, 20, 30...).



SEARCH FIELD

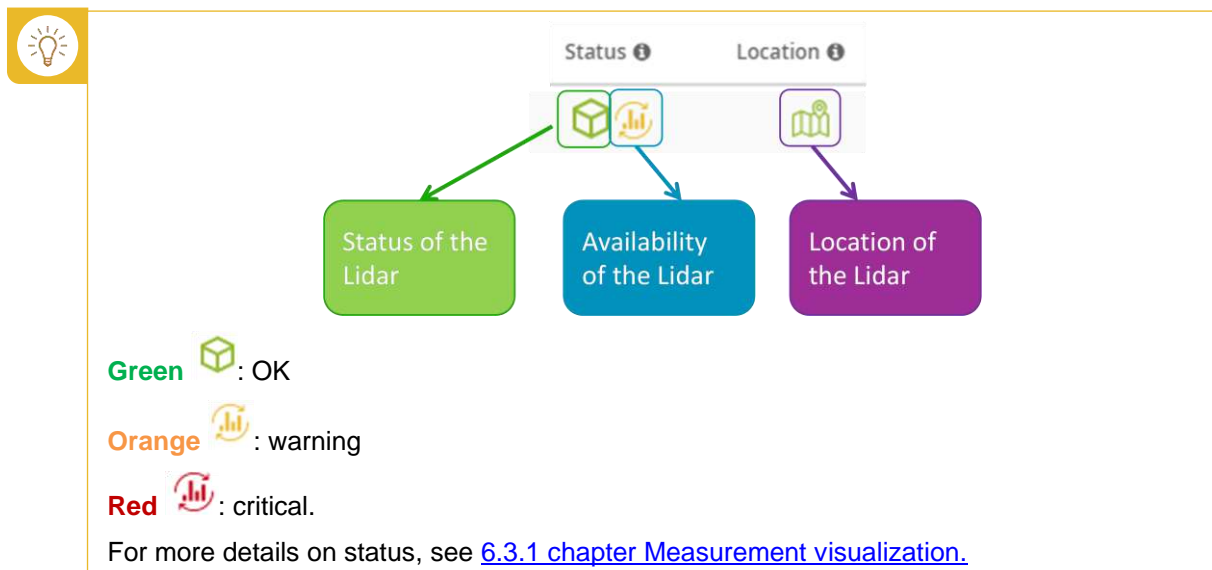


In the search field:

- Seize a character (or a character string of letters or numbers), a sorting will be made, giving all the systems having this character or this character string in its ID or name. Sorting is automatically made when you write a new character.

ICONS OVERVIEW

Next to the Lidar serial number (ID), you will see three icons: Lidar **status**, **data availability** and **location** of the Lidar from left to right.



MEANING OF STATUS ICONS

In **Status column**, two types of information are displayed: Lidar status and the data availability.

ID	Status ⓘ	Location ⓘ	Last update (UTC)
WLS7Prototy...			08:36

Icon colors can be:



In case this icon is displayed in status column, this means the Lidar is in maintenance.

ID	Status ⓘ	Location ⓘ	(UTC)
WLS7I			08:36
WLS7			10:18

By clicking on the ⓘ icon, a pop up will display by giving you the description of each color:

ID	Status ⓘ	Location ⓘ	(UTC)
WLS7P			10:19
WLS7 NEW-F FORM... ..			09:54

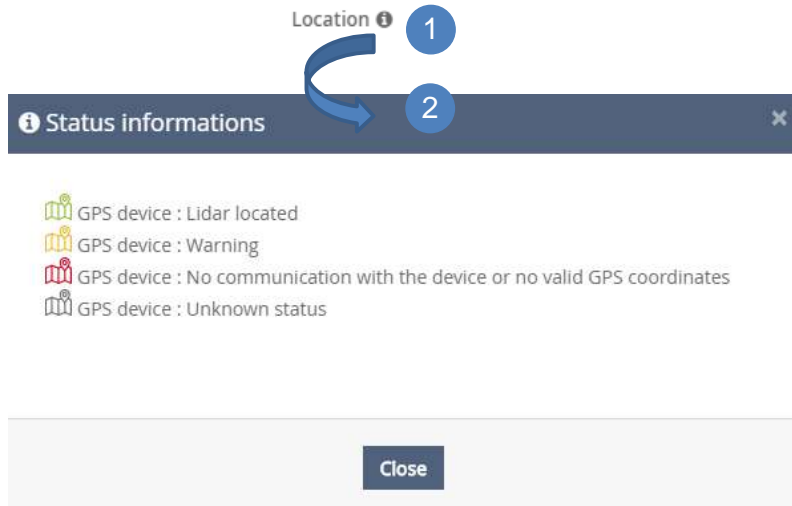
1 Status ⓘ

2

ⓘ Status informations

- Technical status : the Lidar is running nominally.
- Technical status : the Lidar requires your attention.
- Technical status : malfunctions prevent the Lidar from working properly.
- Technical status : unknown // the Lidar is not connected to Windweb.
- Data availability : High (> 80%)
- Data availability : Medium (30%<...<80%)
- Data availability : Low (<30%)
- Data availability : Unknown %
- Maintenance : the Lidar is taken care by technical support.

Close



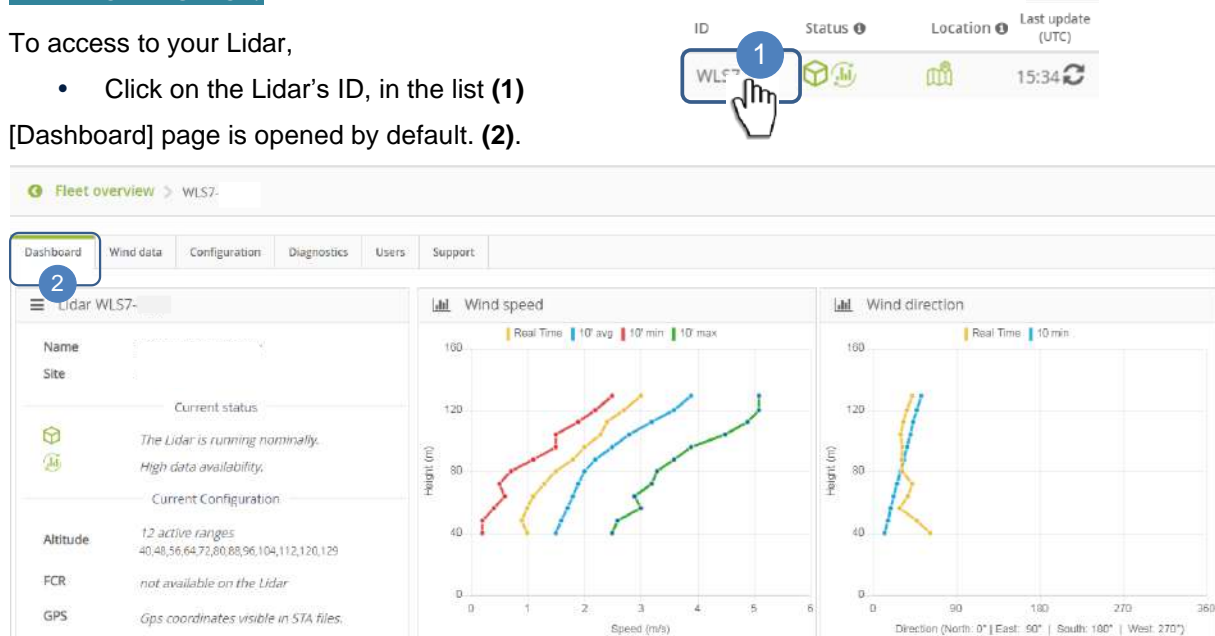
In case of a warning or critical icon, go to [Diagnostics] tab, to know where the problem is coming from.

LIDAR SELECTION

To access to your Lidar,

- Click on the Lidar's ID, in the list (1)

[Dashboard] page is opened by default. (2).



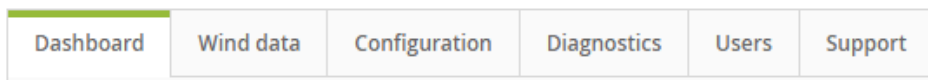
From any tab, you always have the possibility to go back to the fleet overview. To do so,


- Click on **Fleet overview** link, on the top left of the page.



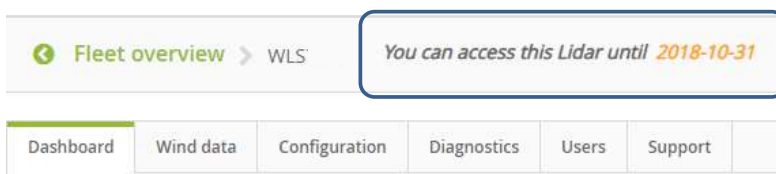
3.3.3 WINDWEB TABS OVERVIEW

Once you have selected one Lidar in the fleet overview, and according to your profile and your access rights, you can access at most to 6 tabs:



In case that your access right does not allow you to reach a tab, a no-entry sign is displayed  on the tab and that tab is un-clickable. For example, [Wind data] and [Users] tabs are not reachable if you don't have the appropriate access right.

The user is warned, directly in Windweb, when his user account is going to expire. Indeed, the information appears in Breadcrumb trail and specifies until when the user can reach the system. If your access is unlimited, no information appears in Breadcrumb trail.



3.3.4 [DASHBOARD] TAB DESCRIPTION



[Dashboard] tab allows a quick glance at system status, configuration, and measurements in real time:

- On the left: current system status and configuration (altitudes, GPS coordinates)
- On the right: real time horizontal wind speed and wind direction graphs

FCR is a feature used on onshore applications when there is complex terrain so, it does not concern the Windcube Buoy. For that reason, the field is deactivated and grey.

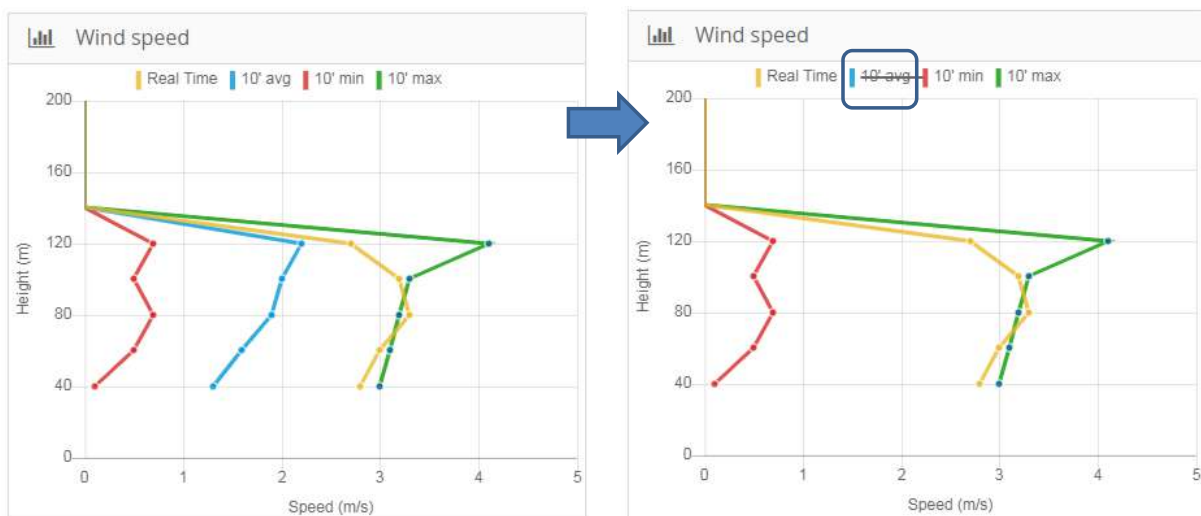


Entering in [Dashboard] tab refreshes all the data.

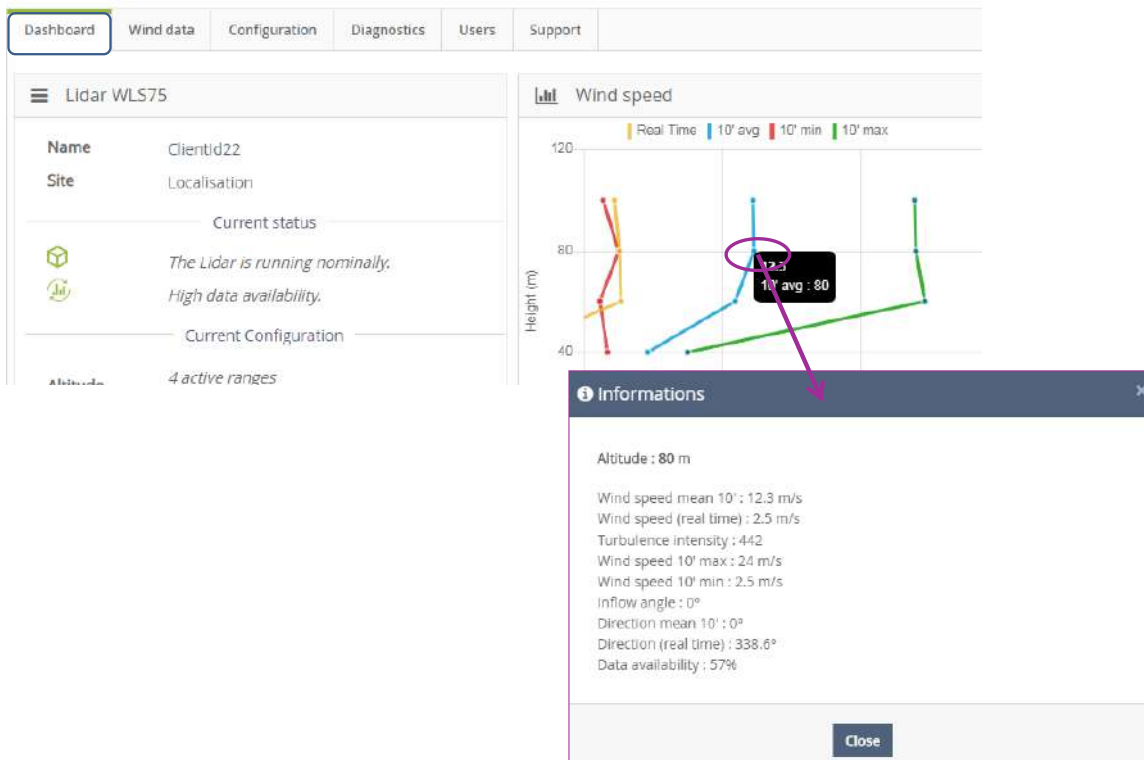
It may take a few seconds to load your Lidar's data on the [Dashboard] page. Wind data is automatically loaded.

If needed, it is possible to hide a curve by clicking on its titles.

Example:



By clicking on a height (dot) in the graph, a pop-up opens and displays information about the altitude.



If you want to edit the Lidar name and the Lidar location, go to [Configuration] tab.

The status of your Lidar is shown on the left, “Current status” on [Dashboard] page. If you need more details about the status of your Lidar, go to [Diagnostics] tab ([see \[Diagnostics\] tab, for more information](#)).

From [Dashboard] tab, you can also see the current configuration on this page, such as altitude, and GPS coordinates.

If you want to modify one of these configurations, please go to the [Configuration] tab ([see \[Configuration\] tab, for more information](#)).

3.3.5 [WIND DATA] TAB DESCRIPTION



Depending on your access rights, the [Wind data] page may not be accessible.

From [Wind data] tab, you can see or download data files. Data are not in real time so you can only download sta file. By default, you receive one file a day, at midnight. On the other hand, if you press “stop acquisition” and then make a “start” this will open a new sta file. Also, if you change a configuration or if you reboot your Lidar, the file will be closed and another one will be generated, so you can receive more than one file a day.

On the timestamp of the file, you have the ID system and also the date of the creation of the file, with the hour.

For more details on files description, please [refer to data file description paragraph](#).

The screenshot shows the 'Fleet overview' page for station WLS7. The 'Wind data' tab is selected. Below the navigation tabs, there are input fields for 'From' and 'to' dates, a 'Submit' button, and buttons for 'Files' and 'Graphs'. A message '231 files found' is displayed. Below this is a table with columns 'Dates', 'Graphs', and 'Files'. The first two rows of the table are highlighted with a purple box, and a purple arrow points from this box to a callout box that reads: 'List of all sta files to which the user is entitled to access'.

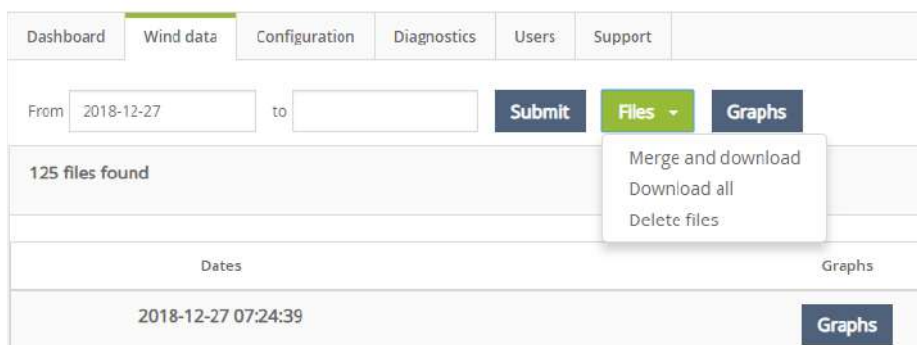
To select the date of the wind data you want to see or download,

- Use the calendar (from – to) for selecting dates **(1 & 2)**
- Click on [Submit] **(3)**

The number of files is displayed **(4)**. You can display and download the files by clicking on [Graph] and [Download] respectively **(5)**.

This screenshot illustrates the steps to select a date and download files.
 (1) and **(2)** point to the 'From' and 'to' date input fields.
 (3) points to the 'Submit' button.
 (4) points to the '4 files found' message.
 (5) points to the 'Download' button in the 'Files' column of the table.
 A calendar for July 2018 is shown, with the date 26th selected. The table below shows four files with their respective 'Graphs' and 'Download' buttons.

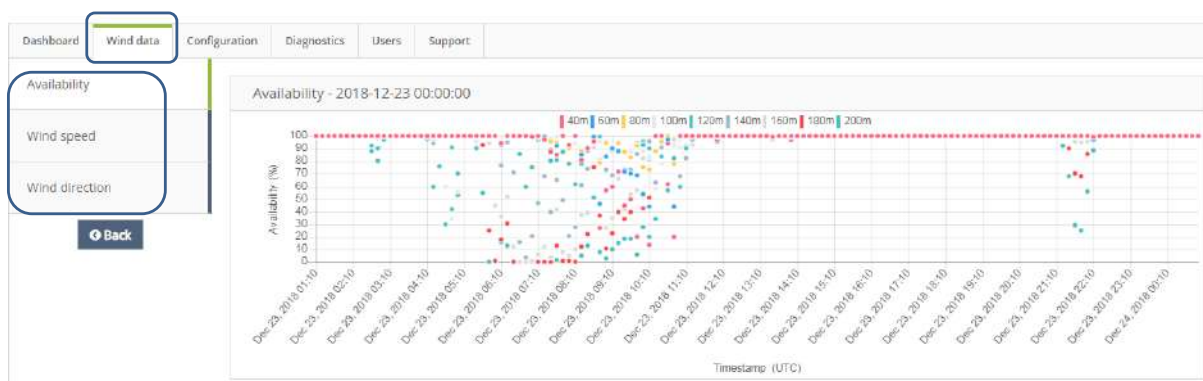
By clicking on [Files] button, a drop-down menu gives you access to three actions: “Merge and download”, “Download all”, and “Delete files”.



- According to your granted rights you have (or not) the possibility of deleting files.
- If you click on Delete files, this action deletes files from the Windweb server.

From [Graphs] button you can visualize 3 kinds of data as graph.

You have 3 tabs on your left, so you can select either [Availability], [Wind speed], or [Wind direction].



Data Monitoring

Horizontal wind speed graph

- Click on [Wind speed] tab to display the corresponding graph:

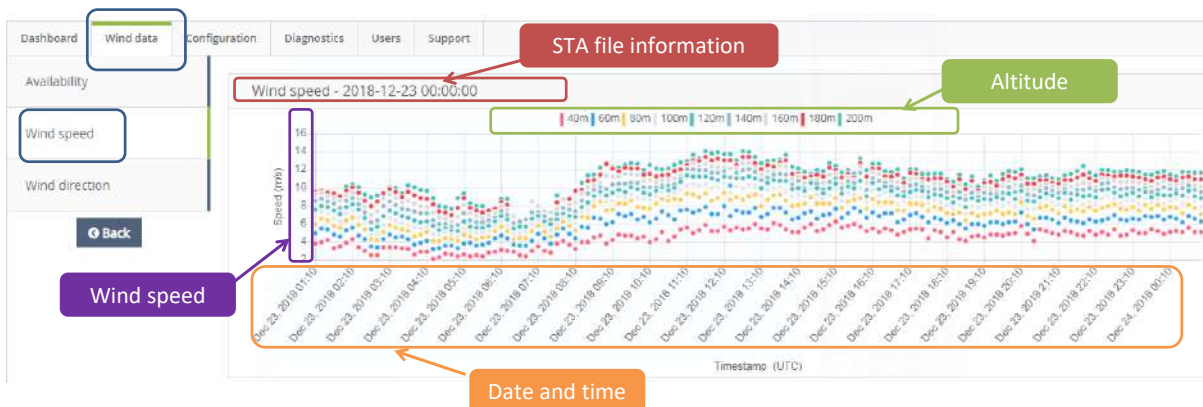


Figure: Wind speed graph

Direction graph

- Click on [Wind direction] tab to display the corresponding graph:

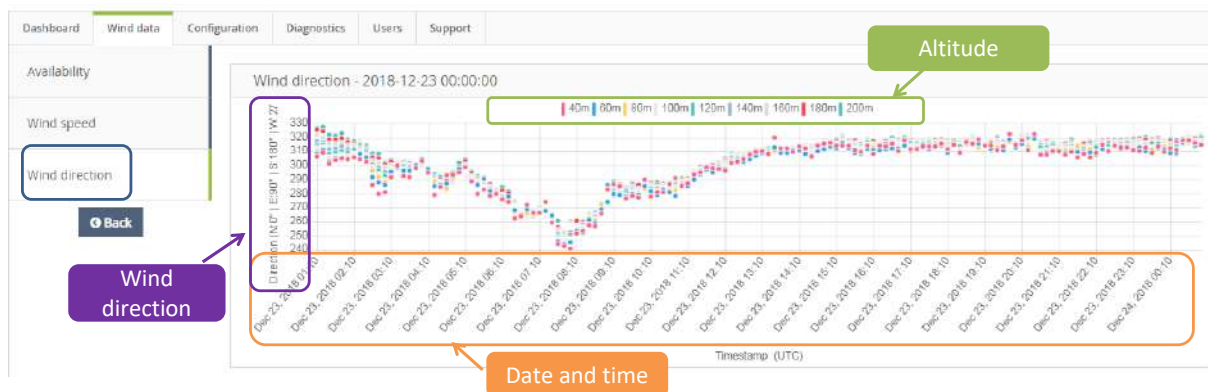


Figure: Wind direction graph

Availability graph

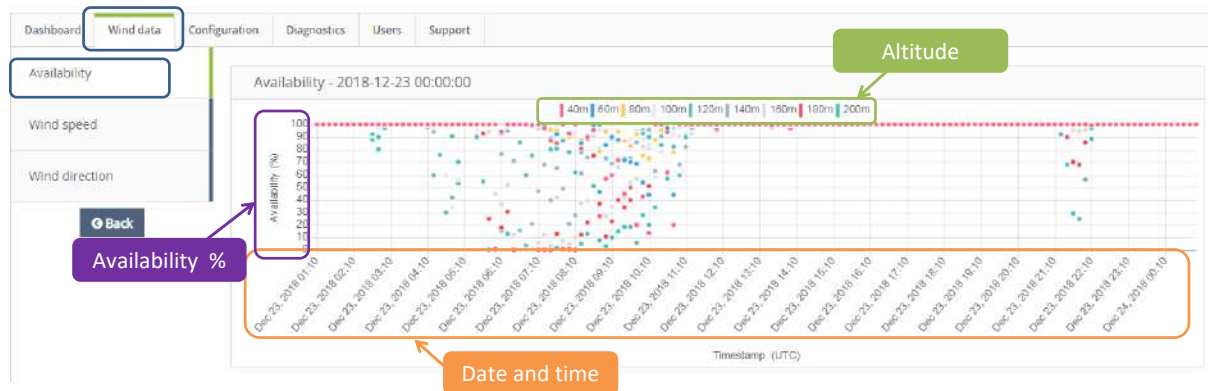


Figure: Availability graph

3.3.6 [CONFIGURATION] TAB DESCRIPTION

Depending on your access rights, from [Configuration] tab, you can give your Lidar a name, a site location and then configure the GPS and heights, set the time synchronization and the direction offset, activate the data push to FTP server, activate the Wi-Fi network and finally add a comment if necessary. The network parameters are only available from Windweb Lite interface, when you are on field.

For more information on [Configuration] tab, [refer to 4.10.1 chapter How to seize your configuration parameters?](#)

Dashboard
Wind data
Configuration
Diagnostics
Users
Support

Lidar ID: WLS

Lidar name:

Site: Localisation

recorded GPS: Lat: 48. N, Long: ☐ Hide GPS in data files.

Measurement heights:
40 60 80 100
Add 12 max.

Direction offset: -110,000 (East)/(West) 180° max

Time Synchron.: ☐ GPS ☒ NTP Server

Averaging time: 10 min

FCR: ☐ Enable FCR (Flow Complexity Recognition)

FTP:
☒ Activate data push to FTP server

☒ SFTP Protocol (SSH) ☐ FTP Protocol

Host:
Port: 22
User: LEOSPHERE
Password:

DATA:
☒ .STA files (~23 Ko / daily file)
☒ .STDSTA files (~23 Ko / daily file)
☒ .RTD files (~10.8 Mo / daily file)
☒ .ALM files (~3 Ko / file)

Wifi:
☒ Activate Wifi network

Local IP address with Wifi will be 192.168.0.1. For example, you will access Windweb Lite with a Wifi access on the Lidar on: http://192.168.0.1/windweb

SSID Key:
Password:

PTH: ☐ Activate PTH option

Powerpack: ☐ Activate Powerpack option

Comments:
modif coord gps / device

Apply changes
Advanced Configuration

For a Windcube Buoy, the fields FCR, PTH and Powerpack are disabled.

In case you have a FTP server, you can activate the data push to FTP server.

For more detail on the FTP configuration, please, [refer to 5.2 chapter, Getting data: FTP Data transfer](#).

If needed, you can also activate the Wi-Fi network. For more details, please [refer to Windweb lite with Wi-Fi connection chapter](#).

Users of the Windcube Buoy are not affected by all these files formats. You can access to STA and RTD files (STDSTA files are for FCR functionalities).

3.3.7 [DIAGNOSTICS] TAB DESCRIPTION

If you have the right for, from [Diagnostics] tab, you can see the status of your Lidar.

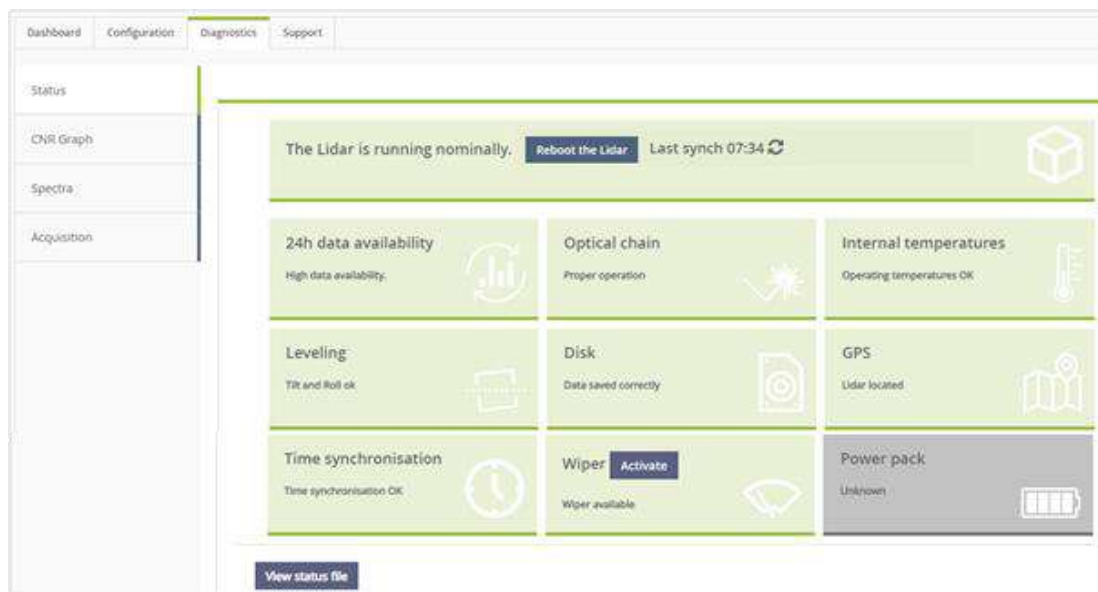
On the left, 3 or 4 sub-tabs allow you to access to the following pages:

- [Status] (not always visible)
- [CNR Graph]
- [Spectra]
- [Acquisition]



If you don't have the right to see status, you will have only 3 sub-tabs: [CNR Graph], [Spectra] and [Acquisition].

From [Diagnostics] tab → [Status] sub-tab, you can see the state of your Lidar:



You have 9 boxes displaying: Data availability, leveling, time synchronization, optical chain, disk, wiper, internal temperatures, GPS, Power pack.

From the top of the page, you can also, if necessary, reboot the Lidar or launch time synchronization.



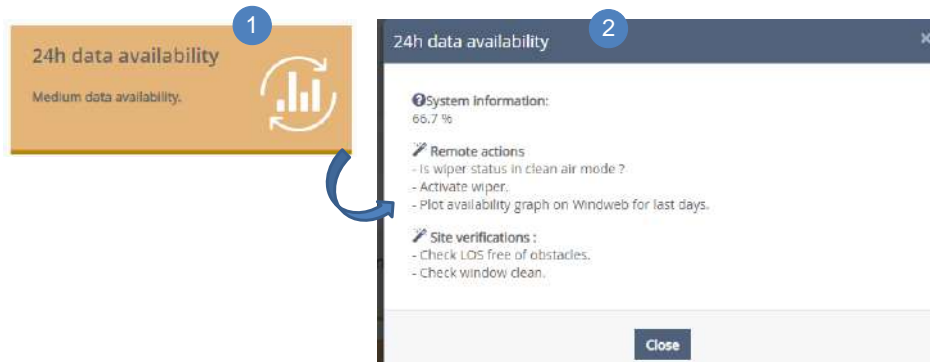
The [View status file] button allows you to access to Real time status file. Statuses are generated every 30 minutes.



The meaning of color boxes is as follow:



If one of the indicators is orange or red, you can click on it to open a pop-up and have more details.



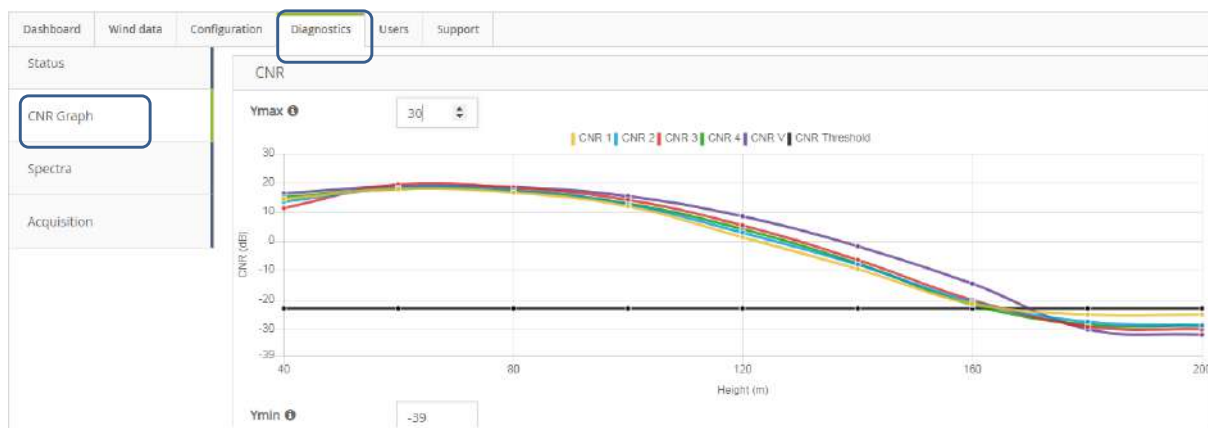
For more information on status, indicators and alarms, refer to [System monitoring chapter → visual indicators and alarms](#).

The [View status file] button, at the bottom of the page, opens a pop-up with all real time statuses, such as: alarm and warning origin state of EDFA Diode, system, signal, compass, data availability, last time synchronization and Power pack.

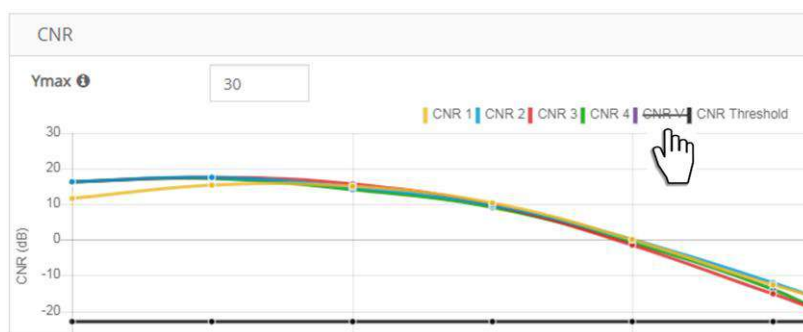
View status file



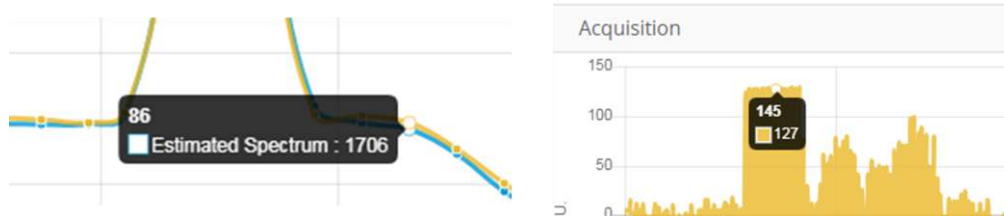
From [Diagnostics] tab → [CNR Graph] sub-tab you can visualize the CNR graph. In order to zoom on CNR graph, you can set Ymax and Ymin scale.



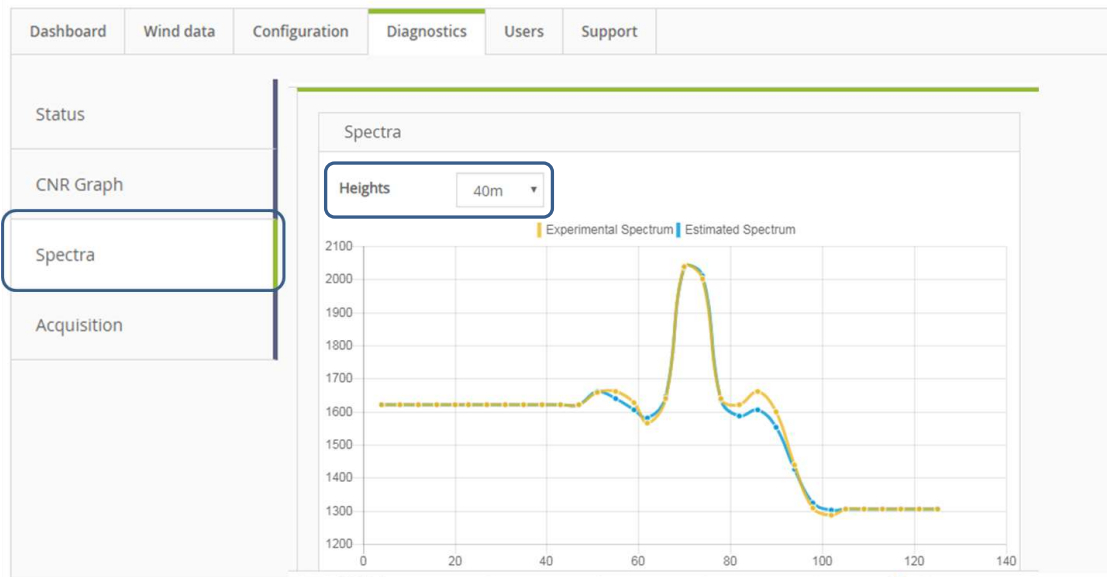
For each graph, you always have possibility to hide a curve by clicking on its title.



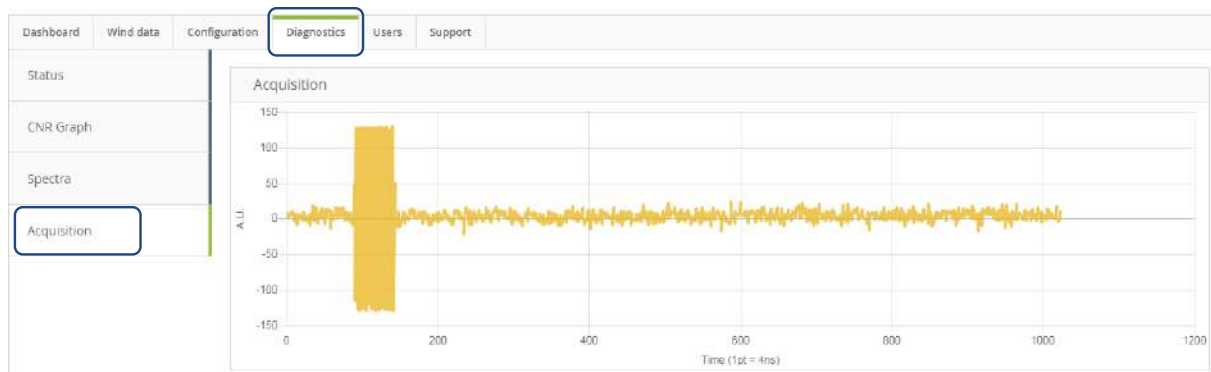
If you move the mouse on a point of the curve, a tooltip appears:



From [Diagnostics] tab → [Spectra] sub-tab you can observe the spectra for the selected height (from 40 to 200 meters).



From [Diagnostics] tab → [Acquisition] sub-tab you can also visualize the acquisition.

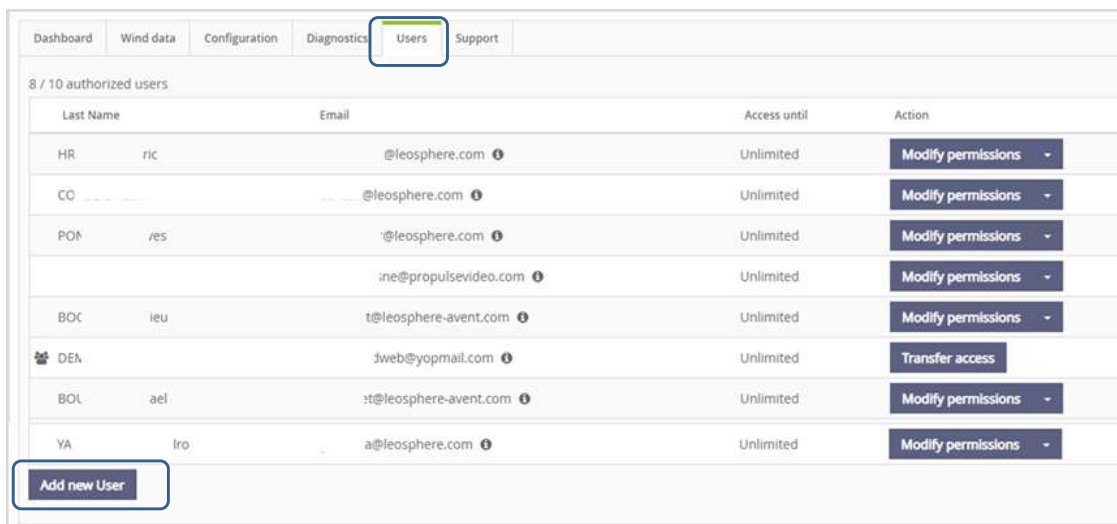


3.3.8 [USERS] TAB DESCRIPTION

The [Users] tab is only accessible for final users with adequate rights. A final user can authorize a maximum of 10 users on a system.

To add a user on a system just

- Click on [Add new user] button.



Last Name	Email	Access until	Action
HR	ric@leosphere.com	Unlimited	Modify permissions
CG	@leosphere.com	Unlimited	Modify permissions
PO	res@leosphere.com	Unlimited	Modify permissions
	ine@propulsevideo.com	Unlimited	Modify permissions
BO	ieu@leosphere-avent.com	Unlimited	Modify permissions
DE	web@yopmail.com	Unlimited	Transfer access
BO	ael@leosphere-avent.com	Unlimited	Modify permissions
YA	iro@leosphere.com	Unlimited	Modify permissions

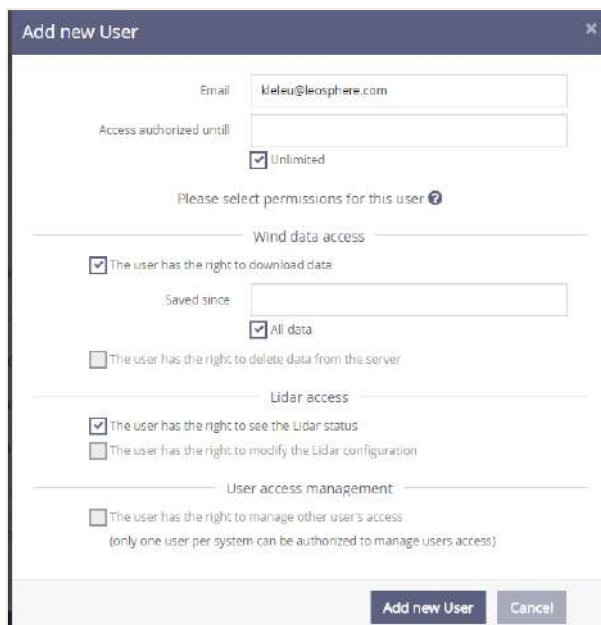
Add new User

From this screen, the final user can:

- add a user,
- transfer his access right to someone,
- modify permissions of a user or
- delete an access to a Lidar
- delete a user account.

Once you have clicked on [Add new user] button, the pop-up showed below opens.

- Select the permissions you want to give to the new user.



Add new User

Email: kleieu@leosphere.com

Access authorized until: ☒ Unlimited

Please select permissions for this user

Wind data access

☒ The user has the right to download data

Saved since: ☒ All data

☐ The user has the right to delete data from the server

Lidar access

☒ The user has the right to see the Lidar status

☐ The user has the right to modify the Lidar configuration

User access management

☐ The user has the right to manage other user's access
(only one user per system can be authorized to manage users access)

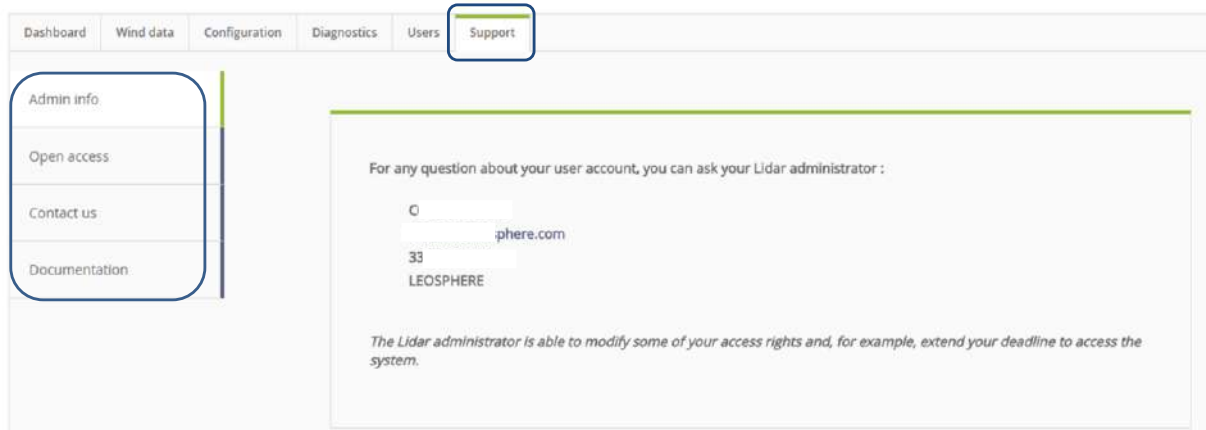
Add new User Cancel

For more information, see [User management chapter](#).

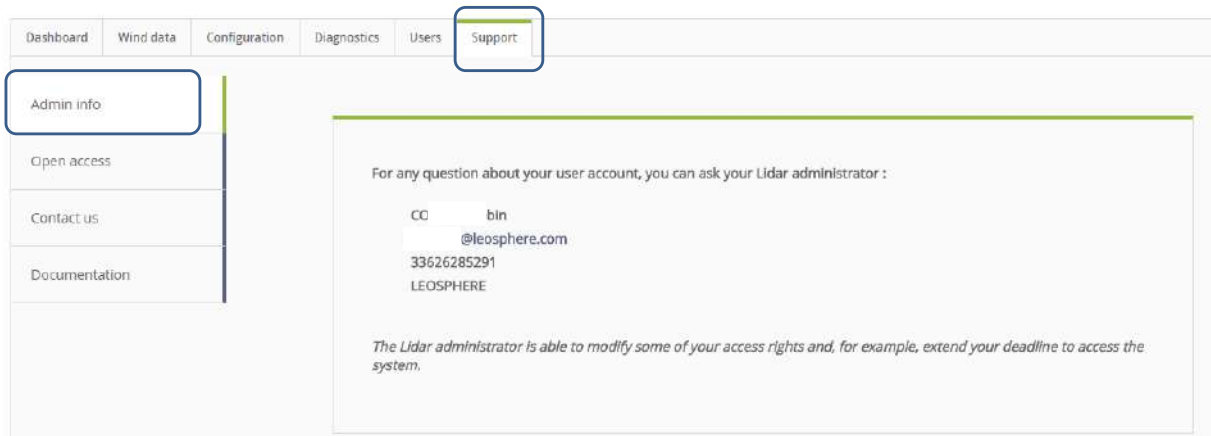
3.3.9 [SUPPORT] TAB DESCRIPTION

From [Support] tab, you can reach some services and information.

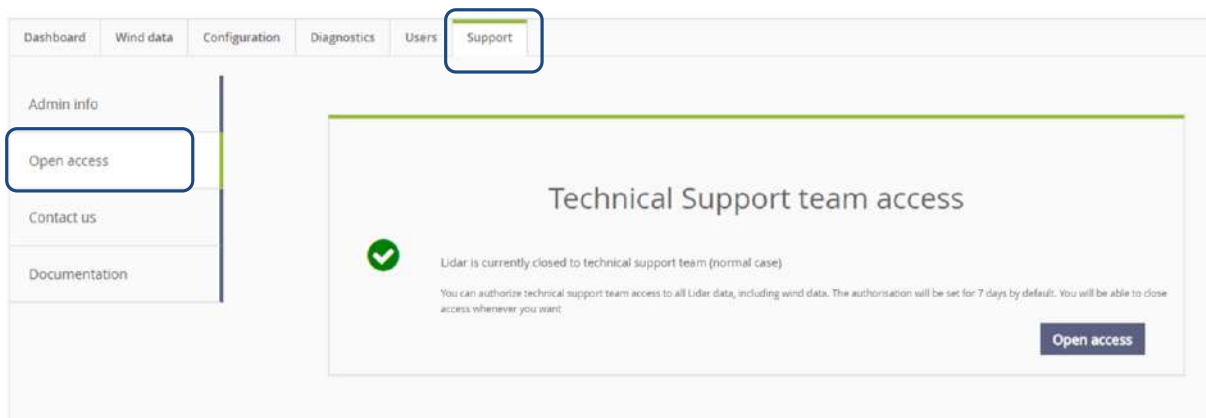
On the left side, you have 4 sub-tabs:



- **[Admin info]** → This sub tab displays your Lidar administrator information in case you need to contact him. The Lidar administrator can modify your access rights, if necessary.



- **[Open access]** → This sub tab allows opening your Lidar to the technical support team. So, the support team can access to your Wind data, during 7 days by default. To do so:
 - Click on [Open access]



You can extend the access during 7 days more if needed and you can also close the access to the technical support whenever you want it.

- **[Contact us]** → form to contact Leosphere technical services. From the drop-down menu (1),
 - Select your type request (2)

- Write a subject and your message **(3)** and a message **(4)**, if necessary
- Click on [Send] **(5)**.

- **[Documentation]** →to access and download the user documentation, matching with your system.

3.4 Requirement for use



Access to Windcube software controls and measurements is achieved via an Ethernet or Wi-Fi connection. For a connection with Wi-Fi, please [refer to 4.7 chapter: Windweb Lite with Wi-Fi connection](#).

3.4.1 COMPONENTS FOR CONNECTION

This connection requires a laptop with the following components:

- Standard network card with standard Ethernet cable or a Wi-Fi card/key
- A recent Web browser (Firefox or Chrome recommended)
- Laptop IP address correctly configured (see below)
- FTP (File Transfer Protocol) software (FileZilla recommended to download files).

IP address configuration example for **Windows 7 operating system** (Fig. below):

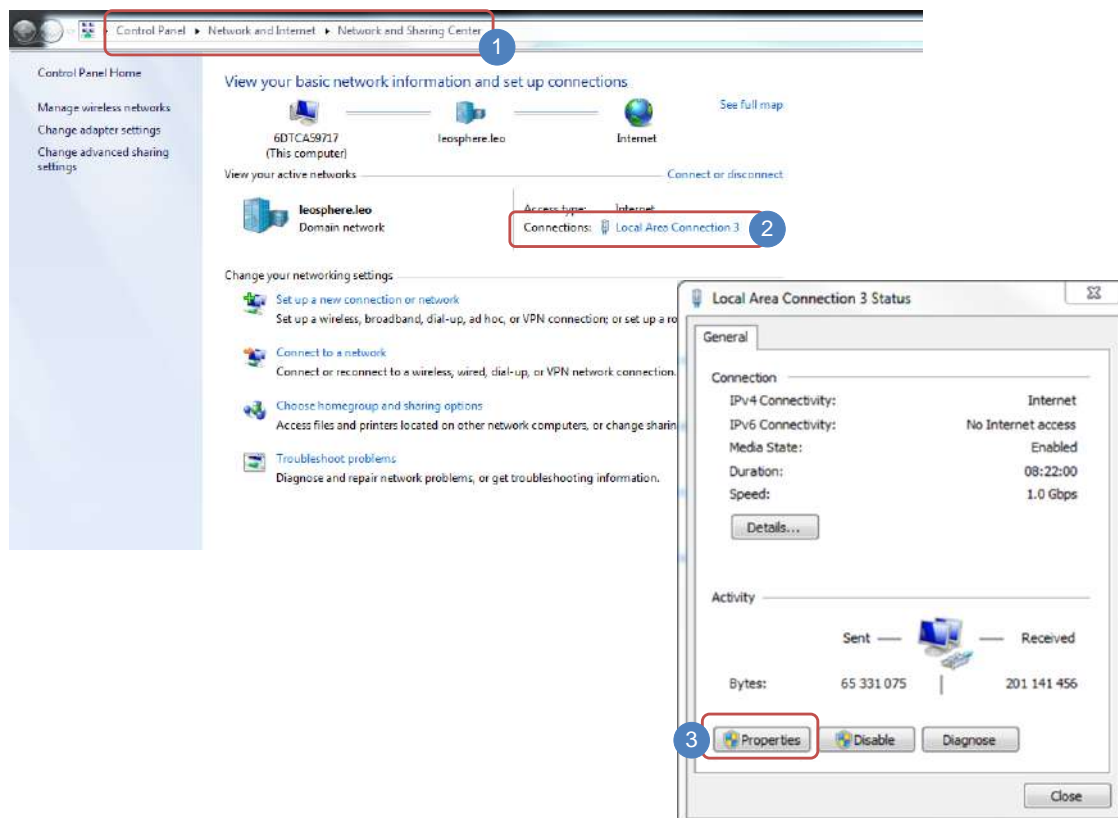
- Select: Start\Settings\Network and Internet → network and sharing center **(1)**
- Double click on “Local area connection” **(2)**, then in the new window,
- Click on [Properties] button **(3)**.

In [Networking] tab,

- Select Internet Protocol version 4 (TCP/IPv4) **(4)**, then
- Click on [OK] **(5)**

In the new window,

- Select “Obtain an IP address automatically” **(6)** or define an address on the same sub-network as the system, you can write 192.168.15.3 and
- Click on [OK] **(7)**.



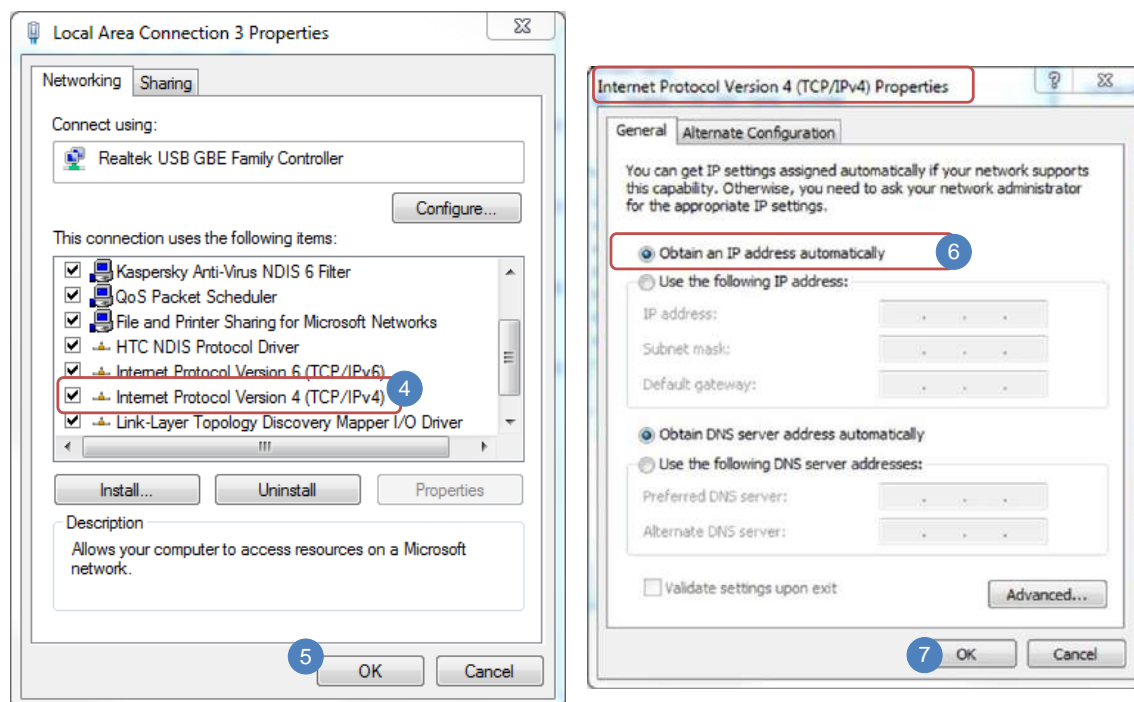


Figure: IP address configuration

FTP SOFTWARE INSTALLATION

- Insert USB key provided or go to <https://filezilla-project.org/> to download the setup file.
- Click on FileZilla setup.
- Click on Execute, then on "I Agree".
- Click on [Next] several times, then on [Install].

To use the remote access Windcube via 3G/GPRS, a SIM card DATA is needed and requires:

➤ A sufficient on site network coverage	➤ PIN code should be deactivated
➤ DATA transfer enabled	➤ SIM card APN address (Access point Name)
➤ A needle or Allen key size 2	

3.5 Data file description

3.5.1 WIND VECTOR DESCRIPTION BACKGROUND

In STA file, wind vector is described with the following wind characteristics:

- **HWS:** Horizontal wind speed vector.
- **x:** Component of horizontal wind speed vector along the axis North to South.

- **y**: Component of horizontal wind speed vector along the axis East to West.
- **z**: Vertical wind speed vector.
- **Direction**: Wind direction, angle given from geographical North. If Geographical North doesn't fit with Beam 1 (impossibility during installation) it can be corrected with the «direction offset» parameter in the Windcube configuration.

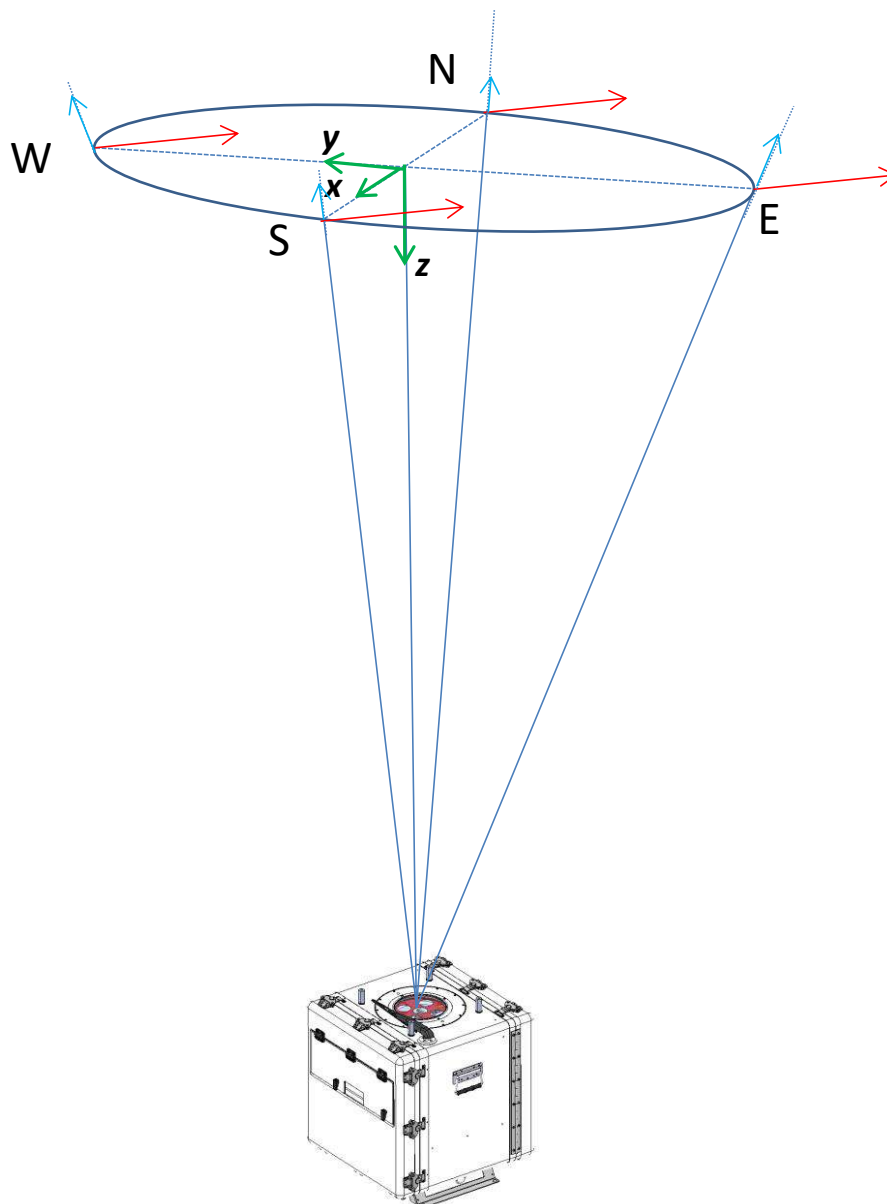


Figure: Wind vector reconstruction



A positive z component corresponds to a down sloping wind vector.

3.5.2 STA FILE

FILE DESCRIPTION

Data are averaged over 10 minutes. STA files contain the daily statistical measurements. They can be downloaded from the remote Windweb or directly from the Windcube.

STA file name is time stamped as describe below:

WLS866-XXXX_YYYY_MM_DD__hh_mm_ss.sta

- **WLS866-XXXX:** Windcube serial number
- **YYYY:** year when the file was created and measurements start
- **MM:** month of data
- **DD:** day of data
- **hh_mm_ss:** time of the first data registered in file (Hour_minute_second)

For example, the file named WLS866-100_2018_04_16__14_01_27 was created the 16th of April 2018, at 14h01min27sec UTC (at 2:01:27 PM UTC) by the Windcube WLS866-100.

FILE STRUCTURE

STA file structure is divided in 3 main parts:

- Header: contains main system information and Windcube parameters aimed for diagnosis only.
- Column titles: corresponding to main data that are measured inside and outside the Windcube.
- Main data: data independent of altitude and data for each measurement altitude.

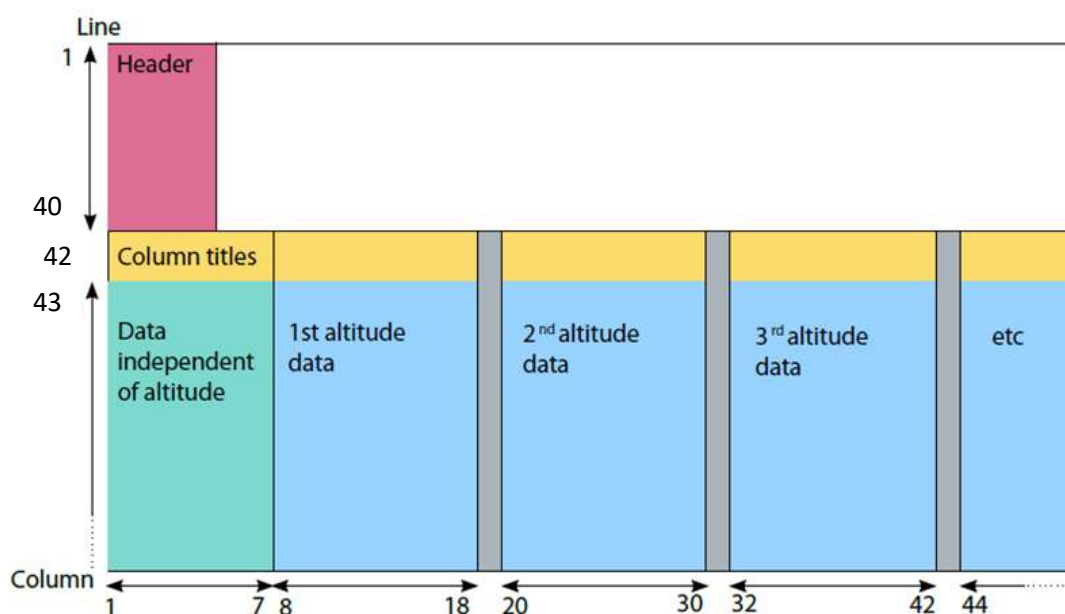
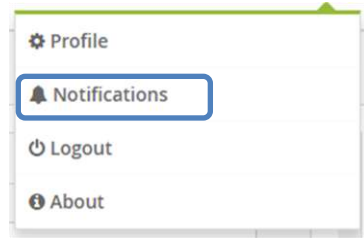


Figure: STA file scheme

Files can be unzipped with the freeware 7-zip, available on internet, and opened with Microsoft Excel.



STA files are sent by mail every 24 hours. Notifications by mail can be managed by clicking on Notifications, from the arrow next to your name.



STA FILE HEADER

	A	B	C	D	E
1	HeaderSize=40				
2	Version=WF 2.1.0				
3	ID System=WLS70000				
4	ID Client=				
5	Location=				
6	GPS Location=				
7	Comments=Comment				
8	FCR Option= OFF				
9	timezone=UTC+0				
10	*****				
11	Windcube Parameters (internal use only)				
12	*****				
13	Sampling Frequency (Hz)=				
14	Ref Frequency (Hz)=				
15	Pulses / Line of Sight=				
16	Samples / Pulse=				
17	Reflected Pulse Start=				
18	Reflected Pulse End=				
19	Ref pulse samples nb=				
20	Nb High Pass Filter Points=				
21	FFT Window Width=				
22	Laser Diode Current (mA)=				
23	LOS=1.25				
24	Init Drive Position (°)=0				
25	Pulse Repetition Rate (Hz)=				
26	Pulse Duration (s)=				
27	Trigger Delay Time=				
28	Wavelength (nm)=				
29	ScanAngle (°)=				
30	DirectionOffset (°)=				
31	Declination (°)=				
32	PitchAngle (°)=				
33	RollAngle (°)=				
34	CNRThreshold=				
35	VrThreshold (m/s)=				
36	SigmaFreqThreshold (m/s)=				
37	WiperCNRThreshold=				
38	WiperAltitude (m)=				
39	WiperDuration (ms)=				
40	Altitudes (m)	40	60	80	100
41	*****				

General system info

Windcube parameters
for diagnosis purposes only

Altitudes

Figure: STA file header detail

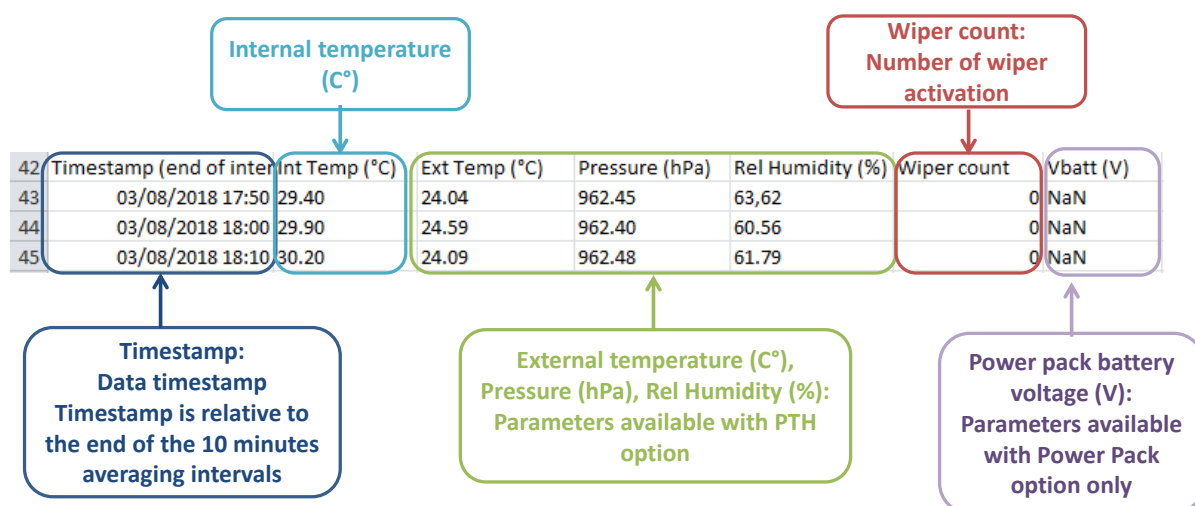


Figure: STA data independent of altitude



Figure: STA data dependent on altitude



For CNR min below the CNR threshold, values are displayed instead of «NaN». Even if the CNR min. is under the CNR threshold, values will be shown

STA file management

WITH WINDWEB

Always when your system is connected to Internet, STA data files are available through the Windweb by clicking on [Wind Data].

STA files can be viewed and downloaded; they can be filtered by date by using the calendars “from” – “to”.

The screenshot shows the 'Wind data' tab in the Windweb interface. The 'From' and 'to' date filters are empty. The 'Submit' button is highlighted. The table shows 128 files found. The first two rows of the table are for the date 2018-12-29 00:10:00, each with a 'Download' button in the 'Files' column.

Every STA files since the Windcube initialization are listed by date and hour. They can be:

- filtered by date with the calendar,
- downloaded one by one, or all together,
- merged and downloaded in one file,
- deleted

The screenshot shows the 'Wind data' tab in the Windweb interface. The 'Files' dropdown menu is open, showing options: 'Merge and download', 'Download all', and 'Delete files'. A purple arrow points from the 'From' and 'to' date filters to a purple box labeled 'Calendar to filter by date'.

Figure: Data management

HOW TO ERASE DATA

To erase data from the server (but not on your system),

- Click on [Wind data] **(1)**.

In files drop-down menu,

- Click on [Delete files] **(2)**.

The “Confirmation” pop-up opens **(3)**

- Enter your password to confirm the deletion of data from ... to ... **(4)**
- Click on [Delete] **(5)**.



STA FILE DISPLAY

User can display individual or merged STA file graphs such as:

- Availability graph
- Wind speed graph
- Direction graph

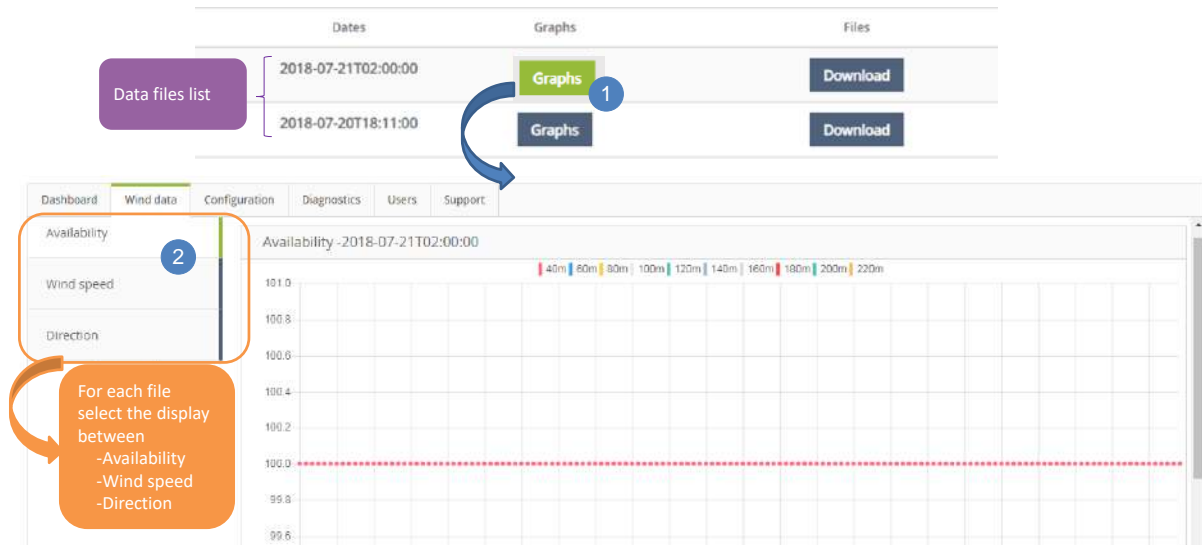


Figure: Data management

3.5.3 RTD FILE

FILE DESCRIPTION

RTD files contain the daily real-time measurements. They can be downloaded using “Push FTP” option or directly from the Windcube using sFTP access.

RTD file name is time stamped as describe below:

WLS866-XXXX_YYYY_MM_DD__hh_mm_ss.rtd

- **WLS866-XXXX:** Windcube serial number
- **YYYY:** year when the file was created and measurements start
- **MM:** month of data
- **DD:** day of data
- **hh_mm_ss:** time of the first data registered in file (Hour_minute_second)

For example, the file named WLS866-1024_2018_09_12__15_21_47 was created the 12th of September 2018, at 15h21min47sec UTC (at 3:21:47 PM UTC) by the Windcube WLS866-1024.

FILE STRUCTURE

RTD file structure is divided in 3 main parts:

- Header: contains main system information and Windcube parameters aimed for diagnosis only.
- Column titles: corresponding to main data that are measured inside and outside the Windcube.
- Main data: data independent of altitude and data for each measurement altitude.

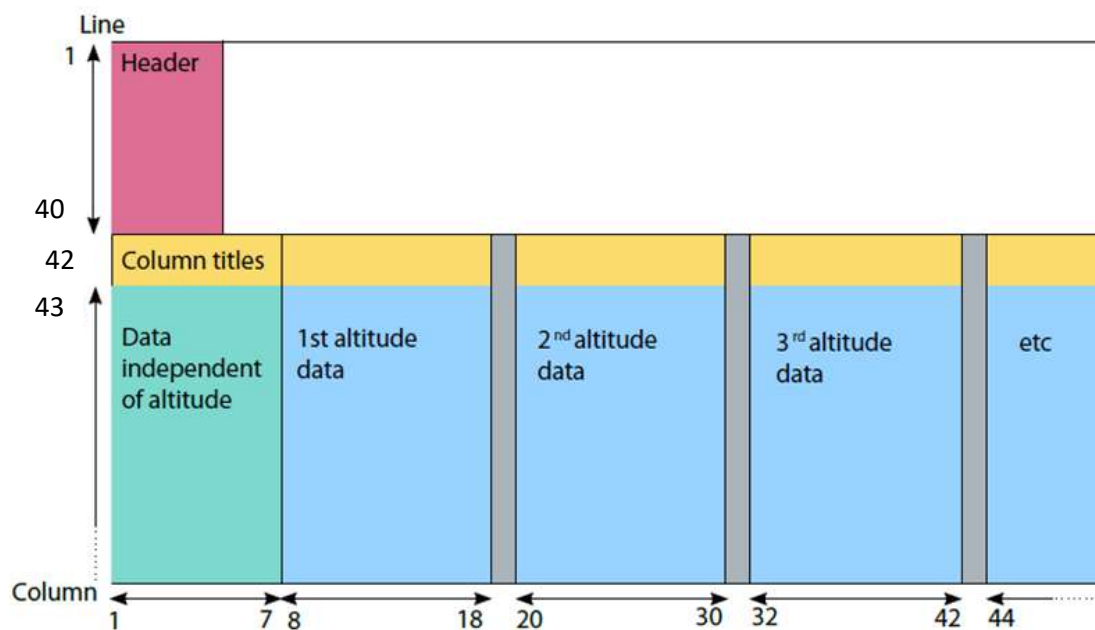


Figure: RTD file scheme

RTD FILE HEADER

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	HeaderSize=40														
2	Version=WF 2.1.0														
3	ID System=														
4	ID Client=Clientid														
5	Location=Localisation														
6	GPS Location=														
7	Comments=														
8	FCR Option= OFF														
9	timezone=UTC+0														
10	*****														
11	Windcube Parameters (internal use only)														
12	*****														
13	Sampling Frequency (Hz)=NA														
14	Ref Frequency (Hz)=NA														
15	Pulses / Line of Sight=NA														
16	Samples / Pulse=NA														
17	Reflected Pulse Start=NA														
18	Reflected Pulse End=NA														
19	Ref pulse samples nb=NA														
20	Nb High Pass Filter Points=NA														
21	FFT Window Width=NA														
22	Laser Diode Current (mA)=														
23	LOS=														
24	Init Drive Position (°)=0														
25	Pulse Repetition Rate (Hz)=NA														
26	Pulse Duration (s)=NA														
27	Trigger Delay Time=NA														
28	Wavelength (nm)=NA														
29	scanAngle (°)=NA														
30	DirectionOffset (°)=														
31	Declination (°)=NA														
32	PitchAngle (°)=														
33	rollAngle (°)=														
34	CNRThreshold=														
35	VrThreshold (m/s)=NA														
36	SigmaFreqThreshold (m/s)=NA														
37	WiperCNRThreshold=														
38	WiperAltitude (m)=														
39	WiperDuration (ms)=														
40	Altitudes (m)	40	50	60	70	80	90	100	110	120	130	140			
41	*****														
42	Timestamp	Position	Temperature	Wiper Count	40m CNR (dB)	40m Radial V	40m Radial V	40m Wind Sp	40m Wind Dir	40m X-wind	40m Y-wind	40m Z-wind (m/s)		50m CNR (dB)	50m Radial V
43	2018/12/09 0	0.999.00		1	-10.82	1.02	0.01	9.11	247.97	1.577	-8.977	0.602		-10.47	0.61

Figure: RTD file header detail

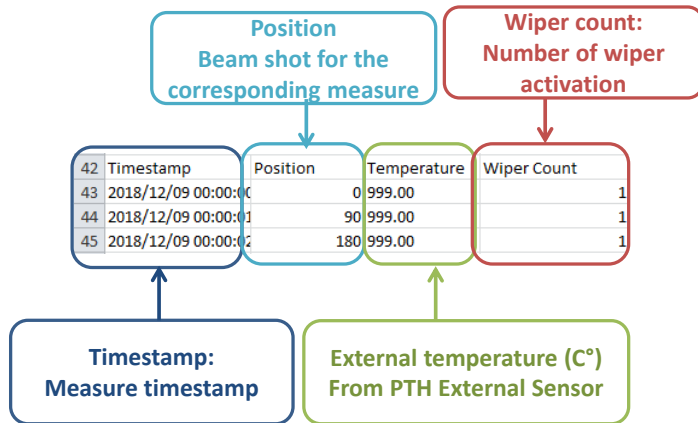


Figure: RTD data independent of altitude

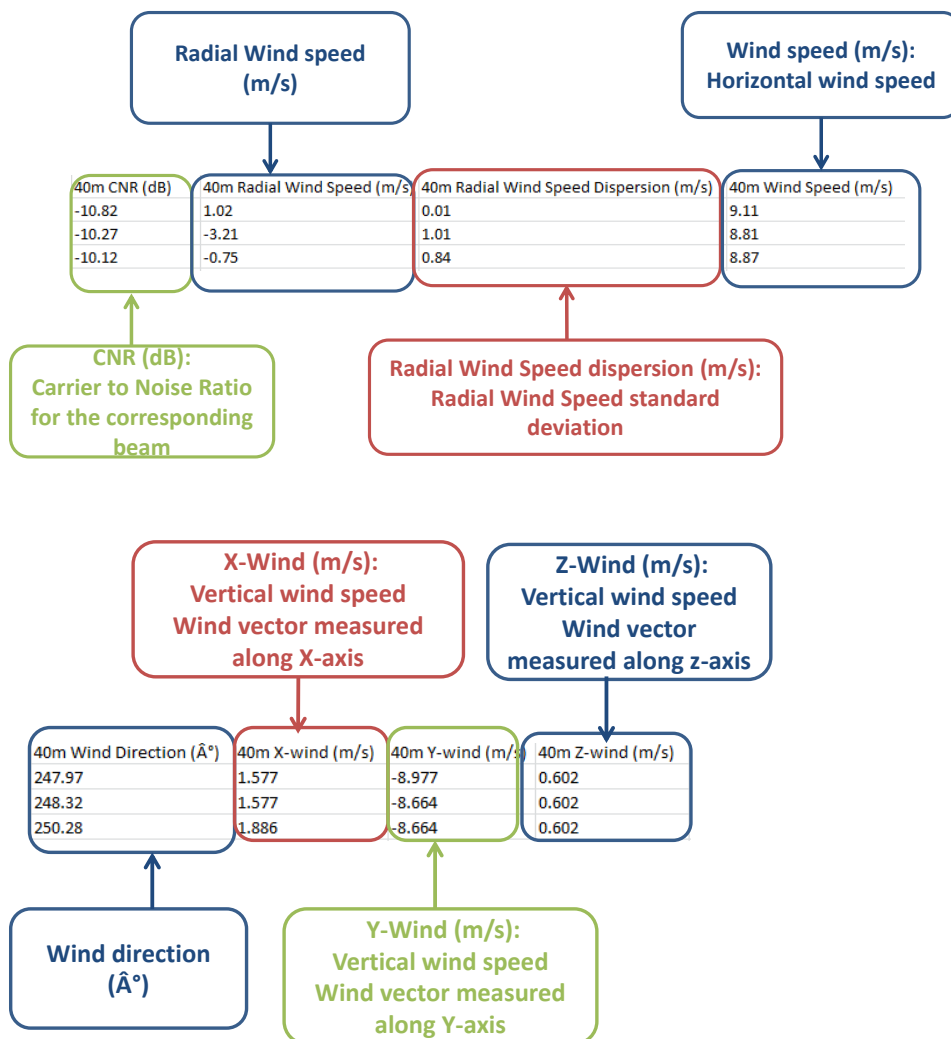


Figure: RTD data dependent on altitude

3.5.4 OUTPUT DATA

Saved data files format are:

V.1.0 - January 2020

- rtd : real-time data
- sta : statistical data

3.5.5 DATA VOLUME

Data are automatically compressed and saved on the Windcube.

The following tab indicates the data volume saved every 24 hours.

Data type	Data volume
rtd.7z	10Mo/24h
sta.7z	20ko/24h

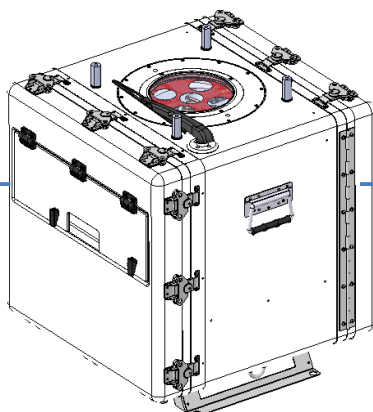
3.6 Overview of Windcube options

For your Windcube, the following options are available:

- [Geofencing](#)
- [PTH](#)

Each option is described separately, in this user guide, from [chapter 10, Windcube options](#).

Geofencing option



PTH option



Using the table of contents, please refer to the option you are interested in.

If one of our partners provides you one of the options, it is possible that the documentation described below, does not correspond exactly to the material you have. In this case, thank you for contacting your partners and ask him the adequate documentation.

3.7 RECOMMENDATIONS FOR DATA CONSUMPTION IN CASE OF 3/4G MODEM OPTION

Here are Leosphere's recommendations of use in order to better control the consumption of data. These recommendations are valid in the following case of use:

- 3/4G Modem

Consumption occurs in the following cases:

- Synchronization and
- Wind data and status files sending

→ This is a set of outgoing requests from the system.

Consumption occurs also in use of the service by a user:

- Request to display real-time data graphs: wind speed and direction, CNR, spectrum and acquisition.
- Request such as loading (editing and modification) of the configuration, loading the file of "statuses in real time".

→ This is a set of outgoing requests from the system at demand of a user on Windweb.



These requests can be minimized and vary according to each user.

We recommend having a good Internet connection and use a 4Go package.

3.7.1 CASE OF PUSH FTP OPTION

If "push FTP" option is enabled, data files (STA, and / or RTD) are sent by the system to an FTP server at the customer's choice.

Each sent file increases the amount of data consumed by the system.

3.7.2 PARAMETERS THAT HAVE AN EFFECT ON DATA CONSUMPTION

- **Number of gates.** Indeed, in the Windcube configuration, the greater the number of measurement heights is, the more data have to be transmitted (both in the STA and Real Time data).
- **Averaging time.** The smaller the averaging time is, the bigger wind data files are (STA, STDSTA, RTD).
- **Quality of connection.** In case of poor connection quality, the consequence is an increase in the amount of consumed data.



- If the connection is lost for a moment, all outgoing requests of the system are overtaken (shutting the modem for a few hours doesn't reduce the consumption, unless the system reboots before reconnecting the modem).

- **Alarms.** If the system reaches back a lot of alarms (system in critical status), this can have an influence on the amount of data consumed.
- **Creation of wind data files.** A large number of files (instead of just the daily file) can therefore involve an overconsumption of data.
- **Other connections** (technical support connections, etc.). Connections to the remote system involve data consumption.



If the system needs to be updated (for example with an upload of a SETUP file on the system), we recommend checking the state of the connection and your package to ensure that it's possible.

3.7.3 RECOMMENDED PACKAGE

- For **GSM modem use**
- 4GB Package/ Month recommended



These elements are mandatory (risk of an uncontrolled overrun):

- "Moderate" consultation of Windweb pages displaying real-time data (wind speed and direction, CNR, spectra and acquisition).

	Per minute	Per day	Per month
System sending its basic data on Windweb (statuses and STA), without the use of Windweb by a visitor (without FTP push enabled)	25 Ko / min	36 Mo / day	1.2 Go / month
Visitor on Windweb (solicitation of real-time values)	250 Ko / min		
In case of Activate data push to FTP server option is checked in Windweb, with STA only; Hyp: 1 file/ day		+ 30Ko	+1Mo
In case of Activate data push to FTP server option is checked in Windweb, with RTD (STA and STDSTA negligible in this case); Hyp: 1 file/ day		+11.1Mo	+350Mo

In case of Activate data push to FTP server option is checked in Windweb, with ALM only, Hyp: 1 alarm / day	+4Ko	+125Ko
--	------	--------

3.7.4 USING CASES EXAMPLES

Classic use, with a daily Windweb consultation

Hypothesis:

- The system has a good Internet connection
 - The system is configured to communicate with Windweb server
 - Push FTP option is not enabled
 - A user connects daily to Windweb to check the status of his system (3 times, during 15 minutes per session)
- Daily consumption:
- $$36 \text{ Mo} + 250\text{Ko} \times 15 \times 3 + 3.6\text{Mo} = 51\text{Mo}$$
- Monthly consumption:
- $$51 \times 31 = 1.6\text{Go}$$



In this case, the user retrieves his files either by email or on Windweb application.

Advanced use with push FTP option checked (RTD) and a daily Windweb consultation

Hypothesis:

- The system has a good Internet connection
 - The system is configured to communicate with Windweb server
 - Push FTP option is enabled with RTDs sending
 - A user connects daily to Windweb to check the status of his system (3 times, 15 minutes per session)
- Daily consumption:
- $$36 \text{ Mo} + 250\text{Ko} \times 15 \times 3 + 3.6\text{Mo} + 11.1 = 62\text{Mo}$$
- Monthly consumption:
- $$62 \times 31 = 2\text{Go}$$



In this case, the user retrieves his files either by email or on Windweb application or with the Push FTP.

4 INSTALLATION AND MECHANICAL INTEGRATION OF THE SYSTEM

- A voltage converter is supplied with the WINDCUBE for a pre-operational use, with specifications available in this manual. The user is the only responsible of the power supply on the floating platform.
- Before installing the system on a floating platform, prepare the system and the location, as presented in the following chapter.
- Make sure no obstacle could obstruct the 5 lines of sight.

4.1 INSTALLATION

A Lidar installation on a floating buoy involves a strong bias in the measurement accuracy and could substantially affect LIDAR Wind measurement reliability.

In order to retrieve properly the wind speed and the wind direction, it is mandatory to monitor the position and movements of the LIDAR.



Before installing your Windcube, determine its future location and ensure that:

- The system is located away from any obstacles in all wind directions of interest.
- Obstacles do not interfere with any of the five laser beams.
- The line of sight must not be obstructed.

4.1.1 ANTENNA REQUIREMENTS

The following section provides a series of guidelines for best practice in antenna installation.

- Obstructions to the line-of-sight can create areas of poor system coverage. The antenna **MUST ALWAYS** have a clear view.
- The antenna must be upright/facing the sky to ensure maximum exposure.
- The antenna must be located so that it has a good view of the sky, ideally providing good horizon coverage.
- Antenna should be mounted so that they are away from structures (masts, buildings, etc.) by a minimum distance of at least 0.5m. Also, any of the antennas types (3G/GPRS, and GPS) should be far from each other.
- Ensure that the antenna is mounted so that it will not become detached from its supporting structure under normal external forces.

4.1.2 PREPARE AND SECURE LOCATION

Before installing the system, make sure to have the following accessories or components:

- at least 40L of soft water
- at least 10L of isopropanol
- a proper power supply that conforms to the specifications mentioned in this manual
- in case the option WINDCUBE Anywhere 3G has been subscribed, make sure to have a mast installed high enough for the antenna.

Unpack the system and its elements. Store the shipping case.



Shipping case is not waterproof and must be stored in a dry environment.

Before putting the WINDCUBE on its floating platform, put it on a stable and firm surface, and install all its peripheral accessories (more information further).

The following chapters explain the installation of:

- WINDCUBE Anywhere 3G/GPRS option
- Water tank

These installations should be prepared before launching the system on the buoy.

- Unpack the system and its elements from the shipping case and the additional box. Put the WINDCUBE on a stable, clean and firm surface.

To handle the system,

- Screw the lifting rings with the plastic washers to prevent from scratching the system surface.



Risks of Lidar failover exist. Thus, we recommend fastening the Lidar to the ground, by using the fixing rings. This also allows a wind resistance and resistance to possible shocks. Please, do not lean or rest on your Lidar.



To prevent theft, chain Windcube to one or more ground anchors.

- Hook a heavy-duty chain (not included) through Windcube ring (Fig. below).
- The anchor should be located below the system, so it is less visible to the public.
- Plan to install hook on chosen spot.

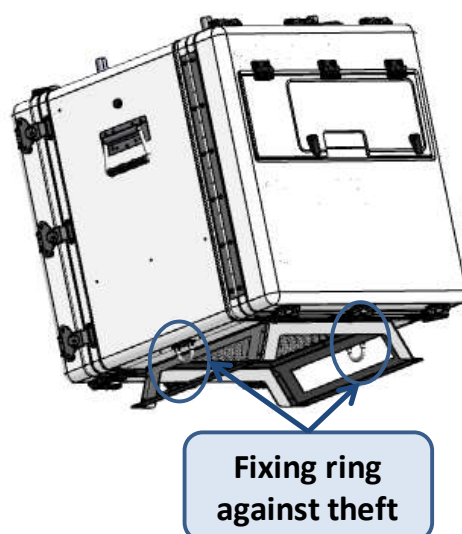


Figure: Chain Windcube to anchor

4.1.3 SUNSHADE

The sunshade aims at protecting the system from extreme heating, due to sun rays.

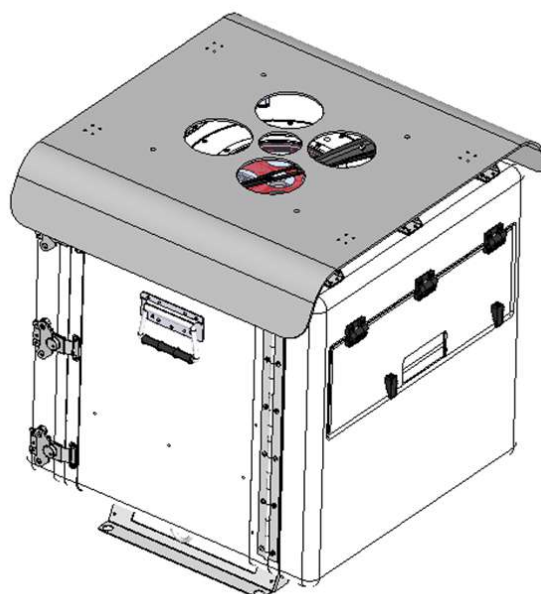
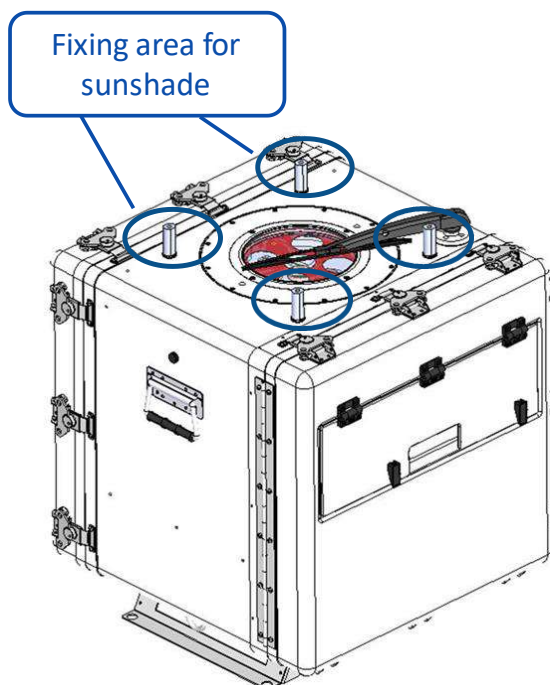


Figure: Windcube with sunshade

4.2 INITIAL SETUP

4.2.1 LOCATION OF YOUR LIDAR

- Unpack the system and its components.
- Install the Windcube in the predetermined location, on a stable and firm surface.
- The system must be fixed to the buoy using the feet

4.2.2 ORIENTATION OF YOUR LIDAR

The recommendations below are only when using the Windcube onshore.

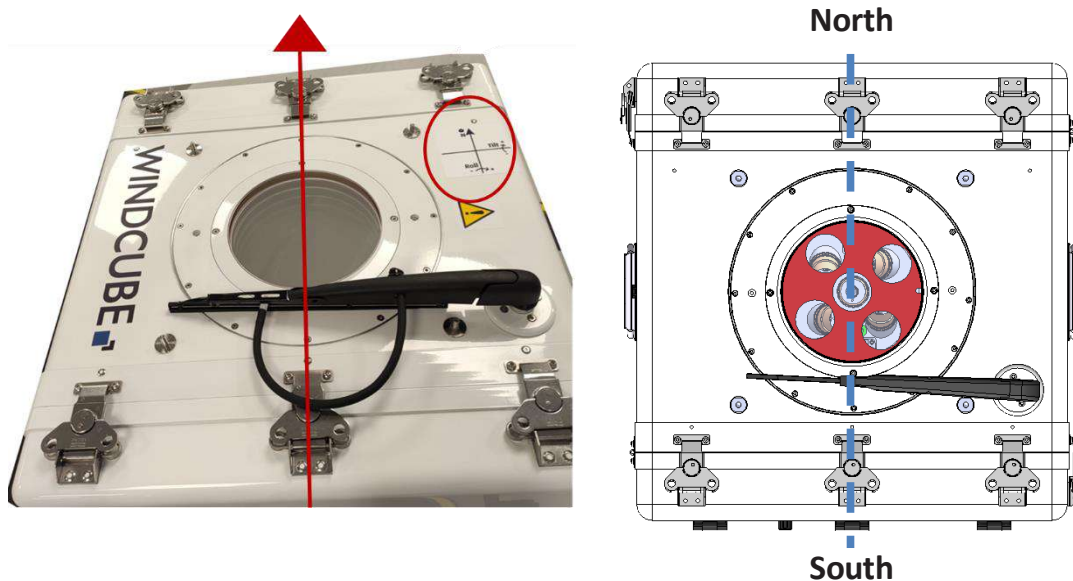


Figure: Northward orientation

4.2.3 EXTERNAL PUMP CONNECTION

- Mount the container by inserting the feet in their dedicated location on the lower part of the container (**Fig below**).



Figure: Water container

NB: Item may differ from photograph

- Install the pump: insert first the power supply cable in the aperture and then, the Neoprene cable, so that the pump is in the container.

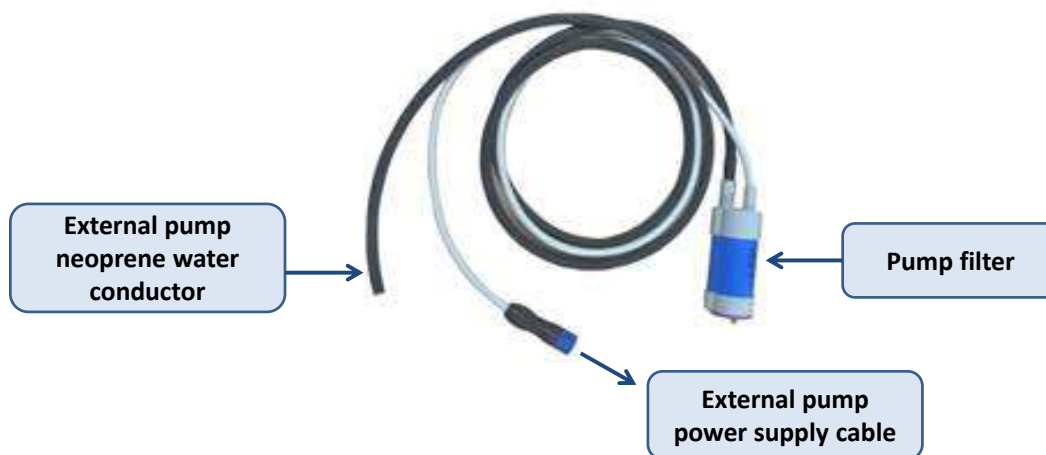


Figure: External water pump

- Fill the container with a mixture of water and isopropanol (isopropyl rubbing alcohol) according to the maintenance program ([refer to section 8.1](#)). Water level must be a minimum of 10 cm in order to completely cover the pump.
- Connect external pump power supply cable into Windcube trapdoor.

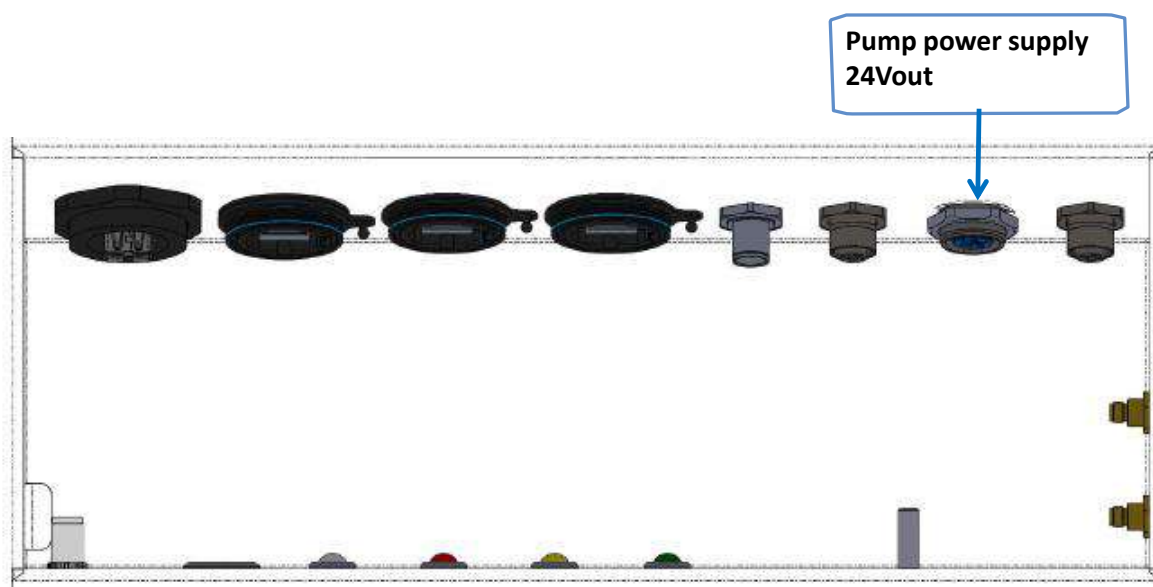


Figure: Connection trapdoor - Pump power supply connector

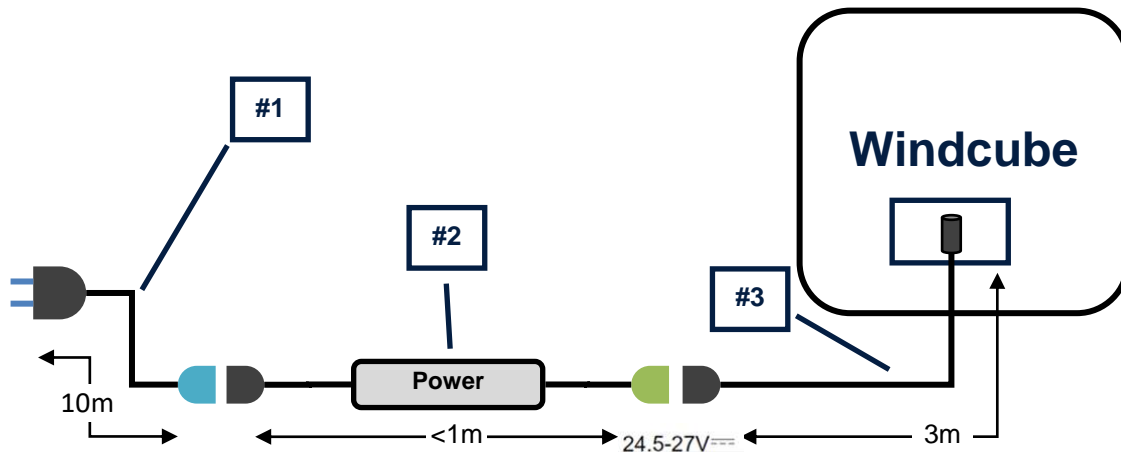
- Connect Neoprene water conductor from external pump to Windcube wiper water conductor using the included adapter.



The pump filter should be regularly cleaned, to ensure external pump efficiency.

4.3 POWER SUPPLY

The Windcube is delivered with a suitable power supply cable (#1), an AC/DC converter (#2) and an extension cord (#3).

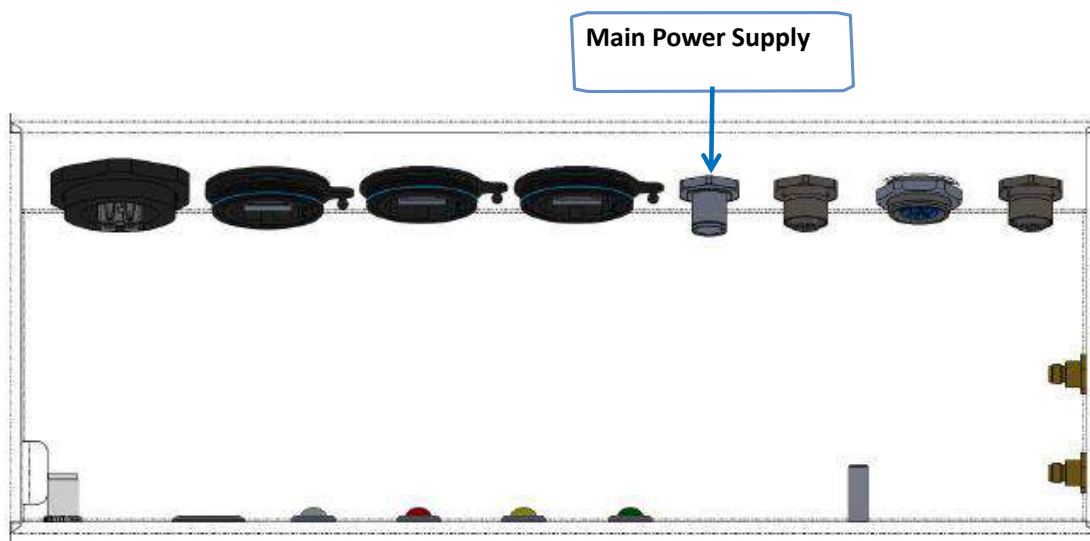


Therefore, user can choose between supplying either high (100-240 VAC) or low (24,5-27 VDC) voltage.

- High voltage would come from standard power supply socket, in which case cable #1 will be used, or from any other source, plugged directly on the converter #2.
- Low voltage would be supplied directly to the Windcube, using its extension cord #3.

4.3.1 POWER SUPPLY CONNECTION

- Connect the chosen supply in Windcube trapdoor.





- The Windcube does not integrate an emergency stop. When powered by the included AC/DC power adapter, the user must remove the adapter's main power plug from the grid.
- The user is responsible for posting safety signs and maintaining easy access to the main power plug.
- Alternative DC power sources can be used to power the Windcube; please refer to [chapter 4.3.3](#).

- Link the system to the ground, when using the Windcube onshore. The ground plug is located in the Windcube trapdoor.

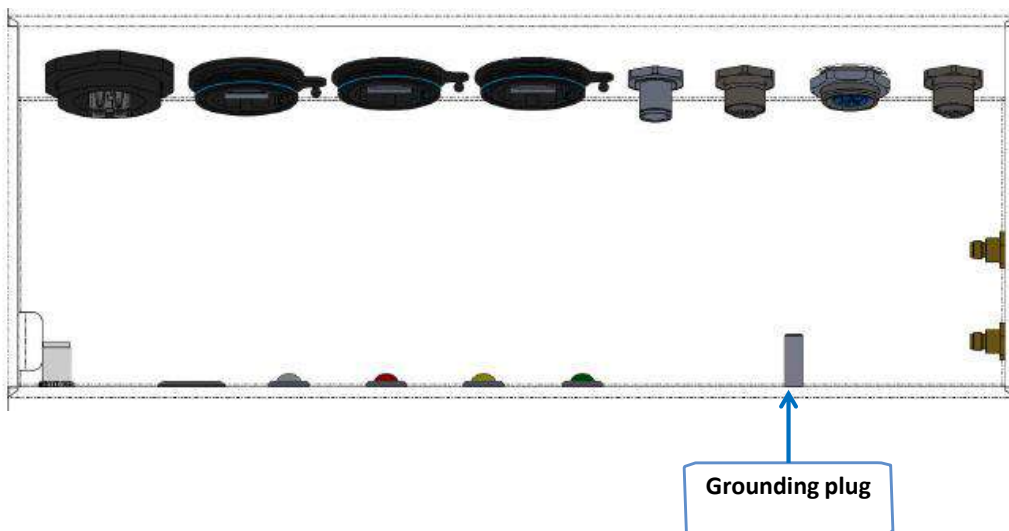


Figure: Connection Trap - Main power supply and GND plug

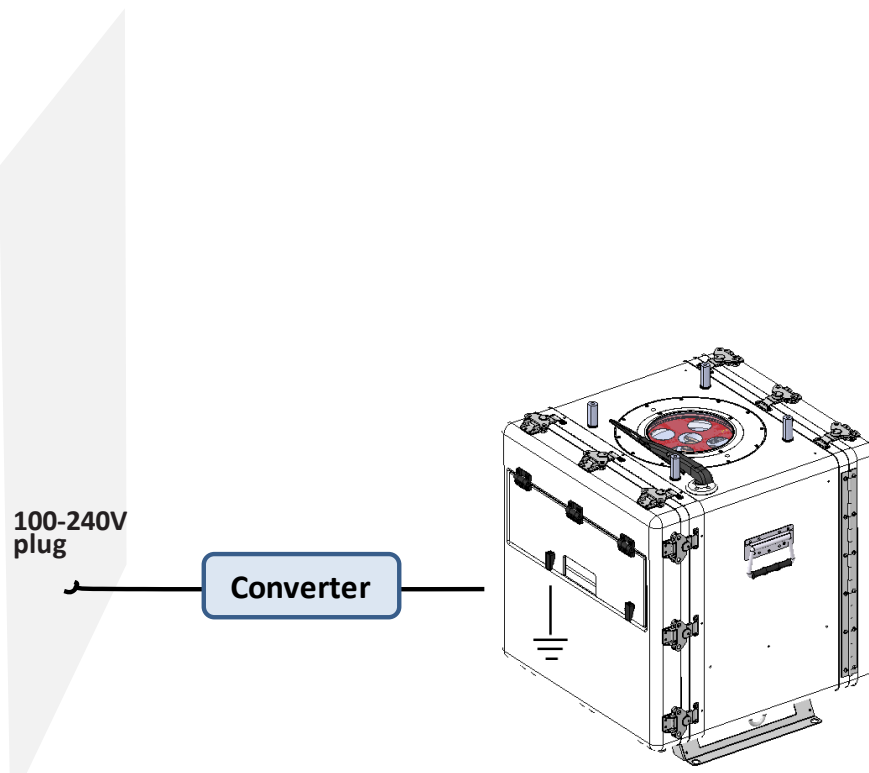


Figure: Power supply scheme

The user can link the system to the earth from the grid or it's also possible to use an earth rod.
Whatever the way, **a correct installation is under your responsibility.**

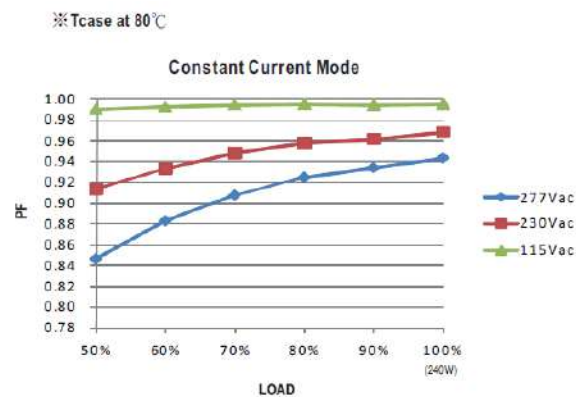
4.3.2 AC VOLTAGE WITH CONVERTER

INPUT POWER SPECIFICATIONS

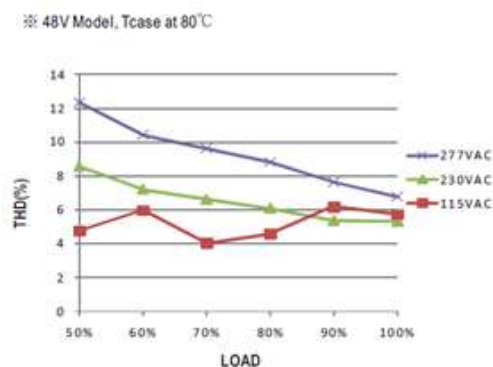
When using a high voltage and AC power supply, the converter **#2** input should meet the specifications below:

SPECIFICATIONS	VALUES
Voltage	100-240V AC
Frequency range	47-63Hz
Power factor (typ.)	PF \geq 0.98/115V AC, PF \geq 0.95/230V AC @ full load (2)
Total harmonic distortion	THD< 20% (@ load \geq 50% / 115V AC,230V AC; (3))
Efficiency (typ.)	92.5%
Ac current (typ.)	4A / 115V AC 2A / 230V AC
Inrush current (typ.)	COLD START 75A (twidth=570 μ s measured at 50% Ipeak) at 230VAC; Per NEMA 410
Max. No. of psus on 16a Circuit breaker	2 units (circuit breaker of type B) / 4 units (circuit breaker of type C) at 230V AC
Leakage current	<0.75mA

➤ Power Factor Characteristics




➤ Total Harmonic Distortion



CABLING TABLE

Cabling description of the power supplying connector to be connected to the input of the standard converter #2.

SIGNAL	CABLING ON <i>BINDER 99-4222-00-04</i>	CABLE COLOR	CABLE SECTION
Earth	PE	Yellow/Green	1.5mm ²
Line	3	Brown	1.5mm ²
Neutral	2	Blue	1.5mm ²
			

4.3.3 DC VOLTAGE WITHOUT CONVERTER**INPUT POWER SPECIFICATIONS**

When using a low voltage and DC power supply, the input should be designed as below:

SPECS	VALUES
Voltage	24,5-27 V DC
Operating current	Up to 4.7 A
Inrush current	10 A
Temp. Stability	5 mV/C°
Line regulation	± 1%
Load regulation	±2%



➤ It is not recommended to connect directly in DC.

CABLING TABLE

Cabling description of the power supplying connector to be used.

SIGNAL	CABLING ON SOURIAU UTS6JC124SSCR	CABLE COLOR	CABLE SECTION
24V	1	Red	1,5mm ²
GND	3	Black	1,5mm ²



4.4 SWITCH ON AND SHUTTING DOWN OPERATION

SWITCH ON

To turn "ON" the Windcube,

- Press the main switch in the trapdoor.
- Check that the power LED is on.

A minute or two after powering on, the Windweb automatically starts. Also, the wiper engine slowly moves counterclockwise. This operation is normal; the wiper initializes its position.



- Never intentionally block the wiper arm. This may damage the wiper arm and the blade.

- Check that the green LED in trapdoor is on, which occurs when the system is measuring (Fig. below).

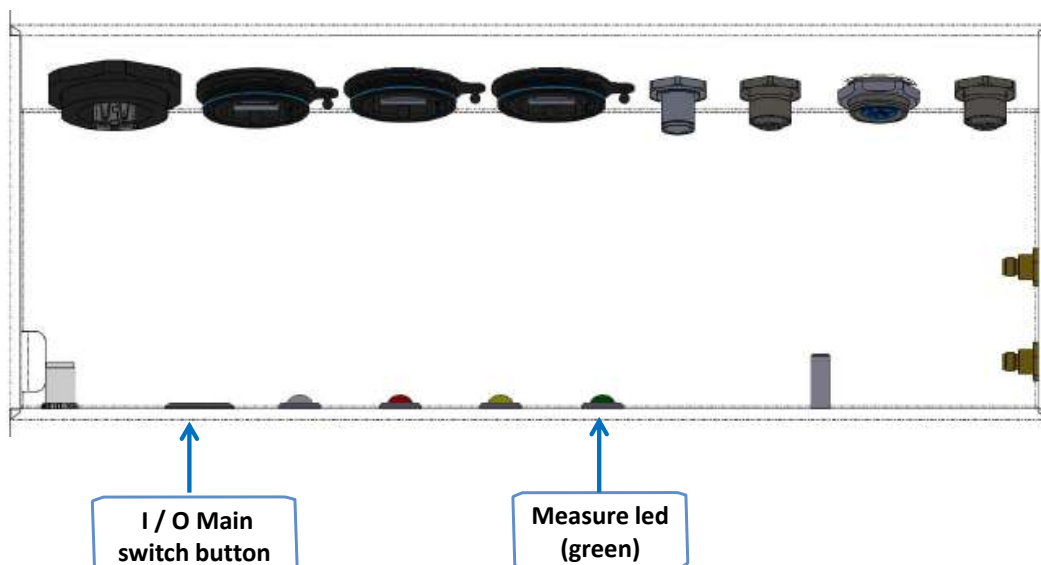


Figure: Connection trapdoor - Main switch and Measurement LED

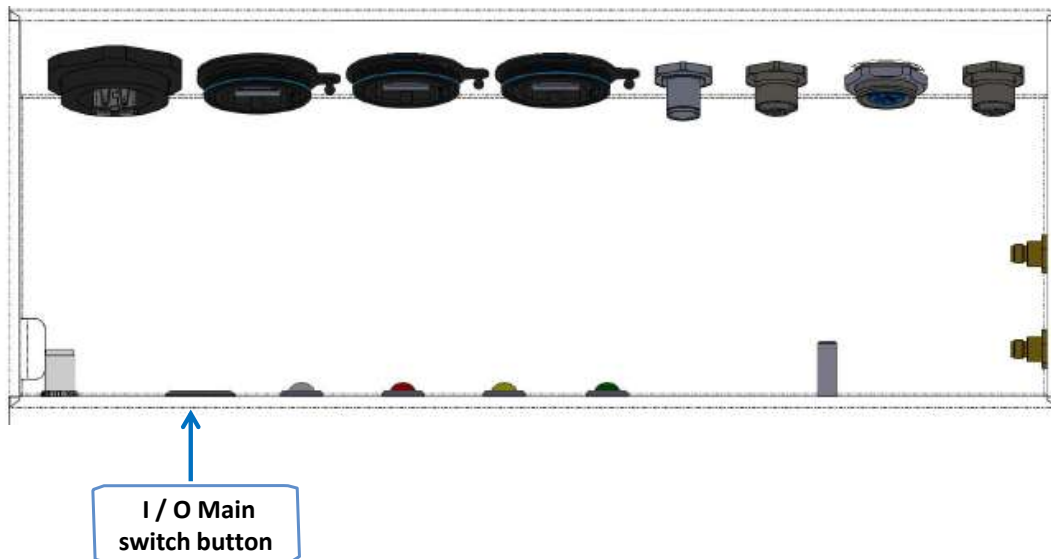


At extreme outdoor temperatures, the system may not start immediately. It can take up to 10 hours if the Windcube is stored at -30°C.

- The Windcube thermal regulation control automatically starts the system once the internal temperature has been properly regulated.

SHUTDOWN

- Switch Windcube off by pushing power button. The complete shutdown can take until 30 seconds.



4.5 CONNECTION TO YOUR WINDCUBE

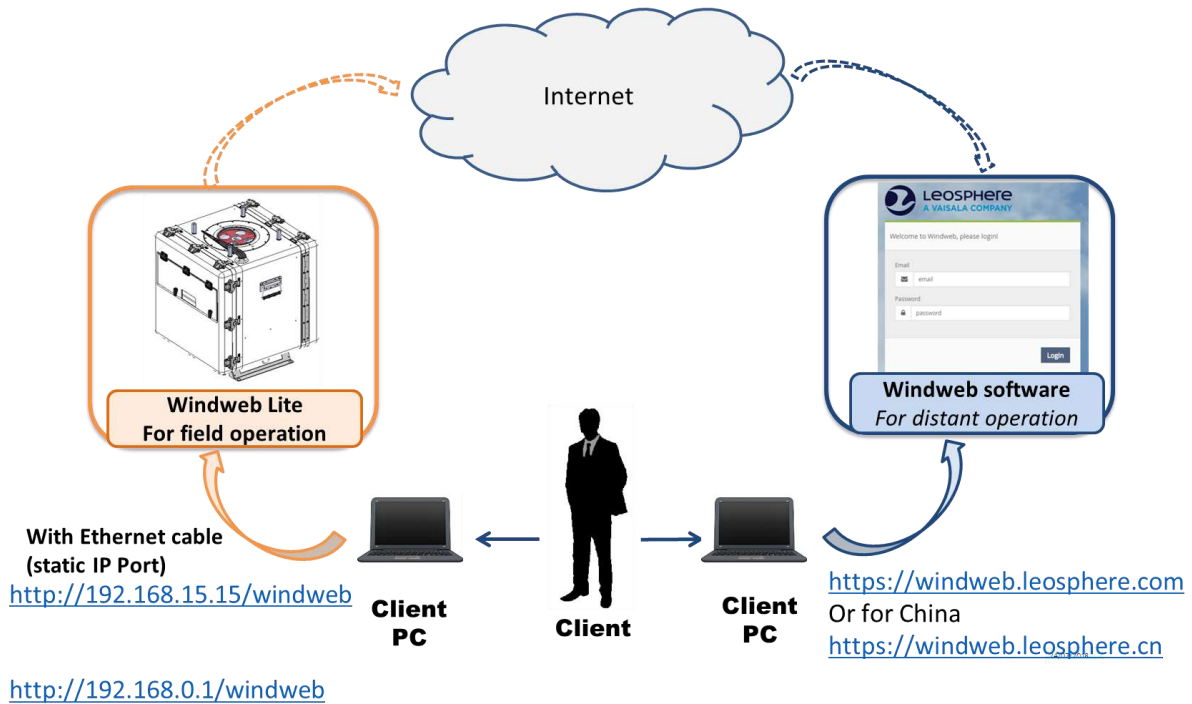
4.5.1 TWO POSSIBILITIES OF CONNECTION

Two types of connection are possible:

- **Windweb Lite** (or Windweb local) is used for field operations → [refer to the beginning of chapter 4 installation and mechanical integration \(from 4.1 to 4.4\).](#)

Windweb Lite is also used for on-site operation such as installation, uninstallation and the maintenance.

- **Windweb software** is used for distant operation to monitor and obtain wind data or download the documentation. For more details → [refer to chapter 6 How to get remote connection?](#)



4.5.2 HOW TO CONNECT TO WINDWEB SOFTWARE?



- Chrome or Firefox browsers are needed to use Windweb and Windweb Lite.

User account is mandatory for Windweb connection ([refer to 6.1 chapter, how to create a Windweb account](#)). You will previously receive an invitation email.

- Enter, in your web browser, the Windweb client interface address:

<https://windweb.leosphere.com/>

The interface is displayed.

- Enter your login **(1)** and password **(2)**.
- Click on [Login] button **(3)**.

For more detail, refer to [6.1 chapter, How to create a Windweb account ?](#)

The screenshot shows the 'LEOSPHERE A VAISALA COMPANY' login page. It includes a 'Welcome to Windweb, please login!' message. There are two input fields: 'Email' (with a placeholder 'email') and 'Password' (with a placeholder 'password'). A 'Login' button is located at the bottom right. Three numbered circles indicate the steps: (1) for the Email field, (2) for the Password field, and (3) for the Login button. A 'Forgot password?' link is at the bottom.

4.6 WINDWEB LITE CONNECTION

- Connect a laptop to the **static IP port** of Windcube via Ethernet cable. Make sure that the laptop was configured as mentioned in Section 2.

You can also connect using the Wi-Fi, to do so [refer to next chapter Windweb lite with Wi-Fi connection](#).

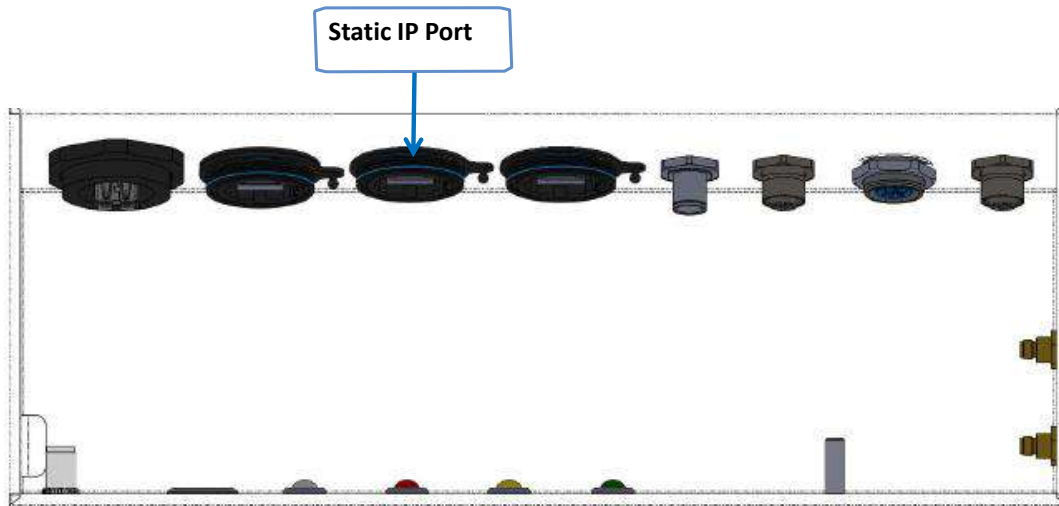


Figure: Connection trapdoor - Local access port

For field installation operations and using the static IP port, please connect to Windweb Lite using: <http://192.168.15.15/windweb> or use the address, configured by yourself.

For a Wi-Fi connection, connect to:

<http://192.168.0.1/windweb>

For more detail on the Wi-Fi connection, please [refer to 4.7 chapter Windweb Lite with Wi-Fi connection](#).

The login page of Windweb Lite is displayed:



When connected, you have the possibility to change the password; a pop-up opens, as shown below.

- Type your old password **(1)**

- Enter a new password **(2)**
- Confirm the new password **(3)**
- Click on [Update] **(4)**

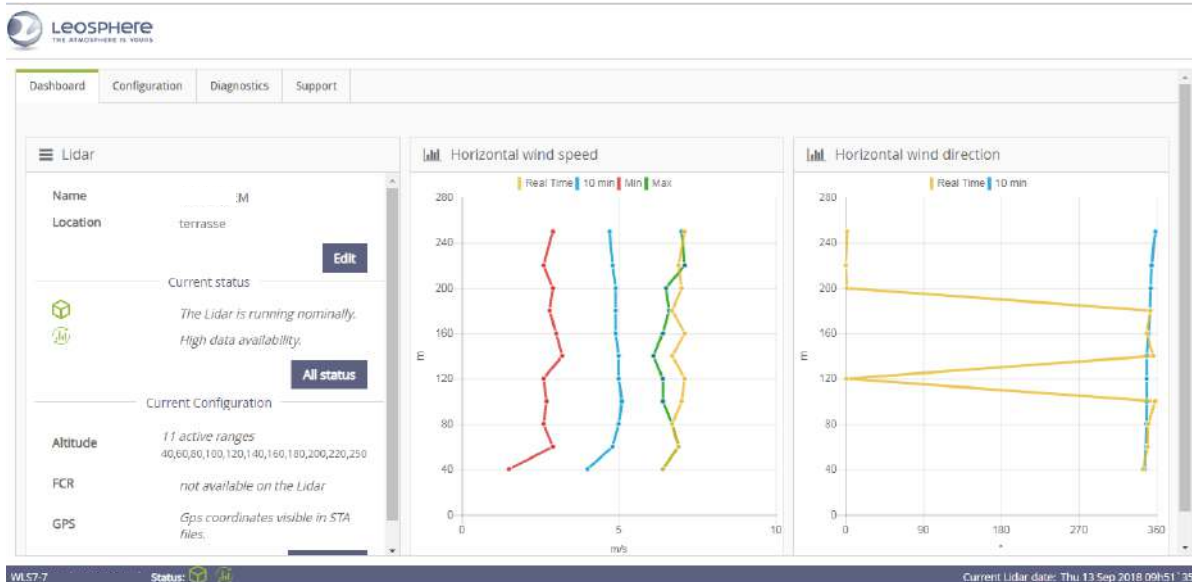


➤ **Be careful!!!**

One system = one password

If you change the password, don't forget it and communicate it only to your colleagues who will need it. If you forget your password Leosphere won't be able to provide it to you.

Once you are connected, the Windweb Lite interface opens on the [Dashboard] tab.



4.7 WINDWEB LITE WITH WI-FI CONNECTION

4.7.2 SYSTEM CONNECTION

- The Windcube system emits a Wi-Fi network.
- By default, Wi-Fi is activated on the system.

If you want a Wi-Fi connection on the system, you can reach the machine through **IP 192.168.0.1**.

Thus, in this case, you will use **Windweb LITE** with a web browser which is:

<http://192.168.0.1/windweb>

The embedded FTP url is also 192.168.0.1

- Search and select the correct network
- Open the browser.



The **Wi-Fi network (SSID)** you have to select is **WindcubeXXXX**
XXXX correspond to the serial number of your system.

WI-FI CONFIGURATION IN WINDWEB

In case the Wi-Fi is not activated, use a wired connection with Ethernet cable and to reactivate the Wi-Fi enter <http://192.168.15.15/windweb>

- Go to [Configuration] tab in Windweb Lite software, and at the bottom of the page,
- Go to the Wi-Fi field,
- Tick “Activate Wi-Fi network” box to activate the Wi-Fi on the system.
- Click on [Apply changes] button.

When you tick “Activate Wi-Fi network”, new fields appear with the corresponding SSID.

The screenshot shows the 'Configuration' tab in the Windweb Lite software. Under the 'Wifi' section, the 'Activate Wifi network' checkbox is checked. Below this, the 'Local IP address with Wifi will be 192.168.0.1' is displayed. The 'SSID Key' field contains 'Windcube1005'. The 'Password' field is empty, with a note: 'Password must have 8 characters minimum including at least 1 uppercase letter, 1 lowercase letter, and 1 digit. Special characters are *NOT* allowed.'

In case SSID key is incorrect, from the bottom of your screen,

- Display the available Wi-Fi networks.
- Select the specific Wi-Fi network (**WindcubeXXXX**)



The **default password** is: **Leosphere1234**

If you change the default password, your new password must contain: 8 characters minimum and at least 1 uppercase letter, 1 lowercase letters and 1 digit. Note that special characters are not allowed.



Please, to secure the Wi-Fi network and your data, change the default password.

Once SSID key and password entered,

- Click on [Apply changes] button.

4.7.3 CASE OF WIRED CONNECTION

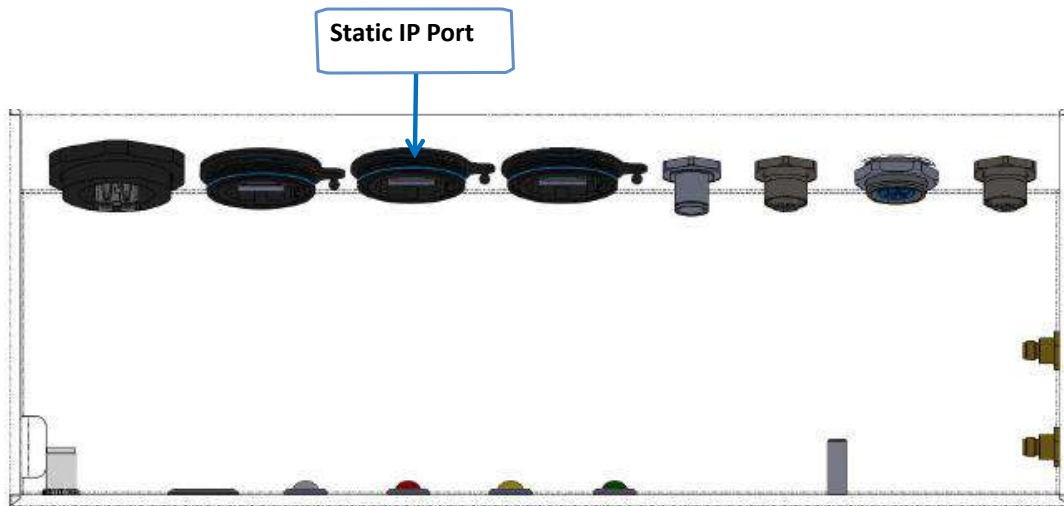
If accidentally the Wi-Fi of the system did not work, you can use a wired connection.



By using a wired connection, we must however warn you that it will have an impact on your personal configuration. For that reason, a wired connection is not recommended. We recommend using the Wi-Fi connection.

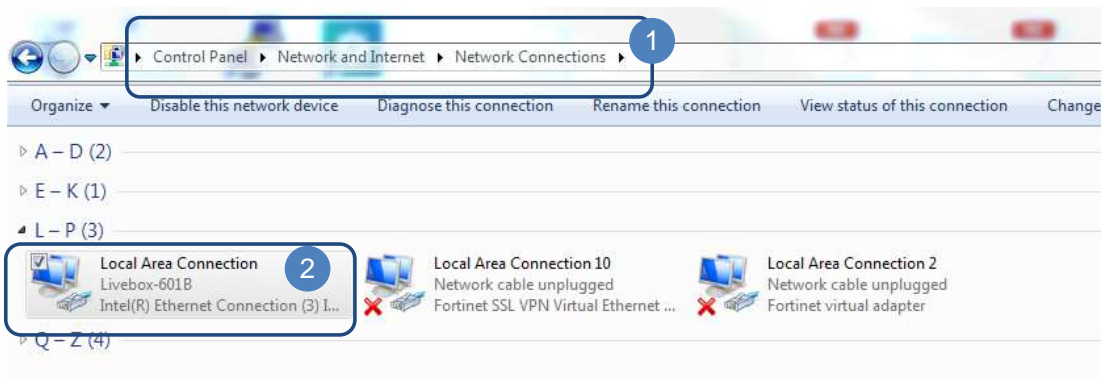
For wired connection, you will have to:

- Connect a network cable directly on the system, on the "Static" port: Then,
- Modify the configuration on your Laptop. **It's necessary to be on the static IP.**
- Connect to 192.168.15.15/Windweb



Example, with Windows 7

- Go to “Control panel” → Network and internet → Network connection (1)
- Go to “connection to the local area network”.

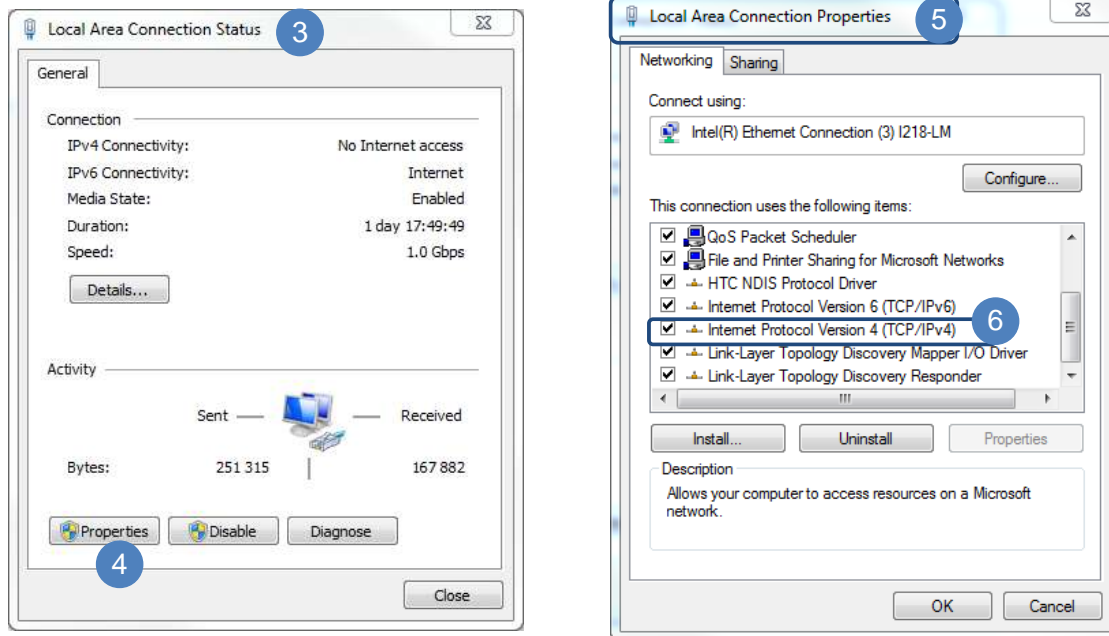


The “Local Area Connection Status” window opens (3)

- Click on [Properties] button (4)

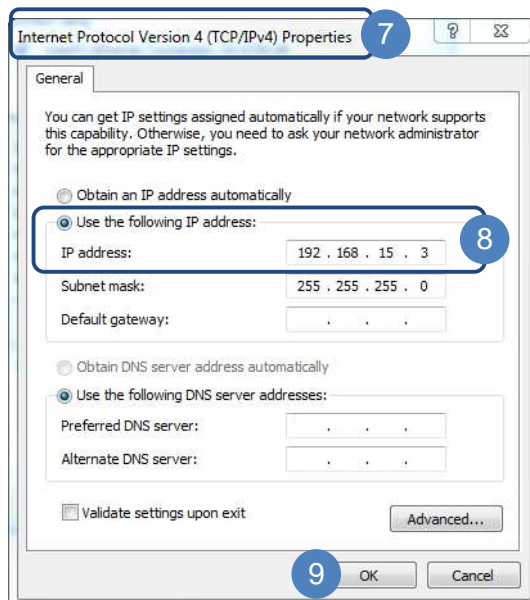
The “Local Area Connection Properties” window opens (5)

- Click on **Internet Protocol version 4** → (TCP/IPV4) (6)



The “Internet Protocol version 4” window opens (7)

- Go to “Properties” and
- Check the box "Use the following IP address", and write 192.168.15.3 in "IP address" field (8).
- Click on [OK] (9).



In our example we have 192.168.15.3.

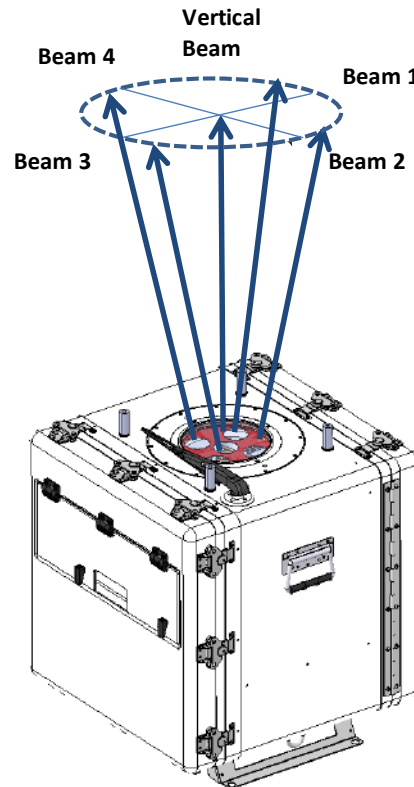
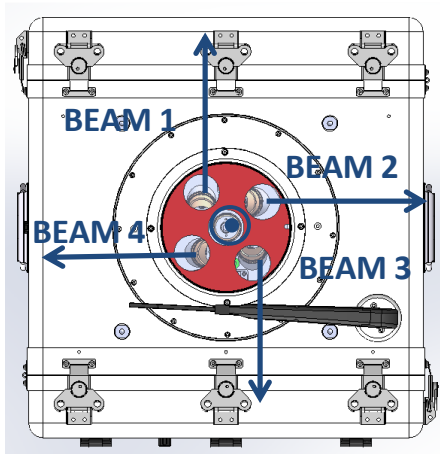
The last number is 3 but it can be another number from 1 to 255 (**but never 15**).

4.8 CHECK INSTALLATION



When installing Windcube, make sure that the beams are not blocked by any obstacle.

The four radial beams are emitted every 90°. The fifth beam is emitted vertically.



Figures: Beams emission direction

- Make sure the window is clean.
- From [Diagnostics] tab (1),
- Click on [CNR Graph] to display CNR graph (2).

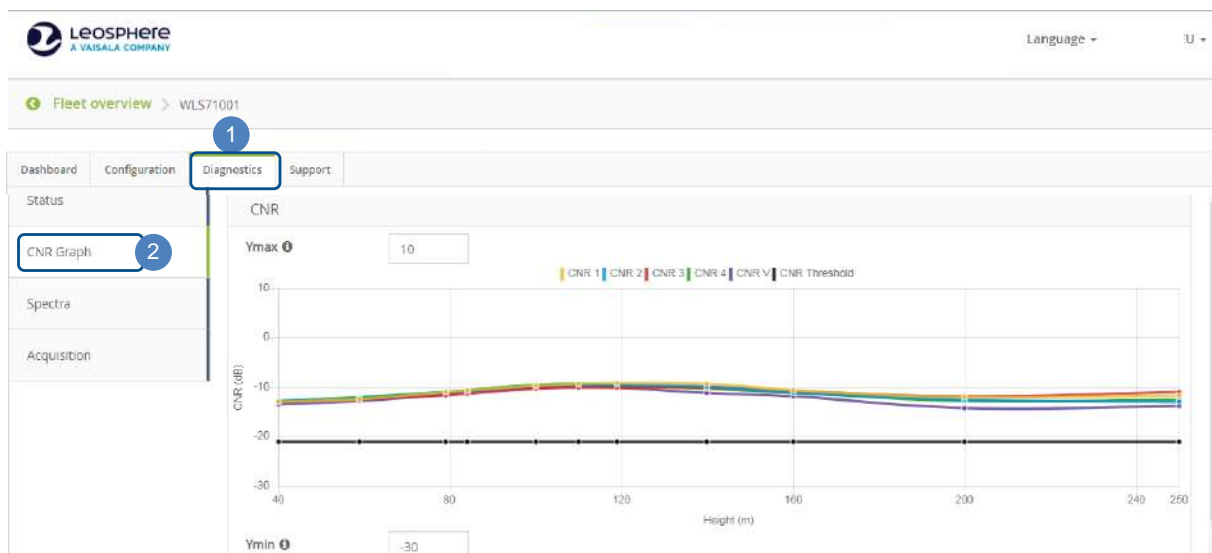


Figure: CNR curves



What is **CNR**?

➤ **CNR** = Carrier to Noise Ratio

This value depends on the concentration of aerosols in the atmosphere that backscatter laser light. High atmospheric backscatter coefficient leads to high CNR.

CNR level depends on weather conditions.

The five curves should have approximately the same signal level. If one (or more) curves are more than 3dB below the others, it could mean that an obstacle blocks one (or more) beam.

When Windcube has technical issues, one (or some) curve(s) could be higher than the others.

- Rotate Windcube in order to have all CNR curves superimposed (within a 3dB tolerance margin) and as shown in the "good CNR" print screen above.

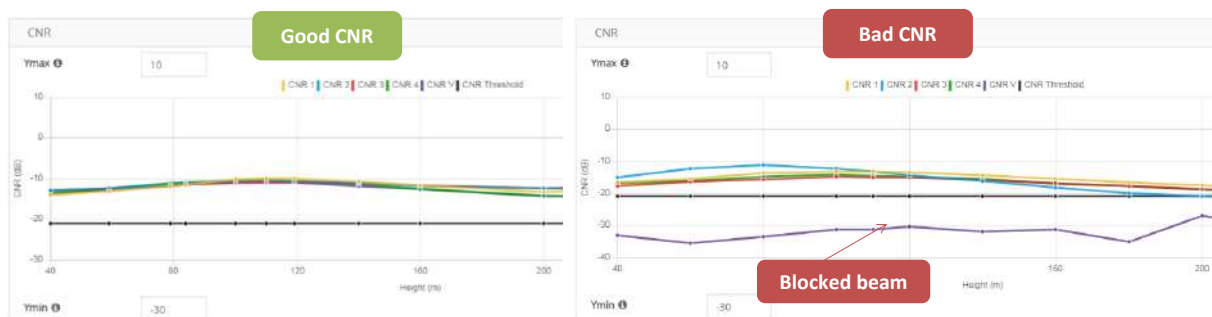


Figure: CNR curves for free and blocked beams



What is **CNR Threshold**?

The **CNR threshold** is the limit under which the measured data are not considered as reliable. Therefore, the data with the CNR below the threshold are neither saved nor used for the wind reconstruction; the measures are only recorded in RTD.

4.9 ORIENTATION AND LEVELING

4.9.1 ORIENTATION

Wind direction measured by Windcube is relative to the system axe.

This section below explains the way to orient your Windcube correctly in case of an onshore use.

The Lidar measures direction in reference to the North indicated in the Beam 1 direction. The deviation from the Lidar North must be considered by an external GPS when using the system in a buoy.

4.9.2 WINDCUBE GEOMETRY

The Windcube uses five laser beams, to reconstruct wind speed and direction at several heights above ground: one vertical and four inclined 28° from the vertical and orientated towards the cardinal points.

During installation, the reference **Beam 1** must be placed to the North or its deviation to the North should be indicated in the software.

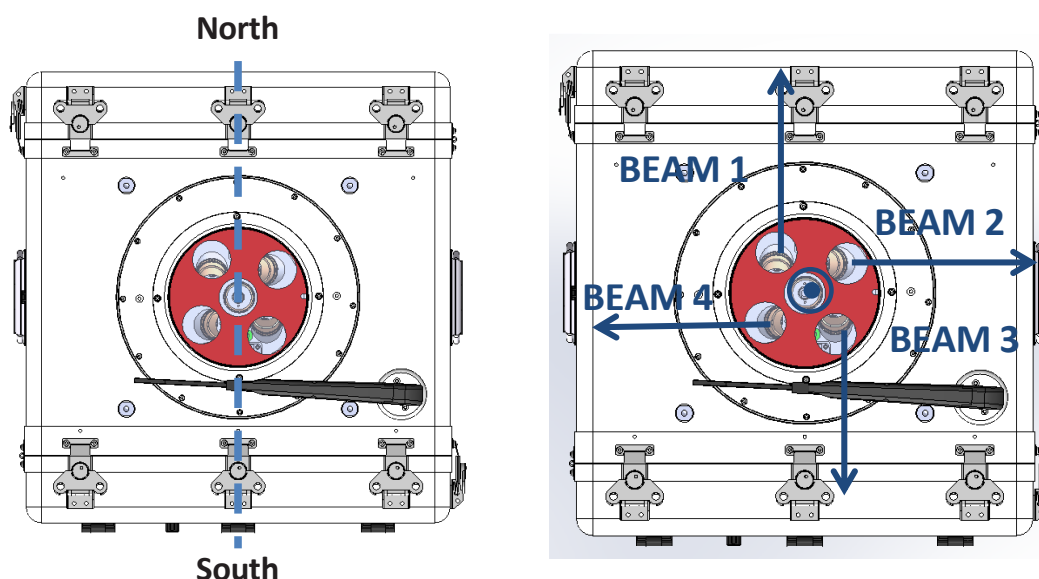


Figure: North direction and Beams direction

In order to obtain a good wind direction measurement, you have to:

- Align your Windcube to the north. You can also measure and configure the offset from the north to adjust the data. The North/South axis on the Windcube is shown in the figure above.

To find the north orientation and calculate the Magnetic Declination, you can follow this link:

<https://www.ngdc.noaa.gov/geomag-web/#declination>



The information given by the magnetic compass delivered with your Windcube is the **magnetic north**. If you like to use the true north in your data, you should use the GPS coordinates of your Windcube to find the local magnetic declination and configure the resulting offset (see next page). You can find this information on a local recent map or on the internet. Declination will be described in degrees east or degrees west, i.e. 12.3E (Positive) or 12.3W (Negative).

ALIGN YOUR WINDCUBE TO THE NORTH

For a use onshore:

- The screws on the north/south axis or one of the edges of the system can be used as a direction indication line to proceed to the alignment with the magnetic compass or with any other tools you choose to use.

- Make sure to be a few meters away from metallic objects to ensure a better precision and no environmental disturbance of the measure.
- Turn your Windcube until you are aligned correctly.

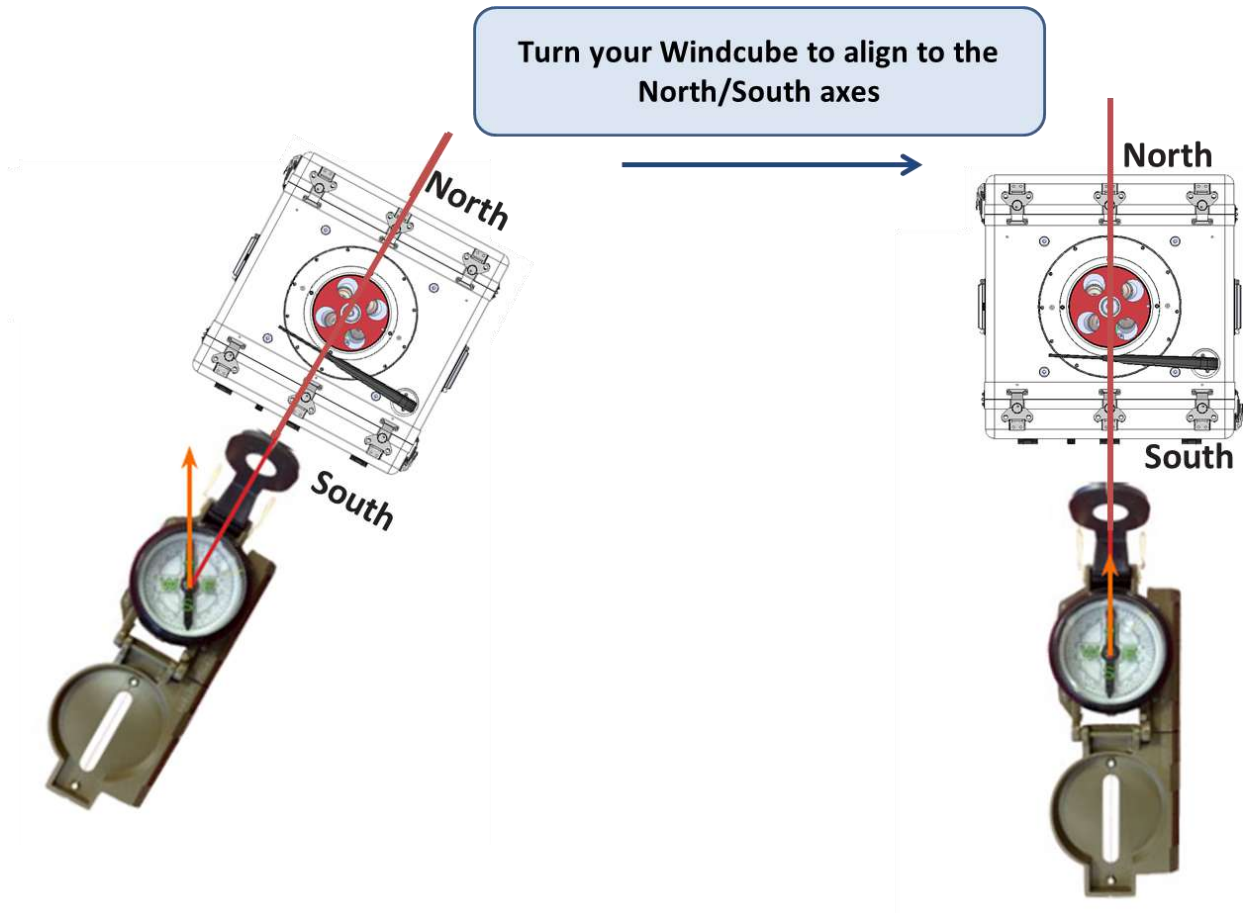


Figure: Alignment to the north



If the installation site does not allow you to orientate the Windcube to the north or if you like to use the true north value, you can configure a **direction offset**. For instance, in New York, USA, the magnetic declination is 12°W. The offset inside the Windweb should be -12 to adjust the data to the true north.

CONFIGURATION OF A DIRECTION OFFSET

To configure a **direction offset**, on the Windweb:

- Click on [Configure] **(1)**.
- Enter the direction offset from the North **(2)** and then click on [Apply changes] button.

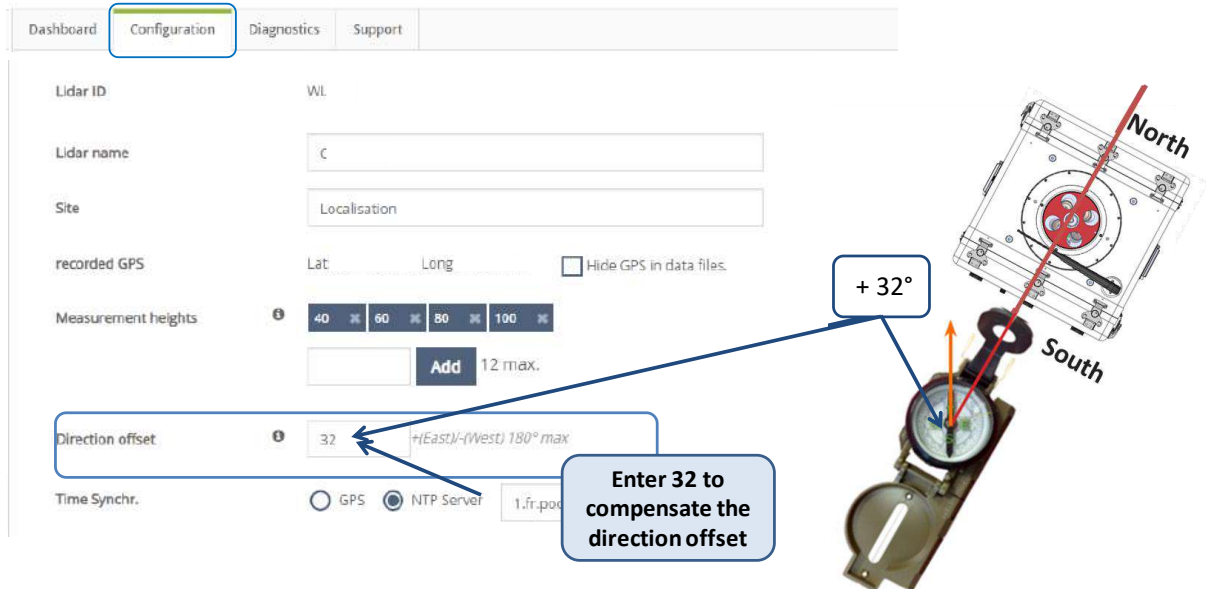


Figure: Windcube Direction offset setting



It is important to fill properly the north direction offset.

4.10 MEASUREMENTS CONFIGURATION



The configuration of the system is necessary:

- For the operator, during the implementation of the system on field (configuration of measurements)
- For the operator to realize operations of support or maintenance of first level.
- For the distributor to realize operations of support or maintenance of upper level.

- Click on [Configuration] tab **(1)**.

Windcube Configuration window appears.

4.10.1 HOW TO SEIZE YOUR CONFIGURATION PARAMETERS?

Your Lidar ID is automatically filled in **(2)**.

- Enter a "Lidar name" for your Lidar **(3)**.
- Enter the location name in "Site" field **(4)**.

GPS field **(5)** is automatically filled. You can also hide the GPS coordinates from your files, by clicking on the box **(6)**.

- Configure the measurement heights **(7)**. Refer to ["How to configure measurement altitudes"](#) chapter, below.

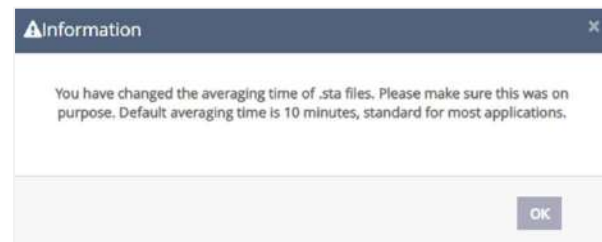
- Enter manually a Direction offset **(8)**.

The Windcube can be synchronized with its internal GPS or any NTP (Network Time Protocol) Server **(9)**.

The “averaging time” can be selected among 1-2-5-10 minutes **(10)**.

By default, it’s configured as 10 minutes.

If you change it, an information pop-up appears.



The 10 minute average wind speed and direction are obtained from the averaging of the high frequency wind speed and wind direction. Each high frequency measurement is associated with a validity status (1 or 0) resulting from specific Lidar signal processing. Only valid measurements are considered for the averaging.

For information, FCR **(11)** is a feature of the standard Windcube which allows a reconstruction of the wind, in complex terrain. This feature is not included in the Windcube Buoy.

For FTP feature **(12)**, you can, or not “Activate data push to FTP server”. If you check the box, you will have to enter information like Host, port, user ... You can define here your FTP server on which the Lidar will send the wind data.

Several formats are available:

- .STA : statistic data, processed with FCR feature if FCR enabled
- .STDSTA : statistic data processed without FCR (data generated only if FCR is enabled)
- .RTD : real-time data

From a Windweb Lite you have the field “network parameters”, you can see and change parameters if needed, by clicking on “see network parameters”.

- Click on **See Network parameters (1)**

The local panel configuration opens **(2)**.

It is important to carefully set this IP address, as it would be impossible to access or modify it with a remote connection. After any modification, don’t forget to click on [Apply changes] button.

Network

Warning : bad configuration of network parameters could disturb Lidar operations, please check your changes before applying new network parameters.

[See Network parameters](#) 1

2

Network

Warning : bad configuration of network parameters could disturb Lidar operations, please check your changes before applying new network parameters.

IP	192.168.3.118
Netmask	255.255.255.0
Gateway	192.168.3.1
DNS 1	208.67.222.222
DNS 2	208.67.220.220

For the Wi-Fi, we recommend activating the Wi-Fi network **(14)**, by checking the box. For more information about the Wi-Fi, [refer to Wi-Fi chapter \(4.7 Windweb lite with Wi-Fi connection\)](#)

If you have the PTH option,

- Tick “Activate PTH option” **(15)**. Be careful, activate the PTH option only if a compatible PTH external sensor is connected to the Lidar. The PTH is an option for the Windcube Buoy.

Power Pack option **(16)** is not activated for Buoy Windcube.

Enter, if necessary, comments in the “Comments” box **(17)**.

- Click on [Apply changes] button to save the configuration **(18)**.

The screenshot shows the 'Configuration' tab of the Windcube interface. The layout includes a top navigation bar with tabs: Dashboard, Wind data, Configuration (active), Diagnostics, Users, and Support. The main configuration area is divided into several sections:

- Lidar ID:** A text input field.
- Lidar name:** A text input field.
- Site:** A text input field.
- recorded GPS:** Displays 'Lat:48.7 N, Long:2.168410°E' and a checkbox 'Hide GPS in data files'.
- Measurement heights:** A row of buttons for 40, 60, 80, and 100 meters, followed by an 'Add' button and a '12 max.' label.
- Direction offset:** A text input field with a unit indicator '(East)/(West) 180° max'.
- Time Synchr.:** Radio buttons for 'GPS' and 'NTP Server' (selected), with a text input field for the NTP server address '1.fr.pool.ntp.org'.
- Averaging time:** A dropdown menu set to '10 min'.
- FCR:** A checkbox labeled 'Enable FCR (Flow Complexity Recognition)'.
- FTP:** A checkbox 'Activate data push to FTP server' (checked), followed by radio buttons for 'SFTP Protocol (SSH)' (selected) and 'FTP Protocol'.
- Host configuration:** Text input fields for 'Host' (192.168.111.102), 'Port' (22), 'User' (LEOSPHERE), and 'Password' (masked).
- DATA:** Four checked checkboxes for file types: '.STA files (~23 Ko / daily file)', '.STDSTA files (~23 Ko / daily file)', '.RTD files (~10.8 Mo / daily file)', and '.ALM files (~3 Ko / file)'.
- Wifi:** A checkbox 'Activate Wifi network' (checked), followed by explanatory text about the local IP address (192.168.0.1) and a URL example. Below are text input fields for 'SSID Key' (Windcubeprotos) and 'Password' (masked).
- PTH:** A checkbox 'Activate PTH option' (checked).
- Powerpack:** A checkbox 'Activate Powerpack option' (unchecked).
- Comments:** A large text area for notes.

At the bottom, there are two buttons: 'Apply changes' and 'Advanced Configuration'.

Figure: "Windcube Configuration" window

INFORMATION ON EACH FIELD OF CONFIGURATION'S TAB

The following fields are displayed in [Configuration] tab:

Lidar ID: Windcube serial number. This information cannot be modified by the user.

Lidar name: Given name to your Lidar. It can be modified by the user.

Site: Given name to the Windcube location. It can be modified by the user.

Recorded GPS: this field displays GPS coordinates; the information is linked to FCR activation. This information can be hidden in data files. To do so, check the box "Hide GPS in data files".

Measurement heights: the user can manually set up to 12 measurement heights.

Direction Offset: It is the direction offset compared to the North direction.

Time synchronization: The user can select to synchronize the Windcube with the integrated GPS or a NTP (Network Time Protocol) server.

Averaging time: For a normal use, the user can select the averaging time among 1, 2, 5, and 10 minutes. If the FCR option is activated, the averaging time is 10 min by default, and can't be modified.

FCR: FCR is a feature of the standard Windcube that allows a reconstruction of the wind in complex terrain. This is not included in the Windcube Buoy.

Network: you can configure your network parameters from Network field (from Windweb Lite) → [see Network parameters](#)

Wi-Fi: to activate Wi-Fi network, check the box ([refer to 'Wi-Fi connection' chapter](#))

Powerpack: not activated for Windcube Buoy.

Comments: The user can fill any information relative to his system.

4.10.2 HOW TO CONFIGURE MEASUREMENT ALTITUDES?

- Enter a measurements height **(1)**
- Click on [Add] to add this measurement **(2)**. You can add up to 12 measurements height.

Under "Measurement height", a table of measurement altitudes is configurable, by clicking on [Add] and

- Click on the cross to delete an altitude **(3)**.
- Click on [Apply changes] button to save the configuration **(4)**.

Measurement heights

40 60 80 100 120 130 160

180 Add

Measurement heights

40 60 80 100 120 130 160 180

Add

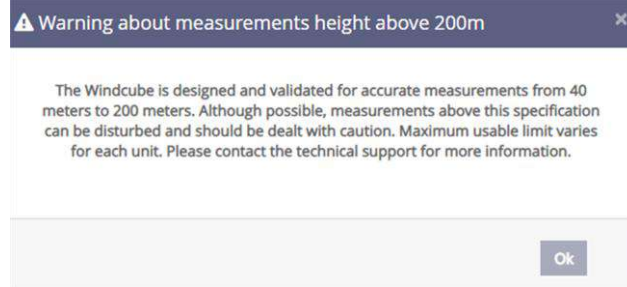
Apply changes



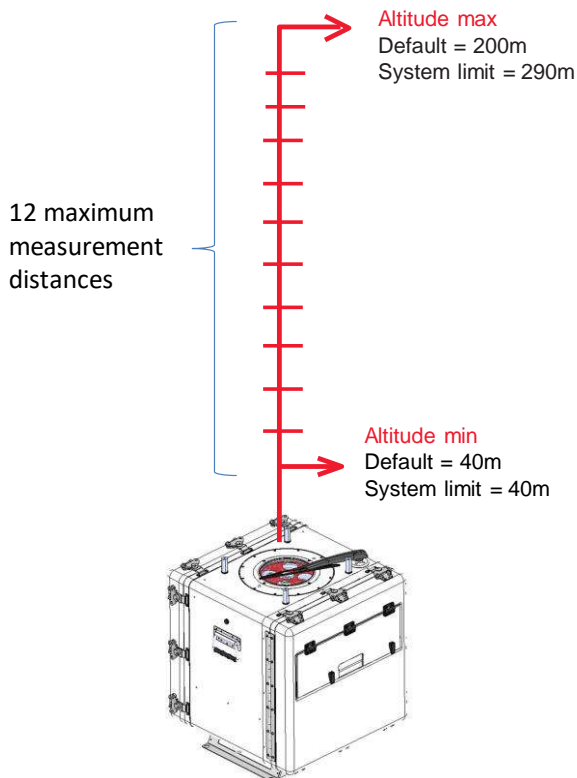
If you enter a wrong value as measurements heights, a warning message appears. Your value must be between 40 and 290 (m).



Nevertheless, if you enter a value above 200 m this warning message displays:



- By clicking on [Apply changes] button the system stops automatically the measurements and then restarts.



- The Windcube is designed to measure accurately from 40m to 200m. Measurements above are possible but depending on each individual system performance. **In any case, no value above 290 meters can be set.**
- Up to 12 heights can be configured, with no minimum distance between them .
- By default, the system is configured in factory with 9 distances ranges every 20 meters, from 40m to 200m.

Figure: Altitude measurement information

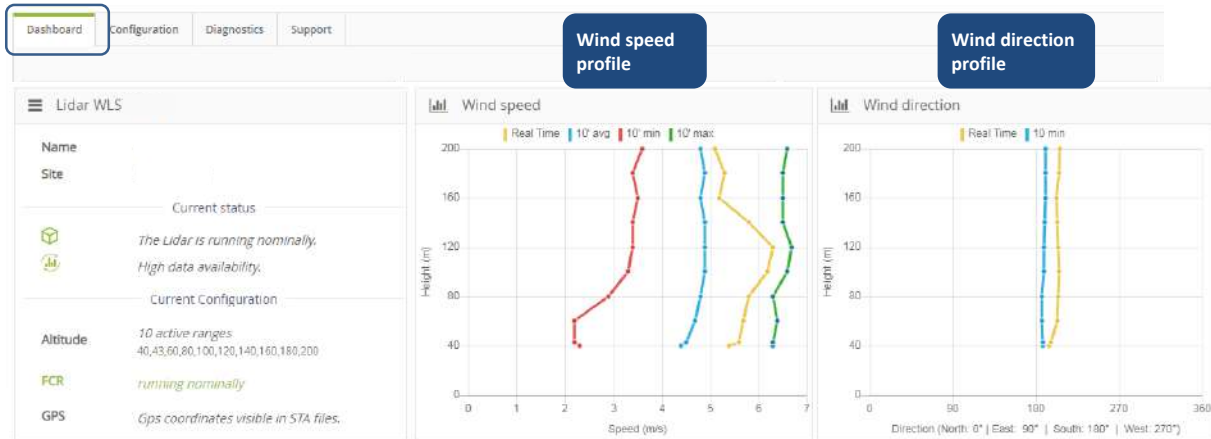
4.10.3 CHECK MEASUREMENTS



LASER ON: [read 1.2.2 chapter](#), cautions relative to Laser Safety.

In order to see if the Lidar is running correctly,

- Check, in [Dashboard] tab, that the horizontal wind speed and wind direction are displayed.



- Check, in [Diagnostics] tab if all indicators are green. Those indicators give information about the proper functioning of Windcube internal elements.

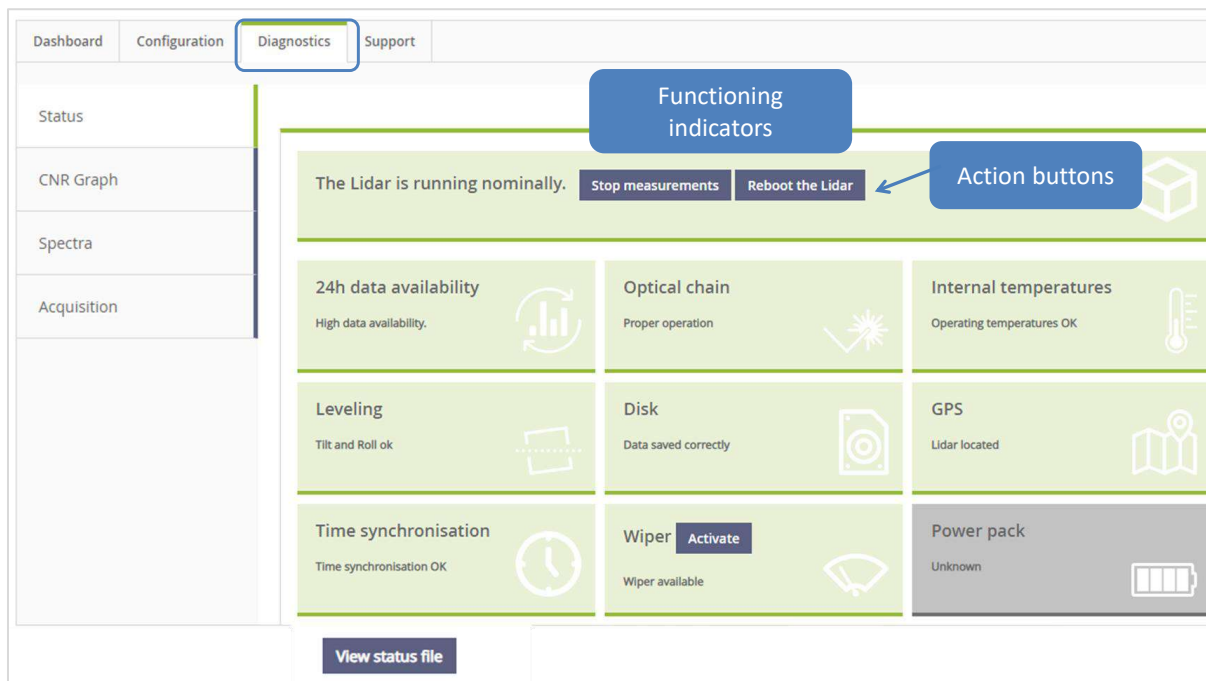


Figure: [Diagnostics] tab - Check proper Windcube functioning



Any indicator: refer [to Measurement visualization chapter](#) (and Visual indicators).

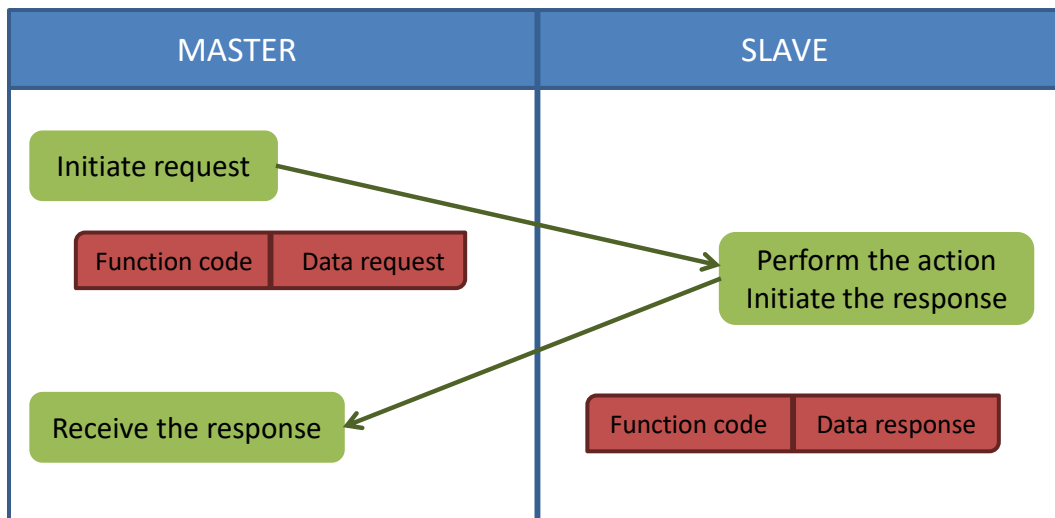
4.11 Advanced features

4.11.1 MODBUS



MODBUS is a communication protocol. Modbus is used in **RTU** mode (Remote Terminal Unit) with serial **RS485**. It is a widely accepted protocol due to its ease of use and reliability. The coding of the information is made in binary.

It works on master-slave mode. Only the master is active, the slaves are completely passive. It is the master who must read and write in each slave.



You will find below a description of the Windcube data format sent by Modbus (slave). For the recovery of the data, you will have to use a Modbus master (this software is not supplied by Leosphere).

By default, the configuration of the Windcube is with the Modbus activated.

You cannot, by yourself, disable or activate this mode of communication.

You just have to make your cable and connect it to the system. First, we recommend connecting the external Modbus cable to the niche and then turning on the system.



MODBUS FORMAT OF THE WINDCUBE

Baud Rate: 9600

Character Size: 8 bits

Parity: None

Flow Control: None

Stop Bits: One point five

Timeout (ms): 25000

Data size: 2 bytes

CABLING TABLE

Type of base on the niche: M12 (female)

1	Not Connected
2	Ground
3	P
4	N

Connector reference: Male M12 recommended to ensure proper seal and locking of connection:

→ Binder 77 3529 0000 50704-0200 (IP67 shielded molded connector)

DATA SENT BY THE MODBUS BUS

List of the data sent by the Modbus bus (example for **N ranges**):

Data type	First data address	Data size	Data number	Last data address	Uses distances
Timestamp "real time data"	0	8	1	3	No
Temperature	4	2	1	4	No
Humidity	5	2	1	5	No
Pressure	6	2	1	6	No
System Temperature	7	2	1	7	No
Laser Direction	8	2	1	8	No
Altitude	9	2	N	9+N-1	Yes
u	9+N	2	N	9+2N-1	Yes
v	9+2N	2	N	9+3N-1	Yes
w	9+3N	2	N	9+4N-1	Yes
Radial speed	9+4N	2	N	9+5N-1	Yes
CNR	9+5N	2	N	9+6N-1	Yes
idDataValid	9+6N	2	N	9+7N-1	Yes
Horizontal Wind Speed "real time"	9+7N	2	N	9+8N-1	Yes
Wind direction "real time"	9+8N	2	N	9+9N-1	Yes
Timestamp "statistic data"	9+9N	8	1	13+9N-1	No
Mean Horizontal Wind Speed	13+9N	2	N	13+10N-1	Yes
Mean Wind direction	13+10N	2	N	13+11N-1	Yes
Mean Vertical Wind Speed	13+11N	2	N	13+12N-1	Yes
Data availability	13+12N	2	N	13+13N-1	Yes

PARAMETERS DEFINITION

Data type	Description	Precision	Unit
Timestamp "real time data"	Number of milliseconds elapsed since 01/01/1970	$y=ax+b : a=1;b=0$	Timestamp
Temperature	Temperature given by the PTH probe	$y=ax+b : a=0.01;b=-100$	°C
Humidity	Relative humidity given by the PTH probe	$y=ax+b : a=0.01;b=0$	%
Pressure	Pressure given by the PTH probe	$y=ax+b : a=0.1;b=0$	hPa
System Temperature	Average of the 2 internal probes in the monorack	$y=ax+b : a=0.01;b=-100$	°C
Laser Direction	LOS System direction (orientation offset / north not taken into account)	$y=ax+b : a=1;b=0$	°
Altitude		$y=ax+b : a=1;b=0$	m
u		$y=ax+b : a=0.01;b=-100$	None

v	$y=ax+b$: $a=0.01;b=-100$	None
w	$y=ax+b$: $a=0.01;b=-100$	None
Radial speed	$y=ax+b$: $a=0.01;b=-100$	m/s
CNR	$y=ax+b$: $a=0.01;b=-100$	dB
idDataValid ok : 0 / warning : 1 / critical : 2 / unknown : 3	$y=ax+b$: $a=1;b=0$	None
Horizontal Wind Speed "real time"	$y=ax+b$: $a=0.01;b=-100$	m/s
Wind direction "real time"	$y=ax+b$: $a=0.01;b=0$	°
Timestamp "statistic data"	$y=ax+b$: $a=1;b=0$	Timestamp
Mean Horizontal Wind Speed	$y=ax+b$: $a=0.01;b=-100$	m/s
Mean Wind direction	$y=ax+b$: $a=0.01;b=0$	°
Mean Vertical Wind Speed	$y=ax+b$: $a=0.01;b=-100$	m/s
Data availability	$y=ax+b$: $a=1;b=0$	%



The accuracy of data is defined by the formula $y = ax + b$

- x: Value written in the registers in decimal
- y: Value measured by the system
- a: Coefficient
- b: Coefficient

4.12 TRANSPORTATION AND STORAGE

- Remove any moving parts that may have been placed inside Windcube casing.

4.12.1 UNINSTALLATION AND PACKING PROCEDURE

For any operations of uninstallation of your Windcube, pay attention to completely **shut down the system**.

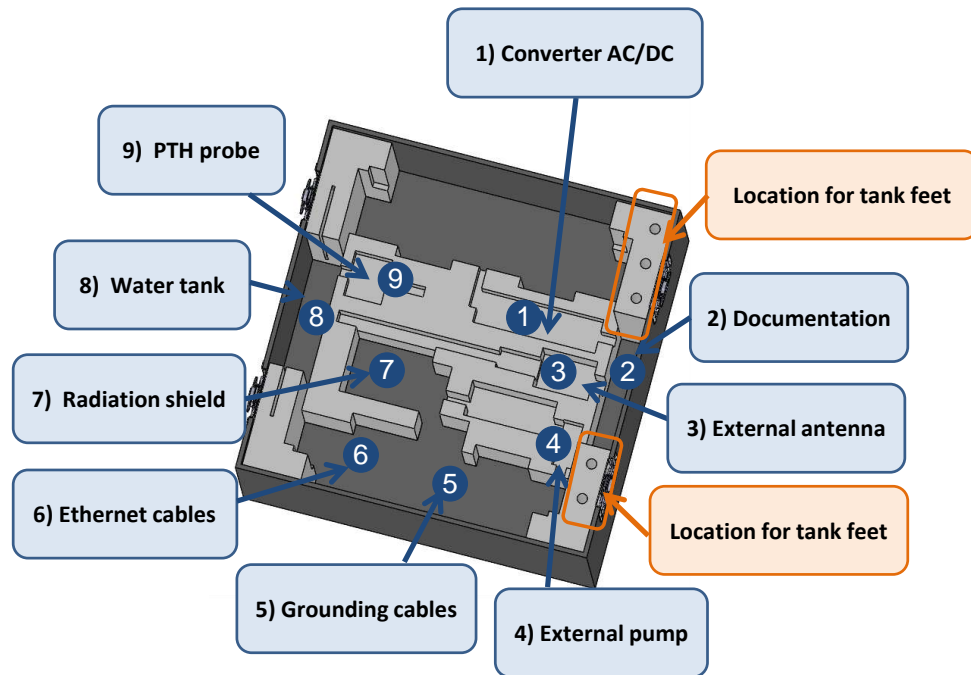


Note that before any packing, each accessory should be cleaned with a dry wipe. In case of dirt on the casing, it is possible to use water to clean it.

Before packing the system:

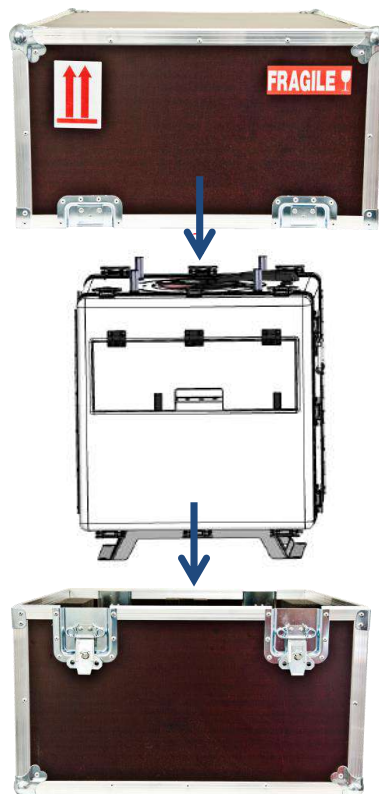
- TURN OFF THE SYSTEM, wait that all indicators are turned off.
- Remove the water pump from the tank.
- Empty the tank and dry it, if possible.
- Put the tank in the shipping case.
- Disconnect the system from its power supply source.
- Remove all the optional components and put them in the shipping case.

- Unmount the solar shield
- Screw the lifting rings on the system.



In the shipping case, you must put back all elements supplied by Leosphere and tidied up them in the same way as they were delivered.

When all elements have been located, place the Lidar in the shipping case and close it.



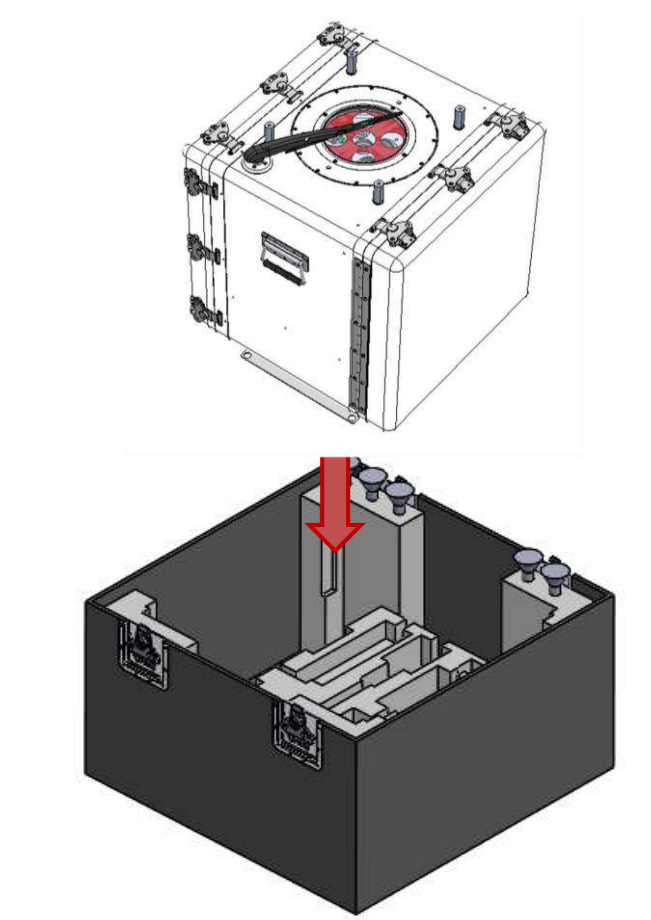


Figure: Storage in its shipping case

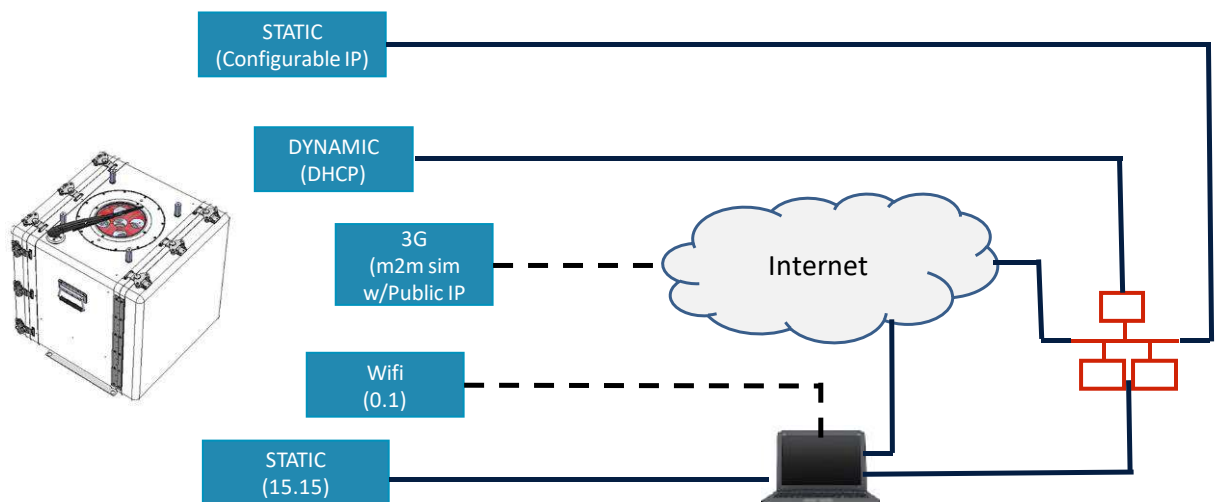


- The shipping case is not waterproof.
- Do not store it outside without any rain protection.

5 HOW TO GET DATA?

You can access your data in the following ways:

- By FTP server on the embedded system (all file types). To connect, you have the following options:
 - Directly with Wi-Fi
 - Directly with a RJ cable
 - Via the network, using the configurable IP
 - Via the network using the Automatic IP, dynamic Port (DHCP)
 - Via internet, from 3G network



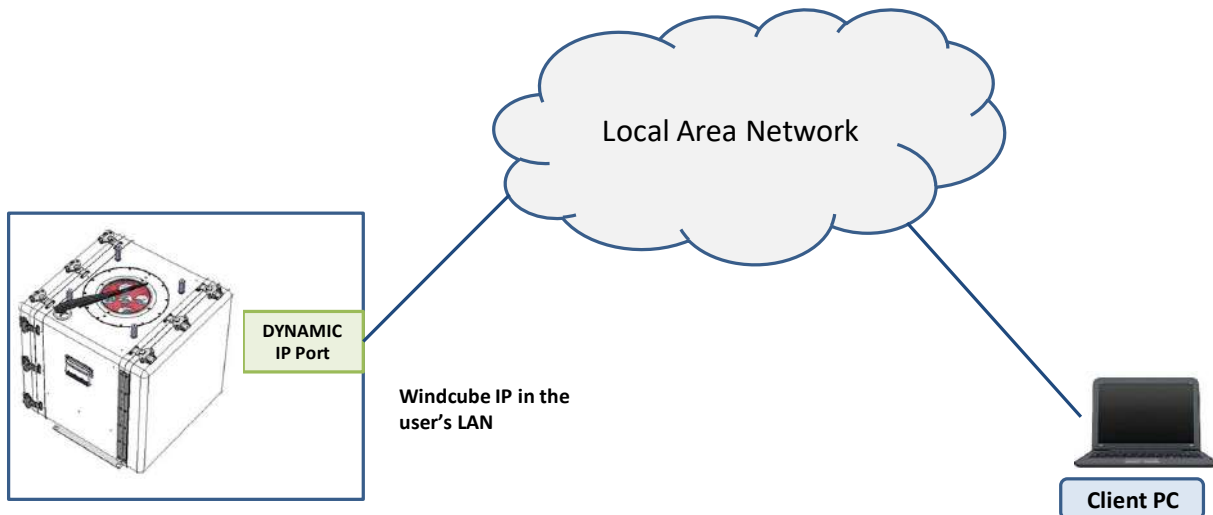
- From Windweb (only STA files)
 - Remotely if your system is linked to internet (Windweb Server)
- From a FTP server, provided by the client if
 - The system is connected to Internet, in a permanent way
 - "Push FTP" option is activated (with all parameters correctly seized).

5.1 GETTING DATA WHEN YOU ARE ON SITE: SFTP DATA TRANSFER

5.1.1 SFTP DATA TRANSFER LOCALLY VIA THE « ETHERNET» PORT

The client accesses directly the data with a sFTP client such as FileZilla.

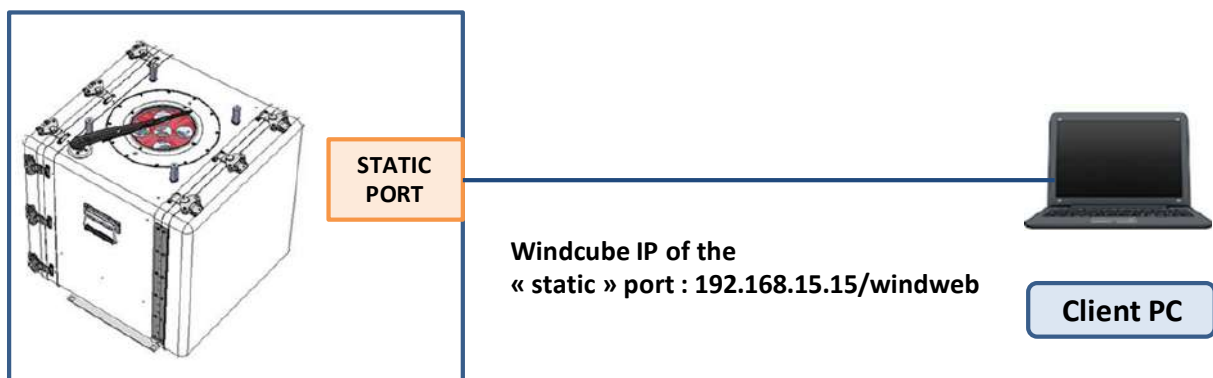
(Refer to the "FTP DATA TRANSFER" section of the user manual using the **Windcube's IP configured in the LAN**).



5.1.2 SFTP DATA TRANSFER LOCALLY VIA THE STATIC PORT

The client reaches data directly with a sFTP client such as FileZilla.

- Refer, if necessary, to the "FTP DATA TRANSFER" section of the user manual.



5.2 GETTING DATA: sFTP DATA TRANSFER

WITH A FTP CLIENT

A FTP server is installed on the Windcube. It allows to access data files registered on the system, and download them.

- Launch FileZilla.
- In the top bar, connect to the system by filling the following information:

- **Host:** 192.168.0.1 (with the Wi-Fi connection) or 192.168.15.15 (with wired connection) or the fixed address you have configured

- **User name:** client

- **Password:** refers to the FTP password on the sticker in the user manual that was delivered with the system.
- **Port:** 22
 - Click on [Quickconnect].

A message «Directory listing successful» should appear on the FileZilla status window.

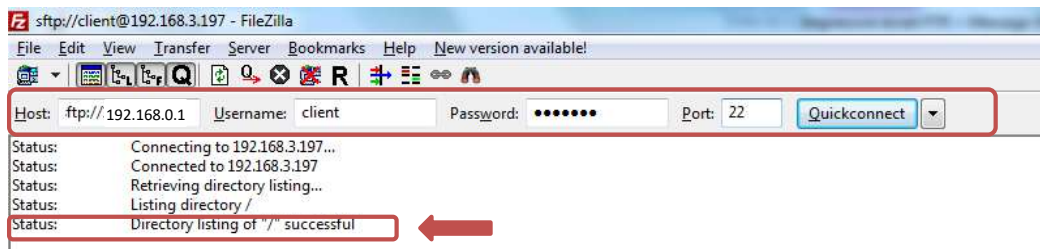


Figure: FileZilla status window

You arrive directly in the data folder.

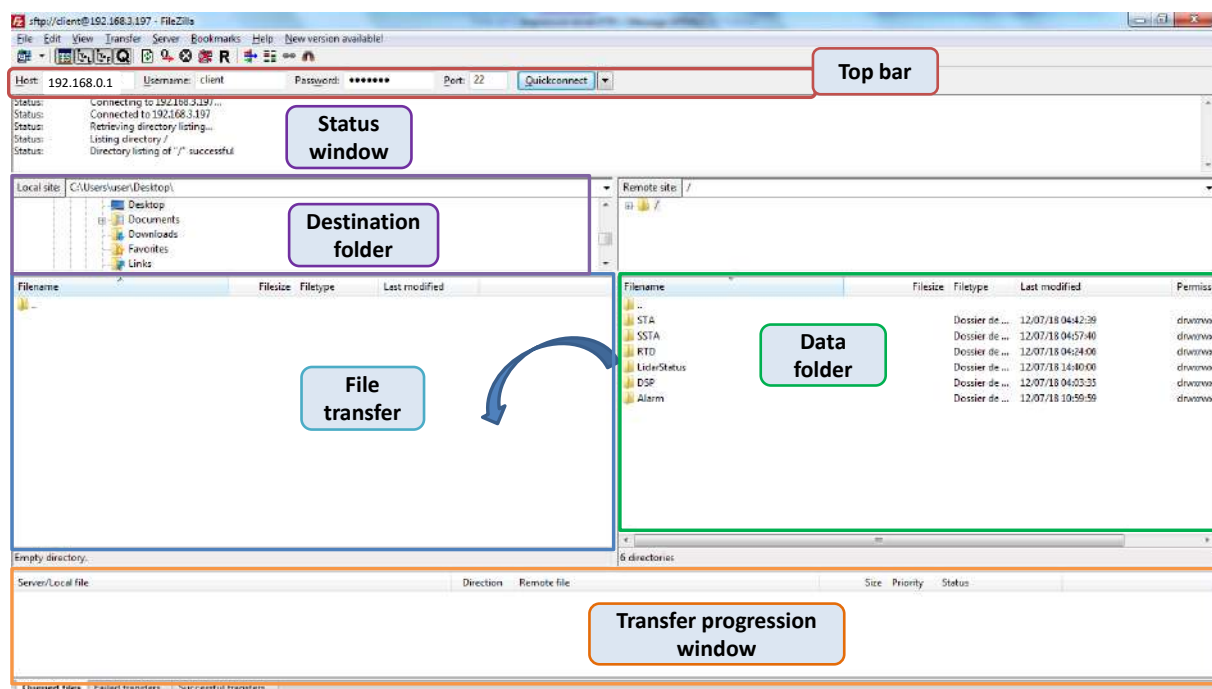


Figure: FileZilla interface

To transfer data,

- Drag and drop files from the Windcube data folder to the destination folder.

Transfer progression bar should appear on the bottom window of FileZilla, and display «Transfer complete» when the transfer occurs properly.

Saved data files format are:

- .rtd: real-time data processed or not with FCR feature
- .sta: statistic data processed or not with FCR feature



Data files are compressed with a .7z extension and can be extracted with the free software 7-Zip.

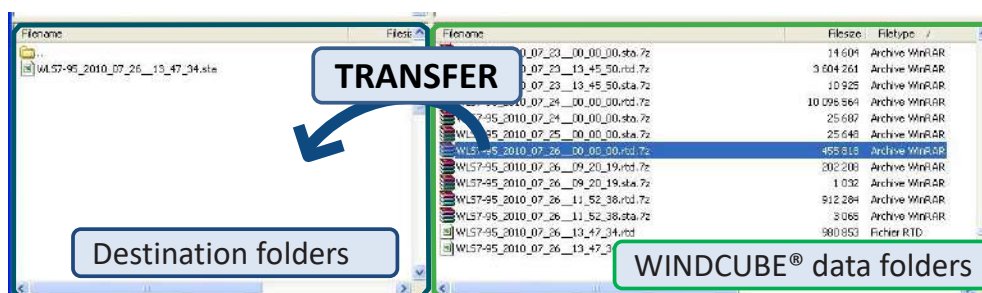
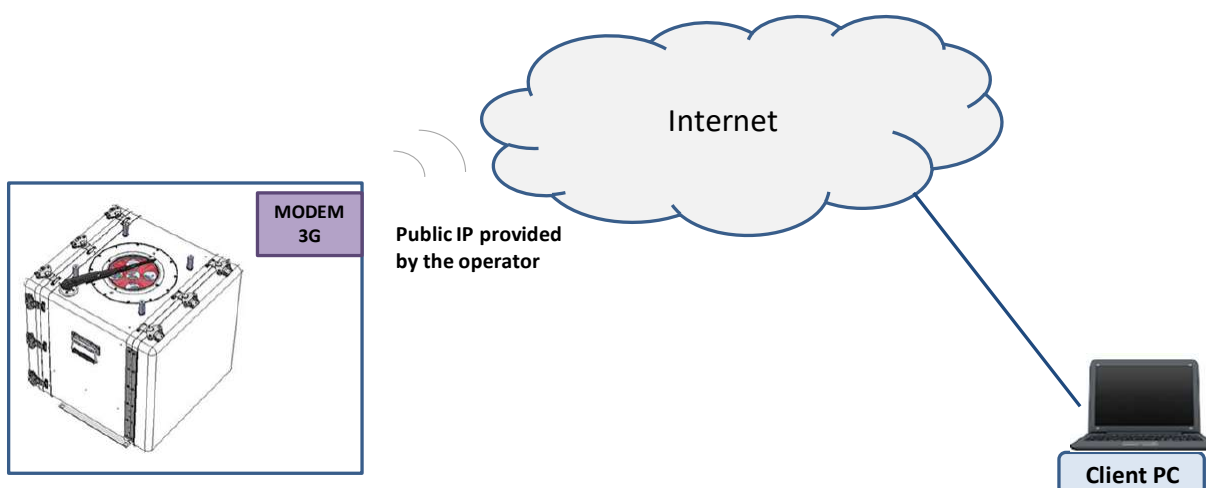


Figure: Data transfer via FTP

5.3 SFTP DATA TRANSFER REMOTELY

- Ask the phone operator for a « m2m » data package with a public available IP.
- Configure the Modem according to the Leosphere procedure.



The client accesses the data directly from the internet with a sFTP client such as FileZilla.

- Refer to the "FTP DATA TRANSFER" section of the user manual using the **public IP provided by the operator**.

SIM CARD TO USE

The SIM card to use depends on the operating mode.



You can request the system by programming queries to the Windcube and thus recover data. The SIM card must have a fixed IP address (accessible anywhere in the world).

FTP CONFIGURATION

In case you have a FTP server, you can activate the data push to FTP server.

In this case, check the box “Activate data push to FTP server”. Then new fields appear allowing configuring the FTP (host, port, user name, and password).

Then select the data type you want (.STA file, .STDSTA files .RTD files or .ALM files).



➤ . STDSTA files are available only if the FCR option activated.

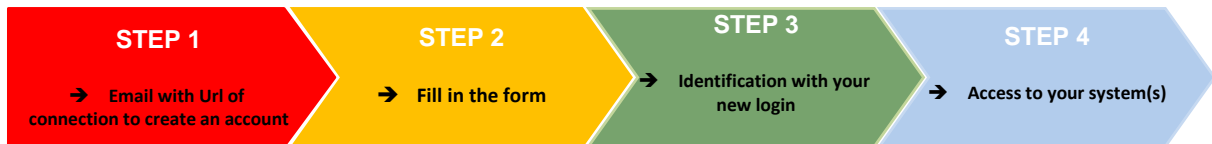
6 HOW TO GET REMOTE CONNECTION?

6.1 HOW TO CREATE A WINDWEB ACCOUNT?



For reaching Windweb software, a user must have a user account.

The connection of a user is secured by a password associated with a unique login.



STEP 1

Once you bought your Lidar, you will receive an email inviting you to connect to your Lidar. If you don't already have a Windweb account, you will be requested to create your user profile on our secured Windweb site.

- Click on the link in the email: <http://windweb.leosphere.com/XXXXXXXXX>



It's a unique link and once your account is created the link will become obsolete.

A Web page opens, with a form you have to fill in (see screenshot below).

STEP 2

Your professional **Email** address is already seized in the corresponding field (1).

- Create a **password** (2). This one has to respect precise criteria to guarantee the safety of your user account.



Your **password** must contain: 8 characters minimum and at least 1 uppercase letter, 1 lowercase letters, 1 digit and 1 special character.

- Confirm your password (3)
- Seize the mandatory fields with your **name, first name**, your **company name** and a **phone number** (4).
- Click on [Create account] button (5).



For the phone number, please enter the format of international phone number.

When all is correctly filled in, a new page opens.

STEP 3

The authentication window is displayed,

- Enter your email address **(1)** and password **(2)**.
- Click on [Login] button **(3)**.

In case of error in the attempt of connection, an error message is displayed. You can reset your password if you forgot it.

So, if you forgot your password, we recommend you, at the second unsuccessful attempt, to click on "Forgot password?" link in order to reset it.

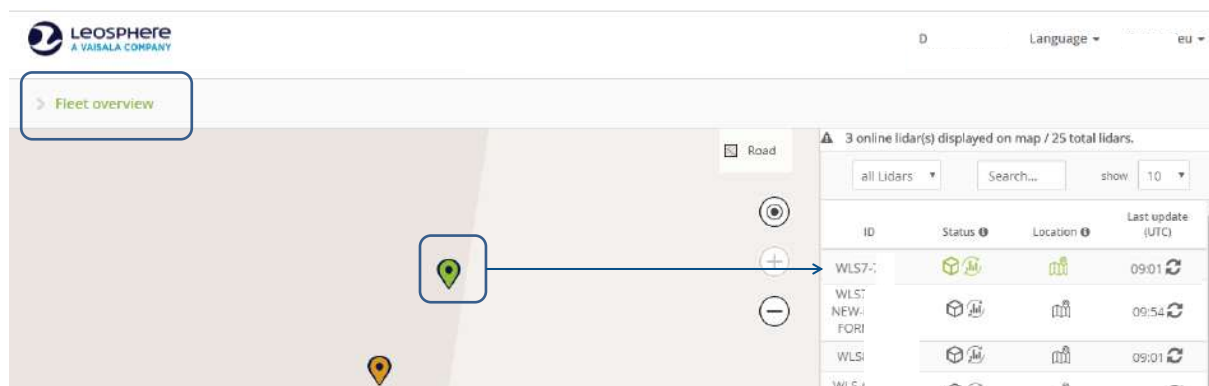


You have only three attempts of connection.

If your email or your password is wrong, your account will be blocked at the end of the 3rd attempt. Your account will remain blocked during 24 hours.

STEP 4

Once your authentication is successful, you enter in Windweb and you can see your system(s).



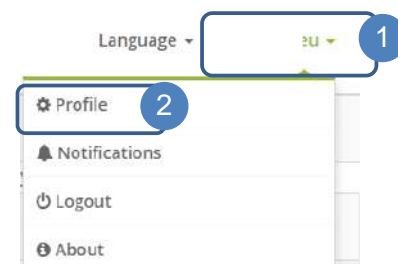
6.1.1 HOW TO CHANGE YOUR PASSWORD?

If you want to change your password, go to the top of your screen, on the right part,

- Click on the arrow next to your name **(1)**

A pop-up opens,

- Click on "Profile" **(2)**

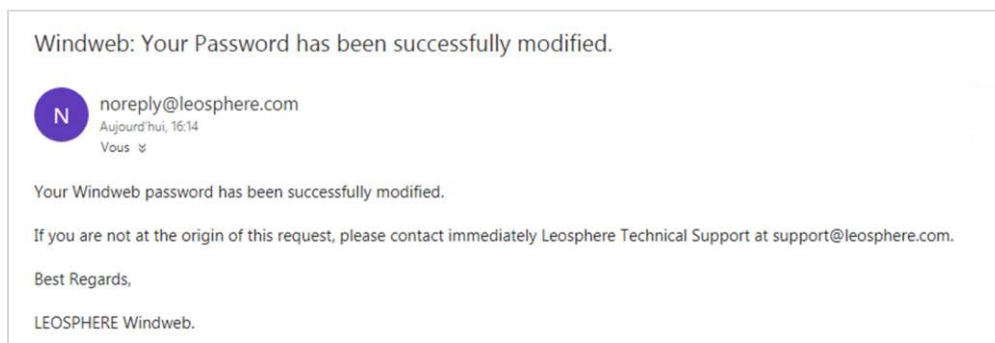


The “Profile” window opens **(3)**

- Enter your old password **(4)**
- Write a new password **(5)**
- Confirm it **(6)**
- Verify the fields “Name”, “First name”, “Company” and “Phone” **(7)**
- Click on [Update] **(8)**.

You will then receive an email which confirms that your password was successfully modified.

The screenshot shows the 'Profile' window. Callout 3 points to the window title. Callout 4 points to the 'Old password' field. Callout 5 points to the 'New password' field. Callout 6 points to the 'Confirm password' field. Callout 7 points to a group of fields including 'Last name', 'First name', 'Company', and 'Phone'. Callout 8 points to the 'Update' button at the bottom right.



6.1.2 FORGOT PASSWORD?

If you have forgotten your password,

- Click on “Forgot password” link **(1)** at the bottom of the login window,

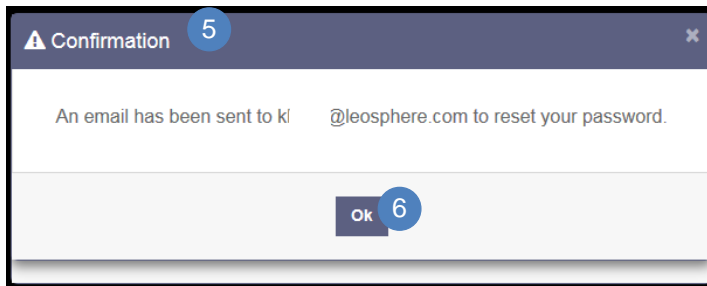
A “Conformation” pop-up opens **(2)**

- Enter your email **(3)**
- Click on [Apply] **(4)**

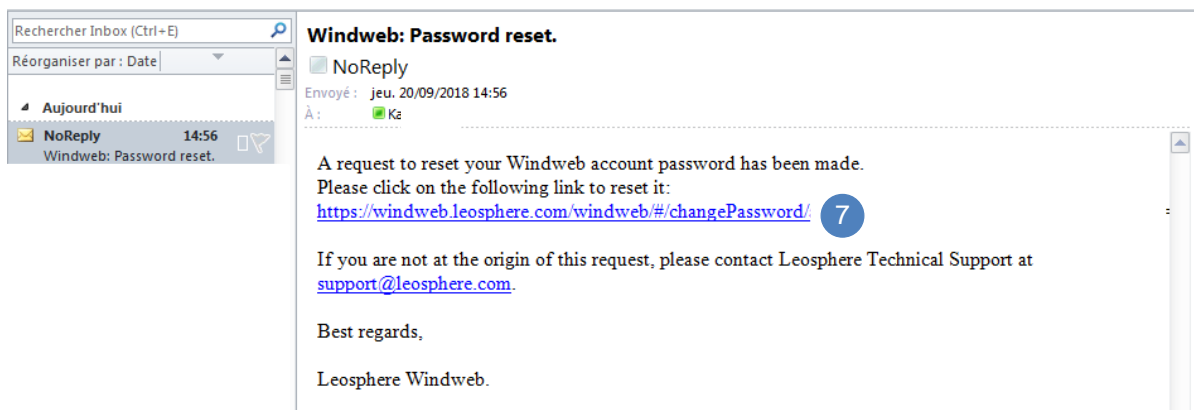
The top screenshot shows the login window with fields for 'Email' and 'Password', and a 'Login' button. A callout 1 points to the 'Forgot password?' link at the bottom. The bottom screenshot shows the 'Confirmation' pop-up with an 'Email' field and 'Apply' and 'Cancel' buttons. Callout 2 points to the pop-up title, callout 3 points to the email field, and callout 4 points to the 'Apply' button.

A “Confirmation” pop-up displays **(5)** to inform you that an email was sent to reset your password.

- Click on [OK] (6).

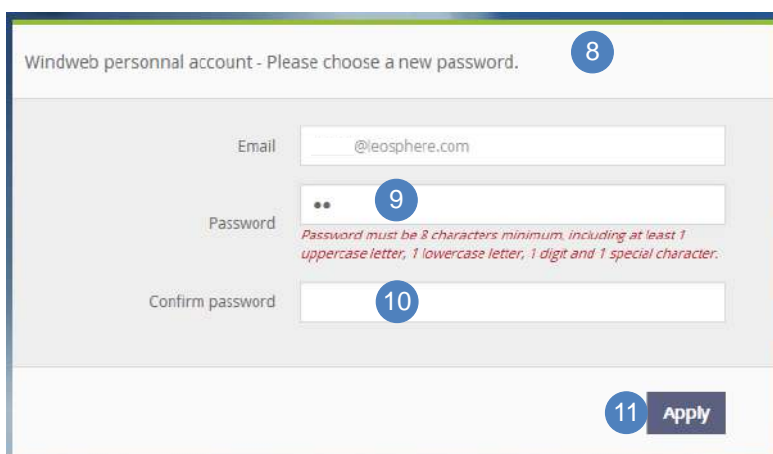


- Go to your email inbox,
- Open your email and
- Click on the link (7)

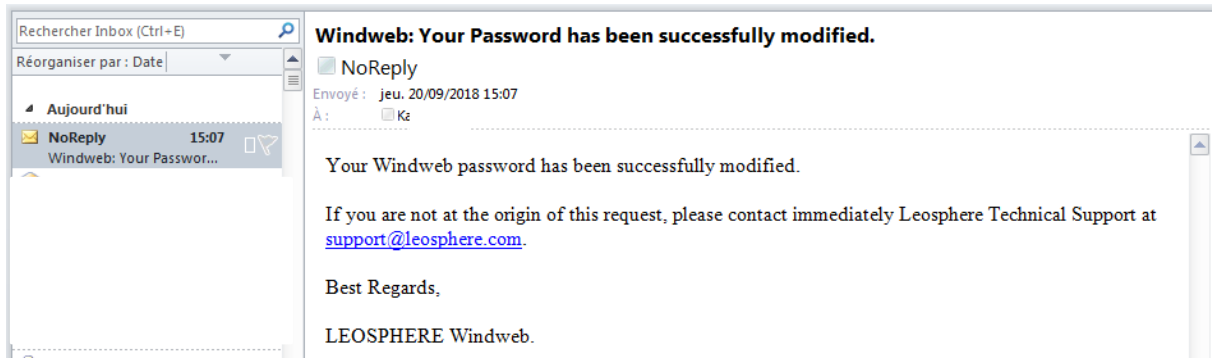


A pop-up opens (8)

- Enter a new password (9)
- Confirm your password (10) and
- Click on [Apply] (11).

A web form titled "Windweb personal account - Please choose a new password." with a blue border. It has three input fields: "Email" with the value "@leosphere.com", "Password" with masked characters "••", and "Confirm password". A red error message below the password field says: "Password must be 8 characters minimum, including at least 1 uppercase letter, 1 lowercase letter, 1 digit and 1 special character." At the bottom right is an "Apply" button. Blue circles with numbers 8, 9, 10, and 11 are placed near the title bar, password field, confirm password field, and the "Apply" button respectively.

You will then receive an email which confirms you that your password was successfully modified.



6.2 USER MANAGEMENT

6.2.1 LICENSES

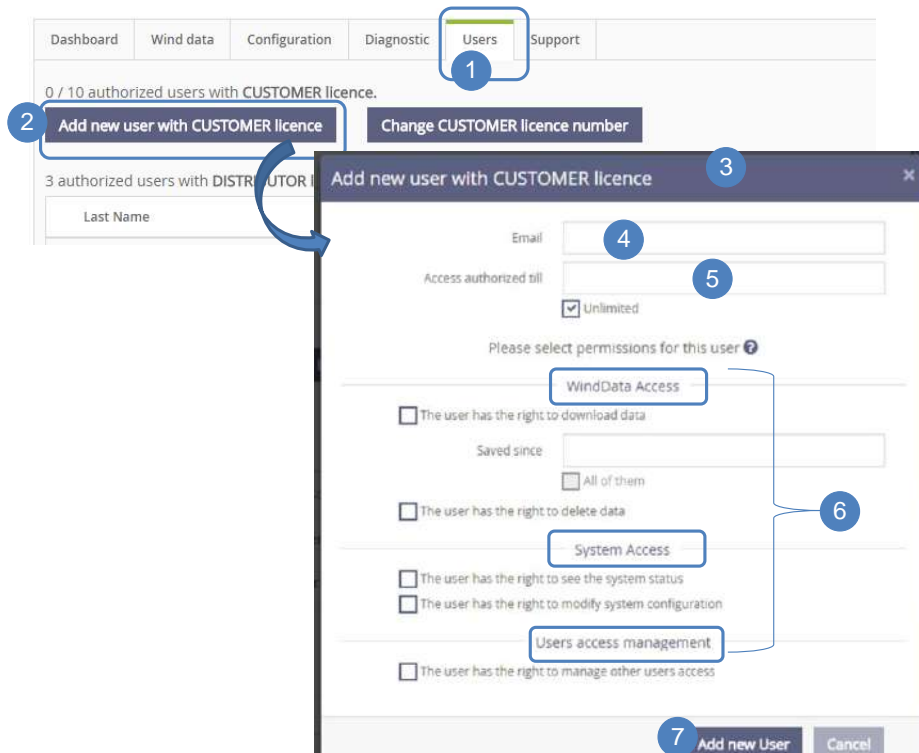
Only the Lidar administrator can reach this tab for inviting or authorizing a new person to create an account.



There is only one Lidar administrator by system; so, a single person by system has access to this tab.

To do so,

- Click on [Users] tab (1)
- Click on [Add new user with customer license] (2). The corresponding pop-up opens (3).
- Enter an email address (4) and select a date for the authorized access (5).
- Select all access you want to give (6) and click on [Add new user] (7).



- Tick the boxes, according to the access you want to give to the user.

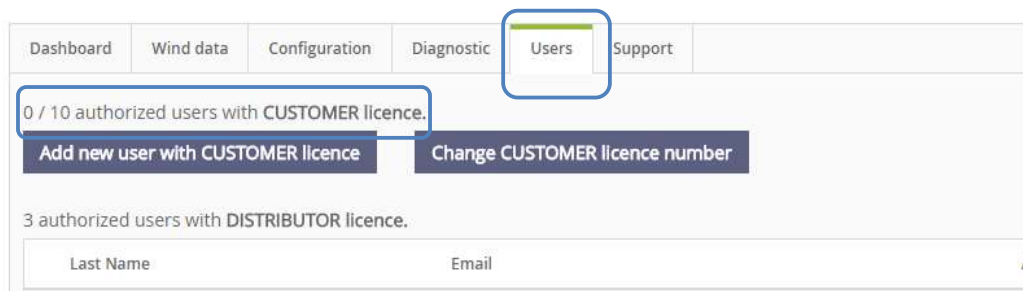
You have 3 levels of access:

- Wind data access,
- System access,
- User access management.

Each client has the possibility to authorize and associate one or more persons on his system.



There are a maximum number of licenses by system. This maximal number is **10**. When you reached the maximal number and if you want to authorize one more person, a pop up opens informing you “you cannot add of new user having access to this system, the maximum number of authorized licenses was reached”.



If you enter an already used email address, you will also receive an alert message.

- Each user having access to a system uses a license (and only one) on this system.

6.2.2 PERMISSIONS

A user can access from 0 to N systems (N is unlimited).



- Permission is the set of functionalities that a user has access to for a particular system.
- Permissions for a same user may vary from one system to another.

The basic principle is that a user cannot give, to another user, permissions he doesn't have himself (on a given system).

The access to certain features on Windweb will be limited depending on the given permissions to the user. A user with appropriate permissions can reach specific pages of a system, for a determined period or unlimited period.

For any recording of new email address authorized on a system: -

- If a corresponding account exists, an email notifying the authorized user will be sent, indicating that a new system is, from now on, accessible in the fleet of the user.
- If no account was created with this email address, an email inviting the user to create an account will be sent.

The highest permissions are:

- Right to see/download data on a determined period of time for one system
- Right to delete data
- Right to see the statuses
- Right to modify the configuration's parameters of the system
- Right to visualize the state and the real time statuses of the system
- Right to manage other user accesses.



A user can have different sets of permissions on different systems.

- The Lidar administrator can visualize the users having access to the system with the parameters of account and list of the given permissions.
- The Lidar administrator can delete the access to a system to another user.
- The Lidar administrator can modify the permissions granted to another user on a system.

MEANING AND CONSEQUENCE OF PERMISSIONS

We will describe all permissions from [User] tab → [modify permissions] button:

Modify permissions

Email

Access authorized until

☐ Unlimited

Please select permissions for this user ?

Wind data access

☒ User has the right to download data:

Saved since:

☒ All data

☐ User has the right to delete data files from Windweb server.

Lidar access

☐ User has the right to see Lidar status.

☐ User has the right to modify Lidar configuration.

User access management

☐ User has the right to manage other user's access.

Update Cancel

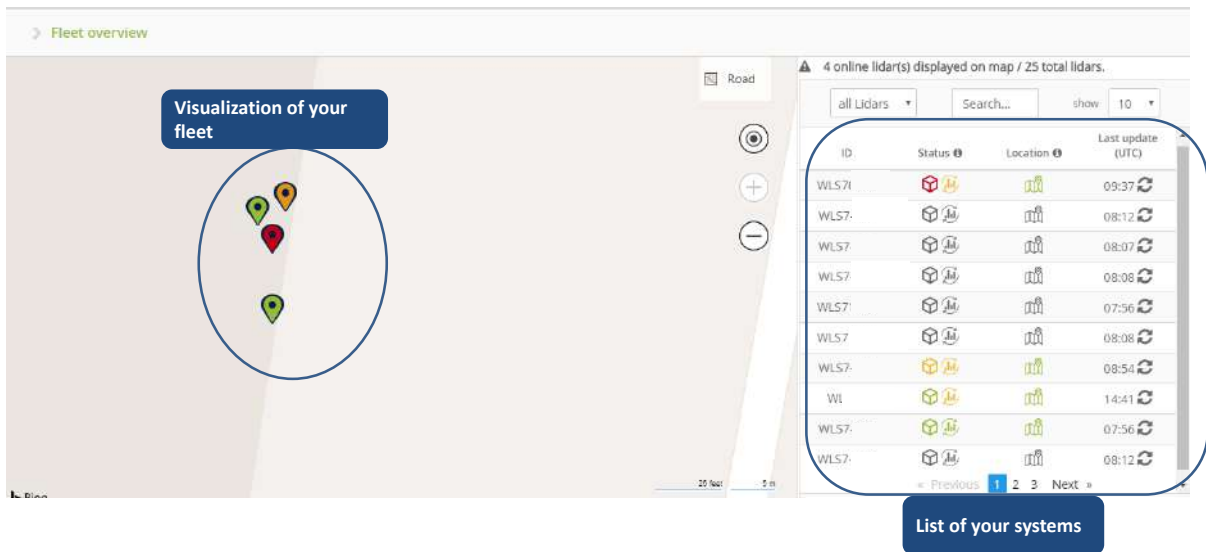
PERMISSION'S DESCRIPTION	PERMISSION'S SIGNIFICATION	CONSEQUENCES
Access authorized until	The user can access to the system's interface for a set period of time	→ the deadline is mentioned in the breadcrumb trail → the system doesn't appear in the fleet overview after the deadline.
User has the right to download the data	The user can access to measured data history	If permission checked → access to [Wind Data] tab If unchecked → access to [Wind Data] tab forbidden
Saved since	The user can download data for a set period of time	If a "precise date" is seized → only recorded files from this date are listed. If "all data" is checked → all STA files are listed in [Wind Data] tab.
User has the right to delete the data files from Windweb server	Permission to delete measured data, from the server	If unchecked → the user can't see, in [Wind Data] tab and from [Files] button, the submenu "delete files" in the drop-down list. 
User has the right to see the Lidar status	The user can visualize the system's state	If unchecked → the user can't see the [Status] submenu in [Diagnostic] tab.
User has the right to modify the Lidar configuration	The user can write and change parameters of system's configuration	If unchecked → the user has access to the [Configuration] tab. He can see the configuration and parameters but cannot modify them
User has the right to manage other user's access	The user has client "administrator" right	If unchecked → access to [User] tab is forbidden

6.2.3 FLEET MANAGEMENT

OVERVIEW

Once connected to Windweb, the user can see the list of the systems associated to him through a list and the map.

The map is visible next to the list of the systems and allows geolocation according to the last known GPS datum.



6.3 SYSTEM MONITORING, DIAGNOSTICS

6.3.1 MEASUREMENT VISUALIZATION

- Connect to Windweb and install it as described [in section 4.5](#), or [in section 4.6](#).
- Select your Lidar in the fleet overview and the [Dashboard] tab opens.

When the system is running and is connected to Internet, wind measurements are automatically displayed on user interface, in [Dashboard] tab.

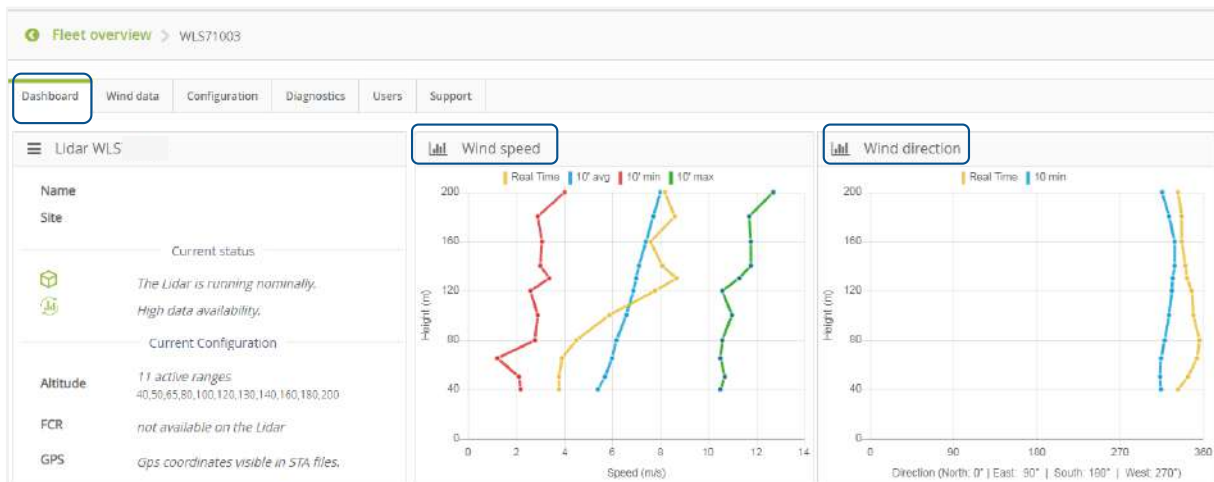
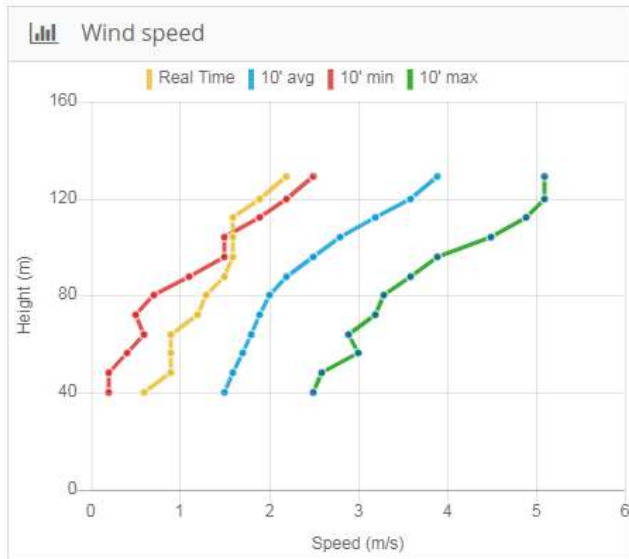


Figure: Windcube Graphical User Interface – Main Windweb interface

The first graph, on the left-hand side, shows the horizontal wind speed profile at user defined altitudes.



The unit of horizontal wind speed is meter per second (m/s).

On this graph, four curves are:

Yellow curve is real time wind profile.

A new curve is refreshed every second.

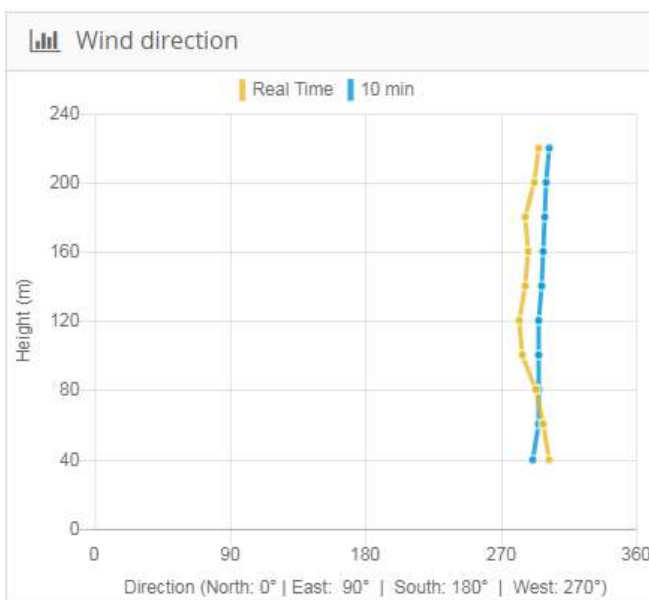
Blue curve is the 10 minutes wind speed average.

Red curve is the minimum wind speed over the last ten minutes.

Green curve is the maximum wind speed over the last ten minutes.

Hover the mouse on a dot on a curve to get additional information.

Figure: Wind speed profile



The second graph, on the right-hand side in the [Dashboard] tab, shows the wind direction profile at user defined altitudes.

The direction is represented on a polar plot and the altitudes are represented from the center (0m) to the perimeter (maximum). A 0° (or 360°) measurement means that the wind comes from North.

Yellow curve is real time direction profile. A new curve is refreshed every second.

Blue curve is the 10 minutes direction average.

Figure: Wind direction profile

- Hover the mouse on a dot to get more information



VISUAL INDICATORS

In [Diagnostics] tab → [Status], nine indicators inform the user about status and proper functioning of Windcube.

In case of an abnormal status (orange, red or grey) you can click on the indicator in order to get more information.

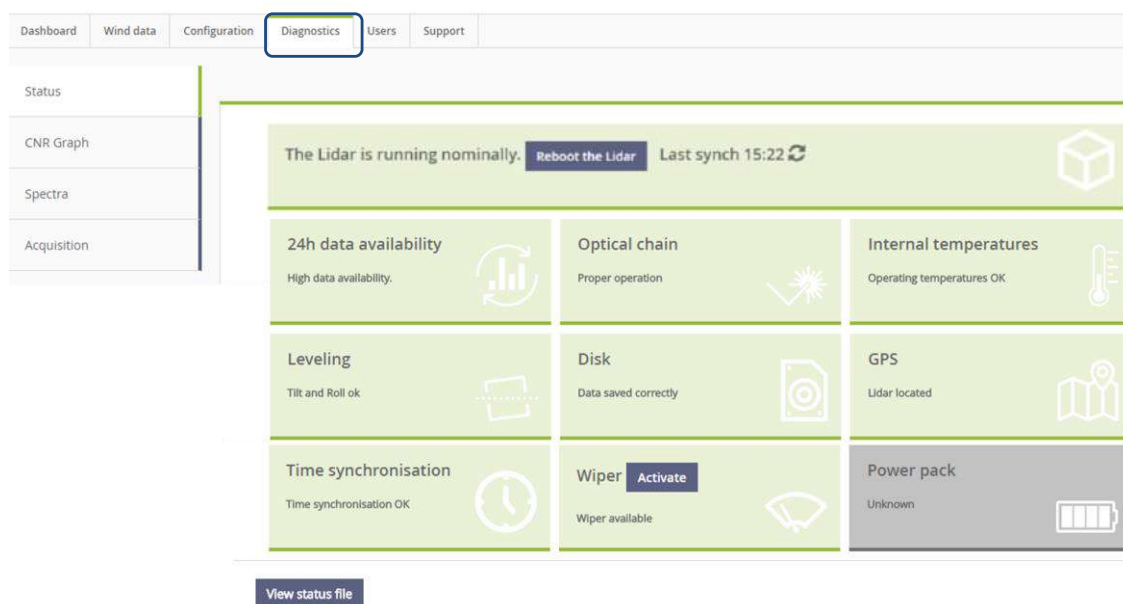


Figure: Indicators on Windweb



What is **availability**?




Under a defined CNR threshold, if the signal detected is too low, the measurement is considered inaccurate and is discarded.

Data availability is the percentage of data exceeding a defined CNR threshold.



What is the **optical chain**?

The **optical chain** corresponds to the status sum of scanner and laser.

INDICATORS	STATUS		
	Green	Orange	Red
<p>24h data availability</p> <p>High data availability</p> 	<p>More than 80% of measured altitudes between 80m and 200 m have MORE than 80% of availability.</p>	<p>More than 80% of measured altitudes between 80m and 200 m have between 30% and 80% of availability.</p>	<p>More than 80% of measured altitudes between 80m and 200 m have LESS than 30% of availability.</p> <p>Poor mean availability at all heights.</p> <p>Suggested action: Check that all lines of sight are free of obstacles.</p> <p>Check that the window is clean.</p>
<p>Optical chain</p> <p>Proper operation</p>  <p>Scanner + Laser</p>	<p>Proper operation</p>		<p>Laser status is abnormal.</p> <p>Wind speed may not be correctly received.</p> <p>Suggested action: Stop and start measurements.</p> <p>Shutdown Windcube and start it again after 30 seconds.</p>
<p>Internal temperatures</p> <p>Operating temperatures OK</p> 	<p>Operation temperature OK</p>	<p>Warning high or low temperature</p>	<p>The system reaches extreme temperatures (under – 30°C and over 45°C).</p> <p>Windcube will stop measurements and then shut down when extreme temperature is reached.</p> <p>When proper temperature is back to normal, system and measurements automatically restart.</p> <p>Suggested action: In warm weather, make sure that fan vents are not obstructed.</p>

Leveling Tilt and Roll ok 	Proper communication with compass and correct tilt and roll	Compass communication loss Suggested action: Shutdown Windcube and start it again after 30 seconds.	Pitch and roll shift above limits. Measurements may be biased. Suggested action: Precise Windcube position in its location
Disk Data saved correctly 	Data saved properly		Data not saved properly Suggested action: Shutdown Windcube and start it again after 30 seconds
GPS Lidar located 	Proper communication with GPS		GPS communication loss. No GPS localization and synchronization Suggested action: Shutdown Windcube and start it again after 30 seconds
Time synchronisation Time synchronisation OK 	Synchronization with the NTP server or with the GPS is OK	Synchronization failed Suggested action: Check the time synchronization settings using Windweb	
Wiper Activate Wiper available 	Wiper is available	Wiper is in standby to limit wear Suggested action: Wiper can be tested by clicking on the wiper indicator	



What is **synchronization**?

Synchronization allows setting of the Windcube internal clock using GPS satellite or Network Time Protocol (NTP).

ALARMS



When using the Windcube on a buoy, make sure the inclinometer is deactivated, otherwise you will receive several alarms.

If a user has subscribed to system alerts (from notification's feature), he will receive status files when one or more status indicator(s) become orange or red.

Notifications are sent in the following cases:

- Critical temperatures prevent the Windcube from working properly.
- Tilt or roll angles are over 1° and below -1°.
- The EDFA status is critical, either it is off or the communication is lost.
- Data are not saved correctly.
- No GPS or NTP synchronization.
- Availability is lower than 30% for 80% of altitudes between 80 and 200m.
- Power pack option has malfunction (error, supply voltage lower than 21V, methanol consumption over 25L...).

Example:



Figure: Example of received email

```

LIDAR WINDCUBE STATUS REPORT
2018_07_23_08_30_01
WLS:
GPS:
V2.1.6.2

Alarm origin: Compass
Warning origin: None

EDFA:
- Loss of Output power?: OK
- Loss of Input power?: OK
- LD current bias?: OK
- Case temperature out of range?: OK
- Laser diode temperature out of range?: OK
- Disabled EDFA?: OK
- Out of range power supply?: OK
LDC=1463
CAT=40

DIODE:
FFT(FMAO) = 2267.547688

Pitch angle(deg)=-3.5
Roll angle(deg)=-0.1
Pitch&Roll error

PTH:
Not connected

DATA AVAILABILITY:
AvailableAltitudes(%)=100.0

LAST TIME SYNC:
23 Jul 08:29:34 ntpdate[19279]: adjust time server 80.74.64.2 offset -0.008567 sec

WINDCUBE POWER PACK M50 (PV):
None

FLOW COMPLEXITY RECOGNITION (FCR):
FCR-disabled
  
```

Figure: pop-up from [Diagnostic] tab → [status sub] tab → [view status file] button

DIAGNOSTICS

The control of the state of the systems allows making sure that the fleet is in a good state.

You see the real time fleet, but you can also verify its state at a previous moment.

This control allows in particular:

- To the operator to detect efficiently possible problems in order to plan support operations.
- To the analyst to understand some variations in the realized measures
- To the person in charge of campaign to verify the proper conduct of its campaign
- To verify, the good state of its material (or to understand the origin of problems if necessary).

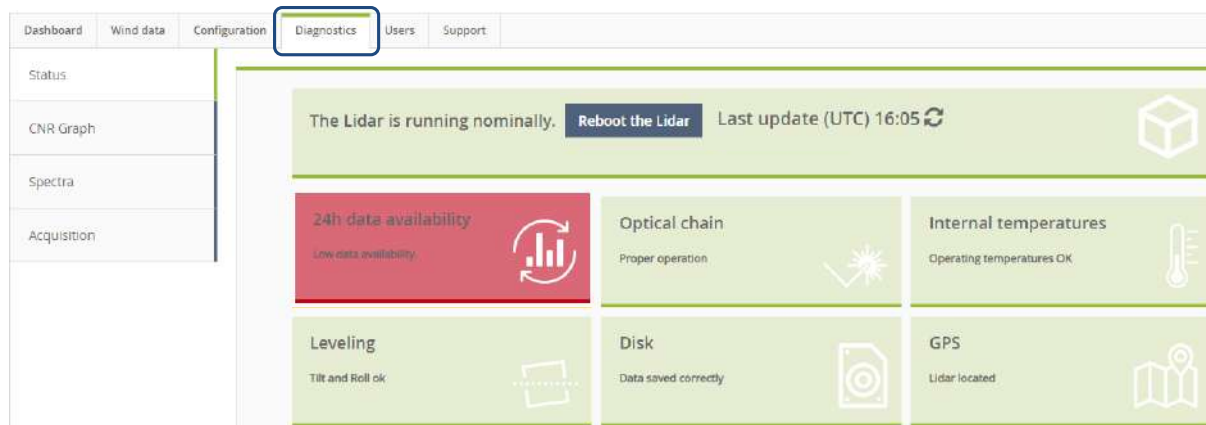


Figure: Example of [Diagnostics] tab with data availability in critical state

7 HOW TO CONNECT YOUR WINDCUBE TO THE NETWORK?

Please refer to the recommendations and steps [in the 4.7 chapter "Wi-Fi connection"](#).

7.1 Internet connection



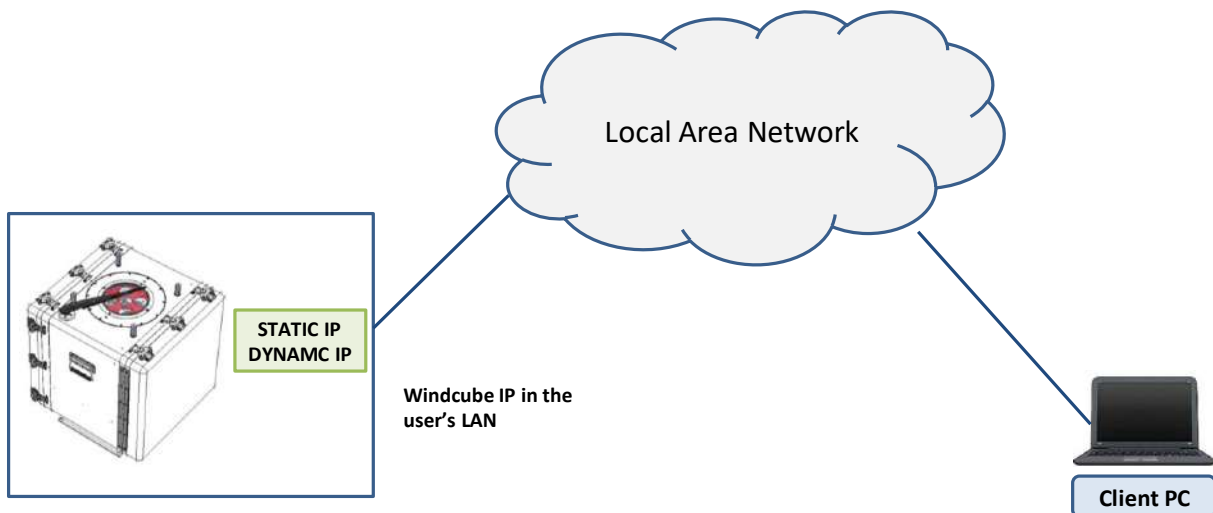
The Windcube can be connected to Internet via a LAN network or via 3G/GPRS using his router. This connection will assure you a remote access to your system to monitor, configure and download your data via the Windweb interface.

7.1.1 LAN NETWORK CONFIGURATION



The Windcube can be connected to a LAN network managed with a DHCP server (Dynamic Host Configuration Protocol), or a network with assigned IP addresses.

It is strongly recommended to seek the assistance of your network administrator if you intend to plug your Windcube to a LAN network.



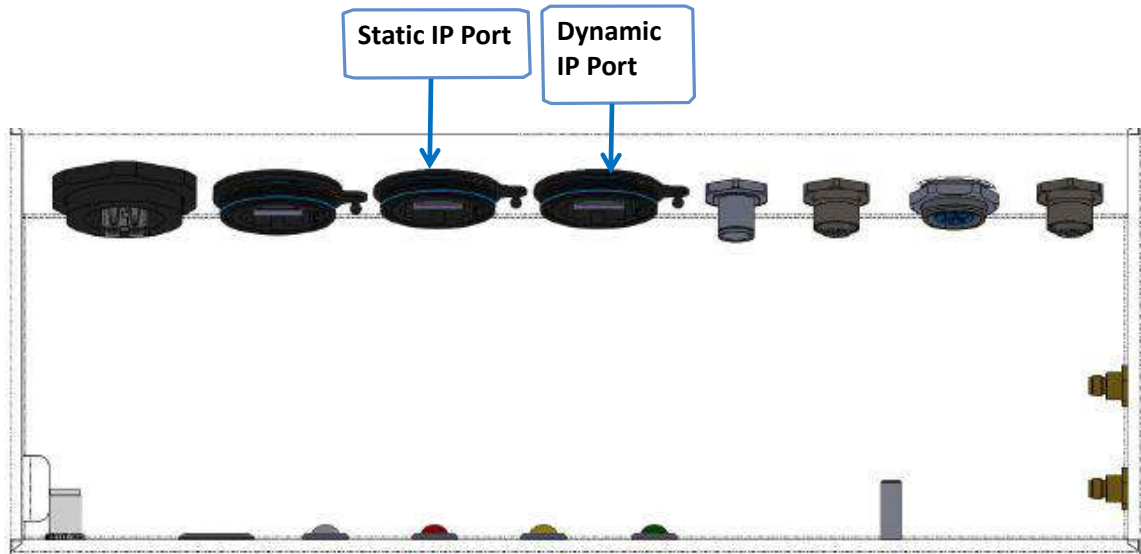


Figure: Connection trapdoor – Static/Dynamic IP port

To configure the IP address of the Windcube,

- Connect a laptop to the static IP port via Ethernet cable on the connection trapdoor and access the Windweb Lite (if necessary, refer to [4.6 chapter: Windweb Lite connection](#)).
- Click on [Configuration] tab (1), then go to Network section (2) to access the configuration of the network.

A screenshot of the Windweb Lite web interface. At the top, there is a navigation bar with tabs: 'Dashboard', 'Configuration' (highlighted with a blue circle and the number 1), 'Diagnostics', and 'Support'. Below the navigation bar, there is a checkbox for '.RTD files' which is checked. The main content area is titled 'Network' and contains a warning message: 'Warning : bad configuration of network parameters could disturb Lidar operations, please check your changes before applying new network parameters.' Below the warning, there are five input fields for network configuration: 'IP', 'Netmask', 'Gateway', 'DNS 1', and 'DNS 2'. A blue circle with the number 2 is placed next to the 'IP' field. At the bottom of the 'Network' section, there is a 'Wifi' section with a checkbox for 'Activate Wifi network' which is checked. Below this, there is a text field for 'Local IP address with Wifi will be' and a text field for 'DNS 1'. A note below these fields says: 'For example, you will access Windweb Lite with a Wifi access on the Lidar on : http://192.168.1.20/windweb'. At the bottom left of the page, there is a button labeled 'Apply changes' with a blue circle and the number 3 next to it.

It is important to carefully set this IP address, as it would be impossible to access or modify it with a remote connection. Finally,

- Click on [Apply changes] (3).

Network

Warning : bad configuration of network parameters could disturb Lidar operations, please check your changes before applying new network parameters.

IP

Netmask

Gateway

DNS 1

DNS 2

Figure: Network configuration

- Connect your Windcube to the LAN network using the Static/Dynamic port in the trapdoor and an Ethernet cable (straight or crossed).
- Start a Web browser and go to the following address:
<https://windweb.leosphere.com>
Windweb interface displays with an authentication window.
- Enter the login and the password (please, refer to [6.1 chapter How to create a Windweb account](#)).

On the fleet overview of your interface you can see, on the right side, the list of your Windcubes and all available Windcubes on the customer's network.

If all information display in grey, it means the system is offline.

ID	Status ⓘ	Location ⓘ	Last update (UTC)
WLS7			10:49

If the status and location appears in green, orange or red that means the system is online.

ID	Status ⓘ	Location ⓘ	Last update (UTC)
WLS7			15:48

- Make sure the system is online. If not, check the Ethernet cable connection or the IP address configuration.

To connect to the system,

- Click on the system ID. Then, all information is available as for the local connection, with the additional [Wind Data] and [Users] tabs.

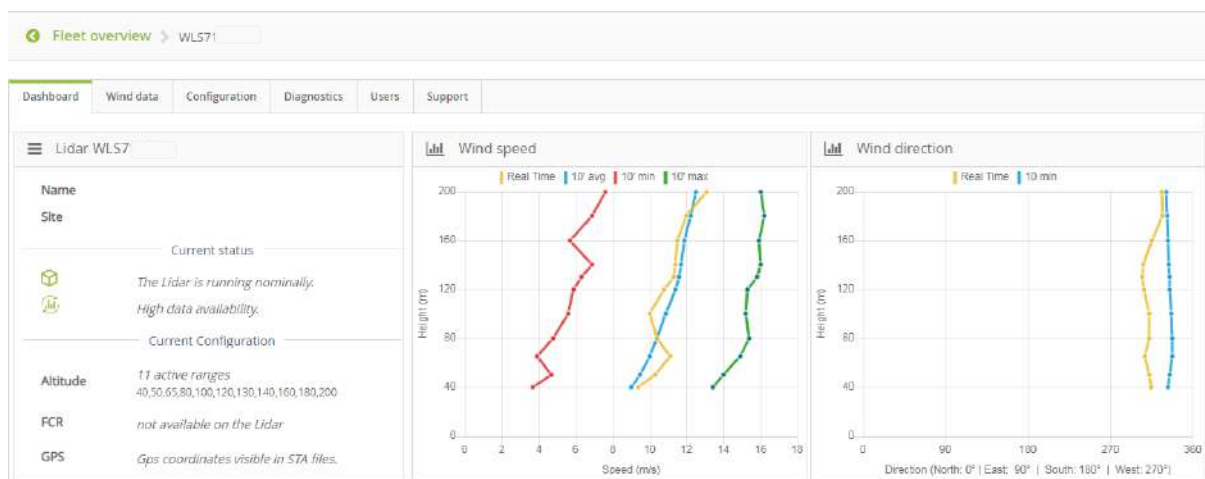


Figure: Windcube Graphical User Interface – Windweb – via a LAN network

7.1.2 3G/GPRS CONFIGURATION



The router installed on your Windcube may be different from the pictures in this section, according to the network available on your geographical location and the date of buying. A 3G/GPRS router allows a remote access to the Windcube from any computer with an internet

This section explains hardware installation, software configuration and specific functions of Windcube Windweb feature.

REQUIRED EQUIPMENT

To configure and use the remote connection, the following materials are required:

- 1 Laptop
- 1 or 2 DATA SIM card
- 1 Ethernet cable
- 1 External Antenna: quadruple band base station and marine antenna for 900MHz, 1800MHz, 1900 Mhz and 2000MHz bands (provided).

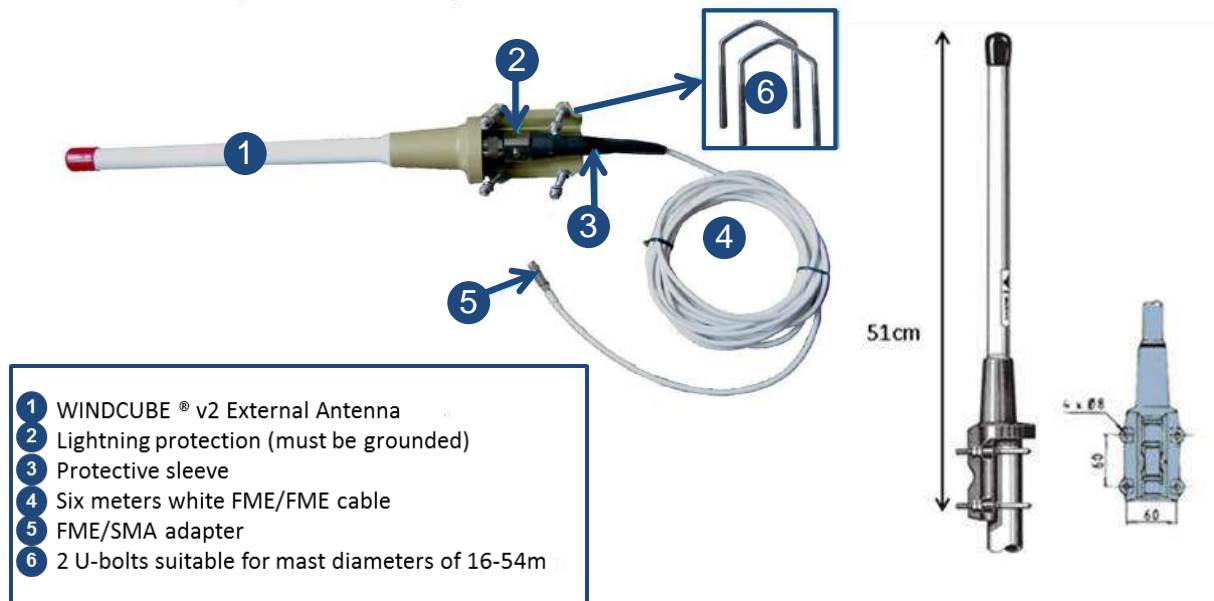


Figure: External antenna overview

ACCESS TO THE ROUTER

To access your router,

- Open the front door of your Windcube.

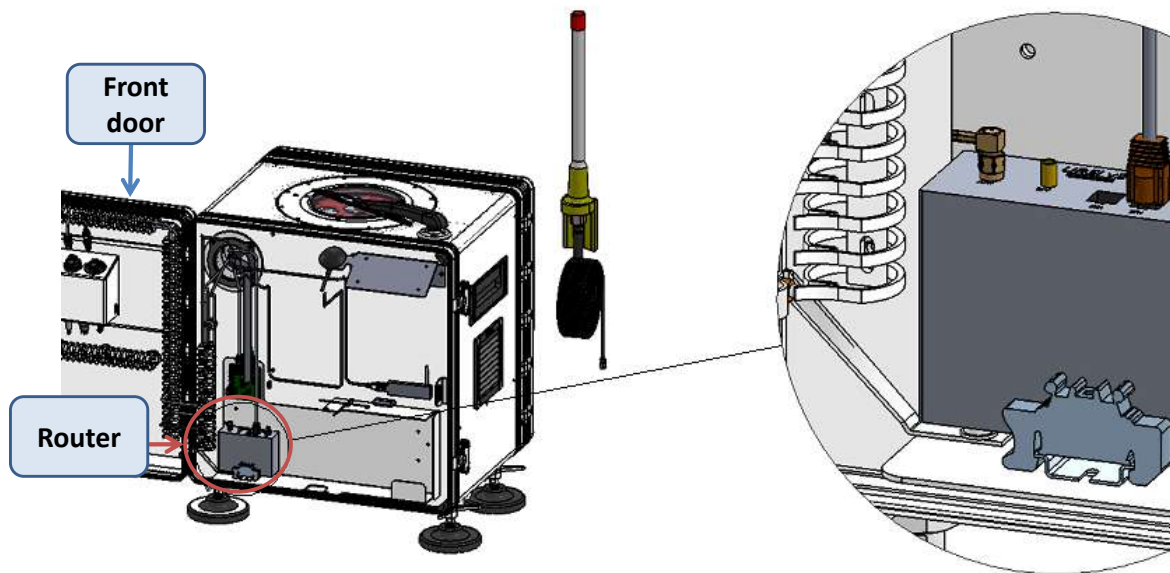


Figure: Access to the router

SIM CARD INSTALLATION

To insert the SIM card inside the router,

- Eject the black SIM card slot by pressing the small button located on the right of the SIM card slot with an Allen key size 2 or a needle.

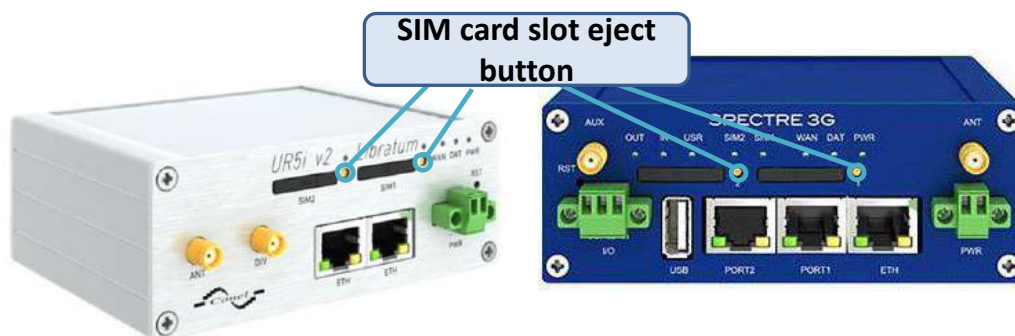


Figure: UR5i v2 Libratum (on the left) and SPECTRE 3G (on the right) routers

- Insert the SIM card carefully into the slot as shown on the following figure. Then close the slot.



Figure: SIM card slot

EXTERNAL ANTENNA INSTALLATION

- Remove the cap on SMA connector if needed and plug the white cable (FME/SReMA adapter side) on the SMA connector in the connection trapdoor outside your Windcube.

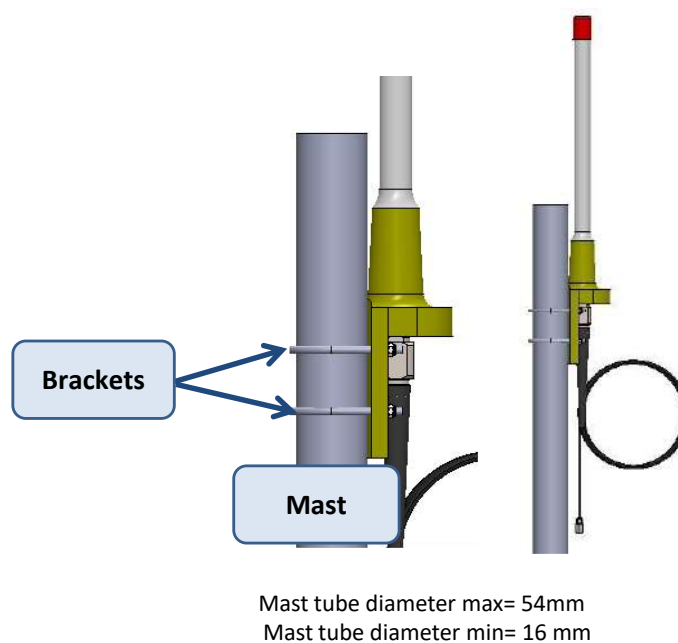


Figure: White cable with FME/SMA adapter



Figure: Connection to the trapdoor – GSM antenna Port

- Attach the external antenna on a mast using the two U-bolts. The mast is not provided. Many configurations can be used as described below.



Mast tube diameter max= 54mm
Mast tube diameter min= 16 mm

Figure: Antenna mast holder

- Connect lightning conductor to ground.

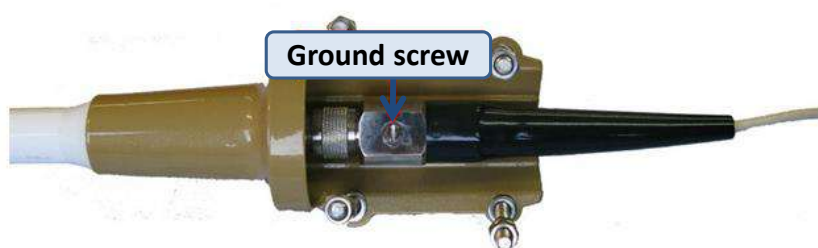


Figure: Ground screw on the lightning conductor

Once the antenna is installed, the user can start the Windcube.

ROUTER CONFIGURATION

When the router is delivered, it is already configured properly. Nevertheless, if needed, the following procedure will give the main information for a proper configuration.



To configure the router, the user should have a laptop configured in DHCP, with an internet web browser and an Ethernet cable.

The Windcube has to be turned on.

- Connect the laptop to the **port ETH0/ETH** with the Ethernet cable.



Figure: Connection to the router

- Launch a web browser and fill in the address bar with the following IP address : 192.168.1.1

An authentication window is displayed. The username and password are both: root. Then,

- Click on [Login].



Figure: Identification window

The user can now access to the router main interface.

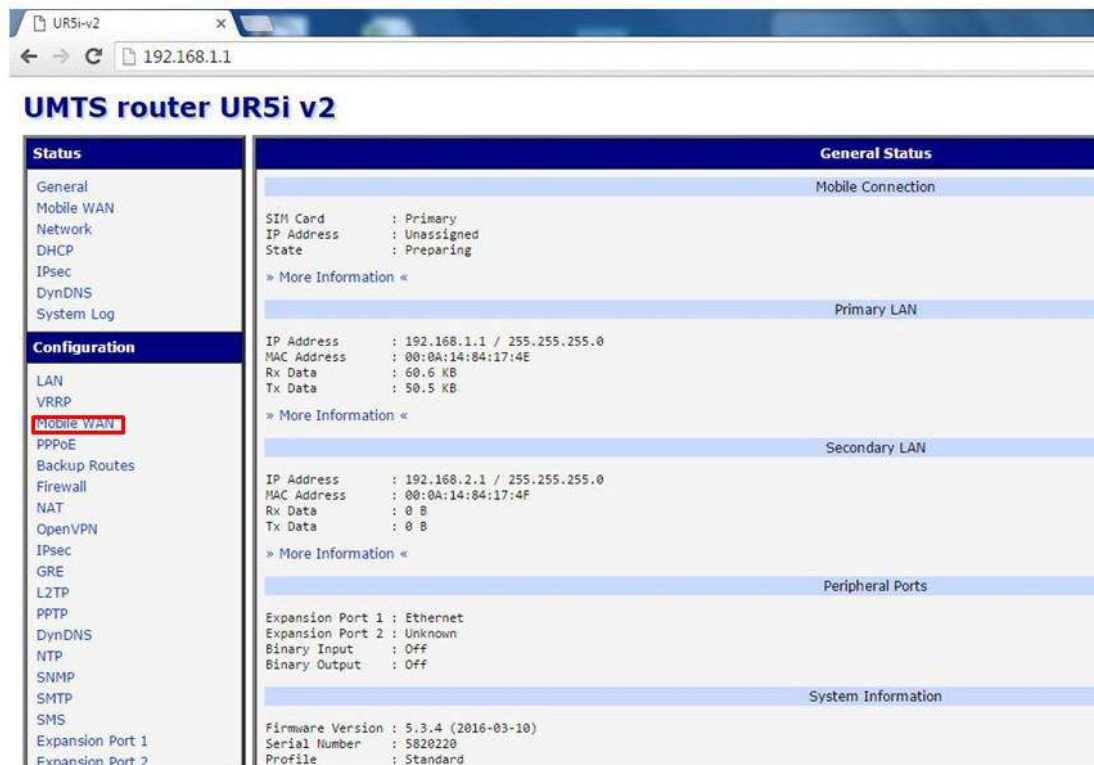


Figure: Router configuration panel

On the left tab, under Configuration part,

- Click on “Mobile WAN”.
- Fill blanks as shown on the following picture. It is possible but not mandatory to fill the APN. Usually the modem will automatically detect the APN.
- Make sure the SIM card is not protected by a PIN number.
- Tick the box “Check connection to mobile network”, and
- Fill the following information:
 - **Ping IP Address:** 8.8.8.8
 - **Ping Interval:** 1800
- Click on [Apply]. Finally,
- Click on “Reboot”. The router is now configured.

UR5iv2

192.168.1.1/ppp.cgi

DNS Server:

(The feature of check connection to mobile network is necessary for uninterrupted operation)

Check Connection:

Ping IP Address:

Ping Interval: sec

☐ Enable traffic monitoring

Data Limit: MB

Warning Threshold: %

Accounting Start:

Default SIM card:

Backup SIM card:

☐ Switch to other SIM card when connection fails

☐ Switch to backup SIM card when roaming is detected and switch to default SIM card when home network is detected

☐ Switch to backup SIM card when data limit is exceeded and switch to default SIM card when data limit isn't exceeded

☐ Switch to backup SIM card when binary input is active and switch to default SIM card when binary input isn't active

☐ Switch to default SIM card after timeout

Initial Timeout: min

Subsequent Timeout *: min

Additive Constant *: min

☐ Enable Dial-In access

Username *:

Password *:

☐ Enable PPPoE bridge mode

* can be blank

Figure: Mobile WAN configuration panel

CHECK THE CONNECTION

Please, follow this procedure to verify the internet access:

- Wait for the router to reboot after the configuration.
- Access now the Status Mobile WAN section.
- Verify at the bottom of the page the presence of the message “connection successfully established”.



The signal strength should be above -90dBm to assure a proper operation. If not, Windweb link may suffer interruptions and you may experience slow interface behavior; you should then consider optimizing your antenna location or using a different network provider.

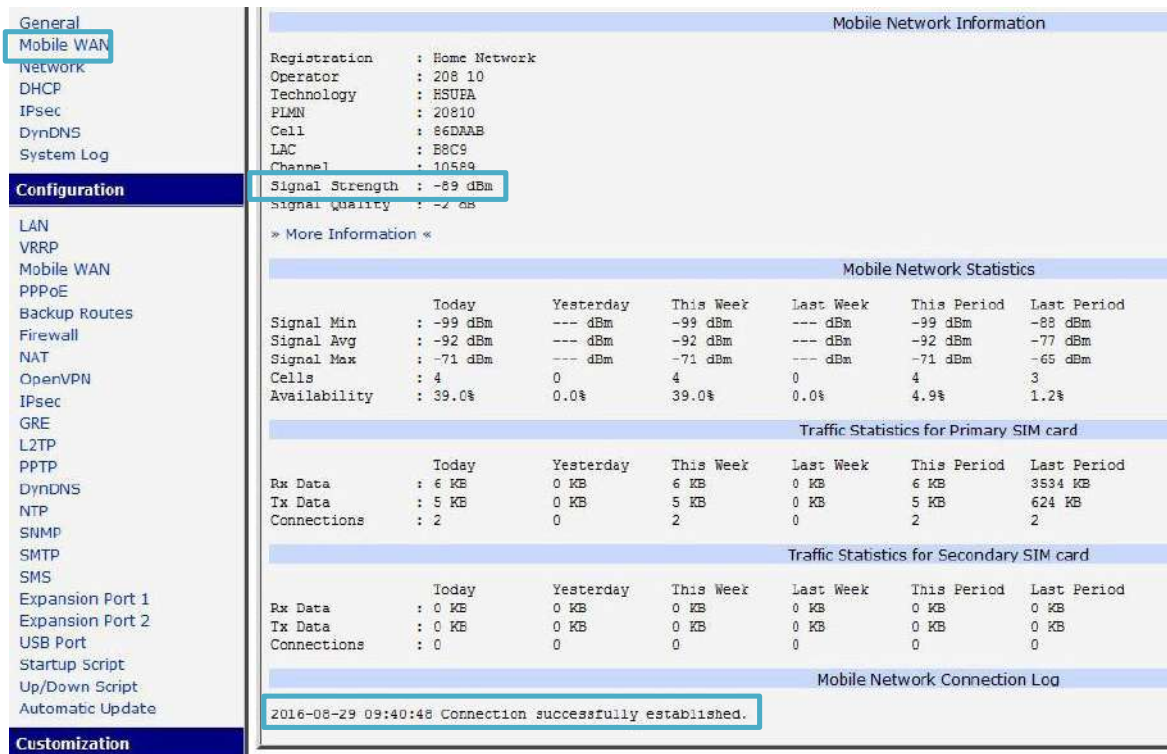


Figure: Mobile WAN status panel

To validate the Internet connection,

- Open a web page and launch a search. If the page successfully loads, you can disconnect your laptop and reconnect the Windcube to the router. If not, verify the PIN code and APN configured.



To be sure that your Windcube is correctly connected to the internet,

- Check on the Windweb that your system is online.

DOUBLE SIM FEATURE

Some routers have two SIM card slots allowing you to define rules for switching between two APNs on one SIM card or between two SIM cards, or network providers.

For instance, it gives you the possibility to switch when:

- **DATA limit is exceeded**
- **Connection is lost.**



If the 3G/GPRS on your location is not sufficient, the use of two SIM cards from two different network providers can assure you a better access quality.

Please, refer to the “Router User Manual” edited by the manufacturer, 5.7.4 section (included in the USB key) for further information on how to configure it.

7.2 VPN CONNECTION



A **VPN** (Virtual Private Network), allows you to create a secure connection to another network over the Internet.

When you connect your computer to a VPN all your network traffic is sent over a secure connection to the VPN. Because your computer behaves as if it's on the network, this allows you to securely access local network resources even when you're on the other side of the world.

The **ports to use** on the system are as follows:

- **port 80 (httpWindweb)**
- **port 22 (sftp)**

8 HOW TO MAINTAIN YOUR WINDCUBE?

8.1 ROUTINE MAINTENANCE



To ensure the warranty period, the customer is only allowed to perform actions described in this section. Damages resulting from unauthorized actions will not be covered by warranty.

- Perform the following care on a regular basis when possible:

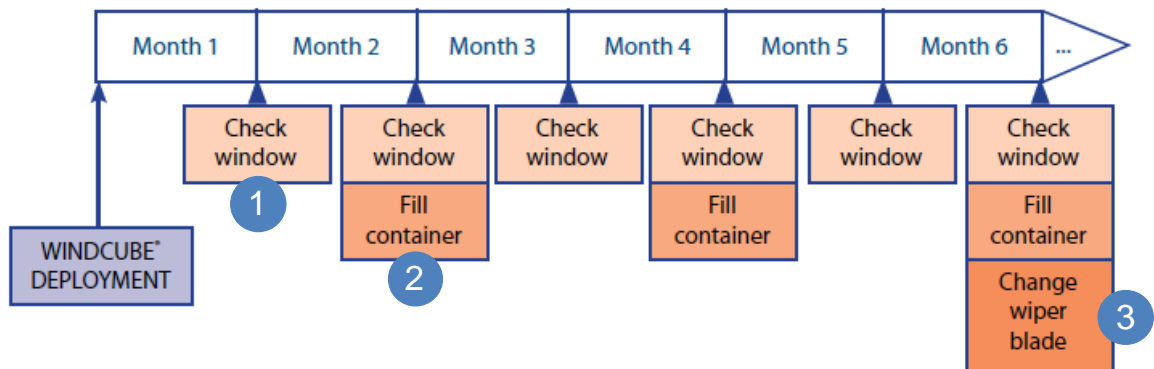


Figure: Example of periodic maintenance schedule

1

Check window → Window cleaning (once a month):

If necessary,

- Clean Windcube window with water or isopropanol (isopropyl rubbing alcohol) and optical tissues.

2

Fill container → Wiper liquid tank refilling (Frequency of refilling depends on climate and location):

- Fill a water container with a mixture of water and isopropanol (isopropyl rubbing alcohol)

according to the table below.

Outside Temperature	<-10°C	>-10°C and <0°C	>0°C
Percentage of isopropanol mixed with water	30%	15%	0%



Hard water may affect measurements by leaving lime scale deposit on the window. LEOSPHERE recommends you use soft water (mineral concentration under 60 mg/L) and will not be responsible in case of damages due to water quality.

LEOSPHERE also recommends using the following windshield wiper fluids:

- The product “Sonax Xtreme Antifreeze”. This reference is available on the website:
→ <http://www.sonax.com>
- The product “Rain-X 2-in-1”, available on the website:
→ <http://www.rainx.com>
- The product “PEAK Windshield Wash”. A list of retailers is available on the website:
→ <http://www.peakauto.com>

If you are using these wiper fluids, always follow the instructions mentioned on the bottle, indicating the proportion of wiper fluids that should be mixed with water in the container.



Any other commercial anti-freeze fluid not specifically approved for this purpose should not be used; it may result in loss of measurement.

3

Change wiper blade (if needed):

- Lift the wiper arm.
- Remove the wiper blade, pulling it away from the middle.
- Clip back the new blade, pushing it from the middle.
- Replace the arm on the window.

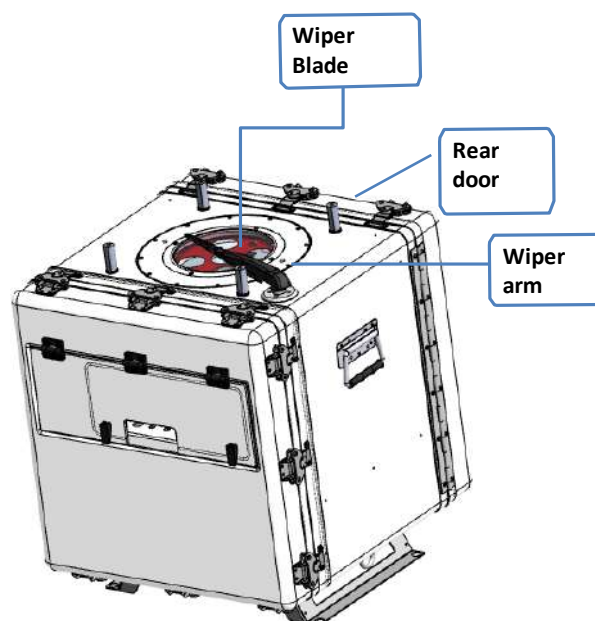


Figure: Windcube wiper blade

8.2 BASIC REPAIR

8.2.1 TROUBLESHOOTING

Some parameters are available for customers to perform a primary diagnosis test. If any of them are not nominal, please contact customer service to complete the diagnosis.

8.2.2 SYSTEM MONITORING, DIAGNOSTICS

Please refer to [6.3.1 - Measurement visualization \(Visual indicators, Alarms\)](#)

8.2.3 SPECTRA VISUALIZATION

- Click on [Diagnostics] tab
- Click on "Spectra" sub-tab to display the Power Spectral Density (PSD) of the detected signal. "Spectra" graph shows noise spectra and Doppler spectra measured at user defined altitudes.

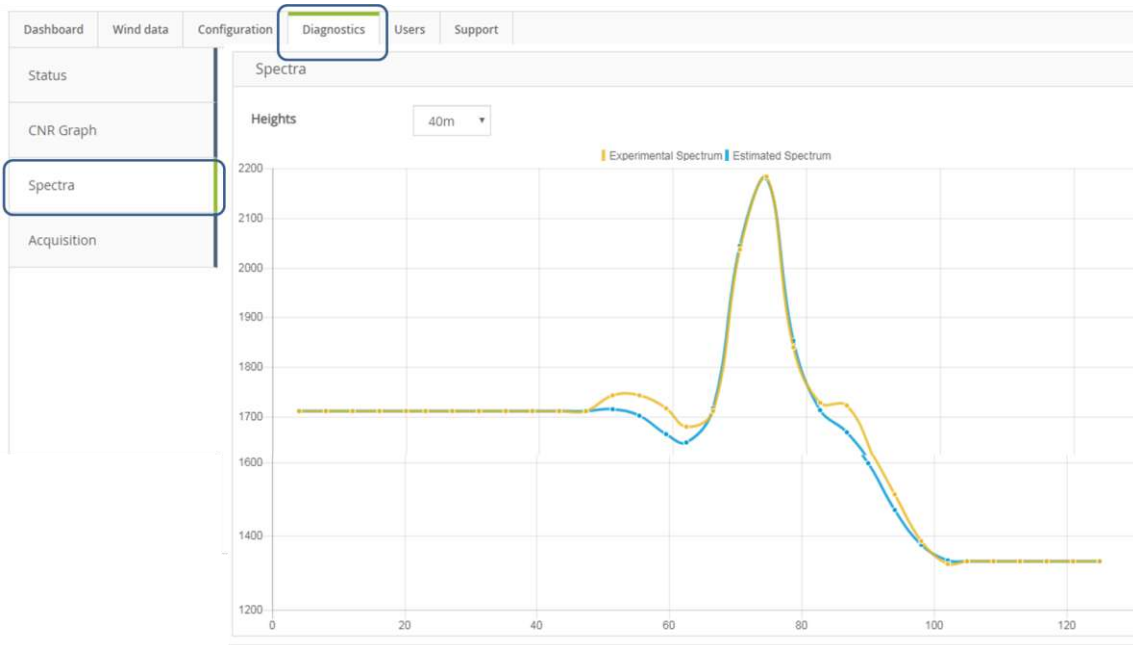
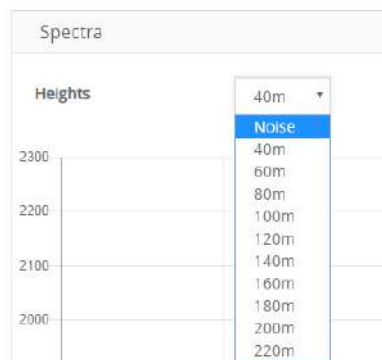


Figure: Windcube Graphical User Interface – Spectra pop-up

Noise and altitudes are selected with the “Heights” drop-down list.



- Nominal signals and main characteristics are described in the following figure:
- Visualize spectra, for an altitude around 100 meters.

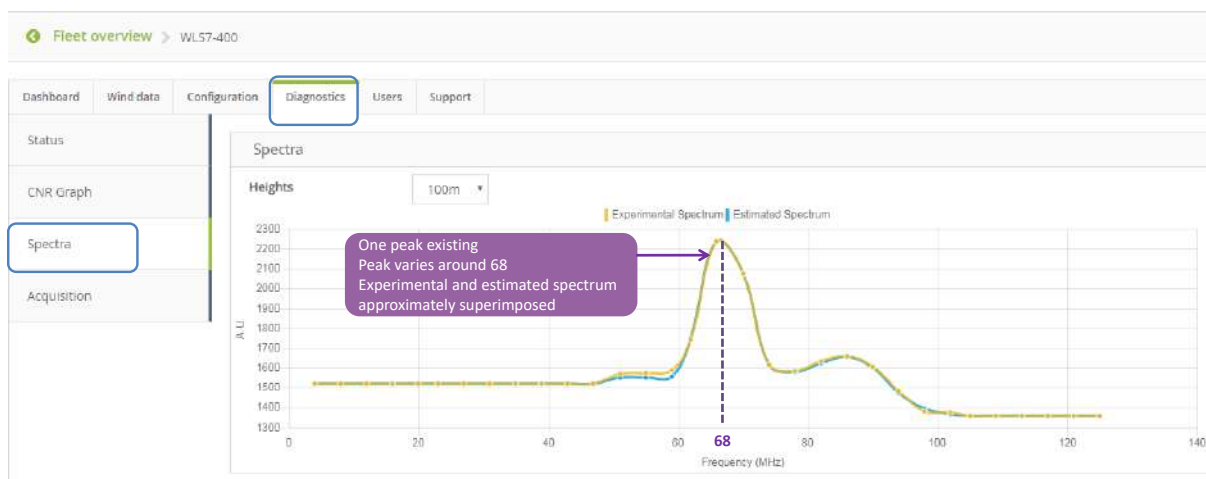
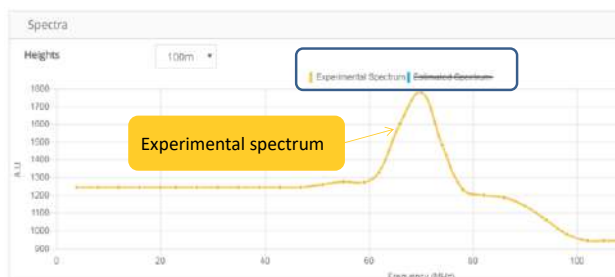
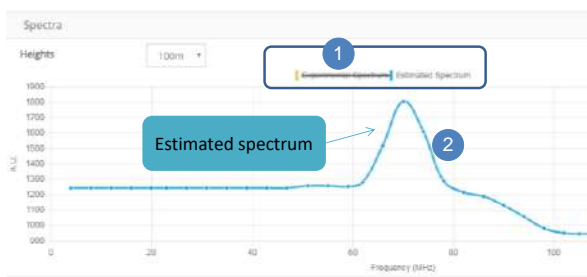
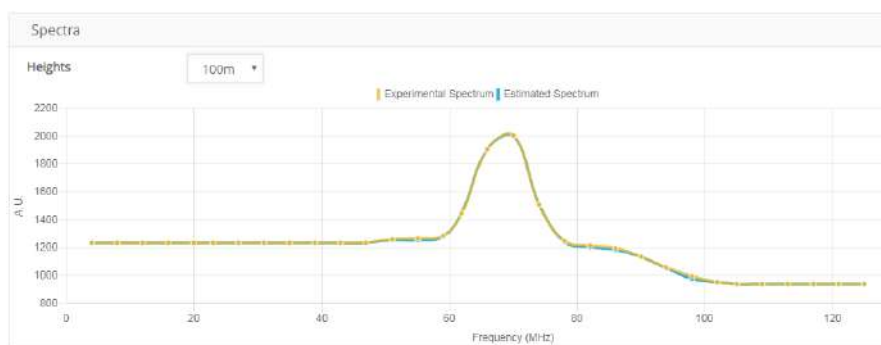


Figure: Spectra of detected signal at 100 m

Example: If you only want to see the “estimated spectrum”,

- Click on “experimental spectrum” title (1) to remove this graph (2).



- Hover the mouse on a dot to get more information:



8.2.4 ACQUISITION

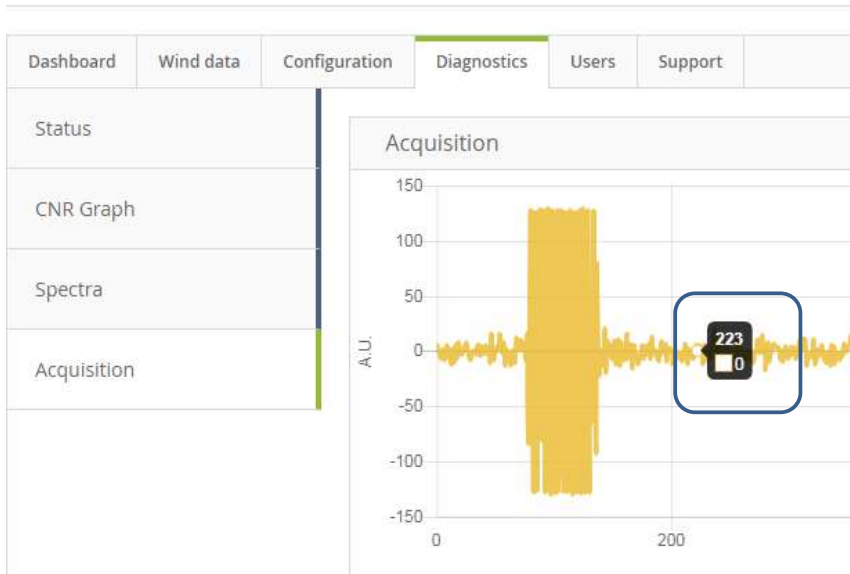
- Click on [Diagnostics] tab,
- Click on [Acquisition] sub-tab to display the raw detected signal.

Nominal signals and main characteristics are described in the following figures:



Figure: [Diagnostics] tab and [Acquisition] sub-tab

- Hover the mouse on a dot to get more information:



8.2.5 STATUS FILE

Status files summarize information relative to Windcube functionality.

- They are generated every 30 minutes and also every time an indicator turns red (case of critical error of systems).
- Status files are available from Data folder

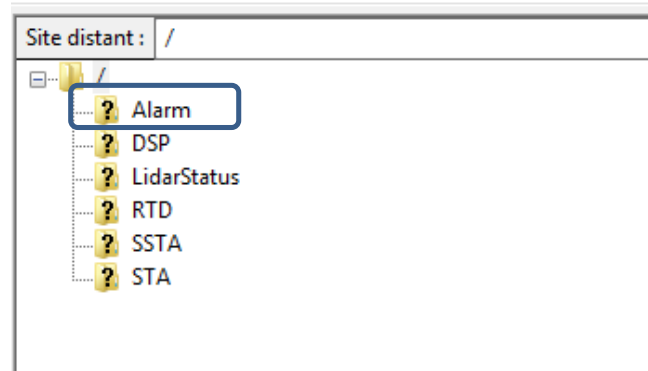


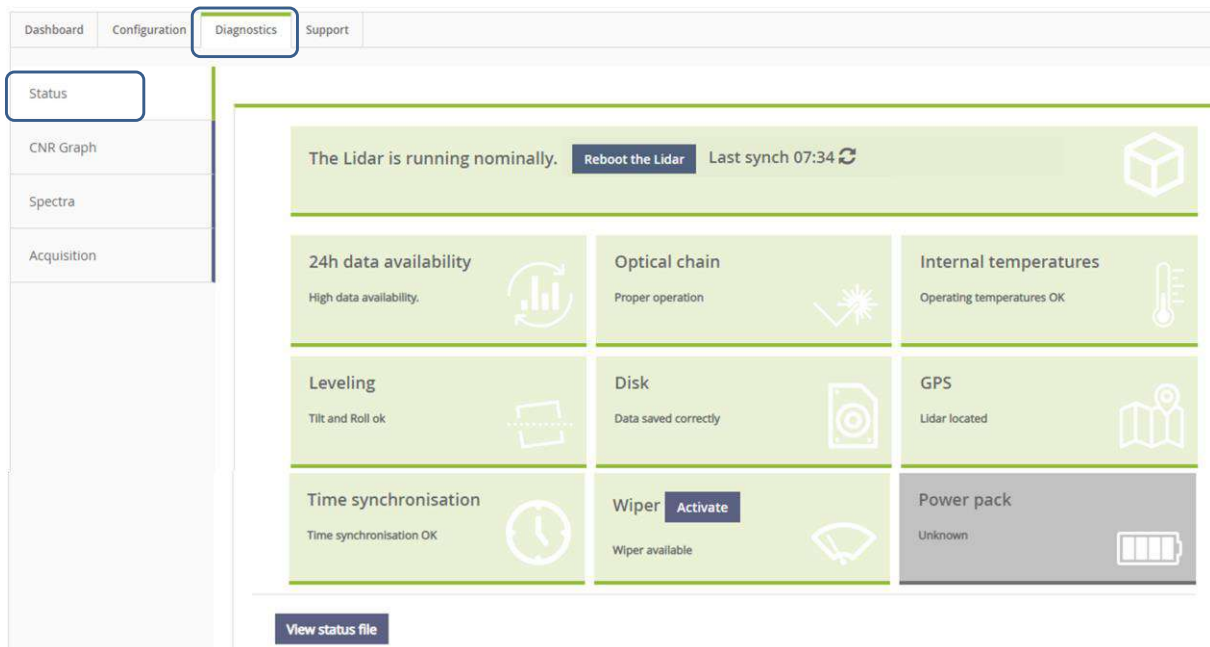
Figure: ALARME folder in DATA folder

Status file name is time stamped as describe below:

WLS866-XXXX_YYYY_MM_DD__hh_mm_ss.alm

- **WLS866-XXXX**: Windcube serial number
- **YYYY**: year of data
- **MM**: month of data
- **DD**: day of data
- **hh_mm_ss**: time of the first data registered in file

Most recent status file contents are always visible directly on Windweb interface by clicking on [Diagnostics] tab → [Status] sub-tab.



STATUS FILES DETAIL

From [Diagnostics] tab → [Status] sub-tab,

- Click on [View status file] button



A pop up opens and displays the real time statuses file.

Real time status file

Realtime status file
LIDAR WINDCUBE STATUS REPORT
2018_08_01
WLS7-
GPS: 5
v2.1.7.

Alarm origin: None
Warning origin: None

EDFA:
- Loss of Output power?: OK
- Loss of Input power?: OK
- LD current bias?: OK
- Case temperature out of range?: OK
- Laser diode temperature out of range?: OK
- Disabled EDFA?: OK
- Out of range power supply?: OK
LDC=1785
CAT=42

DIODE:
FFT(fMAQ) = 515.

SYSTEM:
Optical head: 42.8 C, Computer rack: 43.0 C, Optical rack: 42.0 C
Space disk used(%)=29.57
IP-dhcp: 192.168.1.1
IP-static: None
Data saved correctly
Temp(C)=47.0

SIGNAL:
CNRm =
66.0 -17.1
68.0 -16.9
78.0 -16.3
80.0 -16.2
99.0 -15.7
101.0 -15.7
118.0 -16.1
120.0 -16.2
132.0 -16.7
134.0 -16.8
160.0 -18.1
200.0 -20.2

COMPASS:
Connected
Pitch angle(deg)=0.0
Roll angle(deg)=0.4

PTH:
Not connected

DATA AVAILABILITY:
AvailableAltitudes(%)=100.0

LAST TIME SYNC:
6 Aug 11:59:31 ntpdate[30049]: adjust time server 91.189.94.4 offset -0.000545 sec

WINDCUBE POWER PACK M50 (PV):
None

FLOW COMPLEXITY RECOGNITION (FCR):
FCR-disabled

Figure: Status files details

9 SERVICES AND INFORMATION



The Windcube users have access to a free Hotline in the case when any assistance is required, regarding the system's operations or maintenance.

Qualified software, optoelectronics and LIDAR engineers provide support from Monday to Friday between 9:00 am to 5:00 pm (GMT+1)

- **Hotline:** +33 9 72 68 11 11
- **Email:** support@leosphere.com



Customer service is also available through the Windweb by clicking on [Support] tab.

9.1 CONTACT CUSTOMER SERVICE

The customer service is also available through Windweb by clicking on [Support] tab → [Contact us] sub-tab. The support page opens and will allow the client to contact the customer service.

Figure: Windcube Graphical User Interface – [Support] tab→ [Contact us] sub-tab

On the left side, you have 4 sub-tabs allowing to access to:

- [Admin info] → accessible to all users to know who it's possible to contact to make modify his access rights if necessary
- [Open access] → allows to open your Lidar to the technical support team for acceding to your Wind data
- [Contact us] → form to contact Leosphere technical services
- [Documentation] → to access and download the user documentation matching with your system

For more details, [refer to 3.3.9 chapter \[Support\] tab description](#).

9.2 WARRANTY

Unless provided otherwise, Windcube and its associated instruments and software are warranted for 3 years starting from the date of delivery and are applicable only for delivered materials.



No goods shall be returned without LEOSPHERE prior written agreement. If the user invokes the warranty, LEOSPHERE shall determine intervention methods.

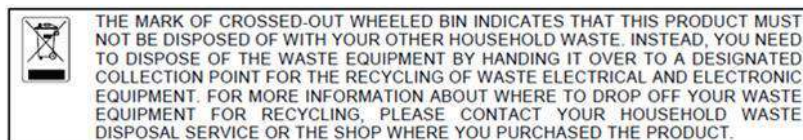
- Return of goods is applicable only to goods that have not been modified or altered in any manner and must be in original packaging.
- The warranty does not cover non-capital goods the cost which are covered by the owner.
- The warranty does not cover replacement and/or repairs resulting from: exterior wear, aging or tear of the instrument components; instrument deterioration, damage or accidents resulting from negligence or disregard for the operating instructions enclosed in this document; lack of

supervision, maintenance or stocking, or from manipulation or use not conforming to LEOSPHERE or manufacturer's specifications.

- The warranty does not confer the right to download new system software versions but the right to the replacement of identical system software as acquired by owner at a time of purchase.
- The warranty does not constitute a maintenance contract. A maintenance contract is available separately.

9.3 DATE OF CARE - RECYCLING MATTERS

- LEOSPHERE intends to deploy and comply with any measure linked to the **environmental and recycling obligations**, subject to be bear by LEOSPHERE. Those measures shall apply to any LIDAR System produced and commercialized by LEOSPHERE.
- LEOSPHERE conducts a permanent legal watch in order to comply with the dedicated national and European laws and regulations which define the scope of its duty of care.
- To achieve that, LEOSPHERE currently conduct a dedicated **recycling policy** either for its LIDAR Systems or for its LIDAR System sub-components in collaboration with any competent organism and LEOSPHERE's suppliers.
- Therefore, LEOSPHERE asks its own suppliers to provide any specific recycling process attached to their components and a strict compliance with the mentioned applicable laws and regulations.



9.4 LIST OF MATERIALS



- No dangerous fluid is entering in the system composition.
- Complex components designed externally by our supplier are not detailed in the table – they are just mentioned as optoelectronics components or electronic component.
- The materials are listed and grouped by system subassembly.

Localization: CASING

- Connectors and cables : copper, brass, tin, nickel, gold alloy copper/zinc, stainless steel, Nylon, PVC, PUR, PA (polyamide), Thermoplastic
- Electrical board
- For mechanicals parts: Stainless steel, Aluminum, Plastic, Rubber
- **Sunshade:** Dibond

Localization: OPTICAL HEAD

- Window: NBK7 or equivalent
- Lens: N-SK11 and N-SF5
- Barrel: brass

- Lambda/4 : Crystal – Quartz
- Switch: opto-elec component (aluminum case)
- Connectors and cables: copper, brass, tin, nickel, alloy copper/zinc, Nylon, PVC, PUR, PO (polyolefin), Thermoplastic
- Inclinator: Electronical component (aluminum case)
- For mechanicals parts: Stainless steel, Carbon, Aluminum, Thermoplastic, Rubber

Localization: OPTO-ELEC RACK

- Multiple opto-elec components
- Connectors and cables: copper, brass, tin, nickel, gold, alloy copper/zinc, aluminum, Nylon, PVC, PUR, PA (polyamide), Thermoplastic
- Electrical boards
- Lithium battery (on the PC card)
- For mechanicals parts: Stainless steel, Brass, Aluminum, thermoplastic

Localization: WIPER

- Connectors and cables: copper, brass, tin, nickel, gold, alloy copper/zinc, Nylon, PVC, PO (polyolefin), Thermoplastic
- Electrical boards
- For mechanicals parts: Stainless steel, rotor, Aluminum, thermoplastic

Localization: POWER CONVERTER

- AC/DC Power converter → Manufacturer: MEAN WELL / Ref: HLG-240H-24A (aluminum case)
- Connectors and cables: copper, brass, gold, PUR, thermoplastic

Localization: PUMP

- Submersible water pump → Manufacturer: COMET PUMPEN / Ref: 1305.79.05
- For mechanicals parts: thermoplastic, Cyanoacrylate

Localization: ACCESSORIES

- GSM Router → specific reference depending on your geographic area, please contact your retailer.
- Geofencing beacon → Manufacturer: GLOBALSTAR / Ref: SmartOne B/LP

10 WINDCUBE OPTIONS:

10.1 GEOFENCING

10.1.1 DESCRIPTION



Figure: Geofencing tracker

The Geofencing option allows to:

- define an authorized area where the Windcube should be,
- localize the Windcube,
- detect the movement of the Windcube if it is moved outside of its authorized area,
- send alerts to inform about the movement of the Windcube outside of its authorized area and localize the Windcube.



Photo of a Windcube used onshore. The location of the Geofencing tracker is the same on a Windcube Buoy

10.1.2 PACKING LIST

LEOSPHERE delivers the Windcube with the Geofencing tracker already installed.

In case you have subscribed this option later after your Windcube delivery, the tracker is not installed.

In this case, Windcube Geofencing option provided parts are:

- Geofencing unit with four (4) AA batteries,
- Four (4) screws M3x10 and four (4) M3 nuts.



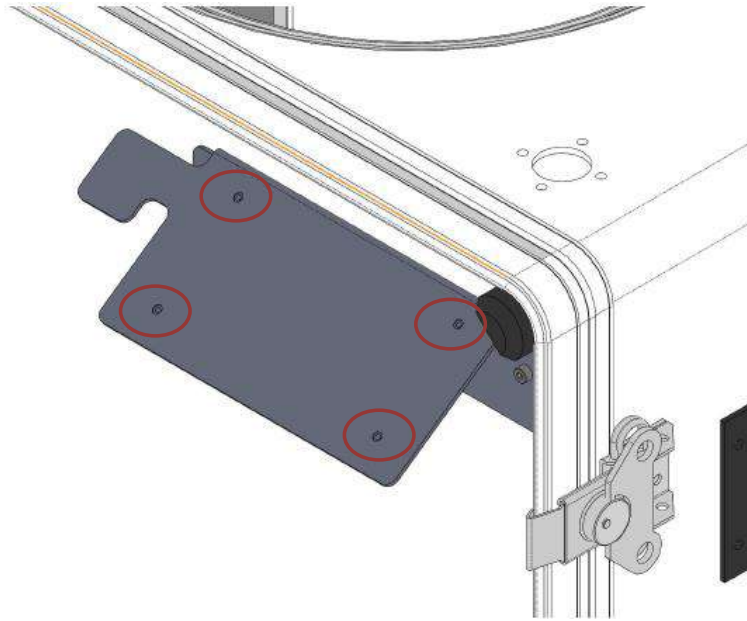
For a long-term use, it is advised to use high quality AA batteries. LEOSPHERE recommends using the AA Energizer Ultimate Lithium 1.5V.

10.1.3 HARDWARE INSTALLATION

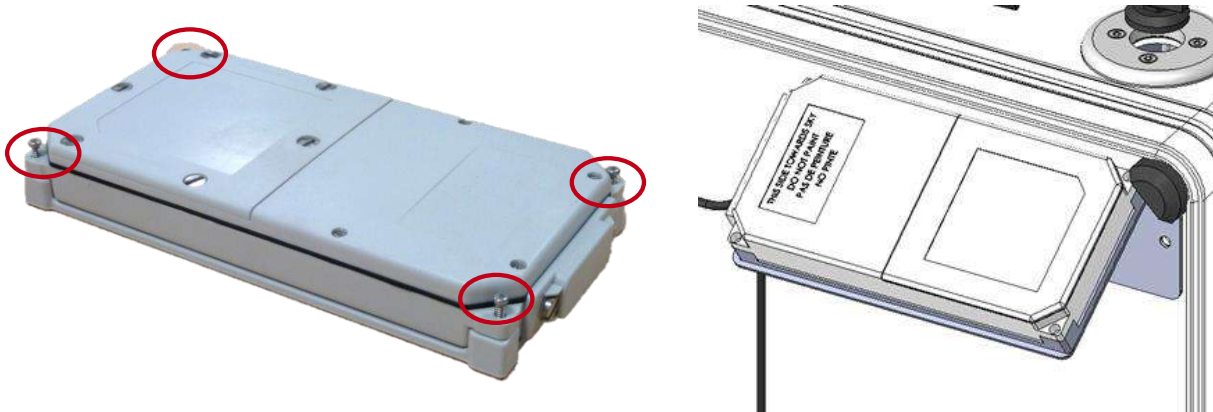
The following instructions will give you the main information to install the tracker inside the Windcube.

STEP 1

- Open the front door of Windcube. On the right, a bracket is already installed. Screw the GPS support on the bracket using 4 screws M3x10 and the nuts.

**STEP 2**

- Install the GPS tracker on its support by using the 4 provided screws on its corners.



The system should be turned ON only when it is placed in its operating geographical position.

STEP 3

- Check that the Geofencing unit is turned OFF.

If it is not turned off:

- Remove the 2 screws with a flat screwdriver, while maintaining the two-way switch.
- Slide the cap on its opposite direction.
- Put the 2 screws back.



10.1.4 CONNECTION TO THE ALARMMANAGER WEBSITE

The Geofencing Interface is a web-based service that can be accessed from any web connected device.

You can only access the command center from two browsers: Firefox or Chrome.



If you try to access the Geofencing Interface from a private network with a firewall, this firewall may block the connections.

If you have trouble connecting to the interface, please check that your network fulfills the required settings below:

- The IP address is 178.33.232.79
- Port 4200 must be open for HTTP connections
- Port 4201 must be open for Websocket connections.

To connect to the Geofencing Interface, enter the following URL:

<http://leosphere.ayudo.fr>



- Enter the username and password provided by LEOSPHERE.



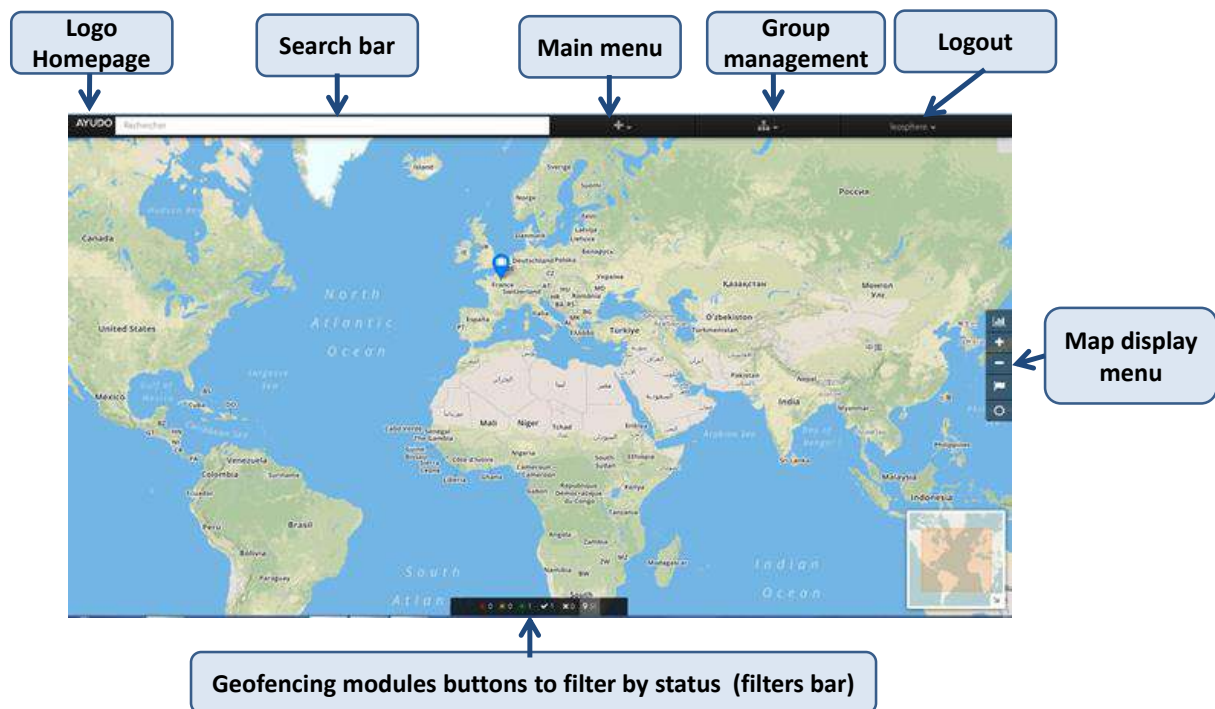
For security reason, there is no “password forgotten” function. If you forget your password and login, please contact LEOSPHERE Service Center. (support@leosphere.com).

10.1.5 INTERFACE

The Interface displays a world map with the positions of your Geofencing modules.

For each module, the color of its tag indicates its activity status:

- Grey: no activity since 12 am
- Blue: activity recorded since 12 am
- Green: currently active (i.e. emitting)



SEARCH BAR

The search bar allows you to find:

- a Geofencing module
- a location by its GPS coordinates: to do so, enter the GPS coordinates using the decimal format “latitude, longitude” (ex: 48.7089, 2.1738).



10.1.6 GEOFENCING MODULE

You can find and select a Geofencing module by three different methods:

- Via the search bar (if you know the name of the Geofencing module)
- On the map by clicking on its con (if you know its location)
- Via the list of all your Geofencing modules (to display it, click on the far-right icon of the bottom bar)

The interface will zoom on the selected module and, the device info box will appear on the left part of the screen.

INFOBOX DETAILS

The info box displays the main characteristics of the Geofencing module.

The screenshot shows the info box for a Geofencing module. The interface is dark-themed. At the top, there is a placeholder icon (a question mark) and the module name 'A29' with a green status indicator. Below this, the 'Group' is listed as 'Group:'. There are two tabs: 'Position' (selected) and 'History'. The main section displays various details in a list format:

- Date and Time:** 16/04/15 14:26:27
- Event:** location
- Media:** globalstar
- Location:** 44.3687, -73.0564
- Source:** 3D-FIX
- Accuracy:** high m
- Movement:** Start
- Battery Status:** ok

Below this list, there is a section for 'Type' and 'Group'. The 'Type' is 'Closed Parcel' and the 'Group' is represented by a black square. At the bottom, the 'End of contract' date is '2nd April 2018'.

Annotations with arrows point to specific elements:

- Name/status:** Points to the module name 'A29'.
- Group Name:** Points to the 'Group:' label.
- Position/history:** Points to the 'Position' tab.
- Time of the last received signal:** Points to the 'Date and Time' value.
- GPS decimal coordinates:** Points to the 'Location' value.
- Accuracy of the position (D-FIX = accuracy of 50 -100m, D-FIX = accuracy of ~ 10m):** Points to the 'Accuracy' value.
- Expiration date of the current Geofencing license attached to this module:** Points to the 'End of contract' date.



Before the end of the license, the customer will receive an automatic warning email concerning license renewal. If the customer does not contact LEOSPHERE on time to purchase such renewal, the Geofencing service will be interrupted at the expiration date.

HISTORY TAB

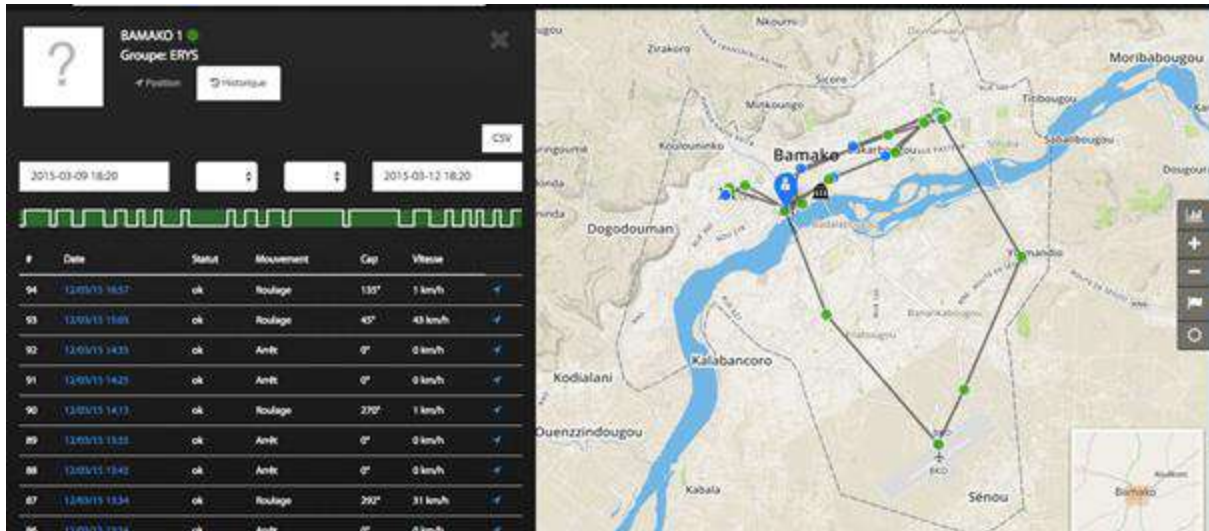
The positions emitted during the last three months are recorded on the interface. To display these positions:

- Click on the Geofencing module to open the info box

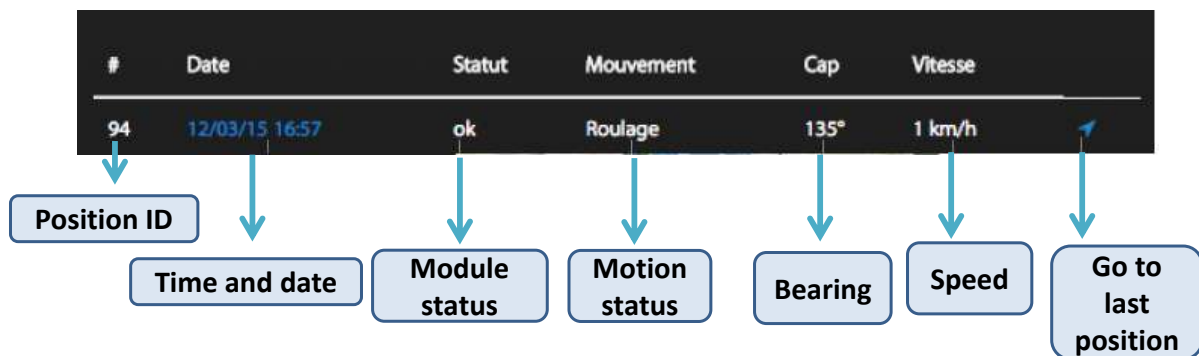
In the infobox,

- Click on “History”.

The “History” module will open, and the map will display the past 72h.



The tab displays the following information:



The time period displayed can be chosen. The “History” data can be downloaded in CSV format.

10.1.7 Interface management

Two main tools are used to define the protection provided by your Geofencing module:

- Geofence: geographical area inside which the Geofencing module is expected to stay. When the module leaves its Geofence, an alarm is emitted.
- Replica: the contacts (email and/or phone number) which will receive the alarms.

To create a Geofence or a Replica,

- Click on (+) on the top bar, and choose the desired item.



GEOFENCE

The Geofence is created point-by-point: you will draw it directly on the map. Once you have placed the points and closed your Geofence by clicking again on the first point, you can still modify it by clicking on one of the points and moving it on the map.



If your Geofence is too small, it might generate false alarm due to GPS accuracy limitations. It is recommended to have at least a 100m boundary around the position of the module inside the Geofence.

For “Type” field, select “Secured (green)”.



REPLICA

A Replica is an email and/or SMS alarm.

The chosen “**Group**” is the group of Geofencing modules for which alarms will be sent.

“**Red Alert**”: alarms sent when a module is outside its Geofence

“**Notification**”: messages sent to inform that the module is inside its Geofence, that a “red Alert” has been stopped by a user on the interface, or that the battery of the module is too low.

10.1.8 Administration and logout

By clicking on your User name on the right of the top bar, you can:

- Open the administration interface
- Logout

The Administration interface displays the list of all your Geofences and replicas. It allows you to check, modify and delete these items.

10.1.9 Check-up of the module

The frequency of signal emission by a Geofencing module is as followed:

- One position sent every 10 minutes when the module is in motion
- One position sent every 12 minutes otherwise

However, because of satellite coverage, a period of 24-36 hours without new position can happen sometimes. This does not prevent the module from emitting if it switches to Alarm mode.

If your module does not emit during more than two days, please start by checking the following points:

- Your system is outside in an open area. If your system is inside a building or a case with quite thick walls, it will block the signal of your Geofencing module.
- Your module is switched ON.
- The batteries of your module are not depleted. In case of doubt, please check them with a voltmeter or replace them.

10.2 PTH

10.2.1 PRECAUTIONS

The PTH is generally used onshore and it was not tested yet for an offshore use.



- PTH probe may be placed at up to 2 m high on a separate vertical mount (not provided).
- PTH probe should not be in direct contact with water.
- After connecting PTH probe, Windcube system must be restarted.

10.2.2 INSTALLATION

- Fasten PTH radiation shield to the vertical mount.
- Unscrew the fixing ring.
- Insert the PTH probe into the radiation shield through the fixing ring, below the shield, and then tighten it.
- Plug the M12 socket to PTH Sensor port in the Windcube trap.

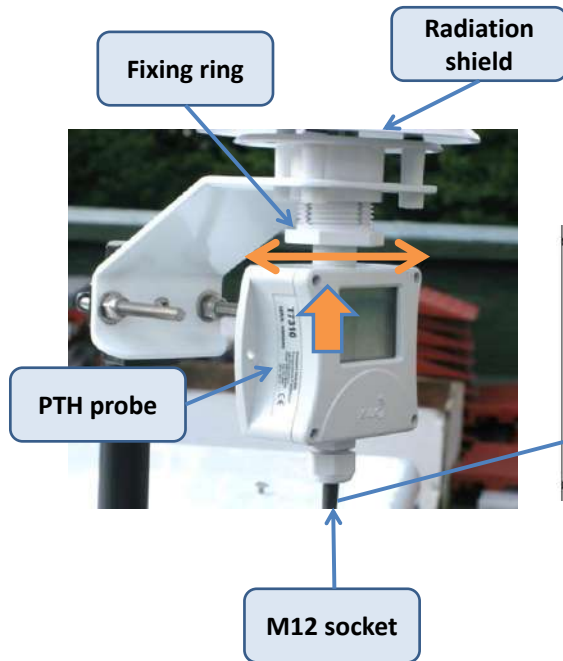


Figure: PTH probe tightening

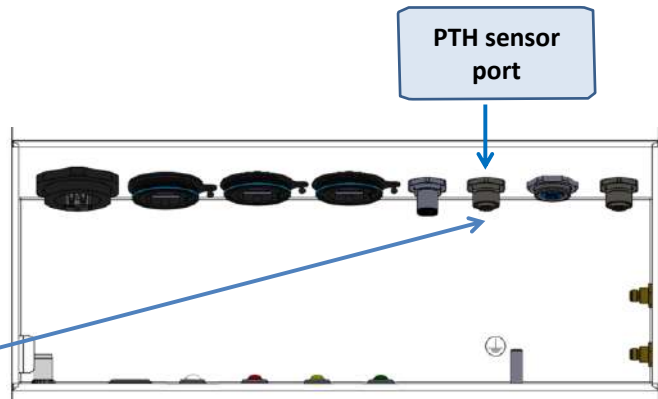


Figure: Connection in the Windcube trap



During installation, you have to:

- Make sure the tip of the PTH probe is properly screwed in, before positioning the radiation shield on the top of the probe. Besides, you must:
- Push well the radiation shield up to the end on the probe and lock this position with the screwing system.
- Ensure that the radiation shield is vertically located; it will serve as a protection for the probe. Indeed, radiation shield will protect from the rain and will strengthen the waterproofness.



- Never connect or disconnect the probe when the Lidar power supply is ON.
- Never connect the probe to another port in the Windcube trap.

11 ANNEXES

11.1 DEPLOYMENT CHECKLIST

Please, refer to the checklists below and fill them up to ensure your installation is proper.

SITE DESCRIPTION

Location/project name (Site/Windfarm Name)	
Country	
Climate site Prevailing wind direction	
Nearest city/town (name and distance)	
Customer Name/contact (Name/Email/Telephone)	
Contact Person on Site (Name/Email/Telephone)	
Site access (chains, locks, fence, required key)	
Lidar installation platform (made of hard material such as concrete, cement, wooden skid etc.)	
Power supply and grounding	

LIDAR LOCATION

Lidar Serial Number	
Lidar GPS Coordinates	
Lidar elevation above sea level	
Magnetic declination	

LIDAR INSTALLATION AND CONFIGURATION

Mark completed items with 'X' / Not applicable, not done with '–' / ; write ON or OFF when necessary. If a note is necessary, assign a letter and clarify in notes section.

	CHECKED
Deploy the system	
Orientate physical North of the LIDAR if possible	
Connect external water pump and fill wiper fluid container	

Connect 3G antenna if needed	
Connect power supply	
Switch ON the Main switch inside the niche (Blue LED turns ON)	
Check that Measurement LED lights green after a few minutes	
Connect your laptop to LIDAR static IP port and check Windweb interface	
Check CNR curves and verify that no line of sight is blocked	
Adjust LIDAR level using Tilt and Roll indication (should be set to 0° +/- 1°)	
Adjust measurement heights	
Activate complex terrain correction / FCR module if required (on/off)	
Set Direction offset if required	
Set remote communication parameter (IP address, modem...)	
Check LIDAR status	
Test Wiper – verify that the water pumps the water properly into the LIDAR window	
Check real time measurement in the Dashboard (Horizontal Wind Speed and direction).	
Check remote communication if possible	
Activate Geofencing module by “turning” hardware, if available/necessary	
Make sure that the front door is properly closed and locked	
Make sure that cables are properly plugged and tightened in the trapdoor. Unused connector caps are tightened.	
Trapdoor closed	

LIDAR OPTIONAL ITEMS

	YES	NO
Mark the applicable option with 'X'		
Geofencing module		
Powerpack-SFC Procube		
MODBUS		
Satellite		
Remarks		

