

Molas B300/B300M Instruction Manual V1.0



NANJING MOVELASER CO.,LTD

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1 Safety Information

Thank you for choosing Molas B300/B300M doppler wind lidar produced by Nanjing Movelaser technology co., LTD. This user manual provides you with important safety, maintenance, operation and other information. Therefore, before using this product, please be sure to read this user manual carefully. To ensure safe operation and normal operation of the equipment, please follow the following instructions and warnings and other information in the manual.

1.1 User Notes

- 1) In case of emergency (such as flood, fire, etc.), please directly disconnect the power supply of the equipment and properly locate the lidar.
- 2) Failure to use in accordance with this user's manual will result in damage to the wind lidar equipment, which is not within the warranty scope of the company;
- 3) Molas B300/B300M wind lidar equipment provided by the company is only used for lawful and scientific measurement purposes;
- 4) Before using the wind lidar, it is necessary to know the main features and operation of the wind lidar.

1.2 Safety Signs

Table1 Safety Signs

	<p>Laser Radiation Hazard: Risk of exposure to invisible laser radiation</p>
	<p>Strong Electricity Danger: Risk of electric shock</p>
	<p>Note: It may cause life injury or damage to products or equipment</p>
	<p>Product Nameplate: Contains information of product model, name, production date, power supply requirements, protection grade and product number</p>

1.3 Laser Safety Level

The laser light source of Molas B300/B300M wind lidar is in accordance with EN 60825-1 eye safety standards in the specification, the beam emitted by the Molas B300/B300M wind lidar is not visible to the naked eye, belong to Class 1M laser products, please do not use optical instrument to view directly.

Do not pull or bend the optical fiber inside the lidar under any circumstances, do not dismantle the optical fiber output device, laser and other optical modules in any environment.

2 Product Introduction

2.1 Operating Principle Of Doppler Wind Lidar

Operating principle of doppler wind lidar is shown in the figure below. The signal light produced by the fiber laser is transmitted to the air to be measured by the optical antenna and scanning mechanism, and the aerosol particles in it act to generate the backscatter signal containing its velocity information. By the doppler principle, the Doppler frequency shift f_d of the echo signal is proportional to the velocity of the aerosol particles (wind speed), therefore, the backscattered signal received by the optical antenna can be processed to obtain the wind field information of the target to be measured by passing the local oscillator light beat frequency and digital demodulation generated by the fiber laser in the system.

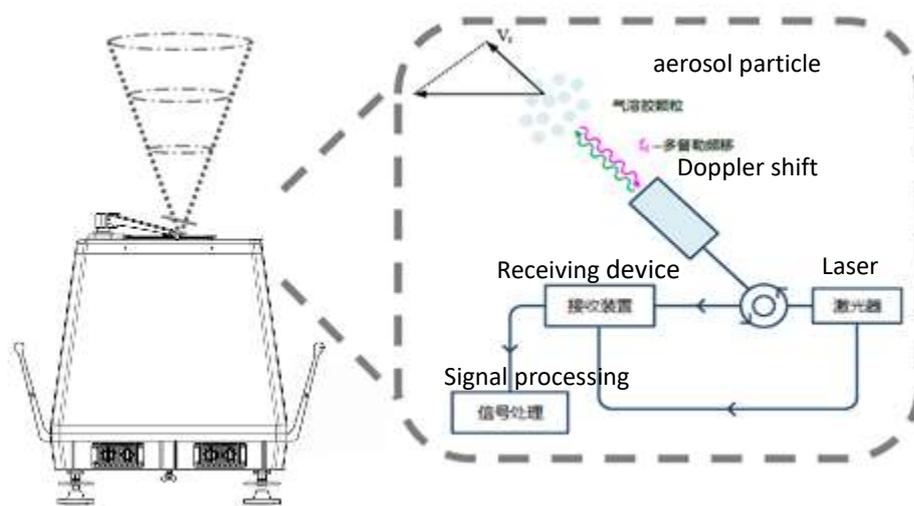


Figure1 Operating Principle

2.2 Product Features

- Wide range
- High-accuracy
- Simple installation, easy maintenance
- Flexible and portable
- High spatial resolution
- Data security and reliable

2.3 Application Fields

- Wind field exploration, site selection
- Wind resource assessment

- The wind field design
- Power curve verification
- Meteorological observation

2.4 Packing List

Table2 Packing List

Serial number	Name	Model	Quantity	Category
1	Doppler Wind Lidar	Molas B300/B300M	1	Product
2	Power Adapter	AC to DC	1	Accessory
3	Temperature, Humidity and Pressure Sensor	--	1	Accessory
4	THP Sensor bracket	--	1	Accessory
5	4G Antenna	--	1	Accessory
6	Ground Wire	--	1	Accessory
7	Power supply adapter	--	1	Accessory
8	Fuse	10A/5*20mm	2	Consumable
9	Packing Box	--	1	Accessory
10	Product Check List	--	1	Documentation
11	Instruction Manual	--	1	Documentation
12	Packing List	--	1	Documentation

2.5 Unpacking And Inspection

The company uses air box and specially designed foam packing to ensure the safety of lidar during transportation. However, in order to avoid the unpredictable situation in the transportation process, users need to carefully check the correct placement of the air box before opening the box, and whether there are obvious signs of collision and cracking on the outside of the box. If there is any abnormality in the air box, please inform us in time so as to deal with it as soon as possible. After unpacking, please check whether the packing list is consistent with the actual goods. If you have any questions, please contact us in time.

Please unpack the lidar at the ground where the lidar is used and take out the lidar. Please pay attention to avoiding collision and scratch on the lidar. Special attention should be paid to avoid scratches and hard objects hitting the output lens on the top of the lidar.

If you need to replace the lidar site, please pack the lidar in the original packing box for transportation or handling.

2.6 Operation Environment

The operating environment of this product is as follows:

Table3 Operation Environment

Power Supply Capacity	≥240W
Put The Environment	No Vibration, No Impact
Working Environment Temperature	-40°C~ 50°C
Working Relative Humidity	0%~100%

2.7 Product Performance

Table4 Main Product Technical Parameters

Specification	
Range	30-300m
Height Level	12①
Sampling Rate	1Hz
Speed Accuracy	0.1m/s
Direction Accuracy	1°
Speed Range	0~75m/s
Direction Range	0~360°
Measure Principle	ulsed Laser Coherent Doppler
Data	

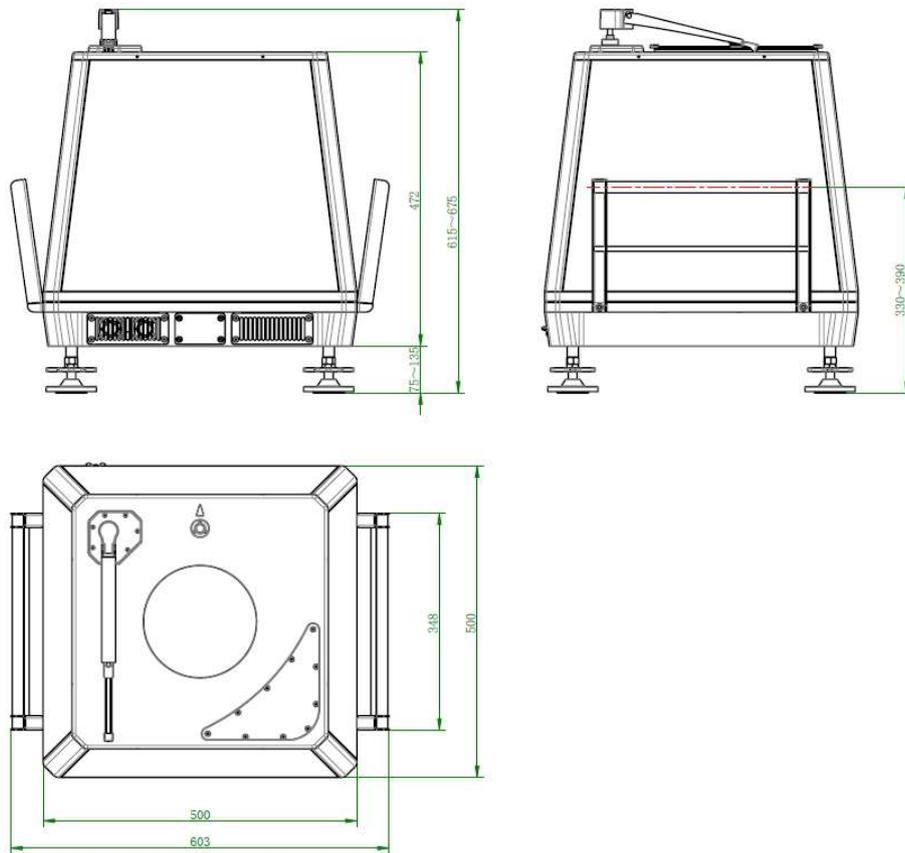
Data Output②③

- Horizontal Speed
- Vertical Speed
- Direction

	<ul style="list-style-type: none"> Statistic Data ④ Time GPS Temperature and humidity pressure (THP)
Data Format	ASCII
Storage	128GB
Communication	<ul style="list-style-type: none"> RJ45 Cable Cellular(2G/3G/4G) WiFi
General	
Power Supply	<ul style="list-style-type: none"> 24V±2% DC 90-270VAC (with adapter, May be different in different countries)
Power Consumption	60W (nominal) ⑤
Dimensions	500*500*602mm ³ (Handle not included) 603*500*602mm ³ (Handle included)
Weight	50kg
Ambient temperature	-40°C ~ 50°C
Operating humidity range	0% to 100%
Protection level	<ul style="list-style-type: none"> IP67
Laser safety level	Class 1M(EN60825-1) ⑥
Anti-corrosion grade	C5M, IEC60068-2-52-2017 (only for Molas B300M)

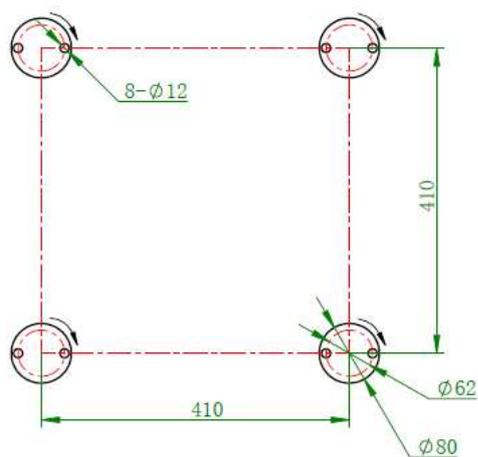
- ① The specific height of each level can be set by the user through the client software.
- ② Can output both second - level data and 10-minute average data at the same time.
- ③ The second level of data is about 60MB per day, the 10-minute average data is about 120KB per day.
- ④ In addition, the data of automation statistics are: signal-to-noise ratio, standard deviation, maximum, minimum and data reliability.
- ⑤ Transaction power varies with the running environment.
- ⑥ Class 1M laser safety level is the human eye safety level.

2.8 Dimension Figure



Dimensions in mm

Figure2 Dimension Figure



Installation dimensions (Unit: mm)

Figure3 Four feet position diagram (mounting hole only for B300M)

2.9 System Structure

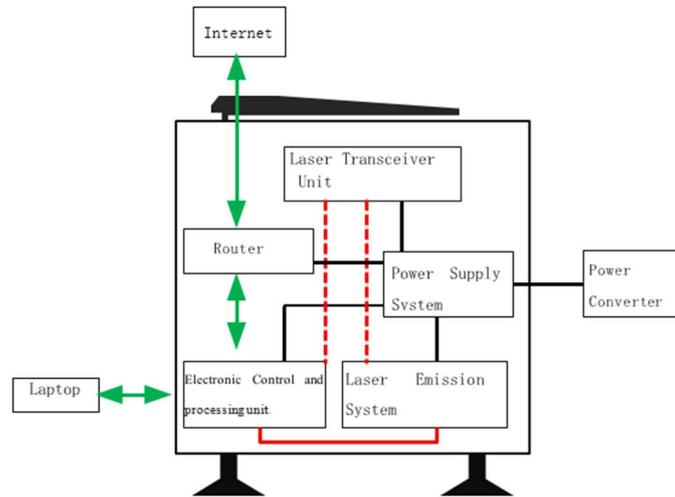


Figure 4 System Structure Diagram

2.10 Lidar Installation Location Requirements

When the lidar is placed, there is no obstruction in the conical area with a vertical angle of 28° above the lidar to avoid affecting the wind measurement effect.



Figure 5 Lidar Installation Location Diagram

Lidars are strictly prohibited to be placed in low recesses or places where water may accumulate. If the installation point cannot be changed, the ground of the installation point must be raised to ensure that the lidar has no risk of being flooded. Faults caused by the lidar being flooded are not covered by the warranty.

The lidar and its accessories, especially the power supply module, need to be fire-isolated from the surrounding environment to prevent fire from damaging the lidar and related equipment. At the same time, the lidar power supply module also has the risk of causing fire.

3 Use Of The Product

3.1 Full View



Figure 6 Lidar Overview

3.2 External Interface

The external interface of Molas B300/B300M can be seen in Figure 7. Some of the connectors have a protective cover. When in use, turn left to open the protective cover. When not in use, please screw on the protective cover in time.

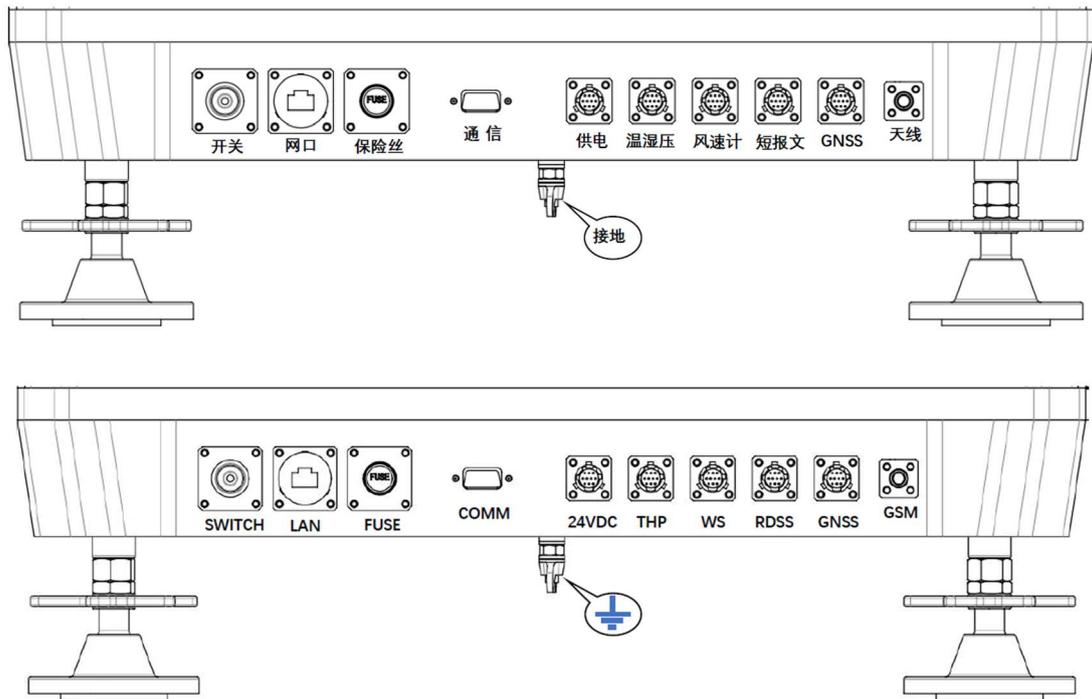


Figure 7 external interface

SWITCH (开关) : Switch button, press it to run the device. The switch on the indicator light can display the status of the lidar. In the running state, the indicator flashes and the device is normal, and the indicator light is always on and the lidar is in a fault state.

LAN (网口) : Network interface, after connecting with the computer using a network cable, the client software can be operated on the computer to perform lidar parameter setting, status observation and data download. It can also be directly connected to the Internet through a network cable.

FUSE (保险丝) : Used to protect the lidar from serious damage due to unstable power supply or short circuit.

COMM (通信) : Output data through serial port (additional order required).

24VDC (供电) : Power interface, which connects with the lidar power supply to supply power for the whole lidar.

THP (温湿压) : Temperature, humidity and pressure sensor interface, connected with the temperature, humidity and pressure sensor to obtain the temperature, humidity and pressure data of the sensor installation point.

WS (风速计) : Anemometer interface, external anemometer for supplementary measurement of the wind speed in the low-altitude blind area of the lidar (additional order required).

RDSS (短报文) : Beidou Short Message Interface for transmitting lidar status data and 10-minute average wind speed data (additional order required).

GNSS: Attitude interface, external attitude sensor is used to obtain real-time lidar attitude (buoy lidar is used with attitude sensor).

GSM (天线) : Antenna interface, an external antenna is used to obtain network signals for the router (lidar).

Note: The interface may have slight changes, please refer to the actual product.

3.3 Device Installation

- 1) Placement location: The lidar must be placed on a flat ground, and wooden boards or four-foot pads can be covered under the lidar to ensure that the lidar is roughly level. During the lidar measurement, the installation ground should remain in the same state as when installed.
- 2) North adjustment: The indicator arrow on the lidar points to the north.

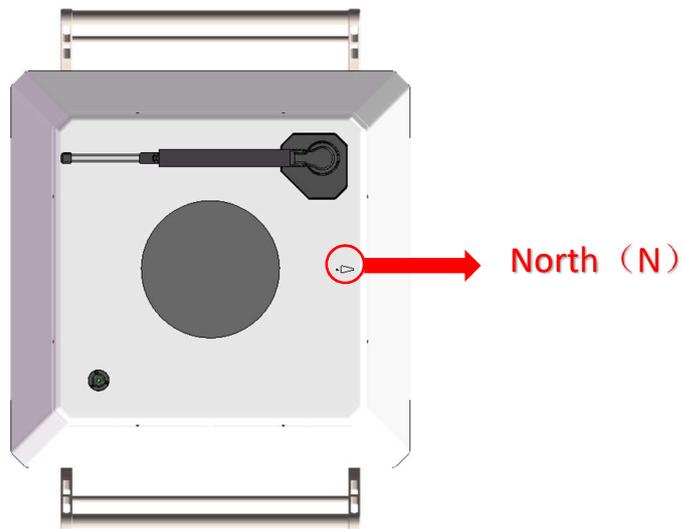


Figure 8 Point north

- 3) Level Adjustment: Adjust the four adjustment wheels below the lidar to adjust the horizontal liquid bubble above the lidar to within the black circle. After the adjustment is completed, the lidar must be stable. Note: Adjust clockwise to extend the foot, the adjustable range of the foot is 40mm.

3.4 Equipment Power Supply

Molas B300/B300M wind measurement lidar adopts 24V DC power supply and is equipped with AC to 24V DC power adapter. When there is residential or industrial power (greater than 240W), the power supply terminal supplies power to the equipment through the power adapter.

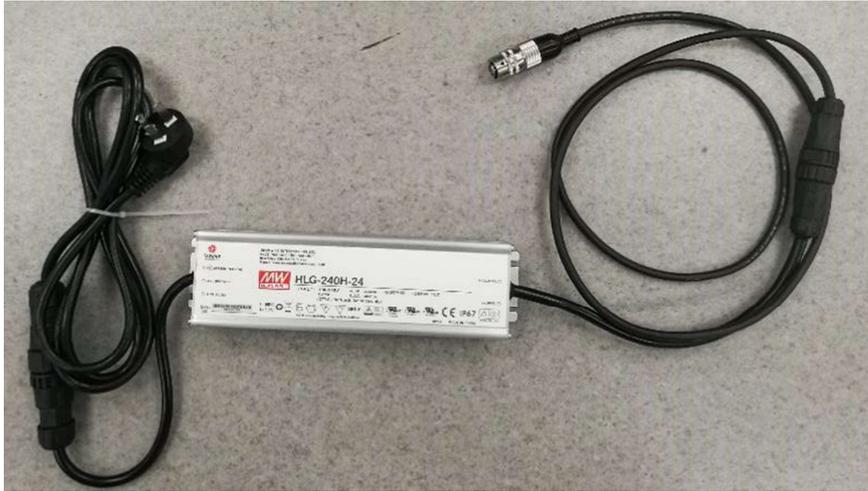


Figure9 Power Adapter

In the case of no power supply, a stable 24V DC power supply is required for the lidar. It is recommended to use solar panels, fuel cells, wind and solar hybrid power supply solutions. If customers build their own power supply system, the power output should meet $24V \pm 2\%$, $\geq 240w$.

3.5 Network Installation

Note: Due to the differences in the network standards of various countries, the built-in lidar router may not be applicable to all countries.

In order to facilitate the data transmission when the equipment is running in the field, Molas B300/B300M wind measurement lidar is equipped with a network communication module. This module requires the customer to prepare a 4G data card with a monthly flow of more than 10G before installation. Note that it must be a standard card (Kcal), the communication module installation process is as follows:

- 1) Use a flat-blade screwdriver to open the SIM card installation cover.



Figure 10 Open the cover

- 2) Insert the prepared SIM card into the card slot as shown in the figure, the chip surface of the card is in contact with the convex point of the card slot, be careful not to pull the card slot forcefully.



Figure 11 Card slot

- 3) After confirming that the installation is correct, close the cover and tighten with a screwdriver.
- 4) Install the antenna, connect the antenna to the "GSM" interface of the connector.



Figure 12 Installing the antenna

The WIFI account has the keyword molas-b300, the initial password is "movelaser.com", and the lidar can be connected directly. After the installation is complete, the installer can use a mobile phone or laptop to connect to WIFI to check the network speed. Due to poor network signal in some areas, this function may not be available in some areas.

3.6 Installation of temperature, humidity and pressure sensor (optional)

Molas B300/B300M wind measurement lidar is equipped with a set of temperature, humidity and pressure sensors. While measuring wind speed data, it records the temperature, humidity and atmospheric pressure at the installation point of the temperature, humidity and pressure sensor. If the sensor is not installed, it will not affect the wind speed measurement. The user can decide whether to install it according to the needs.

Users can install the temperature, humidity and pressure sensor on the lidar handle, as shown in the figure below. The temperature, humidity and pressure sensor can also be fixed on a column near the lidar (the distance from the installation point to the lidar cannot exceed the length of the connection line). After installation, the temperature, humidity and pressure sensor should be perpendicular to the ground (non-vertical installation may cause water damage to the sensor) . After fixing, connect the connector of the temperature, humidity and pressure sensor to the THP interface of the lidar.

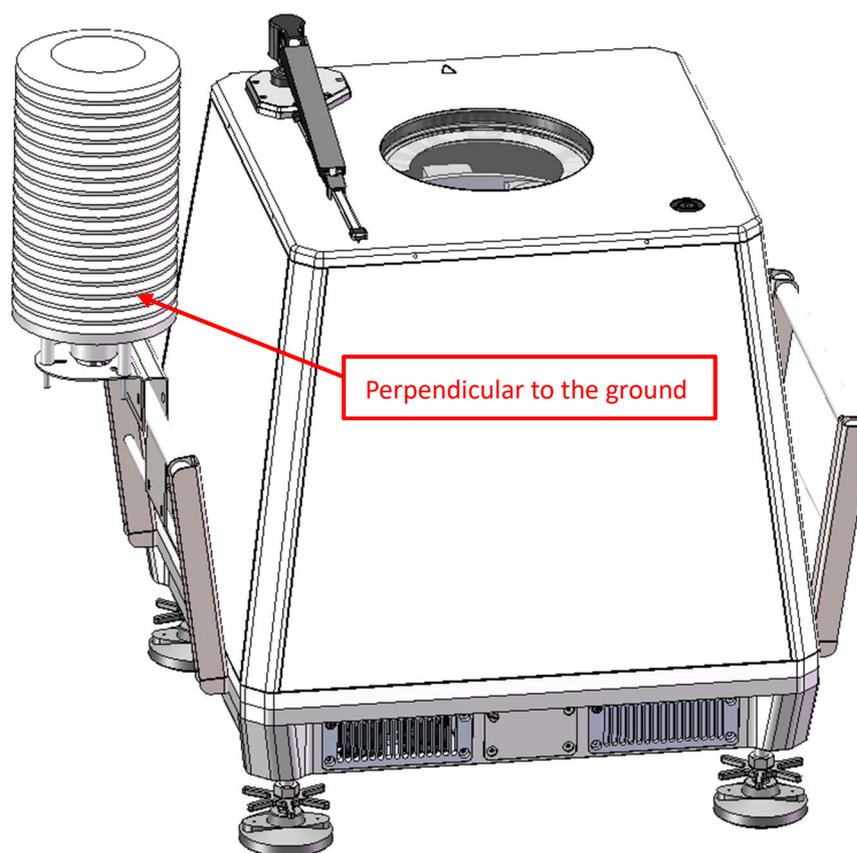


Figure 13 Installation diagram of temperature, humidity and pressure sensor

3.7 Client installation

Prepare a laptop (WIN7 or WIN10) and install software(V2.0.2.0 and above), double-click the installation file, the steps are as follows.

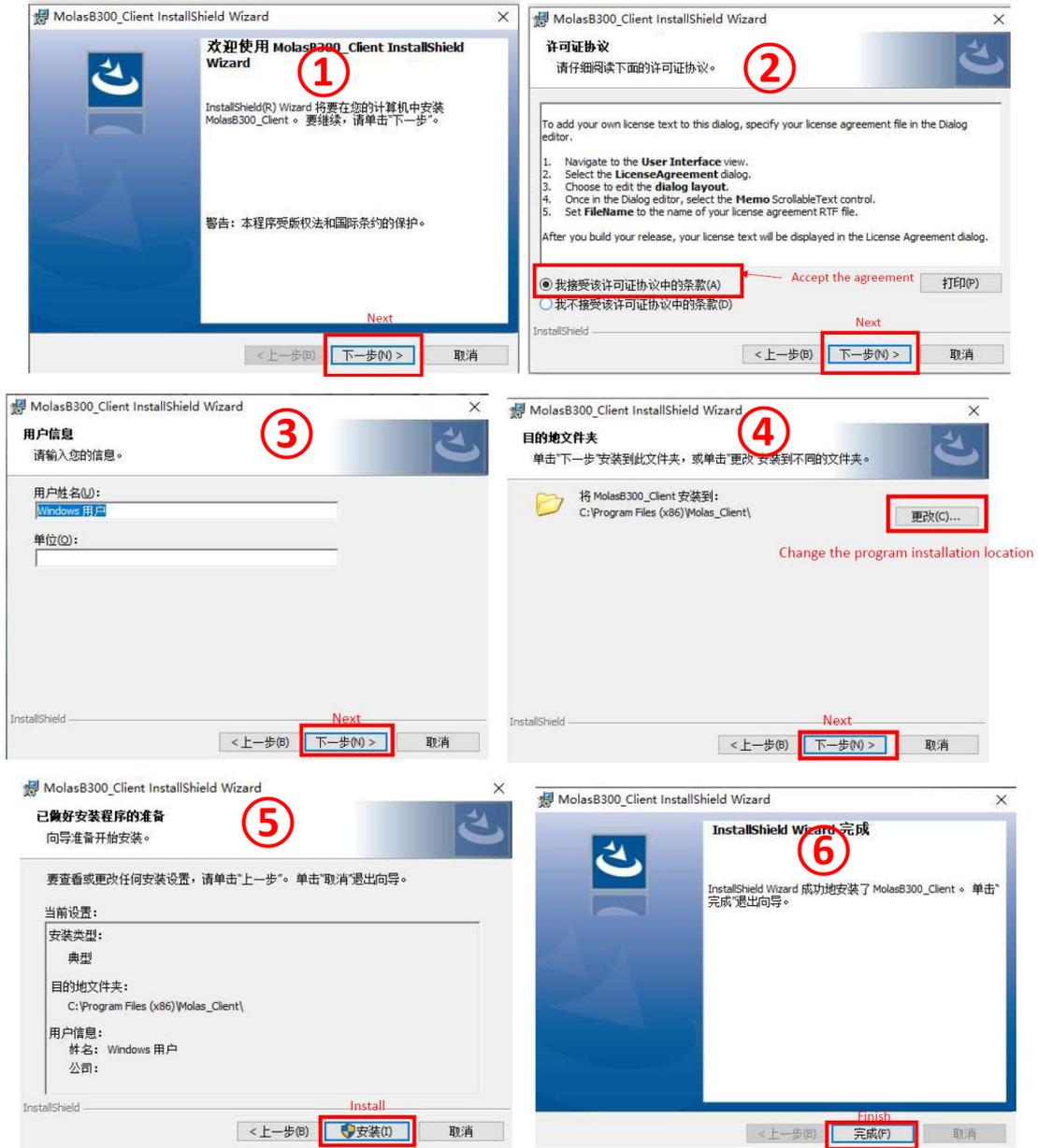


Figure 14 Client installation steps

3.8 Client use and parameter setting

- 1) Before using the software, you need to confirm that the laptop IPV4 is an automatic IP.
- 2) After the lidar is installed (including the lidar power supply), start the lidar operation button, connect the laptop and the lidar through a network cable.
- 3) Double-click the installed software button, you can see the following interface.

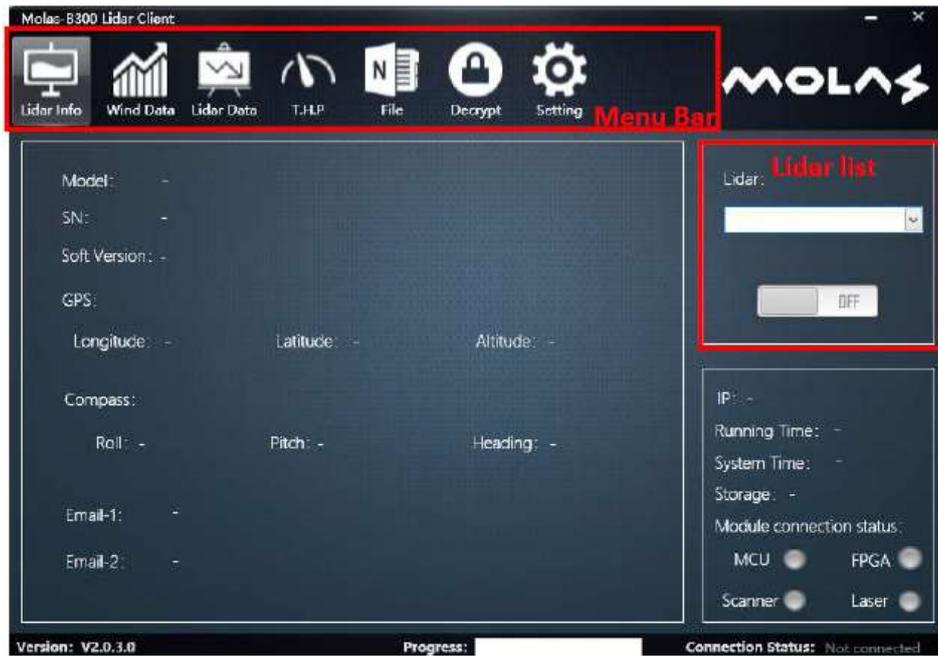


Figure 15 Client Main Interface

- 4) Click the drop-down arrow in the lidar list bar and select lidar from the drop-down menu, the lidar in the drop-down menu consists of lidar type(Molas B300), lidar number(343) and lidar IP(169.254.198.78).

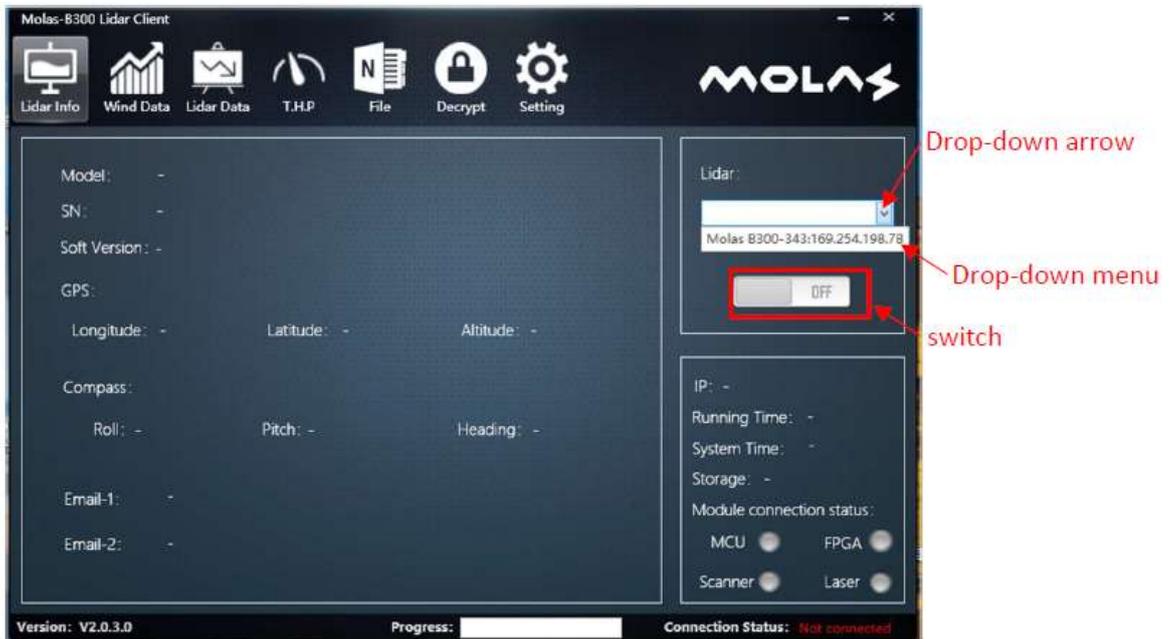


Figure 16 Connect the lidar

- 5) Dial the switch to On, and enter the password 1234 in the pop-up interface, click the OK button to connect to the lidar. After the software has established a connection with the lidar, the lidar status can be checked and the lidar parameters can be set.



Figure 17 Enter password

- 6) **Lidar Info:** After the software is successfully connected to the lidar, the software displays the **Lidar Info** interface, as shown in the figure below. The lidar information bar displays the lidar model, SN, soft version, GPS, and e-mail address used to receive lidar data. The lidar status bar displays the lidar's IP, running time, system time, hard disk capacity, and main module status connection status, under normal circumstances, the four indicators in the lidar status bar are all green, if it is gray, the corresponding module is in abnormal state.

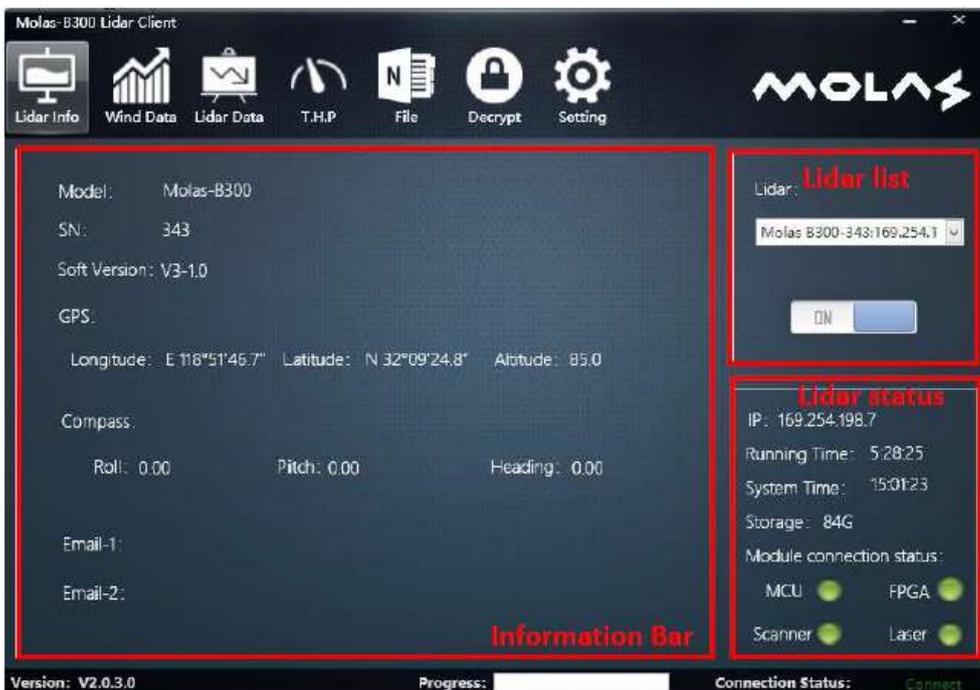


Figure 18 Lidar info interface

- 7) **Wind Data:** Click **Wind Data** in the menu bar, you can see the following interface. In the interface, the left side is horizontal wind speed information, and the right side is horizontal wind direction information. The blue line shows the average wind speed information for the

last ten minutes, the red line shows the real-time horizontal wind speed information.

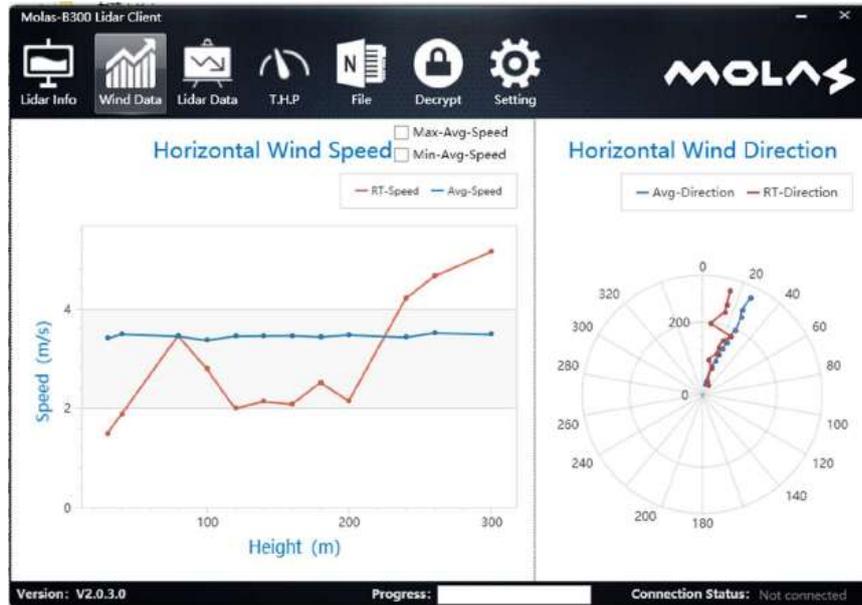


Figure 19 Wind Data interface

- 8) **Lidar Data:** Click **Lidar Data** in the menu bar, you can see the following interface. The upper picture in the interface shows the signal-to-noise ratio of the measured height layer, wind speed information can be measured normally at layers with signal-to-noise ratio greater than $10\log_{10}1.1\text{dB}$ (about 0.414 dB), heavy fog or clean weather (low aerosol concentration in the air) will result in a low signal-to-noise ratio. Continue to observe the real-time signal-to-noise ratio (red line) for more than four seconds. If there is a sudden change in the signal-to-noise ratio, one of the beams may be blocked. You need to find the blocked beam and correct it. The picture at the bottom of the interface shows the time-domain diagram of the lidar signal-to-noise ratio under normal operating conditions. There may be differences in fog or cloudy weather, in other cases, if there is a trend different from the picture, the lidar may be in a malfunctioning state.



Figure 20 Lidar Data interface

- 9) **T.H.P**: Click **T.H.P** in the menu bar, you can see the following interface. This interface is used to view the temperature, humidity, and air pressure measured by the external temperature, humidity and pressure sensor(measure the value where the sensor is installed).

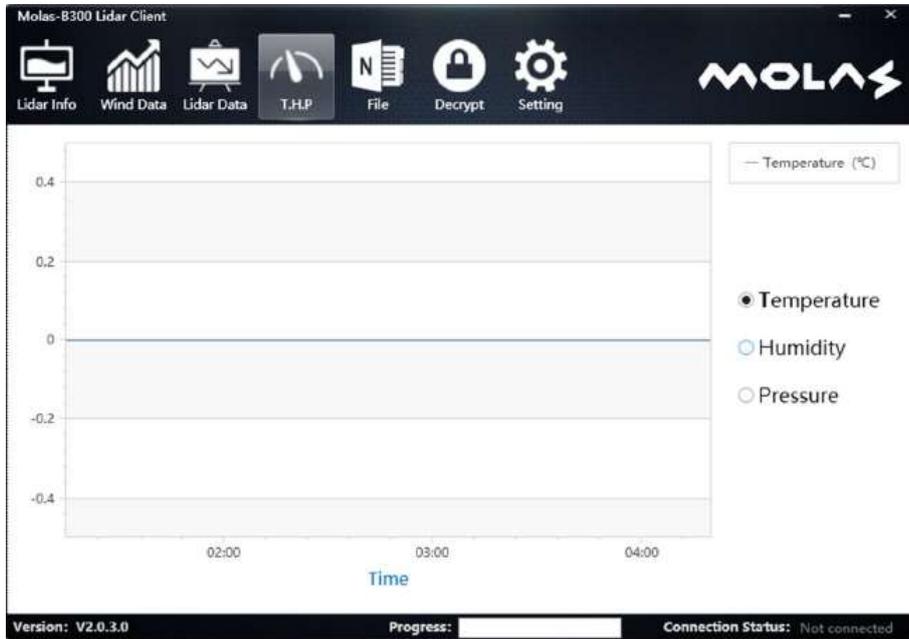


Figure21 T.H.P interface

- 10) **File**: In the **File** interface, we can download the wind speed data stored in the lidar, the steps are as follows.

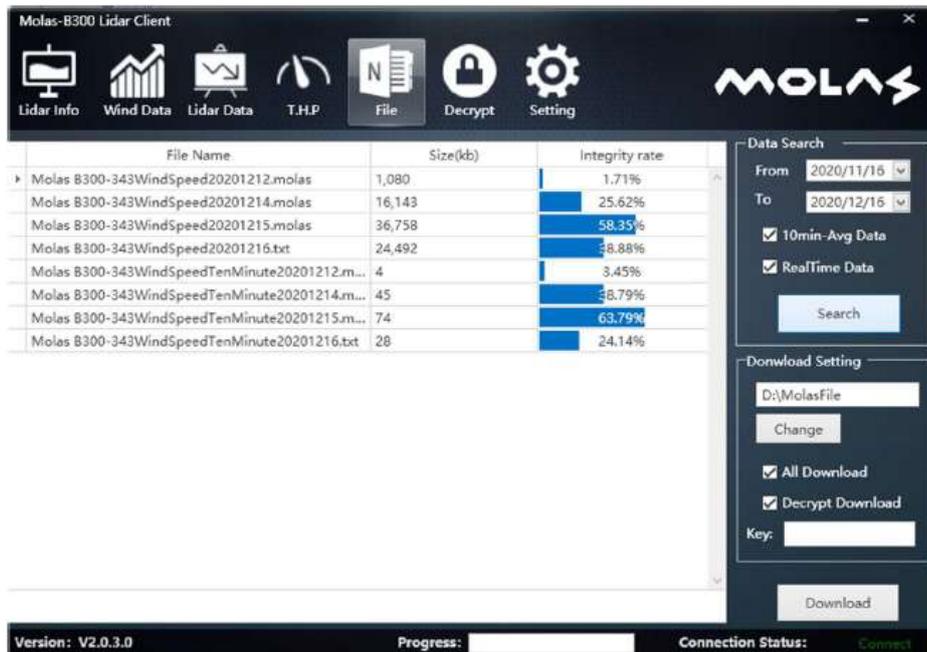


Figure22 File interface

- ① Select the time and type of data to be downloaded in the Data Search column, the time span of one download does not exceed 60 days. If the data to be downloaded exceeds 60 days, multiple downloads can be performed. The data type is divided into ten-minute average data and second-level data(realtime data), which can be selected according to

customer needs, can check one or all.

- ② Click **Search**, the data to be downloaded will be displayed on the left side of the page.
 - ③ Click **Change**, set the storage address of the data in the laptop
 - ④ If you need to download all the data list on the left, check **All Download**. If you download some of the data, you can select the corresponding data in the data list on the left.
 - ⑤ The data stored in the lidar data is encrypted. If the customer needs to decrypt the data, first check **Decrypt Download**, and then enter the key in the Key column (the key of each lidar is unique). Encrypted download is also available, the data downloaded to the computer is encrypted, of course, there is no need to check Decrypt Download.
 - ⑥ Click **Download** to download the data, the progress bar below shows 100% and the download is complete.
 - ⑦ Check the download data in the laptop.
- 11) **Decrypt:** If the downloaded data is encrypted, the customer can use the Decrypt function in the software to decrypt the data (this operation does not need to connect to the lidar)



Figure23 Decrypt interface

- ① Click Slect Files to select the data to be decrypted, the data needs to be in the computer.
- ② Enter the lidar key (data name contains lidar number information)
- ③ Check **Cover the original files**, the original encrypted data will be automatically deleted after decryption, and the decrypted data will be stored in the original encrypted data folder. Do not check Cover the original files, you need to select the decrypted data storage path, and the encrypted data will continue to remain in the original folder.
- ④ Check **Decrypt selected**, you need to select the file to be decrypted in the list on the left. Check **Decrypt All** means that all encrypted files in the list on the left will be decrypted.
- ⑤ Click Decrypt, the progress bar below shows 100% and the decrypt is complete

12) **Setting:** The lidar parameters can be modified in the Setting interface.



Figure24 Setting interface

- ① Height: The user can set 12 height levels, the height setting range is 30-300m, and the value is increasing from left to right from top to bottom, the value can be an integer or one digit after the decimal point, such as 80, 80.5
- ② Email Setting: Two e-mail boxes can be set to receive ten minutes of wind speed data.
- ③ Compass Compensation: If the lidar is installed without pointing north (0°), you can input the real orientation to compensate, for example, if the orientation is 5° , just enter 5. If no value is entered, the default compensation angle is zero. Despite this feature, we strongly recommend that the lidar point north during installation.
- ④ Connection password: The initial password is 1234, which is the password entered when the software connects to the lidar. If you change it, please remember the changed password, and use the new password next time you connect to the lidar. We strongly recommend not to change the connection password because the password may be lost.
- ⑤ TimeZone: User used to change the lidar system time.
- ⑥ After all the above parameters are entered, click Setting, the setting will be displayed on the right.
- ⑦ The Clean button in the upper right corner is used to clear the lidar internal state file or the earliest wind speed file. The user can leave it alone. When the hard disk capacity is insufficient, the lidar will automatically clear the state file or early data. The lidar can store wind speed files for 4-5 years.

3.9 Lidar Protection

In order to enable the product to operate safely outdoors, Movelaser advises customers to adopt appropriate protection schemes for the lidar. For instance, wire mesh can be used around the lidar and its power supply facilities, the stainless-steel guardrail can be used to guard against theft for lidar.

3.10 Packaging and transportation

After the lidar is used, it needs to be moved or transported. Please tighten the protective cover of the connector, adjust the adjusting wheel counterclockwise to shrink the foot of the lidar to the minimum, pack it in the original packing box for transportation, and ensure that the lidar output lens is upward during transportation. It is strictly prohibited to turn upside down.

3.11 Description of consumables

Wiper replacement: It is recommended to replace the wiper for 6 months. If it is damaged before the replacement period, please replace it in time.

3.12 Notes

The lidar measures wind by laser. Please do not look directly at the laser window of the lidar if it is not necessary.

4 Common troubleshooting and Solutions

Table5 Common faults and Solutions

Fault phenomenon	Possible causes	Solution
Failed to receive data on time after setting mailbox	<ol style="list-style-type: none"> 1. Communication card arrears. 2. The antenna is not installed. 3. The antenna is damaged. 4. The above is confirmed to be correct, it may be a router failure 	<ol style="list-style-type: none"> 1. Recharge the communication card and confirm whether the network is restored after recharging. 2. Check the antenna installation, tighten the antenna interface. 3. Replace the antenna. 4. External router, confirm the plan with Movelasar
With 24 V DC power supply, the lidar cannot work normally	<ol style="list-style-type: none"> 1. The lidar is far away from the power supply equipment, the cable is too long, and the voltage drop on the line is large, resulting in the lidar not working. 2. The output voltage of the power supply system does not meet the requirements(24V±2%) 	<ol style="list-style-type: none"> 1. Install the lidar close to the power supply equipment and shorten the power supply line. 2. 24V voltage regulator module is added to the power supply output terminal to ensure that the output voltage is 24V±2%
Incomplete lidar data every day	Insufficient power supply	Adjust the power supply scheme to ensure sufficient power supply
The wiper works frequently	<ol style="list-style-type: none"> 1. Weather reasons: the local air quality is good or the weather is rainy and snowy; 2. The lens is dirty and the wiper fails to remove it 	<ol style="list-style-type: none"> 1. No treatment; 2. Use a soft paper towel dipped in alcohol to wipe gently
The sound of the fan is loud when the lidar is working	The local temperature is higher, and the fan speed is faster for heat dissipation	Do not deal with it
After the altitude level is issued, it changes back to the original parameters	The input value of the height layer is not compliant, such as the height of 100m, may be incorrectly input as 100.0/0100, etc.	Delete all height level data, re-enter and issue settings

The above faults can be simply eliminated by customers. If they do not return to normal state, please contact the relevant technical personnel of Movelasar company in time. Please do not remove or change the internal module of lidar without authorization. In case of other faults, please contact Movelasar company in time. Tel: +86-025-86800600.