牧镭激光

MOVELASER

Expert in laser wind measurement solutions

NANJING MOVELASER CO.,LTD.

Nanjing Movelaser Co., Ltd., established in 2015, is a leading innovator in the development and application of coherent wind LiDAR systems. Our mission is to become a global provider of laser sensing solutions. We have introduced a range of dynamic wind LiDAR products, including ground-based, nacelle-mounted, and 3D scanning systems. Our products have achieved CE and ETL certifications, and their performance parameters have been validated by renowned wind energy assessment organizations such as DNV-GL, Windguard, DTURisø, and the China Meteorological Administration. For three consecutive years, our products have maintained a prominent position in both national and global markets. We have actively participated in international IEC and domestic wind industry standard-setting initiatives. By breaking the foreign monopoly, our ground-based LiDAR has replaced imported products, and the nacelle-mounted LiDAR has become a standard component for selected turbine manufacturers. With a large-scale production line, our annual production capacity exceeds 5,000 units, ensuring cost advantages and providing our customers with a competitive edge.

With a team of over 300 employees, including more than 100 technical professionals, we have obtained more than 100 core intellectual property rights and achieved breakthroughs in key technologies such as high-energy all-fiber single-frequency lasers, micro-nano weak signal detection, high-speed data processing and accurate inversion algorithms, and robust system control. We possess end-to-end capabilities for complex optoelectronic system development, including research, engineering, manufacturing, and testing.

Our achievements have been recognized through various honors and qualifications, including being designated as a national high-tech enterprise, a national specialized and new "Little Giant" enterprise, a national intellectual property advantageous enterprise, a potential unicorn enterprise in the southern Jiangsu region, a demonstration enterprise for transforming scientific research achievements, and a "gazelle" enterprise in Nanjing. Movelaser have been featured in CCTV's programs including "News Broadcast", "Great Nation's Great Achievements" and "Rise of Chinese Products". Additionally, we have received social capital equity investments totaling over CNY 200 million.

Movelaser is committed to leading the global laser sensing technology industry, adapting to increasing competition and challenges, and contributing to the development of renewable energy and artificial intelligence sectors.

2019

January   Molas NL achieved a breakthrough application in offshore wind measurement at Jiangsu Rudong.

June   Molas B300/NL received the new product appraisal certificate from Jiangsu Provincial Department of Industry and Information Technology.

November   Participated in the formulation of IEC industry standards for wind LiDAR.

December: Molas B300/NL obtained CE and ETL certifications.

2017

January   Molas B300 passed performance testing and certification by Windguard (Germany).

October   Released the nacelle-mounted wind LiDAR Molas NL.

November Molas NL received bulk orders.

May 2015

Movelaser officially established.

2015   **2016**   **2017**   **2018**   **2019**

2016

December

Received equity investment from Goldwind.

Featured on CCTV News Broadcast.

Introduced the ground-based wind LiDAR Molas B300.

First installation and application of Molas B300 in the field.

Obtained ISO9001 quality system certification.

2018

May   Received equity investment from Zhongke Hongta Fund.

June   Mass delivery of Molas NL, the first batch for full-scale turbine installation projects.

August   Received equity investment from Huatai Securities.

October   Awarded as a national high-tech enterprise.

November   Molas B300/NL passed performance testing and certification by DTURisø (Denmark).

Company Profile

2021

March   Introduced the fiber optic sensor Molas FD.

April   Molas B300 became the first domestically tested and certified LiDAR by DNV-GL.

May   Featured on CCTV's "Nation's Great Power" program.

July   Hosted the first Wind LiDAR Technology and Wind Power Application Seminar.

August   Received equity investment from China SHEEN Capital.

December   Established a safety standardization system.

2020

Introduced the 3D scanning wind LiDAR Molas 3D.

March   Molas B300 passed performance testing and certification by DNV-GL (Germany).

June   Introduced the airspace LiDAR product Molas CL.

August   Molas NL achieved consistency certification by DNV-GL (Germany).

September   Introduced the floating offshore wind LiDAR.

2020   **2021**   **2022**   **2023**

2022

January   Participated in the formulation of national standards for wind LiDAR.

April   Achieved certification for environmental and occupational health and safety management systems.

August   Successfully selected as a national-level specialized and innovative "Small Giant." Received equity investments from Cornerstone Capital and Huichuan Technology.

September   Honored with the title of National Intellectual Property Advantage Enterprise.

November   Company restructured as Nanjing Movelaser Co., Ltd.

Flexible business cooperation mode

Lidar sales

Suitable for long-term, multi-project applications

Lidar wind measurement service

Providing one-stop lidar wind measurement services such as lidar lease, installation, power supply, protection and data extract.

Lidar operation service

Providing lidar application services, including lidar installation, transportation, maintenance and project implementation, etc.

Project consulting

One-stop data services, including lidar site selection, operation, data analysis and reporting, etc.

Customized service

Over **46 million hours** of data services worldwide

About **800** ground-based lidar have been delivered & a large-scale leasing business has been realizedachieved

About **5000** nacelle lidar have been delivered

Over **300** units have been applied offshore

Knowing the "core": From 0 to 1

A R&D team of more than 90 people/advanced R&D laboratory/complete lidar system design capability, forward-looking patented layout/independent R&D capacity of laser light source/independent algorithm and software development capability, production capability of core components/process development capability/reliability testing platform
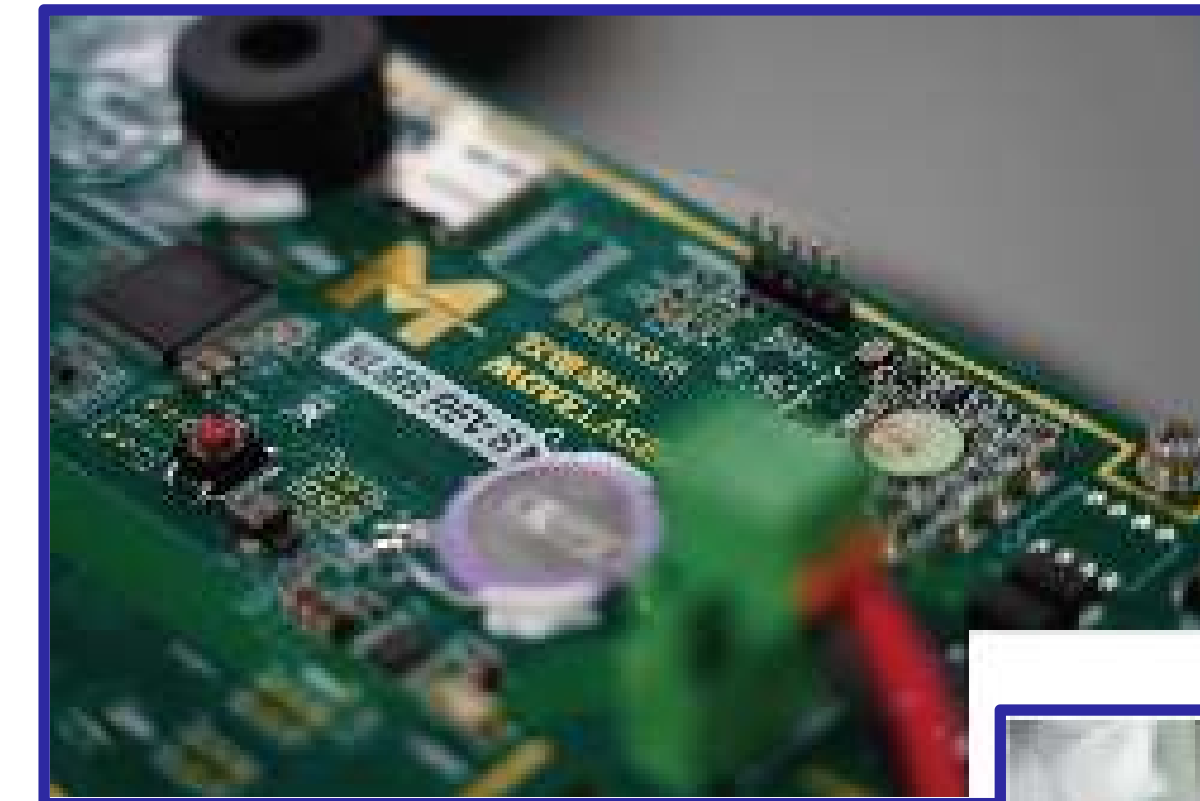
Since the project approval in 2003, Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences has undertaken the R&D of the wind lidar system of a military, taking the first step in the farm of wind lidar. The functions of the lidar, on subsequent projects, are constantly improved, with continuously reduced volume and power consumption, continuously improved reliability, and gradually emerging possibility of industrial application. It has stridden forward from scratch.

Engineers who participated in the technological development of this project also decided to go out of the laboratory and marching towards the market with lidar, so as to complete the journey "from scratch to one hundred". That's all about the previous Movelaser. Originally, there were several people and instruments in the Company, so one person may had to undertake many R&D tasks, but now it has a R&D team with more than 90 people and specialized division of labor in various farms, and a R&D laboratory equipped with various advanced equipment and technology.

With a good technological base and staff size, Movelaser has the ability to independently develop and produce all core modules, especially the core laser light source, optical detection system and production technology. This also provides a cost and reliability basis for the mass production of wind lidar system and the wide application in wind power farm.

Manufacturing the "core": From 1 to +∞

Reliability Testing Centre: It, with perfect reliability testing process and abundant reliability testing equipment, can realize various reliability tests, including environmental adaptability test, vibration test, EMC test, endurance test and defect test. Each lidar must pass all rigorous tests to ensure zero defects in the equipment delivered.

Large scale and mass production: The Company's Production Center is more than 3,000 m2, with 100-level and 10,000-level ultra-clean manufacturing shops, complete production equipment and automated test equipment, thus realizing the production, assembly and test of lasers, optical systems, electrical systems and complete machines. Now, the Company has two series of product lines, and more than a thousand units of lidar equipment can be produced annually.

Quality Management System: The production quality management strictly adheres to the standard of ISO9001 Quality Certification System. In addition, it implements FMEA with reference to the higher quality control standard of the automobile industry, and follows the standard files such as control plans and standard work instructions, etc. The quality controland management of equipment is at the world leading level in the industry.
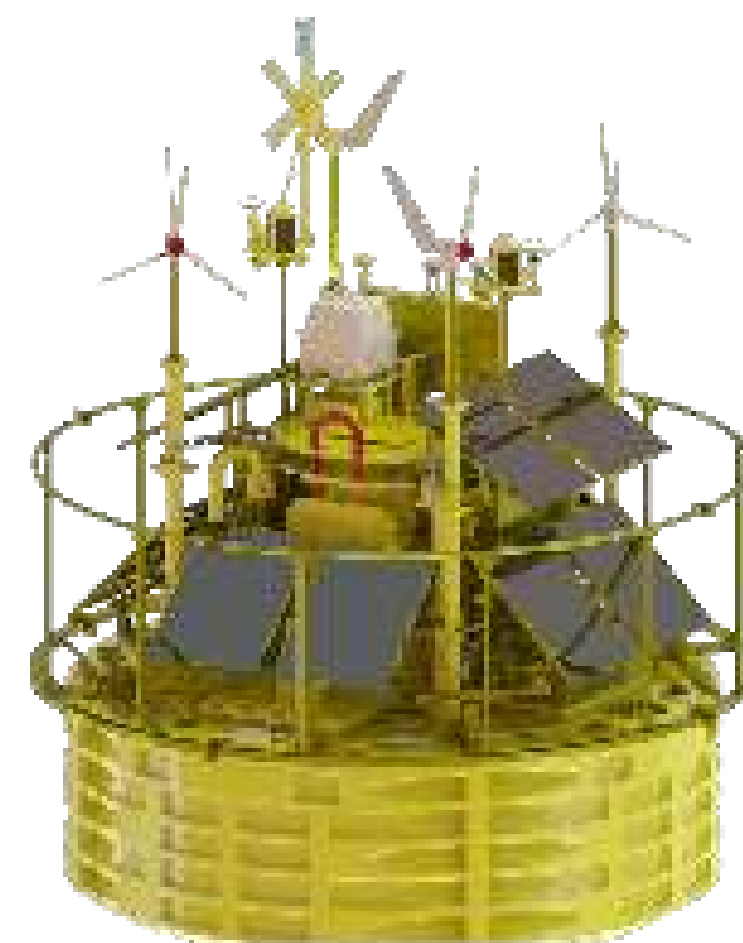
Product Summary
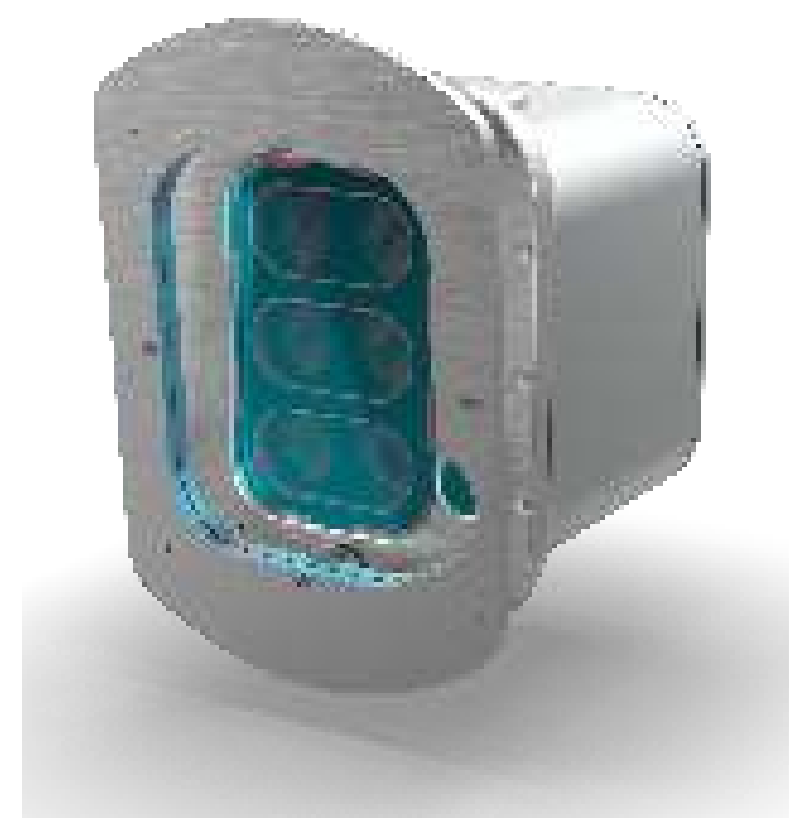
Wind Lidar

Molas B300 series

Molas NL series

Molas NX5

Meteorological and Environmental Protection Radar

PD150

OD235

Molas 3D

Molas CL

Molas FD

HL100

OD150

Performance Verification of International Authorities

German WINDGUARD Certification

Danish DTURisø Certification

German DNV-GL Certification
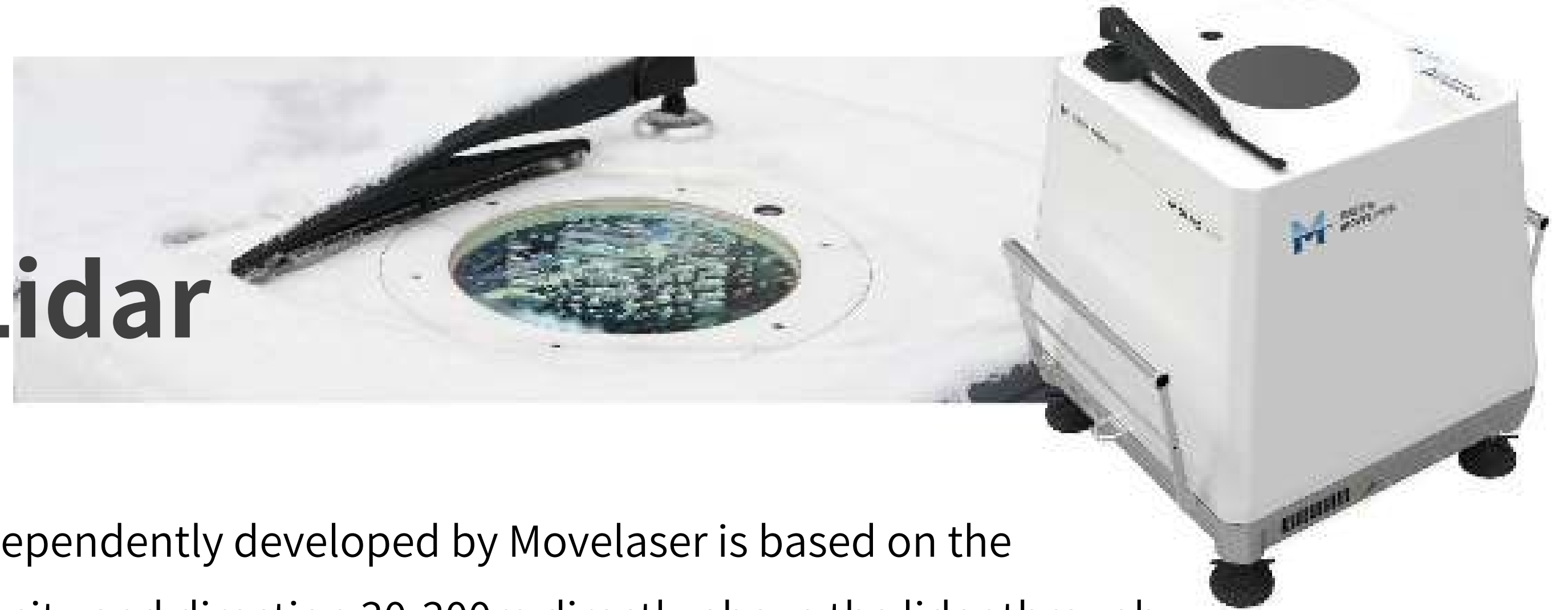
CGC Verification

Ground-based Wind Lidar MolasB300

Accurate/flexible/efficient
A "booster" for wind resource development
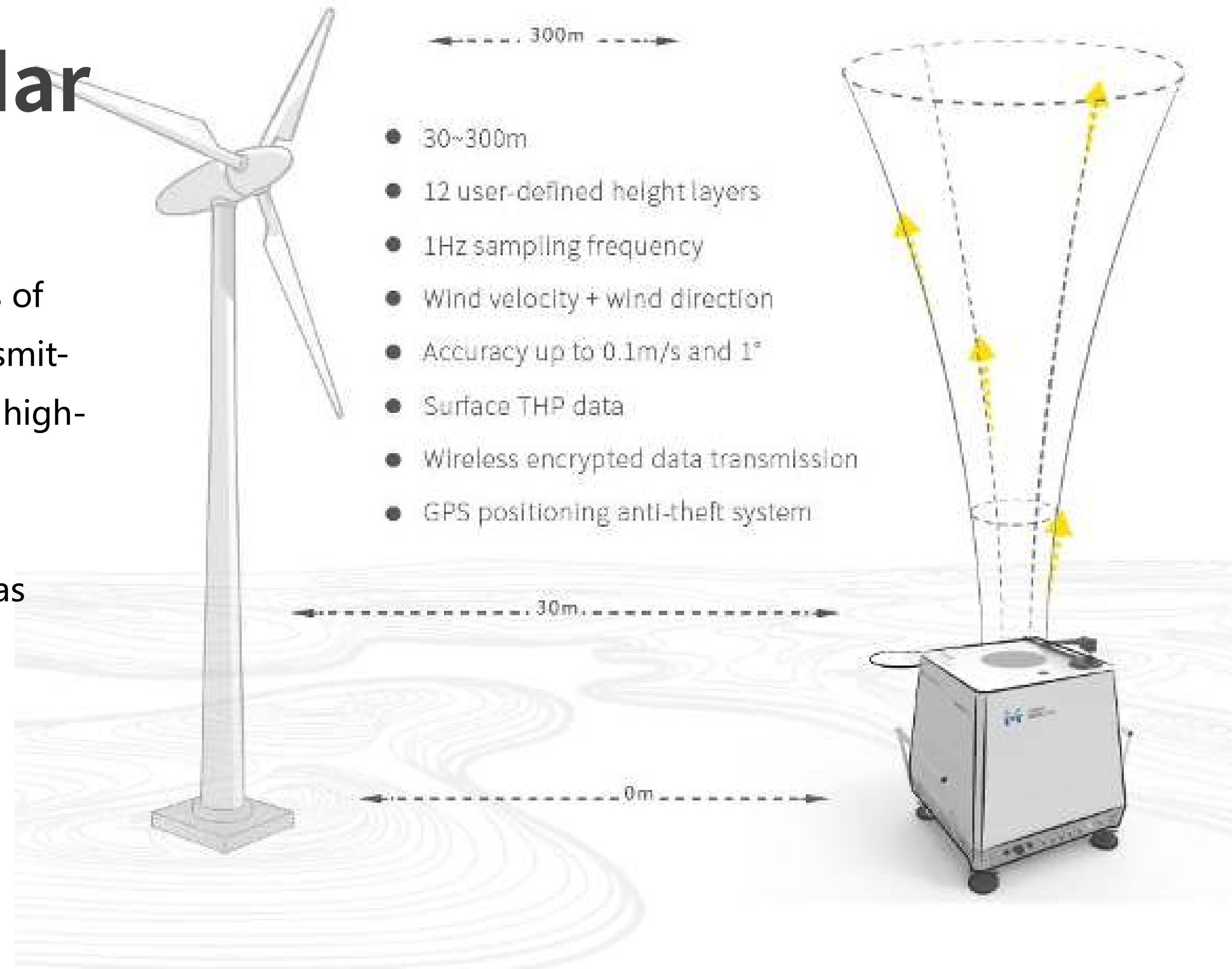
Molas B300
Ground-based Wind Lidar

The All-fiber Doppler Ground-based Wind Lidar independently developed by Movelaser is based on the Doppler frequency effect, and measures the wind velocity and direction 30-300m directly above the lidar through VAD scanning vector composing technology. Ground-based Wind Lidar has the advantages of high measurement accuracy and stable system performance. It is easy to maintain and use, and it is safe, with reliable data, and is an effective alternative to wind tower. Currently, it has passed the test and certification of the authoritative wind power assessment agencies in the world, such as WINDGUARD, DTU, DNV-GL, CGC Verification and China Meteorological Administration, and can be widely used in wind resource assessment, wind farm post-assessment, wind power forecasting system, wind farm operation management, atmospheric physics research, meteorological detection and forecasting and other scenarios.

Molas B300
Ground-based Wind Lidar

MolasB300 series is independently designed in terms of four core modules, namely, fiber lidar emitter, laser transmit-receive system, high-speed data acquisition system and high-accuracy data processing software. Each core module is highly matched, thus ensuring the unification and coordination of the whole system and data security. It has reached the international advanced level.

- 300m
- 30~300m
- 12 user-defined height layers
- 1Hz sampling frequency
- Wind velocity + wind direction
- Accuracy up to 0.1m/s and 1°
- Surface THP data
- Wireless encrypted data transmission
- GPS positioning anti-theft system
- 30m
- 0m

The laser is emitted into the air to be measured through an optical antenna and a scanner, and backscattered signals are generated through the aerosol particles, thus producing Doppler frequency change, and the frequency is proportional to the velocity of movement (i.e. wind velocity) of the aerosol particles. After the backscattered signals are collected by the optical antenna, coherent detection and digital demodulation are performed with the local oscillation light in the system, and the wind velocity and direction of the area to be measured can be obtained.
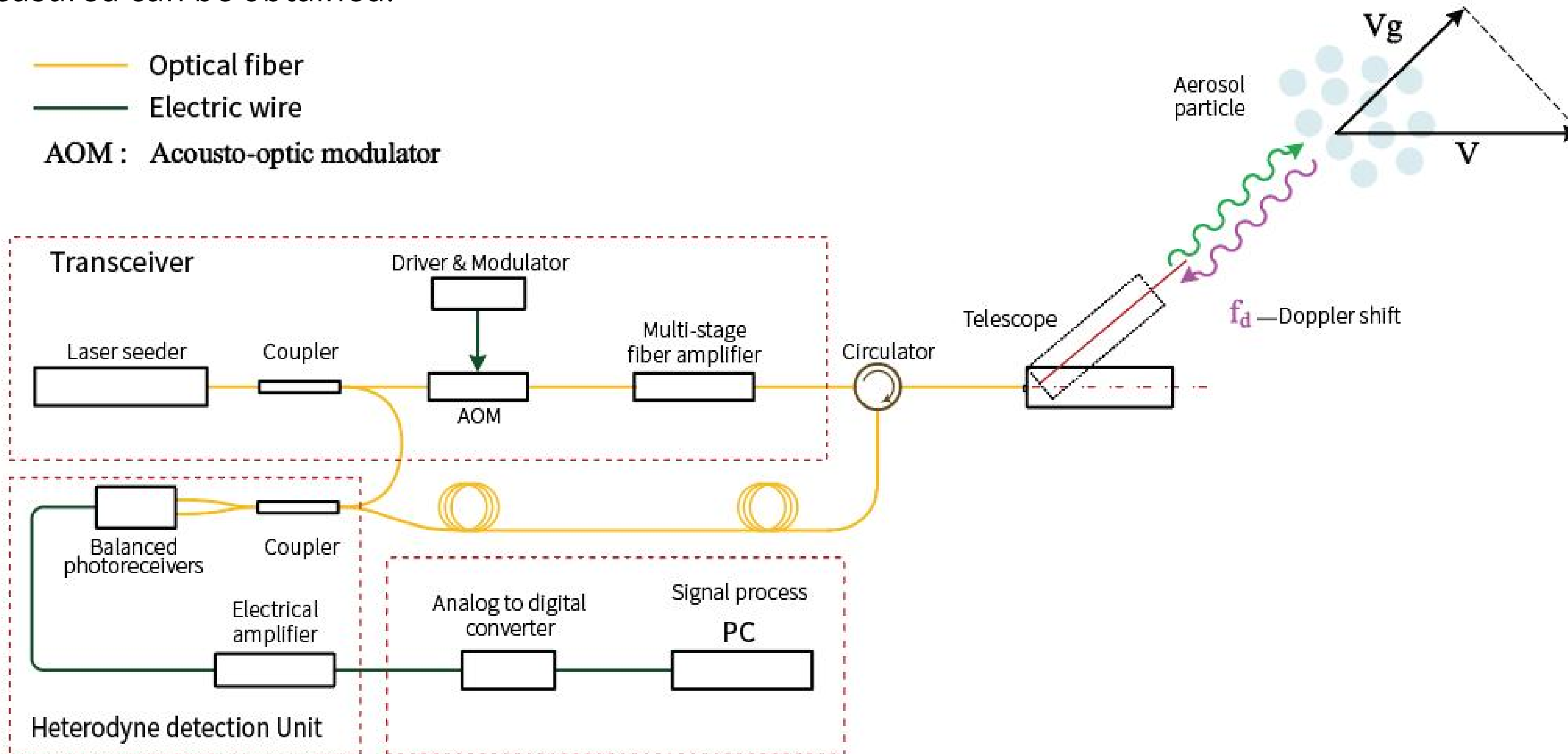
· **Non-contact measurement: Convenient and fast, industry leading**

· **High accuracy: Up to 0.1m/s and 1°**

· **Easy to maintain: Simple and quick maintenance,**

  with no risk of safety production

· **Data security: No economic and policy risks such as data leakage**

 Wide range: 30-300m, 12 user-defined height layers

· **Infrastructure exemption No need of land acquisition and**

  infrastructure, free from worry and saving labor

· **Flexible deployment: Compact and portable,**

  suitable for all kinds of terrain environment

· **All-weather: Fearless of the harsh environment in the wild**

· **Time saving and high efficiency: Easy to operate,**

  quickly put into operation, saving precious time and cost

· **Flexible configuration: Realizing configuration distribution**

  and data transmission through flexible wireless connection

Data parameter

Data output	Horizontal wind speed/vertical wind speed/ wind direction/statistics/time stamp /GPS/ temperature, humidity and pressure
Data format	ASCII
Data storage	128GB / about 5 years @1 Hz
Communication	Ethernet (100BASE-TX)/3G/4G/WIFI/Other customized communication modes

General parameter

Power supply	24VDC,220VAC
Power	60W
Dimension	500*500*602mm3 (excluding handle) 603*500*602mm3 (including handle)
Operating temperature range	- 40°C ~ 50°C
Operating humidity range	0% to100%
Protection grade	IP67

Measurement parameters

Measuring distance	30-300m
Measuring layer	12
Sampling rate	1 Hz
Wind speed measurement accuracy	0.1m/s
Wind direction measurement accuracy	1°
Wind speed measurement range	0~75m/s
Wind direction measurement range	0~360°/s
Measurement principle	Pulsed laser coherent Doppler

Wind resource assessment

. One-stop customized wind measurement service can be provided

. Compared with the traditional measurement mode, the measurement accuracy is higher, faster, more flexible and safer

. No need for land requisition, tower erection, demolition, etc., which is faster and more economical

. Accurate assessment of wind resources to avoid the investment risks of customers

Wind power prediction system

. Accurate lidar wind measurement

. The installation site can be changed as required, with easy installation and no correction

. Safe and stable operation for a long time

. With the wind power prediction software, the wind power can be predicted more accurately, thus preventing customers from being assessed by the power grid and ensuring revenue

Micro-sitting selection and review

. Equipped with obvious advantages in wind measurement in complex terrain and frost areas

. With high measurement accuracy, the land requisition is exempted, and the measurement is faster and more flexible, with lower cost

. The multi-point review greatly improves the scientificity of the wind turbine site selection, ensures the operation safety of the wind turbine, and accurately evaluates the generating capacity

Performance evaluation of wind turbine / wind farm

. Certification and testing of prototype

. Power curve test of wind power plant

. Flexible selection or change of wind measuring points, repeated use, thus avoiding the investment of one-time wind measuring tower

. The measuring height can cover the whole wind wheel, which is more scientific and accurate

Aerological sounding

. Aerological sounding and environmental monitoring

. Research of atmospheric physics

. Wind profile measurement

Advantage

. More efficient and accurate analysis and evaluation of the performance of wind turbines and wind farms

. Effectively guiding the wind farm in carrying out technical upgrades, ultimately ensuring the safe and stable operation of the wind farm

. Increase power generation and increase revenue

Molas B300M Offshore Wind Lidar

Safe, reliable and fearless of challenges

Molas B300M
Offshore Wind Lidar

Molas B300M is a wind lidar specially developed for offshore wind energy measurement by Nanjing Movelaser Co., Ltd. It inherits almost all the advantages of the Ground-based Wind Lidar Molas B300. On this basis, it further improves the protection grade and anti-salt spray corrosion performance of the complete machine, making it meet the severe operating environment at sea. At the same time, it is equipped with high-precision inertial measurement unit and attitude compensation algorithm, so that it can be placed on non-fixed carriers such as buoys and ships for high-precision measurement of real-time wind velocity. Molas B300M supports Ethernet /3G/4G/WiFi/ satellite communication, and can remotely obtain data through the cloud platform and mailbox, thus ensuring that the lidar can be used safely at sea.
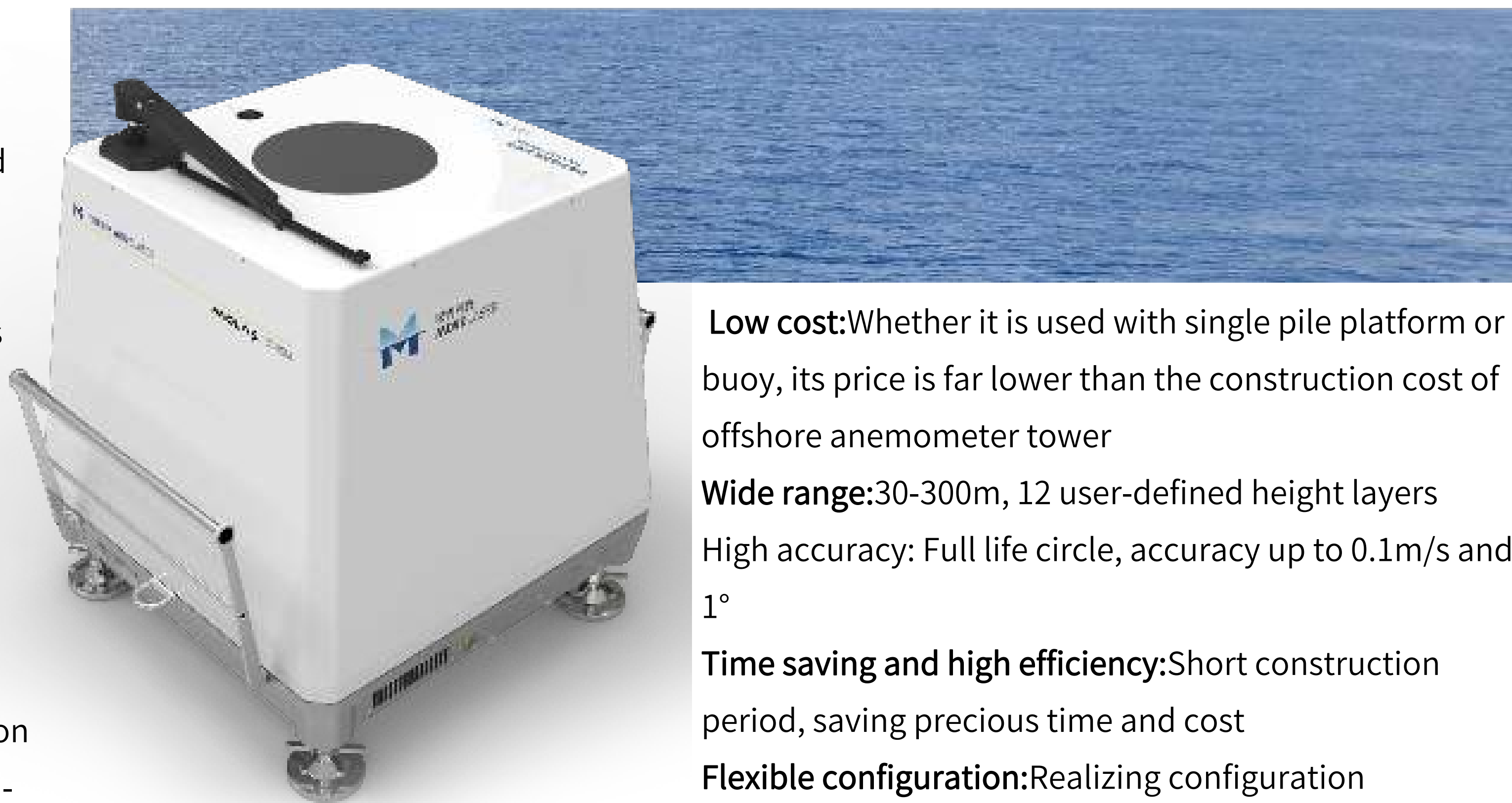
Low cost: Whether it is used with single pile platform or buoy, its price is far lower than the construction cost of offshore anemometer tower

Wide range:30-300m, 12 user-defined height layers
High accuracy: Full life circle, accuracy up to 0.1m/s and 1°

Time saving and high efficiency: Short construction period, saving precious time and cost

Flexible configuration: Realizing configuration distribution and data transmission through flexible wireless connection

Data security: Data encryption, without risk of leakage
Non-contact measurement:Convenient and fast, industry leading

Measurement parameters

Scope of measuring height	30~300m
Height resolution	1m
User-defined height layers	12
Sampling frequency	1Hz
Wind velocity measurement	Range: 0-75m/s, accuracy: 0.1m/s
Wind direction measurement	Range: 0-360°, accuracy: ±1°

Environmental parameters

Operating temperature range	-40-50 (with over-temperature protection)
Operating humidity range	0-100%RH
IP protection	Complete machine IP67
Anti-corrosion grade	C5M IEC60068-2-52-2017

General parameter

System weight	<50KG
Average power	<70w
Power supply	24VDC/220VAC 50Hz 60W
Eye safety	Class 1M EN60825-1
Equipment timing	Internet timing and GPS timing

Application Fields and Scenarios
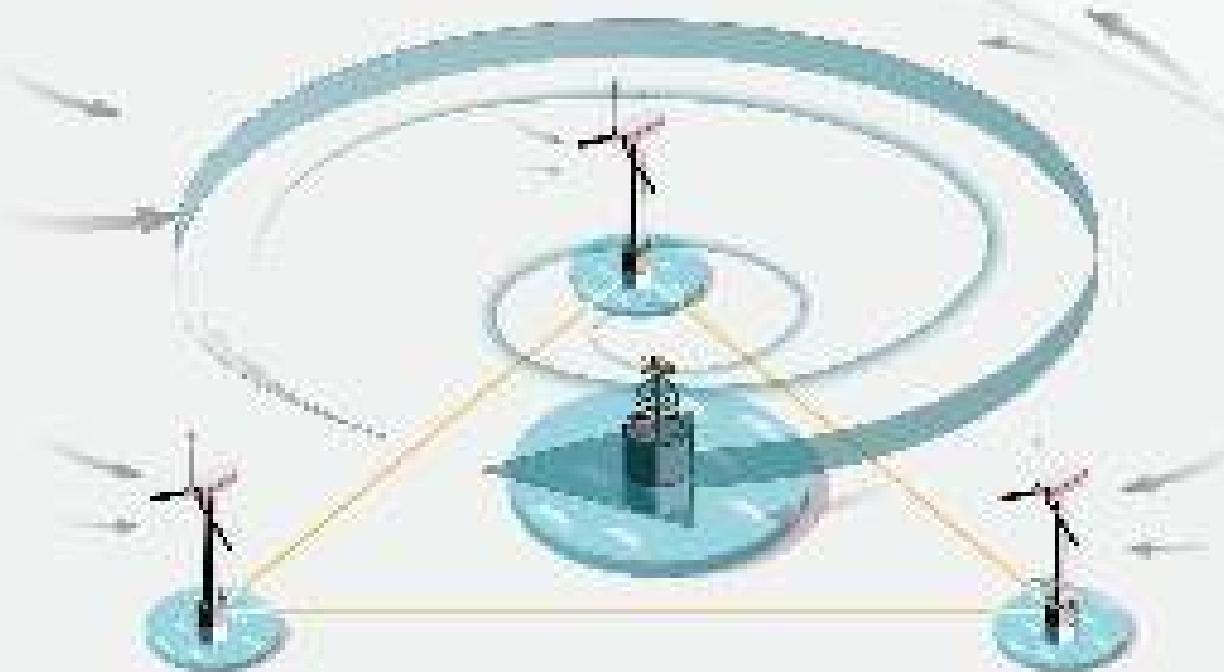
Platform wind measurement

offshore buoy wind measurement

Monitoring of offshore construction, operation and maintenance of wind power
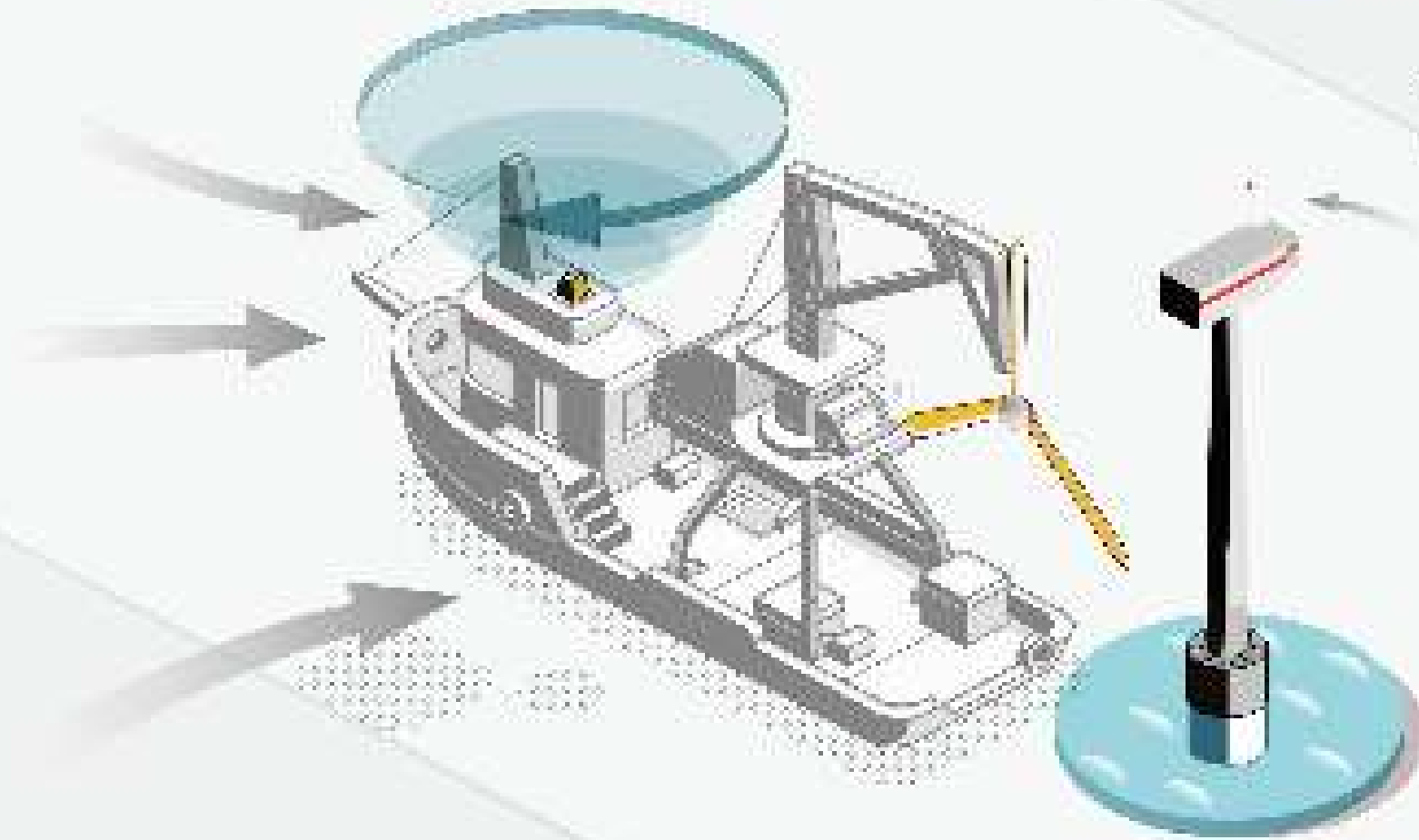
Early wind resource detection

Prediction of wind power of offshore wind farm

Molas B300M
Application scenarios/cases
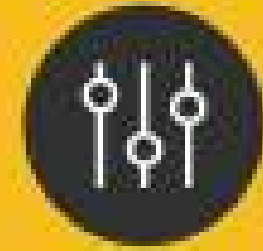
CNOOC Zhanjiang Project

SPIC Zhanjiang Project

Borun New Energy Nantong Project

Data output

Seconds data and ten-minute statistics

Signal to noise ratio

standard deviation

time

wind direction

horizontal wind velocity

vertical wind velocity

max & min

temperature, humidity and pressure

GPS

Lidar information

Real-time data

Signal quality

Temperature and humidity data

Data management

System setting

Using the remote lidar monitoring platform, the operating state of the lidar can be viewed remotely in real time through a computer or a mobile phone, thus ensuring the safe and normal operation of the external farm of the lidar, and data download and parameter setting can be carried out, so that the lidar is more intelligent and convenient to use.

Client software

Lidar sales Suitable for long-term, multi-project applications

Lidar wind measurement service: Providing one-stop lidar wind measurement services such as lidar lease, installation, power supply, protection and data extraction, etc.

Lidar operation service: Providing lidar application services, including lidar installation, transportation, maintenance and project implementation, etc.

Project consulting: One-stop customized data services, including lidar site selection, operation, data analysis and reporting, etc.

Flexible business cooperation mode

Molas NL Nacelle Wind Lidar
Capturing more gifts from the wind

Molas NL series
Nacelle Wind Lidar

Molas NL series is a nacelle wind lidar independently developed by the Company for the intelligent application solutions of wind power customers. It is a laser remote sensing wind measurement device installed at the top of the nacelle of wind turbine. The lidar, based on the principle of laser Doppler frequency deviation, is equipped with a coherent detection system, so as to achieve accurate measurement of wind vector farm at 50m-200m/400m/750m in front of the wind turbine impeller.

Nacelle Wind Lidar Molas NL can measure and record the wind farm data at 200m/400m/750m in front of the wind turbine, which is included in the main control system of the wind turbine, thus realizing feedforward control and the objectives of load optimization and improvement of power generation. In addition, the system can also be applied to various automatic operation scenarios such as yaw correction, power curve testing, wake analysis, intelligent farm control, etc.

Hz, 4 beams, synchronous measurement of 10 distancews
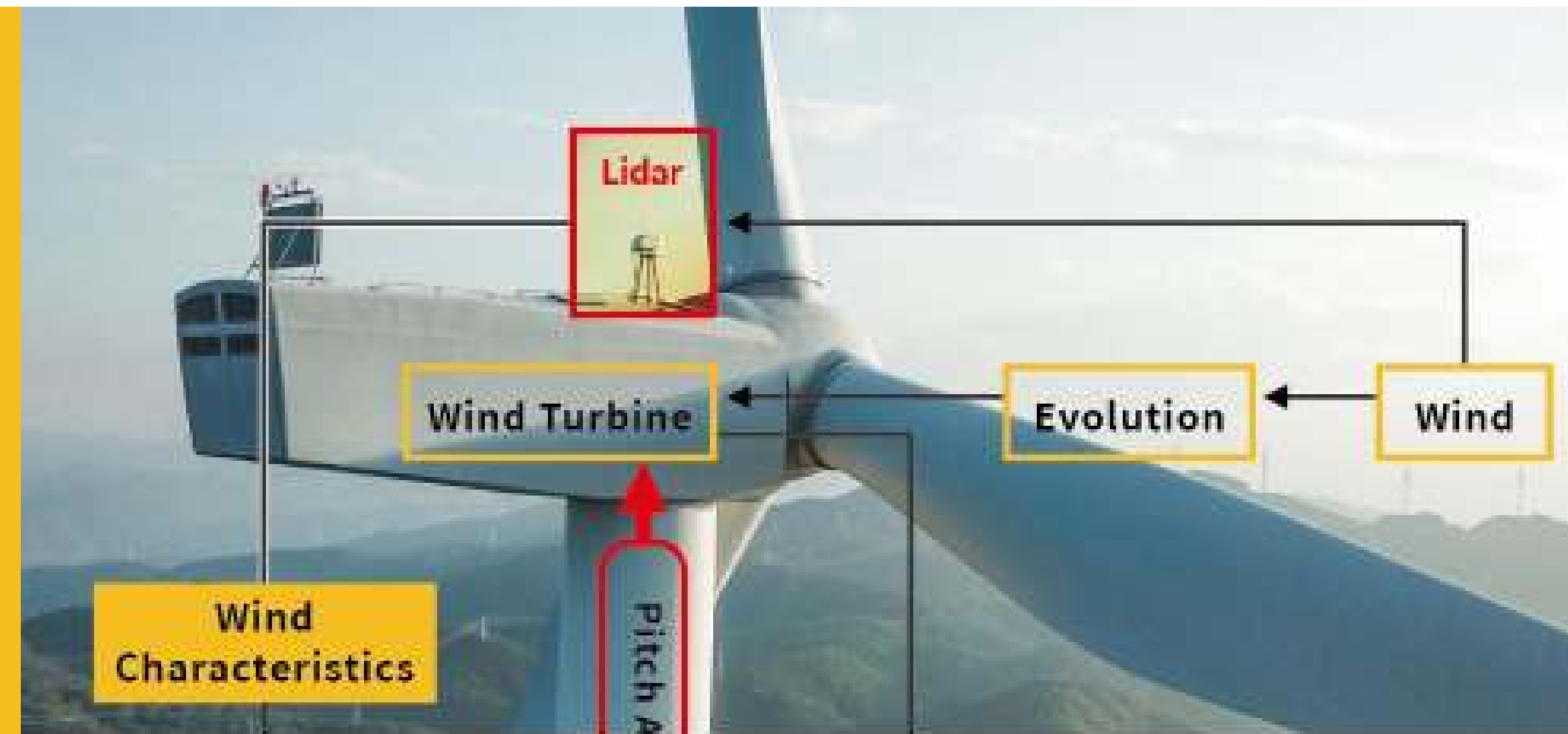
0m-200m/400m/750m

Measurement parameters

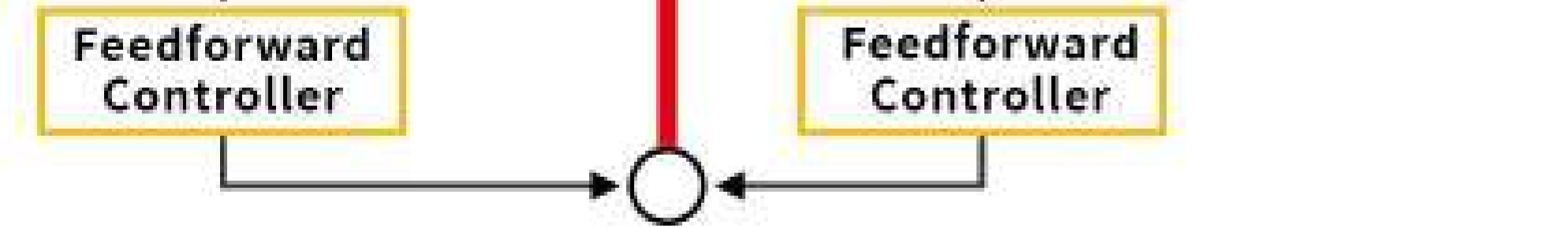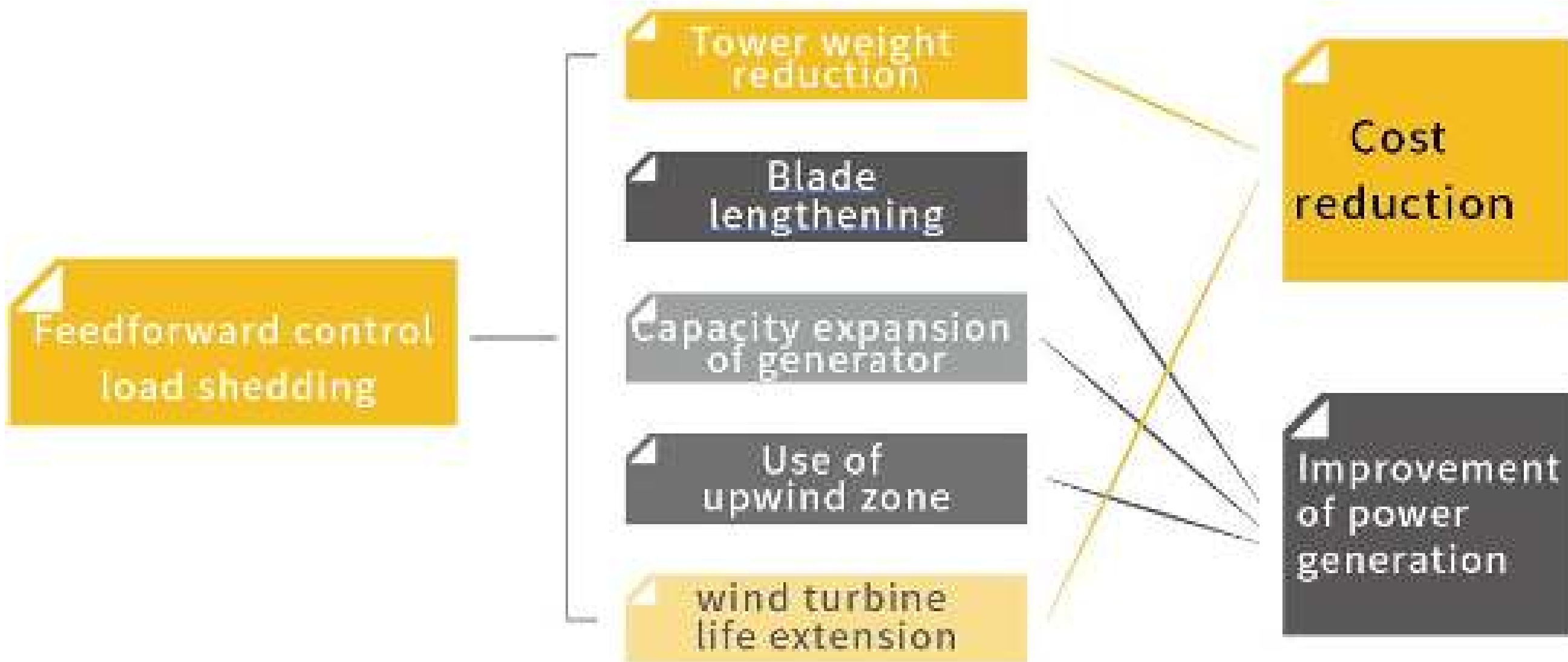|	
Measuring distance	50m~200m（NL200） 50~400m（NL400） 50m~750m（NL750）
Measuring layer	10
Wind speed measurement range	-0m/s~50m/s
Wind velocity measurement accuracy	0.1m/s
measurement range	-90°~90°
measurement accuracy	0.5°
Effective measure frequency	4Hz
Beam structure	4 beams, angle 30°of horizontal plane, angle 25°of vertical plane (NL200) 4 beams, angle 30°of horizontal plane, angle 10°of vertical plane (NL400) 4 beams, angle 30°of horizontal plane, angle 10°of vertical plane (NL750)

Environmental parameters

Work acceleration range	-0.5g~0.5g
Operating temperature range	-40°C~60°C
Survival temperature scope	-40°C~65°C（power down）/ -45°C~60°C （power on）
Survival wind speed	70m/s
Working altitude	≤3500m

Other parameters

Protection grade of optical probe	IP66
Requirements for lens	Anti-freezing, dust, etc.
Anti-corrosion grade	ISO C5
Communication protocol and interface	Profibus DPetc.
Weight of optical probe	≤35kg
Weight of signal processing module	≤10kg
Max passing size	500mm*500mm
Service life	＞5 years

- Real front wind measurement
- Implementation of data transmission and local storage
- Accuracy up to 0.1m/s and 0.5°
- High sampling rate 4Hz
- High applicability Other parameters
- Multi-distance layer: Simultaneous measurement of up to 10 user-defined distance layers
- Intelligent configuration:
- Wide range: Measuring distance: 200/400m, meeting various needs
- Easy to maintain
- Four beams: Covering the impeller surface to truly realize three-dimensional measurement
- Protection grade of optical probe IP66
- Anti-corrosion grade ISO C5

MOLAS NL

The wind speed and direction in front of the rotor, with the application and development of Doppler wind lidar in the field of wind energy, are remotely measured, which solves the problem of lag measurement in the traditional strategy of wind turbine control.Through the accurate measurement of the inflow wind speed and direction, the wind condition on the rotor surface can be accurately predicted, the system parameters can be timely corrected, and feedforward control can be realized, thus reducing the load of wind turbine generator system, improving the power generation efficiency, reducing the manufacturing cost, prolonging the service life of the wind turbine, and achieving the ultimate goal of reducing the cost per kilowatt hour of the electricity.

Lidar
Wind Turbine — Evolution — Wind
Wind Characteristics
Pitch Angle
Rated Rotor Speed
Feedforward Controller
Feedforward Controller

Feedforward control of wind turbine based on lidar

Tower weight reduction
Blade lengthening
Capacity expansion of generator
Use of upwind zone
wind turbine life extension

Feedforward control load shedding

Cost reduction

Improvement of power generation

4%

Correction of yawing error and improvement of power generationIncreasing annual power generation by 2%-4%
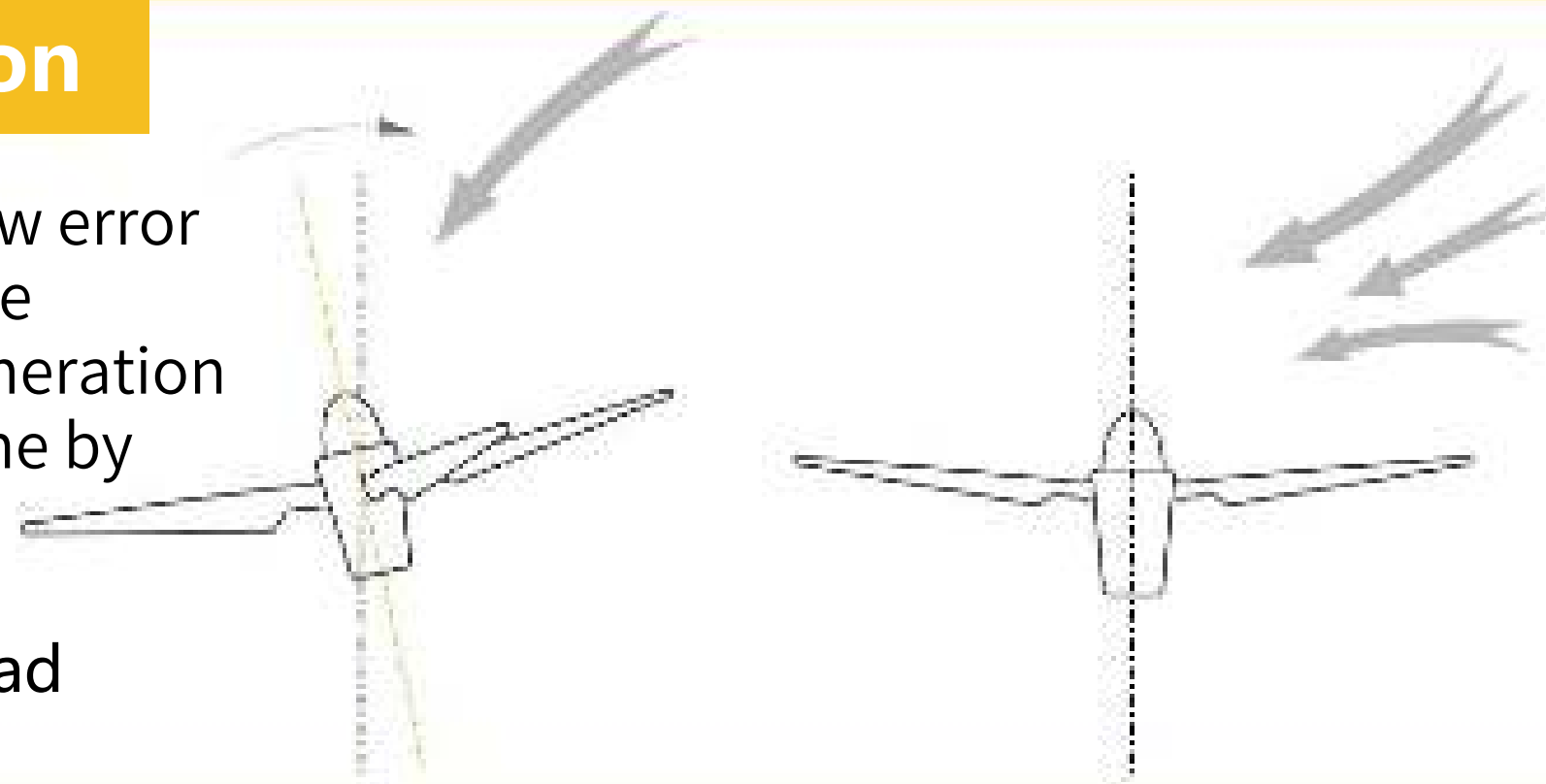
15%

Reducing fatigue load by 5%-10%Reducing the ultimate load by 10%-15%Extending the service life of the wind turbine and reducing its cost

13%

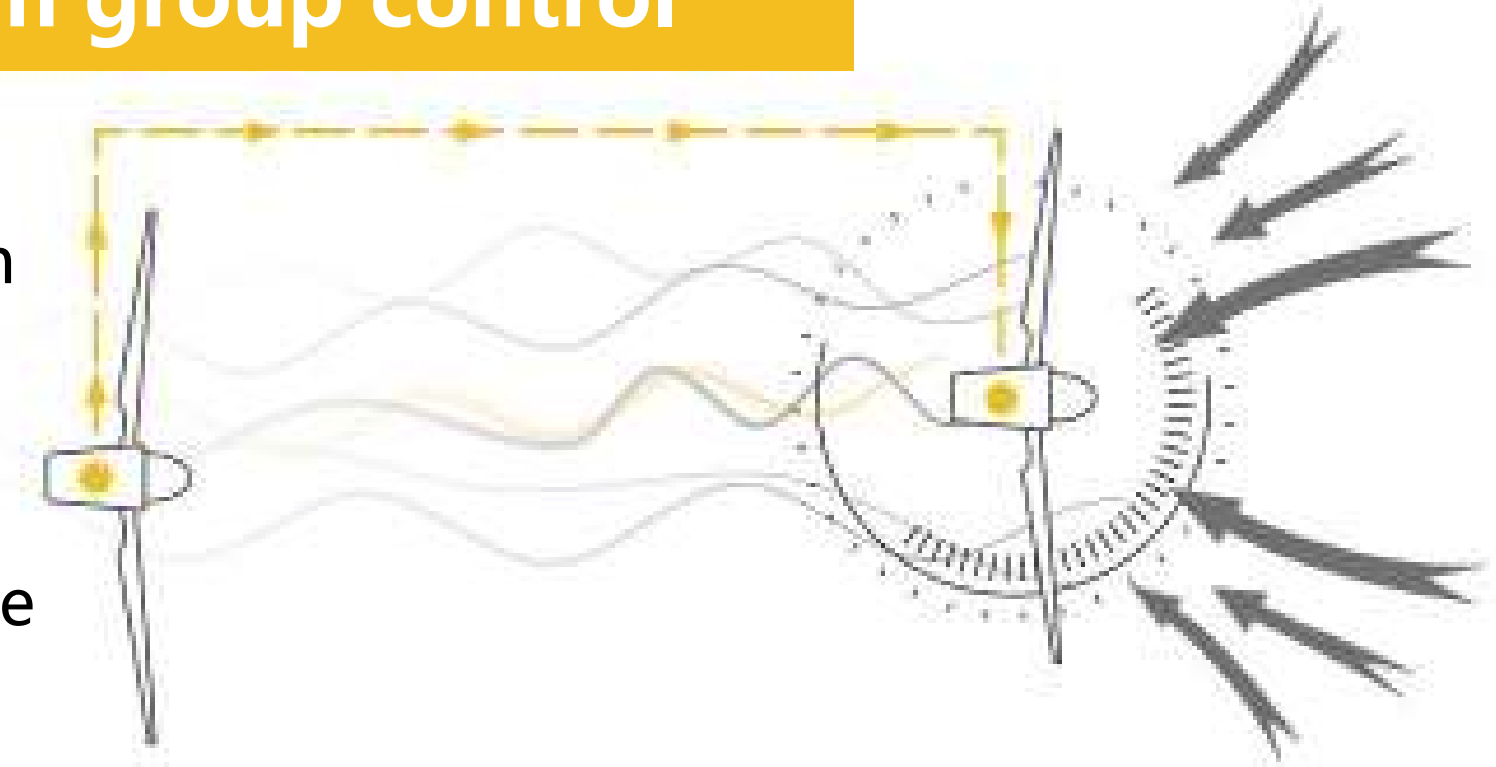Improvement of comprehensive income

Yaw correction

- Correcting the yaw error and increasing the annual power generation of the wind turbine by about 2%-4%
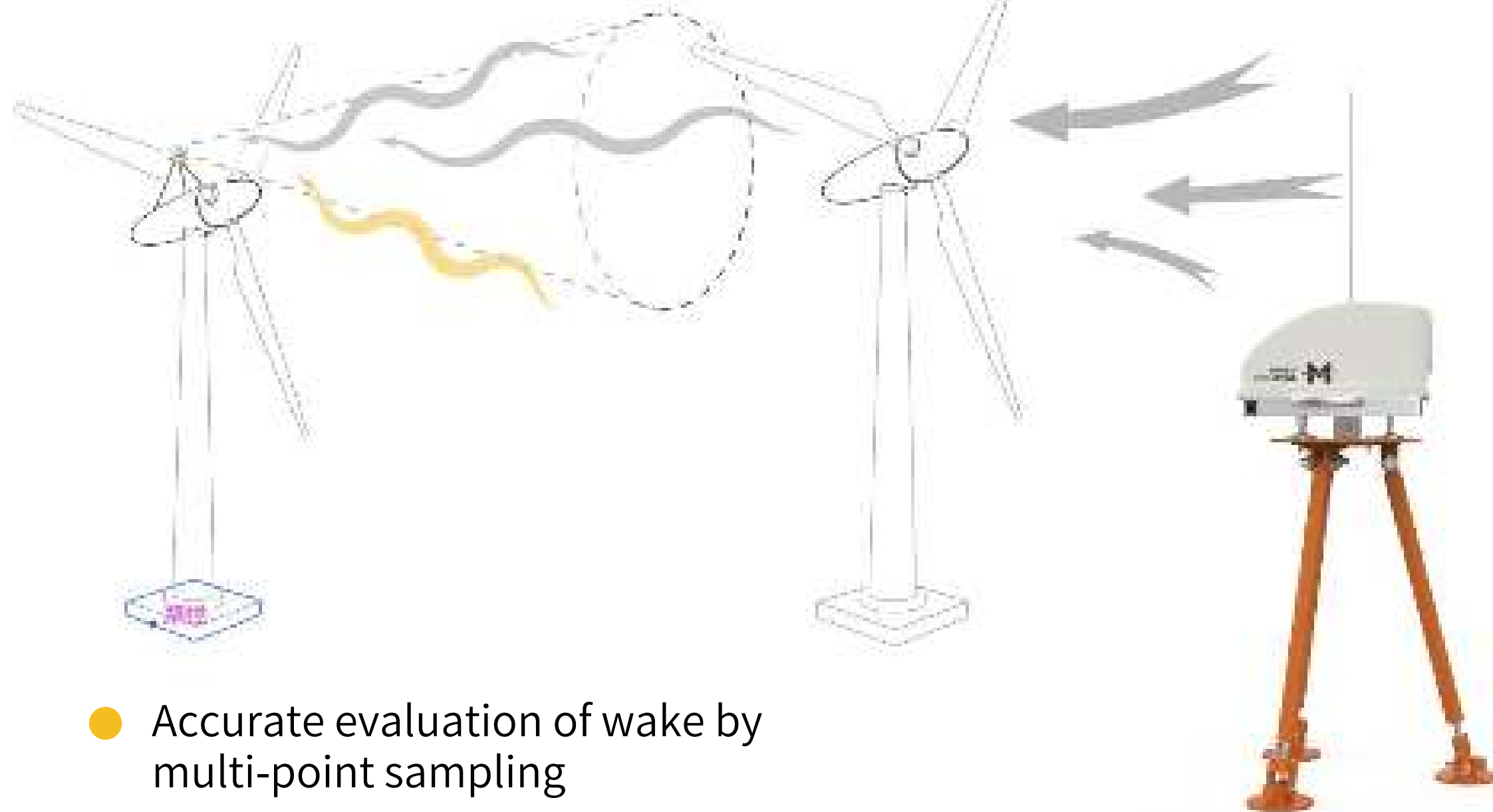
- Reducing unit load

Intelligent farm group control

- Optimizing the whole power of the wind farm by using the wind farm cluster controller
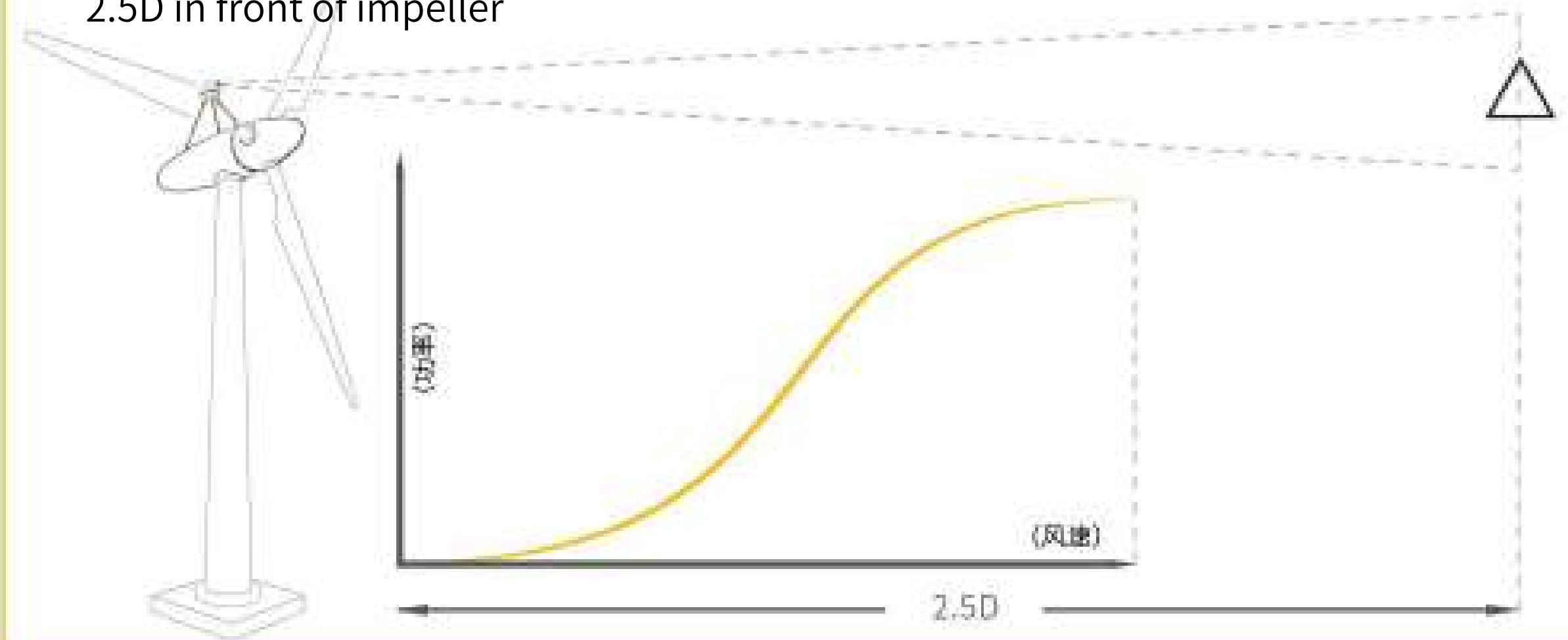
- mproving full-life-cycle benefit of wind farm

Wake analysis

- Remote sensing measurement, deep into the wake

- Accurate evaluation of wake by multi-point sampling

Power curve test

- Realizing remote sensing measurement of wind farm 2.5D in front of impeller

- Improving power curve and test accuracy

- Prototype testing or post-evaluation

(功率)

(风速)

2.5D

Molas NL
Benchmarking Case of Lidar Standard for Full-field Wind Turbine Generator Systems (WTGS)

Since Jun. 2018, Movelaser has successively delivered more than 200 Nacelle Wind Lidar MOLAS NL on a wind power project in Qinghai. The project is located in Gonghe County, Hainan Prefecture, Qinghai Province, with an installed capacity of 450,000 kilowatts, and a total of 225 2MW low-temperature plateau wind-blown sand prevention water-cooled wind turbine generator systems have been installed.

In Nov. 2018, the first wind turbine grid-connection power generation was conducted, and all of them were put into operation for power generation by the end of December.This project is a benchmark application project of the nacelle wind lidar standard for wind turbine generator systems. The standard of nacelle wind lidar has the advantag

Molas 3D 3D Scanning Doppler Wind Lidar
Solutions for Fine Measurement of 3D Wind farm

Molas 3D

3D Scanning Doppler Wind Lidar

- Abundant measurement information: Fine measurement of three-dimensional
- wind farm, up to 300 user-defined distance layers
- Wide range: Typical detection distance of 4/8km
- High accuracy:Pointing accuracy: 0.1°, Accuracy of wind velocity at visual directions: 0.1m/s
- Various scanning modes：PPI/RHI/DBS/LOS/ Programmable Arbitrary Scanning Mode
- Flexible deployment: Compact and portable, easy to make transitions and build stations
- All-weather:No fear of the harsh environment in the farm, with the viability of LPZ0B mine farm
- Safety in use:With the functions of GPS position reporting and geo-fencing; data encryption, without risk of leakage
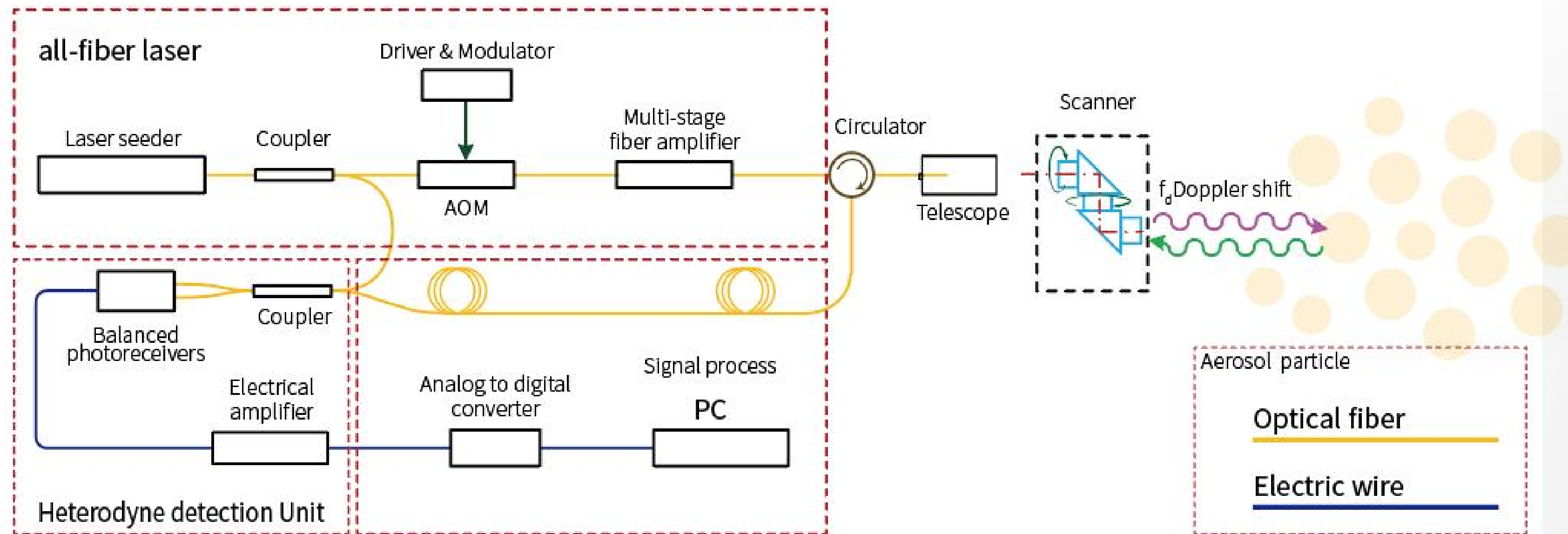- Multiple configuration:2 kinds of range resolutions and 5 kinds of storage time are available

Molas 3D is a 3D scanning Doppler wind lidar based on the principle of pulsed laser coherent Doppler frequency shift, which can finely measure the 3D wind farm within the radius of 4Km of the target point. Its equipped high-precision 3D scanning system can provide various scanning modes (PPI/RHI/DBS/LOS/ programmed scanning). Molas3D series can be applied to offshore wind resource assessment, research of complex terrain, wind turbine wake detection, wind shear warning of airport glide slope, urban meteorological observation, high-altitude turbulence detection and other customized wind velocity measurement scenarios.

Product Introduction

Basic parameter

Detection distance at visual directions	8km (corresponding to 75m distance resolution) 4km (corresponding to 30m distance resolution)
Range resolution	30m　75m
Blind zone width	50m (corresponding to 30m distance resolution) 100m (corresponding to 75m distance resolution)
Storage time	0.5s/1s/2s/4s/8s, optional
Measuring range of wind velocity at visual directions	75~+75m/s
Measurement accuracy of wind velocity at visual directions	0.1m/s
Number of range gates	300
Laser security level	IEC 60825-1(2014) Class1M
Horizontal scanning range (azimuth coverage)	0°~360°
Vertical scanning range (pitch angle coverage)	0°~180°
Angular resolution	0.1°
Pointing accuracy	0.1°
Repeated positioning accuracy	0.1°
Max location update rate	2Hz
Scanning mode	PPI-Constant pitch angle; RHI-Constant azimuth angle; DBS-Vertical profile; LOS-Continuous measurement of fixed line of sight Programming scanning mode (user-defined)
Data product	Timestamp, range gate, apparent wind speed, wind velocity at visual directions, deviation of wind velocity at visual directions, signal-to-noise ratio, azimuth value, pitch angle value, scanning mode, longitude and latitudeheight, equipment operation information, and other necessary information
Data storage duration	5 - 18 months (as appropriate)
Data format	.csvFile

Environmental parameters

Operating ambient temperature	-40~+50
Operating ambient humidity	5%-100%RH, no condensation
Storage temperature	-45~+60
Storage humidity	5%-100%RH, no condensation
Protection grade	Shell IP54, core module IP66

Other parameters

Running power consumption	Within 400W at normal temperature and 1KW at extreme temperature
Supply voltage and frequency	110VAC±20% or 220VAC±20%　50Hz±10%
Dimension	800mm*650mm*1130mm
Weight	150kg

Molas 3D Application Area

1 Wind power farm

Wind resource assessment can measure wind farm data in a large area and reduce the risk of wind site selection

Long-distance power curve measurement and wake vortex measurement can optimize wind energy utilization and unit efficiency
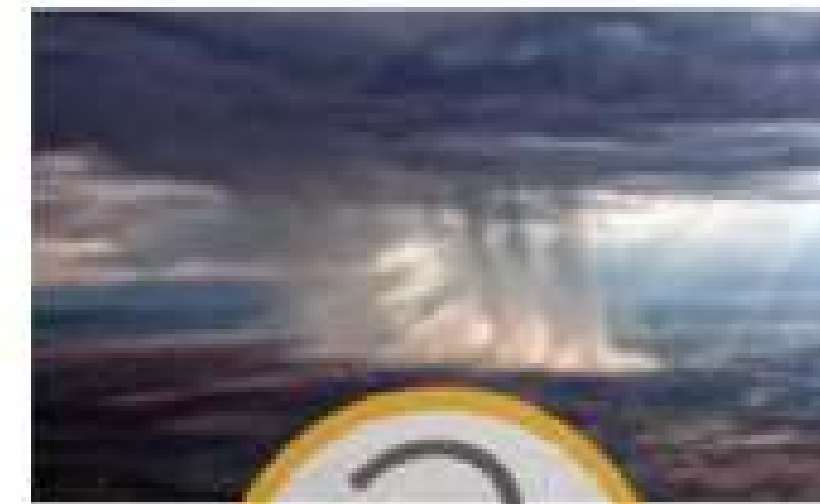
2 Civil aviation farm

Detecting and warning dangerous meteorological phenomena, such as wind shear and microburst, etc.

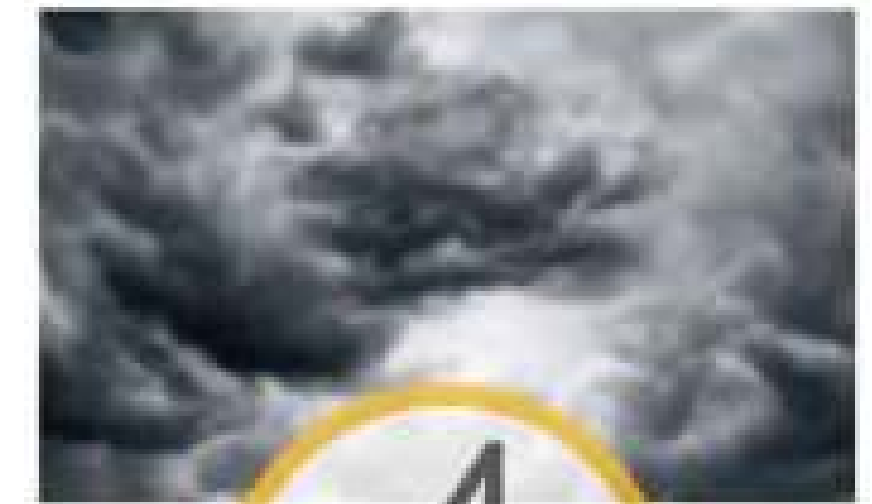Measuring wake vortex and optimizing the flight interval in the airport

3 Meteorological farm

Providing wind farm data, which is convenient for understanding the wind state in the boundary layer

Providing accurate and high space-time wind profile information within a few kilometers of the ground, filling the gap in low-altitude observation

4 Air quality monitoring farm

Real-time three-dimensional information of misty rain diffusion to track emission sources

Optimizing dust emission control in the mining industry

Tower Clearance Lidar Molas CL

Prevention of fan sweeping tower | Reducing accident probability
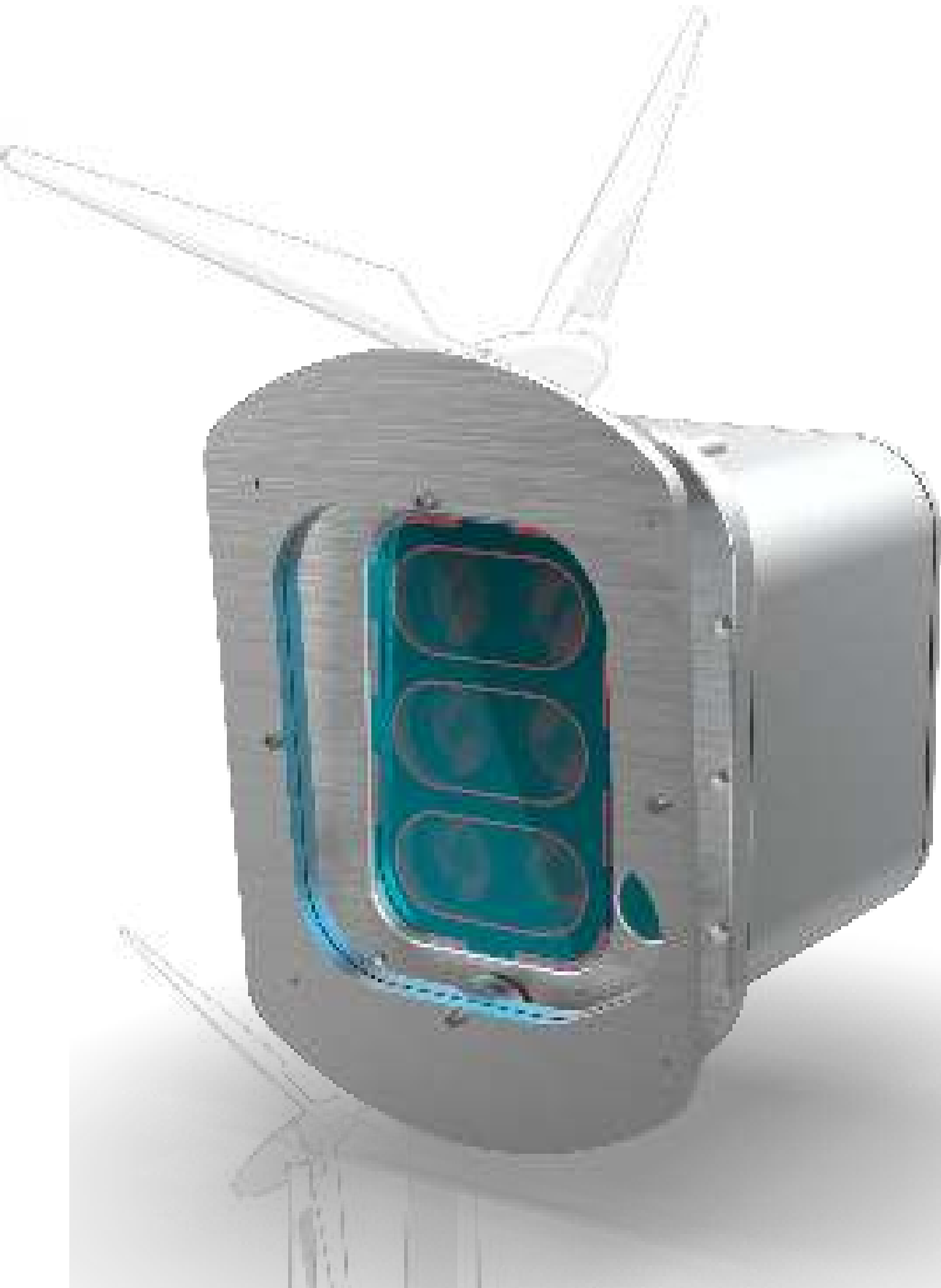
Monitoring blade abnormality

Molas CL
Tower Clearance Lidar

The Tower Clearance Lidar Molas CL is a lidar for real-time monitoring of blade tip clearance distance. When the blade clearance value measured is close to the minimum clearance value prescribed, the fan unit master control can immediately take protective measures, such as deceleration and putting away the oars. The clearance lidar is used for the stock unit to prevent sweeping the tower and lift the power limit of the dangerous unit to improve the generating capacity. If it's used for the future unit, the blade cost can be reduced and the unit design pressure can be lowered.

$$d = c \cdot t \cdot \frac{1}{2}$$

Accurate single-point feedback

threshold detection
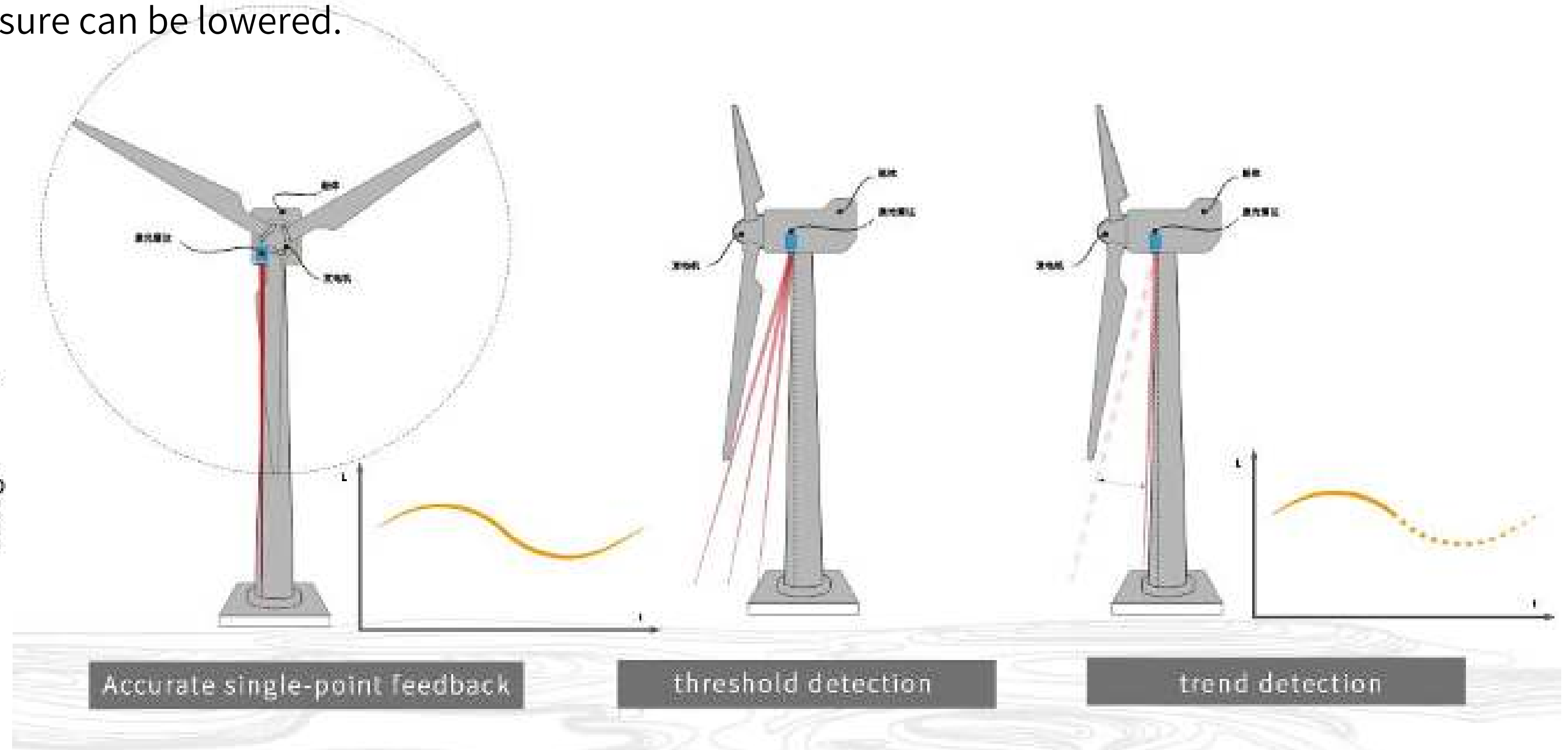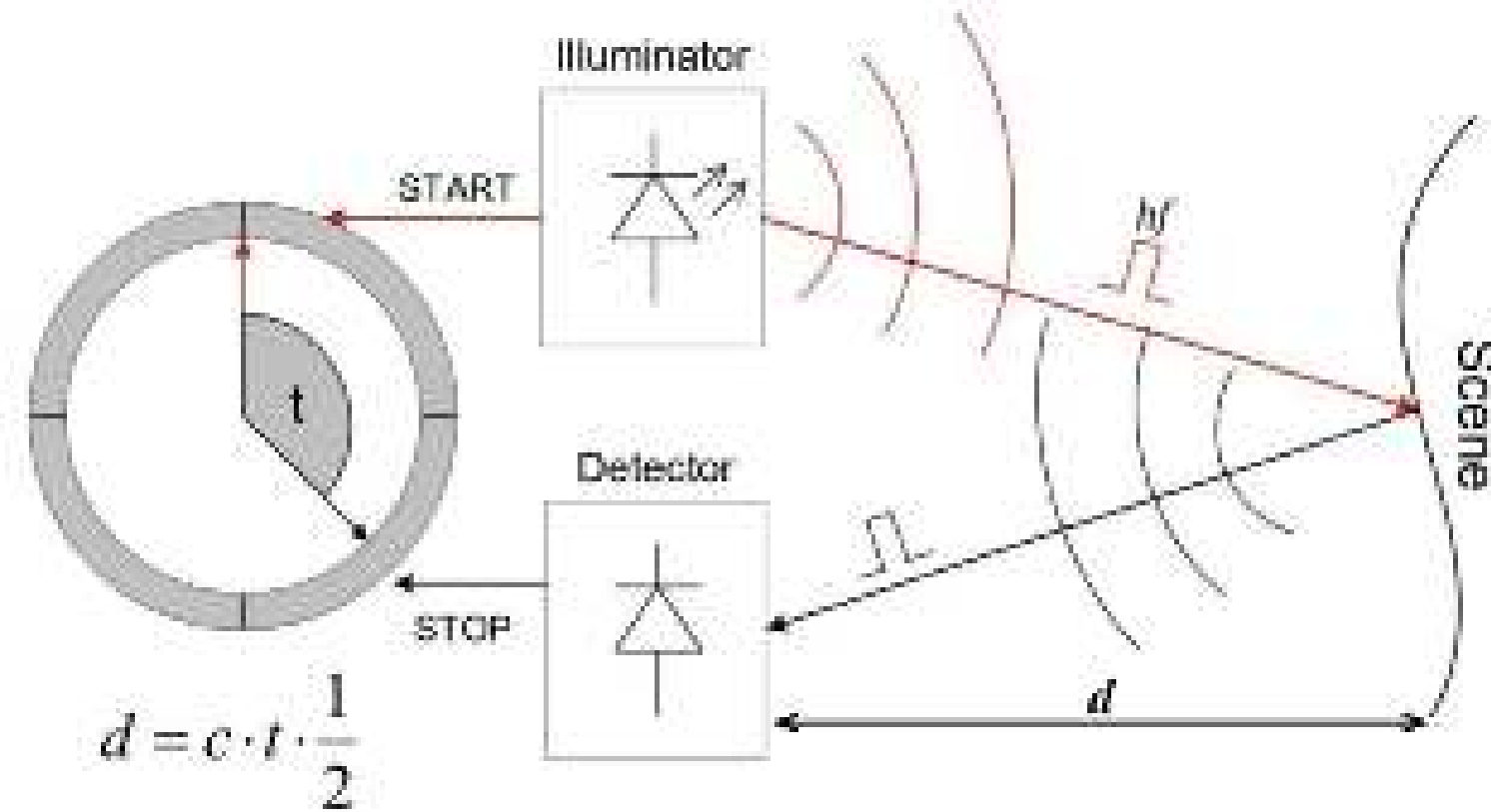
trend detection

Molas CL   Product parameters

Distance measurement index

Distance measurement way	ToF
Detection distance	200m@90% reflectivity / 140m@10%reflectivity
Range resolution	≤0.1m
Measurement accuracy	±0.2m
Repeated measurement	±0.2m

Optical index

Wave length	905nm
Repetition frequency	Each channel: 20KHz
Laser security level	Class 1

Environmental adaptability

Operating temperature range	-40°C~+60°C
Survival temperature scope	-45°C~+65°C
Operating humidity range	0%~100% RH
Shell protection level	IP65 (or depending on concrete requirements)
Work acceleration range	-0.5g～0.5g

Others

Running power consumption	Within 60W
Supply voltage and maximum current	DC 24V，3A
Dimension	200×200×250mm±0.2m
Weight	≤2 kg(host weight) ≤10kg(host and cable weight, determined as per the cable length)

Light beam pointing

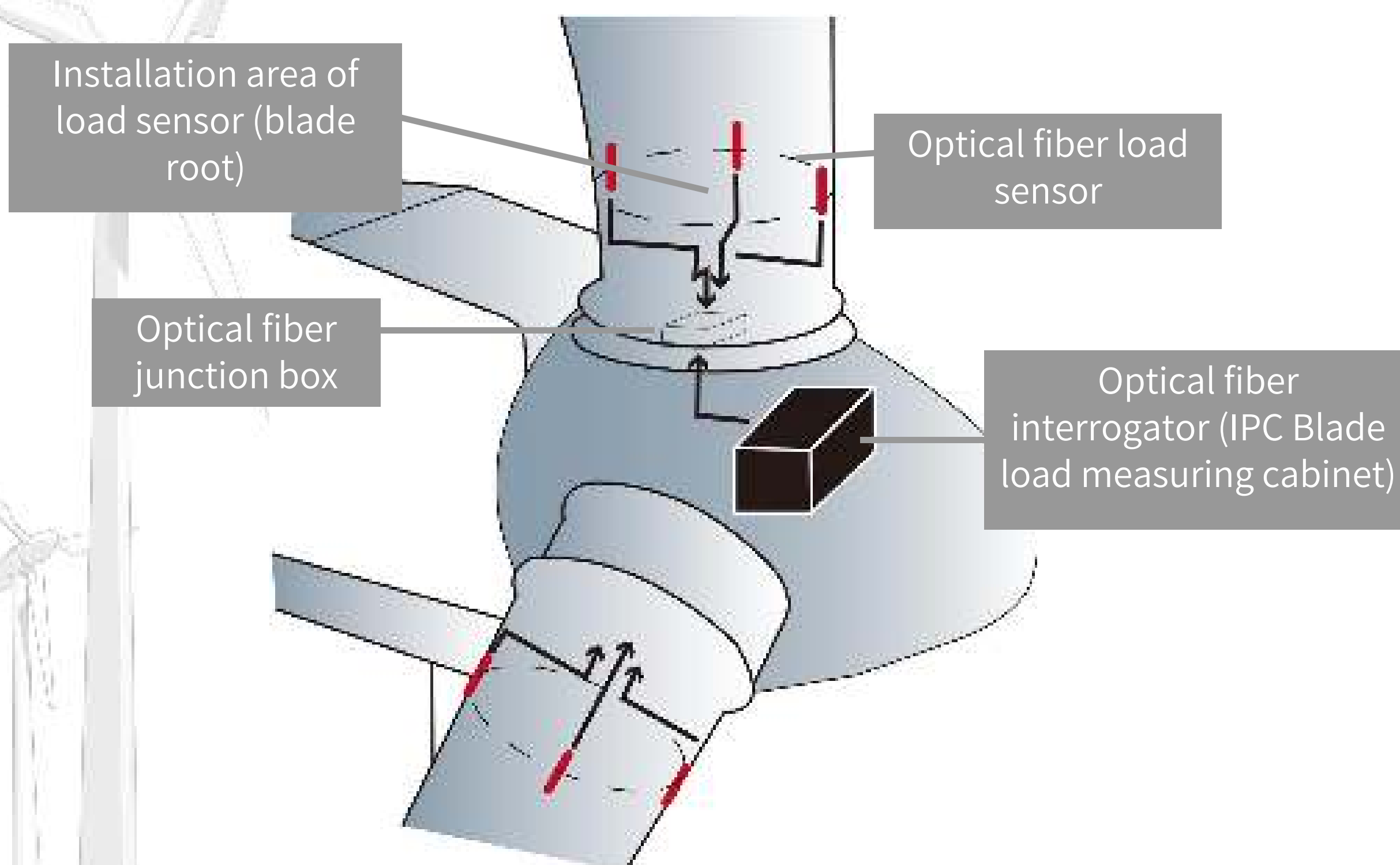|	
Light beam 1	0°
Light beam 2	2.05°±0.2°
Light beam3	4.09°±0.2°
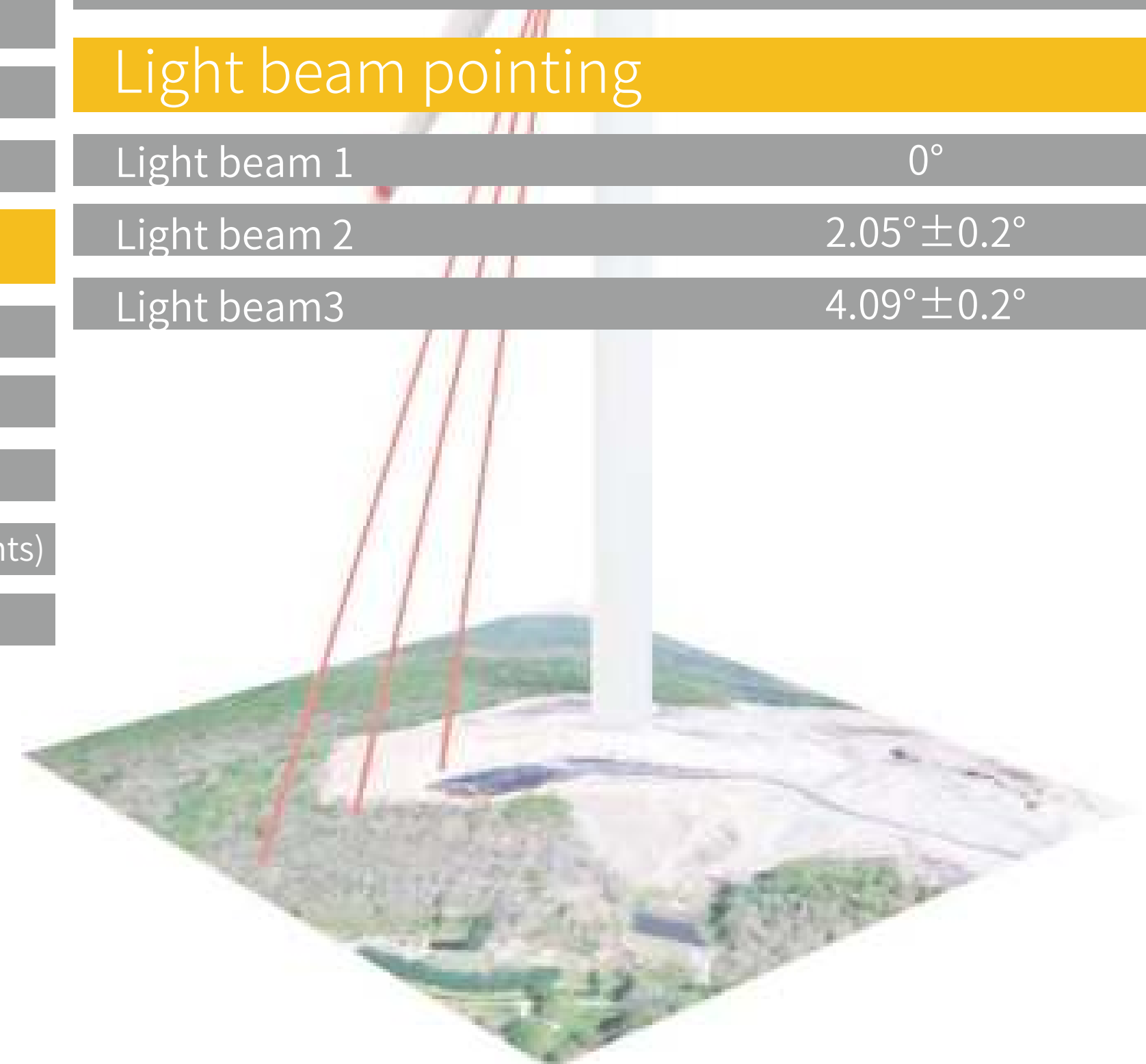
Molas FD Blade Load Measurement System

High-precision / flexibility and portability / data security and reliability

Molas FD

Blade Load Measurement System

    Blade Load Measurement System Molas FD consists of interrogator and sensor. The sensors, through the fiber bragg grating (FBG), convert the measured signals into wavelength signals, which are divided into load sensors, acceleration sensors and temperature sensors, etc. The interrogator demodulates the feedback wavelength of sensors and transmits data to the outside. The interrogator is used with different sensors. The sensors are arranged at the positions to be measured of the blades, so that the load, acceleration, temperature and other data of the blades can be measured.

Installation area of load sensor (blade root)

Optical fiber load sensor

Optical fiber junction box

Optical fiber interrogator (IPC Blade load measuring cabinet)

Product Introduction

Performance Parameters of Interrogator

| Product characteristics

Number of channels	1-16 channels, optional
Measuring range	1546-1558nm
Demodulation precision	20pm
Wavelength resolution	0.01pm
Scanning frequency	1kHz

| Electrical data

Power supply	22-26VDC
Power consumption	<25W
Electrical connection	MC 1,5/2-GF-3,81
Ambient humidity	0%~95RH

| Environmental conditions

IP protection grade	IP20
Maximum working altitude	3000m
Operating temperature	-35~60°C
Storage temperature	-40~80°C
Ambient humidity	5%~95RH
Vibration class	Meet the requirements in GB/T 2423, ±0.5g
Electromagnetic compatibility	Meet the requirements in GB/T 17626

| Mechanical data

Length	217mm
Width	106mm
Height	141mm
Total weight	1.8±0.2kg (excluding packing box)

Performance Parameters of Load Sensor

| Product characteristics

Sensor type	Fiber Bragg Grating (FGB)
Measuring range	±2000 με
Maximum survival strain	3000 με
Resolution	≥0.05 με

| Environmental conditions

IP protection grade	IP67
Maximum working altitude	3000m
Operating temperature	-40~50°C
Storage humidity	-40~80°C
Ambient humidity	0%~95RH

| Mechanical data

Length	220mm
Width	60mm
Height	9mm
Total weight	0.3±0.2kg (excluding packing box)

Performance Parameters of Optical Fiber Bus

| Optical data and interface

Connection	E-2000/APC
Quantity	3/5
Type	Single-mode
Tensile strength of cable	500N
Minimum bending radius of cable	Dynamic 120mm and static 60mm
Attenuation property	≤1dB/km
Flame retardant rating	CMR
Flattening strength / 100mm	1000N

| Environmental conditions

Operating temperature	-40~50°C
Storage temperature	-40~80°C
Ambient humidity	0~95%RH

| Mechanical data

Length	14m
Total weight	1±0.5kg(excluding packing box)

Molas NX5 Buoy Lidar System

Boosting the development of offshore wind power

Buoy Lidar System Molas NX5 a floating wind lidar system equipped with Molas B300M, which integrates the attitude compensation algorithm independently researched and developed, thus ensuring the high-precision measurement of wind velocity in the moving attitude. The overall system has a high integration level and wind measurement precision, with stable and reliable data transmission. It can be operated for more than five months under the condition of no wind and light. Buoy Lidar System Molas NX5 has a rich experience in launching and has withstood the test of many typhoons and other offshore extreme weather. It, in terms of economy, construction convenience or environmental adaptability, can further promote the technological upgrading of floating wind turbine and better boost the development of offshore wind power.
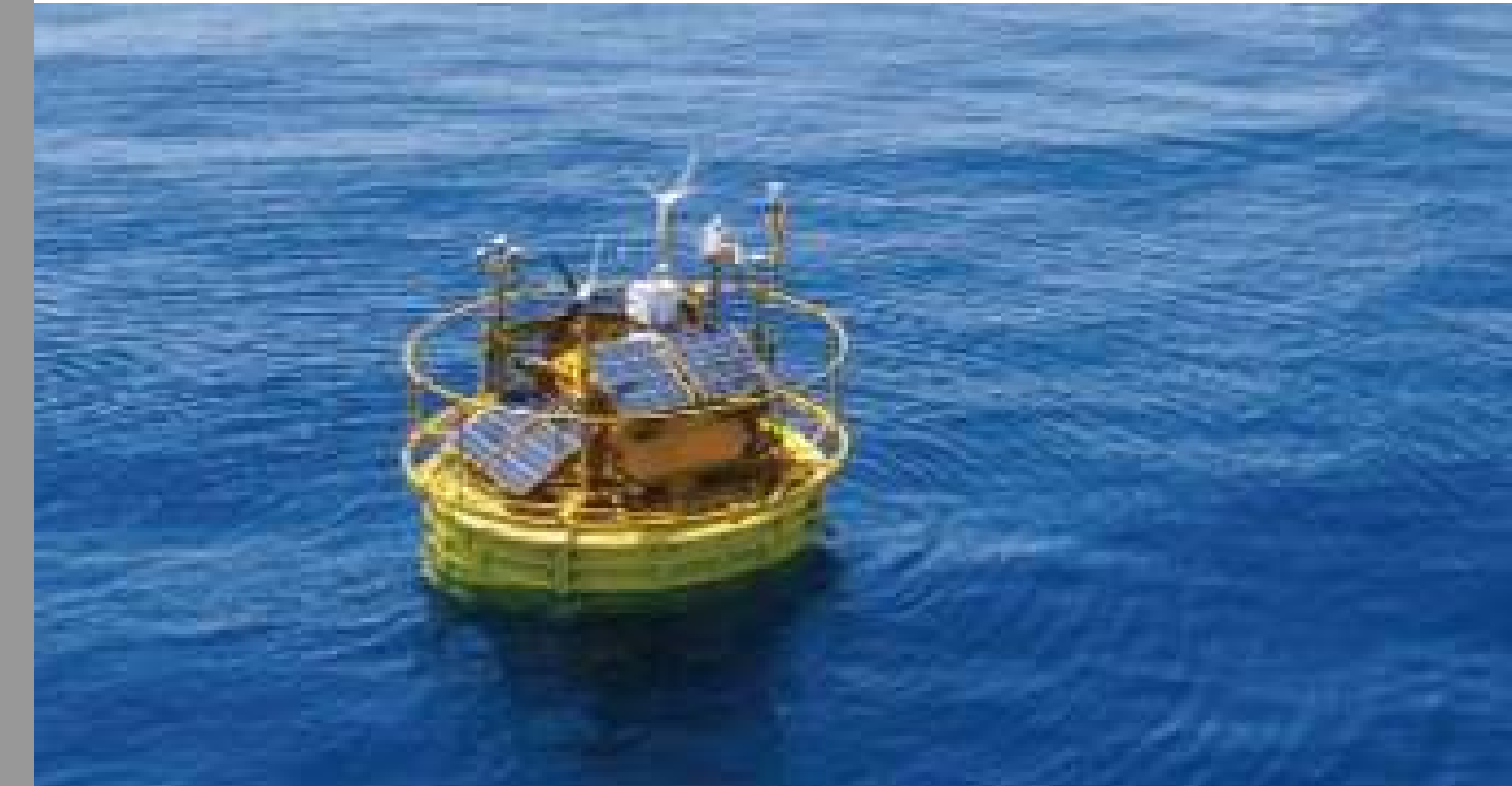
- Motion compensation: Achieving industry-leading data accuracy based on self-developed patent algorithm
- Reliable power supply: There is no need for continuous operation and maintenance of the system, thus ensuring high data availability
- Robustness:Built-in disaster tolerance design such as anti-collision and anti-water
- Redundant backup:Redundant backup of core sensor, supporting dual lidar
- Data security:Encrypted storage and transmission of all data
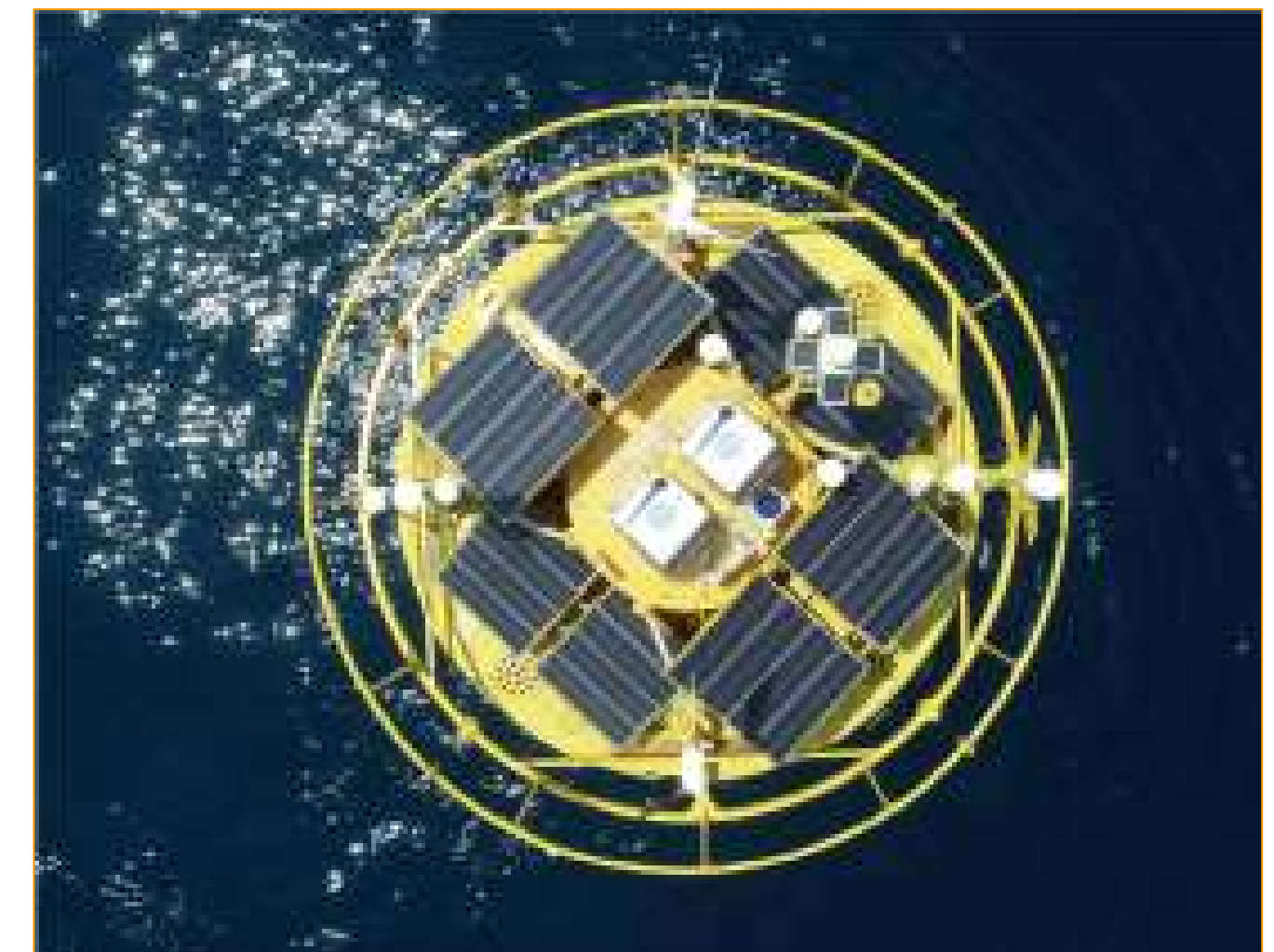
Product Introduction

Floating body

Diameter	5m
Height	9m
Weight	13.5 tons
Net buoyance	10 tons
Structure	Multi-cabin design

Mooring system

Water depth	8-250M
Anchor	Cement anchor, 10 tons
Chain	JT/T 100-2005 chain system, supporting the double chain anchor system. Mooring system shall be independently reviewed and designed according to site characteristics.

Power supply

Battery pack	5 sets
wind turbine	2 sets, optional
Solar energy	Multi-group solar energy
Fuel cell	2 groups, simultaneous operation of dual lidar (optional)

Positioning system

Direction	0-360°
Direction accuracy	0.09 (° 2 baseline)
Horizontal positioning accuracy	0.5m （SBAS）

Communication system

|	
Satellite communication	Beidou short message *2, with optional broadband satellite module
Mobile communication	2G/3G/4G * 1
Wi-Fi communication	2.4G/5G *2

Data acquisition

Industrial server	2
Interface	Multiple redundant serial ports, Ethernet interfaces
Storage	All data can be stored for at least 3 years and capacity expansion is supported

Planning site of offshore wind power plant

Wind velocity and direction data collection
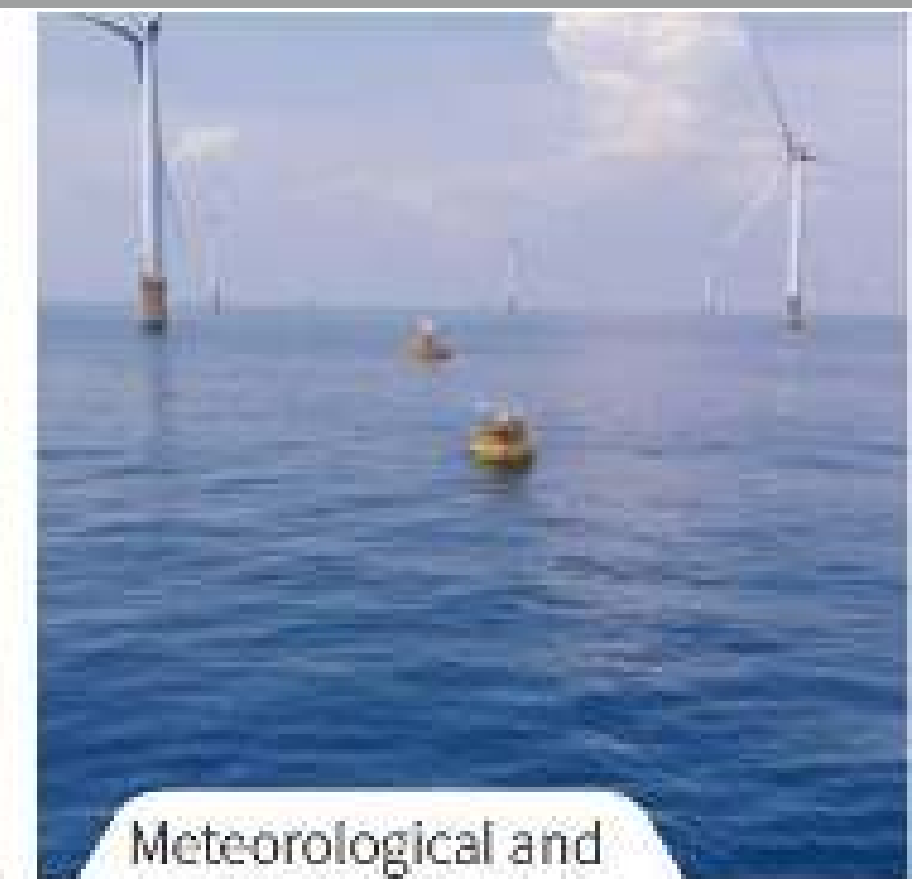
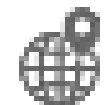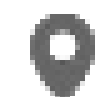Meteorological and hydrological data collection

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THANKS!

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