Piezoelectric Rain Gauge Sensor User Manual



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Important Notes Before Use:



Incorrect identification or operation may cause damage to the device.



Warning symbol indicating that improper operation may cause the device to malfunction.



Information symbol indicating important notes regarding device use.



The calibration interval for SO_2, NO_2, CO, O_3, PM2.5, and PM10 is one year. However, harsh environmental conditions or improper maintenance may shorten the calibration interval.

Warranty

Warranty Commitment:

The product is covered by a 12-month warranty from the date of delivery. This warranty does not cover problems caused by failure to follow the specified technical requirements or by other human-related factors.

After-Sales Service Commitment:

Users can contact our technical support team by phone for assistance with technical issues and receive clear solutions. If the problem is confirmed to be caused by a product quality defect, the product can be returned to the factory for repair or replacement.

1. **Product Introduction**

1.1 Overview

The WQX Series is a range of products developed and tested over many years by professional technical specialists based on actual field application requirements. The series can integrate multiple environmental monitoring parameters, including temperature, humidity, atmospheric pressure, wind speed, wind direction, optical/piezoelectric rainfall, total solar radiation, illuminance, noise, PM2.5, PM10, CO, SO_2, NO_2, CO_2, and O_3.

Featuring a high level of integration, an attractive appearance, easy installation, and convenient wiring, the WQX Series can fully replace traditional small-scale automatic weather and environmental monitoring stations assembled from multiple separate instruments.

1.2 Product Features

- Uses advanced sensor technology for real-time measurements.
- Designed for all-weather operation, unaffected by heavy rain, snow, or frost.
- High measurement accuracy and stable performance.
- Compact and aesthetically pleasing design.

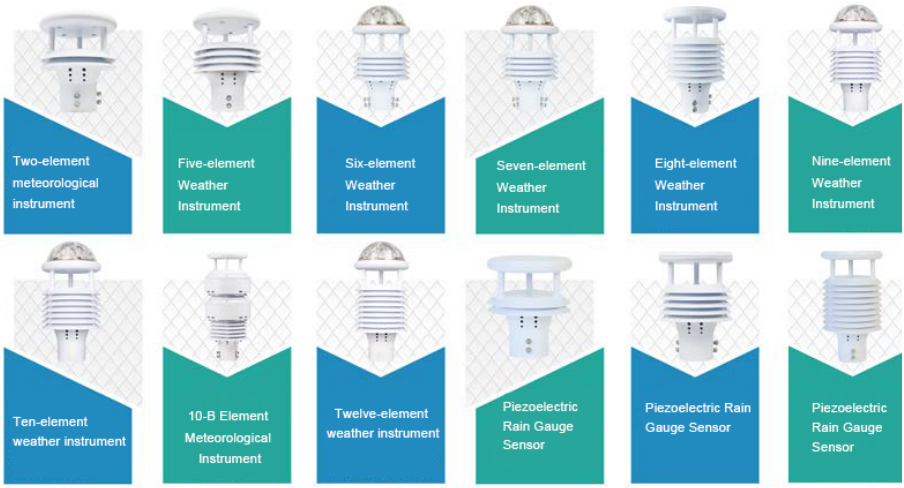
- Highly integrated design for easy installation and removal.
- Convenient maintenance without the need for on-site calibration.
- Made of environmentally friendly ASA engineering plastic, suitable for outdoor applications.

1.3 Applications

- Meteorological Monitoring
- Urban Environmental Monitoring
- Wind Power Generation
- Marine and Ship Applications
- Aviation and Airports
- Bridges and Tunne

2.Product Specifications

2.1 Micro Weather Station Series Selection Table



Micro-weather Instrument Selection Table

Parameter / Model	G1	Y1	WQX2	WQX5	WQX58	WF85	WQX6	Y6	WQX7	WQX8	WQX8B	WQX9	WQX10	WQX10B	WQX12	Y12
Optical Rainfall	✓					✓		✓				✓	✓		✓	
Rainfall Suppression		✓														
Piezoresistive Rainfall							✓									✓
Wind Speed			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Wind Direction			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Temperature				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Humidity				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Air Pressure				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Negative Oxygen Ion					✓									✓		
PM2.5					✓					✓		✓	✓	✓	✓	✓
PM10					✓					✓		✓	✓	✓	✓	✓
Noise									✓				✓	✓		
Lighting								✓					✓			
Total Thermoelectric Radiation											✓					
Black Globe Temperature											✓					
Radiation												✓				
Oxygen Content														✓		
CO														✓	✓	✓
NO2														✓	✓	✓
SO2														✓	✓	✓
O3														✓	✓	✓

2.2 Technical Specifications Table

Monitoring Parameter	Range	Resolution	Accuracy
PM2.5	0-1000ug/m³	1ug/m³	±10% (<500 μg)
PM10	0-1000ug/m³	1ug/m³	±10% (<500 μg)
TSP	0-1000ug/m³	1ug/m³	±10% (<500 μg)
Carbon Monoxide	0-1000ppm	1PPM	±2PPM
Sulfur Dioxide	0-20PPM	0.1PPM	±1PPM
Nitrogen Dioxide	0-20PPM	0.1PPM	±1PPM
Ozone	0-20PPM	0.1PPM	±1PPM
Temperature	-40-80℃	0.01℃	±0.3℃ (25℃)
Relative Humidity	0-100%RH	0.01%RH	±3%RH (20%~80%)
Wind Speed	0-60m/s	0.01m/s	±0.1m/s+0.01 V
Wind Direction	0-360°	1°	±2°

Atmospheric Pressure	30-110Kpa	0.01Kpa	±0.25%
Piezoelectric Rainfall	0-4mm/min	0.01mm	≤±4%
Optical Rainfall	0-4mm/min	0.01mm	≤±4%
Illuminance	0-200000LUX	1LUX	<±3%
Total Radiation (HS)	0~1242W/m²	1W/m²	<±3%
Noise	30-120dB	0.1dB	±1.5dB
Carbon Dioxide	400-5000ppM	1ppM	±(50ppm+5% reading)
Module Temperature	-50-100℃	0.1℃	±0.5℃
Photovoltaic Total Radiation	0-2000W/m²	1W/m²	<±3%
Thermopile Total Radiation	0-2000W/m²	1W/m²	<±3.1%
Sunshine Duration	0-6500h	0.1h	<0.2h
Daily Total Radiation Accumulation	0-65535W·h/m²	1W·h/m²	---------

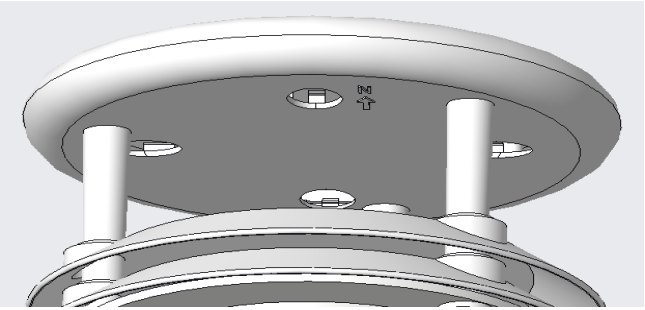
Dew Point Temperature	0-70℃	0.1℃	±1℃

3. Product Specification Drawings



4.Installation

4.1 Direction Selection



Note: Positioning Direction Arrow

During installation, the positioning direction arrow marked on the device should point toward the north. The instrument uses north as 0°, with angles increasing clockwise. Models equipped with an electronic compass do not require north-oriented installation.

ATTENTION When determining the north direction, it is recommended to use a device with magnetic declination correction. If such a device is unavailable, the magnetic declination can be manually corrected based on the geographic coordinates (latitude and longitude) of the installation location.

4.2 Installation Location Selection

When selecting an installation location, the following principles should be followed:

1.Ensure that there are no other ultrasonic devices of the same type nearby to avoid mutual interference.

2.Choose an open area, preferably on the windward side.

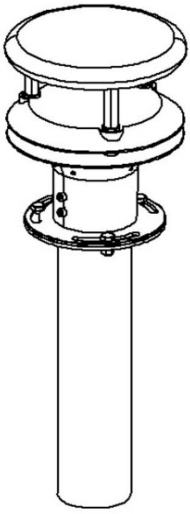
3.The installation height should be no less than 1.5 m. The distance between the

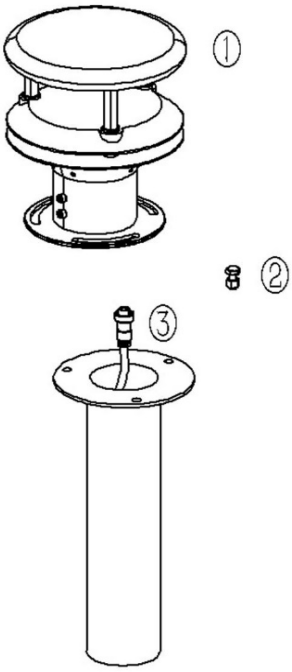
installation position and the nearest obstacle should be at least 10 times the height of the obstacle.

4.When radiation parameters are included, the instrument should be installed in an open area. Throughout the period from sunrise to sunset, the elevation angle of any obstacle within the full vertical viewing range should not exceed 5°. Avoid locations near heat sources with temperatures above 200°C, steam, or brightly colored buildings.

4.3 Mounting Method

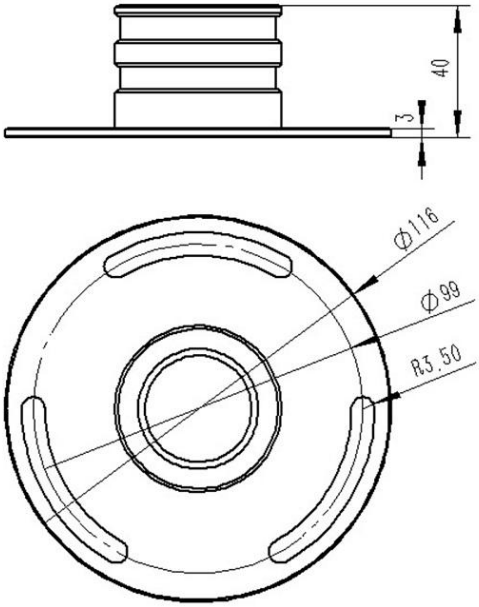
4.3.1 Flange Mounting



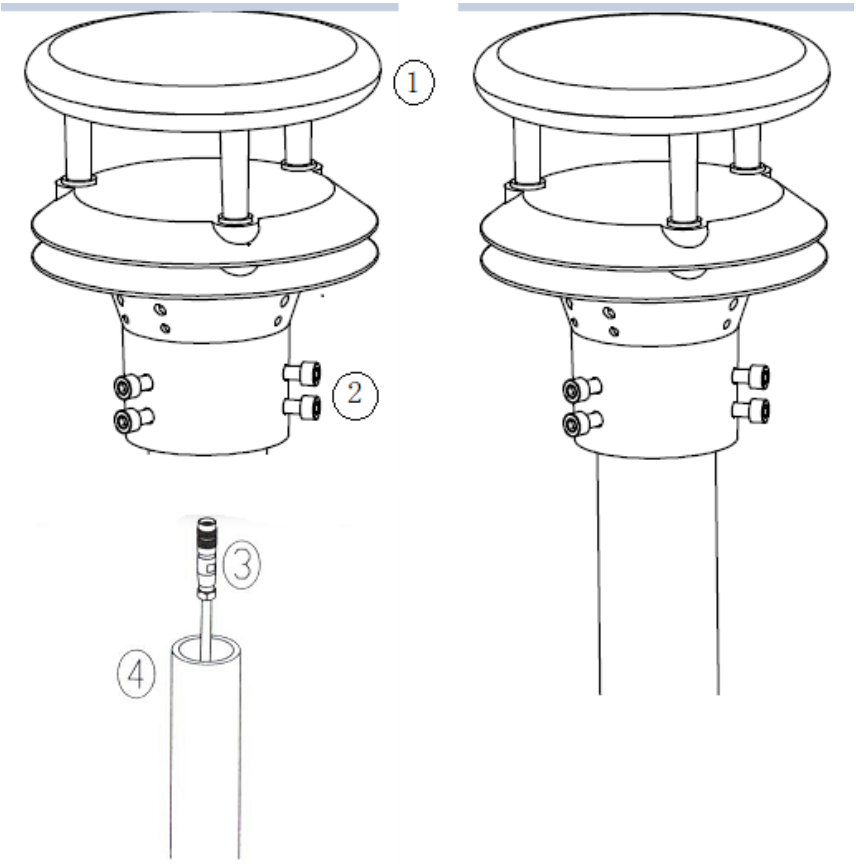


1. Micro
2. Weather Station
3. Mounting Screws

4.3.2 Flange Dimensions

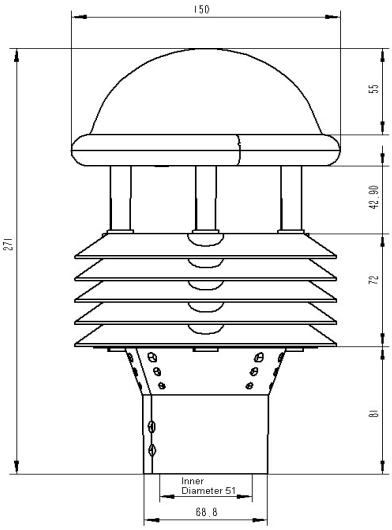


4.3.3 Sleeve-Type Mounting

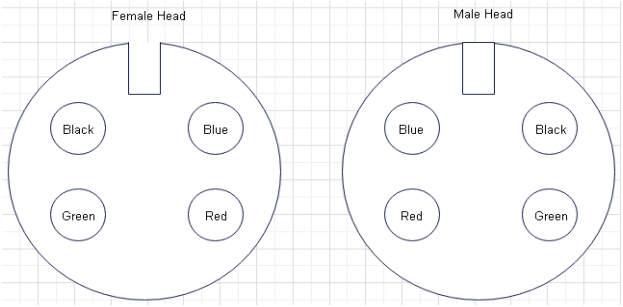


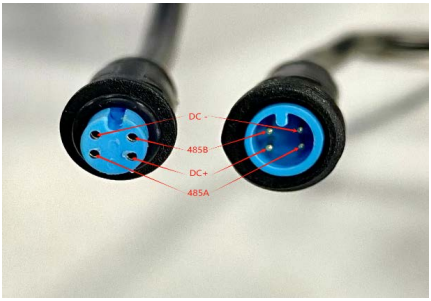
1. Micro Weather Station
2. Screws
3. Communication Cable + Aviation Connector
4. Mounting Bracket

4.4 Product

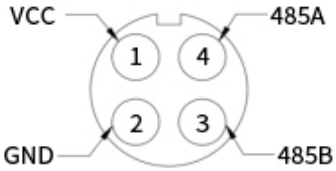


4.5 Wiring Sequence Definitions





Plastic Waterproof Connector





Metal Aviation Connector

4.6 Wiring Definitions

Terminal	Definition	Remarks
VCC	Positive Power Supply	DC 12V
GND	Power Ground	
485A	RS485 A	
485B	RS485 B	



Incorrect wiring may cause permanent damage to the device!

Others

The communication protocol can be customized according to user requirements. Please contact our sales team for further information.

5. System Parameters

Parameter	Specification
Stability	Less than 1% over the sensor's service life
Response Time	Less than 2 seconds
Warm-Up Time	30 seconds (SO_2, NO_2, CO, O_3)
Operating Current	DC 12V, ≤60 mA
Power Consumption	DC 12V, ≤0.72 W
Service Life	At least 3 years, except for SO_2, NO_2, CO, O_3, PM2.5, and PM10 sensors (1 year under normal environmental conditions; service life is not guaranteed in highly polluted environments)
Output	RS485, MODBUS Communication Protocol
Housing Material	ASA Engineering Plastic
Operating Environment	Except for SO_2, NO_2, CO, O_3, PM2.5, and PM10 sensors: Temperature: -30 to 70°C; Relative Humidity: 0–100% (non-condensing)
Storage	-40 to 80°C

Temperature Standard Cable Length	3 m
Maximum Cable Length	100 m (RS485)

6. Communication Instructions

1. Device Inspection

1-1. Check the shipping box for any visible damage. If damage is found, contact the sales or after-sales service team promptly. Take photos and report the issue for documentation.

(Please take clear photos of the overall package, close-up details of any damage, the shipping label and tracking number, etc.)

1-2. If everything is in good condition, open the box, remove the main body of the micro weather station and all included accessories, and check that all items are present.



Micro Weather Station



Connection Cable

Please carefully check the nameplate markings near the tapered hole on the device, including the power supply requirements and wire sequence definitions.

The sensor is supplied with a default DC 12V power supply. If a customized power supply is required, please contact the sales team in advance. This user manual describes the micro weather station with a default DC 12V power supply. Therefore, a regulated DC 12V/1A power adapter is used in the following instructions.

1-1. The micro weather station uses the MODBUS-RTU communication protocol.

1-2. Preparation

Prepare the following tools and equipment:

- Power Supply (DC 12V/1A)
- 3 mm Screwdriver
- USB-to-RS485 Converter
- Computer (Windows OS)








1-3. Accessories and materials such as a USB-to-RS485 converter, DC 12V power adapter, communication cable (customized length in meters), tablet, and flange mounting base should be confirmed with the sales team when placing an order.

By default, the package includes the micro weather station main unit and a 3 m communication cable.

3. Wiring

Wire Color and Connection Definitions:

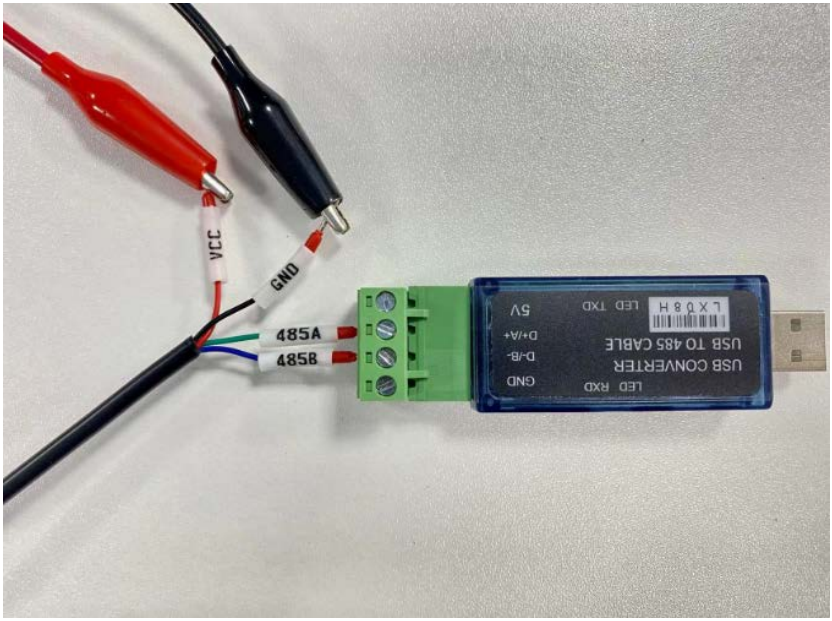
- VCC → DC 12V Positive (+)
- GND → DC 12V Negative (−)
- Green Wire → RS485 A
- Blue Wire → RS485 B

Note: Ensure that the positioning arrows are properly aligned before connecting.

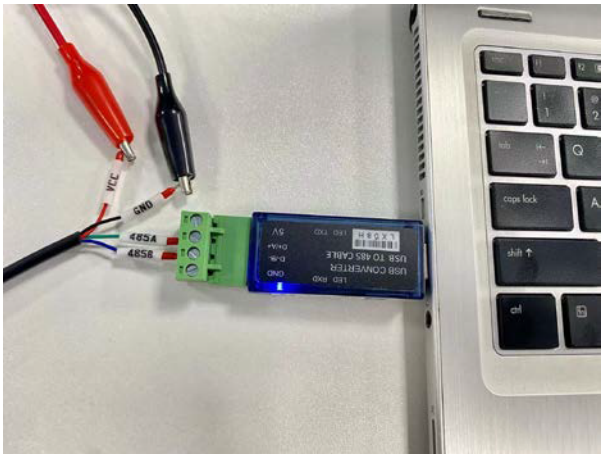




3-1. Connect the wires to their corresponding terminals according to the wiring sequence.



3-2. After completing the wiring, connect the USB cable to the computer.



Connect the power supply.

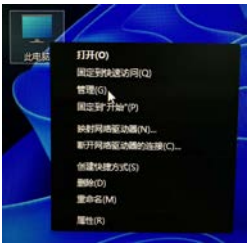


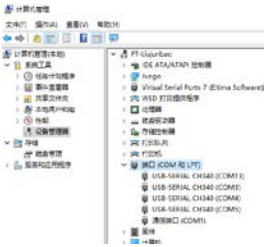
4. Read Data Using Serial Port Assistant Software

4-1. Select the correct COM port. You can find the COM port number by navigating to This PC → Properties → Device Manager → Ports (COM & LPT).

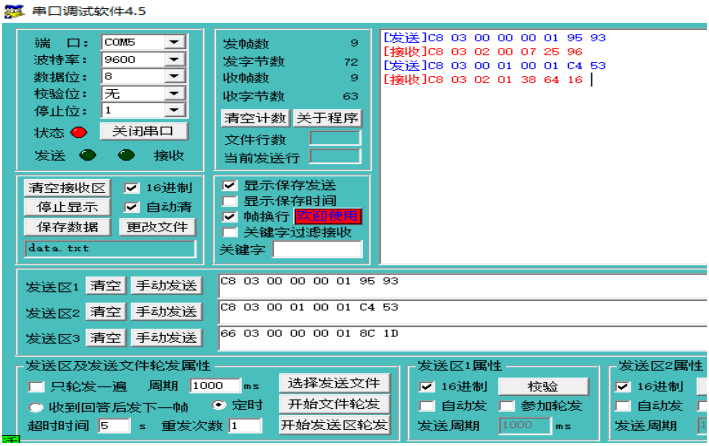
The following figure shows examples of driver names for several different RS485 converters.







4-2. Send a Command to Read Data Using a MODBUS Request Frame (Wind Speed and Wind Direction as Examples).



1- Appendix 1

1-1. Communication Protocol

Communication Protocol: MODBUS-RTU Baud Rate: 9600, N, 8, 1

Name	Slave Addres	Register Address (Hex)	Register Length	Data Type	Variable Unit
PM2.5	0x8A	0x00 01	1	Unsigned 16-bit Integer	µg/m³
PM10	0x8A	0x00 02	1	Unsigned 16-bit Integer	µg/m³
CO	0x5C	0x60 01	1	Unsigned 16-bit Integer	PPM
SO2	0x5B	0x60 01	1	Unsigned 16-bit Integer	/10.0 PPM
NO2	0x5A	0x60 01	1	Unsigned 16-bit Integer	/10.0 PPM
O3	0x5D	0x60 01	1	Unsigned 16-bit Integer	/10.0 PPM
Air Temperature	0x66	0x00 00	1	Signed 16-bit Integer	/100.0 °C
Air Humidity	0x66	0x00 01	1	Unsigned 16-bit Integer	/100.0 %RH
Wind Speed	0xC8	0x00 00	1	Unsigned 16-bit Integer	/100.0 m/s
Wind Direction	0xC8	0x00 01	1	Unsigned 16-bit Integer	Degrees
Atmospheric Pressure	0x66	0x00 02	1	Unsigned 16-bit Integer	/100.0 kPa

Piezoelectric Rainfall	0xC9	0x00 00	2	Unsigned 32-bit Integer	/100.0 mm
Optical Rainfall	0xCA	0x00 00	2	Unsigned 32-bit Integer	/100.0 mm
Illuminance	0xCC	0x00 03	2	Unsigned 32-bit Integer	Lux
Noise	0x66	0x00 03	1	Unsigned 16-bit Integer	/10.0 dB
CO2	0x8A	0x00 00	1	Unsigned 16-bit Integer	PPM
Back Panel Temperature	0x80	0x00 00	1	Signed 16-bit Integer	/10.0 °C
Total Radiation	0xCC	0x00 05	1	Unsigned 16-bit Integer	W/m²
Thermopile Total Radiation	0x26	0x00 00	1	Unsigned 16-bit Integer	W/m²
Daily Total	0x26	0x00 0D	1	Unsigned 16-bit Integer	W/m²
Grand Total	0x26	0x00 0E	2	Unsigned 32-bit Integer	W/m²

Data Parsing

[Temperature Example] Reading Real-Time Data

Address (1byt	Function Code (1byt)	Starting Address (2byt)		Read length (2byt)		CRC (2byt)	
0x66	0x03	0x00	0x00	0x00	0x01	0x8C	0x1D

Slave Response Example:

Address (1byt)	Function code (1byt)	Length (1byt)	Data (2byt)	CRC(2byt)
0x66	0x03	0x02	0x0A 0x02	0x0A 0xED

Data Parsing:

0x0A × 256 + 0x02 = 2562

Temperature = 2562 / 100 = 25.62°C

Note: Temperature is represented as a signed 16-bit integer. When the temperature is below zero, the data is expressed in two's complement format.

Example: -0.20°C

Query Frame: 66 03 00 00 00 01 8C 1D

Response Frame: 66 03 02 FF EC CD F1

Convert 0xFF 0xEC to decimal:

65516

var b = parseInt(H) * 256 + parseInt(L);

if (b >= 32768) b = b - 65536;

return b / 100.0 + "°C";

[Wind Speed Example] Reading Real-Time Data

Address (1 byte)	Function Code (1 byte)	Start Address (2 bytes)	Read Length (2 bytes)	CRC (2byt)
0xC8	0x03	0x00 0x00	0x00 0x01	0x95 0x93

Slave Response Example:

Address (1 byte)	Function Code (1 byte)	Start Address (2 bytes)	Read Length (2 bytes)	CRC(2byt)
0xC8	0x03	0x02	0x02 0x12	0xE5 0x39

Data Parsing:

0x02 × 256 + 0x12 = 530

Wind Speed = 530 / 100 = 5.30 m/s

1-1. Installation Methods

1-2. For both flange mounting and pole mounting, the device must be installed at least 2 meters above the ground, in an open area with no obstructions within a 10-meter radius.

1-3. Flange Base Mounting Method

1-4. Pole Mounting Method





2. Mounting and Fixing – Direction Indicator



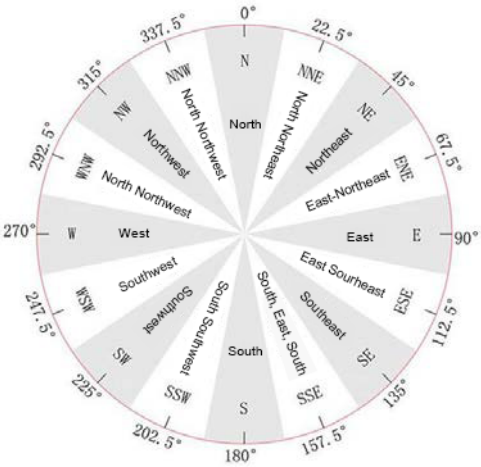
Appendix 2

2-1. Wind Speed Conversion See Table in excel

2-2. Wind Direction Reference Table

Relationship Between Wind Direction Values and Actual Compass Bearings

0	North
22.5	North-Northeast
45	Northeast
67.5	East-Northeast
90	East
112.5	East-Southeast
135	Southeast
157.5	South-Southeast
180	South
202.5	South-Southwest
225	Southwest



247.5	West-Southwest
270	West
292.5	West-Northwest
315	Northwest
337.5	Northwest

7. Troubleshooting Description

Issue	Troubleshooting Solution
No Communication	Check the communication configuration parameters. Check the communication configuration parameters.
Abnormal Data	Check whether the sensor is contaminated by foreign objects. Check for sources of interference nearby.

If the fault cannot be resolved, please contact the manufacturer. Unauthorized disassembly of the device will void the warranty. Any infringement of legal rights will be subject to legal action.