Instruction for Ultrasonic Wind Speed and Direction Sensor

1 Product introduction

1.1 Overview

The ultrasonic wind speed and direction transmitter is a wind measurement instrument developed based on ultrasonic principles. It measures wind speed and direction by calculating the time or frequency difference of transmitted sound pulses at the receiving end. The device features lightweight construction, no moving parts, and robust durability. It requires no maintenance or on-site calibration and can simultaneously output 12 meteorological parameters (customization required).

It can be used in conjunction with computers, data acquisition devices, or other RS485-compatible collection equipment. It is widely applied in wind direction measurement for various environments including greenhouses, environmental protection, weather stations, ships, ports, and aquaculture.

1.2 Technical parameters

Service voltage		DC12-24V
Signal output		RS485
Protocol		standard MODBUS protocol
Baud rate		9600
Average power consumption		120mA
Working temperature		-20-80℃
Working humidity		0-95%RH
Wind speed	Measuring range	0-32.4m/s

	Certainty of measurement	±0.5+2%FS
	Resolution ratio	0.01m/s
Wind direction	Measuring range	0-359°
	Certainty of measurement	±3°
	Resolution ratio	1°
Temperature	Measuring range	-40-60℃
	Certainty of measurement	±0.2℃
	Resolution ratio	0.1℃
Humidity	Measuring range	0-100%RH
	Certainty of measurement	±5%RH
	Resolution ratio	0.1%RH
Pressure	Measuring range	30-130kPa
	Certainty of measurement	±2kPa
	Resolution ratio	0.1kPa
CO	Measuring range	0-10PPM
	Certainty of measurement	±5% F.S
	Resolution ratio	0.001PPM
SO2	Measuring range	0-5PPM
	Certainty of measurement	±5% F.S
	Resolution ratio	0.001PPM

NO2	Measuring range	0-5PPM
	Certainty of measurement	±5% F.S
	Resolution ratio	0.001PPM
O3	Measuring range	0-5PPM
	Certainty of measurement	±5% F.S
	Resolution ratio	0.001PPM
PM2.5	Measuring range	0 ~ 1000ug/m3
	Certainty of measurement	±10%
	Resolution ratio	1ug/m3
PM10	Measuring range	0 ~ 2000ug/m3
	Certainty of measurement	±10%
	Resolution ratio	1ug/m3
Noise	Measuring range	30 ~ 130dB
	Certainty of measurement	±5dB
	Resolution ratio	0.1dB

1.3 Features:

1. Robust construction with an integrated design ensures reliable performance in harsh conditions like strong winds.

2. Easy installation, allowing one person to complete the setup effortlessly.

3. The product boasts an aesthetically pleasing design with all signal line interfaces integrated. Its unique structural design ensures a clean, attractive appearance while maintaining practicality and stability.

1.4 Selection

Type RS485

Power supply voltage: 12-24V DC

Communication Protocol: Modbus Protocol

2 Hardware connection

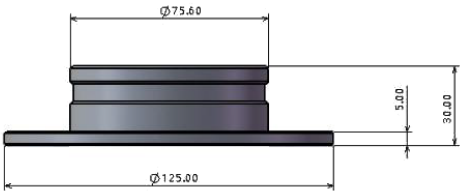
2.1 Pre-installation inspection

Equipment list:
1 sensor
1 sensor lead
One copy each of the certificate of conformity and warranty card

2.2 Wiring instructions

Model	Air service note	Line color description
RS485 interface type Modbus protocol	1 (V+): Power positive 2(G): Power ground 3(T+): RS485+/A/T+ 4(T-): RS485-/B/T-	Red (V+): Power positive Black (G): Power ground Yellow (T+): RS485+/A/T+ Green (T-): RS485-/B/T-

Shell size: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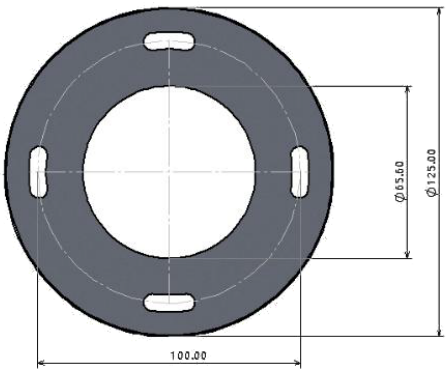
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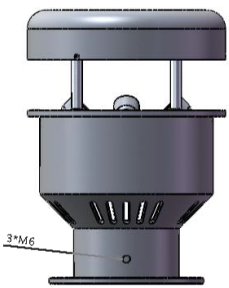
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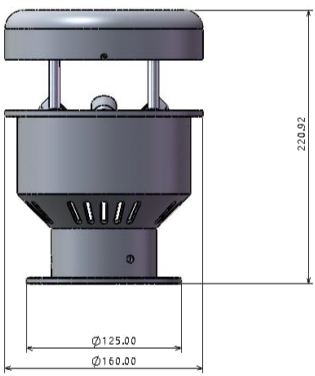
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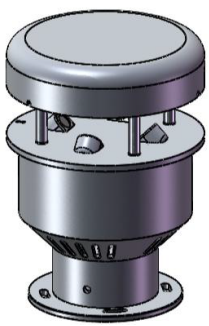

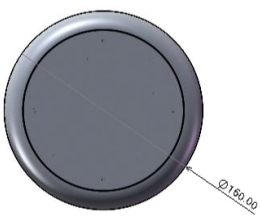
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3 Modbus protocol

3.1 Basic communication parameters (with a range of 60 m/s as an example)

Data bit	8 bits
Parity check bit	not have
Stop bit	1 position
Error check	CRC (Cyclic Redundancy Code)
Baud rate	The factory default is 9600 bits/s

Register declaration

Register address	Parameter name	PLC or configuration address hexadecimal	Type	Parameter declaration
0x0000	Wind speed value	40001	read only	Range: 0-6000 Divide by 100 to get the actual value
0x0001	wind direction	40002	read only	3600 Get the actual value by dividing by 10
0x0002	maximum wind velocity	40003	read only	Maximum wind speed after device power-on (100x magnification)
0x0003	wind scale	40004	read only	Current wind speed corresponds to the wind force level Integer (0-17 levels)
0x0004	16 directions of wind direction	40005	read only	16 cardinal directions corresponding to wind direction
0x0005	temperature scale	40006	read only	0-1000 The actual temperature value is

				obtained by subtracting 40 from 10.
0x0006	Humidity	40007	read only	0-1000 Calculate the actual humidity value by dividing by 10
0x0007	barometric pressure	40008	read only	300-1100 actual pressure value
0x0008	CO price	40009	read only	0-10000 Divide by 1000 to get the actual value
0x0009	SO2 value	40010	read only	0-5000 Divide by 1000 to get the actual value
0x000A	NO2 value	40011	read only	0-5000 Divide by 1000 to get the actual value
0x000B	O3 value	40012	read only	0-5000 Divide by 1000 to get the actual value
0x000C	PM2.5 value	40013	read only	0-1000 actual value
0x000D	PM10 value	40014	read only	0-2000 actual value
0x000E	noise	40015	read only	300-1300 Get the actual value by dividing by 10
0x1000	Equipment Station Number	44097	read-write	0-FF (hexadecimal)

3.2 Format definitions and examples

Example: (1) Read the device parameter (default station number 0x02)

Host inquiry frame (hexadecimal): 02 03 00 00 00 0F 05 FD (first 15 parameters)

Stop number	FC	Register address	Register length	Check digit	Check code high bit
0x02	0x03	0x00 0x00	0x00 0x0F	05	FD

Slave response frame (hex): 02 03 1E 00 25 00 25 00 25 00 01 00 00 02 86 01 CB 03 E9

00 28 00 09 00 06 00 03 00 3E 00 4F 01 2C BD 0A

Stop number	FC	Valid byte count	Data field	Checksum low byte	Check digit high byte
0x02	0x03	0x1E	0x00 0x25 0x00 0x25 0x00 0x25 0x00 0x01 0x00 0x00 0x02 0x86 0x01 0xCB 0x03 0xE9 0x00 0x28 0x00 0x09 0x00 0x06 0x00 0x03 0x00 0x3E 0x00 0x4F 0x01 0x2C	0xBD	0x0A

The wind speed measurement value is calculated as: 0.25 (hexadecimal) = 37 (100 times the expanded value) ÷ 100 = 0.37 m/s

Wind direction measurement calculation: 00 25 (hexadecimal) = 37 (ten times the decimal value) = 3.7°

Maximum wind speed = 0.25 (hexadecimal) = 37 (100x the decimal value) ÷ 100 = 0.37 m/s

Wind level = 00 01 (hex) = 1 (decimal) = Level 1 wind

The 16th direction wind direction is 00 00 (16th) = 0 (north)

Temperature =02 86 (hexadecimal) = (02*256+86)/10-40=24.6℃

Humidity =01 CB (hex) = (01*256+CB)/10=45.9%

Atmospheric pressure = 03 E9 (hexadecimal) = (03*256+E9) = 1001 hPa

CO=00 28 (hexadecimal) = 40 (decimal with a 1000x magnification) = 0.04 ppm

SO2 = 0.00 09 (hexadecimal) = 9 (decimal multiplied by 1000) = 0.009 ppm

NO2=00 06 (hexadecimal) = 6 (decimal multiplied by 1000) = 0.006 ppm

O3=00 03 (hexadecimal) = 3 (decimal multiplied by 1000) = 0.003 ppm

PM2.5 = 0.03E (hexadecimal) = 62 (decimal) = 62 μg/m³

Pm10=00 4F (hexadecimal) = 79 (decimal) = 79ug/m3

Noise = 01 2c (hexadecimal) = 300 (10 times the decimal value) = 30dB

(2) Read the device station number from register 0x1000 (hexadecimal)

Host inquiry frame (hexadecimal): 00 03 10 00 00 01 81 1B

Stop number	FC	Register address	Register length	Check digit	Check code high bit
0x00	0x03	0x10 0x00	0x00 0x01	0x81	0x1B

Slave response frame (hex): 00 03 02 00 15 44 4B

Stop number	FC	Valid byte count	Data field	Checksum low byte	Check digit high byte
0x00	0x03	0x02	0x00 0x15	0x44	0x4B

The current device station number is 00 15 (16) = 21 (10)

3.3 Modify station number

Change the device station number (register 0x1000) to a value between 0 and 255.

Use station ID (broadcast station number) to set any address. Changes take effect immediately.

(1) Example: Change the device station number to 03

Host inquiry frame (hexadecimal): 00 10 10 00 00 01 02 00 03 FA 00 (11 bytes)

Stop number	FC	Register address	Number of registers	Valid byte count	Write device station number	Checksum low byte	Check digit high byte
0x00	0x10	0x10 0x00	0x00 0x01	0x02	0x00 0x03	0xFA	0x00

Response frame (hex): 00 10 10 00 00 01 04 D8 (7 bytes), indicating successful modification

Stop number	FC	Register address	Number of registers	Checksum low byte	Check digit high byte
0x00	0x10	0x10 0x00	0x00 0x01	0x04	0xD8

4 Frequently asked questions and solutions

No output or output error probable cause ：

①. Incorrect selection of the computer's COM port.

②. The port rate is incorrect.

③. The 485 bus is disconnected, or the A and B lines are connected in reverse.

④. For systems with excessive equipment or overly long wiring, install a nearby power supply and add a 485 amplifier, along with a 120Ω termination resistor.

⑤. The USB-to-485 driver is either missing or corrupted.

⑥. Equipment damage.