Forward

Welcome to use our ultrasonic weather meter. In order to use the instrument better, we recommend you to read the product manual carefully before use.

Our company is always in the process of continuous exploration and research and development, and we reserve the right to improve the performance and design without prior notice.

Product Description

Ultrasonic multi-parameter sensor is a fully digital detection, high-precision sensors, can quickly and accurately detect the wind speed, wind direction, atmospheric temperature, atmospheric humidity, atmospheric pressure, built-in signal processing unit can be output according to user demand for the corresponding signals, can be optionally integrated with the PM2.5, PM10, noise, radiation, rain and other elements. High-strength structural design can work reliably in harsh climatic environments, high degree of integration, robust and durable. Widely used in meteorology, environment, airports, ports, laboratories, agriculture, industry and transportation.

Working Principle

The principle of wind speed detection is to measure the ultrasonic transmission time from the N sensor to the S sensor and compare it with the S sensor to N sensor transmission time. Similarly, compare the ultrasonic transmission time from W to E with the E to W time. (N = North, S = South, E = East, W = West) For example, if the wind is blowing from the north, the ultrasonic wave transmission time from N to S will be shorter than that from S to N, and the time from W and E will be the same as the E to W transmission time. By calculating the difference in transmission time of the ultrasonic waves between the two points, the wind speed and direction of the wind can be calculated. This calculation has no relation to other factors such as temperature.

The rain sensor uses piezoelectric ceramic kinetic rain monitoring, which recognizes raindrops according to how hard they fall and hit,

and monitors everything from light rain to pounding rain, measuring individual raindrops and then calculating the amount of rainfall. Raindrops in the landing process by the weight of the raindrops and the role of air resistance, reaching the ground with a constant velocity, according to P = mv, measuring the impact can be derived from the weight of the raindrops, and then get the amount of continuous rainfall.

Technical Parameters

Supply Voltage	DC 9-24V
Signal output	RS485
Communication	MODBUS
Baud rate	9600 bps
Average Power Consumption	0.4W (without dust sensor) 1W (with dust sensor)
Operating	-40-80°C
Operating	0-95%RH
Protection class	IP65

Technical Parameters

	Range	Accuracy	Resolution
Wind speed	0～60m/s	±0.3+3% FS	0.01m/s
Wind direction	0～359°	±3°	1°
Temperature	-40～80℃	±0.5℃	0.1℃
Humidity	0～100%RH	±5%RH	0.1%RH
Pressure	10～1100hPa	±1.5hPa	0.1hPa
PM2.5	0～1000ug/m^3	±10%	1ug/m^3
PM10	0～2000ug/m^3	±10%	1ug/m^3
Noise	30～130dB	±5dB	0.1dB
Illumination	0～200000Lux	±7%	10Lux
Rainfall	0～8mm/min	±10%	0.01mm
Radiation	0～1500W/m^2	±10%	1W/m^2

*Based on the five core parameters (wind speed and direction, temperature, humidity, and air pressure), optional features include illuminance, radiation, PM2.5/PM10, noise. A maximum of 10 parameters can be supported. Solar radiation and illuminance sensors can only be used for one or the other. Heating is an optional feature.

Wiring Method

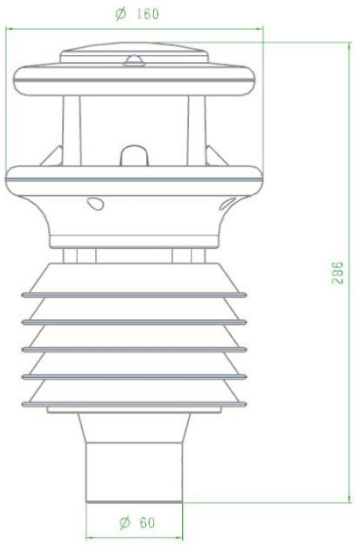
(1) If you are equipped with a collector produced by our company, you can directly use the sensor cable to connect the sensor to the corresponding interface on the collector.

(2) If the sensor is purchased separately, the sensor wire sequence is:

Wire Color	Definition
Red	Power Positive
Black	Power Negative
Yellow	RS485+
Blue	RS485-

Note: The wiring label labeling on the communication cable is final.

Dimensions of the structure



Installation Precautions

Ultrasonic multi-factor integrated sensors can meet a number of specifications and can be used in different environments everywhere, with no complex maintenance or calibration required in the field.

Check frequently to ensure that the sensor is not interfered with by other operating equipment, e.g. radio/radar transmitters, ship's engines, motors, etc;

Do not mount on a flat surface with any radar scanning device, at least a distance of 2 meters should be maintained;

It is recommended to keep a distance from some of the surrounding radio receiving antennas;

Installation position should be far away from the source of vibration;

Use the cable recommended by our company;

If the cable is cut and not properly connected, or if the cable shield is not properly connected, just wire it according to the installation guide instructions;

Ensure continuous power supply to the unit during operation;

Avoid flotsam from surrounding buildings such as trees, utility poles, tall buildings, etc. These can have an effect on the accuracy of the ultrasonic wind speed and direction meter;

The World Meteorological Organization gives the following recommendations:

Criteria for installation of weather meters: 10 meters above ground level in open areas; open areas are defined as 10 meters above the height of any obstacle to the weather meter;

If mounted on a building, the meteorological instrument mounting height should theoretically be 1.5 times the height of the building;

If mounted on a boom on a mast, a tower or a branch of a mast, the length of the boom or branch must be twice the minimum diameter or diagonal of the tower. The boom needs to be installed on the side of the prevailing wind;

Installation method

Installation methods are as follows:

Positioning: generally the device is mounted on a vertical mounting pipe to ensure measurement on the same horizontal plane;

Alignment: the detector should point the pointing point to the north before fixing the installation.

Note: When installing, use a standard compass to determine the direction of the geographic North Pole and keep the instrument pointing north in the same direction as the compass is ideal;

Installation: The mounting tube requires 3 equally spaced holes, tapping M5 screws, positioned 7.5mm from the top of the tube, and passing the cable through the mounting tube;

Note: The user must properly strain relief the cable. The plug can be connected to the unit's plug by rotating the plug and gently pushing inward. Once the plug is attached, the plug can be locked in place by turning the outer sleeve clockwise. Utilizing the 3 stainless steel screws the unit can be secured to the mounting tube. The customer must ensure that the unit is installed in an open area so that surrounding buildings do not obstruct the airflow or cause flocculation. Do not install the unit next to radar or radio transmitters.

After Sales & Service

- The device has no moving parts and no complex routine maintenance is required on site.
- If the user opens the equipment by himself or damages the safety seal on it, he will no longer be entitled to our quality guarantee.
- If there is a problem with the equipment, you can contact our staff for problem analysis and answers;
- If the equipment needs to be returned, please pack the instrument carefully in its original packaging and mail it to our company with a detailed fault description of the instrument.

MODBUS protocol

Communication parameters: baud rate 9600bps, 8 data bits, no parity bit, two communication intervals of at least 1000ms or more

[1] Write device address

Send: 00 10 Address CRC (5 bytes)

Return: 00 10 CRC (4 bytes)

Note:

1. The address bit of the read/write address command must be 00.
2. Address is 1 byte, the range is 0-255

Example: Send 00 10 01 BD C0

Return: 00 10 00 7C

[2] Read device address

Send: 00 20 CRC (4 bytes)

Return: 00 20 Address CRC (5 bytes)

Note: Address is 1 byte, the range is 0-255.

Example: Send 00 20 00 68

Return: 00 20 01 A9 C0

[3] Read real-time data:

If the device address is: 0x01.

For example: 01 03 00 00 00 0C 45 CF

No.	Meaning	Offset	Bytes	Description
1	Device address	0	1	Device Unique Address
2	Opcode (Read)	1	1	Fixed value 0x03
3	Register start number	2	2	First register number read
4	Number of registers	4	2	Number of elements to read

	to read			
5	CRC16 check	6	2	Low before high after

Device returns data frame:

01 03 18 xx xx …… xx xx CRC16

No.	Meaning	Offset	Bytes	Description
1	Address field	0	1	Address (0x01)
2	Operand	1	1	Read only (0x03)
3	Data Length Field	2	1	Data byte length
4	Data field	3	2	Wind speed, resolution 0.01
		5	2	Wind direction, resolution 1
		7	2	Temperature; resolution 0.1
		9	2	Humidity; resolution 0.1
		11	2	Pressure, resolution 0.1
		13	2	PM2.5, resolution 1
		15	2	PM10, resolution 1
		17	2	Noise, resolution 0.1
		19	2	Illumination, resolution 10
		21	2	Cumulative rainfall.Resolution 0.01
		23	2	Real-time rainfall, resolution 0.01
		25	2	Radiation, resolution 1
5	Checksum field	27	2	Low front and high back

"Real-time rainfall" refers to the accumulation of rainfall data recorded every minute. When reading the data, it indicates how much rain has fallen in that minute. "Cumulative rainfall," on the other hand, means continuously adding up the rainfall over time. For example, if it's accumulated over a year, it shows the total for that year; if the device operates for 10 years, it accumulates data for those 10 years until the device malfunctions.

For example, when you select wind speed, wind direction, temperature and humidity, pressure, rainfall, and solar radiation, any unselected parameters will have empty values. To read the solar radiation value, 12 data points will need to be read.

Communication example (reading 5 parameters):

Send: 01 03 00 00 00 05 85 C9

Return: 01 03 0A 01 10 00 B0 00 FA 02 8A 27 AC CRC

01 10 for the wind speed data, is a hexadecimal integer, converted to decimal is 272, wind speed resolution is 0.01, that is, 2.72m / s

00 B0 for the wind direction data, is a hexadecimal integer, converted to decimal is 176, wind direction resolution is 1, that is, the wind direction is 176 degrees.

00 FA for the temperature data, is a hexadecimal integer, converted to decimal is 250, the temperature resolution is 0.1, that is, 25.0 ℃;

Temperature is negative, the negative number returned is in the form of hexadecimal

complement, e.g., if the temperature is FF 65 converted to decimal is -155, the temperature resolution is 0.1, i.e., -15.5 degrees Celsius.

02 8A is the humidity data, which is a hexadecimal integer, converted to decimal is 650, and the humidity resolution is 0.1, i.e. 65.0% RH.

27 AC is the barometric pressure, which is a hexadecimal integer, converted to decimal is 10156, and the barometric pressure sensor resolution is 0.1, which is 1015.6hPa.

[4] Zeroing accumulated rainfall manually

Send ←Address 06 00 08 00 00 CRC

Return ←Address 06 00 08 00 00 CRC

Appendix: Calculation of the CRC16 checksum code

1) Preset one 16-bit register to hex FFFF (i.e., all ones); call this register the CRC register;

2) Isolate the first 8-bit binary data (i.e., the first byte of the communication information frame) with the lower 8 bits of the 16-bit CRC register, and place the result in the CRC register;

3)Shift the contents of the CRC register right one bit (toward the lower bit) to fill the highest bit with 0, and check the shifted-out bit after the right shift;

4) If the shifted out bit is 0: repeat step 3 (shift right one bit again);

If the shifted out bit is 1: the CRC register is iso-or with the polynomial A001 (1010 0000 0000 0001);

5) Repeat steps 3 and 4 until it is shifted right 8 times so that the entire 8-bit data is all processed;

6) repeating steps 2 through 5 for the next byte of the communication information frame;

7) exchanging the high and low bytes of the 16-bit CRC register obtained after all bytes of this communication information frame have been calculated according to the above steps;

8) The content of the CRC register obtained at last is the CRC16 code. (Note that the CRC code obtained is the order of low before high)

Schedule: Wind (wind speed) rating scale

level	Name	Land surface object characteristics	wind speed(m/s)
0	windless	Quiet, smoke straight up	0～0.2
1	soft breeze	Smoke indicates wind direction, leaves move slightly	0.3～1.5
2	Light wind	Wind felt on face, slight movement of leaves	1.6～3.3
3	Breeze	Leaves and twigs shake constantly, flags unfurl, tall grass shakes constantly.	3.4～5.4
4	Harmonious wind	Ground dust and paper blowing, branches swaying, tall grass undulating	5.5～7.9
5	Fresh wind	Leafy trees swaying, small waves on inland water, tall grass undulating noticeably	8.0～10.7
6	Strong wind	Large tree branches swaying, wires whirring, umbrellas difficult to hold, tall grass falling to the ground from time to time	10.8～13.8
7	Strong wind	Trees shake, large branches bend down, inconvenient to walk	13.9～17.l

		in the wind.	
8	Gale	Small branches can be broken, people feel resistance to walk against the wind.	17.2～20.7
9	Gale	Grass huts are damaged, roof tiles are lifted, large branches can be broken.	20.8～24.4
10	Gale	Trees can be blown down, general building damage	24.5～28.4
11	Storm	Large trees can be blown down and buildings are generally severely damaged.	28.5～32.6
12	Hurricane	Rare on land, very destructive	>32.6

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