Foreword

Welcome to use the 3D Ultrasonic Anemometer produced by our company. In order to use the instrument better, we suggest you read the product manual carefully before use.

Our company has been in the continuous exploration and research and development, without prior notice, we reserve the right to improve the performance and design.

Product Description

NBL-W-3D-UWDS 3D Ultrasonic Anemometer adopts advanced ultrasonic measurement technology and unique structural design, which greatly reduces the influence of wind resistance and improves the accuracy of measurement. Made of all-metal material without any moving parts, it is rugged and durable, and can measure both horizontal and vertical wind direction and X/Y/Z-axis wind speed (i.e., U, V, W vector output) at the same time. It is adaptable to all-weather operation in various environments, providing reliable data for meteorological monitoring in various fields. Widely used in urban environment monitoring, wind power generation, meteorological monitoring, bridges and tunnels, marine vessels, aviation airports and other fields.

Working Principle

The distance between three pairs of ultrasonic transducers is fixed, and the transducer transceiver circuit is controlled to realise that multiple pairs of transducers emit and receive ultrasonic waves sequentially, measure the flight time of ultrasonic waves in downwind and upwind, get the wind speed components in three directions through the relationship between wind speed and flight time, and derive the total wind speed value from the vector synthesis principle. The horizontal wind direction is derived from the wind speed component in the horizontal plane, and the vertical wind direction is derived from the vertical wind speed component.

Technical parameters

Supply Voltage	DC 9-24V
Signal output	RS485
Communication	Standard MODBUS protocol
Baud rate	9600 bps
Average power	2W
Operating	-40-80°C
Working Humidity	0-100%RH
Protection class	IP66
Monitoring elements	Synthetic wind speed, horizontal wind direction, vertical wind direction, X/Y/Z axis vector wind speed

Elements	Range	Accuracy	Resolution
Synthetic wind speed	0～60m/s	±(0.5+3%FS)	0.01m/s
Horizontal wind direction	0～359°	±3°	1°
Vertical wind direction	-90～90°	±3°	1°
X-axis wind speed	-60～60m/s	±(0.5+3%FS)	0.01m/s
Y-axis wind speed	-60～60m/s	±(0.5+3%FS)	0.01m/s
Z-axis wind speed	-60～60m/s	±(0.5+3%FS)	0.01m/s

Wiring method

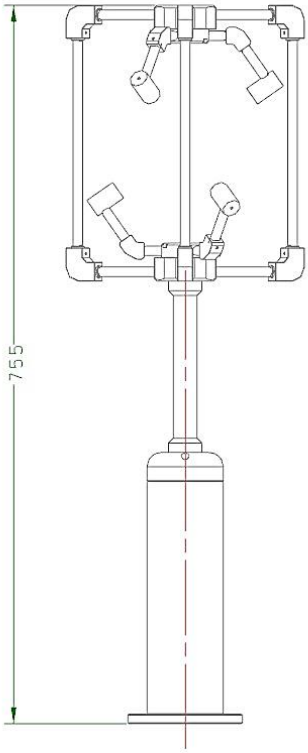
(1) If the collector is equipped with our own collector, use the sensor cable to connect the sensor directly to the corresponding interface on the collector.

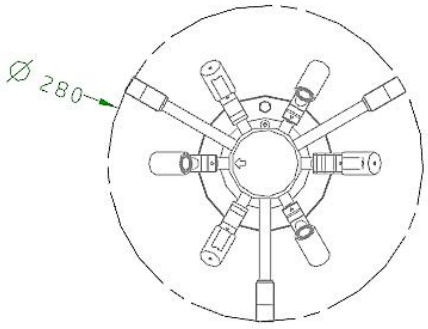
(2) If the sensor is purchased separately, the sensor wiring is defined as follows:

Colour	Lead Definition
Red	Power Input Positive
Black	Power Input Negative
Yellow	RS485+
Blue	RS485-

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

Dimensions of the structure





Installation Precautions

- Ultrasonic wind speed sensors are available to meet a number of specifications and can be used in a variety of environments around the world, with no complex maintenance or calibration required on site.
- Are mounted at the top of the column wherever possible;
- Recommends a mounting height of at least 2 metres from the ground;
- The area around the sensor should be empty and free of obstructions.
- Ensure that the device is powered by a continuous power supply 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 Organisation gives the following advice:
- Installation criteria for weather meters: 10 metres above ground level in open areas; open areas are defined as 10 metres above the height of any obstacle to the weather meter;
- If mounted on a building, the theoretical meteorological instrument mounting height should 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

Positioning: The top of the anemometer is labelled with an indicator mark, which corresponds to the 0° phase of the instrument, starting from this point and increasing clockwise from 0 to 360°. In order to ensure that the instrument is installed correctly, before fixing the instrument, it is necessary to use a precision direction measuring instrument to determine a fixed direction as a reference, based on this direction to determine the installation orientation. (Usually choose to point to the north installation).

Mounting: The device can be fixed to the mounting bracket with 4 stainless steel bolts and nuts. The aviation plug is connected to the connector on the bottom of the unit. When the plug is connected, turn the outer sleeve clockwise to lock the plug. The user must properly strain relief the cables.

NOTE: The customer must ensure that the unit is installed in an open area so that surrounding buildings do not create obstructions to airflow or cause flocculation. Do not install the unit next to radar or radio transmitters.

MODBUS protocol

[1] Write device address
Send: 00 10 Address CRC (5 bytes)
Return: 00 10 CRC (4 bytes)

Description:
1. The address bit of the read/write address command must be 00.

2. Address is 1 byte, the range is 0-255.

For 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.

For 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 06 CRC

No.	Definition	Bytes	Description
1	Device Address	1	Device unique address
2	Opcode (Read)	1	Fixed value 0x03
3	Register start number	2	First register number read
4	Number of registers to read	2	Number of elements to read
5	CRC16 check	2	Low before high after

Device returns data frame:
01 03 0C xx xx …… xx xx CRC16

No.	Define	Bytes	Description
1	Address field	1	Address (0x01)
2	Opcode	1	Read only (0x03)
3	Data Length Field	1	Data byte length
4	Data field	2	Synthetic wind speed
		2	Horizontal wind direction
		2	Vertical wind direction
		2	X-axis wind speed
		2	Y-axis wind speed
		2	Z-axis wind speed
5	Checksum field	2	Low front and high back

Example of communication (get 6 parameters):
Send：01 03 00 00 00 06 C5 C8
Return：01 03 0C 01 10 00 B0 00 B2 01 11 01 12 01 13 81 C9

01 10 is the synthetic wind speed data, which is a hexadecimal integer, converted to decimal is 272, and the synthetic wind speed resolution is 0.01, i.e. 2.72m/s.

00 B0 is the horizontal wind data, which is a hexadecimal integer, converted to decimal is 176, and the horizontal wind resolution is 1, which is 176 degrees.

00 B2 for the vertical wind data, is a hexadecimal integer, converted to decimal is 178, vertical wind resolution is 1, that is, 178 degrees;

01 11 for the X-axis wind speed data, is a hexadecimal integer, converted to decimal is 273, X-axis wind speed resolution is 0.01, that is, 2.73m/s.

01 12 for the Y-axis wind speed data, is a

hexadecimal integer, converted to decimal is 274, Y-axis wind speed resolution is 0.01, that is, 2.74m/s.

01 13 is the Z-axis wind speed data, which is a hexadecimal integer, converted to decimal is 275, and the Z-axis wind speed resolution is 0.01, i.e., 2.75 m/s.

Appendix: Calculation of CRC16 Check Digit

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 (towards 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 to 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)

Maintenance & Service

- If dust is deposited on the instrument, it can be gently scrubbed with a cloth moistened with a soft detergent (soluble reagents should not be used) to avoid scratching the surface of the instrument. If there is snow or ice piled up on the surface of the instrument, you should wait for it to dissolve slowly and naturally, and never use tools to remove it forcibly.
- If the user opens the device by himself, 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.

Contact Us

Pre-sales consultation: +8618073152920

After-sales service: +8615367865107

Postcode: 410000

Email：sales@niubol.com

Website: http://www.niubol.com

Address: Room 103, Zone D, Houhu Industrial Park, Yuelu District, Changsha City, Hunan Province,China