# FAR Ultrasonic Wind Sensor

## Products description and application

FAR wind speed sensor is a maintenance free ultrasonic sensor. Product has no moving parts and has fast dynamic response, which is suitable for gust measurement. Built-in high efficiency heating device, ensure product normal operation in harsh cold environment. Designed for wind monitoring and wind resource assessment in the fields of engineering machinery, port machinery, factories and mines, wind power, environment protection, high way and railway.

## Features

- Adopt time difference measurement principle, strong capacity of environmental interference resistant
- Adopt high efficiency filtering algorithm, special compensation technology design for rain, fog weathers
- Various signal output for option
- Multistage lightening and surge protection design
- Power interface and signal interface full insulation design
- Stainless steel body, corrosion resistant and high strength

## General Specifications

| Electrical | | Mechanical | |
|---|---|---|---|
| Rated voltage | DC24V±20% | Material | Stainless steel |
| Operating current | 100mA (DC24V) | Humidity | 0%~100%RH |
| [1]Heating power | 120W | Operating temperature | Ta-40°C ~ +70°C |
| Lightning surge | IEC61000-4-5 6kV /3kA | IP Rate | IEC60529 IP66 |
| Electrostatic discharge | IEC61000-4-2 air discharge 15kV | Wiring | Aviation socket |
| | IEC61000-4-2 contact discharge 8kV | Color | Metallic |
| Signal output | 4~20mA/0~20mA RS485 | Weight | 2.5 kg |
| Meteorological | | | |
| [2]Wind speed range | 0~50m/s | Wind direction range | 0°~360° |
| Accuracy wind speed | ±0.2m/s (<10m/s) | Accuracy wind direction | ±2° |
| | ±2% (10m/s~60m/s) | Resolution wind direction | 1° |
| Resolution wind speed | 0.1m/s | | |
| Anti-wind level | ＞70m/s | | |

1. The heating function is turned off under default state. If you need the heating function, please refer to the communication protocol 1.5.If the heating function is turned on, when the temperature of the transducer cover drops below + 15 ° C, heating will be started; when the temperature of the cover reaches + 25 ° C, Stop heating.
2. This is the default state and can be customized.

# FAR Ultrasonic Wind Sensor

## Mounting dimensions

Unit：mm



The standard mounting type of FAR ultrasonic wind sensor is tube installation (φ50mm), and have G3/4 male adapter for choice. G3/4 male adapter suit to board mounting (hole dimension is φ27-φ30mm).

**Installation method：**

1.Secure the φ50mm outer diameter tube or secure the G3/4 male adapter.

2. Insert the aviation plug of the cable from the φ50mm tube or G3/4 male adapter and insert into the aviation socket at the bottom of the sensor and lock it.

3. Put the sensor into the top of the installation tube and fix 4 M8 screws.

Point to North：

To show the correct wind direction, the ultrasonic wind sensor must point to true north.The arm with red mark points to the north direction. Please align the arm with red mark to the geomagnetic pole (it can be checked by the north pointer).

**Note:** The magnetic north and the geographic north are not exactly the same, so the error in the position of the when correcting it.

Error related to the location, and its maximum error could be more than 15 ° (such as the northeast of China). In the east China area, the error is negligible (< 3 °). More detailed information about this section is available on the Internet.
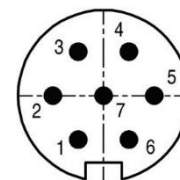
The FAR ultrasonic wind sensor is a precision instrument, please  be handled with care.
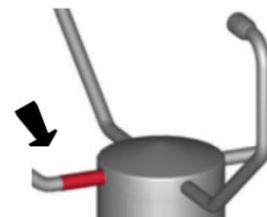
## Wiring diagram

Pin assignment half duplex/analog interface:

| 1 | Wind speed Analog interface + | pink |
|---|---|---|
| 2 | RS485 Serial interface B- | yellow |
| 3 | Wind direction Analog interface + | grey |
| 4 | RS485 Serial interface A+ | green |
| 5 | Analog ground | blue |
| 6 | Supply voltage - | white |
| 7 | Supply voltage + | brown |



View of the aviation plug at the bottom of the sensor

**Caution ：**
**1. Ensure cable connection is correct before power on.**
**2 .Cable shield layer and housing must be reliably grouded.**

## Protocol

# FAR Ultrasonic Wind Sensor

Modbus protocol (Baud rate: 9600bit/s(factory setting), 8bit data, no parity check, one stop bit.)
Factory setting baud rate: 9600bit/s
Factory setting wind sensor address: 01H

## 1 Protocol description (default address: 01H)

### 1.1 Query wind speed data  (coil address:122-123)
#### 1.1.1 Data definition
Command (Hexadecimal): 01 03 00 7A 00 01 A5 D3
Response(Hexadecimal):  01 03 02 00 44 B8 77

#### 1.1.2 Byte definition
Command character
The first byte 01H is the device address
The second byte 03H is the function code
The 3rd and 4th bytes 00H and 7AH are the coil start addresses
The 5th and 6th bytes 00H and 01H are the number of coils
The 7th and 8th bytes 60H and F0H are the upper and lower bits of the first 6 bytes of the CRC check code
Response character
The first byte 01H is the device address
The second byte 03H is the function code
The third byte 02H is the number of returned bytes
The 4th and 5th bytes 00H and 44H are the hundred times of the wind speed, for example, 00H, 44H or 68, indicating the wind speed is 0.68 m/s
The sixth and seventh bytes 60H and F0H are the upper and lower bits of the first five bytes of the CRC check code

### 1.2 Query wind speed data  (coil address:122-123)
#### 1.2.1 Data definition
Command (Hexadecimal): 01 03 00 7B 00 01 F4 13
Response(Hexadecimal):  01 03 02 68 98 96 2E
#### 1.2.2 Byte definition
Command character
The first byte 01H is the device address
The second byte 03H is the function code
The 3rd and 4th bytes 00H and 7BH are the coil start addresses
The 5th and 6th bytes 00H and 01H are the number of coils
The 7th and 8th bytes F4H and 13H are the upper and lower bits of the first 6 bytes of the CRC check code
Response character
The first byte 01H is the device address
The second byte 03H is the function code
The third byte 02H is the number of returned bytes
The 4th and 5th bytes 68H, 98H are the hundred times of the wind speed, for example 68H, 98H or 26776, indicating the wind direction is 267.76 °
The sixth and seventh bytes 96H and 2EH are the upper and lower bits of the first five bytes of the CRC check code

### 1.3 Modify address command
#### 1.3.1 Data definition
Command (Hexadecimal): 01 10 00 00 00 02 04 00 00 00 03 B3 AE
Response(Hexadecimal):  01 10 00 00 00 02 41 C8
#### 1.3.2  Byte definition
Command character
The first byte 01H is the device address
The second byte 10H is the function code
The 3rd and 4th bytes 00H and 00H are the coil start addresses
The 5th and 6th bytes 00H and 02H are the number of coils
The 7th byte 04H is the number of bytes
The 8th, 9th, 10th, and 11th bytes of 00H, 00H, 00H, and 03H are data (value range 1-32)
The 12th and 13th bytes 60H and F0H are the upper and lower bits of the first 11 bytes of the CRC check code
Response character
The first byte 01H is the device address
The second byte 10H is the function code
The 3rd, 4th, 5th and 6th bytes 00H, 00H ,00H and 02H are the number of returned bytes
The 7th and 8th bytes 41H and C8H are the upper and lower bits of the first 6 bytes of the CRC check code

### 1.4 Automatically send wind speed/wind direction command (coil address: 101-102, default status is off)
#### 1.4.1 Data definition
Command (Hexadecimal): 01 10 00 20 00 01 02 00 01 60 F0
Response(Hexadecimal):  01 10 00 20 00 01 00 03
#### 1.4.2 Byte definition
Command character
The first byte 01H is the device address
The second byte 10H is the function code
The 3rd and 4th bytes 00H and 20H are the coil start addresses
The 5th and 6th bytes 00H and 01H are the number of coils
The 7th byte 02H is the number of bytes
The 8th and 9th bytes 00H and 01H are data (value range 0-1, 0 is not automatically sent, non-zero is automatically sent)
The 10th and 11th bytes 60H and F0H are the upper and lower bits of the first 9 bytes of the CRC check code
Response character
The first byte 01H is the device address
The second byte 10H is the function code
The 3rd and 4th bytes 00H and 20H are the coil start addresses
The 5th and 6th bytes 00 and 01H are the number of returned bytes
The 7th and 8th bytes 00H and 03H are the upper and lower bits of the first 6 bytes of the CRC check code

### 1.5 Switch heating function command (coil address 101-102, default status is off)
#### 1.5.1 Data definition
Command (Hexadecimal): 01 10 00 65 00 01 02 00 01 6E 65
Response(Hexadecimal):  01 10 00 65 00 01 11 D6
#### 1.5.2 Byte definition
Command character
The first byte 01H is the device address
The second byte 10H is the function code
The 3rd and 4th bytes 00H and 65H are the coil start addresses
The 4th and 5th bytes 00H and 01H are the number of coils
The sixth byte 02H is the number of bytes
The 7th and 8th bytes 00H and 01H are data (value range 0-100 (decimal), 0 is no heating, 1 is heating power ( 1% of total power), and so on.100 is full power heating
The default is no heating
The 9th and 10th bytes 6EH and 65H are the upper and lower bits of the first 8 bytes of the CRC check code
Response character
The first byte 01H is the device address
The second byte 10H is the function code
The 3rd and 4th bytes 00H and 65H are the coil start addresses
The 5th and 6th bytes 00H and 01H are the return values
The 7th and 8th bytes 11H and D6H are the upper and lower bits of the first 6 bytes of the CRC check code

### 1.6 Broadcast Modify Device Address is 01H Command
#### 1.6.1 Data definition
Host computer command: 00 10 00 00 00 02 04 00 00 00 01 36 93
#### 1.6.2 Byte Definition:
Command character
The first byte 00H is the broadcast address
The second byte 10H is the function code
The 3rd and 4th bytes 00H and 00H are the coil start addresses
The 5th and 6th bytes 00H and 02H are the number of coils
The 7th byte 04H is the number of bytes
The 8th, 9th, 10th, and 11th bytes of 00H, 00H, 00H, and 01H are data (value range 1-32)
The 12th and 13th bytes 36H and 93H are the upper and lower bits of the first 11 bytes of the CRC check code

## 2 Supplementary
**2.1 Please mark as soon as possible after modifying the address; up to 32 slaves can be hanged on a single bus.**
**2.2 CRC check using ANSI CRC16: The polynomial is X16+X15+X2+1.**
**2.3 The interval between frames and frames is not less than 500ms.**
**2.4 Broadcast commands are executed by all slaves, but do not reply to data.**

# FAR Ultrasonic Wind Sensor

Automatically send wind speed/wind direction command (Baud rate: 9600bit/s(factory setting), 8bit data, no parity check, one stop bit)

1. Data definition: auto-output a frame per 1s, total 7 bytes.

| 0xAA/0xBB | 0x04 | 0xXX | 0xXX | 0xZZ | 0xZZ | checksum |
|---|---|---|---|---|---|---|

Byte definition: AA is synchronous-head, 0x04 is message length, next two bytes combine a word 0xXX which indicate wind speed, and nest two bytes combine a word 0Xzz which indicate wind direction. Checksum== 0xXX+0xXX+0xZZ+0xZZ, indicate checksum.

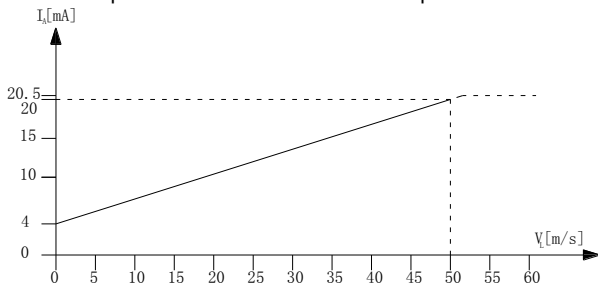**If the frame header is 0xBB that means the sensor is faulty.**

2.For example: 0xAA  0x04 0x01 0x6A 0x01 0x2C 0x98
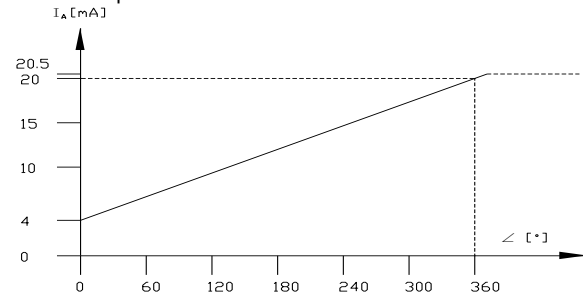  Wind speed is 0x016A = 36.2m/s
  Wind direction is 0x012C =300°

## Output characteristic curve

Current output characteristic curve of wind speed



Current output characteristic curve of wind direction



## How to Order

| P/N | Model | Rated voltage | Signal output | Heating Function | Mount |
|---|---|---|---|---|---|
| **1000409-001** | FAR | DC24V±20% | 4-20mA current, 0-50m/s，0-360° RS485 | Yes (Heating power ≤120W)） | Ø50 mast tube mount, 7-pin aviation socket |
| **1000409-002** | FAR | DC24V±20% | 4-20mA current, 0-60m/s，0-360° RS485 | Yes (Heating power ≤120W)） | Ø50 mast tube mount, 7-pin aviation socket |

## Annex

| Installation diagram | Product name | Description |
|---|---|---|
|  | Safety wire | 1.Tighten the M8 eyebolts<br>2.The installation of safety wire as the picture shown |
|  | Anti-bird tip | 1.Apply thread fastening agent to the anti-bird tip thread;<br>2.Screw the anti-bird tip into the upper threaded hole of the ultrasonic |