Specification

Nine Elements Sensor

HD-S90

File version：V1.4

CONTENTS

1. Product Description

1.1 Product overview

This all-in-one weather station can be widely used in environmental detection, integrating wind speed, wind direction, temperature and humidity, noise collection, PM2.5 and PM10, atmospheric pressure, and light. The equipment adopts standard MODBUS-RTU communication protocol, RS485 signal output, and the communication distance can reach up to 2000 meters. Data can be uploaded to the customer's monitoring software or PLC configuration screen through 485 communications. It also supports secondary development.

With the built-in electronic compass selection device, there is no longer a position requirement during installation, and only the horizontal installation is required. It is suitable for use in mobile occasions such as marine ships, automobile transportation, etc., and there is no direction requirement during installation.

This product is widely used in various occasions that need to measure environmental temperature and humidity, noise, air quality, atmospheric pressure, light, etc. It is safe and reliable, beautiful in appearance, easy to install, and durable.

1.2 Features

This product is small in size and light in weight. It is made of high-quality anti-ultraviolet materials and has a long service life. It uses a high-sensitivity probe with stable signal and high accuracy. The key components adopt imported components, which are stable and reliable, and have the characteristics of wide measurement range, good linearity, good waterproof performance, convenient use, easy installation, and long transmission distance.

- It adopts an integrated design with multiple collection devices and is easy to install.
- Wind speed and direction are measured by ultrasonic principle, no start-up wind speed limit, zero wind speed work, no angle limit, 360° omni-directional, wind speed and wind direction data can be obtained at the same time.
- Noise collection, accurate measurement, the range is as high as 30dB~120dB.PM2.5 and PM10
- Simultaneous acquisition, range: 0-1000ug/m3, resolution 1ug/m3, unique dual-frequency data acquisition and automatic calibration technology, consistency can reach ±10%.
- Measuring the environmental temperature and humidity, the measuring unit is imported from Switzerland, and the measurement is accurate.
- Wide range 0-120Kpa air pressure range, applicable to various altitudes.
- Use dedicated 485 circuit, stable communication.
- Equipment with built-in electronic compass, no direction requirements during installation, horizontal installation.

1.3 Main technical index

DC power supply (default)		10-30VDC
Maximum power consumption	RS485 output	1.2W
Precision	Wind speed	±(0.2m/s±0.02*v)(v is the true wind speed)
	Wind direction	±3°
	Humidity	±3%RH(60%RH,25℃)
	Temperature	±0.5℃（25℃）
	Atmospheric pressure	±0.15Kpa@25℃ 75Kpa

	Noise	±3db
	PM10 PM2.5	±10%（25℃）
	Light intensity	±7%(25℃)
Range	Wind speed	0~60m/s
	Wind direction	0~359°
	Humidity	0%RH~99%RH
	Temperature	-40℃~+80℃
	Atmospheric pressure	0-120Kpa
	Noise	30dB~120dB
	PM10 PM2.5	0-1000ug/m3
	Light intensity	0~20万Lux
Long-term stability	Temperature	≤0.1℃/y
	Humidity	≤1%/y
	Atmospheric pressure	-0.1Kpa/y
	Noise	≤3db/y
	PM10 PM2.5	≤1%/y
	Light intensity	≤5%/y
Response time	Wind speed	1S
	Wind direction	1S
	Temp & Hum	≤1s
	Atmospheric pressure	≤1s
	Noise	≤1s
	PM10 PM2.5	≤90S
	Light intensity	≤0.1s
Output signal	RS485 output	RS485（standard Modbus communication protocol）

1.4 Product model

RS-				Company code
	FSXCS-			Ultrasonic integrated weather station
		N01-		485 communication (standard Modbus-RTU protocol)
			1-	One-piece housing
			None	No built-in electronic compass
			CP	Built-in electronic compass function

2. Equipment size
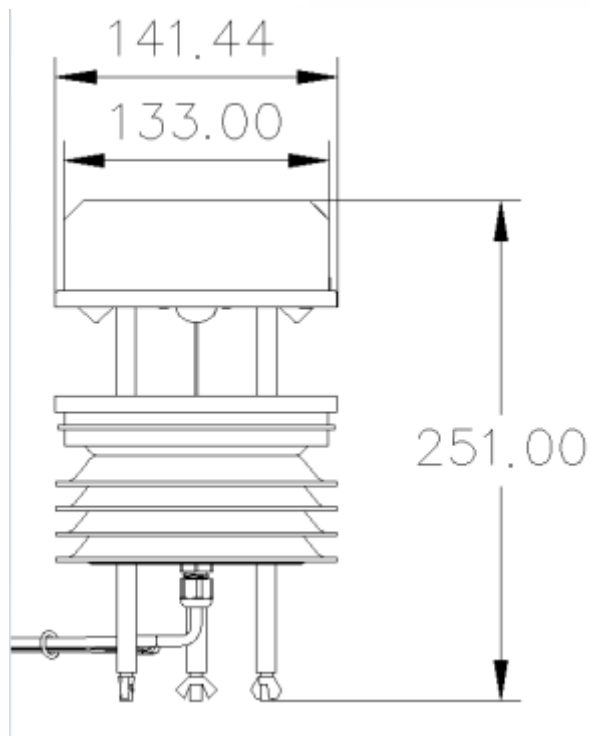
Equipment size chart（UNIT：mm）

3. Equipment installation instructions

3.1 Inspection before equipment installation

Equipment List：

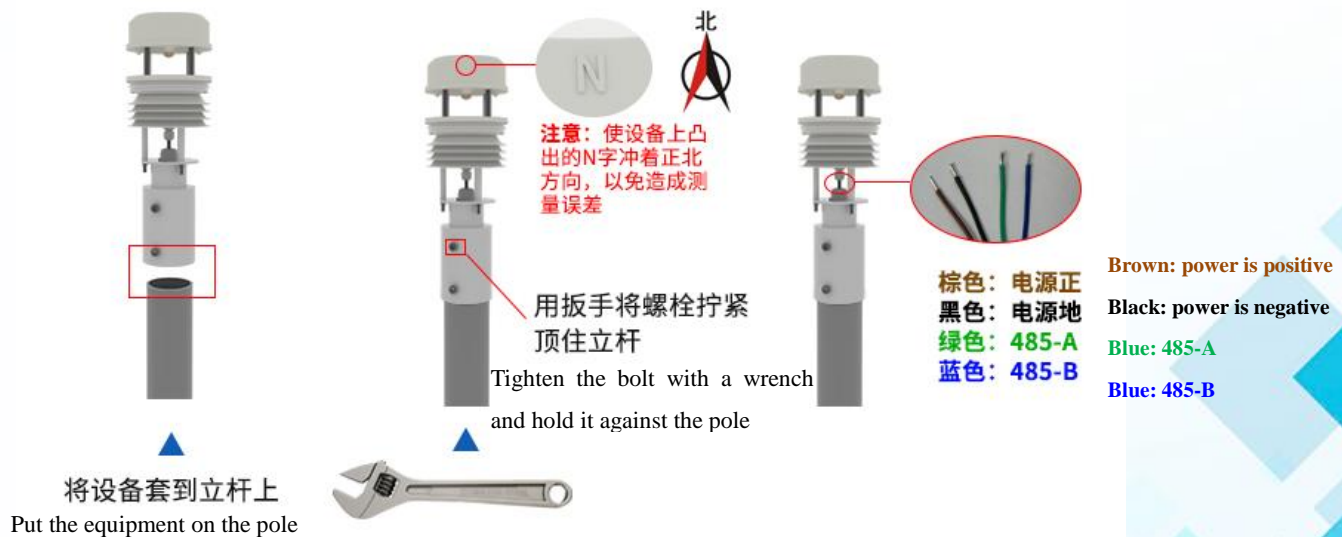■One integrated weather station equipment

■A pack of mounting screws

■Warranty card, certificate of conformity

3.2 Installation method

The installation of equipment without electronic compass is shown in the figure below, and the equipment with built-in electronic compass only needs to be installed horizontally.

Hugging seat installation：

Note: Make the N word protruding on the device face true north to avoid measurement errors

注意：使设备上凸出的N字冲着正北方向，以免造成测量误差

用扳手将螺栓拧紧顶住立杆
Tighten the bolt with a wrench and hold it against the pole

将设备套到立杆上
Put the equipment on the pole

棕色：电源正 Brown: power is positive
黑色：电源地 Black: power is negative
绿色：485-A Blue: 485-A
蓝色：485-B Blue: 485-B

Beam installation：

注意：使设备上的
N字方向冲着正北方向
以免造成误差
Make the N direction on the device face true north to avoid errors

3.3 Interface Description

DC power supply 10-30V power supply. When wiring the 485 signal line, pay attention to the two wires A/B not to be reversed, and the addresses of multiple devices on the bus cannot be conflicted.

	Line color	Illustrate
Power supply	Brown	Power is positive（10-30V DC）
	Black	Power is negative
Communication	Green	485-A
	Blue	485-B

3.4 485 field wiring instructions

When multiple 485 devices are connected to the same bus, there are certain requirements for field wiring. For details, please refer to the "485 Device Field Wiring Manual" in the information package.

# 4. Configuration software installation and use

4.1 Software selection

Open the data package, select "Debugging software" --- "485 parameter configuration software", find "485 parameter configuration tool"
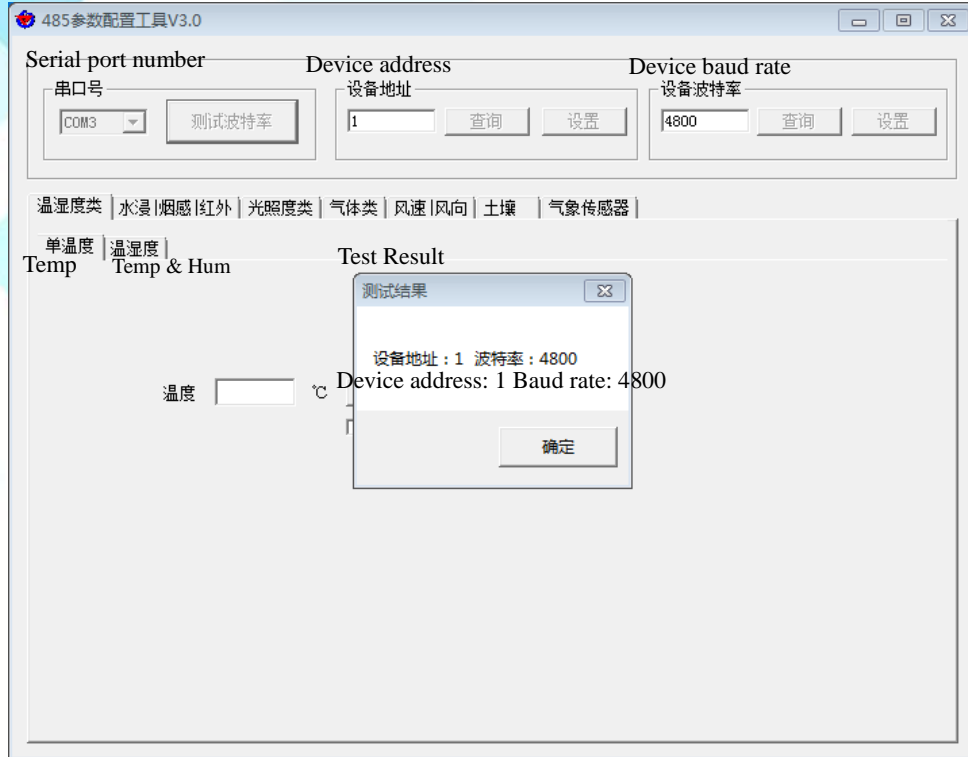
4.2 Parameter settings

①、Select the correct COM port (check the COM port in "My Computer—Properties—Device Manager—Port"). The following figure lists the driver names of several different 485 converters.
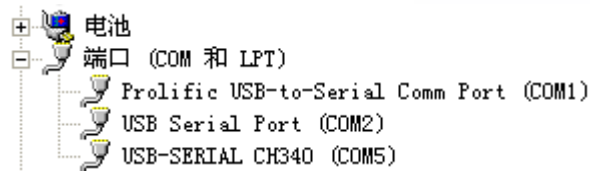
②、Connect only one device separately and power it on, click the test baud rate of the software, the software will test the baud rate and address of the current device, the default baud rate is 4800bit/s, and the default address is 0x01.

③、Modify the address and baud rate according to the needs of use, and at the same time query the current function status of the device.

④、If the test is unsuccessful, please recheck the equipment wiring and 485 driver installation.

485 parameter configuration tool

Serial port number Device address Device baud rate

Temp   Temp & Hum   Test Result

Device address: 1 Baud rate: 4800

5. Communication protocol

5.1 Basic communication parameters

Code	8-bit binary
Data bit	8-bit
Parity bit	None
Stop bit	1-bit
Error checking	CRC（Redundant cyclic code）
Baud rate	Can be set to 2400bit/s, 4800bit/s, 9600 bit/s, the factory default is 4800bit/s

5.2 Data frame format definition

Adopt Modbus-RTU communication protocol, the format is as follows：

Initial structure ≥ 4 bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

Time to end structure ≥ 4 bytes

Address code: the starting address of the transmitter, which is unique in the communication network (factory default 0x01).

Function code: The command function instruction issued by the host, this transmitter only uses function code 0x03 (read register data).

Data area: The data area is the specific communication data, pay attention to the high byte of the 16bits data first!

CRC code: two-byte check code.

Host query frame structure:

Address code	Function code	Register start address	Register length	Check code low byte	Check code high byte
1 byte	1 byte	2 bytes	2 bytes	1 byte	1 byte

Slave response frame structure：

Address code	Function code	Number of valid bytes	Data area	Data area two	Data N area	Check code low byte	Check code high byte
1 byte	1 byte	1 byte	2 bytes	2 bytes	2 bytes	1 byte	1 byte

5.3 Communication register address description

The contents of the register are shown in the following table (support 03/04 function code)：

Register address	PLC or configuration address	Content	Operation	Definition description
500	40501	Wind speed value	Read only	100 times the actual value
501	40502	Wind force	Read only	Actual value (The wind level value corresponding to the current wind speed)
502	40503	Wind direction (0-7 files)	Read only	Actual value (the direction of true north is 0, the value is increased clockwise, and the value of true east is 2)
503	40504	Wind direction（0-360°）	Read only	Actual value (the direction of true north is 0° and the degree increases clockwise, and the direction of true east is 90°)
504	40505	Humidity value	Read only	10 times the actual value
505	40506	Humidity value	Read only	10 times the actual value
506	40507	Noise value	Read only	10 times the actual value
507	40508	PM2.5 value	Read only	Actual value
508	40509	PM10 value	Read only	Actual value

509	40510	Atmospheric pressure value (unit Kpa,)	Read only	10 times the actual value
510	40511	High 16-bit value of Lux value of 20W	Read only	Actual value
511	40512	High 16-bit value of Lux value of 20W	Read only	Actual value

5.4 Communication protocol example and explanation

5.4.1 example：Read the real-time wind speed value of the transmitter device (address 0x01)

Interrogation frame

Address code	Function code	Initial address	Data length	Check code low byte	Check code high byte
0x01	0x03	0x01　0xF4	0x00　0x01	0x C4	0x04

Reply frame

Address code	Function code	Returns the number of valid bytes	Wind speed value	Check code low byte	Check code high byte
0x01	0x03	0x02	0x00　0x7D	0x78	0x65

Real-time wind speed calculation：

Wind speed：007D (Hexadecimal)= 125 => Wind speed = 1.25 m/s

5.4.2 example：Read the wind direction value of the transmitter device (address 0x01)

Interrogation frame

Address code	Function code	Initial address	Data length	Check code low byte	Check code low byte
0x01	0x03	0x01　0xF6	0x00　0x01	0x65	0xC4

Reply frame

Address code	Function code	Returns the number of valid bytes	Wind speed value	Check code low byte	Check code high byte
0x01	0x03	0x02	0x00 0x02	0x39	0x85

Real-time wind speed calculation：

Wind speed：0002 (Hexadecimal)= 2 => Wind speed = East wind

5.4.3 example:Read the temperature and humidity value of the transmitter device (address 0x01)

Interrogation frame

Address code	Function code	Initial address	Data length	Check code low bit	High bit of check code
0x01	0x03	0x01 0xF8	0x00 0x02	0x44	0x06

Reply frame（For example, the temperature is -10.1℃ and the humidity is 65.8%RH）

Address code	Function code	Number of valid bytes	Humidity value	Temperature value	Check code low bit	High bit of check code
0x01	0x03	0x04	0x02 0x92	0xFF 0x9B	0x5A	0x3D

Temperature: upload in the form of complement code when the temperature is lower than 0℃

0xFF9B (Hexadecimal)= -101 => temperature = -10.1℃

Humidity：

0x0292(Hexadecimal)=658=> humidity = 65.8%RH

6. Common problems and solutions

The device cannot connect to the PLC or computer

Possible reason:

1) The computer has multiple COM ports and the selected port is incorrect.

2) The device address is wrong, or there are devices with duplicate addresses (the factory default is all 1).

3) The baud rate, check method, data bit, and stop bit are wrong.

4) The host polling interval and waiting response time are too short, and both need to be set above 200ms.

5) The 485 bus is disconnected, or the A and B wires are connected reversely.

6) If the number of equipment is too much or the wiring is too long, power supply should be nearby, add a 485 booster, and add a 120Ω terminal resistance at the same time.

7) The USB to 485 driver is not installed or damaged.

8) Equipment damage.