TQ03
Manual for Ultrasonic Integrated Weather Station

SIBO.X INDUSTRIAL CO.,LTD.
Add: No. Building 1, No. 1, Jingshi Road, Cicheng Town Industrial Park, Jiangbei District, Ningbo City, Zhejiang, China
https://www.sbxsun.com
Email: info@sbxsun.com
Tel: +86-15958288207

Table of Contents

1. product description

1.1 product description

This small integrated 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 and RS485 signal output. The communication distance can be up to 2000 meters, and data can be uploaded to the customer's monitoring software or PLC configuration screen through 485 communication, and secondary development is also supported.

With the built-in electronic compass selection device, there is no longer a position requirement during installation, just ensure that it is installed horizontally. It is suitable for use in mobile occasions such as marine ships and automobile transportation, 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, light in weight, made of high-quality anti-ultraviolet materials, long service life, high-sensitivity probe, stable signal and high precision. 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.

1. The integrated design of multiple collection devices is adopted, which is easy to install.
2. Wind speed and direction are measured by ultrasonic principle, no angle limit, 360° omni-directional, wind speed and wind direction data can be obtained at the same time.
3. Noise collection, accurate measurement, the range is as high as 30dB~130dB.
4. PM2.5 and PM10 are collected at the same time, range: 0-1000ug/m3, resolution 1ug/m3, unique dual-frequency data collection and automatic calibration technology, the consistency can reach ±10%.
5. Measure the environmental temperature and humidity, the measuring unit is imported from Switzerland, and the measurement is accurate.
6. Wide range 0-120Kpa air pressure range, applicable to various altitudes.
7. Using dedicated 485 circuit, the communication is stable.
8. Equipment with built-in electronic compass, no direction requirements during

installation, just install it horizontally。

1.3 Main Specifications

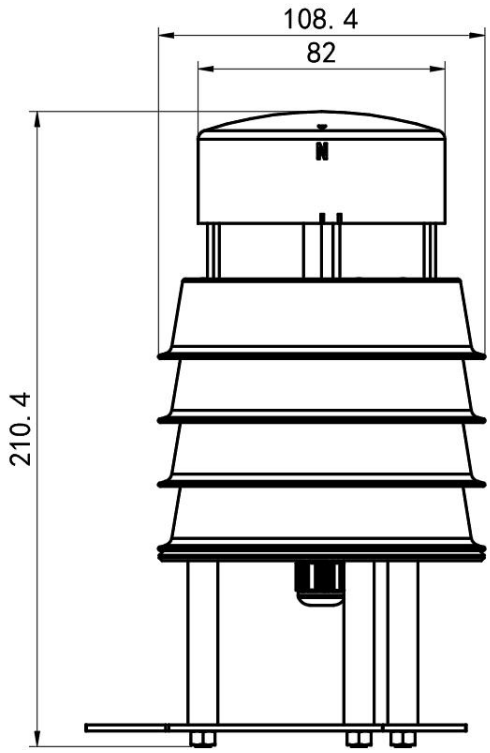
DC power supply (default)	10-30VDC	
Maximum power consumption	RS485 output	1.2W
precision	wind speed	±(0.2m/s±0.02*v) (v is the real wind speed)
	wind direction	±3°
	humidity	±3%RH(60%RH,25℃)
	temperature	±0.5℃（25℃）
	Atmospheric pressure	±0.15Kpa@25℃ 101Kpa
	noise	±0.5dB (at reference pitch, 94dB@1kHz
	PM2.5	Particle counting efficiency: 50%@0.3um, 98%@>=0.5um. ±10ug/m3@0~100ug/m3
	CO2	±(50ppm+ 3%F·S) (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
	CO2	0-5000ppm
	light intensity	0~200000 Lux
long term stability	temperature	≤0.1℃/y
	humidity	≤1%/y
	Atmospheric pressure	-0.1Kpa/y
	noise	≤3db/y
	PM10 PM2.5	≤1%/y

	CO2	≤1%/y
	light intensity	≤5%/y
Response time	wind speed	1S
	wind direction	1S
	Temperature and humidity	≤1s
	Atmospheric pressure	≤1s
	noise	≤1s
	PM10 PM2.5	≤90S
	CO2	≤90S
	light intensity	≤0.1s
output signal	RS485 output	RS485 (standard Modbus communication protocol)
DC power supply (default)	10-30VDC	

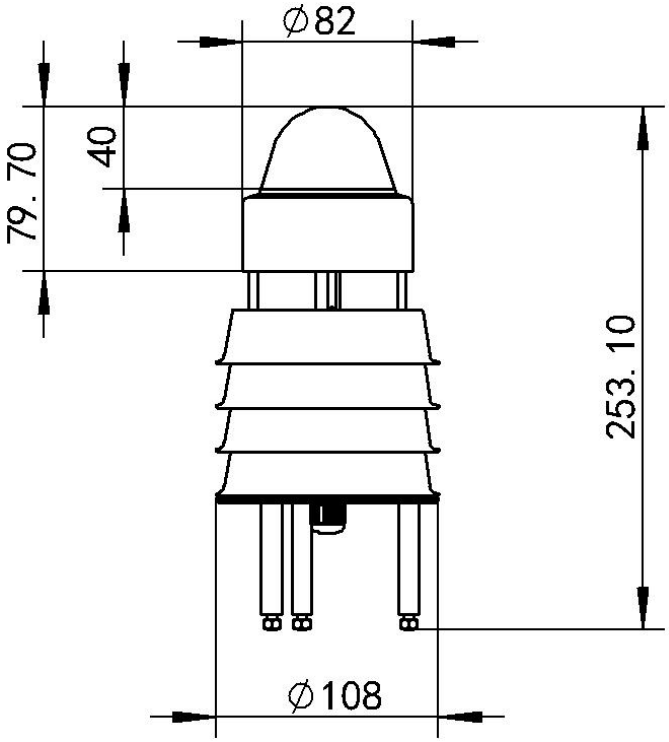
1.4 product model

TQ03-				Ultrasonic integrated weather station
	N01-			485 communication (standard Modbus-RTU protocol)
		3-		Small ultrasonic integrated shell
			no	No built-in electronic compass
			CP	Built-in electronic compass function

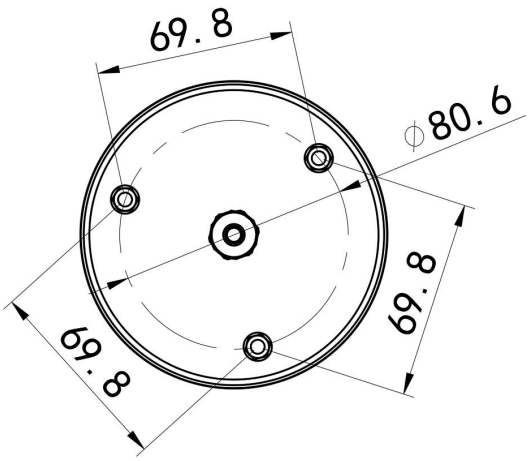
2. Equipment size

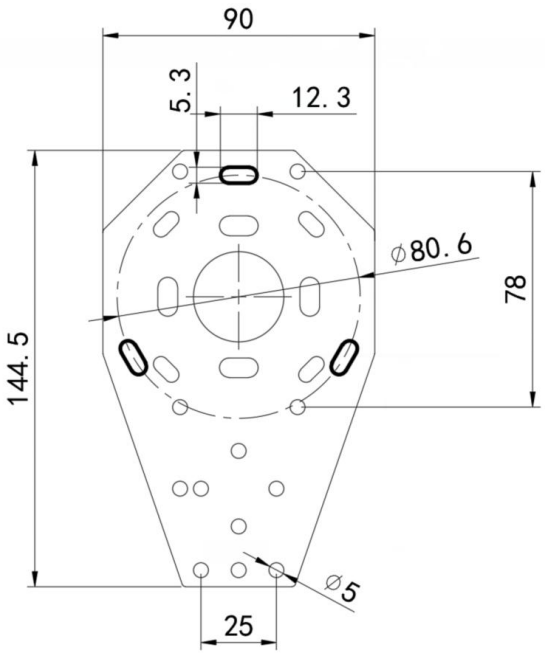


Equipment size drawing (unit: mm)



Dimensional drawing with optical rainfall element (unit: mm)





Dimensions of the mounting bracket (unit: mm)

3. Equipment installation instructions

3.1 Inspection before equipment installation

Equipment List:

1. One integrated weather station equipment

2. Warranty card, certificate of conformity

3.70cm waterproof plug-in male plug, 1 white bracket, 2 M4*10 screws and nuts, 3 M5 nuts

3.2installation method

Beam installation (optional):

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

Note: Make the N-word direction on the device face due north to avoid error.

3.3 Interface Description

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

must not conflict.。

	Thread color	Description
power supply	brown	V+(10-30V DC)
	black	V-
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

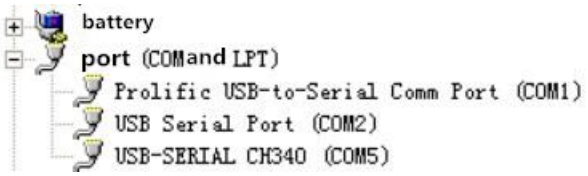
4.1 Software selection

Open the data package, select "Debug software" --- "485 parameter configuration software", find 

“"485 parameter configuration tool" can be opened.

4.2 parameter settings

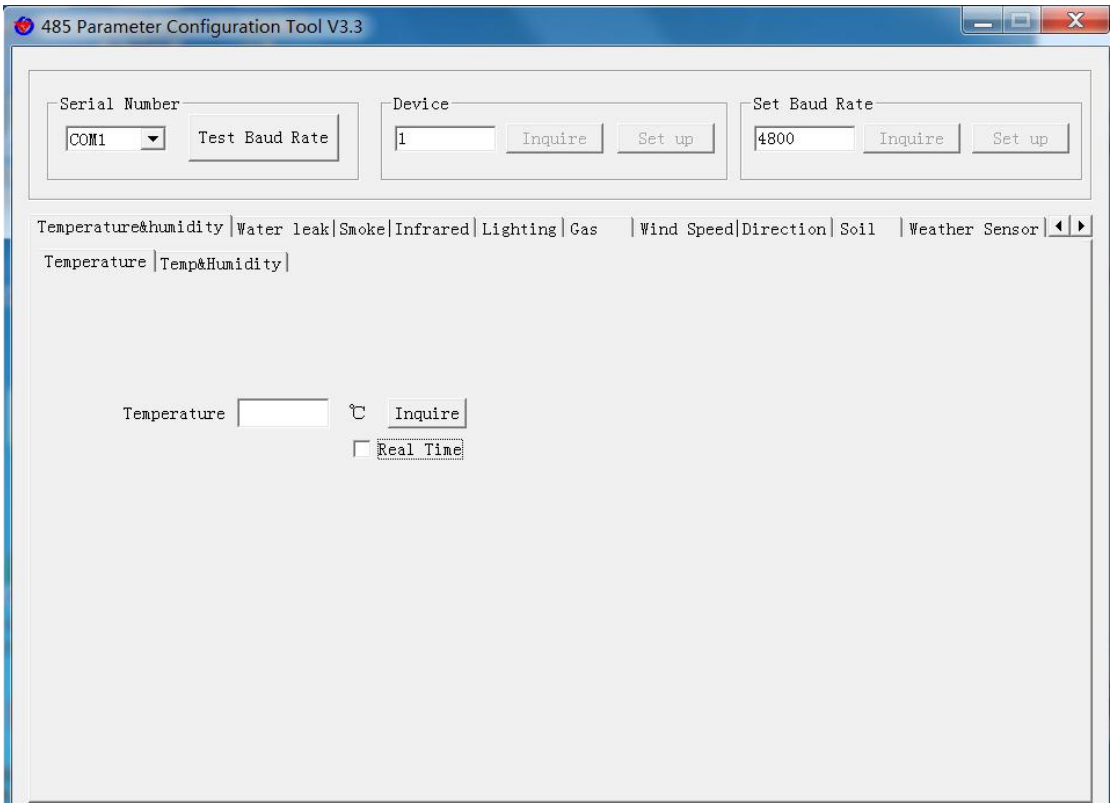
①. Select the correct COM port (check the COM port in "My Computer—Properties—Device Manager—Port"). The following figure lists the driver names of several different 485 converters.



② Connect only one device alone 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, you can query the current function status of the device.

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



5. letter of agreement

5.1 Basic communication parameters

Code	8-bit binary
Data bit	8-bit
Parity bit	no
Stop bit	1 person
Error checking	CRC (Redundant Cyclic Code)
Baud rate	2400bit/s, 4800bit/s, 9600 bit/s can be set, the factory default is 4800bit/s

5.2 Data frame format definition

Using 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
1bit	1bit	2bit	2bit	1bit	1bit

Slave machine 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
1bit	1bit	1bit	2bit	2bit	2bit	1bit	1bit

5.3 Communication register address description

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

Register address	PLC or configuration address	content	operating	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	10 times the actual value

			only	
505	40506	Temperature 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	Low 16-bit value of Lux value of 20W	Read only	Actual value
512	40513	20W light value (unit: hundred lux)	Read only	Actual value
513	40514	Optical rainfall rainfall value (unit: mm)	Read only	10 times the actual value

Contents of the calibration register

Register address	content	Definition description
6000H	Small ultrasonic wind direction offset register	0 means normal direction 1 represents the direction offset 180°
6001H	Small ultrasonic wind speed zero adjustment register	Write 0xAA, wait for 10s, and set the device to zero
6002H	Optical Rainfall Zeroing Register	Write 0x5A, set the rainfall value to zero
6003H	Optical rain sensitivity value	The default value is 28 H, which can increase the sensitivity of rainfall

5.4 Communication protocol example and explanation

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

Interrogation frame

address code	function code	starting 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

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

Interrogation frame

address code	function code	starting address	Data length	Check code low byte	Check code high byte
0x01	0x03	0x01 0xF6	0x00 0x01	0x65	0xC4

Reply frame

address code	function code	Returns the number of valid bytes	Wind direction value	Check code low byte	Check code high byte
0x01	0x03	0x02	0x00 0x02	0x39	0x85

Wind direction calculation:

Wind direction: 0002 (hexadecimal) = 2 => wind direction = east wind

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

Interrogation frame

address code	function code	starting address	Data length	Check code low bit	Check code high byte
0x01	0x03	0x01 0xF8	0x00 0x02	0x44	0x06

Response 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	Check code high byte
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 defaults are all 1).

3) The baud rate, check method, data bit, 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 485 booster, and add 120Ω terminal resistance at the same time.

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

8) The equipment is damaged.