ATMOSPHERIC ANION MONITOR

RY-CFY

MANUAL

INTRODUCTION & PRINCIPLE

Our company has independently developed a set of high-precision atmospheric anion monitor, which conforms to the international technical specifications, and all technical indicators have reached the international advanced level. The product adopts a unique collecting cylinder capacitor and a pure imported signal processing unit, with high efficiency of ion charge conversion and stable charge collection. It has the characteristics of strong anti-interference ability, rain proof ability, stable communication, high test accuracy, strong adaptability to the environment and long-term uninterrupted work in the field.

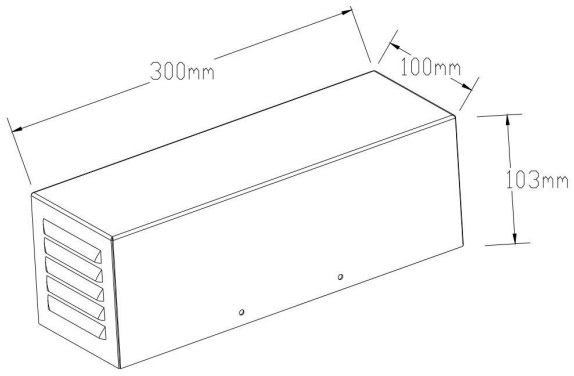
FEATURES

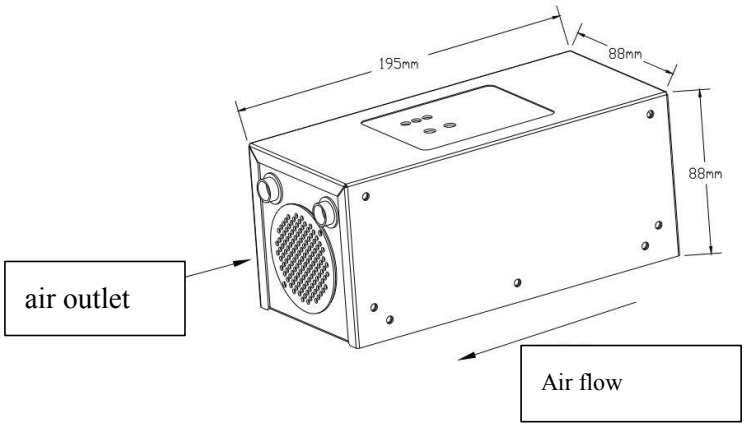
●The measurement method is based on the Japanese JIS measurement method, and meets the data standards specified by the Japan Functional Ion Association's certified material function. It is designed with the most accurate coaxial double-cylinder structure. Compared with the flat plate structure on the market, Significantly improved accuracy.
●Designed for long-term outdoor operation, the sensor collection tube and internal analysis circuit adopt a separate design, which has strong waterproof and moisture-proof characteristics.
●The sensor is equipped with a special separate radiation shield, which is rainproof and sunproof, suitable for long-term monitoring.
●Internal hardware monitoring design, real-time monitoring and collection of internal working voltage, output through RS232 / 485.
●The sensor has an advanced amplification circuit and filtering technology, which can detect the number of negative ions with high sensitivity, stability and accuracy.
●The sensor has excellent electromagnetic shielding function, which can better overcome the adverse influence of static electricity on the measurement.
●Advanced automatic working mode, without manual processing, it will work automatically when power on;
●The use of special material insulation materials, super moisture resistance, to ensure normal work in high humidity environments.
●With a variety of open data interfaces and protocols, it is widely used in various environmental monitoring sites.
●Small size, convenient installation and easy on-site implementation.

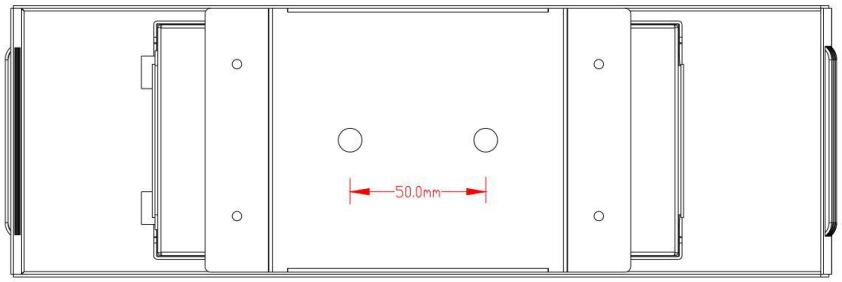
TECHNICAL SPECIFICATION

▲Measurement method: capacitive suction method
▲Measuring range：:0～5×104 个/cm3
▲Resolution：10 个/cm3
▲Measuring ions: negative oxygen
▲Error: negative ≤ ± 15% of reading; ion mobility ≤ ± 15%
▲Sampling frequency: 3 minutes / times (factory default, can be adjusted according to actual conditions)
▲Mobility：0.4（cm2 / V•sec）
▲Working mode: stand-alone rotation
▲Communication interface: Standard RS485
▲Working voltage：DC12V
▲ Working environment： Temperature： -30 ～ 60 ℃ Humidity： 0 ～ 100%RH（Non-condensing)
▲Average power consumption：≤3W
▲Body size：195*88*88（mm）
▲Outline size：300*100*103（mm）

SIZE







Bottom mounting hole

INSTALLATION

1.Location selection

●Selection of the installation site may affect the measurement accuracy or data of the equipment.

● The measuring point shall be the area with good air flow, and the place with pollution source such as pollutant, fine particle and aerosol in the air shall be avoided as far as possible.

●It is better to have water sources near the survey site, especially waterfalls, streams, fountains, etc., but keep a certain distance to ensure that the air is not condensed.

●The survey location shall not be the place that is easy to be struck by lightning, such as local commanding point and high-altitude minefield.

●It is better to use vegetation without vegetation or with low bottom under and around the survey site, and too high vegetation may affect the survey.

● There is no interference source near the measurement site. Such as wireless transmission tower, air conditioning outdoor unit, fan metal isolation network, etc.

●The measurement location shall avoid the selection of the air outlet or the place with excessive wind speed, which has certain influence on the measurement accuracy.

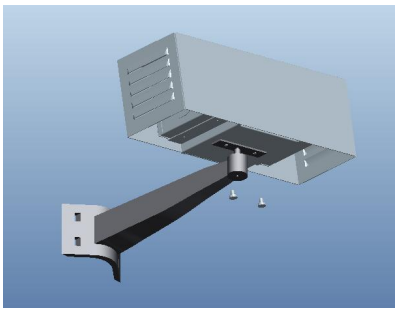
●The best measurement time is long time, and the average value is better. Too short a measurement time does not reflect the real data of the measurement location.
●It is recommended to delete the suddenly high data caused by interference during the measurement. Because the interference data can not reflect the real data of the measurement site.

2.Installation steps

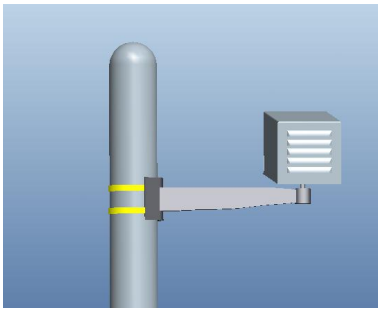
（1）Open the box and check whether the accessories are complete. If there is any omission, please contact our company in time.

（2）Connect power line and signal line (refer to Part 6: wiring instructions).

（3）Fixed mounting base.

<table>
<tr><td>1</td><td>Align the screw hole of the fixing bracket with the screw hole of the instrument mounting base, and tighten the bolt.</td><td rowspan="2">  </td></tr>
<tr><td>2</td><td>There are adjustable direction bolts on the fixing bracket. The instrument is oriented in a T shape with the fixing bracket, and it can be adjusted as shown on the right.</td></tr>
</table>

（4）Securing the mounting base to a pole or bracket。

<table>
<tr><td>1</td><td>After the fixing bracket is connected to the instrument, place it in the corresponding installation position of the pole (the inlet of the instrument is 1.4 meters above the ground)</td><td>  </td></tr>
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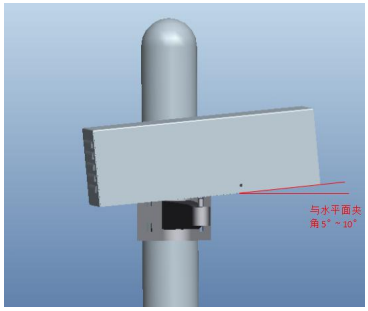
2	Adjust the stainless steel hoop according to the diameter of the pole, and the two hoop can be fully tightened (the rubber pad can be added to the joint of the bracket and the pole).	

（5）Adjust device orientation and angle。

1	After the instrument is installed on the bracket, try to avoid the wind from blowing directly into the inlet and outlet (both ends) of the instrument, and the front of the instrument should face the wind direction.	
2	The instrument is installed relatively horizontally. After the installation is completed, the instrument is tilted 5 to 10 degrees, the fan end is high, and the air inlet of the instrument is 1.4 meters above the ground.	

3.Buttons and displays

The panel indicators are described below：

Mark	Character	Function	Function introduction
Pow ○	Pow	Power light	Power on, the light is on and power off, the light is off Red normally on: the power supply works normally Red is off: the power supply is not normal
Net ○	Net	Working mode indicator	Indicator light on: indirect measurement Indicator light off: continuous measurement

4.Wiring method

（1）Hardware interface

There are two aviation sockets on both sides of the instrument, which are power supply, data output and two expansion interfaces, power socket pow, data output com, and two expansion interfaces ch1 and CH2. 4-20mA output is 2 pins, RS232 output is 3 pins. The two expansion interfaces are four cores, which can expand other sensors or different signal outputs.

（2）Interface

Mark	Interface	Number	Aerial plug sequence	introduction
POW	DC12V Power plug		1	12V Positive
			2	12V negative

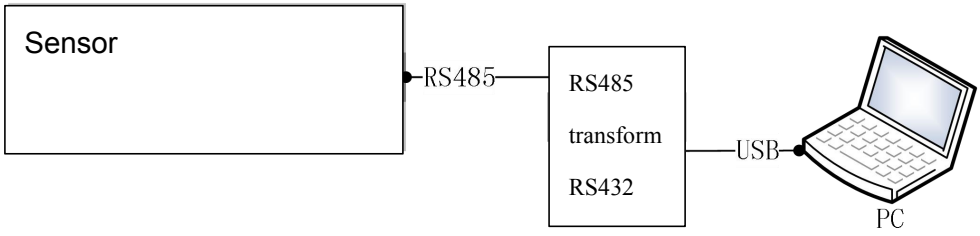
COM	RS485 plug		1	A+
			2	B+
			3	

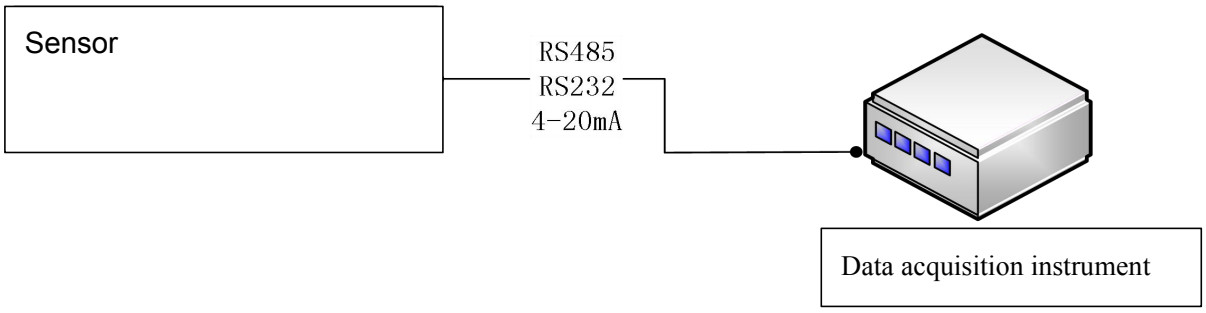
5. **Device output interface**

RS485 output and protocol description

- Support standard RS-485 communication bus.
- Using shielded twisted pair transmission, the transmission distance is less than 1200 meters.
- Baud rate range: 4800/9600/19200/38400
- The minimum interval between data frames is more than 1000ms, and the recommended sampling frequency is> 5S / times.
- Use CRC16 data frame error checking.

6.Wiring method





RS232/RS485Communication protocol

COMMUNICATION PROTOCOL

The device's RS232 / RS485 interface follows the standard MODBUS-RTU communication protocol. The function codes used are as follows:：

Function code	Introductions	Note
03H	Read data	Read all real-time data and configuration data
10H	Write data	Only multiple parts of configuration data can be written

- Communication example: Read register message instruction: 01 03 10 00 00 02 C0 CB (Read the number of negative oxygen ions)
- Message explanation: "01" device address; "03" read function code; "10 00" negative oxygen ion register; "00 02" register number; "C0 CB" check code.
- Message return instruction: 01 03 04 A1 20 00 07 99 C7
- Message explanation: "01" device address; "03" read function code; "04" data length; "A1 20 00 07" is the register value; "99 C7" check code. Calculate negative oxygen ions: 0x0007A120 = 500000.
- Write register message instruction: 01 10 30 00 00 01 02 00 05 56 50
- Message explanation: "01" device address; "10" write function code; "30 00" slave address register, "00 01" write register number; "02" write data byte number, here byte Number = number of registers * 2; "00 05" writes the slave address value; "56 50" check code.
- Return message: 01 10 30 00 00 01 0E C9

- Message explanation: “01” device address; “10” write function code; “30 00” slave address (; “00 01” writes register number; “00 01” writes register number “0E C9” calibration Check code.

- Restore factory address

Device initialization instruction: 00 80 00 01 C0 0C. The factory default address is restored after sending the instruction. (Note: The device sending this instruction does not return a message, it needs to match the correct baud rate to take effect)

- Register description

CV	Address	Date	length	Read/write	Introductions
Number of ions	0x1000	Long	4	R	Actual ion value
Slave address	0x3000	UnSigned	2	R/W	Range: 1-254. Factory default is 1
Baud rate	0x3001	UnSigned	2	R/W	The factory default is 9600. Baud rate 0 --- 1200, 1--2400, 2--4800, 3--9600, 4--19200, 5-38400

Operating mode	0x3002	UnSigned	2	R/W	0--continuous work sampling cycle 1 second / time 1--intermittent work Sampling period can be set
Fan on time	0x300C	UnSigned	2	R/W	Range: 30-65535. The factory default is 90s. (Effective in intermittent operation mode)
Fan off time	0x300D	UnSigned	2	R/W	Range: 30-65535. The factory default is 90s. (Effective in intermittent operation mode)

Note: Measurement cycle calculation: fan on time + fan off time. Example: Set the sampling period to 1min. Therefore, the fan-on time is 30s and the fan-off time is 30s.

Note: If the device is in continuous measurement mode for a long time, it will affect the fan life. It is recommended to measure the sampling indirect mode for a long time, and the sampling period is recommended to be 3min.

Note: Reading the number of ions while the device is initializing and calibrating will return the device to a busy state and will not send the number of ions. Example: When the device address is 01. When the device does not complete the initialization and calibration operations, it sends a read ion number command, and the device returns 01 83 06 c1 32 (where 06 represents the device busy status).

INSTRUMENT TESTING

Ⅰ Instrument power

1.This instrument belongs to precision equipment and has certain requirements for the power supply for testing. It is required that the output current of the power supply is ≥1A, the input rated voltage is 12V, and the ripple and noise are ≤120mVp-p.

⑵Test environment requirements

⑶Indoor environmental requirements

⑷Make sure that there are no air conditioners, humidifiers, air purifiers and other equipment that affect indoor ions on.

⑸Ensure that the indoor humidity is ≥30% RH, the humidity is too low, and the number of environmental ions is usually small, generally less than 50 / cm3.

⑹Test equipment should be kept away from other equipment exhaust ventilation outlets and strong electromagnetic interference equipment.

⑺Avoid odors, ion-adsorbing materials and ion-generating materials around the test equipment.

⑻Because the equipment measurement sampling capacitor suction method will consume the surrounding ions, it is necessary to maintain the air circulation around the equipment.

⑼Outdoor environmental requirements

⑽The measurement points should be selected in areas with good air flow, and try to avoid places with pollution sources such as pollutants, fine particles and aerosols in the air.

⑾It is better to have water near the measurement site, especially waterfalls, streams, fountains, etc., but keep a certain distance to ensure that the air is not condensed.

⑿The measurement site cannot be selected as the local high points, high-altitude minefields and other places vulnerable to lightning strikes.

⒀It is better to have no or low vegetation below and around the measurement site. Too high vegetation may affect the measurement.

⑭There are no interference sources near the measurement site. Such as wireless transmission tower, air conditioner outdoor unit, fan metal isolation network, etc.

⑮Avoid selecting the air outlet or the place where the wind speed is too large. The excessive wind speed has certain influence on the measurement accuracy.

⑯Requirements for instrument installation and placement.

⑰ The air inlet and air outlet at the bottom of the instrument should be kept clear and there is no obstruction around the instrument.

⑱When multiple devices test one point at the same time, the air inlet of the device should be kept on the same side, and the distance between the devices should be no more than 1m and no less than 10cm.

⑲If there is too much testing equipment, in order to ensure the true and valid test values of the equipment, the equipment should be placed in a circle in order to avoid the impact of air flow.

Ⅱ Instrument data reading

This device complies with the standard MODBUS-RTU communication protocol. For specific data reading and wiring, please refer to the description of the output interface of the device (Note: When RS232 communication, please ensure that the computer power supply is a three-hole plug to ensure reliable connection of the ground)

TROUBLESHOOTING & MAINTENANCE

1. Daily inspection and maintenance

The equipment needs to be routinely inspected and maintained according to the actual situation on site. The contents are as follows：

No.	Inspection items	Inspection items	Inspection cycle
1	Device power	Check if the device power is normal	
2	Wiring reliability	Check if the power and communication cables are connected reliably	

3	Equipment cleaning	Check equipment sensor cleaning	Clean according to the actual dirt condition, it is recommended to clean at least once a year

1．**Sensor cleaning**

After the inspection finds that the sensor is dirty, dust removal treatment is needed. The dust removal treatment steps are as follows:

(1) Prepare tools such as brushes and screwdrivers;

(2) Power off the instrument;

(3) Remove the protective cover of the instrument (please pay attention to the ground wire between the protective cover and the instrument when removing the protective cover, do not pull off);

(4) Remove the metal isolation nets at both ends of the instrument;

(5) Gently pull out the fan within 5 cm. Be careful not to disconnect the fan cable.

(6) Lightly brush the sensor cylinder with a brush. The air inlet and outlet must be cleaned. The surface of the cylinder and the fan should be clean and free of dust and attachments.

(7) After cleaning, follow the disassembly steps to replace it.

2.Troubleshooting

In actual use, most of the faults and problems are caused by external environment or network faults. You can quickly repair the faults by observing the fault site. Common system failures are as follows：

Fault code	Failure phenomenon	Possible cause of failure	Solution
1	Power light Pow does not light up	1.The wiring of DC12V power supply is wrong 2. DC12V power has no output. 3. The contact of DC12V power interface is bad. 4. Equipment failure.	1. Check whether the wiring sequence is correct according to the wiring diagram. 2. Make sure the DC12V power output is correct. 3. Reseat the power connector. 4.Remote guidance troubleshooting
2	RS232 / RS485 communication cannot be connected	Bad line contact or communication line interference	1、Check the communication line and reconnect 2、Restart the atmospheric anion monitor
		Communication line too long （RS232<20m；RS485<1200m）	1、Test with short communication line
		Collector serial port configuration error, including device address, baud rate, check bit, etc	1、Check whether the configuration of the data acquisition instrument is consistent with that of the sensor.

3	Sensor has no data	Poor contact in the sensor line	Check the wiring and restart the instrument
		Damaged sensor	Replace the sensor
4	Sensor value is too small	仪器进风口离其他设备散热出口过近	远离其他设备散热出口
		Low ion concentration due to smoke and odor in the test environment	Change test environment
		The wind speed at the inlet of the instrument is too high, and the instrument sampling is too low	The air inlet of the instrument is placed vertically
		Turn on air conditioning for cooling or heating during indoor measurements	Turn off air conditioning during indoor measurements
5	The sensor value is too large	There are ion generating substances around, such as strong oxidants, ion generating devices	Away from interference sources
6	Sensor values jump randomly	周围存在存在强干扰源，如变压器，信号发射器等	保证传感器地线与大地相连
		The power supply of the device is unstable, and the ripple and noise are large.	It is recommended that the power supply of the sensor is> 5W, ripple and noise <200mVp-p, and voltage accuracy <± 5%
7	other		Please contact our technical support for other questions

NOTES ON OPERATION

Negative ion monitoring equipment is a high-precision monitoring instrument with high precision and high requirements on the installation environment and operator level. Therefore, the operation, inspection and maintenance of the equipment must be performed by trained professional technicians. During routine maintenance, please observe the following precautions:

1. Regularly check whether the power supply is open to prevent the power supply from being unstable due to instability.

2. Regularly check the air inlet and outlet to prevent the air duct from being blocked.

3. Arrange a special person to manage the equipment, do a good job of anti-theft and electromagnetic radiation, and minimize personnel activities around the equipment.