



---

**Manual**

**RS485/Analog PM2.5/10 Sensor**

**Weihai Gemho Digital Mine Co.,  
Ltd**

## Chapter I Product Overview

### 1.1 Introduction

PM 2.5 &10 sensor is a new integrated sensor, which can obtain PM2 in the environment of the equipment through the acquisition equipment Value of PM2.5 / 10.

### 1.2 .Product description

The sensor adopts the principle of laser scattering, and the detection range is 0-999  $\mu$  G / m<sup>3</sup>, long service life, 16000 hours of continuous operation under normal temperature and pressure (the service time can be extended accordingly by controlling the working time of the light source), strong anti-interference ability, meeting the requirements of iec61000 electromagnetic compatibility, ultra silent design, and the noise is as low as 17 dB.

### 1.3 Sensor Characteristics

Low power consumption, high precision, high sensitivity, wide linear range, strong anti-interference ability, excellent repeatability and stability.

### 1.4 Applicable scenarios

Air conditioning, automobile purifier, fresh air system, air purifier, air quality detection instrument, industrial dust detection system.

## Chapter II Product Introduction

### 2.1 Product Appearance



### 2.2 Power Supply

The user provides the equipment with a DC power supply with an input of 9 ~ 18V. We can use the 220VAC to DC power supply provided by us, or use 12V solar panel and battery for power supply to meet the needs of different occasions.

### 2.3 Main Product Parameters

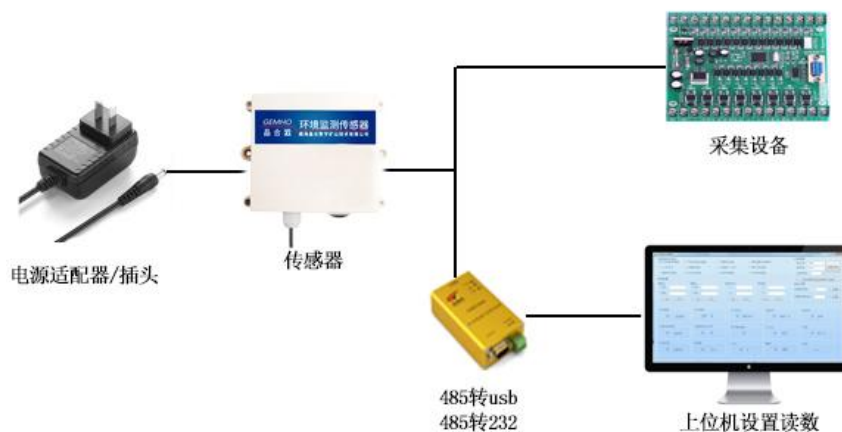
Name	Parameter
POWER SUPPLY	9-18V DC
Output Signal	RS485/0-5V/0-10V/4-20mA
Measuring Range	PM2.5:0-999ug/m <sup>3</sup> PM10:0-1500ug/m <sup>3</sup>
PM2.5	± 10% or ± ug, Take the larger value
Particle size resolution	0.3um
Mass concentration data resolution	1ug/m <sup>3</sup>

Response Time	≤10s
Size	72mm*45mm*15mm
Temperature	5°C~45°C
Humidity	15%RH~90%RH
Pressure	Atmospheric Pressure± 10%
Waterproof Grade	IP67

## Chapter III System Architecture

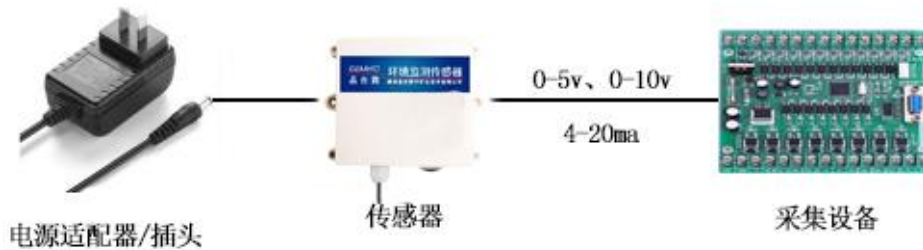
### 3.1 RS485 Output Signal

The sensor is powered by 12V DC power supply and connected to PLC with RS485 interface. It can also be connected to MCU through RS485 interface chip. The MCU and PLC are programmed through the Modbus protocol specified later. Or use USB to RS485 to connect with the computer, and use the sensor configuration tool provided by our company for configuration and testing. Theoretically, one bus can connect more than 16 RS485 sensors. If more RS485 sensors need to be connected, RS485 repeaters can be used to expand more RS485 devices.



## 3.2 Analog Output

Using 12V DC power supply, the sensor can be connected with acquisition equipment such as PLC or single chip microcomputer. Through the measured voltage or current value, the real-time data collected by the sensor can be obtained.



## Chapter IV Installation And Wiring Instructions

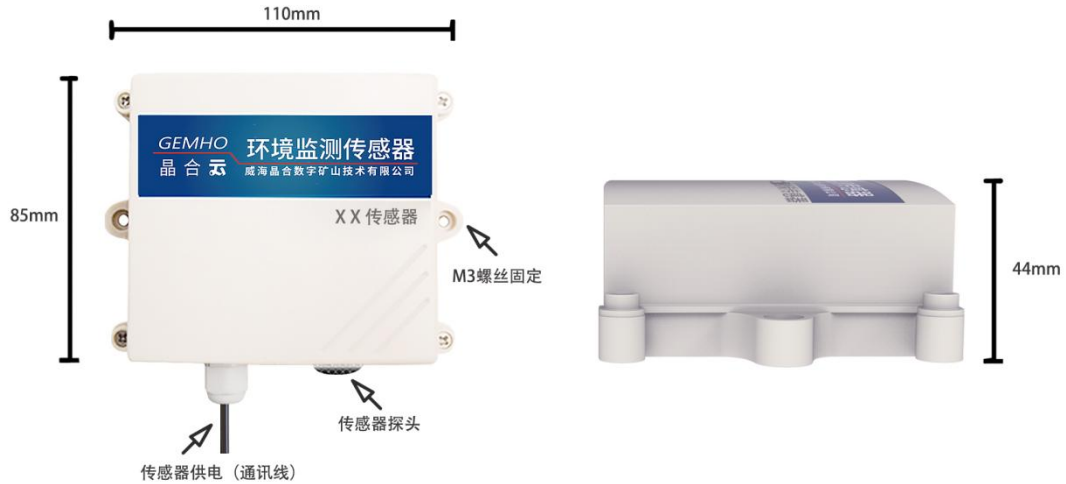
### 4.1 Equipment List

- NH3 Gas Sensor
- 2pcs M3 screws
- Product Certificate, Warranty Card And Manual
- Power Adapter (optional)

### 4.2 Installation Instructions

The equipment adopts wall mounted installation design.

Installation openings are reserved on both sides and can be vertically fixed on the wall through m3 screws or expansion screws.



## 4.3 Wiring Instructions

### (1) RS485 Line Description

Name	Line Name	Line Color
Power Supply	Positive power supply	Red
	Negative power supply	Black
Output Signal	RS485A	Green
	RS485B	Yellow

### (2) Analog Line Description

Name	Line Name	Line Color
Power Supply	Positive power supply	Red
	Negative power supply	Black
Output Signal	PM2.5 Current/Voltage	Green
	PM10 Current/Voltage	Yellow

**Be Careful:**

Please follow the wiring instructions strictly, otherwise it is easy to cause

excessive current and damage the equipment.

If the power adapter is not purchased in our company, it is equipped with 4-core wire, and the customer needs to prepare 9-18vdc power supply by himself.

For customers who have purchased power adapters from our company, we will connect the DC female head to the equipment before the equipment leaves the factory. After receiving the product, the customer can plug in directly to supply power to the equipment.

## Chapter V RS485 Communication Protocol And Host Computer Configuration

### 5.1 RS485 Communication Protocol And Description

Parameter	Content
Coding	8 bit Binary
Data bit	8-bit
Parity bit	Without
Stop bit	1-bit
Error Check	CRC (redundant cyclic code)
Baud Rate	9600 bit/s

### 5.2 Data frame format definition

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

Initial structure  $\geq 4$  bytes of time

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

End structure  $\geq 4$  bytes of time

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

Function code: The instruction function of the command sent by the host. This transmitter only uses function code 0x03 (read register data).

Data area: The data area is the specific communication data.

Note that the 16-bit data high byte is in front!

CRC code: Two-byte check code.

## (1) Read PM2 of device address 0x01 5 and PM10 values

Inquiry Frame:

Address Code	Function Code	Register Start Address	Register Length	CRC L	CRC H
0x01	0x03	0x00,0x0C	0x00,0x02	0x04	0x08

Answer Frame:

Address Code	Function Code	Effective number of bytes	PM2.5	PM10	CRC L	CRC H
0x01	0x03	0x04	0x00,0x55	0x00, 0x9C	0xEA	0x4A

PM2.5 值 : 0055H(HEX)=85=85ug/m<sup>3</sup>

PM10 值 : 009CH(HEX)=156=156ug/m<sup>3</sup>

## (2) Query device address

Reading the current device address can only be completed independently by a single offline sensor.

Example of querying equipment address:

Send: FF 03 00 0f 00 01 A1 D7



Return: FF 03 01 00 60

The data returned by the sensor 0x01 is the device address 0x01.

### (3) Example of modifying equipment address:

Code Address	Function Code	Data Address •	New Address	CRC L	CRC H
	06	0x00,0x0F	H, L		

explain:

1. The range of address code is 0x01 ~ 0xFE, and the default value is 0x01;
2. This machine only supports writing the sensor address value. When writing, the high-order address is in the front and the low-order address is in the back;
3. When the device address is not known, the address code is written to FF

Example of writing sensor address:

Change 01 address to 09 address:

Send: 01 06 00 0f 00 09 79 CF

Return: 01 06 01 09 20 4F

### 5.3 Upper computer reads equipment data and software configuration

- (1) Connect the device to the computer

The device is connected to the computer serial port through "RS485 to

USB" or "RS485 to 232" devices.

(2) Check whether the device is connected

1) Open the computer device manager, check whether a new device is added under the port (COM and LPT), and remember the port number of this device (the following figure is only a schematic diagram, and the port numbers displayed on different computers are different)



( (3) Read Data

1) Run "environmental monitoring setting software".

=

# Weihai Gemho Digital Mine Co., Ltd

The screenshot displays the 'Environmental Monitoring Setup Software' interface. It is divided into several sections:

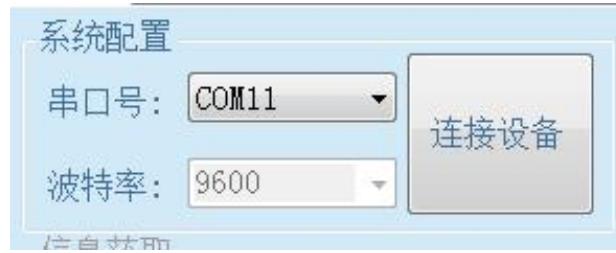
- Sensor Type:** A grid of checkboxes for various sensors including Air Temperature, Air Humidity, Illuminance, Carbon Dioxide, Soil Temperature, Soil Moisture, Soil EC Value, Soil PH, Wind Speed, Wind Direction, PM2.5, PM10, Noise, Ammonia, Ultraviolet Rays, Oxygen, Carbon Monoxide, Ozone, Rainfall, Rain and Snow, Time, Evaporation, water DO sensor, water temperature, water PH, water ORP, and water EC.
- Relay 1:** A dropdown menu set to '1' and a 'Parameter Configuration' section with 'Automatic' selected. It includes fields for Alarm Upper Limit (0.00), Upper Limit of Control (0.00), Lower Alarm Limit (0.00), and Lower Control Limit (0.00), along with a 'Set Up' button and a 'Manual' option.
- System Configuration:** A panel on the right with tabs for 'RS485' and 'RJ45'. It contains a 'Serial Port' dropdown, a 'Baud Rate' dropdown (set to 9600), and a 'Connect Device' button.
- Access to information:** Includes a 'Device Address' field, a 'Current address' button, a 'Read Data' button, and a 'Read Interval (s): 2' dropdown.
- Collection Settings:** Includes a 'Set Interval (min): 1' dropdown and a 'Set Up' button.
- Communication Settings:** Includes a 'Set Device Address' field and a 'Set Up' button.
- Real-time Data 1:** A large empty area at the bottom with a 'Clear' button.

## 2) RS485:

Select serial port number and baud rate (9600 by default, don' t selected)

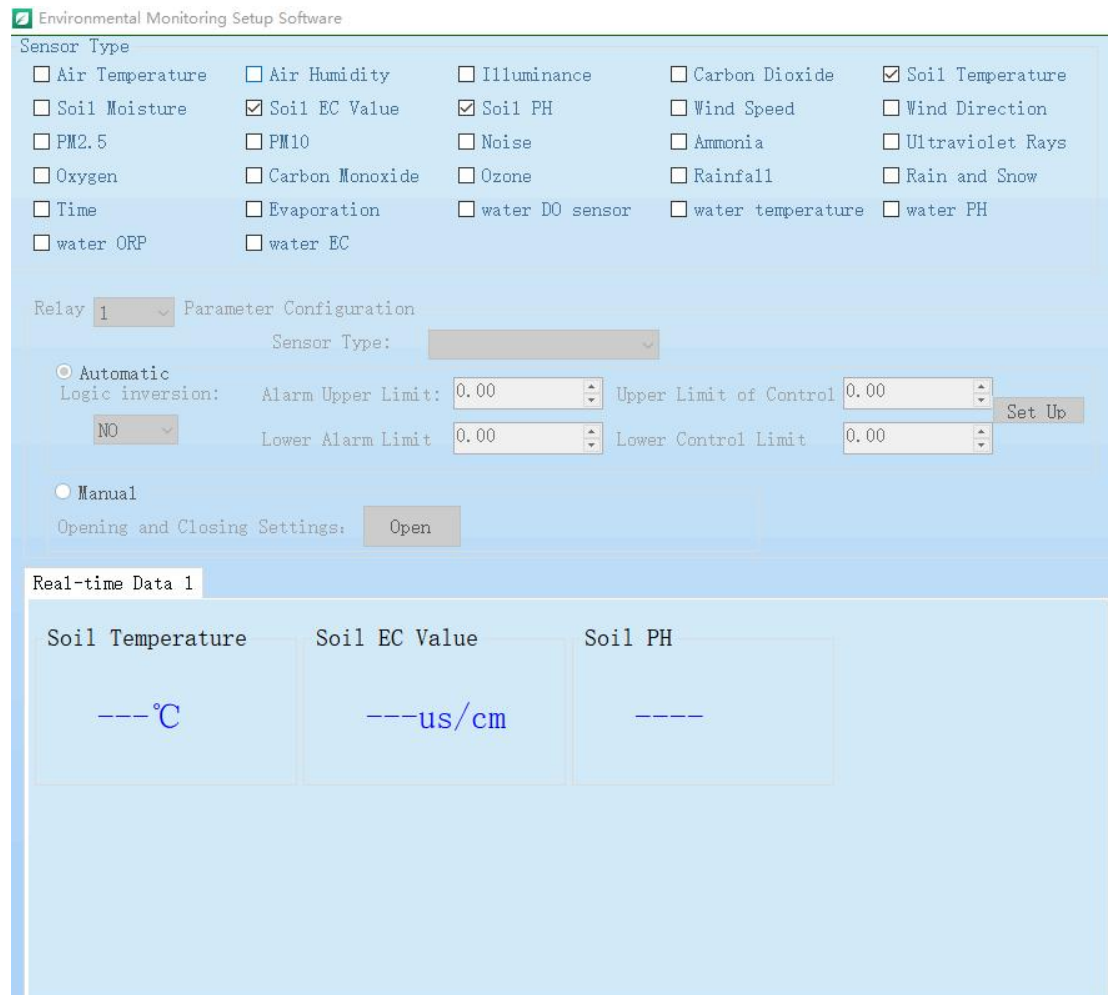
This close-up view of the 'System Configuration' panel shows the following details:

- Two tabs at the top: 'RS485' (selected) and 'RJ45'.
- 'Serial Port': A dropdown menu with a blue box highlighting the dropdown arrow.
- 'Baud Rate': A dropdown menu set to '9600'.
- 'Connect Device': A button with a blue border.
- 'Access to information': A 'Device Address' field, a 'Current address' button, and a 'Read Data' button.
- 'Read Interval (s)': A dropdown menu set to '2'.
- 'Collection Settings': A 'Set Interval (min): 1' dropdown and a 'Set Up' button.
- 'Communication Settings': A 'Set Device Address' field and a 'Set Up' button.

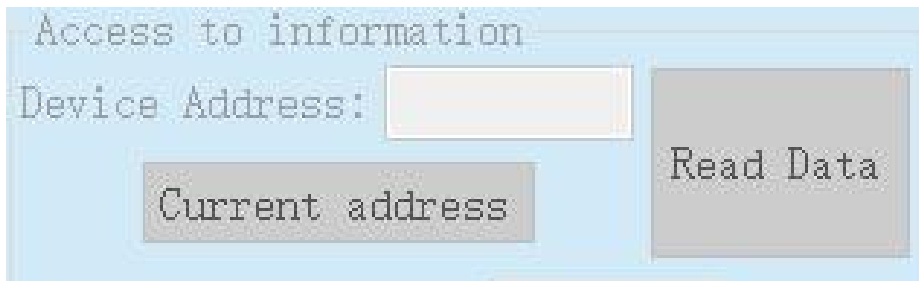


After the device is connected, the device address in [information acquisition] is loaded; In [sensor type selection], the function set in the current panel is checked by default; The checked function list is displayed in [real time data]. As shown in The

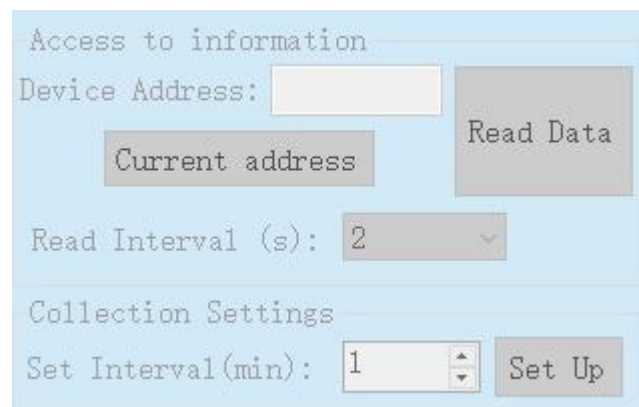
figure



If the current device address is changed or empty, you can manually click the [get current device address] button to get the latest device address.



(4) To modify the device address: select [communication settings], fill in the address to be modified in [set device address], and click [settings] to complete the modification.



After the modification is completed, you will be prompted that the modification is successful.



( 5 ) To modify the baud rate of the equipment: select [communication setting], select the baud rate to be modified in [serial port setting] - [baud rate], and click [setting] to complete the

modification.



## Chapter VI Analog Signal

### 6.1 4-20mA Output Signal

PM2.5 Concentration

Range	Current
0ug/m <sup>3</sup>	4mA
999ug/m <sup>3</sup>	20mA

$$P_{(PM2.5)} = (I_{(Current)} - 4mA) * 62.4375ug/m^3$$

Where P is ug/m<sup>3</sup>, I is mA.

PM10 Concentration

Range	Current
0ug/m <sup>3</sup>	4mA
1500ug/m <sup>3</sup>	20mA

$$P_{(PM10)} = (I_{(current)} - 4mA) * 93.75ug/m^3$$

Where P is ug/m<sup>3</sup>, I is mA.

### 6.2 0-5V Output Signal

PM2.5 Concentration

Range	Current
-------	---------

# Weihai Gemho Digital Mine Co., Ltd

0ug/m <sup>3</sup>	0V
999ug/m <sup>3</sup>	5V

$$P \text{ (PM2.5)} = V_{\text{(voltage)}} * 199.8 \text{ug/m}^3$$

Where P is ug/m<sup>3</sup> , V is V.

PM10 Concentration

Range	Current
0ug/m <sup>3</sup>	0V
1500ug/m <sup>3</sup>	5V

$$P \text{ (PM10)} = V_{\text{(Voltage)}} * 300 \text{ug/m}^3$$

Where P is ug/m<sup>3</sup> , V is V.

## 6.3 0-10V Output Signal

PM2.5 Concentration

Range	Current
0ug/m <sup>3</sup>	0V
999ug/m <sup>3</sup>	10V

$$P \text{ (PM2.5)} = V_{\text{(Voltage)}} * 99.9 \text{ug/m}^3$$

Where P is ug/m<sup>3</sup> , V is V.

PM10 Concentration

Range	Current
0ug/m <sup>3</sup>	0V
1500ug/m <sup>3</sup>	10V

$$P \text{ (PM10)} = V_{\text{(Voltage)}} * 150 \text{ug/m}^3$$

Where P is ug/m<sup>3</sup> , V is V.

## Chapter VII Fault analysis and quality assurance

### 7.1 Fault Analysis

NUM	Performance	Possible Faults	Solution
1	No communication signal	Cable fault	Check the power supply circuit with a multimeter
2	No Data	Interface connection failure	Interface connection failure
3	Wrong Data	Probe Wrong	Contact Us