# RS-MG111-N01-1 Multifunctional air quality transmitter (Type 485) User manual

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# RS-MG111-N01-1 Multifunctional air quality transmitter

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# (Type 485)

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# 1.Product Brief

## 1.1product description

RS-MG111-N01-1 is an air environment multi-element transmitter independently developed by our company. It is used to detect temperature, humidity, PM2.5, PM10, atmospheric pressure, light, TVOC, CO2, formaldehyde in the air environment. , O3, CO, CH4, O2, SO2, NO2, H2, H2S, NH3 and many other elements, basically covering various indicators reflecting air quality.

The transmitter adopts the original imported sensor and control chip, which has the characteristics of high precision, high resolution and good stability. The equipment adopts wide-voltage 10-30V DC power supply, 485 signal output, standard Modbus-RTU communication protocol, ModBus address can be set, baud rate can be changed, and the communication distance is up to 2000 meters. It is widely used in building HVAC, building energy saving, smart home, schools, hospitals, airport stations and other places.

## 1.2Features

Integrating a variety of measurement elements, up to 11 measurement elements can be integrated at the same time.

It can measure temperature, humidity, PM2.5, PM10, atmospheric pressure, light, TVOC, CO2, formaldehyde, O3, CO, CH4, O2, SO2, NO2, H2, H2S, NH3 and many other elements.

Using a circular arc shell, with the base we provide, it can be ceiling-mounted or wall-mounted.

Using dedicated 485 circuit, stable communication, 10~30V wide voltage range power supply.

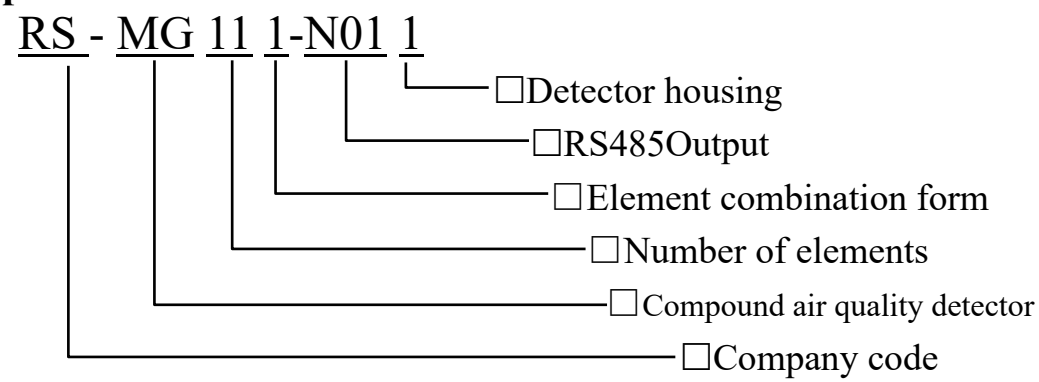
## 1.3Technical index

| | |
|---|---|
| DC power supply (default) | DC 10-30V |
| Maximum power consumption (11 elements including CH4) | 1.5W (24V DC power supply) |
| Detection parameters | Temperature, humidity, PM2.5, PM10, air pressure, light, TVOC, CO2, formaldehyde, O3, CO, CH4, O2, SO2, NO2, H2, H2S, NH3 |
| working environment: | Temperature -10℃-55℃; humidity 0~95%RH non-condensing |
| Signal output | RS485 output (standard Modbus-RTU protocol) |
| product material | ABS |
| Installation method | Wall hanging, ceiling |

| Detection parameters | range | Resolution | precision | Preheat time |
|---|---|---|---|---|
| PM2.5 | 0~1000ug/m$^3$ | 1ug/m3 | Particle counting efficiency: 50%@0.3um, 98%@>=0.5um. PM2.5 accuracy: ± 10ug/m3@0~100ug/m3 | ≤2min |
| PM10 | 0~1000ug/m$^3$ | | | |
| temperature | -40℃~+120℃, default -40℃ ~+80℃ | 0.1℃ | ±0.5℃(25℃) | |
| humidity | 0%RH-100%RH | 0.1%RH | ±3%RH（60%RH,25℃） | |
| Atmospheric pressure | 0~120Kpa | 0.1Kpa | ±0.15Kpa@25℃75Kpa | |
| Illuminance | 0~200000 Lux | 1Lux | ±7%(25℃) | |
| TVOC | 0~60000ppb | 1ppb | Typical Accuracy:15%FS(@C2H6O，0.5ppm，25℃，50%RH) | |
| CO2 | 0~5000ppm | 1ppm | ±(50ppm+ 3%F・S) | 2min (available), 10min (maximum accuracy) |
| CH4 | 0~5ppm | 0.01ppm | Typical accuracy: ± 0.025ppm or ±20%FS whichever is greater | ⩾5 minutes |
| O3 | 0~10ppm | 0.01ppm | Typical accuracy: ± 15%FS | ⩾5 minutes |
| O2 | 0~25%Vol | 0.1%Vol | ±2%FS | ⩾5 minutes |

All the above specifications except those that have been specially stated are measured under the environmental conditions: temperature 20 ℃, relative humidity 50% RH, 1 atmosphere, and the gas concentration to be measured does not exceed the sensor range.

## 2.product model




Element type description：

| 11 optional detection elements | Numbering | | | Explanation |
|---|---|---|---|---|
| PM2.5 | A | | | |
| PM10 | | | | |
| temperature | B | | | Air temperature and humidity |
| humidity | | | | |
| Atmospheric pressure | C | | | 0~120Kpa |
| Illumination | D | | | 0~200000Lux |
| TVOC | E | | | Total volatile organic compounds |
| carbon dioxide | F | | | CO2 range 0-5000ppm |
| formaldehyde | G | 5P | | CH2O range 0~5ppm |
| ozone | H | 10P | | O3 range 0~10ppm |
| In addition to the above detection elements, three gases | I | O2 | 30VOL | O2 range 30VOL |
| | J | H2S | 100P | H2S range 100 ppm |
| | K | CH4 | 100LEL | CH4 range 100 LEL |

| | | | | |
|---|---|---|---|---|
| can be selected from the gas selection on the right | L | CO | 1000P | CO range 1000 ppm |
| | M | NO2 | 20P | NO2 range 20ppm |
| | N | SO2 | 20P | SO2 range 20ppm |
| | O | H2 | 1000P | H2 range 1000ppm |
| | P | NH3 | 100P | NH3 range 100ppm |

**Selection examples：** If the selected measurement elements are PM2.5, PM10, temperature, humidity, formaldehyde, O2, CH4, CO. Then the corresponding selection is RS-MG111-N01-1-ABGIKL

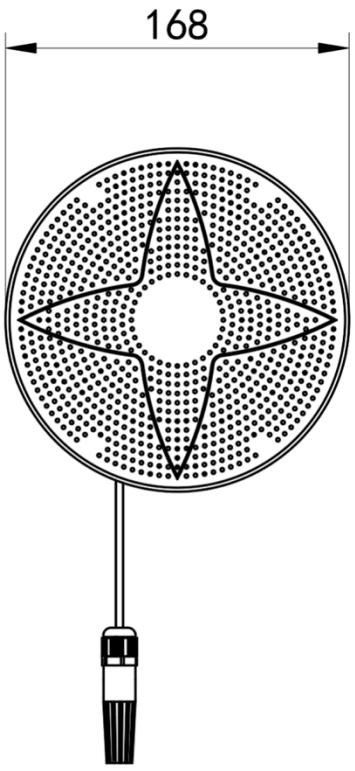
# 3.device installation

## 3.1Check before installation

Equipment List:

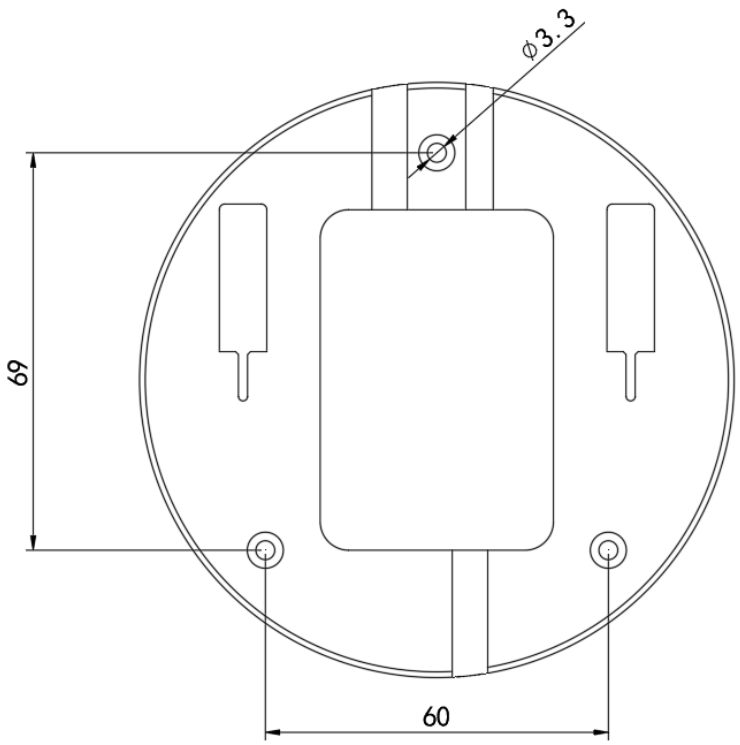
1. A multi-function air quality detector
2. Install a card holder (optional)
3. Pack of mounting screws
4. Product certificate, warranty card

## 3.2Equipment size



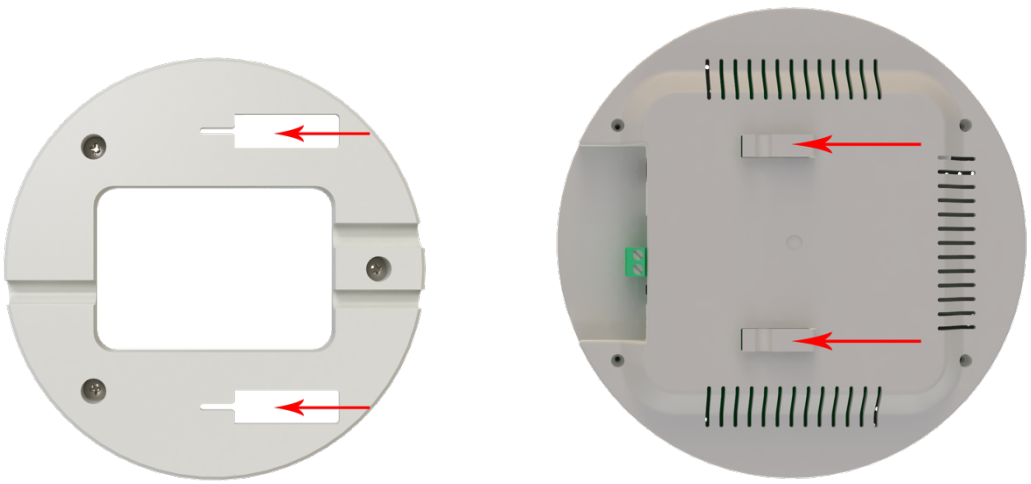
## 3.3Installation Notes

First drill holes in the wall and fix the mounting base to the wall or roof. The installation aperture and spacing are shown in the following figure:



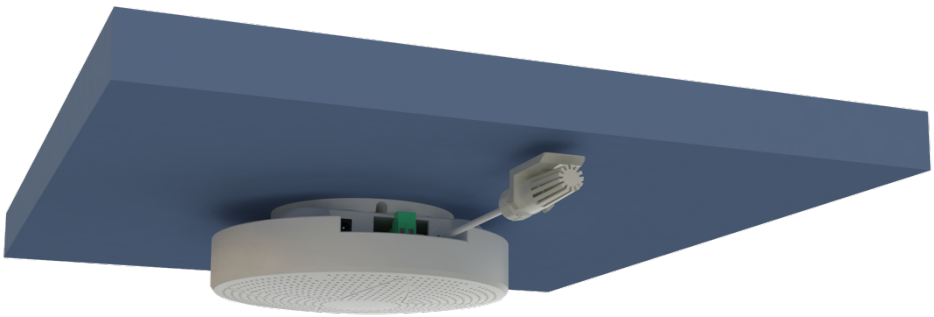

**Mounting base size (unit: mm)**

Fix the installation socket, and snap the device into the installation base, as shown in the following figure:

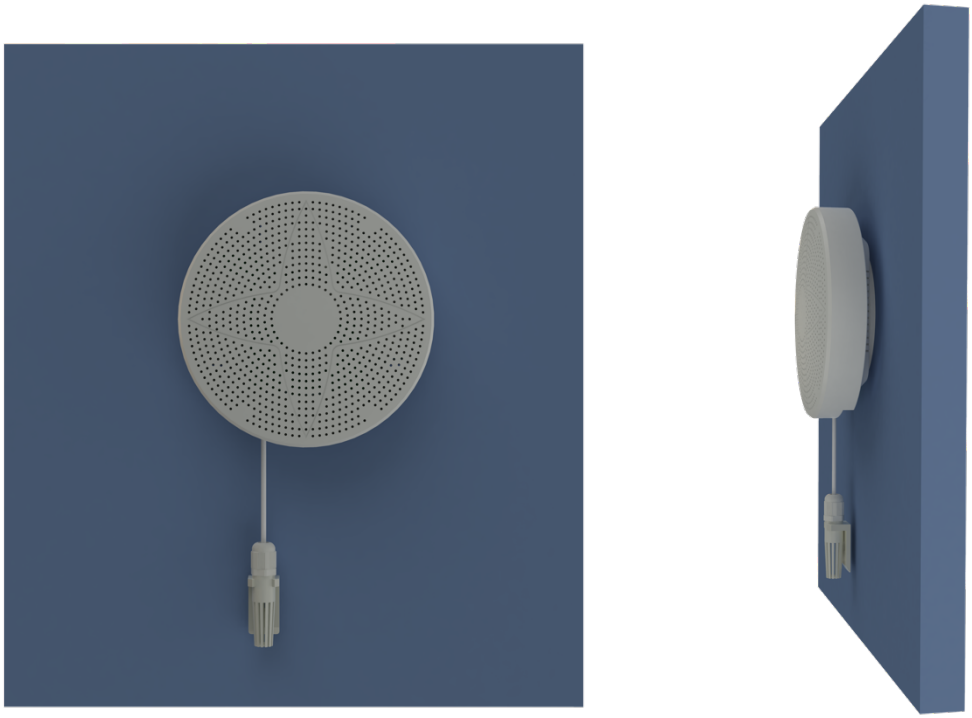


## 3.3Examples of installation methods

### 3.3.1Ceiling installation

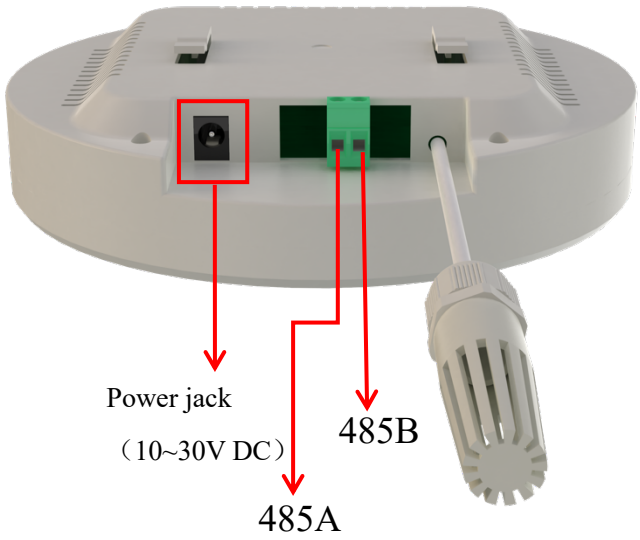


### 3.3.2Wall-mounted installation



# 4.Interface Description

Wide voltage power input can be 10 ~ 30V. When connecting the 485 signal line, please note that the two lines A and B cannot be reversed, and the addresses of multiple devices on the bus cannot conflict.




# 5.Configuration software installation and use

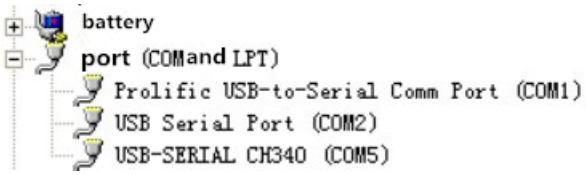
## 5.1Software selection

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

Just open it.

## 5.2parameter settings

①, select the correct COM port ("COM"-"Properties-Device Manager-Port" to view the COM port), the following figure lists the driver names of several different 485 converters.



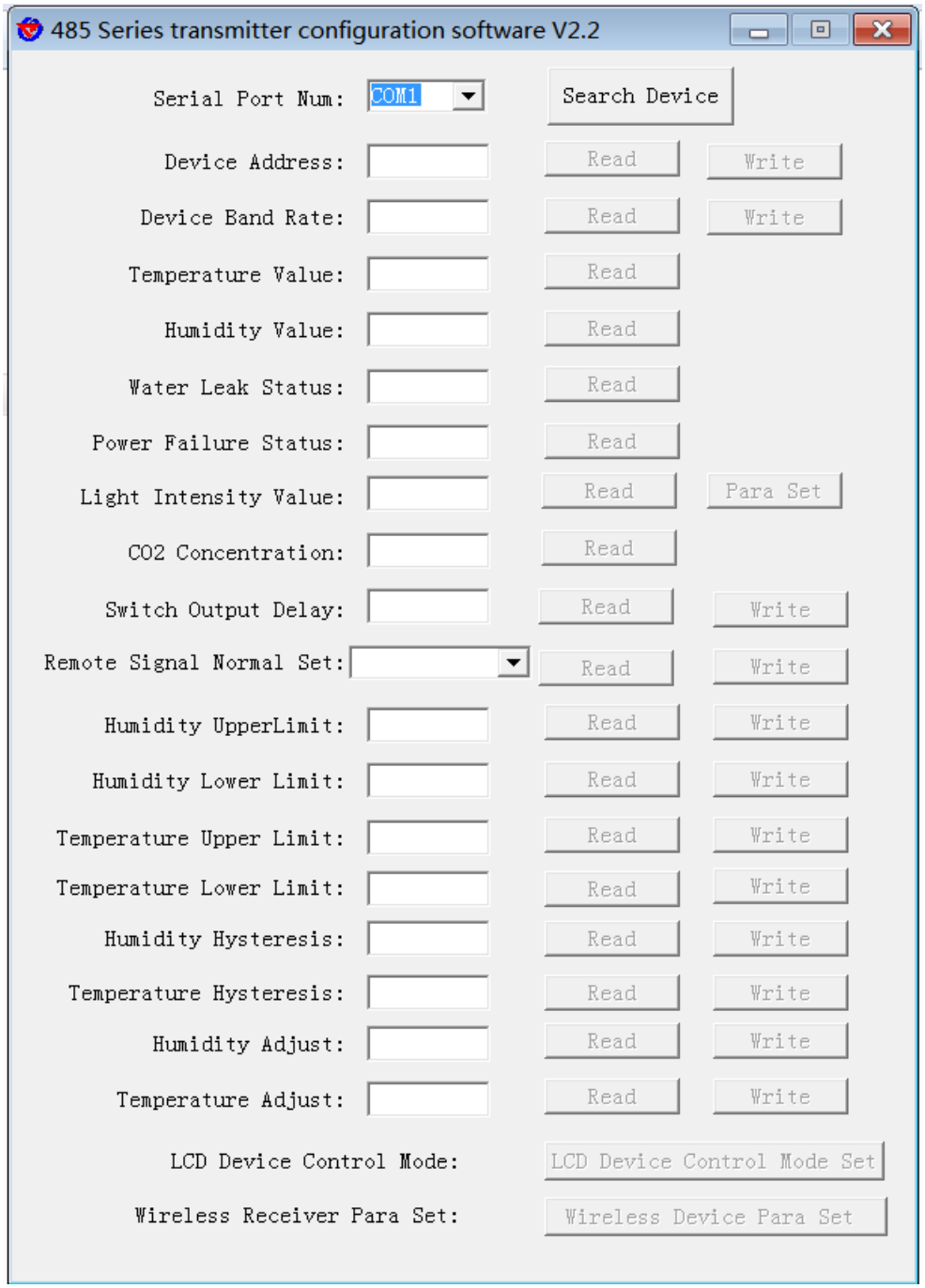

②, only connect one device and power on, click the test baud rate of the software, the software will test the current device baud rate and address, the default baud rate is 4800bit / s, the default address is 0x01.

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

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

⑤ Click on the corresponding gas to directly view the current real-time value of the gas.

⑥ Note: This software can only set three baud rates of 2400bit / s, 4800bit / s and 9600bit / s.




# 6.letter of agreement

## 6.1Communication basic parameters

| | |
|---|---|
| Coding | 8-bit binary |
| Data bit | 8 bit |
| Parity bit | no |
| Stop bit | 1 person |
| Error | CRC (Redundant Cyclic Code) |

| | |
|---|---|
| checking | |
| Baud rate | 2400bit / s, 4800bit / s, 9600bit / s, 19200bit / s can be set, the factory default is 4800bit / s |

## 6.2Data frame format definition

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

Time for initial structure ≥ 4 bytes

Address code = 1 byte

Function code = 1 byte

Data area = N bytes

Error check = 16-bit CRC code

End structure ≥ 4 bytes of time

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

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

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

CRC code: two-byte check code.

Host inquiry frame structure:

| address code | function code | Register start address | Register length | Check digit low | Check digit high |
|---|---|---|---|---|---|
| 1byte | 1byte | 2byte | 2byte | 1byte | 1byte |

Slave response frame structure:

| address code | function code | Effective bytes | Data area | Data area two | Data N area | Check code |
|---|---|---|---|---|---|---|
| 1byte | 1byte | 1byte | 2byte | 2byte | 2byte | 2byte |

## 6.3Register address

| Register address | PLC or configuration address | content | operating | Scope and definition |
|---|---|---|---|---|
| 0000 H | 40001 | PM2.5 (ug/m3) | Read only | Actual value |

| | | | | |
|---|---|---|---|---|
| 0001 H | 40002 | PM10 (ug/m3) | Read only | Actual value |
| 0002 H | 40003 | temperature（℃） | Read only | 10 times more upload |
| 0003 H | 40004 | humidity (%RH) | Read only | 10 times more upload |
| 0004 H | 40005 | Atmospheric pressure (KPa) | Read only | 10 times more upload |
| 0005 H | 40006 | Illumination (Lux) | Read only | High actual light value |
| 0006 H | 40007 | | | Low actual light value |
| 0007 H | 40008 | TVOC (ppb) | Read only | Actual value |
| 0008 H | 40009 | Co2 (ppm) | Read only | Actual value |
| 0009 H | 40010 | $CH_2O$ (ppm) | Read only | 100 times more upload |
| 000A H | 40011 | O3 (ppm) | Read only | 100 times more upload |
| 000B H | 40012 | O (%Vol) | Read only | 100 times more upload |
| 000C H | 40013 | H2S(ppm) | Read only | Actual value |
| 000D H | 40014 | CH4 (%LEL) | Read only | Actual value |
| 000E H | 40015 | CO (ppm) | Read only | Actual value |
| 000F H | 40016 | NO2 (ppm) | Read only | 10 times more upload |
| 0010 H | 40017 | SO2 (ppm) | Read only | 10 times more upload |
| 0011 H | 40018 | H2 (ppm) | Read only | Actual value |

| | | | | |
|---|---|---|---|---|
| 0012 H | 40019 | NH3 (ppm) | Read only | Actual value |
| 0050 H | 40081 | PM2.5 Calibration value | Read and write | Actual value |
| 0051 H | 40082 | PM10 Calibration value | Read and write | Actual value |
| 0052 H | 40083 | Temperature calibration value | Read and write | 10 times more upload |
| 0053 H | 40084 | Humidity calibration value | Read and write | 10 times more upload |
| 0054 H | 40085 | Atmospheric pressure calibration value | Read and write | 10 times more upload |
| 0056 H | 40087 | Illumination calibration value | Read and write | Actual value |
| 0057 H | 40088 | TVOC calibration value | Read and write | Actual value |
| 0058 H | 40089 | CO2 calibration value | Read and write | Actual value |
| 0059 H | 40090 | Formaldehyde calibration value | Read and write | 100 times more upload |
| 005A H | 40091 | Ozone calibration value | Read and write | 100 times more upload |

| | | | | |
|---|---|---|---|---|
| 005B H | 40092 | Oxygen calibration value | Read and write | 10 times more upload |
| 005C H | 40093 | Hydrogen sulfide calibration value | Read and write | Actual value |
| 005D H | 40094 | Methane calibration value | Read and write | Actual value |
| 005E H | 40095 | Carbon monoxide calibration value | Read and write | Actual value |
| 005F H | 40096 | Nitrogen dioxide calibration value | Read and write | 10 times more upload |
| 0060 H | 40097 | Calibration value of sulfur dioxide | Read and write | 10 times more upload |
| 0061 H | 40098 | Hydrogen calibration value | Read and write | Actual value |
| 0062 H | 40099 | Ammonia calibration value | Read and write | Actual value |
| 07D0 H | 42001 | 485 address | Read and write | 1 ~ 255 (factory default 1) |
| 07D1 H | 42002 | 485 baud rate | Read and write | 0 means 2400bit / s<br>1 for 4800bit / s<br>2 for 9600bit / s |

## 6.4Communication protocol example and explanation

### 6.4.1Read the PM2.5 real-time value (actual value) of device address 0x01

Inquiry frame

| address code | function code | starting address | Data length | Check digit low | Check digit high |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x00 0x00 | 0x00 0x01 | 0x84 | 0x0A |

Reply frame

| address code | function code | Returns the number of valid bytes | PM2.5value | Check digit low | Check digit high |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x02 | 0x00 0x12 | 0x38 | 0x49 |

PM2.5:

0012 H (hexadecimal) = 18 => PM2.5 = 18 ug / m3

### 6.4.2 Read the real-time value of SO2 (20ppm) at device address 0x01 (upload 10 times larger)

Inquiry frame

| address code | function code | starting address | Data length | Check digit low | Check digit high |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x00 0x10 | 0x00 0x01 | 0x85 | 0xCF |

Reply frame

| address code | function code | Returns the number of valid bytes | SO2 value | Check digit low | Check digit high |
|---|---|---|---|---|---|
| 0x01 | 0x03 | 0x02 | 0x00 0x64 | 0xB9 | 0xAF |

SO2：

0064 H(Hex) =100 => SO2=10ppm

### 6.4.3SO2 calibration value written to device address 0x01 (enlarge 10 times to write)

Inquiry frame

| address code | function code | starting address | Write data area | Checksum low byte | Check code high byte |
|---|---|---|---|---|---|
| 0x01 | 0x06 | 0x00 0x60 | 0x00 0x14 | 0x45 | 0xDB |

Reply frame

| address code | function code | starting address | data input | Checksum low byte | Check code high byte |
|---|---|---|---|---|---|
| 0x01 | 0x06 | 0x00 0x60 | 0x00 0x14 | 0x45 | 0xDB |

Write SO2 calibration (set the calibration value to 2ppm):

SO2 2ppm Expand ten times write = 20 => 0014 H (Hexadecimal)

# 7.Common problems and solutions

Device cannot be connected to 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) Baud rate, check mode, data bit, stop bit error.

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

5) The 485 bus is disconnected, or the A and B lines are reversed.

6) If the number of devices is too large or the wiring is too long, power should be supplied nearby, and a 485 booster should be added, and 120Ω terminal resistance should be added at the same time.

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

8) The equipment is damaged.