RS485 Air Quality Sensor V2_V1.2

Home and Building Control System

Attentions

1. **Please keep devices away from strong magnetic field, high temperature, wet environment;**

Away from magnetic field	Away from high-temp	Prevent moisture

2. **Please do not fall the device to the ground or make them get hard impact;**

Handle with care

3. **Please do not use wet cloth or volatile reagent to wipe the device;**

Wipe with care

4. **Please do not disassemble the devices.**

Contents

Chapter 1 Overview

The air quality is closely related to our life, and the air quality directly affects our work and life. RS485 air quality sensor is mainly used for real-time monitoring and assessment of the air pollution index in the current environment, including PM2.5/ PM10, VOC, AQI, and temperature and humidity. According to the detected pollution index, temperature and humidity, the corresponding control can be carried out to optimize the home environment and improve the air quality.

The product is connected to the 485 bus through the wiring terminal, and a 12-30V DC power supply is required, and the standard 80 or 86 box wall loading mode is adopted. The user can read the relevant sensor information via the 485 interface protocol as needed.

The main functions of the product are as follows:

- **Display of PM2.5 and PM10 pollution particles detection**

- **Display of the temperature and humidity detection**

- **Display of the air quality grade inspection**

- **Display of the (VOC) atmospheric organic compounds detection**

Chapter 2 Technical Data

Power Supply	Operating voltage	12-30V DC
	Operating current	<62mA/12V DC, <32mA/24V DC <25mA/30V DC
	Consumption	<0.8W
Output	RS485 bus connection terminal	1 fold
Connection	Power supply	Connection terminal(Yellow/White)
Installation	Standard 80 or 86 box wall mounting mode	
Operation and display	Function button	Long press to set slave address
Transport rate	9600 bps	
Transmission distance	< 1 km	
Transmission medium	Twisted pair or shielded wire	
Operating mode	Asynchronous half-duplex differential transmission	
Temperature	Measuring range and Accuracy	-5°C…45°C, ±1°C
	Resolution	0.1°C
Humidity	Measuring range and Accuracy	10...90%, ±4.5% 0...10% / 90...100%, ±8%
	Resolution	0.1%
Particle concentration	Measuring range	0-999 μg/m³
	Counting yield	50%(φ=0.3um) 98%(φ≥0.5 um)
	Response time	≤10s
VOC detection	Range and accuracy	0-9.99 mg/m^3, ±10%
Temperature range	Operation	− 5 °C ... 45 °C
	Storage	− 25 °C ... 55 °C
	Transport	− 25 °C ... 70 °C
Ambient	Humidity	<93%, except dewing
Dimension	86 ×86 ×48.3mm	
Weight	0.15KG	

Chapter 3 Dimensions and Connection Diagram

3.1 Dimension Diagram
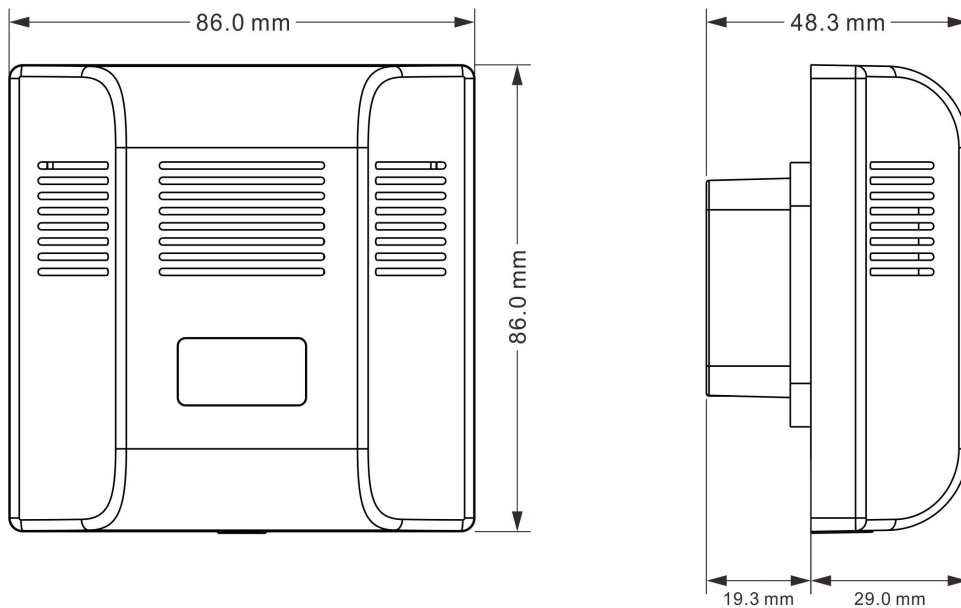
3.2 Structure
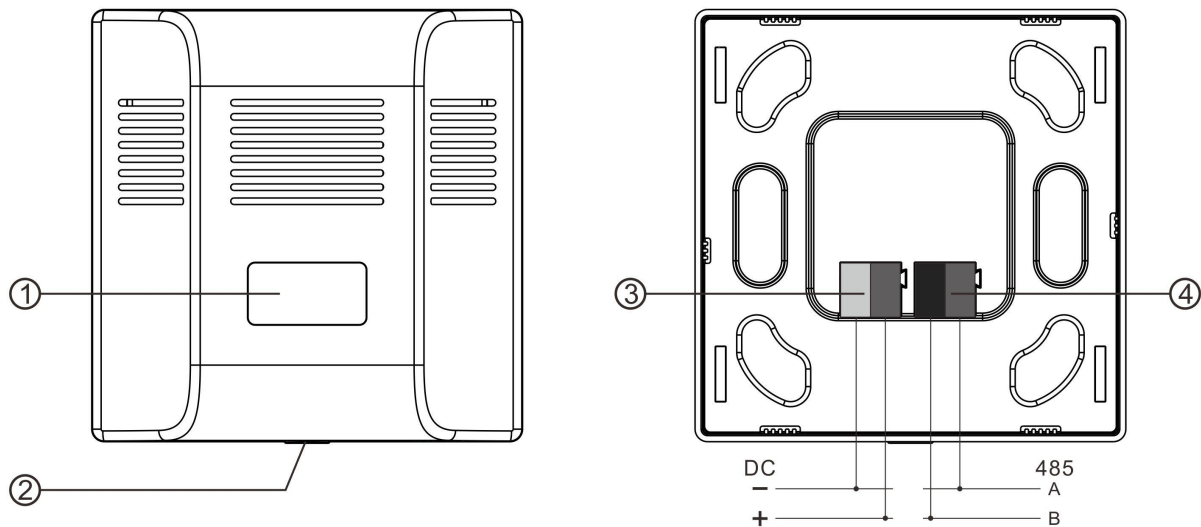
①Display area

②Function button: Long press to set the slave address. Then, short press to modify the one digit of the address, long press to modify the ten place of the address, not operating 8 seconds to exit the setting

③Power supply connection terminal

④RS485 bus connection terminal

Chapter 4 Communication Protocol

RS485 air quality sensor has 9600bps of communication rate, 1 bit stop bit, 8 bit data bit, no check bit. The data communication is LSB first, the communication mode is the host-slave response. Slave is in the state of receiving await under the normal condition, and does not send communication data. Only after the data was sent to the local address by the host, the slave starts to process the signal, and returns a frame of reply data.

4.1   Slave address setting

The operation of this product to set the slave address is to press the bottom key for a long time. After entering the address modification state, by short pressing the button can we modify the individual bit of address,by long pressing the button can we modify the ten bits of the address.If the key not been operated for 8s, then the slave address will be set up and converted back to the normal display state.The slave address setting range is 0..255.

4.2   Function code instruction

The sensor provides two instructions for the user to read the data, and the functions are as follows:

Function code	Information
03H	Read the value of a single register address
04H	Read the value of multiple register addresses

4.3　　Register

Register address	Register internal data structure （ 16 bit：B15~B0 ）															
	B15	B14	B13	B12	B11	B10	B9	B8	B7	B6	B5	B4	B3	B2	B1	B0
03E9H	The value of the register is 10 times that of the actual temperature, that is, if the current temperature is 25.1 degrees, the value of the register is 251. The highest bit B15 is symbolic bit, 0 is positive and 1 is negative. Data range is -50...450															
03EAH	The value of the register is 10 times that of the actual humidity value, that is, if the current temperature is 55.1%, the value of the register is 551. The data range is 0...1000															
03EBH	The value stored in this register is the actual PM2.5 value, with a data range of 0...500															
03ECH	The value of the register is the actual PM10 value, and the data range is 0...500.															
03EDH	The value of the register is 1000 times of the actual VOC value, and the data range is 0...9999.															
03EEH	High 4 digits for AQI level						The last 12 bits represent the AQI value, with a data range of 0...500									
03EFH-07D0H　　reservation																

4.4   Communication format

1)   Host single register query format:

Host send：   **01 03 03 E9 00 01 55 BA**

Slave address	01H
Function code	03H
Starting address (high)	03H
Starting address(low)	E9H
Count of registers (high)	00H
Count of register(low)	01H
CRC（low）	55H
CRC（high）	BAH

Note:

The host queries the data with the slave address 0x01. The function code 0x03 indicates that the host reads the value of the register from the register address 0x03E9, and the number of registers is always 1.

Host respond：   01 03 02 00 FB F9 C7

Slave address	01H
Function code	03H
Data size	02H
Temperature(high)	00H
Temperature(low)	FBH
CRC（low）	F9H
CRC（high）	C7H

Note:

Answer from the machine, respond to the corresponding functional code, respond to the numerical size of the register 0x03E9, and then respond to the data. In this case, 0x03E9 is the temperature register, the read value is 251, and the conversion temperature value is 25.1 degrees.

2) Host multi-register query format

Host send：**01 04 03 E9 00 06 A1 B8**

Slave address	01H
Function code	04H
Starting of address(high)	03H
Starting of address(low)	E9H
Number of register(high)	00H
Number of register(low)	06H
CRC（low）	A1H
CRC（high）	B8H

Note:

The host queries the data with the slave address 0x01. The function code 0x04 indicates that the host reads the values of six registers continuously from the register address 0x03E9.

Slave respond：01 04 0C 01 03 02 5E 00 16 00 18 03 9D 10 1F FC F8

Slave address	01H
Function code	04H
Data size	0CH
Temperature(high)	01H
Temperature(low)	03H
Humidity (high)	02H
Humidity (low)	5EH
PM2.5(high)	00H
PM2.5(low)	16H
PM10(high)	00H
PM10(low)	18H
VOC(high)	03H
VOC(low)	9DH
AQI(high)	10H
AQI(low)	1FH
CRC(low)	FCH
CRC(high)	F8H

Note:
Answer from the machine, respond to the corresponding functional code, respond to the numerical of the register 0x03E9 to 0x3EE, and then respond to the data.

In this case, the data transformations are as follows:

1. Temperature value is 0x0103, the read value is 259, and the conversion temperature value is 25.9 degrees.

2. Humidity value is 0x0302, the read value is 77, and the conversion temperature value is 77%.

3. PM2.5 value is 0x0016, the read value is 22μg/m³, and the conversion PM2.5 value is 22μg/m³.

4. PM10 value is 0x0018, the read value is 24μg/m³, and the conversion PM10 value is 24μg/m³.

5. VOC value is 0x039D, the read value is 985, and the conversion VOC value is 0.985mg/m³.

6. AQI value is 0x101F, the high four bits is AQI level, so the level is 1, the low 12 bits is AQI value, and the conversion AQI value is 31.