



# **Air Quality Module (TTL Serial Port)**

**SM-VOC-P01**

**Ver 2.1**

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# Chapter 1 Product Introduction

## 1.1 Product Overview

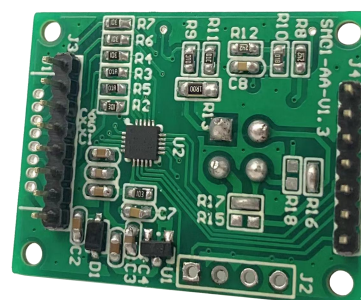
This module is widely used in air purifiers, fresh air ventilation systems, intelligent integrated ceilings, air quality monitors, ventilation fans, air conditioners, etc. It is mainly used for the detection of air quality. It has high sensitivity for various low-concentration pollutants in the air, such as cigarettes, odors from cooking, TVOC (gas volatile from organic solvents), etc. This uses advanced gas sensors and scientific software processing to achieve control closer to human senses and to detect the level of air pollution.

## 1.2 Features

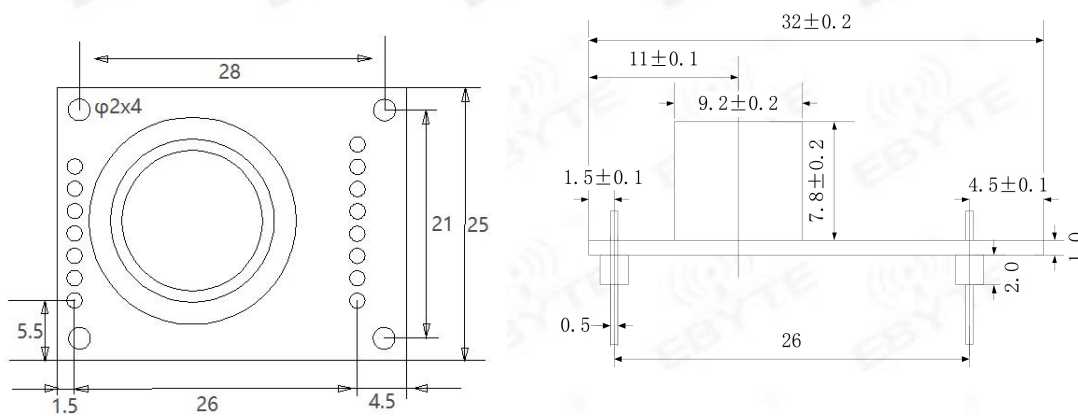
This product adopts high-sensitivity semiconductor probe with stable signal and high precision. Low power consumption, long life, high selectivity to low concentration gas, high sensitivity to cigarette or cooking odor and organic solvent volatilized gas.

## 1.3 Main Parameters

<b>Gas Detection</b>	Formaldehyde, benzene, carbon monoxide, hydrogen, alcohol, ammonia, cigarette smoke, essence, etc.
<b>Sensor Type</b>	Semiconductor (Optional Figaro sensor)
<b>Interface Type</b>	8pin and 7pin 2.0mm pin header
<b>Signal Output</b>	TTL serial port (Modbus-RTU protocol)
<b>Output Data</b>	0~10 pollution signal
<b>Output Data Type</b>	1. TTL serial port 2. Level pulse signal
<b>Working voltage</b>	DC 4.8V~5.3V
<b>Working</b>	≤60mA



<b>Current</b>	
<b>Response Time</b>	$\leq 20$ s
<b>Recovery Time</b>	$\leq 60$ s
<b>Warm-up Time</b>	$\leq 3$ minutes
<b>Operating Environment</b>	Temperature: 0~50 °C Humidity: $\leq 95\%$ RH
<b>Storage Environment</b>	Temperature: -20~60 °C Humidity: $\leq 60\%$ RH
<b>Dimensions</b>	32mm × 25mm × 15mm



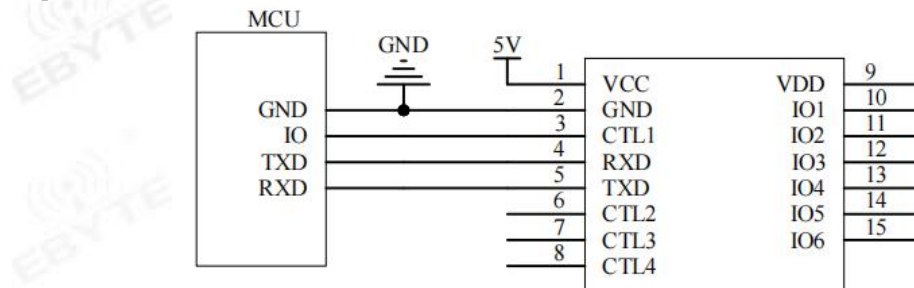
## Pin Function Description

NO.	Name	Function
1	VCC	5V module power input
2	GND	Ground

3	CTL1	level pulse signal		
		高 ms	低 ms	污染等级
		0	100	0
		10	90	1
		20	80	2
		30	70	3
		40	60	4
		50	50	5
		60	40	6
		70	30	7
		80	20	8
		90	10	9
		100	0	10
4	RXD	Serial port RXD data receiving pin		
5	TXD	Serial port TXD data transmission pin		
Other	NC	Reserve		

## 1.4 System Frame Diagram

Principles of application of detection components



## 1.5 Product Selection

SM-				company code
	VOC-			Methane (natural gas)
		P01		TTL serial communication (Modbus-RTU protocol)
		N01-		485 serial communication (Modbus-RTU protocol)
			8	Rail-mount shell

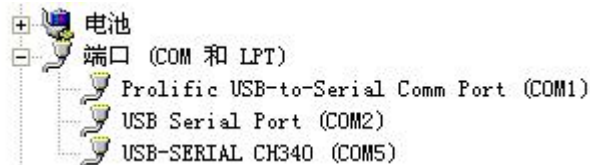
## Chapter 2 Configuring Software Installation and Use

Our company provides supporting "sensor monitoring software", which can easily use the computer to read the parameters of the sensor, and flexibly modify the device ID and address of the sensor.

Note that there is only one sensor on the bus when using automatic acquisition by software.

### 2.1 Connect the Sensor to the Computer

After the sensor is correctly connected to the computer via USB to TTL and provides power, the correct COM port can be seen in the computer (check the COM port in "My Computer - Properties - Device Manager - Port").



Open the data package, select "Debugging Software"---"Parameter Configuration

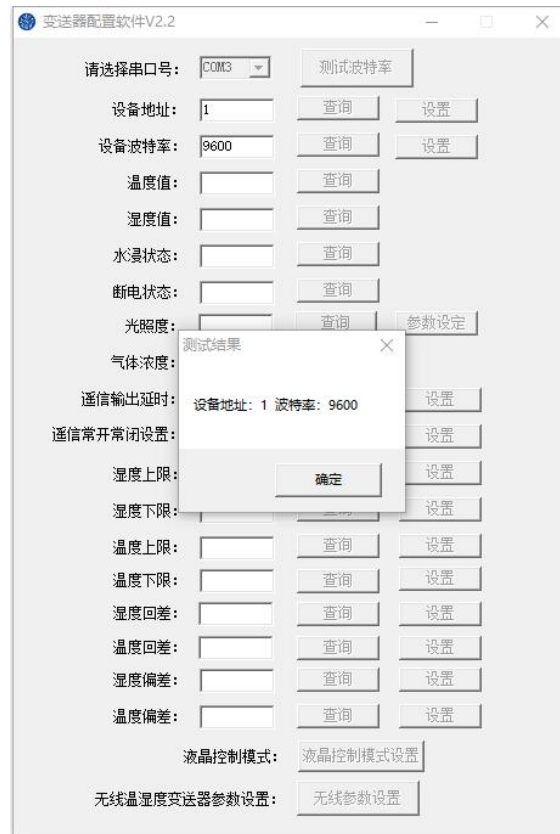


Software", find ControlV22.exe and open it.

If the COM port is not found in the device manager, it means that you have not installed the USB to TTL driver (included in the data package) or the driver has not been installed correctly, please contact a technician for help.

### 2.2 The Use of Sensor Monitoring Software

- ①、The configuration interface is shown in the figure. First, obtain the serial port number and select the correct serial port according to the method in chapter 3.1.
- ②、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 9600bit/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 functional status of the device.
- ④、If the test is unsuccessful, please re-check the equipment wiring and driver installation.



## Chapter 3 Communication Protocol

### 3.1 Basic Communication Parameters

<b>Encoding</b>	8-bit binary
<b>Data Bits</b>	8 bits
<b>Parity Bit</b>	None
<b>Stop Bit</b>	1bit
<b>Error Check</b>	CRC (Redundant Cyclic Code)
<b>Baud Rate</b>	2400bit/s, 4800bit/s, 9600 bit/s can be set, the factory default is 9600bit/s

### 3.2 Data Frame Format Definition

Using 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

Time to end structure  $\geq$  4 bytes

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

Function code:

Function code	Meaning	Operable register address
0x03	Read register data	0x02、0x100~0x10D
0x10	Write multiple registers	0x102~0x10D

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

CRC code: two-byte check code.

Host query frame structure:

Address Code	Function Code	Register Start Address	Register Length	Check code low bit	Check code high bit
1byte	1byte	2byte	2byte	1byte	1byte

Slave response frame structure:

Address Code	Function Code	Number of Valid Bytes	Data Area 1	Data Area 2	Data Area N	Check Code
1byte	1byte	1byte	2byte	2byte	2byte	2byte

### 3.3 Register Address

Register Address	Quantity	Meaning	Status	Data Range
0x02	1	Gas Concentration	Read Only	0~10000PPM
0x100	1	Device Model	Read Only	0~0xFFFF
0x101	1	Device Software Version	Read Only	0~0xFFFF
0x102	10	Device Name	Read&Write	0~0xFFFF
0x10C	1	Device address	Read&Write	0~0xFF
0x10D	1	Serial Port attribute	Read&Write	See serial port



				attribute register
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Serial port properties:

Data Bits	Meaning
BIT15~BIT8	Parity check selection 0: No verification (Factory Default) 1: odd parity 2: Even parity
BIT7~BIT0	Baud rate selection 0: 1200bps 1: 2400bps 2: 4800bps 3: 9600bps (Factory Default) 4: 19200bps

### 3.4 Communication Protocol Example and Explanation

Example 1: Read the gas concentration value of device address 0x01

Query frame (Hexadecimal):

Address Code	Function Code	Starting Address	Data Length	Check Code Low	Check Code High
0x01	0x03	0x00 0x02	0x00 0x01	0x25	0xCA

Response frame (hexadecimal):

Address Code	Function Code	Return valid number of bytes	Gas concentration value	Check Code Low	Check Code High
0x01	0x03	0x02	0x00 0x03	0xF8	0x45

Gas concentration calculation:

Concentration: 0003 H (hexadecimal) = pollution level 3

Example 2: Modify the device address 0x01 to 0x02

Query frame (hexadecimal):

Address Code	Function Code	Starting Address	Data Length	Number of bytes in the data area (2*N)	Data Area	Check Code

0x01	0x10	0x01 0x0C	0x00 0x01	0x02	0x00 0x02	0x37 0x9D
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Response frame (hexadecimal):

Address Code	Function Code	Starting Address	Data Length	Check Code Low	Check Code High
0x01	0x10	0x01 0x0C	0x00 0x01	0xC0	0x36

## Chapter 4 Precautions

### 1. Situations that must be avoided

#### 1.1 Exposure to Volatile Silicon Compound Vapors

Avoid exposure of modules to silicone adhesives, hairspray, silicone rubber, putty, or other locations where volatile silicone compounds are present. Otherwise, the sensitivity of the module will decrease or even not respond.

#### 1.2 Highly corrosive environment

Exposing the module to high concentrations of corrosive gases (such as H<sub>2</sub>S, SO<sub>X</sub>, Cl<sub>2</sub>, HCl, etc.) will cause corrosion or damage to the sensor heating materials and sensor leads in the module, and cause irreversible deterioration of the performance of sensitive materials. changes, which in turn affects the performance and accuracy of the module.

#### 1.3 Exposure to water

If the sensor in the module is splashed or immersed in water, the sensitive characteristics of the sensor will be degraded, which will affect the measurement accuracy of the module.

#### 1.4 Freezing

The freezing on the surface of the sensor sensitive material of the module will cause the sensitive layer to be broken and lose the sensitive characteristics.

### 2. Situations to avoid as much as possible

#### 2.1 Condensed water

Under indoor use conditions, slight condensation will have a slight effect on the sensor performance in the module. However, if water condenses on the surface of the sensitive layer and remains for a period

of time, the sensor characteristics in the module will decrease, and the measurement error of the module will also increase.

## 2.2 In high concentration gas

Regardless of whether the module is powered on or not, long-term placement in high-concentration gas will affect the sensor characteristics in the module. If the lighter gas is directly sprayed to the sensor in the module, it will cause great damage to the sensor in the module and will cause the sensitivity of the module to decrease.

## 2.3 Long-term storage

When the module is stored for a long time without being powered on, the resistance of its sensor will drift reversibly, and this drift is related to the storage environment. Modules should be stored in airtight bags free of volatile silicone compounds. Modules that have been stored for a long period of time require longer power-ups to stabilize before use.

## 2.4 Long-term exposure to extreme environments

Regardless of whether the module is powered on or not, if it is exposed to extreme conditions for a long time, such as extreme conditions such as high humidity, high temperature or high pollution, the performance of the module will be seriously affected.

3. Before installing the module, make sure that the conformal paint on the control board is completely dry.

4. If you need to reset the alarm value of the module, you can contact our sales staff.