



Multi-in-one Sensor Module

(Model: ZPHS01C)

Manual

Version: 1.1

Valid From: 2022.12.29

Zhengzhou Winsen Electronics Technology Co., Ltd

Statement

This manual copyright belongs to Zhengzhou Winsen Electronics Technology Co., LTD. Without the written permission, any part of this manual shall not be copied, translated, stored in database or retrieval system, also can't spread through electronic, copying, record ways.

Thanks for purchasing our product. In order to let customers use it better and reduce the faults caused by misuse, please read the manual carefully and operate it correctly in accordance with the instructions. If users disobey the terms or remove, disassemble, change the components inside of the sensor, we shall not be responsible for the loss.

The specific such as color, appearance, sizes ...etc., please in kind prevail.

We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

Multi-in-One Sensor Module

Profile

This module integrates Electrochemical formaldehyde, Semiconductor VOC sensor, Laser particle sensor, NDIR CO2 sensor and temperature& humidity sensor. (Users could choose CH2O version or VOC version, they are not concomitant.)

Communication Interface: TTL serial, Baud rate:9600, data bit:8, stop bit:1, parity bit: none.

Application

- Gas detector
- Air conditioner
- Air quality monitoring
- Air purifier
- HVAC system
- Smart home

Specification

| | |
|------------------|--|
| Model | ZPHS01C |
| Target Gas | PM2.5, CO2, CH2O, TVOC, Temperature&Humidity |
| Interference gas | Alcohol/CO gas...etc. |
| Working voltage | 5V (DC) |
| Average Current | < 500 mA |
| Interface level | 3 V(compatible with 3.3V) |
| Output signal | UART(TTL) |
| Interface type | MX 1.25-4P |
| Preheat time | ≤ 3min |
| CO2 range | 400~5000ppm |
| PM2.5 range | 0~1000ug/m3 |
| CH2O range | 0~1.6ppm |
| TVOC range | 4 grades |
| Tem. range | 0~65℃ |
| Tem. precision | ±0.5℃ |
| Hum. range | 0~100% RH |
| Hum. precision | ±3% |
| Working Tem. | 0~50℃ |
| Working Hum. | 15~80% RH(no condensation) |
| Storage Tem. | 0~50℃ |
| Storage Hum. | 0~60% RH |
| Size | 62.5mm (L) x 61mm(W) x 25mm(H) |

Table 1: performance parameter

Module Appearance

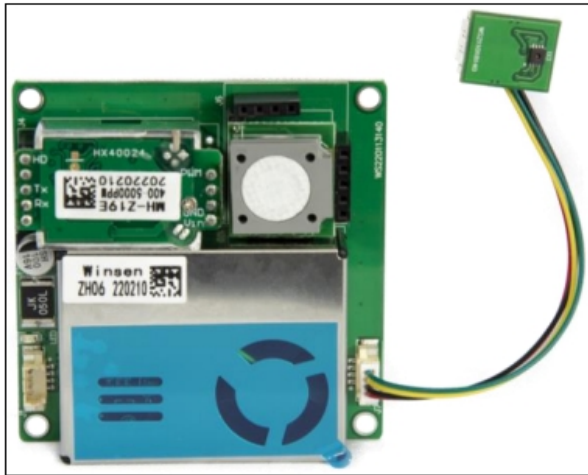


Fig1 : CH2O version

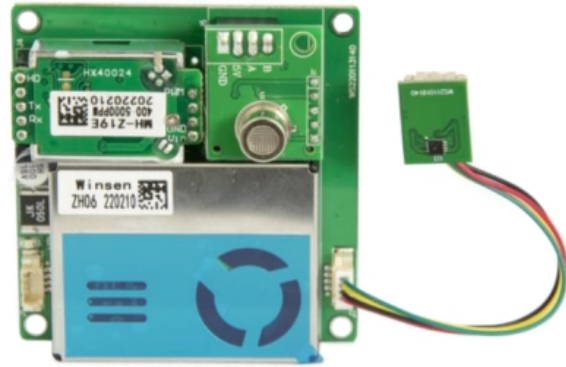


Fig2 : VOC version

Module size

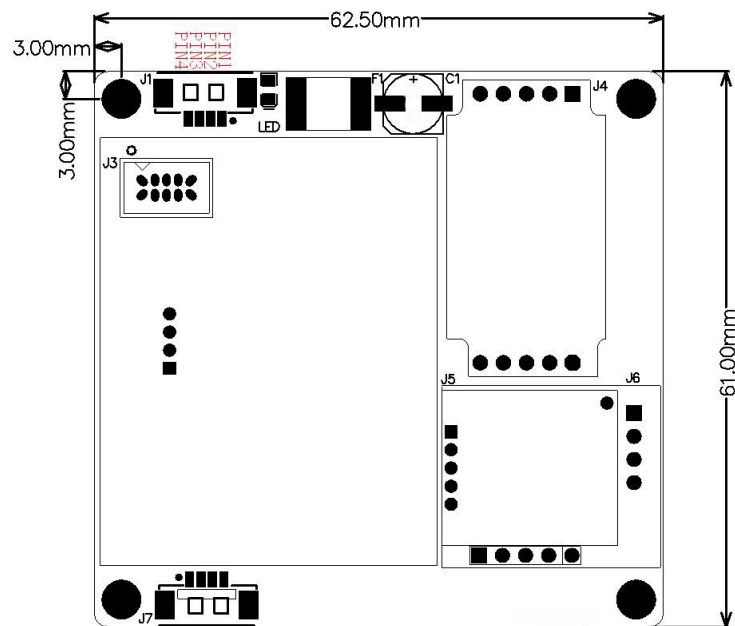


Fig 3: Mounting dimension

Pin Definition

| | | |
|------|-----|--|
| PIN1 | GND | Power input (Ground terminal) |
| PIN2 | Vin | Power input (+5V) |
| PIN3 | RXD | serial port (serial port receiver for modules) |
| PIN4 | TXD | serial port (serial port sender for modules) |

Serial communication protocol format

The host computer sends the format

| | | | | | | |
|-----------------|--------|----------------|--------|-------|--------|----------|
| Start character | length | Command number | Data 1 | | Data n | checksum |
| HEAD | LEN | CMD | Data 1 | | Data n | CS |
| 11H | XXH | XXH | XXH | | XXH | XXH |

Detailed protocol format

| Protocol format | Detailed explanation |
|-----------------|---|
| Start character | Upper PC send [11H], Module responses [16H] |
| Length | Frame byte length = data length+1 (includes CMD+DATA) |
| Command No | Command number |
| Data | Data read or written, with variable length |
| Checksum | Inverse of the sum of data accumulation |

Serial protocol command number table

| NO. | Function | Command NO. |
|-----|-----------------------------|-------------|
| 1 | To read the measure result | 0x01 |
| 2 | CO2 calibration | 0x03 |
| 3 | Start/Stop dust measurement | 0x0C |

Detailed description of protocol

Active upload mode:

To send: 11 02 01 00 EC

 Response: 16 0B 01 01 9A 00 67 01 EA 03 04 00 36 B4
 CO2 VOC/CH2O Humidity Temperature PM2.5 CS

Q&A mode:

To send: 11 02 02 00 EB

 Response: 16 0F 02 01 9A 00 67 01 EA 03 04 00 36 00 3C 00 20 53
 CO2 VOC/CH2O Humidity Temperature PM2.5 PM10 PM1.0 CS

| Identifying | Decimal valid range | Corresponding value | multiple |
|-------------|---------------------|---------------------|----------|
| CO2 | 400~5000 | 400~5000ppm | 1 |
| VOC | 0~3 | 0~3 level | 1 |
| CH2O | 0~2000 | 0~2000μg/m3 | 1 |
| PM2.5 | 0~1000 | 0~1000ug/m3 | 1 |
| PM10 | 0~1000 | 0~1000ug/m3 | 1 |
| PM1.0 | 0~1000 | 0~1000ug/m3 | 1 |
| Temperature | 500~1150 | 0~65℃ | 10 |
| Humidity | 0~1000 | 0~100% | 10 |

- The temperature value increases 500 from the actual measurement results, that is, 0℃ is corresponding to the number of 500.

$$\text{Temperature value} = (\text{DF7} * 256 + \text{DF8} - 500) / 10$$

2. The measured value is represented by two bytes, the higher byte in front while the lower byte in the back.
3. After sending the inquiry command, if the response is received, the module will upload the data every second automatically. There is no need to repeat the command before the power is turned off.

Checksum and calculation**Check=(negate (byte 0+byte 1+.....+byte n))+1****Reference routines are as follows:**

/*****

*Function name: unsigned char FucCheckSum (unsigned char * i, unsigned char ln)

*Function description: sum check

*Function description: add the first element of the array - the penultimate element and take the inverse+1 (the number of elements must be greater than 2)

*****/

```

    unsigned char FucCheckSum(unsigned char *i,unsigned char ln)

```

```

    {

```

```

        unsigned char j,tempq=0;

```

```

        for(j=0;j<(ln-1);j++)

```

```

        {

```

```

            tempq+=*i;

```

```

            i++;

```

```

        }

```

```

        tempq=(~tempq)+1;

```

```

        return(tempq);

```

```

    }

```

CO2 zero point(400ppm) calibration**To send:** 11 03 03 01 90 58**response:** 16 01 03 E6**function:** CO2 zero point calibration**Instruction:** zero point means 400ppm, please ensure that the sensor has already been working for 20 mins at least at 400ppm concentration level before sending this command.**Start & Stop dust measurement**

Send: 11 03 0C DF1 1E C2

Response: 16 02 0C DF1 CS

Function: Start/Stop dust measurement

Instruction:

- 1、 Among send command, DF1=2 means starting measurement, DF1=1 means stopping measurement;
- 2、 Among response command, DF1=2 means starting measurement, DF1=1 means stopping measurement;
- 3、 When the sensor receives the measurement command, it enters the state of continuous measurement by default.

Send: 11 03 0C 02 1E C0 //start dust measurement

Response: 16 02 0C 02 DA //the module is in "on-state dust measurement"

Send: 11 03 0C 01 1E C1 //stop dust measurement

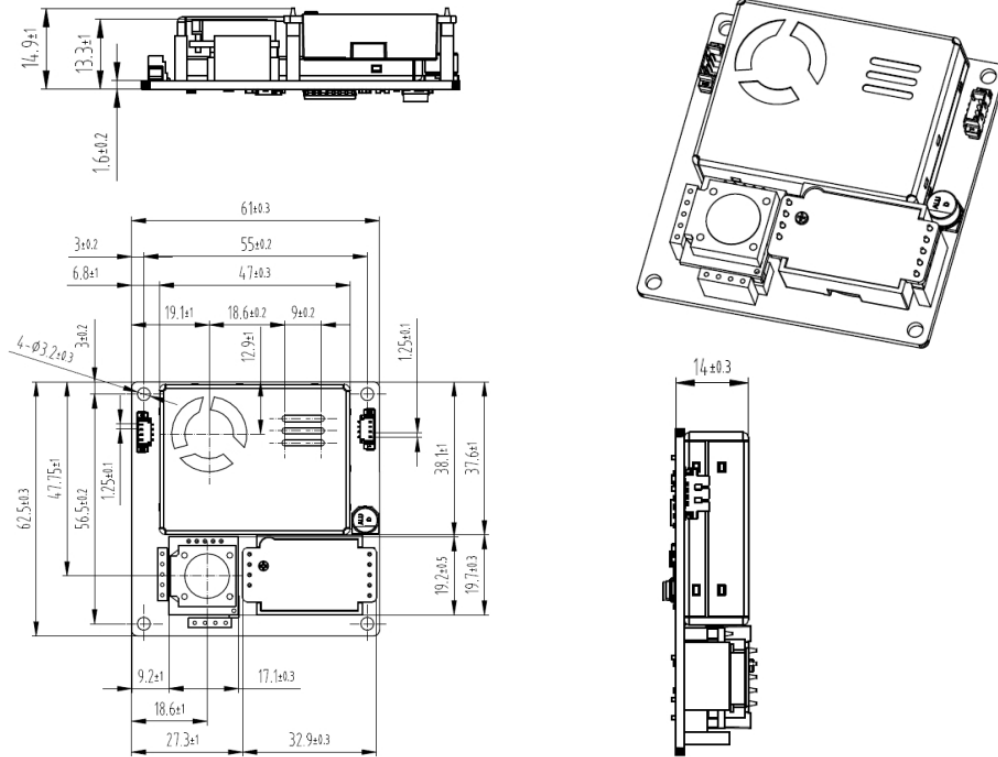
Respond: 16 02 0C 01 DB //the module is in "off-state dust measurement"

Cautions

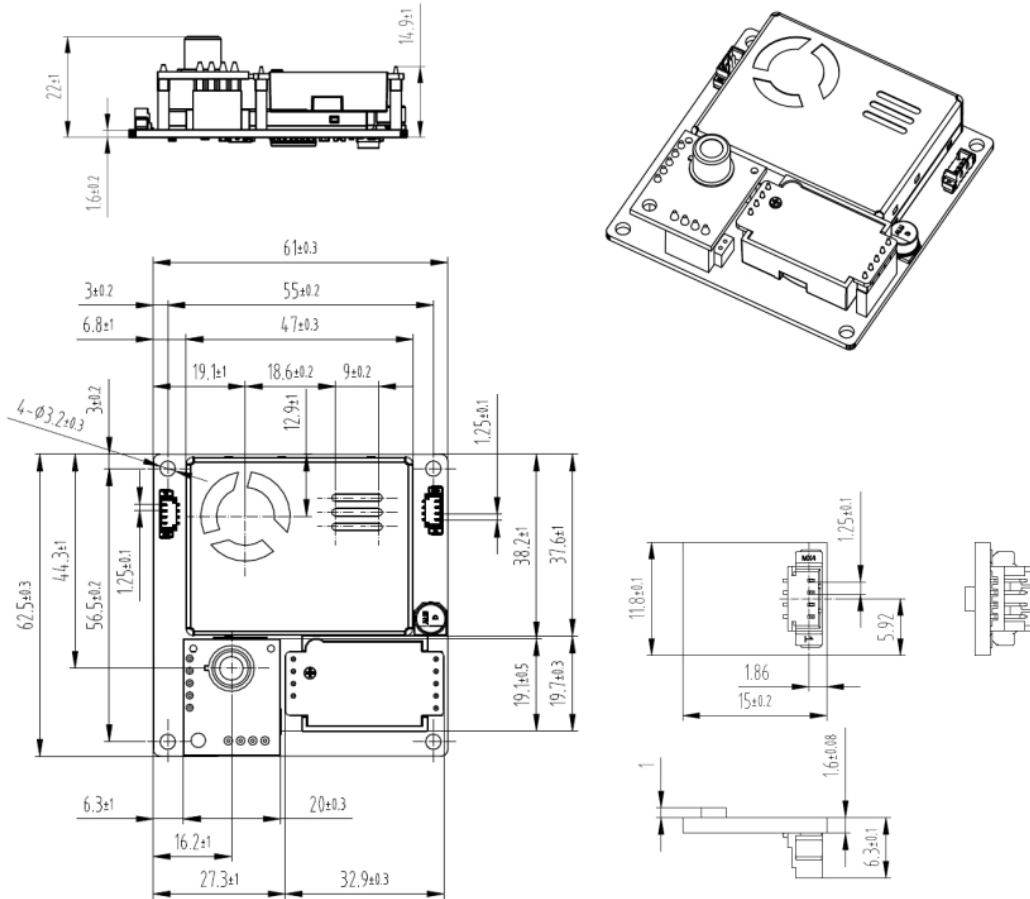
1. The PM2.5 sensor on this module is suitable for the detection of dust particles in ordinary indoor environments. The actual use environment should try to avoid soot environment, excessive dust particles, high humidity environment, such as: kitchen, bathroom, smoking room, outdoor, etc. If used in such an environment, appropriate protective measures should be added to prevent viscous particles or large particles from entering the sensor, forming a buildup inside the sensor, and affecting the sensor's performance.
2. The module should avoid contact with organic solvents (including silica gel and other adhesives), coatings, pharmaceuticals, oils and high-concentration gases.
3. The module cannot be completely encapsulated with resin material, and it cannot be immersed in an oxygen-free environment, otherwise the performance of the sensor will be damaged.
4. The module cannot be used in the environment containing corrosive gas for a long time. Corrosive gas will damage the sensor.
5. The module needs to be warmed up for more than 3 minutes when it is powered on for the first time.
6. Do not use this module in systems involving personal safety.
7. Do not use the module in narrow room, the environment should be ventilated well.
8. Do not install the module in a strong convection air environment.
9. Do not place the module in high-concentration organic gas for a long time. Long-term placement will cause the sensor zero point drift and slow recovery.
10. It is prohibited to use hot-melt adhesive or sealant to seal the module with a curing temperature higher than 80°C.
11. The module should be away from the heat source, and avoid direct sunlight or other heat radiation.
12. The module can't be vibrated or shocked.

Attachment: Structural dimension drawing

CH2O version:



VOC version:

**Zhengzhou Winsen Electronics Technology Co., Ltd**

Add.: NO.299 Jin Suo Road, National Hi-Tech Zone,
Zhengzhou, 450001 China

Tel.: 0086-371-67169097 67169670

Fax: +86- 0371-60932988

E-mail: sales@winsensor.com

Website: www.winsen-sensor.com