Qir-quality and Particles Sensor

（Model：ZPH01）

Manual

Version： 1.2

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Zhengzhou Winsen Electronics Technology Co., Ltd

Statement

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.

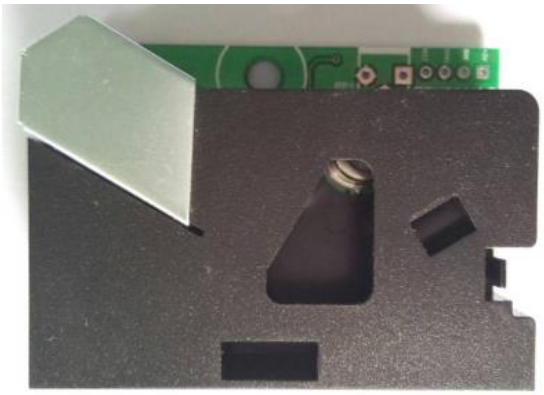
We are devoting ourselves to products development and technical innovation, so we reserve the right to improve the products without notice. Please confirm it is the valid version before using this manual. At the same time, users' comments on optimized using way are welcome.

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

Air-quality and Particles Sensor

Profile



This module integrates mature VOC detection technology and advanced PM2.5 detection technology to detect VOC and PM2.5 at the same time. The VOC sensor in this module has high sensitivity to formaldehyde, benzene, carbon monoxide, ammonia, hydrogen, alcohol, cigarette smoke, essence and other organic vapors.PM2.5 detection adopts particle counting principle to detect the particles (diameter ≥1μm).
Before delivery, the sensor has been aged, debuged, calibrated and has good consistency and high sensitivity. It has the PWM signal output, and it can be configured to be UART digital serial interface and customized IIC interface.

Features

High sensitivity, good stability for long time, calibrated before delivery, built-in heater to snift air automatically. It has the the advantages such as small size, light weight, easy to install and use, simple maintenance &etc.

Applications

Air refresher, air conditioner, ventilating device, monitor equipment for environment, smoke alarm &etc.

Technical Parameters Stable.1

Model		ZPH01
Working voltage range		5±0.2 V DC
Output		PWM /UART
Detection Ability	VOC	Formaldehyde, benzene, carbon monoxide, hydrogen, alcohol, ammonia, cigarette smoke, essence &etc.
	PM2.5 particle	≥1 μm diameter
Warm-up time		≤5min
Detection Range for particles		15000 particles /283ml
Working Current		≤150mA
Humidity range	Storage	≤90%RH
	Working	≤90%RH
Temperature range	Storage	-20℃～50℃
	Working	0℃～50℃
Size		59.47×44.5×20mm
Physical interface		EH-2.54-5P

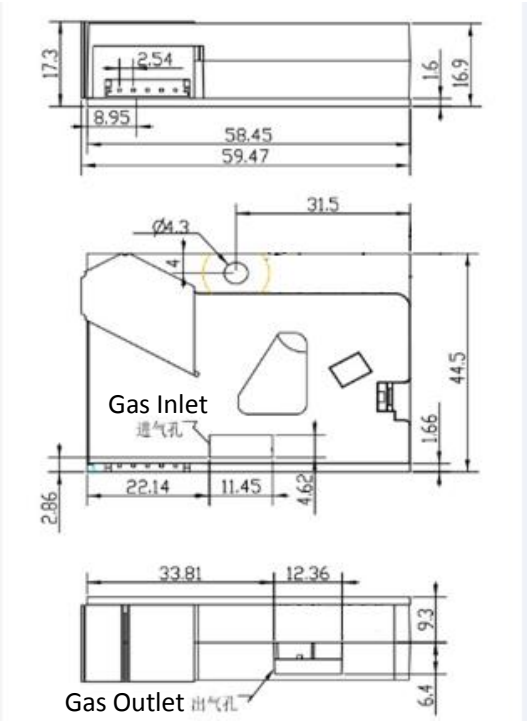


Fig1.Structure

Detection Principle

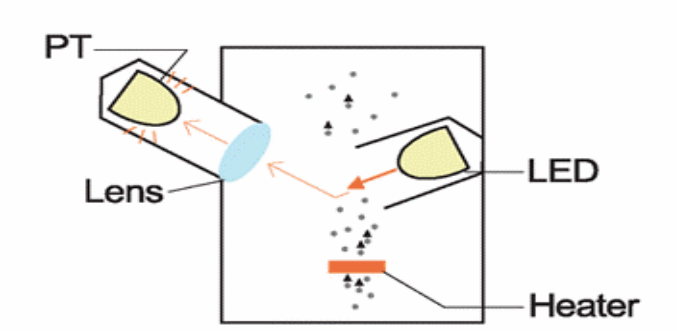


Fig 2.Principle schematic 1

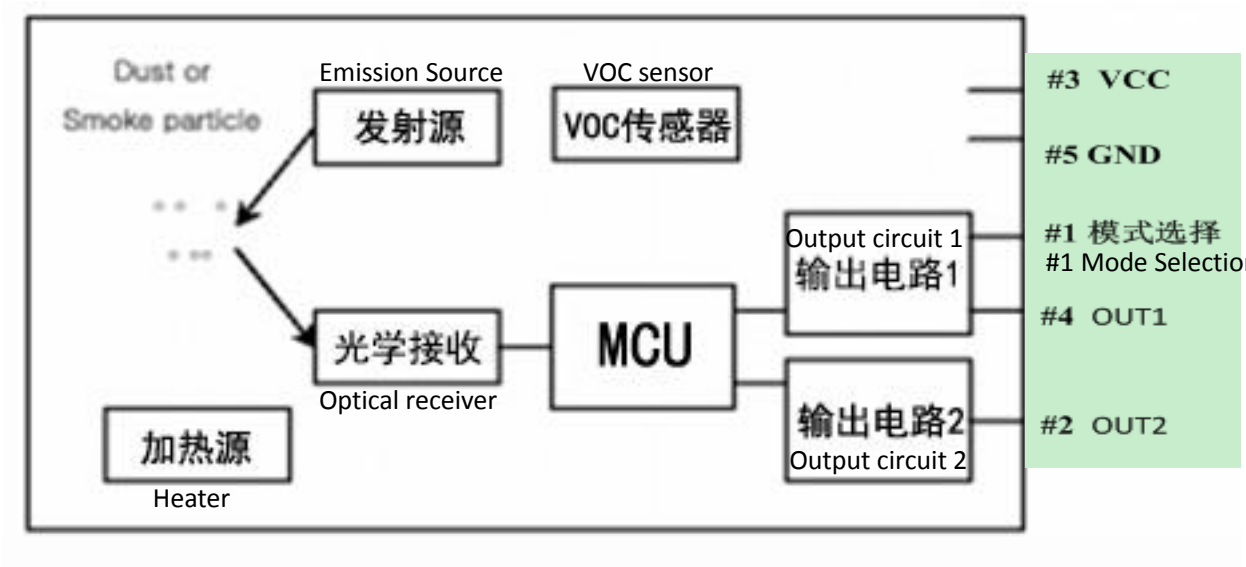


Fig 3.Principle schematic 2

Pins Definition Stable2.

PIN1	Control pin(refer the detailed instructions)
PIN2	Output OUT2/RXD/PM2.5
PIN3	VCC
PIN4	Output OUT1/TXD/VOC level
PIN5	GND

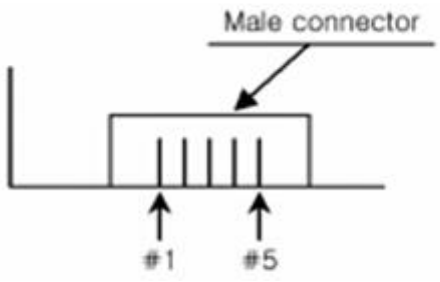


Fig4： Pins sketch

Instructions

1.Heater:the heater is built-in and the heating makes air rise,causing the air outside flow into sensor inside.

2.What kind of particles can be detected:diamete ≥1μm, such as smoke, house dust, mold, pollen and spores.

3.Control pin: this pin is to control output mode.(Vacancy is PWM mode while GND is serial port mode .)

4.Output pins OUT2/ RXD: this pin is RXD in serial port mode while it is ordinary output in PWM mode, sensitivity is pre-setted and the min particles which can be detected is 1μm.

5.Output pins OUT1/TXD: this pin is TXD in serial port mode while it is ordinary output in PWM mode, output is VOC level.

PM2.5 output wave in PWM mode

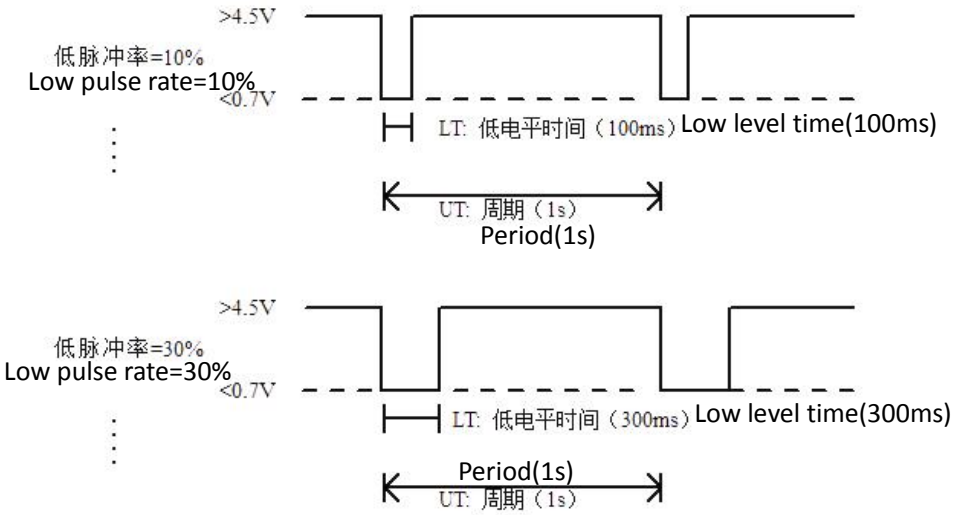


Fig5.PM2.5 output wave in PWM mode

NOTE： 1.LT is the pulse width of low level in one period.
2.UT is the pulse width of one period.
3.Low pulse rate RT: RT=LT/ UT x100%

VOC output wave in PWM mode

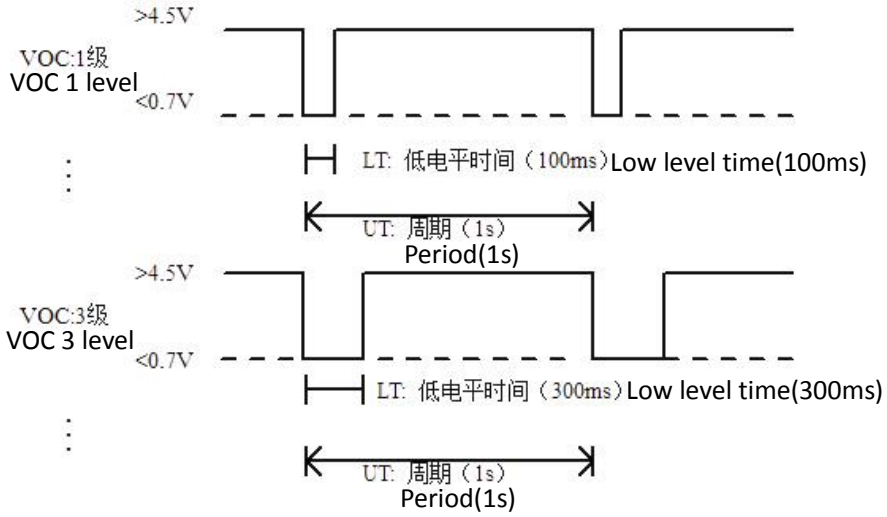


Fig6.VOC output wave in PWM mode

Sensitivi

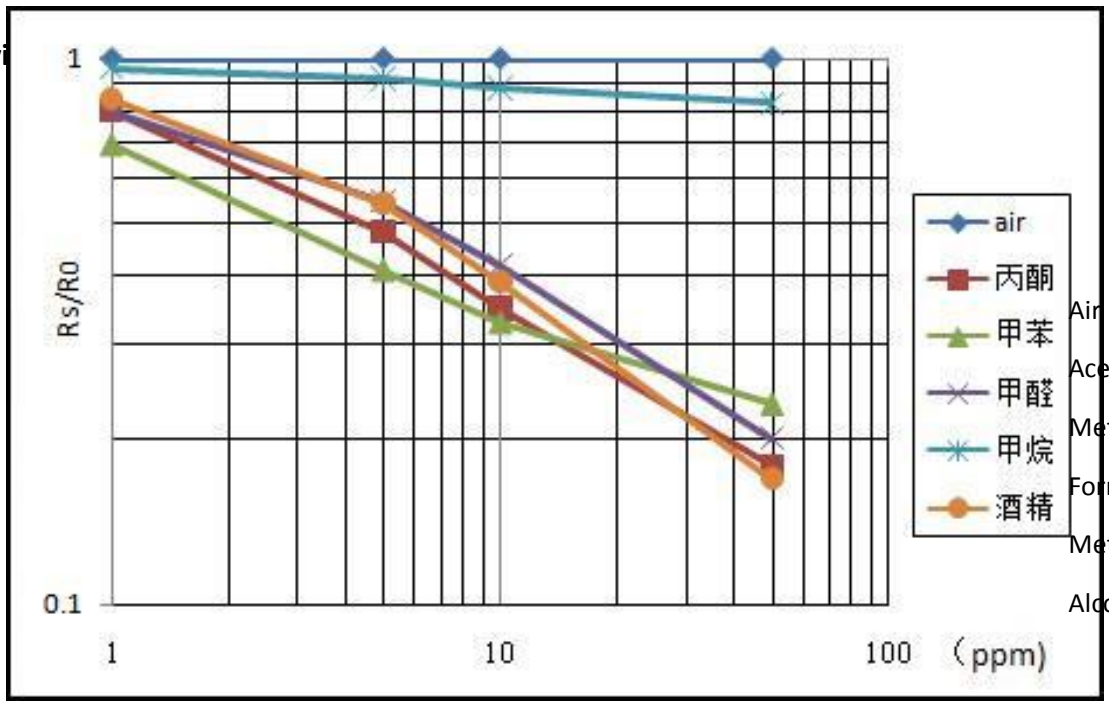


Fig7.Sensitivity curve in different gases

NOTE:

The module is calibrated and the output of 0x00-0x03 means from best air-quality level to worse air-quality level.

The relationship between low pulse rate of output and particles number

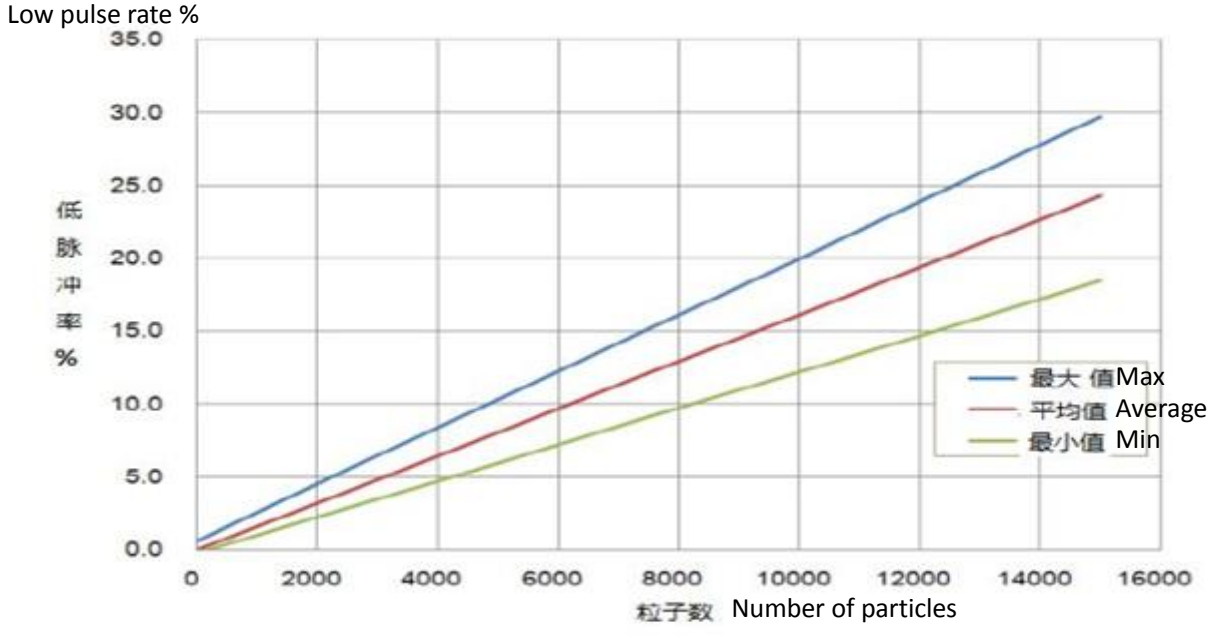


Fig8.The relationship of low pulse rate of output and particles number

The relationship between low pulse rate of output and dust particles concentration

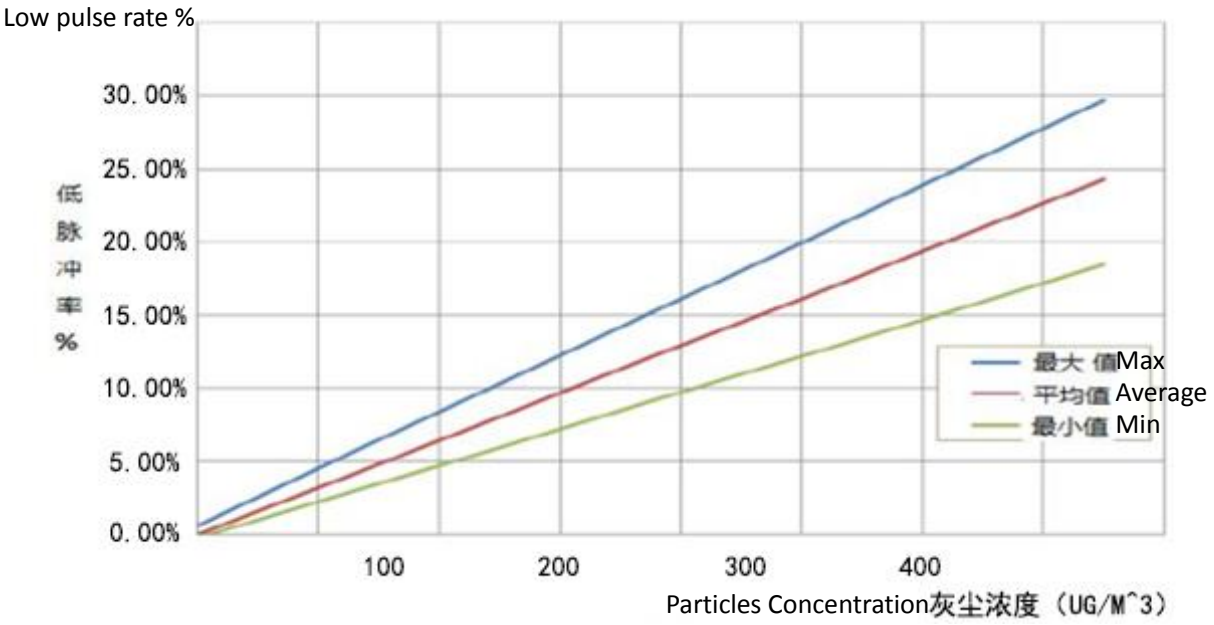


Fig9.The relationship of PM2.5 low pulse rate of output and dust particles concentration

NOTE： People usually use different levels (best,good,bad,worst) to describe the air quality condition.

Program 1.High sensitivity

Best： 0.00%-2.00%

Good： 2.00%-4.00%

bad： 4.00%-6.00%

Worst： ＞6.00%

Program 2.Good consistency

Best： 0.00%-4.00%

Good： 4.00%-8.00%

Bad： 8.00%-12.00%

Worst： ＞12.00%

Communication protocol

1.General Settings

Stable 3.

Baud rate	9600
Data byte	8 byte
Stop byte	1byte
Calibrate byte	no

2.Commnucation command

Module sends the concentration value every other one second.Only send,no receive.Command as follow:

0	1	2	3	4	5	6	7	8
Start byte	Detection type name code	Unit (Low pulse rate)	Integer part of low pulse rate	Decimals part of low pulse rate	Reservation	Mode	VOC level	Check value
0XFF	0X18	0X00	0x00-0x63	0x00-0x63	0x00	0x01	0x00-0x03	0x00-0xFF

Stable 4.

3.Check and calculation

```
/*****************************************************************************
 * Funtion name: ucharFucCheckSum(uchar *i,ucharln)
 * Funtion description:Sum check(Negate the sum of send and receive protocol 1/2/3/4/5/6/7 and
+1 )
*****************************************************************************/
unsigned char FucCheckSum(unsigned char *i,unsigned char ln)
{
    unsigned char j,tempq=0;
    i+=1;
    for(j=0;j<(ln-2);j++)
    {
        tempq+=*i;
        i++;
    }
    tempq=(~tempq)+1;
    return(tempq);
 }
```

Cautions

1.Installation must be vertically.
2.Organic solvents(including sillica gel and other adhesive),paint,pharmaceutical,oil and high concentration of target gases should be avoided.
3.Artificial air steam such as fan should be farm away.For example,when it is used in air refresher,it can't be installed in front or back of fan.Any side of fan shell can be installed on, but ventilation opening on the shell is necessary to guarantee gas from outside flow in.
4.Don't use it the places where there is vapour such as bathroom,or near to air humidifier.
5.Dust sensor adopts optics working principle,so the light radiation will influence the sensor's accuracy.We suggest users use sponge to cover the triangle hole in the middle of the sensor,avoiding light outside irradiate the sensor.Note that don't cover the gas inlet and outlet.
6.Warmup time should lasts 5 min or longer for the first time usage and don't apply it in the system involving people safety.
7.Moist will effect the normal functions of the module,so it should avoid.
8.Lens should be cleaned regularly according to the actual condition(about once per month).Use one end of cotton swab with clean water to scrub the lens,and use the other end to wipe dry.Don't use organic solvent such as alcohol as cleanser.

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