Winsen
炜盛科技

Laser Dust Module

（Model: ZH03A）

Manual

Version: 1.8

Valid from: 2016-2-18

Zhengzhou Winsen Electronics Technology Co., Ltd

Statement

Thanks for purchasing our product. In order to let customers using 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

ZH03A Laser Dust Sensor Module

Profile

ZH03 Laser Dust sensor module is a common type, small size sensor, using laser scattering principle to detect the dust particles in air, with good selectivity and stability. It is easy to use, with UART output & analog output.

Features

Zero error alarm rate
Real time response
Accurate data
Minus resolution of particle diameter 1.0μm

Main Applications

It's widely used in portable instrument, air quality monitoring equipment, air purifiers, ventilation systems, air conditioner, and smart home equipment.

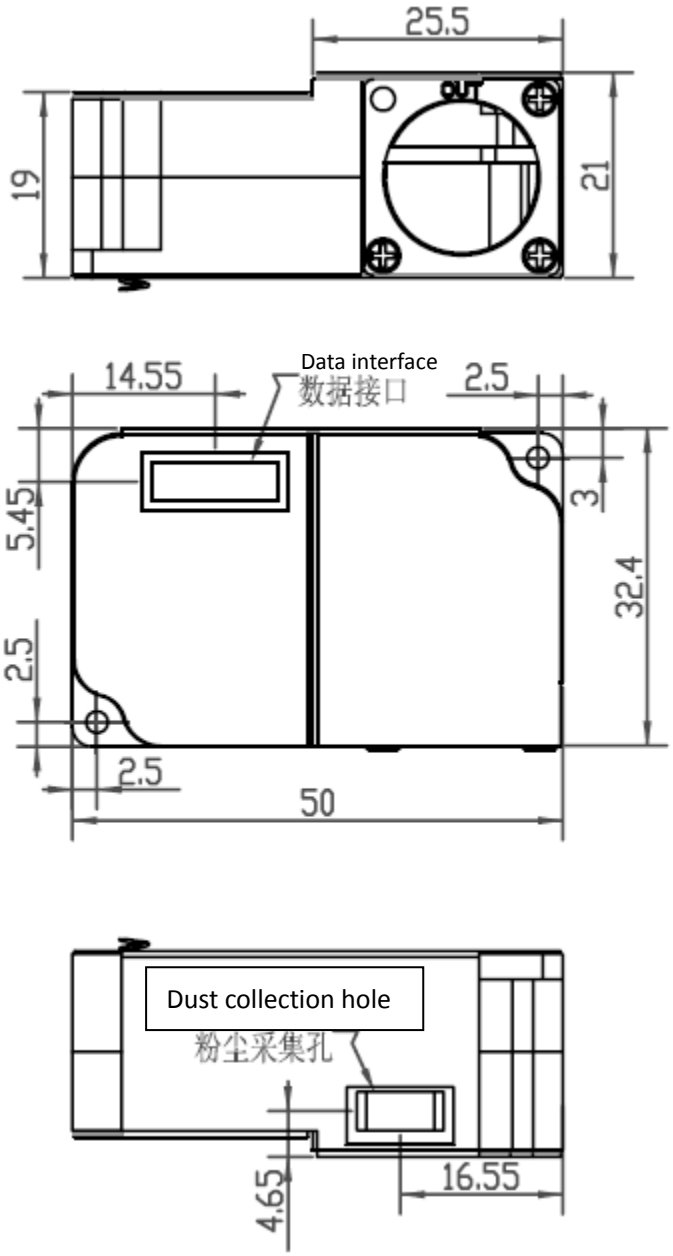
Technical Parameters

Model	ZH03
Detection Gas	PM1.0, PM2.5, PM10
Output	UART OUTPUT (3V TTL)
	DAC (0~2V is corresponding to 0-1000)
	PWM output
Working Voltage	4.5V-5.5V
Working Current	70-140(mA)
Dormancy current	70mA
Response Time	≤90s
Working Humidity	15%RH-80%RH(no condensation)
Working Temperature	-20~40℃
Storage Temperature	-20~60℃
Life Span	3 years (in air)
Dimension	50*32.4*21mm

PIN1	Vin (Voltage Input 4.5V~5.5V)
PIN2	GND
PIN3	SET pin
PIN4	RXD Serial receive pin
PIN5	TXD Serial send pin
PIN6	RESET pin
PIN7	DAC Analog output
PIN8	PWM output

Note: When SET=1 or hang in the air, the module is in continuous sampling mode;

When SET=0, the module is in low consumption mode.



Communication Protocol

1. General Settings

Baud rate	9600
Date byte	8 byte
Stop byte	1byte
Check byte	no

2. Initiative upload

Byte 0	**Start byte 1**	**0x42**
Byte 1	**Start byte 2**	**0x4D**
Byte 2	**Frame length high level 8**	**0x14**
Byte 3	**Frame length low level 8**	
Byte 4	**Data 1 High Level 8**	**reserve**
Byte 5	**Data 1 Low Level 8**	
Byte 6	**Data 2 High Level 8**	**reserve**
Byte 7	**Data 2 Low Level 8**	
Byte 8	**Data 3 High Level 8**	**reserve**
Byte 9	**Data 3 Low Level 8**	
Byte 10	**Data 4 High Level 8**	**PM1.0 concentration**
Byte 11	**Data 4 Low Level 8**	**(atmospheric environment)**
Byte 12	**Data 5 High Level 8**	**PM2.5 concentration**
Byte 13	**Data 5 Low Level 8**	**(atmospheric environment)**
Byte 14	**Data 6 High Level 8**	**PM10 concentration**
Byte 15	**Data 6 Low Level 8**	**(atmospheric environment)**
Byte 16	**Data 7 High Level 8**	**reserve**
Byte 17	**Data 7 Low Level 8**	
Byte 18	**Data 8 High Level 8**	**reserve**
Byte 19	**Data 8 Low Level 8**	
Byte 20	**Data 9 High Level 8**	**reserve**
Byte 21	**Data 9 Low Level 8**	
Byte 22	**Data & Check High Level 8**	**Check= byte 0+……+byte 21**
Byte 23	**Data & Check Low Level 8**	

3. Question & answer mode

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	command	reserve	reserve	reserve	reserve	reserve	Check value
0XFF	0x01	0x86	0x00	0x00	0x00	0x00	0x00	0x79

Return value as follow

0	1	2	3	4	5	6	7	8
Starting byte	Command	High Level (ug/m^3)	Low Level (ug/m^3)	reserve	reserve	reserve	reserve	Check value
0xFF	0x86	0x00	0x64	0x00	0x00	0x00	0x00	0x16

4. Switch between Q&A mode and Initiative upload mode

Set Q&A mode:

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	command	Q&A	Reserve	Reserve	Reserve	Reserve	Check value
0XFF	0x01	0x78	0x41	0x00	0x00	0x00	0x00	0x46

Set initiative upload mode

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	Command	Upload	Reserve	Reserve	Reserve	Reserve	Check value
0xFF	0x01	0x78	0x40	0x00	0x00	0x00	0x00	0x47

5. Calibration

0	1	2	3	4	5	6	7	8
Starting byte	Reserve	command	To calibrate high level 8 of concentration (ug/m^3)	To calibrate low level 8 of concentration (ug/m^3)	Reserve	Reserve	Reserve	Check value
0xFF	0x01	0x88	0x00	0x64	0x00	0x00	0x00	0x13

For example:

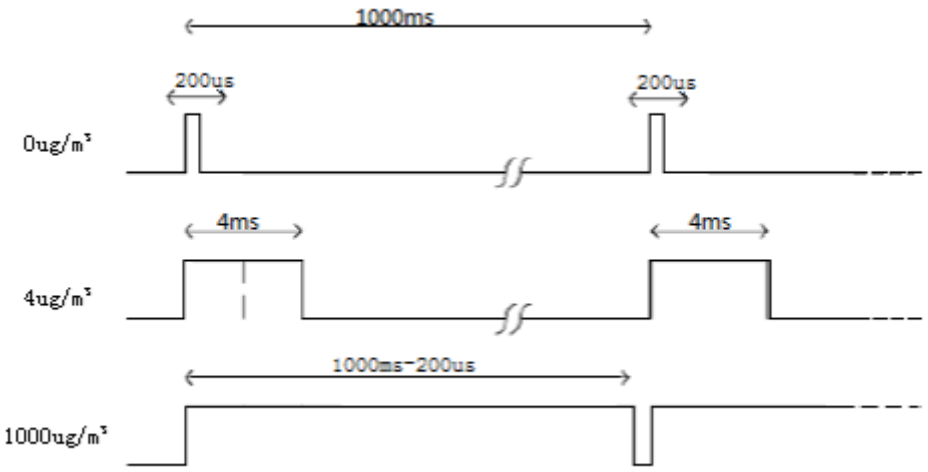
The calibration command for 100ug/m^3 concentration must be done in 80-120 ug/m^3 concentration, when the concentration is stable, wait for at least 3 until the sensor gets stable.

Calibrate checksum:

```
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);
}
```

6. PWM output way

PWM output way	
Suppose the detection range is 0-1000ug/m^3	
PM2.5 concentration output range	0-1000ug/m^3
Period	1000ms±5%
High level output at the period start	200us(theoretical value)
Middle of the period	1000ms±5%
Low level output at the period end	200us (theoretical value)
To calculate PM2.5 through PMW: P ug/m^3=1000x(TH)/(TH+TL)	
P ug/m^3 is calculated value of PM2.5 concentration, its unit is ug/m^3 TH is the time of high level during one period TL is the time of low level during one period	



Cautions:

1. Do not change or displace any electronic components.
2. Please avoid heavy shock and vibration
3. The sensor should be vertical installed, to extend fan's lifespan.
4. Make sure that the air circulation of dust collecting holes is normal when installation.
5. Please avoid sticky particles into the sensor to affect the sensor's performance.

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