Laser dust sensor

(Model: ZH06-Ⅰ)

Manual

Version: 1.1

Valid from: 2018-06-18

Zhengzhou Winsen Electronic 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.

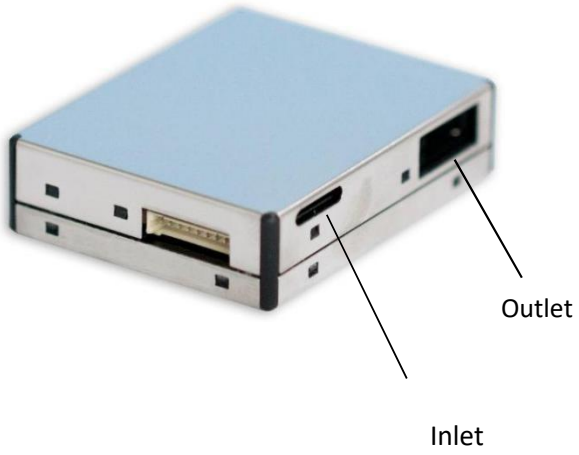
Please keep the manual properly, in order to get help if you have questions during the usage in the future.

Zhengzhou Winsen Electronics Technology CO., LTD

ZH06-Ⅰ Laser dust sensor

Description:

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



Features:

Good consistency

Real time response

Accurate data

Low power consumption

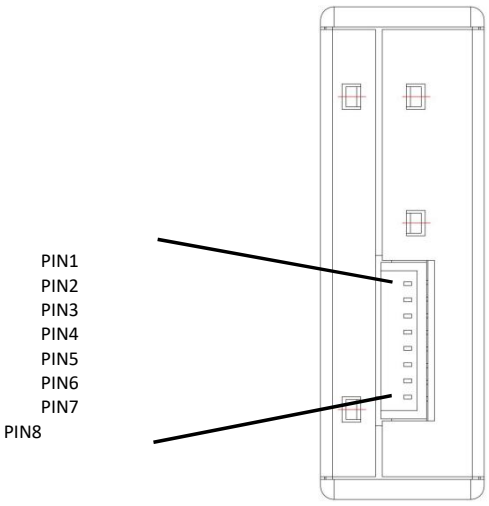
Minus resolution of particle diameter 0.3 μm

Main Applications

Air purifiers , ventilation systems , portable instrument, air quality monitoring equipment, air conditioner, and smart home fields.

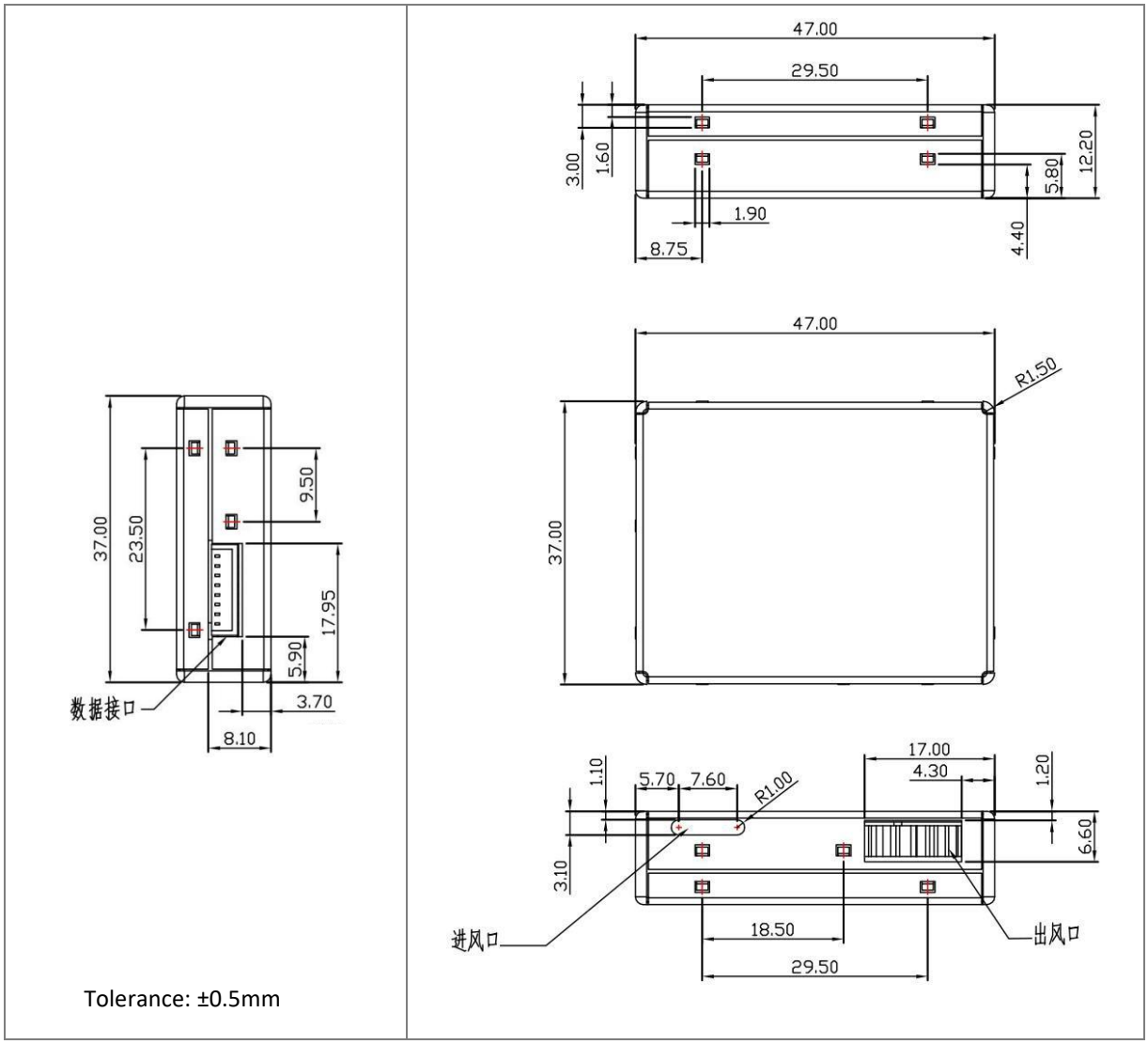
Technical Parameters

Model	ZH06-Ⅰ
Test type	PM1.0、PM2.5、PM10
Output	UART output
	PWM output
Working Voltage	4.9V～5.5V
Working current	＜120mA
Dormancy current	＜20mA
Response Time	T90＜45s
Working Humidity	0～80％RH(no condensation)
Working Temperature	－10～60℃
Storage Temperature	－30～70℃
Dimension	47×37×12.2mm (L×W×H)



PIN1	VDD	4.9V～5.5V
PIN2	GND	
PIN3	Reserved	
PIN4	RXD Serial receive pin	TTL@3.3V
PIN5	TXD Serial send pin	TTL@3.3V
PIN6	Reserved	NC
PIN7	Reserved	NC
PIN8	PWM output	TTL@3.3V

Sensor construction:



Tolerance: ±0.5mm

figure 2

Installation:

Both the air inlet and air outlet of the sensor need to maintain good contact with the outside air. When the sensor is installed and used, avoid strong air flow interference around the sensor;

Connector description：

1.25T-8P connector, Pin spacing 1.25mm, Number of pins: 8

Communication Protocol

1. Serial communication settings

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

2. Initiative upload

Byte 1	Start byte 1		0x42
Byte 2	Start byte 2		0x4D
Byte 3	Frame length	high level 8	0x00
Byte 4		low level 8	0x1C
Byte 5	Data 1	High Level 8	Reserved
Byte 6		Low Level 8	
Byte 7	Data 2	High Level 8	Reserved
Byte 8		Low Level 8	
Byte 9	Data 3	High Level 8	Reserved
Byte 10		Low Level 8	
Byte 11	Data 4	High Level 8	PM1.0 concentration
Byte 12		Low Level 8	(ug/m³)
Byte 13	Data 5	High Level 8	PM2.5 concentration
Byte 14		Low Level 8	(ug/m³)
Byte 15	Data 6	High Level 8	PM10 concentration
Byte 16		Low Level 8	(ug/m³)
Byte 17	Data 7	High Level 8	reserved
Byte 18		Low Level 8	
Byte 19	Data 8	High Level 8	reserved
Byte 20		Low Level 8	
Byte 21	Data 9	High Level 8	reserved
Byte 22		Low Level 8	
Byte 23	Data 10	High Level 8	reserved
Byte 24		Low Level 8	
Byte 25	Data 11	High Level 8	reserved
Byte 26		Low Level 8	
Byte 27	Data 12	High Level 8	reserved
Byte 28		Low Level 8	
Byte 29	Data 13	High Level 8	reserved
Byte 30		Low Level 8	
Byte 31	Check	High Level 8	Initiative upload check=
Byte 32		Low Level 8	= byte1+……+byte 22

NOTE:

A. The default communication mode is initiative upload mode.

B. Calculate method:

Data frames: 42 4D 00 1C 00 54 00 6E 00 7C 00 54 00 6E 00 7C 00 00 00 00 00 00 00 00 00 00 00 00 00 00 03 27

Check value=
0x42+0x4D+0x00+0x1C+0x00+0x54+0x00+0x6E+0x00+0x7C+0x00+0x54+0x00+0x6E+0x00

+0x7C+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00+0x00=
0x0327

0x03 of High level 8 is in 31 byte of data frame, 0x27 of Low level 8 is in 32 byte of data frame.

3. Question & answer mode

User sends command:

0	1	2	3	4	5	6	7	8
Starting	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	Command	PM2.5(ug/m3)		PM10(ug/m3)		PM1.0(ug/m3)		
		High 8 Level	Low 8 Level	High 8 Level	Low 8 Level	High 8 Level	Low 8 Level	Check value
0xFF	0x86	0x00	0x85	0x00	0x96	0x00	0x65	0xFA

Note: The question-and-answer data frame check value calculation method is different from the method for initiative upload data frames. Please refer to the question-and-answer check value calculation example code.

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

User sends command: set Q&A mode:

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

User sends command: Set initiative upload mode

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

Note: Please refer to the sample code for calculating the data frame check value.

5. Dormant mode

User sends command: set dormant/sleep mode:

0	1	2	3	4	5	6	7	8
Starting	Reserve	Main command	Dormant command	Reserve	Reserve	Reserve	Reserve	Check value
0xFF	0x01	0xA7	Enter: 0x01	0x00	0x00	0x00	0x00	0x57
			Quit: 0x00					0x58

Return value as follow:

0	1	2	3	4	5	6	7	8
Starting	Main command	Return Mark	Reserve	Reserve	Reserve	Reserve	Reserve	Check value
0xFF	0xA7	Success: 0x01	0x00	0x00	0x00	0x00	0x00	0x58
		Failture: 0x00						0x59

Note: Please refer to sample code for data frame check value calculation ;

Calculate method for check value:

In Q&A mode, the return value is “FF 86 00 47 00 C7 03 0F 5A”

Check value== 0x86 + 0x00 + 0x47 + 0x00 + 0xC7 + 0x03 + 0x0F

= 0xA6(keep low level 8 only)

= 0x59(Invert)

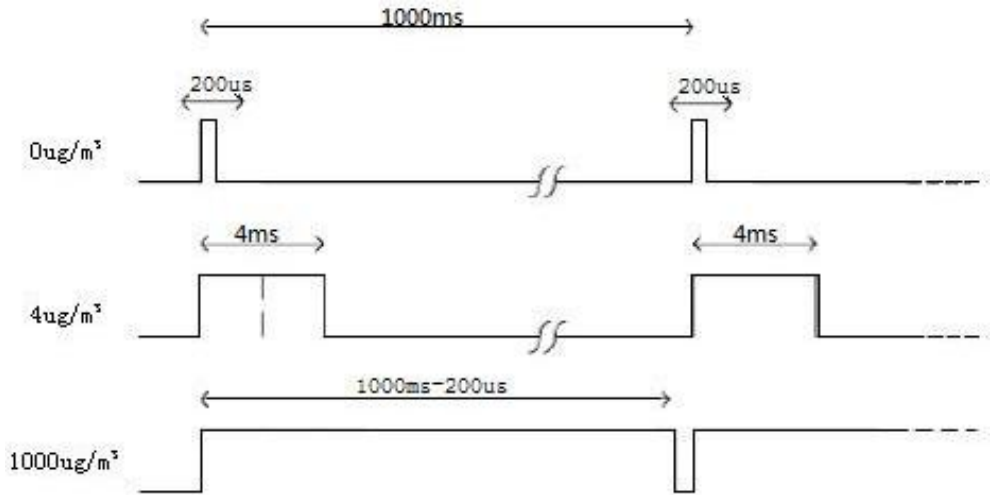
= 0x5A(plus 1)

Eg of code:

```
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);
}
```

PWM Output:

PWM output	
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	



Note: PWM calculated value only represents PM2.5

Note:

1. Do not change or displace any electronic components.
2. Please avoid heavy shock or vibration
3. Avoid the internal airflow of the sensor being affected by the external airflow.
4. Avoid sticky particles entering the sensor, and prevent moisture.
5. The fan is the air outlet, and the dust collection hole is the air inlet. Please ensure that the air inlet and outlet are open to the outside air.

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