SPECIFICATION

Product Name: Laser Particle Count Sensor Module

Item No.: PM5100

Version: V0.1

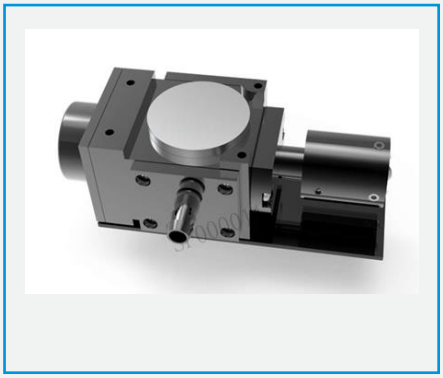
Date: 2022.06.30

Revision

No.	Version	Content	Date
1	V0.1	First version	2022.06.30

Laser Particle Count Sensor Module

PM5100



Applications

- Pharmaceutical industry
- Electronics industry
- Food hygiene industry
- Finishing clean room, precision test area

Description

The PM5100 laser particle count sensor module adopts the principle of optical scattering, which can accurately detect and calculate the number of suspended particles of different particle sizes in the air per unit volume, and can simultaneously output the number of 0.3μm, 0.5μm, 1.0μm, 5.0μm, 10μm particles (pcs/28.3L).

Features

- 5-chanel (0.3μm, 0.5μm, 1.0μm, 5.0μm, 10μm) simultaneous particle numbers output in pcs/28.3L
- Industrial grade constant power linear laser, precise identification
- Small size, easy to install
- Meet the requirements of JJF 1190

Working Principle

The sensor is generated negative pressure by external device for air sampling. When the particles in the sample gas pass through the condensed beam of the light source (laser), light scattering occurs. The scattered light is converted into an electrical signal (pulse) through the photoelectric converter. The larger the particle, the larger the pulse signal (peak value). The quantity of each particle size can be obtained by the peak value and the number of pulses at the same time.

Specifications

Laser Particle Counting Sensor PM5100 Specification	
Operating principle	Laser scattering
Output channels	>0.3μm, >0.5μm, >1.0μm, >2.5μm, >5.0μm, >10μm
Count efficiency	50%@0.3μm 100%@>0.45μm (Take Lighthouse Solair 3100 as a reference, 25±2 ℃, 50±10%RH ambient conditions)
Count repeatability	≤5%
Self-cleaning time	≤5 min
Maximum allowable working concentration	1000000 pcs/28.3L@0.3um
Data refresh rate	1s
working conditions	0~40℃; 5~95%RH (no condensation)
Storage conditions	-10~50℃; 5~95%RH (no condensation)
Operating Voltage	DC 5V±0.2V, ripple <100mV
Average operating current	<250mA
Communication Interface	UART_TTL（3.3V）
Product Size	W99.2*H66*D 41.7mm
Sampling flow rate	28.3L/min (recommended)

Outline structure and interface definition

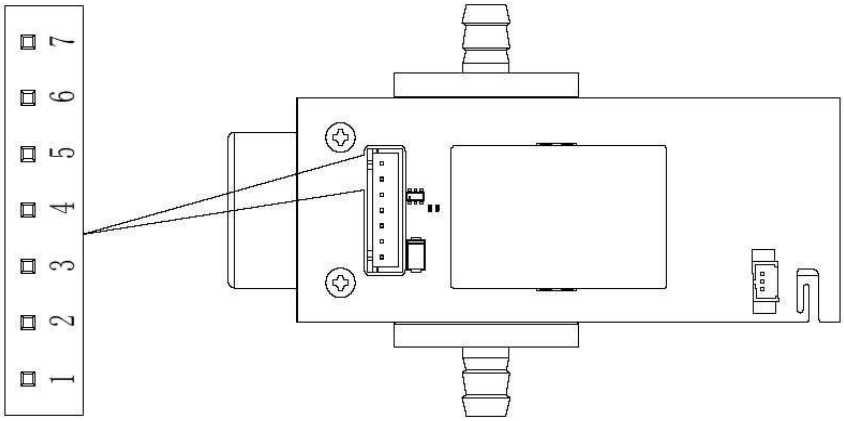


Figure 1 Pin definition diagram

Table 2. Table of pin definitions

No.	Pin	Description
1	GND	Power ground terminal (GND)
2	+5V	Power input terminal (+5V)
3	NC	Dangling
4	S2	Original signal output
5	RX	Serial receiver @3.3V
6	TX	Serial sender@3.3V
7	S1	Original signal output

Table 3. Connector Descriptions

Model	Pin Spacing
XH-7	2. 5 mm pitch

Typical Application Circuits

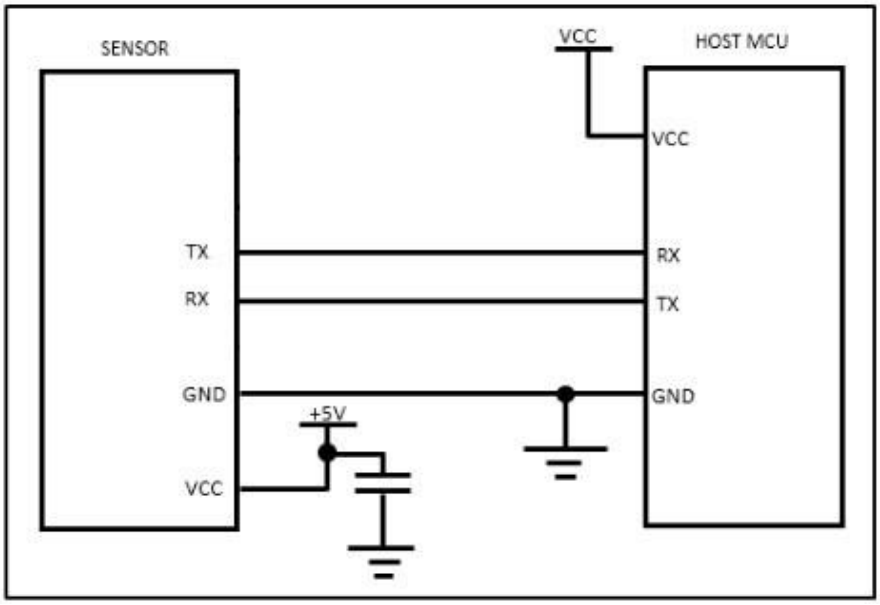


Figure 2 Typical application circuit diagram of UART communication

Notice for circuit design:

※The UART communication level is 3.3V.

※ PIN3, PIN4, PIN7 are the ports for internal debugging and should be left floating in the application circuit.

UART Communication Protocol

1.General Statement

1) The data of this protocol are all hexadecimal data. For example, "46" is [70] in decimal;
2) [xx] is single-byte data (unsigned, 0-255); double-byte data high byte first, low byte after;
3) Baud rate: 9600, DataBits: 8, StopBits: 1, Parity: No.
4) After the mode is set, it will not be saved when power off. The power-on default is continuous mode.

2.Format of Serial Communication Protocol

Sending format of software:

Start Symbol	Length	Command	Data 1	……	Data n.	Check Sum
HEAD	LEN	CMD	DATA1	……	DATAn	CS
11H	XXH	XXH	XXH	……	XXH	XXH

Detail description on protocol format:

Protocol Format	Description
Start symbol	Sending by software is fixed as [11H], module respond is fixed as [16H]
Length	Length of frame bytes= data length +1 (including CMD+DATA)
Command	Command
Data	Data of writing or reading, length is not fixed
Check sum	Cumulative sum of data = 256- (HEAD+LEN+CMD+DATA)

3. Command Table of Serial Protocol

Item No.	Function Description	Command
1	Read particle measurement result	0x0B
2	read code	0x1F
3	Setting and reading particulate calibration coefficients	0x07

4. Detail Description of UART Protocol

4.1 Read Particle Measurement Result

Send: 11 02 0B 07 DB

Response: 16 35 0B DF1- DF52 [CS]

Function: Read measurement result.

Note: Read particles quantity.

Data	Description
DF1~DF4	Reserved
DF5~DF8	Reserved
DF9~DF12	Reserved
DF13~DF16	Reserved
DF17~DF20	Reserved
DF21~DF24	Reserved
DF25~DF28	>0.3μm particle count, unit: pcs/28.3L
DF29~DF32	>0.5μm particle count, unit: pcs/28.3L
DF33~DF36	>1.0μm particle count, unit: pcs/28.3L
DF37~DF40	Reserved
DF41~DF44	>5.0μm particle count, unit: pcs/28.3L
DF45~DF48	>10μm particle count, unit: pcs/28.3L
DF49~DF52	Reserved

>0.3μm particle count = DF25*256^3 + DF26*256^2 + DF27*256^1 + DF28
>0.5μm particle count = DF29*256^3 + DF30*256^2 + DF31*256^1 + DF32
>1.0μm particle count = DF33*256^3 + DF34*256^2 + DF35*256^1 + DF36
>5.0μm particle count = DF41*256^3 + DF42*256^2 + DF43*256^1 + DF44
>10μm particle count = DF45*256^3 + DF46*256^2 + DF47*256^1 + DF48
Note: The reserved bits are used for internal testing, and their value changes have no meaning.

4.2 Query sensor code

Send: 11 01 1F CF
Response: 16 0B 1F DF1 DF2 DF3 DF4 DF5 DF6 DF7 DF8 DF9 DF10 CS
Function: Query sensor code
Description: Code= (DF1*256+DF2), (DF3*256+DF4), (DF5*256+DF6), (DF7*256+DF8), (DF9*256+DF10)
For example: 16 0B 1F 00 00 00 7E 09 07 07 0E 0D 72 9E
Parsing code: 126 2311 1806 3442

4.3 Setting and reading particulate calibration coefficients

Send: 11 02 07 DF1 CS //Set the particle calibration coefficient
Send: 11 01 07 E7 //Read the particle calibration coefficient
Response: 16 02 07 DF1 CS
Function: set/read dust calibration coefficient
Description:
Calibration coefficient = DF1/100; valid range of calibration coefficient setting: 0.1~2.5.
After setting the calibration coefficient, the particle count values of >0.3um, >0.3um, >1um, >2.5um, >5um, >10um are all corrected by this coefficient.

Sensor Dimension

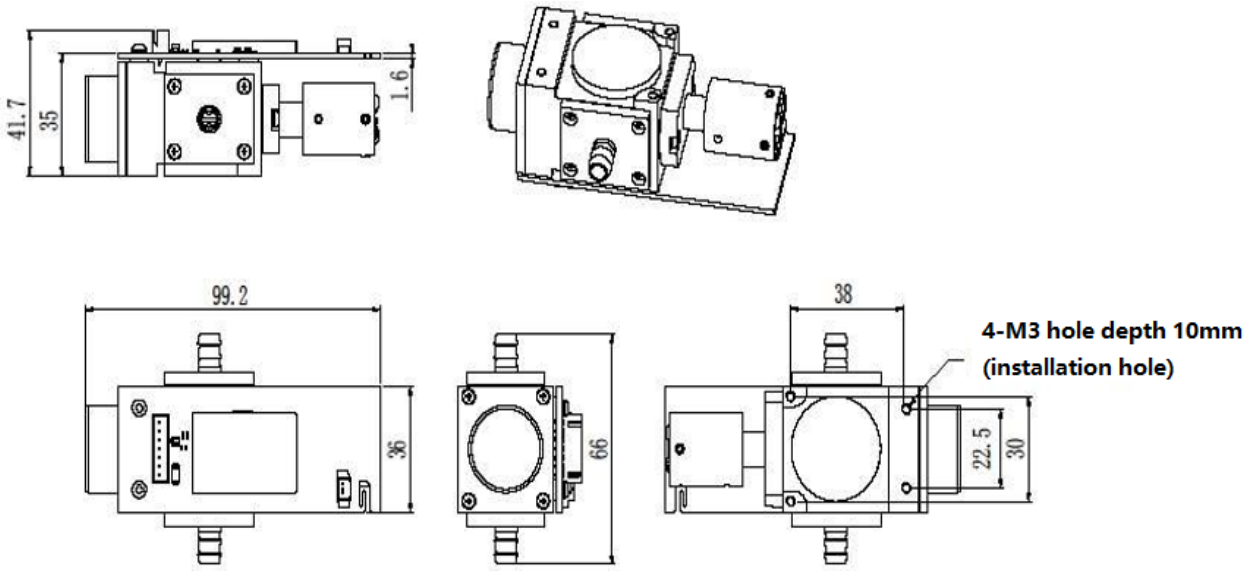


Figure 3 Dimensions (unit mm, tolerance ±0.2mm)

Accessories

Accessories PN	Picture	Description	Function
Gasboard-8500FS-L40		Ultrasonic Flow Meter	To measure air flow rate, measurement range is 0~40L/min

User Attention

※ When this product is installed and used in the system, the air inlet and outlet should be unobstructed, and there should be no large airflow facing the inlet and outlet air; the internal cross-section diagram of the sensor and the recommended installation method are as follows, so as to avoid dust deposition in the sensitive process during use. The surface of the device affects the test accuracy of the sensor.

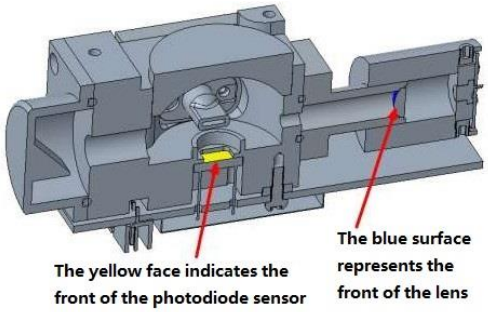


Figure 4 Internal section of the sensor

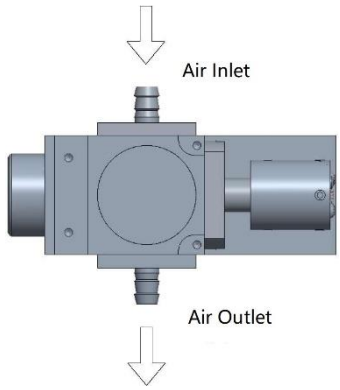


Figure 5 Recommended installation method

※ The size of the ventilation hole opened for the air inlet on the inner wall of the user machine should not be smaller than the size of the air inlet of the sensor.

※ When using the product, it is recommended to add a 50~60 mesh protective filter to the air inlet of the sensor to prevent the pollution of floc and hair from affecting the sensor detection.

※ The sensor is an integral part, users should not disassemble it to prevent irreversible damage.

※ This product is defined as a 3R laser product according to "GB7247.1-2012 Safety of Laser Products", which contains laser radiation to avoid direct exposure to the eyes. The warning signs are as follows:

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