

SPECIFICATION

Product Name: Laser Particle Sensor Module

Item No.: PM3003Q

Version: V0.1

Date: 13th, June 2022

Revision

No.	Version	Content	Date
1	V0.1	First version	2022.06.13

Laser Particle Sensor Module

PM3003Q



Applications

- Industrial PM Monitoring
- Factory Particulate Emission monitoring
- Mining Site Dust Monitoring
- Environment PM Monitoring Alarm System

Description

The PM3003Q laser dust 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. Real-time output of PM2.5, PM10, TSP mass concentration

Features

- PM2.5, PM10, TSP output simultaneously
- Industrial grade laser with high reliability
- Anti-dust design, meet the measurement of high dust environment
- Small size, easy to install

Working Principle

Sampling by the pressure which occurs by the external air pump connected, when sampling particles pass through light beam (laser), there will be light scattering phenomenon. Scattered light will be converted into electrical signal (pulse) via photoelectric transformer. The bigger particles will obtain stronger pulse signal (peak value). Through peak value and pulse value quantity concentration of particles in each size can be calculate. Thus, real-time measured data is obtained through measuring quantity and strength of scattered light.

Specifications

Laser Particle Sensor PM3003Q Specification	
Operating principle	Laser scattering
Measurement range	0~50mg/m ³ Maximum display 1000mg/m ³
Working condition	-30°C ~ 70°C, 0-95%RH (non-condensing)
Storage condition	-40°C ~ 85°C, 0-95%RH (non-condensing)
PM2.5, PM10 and TSP accuracy	0~1 mg/m ³ : ±200µg/m ³ 1~50 mg/m ³ : ±20% of reading (Tested under typical conditions, i.e. 25±2°C, 50±10%RH, with Gold Sample* as reference)
Data refresh cycle	1s
Power supply	DC 5V±0.1V, ripple wave <100mV
Average Working current	< 150mA
Standby current	< 25mA
Digital output	UART_TTL (3.3V)
Dimensions	W90.8*H60.2*D37.6 mm
Sampling flow rate	2 L/min(recommended)

Note:

*Gold Sample traceable instrument is TSI8533, calibrated in ISO 12103-1 A2 test dust environment

Structure and Pin Definition

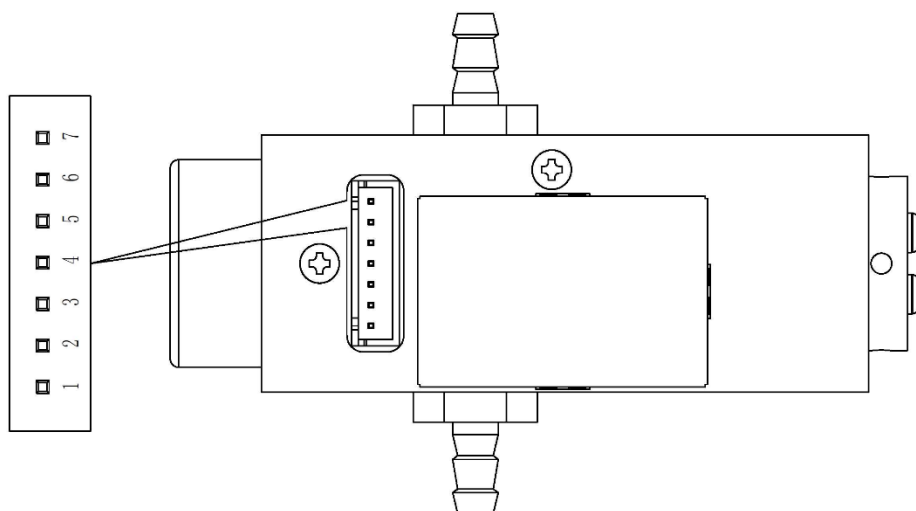


Figure 1 Connector Dimensions

Table 2. Connector Pin Definition

No.	Pin	Description
1	GND	Power input (GND)
2	+5V	Power input (+5V)
3	NC	Dangling
4	NC	Dangling
5	RX	Serial receiver @3.3V
6	TX	Serial sender @3.3V
7	NC	Dangling

Table 3 Connector Description

Model	Pin Spacing
XH-7	2.5 mm pitch

Typical Application Circuit

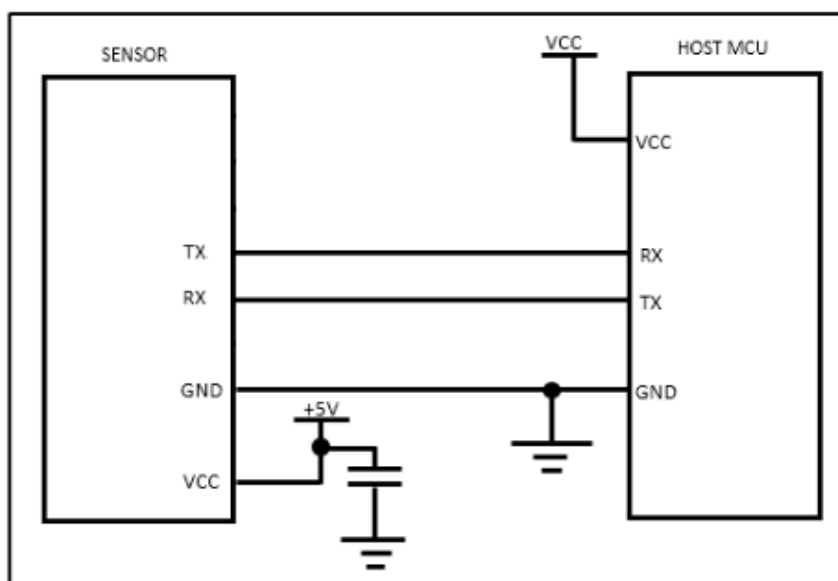


Figure 2 Typical application circuit diagram of UART communication

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

Communication Protocol

◆ UART Communication Protocol

1. General Statement

- 1) The data in this protocol is all hexadecimal data. For example, "46" for decimal [70].
- 2) [xx] is for single-byte data (unsigned, 0-255); for double data, high byte is in front of low byte.
- 3) Baud rate: 9600; Data Bits: 8; Stop Bits: 1; Parity: No
- 4) It is default by continuously mode after powering on. Working mode will not be saved after powering off.

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	Set up and read particle calibration coefficient	0x07
3	Read serial number	0x1F

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 concentration of particle and particles number.

Note: Read particle concentration ($\mu\text{g}/\text{m}^3$)

Data	Description
DF1~DF4	Reserved
DF5~DF8	PM2.5 measuring value, unit: $\mu\text{g}/\text{m}^3$
DF9~DF12	PM10 measuring value, unit: $\mu\text{g}/\text{m}^3$
DF13~DF16	TSP measuring value, unit: $\mu\text{g}/\text{m}^3$
DF17~DF20	Reserved
DF21~DF24	Reserved
DF25~DF28	Reserved
DF29~DF32	Reserved
DF33~DF36	Reserved
DF37~DF40	Reserved
DF41~DF44	Reserved
DF45~DF48	Reserved
DF49~DF52	Reserved

$$\text{PM2.5} = \text{DF5} * 256^3 + \text{DF6} * 256^2 + \text{DF7} * 256^1 + \text{DF8}$$

$$\text{PM10} = \text{DF9} * 256^3 + \text{DF10} * 256^2 + \text{DF11} * 256^1 + \text{DF12}$$

$$\text{TSP} = \text{DF13} * 256^3 + \text{DF14} * 256^2 + \text{DF15} * 256^1 + \text{DF16}$$

DF49: Alarm of sensor module working condition:

Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Alarm definition				1. Fouling alarm	1. Low temperature alarm	1. High temperature alarm		

DF50, DF51, DF52: Reserved

Note: Part of reserved bit is used for internal testing. Reserved bit is not related to function

4.2 Set up and Read Particle calibration coefficient

Send: 11 02 07 DF1 CS //Set the dust calibration coefficient

Send: 11 01 07 E7 //Read the dust calibration coefficient

Response: 16 02 07 DF1 CS

Function: Set/read dust dynamic calibration coefficient

Description:

1. Dust calibration factor = DF1 /100, the range is 0.1~2.5.

4.3 Read Serial Number

Send: 11 01 1F CF

Answer: 16 0B 1F DF1 DF2 DF3 DF4 DF5 DF6 DF7 DF8 DF9 DF10 CS

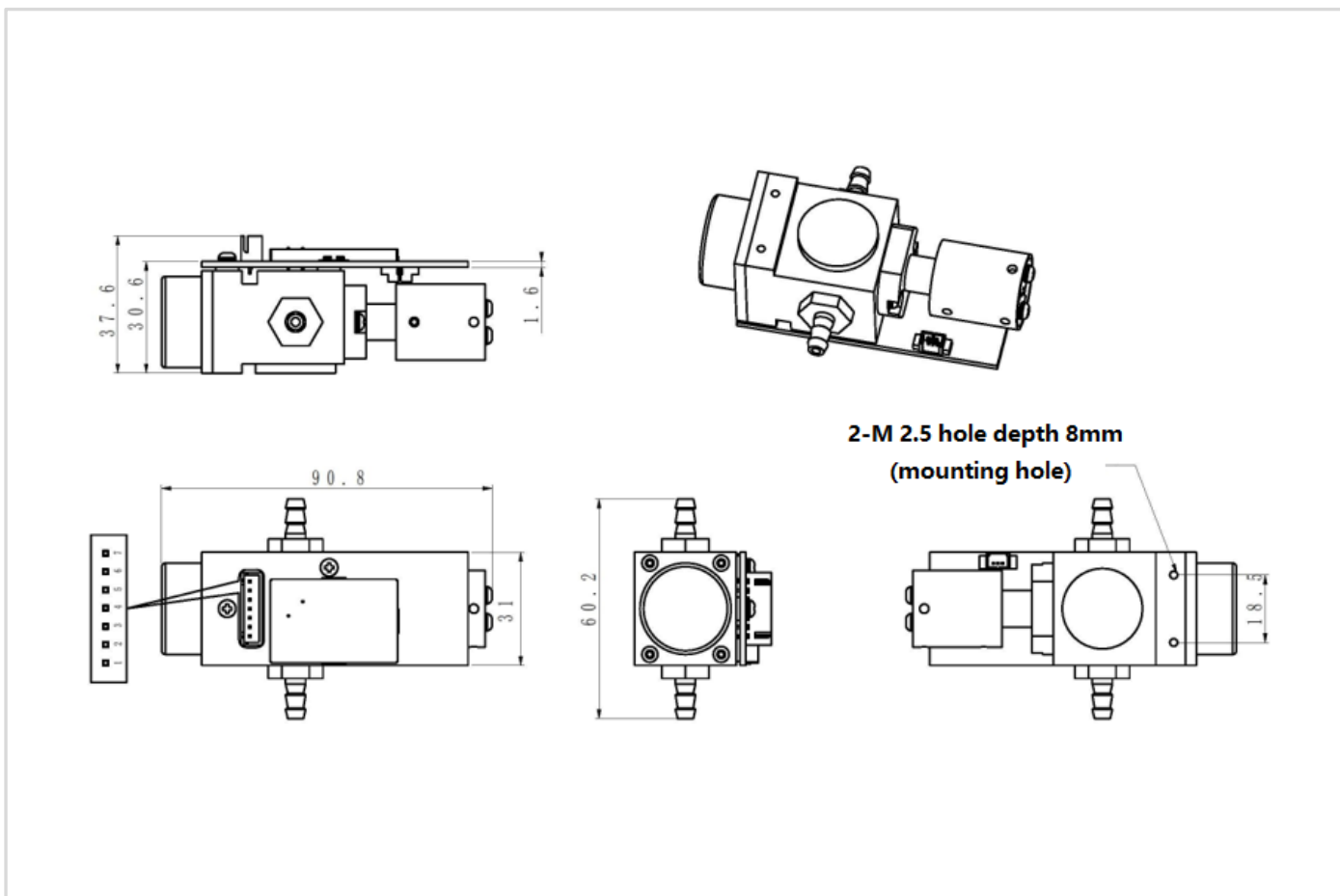
Function: Query sensor code

Description: Number = (DF1*256+DF2), (DF3*256+DF4), (DF5*256+DF6), (DF7*256+DF8), (DF9*256+DF10)

For example, answer: 16 0B 1F 00 00 00 7E 09 07 07 0E 0D 72 9E

Parsing code: 126 2311 1806 3442

Sensor Dimension



User Attention

※ It is the best installation method that the plane where the air inlet and outlet are located is close to the air hole connecting the inner wall of the user machine with the outside world. If this is not possible, there should be a structure between the air inlet and outlet to isolate the air flow in and out, so as to prevent the air from flowing back inside the user machine.

※ When this product is installed and used in the system, the air inlet and air outlet should be unobstructed, and there should be no large airflow facing the air inlet and outlet; the internal section of the sensor and the recommended installation method

As follows, so as to avoid dust deposition on the surface of the sensitive device during use and affect the accuracy of the sensor test.

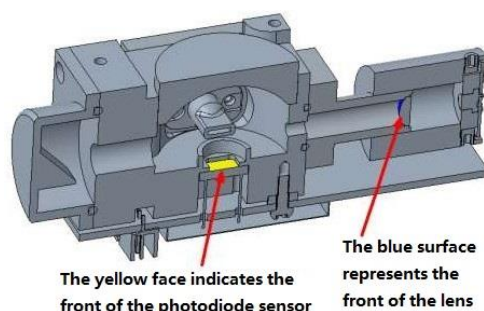


Figure 4 Internal section of the sensor

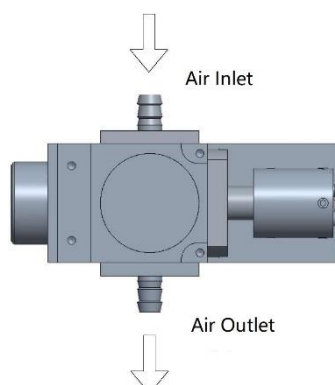


Figure 5 Recommended installation method

※ 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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