

# Environmental Air Quality Sensors

For Indoor and Outdoor Air Quality



Carbon Dioxide Sensor



Particulate Matter Sensor



Integrated Module



Optical Particle Counter



# Super Low Power CO<sub>2</sub> Sensor

## CM1106SL-NS

### Features

- Super low power consumption: 37μA@2minutes
- Accuracy can reach at ±(40ppm+3%of reading), meets the RESET Standard Grade A (Note 1)
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Auto-baseline correction function, maintenance-free
- Signal output: UART\_TTL, I<sup>2</sup>C

### Applications

- Battery powered air quality monitor
- Battery powered HVAC system controller
- Portable battery powered CO<sub>2</sub> meter
- Fresh air system
- Green house

### Specifications

Measurement Range	0~5,000ppm
Accuracy	±(40ppm+3%of reading) (Note 2)
Working Condition	-10°C~50°C, 0~95%RH (non-condensing)
Signal Output	UART_TTL, I <sup>2</sup> C
Working Current	37μA (2 minutes as measurement cycle, default in the sensor)
Power Supply	DC3.3V~5.5V
Dimension	W33.5*H19.7*D9.1 (mm)

Notel: The accuracy standard quotes "The RESET™ Air STANDARD for Accredited Monitors v2.0", copyright © 2018 RESET™.

Note2: In normal IAQ applications, accuracy is defined with 10°C~35°C, 0~85%RH. When the sensor is under single measurement mode (Power supply is controlled by host), the sensor reading output is without moving average. The defined accuracy ±(40ppm+3%of reading) is based on data moving average≥5 and range of 400~2000ppm.



# High Accuracy CO<sub>2</sub> Sensor

## CM1106H-NS

### Features

- High accuracy:  $\pm(30\text{ppm}+3\%\text{of reading})@-10^{\circ}\text{C}\sim 50^{\circ}\text{C}$ , meets the RESET Standard Grade A (Note 1)
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Flexible pin direction design is available
- Auto-baseline correction function, maintenance-free
- Long lifespan  $\geq 15$  years

### Applications

- Fresh air system
- HVAC system controller
- Air quality monitor
- Household & central air conditioner
- Air purifier

### Specifications

Measurement Range	PWM: 0~2,000ppm UART_TTL, I <sup>2</sup> C: 0~10,000ppm (Note 2)
Accuracy	$\pm(30\text{ppm}+3\%\text{of reading}) @-10^{\circ}\text{C}\sim 50^{\circ}\text{C}$ , 0~85%RH
Working Condition	$-10^{\circ}\text{C}\sim 50^{\circ}\text{C}$ , 0~95%RH (non-condensing)
Signal Output	UART_TTL, I <sup>2</sup> C, PWM
Working Current	< 50mA
Power Supply	DC4.5V~5.5V
Dimension	W33*H19.7*D8.9 (mm)

Note1: The accuracy standard quotes "The RESET™ Air STANDARD for Accredited Monitors v2.0", copyright © 2018 RESET™.

Note 2: Sensor is designed to measure in the range 0~2,000ppm (PWM), 0~10,000ppm (UART\_TTL, I<sup>2</sup>C) with specified in the table accuracy.





# Dual Beam CO<sub>2</sub> Sensor

## CM1107N

### Features

- Dual beam(Note 1) detection for high accuracy and long-term stability with little drift
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Measurement range can be extended to 10,000ppm
- Long lifespan ≥15 years

### Applications

- Green house
- Fresh air system
- Household & central air conditioner
- Boiler gas leakage alarm
- Farm

### Specifications

Measurement Range	0~5,000ppm default
Accuracy	±(30ppm+3%of reading)@0°C~50°C, 50±10%RH
Working Condition	-10°C~50°C, 0~95%RH (non-condensing)
Signal Output	UART_TTL, I <sup>2</sup> C, PWM
Working Current	< 50mA
Power Supply	DC4.5V~5.5V
Dimension	W33*H21.7*D12.7 (mm) (without pin)

Note 1: Dual beam CO<sub>2</sub> sensor applies two beams: One for detecting and one for reference, reduces influence of the IR source aging, to ensure high accuracy with little drift. Dual Beam CO<sub>2</sub> Sensor suits for applications without fresh air environments.





# Wide Measurement Range CO<sub>2</sub> Sensor

## CM1107H

### Features

- Wide measurement range, 5%vol CM1107H
- Dual beam detection for high accuracy and long-term stability with little drift
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Low power consumption
- Long lifespan ≥15 years

### Applications

- Wine cellar
- Carbonated beverage factory
- Bar
- Silobag grain
- Intelligent agriculture

### Specifications

Specifications	CM1107H
Measurement Range	0~5%vol
Accuracy	±(0.02%vol +10%of reading) @0~50°C, 50±10%RH
Working Condition	-10°C~50°C, 0~95%RH (non-condensing)
Signal Output	UART_TTL, I <sup>2</sup> C
Power Supply	DC4.5V~5.5V
Working Current	< 50mA
Dimension	W33*H22*D13.1 (mm) (without pin)



# Dual IR Source CO<sub>2</sub> Sensor

## CM1109

### Features

- Dual IR source NDIR technology with independent intellectual property
- Dual Measurement Range
- Matrix calibration to ensure accuracy under whole measurement temperature and measurement range
- High accuracy, long term stability
- Long lifespan ≥15 years
- Signal output: UART\_TTL, PWM, I<sup>2</sup>C

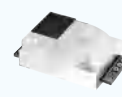
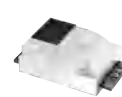


### Applications

- HVAC, central air conditioning
- Agricultural planting, plant cultivation
- Storage, cold chain transportation
- Indoor air quality detector
- Air purifier

### Specifications

Measurement Range	400~5,000ppm/400~20,000ppm
Accuracy	±(50ppm+3%of reading) @0~50°C, 50±10%RH@400~5000ppm
Working Condition	-10°C~50°C, 0~95%RH (non-condensing)
Signal Output	UART_TTL, I <sup>2</sup> C, PWM
Working Current	<45mA
Power Supply	DC4.5V~5.5V
Dimension	W33*H20.3*D11.4 (mm) (without pin)

## Table Overview for Cubic NDIR CO2 Sensors

Product Image	Working Principle	Measurement Range	Accuracy	Signal Output	Power Consumption	Features			
						Matrix Calibration	Temperature and Humidity Compensation	Auto-baseline Correction (default on)	Super Low Power
 CM1106-C	Single beam NDIR	0~5,000ppm	$\pm(50\text{ppm}+5\%\text{ of reading})$ @0~50°C, 50±10%RH	UART_TTL I <sup>2</sup> C PWM	<45mA @1second	✓	✓	✓	
 CM1106SL-NS	Single beam NDIR	0~5,000ppm	$\pm(40\text{ppm}+3\%\text{ of reading})$ @10°C~35°C, 0~85%RH	UART_TTL I <sup>2</sup> C	37uA @2minutes	✓	✓		✓
 CM1106H-NS	Single beam NDIR	0~10,000ppm	$\pm(30\text{ppm}+3\%\text{ of reading})$ @-10°C~50°C, 0~85%RH	UART_TTL I <sup>2</sup> C PWM	<50mA @1second	✓	✓	✓	
 CM1107N	Dual beam NDIR	0~5,000ppm	$\pm(30\text{ppm}+3\%\text{ of reading})$ @0~50°C, 50±10%RH	UART_TTL I <sup>2</sup> C PWM	<50mA @1second	✓	✓		
 CM1107H	Dual beam NDIR	0~50,000ppm	$\pm(200\text{ppm}+10\%\text{ of reading})$ @0~50°C, 50±10%RH	UART_TTL I <sup>2</sup> C	<50mA @1second	✓	✓		
 CM1109	Dual Engine NDIR	0~5,000ppm	$\pm(50\text{ppm}+3\%\text{ of reading})$ @0~50°C, 50±10%RH	UART_TTL I <sup>2</sup> C PWM	<50mA @1second	✓	✓		

\*Matrix calibration: The sensors are calibrated at low (-10°C), normal (25°C) and high (50°C) temperature points under multi-points of CO<sub>2</sub> concentration, to ensure high accuracy under wider temperature and measurement range.

\*Temperature and Humidity Compensation: With the integrated RH&T chip and matrix calibration, ensures the high accuracy under wider temperature and humidity range.

\*Auto-baseline Correction(ABC): After turn on the ABC, sensors will record the lowest value during the ABC period and automatically correct as 400ppm (The applications should ensure that the environments have access to fresh air), maintenance-free.

\*Super Low Power:  $\mu$ A current level, super low power consumption suits for battery supply applications.

\*Due to automatic production line, upstream and downstream vertical integration of supply chain, Cubic has realized stable and fast delivery for all the CO<sub>2</sub> sensors.





# LED Particulate Matter Sensor

## PM1006K

### Features

- Output PM1.0, PM2.5 and PM10
- Built-in MCU, smart algorithm
- Dust deposition correction function
- Compact structure, light weight and easy to install

### Specifications

Measurement Range	0~1000 $\mu\text{g}/\text{m}^3$
Accuracy	PM2.5: $\pm 20\mu\text{g}/\text{m}^3$ or $\pm 20\%$ of reading (25°C $\pm 2^\circ\text{C}$ , 50 $\pm 10\%$ RH, TSI8530)
Working Condition	-20°C~75°C, 0~95% RH (non-condensing)
Power Supply	DC 5V $\pm 0.2\text{V}$
Working Current	$\leq 30\text{mA}$
Signal Output	UART_TTL, PWM
Dimension	W46.2*H34.1*D18 (mm)



# Laser Particulate Matter Sensor

## PM2012 series

## Features

- API (Auto Particle Identification) technology with PM1.0, PM2.5, PM10 output
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Constant power control of laser diode, ensures constant signal output
- Constant fan speed, ensures constant sampling flow and low noise
- Ultra-thin design with small dimension
- Air inlet and outlet on the same side and the opposite side for option

## Specifications

Measurement Particulate Matter	0.3μm~10μm
Measurement Range	0~5000μg/m <sup>3</sup>
Accuracy	PM1.0&PM2.5: 0~100μg/m <sup>3</sup> , ±10μg/m <sup>3</sup> ; 101~500μg/m <sup>3</sup> , ±10% of reading; PM10: 0~100μg/m <sup>3</sup> , ±25μg/m <sup>3</sup> ; 101~500μg/m <sup>3</sup> , ±25% of reading (25°C±2°C, 50±10%RH, GRIMM)
Working Condition	-10°C~60°C, 0~95% RH (non-condensing)
Power Supply	DC 5V±0.1V
Working Current	≤100mA (Working), ≤200uA (Standby)
Signal Output	UART_TTL, I <sup>2</sup> C
Dimension	W38*H35*D12 (mm)



# Laser Particulate Matter Sensor

## PM2008 series

### Features

- API(Auto Particle Identification) technology with PM1.0, PM2.5, PM10 output
- High accuracy, up to  $\pm 5\mu\text{g}/\text{m}^3$
- Matrix calibration within the whole temperature and measurement range
- Hanging ear design for easy installation

### Specifications

Measurement Particulate Matter	0.3 $\mu\text{m}$ ~10 $\mu\text{m}$
Measurement Range	0~5000 $\mu\text{g}/\text{m}^3$
Accuracy	PM1.0&PM2.5: 0~35 $\mu\text{g}/\text{m}^3$ , $\pm 5\mu\text{g}/\text{m}^3$ ; 35 $\mu\text{g}/\text{m}^3$ ~500 $\mu\text{g}/\text{m}^3$ , $\pm 15\%$ of reading PM10: 0~100 $\mu\text{g}/\text{m}^3$ , $\pm 25\mu\text{g}/\text{m}^3$ ; 101~500 $\mu\text{g}/\text{m}^3$ , $\pm 25\%$ of reading (25°C $\pm 2^\circ\text{C}$ , 50 $\pm 10\%$ RH, GRIMM)
Working Temperature	-10°C~60°C, 0~95% RH(non-condensing)
Power Supply	DC 5V $\pm 0.1\text{V}$
Working Current	$\leq 100\text{mA}$ (Working), $\leq 200\mu\text{A}$ (Standby)
Signal Output	UART_TTL, I <sup>2</sup> C, PWM





## Integrated Module AM1002

### Features

- 6 in 1 integrated sensor: PM1.0, PM2.5, PM10, VOC, Relative Humidity&Temperature
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Ultra-thin design with small dimension
- Air inlet and outlet on the same side and the opposite side for option

### Specifications

Measurement Range	Particulate Matter: 0~5000 $\mu\text{g}/\text{m}^3$ VOC: 0~10ppm Temperature: -20°C~70°C Humidity: 0~99%RH
PM Accuracy	PM1.0&PM2.5: 0~100 $\mu\text{g}/\text{m}^3$ , $\pm 10\mu\text{g}/\text{m}^3$ ; 101~500 $\mu\text{g}/\text{m}^3$ , $\pm 10\%$ of reading; PM10: 0~100 $\mu\text{g}/\text{m}^3$ , $\pm 25\mu\text{g}/\text{m}^3$ ; 101~500 $\mu\text{g}/\text{m}^3$ , $\pm 25\%$ of reading (25°C $\pm 2^\circ\text{C}$ , 50 $\pm 10\%$ RH, GRIMM)
Temperature Accuracy	$\pm 1^\circ\text{C}$ (0~40°C)
VOC Consistency	Typical/Max: 200ppb/250ppb or 20%/25%
Humidity Accuracy	Typical/Max: $\pm 5\%$ / $\pm 8\%$ (5%~95%RH)
Working Condition	-10°C~60°C, 0~95%RH (non-condensing)
Working Current	<100mA
Power Supply	DC 5V $\pm 0.1\text{V}$
Signal Output	UART_TTL
Dimension	W38*H35*D12 (mm)



## 7-in-1 Integrated Gas Sensor Module AM1009

### Features

- 7 in 1 integrated sensor module: PM1.0, PM2.5, PM10, VOC, NO<sub>2</sub>, Relative humidity & Temperature
- Matrix calibration to ensure accuracy under whole temperature and measurement range
- Cubic MOX sensor, supports various gas types detection
- Intelligent VOC auto-calibration strategy on site, maintenance-free
- Temperature compensation algorithm
- OEM/ODM available

### Specifications

Operating Principle	PM: Laser light scattering VOC & NO <sub>2</sub> : MOX
Measurement Range	PM: 0~5,000 $\mu\text{g}/\text{m}^3$ ; VOC: 0~10ppm; NO <sub>2</sub> : 0~1,000ppb Temperature: -20°C~70°C; Humidity: 0~99%RH
PM Accuracy	PM1.0 & PM2.5: 0~100 $\mu\text{g}/\text{m}^3$ , $\pm 10\mu\text{g}/\text{m}^3$ ; >100 $\mu\text{g}/\text{m}^3$ , $\pm 10\%$ of reading; PM10: 0~100 $\mu\text{g}/\text{m}^3$ , $\pm 20\mu\text{g}/\text{m}^3$ ; >100 $\mu\text{g}/\text{m}^3$ , $\pm 20\%$ of reading; (GRIMM 11-A, 0~50°C, 50 $\pm 10\%$ RH, dust source: Cigarette+A1)
VOC Accuracy	160ppb or $\pm 40\%$ of reading
NO <sub>2</sub> Accuracy	40ppb or $\pm 40\%$ of reading
Temperature Accuracy	0~50°C: $\pm 1^\circ\text{C}$
Humidity Accuracy	Typical/Max: $\pm 5\%/\pm 8\%$ (5%~95%RH)
Working Condition	-20°C~60°C, 0~95%RH(non-condensing)
Power Supply	DC 5V $\pm 0.1\text{V}$
Average Working Current	$\leq 180\text{mA}$ (continuous operation)
Signal Output	I <sup>2</sup> C (UART is available)
Dimension	W50*H38*D21 (mm)
Life Time	>10 years

### Application

- Air purifier
- Air quality monitor
- Air conditioner
- Ventilation system



# Outdoor Particulate Matter Sensor PM3006S

## Features

- High power industrial grade linear laser, with stable and strong signal output
- Automotive-grade fan with constant current to ensure constant sampling flow
- API (Auto Particle Identification) technology ensures accuracy of particulate matter concentration within the whole temperature and measurement range
- Wide working temperature range  $-30^{\circ}\text{C}\sim 70^{\circ}\text{C}$ , meets outdoor application environment requirements
- With voltage regulator design and EMC compatibility, strong anti-static ability

## Specifications

Measurement Particulate Matter	PM1.0, PM2.5, PM10, TSP
Measurement Range	0~30,000 $\mu\text{g}/\text{m}^3$
Accuracy	PM1.0&PM2.5: 0~50 $\mu\text{g}/\text{m}^3$ , $\pm 5\mu\text{g}/\text{m}^3$ ; 50~1000 $\mu\text{g}/\text{m}^3$ , $\pm 10\%$ of reading; PM10: 0~100 $\mu\text{g}/\text{m}^3$ , $\pm 15\mu\text{g}/\text{m}^3$ ; 100~1000 $\mu\text{g}/\text{m}^3$ : $\pm 15\%$ of reading ( $-20^{\circ}\text{C}\sim 70^{\circ}\text{C}$ , 50 $\pm 10\%$ RH, GRIMM)
Working Condition	$-30^{\circ}\text{C}\sim 70^{\circ}\text{C}$ , 0~95%RH (non-condensing); $-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ working temperature is also available
Storage Condition	$-40^{\circ}\text{C}\sim 85^{\circ}\text{C}$ , 0~95%RH (non-condensing)
Power Supply	DC 5V $\pm 0.1\text{V}$
Working Current	< 250mA
Signal Output	UART_TTL, I <sup>2</sup> C
Dimension	W85*H74*D24.9 (mm)





# Industrial High Concentration Dust Sensor

## PM3003Q

### Features

- 3 channels concentration output PM2.5, PM10 and TSP in  $\mu\text{g}/\text{m}^3$
- Industrial grade laser diode with high reliability particle identification
- Anti dust design, suitable for high dust concentration environment
- Compact size and easy for installation

### Specifications

Measurement Particulate Matter	PM2.5, PM10, TSP
Measurement Range	0~1000mg/m <sup>3</sup>
Accuracy	0~1 mg /m <sup>3</sup> : $\pm 200\mu\text{g}/\text{m}^3$ 1~50 mg/m <sup>3</sup> : $\pm 20\%$ of reading (Test under typical working conditions, 25 $\pm$ 2°C, 50 $\pm$ 10%RH, with TSI8533 as the reference)
Sampling Flow Rate	Recommend 2 L/min
Working Condition	-30°C~70°C, 0~95%RH (non-condensing)
Storage Condition	-40°C~85°C, 0~95%RH (non-condensing)
Power Supply	DC 5V $\pm$ 0.2V, ripple wave <100mV
Working Current	<150mA
Signal Output	UART(TTL 3.3V)
Dimension	W90.8*H60.2*D37.6(mm)



# Online Optical Particle Counter with Display

## OPC-6510DS

## Features

- Real-time output particle quantities of 0.3μm, 0.5μm, 1.0μm, 5.0μm, 10μm in pcs/28.3L or pcs/m<sup>3</sup>
- Sound and light alarm once particle quantity exceeds the set threshold
- ModBus and MQTT communication protocols available
- Calibration coefficient correction available against standard equipment
- Real-time display cleanroom ISO 14644-1 grade level
- Output units switchable between pcs/28.3L and pcs/m<sup>3</sup>
- Constant flow gas sampling system to ensure stable sampling
- Industrial grade laser for high reliability

## Specifications

Measurement Particulate Matter	0.3μm, 0.5μm, 1.0μm, 5μm, 10μm
Counting Efficiency	50%@≥0.3μm, 100%@≥0.5μm Condition: 25±2°C, 50±10%RH, calibration instrument Lighthouse 3100
Working Condition	0~45°C, 0~95%RH (non-condensing)
Storage Condition	-20°C ~ 60°C, 0 ~ 95%RH (non-condensing)
Operating Voltage	DC 24V±15%
Average Operating Current	≤3A
Communication Interface	Rs485 (Standard), Rj45 (Standard)
Sampling Flow Rate	28.3L/min (1CFM)
Display	3.5-inch color touch screen

# Table Overview for Cubic Particulate Matter Sensors

Product Image	Light Source	Measurement Range	Inlet and Outlet	Features						
				Auto Particle Identification (API)	Matrix Calibration	Anti-Dust	Constant Power Control of Laser Diode	Constant RPM Speed Fan	Three-channel Output (PM1.0, PM2.5&PM10 in $\mu\text{g}/\text{m}^3$ )	Particle Count Output (in pcs/L)
 PM1003	LED	0~500 $\mu\text{g}/\text{m}^3$			✓					
 PM1006K	LED	0~1000 $\mu\text{g}/\text{m}^3$			✓				✓	
 PM2016	Laser Diode	0~1000 $\mu\text{g}/\text{m}^3$	Same Side	✓	✓	✓	✓	✓	✓	✓
 PM2008M	Laser Diode	0~5000 $\mu\text{g}/\text{m}^3$	Same Side	✓	✓		✓	✓	✓	
 PM2012	Laser Diode	0~5000 $\mu\text{g}/\text{m}^3$	Same Side & Opposite Side	✓	✓		✓	✓	✓	
 AM1002	Laser Diode	0~5000 $\mu\text{g}/\text{m}^3$	Same Side & Opposite Side	✓	✓		✓	✓	✓	
 AM1009	Laser Diode	0~5000 $\mu\text{g}/\text{m}^3$	Same Side & Opposite Side	✓	✓	✓	✓	✓	✓	
 PM3006S	Laser Diode	0~30,000 $\mu\text{g}/\text{m}^3$	Adjacent Side	✓	✓		✓	✓	✓	
 PM3003Q	Laser Diode	0~1,000 $\text{mg}/\text{m}^3$	Adjacent Side		✓		✓		PM2.5, PM10 and TSP in $\mu\text{g}/\text{m}^3$	
 OPC-6510DS	Laser Diode	0~1,000,000 pcs/28.3L			✓		✓	✓		✓

\*Auto Particle Identification(API): The sensors are calibrated with different dust sources, to ensure identification ability under different particulate matter distributions. With the application of the correct density in professional algorithm, the sensors ensure three channels PM1.0, PM2.5&PM10 output with high accuracy regardless of particulate matter distribution change.

\*Matrix Calibration: The sensors are calibrated at multi-points of low, normal and high temperature under multiple dust concentration points, to ensure high accuracy under wider temperature and measurement range.

\*Anti-Dust: Special structure design to decrease dust accumulation over photodiode, ensures sensors longer lifespan under high dust concentration environments.

\*Constant Power Control of Laser Diode: It ensures constant signal output, which is conducive to identify the particulate matter, to ensure stable performance and high accuracy.

\*Constant RPM Speed Fan: It ensures constant sampling flow, enables sensors with low noise and stability.

\*Three-channel Output: Output PM1.0, PM2.5&PM10 in  $\mu\text{g}/\text{m}^3$  simultaneously.

\*Particle Count: Output in pieces/volume, suits for cleanroom.

## Cubic Sensor and Instrument Co., Ltd.

Add: Fenghuang No.3 Road, Fenghuang Industrial Park, Eastlake Hi-tech Development Zone, Wuhan, 430205, China

Tel: +86-27-81628827

Fax: +86-27-87401159

E-mail: [info@gassensor.com.cn](mailto:info@gassensor.com.cn)

Web: [en.gassensor.com.cn](http://en.gassensor.com.cn)

All products are in continuous development and therefore specifications may be subject to change without prior notice.