SPECIFICATION

Product Name: Integrated Air Quality Sensor

Item No.: AIS-8100

Version: V0.1(Preliminary Version)

Date: 2021-9-22

Revision

No.	Version	Content	Date
1	V0.1	Preliminary Version	2021-9-22

Integrated Air Quality Sensor

AIS-8100

Applications

- In-cabin Air Quality Monitoring
- Automotive Air Conditioner
- Automotive Air Purifier

Description

AIS-8100 sensor is an integrated air quality sensor for vehicle air quality monitoring. By integrated PM sensor based on laser scattering technology and CO_2 sensor based on advanced NDIR technology, AIS-8100 sensor can output accurate and fast PM2.5 and CO_2 concentration measurement via CAN communication. It helps to give a real time vehicle in-cabin air quality monitoring, and provides a health and comfortable in-cabin environment for both drivers and passengers.

Features

- Laser scattering technology adopted, the smallest size of available measurement: 0.3μm
- Real-time PM2.5 output in $\mu g/m^3$
- High-temperature laser module , working temperature can reach 70℃
- Intelligent identification of different dust sources
- Patented NDIR technology adopted for fast response and high accuracy CO_2 concentration measurement
- Auto-calibration mechanism for CO_2 sensing
- Accurate, stable and reliable measurement in various practical and complex road conditions
- Vehicle-level circuit design can be suitable to the harsh vehicle environment
- CAN real-time communication; IP54 protection
- Long life laser, MTTF≥81,500 hours

Working Principle

■ Laser Scattering Technology

Particles in the air have scattering effect on incident light, and the intensity of the scattered light is related to the particle size. Inhaling air particles from the sampling vent, and the air dust particles will pass through the light sensitive area. So, the dust particles are irradiated by light and will scatter a light pulse signal which is proportional to the particle size. This signal is received by the photosensitive device and converted into a corresponding electrical pulse signal. Amplify, by counting the number of electrical pulses in a detection cycle, the number of particles in the air sampled per unit (pcs/L) can be detected, which can then be converted into mass concentration (μg/m3) through algorithm. The basic principle and structure of the sensor are shown in the figure 1 below:

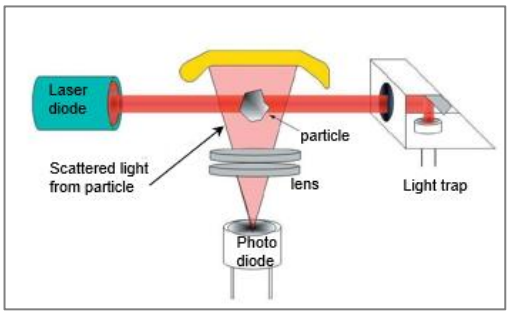


Figure 1 Laser Scattering Technology

■ Non-dispersive Infrared (NDIR) Spectroscopy Technology

The gas to be measured produces strong absorption of infrared at a particular wavelength, and according to Lambert-Bill's law, spectrum absorption has high correlation with gas concentration, commonly referred to as non-dispersive infrared (NDIR) technology. The infrared light source radiates infrared light, and the infrared light passes through the measured gas in the optical path and the narrow band filter, then reaches the infrared detector. By measuring the intensity of the infrared light entering the infrared detector, the concentration of the measured gas can be calculated. The basic principle and structure of the sensor are shown in the figure 2 below:

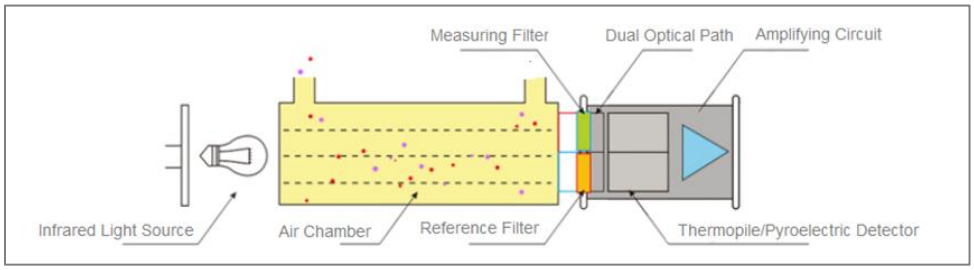


Figure 2 Non-dispersive Infrared (NDIR) Technology

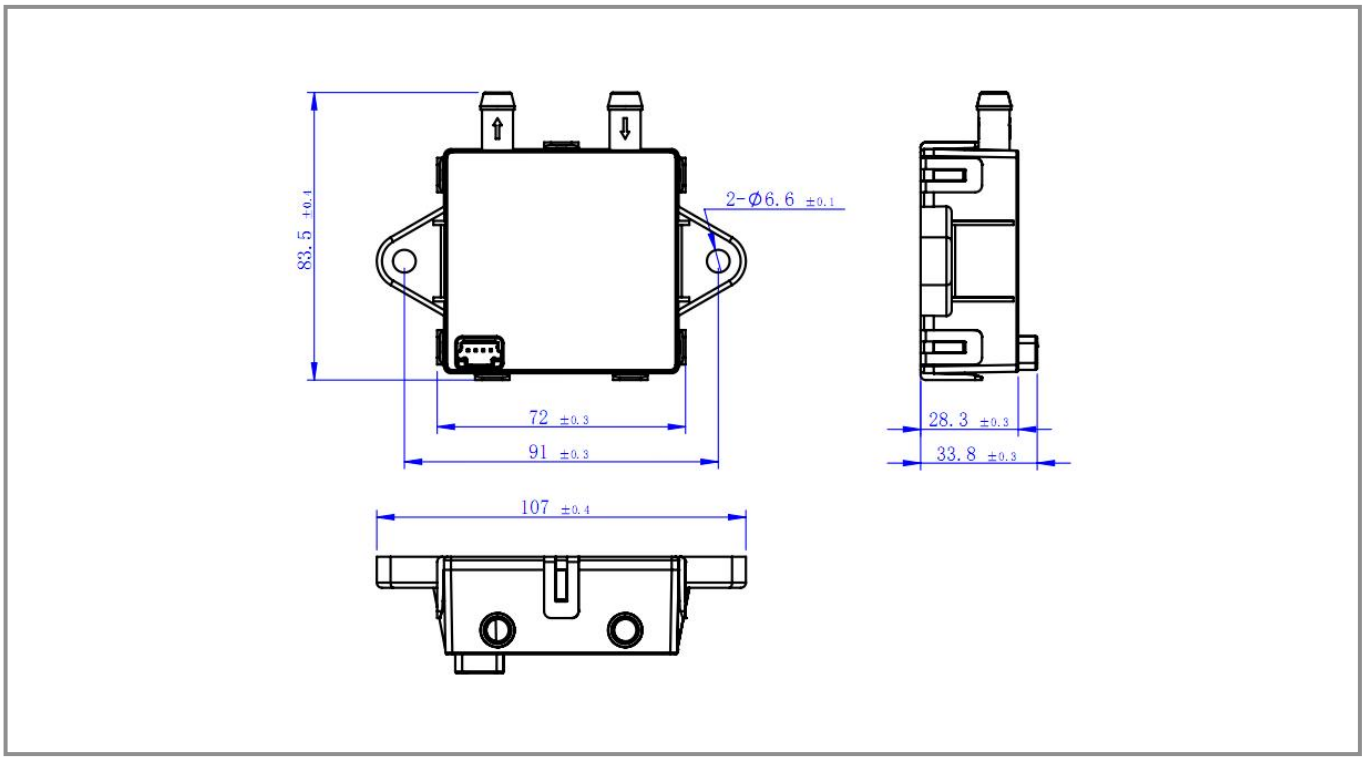
Compared with electrochemical, catalytic combustion, solid electrolyte, semiconductor gas sensor technology, NDIR sensor has the following advantages: good selectivity, anti-aging against harmful gas poisoning, fast response, good stability, high signal-to-noise ratio.

Specification

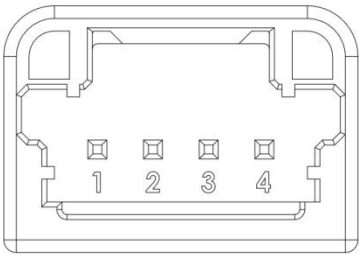
General Performance	
Operating Principle	PM：Laser Scattering Technology CO_2：Non-dispersive Infrared (NDIR) Spectroscopy Technology
Measured Particle Range	0.3μm ~ 2.5μm
Measurement Range	PM2.5：5~500μg/m³ CO_2：400~5000ppm
Resolution	PM2.5：1μg/m³ CO_2：1ppm
PM2.5 Accuracy	≤35μg/m³，±5μg/m³ ＞35μg/m³，±15% of reading
CO_2 Accuracy	≤750ppm，±75ppm ＞750ppm，±10% of reading
Response Time	⩽1s (after activated)
Time to First Reading	⩽30s
Digital output	CAN
IP Rating	IP54
Noise	⩽35dB(A)@50cm
MTTF	⩾81,500 hours (continuous operation)
Environmental	
Working Condition	-40~+85℃,5-95%RH (non-condensing)
Storage Condition	-40~+85℃,5-95%RH (non-condensing)
Electrical	
Power Supply	DC 12V（ DC 9V ~16 V available）
Working Current	⩽150mA
Standby Current	⩽100μA

Dimensions and Connector

1. Dimensions (Unit mm)



2. Pin Definition



No.	Pin	Description
1	VCC	Power input（+12V）
2	CAN_H	CAN High
3	CAN_L	CAN Low
4	GND	Power input（ground）

3. Connector Specification

Item	Part Number	Pitch	Recommendation Manufacturer
Connector	C-1612035-1	2.2mm	Tyco
Matching Connector	C-1473672-1	2.2mm	Tyco

Communication

1. CAN Communication

Name	Parameter
CAN interface	CAN ISO
CAN Version	2.0a
CAN Baud rate	500k
CAN ID	0x0AB

2. CAN Communication Protocol

Message Attributes			Signal Name	Description	Start Bit	Length (bit)	Update Period (ms)	Signal start (bit)	Initial Value	Invalid values	Min Value (phys)	Max Value (phys)	Unit	Offset	State Description
ID (hex)	DLC	Frame name													
0xAB	5	PMS_Sensor_Message_01	PMS_PM2_5V	PM2.5 Value	1	16	1000	0	65534	65535，1001~65533	0	1000	ug/m3	0	Fault 65535
0xAB			PMS_CO2	CO2 Value	3	16	1000	0	550	5001~65535	0	5000	ppm	0	--
0xAB			PMS_Status	Sensor Status	5	8	1000	0	0	65535，1001~65533	0	2	--	0	0: Normal 1: Limited 2: Fault

3. Diagnostic

Diagnostics Supported：

Read Manufacture Date, and Product Number

Read Operating Life

Read Power-on Count

Read Software Reset Count

Fault Response：

Fan Failure

Laser Module Failure

The Light Source Failure

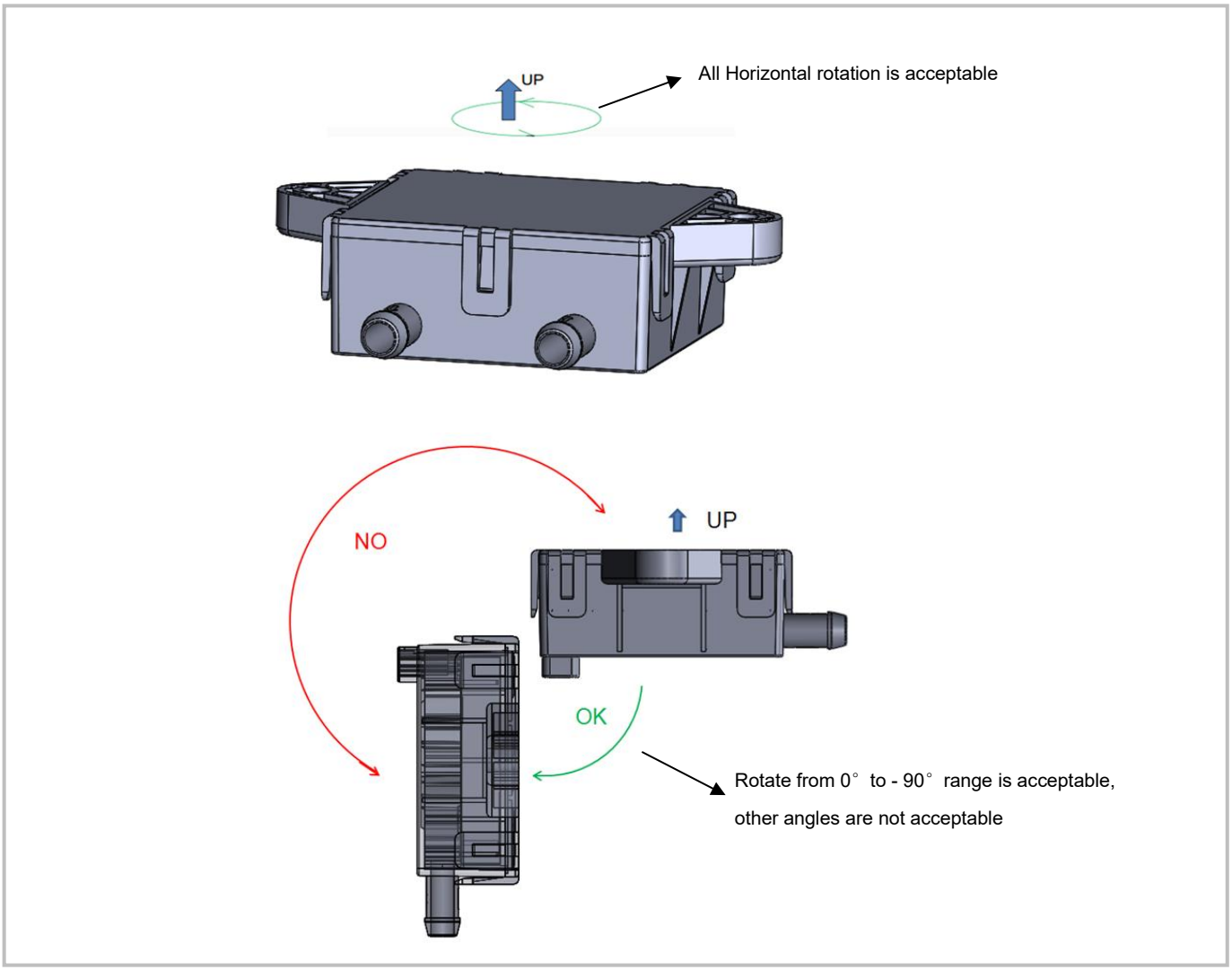
Out of Working Voltage Range

Out of Working Temperature Range

Product Installation

In order to avoid dust deposition on the surface of sensitive component (laser diode and photosensitive diode) which may affect the measurement accuracy, the appropriate installation ways are recommended as below.

Recommended Installation



After-Sales Services and Consultancy

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