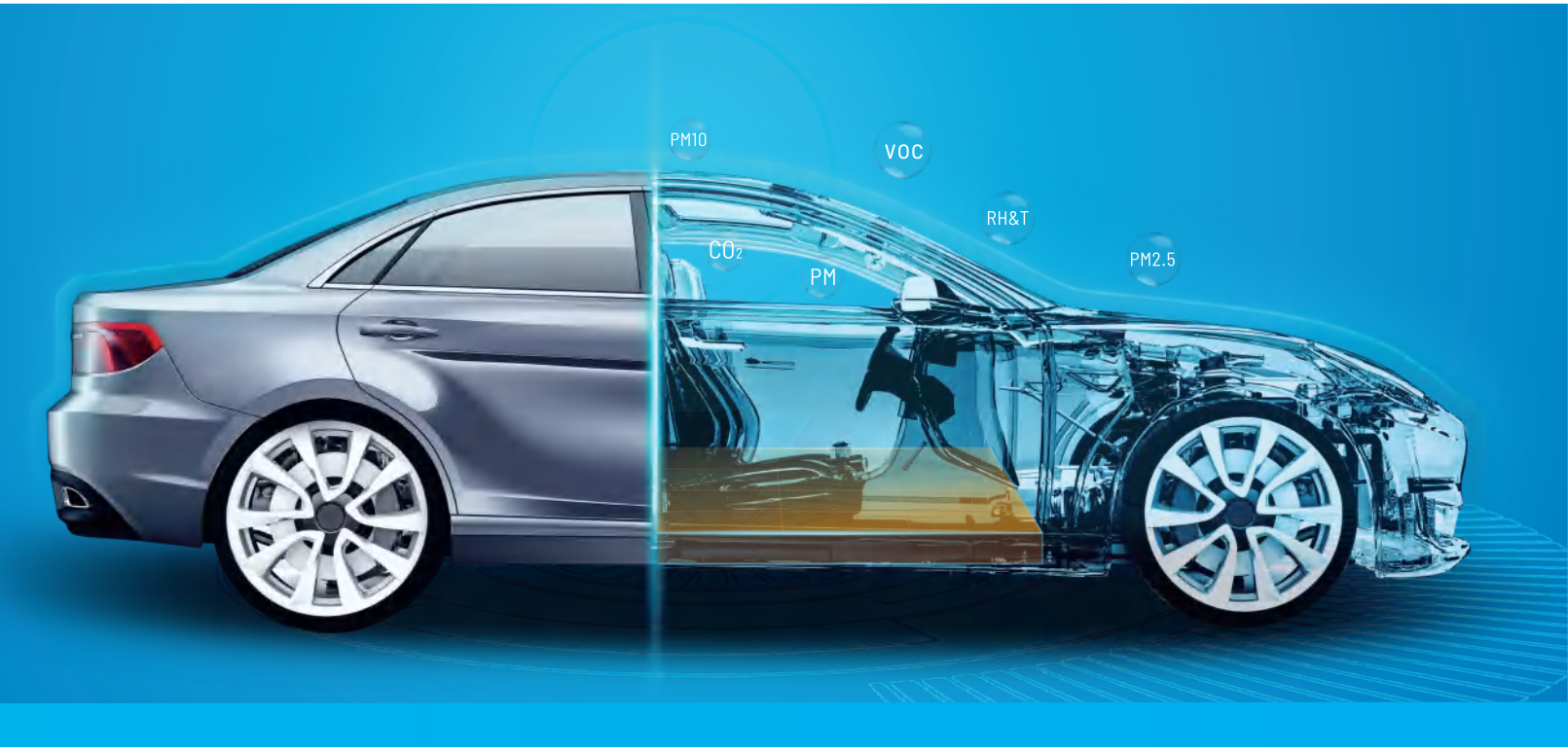


Automotive Gas Sensor Solution

Cubic Sensor and Instrument Co.,Ltd.

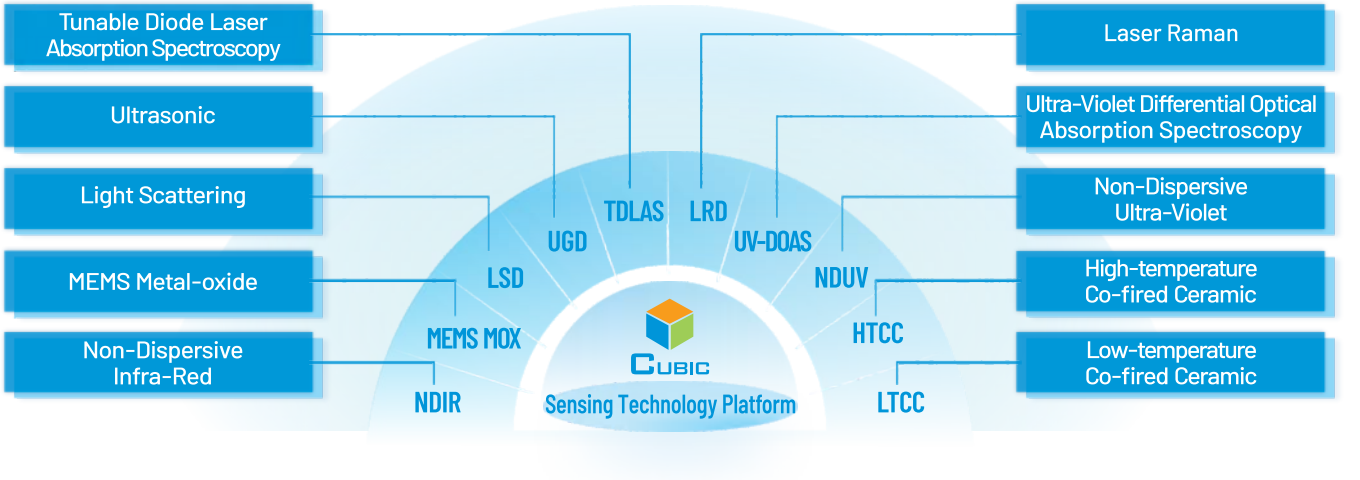
Cubic Introduction

Cubic Sensor and Instrument Co., Ltd. (hereinafter referred to as "Cubic") is a publicly listed company in SSE STAR Market (stock code:688665), specializing in smart gas sensors and superior gas analyzers. Set up in 2003, situated at "Optics Valley" of Wuhan, China, Cubic has established gas sensing technology platforms including optical technologies (NDIR, Ultraviolet, Light Scattering, Laser Raman), ultrasonic technology, MEMS metal oxide semiconductor (MOX) technology, electrochemical technology, ceramic thick-film technology based high temperature solid electrolyte technology and so on. At present, Cubic has obtained more than 100 patents home and aboard, with abundant products widely used in various fields of air quality, environmental monitoring, industrial processes, industrial safety monitoring, healthcare, smart metering and so on.


Headquarter in Wuhan

R&D Center in Wuhan


New Factory in Jia Shan



20 Years

Development and Application of NDIR Technology

15 Years

Development and Application of Ultrasonic Technology

13 Years

Development and Application of Light Scattering Technology

6 Years

Development and Application of MEMS Technologies


ISO 9001:2015


IATF 16949:2016

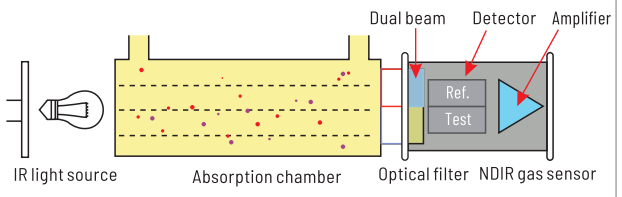

ISO 14001:2015


ISO 45001:2018

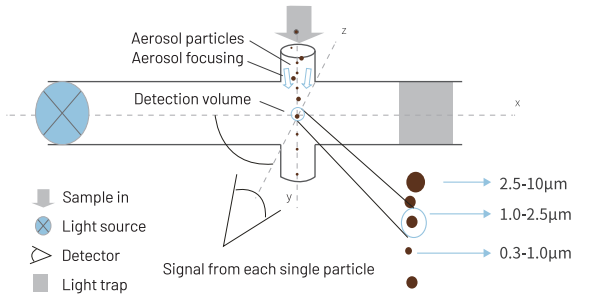
A-SPICE Level 2

Core Technologies

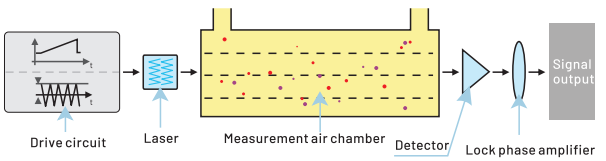
NDIR Gas Sensor Technology



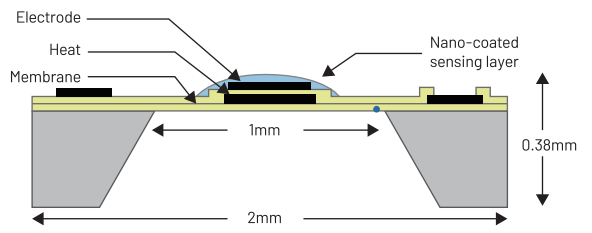
Ligh Scattering Particle Sensor Technology



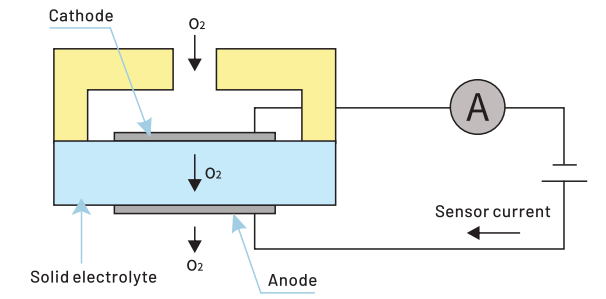
TDLAS Gas Sensor Technology



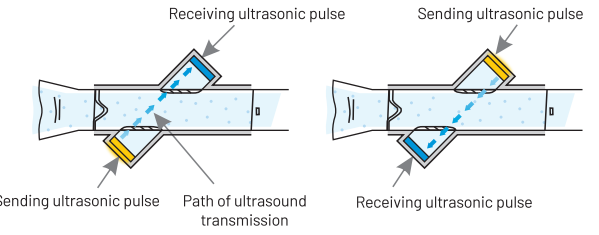
MOX Gas Sensor Technology



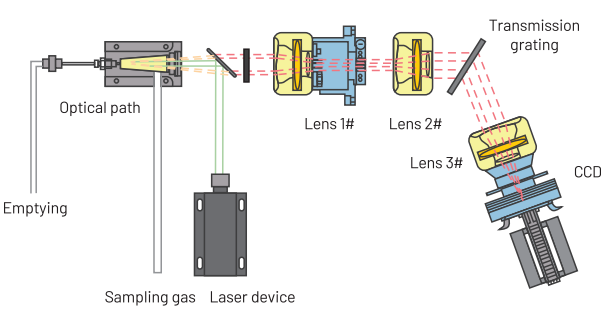
ZrO2 Gas Sensor Technology



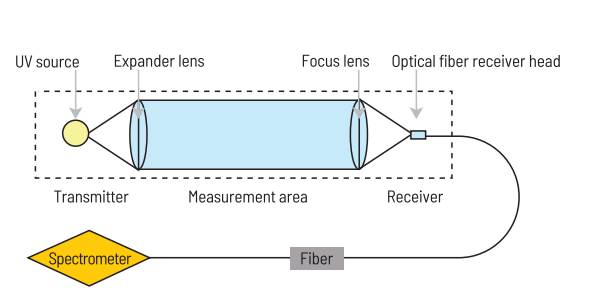
Ultrasonic Gas Sensor Technology



Laser Raman Gas Sensor Technology



UV-DOAS Gas Sensor Technology



Automotive Gas Sensor Solutions

Cabin Comfort Monitoring

Automotive Air Quality Sensors

ACDS-1001
CO_2 Sensor

APMS-3308
PM2.5 Sensor

AQM-1020
AQM Sensor

AIS-8100
CO_2+PM2.5

AIS-9100
PM2.5+MOX

Air Quality Improvement Generators

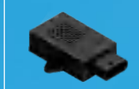
AFG-1000
Fragrance Generator

AAG-1000
Negative Ion Generator

AAG-1001
Plasma Generator

Safety Monitoring

Li-Battery Thermal Runaway Sensors(EV)



ATRS-1011
4 In 1 Integrated Sensor
CO_2+CO/H_2+T+P

ATRS-1021
5 In 1 Integrated Sensor
CO_2+CO/H_2+PM2.5+T+P

ATRS-1031
Aersol Sensor

Refrigerant Leakage Monitoring Sensors

ARS-4203
R290(C_3H_8) Leakage Monitoring Sensor

ARS-744
R744(CO_2) Leakage Monitoring Sensor

Environmental Monitoring

Exhaust Gas Sensors

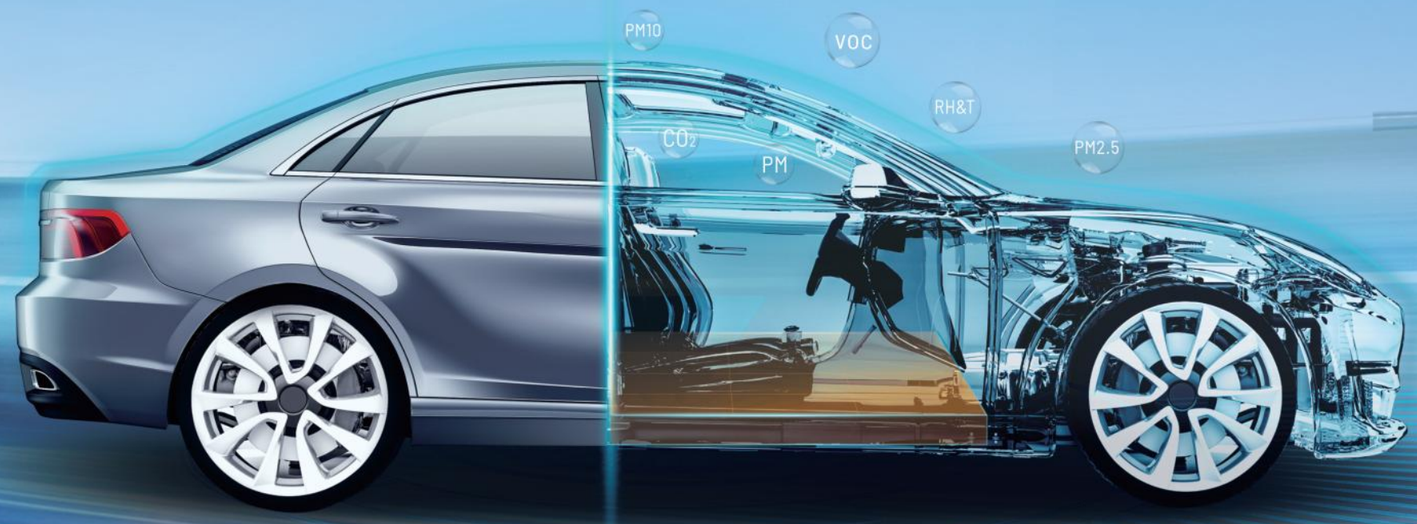
Oxygen Sensor

NOx Sensor

PN Sensor

Gasboard-2000
NDIR Gas Sensor
(CO+CO_2+HC)

Gasboard-2200
UV-DOAS NOx Gas Sensor
(NO+NO_2+NH_3+SO_2)



Cabin Comfort Monitoring Gas Sensors

ACDS-1001
CO_2 Sensor

APMS-3308
PM2.5 Sensor

AQM-1020
AQM Sensor

AIS-8100
CO_2+PM2.5 Sensor

AIS-9100
PM2.5+MOX

AFG-1000
Fragrance Generator

AAG-1000
Negative Ion Generator

AAG-1001
Plasma Generator

ACDS-1001
CO_2 Sensor

Description

ACDS-1001 is a CO_2 sensor based on NDIR (non-dispersive infrared) technology. The diffusion sampling method makes it applicable for automotive HVAC automatic control system. It enables the constant cabin fresh air supply and improves the cabin comfort. At the same time, CO_2 sensor can determine whether there is life left in the car according to the concentration change of CO_2 gas in the car after locking the car, and timely alarm. The sensor has advantages of high accuracy, fast response, no cross interference, low power consumption and long lifetime.

ACDS-1001

Features

- NDIR (non-dispersive infrared) dual channel technology
- Wide measurement range, can up to 40000ppm
- High accuracy for whole measurement and temperature range
- Fast response: T_{90}≤25s
- No cross interference, stable performance
- Low power consumption in μA level

Specifications

Measuring Range	400ppm~5000ppm
Accuracy	±(50ppm+5% of reading)
Working Temperature	-40°C~85°C
Storage Temperature	-40°C~95°C
Supply Voltage	DC 9V~16V
Working Voltage	≤100mA
Communication	LIN

* For more information, please contact: info@gassensor.com.cn

APMS-3308
PM2.5 Sensor

Description

Automotive particulate matter sensor APMS-3308 is a laser particle sensor module for automotive application, which can measure PM2.5 concentration accurately and output in unit of μg/m^3 directly via mathematical algorithm and scientific calibration.

APMS-3308

Features

- Long lifetime, more than 100,000 hours
- High-temperature laser module with constant power output, working temperature can reach 85°C
- Multi-channel output, not only PM2.5 but also PM1.0 and PM10 concentration simutaneously
- lintelligent identification of different dust sources
- Accurate, stable and reliable measurement in various practical and complex road conditions

Specifications

Measuring Range	PM2.5: 0~1000μg/m^3
Accuracy	±15% of reading or ±15μg/m^3
Working Temperature	-40°C~85°C
Storage Temperature	-40°C~95°C
IP Level	IP5K4
Working Voltage	DC 9V~16V
Communication	LIN

* For more information, please contact: info@gassensor.com.cn

AQM-1020
Air Quality Sensor

Description

The air classification module AQM-1020 is a MEMS (Microelectronic Mechanical Systems) sensor which based module for automatic HVAC air intake control. MEMS metal oxide semiconductor gas sensing elements for the detection of oxidizing and reducing environmental gases classify the intake air quality. According to the environmental gas concentrations and implemented internal air diagnostic validation, detailed classification levels are provided via LIN interface.

AQM-1020

Features

- Microelectronic mechanical systems adopted for fast response and high selectivity on VOC
- Accurate, stable and reliable measurement in various gases and complex road conditions
- Vehicle-level circuit design
- Key components are self-made to ensure quality and long life span
- Automotive air quality sensor for in-cabin air quality monitoring

Specifications

Technology	MOX
Detection Gas	CO, NO_2, NH_3(optional)
Gas Flow Speed	≤10m/s
Working Temperature	-40°C~85°C
Storage Temperature	-40°C~120°C
Relative Humidity	0~99%RH(non-condensing)
Working Voltage	9V~16.2V(standard DC 12V)
Working Current	≤40mA
Static Current	≤100uA
IP Level	IP6K7
Communication	LIN/PWM

* For more information, please contact: info@gassensor.com.cn

AIS-8100
Integrated Sensor

Description

AIS-8100 is an integrated sensor module that adopts the optical principle, which can detect PM2.5 and CO_2, and can monitor the temperature inside the vehicle. The product can meet the accuracy requirements in the whole temperature range.

AIS-8100

Features

- High integration, saving installation space in the car
- Using PM2.5 fan sampling, the response speed is faster
- Reducing material and installation costs, more cost-effective
- Easier to install

Specifications

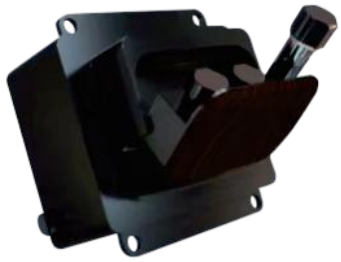
Working Technology	Laser Scattering	NDIR
Detection Type	PM2.5	CO_2
Measurement Range	0~1000μg/m^3	400~5000ppm (can expand to 40000ppm)
Measurement Accuracy	±15% of reading or ±15μg/m^3	≤750ppm, ±75ppm 750~5000ppm, ±10%reading
Response Time	T_{90} ≤ 12s	T_{90}≤ 25s
Pre-heating Time	<10s(start time)	<10s(start time)
Working Temperature	-40°C~85°C	-40°C~85°C
Storage Temperature	-40°C~95°C	-40°C~95°C

* For more information, please contact: info@gassensor.com.cn

AFG-1000
Fragrance Diffuser

Description

AFG-1000 Fragrance Generator is a three-channel intelligent fragrance device, which controls the opening and closing of the fragrance channel through the stepping motor to drive the camshaft to rotate, and then generates the selected fragrance by the blower. It can quickly freshen the air , to create different compartment environments such as joy, warmth, and refreshment in the car (according to different fragrance types).



AFG-1000

Working Principle

The Fragrance Generator communicates with the vehicle through LIN bus. The main control chip of the fragrance generator reads the encrypted identification chip on each fragrance cartridge, and uploads the fragrance information stored in the chip to the central control screen. Customer selects the type and speed of the fragrance cartridge by controlling the central control screen. After the generator receives the information sent by the central control screen, the stepping motor drives the camshaft to rotate, and the camshaft pushes to open the corresponding fragrance cartridge airway valve, and then the main control chip controls the blower to start rotating at the selected wind speed, and brings out the fragrance through the airflow channel.

Features

- Independent intellectual property rights for cutting fragrance structure design, three types of fragrance can be switched without, stringing fragrance
- Cubic unique incense retention technology, high temperature resistance, long life
- Cubic own automotive level fan makes the speed adjustment of fragrance delivery more stable
- With digital identification anti-counterfeiting technology, can automatically identify the type of fragrance installed

AAG-1000
Negative Ion Generator

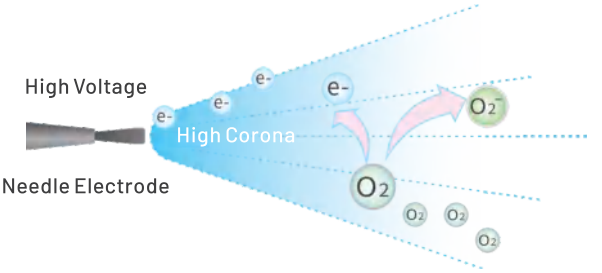
Description

AAG-1000 Negative Ion Generator is a device that generates air negative ions in the air to absorb particles and other harmful substances such as viruses, bacteria, formaldehyde, etc., It can play a key role of smoke, dust removal and sterilization etc., creating a more fresh and warm car environment.

AAG-1000

Working Principle

Ions use pulse and oscillating electrical appliances to raise the low voltage to DC negative high voltage through the negative ion generator, use the carbon brush tip DC high voltage to generate high corona, and release a large number of electrons (e-) at high speed. Electrons cannot exist in the air for a long time (the lifetime of the existing electrons is only nS level), and will be immediately captured by the oxygen molecules (O_2) in the air to form negative (oxygen) ions.



Features

- Output metal tip is corrosion and oxidation resistant
- Meet the fluctuation range of ISO 16750-2 and ISO 11452-4
- Over voltage self-protection
- Dual ion output
- Wide voltage input design (24V±3V)

AAG-1001
Plasma Generator

Description

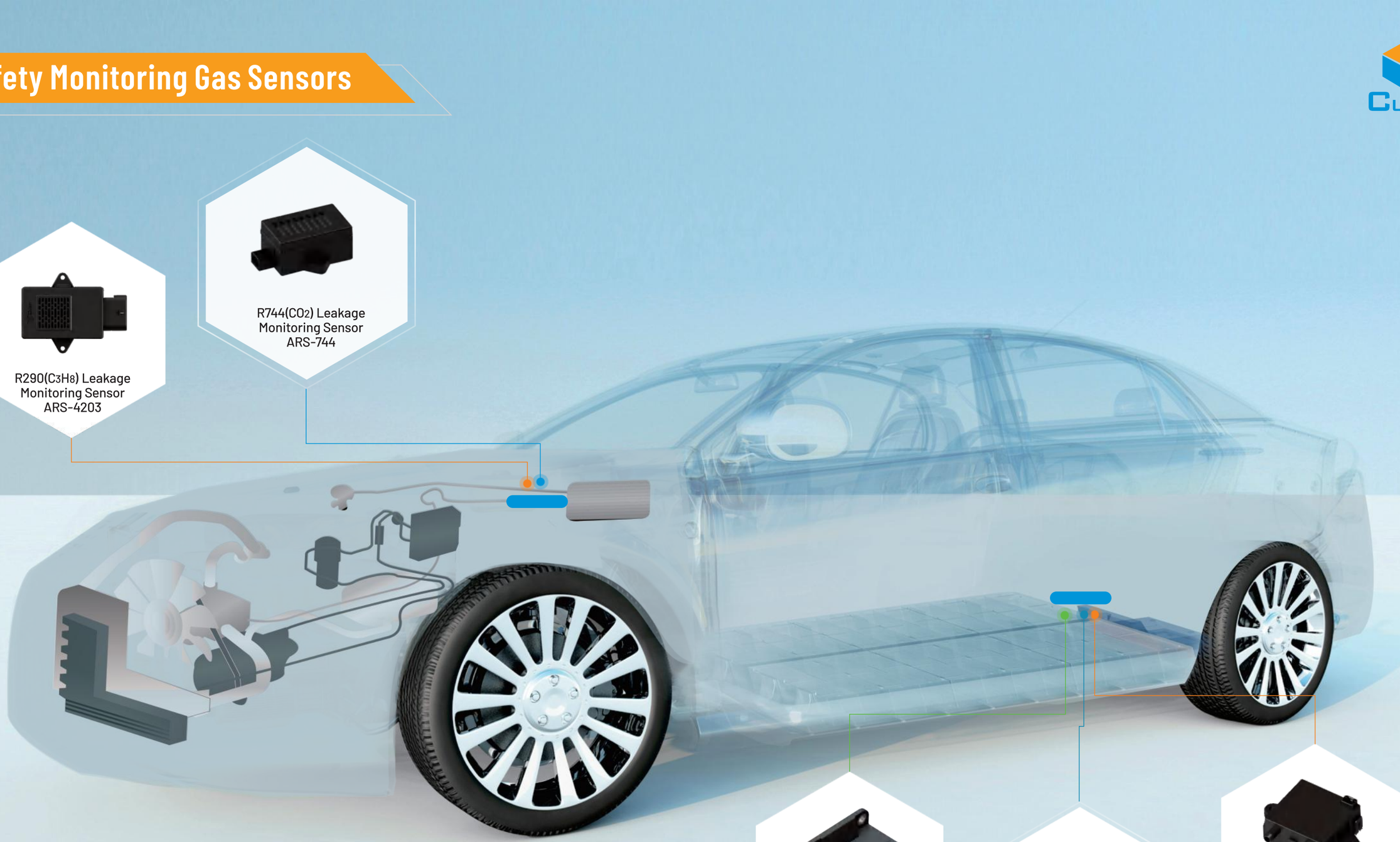
AAG-1001 plasma generator is a device used to remove harmful substances such as bacteria suspended in the car compartment, thereby improving the air quality in the car.

AAG-1001

Working Principle

The plasma is discharged on the basis of negative ions through the high voltage of the negative electrode, and the ionization effect will be stronger than that of the negative ions, and a small amount of ozone O_3 will be released after ionizing the air. The ionization process can effectively destroy cells, such as viruses and bacteria, and produce a sterilization effectly. Since ozone is a redox gas, it combines oxygen atoms in the molecular chain of organic matter to decompose harmful gases, including the removal of odors from the air.

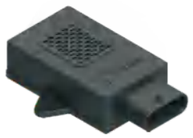
Safety Monitoring Gas Sensors



R290(C_3H_8) Leakage
Monitoring Sensor
ARS-4203

R744(CO_2) Leakage
Monitoring Sensor
ARS-744

Aerosol Sensor
ATRS-1031



4 In 1 Integrated Sensor
CO_2+CO/H_2+T+P
ATRS-1011

5 In 1 Integrated Sensor
CO_2+CO/H_2+PM2.5+T+P
ATRS-1021

ATRS-1011
Li-battery Thermal Runaway Monitoring Gas Sensors

Description

It can effectively detect the indicators such as CO_2, CO/H_2 pressure and temperature released before the battery thermal runaway is triggered, and transmit the measurement signal to the BMS through CAN communication. This solution has the remarkable characteristics of fast response time, less cross-interference, low energy consumption, and long service life.

ATRS-1011

Features

- Multi-parameter measurement without false
- Automotive level circuit design and electronic components are applied
- Communication optional for CAN or LIN
- Detect thermal runaway within seconds

Specifications

Measurement Type	CO_2	CO/H_2	Pressure	Temperature
Measurement Range	0ppm~10000ppm	0~1000ppm	80kPa~120kPa	-40°C~125°C

ATRS-1021
Li-battery Thermal Runaway Monitoring Gas Sensors

Description

It can effectively detect the indicators such as particulate matters, CO2, CO/H2 pressure and temperature released before the battery thermal runaway is triggered, and transmit the measurement signal to the BMS through CAN communication. This solution has the remarkable characteristics of fast response time, less cross-interference, low energy consumption, and long service life.

ATRS-1021

Specifications

Measurement Type	CO_2	CO/H_2	PM	Pressure	Temperature
Measurement Range	0ppm~10000ppm	0~1000ppm	0~5mg/m^3	80kPa~120kPa	-40°C~125°C

* For more information, please contact: info@gassensor.com.cn

ATRS-1031
Aerosol Sensor

Description

It can effectively detect particulate matters concentration and temperature before the battery thermal runaway is triggered, and transmit the measurement signal to the BMS through CAN communication. This solution has the remarkable characteristics of fast response time, less cross-interference, low energy consumption, and long service life.

ATRS-1031

Features

- Multi-parameter measurement without false positives and false negative
- Automotive level circuit design and electronic components are applied
- Communication optional for CAN 2.0
- Detect thermal runaway within seconds
- Low power mode available

Specifications

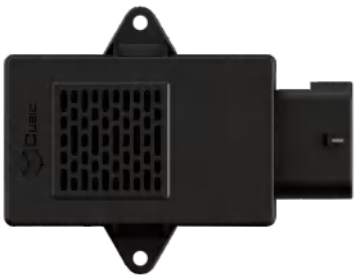
Target Measurement	Particulate Matters Concentration , Temperature
Measurement Principle	Infrared
Measurement Range	Particulate Matters Concentration: 1~10000μg/m^3 Temperature: -40°C~85°C
Resolution	Particulate Matters Concentration: 1μg/m^3 Temperature: 0.1°C
Accuracy	Particulate Matters Concentration: ≤±15% @5000μg/m^3@25°C Temperature: ±2°C
Data Refresh	≤1s
Communication	CAN2.0
Working Temperature	-40°C~85°C; 0~99%RH
Storage Temperature	-40°C~95°C; 0~99%RH

* For more information, please contact: info@gassensor.com.cn

ARS-4203
Refrigerant Leakage Monitoring Sensor

Description

For air-conditioning systems which using R290 refrigerant, sensor can real-time monitoring of R290 gas leakage and output timely alarms.



ARS-4203

Features

- Based on core NDIR technology platform, core components self made
- Flat light source design, anti-vibration, adapt to the driving environment of the car
- Communication optional for CAN 2.0
- Fast response time with T90 less than 25 seconds
- Cost saving and can be combined with PM AQS sensors
- High accuracy for whole measurement and temperature range

Specifications

Measuring Range	0~50% LFL
Accuracy	±2.5% LFL
Response Time	T≤30s
Working Temperature	-40°C~85°C
Storage Temperature	-40°C~95°C
Humidity Range	0~100%RH
Working Voltage	DC 9V~36V
Working Current	<250mA
Communication	CAN

* For more information, please contact: info@gassensor.com.cn

ARS-744
Refrigerant Leakage Monitoring Sensor

Description

For air-conditioning systems which using R744 refrigerant, sensor can real-time monitoring of R290 gas leakage and output timely alarms.

ARS-744

Features

- Based on core NDIR technology platform, core components self made
- Flat light source design, anti-vibration, adapt to the driving environment of the car
- Fast response time with T90 less than 25 seconds
- Cost saving and can be combined with PM AQS sensors
- High accuracy for whole measurement and temperature range

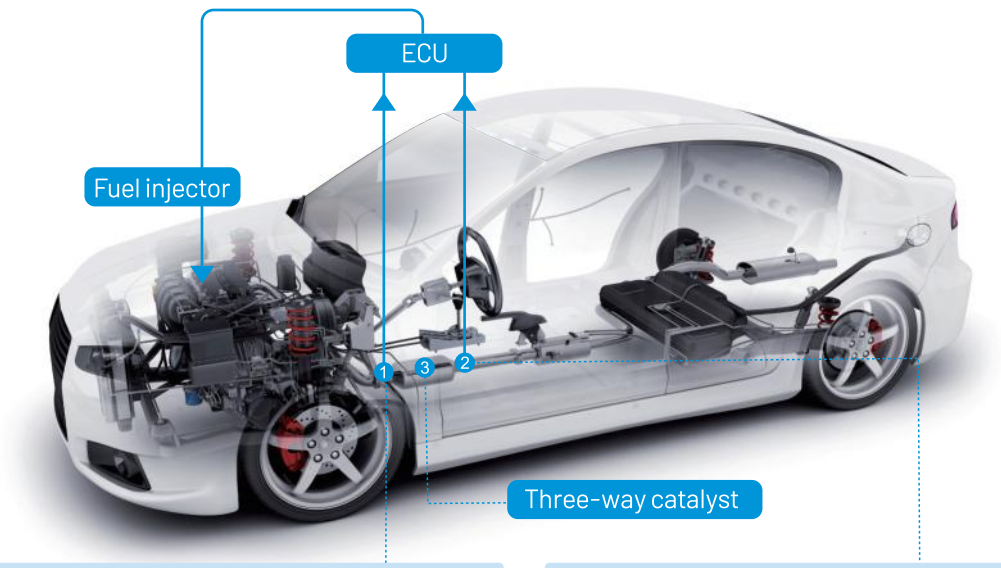
Specifications

Measurement Range	400~40000ppm
Accuracy	≤750ppm, ±75ppm 750~5000ppm, ±10% reading 5000~40000ppm, ±20% reading
Working Condition	-40°C~85°C
Storage Condition	-40°C~95°C
Working Voltage	DC 9V ~16 V
Working Current	≤100mA
Communication	LIN

* For more information, please contact: info@gassensor.com.cn

Environmental Monitoring Gas Sensors

Oxygen Sensor for Gasoline Vehicles



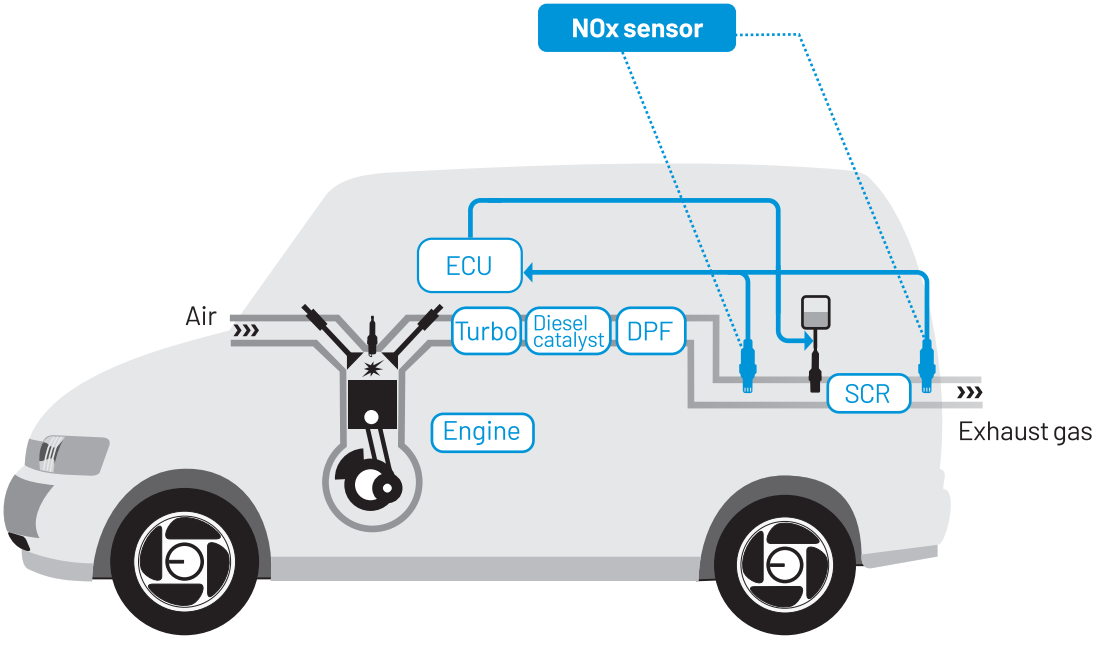
Front O2 sensor

Detects O2 concentration in exhaust gas to the control air fuel ratio and to achieve best performance of the three-way catalyst.

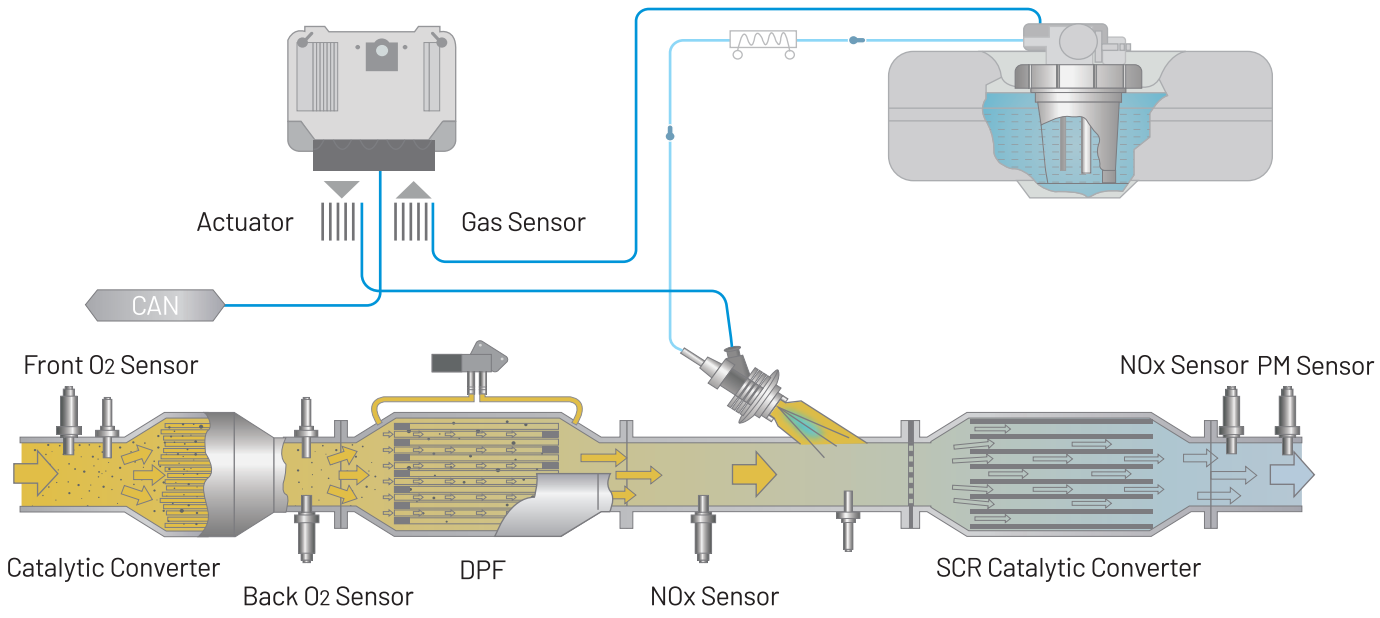
Back O2 sensor

OBD related regulations require O2 sensor at downstream of catalyst to monitor catalyst poisoning and adjust fuel injection amount.

NOx Sensor for Diesel Vehicles



Application of Sensor in Automobile Exhaust Aftertreatment System



Zirconia Sensor Chip Series

Description

High-quality flat chip with advanced ceramic body technology, allowing the product running temperature rising to specific point faster than traditional chips, can effectively reducing the emissions even during harsh cold environment. The sensing element with multiple layers can maintains high precise performance after long-term using.

Zirconia Sensor Chip Series

Features

- Faster ignition time
- Low heating power
- Double protection tube head to prevent various impacts
- Good anti-aging performance
- Anti-coating and anti-poisoning
- Long lifespan

Specifications

Product Name	Oxygen Sensor Chip (Concentration Type)	Oxygen Sensor Chip (Wide Type)	Nitrogen Oxygen Sensor Chip
Measurement Range	λ=0.98~1.02	λ=0.65~+∞	0~1500ppm
Working Temperature	-40°C~1000°C	-40°C~1000°C	-40°C~1000°C
Environment Temperature	-40°C~105°C	-40°C~105°C	-40°C~105°C
Standard Supply Voltage	12V	12V	12V/24V
CAN Communication Baud Rate	——	——	250k
CAN Sending Frequency	——	——	50msec

* For more information, please contact: info@gassensor.com.cn

Oxygen Sensor Series

Description

Automotive oxygen sensor is is a sensor to detect whether there is excess oxygen in the exhaust gas after engine combustion, that is, to test the oxygen content in the exhaust gas, and convert the oxygen content to electrical signal, and send signal to the engine computer, so that the engine can achieve good control of targeted excess air ratio (λ =1) ; to ensure the maximum conversion efficiency of the three pollutants in the exhaust, hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx), and to maximize the purification of pollutants.

Switch Type Oxygen Sensor

Features

- Self-developed and produced chips
- Covering multiple series of vehicles
- Stable sensor signal, high precision and long life in various vehicle driving condition

Specifications

Product Name	 Switch Type Oxygen Sensor	 Air Fuel Ratio Oxygen Sensor	 LSF X-FOUR Oxygen Sensor	 LSU ADV Oxygen Sensor	 Wide Band Oxygen Sensor-LSU4.2	 Wide Band Oxygen Sensor-LSU4.9
Heating Resistor	9Ω ±1.5Ω	2.7Ω ±0.5Ω	3.2Ω ±0.8Ω	3.2Ω ±0.8Ω	3.2Ω ±0.8Ω	3.2Ω ±0.8Ω
Working Voltage	12V~14V	6V~8V	6V~8V	6V~8V	6V~8V	6V~8V
Air-fuel Ratio Range	0.98~1.02	0~2	0~2	0.65~+∞	0.65~+∞	0.65~+∞
Ignition Time	<15s	≤15s	≤15s	≤10s	≤15s	≤15s
IP-level	IP67	IP67	IP67	IP67	IP67	IP67

* For more information, please contact: info@gassensor.com.cn

Motorcycle Oxygen Sensor

Description

The motorcycle oxygen sensor is a sensor to detect whether there is excess oxygen in the exhaust gas after engine combustion, that is, to test the oxygen content in the exhaust gas, and convert the oxygen content to electrical signal, and send signal to the engine computer, so that the engine can achieve good control of targeted excess air ratio (λ =1) ; to ensure the maximum conversion efficiency of the three pollutants in the exhaust, hydrocarbons (HC), carbon monoxide (CO) and nitrogen oxides (NOx), and to maximize the purification of pollutants.

Motorcycle Oxygen Sensor

Features

- Self-developed and produced chips
- Covering multiple series of vehicles
- Stable sensor signal, high precision and long life in various vehicle driving condition

Specifications

Heater Resistance	9Ω ±1.5Ω
Working Voltage	12V ~14V
Maximum Operating Current	0.65A
Working Temperature	≤930°C
λ Value at 450mV	1.005±0.004
Ignition Time	≤15s

* For more information, please contact: info@gassensor.com.cn

Nitrogen Oxygen Sensor

Description

The nitrogen oxygen sensor measures the NOx concentration in the exhaust gas of the diesel engine, converts it into an electrical signal and send the signal to the SCR system to judge the fuel injection amount, and control the injection amount of urea to reduce the NOx in the exhaust gas to meet the emission standard.

Nitrogen Oxygen Sensor

Features

- Self-developed and produced chips
- Covering multiple series of Vehicles
- Stable sensor signal, high precision and long life in various vehicle driving condition

Specifications

Working Voltage	12V/24V
Response Time	NOx $T_{33\sim66\%}$: 1200ms O_2 $T_{33\sim66\%}$: 1000ms
Measuring Range	NOx: 0~1500ppm O_2: 0~21%
Accuracy	<100ppm: ±10ppm ≥100ppm: ±10%
IP-level	IP67
Ignition Time	T_{NOx}: 100s T_{O2}: 80s

* For more information, please contact: info@gassensor.com.cn

Product Selection Table

Applications and Sensors		Environment Monitoring and HVAC System Control	Car Cabin Driving Comfort	Car Cabin Driving Health	Cabin Interior and Exterior Environmental Management	Engine Exhaust Emission Management	Refrigerant Leakage Alarm	Battery Thermal Runaway Safety Warning
Core Gas Sensors and Applications	CO_2 Sensor	✓	✓	✓	✓			
	PM Sensor (PM1.0+PM2.5+PM10)	✓	✓	✓	✓			
	Air Quality Sensor (CO, NO_2, NH_3)		✓	✓	✓			
	Integrated Sensor (PM2.5+CO_2+RH+T)	✓	✓	✓	✓			
	R290(C_3H_8) Leakage Monitoring Sensor						✓	
	R744(CO_2) Leakage Monitoring Sensor						✓	
	Aersol Sensor							✓
	Li-battery Thermal Runaway Sensors (CO_2/CO/T/P)							✓
	Li-battery Thermal Runaway Sensors (CO_2/CO/PM2.5/T/P)							✓
	Oxygen Sensor					✓		
	NOx Sensor					✓		
Air Quality Improvement Sensors and Applications	Fragrance Generator		✓					
	Negative Ion Generator	✓	✓	✓				
	Plasma Generator	✓	✓	✓				