

SPECIFICATION

Product Name: NOx sensor

Item No.: ZS-NOx-05

Date: 25th. Feb, 2023

Writer	Audit	Approved

Revision

No.	Version	Content	Reviser	Date
1	V0.1	First edition		2023-2-25

1. Application range

This specification is applicable to ZS-NOX-05 nitrogen oxygen sensor of our company.

2. Product Overview

2.1 Product description

ZS-NOX-05 nitrogen oxygen sensor is a kind of sensor which uses electrochemical principle to accurately measure the NOX content in automobile exhaust by measuring the current. ZS-NOX-05 nitrogen oxygen sensor is mainly used in diesel engine SCR system, gasoline engine exhaust treatment system, off-road mobile machinery field and power plant desulfurization and denitrification detection and control system and other industrial fields.

2.2 Function Description

A ceramic sensor element made of zirconia electrolyte material measures the oxygen concentration of the exhaust gas entering the first chamber through the diffusion barrier. The oxygen concentration in the first chamber is controlled at a constant concentration of the order of one ppm. Other components of the exhaust gas, such as HC, CO and H₂, also enter the first chamber, where they are oxidized at the pump electrode (containing Pt).

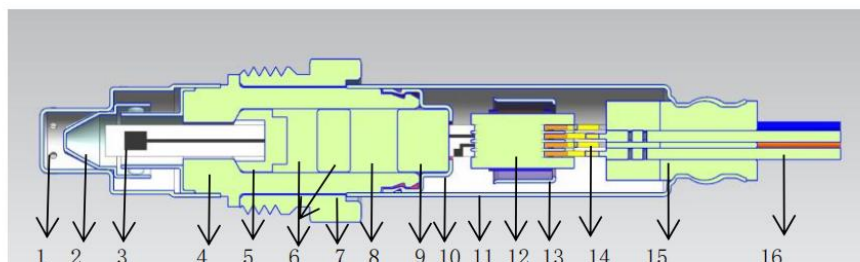
The test gas of ppm O₂ and NO_x enters the second chamber from the first chamber, and the oxygen in the second chamber is completely discharged by the auxiliary pump. At this time, the equilibrium state $2NO \rightarrow N_2 + O_2$ at the measuring electrode is broken. NO is catalytically reduced to N₂ and O₂, and the reduced O₂ is completely pumped out of the chamber by the measuring pump to form a pump current IP₂, that is, the concentration of nitrogen oxides in the tail gas is obtained.

An application specific integrated circuit (ASIC) controls all the pump units to work to determine the NO_x concentration, the air-fuel ratio and the lambda value signal are realized, and the ECU provides the concentration value of the measured gas in the form of a digital signal through the CAN bus.

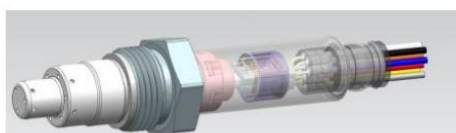
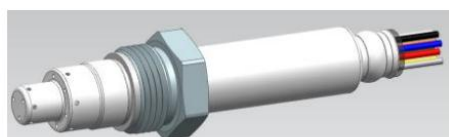
NO_x sensor is composed of sensor probe, PCB controller and wire.

3. Product Structure and Size

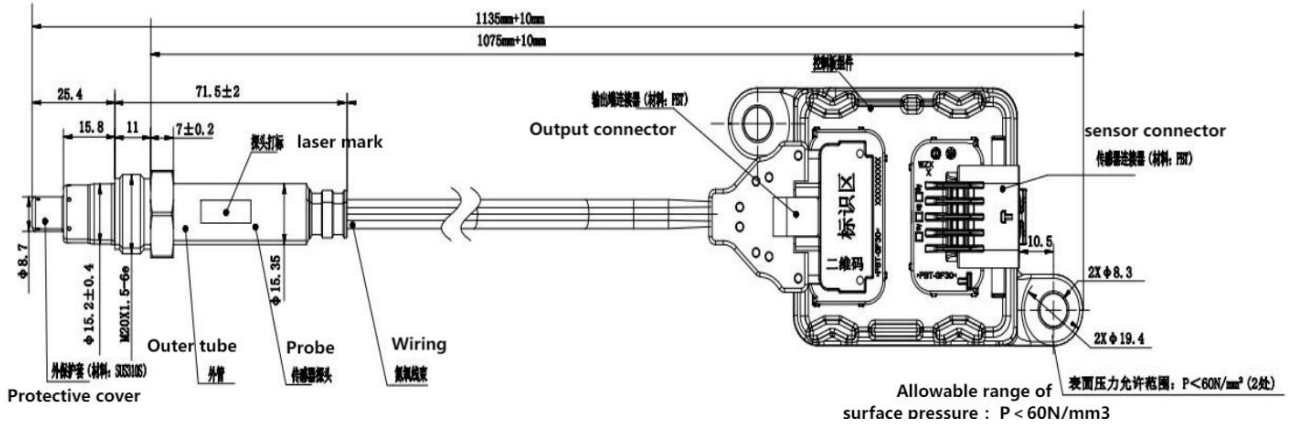
3.1 Main structure drawing



- 1: Outer shield
- 2: Inner and Cone shield
- 3: Sensing element
- 4: Main seat
- 5: Front of the ceramic
- 6: Sealing powder ring
- 7: Fastener
- 8: Middle of the ceramic
- 9: Back of the ceramic
- 10: Protective casing
- 11: Outer thimble
- 12: Terminal ceramic
- 13: Square spring, round clamp
- 14: Connector port
- 15: Fluorine rubber plug
- 16: Wire

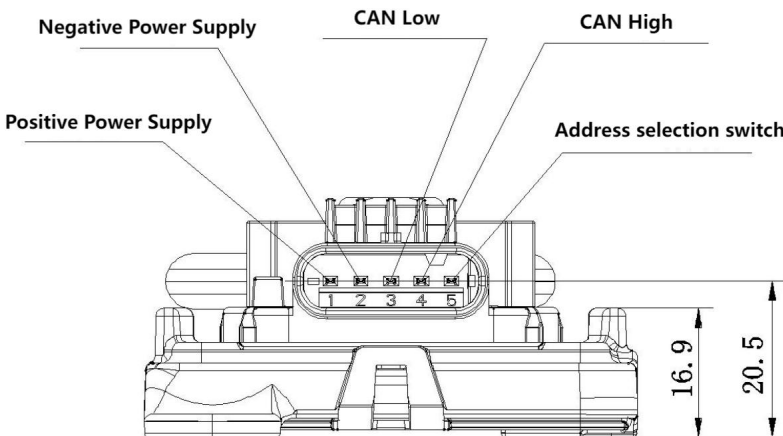


3.2 Size and weight



Typical weight (length 950mm, without additional parts and protective caps) --- < 330g
 Electronic control unit --- < 180g

3.3 Definition of the Connector and PIN



Connector Pin	Definition
Pin 1	Positive Power Supply
Pin 2	Negative Power Supply
Pin 3	CAN Low
Pin 4	CAN High
Pin 5	Address selection switch

4. Product Specification

4.1 Application

Item	Parameter
Measuring range	0—2500ppm
Fuel compatibility	Gasoline/Diesel/E85
Discharge pressure	≤2.5bar
Maximum acceleration (sensor probe)	490m/s ²
Maximum acceleration (electronic control unit)	11 Hz -1000 Hz, 12.01g

4.2 Mechanical Parameter

Item	Parameter
Mounting thread	M20X1.5-6e
Wrench size	22mm
Tightening torque	40—60N*m

4.3 Main Specification

4.3.1 Output signal and accuracy

Test Item	Output value	Accuracy (-40~105°C)	Accuracy (105~115°C)
NOx concentration	0~1500ppm	±10 ppm (<100 ppm)	±15 ppm (<100 ppm)
		±10% (100ppm-500ppm)	±15% (100ppm-500ppm)
		±15%(501ppm-1500ppm)	±20% (100ppm-500ppm)
	1501~2500ppm	±30%	±35%

4.3.2 Response Time and Light-off Time

No.	Item	Symbol	Factory data	Data after durability test
1	Response Time	T(33%~66%)NOx	<1400ms	<1800ms
		T(66%~33%)NOx	<1400ms	<1800ms
2	Light-off Time	T _{NOx}	<165s	<165s

4.3.3 Using Condition

Item		Temperature range
Storage Temperature(ECU)		-40℃~120℃
Storage Temperature(Unpowered)		-40℃~95℃
Maximum storage time		2 years
Working environment	A: Exhaust gas temperature (top of the sensor)	≤800℃ (100h working allowed for 950℃)
	B: Hexagon nut	≤620℃ (100h working allowed for 650℃)
	C: Seal rubber	-40℃~200℃ (100h working allowed under 230℃)
	D: Wire	≤250℃
	G: Control panel fittings	-40℃~85℃ (1h working allowed under 105℃)

4.3.4 Reliability Test

Test Item	Standard	Test methods and conditions
Durability test	Meet 4.1 requirements after the test	According to the durability operation test method in HJ 438-2008, the NOx sensor shall be subject to the durability test for not less than 500h on the engine bench.
Water proof test	Meet 4.1 requirements after the test	The waterproof test of DUT shall be carried out in water for a short time according to the regulations, and the power supply to the electronic control unit shall not be provided. The size of the immersion tank shall be such that after the sample is put into the immersion tank, the water surface shall be at least 150mm higher than the top of the sample, the distance from the bottom of the sample to the water surface shall be at least 1m, the test time shall be at least 30min, and the temperature difference between the water and the electrical appliance shall not be greater than 5℃.
Strain relief test	Meet 4.1 requirements after the test	After applying a tension of 70 N between the connector of the sensor and the probe, check the wire connections for looseness and electrical continuity.
Vibration test	Meet 4.1 requirements after the test	According to the provisions of GB/T 2423.10, the sensor part and the electronic control unit part of the sensor shall be separately subject to the sweep frequency vibration test in X, Y and Z directions.

<p>Change of temperature test</p>	<p>Meet 4.1 requirements after the test. And the overall appearance of the sensor does not crack and other bad phenomena.</p>	<p>According to the provisions of GB/T 2423.22, the probe part and the electronic control unit part of the NOx sensor shall be tested separately according to the following test parameters.</p> <p>Low temperature: -40°C; High temperature: 125°C (sensor) , 80°C (ECU)</p> <p>Test time: 2h/1 time; Switching time: 22.2min; Cycle-index: 500</p>
<p>Combined temperature/humidity cycle test</p>	<p>Meet 4.1 requirements after the test</p>	<p>According to the provisions of GB/T 2423.34, the temperature/humidity combined cycle test shall be carried out for 4 cycles between -10 °C and 65 °C, and each cycle shall be 24h. The NOx sensor probe is sealed during the test.</p>
<p>Salt spray test</p>	<p>Meet 4.1 requirements after the test</p>	<p>According to the regulations of GB/T 10125, a 48-hour salt spray test is carried out on the NOx sensor.</p>
<p>Free drop test</p>	<p>Meet 4.1 requirements after the test</p>	<p>The drop test shall be carried out for the sensor according to the provisions of "Method 1: Free Drop" in GB/T 2423.8, and the impact surface shall be the concrete ground. The drop height of the NOx sensor is 1.0 m, and the product is dropped once in the horizontal direction and once in the vertical direction.</p>
<p>High and low temperature resistance test</p>	<p>Meet 4.1 requirements after the test</p>	<p>Low temperature test According to the provisions of GB/T 2423.1, carry out 72h low temperature storage test and 72h low temperature operation test under the low temperature condition of -40 °C. High temperature test: according to the provisions of GB/T2423.2, carry out 72 H high temperature storage test and 72 H high temperature operation test under the condition of 85 °C high temperature and dry heat.</p>

5. After-Sales Services and Consultancy

Cubic Sensor and Instrument Co.,Ltd.

Tel: +86 (0)27 81628827 Fax: +86 (0)27 81628821

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

E-mail: info@gassensor.com.cn