SPECIFICATION

Preliminary Version

Product Name: Switch Type Oxygen Sensor-LSF

Item No.: ZS-ST-01

Version: V0.1

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Writer	Audit	Approved

Revision

No.	Version	Content	Reviser	Date
1	V0.1	First edition		2021-2-22

Switch Type Oxygen Sensor

Application

Engine management

– Gas engines

Three Way Catalyst (TWC) Check

– Vehicle Three Way Catalysts

– On-Board Diagnostic System (OBD)

Description

Cubic switch type oxygen sensor ST is also called as four-wire oxygen sensor, it is a planar 2-state λ=1 sensor of ZrO2 (Nernst-principle) with an integrated heater. The sensor contains 4 wires, in which two wires are for heaters, the other two wires are for transmitting voltage signals.

This oxygen sensor can be installed upstream in Three Way Catalyst (TWC), tests the oxygen content in the gas emission released by the engine, and send corresponding voltage signals to Electronic Control Unit (ECU), which reflects the fuel air mixture ratio. According to the signal, ECU controls fuel injection and air inflow quantity, so as to keep the engine operating in the situation of best fuel air mixture (λ =1), which creates a perfect condition of Three Way Catalyst (TWC) to treat exhaust gas. If the proportion of fuel is high ($\lambda <$), the fuel injection quantity should be decreased; if the proportion of fuel is low ($\lambda >$1), the fuel injection quantity should be increased; the oxygen sensor can also be installed downstream in TWC, the oxidation reaction occurs when the TWC is working, such as CO+O2=CO2, so the oxygen content detected by the downstream oxygen sensor must be less than that of the upstream oxygen sensor, otherwise purifying capacity of TMC decreases or TMC fails.

Features

- Short light-off time
- Low heating power
- Low driven cost
- Less dependent on exhaust temperature (conducive to the stability in different operating situations)
- Double protection on the top of tube to confront impact
- Good aging resistance
- Anti-coating and anti-poisoning
- Compact structure (high anti-vibration level)
- Longer duration
- Independent R&D and production for ceramic/zirconia oxide ZrO2 chips
- Strong ODM/OEM capacity, cover multiple series of car models

Working Principle

Oxygen sensor makes use of the Nernst Principle. The core component of lambda sensor is ZrO2 ceramic chip, which is a kind of solid electrolyte, compressing all functional layers together with screen printing technique into planarity. Porous platinum electrodes are sintered both inside and outside the platelet. Under certain temperature, because of the difference of oxygen concentration on each side, the oxygen molecules of the dense side will be absorbed to the platinum electrode and join with electrons (4e) forming O2 which makes the electrode positively charged. Through the oxygen ion space, O2 will move to the side with low oxygen concentration (the side of exhaust), which makes the electrode negatively charged. As a result, voltage is produced. The greater the concentration difference, the greater the voltage difference.

When the air-fuel ratio is low (rich fuel), the oxygen proportion in the exhaust is low, the ceramic chip has less O2 outside, forming an electromotive force of about 1.0 V. When the air-fuel ratio is 14.7, forming an electromotive force of about 0.4-0.5 V, the electromotive force is the basis electromotive force. When the air-fuel ratio is high (low fuel), the oxygen proportion in the exhaust is high, the concentration difference between the two side of the ceramic chip is low, so the electromotive force produced is low and close to 0V.

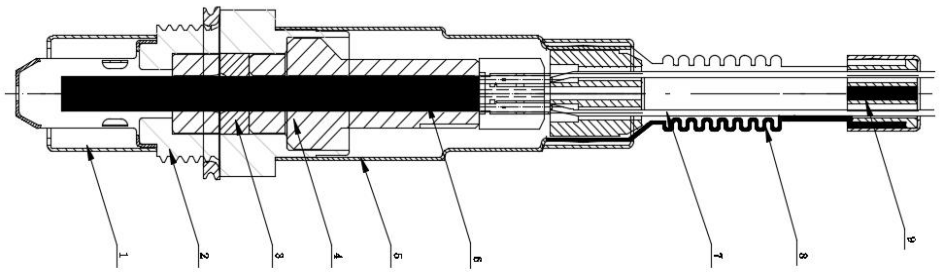
Ceramic Chip

Oxygen sensor makes use of the Nernst Principle, the core component of lambda sensor is 5YSZ ZrO2 ceramic chip, which is a kind of solid electrolyte, compressing all functional layers together with screen printing technique into planarity. Porous platinum electrodes are sintered both inside and outside the platelet. Under certain temperature, because of the variety of oxygen concentration on each side, the oxygen molecules of the dense side will be absorbed to the platinum electrode positively charged. Through the oxygen ion space, O2- will move to the side with low oxygen concentration (the side of exhaust), which makes the electrode negatively charged. As a result, voltage is produced.

Chip specification

Type	Name	Specification			Resistance Ω	Isolation resistance at 400°C KΩ	Internal Resistance Ω	Remarks
		Length mm	Wide mm	Thickness mm				
ST	Switch type oxygen sensor	59.4±0.5	4.3±0.08	1.2 ±0.05	9±1.5	500	≤500/350℃ ≤250/850℃	

Planar Type Sensors (Type Code ST)



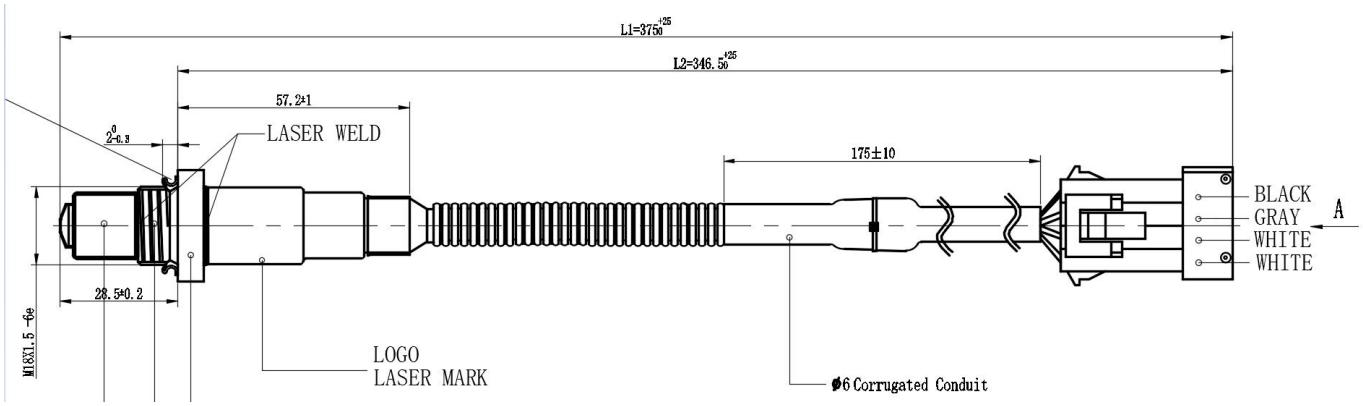
1=Guard Tube
2=Seat Base Hexagon
3=Sealing element
4=Ceramic assembly
5=Protective cap
6=Sensing element
7=Connection cable
8=corrugated pipe
9=semipermeable membrane

Oxygen Sensor Universal Characteristics

		Note	Parameter
Storage temperature			-40°C+100°C
Working Temperature	Exhaust gas		<930°C
	Minimum exhaust gas temperature recommendation		>150°C
	Sensor seat	T hexagon	<570°C
	Temperature of the wire harness sealing jacket	Close to the side of the connector (bigger jacket)	<250°C
		Close to the side of the connector (small jacket)	<200°C
	The insulation jacket tube and cable		<250°C
	Connector		≤120°C
	Max temperature (In the whole application period limit, it can be used for up to 250Hrs)	Exhaust gas	<1030°C
		Sensor seat with hexagon head (T hexagon)	<650°C
	Temperature of the wire harness sealing jacket(During a internal 10 minutes, the whole application period limit is up to 40 Hrs)	Close to the side of the connector (bigger jacket)	<280°C
		Close to the side of the connector (small jacket)	<230°C
	The insulation jacket tube and cable		<280°C
Rated heating voltage			12V
Insulation resistance between heating machine and sensor		measured with 800VDC	>30MΩ
R & sensor internal resistance		350°C	<500Ω
		850°C	<250Ω
output voltage		λ=0.97 (350°)	800±55mv
		λ=1.10 (350°)	50±30mv
Response time		600mv-300mv	<125ms
		300mv-600mv	<60ms

Dimensions and specifications

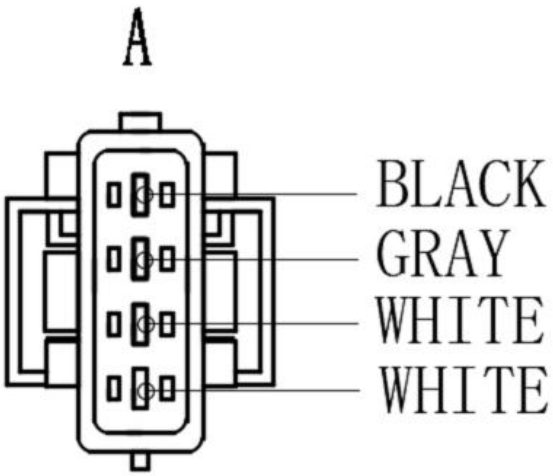
1. Dimensions



2.Specifications

Heater resistance	9±1.5 Ω
Operating voltage	12-14V
Maximum heating current	1.0A
Operating temperature / Exhaust gas temperature	<930°C
Light-off time	<20S

Electrical connection



Pin Definitions

Pin	Line color	Description
N/A	Black	sensor signal (output 0~1V)
N/A	Gray	sensor ground (0V)
N/A	White	heater (0V)
N/A	White	heater (12V)

After-Sales Services and Consultancy

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