

# THE CRITICAL ENGINE COMPONENT

A critical component of today's modern vehicle is the sensor measuring the exhaust gases. This sensor works with the vehicle Electronic Control Unit (ECU) to constantly maintain the operational efficiency of the engine. If the oxygen content in the exhaust gas is too high (a lean mixture) or too low (a rich mixture), the sensor is able to transmit this information back to the ECU, which then adjusts the air to fuel ratio.

Not all vehicles have sensors with the same output characteristics and these sensors are not interchangeable. It is important to confirm sensor type before making the repair.

In vehicles equipped with a heated oxygen sensor, the output voltage changes in accordance with the oxygen concentration in the exhaust gas. The ECU uses this output voltage to determine whether the present air/fuel ratio is richer or leaner than the stoichiometric air/fuel ratio (14.7:1).

Vehicles equipped with an air/fuel ratio sensor have approximately 0.4 V constantly applied to the sensor, which outputs a current that varies in accordance with the oxygen concentration in the exhaust gas. The ECU converts the changes in the output current into voltage allowing a response that is directly proportional to the input of the present air/fuel ratio in the exhaust system.

## DIFFERENCES BETWEEN AN OXYGEN SENSOR AND AN AIR/FUEL SENSOR

The exterior appearance of air/fuel sensor and oxygen sensor may be very similar but that's where the similarity stops. Using a light bulb analogy, the oxygen sensor sends voltage to the vehicle engine control unit and acts like an on/off switch turning the bulb on and off. The air/fuel sensor receives voltage from the vehicle engine control unit and acts like a dimmer switch making the bulb brighten and dim.

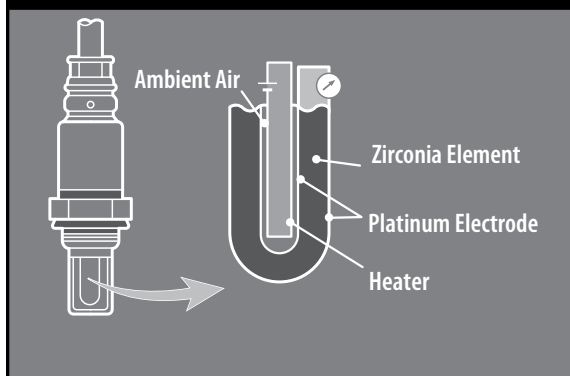
**Oxygen Sensor**



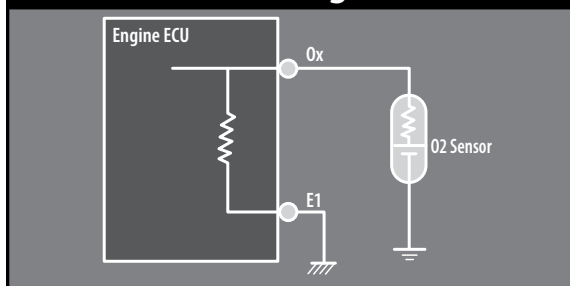
**Air/Fuel Sensor**



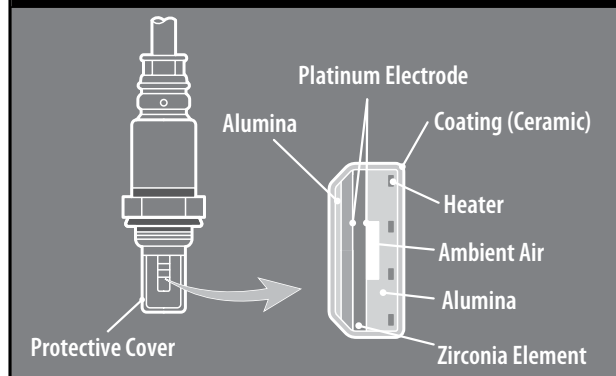
### Construction



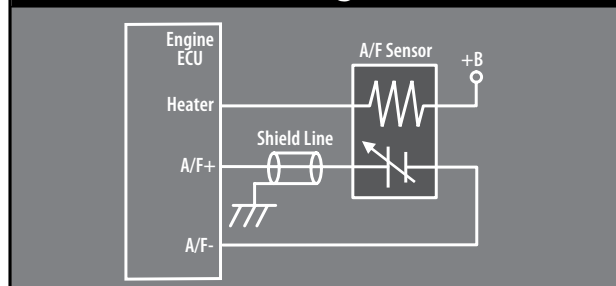
### Circuit Diagram



### Construction



### Circuit Diagram





# SUPERIOR OXYGEN SENSOR TECHNOLOGY

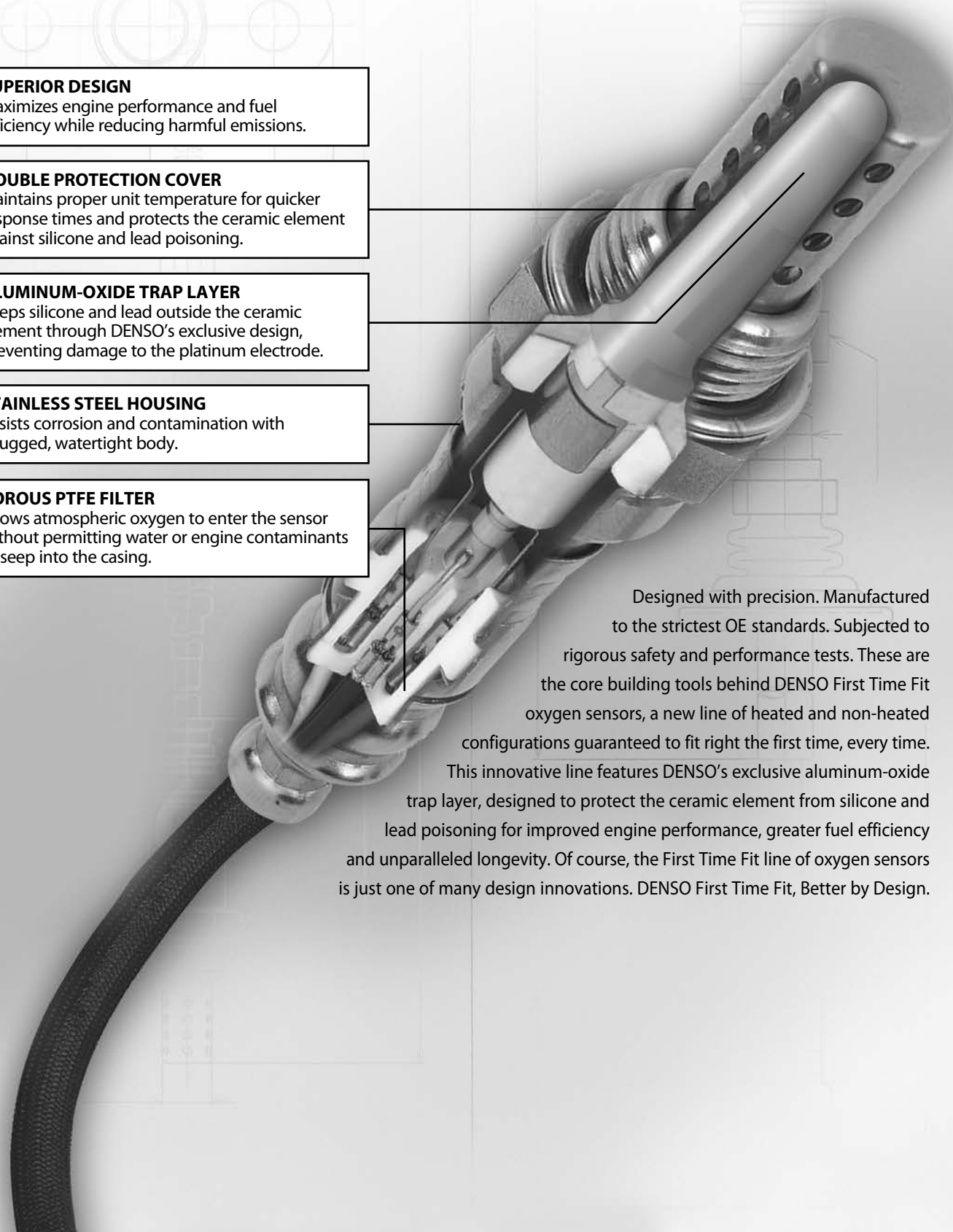
**SUPERIOR DESIGN**  
Maximizes engine performance and fuel efficiency while reducing harmful emissions.

**DOUBLE PROTECTION COVER**  
Maintains proper unit temperature for quicker response times and protects the ceramic element against silicone and lead poisoning.

**ALUMINUM-OXIDE TRAP LAYER**  
Keeps silicone and lead outside the ceramic element through DENSO's exclusive design, preventing damage to the platinum electrode.

**STAINLESS STEEL HOUSING**  
Resists corrosion and contamination with a rugged, watertight body.

**POROUS PTFE FILTER**  
Allows atmospheric oxygen to enter the sensor without permitting water or engine contaminants to seep into the casing.



Designed with precision. Manufactured to the strictest OE standards. Subjected to rigorous safety and performance tests. These are the core building tools behind DENSO First Time Fit oxygen sensors, a new line of heated and non-heated configurations guaranteed to fit right the first time, every time. This innovative line features DENSO's exclusive aluminum-oxide trap layer, designed to protect the ceramic element from silicone and lead poisoning for improved engine performance, greater fuel efficiency and unparalleled longevity. Of course, the First Time Fit line of oxygen sensors is just one of many design innovations. DENSO First Time Fit, Better by Design.

# SUPERIOR AIR/FUEL SENSOR TECHNOLOGY

## Air/Fuel Sensor

As with the oxygen sensor, an air/fuel sensor detects the oxygen concentration in the exhaust emissions. However, vehicles equipped with this sensor, have approximately 0.4 V constantly applied to the air/fuel sensor, which outputs a current that varies in accordance with the oxygen concentration in the exhaust gas. The ECM converts the changes in the output current into voltage allowing a response that is directly proportional to the input of the present detected air/fuel ratio.

## Features and Benefits

- Quick activation of zirconia solid electrolyte  
DENSO's planar type air/fuel sensor has a zirconia solid electrolyte integrated with an alumina heater substrate, allowing it to more quickly detect oxygen concentration with a light-off time of 10 seconds.
- High-detection accuracy  
Precisely controls the amount of oxygen ions that flow in the diffusion layer to limit current flow, resulting in high-accuracy detection.

## Air/Fuel Product Types

Product Type	Heater	Light-off Time (Seconds)	Response Time (milliseconds)
Planar Type	Integrated with solid electrolyte	15	200
Thimble type	Integrated with solid electrolyte	20	200

