Product Information
LSU Planar Wide-Band Lambda Sensor

BOSCH
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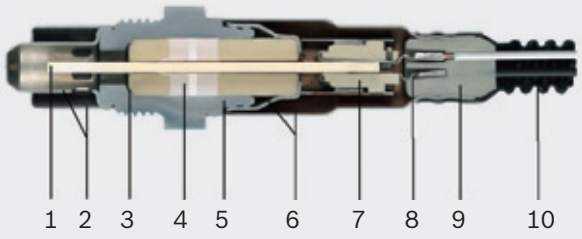


LSU Planar Wide-Band Lambda Sensor Cross-Section

1 Sensor element	6 Protection sleeve
2 Double protection tube	7 Contact bracket
3 Seal ring	8 Contact clip
4 Seal packing	9 PTFE grommet
5 Sensor housing	10 PTFE formed hose

Customer benefits in general

- Continous λ control
- Safe adherence to stringent exhaust gas and OBD legislation
- Reduced light-off time (≤ 5 s) and fast response times

Additional benefits (gasoline engine)

- Operating of catalytic converter at best conditions and with reduced noble metal content
- Individual cylinder balancing capable
- High temperature resistance and functional reliability
- Very long service life

Additional benefits (diesel engine)

- Up to 20 % advantage with emissions for Euro-4 exhaust gas standard
- No clouds of smoke when accelerating
- Improved engine protection (full load protection)
- Required for regeneration strategy for NO_x accumulator catalytic converters

LSU Planar Wide-Band Lambda Sensor

Short-form description

Lambda sensors are used to determine the oxygen concentration in the exhaust gas. This enables the air/fuel ratio (λ) in the combustion chamber to be established.

LSU wide-band lambda sensors can obtain extremely precise measurements at the stoichiometric point (λ=1) as well as in the “lean” (λ>1) and “rich” (λ<1) ranges. They supply a constant signal across a wide measuring range. The sensor is suitable for gasoline λ=1 control as well as for the lambda control of lean-burn gasoline engines, and for both diesel and gas-powered engines.

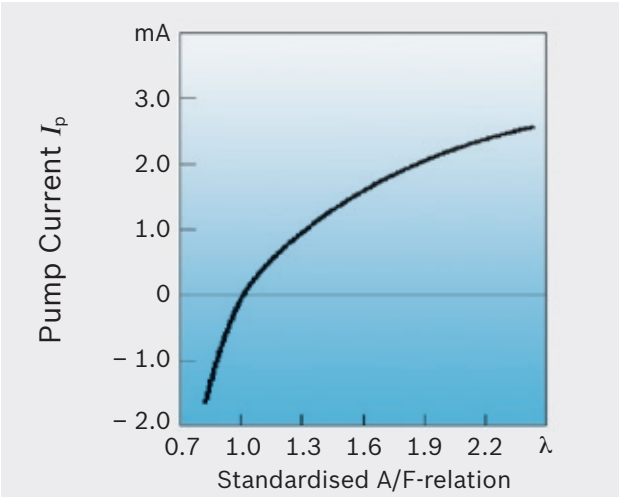
Design and function

The modular design of the planar technology allows various functional elements, such as measuring cell and heater element, to be integrated in a single sensor element.

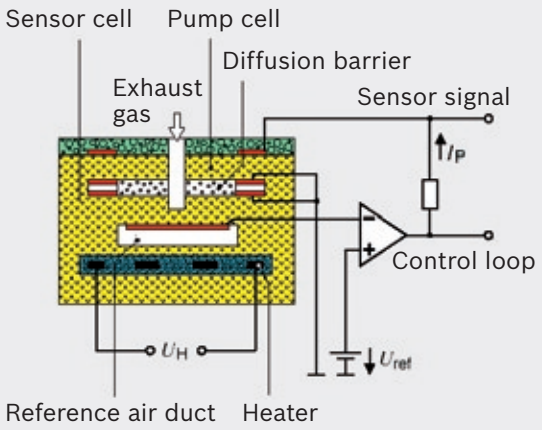
The sensor element of the LSU wide-band lambda sensor is comprised of a Nernst concentration cell (O_2 measuring cell) in combination with an oxygen pump cell that transports oxygen ions.

In an oxygen pump cell, oxygen ions are “pumped” from the cathode to the anode when an electrical voltage is applied to a zircon-dioxide ceramic.

In the LSU sensor, the oxygen pump cell and the Nernst concentration cell are arranged in such a way as to produce a diffusion gap between them. This gap contains two porous platinum electrodes, a pump electrode and a Nernst measuring electrode.



LSU Planar Wide-Band Lambda Sensor Signal



LSU Planar Wide-Band Lambda Sensor Design

Technical data	
Measuring range	λ = 0.65... air
Maximum permissible temperature	
– Exhaust gas	... 1,030 °C
– Sensor hexagon	... 680 °C
– Sensor cable exit	... 280 °C
Minimum installation height	84 mm
Weight	approx. 130 g
Service life up to	... 240,000 km

The diffusion gap is in contact with the exhaust gas through a gas ingress aperture. The components of the exhaust gas diffuse through the diffusion gap to the electrodes of the oxygen pump cell and the Nernst concentration cell, where they are thermodynamically balanced. A porous diffusion barrier already in place in the diffusion gap restricts follow-on flow. As a result, when the pump voltage is sufficient, a limit current is achieved that is proportional to the excess or deficit of oxygen in the exhaust gas.

An electronic circuit controls the pump flow through the oxygen pump cell in such a way that the composition of the gas in the diffusion gap remains constant λ=1. This is measured by the Nernst cell. If the exhaust gas is lean, the oxygen pump cell is activated to pump oxygen out of the diffusion gap. If the exhaust gas is rich, the direction of flow is reversed so that the cell pumps oxygen into the diffusion gap. The flow from the pump is proportional to the oxygen concentration in the lean exhaust gas or to the oxygen deficit in the rich exhaust gas.

In conjunction with a control system, the sensor delivers a steady, constant electrical signal over a wide lambda range (0.65<λ<air). The integrated heater ensures that the necessary operating temperature is maintained. The influence of the exhaust gas temperature on the temperature of the sensor ceramic, and thus on the temperature-dependent sensor functions, is practically eliminated by controlled sensor heating. The sensor's direct heater also has the effect of heating the sensor element very rapidly so that it is ready for lambda control within a few seconds of the engine being started ("Fast Light Off").

Every sensor needs a specific operational electronic circuit. This will contain the internal control electronics for the oxygen pump cell and the Nernst concentration cell to generate the sensor signal. It also contains the electronic circuit for controlling the sensor temperature.

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Printed in Germany
1 987 789 195-GS-EX/MKT-0905