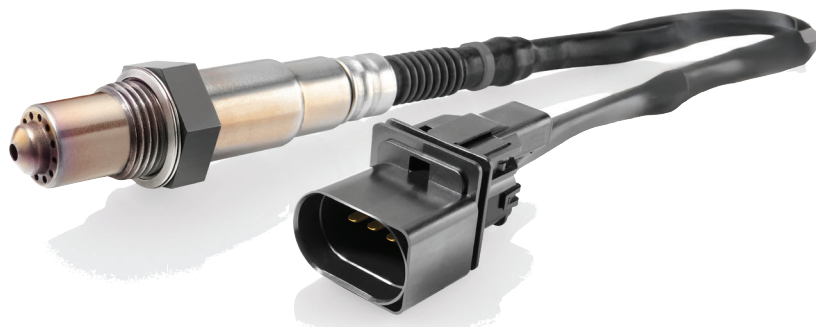


# Lambda Sensor

## common faults



The team at Bosch bring you some real-world examples of engine management issues and how to go about diagnosing these types of faults. There is no greater frustration than carrying out engine management component tests, only to find the problem persists.

**L**ambda sensors (also known as oxygen sensors or O2 sensors) are critical components in a vehicle's emissions and engine management systems. They monitor the oxygen levels in the exhaust gases to help optimize the air-fuel mixture for combustion. By providing real-time feedback to the engine control unit (ECU), these sensors enable precise adjustments to fuel injection, which improves fuel efficiency, reduces harmful emissions, and ensures optimal engine performance. Lambda sensors are essential for meeting modern environmental regulations and maintaining proper operation of catalytic converters.

### The Problem

The engine management ECU has a fault description of 'oxygen sensor signal too low'.

The oxygen (Lambda) sensor has been replaced, but still outputs a low signal of 0.2 volts.

Lambda sensor and mixture adaptation fault codes don't always mean the Lambda sensors are faulty. They can be an indication of what is wrong with vehicle engine management system.

### Possible Causes

- An air leak either in the intake or exhaust system, upstream of sensor
- The fuel pressure or delivery rate is incorrect
- Sensor inputs to engine management ECU cause an incorrect injector opening time
- Blocked fuel injectors

**Note:** In some cases the engine management ECU may have made an increase to the fuel mixture to compensate and bring the Lambda sensor signal back to normal working parameters.

### Diagnosis

Talk to the customer and obtain as much information as possible, about the conditions when the fault occurred and the drive cycle of the vehicle, around town or motorway. If the vehicle has fault diagnosis capability, check for fault codes.

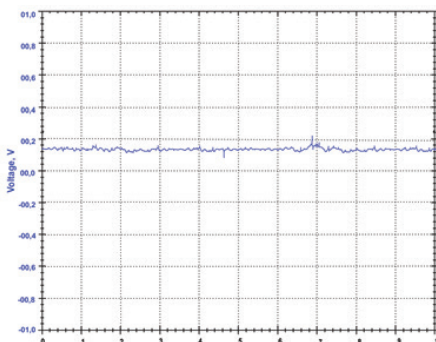
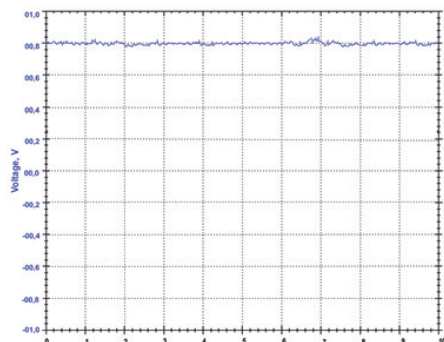
If actual values are available for the lambda sensor then look at these. Remember that the OBD programme is emissions related and can have useful actual values when diagnosing these faults. Compare these to any stated values, shown in your vehicle information system (eg. Bosch ES[tronic]).

Compare these actual values to the exhaust gas readings via a four gas analyser

In some cases, it may be necessary to check the output of the lambda sensor or sensors with an oscilloscope.

From this procedure you should be able to establish if the lambda sensor is reading correctly or not, and what other areas of the engine management system need further testing.

These basic principles and procedures can be applied to most of the associated lambda sensor and mixture adaptation fault codes and descriptions.



Scope traces of a lambda sensor when the engine is running rich (on left) and Lean on right


**BOSCH**