TROUBLESHOOTING ON THE EXHAUST GAS RECIRCULATION SYSTEM

OF PETROL AND DIESEL ENGINES

Exhaust gas recirculation (EGR) is a tried-and-tested way of reducing emissions: adding exhaust gas reduces the oxygen content in the air-fuel mixture and lowers the combustion temperature in the cylinders. As harmful nitrogen oxides (NO\textsubscript{x}) are predominantly generated at high temperatures and pressures, this means that the emitted NO\textsubscript{x} concentrations can be reduced by up to 50%. The formation of soot particulates is also reduced by approx. 10% in diesel engines. Exhaust gas recirculation is only activated at certain operating points. Generally, for petrol engines it occurs above idling to up to the upper part load; for diesel engines, up to approx. 3000 rpm and medium load.

ATTENTION
For troubleshooting advice, see pages 3 and 5.

Principle of exhaust gas recirculation (pneumatic)

01 Air filter
02 Air mass sensor
03 Throttle valve/regulating throttle
04 Cylinder
05 EGR valve (here: pneumatic)
06 Pressure transducer
07 Lambda sensor (petrol)
08 Catalytic converter

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<td>Less CO\textsubscript{2}</td>
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All content including pictures and diagrams is subject to change. For assignment and replacement, refer to the current catalogues or systems based on TecAlliance.

OUR HEART BEATS FOR YOUR ENGINE.
EXHAUST GAS RECIRCULATION (EGR) COMPONENTS

The EGR valve doses the amount of exhaust gas returned. It is installed either at the exhaust manifold or the intake air system. Or it is located in a heat-resistant exhaust pipe which connects the exhaust manifold to the intake air system.

Pneumatic EGR valves are actuated via electric valves using a vacuum: in simple systems with a switchover valve, the EGR valve only has an open/close function. In systems with a pressure transducer, the EGR valve can be continuously adjusted. The vacuum is taken from the intake manifold or generated by a vacuum pump.

Electric or electromotive EGR valves are controlled directly by the control unit and do not require a vacuum or solenoid valve.

Due to the high return rates involved, EGR valves in diesel vehicles have large opening cross-sections.

01 Pneumatic EGR valve
02 Pneumatic EGR valve with position detection
03 Electric EGR double poppet valve

With EGR valves in petrol engines, the cross sections are much smaller.

04 Electric EGR valve with connection to the coolant circuit
05 Pneumatic EGR valve
06 Electric EGR valve

Pneumatic EGR valves are actuated using electric valves.

The air mass sensor is required in diesel engines to regulate the exhaust gas recirculation, for example.

In diesel vehicles, the difference in pressure between the exhaust and intake side is not sufficient for the high exhaust gas recirculation rates. As a result “regulating throttles” are placed in the intake manifold to generate the vacuum required.
The most common causes of faults in the EGR system are stuck or carbonised EGR valves. In addition to harmful gases, the returned exhaust gas also contains soot particulates – this applies to diesel vehicles in particular. Carbon deposits and sticking are often the result. From a certain point, the strength of the EGR valve is no longer enough – it can no longer open or remains stuck in an open position. This causes jerking, irregular idling and a lack of power.

The causes of extremely oily intake or charge air may be faults in the crankcase ventilation, worn bearings, a blocked oil return line on the turbocharger, worn valve stem seals and guides, the use of an unsuitable engine oil grade or an engine oil level that is too high. Unusually high deposits may also be caused by faults in the injection.

Even though EGR valves are designed for the high temperatures in the exhaust tract, there may occasionally be heat damage on the valve. The causes of this may be incorrect actuation, exhaust gas back pressure that is too high, or a blow-off valve (wastegate valve) in the turbocharger that does not open. The system may also have been manipulated ("tuning") to increase the boost pressure.

In the case of pneumatic EGR valves, the cause of faults may be found in the entire area of the vacuum control (vacuum pump, vacuum lines, solenoid valves).

Electric EGR valves and solenoid valves can mostly be actuated by the engine tester via an actuator diagnosis. A functioning valve switching can easily be heard when the engine is stopped.

If, following damage, a new EGR valve is installed but the vehicle still behaves as if the valve had not been changed, the map data necessary for operation must be "learnt" again. This can be achieved during a relatively long test run or by a special engine tester program point, for example "basic settings".

ATTENTION

We advise against cleaning the EGR components! If a component is already faulty, no improvement will be achieved by cleaning it. If functional components are treated in this way, they may be damaged by the cleaning process. A faulty component should always be replaced with a new one.
# TROUBLESHOOTING IN EXHAUST GAS RECIRCULATION

## PROBLEM DUE TO EGR VALVE

<table>
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<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
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</thead>
</table>
| • Irregular idling  
• Jerking  
• Lack of power  
• Limp home function  
• MIL illuminated/fault code set  
• Lack of power in lower engine speed range or in cold running range (petrol)  
• Lack of power in upper engine speed range (diesel) | In general: carbonised/stuck EGR valve  
• Poor, unclean combustion  
• Errors in the engine management  
• Frequent short-distance drives  
• Leaking in the vacuum system  
• Defective solenoid valves  
• Faults in vacuum system | • Check engine control  
• Check software version of the engine control unit  
• Avoid purely short-distance drives  
• Replace valve |
| | Extremely oily intake or charge air:  
• Faults in the crankcase ventilation  
• Engine oil level too high  
• Poor engine oil grade  
• Worn valve stem seals and guides | • Check function, electrical actuation and tightness of the vacuum system  
See below: “Vacuum system” |
| • P0401 “Flow rate too low”  
• P0103 “Air mass too high” | EGR valve does not open or is not actuated  
EGR system has been shutdown (vehicle no longer complies with ABE) | • Check connections and actuation |
| • P0402 “Flow rate too high”  
• P0102 “Air mass too low” | EGR valve does not close/is constantly open  
Uncontrolled, constant EGR | • Replace EGR valve  
• Check connections and actuation |
| • EGR valve has temperature damage, visible discolouration, fusion (petrol) | Incorrect actuation  
Exhaust gas back pressure too high  
Turbocharger blow-off valve does not open | • Replace EGR valve  
• Check actuation of the EGR valve  
• Check exhaust gas back pressure  
• Check turbocharger blow-off valve (wastegate) and its actuation |
| • New EGR valve is not working  
• High idling after installation | New EGR valve was not adapted | • Perform basic setting for the EGR valve using the engine tester |

ABE = general vehicle operating licence; EGR = exhaust gas recirculation; MIL = malfunction indicator lamp
### TROUBLESHOOTING IN EXHAUST GAS RECIRCULATION

#### PROBLEM DUE TO AIR MASS SENSOR

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| • Sawing engine  
• Engine misfires  
• Limp home function  
• Decreasing braking power | • Defective hoses (porous, rodent attack)  
• Leaking connections at pneumatic valves  
• Leaking non-return valves/vacuum reservoir  
• Defective/porous diaphragms or seals on pneumatic actuators  
• Leakage in intake manifold | • In the event of damage, check all components in the vacuum system for leaks and replace the damaged part |

#### TROUBLESHOOTING IN EXHAUST GAS RECIRCULATION

#### PROBLEM DUE TO VACUUM SYSTEM/SOLENOID VALVE

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
</table>
| • P0401 “Flow rate too low”  
• Black smoke  
• Lack of power  
• Limp home function | Air mass sensor damaged/dirty due to  
• Dirt particles in the intake air  
• Leakages in the intake air system, splash water  
• Air filter replacement was not clean  
• Blocked air filter  
• Oil-wetted sports air filter | • Avoid ingress of water and particles in the intake air system |
| • Damaged turbocharger | • Check turbocharger |