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SERVICE INFORMATION

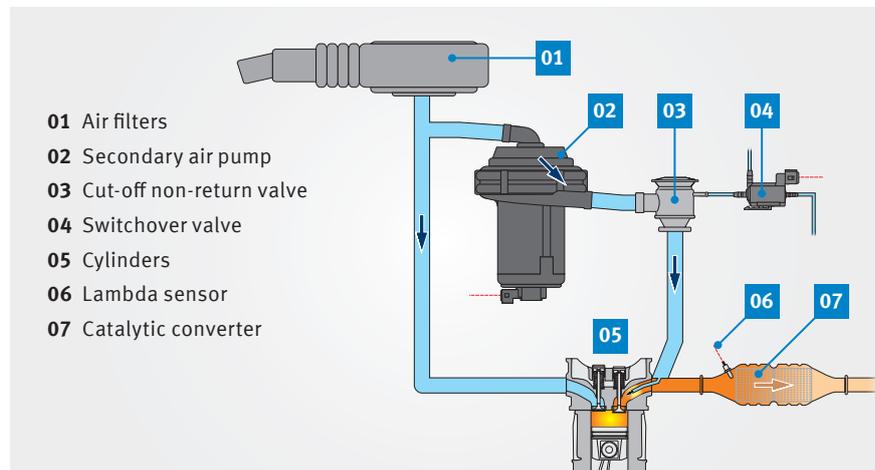
SECONDARY AIR SYSTEM

DESIGN, COMPONENTS, TROUBLESHOOTING

Suitable for	Product
All petrol-driven vehicles with a secondary air system	Secondary air valve, secondary air pump, switchover valve

With spark-ignition engines, the greatest pollution occurs on cold starting. Secondary air systems have been successfully employed to reduce such cold starting emissions.

A "rich mixture" ($\lambda < 1$), i.e. a mixture with excess fuel, is required for a cold start of a petrol engine. Until the catalytic converter reaches operating temperature and Lambda control action starts to take effect, large quantities of carbon monoxide and unburnt hydrocarbons are produced. To reduce the level of these pollutants, ambient air with a high oxygen content (secondary air) is injected into the exhaust manifold directly downstream of the exhaust valves during the cold start phase. This results in post-oxidation ("afterburning") of the pollutants to form carbon dioxide and water. The heat generated in this process additionally warms the catalytic converter and speeds up the onset of Lambda control action.



Block diagram of secondary air system (pneumatically actuated)



Secondary air valve and secondary air pump in BMW E46 (highlighted)

All content including pictures and diagrams is subject to change. For assignment and replacement, refer to the current catalogues or systems based on TecAlliance.



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**INSPECTION: SECONDARY AIR VALVE**

Following removal, operation of a vacuum-controlled secondary air valve can be checked using a vacuum hand pump:

- The secondary air valve must be replaced if it does not open on applying vacuum.
- If the secondary air valve opens on applying vacuum, the solenoid actuation valve (switchover valve) and the vacuum hoses must be checked.
- The secondary air valve diaphragm is leaking if the vacuum applied with the vacuum hand pump decreases.
- Deposits on the side facing the secondary air pump (finger test, Fig.) are an indication of non-return valve leakage.
- To check, unfasten the connection hose between the secondary air pump and secondary air valve.

In this case, the secondary air pump may already have suffered damage: Check and, if necessary, replace the secondary air pump.

INSPECTION: SWITCHOVER VALVE

The switchover valve remains energised for the blowing in of secondary air (cold start phase).

The switchover valve is open when energised and closed when de-energised.

- A vacuum hand pump can be used to check for opening and leakage.
- During blowing in of secondary air, the on-board voltage must be applied to the plug of the switchover valve. If not, an electrical fault has occurred and must be localised with the help of a circuit diagram.

INSPECTION: VACUUM SYSTEM

The control vacuum may not be attained in the event of leakage.

- A pressure gauge, e.g. on the vacuum hand pump, can be used to check the control vacuum at the switchover valve and on vacuum-controlled secondary air valves.
- If a minimum control vacuum of 390 mbar (corresponding to an absolute pressure of 610 mbar) is not attained, the entire vacuum system must be examined for leakages and the damaged component replaced.

POSSIBLE SOURCES OF TROUBLE

- 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
- Defective vacuum pump

INSPECTION: CONNECTION TO EXHAUST MANIFOLD

Exhaust gas may be heard to escape at the connecting flange if a gasket is defective.

- Check the connection for leaks and re-seal if necessary.



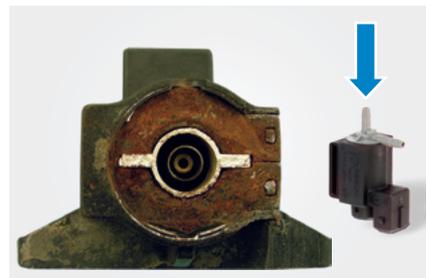
Open secondary air valve
Left: Damage caused by exhaust gas condensate
Right: New condition



Checking a secondary air valve with a vacuum hand pump



Finger test at secondary air valve in BMW 520i (highlighted)
If deposits are found on this end, the non-return valve is leaking and must be replaced.



Corroded switchover valve (open)