

Function of the Secondary Air System

Immediately after starting a cold spark-ignition (petrol) engine, until Lambda control starts to take effect, undesirable quantities of harmful HC and CO are emitted. The use of a secondary-air system can significantly reduce the level of such pollutants in the cold starting phase. PIERBURG describes the basic function of the secondary air system and how they work.

The secondary air system supplies ambient air to the exhaust when the engine first starts up, until the engine is warm enough for the oxygen sensor to take control over the combustion mixture.

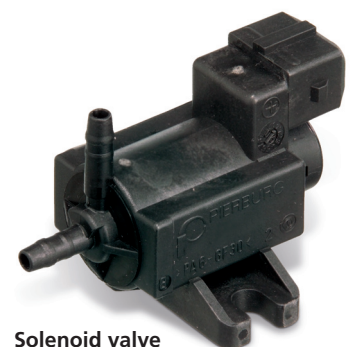
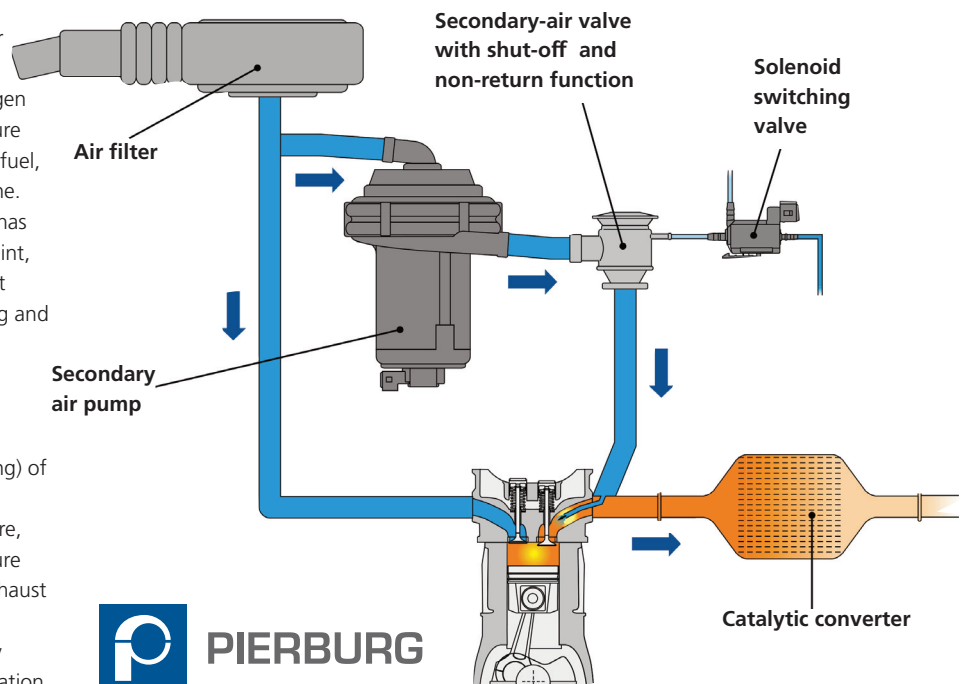
A "rich mixture", i.e. a mixture with excess fuel, is required for starting a cold spark-ignition engine.

Due to the fact that the catalytic converter has not yet reached operating temperature at this point, large quantities of carbon monoxide and unburnt hydrocarbons are produced between cold starting and the onset of Lambda control action – even with "clean" spark-ignition engines.

The injection of ambient air with a high oxygen content into the exhaust manifold (secondary-air) causes post-oxidation (afterburning) of the pollutants.

When the engine is at operating temperature, the lambda sensor begins to control the fuel mixture and secondary air is no longer supplied to the exhaust manifold.

Any pneumatic valve can be easily tested by applying a vacuum to the valve to check its operation.



Secondary-air pumps are high-speed radial blowers. Because of their compact, robust design they can be fitted almost anywhere in the vehicle. The pump supplies air to the air valve, which directs air to the exhaust when the engine is cold.

The shut-off function ensures that secondary-air is only routed to the exhaust manifold in the cold starting phase. The integrated non-return function stops exhaust gas, condensate or pressure peaks in the exhaust system (e.g. misfiring) causing damage to the secondary-air pump.

Solenoid switching valves act as switches for vacuum-controlled components. They are required for opening and closing pneumatic secondary-air valves. The latest generation of valves manages without actuation by a solenoid switching valve.