

4.2

The fuel tank ventilation system (AKF system)

vapours are formed above the surface of the fuel in the fuel tank. The fuel tank ventilation system prevents fuel vapours from escaping into the environment with the hydrocarbons (HC) they contain. They are therefore accumulated in an AKF (activated carbon filter) canister.



Important note:

Another name for the fuel tank ventilation system is the “activated carbon filter” system, or “AKF” system.

Because the storage capacity of the activated carbon in the AKF canister is limited, the accumulator must be emptied (“regenerated”) regularly and the condensates recirculated back into the combustion. This is done by suctioning ambient air from

the manifold vacuum into the AKF canister. It is dosed by the AKF regeneration valve. In systems with increased pressure in the fuel tank, a fuel tank pressure valve can also be added.

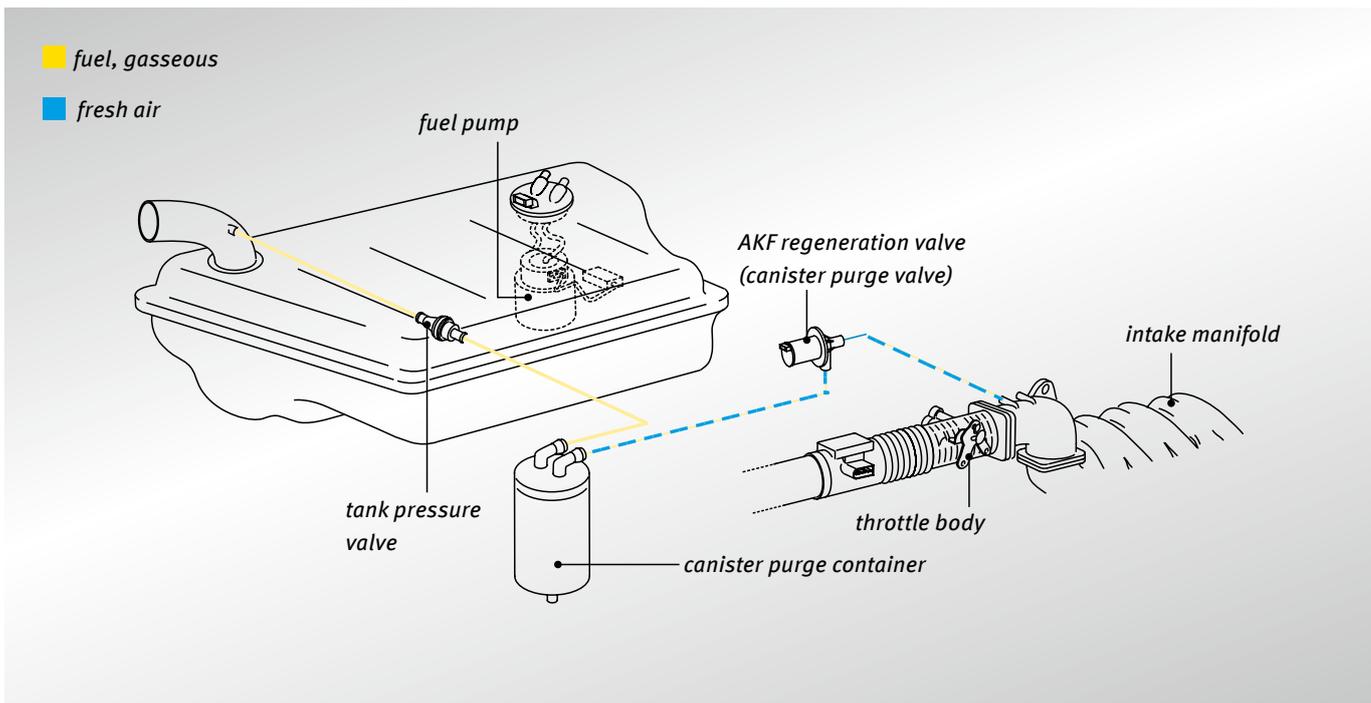


Fig. 17: fuel tank ventilation system, schematic

To “regenerate” the activated carbon filter, i.e., to rinse out the hydrocarbons accumulated in it, the AKF regeneration valve is opened by the engine control unit in certain operating states. The hydrocarbons accumulated in the activated carbon filter are introduced into the intake manifold and thus fed to the combustion.



Important note:

The AKF regeneration valve is also referred to as the canister purge valve, regeneration valve, or tank ventilation valve.



4.2.1

Monitoring

With the most common methods of monitoring, the lambda value is first measured after the AKF regeneration valve is closed. Then the AKF regeneration valve is opened.

- If many hydrocarbons are bonded in the activated carbon filter, the fuel mixture will be too rich for a brief period. The lambda control then regulates in the “lean” direction.
- If no active hydrocarbons, or only a few are accumulated in the activated carbon filter, only air or air with a low fuel content will flow when the AKF regeneration

valve is open. This will produce leanness. The lambda control will then regulate in the “rich” direction.

If this adjustment does not occur within a certain time in both cases, and error will be indicated.

Lambda control will not react if a mix of lambda = 1 is produced at random when the AKF regeneration valve is opened. In this case the idle speed actuator will prevent the engine speed from increasing. During proper functioning the diagnostic threshold must also be reached within a certain time here. Here as well an error will be detected if the adjustment does not occur within a certain time.

A further method is the modulation diagnosis. In this case the AKF regeneration valve is opened and closed again by the control unit within a certain test interval. This generates pressure changes in the intake manifold that are registered by the intake manifold pressure sensor. The measured values are compared with the set-point values in the control unit. When there are deviations, an error will be detected.

Monitoring conditions

- Monitoring occurs
- during idling
 - at operating temperature.

Possible fault codes

P0170	fuel trim (bank 1)	malfunction
P0171	fuel trim (bank 1)	system too lean
P0172	fuel trim (bank 1)	system too rich
P0175	fuel trim (bank 2)	system too rich
P0440	evaporative emission control system	malfunction
P0441	evaporative emission control system	incorrect purge flow
P0442	evaporative emission control system	leak detected (small leak)
P0443	evaporative emission control system	purge control valve circuit
P0444	evaporative emission control system	purge control valve circuit open
P0445	evaporative emission control system	purge control valve circuit shorted
P0446	evaporative emission control system	vent control circuit
P0447	evaporative emission control system	vent control circuit open
P0448	evaporative emission control system	vent control circuit shorted
P0449	evaporative emission control system	vent valve/solenoid circuit
P0450	evaporative emission control system	pressure sensor
P0451	evaporative emission control system	pressure sensor range/performance
P0452	evaporative emission control system	pressure sensor low input
P0453	evaporative emission control system	pressure sensor high input
P0454	evaporative emission control system	pressure sensor intermittent
P0455	evaporative emission control system	leak detected (gross leak)
P0456	evaporative emission control system	leak detected (very small leak)
P0457	evaporative emission control system	leak detected (fuel cap loose/off)
P0460	fuel level sensor circuit	malfunction
:		
P0464	fuel level sensor circuit	intermittent
P0465	EVAP purge flow sensor circuit	malfunction
:		
P0469	EVAP purge flow sensor circuit	intermittent

Diagnostic instructions

In addition to electrical errors, that in any event are recorded and output as fault codes, there are other errors that can cause malfunctions. In the case of these errors the cause is not always diagnosed. The following table is intended as a help in determining the causes of such errors.

Component	Possible causes/errors	Possible solutions/actions
activated carbon filter	<ul style="list-style-type: none"> • fuel tank aeration and ventilation (external aeration) insufficient (soiled, clogged) • activated carbon filter flooded by fuel overflow • filling in activated carbon filter ineffective (granulates have disintegrated) 	<ul style="list-style-type: none"> • visual inspection • clean or replace defective components • examine fit of AKF regeneration valve and check lines for deposits (dust/grime). This is an indication of disintegrated granulates
AKF regeneration valve	<ul style="list-style-type: none"> • idling problems • idle control has reached the control limit • valve stuck • valve partially blocked/leaking • noticeable smell of petrol especially at higher temperatures 	<ul style="list-style-type: none"> • check non-return valve for functioning with vacuum hand pump • run self/actuator diagnosis • check electric resistance of the valve • clean valve, if necessary, replace defective valve
lines (to AKF regeneration valve or intake manifold)	<ul style="list-style-type: none"> • fuel tank aeration and ventilation (external aeration) insufficient (soiled, clogged) • lines soiled, broken off or no longer connected • drooping lines plugged by condensates 	<ul style="list-style-type: none"> • clean or replace defective components • check lines