

Tips & Technology

For Bosch Partners

Current topics for successful workshops No. 45/2012

Diesel injection



BOSCH

Invented for life

Denoxtronic 3.1 Dosing system for AdBlue in SCR systems

New exhaust gas treatment requirements

In recent years, the permitted limits have been continually lowered worldwide in order to reduce environmental pollution from vehicle emissions. Emissions targets that go beyond the Euro 5 limits can no longer always be achieved by measures inside the engine, which is why treatment of the exhaust gas is required. When measures are taken inside the engine, there may be a conflict of interest between the need for compliance with limits for nitrogen oxides (NO_x), particulates, consumption and noise. Exhaust gas treatment helps to resolve these conflicts of interest, while simultaneously lowering CO₂ emissions.

Modern car diesel engines with common rail systems have 96% lower raw NO_x emissions than a typical diesel engine from 1990. The SCR (Selective Catalytic Reduction) system with the Denoxtronic from Bosch reduces these raw NO_x emissions by as much as another 95%. To achieve this, the reducing agent AdBlue is introduced into the flow of exhaust gas. The Denoxtronic 3.1 reducing agent dosing system developed by Bosch has been installed as standard by several vehicle manufacturers since mid-2008. When the Denoxtronic 3.1 is used, Euro 6 and Tier 2 bin 5 limit values can already be complied with.



Figure 1: Control unit, delivery unit and dosing module of the Denoxtronic 3.1

Operating principle

In the SCR process, the AdBlue reducing agent – a 32.5% aqueous urea solution – is added to the exhaust gas. A pump in the delivery module of the Denoxtronic pumps the AdBlue out of the tank to the dosing module. This module injects the AdBlue directly into the flow of exhaust gas before the SCR catalytic converter. There, through a process of thermal hydrolysis, the urea is transformed into ammonia, which is required for the subsequent reactions. In the SCR catalytic converter, the ammonia reduces the nitrogen oxides from the exhaust gas into water and nitrogen. The electronic control can be integrated in the engine control unit (ECU) or, alternatively, accommodated in a dosing control unit (DCU). In the latter case, the dosing system receives the current operating data of the engine via a CAN (Controller Area Network) bus, and also processes all the sensor data required for the dosing system. The dosing strategy enables the quantity of reducing agent to be precisely adjusted in line with the current engine operating point and the characteristics of the catalytic converter, in order to achieve maximum conversion of nitrogen oxides.

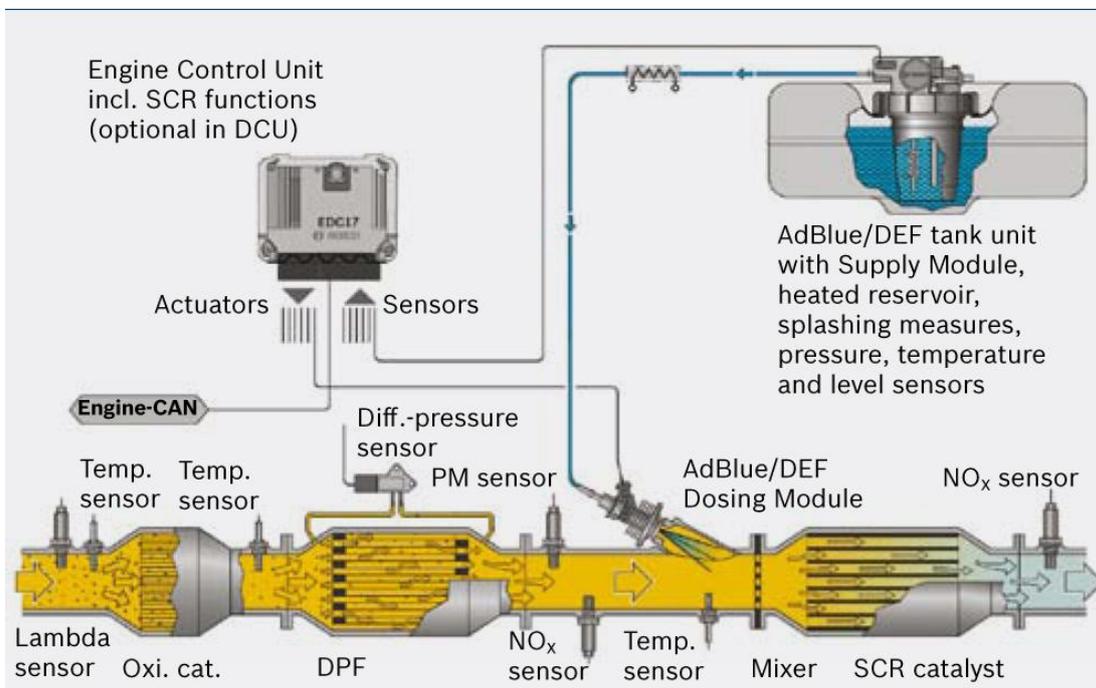


Figure 2: System layout of Denoxtronic for passenger cars

What is AdBlue?

AdBlue is an aqueous urea solution containing 32.5% urea. Its properties are as follows:

- Water-soluble
- Non-flammable
- Freezing point -11.5°C
- Over 30°C hydrolysis (breaking down into CO₂ and ammonia)
- Density 1087-1092 kg/m³
- Water hazard class 1 (low hazard to water)
- No mandatory labeling required
- Not a hazardous substance
- Good biodegradability
- Specified to DIN 70700



Figure 3: AdBlue warning sign

Tips for working on SCR systems

When inspecting passenger cars with SCR systems, the AdBlue tank must be filled. As AdBlue fluid has aggressive properties and can trigger rust on steel, oxidation on aluminum and pitting on brass, ensure absolute cleanliness during this work. To ensure the correct handling of AdBlue:

- Dispose of escaped AdBlue as waste
- Do not dispose of in the sewage system
- Store at 25°C in a dark place for max. 1 year
- Wear safety goggles, protective gloves and protective clothing when handling AdBlue
- If AdBlue gets onto skin or into eyes, rinse generously with water
- Do not put any other substances into the tank. Filling with the wrong fuel will irreparably damage the system. Even the tiniest quantities of diesel are harmful
- Take care not to get AdBlue in electrical connections

AdBlue has a very low viscosity and therefore has an extreme tendency to creep or leak. Even very minor leaks in components and sealing points can cause AdBlue to leak, therefore causing serious damage to the delivery module.