Service Training

Commercial Vehicles

Self-study programme 446

The 2.5l TDI EURO V engines with SCR system in Crafter

Design and function

The worldwide tightening of emission limits for passenger cars and commercial vehicles with diesel engines calls for both the continuous improvement of combustion inside the actual engine and increasingly powerful exhaust gas treatment systems.

The new 2.5l TDI engines in the Crafter are equipped with the SCR (Selective Catalytic Reduction) system. Volkswagen Commercial Vehicles is thus making a further contribution to protecting the environment and combating climate change.

In this self-study programme, you can find out about an exhaust gas treatment system that reduces harmful nitrogen oxides (NO_x) in the exhaust gas.

S446_002

This self-study programme describes the Selective Catalytic Reduction SCR) exhaust gas treatment system for the Crafter.
Further information about the SCR system can be found in self-study programme 424 "The Selective Catalytic Reduction exhaust gas treatment system".

The self-study programme presents the design and function of new developments! The content is not updated.

Current testing, adjustment and repair instructions can be found in the applicable service literature.

Caution Note

At a glance

Introduction

The 2.5l TDI engines with SCR system (EURO V)

New emission limits as a result of the introduction of EURO V demand new exhaust gas treatment systems to reduce harmful emissions. In the past, Volkswagen has played an important role in driving the development of new systems to create cleaner diesel engines and faces up to its responsibility to clean up the environment. Examples include the efficient and economical TDI technology, as well as higher performance injection and exhaust gas treatment systems.

The 2.5l TDI engines that comply with EURO V, have therefore undergone modifications in the following major areas.

- Adaptation of the engine mechanics and engine management to optimise internal combustion
- Optimisation of the exhaust gas treatment system

In addition to the optimisation measures involving existing components, the exhaust gas treatment system has been extended and optimised with the new SCR system. SCR stands for Selective Catalytic Reduction. It is a technology that selects the nitrogen oxides (NO_x) from the exhaust gas components and reduces them.

Technical features

The technical features only list those changes resulting from the modification of the engine outlined above.

The engine torques have been raised and torque curves optimised. These adaptations have been implemented exclusively by modifying the software in the engine control unit.

The increase in torque, combined with a new gearbox with a longer transmission, ensures a reduced engine speed. The engine runs more smoothly. This brings a significant improvement in both driving comfort and fuel consumption.

The SCR system reduces nitrogen oxide emissions and thus supports compliance with the limits in the EURO V emissions standard.

The following page provides a brief overview outlining the parts and assemblies affected by the modifications to the engine. The self-study programme then continues with more detailed explanations.

Self-study programme 371 "The 2.5l TDI engines in the Crafter" contains further information about technical features.

Changes to the engine mechanics

- Engine speed sensor
- Turbo-charger

Engine speed sensor

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Turbo-charger

S446_084

New developments on diesel particulate filter

- Pre-catalytic converter
- Diesel particulate filter
- Mounting of diesel particulate filter

Diesel particulate filter

S446_085

New developments due to SCR system

- Reducing agent injection valve
- SCR tank system
- Mixer in exhaust pipe
- Reduction catalytic converters

Injection valve

S446_086

SCR tank system

S446_087

Mixer in exhaust flow

S446_088

Reduction catalytic converters

S446_089

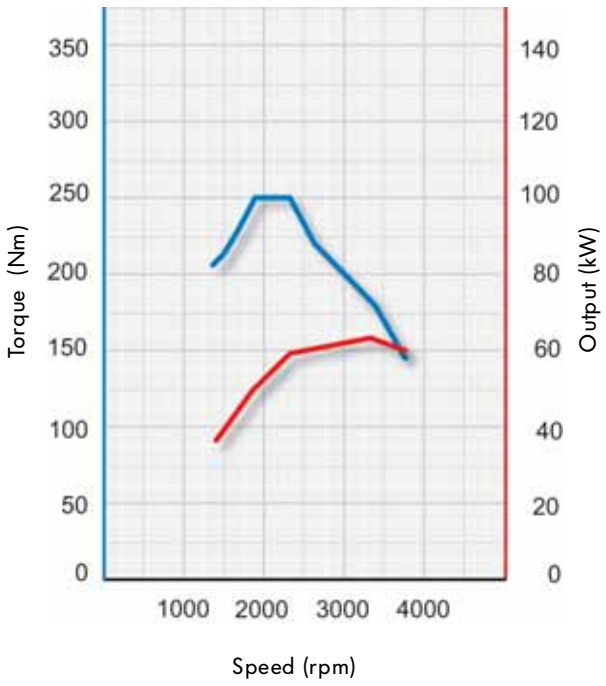
S446_091

Technical specifications

The 2.5l 65kW TDI engine

Engine codes	CEBA
Type	5-cylinder in-line engine
displacement	2461 cm^3
Bore	81,0 mm
Stroke	95,5 mm
Valves per cylinder	2
Compression ratio	18 : 1
Max. output	65 kW at 3300 rpm
Max. torque	250 Nm at 1900 rpm up to 2300 rpm
Engine management	Bosch EDC 17 CP
Fuel	Diesel fuel min. 51CZ
Exhaust gas treatment	Exhaust gas recycling with exhaust gas cooling, pre-catalytic converter, diesel particulate filter, reduction catalytic converters
Emission standard	EURO V

Output and torque curve

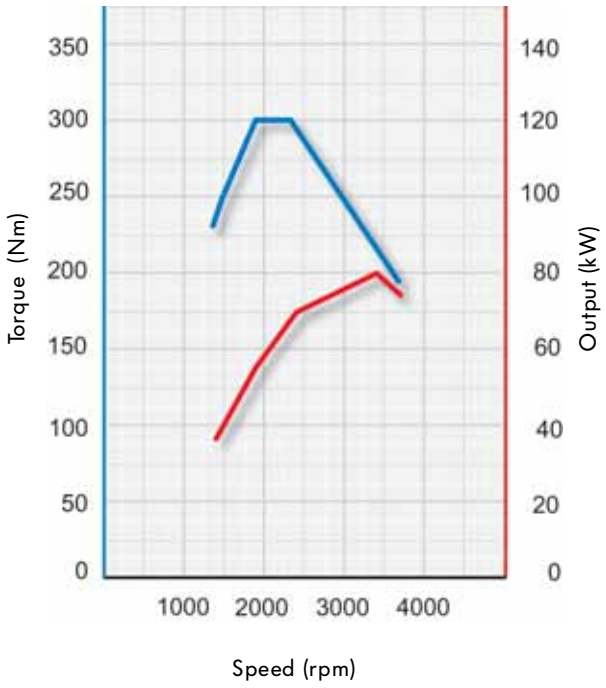


S446_005

The 2.5l 80kW TDI engine

Engine codes	CEBB
Type	5-cylinder in-line engine
displacement	2461 cm^3
Bore	81,0 mm
Stroke	95,5 mm
Valves per cylinder	2
Compression ratio	18 : 1
Max. output	80 kW at 3300 rpm
Max. torque	300 Nm at 1900 rpm up to 2300 rpm
Engine management	Bosch EDC 17 CP
Fuel	Diesel fuel min. 51CZ
Exhaust gas treatment	Exhaust gas recycling with exhaust gas cooling, pre-catalytic converter, diesel particulate filter, reduction catalytic converters
Emission standard	EURO V

Output and torque curve

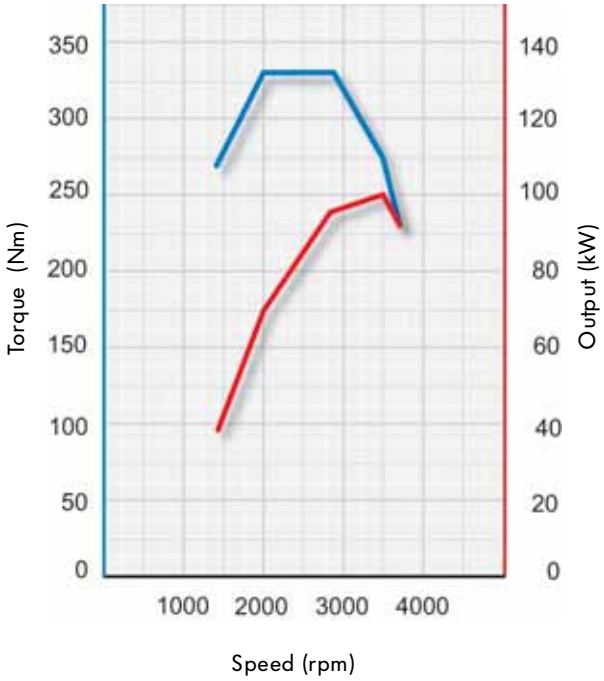


S446_006

The 2.5l 100kW TDI engine

Engine code	CECA
Type	5-cylinder in-line engine
displacement	2461 cm^3
Bore	81,0 mm
Stroke	95,5mm
Valves per cylinder	2
Compression ratio	18 : 1
Max. output	100kW at 3500 rpm
Max. torque	330 Nm at 2000 rpm up to 2800 rpm
Engine management	Bosch EDC 17 CP
Fuel	Diesel fuel min. 51CZ
Exhaust gas treatment	Exhaust gas recycling with exhaust gas cooling, pre-catalytic converter, diesel particulate filter, reduction catalytic converters
Emission standard	EURO V

Output and torque curve

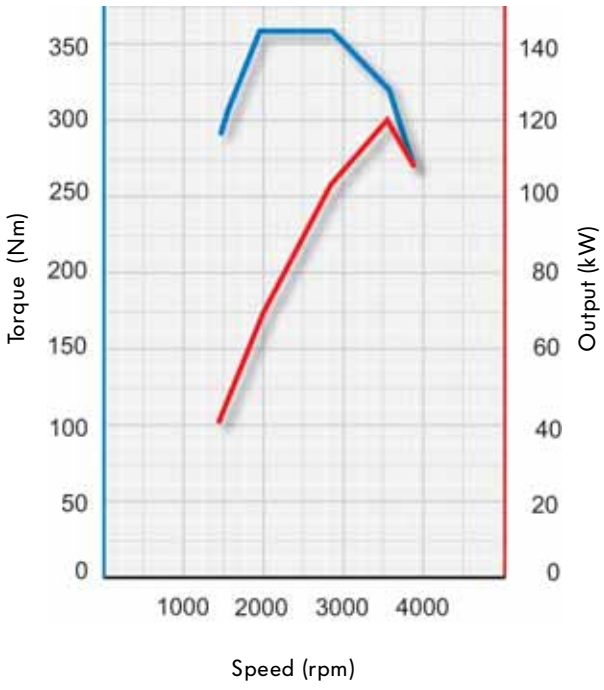


S446_007

The 2.5l 120kW TDI engine

Engine code	CECB
Type	5-cylinder in-line engine
displacement	2461 cm^3
Bore	81,0 mm
Stroke	95,5 mm
Valves per cylinder	2
Compression ratio	18 : 1
Max. output	120 kW at 3500 rpm
Max. torque	360 Nm at 2000 rpm up to 2800 rpm
Engine management	Bosch EDC 17 CP
Fuel	Diesel fuel min. 51CZ
Exhaust gas treatment	Exhaust gas recycling with exhaust gas cooling, pre-catalytic converter, diesel particulate filter, reduction catalytic converters
Emission standard	EURO V

Output and torque curve



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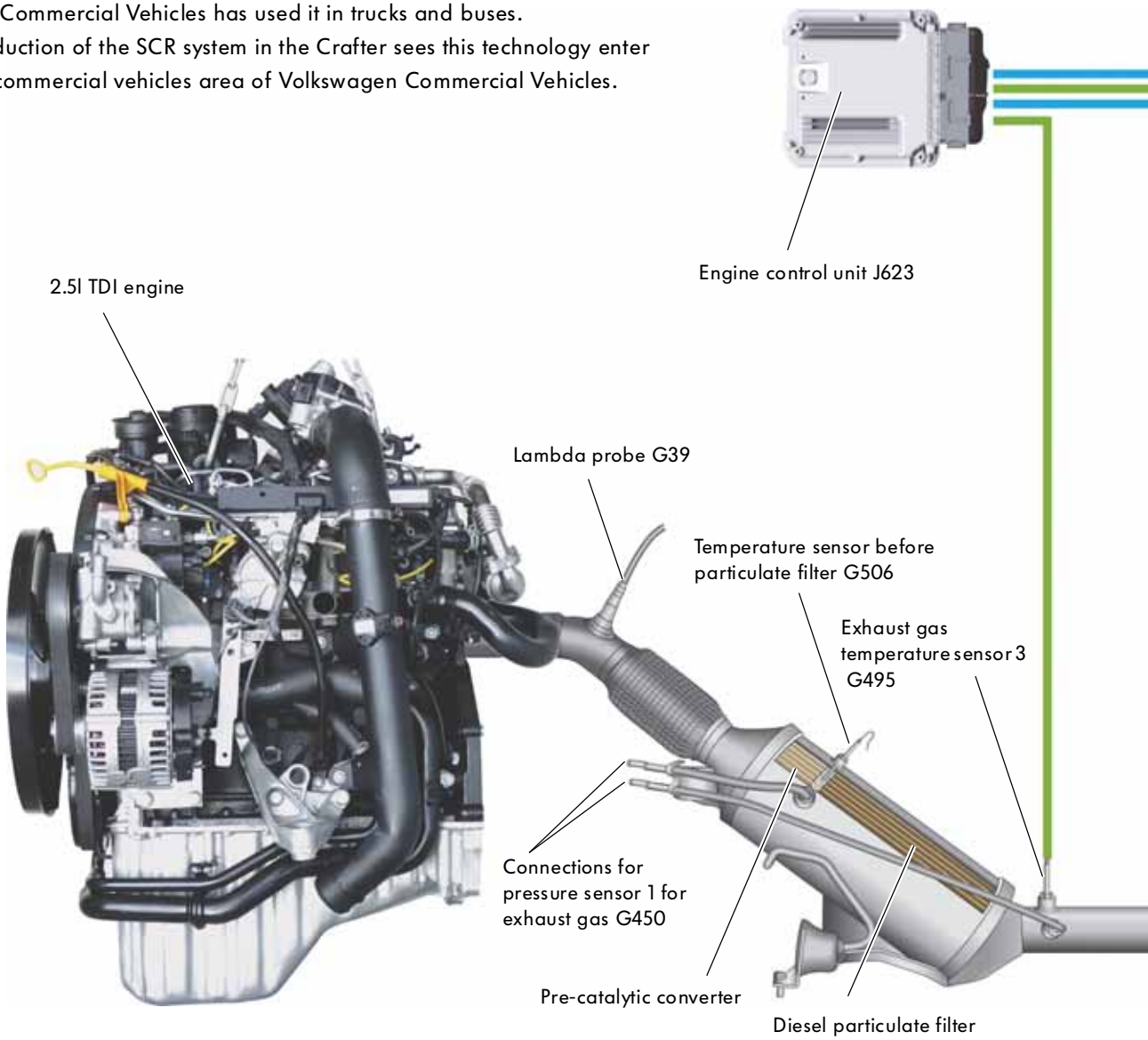
Exhaust gas treatment system

System construction

The schematic system overview shows the key assemblies of the modified 2.5l TDI engines, which make a vital contribution to achieving compliance with the requirements of the new EURO V emissions legislation.

In addition to the changes to the engine mechanics and the diesel particulate filter, the new SCR system for reduction of nitrogen oxides is particularly important.

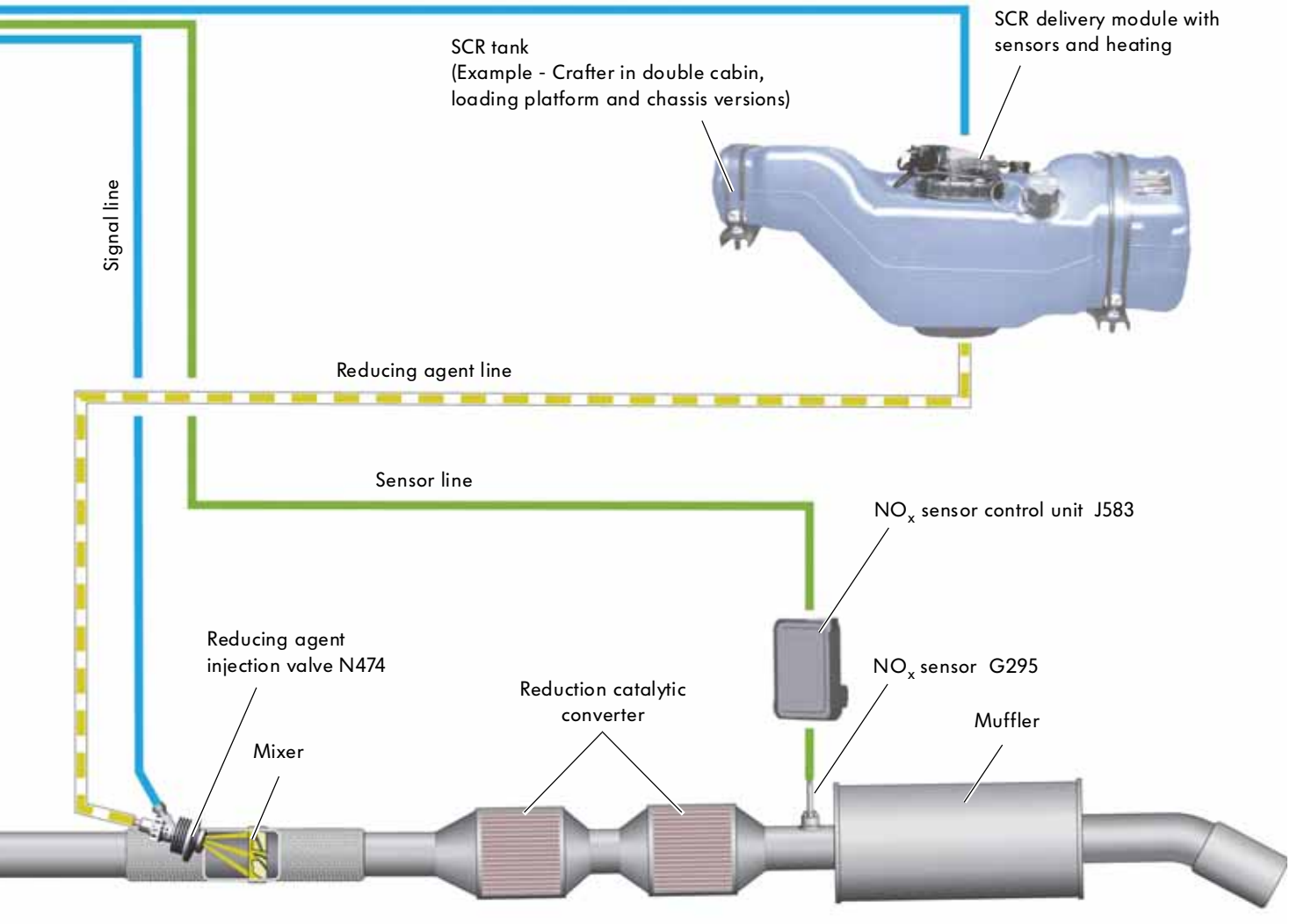
SCR technology has already been in use in automotive engineering for some time and Commercial Vehicles has used it in trucks and buses.
The introduction of the SCR system in the Crafter sees this technology enter the light commercial vehicles area of Volkswagen Commercial Vehicles.



SCR system

The reduction catalytic converters convert the nitrogen oxides (NO_x) contained in the exhaust gas into nitrogen (N_2) and water (H_2O). To achieve this a reducing agent is continuously injected into the flow of exhaust gas before the reduction catalytic converters. The reducing agent is stored in a separate additive tank.

The system is controlled by the engine control unit J623 in conjunction with the NO_x sensor control unit J583 and the sensors responsible for the system.



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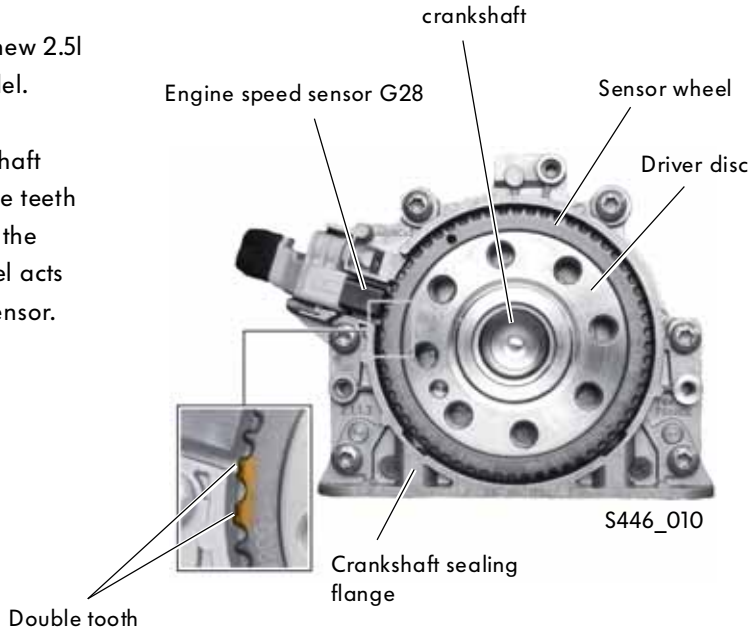
The essential components will be explained at the end of this system overview.

Engine speed sensor G28

A different engine speed sensor is used in the new 2.5l TDI engine than that used in the previous model.

The engine speed sensor is fixed to the crankshaft sealing flange. It is Hall sensor, which scans the teeth of a 60 + 2 sensor wheel, which is fixed onto the driver disc. A double tooth on the sensor wheel acts as a reference marker for the engine speed sensor.

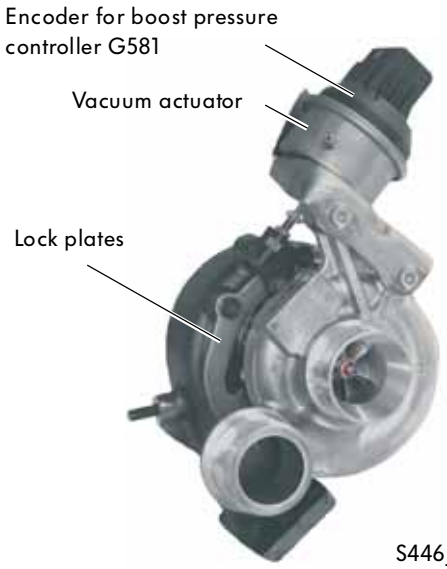


Turbocharger

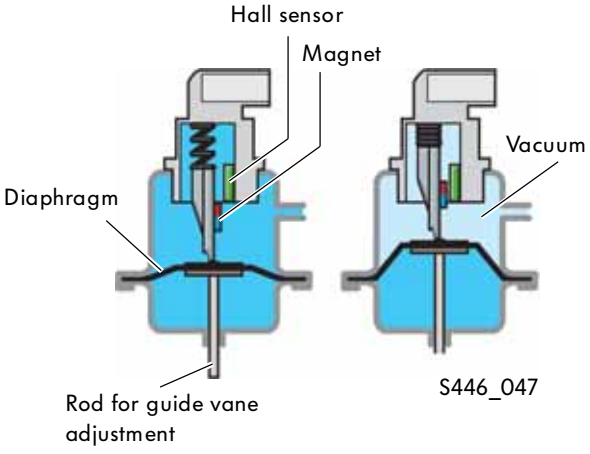
The turbocharger is equipped with lock plates, which reinforce the connection between the turbine housing and the bearing case,

The encoder for the boost pressure controller G581 is integrated into the vacuum actuator in the turbocharger.

The encoder is a displacement sensor, which enables the engine control unit to determine the position of the turbocharger guide vanes.

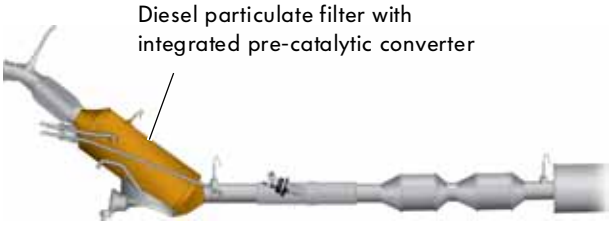


The function of the encoder for the boost pressure controller is explained in detail in self-study programme 368 "The 2.0 l 125 kW TDI engine with 4-valve technology".



The diesel particulate filter

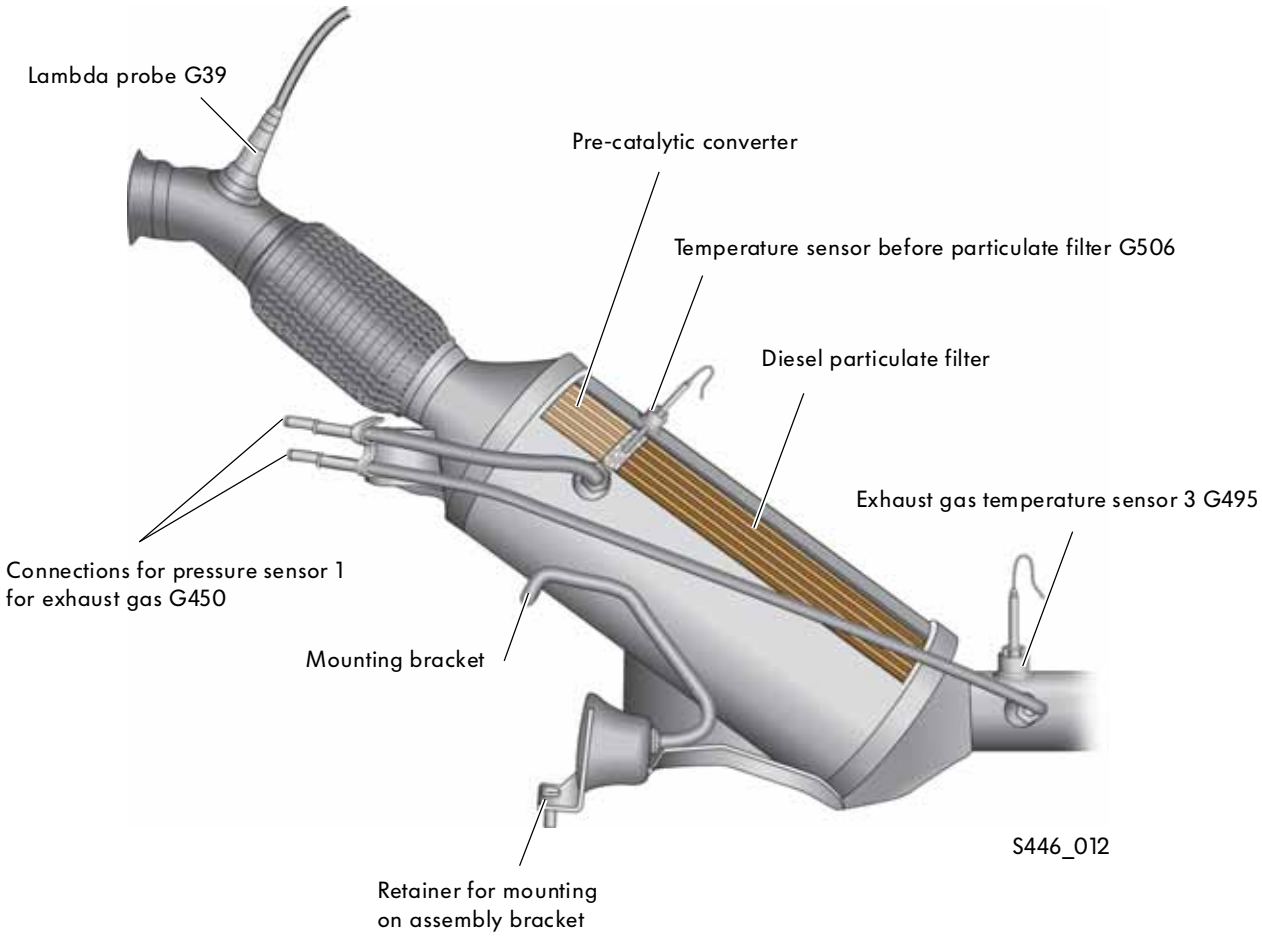
The new diesel particulate filter has a modular design, which combines the pre-catalytic converter and the diesel particulate filter that follows it. This construction combined with the installation position close to the engine ensures effective temperature management. The reaction temperature of the pre-catalytic converter is used for additional heating of the diesel particulate filter.



Regeneration control for the diesel particulate filter has been optimised by:

- shorter regeneration time
- longer regeneration intervals

The mounting of the diesel particulate filter has been changed. It is now no longer mounted directly on the engine, but on the engine assembly bracket. This mounting means that fewer oscillations/vibrations are transmitted to the exhaust system.

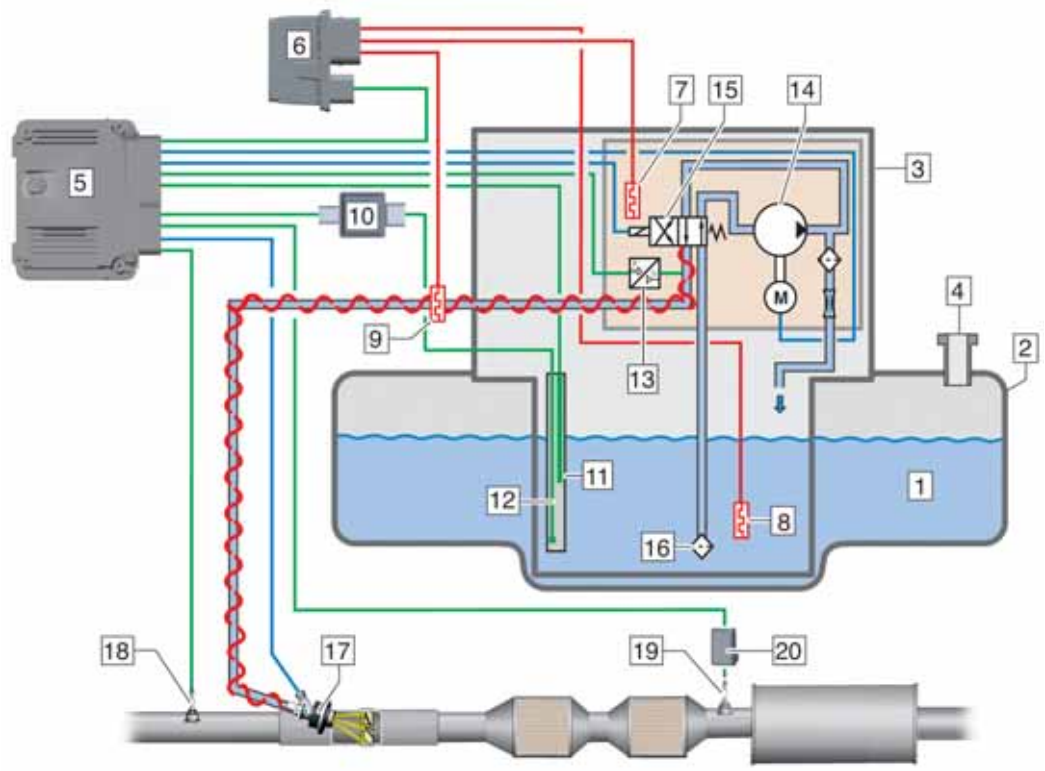


Overview of SCR system

The SCR system comprises the following main areas:

- Reducing agent
- Tank system
- Delivery system with heating
- Reducing agent injection and distribution in exhaust flow
- Reduction catalytic converters and
- measuring / control components

A brief overview of these areas is provided on the following pages, in the order of the actual process, starting with the tank system.



S446_050

1 - Reducing agent
2 - Reducing agent tank
3 - Reducing agent delivery module
4 - Filler
5 - Engine control unit J623
6 - Reducing agent heater control unit J891
7 - Reducing agent pump heater Z103
8 - Reducing agent tank heater Z102
9 - Reducing agent line heater Z104
10 - Reducing agent level evaluation unit G698
11 - Reducing agent level sensor G697
12 - Reducing agent temperature sensor G685
13 - Pressure sensor for reducing agent metering system G686
14 - Reducing agent pump V437
15 - Reducing agent reversing valve N473
16 - Filter
17 - Reducing agent injection valve N474
18 - Exhaust gas temperature sensor 3 G495
19 - NO_x sensor G295
20 - NO_x sensor control unit J583

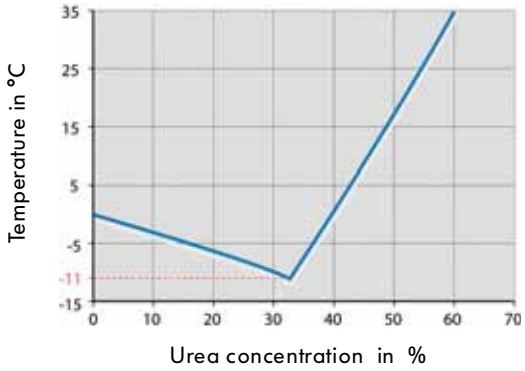
AdBlue® reducing agent

The ammonia necessary to reduce the nitrogen oxides is not used in a pure form, but in the form of an aqueous urea solution. Ammonia in its pure form has an irritating effect on skin and mucus membranes and also has an unpleasant odour. The reducing agent used in the SCR system is a liquid that is referred to by the automotive industry by the standard brand name AdBlue®.

AdBlue® is a high purity, transparent 32.5% solution of urea in water. It is manufactured synthetically.

Freezing point of AdBlue®

AdBlue® has a urea content of 32.5 %, because the reducing agent has the lowest freezing point at this mixing ratio.



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Properties of AdBlue®:

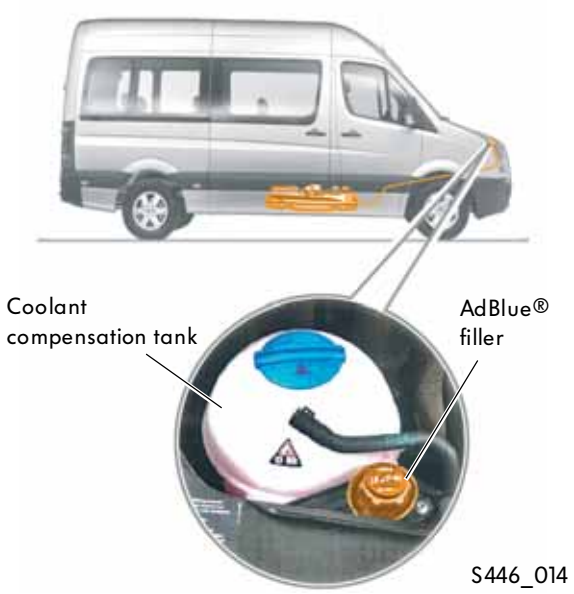
- AdBlue® freezes at temperatures below –11 °C.
- AdBlue® decomposes at high temperatures (approx. 70 °C - 80 °C). The consequence of this is that ammonia is formed, which can cause an unpleasant odour.
- Impurities caused by foreign substances and bacteria can make AdBlue® unusable.
- Leaked and crystallised urea creates white spots. These spots can be cleaned with water and a brush (immediately if possible).
- AdBlue® has a high creep capability. Electrical components and connections must be protected against the ingress of AdBlue®.

Instructions for handling AdBlue®:

- Only AdBlue® complying with the approved manufacturer's standard from original vessels is to be used.
- Drained AdBlue® may not be reused, to prevent impurities.
- The reducing agent tank is only to be filled using containers and adapters approved by the manufacturer.
- The reducing agent can irritate skin, eyes and the respiratory system. If this liquid comes into contact with the skin, wash it off immediately with plenty of water.
  If necessary, seek medical advice.

The tank system

Depending on the Crafter version - panel van/Kombi or loading platform/double cabin - the tank system differs in terms of the positioning of the tank, the shape and the filling connection.



AdBlue® tank for panel van / Kombi

The AdBlue® tank for the closed Crafter panel van/ Kombi design is positioned below the body platform.

It has a capacity of

- Standard design b approx. 25.3l
- Cold country design b approx. 18.5l

The filler is located on the right of the engine compartment close to the coolant compensation tank.

The tank is emptied using a drain hose, which is clamped into the rear of the tank. To empty the tank, the hose is detached from the clamp and bent downwards. To open the drainage hose, the closure must be unlocked and detached.

Rear of tank with drainage hose

AdBlue® tank for loading platform / double cabin

On the open loading platform/double cabin Crafter design, the AdBlue® tank is located on the right, below the loading area.

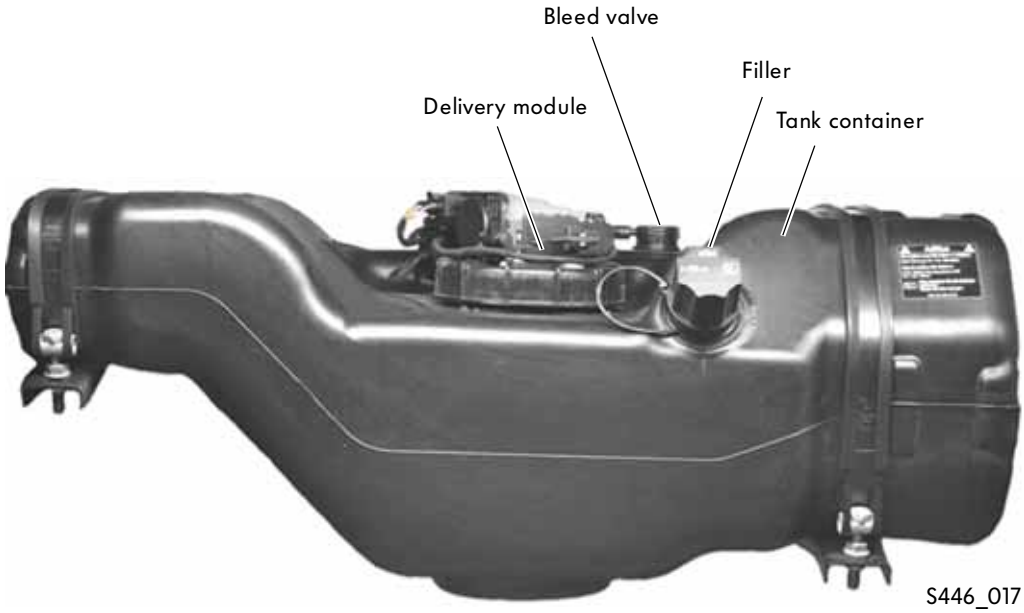
S446_016

It has a capacity of

- Standard design b approx. 25.3l
- Cold country design b approx. 18.5l

The filler is located directly on the tank.

The control units are attached to the rear of the tank.



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Special key for opening the AdBlue® tank closure

The tank closure must be opened with a special key. The key is located on the right of the footwell in the on-board tool compartment.

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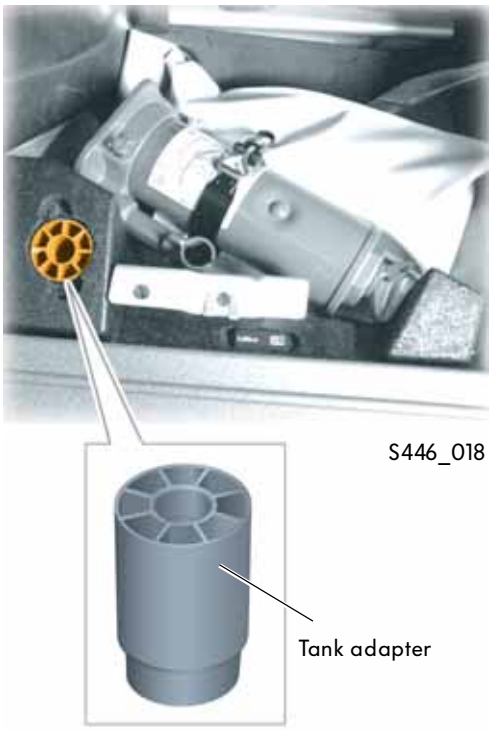
For all tank versions:
Top up quantity = Fill tank,
see also operating instructions.

Tank adapter for unlocking the AdBlue® filling nozzle

If an AdBlue® filling nozzle is to be used to fill up at an AdBlue® filling station, a tank adapter must be used.

This tank adapter is located on the right of the footwell in the on-board tool compartment.



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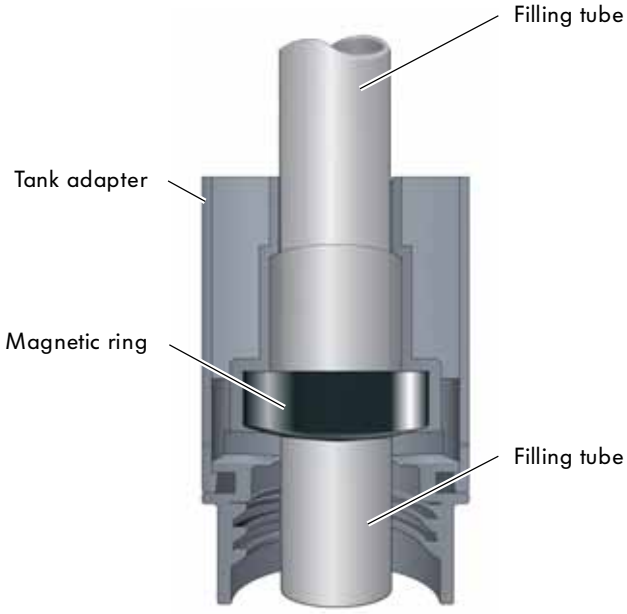
How it works

The tank adapter is screwed onto the tank filler. When the filling nozzle is inserted, the magnetic ring unlocks a safety valve in the nozzle's filling tube.



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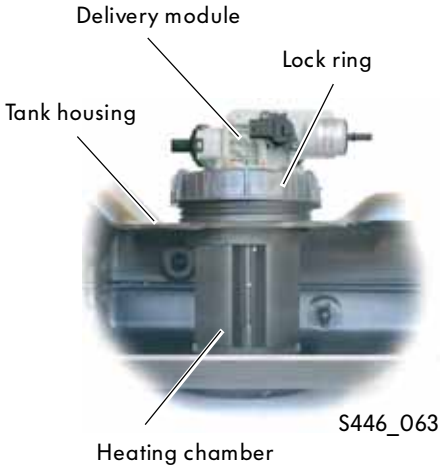
Reducing agent delivery module

The reducing agent delivery module is screwed onto the top of the heating chamber
The heating chamber is secured in the lower section of the tank with lugs and screwed onto the tank housing using a lock ring.

The delivery module is used to deliver and provide the reducing agent for the injection valve.

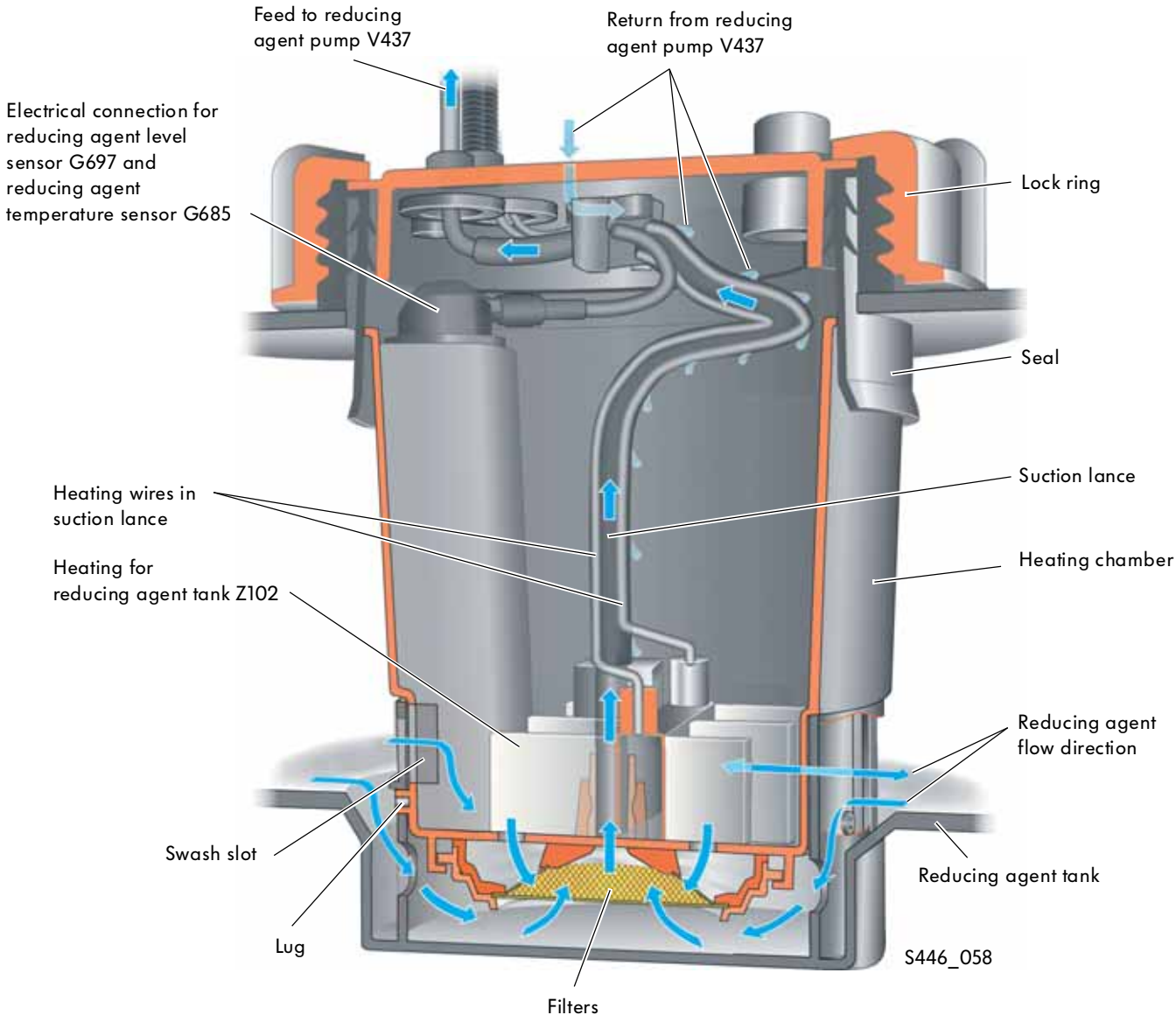
The reducing agent pump V437, the reducing agent reversing valve N473, the pressure sensor for the reducing agent metering system G686 and the reducing agent pump heater Z102 are integrated into the delivery module.



SCR system

Heating chamber

The heating chamber has an important position in the SCR tank system. It ensures that a stable supply of reducing agent is guaranteed.



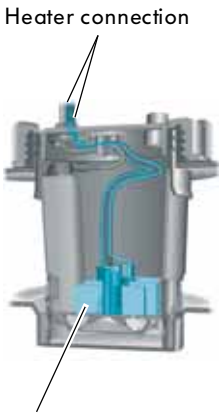
The reducing agent is drawn from the delivery module heating chamber through a filter and a suction lance by the reducing agent pump. The filter is designed to prevent damage to the SCR system due to dirt particles in the reducing agent. A heater in the heating chamber ensures that SCR operation is possible even at low outside temperatures. The reducing agent flowing back from the pump drips from the outside of the suction lance into the heating chamber The reducing agent passes through swash openings from the tank into the heating chamber
At low temperatures, the swashing movement of the reducing agent out of the heating chamber thaws out the frozen reducing agent in the tank.

Heaters in the SCR system

Tank heater

The heater for the reducing agent tank is a heating element with a PTC resistor. PTC resistors have maximum conductivity when cold. They have a positive temperature coefficient (= PTC). This means that, as the temperature rises, the resistance increases, reducing the flow of current.

The heating element is cast in plastic and is located directly in the reducing agent tank heating chamber. The heater is actuated by the engine control unit using the power output stage.

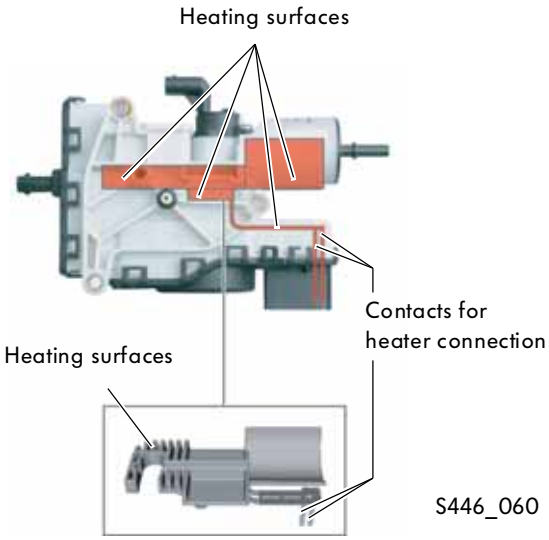


Heater for reducing agent tank Z102

Reducing agent pump heater

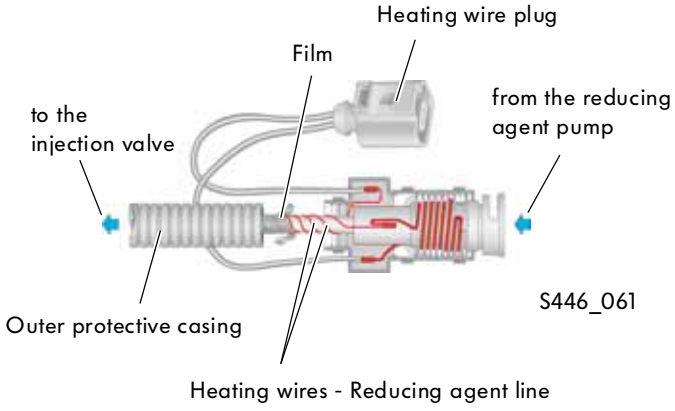
The heater for the reducing agent pump is also a heating element with a PTC resistor. As before, as the temperature rises, the resistance increases, reducing the flow of current.

The heating element is cast into the delivery module and is used to heat the reducing agent pump, the reversing valve and the feed line connection. The reducing agent pump heater is actuated by the engine control unit using the power output stage.



Line/plug heater

The heater for the reducing agent line is a stainless steel resistance wire.
The resistance wire has a spiral shape, wrapped around the feed line and is protected on the outside by a plastic tube. The reducing agent line heater is actuated by the engine control unit via the reducing agent heater control unit.



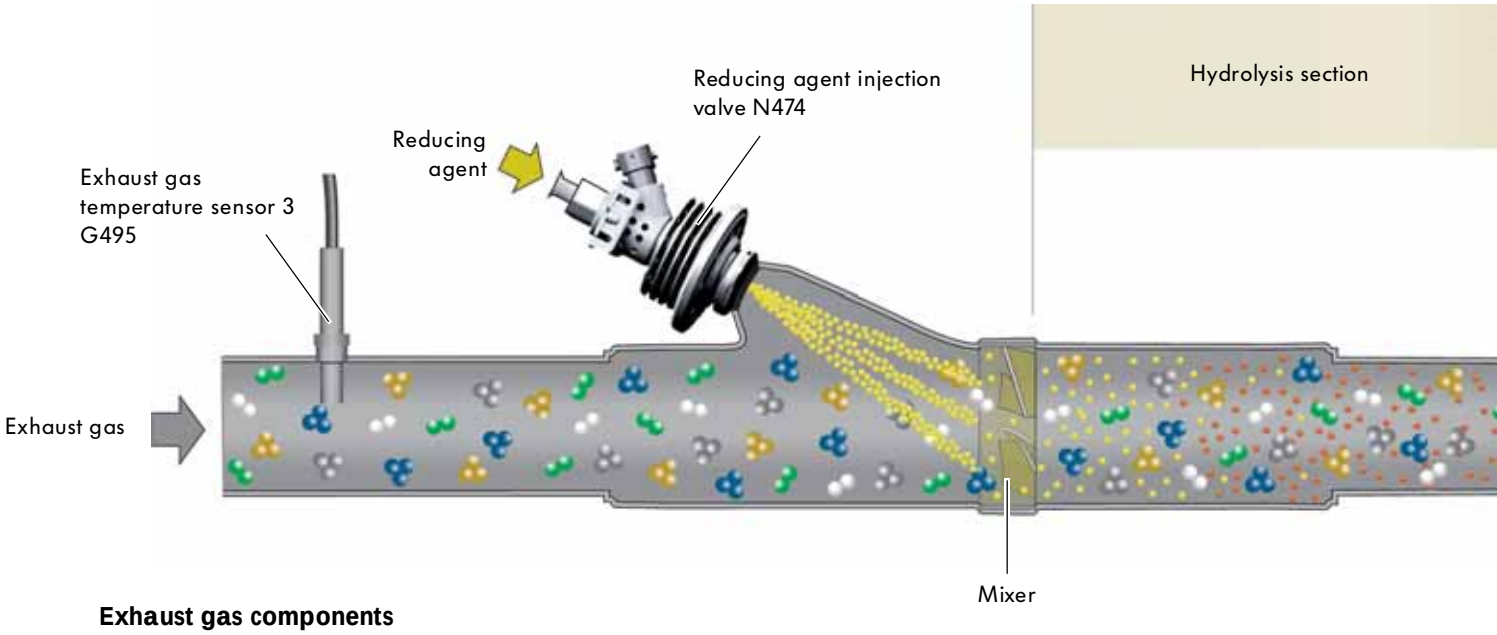
Functional principle of SCR system

The reduction catalytic converters reach their operating temperature at around 200 °C. Information about the exhaust gas temperature before the reduction catalytic converters is sent to the engine control unit by the exhaust temperature sensor 3 G495.

The AdBlue® agent is drawn from the reducing agent tank by the reducing agent pump and pumped at approx. 5 bar through the heated supply line to the reducing agent injection valve.

The reducing agent injection valve is actuated by the engine control unit and injects a metered quantity of reducing agent into the exhaust tract. The injected reducing agent is carried along by the exhaust gas flow and evenly distributed in the exhaust gas by the mixer. On the way to the reduction catalytic converters, known as the hydrolysis section, the reducing agent is broken down into ammonia (NH_3) and carbon dioxide (CO_2).

In the reduction catalytic converters, the ammonia (NH_3) reacts with the nitrogen oxides (NO_x) to form nitrogen (N_2) and water (H_2O).
The efficiency of the SCR system is monitored by the NO_x sensor G295.



Exhaust gas components

- Carbon dioxide
- Water
- Nitrogen oxide
- Oxygen
- Nitrogen
- Reducing agent - AdBlue®
- Ammonia - NH_3

The following requirements must be met for the engine control unit to inject the reducing agent:

- The reduction catalytic converters have reached their operating temperature of around 200 °C.
- There must be ensured that sufficient liquid reducing agent available for injection at cold outside temperatures.

If the following conditions exist, the engine control unit interrupts injection of the reducing agent:

- Insufficient exhaust gas mass flow rate, for example when idling.
- If the exhaust gas temperature falls too far below the operating temperature of the reduction catalytic converters.

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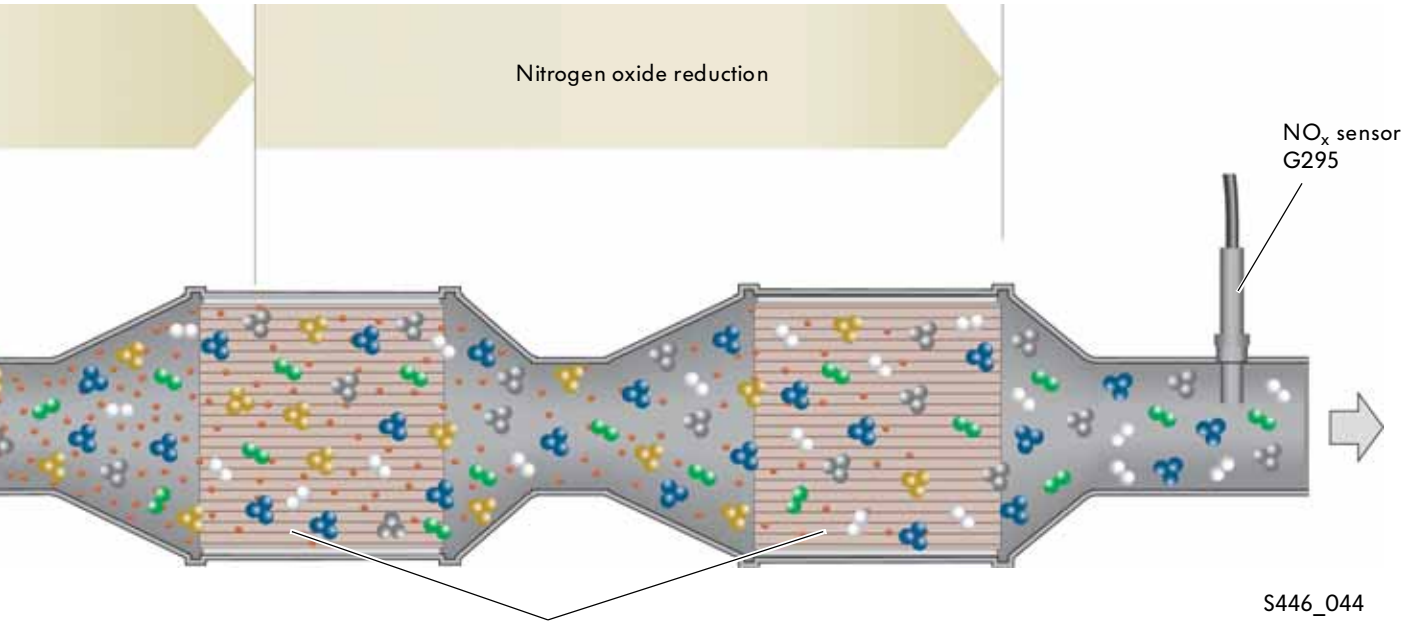


S446_044

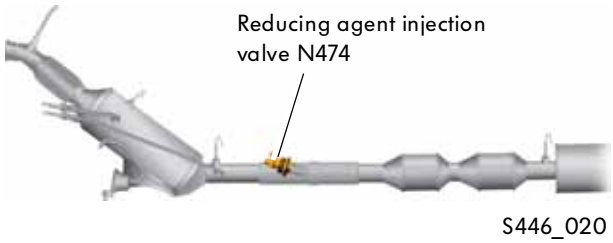
The design of the reduction catalytic converters is based on the same construction as a pre-catalytic converter with honeycombed ceramic body. The coating of the reduction catalytic converter is made up of copper zeolite. This is used to accelerate the nitrogen oxide reduction process.

Reducing agent injection

The reducing agent is injected into the exhaust system through the reducing agent injection valve N474.

The injection valve is screwed into an angled inlet into the exhaust pipe. Depending on the actuation, it sprays the reducing agent in metered quantities onto the mixer with an injection angle of 10°.

It is actuated by a pulse width modulated signal from the engine control unit.



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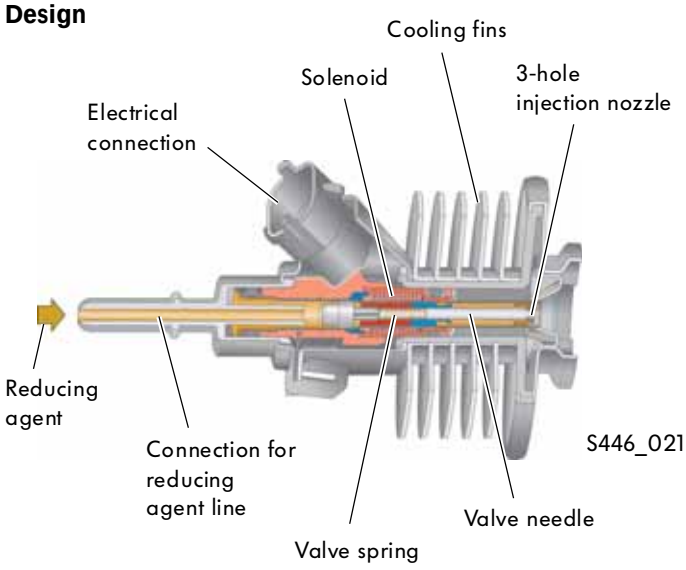
Design



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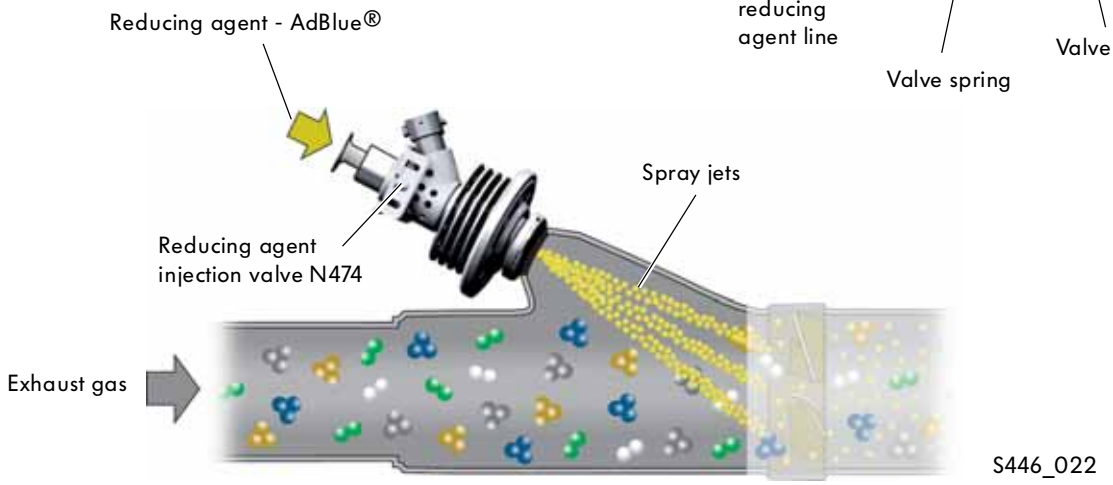

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How it works

The reducing agent pressure generated by the reducing agent pump is present in the injection valve. When idle, the valve needle closes the outlet holes due to the force of the valve spring.

To inject the reducing agent, the engine control unit actuates the solenoid. This results in a magnetic field, which raises the valve armature and the valve needle. The injection valve opens and reducing agent is injected. When actuation of the solenoid ends, the magnetic field collapses and the valve needle closes under the force of the valve spring.

Distribution of the reducing agent

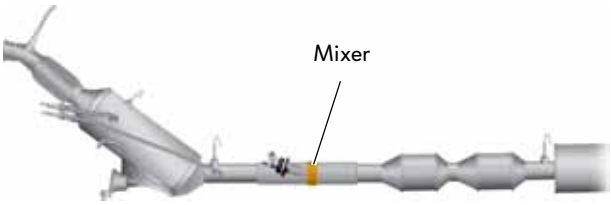
After injection, the reducing agent must be distributed as efficiently as possible in the exhaust gas flow.

This is achieved using a mixer, which is installed into the exhaust pipe immediately after the injection valve.

The mixer consists of several slightly twisted baffles between which the exhaust gas flows.

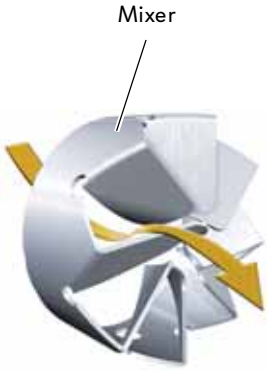
They swirl the reducing agent, distributing it as evenly as possible in the exhaust gas flow.

The installation position and geometry of the mixer are designed to ensure that the spray jet from the injection valve impacts on the baffles in such a way that optimum distribution of the spray droplets can occur.



S446_023

Design



S446_024

S446_025

How it works

The spray droplets are reduced in size when they impact on the baffles. This allows the injected reducing agent to evaporate more quickly and transfer to the gas phase. It also prevents larger spray droplets from reaching the reduction catalytic converter.

Because of the geometry and arrangement of the baffles, the exhaust gas flow is also given a swirling motion. This leads to better mixing and even distribution of the spray droplets in the exhaust gas flow.

Hydrolysis

The hydrolysis section is located between the reducing agent injection valve and the reduction catalytic converters. Here, the ammonia (NH_3) required to reduce the nitrogen oxides is formed from the reducing agent (aqueous urea solution). This is achieved by a thermolysis and hydrolysis reaction of the injected reducing agent.

When the reducing agent is injected into the hot exhaust gas flow, first the water evaporates.

Thermolysis breaks down the reducing agent (aqueous urea solution) into ammonia and isocyanic acid.

$$CO(NH_2)_2 \rightarrow NH_3 + HNCO$$

Urea → Ammonia+ Isocyanic acid

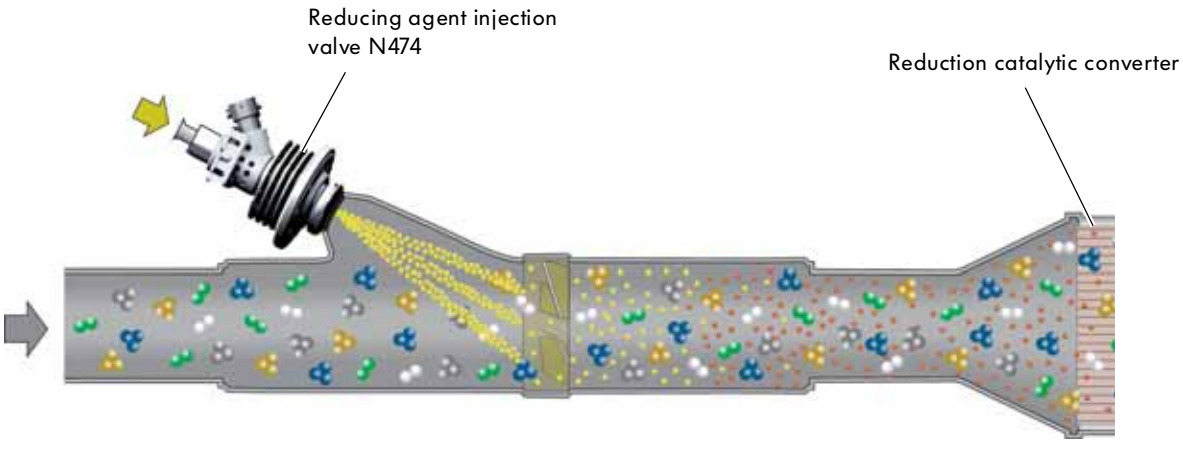
This is followed by hydrolysis, in which the isocyanic acid reacts with the water contained in the exhaust gas. This results in a further molecule of ammonia and carbon dioxide.

$$HNCO + H_2O \rightarrow NH_3 + CO_2$$

Isocyanic acid + Water → Ammonia + Carbon dioxide

Thermolysis = Thermolysis is a chemical reaction in which a starting substance is broken down into several products by heating.

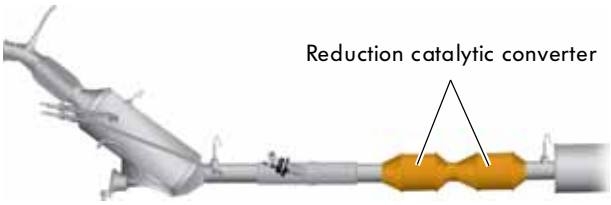
Hydrolysis = Hydrolysis is the separation of a chemical compound by reaction with water.



Good mixing and even distribution of reducing agent and exhaust gas is crucial. Before it enters the reduction catalytic converters, the reducing agent must be completely evaporated. The more even the distribution, the greater the efficiency of the reduction catalytic converters.

Reduction

Reduction catalytic converters are used to reduce the nitrogen oxides. This means that the process extracts the oxygen molecules from the nitrogen oxides. In reduction catalytic converters, the nitrogen oxides ($NO + NO_2$) react with the ammonia (NH_3) to form nitrogen (N_2) and water (H_2O).

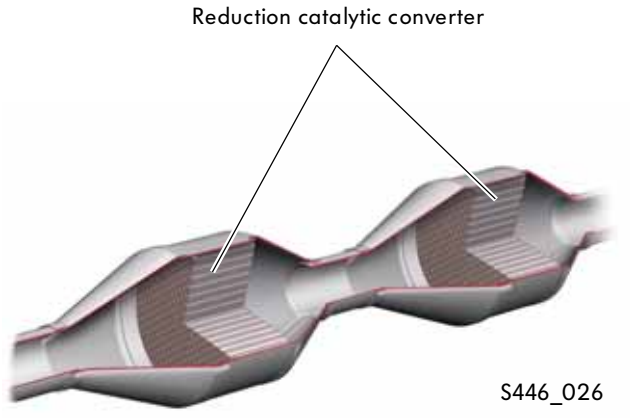


S446_042

The correct ratio of NO and NO_2 in the exhaust gas for the reduction process is formed in the pre-catalytic converter, which is upstream of the diesel particulate filter.

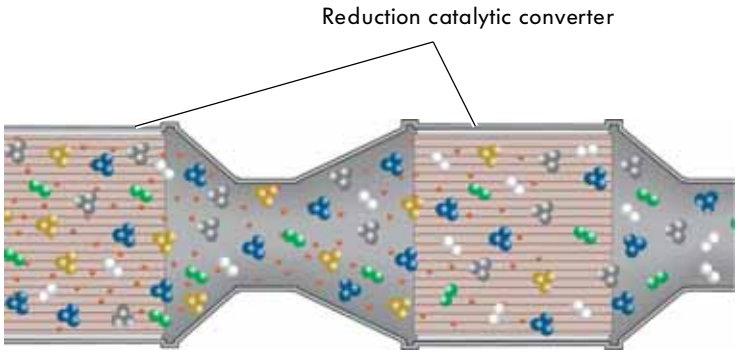
$NO + NO_2 + 2NH_3$ b $2N_2 + 3H_2O$

Nitrogen monoxide + Nitrogen dioxide + Ammonia b Nitrogen + Water



S446_026

The reduction catalytic converters reach their operating temperature at around 200 °C. Information about the exhaust gas temperature before the reduction catalytic converters is sent to the engine control unit by the exhaust temperature sensor 3 G495.



S446_027

After the reduction process, the exhaust gas contains the following substances:

Carbon dioxide

Water

Oxygen

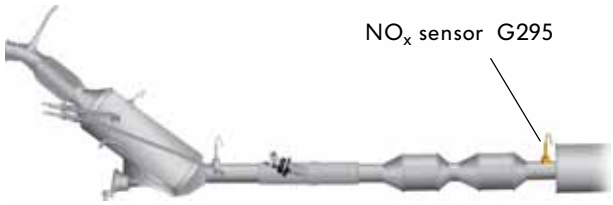
Nitrogen

SCR system

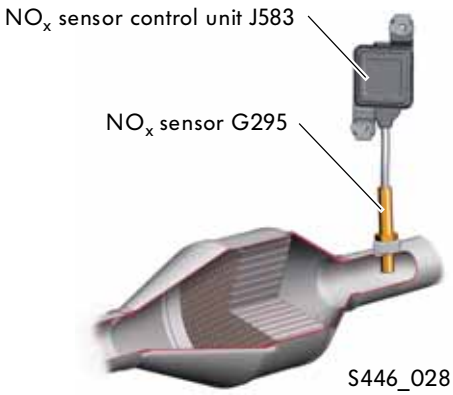
Nitrogen oxide content in exhaust gas

The nitrogen oxide content in the exhaust gas is determined by the NO_x sensor G295, which is screwed into the exhaust pipe directly after the reduction catalytic converters.

The nitrogen oxide content determined is evaluated by the NO_x sensor control unit J583.



S446_043



S446_028

How it works

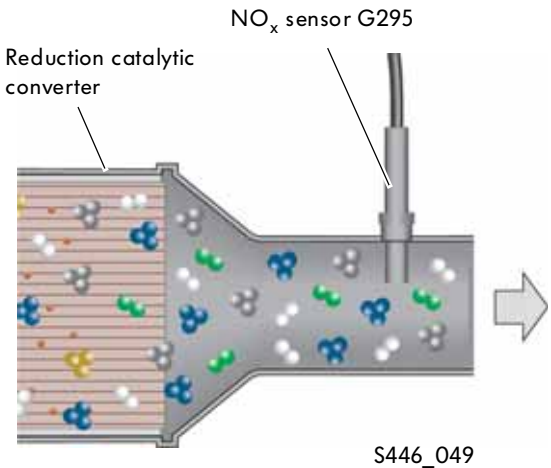
To monitor the function of the SCR system as part of the Euro on-board diagnostics, the signal from the NO_x sensor is used to determine the efficiency of the reduction catalytic converters. This is done by comparing the measured value with a nitrogen oxide calculation model in the engine control unit.

If the efficiency falls below a certain level, the exhaust gas warning lamp K83 (MIL) and the AdBlue® warning indicator for system faults are activated in the dash panel insert display. A fault is entered in the fault memory.

The signal currents for the NO_x sensor are in the micro-ampere range. To ensure high measuring accuracy, the signals are not sent to the engine control unit J623 via a long line, but are evaluated over a short distance by the NO_x sensor control unit. The NO_x sensor control unit processes the signals and sends them to the engine control unit.

The NO_x sensor and the NO_x sensor control unit form a single unit and must be replaced together in case of faults.

If the sensor fails, the driver is notified by the AdBlue® warning lamp in the dash panel insert.



S446_049

Further information can be found in self-study programme 424 "The Selective Catalytic Reduction exhaust gas treatment system".

AdBlue® indicators in dash panel insert

Information about the function of the SCR system can be displayed using the AdBlue® warning lamp and the display in the dash panel insert.

AdBlue® warning lamp

The AdBlue® warning lamp lights up to give the driver early notice of the need to top up the reducing agent or to notify them of a system fault. The position of the AdBlue® warning lamp depends on the type of dash panel insert - Lowline or Highline.

Lowline instrument
The AdBlue® warning lamp is positioned above the display.

Highline instrument
The AdBlue® warning lamp is positioned in the right circular instrument.

S446_093

Manually retrievable range

The current possible range can be manually retrieved using the display.
Possible variations of the remaining range display for the Lowline and Highline equipment options are shown below. On the Highline instrument, it appears in the upper large display.

Lowline					
Highline					

AdBlue® indicator concept

AdBlue® indicator for a lack of reducing agent

If the quantity of reducing agent in the tank falls below a certain level, the driver is prompted to top up the AdBlue® using two warning levels.

Remaining range	Warning lamp	Acoustic warning	Display in Highline dash panel insert	Information for the driver
Above 2400 km	AdBlue® warning lamp 	Gong 		This notification appears if the quantity of reducing agent is only sufficient for the remaining range specified in the text. The driver is prompted to top up the reducing agent. An acoustic warning signal (gong) sounds as an additional indicator.
0 km	AdBlue® warning lamp 	Warning buzzer 		This notification appears if there is no more reducing agent in the tank. The driver is notified that the vehicle will only run with a limited driving function. He is prompted to top up the reducing agent. The warning lamp flashes and, as an additional indicator, 3 consecutive warning signals sound (warning buzzer).

AdBlue® indicator for a system fault

If there is a system fault in the SCR system the NO_x sensor can detect a reduced efficiency of the reduction catalytic converters. The driver is notified of this in the dash panel insert as follows.

Warning lamp	Acoustic warning	Display in Highline dash panel insert	Information for the driver
AdBlue® warning lamp  K83 	Gong 		This notification appears if the quantity of reducing agent is only sufficient for the remaining range specified in the text. The driver is prompted to top up the reducing agent. The warning lamp flashes and an acoustic warning signal (gong) sounds as an additional indicator. The exhaust warning lamp K83 also lights up.

Display in Lowline dash panel insert (the display is represented by a scrolling text in English)

If the minimum AdBlue® level in the tank is reached, the tank must be completely topped up. The restricted driving function can only be resolved by filling up the tank.

From a remaining range of 2400 km onwards, the predicted remaining range can be indicated using the multi-function display in the dash panel insert.

Display in Lowline dash panel insert (the display is represented by a scrolling text in English)


The display content shown on pages 27 - 29 correspond to the dash panel insert with German system settings and are intended as examples.
The text content for the dash panel insert display in the relevant national language can be found in the corresponding operating instructions.

System overview

Sensors

Engine speed sensor G28

Hall sensor G40

Gas pedal position sensor G79

Air mass meter G70

Coolant temperature sensor G62

Boost pressure sensor G31
Intake air temperature sensor G62

Intake manifold pressure sensor G71

Fuel temperature sensor G81

Fuel pressure sensor G247

Potentiometer for exhaust gas recycling G212

Lambda probe G39

Exhaust gas pressure sensor 1 G450

Exhaust gas temperature sensor 1 G235

Temperature sensor before particulate filter G506

Exhaust gas temperature sensor 3 G495

Brake light switch F

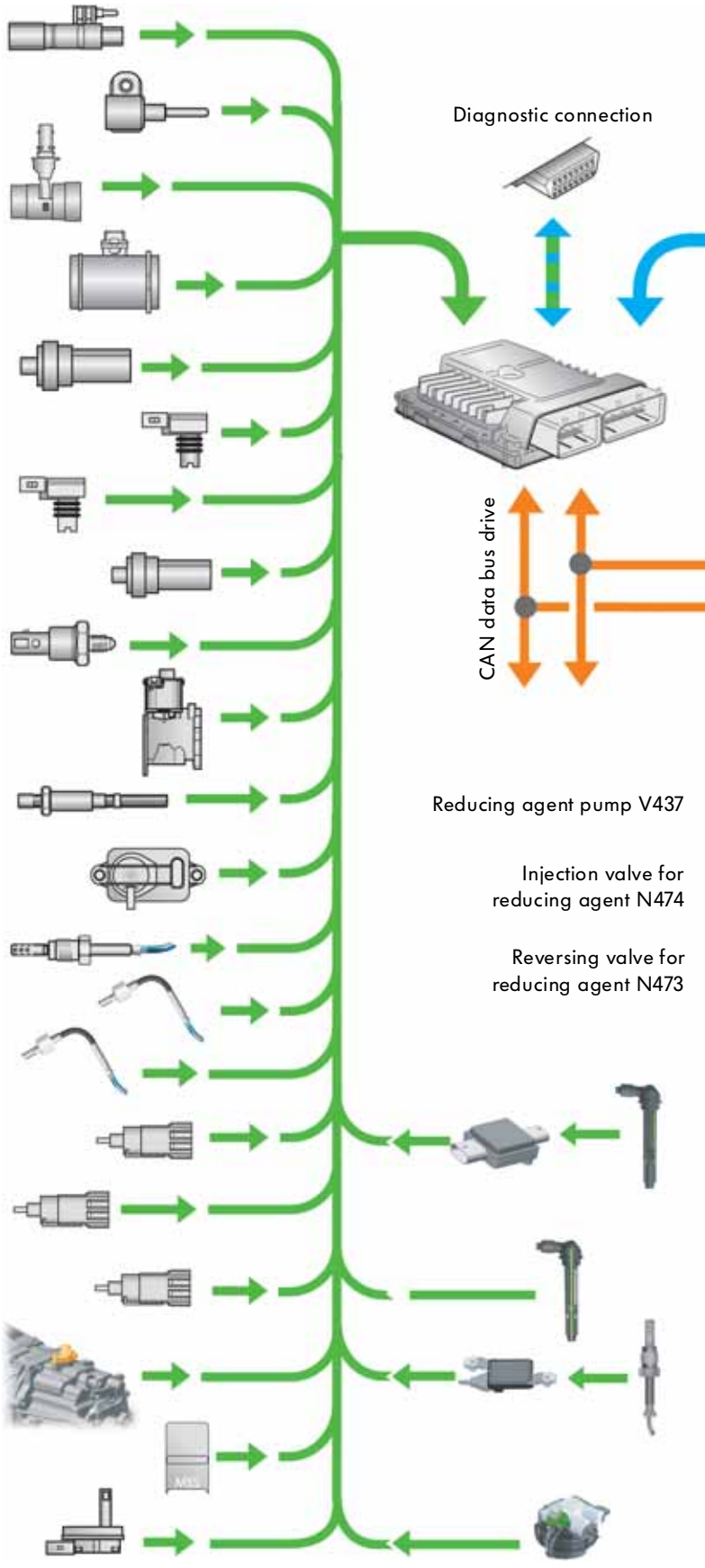
Clutch pedal switch F36

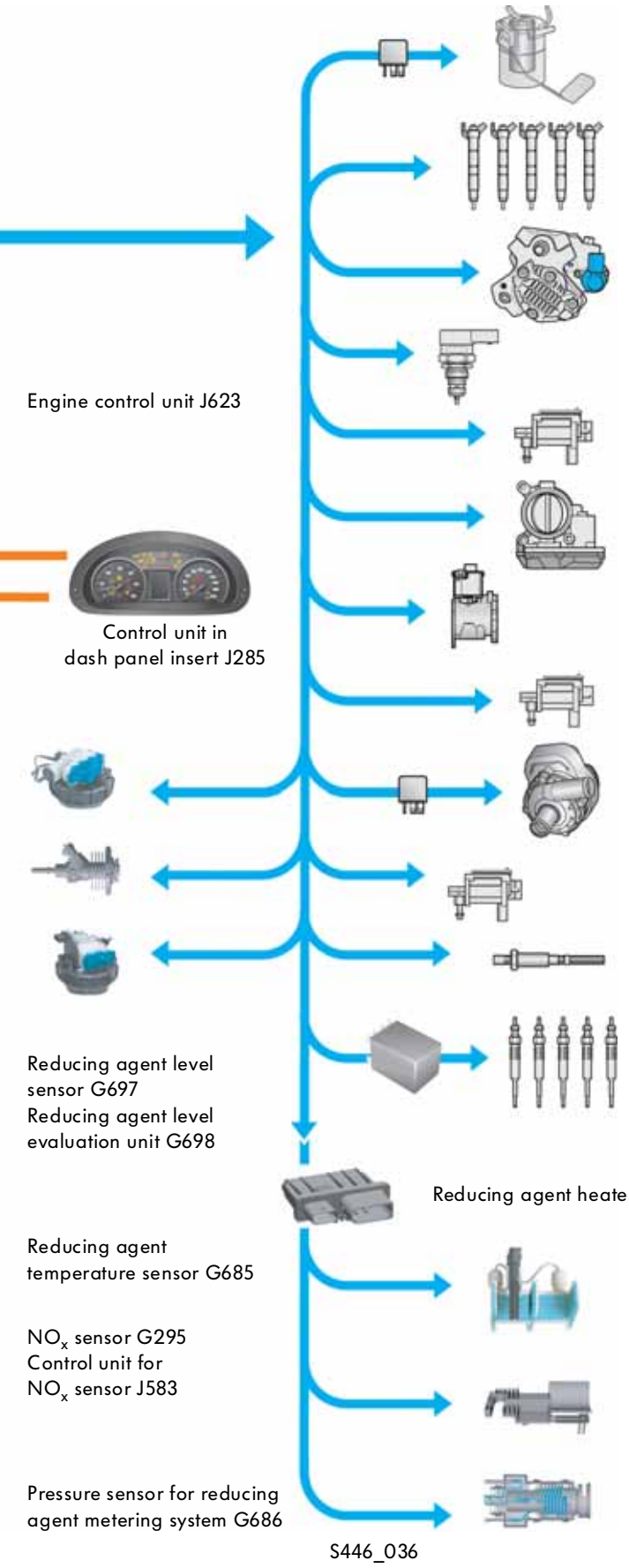
Clutch pedal switch 2 F379

Gearbox neutral position switch F365

Master switch for stop/start system E101

Oil level and temperature sensor G266





Actuators

Fuel pump relay J17
Fuel pump for pre-delivery G6

Injection valve for cylinder 1 N30
Injection valve for cylinder 2 N31
Injection valve for cylinder 3 N32
Injection valve for cylinder 4 N33
Injection valve for cylinder 5 N83

Fuel metering valve N290

Fuel pressure regulator valve N276

Solenoid valve for boost pressure limitation N75

Motor for intake manifold flap V157

EGR valve N18

Reversing valve for exhaust gas routing cooler N345

Relay for coolant delay J151
Coolant circulation pump V50

Coolant circuit valve N214

Heater for Lambda probe Z19

Automatic preheating control unit J179
Glow plug 1 Q10
Glow plug 2 Q11
Glow plug 3 Q12
Glow plug 4 Q13
Glow plug 5 Q14

Reducing agent tank heater Z102

Reducing agent pump heater Z103

Reducing agent line heater Z104

Special tools and equipment

Designation	Tool	Use
Retaining plate V.A.G 1383A/1	 S446_053	The retaining plate is used to securely hold the container VAS 6542/1 when filling using the filler VAS 6542.
Vacuum box VAS 6557	 S446_054	The vacuum box is used for extracting the AdBlue® from the reducing agent tank.
Filler for AdBlue® VAS 6542	 S446_055	The VAS 6542 is used to fill the reducing agent tank with AdBlue®. The VAS 6542/1 container has a capacity of 10 litres.
Spanner T50014	 S446_056	The spanner is used to fit the lock ring on the reducing agent delivery module.

Topping up the reducing agent

Top-up canister

Content: 1.89 litres (equivalent to half a gallon)

Filling concept:
To fill the reducing agent tank, the top-up canister must be manually screwed onto the tank filler. Pressure on the canister releases an opening in the adapter fitting and the AdBlue® can flow into the tank. The vapours from the tank are collected by the top-up canister during filling and thus do not escape to the atmosphere.

S446_039

Top-up canister

The reducing agent tank is fully filled in the factory. It can be topped up using the top-up canister either using the VAS 6542 filler or directly using the screw-on fitting.

S446_040

AdBlue® filling station

The Crafter can also be fuelled at an AdBlue® filling station.
There has been comprehensive AdBlue® coverage throughout Europe since 2005.

S446_041

Test your knowledge

Which answer is correct?

One or more of the answers given can be correct.

1. A key is required to open the AdBlue® tank on the EURO V Crafter with loading platform. Where is the required key located?

☐ a) On the right of the footwell in the on-board tool compartment.

☐ b) The key is a special tool.

☐ c) In the glove compartment.

2. What is the role of the tank adapter on the Crafter EURO V loading platform/double cabin model?

☐ a) The tank adapter unlocks the AdBlue® filler nozzle using a magnetic ring.

☐ b) The tank adapter is used to extend the filler.

☐ c) The tank adapter is required when using top-up canisters

3. Where is the AdBlue® filler located on the Crafter EURO V panel van/Kombi?

☐ a) In the left B-pillar.

☐ b) In the engine compartment close to the coolant compensation tank.

☐ c) In the rear right side panel.

4. What are the effects of an empty AdBlue® tank?

☐ a) An empty AdBlue® tank has no effects.

☐ b) Restarting is blocked after turning off the engine.

☐ c) The engine torque is reduced by 25 %.

5. What needs to be done when the AdBlue® tank is empty?

☐ a) To resolve the reduced performance, at least 10 litres of AdBlue® has to be added.

☐ b) To resolve the reduced performance, at least ½ gallon of AdBlue® has to be added.

☐ c) To resolve the reduced performance, the AdBlue® tank has to be completely filled.

6. What is the construction of the diesel particulate filter in the Crafter EURO V?

☐ a) It is a catalytically coated diesel particulate filter.

☐ b) The diesel particulate filter and pre-catalytic converter are fitted as separate components.

☐ c) The diesel particulate filter and pre-catalytic converter are separate components in a single housing.

Solutions:
1. a; 2. a; 3. b; 4. c; 5. c; 6. c

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