Air cleaner

A round filter is employed instead of a flat filter to achieve a larger filter surface area for more air throughput in view of the different amount of space available.

SSP282_018

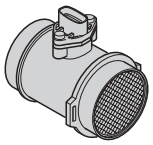
Furthermore, an additional intake air flap in the air cleaner is opened as a function of load at engine speeds as of 3,000 rpm to attain the large volume of air required at full throttle. This flap enables additional air to be drawn in from the engine compartment and reduces the air velocity in the air cleaner.

SSP282_019

System layout

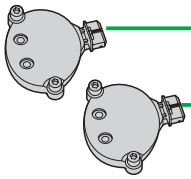
Actuators/sensors

Hot-film air-mass meter G70

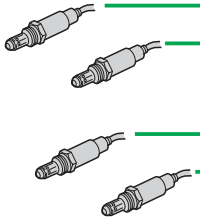


Engine speed sender G28

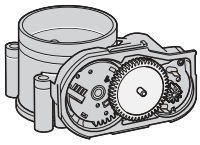
Hall sender G40 (bank 2) and
Hall sender 2 G163 (bank 1)



Lambda probe G39
(bank 1)
Lambda probe II G108
(bank 2)
Lambda probe after catalyst G130
(bank 1)
Lambda probe II after catalyst G131
(bank 2)

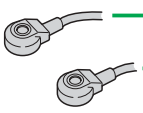


Throttle valve control
part J338 with
Throttle valve drive G186
(electric power control)
Throttle valve drive angle sender 1 G187
Throttle valve drive angle sender 2 G188

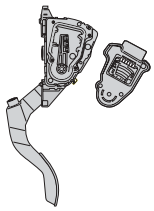


Coolant temperature sender G62

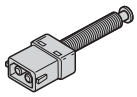
Knock sensor I G61 (bank 1) and
Knock sensor II G66 (bank 2)



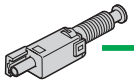
Additional signals:
- Air conditioner requirement
- Cruise control switch
- Term. 50, stage 1
- Automatic gearbox selector lever position



Pedal position sender/accelerator pedal module with accelerator pedal position sender G79 and accelerator pedal position sender 2 G185

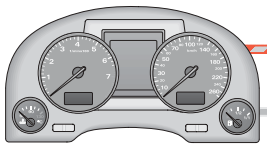


Brake light switch F and
Brake pedal switch F47

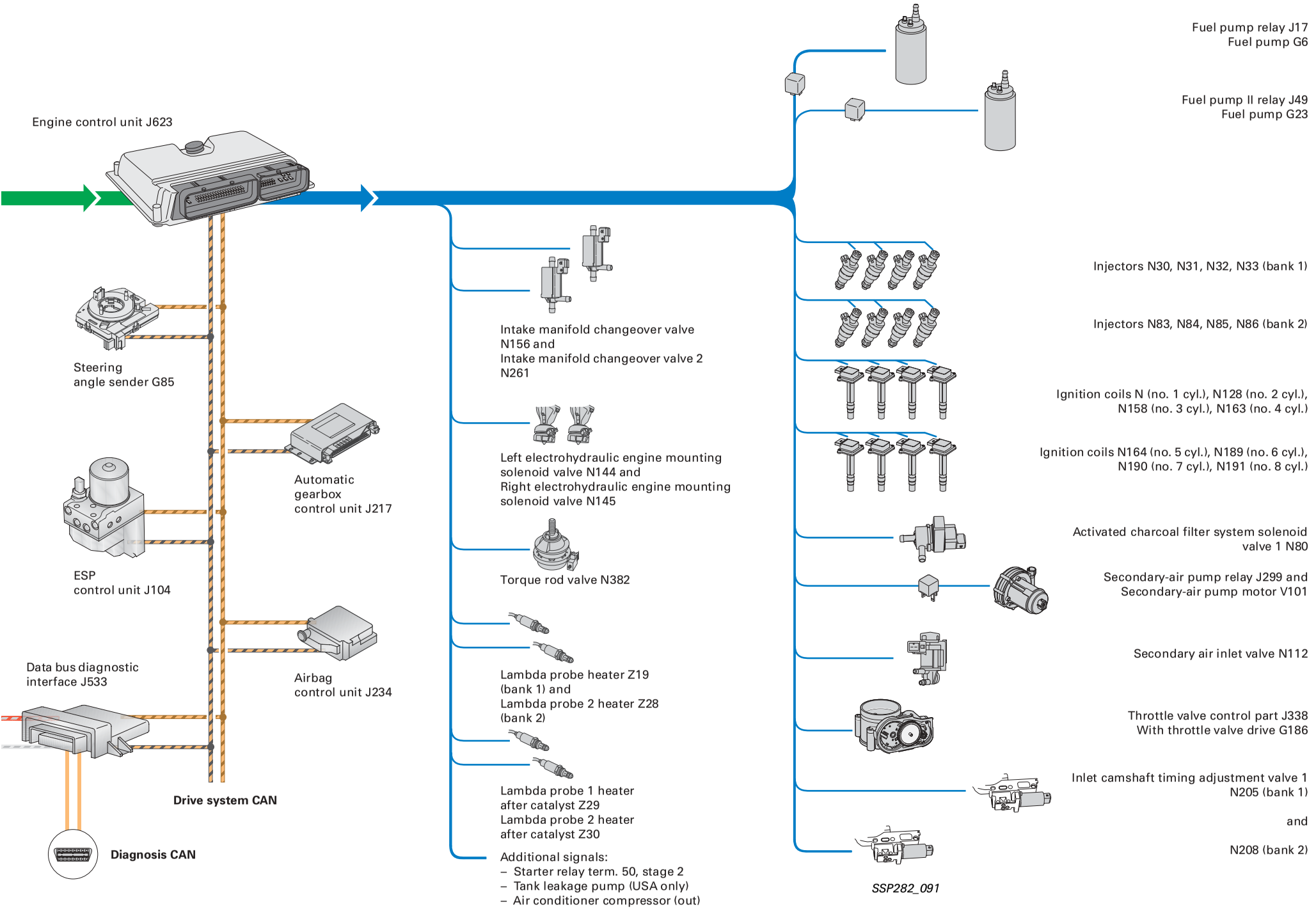


Clutch pedal switch F36
(manual gearbox only)

Dash panel insert CAN

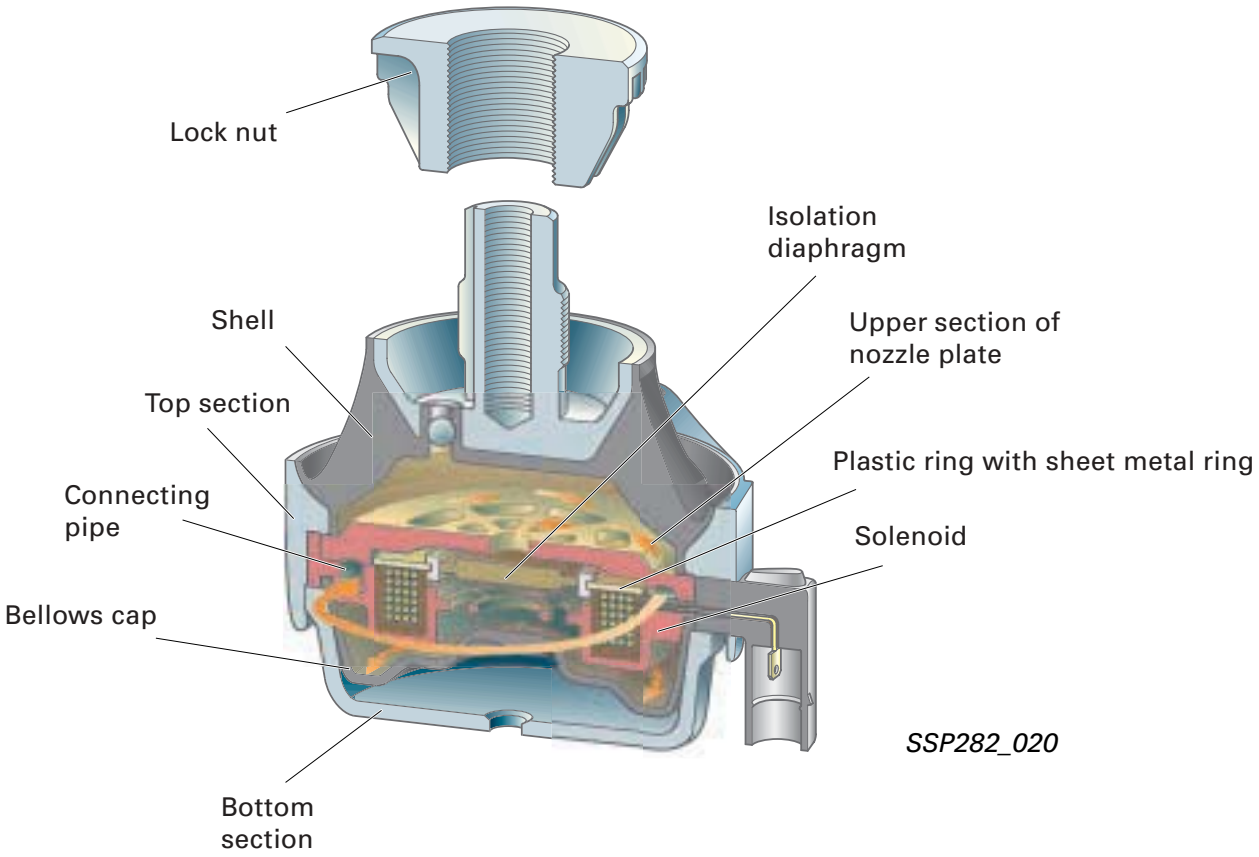


Control unit with display in dash panel insert J285


Engine control unit J623
Steering angle sender G85
Automatic gearbox control unit J217
ESP control unit J104
Airbag control unit J234
Data bus diagnostic interface J533
Drive system CAN
Diagnosis CAN
Intake manifold changeover valve N156 and Intake manifold changeover valve 2 N261
Left electrohydraulic engine mounting solenoid valve N144 and Right electrohydraulic engine mounting solenoid valve N145
Torque rod valve N382
Lambda probe heater Z19 (bank 1) and Lambda probe 2 heater Z28 (bank 2)
Lambda probe 1 heater after catalyst Z29 Lambda probe 2 heater after catalyst Z30
Additional signals:
– Starter relay term. 50, stage 2
– Tank leakage pump (USA only)
– Air conditioner compressor (out)
Fuel pump relay J17
Fuel pump G6
Fuel pump II relay J49
Fuel pump G23
Injectors N30, N31, N32, N33 (bank 1)
Injectors N83, N84, N85, N86 (bank 2)
Ignition coils N (no. 1 cyl.), N128 (no. 2 cyl.), N158 (no. 3 cyl.), N163 (no. 4 cyl.)
Ignition coils N164 (no. 5 cyl.), N189 (no. 6 cyl.), N190 (no. 7 cyl.), N191 (no. 8 cyl.)
Activated charcoal filter system solenoid valve 1 N80
Secondary-air pump relay J299 and Secondary-air pump motor V101
Secondary air inlet valve N112
Throttle valve control part J338 With throttle valve drive G186
Inlet camshaft timing adjustment valve 1 N205 (bank 1)
and
N208 (bank 2)
SSP282_091

Electrohydraulic torque reaction support

Stress-free alignment of the torque reaction support is implemented by way of the lock nut.



The purpose of torque reaction support is to cushion the drive shaft and propshaft torque. The position of the support bearing at the front right of the engine is ideal, as this is where the engine motion resulting from drive shaft and propshaft torque accumulates.

The torque reaction support is divided into two halves by the plastic ring, the sheet metal ring and the isolation diaphragm. Both halves are filled with fluid (glycol). The isolation diaphragm is flexibly linked to the plastic and sheet metal rings.

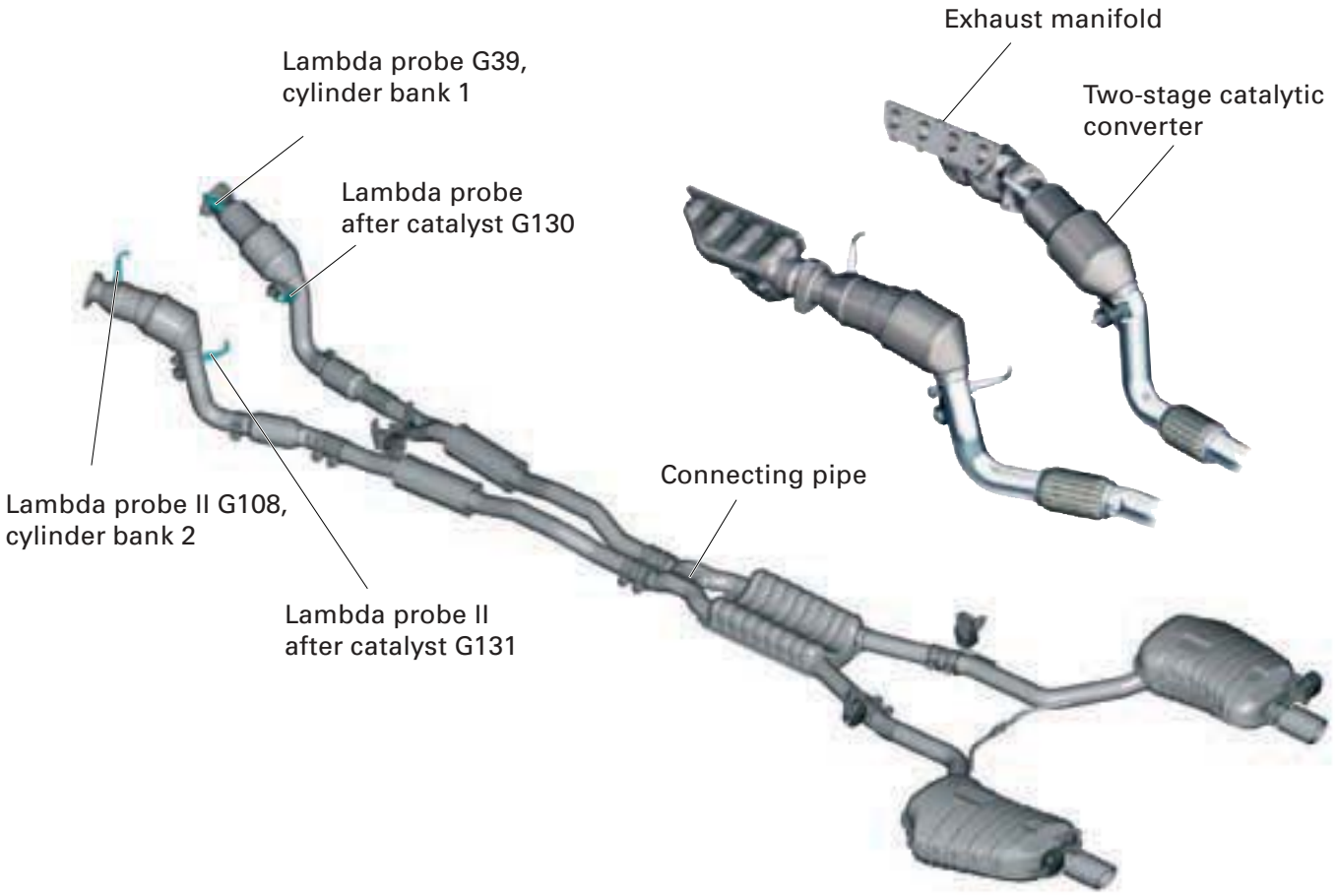
If the torque reaction support is subjected to load, the fluid can be displaced between the top and bottom section by way of a connecting pipe, the dimensions of which are such that it acts as a restrictor as of a defined frequency.

When the solenoid is deenergised, vibration causes the plastic ring with sheet metal ring and isolation diaphragm to oscillate as well. The moments are damped slightly and thus transmitted to a lesser extent to the body.

As of an engine speed of approx. > 1,100 rpm and a vehicle speed of > 5 km/h, the solenoid is energised and attracts the sheet metal ring together with the plastic ring.

This restricts the movement of the isolation diaphragm, which can then only vibrate slightly. In this case there is a high level of vibration damping and the torque reaction support is "hard".

Exhaust system



SSP282_028

With the 4.2 l and 3.7 l engines, the exhaust system is of the dual-flow type.
It consists of two underbonnet catalytic converters, two flexible decoupling elements, two reflection-type front silencers, an absorption-type centre silencer and two reflection-type rear silencers with visible tail pipes. The catalytic converters are of the two-stage type and fitted with a ceramic monolith.

Thin-walled ceramic monoliths are used to improve cold starting behaviour.
On environmental grounds, the centre silencer is fitted with long-fibre glass wool instead of basalt wool.
A connecting pipe is located directly upstream of the centre silencer.
This forms the joint between the two exhaust pipes required for acoustic reasons.

Fuel tank

The fuel tank capacity is approximately 90 litres.
The basic unit consists of two plasma-welded stainless steel shells. There are no differences between petrol and diesel engine versions.

The filler neck is a single piece and welded to the basic unit. For reasons of crash safety, the centre section of the filler neck takes the form of a corrugated tube.

In crash situations, this section is subject to defined deformation to prevent cracks and fuel spillage.

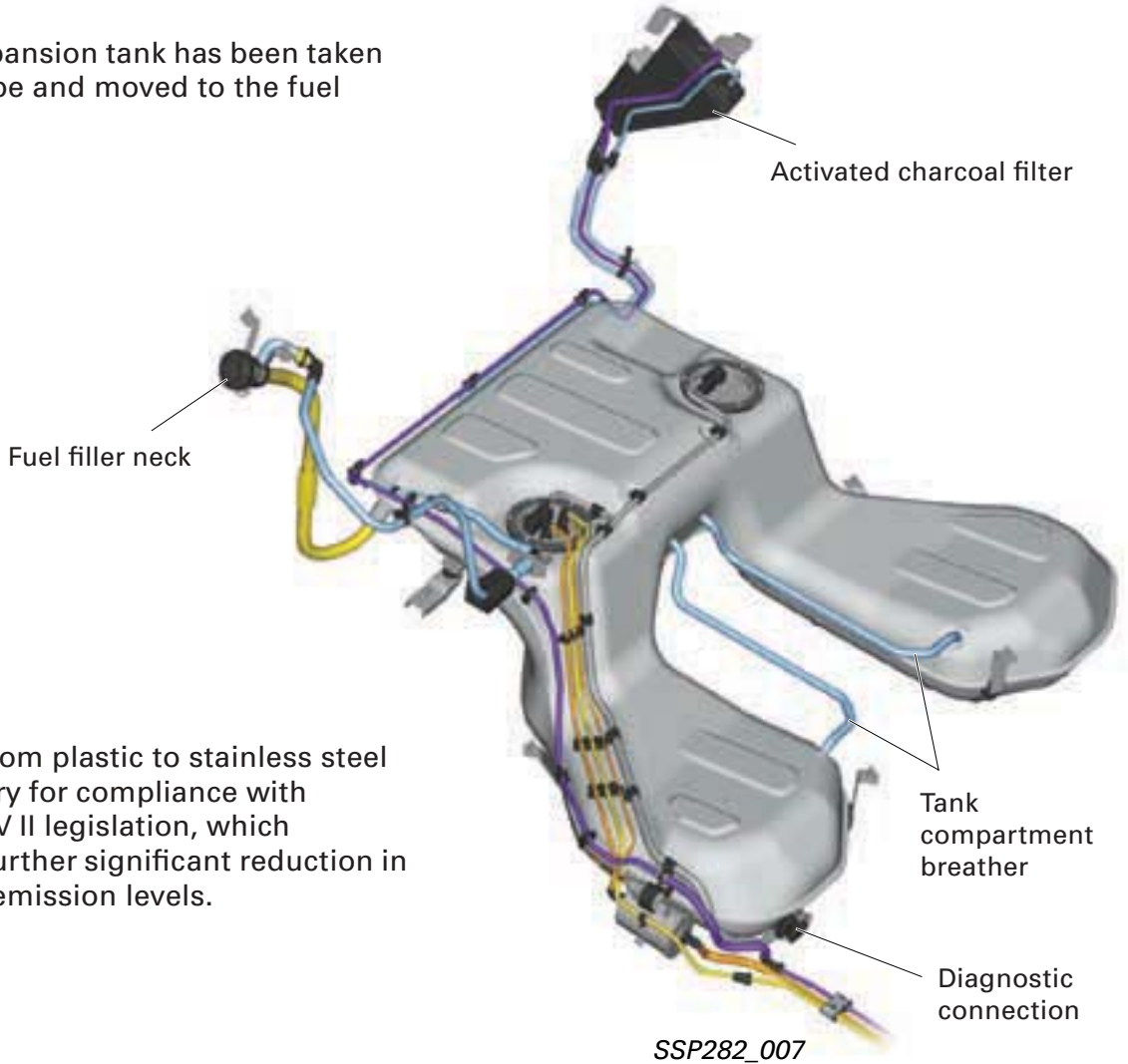
To create the best possible ergonomic conditions for the rear passengers in combination with maximum luggage compartment volume, the two tank compartments are shallower than in the predecessor model.

The additional expansion tank has been taken out of the filler pipe and moved to the fuel tank.

The tubing system for the tank breather at the filler pipe has been considerably simplified as compared to the predecessor model. With the exception of diesel vehicles, the pipe connections have been converted to quick-release couplings.

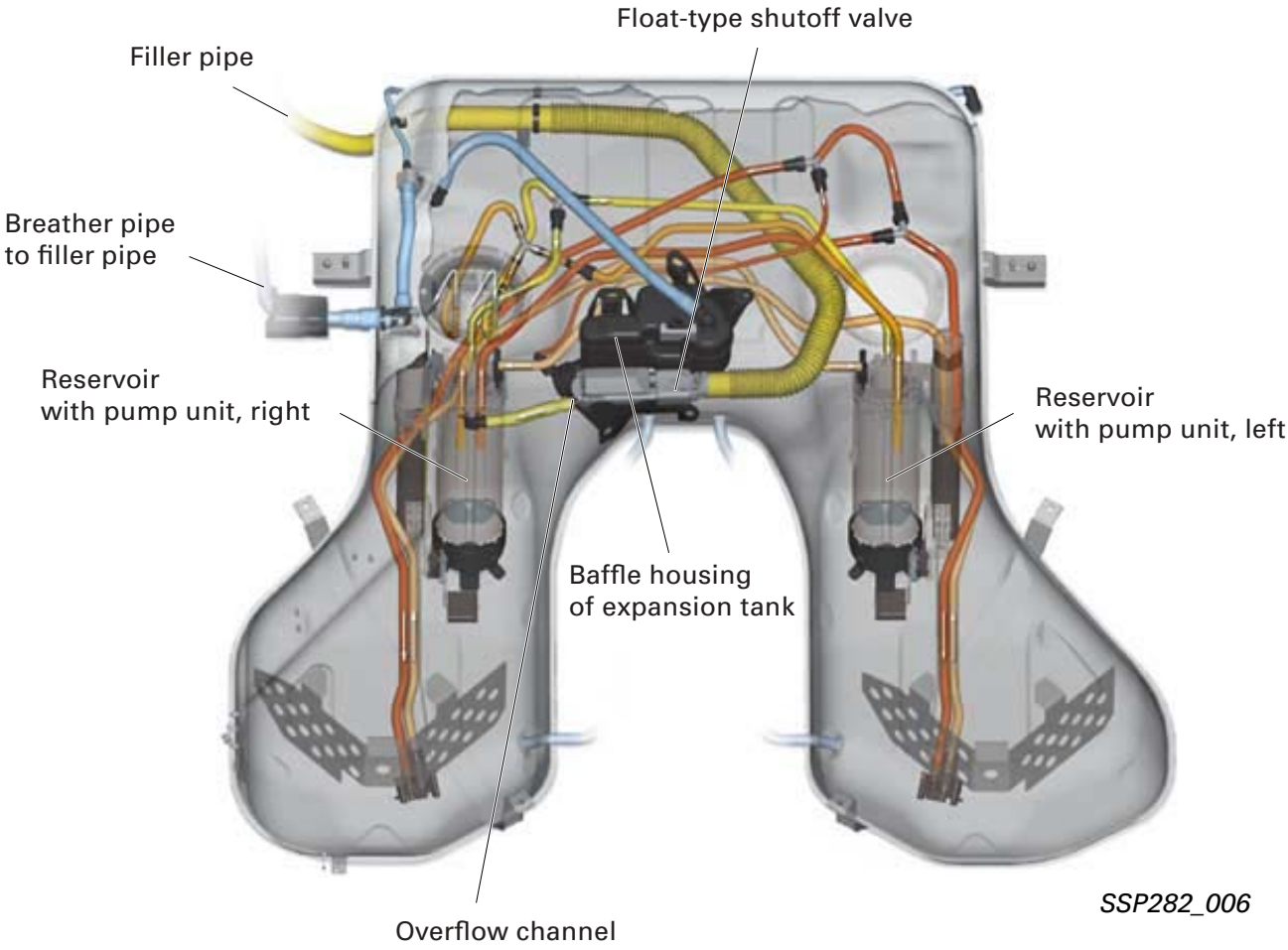
A new feature is the use of a 2-stage delivery pump for each tank chamber in separate reservoirs.

The fuel level is measured by two immersion tube senders combined with two angle senders.



The switch from plastic to stainless steel was necessary for compliance with American LEV II legislation, which demands a further significant reduction in permissible emission levels.

Interior of fuel tank (filling)



The fuel is conveyed via the filler pipe into the right tank chamber (as viewed in direction of travel). The fuel passes via an additional overflow channel at the end of the filler pipe predominantly into the right pump reservoir.

Use of the small overflow channel ensures that even small quantities of fuel (e.g. filling from canister) pass directly into the pump reservoir.

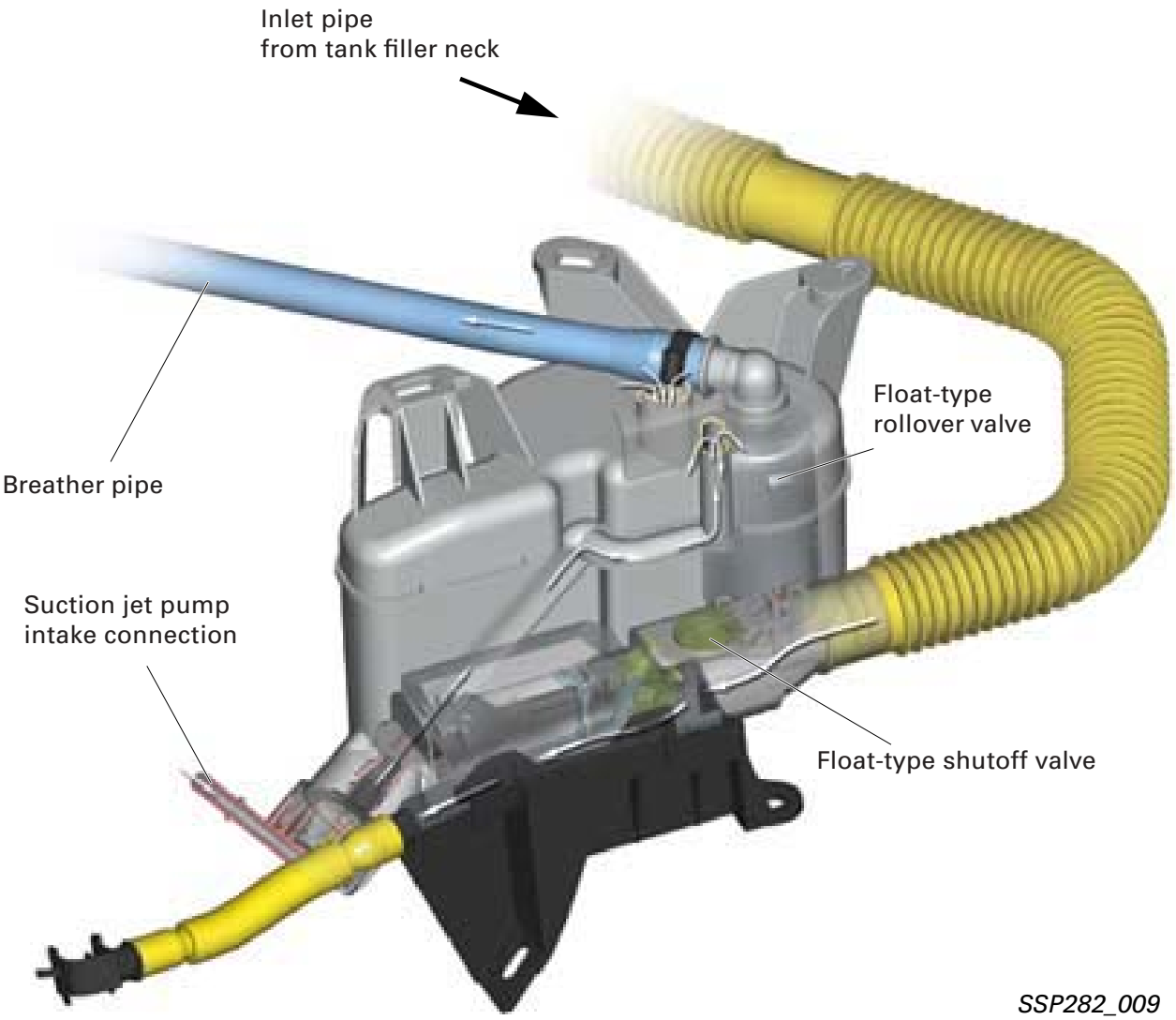
The breather function for the side compartments is provided by two breather pipes to the main chamber.

Routing the filler pipe beneath the longitudinal member means that the lowest point of the pipe is not at the connection to the fuel tank, thus producing a siphon effect.

A residual quantity of fuel remains in the filler pipe. This necessitates a separate pipe to the filler neck for the main chamber breather function and for OBD II leakage diagnosis.

When the tank is full, the filler hose is closed by a float-type shutoff valve at the end of the filler pipe.

Expansion tank



SSP282_009

The expansion tank (capacity approx. 2 litres) consists of a plastic housing clipped to the upper shell of the tank.

The internal expansion tank houses a float-type rollover valve and a small suction jet pump which constantly pumps the tank empty whilst driving.

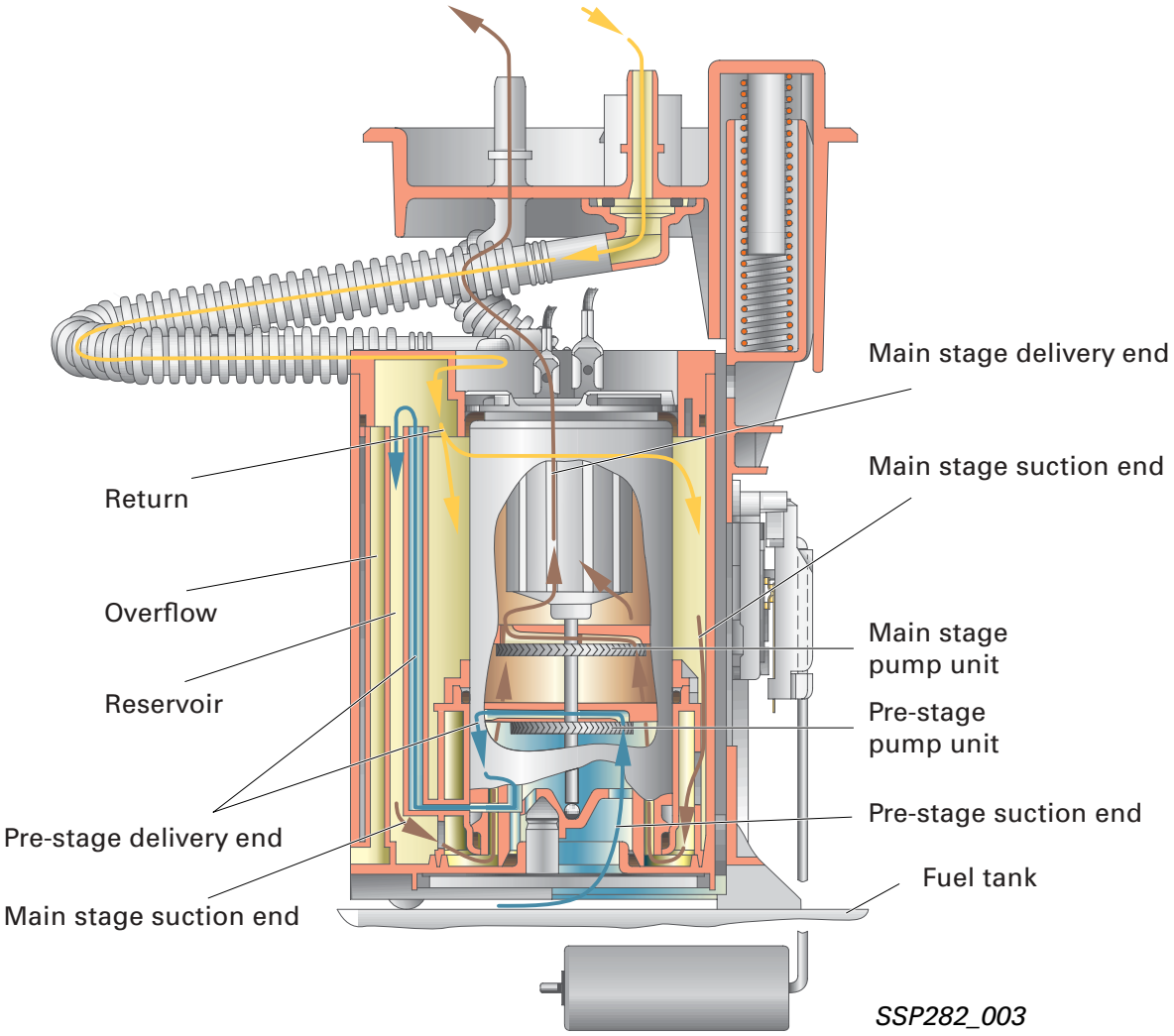
Function

The main functions of the float-type rollover valve are as follows:

- Closing-off of pipe to filler neck in the event of rollover
- Closing in dynamic driving mode
- Closing by rising of float in valve in the event of a brief excess of fuel in the tank due to sloshing

Closing-off of the pipe to the activated charcoal filter stops fuel overflowing into it.

Two-stage fuel pumps



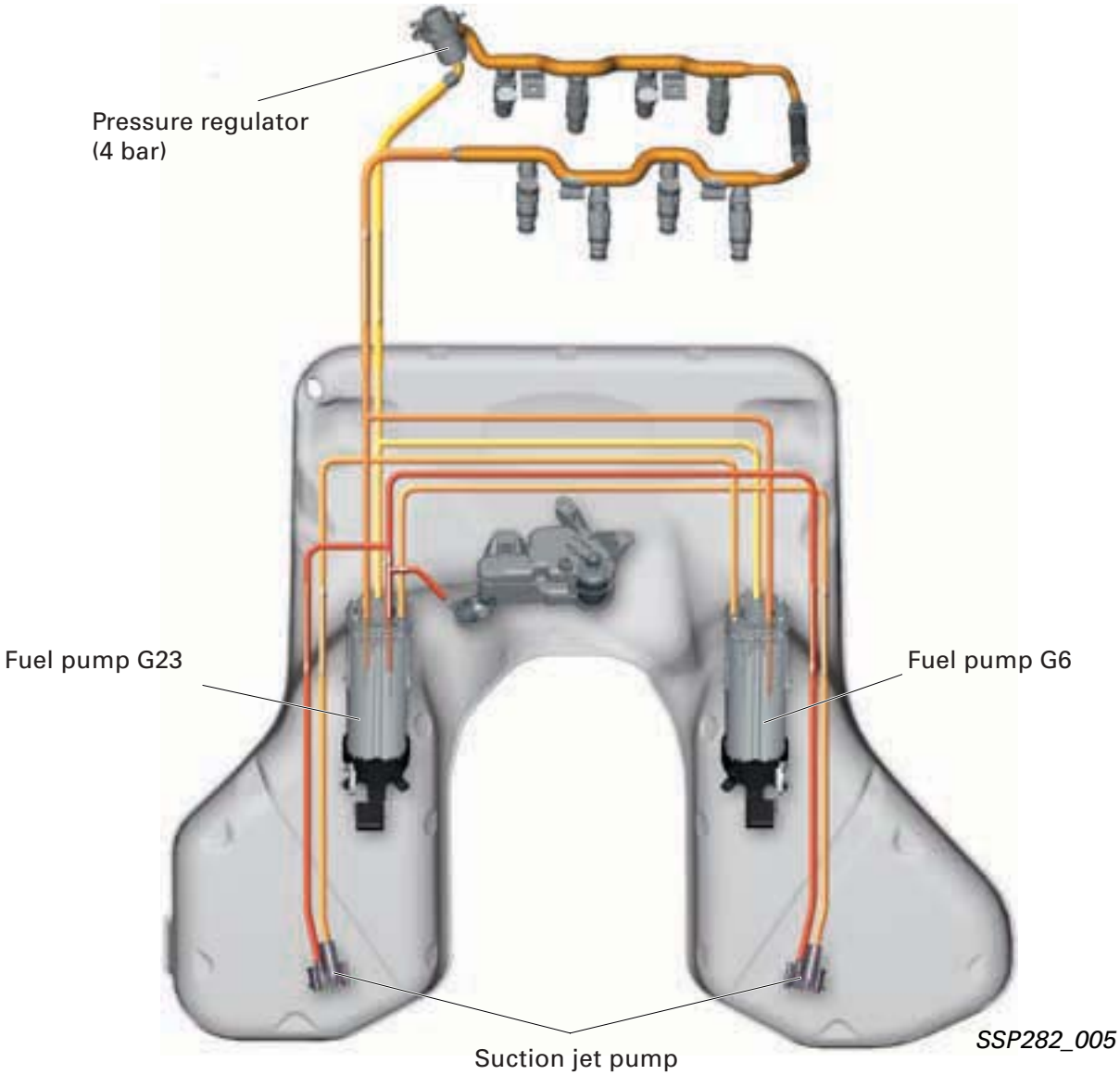
The two fuel pumps (petrol engine) are of the two-stage flow type.

The first stage (pre-stage) pump unit draws in fuel from the bottom of the tank and conveys it into the reservoir. This ensures that even small residual quantities can be transported. The second stage (main stage) pump unit draws in fuel directly from the reservoir.

The reservoirs with pumps and immersion tube senders rest on and are clipped to the bottom of the tank. Flanged covers provide access to the components.

Single-stage pumps are used for diesel engines (Common Rail). On account of the higher viscosity of diesel fuel, pre-delivery (extraction from bottom of tank) is not implemented by way of separate pump units, but rather by suction jet pumps.

Fuel system (hydraulics)



When the ignition is switched on (terminal 15), the fuel pump G23 conveys a maximum volume to the pressure regulator at the fuel rail to achieve short starting times.
The pump G6 also conveys fuel to the pressure regulator and additionally into the pipes for the two suction jet pumps in the side tank compartments.

The suction jet pumps convey the fuel from the side compartments "diagonally" into the pump reservoirs.

Such pipe routing prevents dry running of a pump in critical driving situations such as cornering or if the vehicle is at an extreme angle.
The return pipe is shared by both reservoirs.

If one reservoir is full, the pipe is closed by a non-return valve and the entire return volume runs into the second reservoir.

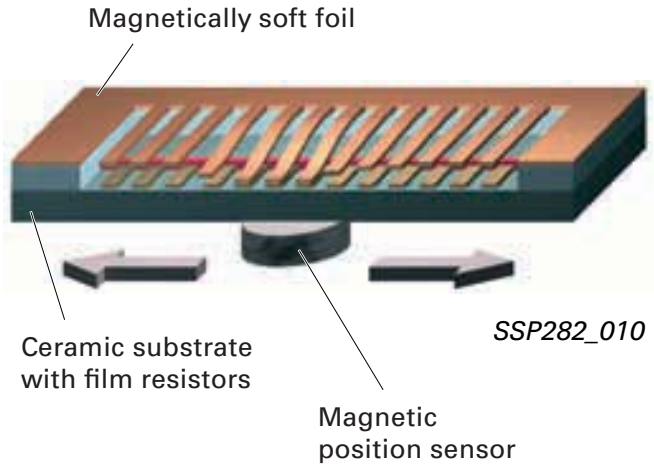
If both reservoirs are full, the non-return valves are overridden and the fuel runs into the tank.

Tank senders

The fuel level is sensed by two immersion tube senders and two angle senders. A new feature is the design of the angle sender, which is equipped with a magnetically passive position sensor.

The ceramic substrate is provided with 51 series-connected film resistors with individual pick-off. Fitted with a small clearance on top of this is a magnetically soft foil with the same number of spring contacts. The magnetic position sensor beneath the ceramic substrate pulls the spring contacts onto the pick-offs.
The electrical output signal varies proportionally as a function of the position of the magnet.

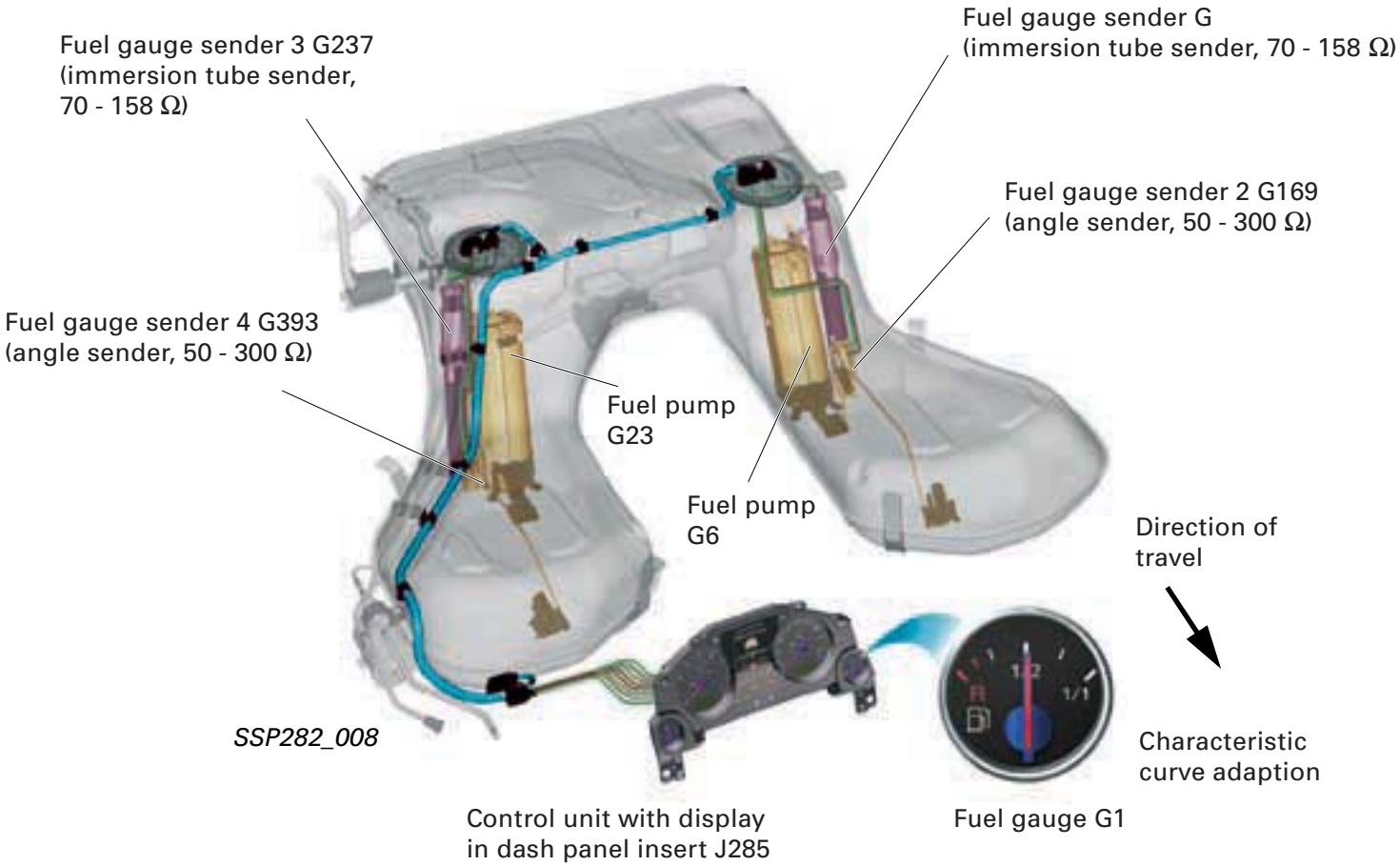
Thanks to the magnetic coupling it was possible to provide a hermetic seal for the measurement system.



SSP282_010

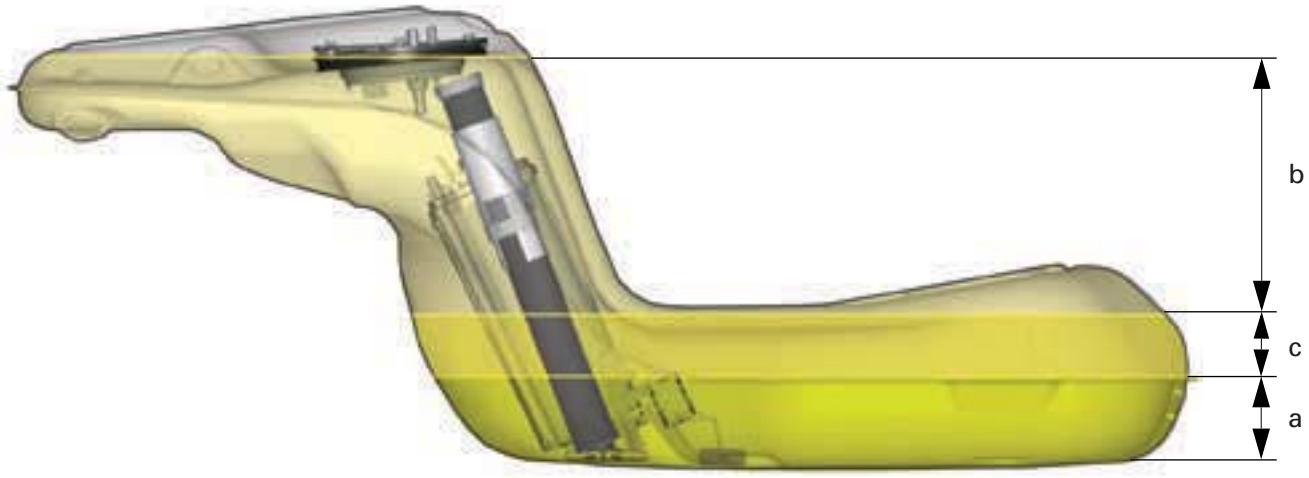
Advantages:

- Longer service life thanks to noncontacting measurement system
- Protection against dirt and deposits
- Low contact currents



SSP282_008

Determining fuel level



SSP282_004

The fuel level is determined by way of a logical system of immersion tube and angle sender signals.

a - Low levels are determined exclusively by way of the angle sender measured values

b - High levels are determined exclusively by way of the immersion tube sender measured values.

c - Medium levels are determined by a combination of all sender signals

The sender signals are evaluated by the dash panel insert. All senders are connected in parallel.

The wires are bunched beneath the fuel tank, thus enabling resistance measurements to be taken without the need for further dismantling.

Automatically controlled starting

The automatic start control is integrated into the engine control unit.

A new feature is that starter control is no longer implemented by way of the ignition/ starter switch D (switching of terminal 50), but rather it is performed automatically by the engine control unit.

Release for starter actuation is always transmitted by the entry and start authorisation control unit J518 to the engine control unit J623.

In addition to general release by the immobilizer, the following start release conditions also have to be satisfied:

- Start signal from entry and start authorisation switch E415 or entry and start authorisation button E408
- [1] Clutch pedal pressed, signal from clutch pedal switch F194 (manual gearbox only)
- [1] Selector lever position P or N (automatic gearbox control unit J217)
- [2] In the event of start signal via entry and start authorisation button E408, brake must be pressed (signal from brake light switch F via separate interface)

[1] As a safeguard, P/N signal or signal from clutch pedal switch F194 must be applied to the separate interfaces of the two control units (J623 and J518).

[2] Additional safeguard, as entry and start authorisation button E408 can be actuated by front passenger.

Sequence of operations

1 Entry and start authorisation switch E415/ entry and start authorisation button E408

The driver triggers a brief start signal (min. 20 ms) by turning the ignition key to start position or by pressing the entry and start authorisation button E408.

2 Entry and start authorisation control unit J518

The entry and start authorisation control unit checks for authorisation – in the form of information on selector slide position N or P – from the automatic gearbox control unit J217 and for brake application in the case of a start signal from the entry and start authorisation button E408.

If the start prerequisites have been satisfied, the entry and start authorisation control unit J518 transmits a start request – terminal 50 ON – to the engine control unit J623.

The entry and start authorisation control unit J518 also controls the terminal 15 and terminal 75x circuits.

3 Engine control unit J623

Application of selector slide position P/N or "clutch pressed" information to the engine control unit (separate interface) causes the two starter relays J53 and J695 to be actuated simultaneously. The relays then switch terminal 50 for starter actuation. The starter operates and cranks the engine. On exceeding a defined engine speed, the engine control unit J623 recognises that the engine has started and the relays are deenergised (thus terminating starting process).

As a safeguard, two relays are connected in series. In the event of fusion welding of the make contacts (relay remains closed following deenergisation), the engine control unit J623 can thus interrupt the circuit (terminal 50) by way of the other relay in each case.

The two relays are deenergised alternately in order to ensure even make contact wear (break spark) in both relays. The deenergisation sequence alternates.

Relay operation is monitored and faults diagnosed by evaluating the alternating deenergisation with the aid of the terminal 50R interface.

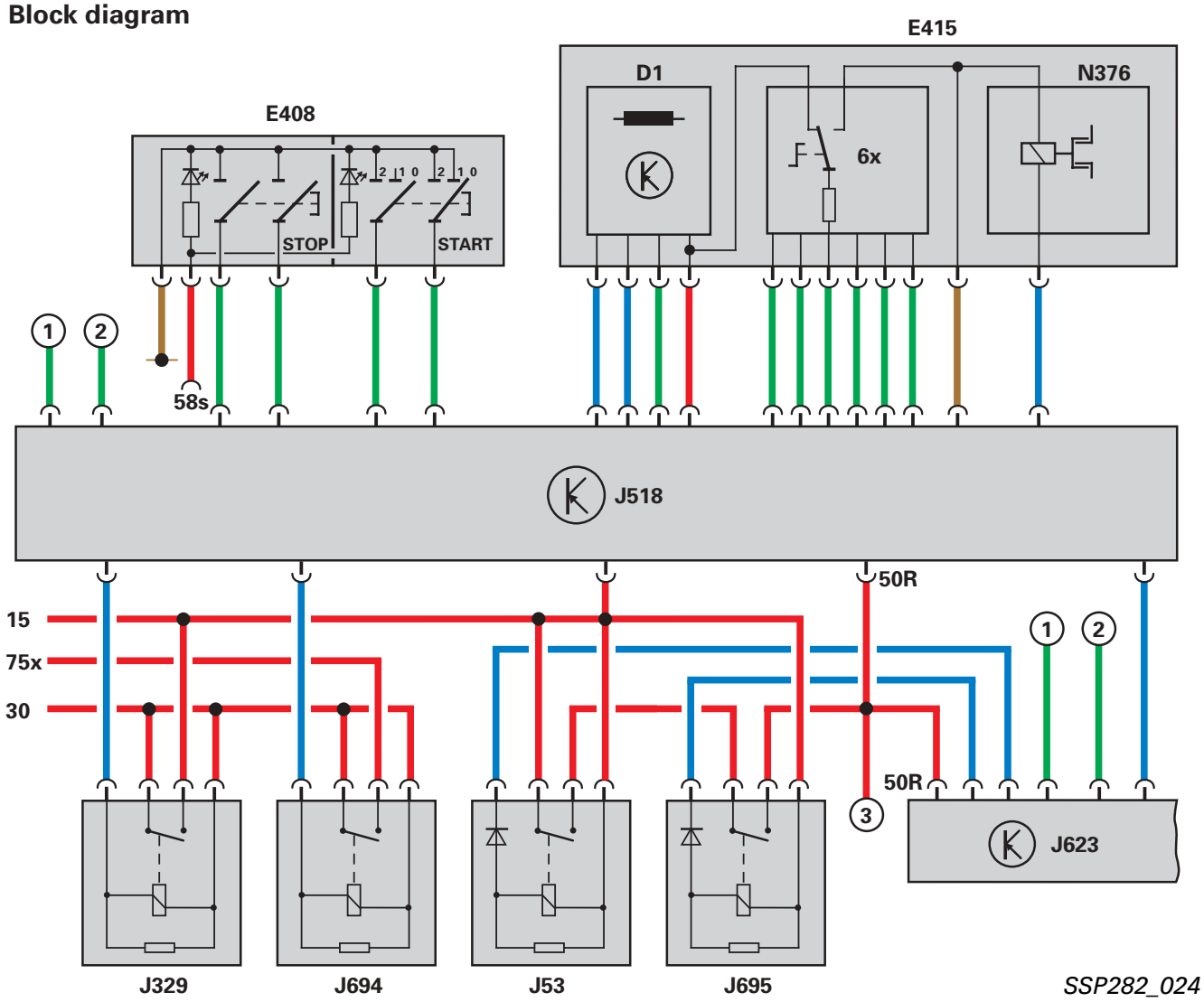
The terminal 50R interface represents a link with terminal 50 and provides the engine control unit J623 with feedback for start control/diagnosis.

Automatically controlled starting is not permitted in the event of undervoltage or a system fault.

The engine can however be started manually by way of corresponding start signal actuation.

To relieve the load on the starter and battery, the relay actuation time is limited to approx. 10 seconds per starting operation (automatic or manual starting).

Block diagram



D1 Inhibitor reading unit
E408 Entry and start authorisation button
E415 Entry and start authorisation switch
J53 Starter motor relay
J329 Terminal 15 voltage supply relay
J518 Entry and start authorisation control unit
J623 Engine control unit
J694 Terminal 75x voltage supply relay
J695 Starter relay 2
N376 Ignition key withdrawal lock magnet

Colour code

= Input signal

= Output signal

= Positive supply

= Earth

Additional signals

(1) F - Brake light switch

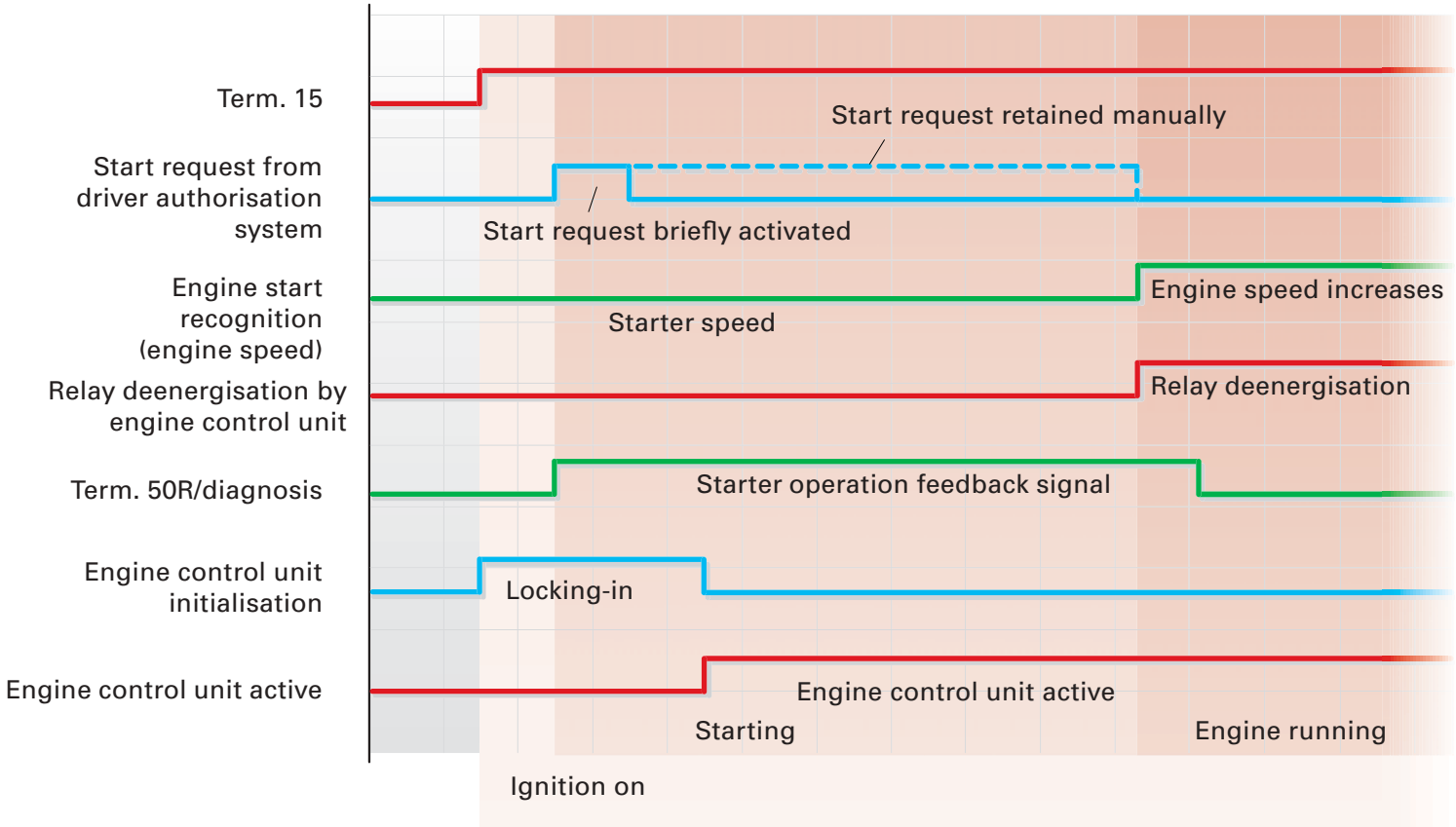
(2) Manual gearbox -> F194
Clutch pedal switch
Automatic gearbox -> Selector lever position from automatic gearbox control unit J217

(3) Terminal 50/starter

Explanatory notes on internal control unit sequence chart

Request for starting (terminal 50 ON from entry and start authorisation control unit J518) energises the two relays. Locking-in takes place during the initialisation phase of engine control unit J623.

After initialisation, the engine control unit assumes further starter control tasks as described under item 3.



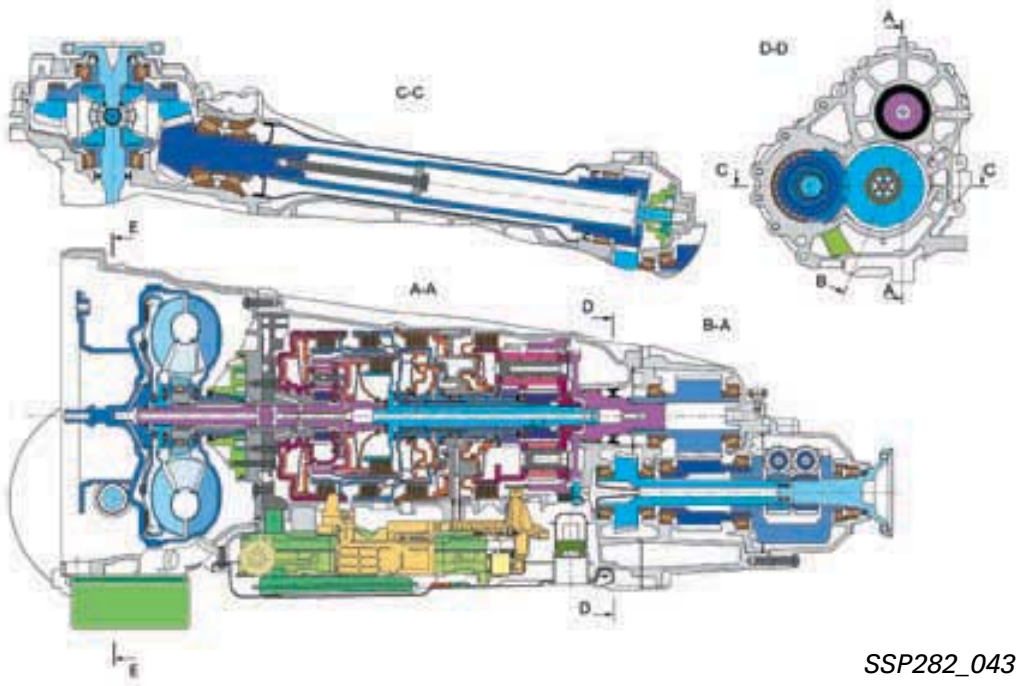
SSP282_064

To satisfy high comfort requirements, the Audi A8 ´03 features a new 6-speed automatic gearbox capable of handling a high engine torque of max. 600 Nm.

Two different versions are available:

- 420 Nm for the V8 5V 4.2 l or 3.7 l engine and
- 600 Nm for the V8 TDI 4.0 l or 6.0 l W12 engine

Design and operation of the 09E gearbox are described in SSP 283 (Part 1) and SSP 284 (Part 2).



SSP282_043

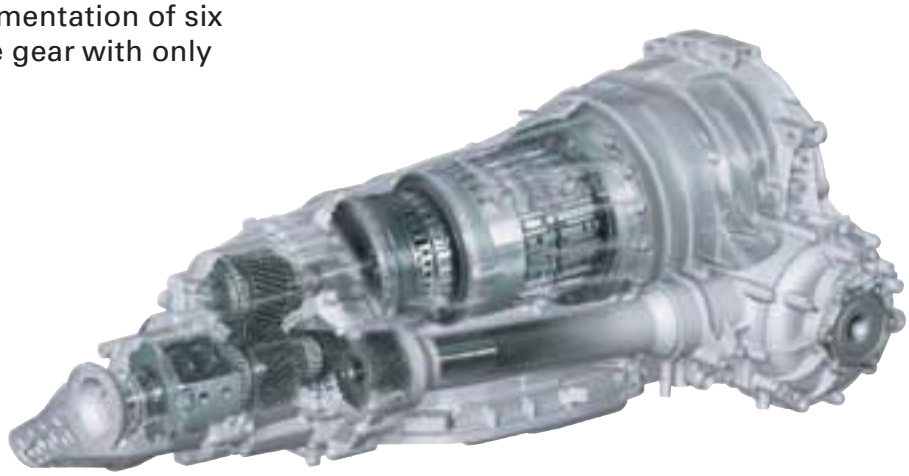
Technical data

Designation:	09E
Factory designation:	AL 600-6Q
ZF designation:	6HP-26 A61
Type:	6-speed planetary gearbox, featuring electro-hydraulic control with hydrodynamic torque converter and slip-controlled lock-up clutch
Control:	Via mechatronic system (integration of hydraulic control unit and electronic control to form one unit)
Max. torque transmission:	420 Nm for V8 5V 4.2 l /3.7 l engine 600 Nm for V8 TDI 4.0 l /W12 6.0 l engine
Front/rear axle torque distribution:	50/50
Gear oil capacity (total):	10.4 litres ATF
Gear oil capacity (replacement):	10 litres ATF
Total weight:	approx. 138 kg (420 Nm version) approx. 142 kg (600 Nm version)

Gearbox

Highlights of automatic gearbox 09E (AL 600-6Q)

The 6-speed planetary gearbox is based on the Lepelletier principle.
This concept is characterised by harmonic gear ratio steps and the implementation of six forward gears and one reverse gear with only five selector elements.



SSP282_044

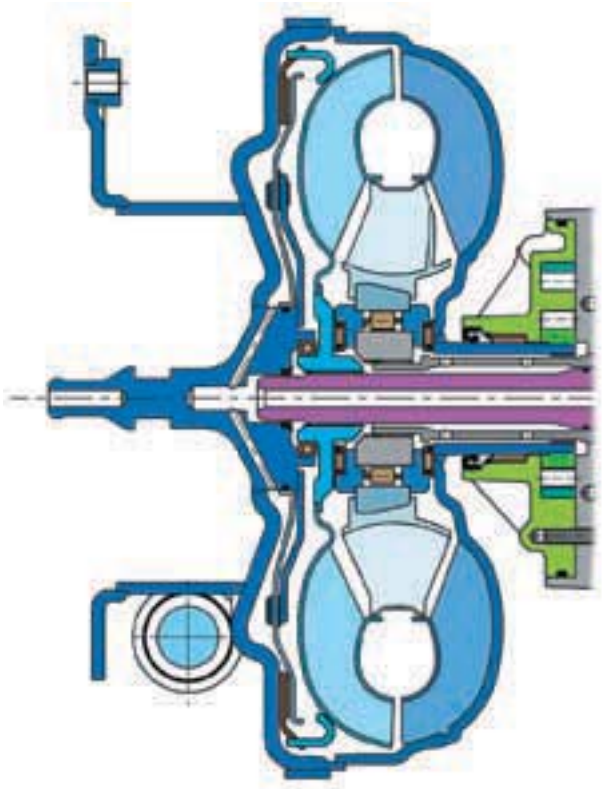
Use is made in this gearbox of a new internal gear oil pump featuring a lower delivery volume and reduced leakage.

In addition, it was possible to achieve optimisation of the oil supply with lower leakage rates in the hydraulic control system.

The "stationary disconnection" function reduces engine output when the vehicle is stopped with a gear engaged by interrupting power transmission.

A particularly noteworthy feature of the 09E automatic gearbox is the relocation of the front-axle differential (flange shaft) to in front of the torque converter.

The distance between flange shaft and engine flange is now only 61 mm (01L = 164 mm).



SSP282_045