Self Study Programme 478

Audi A7 Sportback

Audi
Service Training

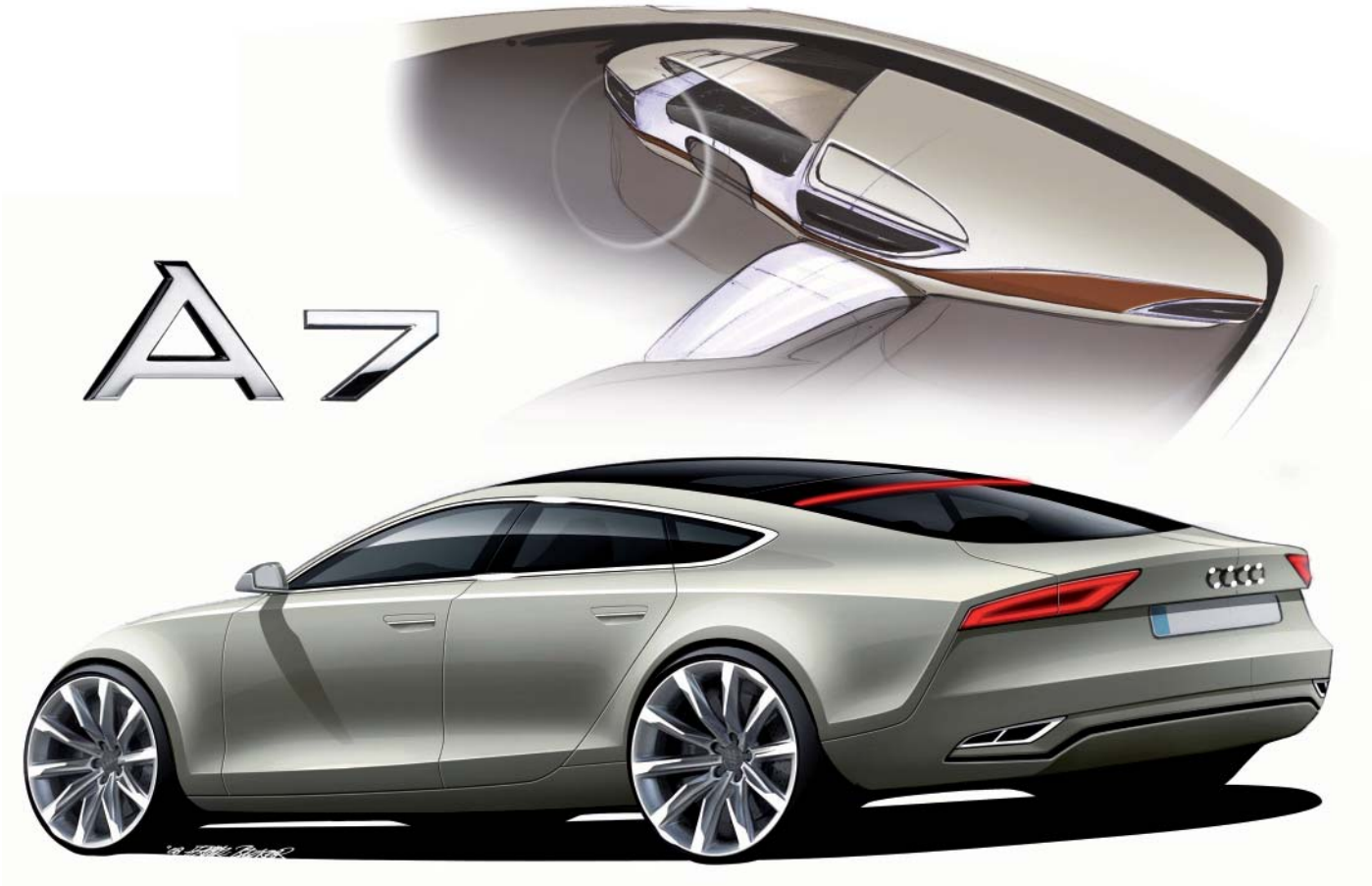
The Audi A7 Sportback is an entirely new class of vehicle. It unites the purist elegance of a saloon, the well-defined functionality of an Avant and the passionate dynamism of a coupé.

The new Audi A7 Sportback oozes enthusiasm. Above the accentuated wheel arches, a prominently sharp dynamic line extends along the entire length of the vehicle. It imbues the Audi A7 Sportback with a unique "stealth" look. The perfect balance of puristic lightness and flowing lines creates a new statement of dynamism and elegance.
The striking trailing edge interacts harmoniously with the spoiler edge to provide a dynamic finishing touch to the muscular rear end. The innovative vehicle concept with its wide-opening tailgate in coupé-like style is impressive not just because of its unusual design. The Audi single-frame radiator grille is trimmed with high-quality horizontal chrome struts and conveys an aura of elegance and progressiveness.

This re-interpretation of the radiator grille gives the headlights even more presence and character. The interior concept of the Audi A7 Sportback cossets the driver and passengers, giving them a feeling of complete security.
The cockpit is driver-oriented in design, i.e. the centre console leans towards the driver. Attractive inlays with continuous lines provide accentuation in the interior.

The Audi A7 Sportback has powerful yet efficient FSI, TFSI and TDI engines. The quattro permanent all-wheel drive delivers this power to the road superbly. The optional quattro with sport differential distributes drive power variably to the individual wheels, giving enhanced driving dynamics, agility and traction.

Nothing is more inspiring than a blank sheet of paper. A car came into being on one: contemporary, fascinating, new.
The Audi A7 Sportback.



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Learning objectives of this Self Study Programme are:

This Self-Study Programme provides you with general information about the Audi A7 Sportback. When you have worked your way through this Self Study Programme, you will be able to answer the following questions:

- From which types of steel is the body built?
- Which engines and which new features are fitted?
- How does the crown-gear limited slip differential work?
- With which type of steering is the Audi A7 Sportback fitted?
- How is Innovative Thermal Management implemented in the engines?
- How is the head-up display projected onto the windscreen?
- What does the speed limit indicator display?
- Which sound systems are integrated?

Contents

The Self Study Programme explains the basics of the design and function of new models, new automotive components or new technologies.
It is not a Repair Manual! Figures given are for explanatory purposes only and refer to the data valid at the time of production of the SSP.
For maintenance and repair work, always refer to the current technical literature.

Note

Reference

Introduction

In brief

478_029

478_030

478_031

478_032

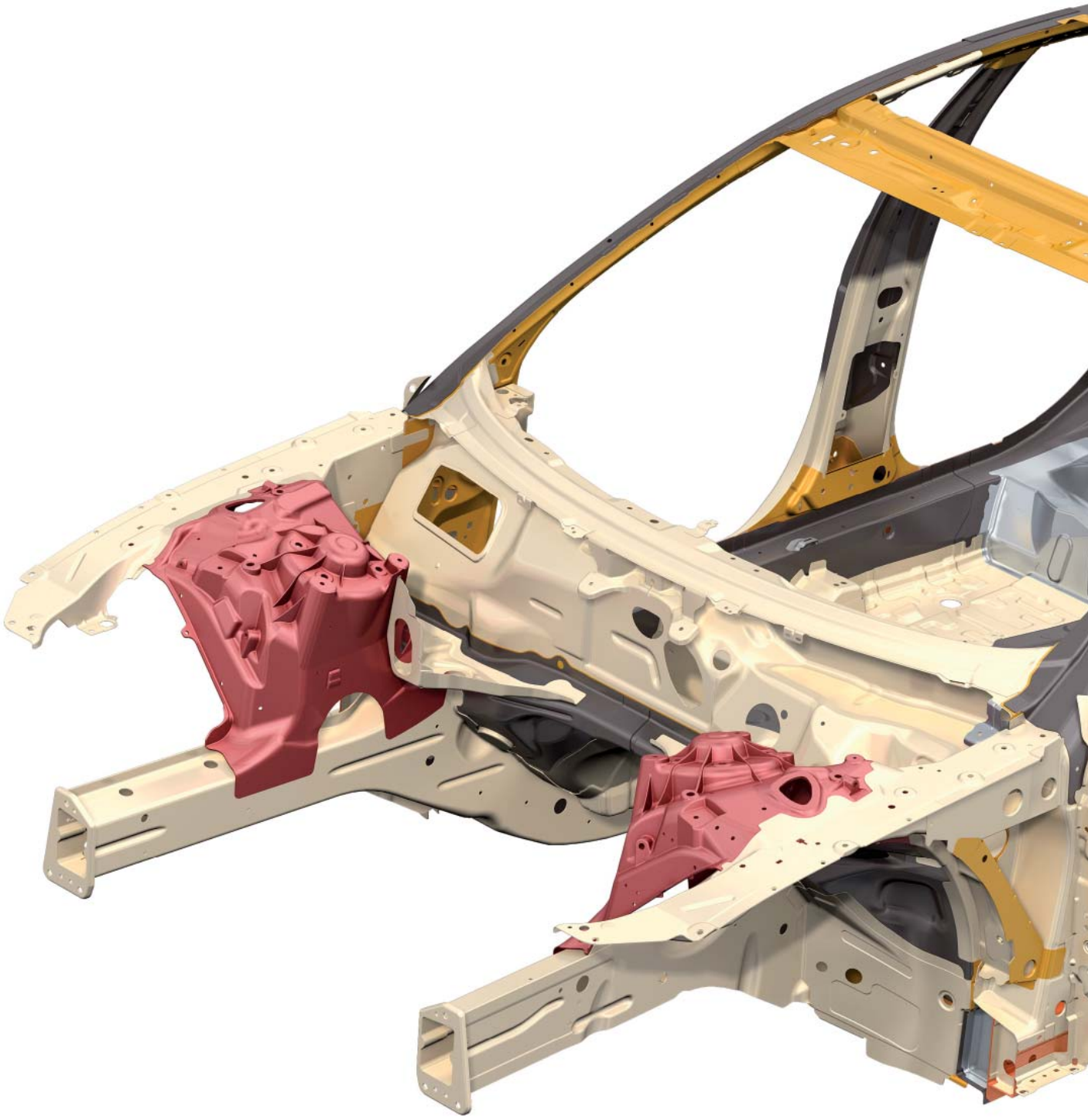
Length in mm	4969	**Interior width, front** in mm	1452
Width in mm	1911	**Inner width, rear** in mm	1421
Height in mm	1420	**Headroom, front** in mm	1028
Track width, front in mm	1644	**Headroom, rear** in mm	944
Track width, rear in mm	1635	**Through-loading width** in mm	915
Wheelbase in mm	2914	**Load sill height** in mm	689
Trailer load in kg with brake and a gradient of 8 %	2100	**Boot capacity** in l	535/965
Kerb weight in kg	1845	**Tank capacity** in l	65
Max. gross weight in kg	2320	**Drag coefficient** in c_w	0.29

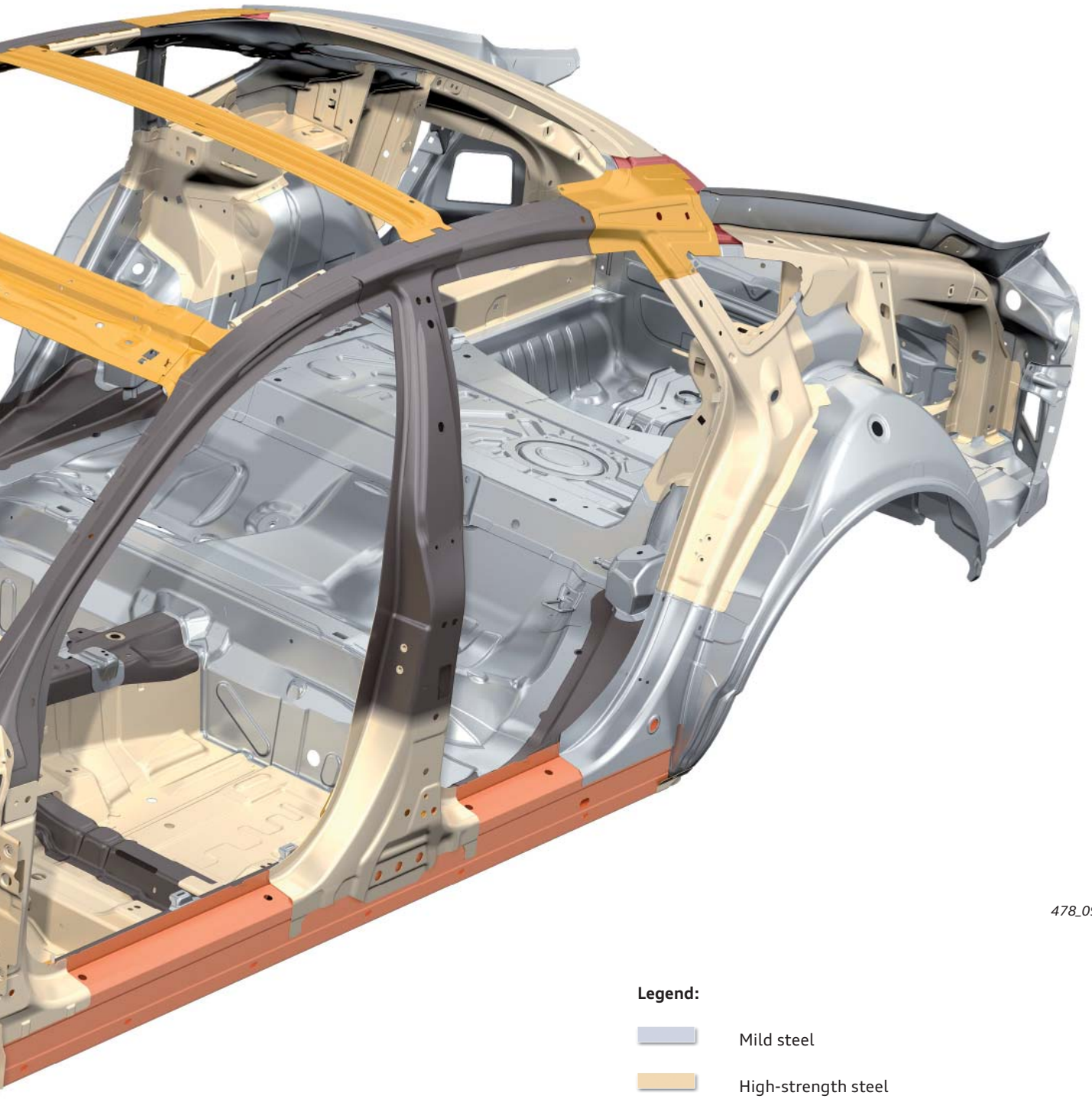
Body

Introduction

The body of the Audi A7 Sportback is of hybrid construction. In this lightweight construction concept, aluminium components are used in addition to sheet-metal parts.

In addition to mild, high-strength, modern high-strength and ultra-high-strength sheet-steel parts, the bodyshell has four aluminium castings. These are the front strut mountings and the hinge mountings for attaching the tailgate.





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Legend:

- Mild steel
- High-strength steel
- Modern high-strength steel
- Ultra-high-strength steel
- Ultra-high-strength steel (hot-formed)
- Cast aluminium

Body structure

The use of ultra-high-strength hot-formed components on the Audi A7 Sportback helps to enhance body rigidity and crash safety in particular.
The following components and assemblies, among others, are manufactured from this type of material:

- Front side member reinforcement
- Bulkhead
- A post and roof frame side
- B post
- Chassis rail (sill)
- Front seat cross member
- Tunnel reinforcement
- Rear longitudinal member

B post

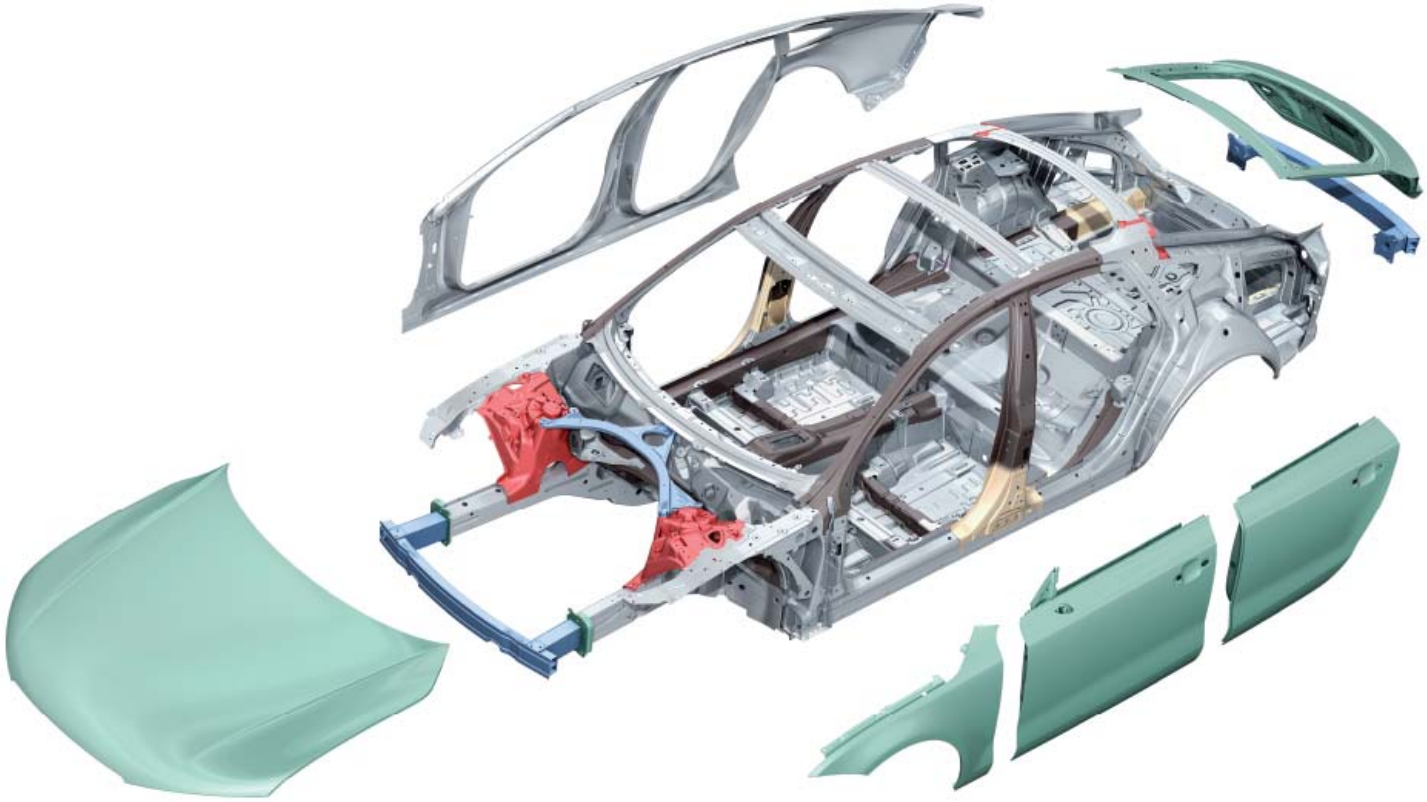
The B post and the striker plate are partially tempered in the forming process. The component is very hard at the top end and softer below a narrow transition zone. This allows the forces arising during a side impact to be absorbed effectively.

Side member

The rear end employs a similar structural solution. The side member is manufactured from tailored blanks. It is made of high-strength sheet metal at the rear end and joins up with an ultra-high-strength hot-formed component towards the occupant cell. Both sheet metal blanks are butt joined by a laser weld prior to forming.

Body attachments

To reduce vehicle weight, attachments like the front and rear bumper mounts, wings, strut brace, doors and flaps are made from aluminium.



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Legend:

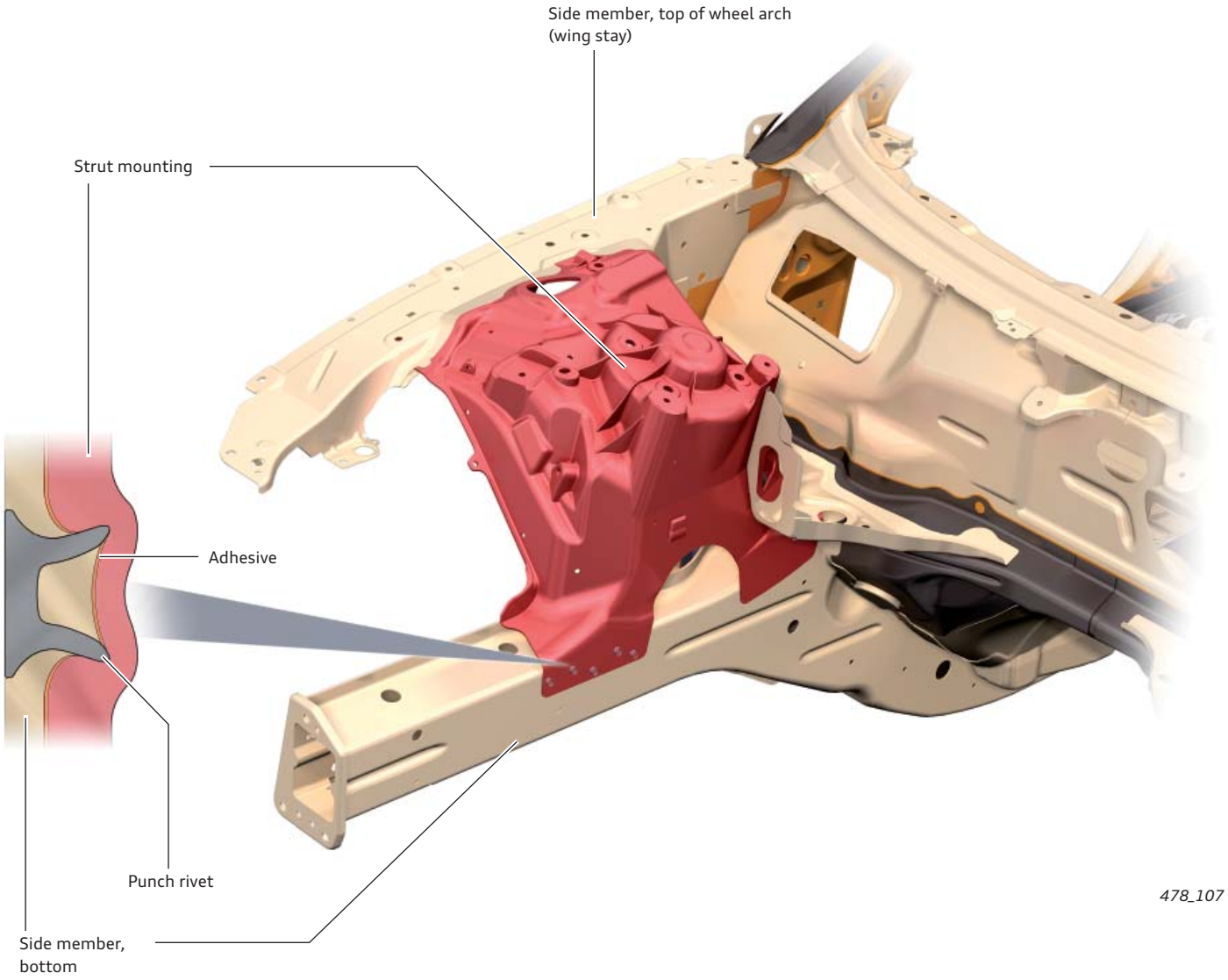
- Aluminium panels
- Aluminium castings
- Extruded aluminium sections
- Ultra-high-strength steel (hot-formed)
- High-strength areas in B post and side member
- Steel

Aluminium castings

The aluminium castings in the vehicle structure are joined to the adjacent sheet-metal parts with punch rivets and structural adhesive. The adhesive between these two materials also acts as an insulator and prevents contact corrosion. This method of joining is also used on the Audi TT ’07 and Audi A8 ’10, among others.

Specific repair solutions have been developed for repairing damage to these aluminium castings or the adjacent sheet-steel parts. Furthermore, no straightening and reshaping work is permitted at the front end of the Audi A7 Sportback because this can result in externally invisible cracks in the aluminium castings. For further information, refer to the Audi workshop literature.

Structural integration of front end and strut mounting



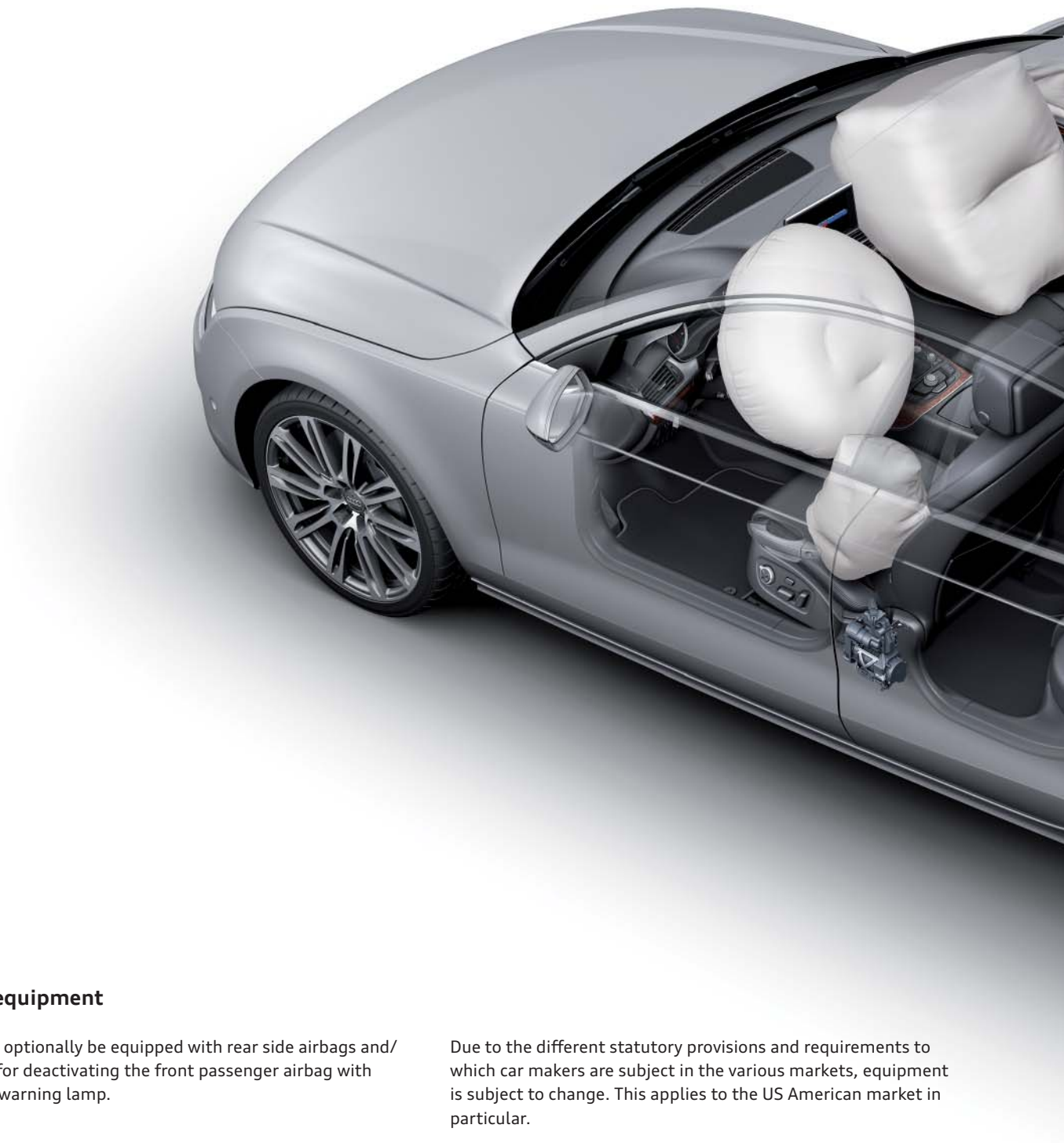
Reference
For further information about punch riveting, refer to Self Study Programme 383 "Audi TT Coupé ’07 — Body".

Occupant protection

Overview

On the following pages, you will find a summary of the occupant protection system in the Audi A7 Sportback.

The diagram shown in the chapter "Occupant protection" is a schematic diagram and is used to give a better understanding.



Additional equipment

The vehicle can optionally be equipped with rear side airbags and/or a keyswitch for deactivating the front passenger airbag with accompanying warning lamp.

Due to the different statutory provisions and requirements to which car makers are subject in the various markets, equipment is subject to change. This applies to the US American market in particular.

Reference
For further information about the occupant protection system of the Audi A7 Sportback, refer to Self Study Programme 484 "Audi A7 Sportback Occupant Protection, Infotainment, Air Conditioning".

Components

The occupant protection system of the Audi A7 Sportback comprises the following components and systems:

- Airbag control unit
- Adaptive driver and front passenger airbags
- Front side airbags
- Head airbags
- Front airbag crash sensors
- Crash sensors for side impact detection in the doors
- Crash sensors for side impact detection in the C posts
- Front inertia-reel seat belts with pyrotechnic belt tensioners and active belt force limiters
- Battery isolator
- Seat belt reminder for driver and front passenger
- Seat belt switch, driver and front passenger sides
- Seat occupancy sensor in front passenger seat
- Driver and front passenger seat position recognition

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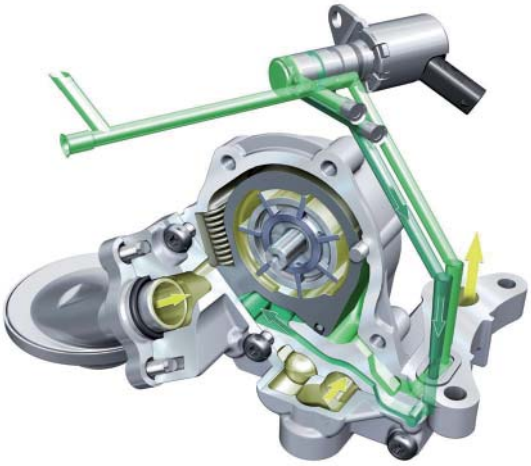
Engine

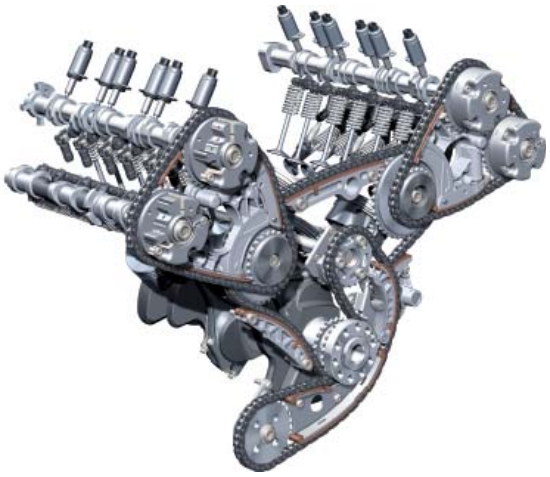
2.8l V6 FSI engine

Technical features

New spark plugs



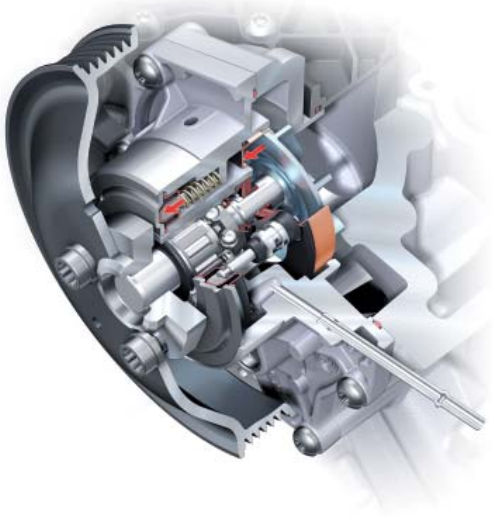
Oil pump with reduced power consumption



Friction-reduced chain gear with:
- Modified camshafts
- Camshaft adjusters modified for less leakage

Reference
For further information about the design and function of the 2.8l V6 FSI engine, refer to Self Study Programme 411 "Audi 2.8l and 3.2l V6 FSI Engines with Audi valvelift system".

Start-stop system and recuperation



Innovative Thermal Management system with active coolant pump

Improved high-pressure injectors

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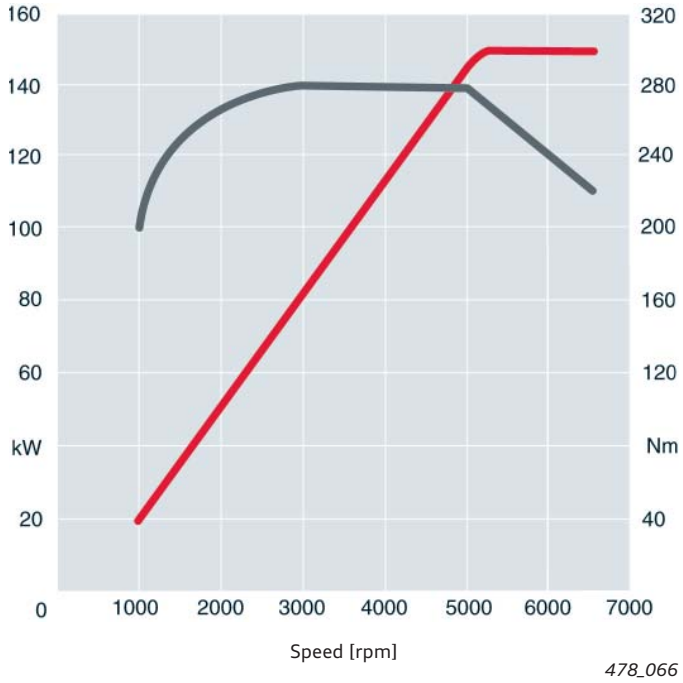
Adapted belt drive
(without power steering pump)

Specifications

Torque-power curve

Power in kW

Torque in Nm



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Engine code	**CHVA**
Type	Six cylinder V engine with 90° included angle
Displacement in cm^3	2773
Power output in kW (HP)	150 (204) at 5250 – 6500
Torque in Nm	280 at 3000 – 5000
Number of valves per cylinder	4
Bore in mm	84.5
Stroke in mm	82.4
Compression ratio	12 : 1
Powertrain type	quattro
Engine management	Simos 8.1
Fuel	Premium unleaded (sulphur-free) 95 RON
Emissions standard	EU V
CO_2 emission in g/km	187

Modifications to the 2.8l V6 FSI engine

Cylinder block	▸ Modifications to the cylinder block for the Innovative Thermal Management system (active coolant pump)
Cylinders	▸ The cylinders are honed to give a textured finish designed to reduce oil consumption and wear ▸ Increased piston fitting clearance ▸ Reduced prestress on the third piston ring land
Main bearing bushes	▸ Bearing bushes are coated with an additional wear-resistant layer designed to withstand composite friction produced by the start-stop system at restart
Chain drive	▸ The chain tensioners have been reconfigured and adapted for reduced oil flow
Oil pump	▸ The oil pump is now smaller thanks to the reduction in oil flow rates and, thus, consumes less power and generates less friction
Auxiliaries drive	▸ No power steering pump is used
Starter	▸ Optimised design (start-stop system)
Secondary air system	▸ New (refer to SSP 437 for details of function)
Spark plugs	▸ Heat ratings have been adapted to the optimised combustion process

Valve gear

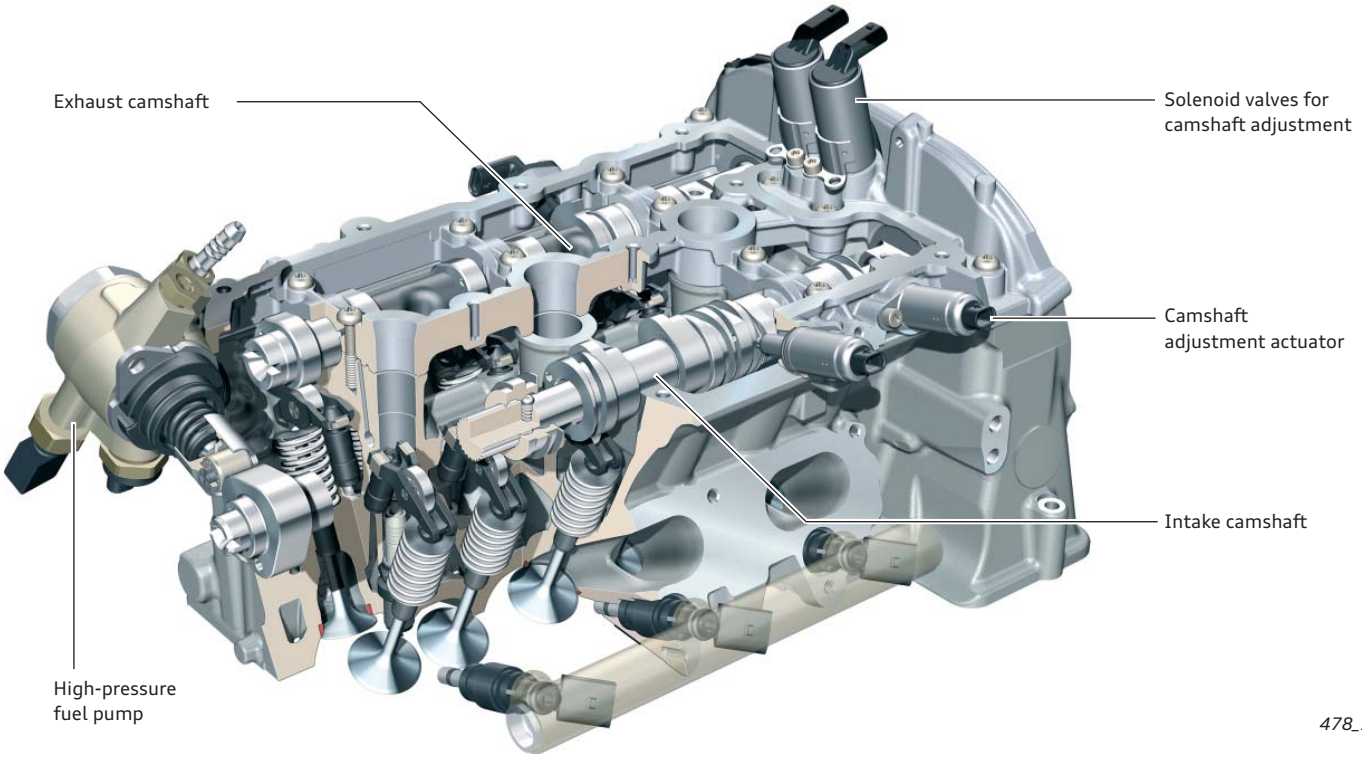
The following modifications have been made to the valve gear:

- Weight-optimised intake camshafts
- Cam contour from the 140 kW engine of the Audi A6 ’05 (PA)
- Weight-optimised exhaust camshafts
- The exhaust camshafts are composite camshafts
- Camshaft adjusters have been modified for less leakage and functionally enhanced, thus further reducing the pressure in the oil circuit
- Reduced valve spring forces

Audi valvelift system

The Audi valvelift system utilises the so-called "cam pieces" which are seated on the intake camshafts and can be moved axially.

There are two different, juxtaposed cam profiles - one for small valve lifts and the other for large valve lifts. Changing the position of the cam pieces allows the intake valve timing to be adjusted to load state.



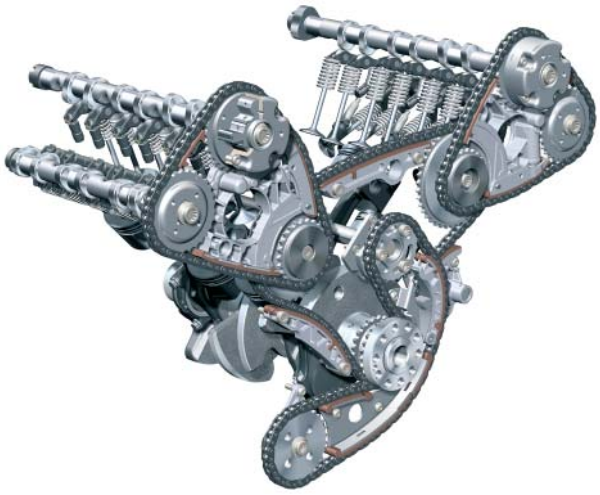
478_109

3.0l V6 TFSI engine

Technical features

New spark plugs

Oil pump with reduced power consumption



Friction-reduced chain gear with:
- Modified camshafts
- Camshaft adjusters modified for less leakage

Reference
For further information about the design and functionality of the 3.0l V6 TFSI engine, refer to Self-Study Programme 437 "Audi 3.0l V6 TFSI Engine with Roots Blower".

Start-stop system and recuperation

Innovative Thermal Management system with active coolant pump

478_009

Adapted belt drive
(without power steering pump)

Improved high-pressure injectors

Specifications

Torque-power curve

Power in kW

Torque in Nm

478_053

Engine code	**CGWB**
Type	Six cylinder V engine with 90° included angle
Displacement in cm^3	2995
Power output in kW (HP)	220 (300) at 5250 – 6500
Torque in Nm	440 at 2900 – 4500
Number of valves per cylinder	4
Bore in mm	84.5
Stroke in mm	89
Compression ratio	10.5 : 1
Powertrain type	quattro
Engine management	Simos 8
Fuel	Premium unleaded (sulphur-free) 95 RON
Emissions standard	EU V
CO_2 emission in g/km	190

Modifications to the 3.0l V6 TFSI engine	
Cylinder block	▸ Modifications to the cylinder block for the Innovative Thermal Management system (active coolant pump)
Cylinders	▸ The cylinders are honed to give a textured finish designed to reduce oil consumption and wear ▸ Increased piston fitting clearance ▸ Reduced prestress on the third piston ring land
Main bearing bushes	▸ Bearing bushes are coated with an additional wear-resistant layer designed to withstand composite friction produced by the start-stop system at restart
Chain drive	▸ The chain tensioners have been reconfigured and adapted for reduced oil flow
Camshafts	▸ Weight-optimised intake camshafts ▸ Cam contour from the 140 kW engine of the Audi A6 ’05 (PA) ▸ Weight-optimised exhaust camshafts ▸ All camshafts are composite camshafts
Camshaft adjusters	▸ Modified for less leakage and functionally enhanced, thus further reducing the pressure in the oil circuit
Valve gear	▸ Reduced spring forces
Oil pump	▸ The oil pump is now smaller thanks to the reduction in oil flow rates and, thus, consumes less power and generates less friction
Auxiliaries drive	▸ No power steering pump is used
Starter	▸ Optimised design (start-stop system)
Spark plugs	▸ Heat ratings have been adapted to the optimised combustion process

Charging

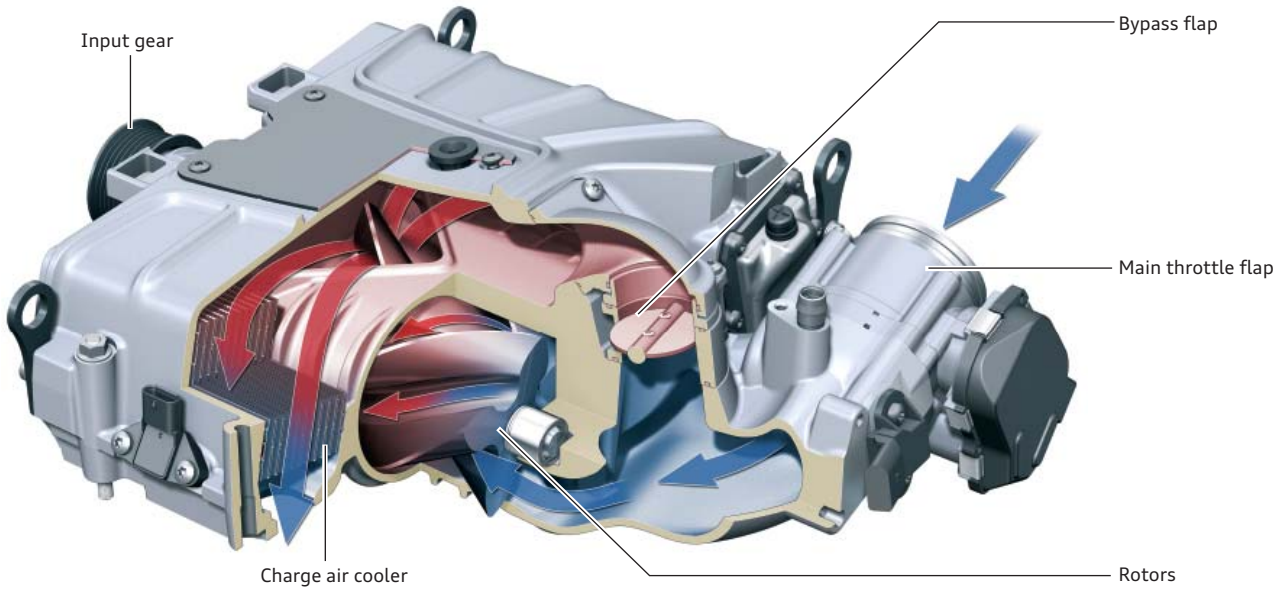
The 3.0l V6 TFSI is currently the top-of-the-range Audi V6 petrol engine.

- Fast dynamic torque build-up
- Flat torque curve
- Excellent drive-away performance
- Maintenance-free operation

A special feature of this engine is that it is charged by a Roots blower which offers a number of advantages:

- Harmonised basic engineering concept for naturally aspirated engine and supercharged engine
- Extremely compact supercharger unit design
- High percentage of common parts shared with other V engined models

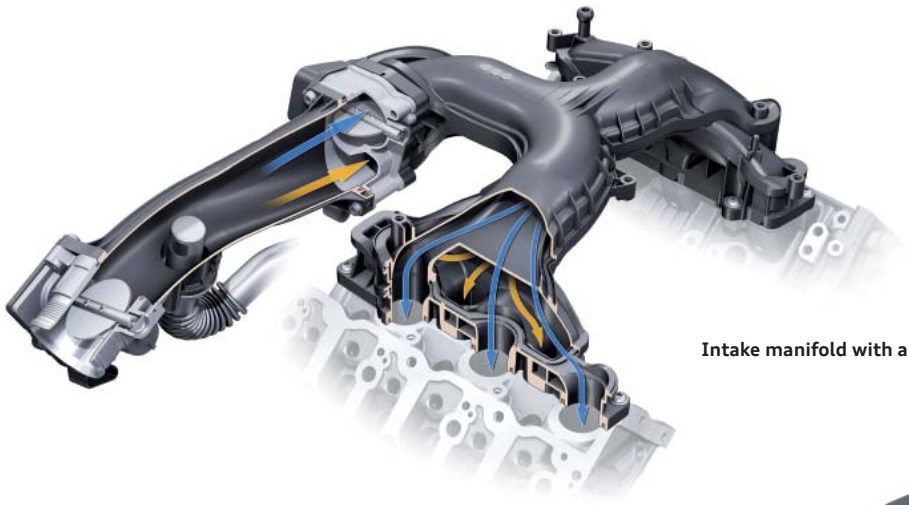
Supercharger module



478_110

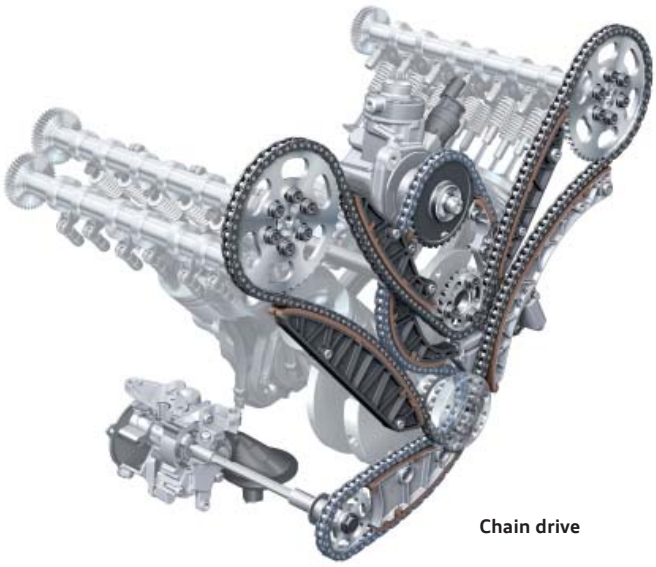
3.0l V6 TDI engine (second generation)

Technical features



Intake manifold with a single swirl flap

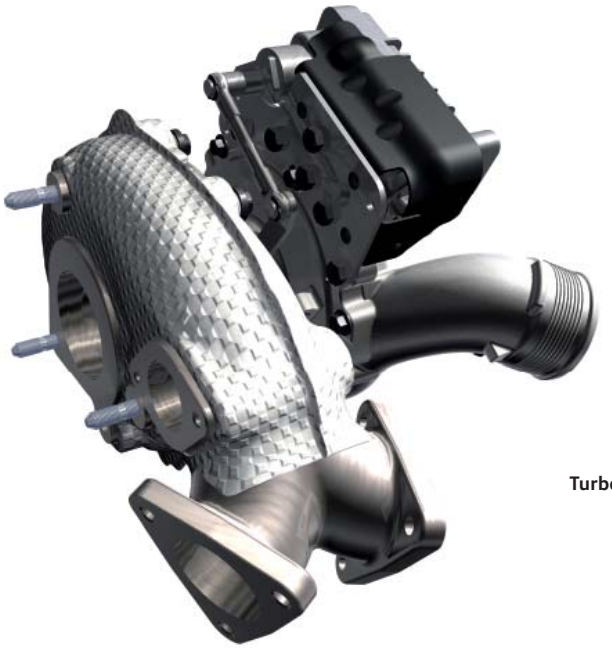
Common rail injection system



Chain drive

Reference
For further information about the design and functionality of the 3.0l V6 TDI engine, refer to Self-Study Programme 479 "Audi 3.0l V6 TDI Engine (second generation)".

Start-stop system and recuperation



Turbocharger module

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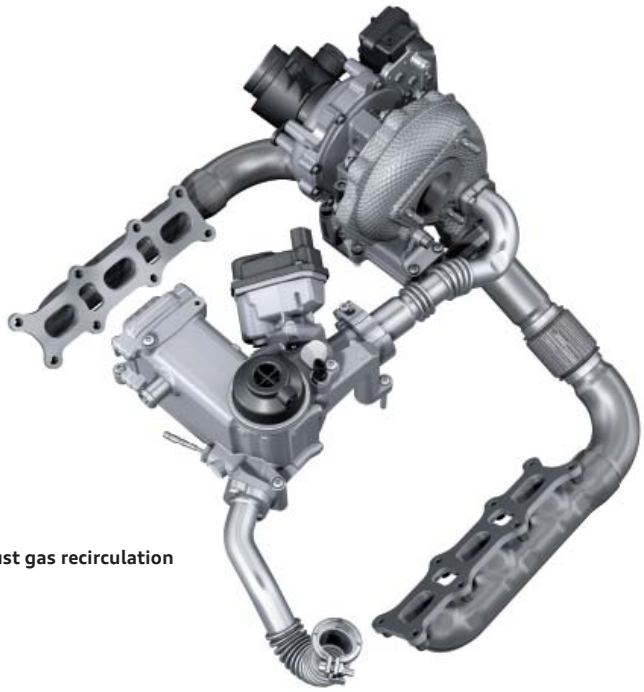
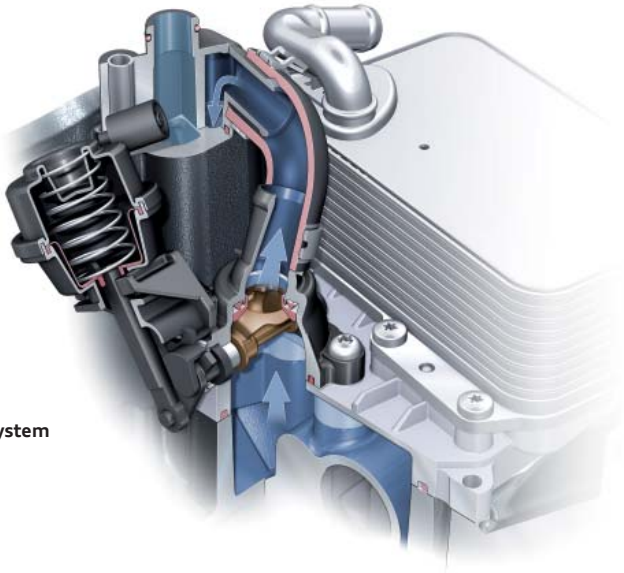


Exhaust gas recirculation



Thermal management system

Specifications

Torque-power curve

Engine with code CDCU

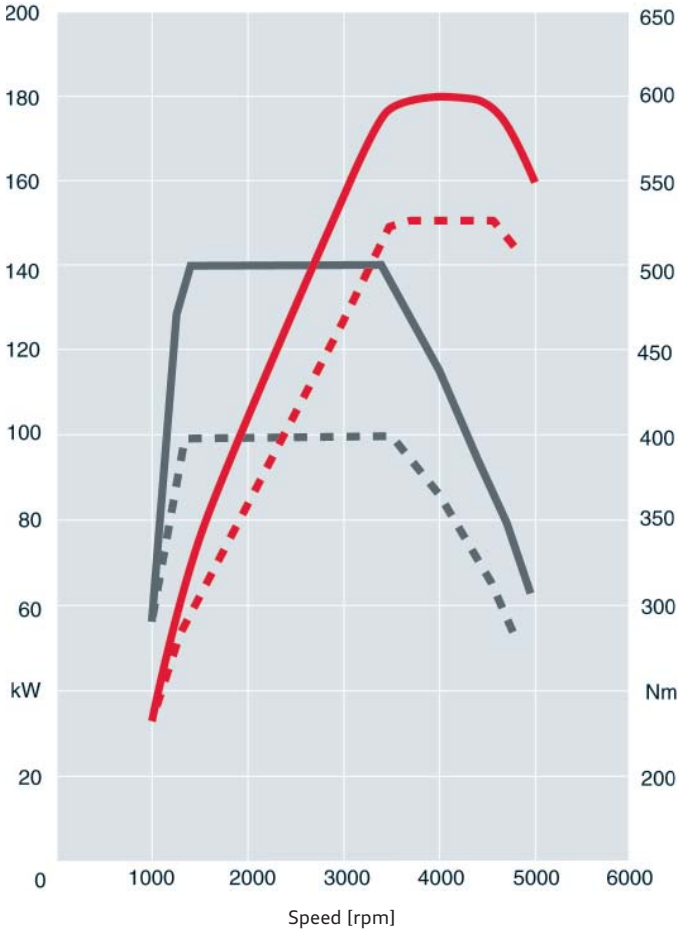
Power in kW

Torque in Nm

Engine with code CLAB

Power in kW

Torque in Nm



478_001

Engine code	CDUC	CLAB
Type	Six cylinder V engine with 90° included angle	Six cylinder V engine with 90° included angle
Displacement in cm^3	2967	2967
Power output in kW (HP)	180 (245) at 4000 – 4500	150 (204) at 4000 – 4500
Torque in Nm	500 at 1400 – 3250	400 at 1400 – 3250
Number of valves per cylinder	4	4
Bore in mm	83	83
Stroke in mm	91.4	91.4
Compression ratio	16.8 : 1	16.8 : 1
Powertrain type	S tronic quattro	multitronic with front wheel drive
Engine management	Bosch EDC 17	Bosch EDC 17
Fuel	Diesel to EN 590	Diesel to EN 590
Maximum injection pressure in bar	1800	2000
Emissions standard	EU V	EU V
CO_2 emission in g/km	158	139 (front wheel drive)

Modifications to the 3.0l V6 TDI engine	
Engine mechanicals	▸ Cranktrain ▸ With weight-reduced bores in the crank pins ▸ Chain drive reduced from four to two simplex chains ▸ Intake ports with cylinder heads optimised for swirl and flow ▸ Layout and downsizing of the exhaust valves ▸ Lighter composite camshafts with new mounting ▸ Further improved engine ventilation system
Oil circuit	▸ Oil circuit with two-stage flow controlled vane cell pump ▸ Oil cooler bypass thermostat
Cooling system	▸ Revised cooling system (cylinder head and cylinder block cooling circuit) ▸ Flow optimisation ▸ Innovative Thermal Management
Exhaust gas recirculation	▸ Optimised and compactly built in modular design (EGR valve, EGR cooler and bypass valve in module) ▸ Active EGR cooler without thermostat control and auxiliary coolant pump
Charging	▸ Exhaust gas turbocharger modified for reduced internal friction losses ▸ Different chargers are used depending on engine power output ▸ Overboost function
Air circulation	▸ Dual-flow superposed intake manifold with only one central swirl flap in lieu of the previous six swirl flaps
Common rail injection system	▸ Injection system with injection pressures of up to 2000 bar ▸ Dual-piston high pressure pump (CP4.2) ▸ High pressure fuel pump driven by auxiliaries chain
Exhaust gas aftertreatment	▸ Use of aluminium titanate as a new diesel particulate filter substrate ▸ More advanced generation of particulate filters (three post injections)
Auxiliaries drive	▸ No power steering pump is used

Engine version developing 150 kW (efficiency version)

In addition to the performance versions, the new generation of engines includes an efficiency version developing 150 kW and 400 Nm (engine code CLAB).

Differences between the efficiency and performance versions are:

- An exhaust turbocharger GT2056 optimised for lower power output
- Common rail injection system with a maximum rail pressure of 2000 bar
- Reduced hydraulic flow through the eight-hole nozzles in the piezoelectric injector

A further measure designed to increase the efficiency of the 150 kW unit is a performance-based reduction in the exhaust timing duration from 202 deg. to 176 deg., thus allowing more efficient use to be made of expansion in the cylinder. Thus, fuel consumption has been reduced still further.

Innovative Thermal Management (ITM)

ITM is a subsystem of the engine control unit. The subsystems indicate their "status" to the ITM (e.g. heating required, no heating required, etc.).
The ITM function weighs up requirements and decides which users have the highest priority and, thus, determines which actuators need to be activated. ITM sends activation commands to the users, which in turn activate the actuators.

Units are warmed up in two phases:

- Phase 1: the stationary coolant produces a faster increase in temperature within the engine, thereby reducing friction losses. The injection cycle can also be optimised.
- Phase 2: the hot coolant is now used to rapidly heat the gear oil via a heat exchanger. For this purpose, the heat flow is diverted by an electrical control valve actuated by the gearbox control unit.
  The mixing phase is cycled in order to avoid excessive thermal stresses and to ensure that the hot engine coolant is not circulated immediately (this would impair the frictional properties of the engine).

Heating of the cabin

If the customer wants the cabin to be heated as quickly as possible, heat is transferred as quickly as possible in order to heat the interior. In this case, the engine coolant is not stationary.

Gearnoil cooling/heating

However, the gear oil is not only heated. It can also be cooled, as required. Since there is no separate cooling circuit, the gear oil is cooled down to the temperature level of the engine cooling circuit.

The coolant flow to the gear oil cooler is shut off by the coolant flow control valve during the optimal gearbox temperature phase.

Technical summary of the Innovative Thermal Management system

2.8l V6 FSI engine	3.0l V6 TFSI engine	3.0l V6 TDI engine
▸ Active coolant pump	▸ Active coolant pump	▸ Coolant shut-off valve ▸ Ball valve in small coolant circuit (actuated by N489) ▸ Cylinder head coolant valve (same as on 4.2l V8 FSI of A8 ’10)
▸ Two sensors: ▸ Temperature sender for engine temperature control G694 ▸ Coolant temperature sender G62	▸ Two sensors: ▸ Temperature sender for engine temperature control G694 ▸ Coolant temperature sender G62	▸ Two sensors: ▸ Temperature sender for engine temperature control G694 ▸ Coolant temperature sender G62
▸ Gear oil heating/cooling	▸ Gear oil heating/cooling	▸ Gear oil heating/cooling
▸ Heating cut-off	▸ Heating cut-off	▸ Heating cut-off
▸ Thermostat opens at 95 °C	▸ Thermostat opens at 87 °C	▸ Mapped engine cooling thermostat (65 °C – 90 °C)
		▸ Oil cooler bypass thermostat

Temperature sender for engine temperature control G694

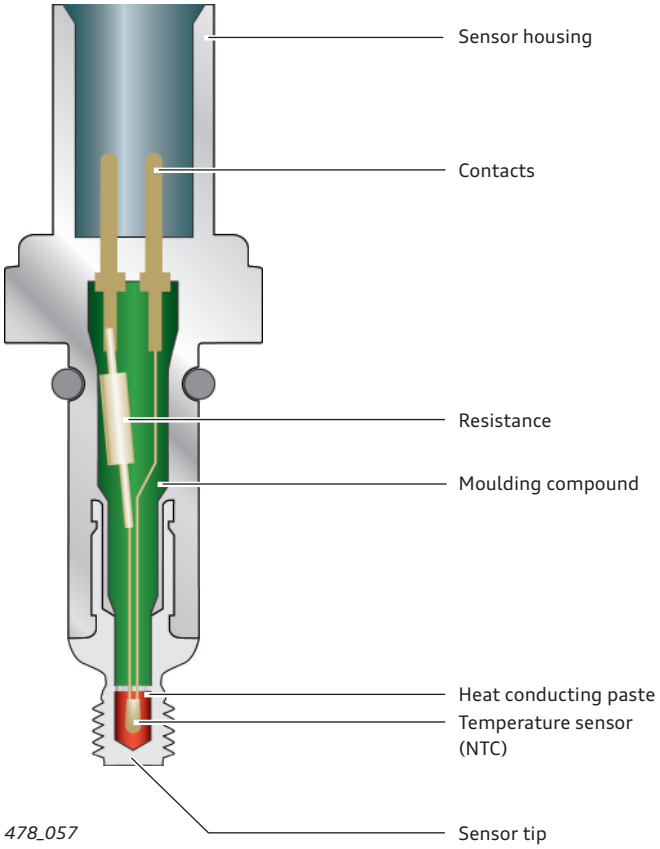
An engine temperature sensor is used on petrol models. A special feature of this type of sensor is that it has a larger surface area due to its thread being in the heat transfer zone (allowing faster heating and cooling). The temperature sender G694 is mounted in the cylinder head, i.e. in a position where components can be expected to reach critical temperatures most quickly.

The technical reason for the use of temperature sender G694 is to provide component protection. It ensures that coolant pump drive is maintained even even in the event of a torn ribbed V-belt and sudden or gradual coolant loss - situations in which a conventional coolant sensor would be left "high and dry" and unable to deliver any information on engine oil temperature.

The new sensor also protects against "coolant boil-off" since it enables warnings to be issued earlier by providing a "faster" measurement at the "critical point".

The Innovative Thermal Management control unit performs the following functions:

- Warm-up control when the coolant is stationary
- Actuator control (e.g. active coolant pump)
- Heater coolant
- Coolant radiator fan
- Coolant protection against boiling

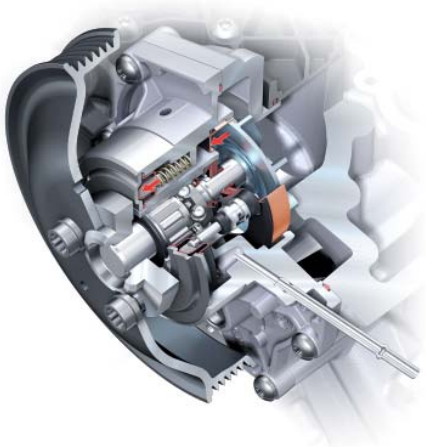


478_057

Active coolant pump

The coolant pump is activated via the engine control unit, which does so by switching the vacuum on and off using a solenoid valve. Activating the coolant pump stops the coolant flow since the pilot valve is inverted over the pump gear. Thus, the flow of coolant through the engine is shut off completely. In this operating state, drive power is reduced.

Brief activation of the coolant pump at high engine speeds serves to protect the engine from overheating. The coolant flow is activated in a cycled fashion. This allows the engine temperature to be gradually equalised during the mixing phase after the warm-up phase.

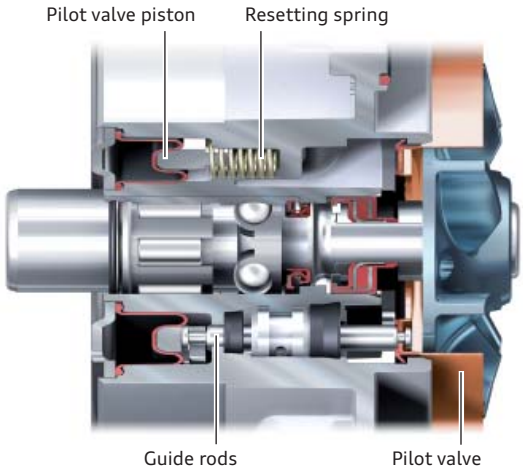


478_085

Function

Evacuating the vacuum chamber exerts force on the pilot valve piston. Thus, the pilot valve is pushed over the impeller on the cylinder block against the pressure of the spring via the guide rods. The coolant flow is hereby restricted at the pump outlet on the pressure side. Three circumferential return springs ensure that full delivery is maintained in the event of problems with the vacuum supply.

The pump is not activated at coolant temperatures below –20 °C because the seals and diaphragms could otherwise suffer damage. The pump is not activated when the engine is restarted either.



478_088

Fuel delivery unit

The delivery unit is driven by an "EC motor" (operating voltage 5 – 16 V). The EC (electronic commutated) motor is a brushless, permanently excited synchronous motor. It is vastly superior to other rotating motors in terms of its dynamics. Thanks to its brushless design, the motor is wear-free apart from the bearing.

The delivery unit is activated by the fuel pump control unit J538. It is activated by the engine control unit J623 by means of a PWM signal (faults are indicated over the same line).

The level sender uses three-wire technology. On petrol models, the fuel filter is mounted directly on the delivery unit.

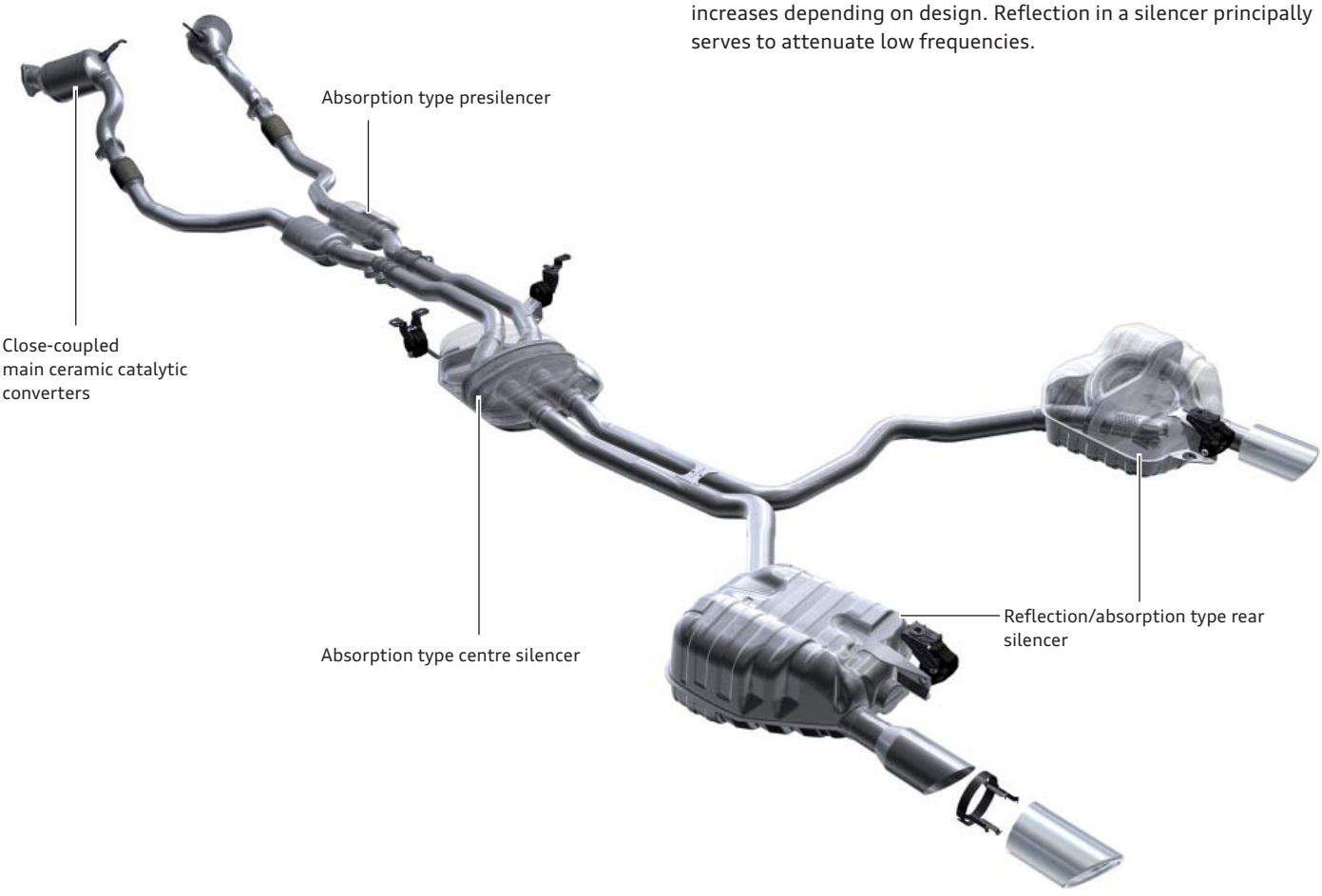
The illustration shows the fuel delivery unit of a petrol model.

478_060

Exhaust systems

All exhaust systems on models with V6 engines have push-on trims fitted to the tail pipes. These can also be ordered separately.

2.8l V6 FSI engine



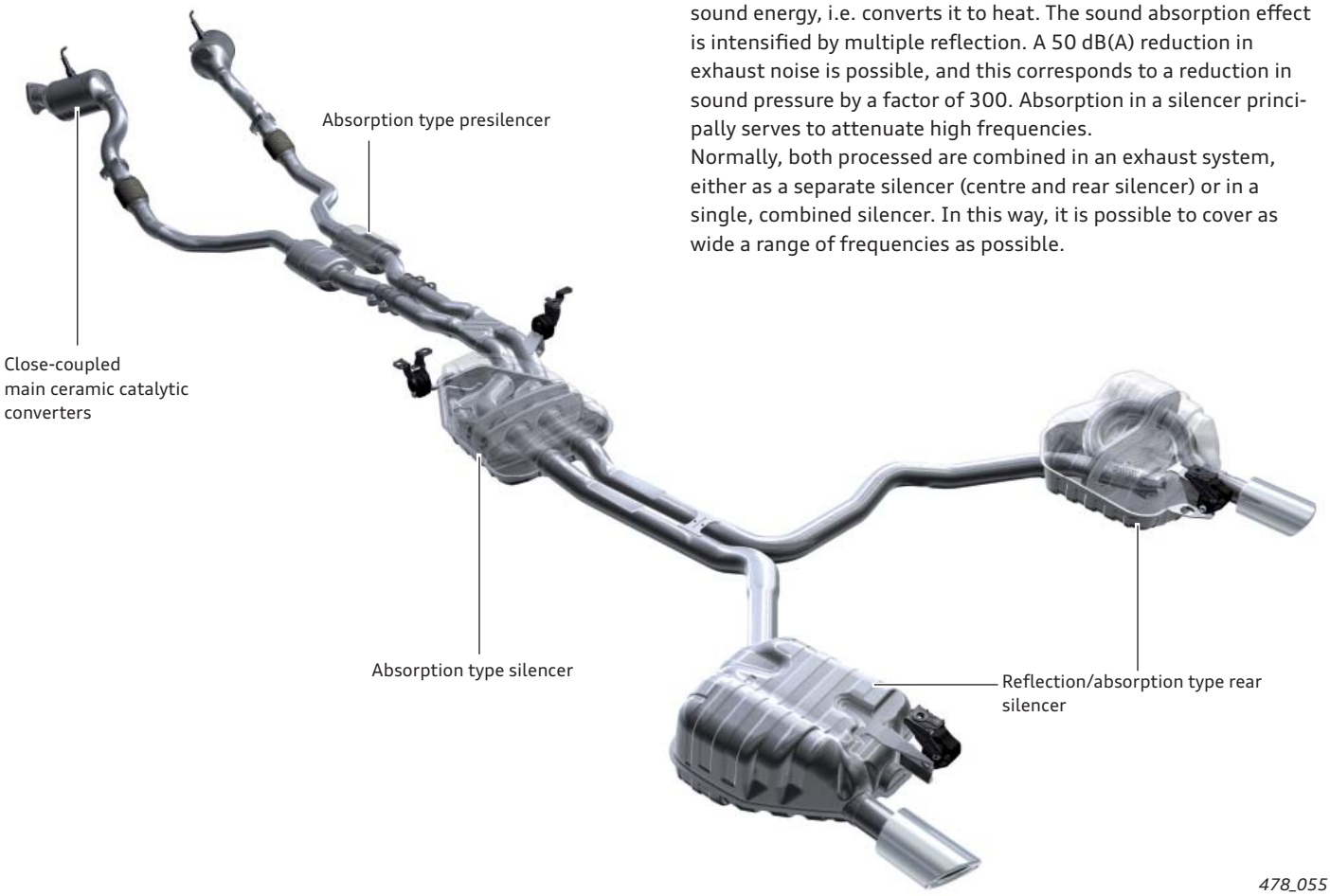
478_054

Reflection silencer

The silencer comprises multiple (typically four) chambers to utilise the principle of sound reflection. The sound pressure amplitude is averaged during multiple passes through the inner chambers, thus reducing the sound pressure peaks.

Reflections are produced in a silencer by baffles, wider and narrower cross-sections. However, the exhaust gas backpressure increases depending on design. Reflection in a silencer principally serves to attenuate low frequencies.

3.0l V6 TFSI engine



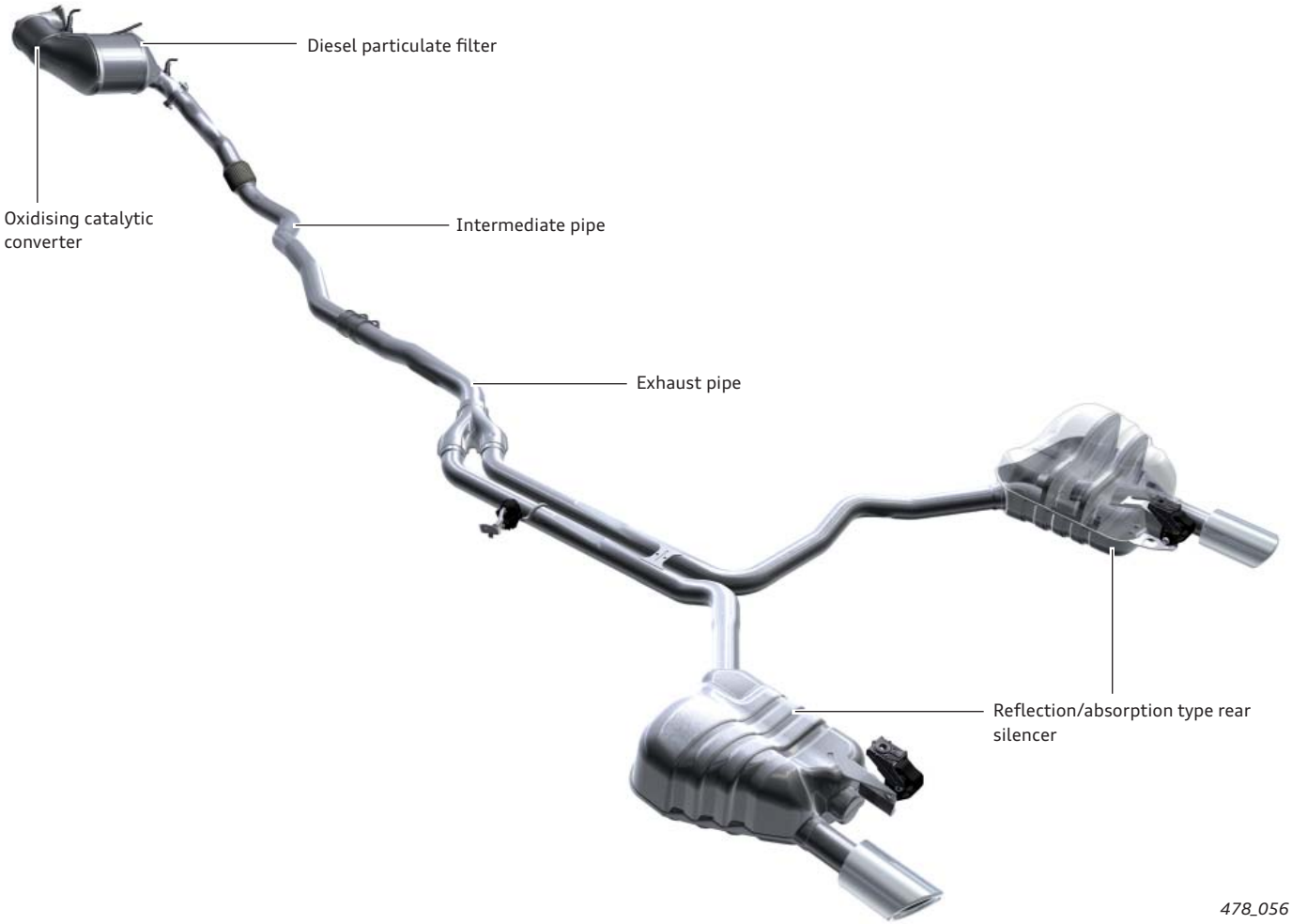
478_055

Absorption type silencer

An absorption type silencer consists of porous material, normally rock wool, glass wool or glass fibre, which partially absorbs the sound energy, i.e. converts it to heat. The sound absorption effect is intensified by multiple reflection. A 50 dB(A) reduction in exhaust noise is possible, and this corresponds to a reduction in sound pressure by a factor of 300. Absorption in a silencer principally serves to attenuate high frequencies.

Normally, both processed are combined in an exhaust system, either as a separate silencer (centre and rear silencer) or in a single, combined silencer. In this way, it is possible to cover as wide a range of frequencies as possible.

3.0l V6 TDI engine



478_056

Power transmission

Summary of new features

The Audi A7 Sportback fully utilises advantages of the new generation of gearboxes – with forward-shifted final drive – in the C series (see reference).

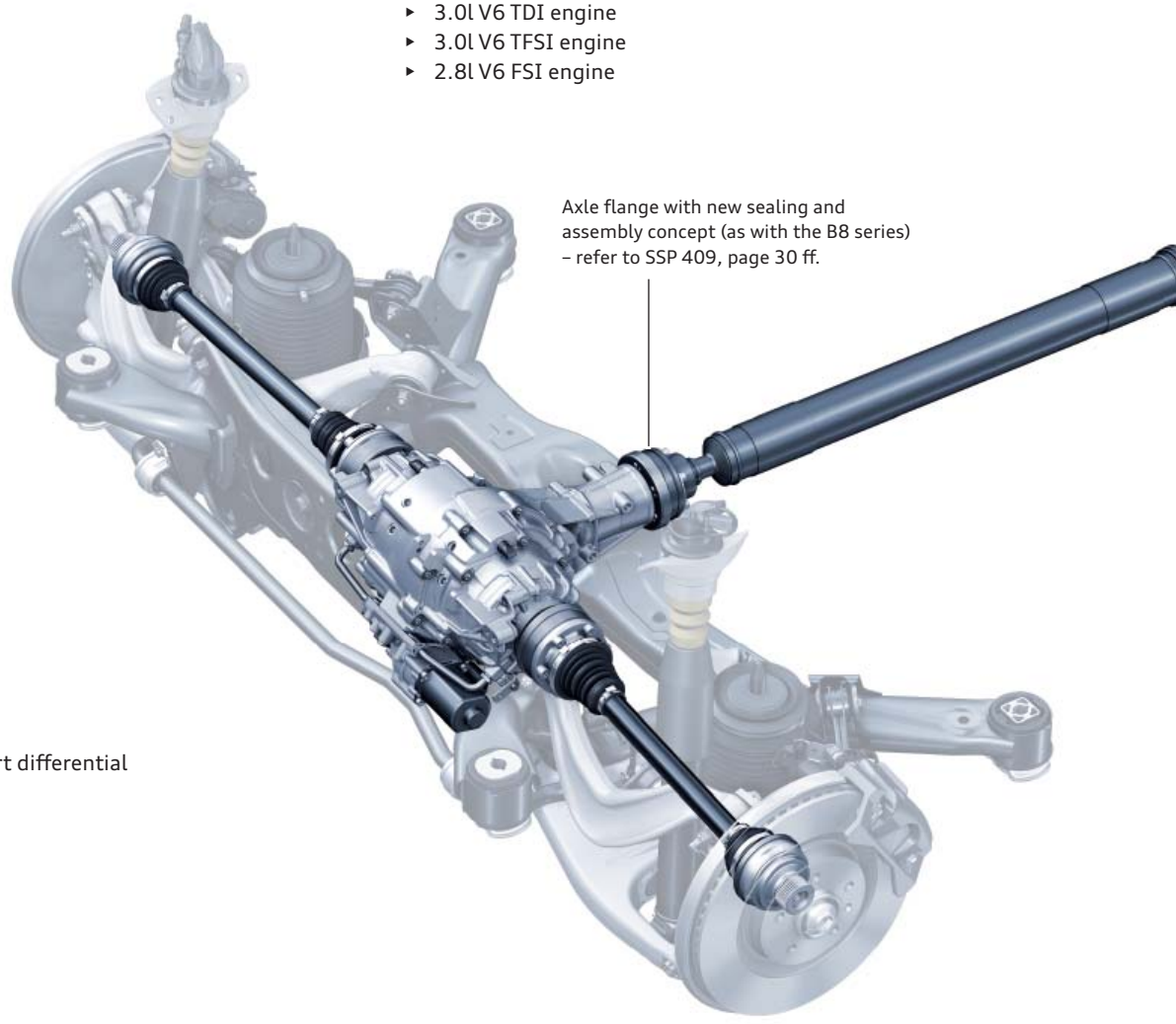
The Audi A7 Sportback will initially be available with a 7-speed dual clutch gearbox 0B5 and quattro drive.
The latest generation of the quattro powertrain – with crown-gear differential and torque vectoring – was first launched on the Audi RS5 and now also endows the Audi A7 Sportback with exceptional driving dynamics (see pages 32 and 33).

A front wheel drive version is scheduled for future release. There are no current plans for a manual gearbox on the Audi A7 Sportback.
The selector mechanism on the Audi A7 Sportback has been enhanced for easier use (see page 39).

478_011

**The 7-speed dual clutch gearbox 0B5 – S tronic –
will initially be used in combination with the following engines:**

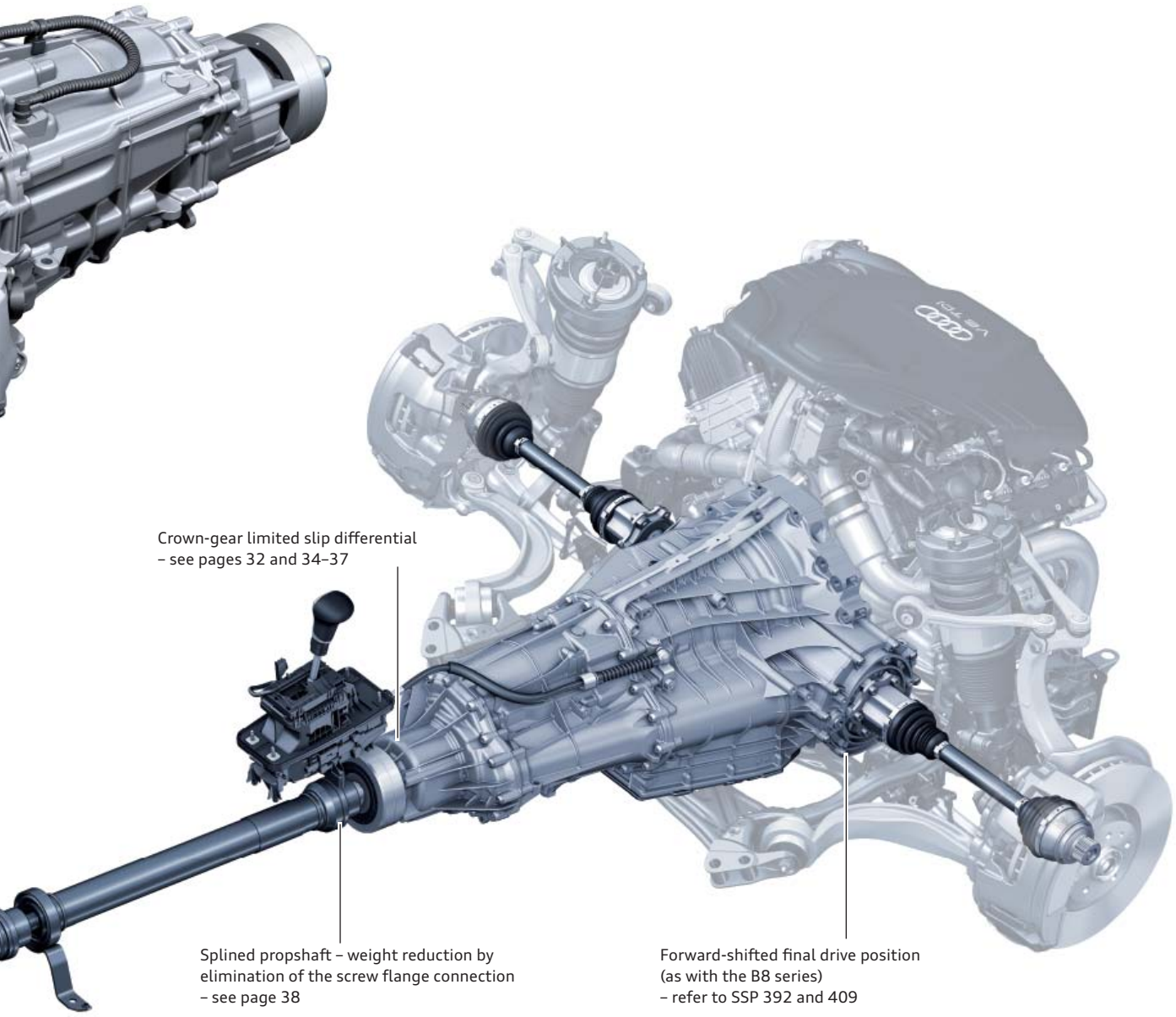
- 3.0l V6 TDI engine
- 3.0l V6 TFSI engine
- 2.8l V6 FSI engine



Rear axle differential
Standard:
Rear axle differential 0BC

Optional:
Rear axle differential 0BF – sport differential
– see page 33

Reference
The drive concept of the Audi A7 Sportback is in many respect identical to that of the B8 series (Audi A4/A5). For information about the axle position and the new sealing and assembly concept of the axle flange for the rear axle differential, refer to SSPs 392 and 409 as well as Audi iTV programme – Audi A5 Power Transmission – (broadcast on 02.2010). This information also applies to the Audi A7 Sportback and represents basic knowledge of this topic.



478_010

Future gearboxes on the Audi A7 Sportback

multitronic 0AW

478_027

To be able to offer a highly fuel efficient model in this class too, Audi is also planning a version with front wheel drive and multitronic gearbox 0AW.
multitronic 0AW is used in combination with the 2.8l V6 FSI engine (150 kW / 280 Nm) and the 3.0l V6 TDI engine (150 kW / 400 Nm).

8-speed automatic gearbox 0BK

478_018

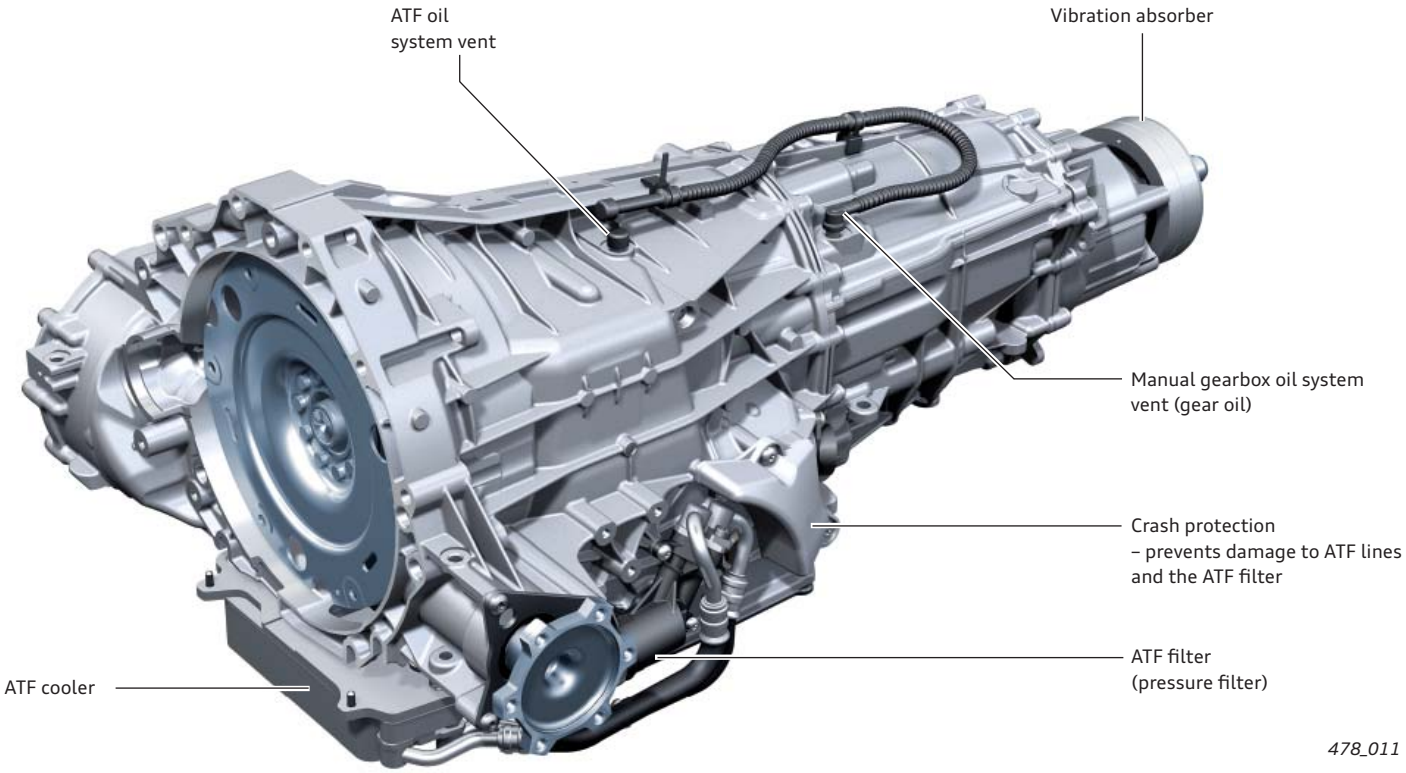
The 0BK gearbox is designed for the US market. It is also used in other markets in combination with high-performance engines (developing over 550 Nm). The 0BK gearbox derives from the Audi A8 '10 (D4 series) and is described in SSP 457. Unlike the Audi A8, the 0BK gearbox on the Audi A7 Sportback has a selector mechanism and mechatronics with selector lever cable.

New features of the 7-speed dual clutch gearbox 0B5 (S tronic)

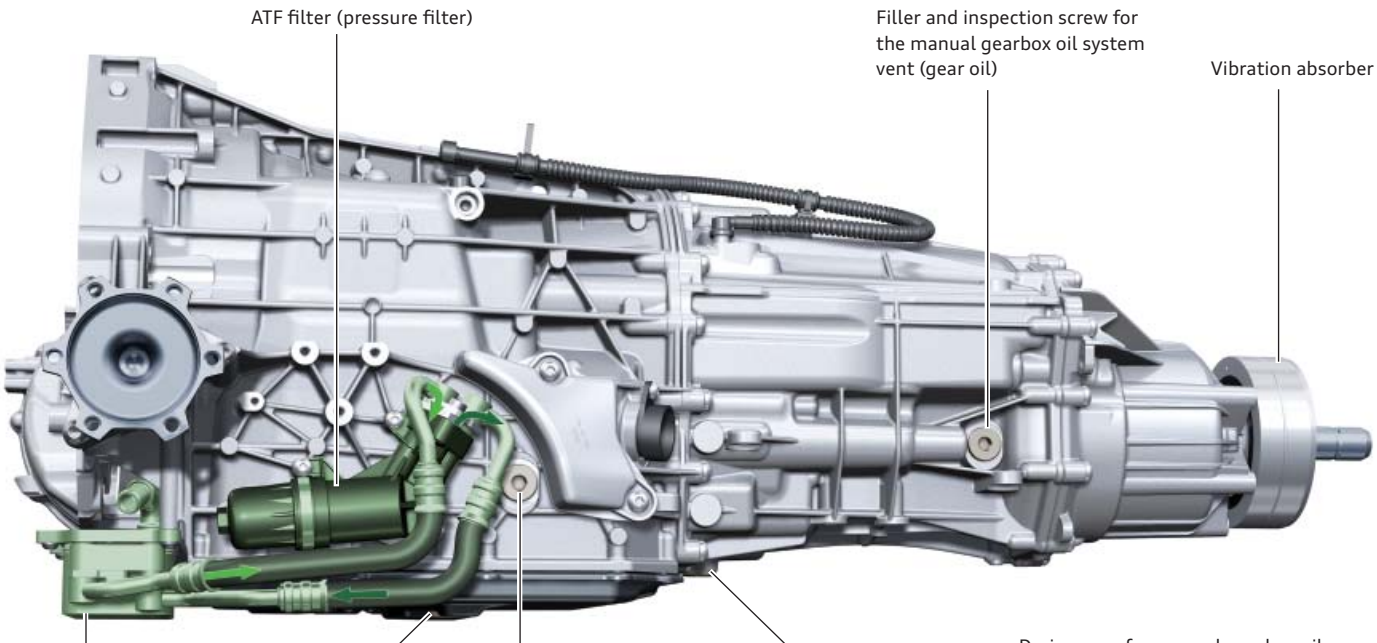
The Audi A7 Sportback marks the entry of S tronic to the C series. Thus, A7 Sportback owners can now enjoy all the advantages of the S tronic.
S tronic 0B5 combines sportiness, dynamism and driving comfort with excellent overall efficiency in an exemplary fashion.

The 7-speed dual clutch gearbox 0B5 is described in detail in SSP 429 "Audi Q5 – Engines and Transmissions". You will also obtain further information from the iTV programmes broadcast on 10.2008, 11.2008, and 04.2010.

Several modifications came into effect from week 22/2010. The key modifications relevant to service are explained below.



478_011



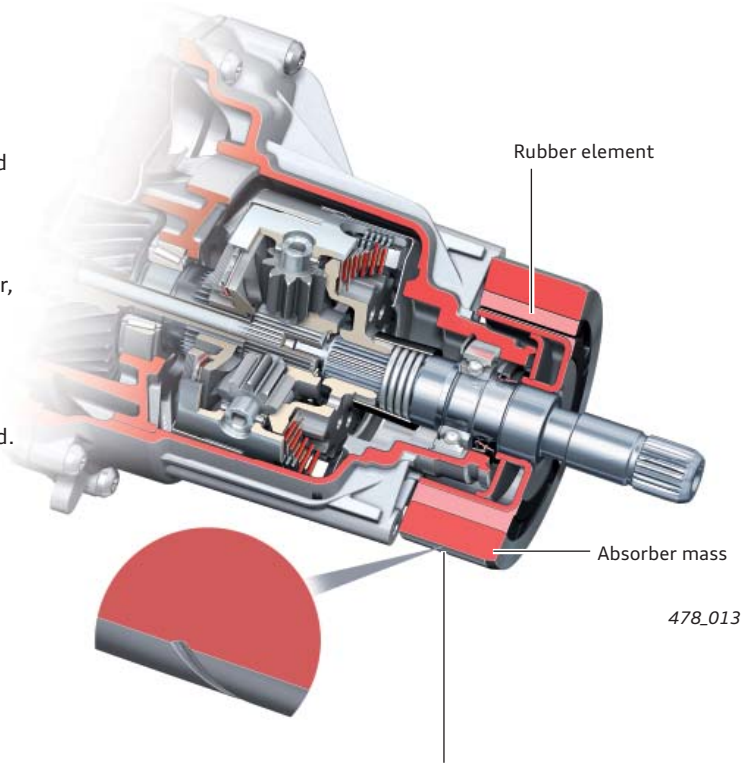
478_012

Vibration absorber[1)]

Depending on which engine is combined with the 0B5 gearbox, different vibration absorbers are used:

the flexural vibration absorber – is bolted to the gearbox cover and eliminates flexural vibration
the torsional vibration absorber – is press-fitted to the gearbox output shaft and eliminates torsional vibration
the combination absorber – is, like the torsional vibration absorber, press-fitted to the gearbox output shaft and eliminates flexural and torsional vibration

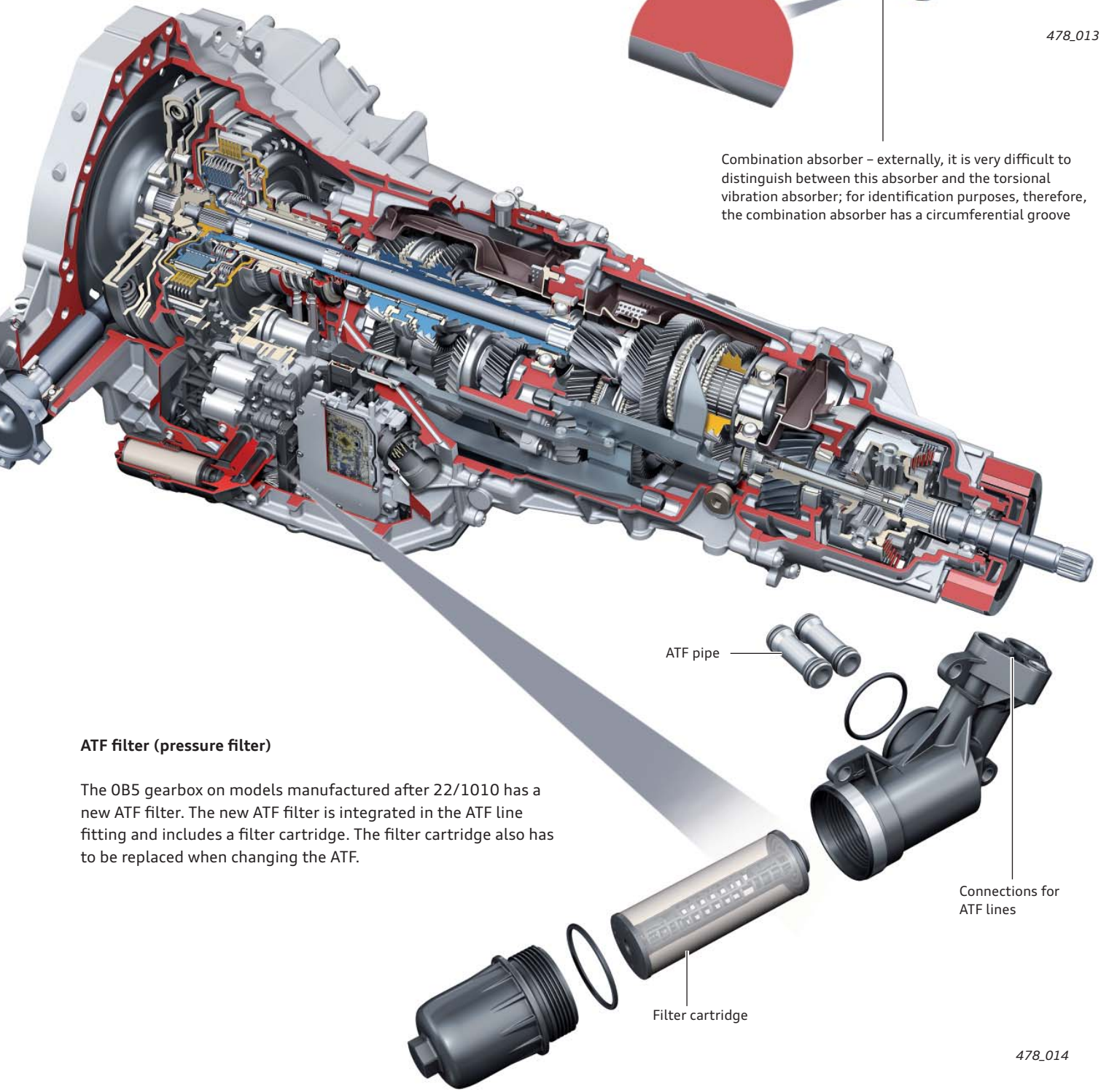
[1)] There are also versions in which no vibration absorber is installed. Pay attention to the correct assignments of the various absorbers in ETKA (electronic parts catalogue).



Combination absorber – externally, it is very difficult to distinguish between this absorber and the torsional vibration absorber; for identification purposes, therefore, the combination absorber has a circumferential groove

ATF filter (pressure filter)

The 0B5 gearbox on models manufactured after 22/1010 has a new ATF filter. The new ATF filter is integrated in the ATF line fitting and includes a filter cartridge. The filter cartridge also has to be replaced when changing the ATF.



quattro powertrain on the Audi A7 Sportback

To celebrate the 30th anniversary of the quattro, Audi presents a new evolutionary stage of the permanent four wheel drive for longitudinally mounted engines – the quattro drive with crown-gear differential and selective torque control.

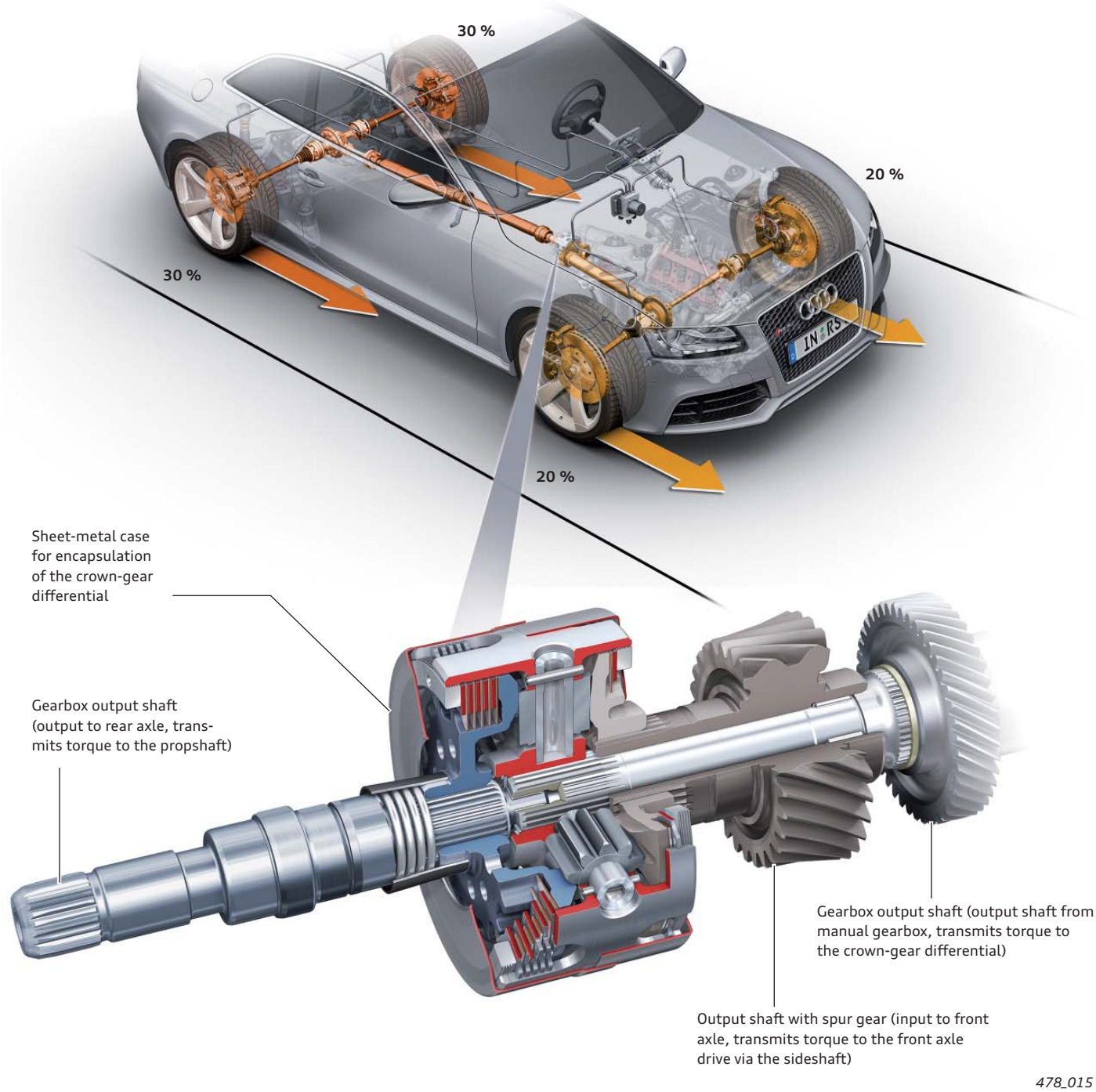
With not one, but two innovative in-house developments, Audi continues to extend its lead over the competition. These innovative technologies made their debut in the high-performance Audi RS5 coupé. There are iTV programmes showcasing these technologies for the RS5 (3rd and 4th quarter 2010).

Crown-gear differential

The crown-gear differential belongs – like its predecessor – to the category of limited slip centre differentials with asymmetric-dynamic torque split. It surpasses its predecessor thanks to a wider dynamic torque split – which improves traction – and better integratibility with electronic brake control systems.
Other strong points of the crown-gear differential are its compactness and low weight. At 4.8 kilograms, it is two kilograms lighter than the previous unit.

The basic torque split is 60 percent to the rear axle and 40 percent to the front axle. In the dynamic operating range (asymmetric-dynamic torque split), the differential distributes up to 85 of torque to the rear axle and up to 70 percent to the front axle.

The illustration shows the Audi RS5.



478_015

Torque vectoring

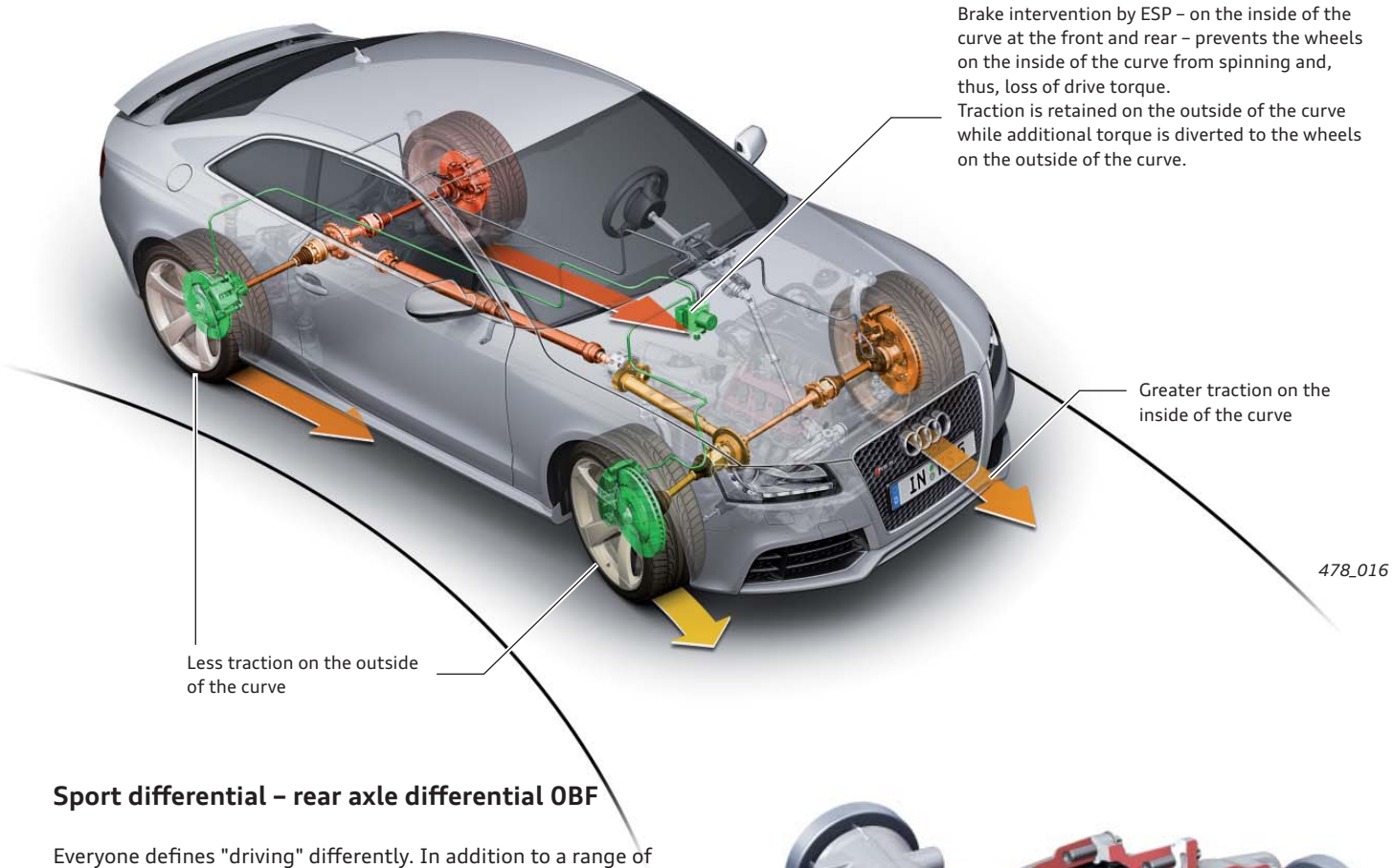
Audi pairs the crown-gear differential with a torque vectoring system. This software, specially developed by Audi, is integrated in the ESP control unit. Torque vectoring is evolutionary form of the electronic transverse lock (EDL) that is familiar from front-wheel-drive models. A new feature is that each of the four wheels is accessible.

When cornering at high speeds, the ESP control unit determines the reduced load on the wheels on the inside of the curve and the increased load on the wheels on the outside of the curve. From this information, it can determine the possible drive power for each individual wheel with a relatively high degree of accuracy. A lower brake pressure (approx. 3 – 15 bar) at the wheels on the inside of the curve is enough to counteract the onset of undesirable slip.

This means that torque vectoring intervenes before the wheels incur critical levels of slip that impair drive and dynamic stability. This means that more drive torque is available to the wheels on the outside of the curve, helping to maintain neutral handling for noticeably longer. Understeer when turning into corners and accelerating is, as it were, neutralised, and the ESP stabilisation program intervenes later – if it is even necessary at all. For further information, refer to SSP 457, page 66.

Vehicles with rear axle drive 0BC have torque vectoring on the front and rear axles. On models with a sport differential, torque vectoring acts only on the front axle; the torque control system of the sport differential acts on the rear axle.

The illustration shows the Audi RS5.

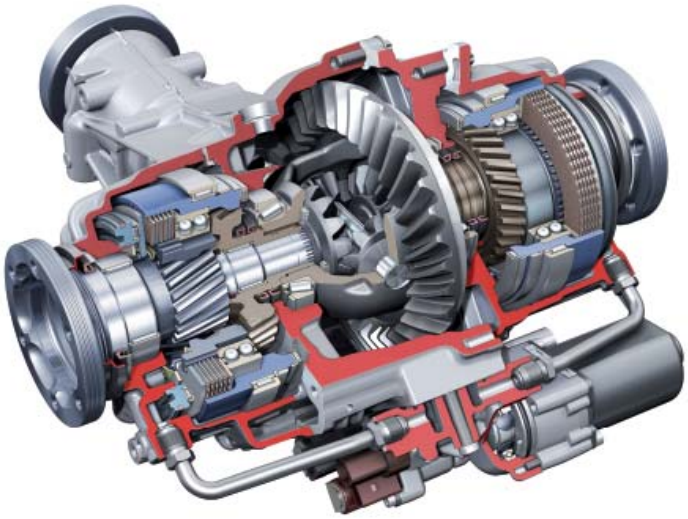


Sport differential – rear axle differential 0BF

Everyone defines "driving" differently. In addition to a range of other optional dynamics-enhancing systems, the sport differential is strongly recommended for anyone seeking to experience the true driving dynamics of the Audi A7 Sportback.

The sport differential of Audi A7 Sportback models manufactured after week 41/2010 will feature a special starting function. When driving off from a standing start, additional torque is diverted to the wheel with the better traction. If the left rear wheel begins to spin when driving off, more drive torque is diverted to the (stationary) right wheel by activating the speed modulation unit.

You will find out more about the sport differential in a total of four Audi iTV programmes.
Visit www.Audi-training-online.com.



478_017

Crown-gear differential

Design and function

Basically, the limited slip centre differential is a crown-gear differential comprising two crown gears and four cylindrical spur gears which transmit drive torque and act as differential gears. This configuration is closely matches that of the bevel gear differential as used in the final drive of a gearbox.

A special feature of this differential is that both crown gears have different reference diameters[1]. This provides the desired asymmetric torque split. The cylindrical differential gear shafts are mounted in bearings in the differential case.

On the back of both crown gears there is a multi-plate clutch which engages with the corresponding crown gear. The inner plates of both multi-plate clutches interlock with the crown gears, the outer plates with the differential casing. Threaded rings[2] act as counter-bearings of the multi-plate clutches and close the crown-gear limited slip differential.

Gearbox output torque is transferred to the differential case. Four shafts transmit the torque to the differential gears, which in turn transmit torque to both crown gears – one of which directs the torque to the front axle and the other to the rear axle. The multi-plate clutches give the differential the desired lock-up effect.

Background

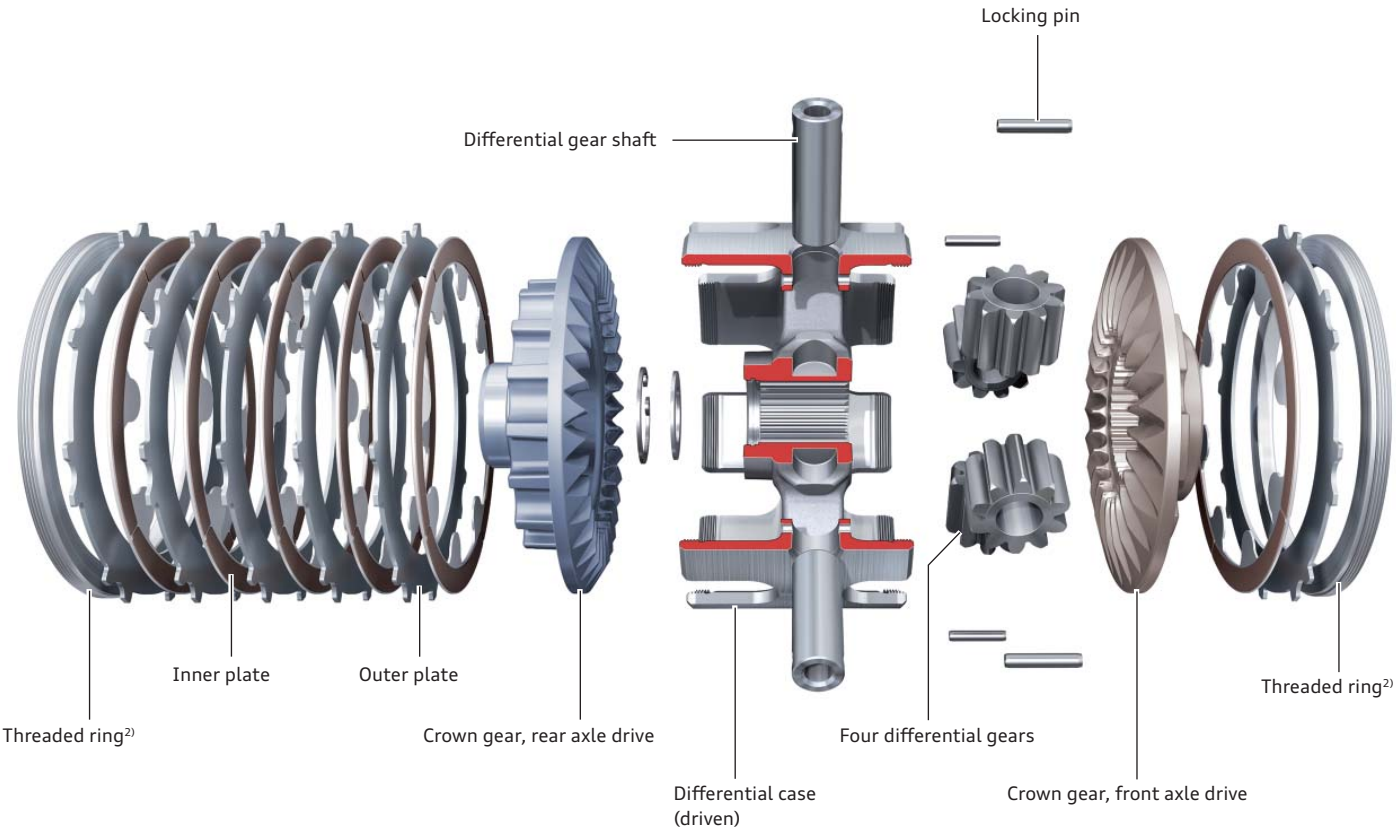
To understand the power distribution scheme of the crown-gear limited slip differential, one must consider two effects – **basic torque split** and **dynamic torque split** When the vehicle is in operation, the basic split is always superimposed by the dynamic torque split.

The appendage **"asymmetric"** means, in this context, that there are differing degrees of torque split between the front and rear axles.

An asymmetric limited slip centre differential is defined by four operating states:

- Distribution to the front axle under throttle
- Distribution to the front axle during overrun
- Distribution to the rear axle under throttle
- Distribution to the rear axle during overrun

In each of these four operating states, the differential has a different lock-up effect. The torque split in the above four operating states is defined at the design stage in order to provide the desired handling under throttle and during overrun.



478_019

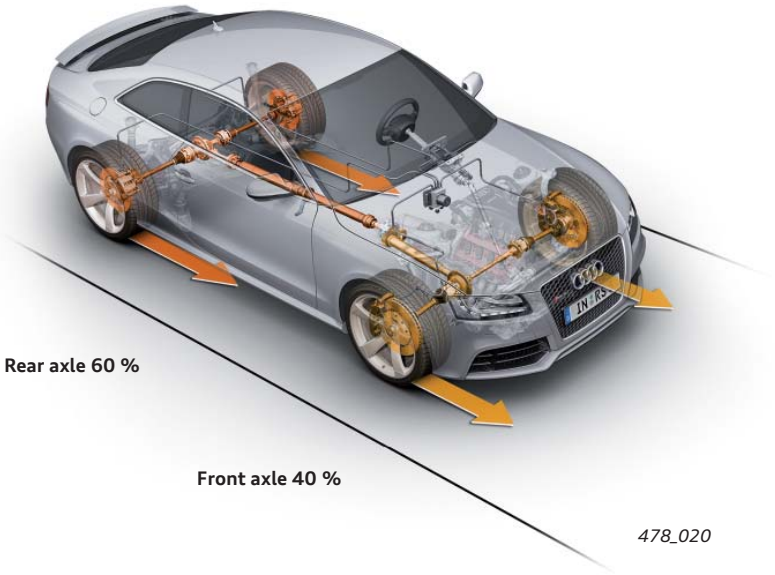
[1] The term "reference diameter" is used to describe the effective working diameter of a gear.

[2] The manufacturer uses threaded rings to eliminate clutch backlash and set a defined amount of clutch torque. The threaded rings are locked securely in place by means of spot welds and must not be detached.

Asymmetric basic torque split

As already mentioned, the different reference diameters of the crown gears (number of teeth) produce an asymmetric torque split. We refer to this torque split, defined by the geometry of the components, as the "asymmetric basic torque split".

The differential reference diameters produce different amounts of leverage, with the result that input torque is transmitted in a ratio of approx. 60 : 40. Hence, approx. 60 % of total drive torque is distributed to the rear axle differential and approx. 40 % to the front axle differential. The basic torque split is, in principle, effective in all operating states and is superimposed by the dynamic torque split. Together, they produce the asymmetric-dynamic torque split.



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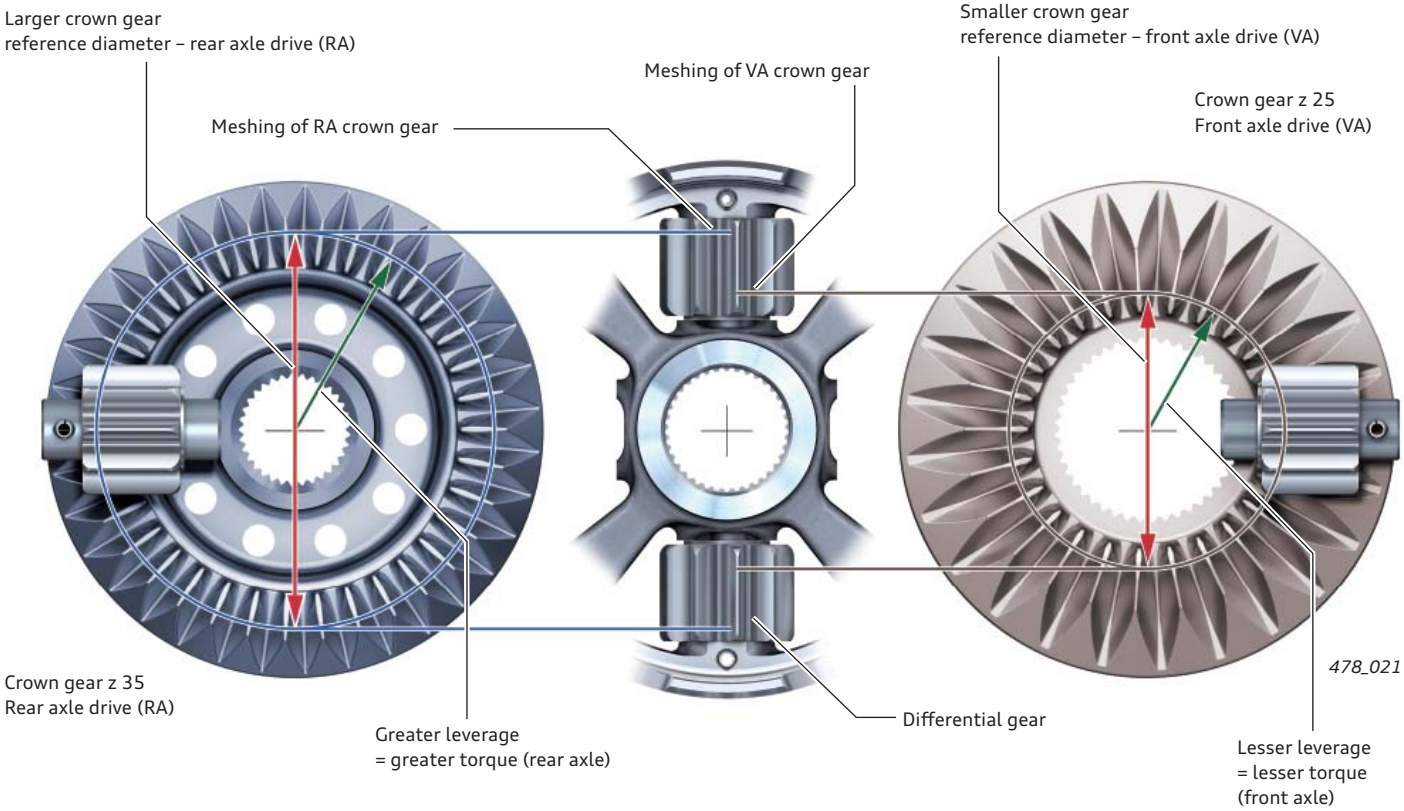

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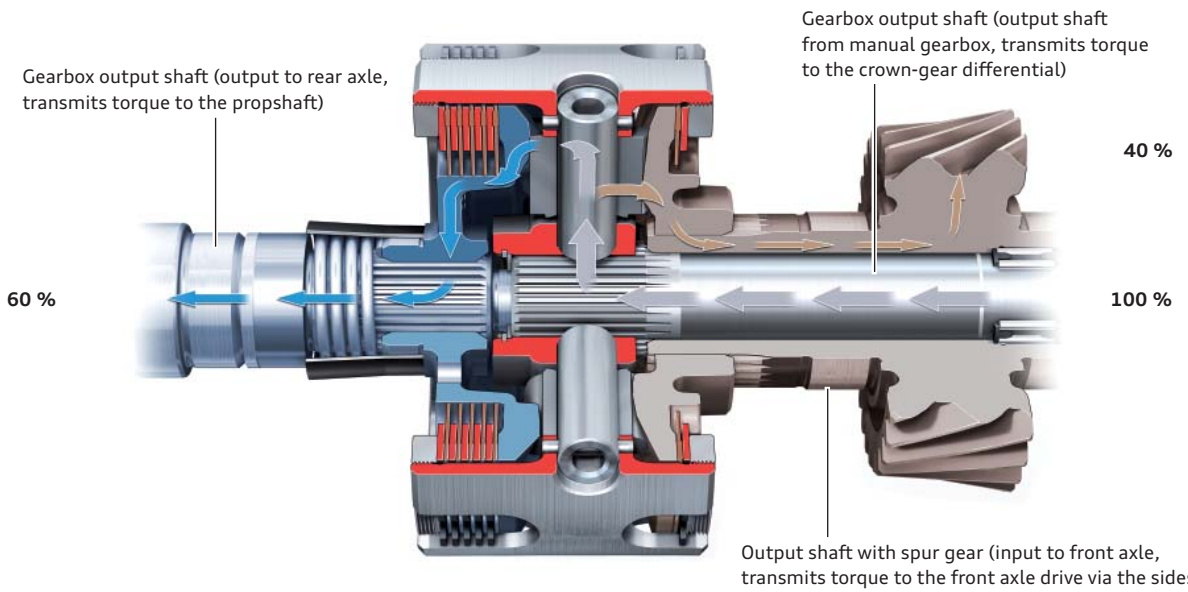


478_022

Asymmetric-dynamic torque split

In addition to the asymmetric basic torque split of approx. 40 : 60, a locking torque proportional to the drive torque is produced in the differential. This locking torque plus the basic torque split gives the possible torque distribution to both axles.

Thus, the crown-gear differential locks up before any changes in traction occur between the axles. If an axle loses traction, drive torque is immediately diverted to the other axle within the allowable lock-up range and according to how much traction the wheels have. If the working range is exceeded, ESP intervention delivers additional torque and, thus, provides forward propulsion.

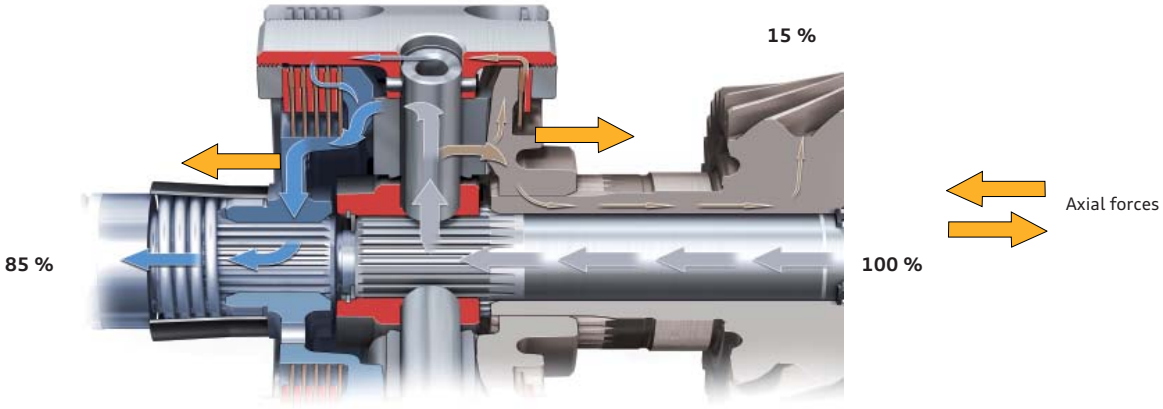
Function

As soon as torque is input into the crown-gear differential, an axial force occurs between the differential gears and the crown gears due to the tooth shape and design. The differential gears are supported by the opposing crown gears. Both crown gears are thrust in an axial direction and compress the clutch plate assembly. Depending on the axial force, this produces a clutch torque which positively connects the crown gears with the differential case.
This means that the clutch plate assembly is prestressed depending on drive torque, thus producing a corresponding lock-up effect. The lock-up effect is defined by the lock-up value. The lock-up value describes the output torque differential at both outputs resulting from the lock-up effect of the differential.

85 : 15 torque split

If the front axle loses traction – without yet exceeding the traction limit – the rear axle can transmit up to 85 % of drive torque. If the traction limit is exceeded, slip occurs at the wheels of the front axle.

When wheel slip exceeds a defined level, the ESP control system intervenes and produces additional torque. The additional torque, the basic torque split and the lock-up effect produce a corresponding drive torque at the rear axle.

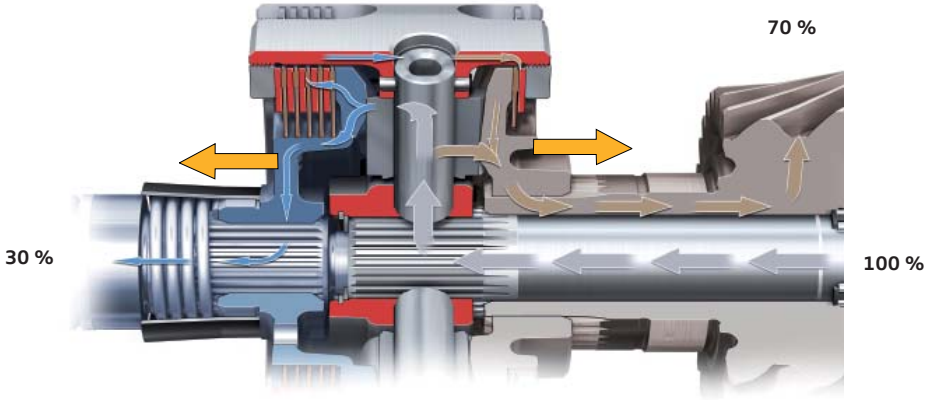


478_023

30 : 70 torque split

If the rear axle loses traction – without yet exceeding the traction limit – the front axle can transmit up to 70 % of drive torque. If the traction limit is exceeded, slip occurs at the wheels of the rear axle.

When wheel slip exceeds a defined level, the ESP control system intervenes and produces additional torque. The additional torque, the basic torque split and the lock-up effect produce a corresponding drive torque at the front axle.



478_024

Operating instructions

The crown-gear limited slip differential operates entirely independently, is maintenance-free and requires no driver input. The quattro powertrain, together with torque vectoring, offers driver a high standard of driving dynamics, safety and comfort. Nevertheless, there are a few points to note regarding the quattro powertrain.

- The crown-gear limited slip differential cannot be compared to a 100 % mechanical differential lock. If an axle or a wheel begins to spin, no drive will be available until the ESP has produced additional torque via brake intervention (EDL intervention). ESP does not intervene until it detects a defined engine speed differential and a corresponding engine torque. The driver must apply throttle until ESP produces additional torque by brake intervention. The additional torque results in drive torque at the tractive wheels. The crown-gear differential assists torque distribution in the way described above. To prevent the brake from overheating during heavy and extended ESP intervention, the EDL function is deactivated at a brake disc temperature computed by the ESP control unit. As soon as the brake has cooled down, the EDL function cuts in again automatically.

- Continuous synchronisation of high differential rotation speeds between the front and rear axles coupled with high engine load is harmful to the crown-gear differential.

- In the case of the Audi A7 Sportback, snow chains may only be fitted on certain wheel/tyre combinations and on the front axle only. Please note the guidelines and specifications in the Owner's Manual and in the tyres/wheels catalogue.

- Drive will not be available if the propshaft has been removed.

- A performance test can/may only be performed on the four-wheel roller dynamometer.

- A brake test can be safely performed on a slow-running test bench (max. 6 kph). The drive must be provided by the dynamometer.

- The vehicle must not be towed with the front or rear axle elevated (refer to Owner's Manual).

- When towing a model with an automatic gearbox, note that the maximum towing speed is 50 kph and the maximum towing distance is 50 km. The selector lever must be in the N position. Please also refer to the guidelines for towing models with an automatic gearbox in the Owner's Manual and in SSP 429 on page 45.

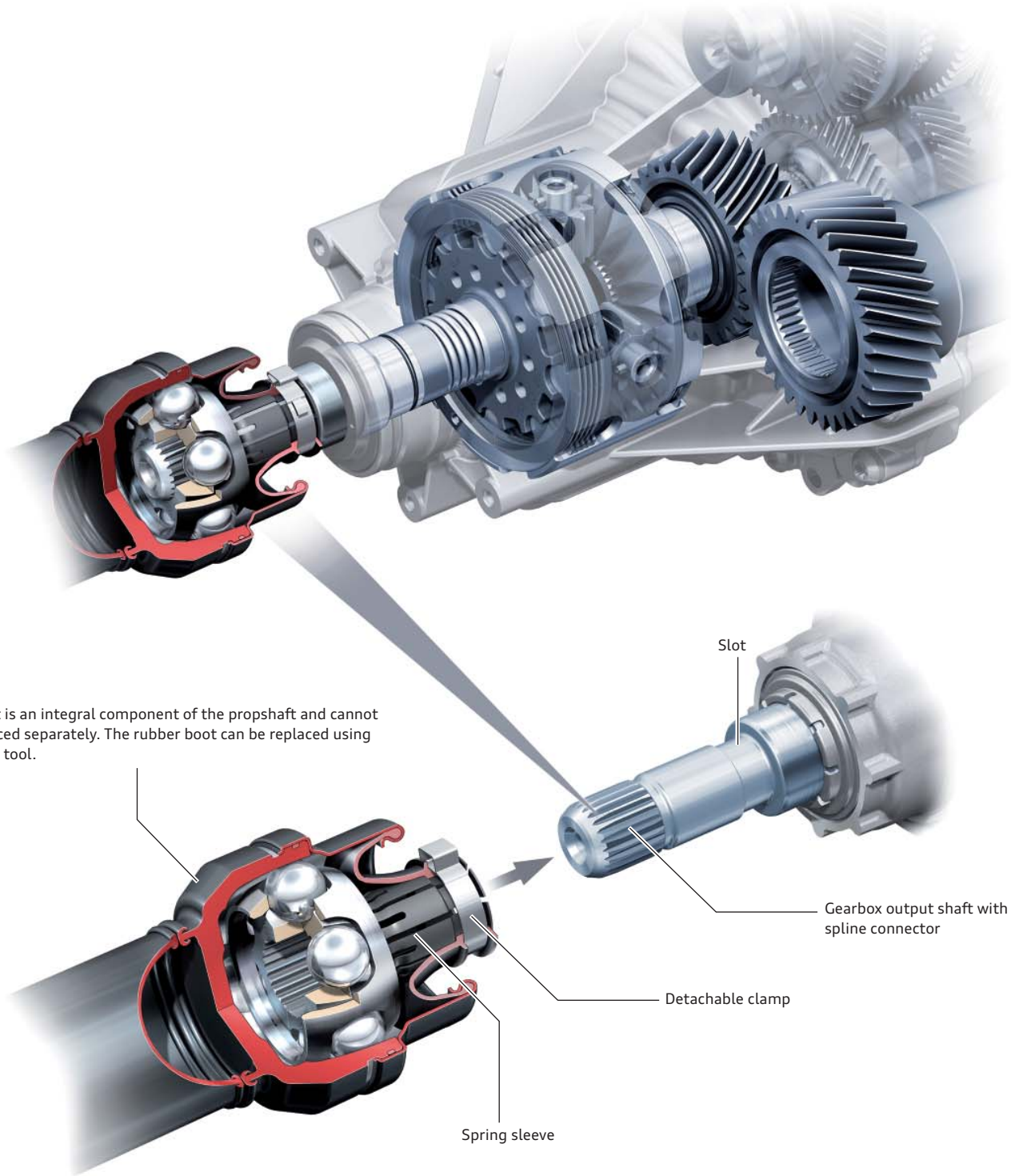
Reference
The mode of action of the crown-gear differential is identical to that of the previous limited slip centre differential. You will find further general information in Self Study Programme 363 "Audi Q7 – Transmission / Distributor Gear", page 18 ff.

Splined propshaft

The innovative new propshaft connector system was first used on the Audi A8 ’10. The propshaft is simply splined onto the gearbox output shaft. The connection is secured axially by a spring sleeve together with a detachable clamp. The spring sleeve interlocks with the inner race of the joint.

During assembly, the joint must be pushed onto the gearbox output shaft until the spring sleeve locks into the slot. The detachable clamp ensures that the joint is fixed securely and sealed tightly. This connector system is not only 0.6 kg lighter, but also saves a considerable amount of time during assembly and dismantling. The spline connector will be adopted for all other gearboxes in the course of further development.

The joint is an integral component of the propshaft and cannot be replaced separately. The rubber boot can be replaced using a special tool.



478_025

Selector mechanism

The operating logic of the selector for the sport program (speed S) has been reconfigured. To shift from D to S (or from S to D), the selector is flicked back out of D once only. The selector always springs back to the D/S position. The shift schematic has has been adapted to the new operating logic.

Advantages for the customer:

- on models equipped with Audi drive select, the S program can now be selected irrespective of the mode selected in Audi drive select.
- tiptronic mode can now also be selected in the S program

The shift schematic with gearshift indicator is integrated in the console trim frame. The display unit Y26 is installed from below as a separate component.

478_026

Reference
For further information about the selector mechanism, refer to Self Study Programme 409 "Audi A4 ’08", page 34 ff.

Suspension system

Introduction

One of the key development goals for the chassis of the safety and comfort was to provide outstanding agility, driveability and hence driving enjoyment combined with a high standard of safety and comfort. This was made possible by adopting the proven concept of the five-link front suspension in combination with a self-tracking trapezoidal-link rear axle. Like the Audi A8 and Audi A6 before it, the Audi A7 Sportback is available with adaptive air suspension (aas). This equipment is optional here; a steel-sprung suspension with conventional shock absorbers is standard.

In design terms, the Audi A7 Sportback employs the same power-train concept as that first realised on the Audi A5, with the wheel drive positioned ahead of the differential to provide a large wheel-base and small front overhang.

Compared to the Audi A6 '05, the wheelbase is 69 mm longer and the front axle track width is 15 mm larger. Mounting the steering gear on the subframe in front of the front axle provides the neces-sary, exact steering response and a precise steering feel in every driving situation.

Electrical power steering gives improved fuel economy of up to 0.3 litres per 100 km. Various additional functions can also be realised.

478_073

Production control number (PR)	Designation	Technical implementation	Ride height	Availability
1BA	Standard suspension	Steel springs	0 (basic ride height)	Standard
1BE	Sport suspension	Steel springs	–10 mm	Option
1BV	S Line sport suspension by quattro GmbH	Steel springs	–10 mm	Option
1BB	Heavy duty suspension	Steel springs	13 mm	Option
1BK	adaptive air suspension	Air suspension	depends on setup selected in Audi drive select	Option
1BS	adaptive air suspension for rough road markets	Air suspension		Option

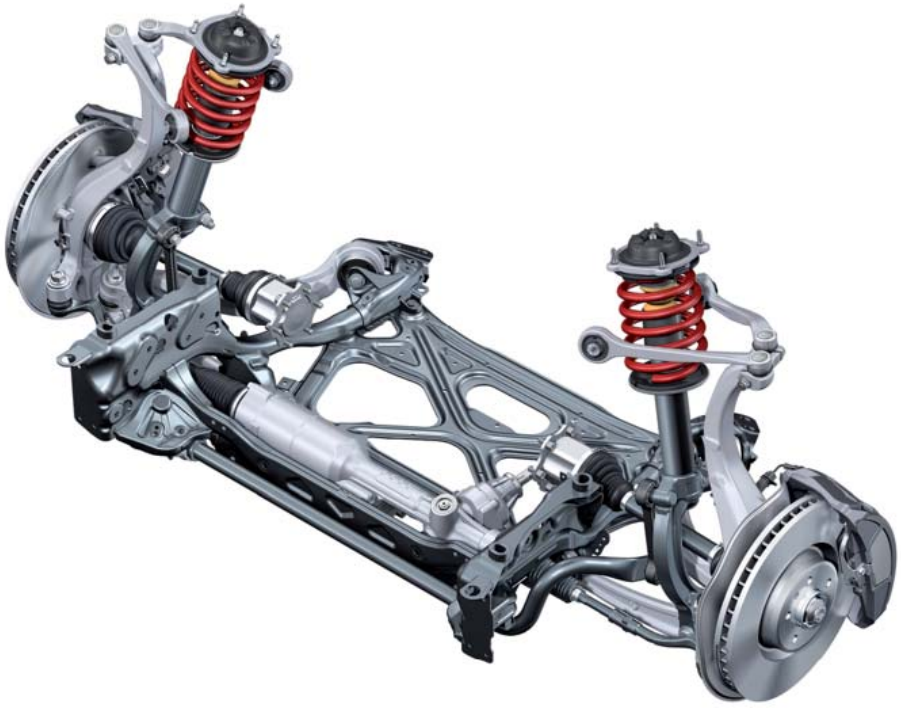
Reference
For further information about the suspension system of the Audi A7 Sportback, refer to Self Study Programme 480 "Audi A7 Sportback Suspension".

Axles

Front axle

The basis for the development of the front suspension was the five-link front suspension used on Audi models A4 ’08 and A8 ’10. On the Audi A7 Sportback too, the bearing pedestal supporting the upper wishbone has been integrated in the bodyshell.

In addition to saving weight and increasing rigidity, this also reduces the fitting tolerances of the upper wishbones. Antiroll bars and shock absorbers have been reconfigured.

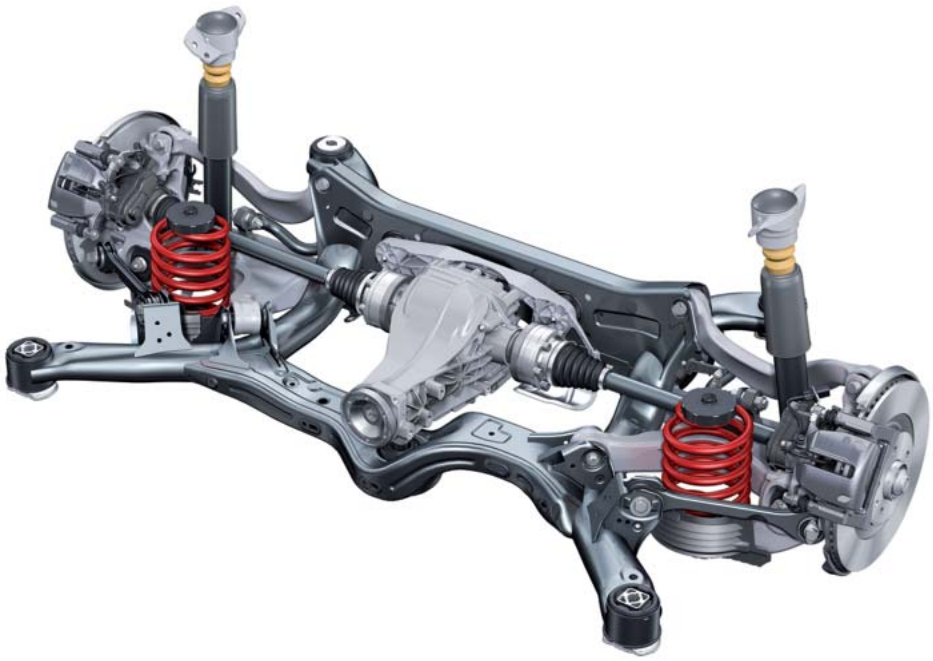


478_074

Rear axle

The basis for the development of the rear suspension was the trapezoidal-link rear axle previously used on the Audi Q5 ’09.

Springs and shock absorbers are spatially separated from one another, thus providing a large through-loading width and a flat load floor.



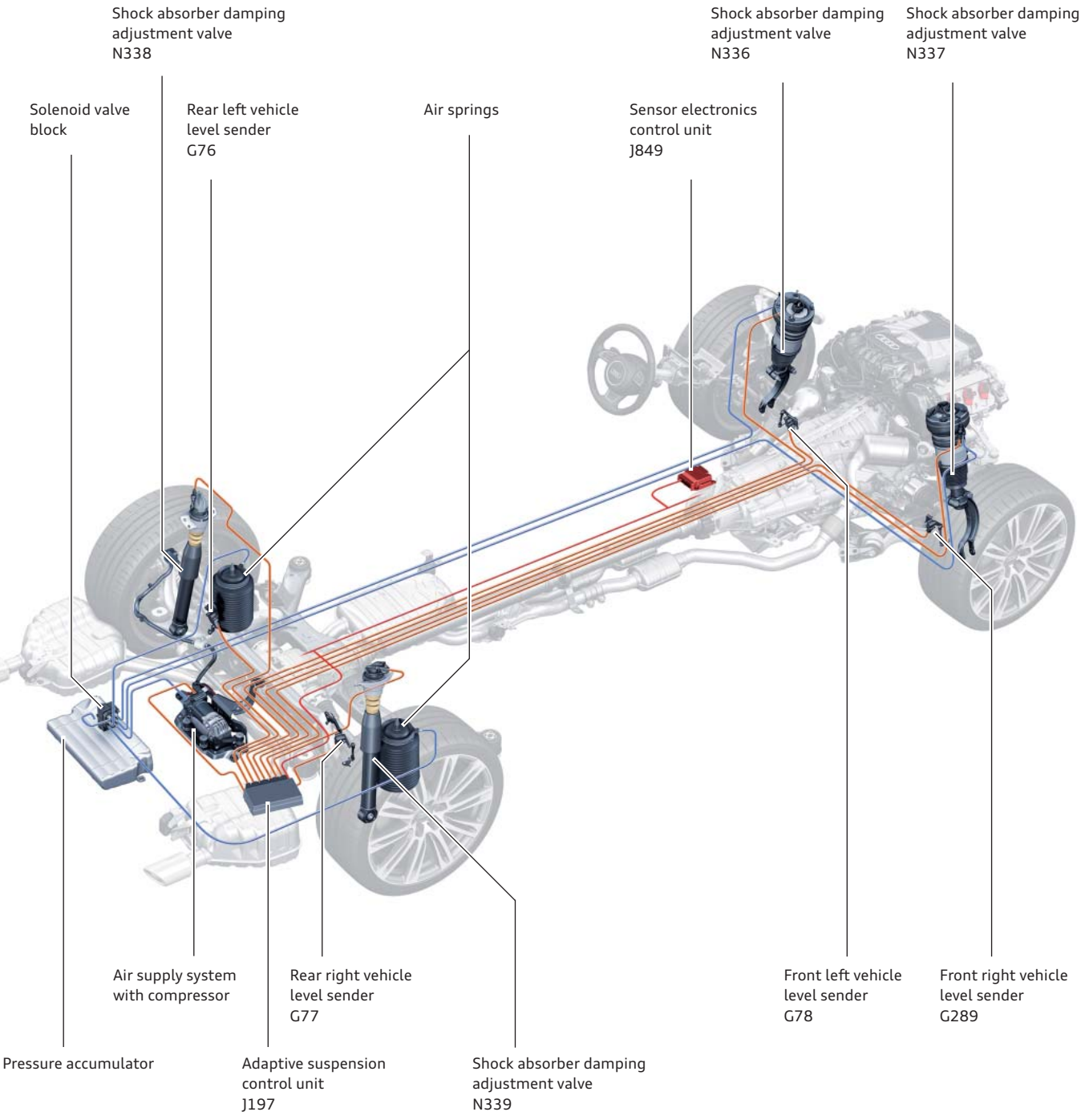
478_075

adaptive air suspension (aas)

Overview

The adaptive air suspension system of the Audi A7 Sportback basically has the same design and function as that of the Audi A8 '10. Two different systems are optionally available for the Audi A7 Sportback. The adaptive air suspension with production control number 1BK is the basic system.

The 1BS suspension developed specially for use on rough roads is available for certain markets. Both systems have different control programs; the system components are identical.



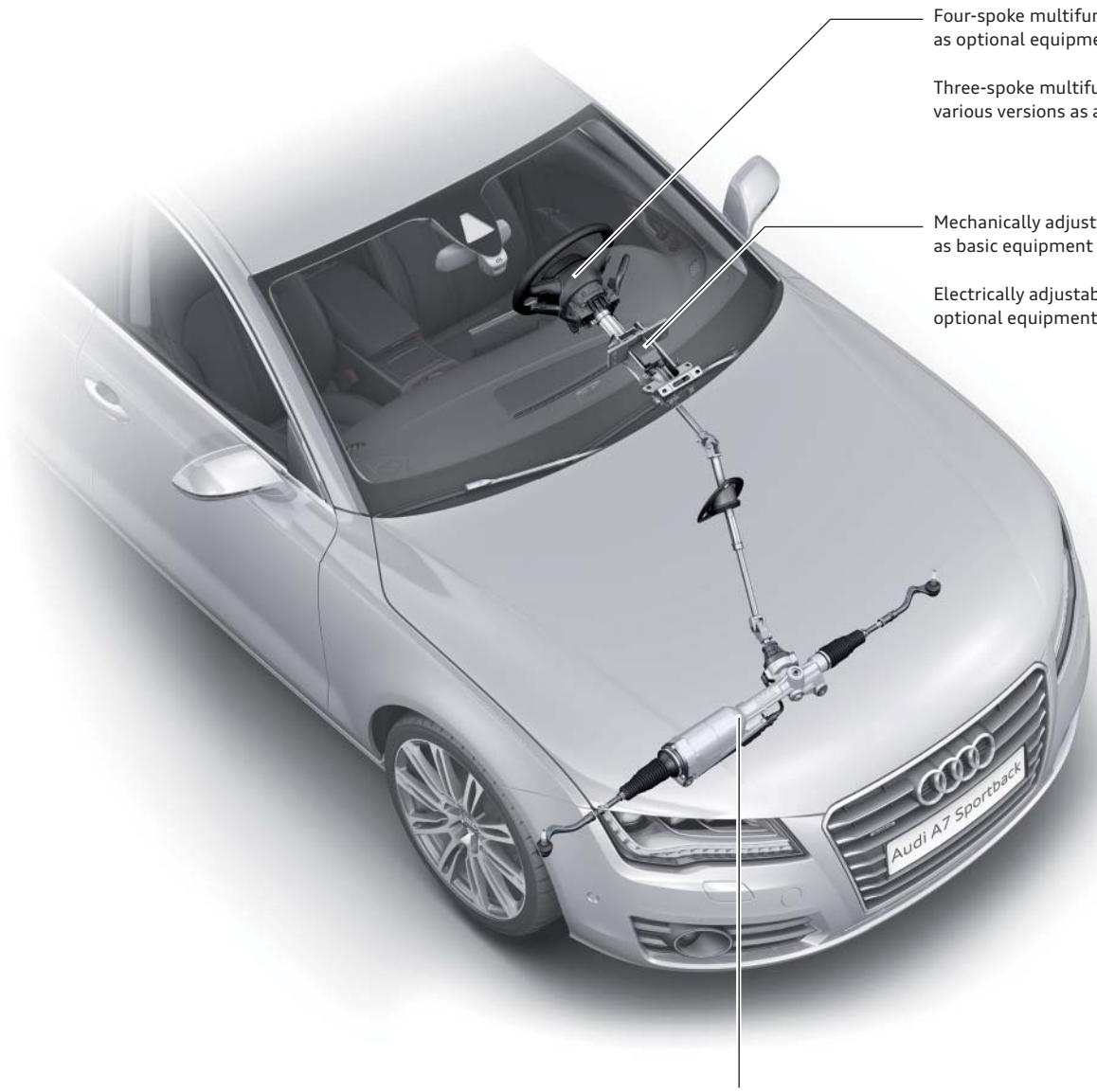
478_076

Steering system

Overview

The key innocation in the steering system of the Audi A7 Sportback is the use of electromechanical steering. The Servotronic® function is, therefore, standard equipment. The steering column is mechanically adjustable in basic trim.

An electrically adjustable steering column is optional. In basic trim, the vehicle comes equipped with a four-spoke multifunction steering wheel. As an option, a three-spoke multifunction sports wheel can be ordered in various versions.



Brake system

Overview

The brake system of the Audi A7 Sportback is a further development of the current brake systems on Audi A4 ’08 models as well as those of the Audi A8 ’10. Both 16 and 17 inch systems will be used at the start of production. The electromechanical parking brake (EPB) functions as a parking brake.

A high-performance ESP by Bosch with an extended range of functions provides a high standard of safety. As previously on the Audi A8 ’10, the sensor electronics control unit J849 supplies the information on vehicle dynamics required to calculate the control operations.

478_078

adaptive cruise control (ACC)

ACC will also be available as an option for the Audi A7 Sportback. The dual sensor system previously introduced in the Audi A8 ’10 is now also used on the Audi A7 Sportback.

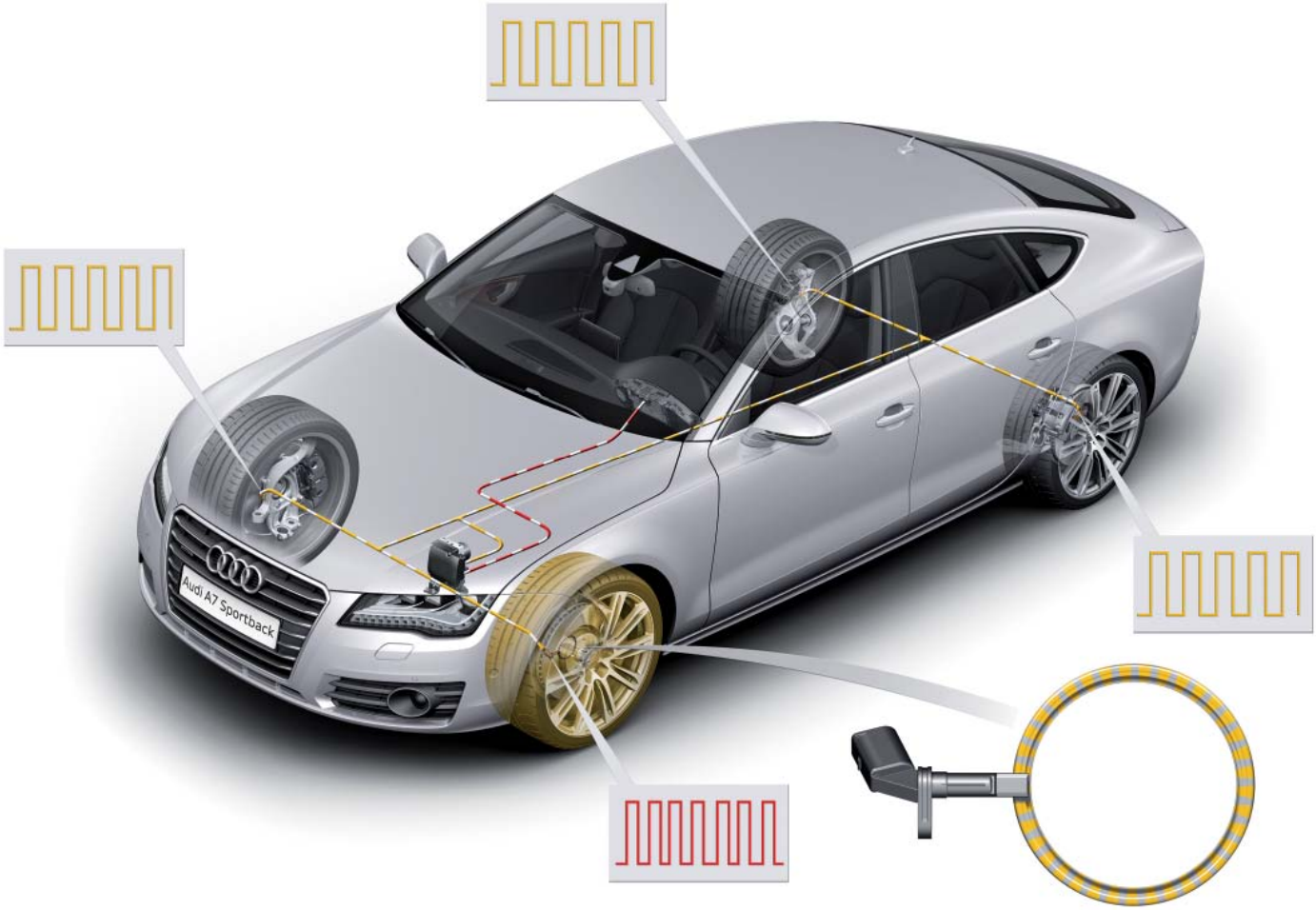
478_079

Wheels and tyres

From start of production, the Audi A7 Sportback comes as standard with 17 inch lightweight aluminium forged wheels. 18 to 20 inch wheels are optionally available. Tire Mobility System (TMS) is standard equipment; a space saver spare wheel is optionally available.

Tyre pressure indicator

The familiar second-generation tyre pressure monitoring system, the "tyre pressure indicator", is also used on the Audi A7 Sportback. The system is fitted as standard on this model world-wide. The system is identical to those already in use on other Audi models in terms of its design, function, operation and driver information, as well as its scope of servicing and diagnostics.



478_080

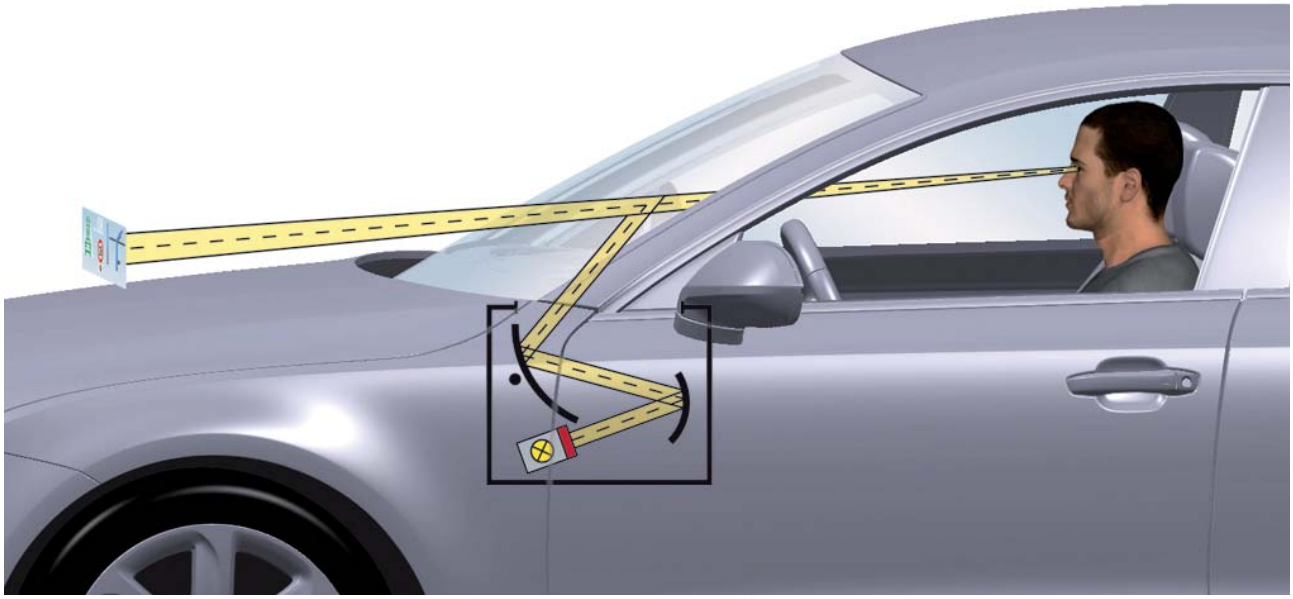
Electrical system

Head-up display

Introduction

The term "head-up display" describes optical systems which project information from various automotive systems into the driver's extended field of vision. To view this information, the driver does not have to change his/her head position significantly and can continue to focus on the road ahead while maintaining an upright posture. Since the driver's head can remain "up" and need only be lowered slightly, the system is referred to as a "head-up" display.

The use of special windscreens on models with a head-up display give the impression that the head-up display is not actually in the windscreen area, but at a comfortable distance of between two and two and a half metres away from the driver. The head-up display appears to hover over the bonnet.



478_045

Windscreen projection system control unit J898

The central element of the head-up display is the windscreen projection control unit J898. All optical, mechanical and electrical components required for the head-up display are accommodated in this control unit. It is located in the dash panel directly in front of the instrument cluster.

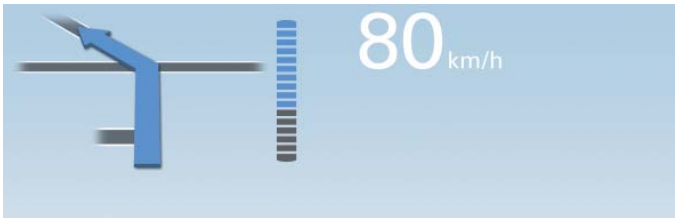
The windscreen projection control unit J898 is self-diagnosable and addressed with **address word 82**.

478_052

Note
If a component of control unit J898 malfunctions, the complete control unit must always be replaced.
The windscreen has to be replaced when replacing control unit J898. For further information about removing control unit J898, refer to the relevant Workshop Manual.

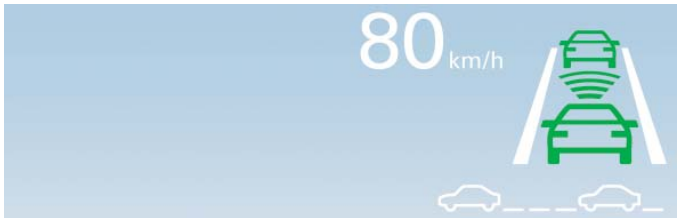
Displays of the head-up display.

The head-up display can show the following content.



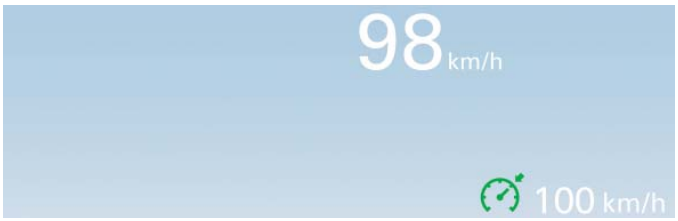
478_046

The current vehicle speed is the only vehicle variable that is always displayed. This display **cannot** be deactivated by the driver. Navigation information is only displayed when the route guidance function is active.



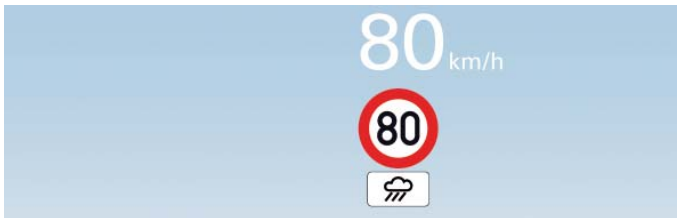
478_050

The display at the top right appears if ACC or Audi active lane assist is activated. The current control speed of the ACC is displayed briefly at the bottom right after an adjustment is made.



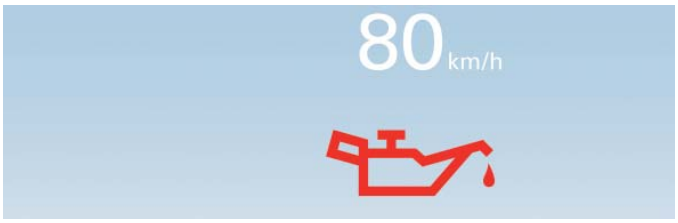
478_047

The current control speed of the cruise control system is displayed briefly at the bottom right after an adjustment is made.
The same also applies when the control speed of the ACC is changed.



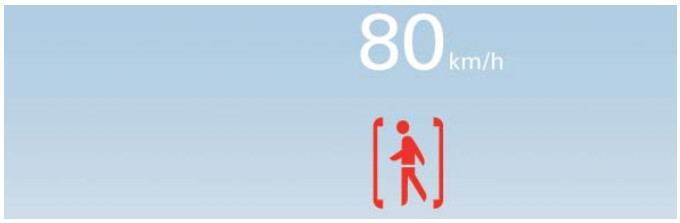
478_051

The current speed limits determined by the speed limit indicator are still displayed. Selected additional signs can also be displayed.



478_049

If red warning signals appear in the instrument cluster, they also appear on the head-up display. The display of red warning symbols cannot be deactivated. They are only displayed briefly.
When red warning signals are displayed, all other content is suppressed apart from the vehicle speed.



478_048

Audi night vision assist warnings can also be indicated on the head-up display.

Note
The displays of the navigation system, speed limit indicator, night vision assist, cruise control system and the combined display of the Audi active lane assist and ACC systems can be activated or deactivated via the MMI on the head-up display.

Speed limit indicator

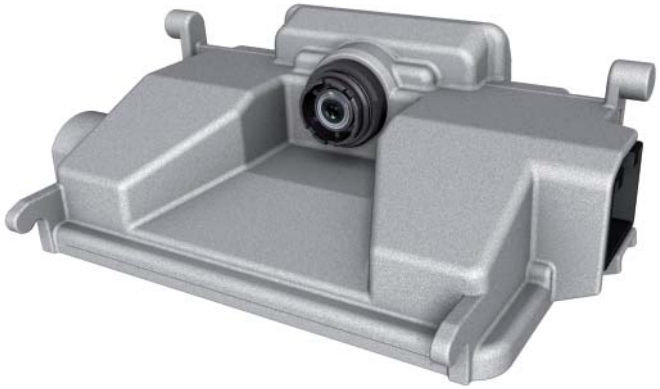
System components

The speed limit indicator utilises the image processing system and the MMI Navigation Plus system known from the Audi A8 ’10.

The image processing system consists of the camera control unit J852 for recording the area in front of the vehicle and the image processing control unit J851 for the evaluation of camera images.

The camera images are transferred from the camera control unit to the image processing control unit, where they are analysed for road signs indicating speed limits.

The software of the speed limit indicator function is also integrated in the image processing control unit J851.



478_036

Camera control unit J852

478_037

Image processing control unit J851

The speed limit indicator function compares the visually detected speed limits to the speed limits contained in the navigation data. If both systems have different information, the information of either the image processing system or the navigation system is prioritised and displayed depending on the actual situation.

If either source of information fails, the speed limit indicator will continue to function but with reduced features. A message indicating this will appear on the display of the driver information system.

Note
No driver alert is given when the vehicle exceeds the speed limit! Neither does the system intervene in the driving process.

Road signs displayed by the speed limit indicator

In the following section, all road signs that can be displayed by the speed limit indicator are, by way of example, shown with a speed limit of 80 kph.

478_038

1. A speed limit without any additional sign

478_039

2. A speed limit with the additional sign "Only in wet conditions"

The road sign with the restriction "only in wet conditions" is normally detected by the image processing system. If it has been detected, it is displayed regardless of the actual weather conditions.

If the image processing system has not clearly recognised the additional sign, but the navigation data includes a speed limit with the additional sign "Only in wet conditions" for this section of road, the additional sign "Only in wet conditions" is also displayed.

478_040

3. A speed limit with a time restriction

The image processing system cannot reliably identify the exact time restriction from the camera image. This information is extracted from the navigation data. From the camera image the system registers only that it is a road sign indicating a speed limit with an additional sign.

The additional sign is always represented graphically by a clock symbol which does not show the exact time restriction.

This road sign is always displayed regardless of the actual time. It is, therefore, displayed even if the time restriction does not momentarily apply.

478_041

4. A speed limit with the additional sign "Only when towing trailer"

This road sign is displayed only if the menu option "Signs for trailers" has been activated in the MMI. If this is not the case, a speed limit with the additional sign "Only when towing trailer" is always shown on the full screen display. The trailer detector control unit J345 does not evaluate CAN messages for controlling the display.

Display media of the speed limit indicator

The road signs of the speed limit indicator can appear on the following displays:

1) On the full screen display of the driver information system

478_042

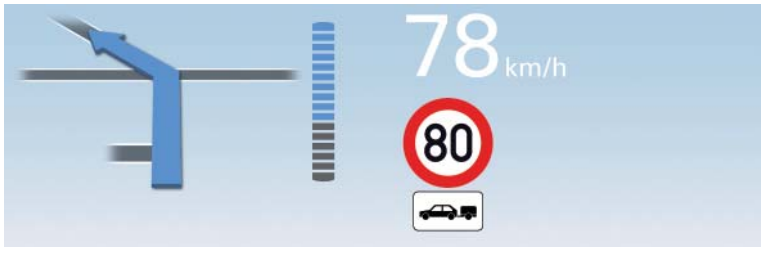
- Display of up to three speed limits simultaneously
- Road signs with or without additional signs

2) On the additional display of the driver information system (top left display)

478_043

- Only one speed limit can be displayed
- Road sign with or without additional sign
- The information displayed is prioritised if necessary

3) On the head-up display



478_044

- Only one speed limit can be displayed
- Road sign with or without additional sign
- The information displayed is prioritised if necessary

Reference
For more detailed information about the head-up display and the speed limit indicator, refer to Self Study Programme 482 "Audi A7 Sportback – Head-up Display and Speed Limit Indicator".

Audi active lane assist

Audi launched the Audi lane assist system in 2007. This system helps drivers stay in line while driving. Lane marking lines are identified with the aid of a camera.

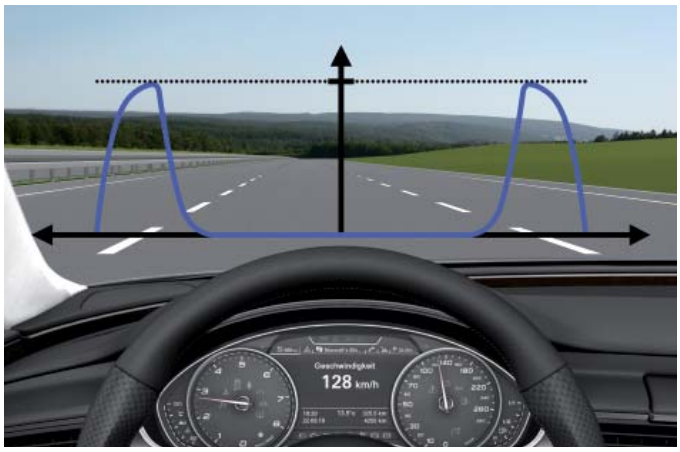
If the vehicle approaches an identified lane marking line and is about to leave the lane inadvertently, the steering wheel vibrates to alert the driver. If the driver activates the indicators when crossing over a lane marking line, the warning is suppressed since the system assumes that the lane change is intentional.

New features of Audi active lane assist

The Audi A7 Sportback employs a new generation of the lane assist system: Audi active lane assist. The electromechanical steering on the Audi A7 Sportback has made possible the introduction of this new-generation system.

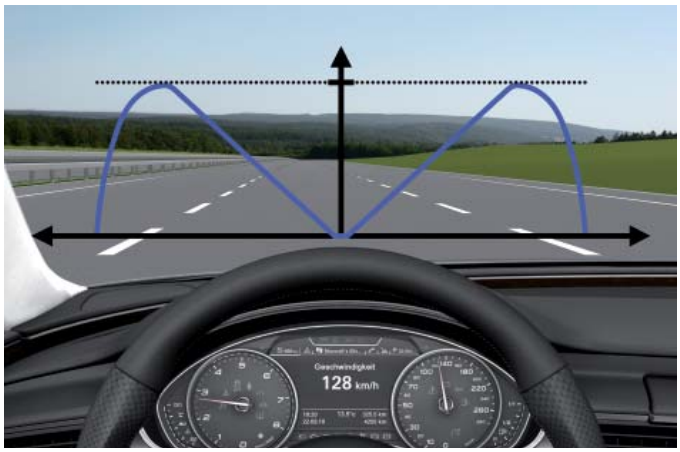
The Audi active lane assist has the following new features:

- Corrective steer control by the electromechanical steering motor.
- A system mode which is activated when the vehicle approaches a lane marking line and is designed to ensure that the driver does not leave his/her lane inadvertently. To achieve this, the power steering motor V187 briefly applies some torque to the steering which steers the vehicle back towards the centre of the lane. This is the default mode on the MMI when the new vehicle is delivered to the customer.



478_064

- A system mode which helps the driver keep to the centre of his/her lane by continuous corrective steer control. The further the vehicle moves away from the centre of the lane, the greater the steer torque applied by the power steering motor V187. This mode can be selected by the customer on the MMI control panel.



478_065

- Steering wheel vibrations are produced by the electromechanical steering motor, and no longer by an unbalanced motor in the steering wheel spoke.
- The vibration alert function can be deactivated on the MMI control panel.
- The master control unit for this function is the image processing control unit J851, and no longer the camera control unit J852 or the Audi lane assist control unit J759.

Reference
For more detailed information about Audi active lane assist, refer to Self Study Programme 483 "Audi A7 Sportback – Convenience Electronics and Audi active lane assist".

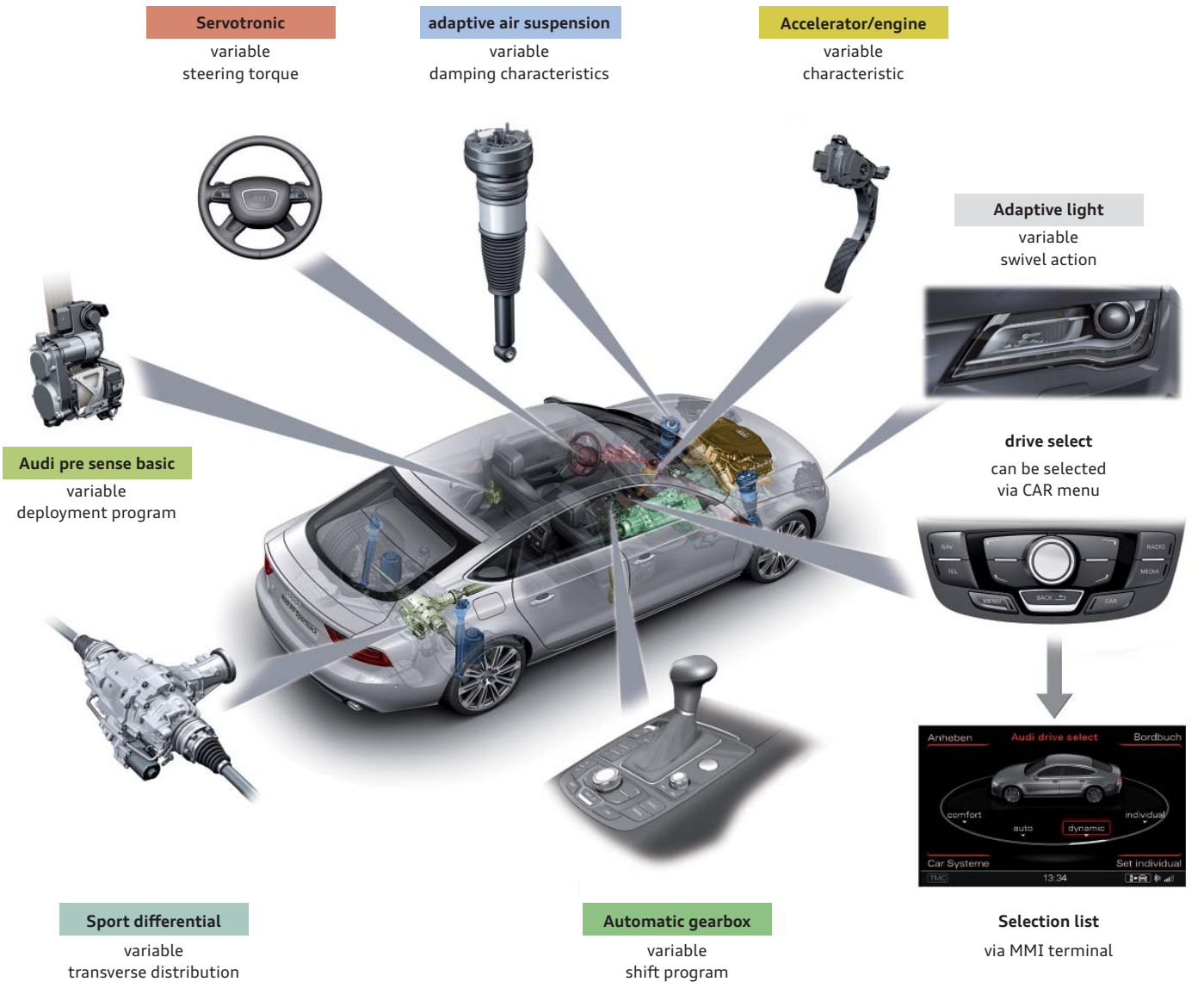
Audi drive select

The Audi drive select first offered on the Audi A5 will also be available on the Audi A7 Sportback. Audi drive select allows different vehicle setups to be configured.

There are three modes - comfort, auto und dynamic. The driver can select these via the MMI control panel and, for example, switch from a sporty to a comfort-oriented driving mode. In addition to this, the driver can configure the vehicle setup to suit his/her personal preferences in individual mode.

For instance, a sporty engine setup can be combined with a light steering action. The trim level dictates which systems are configurable by Audi drive select. In all cases, however, the engine, gearbox and steering systems are controlled.

Optionally, the following systems can be set via Audi drive select: sport differential, cornering light, reversible belt pretensioners and adaptive air suspension.



478_061

Operating modes

The operating modes of Audi drive select Systems are by no means rigid driving programs. In each operating mode, the vehicle is adapted and controlled by the various vehicle systems depending on driving situation and speed.

comfort
The **comfort** mode provides a comfort-oriented vehicle setup. The engine, automatic gearbox and sport differential respond moderately to accelerator pedal inputs. The steering is light, and the air suspension and cornering light use their comfort-oriented characteristic. This setting is suited, for example, to driving long distances, e.g. on motorways.

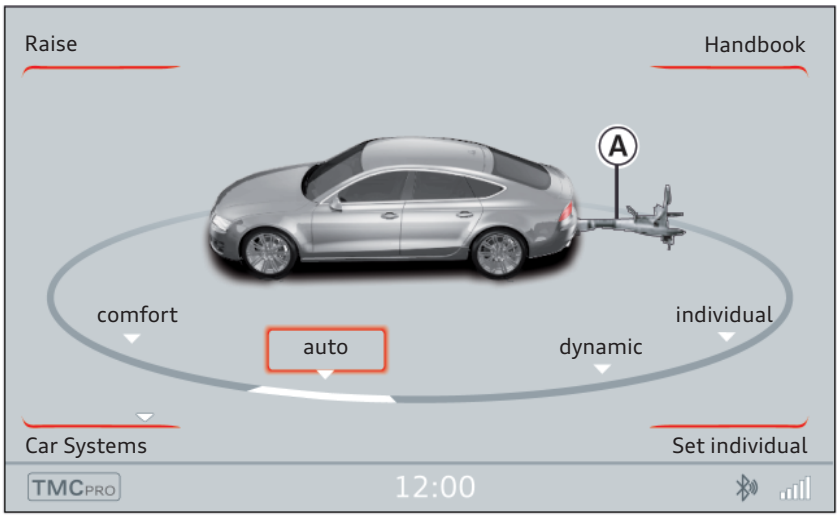
auto
The **auto** mode provides a comfortable yet dynamic overall driving feel. This setting is well suited to everyday use.

dynamic
The **dynamic** mode gives the vehicle a sporty driving feel. Throttle response is more immediate and the steering is configured for sporty handling. The sport differential provides extra agility, the air suspension is firmer and the gearbox its adjusts its shift points to higher up the rev band. In addition, the adaptive light uses its dynamic characteristic. This setting is suited to a sporty driving style.

individual
In **individual** mode, the driver can select his/her own personal setup. These settings are stored and assigned to the RKE key in use.

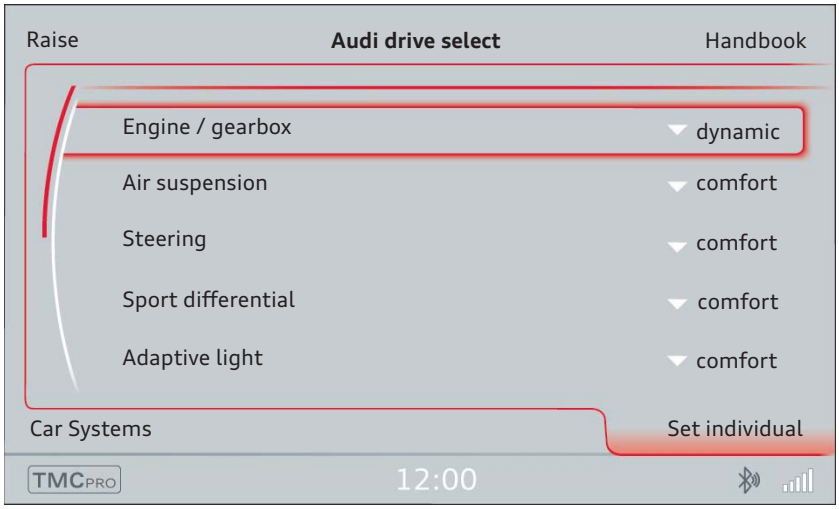
Unlike the B8 series models (A5, A4 '08 and Q5), which had a separate switch module for setting Audi drive select, on the Audi A7 Sportback the settings are made via the MMI control panel using the turn-push button. After pushing the "CAR" function button in the MMI menu, the operating modes can be selected.

If a trailer is automatically detected or if the customer selects trailer mode manually, the Audi drive select menu will display a towbar.



478_059

If the driver pushes the "Set individual" control button, the individual vehicle systems can be configured individually.



478_062

Charakteristic

Engine and gearbox respond more immediately or more moderately to accelerator pedal inputs. The **power steering** (servotronic) is adapted to the driving situation and is lighter or firmer depending on which setting is selected.

The adaptive air suspension (**Air suspension** in the MMI) is an electronically controlled air suspension and damping system. It is set depending on what mode is selected and on the driver's steering, brake and accelerator inputs, as well as on road surface, vehicle speed and payload.

The vehicle's ground clearance varies according to selected mode and speed. If the driver is driving in auto or dynamic mode at a speed of over 120 kph for longer than 30 seconds, the motorway ride height is set automatically. If the vehicle's speed drops below 70 kph for longer than 120 seconds, ground clearance is automatically increased.

In dynamic mode, the deployment thresholds of the **reversible belt pretensioners** are adjusted according to transverse dynamics.

As an integral part of the all-wheel drive (quattro®), the **sport differential** distributes drive power to the rear axle depending on the situation. The distribution of power varies depending on which mode has been selected. A high level of agility and acceleration are achieved when cornering. The vehicle responds very quickly to steering inputs.

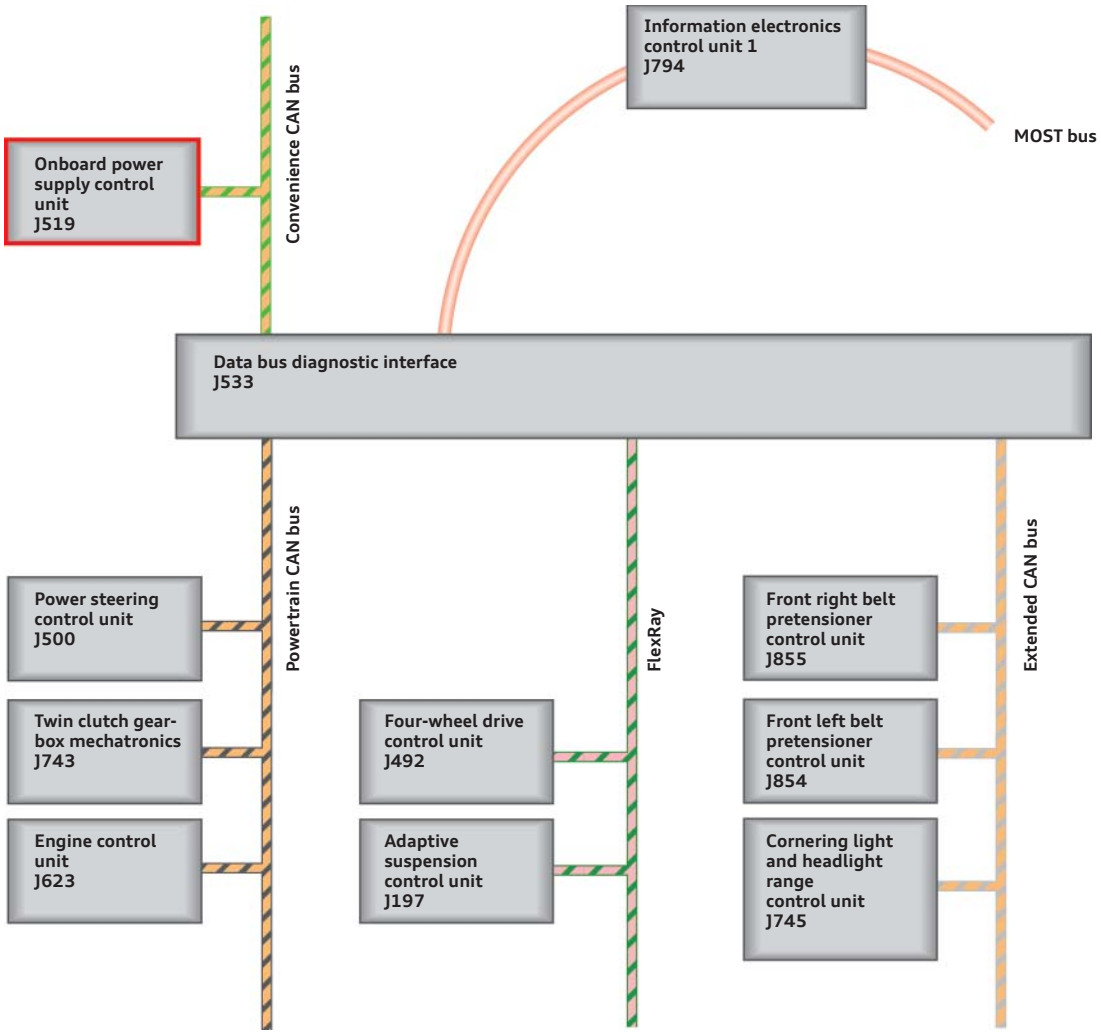
The **cornering light** adapts to the curvature of the corner at speeds of between 10 kph and 110 kph. The swivel action of the light and the illumination level are also adapted to this mode.

The following table provides an overview of the characteristics in each mode.

		comfort	auto	dynamic
	**Engine / gearbox**	balanced	balanced	sporty
	**Air suspension**[1)]	comfortable	balanced	sporty
	**Steering**	comfortable	balanced	sporty
	**Sport differential**	balanced	agile	sporty
	**Adaptive light**	comfortable	balanced	sporty
	**Reversible belt pretensioners**	standard	standard	Adapted deployment

[1)] The control strategy of the air suspension system is described in SSP 480 "Audi A7 Sportback – Suspension".

System integration



478_063

The onboard power supply control unit J519 performs the central function of Audi drive select. The information electronics control unit 1 reads in the driver input information and transfers it to the onboard power supply control unit via the MOST bus, the data bus diagnostic interface (gateway) and the convenience CAN bus.

The onboard power supply control unit generates the relevant commands from this information and sends them to the gateway via the CAN bus. The gateway distributes these commands via the extended CAN bus, the powertrain CAN bus and the FlexRay bus to the control units participating in Audi drive select.

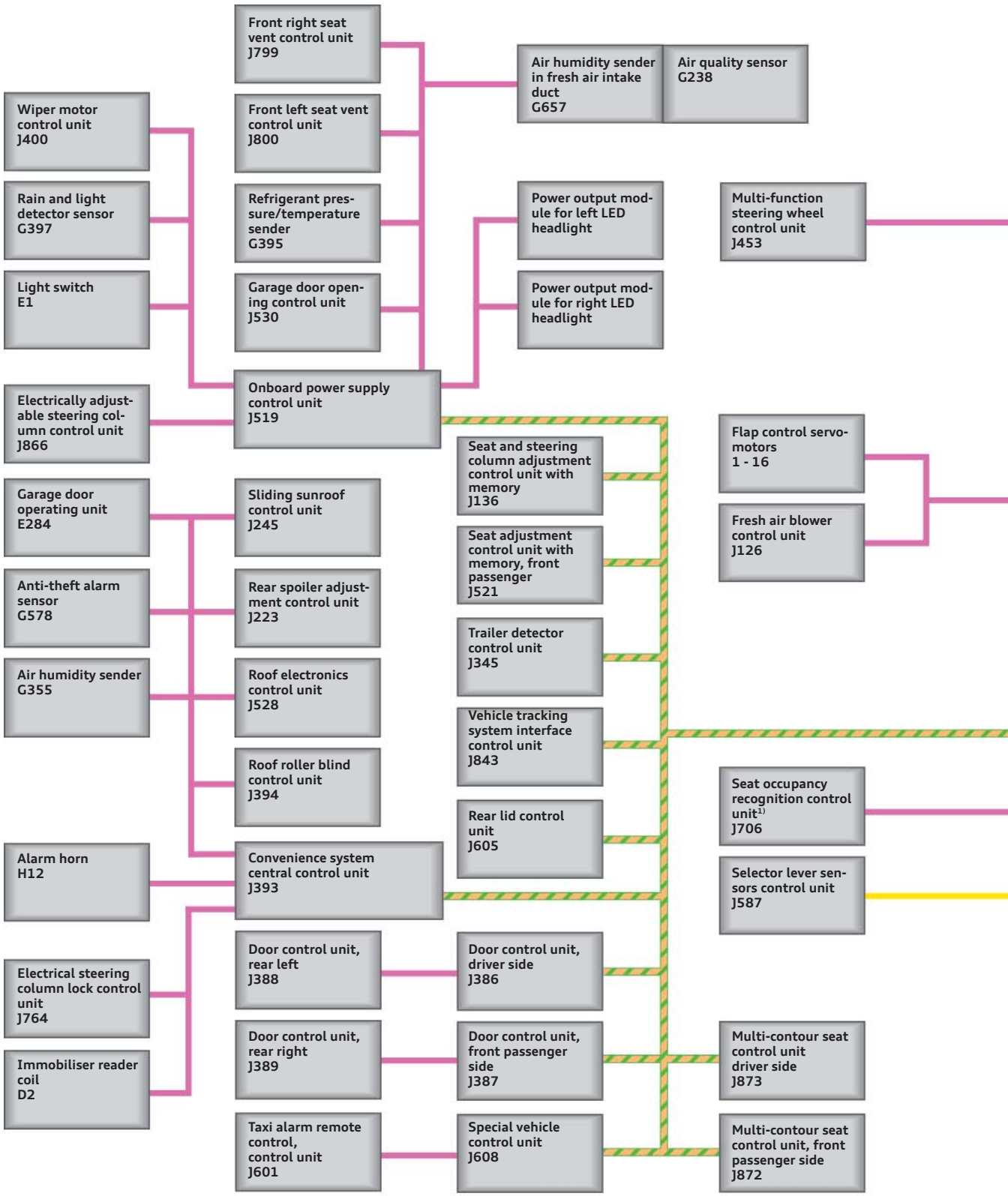
As soon as all switching conditions have been met, the user system control unit confirms the change-over by sending an acknowledge message back to the onboard power supply control unit via the gateway.
In this way, the onboard power supply control unit is kept informed as to which user system is operating in which characteristic, thus ensuring that change-overs always appear logical from the driver's viewpoint.

On B8 series models, Audi drive select was always reset to auto mode after removing the ignition key.
On the Audi A7 Sportback, the mode selected by the driver is memorised for the next restart after turning off the ignition. Only the engine and gearbox systems always start in the balanced operating mode (this corresponds to selector position "D"). The last mode setting as well as the individual settings are stored automatically and assigned to the vehicle key.

- dynamic mode provides a sporty shift characteristic. The gearbox position "S" is selected automatically.
- On models with a sport differential, **dynamic** mode is disabled when towing a trailer.
- On some models, the vehicle reaches its top speed only in auto and dynamic driving modes.

For further information on operation of Audi drive select, please refer to the Owner's Manual.

Topology



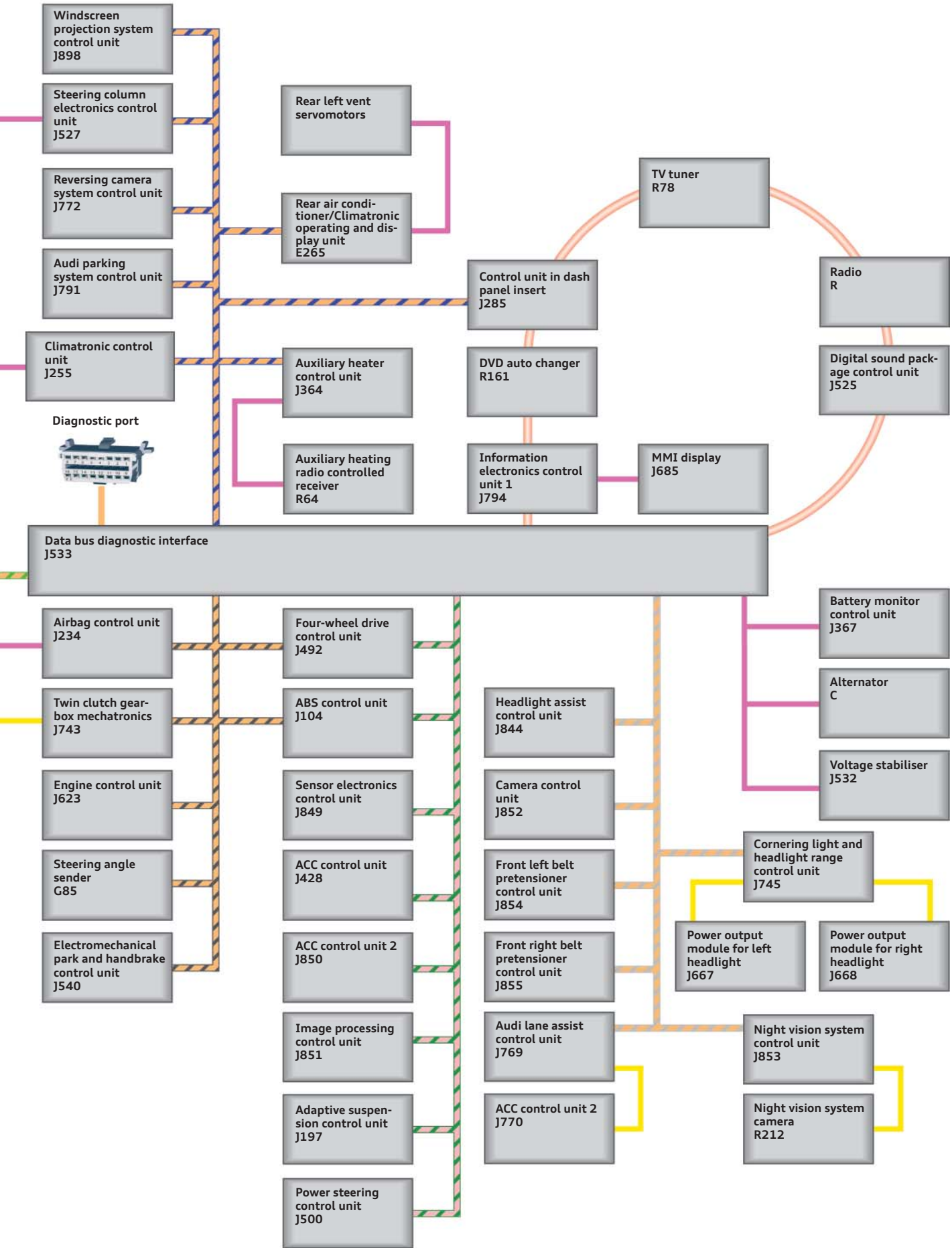
Legend:

- Powertrain CAN bus
- Convenience CAN bus
- Extended CAN bus
- Display and operation CAN bus
- Diagnostics CAN bus
- FlexRay
- MOST bus
- LIN bus
- Sub-bus systems

The diagram shows the topology of a model version with an extensive equipment specification.

Some of the control units shown here are optional and/or country-specific equipment.

[1] specific markets only


Windscreen projection system control unit J898
Steering column electronics control unit J527
Reversing camera system control unit J772
Audi parking system control unit J791
Climatronic control unit J255
Diagnostic port
Rear left vent servomotors
Rear air conditioner/Climatronic operating and display unit E265
Auxiliary heater control unit J364
Auxiliary heating radio controlled receiver R64
TV tuner R78
Control unit in dash panel insert J285
DVD auto changer R161
Information electronics control unit 1 J794
MMI display J685
Radio R
Digital sound package control unit J525
Data bus diagnostic interface J533
Airbag control unit J234
Twin clutch gearbox mechatronics J743
Engine control unit J623
Steering angle sender G85
Electromechanical park and handbrake control unit J540
Four-wheel drive control unit J492
ABS control unit J104
Sensor electronics control unit J849
ACC control unit J428
ACC control unit 2 J850
Image processing control unit J851
Adaptive suspension control unit J197
Power steering control unit J500
Headlight assist control unit J844
Camera control unit J852
Front left belt pretensioner control unit J854
Front right belt pretensioner control unit J855
Audi lane assist control unit J769
ACC control unit 2 J770
Battery monitor control unit J367
Alternator C
Voltage stabiliser J532
Cornering light and headlight range control unit J745
Power output module for left headlight J667
Power output module for right headlight J668
Night vision system control unit J853
Night vision system camera R212

478_096

Air conditioning

Introduction

Versions of the air conditioning system

Energy efficient air conditioning systems are used on the Audi A7 Sportback. The entry-level Audi A7 Sportback has an automatic front air conditioning system with separately controllable temperature zones.

The system has two humidity senders – the humidity sender in the fresh air intake duct G657 and the air humidity sender G355. In the automatic front air conditioning system with separately controllable temperature zones, rear ventilation is provided by outlets in the centre console.

As an option, the customer can order a front and rear air conditioning system with a second control panel in the cabin.

In addition to the automatic front air conditioning system, the four zone air conditioning system has a rear air conditioner/Climatronic operating and display unit E265 with the following functions:

- Temperature adjustment
- Blower adjustment
- Separate rear left and right air distribution adjustment

To provide air conditioning in the rear, the four zone air conditioning system has air outlets in the B posts. The four zone air conditioning system has additional deluxe options:

- Automatic recirculation control by air quality sensor G238
- Residual heat function
- Separate footwell temperature control
- Glove compartment cooling system
- Three different air conditioning modes: soft, medium and intensive

Dual zone air conditioning system
(basic air conditioning system)

478_068

Four zone air conditioning system
(deluxe air conditioning system)

478_069

Reference
For further information about the air conditioning system of the Audi A7 Sportback, refer to Self Study Programme 484 "Audi A7 Sportback Occupant Protection, Infotainment, Air Conditioning".

Operation

Climatronic control unit J255 for the dual zone air conditioning system

The Climatronic control unit of the dual zone air conditioning system has two temperature control knobs for adjusting the temperature of the two front climate zones. Depending on country specification, the control knobs indicate the temperature either in degrees Celsius or degrees Fahrenheit.

The control knob for setting the blower speed is located in the centre – there is only one common blower speed for both temperature zones.

478_070

Control knob with temperature scale according to country specification

Climatronic control unit J255 for the four zone air conditioning system

The functions can be activated/deactivated by pushing the buttons. The control knob is used for adjusting temperature, blower speed and air distribution in the front two climate zones.
The diode in each button is lit when the function is activated. The front climate settings are indicated on the Climatronic control unit display and, for several seconds, on the MMI display. The air conditioning can be adjusted separately for the driver and front passenger sides. In addition, the front passengers can adjust the rear cabin settings or synchronise all four zones with the driver's climate zone setting.

Residual heat
In the four zone air conditioning system the "Residual heat" function can be activated when the ignition is "off" by pressing and holding the blower speed setting button. The residual heat of the cooling water is used for heating the interior of the occupant cell. The coolant run-on pump V50 continuously circulates the hot water through the heating system. The "Residual heat" function is deactivated automatically after approximately 30 minutes.

478_071

Seat heating/ventilation adjustment buttons

Rear air conditioner/Climatronic operating and display unit E265

In the four zone air conditioning system both rear climate zones can be controlled by the rear air conditioner/Climatronic operating and display unit E265.

In vehicles with a four zone air conditioning system, a seat heater can be ordered as an option for both front seats.

Rear seat heater with three settings

478_072

Infotainment

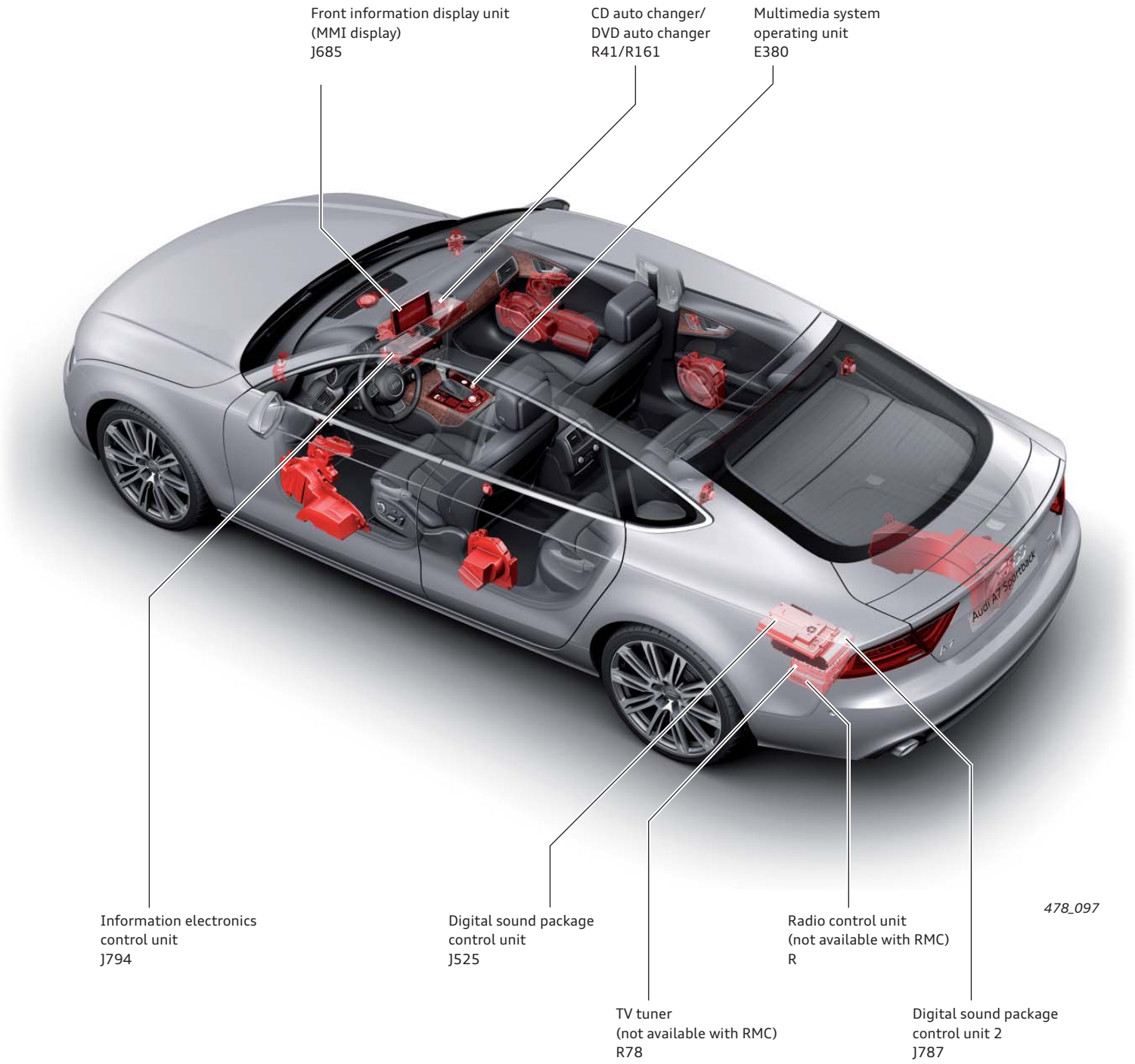
The Audi A7 Sportback is available with two radio systems and two navigation systems. Depending on country, standard equipment is either the MMI Radio or MMI Radio plus. The MMI systems "Radio", "Radio plus" and "Navigation" are based on the Radio Media Center platform.

They are similar, functionally, to the concert radio with MOST bus on the Audi A1. The MMI Navigation plus system is based on the system of the same name on the Audi A8 '10.

Installation locations of the infotainment control units

The control units of the infotainment system on the Audi A7 Sportback are installed in different positions.

The following diagram shows the possible installation locations of all infotainment control units on an Audi A7 Sportback with MMI Navigation plus.



Reference
For further information about the infotainment system of the Audi A7 Sportback, refer to Self Study Programme 484 "Audi A7 Sportback Occupant Protection, Infotainment, Air Conditioning".

MMI radios and navigation systems

MMI Radio (RMC)

The MMI Radio of the Audi A7 Sportback has a similar configuration and functions to the concert radio with MOST bus on the Audi A1. The MMI Radio of the A7 Sportback has the following equipment features:

- 6.5-inch display with 400 x 240 pixel resolution
- Control panel with six freely assignable radio station keys
- FM dual tuner with phase diversity (for FM), as well as a single tuner for MW (medium wave) and LW (long wave) in Europe
- TP memo
- Single CD drive
- Integrated amplifier with 4x 20 watts power output
- Car menu

Front panel of J794 for MMI Radio *478_098*

MMI Radio plus (RMC)

Compared to MMI Radio, MMI Radio plus has the following different and/or additional features:

- Two SD card readers
- Integrated six-channel amplifier for Audi Sound with 180 watts power output
- Bluetooth interface
- Speech dialogue system
- Driver information system with monochrome screen in the dash panel insert
- Digital satellite radio (available in USA and Canada only)
- AUX In on centre console
- Provision for optional equipment

Front panel of J794 for MMI Radio plus *478_099*

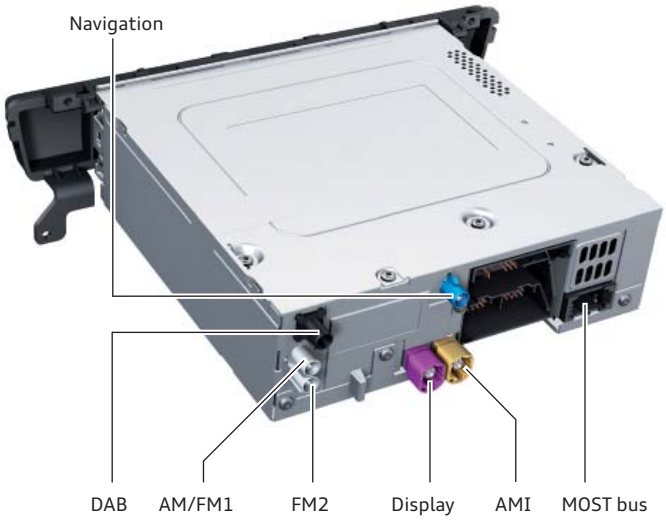
MMI Navigation (RMC)

The MMI Navigation infotainment system has a navigation function in addition to the features of MMI Radio plus. The navigation map is stored on an SD card. In Europe, for example, a 4GB SDHC card is used. The navigation system operates only with the SD card inserted. The navigation system uses a 2D map display and can be configured to display maps in 3D birdview.

Other special features of the navigation system include a maneouvres lists and detailed intersection maps. This information is displayed in split screen mode.
Trip destinations can be entered using the speech dialogue system.

Front panel of J794 for MMI Navigation *478_099*

Maneouvres list *478_101*



Back panel of J794 for MMI Navigation *478_100*

MMI Navigation plus

The MMI Navigation plus system is identical to the system of the same name on the Audi A8 '10. It is a third generation MMI system. The internal designation is MMI3G plus.
The following features are standard on the Audi A7 Sportback:

- 60 GB hard drive with approx. 20 GB for Jukebox
- 3D navigation with 3D city models
- DVD drive
- Two SD card readers (for SDHC cards up to 32 GB in size)
- Premium speech dialogue system
- Radio control unit with phase diversity
- Six-channel amplifier with 180 watts power output (integrated in the radio control unit)
- 8 inch TFT screen with 800 x 480 pixel resolution
- Driver information system with 7-inch colour screen in the dash panel insert
- MMI touch
- Bluetooth interface

Front panel of J794 for MMI Navigation plus *478_102*

MMI display
(front information display unit J685)

Two different displays are used on the Audi A7 Sportback. They differ from one another in terms of size and resolution.

The 6.5-inch display with 400 x 240 pixel resolution comes with the following MMI versions:
- MMI Radio
- MMI Radio plus
- MMI Navigation

The 8.0-inch display with 800 x 480 pixel resolution It comes exclusively with MMI Navigation plus.

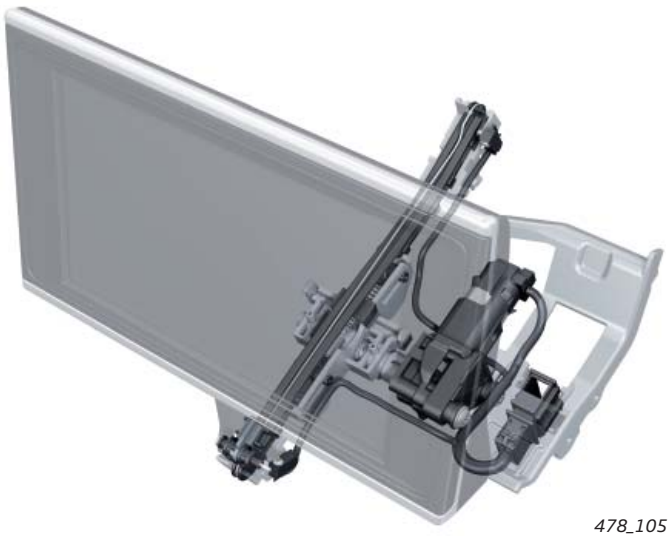
6.5-inch display *478_103*

8.0-inch display *478_104*

Swivel mechanism of the MMI display

The swivel mechanism of the display on the Audi A7 Sportback is a new development. Compact fitting dimensions are achieved by using a cable pull drive.

The motor and both limit switches are activated and evaluated by the multimedia system operating unit E380.
The swivel mechanisms of the 6.5 inch display and the 8.0 inch display have different driving gears. To replace the display, the rotation mechanism must be moved into a service position, which is activated using the Guided Fault Finding function.



478_105

Sound systems

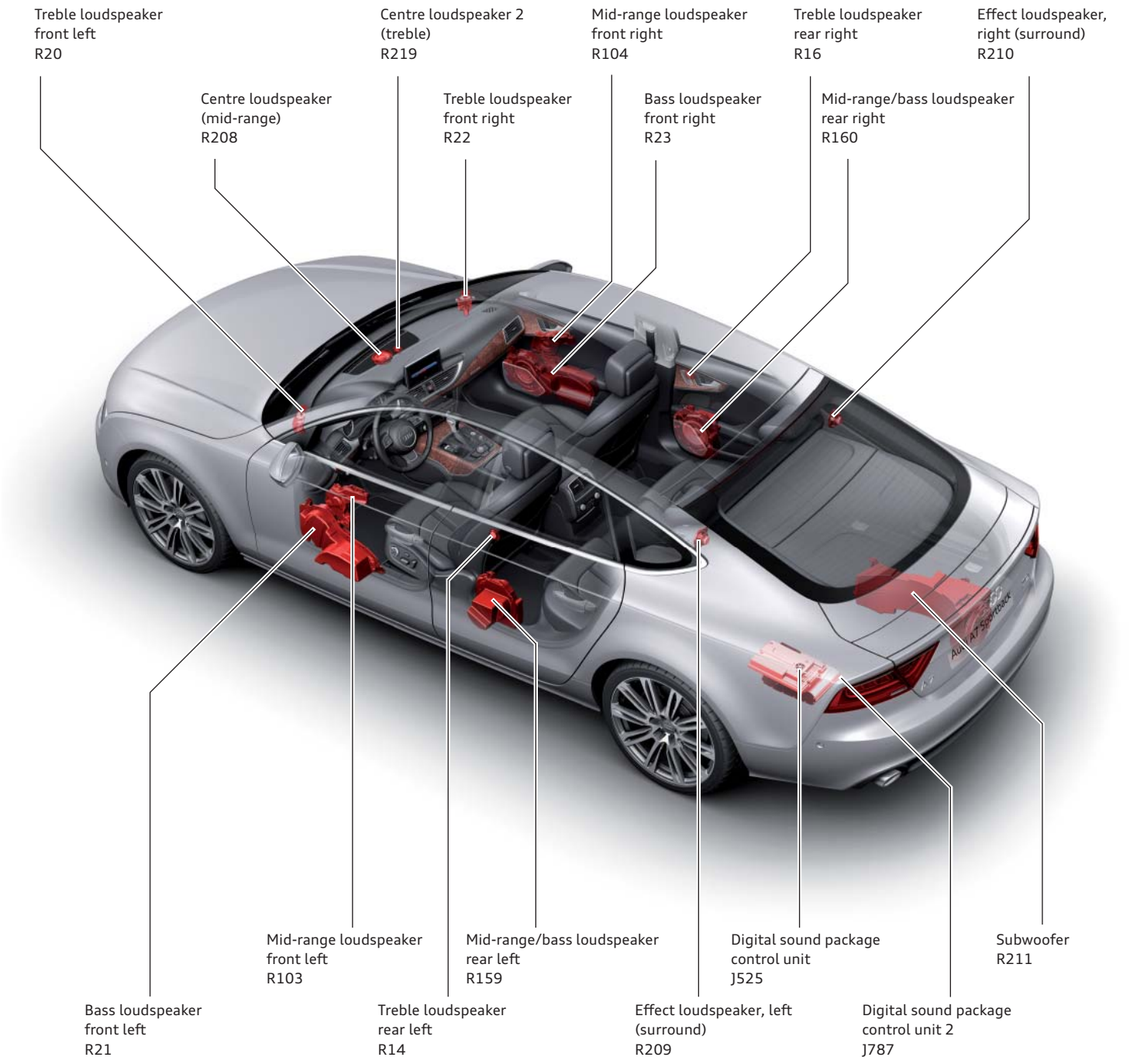
The Audi A7 Sportback is fitted as standard with two loudspeakers per door. The audio amplifier supplies these eight loudspeakers with a total of 80 watts RMS output power.
With MMI Radio plus and higher, the Audi sound system has a total power output of 180 watts.

This power is distributed to ten loudspeakers. The Bose Surround Sound System is optional. The separate Bose amplifier distributes 630 watts of power to a total of 14 loudspeakers.

Audi A7 Sportback with Bang & Olufsen Advanced Sound System

The Bang & Olufsen Advanced Sound System uses 15 loudspeakers and two amplifiers. They create a sense of space resembling the ambience of a concert hall.

Both amplifiers supply the loudspeakers with 1300 watts total RMS output power. Retractable tweeters in the dash panel set the stage for a perfect production.



478_106

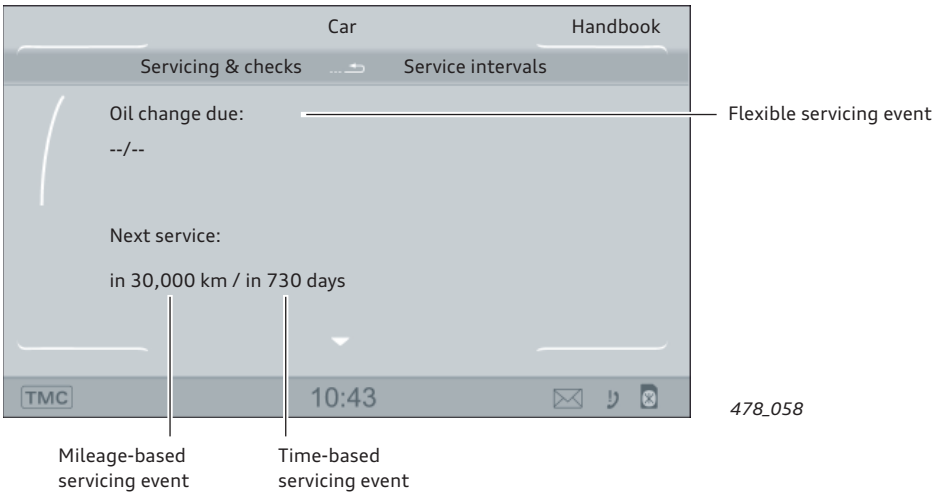
Service

Inspection and maintenance

The following servicing work is displayed separately:

- Oil change as a flexible servicing event dependent on the individual driving profile.
- Mileage-based servicing events due after a multiple of 30,0000 km
- Time-based servicing events due on expiration of pre-determined time intervals, e.g. inspection every 2 years.

Example of a service interval display in the MMI



On new vehicles, the field for the next due oil change (flexible servicing event) is initially blank. This interval has to be computed from the driving profile and engine load, and is not displayed until 500 km have been covered. The message "Oil change due" then changes to "Next oil change". The message "Oil change due" does not reappear until the due date for the next oil change has expired. Likewise, "Service due" does not reappear until after the due date for the next service.

Here, for example, the display changes to:
SERVICE DUE:
since 1000 km / 5 days.

The field for the mileage-based servicing events now displays 30,000 km for new vehicles and counts down in increments of 100 km. The value in the field for the time-based servicing events is now 730 days (2 years) for new vehicles and is updated on a daily basis.

Overview of service intervals

	Audi A7 Sportback 2.8l FSI 150 kW	Audi A7 Sportback 3.0l TFSI 200 kW	Audi A7 Sportback 3.0l TDI 150 kW / 180 kW
Oil change interval, flexible	15,000 km / 1 year – 30,000 km / 2 years (market-dependent)		
Service interval, fixed	30,000 km / 2 years	30,000 km / 2 years	30,000 km / 2 years
Dust and pollen filter	30,000 km / 2 years	30,000 km / 2 years	30,000 km / 2 years
Brake fluid	Change for the first time after 3 years (depending on market), and thereafter every 2 years		
Air filter	90,000 km	90,000 km	90,000 km
Spark plugs	90,000 km	90,000 km	-
Fuel filter	Lifetime	Lifetime	60,000 km
Gear oils			
▸ multitronic	60,000 km	60,000 km	60,000 km
▸ 7-speed dual clutch gearbox			
▸ ATF[1)]	60,000 km	60,000 km	60,000 km
▸ MTF[2)]	Lifetime	Lifetime	Lifetime
Timing drive chain	Lifetime	Lifetime	Lifetime

[1)] ATF = Automatic Transmission Fluid

[2)] MTF = Manual Transmission Fluid

Note
The specifications in the current service literature always apply.

Special tools and workshop equipment

Workshop equipment

Isolator box VAS 6606

478_092

For diagnostics on new-generation control units, with 198-pin terminals (UDS control unit) The illustration shows a prototype.

Retainer VAS 6395/6

478_114

Engine holder VAS 6095-1-11

478_118

Guide plate VAS 5161-29

478_117

Calibration board for head-up display VAS 6656

478_120

Sealing bolt VAS 5161-29-1

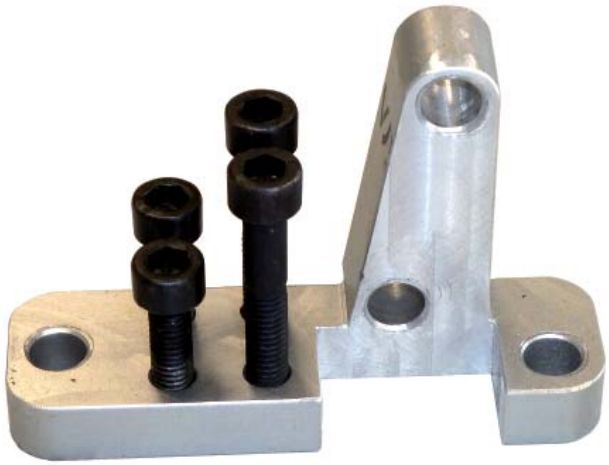
478_119

Special tools

Installing tool T40048/7

478_113

Detent T40246



478_112

Counter-hold tool T40248

478_115

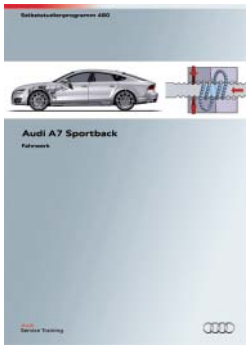
Locking pin T40245

478_116

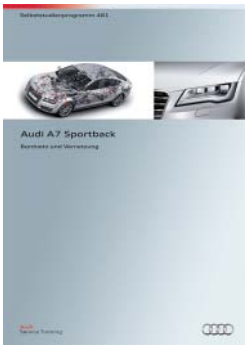
Self Study Programmes

For further information about the technology of the Audi A7 Sportback, refer to the following Self Study Programmes.

478_034



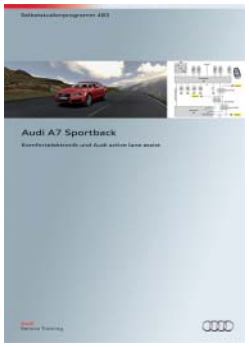
478_111



478_093

SSP 479 Audi 3.0l V6 TDI engine (second generation), order number: A10.5S00.72.20
SSP 480 Audi A7 Sportback Chassis, order number: A10.5S00.73.20
SSP 481 Audi A7 Sportback Onboard Power Supply and Networking, order number: A10.5S00.74.20

478_081



478_082

478_035

SSP 482 Audi A7 Sportback Head-up Display and Speed Limit Indicator, order number: A10.5S00.75.20
SSP 483 Audi A7 Sportback Convenience Electronics and Audi active lane assist, order number: A10.5S00.76.20
SSP 484 Audi A7 Sportback Occupant Protection, Infotainment and Air Conditioning, order number: A10.5S00.77.20

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