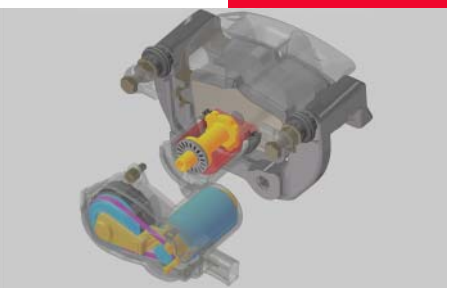
Service Training



Audi A5 - Suspension

Self-Study Programme 394

Four suspension versions are used on the Audi A5.The standard suspension 1BA is basic equipment.A sports suspension 1BE will be optional. Both suspension versions have the same ride height, but different springs, shock absorbers and anti-roll bars.A suspension system with electronic damping control 1BL is a third option.

This feature allows the driver to select between comfortable and sporty suspension set-ups at the touch of a button.quattro GmbH offers an S-Line suspension 1BV. It has an even more sporty suspension setup than the sports suspension, and ride height is 10 mm lower than 1BA and 1BE.

394_001

Contents

The self-study programme teaches the design and function of new vehicle models, new automotive parts or new technologies.

The self-study programme is not a repair manual!
All values given are intended as a guideline only and refer to the software version valid at the time of preparation of the SSP.

For maintenance and repair work, always refer to the current technical literature.

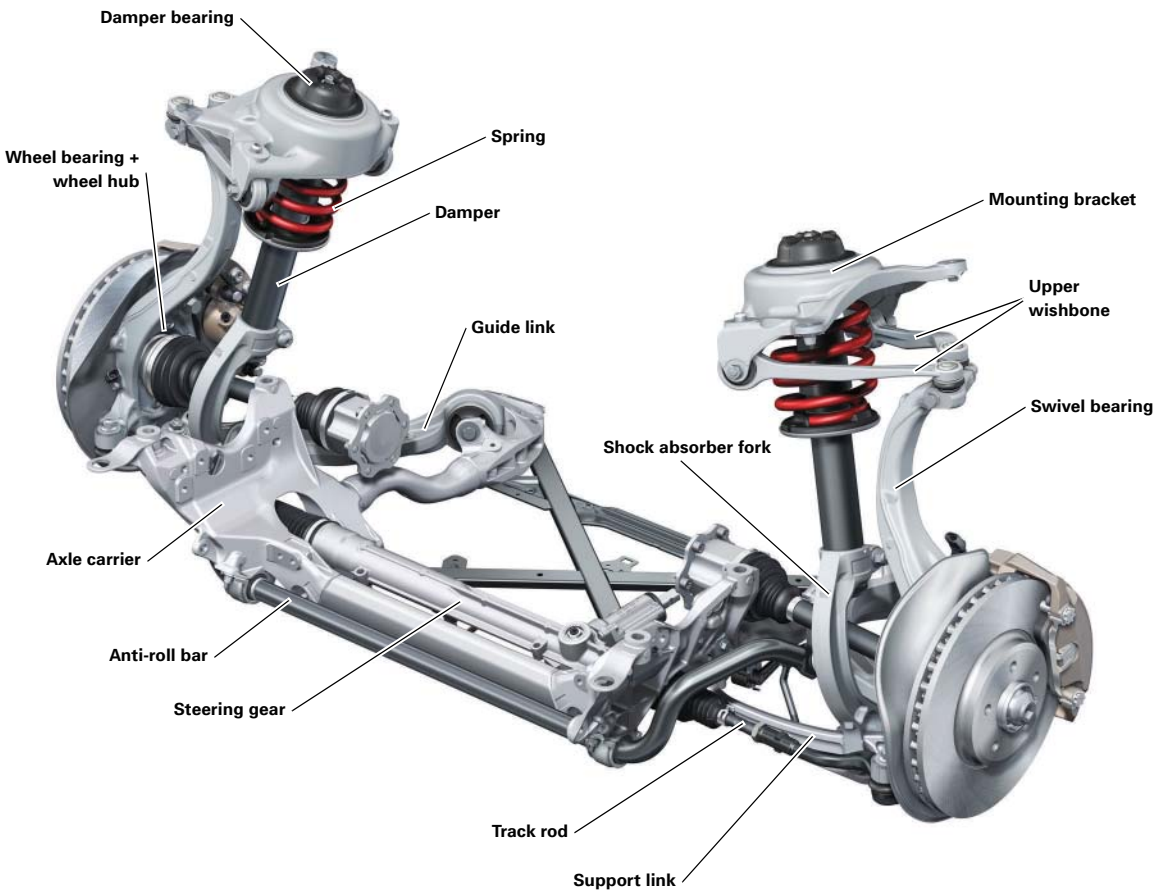
Reference

Note

Overview

A newly developed five-link front axle is used.In comparison with the current Audi A4, the front axle is 152 mm further forward on the vehicle. This optimises axle load distribution and reduces the front overhang, giving the car a more dynamic look.The steering gear is now bolted to the axle carrier.The track rod constitutes the fifth wishbone.The axle carrier is rigidly attached to the vehicle body. This ensures a high level of transverse rigidity, resulting in immediate and precise steering response.The kingpin inclination angle and the castor angle have been enlarged compared to the current Audi A4.

The new axle geometry provides good self-centring of the steering system when travelling in a straight line.The suspension kinematics have been designed with the aim of achieving the smallest possible turning circle despite the much larger wheelbase compared to the current Audi A4. The design and geometric arrangement of the wishbone bearing components provide sporty handling characterised by exceptional agility, outstanding steering precision and high driving stability to within the vehicle's dynamic limit range.



394_002

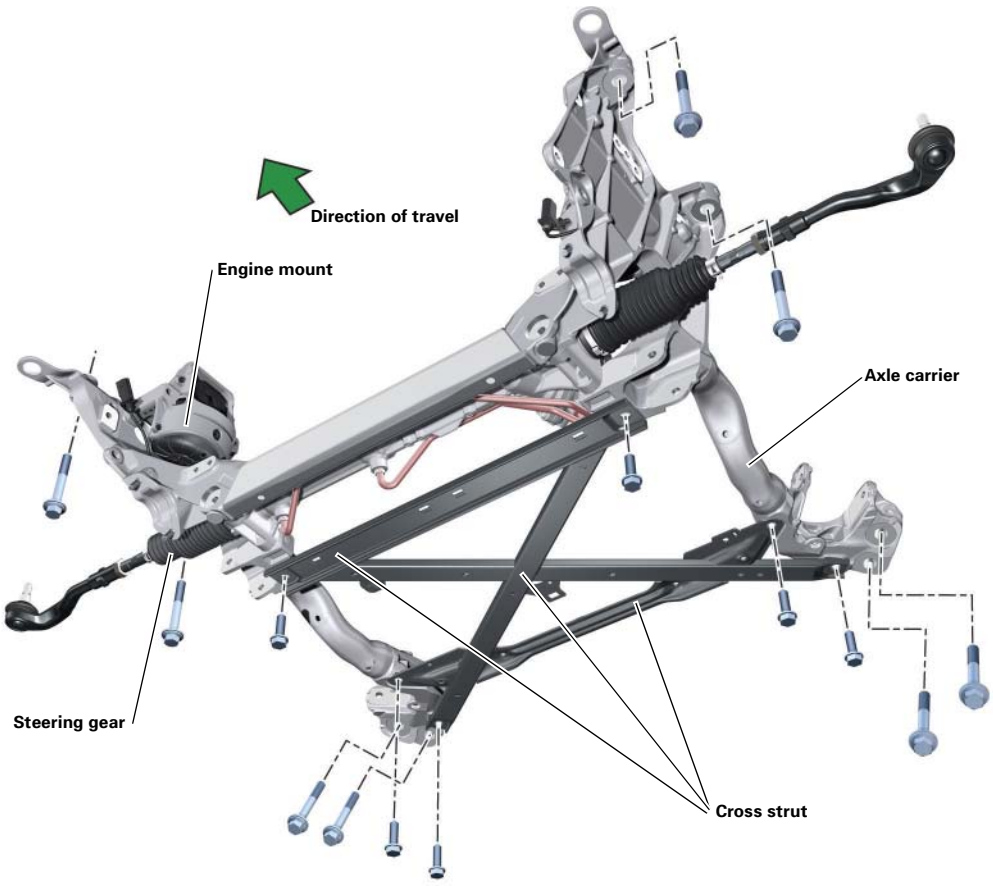
System components

Axle carrier

The axle carrier is made of aluminium and rigidly bolted to the body at eight screw attachment points. The front and rear cast nodes are welded to aluminium tubes as cross members. The axle carrier is additionally reinforced by a bolted cross strut. These modifications greatly reduce tyre noise inside the vehicle.

The engine mounts are bolted to axle carriers and couplings by means of screw couplings on the axle carrier.

The steering gear is mounted on the axle carrier. As a result, steering power is transmitted more directly to the wheels to give improved steering response. The rigidly mounted axle carriers assist the rapid build-up of steering power.



394_003

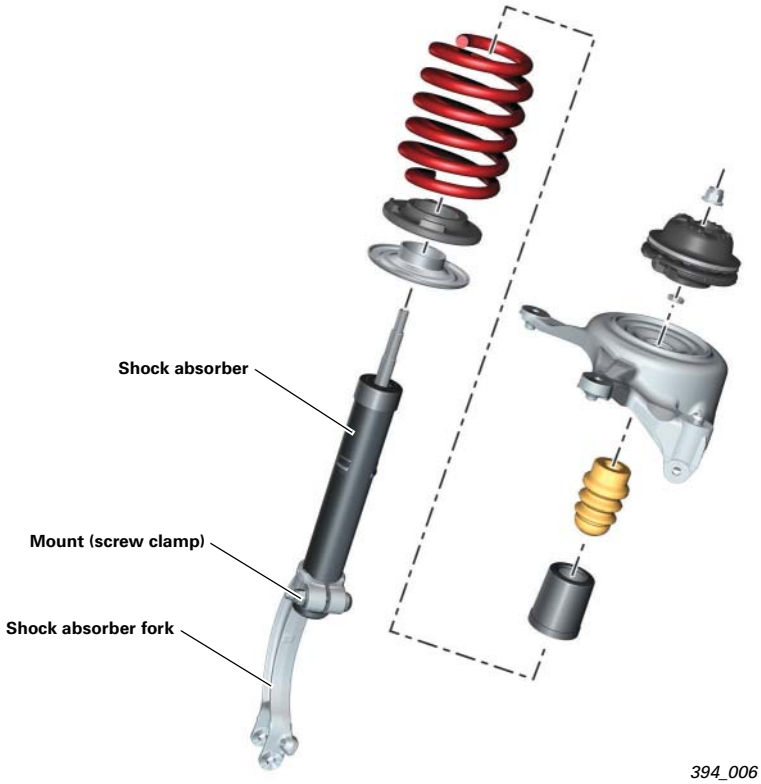
Note

The vehicle must not be set down on its wheels unless the engine mounting, couplings, steering gear and cross strut are mounted properly.

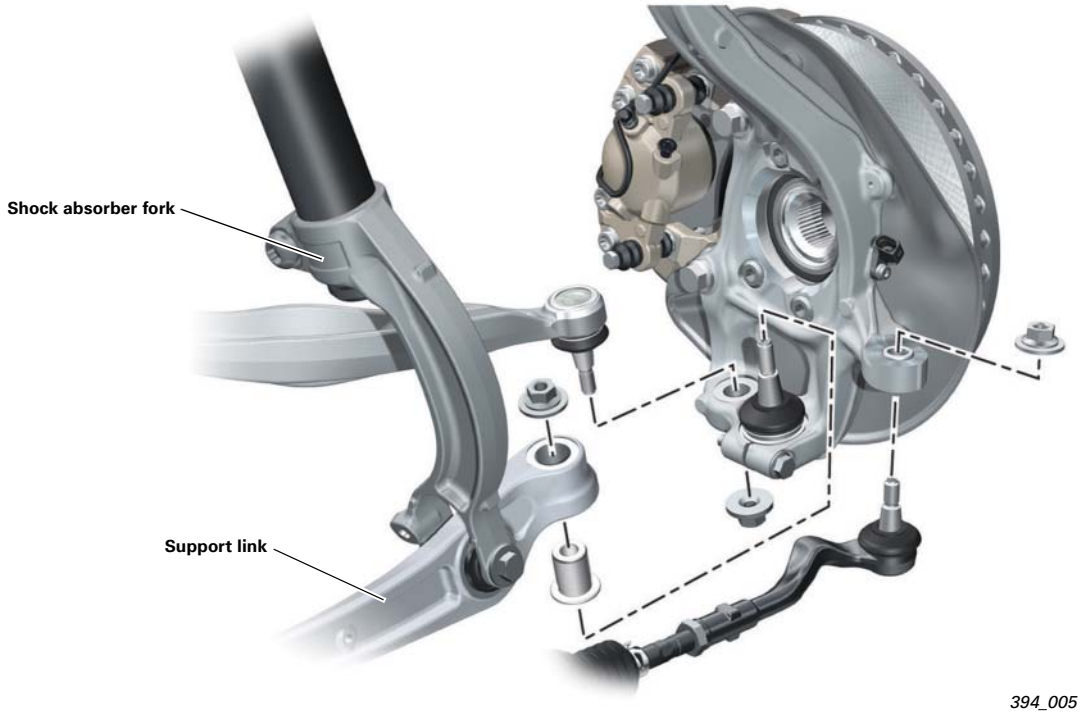
Springs and dampers

In order to ensure free movement of the drive shaft, cast shock absorber forks are used.

The damper is connected to the shock absorber fork by a screw clamp. The shock absorber fork is bolted to the support link.



394_006



394_005

Swivel bearing, wheel bearing, wheel hub

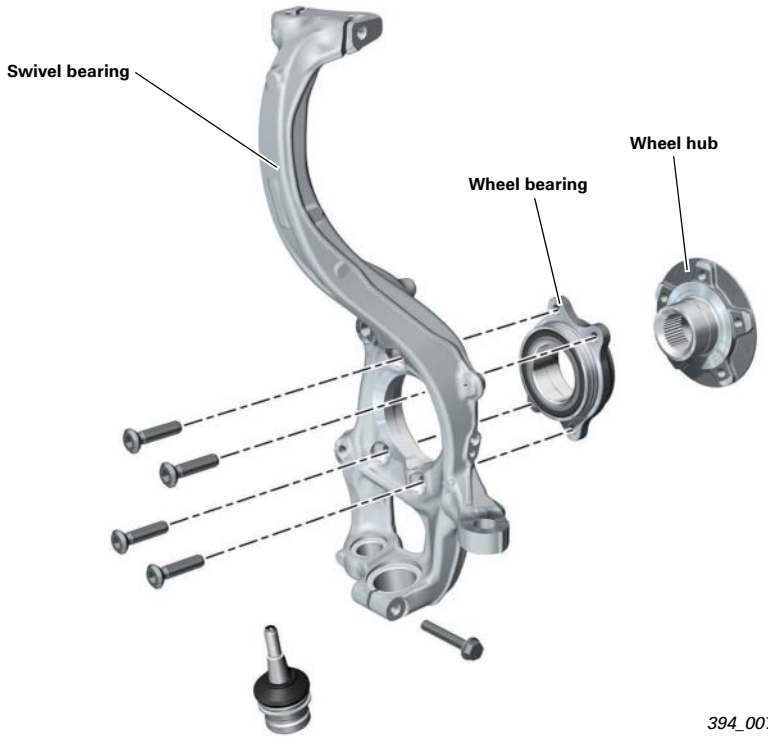
The swivel bearing is made of aluminium. The second generation wheel bearing is bolted to the swivel bearing.

The Audi A5 has larger wheel bearings than the current Audi A4.

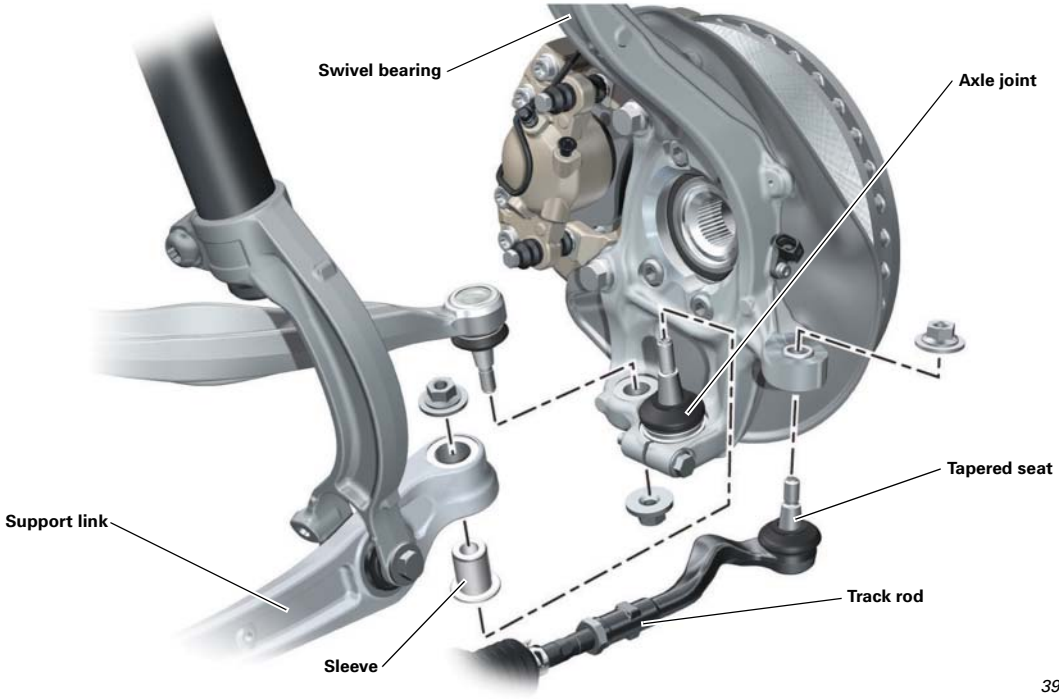
The track rod is attached lower down because the steering gear is arranged at the bottom.

The track rod joint is now mounted in a tapered seat in the steering arm.

The support link is connected to the swivel bearing by a new axle joint. The axle joint is a separate component and is located by a screw clamp in the swivel bearing.



394_007

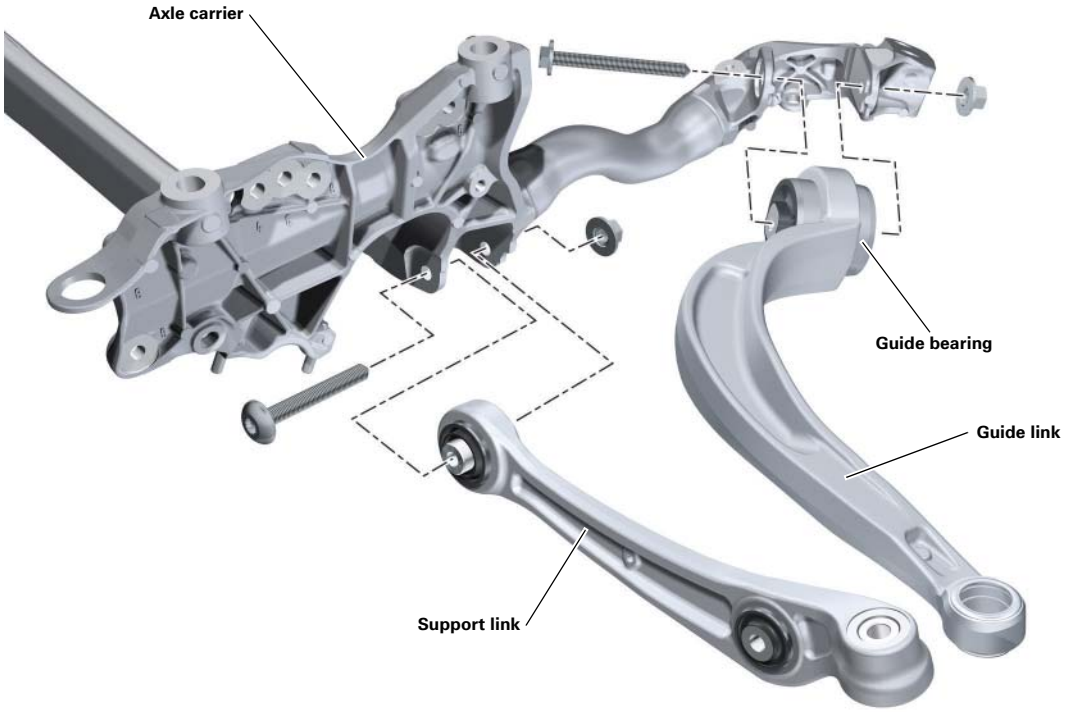


394_005

Lower wishbone

The support link and the guide link are aluminium forgings.

The guide link is mounted in jumbo sized guide bearings in the axle carrier.

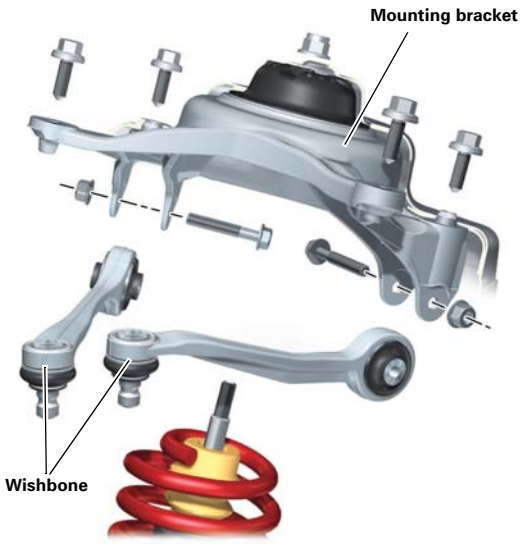


394_009

The mounting bracket which holds the upper wishbone is now attached to the body by four screws.

The screws used for attaching the wishbone to the mounting bracket are now inserted from the inside. This allows individual wishbones to be removed without dismantling the complete mounting bracket.

The mounting bracket is made of cast aluminium and the wishbones are aluminium forgings.

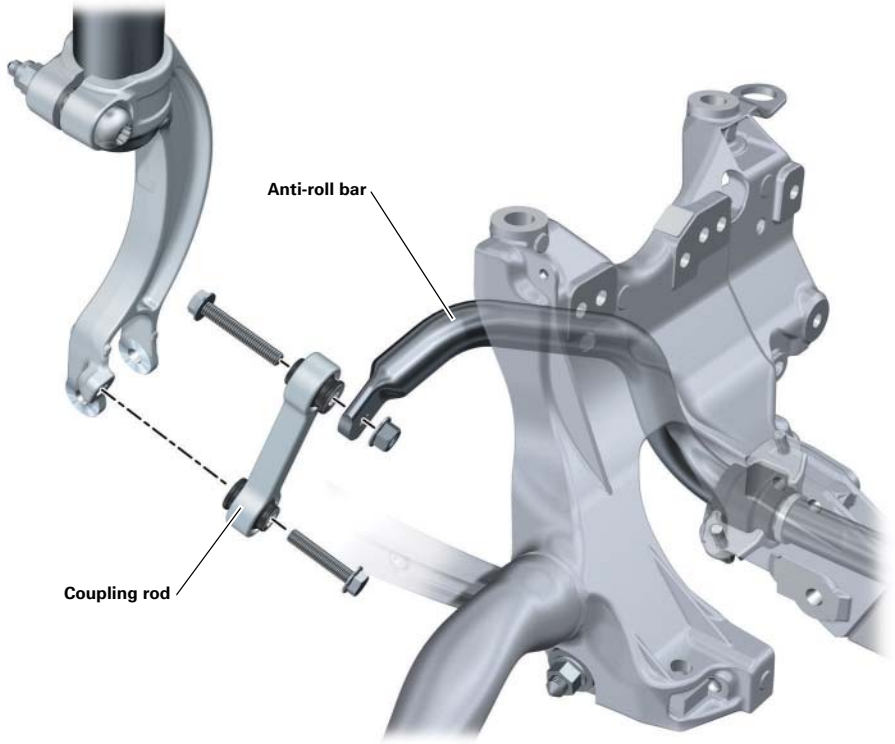


394_011

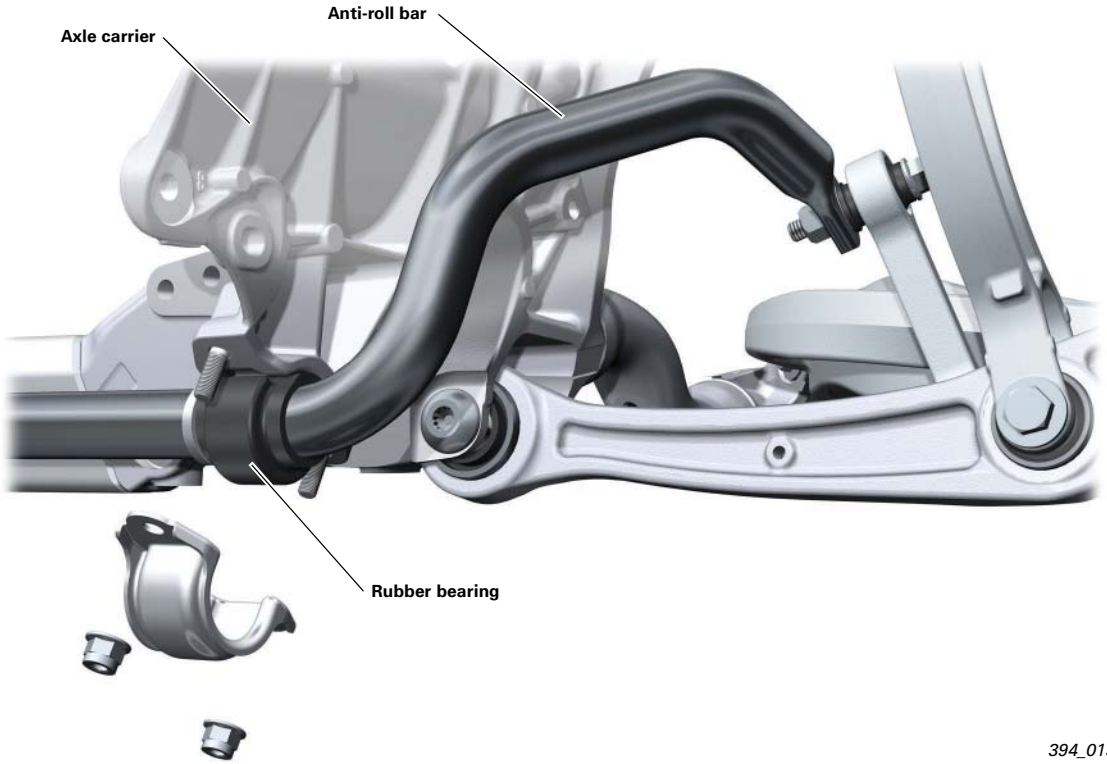
Anti-roll bar

The tubular anti-roll bar is attached to the shock absorber fork by a link rod and mounted in rubber bearings at the axle carrier.

Optimum response is ensured by attaching the anti-roll bar to the far outside of the suspension strut. This allows the use of small-gauge tubing and saves weight.



394_012

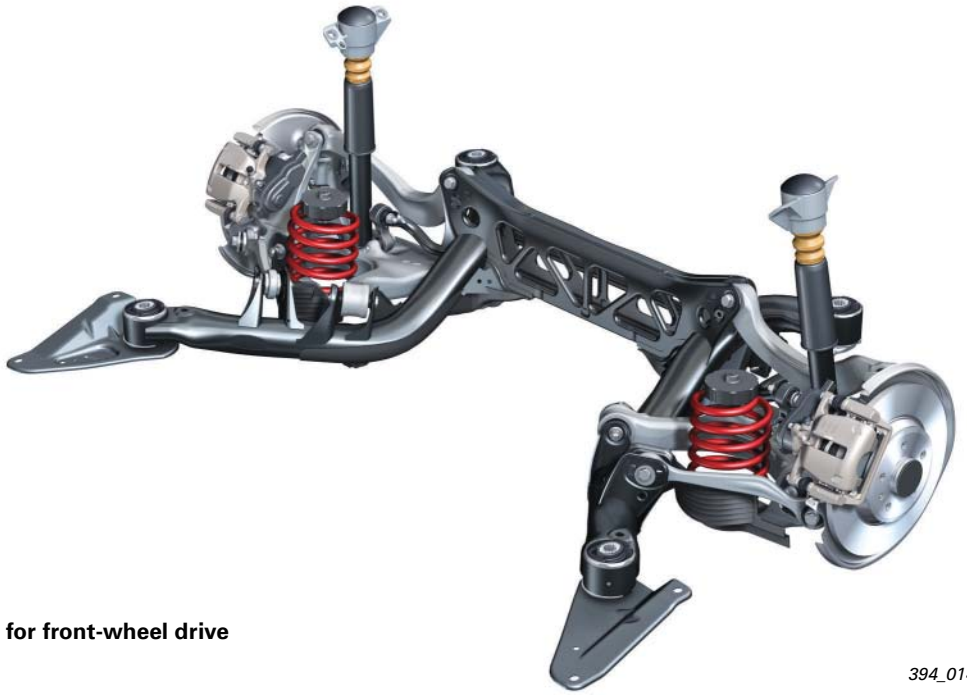


394_013

Overview

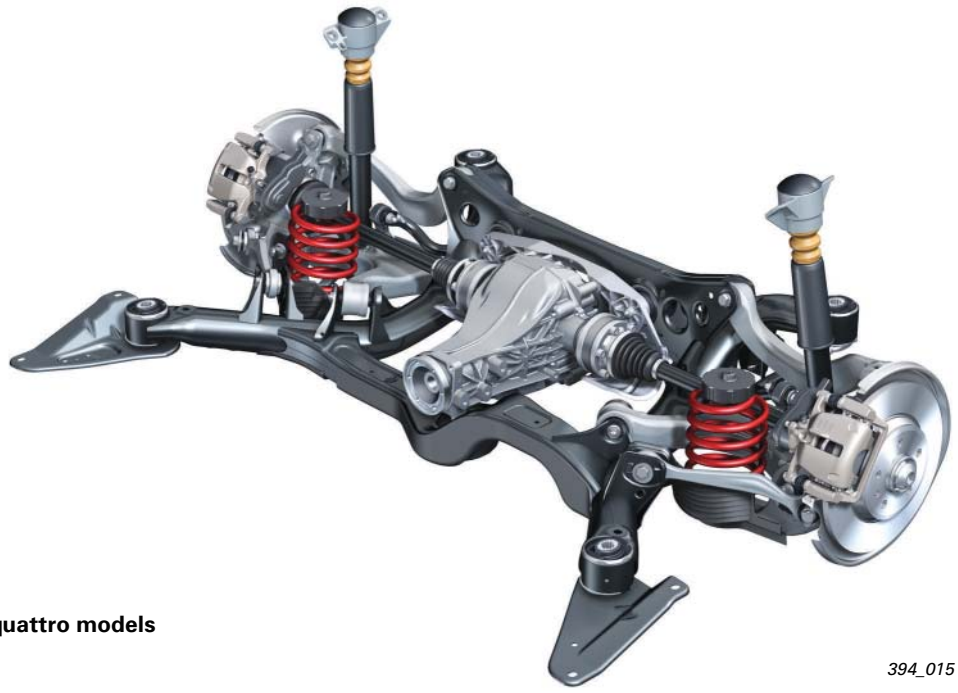
A newly developed trapezoidal link rear axle is used on the Audi A5. Variants are available for front wheel drive and quattro drive.
They only differ with regard to the axle carriers, wheel carriers and wheel bearings.
The development aim was to create a compact axle requiring a minimum of installation space.The result is a high
luggage compartment volume as well as a large through-loading width
and a low boot floor.

The kinematic axle design provides good anti-dive behaviour. The spatial arrangement of the wishbones and the design of the link bearings result in increased toe angle under bump, lateral and longitudinal forces.This track-stabilising feature provides high driving safety and driving stability to within the vehicle's dynamic limit range.



Rear axle for front-wheel drive

394_014



Rear axle for quattro models

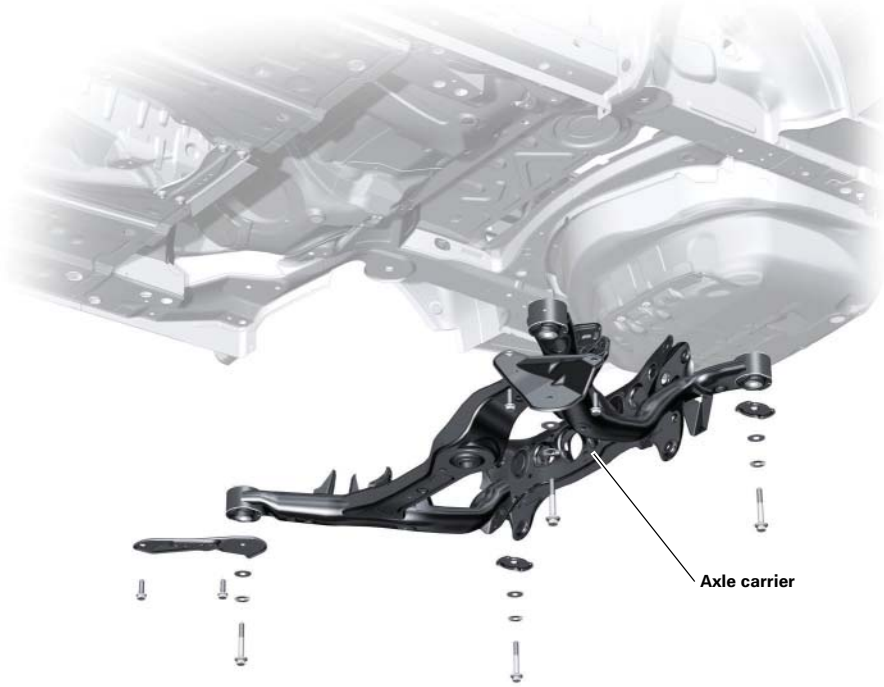
394_015

System components

Axle carrier

The axle carrier is a welded steel construction. It serves as a carrier for the wishbones and rear axle differential on vehicles with quattro drive. Furthermore, it isolates the axle from the body, both acoustically and vibrationally.

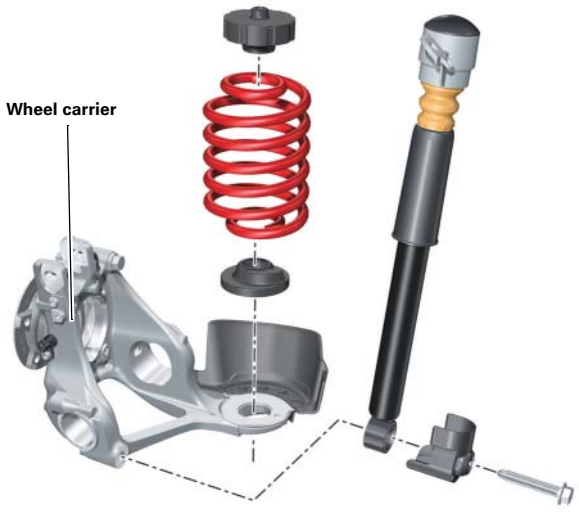
For this purpose, the axle carried is attached to the body by bonded rubber bushings. The bushings are fitted in such a way that they can be replaced in the service workshop.



394_016

Wheel carrier

The wheel carrier is an aluminium casting. It carries the wheel bearing and is connected to the wishbones. A new feature is that the coil spring is supported by the wheel carrier. The damper is also bolted directly to the wheel carrier. This provides very good kinematic ratios for suspension and damping, which in turn translates to optimal suspension comfort and crisp handling. The highly sensitive damping system responds to even the smallest bump and rebound movements. Moreover, this component layout permits a very compact design, as well as a large through-loading width and a flat boot floor.

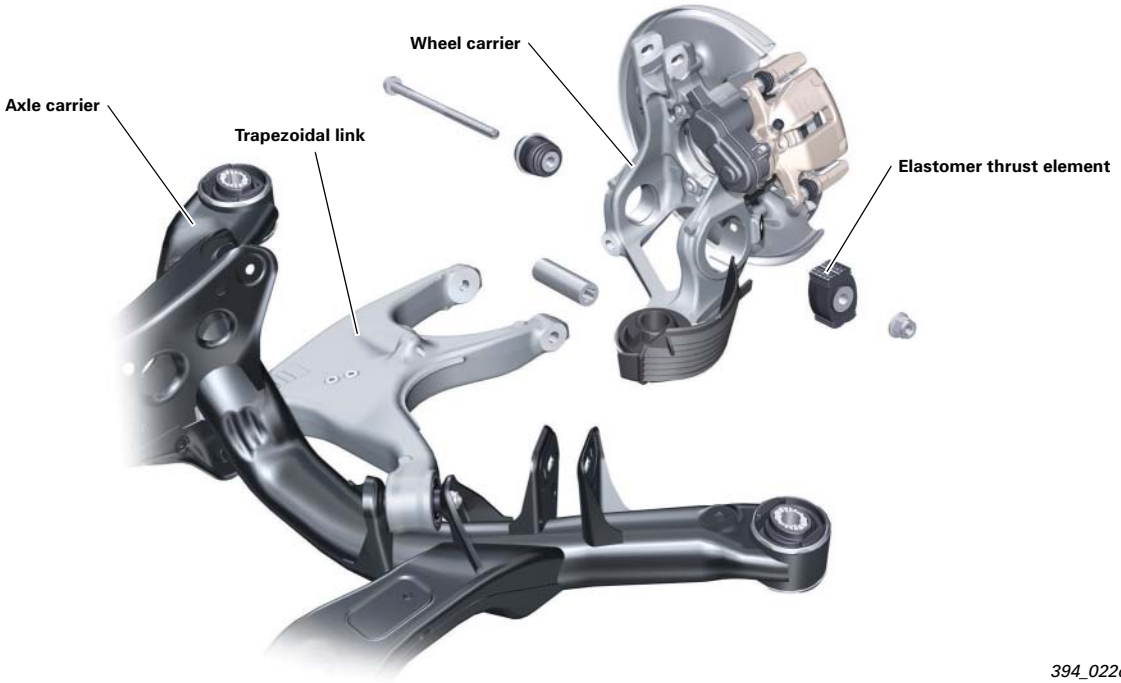


394_017

Wheel carrier, trapezoidal link

The trapezoidal link is an aluminium casting. It is seated in two bonded rubber bushings on the axle carrier. The trapezoidal link and the wheel carrier are connected by a ball joint and a bonded rubber bush with an integrated elastomer thrust element. This entirely new component allows relative movement between the trapezoidal link and the wheel carrier.

This complex bearing system has elasto-kinematic advantages and allows controlled adaptation of the axle geometry under external forces. In addition, the linkage for the headlight range control sensor is bolted to the trapezoidal link.

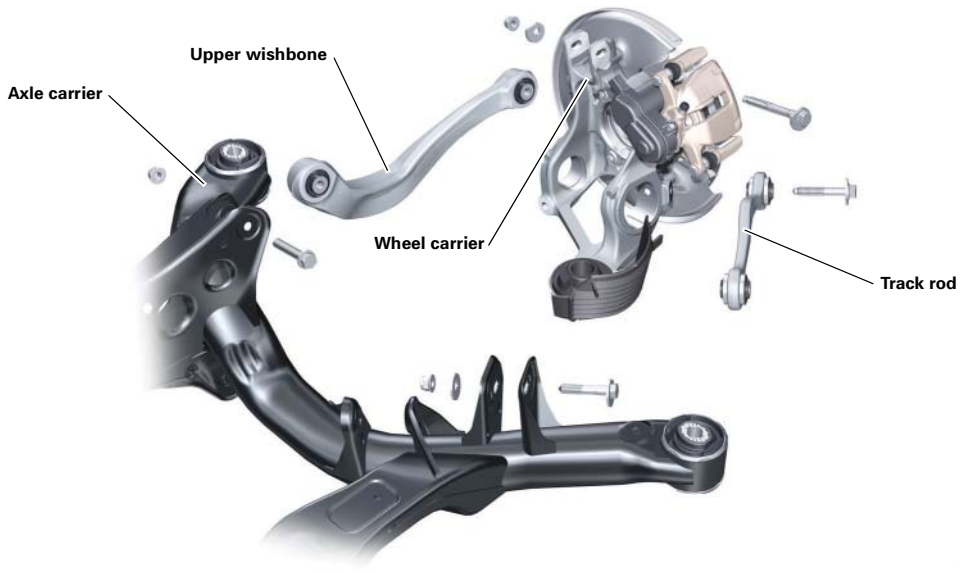


394_022a

Upper wishbone, track rod

Both links are aluminium forgings. They are mounted in bonded rubber bushing on the axle carrier and wheel carrier.

These components are notable for their very high rigidity, which ensures precise wheel location in all driving situations.

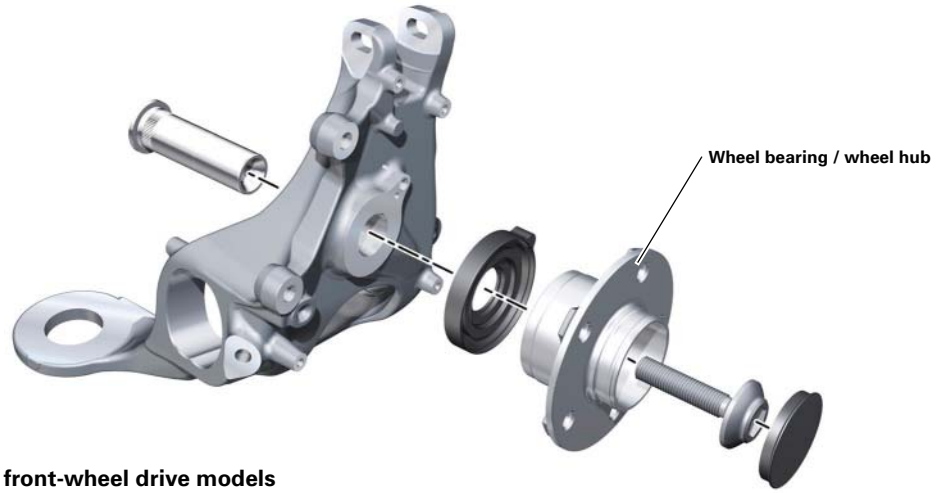


394_022b

Wheel bearing and wheel hub

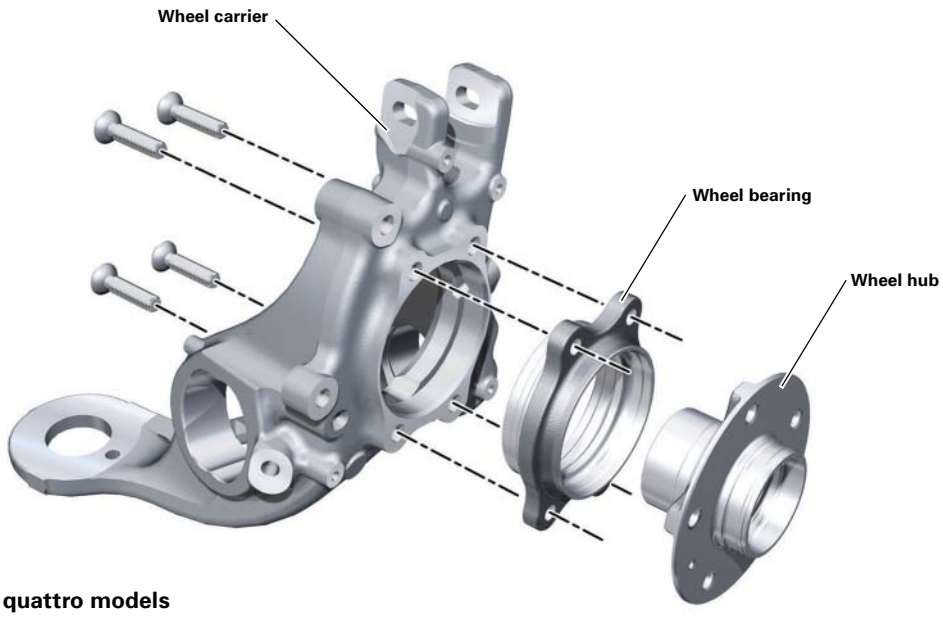
A second generation wheel bearing unit with rotating outer race is used on front-wheel drive models. The wheel bearing and wheel hub are a single component.

A second generation wheel bearing with rotating inner ring is used on quattro models. The wheel bearing is bolted to the wheel carrier. The wheel hub is a separate component.



Wheel bearings for front-wheel drive models

394_019

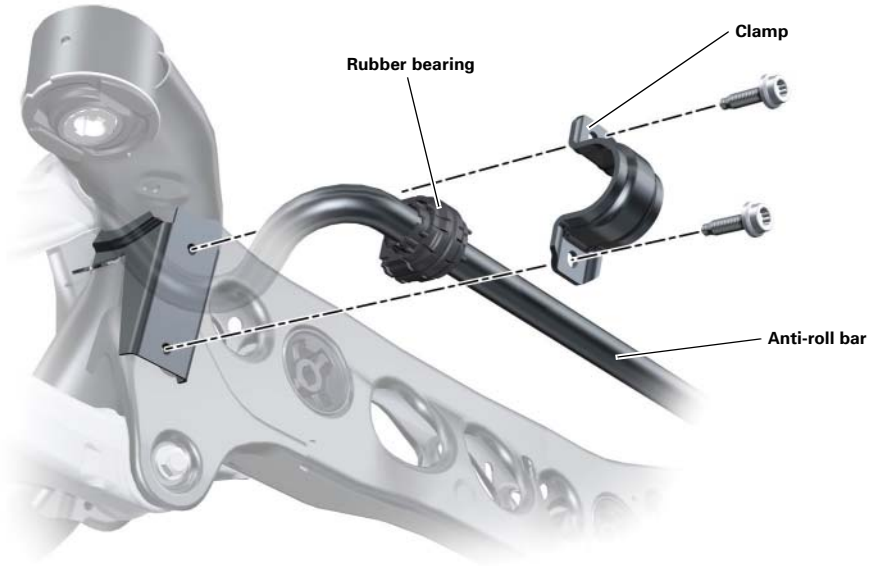


Wheel bearings for quattro models

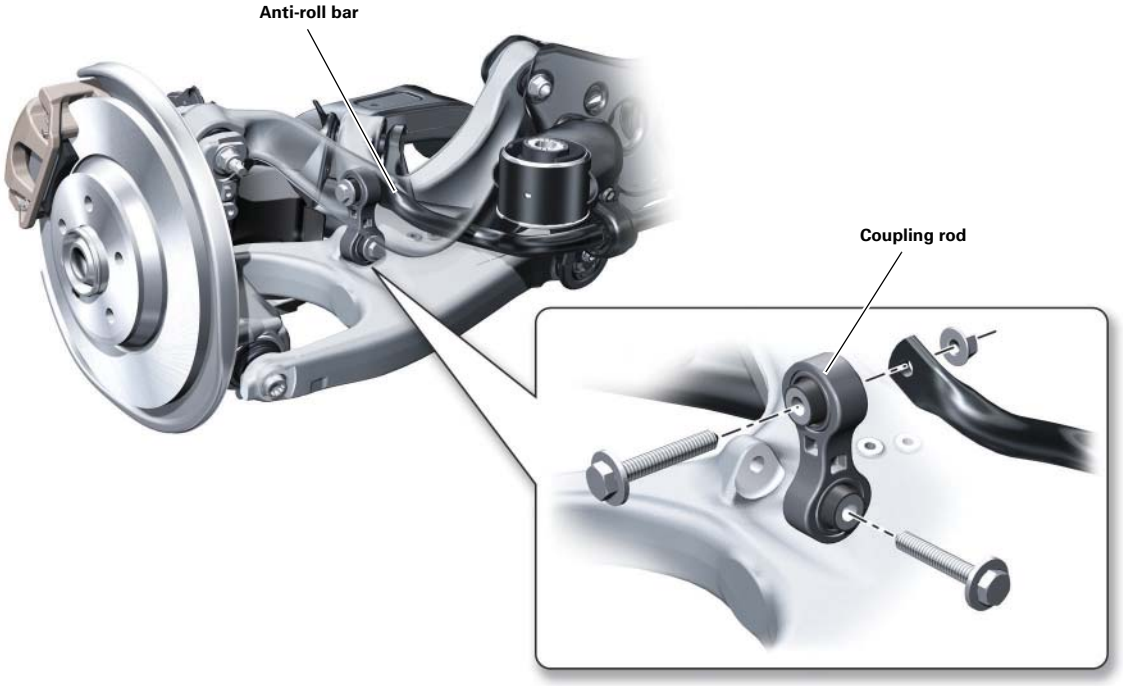
394_020

Anti-roll bar

Tubular anti-roll bars are used to save weight. The anti-roll bar is mounted on the axle carrier by means of rubber bearings and clamps and connected to the trapezoidal links by plastic link rods.



394_023

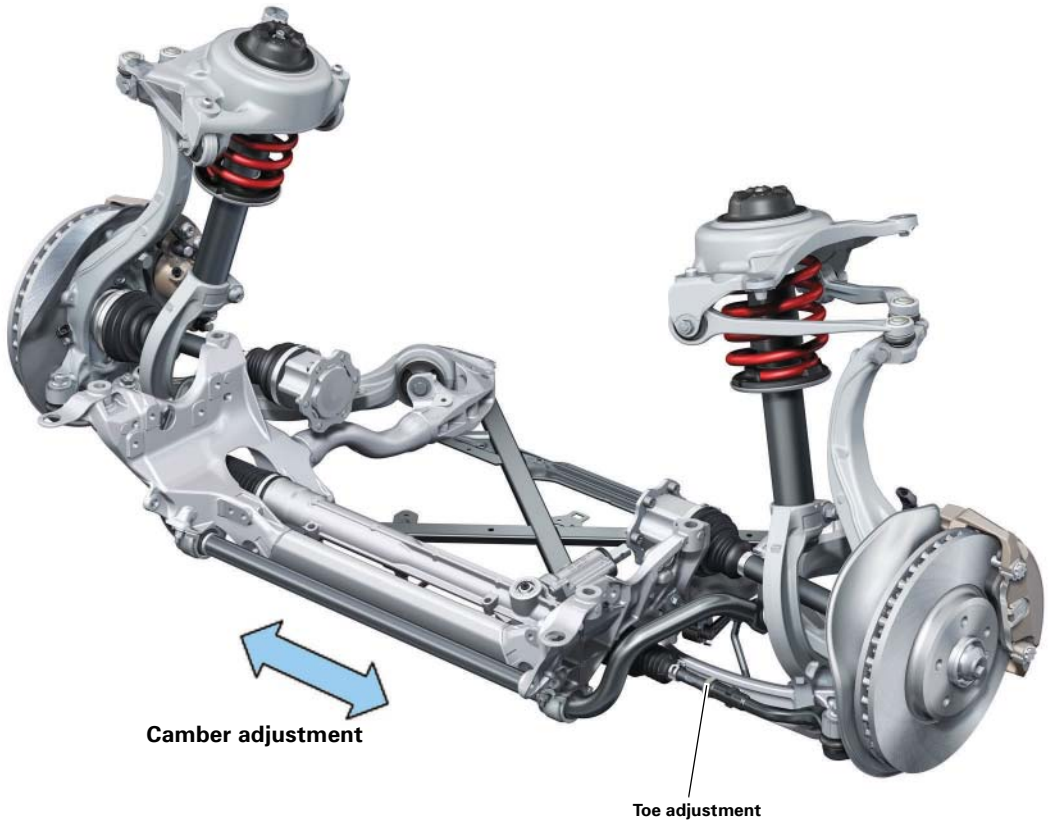


394_024

Front axle

Camber can be adjusted slightly at the front axle by shifting the axle carrier sideways within the bore tolerances.
Toe-out can be adjusted individually at the track rods.

One of the key modifications is that adjustment of the S-point is no longer needed due to arrangement of the steering gear on the axle carrier.

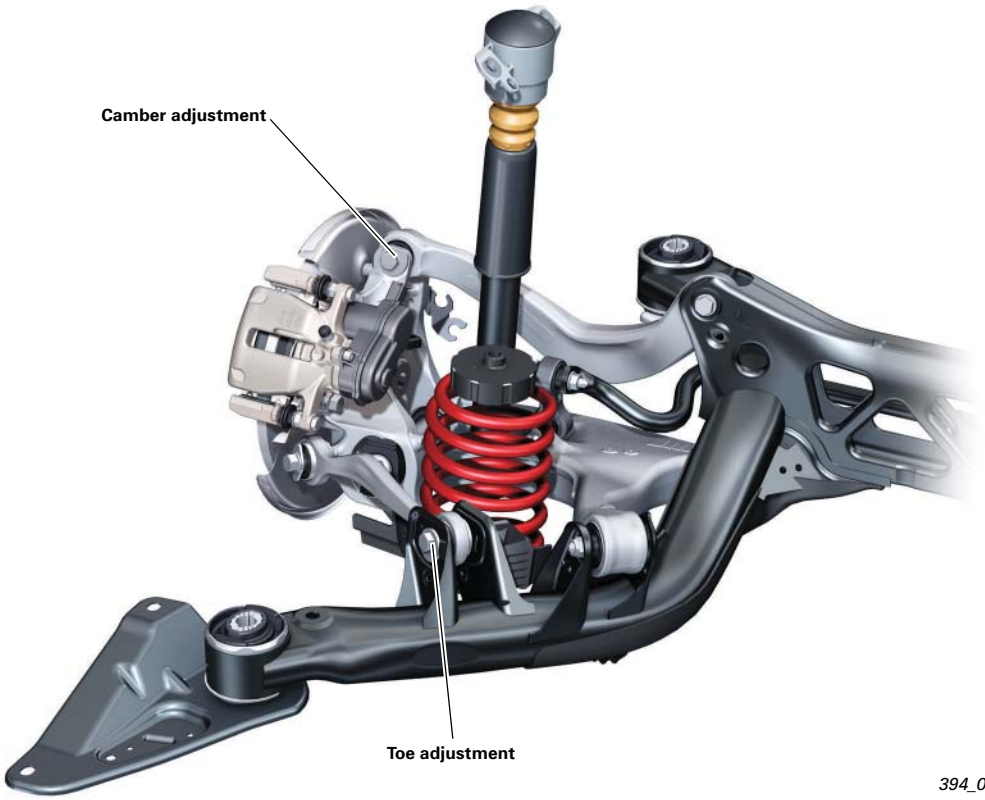


394_025

Rear suspension

It is possible to set the individual toe values at the rear axle. For this purpose, an excentric adjustment is provided at the track rod - axle carrier joint.

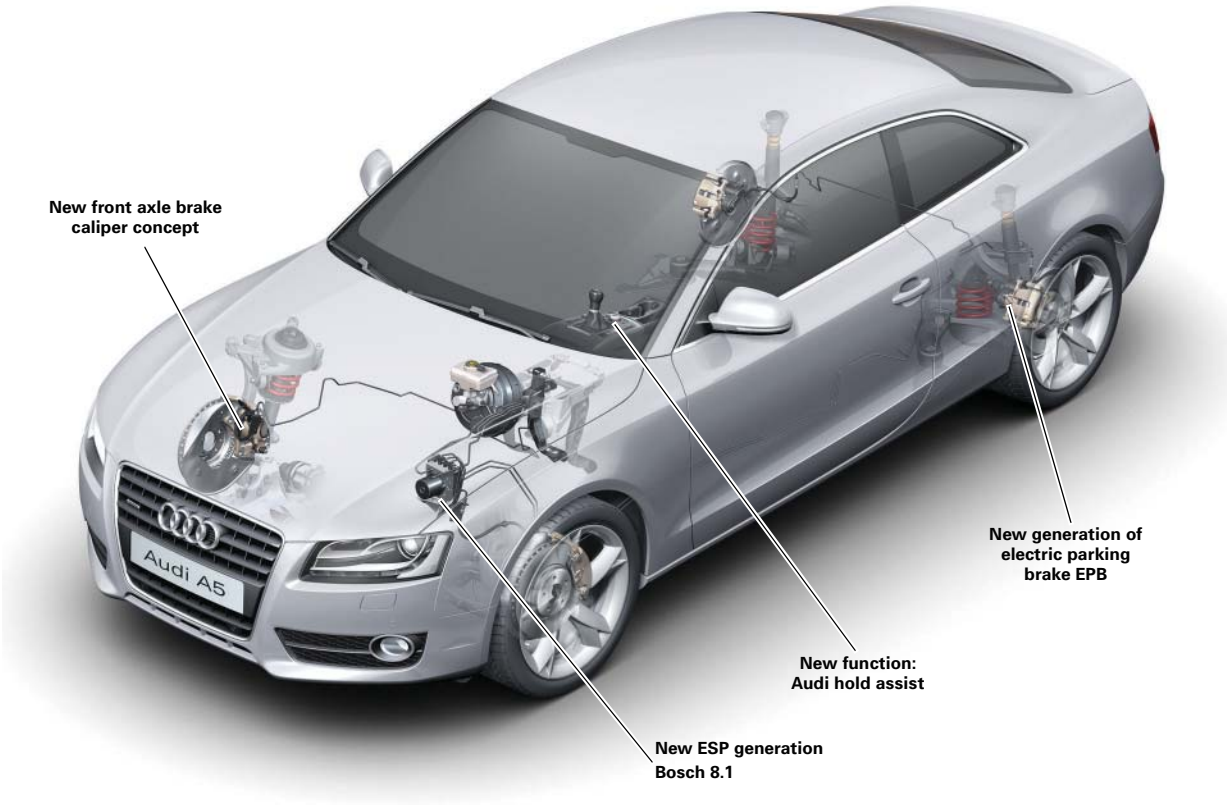
The individual toe camber values can be set at the upper wishbone - wheel carrier joint.



394_026

Overview

The brake system of the Audi A5 is generously specified to ensure high performance as well as optimum stability.



394_027

Wheel brakes overview

Front axle

Engine	3.0l TDI	V8 4.2l FSI
Minimum wheel size	16"	17"
Brake type	TRW FBC-57 16"	TRW FBC-57 17"
Number of pistons	1	1
Piston diameter (mm)	57	57
Brake disc diameter (mm)	320	347

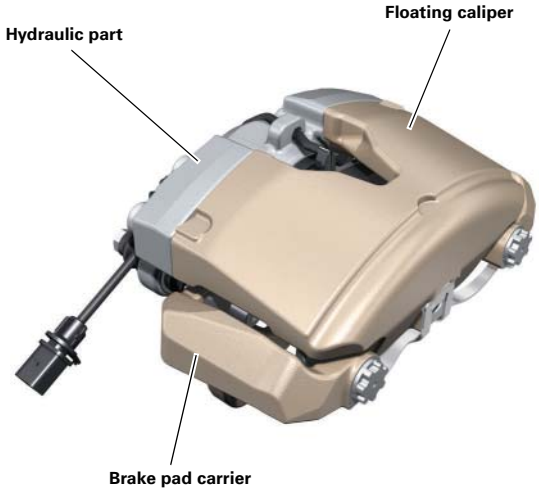
Rear suspension

Engine	3.0l TDI	V8 4.2l FSI
Minimum wheel size	16"	17"
Brake type	TRW CII-43 EPB 16 "	TRW CII-43 EPB 17"
Number of pistons	1	1
Piston diameter (mm)	43	43
Brake disc diameter (mm)	300	330

Wheel brakes - front axle

FBC brake caliper

A new brake caliper concept called FBC (foundation brake compound) is used on the Audi A5. The caliper for the Audi A5 is painted black and bears the logo S5.



394_030

Design

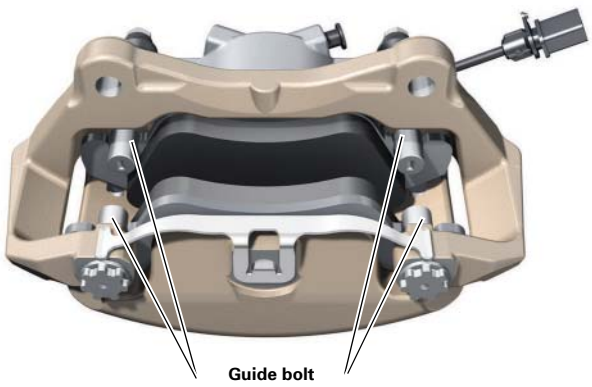
The brake caliper housing comprises a floating caliper made of spheroidal graphite cast iron and a hydraulic part made of aluminium.
The cast material allows high component strength and compact design.
The use of aluminium for the hydraulic part provides a lightweight design and, in turn, reduced unsprung masses.

Note

Important! The threaded connections between the hydraulic part and the floating caliper must not be removed during servicing! In the event of a fault, the complete brake caliper housing must be replaced.

The main new feature is the pad carrier. Four guide bolts are inserted into the pad carrier.

The small points of contact between the pad carrier and the guide bolts allow easy brake pad movement. The sticking caused by corrosion is also prevented.

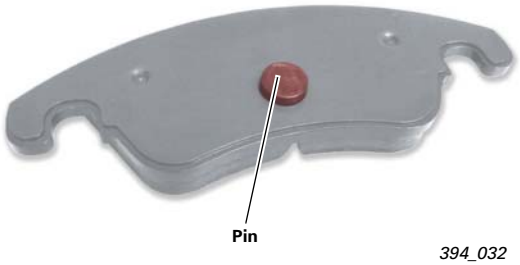


394_031

FBC brake caliper

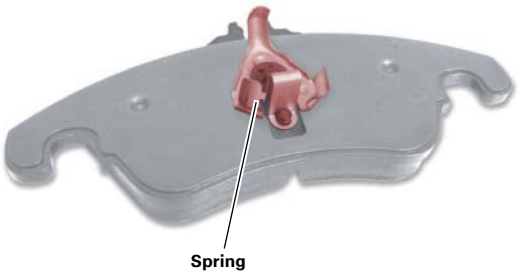
Design

The brake pad on the floating caliper is supported by a pin on the pad carrier which engages in a recess on the floating caliper.



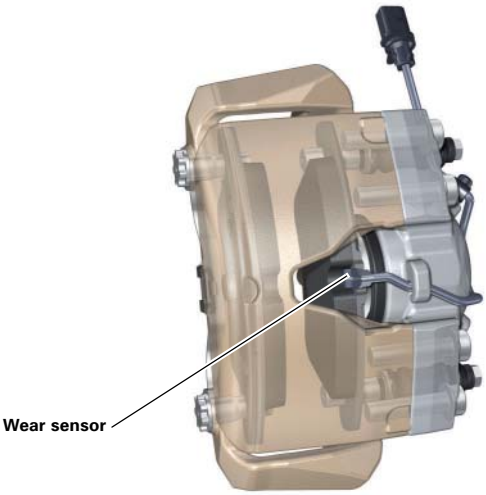
394_032

The brake lining on the piston side is held in place in the brake piston by a stainless steel spring.



394_033

The brake pad wear indicator sensor is located in the front left wheel brake pad. The signal from this sensor is read in by the onboard power supply control unit J519.



394_034

Very light and filigree brake discs are used in combination with the FBC brake calipers. As a result, the brake discs cool down very quickly and fading tendency is considerably reduced.

The brake discs are connected to the wheel hubs by locking screws.

394_035

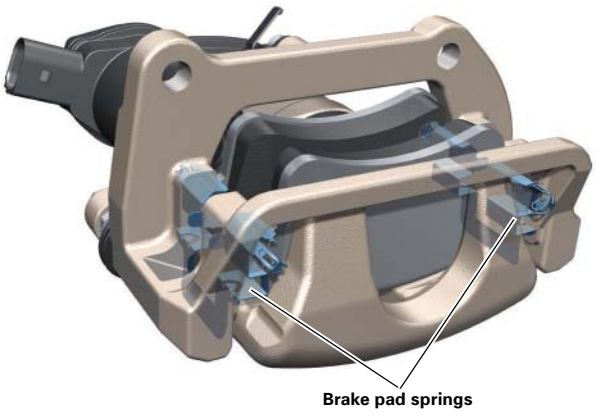
Wheel brakes - rear axle

Brake caliper

TRW Colette II brake calipers are used in combination with the electromechanical parking brake EPB on the rear axle.

394_036

A major new feature is the use of stainless steel springs between the brake pad and the pad carrier. The brake pad springs ensure a symmetrical distribution of pad play between the brake pads and the brake disc. This effectively prevents premature one-sided brake pad wear.



394_037

Note

Special attention must be paid to correct installation of the brake pad springs when replacing the brake pads! For detailed information, refer to the current workshop manual.

Brake servo

Design and function

A conventional 8/9 inch TRW tandem brake servo is used.
The brake servo operates at a constant ratio of i=8.

394_038

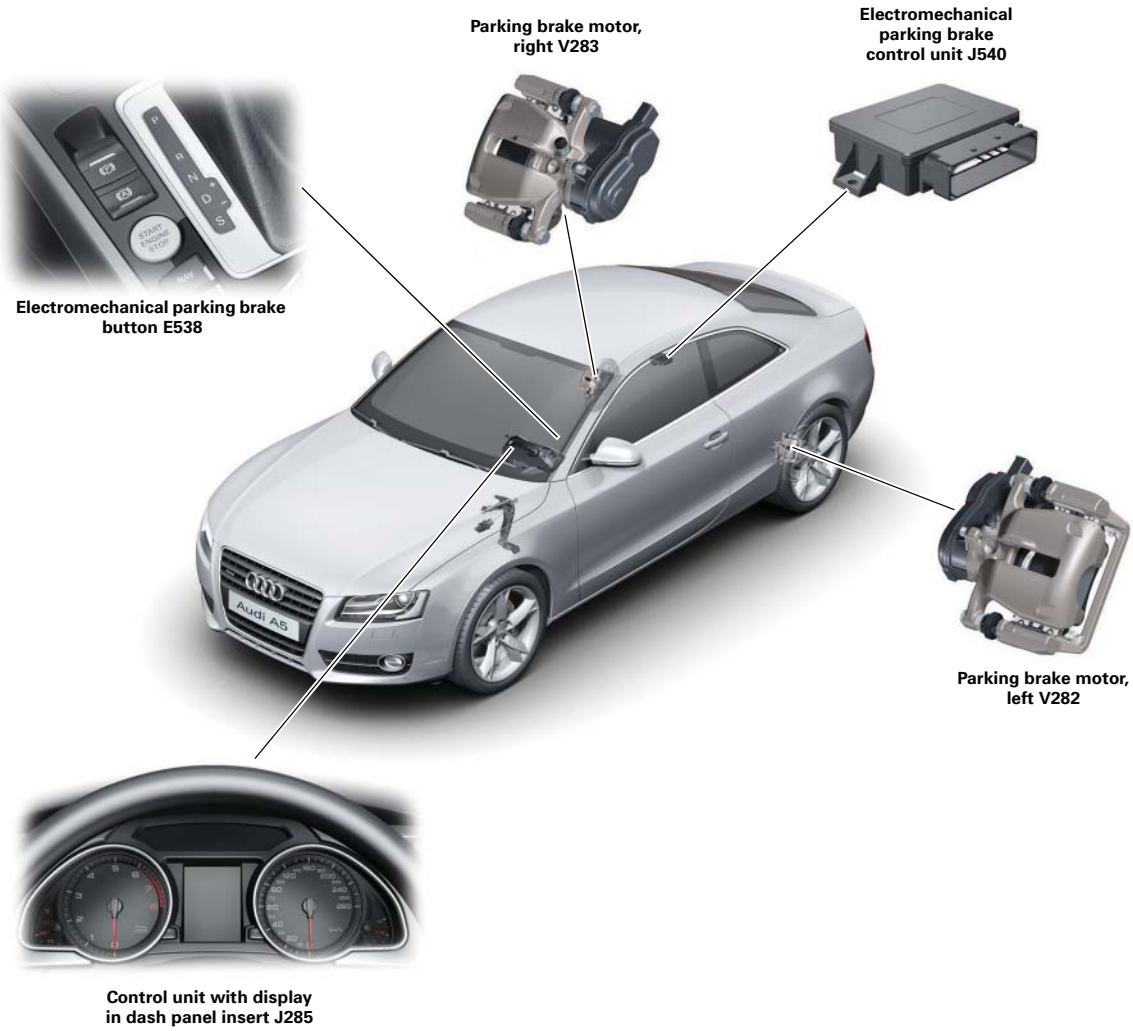
The Reed switch for the brake fluid level warning indicator is now integrated in the screw cover on the brake fluid tank. Previously, the contact was open in the neutral position. Therefore, if a switch failed, a low brake fluid level was not indicated.

Due to the modified installation position of the switch, the Reed contact is closed in the neutral position, i.e. when the brake fluid level is ok. The warning is activated by opening of the contact. In this way, switch failure and open circuit are detected and indicated.

394_039

Electromechanical parking brake EPB

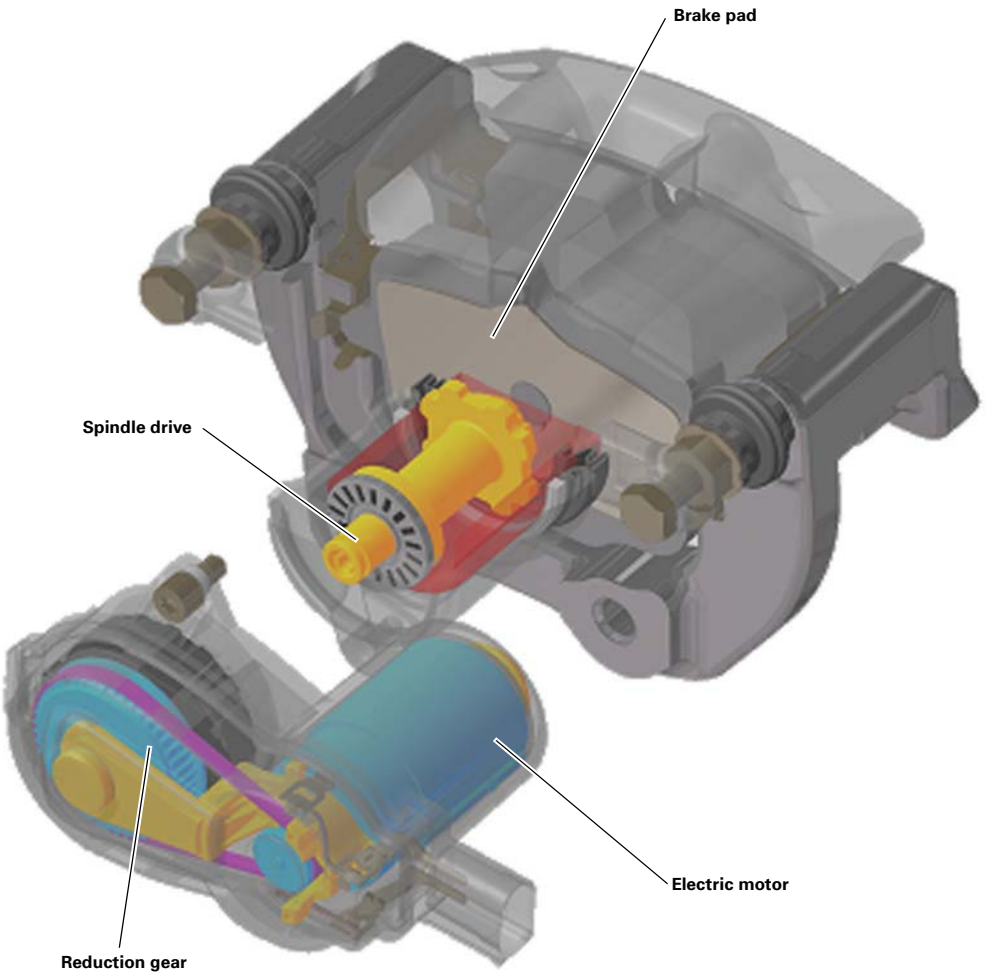
System components - overview



394_040

System components - parking brake motor V282/283

The brake pads are tensioned by a spindle drive. The spindle drive on the Audi A5 has the same design and functional principle as the systems already in use on the Audi A8 and Audi A6, which are described in Self-Study Programme 285.

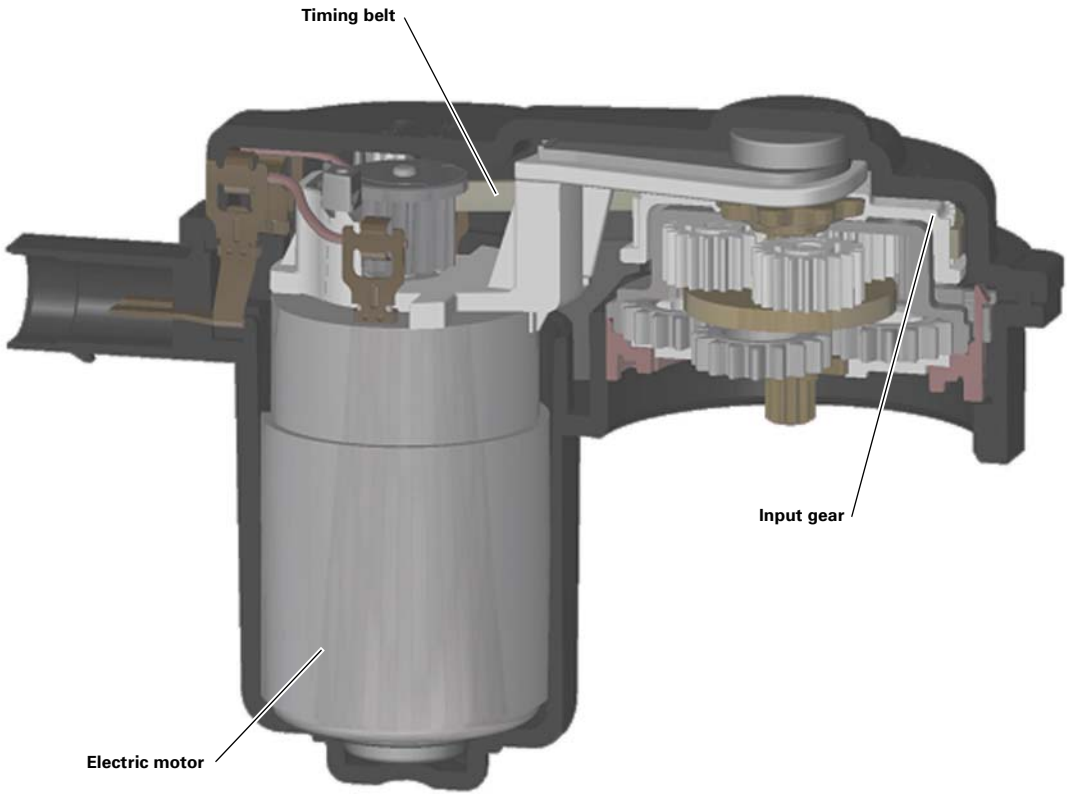


394_041

System components - parking brake motor V282/283

The reduction gear is a new feature. A planetary gear is now used in place of a wobble-plate gear. Drive is provided by an electric motor via a helical-cut timing belt.

The planetary gear offers acoustic advantages and requires less installation space.



394_042

The overall ratio of approx. 1:150 is achieved in three stages:

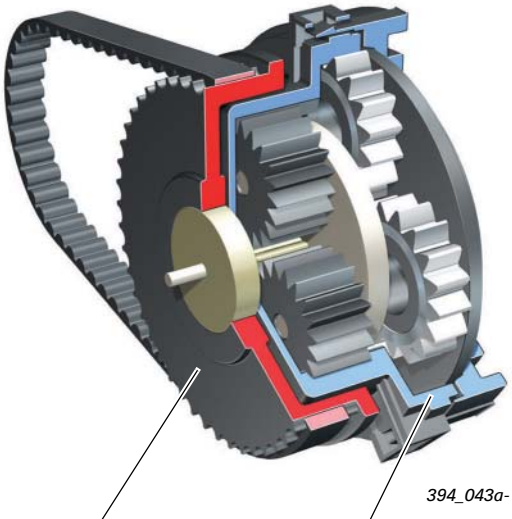
1. by means of a toothed belt drive between the engine and gearbox input (1:3)
2. by means of a planetary gear (1:50)
3. by means of a spindle drive (1:1.25)

System components - parking brake motor V282/283

Power flow

The large reduction ratio is implemented technically by two serial planetary gears. The input gear driven by the timing belt acts as the sun gear for the first planetary gear train. The ring gear is rigidly connected to the housing. In this way, the rotational movement of the driven sun gear is reduced to the planetary gear.

The planetary gear is designed as a pinion on the output side and serves as the sun gear for the second planetary gear train. The planetary gear of the second reduction step is the output gear and is connected directly to the spindle drive.



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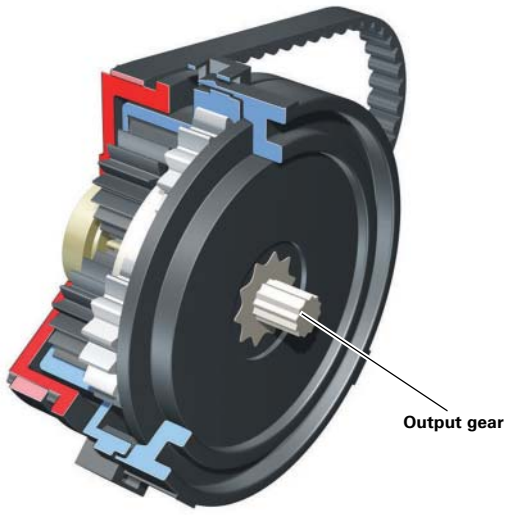

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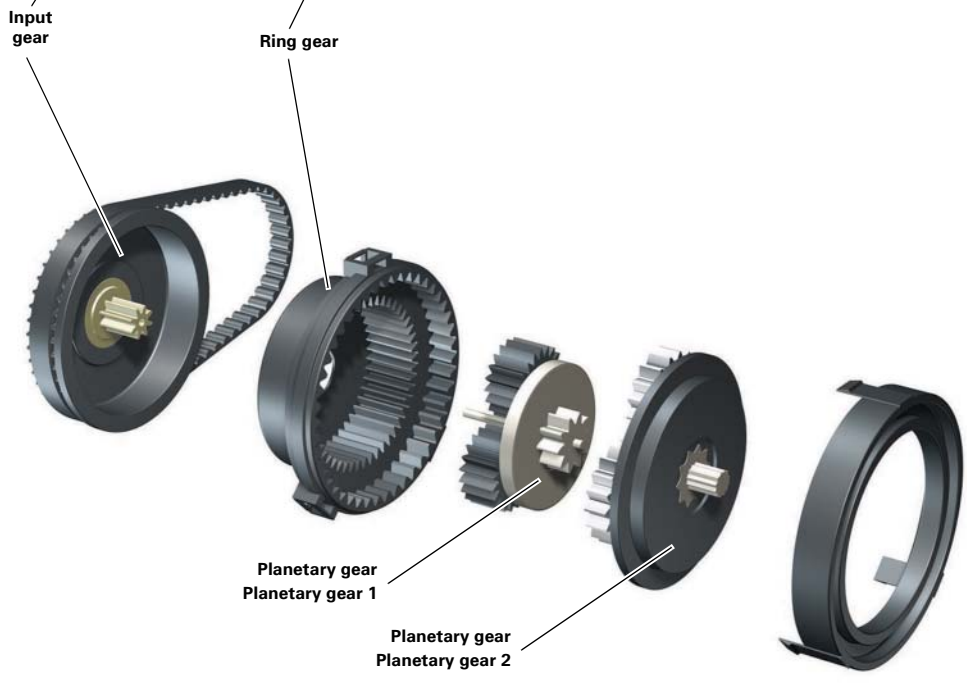


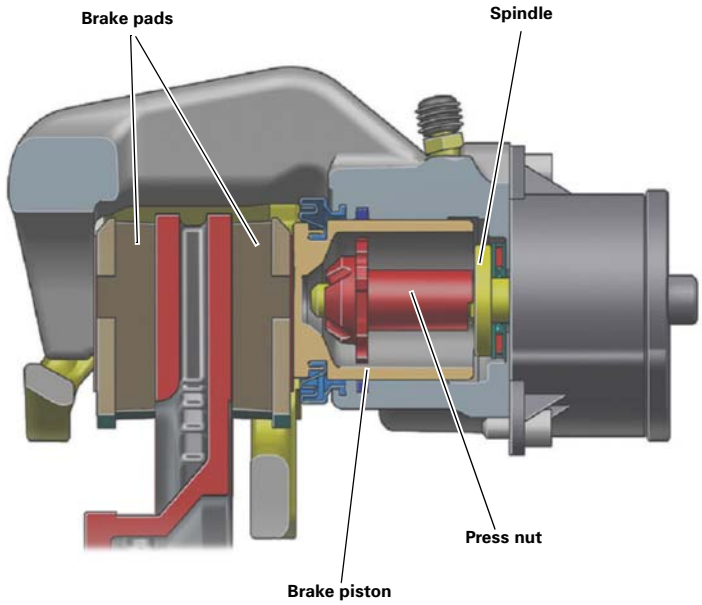
394_043a-2

System components - parking brake control unit J540

Functional principle

The brake pad is controlled through the activation of the electric motor by control unit J540.

The activation current increases sharply when the brake pads come into contact with the brake disc. The switch-off point, and hence the maximum tension, are determined by evaluation of the voltage and current characteristics.
Movement of the brake pad is not directly measured.



394_043

The control unit is installed in the luggage compartment on the right. Like in the Audi A6 and Audi A8, the parking brake motors V282/283 are separately activated downstream of the battery for the left and right motors.
Two processors are implemented in the control unit. Enabling decisions are always made by both processors. A micromechanical inclination sensor is integrated in the control unit. The EPB control unit also determines the actual longitudinal acceleration of the vehicle from the sensor signal. This value is utilised by the ESP control unit in the Audi A5. Control unit J540 has its own internal run-on cycle, irrespective of the CAN run-on cycle. This cycle has a minimum duration of 20 seconds. This ensures that the display remains active for a further 20 seconds after ignition off when the parking brake is closed.
Flash programming is now possible.

394_044

It is no longer necessary to encode the control unit after servicing.

Functions - overview

The EPB functions implemented on the Audi A5 are basically identical to those of the EPB on the Audi A6 and Audi A8:

in addition to the actual parking brake function, a dynamic emergency brake function, a Hill Start Assist function and the TUEV mode are implemented.

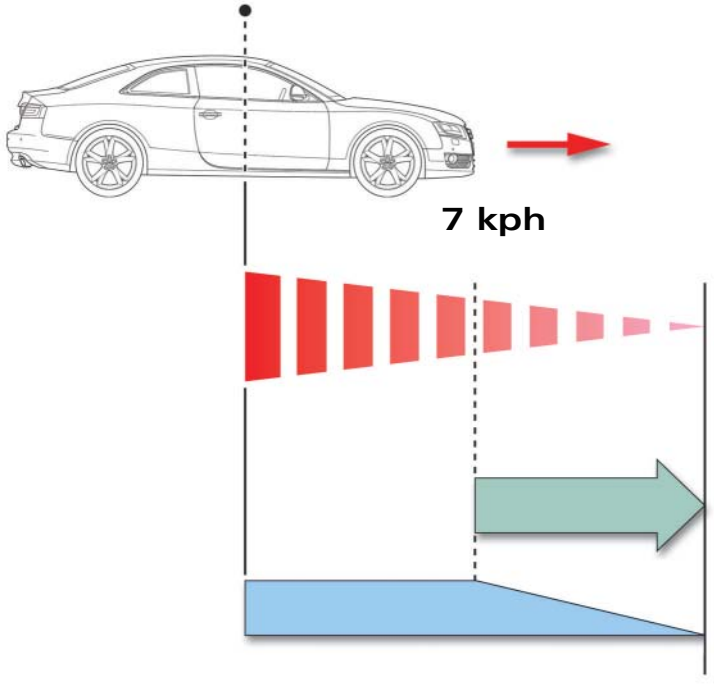
Reference

For detailed information, please refer to SSP285 and SSP324.

Dynamic emergency brake function

The dynamic emergency brake has the same general functional principle as the systems on the Audi A6 and Audi A8: If the function is activated when the vehicle is travelling at a speed of greater than 7 kph, the ESP brakes the vehicle by actively building up brake pressure at the rear wheels. If the vehicle is then braked to a speed of less than 7 kph, the EPB is activated and ESP reduces the brake pressure.
The ESP builds up brake pressure at the command of the EPB control unit. In certain situations, the ESP control unit may not be able to execute this command and build up any brake pressure (e.g. if excess temperature is detected at the wheel brakes or in the case of certain ESP faults).

The dynamic emergency brake function is unavailable on the Audi A6 and Audi A8 at road speeds of greater than 7 kph.
In this case, EPB assumes the ESP function on the Audi A5. Even at speeds of greater than 7 kph, the vehicle is braked by rapid alternate closing and opening of the parking brake (at a maximum rate of approx. 2 Hz). The wheel speeds at the front and rear axles are continuously compared to avoid overbraking the rear axle and thereby prevent instability.

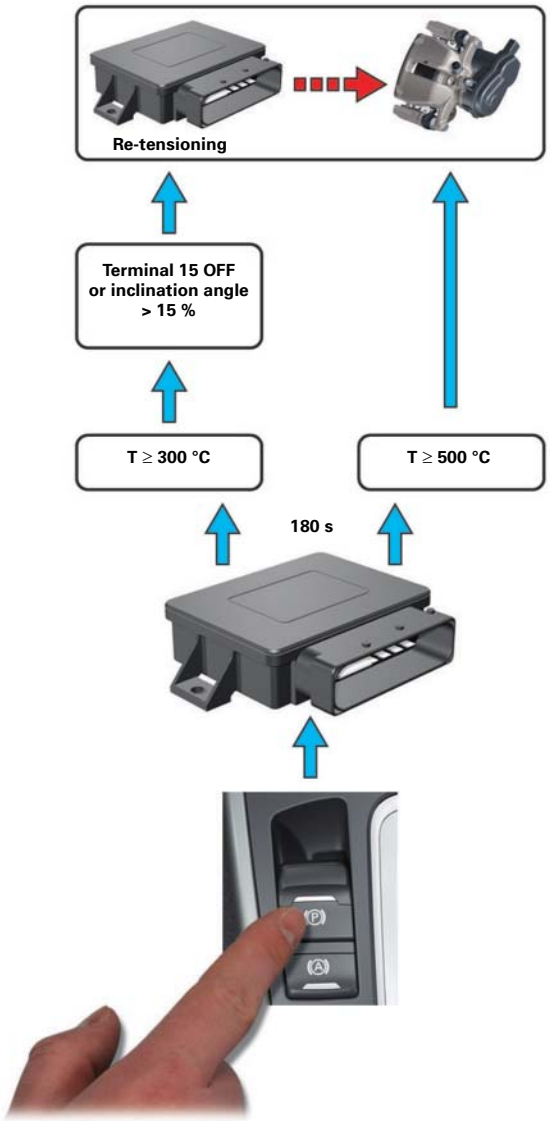


394_045

Functions - automatic re-tensioning at high brake disc temperature

The parking brake on the Audi A5 is automatically re-tensioned when the vehicle is stationary and at high brake disc temperature. The brake disc temperature is measured by the EPB control unit using a temperature model. The EPB control unit measures the actual brake disc temperature three minutes after closing the parking brake.

The brake disc is re-tensioned at a disc temperature greater than 300 degrees Celsius, when the ignition is turned off and if the inclination angle is greater than 15 %. The brake disc is re-tensioned at a disc temperature of 500 degrees Celsius of higher regardless of whether the ignition is on or off. This is indicated by the flashing of the warning lamp.



394_046

Automatic brake pad clearance correction

This function has been adopted from the Audi A6. If the driver does not use the parking brake for a lengthy period of time, the distance which the spindle drive must travel to apply the brake pads will increase. This is caused by brake pad wear. When the parking brake is actuated, it may under certain circumstances take much longer to close.

To prevent this, the parking brake function is activated automatically if it has not been activated during the last 1000 kilometres covered. The condition for this is that the vehicle is parked with the parking brake open and the ignition OFF.

Operation and displays

The parking brake function is activated by pressing the electromechanical parking brake button E538. The conditions for activation, deactivation and indication by the warning lamps and display are identical to those of the EPB on the Audi A6 and Audi A8.

A new features is the activation of the parking brake warning lamp via CAN bus.
The lamp is activated discretely on the Audi A8 and A6. The yellow warning lamp in the centre display on the Audi A5 is activated via CAN, as was the case previously on the Audi A6.

394_047

Servicing

The following changes had been made compared to the Audi A6 and Audi A8.

Encoding of control unit J540

Encoding of the control unit is no longer necessary. After replacing the control unit, the inclination sensor must be calibrated (Basic setting 20) and Basic setting 10 (closing and opening the parking brake three times) must be performed before putting the control unit into operation. In the Guided Fault Finding program, these functions are automatically incorporated into the test plan, which must be carried out when the control unit is replaced.

394_048

Reverse polarity test cable VAS 1598/55

In case of failure of parking brake motor V282/283, this new special tool is used to determine whether the parking brake motor or the control unit is faulty.

394_049

Data blocks

The peak brake disc temperature is stored in new data blocks 8 and 9.

Final control test

The final control test now also includes a test for the Audi Hold Assist warning lamp.

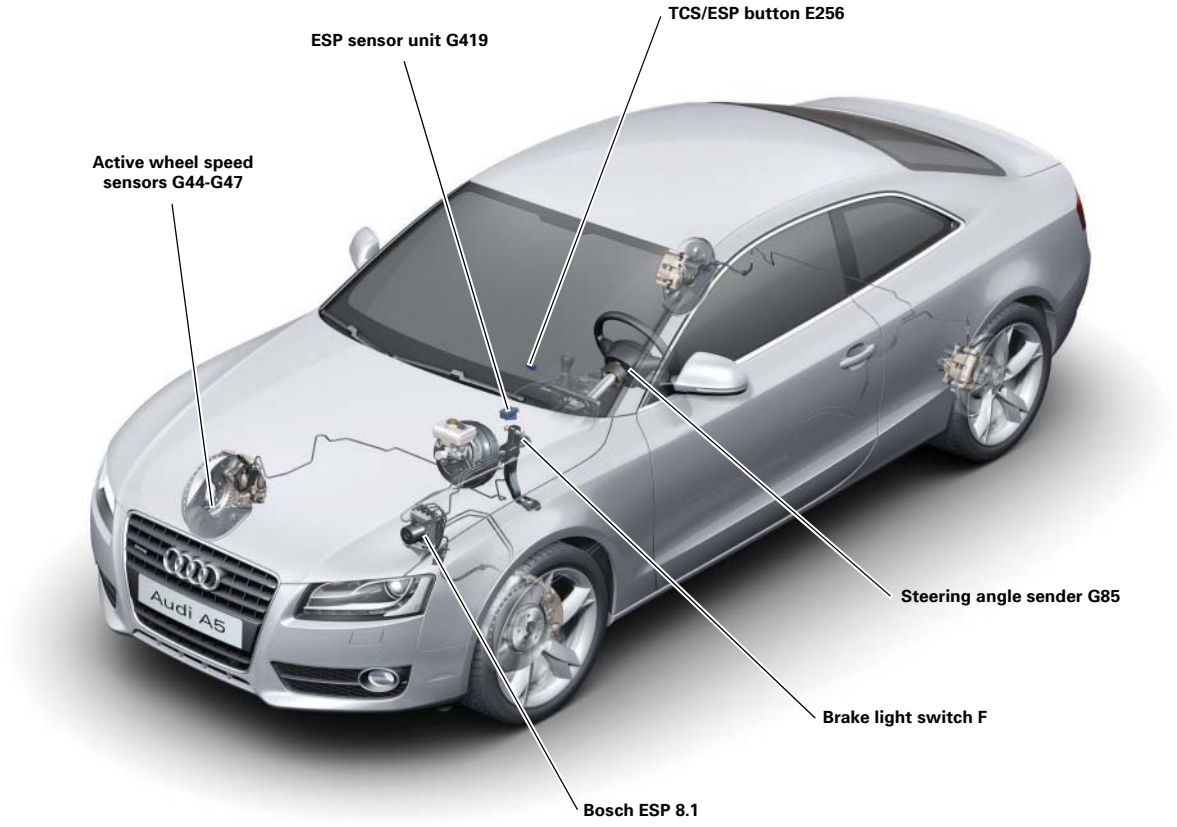
Reference

For detailed information, refer to the current workshop manual and the Guided Fault Finding program in the diagnostic tester

ESP

Overview

For the first time in an Audi, the Bosch ESP 8.1 system is used on the Audi A5. This new ESP system differs from the previous ESP 8.0 basically in that it has uprated valves and a wider range of functions. Active wheel speed senders are used.



394_050

System components - ESP unit

The ESP unit is used in four versions. In addition to a basic version, a unit with an extended range of functions is used. A distinction is generally made between front wheel drive and quattro drive.

The ESP 8.1 has the same outer dimensions as the ESP 8.0.

The tightness of the control valves when closed has been optimised.

The ESP control unit has run-on capability and can be actively kept in a wake state via the powertrain CAN bus.

394_051

Note

In the case of the ESP 8.1, too, it is not permitted to disconnect the control unit and the hydraulic unit during servicing.

System components - wheel speed sender

Active senders are used. They are identical in design and functional principle to the senders already used on the Audi A8 and Audi A6.

394_052

Reference

For detailed information, please refer to SSP285

System components - ESP sensor unit G419

The sensor unit is identical in design and functional principle to the unit on Audi A4 and Audi A6.

On the Audi A5 data is transferred to and from the ESP control unit via the sensor CAN bus.

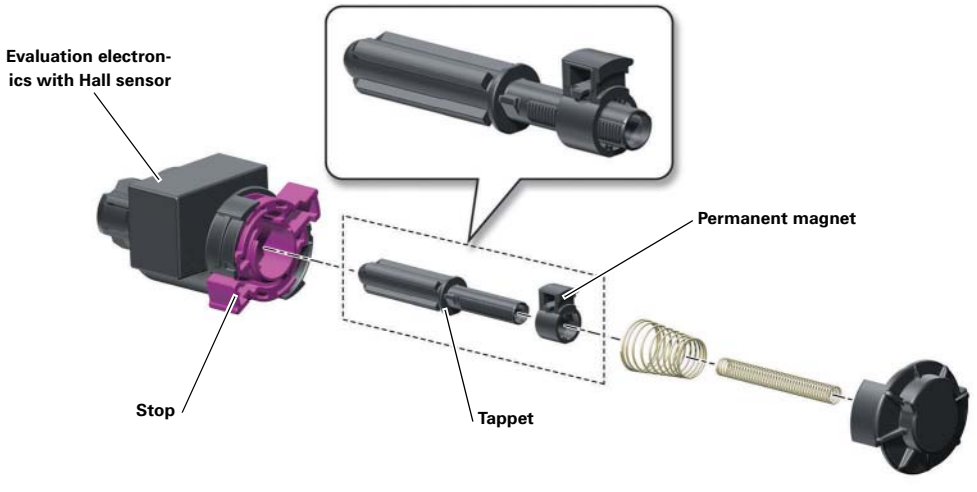
394_053

System components - brake light switch F

An electronic brake light switch is attached to the brake pedal. Actuation of the brake pedal moves a tappet within the sensor. A permanent magnet is attached to the tappet. Magnetic field strength is measured by a Hall sensor. The evaluation electronics supply the two inverse signals brake light switch (BLS) and brake test switch (BTS). Only the BLS signal is utilised as an input signal on the Audi A5. This signal is checked for plausibility through evaluation of the brake pressure. The brake pressure is measured by pressure sensor G201 in the ESP hydraulic unit.

394_054

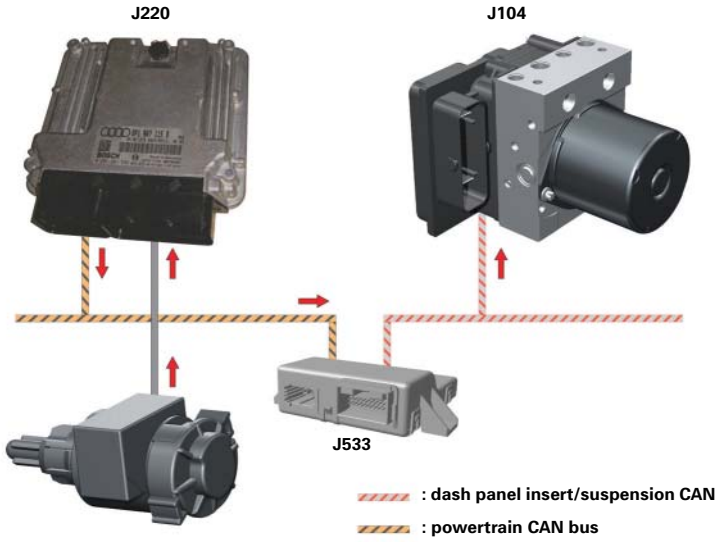
The sensor is fixed in place in the holder on the pedal bracket by rotating the stop. The permanent magnet is rotated at the same time. The tappet is located within the housing and maintains its position. The two components interlock through the rotation of the permanent magnet against the tappet. The permanent magnet is fixed in position through the actuation of the stop on the tappet. Thus, the sensor is positioned relative to the brake pedal.



394_054b

System components - brake light switch F

The signal from the brake light switch is read in by the engine control unit J220 and output to the CAN bus. Here, it is read in by the ESP control unit J104.



394_055

System components - steering angle sender G85

The steering angle sender is a new development. It is still installed in the switch module together with the steering column electronics control unit.

The switch module on the Audi A5 is positioned on the steering column crash tube by means of a fitting key. Installation tolerances are minimised in this way.

The code disc on the steering angle sender is now "driven" directly by the steering wheel. Previously, steering movements were transmitted from the steering wheel to the steering tube and in turn to the sender code disc. Measuring accuracy is higher on the Audi A5 because the code disc is driven directly (see chapter "Steering system - steering wheel").

394_057a

Functions

The following functions of the ESP 8.1 have already been implemented in the ESP 8.0 on the Audi A6:

ESP (electronic stabilisation program)
ABS (anti-lock braking system)
EBD (electronic brake pressure distributor)
TCS (traction control system)
EDL (electronic differential lock)
EBC (engine braking control)
HBA (hydraulic brake assist)
FBS (fading brake support)
Emergency brake signal
Brake disc cleaning

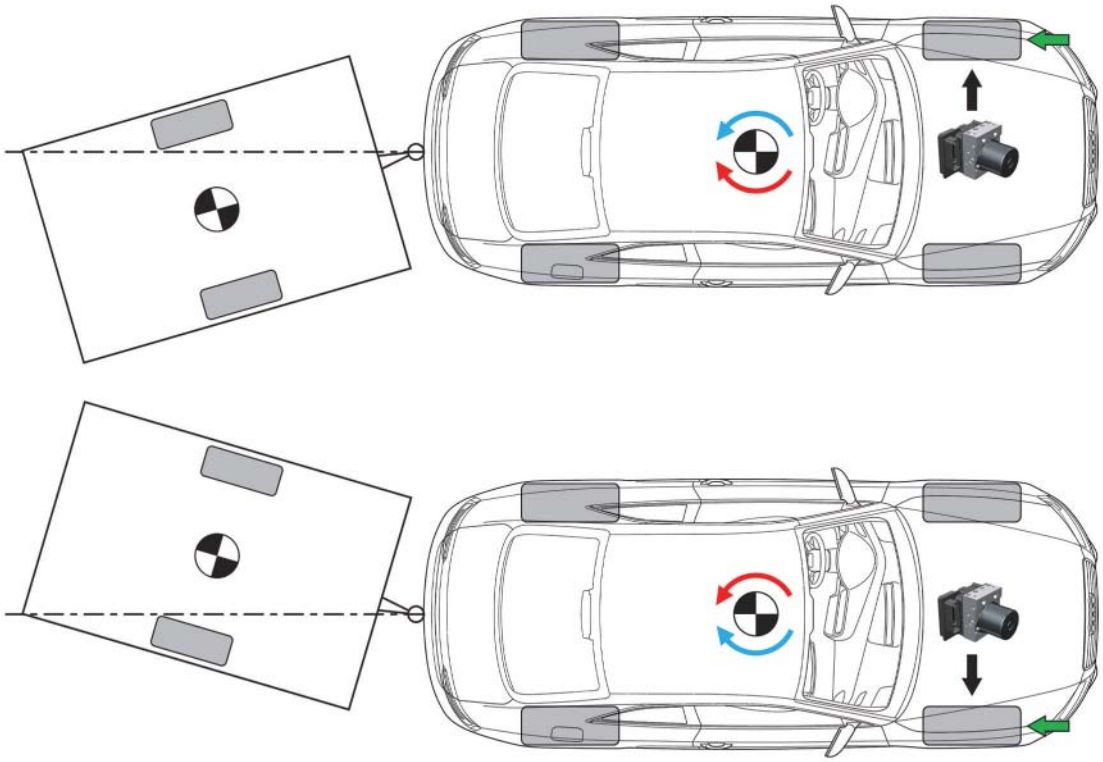
Trailer stabilisation system

The trailer stabilisation control function has been optimised. Swinging of the vehicle is caused by alternating torque ("reciprocating torque") about the vehicle's vertical axis in the direction of rotation. The ESP Bosch 8.0 brakes the vehicle at all four wheels in order to reduce the vehicle's speed to a non-critical level. The new ESP Bosch 8.1 builds up brake pressure alternately at the left and right front wheels.

A torque is which counteracts the "reciprocating torque" is produced about the vehicle's vertical axis by braking the corresponding front wheel. The advantage of this new control strategy is that the vehicle's speed does not have to be reduced as much in order to stabilise the car-trailer combination.

Note

This function is available only in combination with a tow bar fitted ex-factory or with a retrofitted Audi Genuine Parts tow bar.



394_057_1

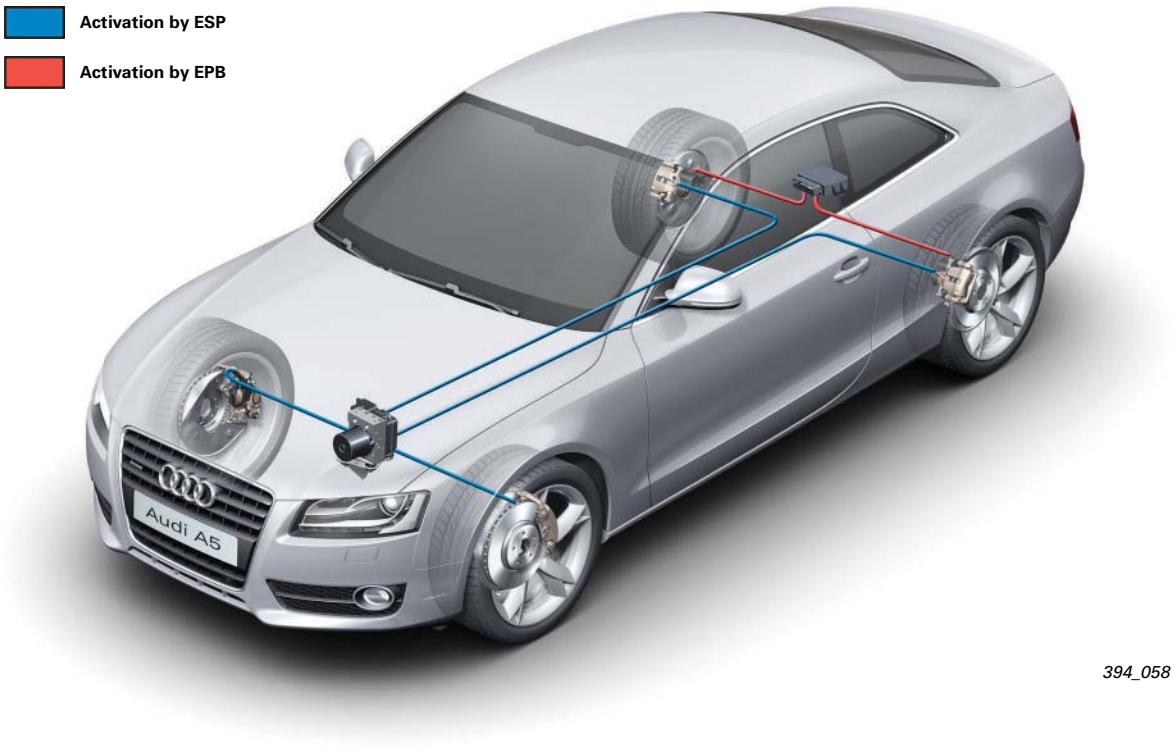
Audi Hold Assist (AHA)

This new function is used for the first time on the Audi A5. AHA is an optional convenience function.

Functional principle:

Its basic function is to hold the vehicle stationary on a gradient. To achieve this, the ESP system actively builds up brake pressure at all four wheels.The activated ESP solenoid valves heat up when the vehicle is stationary for lengthy periods of time. When the temperature of the solenoid valves exceeds approx. 200°C, the braking function is transferred to the electric parking brake.This is a precaution to avoid damaging the coils of the ESP solenoid valves.

When the driver wishes to set off again, the brake is not released until sufficient engine torque is available, in order to prevent the vehicle from rolling back.



394_058

Functional principle

The brake release point is determined on the basis of the following data:

- Engine torque
- inclination angle (determined by the inclination sensor on the EPB control unit)
- Gear selected
- Clutch travel (clutch position sender) or converter engagement

Audi Hold Assist (AHA)

Operation

The function is activated by pressing the Auto Hold button E540.

The following operating states exist:

deactivated: LED in switch not activated

stand by: LED in switch activated

active: LED in switch activated, display on dash panel insert (green (P)

394_059

To activate the function (stand by), defined activation conditions must be met:

- driver wearing seat belt
- The engine is running
- Driver's door closed
- ESP and EPB are fault free

The braking function is transferred from ESP to EPB when:

- the temperature of the ESP valves has reached a limit of approx. 200°C
- the driver's door is opened
- the seat belt is unfastened
- the engine is shut off
- the ignition is turned off
- the switch is actuated
- the brake pedal or accelerator pedal is depressed.

394_061

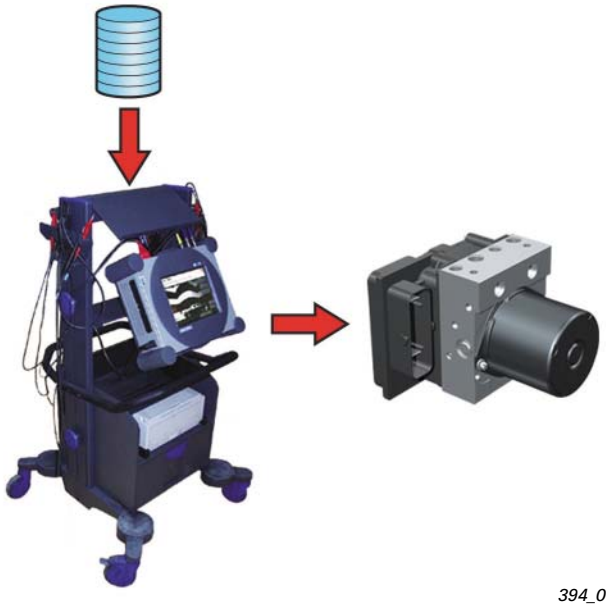
When the braking function is transferred to EPB, the display on the dash panel insert changes from green (P) to red (P)

Servicing

The following modifications have been made to the ESP 8.0 on the Audi A6.

Encoding of the control unit

The control unit is now encoded online.



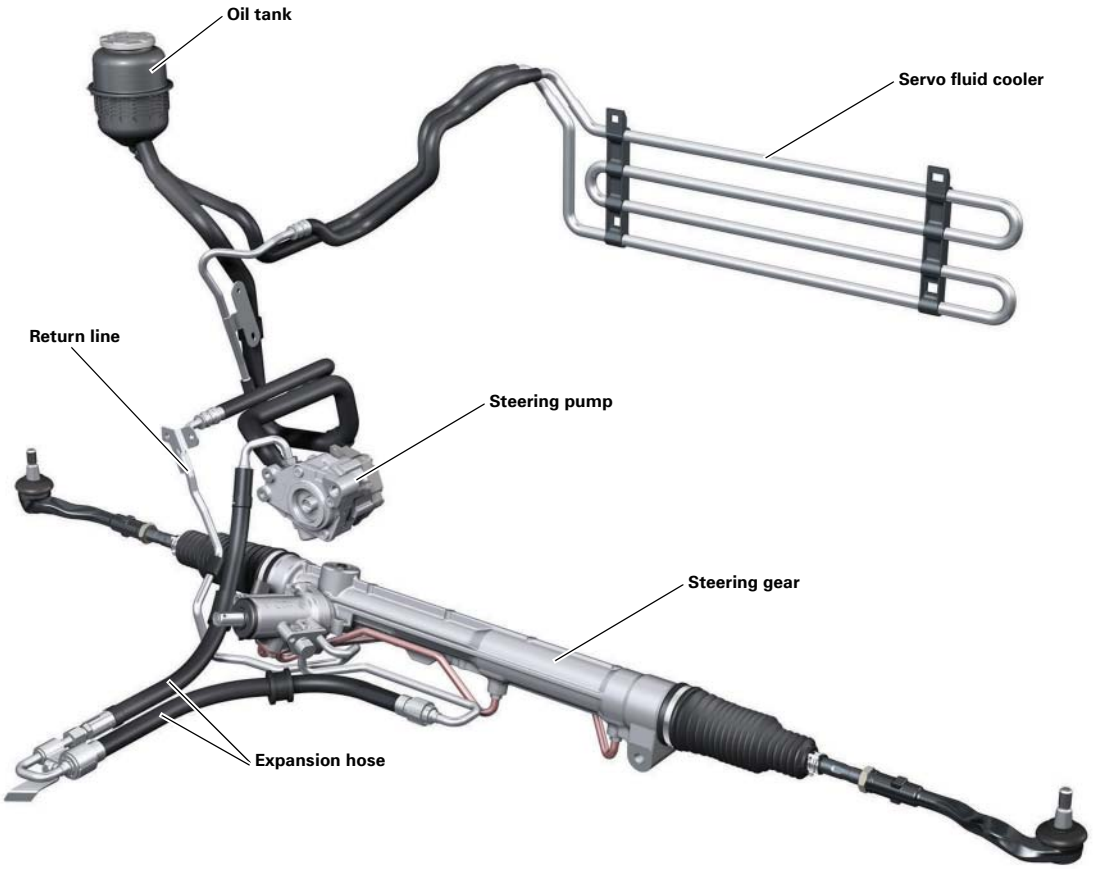
394_062

Brake light switch

The brake light switch is self-adapting. It is not necessary to calibrate the switch after replacing parts.

394_054

Overview



394_064

System components

Steering gear

A hydraulic rack-type steering gear is used. The basic steering gear is standard on all engine types up to 200 bhp. Vehicles with higher power outputs also have a speed-sensitive Servotronic® power steering system.

The steering gear ratio is constant. In comparison with the current Audi A4, higher forces have to be transmitted due to the modified kinematics. For this reason, piston diameter has been increased to 42 mm from 40 mm (= enlargement of the effective piston surface area).
The axial joints and the press piece have been adopted from the current Audi TT.

Due to the arrangement of the steering gear on the axle carrier, the track rods have a smaller flex angle than those on the current Audi A4. As a result, reduced transverse forces act on the rack.

As on the Audi A6, the steering valve bolted to the steering gear housing. The screw couplings of the expansion hose and the return line on the steering valve are designed as block couplings.

There is no steering rack centring facility. A centre mark is cast onto the steering valve boss at the top and, when centred, is in alignment with the mark on the end cap.

394_065

Steering pump

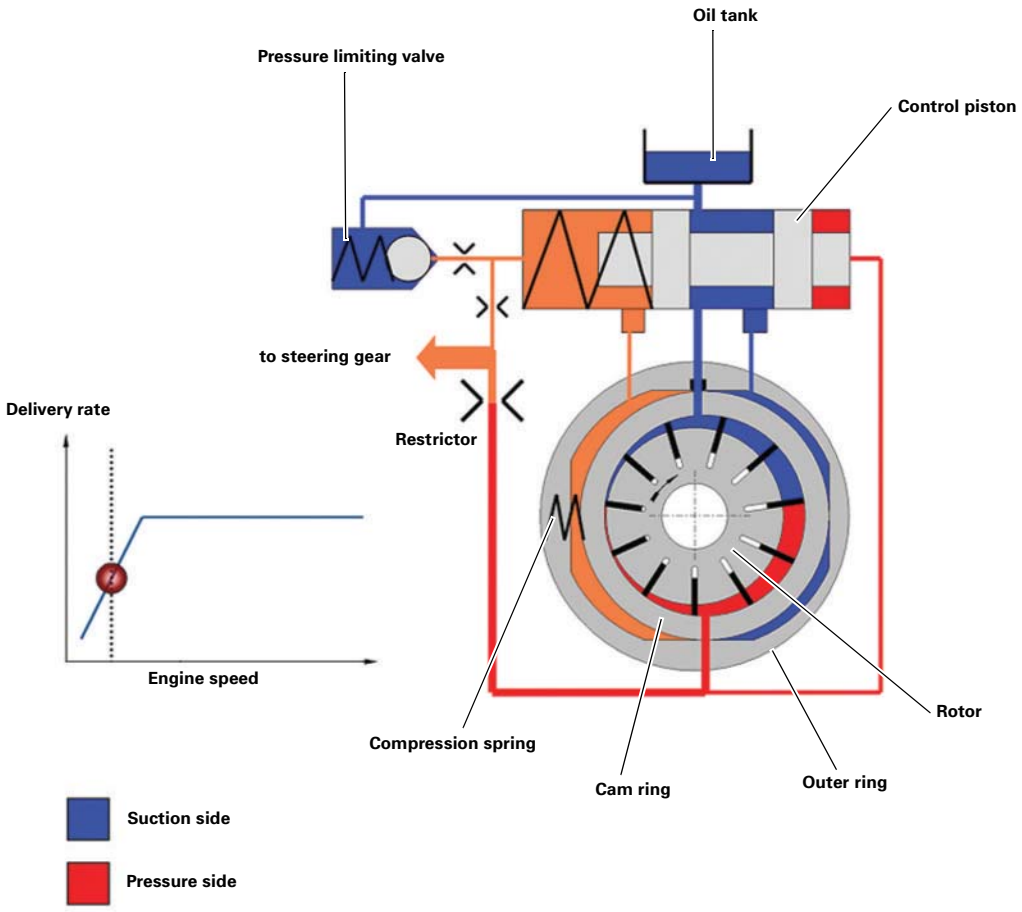
A direct-driven open-loop ZF FP6 pump is used on the eight-cylinder Audi S5. This pump rotates in counter-clockwise direction and, like on the current Audi A4, is attached to the chain housing.

All Audi A5 models without dynamic steering are equipped with ZF and Hitachi flow-controlled pumps. For detailed information about the design and function of the dynamic steering system, refer to SSP 402.

Flow control

At idling speed, the cam ring the pump is pressed against the outer ring by the spring force and the internal pressure conditions.

This maximises the possible delivery rate on the suction and pressure sides. The delivery rate increases in proportion to engine speed.

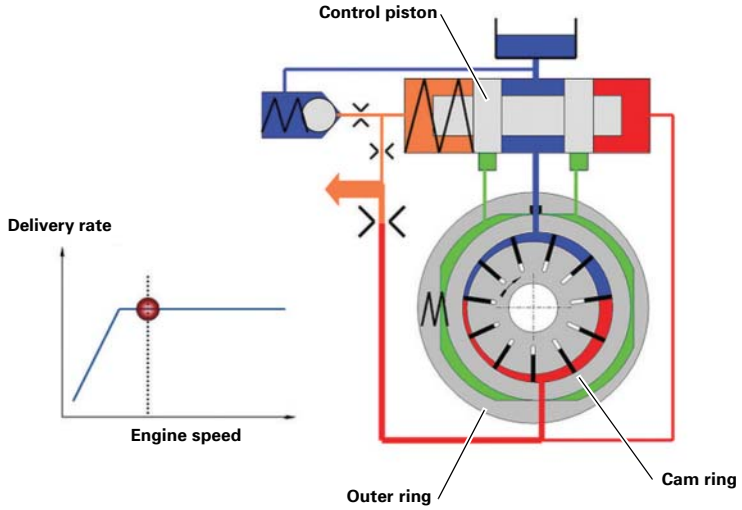


394_066

Steering pump

The pressure inside the pump also rises with increasing engine speed. Pump pressure is applied to the control piston on one side, and when the pressure rises the control piston is displaced to the left against the pressure of the spring. The control piston closes the channels leading to the spaces between the outer ring and the cam ring within a defined medium engine speed range.

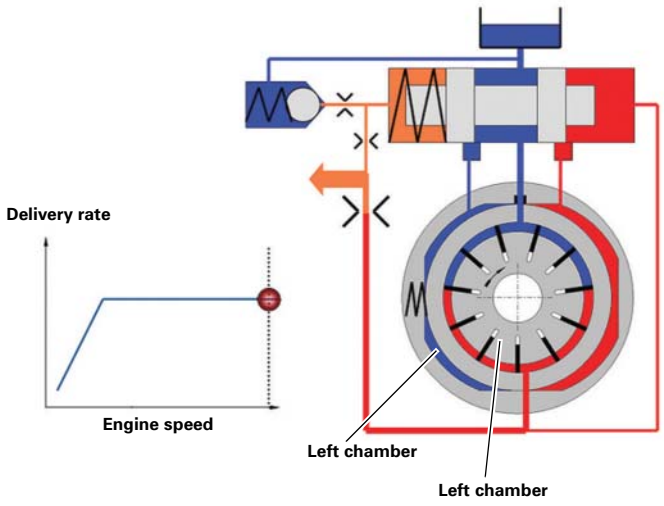
The pressure between the two spaces is thus equalised. The cam ring is held in a defined mid position and the delivery rate is near-constant.



394_067

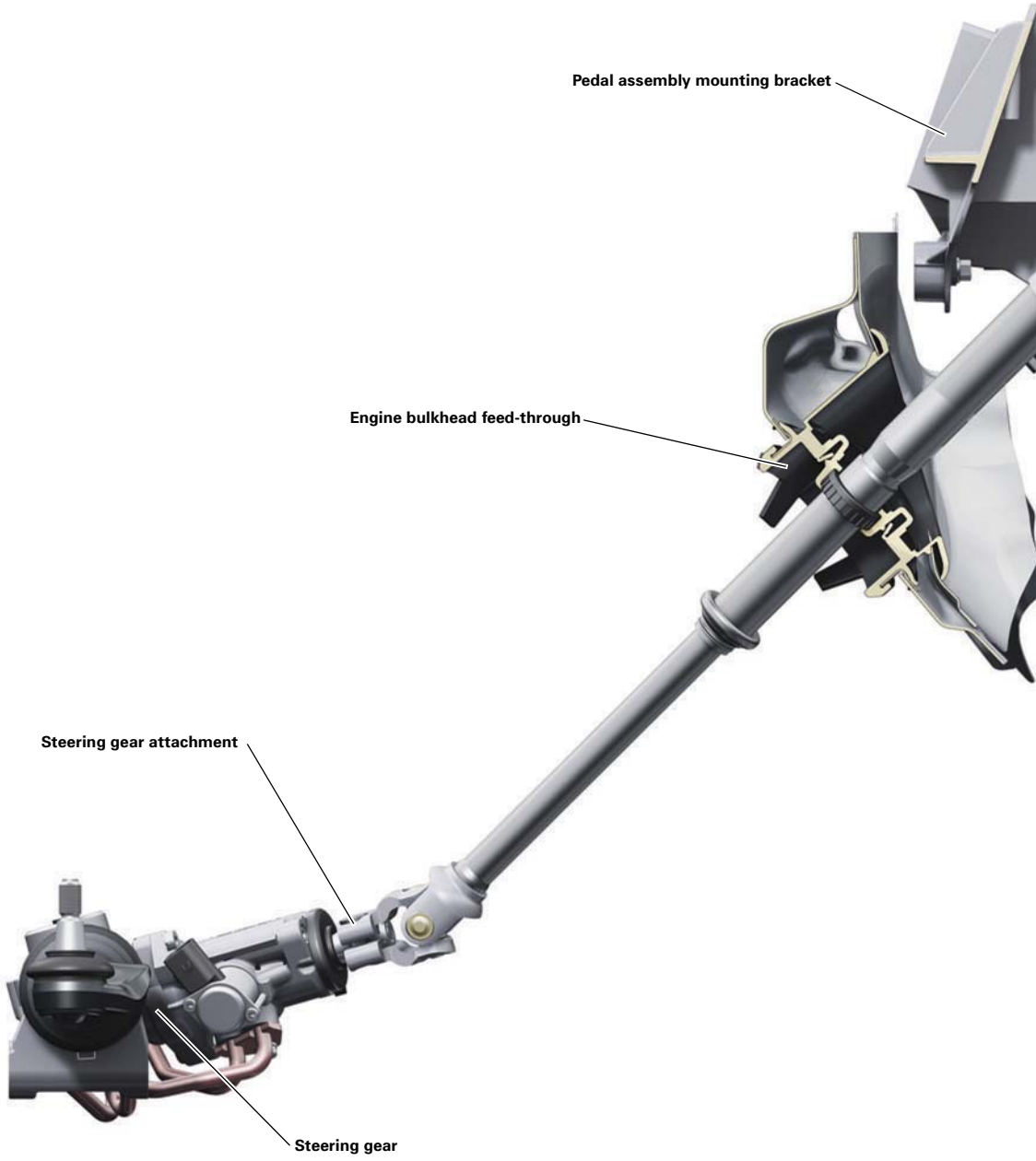
If engine speed continues to increase, both the delivery rate and pressure increase. The control piston displaced further to the left is against the pressure of the spring. As a result, the channel leading to the left chamber is connected to the suction line. The pump pressure flows into the right chamber on the opposite side.
The cam ring is displaced to the left against the pressure of the spring.

As a result, excentricity between the rotor and cam ring is reduced. The delivery rate is reduced and the "overproduction" of hydraulic oil is avoided. Energy consumption is significantly reduced due to the associated reduction in pump power consumption.

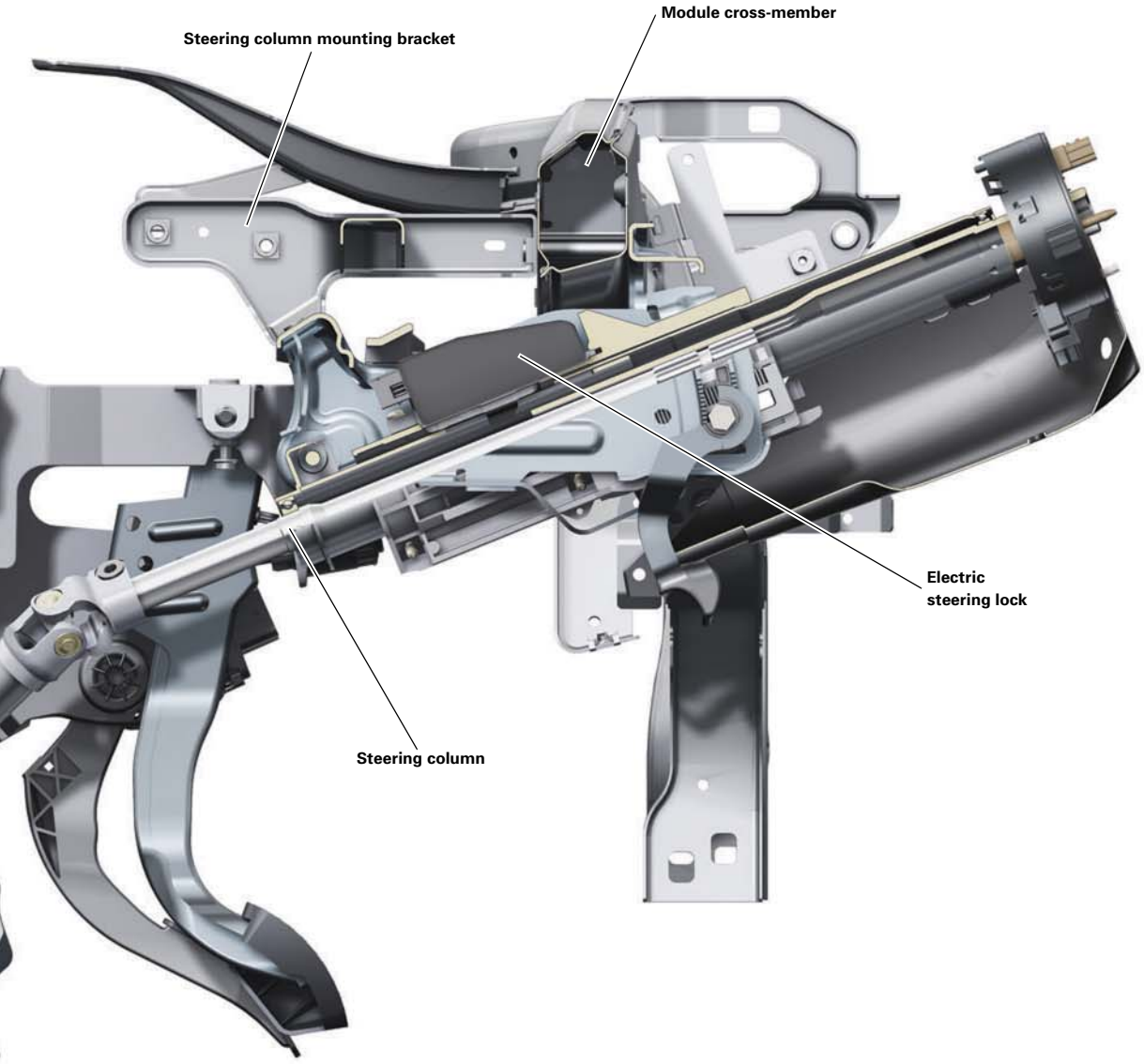


394_068

Steering column - overview



Cutaway view of the steering column as installed


Steering column mounting bracket
Module cross-member
Electric steering lock
Steering column

394_069

Steering column

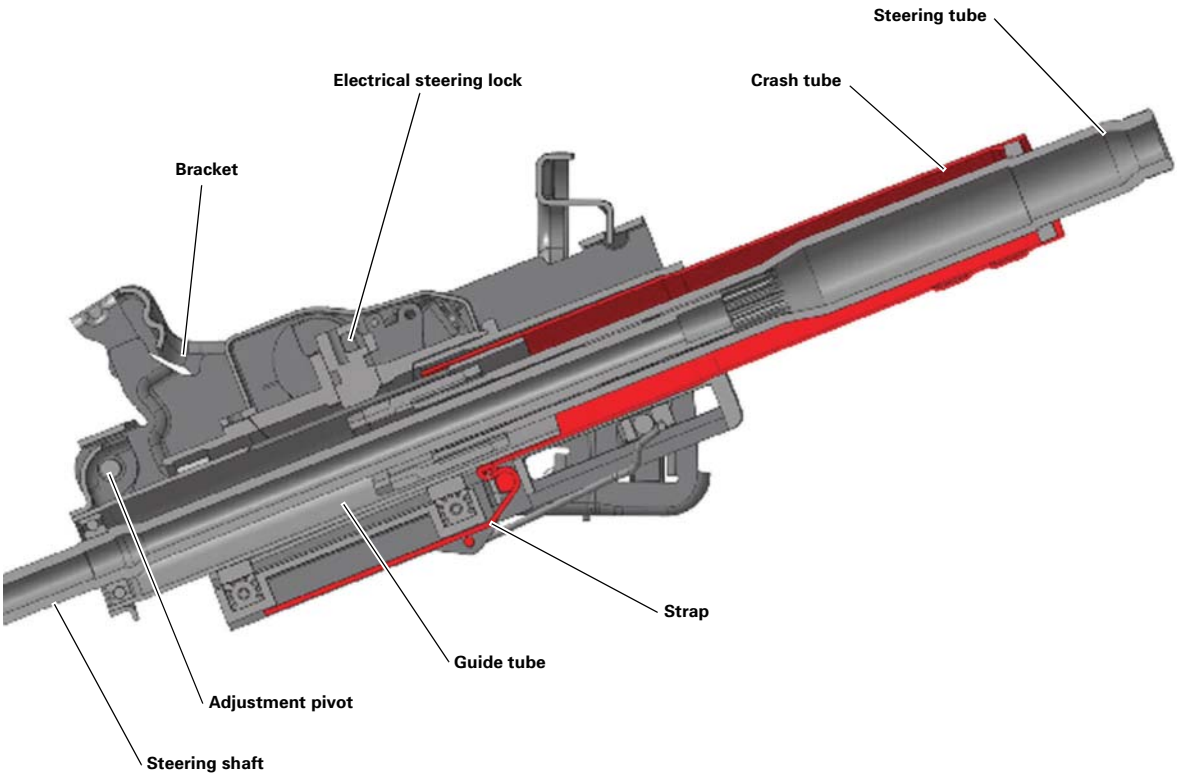
A newly developed mechanically adjustable steering column is available for the Audi A5. The adjustment range is 60 mm in the horizontal direction and 50 mm in the vertical direction.

The steering column is mounted in a sheet-steel bracket.

The roller carriage for displacement of the steering column in a crash is no longer used. A "tube in tube" crash system is used instead.

The steering tube is mounted in roller bearings in the crash tube. The steering shaft runs in a roller bearing in the guide tube. The steering shaft is inserted into the longitudinal toothing on the steering tube. The crash tube is seated on the guide tube.

The electrical steering lock ELV is now bolted to the bracket and can be replaced in the service workshop.

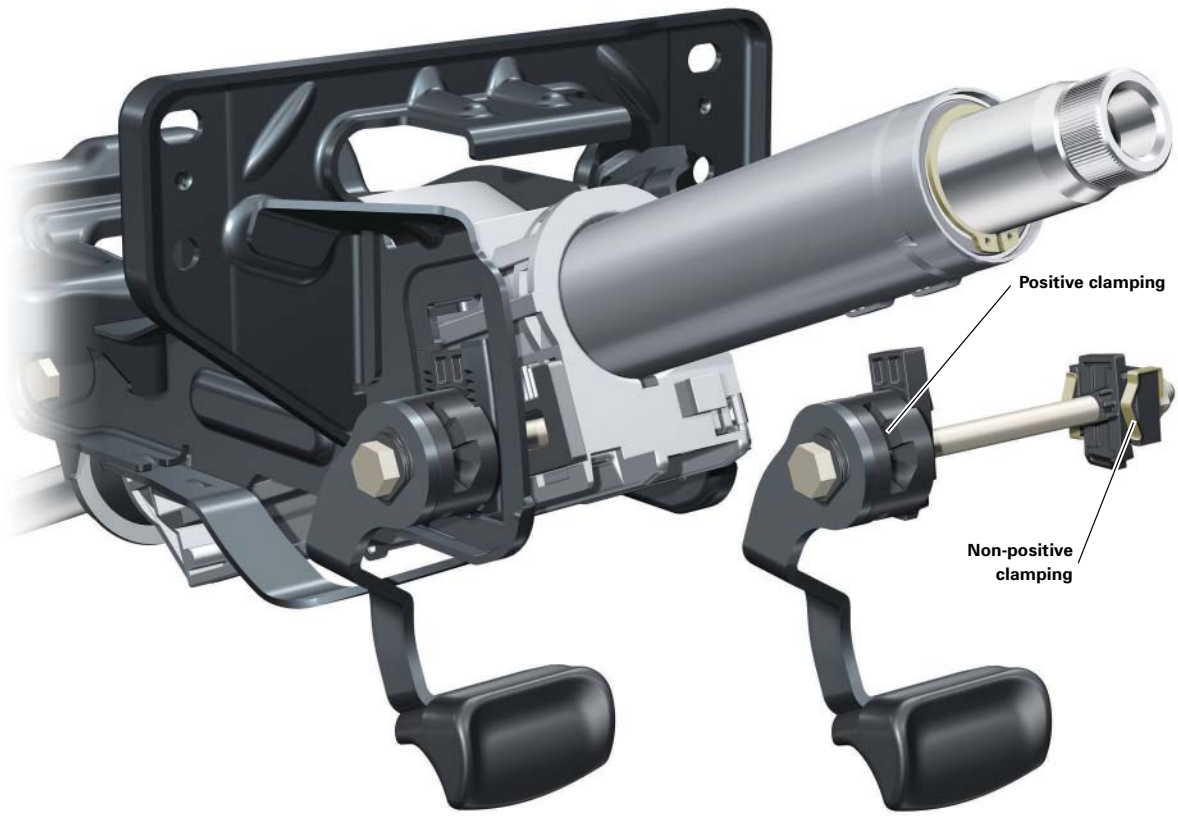


394_070

Steering column

The steering column is now adjusted in steps. Tensioning is now by means of a lever actuated excentric. On the right-hand side, the steering column is clamped in a non-positive manner by frictional engagement.

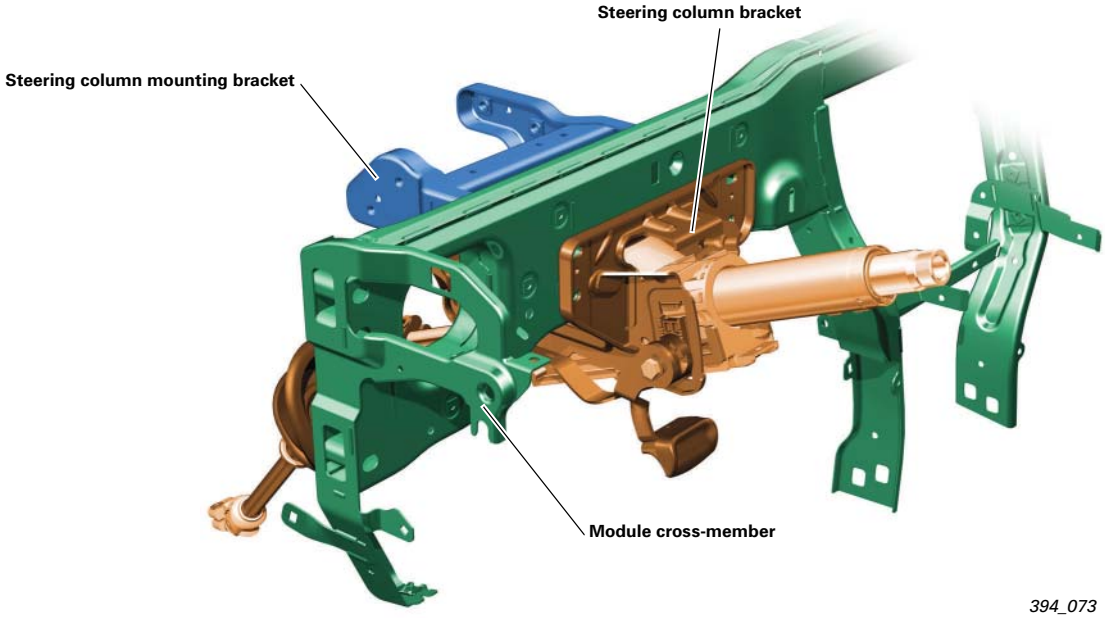
On the left-hand side, the steering column is located in a positive manner by interlocking tooth segments.



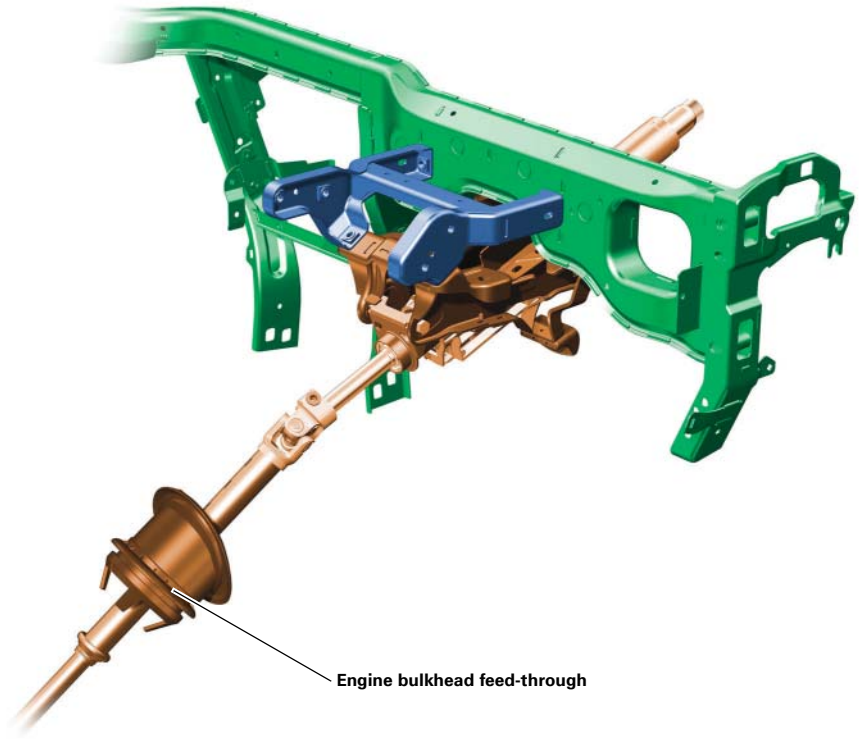
394_072

The steering column bracket is connected to the module cross-member at two screw attachment points. The steering column mounting bracket is bolted to the module cross-member, while the steering column bracket is bolted to the mounting bracket.

As a result, the steering column attachment points are relatively far apart, creating a broad base which has a positive effect on the vibrational characteristics of the steering column.



394_073

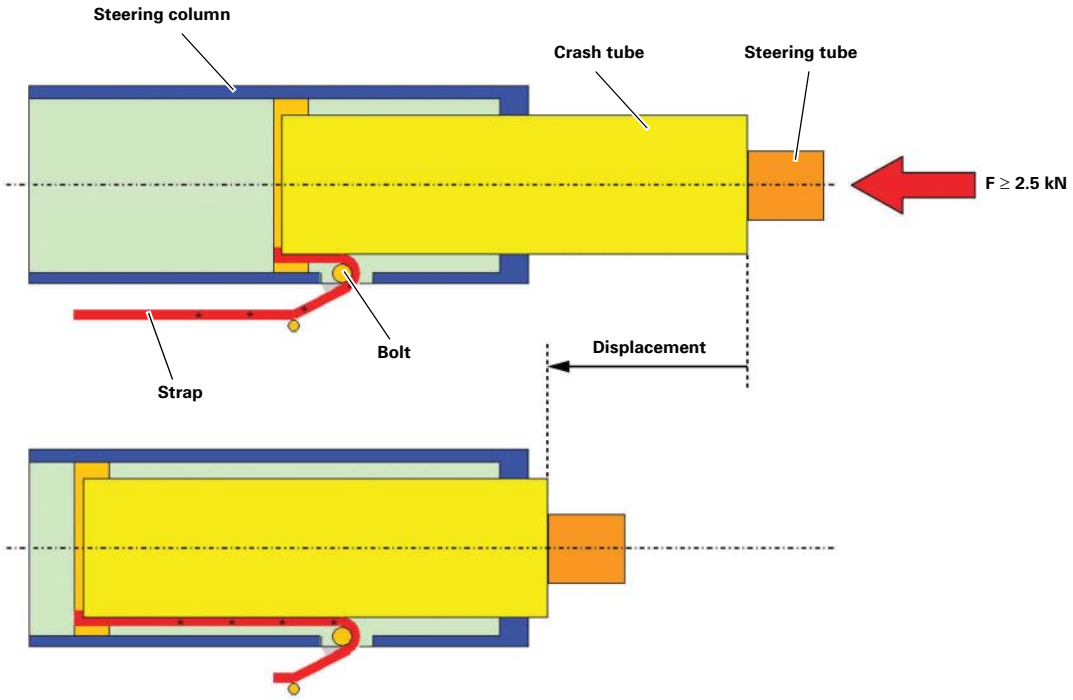


394_074

Steering column - crash behaviour

In the event of a crash the driver's torso impacts the steering wheel. As of a force of approximately 2.5 kN, the steering wheel together with the steering tube and the crash tube are displaced towards the dash panel. The crash tube compresses into the steering column tube. The steering tube simultaneously compresses onto the longitudinal toothing of the steering shaft (see illustration on page 46). These movements are governed by a defined force-distance characteristic. The characteristic is defined by the geometry of the strap. The strap is connected securely to the lower part of the crash tube.

The upper part of the strap is guided by a bolt which is connected securely to the steering column tube. Due to the "immersive" movement of the crash tube, the strap wraps itself around the stationary bolt. The force required for this purpose is predefined by the geometry of the strap and designed in such a way as to minimise the risk of injury to the driver.



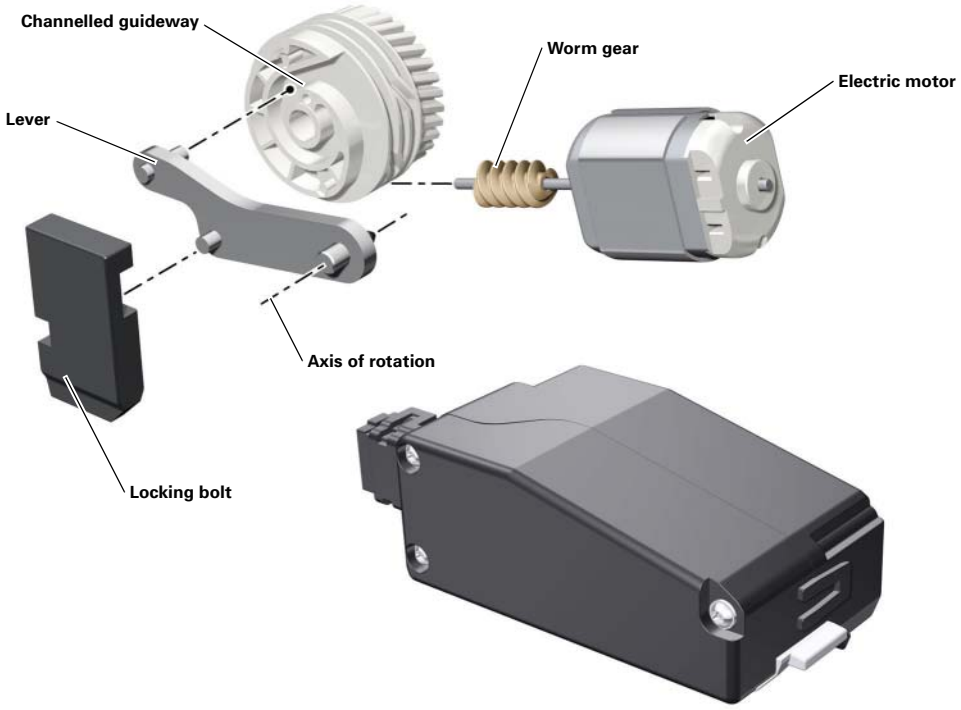
394_075

Electrical steering lock ELV

Design

A new ELV system is used on the Audi A5. Locking is provided by a locking bolt moved by an electric motor. The back of the spur gear on the worm drive is designed as a channelled guide. A trunnion on the lever engages in this channel. A second trunnion on the opposite side of the lever engages into a slot in the locking bolt.

The slot rotates the spur gear is driven by the worm gear of the electric motor. The trunnion slides along the guideway and the lever is actuated. This movement is transmitted by the trunnion on the opposite side of the lever to the locking bolt. The limit positions are monitored by two microswitches.



394_077

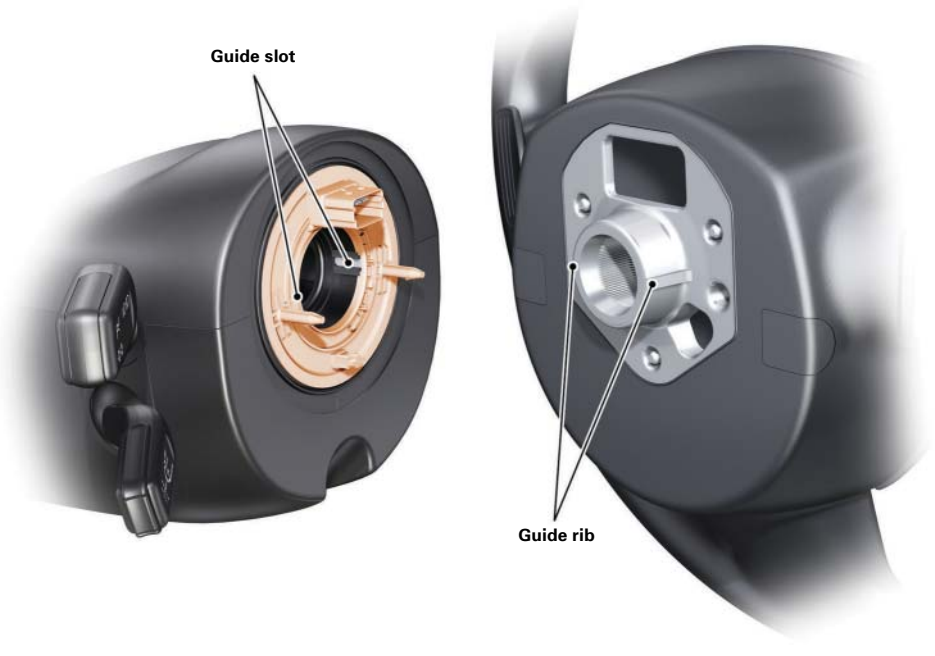
Reference

The functional principle of the ELV and the electrical control device are described in SSP 393.

Steering wheel

A newly developed TRW three-spoke steering wheel is used on the Audi A5. A major new feature is that steering wheel movements are transmitted directly from the steering wheel to the code disc on the steering angle sender. Guide ribs cast onto the steering wheel hub engage in the guide slots in the code disc of the steering angle sender. This concept halves the tolerances during measurement of the steering movement by the steering angle sender. Previously, the steering movement was transmitted from the steering wheel to the steering tube and in turn to the code disc of the steering angle sender. Tolerances are further minimised by the use of a fitting key to position the switch module with steering column electronics control unit J527 on the crash tube.
The steering centre point is predefined at the factory by marks on the steering wheel hub and steering tube.

394_078



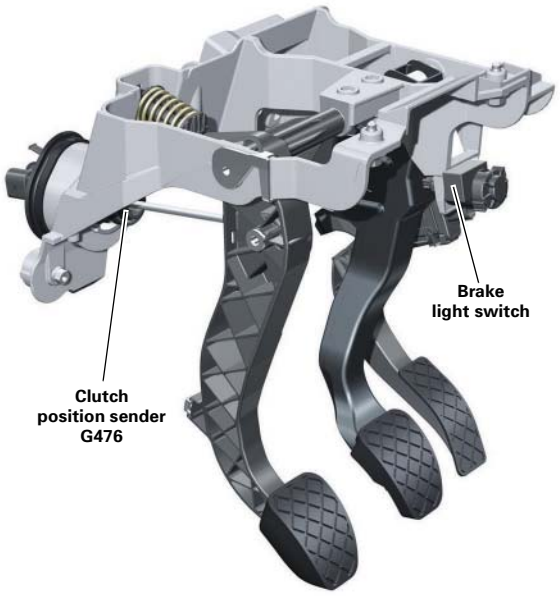
394_057

Foot controls

The mounting bracket is made of aluminium. In addition to serving as a mounting for the pedals, the mounting bracket on the Audi A5 is used for the first time to attach the front part of the steering column.

The brake pedal is made of sheet steel. As previously on the Audi A3 and Audi TT, actuation of the pedal is detected by an electronic contactless brake light switch (for detailed information, refer to the chapter on "ESP").

The accelerator pedal and clutch pedal are plastic parts.



394_081

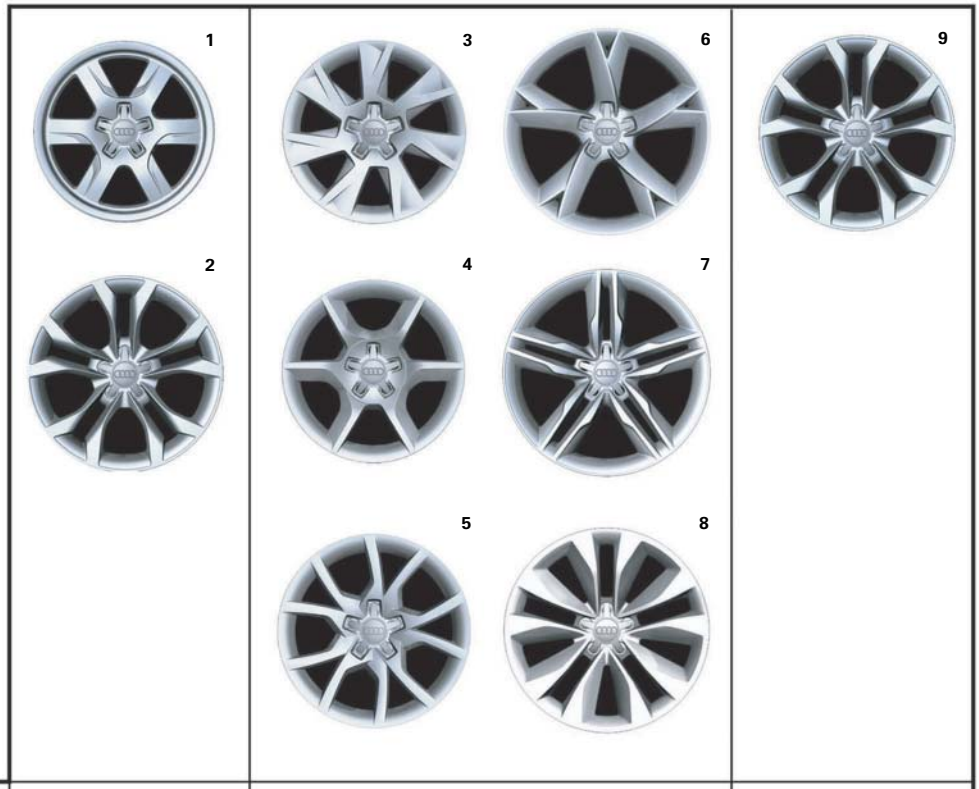
Clutch position sender G476

The position of the clutch pedal must be determined in order to implement the Hill Start Assist function of the EPB and the Audi Hold Assist on models with a manual gearbox. The EPB control unit determines the brake opening point by evaluating the clutch pedal position, the gear selected, the inclination of the road and the engine torque.

In the same way, the EPB control unit determines on models with Audi Hold Assist the moment at which to deenergise the solenoid valves and reduced the brake pressure in the system. In both cases, brake pressure is not reduced until sufficient engine torque is available to prevent the vehicle from rolling back.

394_082

Overview



Engine	Basic wheels	Optional wheels		Winter wheels
4 and 6 cylinder	7.5J x 17 H2 ET28 (1) Forged aluminium wheel snow chain compatible 225/50 R17	7.5J x 17 H2 ET28 (3) Cast aluminium wheel snow chain compatible 225/50 R17	8.5J x 19 H2 ET28 (6) Cast aluminium wheel 255/35 R19	8.5J x 18 H2 ET31 (9) Cast aluminium wheel snow chain compatible 255/35 R18
		8J x 17 H2 ET26 (4) Cast aluminium wheel 245/45 R17	8.5J x 19 H2 ET32 (7) Cast aluminium wheel 255/35 R19 Chrome	
		8.5J x 18 H2 ET29 (5) Cast aluminium wheel 245/45 R18		
8-cylinder	8.5J x 18 H2 ET29 (2) Cast aluminium wheel 255/50 R18		8.5J x 19 H2 ET32 (8) Cast aluminium wheel manufactured by flow-forming 255/35 R19	

394_083

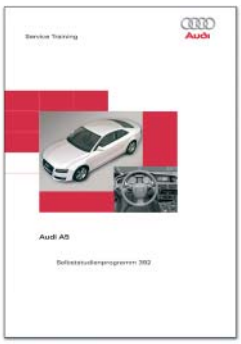
In case of emergency, the tire mobility system is fitted as standard. A car jack comes as standard when the Minispare wheel is ordered and in combination with winter tyres, otherwise it is an optional extra.
A full-size spare wheel is not available.

Note

Self-study programmes relating to the Audi A5

The following self-study programmes have been prepared for the Audi A5:

- SSP 392 Audi A5
- SSP 393 Audi A5 - Convenience Electronics and Driver Assist Systems
- SSP 394 Audi A5 - Suspension
- SSP 395 Audi A5 - Networking



SSP 392 Audi A5

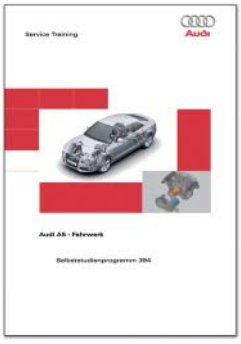
- Body
- Occupant protection
- Engine
- Gearboxes
- Suspension
- Electrical systems
- Infotainment
- Air conditioning
- Service
- Diagnostics

Order number: A07.5S00.34.20

SSP 393 Audi A5 - Convenience Electronics and Driver Assist Systems

- Dash panel insert
- Door control unit
- Convenience system control unit
- Electronic ignition lock
- Audi Service Key

Order number: A07.5S00.35.20



SSP 394 Audi A5 - Suspension

- Front axle
- Rear suspension
- Brake system
- Steering system

Order number: A07.5S00.36.20

SSP 395 Audi A5 - Networking

- Networking / topology
- Battery monitoring
- Onboard power supply control unit
- Exterior lights

Order number: A07.5S00.37.20

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