

Service.



Self-Study Programme 302

Touareg Chassis and four-wheel drive concept

Design and function



The chassis of the Touareg sets new standards with its outstanding on and off-road properties. The Touareg technically combines the best properties of off-road vehicles and sedans/hatchbacks.

The design of the front and rear axles ensures the noise and comfort level of a luxury sedan, and the exact wheel location provides the driving precision of a sports car. To this we have added a suspension system which, due to its optional air springs and electronically controlled shock absorbers, provides a very high level of suspension comfort, both on and off the road.

The Touareg is equipped with electronically controlled four-wheel drive as standard. A transfer gearbox, equipped with off-road reduction as standard, delivers the engine power to the drive wheels via limited-slip differentials. Depending on requirements, up to 100% of the drive force can be delivered to one of the two axles. The 4-wheel EDL, fitted as standard, finely distributes the drive force to the wheels.

The short front and rear body overhangs as well as the large ground clearance and fording depth are other characteristics of the Touareg's off-road capability. Its climbing ability and lateral inclination also enable off-road use in extreme terrain.



S302_001

NEW



**Caution
Note**



The self-study programme depicts the design and operation of new developments! Contents will not be updated.

Please refer to the appropriate service material for current test, setting and repair instructions.



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Introduction

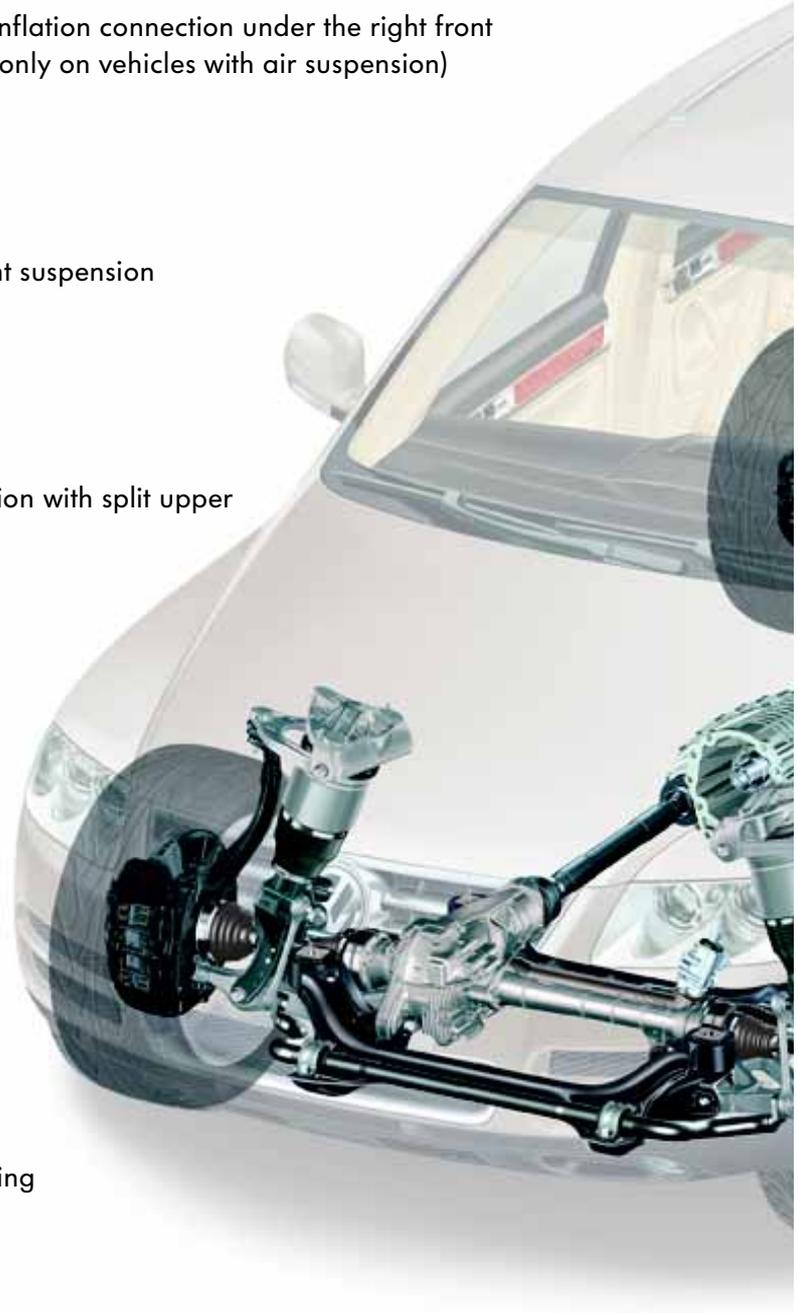


The Touareg chassis

The chassis with continuous 4-wheel drive delivers exceptional off-road performance with its centre differential and reduction stage.

On the other hand, its independent suspension also ensures the highest driving comfort on normal roads.

- Tyre inflation connection under the right front seat (only on vehicles with air suspension)
- Dual wishbone front suspension
- Dual wishbone rear suspension with split upper transverse link
- Front and rear anti-roll bars
- Independent suspension
- Air suspension with regulated damping optional, standard equipment in V10 TDI





- Centre and rear axle differential locks



- Foot parking brake,
Duo servo drum brake

- Tyre pressure control, optional

- Ventilated disc brakes
(front and rear)

- Conti Teves MK25, ESP system with braking
assistant and 4-wheel EDL

- Hill incline assistant
Hill decline assistant

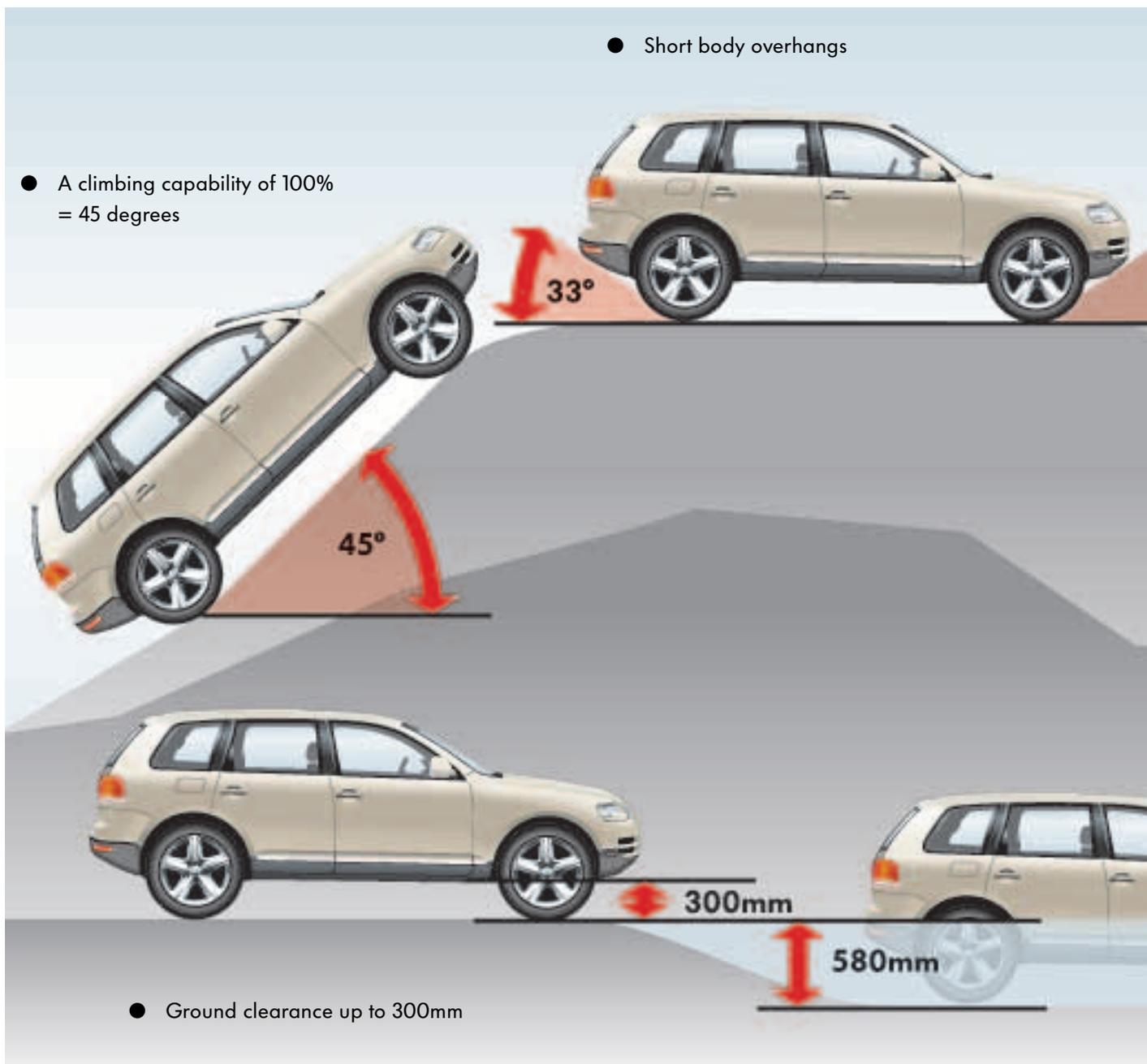
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Introduction



The 4-wheel concept

The Touareg has the technical prerequisites for excellent off-road capability. Short body overhangs, a ground clearance of up to 300mm, a fording depth of up to 580mm, a climbing capability of 100%, a lateral incline of 35 degrees, the ramp angle and the pitching angle all enable extreme off-road use.





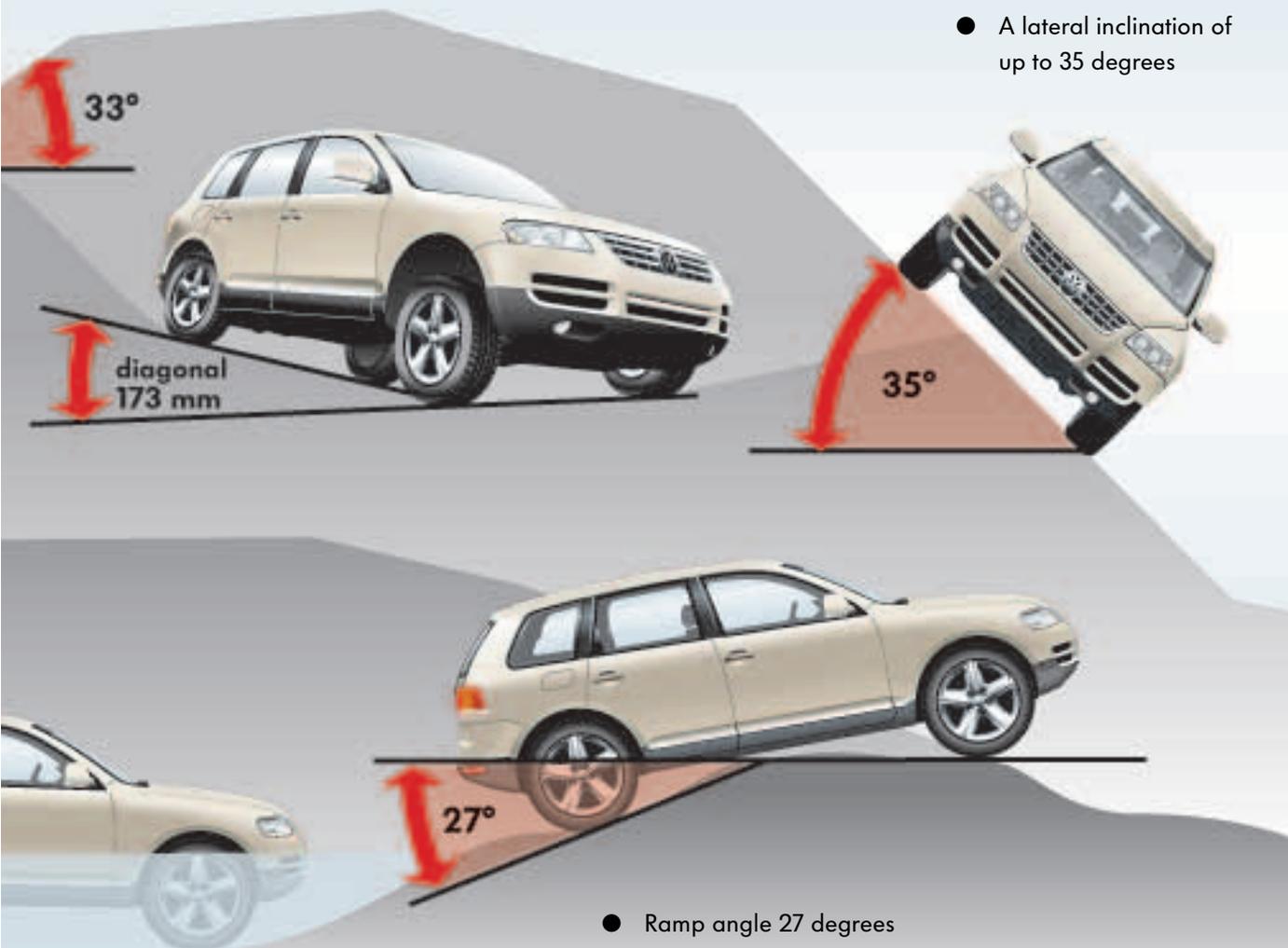
Details for vehicles with steel spring suspension:

- Fording depth = 500mm
- Ground clearance = 200mm
- Body overhangs = 28°
- Ramp angle = 22°
- Diagonal pitching = 157mm



The values shown in the illustration apply to vehicles with air suspension

- Pitching of the axles



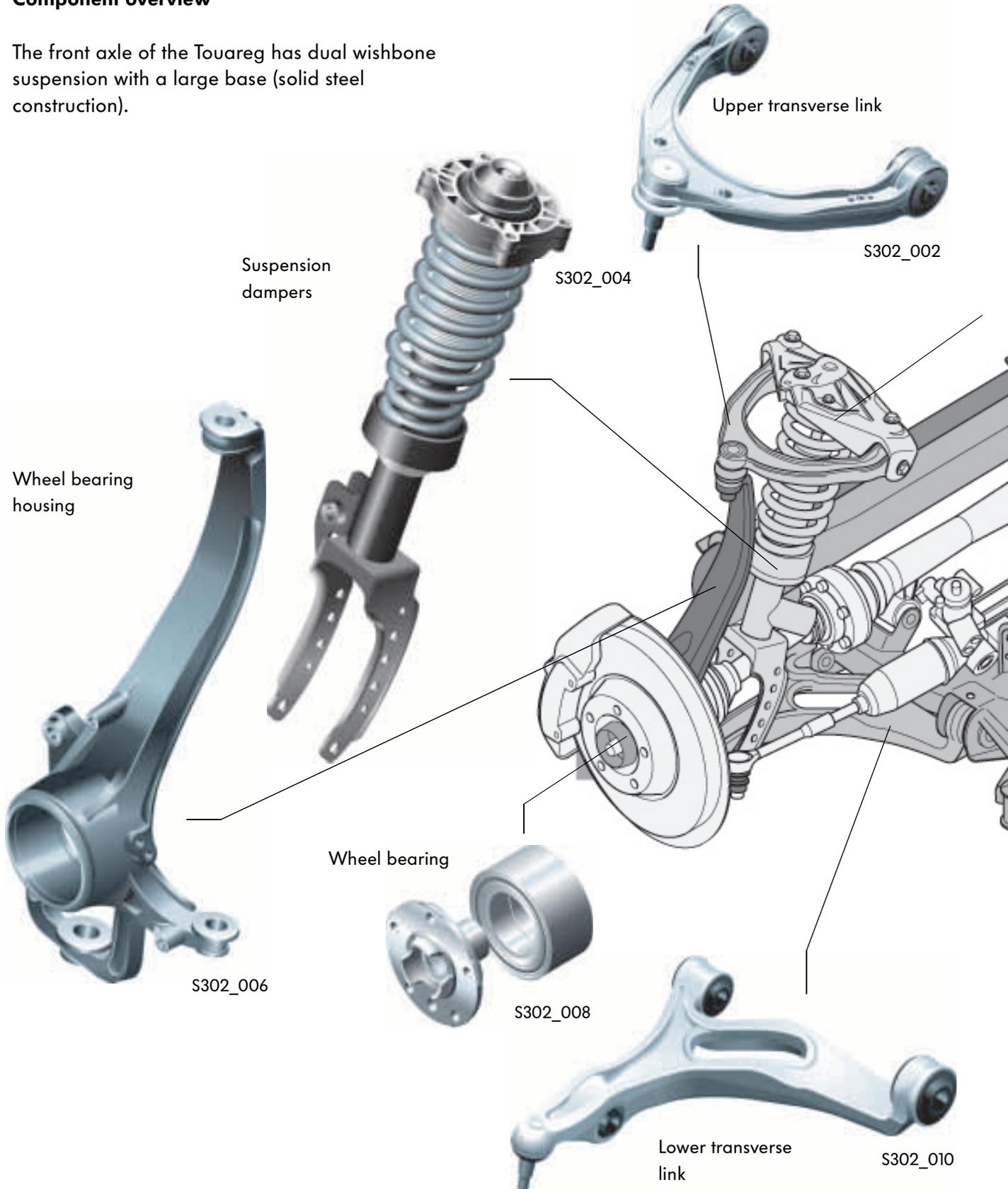
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Front axle

The front axle

Component overview

The front axle of the Touareg has dual wishbone suspension with a large base (solid steel construction).



Transverse link retainer
Fitting position rotated 90°

S302_106

Anti-roll bar

S302_018

S302_012

Unit bearing
frame

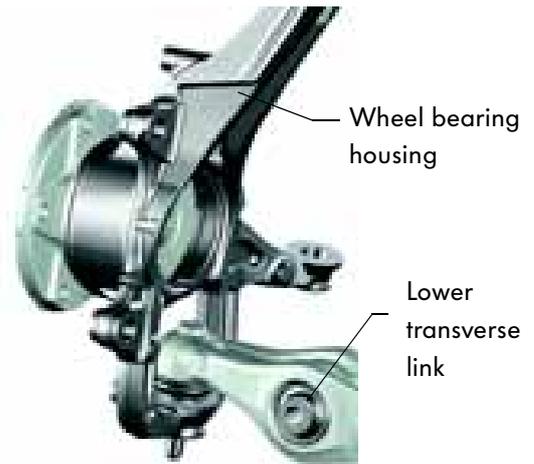
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Front Axle

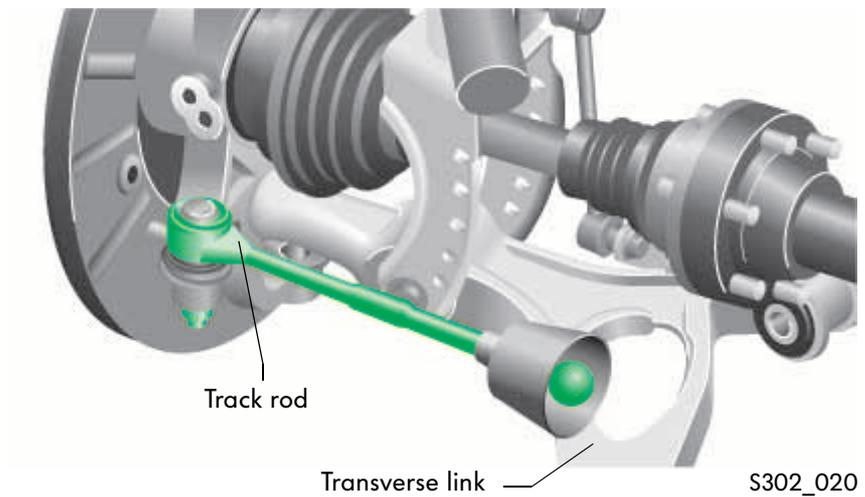
The lower transverse link connection

The lower transverse link is connected to the wheel bearing housing from above.



S302_079

The track rod connection



S302_020

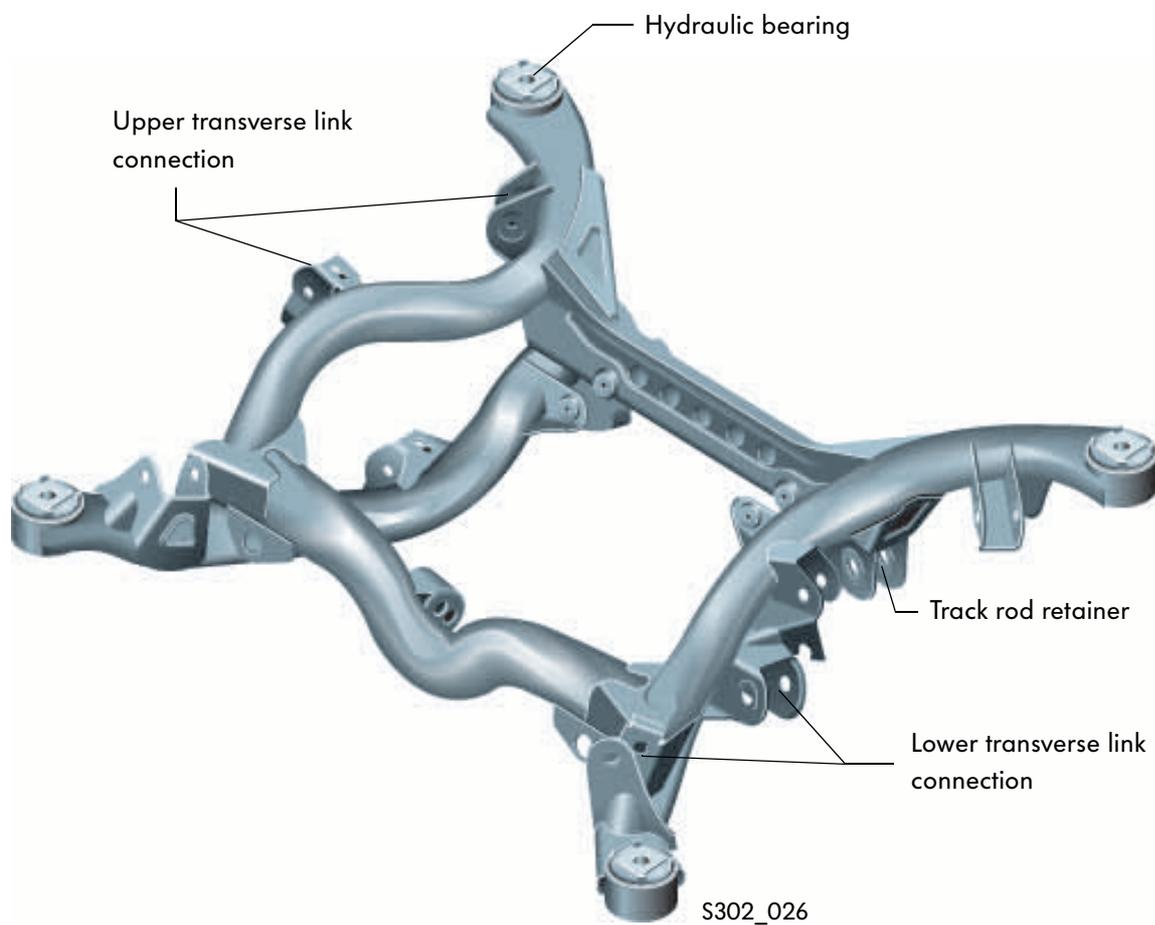
The rear axle

The unit bearing frame

The unit bearing frame for the rear axle has a pipe-frame construction. It supports the following components:

- Upper and lower transverse links
- Anti-roll bar
- Track rod
- Rear axle differential

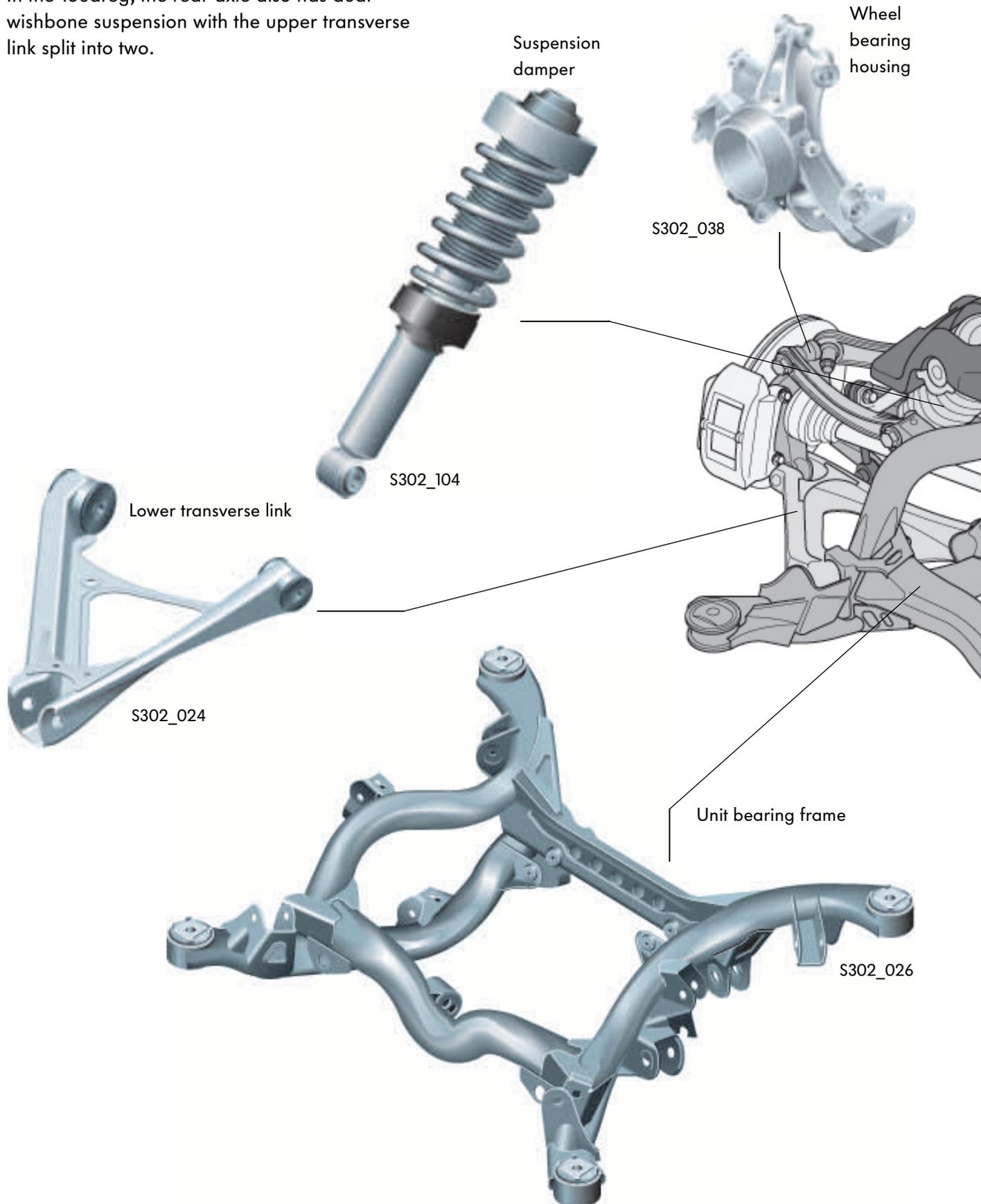
Hydraulic bearings isolate the unit bearing frame.

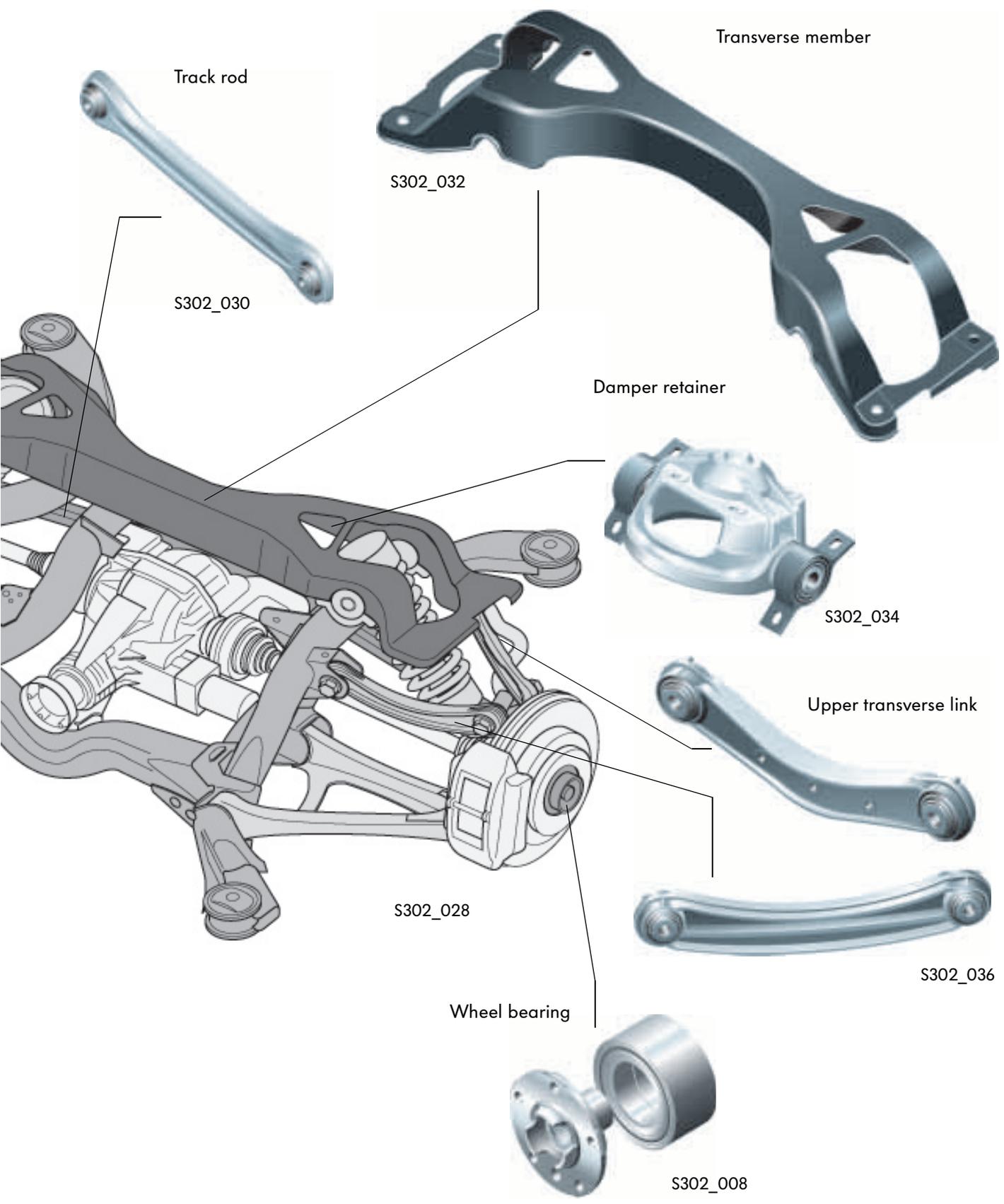


Rear axle

Component overview

In the Touareg, the rear axle also has dual wishbone suspension with the upper transverse link split into two.





Track rod

S302_030

Transverse member

S302_032

Damper retainer

S302_034

Upper transverse link

S302_028

S302_036

Wheel bearing

S302_008



Suspension/damping system

The suspension dampers

In the Touareg's suspension system, the suspension damper elements connect the wheel suspension to the body. Here, steel spring suspension struts or optional air spring dampers are used. Air suspension is standard in the V10 TDI.

Steel spring suspension strut

Ground clearance 237mm



Air spring damper

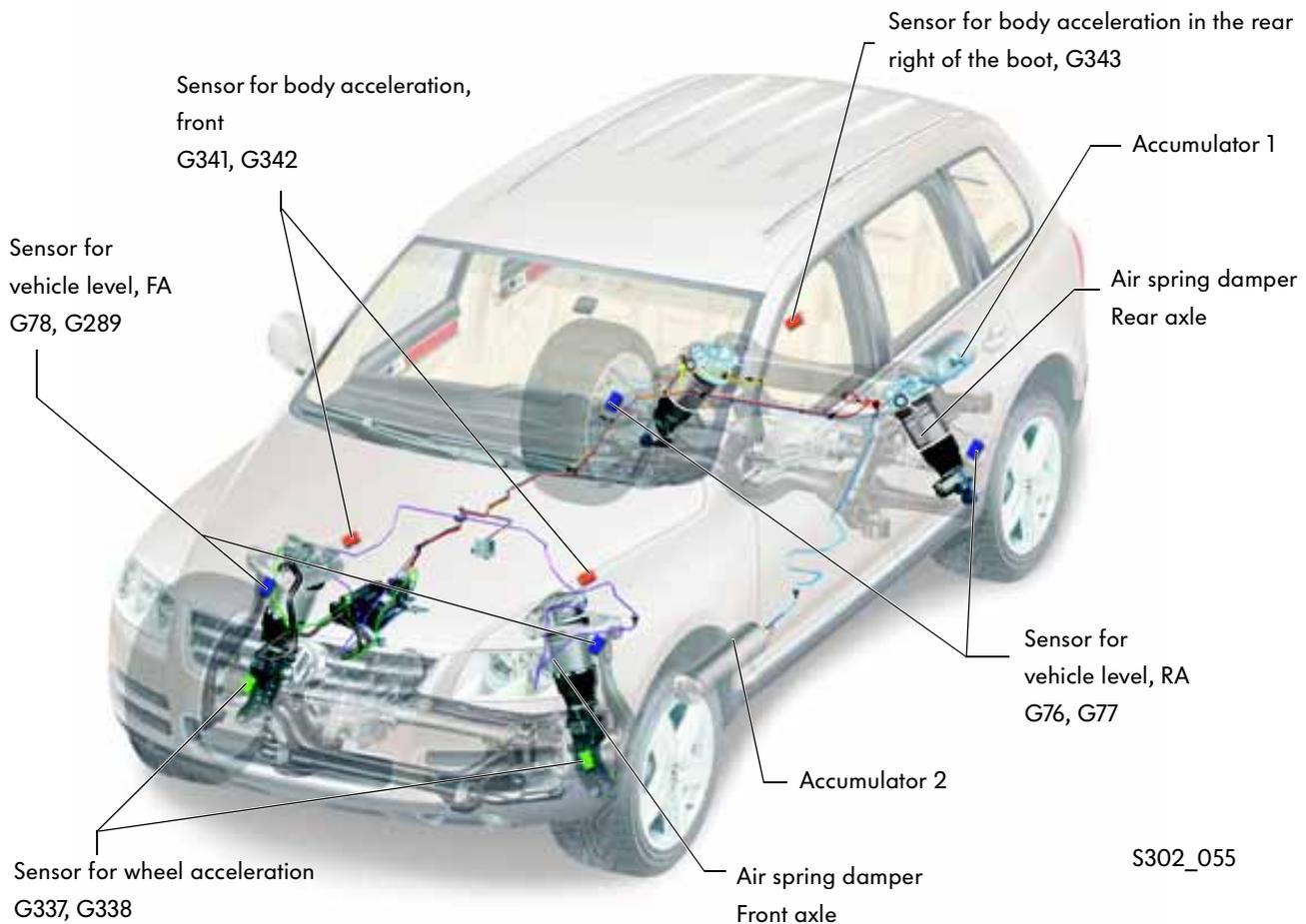
Ground clearance approx. 160-300mm



The air suspension is combined with a controllable vibration damping system.

The air suspension

The air suspension of the Touareg is based on the Phaeton's air suspension. It has been adapted in some areas to the weight of the Touareg.



The Touareg system differs from the Phaeton system in the following points:

- 2 wheel acceleration sensors instead of 4
- 2 large accumulators with a volumetric capacity of
 - 4.8 L for accumulator 1
 - 5.2 L for accumulator 2
- Powerful air supply unit with modified dryer configuration
- Larger volume air spring elements in the air spring dampers
- External valves for damper adjustment
- Tyre inflation connection
- Larger cross section of the air supply lines (6mm)

Air suspension

The level adjustment

The air suspension enables you to adjust the vehicle level for every situation. You adjust the level using the chassis switch (right rotary switch). You can set the ground clearance from 160mm to 300mm. Lowering the vehicle improves the road position and reduces wind resistance. When the vehicle reaches certain limit speeds, the level is adjusted automatically.

Rotary switch for level adjustment

S302_015		 under 5 km/h Loading level	 160 mm
S302_017		 over 125 km/h High speed I	 190 mm
S302_019		 under 80 km/h Street level	 215 mm
S302_021		 under 40 km/h Off-road level	 240 mm
S302_023		 under 25 km/h Xtra level	 300 mm



At 180 km/h or faster, the vehicle is lowered again by 10mm.

The damping regulator

The Touareg's damping regulator increases driving comfort in all driving situations.



S302_083



S302_050

In the Touareg, you set the damping using the damping regulator switch in the middle of the chassis control panel.

The chassis control panel is in the centre console behind the gear lever.

The damping regulator switch has three different damper settings:

- Auto - middle damper setting (standard)
- Sport - hard damper setting
- Comfort - soft damper setting

The lock button limits the maximum speed in off-road level to approximately 70 km/h. This prevents the vehicle from being lowered in off-road terrain.



With a sporty driving style, e.g. fast curves, damping is automatically set to "Sport" regardless of the setting selected. In this case, the damping regulator switch does not change position. In the "Sport" damper setting in street level, the vehicle is lowered to High speed I level even below 125 km/h.



Air suspension

The damper control

The control system for the damping regulator uses wheel acceleration sensors and three body acceleration sensors to monitor the road condition through vehicle movement.

The characteristic curves of the individual vibration dampers are adjusted according to the calculated damping requirement. Here the dampers work as semi-active components in extend and compress mode.

Continuous damping regulation is based on vibration dampers that have characteristic curves which can be adjusted electrically. These vibration dampers are integrated into the air spring dampers.

The damping force is adjusted according to the characteristic diagram using a proportional valve positioned on the vibration damper. Thus, within milliseconds it is possible to adapt the damping force to the driving situation and the road conditions.

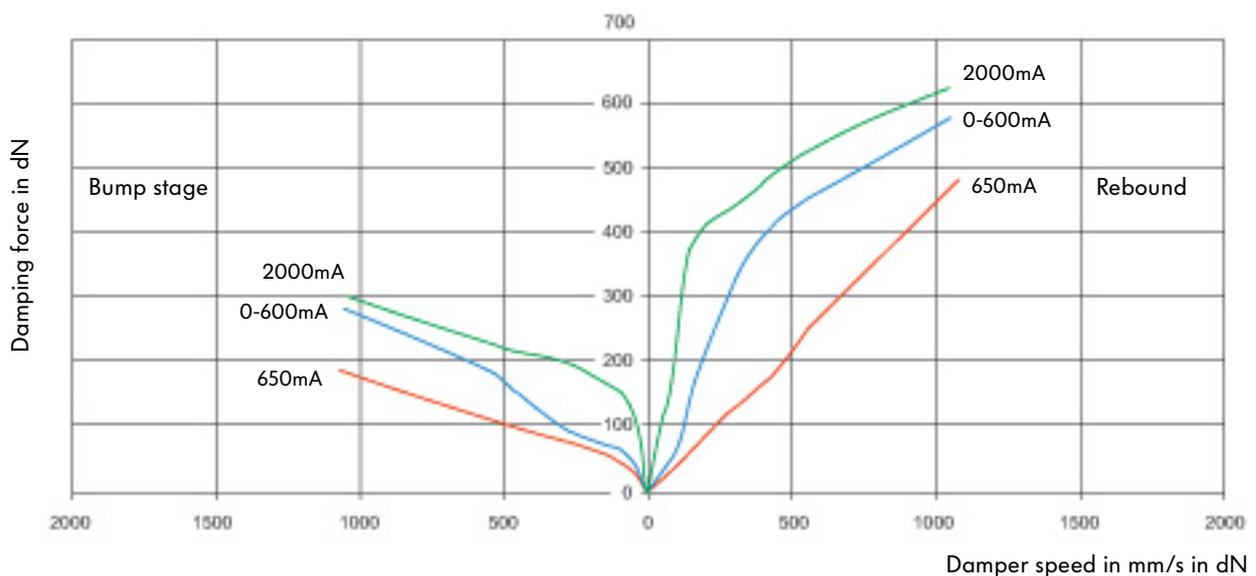
On principle, the system tries to adjust the damping force according to the "sky-hook control strategy". The damper is adjusted in proportion to the vertical acceleration of the wheels and the vehicle body. Ideally, damping is regulated so that the vehicle body "hangs on a sky-hook" and floats above the road with almost no disruptive movements.

Thus, maximum driving comfort is achieved!



Large control currents lead to hard damping. Small control currents lead to soft damping. The middle characteristic curve results when there is no control current.

Damping force characteristic diagram for the Touareg front axle



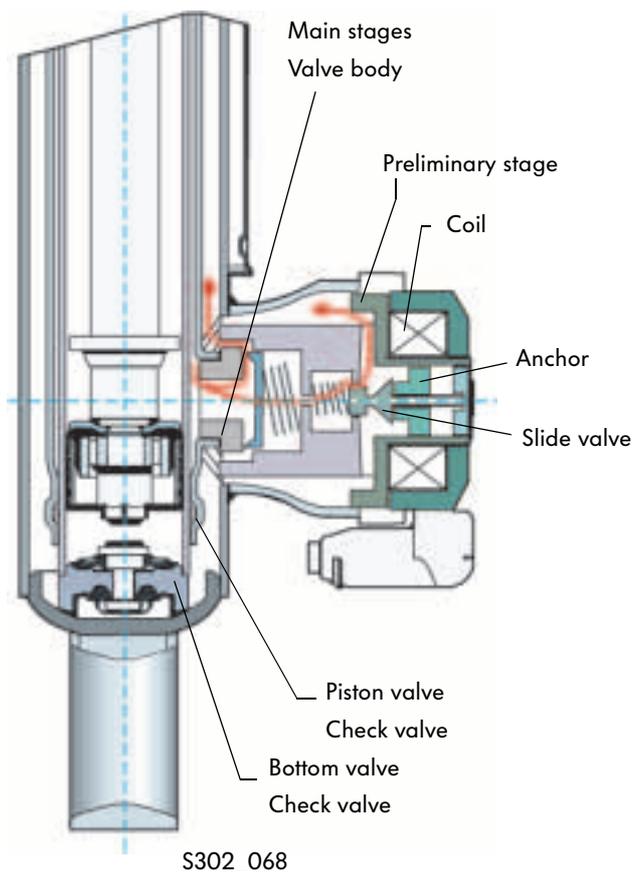
S302_044

The damping adjustment valve

The damping force of the CDC two-pipe gas shock absorber can be adjusted over a wide range by an electrically controlled valve mounted externally on the damper. By changing the current to the solenoid, the oil flow through the CDC valve, and thus the damping force, can be adjusted to the instantaneous requirements within a few milliseconds. Oil flows through the CDC valve in the same way in both rebound and bump directions. The check valve function of the piston and the bottom valve ensures this.

The wheel acceleration sensors mounted to the front axle dampers send signals which, together with the signals from the body acceleration sensors, are used to calculate the required damper setting. The fast detection and control between bump and rebound stages ensure that only the damping force required for the instantaneous driving situation is set. The characteristic diagrams for the driving situation are stored in the self-levelling suspension control unit.

Example of the CDC valve



With certain dynamic driving conditions, usually with longitudinal and/or transverse dynamics, self-levelling is temporarily disabled and damping regulation becomes hard according to the situation.

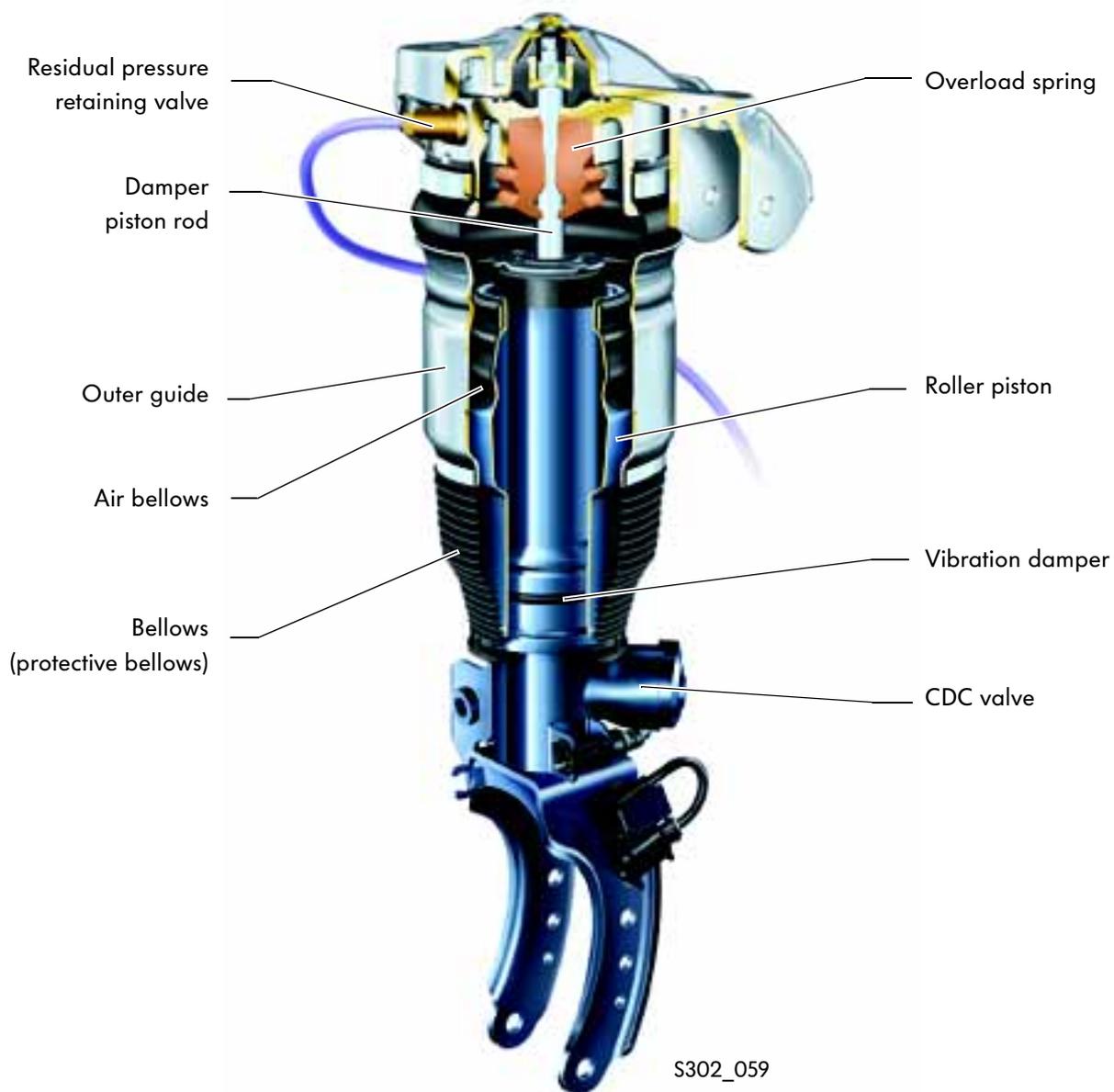


Air suspension

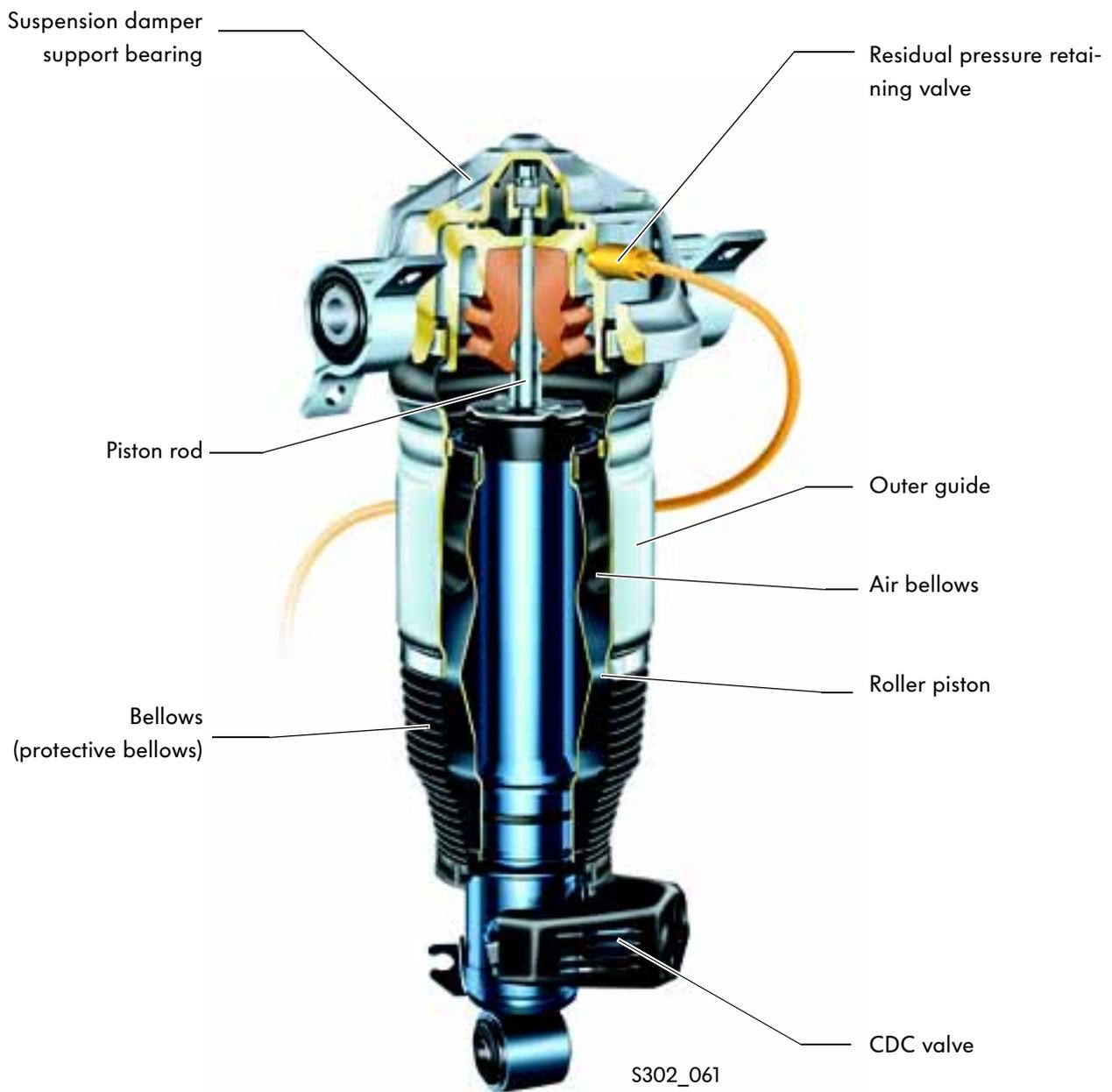
The front axle air spring damper

The air spring dampers are calibrated to the weight of the Touareg. They are structurally the same as the air spring dampers in the Phaeton. The features of these air spring dampers are:

- The large volume of air, and
- The external CDC valve



The rear axle air spring damper



Air suspension

The air supply unit

The air supply unit is mounted to a vibration-isolated holder on the front right underbody as a compact unit.

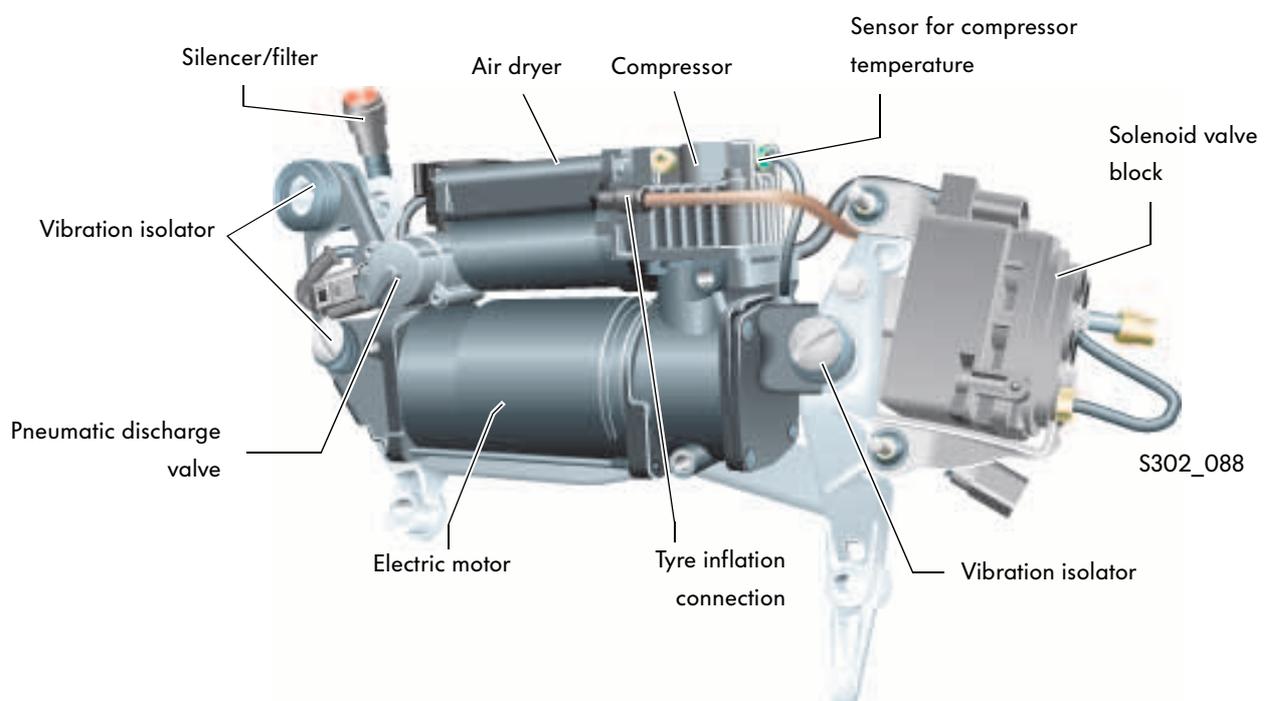
A plastic cover with ventilation holes protects it from dirt.

Air for the compressor is supplied from the motor air filter. The air is drawn via the silencer/filter, cleaned and then blown off again.

An integrated temperature sensor protects the compressor from overheating.

The air supply unit consists of:

- The compressor unit with electric motor, dry run compressor, air dryer, electromagnetic discharge valve, silencer with air filter, integrated sensor for compressor temperature (temperature sensor for overheat protection), pneumatic discharge valve with residual pressure retaining function and maximum pressure limit
- tyre inflation connection and
- the solenoid valve block with the control valves for each air spring damper and for the accumulator and an integrated pressure sensor for monitoring.



The air dryer

The air in the pressure system has to be dehumidified so that no problems with:

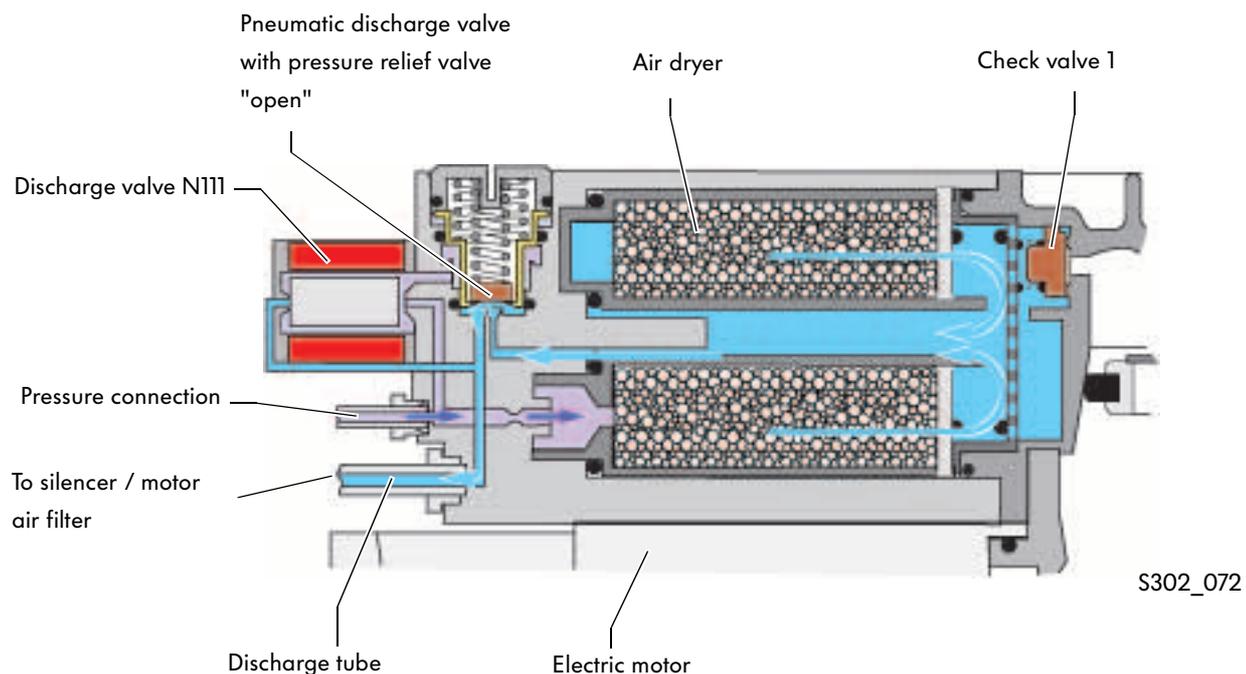
- Corrosion and
- Freezing

due to condensation occur.

An air dryer is used for dehumidification. The air dryer operates using a regenerative process, or in other words: The compressed air in the self-levelling control system passes through the silicate granulate and is dried in the process.

This granulate can, depending on the temperature, absorb more than 20% of its own weight in moisture. If the dried air is discharged (during lowering), this air flows back through the granulate on its way out into the open, and in doing so draws the moisture out of the granulate that was temporarily stored there.

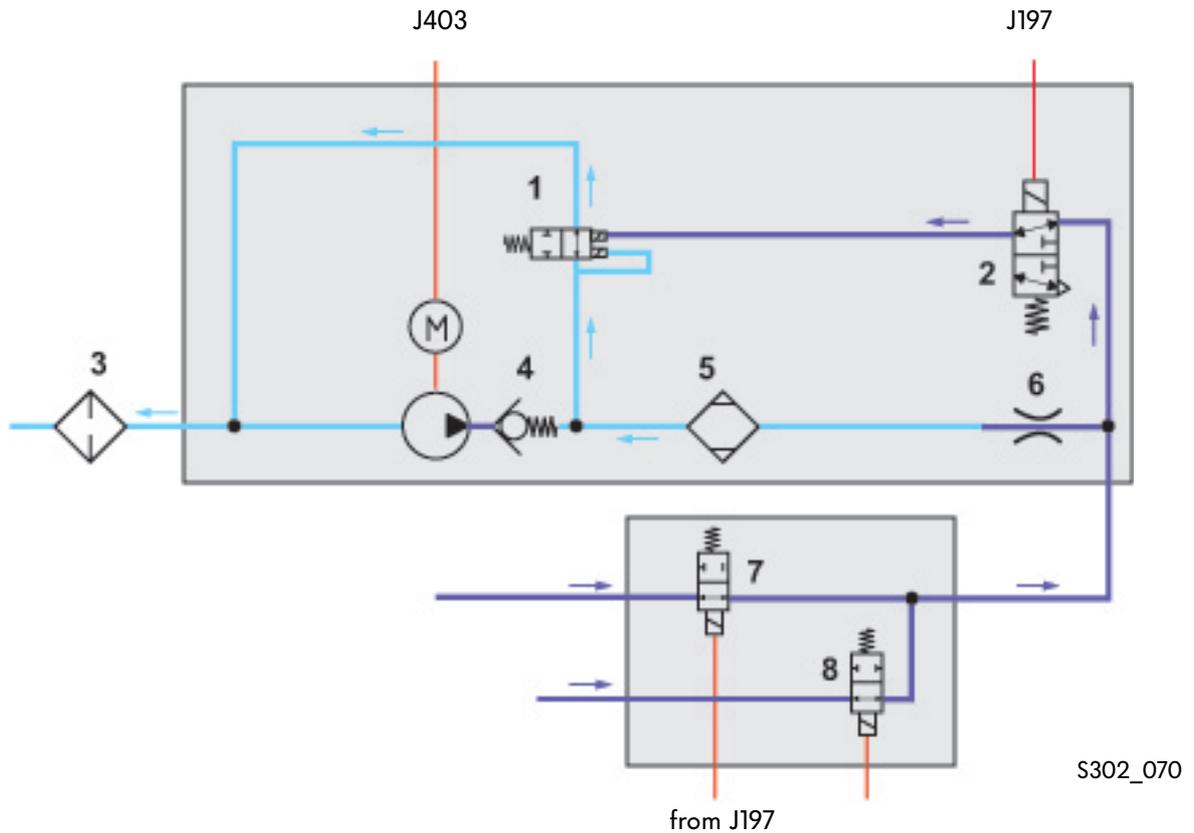
Due to this regenerative process, the air dryer requires no maintenance. There is no changing interval.



Air suspension

The air dryer configuration

The air dryer configuration of the Touareg is different to that of the Phaeton. Therefore, the compressor may also be used to inflate the spare wheel.



- 1 - Pneumatic discharge valve
- 2 - Electric discharge valve N111
- 3 - Silencer/filter
- 4 - Check valve 1
- 5 - Air dryer
- 6 - Throttle
- 7 - Valve for suspension damper N148
- 8 - Valve for suspension damper N149

 "Discharge" function
= outflowing air

The accumulators

The purpose of the accumulators is to guarantee fast and silent level-regulation up to a speed of 50 km/h. The maximum pressure of the accumulators is 16.5 bar. If the pressure in the accumulators falls below 11 bar, the compressor starts and adjusts the vehicle to the set level. The rear accumulator has a volume of 4.8 L and the front 5.2 L.

The tyre inflation connection

When air is withdrawn from the compressor to inflate the spare tyre, a reed contact switches the solenoid valves of the compressor off. Thus, no air can escape from the whole system (level change).

The sensor/actuator system

The sensors (such as the body acceleration sensors) and the actuators operate on the same principle as those of the Phaeton.



For further information, please refer to "The Phaeton - air suspension with regulated damping" in SSP 275.

Level change

When the vehicle level is changed, the bar indicator in the display unit on the dash panel insert flashes until the selected level is reached.

Vehicle jack mode

Switching on

- The vehicle is stationary
- Ignition on
- Parking brake applied
- Press and hold the lock button for more than 5 seconds

Switching off

- Drive faster than 5 km/h or
- Press and hold the lock button for more than 5 seconds



If you activate vehicle jack mode, the level that was previously set is kept and an indicator appears in the dash panel insert.

Air suspension

System overview

E388 Levelling control knob

E387 Damper adjustment switch

G76 Vehicle level sensor,
rear left

G77 Vehicle level sensor,
rear right

G78 Vehicle level sensor,
front left

G289 Vehicle level sensor,
front right

G290 Sensor for compressor temperature

G291 Levelling control pressure sensor

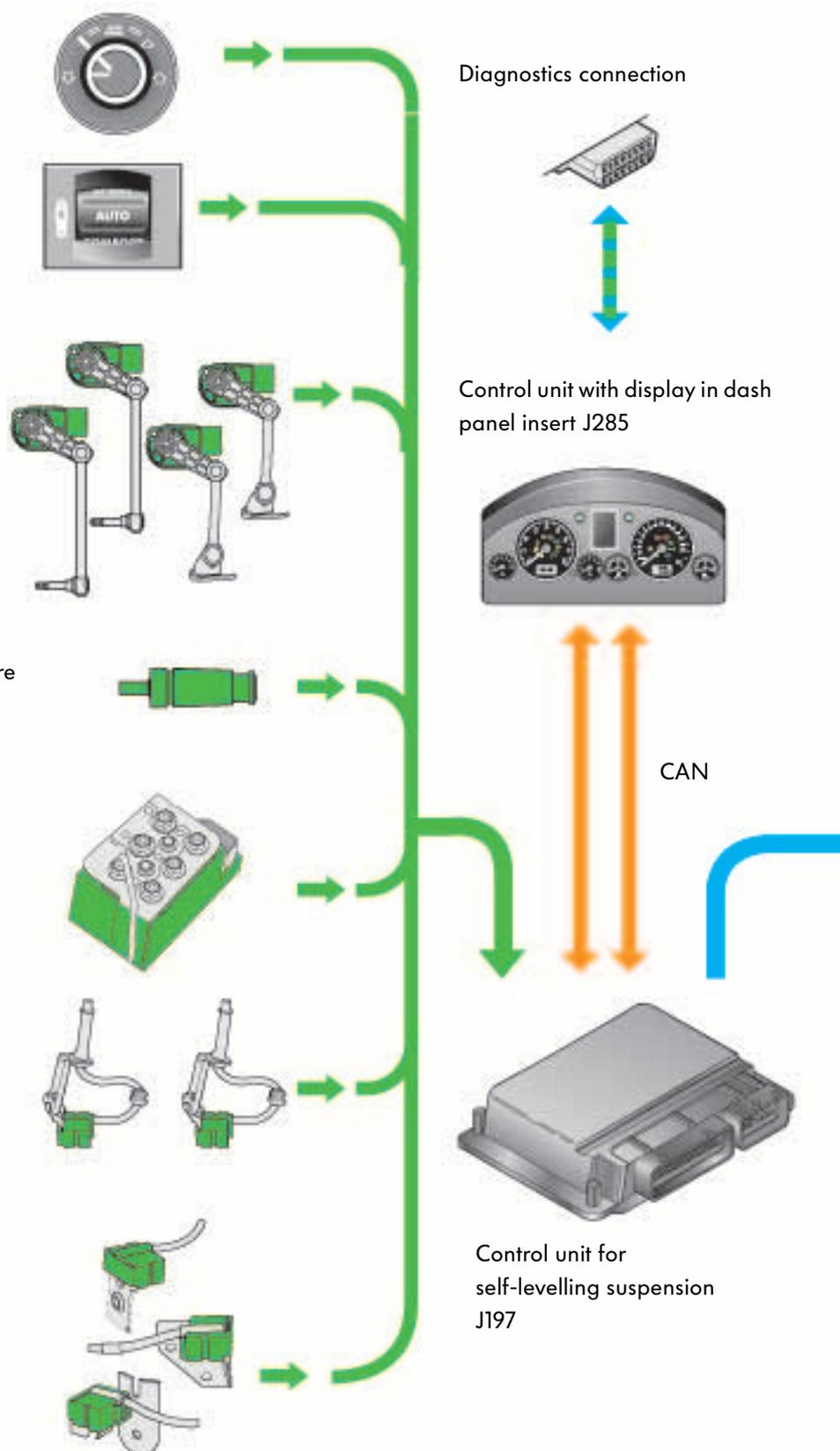
G337 Wheel acceleration sensor,
front left

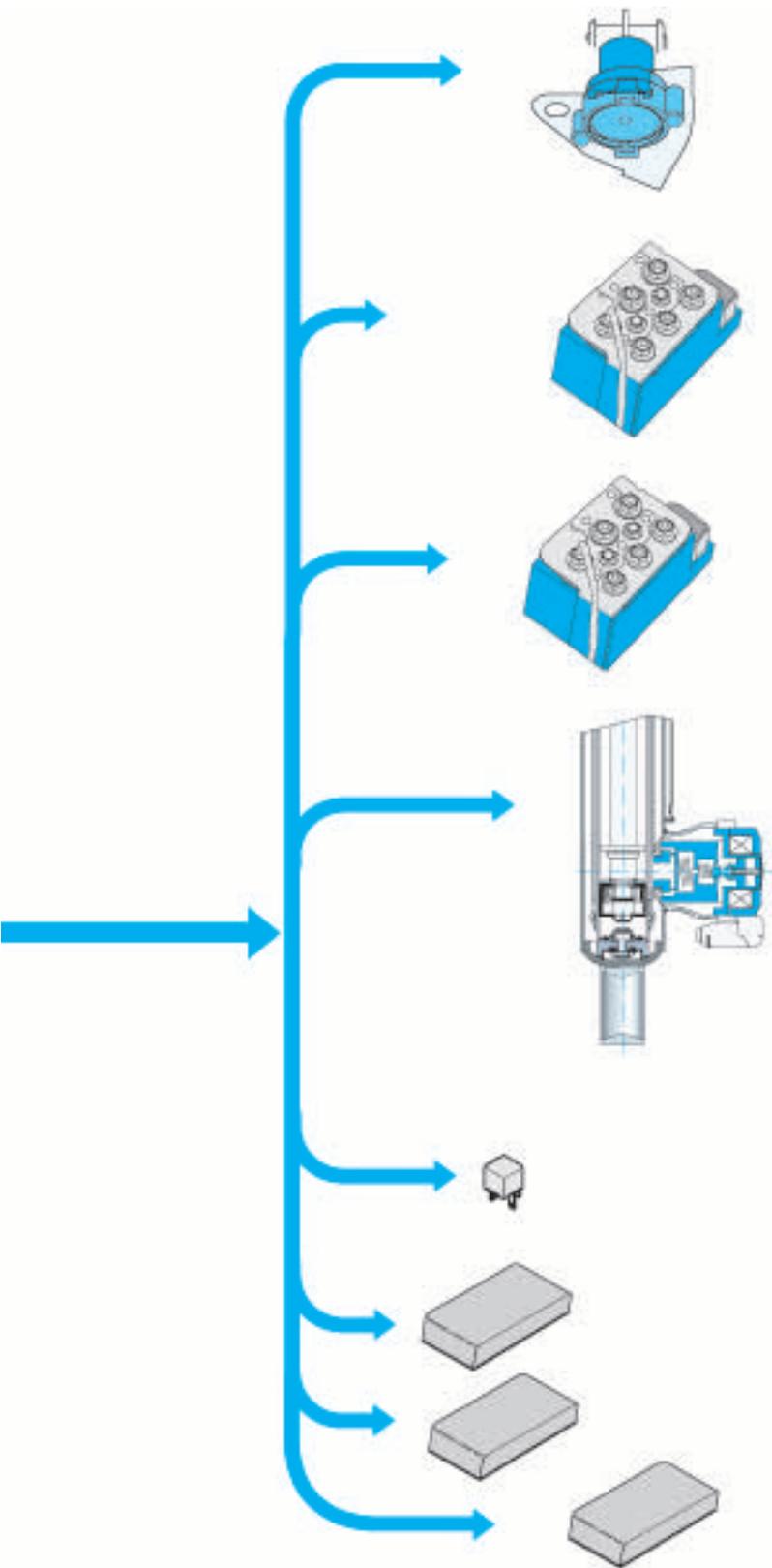
G338 Wheel acceleration sensor,
front right

G341 Body acceleration sensor,
front left

G342 Body acceleration sensor,
front right

G343 Body acceleration sensor,
rear





N111 Self-levelling suspension discharge valve
(integrated into solenoid valve block)

N148 Valve for front left suspension damper
N149 Valve for front right suspension damper
N150 Valve for rear left suspension damper
N148 Valve for rear right suspension damper

N311 Valve for accumulator
(integrated into solenoid valve block)

N336 Valve for damper adjustment, front left
N337 Valve for damper adjustment, front right
N338 Valve for damper adjustment, rear left
N339 Valve for damper adjustment, rear right
(joined to the corresponding air spring damper)

J403 Self-levelling suspension compressor relay

J567 Control unit for headlight range control, left

J568 Control unit for headlight range control, right

E472 Operating unit for tyre inflation connection



Brake system

The brake system

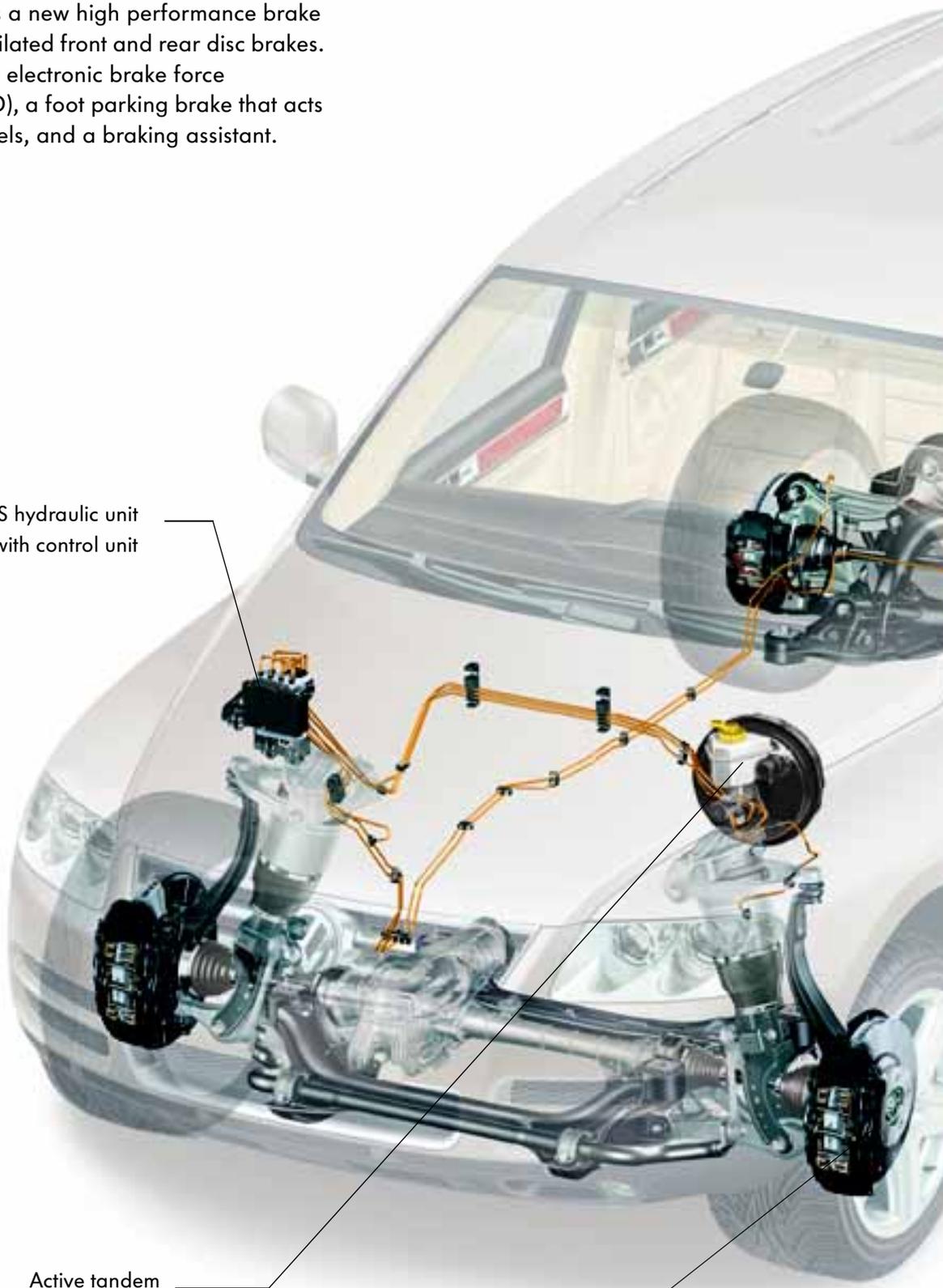
The Touareg has a new high performance brake system with ventilated front and rear disc brakes. Moreover, it has electronic brake force distribution (EBD), a foot parking brake that acts on the rear wheels, and a braking assistant.



ABS hydraulic unit
with control unit

Active tandem
brake servo

Front wheel brake





S302_077

Rear wheel brake



Brake system

The brake equipment

To achieve excellent deceleration values during braking, the Touareg is fitted with large front and rear wheel brakes. The brake discs are ventilated and the fixed callipers made by Brembo are constructed of aluminium. The Touareg has a brake pad wear indicator for the front and rear disc brakes so that brake pad wearout can be detected in good time.

Engine	Front Ø in mm	Rear Ø in mm
V6, V8	350 x 32 6 piston	330 x 28 4 piston
V10 TDI	350 x 34 6 piston	330 x 28 4 piston

The front wheel brakes

The Touareg has Brembo brake callipers for the front wheel brakes.

The are of monoblock construction and made of aluminium.



S302_057

The rear wheel brakes

The Touareg's rear wheel brakes are high performance brakes with ventilated discs. The fixed aluminium calliper has four brake pistons.

A duo servo drum brake is integrated into the brake disc. The following pages describe how this parking brake functions.



S302_085



Brake system

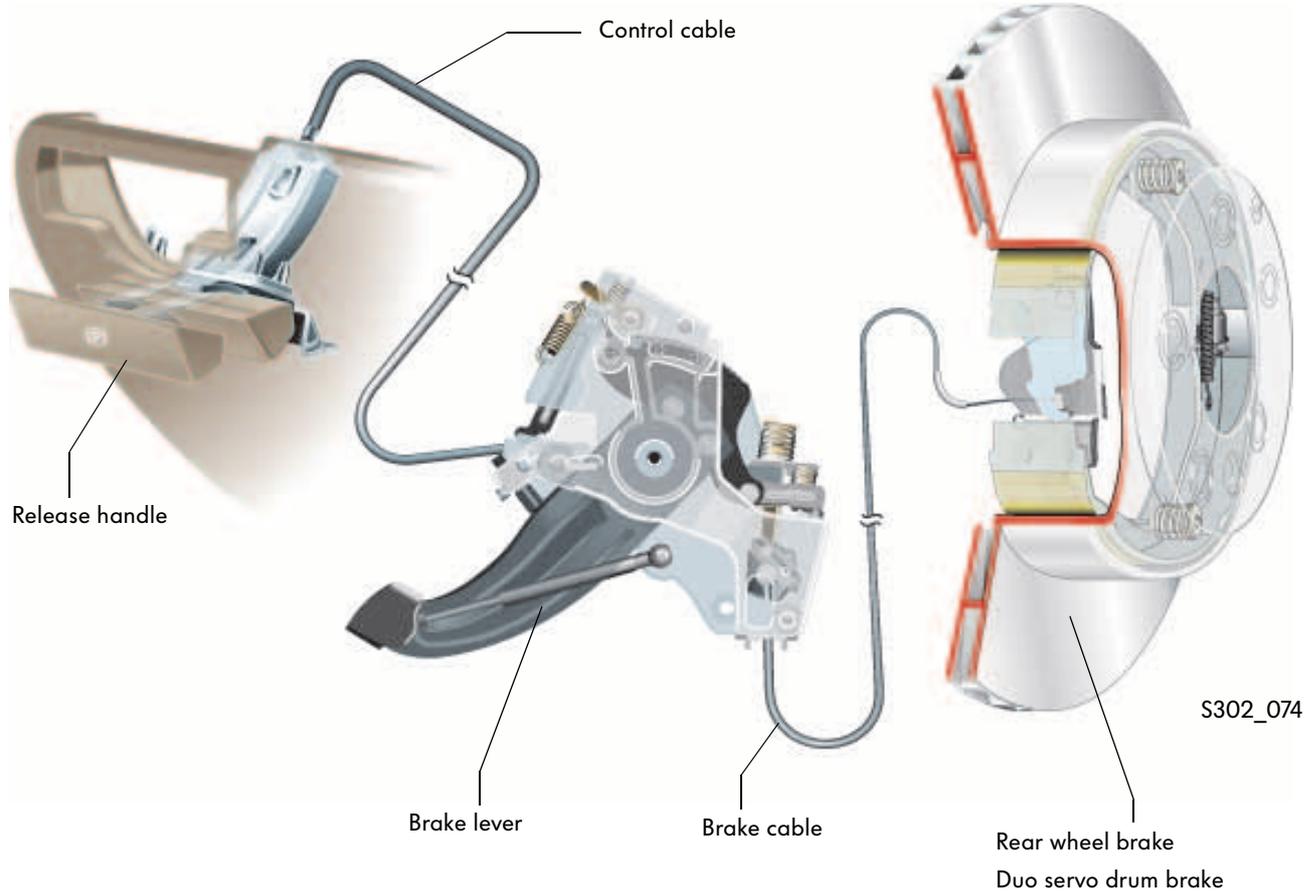
The foot parking brake

A foot parking brake holds the vehicle securely in place in every hillside situation.

The foot parking brake lever is located in the footwell in the A-pillar area. When the driver presses the parking brake pedal, a control cable transfers the applied force to a lever mechanism. Here, the force is distributed over two brake cables which operate the actuating mechanisms on the rear wheel brakes.

The parking brake is designed as a duo servo drum brake. Brake shoes inside the drum provide the braking action.

The release handle and control cable for releasing the foot parking brake are integrated into the dash panel.



The parking brake pedal

Applying the brake

The toothed piece and parking brake pedal are mounted on a pivot bearing and are fixed to each other.

Pressing the parking brake pedal actuates the control cable. A ratchet that locks into the toothed piece holds the brake.

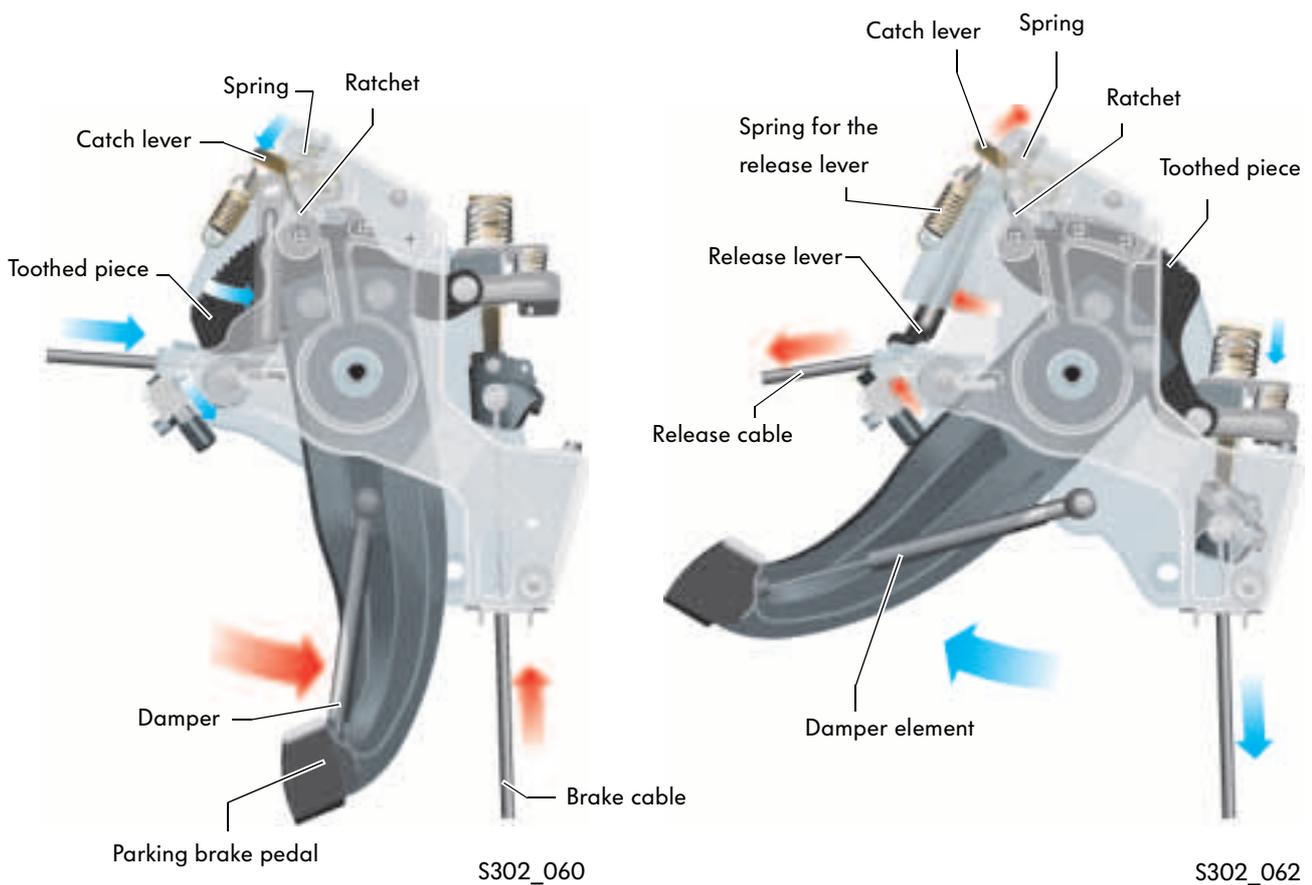
The force of the spring on the catch lever prevents the ratchet from jumping out. At the same time, the damper is compressed.

The brake cable is pulled.

Releasing the brake

When the driver pulls the release lever, the catch lever lifts the ratchet which releases the toothed piece. The release lever spring, now tensioned, pulls the release lever back into its normal position when the driver lets go.

The compressed damper with its spring/damping action guides the parking brake pedal slowly back to its starting position.



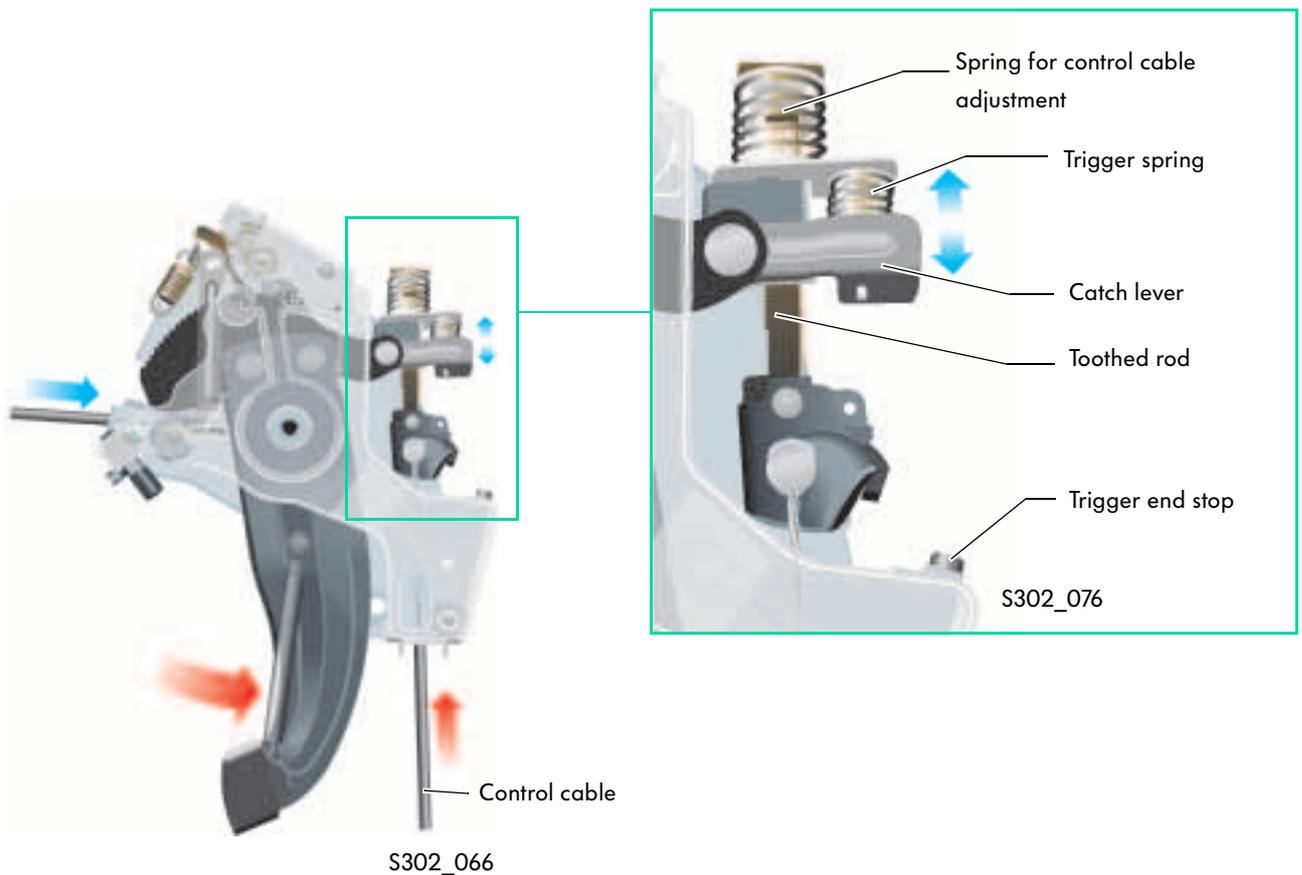
Brake system

The adjustment mechanism

An adjustment mechanism is integrated into the foot parking brake module to ensure that the control cable to the rear wheel brakes always has the optimal length. This adjustment mechanism is fixed to the parking brake pedal.

- Pre-loaded mechanism

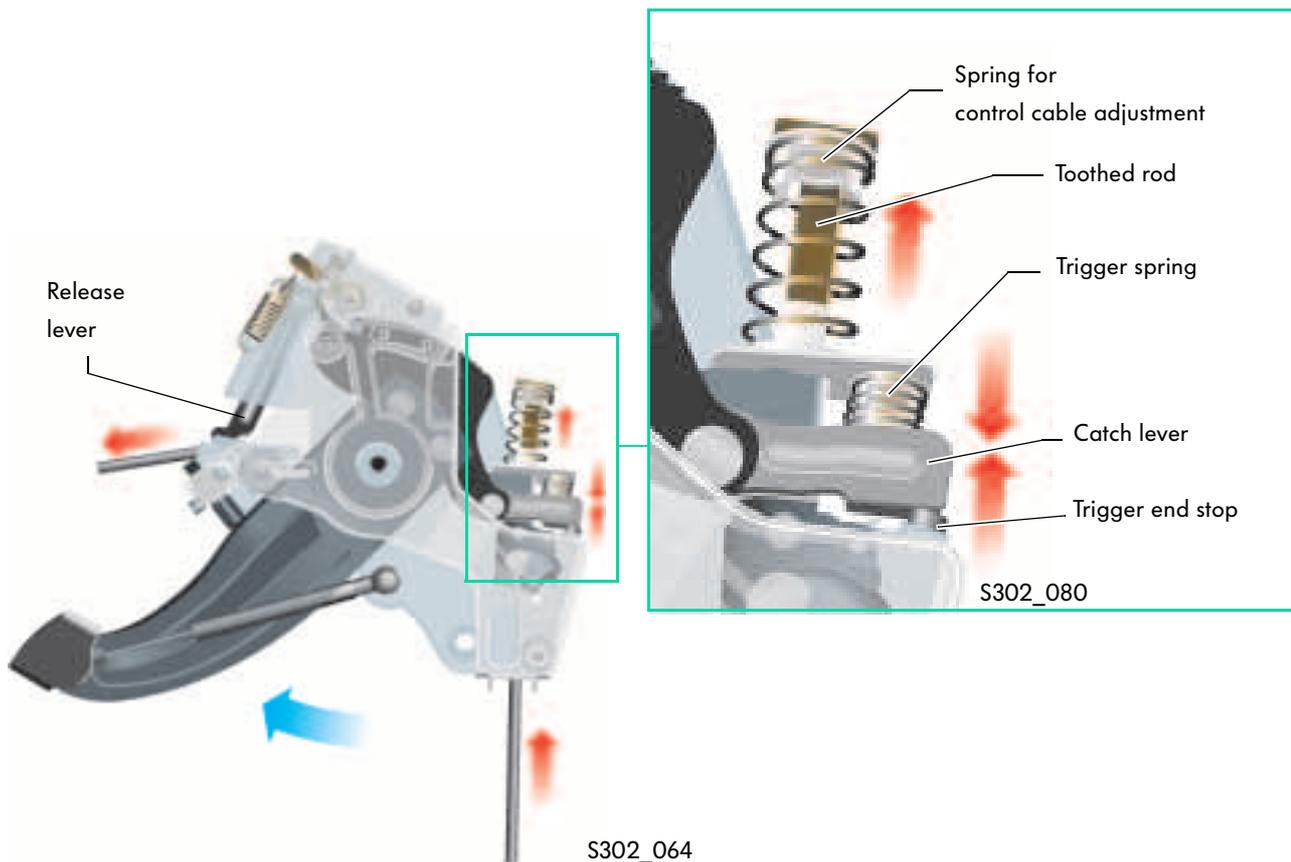
The spring for control cable adjustment is pre-loaded. A catch lever locks into the toothed rod inside the spring. The trigger spring presses on the catch lever to prevent it from jumping out and thus from triggering the adjustment mechanism too soon. When the driver applies and releases the foot parking brake, the whole adjustment mechanism moves up and down.



- Triggered mechanism

The mechanism moves downwards when the driver pulls the release lever.

The catch lever bears on the trigger end stop. This pushes the catch lever up against the force of the trigger spring and momentarily releases the toothed rod. The pre-loaded spring for control cable adjustment can move upwards and adjust the cable length accordingly.



Brake system

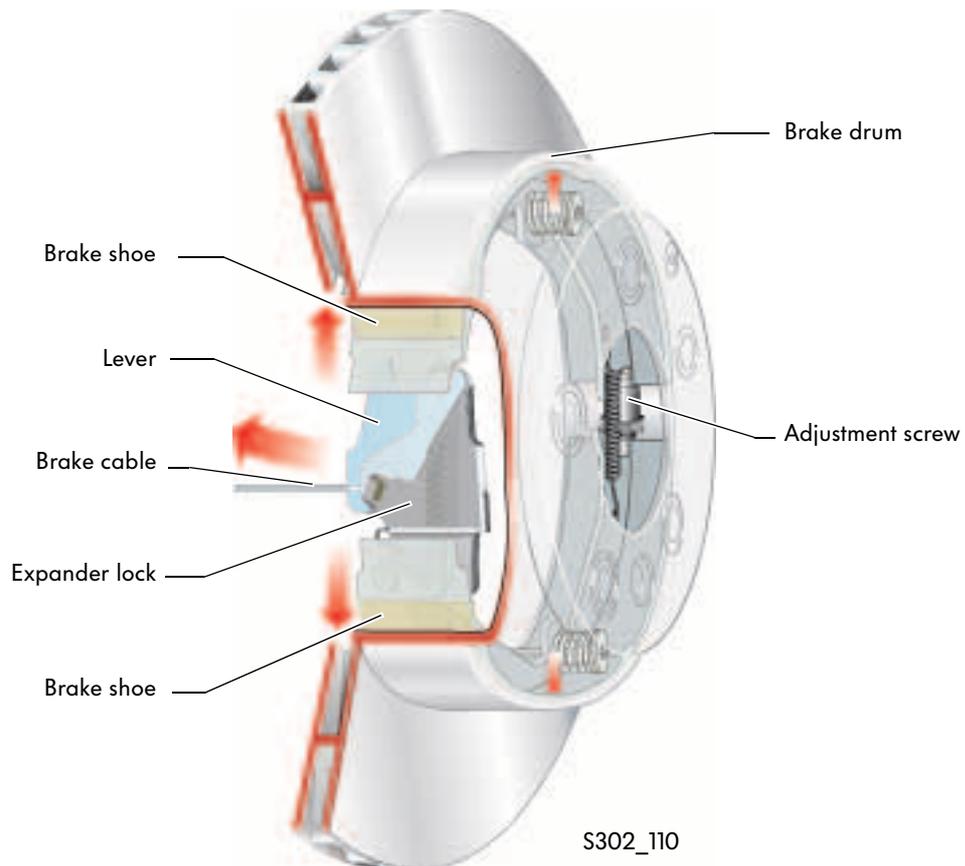
The foot braking function

Brake shoes inside the duo servo drum brake provide the braking action of the foot parking brake.

Applying the brake

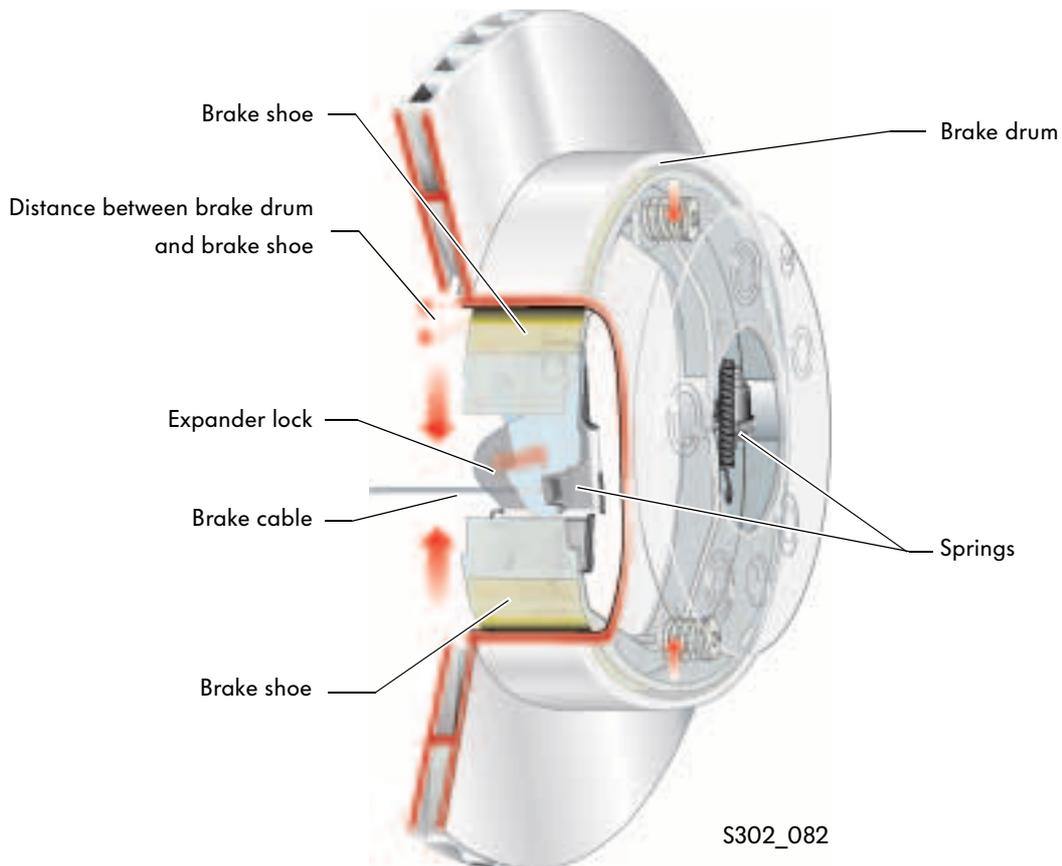
Pressing the parking brake pedal pulls the brake cable which then actuates the lever of the expander lock.

The expander lock pushes the brake shoes apart, pressing them against the inner side of the brake drum. In this way the vehicle can be held securely in place in every hillside situation.



Releasing the brake

When the brake is released, there is no longer any tension in the brake cable. The springs pull the brake shoes together so that they no longer press against the inner side of the brake drum and the expander lock returns to its starting position.



Brake system

The anti-lock brake system ABS/ESP Continental/Teves MK 25

The MK 25 ABS/ESP system with braking assistant brings the Touareg safely to a halt in every situation and on any road surface.

- The hydraulic unit and control unit are integrated into one unit
- The active wheel sensor system detects forwards and reverse travel

The ESP sensor unit G419 contains the lateral acceleration sensor G200, the longitudinal acceleration sensor G251 and the yaw rate sensor G202 in one housing. Each individual sensor works according to the well-known principles.



S302_102

The following functions of the MK 25 ABS/ESP system increase passenger safety:

- Braking assistant
- Electronic differential lock
- Traction control system
- Engine braking control
- Hill incline assistant
- Hill decline assistant
- Off-road ABS

The electronic differential lock (EDL)

The 4-wheel EDL enables braking on both sides in various situations up to speeds of 120 km/h. Here, the free-spinning wheel is slowed by brake application. If, however, the braking action is not sufficient to stabilise the vehicle, the motor torque is also reduced.

The hill incline assistant (in vehicles with manual gearboxes)

The hill incline assistant is a comfort-oriented aid for starting off on uphill slopes. It does not make any difference whether you want to drive forwards or in reverse. It stores the brake pressure/force (driving brake and/or parking brake) that is used to stop or park the vehicle. When you start off again, it slowly reduces the stored brake pressure. It intervenes in the active brake servo. With automatic vehicles, a brake in the transmission holds the vehicle on inclines.

The hill decline assistant

The hill decline assistant intervenes:

- At speeds less than 20 km/h
- On slopes greater than 20%
- During forwards and reverse driving
- When ESP is active

In this case, the driver may not press the accelerator. It intervenes when, for example, one wheel loses traction.

Using the ABS pump, the brakes are applied at the wheels that have good traction. This acts against the vehicle acceleration caused by the descending force and keeps the vehicle speed constant.

When this process is complete, the vehicle returns to the previous driving speed.

The off-road ABS

The off-road ABS permits the front wheels to lock momentarily. The wedge action created in front of the front wheels supports braking.

The off-road ABS only acts:

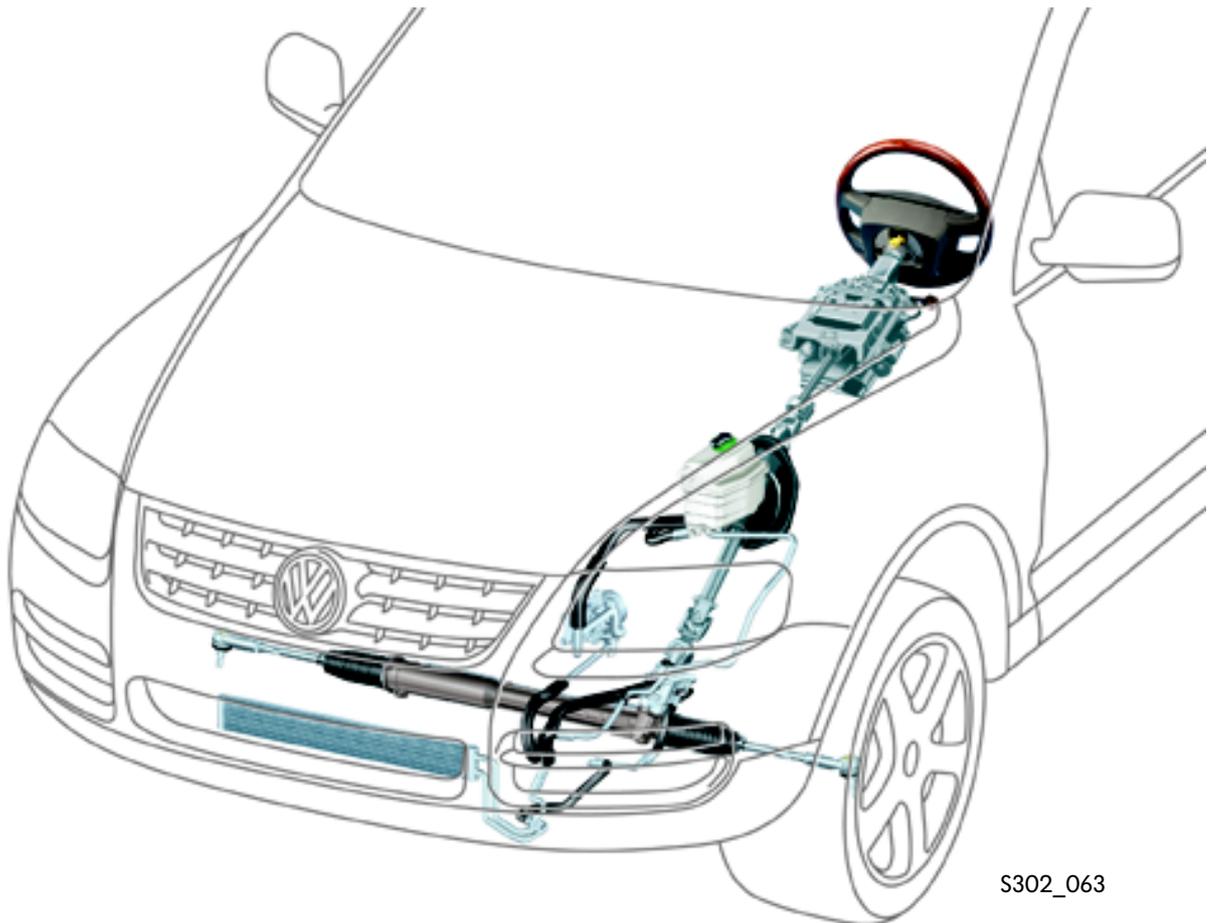
- At speeds less than 30 km/h
- On the front wheels
- When driving forwards
- In low range gear reduction



Steering system

The steering system

Overview



S302_063

The standard power-assisted steering consists of the following components:

- Rack-and-pinion steering box
- Hydraulic pump (vane-type pump)
- Hydraulic supply lines with large oil cooler

The steering column

The steering column is electrically lockable and can be adjusted in the vertical and axial directions. The steering column is available with either manual or electric adjustment. The steering components are functionally the same as those of the Phaeton. The travel range is 50 mm in the axial direction and 40 mm in the vertical direction.

The wheels and tyres

Steel (17") / alloy wheels (17" - 19")



S302_112

"Canyon 5"
7.5 J x 17 ET 55



S302_114

"Manhattan"
8 J x 18 ET 57



S302_116

"Fat Boy"
8 J x 18 ET 57



S302_118

"Atheo"
9 J x 19 ET 60

The tyre range

Tyre size	Wheel design	Rim size
235/65 R 17	Steel / aluminium	7.5 J x 17
235/60 R 18	Aluminium	8 J x 18
255/60 R 17	Aluminium	7.5 J x 17
255/55 R 18	Aluminium	8 J x 18
275/45 R 19	Aluminium	9 J x 19



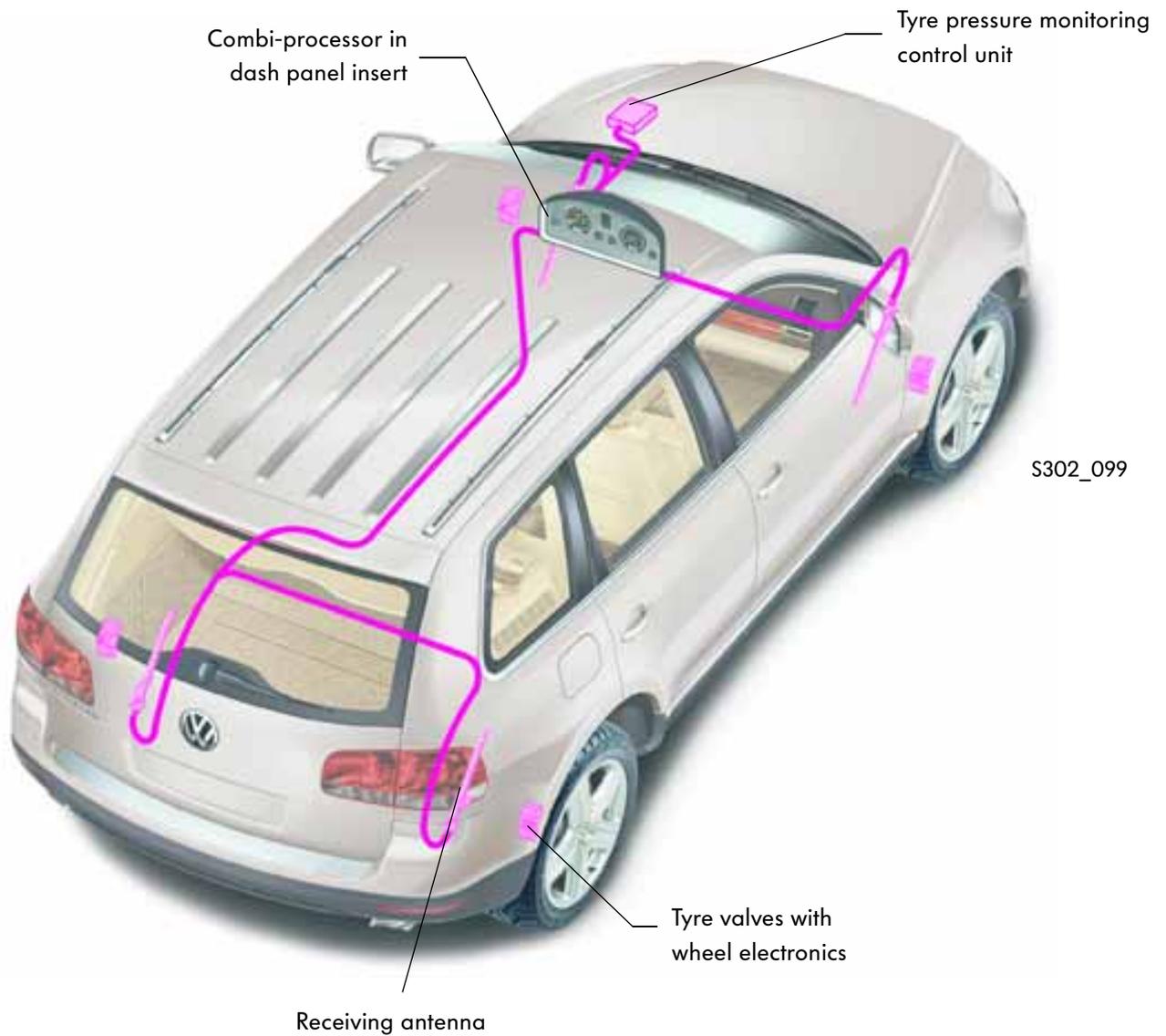
Collapsible spare tyre

Tyre size	Wheel design	Rim size
195/80 R 17	Steel	6.5 J x 17 ET 40
195/75 R 18	Steel	6.5 J x 18 ET 53

Tyre pressure control

The tyre pressure control (TPC)

The tyre pressure control continuously monitors the tyre pressure while driving.



Function of the tyre pressure control

The tyre pressure control used in the Touareg is a 4-wheel system.

A high frequency antenna is installed in each wheel housing. This receives data messages by radio from the respective tyre pressure sensor. The tyre pressure sensors are screwed to the valves in the four wheels.

Data messages are received every 54 seconds in normal mode and every 850 milliseconds in rapid-send mode. Rapid-send mode is triggered when the rate of pressure loss in the tyre is greater than 0.2 bar/min.

The tyre pressure control continuously monitors the tyre pressure while driving and when parked. A wheel electronics unit mounted inside the tyre measures the tyre pressure and temperature at regular intervals. This data is sent to the central control unit and evaluated.

The tyre pressure control makes it possible to always have the optimal air pressure inside the tyres. This minimises tyre wear and fuel consumption.

The control unit evaluates the tyre pressures or tyre pressure changes and sends the appropriate system messages to the dash panel insert.

TPC provides the following benefits:

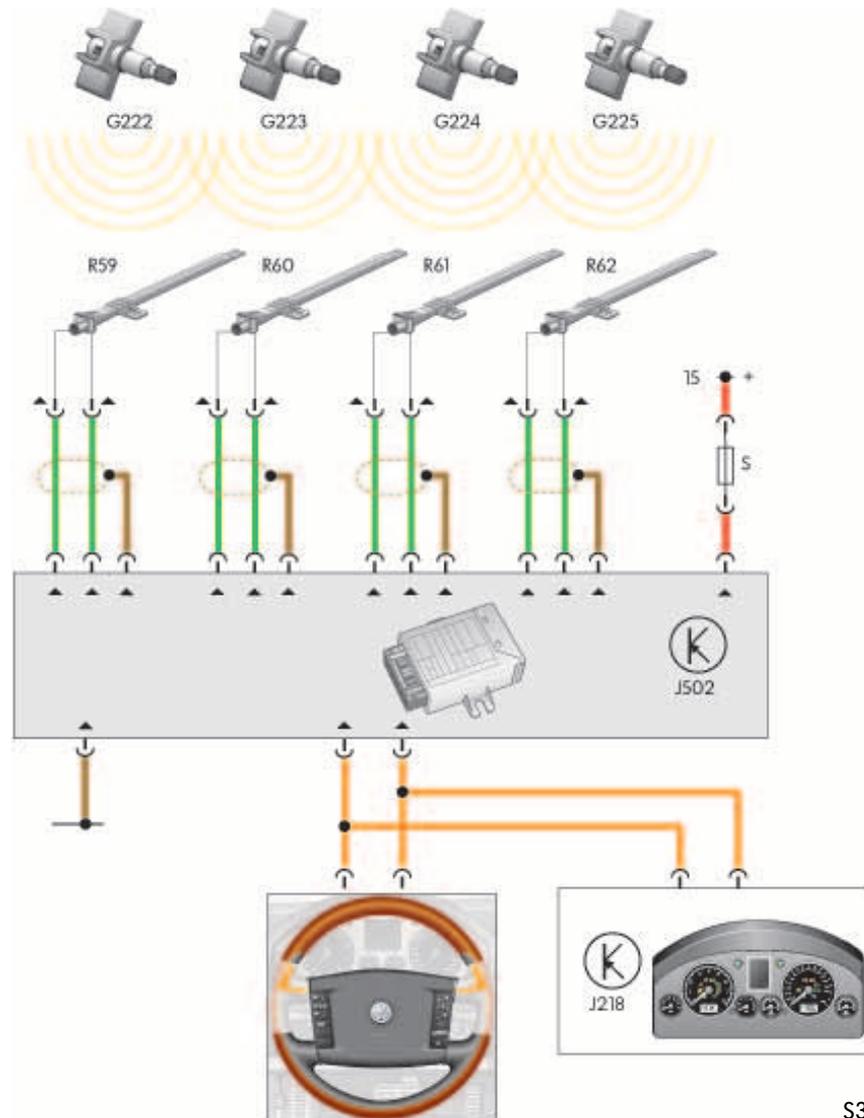
- Constant display of tyre pressure
- Gradual pressure loss:
The system informs the driver in time to be able to correct the tyre pressure.
- Sudden pressure loss:
The system warns the driver immediately while driving.
- Excessive pressure loss when the vehicle is stationary:
The system warns the driver immediately after the ignition is switched on.



To prevent system faults, the external spare wheel is not allowed to be fitted with a wheel electronics unit.

Tyre pressure control

System overview



S302_096

The components

- G222 Front left tyre pressure sensor
- G223 Front right tyre pressure sensor
- G224 Rear left tyre pressure sensor
- G225 Rear right tyre pressure sensor
- J218 Combi-processor in dash panel insert
- J502 Tyre pressure monitoring control unit
- R59 Tyre pressure monitoring antenna, front left

- R60 Tyre pressure monitoring antenna, front right
- R61 Tyre pressure monitoring antenna, rear left
- R62 Tyre pressure monitoring antenna, rear right

- = Input signal
- = Output signal
- = Positive
- = Ground
- = CAN data bus
- = Gold contact

The tyre pressure sensors G222...G225

The tyre pressure sensors are functionally the same as those of the Phaeton. The only difference is increased transmission power. This is required because the tyre walls are thicker. The sensors with increased transmission power can be recognised by the eight white stars on the top of the sensor.



S302_058

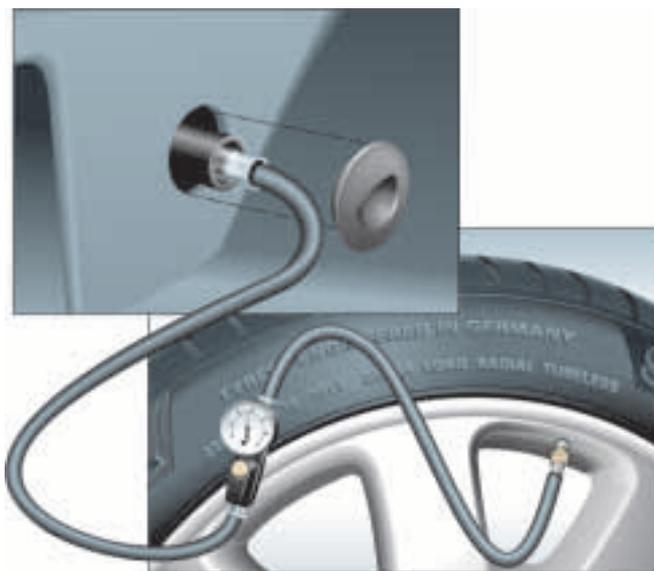
Transmission power:

- Phaeton = 10 μ W -30 μ W
- Touareg = approx. 100 μ W



For more information on the function of the sensors, please refer to "The Phaeton – chassis" in SSP 277.

The tyre inflation connection



S302_048

Vehicles with air suspension have a separate tyre inflation connection. This is located under the front right seat. It may only be used to inflate the collapsible spare tyre and tyres filled with puncture sealer.



Differential locks

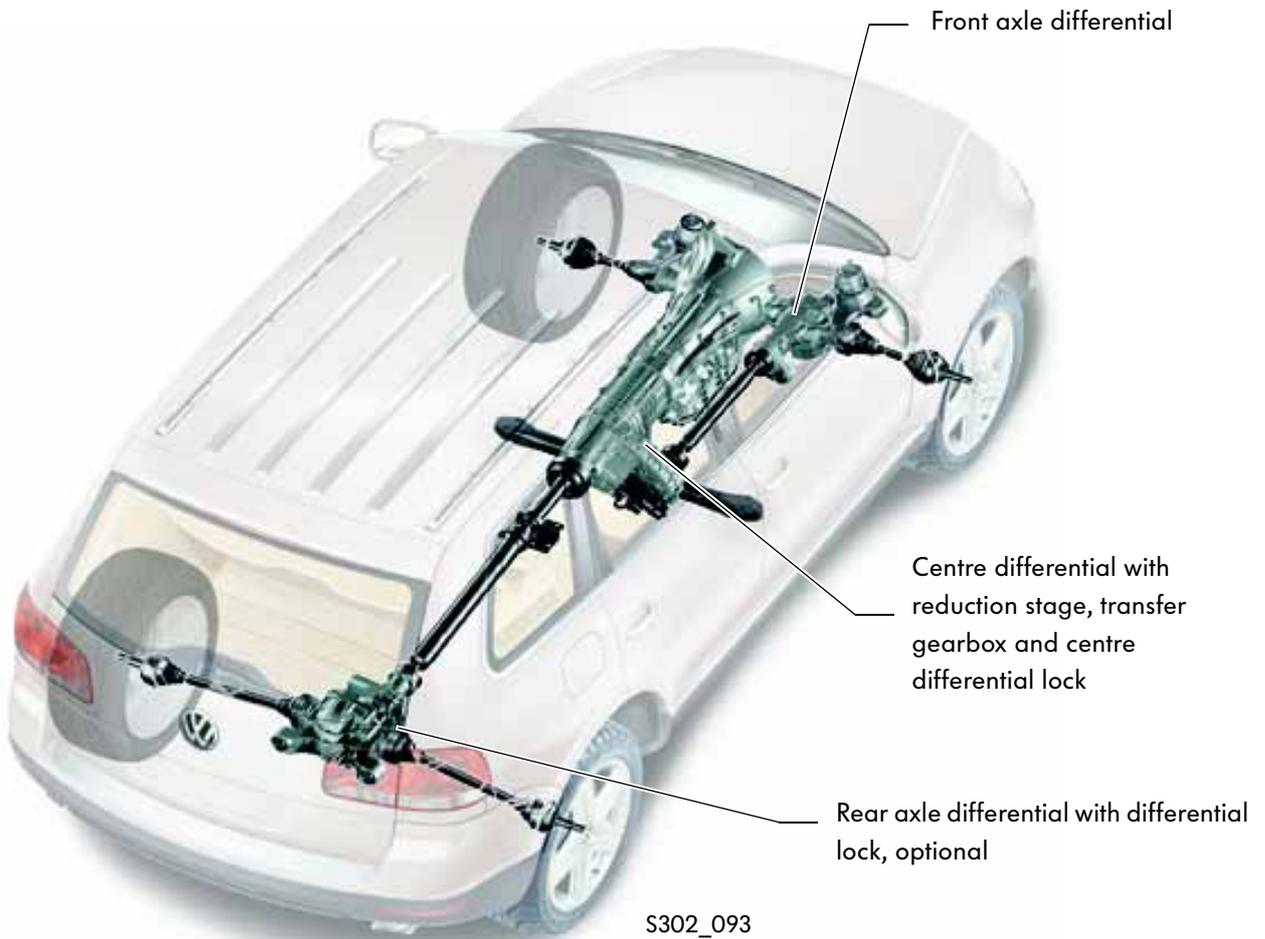
General Information

The motor and gearbox in the Touareg are mounted in the longitudinal direction. With the Touareg's full-time 4-wheel drive, the drive torque is distributed uniformly to the front and rear axles without slip.

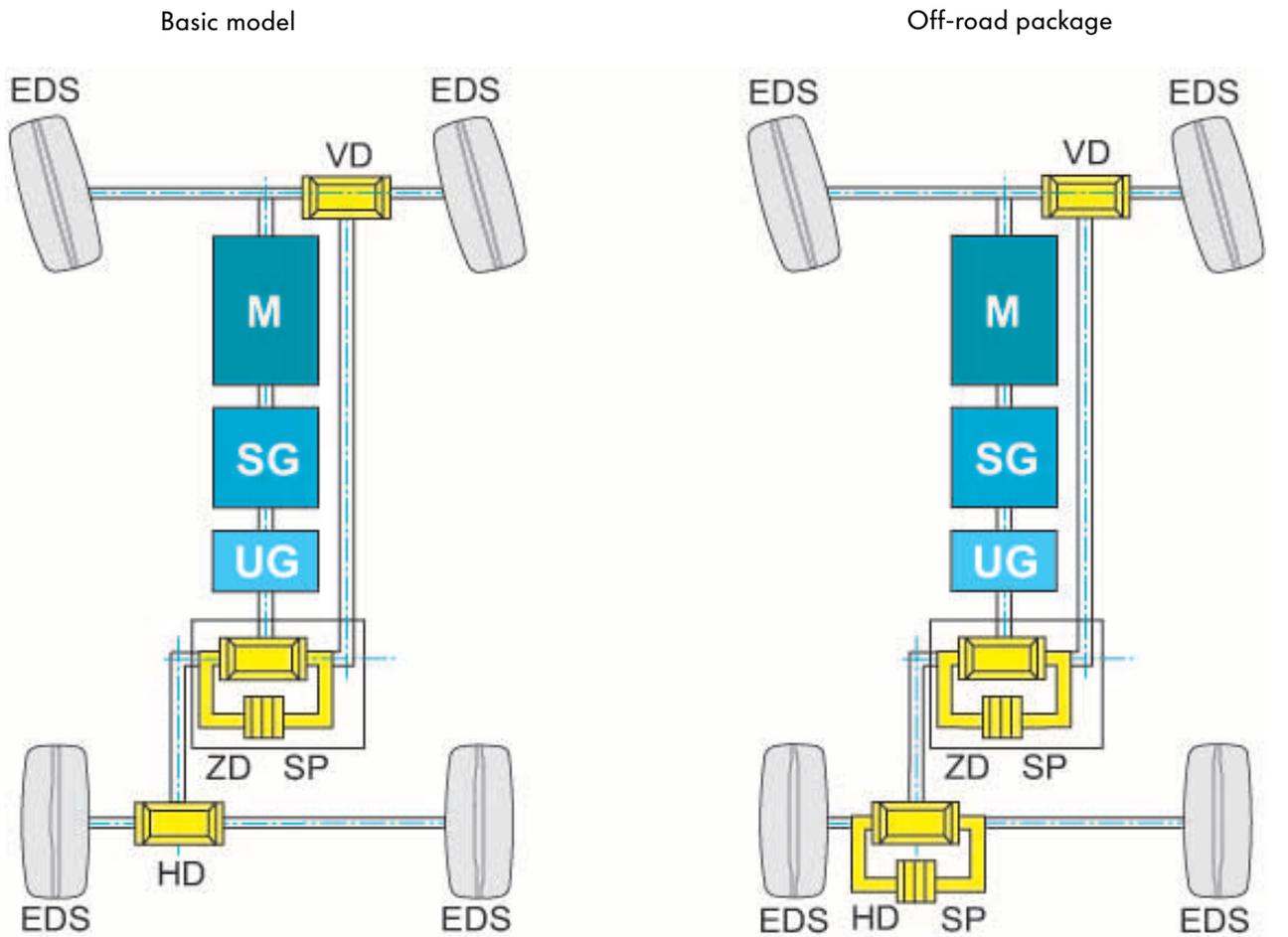
The front differential is located to the right of the motor in the direction of travel.

So that equal-length drive shafts can be used at the front axle, the gearbox housing has been extended on the left in the travel direction to accommodate an extended floating shaft.

Equal-length shafts improve the application of torque.



There are two drive equipment options.



S302_056

M - motor; MG - manual gearbox; RG - reduction gearbox; CD - centre differential;
 RD - rear axle differential; FD - front axle differential; DL - differential lock; EDL - 4-wheel brake intervention



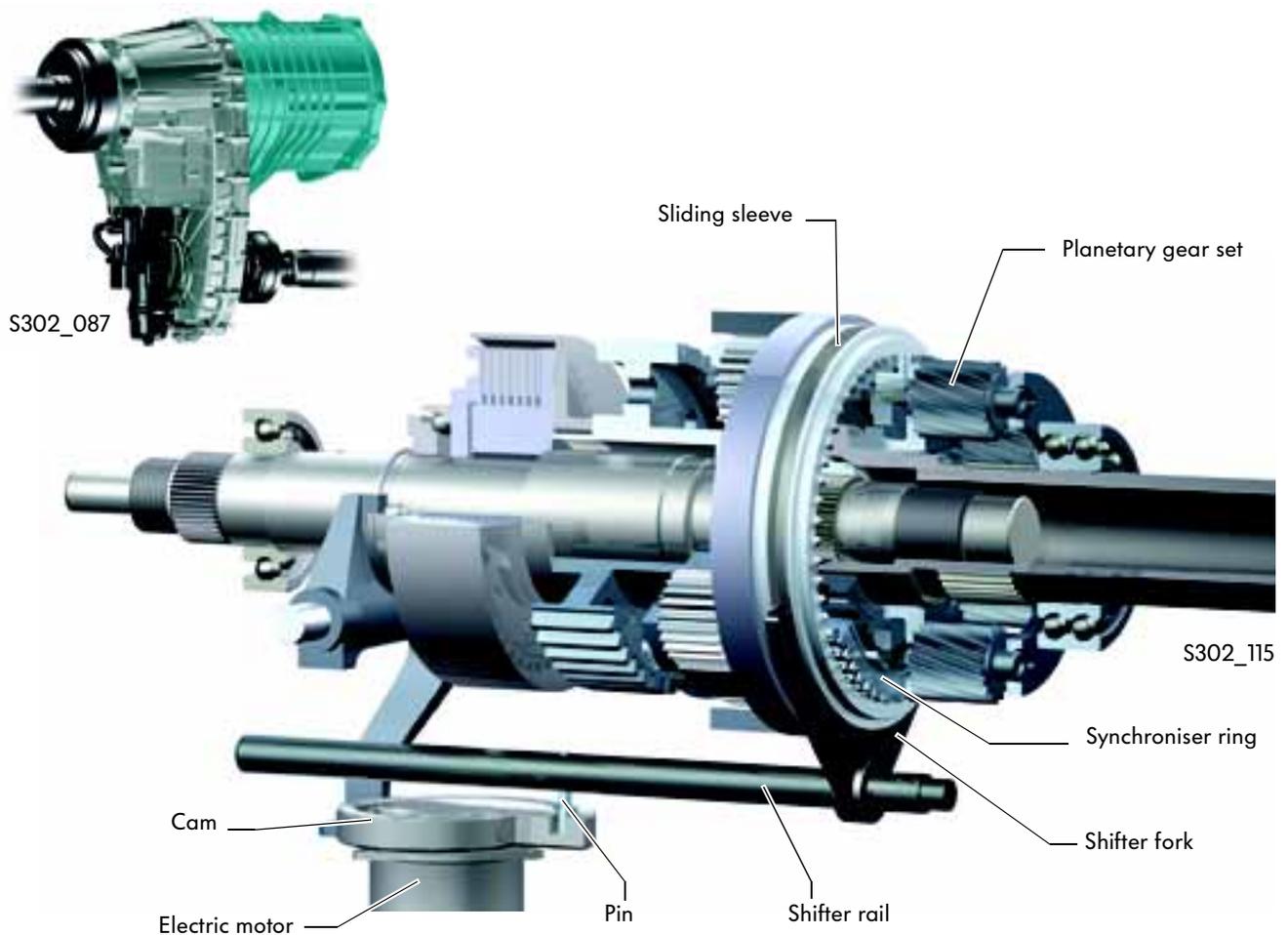
Differential locks

The function of the differentials

Centre differential

The Touareg has a centre differential as standard with an electric differential lock and reduction stage. All components are integrated into the transfer gearbox.

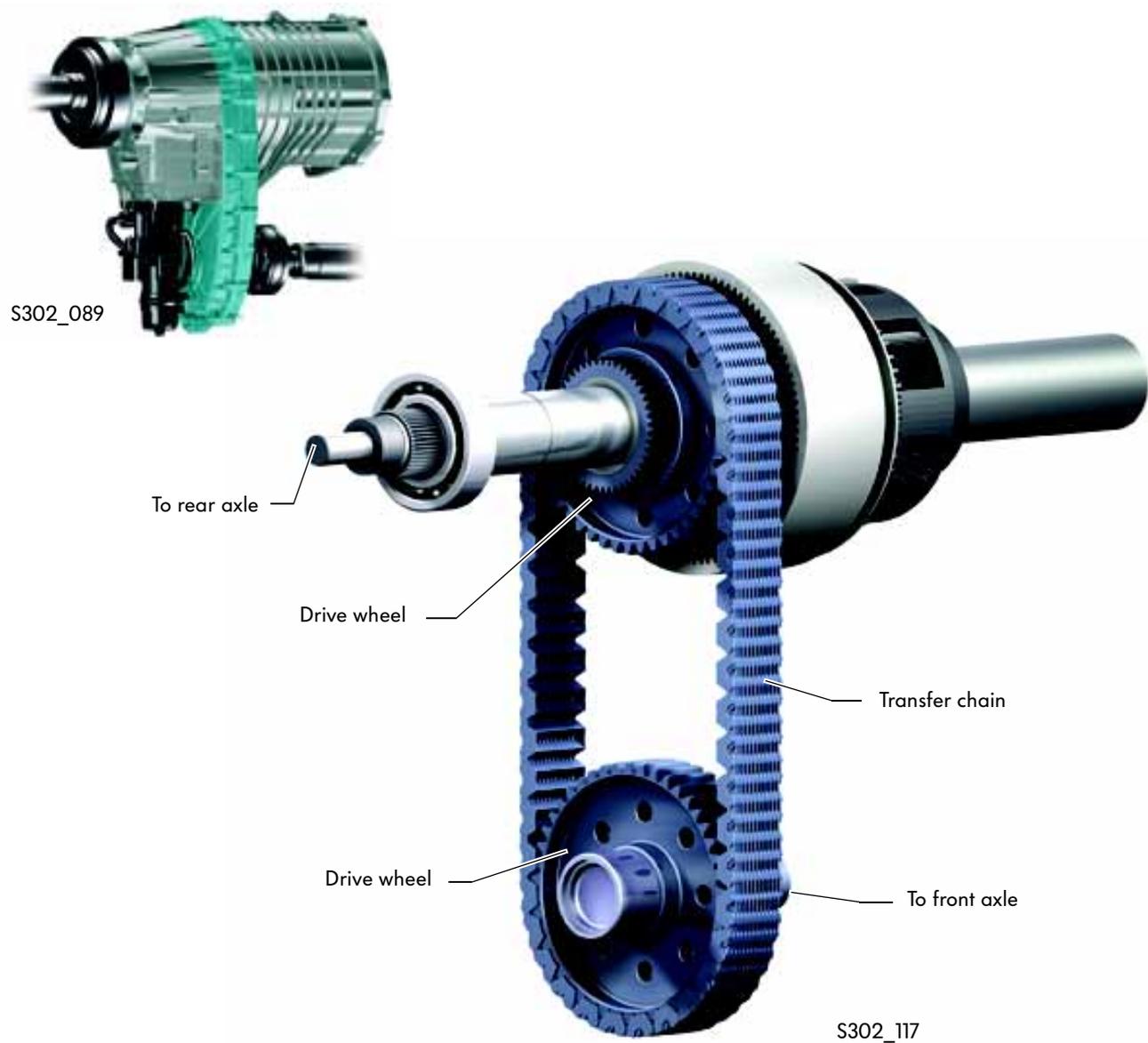
The reduction stage



Connecting or opening the planetary gear set engages or disengages the 2.7:1 gear reduction stage. An electric motor actuates the cam. This cam has a curved inner track that moves a pin, which in turn moves the shifter rail and shifter fork. The shifter fork locks into a sliding sleeve. The inner part of this sliding sleeve is the internal gear of a planetary gear set. The internal gear is engaged and disengaged with the assistance of the synchroniser rings.

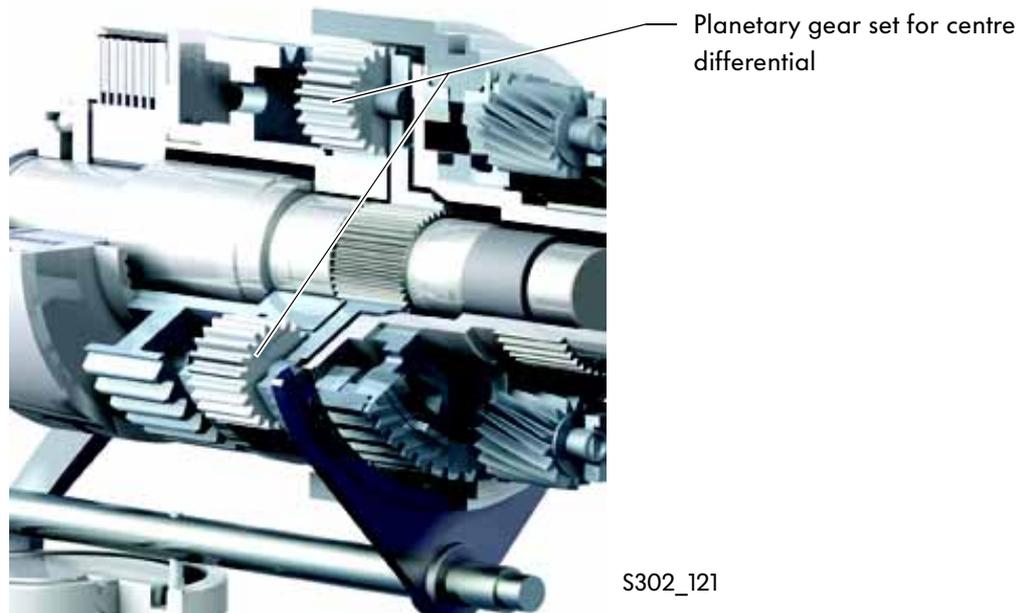
The transfer gearbox

In normal driving (without slip), the differential distributes the torque 50:50 to the front and rear axles. Two gears and a chain transfer the torque to the front axle.

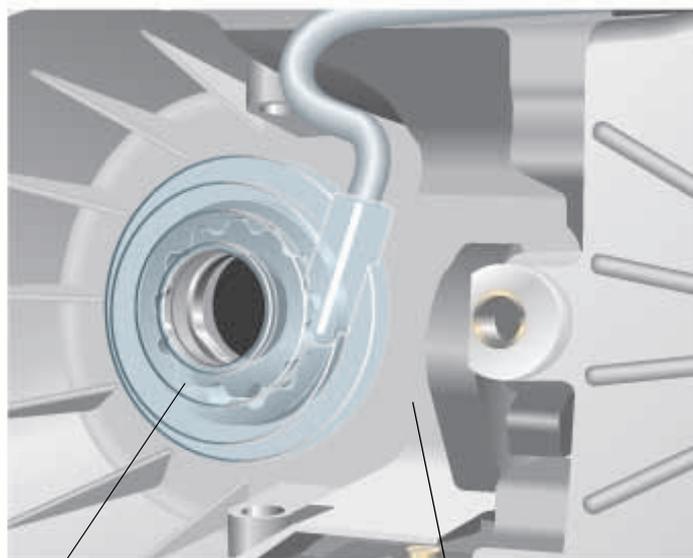


Differential locks

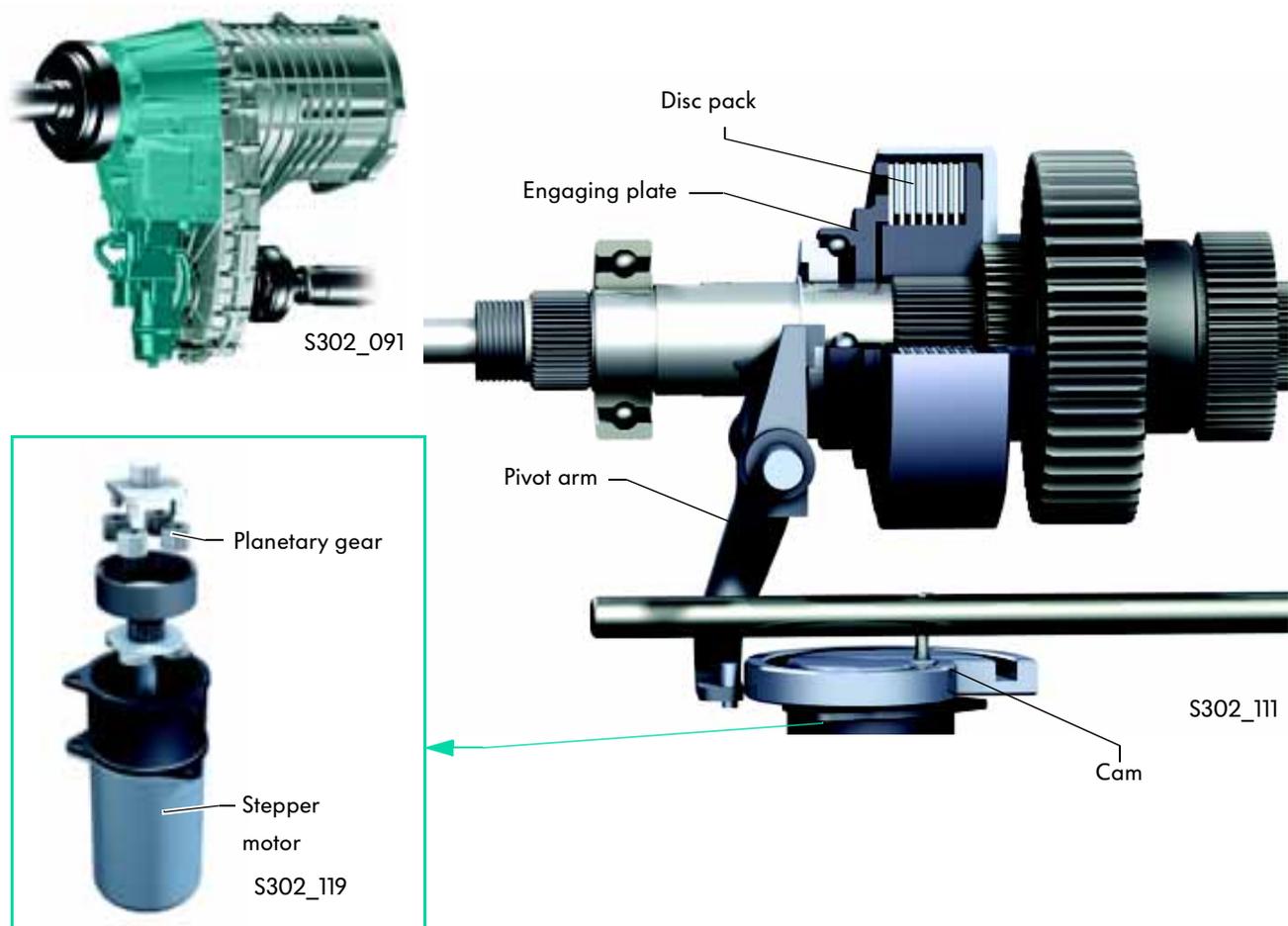
The Touareg has a centre differential as standard. A planetary gear set serves as the differential between the front and rear axles.



An oil pump driven by the main shaft supplies oil to all lubrication points through the hollow-bored shaft.



The centre differential lock



The centre differential lock is a multiple-disc lock that is actuated by an electric motor. The electric motor turns a cam which actuates a pivot arm. The pivot arm then pushes against an engaging plate. The engaging plate presses the disc pack together.

The centre differential lock is always engaged. A planetary gear set with gear reduction is connected to the actuating motor on the load side. This allows the required torque, calculated by the control unit, to be set very quickly and exactly.

The amount of pressure necessary for the differential lock to operate without slipping is always applied to the multiple disc clutch.

In off-road terrain, we recommend that you engage the differential lock to 100% using the rotary switch.

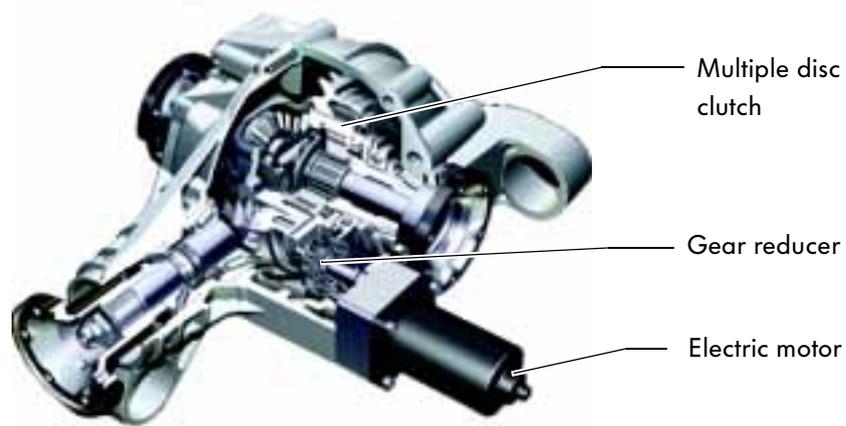
Before you can engage the lock, the off-road reduction stage must be engaged. There is then no regulation process.



Differential locks

The rear wheel differential lock

The rear differential lock is also actuated electro-mechanically. The electric motor actuates a gear reducer which turns a gear segment.



S302_053

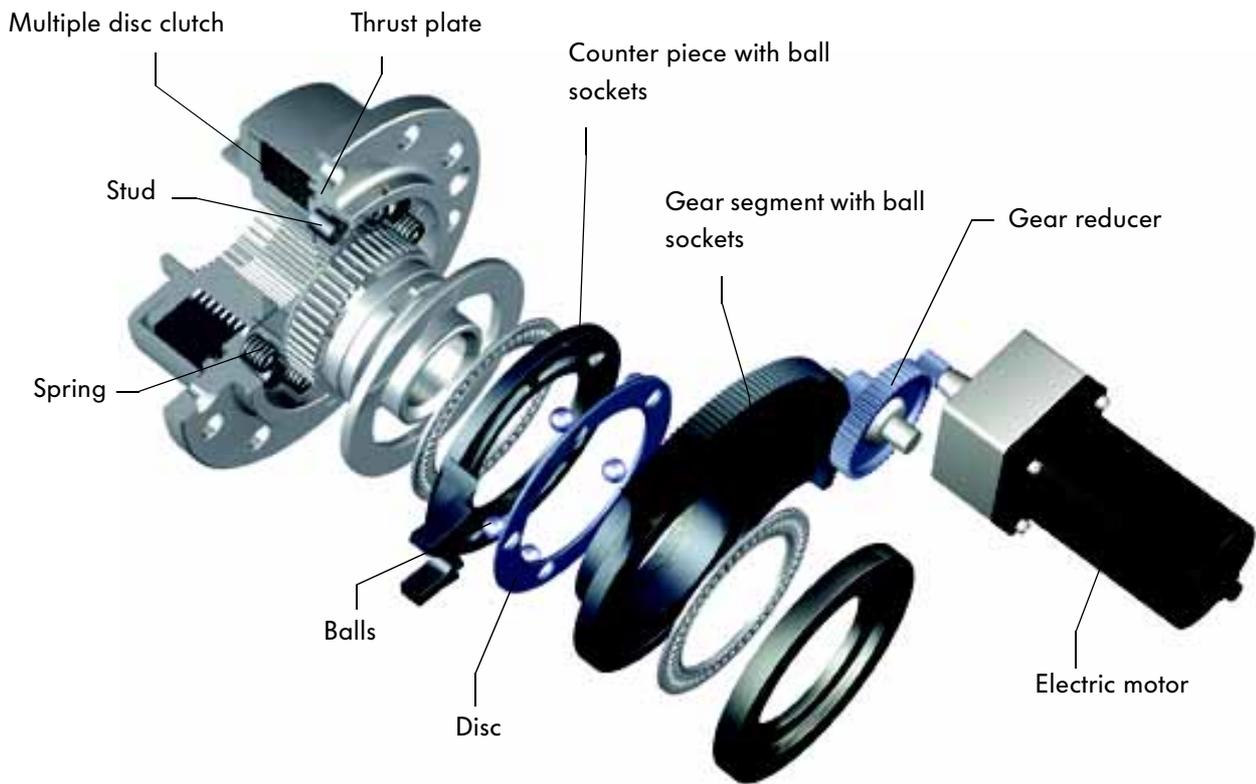
In the gear segment are elongate ball sockets which are deeper on one side than on the other. These act like a skew ramp.

There are also elongate ball sockets in the counter piece, which is held by the differential housing. In-between is a disc with holes and there are balls in these holes.

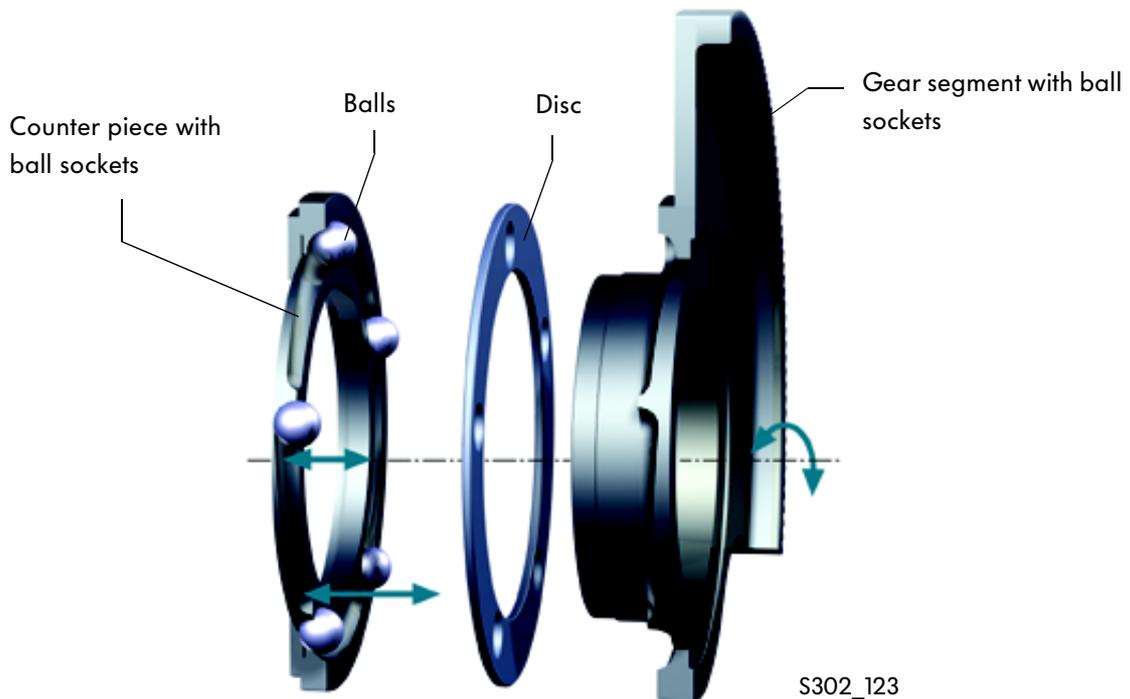
When both plates are rotated relative to each other, they are pressed apart, creating an axial movement which applies pressure to 6 studs. The studs engage the multiple disc clutch by actuating a thrust plate.

If there is no current to the motor, the lock is opened by springs.





S302_113



S302_123



Differential locks

Electronic drive train management

Electronic drive train management enables the off-road reduction stage to be engaged and the differential locks to be activated automatically or manually. You make the settings using the selector switch.



The **"HIGH"** setting is for on-road driving. The differential locks are engaged automatically depending on the situation (e.g. icy conditions). In this case, the differential lock is not closed to 100%, as for example with a constant mesh coupling, but is engaged with a soft setting. The off-road reduction stage is not engaged.

Using the other two settings on the selector switch, you can engage the centre differential lock and the rear differential lock manually.

When driving off-road, the **"LOW"** setting can be engaged while driving (up to 15 km/h). This engages the off-road reduction stage. The differential locks again react automatically.



Control strategy



S302_049

Independently of the "HIGH" and "LOW" switch settings, the differential lock is engaged according to the conditions. The locking effect depends for example on the engine speed, engine load, steering angle, accelerator position and wheel speeds. Using these parameters, the actuating motor sets the closing pressure of the multiple disc clutch to transfer the torque that is calculated based on requirements. Since the parameters change constantly, the torque to be transferred also changes constantly.

The differential locks must always operate without slipping, since otherwise they burn.

If you want to engage or disengage the reduction stage, you set the rotary switch accordingly, and this then sends the signal to the control unit. The reduction stage only engages or disengages when you drive according to the requirements shown in the display [speed < 15 km/h (<40 km/h to disengage), gear shift lever in N].

If the time limit expires before you adjust your driving to these parameters, the control unit assumes that you do not want to continue with the shift sequence and that it is implausible.

To protect the automatic gearbox, the driving speed and the engine speed are limited (80 km/h) when the reduction stage is engaged.



Service

Special tools

Special tool number	Designation	Usage
T10187	Ball joint separator	For separating the ball joints for transverse and radius links
T10188	Plug tool	For camber adjustments
T10189	Release tool	For releasing the brake pedal
T10190	Master set	For fitting and removing anti-theft wheel bolts
T10206	Drawing device	For fitting jointed shafts to the wheel hub
T10209	Plug cartridge SW 32	For fitting jointed shafts to the wheel hub
T10103/1	Adaptor plate	For pressing out the jointed shaft



Check your knowledge

1. What distinguishes the Touareg with respect to its off-road capability?

- a) Large body overhangs, coarse-tread off-road tyres and rigid axles
- b) Limited-slip differential on the rear axle, climbing capability of 100%, a ground clearance of up to 300mm and ramp angle of 27°
- c) 4-wheel drive with fixed power distribution, limited suspension comfort, off-road gear reduction that can only be engaged when stationary

2. How many level and acceleration sensors does the Touareg's air suspension use?

- a) 9, that is, 3 sensors for body acceleration, 4 sensors for vehicle level and 2 sensors for wheel acceleration
- b) 12, that is, 4 sensors each for body acceleration, vehicle level and wheel acceleration
- c) 10, that is, 4 sensors for vehicle level, 3 sensors for wheel acceleration and 3 sensors for body acceleration

3. The hill decline assistant intervenes at:

- a) Speeds less than 30 km/h
- b) Slopes greater than 20%
- c) ESP must be active



Check your knowledge

4. Where is the adjustment mechanism for the foot parking brake?

- a) In the drum
- b) It is not required
- c) On the lever of the expander lock
- d) In the foot parking brake module

5. What do you have to pay attention to when you want to engage the reduction stage with an automatic gearbox?

- a) It can be engaged at any speed
- b) The speed must be < 15 km/h
- c) You need to put the selector lever in neutral
- d) You need to press the brake pedal



**Solutions**

1.) b

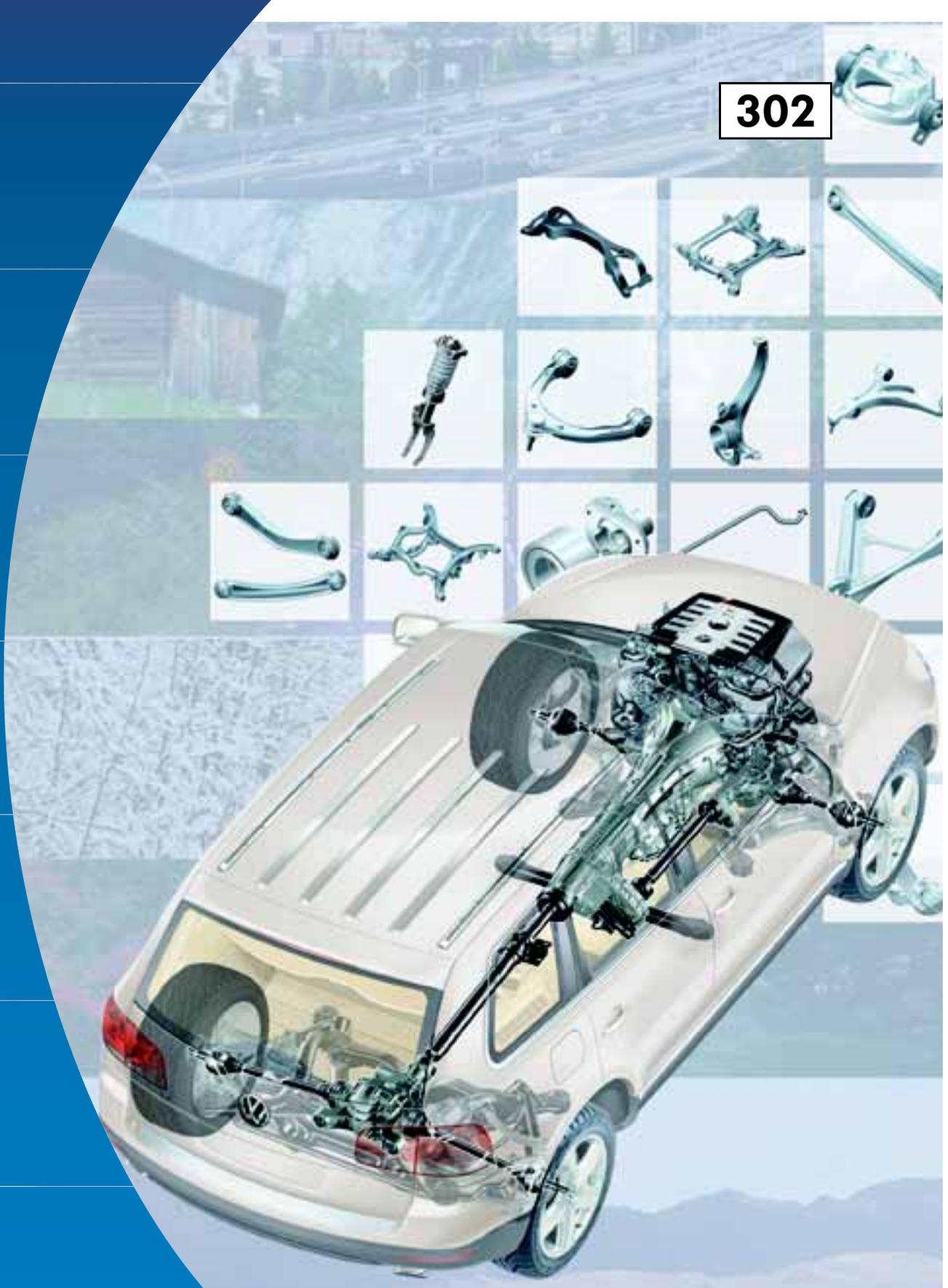
2.) a

3.) b, c

4.) d

5.) b, c





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♻️ No chlorine was used to bleach this paper during manufacture.