The new chassis was designed with the aim of achieving the optimal combination of highest driving convenience and outstanding driving characteristics. The rack and pinion type steering system with new electromechanical steering assistance contributes to this in addition to the new axles.

The effective and reliable brake system, which distinguishes itself through fast response and exact proportioning of the braking force, offers a high safety level.

For the first time **Škoda**Octavia is offered with the system TPM*, which monitors the inflation pressure in the individual tyres.

* Tyre Pressure Monitoring

Contents

Part I – Chassis

Part II – Electromechanical power-assisted steering

You will find notes on inspection and maintenance, setting and repair instructions in the Workshop Manual.

Introduction

Chassis

The chassis of **Škoda**Octavia once again sets the yardstick in its category.
For example the use of suspension struts of the front axle with an optimized dynamic suspension characteristic.
Or the introduction of the new multi-arm axle, in order to achieve a good driving dynamics and a good suspension convenience.
The electromechanical power-assisted steering assists the driveability in a good manner and obtains a pleasant steering sensation.
It adapts the steering forces harmoniously in line with the vehicle speed.

The **Škoda**Octavia can be equipped with a standard chassis, sport chassis or rough road chassis. The chassis differ through the suspensions, setting of the shock absorbers, dimension of the anti-roll bars and the auxiliary suspensions, which also function as stop buffers.

The sport chassis is positioned 15 mm lower in contrast to the agile and convenience-oriented standard chassis. The vehicle structure of the rough road chassis is positioned 25 mm higher in contrast to the standard chassis.

SP58_01

Technical highlights

- Stationary accelerator pedal with contactless accelerator pedal position senders
- Optimized suspension strut axle according to the McPherson principle at the front axle
- Anti-roll bar tie via coupling rods to the suspension struts
- Electromechanical power-assisted steering
- Multi-arm rear axle
- Electronic stability program of MK60 system of the company Continental Teves, optional
- Tyre pressure inspection display, optional
- Brake assistance
- Separately adjustable track and camber on the rear axle
- Wheel rim sizes: 15″, 16″ or 17″

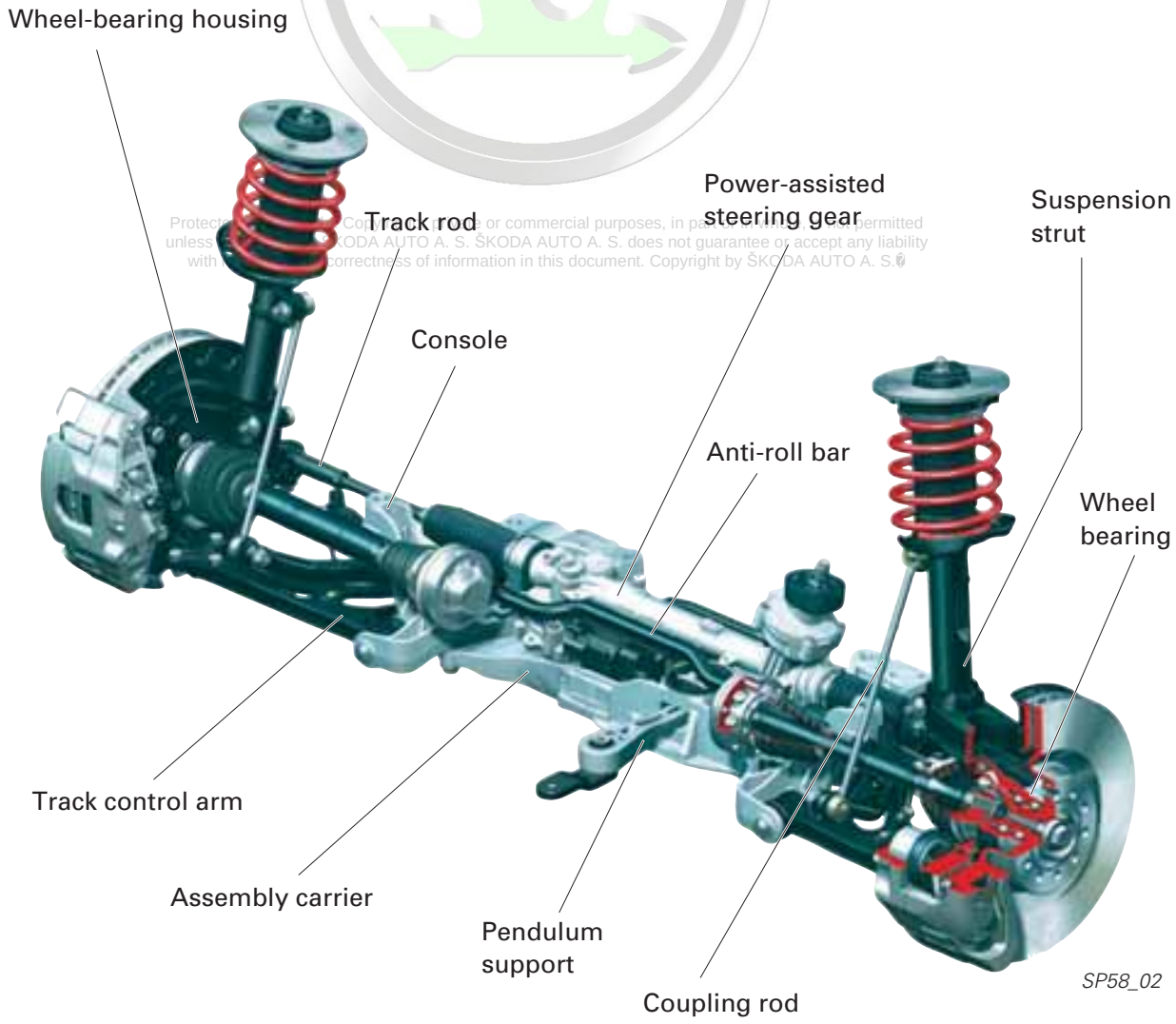
Front axle - Overview

The kinematically proven independent McPherson front wheel suspension was used for the front-wheel-drive of the **Škoda**Octavia. It is equipped on both sides with a track control arm and a wheel-guiding suspension strut. The front axle offers optimal convenience for very good driving dynamics.

The positioning of the front axle in the aluminum assembly carrier is new. Thus, the improvement of kinematic and elastokinematic characteristics was achieved through simultaneous reduction of the axle weight.

The outstanding characteristics of this type of axle could still be improved through a careful development. The result is a considerably improved agility of the chassis, the steering accuracy and thus a noticeable improvement of the driving convenience.

The lateral stability of the vehicle front was also increased, which provides for an exact and safe curve guidance of the vehicle.

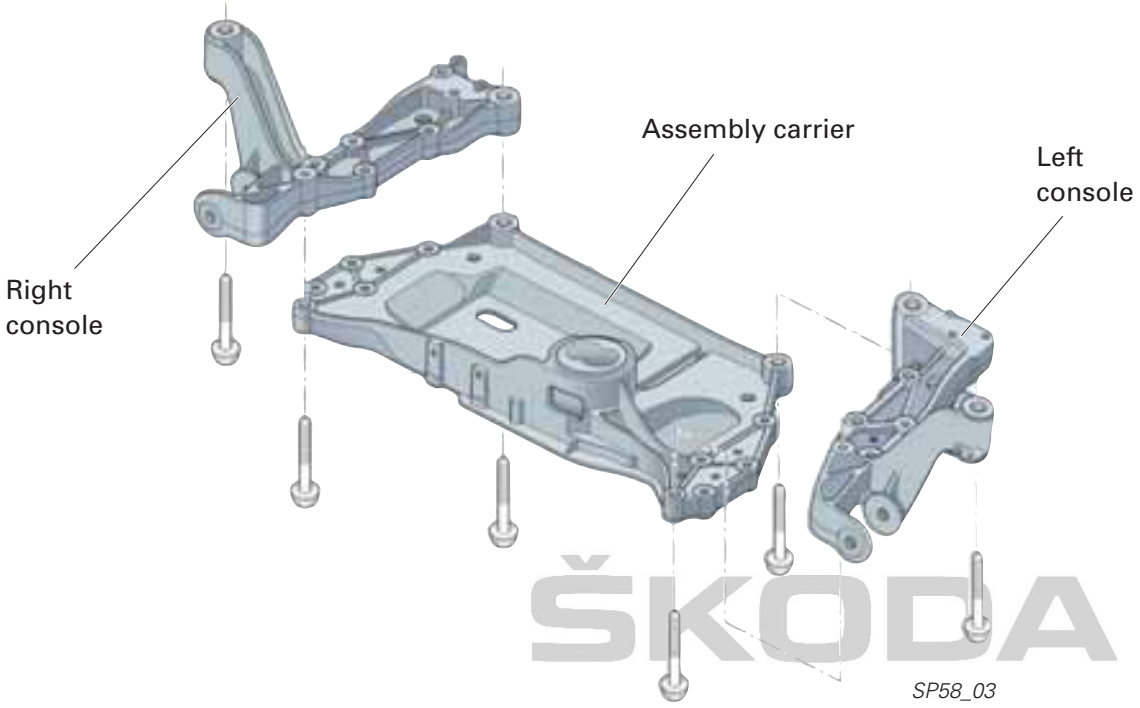


Front axle

Assembly carrier

The three-part aluminum assembly carrier serves as support of the track control arm, the anti-roll bar and the power-assisted steering gear.

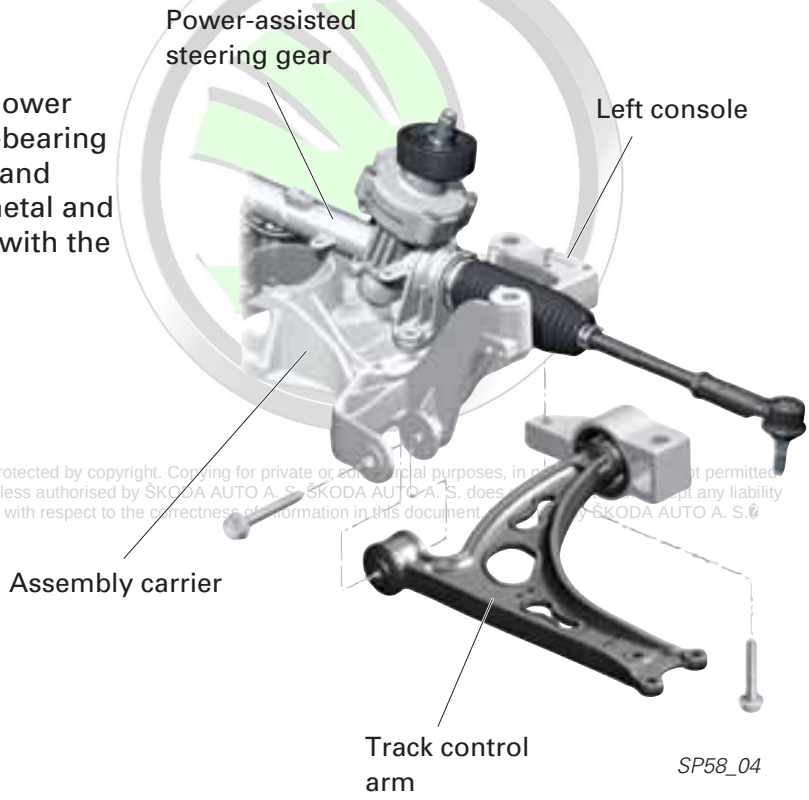
A high rigidity and a good driving dynamics is obtained through the 6-pin rigid screwed connection.



SP58_03

Track control arm

The track control arm represents the lower connection between body and wheel-bearing housing. They are engine dependent and made out of grey cast iron or sheet metal and connected via rubber metal bearings with the consoles of the assembly carrier.

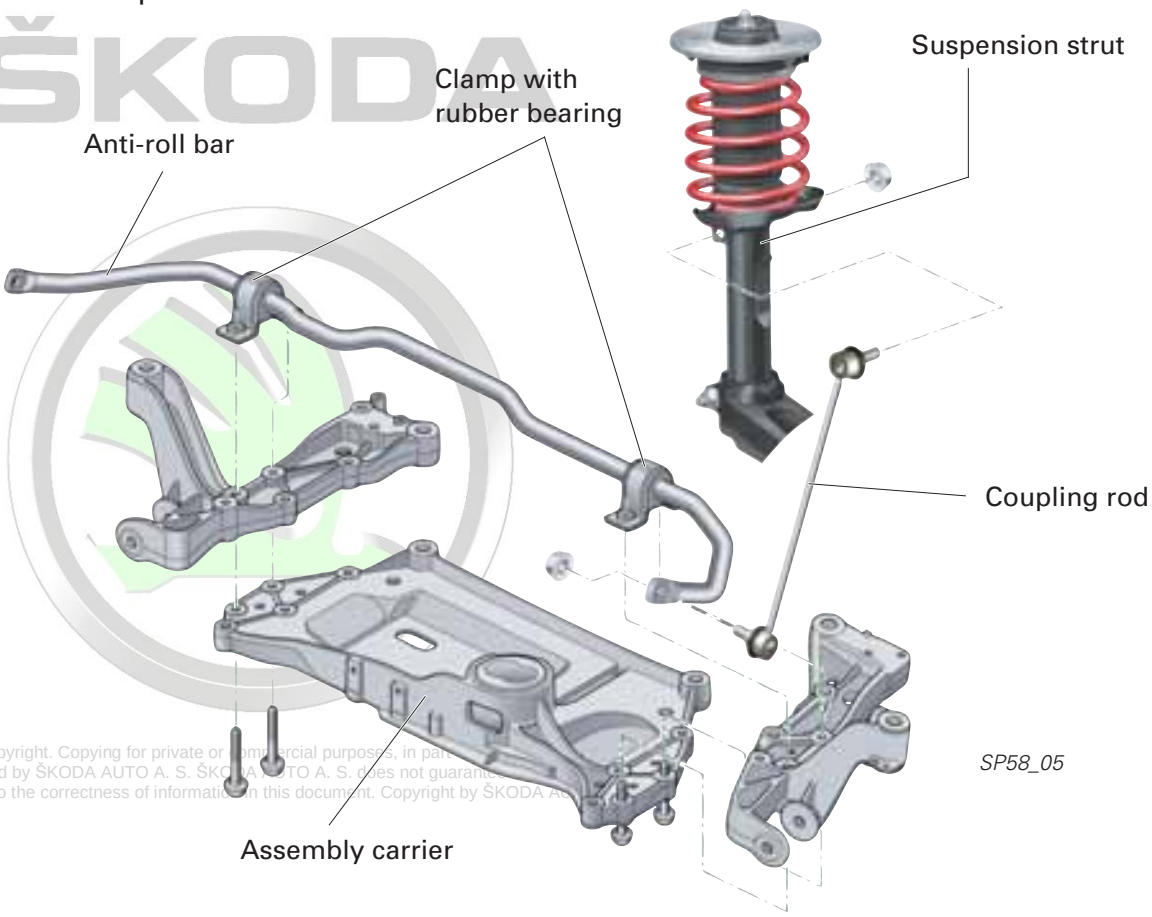


SP58_04

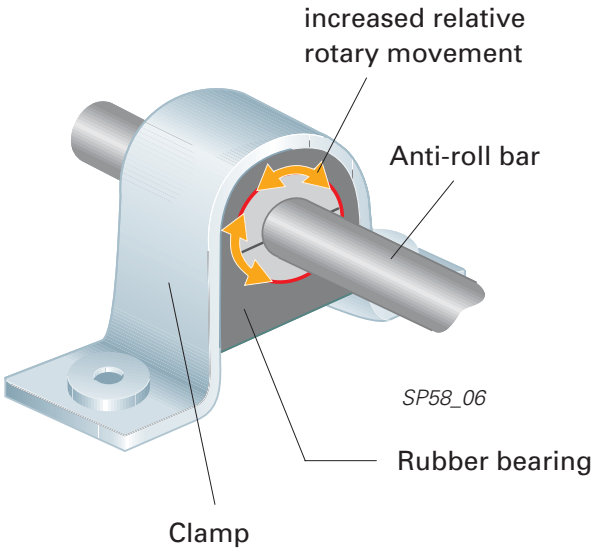
Anti-roll bar

The anti-roll bar (pipe) is fastened via two coupling rods to the suspension struts.
The suspension strut is firmly connected to the wheel-bearing housing. The advantage in relation to the "old" Octavia is that the force works directly between the suspension strut and the anti-roll bar.
On the "old" Octavia the forces of the anti-roll bar worked via a suspension arm on the wheels.

A higher effect of the anti-roll bar was achieved through the new tie. The anti-roll bar could be manufactured from pipe, which gives a weight reduction.



The anti-roll bar is fastened to two rubber bearings via clamps at the assembly carrier. There is such a large pretension in the rubber bearings that it is not possible for the anti-roll bar to turn. The relative rotary movement between the anti-roll bar and the clamp is eliminated by the deformation of the rubber bearing.



Front axle

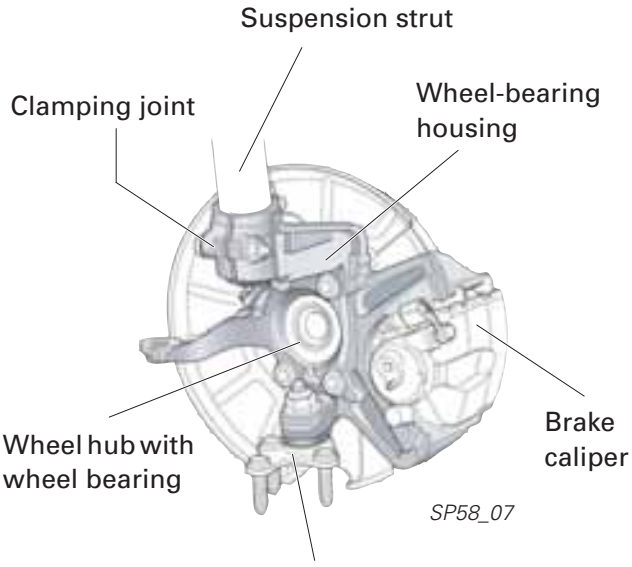
Wheel-bearing housing

Depending upon engine type, the wheel-bearing housing is used with:
- integrated brake carrier or
- screwed on brake carrier.

The wheel-bearing housing is firmly connected with the suspension strut via a clamping joint.
In the lower area, the wheel-bearing housing is bolted to the track control arm by a steering joint.

Wheel-bearing housing with integrated brake carrier (brake FS-III)

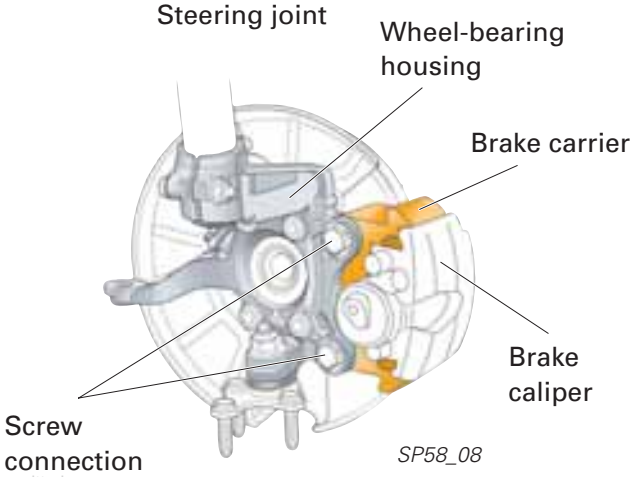
This version is intended for lower engine types. The brake carrier is an integral part of the wheel-bearing housing. Thus the brake caliper is screwed directly to the wheel-bearing housing.
The brake pads are supported at the arms of the wheel-bearing housing. The arms absorb the brake forces.



SP58_07

Wheel-bearing housing with screwed on brake carrier (brake FN3)

This version is intended for higher engine types. On this version the brake carrier is an independant part and fastened with two screws to the wheel-bearing housing.
The brake caliper and the brake carrier are screwed with each other.
The brake pads are supported on the brake carrier. The braking forces are transferred via the two screws into the wheel-bearing housing and absorbed.

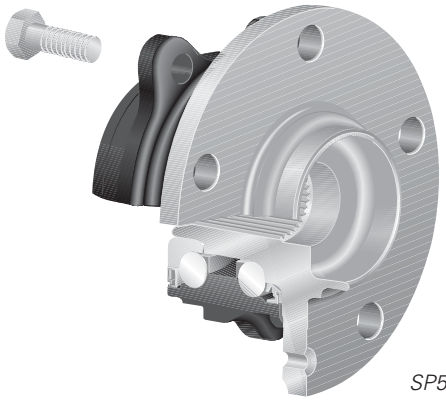


SP58_08

Wheel hub with wheel bearing

Wheel hub with wheel bearing form a compact wheel bearing unit. A double-row angular ball bearing of the 3rd generation was used.
This wheel bearing unit is screwed with four screws to the wheel bearing housing.

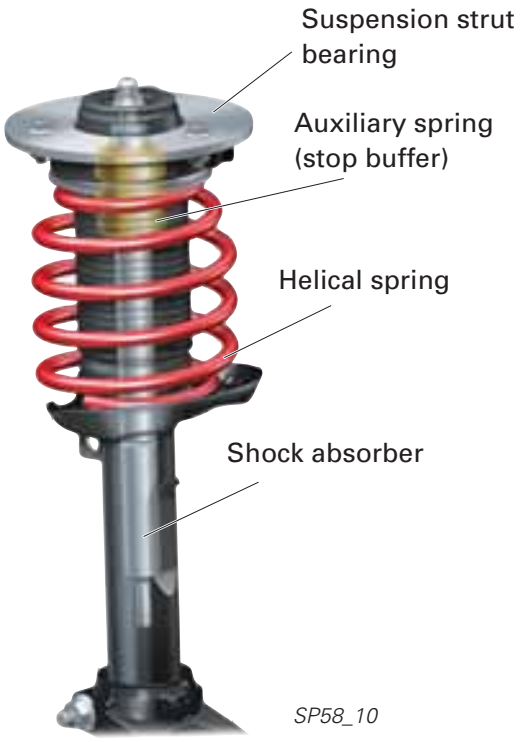
The advantage of this wheel bearing unit is an easy removal and installation.


SP58_09

Suspension strut

Suspension struts with a combination of two springs are used for the suspension of the vehicle. The main element is the helical spring, the side element is the auxiliary spring. It serves at the same time as upper stop buffer.
The helical spring has a linear spring characteristic and is made out of high-tensile steel. The spring is pulled in at the ends.
The auxiliary spring has a progressive spring characteristic and consists of foam polyurethane.

The movements of the body and the wheels are absorbed by a hydraulic shock absorber when driving over a bumpy road.



SP58_10

Suspension strut bearing

The suspension strut bearing is a rubber metal bearing. The spring force is introduced separately into the body by decoupling the spring and shock absorber tie to the body. Thus a pretension of the shock absorber bearing is prevented.
This influences positively the roll off convenience and reduces the transmission of the roll off noises to the body. The suspension strut bearing has a soft characteristic in the driving direction.
Thus the driving convenience and the vehicle acoustics is improved. In transverse direction it is designed rigidily. This measure influences positively the driving dynamics and the response of the steering.


SP58_11

Rear axle

Rear axle - Overview

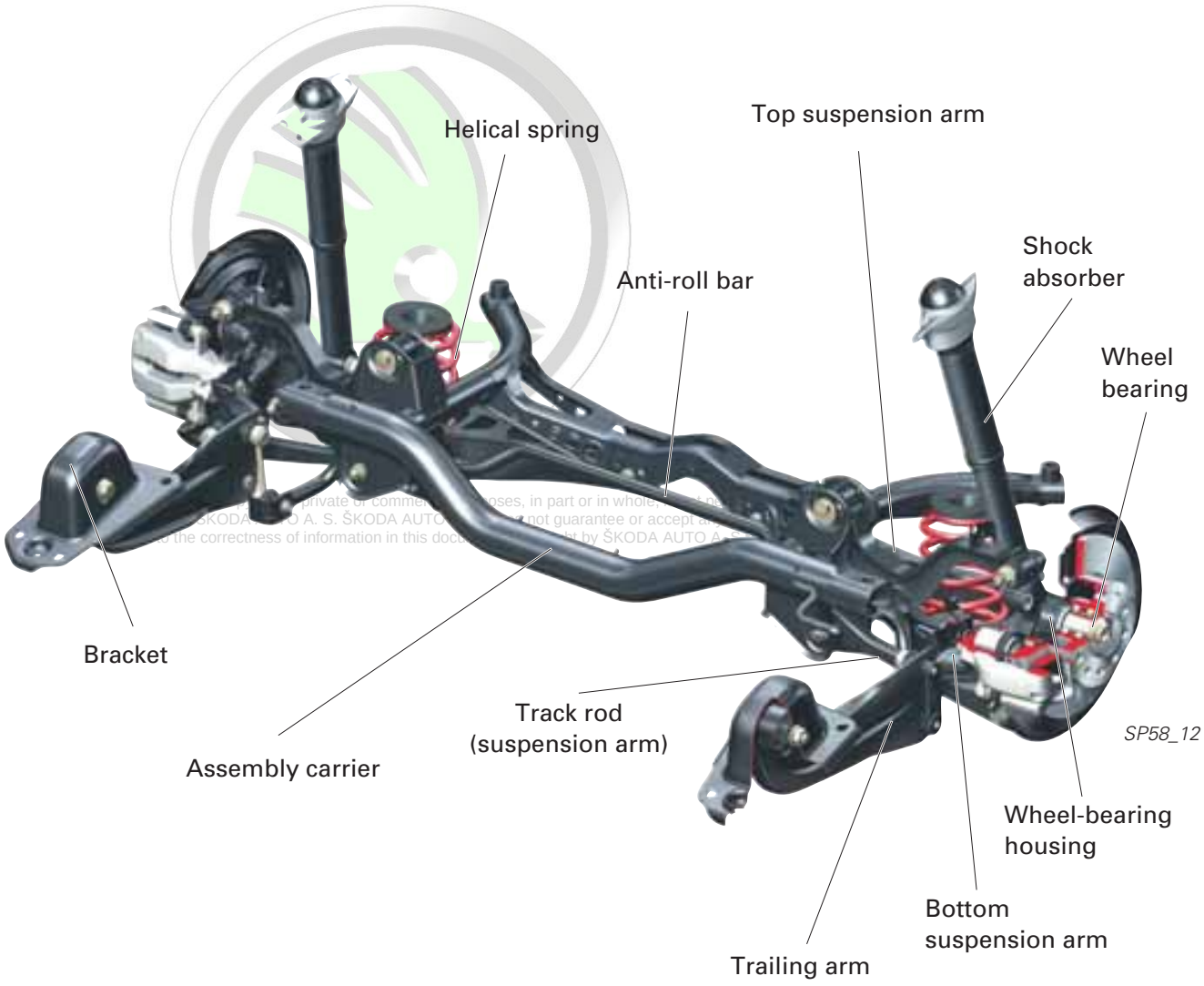
The rear axle was completely newly developed. For the first time a multi-arm axle is used in the new **Škoda**Octavia.
It enables excellent driving characteristics and more stability in extreme situations.
The multi-arm rear axle consists of four-arm semi axles

- Top suspension arm,
- Bottom suspension arm,
- Track rod (suspension arm) and
- Trailing arm.

This design solution enables an ideal response to the longitudinal and transverse forces.
The transverse dynamics is secured by three suspension arms

- Top suspension arm,
- Bottom suspension arm and
- Track rod (suspension arm).

The carefully defined and co-ordinated position enables an accurate setting of the necessary work modes.



Assembly carrier

The assembly carrier is a welded component out of steel. It is rigidily screwed to the body.

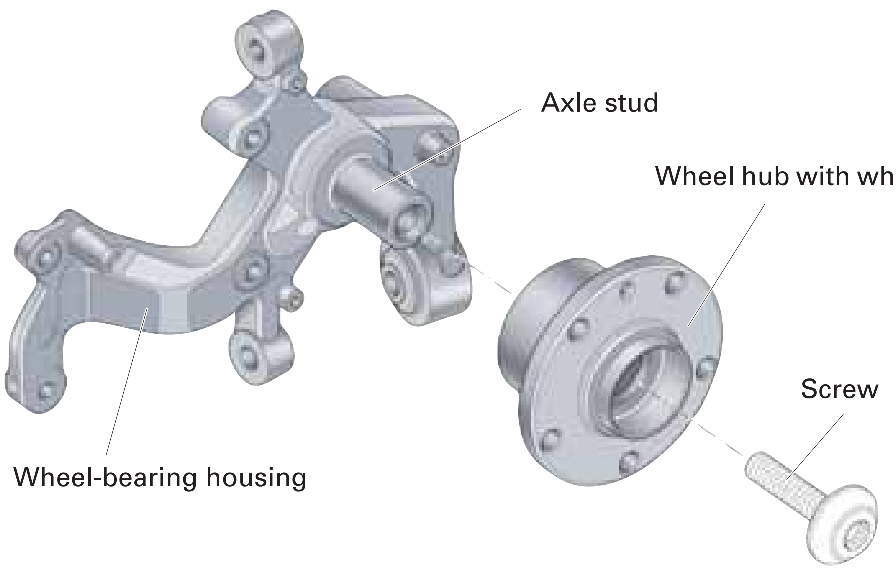
SP58_13

Wheel-bearing housing

The wheel bearing housing is a forged component out of steel with shaped axle stud for the support of the wheel hub with wheel bearing.

Wheel bearing

The wheel bearing is a double-row angular ball bearing of the 2nd generation.
Wheel hub and wheel bearing form a compact unit.
The wheel hub with wheel bearing is positioned on the axle stud of the wheel-bearing housing.
A screw secures the wheel hub with the wheel bearing. The tightening of the screw ensures the optimal necessity of the pretension.



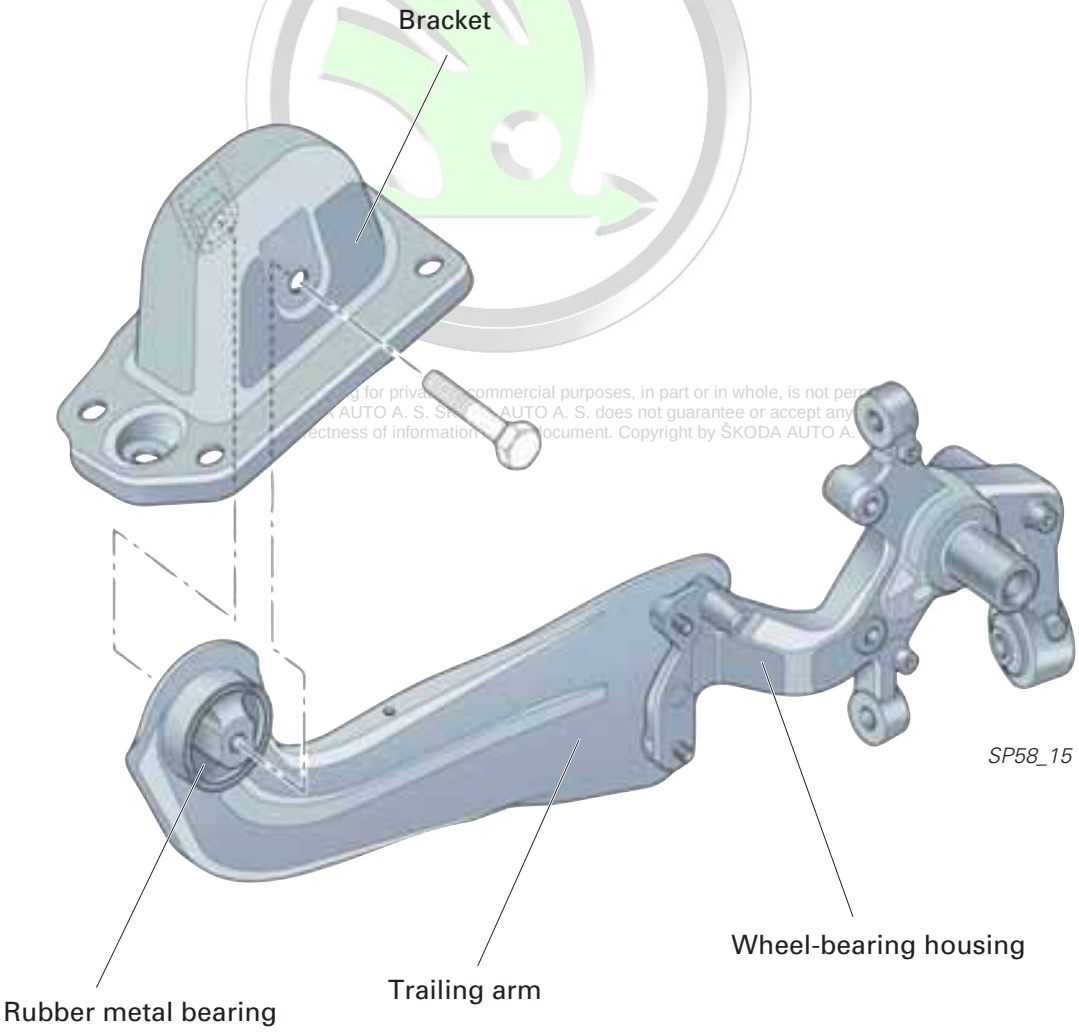
SP58_14

Rear axle

Trailing arm

The trailing arm is mounted on the side of the body with a rubber metal bearing in a steel plate bracket. The bracket is rigidly screwed to the body. The large volume rubber metal bearing contributes considerably to the good roll off convenience.

The trailing arm is rigidly screwed to the wheel-bearing housing. In upright direction it is resistant to bending and thereby supports the braking and starting off torques.



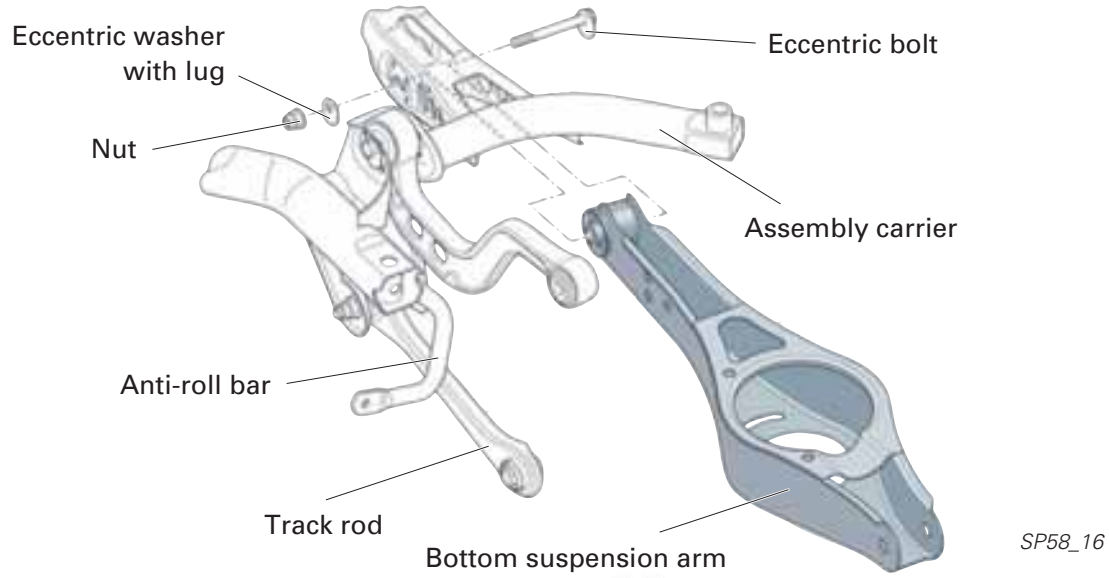
Note:
The rubber metal bearing is in the installation position – see Workshop Manual.

The screwed connection of the trailing arm to the bracket is performed before the screwed connection of the bracket to the body.
Observe the position of the parts to each other – see Workshop Manual.

Bottom suspension arm

The body rests on the bottom suspension arms above the helical springs.
The bottom suspension arm is a moulded steel part. For protection against stones, the bottom suspension arm on the rough road chassis is provided with an additional plastic cover.

The coupling rod for the rear left vehicle level sender G76 is fastened to the left bottom suspension arm.
The fastening of the bottom suspension arms to the assembly carrier is performed with eccentric bolts, eccentric washers and nuts.
The track is adjusted by turning the eccentric bolts.

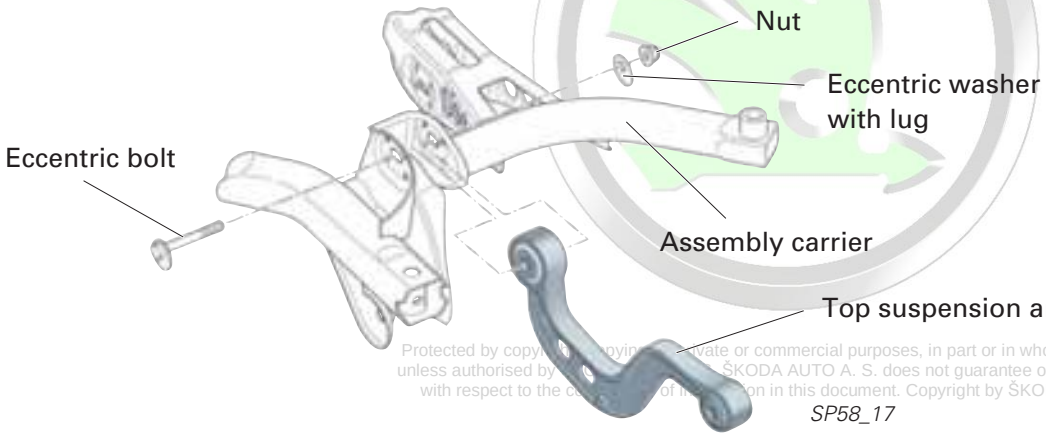


SP58_16

Top suspension arm

The top suspension arm establishes the connection between assembly carrier and wheel-bearing housing.
The suspension arm has a T-shape cross-section and absorbs particularly the side forces.

The fastening of the top suspension arms to the assembly carrier is performed with eccentric bolts, eccentric washers and nuts.
The track is adjusted by turning the eccentric bolts.

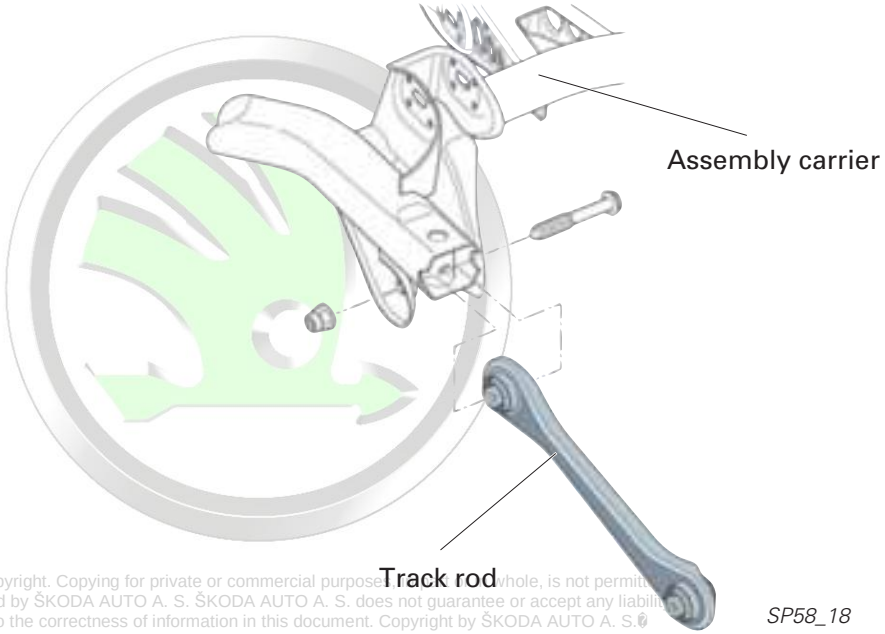


SP58_17

Rear axle

Track rod

The track rod is made out of steel plate and serves as support of the transverse forces.

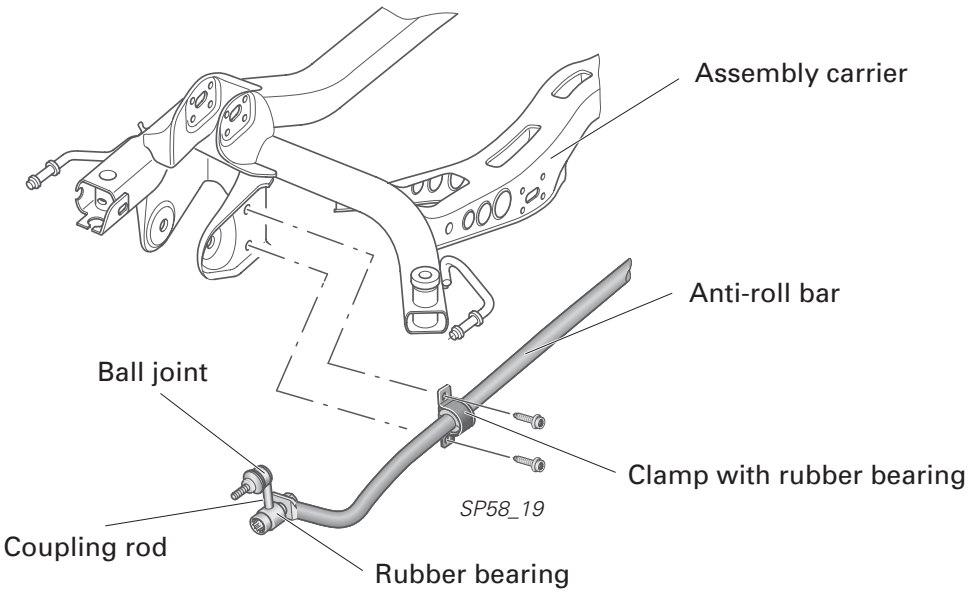


SP58_18

Anti-roll bar

Anti-roll bars with different dimensions are used for the standard, sport and rough road chassis. For reasons of weight the anti-roll bars are manufactured from pipe.
The anti-roll bar is fastened to the assembly carrier in the rubber bearings with clamps as on the front axle.

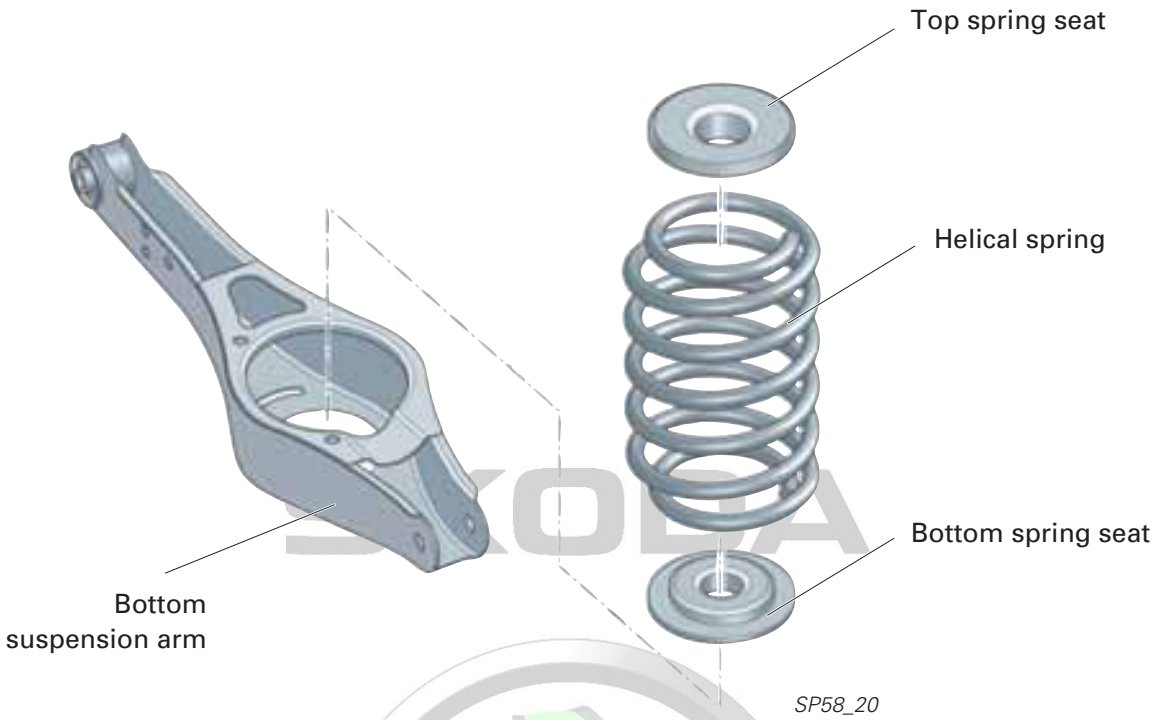
The anti-roll bar is screwed to the wheel-bearing on both sides by means of the coupling rod above the trailing arm.
The coupling rods are made out of steel.
They have a ball joint on the side of the wheel-bearing, a rubber bearing on the side of the anti-roll bar.



SP58_19

Helical spring

A cylindrical spring out of high-tensile steel and pulled-in ends with linear spring characteristic is used. The mounting at the body and bottom suspension arm is performed through spring seats.

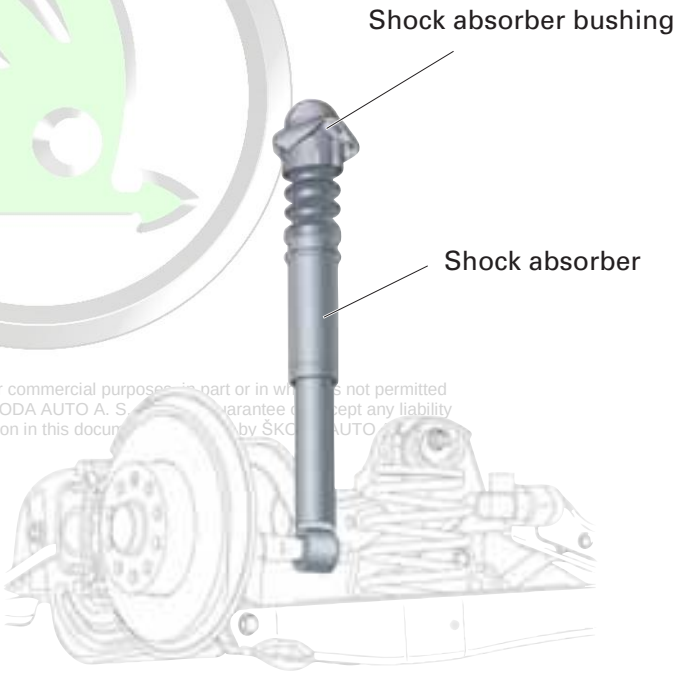


SP58_20

Note:
The helical spring is fitted in position above the bottom spring seat, see Workshop Manual.

Shock absorber

The two-pipe pressurized shock absorbers are mounted on the wheel-bearing housings. Thus an optimal ratio of the wheel path to the shock absorber path is possible and a large through-loading width is guaranteed.
In comparison to the previous vehicle, the shock absorber internal pressure was reduced through larger dimensions of the shock absorber pipe and piston. This results in an enhancement.



SP58_21

Brake system

Well-designed brakes, which bring the vehicle in time and reliably to a halt, are a substantial component of a perfect chassis. Due to the constantly increasing demands on vehicle dynamics and active safety, the brake systems were further developped on **Škoda**Octavia.

ABS

In all equipment versions an ABS with diagonally distributed dual circuit brake system with brake booster is used.

SP58_22

Brake booster

The brake system is equipped with a brake booster with the function "Dual-Rate".
This function provides for the increase of the braking force reinforcement during operation of the brake pedal in critical situations.

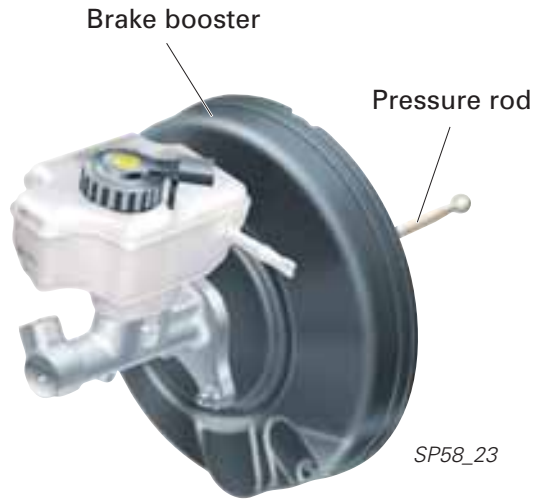
Brakes

In order to guarantee a sufficient braking effect with a fast start-off time, size and cooling of the brake disc as well as the brake calipers are of importance.
The vehicles **Škoda**Octavia are equipped with brakes of the types FN and FS, which offer an optimal brake output. The materials used for the brake pads are environmentally friendly.
Disc brakes at front and rear axle are used for all engine types.

Brake booster

A 10“brake booster of the company Conti-Teves is used in **Škoda**Octavia.

The "dual rate characteristic" is a substantial innovation on this brake booster.
This means that the brake booster functions according to a two-stage characteristic.
A characteristic with progressive course according to a so-called "dual rate characteristic" is implemented by a correspondingly altered interior structure of the brake booster.
Brake boosters, which implement the "dual rate characteristic", are called brake boosters with mechanical brake assistant (MBA).
During a strong brake pedal actuation this results in higher brake pressures as for conventional brake boosters (without MBA).
This ensures a good balance.

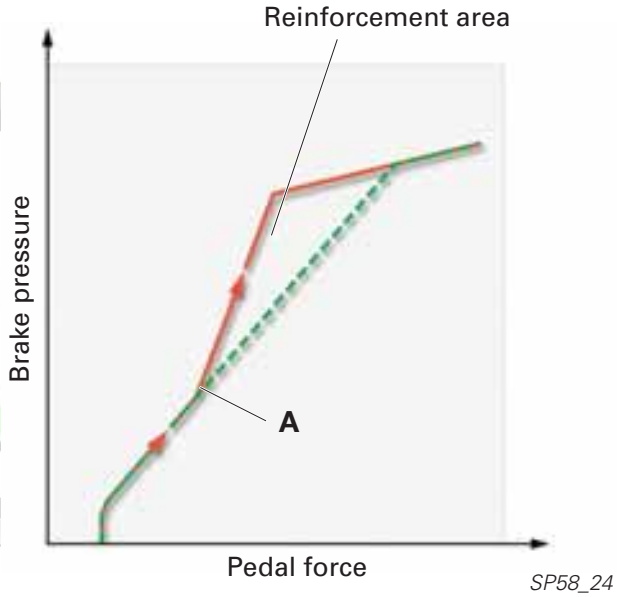


For safety aspects an optimized pressure rod is fitted in the brake booster, which fulfills the requirements of the crash tests.

Note:
The right-hand drive vehicles receive a tandem brake booster of the dimension 7/8“.

"Dual-Rate characteristic"

When operating the brake pedal, the brake pressure in the brake booster does not rise linear over the entire area.
Starting from a certain pedal force (in the diagram point A), the brake pressure increases faster than with the conventional brake booster.



Brake booster with the function "Dual-Rate"

conventional brake booster

Hydraulic control units

Hydraulic control unit MK70

The hydraulic control unit consists of:

- Hydraulic unit with hydraulic pump and electric motor
- Control unit

In **Škoda**Octavia is fitted the hydraulic controlunit MK70 of the company Conti-Teves.

It distinguishes itself by the following technical highlights:

- Antilock braking system (ABS) with
- electronic braking force distribution (EBV)
- Engine towing torque control (MSR)
- Traction control system (ASR) is realised by the engine control unit; this means without active brake interference

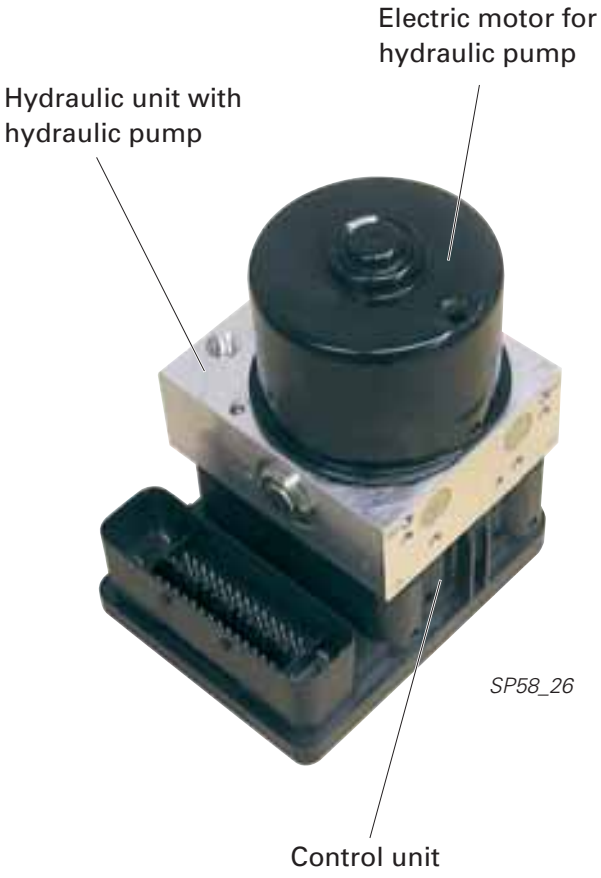
SP58_25

Hydraulic control unit MK60

Optionally the hydraulic control unit MK60 with integrated pressure sensor (brake pressure sender 1 G201) is used in **Škoda**Octavia.

In comparison to the hydraulic control unit MK70, it has in addition the following technical highlights:

- electronic stability program (ESP)
- hydraulic brake assistant (HBA)
- traction control system (TCS)
- electronic differential lock (EDL)
- uphill-start off-assist (HHC) – only as special equipment



SP58_26

Note:
A hydraulic control unit MK70 is used as an ABS system.
As it includes only the ABS function (4 inlet and 4 outlet valves), it is smaller and easier in relation to the hydraulic control unit MK60.

Antilock braking system ABS/ESP

Hydraulic control unit MK60 of Conti-Teves

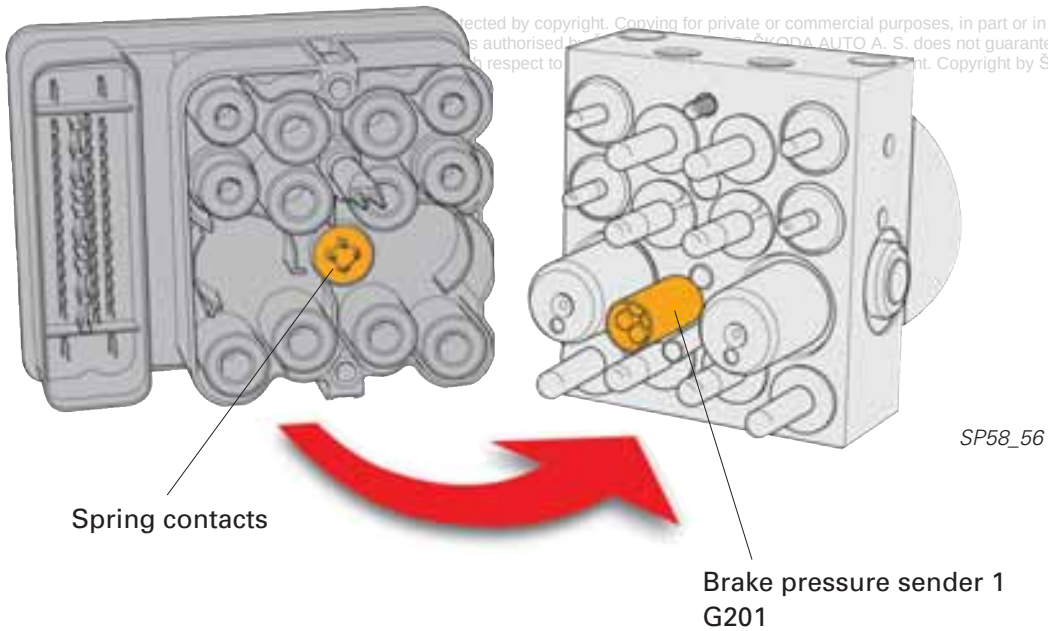
The hydraulic control unit MK60 for the **Škoda** Octavia has the following main innovations:

- active wheel speed sensors (without forwards and reverse detection)
- combined yaw rate sender G202 and lateral acceleration sender G200 (under the front passenger seat); these combined senders transmit the information via the separate CAN bus
- Integration of the brake pressure sender 1 G201 into the hydraulic unit; the sender was previously screwed into the tandem master brake cylinder
- new ESP and TCS warning light K155

SP58_55

SP58_53

Brake pressure sender 1 G201



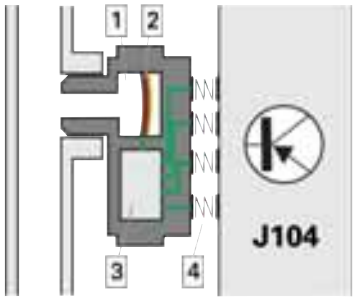
SP58_56

Brake system

Task

The brake pressure sender 1 G201 measures the brake pressure introduced by the driver via the brake pedal. In order to ensure a higher safety, the sender supplies two pressure signals which are independent of each other.

These are transmitted simultaneously as two contra-rate voltages. The ABS control unit compares these permanently with each other.



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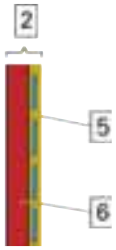

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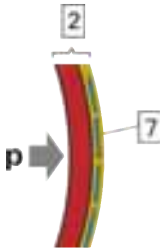


SP58_59

1 – Measuring chamber
2 – piezo resistant* thick film measuring element
It consists of:
- flexible thick film diaphragm and
- piezo resistant measuring bridge with the Piezo bridge elements

3 – Sensor electronics and signal reinforcement
4 – Spring contacts
Two contacts serve the voltage supply, the two others are used for the two independent pressure signals.

5 – piezo-resistant measuring bridge
6 – flexible thick film diaphragm
7 – Piezo bridge element within the piezo-resistant measuring bridge
p – Brake fluid pressure

Structure

The sender operates according to the piezo-resistant method. Thereby the change in the conductivity of materials is used through structure deformation.
Four piezo-resistant Piezo bridge elements **7**, which are interconnected to a piezo-resistant measuring bridge **5**, are fitted on a flexible thick film diaphragm **6**. The Piezo bridge elements are resistors out of semiconductor material.
The function mode is comparable to the one of the wires.

Working mode

A pressure increase of the brake fluid changes the length of the flexible thick filmdiaphragm **6** and the piezo-resistant measuring bridge **5** connected to it.
By means of this length modificaton, forces are applied to the **5** Piezo bridge elements **7** contained in the piezo-resistant measuring bridge, which change the charge distribution within the Piezo bridge elements **7**.
The electrical characteristics of the Piezo bridge elements **7** change with the modified charge distribution. These are proportional to the brake fluid pressure **p** and are passed on as a reinforced sensor signal to the ABS control unit J104.

Effects of signal failure

If the signal of the brake pressure sender fails, the ESP function is reduced to the function ABS and EBV (electronic braking force distribution).

* Piezo-resistant effect = Change of the specific resistance of metals or semi-conductors in case of mechanical stress.

Brake assignment

Engine	Front brake	Rear brake
1.4 ltr./55 kW 1.6 ltr./75 kW 1.9 ltr./77 kW with front-wheel-drive and with manual gearbox	Ø 280 x 22 mm FS-III  SP58_27	Ø 255 x 10 mm C38  SP58_49
1.6 ltr./85 kW		Ø 260 x 12 mm CII41  SP58_29
1.9 ltr./77 kW with four-wheel drive and with manual gearbox as well as with front-wheel-drive and with automatic gearbox DSG 2.0 ltr./100 kW 2.0 ltr./103 kW 2.0 ltr./110 kW	Ø 288 x 25 mm FN3  SP58_28	Ø 260 x 12 mm CII41  SP58_29

Electromechanical power-assisted steering

Introduction

It is a prime advantage that in contrast to the hydraulic steering systems a hydraulic system is not necessary for the electromechanical power-assisted steering with double pinions (steering pinion and drive pinion). This results in further advantages, such as:

– hydraulic components, such as servo oil pump, hoses, hydraulic oil reservoir, not applicable
– hydraulic oil not applicable
– structure chamber not required
– low noise development
– energy saving

The steering-assisted components are seated and effective directly on the power-assisted steering gear.

A clear energy saving is achieved. In contrast to the hydraulic steering, which requires a permanent volume flow, the electromechanical power-assisted steering only uses energy when steering. The fuel consumption is reduced by the power absorption capacity, which fulfils this demand.

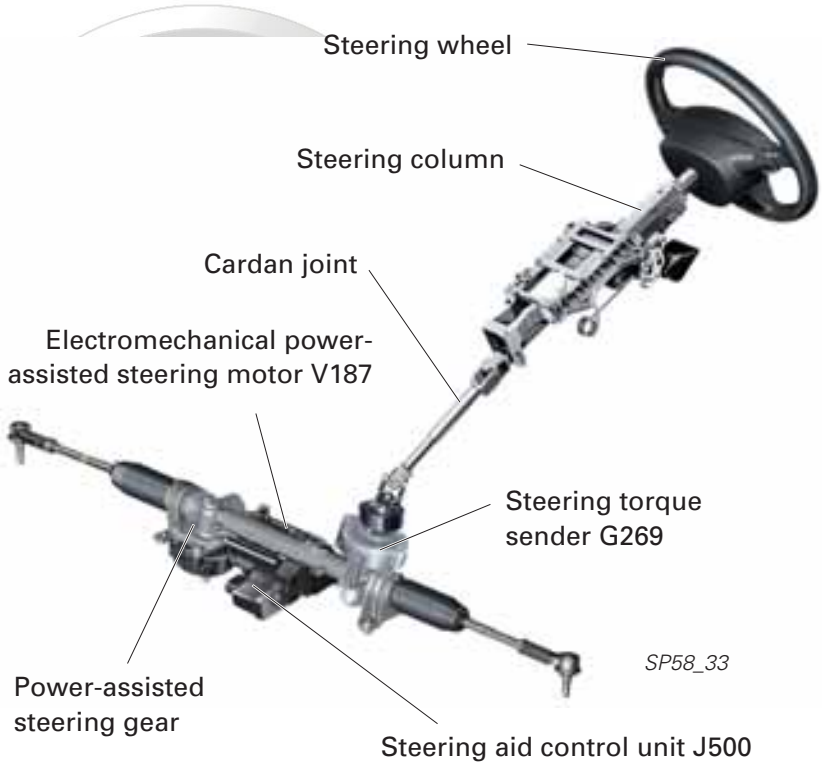
The driver has an optimal driving sensation in each situation, through

– a good straight course (the resetting of the steering in the straightahead position is actively assisted by the electromechanical power-assisted steering),
– a direct, but soft response to steering commands,
– no unpleasant steering reactions on bumpy road.

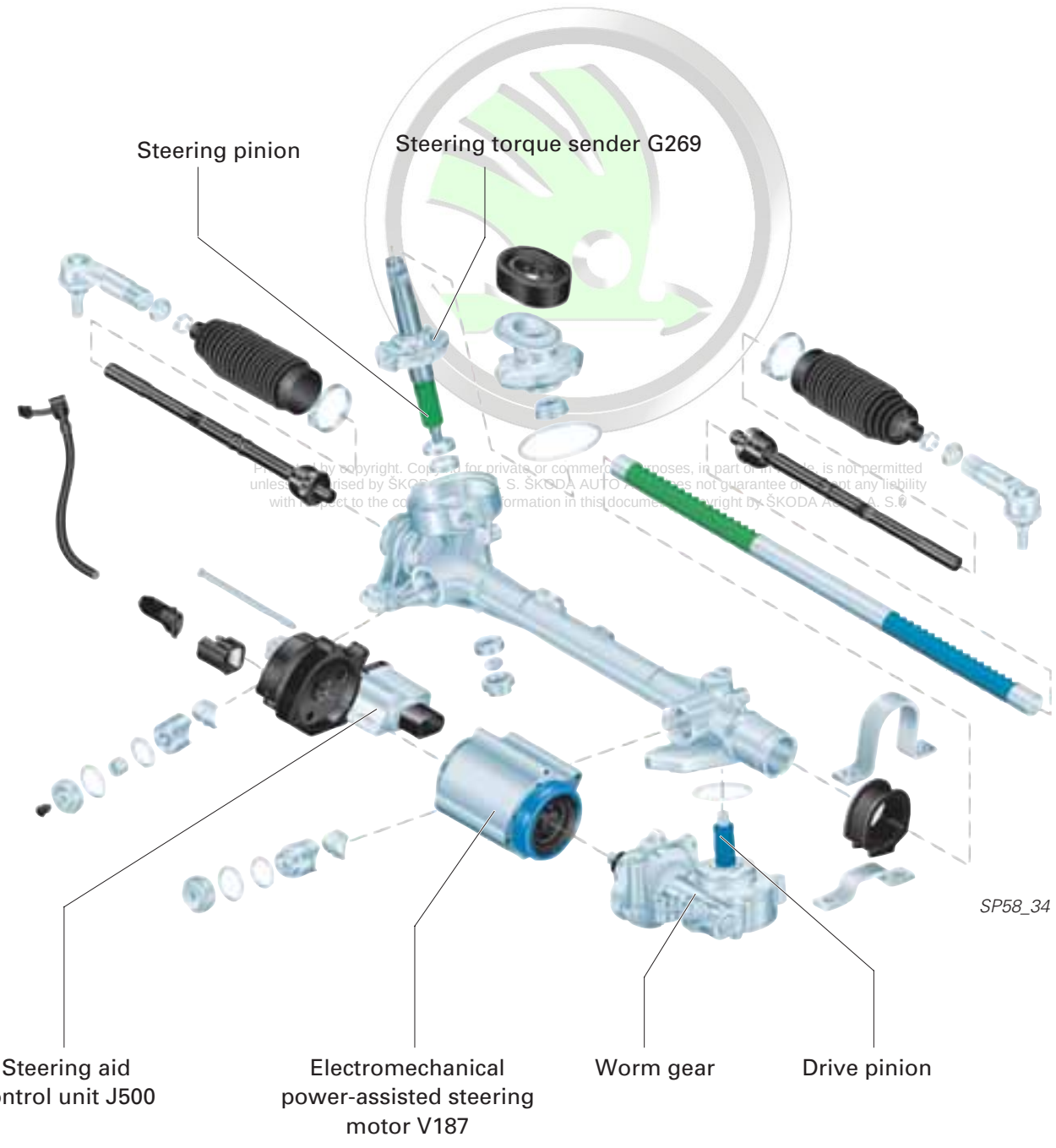
Note:
The fuel saving amounts up to 0.2 litres on 100 kilometers.

The steering assistance takes place also when towing, if the following requirements are fulfilled:

- **Towing speed more than 7 km/h**
- **Ignition on**
- **Battery sufficiently charged**



Overview of individual parts



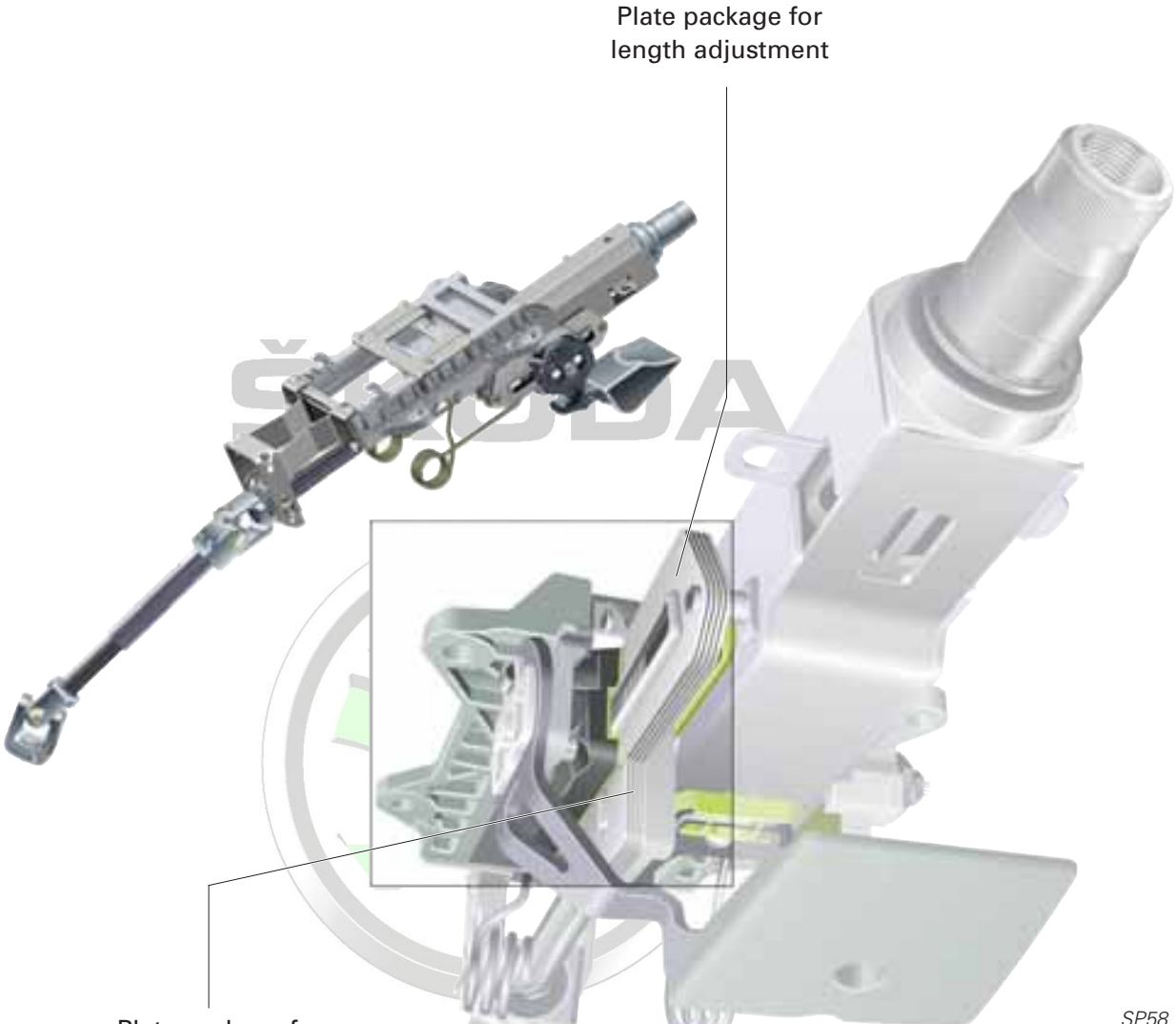
Steering column

The height and length adjustment of the steering column is mechanical. It can be adjusted for optimal adjustment to the needs of the driver in vertical direction by 50 mm and in longitudinal direction by 60 mm.

The clamping of the steering column is performed by a plate package with ten steel plates.
Five plates mounted in horizontal position enable the length adjustment.

The other five plates are mounted in the vertical direction and enable the height adjustment.

The connection of the steering column to the central pipe/dash panel is performed via a holder out of aluminium cast iron.



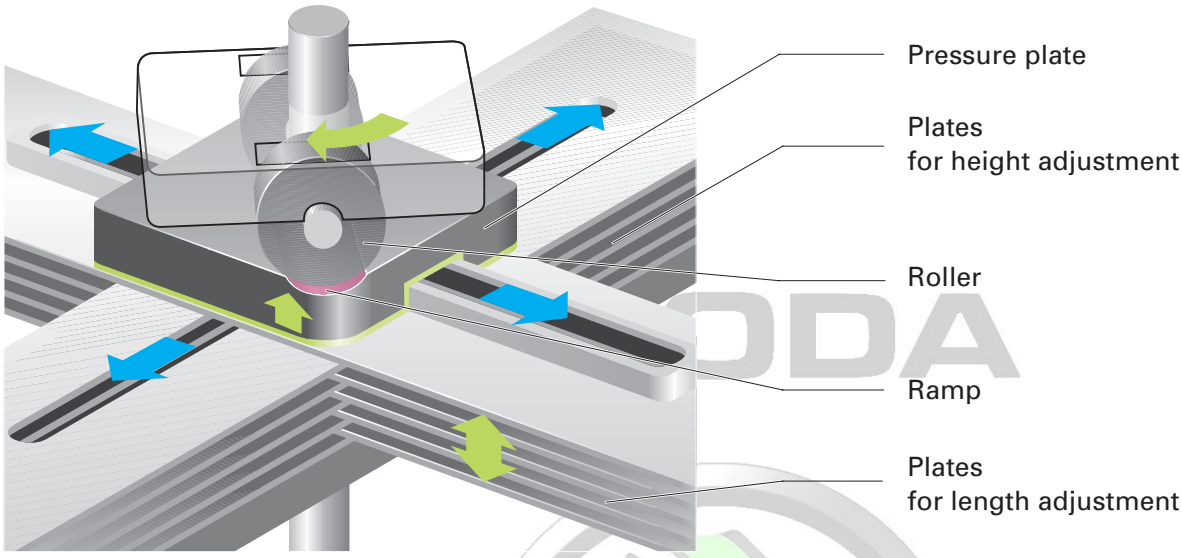
SP58_62

Function principle of clamping

The clamping is produced by two rollers, which run up a ramp during the fixing procedure.
This compresses the plate package above the pressure plate.

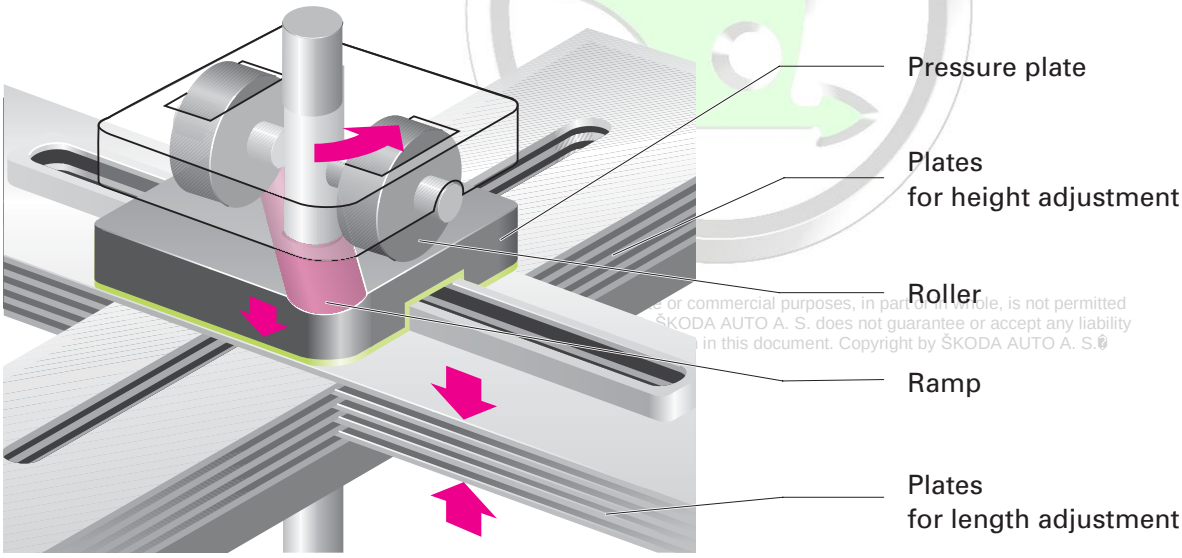
The adjustment is stepless, because the serrations in the clamping mechanism have been eliminated, i.e., one can lock the steering column problem-free in each position.

Plate package released



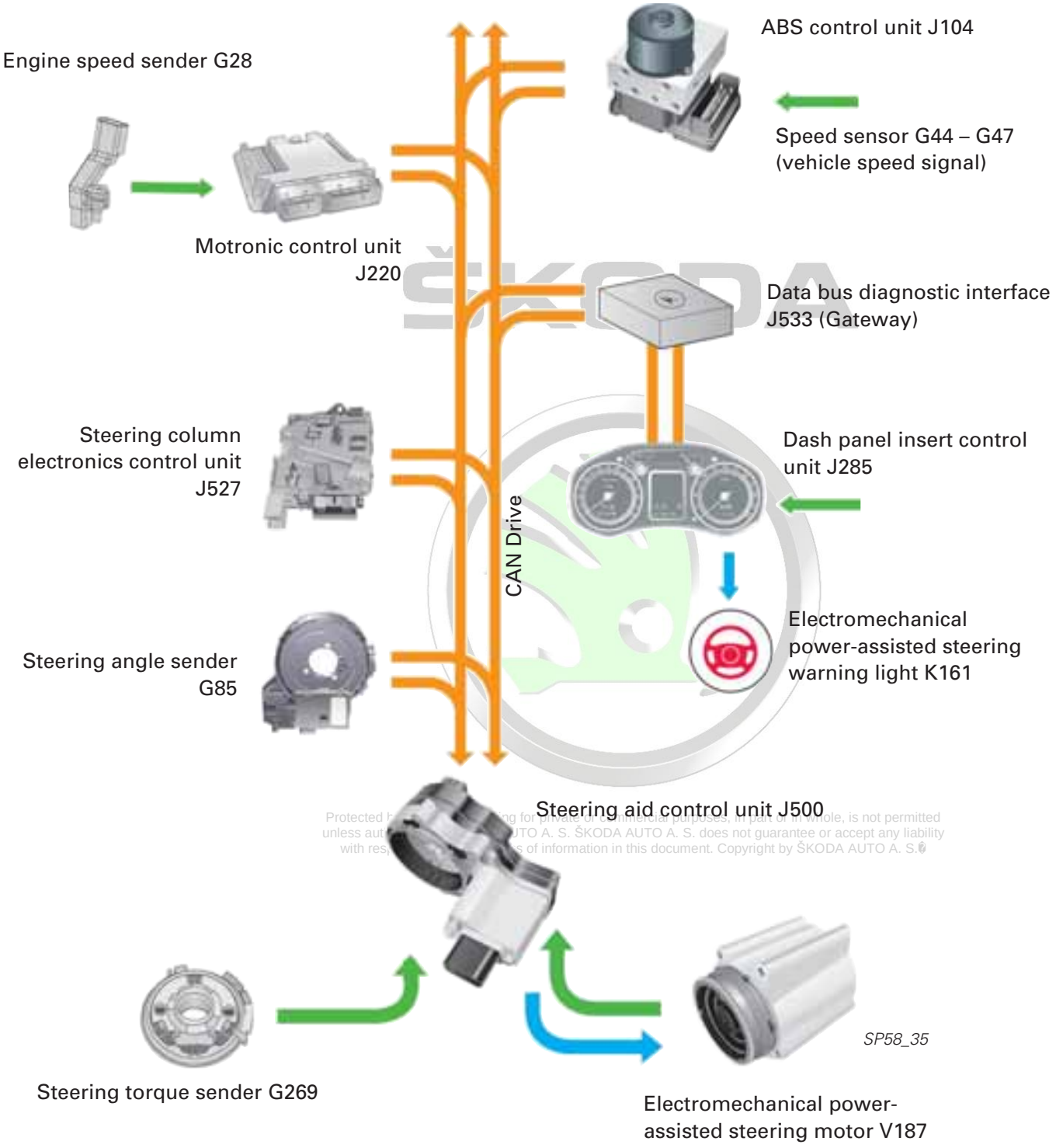
SP58_63

Plate package clamped



SP58_64

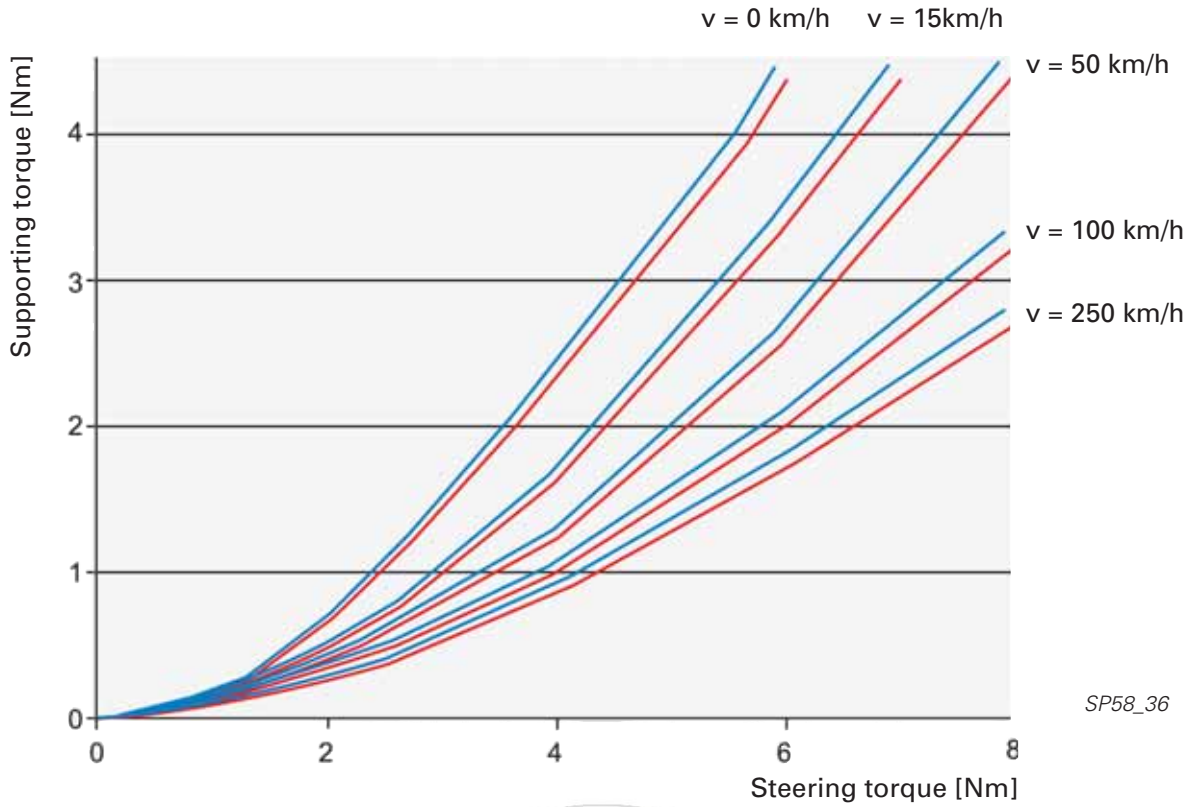
System overview



Performance maps and characteristics

The control of the steering assistance is performed by a performance map in the permanent program memory of the steering aid control unit J500. At present on the **Škoda**Octavia seven different performance maps are used.
Depending on demand (e.g. vehicle weight) a performance map is activated at the factory.

For the customer service the performance map can also be activated using the vehicle diagnosis, measuring and information system VAS 5051.
This is necessary e.g. when changing the complete electromechanical power-assisted steering.



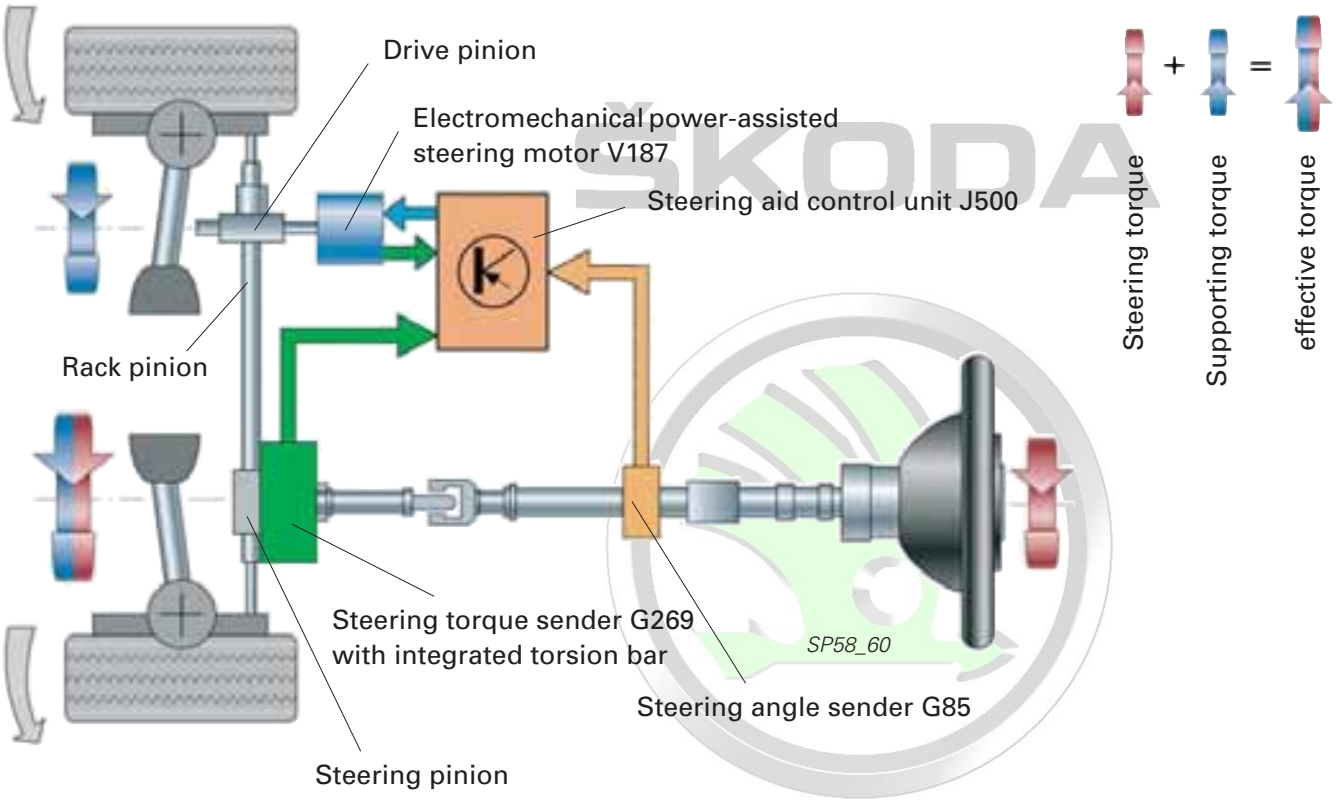
Selected as examples are a performance map for a heavy vehicle and a performance map for a light vehicle of the 7 existing performance maps from **Škoda**Octavia.

- Characteristic for heavy vehicle
- Characteristic for light vehicle

Each performance map contains five different characteristics for different vehicle speeds (e.g. 0 km/h, 15 km/h, 50 km/h, 100 km/h and 250 km/h). Each characteristic indicates the size of the supporting torque for its driving speed in line with the steering torque.

Function

Steering procedure



Input signal

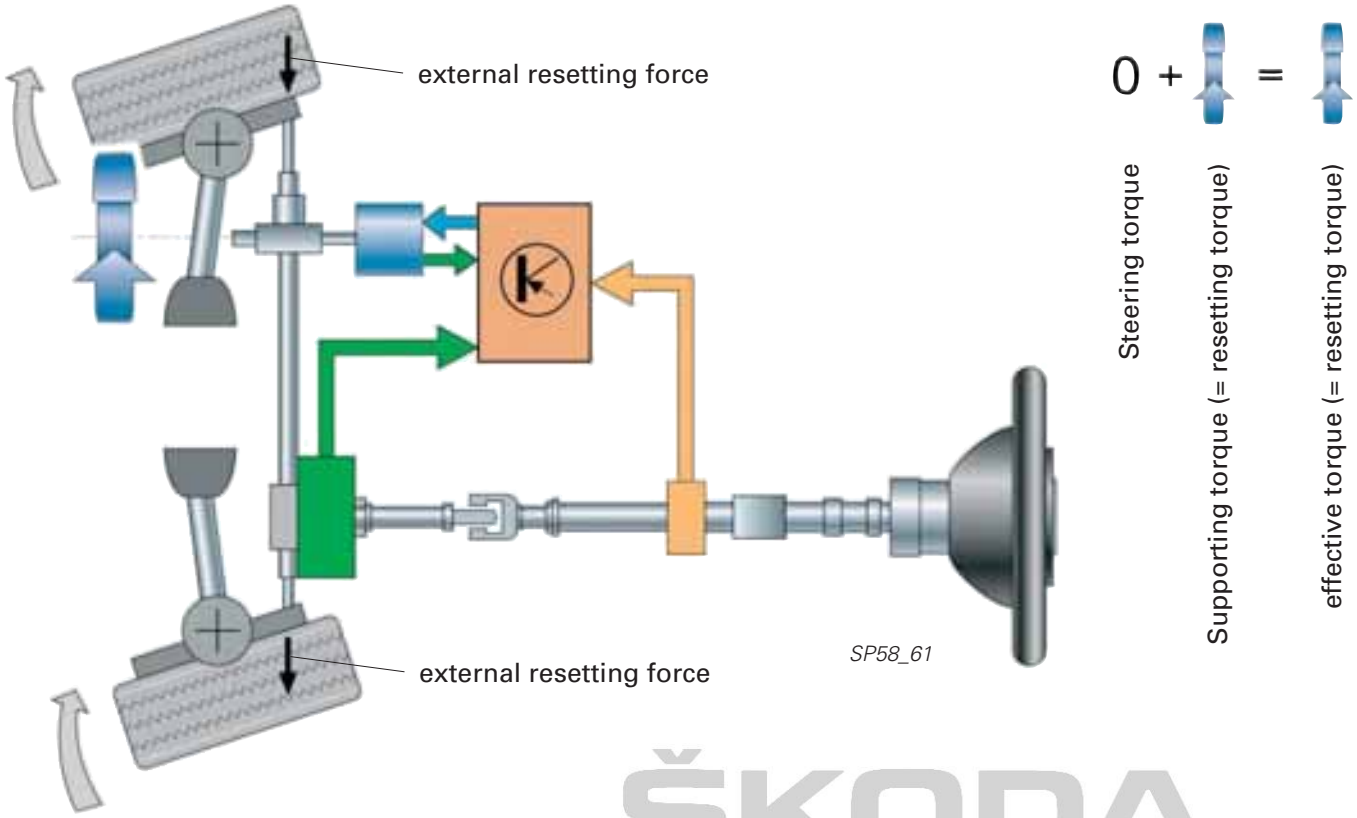
Output signal

CAN Drive

The driver begins to steer. The torsion bar in the steering torque sender G269 is turned by the torque on the steering wheel.
The steering torque sender detects the turn and reports the determined steering torque to the steering aid control unit J500.
The steering aid sender G85 reports the actual steering angle and the steering speed to the steering aid control unit.

The steering aid control unit determines the required supporting torque of the electro-mechanical power-assisted steering motor V187 from the steering torque, vehicle speed, engine speed, steering angle, steering speed and the characteristics stored in it.
The sum from the steering torque and the supporting torque is the effective torque for the movement of the rack pinion.

Active resetting



If the driver uses no more force on the steering wheel, the steering torque is equal to zero and the torsion bar is released.

On the basis of the axle geometry, resetting forces develop on the cramped wheels.
Due to the friction in the steering system the effect of these external resetting forces is often too low to move the wheels again into the straightahead position.

The steering aid control unit J500 determines the required supporting torque (resetting torque) from the well-known input sizes and the characteristics stored in it.

The electromechanical power-assisted steering motor V187 is actuated and the wheels are turned back into the straightahead position.

System behaviour in case of emergency

In case of undervoltage of the battery, the onboard supply control unit J519 ensures that sufficient current for the electromechanical power-assisted steering is available when engine is running.
If necessary certain electrical consumers of low priority are switched off. If the system is completely switched off due to a system error, the legal requirements are further fulfilled, the vehicle remains unrestrictably steerable.

Electronics of the power-assisted steering

Steering torque sender G269

SP58_46

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The steering torque is determined with the aid of the steering torque sender G269 directly at the steering pinion. The sender operates according to the magnetic-resistant* function principle. In order to ensure a highest possible safety it possesses two independent areas - designed in double (redundant).

There is a torsion bar between the connecting piece of the steering column and the connecting piece of the power-assisted steering gear.
A magnetic magnet wheel with 24 poles is fitted onto the connecting piece of the steering column. The magnet wheel is firmly connected to the connecting piece of the steering column.
Two poles are always used for the steering torque determination.
The counterpart is a redundant, magnetic-resistant sensor element, which is fastened at the connecting piece to the steering gear.

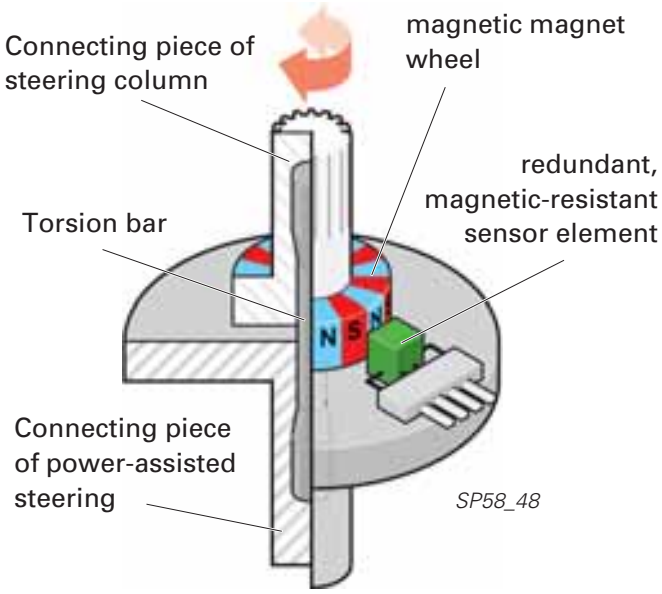
If the steering wheel is operated, both connecting pieces rotate against each other according to the occuring torque. As the magnetic magnet wheel rotates against the sensor element, the occuring steering torque can be measured and transmitted as signal to the steering aid control unit.

Effects of failure

In case of failure of the two areas on the steering torque sender, the power-assisted steering gear must be replaced.
If a failure is detected, the steering assistance is deactivated. The deactivation is not performed suddenly, rather "soft". In order to achieve this "soft" deactivation, a steering torque replacement signal of the steering aid control unit is calculated from the

- steering angle sender G85 and
- electromechanical power-assisted steering motor V187.

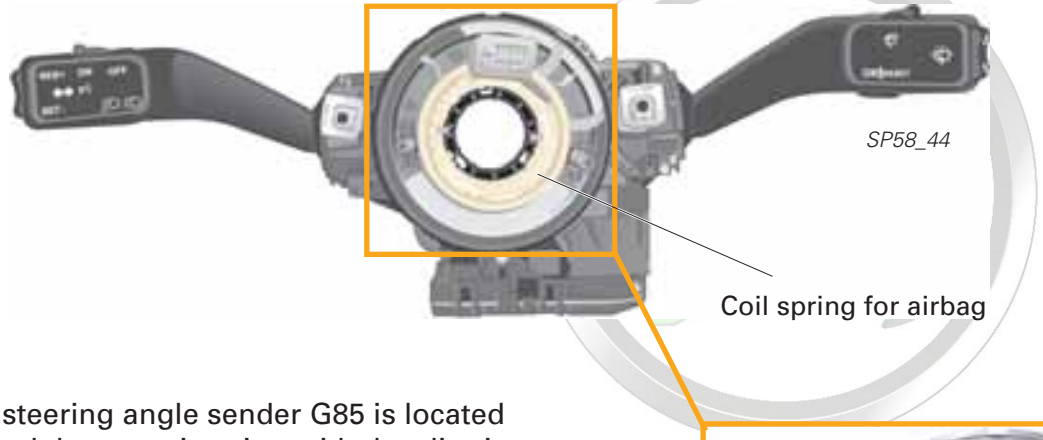
The electromechanical power-assisted steering motor V187 is still actuated via a time interval.
A fault is displayed through the red lighting up of the warning light K161.
In case of failure of only one of the two areas, the power-assisted steering continues to function without restriction. In this case the fault is displayed through the yellow lighting up of the warning light K161.



SP58_48

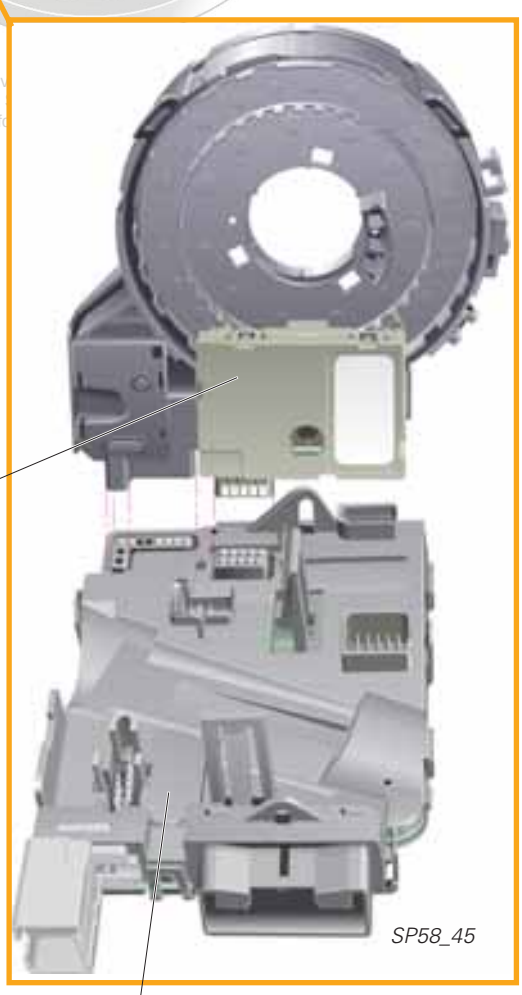
* Magnetic-resistant effect = modification of resistance of the electrical conductors through magnetization.

Steering angle sender G85



The steering angle sender G85 is located behind the restoring ring with the slip ring for airbag.
It is seated on the steering column between the steering column switch and the steering wheel.

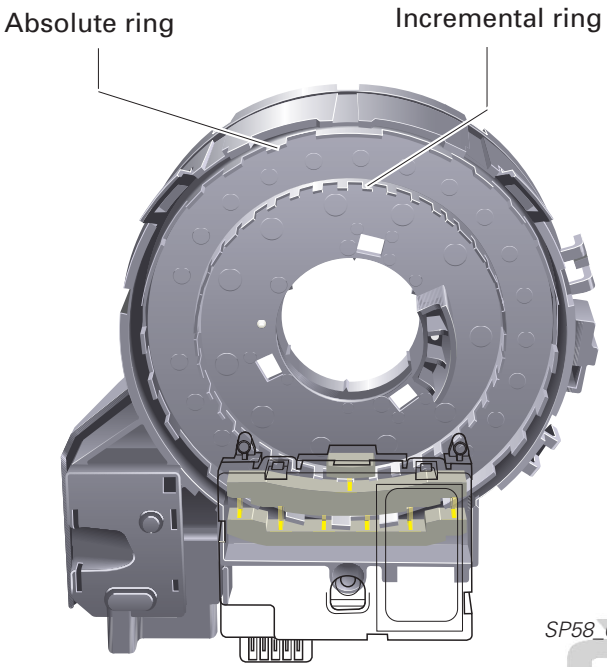
It supplies the signal for determining the steering angle and the signal of the steering speed.
Both signals are evaluated first in the steering column electronics control unit J527 and then transmitted via the CAN databus to the steering aid control unit J500.



Effects of failure

In case of failure of the steering angle sender G85 an emergency operation programme is started. The missing signal is set to a replacement value.
The steering assistance has its full function.
The fault is displayed through the yellow lighting up of the warning light K161.

Electronics of the power-assisted steering



SP58_65

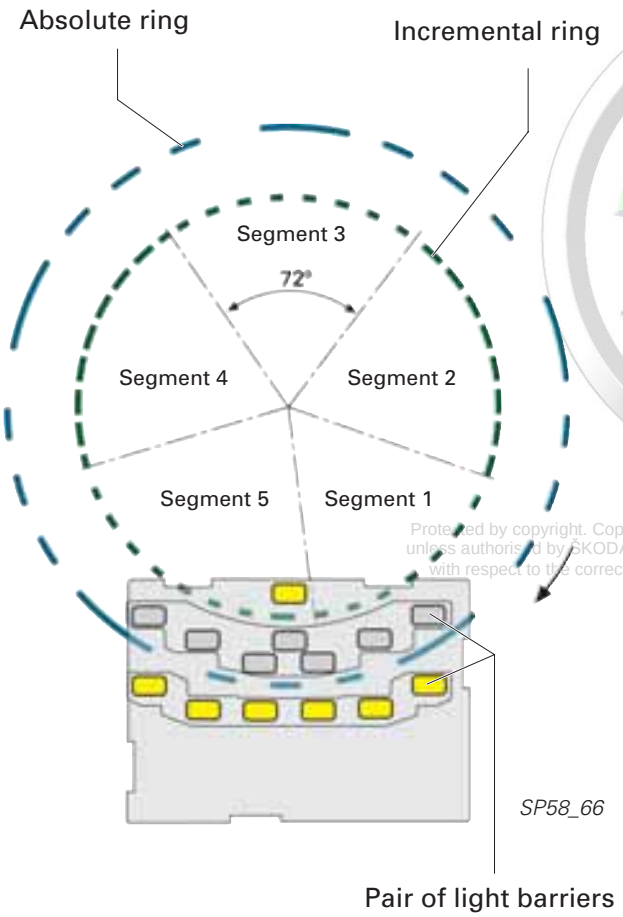
Working mode

Basic components of the steering angle sender G85 are:

- a coding disc with two code rings
- 7 pairs of light barriers with each one light source and an optical sensor

The coding disc consists of two rings, the external absolute ring and the inner incremental ring.

Note:
See also the description of the steering angle sender in the SSP no. 28.



SP58_66

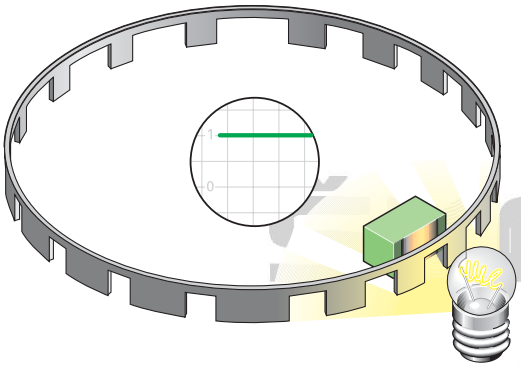
The incremental ring is divided into 5 segments with each 72° and read off from a pair of light barriers. The ring has openings within the segment.
The succession of the openings is similar within a segment, but different between the segments. This results in the coding of the segments.

The absolute ring determines the angle. It is read off by six pairs of light barriers.

The steering angle sender can detect the ±1044° steering angle. It adds the angle degree.
It detects that a steering wheel turn has been completed when exceeding the 360° marking.

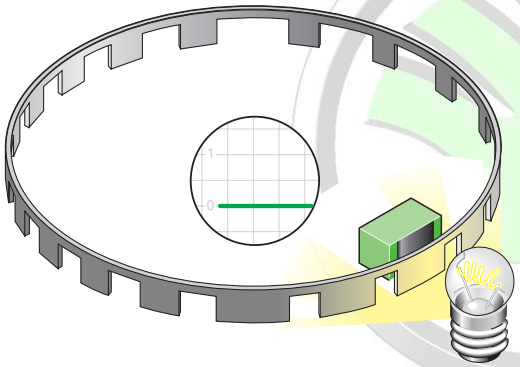
The constructive design of the steering gear enables ±2.9 turns of the steering wheel.

The measurement of the angle is performed according to the principle of the light barrier. If the incremental ring is used as a means of simplification, the source of light is located on the one side of the segment ring and the optical sensor on the other side.



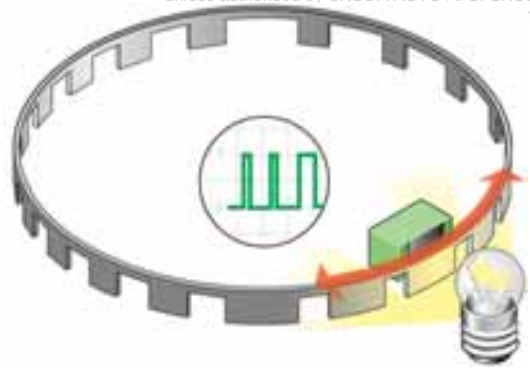
SP58_67

If light falls through a gap on a sensor, it results in a signal voltage.



SP58_68

If the light source is covered, the voltage is interrupted again.



SP58_69

If one now moves the incremental ring, it results in a succession of signal voltages.

A succession of signal voltages per each pair of light barriers occur in the same way for the absolute ring. All successions of signal voltages are processed in the steering column electronics control unit. The system can calculate how far the rings were moved through the comparison of the signals.
The starting point of the movement is determined by the absolute part.

Electronics of the power-assisted steering

Electromechanical power-assisted steering motor V187

SP58_46

SP58_50

The electric motor V187 is a brushless asynchronous engine. It develops a maximum torque of 4.1 Nm, with which the steering is supported.

Asynchronous engines do not possess a permanent magnetic field or an electrical excitation. Name-giving identification of asynchronous engines represents a difference between the frequency of the set voltage and the rotating frequency of the engine. Both frequences are not identical - this means also asynchronous.

Asynchronous engines are simple in structure (without brushes) and therefore very safe for driving.

They possess a short response mode and thereby are suitable also for the fastest steering movements.

The electric motor is fitted into an aluminium housing. It grips with a shaft end via a worm gear and a drive pinion into the rack pinion and thereby transfers the steering assisted force.

There is a magnet at the other shaft end, which is used by the steering aid control unit for detecting the rotor speed.
The signal serves the steering aid control unit for the determination of the steering speed.

Effects of failure

An advantage of the asynchronous engine consists of the fact that the engine can be moved also in the dead condition via the steering gear. This means that in case of failure of the engine and the steering assistance the steering can be moved with low increased force.

Even in the case of a short-circuit the engine is not blocked. A fault is displayed through the red lighting up of the warning light K161.

Rotor speed sender

The rotor speed sender is a component of the electromechanical power-assisted steering motor V187. It is not accessible from the outside.

Use of signal

The rotor speed sender functions according to the magnetic-resistant* function principle and is similar in structure to the steering torque sender G269. It detects the rotor speed of the electromechanical power-assisted steering motor V187. The rotor speed sender transmits the information about the rotor speed to the steering aid control unit J500.

Effects of failure

In case of failure of the rotor speed sender, a replacement signal for the steering speed is used. The steering assistance is safely reduced. Thus a sudden deactivation of the steering assistance is avoided through sender failure. A fault is displayed through the red lighting up of the warning light K161.

Vehicle speed

The vehicle speed signal is supplied by the ABS control unit.

Effects of failure

In case of failure of the signal for the vehicle speed an emergency operation programme is started.
The driver has a full steering assistance, but no Servotronic function (i.e. speed-dependent steering assistance) is available. The fault is displayed through a yellow lighting up of the warning light K161.

Engine speed sender G28

The engine speed sender is a Hall sender.
It is screwed into the housing of the crankshaft sealing flange.

Effects of failure

If the signal of the engine speed sender fails, use as replacement the last detected value of the engine speed. The fault is **not** displayed through lighting up of the warning light K161.

* Magnetic-resistant effect = modification of resistance of the electrical conductors through magnetization.

Electronics of the power-assisted steering

Steering aid control unit J500

SP58_46

SP58_52

The steering aid control unit J500 is fastened directly to the electromechanical power-assisted steering motor V187, so that a complex cable routing to the components of the power-assisted steering does not apply.

On the basis of the input signals such as

- the steering angle signal,
- the engine speed,
- the steering torque,
- the rotor speed,
- the signal of the vehicle speed and
- the signal that the ignition key of the dash panel insert control unit J285 has been identified,

the control unit determines the respective requirement for steering assistance.
The current of the exciter current is calculated and the electric motor V187 is actuated.

A temperature sensor is integrated into the steering aid control unit, in order to detect the temperature of the steering system.
If the temperature increases above 100 °C, the steering assistance is continuously reduced.

If the steering assistance goes below a value of 60 %, the warning light for electro-mechanical power-assisted steering K161 lights up yellow.

Effects of failure

If the steering aid control unit fails, the power-assisted steering is no longer assisted, but despite this the vehicle remains fully steerable.
The warning light K161 lights up red.

Note:
In case of defective steering aid control unit J500 the complete power-assisted steering gear must be replaced.
You will find the description for the replacement in the respective Workshop Manual.

Electromechanical power-assisted steering warning light K161

The warning light is located in the display unit in the dash panel insert. It serves the display of malfunctions or interferences of the electromechanical power-assisted steering. The warning light lights up in two colours for malfunctions. Yellow lighting up means a warning. In case of red lighting up of the warning light, one must immediately go to a workshop. If the warning light lights up red, an acoustic warning signal sounds, a triple gong:

SP58_53

When switching off the ignition the warning light lights up red, a self-check must be carried out for the system of the electromechanical power-assisted steering.

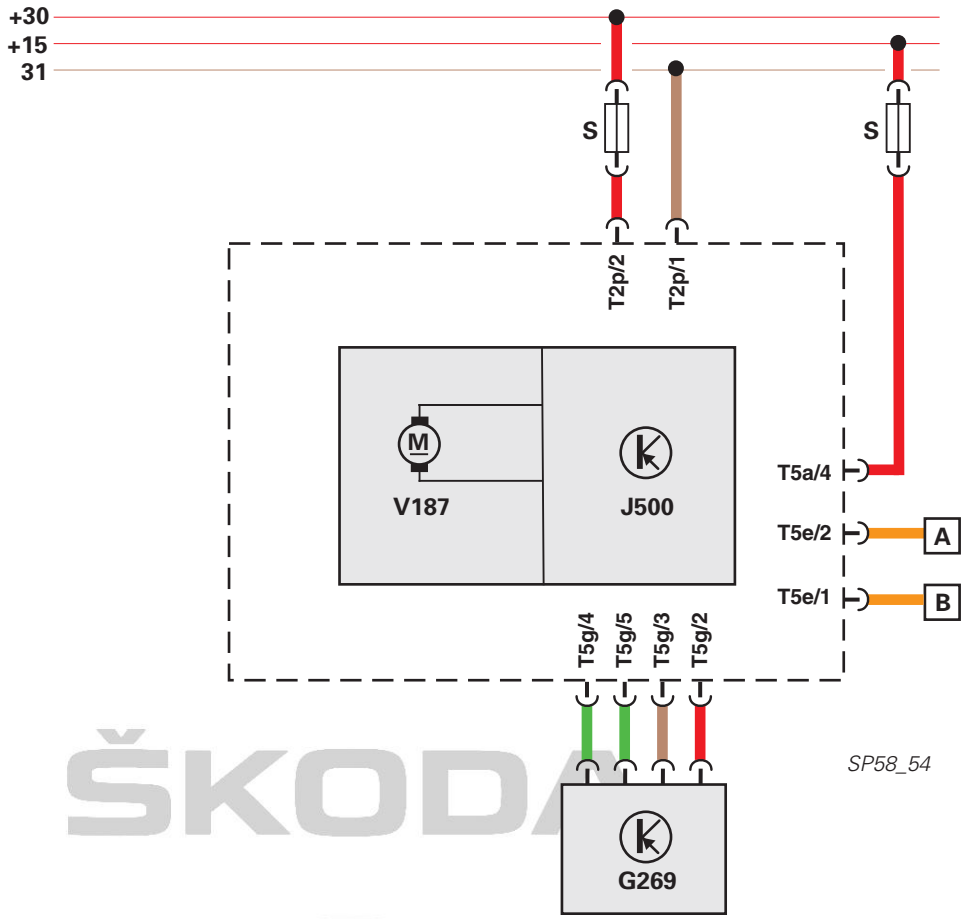
Only if the signal comes from the steering aid control unit, the system functions properly, the warning light goes out. This self-check lasts approx. two seconds.
When starting the engine the warning light goes out immediately.

Note:
The steering system detects and reacts to undervoltage. If the battery voltage drops below 9 Volt, the steering assistance is reduced until deactivation and the warning light K161 lights up red.

In case of brief voltage interruption under 9 Volt the warning light K161 lights up yellow.

Function diagram

Function diagram



A	CAN data bus Low
B	CAN data bus High
G269	Steering torque sender
J500	Steering aid control unit
S	Fuse
V187	Electromechanical power-assisted steering motor

Colour coding

- Input signal
- Output signal
- Supply voltage
- Earth
- CAN data bus