

SP 26-5

Technical progress in vehicle engineering is constantly perfecting vehicles in terms of active safety and is helping, more than ever, to prevent or minimise the consequences of accidents in the passive field.

Our safety engineers have implemented further measures in terms of active and passive safety in the ŠKODA OCTAVIA.


















For instance, the antilock brake system has been equipped with additional functions, the existing safety system of airbag and seat belt tensioner has been enlarged to include side airbags for driver and front passenger.

The anti-theft alarm system also now features additional components.

We wish to present the design of these modified systems in this Self Study Programme and to explain how they operate.

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# Contents

	<b>ABS</b>	4
	Antilock brake system	4
	System overview	5
	<b>ABS + EBD</b>	7
	Electronic brake force distribution EBD	7
	<b>ABS Sensors</b>	8
	<b>ABS Actuators</b>	11
	<b>ABS</b>	12
	Brake function with antilock control	12
	<b>EDL</b>	16
	Function description	18
	<b>ESBS</b>	22
	<b>EBC</b>	24
	<b>CAN BUS</b>	25
	<b>ABS Self Diagnosis</b>	26
	<b>ABS Service</b>	27
	<b>ABS/EDL Function Diagram</b>	28
	<b>Pedal Assembly</b>	30
	<b>ABS Knowledge</b>	31
	<b>Side Airbags</b>	32
	Task and function	32
	Service work	34
	Self-diagnosis	35
	Function diagram	36
	<b>Alarm System</b>	38
	<b>Test Your Knowledge</b>	44

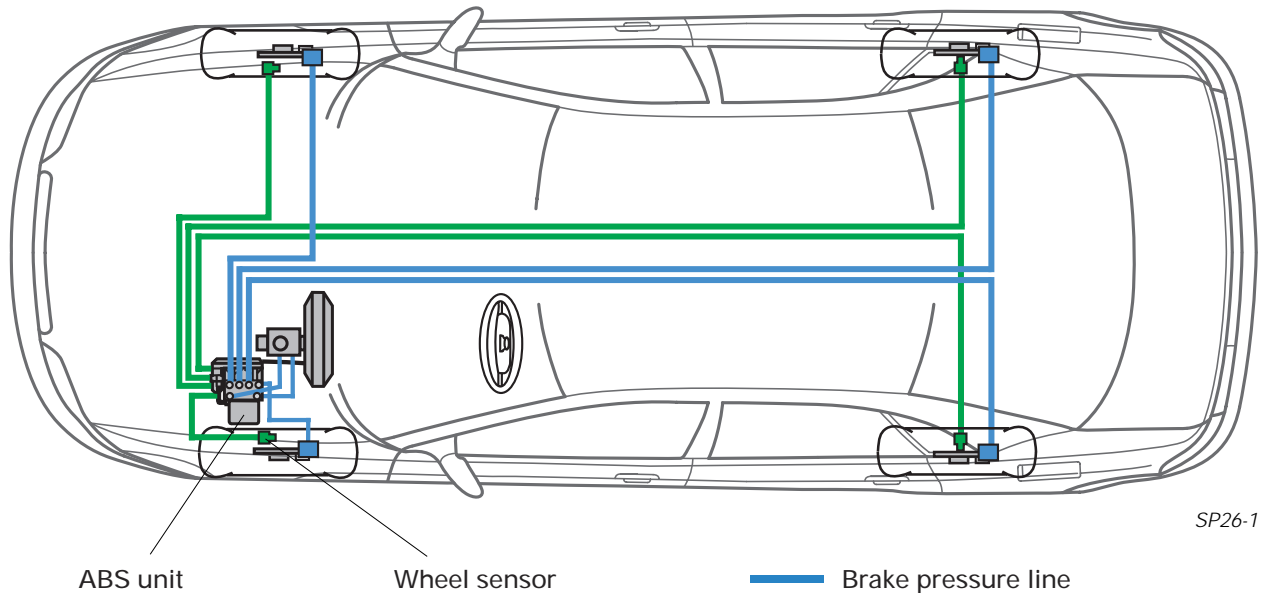
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**You will find notes on inspection and maintenance, setting and repair instructions in the Workshop Manual.**



# ABS

## Antilock brake system - ABS



SP26-1

ABS unit

Wheel sensor

— Brake pressure line

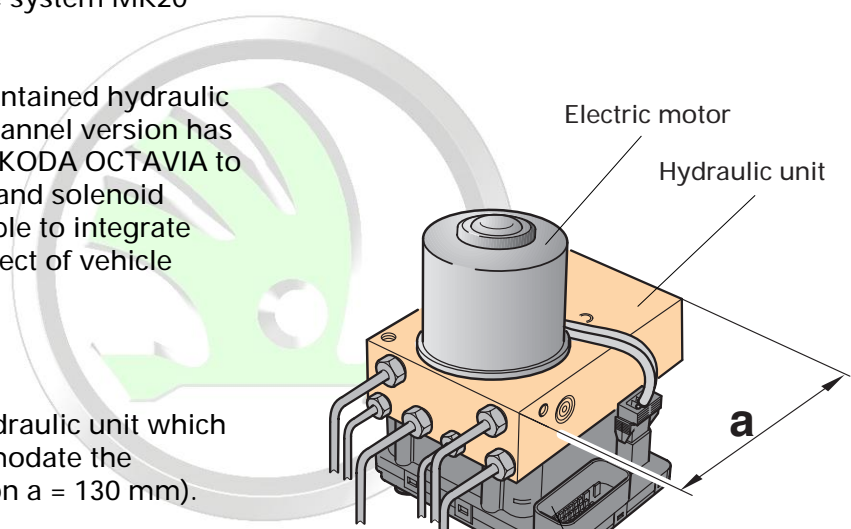
— Sensor line

# ŠKODA

You will be familiar with the operation and design of the antilock brake system MK20 from the ŠKODA FELICIA.

The tried-and-tested self-contained hydraulic modular system of the 4-channel version has now been enlarged in the ŠKODA OCTAVIA to include electronic controls and solenoid valves which make it possible to integrate additional functions in respect of vehicle dynamics.

The ABS unit **ABS/EDL-ITT Mark 20IE** differs externally by the hydraulic unit which is 30 mm longer to accommodate the additional valves (dimension a = 130 mm).



Electric motor

Hydraulic unit

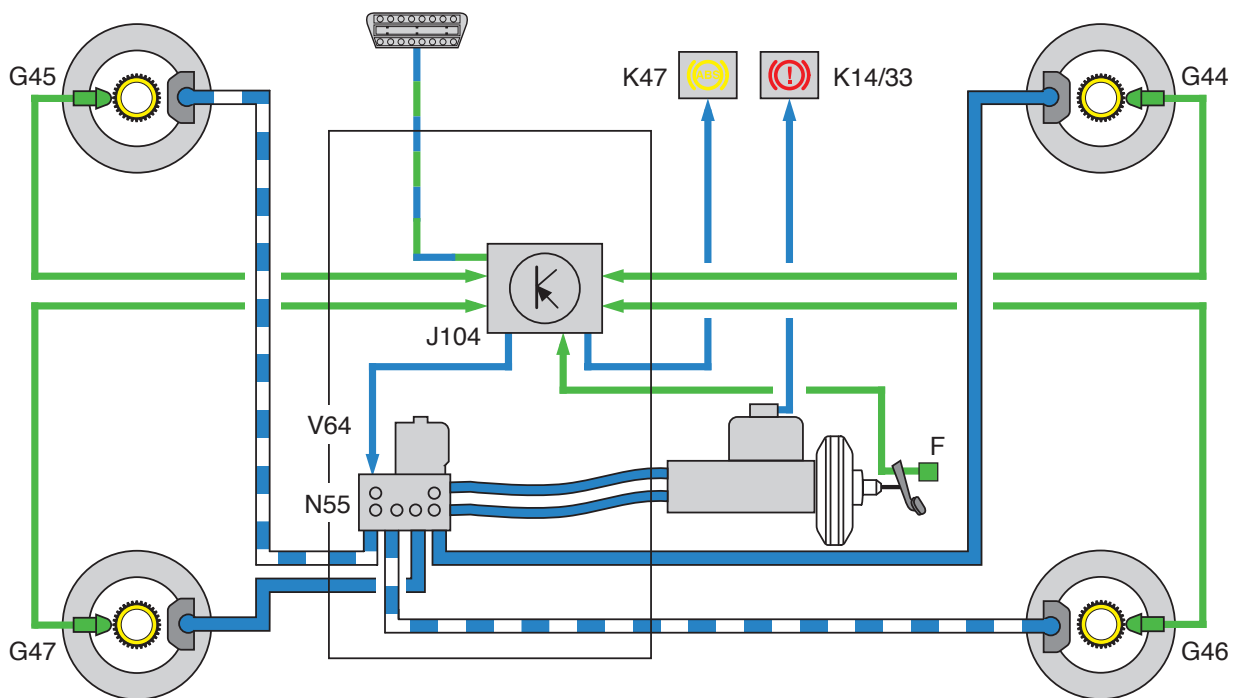
a

We recognize from the designation **IE** that this unit has been enlarged and that the control unit is linked to the CAN BUS drive.

SP26-26

Electronic control unit

## ABS system overview (block diagram)



SP26-25

Abbreviated designation of components - see function diagram

— Brake circuit  
- - - Brake circuit

— Outgoing information

— Incoming information

The brake circuit is split, as before, into an X arrangement, also known as a diagonal split. Each brake circuit acts on a front wheel and on the diagonally opposite rear wheel. A separate brake line runs from the hydraulic unit to each wheel (4-channel version).

The relevant ABS sensor system consists of the four wheel speed sensors (G44 to G47) with pulse rotors.

The new additional functions which the system permits, are:

**EBD** Electronic brake pressure distribution  
**EDL** Electronic differential lock  
**EBC** Engine braking control  
**TCS** Traction control system

Faults in the ABS-specific range are indicated by means of the ABS warning light (K47) and by the brake fluid level warning light (K14/33).

The entire system is covered by the self-diagnosis.

(EBC and TCS are in preparation for the OCTAVIA).

# ABS

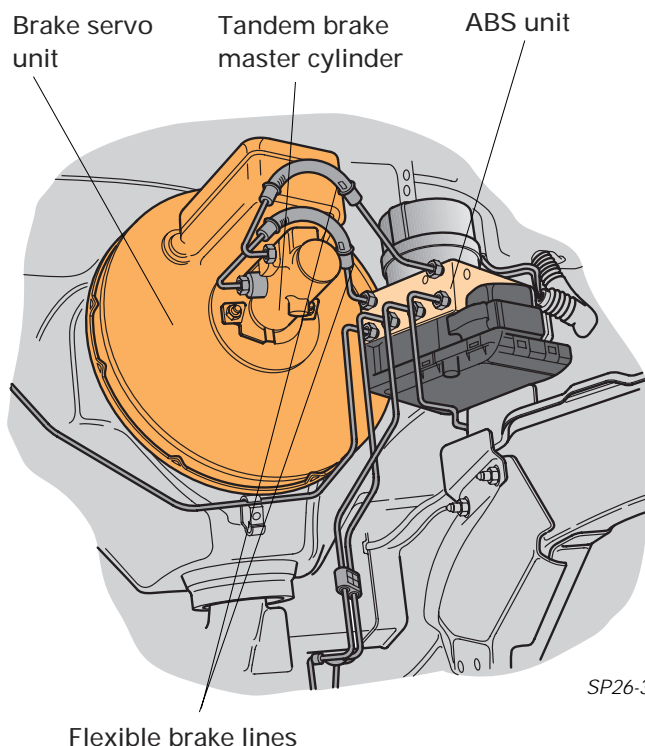
## Installation position

The brake servo unit with tandem brake master cylinder and the ABS unit are two separate components.

As on all ŠKODA models, the brake servo system employs the vacuum servo assistance principle, in other words a tried-and-tested technical and economic solution (left-hand drive models with 10" brake servo unit).

The ABS unit is a separate module which is attached to the wheelhouse in the left of the engine compartment. This installation position is the same for left-hand and right-hand drive models (right-hand drive models then have the separate 7" / 8" brake servo unit on the right of the engine compartment).

The tandem brake master cylinder is connected to the ABS unit by flexible brake lines.

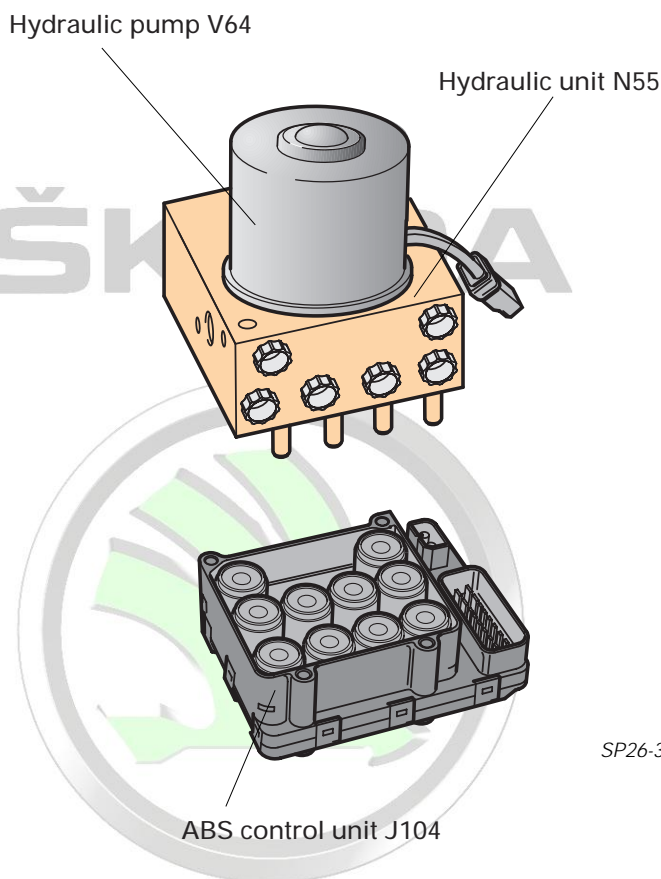


SP26-3

## The ABS unit

can only be separated once it has been removed.

The hydraulic pump must not, however, be separated from the hydraulic unit.



SP26-31



### Note:

Please refer to the information on service work, in particular bleeding the brake system fitted with ABS/EDL Mark 20IE.

You will find this in the Workshop Manual OCTAVIA Running Gear.

## EBD - Electronic brake pressure distribution

The electronic brake pressure distribution is a fixed element of the ABS software in the ABS/EDL-ITT MK 20IE unit.

The load-responsive brake pressure regulator at the rear wheels is not fitted to models with this equipment level.


### Function

During a normal brake application below the wheel locking limit, the brake application is controlled by distributing the brake pressure. The wheel deceleration at each wheel is constantly monitored in this case.

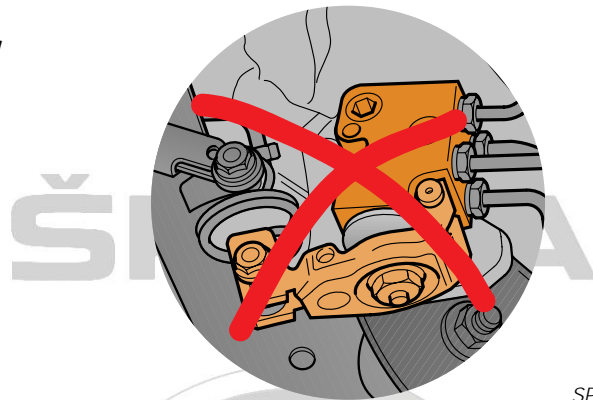
The control unit detects the distribution of the braking forces by comparing the wheel deceleration of the front wheels with those of the rear wheels.

If the braking forces at the rear wheels are too high, the pressure is reduced by means of the solenoid valves of the hydraulic unit.

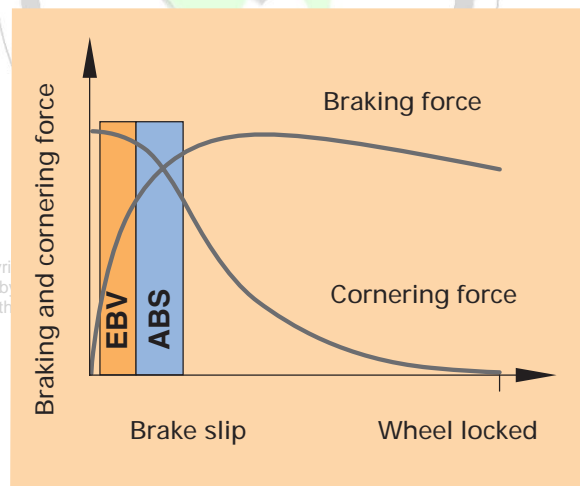
What is achieved is an optimum distribution of the braking forces with high cornering forces at the rear wheels. The brake pressure is controlled in such a way as to avoid the rear wheels being overbraked.

 **Note:** For safety reasons, the functions of the antilock brake system and the electronic brake pressure distribution are performed separately in the control unit.

If the ABS function fails, the EBD control, for example, remains operational, and vice versa. The failure of the EBD control is signalled to the driver by the brake fluid warning light, together with the ABS warning light.



SP26-32



permitted  
any liability  
A. S. 0

(EBV = EBD)

SP26-33





# ABS Sensors

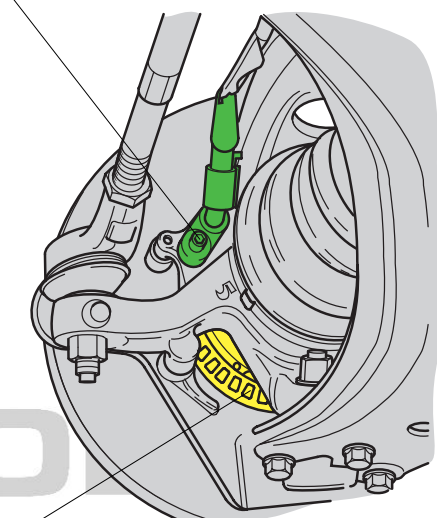
**Front speed sensors G45, G47**  
**Rear speed sensors G44, G46**

## Use of signal

The speed sensors supply the speed signals to the control unit J104.

The momentary wheel speed is calculated in the control unit.

Front speed sensor



Pulse rotor for front speed sensor

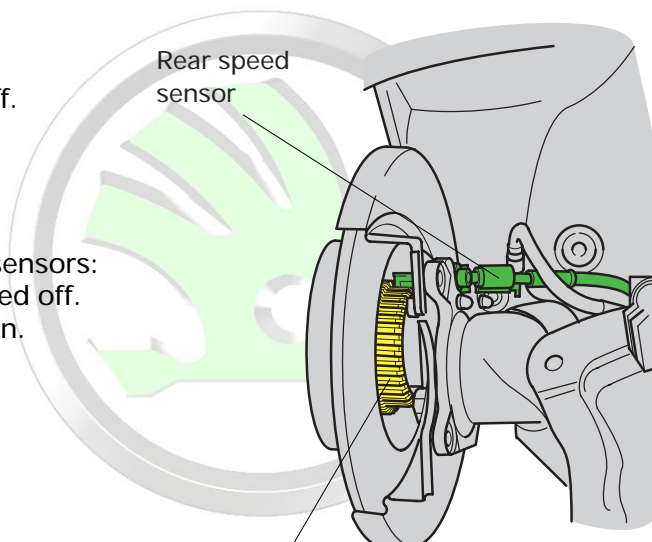
SP26-35

**Effects in the event of signal failure**  
 (applies to both front and rear speed sensors)

**Failure of a speed sensor:**  
 The ABS/EDL system is switched off.  
 The EBD function is retained.  
 ABS warning light (K47) comes on.

**Failure of both front or rear speed sensors:**  
 The ABS/EDL/EBD system is switched off.  
 Both system warning lights come on.

Rear speed sensor



Pulse rotor for front speed sensor

SP26-36

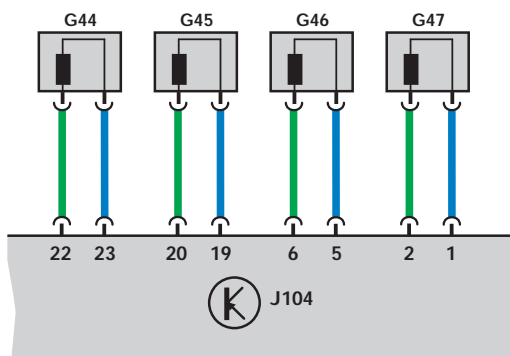
## Self-diagnosis/Fault message

All the speed sensors are covered by the self-diagnosis.

Specific information can be retrieved in the functions

- 02 - Interrogating fault memory
- 08 - Reading measured value block.

Electric circuit



SP26-37

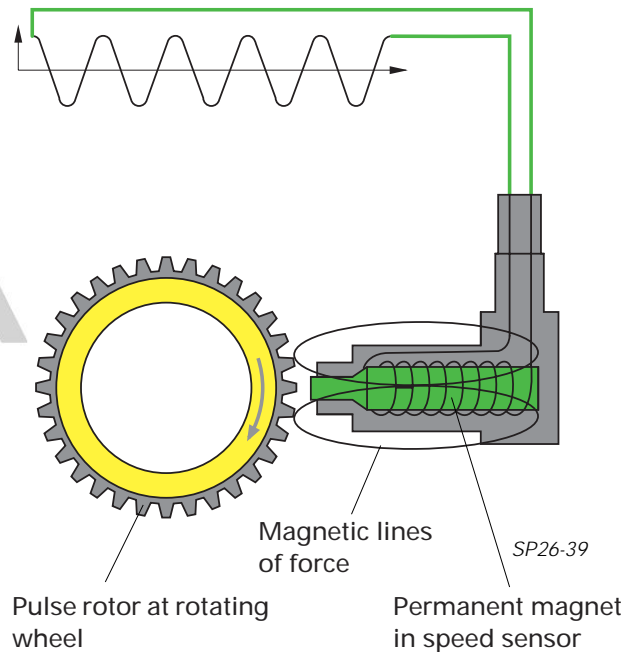
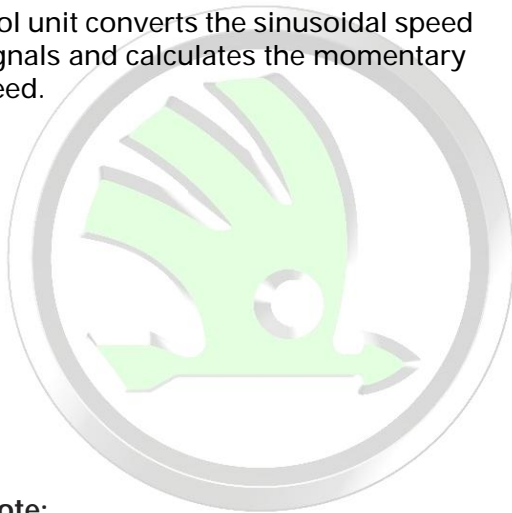
## Pulse rotor and speed sensor

The speed sensor consists of a permanent magnet and a coil.

This is connected to the control unit. The speed sensor operates on the principle of a generator, in other words when the gearwheel of the pulse rotor rotates in front of this sensor, a sinusoidal alternating voltage is generated in the coil.

The frequency is depending on the wheel speed.

The control unit converts the sinusoidal speed sensor signals and calculates the momentary wheel speed.



### Note:

The gap between the pulse rotor and the speed sensor is of major significance for proper operation of the ABS system (the signal amplitude  $\dot{u}$  is influenced by this).

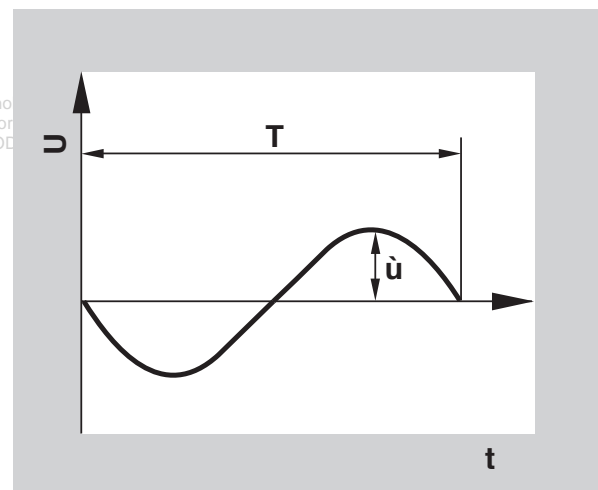
When driving, the wheel bearing play and the movement of the suspension result in a slight movement of the wheel speed sensor.

The size of the gap alters.

That is why, it is important to check the gap as specified in the Workshop Manual when carrying out installation work.

If an excessive gap exists, the control unit switches off the control at this wheel.

Dirt which can clog the teeth gap in the pulse rotor are also sources of faults in the ABS system.



SP26-38

Sinusoidal alternating voltage

T = Period of oscillation

t = Time

U = Voltage

$\dot{u}$  = Signal amplitude



# ABS Sensors

## Brake light switch F

### Task

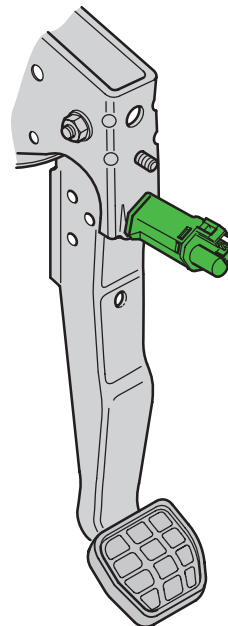
The brake light switch is located at the pedal assembly.

It operates as a normally-open (NO) contact, its main function being to switch on the brake lights. The function is used at the same time for transmitting a signal to the ABS control unit.

### Use of signal

The "Brake operated" signal is required in the ABS control unit for achieving improved comfort during an ABS/EBD control (the brake pedal pulsates less if the control is more accurate).

In the absence of these signals, it would be possible, for example, that the control unit interprets a deceleration of a wheel caused by an uneven road surface as a braking manoeuvre.



SP26-40

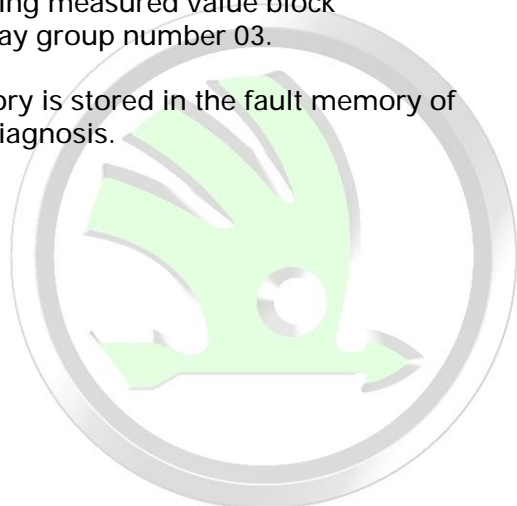
### Effects in the event of signal failure

Reduced level of comfort during ABS/EBD control. The EDL function does not operate.

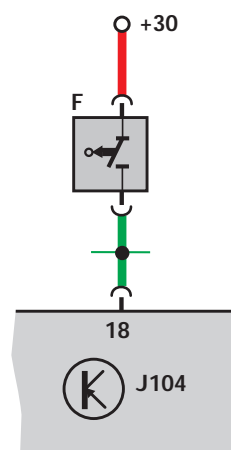
### Self-diagnosis/Fault message

Operational check using function  
08 - Reading measured value block  
Display group number 03.

No memory is stored in the fault memory of the self-diagnosis.



### Electric circuit



SP26-41

# ABS Actuators

# SKODA

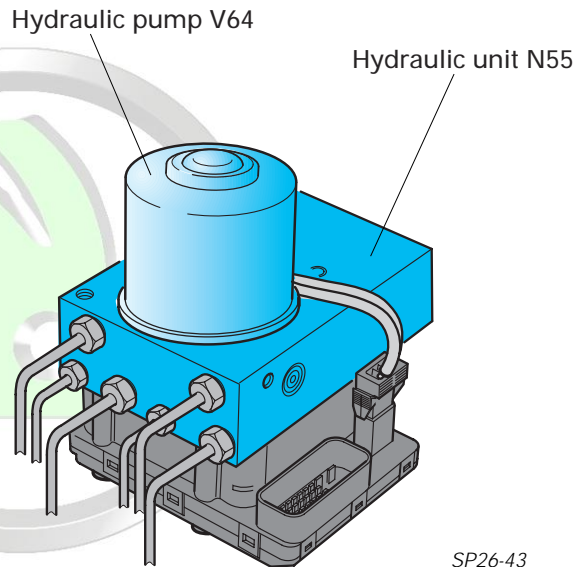
## Hydraulic pump V64 Hydraulic unit N55

### Tasks

These two components form a single unit and must not be separated.

The hydraulic unit contains the control valves of the ABS system which are used to perform the ABS control cycle.

The hydraulic ABS energy supply is provided by the hydraulic pump. This operates when a control cycle is detected, draws in brake fluid and pumps it through the open inlet valve to the wheel brake in order to produce the pressure required.



SP26-43

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### Effects in the event of signal failure

V64 The ABS/EDL system is switched off.  
EBD function is retained.  
ABS warning light comes on,

Vehicle can continue to be braked with the normal brake system.

N55 ABS/EDL/EBD is switched off.  
ABS and brake fluid warning lights come on.

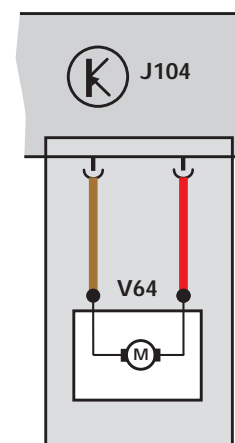
Driver has to expect altered braking characteristics of vehicle.

### Self-diagnosis/Fault message

The hydraulic pump is covered by the self-diagnosis in function 02 - Interrogating fault memory, and can be tested in function 03 - Final control diagnosis.

The hydraulic unit is tested by means of the self-diagnosis.

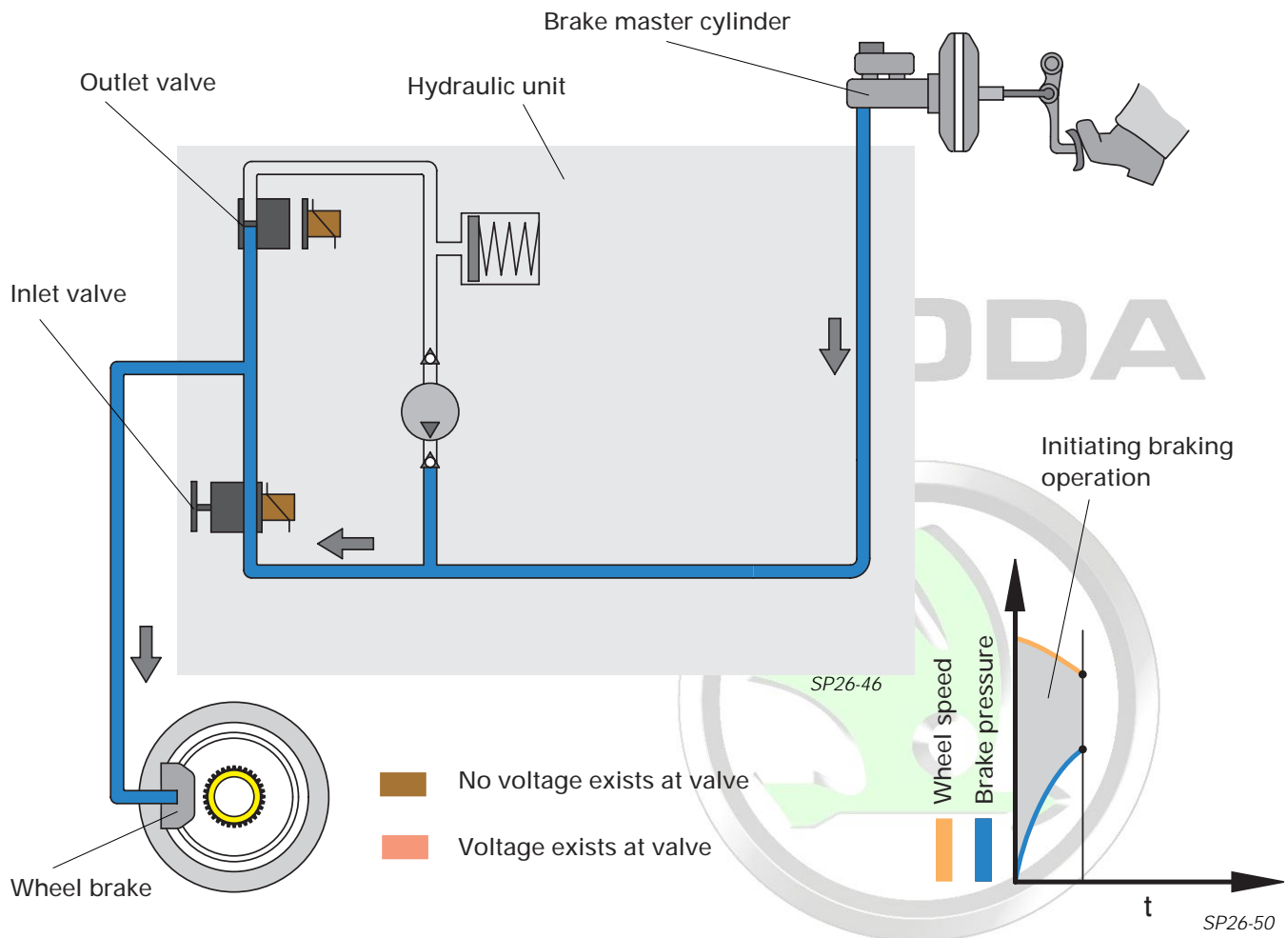
### Electric circuit



SP26-44

# ABS

## Braking function with antilock control



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### Initiating braking operation - increasing brake pressure

The brake pressure is increased by the brake master cylinder during a brake application.

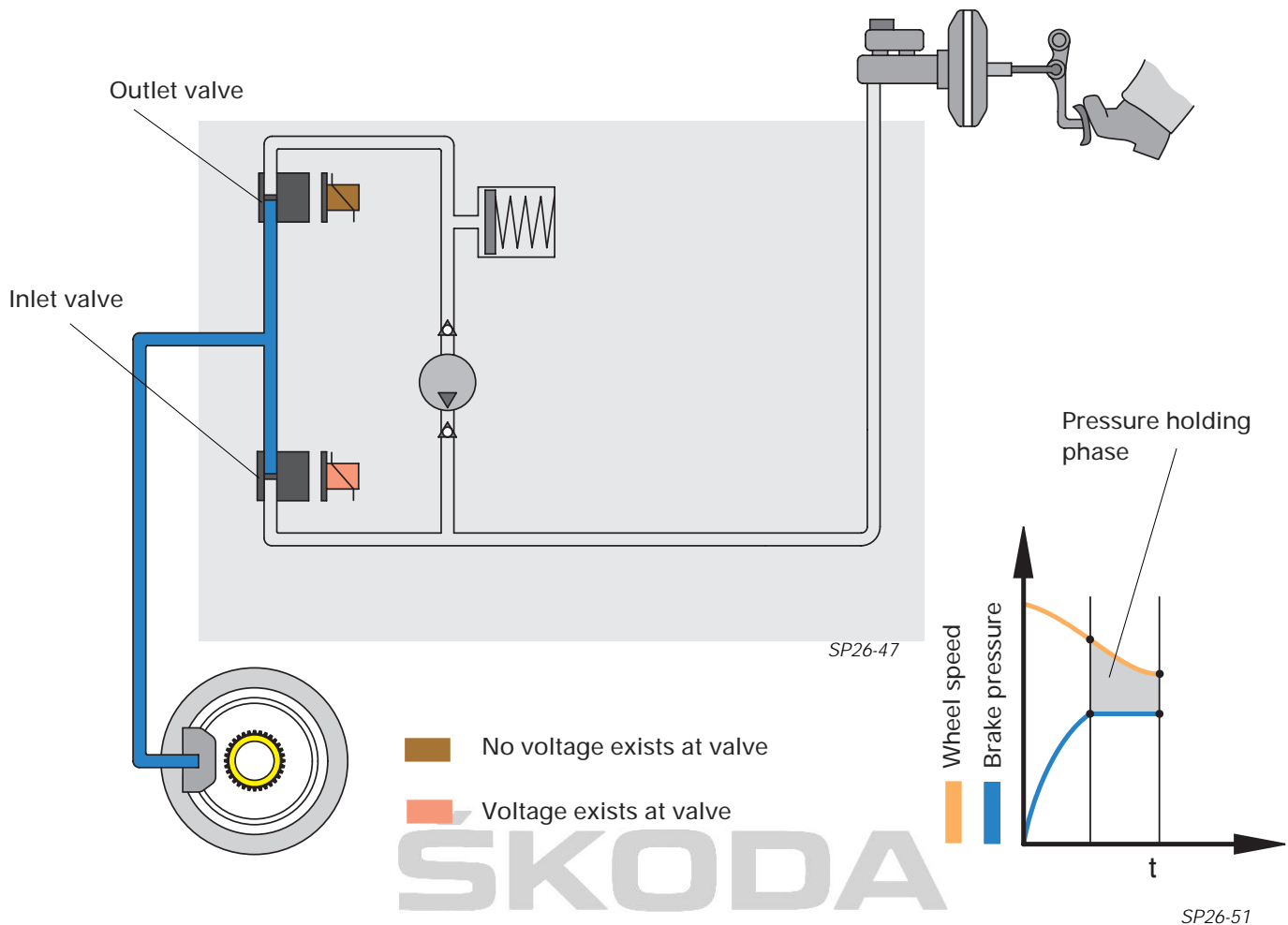
The brake pressure passes through the open inlet valve (de-energized) to the wheel brake.

The outlet valve is closed (likewise de-energized).

The speed of the wheel continues to reduce until the ABS control unit detects a tendency for the wheel to lock from the signal supplied by the wheel speed sensor.



To make it easier to understand, the control operation is described only at the control circuit of one wheel and only those components involved are explained.



### Pressure holding phase

If a wheel is tending to lock, voltage is applied first of all to avoid any further increase in the brake pressure at the inlet valve.

As a result of this, the valve is closed.

The outlet valve remains de-energized and is thus also closed.

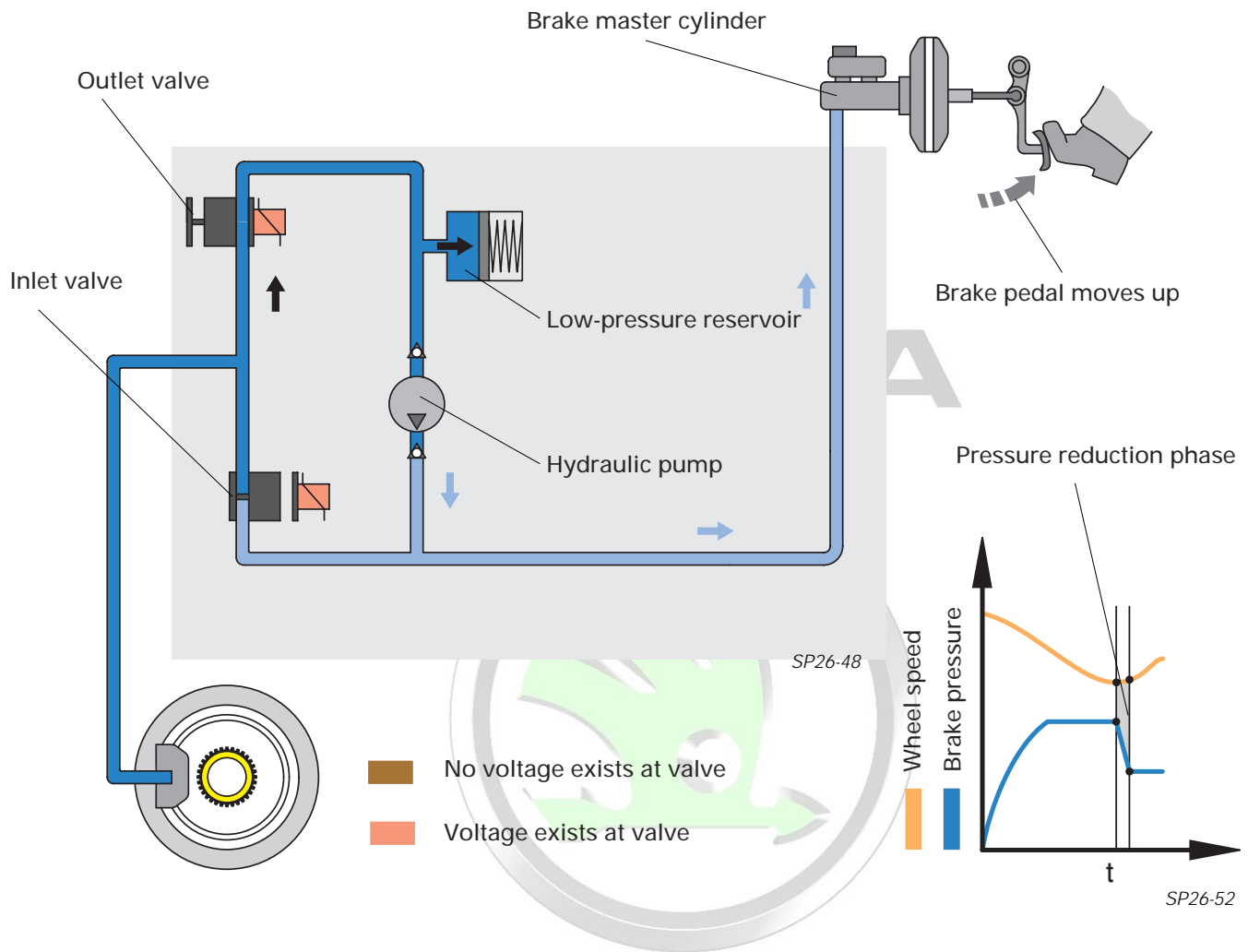
The brake pressure between the inlet valve and outlet valve remains constant during this phase (pressure holding phase).



**Note:**  
**Note the following special design feature for function reasons.**  
**Inlet valve = open when de-energized;**  
**Outlet valve = closed when de-energized;**  
**(this is important so that the brake system can also build up pressure without ABS).**

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# ABS



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## Pressure reduction phase

If the speed of the wheel continues to drop although a constant brake pressure exists and the tendency for the wheel to lock also exists, the brake pressure must then be reduced.

Voltage is applied to the outlet valve for this purpose.

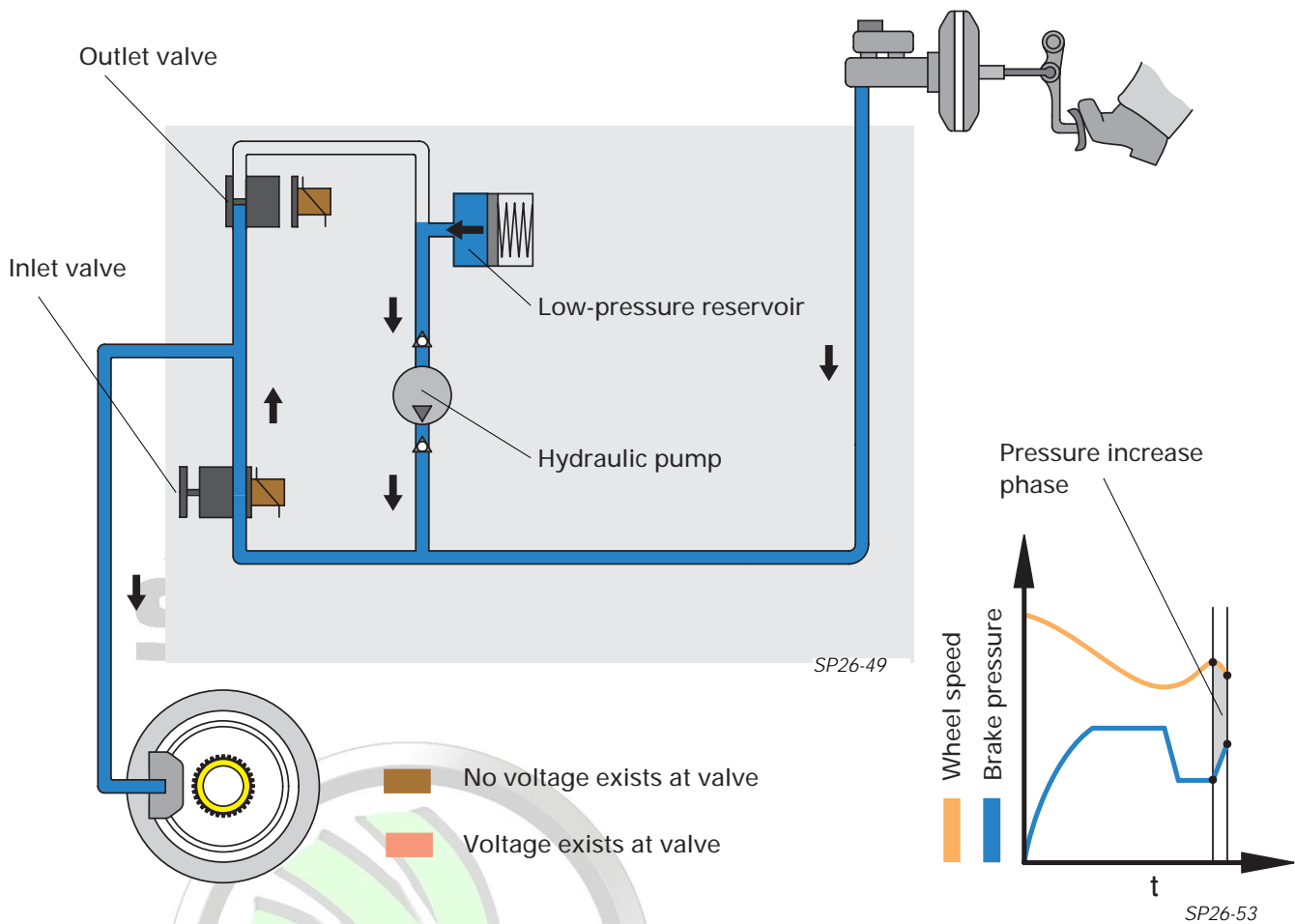
As a result of this, the valve is opened. The brake pressure is reduced through the low-pressure reservoir.

The inlet valve continues to be energized and is thus closed.

The hydraulic pump operates and pumps brake fluid out of the low-pressure reservoir into the brake master cylinder.

The brake pedal moves slightly up as a result of this.

The wheel which is at risk of locking is again accelerated and gains speed.



### Pressure increase phase

An increase in the pressure is necessary from a certain wheel speed in order to achieve optimum braking.

The inlet valve is de-energized for this purpose.

As a result, the valve is opened.

The outlet valve is likewise de-energized and is thus closed.

The hydraulic pump continues operating, draws the remaining brake fluid out of the low-pressure reservoir and pumps it into the brake circuit (hydraulic brake servo assistance).

The wheel is once again braked as the brake pressure rises.

The wheel speed is reduced.



These control phases of the antilock brake system are repeated as much as 5 - 6 times a second and wheel.

They are detectable from a pulsating movement at the brake pedal!



# EDL

What is the effect of the

Electronic  
Differential  
Lock



As a result of the differential, 50 % of the available driving torque  $M_A$  is active at each driven wheel provided wheel adhesion is adequate.

If driving on a road surface which is slippery on one side and where wheel adhesion is not adequate, the wheel with the lower adhesion determines the level of the driving torque transmitted  $1/2 \times M_A$ .

Taking into account the effective radii  $R$ , the two driving forces  $F$  are the result of the driving torques  $1/2 \times M_A$ .

**Important:**

The wheel on the road surface providing good grip, only transmits as much driving force as the poorer adhesion permits (always 50 : 50). That is why, it is possible to transmit only a part of the total driving force available for the vehicle. The total tractive force  $F_{tot 1}$  is the product of the subtotal of the two available driving forces  $F$ .

If the adhesion limit is exceeded, the right-hand wheel spins (see diagram).

This is detected by the wheel speed sensor and signalled to the ABS/EDL control unit.

The control unit thereupon activates a gentle and controlled braking of the wheel.

This produces the braking torque  $M_B$ .

The wheel which is not slipping, is now able to transmit an additional tractive force  $F_{EDL}$ . This is the result of the braking torque  $M_B$  and the radius  $R$  of the slipping wheel.

Result:

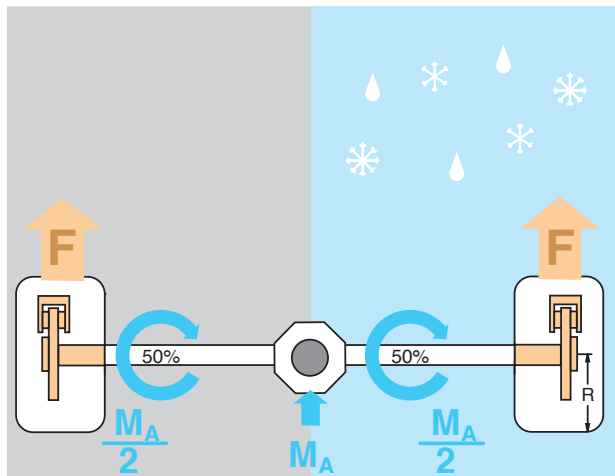
Added traction as a result of the additional driving force  $F_{EDL}$ . The result is the tractive force  $F_{tot 2}$ .

**Note:**



$F_{tot 2} > F_{tot 1}$

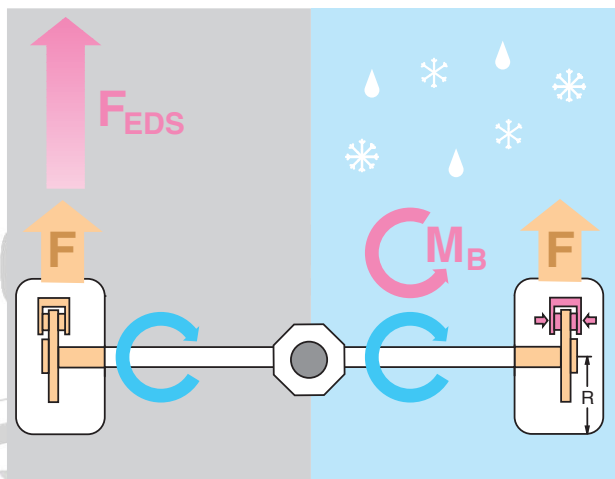
**New!**



SP26-23

Driving forces without differential lock

$F_{tot 1} = F + F$



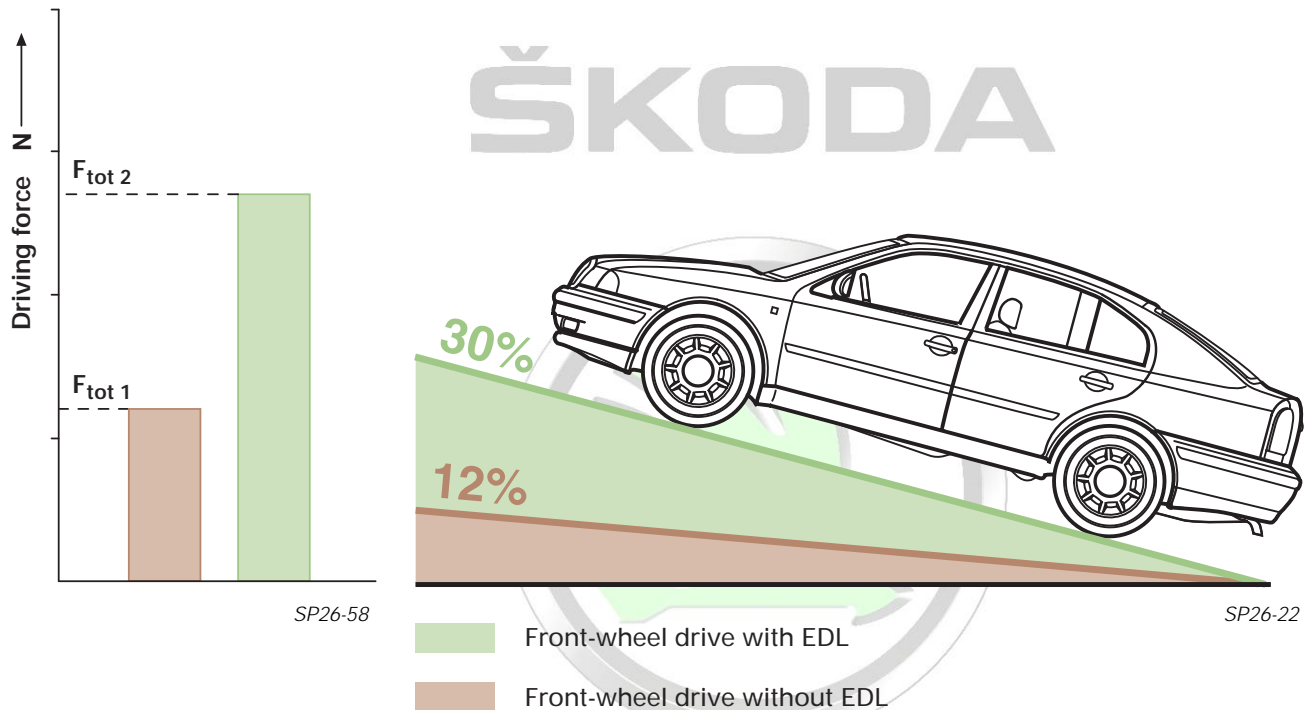
SP26-24

Driving forces with electronic differential lock (EDS = EDL)

$F_{EDL} = \frac{M_B}{R}$

$F_{tot 2} = F + F + F_{EDL}$

## Driving force/climbing ability of vehicles with and without EDL on a road surface slippery on one side



The electronic differential lock is an addition to the ABS, as you will already be familiar with from the FELICIA and OCTAVIA.

Based on the components of the ABS, the electronic differential lock supplements the safety offered by this system and improves traction when road conditions are particularly unfavourable, with a road surface which is slippery on one side. The advantages of this system are fully felt when starting off, accelerating or climbing a hill.

For the EDL function, the ABS unit has been enlarged to include additional valves and elements of the electronic control.

The electronic control unit detects the speeds of the driven wheels by means of the speed sensors of the ABS, and constantly compares them.

If differences in speed arise, as is the case when a wheel begins slipping, the slipping wheel is automatically braked by the ABS/EDL-MK20 unit through the wheel brake to the point at which it has approximately the same speed as the wheel which is not slipping.

What is produced is the braking torque  $M_B$ , which, if need be, has the effect of a mechanically locked differential.

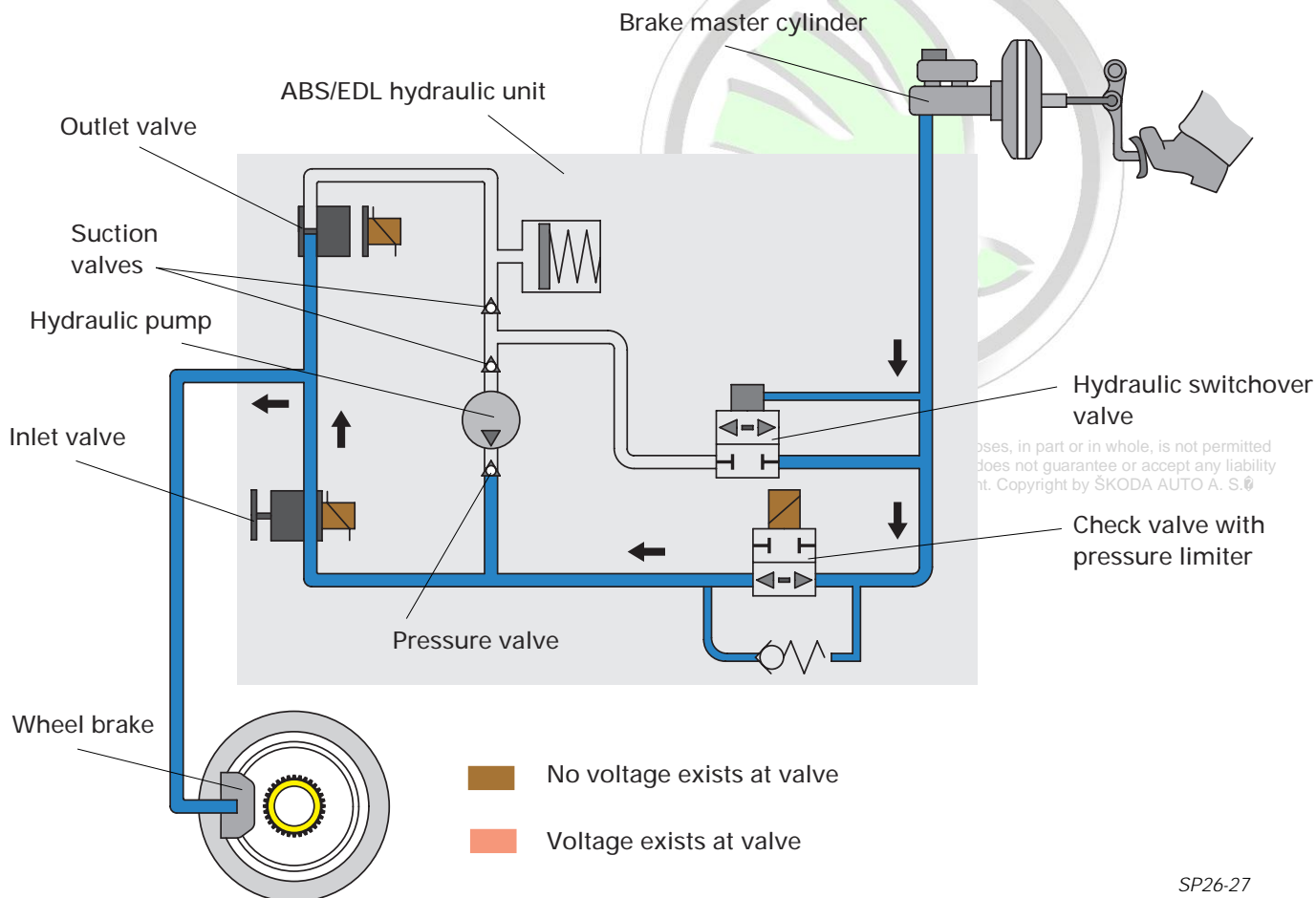
The wheel with the better adhesion properties is able to transmit a higher driving force.

# EDL

## Function description

To simplify understanding of the system, only the control loop of one wheel is shown.

The braking operation is initiated by depressing the brake pedal.



SP26-27

During a brake application, the brake pressure is increased by the brake master cylinder.

The hydraulic switchover valve closes when the pressure is increased manually.

No voltage exists at the check valve with pressure limiter and at the inlet valve; both are open.

The brake pressure flows through both valves to the wheel brake.

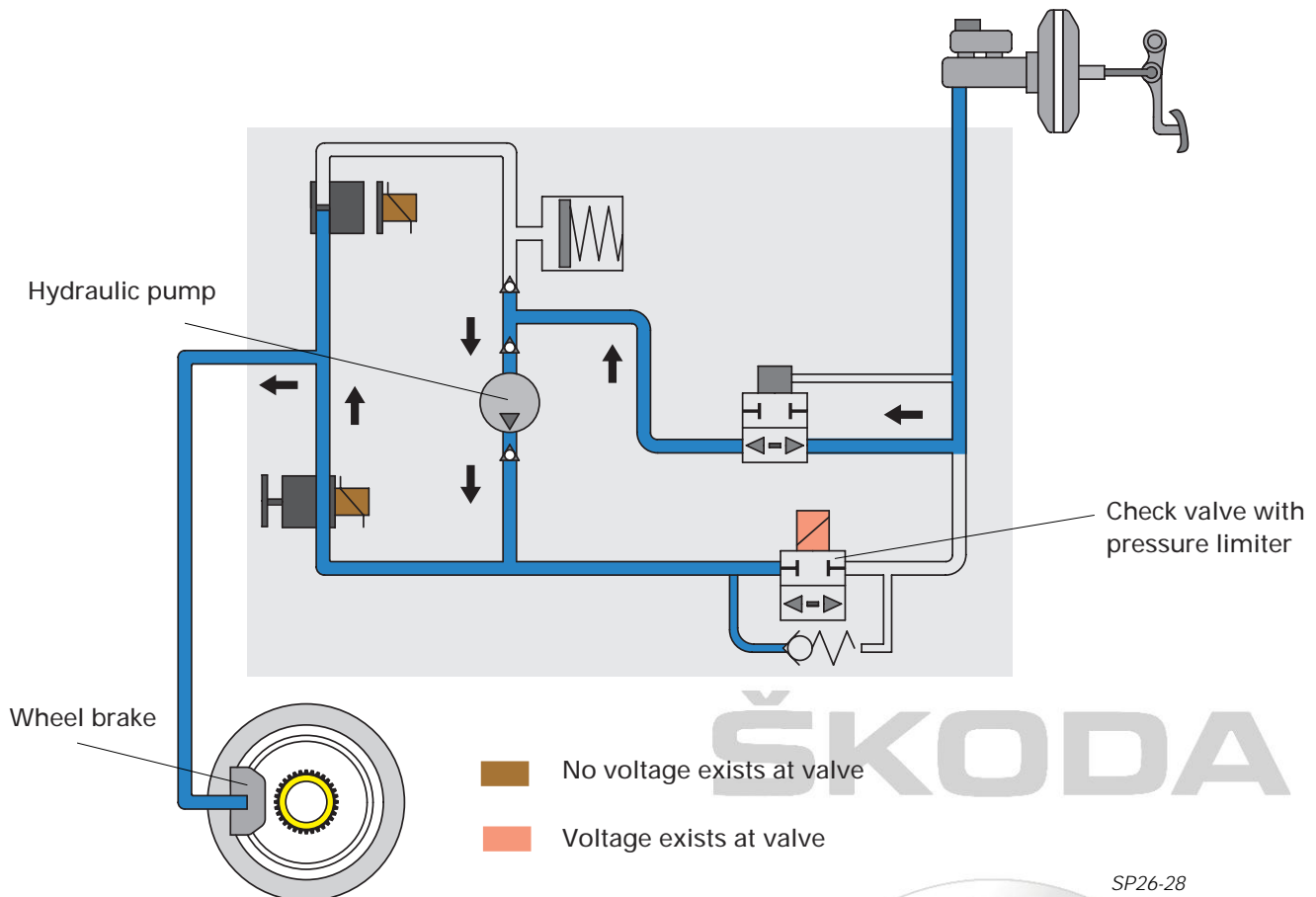


### Note:

The ABS/EDL hydraulic unit is recognizable from the longer valve block. In addition to the ABS valves, the ABS/EDL system features two solenoid valves (check valves with pressure limiter) and two hydraulic switchover valves in the brake circuits of the front wheel.

## Pressure increase with EDL

If the ABS/EDL control unit detects a slipping driven wheel during acceleration from the signals transmitted by the wheel speed sensors, the EDL function is activated.



The inlet valves of the rear wheel brake circuits are closed. Consequently, the rear wheels are not braked during the EDL function.

Voltage is supplied to the check valve with pressure limiter, and the valve closes.

The hydraulic pump is operated. It pumps brake fluid out of the brake master cylinder to the wheel brake of the wheel which is slipping.

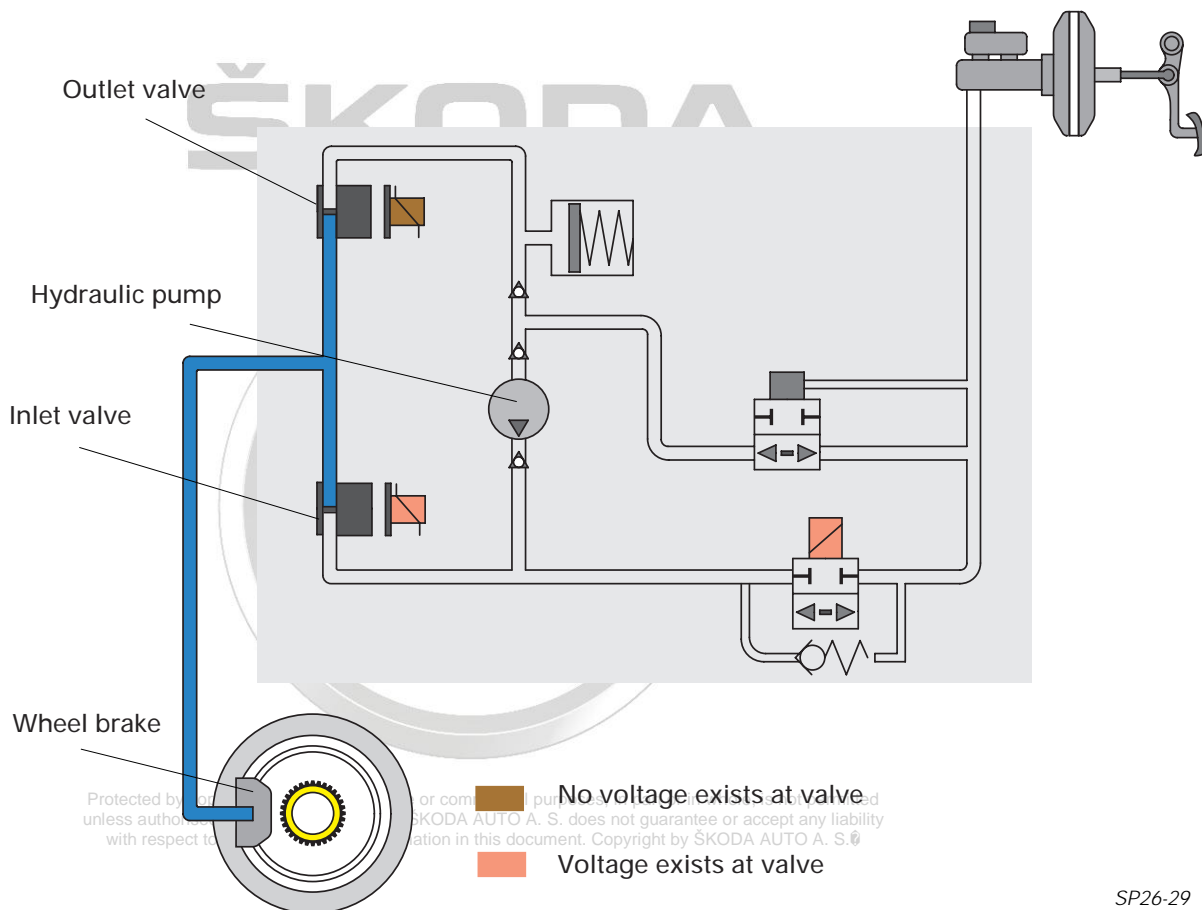
## The slipping wheel is braked.

The closed check valve prevents the brake fluid in the brake circuit of the slipping wheel, flowing back to the brake master cylinder.

The task of the pressure limiter is to limit the brake pressure produced by the hydraulic pump.

# EDL

## Pressure holding phase with EDL



SP26-29

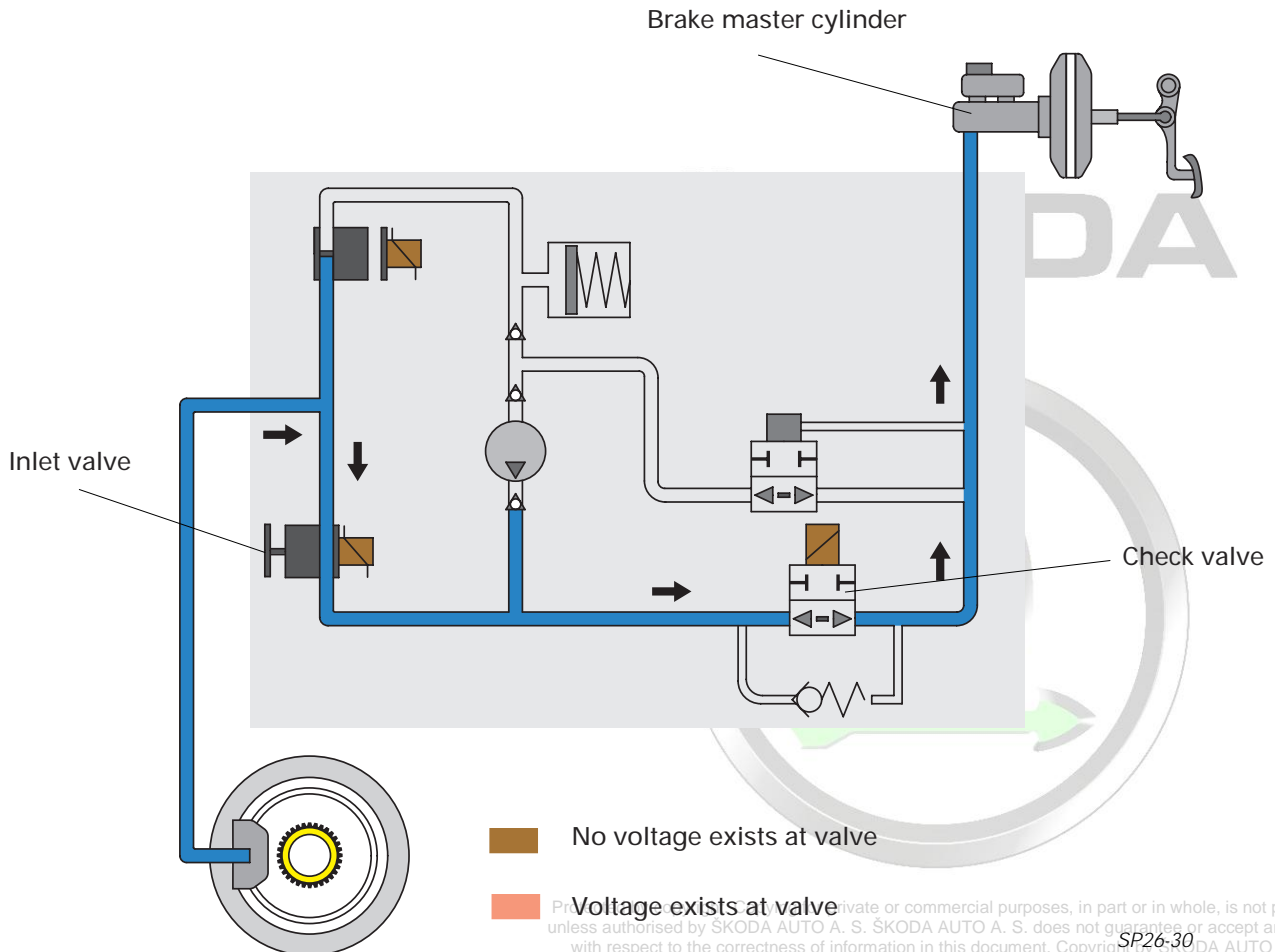
If the ABS/EDL control unit detects a decreasing acceleration tendency at a wheel on the basis of the signals supplied by the wheel speed sensor, the hydraulic pump is first of all switched off in order to avoid any further increase in pressure.

Voltage is supplied to the inlet valve and as a result the valve is **closed**.

No voltage is supplied to the outlet valve and the valve remains **closed**.

The slipping wheel continues to be braked.

## Pressure reduction phase with EDL



If the ABS/EDL control unit detects that none of the driven wheels is slipping any more during acceleration, on the basis of the signals supplied by the wheel speed sensors, voltage is no longer supplied to the inlet valve and as a result the valve is **opened**.

The check valve is likewise **opened**.

As a result, the pressure to the brake master cylinder is reduced.

The **EDL function** is completed.

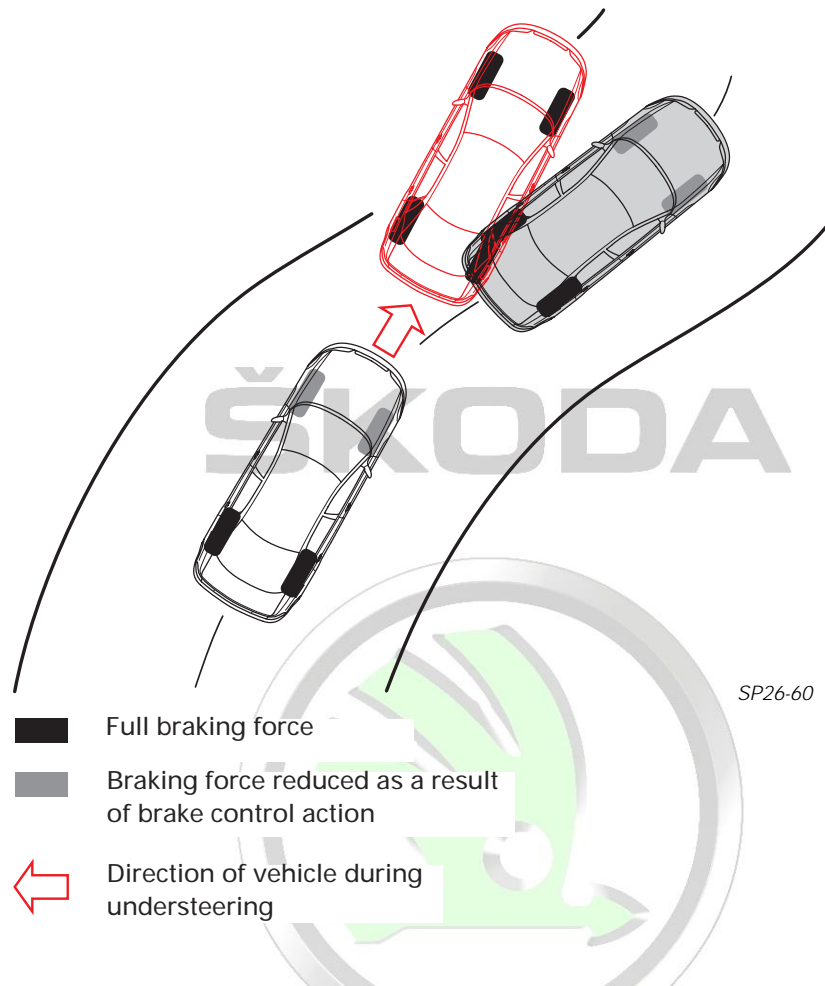


# ESBS

## Electronic Stability Brake System ESBS

The electronic stability brake system improves directional stability and the steerability of the braked vehicle by specific control actions at the brakes.

It makes use of the sensors and actuators which are familiar from the ABS system. The ESBS is a further software development in the ITT Mark 20 IE control unit.



### Understeering

If the vehicle understeers, it is pushed by the front wheels to the outside of the curve (typical for front-wheel drive vehicles).

If a vehicle understeers during a brake application, the maximum cornering force of the front wheels is exceeded. The vehicle is pushed by the front wheels to the outside of the curve.

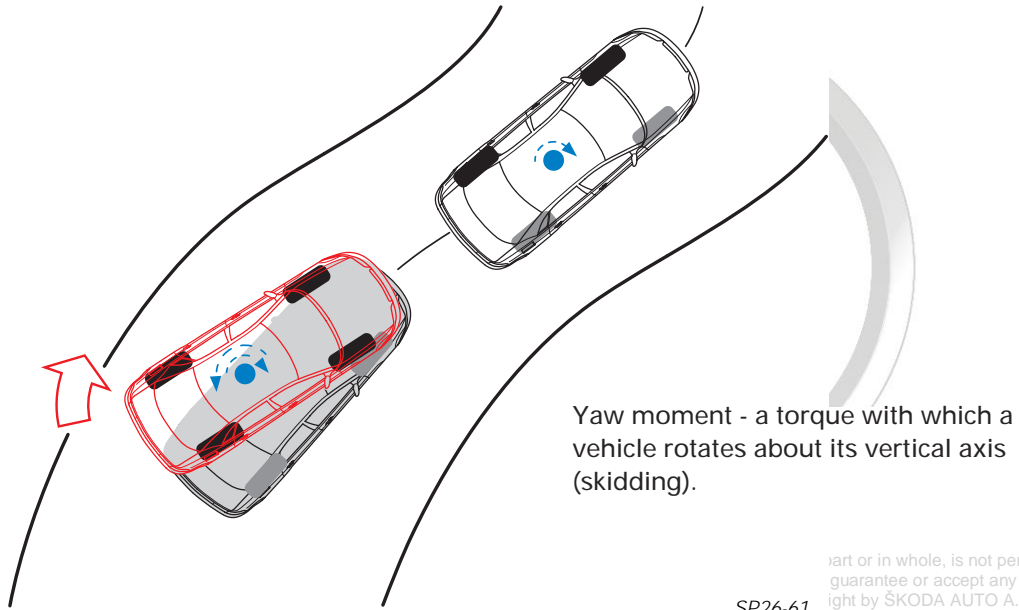
The ABS control unit detects this situation on the basis of the circumferential velocity of the wheel. Based on this, the braking force at the front wheels is reduced in order to in turn increase the cornering forces. The vehicle is stabilised and follows the desired steered direction.



**Note:**

The driving situations of oversteering and understeering can, in certain circumstances, also occur the other way around, in other words a front-wheel drive vehicle may oversteer or a rear-wheel drive vehicle may understeer.

Both are critical driving situations which pose problems as a rule even for skilled drivers. What they represent is in fact an undesired variation from the set course of the vehicle.



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- Full braking force
- Braking force reduced as a result of brake control action
- Movement of vehicle during oversteering
- Vertical axis of vehicle
- Yaw moment
- Counteracting yaw moment (= correction moment)

**Oversteering**

When a vehicle oversteers, the rear of the vehicle breaks away to the outer edge of the corner (typical for rear-wheel drive vehicles).

If a vehicle oversteers during a brake application, the maximum cornering force of the rear wheels is exceeded. The vehicle breaks away at the rear wheels to the outside of the corner.

The ABS control unit detects this situation on the basis of the reduced rotational velocity at the rear wheels and reduces the braking force at the inside wheels.

The cornering forces at the inside wheels are increased; this reduces a counteracting yaw moment and the vehicle is thus stabilised.



**Note:**

It is not possible to either diagnose or rectify a fault in the ESBS functions as it is not possible to simulate the vehicle dynamics with workshop tools.

**New!**

## EBC – Engine Braking Control - an additional function of the ABS

This additional function is made possible by networking the electronic control units of the ABS system and the engine. The software of the two control units has been enlarged accordingly.

This is envisaged in the OCTAVIA for Model Year 99 for diesel engines and turbodiesel engines.

### Why have engine braking control?

When decelerating, the engine produces a braking torque which acts on the driven wheels and brakes the vehicle (= braking with the engine).

On a smooth road surface, when the driver eases off the accelerator or shifts down, this braking torque may be sufficient to cause the driven wheels to lock. The "engine brake" reacts too sharply.

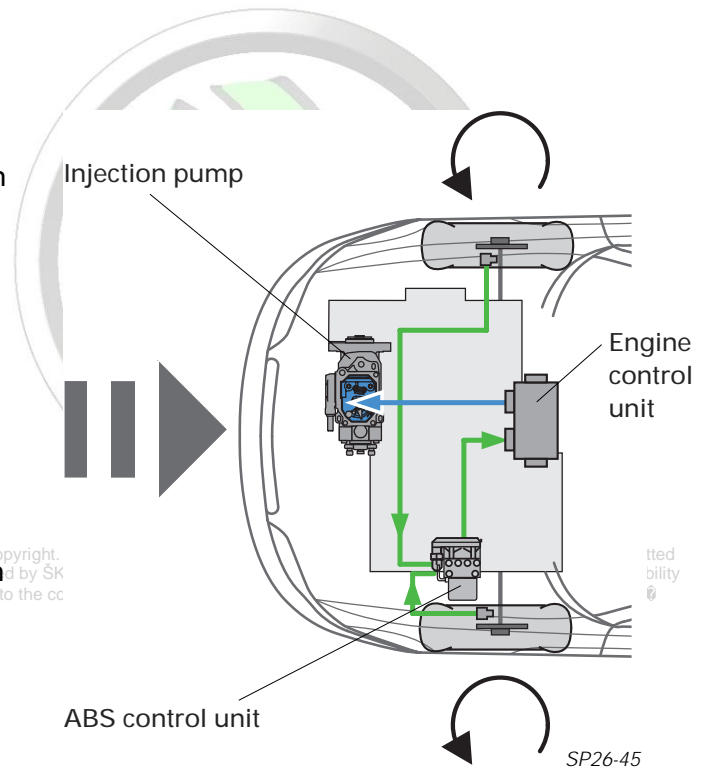
### Function of EDC control

The ABS sensors and electronic control detect that there is a tendency for the driven wheels to lock.

A message is sent over the CAN databus to the engine control unit, to increase the engine speed.

The engine control unit immediately implements this message and the engine speed is increased sufficiently to reduce the braking torque of the engine to a very low level so that the driven wheels no longer tend to lock and the vehicle can be decelerated stable.

The engine braking control operates over the entire speed range of the engine.



**Note:**  
As a result of the electronic intervention of the engine control unit (electronic throttle operation) the engine speed can be increased without any problem.

## Information with other systems now over databus

You will already be familiar with the fact, for example, that the engine control unit communicates with other vehicle systems such as the running gear and automatic gearbox; in other words that a transfer of information takes place.

This information transfer generally takes place over separate wires.

On certain engine systems, as on the 1.8-ltr. turbo engine, a CAN BUS is used for the information transfer (you will already be familiar with the CAN BUS in the OCTAVIA from the convenience electronics system).

The ABS control unit has been adapted to this information transfer and now has 2 connections for the CAN BUS H and CAN BUS L.

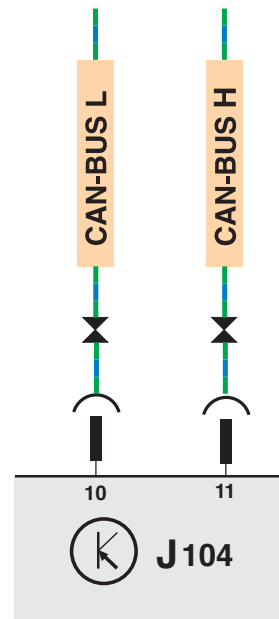
The following electronic systems of the vehicle are interlinked through the CAN BUS H and CAN BUS L

- Motronic control unit
- ABS control unit
- Automatic gearbox control unit.

The link makes use of a twisted 2-wire cable. The control unit communication is known as the databus drive.

On models with a manual gearbox, in other words not fitted with the automatic gearbox control unit, the ABS and the engine control units are linked through the CAN BUS.

**New!**

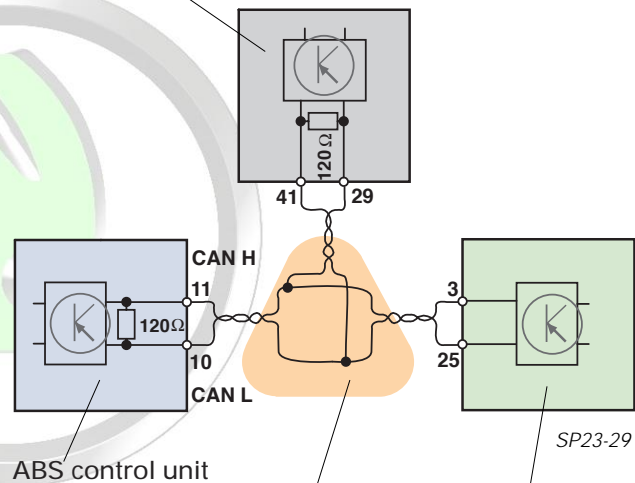


SP26-21

J104 = ABS/EDL control unit

SKODA

Motronic control unit



SP23-29

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**Note:**  
You can find more detailed information on the CAN BUS in Self Study Programme 24.

Automatic gearbox control unit

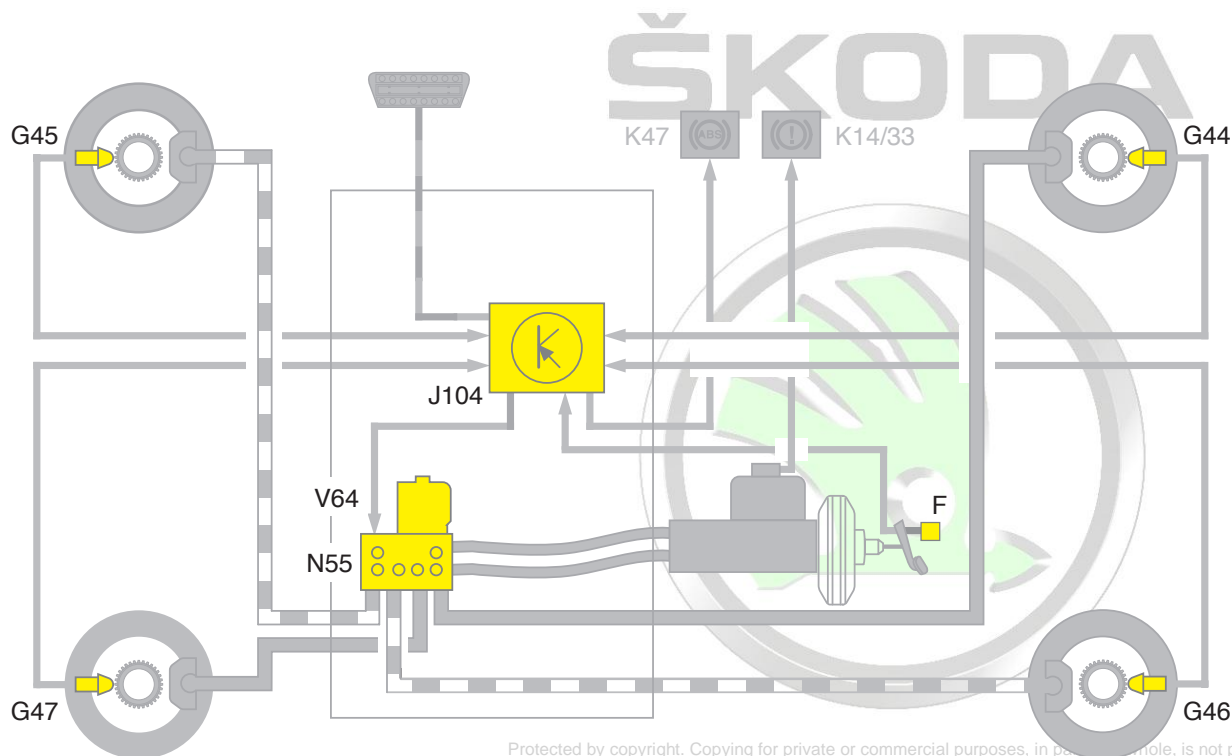
# ABS Self Diagnosis

## The self-diagnosis

electronically monitors

- the signals of the sensors
- the operation of the actuators and
- conducts a self-check of the control unit

The colour-coded sensors and actuators shown below are integrated in the monitoring system and in the electrical test.



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The tests are conducted with the vehicle system tester V.A.G 1552, the fault reader V.A.G 1551 or with the vehicle diagnosis, measuring and information system VAS 5051.

### Address word: 03 - Brake electronics

- The following functions are available
- 01 - Interrogating control unit version
  - 02 - Interrogating fault memory
  - 03 - Final control diagnosis
  - 04 - Basic setting
  - 05 - Erasing fault memory
  - 06 - Ending output
  - 07 - Coding control unit
  - 08 - Reading measured value block

The ABS control unit J104 permanently monitors the ABS and ABS/EDL systems and stores any possible faults.

The fault memory is read as part of the maintenance service/inspection.

The hydraulic pump can be tested in function 03 - Final control diagnosis, as part of the electrical test.

In addition, the function of the brake circuits can be tested (assignment of brake lines to wheel brakes, operation of valves).



### Note:

Please refer to the Workshop Manual OCTAVIA Running Gear for the exact procedure for self-diagnosis of ABS and for all the service operations.

## Service work on the ABS

The ABS and the additional functions are part of the active vehicle safety systems.

All the service operations require system knowledge.

In particular, before commencing service work, it is important to check the two warning lamps which indicate faults

- ABS warning light
- handbrake/brake fluid level warning light.

Use the vehicle system tester V.A.G 1552 for conducting specific fault finding.



SP26-55

Certain tests - e.g. final control diagnosis - necessitate raising the vehicle and rotating the wheels. A second fitter is required for these tests.

On vehicles fitted with ABS/EDL, initiate function 04 - Basic setting for bleeding the brake system/hydraulic unit.

A road test is essential as, for example, certain system faults are not detected until the vehicle has been restarted and has reached a speed of more than 20 km/h.

During the road test, carry out a controlled brake application at least once (this can be detected from the "pulsing" of the brake pedal).

Certain rules of conduct have to be adhered to before carrying out welding work on the vehicle with electric welding equipment as welding may affect the ABS system.

### Warning functions of the warning lights

Indication	Meaning
	Brake fluid level too low or handbrake applied.
	Operational fault in ABS or ABS/EDL, ABS switched off. Brake servo assistance retained.
	ABS and EBD failed, expect different braking characteristics (brake pressure at the rear wheels is no longer controlled).

The rule which applies to both warning lights is:

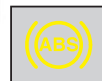
Both come on for a few seconds after the ignition is switched on - self-check.



Brake fluid level too low or handbrake applied.



Operational fault in ABS or ABS/EDL, ABS switched off. Brake servo assistance retained.



ABS and EBD failed, expect different braking characteristics (brake pressure at the rear wheels is no longer controlled).

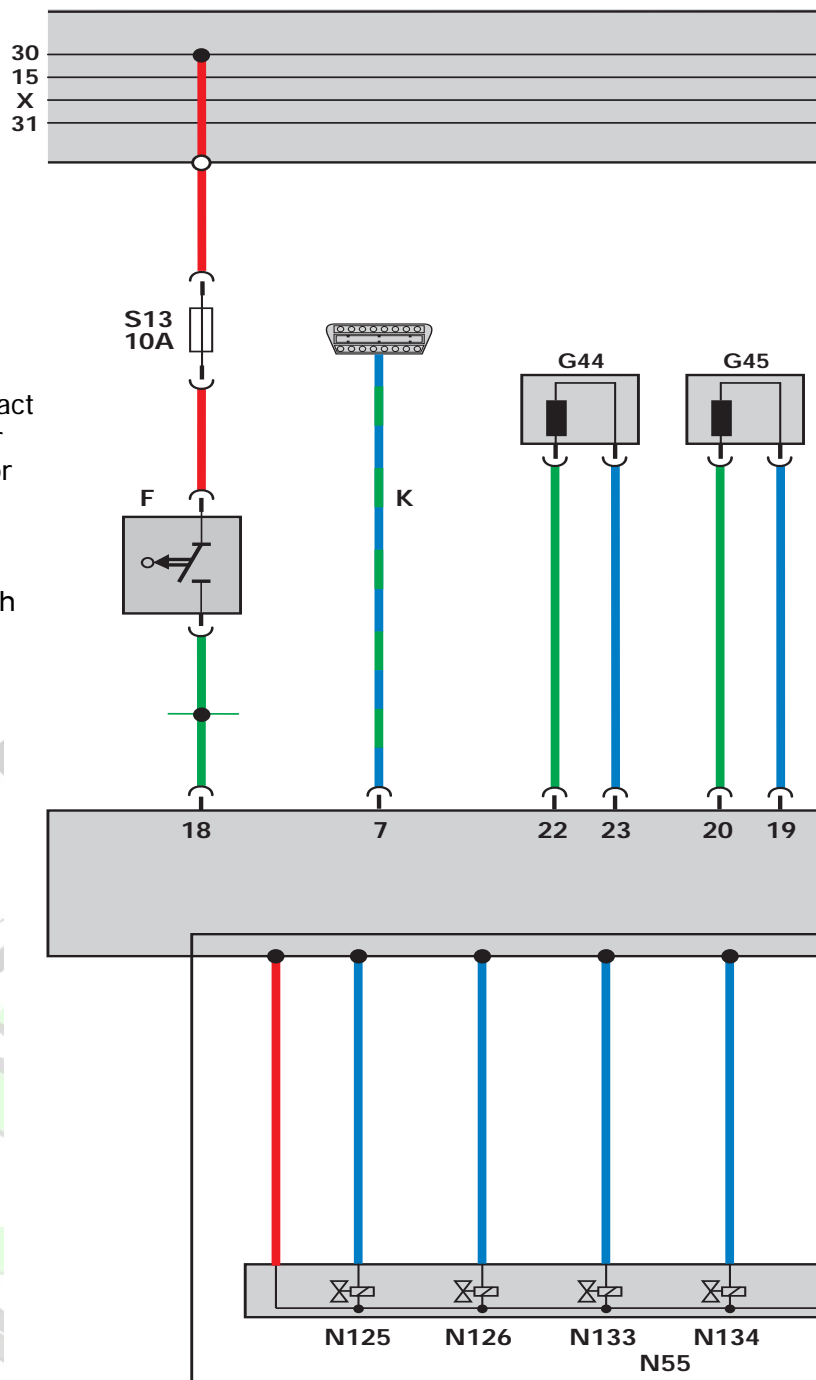


# ABS/EDL Function Diagram

The function diagram represents a simplified current flow diagram and shows the linkage of all the system components of the antilock brake system.

## Components

- F Brake light switch
- F9 Handbrake indicator switch
- F34 Brake fluid level warning contact
- G44 Rear right wheel speed sensor
- G45 Front right wheel speed sensor
- G46 Rear left wheel speed sensor
- G47 Front left wheel speed sensor
- J104 ABS/EDL control unit
- J218 Combination processor in dash panel insert
- K Diagnosis line
- K14/33 Handbrake/brake fluid level warning light
- K47 ABS warning light
- N55 ABS hydraulic unit
- N99 Front right ABS inlet valve
- N100 Front right ABS outlet valve
- N101 Front left ABS inlet valve
- N102 Front left ABS outlet valve
- N125 Differential lock valve 1
- N126 Differential lock lock valve 2
- N133 Rear right ABS inlet valve
- N134 Rear left ABS inlet valve
- N135 Rear right ABS outlet valve
- N136 Rear left ABS outlet valve
- V64 ABS hydraulic pump
- S Fuses



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31

## Colour coding/Legend



= Diagnostic connection



Input signal



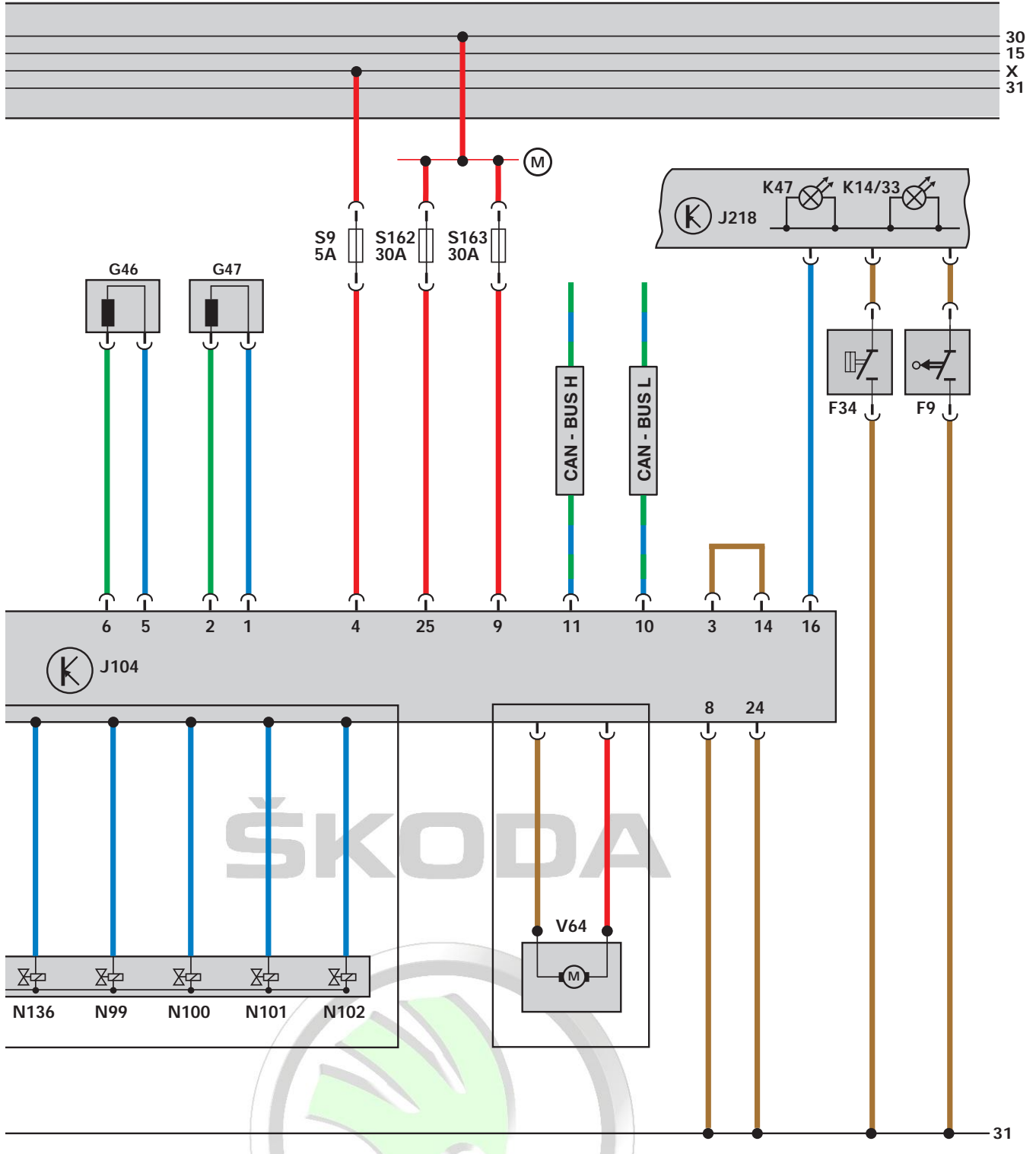
Output signal



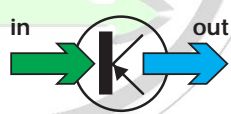
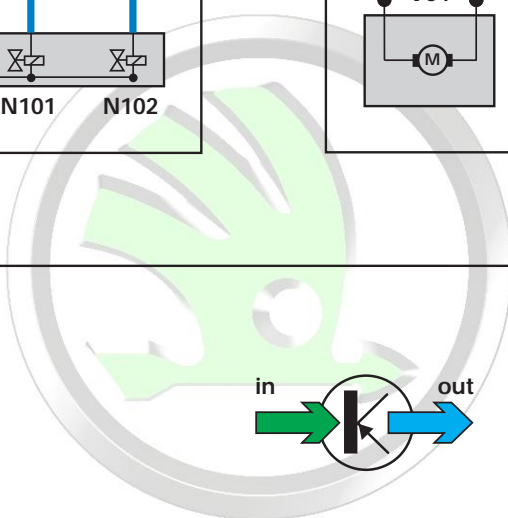
Battery positive



Earth



ŠKODA



30  
15  
X  
31

SP26-2

# Pedal Assembly

## Crash optimised pedal assembly

New!

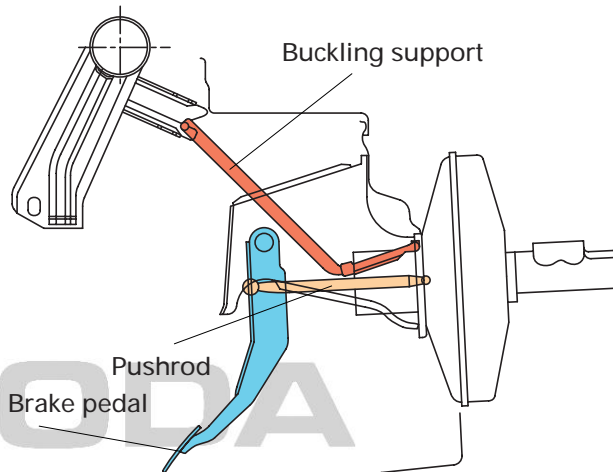
### Task and function

The feet of the occupants are at risk if the vehicle structure is severely deformed during a severe frontal collision.

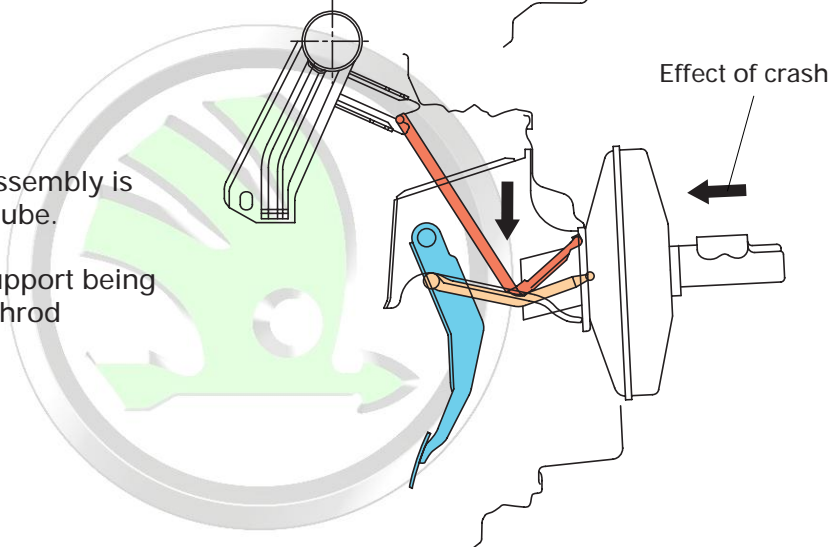
That is why the brake pedal swivels out of the foot area in order to reduce the likelihood of injuries to the feet of the occupants.

This swivelling action is initiated by a buckling support.

The function is determined by the deformation of the bulkhead. It is active irrespective of the operation of the brake pedal.

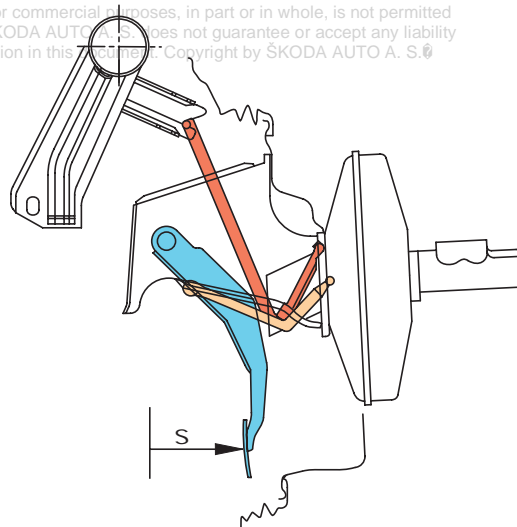


- In a frontal crash, the pedal assembly is displaced toward the central tube.
- This results in the buckling support being deflected followed by the pushrod buckling.



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- The pedal plate is swivelled out of the way by the excursion "s" (as much as 170 mm).
- The angular motion of the braking foot is minimised by the buckling of the pushrod and by the deformation work which is produced as a result.
- The acceleration forces which normally occur (braking foot) are considerably reduced.



SP26-59

# ABS KNOWLEDGE

## KNOWLEDGE

### on abbreviations relating to vehicle dynamics

The abbreviations relating to the vehicle dynamic systems differ from manufacturer and model.

The different abbreviations often in reality conceal identical functions.

The overview below of current abbreviations is designed to provide you with an aid.



SP26-20

System		Function
<b>ABS</b>	<b>Antilock Brake System</b>	Prevents the wheels from locking during brake application. Permits high braking forces while maintaining directional stability and steerability.
<b>ASR</b> <b>ASC</b> <b>ASC+T</b> <b>TCP</b> <b>TCS</b>	<b>Acceleration Slip Regulation</b> <b>Automatic Stability Control</b> <b>Automatic Stability Control+Traction</b> <b>Traction Control Plus</b> <b>Traction Control System</b>	Prevents the driven wheels from slipping by controlling the brakes and the engine management system. Prevents the vehicle from understeering or oversteering when cornering.
<b>DSA</b>	<b>Dynamic SAfety</b>	Stabilises the vehicle during brake applications and prevents the vehicle breaking away by altering the wheel tow of the wheel with the best adhesion.
<b>EDS</b> <b>ETS</b>	<b>Electronic Differential Lock</b> <b>Electronic Traction System</b>	Permits optimal starting-off on different road surface conditions by braking the slipping wheel.
<b>ALD</b>	<b>Automatic Locking Differential</b>	Permits optimal starting-off on different road surface conditions by means of a multi-plate lock in the differential.
<b>EBD</b>	<b>Electronic Brake pressure Distribution</b>	Adapts the braking action of the front and rear wheels to the particular driving situation.
<b>ESBS</b>	<b>Electronic Stability Brake System</b>	Minimises understeering or oversteering if the vehicle is braked when cornering, improves directional stability and steerability.

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# Side Airbags

## Task and function

In a side impact, only a limited distance is available for the deformation at the vehicle - namely the constructional depth of the door.

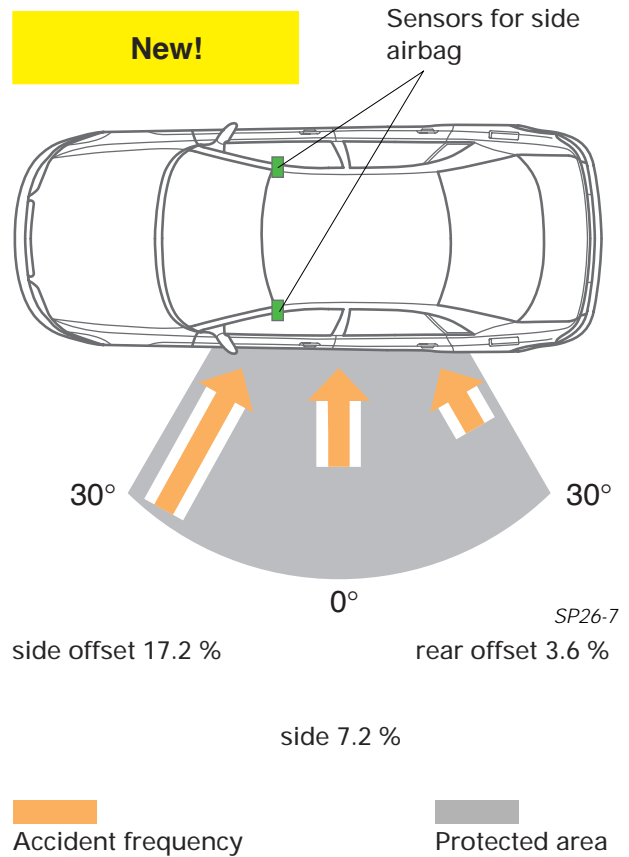
Accident statistics reveal that more than 25 % of all accidents affect the side of the vehicle. The consequences of such accidents are considerable because the crumple zone and the seat belts primarily offer protection in frontal and offset collisions.

The measures for side impact protection which are offered as standard on the ŠKODA OCTAVIA include

- door stiffeners,
- tubular stiffener in the lower door sill,
- foam-lined side impact cushion in the doors for hip and rib area

and are now optionally supplemented by means of side airbags for driver and front passenger.

The side airbags considerably reduce the injuries to the upper body in an accident.



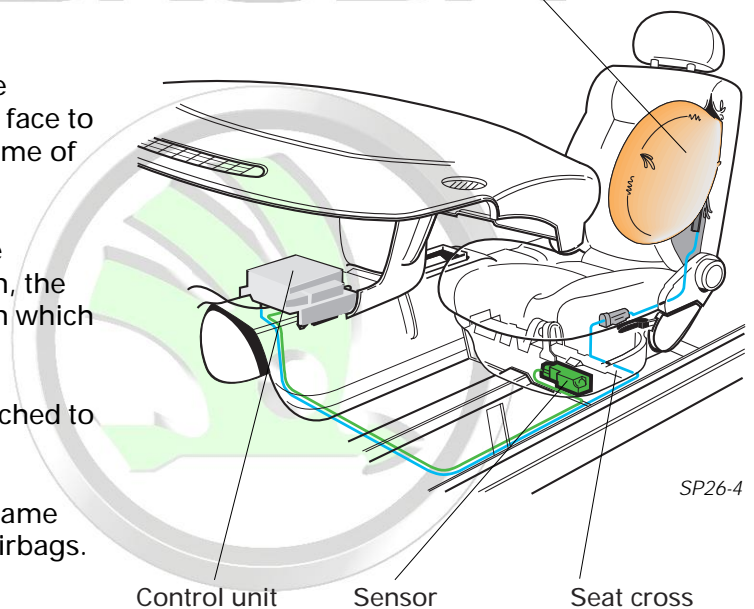
ŠKODA Side airbag

The side airbags are located in the side bolsters of the stable front seats which face to the outside. The side airbag has a volume of 12 litres.

In the event of a side impact within the protected area shown in the illustration, the side airbag on the side of the vehicle on which the impact occurs, is activated.

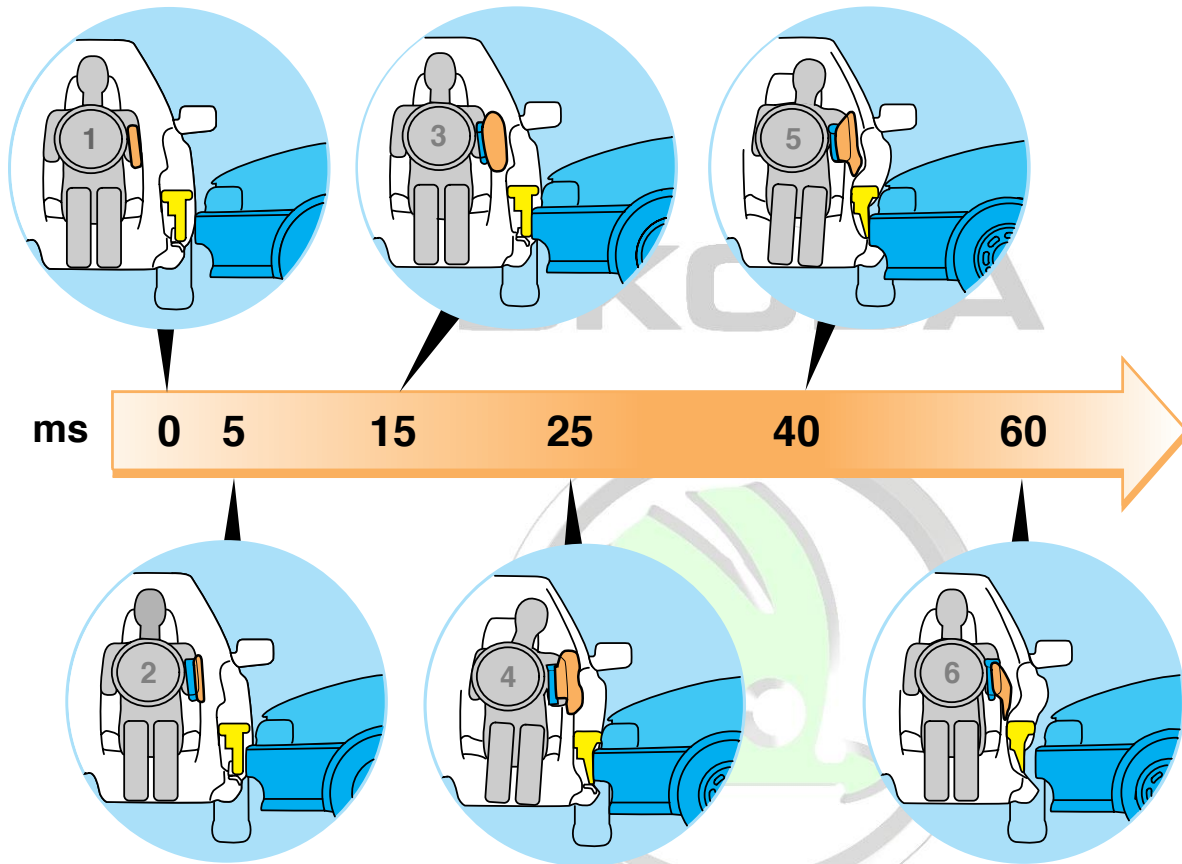
The sensors for the side airbag are attached to the cross members of the front seats.

The side airbags are deployed by the same control unit which activates the front airbags.



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The deployment of the side airbag plotted over time - six phases are characteristic.



SP26-8

The technical problem which is encountered in developing the side airbags is the fact that they must inflate even more rapidly than the front airbags, and the sensor has to be able to reliably detect a side impact.

As a result of the electronic analysis, it is possible for the side airbags to provide their protective function in an accident within only 15 ms.



**Note:**

The sensor reacts only to an impact from the side or offset at the side, where the protective function requires to be provided. Frontal, offset and rear collisions are not registered.

0 ms Collision - the vehicle suffers a side impact

5 ms The electronic sensor signals the side impact to the control unit and the appropriate side airbag is ignited

15 ms The side airbag is inflated and has assumed its protective position

25 ms The occupant is cushioned by the side airbag

40 ms The side airbag deflates

60 ms The occupant moves back away from the side wall of the vehicle

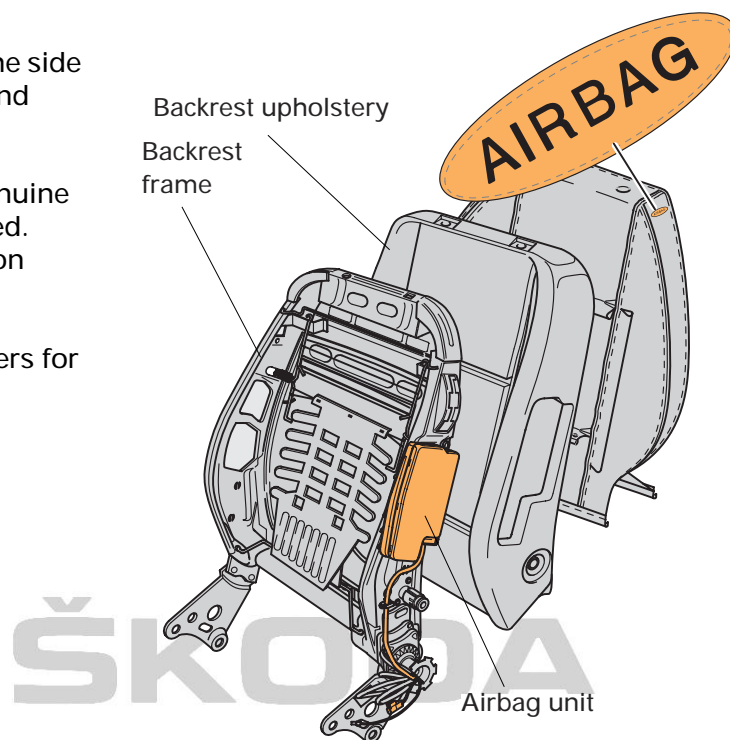
# Side Airbag

## Service work

The safety precautions which apply to the side airbags are the same as for the driver and passenger airbags.

When carrying out repair work, only genuine seat covers for the backrest may be fitted. These are recognizable from the sewn-on inscription "AIRBAG".

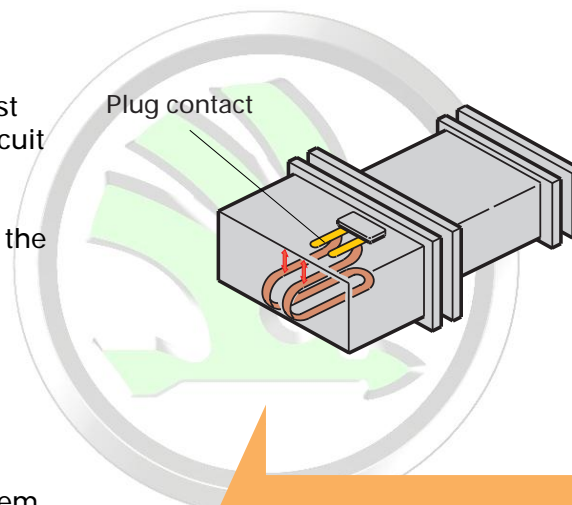
It is not permitted to use protective covers for the backrest.



SP26-9

The plug connections are protected against inadvertent triggering by flexible short-circuit bridges.

If an electrical connection is activated, the plug contact positioned in the direction of the airbag is short-circuited by means of a resilient metal loop.



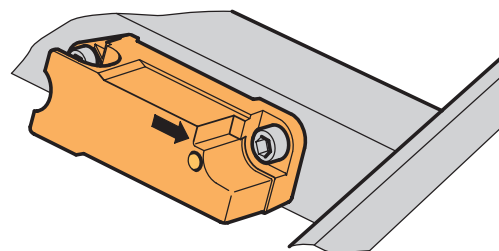
SP26-10

The propellant charge and the airbag system control unit have an operating life of 15 years.

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**Limited service life!**

The sensor for the lateral acceleration is identical for the left and right sides. When installing, note: The arrow faces out toward the door!



SP26-57



## Self-diagnosis

As a basic rule, it is only permitted to use the vehicle system tester V.A.G 1552, the fault reader V.A.G 1551 or the vehicle diagnosis, measuring and information system VAS 5051 for conducting tests.



**Warning!**  
Carry out only a visual inspection of the wiring!  
Do not conduct any electrical continuity test or measurement in the ignition circuits!  
Do not inspect wiring unless the ignition is switched off!

The airbag control unit J234 which controls the front airbags and the side airbags is equipped with a fault memory.

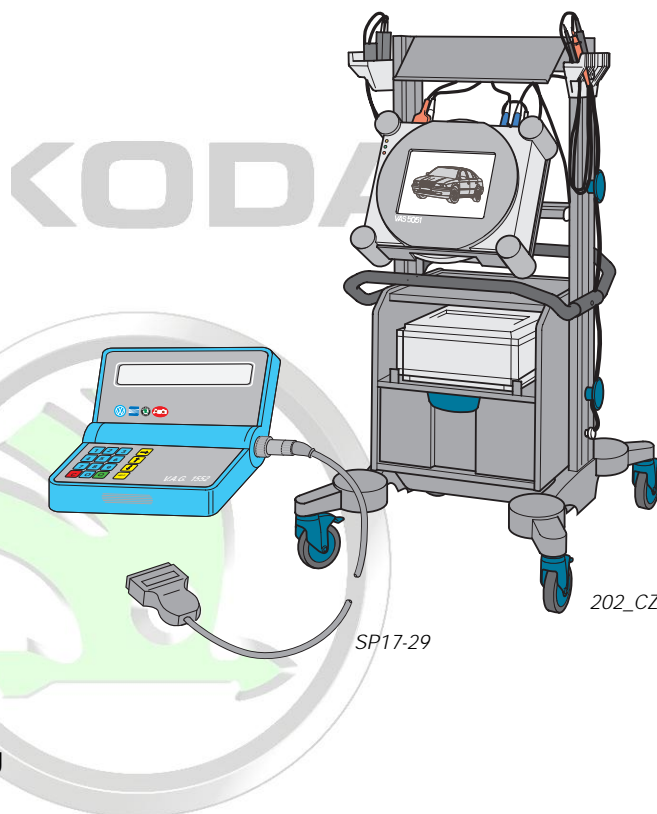
It detects faults and malfunctions in the airbag system.

The following functions are available for the complete airbag system:

- 01 - Interrogating control unit version
- 02 - Interrogating fault memory
- 03 - Final control diagnosis
- 05 - Erasing fault memory
- 06 - Ending output
- 07 - Coding control unit
- 08 - Reading measured value block
- 10 - Adaptation

The airbag warning light K75 is integrated in the operational test.

This light comes on for about 4 seconds after the ignition is switched on, and then goes out. If it does not go out, there is a fault in the supply voltage for the control unit. Interrogate the fault memory in this case. If the warning light comes on again, this also indicates a fault. Interrogate the fault memory. If the warning light constantly flashes, it is then necessary to replace the control unit.

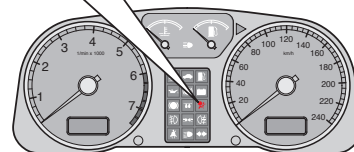


SP17-29

202\_CZ\_002



Airbag warning light



SP26-11



### Note:

Please refer to the Workshop Manual OCTAVIA Body Removal and Fitting Work for the exact procedure for self-diagnosis.

You will also find information regarding deactivating the passenger airbag in this document.

# Side Airbag

## Function diagram

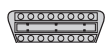
The function diagram presents a simplified current flow diagram. It shows the linkage of all the system components of the airbag system with driver airbag, passenger airbag, side airbag for driver side and passenger side.

## Components

D	Ignition/starter switch
F138	Airbag coil connector/return spring with slip ring
G179	Side airbag crash sensor, driver's side
G180	Side airbag crash sensor, front passenger's side
J218	Combination processor in dash panel insert
J234	Airbag control unit (with deployment sensors)
J393	Convenience system central control unit
K75	Airbag warning light (in dash panel insert)
N95	Airbag igniter - driver's side
N131	Airbag igniter - front passenger's side
N199	Side airbag igniter - driver's side
N200	Side airbag igniter - front passenger's side

# ŠKODA

## Legend



Diagnostic connection



Earth bridges

## Colour coding



Input signal



Output signal



Positive



Earth

## Earth connection



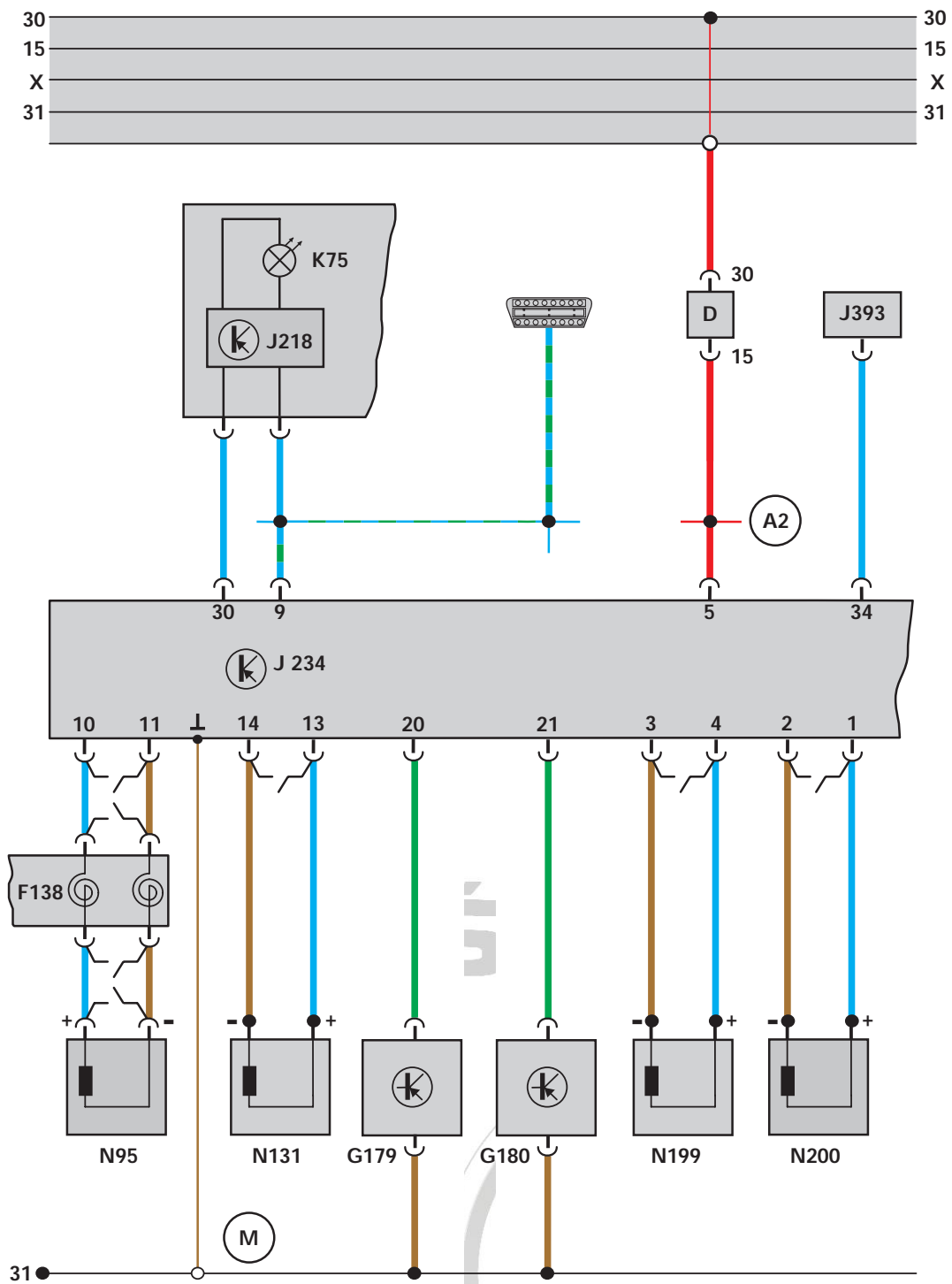
= Earth connection of airbag control unit by means of 3 bolts on floor tunnel

## Positive connection

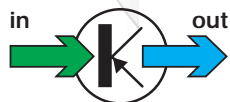


= Positive connection -15- in wiring loom

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SP26-6

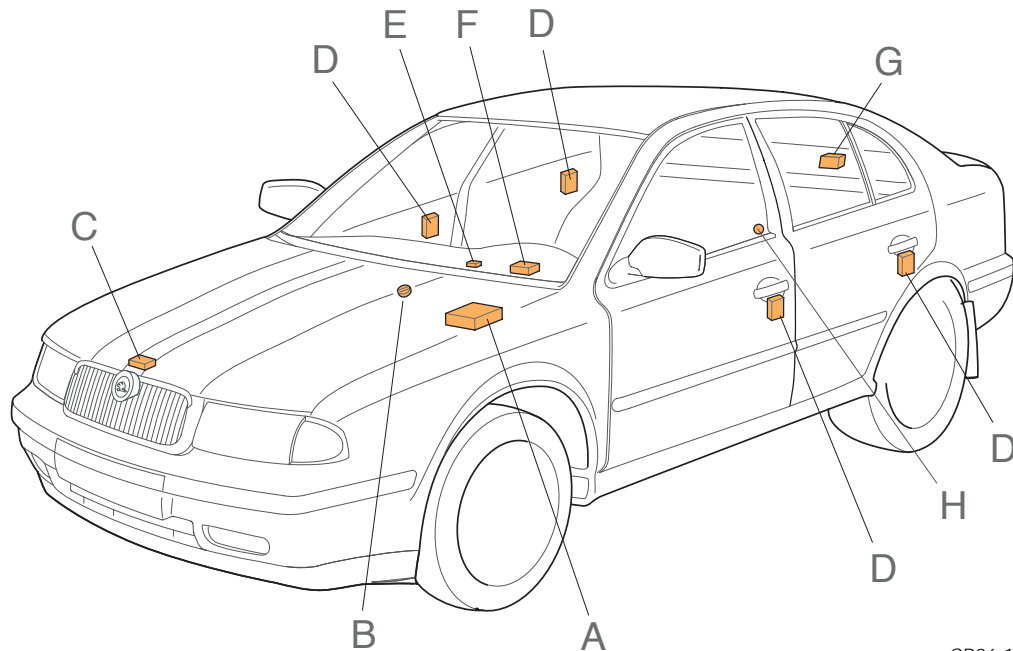


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# Alarm System

## Anti-theft alarm system with interior monitor

New!



SP26-15

The anti-theft alarm system with interior monitor is part of a further generation of the vehicle convenience system.

The anti-theft alarm system monitors the following parts of the vehicle:

- all the doors
- tailgate
- bonnet
- ignition lock
- interior of vehicle

The warning system is automatically switched on when the driver's door or the tailgate is locked.

This is done by means of the car key or by the radio remote control if a locking operation is performed.

If you wish to lock the vehicle without switching on the warning system, the locking operation must then be performed twice within 5 seconds.

### System components

The existing components of the convenience system and the additional components are interlinked for the anti-theft alarm. The additional components are shown encircled.

- A Convenience system central control unit J393
- B** Anti-theft alarm signal horn H 8
- C** Bonnet contact switch F120 in lock of bonnet
- D Rotary tumbler switch in door locks
- E** Interior motion sensor G273
- F Ignition lock
- G Contact switch in lock cylinder of tailgate
- H Central locking warning light K133

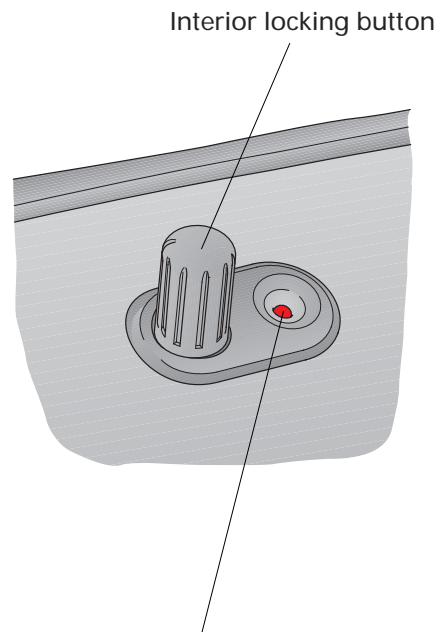
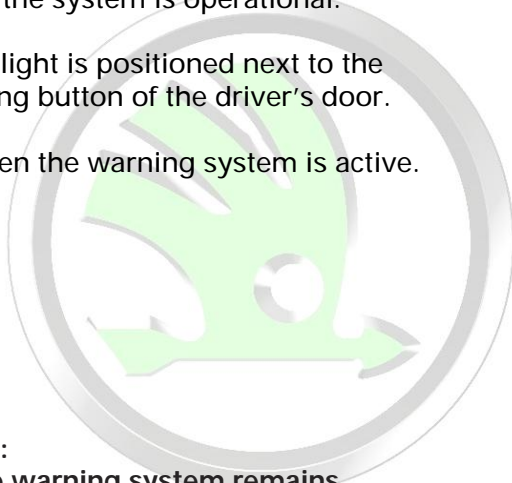
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## Indication of anti-theft alarm operational

When the anti-theft alarm system is switched on, all the turn signal lights flash once to indicate that the system is operational.

An indicator light is positioned next to the interior locking button of the driver's door.

It flashes when the warning system is active.



SP26-14



### Note:

**If the warning system remains activated over a lengthy period, the warning light goes out after 28 days.**

**This ensures that no current is drawn from the car battery if the car is parked for a lengthy period. The system itself remains operational.**

## The alarm signal

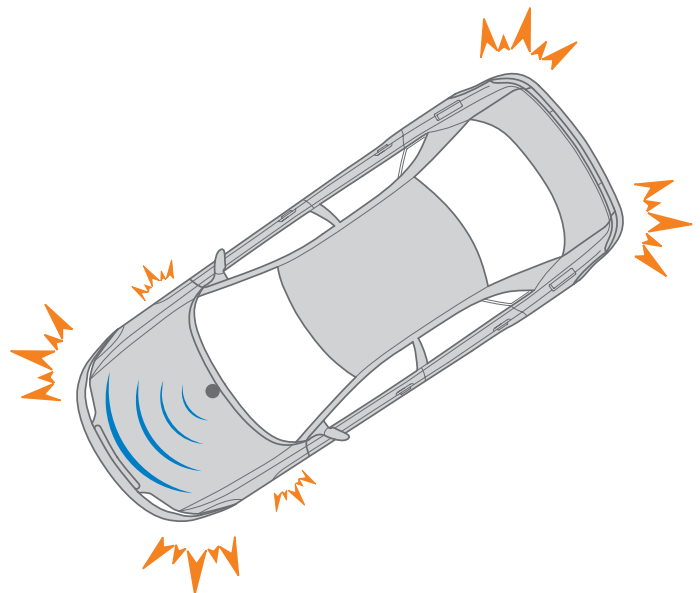
The sensors of the anti-theft alarm system signal an unauthorized attempt to enter the car to the central control unit if

- a door is opened
- the tailgate is opened
- the bonnet is opened
- the ignition is switched on
- the side windows of the car are smashed in.

The control unit activates all the turn signal lights of the vehicle and the alarm horn.

The visual and audible alarm sounds for approx. 30 seconds.

If a further attempt is made to break into the car after this period, the alarm is once again triggered.



SP26-16

# Alarm System



## Interior monitor

### Operating principle

The interior motion sensor G273, a microwave sensor, monitors the interior of the vehicle. It creates a cubic monitored area in the interior of the car.

The sensor detects any changes within this monitored area.

The motion alarm system reacts if there is a breach of the integrity of the space, for example an attempt to break into the car if the windows of the car are smashed in.

### Design

#### Components of the motion alarm system

- convenience system control unit J393
- interior motion sensor G273

The sensor is attached in the middle of the car by an angle bracket to the console of the glove compartment. It is located behind the ashtray.

The motion alarm signal is an addition to the anti-theft alarm system and is activated together with the latter.

The anti-theft alarm system and motion alarm system interact.

#### Switching off the interior motion sensor

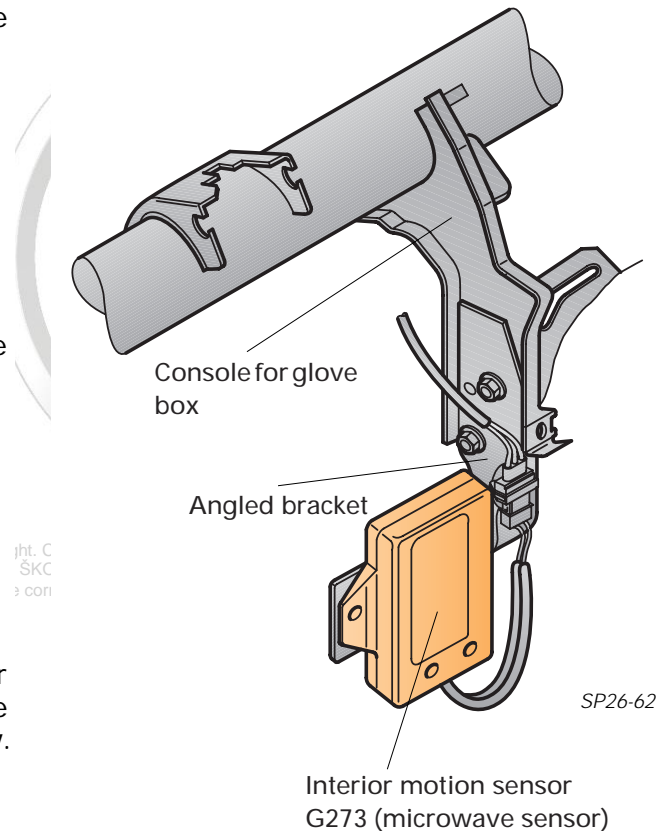
It is possible to switch off the interior motion sensor manually when the anti-theft alarm is activated.

To do this, press the remote control "closed" twice.

The anti-theft alarm then operates without the interior motion sensor.

This programme must be coded separately in the convenience system central control unit, this being done with address word 46, function 10 - Adaptation, channel 05.

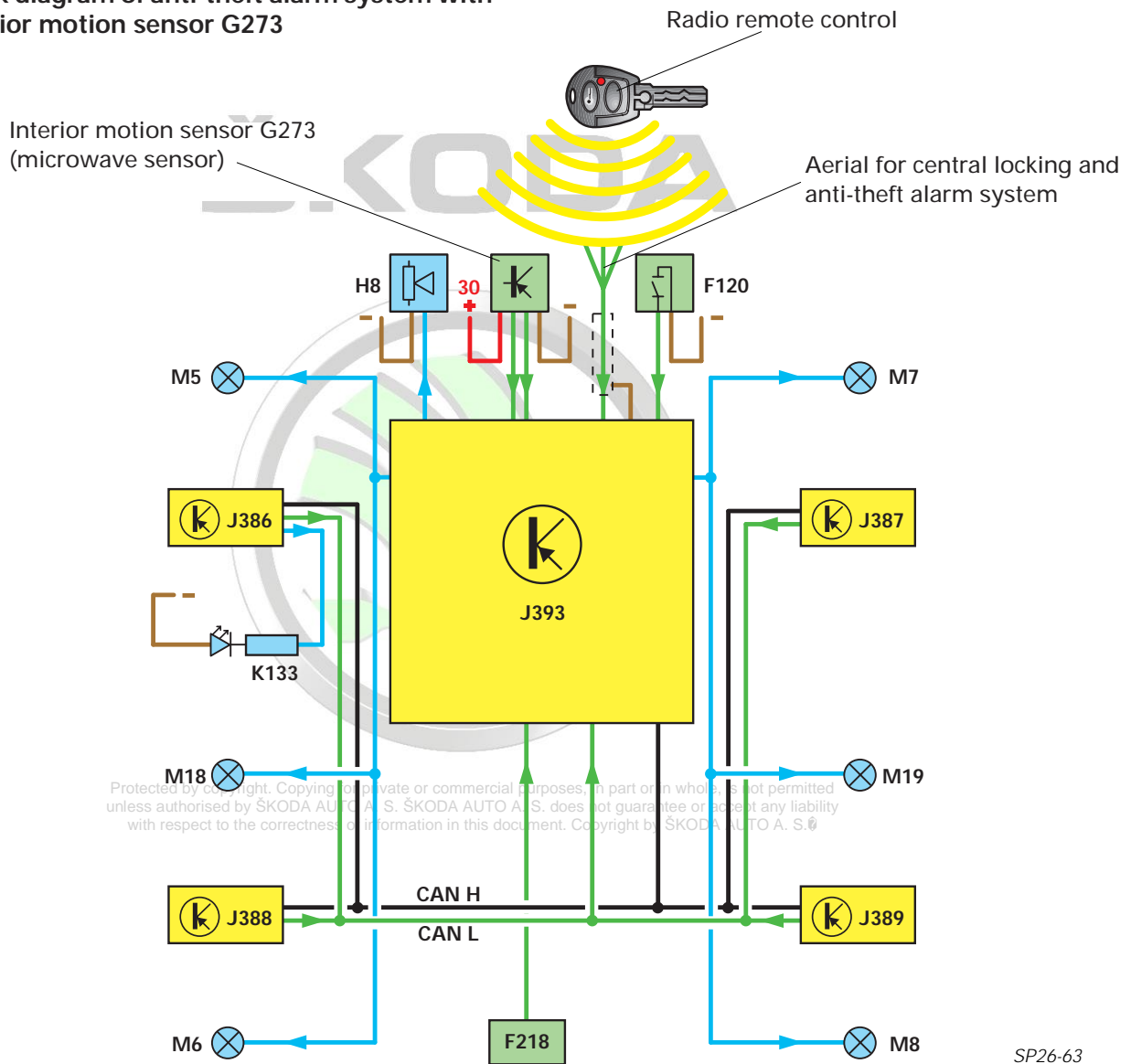
The procedure is described in the Workshop Manual.



#### Note:

A certain period of time elapses from switching on the monitoring system until it is operationally ready. During this time, the microwave sensor creates its cubic monitored area and carries out a self-check. The time period is displayed visually by the flashing frequency of the indicator light. The light begins with a higher frequency and after about 30 seconds continues flashing with a lower frequency. The system is then activated.

## Block diagram of anti-theft alarm system with interior motion sensor G273



SP26-63

### Sensors

- Aerial of radio remote control
- Interior motion sensor G273
- Control units J386, J387, J388, J389 in the doors
- Bonnet contact switch F120
- Tailgate central locking switch F218

### Actuators

- Anti-theft alarm signal horn H8
- Turn signal lights M5, M6, M7, M8, M18, M19
- Central locking warning light K133

### Note:

The information from the door control units passes over the CAN BUS.  
The interior motion sensor, alarm horn and bonnet contact switch are connected to the convenience system central control unit over direct cables.



# Alarm System

## Self-diagnosis

The anti-theft alarm system with the interior motion sensor features a comprehensive self-diagnosis.

If faults occur at the system components, fault codes are stored in the fault memory of the control unit.

Self-diagnosis can be performed with the vehicle system tester V.A.G 1552, the fault reader V.A.G 1551 or with the vehicle diagnosis, measuring and information system VAS 5051.

**Address word: 46 - ignition switched on**  
(as for convenience system, the control unit version is enlarged by the function of the anti-theft alarm system)

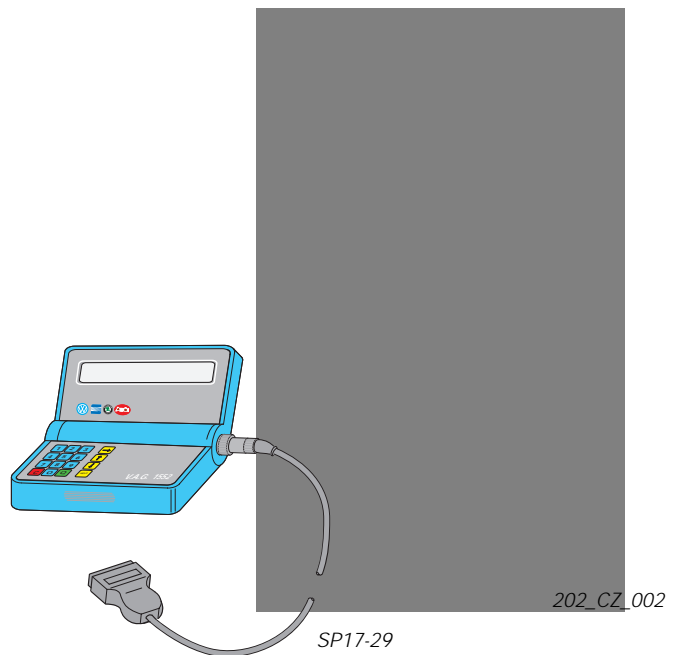
Once the link to the system has been established, it is possible to select the individual functions also with the ignition switched off.

**The following functions are available:**

- 01 - Interrogating control unit version
- 02 - Interrogating fault memory
- 03 - Final control diagnosis
- 05 - Erasing fault memory
- 06 - Ending output
- 07 - Coding control unit
- 08 - Reading measured value block
- 10 - Adaptation

You can find, for example, a list of the alarm sources in function 08 - Reading measured value block, display group 15.

Please refer to the current Workshop Manual OCTAVIA Body Removal and Fitting Work for the individual fault codes.



### Note:

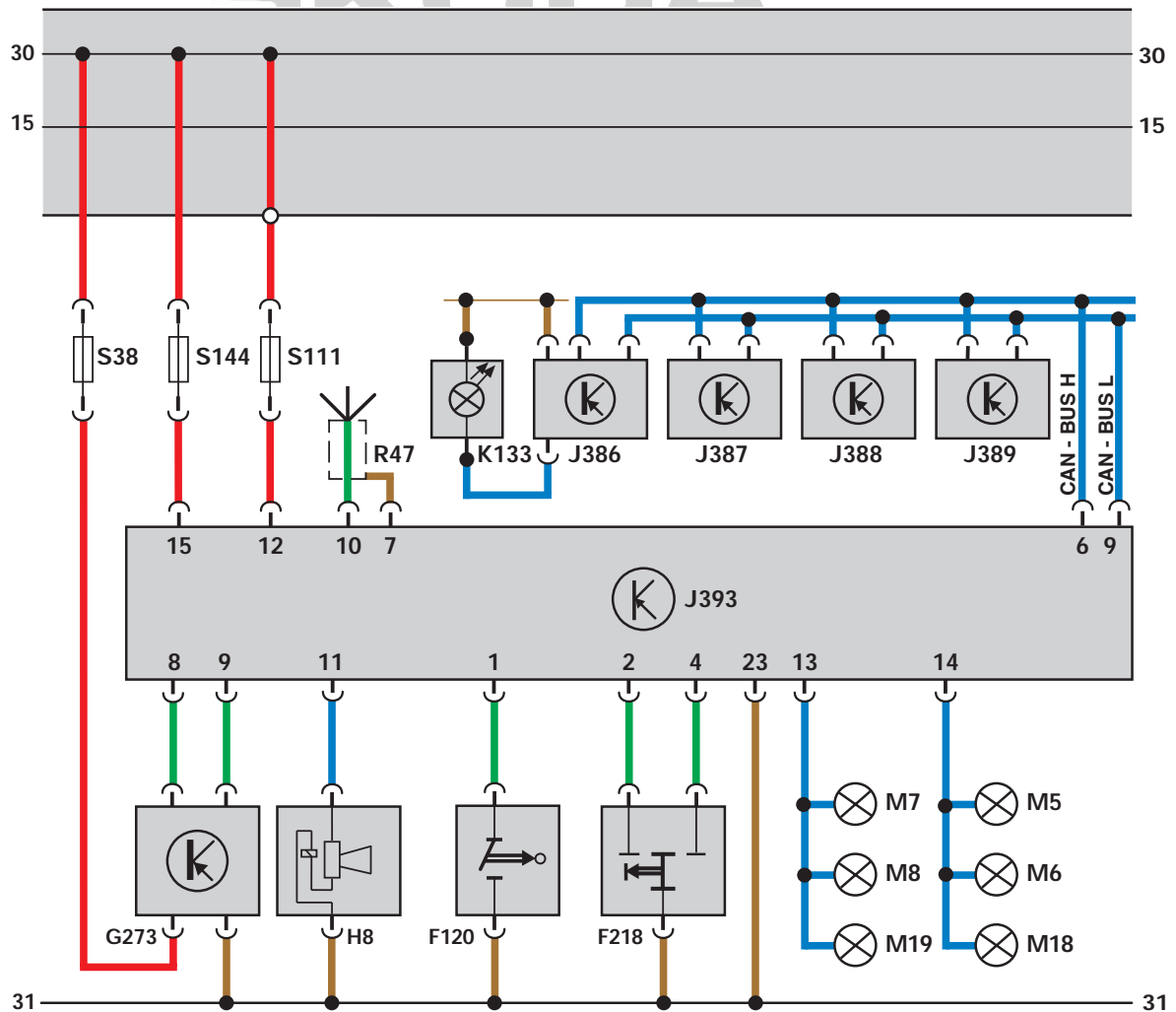
**A practical operational check of the interior motion sensor can be carried out as follows:**

- Open a side window about 10 cm.
- Lock vehicle and arm system.
- Wait until indicator light flashes slowly.
- Place your hand through the opening of the window into the monitored area of the microwave sensor.

**If the system is operating properly, the alarm will be triggered.**

## Function diagram of alarm system

The function diagram represents a simplified current flow diagram. It shows the linkage of the anti-theft alarm system to the components of the interior monitoring system and the convenience system.



SP26-64

### Legend

- Positive
- Earth
- Input signal
- Output signal

- F120 Bonnet contact switch
- F218 Tailgate central locking switch
- G273 Interior motion sensor
- H8 Anti-theft alarm signal horn
- J393 Convenience system central control unit
- K133 Central locking warning light
- S Fuse
- R47 Aerial for central locking and anti-theft alarm system

Refer to the block diagram on page 41 for the designation of the other components.

# Test Your Knowledge

Which answers are correct?

Sometimes only one.

But perhaps also more than one - or all of them!



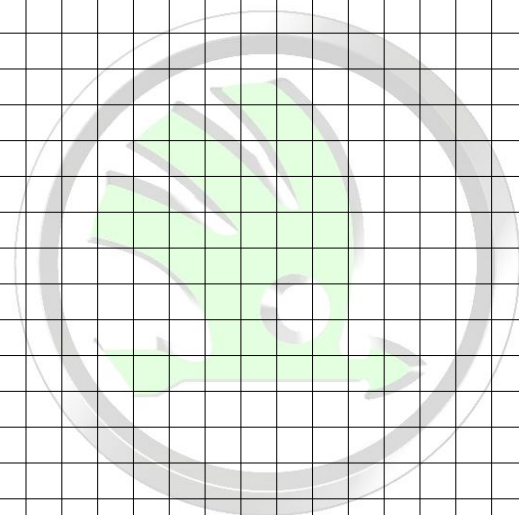
1. The new antilock brake system offers a range of additional functions. The relevant ABS unit is:
  - A. on the outside not distinguishable from the conventional ABS unit
  - B. recognizable from the longer hydraulic unit
  - C. equipped with an enlarged software for the additional functions
  
2. What are the advantages which the electronic differential lock offers?
  - A. improvement in traction on unfavourable road surfaces when braking.
  - B. improvement in traction on unfavourable road surfaces when starting off and accelerating.
  - C. offers, if need be, the effect of a mechanically locked differential.
  
3. For operational reasons, the electromagnetic inlet and outlet valves for the wheel brake are:
  - A. always open when de-energized
  - B. always closed when de-energized
  - C. inlet valve open when de-energized and outlet valve closed when de-energized
  
4. The electronic differential lock uses existing components of the ABS. These are supplemented by:
  - A. two solenoid valves in the hydraulic unit
  - B. additional wheel speed sensors at the driven axle
  - C. an enlarged software in the control unit
  
5. Each wheel is fitted with a wheel speed sensor and a pulse rotor; there is a gap between both of these components.
  - A. The gap between the pulse rotor and wheel speed sensor is of no significance for operation.
  - B. The gap influences the signal amplitude and therefore must be checked.
  - C. If the gap is excessive, the ABS control unit activates an emergency running mode.

6. The engine braking control is possible:
- A. by using the ABS sensors as additional information for the engine control unit
  - B. by enlarging the software of the control units
  - C. by interlinking the ABS and engine control units
7. Driver and front passenger seats are equipped with an airbag for side impacts. Is it necessary to replace the units after a certain vehicle operating period?
- A. These units require no maintenance and do not need to be replaced.
  - B. After a vehicle operating period of 10 years.
  - C. After a vehicle operating period of 15 years.
8. Which precautionary measures require to be taken when removing a front seat fitted with a side airbag?
- A. The earth circuit of the airbag system should be closed by using an adapter.
  - B. The fitter has to electrostatically discharge himself before separating the plug connections to avoid the airbag being activated.
  - C. The airbag control unit must be removed first of all to avoid the airbag being activated.
9. The interior monitoring system is:
- A. an additional function of the anti-theft alarm system
  - B. an optional equipment which replaces the anti-theft alarm system
  - C. active each time the vehicle is locked conventionally. For this reason, small animals must not be left in the vehicle otherwise the system would be activated.
10. The anti-theft alarm system
- A. has its own system of sensors, actuators and control.
  - B. uses the sensors and the control unit of the central locking system.
  - C. uses the sensors and the control unit of the convenience system and is enlarged by additional sensors and actuators.

1. B., C.; 2. B., C.; 3. C.; 4. A., C.; 5. B.; 6. A., B., C.; 7. C.; 8. B.; 9. A., C.; 10. C.

Answers

ŠKODA



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