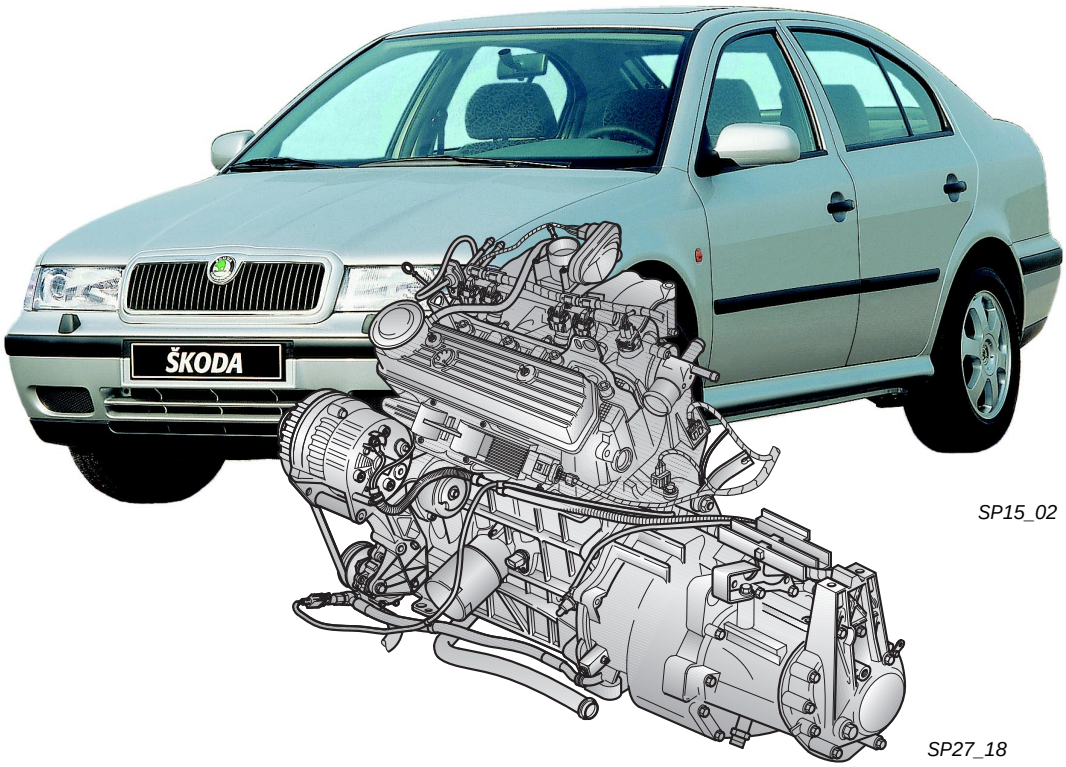
ŠKODA is enlarging its range of petrol engines in the OCTAVIA with a new 1.4-ltr. OHV engine.

This compact and lightweight engine is a ŠKODA development and is based on tried-and-tested components of the 1.3-ltr. light-alloy engine.
The engine is classified as conforming with the EU II emission standard.



SP15_02

SP27_18

You can find out more regarding design and operation of this new engine in this Self Study Programme.

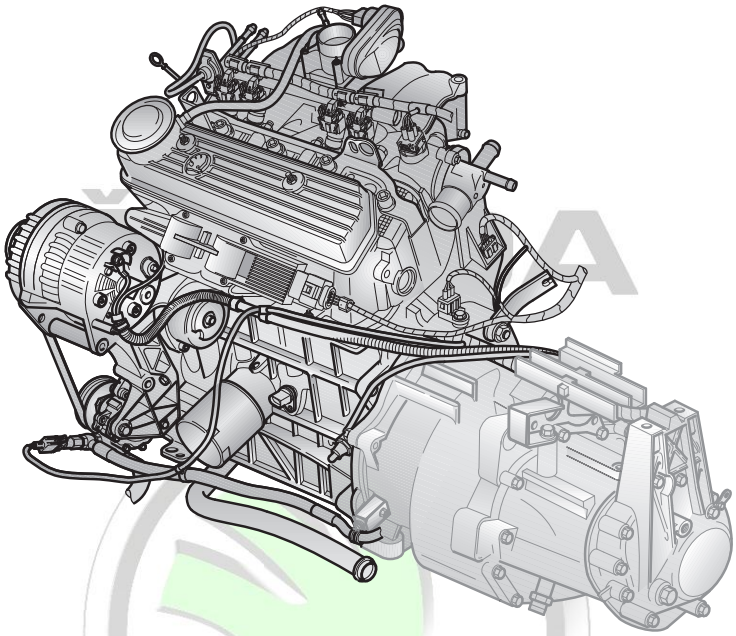
Contents

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

Summary of New Features

The technical data

New!



SP27_61

Code letter:	AMD
	Petrol engine
Type:	4-cylinder in-line engine
Displacement:	1397 cm^3
Bore:	75.5 mm
Stroke:	78 mm
Compression ratio:	10.0 : 1
Rated output:	44 kW (60 HP) at 4500 rpm
Max. torque:	120 Nm at 2500 rpm
Engine management:	Simos 3PB (electronically controlled sequential fuel injection and fully mapped ignition with cylinder-selective knock control)
Valves per cylinder:	2
Emission control:	Lambda control, 1 catalytic converter
Emission standard:	Complies with EU II
Fuel:	95 RON unleaded

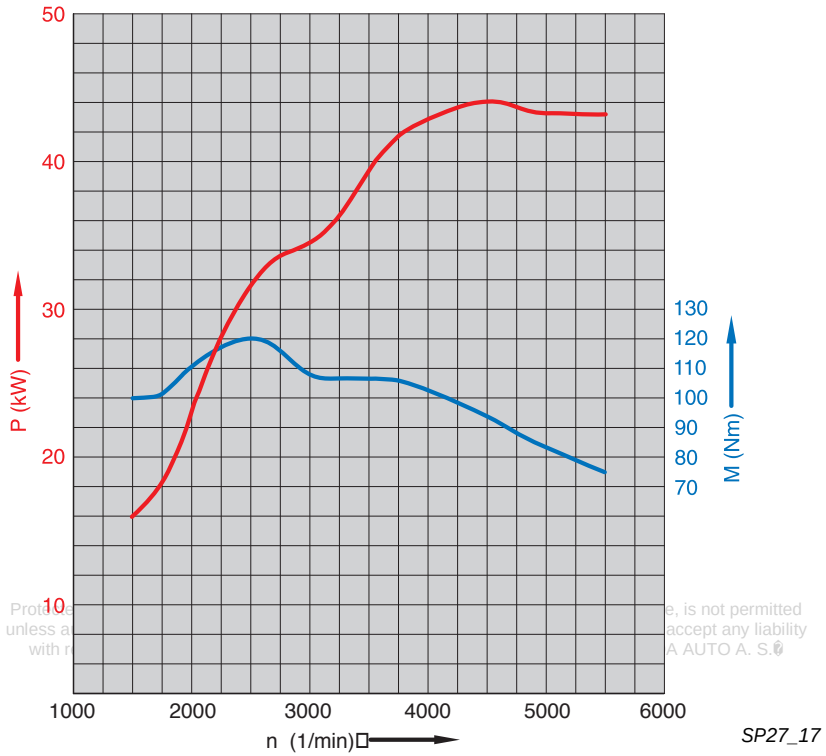
The basic design of the 1.4-ltr. engine is derived from the tried-and-tested 1.3-ltr. light-alloy engine fitted to the FELICIA.

- Cross-flow cylinder head with 2 valves for each cylinder.
- Bottom-mounted camshaft driven by a duplex roller chain.
- Valves driven by tappets, tappet rods and rocker arms.
- Replaceable cylinder liners, cooled directly by coolant.
- Crankshaft mounted in 3 bearings.
- Oil pump driven by camshaft.

Note:
The engine can also be operated with 91 RON unleaded fuel although this results in torque and power losses as a result of the knock control.

The engine characteristics

New!



SP27_17

The technical highlights

– The displacement has been increased as a result of enlarging the stroke to 78 mm while maintaining the original bore of 75.5 mm.

– The valve tappets of the valve gear have been replaced by hydraulic valve tappets which ensure automatic compensation of the valve clearance. This makes it possible to eliminate the setting of the valve clearance as part of the service interval. At the same time, a reduction in valve gear noise has been achieved.

– The following measures have been implemented with the aim of reducing vibrations and improving the noise characteristics:

  Forged crankshaft with eight balancing weights for achieving optimal mass balance.

  The stiffness of the crankshaft mounting in the housing is enhanced by combining the bearing caps in a ladder frame (bearing unit).

  The oscillating masses of the crank gear have been reduced by opting for a smaller size of piston pins (Ø 17 mm) and lighter weight pistons.

  The stiffness of the crankcase has also been enhanced by new type of ribbing.

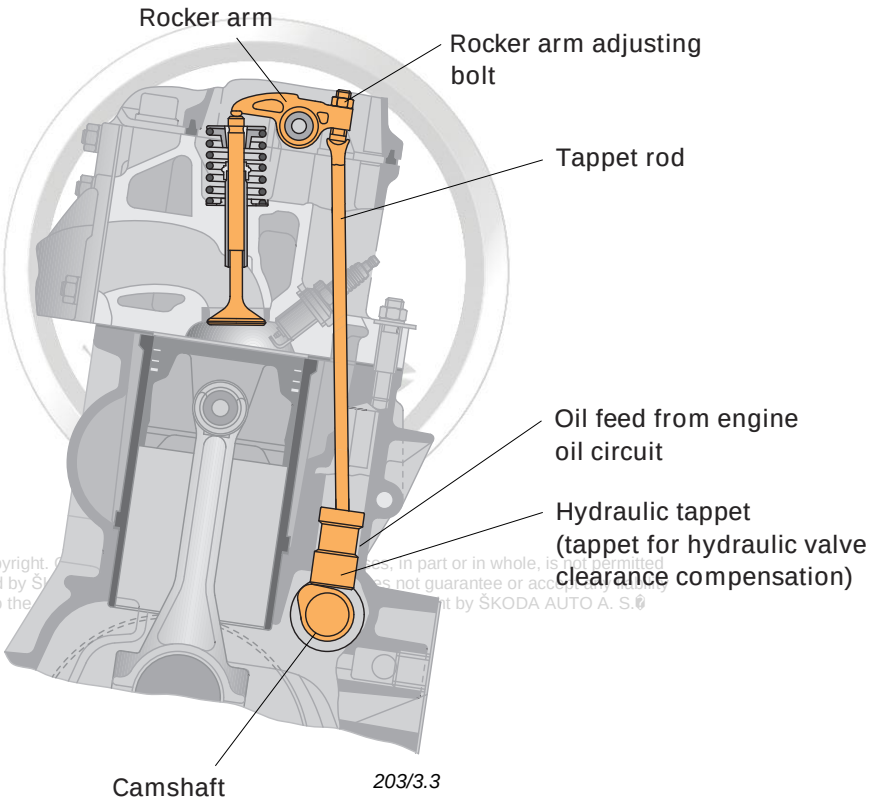
  The flexural stiffness of the engine-gear-box connection has been enhanced by a new stiffening to the oil pan flange.

– The Simos 3PB system with sequential fuel injection and electronic throttle flap control (electronic throttle) has been used for the first time as the engine management system in a ŠKODA engine.

Mechanical Components

Valve gear

New!



The valves of the 1.3-ltr. engine are driven by the bottom-mounted camshaft through tappet rods.

Valve clearance compensation is achieved by the hydraulic system in the tappet, while incorporating the engine oil pressure.

Advantage

The valve clearance remains constant during the entire engine operating life, which has a positive impact in reducing exhaust emissions.

It is not necessary to re-set the valve clearance during service work.

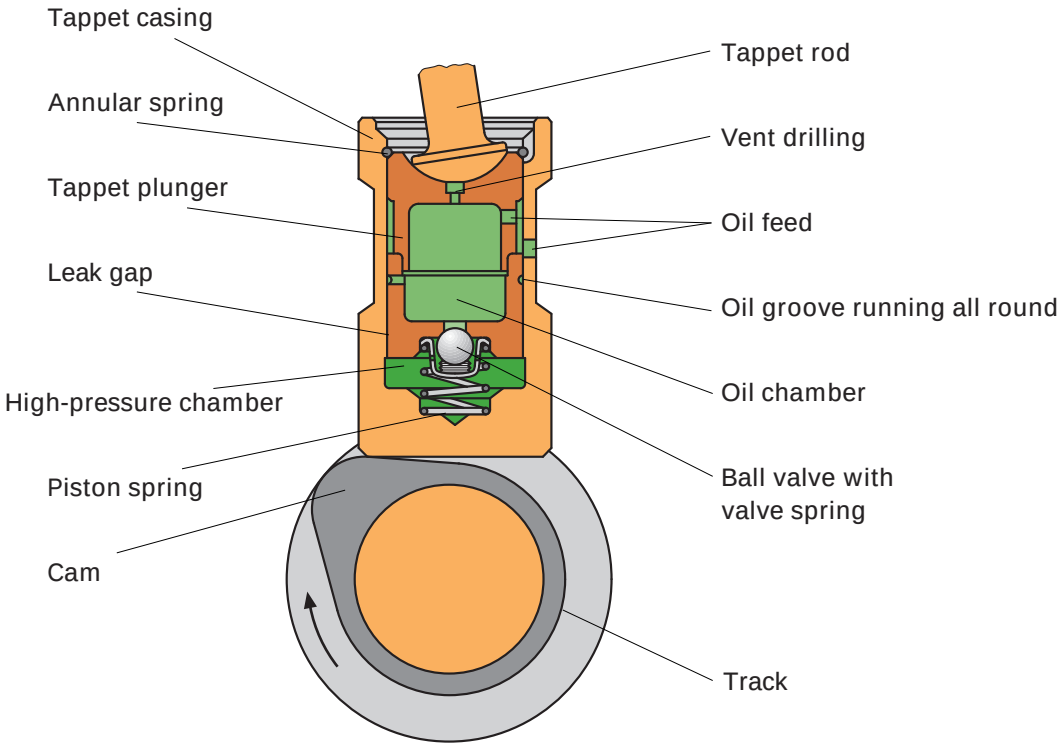
After replacing parts of the valve gear, a basic setting of the hydraulic tappet should be performed.

This is done by means of the rocker arm adjusting bolt. Please refer to the Workshop Manual OCTAVIA, 1.4-ltr./44 kW Engine for further information on this step.

Note:
For repair work, always stop the tappets in the installed position in order to retain the oil supply.

Scrupulous cleanliness is essential for all work.

New!



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Function of the hydraulic tappet

– The tappet plunger moves within the cylindrical tappet casing which is closed at the bottom, and is supported by the piston spring.

– Tappet plunger and tappet casing form the high-pressure chamber at the bottom in which an oil cushion is enclosed. This forms the power connection between cam and valve gear (tappet rods, rocker arms).

– An annular spring between tappet casing and tappet plunger ensures that the power connection is free of play.

– At the commencement of the valve stroke, the cam exerts a force on the hydraulic tappet. The ball valve seals off the oil chamber to the high-pressure chamber. The pressure in the high-pressure chamber rises.
A slight, defined quantity of oil is forced out of the high-pressure chamber through the leak gap, and this oil flows around the oil groove into the oil chamber.
As a result, the tappet plunger is moved and the gap of 0.03 mm to 0.06 mm which is required for proper operation of the valve timing, is thus assured.

– As the cam rotates around the circular track, the missing oil in the high-pressure chamber flows out of the oil chamber through the ball valve.

– The oil supply in the hydraulic tappet is constantly topped up from the oil circuit of the engine through drillings in the tappet casing and plunger.

– Longitudinal changes in the valve gear caused by temperature or wear are constantly compensated.

Valve timing

New!

The timing of the valves influences the gas change cycles in the engine and the level of pollutant emissions.

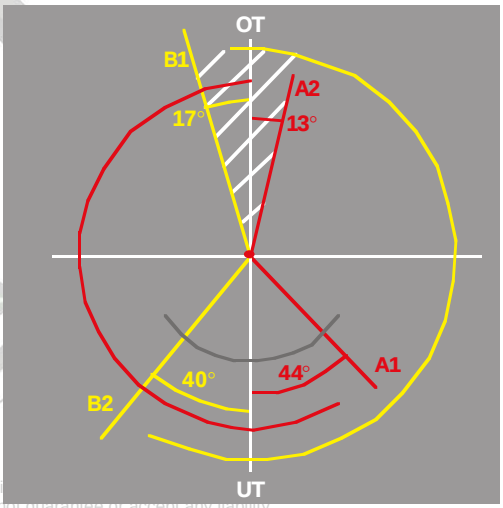
Engine torque has been boosted by enlarging the displacement to 1397 cm^3, this being achieved by an increase in stroke from 72 mm to 78 mm.
The shape of the cam of the inlet and exhaust valves has been optimised to match these new parameters.

As a result of this modification to the cam shape, the following valve timings now exist:

A1 = Outlet valve opens 44° before BDC
A2 = Exhaust valve closes 13° after TDC
B1 = Inlet valve opens 17° before TDC
B2 = Inlet valve closes 40° after BDC

This results in a marked range of valve overlap at the gas change TDC.

TDC = top dead centre
BDC = bottom dead centre



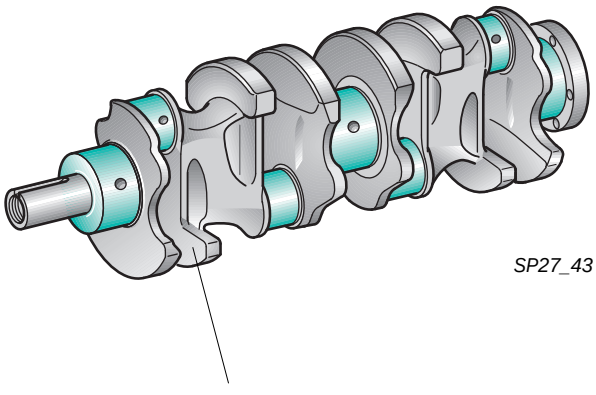
SP27_42

Crankshaft

New!

The crankshaft features eight balancing weights in order to enhance smooth engine running and to achieve good mass balancing.

The crankshaft is located axially by means of the middle main bearing with two guide segments.



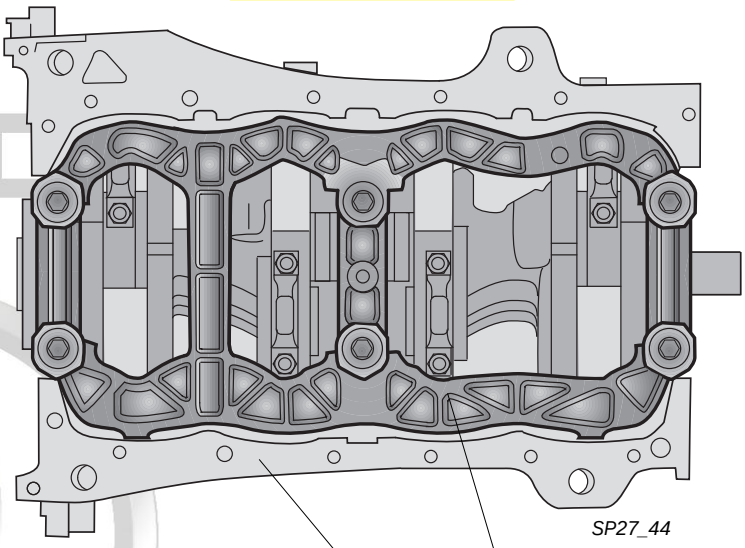
SP27_43

The crankshaft bearings

New!

The stiffening of the crankshaft bearings in the cylinder block is enhanced by the connection of the bearing caps to form a single unit.

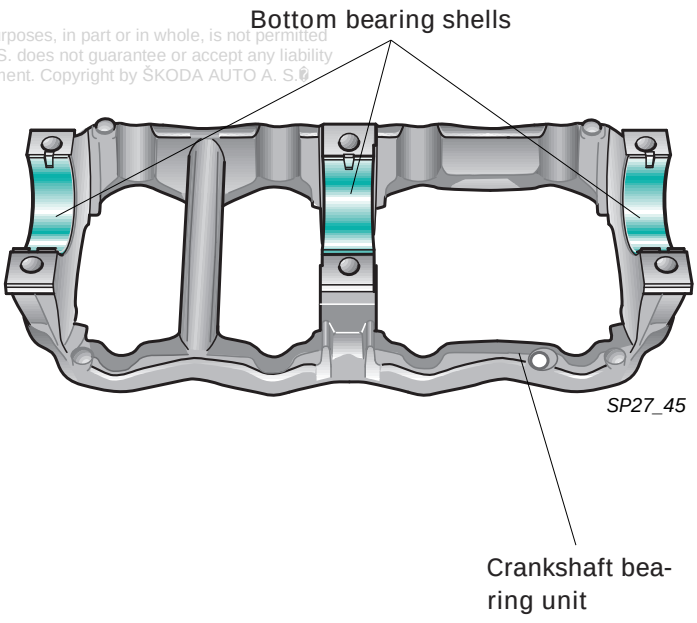
The crankshaft bearing unit is an iron casting.



Longitudinal sections connect the 3 bearing caps to form a self-contained frame.

The bottom bearing shells of the crankshaft bearings are located directly in the frame, as is the case for single bearing caps.

An important point to note during installation is that the bearing shells are installed with the matching bearing caps because the middle bearing shell is wider.



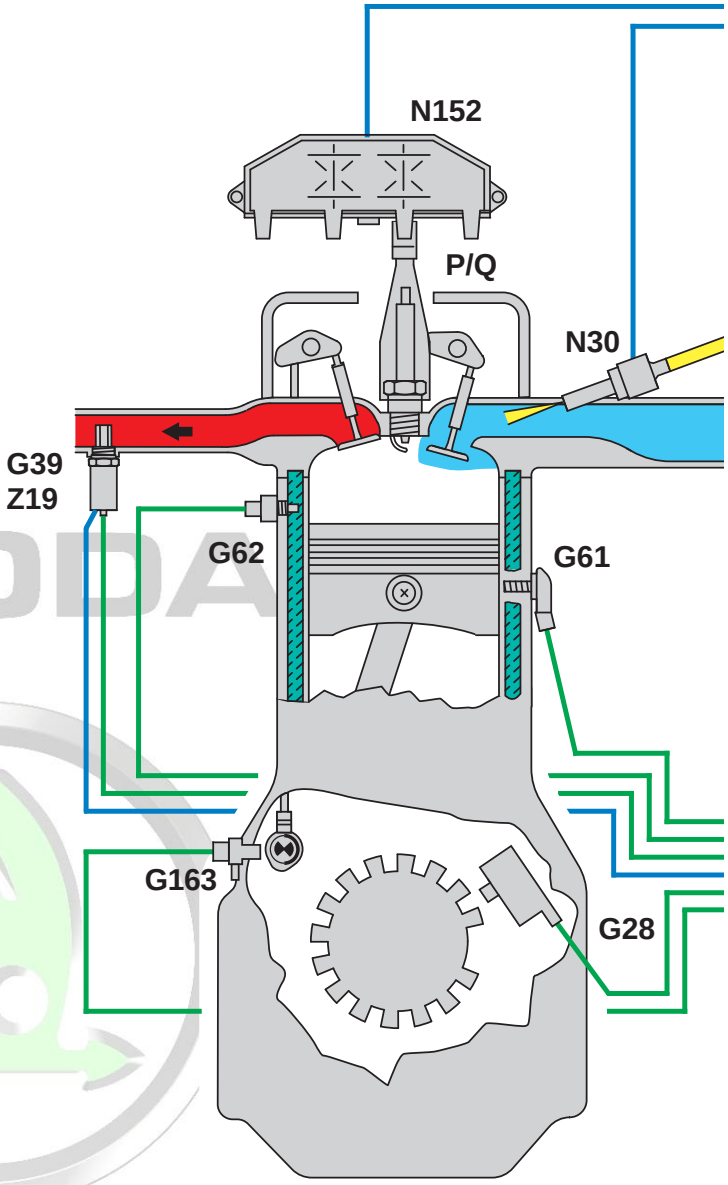
System Overview

Simos 3PB engine management

The Simos engine management system controls the fuel injection and the ignition in line with the current engine load. The engine load is detected by the engine speed sensor and by the intake manifold pressure sensor. The control unit uses this information to calculate the ignition timing point and period of injection, taking into account the correction factors.

The correction factors are:
- Cylinder-selective knock control
- Lambda control
- Idle speed control
- Activated charcoal filter control

The position of the throttle flap is controlled electrically.
Additional signals regarding the clutch pedal and brake pedal position and load supplied by the power steering pump, are integrated in the control system of the engine management.
The engine control unit is designed to operate with CAN data transfer.



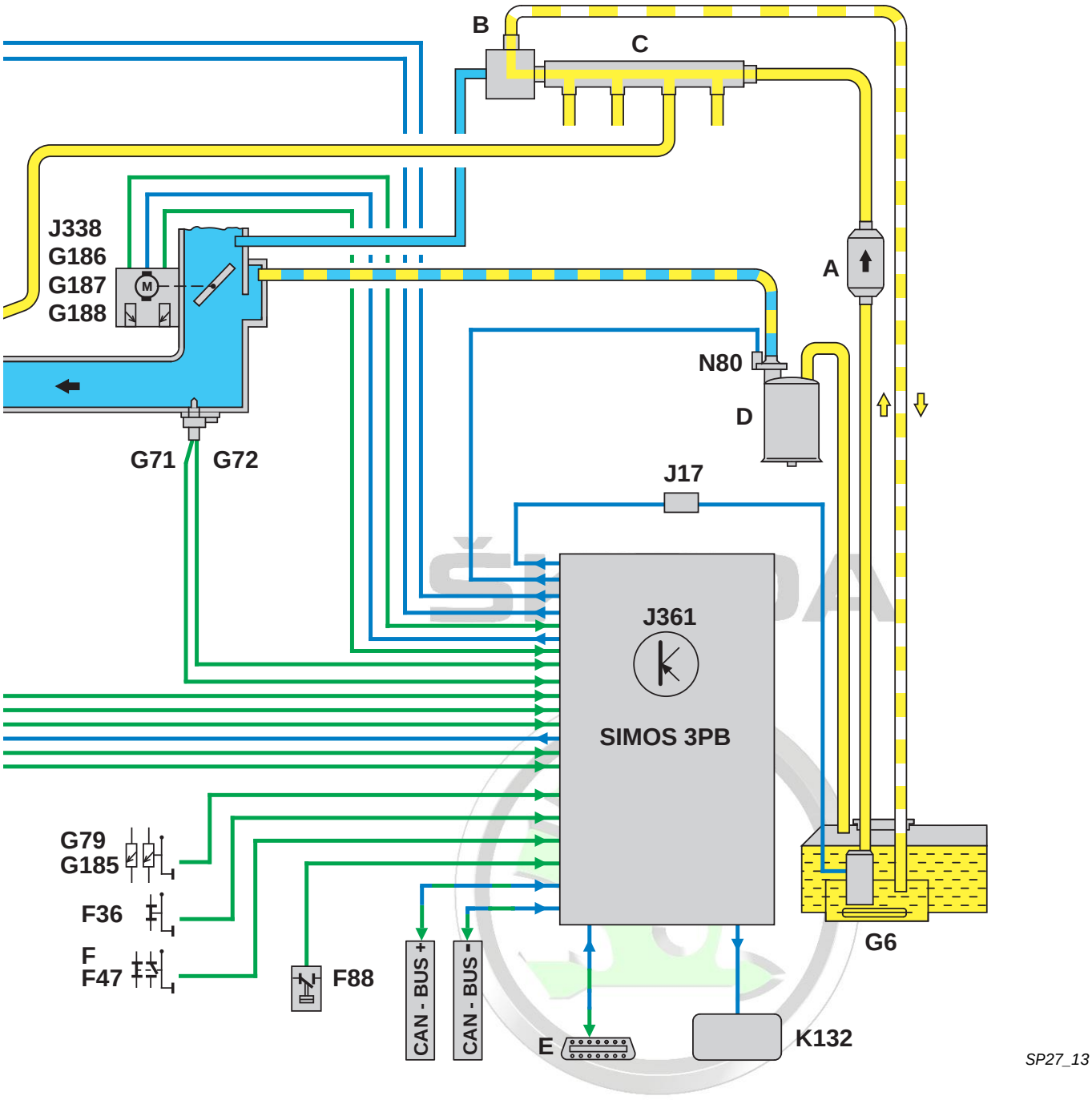
Legend

F/F47	Brake light/brake pedal switch
F36	Clutch pedal switch
F88	Power steering pressure switch
G6	Fuel pump
G39	Lambda sensor
G28	Engine speed sensor
G61	Knock sensor
G62	Coolant temperature sensor
G71	Intake manifold pressure sensor
G72	Intake manifold temperature sensor
G79	Accelerator pedal position sensor
G163	Camshaft position sensor
G185	Sensor 2 for accelerator pedal position
G186	Throttle flap drive
G187	Angle sensor 1 for throttle flap drive
G188	Angle sensor 2 for throttle flap drive
J17	Fuel pump relay
J338	Throttle flap control unit
J361	Simos 3PB control unit
K132	Electronic throttle fault lamp
N30	Injector
N80	Activated charcoal filter solenoid valve
N152	Ignition transformer
P	Spark plug connector
Q	Spark plugs
Z19	Lambda probe heater

Simos 3PB

3rd generation with electronic throttle and CAN BUS

Siemens **e**ngine **c**ontrol



SP27_13

= Output signal

= Input signal

A = Fuel filter
B = Fuel pressure regulator
C = Fuel rail
D = Activated charcoal filter
E = Diagnostic connection

= Fuel feed

= Fuel return

= Intake air

= Exhaust

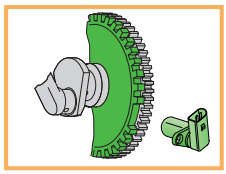
System Overview

The processor-based Simos 3PB engine management system is matched to the requirements of the electronic throttle.

New or additional components compared to the familiar Simos 2P system are outlined in colour.

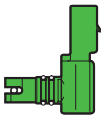
Sensors

Engine speed sensor G28

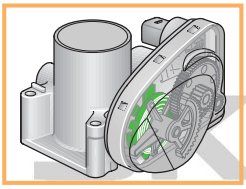


Camshaft position sensor G 163

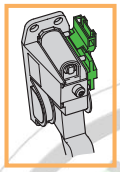
Intake manifold pressure sensor G71 and
Intake manifold temperature sensor G72



Throttle flap control unit J338 (electronic throttle positioner)
Angle sensors for throttle flap drive G187 and G188

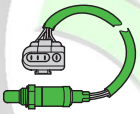


Sensors for accelerator pedal position G79 and G185



Coolant temperature sensor G62

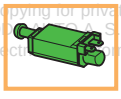
Lambda sensor G39



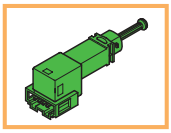
Knock sensor G61

Power steering pressure switch F88

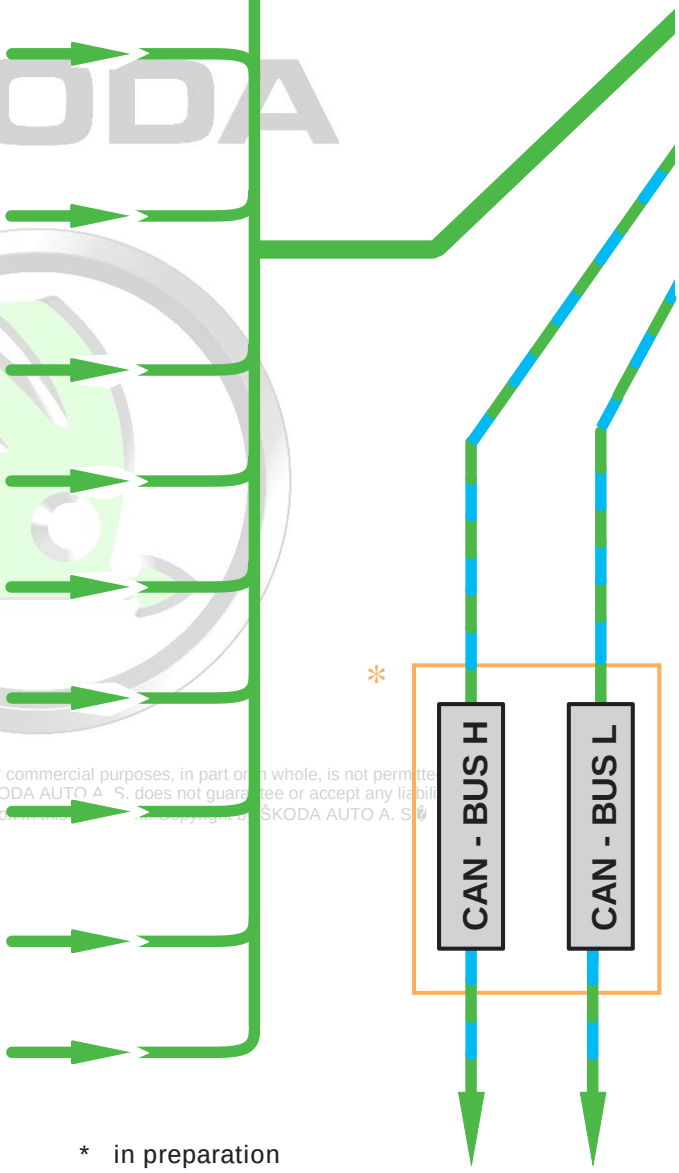
Clutch pedal switch F36



Brake light switch F and
Brake pedal switch F47



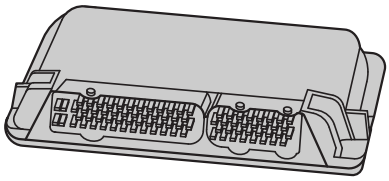
Air conditioning (pressure sensor)
AC compressor (AC switch operation)
AC compressor
Road speed signal

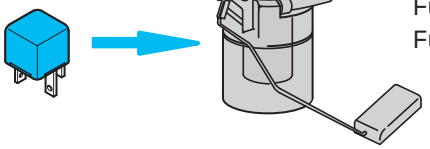


* in preparation

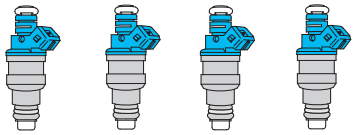
Actuators

Simos 3PB control unit
J361

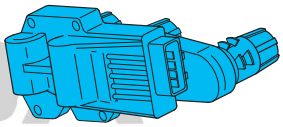




Fuel pump relay J17
Fuel pump G6

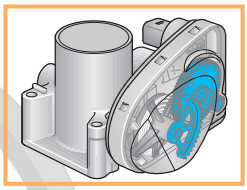


Injectors N30 ... N33

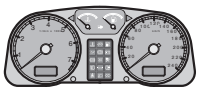


Ignition transformer (4x)
N152 (ignition block)

W

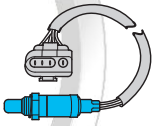


Throttle flap control unit J338
Throttle flap drive G186



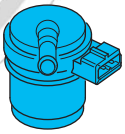
J218

Combination processor in dash panel insert/ immobiliser

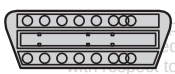


Lambda probe heater Z19

K



Activated charcoal filter solenoid valve N80



Diagnostic connection

EPC

Electric throttle control fault lamp K132

Vehicle speed signal (dash panel insert)
AC compressor
Fuel consumption signal (dash panel insert)

System Overview

Engine speed sensor G28

Installation point

The sensor is installed at the gearbox above the flywheel.

Use of signal

The engine speed sensor is an inductive sensor.
It detects the engine speed and the exact angular position of the crankshaft.

Operation and design

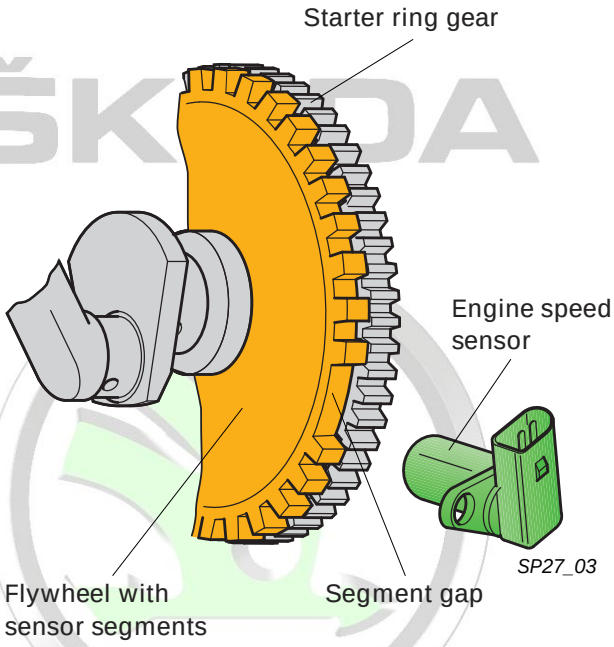
Sensor segments are integrated around the circumference of the flywheel, in addition to the starter ring gear. The circumference is divided into 60 segments for this purpose and features a gap of two segments.

When the segments rotate past the sensor, the magnetic field of the sensor is altered. This change in the magnetic field induces an electric voltage in the coil winding of the sensor. Its frequency changes in line with engine speed. The frequency is a measure of engine speed. The electric voltage is passed to the control unit.

The position of the crankshaft is fixed by means of the segment gap. Together with the camshaft position sensor, the exact position of the engine mechanical components, i.e. the ignition TDC of cylinder 1, is detected.
This serves as a basis for defining the injection and ignition timing points.

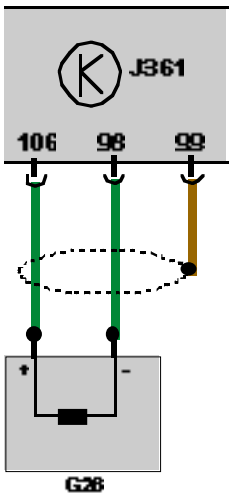
Substitute function and self-diagnosis

The signal supplied by the engine speed sensor is checked for plausibility together with the signal supplied by the camshaft position sensor. If the Simos control unit does not detect any signal from the engine speed sensor, the engine stops. It can, however, be started again. In this case, it operates in the emergency running programme and uses signals supplied by the camshaft position sensor G163.
Self-diagnosis detects:
“G28 no signal” and “G28 implausible signal”.



SP27_03

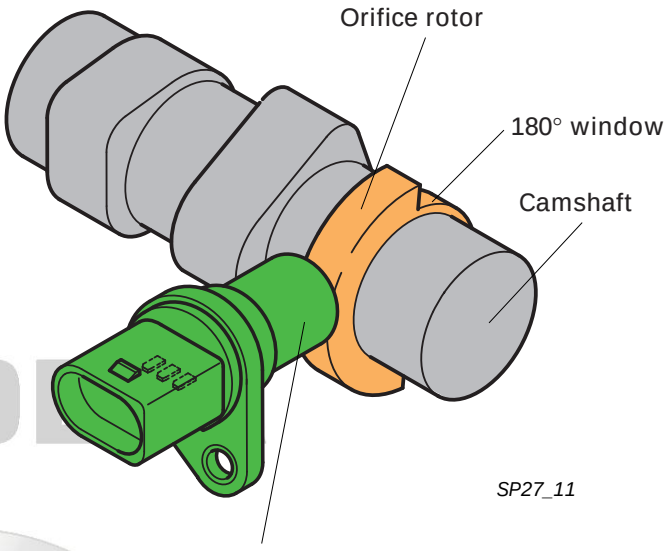
Electric circuit



SP27_10

Camshaft positions sensor G163

The camshaft position sensor operates on the Hall sensor principle. It is located next to the oil filter at the level of the camshaft.



SP27_11

Use of signal

It is essential to accurately define cylinder 1 for the cylinder-selective knock control and the sequential fuel injection.

Ignition TDC of cylinder 1 is detected (synchronisation of cylinder 1) by means of the signal supplied by the camshaft position sensor together with the signal supplied by the engine speed sensor G28 (engine speed sensor and reference mark).
Once both signals have been received simultaneously, initial fuel injection and ignition is then activated.

Operation and design

The “camshaft pulse generation” is effected directly by the orifice rotor, which is part of the camshaft. it has a 180° window and a continuous segment of 180°.

The 180° segment passes through the magnetic field of the sensor and intersects the lines of magnetic force.
As it passes, it generates a voltage.
In contrast, the 180° window does not affect the magnetic field.

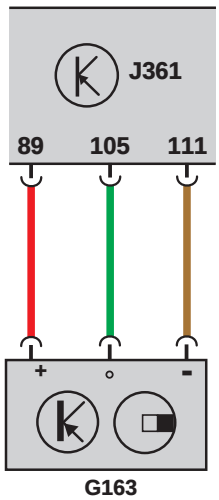
The Simos control unit processes this signal sequence.

Substitute function and self-diagnosis

In the event that the camshaft position sensor fails, the engine control unit switches off the knock control and the ignition angle is retarded.
The engine continues running using as a substitute the signal supplied by the engine speed sensor G28.

Self-diagnosis detects:
“G40 implausible signal” and “G40 signal too small”.

Electric circuit



SP27_12

System Overview

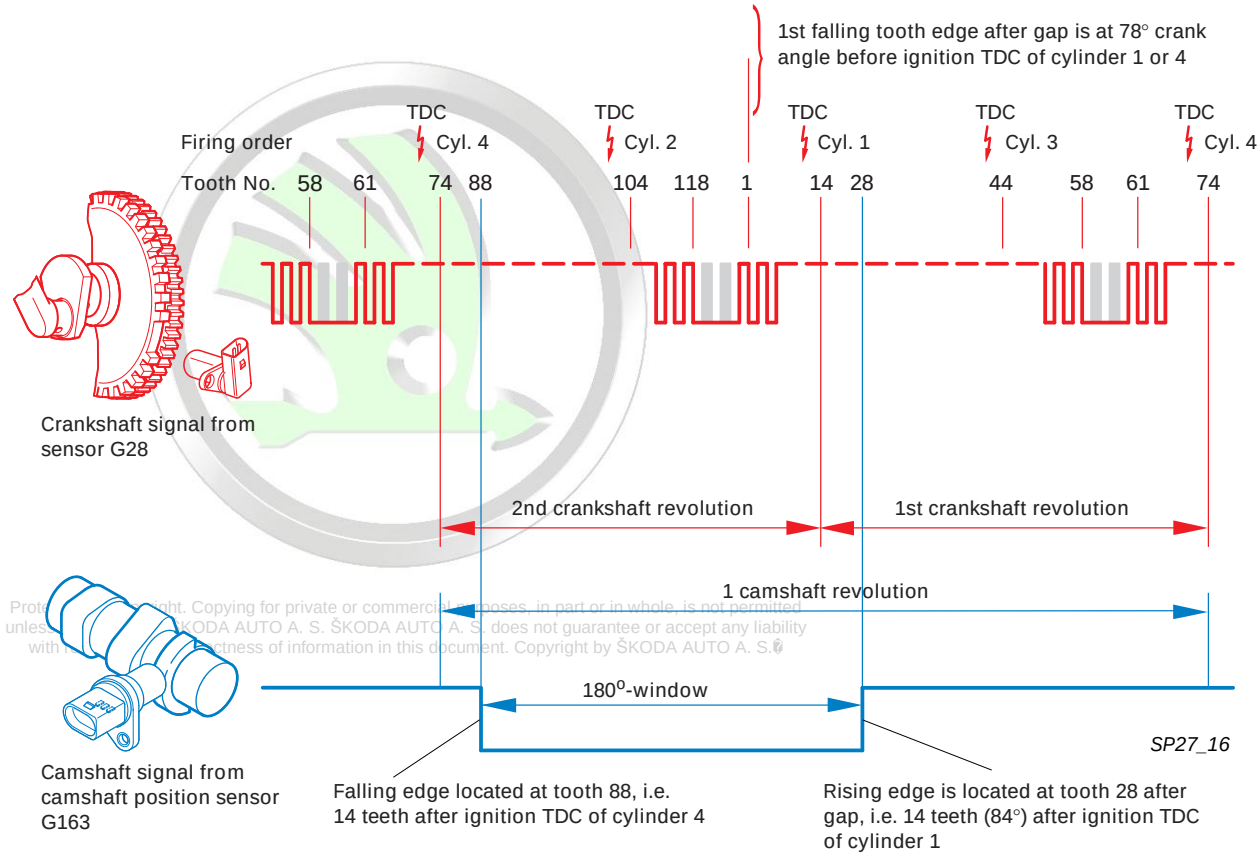
Simos 3PB system function

In the diagram below, we see the signal pattern of the engine speed sensor and the camshaft sensor.

The signal patterns can also be rendered visible with the oscilloscope function of VAS 5051.

They illustrate how the signals are processed in the Simos control unit in order to determine the position of the engine mechanical components for defining the fuel injection and ignition timing points.

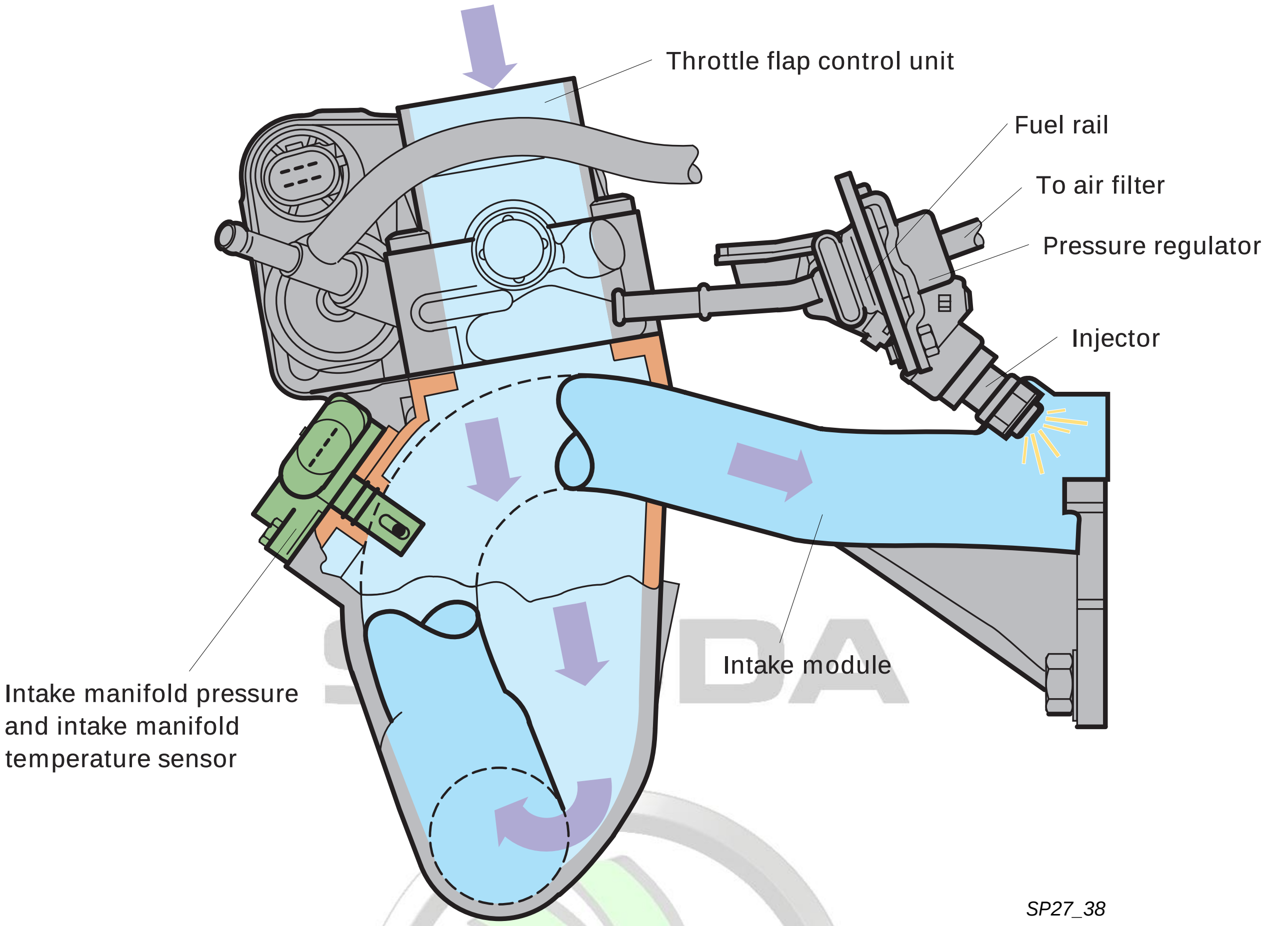
Note:
2 crankshaft revolutions with 2 x (60 – 2) teeth (teeth are numbered consecutively up to 120) and 1 camshaft revolution with 1 x 180° window, form an analysis cycle.
The top dead centre is at the same time the ignition top dead centre.



Effects in the event of signal failure

refer to pages 14 and 15

Fuel injection



SP27_38

Intake module

The intake module houses the throttle flap control unit and the fuel rail together with the injectors and the pressure regulator. The intake manifold pressure and intake manifold temperature sensor is located at the side of the intake manifold.

Fuel injection

Each cylinder features an electro-magnetic injection valve which is positioned in the intake manifold upstream of the inlet valve.

The valves are supplied with fuel by the fuel pump and actuated through earth by the engine control unit.

The fuel injected gathers first of all in the intake port and is inducted into the combustion chamber together with the air when the inlet valve opens.

The injectors are operated in line with the firing order of 1 – 3 – 4 – 2 (sequential fuel injection).

The commencement of injection angle is always related to the ignition TDC of the corresponding cylinder.

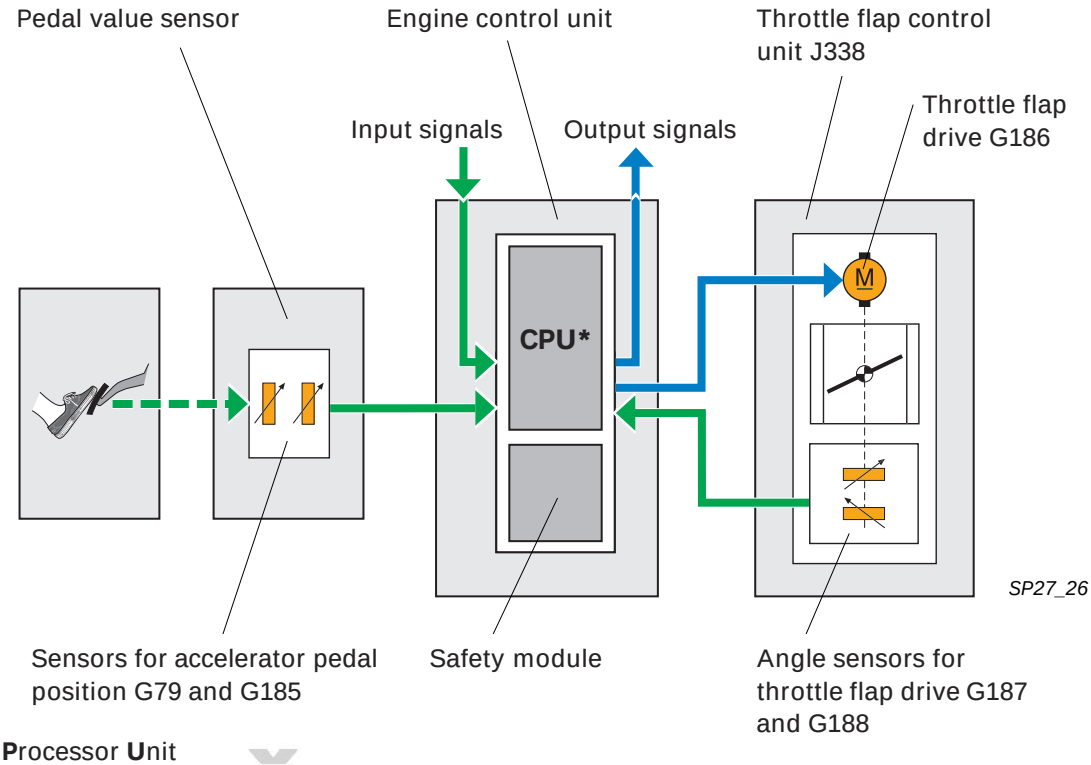
The control unit takes into account the following correction factors for determining the opening time of the injectors:

– Cylinder-selective knock control
– Lambda control
– Idle speed control
– Activated charcoal filter control

Electronic Throttle Function

Electrically operated throttle flap

New!



* **C**entral **P**rocessor **U**nit

There is no mechanical and no direct electrical link in the Simos 3PB engine management system between accelerator pedal and throttle flap. These are replaced by an electronic control.

The system includes:
– Pedal value sensor (at accelerator pedal)
– Engine control unit
– Throttle flap control unit

The driver input at the accelerator pedal is detected by the pedal value sensor and transmitted to the engine control unit.

The engine control unit alters the position of the throttle flap by means of a dc motor. The position of the throttle flap is, in turn, continuously signalled back to the engine control unit.

Advantages

In addition to the intake air control, functions such as
– idle speed control
– vehicle speed control
– engine speed limit
are achieved in a simple and convenient way.

The throttle flap can be opened irrespective of the position of the accelerator pedal.

The electronic throttle makes it possible to achieve significantly improved emission and fuel consumption levels in certain engine load states.

A wide range of measures in terms of hardware and software (duplicate sensors, self-monitoring processor structure) are intended to ensure high operational reliability.

Accelerator pedal with pedal value sensor (sensors for accelerator position G79 and G185)

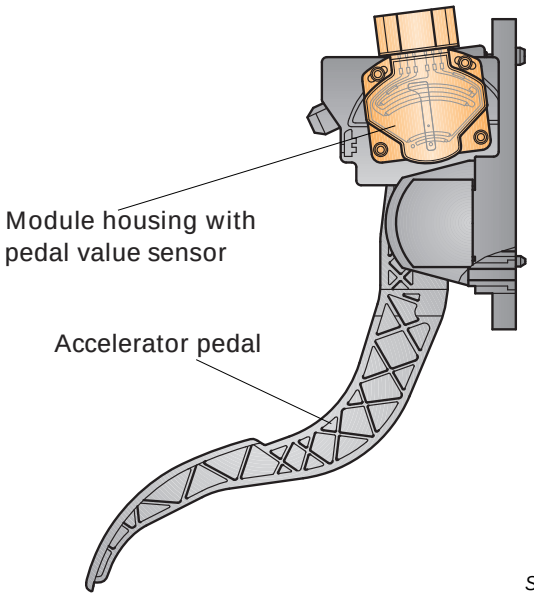
Accelerator pedal and pedal value sensor form a single unit and are also known as the accelerator pedal module.

The mechanism is housed in the module housing.

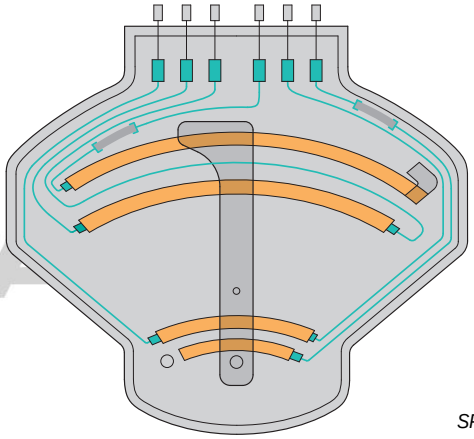
The sensors – accelerator pedal position sensor G79 and G185 – are located in the housing.

Two sensors operating independently, are used in order to provide reliable operation of the electronic throttle.

The pedal value sensor operates as a sliding-contact potentiometer.
A stabilised voltage of 5 V is supplied by the engine control unit to each potentiometer for detecting the position of the accelerator pedal at the sliding-contact potentiometer.
The signal regarding the position of the accelerator pedal is passed as a voltage signal to the engine control unit.



SP27_27



SP27_28

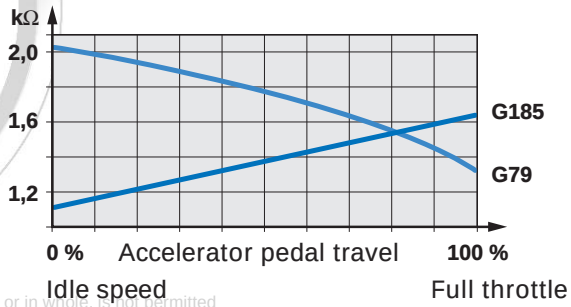
Sensor for accelerator pedal position G79 and sensor 2 for accelerator pedal position G185 in module housing

The characteristic curves of the two sensors differ in pattern (see chart).

The engine control unit monitors the function and plausibility of the two sensors.

If one sensor fails, the other acts as a substitute.

The entire module is pre-set.
It is replaced as a complete unit in the event of repairs.



SP27_29

Electronic Throttle Function

Self-diagnosis/emergency running to accelerator pedal

If a fault occurs at the pedal value sensor or in the wiring, two emergency running programmes are available, depending on the type of fault.

Failure of one sensor for accelerator pedal position

Emergency running programme 1

– Electronic throttle fault lamp K132 comes on.

– Fault is stored.

– Engine continues running normally.

– The customer should take the car to a service workshop.

Requirement for emergency running programme:
Idle throttle position must be detected once by the operating sensor.

– The signal of the brake light switch F and brake pedal switch F47 is used for detecting idle speed.

– Convenience features such as cruise control system are disabled.

Failure of both sensors for accelerator pedal position = not possible to detect driver input

Emergency running programme 2

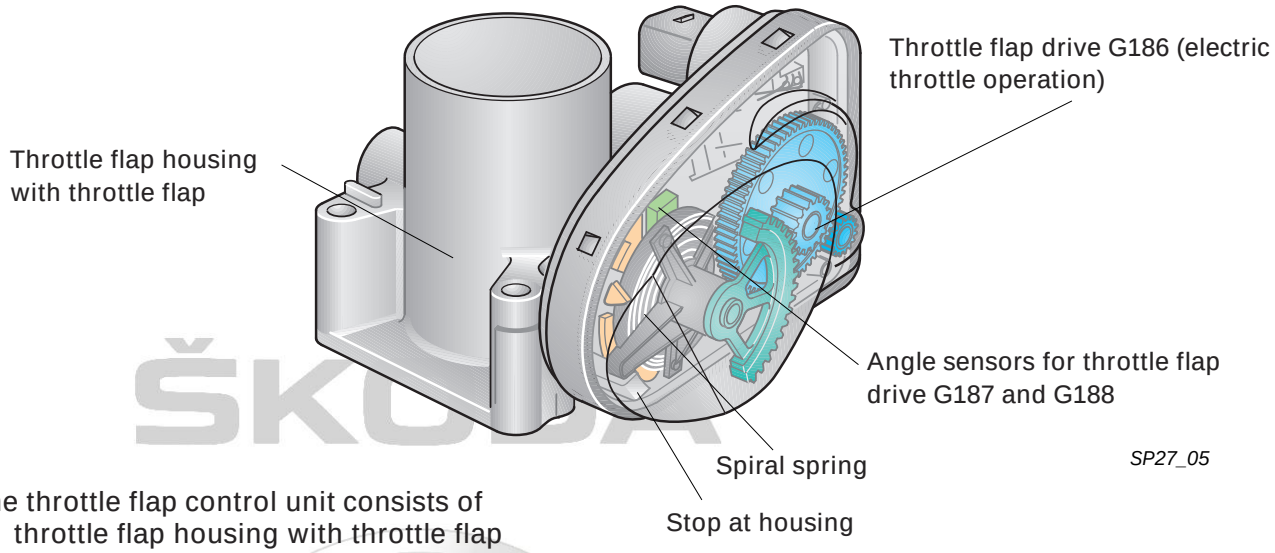
– Electronic throttle fault lamp K132 comes on.

– Fault is stored.

– Engine runs at increased speed of approx. 1500 rpm.

– Customer should take car to a service workshop.

Throttle flap control unit J338 with throttle flap drive G186, angle sensor 1 G187 and 2 G188 for throttle flap drive



SP27_05

The throttle flap control unit consists of
– throttle flap housing with throttle flap
– throttle flap drive G186
– angle sensors for throttle flap drive G187 and G188

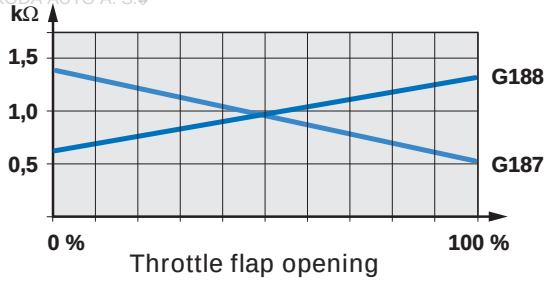
The throttle flap is moved by the throttle flap drive (dc motor). It is operated by the engine control unit and in this way regulates the air flow required for producing the torque. The feedback signal regarding the current throttle flap angle is supplied by two angle sensors (potentiometers) to the engine control unit. These sensors are attached to the throttle flap shaft.

The throttle flap is limited in the top and bottom position by a mechanical stop.

Two angle sensors are used for safety reasons. Their resistance characteristic curves are inversed (see chart).

If one angle sensor fails, the engine control unit activates an emergency running programme and the operation of the electronic throttle is maintained. If the drive is de-energized, the throttle flap is moved into an emergency running position by the force of a spring.

Note:
The throttle flap control unit must not be opened.
The angle sensors must be “learned” in a basic position.
Please refer to the information in the Workshop Manual.



SP27_36

Electronic Throttle Function

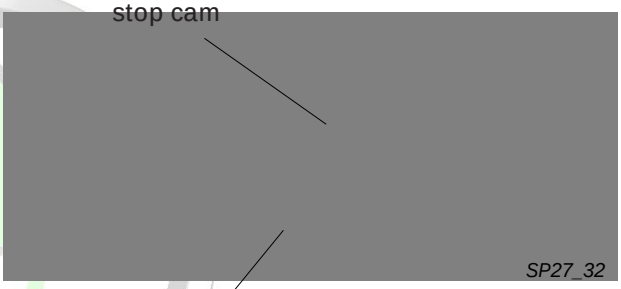
Function position of the throttle flap control unit

The engine control unit detects four important function positions.

Throttle flap is word linearly

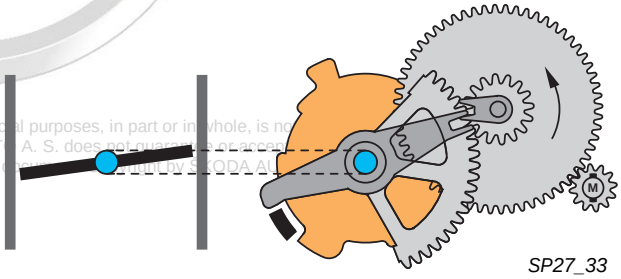
Lower mechanical stop

Throttle flap is fully closed. This position is required for adapting the angle sensors.



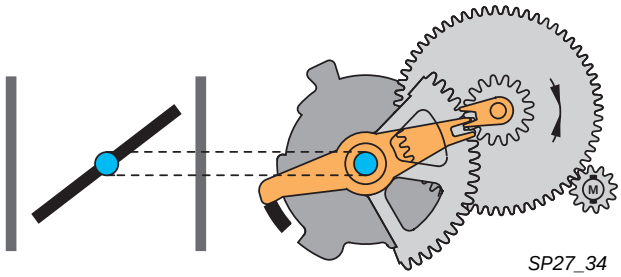
Lower electrical stop

Is defined by the engine control unit. Is positioned only slightly above the bottom mechanical stop.
In operation, the maximum closed position of the throttle flap is fixed by this stop.
This prevents the throttle flap “working into” the housing.



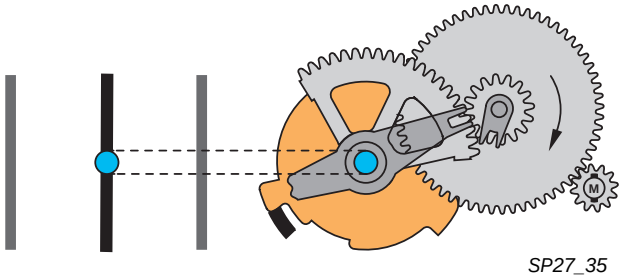
Emergency running position

Position of throttle flap in the de-energized state. Adequate air flow is assured in the event of the electronic throttle failing. Fast engine idling speed of approx. 1500 rpm. Car can continue to be driven with severe restrictions.



Upper mechanical stop

Full throttle position of throttle flap.
Of little significance in operational terms.
Full throttle is set by the “upper electrical stop”, which is defined by the engine control unit.



Basic setting (adaptation) of throttle flap control unit

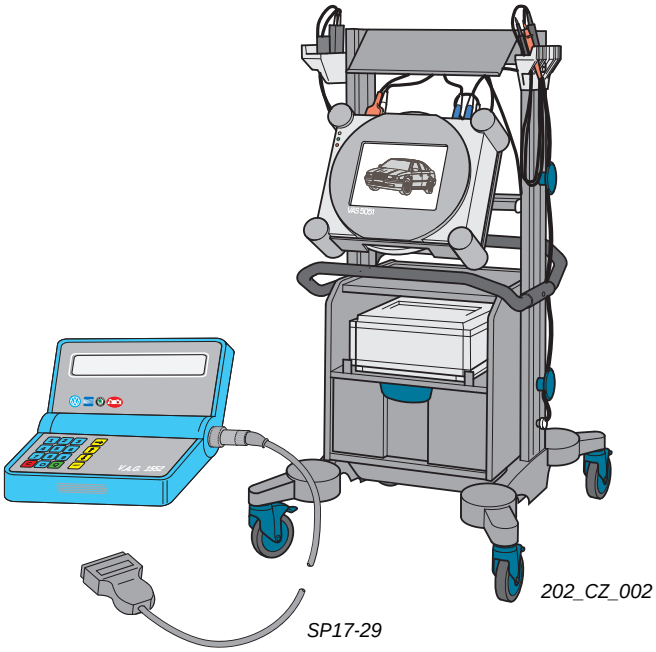
The angle sensors of the throttle flap drive G187 and G188 have to be learned to enable the exact angle position of the throttle flap to be detected.

Learning is done by initiating function 04 – Basic setting.

This can be performed using the vehicle system tester V.A.G 1552, the fault reader V.A.G 1551 or with the vehicle diagnosis measurement and information system VAS 5051.

Adaptation of the throttle flap position is performed when function 04 Basic setting is activated with “display group number 60”.

When this is done, the throttle flap positioner is moved out of the “emergency running position” (de-energized state) to the MIN and MAX positions. The values of the potentiometer voltages which are measured in these positions, are then stored in the control unit.



202_CZ_002

SP17-29

Adaptation conditions!

“Engine not running, ignition on”.

If an attempt is made to activate the throttle flap adaptation if the vehicle is not in this state or if throttle flap adaptation is prevented for other reasons (e.g. throttle flap positioner opened mechanically, diagnostic fault of positioning motor, etc.), this is displayed with a text at the vehicle system tester.

Note:
Pay attention to the adaptation conditions!

“Function is unknown or cannot be carried out at the moment.”

Measured value blocks for throttle flap actuation can be retrieved with function 08 – Reading measured value blocks.

Electronic Throttle Function

Self-diagnosis/emergency running to throttle flap control unit

If a fault occurs at the throttle flap control unit or in the wiring, emergency running programmes are available, depending on the type of fault.

Note:
A faulty throttle flap control unit is not repaired. If a fault occurs at the throttle flap positioner or at the angle sensors, the complete control unit must be replaced.

Failure of one angle sensor for throttle flap drive or implausible signal

- System activations which increase engine torque (e.g. cruise control system, engine braking torque control) are suppressed.
- Electronic throttle fault lamp K132 comes on.

Emergency running programme 1

Requirement
One angle sensor is operating properly. Plausible air mass flow is detected (intake manifold pressure sensor G71 and intake manifold temperature sensor G72 operating normally).

Failure or control fault of throttle flap drive

- The throttle flap drive is switched off. The throttle flap moves into the emergency running position. This is noticeable from a sharp drop in engine output and fast engine idling speed.
- Electronic throttle fault lamp K132 comes on.

Emergency running programme 2

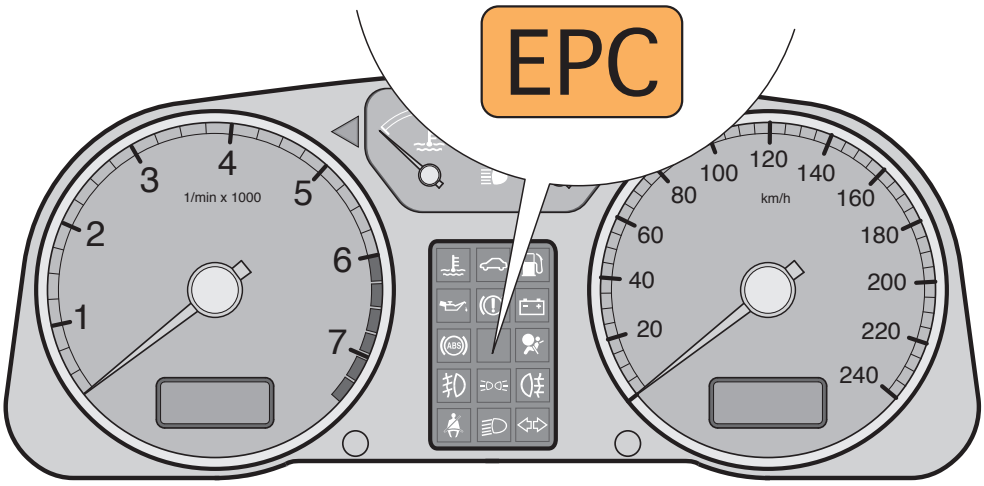
Requirement
The emergency running programme is only activated if the emergency running position is detected by both angle sensors of the throttle flap drive.

No clear detection of throttle flap position possible or if it is not certain that throttle flap is not in the emergency running position

- The throttle flap drive is switched off. The throttle flap moves into the emergency running position, if possible. This is noticeable from fast engine idling speed.
- Engine speed is limited to approx. 1500 rpm by switching off fuel injection.
- Electronic throttle fault lamp K132 comes on.

Emergency running programme 3

Electronic throttle fault lamp K132



SP27_08

When the ignition is switched on, the EPC fault lamp comes on in the indicator lamp panel of the dash panel insert. It must go out again after 3 seconds (operational test of lamp).

The fault lamp is operated directly by the engine control unit J361 through an earth voltage to the combination processor in the dash panel insert J218.

If a fault occurs in the electronic throttle system, this is detected by the self-diagnosis and indicated by the separate EPC fault lamp. In this case, the fault lamp comes on and remains on.

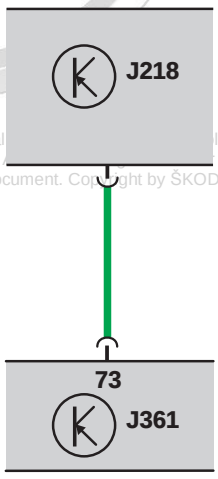
At the same time, an entry is stored in the fault memory.

If a fault occurs in the electronic throttle system, a matching emergency running programme is activated (refer also to sensors for accelerator pedal position and throttle flap control unit).

Note:
EPC means

Electronic Power Control (electronic throttle)

Electric circuit



SP27_60

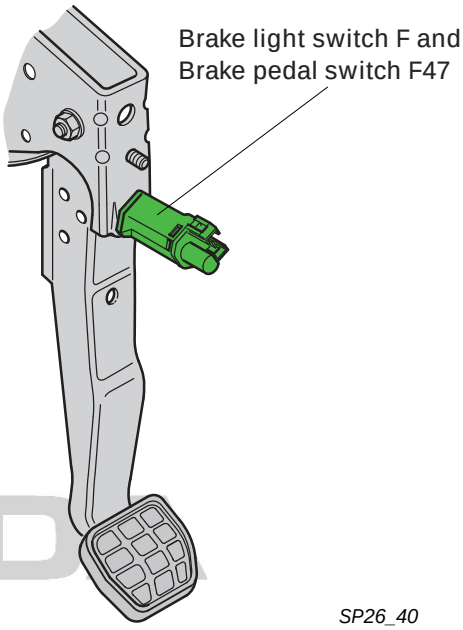
Brake light switch F and brake pedal switch F47

Task

The information “brake operated” is used for controlling two systems:

– Backup interrogation of electronic throttle function (idle speed detection in emergency running mode of pedal value sensor)
– Operation of cruise control system (on models fitted with this).

(The main function is switching on the brake lights; on models fitted with ABS, this signal is used for informing the ABS control unit.)



SP26_40

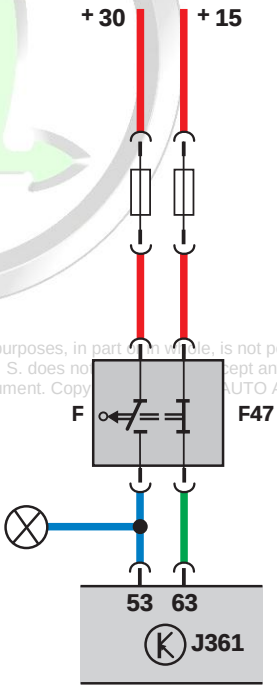
Function

The brake light switch F and the brake pedal switch F47 are combined to form a single component. For safety reasons, both act as information senders for “brake operated”. The combination switch has four connections.

The brake light switch F is open in the off position and is supplied with voltage through terminal 30.
It is the switch for operating the brake lights and acts as an **additional** information input for the Simos control unit.

The brake pedal switch F47 is closed in the off position and is supplied with voltage through terminal 15.
Its **only purpose** is to act as an information input for the Simos control unit.

Electric circuit



SP27_48

Self-diagnosis

Both switches are checked mutually for plausibility by the self-diagnosis.

Note:
If an accelerator pedal position sensor fails, the electronic throttle function uses the signal from the brake light switch or brake pedal switch to detect idle speed.

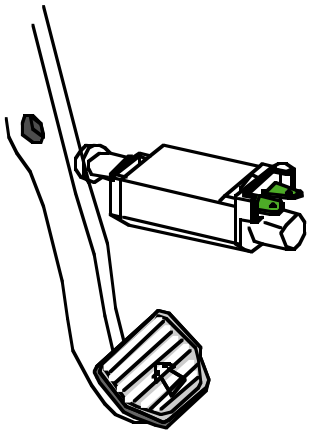
Clutch pedal switch F36

Task

The information “clutch operated” is used for controlling two systems:

– On models fitted with a cruise control system, the function of the cruise control system is switched off.

– The load change functions are deactivated during a gearshift. The load change function is controlled by influencing the ignition angle and by the closing rate of the throttle flap.



SP23_32

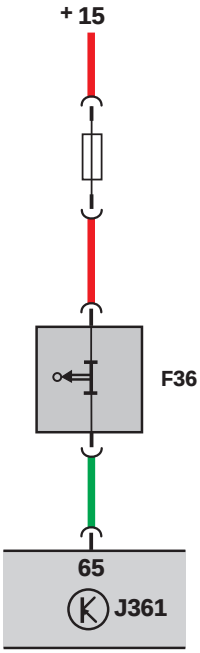
Function

Like the brake pedal switch, the clutch pedal switch is closed in the off position.
It is supplied with voltage through terminal 15.
cal resistance.
When the clutch pedal is operated, the information passes directly to the Simos control unit.

Substitute function and self-diagnosis

The clutch pedal switch is not detected by the self-diagnosis.
Consequently, no substitute functions are derived. If no signal is received, the function is not activated.

Electric circuit



SP27_49

Note:
In the event of an incorrect setting, electrical malfunction or incorrect operation (driver leaves foot on clutch pedal), this can result in operating problems (load change jolts, sudden increases in engine speed).

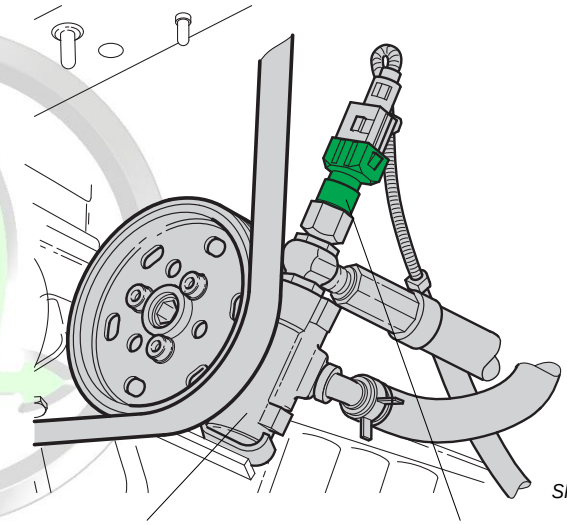
Power steering pressure switch F88

All OCTAVIA models are fitted as standard with a power-assisted steering.

The hydraulic pump of the power steering, which is driven by the engine through the ribbed V-belt, increases the load on the engine when the steering is turned to full lock; when the engine is idling, this may result in a sharp drop in engine revs.

The Simos 3PB system control compensates for this situation and additionally processes a signal which supplies information regarding the additional load resulting from the power steering.

The engine control unit detects the additional engine load at an early stage by means of the signal supplied by the power steering pressure switch F88 and controls the idle speed accordingly.



SP27_46

Power steering hydraulic pump

Power steering pressure switch F88

Operating principle

The power steering pressure switch is located at the hydraulic pump.

The pressure switch is open at a pressure of < 0.28 MPa (28 bar).

If the pressure rises, the switch is closed at 0.4 MPa (40 bar).

The signal passes to the Simos engine control unit.

The engine control unit in turn operates the throttle flap drive G186 which opens the throttle flap by a particular angle.

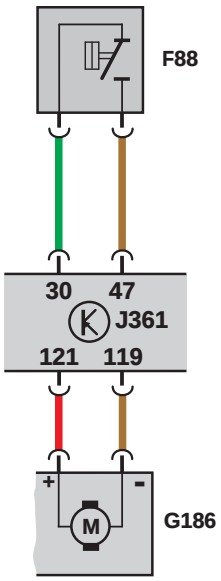
Idle speed is thus stabilised to compensate for the increased load of the hydraulic pump.

Self-diagnosis

Self-diagnosis is performed in the functions

02 - Interrogating fault memory
08 - Reading measured value block

Electric circuit



SP27_47

Lambda sensor G39

New!

A new generation of lambda sensors is used on the 1.4-ltr./44 kW engine.

The planar (= flat) lambda sensor is a further development of familiar finger-shaped lambda sensor and has a step characteristic at $\lambda = 1$.

Advantage

- Short heating-up time and thus improved emission levels in the warming-up phase
- Reduced heating capacity demand
- More stable control characteristic

Rapid response of the lambda sensor is essential in order to be able to ensure efficient emission control. This necessitates the lambda sensor achieving its operating temperature in the shortest possible time. This is made possible by the planar (= flat) design of the sensor.

The sensor heater is integrated in the sensor element. The operating temperature is reached more rapidly with a reduced heating capacity.

Particular feature

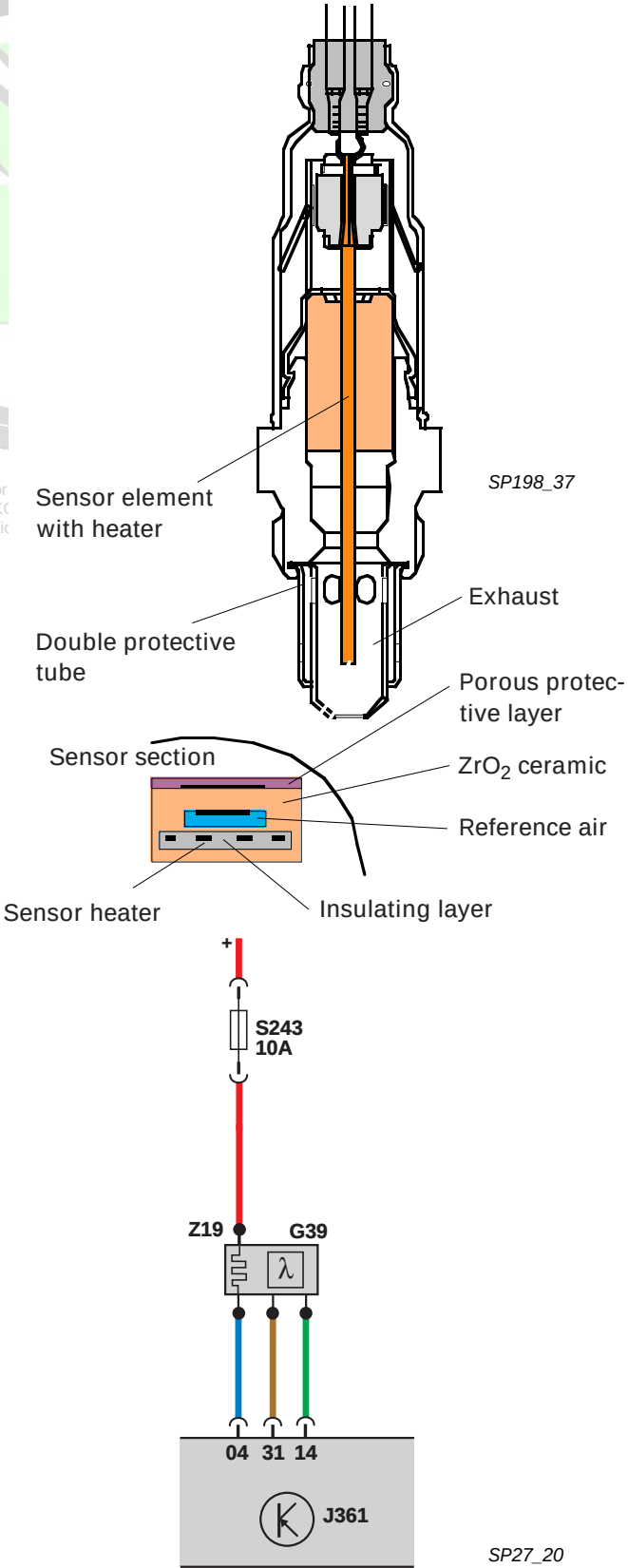
The sensor heater generates the necessary minimum temperature of 350°C at an exhaust temperature as low as 150°C.
The lambda control reaches operational readiness about 10 seconds after engine start.

The sensor element consists of circon dioxide (ZrO_2).

A porous, ceramic protective layer is applied to the sensor element. This prevents any damage occurring as a result of residues in the exhaust gases.
High operational life and reliable achievement of the high operational demands are assured.

Substitute function

Open-loop control mode by means of map.



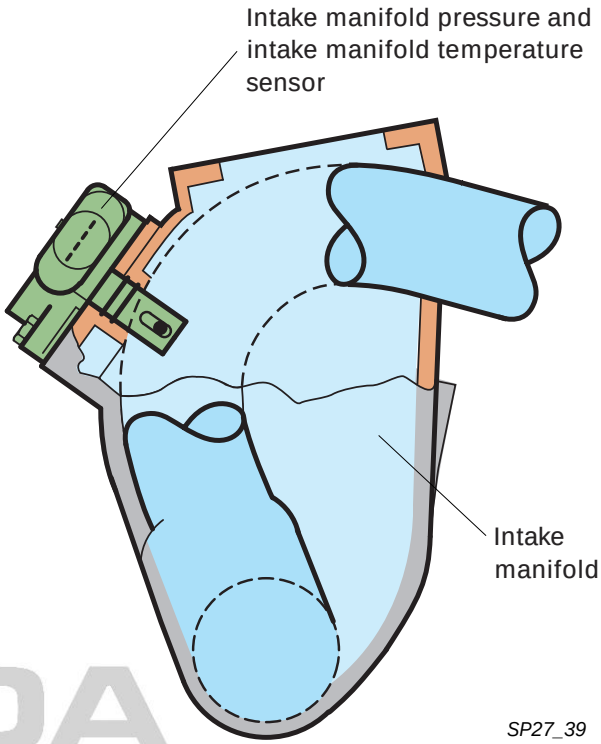
SP198_37

SP27_20

Sensors

Intake manifold pressure sensor G71 and intake manifold temperature sensor G72

The sensor is located at the middle part of the intake manifold directly downstream of the air inlet. Pressure sensor and air temperature sensor thus are in direct contact with the air inducted into the intake manifold.



SP27_39

Use of signal

Intake manifold pressure and intake manifold temperature are transmitted to the engine control unit. They are required in order to calculate the quantity of air inducted by the engine. This information is used to calculate the injection time required as well as the ignition timing point.

Substitute function

If the signals are not received, the engine control unit uses the signal of the throttle valve position and of the engine speed for calculating the injection time as well as the ignition timing point.

The engine is operated in accordance with an emergency running map!

If the signal from the intake manifold temperature sensor is not received, a substitute value based on the coolant temperature is then used.

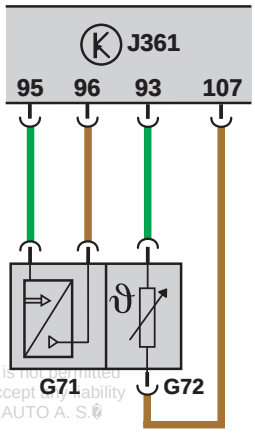
Self-diagnosis

Self-diagnosis checks both input signals.

The following faults can be detected:

- Short circuit to earth
- Short circuit to positive voltage and reference voltage
- Open circuit

Electric circuit



SP27_40

G71 Intake manifold pressure sensor
G72 Intake manifold temperature sensor
J361 Simos control unit

Function Diagram

Legend to function diagram of page 32

The function diagram represents a simplified current flow diagram.

It shows all the connections of the Simos 3PB engine management system for the 1.4-ltr./ 44 kW engine.

Additional signals

A	Engine speed
B	Fuel consumption signal
C	Diagnostic cable
D	Vehicle speed signal (in)
E	AC standby (in)
F	AC compressor on/off
G	AC pressure signal
H	Signal to electronic throttle fault lamp

Colour coding/Legend

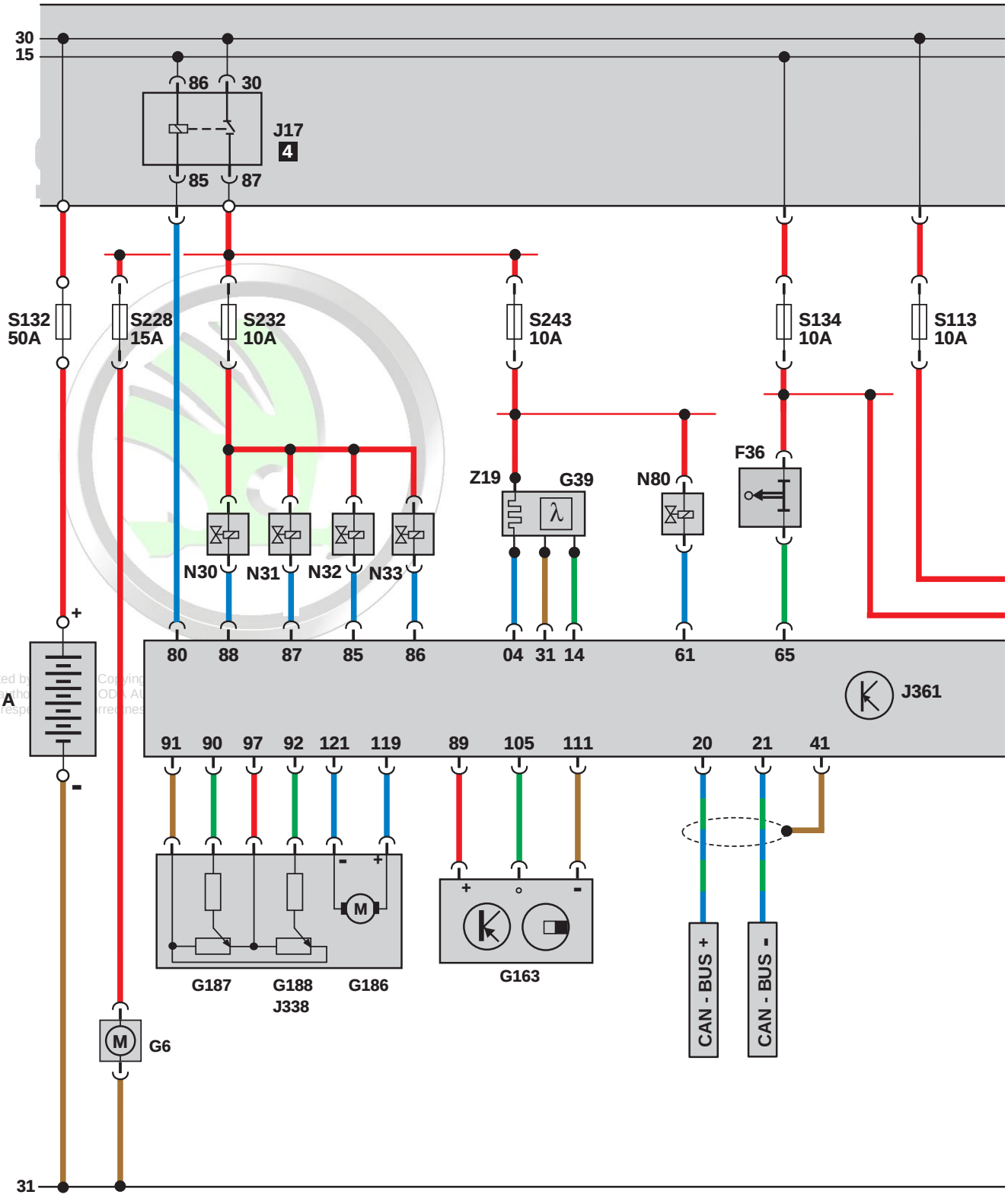
	= Input signal
	= Output signal
	= Battery positive
	= Earth
	= Bidirectional

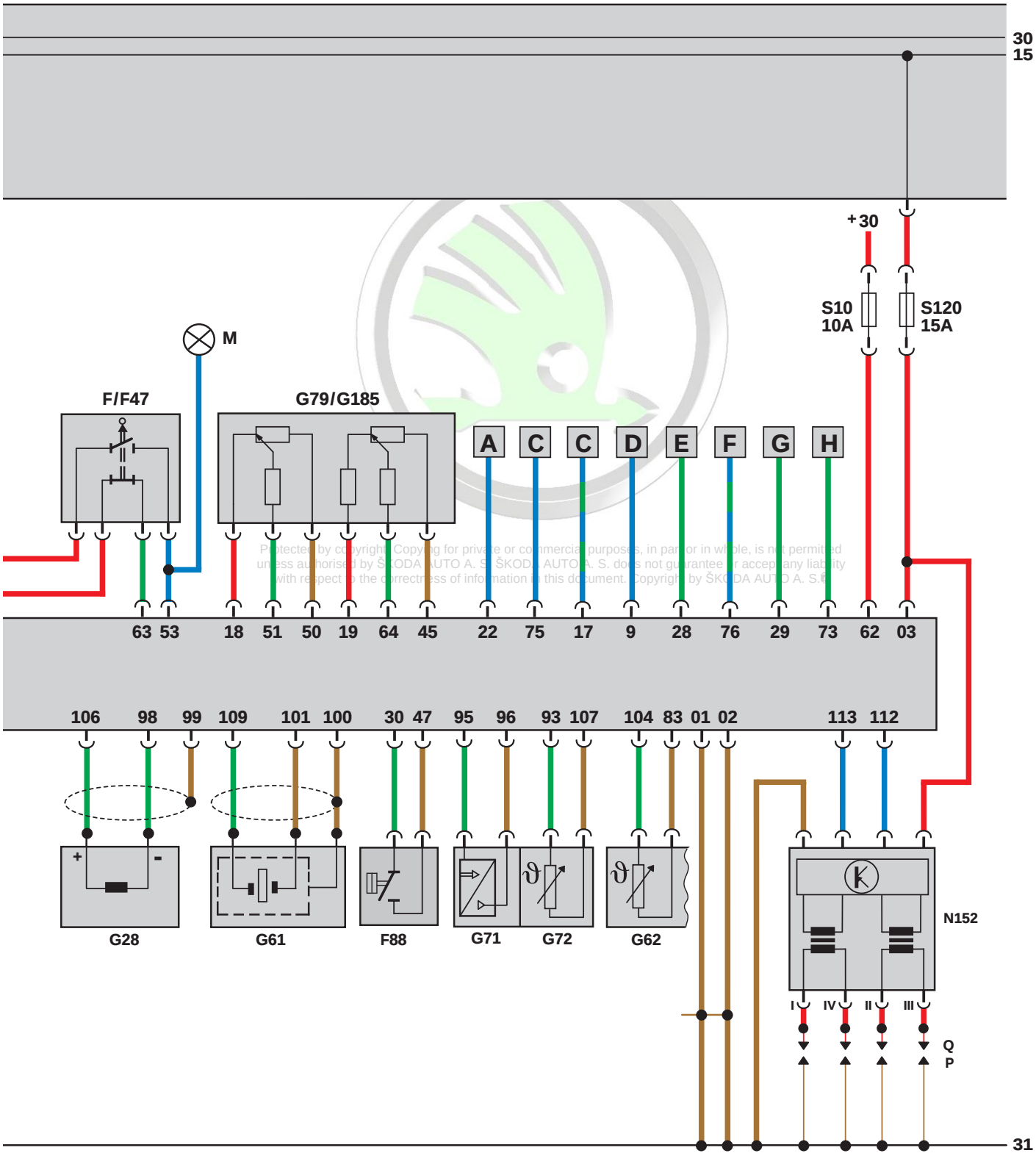
Components

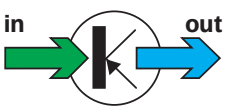
A	Battery
F	Brake light switch
F36	Clutch pedal switch
F47	Brake pedal switch
F88	Power steering pressure switch
G6	Fuel pump
G28	Engine speed sensor
G39	Lambda sensor
G61	Knock sensor
G62	Coolant temperature sensor
G71	Intake manifold pressure sensor
G72	Intake manifold temperature sensor
G79	Accelerator pedal position sensor
G163	Camshaft position sensor
G185	Sensor -2- for accelerator pedal position
G186	Throttle flap drive (electric throttle operation)
G187	Angle sensor -1- for throttle flap drive (electric throttle operation)
G188	Angle sensor -2- for throttle flap drive (electric throttle operation)
J17	Fuel pump relay
J361	Simos control unit
J338	Throttle flap control unit
M	Brake light
N152	Ignition transformer
N30...33	Injectors
N80	Activated charcoal filter system solenoid valve
P	Spark plug connector
Q	Spark plugs
S	Fuse
Z19	Lambda probe heater

Function Diagram

Simos 3PB



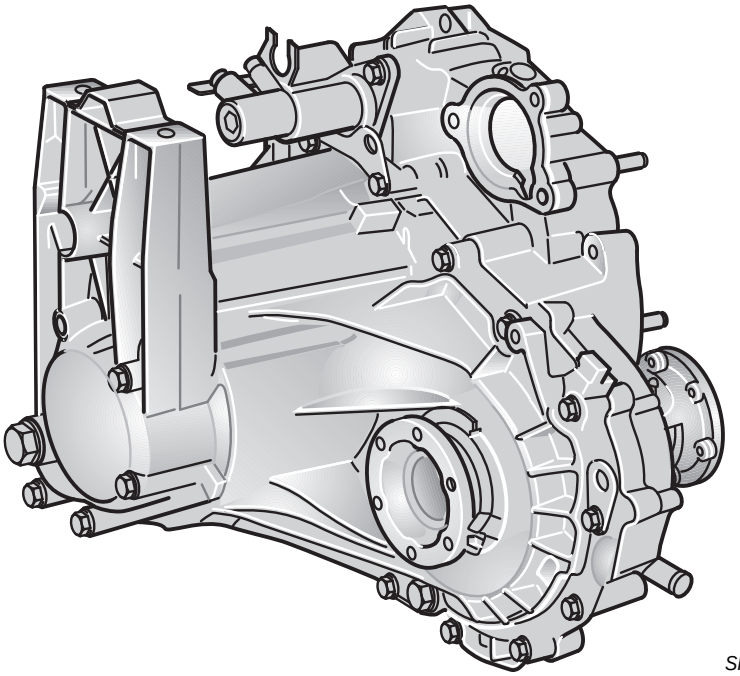




SP27_02

Technical features

New!



SP27_14

The 1.4-ltr./44 kW engine is fitted to the ŠKODA OCTAVIA in combination with the manual gearbox M5 002.

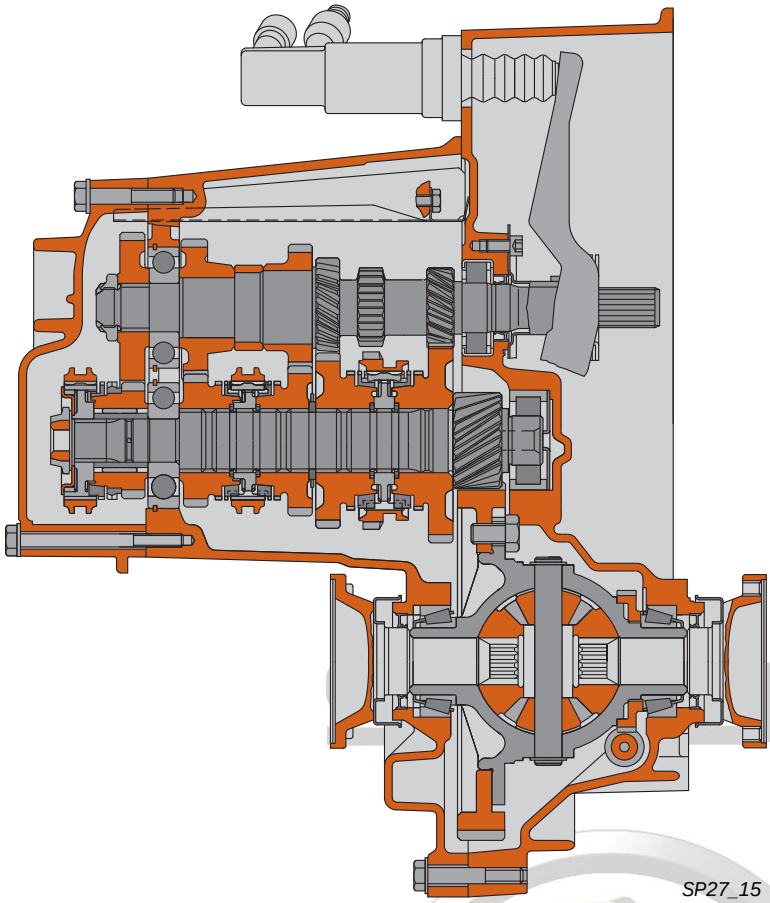
The manual gearbox is based on the tried-and-tested gearbox 14 SK.

It is matched to the engine characteristics and to the pendulum mounting in the OCTAVIA.

Transmission code letter: **DTQ**

- 5-speed manual gearbox.
- Light-alloy two-section housing, with compact gearbox end cover.
- Gearbox end cover designed as bearing bracket for mounting the gearbox bearing for the pendulum mounting of the engine block.
- Connection of pendulum support with a bolt on the underside of the gearbox housing.
- 5 all-synchromesh forward gears, non-synchromesh reverse gear.
- Common oil supply for gearbox and final drive.
- Final drive with flange shafts for attaching the CV joint shafts.
- Overhead starter.
- Hydraulic clutch mechanism.
- External shift designed as cable shift.

Block diagram of gearbox



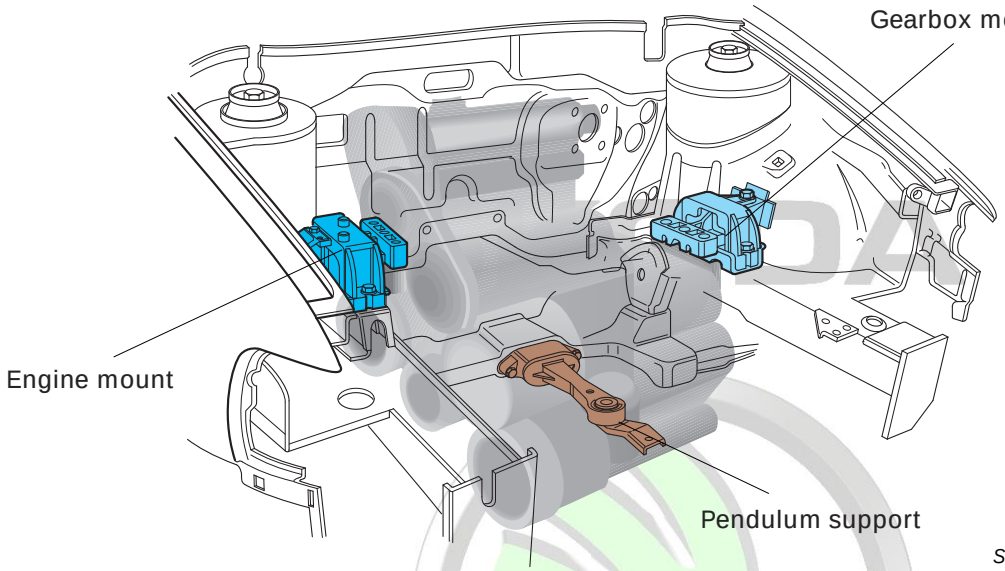
SP27_15

- Helical gears are used for the gearing of the sliding and fixed forward speed gears.
- The sliding gears (loose gears) of 1st to 4th speed run in friction bearings while 5th speed is mounted in needle bearings.
- The gears are shifted by means of shift forks.
- Mechanical tapping of engine speed for the speedometer with drive gear and pinion at final drive. Vehicle speed signal to electric speedometer by means of pulse generator.

Gear reduction i =	Teeth of driven gear z_2 / Teeth of driving gear z_1		
	z_2	z_1	i
1st gear	45	13	3.462
2nd gear	45	23	1.957
3rd gear	38	28	1.357
4th gear	40	38	1.053
5th gear	36	42	0.857
Reverse	29 38	13 29	2.923
Final drive	72	17	4.235
Speedometer	16	27	0.593

Engine/Gearbox Mounting

Complete engine/gearbox mounting



SP15_50

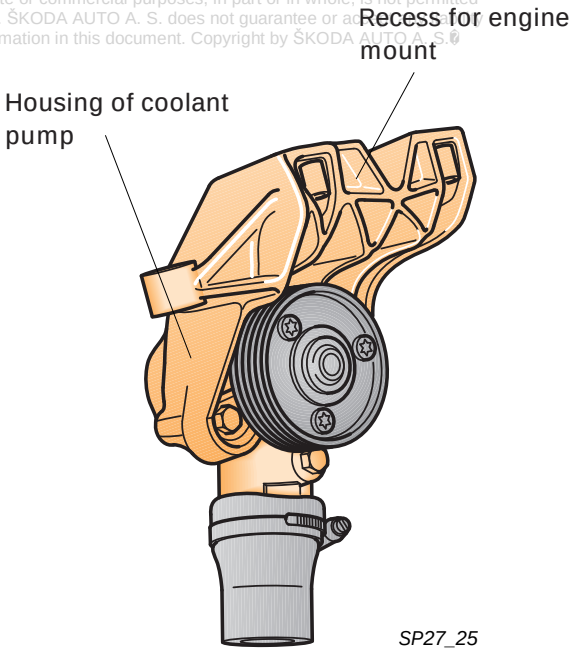
You will be familiar with the principle of the engine/gearbox mounting in the OCTAVIA (pendulum mounting) from Self Study Programme 15.

Appropriate adaptations have been made to the engine and gearbox for the design of the engine mount, the gearbox mount and the pendulum support.

Engine mount

The combination of housing for coolant pump and supporting arm for engine mount has been retained.

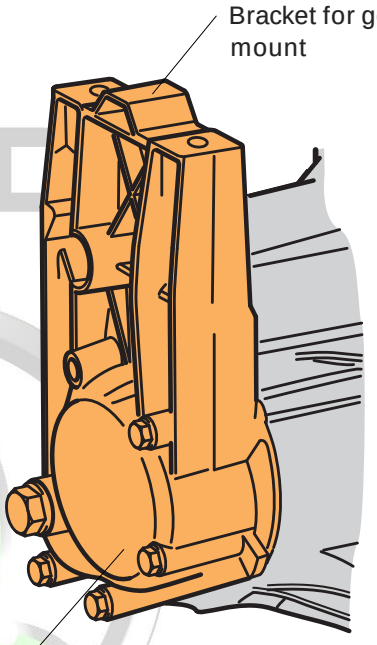
The housing of the coolant pump has been matched to the conditions of increased mechanical stress and designed for directly accommodating the engine mount.



SP27_25

Gearbox mount

The rear gearbox end cover is designed at the same time as a bracket for accommodating the gearbox mount.



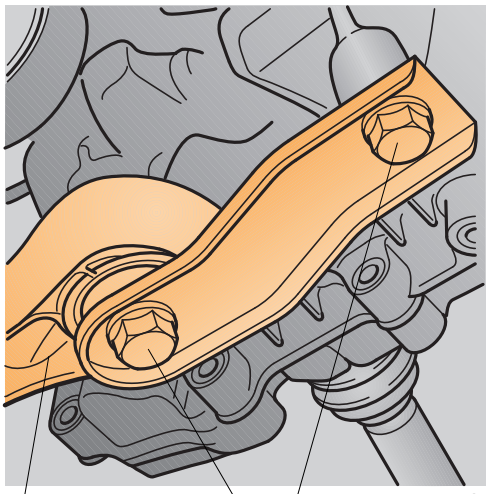
SP27_23

Pendulum support

As on gearboxes 02K and 02J, the pendulum support is attached directly to the bottom of the gearbox with two bolts.

The gearbox housing is strengthened locally at the point at which the pendulum support is attached at the front.

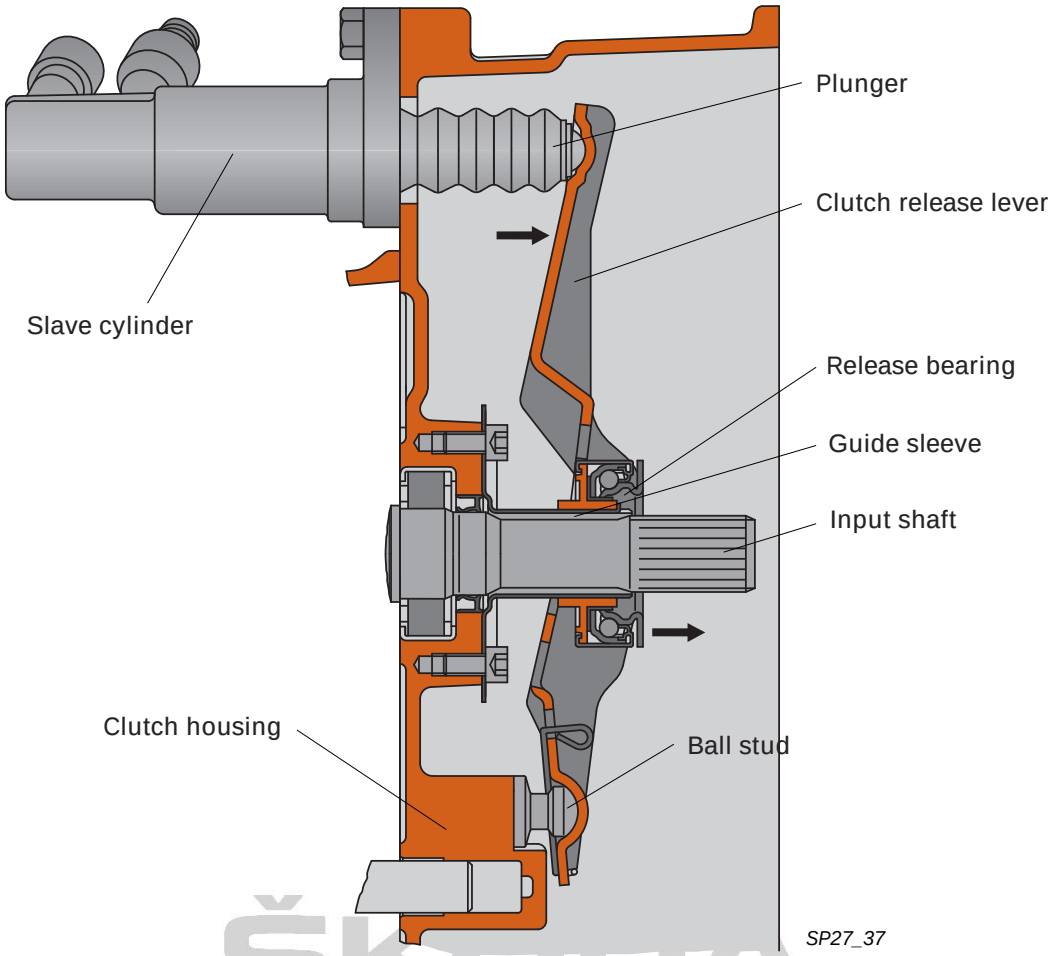
The light-alloy housing is reinforced by a steel insert at the bolt attachment point.



SP27_24

Clutch Mechanism

New!



The clutch mechanism is matched to the installation conditions in the OCTAVIA and is operated hydraulically. The slave cylinder is located at the clutch housing.

It presses on the clutch release lever by means of a plunger.

The clutch release lever is supported by means of a ball head at the clutch housing.

The release bearing is mounted on a guide sleeve which is bolted to the clutch housing.

The clutch is operated through the release bearing.

The clutch release lever is guided at the release bearing, which is secured by the guide sleeve to prevent it slipping out.

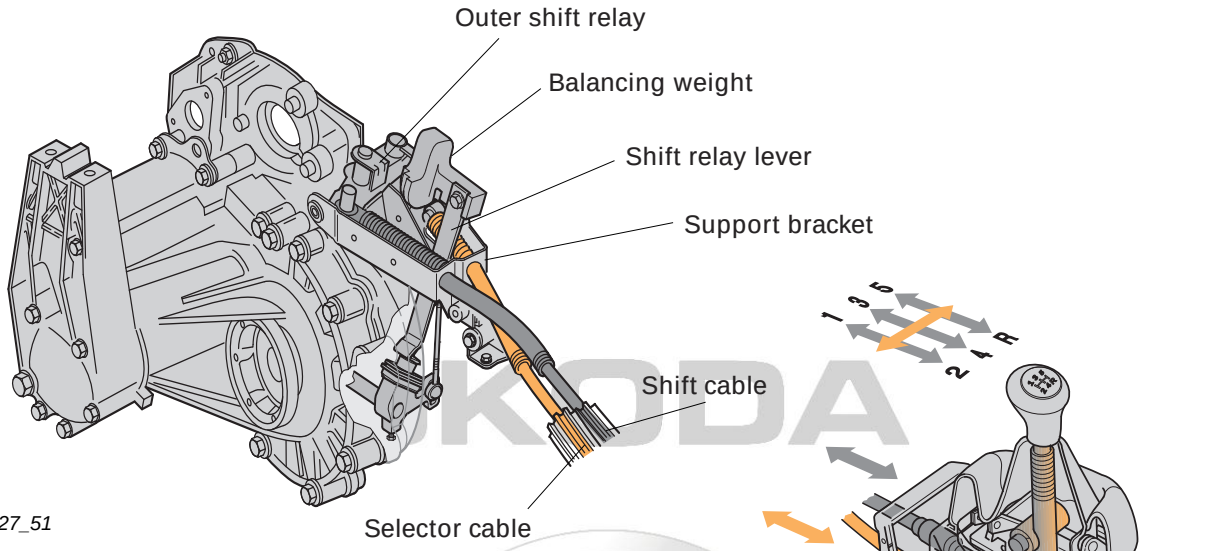
Consequently, it is not necessary to carry out any additional securing work when removing the gearbox.

Note:
After removal and installation work at clutch mechanism, the system should be bled with a brake filling and bleeding appliance.

External Shift

Two cables are used to transmit the shift movements (selecting and shifting). The operating principle is similar to that of manual gearbox 02J.
The shift pattern and the position of the reverse gear are the same as on the shift mechanism familiar from the FELICIA.
The shift movements of the gearshift lever are transmitted to the inner shift mechanism of the gearbox by means of an outer shift relay.

A balancing weight on the shift relay lever is designed to absorb vibrations and as a shift force assist.
The two cables are supported by a support bracket.
The support bracket is guided at the front at the gearbox and at the rear at the steering gear in Silent bushes.



SP27_51

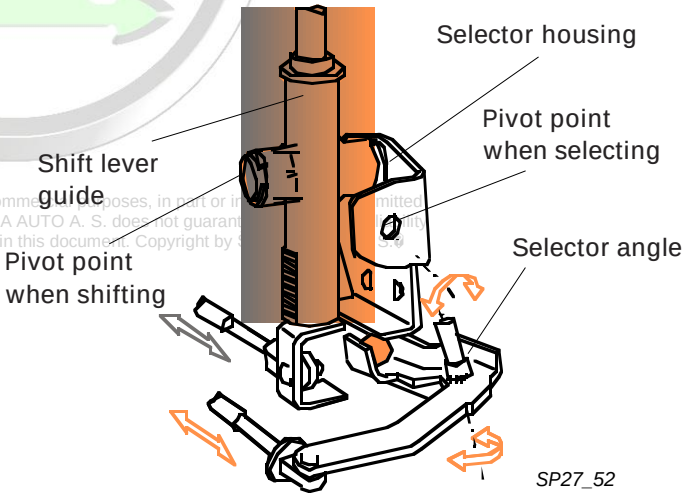
SP27_50

Shifting and selecting at gearshift lever

If the gearshift lever is moved when selecting, the pivot point is located in the selector housing. The gearshift lever guide is linked for this purpose to the selector housing. The latter is mounted in the shift housing.

The ball head attached to the bottom of the selector housing performs an opposite movement. It is surrounded by the selector angle. This converts the movement of the gearshift lever during selection into a pull/push movement.

If the gearshift lever is moved in the direction of a gear (shifting), the pivot point is located in the gearshift lever guide. The shift cable transmits the forward/reverse movement through the relay mechanism to the shift shaft of the gearbox.



SP27_52

External Shift

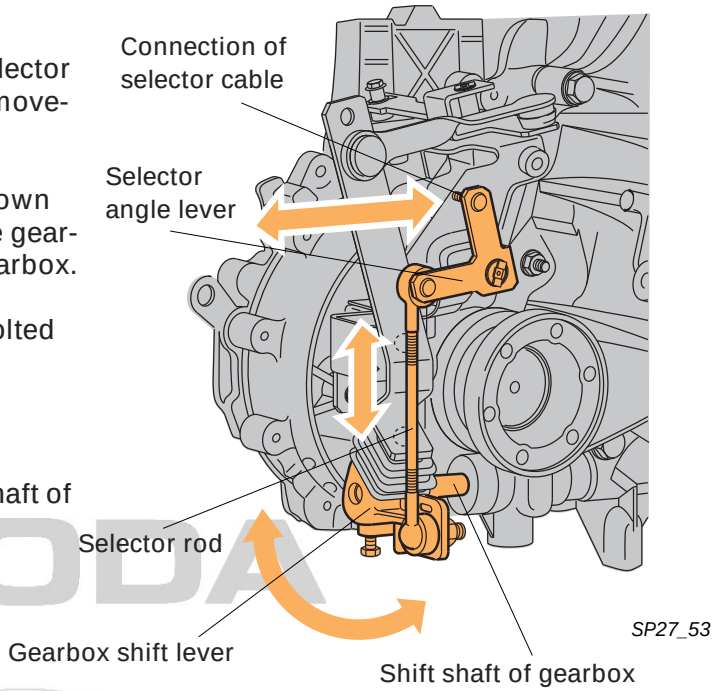
Selection operation

The selector cable is connected to the selector angle lever. This absorbs the pull/push movement of the selector cable.

The selector movement is transmitted down through the selector rod and through the gearbox shift lever to the shift shaft of the gearbox.

Gearbox shift lever and shift shaft are bolted together.

The linear movement coming from the selector cable is thus converted into the circular selector movement of the shift shaft of the gearbox.



Shift operation

The shift cable is connected at the shift intermediate lever.

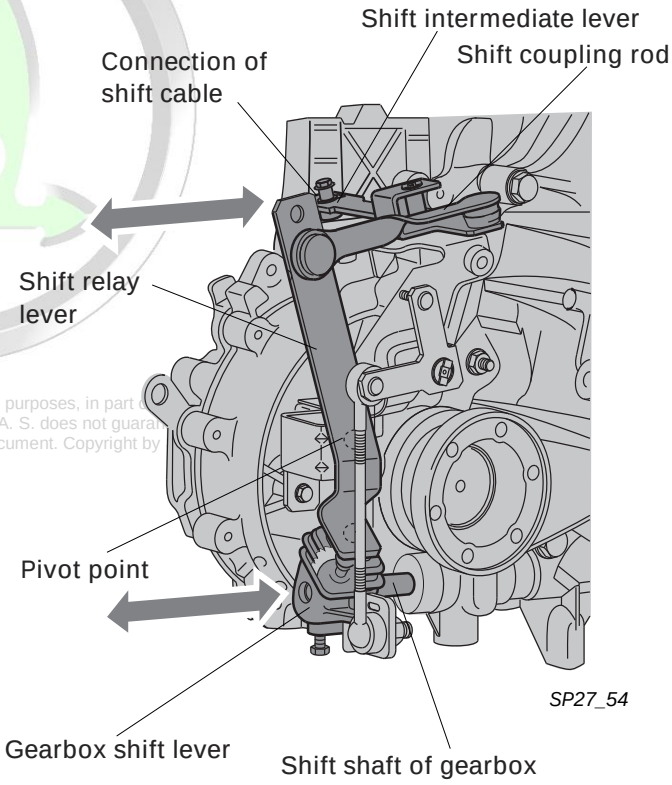
This absorbs the forward/backward movement of the shift cable and transmits it through the shift coupling rod to the shift relay lever.

The shift relay lever has a fixed pivot point and at the bottom runs into the gearbox shift lever by means of a ball head.

During a gearshift, the linear movement of the shift cable which is initiated at the top is transmitted linearly, as a result of the double reversal, to the shift shaft of the gearbox.

The ball head of the shift relay lever compensates for different angle positions, caused by the selector movements.

(Note: Balancing weight not illustrated)



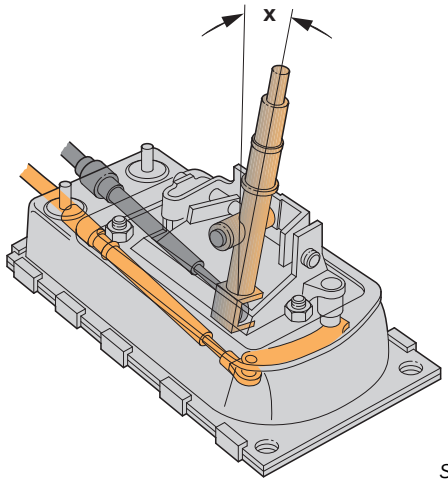
Adjusting outer shift

The components of the outer shift mechanism have to be adjusted relative to the inner gearbox shift mechanism to ensure smooth and proper gearshifts.

Gearshift lever

In Neutral, the gearshift lever should be in position x. In this position, the gearshift lever is angled back 3° and to the right 4°. This position is fixed by means of a gauge.

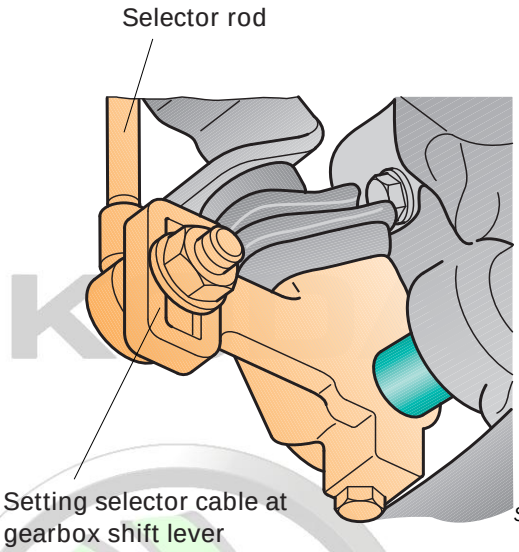
The gearshift lever and gearbox are in Neutral in the gate of 3rd/4th gear for this step.



SP27_57

Selector cable

The selector cable should not have any play in the fixed position. A slot is provided for this purpose at the gearbox shift lever to enable the selector rod to be set free of play.

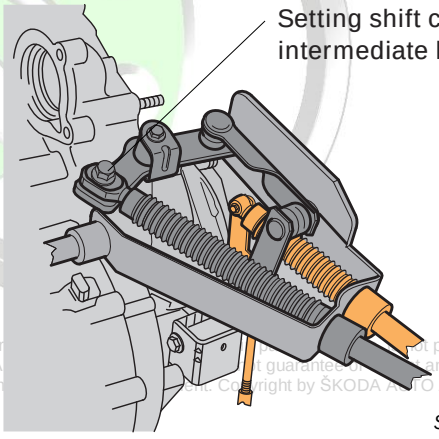


SP27_55

Shift cable

The shift cable is set at the shift intermediate lever with a gear engaged (e.g. 1st gear engaged manually, gearshift lever set to 1st gear position).
A slot is provided for this setting.

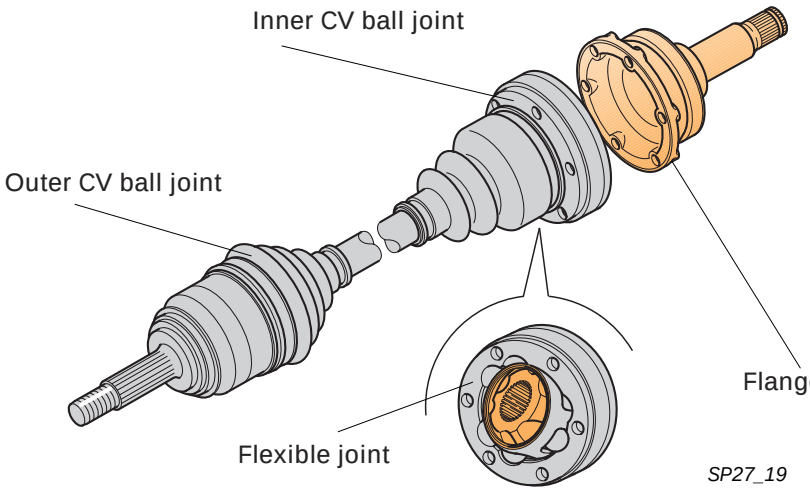
Note:
Please refer to the Workshop Manual OCTAVIA, 5-Speed Manual Gearbox 002 for the exact setting procedure. After completing the setting, once again shift through all gears. Pay particular attention to the reverse gear lock.



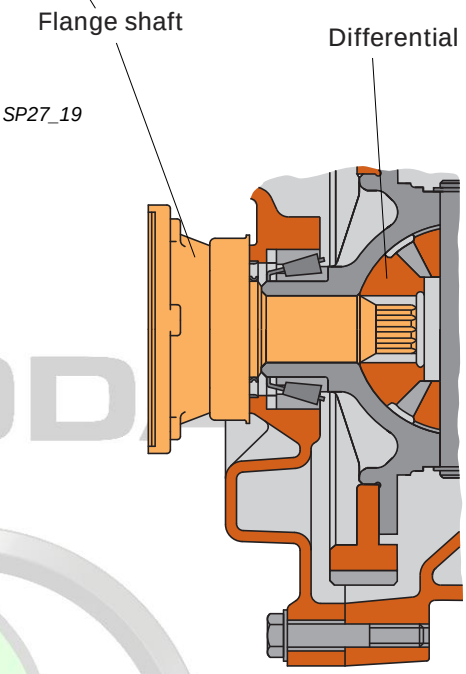
SP27_56

Final Drive/Speedometer Drive

New!



SP27_19



SP27_21

Connection of drive shafts

All the manual gearboxes fitted to the OCTAVIA have drive shafts which feature outer and inner constant-velocity ball joints.

The flange shafts of the gearbox have been matched to these requirements.

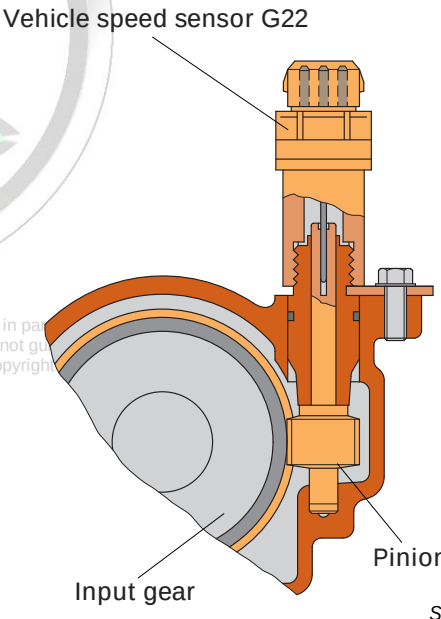
Both flange shafts are inserted into the differential with a spline section.

A circlip holds the flange shaft in position to prevent it dropping out when the gearbox is removed.

Speedometer drive

The vehicle speed signal is supplied electro-mechanically by the gearbox to the speedo-meter.
Mechanical tapping in gearbox (input gear/ pinion).
The vehicle speed sensor G22 is installed at the gearbox in place of the speedometer shaft. It is driven by the pinion (in the same way as automatic gearbox in OCTAVIA).

Engine speed is transmitted not mechanically with a speedometer shaft, but electrically in the form of pulses from the sensor to the combination processor in the dash panel insert. The pulses are processed there for displaying the vehicle speed and the distance. Advantage: greater accuracy and smoother operation.



SP27_62

Service information

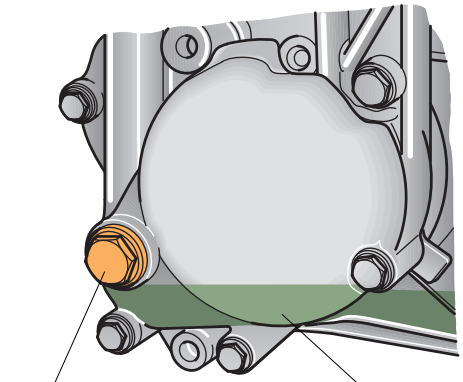
New!

Oil filling

The oil filling is designed for the entire operating life of the gearbox.
The opening for inspecting oil level is located at the bottom in the gearbox end cover.

Correct oil level = Oil filling extends up to the thread of inspection opening

The screw plug is inserted with sealant.
The oil level is no longer checked in a service workshop at the opening of the speedometer drive with the aid of the speedometer pinion.



SP27_22

Screw plug for inspecting oil level

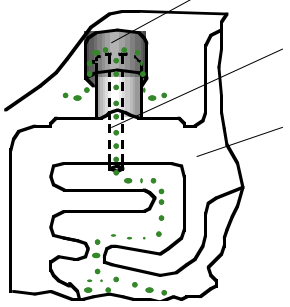
Oil filling

Note:
Please refer to Workshop Manual OCTAVIA, 5-Speed Manual Gearbox 002 for the quantity and specification of the oil.

Bleeding gearbox and topping up gearbox oil

The bleeder plug is located above a labyrinth which is cast into the top of the gearbox housing.

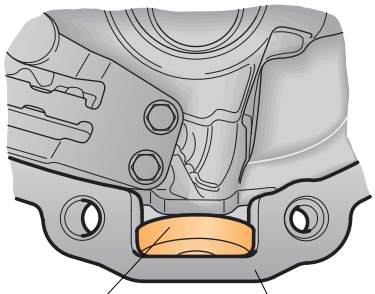
It is also possible to top up the oil, if necessary, through the bleeder hole.



SP27_30

Magnet for metal abrasion

A magnet for collecting metallic abrasion is now provided at the lowest point of the gear-box housing in a recess.



SP27_31

Magnet

Housing