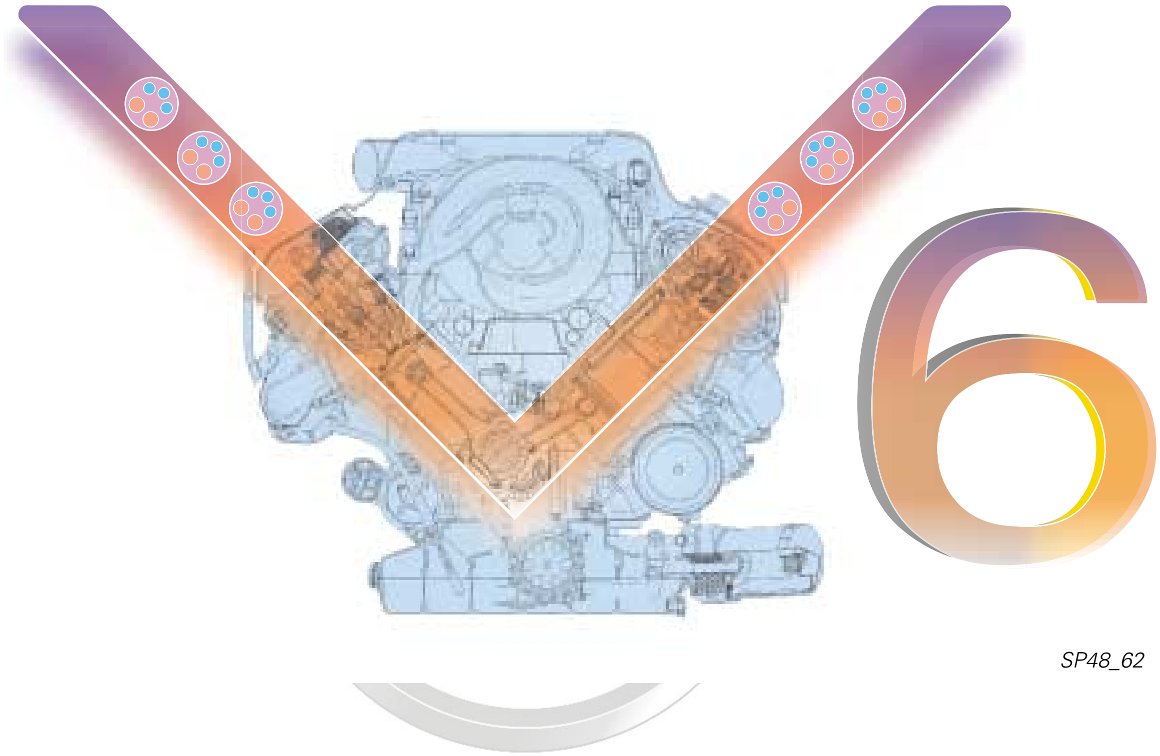
Service 48

ŠkodaSuperb

V6 Internal Combustion Engine 2.8 litre/142 kW

Self-Study Programme

The new ŠkodaSuperb
.... with a V6 engine



SP48_62

This is the first time that Škoda has used a V6 engine, in the new **Škoda**Superb, the first vehicle from Škoda in the upper middle class.

The longitudinally mounted 2.8 litre/142 kW engine using five valve technology originates from the VW/Audi range of engines and

- has a high performance and a high torque with a correspondingly low fuel consumption,
- is fitted out with a modern engine management system.

The engine is built into vehicles with either a 5-speed manual gearbox or an automatic gearbox with five driving positions.

Contents

Introduction	**4**
Technical overview	
Engine management	**5**
Motronic ME7.1	5
A system overview for the Motronic ME7.1	6
Positions of the various components	8
A function plan	**10**
Engine mechanics	**13**
The crankcase and crankshaft drive	13
The cylinder head and valve gear	16
The camshaft adjuster	17
The timing belt drive	19
Drive for the ancillary units	21
The visco fan coupling	22
The switching intake manifold	25
Engine lubrication	**26**
The oil circulation system	26
Components of the oil circulation system	27
Cooling	**29**
Ventilation of the crankcase	**31**
The vacuum system	**32**
Supply the engine with fuel	**34**
The exhaust system	**35**
The secondary air system	**36**
Self-diagnosis	**38**
Notes	**39**

You can find information regarding inspection and maintenance, setting and repair instructions in the Workshop Manuals.

Technical overview

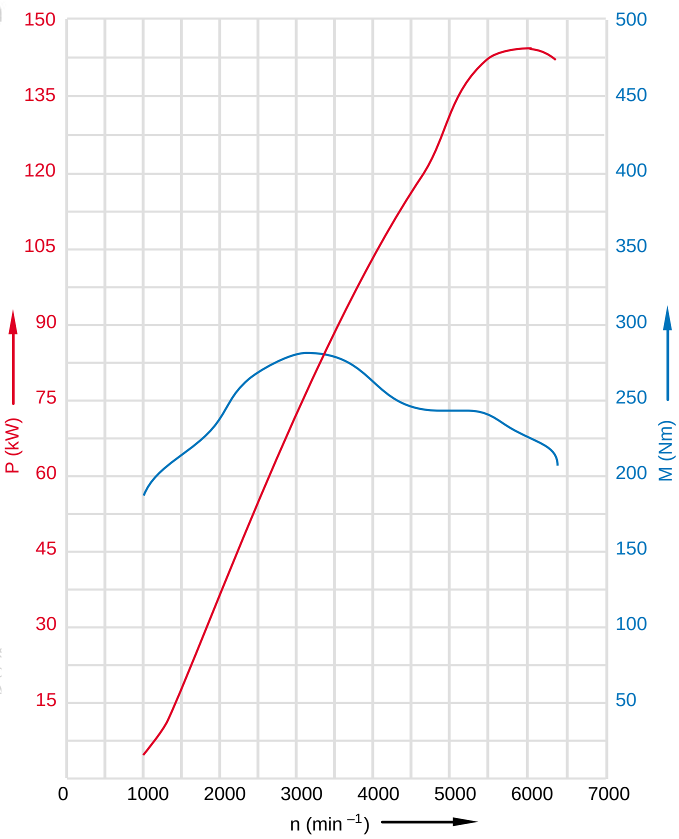
Technical features

- V6 engine with 5-valve technology
- 2 overhead camshafts (DOHC), inlet camshaft with hydraulic adjustment
- an electronic fuel injection system with integrated performance map ignition
- cylinder-selective knocking regulation
- a maintenance-free ignition system with dormant high voltage ignition distribution
- a switching intake manifold
- 2 pre-catalytic converter lambda probes
- 2 post-catalytic converter lambda probes
- a secondary air system
- fulfilment of all EU4 standards

SP48_01

Technical data

Engine code	AMX
Type	V-engine
Number of cylinders	6
Valves per cylinder	5
Compression ratio	10.6 : 1
Displacement	2771 cm^3
Bore diameter	82.5 mm
Stroke	86.4 mm
Max. power output	142 kW at 6000 rpm
Max. torque	280 Nm at 3200 rpm
Engine management	Bosch Motronic ME7.1
Fuel /air mixture preparation	Electronic fuel injection plant (MPI)
Fuel	Petrol, lead-free RON 98 (RON 95 is possible with some reduction in performance)

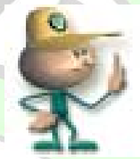


SP48_02

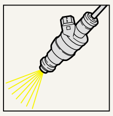
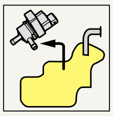
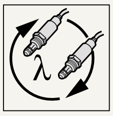
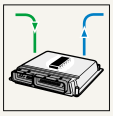
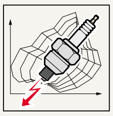
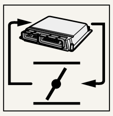
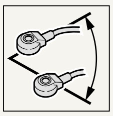
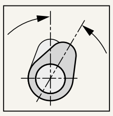
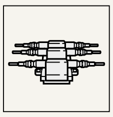
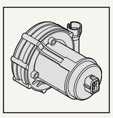
Motronic ME 7.1

The engine control ME 7.1 operates through orientation on the torque.
This allows the Electronic Throttle System Function to operate.
External and internal demands for torque are co-ordinated by the engine control unit while taking due consideration of the operating efficiency and the exhaust gas standard (EU4) and are translated into action over the available actuators.

The engine management system is fitted with a rapid start function. Two camshaft position sensors and an engine run-out recognition system (position of the next cylinder in line at the ignition top dead centre) create the conditions whereby one can immediately begin to spray in fuel. This has a positive effect on the starting behaviour.



Note:
There are also functions for the 3rd generation of vehicle immobilisers integrated in the ME 7.1 (see SSP 46).

Part	Function	Part	Function
 SP48_04_1	Sequential fuel injection (see SSP 19)	 SP48_04_6	AKF system
 SP48_04_2	Lambda regulation of the two cylinder banks	 SP48_04_7	Torque-oriented engine management
 SP48_04_3	Performance map ignition	 SP48_04_8	Electrically operated throttle valve (Electronic Throttle System Function) (see SSP 27)
 SP48_04_4	Knocking regulation of the two cylinder banks	 SP48_04_9	Performance map inlet camshaft adjustment (see page 18)
 SP48_04_5	Dormant high voltage ignition distribution over an ignition transformer	 SP48_04_10	Secondary air system (see page 36)

Engine Management

A system overview for the Motronic ME7.1

Sensors

Air mass flow meter G70

Sender for the engine speed G28

Hall sender (Bank 1) G40 and (Bank 2) G163
(camshaft position sensor)

Lambda probe (Bank 1) G39 and G130
Lambda probe (Bank 2) G108 and G131

Throttle valve control unit J338
with angle sender (1) G187 and (2) G188

Sender for the inlet air temperature G42

Sender for the coolant temperature G62

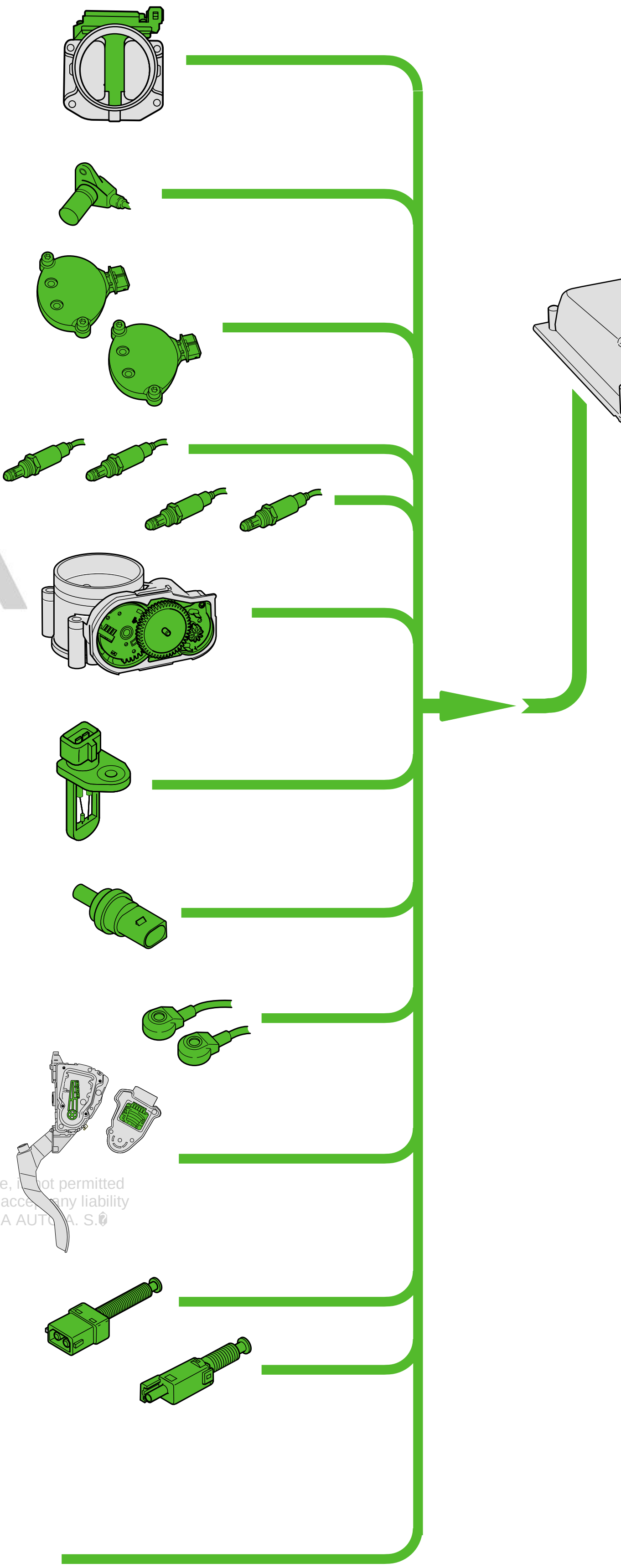
Knocking sensor (Bank 1) G61 and (Bank 2) G66

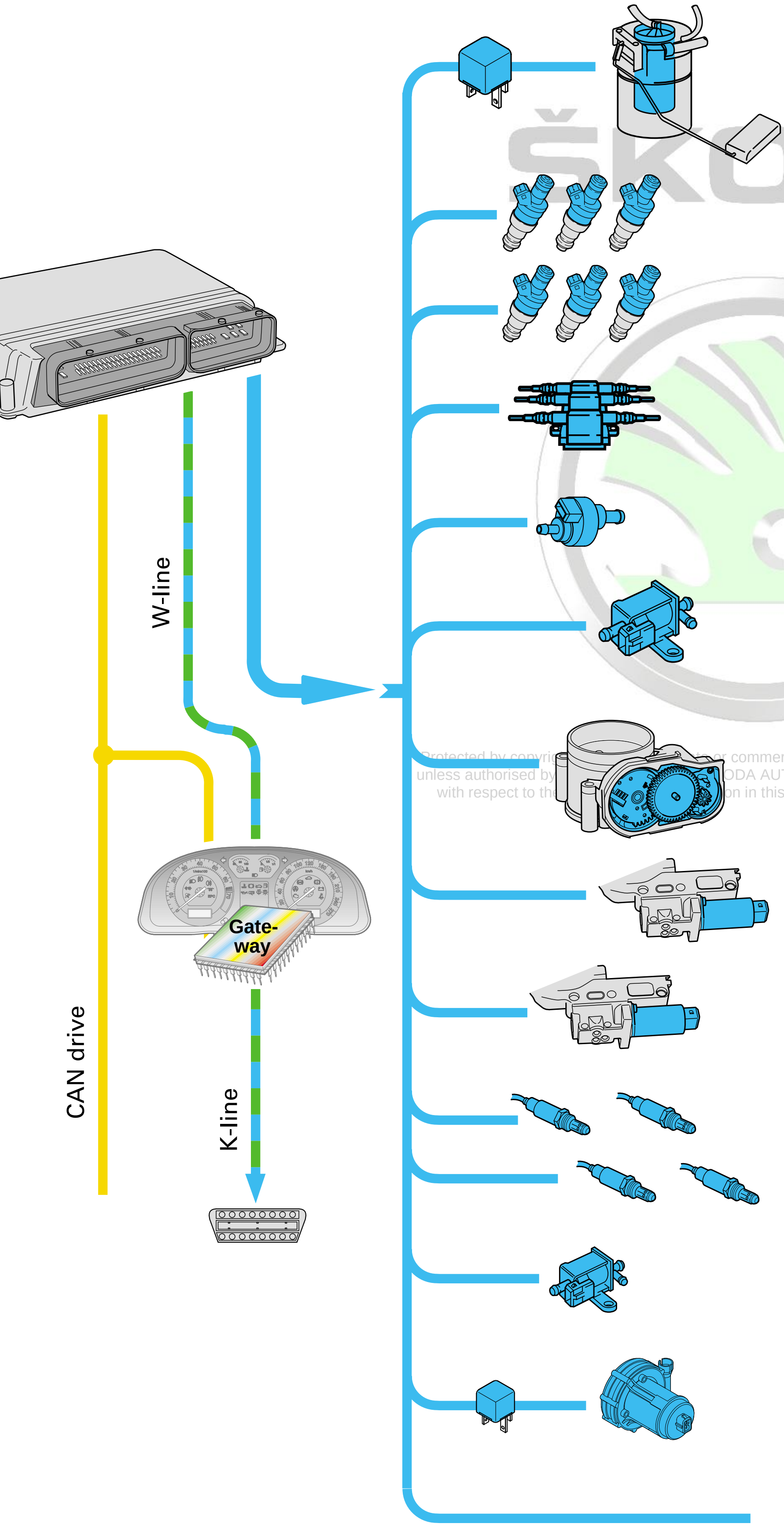
Accelerator pedal module with sender for the
accelerator pedal position G79 and G185

Brake light switch F and brake pedal switch F47

Clutch pedal switch F36

Additional signals:
- air-conditioning compressor - On
- driving speed
- switch for the speed control equipment





Actuators

Fuel pump relay J17 and fuel pump G6

Injection valve (Bank 1) N30, N31, N32

Injection valve (Bank 2) N33, N83, N84

Ignition transformer N152

Magnetic valve for the active charcoal filter system N80

Valve for variable intake manifold changeover N156

Throttle valve control unit J338 with a throttle valve drive G186

Valve for camshaft adjustment (Bank 1) N205 and (Bank 2) N208

Heating for the lambda probes (Bank 1 und 2)

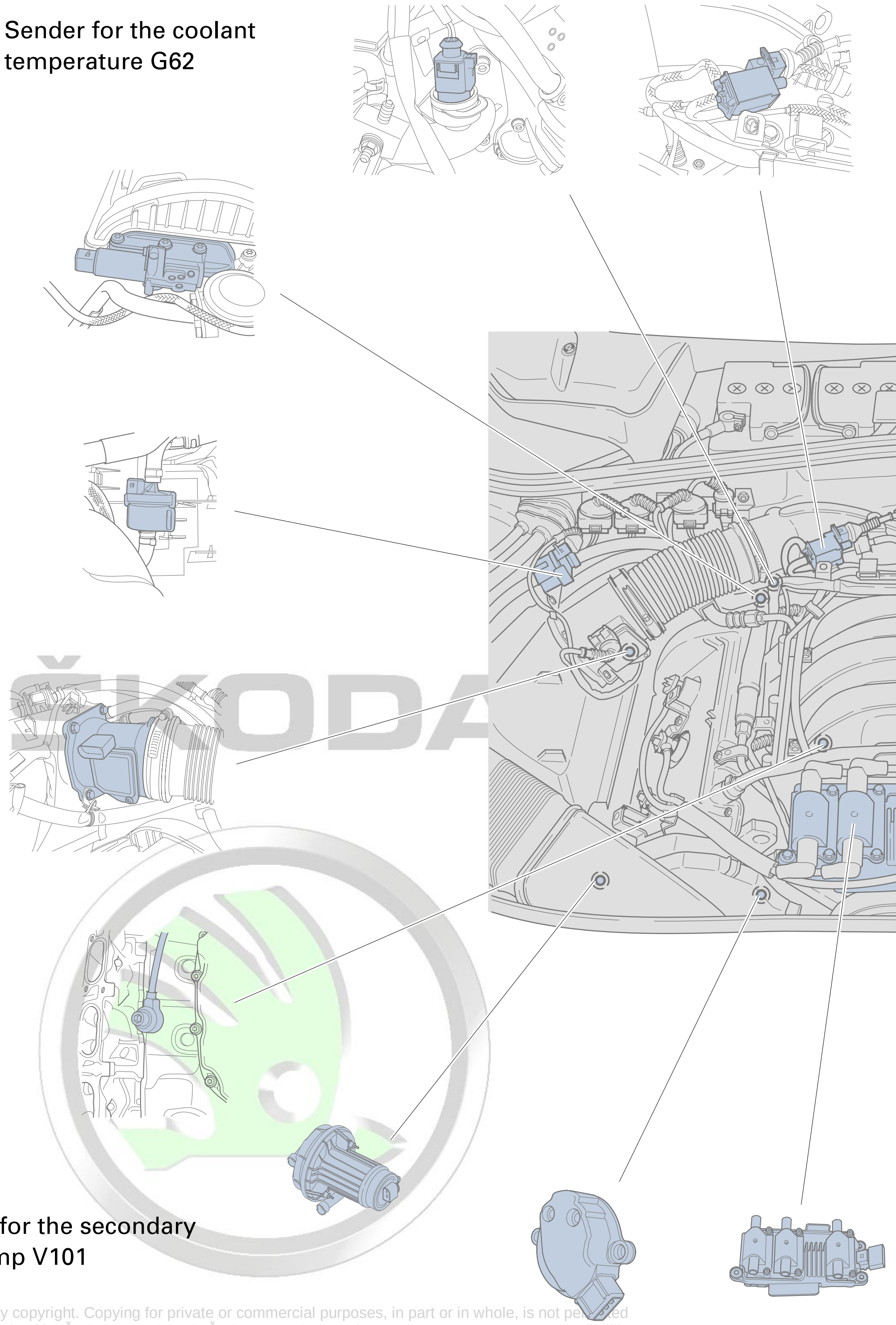
Secondary air inlet fan valve N112

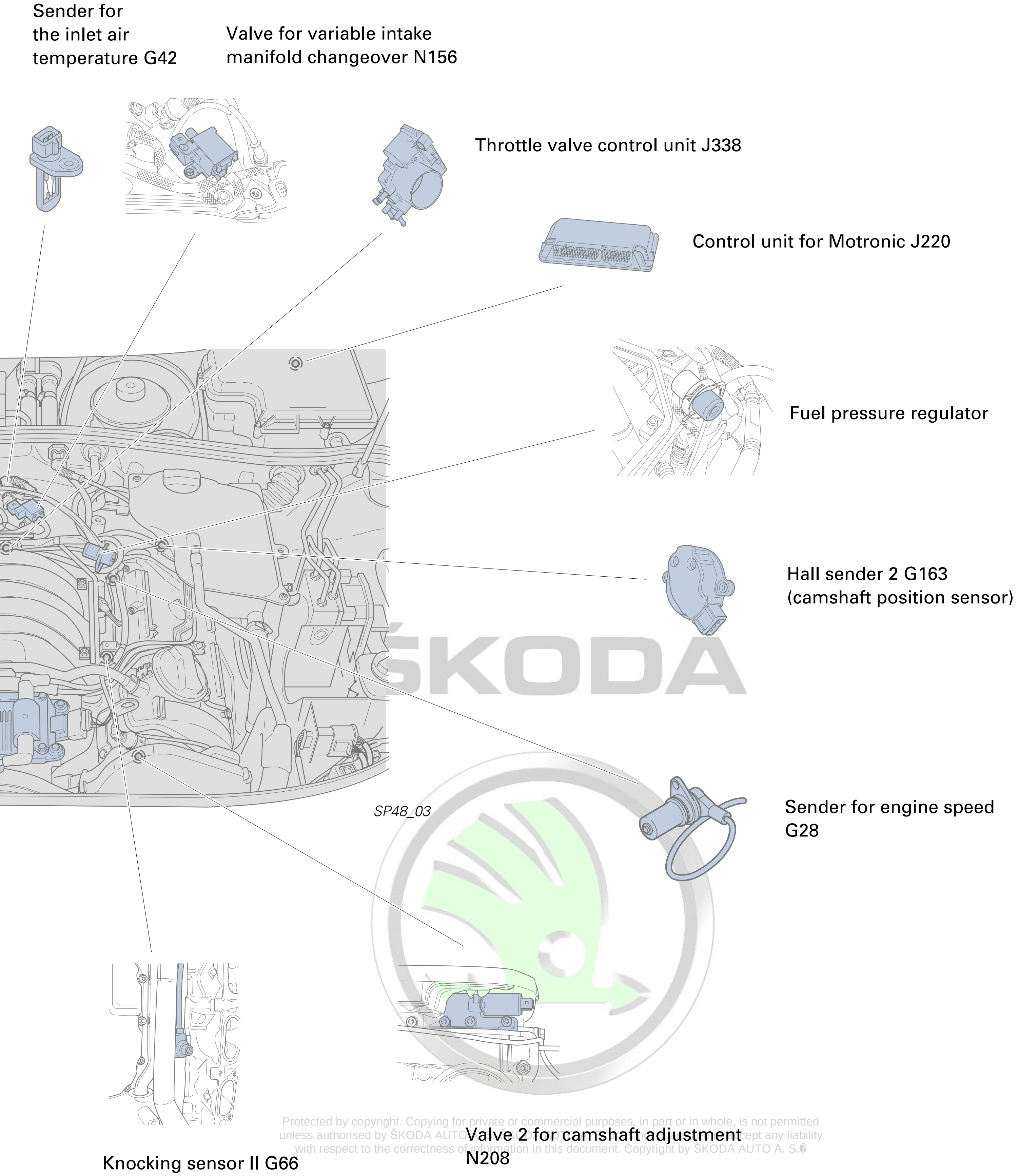
Relay for the secondary air pump J229 and motor for the secondary air pump V101

Additional signal:
- air-conditioning compressor - Off

SP48_05

Positions of the parts

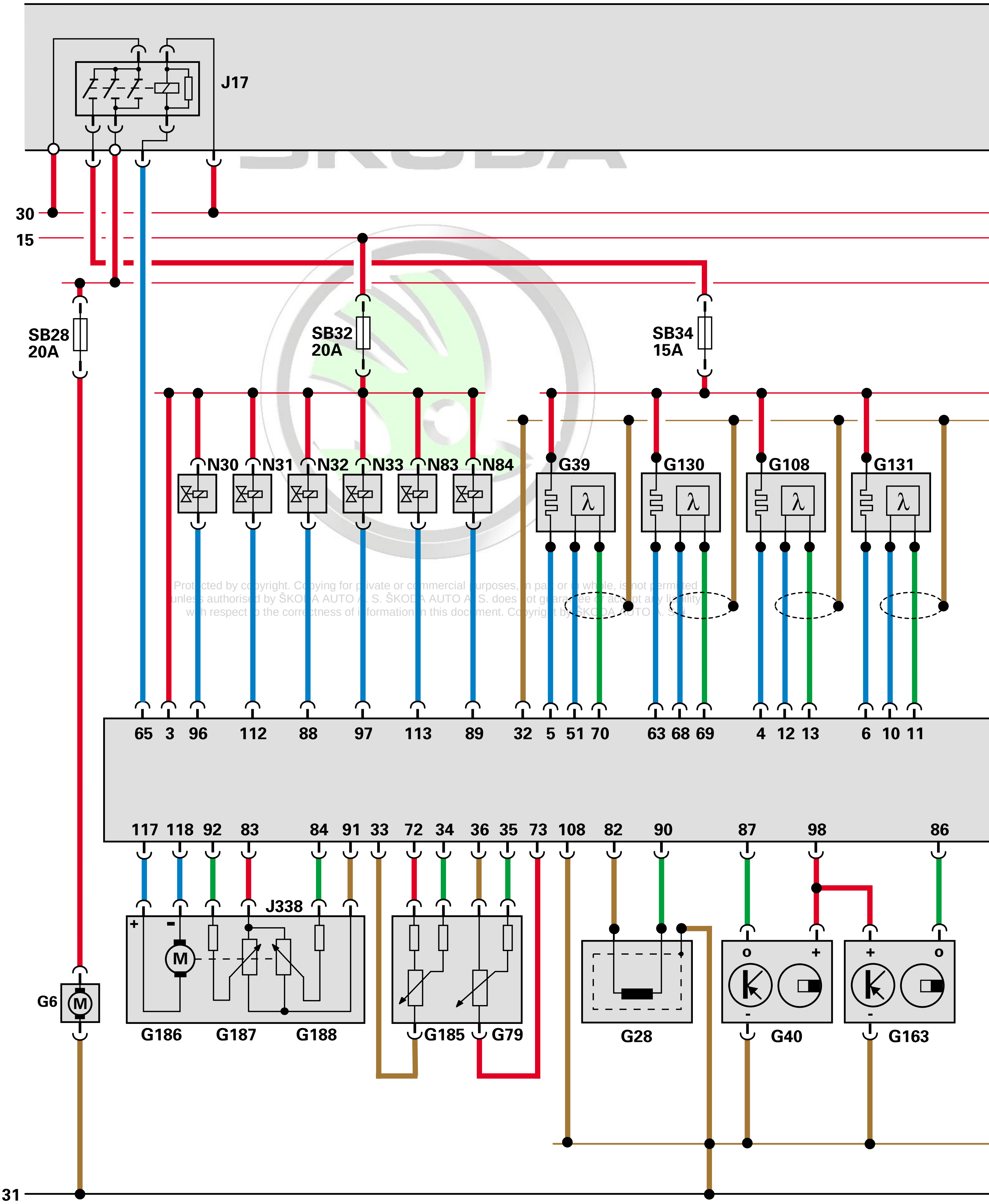




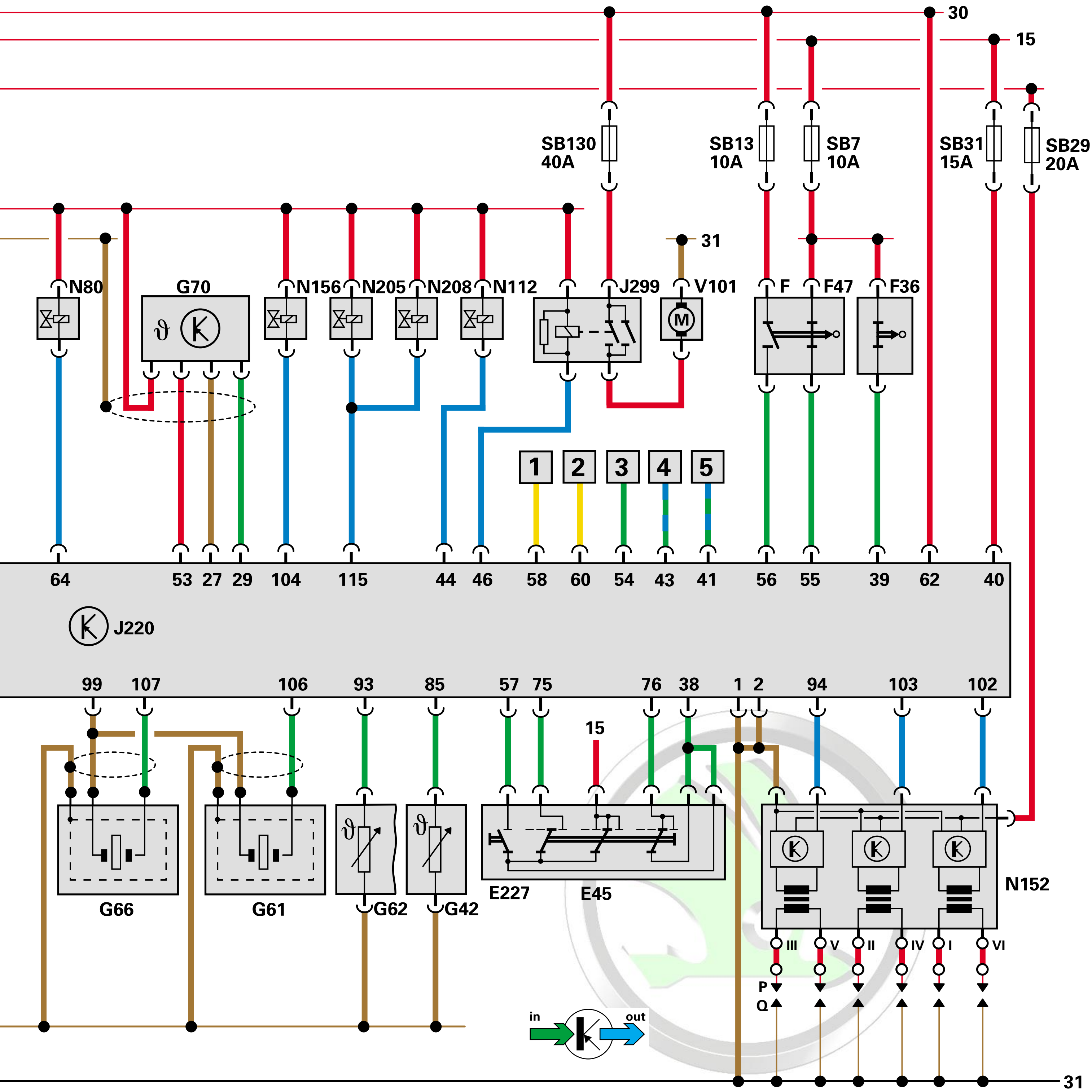
Sender for
the inlet air
temperature G42
Valve for variable intake
manifold changeover N156
Throttle valve control unit J338
Control unit for Motronic J220
Fuel pressure regulator
Hall sender 2 G163
(camshaft position sensor)
Sender for engine speed
G28
Knocking sensor II G66
Valve 2 for camshaft adjustment
N208

SP48_03

Function plan



Legends to the function plan
See page 12.



30
15
31
SB130
40A
SB13
10A
SB7
10A
SB31
15A
SB29
20A
N80
G70
N156
N205
N208
N112
J299
V101
F
F47
F36
1
2
3
4
5
64
53
27
29
104
115
44
46
58
60
54
43
41
56
55
39
62
40
J220
99
107
106
93
85
57
75
76
38
1
2
94
103
102
15
G66
G61
G62
G42
E227
E45
N152
III
V
II
IV
I
VI
P
Q
in
out

SP48_48

Function plan

Legends to the function plan

Components

E45	Switch for the speed control equipment
E227	Key for the speed control equipment (set)
F	Brake light switch
F36	Clutch pedal switch
F47	Brake pedal switch
G6	Fuel pump
G28	Sender for the engine speed
G39	Lambda probe before the catalytic converter
G40	Hall sender
G42	Sender for the inlet air temperature
G61	Knocking sensor I
G62	Sender for the coolant temperature
G66	Knocking sensor II
G70	Air mass meter
G79	Sender for the accelerator pedal position
G108	Lambda probe II before the catalytic converter
G130	Lambda probe after the catalytic converter
G131	Lambda probe II after the catalytic converter
G163	Hall sender 2
G185	Sender 2 for the accelerator pedal position
G186	Throttle valve drive
G187	Angle sender 1 for the throttle valve drive
G188	Angle sender 2 for the throttle valve drive
J17	Fuel pump relay
J220	Control unit for the Motronic
J299	Relay for the secondary air pump
J338	Throttle valve control unit
N30	Injector for cylinder 1
N31	Injector for cylinder 2
N32	Injector for cylinder 3
N33	Injector for cylinder 4
N80	Solenoid valve 1 for the active charcoal filter system
N83	Injector for cylinder 5
N84	Injector for cylinder 6
N112	Secondary air fan valve
N152	Ignition transformer
N156	Valve for variable intake manifold changeover
N205	Valve 1 for camshaft adjustment
N208	Valve 2 for camshaft adjustment
P	Spark plug terminal
Q	Spark plug
SB	Fuse
V101	Motor for the secondary air pumps

Additional signals

1	CAN drive (Low)
2	CAN drive (High)
3	Driving speed signal
4	W-line
5	Air-conditioning compressor - Off/On

Colour coding/legends

= input signal

= output signal

= battery positive

= earth

= CAN bus

= bi-directional

Note:
The function plan shows a simplified electrical circuit diagram.

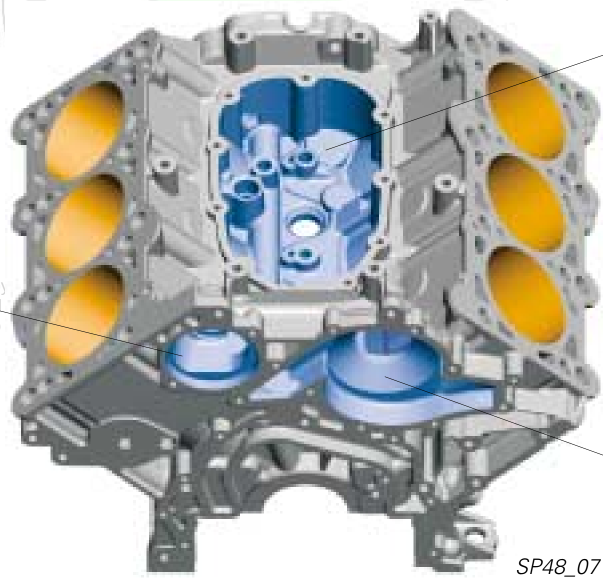
The crankshaft and crank drive

The 90° V construction allows one to build an engine with a lower constructional height which also, at the same time, offers much space between the cylinder banks for mounting the compact inlet manifold.

There is a settling chamber located under the inlet manifold for crankcase ventilation which is closed off with an aluminium cover.

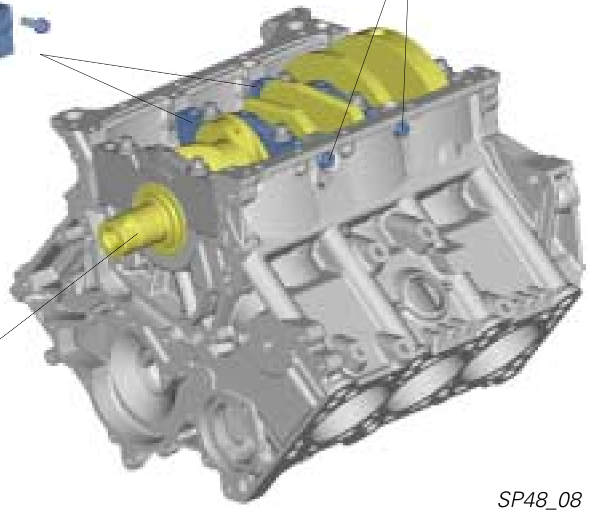
The thermostat and coolant pump housings are integrated into the rear side of the crankcase. This coupled with the lower displacement of the row of cylinders by 18.5 mm means that a shorter constructional length is achieved.

The crankcase is made out of cast iron.



SP48_07

SP48_30



SP48_08

The crankshaft

The crankshaft sits on four bearings and the middle bearing caps are screwed to the crankcase crosswise on both sides to obtain a stiffening effect.

Advantage:
Improved engine acoustics.

Large counterweights on the crank arms serve to achieve optimum mass balancing.

The crank pin throw

A V6 engine has an equal ignition spacing between the cylinders of 120°. This means that there should be a 30° throw of the three crankshaft pins because of the V-angle of 90° between the two cylinder banks.

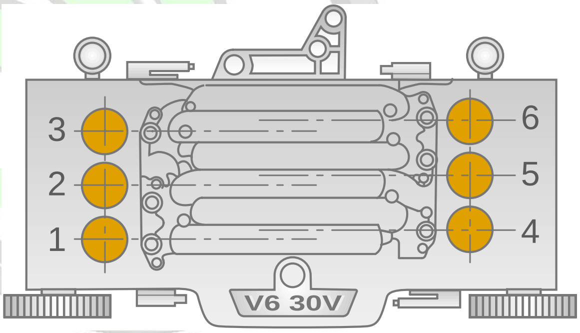
The effect of the crank pin throw

The piston rod for

Cylinder 1 and 4
Cylinder 2 and 5
Cylinder 3 and 6

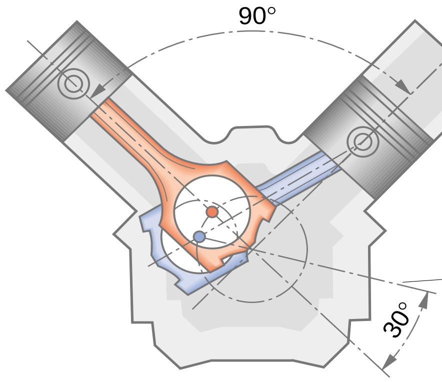
is located on each of the cranked (split) crankshaft pins.

Ignition sequence: 1 - 4 - 3 - 6 -2 -5



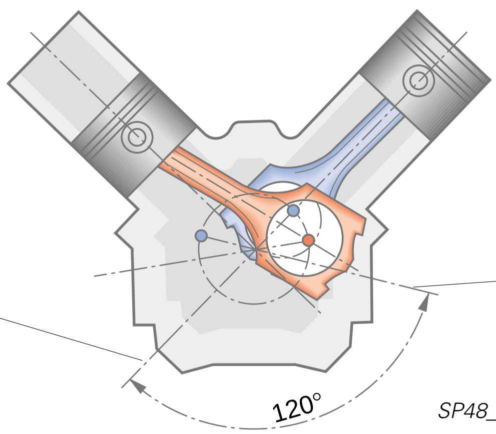
SP48_09

Position of the crank pin of cylinder 4 for cylinder 1 at TDC



SP48_10

... after a 120° turn of the crankshaft



SP48_11

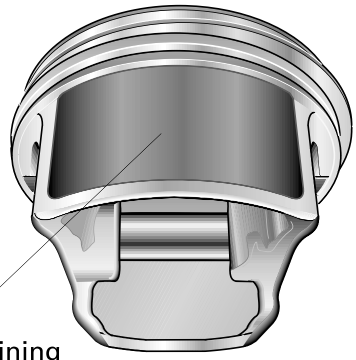
A 120° turn of the crankshaft = the ignition interval

Pistons

The engine is fitted with pistons which have piston bolt eyes located close together.

The piston bolts which are somewhat smaller in length and diameter allow reduction of the masses which are moving back and forth (oscillating).

The piston cooling is achieved through using piston spray jets in the crankcase.
The piston shaft is fitted with a wear-resistant, graphite-containing gliding layer which is applied by a screen printing process.



SP48_12

Con-rods

The V-6 2.8 litre/142 kW engine is fitted with lightweight cracked steel con-rods.

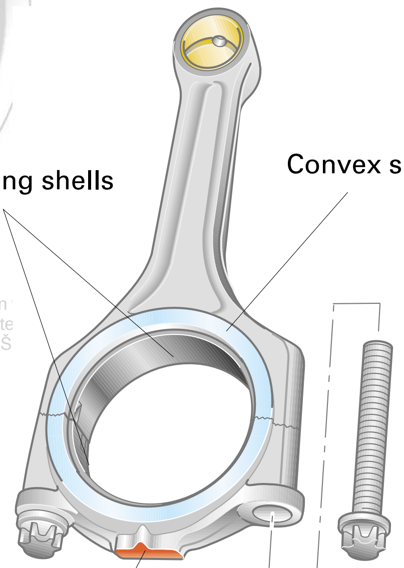
The con-rods on this engine perform an eccentric crank movement reciprocally on the cranked crankshaft pins.
Wear is avoided due to the convex shaping of the side surfaces.

The upper and lower bearing shells are made out of three materials (composite material):

- steel
- lead bronze
- a galvanised layer (lead, tin, copper)

The advantage:

Small pieces of dirt from the engine oil can get embedded in the lead bronze layer which can then no longer damage the bearing like an abrasive.
This means that one can achieve a much higher working life for the bearing.



SP48_13

Note:
The convex shapings (peak of the con-rod bearing cover) of the con-rod must stand opposite each other.

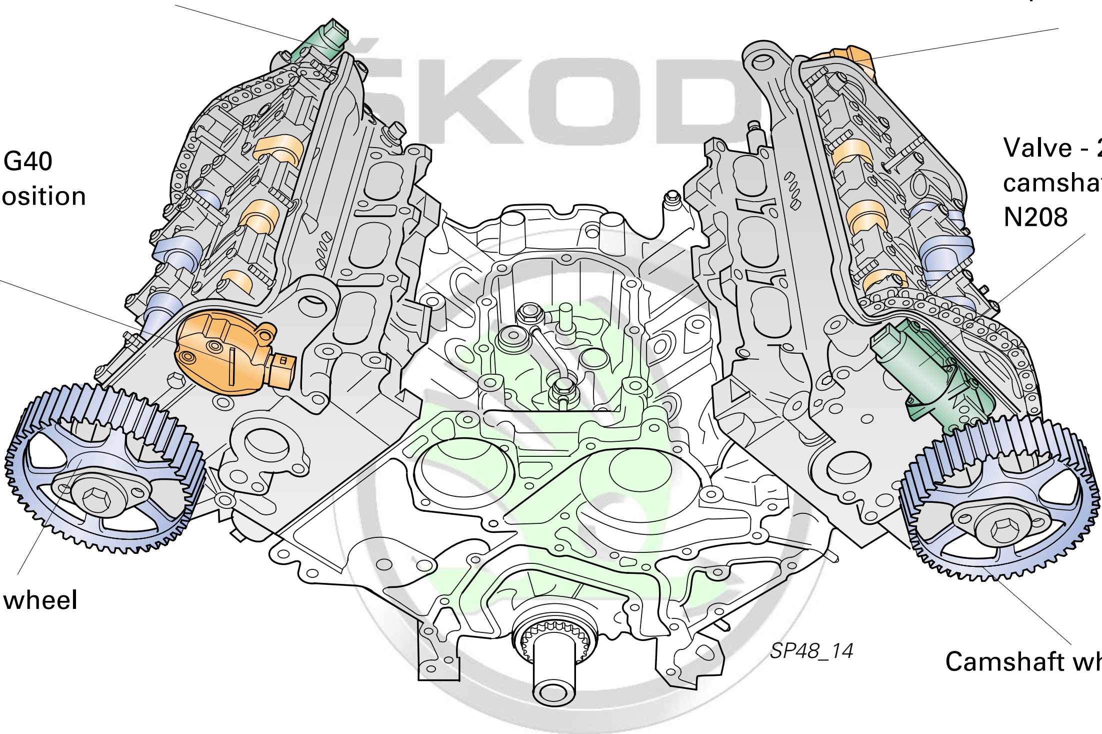
The cylinder head and valve gear

The cylinder heads are designed as cross-flow heads due to the central intake manifold.

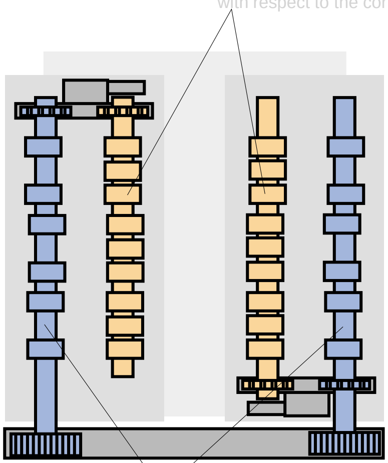
This allows advantageous configuration of the inlet channels and thus good filling of the cylinder. The drive of the two camshafts takes place from the rear over a timing belt (see page 19).

The five valve technology is the same as that used on the 1.8 litre engine on the **Škoda**Octavia (see SSP 23).

The camshaft adjustment system only adjusts the inlet camshaft.



SP48_14



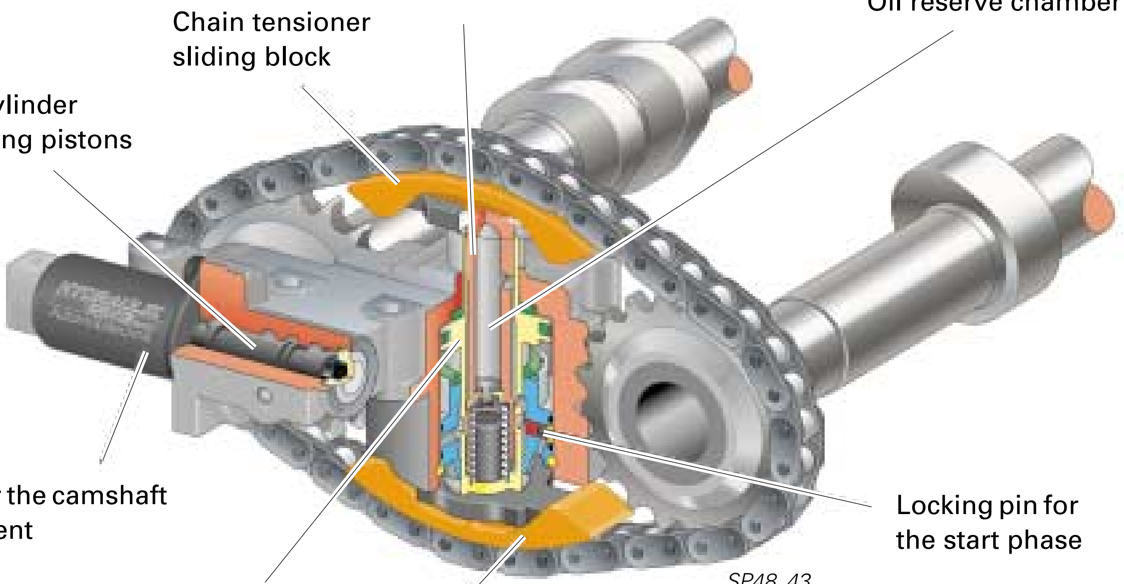
SP48_15

The construction of the V6 engine places particular demands on the camshaft adjustment.
Viewed from above the outlet camshafts are on the outside while the inlet camshafts are in the inside.

This means that the camshaft adjustment system on the left and right cylinder bank must work in opposition to each other.

Camshaft adjustment system

(Cylinder bank 1)



SP48_43

The system used for adjusting the camshafts in the 1.8 engine is also used in the V6 5-valve generation of engines.

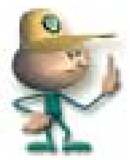
There is no oil pressure being applied to the chain tensioner and the camshaft adjustment mechanism when the engine is not running.

On the starting the 1.8 litre engine, and until sufficient oil pressure has built up, the chain drive vibrates due to a reversal of stress reaction, which produces noise.

The V6 5-valve engine was subjected to further development and the tried and tested system received a locking function and an oil reserve chamber.

These new developments prevent vibrations arising in the chain drive which thus have a positive effect on the noise generated when starting up the engine.

The position of the locking pin is different for the camshaft adjusters on cylinder banks 1 and 2.



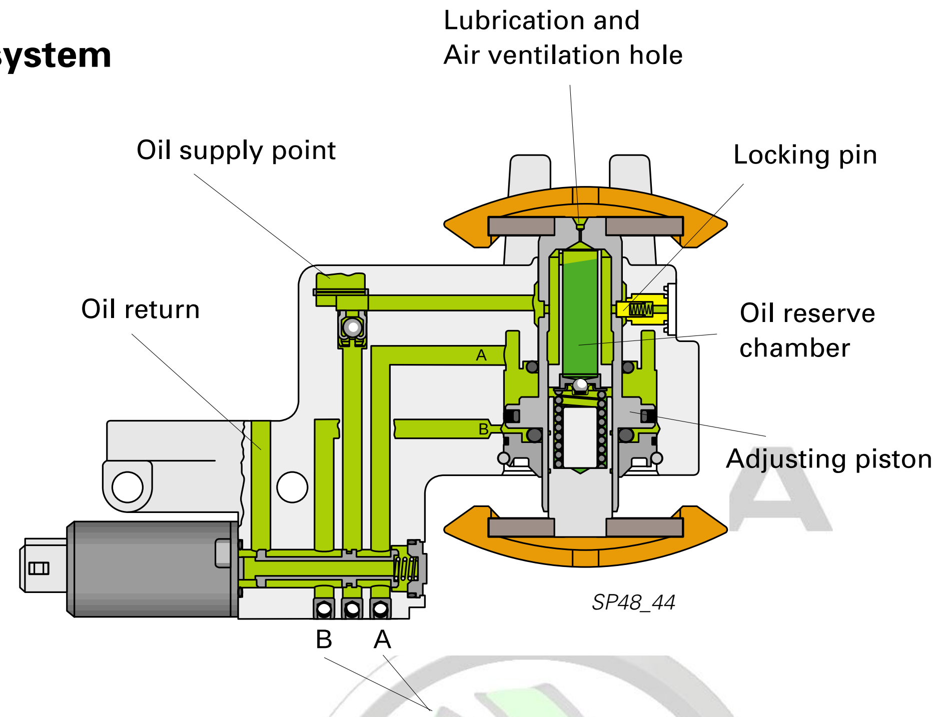
Note:
You can inform yourself extensively about the principle of the camshaft adjustment mechanism in the Self-Study Program No. 19.

Camshaft adjustment system

(Cylinder bank 2)

With the engine off:

A spring-loaded locking pin is pressed into the resting groove of the adjusting when there is no oil pressure.



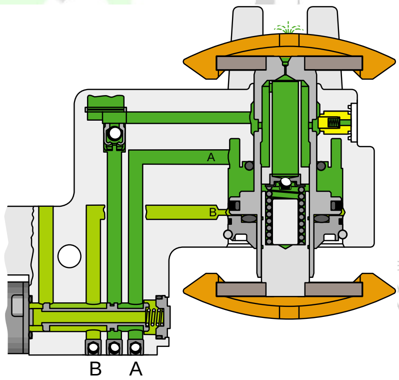
SP48_44

When the engine is started:

The adjusting piston is locked until sufficient oil pressure has built up and prevents vibrations occurring in the chain drive and therefore the generation of noise.

The camshaft adjuster is blocked in the direction "late position".

Late position
(basic or power position)

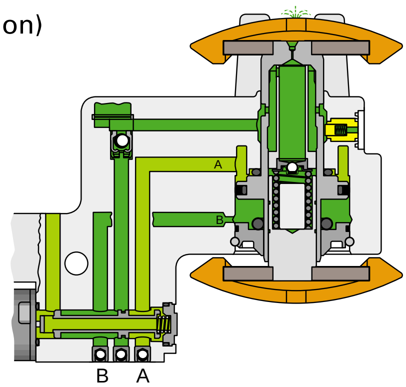


SP48_45

The engine is running:

Once a pre-determined oil pressure is reached this acts upon the surface of the locking pin and thus against the force of the spring.
The locking pin frees the adjusting piston so that it can be moved in the direction of "early position" in according to activation from the engine control unit.

Early position
(torque position)



SP48_46

The oil reserve chamber

Ensures that the clamping piston pressure chamber is filled up without being under pressure in the start phase. This also has a positive effect on the generation of noise while the engine is being started.
A bore hole on the upper end of the oil reserve chamber allows air to be ventilated from this part and delivers oil to the chain.

The timing belt drive

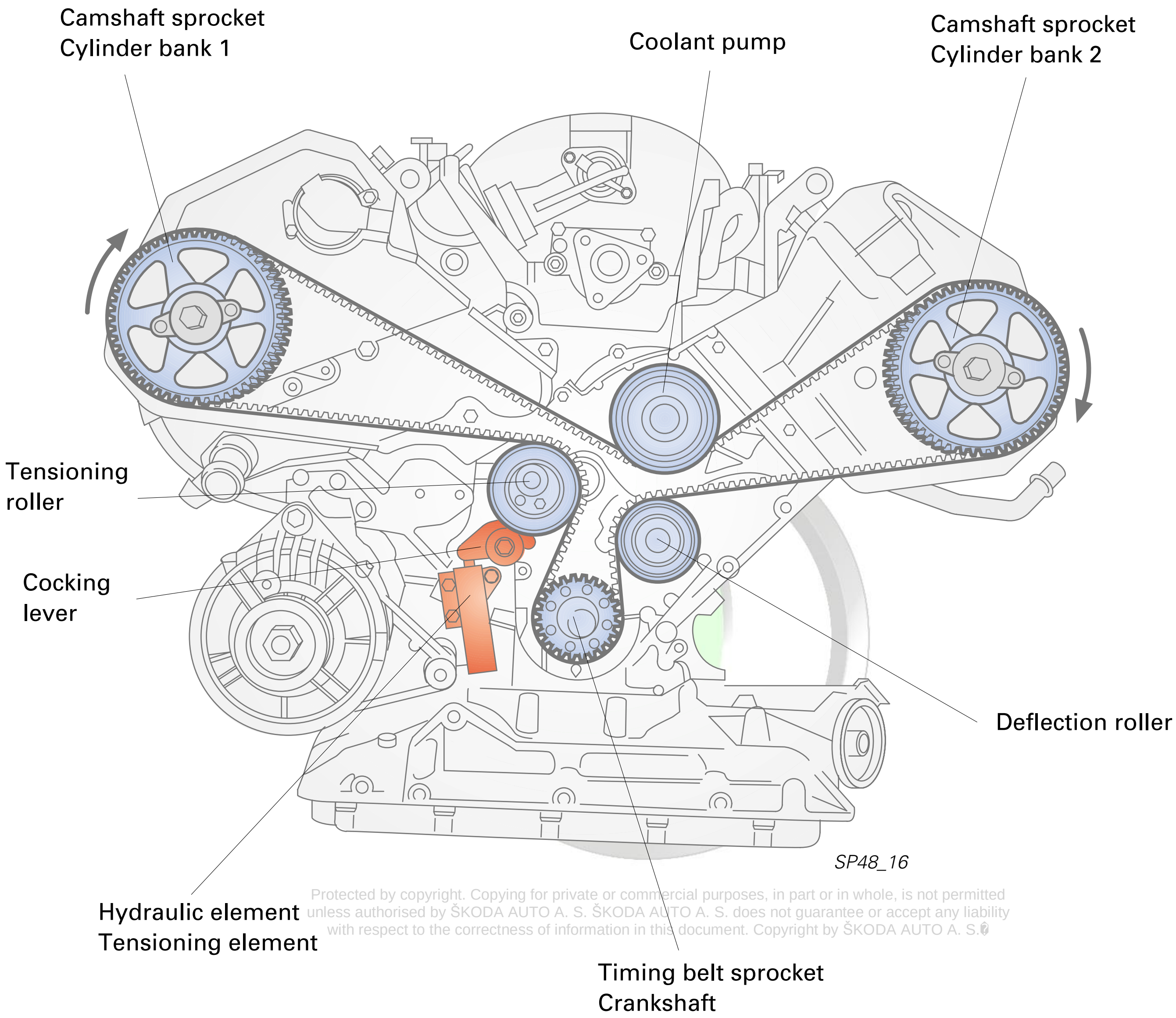
The timing belt sprocket - crankshaft drive:

– both camshafts on cylinder banks 1 and 2
– the coolant pump

The tensioning roller and the deflection roller in the timing belt drive are arranged in such a way that an angle of wrap of 210° is obtained on the timing belt sprocket - crankshaft.

The timing belt tension is set hydraulically from a tensioning element over the cocking lever and the tensioning roller.

The deflection roller, tensioning roller, hydraulic tensioning element and cocking lever are fixed onto the sealing flange at the front.

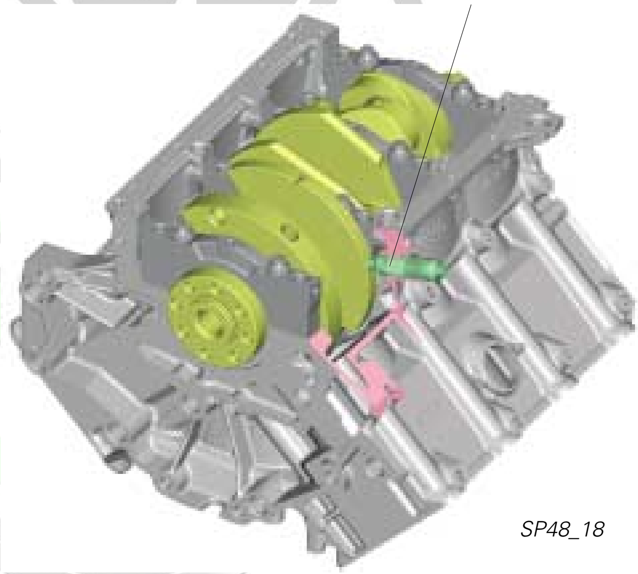


SP48_16

Adjustment of the timing belt

The piston of the third cylinder must be at TDC in order to adjust the valve timing of the valve drive. This position is determined by a mark on the timing belt sprocket - crankshaft and the timing belt cover.

The crankshaft is securely interlocked into this position using a stop screw.



SP48_18

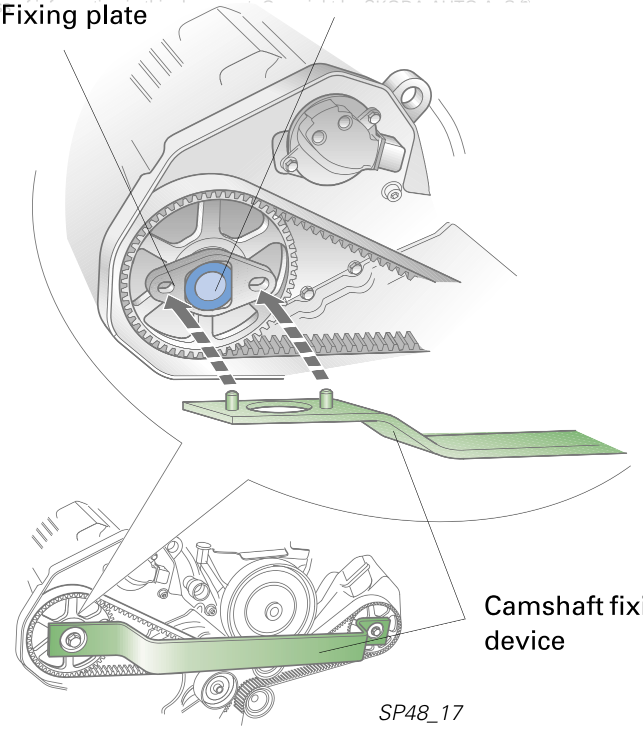
The camshafts on cylinder banks 1 and 2 must stand in a particular position relative to each other.

The camshaft sprockets should be adjustable on the camshaft as for a diesel engine in order to balance out tolerances.

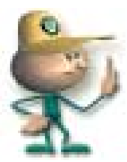
Setting takes place using a camshaft fixing device.

The camshaft and fixing plate are bound snugly together.
The camshaft sprocket can be turned at the cone of the camshaft.

The camshaft sprocket is then firmly screwed to the camshaft when the camshaft fixing device is mounted.



SP48_17



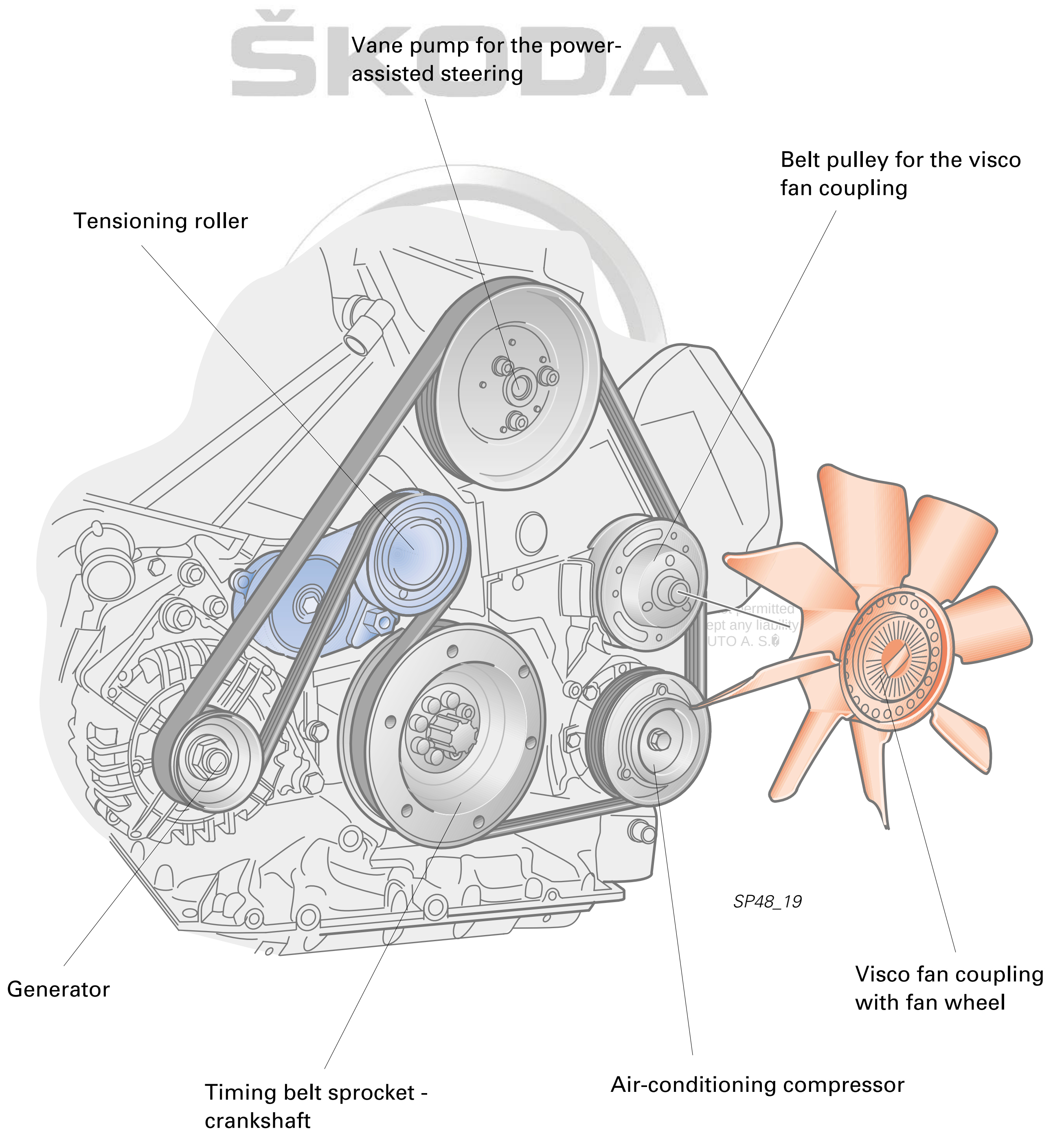
Note:
You can inform yourself extensively about setting up a timing belt in the Service Manual.

Drive for the ancillary units

The drive for the ancillary units takes place over a V-ribbed belt.

This drives:

- the AC generator
- the air-conditioning compressor
- the vane pump for the power-assisted steering
- the visco fan coupling



The visco fan coupling

The fan for the engine cooling is regulated over a visco fan coupling depending on the temperature.
This means that it only operates when additional engine cooling is required.
The visco fan coupling runs maintenance-free.
The adjusting screw must not be turned.

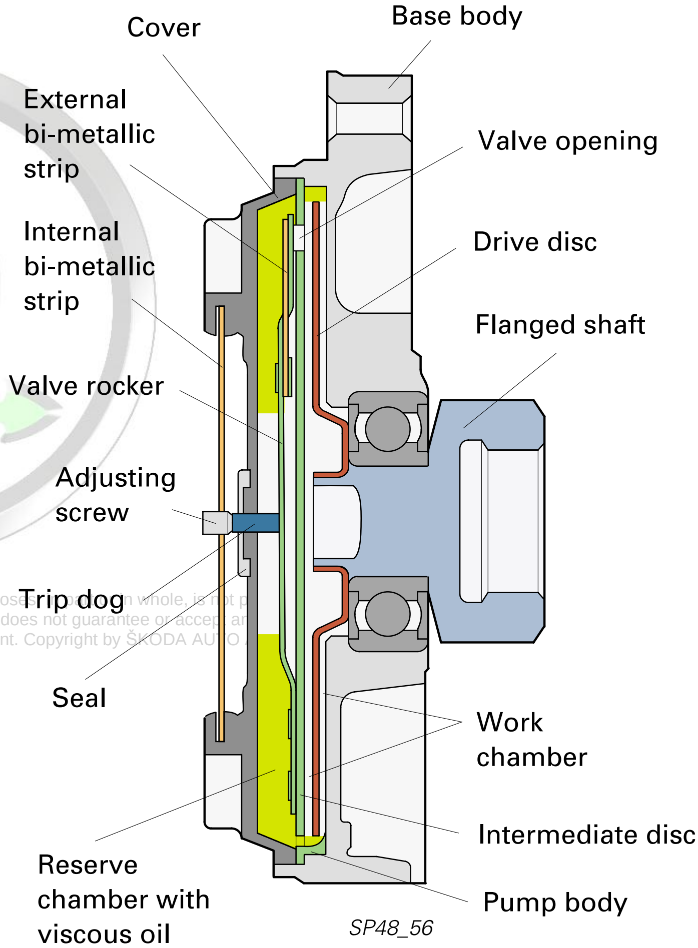
Advantages:
- more power output from the motor
- less fuel consumption
- less noise

Installation and function

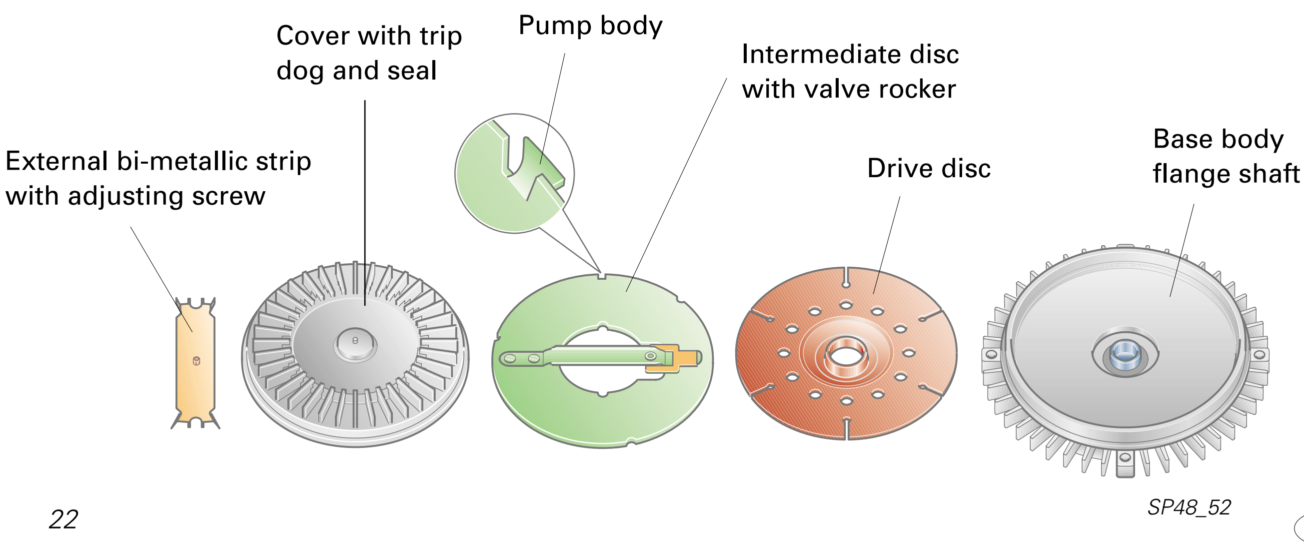
The visco coupling consists essentially of two chambers:
- the **work chamber** with the drive disc which fits snugly together with the flange shaft and
- the **storage chamber** with an intermediate disc which is bound friction-locked with the base body of the coupling.

The intermediate disc has a valve opening and the pump body (angular nose). The valve rocker is fixed to this which opens the trip dog of the valve over the external bi-metallic strip depending on the temperature.

The viscous oil circulates around the body of the pump and the valve opening between the operating chamber and the oil reserve chamber. The more viscous oil there is in the operating chamber the greater the frictional bond between the drive disc and the base body of the coupling and therefore the higher the rotational speed of the fan.

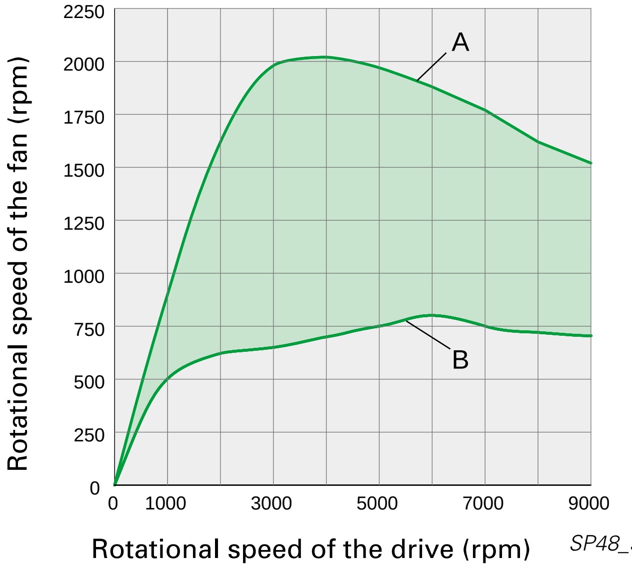


SP48_56

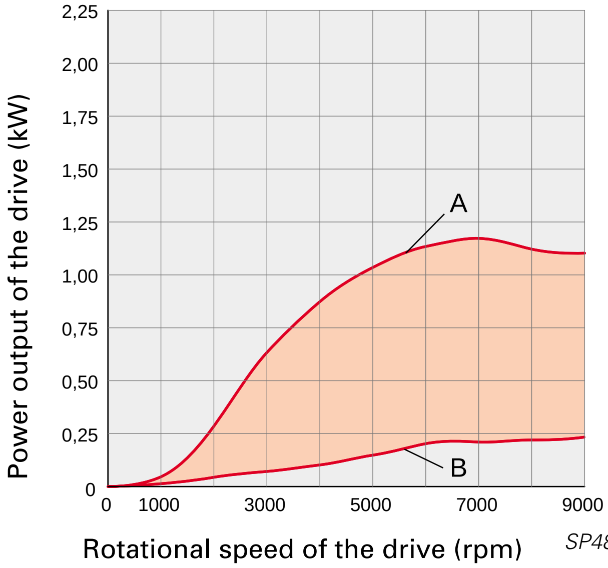


SP48_52

The diagrams for the rotational speed of the fan and the power output of the drive generally apply for all operating conditions of the engine - cold/warm/hot.



SP48_57

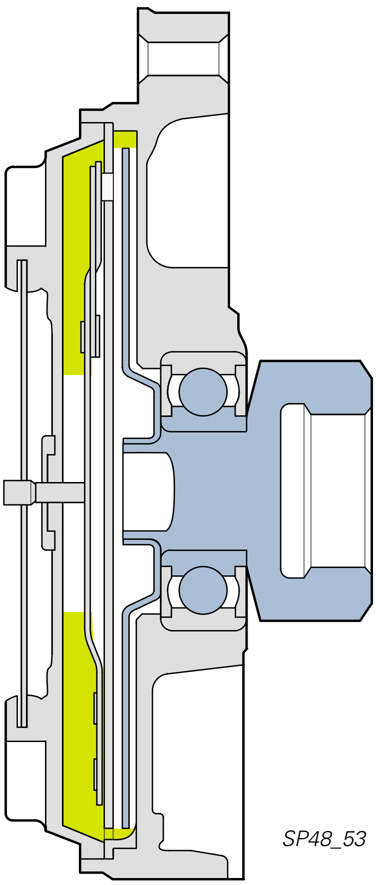


SP48_58

The rotational speed of the fan will fall off at higher temperatures at the external bi-metallic strip and a rotational speed of the drive in excess of 4000 rpm because of the lower viscosity of the viscous oil (internal friction).

A - coupling fully connected in for a temperature on the external bi-metallic strip of ≥ 85 °C

B - coupling fully disconnected for a temperature on the external bi-metallic strip of ≤ 40 °C

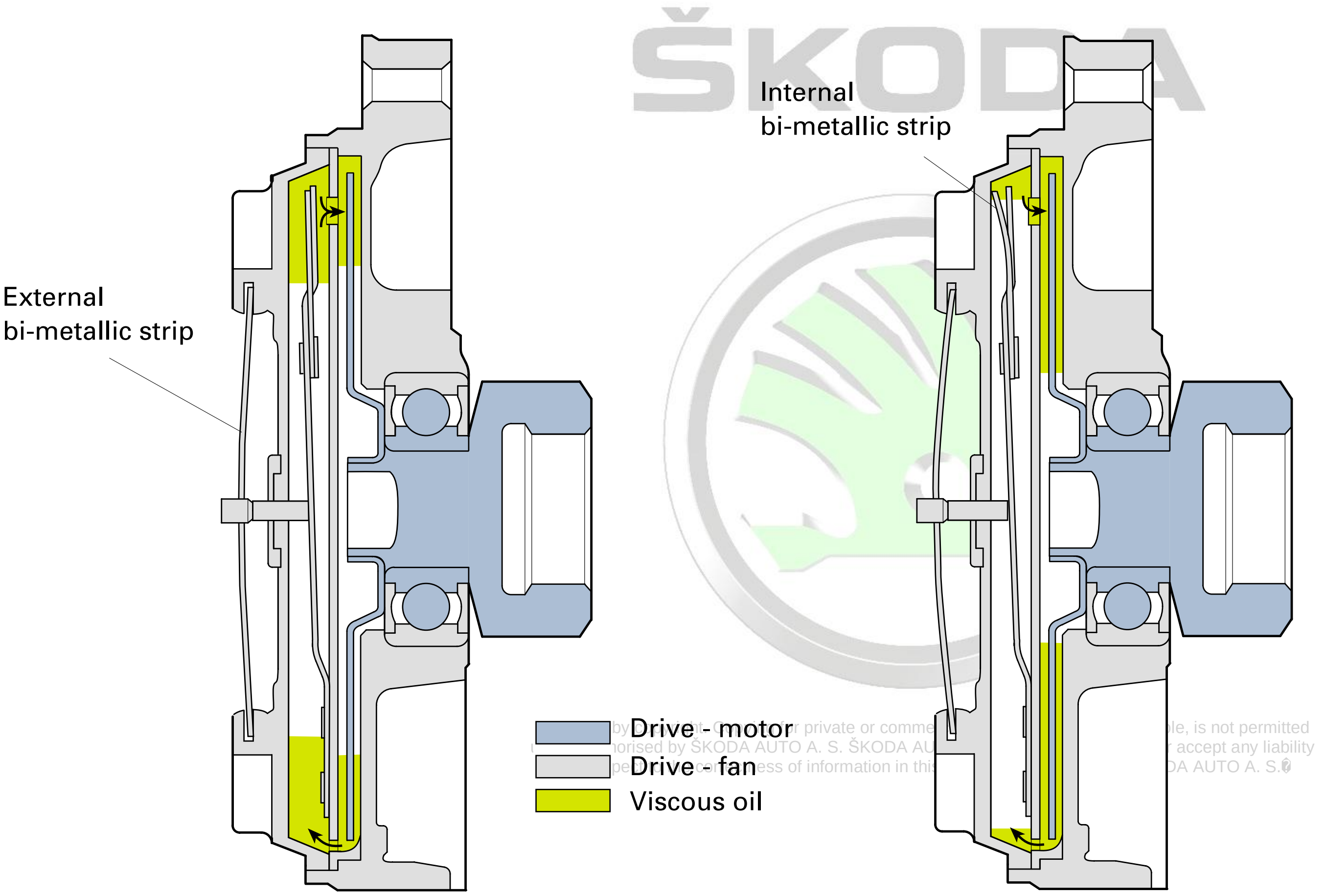

SP48_53

Engine cold

The rotation of the drive disc causes the viscous oil to be pumped out of the operating chamber over the pump body into the reserve chamber. The valve rocker which is actuated over the external bi-metallic strip/trip dog closes the valve opening so that no viscous oil can flow back into the operating chamber. There is no frictional bond between the drive disc and the base body of the unit when the operating chamber does not contain any oil which means that the fan only turns at a low slave rotational speed (internal friction).

Drive - motor
Drive - fan
Viscous oil

Engine Mechanics



SP48_54 SP48_55

Engine warm

The valve rocker which is actuated over the external bi-metallic strip/trip dog opens the valve opening so that viscous oil can flow into the operating chamber. This creates a connection between the drive disc and the intermediate disc/base body of the unit.
The rotational speed of the fan increases.
The viscous oil is then pumped between the operating chamber and the reserve chamber where the amount of oil pumped depends upon the difference in rotational speed between the drive disc and the intermediate disc/base body of the unit.

Engine hot

The higher the ambient temperature at the external bi-metallic strip becomes, the greater the upward thrust of the valve rocker. This causes more viscous oil to flow into the operating chamber and the maximum rotational speed of the fan is then achieved.
The difference in rotational speed between the drive disc and the intermediate disc/base body of the unit in this operating condition is at its lowest.
This also means that only a small amount of viscous oil is pumped from the operating chamber into the reserve chamber.
An internal bi-metallic strip protects the visco fan coupling from thermal overload. It supports itself on the cover at certain temperatures and therefore works against the upward thrust of the valve rocker.

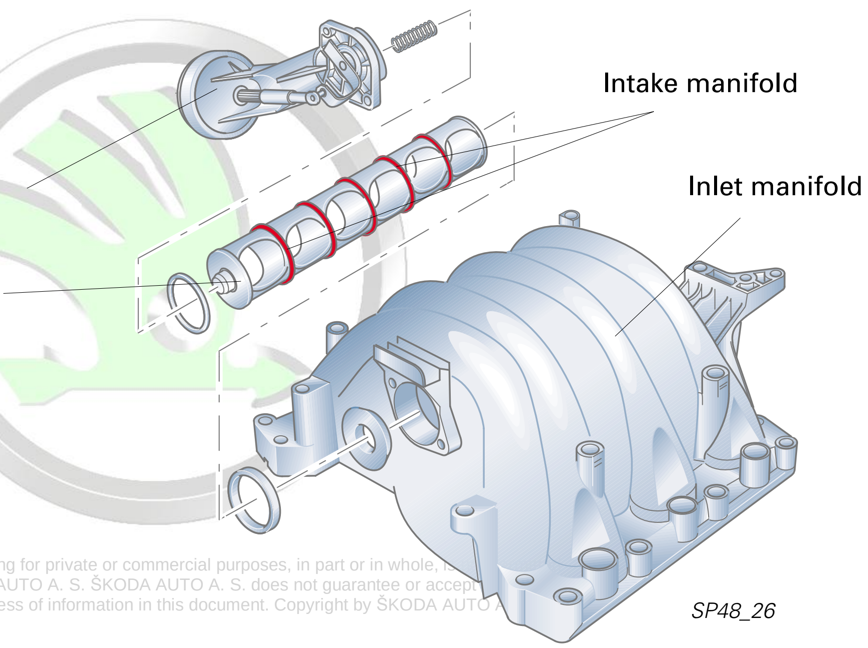
The intake manifold

A switch-over roller is installed which allows the length of the intake manifold to be set to two different values in order to optimise the available torque and power output achievable.

One torque and power channel is created per cylinder from a common collective volume. They are brought together again before the injector.

The switch-over roller arranged in the power channel opens the shorter power channel through a 90° turn at 4360 rpm which means that less air now flows through the torque channel. The power channel is closed again at 4280 rpm.

Actuation of the switching roller is undertaken over a vacuum setting element. The control is undertaken by the engine control unit for the variable intake manifold changeover.



The seal between the individual channels is achieved using separate sealing rings.

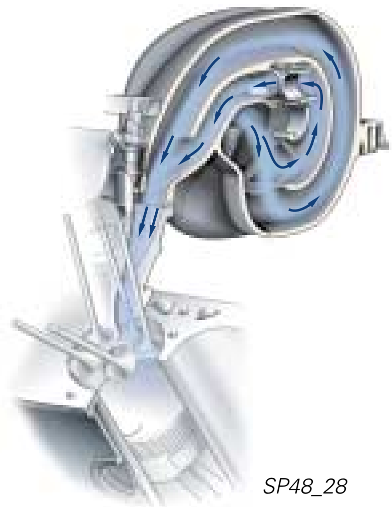
SP48_26

Torque position

Channel length:
575 mm

SP48_27

Power position



Channel length:
310 mm

SP48_28

The oil circulation system

A duo-centric oil pump sucks up the oil over a large mesh filter. There is an oil pressure limiting valve located in the pressure chamber of the pump to protect downstream components from pressure peaks arising when starting from cold.

The oil is led over the oil cooler to the oil filter.

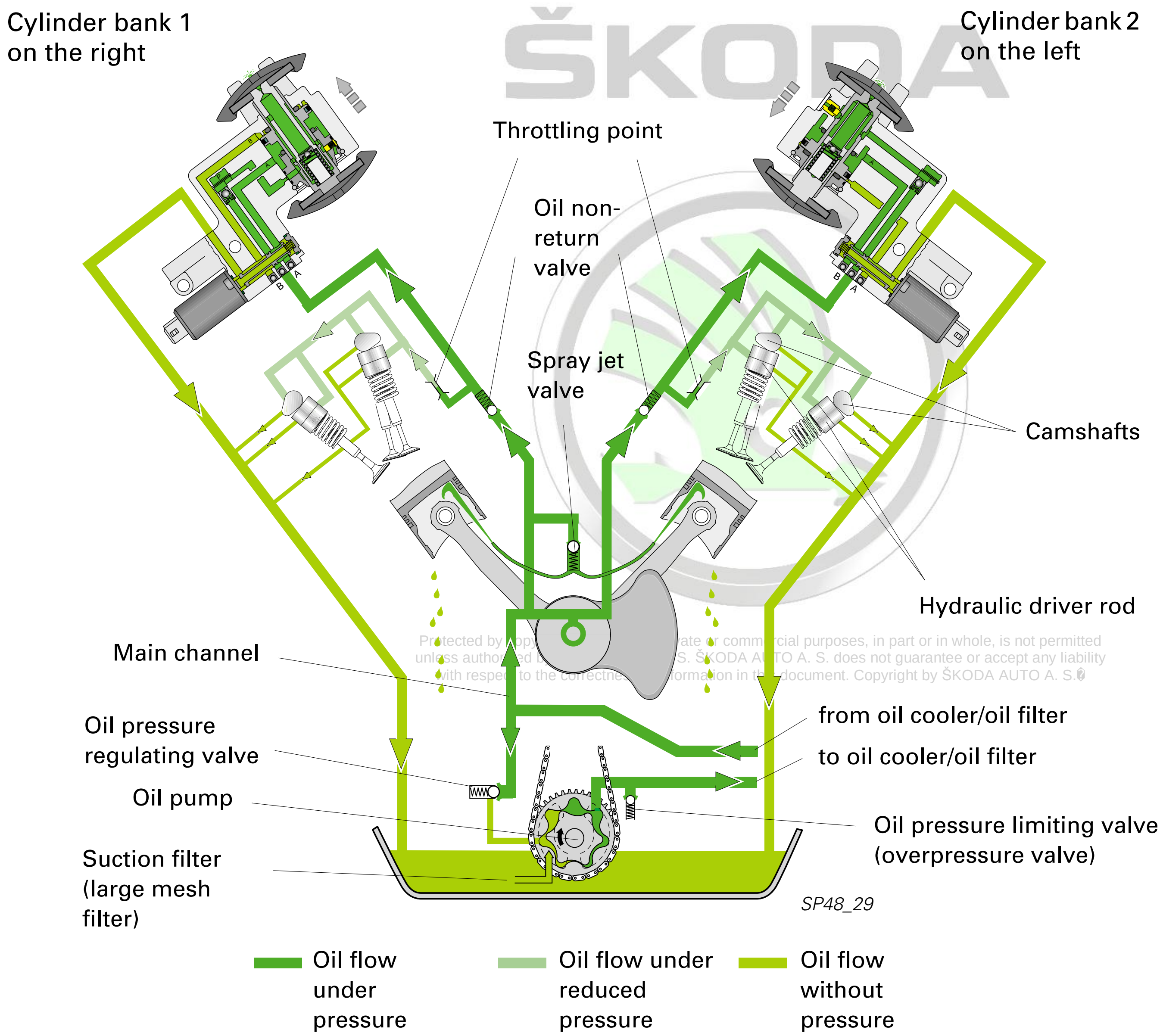
The oil then flows into the main channel and a branch line leads to the oil pressure regulating valve (on the clean oil side).

The main channel feeds:

- the four crankshaft bearings
- the three piston spray jet pairs above the spray jet valve
- the cylinder heads above one oil non-return valve respectively

The camshaft adjusters are subjected to the full oil pressure.

The oil pressure to the lubrication system for the camshafts and hydraulic driver rod is reduced over a throttling point.



SP48_29

The components in the oil circulation system

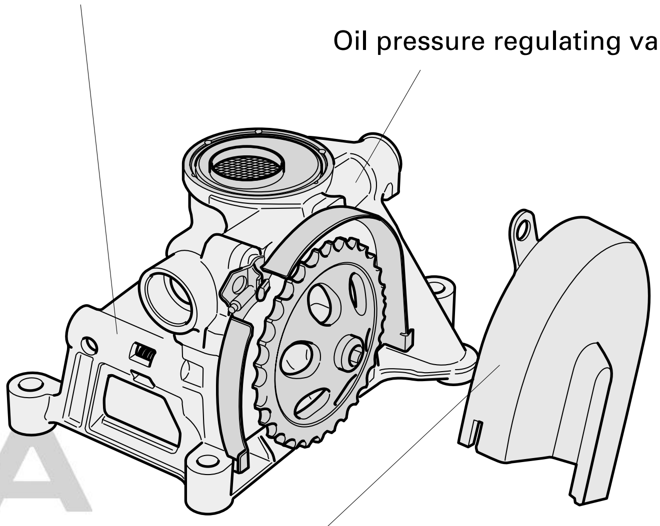
The oil pump

is an inner gear pump. This is attached as a separate component to the crankcase.

This type of construction allows the oil pump to reach deeply into the oil pan. It plunges completely into the engine oil when the oil level is correct which avoids the pump from running dry. This, in connection with a very short suction length, allows rapid and secure build-up of the oil pressure, particularly from a cold-start.

The drive on the oil pump is achieved from the crankshaft over a simple chain. A spring-loaded sliding block (chain tensioner) ensures that the chain is the under the correct tension.

One uses a chain shield made out of steel metal plate which encapsulates the chain wheel and chain within a generous volume. This is a reliable antidote for foaming of the oil and all that that entails.



The oil filter

contains a filter element and the filter bypass valve. The latter has the purpose to maintain engine lubrication over the filter bypass valve even when the filter element is blocked up or the oil viscosity is high.

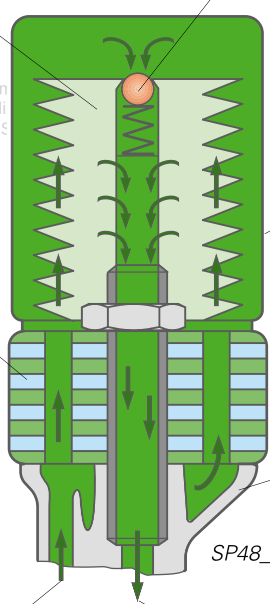
The oil cooler

is integrated into the main stream of flowing oil. The whole stream is fed over the oil cooler.

The spray nozzle valve

frees up the oil stream to flow to the piston spray nozzles once an oil pressure of greater than 0.18 Mpa (1.8 bars) has been reached.

The reason: The oil pressure would drop below the admissible minimum value at low viscosity and lower rotational speeds. It is also not necessary to use piston cooling at lower rotational speeds.



Oil pressure regulating valve

regulates the oil pressure in the engine. It is situated in the housing of the oil pump. The "diverted" oil is led to the suction side which contributes to optimisation of the efficiency.

Oil pressure limiting valve

is a safety valve. It is installed in the oil pump housing and opens when the oil pressure is too high (during a cold start). Components in the oil circulation system can be damaged if the oil pressure is too high (e.g. the oil filter, oil cooler) and it is also possible through "pumping up" of the hydraulic driver rod that the inlet and outlet valves no longer close. This would mean that the engine would not start-up.

The oil non-return valve

prevents the situation arising where the oil runs back from the cylinder heads to the oil sump when the engine is not running.

The throttling points

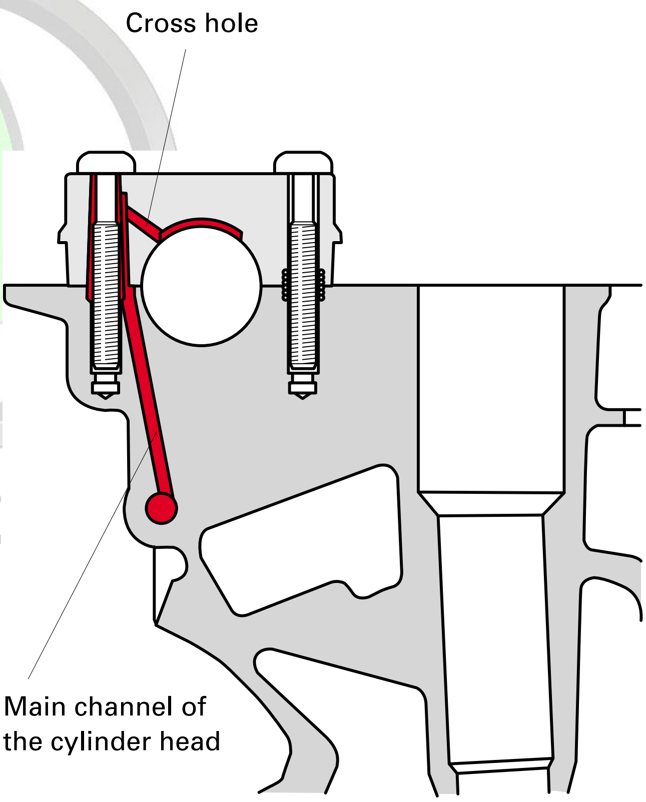
prevent "over-flowing" of the cylinder heads. A lot of oil finds its way into the cylinder heads at high engine speeds which has to be transported away over the oil return bore holes. The throttling points reduce the oil flow and thus secure the return flow.

The "integrated oil supply system"

Each camshaft bearing is supplied with oil from a bore hole which comes from the main channel of the cylinder head.
The oil is led along in the bearing cover on the screw shaft to a transverse bore hole. A lubrication groove distributes the oil in the camshaft bearing so a separate pipeline to the individual bearing covers is not needed.

Advantages:

- less components
- more rapid and even oil supply
- lower costs



SP48_32

The coolant circuit

The engine has a conventional longitudinal stream cooling system.

– **inlet** on the cylinder block at the front
– **outlet** on the cylinder block at the rear

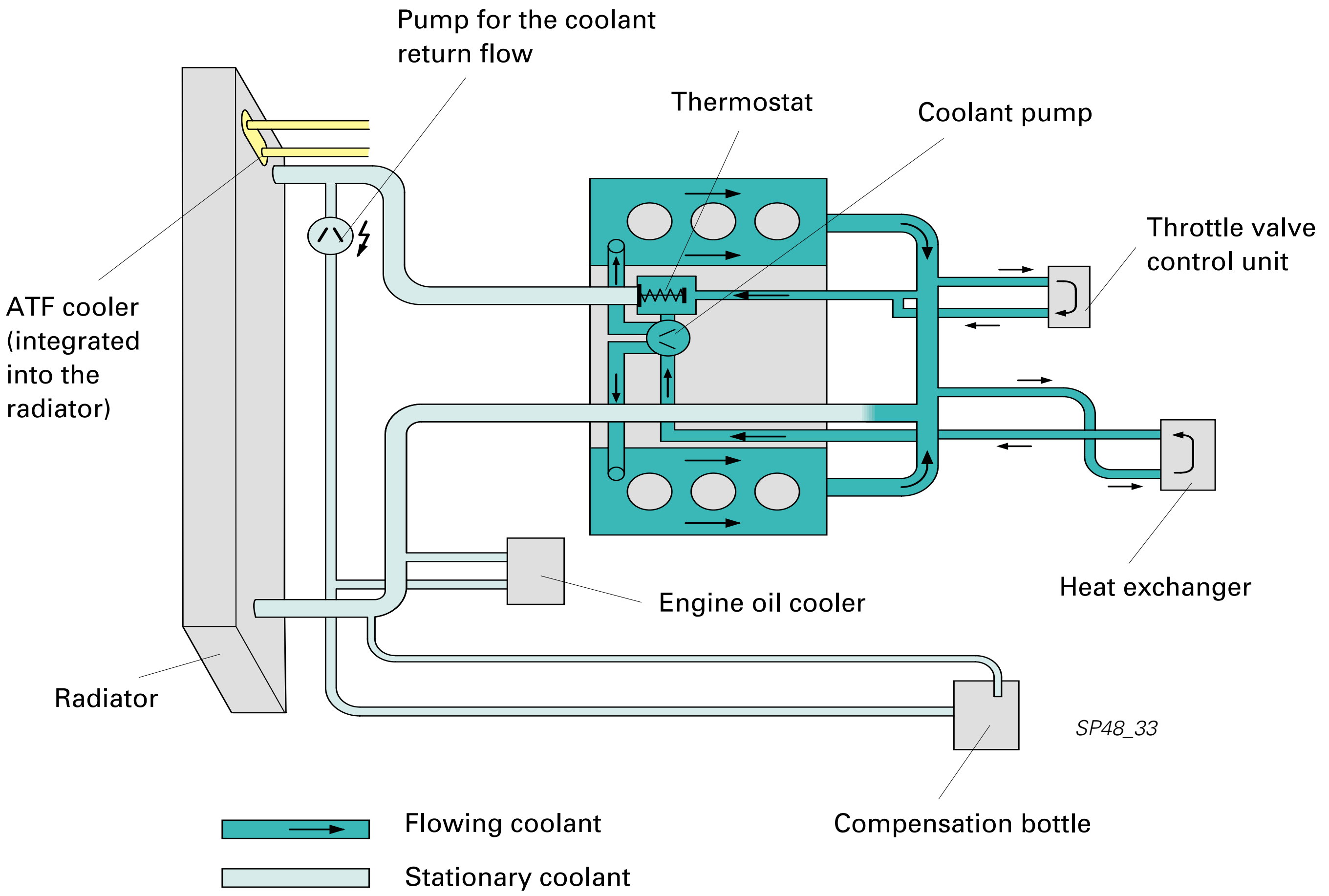
Both cylinder banks are supplied with coolant from the coolant pump chamber. The coolant flows from the cylinder block vertically into the cylinder head whereby the exhaust gas sides are more intensively fed with coolant than the other sides (larger cross-sections).

The coolant is then led from the gathering chamber in the cylinder head to the rear in the connecting pipe.

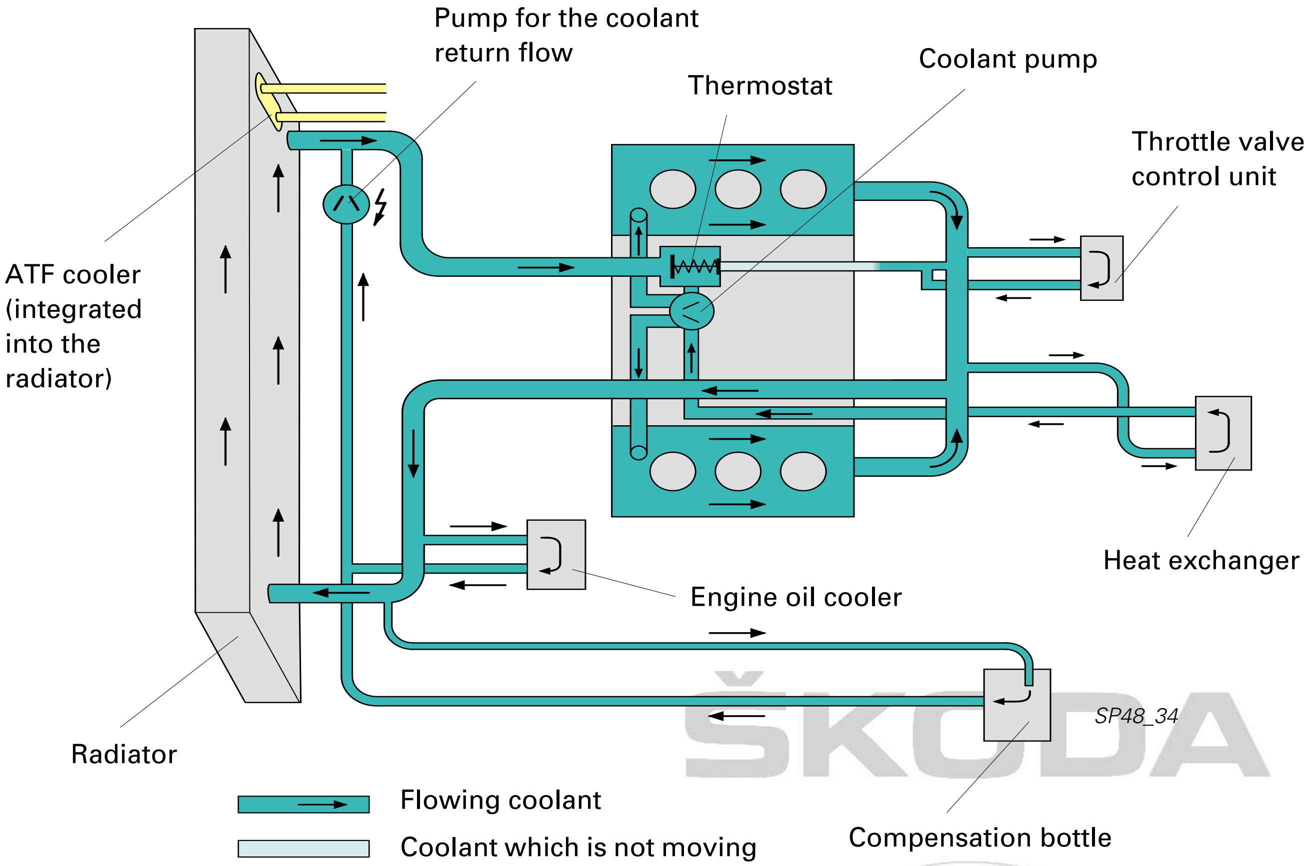
The thermostat opens the large coolant circuit and also closes the connection from the thermostat housing to the connecting pipe at the same time.

Note:
Please observe the instructions given in the Service Manual for filling and ventilating the coolant circuit.

Smaller coolant circuit



Larger coolant circuit

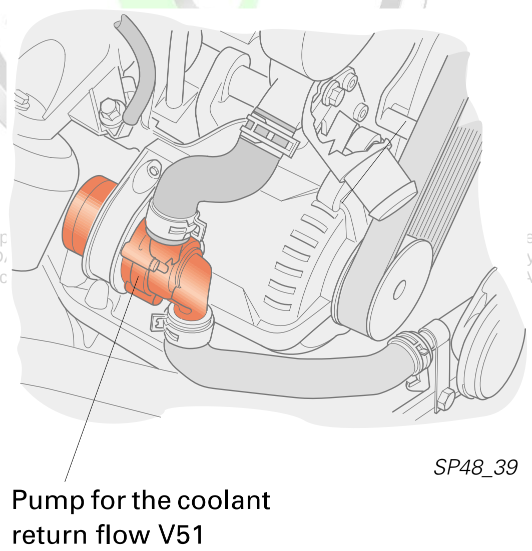


Pump for the coolant return flow

The pump for the coolant return flow V51 is additionally built onto vehicles in countries which have a high ambient temperature.

Function:

The pump for the coolant return flow is generally actuated for 10 - 12 seconds some 15 seconds after switching off the ignition. The fan for the coolant V7 is also switched on if the coolant temperature is greater than 92 °C.

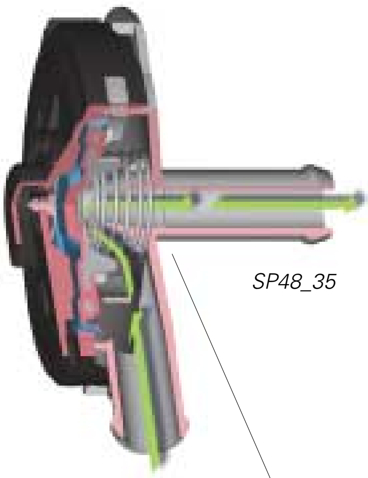


The ventilation system for the crankcase

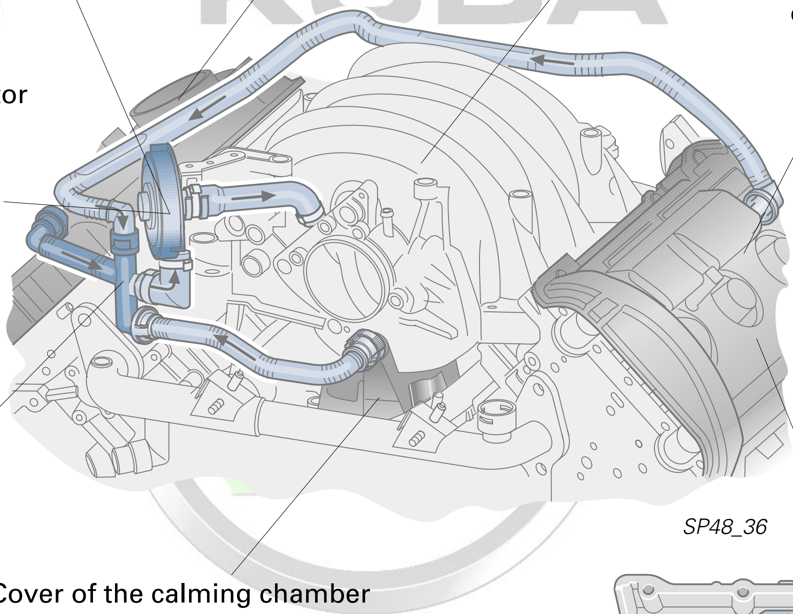
consists of a distribution piece, a ventilation valve and the associated hosing. The oil which also comes out of the crankcase and the two cylinder heads is led back to the oil circuit.

In This is achieved by installing an oil separation plate in both cylinder head covers. The rest of the oil mist and the blow-by-gases are then led together in the distribution piece out of the cylinder heads and the crankcase.

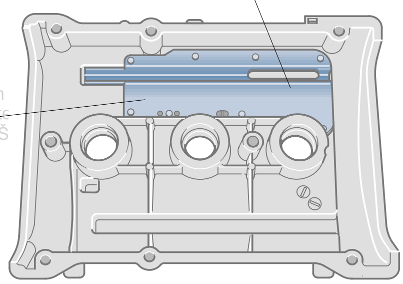
The ventilation valve (a differential pressure controlled membrane valve) controls the return flow of the gases for burning depending on the inlet manifold pressure.



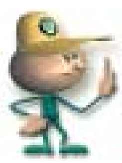
SP48_35



SP48_36



SP48_51

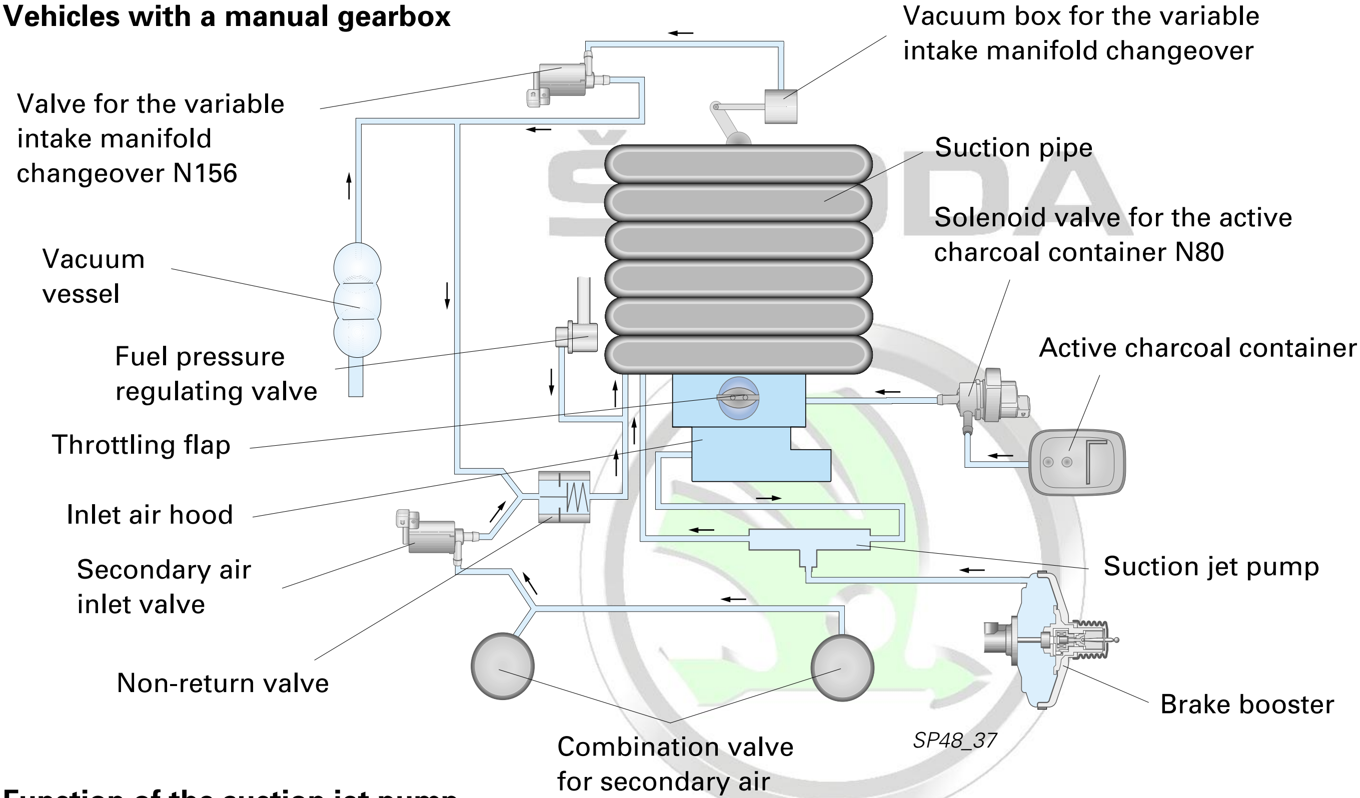


Note:
The blow-by-gases are those gases which leak by the piston rings in the crankcase.

The vacuum system

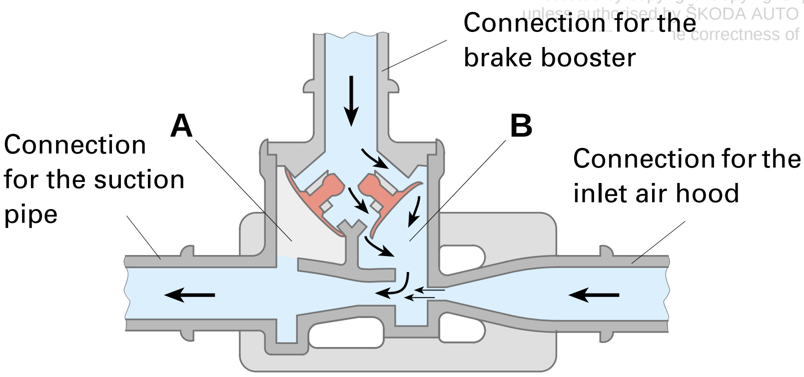
An overview of the vacuum system

Vehicles with a manual gearbox

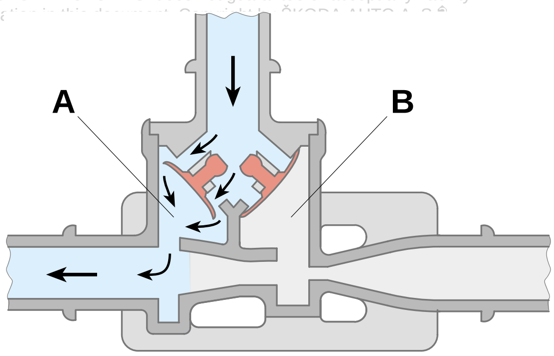


SP48_37

Function of the suction jet pump



SP48_59



SP48_61

Throttling flap closed or slightly opened
(idling/thrust/low loading)

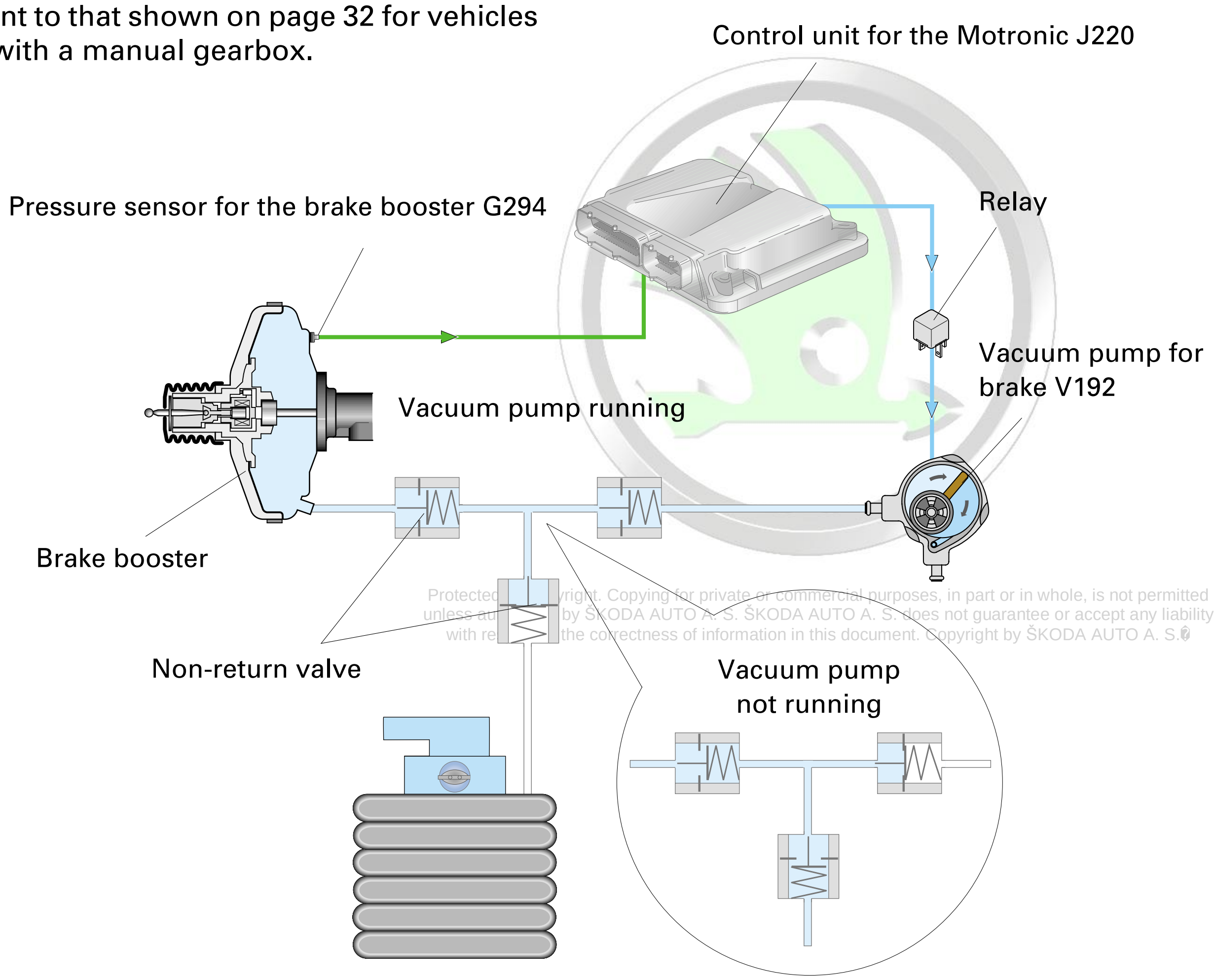
– a large pressure differential before/behind the throttle valve, air suction from the inlet air hood
– high vacuum in Chamber B due to the high throughflow speed in the narrowed cross-section (Venturi nozzle)
– non-return valve in Chamber B open

Start phase
(no vacuum or very little in the brake booster)

– a large pressure differential between the brake booster and the suction pipe
– a vacuum in Chamber A
– a low level of vacuum in Chamber A
– non-return valve in Chamber A open

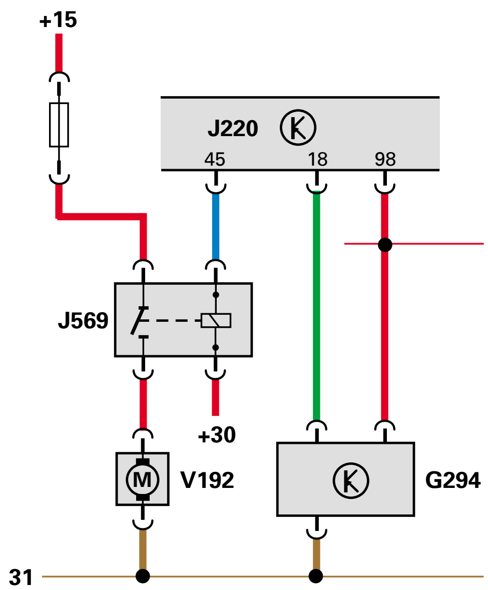
Vehicles with an automatic gearbox

The supply of vacuum to the brake booster on vehicles fitted with an automatic gearbox is different to that shown on page 32 for vehicles fitted with a manual gearbox.



SP48_60

The electrical circuit



SP48_49

The steadily increasing loading requirement (further opening of the throttling flap) for some operating conditions, e.g. the catalytic converter heating phase when idling after starting up the engine, leads to reduction of the ability of the engine to provide a vacuum.

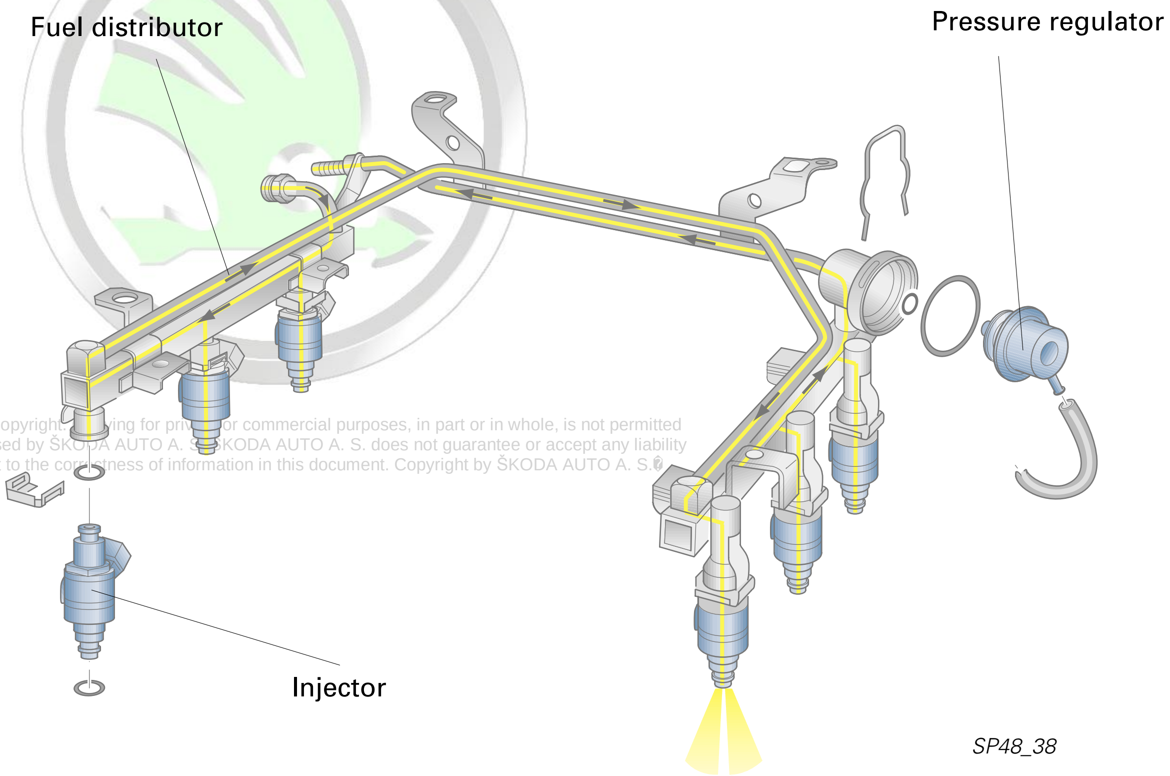
An electric vacuum pump is installed to ensure that the brake booster has an adequate supply of vacuum for every engine operating condition.

The vacuum pump switches on when the vacuum in the brake booster falls below a certain level and continues to run until an adequate supply of vacuum has been built up.

Supply the engine with fuel

The fuel system

is constructed analogue to that for the previous 4-cylinder engines.



The fuel pump in the fuel tank pumps the fuel at a pressure of at least 0.4 Mpa (4 bars).

The fuel passes over the fuel filter into the fuel distributor where it is evenly fed on to the six injectors.

The injection system pressure is 0.4 Mpa (4 bars) minus the pressure in the vacuum pipe. The pressure regulator is located in the return flow of the distributor and regulates this pressure.

A direct hose connection from the pressure regulator to the suction pipe ensures that the pressure differential between the suction pipe and the pressure of the fuel in the distributor remains constant.

The volume of injected fuel is therefore independent of the suction pipe pressure and only depends upon the period of duration of injection.

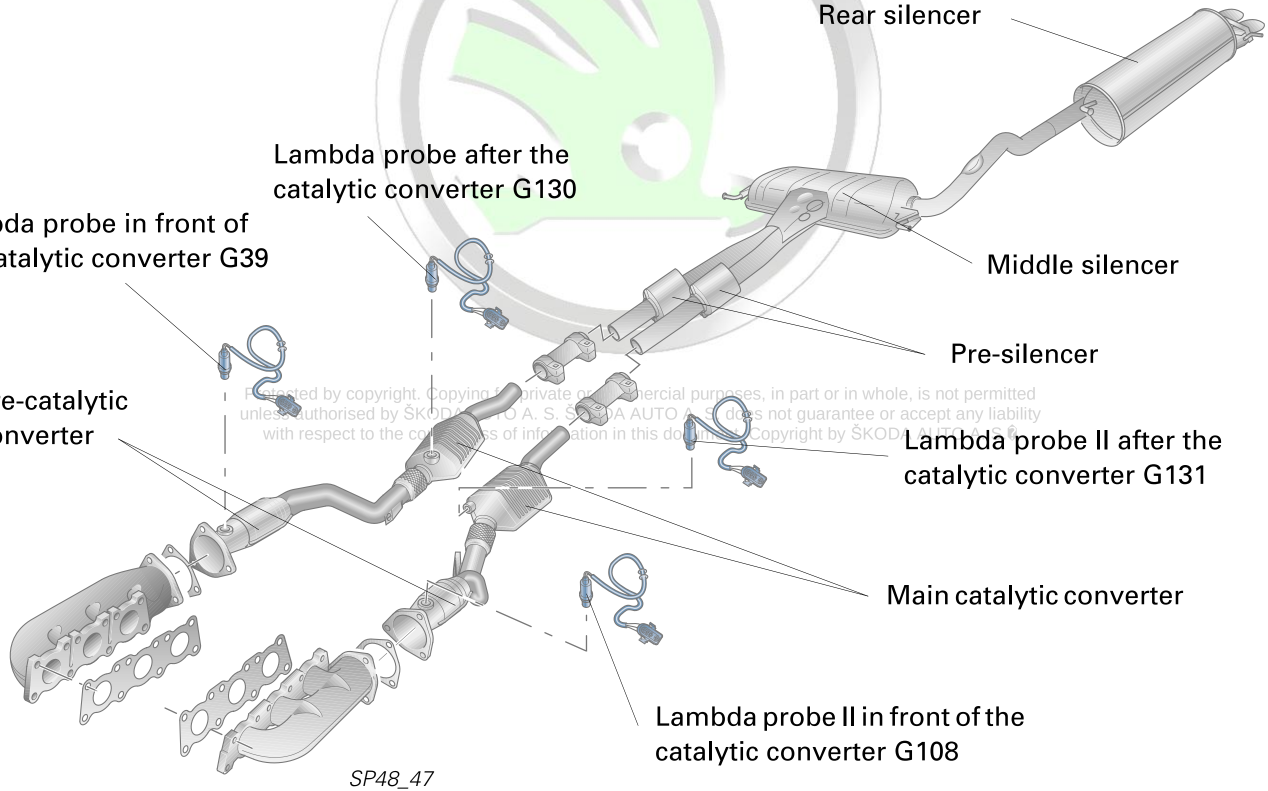
Fuel which is not needed flows back through the pressure regulator over the fuel return line to the fuel tank.

The injectors have a two-hole nozzle which provides an homogenous fuel-air mixture and therefore achieves optimum combustion.

Structure

The exhaust gas system essentially consists of:

- two pre- and main catalytic converters each with a heatable two-point lambda probe (Bosch LSF 4.7)
- A front, middle and rear silencer.



SP48_47

Two-probe lambda regulation

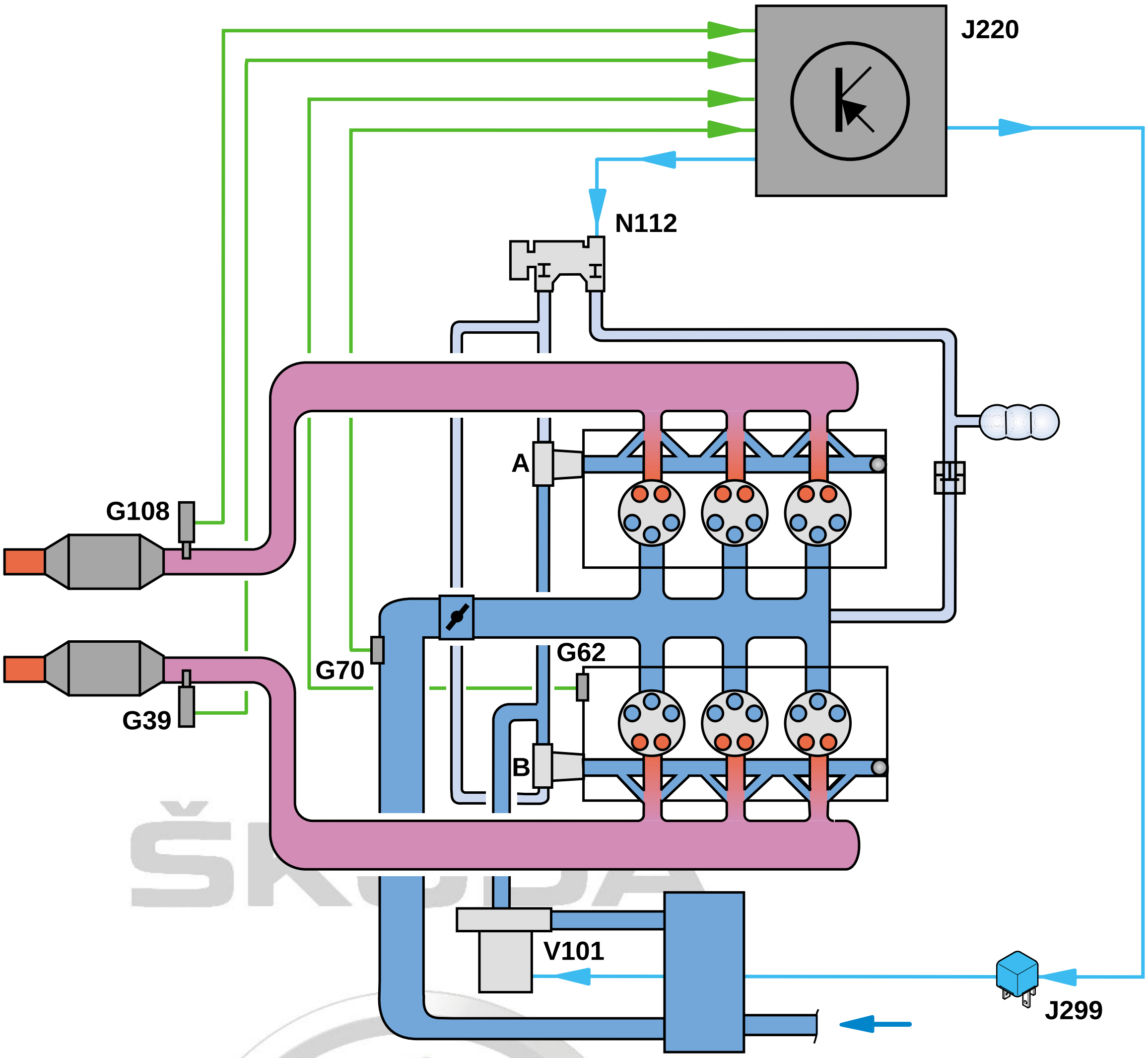
The pre-catalytic converters age more than the main catalytic converters due to the higher exhaust temperatures.
The lambda regulation of the two exhaust gas streams therefore only refers to the pre-catalytic converters which are arranged nearer to the exhaust manifold.
This means that more rapid warming of the lambda probes is achieved after a cold start and the lambda regulation kicks in earlier.

If the "lambda probes after the catalytic converter" were to be located after the main catalytic converter then the longer reaction times and possible faults in the main catalytic converter would negatively effect the lambda regulation.

The combined system of the pre- and main catalytic converter, lambda probes and engine management means that the limit values for EU4 are already being guaranteed today.

The function of two-probe lambda regulation is already described in SSP 30 and generally also applies to this engine.

An overview



SP48_41

Structure and function

The high degree of enrichment of the mixture during the cold start and the warming up phase mean that there is an increased concentration of unburned hydrocarbons in the exhaust gases at these times.

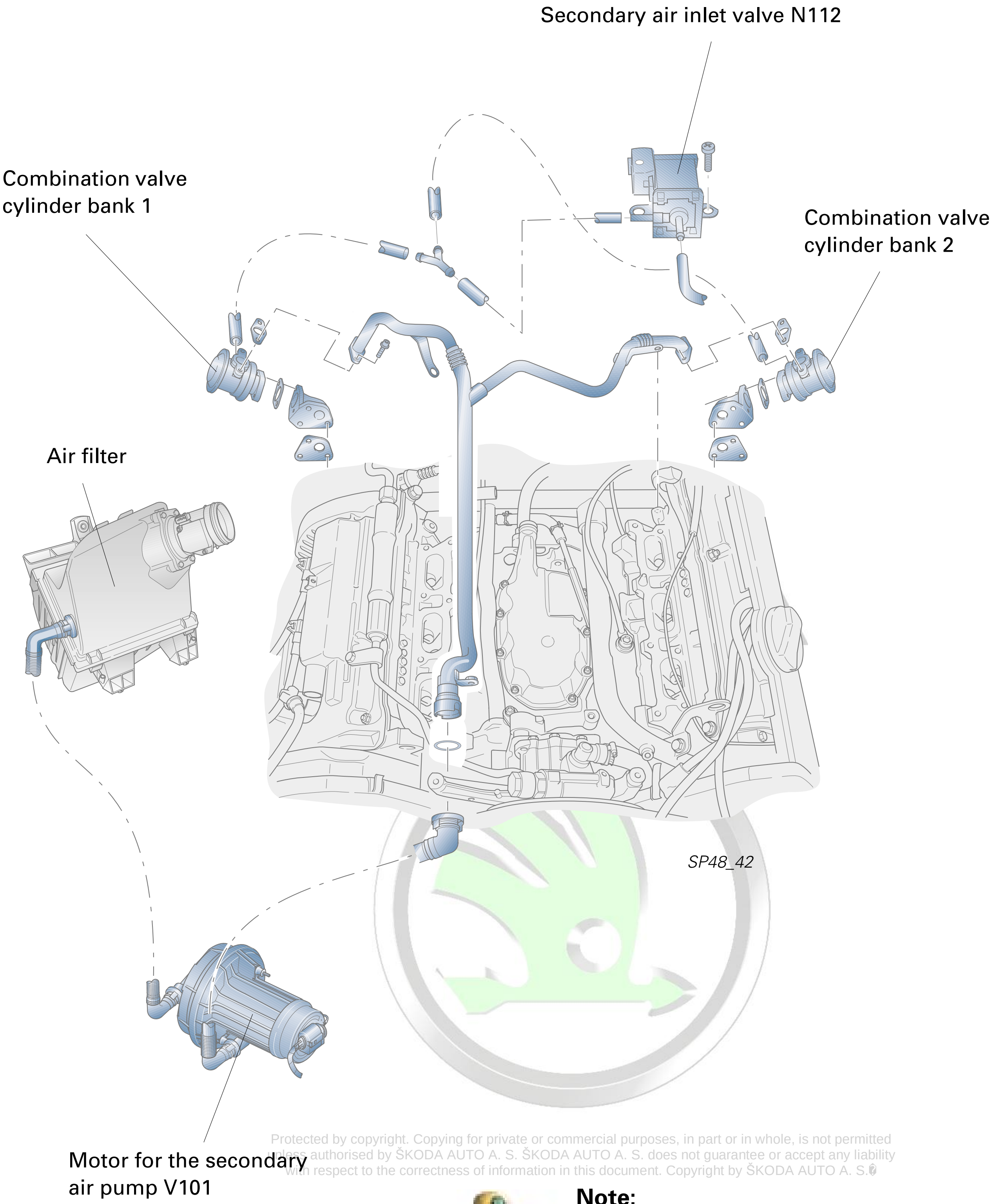
This concentration of hydrocarbons cannot be handled by the catalytic converter since:

– the required operating temperature of the catalytic converter has not been reached yet and
– a mixture of lambda = 1 must be available to obtain full conversion.

Blowing in air rear of the outlet valve achieves an increase in the concentration of oxygen in the exhaust gases whereby retrospective oxidation (back burning) of the hydrocarbons and the carbon monoxide takes place. The heat so generated provides additional heat to the catalyser and therefore brings it up to operating temperature more rapidly.

The secondary air system consists of:

– the control unit for the Motronic J220
– a relay for the secondary air pump J299
– motor for the secondary air pump V101
– the secondary air inlet valve N112
– two combination valves **A** and **B**



SP48_42

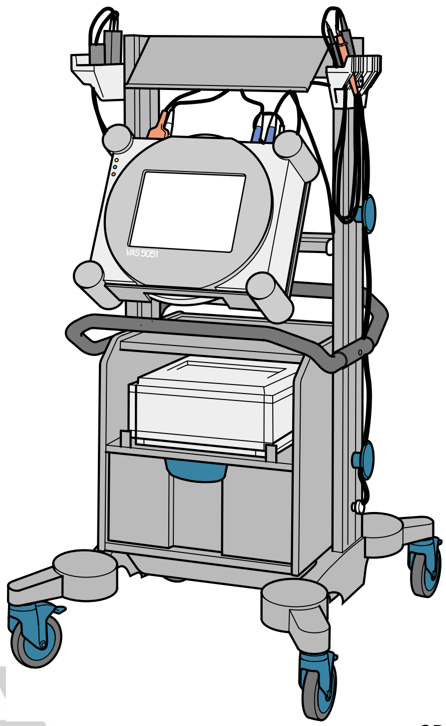
Note:
An extensive description of thesecondary air system can be found in SSP 30.

The self-diagnostic function can only be executed along with the VAS 5051 Vehicle Diagnosis, Measurement and Information System.

The previously known functions such as:

– interrogating the control unit function
– interrogating the fault memory
– undertaking an actuator diagnosis
– undertaking movement to the home position
– interrogating the fault memory and deleting it
– coding the control unit
– read a measuring value block
– reading off the readiness code

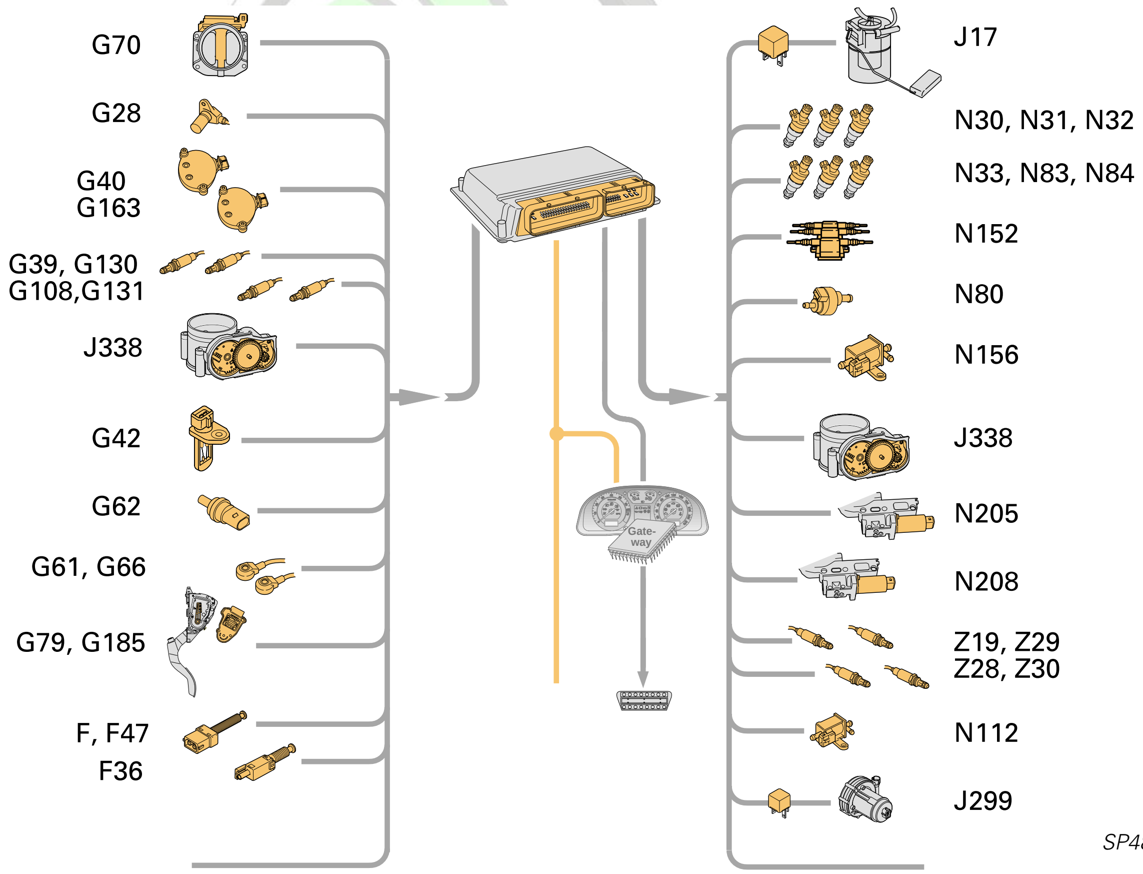
are integrated into the "Guided search for faults".



SP48_63

Note:
Further information can be taken from the Operating Manual for the VAS 5051.

All coloured components of the system are monitored by the self-diagnosis system.



SP48_64

List of Self-Study Programmes published so far

No.	Title
1	Mono-Motronic
2	Central Locking
3	Anti-Theft Alarm
4	Working with Current Flow Diagrams
5	ŠKODA FELICIA
6	ŠKODA Vehicle Safety
7	Principles of ABS - *Not published*
8	ABS FELICIA
9	Immobiliser with Transponder
10	Air Conditioning in Vehicles
11	FELICIA Air Conditioning
12	1.6-ltr. Engine with MPI
13	1.9-ltr. Naturally Aspirated Diesel Engine
14	Power-Assisted Steering
15	ŠKODA OCTAVIA
16	1.9-ltr. TDI Engine
17	OCTAVIA Convenience Electronics System
18	OCTAVIA Manual Gearbox 02K/02J
19	1.6-ltr./1.8-ltr. Petrol Engines
20	Automatic Gearbox Fundamentals
21	Automatic Gearbox 01M
22	1.9-ltr. 50 kW SDI/1.9-ltr. 81 kW TDI
23	1.8-ltr. 110 kW turbo petrol engine 1.8-ltr. 92 kW petrol engine
24	OCTAVIA CAN databus
25	OCTAVIA – CLIMATRONIC
26	OCTAVIA – Vehicle Safety
27	OCTAVIA – 1.4-ltr. Engine and Gearbox 002
28	OCTAVIA – ESP
29	OCTAVIA – 4 x 4
30	Petrol Engine 2.0-ltr. 85 kW and 88 kW
31	OCTAVIA – Radio/Navigation System
32	ŠKODA FABIA
33	ŠKODA FABIA – Vehicle Electrics
34	ŠKODA FABIA – Power Steering
35	Petrol Engines 1.4-ltr. - 16 V 55/74 kW
36	ŠKODA FABIA – 1.9-ltr. TDI Unit Injection
37	5-Speed Manual Gearbox 02T and 002
38	**Škoda**Octavia – Model 2001
39	Euro On-Board Diagnosis
40	Automatic Gearbox 001
41	6-Speed Manual Gearbox 02M
42	**Škoda**Fabia – ESP
43	Exhaust Emissions
44	Extended Service Interval
45	1.2-ltr. 3-Cylinder Petrol Engines
46	**Škoda**Superb; Presentation of the Vehicle Part I
47	**Škoda**Superb; Presentation of the Vehicle Part II
48	**Škoda**Superb; V6 Internal Combustion Engine 2.8 litre/142 kW

S00.2003.48.20 GB Technical Status 03/02

http://partner.skoda-auto.com

This paper has been manufactured from chlorine-free bleached cellulose.