The Lupo

Design and function

Self-Study Programme No. 201

The Lupo, a new addition to the subcompact family, extends the Volkswagen product range.

In spite of its compact dimensions, the Lupo boasts a specification which stands comparison with any saloon and is rounded off by a distinctive design.

Environmental pollution kept to a minimum by using fuel-efficient, low-emission and quiet engines as well as recycleable and recycled plastic parts.

The Lupo conforms to all internationally recognised safety standards for head-on collision, side impact, offset collision and rear collision as well as for rollover.

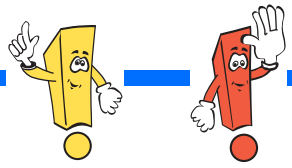
SSP 201_130

SSP 201_134

SSP 201_131

The small and highly manoeuvrable vehicle is simply likeable, chic and natural.

New **Important Note**



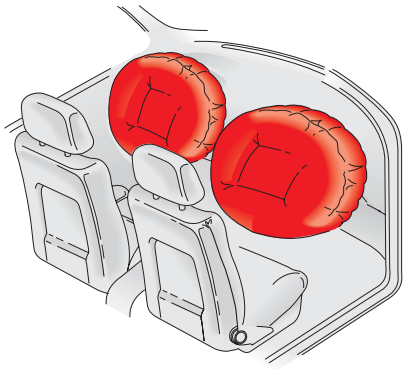
The Self-Study Programme is no Workshop Manual.

Please always refer to the relevant Service Literature for all inspection, adjustment and repair instructions.

At a glance

The Lupo

The small LUPO achieves great things in terms of safety, quality, performance, running gear and equipment.



SSP 201_174

• Safety

The safety bodyshell, belt tensioners, front airbags and side airbags mean that the little Lupo is no baby when it comes to safety.

SSP 201_133

• The running gear

SSP 201_080

The suspension strut front axle with wishbones, as well as the torsion beam rear axle are a winning team and place the LUPO firmly on the road.

• Equipment level

A 4-seater or 5-seater version can be specified. Easy Entry seats are standard for the driver and front passenger. They exceed the standard specification.
Also available for the LUPO is a complete range of extras ranging from the electric fabric sliding roof and the air conditioning system to the navigation system.

SSP 201_168

• Quality

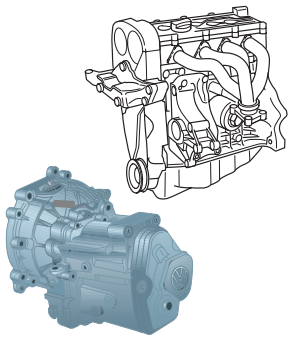
The Lupo also meets Volkswagen's recognised quality standard:
• Narrow body joints
• High-quality materials

SSP 201_131

SSP 201_132

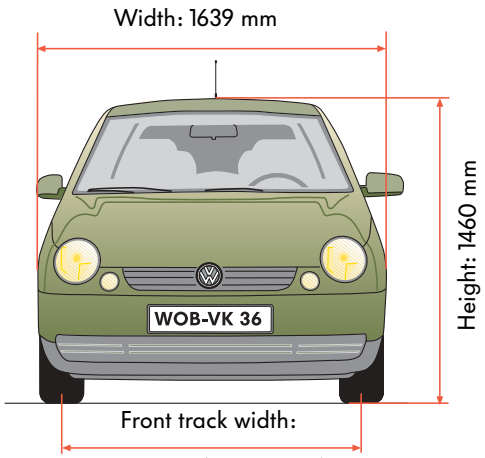
• Engines and gearboxes

A choice of four petrol engines and one
diesel engine in combination with a 5-speed manual gearbox and a 4-speed automatic gearbox will be available when the LUPO is launched on the market.

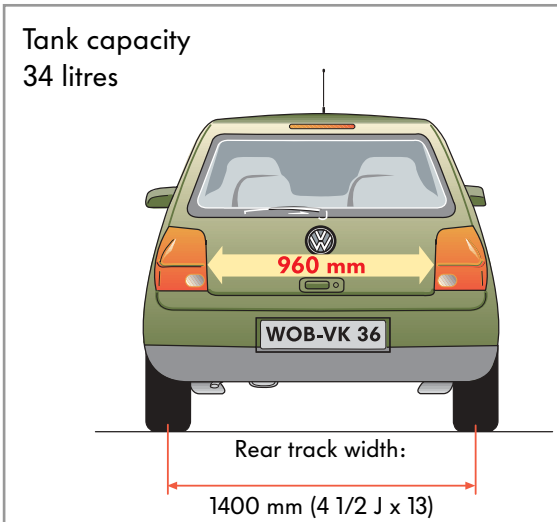


The Lupo

Vehicle dimensions

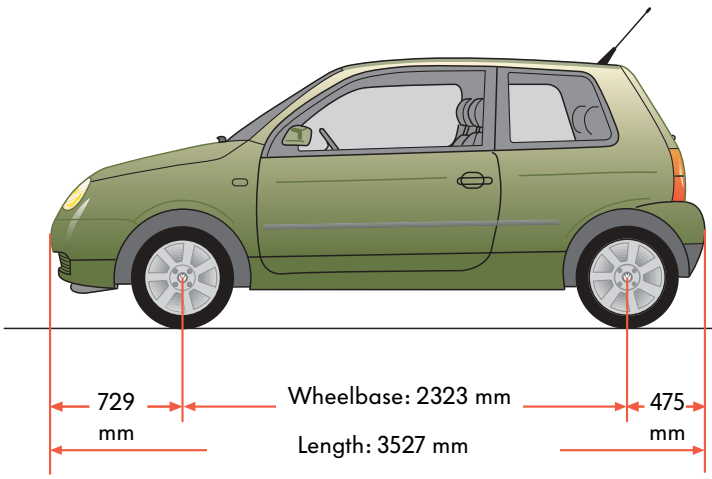


SSP 201_010



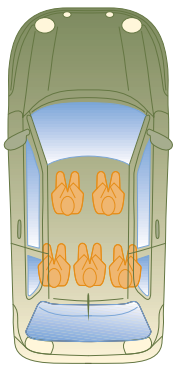
SSP 201_011

With a maximum length of 3527 mm, the LUPO belongs to the subcompact class.



SSP 201_012

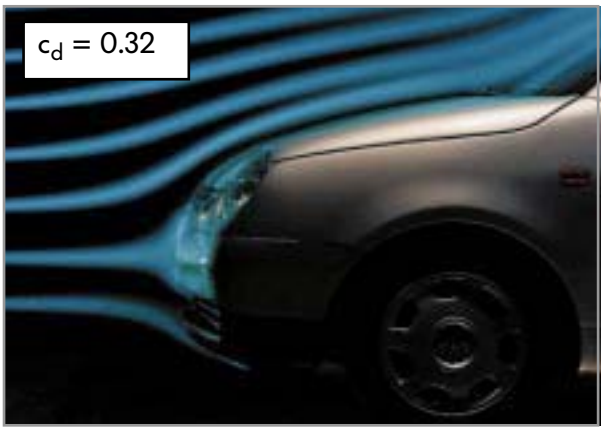
The Lupo offers space for 4 or 5 persons, depending on the equipment level.



SSP 201_007

The luggage compartment has a capacity of 139 or 792 litres. The rear seat backrest can be folded down. The inclination of the rear seat backrest can be adjusted in two stages in order to enlarge the luggage compartment.

Aerodynamics



SSP 201_018

SSP 201_130

Aerodynamic drag
D = 0.62 m^2

SSP 201_020

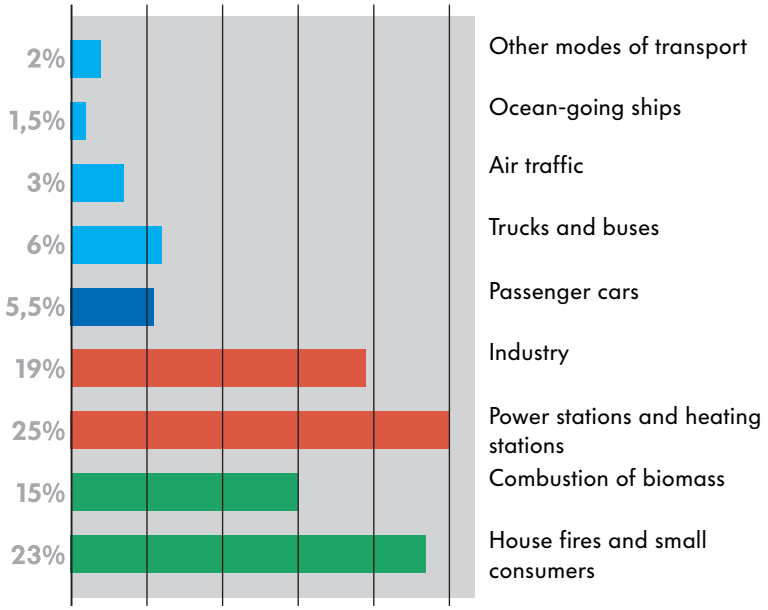
One of the main goals in the development of the LUPO's aerodynamics was to streamline the bodyshell in such a way as to eliminate additional measures to improve the vehicle's aerodynamics, measures which involve higher costs and weight.

A streamlined bumper with integral front spoiler, optimised door mirror, small gap and joint dimensions as well as flush-fitting windows and headlights minimise aerodynamic drag and wind noise.

The car and the environment

In addition to households, industry, power stations, heating stations and industrial agriculture, the car is one of the principal sources of air pollution.

Global annual CO_2 emissions caused by man

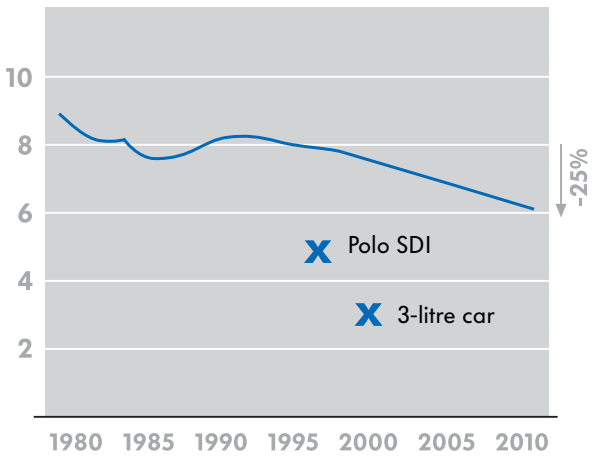


Source: Technical University of Vienna

SSP 201_005

CO_2 emissions constitute approx. 50 percent of the greenhouse gases which are responsible for the "man-made" phenomenon of global warming. Industry, power stations, households and small consumers are responsible a good two thirds of CO_2 emissions. Road traffic worldwide accounts for approx. 12 percent of CO_2 emissions, whereas cars contribute less than 6 percent.

Fuel consumption of cars supplied by Volkswagen in Germany



Source: VOLKSWAGEN AG

SSP 201_006

For Volkswagen, reducing fuel consumption, and along with it CO_2 emissions, is one of its main goals in the development of new automobiles. We have agreed to reduce the fuel consumption of our new vehicles by 25 percent between 1990 and 2005. During the period from 1990 to 1995, we achieved a 10 percent reduction. We plan to achieve another 15 percent reduction within the next ten years. The so-called "3-litre car" (a car which consumes 3 litres of fuel per 100 km) is a major step towards low-CO_2-emission vehicles, both for production and during operation.

Recycling

Volkswagen, in association with disposal firms, runs a Workshop Disposal Programme. This process is co-ordinated through the distribution centre or the importer in charge in accordance with prevailing national legislation.

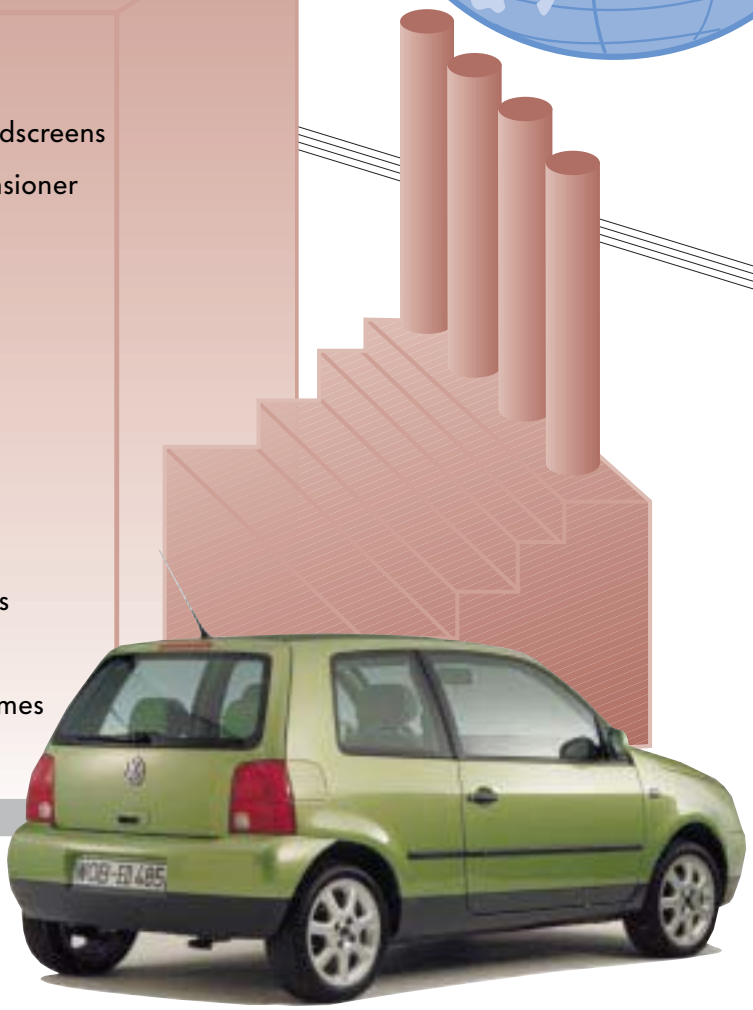
Workshop Disposal Programme:

- Disposal of a wide range of automotive components and media free of charge
- Advice in matters concerning the environment and waste disposal
- Inexpensive disposal offers for other items

SSP 201_013

These components can be disposed of without posing a burden on the environment:

- Starter batteries
- Laminated glass windscreens
- Airbags and belt tensioner (not fired)
- Brake fluid
- Coolant
- Shock absorbers
- Plastic bumpers
- Radiator grilles
- Plastic fuel tanks
- Wheel housing liners
- Wheel covers
- Lock carriers/subframes
- Old tyres



SSP 201_009

Body

Development of the safety bodyshell

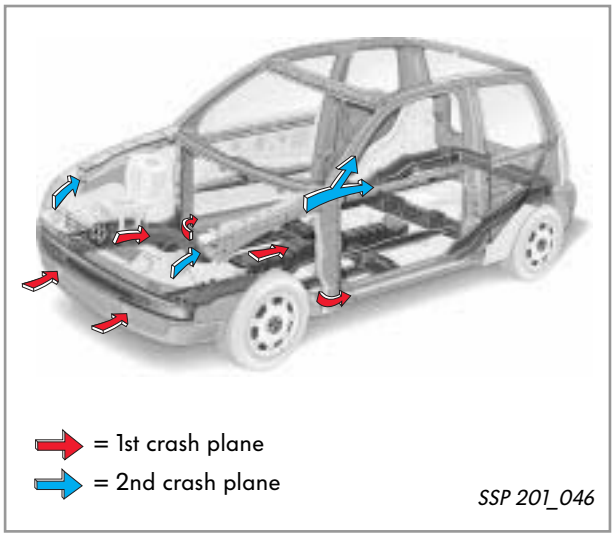
The blueprint for development of the LUPO's body was the Polo '95.
A key development goal was to design a body whose occupant cell offers a high level of dimensional stability in crash situations.

SSP 201_021

During a head-on collision,

the impact energy is absorbed via 2 crash planes:

In the 1st crash plane, the side re-inforcement in the doors located directly behind the bumper cover, transmits the impact energy to the side members. The energy is then distributed evenly to the centre tunnel and re-inforced side members.

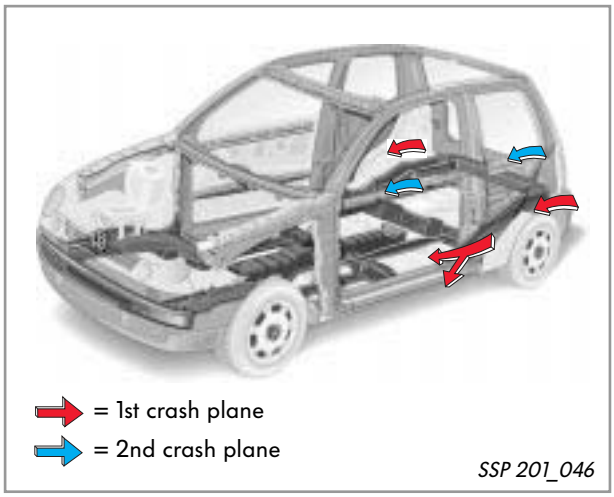


SSP 201_046

In the 2nd crash plane, the wheelhouse side members transfer the impact energy via the door re-inforcements to the rear end.

In the event of a rear collision,

the side re-inforcement in the doors behind the bumper cover transmits the force to the side members.
The body side panel which is almost fully enclosed on the inside helps to absorb more energy.



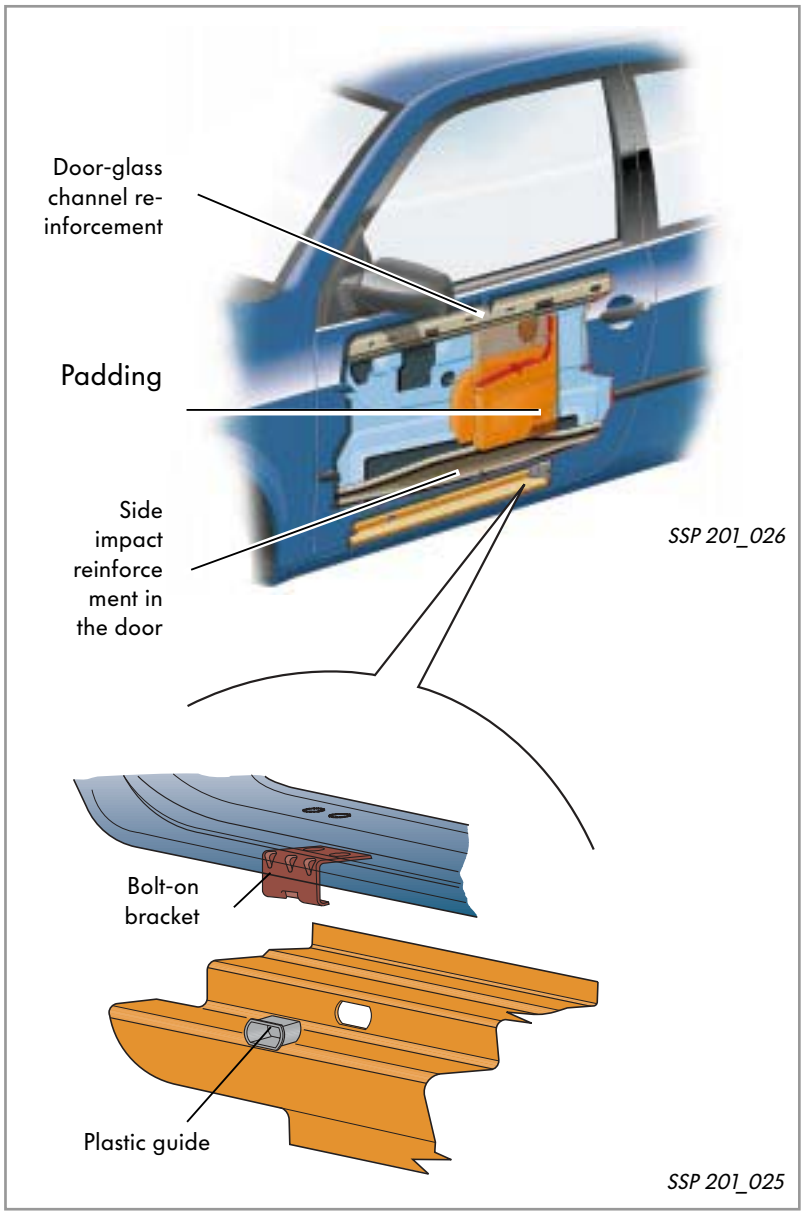
SSP 201_046

In the event of a side impact,

the re-inforced A- and B-pillars, the strong side members and the almost fully integrated inner panel of the door minimise deformation of the occupant cell.

SSP 201_024

The side impact re-inforcement in the door, the door-glass channel re-inforcement and the intermediate padding produce an optimal barrier against the force of impact.



SSP 201_026

SSP 201_025

The closed door is securely anchored to the side member by means of a bracket on the underside. During a side impact, it prevent the door from intruding into the occupant cell.

Body

The body of the LUPO has

features which surpass the norm for this class:

- Long-term corrosion protection
- Fully-galvanised body
- Crash performance in acordance with VW's safety standard
- Modular design
- Narrow ioints

Paintwork structure and corrosion protection

Environmentally friendly, water-dilutable paints are:

- The cathodic cataphoresis, filler, top coat (met. base coat,
  solid base coat)
- All outer panel are electroplated.
- All inner panels are hot-dip galvanised.

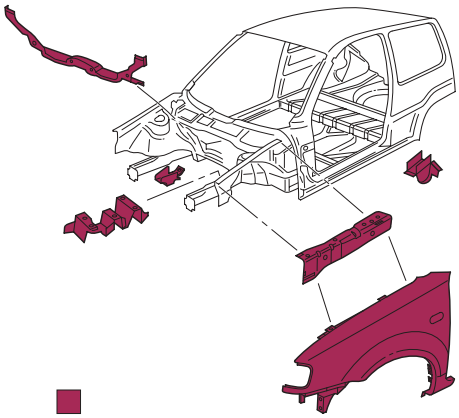
SSP 201_027

Legend:

- Galvanised sheet steel
- Zinc phosphatisation
- Water based
- Cathodic immersion cataphoresis
- Filler coat
- Top coat
- Clear coat

High-strength body panels

are also used in the LUPO.
They are not as thick as conventional body panels and, as a result, weigh less but are stronger.
High-strength body panels have the task of absorbing and distributing energy during a crash in a more controlled manner.
They absorb vibrations at the rear axle mount.

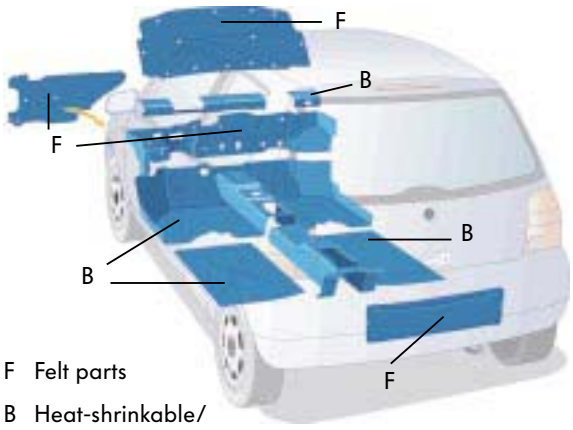


High-strength body panels

SSP 201_028

You can find detailed information regarding high-strength sheet-metal panels in Self-Study Programme No. 200.

Bitumen-based heat-shrinkable and adhesive foils of various thickness as well as felt parts and carpeting are used for soundproofing purposes. The adhesive foils absorb the vibrations which occur in various areas of the body. Felt parts absorb noise by interrupting the sound wave.



F Felt parts

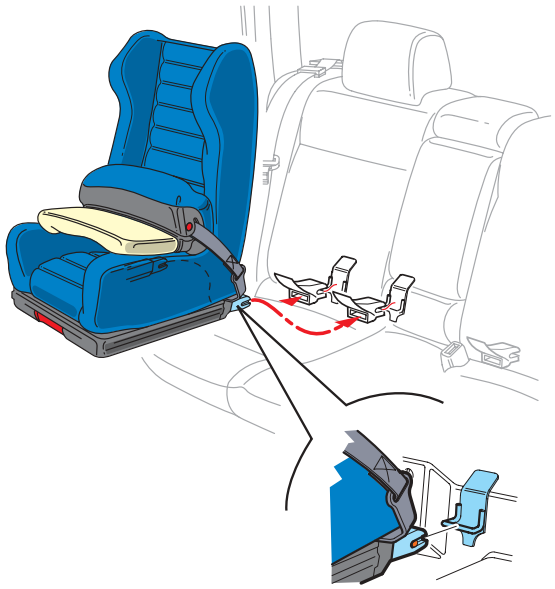
B Heat-shrinkable/ adhesive foils

SSP 201_029

The Isofix child safety seat fastening

is fitted in the LUPO as standard.

There are 4 retaining eyelets below the rear seats, which make it possible to install two child safety seats with the Isofix fastening system. The retaining eyelets are welded to the floorpan assembly and hold the child safety seat securely during a crash.



SSP 201_030

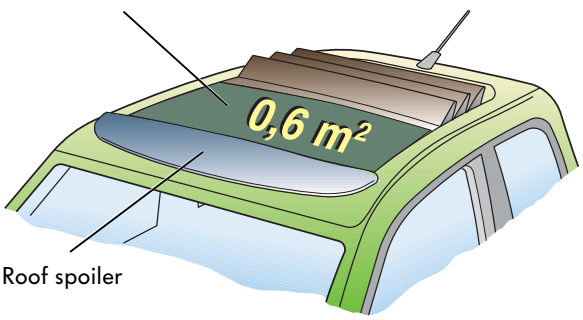
The electric fabric sliding roof

In addition to the electrically-operated glass sliding/tilting roof, an electrically-operated fabric sliding roof is also available for the LUPO. The roof spoiler allows the vehicle to be driven without any draught and quietly with the sunroof open, even at high speed.

The electric fabric sliding roof is identical to the sunroof used in Polo model '95.

Fabric sliding roof

Sunroof opening



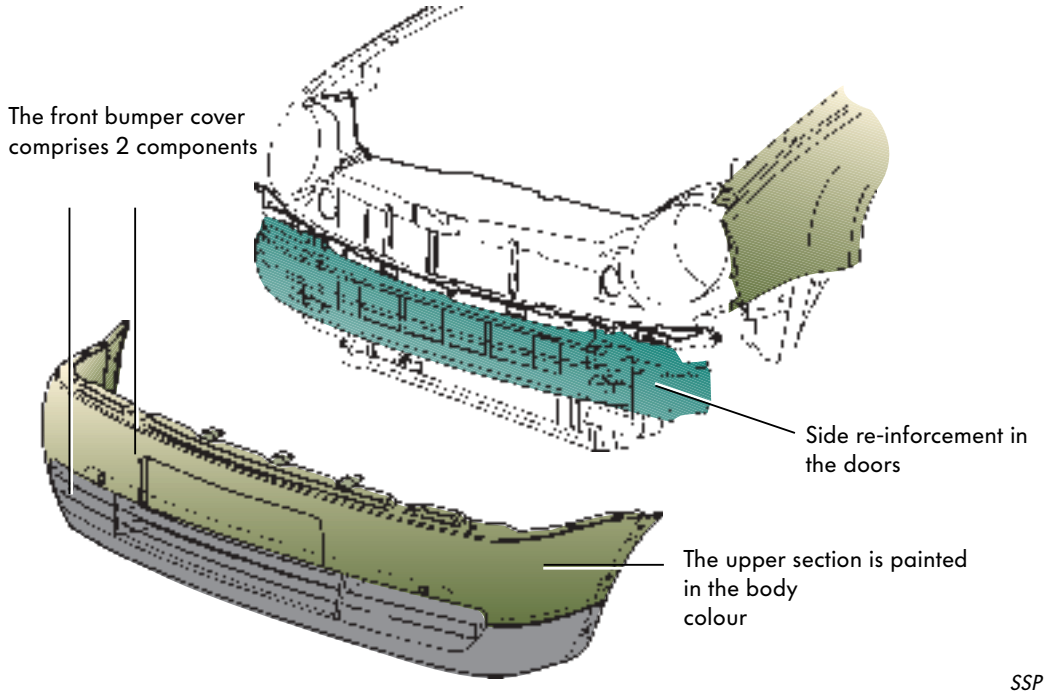
SSP 201_031

Body

The front and rear bumpers

comprise a side re-inforcement in the doors and a bumper cover.

Front



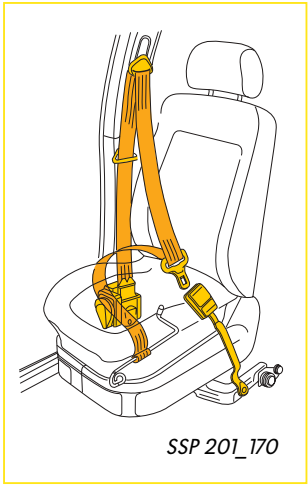
SSP 201_032

The front and rear bumper covers are capable of absorbing impact energy at speeds of up to 4 kph without damage.
Higher impact speeds of up to approx. 15 kph are absorbed by the side re-inforcement in the doors without deformation of the side members. The side members only become deformed as a result of a severe impact.

Rear

SSP 201_034

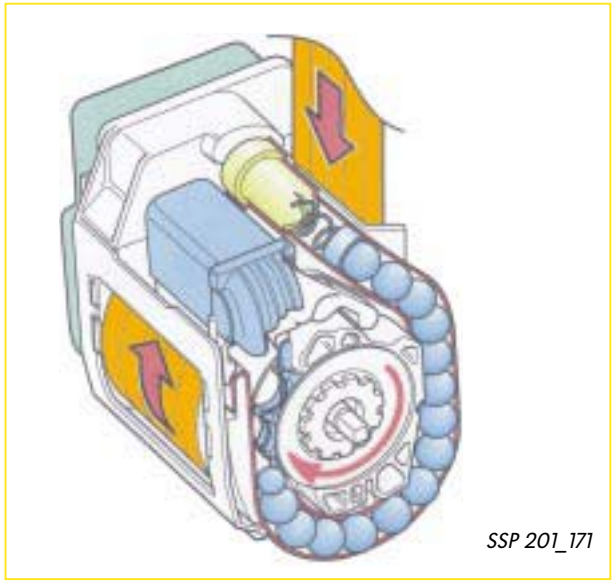
The restraint system and the airbags



SSP 201_170

Seat belts
Front:

They have ball-type tensioners which are fired both mechanically and pyrotechnically.

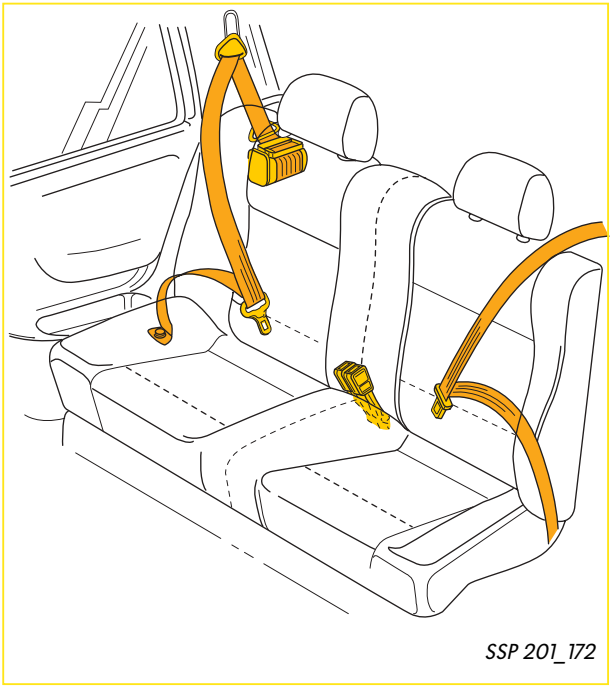


SSP 201_171

For more detailled information on the belt tensioners, please refer to Self-Study Programme No. 192.

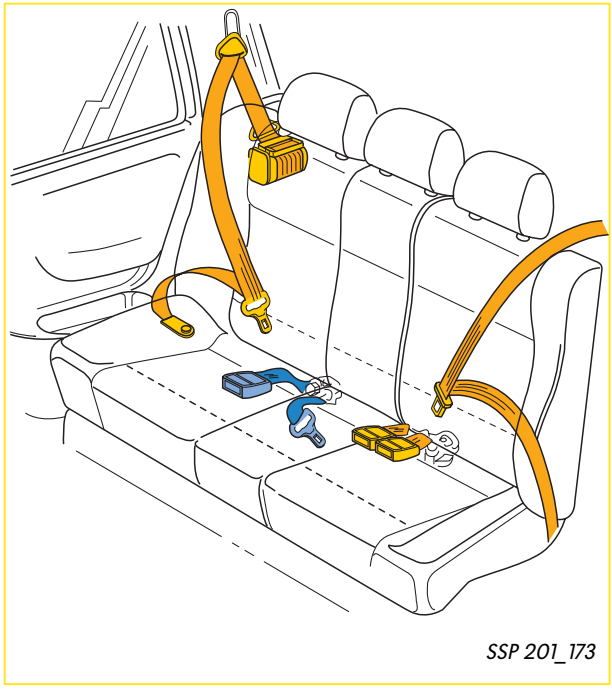
3-point seat belt concepts for the rear seats

Standard equipment



SSP 201_172

The 5-seater version is also equipped with a lap belt for the middle seat.

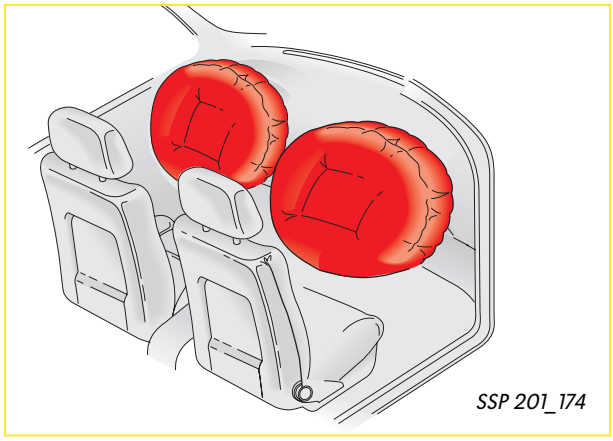


SSP 201_173

The front airbags

have a volume of 57 litres for male/female drivers
and a volume of 95 litres for the front passenger.

At production launch, a 120-litre front passenger's airbag will be used. It will be identical to the airbag used in the Golf '98.
The 120-ltr. front passenger's airbag cannot be replaced by the 95-ltr. airbag, therefore it can only be replaced in accordance with the original equipment level.

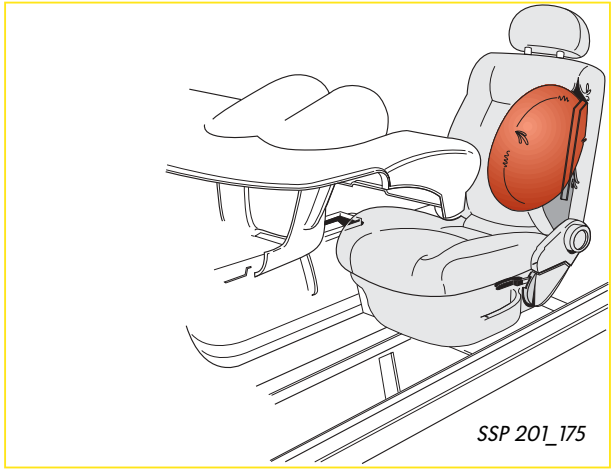


SSP 201_174

The side airbags

have a volume of 12 litres.

All gas generators contain acid-free propellant.

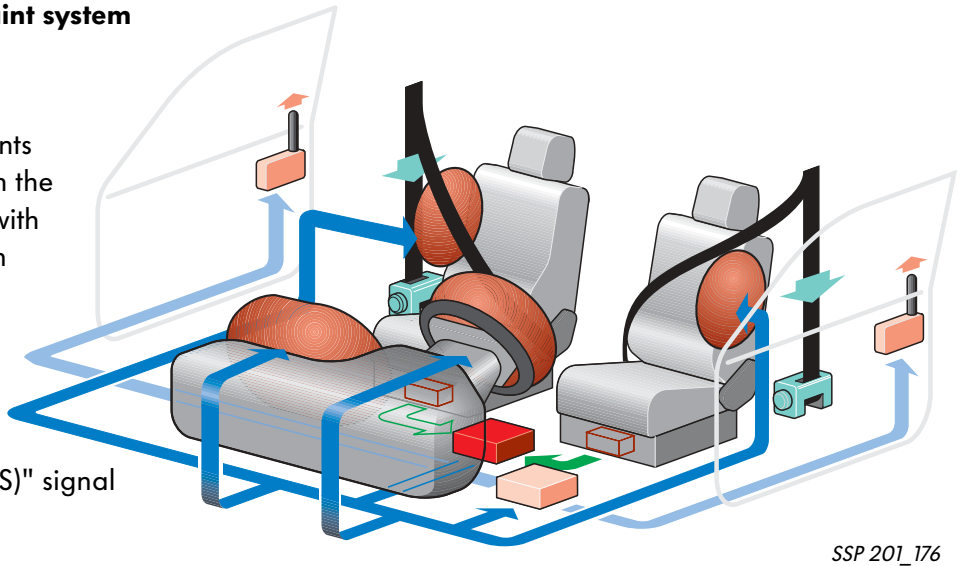


SSP 201_175

The function of the restraint system during severe accidents

The restraint system prevents contact occurring between the shoulder and head area with the steering wheel or dash panel insert.

Once the firing threshold is attained, the airbag control unit transmits the "Open central locking (CLS)" signal to the CLS control unit.



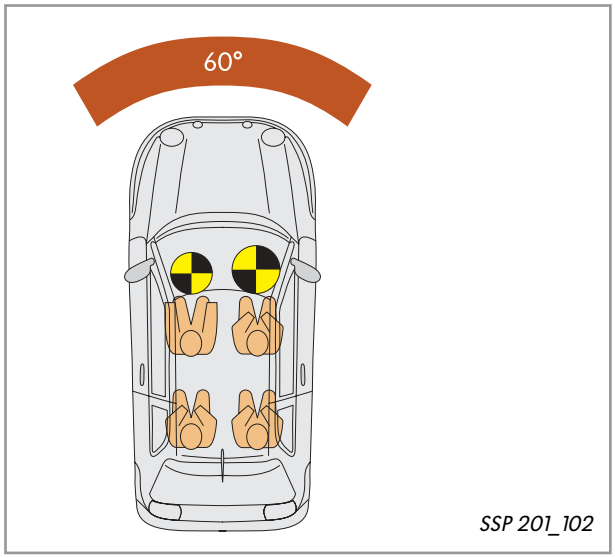
SSP 201_176

The airbag system

As of a defined degree of accident severity and the
the associated delay period, the appropriate airbags are triggered depending on the impact side and the angle of impact.

Head-on collision

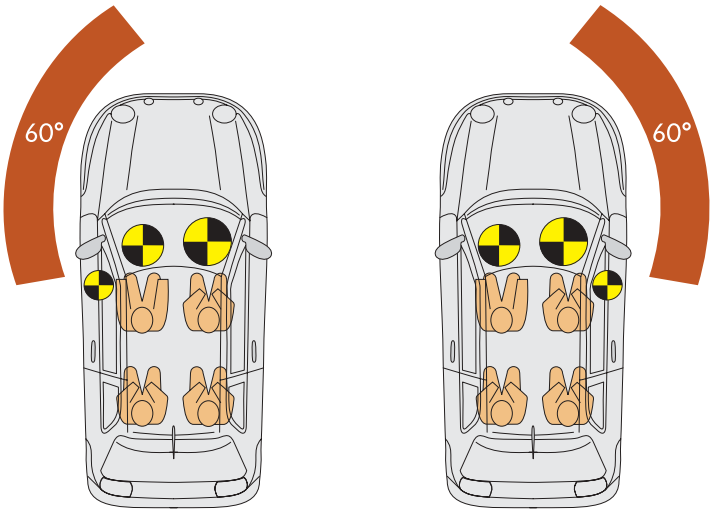
The driver's and front passenger's airbags are triggered.



SSP 201_102

Side/head-on collision

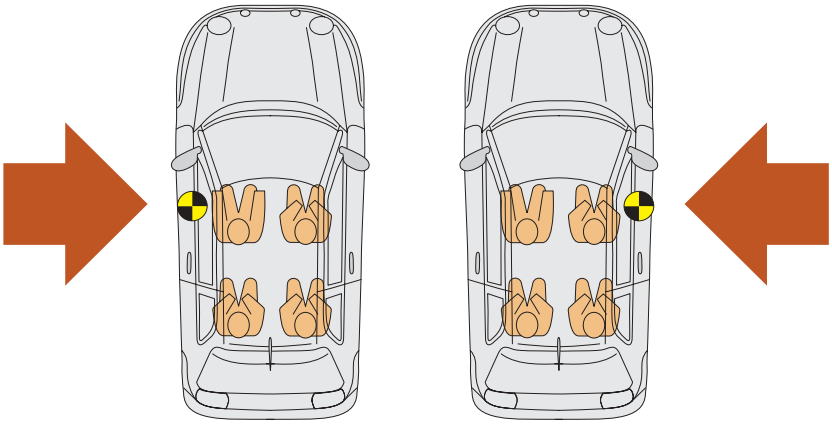
The driver's, front passenger's and side airbags are triggered.



SSP 201_103

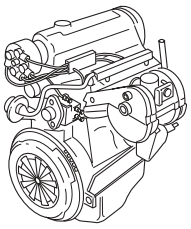
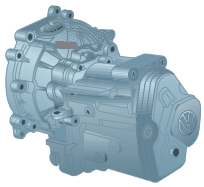
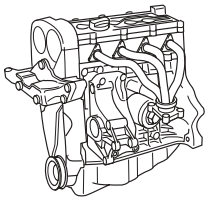
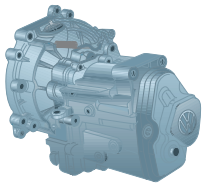
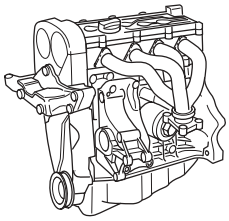
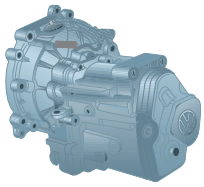
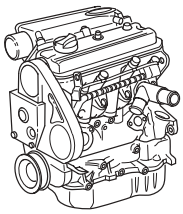
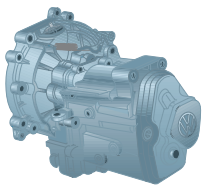
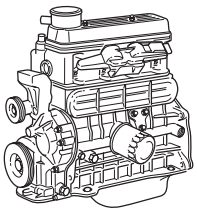
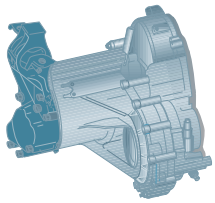
Side impact

Only the side airbag which is actually required to protection the vehicle's occupants is triggered. This considerably reduces repair costs after an accident.


SSP 201_104

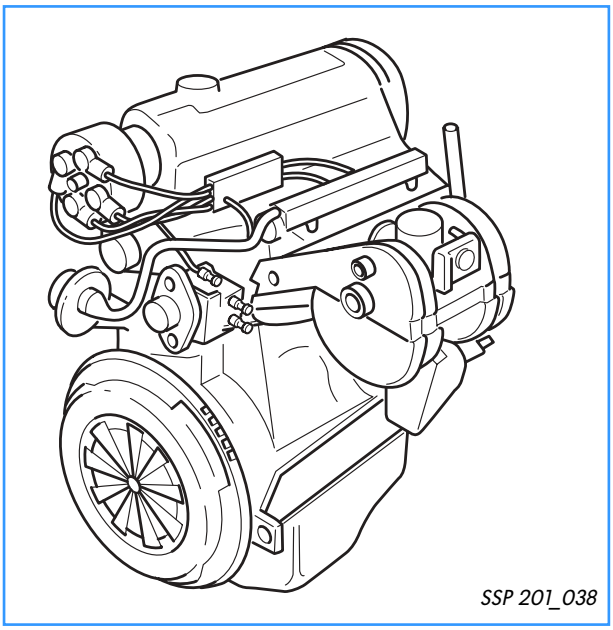
Engines

The engine-gearbox combination

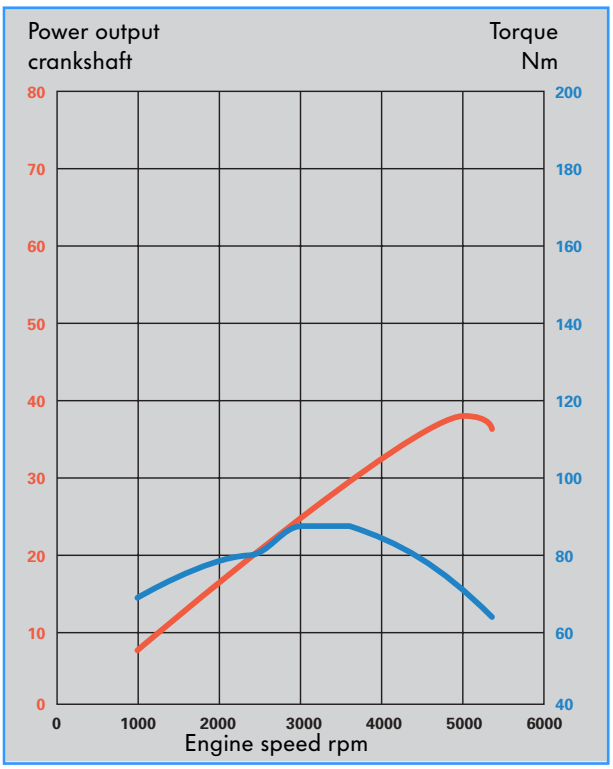
Engines \ Gearbox	5-speed manual gearbox 085	4-speed automatic gearbox 001	5-speed manual gearbox 002
 1.0-ltr. 37 kW petrol engine with camshaft in block			
 1.4-ltr. 16V 55 kW petrol engine			
 1.4-ltr. 16V 74 kW petrol engine			
 1.7-ltr. 44 kW SDI engine			
 1.0-ltr. 37 kW rocker lever petrol engine			

The 1.0-ltr. 37 kW petrol engine

is an advanced version of the proven 1.0-ltr. aluminium engine with the camshaft in block



SSP 201_038



SSP 201_041

Features of the engine mechanicals are:

- Aluminium cylinder crankcase with press-fitted cast iron cylinder liners
- Cylinder head with single overhead camshaft
- Bucket tappets with hydraulic adjusters

Features of the engine management system are:

- Motronic MP 9.0 (refer to Self-Study Programme No. 168)
- Sequential injection
- Rotating ignition voltage distribution
- Selective knock control
- Conforms to exhaust emission standards EU III and D3

Specifications

Engine code "ALL"
4-cylinder inline engine

Valves per cylinder	:	2
Displacement	:	999 cm^3
Bore	:	70.6 mm
Stroke	:	67.1 mm
Compression ratio	:	10.5 : 1
Max. output	:	37 kW at 5000 rpm
Max. torque	:	86 Nm at 3000 to 3600 rpm
Engine management	:	Bosch Motronic MP 9.0
Fuel type	:	unleaded 95 RON

Knock control allows the engine to be operated alternatively with unleaded 91 RON fuel but with a slight reduction in power output and torque.

The new engine generation:

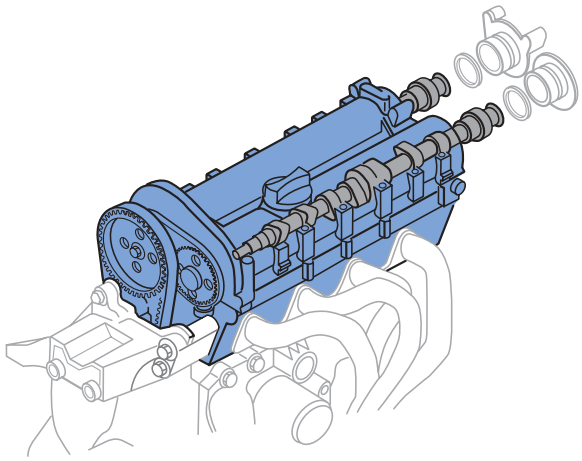
Overview

The 1.4-ltr. engines described on the following pages belong to a new generation of petrol engines.

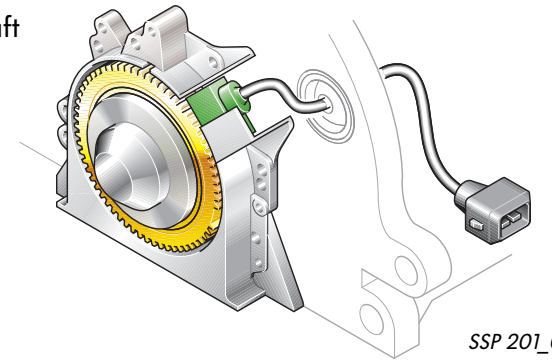
All have:

- a new cylinder head with valve activtion via roller cam follower
- Aluminium cylinder block
- An engine speed sensor which is integrated in the flange for the crankshaft sealing ring at the flywheel end
- static high-voltage distribution

All conform to
exhaust emission standards EU III and D3.



SSP 201_049



SSP 201_044

Cylinder head

The camshafts are mounted in the camshaft housing. The camshaft housing also acts as the valve cover.

The valves and hydraulic support elements are fitted in the cylinder head.
The roller cam follower engages in the support element and abut the end of the valve stem.

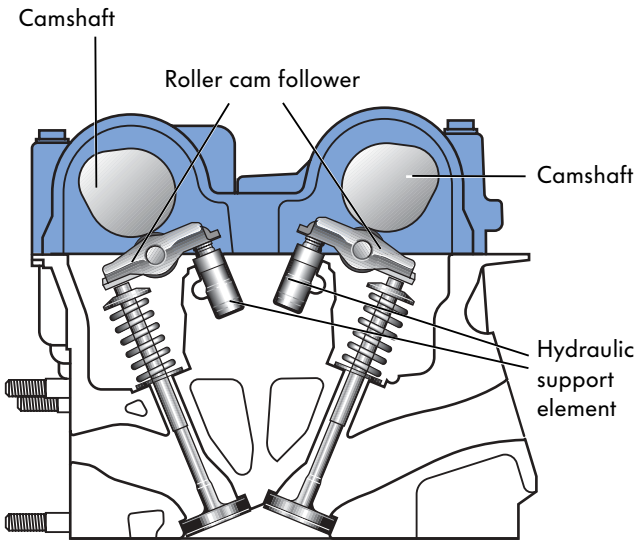
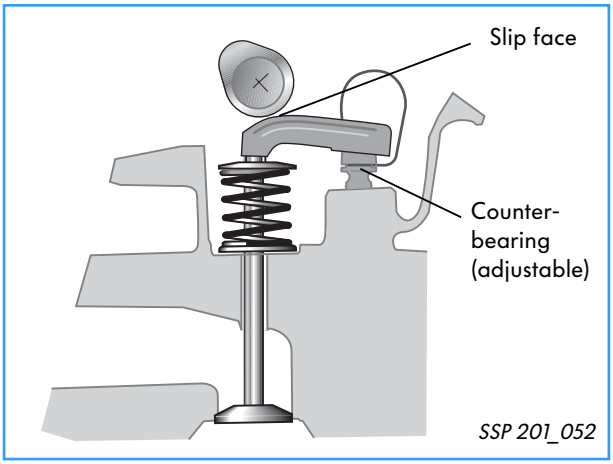


Illustration of the 16V engine

SSP 201_050

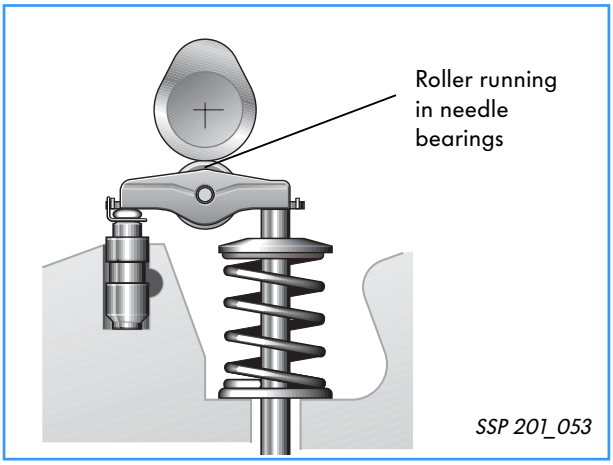
Valve activation by roller cam follower

Conventional cam follower



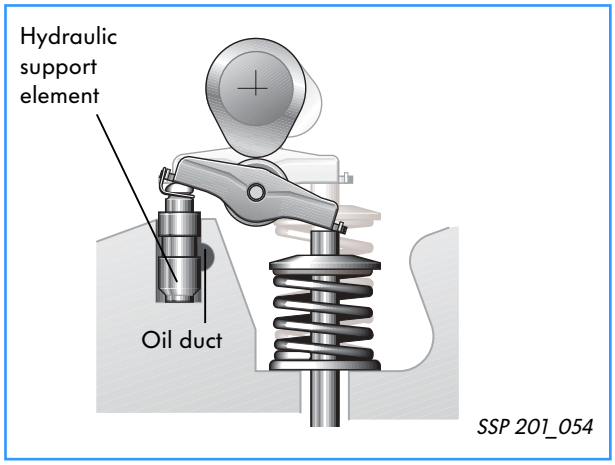
The cam glides over the slip face of the cam follower. As a result, high friction losses occur and the cam follower is subjected to mechanical stress.
Valve clearance is adjusted manually via the adjustable counter-bearing.

The roller cam follower



The cam of the roller cam follower rolls off a roller running in needle bearings.
The cam stroke is transmitted to the valve stem with minimal friction loss.

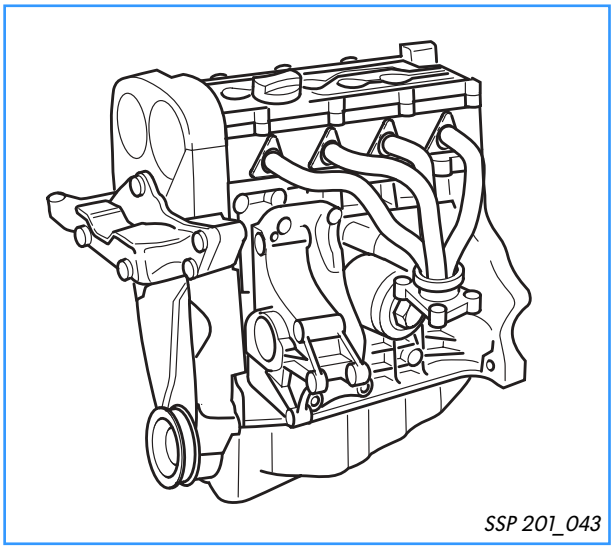
The roller cam follower (depressed)



The hydraulic support element replaces the manually adjustable counter-bearing. It acts as the pivot for the roller cam follower and assumes the task of automatic valve clearance adjustment. Lubrication and filling are performed via an oil channel in the cylinder head.

For more detailled information, please refer to Self-Study Programme No. 196.

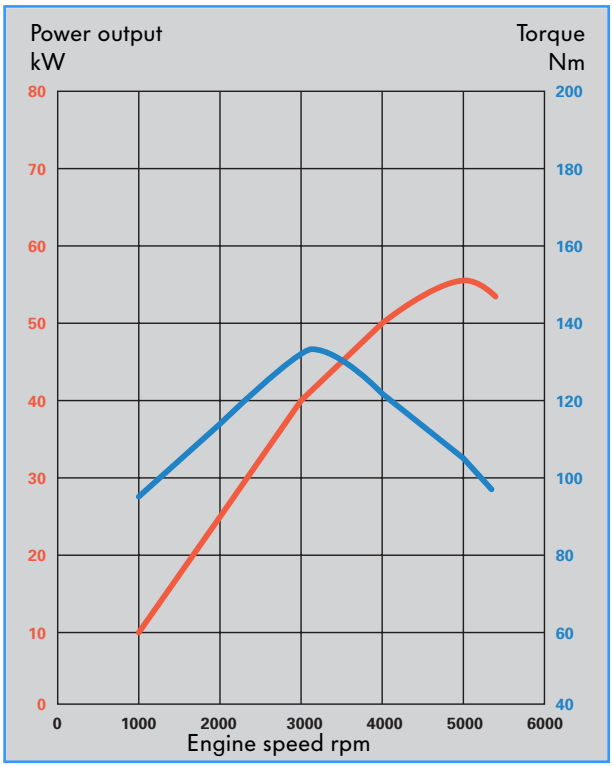
The 1.4-ltr. 16V 55 kW petrol engine



SSP 201_043

Features of the engine mechanicals:

- Aluminium cylinder crankcase
- Press-fitted cast iron cylinder liners
- Cylinder head with roller cam followers
- Secondary belt drive
- Primary catalytic converter integrated in the exhaust manifold
- Conforms to exhaust emission standards EU III and D3



SSP 201_045

Specifications

Engine code "AKQ"
4-cylinder inline engine

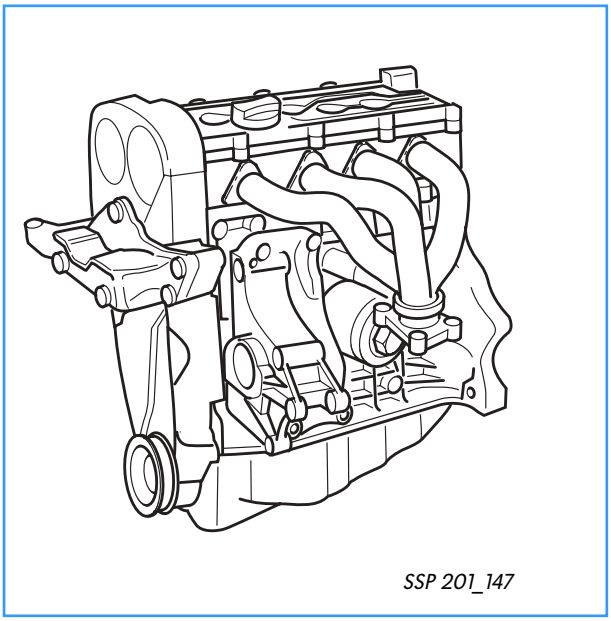
Valves per cylinder	:	4
Displacement	:	1390 cm^3
Bore	:	76.5 mm
Stroke	:	75.6 mm
Compression ratio	:	10.5 : 1
Max. output	:	55 kW at 5000 rpm
Max. torque	:	128 Nm at 3300 rpm
Engine management	:	Magneti Marelli 4AV
Fuel type	:	unleaded 95 RON

Knock control allows the engine to be operated alternatively with unleaded 91 RON fuel but with a slight reduction in power output and torque.

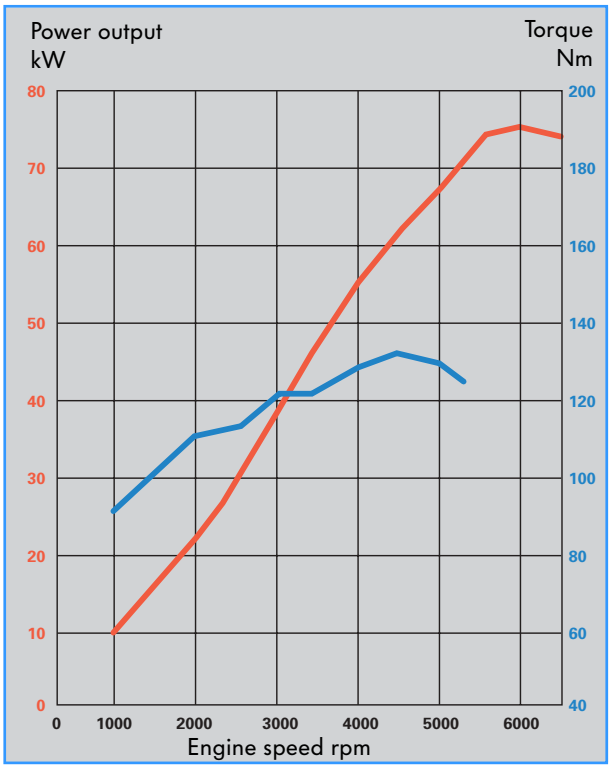
For more detailed information, please refer to Self-Study Programme No. 196.

The 1.4-ltr. 16V 74 kW petrol engine

The basic engine is the 1.4-ltr.-16V 55 kW petrol engine.



SSP 201_147



SSP 201_048

For more detailed information, please refer to Self-Study Programme No. 196.

The key differences compared to the 1.4-ltr. 16 V 55 kW petrol engine

- Stronger pistons
- Cylinder head with larger intake and exhaust ducts
- Modified camshaft timing
- Modified intake module
- Modified exhaust system
- Aluminium oil sump for increased rigidity of higher-performance engine
- conforms to exhaust emission standards EU III and D3

Specifications

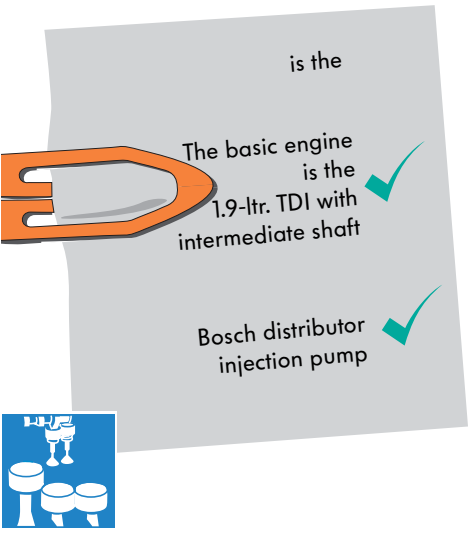
Engine code “ANM“
4-cylinder in-line engine

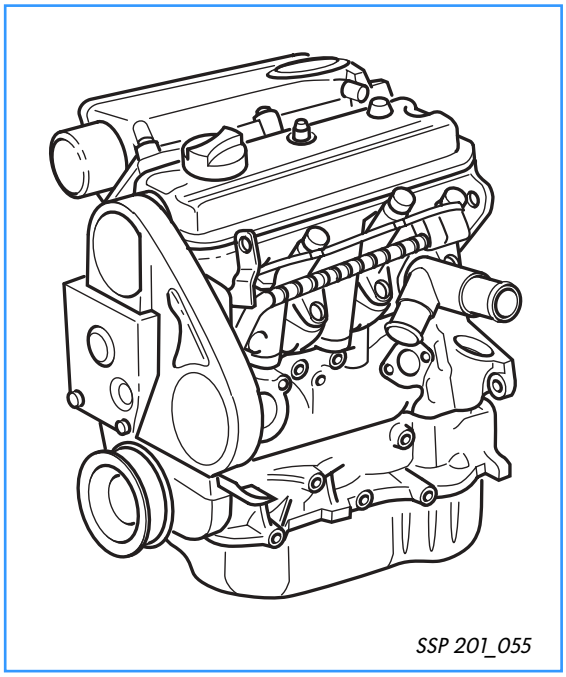
Valves per cylinder	:	4
Displacement	:	1390 cm^3
Bore	:	76.5 mm
Stroke	:	75.6 mm
Compression ratio	:	10.5 : 1
Max. output	:	74 kW at 6000 rpm
Max. torque	:	128 Nm at 4500 rpm
Engine management	:	Magneti Marelli 4 AV
Fuel type	:	unleaded 98 RON

The knock control also allows the engine to be operated alternatively with unleaded 91 RON fuel with a slight reduction in power output and torque.

Drive units

the 1.7-ltr. 44 kW SDI diesel engine

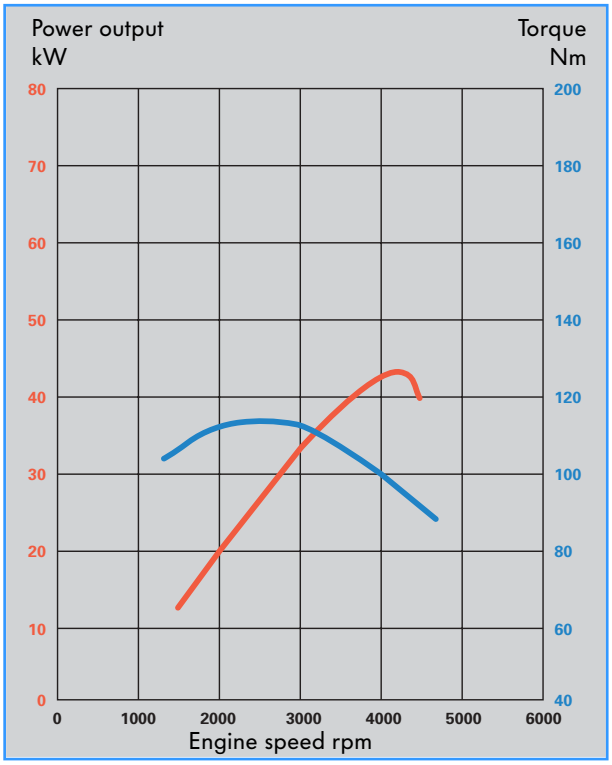




SSP 201_055

Features of the engine mechanicals:

- Diesel direct injection engine
- Naturally aspirated engine
- Displacement was reduced to 1.7-ltr. from 1.9-ltr. by modifying the crankshaft stroke.
- The external crankcase breather has been deleted.
- The gases in the crankcase are diverted into the intake duct via the oil return ducts and the valve cover.
- Two-stage EGR valve for better metering of the exhaust gas recirculation
- conforms to exhaust emission standards EU III



SSP 201_057

Specifications

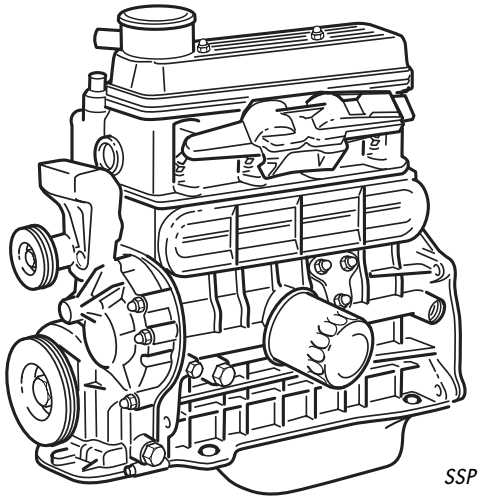
Engine code "AKU"
4-cylinder inline engine

Valves per cylinder	:	2
Displacement	:	1.7-ltr.
Bore	:	79.5 mm
Stroke	:	86.4 mm
Compression ratio	:	19.5 : 1
Max. output	:	44 kW at 4200 rpm
Max. torque	:	115 Nm at 2200-3000 rpm
Mixture preparation	:	Bosch distributor injection pump and electronic control unit EDC 15
Fuel type	:	min. 45 CN

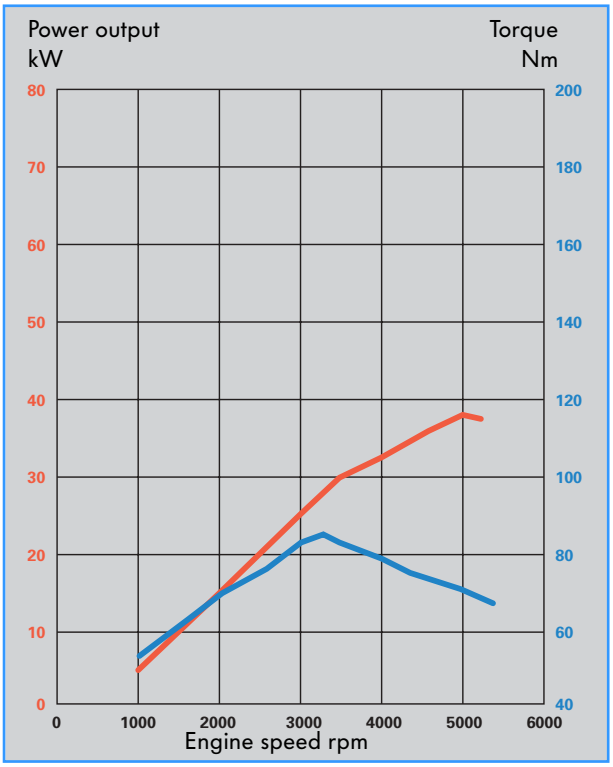
The 1.0-ltr. 37 kW petrol engine

is an improved version of the 1.3-ltr. engine fitted in the Skoda Felicia.

(for certain markets only)



SSP 201_037



SSP 201_039

For more detailed information, please refer to Self-Study Programme No. 203.

Features of the engine mechanicals are:

- The valve is driven via a camshaft in block (ohv), tappets, push rods and rocker levers
- The cylinder crankcase is made of die cast aluminium
- "wet-type" cast iron cylinder liners
- The crankshaft runs in 3 bearings

Features of the engine management system are:

- Multipoint injection
- Static high-voltage distribution
- Conforms to exhaust emission standards EU III and D3

Specifications

Engine code "AHT"
4-cylinder in-line engine

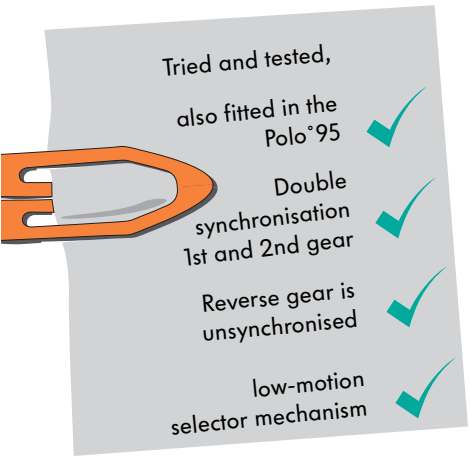
Valves per cylinder	:	2
Displacement	:	997 cm^3
Bore	:	72 mm
Stroke	:	61.2 mm
Compression ratio	:	10 : 1
Max. output	:	37 kW at 5000 rpm
Max. torque	:	84 Nm at 3250 rpm
Engine management	:	Siemens Simos 2P
Fuel type	:	unleaded 95 RON

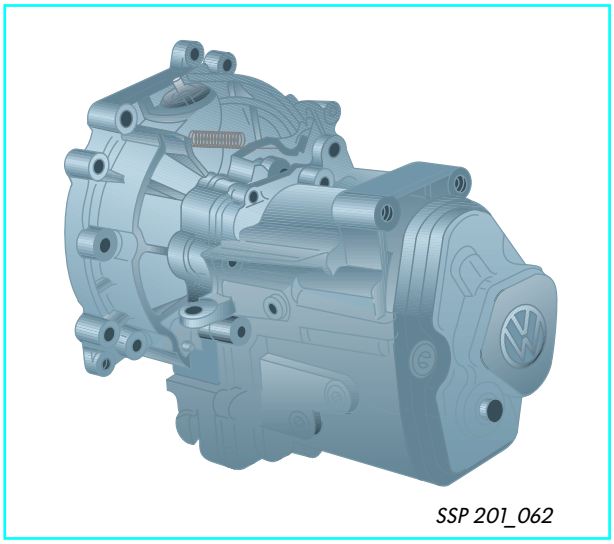
Knock control allows the engine to be operated alternatively with unleaded 91 RON fuel with a slight reduction in power output and torque.

Power transmission

The 5-speed manual gearbox 085

is fitted in petrol engines with overhead camshaft and in the diesel engine.



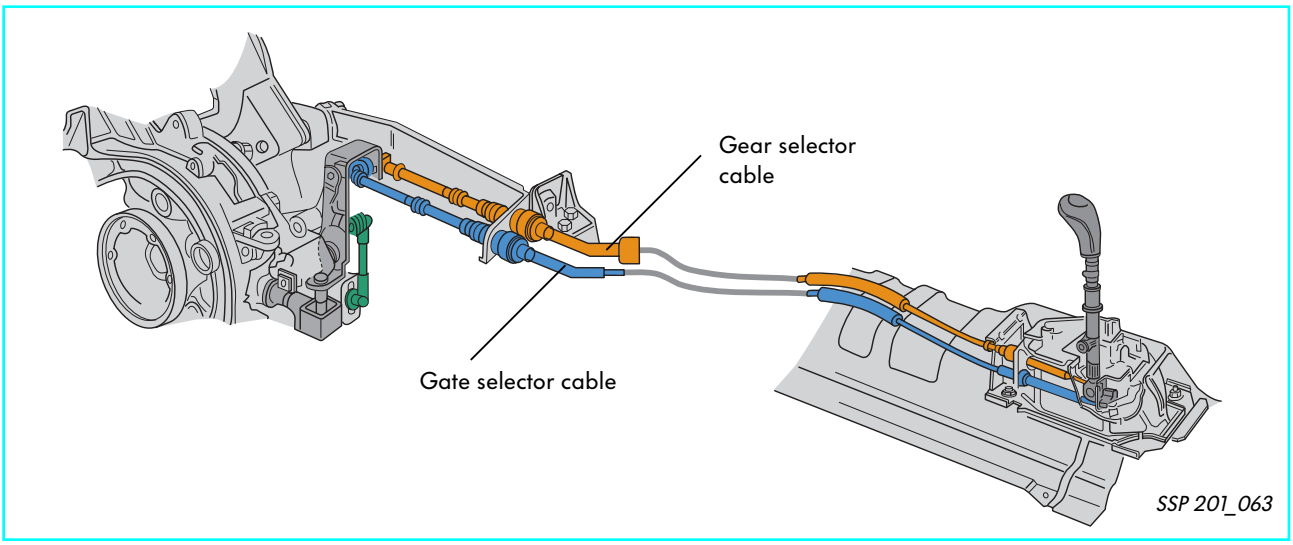


SSP 201_062

The total transmission ratio matched to the installed engine version is spread by means of different gear ratios and final drive ratios. The gearbox is assigned to the engine via the gearbox code.

The gear selection system

Gear engagement is via a gate selector lever and gear selector cable.



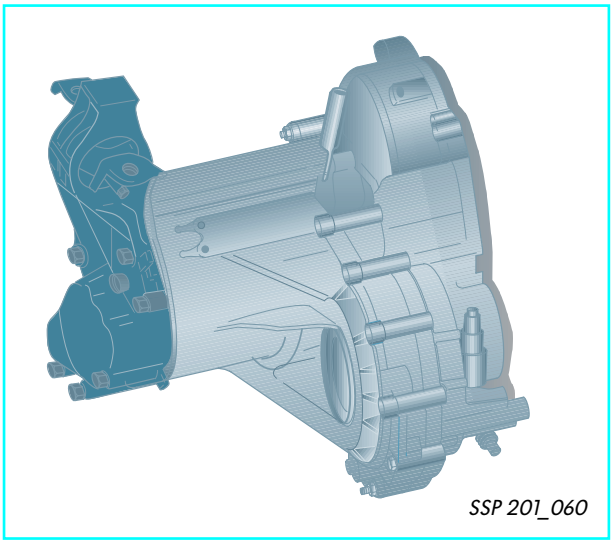
SSP 201_063

Thanks to the selector cables, the swinging motion of the engine only has a minimal effect on the gear lever. As a result, gears can be selected with greater precision.

The 5-speed manual gearbox 002

is exclusive with the 1.0-ltr. rocker lever petrol engine “AHT“, an improved version of the 1.3-ltr. engine in the Skoda Felicia.

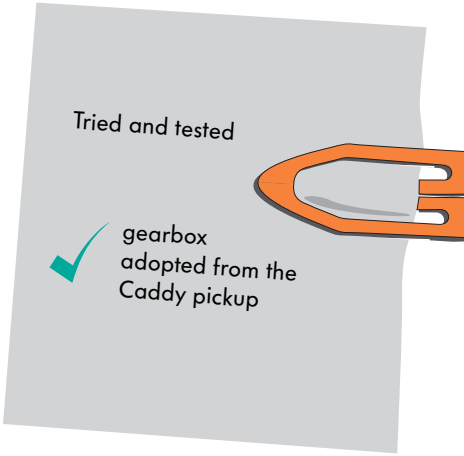
(for certain markets only)



SSP 201_060

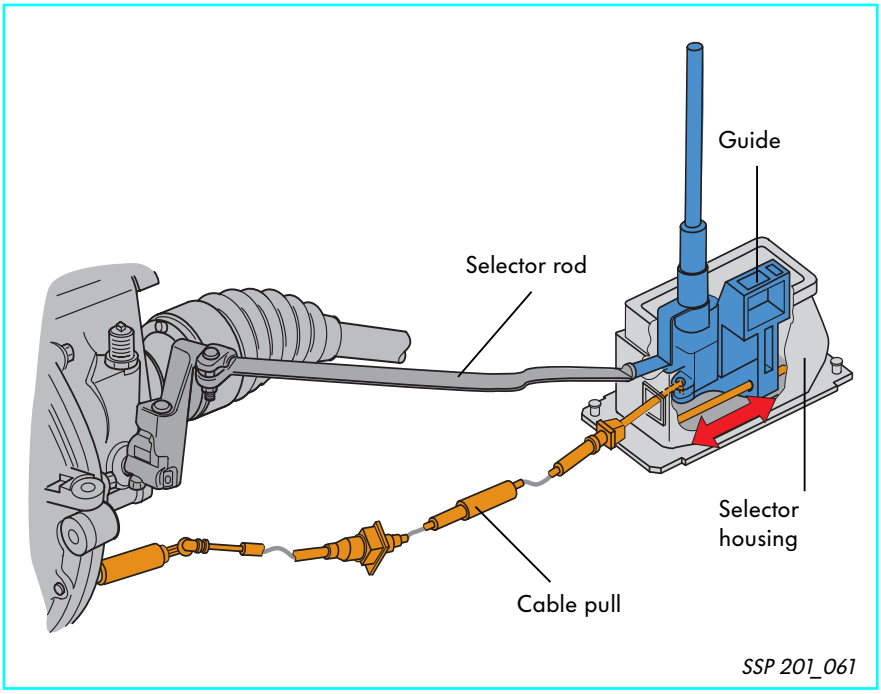
Technical features:

- 5-speed manual gearbox
- Reverse gear is unsynchronised
- Two-part aluminium gearcase
- The end cover and the engine suspension have been modified.
- Common oil filling for gearbox and final drive
- Final drive via drive shaft flanges



A gear change

is performed by a selector rod.



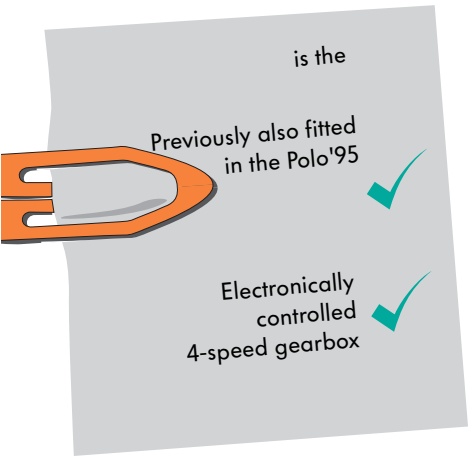
SSP 201_061

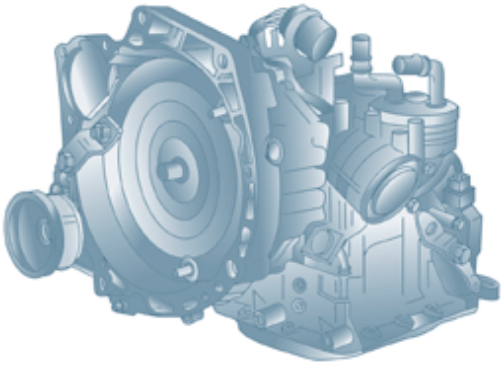
The gear lever is mounted on two bearing bolts in a guide in floating configuration. A cable pull transmits the relative movement of the engine to the guide. This reduces oscillation at the gear lever.
The gears can therefore be engaged with greater precision.

Power transmission

The 4-speed automatic gearbox 001

is available for 1.4-ltr. 16V 55 kW petrol engine “AKQ“.





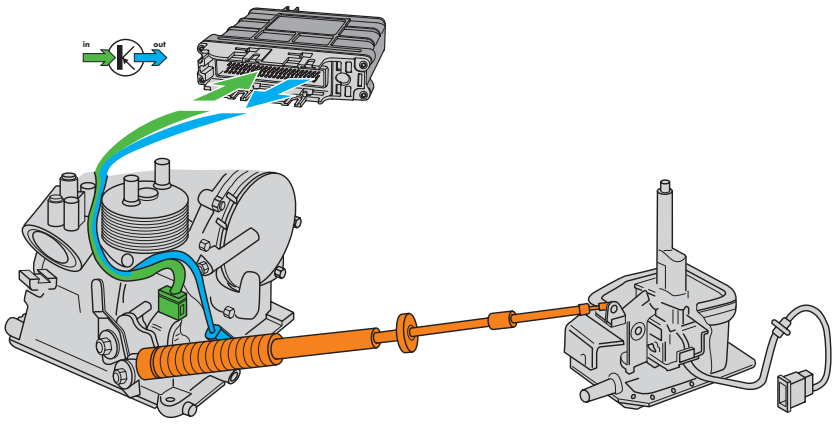
SSP 201_064

Technical features:

- Ravigneaux planetary gear
- Torque converter with integrated lock-up clutch
- Solenoid valves at the valve body for electro-hydraulic control
- Common oil supply for planetary gear and final drive

Gear selection

The individual drive positions, the parking lock and neutral are selected mechanically with the gate selector lever.



SSP 201_065

The control unit records the incoming sensor signals during vehicle operation, evaluates these signals and activates the individual solenoid valves.
The integrated dynamic shift program automatically selects the "Eco" shift characteristic or "Sport" shift characteristic.

For more detailed information, please refer to in Self-Study Programme No. 176 “4-speed Automatic Gearbox 001“ .

The fuel tank

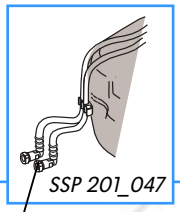
of the LUPO is located in the crash-protected area in front of the rear axle.
It has a volume of 35 litres.

Proven

- Electric interior tank pump
- Gravity pressure relief valve
- Activated charcoal canister system

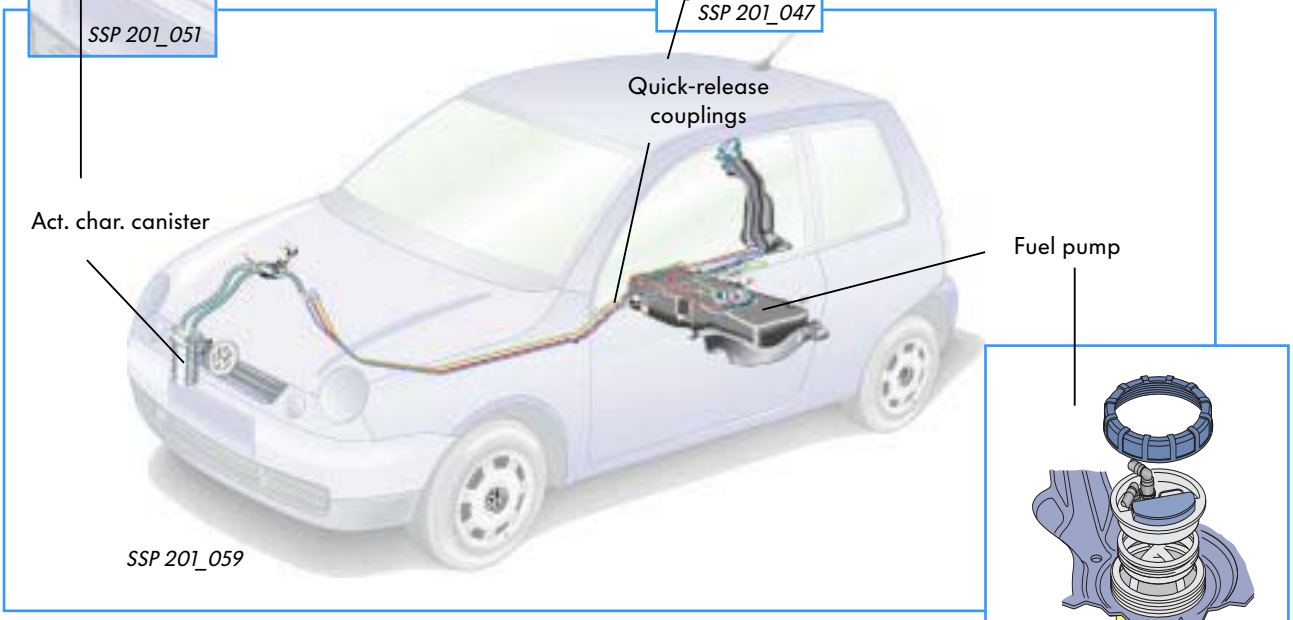
SSP 201_051

The activated charcoal canister is located at the front right-hand side of the vehicle.
The activated charcoal absorbs fuel components from fuel vapours.



SSP 201_047

Quick-release couplings are used for installing the fuel pipes.



SSP 201_059

SSP 201_058

The fuel gauge sender is attached to the fuel pump housing.

Diesel engines

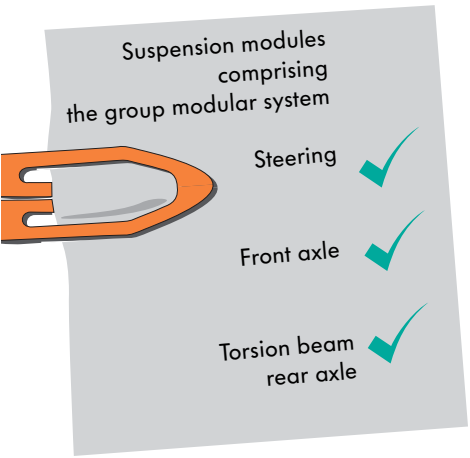
Diesel-engined vehicles do not require a fuel pump or activated charcoal canister. The fuel gauge sender, in combination with the intake manifold for the intake, form a single unit. The fuel pump is an integral part of the distributor injection pump.

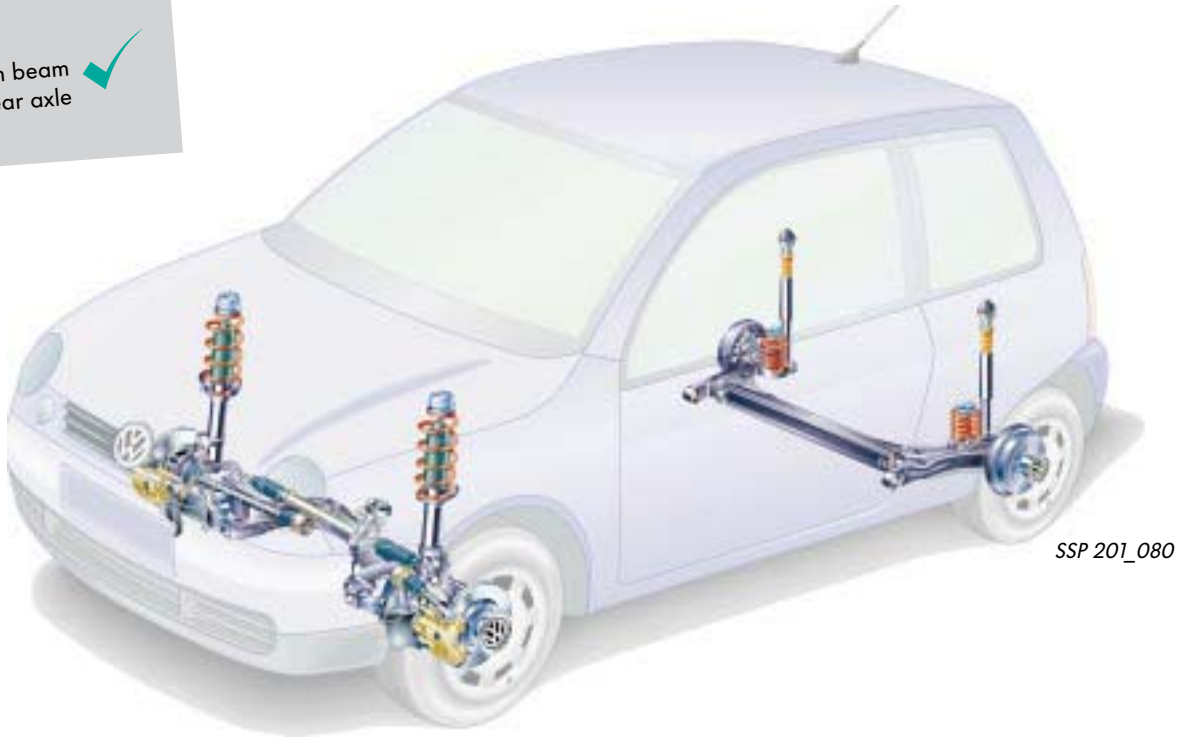
Running gear

The running gear

of the LUPO is identical to the Polo'95.

The running gear has been adapted to the LUPO, making allowance for driving safety and driving comfort.





SSP 201_080

The following pages will present you with the following items:

- The steering
- The front axle
- The rear axle
- The brakes
- The traction control systems

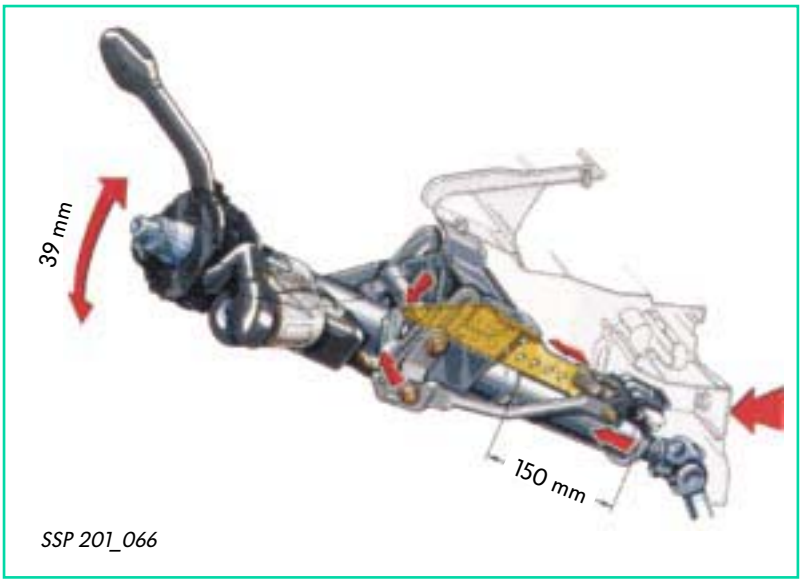
The steering

comprises a safety steering column which is height-adjustable and a mechanical steering gear.

Suspension modules comprising the Group modular system

- Safety steering column
- Mechanical steering gear
- Power steering gear

The safety steering column



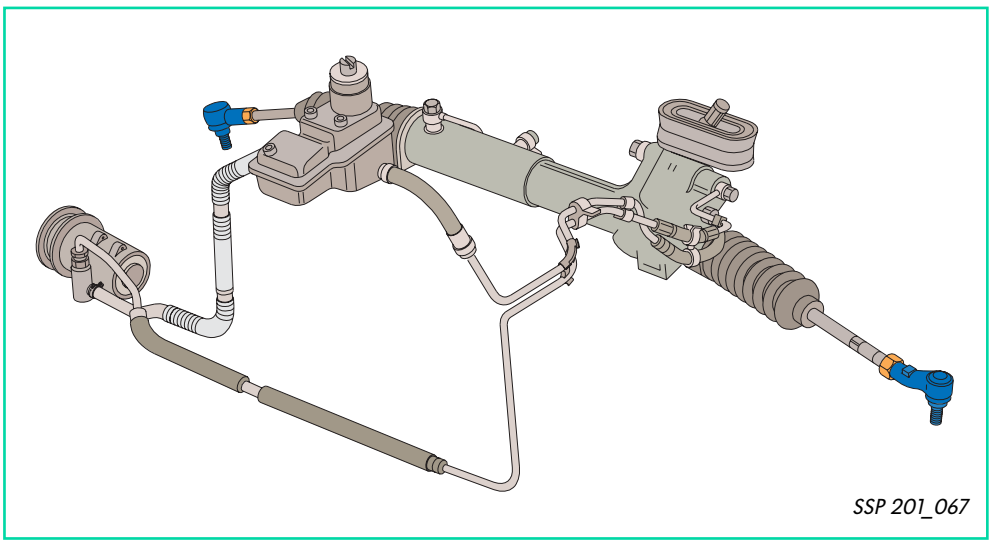
SSP 201_066

The safety steering column can be compressed by up to 150 mm during a crash. This reduces the injury risk for the driver.

Power steering

Depending on performance and wheel size, the LUPO is equipped with power steering.

The two track rods for power steering and mechanical steering are adjustable.



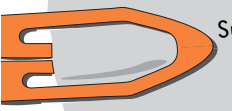
SSP 201_067

Running gear

The front axle of the LUPO

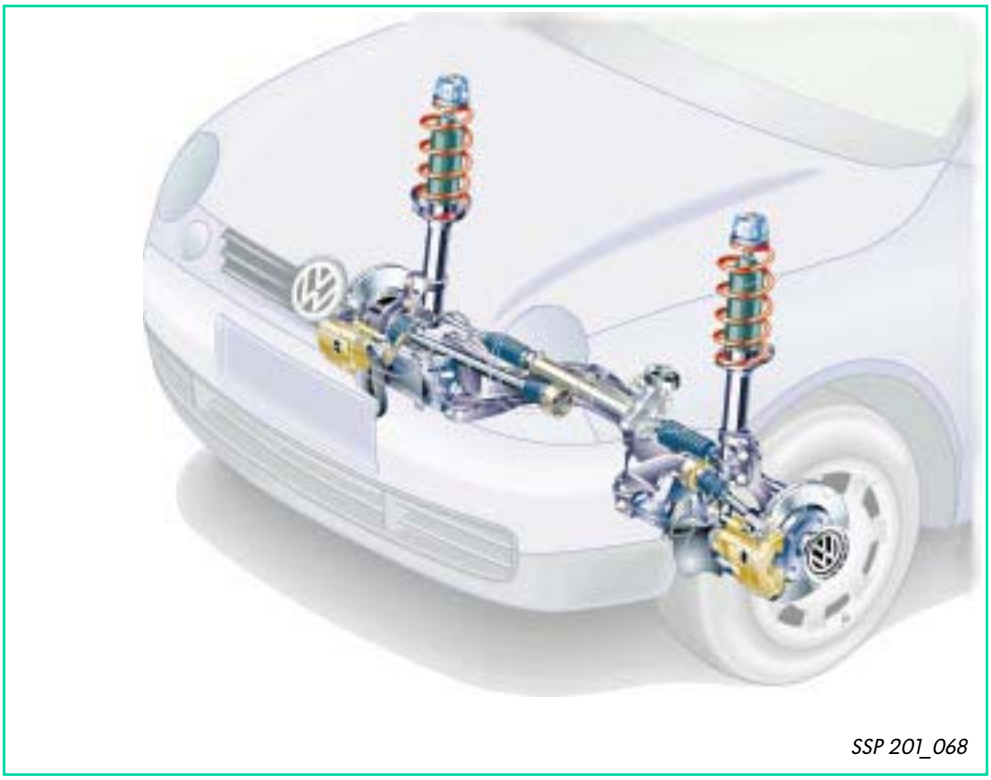
comprises suspension struts and wishbones. The suspension struts are bolted to the wheel bearing housing and the wishbones are bolted to the subframe by rubber mountings.

Suspension modules from the Group modular system



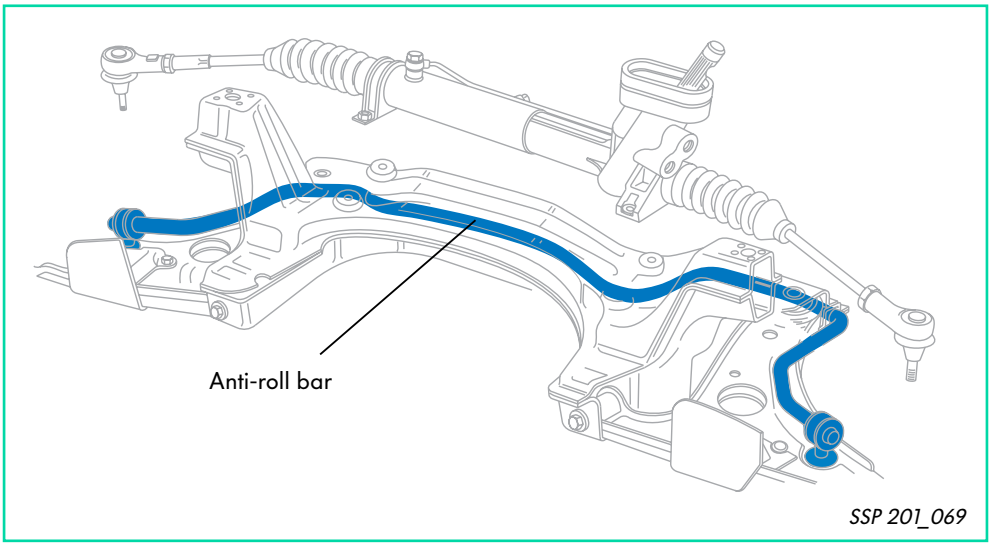
- Suspension strut
- Subframe
- Wheel bearing housing

For more detailed information regarding this axle in respect of castor, shock absorption characteristics and the track-stabilising kingpin offset, please refer to Self-Study Programme No. 166.



SSP 201_068

The Lupo with power steering has an anti-roll bar on the front axle.



SSP 201_069

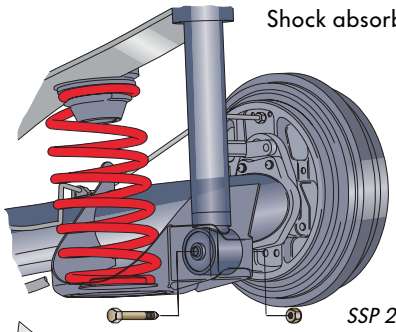
The rear axle

is a torsion beam axle.

Toe and camber design are defined by design and are non-adjustable. For vehicle alignment, the ascertained values can only be compared with the nominal values in the Workshop Manual.

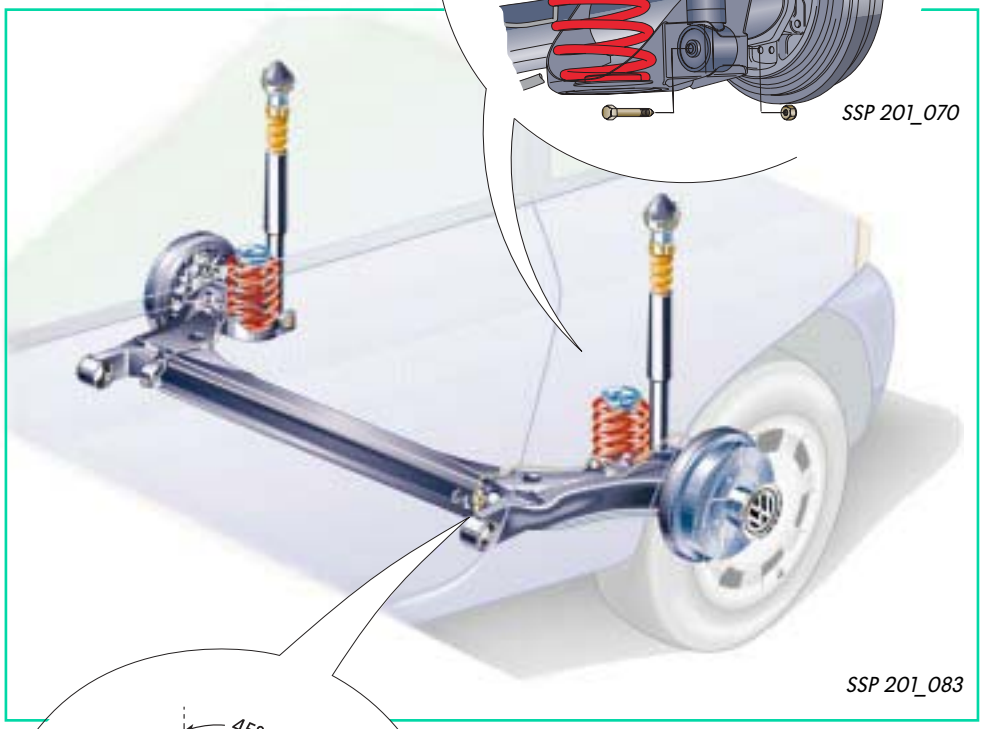
Suspension modules comprising
The Group modular system

- Torsion beam-rear axle
- Second wheel bearing generation

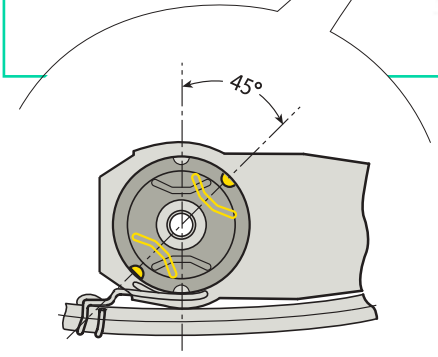


SSP 201_070

Springs and dampers are positioned separately.



SSP 201_083



SSP 201_072

The bonded rubber bushes of the rear axle have been fitted rotated through 45°. This reduces noise transmission from the road to the body.

The following items are standard equipment in all vehicles:

- Diagonal split dual-circuit brake system
- Brake servo
- Load-dependent brake pressure regulator

The brake system

The standard equipment comprises:

- ventilated front disc brakes
- self-adjusting rear drum brakes

For added active safety, the anti-lock braking system ITT Mark 20 IE is available with electronic brake pressure distributor.

SSP 201_073

The front brakes

Ventilated disc brakes

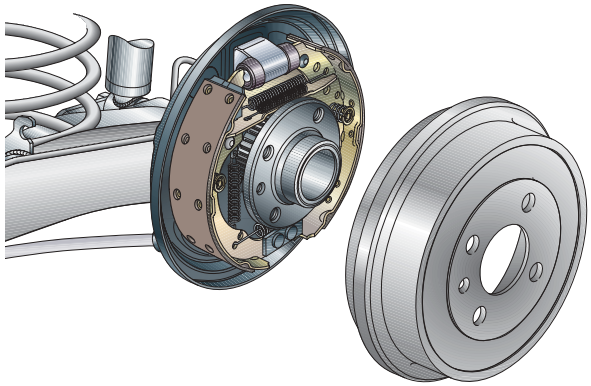
up to 55 kW	as of 74 kW
dia. 239 mm x 18 mm	dia. 256 mm x 20 mm

SSP 201_074

SSP 201_071

The rear brakes

Drum brakes to 55 kW		Disc brakes for 74 kW and above
dia. 180 x 30 mm without ABS	dia. 200 x 40 mm with ABS	dia. 232 x 9 mm Alu. sliding caliper



SSP 201_075

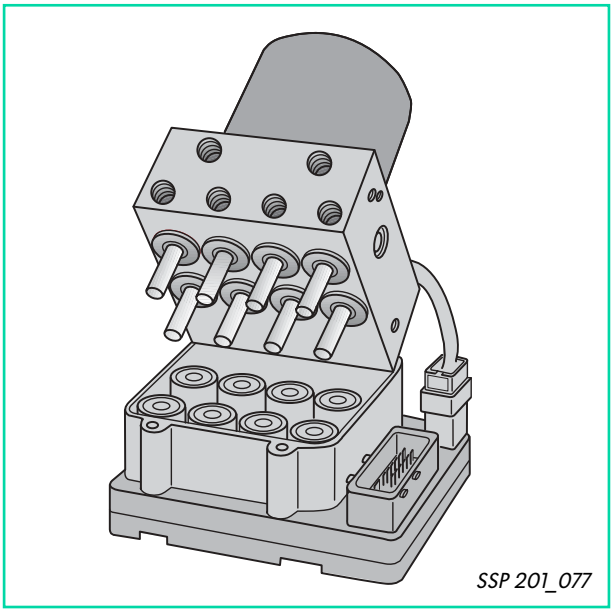
SSP 201_076

The ElectronicStabilityBrakeSystem

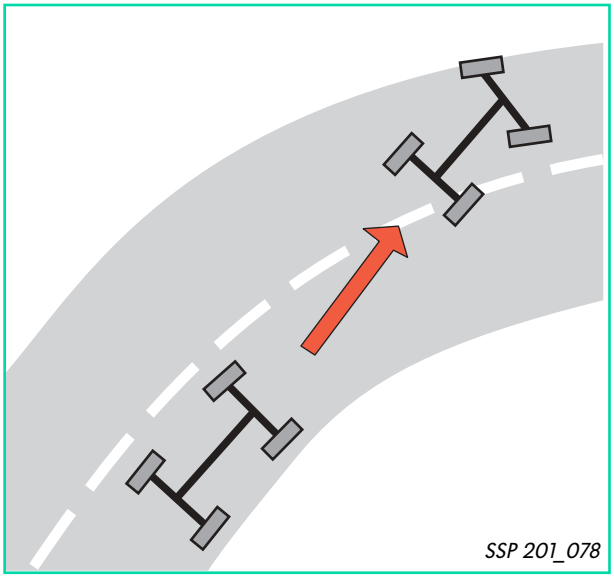
improves track stability and steerability when the vehicle is being braked by activating the brakes selectively.

ESBS is an improved software in the ITT Mark 20 IE control unit.

It utilises the sensors and actuators from the anti-lock braking system system.



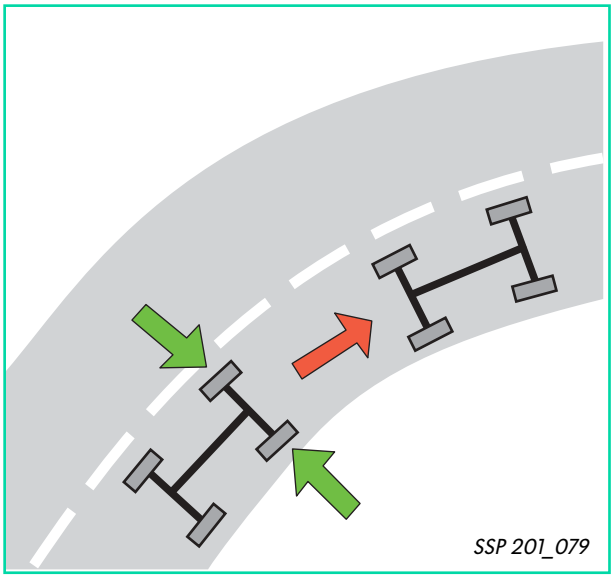
SSP 201_077



SSP 201_078

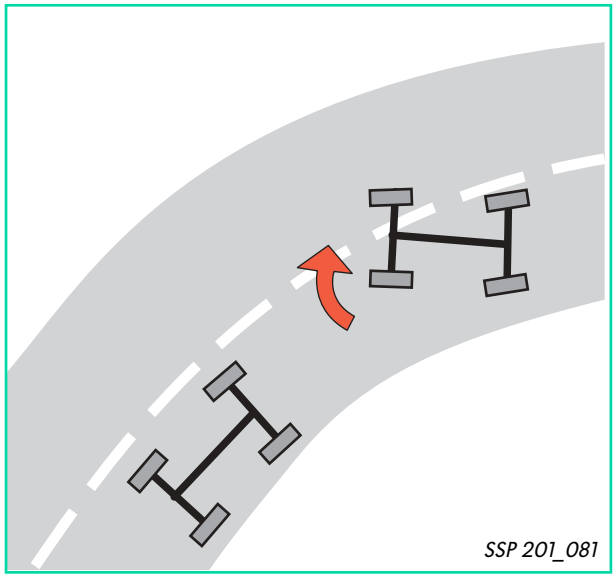
Understeer

If a vehicle is braked heavily in a corner, the wheel location forces acting on the front wheels are reduced.
As the vehicle has forwards momentum, its pushes towards the outer edge of the corner over the front axle.
This driving situation is termed “understeer“.



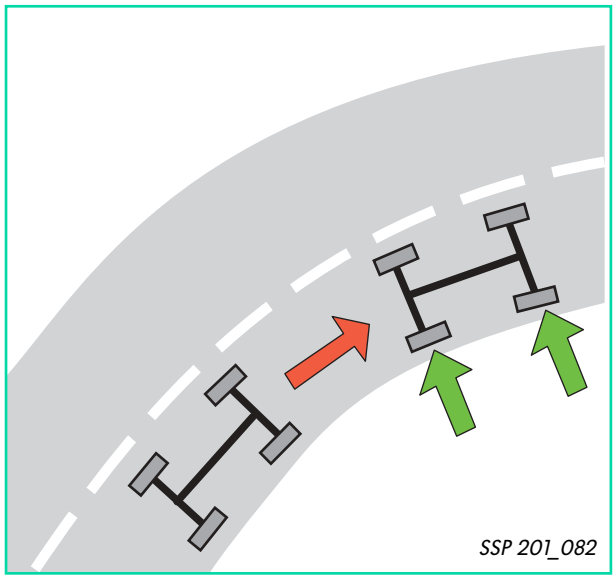
SSP 201_079

In vehicles with ESBS, the ABS control unit recognises this driving situation and responds by altering the speeds of the individual wheels as appropriate.
The anti-lock braking system reduces the brake pressure applied to the front axle. This increases the wheel location forces and the vehicle retains its directional stability.



Oversteer

If the vehicle is steered into a corner too sharply at high speed and if the brakes are applied heavily, the rear will break away towards the outer edge of the corner.
This driving situation is referred to as “oversteer“.



The ABS control unit recognises this situation and responds by reducing the speed of the rear wheels and reducing the brake pressure applied to the wheels on the inside of the corner. This increases the wheel traction forces acting on the wheels on the inside of the corner and the vehicle rear end retains its directional stability.

Malfunctioning of the ESBS can neither be diagnosed nor repaired, because a vehicle's driving dynamics cannot be reproduced with workshop facilities.

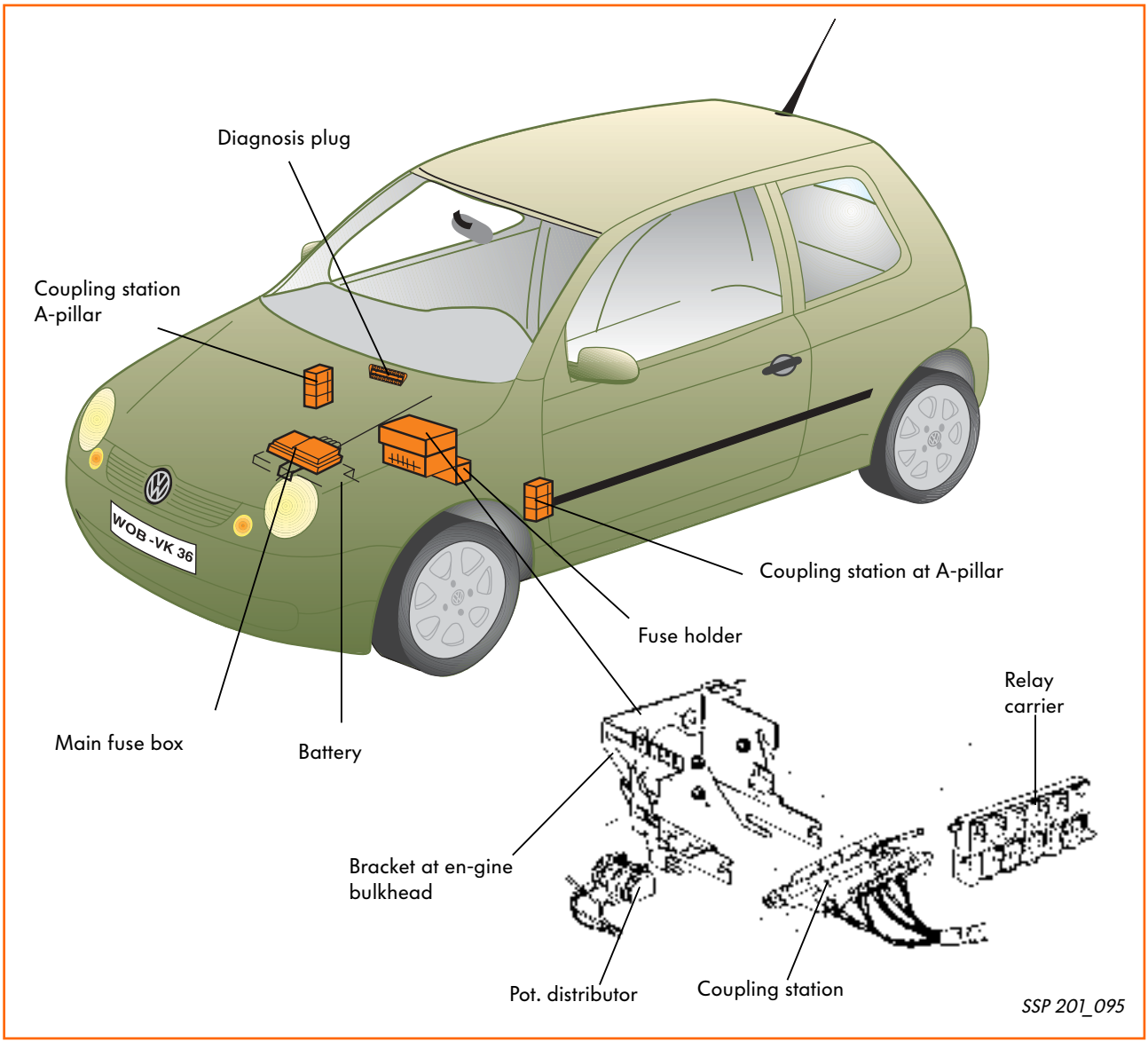
Electrical system

Decentralised vehicle electrical system

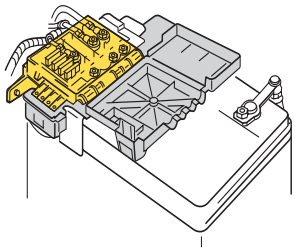
The layout of the electrical system is decentralised, i.e. the basic component parts of the electrical system are located at different fitting locations.

The main components are:

- Main fuse box at the battery
- Relay carrier, coupling station, potential distributor and fuse holder behind the dash panel insert
- Coupling station at A-pillar, left and right
- Vehicle-specific wiring harness
- Diagnosis plug



The components of the decentralised vehicle electrical system



SSP 201_090

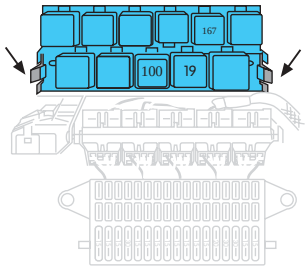
Main fuse box

Here, the electrical system is protected by fuses directly behind the battery.

- The alternator, cabin power supply, glow plug system and the air conditioning system are protected by metal fuses.

- The ABS system and the radiator fan are protected by micro-fuses (Little Fuse).

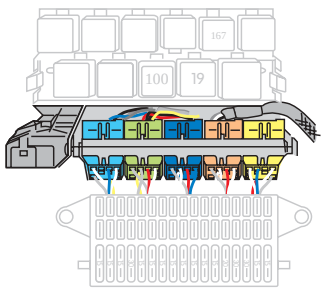
In the current flow diagram, the fuses positioned here have the code designation “SA“.



SSP 201_091

Relay carrier

Used for mounting the relays for standard equipment and optional extras.The relay carrier is fixed by two retaining lugs.



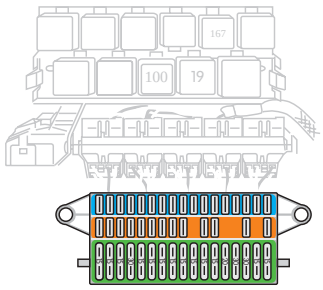
SSP 201_092

Coupling station below relay carrier

The connections to the vehicle electrical system are made in the coupling station by means of colour-coded and mechanically coded connectors (e.g. engine compartment, dash panel insert). The potential distributor is located on the left next to the coupling station (threaded terminal, terminal 30).

Electrical system

The components of the decentralised vehicle electrical system



SSP 201_093

Fuse-holder

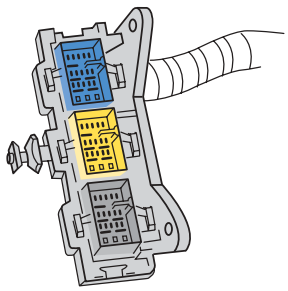
Two different fuses are used to protect the electrical circuit.

- Mini-fuse rated for max. 15A
- Micro-fuse (Little Fuse) rated for over 15 A

This combination offers the following advantages:

- More fuses within the same construction space
- More electrical circuits protected by individual fuses

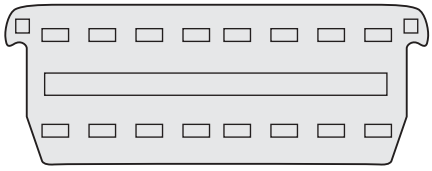
In the current flow diagram, the fuses positioned here have the code designation “SB“.



SSP 201_097

Coupling station at A-pillar

The connections to the doors, e.g. loudspeakers, central locking and power windows, are located in this coupling station.

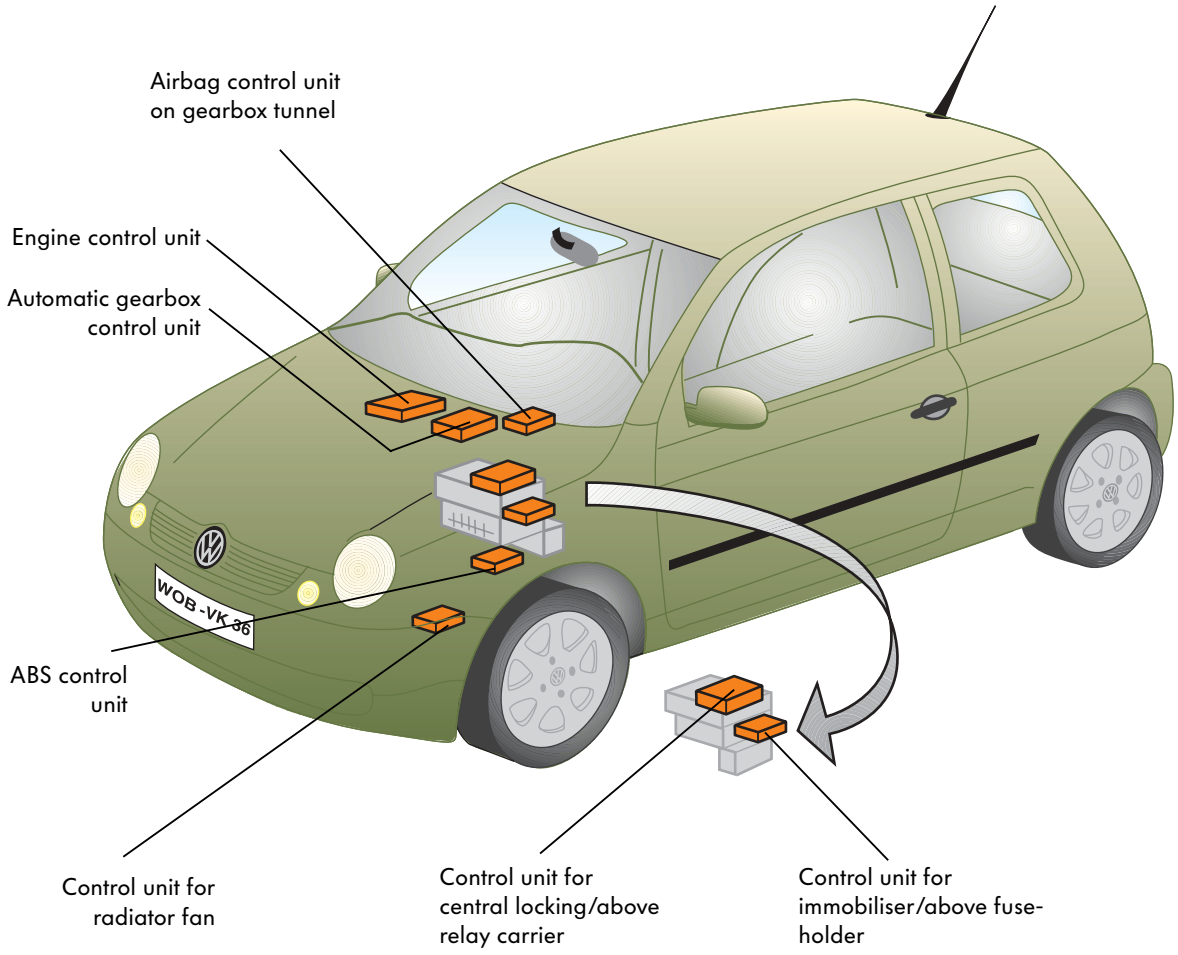


SSP 201_087

Diagnosis plug

Fitting location: in dash panel insert, behind oddments tray.

The fitting locations of the control units

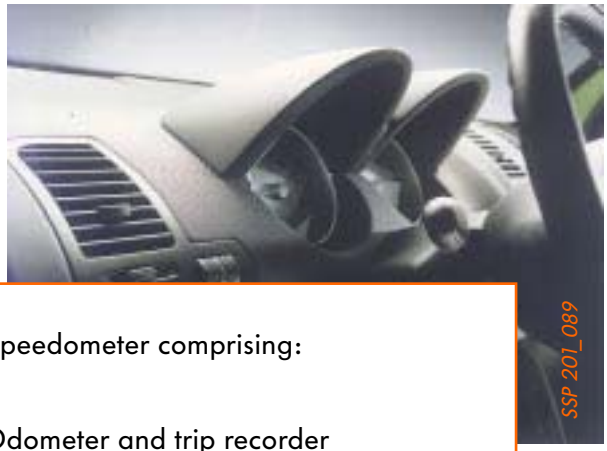


SSP 201_094

Electrical system

The dash panel insert

The distinctive design of the dash panel insert comprises two instrument clusters.

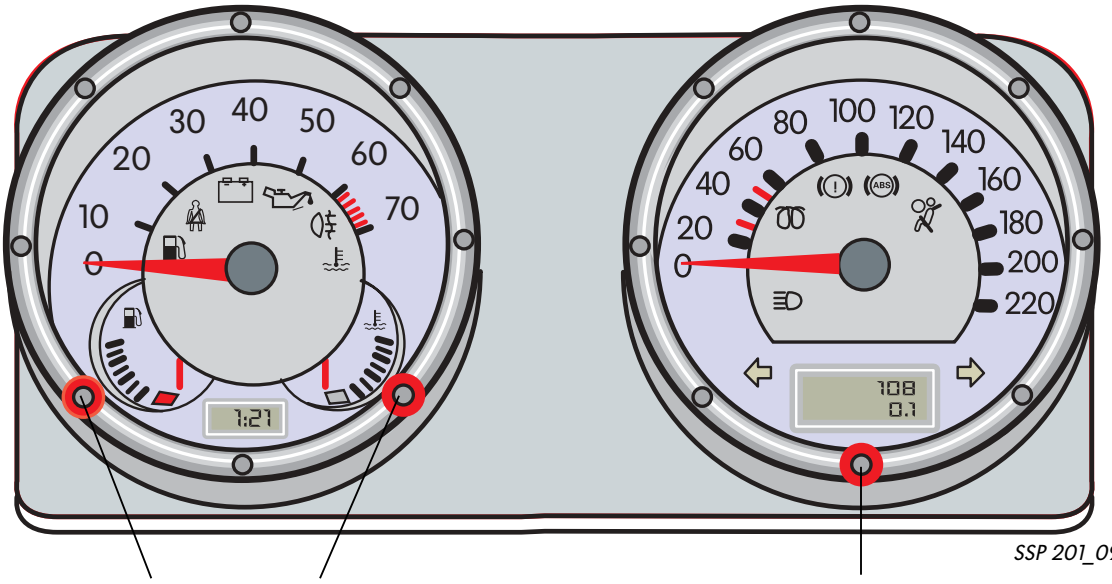


The rev counter comprising:

- Fuel indicator
- Coolant temperature display
- Digital clock
- and warning lamps

The speedometer comprising:

- Odometer and trip recorder
- Service Interval Display
- Indicator
- and warning lamps



Setting buttons for digital clock

Reset button for trip recorder and Service Interval Display

Technical features:

- LEDs are used exclusively for illumination and as warning lamps.
- Blue instrument lighting with luminous red pointers.
- The analogue displays (rev counter, speedometer, fuel gauge and coolant temperature) are activated by stepping motors with software-controlled damping.
- Connected to vehicle electrical system by means of a 32-pin connector.
- The same version of the dash panel insert is used for all model variants.
- The Lupo has the same self-diagnosis (address word 17) as in the Polo '98.

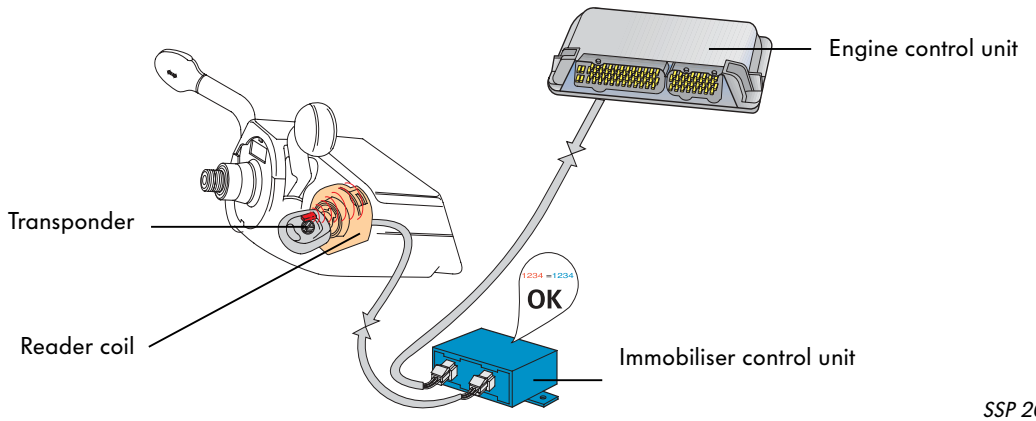
The immobiliser

The immobiliser has a separate control unit which is equivalent to the 2nd generation in design and function and comprises an additional variable code. The control unit is behind the dash panel insert via the fuse holder.
The self-diagnosis function (address word 25) is identical to the POLO '98.

Functional description:

After turning on the ignition, the transponder transmits a fixed code via the reader coil to the immobiliser control unit. If this code matches the code stored in the immobiliser control unit, a random number generator generates a variable code. This variable code is transmitted to the transponder in the car key fob. A secret arithmetic operation is now started in the transponder and in the immobiliser control unit.

The transponder transmits its result to the immobiliser control unit which recognises the correct car key by comparing this result with its own result.
A variable code is then cross-checked between the immobiliser control unit and engine control unit. Once a match has been established, the vehicle is ready for operation.



SSP 201_099

Electrical system

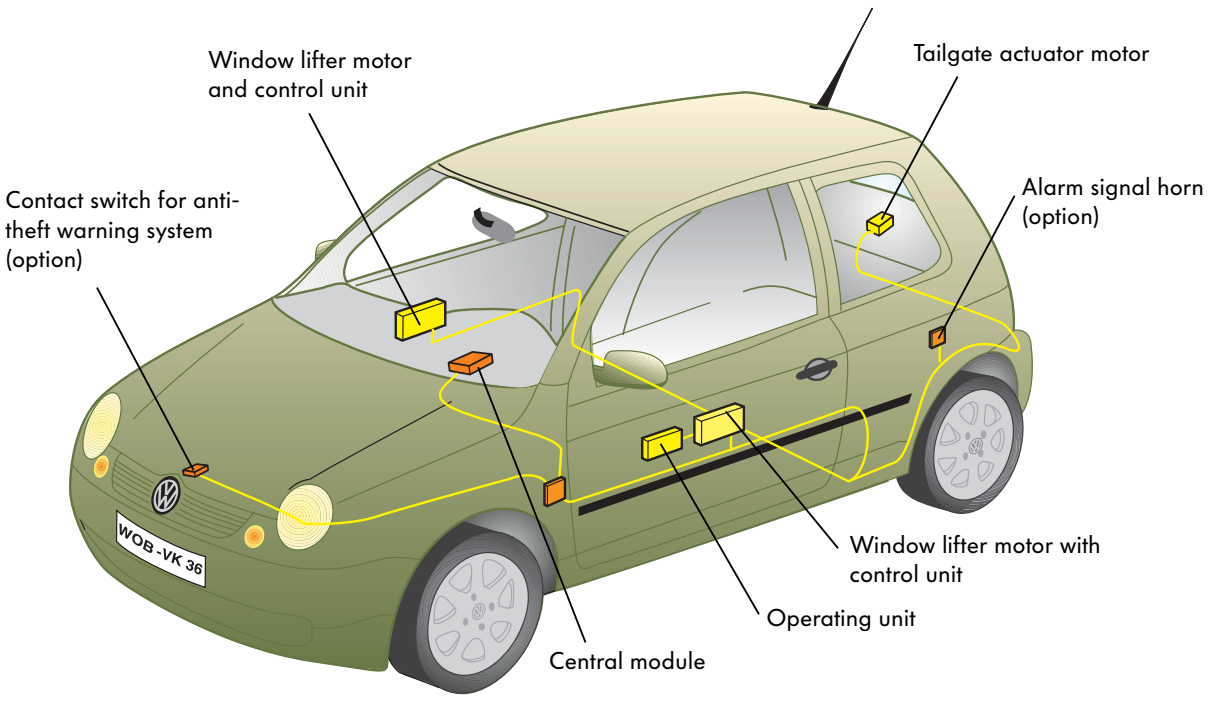
The central locking system

The central locking system, in combination with manual window lifters, is available as an optional extra. The motors for central locking are activated directly by the central control unit.

In vehicles that are also equipped with power windows, a control unit is integrated in the window lifter motor for operation and force limitation. With this version also, the motors for the central locking and window lifters are activated directly by the central control unit.

The central locking comprises the following functions:

- Electric motor operated central locking system with SAFE function for locking the doors and tailgate.
- Doors are locked and unlocked with interior Lock - Unlock button
- Interior light and boot light control.
- The airbag control unit unlocks the doors if it recognises that the vehicle has been involved in a crash.
- Convenience opening of the power windows as well as convenience locking of the window lifters and sliding/tilting roof is possible via the door lock cylinder.
- Self-diagnostic capability (address word 35).
- Anti-theft warning system with radio-wave remote control as an option



SSP 201_096

Radio generation ‘99

The *BETA* and *GAMMA* radio systems have been fundamentally revised from a technical viewpoint and their design has been updated. The alpha radio system is available with unchanged technology and design.

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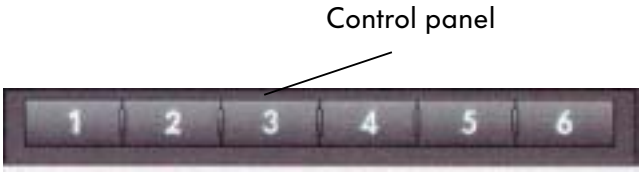
The figures show the user interface of the *BETA* and *GAMMA* radio systems with removable control panel.



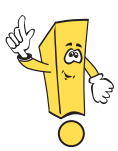
SSP 201_124

Radio system *BETA*

SSP 201_118

Radio system *GAMMA*

SSP 201_119



The main new features of the *BETA* and *GAMMA* radio systems are:

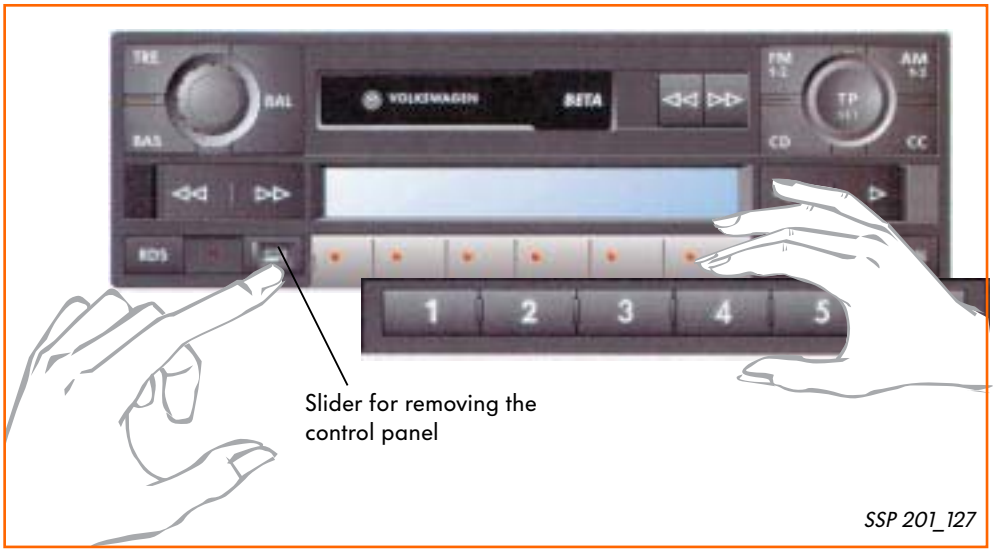
- Display lighting in blue, button and buttons backlit in red.
- Optionally available with permanent or removable control panel.
- New menu adjustments, e.g. balance or bass, and on-screen menu assistance are possible.
- The convenience anti-theft device saves recoding the radio system, e.g. after cutting off the power supply for servicing.
- Self-diagnostic capability

Electrical system

The *BETA* radio system

The new functional features are:

- 30-station memory
- The loudspeaker balance on the left and right can be adjusted with the BAL (Balance) button.
- Speed-dependent volume adaption / **GALA**
- Prepared for connecting CD changer
- Playback of calling or called party through all loudspeakers while conducting a telephone call.



The convenience anti-theft device

To commission the radio, the four-digit code number of the electronic anti-theft device must be entered.

When the NO contact is closed, a communication link is established between the radio and the dash panel insert via the self-diagnosis wire (K wire).

If the supply is cut off, e.g. to carry out work on the electrical system, the radio checks whether the dash panel insert is the same as before voltage cut-off after inserting the ignition key and turning on the ignition.

If the radio recognises the dash panel insert, the radio is again ready for operation without having to reenter the four-digit code number a delay of several seconds.

However, if the radio is fitted in another vehicle, the four-digit code number must be re-entered.

The *GAMMA* radio system

offers the following new features in addition to the functional features of the *BETA*:

- If the vehicle has a Highline dash panel insert, the frequency and the station name are displayed.

The above-specified combination is currently not available for the LUPO.

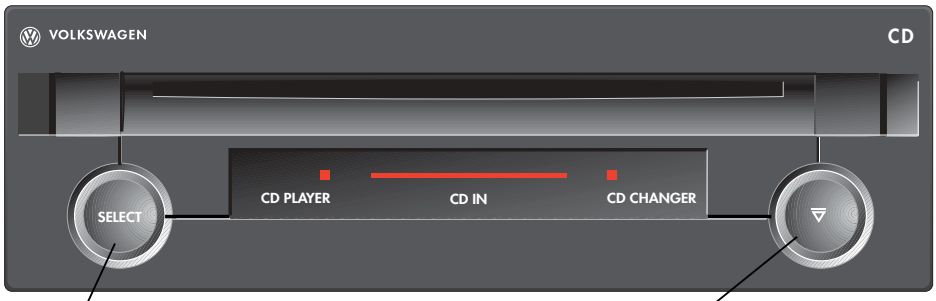
- With the TIM function, up to 9 traffic announcements of a selected TP station can be recorded automatically.
  Max. total duration is 4 minutes.
  When the radio is on, every traffic information message is recorded as soon as TP appears in the display. When the radio is off, record mode can be activated by briefly pressing the TIM button. The memory automatically stores traffic information messages for a 24-hour period.
  Once this period of time has elapsed or when the radio is switched on, the standby function ends.

- Due to programme content, e.g. classical music or rock music, the various stations have a different basic volume.
  The radio adjusts the basic volume by automatically adapting the volume, provided that the stations have been programmed in the station keys.

For more detailed information regarding the subject of Radio Reception/Basics, please refer to Self-Study Programme No. 147 “Radio Systems ´94“.

The CD player

The new CD player can be combined with the *BETA* and *GAMMA* radio systems.
The fitting location is above or below the radio, depending on the vehicle model.



SSP 201_125

SELECT button
To select CD player mode and CD changer mode

CD eject button

The CD player can play back one music CD at a time. The CD player is operated by means of the radio buttons.

The CD player can also be combined with a 6-disc CD changer which has been optimised in size.

Heating, air conditioning

For heater and air conditioner operation in the LUPO, two equipment variants are available:

- a heater or

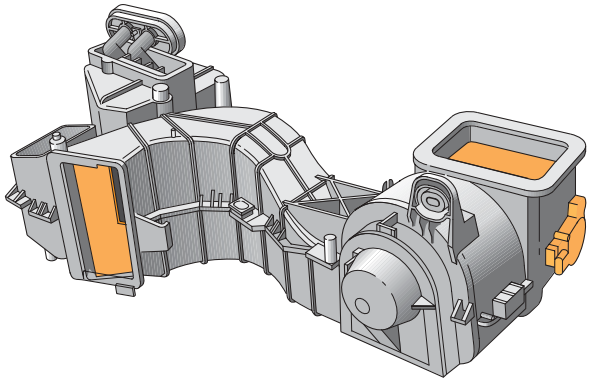
- a manually operated heater and air conditioner

Heater

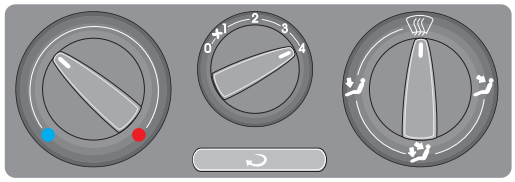
As in other models, too, fresh air/air recirculation mode is possible for added comfort.

Air recirculation mode can be switched on and off with the air recirculation button

Air recirculation mode is switched off automatically when the rotary switch for air distribution is set to "Defrost".
The depressed air recirculation button is released mechanically.
This keeps any moist cabin air, e.g. due to wet clothing, away from windscreen.



SSP 201_106

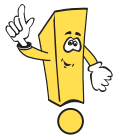


SSP 201_107

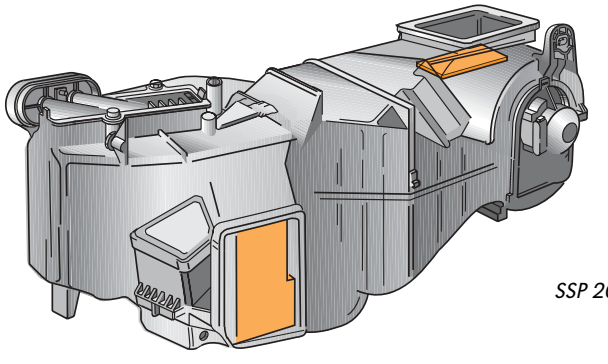
Manual air conditioner

In the case of the manual air conditioning system, the driver or front passenger controls the interior climate. Air conditioning mode can be switched on or off by pressing the AC button (Air Conditioning).

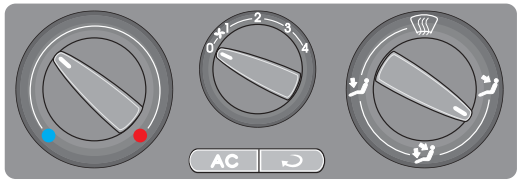
The fresh air/air recirculation flap isoperated by electric motor. All other flaps are activated via Bowden cables.



An electronic high pressure sender records the overall refrigerant pressure curve.



SSP 201_108



SSP 201_109

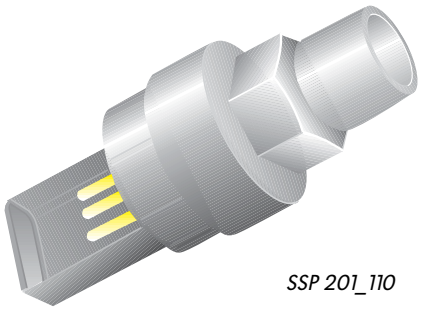
High pressure sender G65

is integrated in the high-pressure pipe of the refrigerant circuit.

It records the refrigerant pressure and transduces the physical quantity of "pressure" into an electrical signal.

It is an electronic pressure sensor which replaces the air conditioner pressure switch F 129 used previously.

Unlike the pressure switch for the air conditioning system, not only the defined pressure thresholds but also the overall pressure characteristic of the refrigerant are recorded.



SSP 201_110

The high pressure sender is currently fitted in petrol-engined vehicles with air conditioning system.

Signal utilisation:

By evaluating the signal, the engine control unit and the radiator fan control unit recognise the load which the air conditioner compressor exerts on the engine.

Signal failure:

If the radiator fan control unit does not detect a pressure signal, the air conditioner compressor is switched off.

Plus-points:

- In idling mode, engine speed can be adapted exactly to the power consumption of the air conditioner compressor.

- The cut-in and cut-out cycles of the radiator fan settings are staggered by a short delay time. This ensures that the speed variations of the cooling fan are barely perceptible in idling mode and enhances comfort particularly in vehicles with less powerful engines.

Self-diagnosis “fault message“:

The high pressure sender is stored in the fault memory of the engine electronics.

e.g.: 00819 high pressure sender G65 “Signal too low“

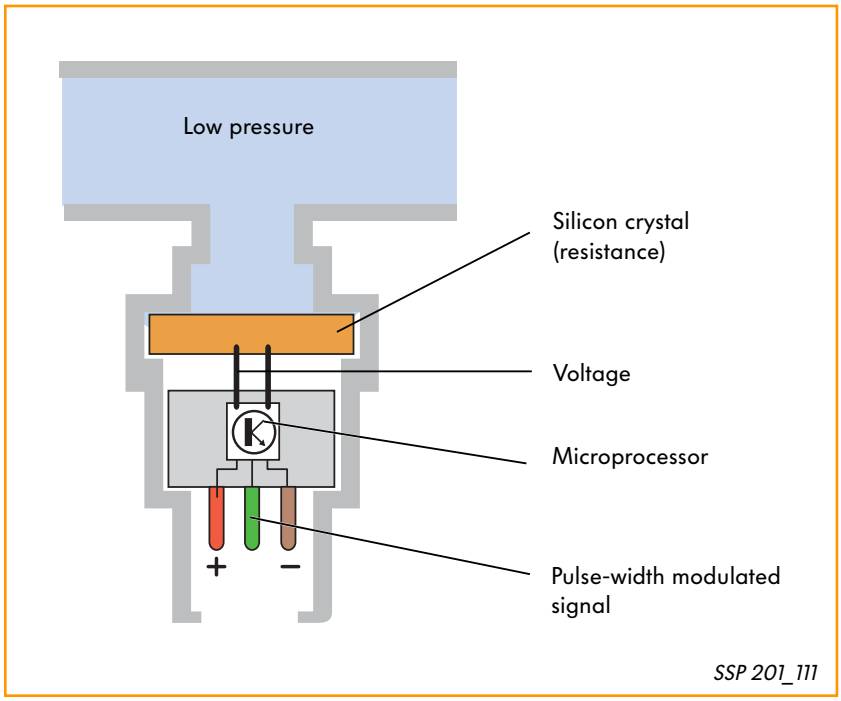
Function of the high pressure sender

The refrigerant pressure is sent to a silicon crystal. A characteristic of this silicon crystal is that its electrical resistance changes as soon as it is “bent“. This is dependent on pressure level and curve.

The silicon crystal, together with a microprocessor, is integrated in the sensor and supplied with voltage.
Changes in the resistance of the silicon crystal and the resulting voltage changes in the crystal are processed by the microprocessor and converted into a pulse-width modulated output signal (PWM).

At low pressurea

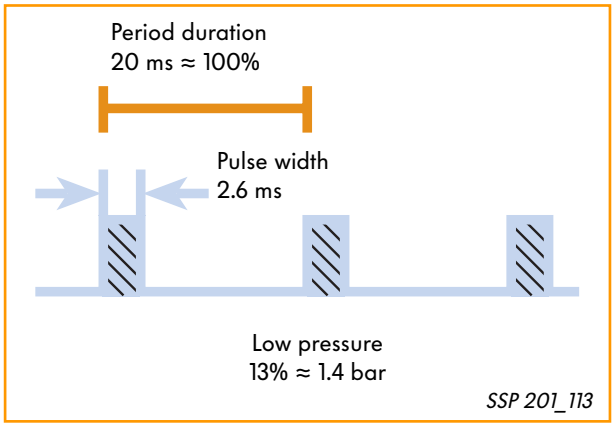
If the crystal is only “bent“ minimally, the resistance change is equally as a small as the voltage change.



Pulse-width modulated signal (PWM)

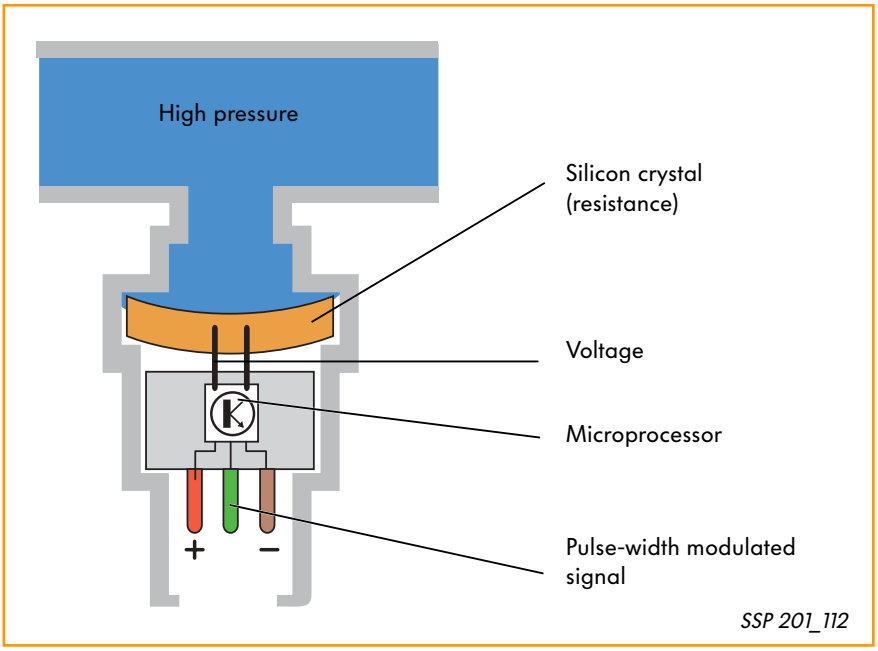
The pulse-width modulated signals are generated at a frequency of 50 Hz.
This results in a period duration of 20 ms, which is equivalent to 100%.

The pulse width at a low pressure of 1.4 bar is 2.6 ms. This is equivalent to 13% of the period duration.



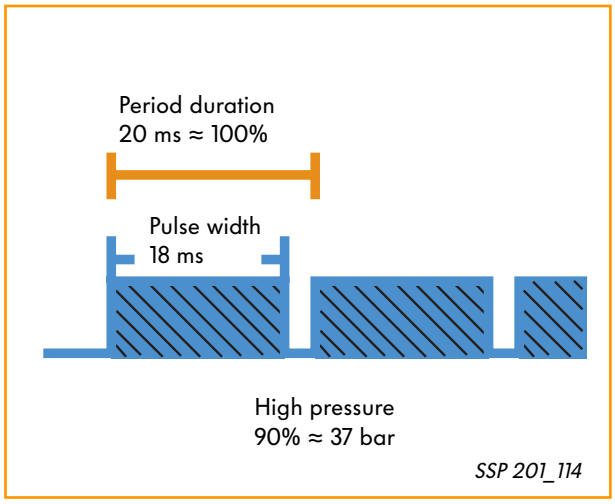
At high (rising) pressure

is the crystal thickness “bent“. The resistance increases in direct proportion to the voltage change.



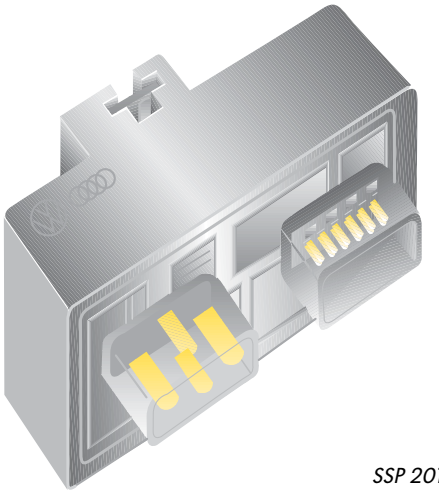
Pulse-width modulated signal (PWM)

The pulse width increases in direct proportion to increasing pressure.
The pulse width at a high pressure of 37 bar is 18 ms.
This is equivalent to 90% the period duration.



Radiator control unit J293

has been improved technically, and its function has been adapted to the new high pressure sender G65.
It will be fitted with the high pressure sender, and its distinguishing design features are its modified plug connections.



SSP 201_121

The functions are:

- Activating/de-activating the next higher radiator fan setting and the solenoid coupling of the air conditioner compressor

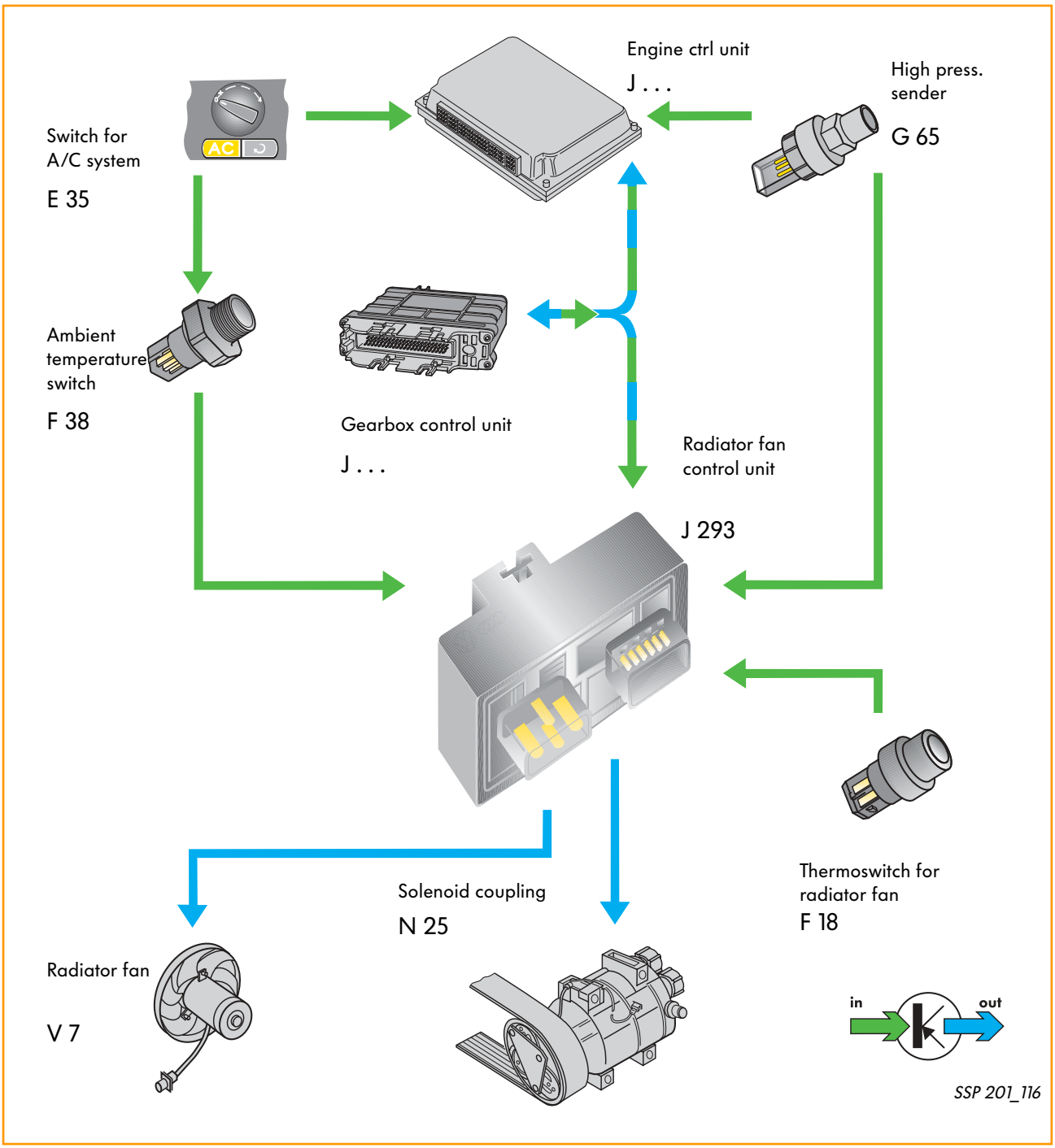
- Monitoring the overall pressure characteristic of the refrigerant by evaluating the pulse-width modulated signal (PWM) from the high pressure sender

- Bi-directional signal exchange with the engine and gearbox control unit

Test function:

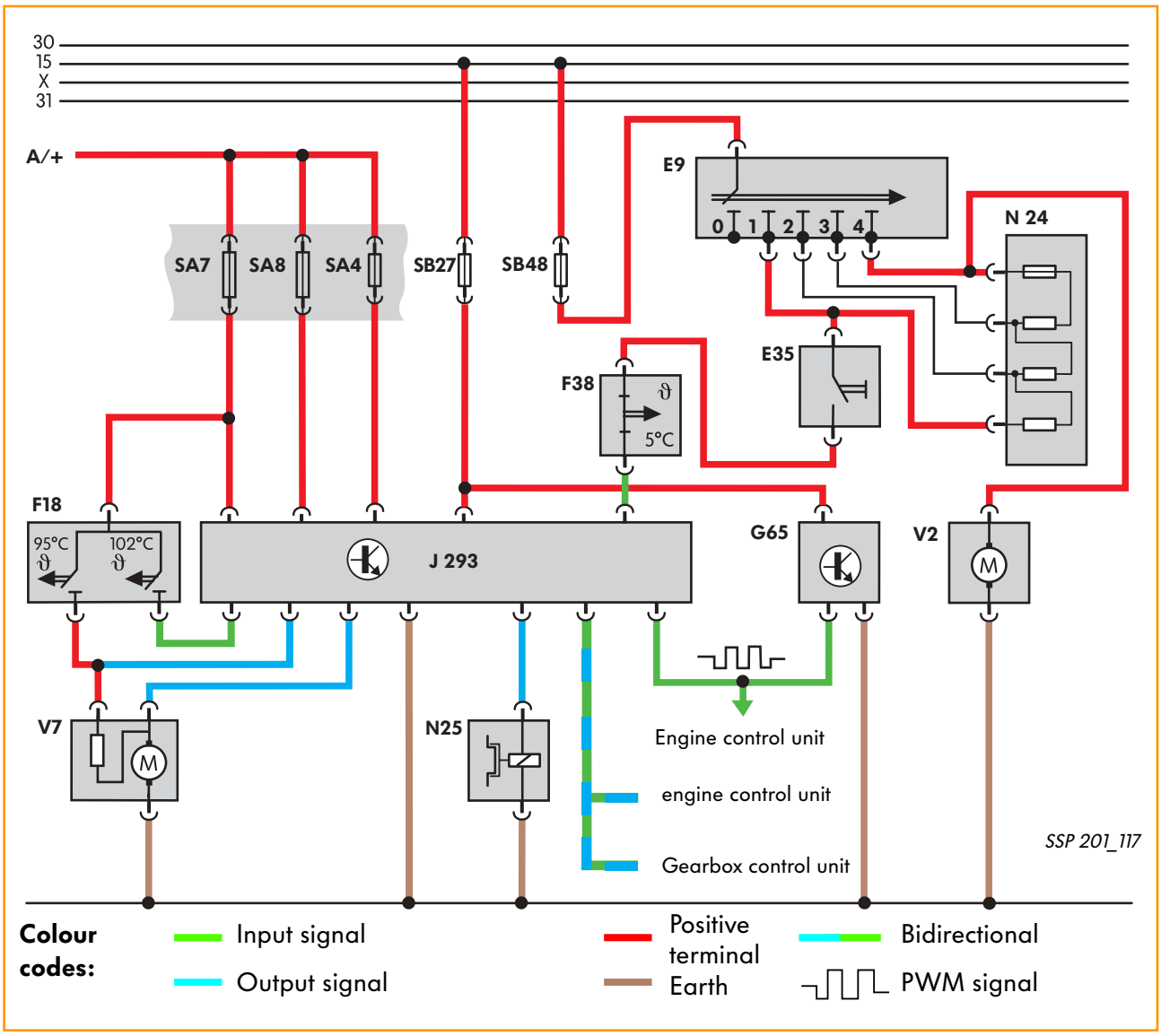
The control unit currently does not have self-diagnostic capability. For details of test possibilities, please refer to the current Workshop Manual on the "Heating/air conditioning system".

System overview



Heating, air conditioning system

Functional diagram



Components

A/+ Battery positive terminal

E 9 Switch for fresh air blower

E 35 Switch for air conditioning system

F 18 Thermoswitch for radiator fan

F 38 Ambient temperature switch

G 65 High pressure sender

J 293 Radiator fan control unit

N 24 Series resistor for fresh air blower with safety thermal cut-out

N25 Solenoid coupling

SB 27 Fuse in fuse holder/relay board

SA 4 Fuse in fuse holder/battery

SA 8 Fuse in fuse holder/battery

SA 7 Fuse in fuse holder/battery

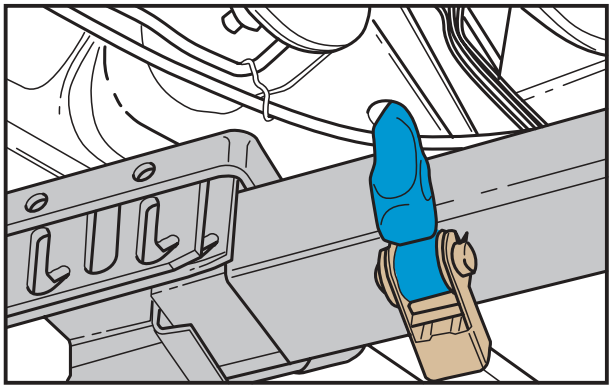
SB 48 Fuse in fuse holder/relay board

V 2 Fresh air blower

V 7 Cooling fan

Here you can see the new special tools and workshop equipment

Lashing strap set (2 pcs.)
T 100 38



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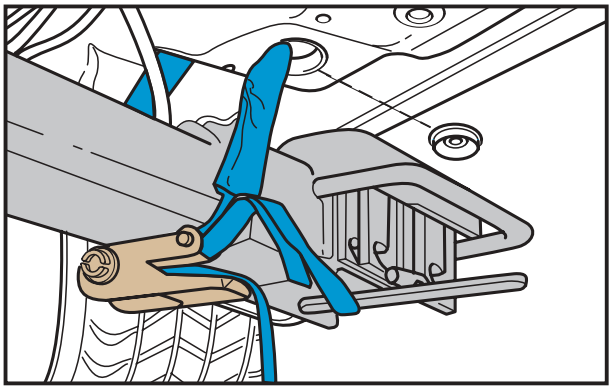

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Application

Before removing the rear axle, the Lupo must be lashed to the support arms of the lifting platform.

For this purpose, the plugs must first be removed from the side members. The lashing straps on the left and right must then be fed through the holes in the side members and lashed securely.

If the vehicle is not lashed securely, there is the danger that the vehicle will slide off the lifting platform because the front end of the vehicle bears most of the weight.

Service.

201

740.2810.15.00 Technical status: 08/97