Service Training

Self-study Programme 520

The Golf 2013
Body and Occupant Protection

Design and Function

The primary objective in the development of the new Golf was the reduction of vehicle weight while increasing the demands on vehicle safety and comfort.

Based on the modular transverse matrix (MQB) in lightweight steel construction, the new Golf saves a significant 23kg in the body structure while reducing material costs and production time. Compared to the previous model and taking into account all subassemblies of the Golf 2013, a weight saving of up to 100kg was possible (depending on the equipment variant).

This self-study programme shows you the innovations in the Golf 2013 concerning the body and occupant protection.

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The self-study programme presents the design and function of new developments!
The content will not be updated.

Current testing, setting and repair instructions can be found in the provided service literature.

Important note

Contents

The modular transverse matrix (MQB)

The body of the Golf 2013 is a completely new construction. The new modular strategy forms the basis of the floor. The modular transverse matrix strategy was developed by Volkswagen Technical Development in Wolfsburg. This modular transverse matrix forms the basis for future vehicle projects in the Volkswagen Group.

Sheet steel

High tensile strength <1000 MPa

Ultra-high tensile strength (hot-formed) >1000 MPa

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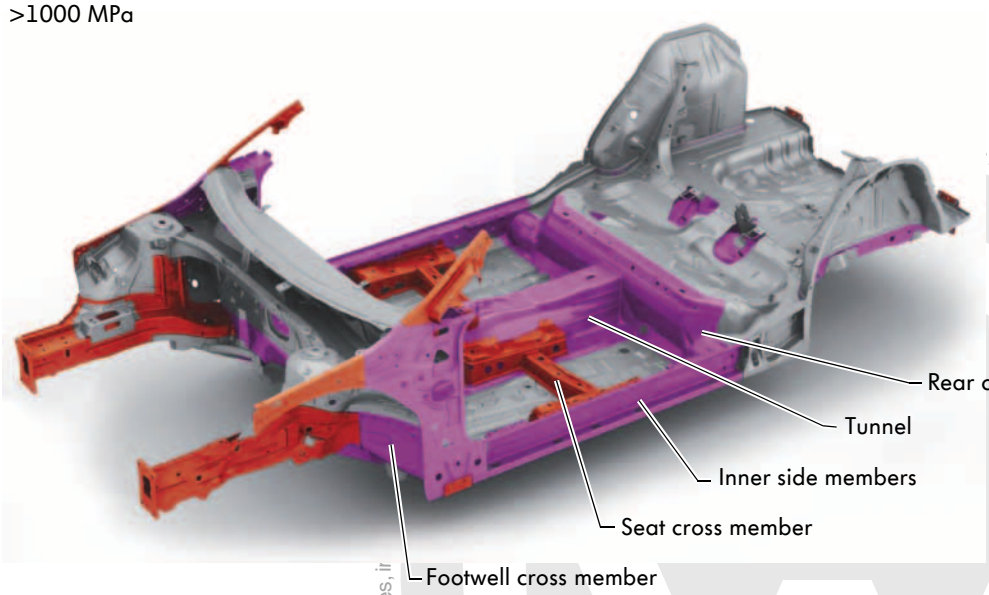
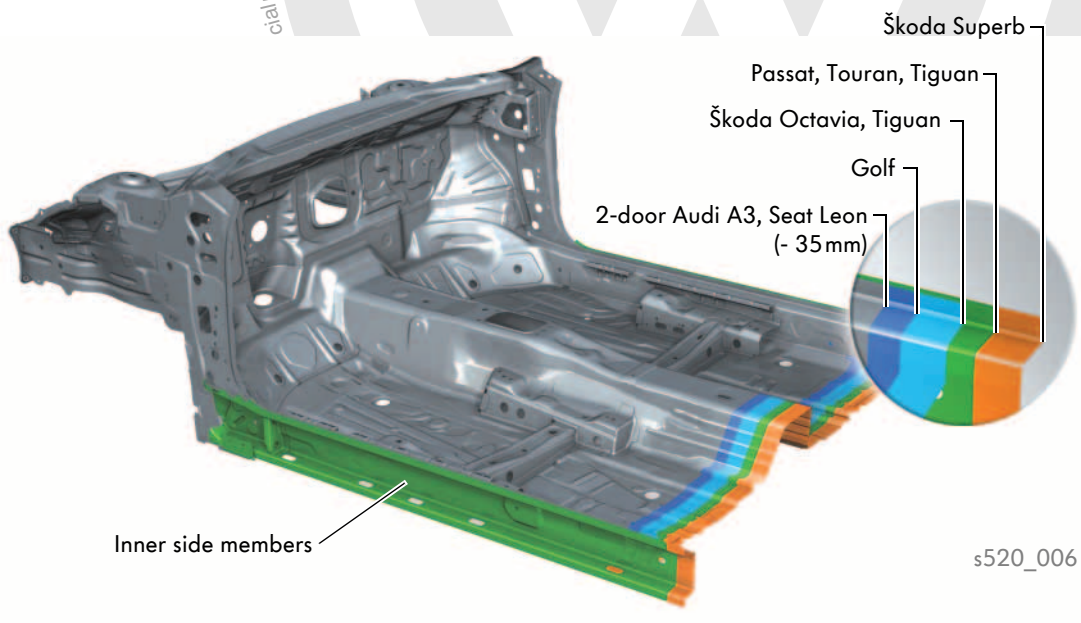


By increasing the quality of the materials used, in particular the ultra-high tensile strength (hot-formed) components, a weight saving of 18 kg could be achieved compared to the previous platform. The vehicle floor of the Golf 2013 is characterised by a frame structure that is made of ultra-high strength components and comprises the tunnel, upper and lower footwell cross members, inner side members and rear cross member.
An additional lateral support is the high-strength seat cross member. This also makes the modular transverse matrix ready for future alternative drive systems, such as electric hybrids and plug-in hybrids.

Further information about the modular transverse matrix can be found in Self-study Programme 513 “The Golf 2013”.

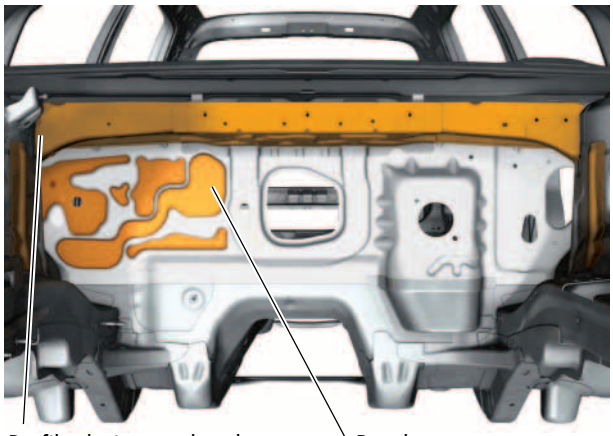
The modular transverse matrix is designed to cover vehicle classes, meaning that the variability of the wheelbase is determined by the length of the floor panels. One tool is able to produce the floor panels in five different lengths (length difference of 165 mm). The width variability is determined by the inner side members and the strut holders in the wheel housings.



Plenum chamber bulkhead

The Golf 2013 has a closed plenum chamber bulkhead. It has been optimised thanks to the geometry of the profiles and the lock-beading of the surfaces. These beads improve the acoustic properties and the rigidity. This means sheets are designed thinner, and no heavy insulation mat is needed.

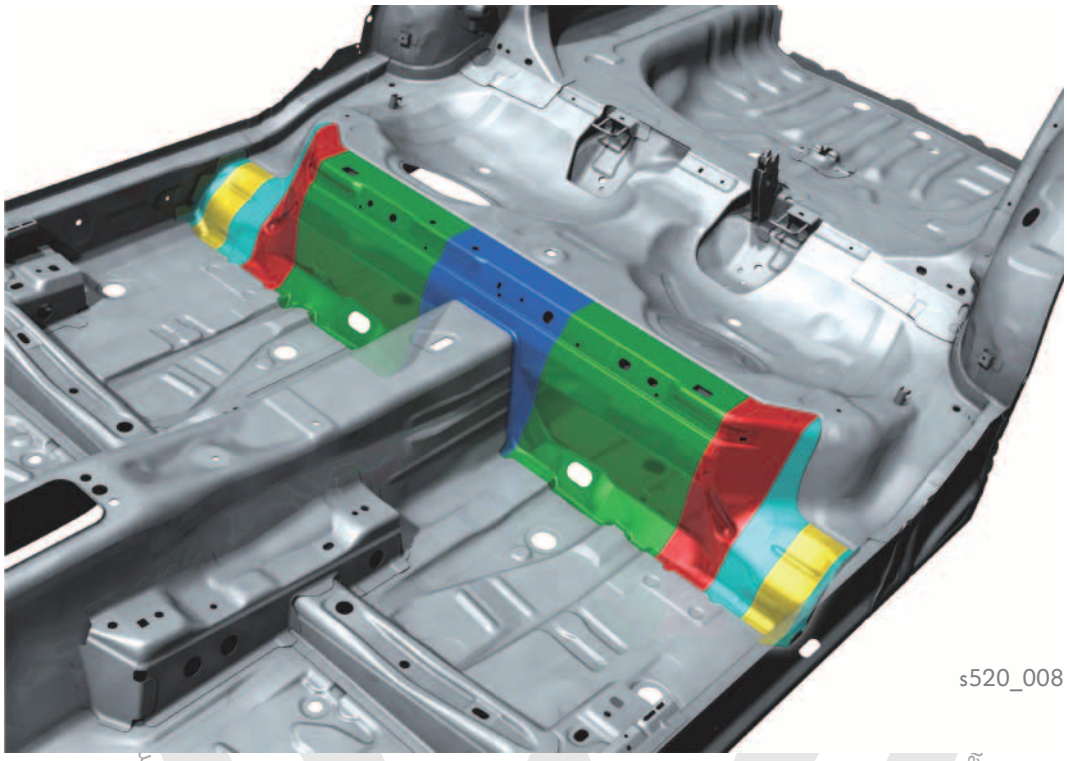
An optimum profile design in the plenum chamber area ensures the rigidity of the suspension links in the vehicle front end.



Introduction

Rear cross member

To satisfy all crash and rigidity requirements, the cross member under the rear floor between the two wheel housings is also ultra-high strength (hot-formed). At the transition from the front floor to the rear floor, the ultra-high strength (hot-formed) rear cross member is the load-distributing function in the event of a side crash.
The different plate thicknesses, customised using tailored rolled blank technology between min. 0.95 and max. 1.70 mm, ensures the deformation zones are at the right places and also results in a 2.0 kg weight reduction for this component alone.



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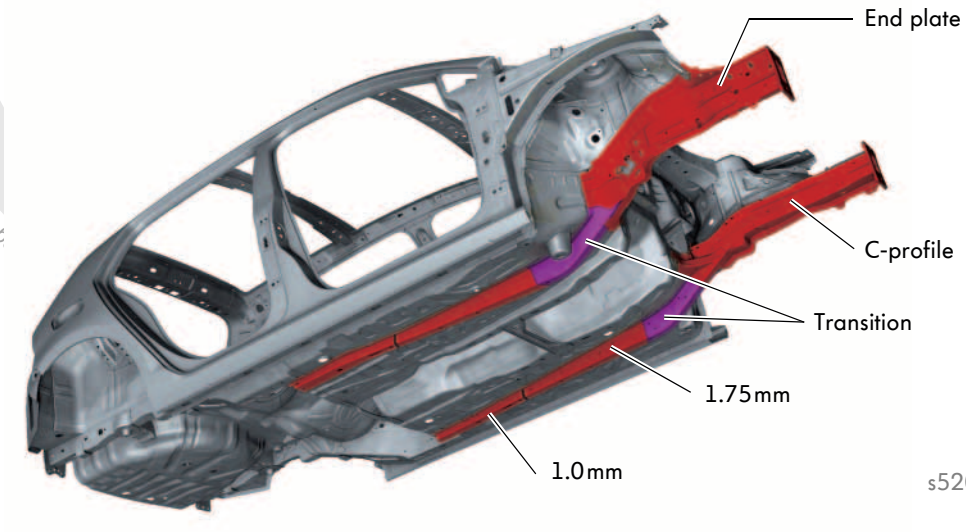
Sheet thicknesses

- 0.95 mm
- 1.15 mm
- 1.25 mm
- 1.50 mm
- 1.70 mm

Front longitudinal member

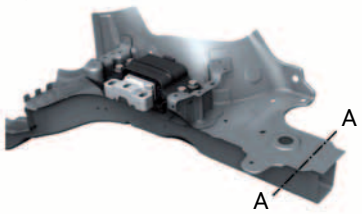
The longitudinal members are designed as inner C-profiles of 2.0mm in the front area and as outer end plates of 1.5mm, both in the same quality. The longitudinal member transition extending under the front floor is made of ultra-high strength 2.0mm steel (hot-formed). The longitudinal member under the vehicle floor from the transition to the rear cross member is in two different material strengths. It is a tailored rolled blank component. The front area is 1.75mm thick and the rear area 1.0mm.

The forces exerted by the longitudinal member in the transition from the vehicle front end to the vehicle cell are distributed from the ultra-high strength single piece tunnel through the upper and lower footwell cross members (forming the profile in the centre of the vehicle) and outwards through the ultra-high strength inner side members.

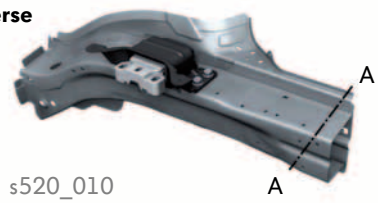


By positioning the gearbox mounting in the longitudinal member, the local rigidity could be increased while still saving weight. The height of the longitudinal member was increased by 25%.

U-longitudinal member, Golf 2009



C-longitudinal member of the modular transverse matrix, Golf 2013



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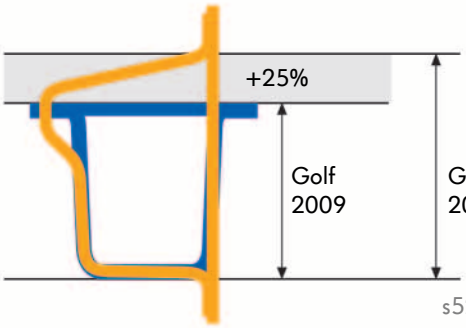
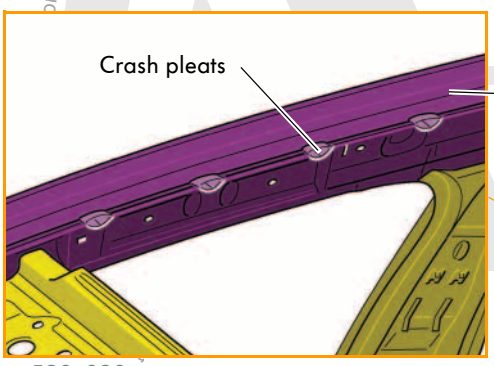
Section A-A



Profile section of longitudinal member comparison, front

Body structure

Ultra-high strength (hot-formed) components are also used in the body-in-white assembly in the Golf 2013 to guarantee optimal safety and a high level of comfort for increased crash and rigidity requirements as well as for greater vehicle dimensions. A new feature is a single piece side member design with fitted B-pillar reinforcement and inner A-pillar reinforcement. Both are ultra-high strength (hot-formed) components. For this reason there are crash pleats in the upper area of the A-pillar in the roof side member. In the event of a side crash with a pole or piling, the material surplus of the crash pleats absorbs the energy. This increases the component rigidity of the roof frame.



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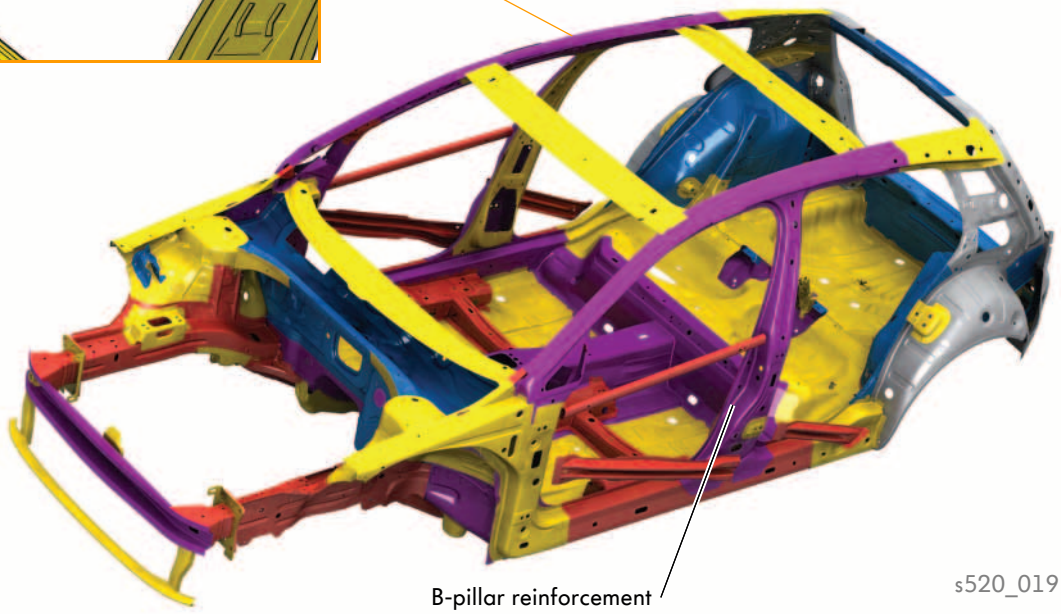

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Strength of steel sheets

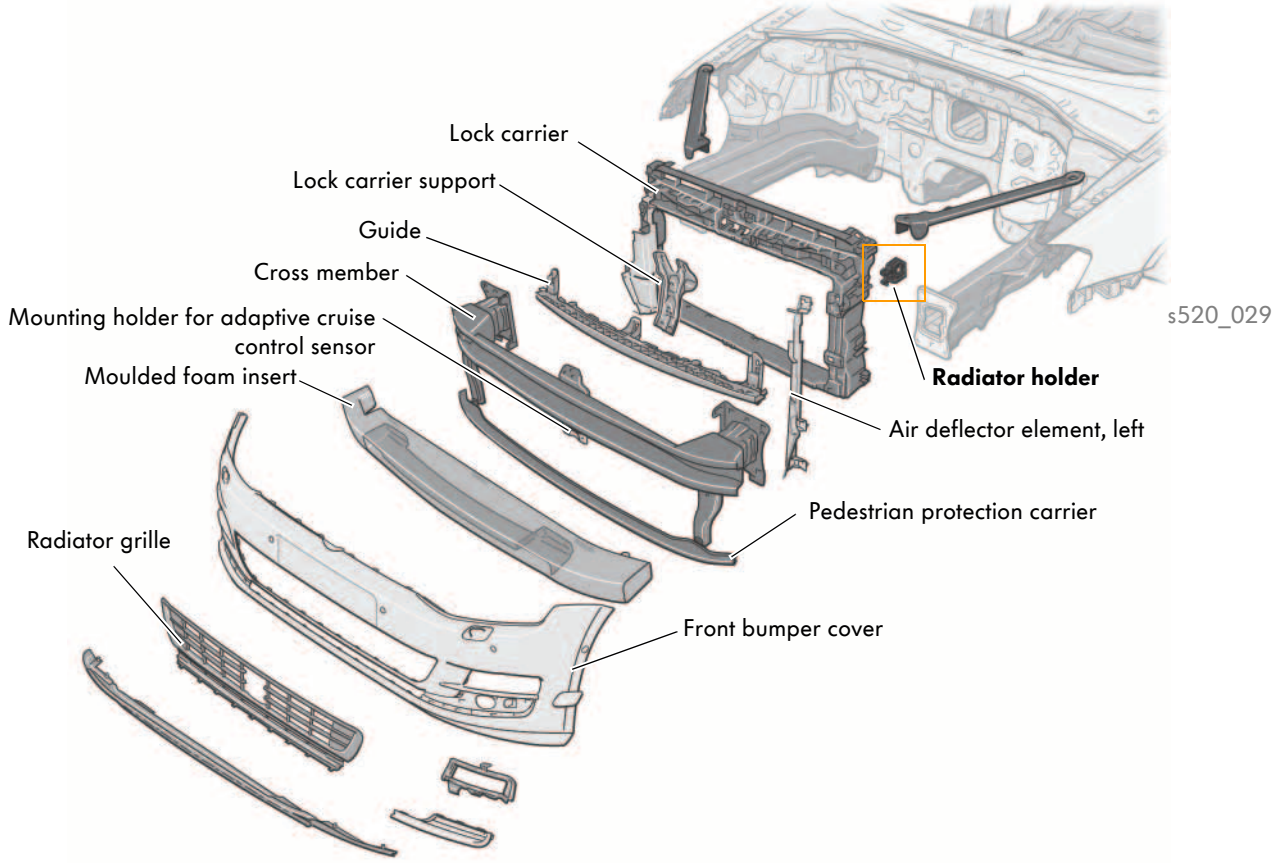
- <160 MPa
- <220 MPa
- <420 MPa
- <1000 MPa
- ultra-high tensile strength (hot-formed) >1000 MPa

Front body

Front bumper with lock carrier

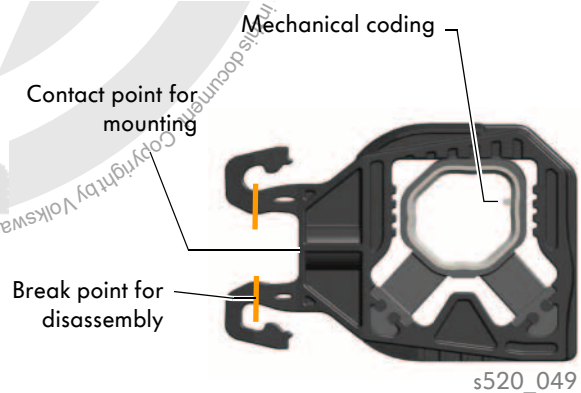
The lock carrier consists of 40% polymide glass-fibre reinforced plastic.

Two types of lock carrier are fitted. It has screw holes in the area of the radiator grille attachment for fastening the grille in the event of a repair. The pedestrian protection carrier is riveted to the cross member. The holder for the sensor for adaptive cruise control is bolted to the cross member. The lock carrier can be removed if needed.



Radiator holder

The radiator components are now fastened with new holders in the front end. Mechanical coding prevents radiator holders from being incorrectly fitted. The corresponding grooves are located in the journals on the radiator.



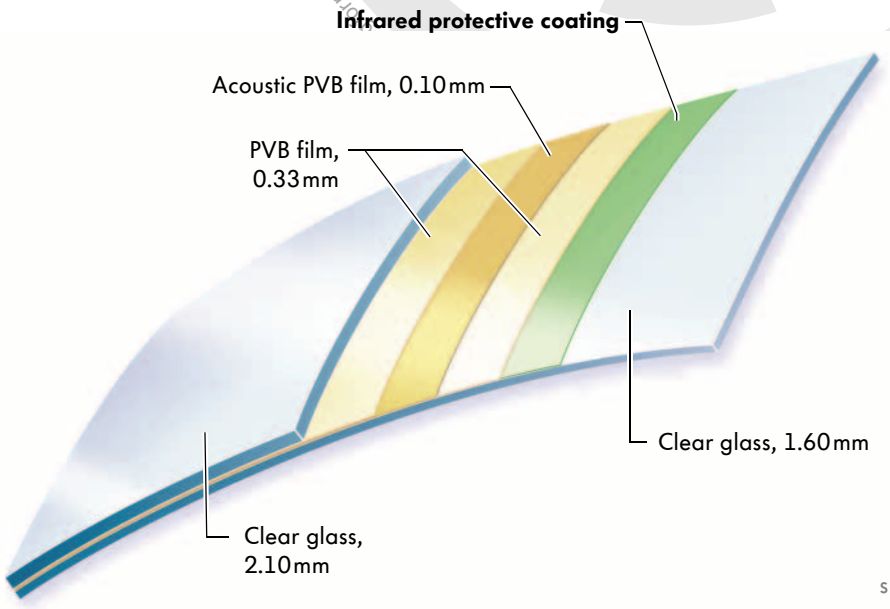
Climate comfort windscreen

A climate comfort windscreen is optionally available for the Golf 2013. A new feature is that the heat insulation and a heating function are integrated into the windscreen without visible heating wires. When a vehicle is parked in the sun, the reflective infrared protective coating reduces the temperature by up to 15°C in the interior compared to a conventional glass windscreen, as 60% of the sun's heat does not penetrate the vehicle interior. The additional heating function ensures the windscreen in the interior remains free of condensation on cold days. These windscreens are identified on the windscreen stamp with IR-H (Infrared Reflective Heatable).

s520_016

Infrared protective coating

The infrared protective coating is a very thin silver coating on the outside of the inner sheet. Because less heat enters the vehicle, the air conditioning system does not need to work as hard, which in turn lowers fuel consumption. Less of a cold draught in summer air conditioning mode increases comfort.



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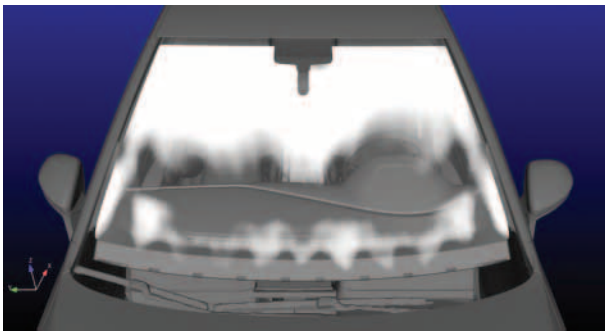
Heating function



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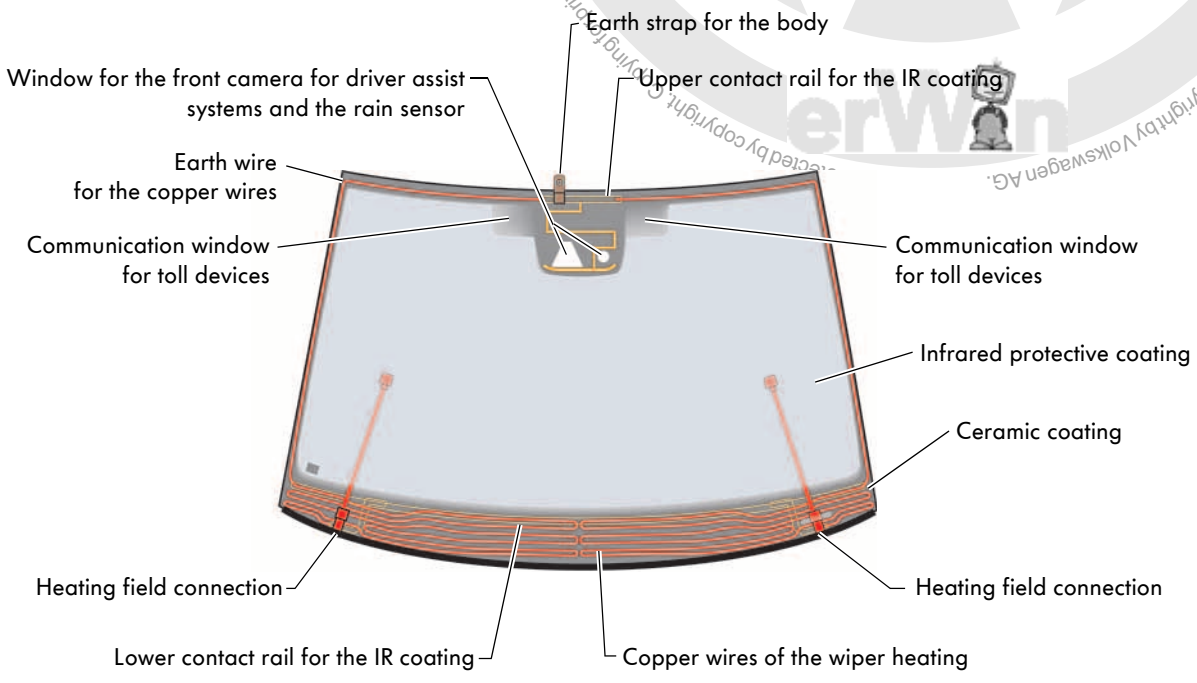
The climate comfort windscreen is heated when the silver coating is electrically activated. The wireless windscreen heating can help defrost a slightly iced and frosted outer surface.

Heavier ice and/or snow must be removed by hand.

Design and function

There are uncoated, unheated areas in the upper area of the windscreen. This ensures the operation of the rain sensor, front camera for driver assist systems, and the toll collection device. Ice must be manually removed from this area if necessary.

Also, copper wires invisible from the outside are located in the lower area of the windscreen and serve to heat the wipers and defrost the wiper blades.



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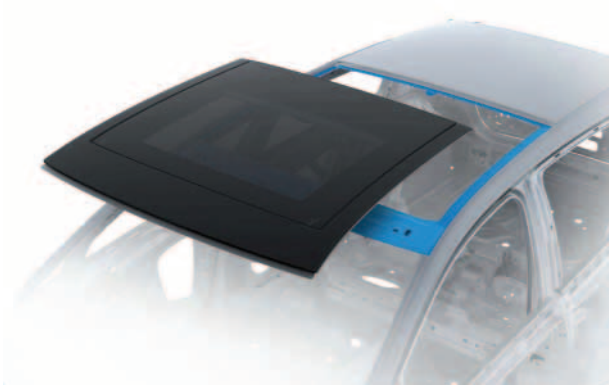
Panoramic tilting and sliding sunroof

The bonded panoramic tilting and sliding sunroof is designed as an outside roof system.

This roof is a further development of the tilting panoramic roof and now has the added function of sliding over the roof of the vehicle. The panoramic tilting and sliding sunroof is equipped with a manually operated sun blind.

The roll-back function is compliant with the legal requirements.



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Function

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Tilt function
The roof moves first to the tilt position when opened.

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Sliding function
The glass panel moves over the roof when opened with the sliding function. The wind deflector, which then moves up into place, deflects the air stream over the opened glass panel.

Thermal insulation

The glass panel is tinted and contributes to thermal insulation. The thermal insulation features the following reflection percentages:

- Reflection of 99% of the ultraviolet radiation
- Reflection of 92% of the thermal radiation
- Reflection of 90% of the light radiation

Design

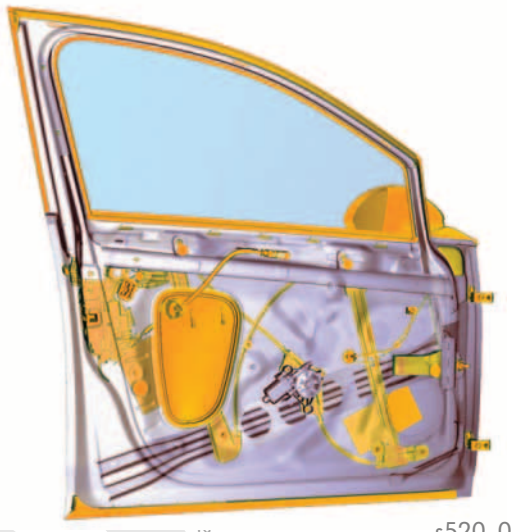
Doors

Front door

The doors on the Golf 2013 consist of of the outer panel and the inner panel of the door. There are no longer pre-assembled door subframes.
All inner components are mounted through a large assembly opening. The assembly opening is sealed with a plastic cover through which the cable for the inner door opener is passed.

The window regulator motor is bolted onto the inner door panel from outside and forms a unit with the window regulator in the door.

The door window is latched into place in the window regulator during assembly. To remove the window, press the locking lugs, which are accessible via the assembly opening.



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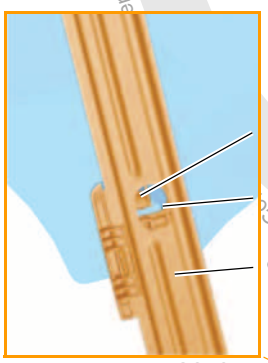
Mounting parts



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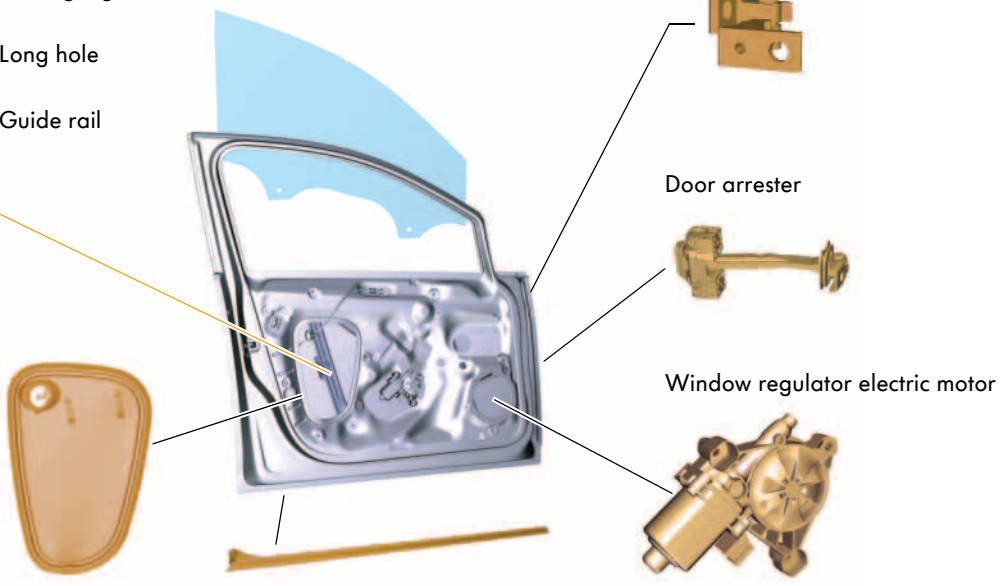
Door window attachment

Locking lug

Long hole

Guide rail



Upper door hinge

Door arrester

Window regulator electric motor

Cover for assembly opening

Lower gap seal

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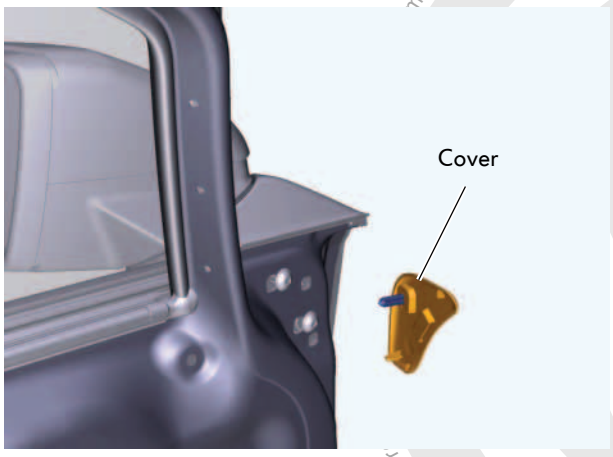
Attachments



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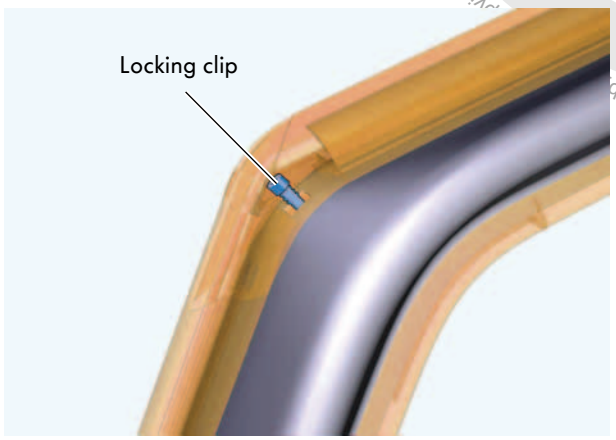
The exterior mirror has been given a new attachment in the door shut. It is attached under the cover with two screws. The connector is located directly on the door control unit, which is built into the inner door.



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The door window guide seals are mounted and secured using a locking clip in the corner of the windscreen frame and the triangular A-pillar window.

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The B-pillar gap seal is bonded onto the B-pillar in the side window area, but only on two-door vehicles.

Body assembly

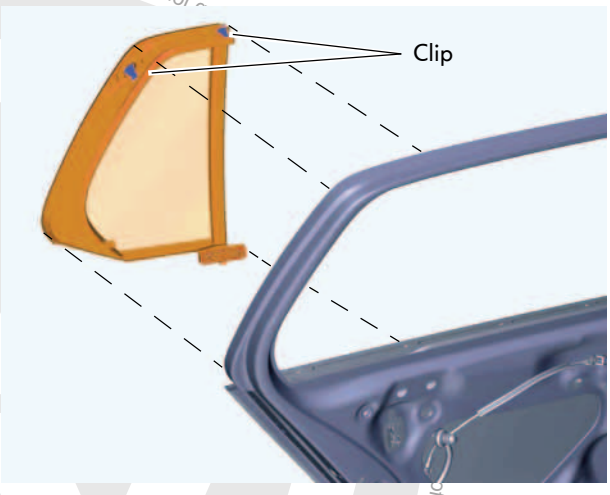
Door arrester

The convenience-optimized door arrester is a self-contained component and is no longer integrated into the lower door hinge. Up to the first locking step the door closes again; after the first locking step the door can be steplessly opened. The end stop is at the second locking step.

s520_055

Rear triangular window

The triangular window is assembled together with the B-pillar window guide and gap seal. The triangular window is attached at the top of the door frame using two clips. The window channel is inserted into the top of the door frame and fastened onto the inner door panel using two screws.



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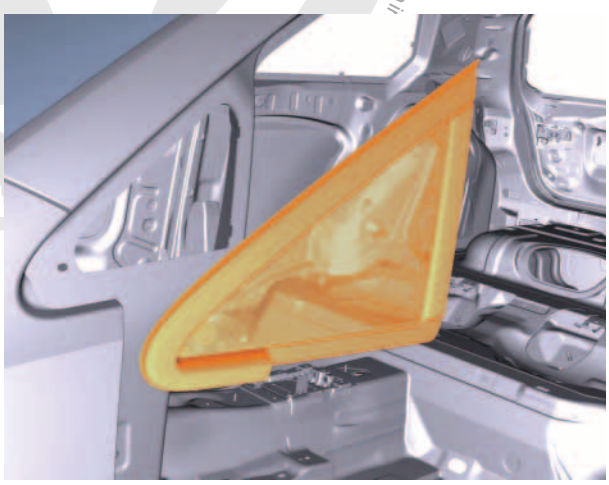
Front triangular window

The triangular window is force-fitted to the A-pillar and bonded. It is not part of the front doors.



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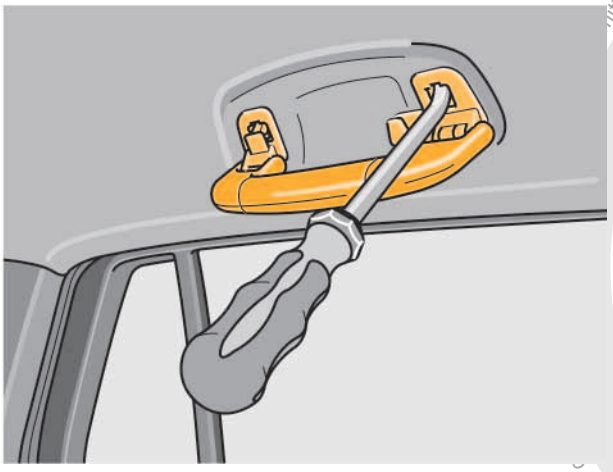
Grab handles



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The grab handles are attached to the screwed-in retaining bracket during production and fastened with a clip.

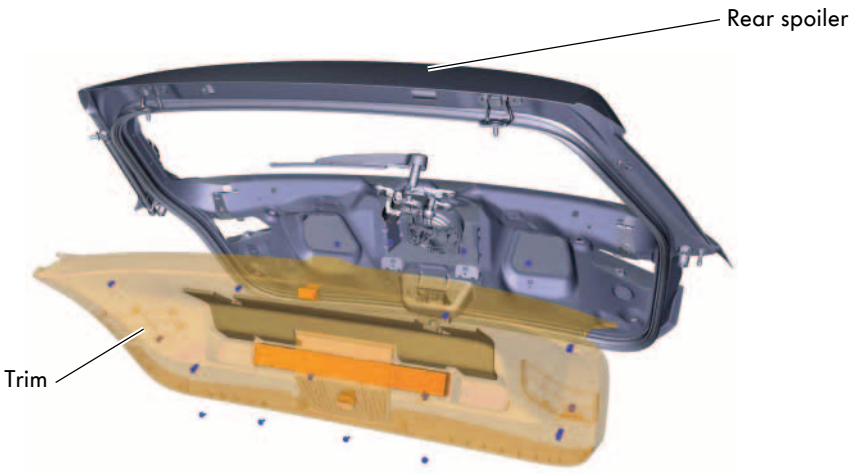
Special tool T10517 is required to remove the grab handles.

Tailgate

The tailgate is attached to the body by means of single-pivot hinges. Adjustment can be performed via the large screw holes. The trims on the tailgate are installed together. To disassemble, first the trims on the window frame must be removed and then the tailgate trim.

Depending on the equipment version, a reversing camera can be installed into the VW badge, which also serves as an unlocking element. The water drain hose conveys water away from the unlocking element of the loadspace floor.

The rear spoiler is integrated into the outer panel of the tailgate.



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Trailer towing coupling

The Golf 2013 has a trailer towing coupling with a ball head that can be manually operated. A release handle for operation is located in the lock carrier trim.

A LED light is located next to the release handle in the trim of the lock carrier. It is lit green when the ball head is correctly engaged. The indicator lamp flashes red if the ball head is released but not engaged.

s520_024

If the Golf 2013 is equipped with a trailer towing coupling, it has the large radiator package for engine power from a displacement of 1.6 litre.

Fuel filler flap module

The fuel filler flap module consists of:

- the control motor
- the tank flap cup for the filler neck with the mounting plate for the tank cap
- the tank cap.

The tank cap is mounted onto the mounting plate. It can be removed by pushing it forward.

s520_046

Dash panel and centre console

Depending on the equipment level, the decorative trim of the dash panel may or may not have chrome inserts.

Two versions of the centre console are available. The standard version has open storage compartments.
The optional equipment has a centre armrest. Its compact construction offers a generous longitudinal adjustment of 100mm and a, five-step height adjustment.

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Standard version centre console

Seats

Ergo active seat

For the first time the Golf 2013 has an Ergo Active Seat with enhanced adjustment possibilities for the driver. It offers seat height adjustment and seat heating, manual adjustment of the seat height and inclination as well as electrically adjustable 4-way lumbar support plus massage function. The seat has already received Germany's official seal of approval from AGR (Campaign for Healthier Backs) for these outstanding ergonomic characteristics.

s520_022

Adjustment options

- Height of the head restraint
- Inclination of the backrest
- Height of the seat
- Longitudinal adjustment
- Inclination of the seat cushion
- Seat depth adjustment
- Massage adjustment
- Lumbar support

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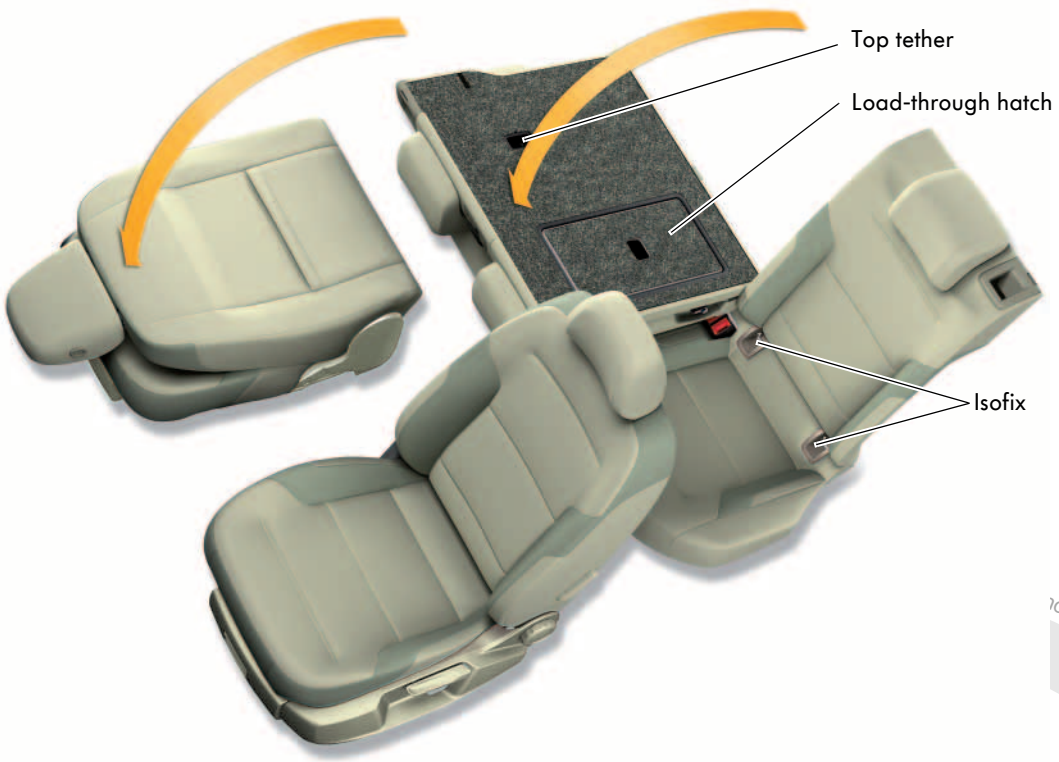
Folding function

The rear backrest is 60/40 foldable and together with the foldable front passenger seat offers high functionality when transporting goods in conjunction with the luggage compartment. The inclination of the backrest when it is folded has been significantly reduced compared to its predecessor. The result is a variable luggage compartment floor that is a nearly flat loading surface. A load-through hatch is standard beginning with the Comfort equipment level.



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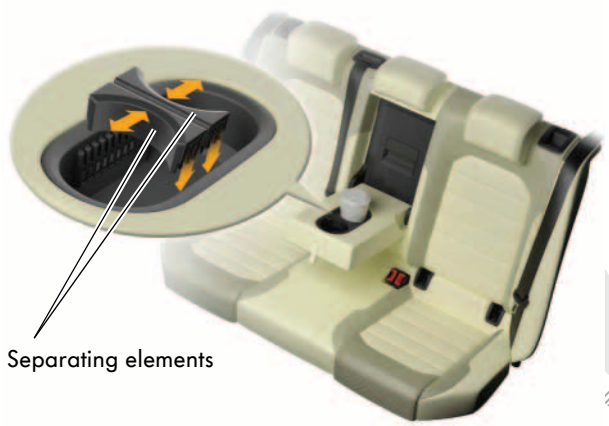
Rear seat



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The weight of the rear seat backrest was reduced through the systematic use of lightweight construction measures. Cup holders are located in the folded centre armrest. They can accommodate a variety of beverage containers. This is made possible by two separator elements.

Safety systems

The introduction of the modular transverse matrix has given rise to numerous innovative safety functions. Networking the active safety systems with the passive safety systems has resulted in new preventative safety functions.

The innovative and comprehensive safety equipment of the new Golf provides optimal protection for all vehicle occupants. Driver and front passenger airbags, curtain airbags for both front and rear seats, the side airbags for the front seats as well as the knee airbag on the driver's side are all standard equipment.

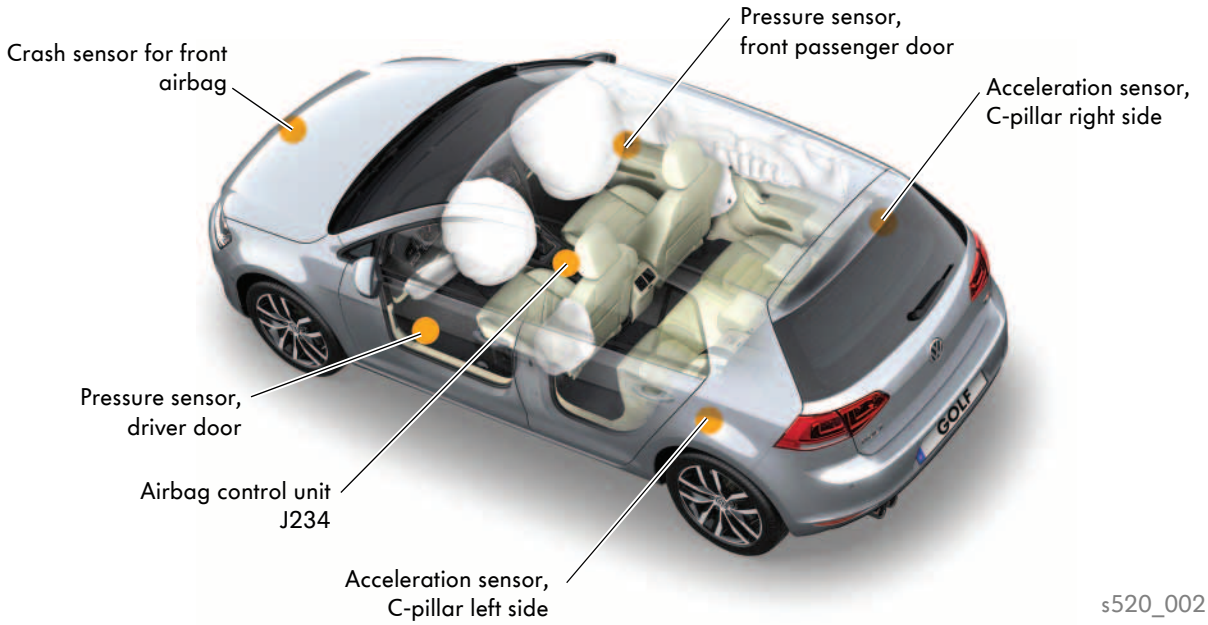
The rear side airbags are also optionally available in conjunction with the belt tensioners. All seats are equipped with three-point seat belts. The standard belt tensioners on the front seats and the belt force limiters on all seats provide effective protection. The seat belt reminder for driver and front passenger is also standard equipment. A belt status indicator for the rear seats is optionally available.

Airbag system:

- Single-stage driver airbag
- Single-stage, disengagable front passenger's airbag
- Side airbags, front
- Side airbags, rear (optional)
- Curtain airbags
- Knee airbag on driver's side

Belt system:

- Three-point front seat belt with tensioner
- Three-point rear seat belt at rear
- Reversible front belt tensioner on the proactive occupant protection system, optional
- Front belt force limiter
- Top tether



Sensor system for crash recognition

The crash sensors need to respond within a few milliseconds in severe frontal collisions so that the airbag control unit J234 can immediately initiate deployment of the restraint systems.

The optimised sensor system for crash detection measures the deceleration of the vehicle and then determines whether the airbags or belt tensioners should be deployed.

Sequence of events

- Evaluation of the low frequency “palpable” signs of deceleration
- Measurement of the mid “audible” frequency in the range of 20kHz (as structure-borne noise when there is fast deformation of load-bearing structures in the vehicle front end)
- Intelligent linking of both signal parts within the crash algorithm for characterising the crash

More detailed information about the optimised sensor concept can be found in Self-study Programme no. 492 “The Jetta 2011 EU”.

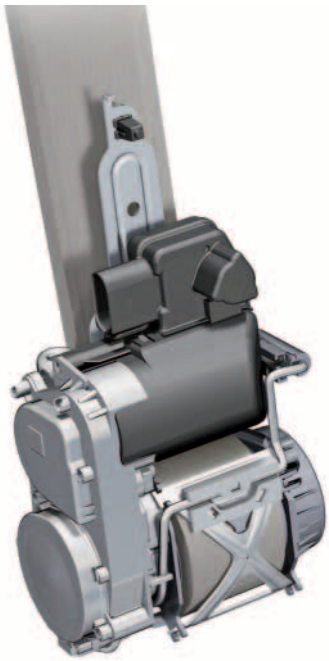
Reversible belt tensioner

The reversible belt tensioners consist of a pyrotechnic and an electric reversible belt tensioner as well as a control unit. The control units are integrated into the CAN data bus system.

When the corresponding information is available on the data bus, the electric, reversible seat belt pre-tensioners are actuated. The pyrotechnic belt tensioners are triggered by the airbag control unit.

Two different levels of force are available:

1. Medium force = partial tensioning in the event of critical lateral and longitudinal dynamics
2. High force = full tensioning in the event of very critical lateral and longitudinal dynamics



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Proactive occupant protection

The characteristic feature of this optional occupant protection system is that it links active and passive safety elements together. It is based on using sensors of the driving dynamics control systems, e.g. ABS, ESP and Front Assist. They are able to detect critical driving dynamics situations that have high crash potential.

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The proactive occupant protection can initiate the following measures:

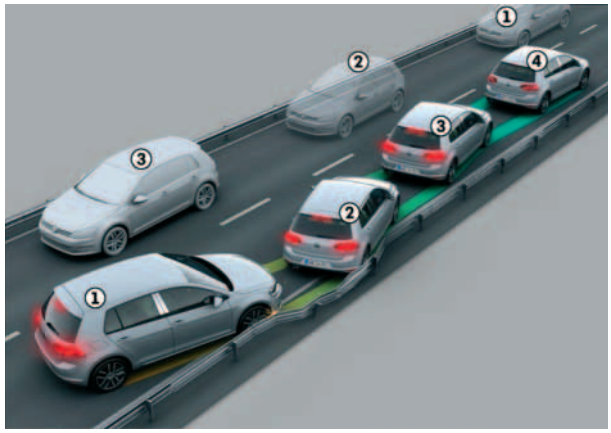
- Electric motor tensioning of the seat belt to secure the driver and front passenger in their seats
- Closing the panoramic tilting and sliding sunroof and the side windows in the event of understeering or oversteering, leaving only a small gap.

More detailed information about the proactive occupant protection system can be found in Self-study Programme no. 449 “The Touareg 2011”.

Multicollision brake

Subsequent collisions occur after the first impact in about one-quarter of all accidents. The reason for this is that many drivers lose control of their vehicles in the first moment of shock. Automatically initiated braking may effectively prevent possible subsequent collisions.

The multicollision brake triggers an automatic braking intervention after the first detected collision so that the vehicle is braked in a controlled manner. The driver can intervene at any time and can interrupt the multicollision braking by pressing the accelerator or by braking harder.



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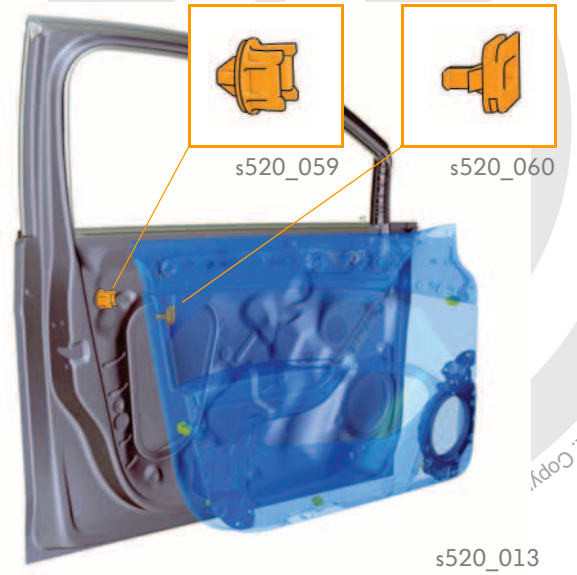
More detailed information about the multicollision brake can be found in Self-study Programme no. 516 “The Golf 2013 – Driver Assist Systems”.

Crash clip

The crash clip is a special securing element that keeps the door trim panels on the inner door panel in the event of a crash and thus permits unhindered expansion of the side airbag. The crash clip is installed only in four-door vehicles. The clip has a holding force of more than 1000 N.

The clip is not available on 2-door vehicles, as the trim is held firmly in place by the B-pillar.



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s520_013

Test your knowledge

Which answers are correct?

One or several of the given answers may be correct.

1. Which statement about weight reduction is correct?

❒ a) The body-in-white of the Golf 2013 is 23 kg lighter than the body-in-white of the Golf 2009.

❒ b) The modular transverse matrix is 23 kg lighter than the body of the Golf 2009.

❒ c) The body-in-white is up to 100 kg lighter than the body-in-white of the Golf 2009.

2. Which statement about the width variability of the modular transverse matrix is correct?

❒ a) The width variability is solely determined by the outer side members and the strut holders.

❒ b) The width variability is determined by the inner side members and the strut holders in the wheel housings.

❒ c) The width variability is solely determined by an individual cap.

3. How is the overall basic rigidity of the vehicle front end realised?

❒ a) By a closed bulkhead

❒ b) By a separate body brace

❒ c) By a self-enclosed torsion ring

❒ d) By high-strength hot-formed material in the vehicle front end area

4. What is the name of the construction of the front longitudinal member on the modular transverse matrix?

❒ a) C-longitudinal member

❒ b) U-longitudinal member

❒ c) B-longitudinal member

❒ d) O-longitudinal member

5. How is the front door window secured on the Golf 2013?

❒ a) The door window is bolted into the window regulator during assembly. For disassembly, these screws have to be removed through the assembly opening.

❒ b) The door window is riveted to the window regulator during assembly. For disassembly, these rivets have to be removed through the assembly opening.

❒ c) The door window is latched into place in the window regulator during assembly. To remove the window, press the locking lugs, which are accessible via the assembly opening.

6. What is the special feature in the front doors of the four-door Golf 2013?

❒ a) The front doors have a built-in assembly carrier.

❒ b) The front doors have a crash clip that can absorb 1000N.

❒ c) The door trim contains an airbag for the first time.

7. How many tensioners are there in the reversible belt tensioner in the Golf 2013?

❒ a) There are three tensioners: beltless, partial tensioning and full tensioning.

❒ b) There is a partial tensioning and a full tensioning.

❒ c) There are only pyrotechnic tensionings.

Solution:
1. a); 2. b); 3. a), c); 4. a); 5. c); 6. b); 7. b)

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