

Guide for Rescue Services  
Passenger Cars  
Edition 2005



Mercedes-Benz

# Guide for Rescue Services, Passenger Cars

Edition 2005

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### Dear Reader,

One of DaimlerChrysler's top priorities has traditionally been to guarantee the highest possible standards of safety.

For this reason our vehicles always represent the state of the art. And this is especially true for vehicle safety.

Our comprehensive safety concept also extends to providing rescue crews with specific information about our vehicles and their safety systems.

The top priority of the rescue crew is to save lives. The rescue team must be able to gain access to the accident victims as quickly as possible without exposing them or themselves to additional danger.

In order to do this, the rescue services must be properly trained. In addition, knowledge of vehicle-specific accessibility options and of the function and operation of the safety systems is absolutely essential.

Mercedes-Benz has been providing this information in its "Guidelines for Rescue Services" since March 1994. The guidelines have been revised regularly ever since.

This is the 2005 edition. The constant development of our vehicles, particularly in the field of vehicle safety, and the expansion of our product range have necessitated another update.

These guidelines contain several methods for rescuing accident victims from a vehicle. We must emphasize, however, that these guidelines cannot claim to be exhaustive and on no account should they, nor are they intended to, act as a substitute for proper specialist training and the relevant specialized literature.

As well as including new passenger car models, these guidelines also contain essential information on occupant restraint systems, on the KEYLESS GO access and drive authorization system, on the fuel cell drive system and the bivalent natural gas drive (NGT), as well as on new materials.

For their helpful cooperation we should like to extend our warmest gratitude to our company fire brigades at the Untertürkheim and Mettingen plants, to the Stuttgart Fire Service, to our accident research department, to our development department, to our company medical services at Sindelfingen, Mettingen and Untertürkheim, and to everybody else involved.

The photographs were taken while performing cutting tests on vehicles of various model series as well as during an exercise series "Technical assistance for passenger cars, patient-suitable rescue" of the plant firefighting department at DaimlerChrysler Sindelfingen, Germany.

DaimlerChrysler AG

Teile-Technik und Technische Information (GSP/TI)

## Patient-suitable rescue

Whereas formerly priority was given to quickly rescuing the trapped accident victims from their predicament, the primary concern nowadays is medical and psychological assistance. The aim is to prepare the victim as well as possible for the rescue work.

The medical and rescue personnel can then work as a team to free the victim from the vehicle.

### The most important immediate measures at the scene of accident are:

- Safeguarding or restoring vital functions (respiration/circulation)
- Keeping the respiratory paths free and rectifying any breathing difficulties
- The assessment of shock conditions and the initiation of stabilization measures
- Rendering psychological support to the victim
- Treating life-threatening injuries
- Stopping major bleeding
- Immobilizing certain body parts

### Immobilizing the neck

As the head often experiences extreme movements in traffic accidents, there is an increased risk of spinal injury in the neck region. To prevent further damage to the cervical vertebrae, it is essential to immobilize the neck before any further rescue action is undertaken. To this end the cervical collar ("stiff neck") is normally used; it consists of a plastic part, which is placed around the neck and sealed with the aid of a Velcro strap.

If access to the victims is difficult, the head restraint can be removed first before fitting the cervical collar.

**i** The main priority is to render medical and psychological aid to the accident victim!

**i** However, the safety of the medical and rescue crews themselves should not be neglected!

- Wear protective clothing
- Wear safety glasses
- Wear a protective mask
- Secure vehicle involved in accident

**i** Removal of the head restraints should be performed in exceptional cases only!

- When removing the head restraints the victim is also subject to additional movement
- The head restraints then no longer serve to stabilize the head
- Removal of the head restraints result in sharp edges being exposed

### Extinguish fire in accordance with the professional fire service guidelines!

#### Body:

The material magnesium is increasingly being used in safety-relevant reinforcement structures on the body. Thus, e.g. the inner door panels on the S-Class Coupé (model 215) and SL-Class roadster (model 230) are made of magnesium.

 Magnesium is a Class D flammable material according to the European "Flammable materials of various kinds" EN2 standard!

#### Vehicles with fuel-cell drive:

Vehicles with a fuel-cell drive (A-Class, F-cell) are equipped with hydrogen tanks. On these vehicles the guidelines on extinguishing gas fires, in particular, must be observed.

 Hydrogen (H<sub>2</sub>) is a Class C flammable material according to the European "Flammable materials of various kinds" EN2 standard.

#### Vehicles with gasoline and natural gas drives:

In the E-Class sedan of the model series 211 an engine is used for the first time which can be operated optionally with gasoline or natural gas.

A comprehensive series of tests have shown that the high-strength tanks, lines, threaded connections and other equipment also provide the greatest possible safety in the event of an accident.

The location of the components ensures that the natural gas does not enter the vehicle's interior.

The danger of fire is no greater in natural gas vehicles than in gasoline or diesel-powered vehicles.

 Natural gas is a Class C flammable material according to the European "Flammable materials of various kinds" EN2 standard!

## Extinguishing vehicle fires

### Restraint systems:

In the event of a fire breaking out in the vehicle interior, the front, side and head/thorax sidebag gas generators or pyrotechnical emergency tensioning retractors may be triggered.

Gas generators are designed to ignite as soon as the temperature inside the generator reaches 160 - 180 °C in the gas generator. In such cases the ignition squib and the solid fuel burn without destroying the gas generator. During combustion a specific volume of gas is released at a specific pressure.



**If the front, side and head/thorax sidebags as well as the emergency tensioning retractors are triggered the corresponding component will burn in a controlled manner and not explode.**

### Windowbags

The windowbags' compressed gas generators are not filled with solid fuel, but rather with compressed gas.



**The compressed gas generators of the windowbags must not be cut, as otherwise the compressed gas may suddenly escape!**



**Before cutting the corresponding body panels the inner paneling of the A, B or C-pillars must be removed using a suitable tool and the exact installation location of the gas generators determined!**

 Risk of injury	Measures
<p><b>Electrolyte fluid</b> may escape if the <b>mirror glass is broken</b>. This fluid acts as an <b>irritant</b> and must not be allowed to come into contact with the <b>skin, eyes or respiratory organs</b>.</p>	<p>If it comes into contact with the skin or eyes, <b>immediately rinse off the fluid with generous amount of clean water</b>. Seek medical attention if necessary.</p>

### Automatic dimming mirror:

On CLK-Class (model 209), E-Class (model 211), CLS-Class (model 219) and the SL-Class (model 230) vehicles the inside rear view mirror and the outside mirror have an electrolyte fluid for automatic dimming.

Vehicles of other model series may also be fitted with automatic dimming mirrors as special equipment (SA).



## Secure and support



### Risk of injury

**Unintended movements** of the bodywork during rescue operations may cause further **injury** to the accident victims.

### Measures

**To prevent dangerous movements from occurring while rescuing the victims, the vehicles involved should first be secured.**

On arrival at the scene of the accident, the first priority of the rescue crew should be to determine and assess the condition of the victims.

A patient-suitable rescue of the occupants from the vehicle should not take place until after the vehicle has been made secure and - where possible - in coordination with the emergency physician (no crash rescue!).

Trapped victims are in direct contact with the accident vehicle. For this reason the substructure must ensure that the vehicle cannot move in the event of any subsequent rescue action.

The substructure support must remain secure throughout the entire duration of the rescue operation and must be able to withstand the use of hydraulic equipment.

For supporting with substructure sliding blocks, the air can be let out of the tires after the blocks have been slipped underneath.



P00.60-2024-00



**The supporting the vehicle with wooden planks, substructure sliding blocks or similar objects must enable a vibration free and protective rescue operation!**  
**When positioning the substructure sliding blocks, care must be taken to ensure that the following rescue measures are not impaired.**

Vehicles in a side position must be secured against sliding and tilting e.g. using supporting struts, wheel chocks, ropes and belts.

- Secure vehicle using supporting struts
- Attach belts to vehicle by wrapping them around vehicle parts such as axles or other permanently bolted or welded part on the vehicle
- Attach steel cable to belt and tighten using tensioner (grip puller) or cable winch
- Secure opposite vehicle side using wheel chocks



P00.60-2048-00

The STAB FAST passenger car support system is offered as an alternative, with which vehicles can still be stabilized even when in complicated positions.



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**STAB FAST passenger car support system**

If the vehicle is on sloping ground, a sling is useful for securing the vehicle. It can also be used for recovering the vehicle.

The endless sling should be attached either by threading it through the window openings (even with the windows removed) or by slinging it around vehicle components such as axles or other parts rigidly bolted or welded onto the vehicle.

Care should be taken to pass the sling around a number of components if possible, in order to distribute the forces evenly.



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## Special protection vehicles

The methods described in these guidelines are of limited usefulness on specially protected vehicles.

In the majority of cases significantly greater force must be used due to the many material reinforcements when cutting or deforming the body. These forces generally exceed the capacity of conventional rescue equipment.

This makes it much more difficult to rescue victims from specially protected vehicles.

### **Peculiarities of specially protected vehicles:**

- The windows are much thicker and cannot be removed by the usual methods
- The door hinges are made of hardened steel
- The body panels are reinforced with thick steel plates
- Stepped steel profiles mesh at the door gaps, making these less suitable for use as lift contact points for rescue equipment

The roof and vehicle floor are reinforced with special, high-strength materials.

 Risk of injury	Measures
<p>Work on <b>windows</b> and <b>glass roofs</b> may produce <b>glass splinters</b> which can cause <b>injuries</b> to the occupants and rescuers.</p>	<p><b>Cover occupants before commencing any work preferably with a transparent sheet.</b></p> <p><b>Wear protective clothing and gloves and safety glasses.</b></p>

 Risk of injury	Measures
<p>Always remove the <b>windows</b> when working on adjacent components.</p> <p><b>Windows</b> may <b>shatter</b> resulting in tiny, sharp <b>glass particles flying around</b> which may cause <b>injury</b> to the occupants and rescuers.</p>	<p><b>Cover occupants before commencing any work preferably with a transparent sheet.</b></p> <p><b>Wear protective clothing and gloves and safety glasses.</b></p>

Windows adjacent to components that are being worked on must always be removed before using hydraulic tools. This applies above all to the windows in the doors. If the windows are not removed, then when opening the doors using the spreader together with the corresponding body panels, they can be subjected to enormous pressure.

Once the pressure reaches a certain level, the forces acting on the windows will exceed the strength of the glass, and the windows will suddenly and violently shatter. The glass shards released as a result of this may cause injury.

Vehicles in the Mercedes-Benz passenger car model series are generally equipped with two types of safety glass.

The windshield and door windows are made of laminated safety glass (VSG), the rear and side windows on almost all vehicle are made of single-pane safety glass (ESG).

## Removal of vehicle windows

### Remove windows using a glass saw:

The glass saw is usually chosen to remove windows made of **laminated safety glass** (VSG).

- First, an opening is knocked into the pane
  - Then the pane is sawed out around its edges
- Sawing action here is when it is pulled and not - as usual - when it is pushed. The advantage of this is that the victim inside the vehicle is less exposed to the glass particles produced.



P67.00-2028-00



P67.00-2036-00

The **pendulum jigsaw** can be used as an alternative to removing the laminated glass window.

Here one should note that when sawing, fine-grained **glass dust** is created. For this reason before commencing the sawing process safety precautions must be taken:

- The occupants should be covered preferably with a **transparent sheet**
- The rescue personnel should also wear a **mask and safety glasses** in addition to the helmet visor



P67.00-2041-00

### Removing windows with the spring punch:

The side windows on all vehicles are made of single-pane safety glass and can be removed using a spring punch:

- Stick adhesive foil or tape to window
- Position the spring punch at one of the lower corners
- Use the spring punch to center punch the glass
- The pane then fractures into small parts, which then stick to the adhesive foil or tape.
- Remove window pane outwards
- Remove remaining glass from window frame (remove rubber edge stripping)



P67.00-2029-00



**Before windows are sawn or opened using special removal tools, the occupants must be covered - preferably with a transparent sheet - to prevent any injury. The following applies for the rescue personnel:**

**Wear protective clothing, safety glasses and a mask in addition to the helmet visor!**

## Switching off the engine

### Switching off the engine in vehicles with automatic transmission or KEYLESS GO

#### On vehicles with automatic transmission:

Switch off engine by turning the ignition key counter-clockwise to "0" position and then remove the ignition key.

**i** On vehicles with automatic transmission, the ignition key can only be removed when:

- the selector lever is in position "P" and
- the service brake is applied

#### On vehicle with KEYLESS-GO:

KEYLESS-GO is a keyless access and drive authorization system.

In some accident situations the engine may continue to operate after a crash. If the vehicle key is not in the ignition switch in vehicles with KEYLESS GO, the engine can be switched off as follows:

- Move the selector lever to position "P" or "N"
- **Press START/STOP button (1)** again on selector lever



P80.61-2033-00

## Emergency opening of central locking

### Automatic release of central locking in event of an accident

Mercedes-Benz vehicles are equipped with the "**Central locking emergency opening**" function in the event of a crash.

Installed in a separate control unit is an additional crash sensor. At a defined vehicle acceleration the signal for emergency opening is transmitted after a specific waiting time to the door control units. The doors are then unlocked by the respective door control unit.

### Hazard warning flasher

In the event of a crash case, the hazard warning system is automatically switched on.

It can be switched off again using the hazard warning flasher switch (1).

Generally, the hazard warning system is used to show the rescue team that the vehicle voltage supply is operational.

The hazard warning system is not deactivated until the battery/batteries is/are disconnected. This shows that the vehicle is free of electric current.



P54.25-4401-00

**Example, A-Class (model 169)**

1 Hazard warning flasher switch



The triggering strategies for the supplemental restraint system are subject to modification such as gained from recent knowledge in accident research.

## Removal of vehicle doors

First check whether the door catch can be opened **in spite of the deformed door**.

The door may be able to be opened to the extent that the spreader can be inserted into the resulting gap. If the lock cannot be opened, the following procedure is recommended:

**i** Do not use excessive force to ram the spreader into the door gap, to avoid any unintended body movement. Proceed carefully with the patient in mind.

### Opening on the lock side:

- Push one tip of the spreader into the door gap (at about the height of the door lock) on the B-pillar
- Grip the door fold with the spreader and bend outwards
- Push both ends of the alligator spreader into the resulting opening and progressively widen the opening in a series of spreader activations. During this process slide the ends of the spreader toward the door lock, continuing until the door pops open.



P72.00-2053-00

### Opening on the hinge side:

- Squeeze the front fender with the spreader to enlarge the door gap on the hinge side

This procedure cannot be used on fenders made of plastic.



P72.00-2058-00

### Opening on the hinge side:

Where plastic fenders are involved or where the accident has closed off access proceed as follows:

- Remove side window
- Insert spreader between door and upper door frame
- Expand spreader until a sufficient gap forms at the hinge side of the door



P72.00-2132-00

The following procedure can also be used:

- Remove side window
- Apply spreader at an incline from above
- Squeeze door using spreader until a sufficient gap forms at the hinge side of the door



P72.00-2133-00

## Removal of vehicle doors

- Further enlarge the door gap at the height of the door lock using a spreader
- Cut off the hinges using the cutting gear or spread them with the spreader until they break off
- Cut electrical lines using cable shears
- Remove door



P72.00-2054-00



P72.00-2131-00

**i** The hinge pins are hardened. Hardened parts cannot be cut. There is a risk that the cutting blade on the hydraulic cutting gear may be damaged or destroyed.



### Risk of injury

When vehicle parts are **cut open** or **cut off from the vehicle**, this produces **sharp interfaces** with the potential to cause **injury** to both **rescue personnel** and the **accident victims** within the vehicle.

### Measures

Cover the appropriate parts with protective covers or pillar protection.



### Risk of injury

**The gas generators of windowbags** are filled with compressed gas and **they must not be cut!**

The bursting of a gas generator may lead to **sharp-edge parts** being ejected at high speeds. The loud noise may result in the victims experiencing a **blast trauma**.

### Measures

**Remove inner paneling of A, B and C-pillars using a suitable tool and check whether any gas generators are installed in the area of the planned cuts. Mark installation location on outside of vehicle.**

**The following procedure can be used to push away the instrument panel:**

- Carefully support and stabilize the vehicle
- Remove inner paneling of A-pillars
- Locate the position of any windowbag gas generators present and mark on outside of vehicle
- Cut through the A-pillars above the instrument panel. The cut should be as high up as possible to ensure that sufficient stability is given for the use of the rescue ram.

**Gas generators must not be cut!**



P62.00-2010-00

## Pushing away the instrument panel

- Make a bypass cut at the front on the lower A-pillar



P62.00-2011-00

- Position the rescue ram between the A-pillar and the B-pillar To prevent the base of the rescue ram from breaking through, make sure that the **supporting point is a stable one**. The **door sill attachments (1)** available with rescue rams are particularly well suited for stabilizing purposes.
- Extend the rescue ram as far as necessary
- To prevent vehicle parts from any spring back, the rescue ram should be left under pressure until the victim(s) has/have been rescued from the vehicle



P62.00-2012-00

1 Sill attachment

If the B-pillar has been removed or damaged and no longer provides a sufficient degree of stability for the rescue ram, then the sill attachment (1) can be fastened in place using one or two spreaders (2).

**Disadvantage:** This means that the spreader is tied up and is no longer available for any additional rescue measures!



P62.00-2087-00

1 Sill attachment  
2 Spreader



## Risk of injury

When vehicle parts are **cut open** or **cut off from the vehicle**, this produces **sharp interfaces** with the potential to cause **injury** to both **rescue personnel** and the **accident victims** within the vehicle.

## Measures

**Cover the appropriate parts with protective covers or pillar protection.**



## Risk of injury

**The gas generators of windowbags** are filled with compressed gas and **they must not be cut!**

The bursting of a gas generator may lead to **sharp-edge parts** being ejected at high speeds. The loud noise may result in the victims experiencing a **blast trauma**.

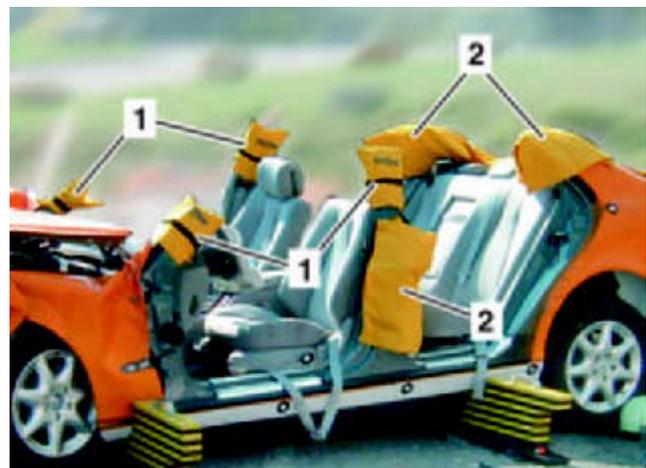
## Measures

**Remove inner paneling of A, B and C-pillars using a suitable tool and check whether any gas generators are installed in the area of the planned cuts. Mark installation location on outside of vehicle.**

The roof plays a major role in lending rigidity to the body. When cutting away the roof, it is absolutely essential to ensure that the vehicle is adequately and safely supported so as to prevent the body from collapsing and causing further injury to the occupants. Furthermore, important fixed points on the bodywork, which may be necessary later in the rescue of the victims, could be destabilized or destroyed by cutting away the roof.

Removing the vehicle roof must therefore be considered a critically important event and should be planned with the emergency physician. If removing the roof is the only possible way of gaining access to the victim or of initiating other essential action, carefully consider whether partial removal of the roof might be sufficient.

Depending on the accident situation, the corresponding pillar can be folded forward or backwards after being cut. The partial removal of the roof through folding it backward is illustrated below.



P62.00-2068-00

**Protective cover set from Weber Hydraulik company**

- 1 Pillar protection with Velcro fastener
- 2 Protective cover with round magnets

## Removing the roof

The roof can be removed in the following way:

### Partial removal of roof:

- Saw out windshield at edges (cf. Chapter: Removal of vehicle windows)
- Remove inner paneling of A-pillar and check whether a gas generator has been installed in the A-pillar for the windowbag. Mark cutting position on outside of vehicle
- Cut A-pillar as far down as possible; in doing so do not cut through the given **gas generator** !



P62.00-2085-00

- Remove inner paneling of B-pillar and determine location of seat belt height adjustment or any given structural reinforcements
- Cut through B-pillar above the seat belt height adjustment



P62.00-2086-00

- Cut B-pillar with structural reinforcements (e. g. E-Class, model 211 and CLK-Class, model 209) with a V-shaped incision at the side of the roof



P62.00-2075-00

- Saw out rear window at edges
- Remove inner paneling of C-pillar and check whether a gas generator has been installed in the C-pillar for the windowbag. Mark cutting position on outside of vehicle
- Make v-shaped incision on top of C-pillars; in doing so do not cut through the given **gas generator** !



- Make v-shaped roof bypass cut at rear in center of roof



- Fold the roof back towards the rear taking into account wind strength and direction and secure roof with ropes to prevent it from springing back



## Removing the roof

### Complete removal of the roof:

- Remove inner paneling of A-pillar and check whether a gas generator has been installed in the A-pillar for the windowbag. Mark cutting position on outside of vehicle
- Cut A-pillar as far down as possible; in doing so do not cut through the given **gas generator !**
- Leave the windshield (bonded) in its frame and saw open across its entire width at the height of the cuts in the A-pillars The windshield can be removed together with the roof.



P63.20-5675-00

- Remove inner paneling of B-pillar and determine location of seat belt height adjustment or any given structural reinforcements
- Cut through B-pillar above the seat belt height adjustment
- Cut B-pillar with structural reinforcements (e. g. E-Class, model 211 and CLK-Class, model 209) with a V-shaped incision at the side of the roof



P62.00-2086-00

- Saw out rear window at edges
- Remove inner paneling of C-pillar and check whether a gas generator has been installed in the A-pillar for the windowbag. Mark cutting position on outside of vehicle
- Cut C-pillar as near top as possible; in doing so do not cut through the given **gas generator !**



P63.20-5676-00

- Raise roof together with windshield and, depending on the accident situation, move away to front or rear



P65.00-2103-00

- With regard to partial or complete removal of vehicle roof, all cutting edges on the A, B and C-pillars should be covered with protective covers or pillar protection



P60.00-2659-00

## Removing the roof

### Rescuing occupants with closed soft top, coupé roof or Vario roof

**i** Before and while opening the roof, always ensure that the victims' freedom of movement is not restricted and that nobody will be injured by the moving parts (roll bar, soft top, soft top compartment lid, soft top linkage).

**i** If the coupé roof (SL-Class, model 129) can no longer be removed it can then be cut as for a normal roof. For vehicles with a glass roof version proceed as for removal of the windshield (cf. chapter on "Removal of vehicle windows").

### SLK-Class (model 171)

The new SLK-Class is equipped as the predecessor with a Vario roof, which looks identical to a coupé roof, but which can be opened and closed electrohydraulically like a convertible soft top.

The control switch is located in the center console.



P77.30-2295-00

**i** The Vario roof on the SLK-Class (model 171) is operated electrohydraulically and must be cut away as for a normal roof if the electrical system has failed or if the battery has been disconnected!

## SL-Class (model 230)

The SL-Class is equipped with a Vario roof, which looks identical to a coupé roof, but which can be opened and closed electrohydraulically like a convertible soft top.

The control switch is located in the center console.



P77.39-2068-00

**i** The Vario roof on the SLK-Class (model 230) is operated electrohydraulically and must be cut away as for a normal roof if the electrical system has failed or if the battery has been disconnected!

## G-Class convertible (model 463)

The convertible in the G-Class has two independent of each other locking hooks at the left and right on the windshield panel that have to be opened.

The control switch for the electric power soft top is located in the center console.

### Emergency opening:

To open in an emergency, fold the locking lever all the way down and push the soft top towards the rear by hand until mechanically locks up.



P77.33-2045-00

## Removing the roof

### CLK-Class convertible (model 209)

On the convertible of the CLK-Class (model 209) the soft top is locked or unlocked electrically.

The control switch for the electric power soft top is located in the center console.

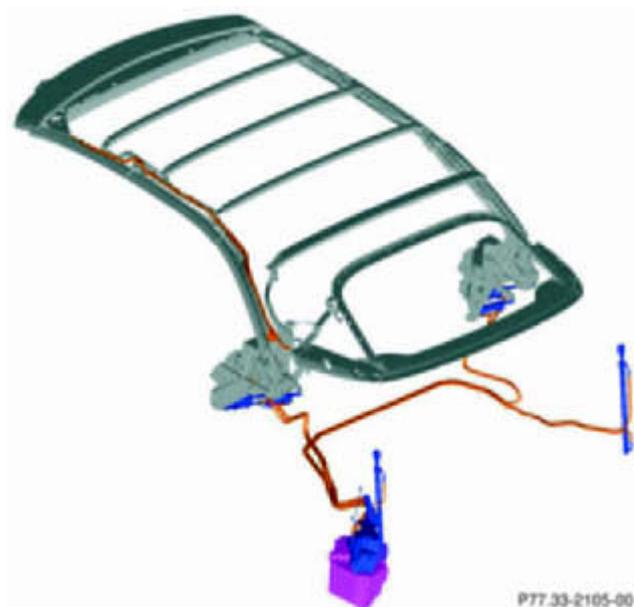


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### Soft top frame

The soft top frame is a combined steel/aluminum structure. The header bow and retaining bracket are made of die-cast aluminum. The corner bows and cross bows consist of extruded aluminum profiles. In combination with the steel struts these parts are given bending and profile strength.

The rear-wall window is made of single-pane safety glass (ESG) and bonded into a frame compound.



P77.33-2105-00

 Risk of injury	Measures
<p>When vehicle parts are <b>cut open</b> or <b>cut off from the vehicle</b>, this produces <b>sharp interfaces</b> with the potential to cause <b>injury</b> to both <b>rescue personnel</b> and the <b>accident victims</b> within the vehicle.</p>	<p><b>Cover the appropriate parts with protective covers or pillar protection.</b></p>

If the battery has not yet been disconnected, then for vehicles with power seats the "seat adjustment" switch can be used to try and adjust the seats electrically.

Due to deformation of the seat rails seats with manual or electric seat adjustment can frequently no longer be moved forward or back after an accident.

**Electric seat adjustment is - at the latest - no longer functional after disconnecting the battery.**

In these cases, the **instrument panel** can be pushed away from the victim using a hydraulic rescue ram. This is described in more detail in the chapter entitled "Pushing away the instrument panel".

## Seat adjustment

### Partially electric seat adjustment:

The seat elements depicted by the differently shaped segments of the switch can be moved in the desired direction by pressing the appropriate switch (cf. illustration).

The switch group is located on the bottom of the seat on the door side.



P91.29-2200-00

**i** When operating the partially electric seat adjustment make sure that no-one can be jammed in between the moving parts.

### Fully electric seat adjustment:

The seat elements depicted by the differently shaped segments of the switch can be moved in the desired direction by pressing the appropriate switch (cf. illustration).

The switch group is located at the top on the relevant door.



P91.29-2201-00

**i** When operating the fully electric seat adjustment make sure that no-one can be jammed in between the moving parts.

 Risk of injury	Measures
<p>Due to the fact that when <b>the head restraints are removed</b> the victim is subject to an additional <b>risk of injury</b> , because the head restraint is then no longer available and, in addition to this, <b>sharp edges</b> are created when the head restraints are removed, the processing of cutting off the head restraints should only take place <b>in exceptional cases</b> and after <b>consultation with the emergency physician</b>.</p>	<p><b>Generally, you should first try to move the seat backrest back as far as is possible to create the necessary space for the victim. (cf.. Chapter on "Seat adjustment").</b></p> <p><b>The head restraint may be useful for stabilizing the victim.</b></p>

 Risk of injury	Measures
<p>When <b>cutting the round material</b> on the head restraints using hydraulic cutting gear the <b>greatest care</b> is called for.</p> <p>The intervention is made in <b>the immediate vicinity of the accident victim</b>. There are potential additional <b>injury hazards</b> from cut <b>metal parts</b> and sharp <b>cutting edges</b>.</p>	<p><b>Cover occupants before commencing any work preferably with a transparent sheet.</b></p> <p><b>Wear protective clothing / safety glasses.</b>  <b>Cover up cutting edges using protective cover.</b></p>

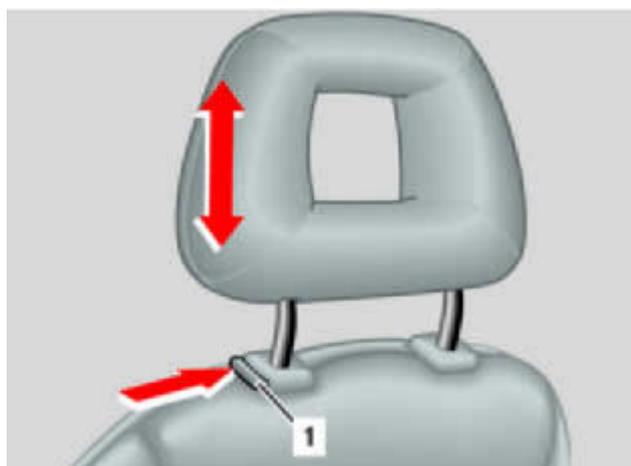
## Removal of head restraints

Following an accident it is occasionally useful to remove the head restraints **after consultation with the emergency physician**:

- to provide access to the rear passengers in two-door vehicles
- to provide the rescue personnel with more space to fit the cervical collar (stiff neck) to the victim

### Manual head restraint adjustment:

In most mechanical head restraint systems, the head restraint is moved to the top position simply by pulling on it. Pressing the release button (1) and then pulling upwards allows the head restraint to be removed from its guides. The release button is usually located on the receptacle for the head restraint bracket.



P91.16-2139-00

### Electric head restraint adjustment:

The switch for electric head restraint adjustment is integrated into the switch group for fully electric seat adjustment.

The head restraint is moved to the top position by pressing the switch. Then the head restraint can be pulled out of its guide by pushing it beyond the resistance of the end locking device.



P91.16-2206-00



## Risk of injury

If **easy entry / exit** is switched on when the **driver door is opened** after switching off the ignition or if the electronic transmitter **key is removed** the steering column is moved and the driver seat is moved to the rear. It is absolutely essential that care is taken to ensure that no-one is jammed by **moving parts**.

## Measures

Where possible, disconnect all batteries.

**If the easy entry/exit feature is activated, stop the adjustment procedure immediately.**

For Mercedes-Benz vehicles an electronic easy entry/exit is available as special equipment.

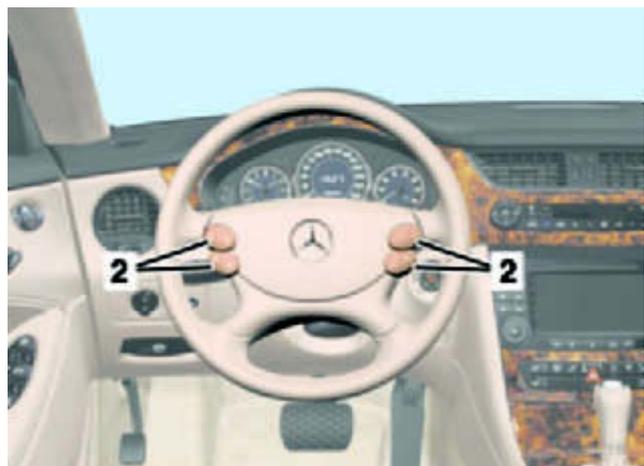
When the driver's door is opened (ignition off) or when the electronic key is removed, the steering column is moved in the direction of the instrument panel and raised. At the same time, if preset, the driver seat is moved to the rear. When closing the driver door the steering column and driver seat are automatically reset to the last adopted position.

The rotary switch (1) for the easy entry/exit is located on the adjuster lever for the electronic steering column adjustment below the combination switch (lights and windshield wipers) on the steering wheel.

On the latest-generation Mercedes-Benz vehicles the easy entry/exit in the control system can be switched on or off using the buttons on the multifunction steering wheel (2).



P46.15-2079-00



P46.15-2163-00

## Deactivation of easy entry/exit

### Deactivation of easy entry/exit

Care must be taken to ensure that no-one gets caught in moving parts when the easy entry/exit feature is operated.

The procedure must be stopped immediately if there is any risk of someone being caught in between moving parts.

This can be done either:

- By actuating the steering column adjustment switch (1) on the steering wheel

The seat and steering column immediately stop.



P46.15-2165-00

- By pressing the steering column adjustment switch (2) on the control panel on the driver door

The seat and steering column immediately stop.



P46.15-2164-00

- By actuating the switch for seat adjustment (3) on the control panel on the driver door
- By pressing the position key of the memory function (4)

The seat and steering column immediately stop.



P91.29-2380-00



### Risk of injury

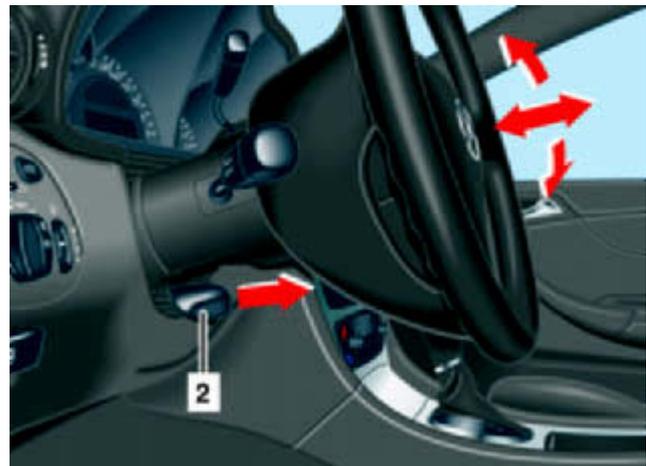
With regard to electronic steering column adjustment, when the switch is pressed, make sure that no-one gets jammed by the moving parts.

### Measures

**Stop the adjustment procedure immediately if anyone is at risk of getting caught in moving parts.**

Depending on the equipment specification Mercedes-Benz vehicles have a manual or electronic steering column adjustment.

The lever for manual steering column adjustment (2) is located lower down on the steering column.



P46.15-2080-00

The switch for electric steering column adjustment is located underneath the combination switch (lights and windshield wiper) on the steering wheel or on the control panel on the driver door (3).



P46.15-2081-00

## Observe roll bar



### Risk of injury

When **disconnecting the batteries** or when **cutting electrical lines**, the **ground lines must always** be disconnected or cut through first, as otherwise **there is a risk of short-circuiting**.

### Measures

**If this is not possible, insulated tools must be used to disconnect or cut the cables.**



### Risk of injury

There is a **risk of injury** through an untriggered **roll bar** in its **deployment area**.

If, in the course of **rescue work**, where **the battery has not been disconnected**, parts of the vehicle **undergo significant movement** or **electrical lines are cut**, a **deployment of the roll bar** cannot be ruled out. This can cause **injury** if there is anyone within the **deployment area** of the roll bar.

### Measures

**Disconnect all batteries. If this is not possible, the occupants must be protected before raising the roll bar.**

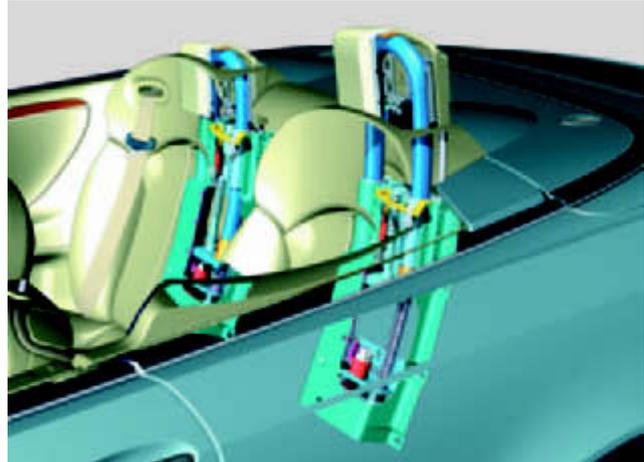
**Assistants should not be located in the deployment area, if the roll bar has not been deployed, unless it is absolutely necessary.**

**Do not place any objects in the area of a roll bar that has not been deployed.**

**Roll bar:**

In cases where the rescue or treatment of victims has to be carried out within the movement radius of an untriggered roll bar (e.g. where persons are trapped), the following points must be observed before commencing rescue operations:

- Switch off ignition
- Disconnect or cut both battery lines (positive and negative cables) (for vehicles with two batteries at both batteries)
- Do not place tools, rescue equipment or other objects on the roll bar when it has not been extended



P91.50-2058-00-00

*Extendable roll bar*

P91.50-2050-00

*Retractable roll bar*

## Observe occupant restraint systems



### Risk of injury

When **disconnecting the batteries** or when **cutting electrical lines**, the **ground lines** must always be disconnected or cut through first, as otherwise **there is a risk of short-circuiting**.

### Measures

**If this is not possible, insulated tools must be used to disconnect or cut the cables.**



### Risk of injury

In the **deployment area of airbags** that have not triggered, **there is a risk of injury**.  
If, during **rescue work**, where the **battery has not been disconnected**, parts of the vehicle **undergo significant movement** or **electrical lines are cut**, then **an airbag** (front airbag, sidebag or windowbag) may be deployed. In this case, **both the airbag and any loose objects or glass splinters**, which could be projected towards the accident victims or assistants, **may cause injuries**.

### Measures

**Cover occupants before commencing any work, preferably with a transparent sheet.**

**Wear protective clothing / safety glasses.**

**Disconnect all batteries. If this is not possible, avoid entering the untriggered airbag area!**

**Do not perform cutting work near untriggered airbags!**

**Avoid heating near untriggered airbags!**

**Do not use the area around untriggered airbags as a place to lay objects.**



**In the following vehicles both batteries must be disconnected:**

- E-Class (model 211)
- CLS-Class (model 219)
- SL-Class (model 230)

**If only one battery is disconnected, the other battery supplies the airbag system so that it remains active!**



**Merely cutting through the steering wheel rim or the spokes will not usually trigger the airbag!**

### Occupant restraint system (SRS - Supplemental Restraint System):

All Mercedes-Benz vehicles are equipped with seat belts and a supplemental occupant restraint system (SRS). The system encompasses:

- Indicator lamp **SRS** in instrument cluster
- Emergency tensioning retractor
- Belt force limiters
- Airbags

The rough position of an airbag in the vehicle can be ascertained by the "**SRS AIRBAG**" or "**AIRBAG**" badge at the installation location or in its immediate vicinity.

The following airbags may be available in the vehicle if equipped:

- Driver airbag in steering wheel housing
- Front passenger airbag above or in place of glove box
- Sidebags at front in doors or in outer sides of front seat backrests
- Sidebags at rear in doors or side panels
- Head/thorax sidebags in doors or in outer sides of front seat backrests
- Windowbags in roof frame between A and C-pillars
- Knee airbag in driver/front passenger footwells



P91.60-2419-00-00

*Driver airbag*



P91.60-2420-00

*Passenger airbag*



P91.60-2425-00

*Sidebag or head/thorax sidebag*

## Observe occupant restraint systems

**i** Various safety devices are available on the market which are intended to protect the victims and the rescue teams from airbag deployments.

The Mercedes-Benz vehicle airbag systems, however, are designed so that they can no longer be triggered by the airbag sensor systems after the battery has been disconnected. Such protection devices are therefore no longer required.



Sidebag or head/thorax sidebag

P91.60-2638-00-00

### **⚠** Risk of injury

When **protection devices** are used, whose purpose is to protect against **airbag deployment** after an accident, there is a **risk** that these protection devices may be **catapulted out of position** by the airbag deployment and thus present an **additional hazard potential** to both victim and rescue personnel.

We advise against using such "**protection devices**", which could **penetrate** the airbag fabric and thus prevent any pressure buildup, **because** in the event of an airbag deployment **the hot burn-off gas** can escape unhindered and cause **burn injuries**.

### Measures

**Cover occupants before commencing any work, preferably with a transparent sheet.**

**Wear protective clothing / safety glasses.**

**Disconnect all batteries. If this is not possible, avoid entering the untriggered airbag area!**

**Avoid heating near untriggered airbags!**

**Do not use the area around untriggered airbags as a place to lay objects.**

### Sidebags and windowbags:

Windowbags (1) and sidebags (2) or head/thorax sidebags are triggered:

- Whenever a high vehicle deceleration or acceleration acts in the transverse direction in the early stages of a collision
- Whenever additional protection can possibly be provided
- Always on the side of the collision; In vehicles with automatic front passenger seat occupied recognition, but only if the front passenger seat is detected to be occupied by a weight in excess of the minimum weight.
- Independently of the front airbags
- Irrespective of any activation of the emergency tensioning retractors
- When the vehicle overturns, only if a high vehicle deceleration in the transverse direction is detected and additional protection can be provided as a precaution



P91.60-2857-00

#### CLS-Class (model 219)

- 1 Window airbags
- 2 Side airbags
- 3 Gas generator windowbags

Neither the front nor the side airbags usually deploy in the case of rear-end collisions or rollovers.

On vehicles in the following model series both windowbags may be triggered following certain rollovers around the vehicle's longitudinal axis:

- E-Class (model 211)
- CLS-Class (model 219)
- S-Class (model 220, as of model refinement 10/2002)
- S-Class Coupé (model 215, as of model refinement 10/2002)

The head/thorax sidebags could be triggered on the passenger side and, depending on the seat occupation, on the following model series:

- SLK-Class (model 171)
- SL-Class (model 230)
- CLK-Class convertible, (model 209)

On vehicles in the other model series, windowbags are generally not triggered in the event of a rollover.

**i** By contrast to other airbag units the gas generators in the windowbags do not contain any solid fuel, but rather they are filled with highly-compressed gas and must not be cut! Depending on the vehicle model the gas generators for windowbags are located in the A or C-pillars. For technical reasons the installation locations deviate somewhat in the various model series.

For this reason, we urgently recommend that before commencing any cutting operations on A or C-pillars the corresponding inner paneling be removed and the installation positions of the gas generators for windowbags be ascertained.

## Observe occupant restraint systems

### Two-stage front airbag units:

 Risk of injury	Measures
<p>If on two-stage front airbag units, <b>only the first ignition stage</b> has been activated, then this <b>cannot be seen from the outside!</b> Despite a <b>triggered airbag</b> the same <b>safety precautions</b> must be met as for an airbag that has not yet triggered. A <b>triggering of the second ignition stage</b> during rescue work cannot always be ruled out.</p>	<p><b>Cover occupants before commencing any work, preferably with a transparent sheet.</b>  <b>Wear protective clothing / safety glasses.</b></p> <p><b>Disconnect all batteries. If this is not possible, avoid entering the untriggered airbag area!</b></p> <p><b>Do not perform cutting work near untriggered airbags!</b></p> <p><b>Do not use the area around untriggered airbags as a place to lay objects.</b></p>

Two-stage front airbag units are equipped with two ignition stages which are triggered independently depending on the deceleration values in the longitudinal direction.

The following vehicles are fitted with two-stage front passenger front airbags as standard:

- S-Class (model 220)
- S-Class coupé (model 215)

Two-stage driver and front passenger airbags are included in standard equipment for the following vehicles:

- A-Class (model 169)
- C-Class (model 203)
- E-Class (model 211)
- CLK-Class (model 209)
- CLS-Class (model 219)
- SLK-Class (model 171)
- SL-Class (model 230)
- SLR McLaren (model 199)
- M-Class (model 163 as of 09/2000)

On vehicles with two-stage front airbag units, only one ignition stage may be activated, depending on the severity of the accident

It is not **externally apparent**, whether only **one** or **both ignition stages** have been activated. For this reason, the safety precautions for vehicles with two-stage front airbag units are to be observed (just like for airbags that have not been deployed) despite a triggered front airbag.

 The triggering strategies for the supplemental restraint system are subject to modification such as gained from recent knowledge in accident research.

 Risk of injury	Measures
<p>Occupants may be injured through <b>contact with the airbag</b> during the deployment, e.g. the insides of the lower arm or the face may suffer from <b>reddening of the skin</b> and <b>abrasions</b>. Slight <b>irritation of the respiratory passages</b> cannot be ruled out.</p>	<p><b>The state of the accident victim must, where possible, be assessed taking the following aspects into consideration, in order to implement suitable precautions.</b></p>

The airbag's air sack inflates within a few milliseconds during the collision. The air sack reaches its maximum volume in approximately 45 ms. Immediately after maximum volume is reached the airbag starts to deflate. The gas escapes through an air hole or through the fabric and the airbag collapses (exception: windowbags).

Triggered airbags that are hanging down can be pushed to the side or upwards so as to create the required space for the rescue measures. Airbags do not have to be cut or covered up. A triggered airbag has no medical risks for the occupants or the rescue crew.

In cases in which the rescue or care is to be performed in the area of airbags that have not been triggered, the following must be observed:

- Switch off ignition
- Detach or cut electrical lines on battery (for vehicles with two batteries this applies to both batteries)
- Do not perform cutting work in the immediate vicinity of the airbag units concerned!
- If there are no occupants in the rear seats, move the front seats as far to the rear as possible

Avoid overheating the area around the airbag unit, such as the steering wheel impact plate, the instrument panel on the passenger side and the door linings. If an airbag unit is heated e.g. through fire to **more than 160° C, then it will probably be triggered.**

 **The white, powdery residues left inside the vehicle after deployment of an airbag are nontoxic. They consist for the most part of talcum, which acts as a lubricant for the airbag fabric!**

## Observe occupant restraint systems

### Seat belts

The seat belt buckles can usually be opened normally after a crash. However, it is often easier to cut the belts at an easily accessible point. In this way the rescue crew do not need to lean over the victim, which might cause further discomfort or injury. Furthermore, leaving the belt buckle fastened provides the police with evidence that the belt was being worn.

Mercedes-Benz vehicles (depending on the vehicle model and equipment) are equipped with emergency tensioning retractors on both the driver and front passenger seats as well as the outer rear seats.

### Emergency tensioning retractor

The emergency tensioning retractors and seat belt retractors are installed as a unit lower down on the B and C-pillars, the buckle emergency tensioning retractors are located in the seat belt buckles. The seat belt emergency tensioning retractors are activated in frontal or rear-end collisions with a sufficiently high deceleration or acceleration acting in the longitudinal direction. Additionally, the emergency tensioning retractors are activated at specific rollovers around the vehicle's longitudinal axis, if the vehicle is equipped with a rollover sensor, and in the event of a side collision on the side away from the impact. The emergency tensioning retractors and buckle emergency tensioning retractors are only activated if the seat belt buckles are inserted.

The seat belt emergency tensioning retractors do not normally require special consideration,

### Automatic comfort-fit belt feature

The automatic comfort-fit feature reduces the extension and retraction forces of the inertia reel when the belt is being worn, and makes the wearing of the seat belt more comfortable for the occupants.

When the tab of the seat belt is inserted into the buckle, the mechanism switches from a strong to a weaker comfort spring.



**When the seat belt emergency tensioning retractor is activated, the belt is retracted by max. 150 mm. The retractors cannot be triggered after the battery has been disconnected!**

### Emergency tensioning retractors on PRE-SAFE

The preventive passive occupant protection system PRE-SAFE can recognize critical driving situations that present an increased accident hazard, and prepare the vehicle and occupants preventively for a possible collision:

- The driver's and front passenger's seat belts are tightened as a precaution
- The front passenger seat is moved to a better longitudinal position and the cushion and backrest angles adjusted
- In vehicles with electrically adjustable individual rear seats, the inclination angle of the seat cushion can be optimized

The aim of this system is to move the occupants into the best possible position before any collision so that the seat belts and airbags can provide optimum protection in the crash.

When skidding outside the ESP controlled range, which could ultimately cause the vehicle to rollover, the sliding roof (when open) is closed.



P91.40-2456-00

### Reversible emergency tensioning retractors

The seat belt emergency tensioning retractors in the inertia reels are electrically operated and reversible. If an accident is prevented, the preventive emergency tensioning retraction loosen the seat belts again.

### Buckle emergency tensioning retractor

The buckle emergency tensioning retractors are activated by pyrotechnics in the event of a collision. These are located on each seat belt buckle.



P91.40-2457-00

## Fuel cell drive system

### A-Class F-cell (model 168) with fuel-cell drive



#### Risk of injury

#### Measures

**Risk of injury** from cables and components carrying the traction voltage.

**Deactivate the traction voltage circuit.**  
**Do not cut traction voltage lines.**



#### Risk of injury

#### Measures

**Risk of explosion** from escaping hydrogen.

**Deactivate the traction voltage circuit.**  
**Deactivate the hydrogen circuit.**  
**Do not cut hydrogen lines.**



#### Risk of injury

#### Measures

**Risk of injury** from cables and components carrying the traction voltage.

**Risk of explosion** from escaping hydrogen.

**Do not deform or cut through the bodywork near the right and left C-pillars or along the vehicle floor using cutting equipment.**

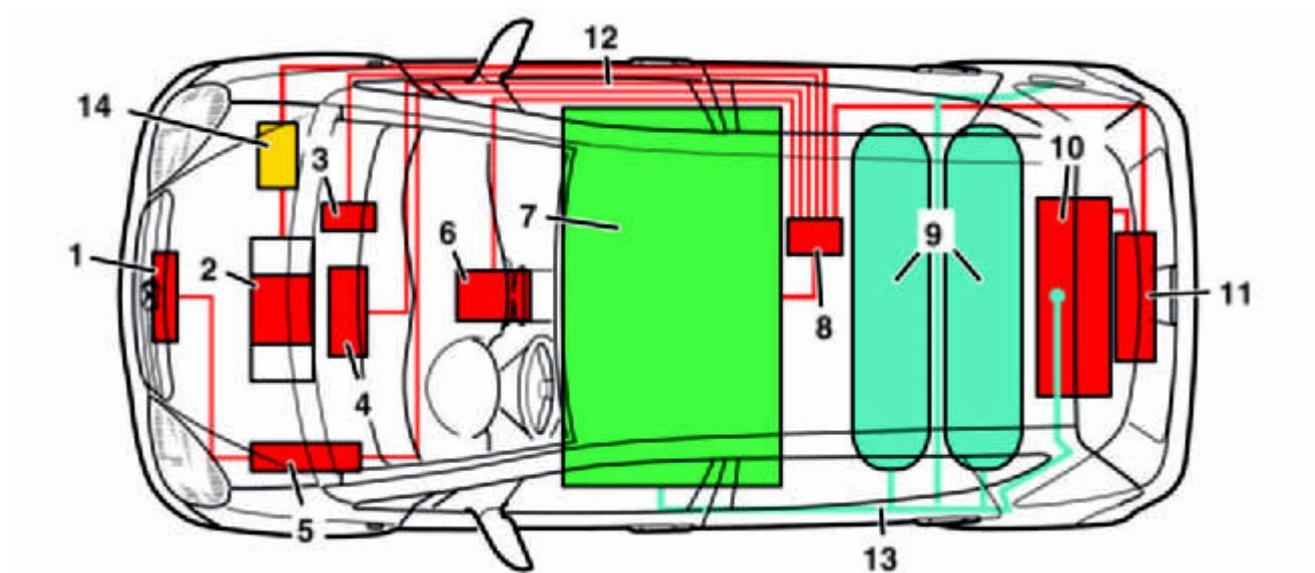
## Special features of vehicles with fuel cell drive system (A-Class F-Cell)

The body, interior equipment and the location of the airbags are the same as in the A-Class (model 168) with internal combustion engine (cf. summary on page 61).

The overall fuel cell system is arranged in the sandwich body floor of the A-Class (model 168) with long wheelbase.

The 12 V power supply battery (14) is located on the right side of the engine compartment, and two cylindrical hydrogen tanks (9) are installed at the rear in place of the fuel tank.

## Location of components



P00.00-3457-00

- |                                 |                                     |
|---------------------------------|-------------------------------------|
| 1 Fan motor                     | 8 Power distribution unit (PDU)     |
| 2 Engine with transmission      | 9 Hydrogen tanks                    |
| 3 High-temperature coolant pump | 10 450V traction voltage battery    |
| 4 Air conditioner compressor    | 11 DC/DC traction voltage converter |
| 5 Fan rectifier                 | 12 Traction voltage cables          |
| 6 PTC heater booster            | 13 Hydrogen lines                   |
| 7 Fuel cell stack               | 14 12V power supply battery         |

## Fuel cell drive system

The traction voltage lines between the fuel cell stack, engine and the traction voltage battery in the trunk are routed under the right side of the vehicle. The **traction voltage lines** are colored **orange**.

The hydrogen lines between the tanks and the fuel cell stack are arranged at the bottom left of the vehicle. The tank line runs from the tank connection at the rear on the right over the wheel housing to the hydrogen tanks. The **hydrogen lines** are marked:

- **Yellow = low pressure**
- **Yellow/Red = high pressure**

**i** Before commencing any rescue action, make sure that the traction voltage and hydrogen circuits are deactivated!

**i** If the venting line is cut, hydrogen gas may escape into the inside of the car, or the cut venting line may seal itself.

### Venting line:

The venting line leads from the main valve on the hydrogen tanks, along the left C-pillar to the discharge opening in the base of the antenna (arrow) on the roof.



P47.30-2074-00

### Shutting off the voltage and hydrogen circuits manually:

- Move the selector lever to position "P"
- Turn the ignition key to position "OFF" and remove
- Disconnect 12 V battery (in engine compartment)
- Press the Service Disconnect switch

**i** The traction voltage battery (450 V) in the trunk does not need to be disconnected. It is automatically switched off via a contactor, if hydrogen or a 12 V voltage circuit is interrupted or disabled.

## Automatic shutoff of the voltage and hydrogen circuits:

The F-Cell safety system monitors all the safety-relevant operating states of the vehicle. If a critical state occurs, appropriate actions are initiated.

In event of a crash the active crash safety system actuates the restraint systems (airbags, emergency tensioning retractors) and disables by way of an additional crash switch the hydrogen supply of the fuel cell and the traction voltage circuit. The crash switch responds as of a defined acceleration in the longitudinal and transverse directions.

After triggering, the ball in the crash switch can be pushed back into its original position. This allows the vehicle to be driven to the nearest workshop following a minor accident, without damage to the safety-relevant components of the fuel cell system.

The crash switch is located on the center console in the right footwell (arrow).



P54.25-3408-00

## Shutting off the voltage and hydrogen circuits manually:

In order to ensure that the **hydrogen and traction voltage circuits have been deactivated**, the Service Disconnect switch must be actuated by separating plug connector. The plug connector (arrow) is located behind the cover on the right in the trunk. If the Service Disconnect switch is not accessible after an accident, disconnect the 12 V battery in the engine compartment or cut through the electrical lines on the battery.



P54.25-3409-00

## Natural gas power

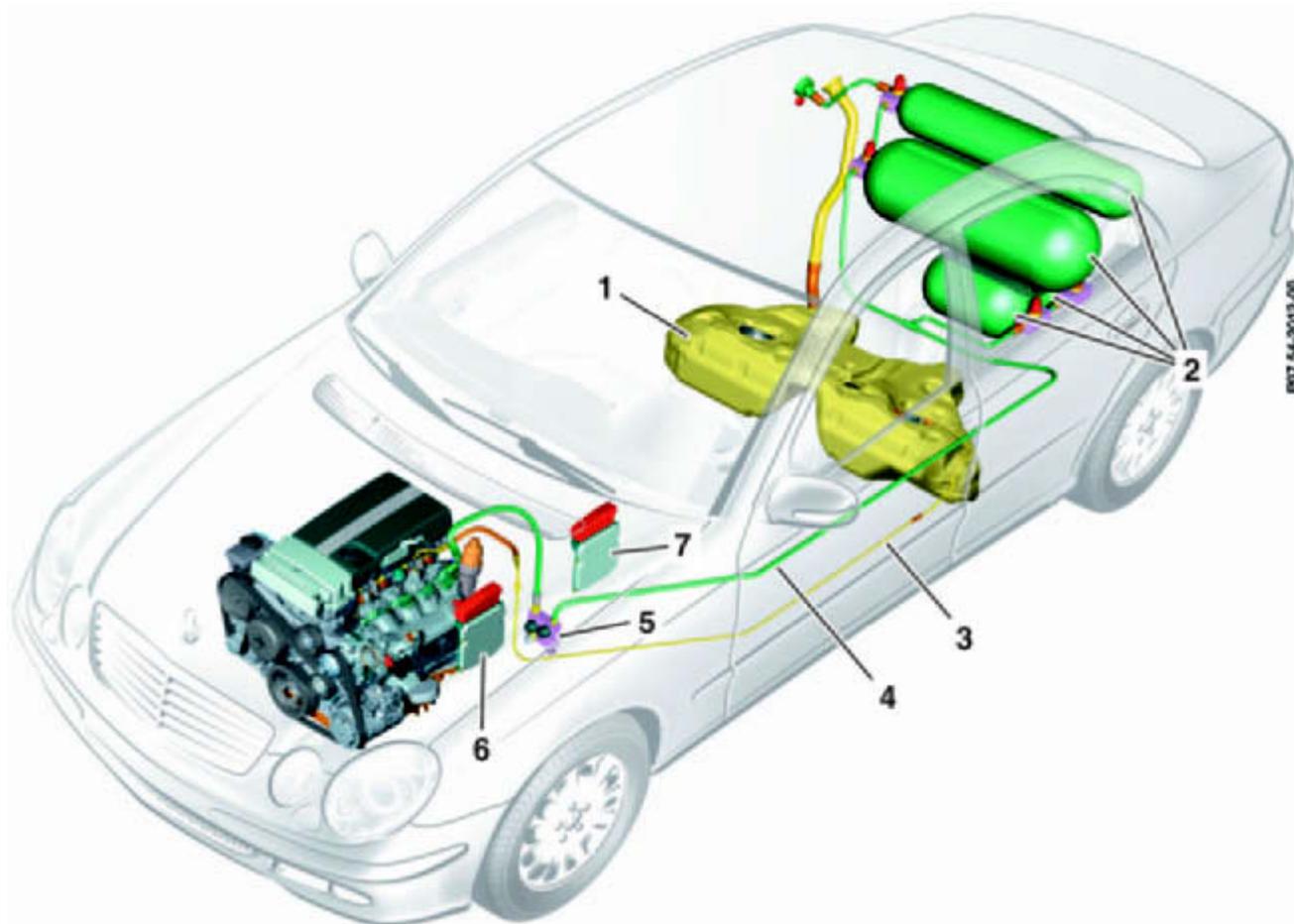
### Bivalent engine operation

In the sedan of the E-Class (model 211) an engine is used for the first time with a gasoline and natural gas drive. The engine can be operated with either natural gas or gasoline. The changeover of modes is done manually using the buttons on the multifunction steering wheel or automatically, if one of the two fuel modes has been used up.

In addition to the conventional fuel tank, the vehicle is fitted with four stainless steel natural gas tanks which are located in the spare wheel well and behind the rear seats in the trunk. The natural gas is stored in these pressure tanks under a normal pressure of up to

200 bar at a gas temperature of 15° C. Filling of the natural gas tanks is done by way of a filling connection, which is located next to the gasoline filler neck behind the extended fuel filler flap at the right rear in the direction of travel.

The most suitable form of natural gas for operating a vehicle is compressed natural gas (CNG). CNG is naturally occurring gas in compressed form.



**E-Class sedan (model 211) E 200 NGT (Natural Gas Technology)**

- |                         |                                       |
|-------------------------|---------------------------------------|
| 1 Gasoline fuel tank    | 5 Gas pressure regulator              |
| 2 Gas cylinders         | 6 Motor electronics control unit (ME) |
| 3 Gasoline fuel line    | 7 CNG control unit                    |
| 4 Natural gas fuel line |                                       |

## Safety

- Natural gas is lighter than air. Thus there are no restrictions on driving natural gas vehicles in multilevel car parks and tunnels.
- Extensive series of tests (drop tests, fire tests, crash tests) have demonstrated that the high-strength tanks, lines, threaded connections and other fittings guarantee the highest possible safety levels even in the event of accidents. Thus, natural gas vehicles have no disadvantages in terms of crash behavior compared to conventionally powered vehicles.
- The installation of components in the vehicle for the natural gas mode serves to ensure that gas cannot enter the vehicle's interior.
- The risk of fire is no greater in natural gas vehicles than in gasoline or diesel-powered vehicles.



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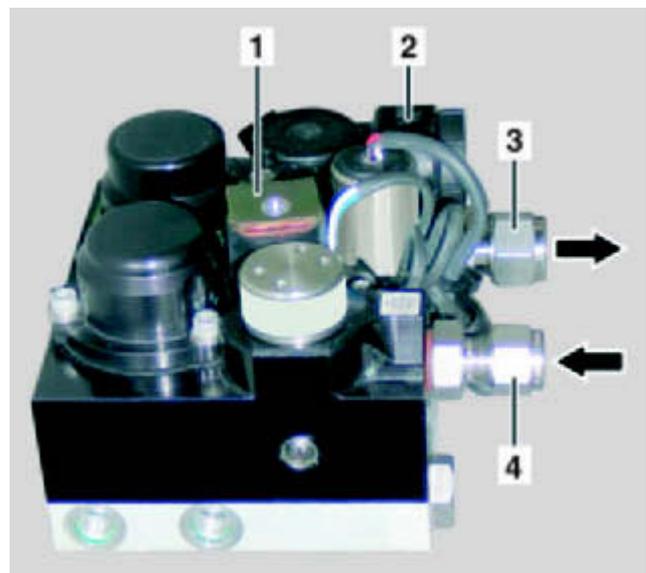
**Natural gas filling terminal**

## Gas pressure regulator

The task of the gas pressure regulator (in the engine compartment) is to reduce the high-pressure prevalent in the gas cylinders to the pressure required for the engine induction side.

The gas safety shutoff valve (1) in the pressure regulator is shutoff, if a system error is detected by the CNG control unit or, in the event of an accident, a corresponding crash signal is processed.

In the event of a malfunction in the pressure regulator, an overflow restrictor (2) reduces impermissibly high pressure by releasing it into the atmosphere.



P07.54-2036-00

**Gas pressure regulator**

- 1 Gas safety shutoff valve
- 2 Overflow restrictor
- 3 Line connection to engine
- 4 Line connection from gas cylinders

## Natural gas power

### Gas cylinders and connection fitting with safety functions

- **Gas safety shutoff valve (1)**

At ignition "ON" and gas operation the safety shutoff valve is opened. When the engine is off or in gasoline mode or in an emergency situation (crash signal from ME-SFI control unit), the solenoid valve circuit is interrupted, and the valve closes automatically.

- **Mechanical shutoff valve (2)**

During service work, or if the natural gas tank system leaks, the gas cylinders can be sealed using a suitable tool with the mechanical shutoff valve. It is closed by turning in the clockwise direction.

- **Fuse (3)**

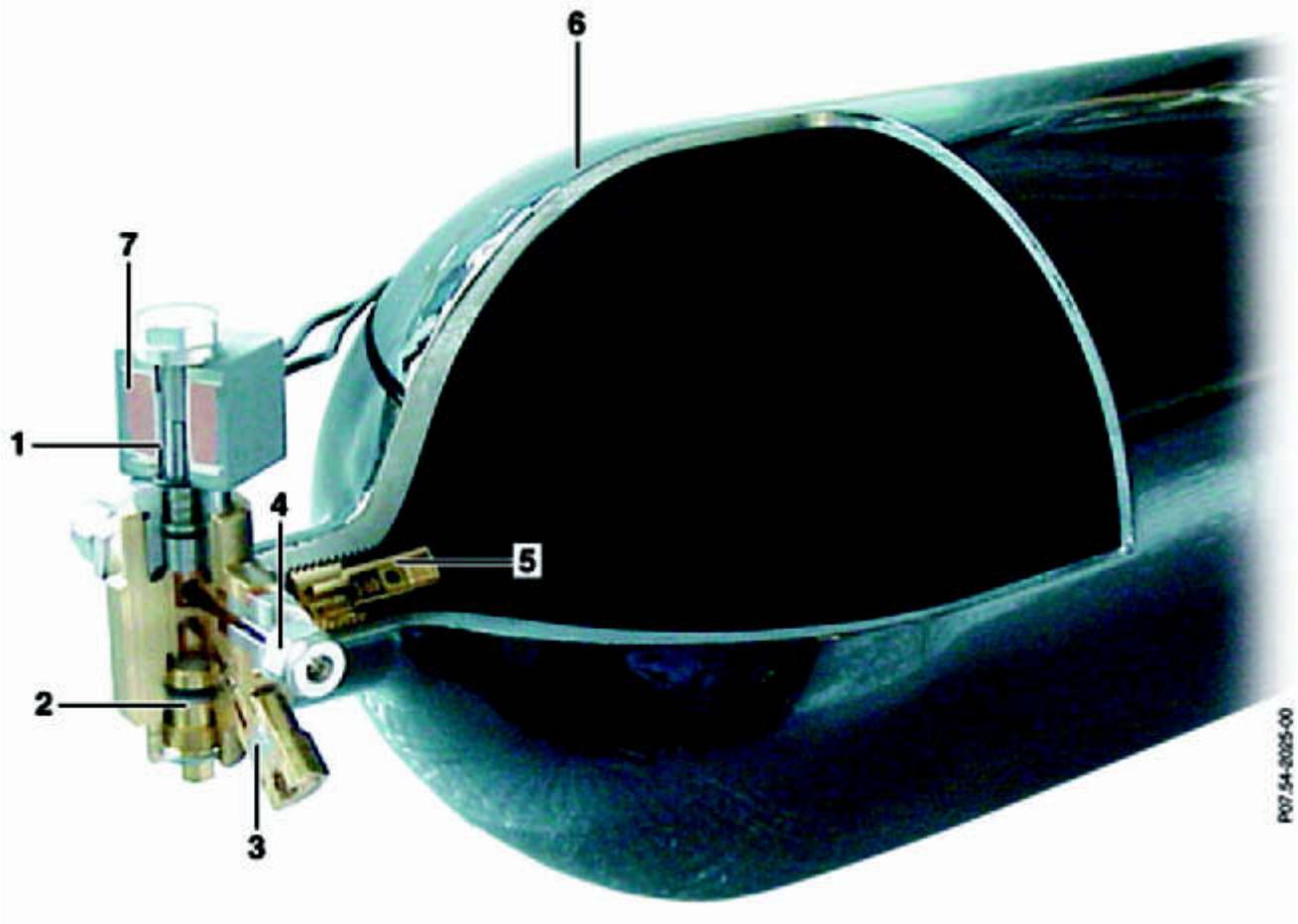
The fuse reacts at temperatures above 110 ° C and opens the associated gas cylinder. The content of the gas cylinder can then escape into the atmosphere in a controlled manner via the flow limiter (5).

- **Flow limiter (5)**

If there is a significant pressure drop in the system, e.g. in a crash involving separation of the entire connection fitting or a broken line in the system between a gas cylinder and the gas pressure regulator, the flow limiter screwed into the neck of the gas cylinder reduces the escaping gas by means of a very small shutter.

- **Rubber caps (6)**

The safety fittings are fitted with gas-tight rubber caps. If the fuse (3) blows or gas escapes at the shutoff valves (1, 2), it is collected in the rubber caps and directed into the atmosphere via the connected corrugated tube on the vehicle floor.



**Gas cylinder and connection fitting with safety functions**

- 1 Safety shutoff valve
- 2 Manual shutoff valve
- 3 Fuse
- 4 Threaded connection
- 5 Flow limiter
- 6 High-strength steel cylinder

## General

### Location of airbags:

The airbags in Mercedes-Benz passenger car model series are located as follows if equipped:

- In the steering wheel (driver airbag)
- Above glove box or in place of it in the instrument panel (front passenger airbag)
- In the doors (sidebags or head/thorax sidebags)
- In the outer areas of the seat backrests (front sidebags or head/thorax sidebags)
- In the area of the roof pillars and side roof frame (windowbags)
- In the footwell below the instrument panel (knee airbags)

The position of each airbag is recognizable by the symbol "**SRS AIRBAG**" or "**AIRBAG**" on the airbag or in immediate vicinity of installation location.

### Location of battery:

The battery in Mercedes-Benz passenger car model series is located as follows if equipped:

- In the engine compartment
- In the right front of the passenger compartment
- Under the left or right rear seat
- Under the driver seat
- under the front passenger seat
- In the luggage or load compartment

On vehicles with two batteries (E-Class/model 211, CLS-Class/model 219, SL-Class/model 230) one battery is in the luggage compartment and one in the engine compartment.

On the SLR McLaren (model 199) both batteries are located in the luggage compartment.

All models are fitted with a prefuse which breaks the connection between the alternator and the positive battery terminal in the event of a short circuit, thus eliminating one potential source of fire.

SLK-Class vehicles (model 171) with compressor engine are equipped with a cutoff relay (alternator/battery) or a prefuse. The cutoff relay interrupts the connection between the alternator and the positive battery terminal in the event of a crash involving activation of an airbag or the seat belt emergency tensioning retractors. This prevents possible short circuits caused by deformed vehicle parts. The cutoff relay is activated on "Ignition ON" and is triggered directly by the airbag control unit.

**Location of structural reinforcements:**

The structural reinforcements of relevance to rescue operations are all located in the region of the passenger cell.

The layout of the side protection elements differs according to the model series concerned. These include in particular the A, B and C-pillars, all the roof frames and the door areas. With regard to the doors, the significant areas are the end faces of the doors (hinge or lock area) and all the longitudinal and lateral reinforcements running between the door end faces. Tubular door reinforcements are installed at the height of the car bumpers.

**Location of fuel tank:**

The fuel tank in the Mercedes-Benz passenger car model series is located in the area in front or above the rear axle or under the loading floor.

The fuel lines are routed in protected areas along the center tunnel or the side skirt and are mainly made of metal. In the engine compartment they are routed such that in the event of a deformation of the front end as a consequence of a head-on collision a fuel line can for the most part not be ripped off.

The fuel pump is shut down automatically when the engine comes to a stop.

The illustrations on the following pages show the possible location of **airbags, batteries, structural reinforcements and fuel tanks**.

This is special equipment for some of the airbags. In other words, not all the airbags listed are available in each vehicle model.



**The tubular door reinforcements between the end faces of the doors, the A and B-pillar reinforcements and the retractable top linkage on convertibles and roadsters cannot be cut using conventional fire brigade hydraulic cutting gear!**

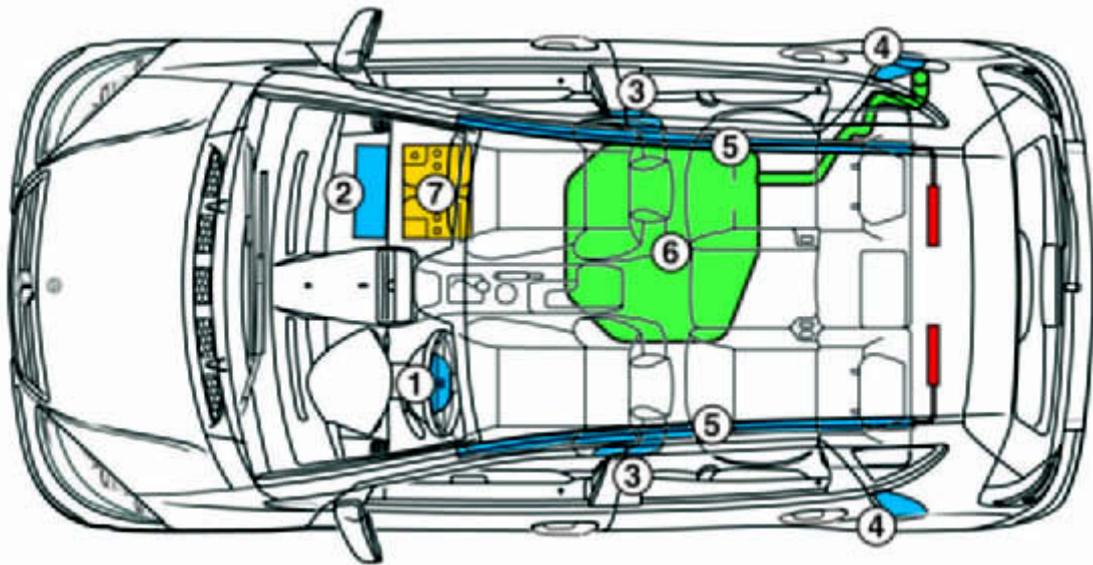
They are made of high-strength steel with a tensile strength significantly higher than  $1000 \text{ N/mm}^2$ , they have a tube diameter between 20 and 30 mm and a wall thickness of approx. 2 to 3 mm.

Sedan

A-Class (model 169)



P00.00-3665-00



P00.00-3664-00

Location:

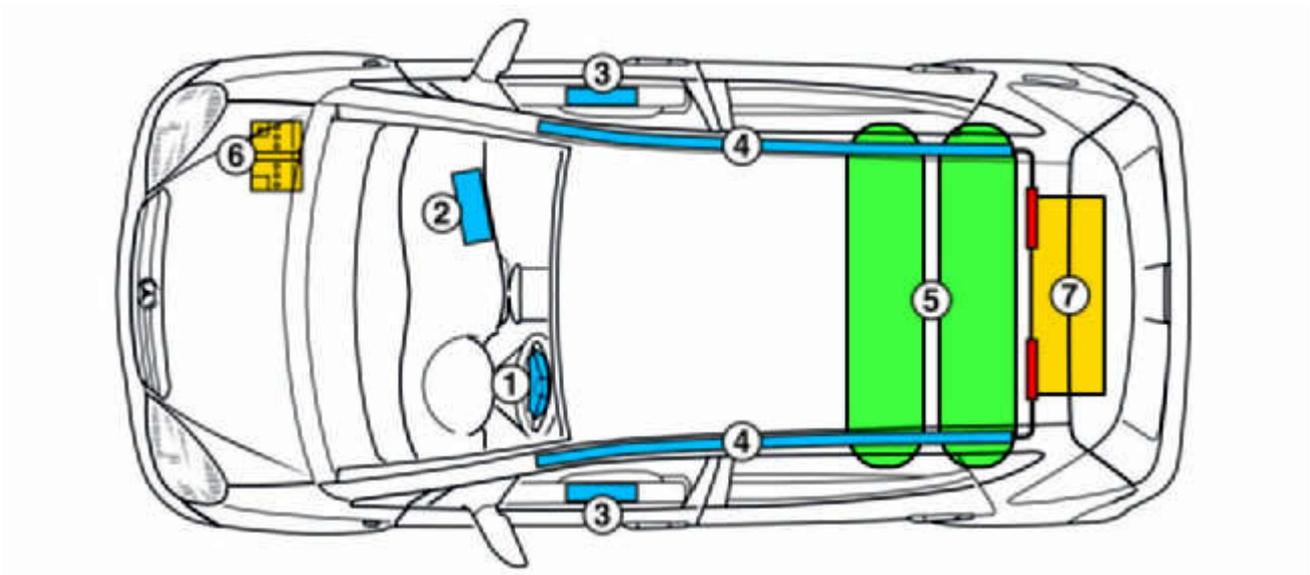
- Airbag
- Gas generators
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Head/thorax sidebags or front sidebags (in seat backrests)
- 4 Rear sidebags (in C-pillars)
- 5 Window airbags
- 6 Fuel tank
- 7 Battery (footwell on front passenger side)

*A-Class F-Cell (model 168)*



P00.00-3459-00



P00.00-3460-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank

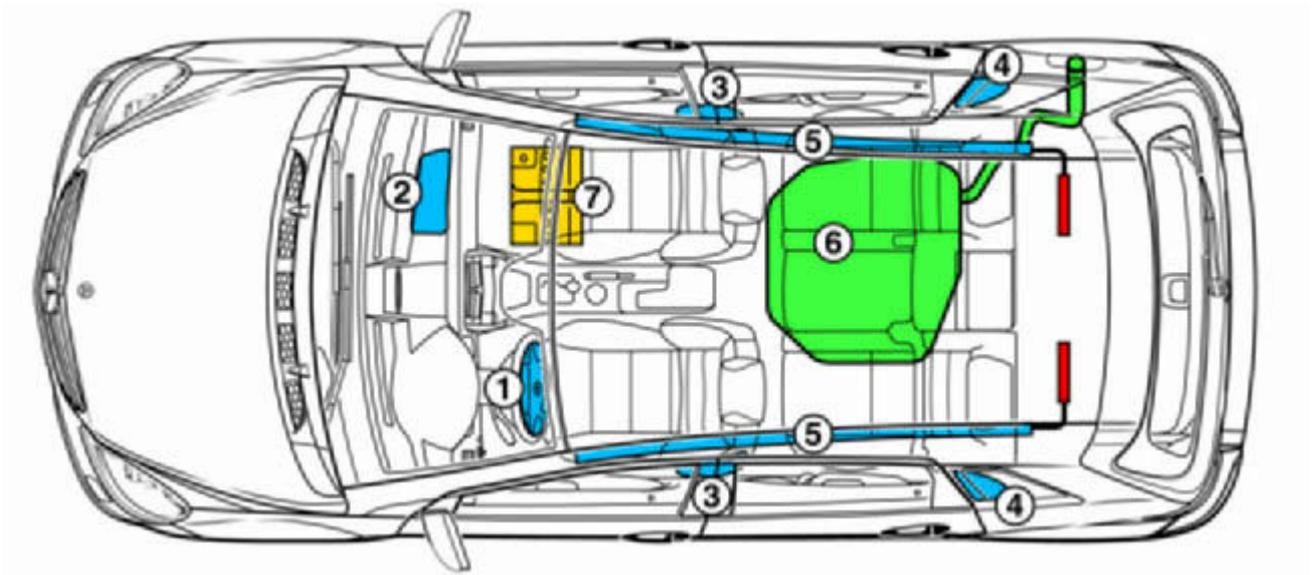
- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Window airbags
- 5 Hydrogen tanks
- 6 Power supply battery 12V
- 7 450 V traction voltage battery

Sedan

*B-Class (model 245)*



P00.00-3812-00



P00.00-3815-00

**Location:**

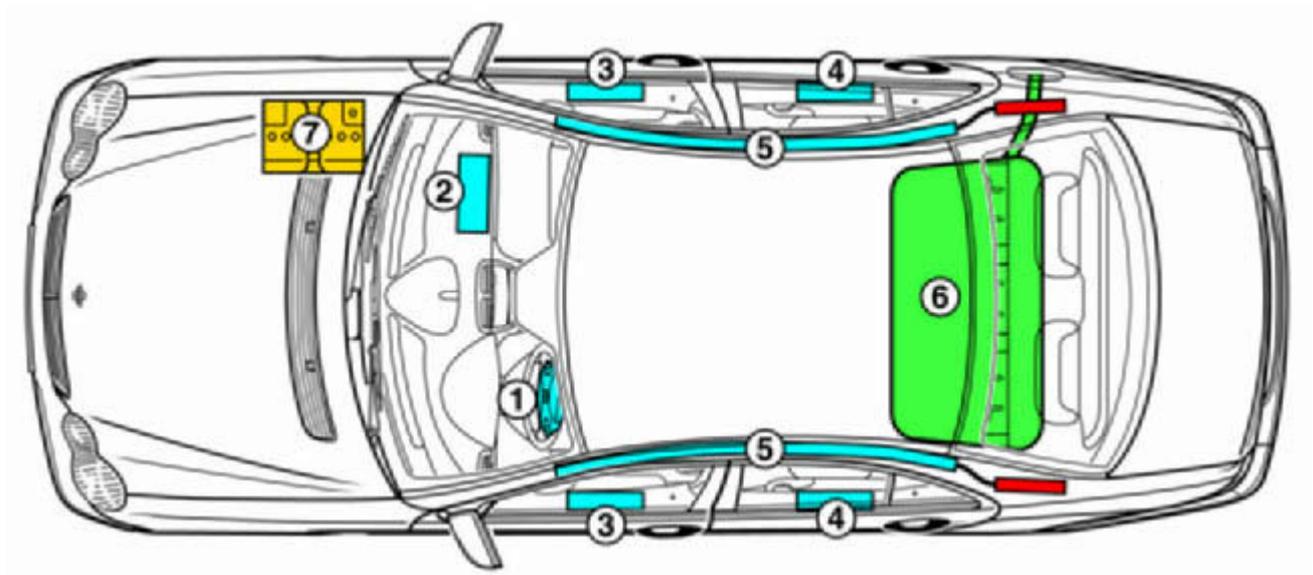
- Airbag
- Gas generators
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags in the seat backrests
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery in front passenger footwell

*C-Class (model 203)*



P00.00-3248-00



P00.00-3249-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank

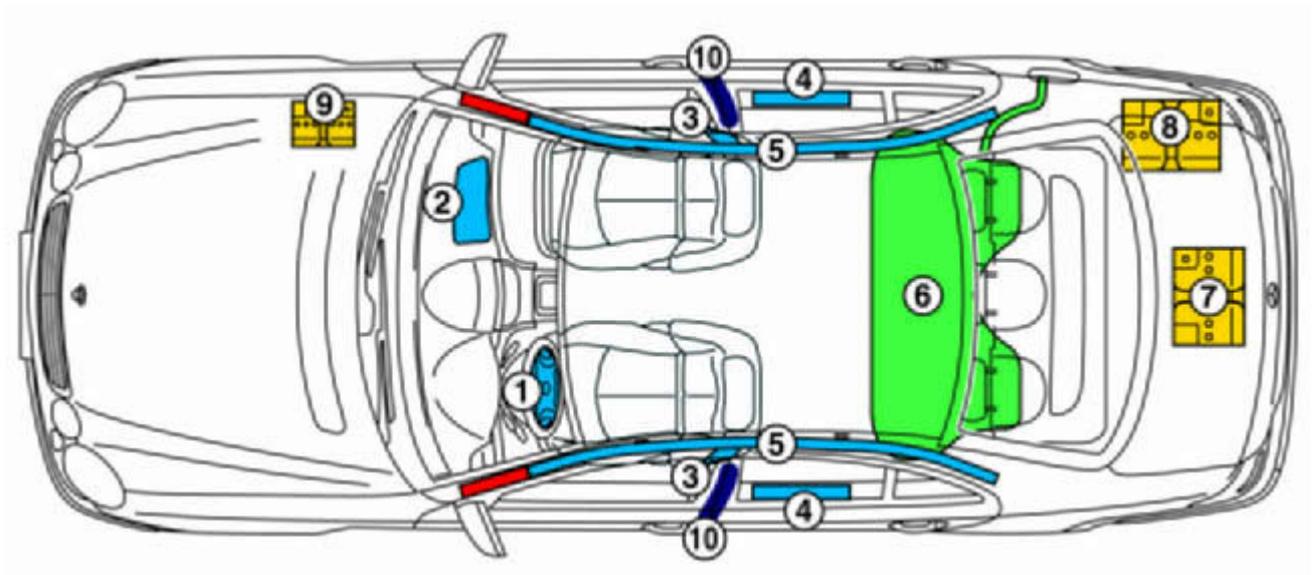
- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery

Sedan

*E-Class (model 211)*



P00.00-3666-00



P00.00-3379-00

**Location:**

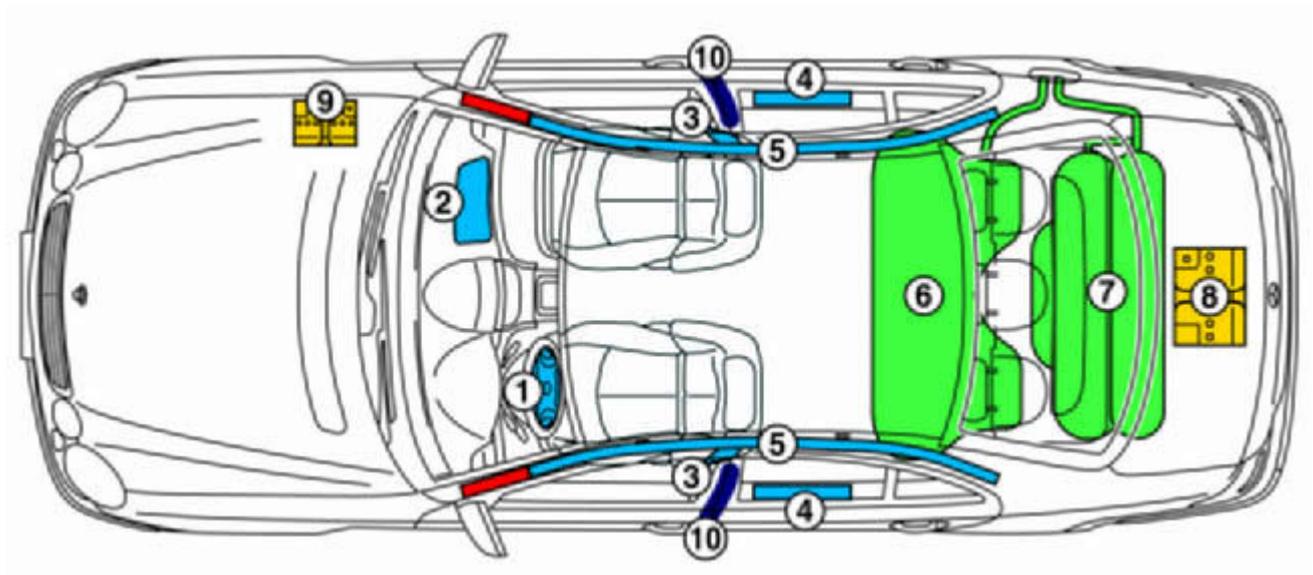
- Airbag
- Gas generators
- Battery
- Tank
- Structural reinforcements

- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags (in seat backrests)
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Main battery (equipment without spare wheel)
- 8 Main battery (equipment with spare wheel)
- 9 Battery in engine compartment
- 10 Reinforcement for B-pillars

**E-Class (model 211)**  
**with bivalent natural gas drive**



P00.00-3666-00



P00.00-3667-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank
- Structural reinforcements

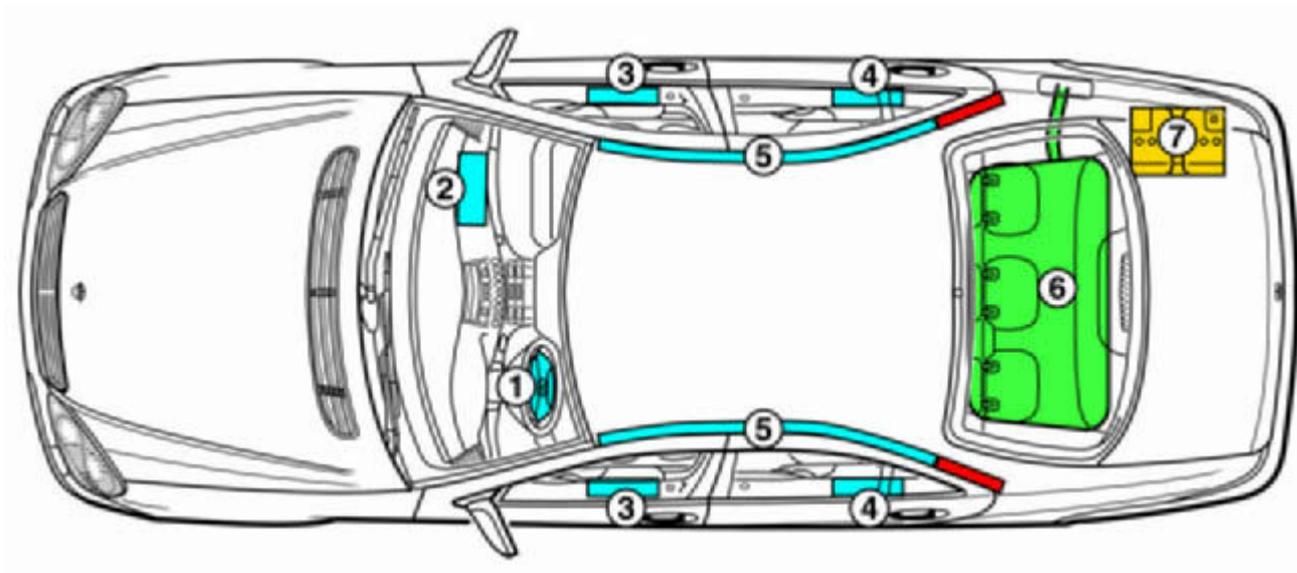
- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags (in seat backrests)
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Natural gas tanks
- 8 Main battery in luggage compartment
- 9 Battery in engine compartment
- 10 Reinforcement for B-pillars

# Sedan

*S-Class (model 220)*



P00.00-3256-00



P00.00-3257-00

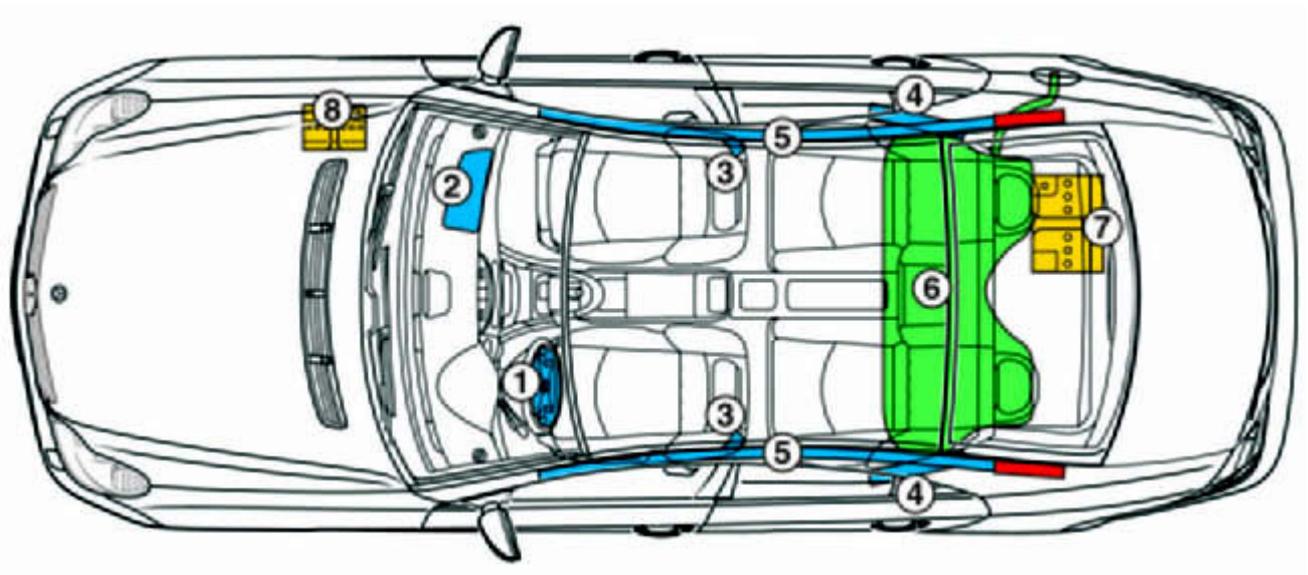
**Location:**

- Airbag
- Gas generators
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery

*S-Class (model 221)*

P00.00-3811-00



P00.00-3814-00

**Location:**

	Airbag
	Gas generators
	Battery
	Tank

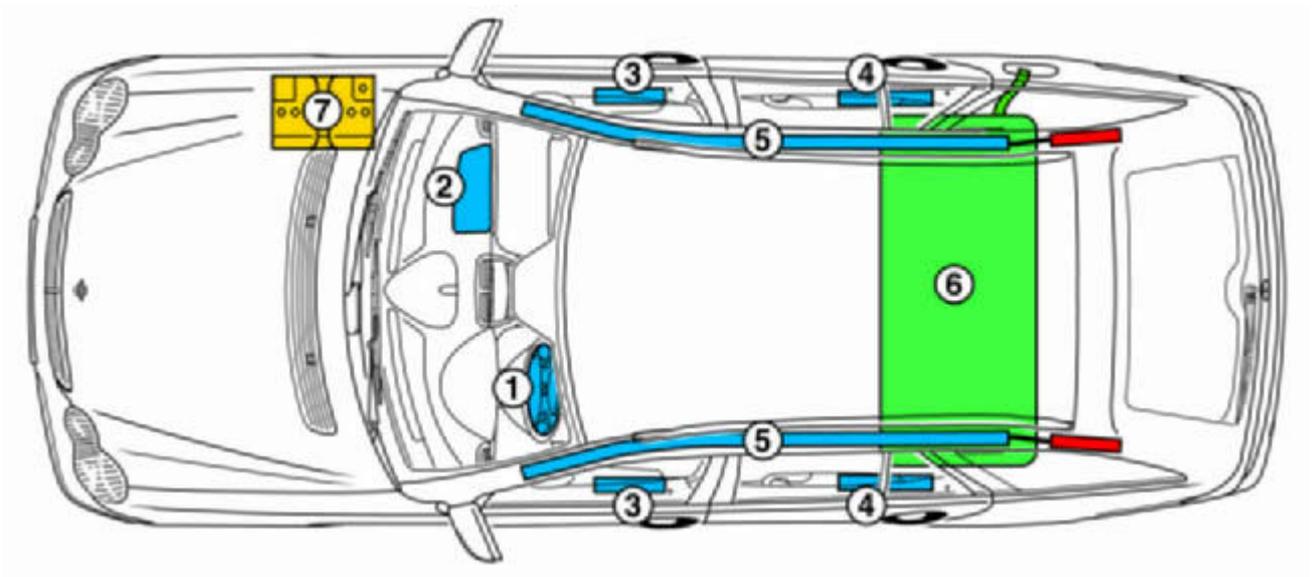
- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags in the seat backrests
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 On-board electrical system battery in trunk
- 8 Starter battery in engine compartment

# T-model

C-Class (model 203)



P00.00-3464-00



P00.00-3456-00

**Location:**

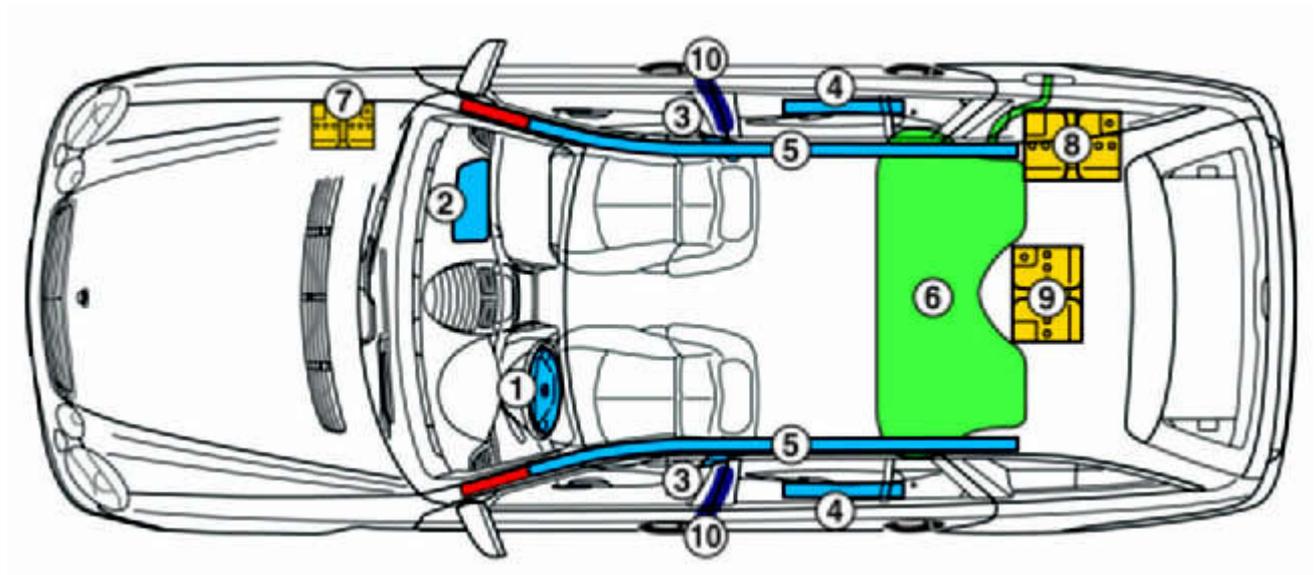
- Airbag
- Gas generators
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery

*E-Class (model 211)*



P00.00-3453-00



P00.00-3454-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank
- Structural reinforcements

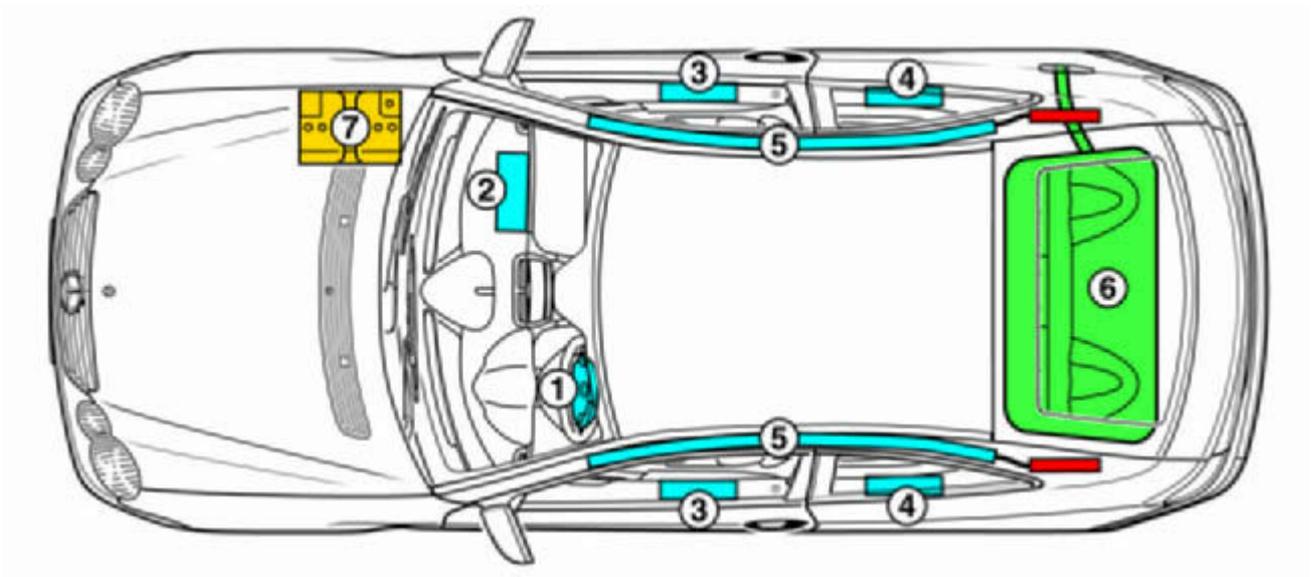
- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags (in seat backrests)
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery in engine compartment
- 8 Main battery (equipment with spare wheel)
- 9 Main battery (equipment without spare wheel)
- 10 Reinforcement for B-pillars

# Coupé

*C-Class sports coupé (model 203)*



P00.00-3246-00



P00.00-3247-00

**Location:**

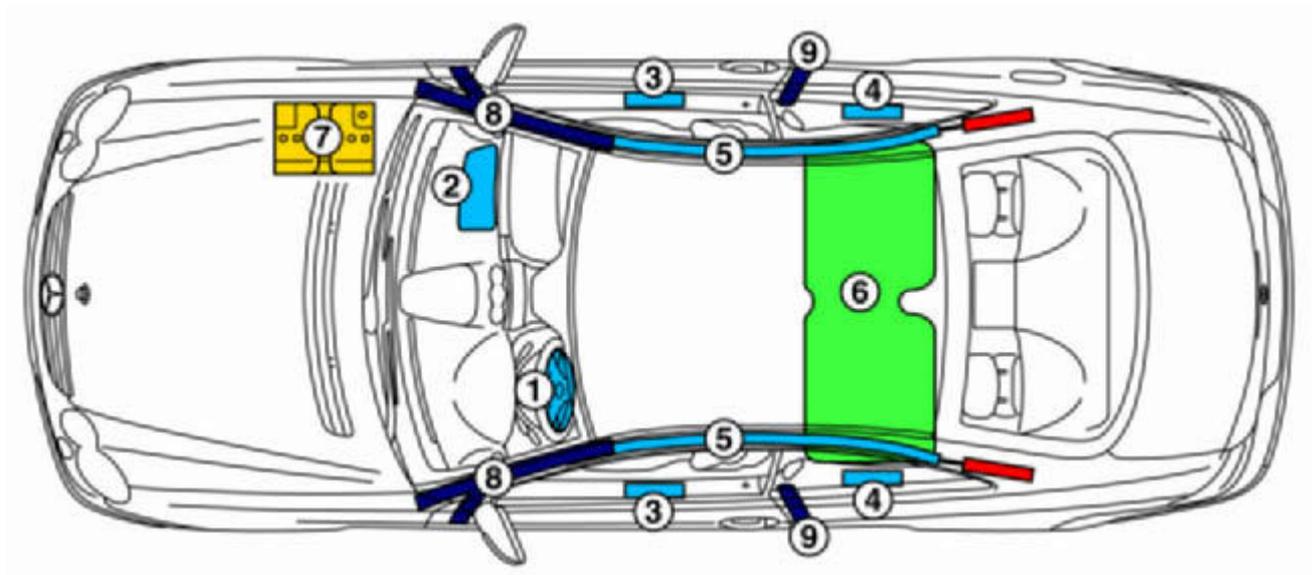
- Airbag
- Gas generators
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery

**CLK-Class** (model 209)



P00.00-3465-00



P00.00-3377-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank
- Structural reinforcements

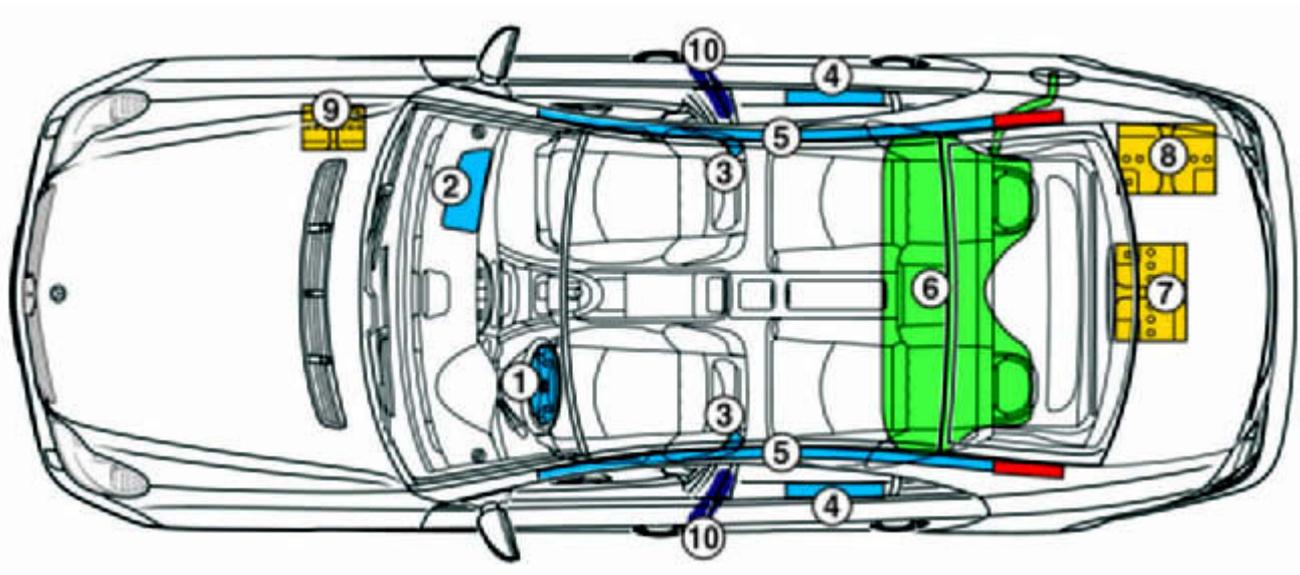
- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery
- 8 Structural reinforcements on A-pillars
- 9 Structural reinforcements on B-pillars

# Coupé

*CLS-Class (model 219)*



P00.00-3671-00



P00.00-3672-00

**Location:**

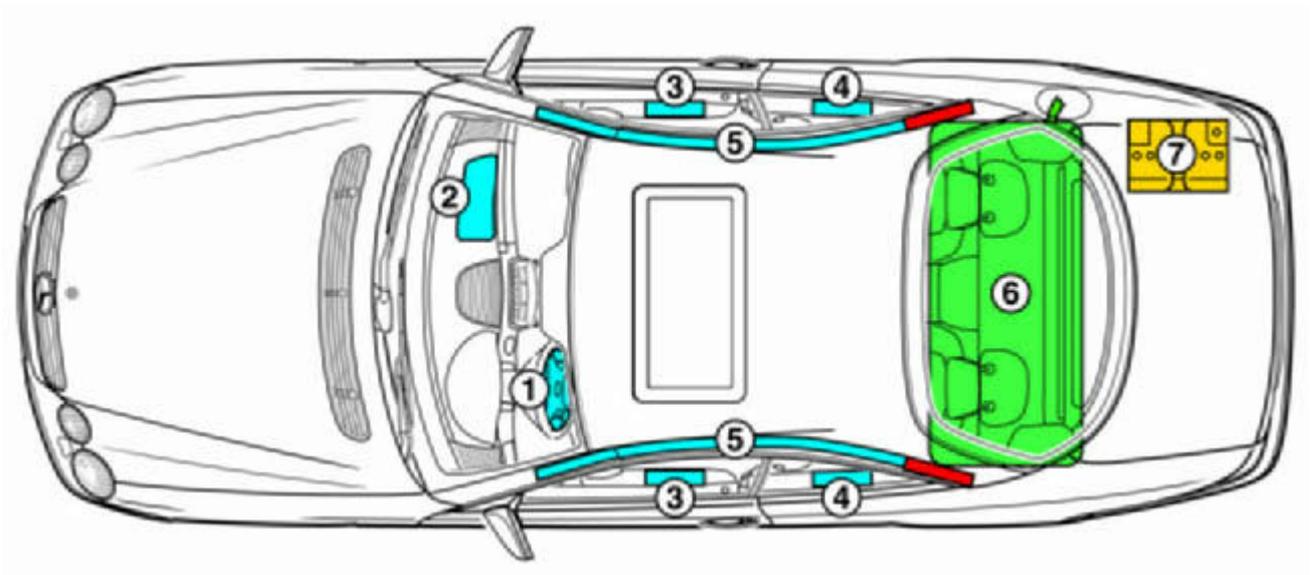
- Airbag
- Gas generators
- Battery
- Tank
- Structural reinforcements

- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Main battery (equipment without spare wheel)
- 8 Main battery (equipment with spare wheel)
- 9 Battery in engine compartment
- 10 Structural reinforcement of B-pillars

*S-Class coupé (model 215)*



P00.00-3467-00



P00.00-3255-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank

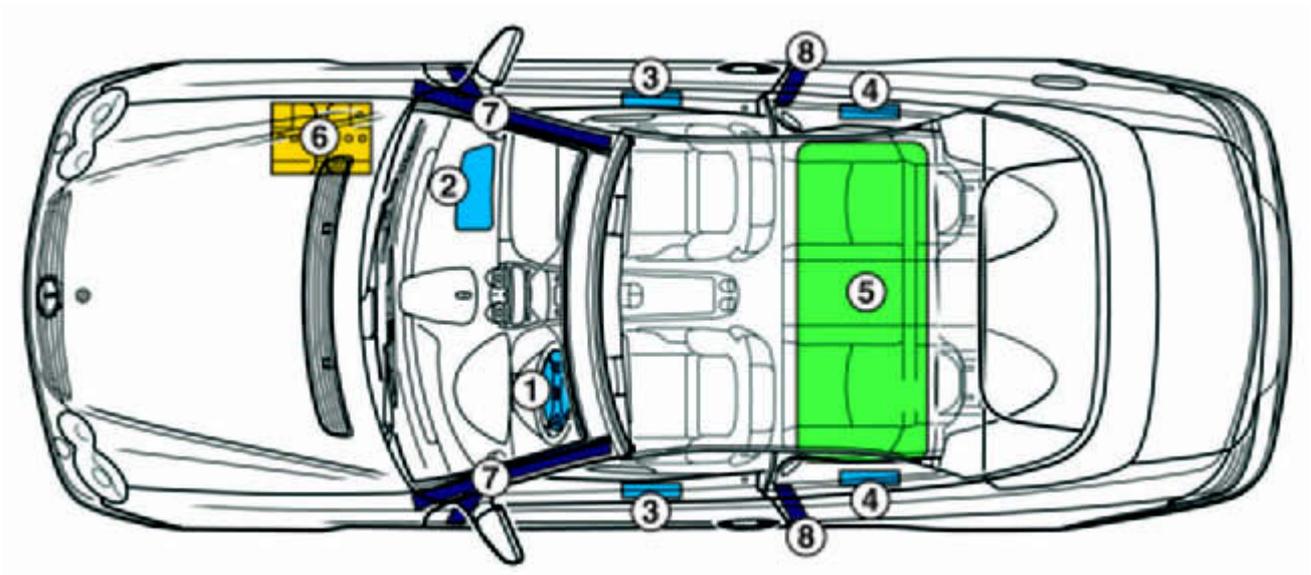
- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery

# Cabrio

*CLK-Class (model 209)*



P00.00-3675-00



P00.00-3676-00

**Location:**

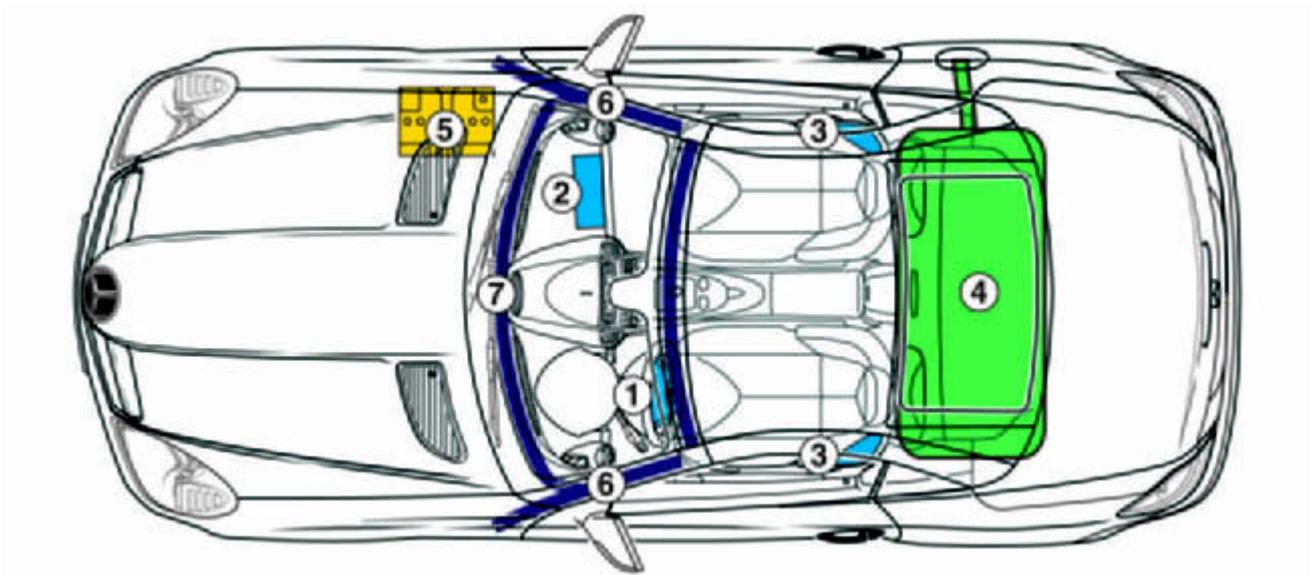
- Airbag
- Battery
- Tank
- Structural reinforcements

- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Fuel tank
- 6 Battery
- 7 Structural reinforcements on A-pillars
- 8 Structural reinforcements on B-pillars

*SLK-Class (model 171)*



P00.00-3677-00



P00.00-3678-00

**Location:**

- Airbag
- Battery
- Tank
- Structural reinforcements

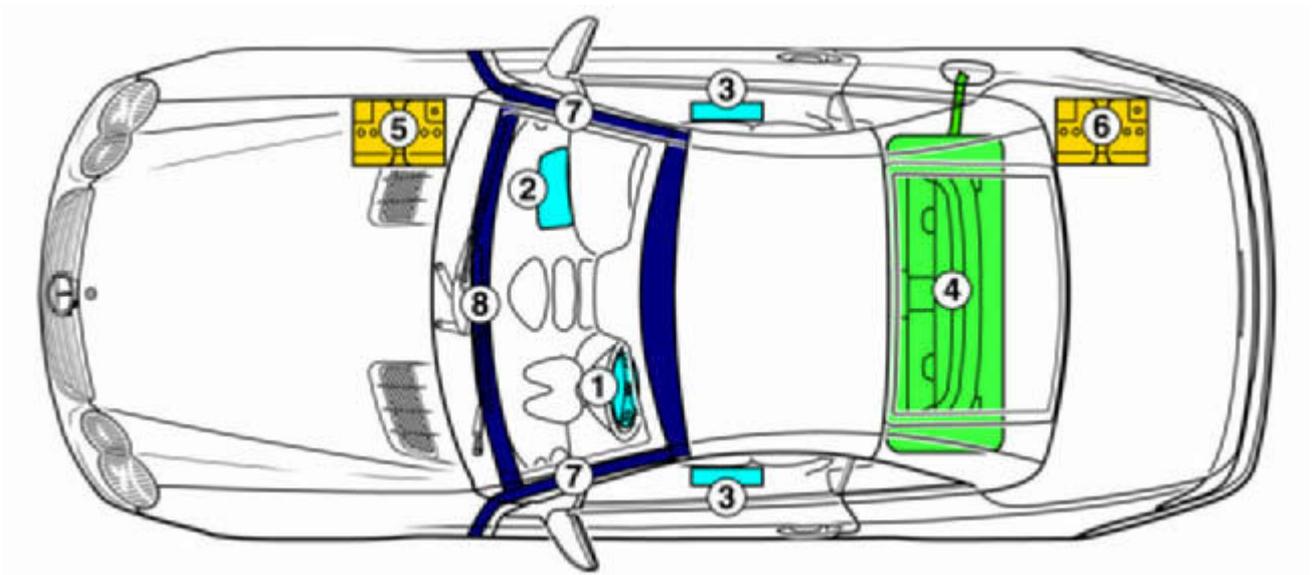
- 1 Driver airbag
- 2 Passenger airbag
- 3 Head/thorax sidebags (in seat backrests)
- 4 Fuel tank
- 5 Battery
- 6 Structural reinforcements on A-pillars
- 7 Structural reinforcements on firewall

# Roadsters

*SL-Class (model 230)*



P00.00-3258-00



P00.00-3259-00

**Location:**

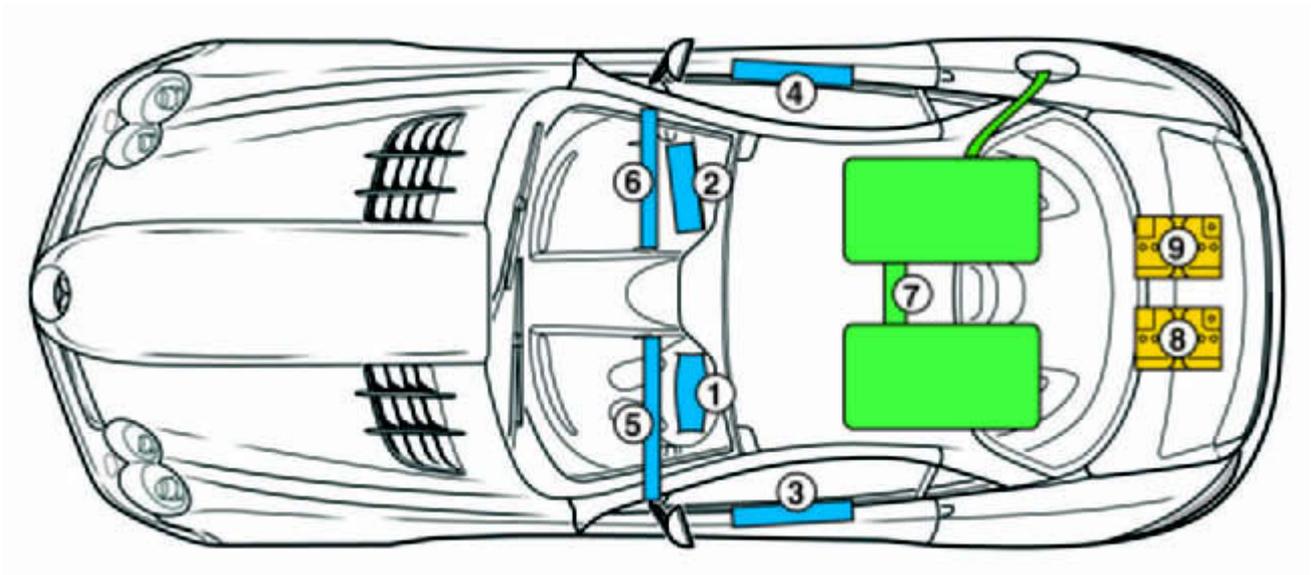
- Airbag
- Battery
- Tank
- Structural reinforcements

- 1 Driver airbag
- 2 Passenger airbag
- 3 Head/thorax sidebags
- 4 Fuel tank
- 5 Starter battery
- 6 Power supply battery
- 7 Structural reinforcements on A-pillars
- 8 Structural reinforcements on firewall

*SLR McLaren (model 199)*



P00.00-3681-00



P00.00-3659-00

**Location:**

- Airbag
- Battery
- Tank

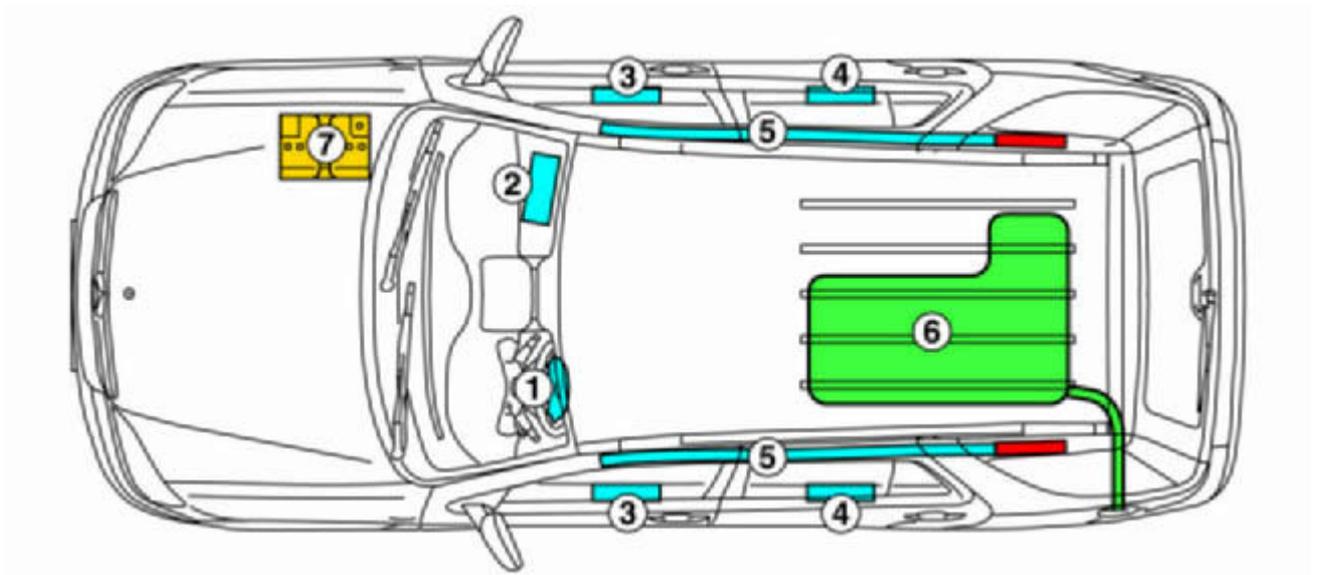
- 1 Driver airbag
- 2 Passenger airbag
- 3 Head/thorax driver sidebag
- 4 Head/thorax front passenger sidebag
- 5 Driver knee airbag  
(under left instrument panel)
- 6 Front passenger knee airbag  
(under right instrument panel)
- 7 Fuel tank
- 8 Power supply battery
- 9 Starter battery

## Cross-country vehicles

*M-Class (model 163)*



P00.00-3238-00



P00.00-3239-00

**Location:**

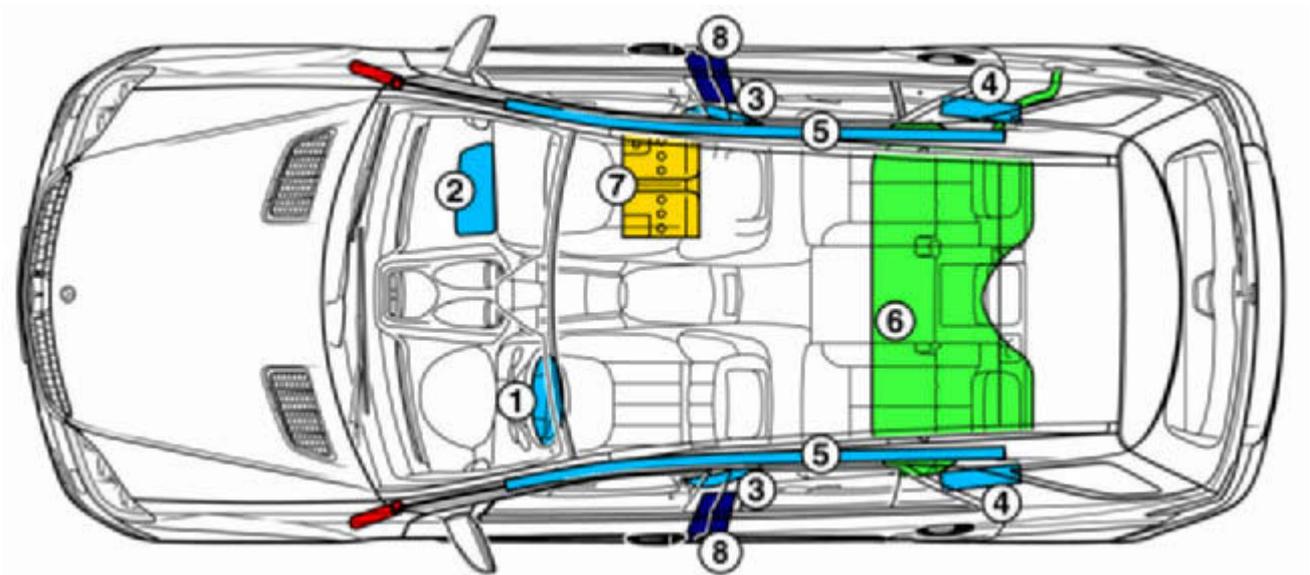
-  Airbag
-  Gas generators
-  Battery
-  Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery

*M-Class (model 164)*



P00.00-3813-00



P00.00-3816-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank
- Structural reinforcements

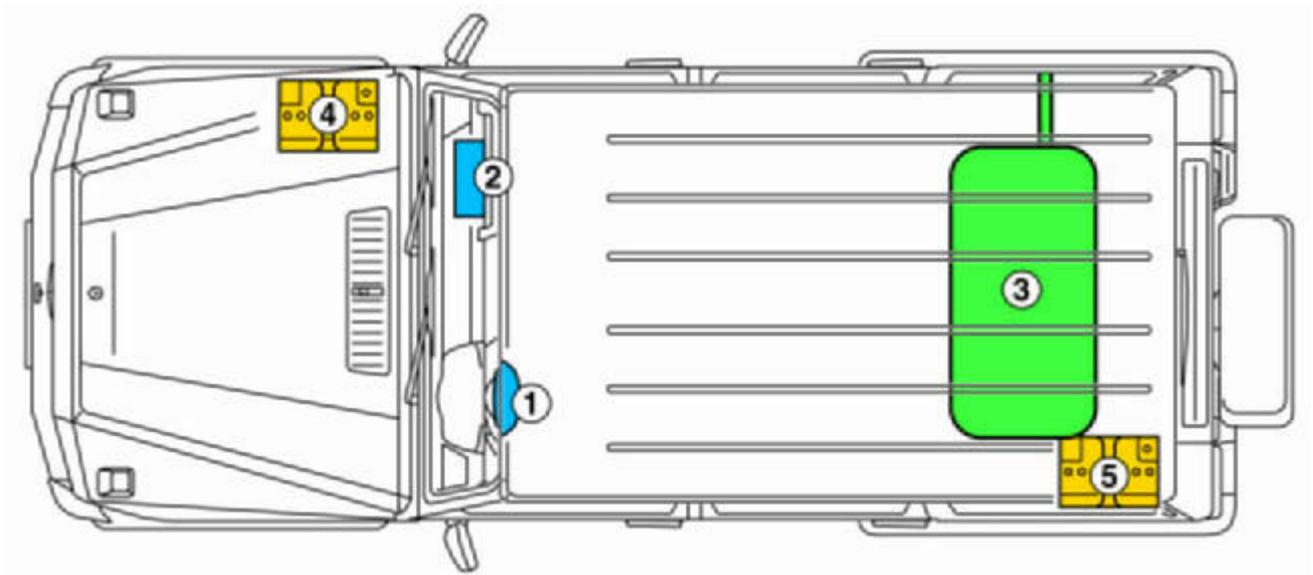
- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags in the seat backrests
- 4 Side airbags at rear
- 5 Window airbags
- 6 Fuel tank
- 7 Battery under front passenger seat
- 8 B-pillar structural reinforcement

## Cross-country vehicles

*G-Class (models 461, 463)*



P00.00-3262-00



P00.00-3263-00

**Location:**

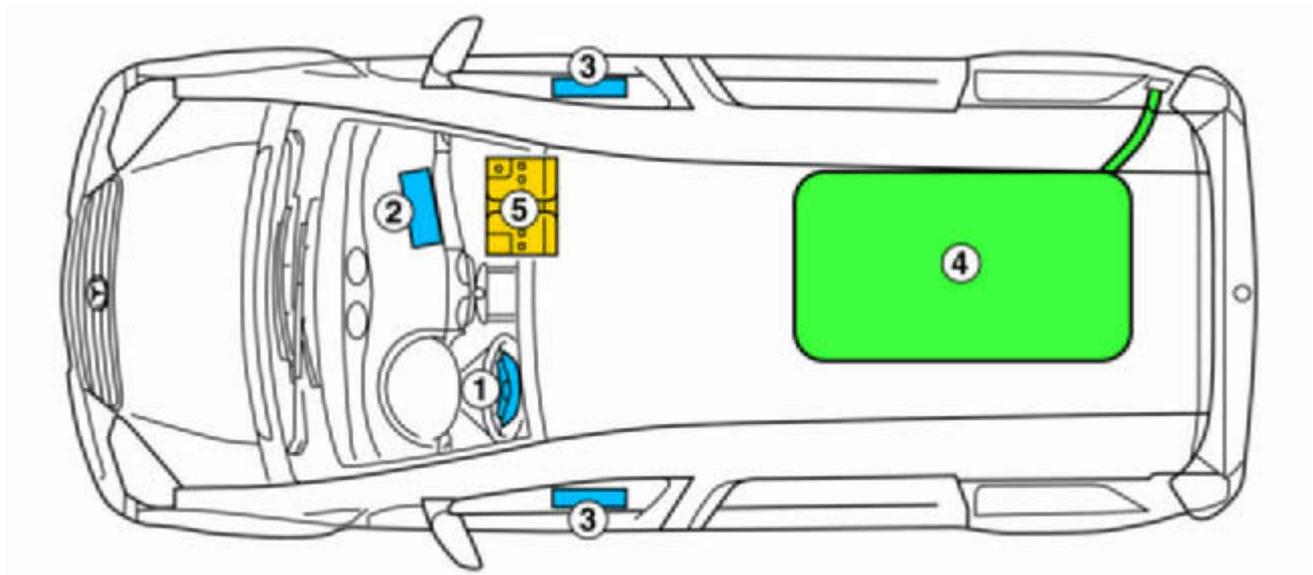
- Airbag
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Fuel tank
- 4 Battery: Up to 09.96
- 5 Battery: As of 10.96

*Vaneo (model 414)*



P00.00-3260-00



P00.00-3261-00

**Location:**

-  Airbag
-  Battery
-  Tank

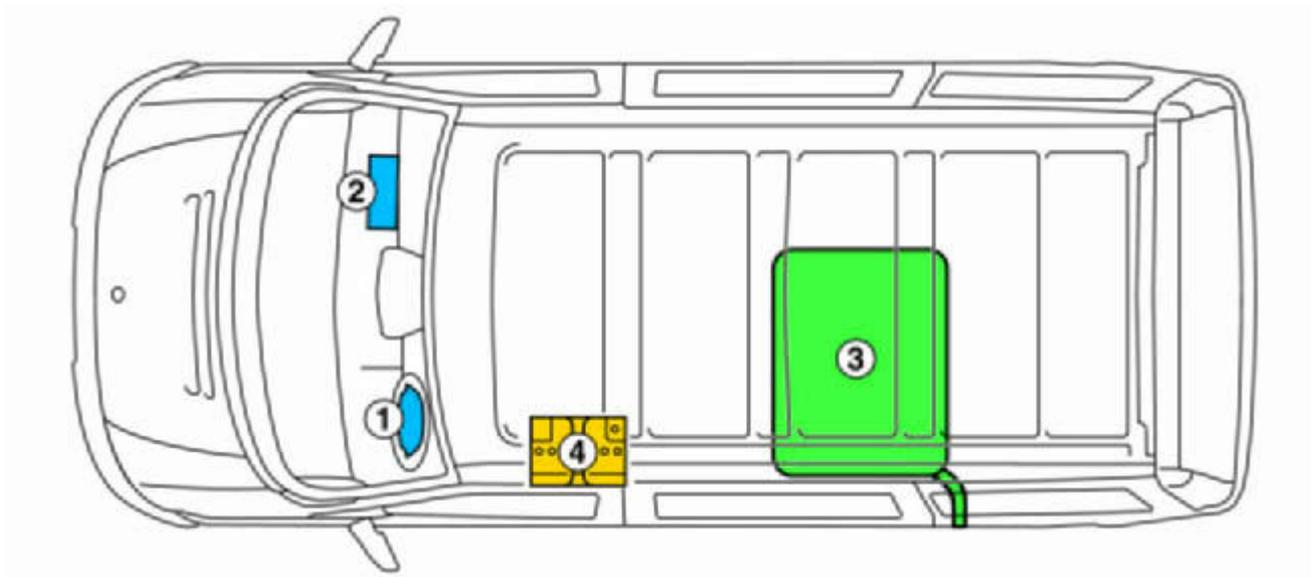
- 1 Driver airbag
- 2 Passenger airbag
- 3 Side airbags at front
- 4 Fuel tank
- 5 Battery (footwell on front passenger side)

# Van

V-Class Vito (model 638)



P00.00-3463-00



P00.00-3265-00

**Location:**

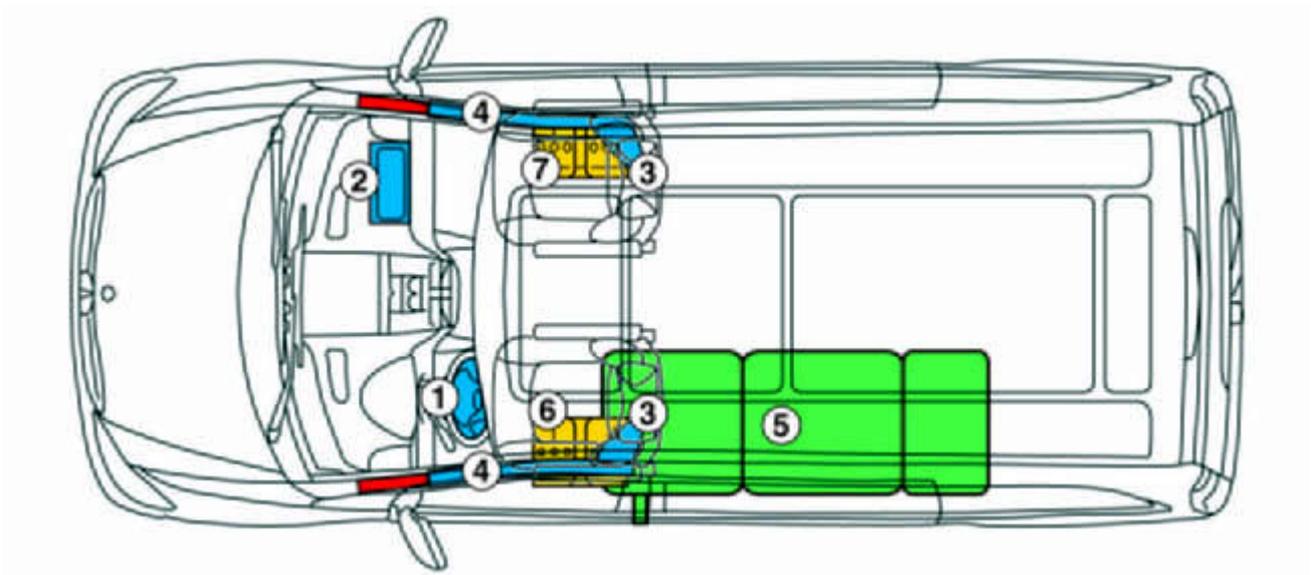
- Airbag
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Fuel tank
- 4 Battery (under driver seat)

*Viano/Vito (model 639)*



P00.00-3679-00



P00.00-3680-00

**Location:**

- Airbag
- Gas generators
- Battery
- Tank

- 1 Driver airbag
- 2 Passenger airbag
- 3 Front sidebags (in seat backrests)
- 4 Front windowbags
- 5 Fuel tank
- 6 Battery (under driver seat)
- 7 Additional battery (under front passenger seat)  
*in "Marco Polo" and "Fun" models*

## Safety concept



### PRO-SAFE™-5 point safety philosophy

As a result of increasing complexity – due to new technological innovations and enhancements of existing ones – it is no longer possible to cover the full range of vehicle safety topics with terms such as active and passive safety. The new PRO-SAFE™ concept groups all the different aspects and details of automotive safety into thematic clusters which are presented in a customer-friendly way.

PRO-SAFE™ therefore stands for one of the core values of the Mercedes-Benz brand: the philosophy of achieving the highest possible degree of road safety, focusing on the human factor. Mercedes-Benz underlines its social responsibility, as typified by realworld accident research, the protection of other road users and safety features pioneered by the brand, including in-house inventions such as the crumple zone. PRO-SAFE™ is based on the following modules:

#### PERFORM-SAFE

This comprises aspects of active safety, that is to say, measures and equipment which help the driver to avoid hazards before they develop fully, which provide early warning of them, or which provide assistance in critical situations. In other words, all the measures which help to prevent an accident from occurring in the first place.

##### Examples

- Night view assist
- DISTRONIC PLUS
- BAS PLUS
- ADAPTIVE BRAKE
- Adaptive brake lights
- AIRMATIC or ABC
- Bi-Xenon headlamps with Active Light System, incl. cornering light function
- Tyre pressure monitoring system
- Multicontour seat
- Aero windscreen wipers

#### PRE-SAFE®

PRE-SAFE® denotes anticipatory occupant protection, that is to say, systems which come into action in the event of danger, taking measures which further enhance the occupant protection characteristics as soon as a critical situation is identified. Both the PRE-SAFE® trigger mechanisms and the PRE-SAFE® measures have been further enhanced for the new S-Class.

##### Examples:

- enhanced trigger mechanisms (e.g. panic braking)
- Reversible belt tensioners
- Positioning driver's seat, front passenger seat, individual rear seats
- Side window closing
- Closure of sliding roof



### PASSIVE-SAFE

Essentially, this comprises the passive-safety aspects such as the structure of the passenger cell as well as systems and features which come into action in the event of an accident such as airbags and restraint systems.

Beispiele:

- Adaptive belt-force limiter
- Front sidebags integrated in seat backrests
- Two-stage driver and front passenger airbags
- Rear sidebags as standard
- Pressure sensor in the doors to optimise airbag deployment in the event of a side impact
- Central ARCADE control unit
- Optimised bodyshell incorporating extremely high-strength steel

### POST-SAFE

This covers systems and measures which come into action after an accident to facilitate and expedite the work of the rescue services, to avoid consequential damage, and to make the accident site easy to find.

Examples:

- Cutting points marked to show rescue teams where to use cutting tools and equipment
- Online guidelines for rescue teams
- Automatic door unlocking
- Automatic engine cut-off
- Fuel supply cut-off
- Automatic partial opening of the windows to ventilate the interior

## PERFORM-SAFE

### Anticipatory safety

The numerous systems in the new S-Class have been further optimised in terms of driving safety, perceptual safety, driver-fitness safety and operating safety as well as hazard-detection and warning technology. The safety features that make up the PERFORM-SAFE module include technical innovations such as the night view assist and DISTRONIC PLUS as well as tried-and-trusted components such as bi-xenon headlamps with Active Light System including cornering function or multicontour seats with PRE-SAFE® positioning function.

### Night view assist

The night view assist, a Mercedes-Benz innovation, makes a valuable contribution to perceptual safety.

By means of infrared main-beam headlamps, the night view assist ensures noticeable better detection of objects and surroundings at night.

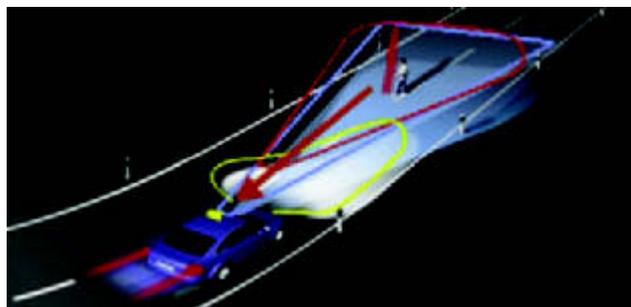
It uses near-infrared (NIR) light, which is invisible to the naked eye, to provide optimum illumination of the main-beam zone, the image being picked up by a special infrared camera and shown on the instrument cluster display. The driver can use the system for sporadic guidance - in much the same way as the rear-view mirror is used.

The effect of the night view assist corresponds to that obtained with headlamps permanently in main-beam mode, with the great advantage that the occupants of oncoming vehicles cannot see the NIR beam and therefore not dazzled.

The night view assist thus enables the driver to see the course of the road more clearly and to notice obstacles significantly earlier.



*Night view assist's greyscale image on the instrument cluster*



*Yellow: dipped beam illumination  
Red: infrared light illumination  
Blue: range of vision with infrared camera*

### Night view assist components and operation

- Halogen projection-beam headlamps with infrared filters in the headlamp units for illumination of the road ahead
- An infrared monocular camera situated on the windscreen near the interior rear-view mirror
- 8" TFT display in the instrument cluster for showing the scene recorded by the camera as a greyscale image.



*Infrared camera*

#### Note

When the night view assist is activated, the camera image is shown on the screen instead of the (virtual) speedometer (which appears instead as a horizontal bargraph at the bottom of the instrument cluster).

### Bi-Xenon headlamps with Active Light System and cornering light

Based on the familiar bi-xenon headlamps, the functions offered by this item of optional equipment comprise low-beam mode with the bi-xenon-Æ70 projection module, the Active Light System and the cornering light function which is now integrated in the main headlamps.

These different elements are combined and coordinated in such a way that they generate a light which increases perceptual safety as well as enhancing driving comfort and relieving driver stress.



## PERFORM-SAFE

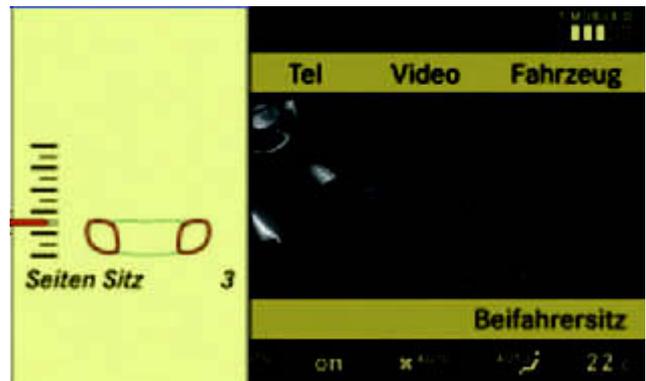
### Multicontour seat with extended functionality

Available as an optional extra, the multicontour seat makes a major contribution to improving driver-fitness safety and to anticipatory occupant protection.

It allows the seat contours to be adjusted in the following zones:

- The lateral support section of the cushion
- The lumbar support area
- The lateral support section of the backrest
- The shoulder support area.

The new contour adjustments have undergone further enhancement compared with the predecessor model and also offer significantly more scope for adjustment. Moreover, the multicontour seat is integrated in the PRE-SAFE® functions.



### Adaptive brake light

In the event of emergency braking, the adaptive brake lights are activated based on certain criteria such as brake pressure or vehicle speed and the LEDs in the brake lights flash at a frequency of 5.5 Hz..

If the vehicle is braked to stop from a high speed, the hazard warning lights are activated automatically. They are deactivated when the car moves off again.

A study has shown that, if adaptive brake lights are fitted, the reaction times of drivers in the vehicles behind are shortened significantly, thus minimising the risk of a collision.



## DISTRONIC PLUS

The enhanced DISTRONIC PLUS function extends the controlled range to cover the speed range from 0 - 200 km/h - rather than 30 - 200 km/h as before - to relieve driver stress in stop-and-go traffic.

DISTRONIC PLUS therefore offers a high degree of stress-relieving comfort by sparing the driver tiring routine tasks. This makes for more relaxed driving both in traffic tailbacks and normally flowing traffic and so increases drivers-fitness safety.

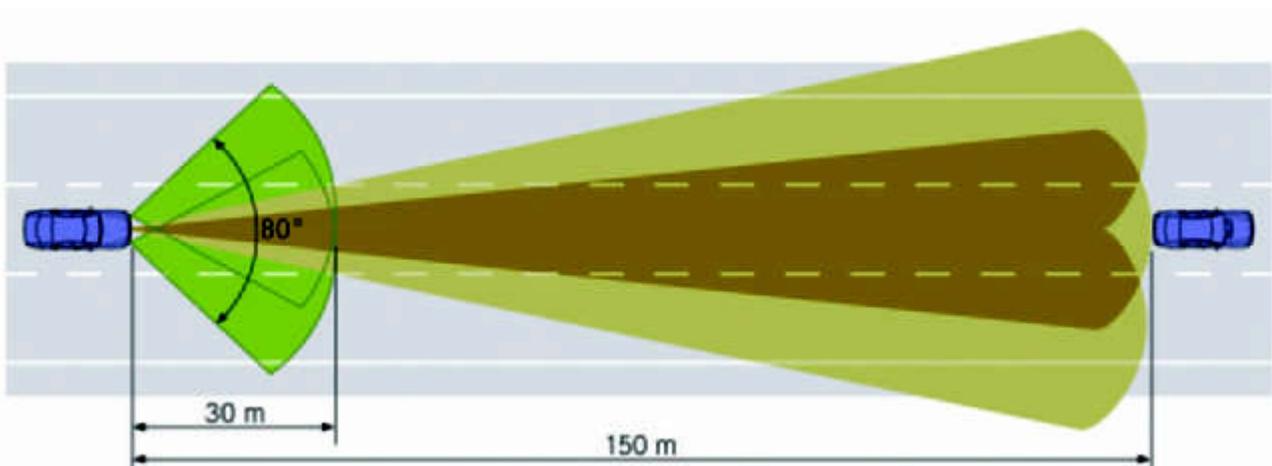


## BAS PLUS

BAS PLUS marks the debut of a new generation of the familiar Brake Assist safety feature. A new feature is the linking of BAS PLUS with the DISTRONIC PLUS sensor system. BAS PLUS is therefore an anticipatory version of Brake Assist which not only evaluates the way in which the driver applies the brakes but also takes account of the situation immediately around the vehicle (object detection) as a trigger factor.

The extra braking assistance which this feature provides ahead of a potential collision is designed to prevent an accident from occurring or - if this is not possible - to reduce its consequences significantly.

BAS PLUS is triggered only if the driver brakes and the system detects that there is a risk of an accident. As with DISTRONIC and DISTRONIC PLUS, if this is the case, a signal alerts the driver to the need to brake. If the braking force applied is insufficient, the intelligent BAS PLUS brake assistant is triggered. The system adapts the strength of braking to the situation in hand. Because the full braking force is not always applied immediately, the braking distance for vehicles behind is increased, thus reducing the risk of a collision.



*Funktionsprinzip BAS PLUS*

## PRE-SAFE

### Anticipatory occupant protection

As soon as a critical situation is identified, this system initiates precautionary measures to put the occupant protection features into an optimum configuration. PRE-SAFE® makes extensive use of input from the sensors of existing systems. In the case of the new S-Class, the degree of anticipatory occupant protection has been developed further through the integration of new functions such as DISTRONIC PLUS, BAS PLUS and the multicontour seats as well as through the extension of existing measures such as seat positioning or closing functions.

### PRE-SAFE® trigger mechanisms

- Emergency breaking
- Heavy oversteer
- Heavy understeer
- Panic breaking: the driver's desire to decelerate is clearly higher than the degree of vehicle deceleration which is physically possible to achieve on slippery roads (aquaplaning, ice, snow)
- Strong braking on approach to a specific stopping point/BAS PLUS braking: Powerful support of driver's braking action by BAS PLUS on the basis of a radar-supported assessment of the surroundings and the evaluation of the braking force applied
- Critical steering movements: rapid steering movements at high speed ( $V > 140$  km/h) which indicate a panic response by the driver and can destabilise the vehicle

### PRE-SAFE® measures

- Driver and front passenger secured in their seats at an early stage by electric belt tensioners to prevent movements which could compromise their safety
- Moving of front passenger seat and (if fitted) the optional electrically adjustable rear seat unit: front passenger/left and right rear passengers moved into a more favourable crash position (safety position)
- Head restraints raised to a more favourable crash position if the rear bench seat with electrically adjustable outer seats or „individual-look“ rear seats are specified.
- Almost complete closure of side windows and optional tilting/sliding sunroof, if fitted, to protect occupants from any objects entering the vehicle and to help prevent injuries which could result from an occupant's head or arm protecting outside the vehicle through a window or roof opening
- Positioning of multicontour seats or dynamic multicontour seats through inflation of the cushioning and backrest side bolsters in order to provide lateral support for the occupants

If no collision occurs, the tension applied to the front seat belts is released and the multicontour/dynamic multicontour seats are deflated once the dynamic handling signals fall back below the trigger point. The other systems which have been adjusted can be reset manually.



## Optimised crash protection

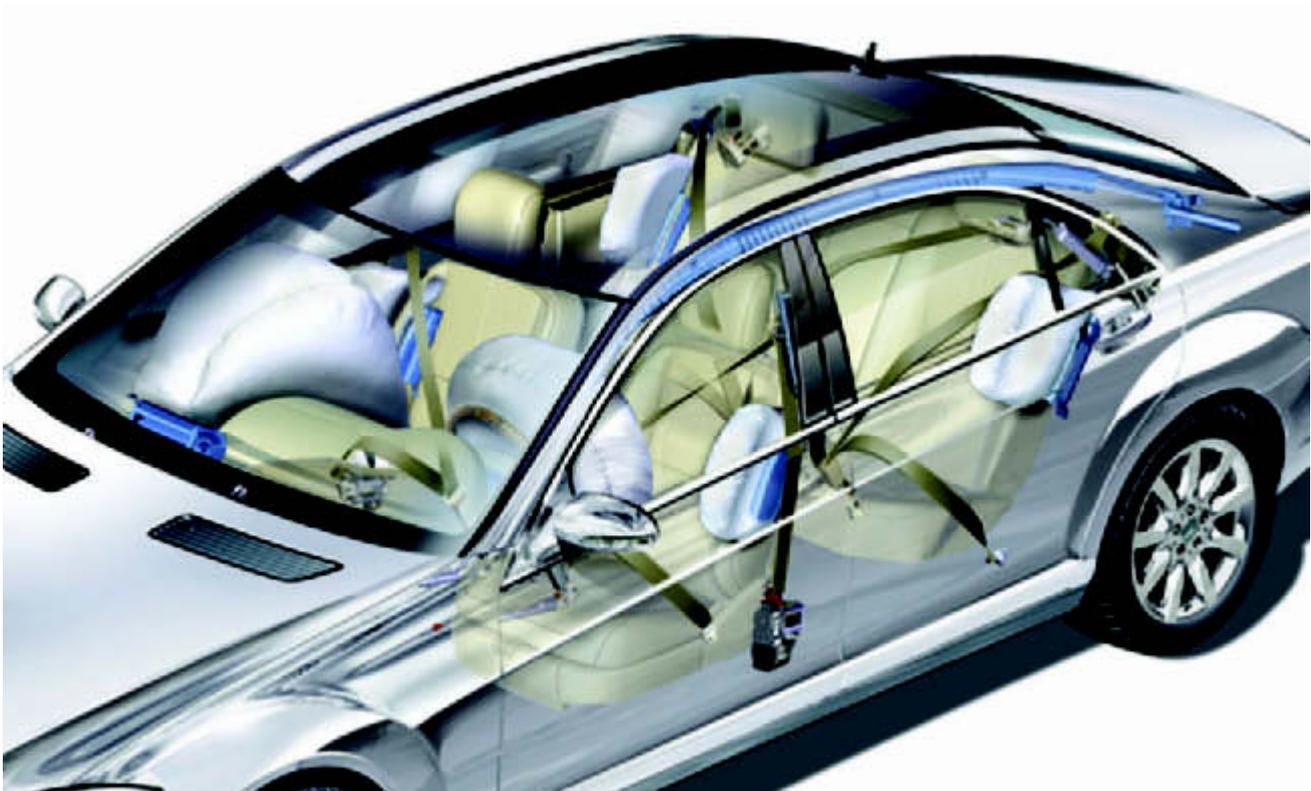
Numerous innovations and enhanced components, a bodyshell which has been optimised even further compared with the predecessor model as well as standard rear sidebags contribute to the very high standard of crash protection (PASSIVE-SAFE) offered by the new S-Class.

Furthermore, the new S-Class meets statutory pedestrian- protection requirements.

## Airbags

The airbags fitted in the new S-Class are controlled by the ARCADE control unit. The vehicle's full complement of airbags comprises:

- Driver and front passenger airbags with two-stage, adaptive deployment function
- Front passenger seat also equipped with a seat occupancy sensor
- Front sidebags integrated in the seat backrests
- Rear sidebags fitted under the wheel-arch trim
- Crash sensors in the door to optimise airbag deployment in the event of a side impact.



## PASSIVE-SAFE

### Seat belts

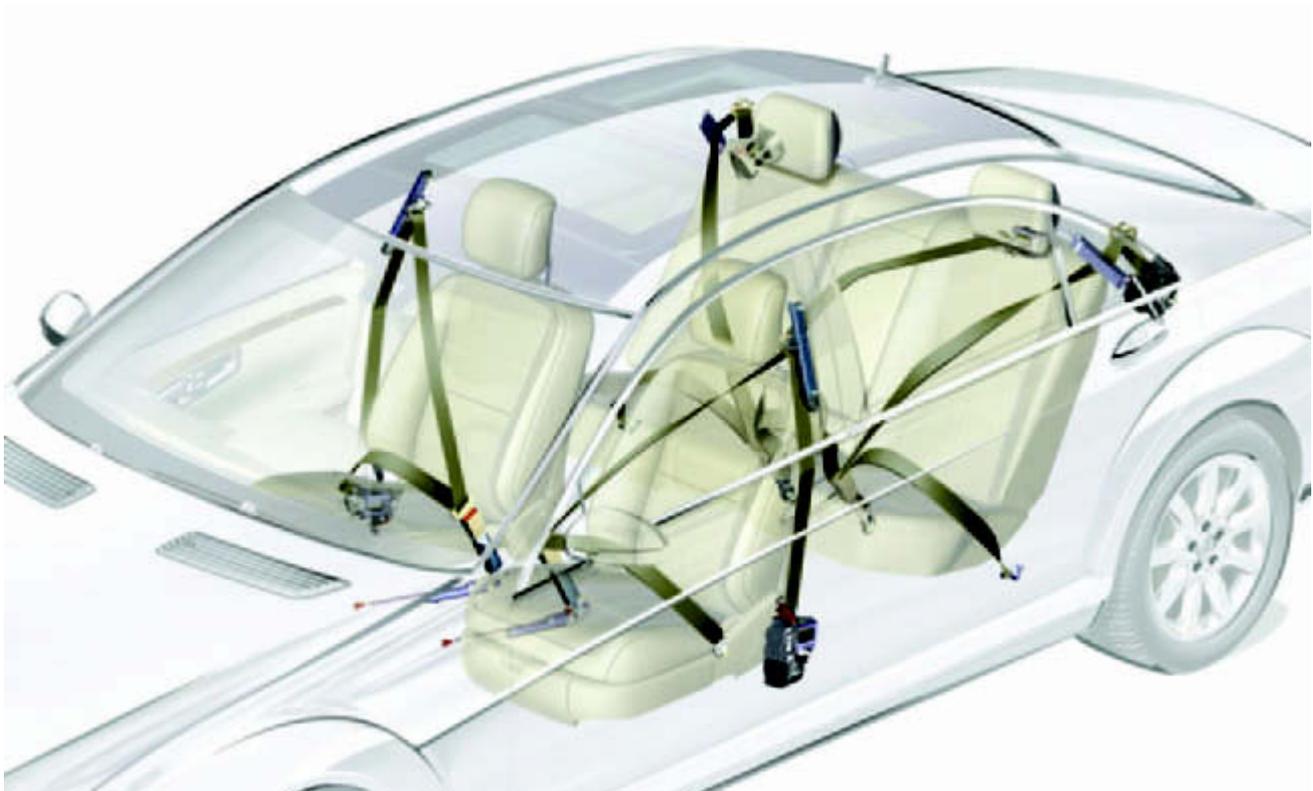
The seat belts fitted in the latest-generation S-Class have been enhanced compared with those found in the predecessor model. The key features of the three-point belts for the driver and front passenger are:

- Belt tensioners and adaptive belt-force limiters, with input from belt reels
- Automatic belt height adjustment
- Electrically controlled comfort-fit function and belt-in-use detection

The rear seats feature three-point seat belts on the outer seats are equipped with

- An automatic height adjustment function
- Retractor pretensioners and belt-force limiters.

If the optional electrically adjustable outer rear seats are specified, the specification also includes an electrically controlled comfort-fit function with seat belt buckles which move with the seat, pneumatically raised head restraints and a belt-in-use detection system.



**Reduction of accident consequences**

Occupants ensconced inside the new S-Class can count on a whole host of safety measures and equipment features which help prevent accidents or, if an accident is unavoidable, provide comprehensive protection.

But Mercedes-Benz goes a stage further and also implements a raft of measures to help prevent consequential damage after an accident as well as facilitate and expedite the work of the rescue services.

POST-SAFE measures include:

- Automatic fuel cut-off to prevent fire from breaking out in the event of a crash
- Automatic activation of the hazard warning lights to warn other road users and make the accident site easier to find, especially in the dark
- Automatic door unlocking to enable the occupants to get out of the car more quickly
- Cutting points marked for rescue teams so that they know where to use cutting tools and equipment
- Safety guidelines for rescue teams, which can be accessed on the internet



## Occupant restraint systems

### Function

The central **airbag control unit**, mounted on a bearing bracket in front of the gearshift lever, is rigidly connected with the vehicle's transmission tunnel and computes the vehicle deceleration and acceleration in the longitudinal and transverse directions.

Newer models are fitted with additional satellite sensors (known as upfront sensors) near the radiator. In addition to the airbag control unit these also act to determine the longitudinal acceleration of the vehicle and thus help to provide more differentiated and earlier triggering of the seat belt emergency tensioning retractors and front airbags.

To assist in calculating the lateral acceleration of the vehicle, two satellite sensors are mounted on the crossmember under the front or rear seats.

In the event of high acting deceleration or acceleration, electrical ignition pulses are sent to the gas generators (airbags or emergency tensioning retractors).

In the event of accidents with low decelerations or accelerations in the longitudinal direction, only the seat belt emergency tensioning retractors are triggered. In the case of accidents with high decelerations or accelerations in the longitudinal direction, the front airbags are also triggered (in one or two stages).

When the lateral acceleration threshold is exceeded, the side airbags and window airbags or the head/thorax sidebags are triggered on the side facing the impact.

The following vehicles

- E-Class (model 211)
- S-Class (model 220, since model refinement 10/2002)
- S-Class Coupé (model 215, since model refinement 10/2002)
- SLK-Class (model 171)
- CLS-Class (model 219)
- SLK-Class (model 171)
- SL-Class (model 230)
- CLK-Class convertible, (model 209)

are equipped in the central airbag control unit with an extra rollover sensor, which in the event of a specific rollover about the vehicle's longitudinal axis, activates all emergency tensioning retractors and both window-bags or both head/thorax sidebags (only on front-passenger side when occupied).

The airbag control unit housing and its electrical connections are designed to reliably prevent malfunctions due to electrical interference in the on-board electrical system, caused by the activation of ancillary electrical equipment and electromagnetic interference on public roads.

## Driver airbag:

The **driver airbag unit** (1) is located in the steering wheel (5) and essentially consists of the cover, airbag (4) and gas generator (3).

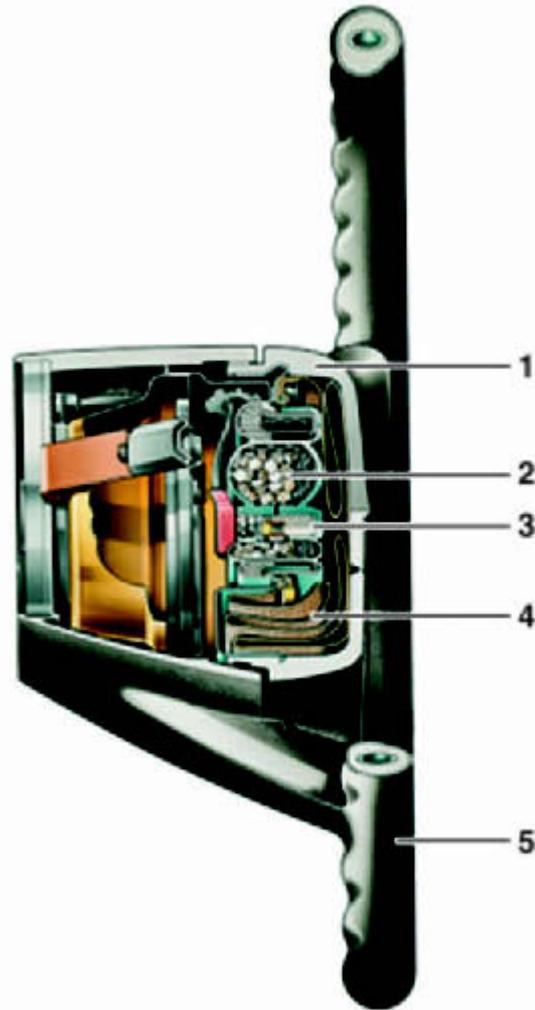
The gas generator (3) contains the solid fuel (2) in tablet form (sodium azide or azide-free depending on the year of manufacture). When the control unit delivers an appropriate pulse (ignition energy) via the slip rings or the clock spring contact to the ignition squib inside the gas generator, the solid fuel in the gas generator is ignited. Depending on the vehicle model, either one-stage or two-stage gas generators are used in the driver airbag units.

The fuel burns within milliseconds, developing a defined volume of gas under a defined pressure.

The gas is then directed into the airbag through a filter. The nylon fabric airbag folded on top of the gas generator tears open the cover at a predetermined fracture point. The air sack is filled with gas within a few milliseconds. As he moves forward opposite the impact direction, the occupant comes into contact with the inflated air cushion, which reduces his forward speed. The front airbags substantially reduce the risk of head, neck and chest injuries.

The gas escapes within a short period of time through the airbag's air hole and the air cushion collapses.

As the solid fuel burns off, the gas generator (3) heats up, but not the steering wheel (5).



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### **Driver airbag**

- 1 Airbag unit
- 2 Solid fuel
- 3 Gas generator
- 4 Air sack
- 5 Steering wheel

## Occupant restraint systems

### Front passenger airbag:

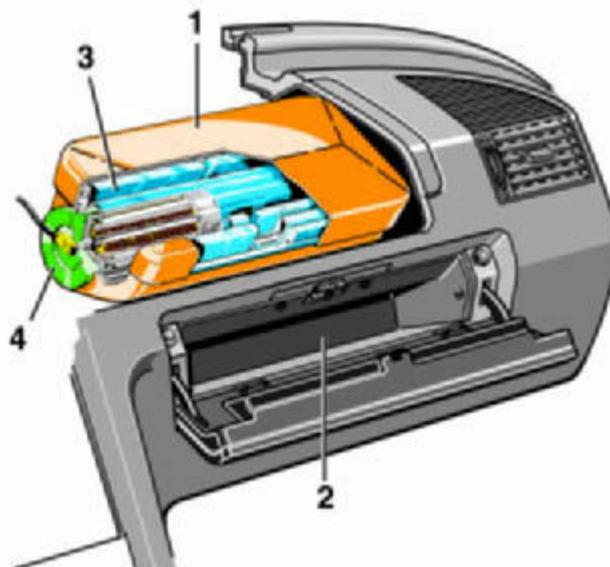
The **front passenger airbag unit** (1) is installed either above the glove box (2) or in place of it, depending on the vehicle model series. The air bag (3) has approximately twice the capacity of the driver airbag, as the space between the front passenger and the instrument panel is larger than that between the driver and steering wheel. It deploys within approximately 40 ms.

The effect of the front passenger airbag, its operating times, triggering sequence and inflation and deflation processes are comparable with those of the driver airbag.

Depending on the vehicle model, either one-stage or two-stage gas generators (4) are used in the front passenger airbag units.

The following model series are equipped as standard with two-stage gas generators:

- A-Class (model 169)
- C-Class (model 203)
- E-Class (model 211)
- CLK-Class (model 209)
- CLS-Class (model 219)
- SLK-Class (model 171)
- SL-Class (model 230)
- SLR McLaren (model 199)
- M-Class (model 163 as from 09/2000)



**Passenger airbag**

- |   |               |
|---|---------------|
| 1 | Airbag unit   |
| 2 | Glove box     |
| 3 | Air sack      |
| 4 | Gas generator |

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### Side airbag:

The **sidebag units** (1) are installed at the front in the doors or in the front seat backrests, at the rear in the doors or side panels or for the A-Class (model 169) in the C-pillars and when inflated they have a volume of 9 l-15 l each (depending on vehicle model and sidebag position).

Their effectiveness is down to the way they influence the movement of the occupants and reduce impact severity in the door area.

This reduces the risk of chest injuries. When the triggering threshold is exceeded in a side-on collision, the rear side airbag (if installed) on the side facing the impact is activated simultaneously with the side airbag in the front door or seat and the window airbag (if installed).

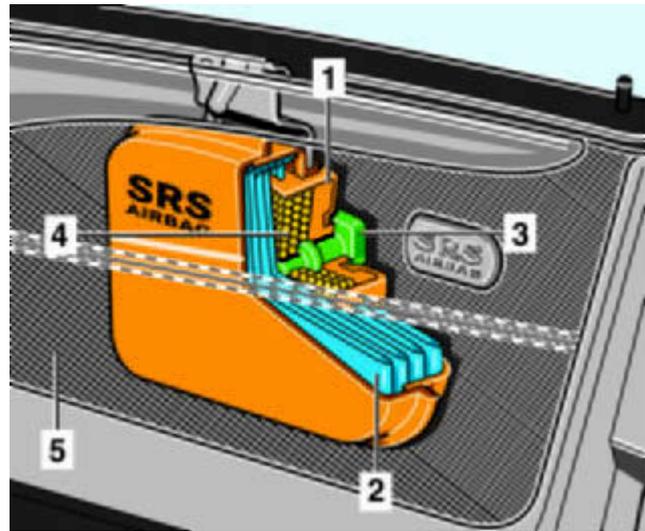
The front passenger side airbag is only activated when the seat occupied recognition sensor detects that the front passenger seat is occupied.

It is triggered by an electrical pulse, which is generated by the airbag control unit and relayed to the ignition squib (3) of the appropriate gas generators.

The ignition squib (3) ignites the solid fuel (4) in the gas generator. The solid fuel burns and produces a gas, which is directed into the folded air sack (2) under high pressure within a few milliseconds.

Under the pressure of the incoming gas, the inflating air sack breaks open the side airbag housing and the tear seam in the door lining (5) at such a predetermined fracture point, and enters the interior compartment. The air sack reaches its maximum volume of 15 liters in approximately 20 ms.

When this maximum volume is reached, the pressure in the air sack begins to drop. The air sack collapses.



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#### Sidebag

- 1 Airbag unit
- 2 Air sack
- 3 Squib
- 4 Solid fuel

## Occupant restraint systems

### Windowbag

The **window airbag unit** consists of a compressed gas generator (1) and a folded-in air sack (2). The air sack is subdivided into a number of vertical air chambers. When deployed, it forms an air cushion with a total volume of about 12 - 19 liters (depending on vehicle model) and extends from the rear roof pillar to the front one. The compressed gas generators are located in the A or C-pillars - depending on the model series.

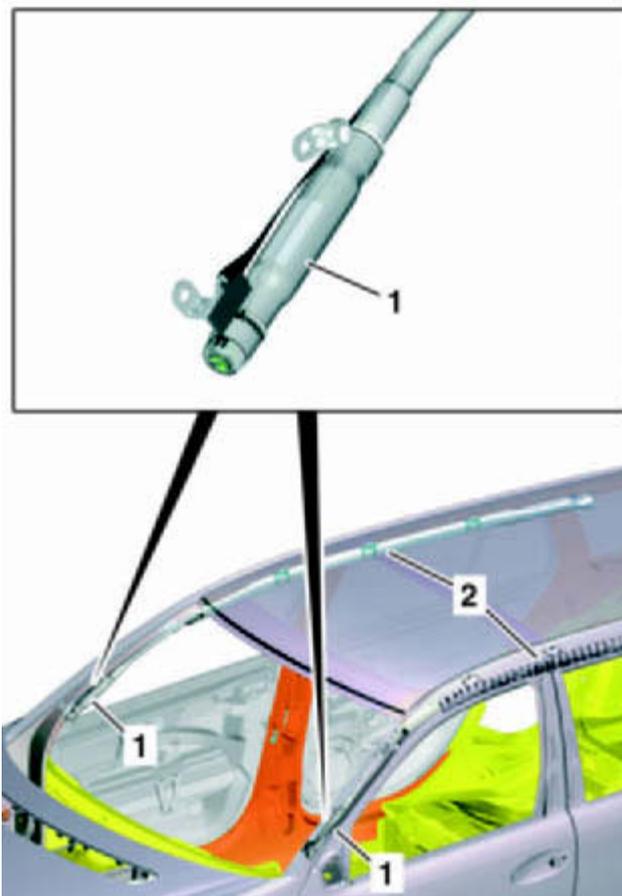
In the event of a side impact of a defined severity the window airbag inflates simultaneously with the side airbag on the side facing the impact and extends along the entire length of the passenger compartment like an inflatable curtain. In this way the window airbag can reduce the risk of occupants' heads colliding with the side windows, roof pillar, roof frame and parts protruding into the compartment, and - thanks to its size - it also lowers the risk of head injuries to the rear-seat passengers.

Additionally, the window airbag holds back glass splinters and other objects which may enter the interior compartment and pose an increased injury risk.

When the windowbag is triggered the squib ignites a small propellant charge, which then opens the closing cover on the gas pressure container. In turn the compressed gas then flows into the airbag folded into the roof frame.

The window airbag then inflates, and tears open the inner paneling on the side of the roof frame whereupon it enters the interior compartment.

The window airbag reaches its maximum volume in approximately 25 ms. This volume is retained for several seconds, to ensure that in the event of any roll-overs the protective effect is maintained for as long as possible.



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**Windowbag E-Class (model 211)**

- 1 Compressed gas generator
- 2 Air sack

### Head/thorax sidebag

So-called head/thorax sidebags are available for several model series. They combine the protective effect afforded by the sidebags and windowbags and thus increase the protection potential for the head and thorax on the occupant side facing a side impact. Head/thorax sidebags are installed in the doors or in the outer areas of the front seat backrests. Triggering is the same as for the sidebags, and in addition to this the head/thorax sidebags in the SLK-Class (model 171) and CLK-Cabrio (model 209) are triggered by certain rollovers.

### Knee airbags

The task of a knee airbag is to boost the protective potential for the driver and front passenger knees. If a knee airbag is installed in the vehicle it is activated

- In the event of a collision with high, in longitudinal direction acting vehicle deceleration or acceleration
- Dependent on use of seat belts
- Dependent on front airbags

In the event of an activation the knee airbag is inflated in the lower area of the instrument panel.

### Seat occupied recognition sensor:

The seat occupied recognition sensor in the front passenger seat prevents activation of the passenger-side front airbag, side airbag and the seat belt emergency tensioning retractor when the seat is unoccupied. If there is someone sitting in the front passenger seat, the pressure on the seat surface is increased. This changes the resistance of the film pressure sensor in the sensor mats on the surface of the seat. When the pressure on the seat surface exceeds a defined value, the electronic analysis system recognizes that the front passenger seat is occupied and transmits an "occupied" signal over the data line to the airbag control unit.

The status of the seat is re-scanned every 2.5 seconds. The "occupied" signal remains for approx. 40 s after the front passenger seat is vacated. Preserving this signal prevents the safety facilities from being deactivated immediately if the front passenger seat is only vacated for a short time.

## Occupant restraint systems

### Automatic child seat recognition

In vehicles with automatic child seat recognition "ACSR" (US designation: BabySmart™), the front passenger airbag is not triggered in a crash if a child seat is detected. The side airbag and window airbag remain activated. Proper functioning of the automatic child seat recognition is only guaranteed when using a special child seat approved by Mercedes-Benz.

This child seat must be equipped with two transponders (resonators) located in the base of the seat on the left and right sides. When this special child seat is installed on the front passenger seat, the front passenger airbag is deactivated.

This is indicated by the AIRBAG OFF indicator lamp permanently lit on the center console.

With a child seat installed, the signals emitted by the electronic analysis system via the transmitting antennas in the sensor mat are altered by the resonators in the child seat. The signals are received by the relevant receiving antennas in the sensor mat and are relayed to the electronic analysis system. This evaluates the signals and relays the current status over the data line to the airbag control unit with the signal:

- child seat present
- child seat not present
- child seat incorrectly positioned.

 **After removal of the child seat the front passenger airbag is automatically activated again. Any triggering is dependent on the seat occupation.**

### Seat belt emergency tensioning retractors:

The complete units inclusive seat belt retractor are installed in the B-pillars, in the version as buckle emergency tensioning retractor in the seat belt buckles.

Vehicles with rear-seat emergency tensioning retractors are equipped with additional units in the C-pillars.

In C-Class vehicles (model 203) the rear-seat emergency tensioning retractors (buckle retractors) are installed under the rear seat cushion. In vehicles in the S-Class (model 220 as from 10/2002) the front emergency tensioning retractors are also buckle emergency tensioning retractors. The S-Class coupés (model 215) and the SL-Class (model 129 and model 230) have the entire seat belt system with emergency tensioning retractors in the backrest. The task of the seat belt emergency tensioning retractor is to turn back the reel shaft in order to tighten a loosely fitting belt and to reduce the film reel effect. For the buckle emergency tensioning retractor a similar effect is achieved through lowering the seat belt buckle.

The belt then fits tightly on the occupant and offers the fullest possible protection.

The belt retraction is approx. 150 mm. The forces of the emergency tensioning retractor are measured such that they are unable to pull the occupants back into the seat using the seat belt. The automatic belt retractors in various models also contain a mechanical belt force limiter which employs a torsion shaft to ensure that the belt gives as soon as a defined force is exceeded. This further reduces stresses acting on the chest.

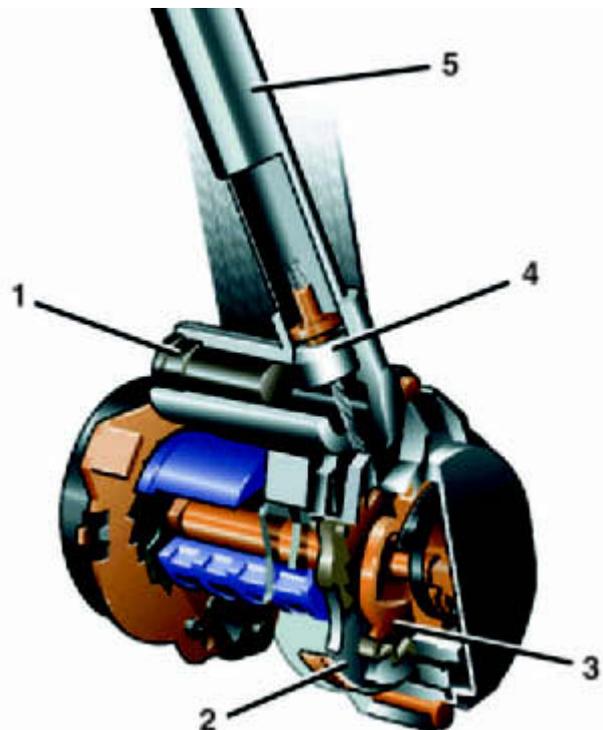
### Function:

The various model series are fitted with seat belt emergency tensioning retractors and belt force limiters of different designs (including different versions of turbine tensioning retractors). The function is described below on one type for the purposes of illustration:

When the control unit delivers an electrical pulse to the fuel cartridge (1), high-pressure combustion gas is produced. This propellant gas is delivered via a T-piece to the piston (4), which is accelerated upwards in a tube (5).

The wire cable transmits a torque to the cable pulley (2) and the cable pulley is connected by friction with the reel shaft via the clutch (3).

The reel shaft is turned back, tightening the loosely fitting belt thus reducing the film reel effect.



- 1 Fuel cartridge
- 2 Cable pulley
- 3 Clutch
- 4 Pistons
- 5 Tube

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## Roll bar systems

### Roll-over protection/roll bar

Convertibles and roadsters in the Mercedes-Benz passenger car model series are equipped with roll bars. They protect the occupants against severe injury in the event of a vehicle rollover.

A differentiation is made between three types of roll-bar systems:

#### Rigid roll bar:

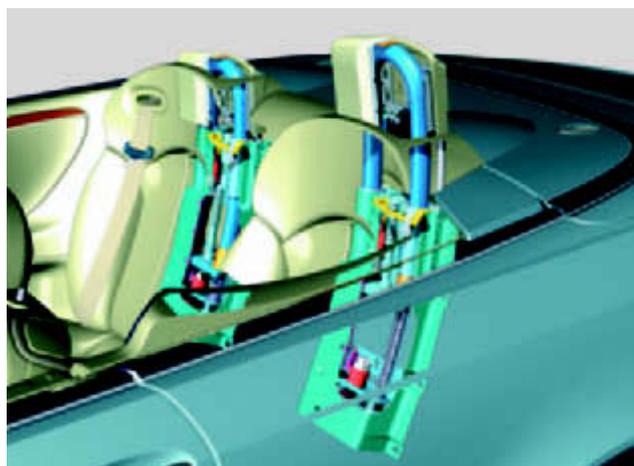
SLK-Class vehicles (model 171) are equipped with two roll bars, which are bolted rigidly to the body behind the seats. The bars are made of tubular steel and are padded with plastic.



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#### Vertically extendable roll bar:

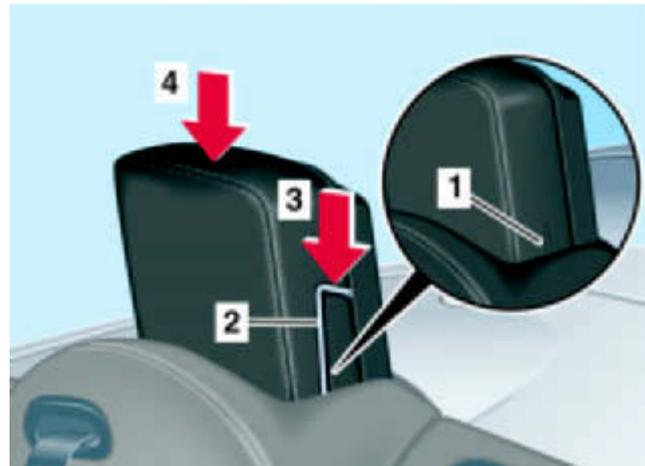
In the CLK-Class cabriolets (model 209) the roll-over protection consists of two cassettes in the area behind the rear backrest. The movable part of the roll bar is located inside the rear head restraints. If triggered automatically in the event of a crash, the roll-over protection is moved to the extended end position by the force of two pre-compressed springs (one on the left and one on the right). Locking pawls prevent the roll-over protection from being pushed back in by the force of the vehicle overturning.



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### Manual lower roll bar:

- Remove Allen wrench from operator's manual folder
- Guide Allen wrench (2) with its long side next to each respective head restraint and along the orientation seam (1) in to the left gap (in direction of travel)
- Press Allen wrench forcefully down (3) and hold there
- Push head restraint down until it latches into place (4)
- Remove Allen wrench and release head restraint
- Repeat procedure on other head restraint



P77.00-2256-00

- 1 Trim seam
- 2 Allen wrench
- 3 Push wrench downwards
- 4 Push head restraint downwards



**If the roll bar has triggered, the rear head restraints cannot be retracted and the soft top cannot be opened or closed.**

## Roll bar systems

### Retractable roll bar

For roadsters in the SL-Class (model 230) the roll bar is located in the storage position in front of the soft-top compartment.

The control unit automatically actuates (within 0.3 ms) the roll bar in the event of an accident or a critical driving situation (e.g. an inclination in excess of a specific angle or if the vehicle exhibits a swerving motion).

### Manual operation

Pressing the roll bar switch enables the roll bar to be raised or retracted.

On the roadster of the SL-Class (model 230) manual operation ensues using the roll bar buttons; they are located under the switch for the Vario roof.

#### Raising the roll bar

- Lift Vario roof switch
- Press button (2) until the roll bar is raised and heard to engage in place

#### Lower roll bar

If the roll bar has been manually raised:

- Lift Vario roof switch
- Press button (1) until the roll bar is lowered

If the roll bar has been automatically raised:

- Lift Vario roof switch
- Press button (2) until the roll bar is heard to engage in place
- Press button (1) until the roll bar is lowered.



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## KEYLESS-GO access and drive authorization system

KEYLESS GO allows the vehicle to be accessed and started without a mechanical key. To acquire access authorization all that need be done is to insert a valid transmitter key. To issue access and drive authorization, the vehicle exchanges data with the transmitter key via various antennas.

### Unlock vehicle:

Prerequisite: A valid transmitter key must be held outside the vehicle at a maximum distance of 1.5 m. The vehicle can then be unlocked by:

- Pulling on one of the door handles
- Pressing the trunk lid release switch
- Pressing the appropriate button on the transmitter key

### Lock vehicle:

Prerequisite: A valid transmitter key must be held outside the vehicle at a maximum distance of 1.5 m. The vehicle can then be locked by:

- Actuating the door contact on one of the door handles
- Pressing the KEYLESS GO button on the trunk lid
- Pressing the appropriate button on the transmitter key

### Switching on the ignition:

Prerequisites:

- A valid **transmitter key** is located **in** the vehicle and the foot brake has **not** been actuated
- First press of START/STOP button: Corresponds to ignition/starter switch to "Radio" position
- Further press of START/STOP button: Corresponds to ignition/starter switch to "Ignition ON" position
- Further press of START/STOP button: Radio and ignition "OFF"

## KEYLESS GO

### Starting the engine:

The engine can be started by pressing the START/STOP button on the selector lever (1) if the following prerequisites are satisfied:

- Valid **transmitter key** is located in the vehicle interior
- Selector lever is in the "P" position for parking
- **Service brake** is actuated

### Switching off the engine:

The engine can be switched off by pressing the START/STOP button on the selector lever (1), if the selector lever is in position "P" or "N".



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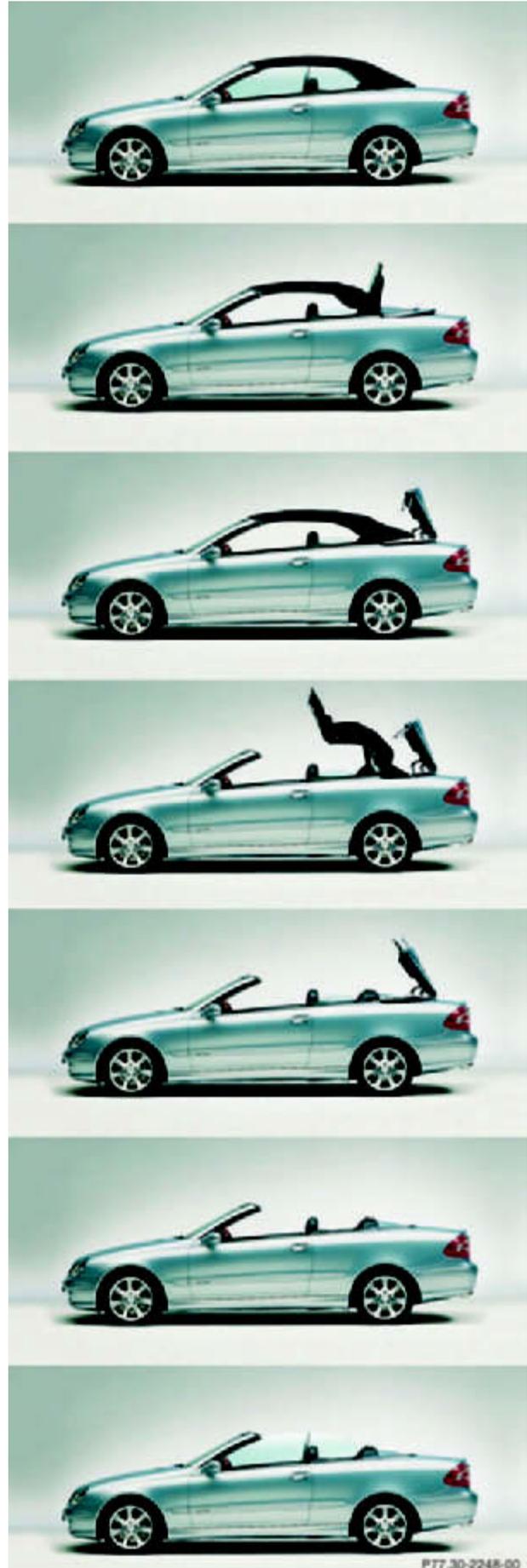
### Open/close soft top:

The soft top system of the SL-Class cabriolet (model 129), CLK-Class cabriolet (model 209) and G-Class cabriolet (model 463) have a similar design. The sequence of movements for opening the soft top described below applies for all models.

The two catch hooks (G-Class/model 463) are used to unlock the soft top from the windshield frame and raise it slightly (SL-Class/model 129 and CLK-Class/model 209 locks and unlocks electrically).

The soft top can be fully opened/closed when the following conditions are satisfied:

- Ignition switched on
- Vehicle stationary or moving at max. 8 km/h
- Trunk partition closed
- Trunk lid closed
- Soft top switch/remote control actuated until the opening/closing sequence is complete.

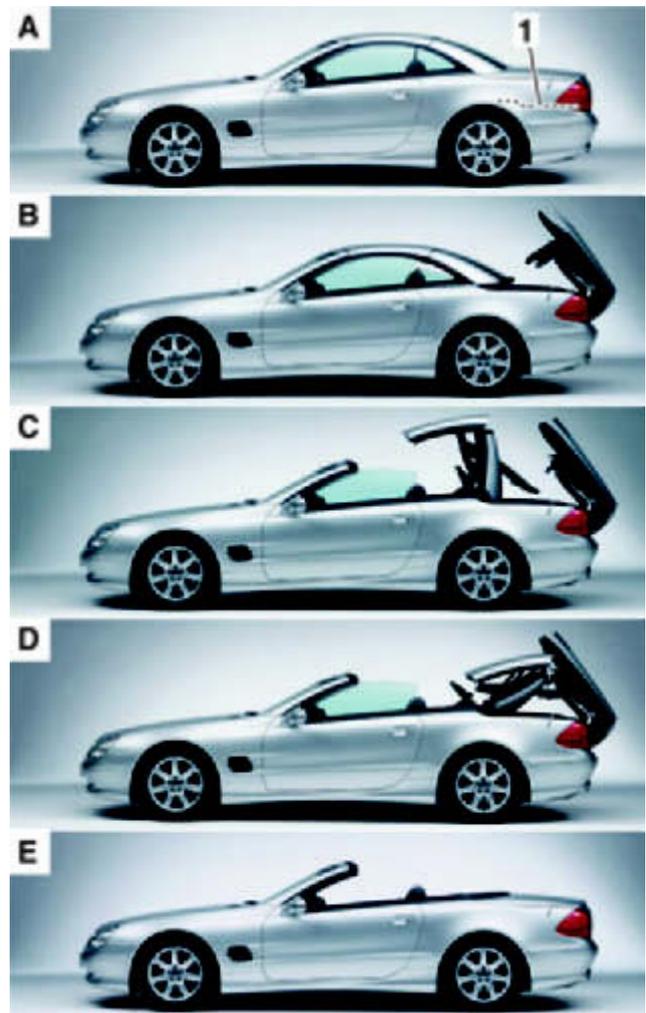


## Vario roof (VD)

### Opening the Vario roof:

The Vario roof on the roadster of the SLK-Class (model 171) and the SL-Class (model 230) can be opened as follows:

- Engage (A) the trunk luggage cover (1)
- Push back and hold down the control switch
- The side windows are lowered (B)
- The indicator lamp lights up
- The trunk cover swings out towards the rear (B)
- The Vario roof is retracted into the luggage compartment (C, D)
- The trunk cover is closed (D)
- The indicator lamp goes out - the opening sequence is complete (E)
- If the control switch is held down longer or pressed again within 30 s, the front side windows close



P77.30-2257-00

**i** **Caution:** If the trunk luggage cover is not correctly hung-in, then the Vario roof cannot be opened!

### A-Class F-cell (V168CH2) with fuel cell drive

The "F-Cell" A-Class is the first Mercedes-Benz passenger car to be launched with fuel cell drive.

For passenger cars, proton conducting fuel cells (PEMFC - Proton Exchange Membrane Fuel Cells) are particularly suited on account of their low operating temperature of approx. 80° C and the high power density. The reaction of hydrogen and oxygen under controlled conditions provides the power for the vehicle's electrical drive system. Chemically pure water is created here.

#### Function

The core of the PEM fuel cell is a proton conducting plastic film (diaphragm) which is only one tenth of a millimeter thick. It separates the two reaction gases from each other thus supporting the reaction. Both sides are coated with an extremely thin platinum layer. This decomposes the hydrogen in positively charged protons and negatively charged electrons. The protons migrate through the film to the oxygen, with which they then combine to form water. For electrons the diaphragm is impervious - they are held in check. The electron surplus on the hydrogen side and the deficiency of electrons on the oxygen side cause a positive and negative pole to be created. If these poles are connected to each other electric current flows.

Several fuel cells are combined to form a cell stack in order to generate the amount of energy necessary to drive a passenger car.

### Traction voltage network (450V)

The V168CH2 contains two electrical power networks

- 12 V network (conventional battery)
- 450 V - Traction voltage network (traction voltage battery and fuel cell stack)

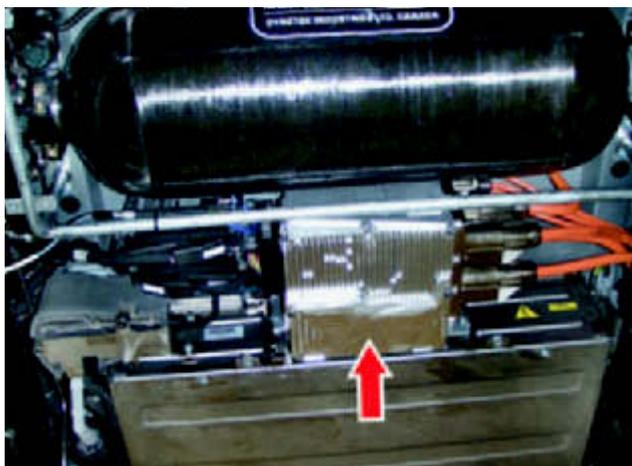
The energy for the starting procedure is supplied by the traction voltage battery. This is charged by the fuel cell stack via the traction voltage DC/DC converter.

After deactivation of the traction voltage network, the residual voltage of the traction voltage consumers drops to below 48 V within 60 s. Only the fuel cell stack retains a residual voltage for longer than 60 s after deactivation.

## Fuel cell drive system

### PDU - Power Distribution Unit

The PDU is the central traction voltage distributor between the fuel cell stack, the traction voltage battery and the traction voltage consumers. It is located between the fuel cell stack and the refueling system.



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### Traction voltage battery

The traction voltage battery (1) is located in the trunk floor. The battery is monitored by two temperature sensors and cooled by means of fans.

In front of this is the traction voltage DC converter (2).



P54.10-2266-00

### 12 V battery

The 12 V battery (3) serves as a power supply for conventional systems such as, e.g.

- Interior and exterior lights
- Telephone, audio and communications systems
- Convenience systems

The 12 v battery is located in the right of the engine compartment.



P54.10-2500-00

### E-Class sedan (model 211) with bivalent natural gas drive

The most suitable form of natural gas for operating a vehicle is compressed natural gas (CNG). This refers to naturally occurring natural gas in compressed form.

Natural gas is classified according to its gross calorific value as H-gas (high) and L-gas (low):

- H-gas has a gross calorific value of over 11 kWh/m<sup>3</sup>
- L-gas is approx. 9.5 kWh/m<sup>3</sup>.

Because of the different energy outputs, the operating range of a vehicle running on L-gas is reduced by up to 20 %.

### Natural gas/gasoline operating mode

The driver can select the mode manually using the buttons on the multifunction steering wheel:

- Gasoline
- Natural gas

The vehicle automatically switches from one mode to the other as soon as one of the two fuels is used up.



P07.54-2037-00

#### Mode display

- 1 Vehicle operating mode
- 2 Natural gas
- 3 Gasoline

### Instrument cluster display

For gas-powered vehicles the display in the instrument cluster is additionally equipped with the following features for natural gas drive:

- Natural gas drive status indicator
- Tank fill level gauge
- Warning and operating messages
- Tank reserve warning

Gas pressure indicator in gas cylinder (workshop level only)



P07.54-2038-00

#### Natural gas tank fill level gauge

## Bivalent natural gas drive

### System Components

The following components are used for natural gas operation:

- Gas manifold with integral low pressure sensor and temperature sensor
- Gas injection valves
- CNG control unit
- Gas pressure regulator with integral filter, high pressure sensor and electromagnetic shutoff valve

The 4-cylinder supercharged engine has been supplemented by the addition of gas injection valves on the underside of the intake manifold.

A near-engine mounted gas pressure regulator with high pressure sensor and electromagnetic shutoff valve controls the natural gas supply.

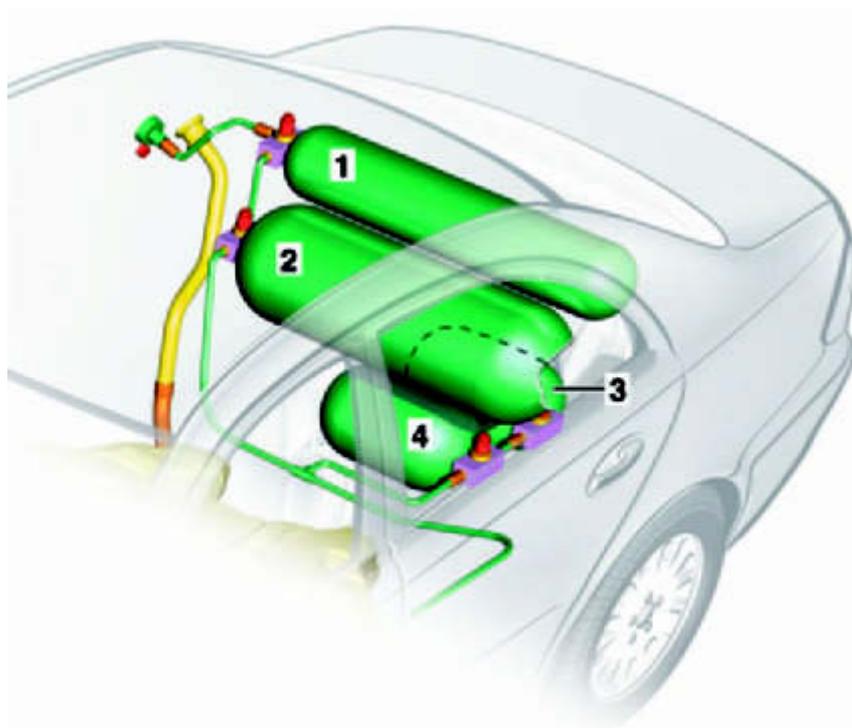
### Fuel supply system

The natural gas tank system consists of four black gas cylinders made of high-strength steel (wall thickness > 5 mm) with a total volume of 107.5 liters.

The gas cylinders are accommodated in sturdy brackets where they are protected in the event of a crash.

The standard fuel tank for gasoline retains its full volume of 65 liters.

A fuse (solder fuse) and a flow limiter ensure that the gas cylinders cannot explode even in extreme situations. In addition, each gas cylinder can be manually locked.



#### Location of gas cylinders

- 1 Gas cylinder 1, volume 30 l
- 2 Gas cylinder 2, volume 45.5 l
- 3 Gas cylinder 3, volume 16 l
- 4 Gas cylinder 4, volume 16 l

P07.54-2024-00

## Body

The vehicle structure of the SLR consists of four main sections:

- Monocoque
- Trunk cell
- Front crash structure
- Front frame

The body-in-white with the exception of the front frame and the doors and hood of the SLR are made of corrosion-resistant **carbon-fiber composite material**.

Manufacturing the monocoque out of **carbon-fiber composite material** enables a high torsion and bending strength to be achieved. The enormous strength of the carbon-fiber reinforced plastic (CFK) contributes significantly to occupant protection.



*SLR McLaren vehicle structure*

## SLR McLaren

### Monocoque

The passenger compartment and fuel tank are surrounded by a safety cell (monocoque). This safety cell is made of carbon-fiber composite material. The monocoque consists of several components:

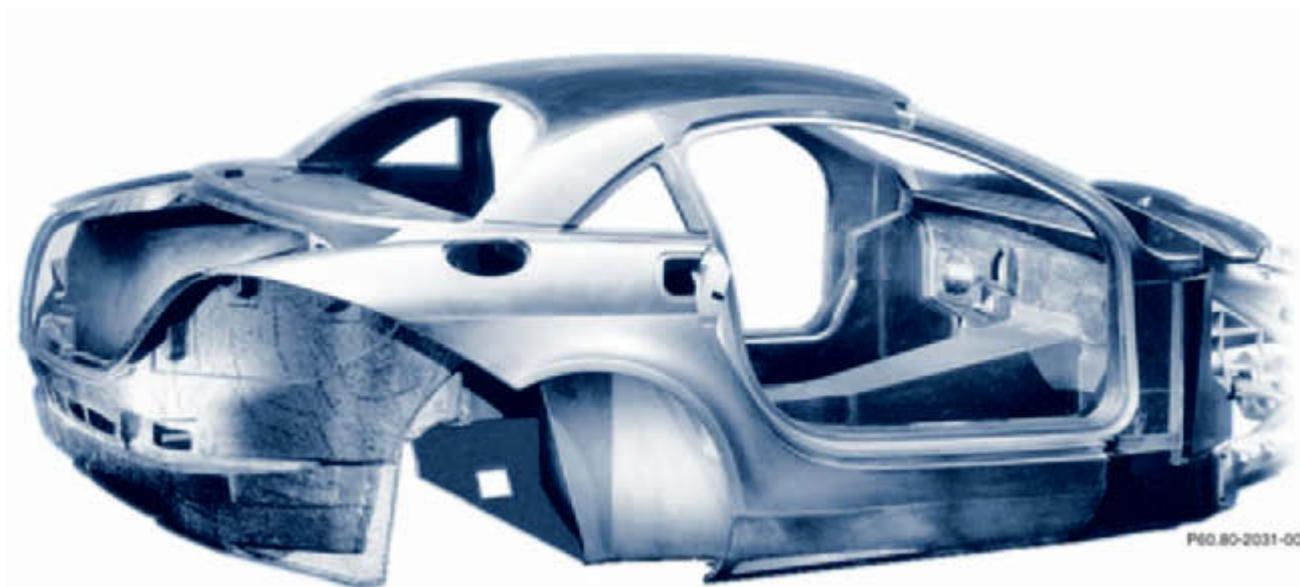
- Pan with integral engine/transmission tunnel
- Differential supporting frame
- Door sill panels
- One-piece roof frame with roll-over protection

### Trunk cell

Similar to the front frame, the trunk cell is also bolted onto the monocoque. The rear area houses the following components:

- Battery mounting
- Interior compartment vents
- Cooler for rear axle differential
- Luggage compartment
- Rear suspension

The trunk cell is designed to absorb the vast majority of the energy in a rear end collision.



P60.80-2031-00

*Monocoque and trunk cell*

## Front crash structure

The front crash structure made of carbon-fiber composite material is bolted onto the front frame by way of the two tubular-shaped energy-absorbing elements.

The crash absorbers are designed such that they are converted into smaller particle energy through uniform progressive disassembly of the fiber composite structure from the front to the rear thus causing a controlled, mainly constant deceleration.



*Front crash structure*

## Front frame

The front frame consists of two separate high-strength aluminum box profiles bolted on to each side of the monocoque, on which the engine is mounted.

The following components are also mounted to the front frame along with the engine:

- Radiator
- Front suspension
- Stabilizer bar
- Exhaust muffler
- Steering
- Front crash structure



*Front frame*



According to the latest knowledge, vehicle structures made of carbon-fiber composite material can be separated or deformed using the customary rescue devices.

## List of abbreviations

---

**ABC**

Active Body Control

**AKSE**

Automatic child seat recognition (ACSR)

**BAS**

Brake Assist

**CAN**

Controller Area Network

**CFK**

Carbon fiber reinforced plastic (CRP)

**CNG**

Compressed natural gas

**ESG**

Single-pane safety glass

**ESP**

Electronic Stability Program

**LED**

Light emitting diode

**LPG**

Liquefied petroleum gas

**ME**

Motor electronics (ME-SFI)

**NGT**

Natural gas technology

**NIR**

Near-infrared light

**PDU**

Power distribution unit

**PEM**

Proton Exchange Membrane

**PEMFC**

Proton Exchange Membrane Fuel Cell

**SRB**

Fuse and relay box

**VSG**

Laminated safety glass

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