

# Rescue Manual

## Information for Rescue Services

### 2003



**BMW Group**



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# Introduction

Optimum safety under all conditions is a natural development objective for BMW products. Bringing about the "Ultimate Driving Machine" thus does not just amount to providing attractive and technically sophisticated vehicles.

It is just as natural for BMW to have a suitable safety concept.

The BMW safety philosophy is impressively reasserted by the introduction of the "Intelligent Safety Information System", ISIS for short, beginning with the E65 model series. This is based on the approach of considering all systems in their entirety, i.e. precise coordination of all active and passive safety systems. This stretches far beyond merely satisfying the legal requirements and also takes into account the necessary technical pre-conditions for life-saving applications.

In effect, this involves providing specific information on dealing with the BMW restraint and safety systems and tips on using rescue equipment.

This brochure contains all the information on airbags needed for rescue operations incl. **ITS** (Inflatable **T**ubular **S**tructure = head airbag) and **AIMS** (Advanced ITS), seatbelt tensioners, rollover protection, safety battery terminal, side-impact protection, tips for using rescue equipment and installation drawings of the battery and tank. All details refer exclusively to factory-installed systems in BMW and MINI cars.

The Chapter Battery layout also features the illustrations of left-hand drive (**LHD**) and right-hand drive (**RHD**) models.

In order to satisfy the needs and requirements that occur in practice, we have compiled this brochure in close cooperation with the Munich Fire Service.



Munich Fire Service



# Tips for Rescue Services

Medical and technical aspects must be coordinated and developed hand in hand.

## Medical aspects

First of all, access must be established to the (trapped) persons.  
Non-jolting methods should be used here if at all possible.

The life-saving measures and the initial examination (basic check) must still be performed inside the accident vehicle.

### Exception

Immediate danger posed by fire or crash.  
A crash rescue operation will be required for medical reasons.

In all cases, it is absolutely essential to avoid (hectically) pulling the person out of the vehicle. The injured person should initially be left in the vehicle provided there is no immediate danger to the person or rescuer.

Before initiating any rescue measures, **always** immobilise the injured persons, i.e. provide suitable restraints.

The medical measures that are carried out in the vehicle should be restricted to the most essential. However, in the case of unconscious persons, this involves preserving the vital functions by means of infusion/intubation with artificial respiration.  
In this case, the doctor/paramedic must be provided with access to the person so that he/she can carry out the life-saving measures.

During the rescue measures, the injured persons must be provided with **permanent** medical care.  
It is absolutely essential to follow a caring procedure.

## Technical aspects

- Identification of the vehicle model
- Visual inspection to ascertain fitted restraint and safety systems
- Body peculiarities with regard to the deployment of hydraulic rescue equipment

## "Assist" automatic emergency-call system

If one of the restraint systems is triggered, an emergency call is automatically made to the service provider via the factory-installed, activated mobile cellular phone in conjunction with the navigation system. In this process, the vehicle data, the phone number of the vehicle involved in the accident and the current position are transmitted as an SMS to the service provider's call centre. The service provider tries to make a call back to the transmitted phone number. If this attempt fails, the nearest rescue control centre is notified and a rescue operation is initiated.

# Models

## 3 Series

E30

E36

E46

Saloon/Sedan



Touring



Convertible



Coupé



Compact



# Models

## 5 Series

**E34**

**E39**

**E60**

**Saloon/Sedan**



**Touring**



## 7 Series

**E32**

**E38**

**E65/E66**

**Saloon/Sedan**



## 8 Series

**E31**

**Coupé**



# Models

## Z3, Z4, Z8

**Z3 Roadster**



**Z3 Coupé**



**Z4**



**Z8**



## X models

**X5**



## MINI



### **General information**

The 5 Series (E39, E60) and 7 Series (E38, E65, E66) models can be fitted with special protective glass. This can be recognised from the outside by thicker glass.

# Restraint and Safety Systems

## Important notes

### Battery

Turn off the ignition, then disconnect **both** battery leads (first negative and then positive) from the battery.

**The safety battery terminal only disconnects the positive battery lead between battery and starter/alternator.** In order to de-energise the protection systems, you must disconnect **both** battery leads (first negative and then positive) from the battery.

### Important

If the vehicle **cannot be de-energised**:

- Move heads out of the deployment range of an untriggered airbag if heavy life-saving equipment is used
- Tend to injured persons from the side

## Response of restraint and safety systems after an accident

**The restraint systems are not usually triggered when a vehicle is stationary!**

### Exceptions

- Heating of the solid propellant in the gas generator to over 200 °C results in a controlled airbag triggering.
- Massive mechanical strain on the airbag modules (sawing, drilling, grinding, welding) could cause an airbag to be triggered.
- A short circuit in the electrical wires for activating the squibs can cause an airbag to be triggered.
- The stationary vehicle is hit by another vehicle.  
The restraint systems are triggered provided the triggering criteria are satisfied.

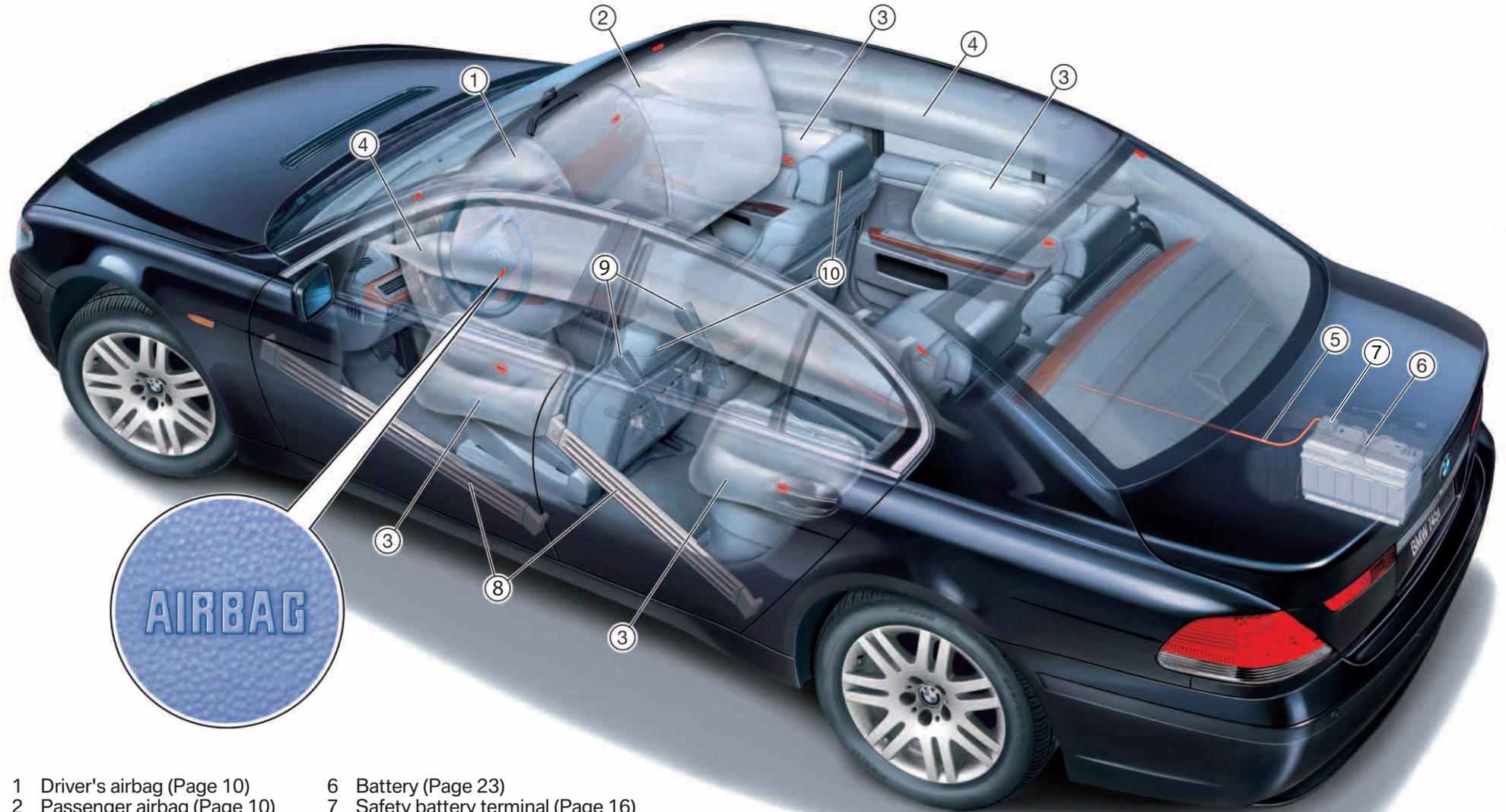
### Child restraint systems

The passenger and side airbags can be deactivated when child restraint systems are being used. In this case, stickers are attached next to the relevant airbag.

### Use of radio equipment

It is quite safe to use **radio telephones/walkie-talkies** in the immediate vicinity of untriggered restraint systems.

# Overview of Restraint and Safety Systems



- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| 1 Driver's airbag (Page 10)       | 6 Battery (Page 23)                 |
| 2 Passenger airbag (Page 10)      | 7 Safety battery terminal (Page 16) |
| 3 Side airbag (Page 10)           | 8 Side-impact protection (Page 17)  |
| 4 Head airbag (Page 11)           | 9 Seatbelt tensioner (Page 13)      |
| 5 Battery positive lead (Page 23) | 10 Active head restraint (Page 14)  |

# Airbag

## Identifying airbag systems

### Driver's airbag

SRS, SRS Airbag or Airbag lettering on the steering wheel

### Passenger airbag

SRS, SRS Airbag or Airbag lettering on the lid on the right side of the instrument panel (passenger side)

### Side airbag

BMW models

SRS, SRS Airbag or Airbag lettering on the door trim panel in the door-lock area

MINI models

Airbag lettering on the outside of the backrest of the driver's and front passenger seats

### Head airbag

SRS, SRS Airbag or Airbag lettering on the panel of the A- and C-pillars

## Driver's airbag

The driver's airbag is integrated in the impact absorber on the steering wheel.

An acceleration detected in the sensor is integrated and evaluated. The driver's airbag is fired once the appropriate triggering thresholds have been exceeded. The squib in the gas generator receives the firing voltage from the airbag control unit or from the relevant satellite. The gas generated after firing escapes into the airbag.

## Passenger airbag

The passenger airbag is located in the instrument panel above the glove compartment on the passenger side.

A seat-occupancy detector has been integrated for years in order to prevent unnecessary triggering of the passenger airbag in the event of a crash (passenger seat is not occupied).

The front passenger seat is identified as being occupied from a weight of 12 kg by the sensors in the front passenger seat and through evaluation of the data in the airbag control unit or in the satellite and the system is thereby activated.

## Side airbag

The side airbags are located behind the side trims in the doors in BMW models and in the backrests of the driver's and front passenger seats in MINI models.

In the event of a side impact, the transversal acceleration that occurs is measured by appropriate sensors.

If the triggering threshold is exceeded, the airbag control unit or the relevant satellites fire the side airbags and, if fitted, also the head airbag.

# Airbag

## Head Airbag

The **ITS (Inflatable Tubular Structure)** and **AITS (Advanced Inflatable Tubular Structure)** head airbags are installed along the A-pillar and the roof frame on the driver's and passenger sides and are fired with the corresponding side airbags. With an additional head airbag at the rear, the airbag is installed along the A-pillar, the roof frame and the C-pillar.

Unlike the other airbags, the ITS head airbag is a tubular system which is secured to the body with belt straps.

The AITS head airbag is a head protection system like the ITS with the advantage of the area protection afforded by a curtain.

When the generator is fired, this increases the diameter of the head airbag, thereby reducing its overall length. With this procedure, the head airbag stretches between the lower end of the A-pillar and the rear attachment to the roof frame.

Unlike front and side airbags, which collapse relatively quickly after inflating, the head airbag retains the gas volume and thus also offers protection in the event of the car rolling over or secondary accidents.

The head airbag can be cut off at the belt straps or cut through safely.

## Airbag control unit

The airbag control unit is the central unit of the entire restraint and safety system and assumes the following functions:

- Crash detection
- Determining firing point of airbags, seatbelt tensioners and safety battery terminal
- Firing the airbags, seatbelt tensioners and safety battery terminal
- Self-test
- Fault indication and fault memory with diagnostic capabilities
- Seat-occupancy and weight detection of front passenger seat

## Satellites

Satellites are electronic control units, if necessary with integrated sensors, for activating actuators. Satellites can make decisions on triggering actuators. Centralised control is assumed by the ISIS. From the 7 Series (E65) models, the vehicles are fitted with the "**Intelligent Safety Integration System**" (ISIS) including a number of satellites.

# Function of airbag



Driver's airbag

## Firing sequence

Airbags are triggered by the airbag control unit or the relevant satellite (control unit). When the triggering limits are exceeded, the integrated sensors activate the required systems.

In the gas generator, the solid propellant sodium azide burns completely into nitrogen. The gas flows into the airbag and inflates it. When the airbag inflates, the cover (impact absorber of driver's airbag, cover of passenger airbag, trim of side/head airbags) splits open at the programmed rupture point.

The talc from the airbag that is deposited in the passenger compartment is completely safe.

## Safety mechanisms

All models except 7 Series (E65, E66).

The restraint and safety systems are triggered by way of electronic and mechanical acceleration sensors. **Two independently** operating sensors are always fitted to trigger the airbags.

### Electronic acceleration sensors

Driver's and passenger airbags, head and side airbags, seatbelt tensioners and safety battery terminal.

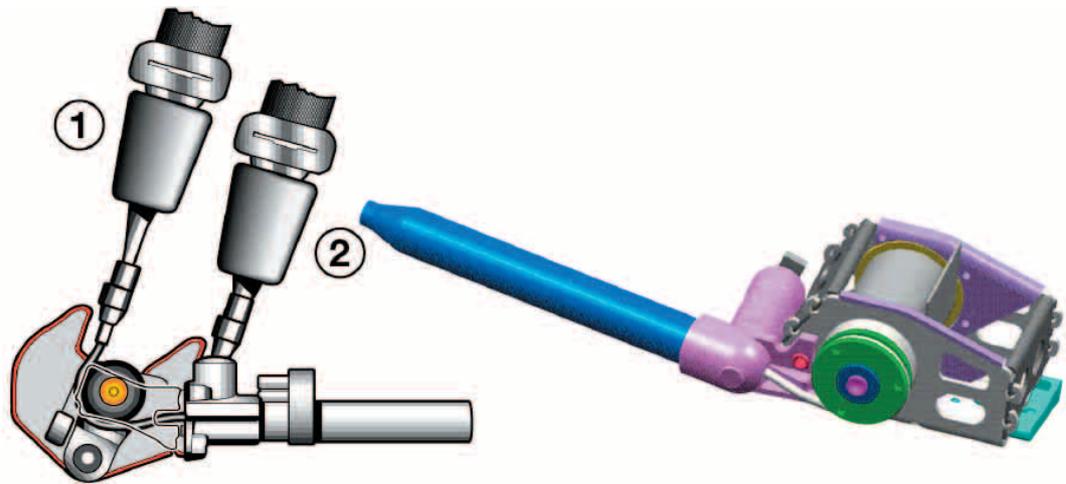
### Mechanical acceleration sensors (saving sensors)

Driver's and passenger airbags are triggered in conjunction with the mechanical acceleration sensors.

### Electronic side-impact sensors

Side and head airbags are triggered in conjunction with the electronic acceleration sensors.

# Seatbelt and Anchor-Fitting Tensioners



Pyrotechnical seatbelt tensioner

Pyrotechnical anchor-fitting tensioner

- 1 Seatbelt tensioner not triggered
- 2 Seatbelt tensioner triggered

Three types of system are used in the vehicles to reduce belt slack:

- Mechanical seatbelt tensioners
- Pyrotechnical seatbelt tensioners
- Pyrotechnical anchor-fitting tensioners

## Identifying seatbelt tensioners

No markings.

## Safety instructions for untriggered seatbelt tensioners

There is no special procedure required for untriggered seatbelt tensioners.

## Function of seatbelt tensioner

### Pyrotechnical seatbelt tensioners

The seatbelt tensioners are fired by the airbag control unit or the seat satellites, a pyrotechnical unit tightens the seat belt.

### Mechanical seatbelt tensioners

The seatbelt tensioners are unlocked mechanically and tighten the seat belts.

### Pyrotechnical anchor-fitting tensioners

The anchor-fitting tensioners are fired by the seat satellites, a pyrotechnical unit tightens the seat belt.

# Active Head Restraint



Active head restraint

The active head restraints are integrated in the driver's and passenger seats.

In the event of a rear-end collision, the complete head restraint is tilted forwards to the head in order to reduce the distance between the head and the head restraint.

## Identifying active head restraints

No markings

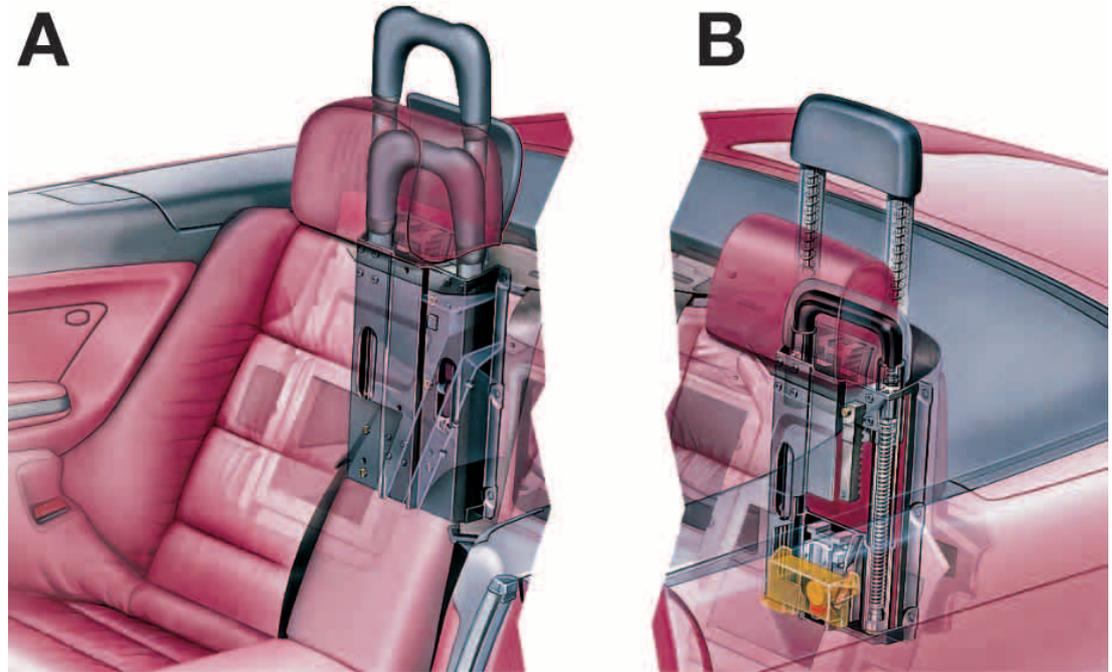
## Safety instructions for untriggered active head restraints

There is no special procedure required for untriggered active head restraints.

## Function of active head restraint

In the event of a rear-end collision, the gas generator in the seat back is activated by two additional crash sensors in the vehicle rear end. This activates the movement mechanism and the head restraint is tilted forwards in order to reduce the distance between the head and the head restraint.

# Rollover Protection



Triggered rollover protection for 3 Series (E46 and E36) Convertible

**A** Rollover protection system 3 Series (E46)      **B** Rollover protection system 3 Series (E36)

The rollover protection system is only installed in 3 Series (E36, E46) Convertible models.

## Identifying rollover protection system

3 Series (E36) no markings.

3 Series (E46) "Rollover protection system" marking on top side of head restraints of rear seats.

## Safety instructions for untriggered rollover bars

There is no special procedure required for untriggered rollover bars.

## Function of rollover protection system

The rollover protection system consists of two rollover bars behind the rear-seat head restraints in 3 Series (E36) models (visible) and two rollover bars in the rear-seat head restraints in 3 Series (E46) models (not visible).

When the limit values are reached, the integrated rollover sensors release the locks and the rollover bars are extended by spring force.

The rollover bars are locked mechanically in their end position.

The rollover protection system is a separate system and is not connected in any way to the airbag control unit.

# Safety Battery Terminal



Safety battery terminal

The safety battery terminal disconnects the positive battery lead between battery and starter/alternator and prevents short circuits. The remaining electrical loads continue to be supplied with voltage.

## **Important**

The safety battery terminal only disconnects the positive battery lead between battery and starter/alternator. In order to de-energise the protection systems, you must disconnect both battery leads (negative and positive) from the battery.

## **Identifying safety battery terminal**

No markings

## **Safety instructions for untriggered safety battery terminal**

The squib of the safety battery terminal must not be crushed, cut or heated.

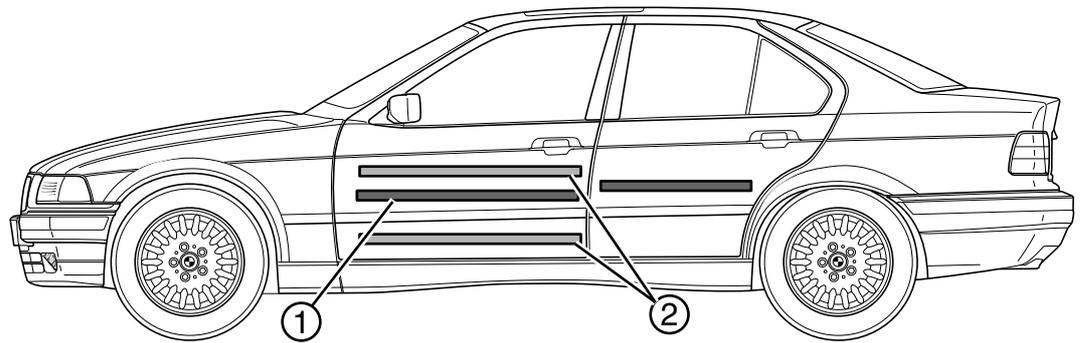
## **Function of safety battery terminal**

The safety battery terminal is attached to the battery positive terminal.

The firing unit in the safety battery terminal is fired by the airbag control unit or by the right B-pillar satellite (control unit) in accordance with the airbag triggering criteria. The generated gas volume forces the lead pin out of its mount in the battery terminal, thereby disconnecting the lead connection between battery and starter/alternator.

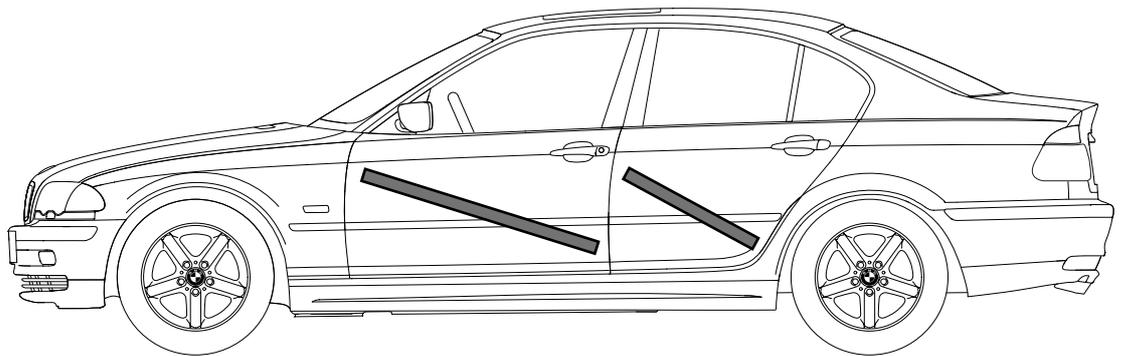
The remaining electrical loads continue to be supplied with voltage by way of the second lead connection.

# Side-Impact Protection



Installation drawing, side-impact protection, horizontal

- 3 Series (E36) (1)
- 3 Series (E46) Compact (2)
- 8 Series (E31) (1)

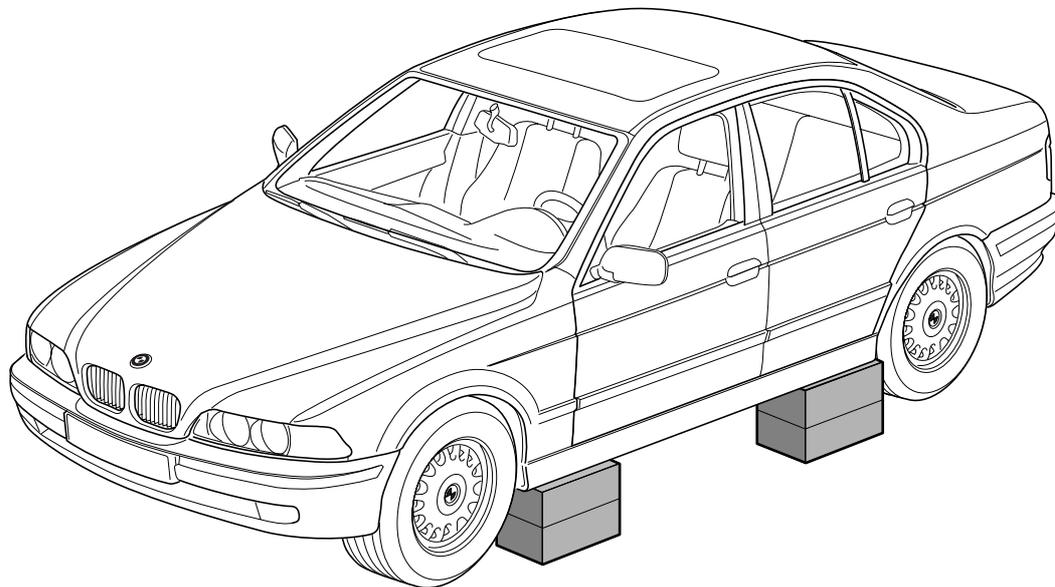


Installation drawing, side-impact protection, diagonal

- 3 Series (E46), except Compact
- 5 Series (E39)
- 7 Series (E38, E65)
- X5
- Z3, Z4, Z8
- MINI

# Tips for Using Rescue Equipment

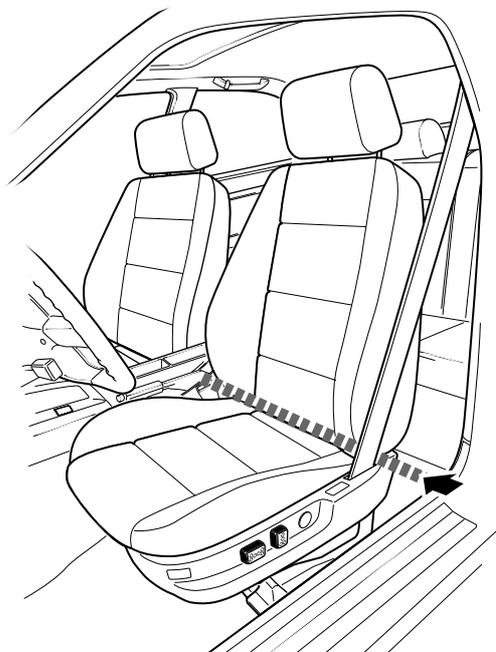
## Jacking vehicles



Jacking vehicles

The vehicles can be fitted with jacks under the entire side sill. Ideally, you should use the designated support ports for the jack.

## Seat adjustment

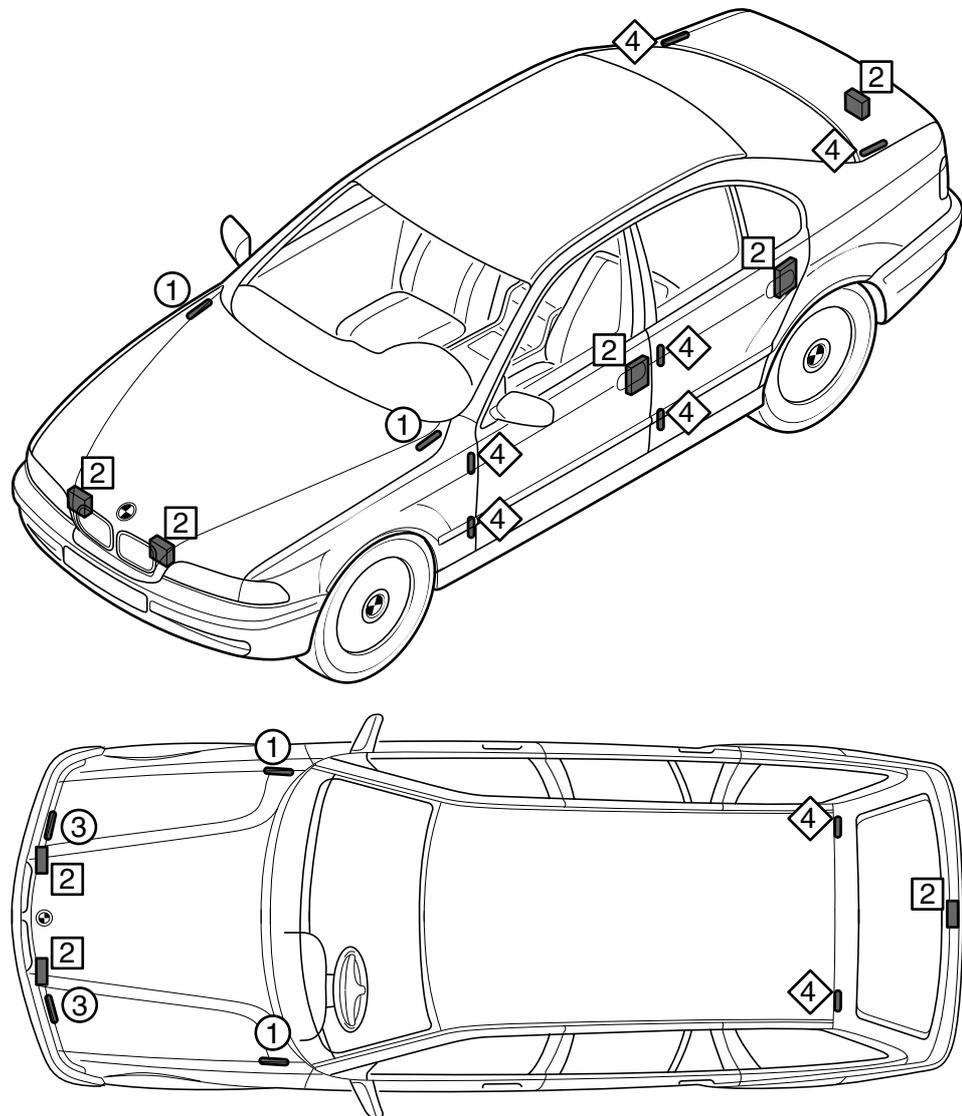


Seat

Since electric seats can no longer be adjusted once the battery has been disconnected, disconnection is recommended in the marked area.

# Tips for Using Rescue Equipment

## Hinges



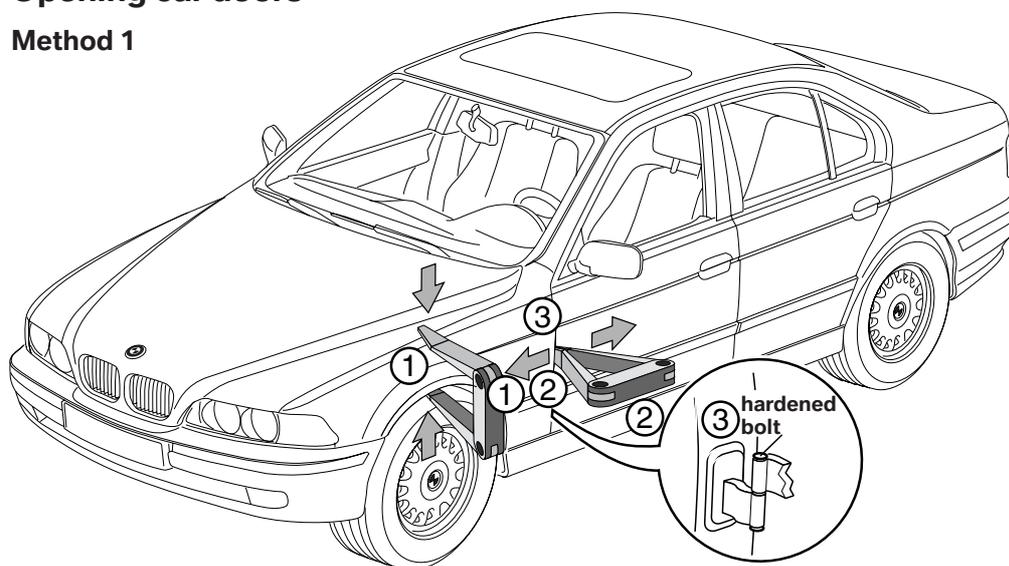
Installation drawing, hinges and locks

- ① Bonnet/hood hinges: all models (BMW and MINI) except ③
- ② Locks: all models
- ③ Bonnet/hood hinges
  - 3 Series (E30)
  - 5 Series (E34)
  - 7 Series (E32)
  - Z3, Z4, Z8
- ④ Door and luggage-compartment hinges: all models (BMW and MINI)

# Tips for Using Rescue Equipment

## Opening car doors

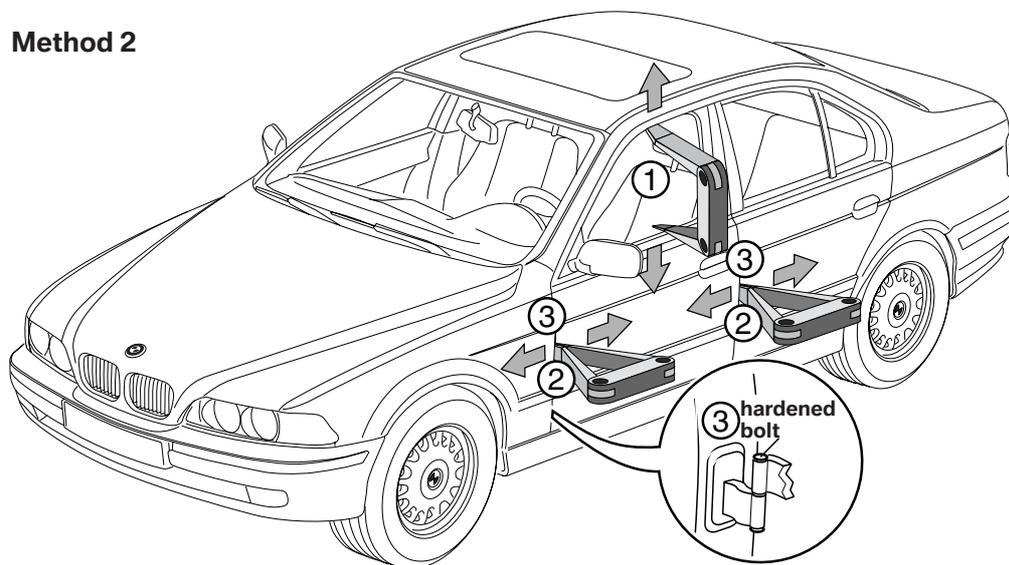
### Method 1



Starting points for opening door at A-pillar

- 1 Compress the fender with the hydraulic rescue spreader. This creates a bigger gap between the fender and the front door
- 2 Then use the spreader to enlarge the gap at the height of the hinges (see Page 19)
- 3 Cut off the hinges with the hydraulic cutters and open the door

### Method 2

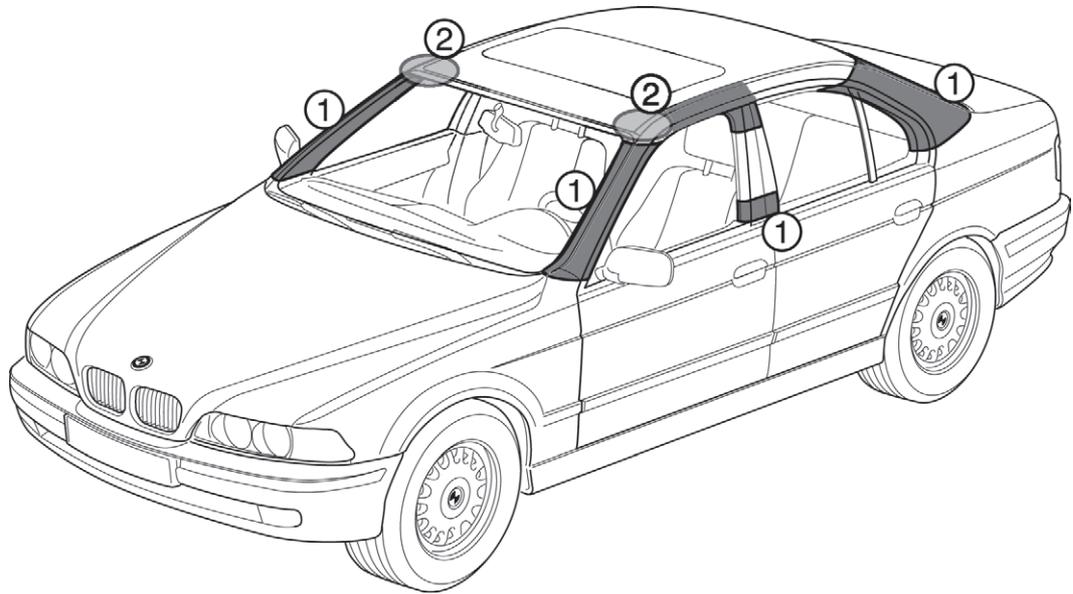


Starting points for opening door at A- or B-pillar

- 1 Force the window apart with the hydraulic rescue spreader. This creates a bigger gap between the front door and the B-pillar or between the fender and the front door
- 2 Use the spreader to enlarge the gap at the height of the hinges (see Page 19)
- 3 Then open the door on the hinge or lock side (on the lock side on cars without horizontal side-impact protection, see Page 17)

# Tips for Using Rescue Equipment

## Cutting off roof



Cutting lines on A-, B- and C-pillars and roof

### **All models except Convertible**

The grey shaded areas (1) designate the areas for models except Convertibles at which the A-, B- and C-pillars can be cut through.

### **Convertibles only**

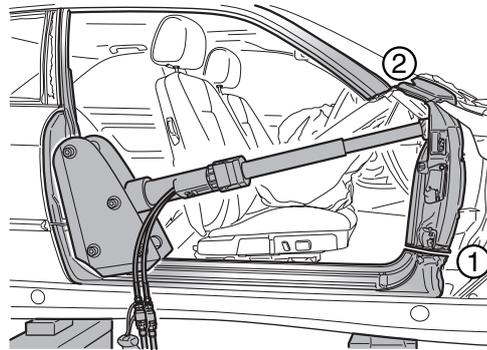
The grey shaded area (2) designates the areas for Convertibles with hard tops at which the A-pillar can be cut through.

## **Door windows**

The 5 Series (E39, E60) and 7 Series (E38, E65, E66) models can be fitted with special protective glass. This can be recognised from the outside by thicker glass.

# Tips for Using Rescue Equipment

## Pressing instrument panel back



### Pressing instrument panel back

- Secure the vehicle floorpan against buckling with supporting material
- Cut off the door at the hinges with the hydraulic cutters
- Cut the side sill (1) away from the occupant in the direction of the front end with the hydraulic cutters
- Cut through both A-pillars (2) with the hydraulic cutters
- Place the supporting bracket as illustrated on the B-pillar
- If possible, place the rescue cylinder between the centre mounting and the instrument panel, below the cut
- Press the front end back

### Note

Install the supporting bracket if the rescue cylinder is too short. The procedure for pressing the front end back with the rescue cylinder is more suitable for the occupant than moving the steering column with the chain hoist.

### Important

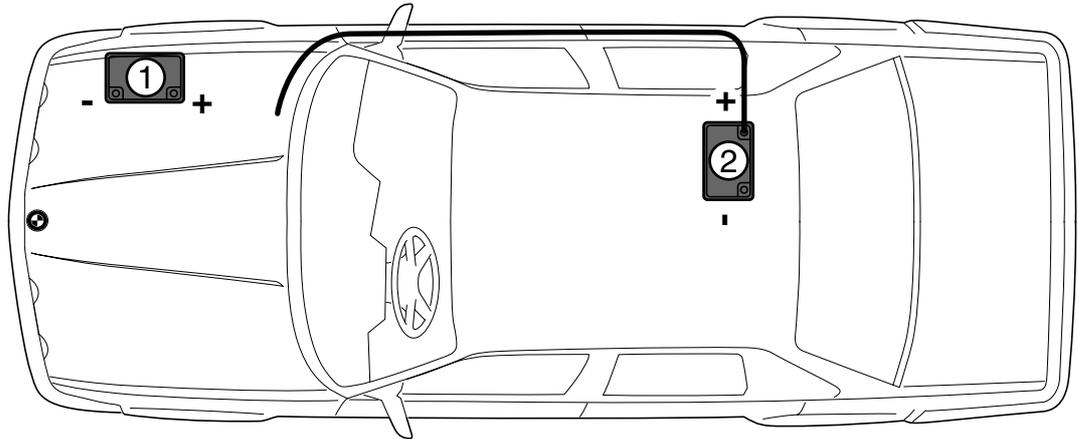
Rescue equipment can slip off.

# Installation Drawings

## Battery layout and cable laying

The battery layout depends on the vehicle's engine and equipment.

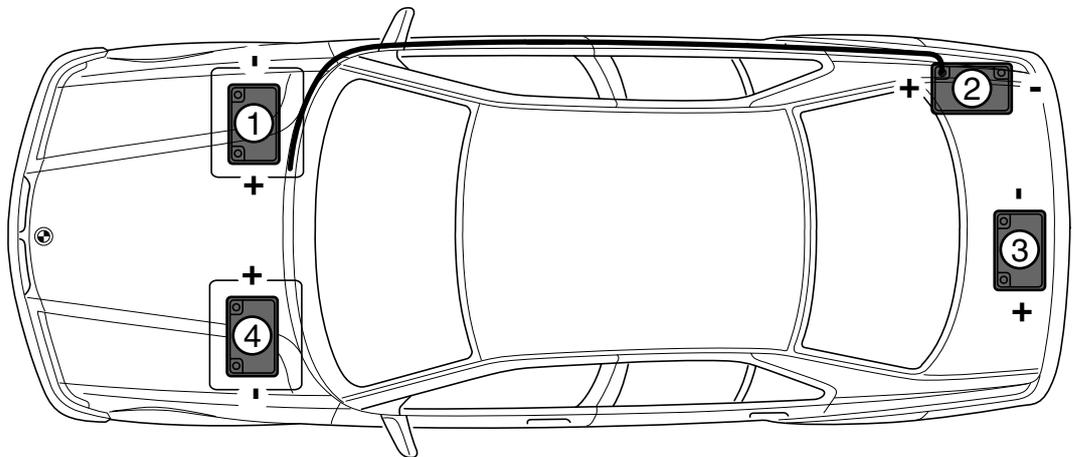
If the vehicle is fitted with two batteries, the positive and negative terminals must always be disconnected on **both** batteries.



Installation drawing, battery and positive leads

5 Series (E34) Saloon/Sedan, Touring and M5 - LHD (1) or (2); RHD (2)

7 Series (E32) Saloon/Sedan - LHD and RHD (2)



Installation drawing, battery and positive leads

3 Series (E30) Saloon/Sedan, Touring, Convertible and M3 - LHD (1) or (2); RHD (2) or (4)

3 Series (E36) Saloon/Sedan, Touring, Coupé, Convertible and M3 - LHD (1) or (2); RHD (2) or (4)

3 Series (E46) Saloon/Sedan, Touring, Coupé, Compact - LHD (1) or (2); RHD (2); Convertible and M3 - LHD and RHD (2)

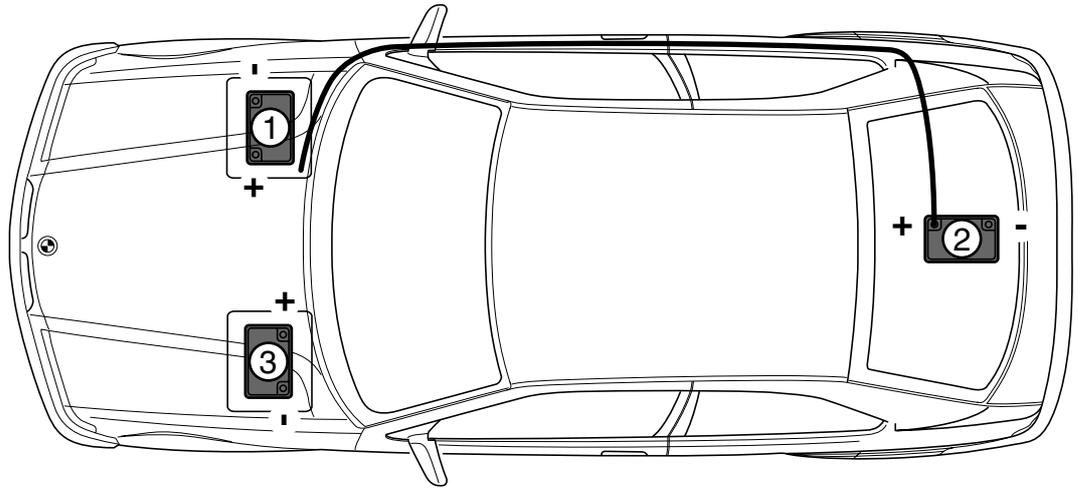
5 Series (E39) Saloon/Sedan, Touring - LHD and RHD (2) M5 - LHD and RHD (3)

5 Series (E60) Saloon/Sedan - LHD und RHD (2)

7 Series (E38) Saloon/Sedan - LHD and RHD (2)

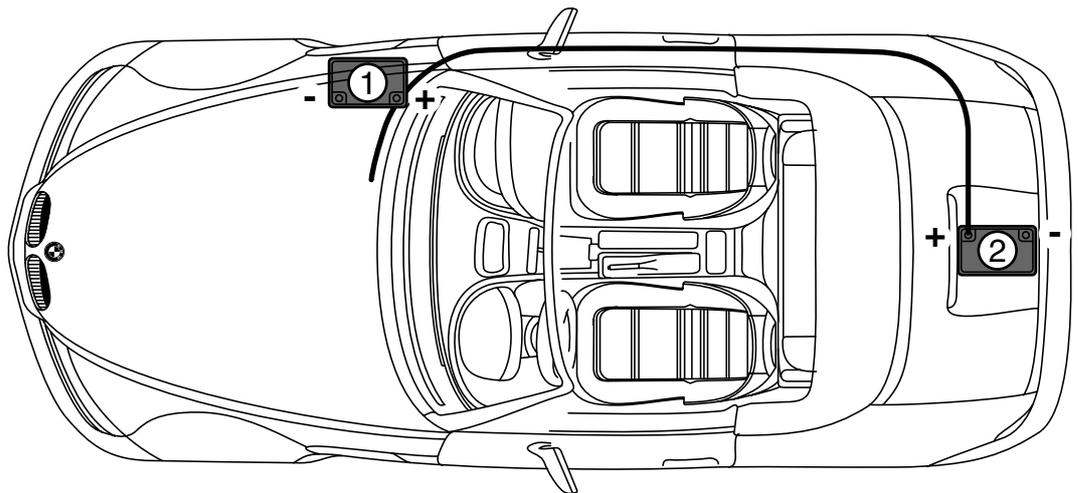
7 Series (E65) Saloon/Sedan - LHD and RHD (2), positive battery lead is a ribbon cable

# Installation Drawings



Installation drawing, battery and positive leads

3 Series (E36) Compact - LHD (1) or (2); RHD (2) or (3)

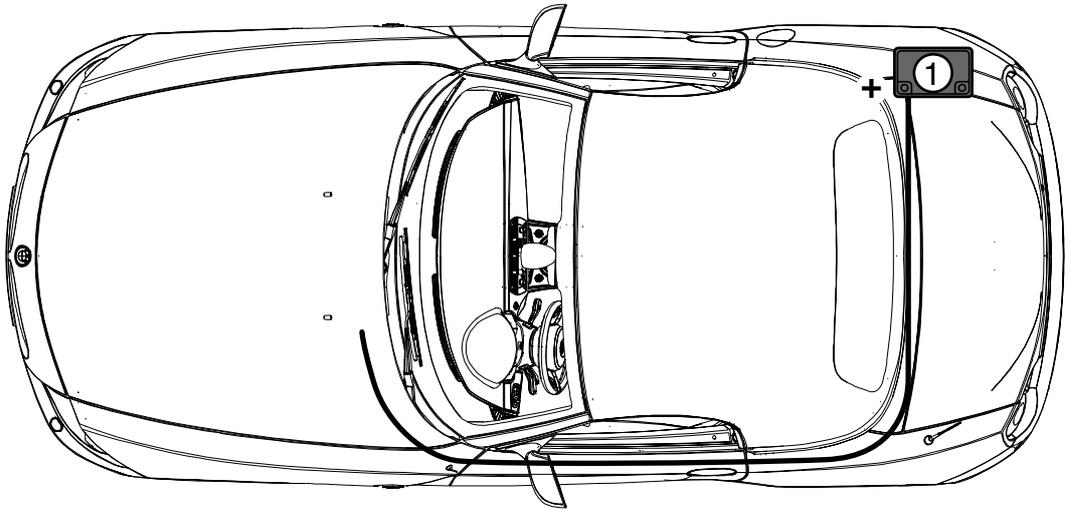


Installation drawing, battery and positive leads

Z3 Roadster, Coupé and M Version - LHD (1) or (2); RHD (2)

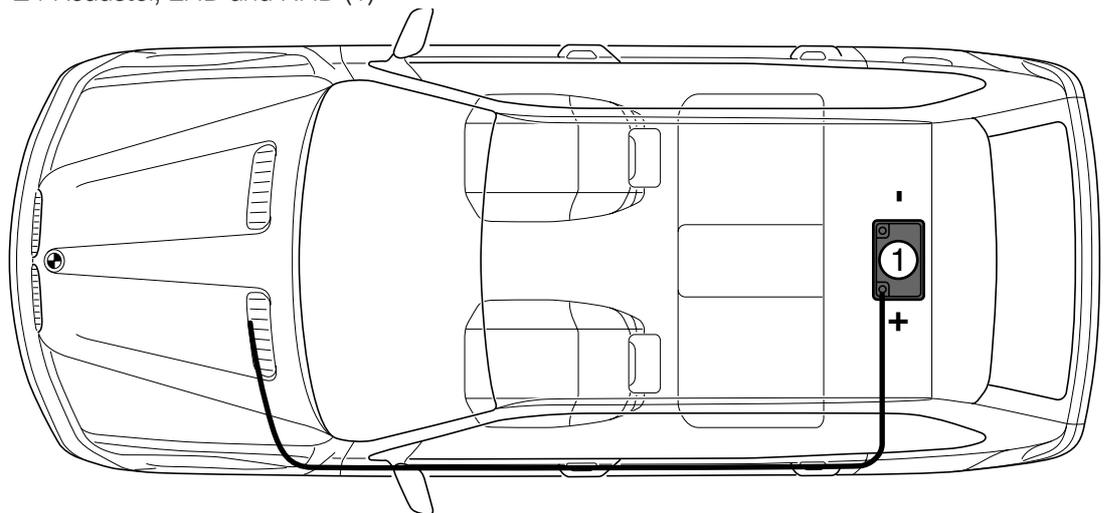
Z8 Roadster - LHD and RHD (2)

# Installation Drawings



Installation drawing, battery and positive leads

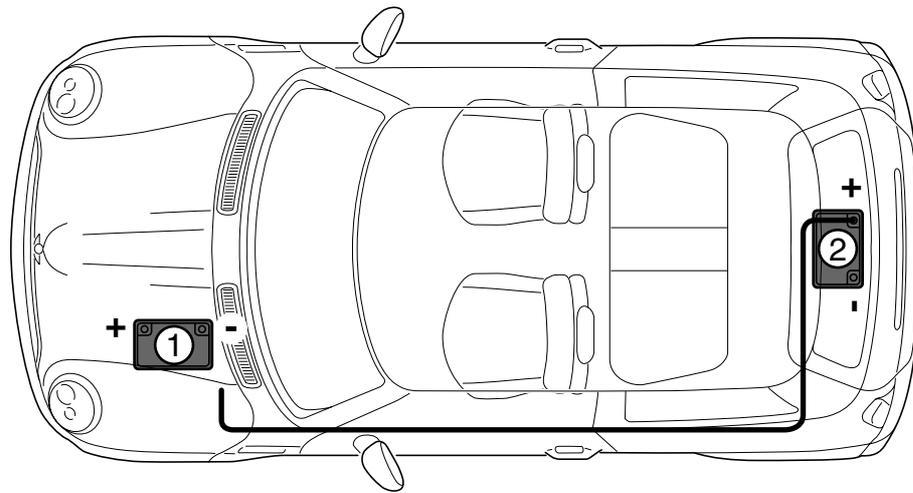
Z4 Roadster, LHD and RHD (1)



Installation drawing, battery and positive leads

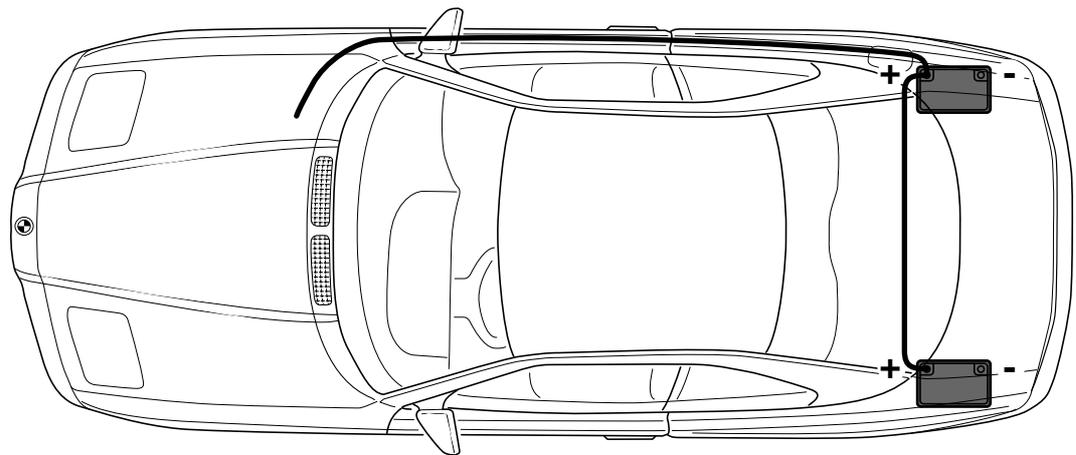
X5 - LHD and RHD (1)

# Installation Drawings



Installation drawing, battery and positive leads

MINI ONE, MINI Cooper - LHD and RHD (1)  
MINI Cooper S - LHD and RHD (2)

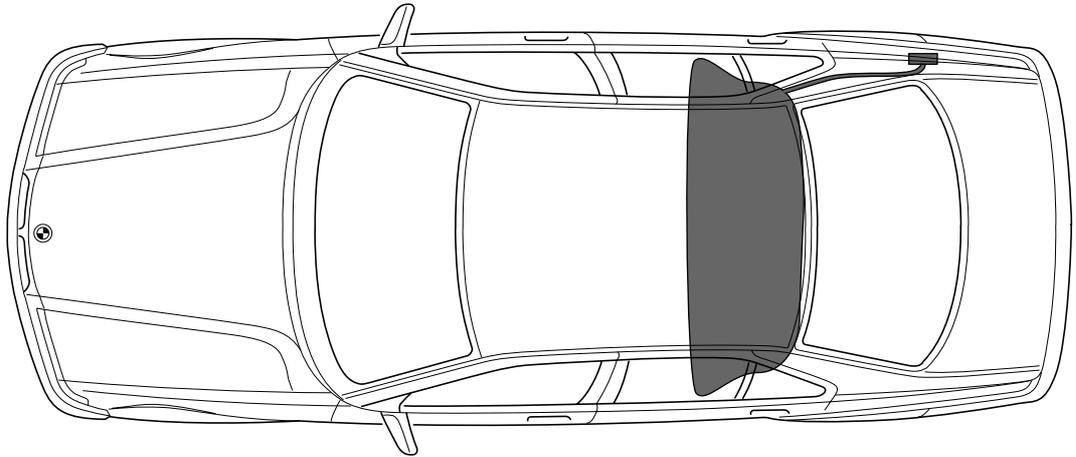


Installation drawing, battery and positive leads

The 8 Series (E31) only becomes de-energised when the negative and positive terminals are disconnected on both batteries.

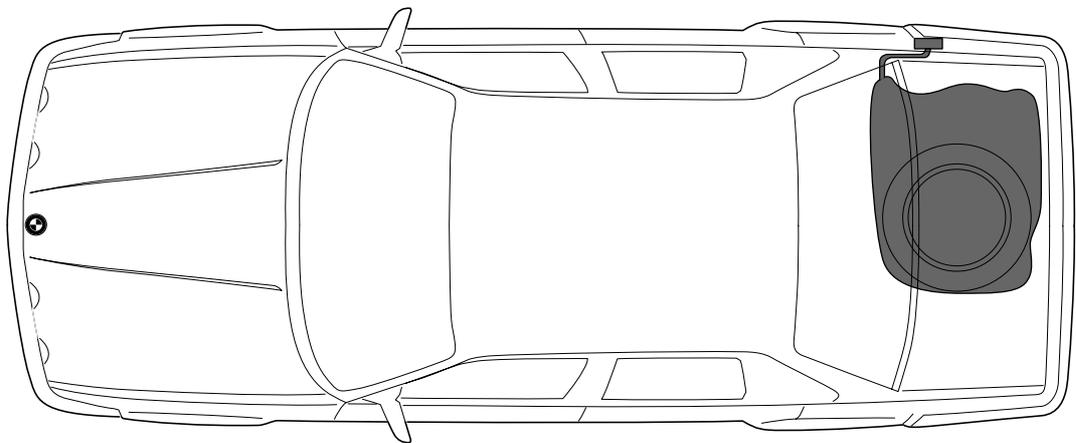
# Installation Drawings

## Fuel system



Installation drawing, fuel tank

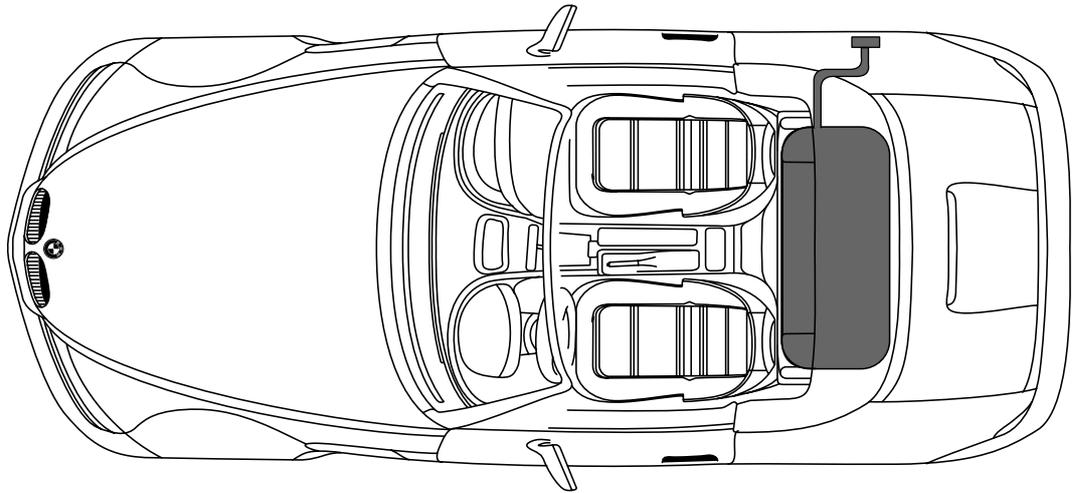
- 3 Series (E30, E36, E46)
- 5 Series (E39, E60)
- 7 Series (E38, E65)
- 8 Series (E31)
- X5
- Z8



Installation drawing, fuel tank

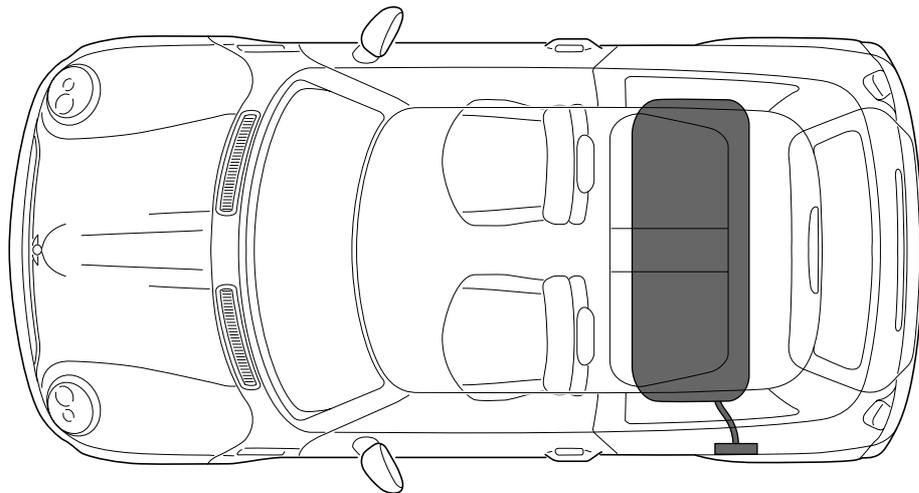
- 5 Series (E34)
- 7 Series (E32)

# Installation Drawings



Installation drawing, fuel tank

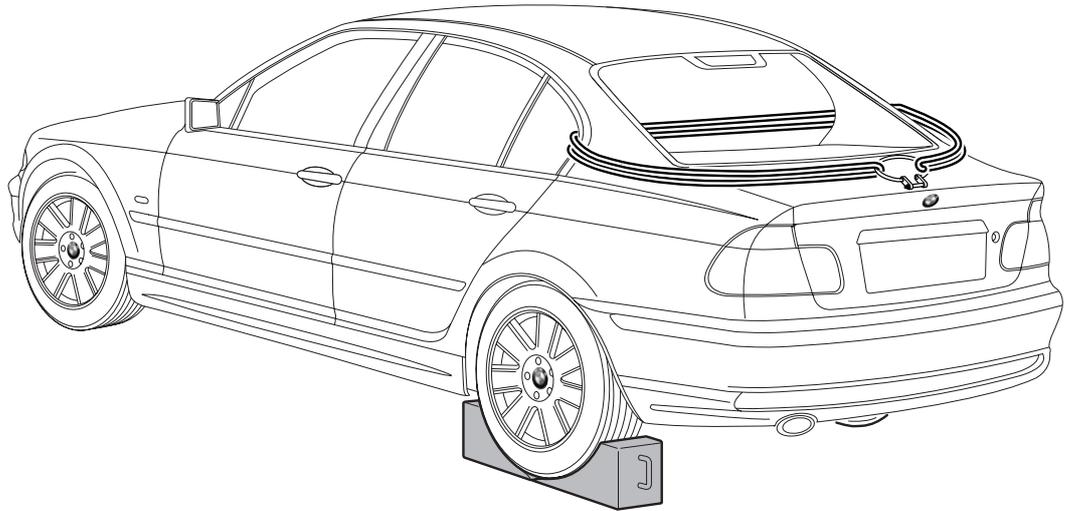
- Z3 Roadster, Coupé and M Version
- Z4
- Z8



Installation drawing, fuel tank

- MINI

# Securing Vehicles



Securing options

## **Chock**

Place a chock on the opposite side to where the vehicle is raised in front of and behind the wheel on the rear axle.

## **Endless sling**

Feed the endless sling through the window openings to the rear or front and secure to a suitable counter-support.

## **Front and rear axles**

To secure the vehicle, always combine several axle components (axle carrier, steering arm, drive shafts).

## **Towing eye**

### **Important**

The towing eye must not be used to recover or secure the vehicle.

# Frequently Asked Questions

## **How does an airbag function?**

An acceleration detected in the central sensor is integrated and evaluated. The required airbag is fired once the appropriate triggering thresholds have been exceeded. The squib in the gas generator receives the firing voltage from the airbag control unit. The generated gas escapes into the airbag.

## **How can you tell whether a vehicle is fitted with airbags?**

AIRBAG or SRS or SRS AIRBAG lettering on the steering wheel, instrument panel, door trim panel and A-pillar panel. If in doubt, you may assume above all that newer cars will be fitted with airbags.

## **Is smoke discharged during the firing process?**

There is mainly a buildup of dust due to the talcum powder with which the airbag is coated at the factory.

## **Does the airbag get hot?**

The airbag does not get hot. Only the components inside the airbag module reach high temperatures when the airbag is triggered. These components are located in the area of the airbag mounting and do not pose any danger to the rescuers. The parts take approx. 15 minutes to cool down.

## **Can traces of sodium azide be found in the residues?**

Sodium azide, the solid propellant in the gas generator, burns up completely when the gas generator is fired and is chemically converted up to 100%. The reaction product consists primarily of harmless nitrogen, which makes up approx. 80% of the air we breathe.

## **What precautions must be taken if an untriggered airbag module is damaged mechanically?**

In the extremely unlikely event of the airbag gas generator being destroyed, the propellant compressed into tablet form could fall out. In this event, it is absolutely essential to avoid skin contact (wear gloves and protective goggles). The tablets must be handled and disposed of separately from normal waste. They must be kept away from all ignition sources (electric, fire etc.).

## **In the event of a vehicle fire, is there a danger of the airbag generator exploding?**

The gas generator is designed in such a way that it triggers normally when exposed to a fire when the surface temperature of the gas generator exceeds 200°C.

## **Can water be used to extinguish a fire?**

Yes. Every effective fire-extinguishing agent can also be used on cars equipped with airbags.

## **Is it safe to breathe the air in the passenger compartment after an airbag has been triggered?**

Yes. Chemical and medical analyses have confirmed this to be safe. Short-term skin irritation may occur however.

## **If the airbag was not triggered in the crash, is it likely to be triggered after the crash?**

No. The crash sensors react to the physical characteristics of an accident.

# Frequently Asked Questions

## **Is there a danger to persons administering first aid?**

No. A person administering first aid (a helper without life-saving equipment) will encounter the same situation as in normal mode. When a car is stationary, the airbag systems will not be triggered.

## **If the airbag was not fired in the crash, how can the system be deactivated?**

Turn off the ignition, then disconnect both battery leads (first negative and then positive) from the battery.

This eliminates the risk of an airbag being triggered during the rescue operation. Exceptions, see Page 8.

## **Should the rescue personnel wait until the airbag system is deactivated before continuing the rescue operation?**

No. Turn off the ignition, then disconnect **both** battery leads (first negative and then positive) from the battery.

When the points on the subject "Response of restraint and safety systems after an accident" have been heeded, you can immediately begin to save the passengers.

## **How should you react when persons are trapped, individual airbag systems have not been triggered and the vehicle cannot be de-energised?**

Initiate emergency medical measures immediately.

Create openings for tending to the trapped persons as a matter of priority.

Check: Which airbag systems in the vehicle have not yet been triggered and are located in the areas where the rescue personnel are working?

If at all possible, do not pull the steering column with the spreader.

Do not cut through any cables in the area of the airbag systems (there is a small risk of airbags being triggered as a result of a short circuit).

Initiate measures to protect the injured persons in the inflation area of an untriggered airbag.

Tend to injured persons from the side.

If at all possible, do not move your head or upper body into the operating area of the airbag if heavy rescue equipment is being used on the vehicle.

# Notes

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