Accident Assistance and Recovery of Vehicles with High-voltage Systems

Frequently Asked Questions
(FAQs)

VDA | Verband der Automobilindustrie

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Project group “Recovery of vehicles with high-voltage systems from accidents”

Berlin, 18 November 2013

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Topic of this brochure

Recovery of accident-damaged vehicles with high-voltage (HV) batteries/energy storage/propulsion systems, including vehicle components, whenever they have been installed by the vehicle manufacturers as standard, or have been approved by the vehicle manufacturers as retrofit solutions

Target group

Danger prevention experts in the police force and other organisations (police of the German states, national police, authorities, fire services, the Federal Agency for Technical Relief (THW), rescue services, vehicle recovery and towing services, and emergency doctors)

Scope of application

The information/details given here are explicitly restricted to vehicles and components in the categories passenger cars and light commercial vehicles up to 3.5 t (M1 and N1 pursuant to Directive 2007/46/EC). This document covers only measures in the Federal Republic of Germany. If it is applied in other states, it must be adapted to the respective national legislation.

Important note

Retrofit solutions and conversions by providers not approved by the vehicle manufacturer are not covered by this brochure, as the widely differing ways in which such systems and components are designed and realised do not allow us to make any safe recommendations which would assist the target group.

In cases of doubt, refer to the manufacturer’s specifications and instructions. Useful information may be contained in the operating instructions and/or manuals, and rescue data sheets for individual vehicle models.

Preliminary remark and liability disclaimer

With the increasing diversity of new vehicles with electric drive trains, products and technologies, it becomes ever more complex to recommend procedures to members of the police and other organisations for danger prevention with vehicles involved in accidents. To support the personnel attending the scene, rescue data sheets for specific models are available as free downloads from the German Association of the Automotive Industry (VDA) and the Association of Motor Vehicle Importers (VDIK) (www.vda.de and www.vdik.de) in close cooperation with emergency doctors, fire services and other experts.

This document was elaborated by the VDA project group “Recovery of vehicles with high-voltage systems from accidents” in collaboration with the VDIK, to provide additional procedural recommendations to staff deployed at accidents to recover vehicles with high-voltage systems.

It answers typical questions concerning the handling of accident-damaged vehicles with high-voltage battery and propulsion systems.

If recommendations contained in this document are used by third parties (e.g. commercial recovery/towing companies), deviations may apply depending on the legislation in force. This applies in particular to the commercial transport of hazardous substances and goods, pyrotechnic restraint systems, and emergency shutdown/opening systems.

This document does not replace training courses/programmes delivering specialist and/or technical knowledge or skills.

The publisher does not accept any liability or issue any guarantee that the following information on rescue measures is up-to-date, correct, complete or of a particular quality. Any liability claims against the publisher, which relates to damage of a material or immaterial nature and which arise from the use of this information, are excluded if there is no evidence that the publisher has been wilfully or grossly negligent.

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1. Information requests/vehicle identification

1.1. What are the signs that a particular vehicle has a high-voltage system?

- This may be indicated by the type designation on the rear of the vehicle, such as Hybrid, Electric Drive, or additional designations, e.g. on the wings or similar locations.
- If the type is not indicated on the vehicle itself, the following features may indicate a vehicle with a high-voltage system:
    - electrical charging connector
    - orange high-voltage cables
    - warning stickers on high-voltage electrical components
    - charge indicator in the instrument cluster
    - symbols on the instrument panel
    - absence of an exhaust pipe

However, lack of these features does not necessarily indicate that the vehicle has no high-voltage system.

- In January 2013, a system was introduced in Germany for requesting vehicle information from rescue control centres based on registration plates (for vehicles registered in Germany). This enables the correct rescue data sheet to be identified for a particular vehicle.

2. Risk of electric shock

2.1. After an accident, is it possible to receive an electric shock by touching the vehicle or parts of it?

- Generally there is no risk to human beings from an electric shock. However, it depends on the type of accident.
- The vehicles are equipped with several different protection mechanisms.
    - The high-voltage (HV) system is protected against touching.
    - The HV system is fully electrically insulated from the vehicle chassis (galvanic/electrically separated).
    - In serious accidents where an airbag has been deployed, in most vehicles the HV system is then switched off, or similar protection mechanisms are installed (for details see vehicle's rescue data sheet).
- If there is any doubt, the vehicle's HV system should be deactivated manually if possible (see question 2.4).

2.2. Is it possible to tell whether the HV system has been switched off in an electric/hybrid vehicle involved in an accident?

- After an accident it is not possible to indicate directly that the system is de-energised, owing to the widely varying possible damage scenarios.
- If there is any doubt, the vehicle's HV system should be deactivated manually if possible (see question 2.4 below).

2.3. Can a parked vehicle involved in an accident represent an electrical hazard?

A vehicle's high-voltage system can be active while the vehicle is not in motion (e.g. air-conditioning). When a stationary HV vehicle is involved in a crash, the airbags are generally not triggered, which means it is not possible for deployment to switch off the HV system. Therefore after a serious accident the vehicle's HV system should be deactivated (see rescue data sheet).

This applies both to vehicles at an electric charging point and to parked vehicles not connected to a charging point.

2.4. Can the rescue services deactivate a high-voltage system manually?

Yes, electric/hybrid vehicles have various options for manual deactivation of the HV system.

- Most vehicles are equipped with an additional cut-off device for the high-voltage system, which can be used by emergency personnel. These mechanisms are 12 V separation points. They can also be operated by non-HV specialists to deactivate the HV system.
  Note: This does not discharge the high-voltage battery (also called high-voltage battery pack or RESS, rechargeable energy storage system) – however it is electrically disconnected from the rest of the HV system.

- The recommended procedure for manual deactivation is described in the rescue data sheet from the relevant manufacturer.

2.5. What is the danger from damaged high-voltage cables after an accident, if it can be seen that the airbags have not been deployed?

Damaged high-voltage cables or components can always cause an electrical hazard. Do not touch high-voltage cables/components!

Note: High-voltage cables are always coloured orange.

3. Hazards arising from high-voltage batteries

3.1. Can high-voltage batteries be discharged after an accident?

No, it is not practicable to electrically discharge the HV batteries at the scene of an accident.

3.2. What is the procedure for dealing with a damaged HV battery in a vehicle at the scene of an accident?

- Do not touch a damaged HV battery.
- Take note of the condition of the HV battery (e.g. release of smoke).

A specialist qualified in HV systems should be requested from the control centre, to assess the specific electrical danger and to determine how to proceed.

3.3. What is the procedure for dealing with HV batteries or parts of one that have become disconnected from the vehicle?

In this very unlikely case, the HV battery may present electrical, chemical, mechanical and thermal risks. Do not touch the HV battery. A specialist qualified in HV systems should be requested from the control centre, to assess the specific electrical danger and to determine how to proceed.

4. Chemical hazards

4.1. What factors are important when dealing with electrolyte leaking from high-voltage batteries after an accident?

- Electrolytes are usually irritant, flammable and potentially corrosive. Avoid contact with the skin and inhaling the fumes under any circumstances.
- Conventional binders should be used.

4.2. What hazards arise from degassing a high-voltage battery?

- In the immediate vicinity, the gases are irritant, flammable and potentially corrosive; therefore avoid inhaling them under any circumstances.
- Vehicle recovery should be interrupted and the further procedure clarified with the fire service control centre.

5. Thermal hazards (fire)

5.1. Is it likely that a high-voltage battery will explode if the vehicle catches fire?

- The safety technology employed will prevent HV batteries from exploding.
- The HV battery and its individual cells are equipped with mechanical safety devices that will open if, for example, a fire causes a rise in temperature and pressure; this results in “degassing” and releases the pressure.

5.2. Do fires in electric/hybrid vehicles generate toxic smoke?

Yes, just as with conventional vehicles, fires in electric/hybrid vehicles generate harmful smoke from burning materials such as plastics.

5.3. Can a high-voltage battery still catch fire some time after an accident?

Yes, just as with conventional vehicles involved in accidents, the risk of delayed outbreak of fire cannot be ruled out completely, particularly with damaged HV batteries (see also question 8.5 below).

5.4. Can a fire in a vehicle with a high-voltage battery be extinguished and which extinguishing agent should be used?

Generally, yes, it can be extinguished.

Water is the preferred extinguishing agent, because it also cools the HV battery down. Large quantities of water are needed for extinguishing and cooling.

6. Electrical charging infrastructure

6.1. What must be done if an electric/hybrid vehicle connected to a charging station is involved in an accident (stationary crash)?

If possible, disconnect the charging cable from the charging station, or switch off the charging station. The charging cable should always be disconnected from the vehicle. Before disconnecting, check the cable and the plug for any visible signs of damage. After a **serious accident** the vehicle's high-voltage system should be deactivated (see rescue data sheet).

Note: A stationary vehicle's HV system may be active independent of the charging point (e.g. air-conditioning).

6.2. What happens when a charging cable at a public charging station is severed by vandals while the vehicle is charging?

In such cases the technical infrastructure at the public charging station ensures safety and generally the power is turned off.

The operator of the public charging point should be informed.

7. Vehicles in water

7.1. Are any special risks associated with electric/hybrid vehicles in water?

- The high-voltage system does not present an increased risk of electric shock when the vehicle is in water.
- The information in sections 2 and 3 above applies.
- The recovery procedure is identical to that for conventional vehicles.

This also applies to bodies made of carbon-fibre composite materials.

7.2. In drinking water protection areas (e.g. reservoirs), is there a water safety hazard if an electric/hybrid vehicle enters the body of water?

Compared with conventional vehicles, there are usually no additional hazards for drinking water.

8. Towing, recovery, transportation, breakdown assistance and storage

8.1. What factors are important if an electric/hybrid vehicle has to be towed out of a danger zone (e.g. motorway construction site) using a tow-bar/rope?

- It is always permissible to tow the vehicle out of the immediate danger zone **at walking pace**.
- Further information about towing may be found in the owner's manual provided by the vehicle manufacturer.

8.2. What factors are important if an electric/hybrid vehicle is to be loaded onto a recovery vehicle after a serious accident?

- The high-voltage system should be deactivated before loading. Notes on this may be found in the owner's manual or the rescue data sheet.
- It is recommended that when the vehicle is handed over to representatives of the authorities or to recovery personnel, they be informed of the fire safety measures already carried out (HV deactivation). In particular, attention should be drawn to any potential hazards from damaged high-voltage components (e.g. electric shock or risk of fire from batteries).
- The national regulations/standards for loading and transportation must be observed (in Germany: BGI 800, BGI 8664, BGI 8686 and BGI 5065).
- If the vehicle is handed over to any third parties, it is recommended that they be informed of the measures carried out and confirm this in writing.
- If the vehicle is to be lifted using a crane/jack, or loaded onto a recovery vehicle, we recommend pointing out that when a winch is used, HV components should not be damaged.

8.3. What factors are important for the transportation/towing of electric/hybrid vehicles involved in accidents?

- Damaged vehicles should only be transported by a platform vehicle and in accordance with the manufacturer's instructions.
- If a vehicle is being towed away in a lifting cradle, the electric/hybrid system may be damaged if the drive axle(s) remain(s) in contact with the road surface. Note: Be aware of four-wheel drive!
- Vehicles with damaged batteries should be transported to the nearest suitable workshop or to a safe storage facility (see also question 8.5 below).

8.4. Are there any regulations restricting passage through tunnels of a recovery vehicle loaded with a damaged electric/hybrid vehicle?

- No, the removal of battery-powered and hybrid vehicles is governed by the provisions of the ADR (European Agreement concerning the International Carriage of Dangerous Goods by Road/Accord européen relatif au transport international des marchandises dangereuses par route).
- Taking the measures described above (in section 8.2) and considering the severity of the damage, the vehicle recovery personnel should ensure that the transport is safe to go on the road. Be aware of potential risks from damaged HV components (e.g. electric shock or risk of fire from batteries).
- The transport must comply with national regulations and the requirements of the operator applicable to tunnels.

8.5. How should damaged electric/hybrid vehicles be parked and stored?

- Just like conventional vehicles, for fire safety reasons electric/hybrid vehicles that have been involved in accidents should be parked in a restricted-access section of an **open-air parking area** a sufficient distance away from other vehicles, buildings and other combustible objects.
  The vehicle should be labelled accordingly.
- This should be observed in particular if the vehicle arrives outside business hours.

9. Further information

The German mnemonic “AUTO” has proven useful for recognising alternative propulsion technologies:

A Check for fuel leaks
U Check the underbody
T Open the fuel tank cap
O Investigate the surface

Additional information about electrical hazards at the scene of an accident may also be found in the publication BGI/GUV-I 8677 (“Elektrische Gefahren an der Einsatzstelle”/“Electric hazards at the scene of an accident”, available in German).

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