

# Safety and protective measures when working with high-voltage batteries

The following is a summary of the basic safety rules and procedures for working with electric vehicles, hybrid vehicles with a high-voltage system, and high-voltage batteries. Compliance with these principles is essential to ensure the safety of personnel in the workplace and to prevent damage to equipment.

## Key safety rules

Whenever high-voltage batteries are handled, including when they are prepared for reuse, the prescribed safety rules and working procedures must be followed.

### Qualified personnel

High-voltage batteries may only be de-energised and handled by personnel qualified to do so under applicable national regulations and in accordance with those regulations.

### Personal protective equipment

The prescribed personal protective equipment must always be used when working with high-voltage systems.

### Suitable tools and equipment

Work on high-voltage systems requires specialist equipment. Only certified and insulated tools, together with appropriate diagnostic equipment, ensure that personnel are protected against injury and that the vehicle or battery is protected against damage.

### Storage

Designated storage areas must meet the prescribed requirements. They must be lockable, ventilated, protected against external influences, and equipped with the necessary emergency and fire-fighting equipment.

### Health risks

Being in the vicinity of energised electrical equipment or a high-voltage system may affect the operation of electronic devices that support vital functions, such as pacemakers, implanted defibrillators, brain stimulators, insulin pumps, internal analgesic delivery devices, and hearing aids.

## Criteria for assessing whether a battery is hazardous

The initial inspection is the first step in assessing each high-voltage battery. If any anomaly is identified, the battery or vehicle must, for safety reasons, be placed in quarantine immediately.

### Quarantine

A vehicle or high-voltage battery placed in a quarantine area must be monitored until

it has shown no signs of reaction for at least 12 hours.

To make handling and observation easier, the high-voltage battery may be removed from the vehicle and monitored separately.

### **Requirements for the quarantine area**

National legislation must be observed when defining the quarantine area. The quarantine area should be:

- clearly demarcated;
- quickly accessible;
- kept clear at all times.

### **Hazardous battery**

A high-voltage battery is considered potentially hazardous if it shows any of the following signs:

- visible mechanical damage, including mechanical damage with exposed contacts or conductors;
- signs of fire;
- sparking, smoke, or vapour;
- unusual noise inside the high-voltage battery, such as cracking or hissing;
- the presence of liquids, or a suspected presence of liquids, in the high-voltage battery system;
- a pungent odour;
- the high-voltage battery is accessible for temperature measurement, for example because bodywork parts are missing or damaged, and the surface temperature of the high-voltage battery is above 80 °C.