11. JUNI 2024

# ENGINIUS BLUEPOWER® GEN 1.0

## RESCUE GUIDE FROM 03.2022

TECHNICAL EDITORIAL OFFICE
ENGINIUS GMBH
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## ENGINIUS GMBH – About this document

This Emergency Rescue Guide is part of the existing safety concept and contains supplementary information on the vehicle-specific rescue card and applies to the following vehicle types:

- BP27E
- BP19E

Target group: Emergency services and first aiders.

The current edition is based on the requirements of ISO 17840-3 and ISO 7000 in terms of structure, colours and pictograms.

It is hereby expressly pointed out that this Emergency Rescue Guide does not claim to be exhaustive. It cannot and is not intended to be a substitute document for fundamental training and relevant technical literature. The information in this rescue guide is expressly limited to lorries of category N3, in accordance with the Official Journal of the European Union (2018/858/EU). Please observe the country-specific laws and guidelines.

The illustrations in this Emergenca Rescue Guide are examples and may differ from the vehicle you are working on. A left-hand drive vehicle was used as the basis for this rescue guide. Vehicle-specific information can be found in the vehicle operating instructions.

**Subject to change without notice.**

**This document is subject to change without notice.**

## Impressum

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## Validity

- From publication, until cancelled or replaced
- BluePower® series vehicles with production site ENGINIUS (Bremen)
  - Recognisable by number 11 in the VIN: WK7 XXXXXXX B XXXXXX

## Retention and completeness

This Emergency Rescue Guide is a fully-fledged component of the BluePower® safety concept and must be accessible to authorised and authorised persons at all times.

A missing Emergency Rescue Guide or missing pages must be replaced immediately if lost.

## Scope of application

This Emergency Rescue Guide applies exclusively to ENGINIUS BluePower® vehicles, which have been produced by ENGINIUS GmbH in Bremen since March 2022.

## Applicable documents

- Rescue Sheet BP27E LHD from 03.2022
- Rescue Sheet BP27E RHD from 03.2022
- Rescue Sheet BP19E LHD from 03.2022
- Rescue Sheet BP19E RHD from 03.2022

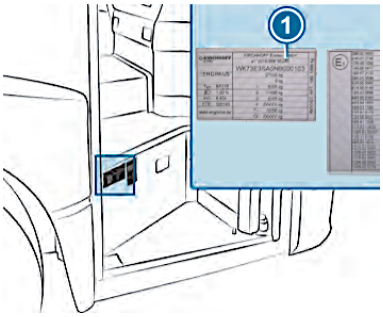
Rescue sheets can be downloaded from the ENGINIUS website.

www.enginius.de

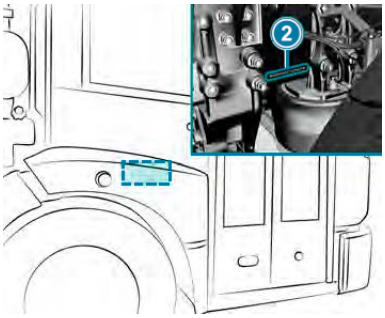
## Contents

## Identification / Recognition

ENGINIUS GmbH, a subsidiary of Kirchhoff Ecotec AG, produces fuel cell electric vehicles (FCEV) at its site in Bremen. A "Glider" from Daimler Truck AG is used as the basic vehicle. Gliders are vehicles that are produced without a drivetrain (engine, transmission and exhaust system). ENGINIUS GmbH is a selected original equipment manufacturer and completes the Glider into a high-voltage vehicle with fuel cell technology. Kirchhoff Eco-tec AG is therefore regarded as a global manufacturer and ENGINIUS GmbH as a manufacturing plant.




The vehicle type plate 1 is located in the entrance on the passenger side, behind the folding door. The unique vehicle identification number (VIN) is stamped 2 on the chassis frame in the right-hand wheel housing.




### Breakdown of vehicle identification number

Example: WK7 3E1SA0 RB002024

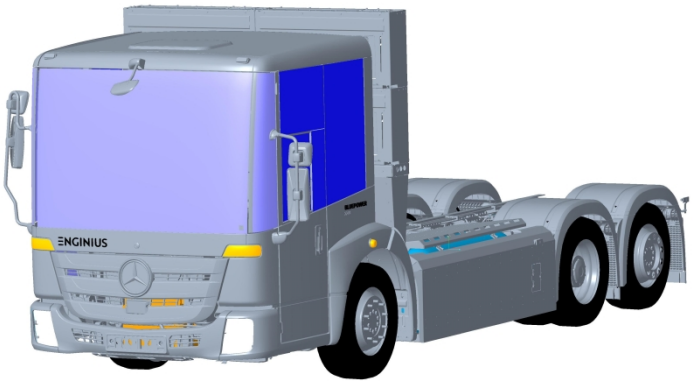
- RB002024 → Consecutive number
- 3E1SA0 → Vehicle descriptive part
- WK7 → Global manufacturer code

| | |
|---|---|
| WK7: | Global manufacturer code – Kirchhoff Ecotec AG |
| 3: | Number of axles |
| E: | Vehicle version - ECONIC |
| 1: | Number of fuel cells |
| S: | Alignment of the H2 system - on the side of the chassis |
| A: | Type of motor |
| 0: | Check digit |
| R: | Year of production - 2024 |
| B: | Production site - ENGINIUS Bremen |
| 002024: | Consecutive number |

## Type designation

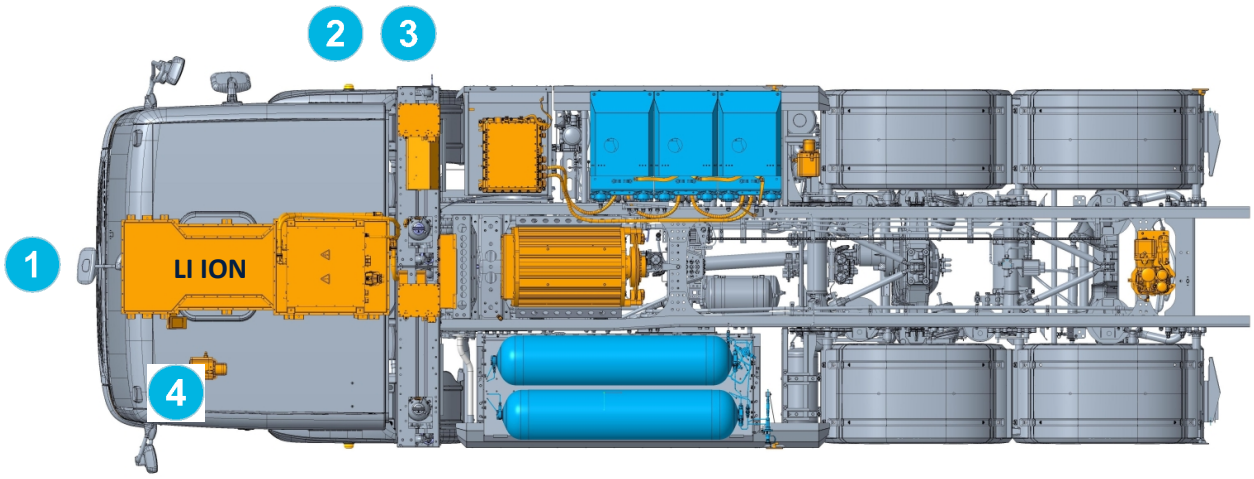
### BP27E

| | |
|---|---|
| BP | BluePower® |
| 27 | Technically permissible total mass (x 1000) in kg |
| E | Electric drive |




### BP19E

| | |
|---|---|
| BP | BluePower® |
| 19 | Technically permissible total mass (x 1000) in kg |
| E | Electric drive |




1 


- Kirchhoff LOGO
- ENGINIUS Lettering
- 


2 


- Model designation

3 

- CCS Typ 2 Charging interface

4 

- Power display in instrument cluster

Piktogram
According to
ISO 17840-4


- Hydrogen-based vehicle
- Fuel cell electric vehicle

Depending on country-specific legislation, the licence plate number may indicate the drive type.

High-voltage components are labelled with a warning sticker and high-voltage cables have orange insulation. These cables run through the entire vehicle and are connected to the high-voltage battery in the original engine compartment under the cab. Due to the large number of high-voltage cables in the vehicle, not all cables are shown in the diagrams.

## Immobilisation / stabilisation / lifting

Modern vehicles have components and systems installed that can be active even when the drive system is switched off. The ignition delay of the Glider, from the Daimler Benz AG brand, is up to 30 minutes.

Depending on the accident situation, the vehicle status cannot be determined. In general, it can be assumed that every vehicle is "ON" when the rescue services arrive. Before starting the rescue operation, it is essential to ensure that the vehicle is switched off. Further information can be found in the following chapter: Disable direct hazards / safety regulations.

The control unit for the electric parking brake is located next to the driver information display.

- Press the button or (P) pull the lever over the pressure point. The electric parking brake is activated when the LED is illuminated.

- Press the brake pedal
- Turn the direction of travel selector on the multifunction lever to N = neutral position
- The selected direction of travel is shown in the driver information display on the dashboard

- Secure the vehicle against rolling away 

To realise a gentle rescue, casualties should not be subjected to any unnecessary movements if possible. Consequently, the cab suspension and the chassis levelling system must be deactivated or lowered.

The following options for reducing the compressed air supply can be considered:

- Operating the levelling control when the vehicle is not yet switched off.
- Press the brake pedal several times in quick succession over the entire pedal travel.
- Empty compressed air reservoir via drain valve.

## Secure the cab

To secure the cab against unnecessary movement, a suitable lashing strap can be used and lashed to the ladder frame as an attachment point. This measure prevents unnecessary movement and slipping of the cab if the cab bearings are damaged.

The lashing straps must be fastened in such a way that no subsequent rescue operation is impeded.



*© Daimler Truck AG / W60.80-A022-74*

### Possible procedures

### Cab / front axle

- Place the round sling on the right and left around the front axle and pull upwards.
- Fasten the tensioning strap to the round sling with the ratchet including the eye hook.
- On the other side of the vehicle, attach the tensioning strap to the round sling using the eye hook.
- Throw the tensioning strap over the cab.
- Thread the tensioning strap into the ratchet.
- Lash the cab to the ladder frame with the ratchet.
- Secure the ratchet

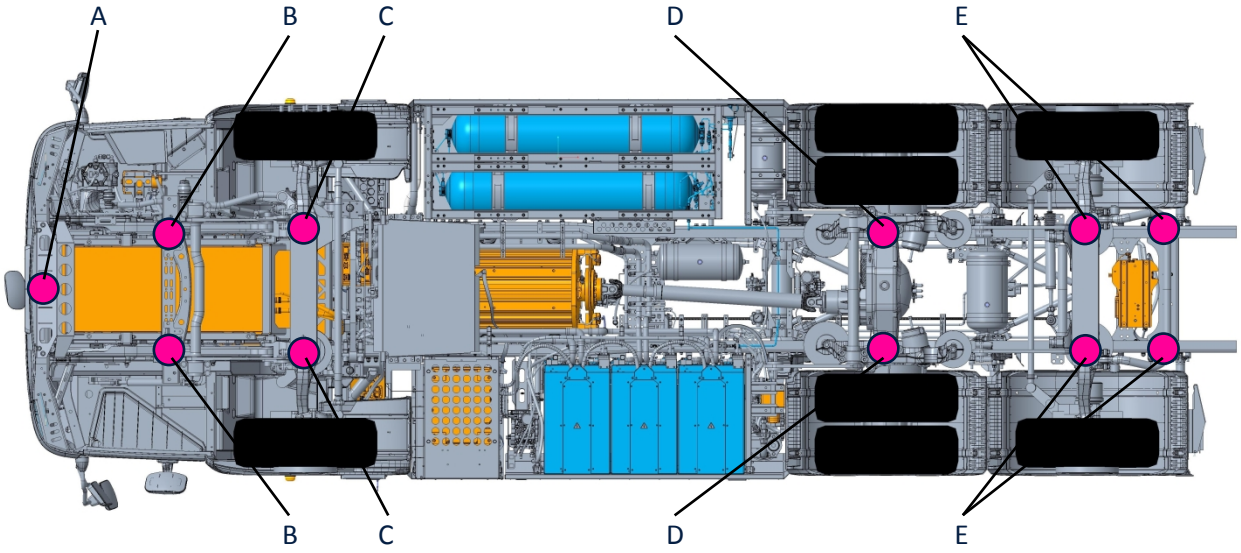
**Cab / front wheels**

- Fasten the tensioning strap with ratchet including eye hook to the rim.
- On the other side of the vehicle, attach the tensioning strap to the rim with eye hooks.
- Throw the tensioning strap over the cab.
- Thread the tensioning strap into the ratchet.
- Lash the cab to the ladder frame with the ratchet.
- Secure the ratchet.

**Securing and support system**

- Position the support system at an angle of approx. 45° to the side of the cab.
- Ensure sufficient lateral clearance to the doors.
- Adjust the required length by extending the telescopic arm.
- Attach the tensioning strap to the rim with eye hooks.
- Lash the tensioning strap.
- Secure the ratchet.

## Stabilisation and lifting




### Jacking points (6x2/4)

A = At the paddock mouth

B = At the front end of the vehicle frame

C = On the front axle

D = On the drive axle

E = In the area of the trailing axle (only with plate)

If possible, the jacking points provided should be used to stabilise and lift the vehicle. In these cases, please note the information on unsuitable vehicle areas.

If possible, the vehicle should only be lifted or jacked up when unladen and always simultaneously at two opposite jacking points.

### Unsuitable vehicle areas

Under no circumstances should the vehicle be lifted at the positions of the high-voltage battery or its components in the drivetrain, as this can lead to damage with a high risk potential.

## Disable direct hazards / safety regulations

No crash sensors are installed in the BluePower® vehicles of generation 1.0. The high-voltage system cannot be switched off by means of pyrotechnic devices. This means that various systems cannot be switched off. Before starting rescue operations, it is essential to ensure that the vehicle is switched off.

Escaping hydrogen can lead to deflagrations. Depending on the oxygen concentration, combustion occurs with a whistling noise.

Caution: Hydrogen burns with an almost invisible flame and can be recognised with a thermal imaging camera.

Do not neglect your own safety!

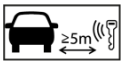
The control unit for the electric parking brake is located next to the driver information display.
Press the button (P) or pull the lever over the pressure point. The electric parking brake is activated when the LED is illuminated.

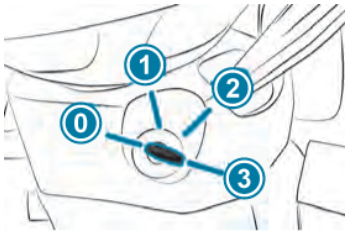
- Press the brake pedal
- Turn the direction of travel selector on the multifunction lever to N = neutral position

The selected direction of travel is shown in the driver information display on the dashboard


- Press the START-STOP button once without applying the service brake. The power indicator in the instrument cluster switches to OFF.

Deposit the keys at least 5 metres away from the vehicle.

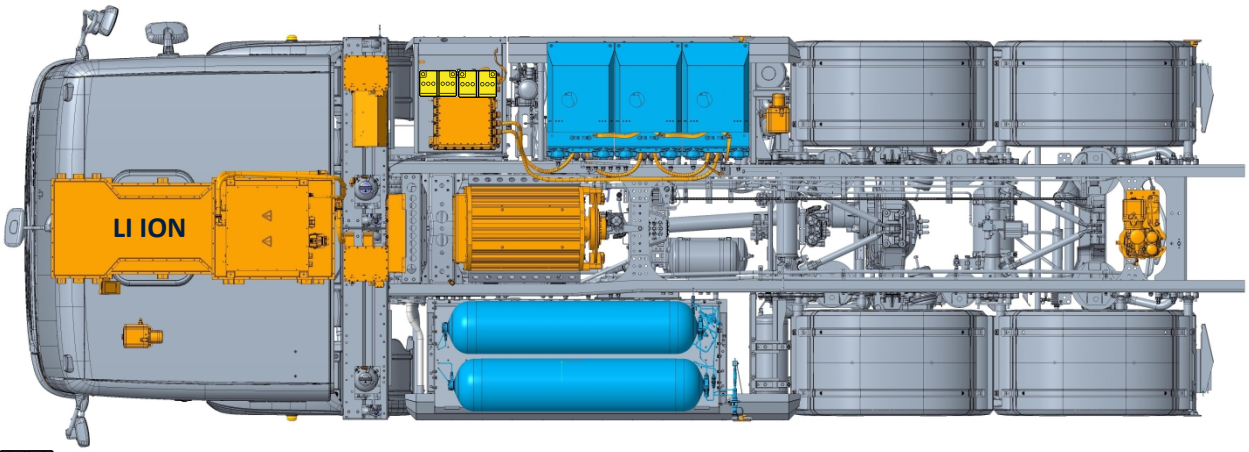


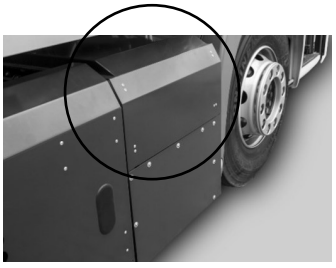

Or:

- Turn the spanner to the 0 position and remove.

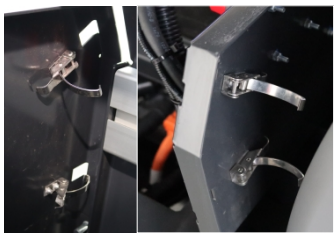
## 24 VDC De-energise the vehicle electrical system



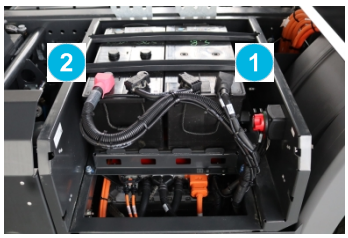

Low-voltage battery pictogram



- The batteries are located on the right-hand side of the vehicle behind the cab in the Electrical Equipment Box (EEB).



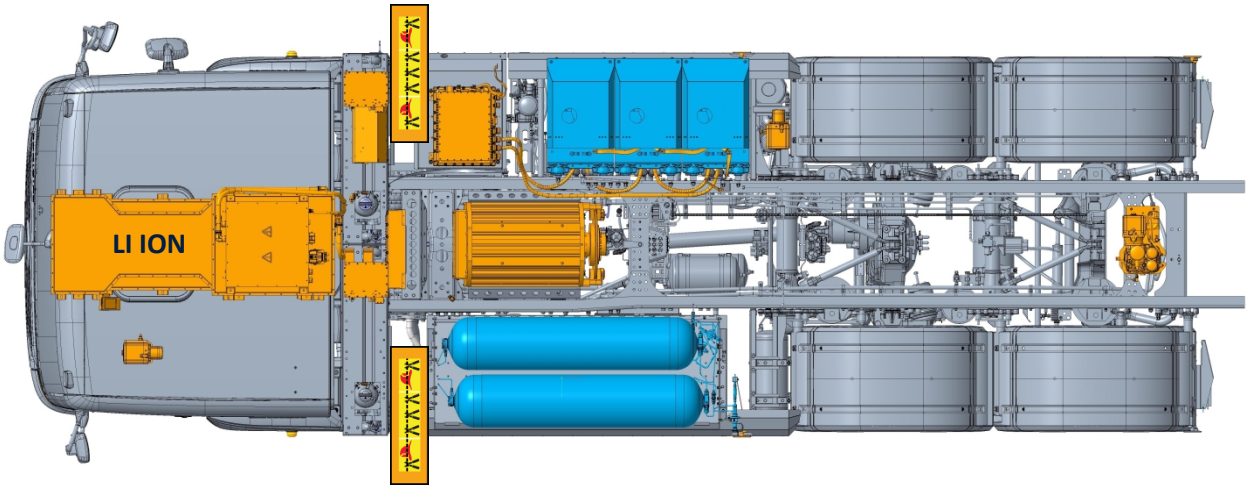
- Reach over the side panelling on the left and right and open the latches
- Pull off the cover of the electrical equipment box




- First disconnect the negative terminal 1, then the positive terminal 2.

- No battery main switch
- Service disconnect for the service organisations (HVIL)

## De-energise high-voltage system




### High-voltage cut-off device:

The high-voltage cut-off devices are located on both sides behind the mainframe on the mudguard, on the driver's and passenger's side and are labelled.

To ensure that there is no residual voltage in the high-voltage system, wait 10 minutes after switching off.

Generation 1.0 BluePower® vehicles are equipped without an E-STOP switch for the vehicle's high-voltage system. Existing E-STOP switches in the driver's cab are assigned to the respective vehicle body.

Once the high-voltage cut-off device has been disconnected, the vehicle cannot be made ready to drive. Contact an authorised service partner.

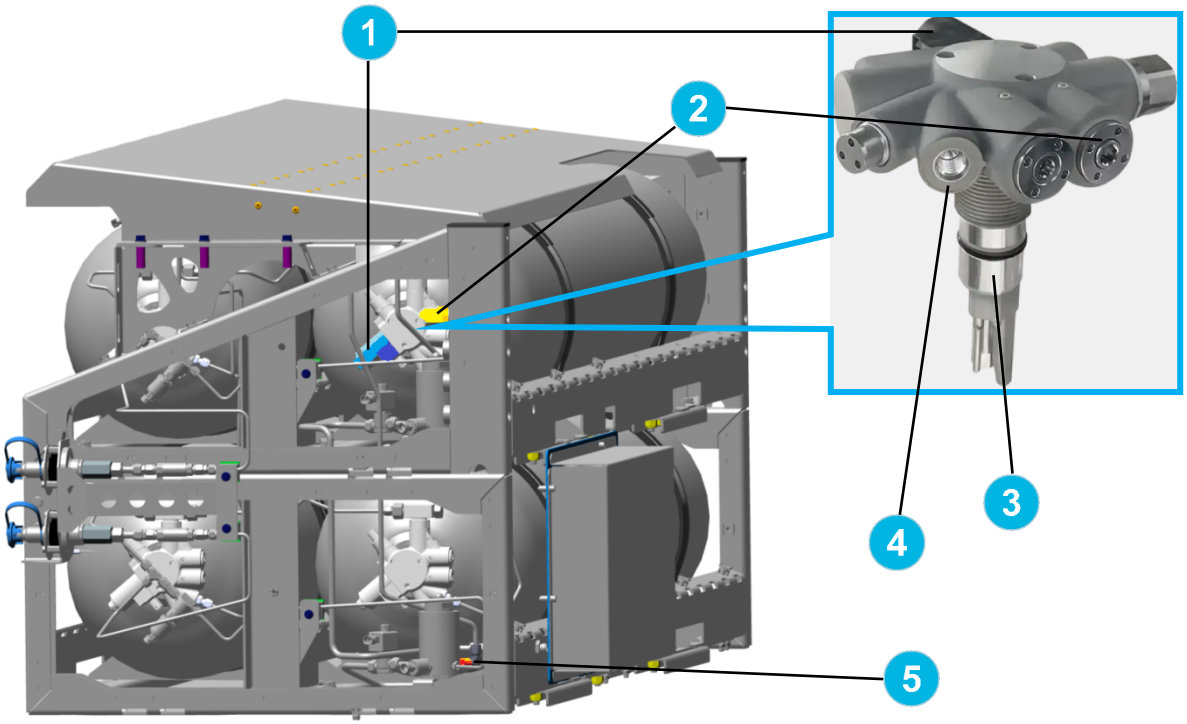
## Switch off the hydrogen system

Extremely flammable gas

Contains pressurised gas; may explode when heated
Flammable


Manual gas shut-off valve


Automatic hydrogen overpressure safety valve




**1** **Electrical shut-off valve**
Controlled via software. NC - normally closed. Valve only open when voltage is applied.
Only open when fuel cell is switched on.
Closed during refuelling. Flow through bypass line with non-return valve.

**2** **Manual shut-off valve**

- Closing is achieved by actuating in a clockwise direction. 24 Nm -1/+0 Nm
- A standard Allen key 7 is required.

**3** **Flow limitation valve**
Mass flow limiting valve closes if the outflowing gas exceeds a certain mass flow. (line break)

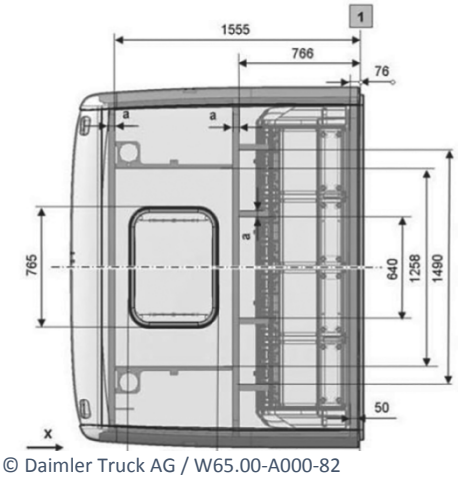
**4** **Thermal Pressure Relief Device (TPRD)** or thermal pressure relief device:

- Discharge hydrogen via vent lines if the temperature exceeds 110°C

**5** **Automatic hydrogen overpressure safety valve**

## Access tot he occupants

### Access via the roof hatch




© Daimler Truck AG / W65.00-A000-82

Another alternative for accessing the cab is via the roof hatch. As this can be electrically operated, only a hatch that is already open should be used. For vehicles in a sideways position, it may make sense to use a roof hatch as a first access point even when it is closed. In this case, the hatch must be removed or an opening cut into the glass or sheet metal.

### Emergency opening folding door from the inside


The folding door can be unlocked using the emergency opening rotary switch 1.

Vehicles with locking cylinder: Unlock the door lock on the outside of the folding door.

Open: Turn emergency opening rotary switch 1 by 90°. Opening the folding door by hand.

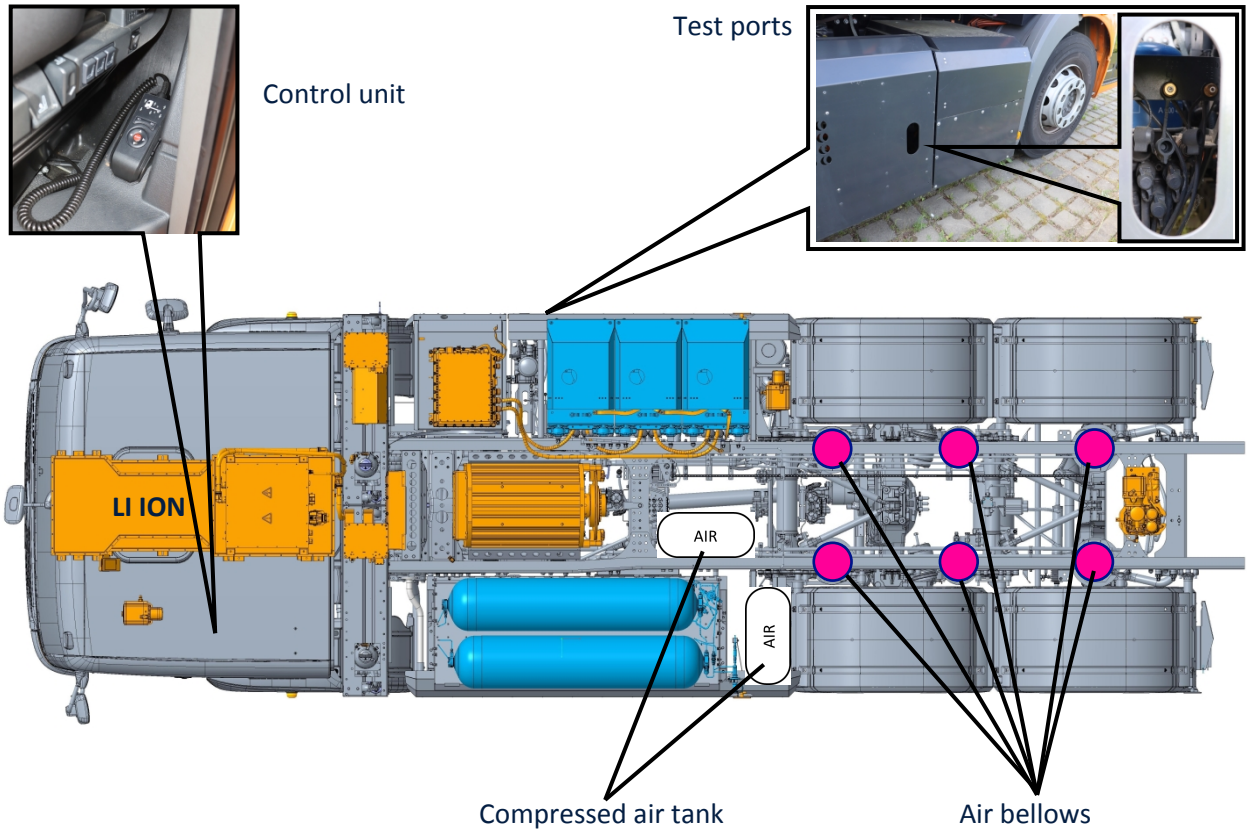
## Rescue height

### Reduce rescue height by releasing tyre pressure

The rescue height can be reduced by unscrewing the tyre valves. This measure can lower the vehicle by around 150 mm. The tyres should never be destroyed (punctured, etc.), as this makes it more difficult to remove them.

*© Daimler Truck AG / W40.10-A005-71*

**Reduce rescue height with frame air suspension**




In vehicles with full air suspension, the chassis is equipped with air suspension. By far the most common variant is to equip only the rear axle suspension with air suspension. On a vehicle with full air suspension, the rescue height can be reduced by lowering the air suspension.

**Lowering with control unit**

With this variant, the key in the steering lock must be turned to the "drive position" and the battery must still be connected. The vehicle must already be secured against rolling away. This can be done using the parking brake, for example, but it is better to use wheel chocks.

**Lowering via the test connections**

Another non-destructive way of releasing the air from the air suspension is via the test connections. To lower the vehicle frame, the valves must be vented (can be done using a tyre inflation hose). The front axle can be lowered by bleeding the air via the front axle test connection (1). The rear axle can be lowered by bleeding the air via the rear axle left test connection (2) and rear axle right test connection (4).

## Shell construction

Daimler Truck AG – Econic, Typ 956

*© Daimler Truck Ag / Auszug W60.80-A020-79*

The type and percentage of the respective materials differ for the individual Daimler Truck AG model series. The aim of the design is to achieve high operational stability and optimised crash behaviour.[1]

**DANGER**

**Risk of injury: Warning of sharp-edged interfaces after cutting or severing vehicle parts**

Cover sharp-edged interfaces with protective covers or column protection.

Use personal protective equipment

**ATTENTION**

**Risk of injury: Warning due to glass splinters when removing vehicle windows**

Cover vehicle occupants.

Use personal protective equipment including dust masks.

[1] Extract from the rescue guide for emergency services. Document has a textual note regarding duplication, but no © symbol. Original labelling: @ 2022 by Daimler Truck AG

## Glass management

**ATTENTION**

**Risk of injury: Warning due to glass splinters when removing vehicle windows.**

Cover vehicle occupants.

Use personal protective equipment including dust masks.

### Removal of vehicle windows

It is essential to remove panes from adjacent components that are being worked on before using hydraulic tools. This applies in particular to the door panes. If the discs are not removed, they will be subjected to considerable pressure, as will the parts during spreading. The panes can no longer withstand this pressure above a certain pressure force and then suddenly and forcefully burst apart. Very small, sharp pieces of glass fly around. These pieces can cause injuries; they spread around the accident area, creating an acute risk of cuts.

### Windscreen

The laminated safety glass (LSG) windscreen is glued in place.

The windscreens on lorries have a high dead weight of up to 35 kg.

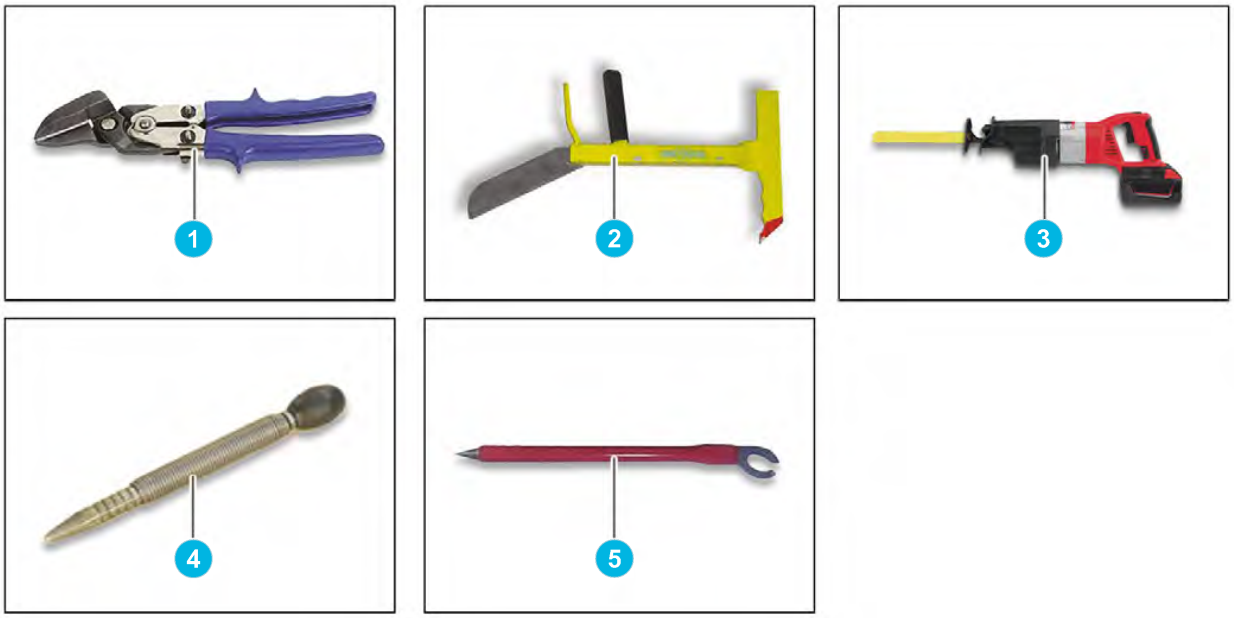
### Glued-in windscreens

For glued-in windscreens, one of the methods is to cut out the windscreen with a glass saw or sabre saw. First, an opening is cut in the windscreen outside the danger zone for the patient. The patient is hardly exposed to any glass particles inside the vehicle, but should be covered with a tarpaulin or blanket for safety. This method is only recommended for lorries if the cab is secured against rocking.

The lifting movement of the tool causes the cab to sway. This exposes the patient to considerable movement. Exception: The suspension of the cab and the frame is already deactivated. (See chapter "Immobilisation / stabilisation / lifting"). Another way to remove a glued windscreen is to use a sheet metal ripper. The handling is similar to that of a glass saw. The splintering effect and the production of glass powder is less than with a glass saw. The cutting edge is a disadvantage. It is coarser and less clean. With this method, the cab is hardly exposed to any fluctuations, as no lifting movements of the tool are required to cut the pane.

First, a hole is made in the disc (outside the danger zone for the patient). Then, starting from this hole, the windscreen is torn open all the way round. The windscreen cut in this way can then be removed. Large tin snips are another alternative. Make a hole in the lower part of the windscreen at a sufficient distance from the patient and then cut it open.

**Tools for removing vehicle windows**




1. Large sheet metal shears
2. Glass saw
3. Reciprocating saw
4. Feather grains
5. Sheet metal ripper

**Removing discs with the spring centre punch**

*© WEBER RESCUE SHOP GmbH*

Panes of toughened safety glass (ESG), usually side windows and rear windows, can be removed with the spring centre punch. The pane to be removed is covered with a self-adhesive film or adhesive tape. The glass pane is then scored in one corner with the spring centre punch. The pane shatters into small individual pieces and is held together by the previously applied film or adhesive tape. The shattered glass pane is carefully removed from the vehicle interior to the outside. One example is the method using adhesive tape and a parcel tape dispenser. This is an inexpensive and quick way to remove single-pane safety glass. If the pane is wet, it must be dried beforehand.

## Vehicle control

Steering column adjustment, pneumatic

Seat height adjustment, pneumatic

Seat length adjustment, mechanical

### Steering column adjustment


1 Pneumatic fuse switch (on the steering column)

By adjusting the steering column, the vehicle occupant's abdomen and chest can be relieved. The basic requirement is a sufficient supply of compressed air. The steering column is secured against unintentional adjustment by a pneumatic safety device.

Procedure:

- Press down the pneumatic fuse switch. 1
- Adjust the steering column to the desired position.
- Press the pneumatic fuse switch 1 upwards.

**Seat adjustment**


To adjust the seat length, lift the locking bar 1 and move the seat using the buttock muscles.

The ignition must be switched on and a sufficient supply of compressed air must be available to adjust the seat height of the air-sprung suspension seat. The seat can be raised or lowered continuously by pressing the seat height button. 2

- Press the seat height button 2 upwards: Raising the seat.
- Press the seat height button 2 downwards: Lowering the seat.

Fast lowering of the seat.

The seat level of the air-sprung suspension seats can also be changed using the quick lowering button. Pressing the quick lowering button 3 once lowers the seat to the lowest position. Pressing the quick lowering button 3 again raises the seat back to the saved position.

## Stored energy / liquids / gases / solids

Corrosion antifreeze

Corrosion antifreeze deionised; fuel cell cooling circuit

Windscreen washer concentrate

Axle oil

Air conditioning refrigerant

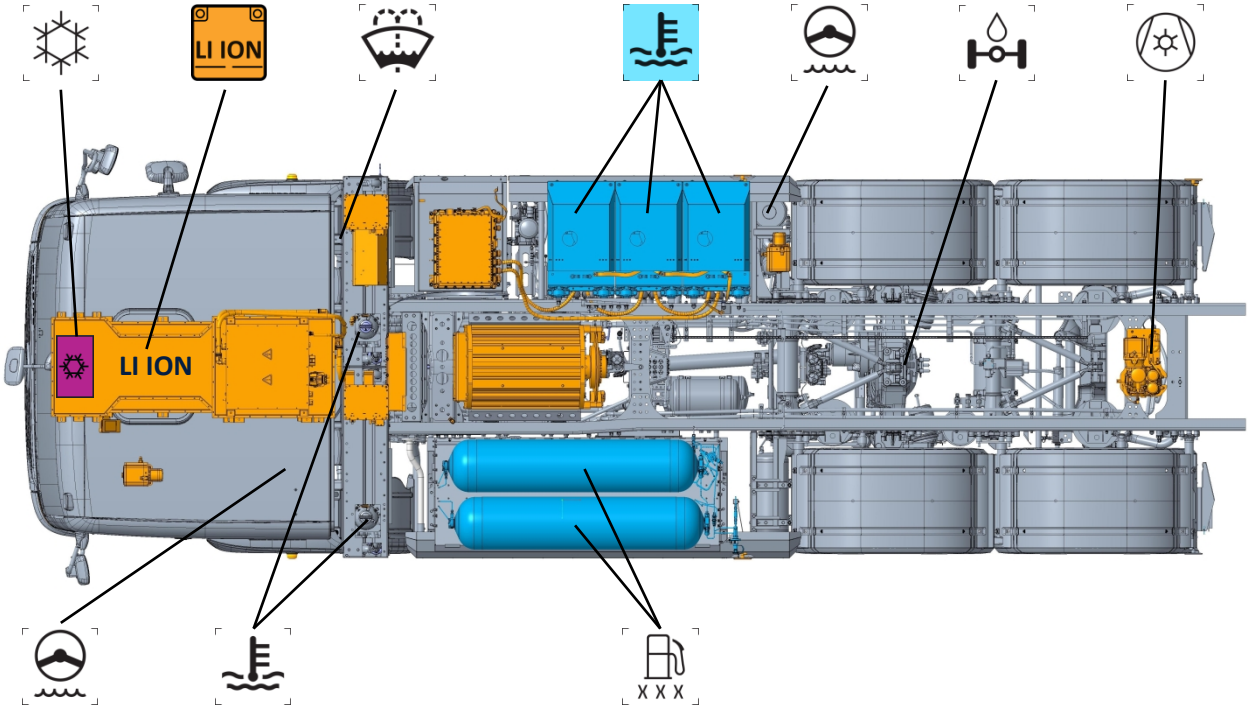
Steering oil


Energy source: Hydrogen

Compressor oil


High-voltage battery

### Mounting position



## Cooling system

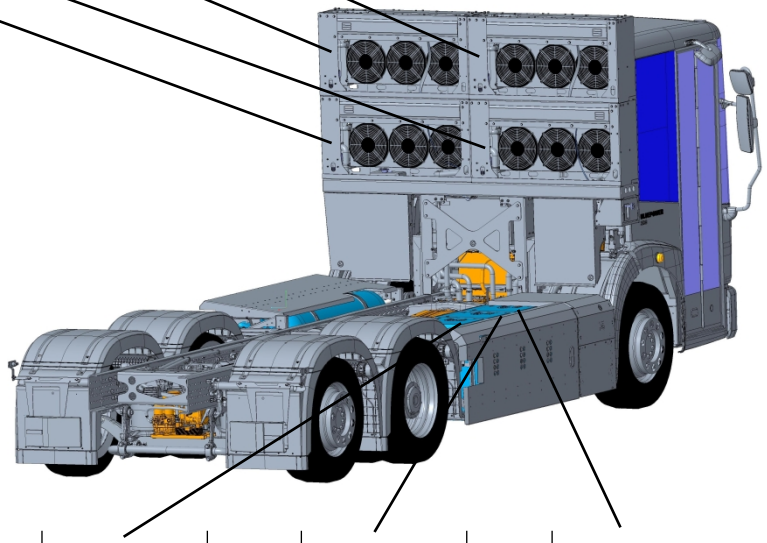
### Corrosion antifreeze

Cooling module fuel cell 3*

Cooling module fuel cell 2*

Cooling module fuel cell 1

Cooling module cooling system



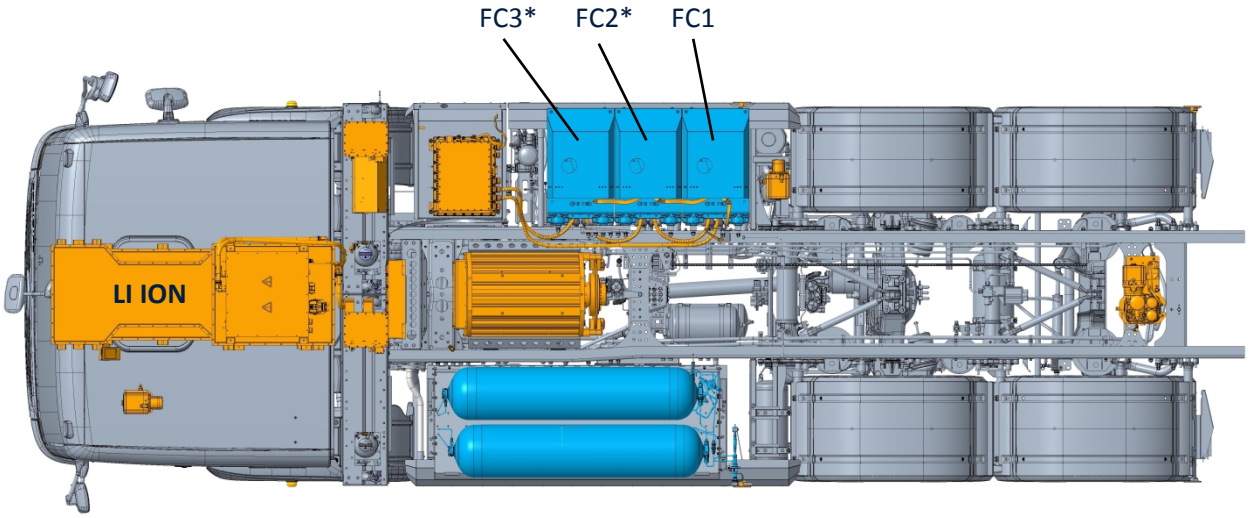
| Main cooling circuit | | FC1 | | FC2* | | FC3* |
|---|---|---|---|---|---|---|
| Water-glycol mixture 50/50 38,5 L | + | 20 L | + | 20 L | + | 20 L |

*Option - depending on the vehicle configuration

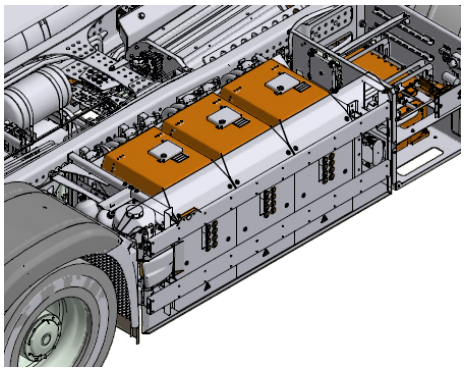
## Fuel cell cooling system

Corrosion antifreeze deionised; fuel cell cooling circuit

Each fuel cell has a separate cooling circuit. The heat is transferred from the deionised cooling water to the cooling water filled at the factory via a heat exchanger.




*Option - depending on the vehicle configuration



Product: Glysantin FC G 20-00/50

Volume: 6,5L / fuel cell

## Windscreen washer concentrate

The wiper fluid tank for the windscreen washer concentrate has a capacity of approx. 16 litres.

Due to the wide range of over-the-counter products available from wholesalers and retailers, it is not possible to carry out a hazard analysis of the ingredients.

Basically the following applies:

- Inhalation: Supply the affected person with fresh air and consult a doctor depending on the symptoms.
- Skin contact: Wash with plenty of water. If skin irritation occurs, consult a doctor.
- Eye contact: Remove contact lenses. Rinse eyes thoroughly for several minutes. Consult a doctor.
- Ingestion: Rinse mouth thoroughly with water. Drink plenty of water and consult a doctor.

## Axle oil

The factory-filled rear axle oil from Daimler Truck AG corresponds to a "hypoid gear oil" SAE 90, 80W/90.

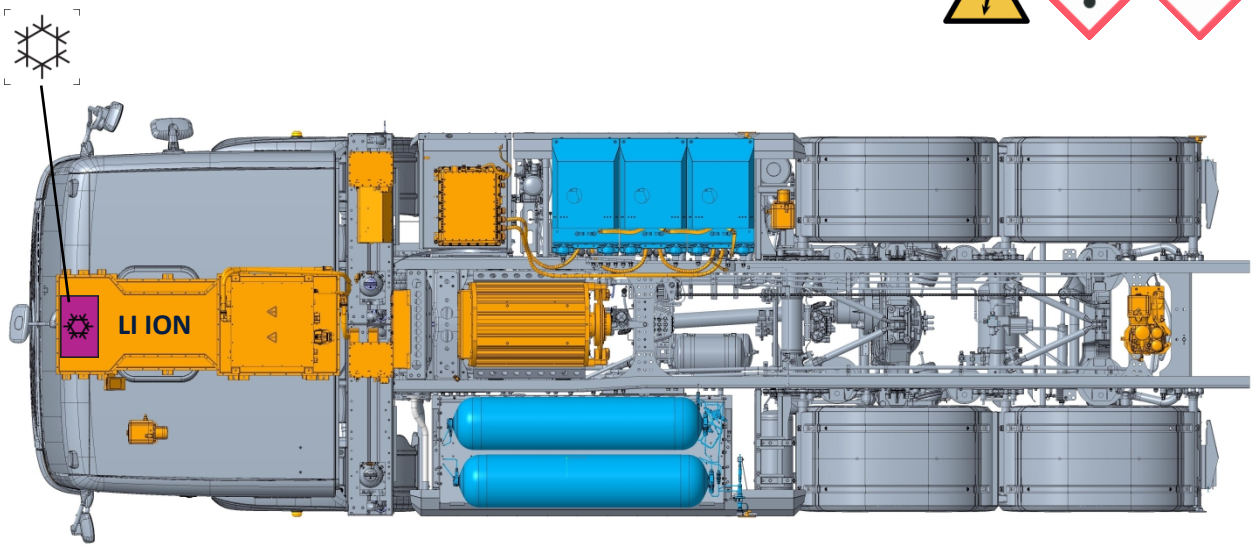
Filling quantity: 9.7 litres

Outer planetary gears (each side) 3.25 litres

Basically applies:

- Inhalation: Supply the affected person with fresh air and consult a doctor depending on the symptoms.
- Skin contact: Wash with plenty of water. If skin irritation occurs, consult a doctor.
- Eye contact: Remove contact lenses. Rinse eyes thoroughly for several minutes. Consult a doctor.
- Ingestion: Rinse mouth thoroughly with water. Do not induce vomiting, seek medical attention immediately.

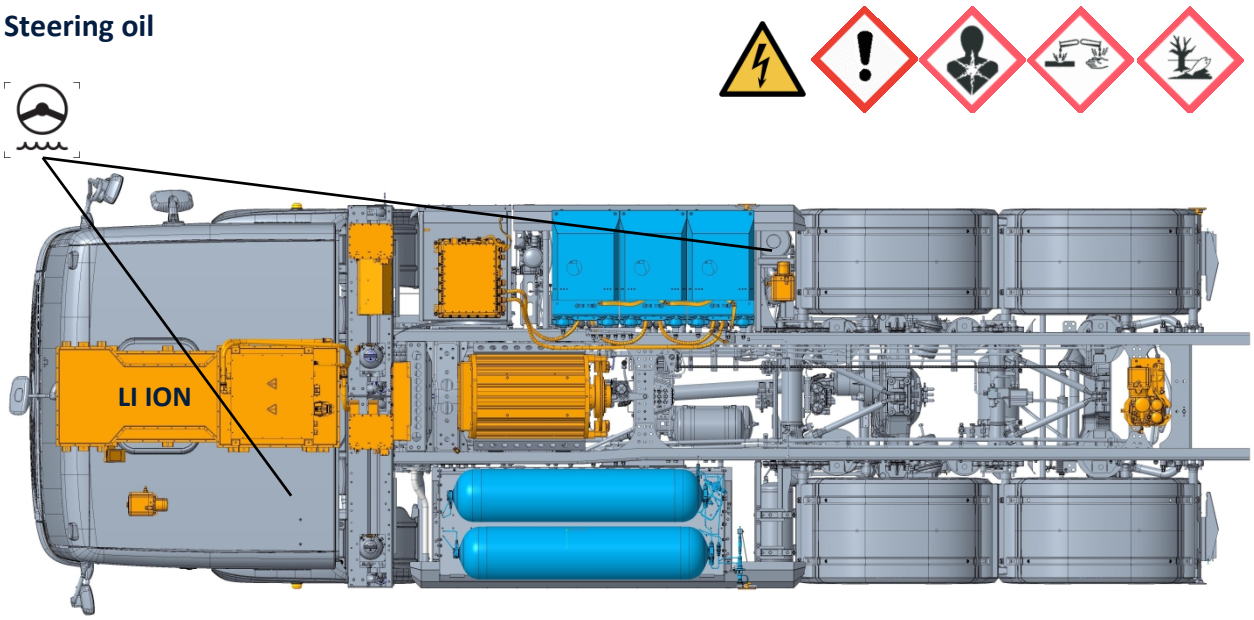
## Refrigerant




| | |
|---|---|
| Refrigerant | R134a |
| Filling quantity | 750 g |
| Compressor oil quantity | 90 ml |
| Compressor oil type | POE-ÖL RL68H |

- Inhalation: Supply affected person with fresh air and, depending on symptoms, consult a doctor. In case of respiratory arrest, initiate resuscitation.
- Skin contact: In case of cold burns, rinse with water for at least 15 minutes. Cover with sterile dressing. Call a doctor.
- Eye contact: Remove contact lenses. Rinse eyes thoroughly with water for 15 minutes. Consult a doctor.
- Ingestion: Rinse mouth thoroughly with water. Do not induce vomiting, seek medical attention immediately.

## Steering oil




The factory-filled steering oil corresponds to an "ATF oil".

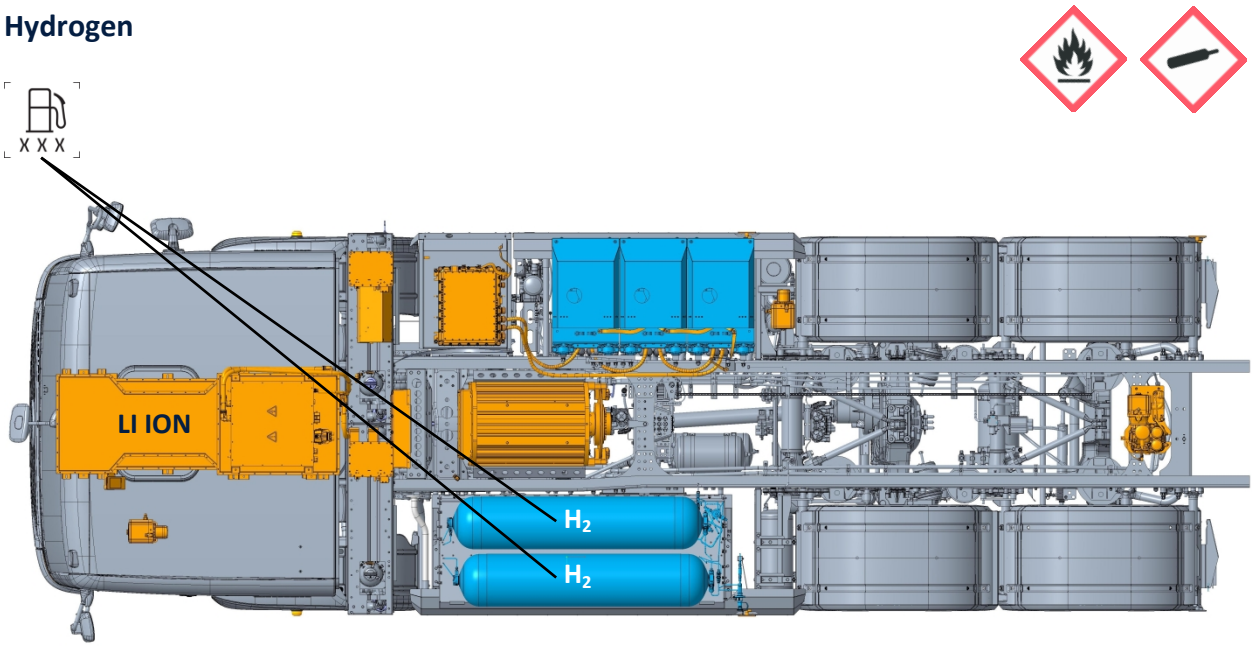
Filling quantity front axle: 2.0 litres

Filling quantity trailing axle: 9.0 litres

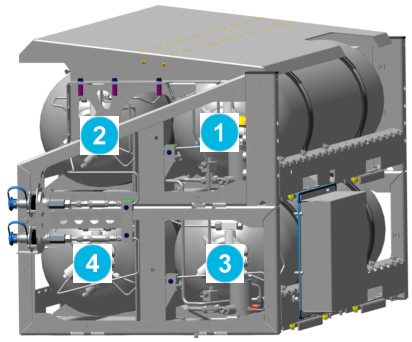
The following always applies:

- Inhalation: Supply the affected person with fresh air and consult a doctor depending on the symptoms.
- Skin contact: Wash with plenty of water. If skin irritation occurs, consult a doctor.
- Eye contact: Remove contact lenses. Rinse eyes thoroughly for several minutes. Consult a doctor.
- Ingestion: Rinse mouth thoroughly with water. Do not induce vomiting, seek medical attention immediately..

## Hydrogen




The hydrogen tank system is refuelled with a pressure of 70 MPa. Refuelling at filling stations with a system pressure of 35 MPa is only permitted with the written approval of ENGINIUS GmbH.

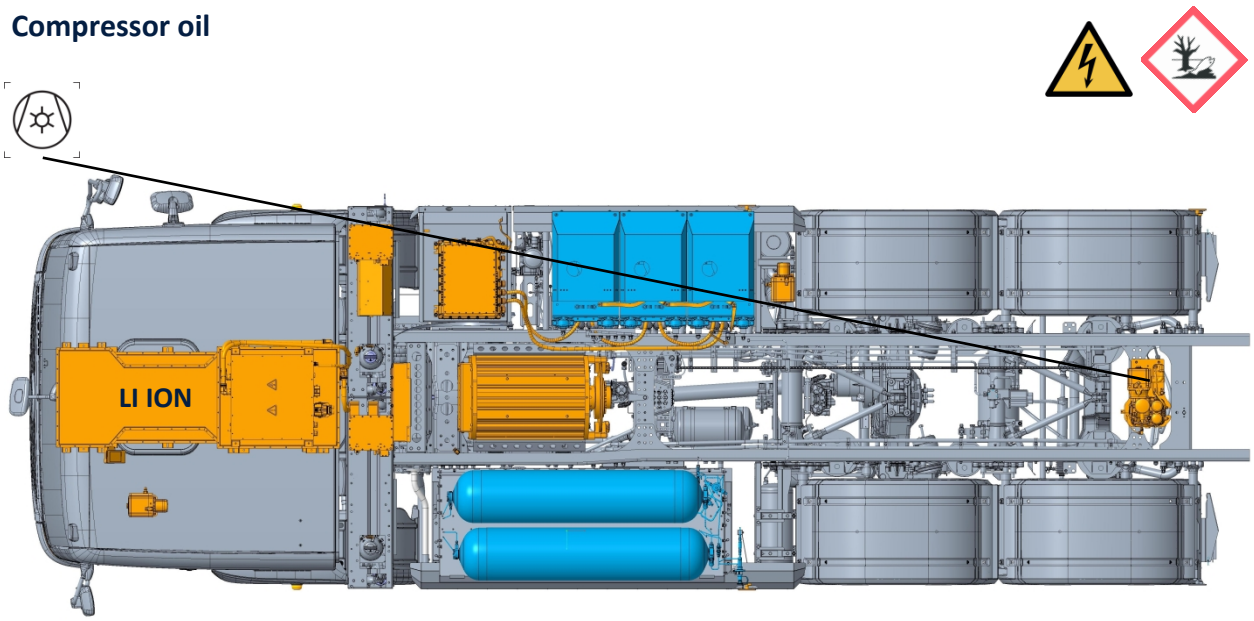



| $H_2$ | $kg_{Total}$ | Total |
|---|---|---|
| 4* | 16 | 412 L |
| 3* | 12 | 309 L |
| 2* | 8 | 206 L |
| 1 | 4 | 103 L |

*Option - depending on the vehicle configuration

- Inhalation: Supply affected person with fresh air and, depending on symptoms, consult a doctor. In case of respiratory arrest, initiate resuscitation.
- Skin contact: In case of cold burns, rinse with water for at least 15 minutes. Cover with sterile dressing. Call a doctor.
- Eye contact: Remove contact lenses. Rinse eyes thoroughly with water for 15 minutes. Consult a doctor.
- Ingestion: Rinse mouth thoroughly with water. Do not induce vomiting, seek medical attention immediately.

## Compressor oil




The factory-filled compressor oil complies with the ISO 46 standard.

Filling quantity: 1.2 litres

The following always applies:

- Inhalation: Supply the affected person with fresh air and consult a doctor depending on the symptoms.
- Skin contact: Product is not irritating to the skin
- Eye contact: Remove contact lenses. Rinse eyes thoroughly for several minutes.
- Ingestion: Rinse mouth thoroughly with water. Do not induce vomiting.

## High-voltage battery

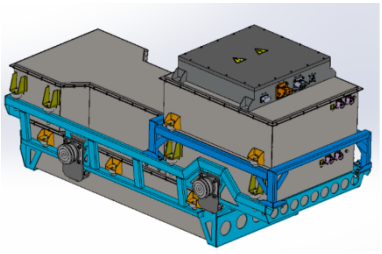

**DANGER**

**Danger de mort : mise en garde contre les hautes tensions**

Do not touch damaged or defective live components and cables or uninsulated electrical connections and cables.

Use personal protective equipment

High-voltage batteries with lithium-ion (NCM) battery cells are used in the ENGINIUS BluePower® vehicle. The voltage range in the driving cycle is between 474 VDC - 662 VDC. The specified nominal voltage is 568.8 VDC.



The high-voltage battery system is housed in a compact design including a high-voltage control box under the cab. To monitor the system parameters during operation, the battery management system (BMS) constantly checks all safety-relevant data and limits the system output if necessary. In the event of a safety-relevant event, the BMS activates the high-voltage control box and the high-voltage relays remain permanently open.

The high-voltage battery remains electrically charged after the high-voltage system has been switched off and discharged. Further information See: Disable direct hazards / safety regulations

### Damaged and undamaged high-voltage battery

In a high-voltage battery, for example, mechanical impact can lead to an internal short circuit in the battery cells. As a result, chemical energy is converted into thermal energy.


External signs such as smoke or fire are not necessarily recognisable. A critical condition of the high-voltage battery must be assumed. The condition of the high-voltage battery must be permanently monitored, as spontaneous combustion of the battery cells cannot be ruled out.

Basically the following applies:

- Use conventional binding agent
- Wear personal protective equipment
- Inhalation: Supply affected person with fresh air and consult a doctor depending on symptoms.
- Skin contact: Rinse skin with water and brush off loose particles from skin. Immediate medical treatment necessary, as untreated burns lead to wounds that are difficult to heal.
- Eye contact: Remove contact lenses. Rinse eyes thoroughly with water for 15 minutes. Seek medical attention.
- Ingestion: If swallowed, there is a risk of perforation of the oesophagus and stomach (strong corrosive effect)

Electrolytes are only present in small quantities (ml) in the individual cells.

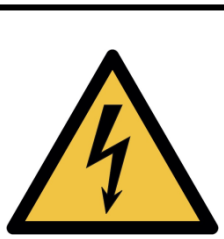
**Outgassing a high-voltage battery**

The following must be observed when outgassing a high-voltage battery:

- Escaping gases are irritating, flammable, hot, potentially corrosive, toxic and should therefore never be inhaled.
- Always monitor the recovery process.
- In addition, extend the danger zone around the vehicle.
- If possible, constantly cool the outgassing high-voltage battery with water.

Escaping gases can usually also be detected by a pungent, acrid odour.

## High-voltage cables



**DANGER**

**Danger to life: Warning of high voltages**

Do not touch damaged or defective live components and cables or uninsulated electrical connections and cables.

Use personal protective equipment

High-voltage cables have orange insulation and are the connecting elements between the high-voltage components and the high-voltage battery. When combined, they form the high-voltage vehicle electrical system. All components of the plug connections are touch-protected and sensorised.

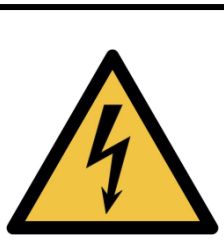
### Insulation monitoring

Insulation monitoring is integrated as an extended safety feature of the high-voltage on-board electrical system. If a serious insulation fault is detected, the high-voltage on-board electrical system is switched off.

The high-voltage on-board electrical system is completely electrically insulated from the vehicle body.

## High-voltage components

High-voltage components are labelled with corresponding pictograms.



**GEFAHR**

**Danger to life: Warning of high voltages**

Do not touch damaged or defective live components and cables or uninsulated electrical connections and cables.

Use personal protective equipment

# In case of fire

When motor vehicles catch fire, harmful fumes can be produced due to the different burning materials and fuels.

In general, caution is required in the event of fires, as plastics, composite materials and liquids can generate toxic vapours at high temperatures and plastics can drip at certain temperatures, which is not unusual in vehicle fires.

BluePower® vehicles can be moved in gearbox position "N" and with the parking brake released. A sufficient supply of compressed air is required. Make sure that the vehicle does not roll away in an uncontrolled manner. To engage gear position "N", the ignition must be switched on and the brake pedal depressed (see chapter Disable direct hazards / safety regulations)

Vehicle fires must be extinguished in accordance with fire brigade guidelines.

Water has proven to be a suitable cooling and extinguishing agent, but specific extinguishing agents should be used that correspond to the fire class of the burning medium.

**Fire class A**

Fires involving solid materials, mainly of an organic nature, which normally burn with the formation of embers, e.g. wood, paper, straw, textiles, coal, car tyres.

**Fire class B**

Fires involving liquid or liquidising substances, e.g. petrol, benzene, oils, paints, tar, ether, alcohol,

stearin, paraffin.

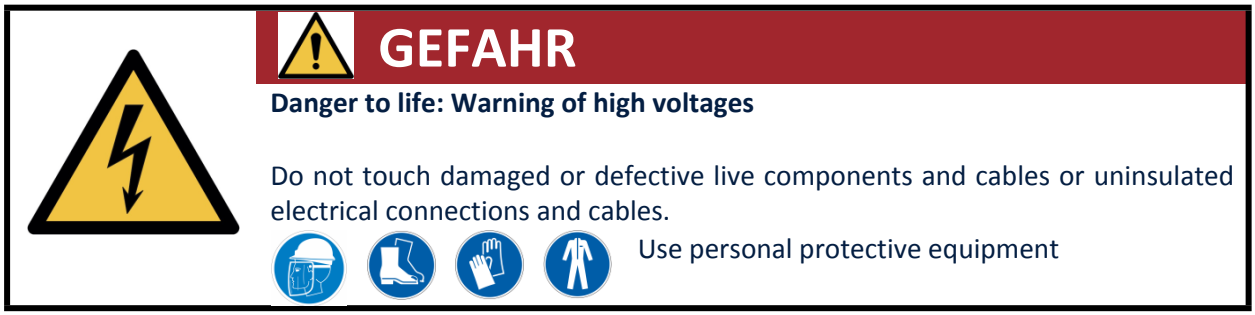
**Fire class C**

Gas fires, natural gas, LPG and also hydrogen, must be allowed to burn in a controlled manner, as extinguishing promises little or no success. If extinguishing is necessary, extinguishing powder C should be used.

**Fire class D**

Fires involving metals, e.g. aluminium, magnesium, lithium, sodium, potassium and their alloys. Metal fires such as magnesium fires cannot be extinguished with water or CO2 extinguishers, the substances mentioned accelerate the reaction and explosive oxyhydrogen gas can also be produced. If extinguishing is necessary, sand or metal fire powder should be used.

## High Voltage Battery


Extinguish a vehicle fire in which the high-voltage battery is not affected using typical fire-fighting measures for a vehicle fire in accordance with fire brigade guidelines.

A high-voltage battery is fundamentally combustible due to its material components. Safety is further improved by additional design measures on the housing of the high-voltage battery and the installation location of the high-voltage battery. Due to these safety measures, no increased fire risk is generally to be expected compared to conventional vehicles.

**Burning / outgassing high-voltage battery**

An outgassing high-voltage battery poses an acute fire hazard.

The resulting flue gas contains toxic and corrosive components such as small amounts of hydrofluoric acid. The following measures should therefore be observed:

- Escaping gases are irritant, flammable, hot, potentially corrosive, toxic and should therefore not be inhaled under any circumstances. Use respiratory protection. 
- Put on personal protective equipment
- Always monitor the recovery process. 

- In addition, extend the danger zone around the vehicle. Thermal reaction can spread to surrounding objects.
- If possible, constantly cool the outgassing high-voltage battery with water.

Escaping gases can usually also be detected by a pungent, acrid odour.

### Extinguishing media

In the event of a fire in a hydrogen/electric vehicle, it is possible that the high-voltage battery may also ignite, e.g. due to prolonged thermal exposure. In principle, water is also the most suitable extinguishing agent in this case. Depending on the battery type, it is possible that a self-igniting high-voltage battery cannot be completely extinguished, but can re-ignite until it has burnt itself out. In this case, the high-voltage battery should be cooled with water to prevent the fire from spreading further and allow it to burn out in a controlled manner.

In principle, any available extinguishing agent can be used. If possible, extinguish with a very high proportion of water. Permanent extinguishing with water can cool the high-voltage battery sufficiently to minimise the effects of a thermal reaction and prevent the fire from spreading to other components.

### Recommendation for firefighting

With *closed* metal housing of the high-voltage battery:

- Object temperature up to 80 °C: Cool with plenty of water from a safe distance. Continue to monitor as the temperature rises.
- Object temperature above 80 °C: Extinguish (cool) with plenty of water from a safe distance.

If the metal housing of the high-voltage battery is *open*:

- Extinguish (cool) with plenty of water from a safe distance Move the vehicle or high-voltage battery to a safe place outdoors (observation point) if possible. Allow the high-voltage battery to burn down in as controlled a manner as possible while preventing the fire from spreading further.

Information on handling a damaged high-voltage battery can be found in chapter "Stored energy / liquids / gases / solids".

## In case of submersion

In principle, there is no difference between conventional vehicles and vehicles with a high-voltage electrical system when recovering vehicles partially or fully submerged in water. In principle, there is no increased risk of electric shock from the high-voltage electrical system surrounded by water.

Rescue the vehicle partially or completely submerged in water in accordance with the fire brigade's guidelines.

Pull the vehicle out of the water as far as possible. Secure the vehicle and put it out of operation before continuing the rescue operations. Possible fixing and securing points are described in the chapter "Immobilisation / stabilisation / lifting".

Always adapt the personal protective equipment to the situation. Observe the instructions in chapter "Stored energy / liquids / gases / solids".

**Environmental hazard**

Risk of groundwater pollution and harmful effects on aquatic organisms. Fuels and operating materials can be hazardous to the environment.

Observe the notes in chapter "Stored energy / liquids / gases / solids".

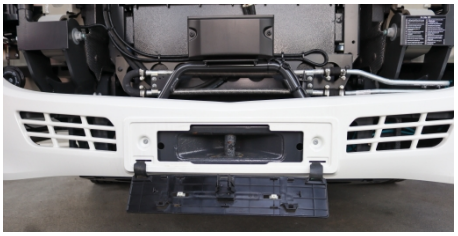
**Recommendation for recovering from the water**

After recovering the vehicle from the water, deactivate the high-voltage on-board electrical system according to the specified switch-off procedure if possible (see chapter "Avoiding direct hazards / safety regulations").

When deactivating the high-voltage on-board electrical system on vehicles recovered from the water, suitable personal protective equipment must be worn, e.g. face protection and insulating gloves protection class 0. The high-voltage battery is located under the driver's cab. When using rescue equipment, care must be taken to ensure that the high-voltage battery is not damaged.

## Towing / transportation / storage

Towing the BluePower® vehicle by axle is only permitted with the drive shaft removed.



When recovering a vehicle from the danger zone, the vehicle with electric drive may only be moved at walking speed. The coupling jaw is located behind the licence plate holder.

The vehicle must be transported in accordance with the applicable guidelines for towing/recovery companies. Always observe the national regulations/standards when loading and transporting the vehicle.

For vehicles with alternative drive systems in particular, country-specific and/or operator-specific regulations must be observed, e.g. tunnel regulations or guidelines for storage in enclosed spaces.

## Recommendation for towing a vehicle with a high-voltage electrical system

Once it has been ensured that there is no further danger, the vehicle can be made accessible to the following emergency services (e.g. police, tow truck). The high-voltage battery must be completely cooled down before the vehicle is made accessible to the following emergency services or the scene of the incident is left. Always point out to the following emergency services that the battery can re-ignite.

- The high-voltage on-board electrical system should be deactivated before loading, see chapter "Avoiding direct hazards / safety regulations".
- When handing over the vehicle, e.g. to representatives of the authorities, towing/recovery companies, workshops or waste disposal companies, the drive type of the vehicle and the firefighting measures taken (e.g. deactivation of the high-voltage on-board electrical system) must be communicated. In particular, possible hazards due to damaged high-voltage components or high-voltage components that have come into contact with water (e.g. electric shock or fire risk, even with a time delay, due to the high-voltage battery) must be pointed out.
- National regulations/standards must be observed for loading and transport (in Germany: DGUV Information 214-010 and DGUV Information 205-022, DGUV Information 209-093 and DGUV Information 214-081 as well as the regulations of the Accord européen relatif au transport international des marchandises Dangereuses par Route (ADR) - European Agreement concerning the International Carriage of Dangerous Goods by Road).
- Taking into account the measures already taken and the degree of damage to the vehicle, the towing/recovery company must ensure the road safety of the transport. Possible hazards due to damaged high-voltage components (e.g. electric shock or fire risk due to the high-voltage battery) must be taken into account..
- When lifting with a crane/jack, working with a cable winch or loading, make sure that no high-voltage components are or will be damaged.

## Warehousing

Various measures must be carried out in order to park an accident vehicle safely. If the vehicle is taken to a workshop, the responsible specialist personnel must be informed of the measures already carried out (e.g. high-voltage cut-off device has been activated).

## Recommendation for storing a vehicle with a high-voltage electrical system

- For fire safety reasons, vehicles with a high-voltage electrical system that have been involved in an accident must be parked in a cordoned-off area in an outdoor parking area with sufficient distance to other vehicles, buildings, flammable objects and flammable surfaces, just like conventional vehicles.
- Parking a vehicle with a damaged high-voltage on-board electrical system in a closed hall is not recommended under any circumstances. Further information can be found in the vehicle-specific rescue card (see chapter "Rescue cards").
- Alternatively, accident-damaged vehicles with a high-voltage on-board electrical system can be parked in fire protection systems designed for this purpose.
- Parked vehicles with a high-voltage electrical system that have been involved in an accident and whose high-voltage components are directly exposed to the weather must be covered to protect them from the weather.
- The vehicle must be labelled accordingly.

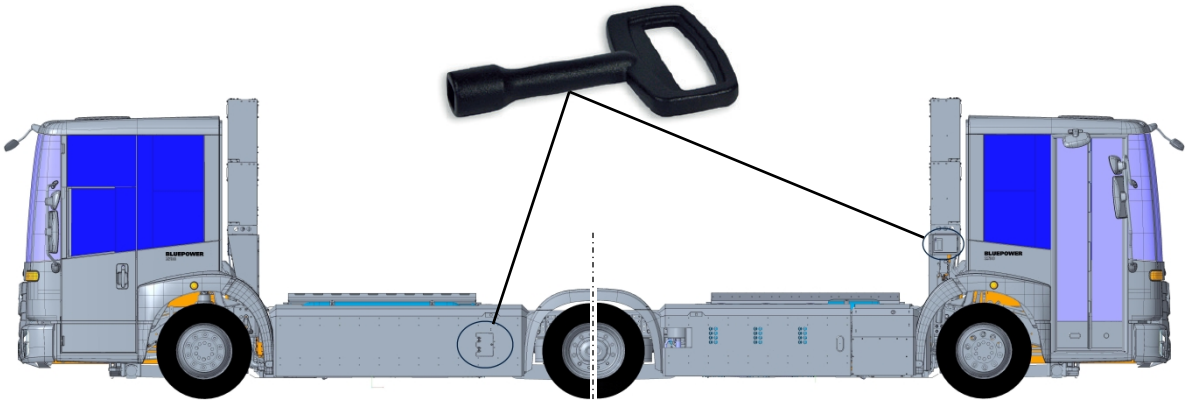
## Follow-up of damaged high-voltage batteries

- Damaged high-voltage batteries must be left in the vehicle and transported safely to a specialised workshop.
- The temperature measurement on the surface of the high-voltage battery, e.g. with a thermometer or an infrared thermal imaging camera, must be < 60 °C.
- The vehicle must be transported safely and directly to a specialised workshop and parked in a quarantine area / secure outdoor area, away from buildings.
- Individual high-voltage battery parts must be placed in a special transport container for "non-transport-safe high-voltage batteries" and transported to a specialised workshop.

## Important additional information

### Triangular spanner

A triangular socket spanner (h=6.5 mm) is required to open the charging interface and hydrogen refuelling interface



### Safety belt

The BluePower® vehicle is fitted with seat belts without pyrotechnic restraint systems.

### High-voltage battery charging stop

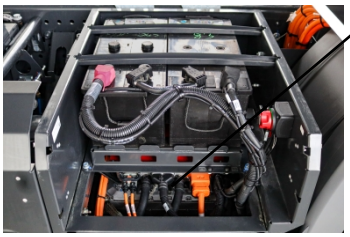

There is a button under the outer passenger seat to interrupt the charging of the high-voltage batteries.

There are two buttons in the Electrical Equipment Box:

Start charging process

Stop charging process

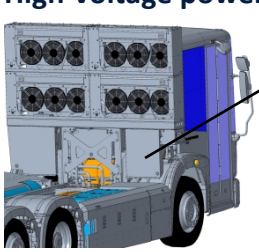
## Electrical Equipment Box



The On Board Charger* (OBC) is located underneath the battery  (12 VDC).

*Option - depending on the vehicle configuration

## High-voltage power distribution unit (HV-PDU)



The high-voltage distribution unit is the central interface of the high-voltage system, where all cables are brought together. The high-voltage distribution unit contains electrical switching and switching devices.

## Explanation of pictograms used


Use eye protection
ISO 7010-M004


Use hand protection
ISO 7010-M009


Use breathing protection
ISO 7010-M017


General warning
ISO 7010-W001


Warning of hot surface
ISO 7010-W017


Warning of hand injuries
ISO 7010-W024

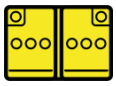

Extinguish with water
ISO 7010-P011


Danger/Attention: Flame
GHS02


Attention: corrosive effect
GHS05


Danger/Attention: Health hazard
GHS08


Warning: High-voltage component


Battery: Low voltage
ISO 17840-1

Battery: Battery High Voltage
ISO 17840-1


Disconnector: High voltage
ISO 17840-1


High-voltage cable
ISO 17840-1


Seat height adjustment, pneumatic
ISO 17840-3


Attention, hydrogen burns with an invisible flame
ISO 17840-3


Observe instructions
ISO 7010-M002


Use foot protection
ISO 7010-M008


Utiliser des vêtements de protection
ISO 7010-M010


Warning of electrical voltage
ISO 7010-W010


Warning of sharp object
ISO 7010-W022


Attention: Gas bottle
GHS04

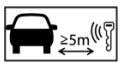

Attention: Attention
GHS07


Attention: Environment
GHS09


High-voltage cut-off device
ISO 17840-1


Automatic overpressure safety valve
ISO 17840-1


Manual shut-off valve
ISO 17840-1



Distance radio key to vehicle
ISO 17840-1


Levelling, pneumatic
ISO 17840-3

Air conditioning: Refrigerant
ISO 7000-0027

Cooling system
ISO 7000-0246

Battery charging
ISO 7000-0247

Seat adjustment
ISO 7000-1428

Steering column adjustment
ISO 7000-2064


Fuel type: Hydrogen
ISO 7000-2641

Axle oil
ISO 7000-3371

Compressor oil Compressed air system
ISO 7000-0138

Fuel cell cooling system
ISO 7000-0246

Windscreen washer fluid
ISO 7000-1422

Battery charging stop
ISO 7000-2063

Steering oil
ISO 7000-2440

Information
ISO 7000-2760