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**EMERGENCY RESPONSE GUIDE**



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## 1. INTRODUCTION

### 1.1 INTRODUCTION

This manual has been created to assist the first responders in identifying and responding to vehicles equipped with a DAF hybrid system.

The DAF hybrid vehicle uses high-voltage AC to power an electric motor in combination with a diesel engine to improve fuel economy and reduce emissions. A high-voltage battery pack stores energy until it is required to power the vehicle.

The DAF hybrid system has been designed with many features for user protection, to ensure safe access to and from the vehicle under various conditions. It is important to read and understand the 'Emergency Shutdown Procedures'.



***WARNING! Always assume the vehicle is powered up***

# EMERGENCY RESPONSE GUIDE

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Introduction

LF45IV series

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## 2. IDENTIFICATION

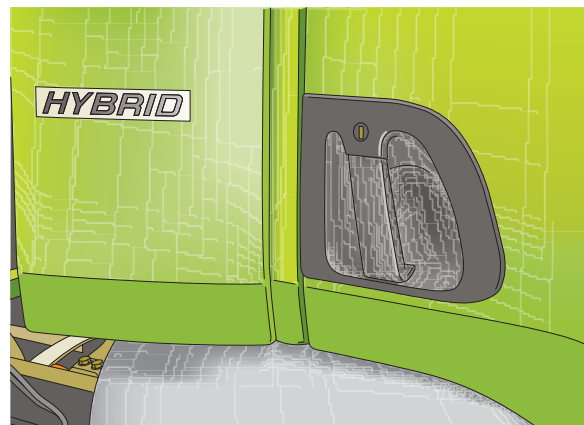
### 2.1 IDENTIFICATION

There are several methods to identify a vehicle equipped with a DAF hybrid system.



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- The outside of a DAF hybrid vehicle contains the word 'HYBRID'.



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- The shift label located on the shift console states 'Hybrid Drive'.



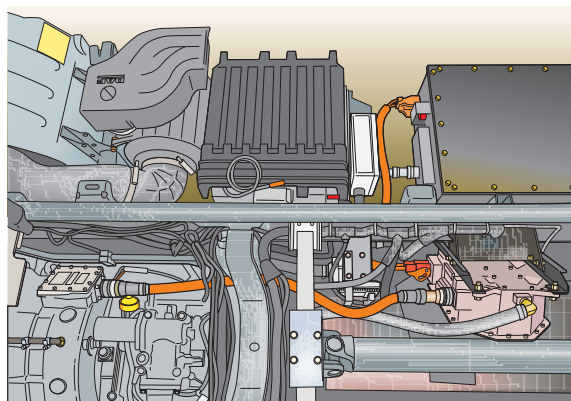
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# EMERGENCY RESPONSE GUIDE

## Identification

LF45IV series

- The vehicle will have orange 'high-voltage' cables, which are connected to the 'high-voltage' components.



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### 3. WARNINGS & CAUTIONS

#### 3.1 WARNINGS & CAUTIONS



**WARNING!** This hybrid vehicle is equipped with high-voltage components and wiring. Failure to follow these instructions may result in severe personal injury or death.

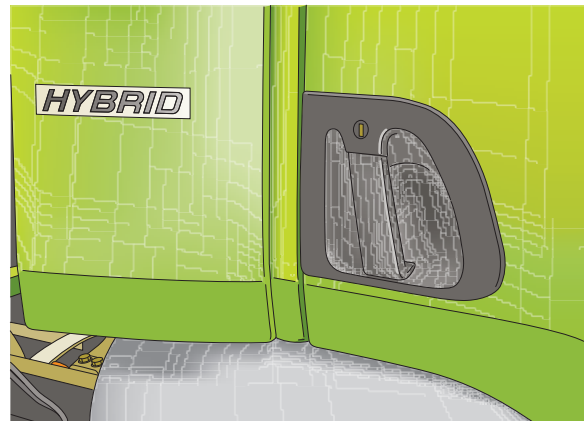
- Always observe the safety instructions in this manual and do not ignore them.
- Avoid the high-voltage components, identifiable by a warning sticker.
- Avoid the orange-coloured high-voltage wiring and connectors.



**CAUTION:** This hybrid vehicle is equipped with a red service switch on the hybrid battery box. Pushing this button during normal vehicle operation can lead to damage to the hybrid system.

- Only push the red service switch in case of emergency or if directed to do so by this manual.

#### Identification



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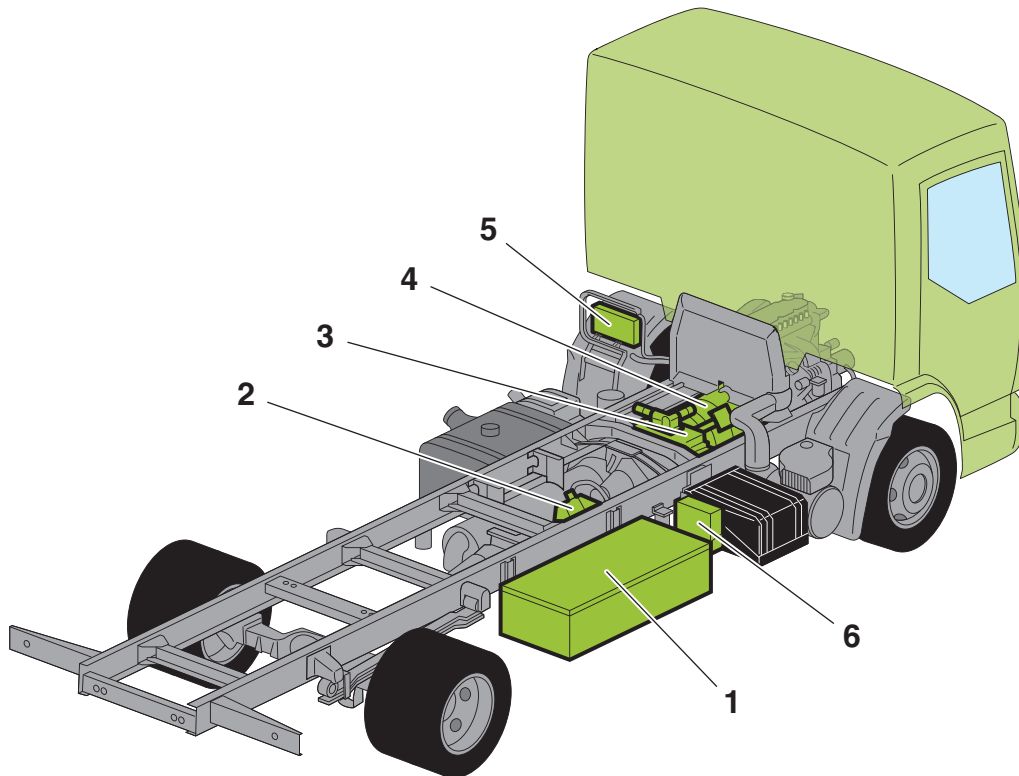
This hybrid vehicle can be identified by a badge 'Hybrid' on the outside of the vehicle, as well as a sticker inside the cab.



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## Location of hybrid components

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1. Hybrid battery box (high-voltage)
2. Inverter (AC/DC) or (DC/AC)
3. Automated gearbox
4. Electric motor/generator
5. Hybrid cooling system reservoir
6. Hybrid system relay and fuse box (low-voltage)

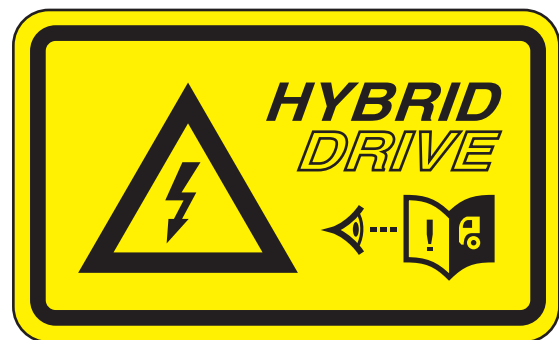
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### High-voltage components

The hybrid battery (1), the inverter (2) and the electric motor/generator (4) are high-voltage components. All high-voltage components can be identified with a warning sticker with a high-voltage symbol.



**WARNING!** Do not touch components indicated with the 'high-voltage' symbol or orange 'high-voltage' wiring.



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### High-voltage wiring

All 'high-voltage' wiring is covered in orange insulation.



**CAUTION:** *The hybrid system continuously monitors all high-voltage components. The high-voltage system is switched off if a high-voltage drop is detected, due to a loose high-voltage connector for example.*

## Do's and Don'ts

### Do's

- Always assume the vehicle is powered up when you approach the hybrid vehicle.
- Always perform one of the three 'Emergency Shutdown Procedures' and allow the vehicle to set for 5 minutes prior to work on the hybrid vehicle.

### Don'ts

- Never work on the vehicle if you haven't performed one of the three "Emergency Shutdown Procedures" and allowed the vehicle to set for 5 minutes.
- If at all possible, never cut the orange high-voltage cables.
- If at all possible, never cut into or open the Inverter, electric motor/generator or hybrid battery box.

# EMERGENCY RESPONSE GUIDE

Warnings & Cautions

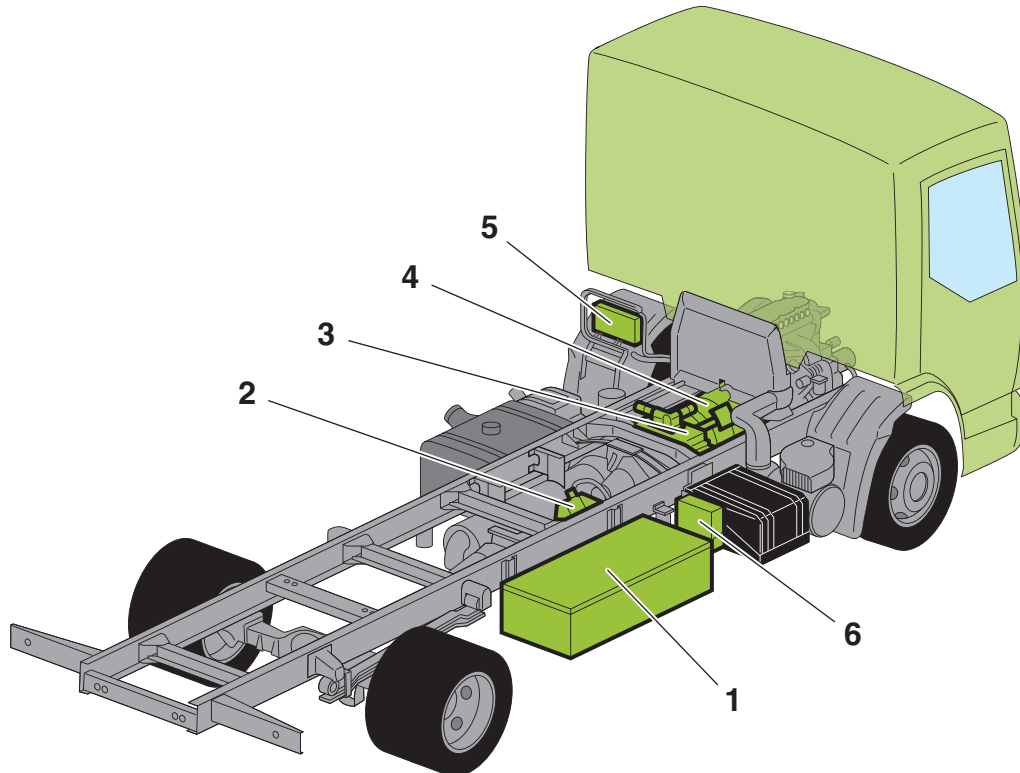
LF45IV series

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## 4. HIGH-VOLTAGE BATTERIES

### 4.1 HIGH-VOLTAGE BATTERIES

The high-voltage batteries are located inside the hybrid battery box (1).



1. Hybrid battery box (high-voltage)
2. Inverter (AC/DC) or (DC/AC)
3. Automated gearbox
4. Electric motor/generator
5. Hybrid cooling system reservoir
6. Hybrid system relay and fuse box (low-voltage)

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The hybrid battery box (1) contains two high-voltage batteries that are connected in series with each battery producing 172 volts. Each battery consists of 48 individual cells that contain 3.6 volts and are connected in series to produce 172 volts.

Each cell is contained in a sealed container. The batteries contain lithium manganese oxide. The electrolyte used in the battery is a lithium salt in an organic solvent.



**WARNING!** *The battery cells inside the hybrid battery box contain electrolyte.*

**Electrolyte is a toxic fluid. Physical contact can lead to serious health problems.**

- **Avoid physical contact with electrolyte in case of exposure.**
- **If there is contact with the eyes: rinse with plenty of water for at least 15 minutes and consult a doctor.**
- **Avoid skin contact. If there is skin contact: wash the skin with water and soap.**

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## Battery Composition

- Chemical system: lithium manganese oxide (partially substituted with nickel and cobalt)/ carbon. (Li-Mn-Ni-Co-O / C).
- Electrolyte: lithium salt in an organic solvent (non-aqueous liquid). The electrolyte is absorbed into 48 individual cells per battery and will not normally spill or leak if the battery is damaged.
- If electrolyte leaks from a cell, use a towel to wipe it up.
- Maximum electrolyte for the two battery system is 4000cc.



**WARNING!** *The batteries should be kept away from heat, ignition sources and water.*

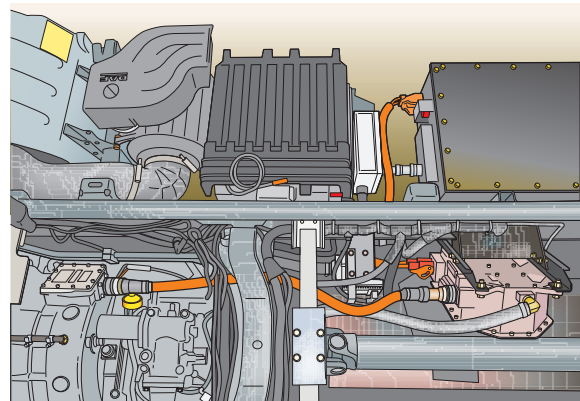


## 5. BUILT-IN SAFETY FEATURES

### 5.1 BUILT-IN SAFETY FEATURES

All high-voltage cables which are connected to the 'high-voltage' components are covered in orange insulation.

A high-voltage fuse located in the hybrid battery box provides protection in the high-voltage battery system.

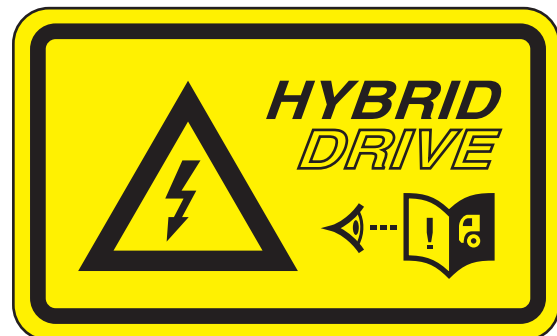


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The high-voltage cables coming from the hybrid battery box are controlled by relays that are normally open. When the ignition key is turned off, the relays open, which contains the voltage inside the hybrid battery box.

All positive and negative high-voltage cables are isolated from the metal chassis to prevent shock when touching the metal chassis.

If a malfunction is detected the high-voltage system will shut off.



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# EMERGENCY RESPONSE GUIDE

Built-In Safety Features

LF45IV series

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## 6. EMERGENCY PROCEDURES

### 6.1 EMERGENCY PROCEDURES

#### Safety instructions in case of accident



**WARNING!** This hybrid vehicle is equipped with high-voltage components and wiring. Failure to follow these instructions may result in severe personal injury or death.

- Always observe the safety instructions in this manual and do not ignore them.
- Avoid the orange-coloured high-voltage wiring and connectors.
- Avoid the high-voltage components, identifiable by a warning sticker.



**WARNING!** The battery cells inside the hybrid battery box contain electrolyte.

Electrolyte is a toxic fluid. Physical contact can lead to serious health problems.

- Avoid physical contact with electrolyte in case of exposure.
- If there is contact with the eyes: rinse with plenty of water for at least 15 minutes and consult a doctor.
- Avoid skin contact. If there is skin contact: wash the skin with water and soap.

#### In case of accident:

The hybrid battery box is equipped with an inertia switch. During an accident where a specific vehicle deceleration is exceeded, the inertia switch shuts off the high-voltage supply in the hybrid battery box. In this case, the high-voltage supply in the hybrid battery box can only be switched back on by a DAF service dealer.

- Perform an emergency shutdown procedure.
- Avoid the high-voltage components, identifiable by a warning sticker and the orange coloured wiring.
- Do not cut into or remove any of the orange high-voltage cables.
- Do not cut into or open the hybrid battery box.
- Do not cut into or open the inverter.

#### In case of fire

##### Fire extinguisher

Use only CO<sub>2</sub> or dry chemical fire extinguishers.

- Perform an emergency shutdown procedure.

# EMERGENCY RESPONSE GUIDE

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- Avoid the high-voltage components, identifiable by a warning sticker and the orange coloured wiring.
- Do not cut into or remove any of the orange high-voltage cables.
- Do not cut into or open the hybrid battery box.
- Do not cut into or open the inverter.

## **In case of a submerged vehicle**

Pull the vehicle out of the water. There is no risk of electric shock from touching the body or chassis in or out of the water.

- Perform an emergency shutdown procedure.
- Avoid the high-voltage components, identifiable by a warning sticker and the orange coloured wiring.
- Do not cut into or remove any of the orange high-voltage cables.
- Do not cut into or open the hybrid battery box.
- Do not cut into or open the inverter.

**7. EMERGENCY SHUTDOWN PROCEDURES****7.1 EMERGENCY SHUTDOWN PROCEDURES**

In case of an emergency (accident, fire) the high-voltage supply of the hybrid system must be shut off. It takes up to five minutes before the high-voltage has dropped to a harmless level after an emergency shutdown procedure has been carried out. Depending on the situation, one of the following three emergency shutdown procedures can be carried out:

**Emergency shutdown procedure 1 (preferred)**

- Enter the cab.
- Apply the parking brake.
- Push 'N' on the gearbox control panel to shift the gearbox to neutral.
- Switch off the ignition.
- Exit the cab.

**Emergency shutdown procedure 2**

In case it is not possible to enter the cab, disconnect the vehicle batteries (24V) or switch off the main switch, if present.

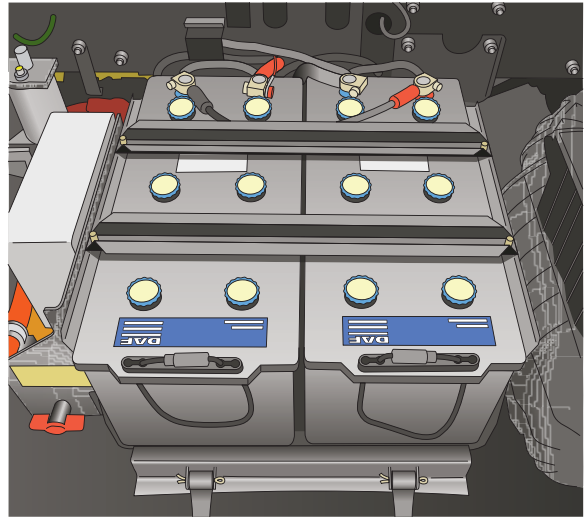
# EMERGENCY RESPONSE GUIDE

## Emergency shutdown procedures

LF45IV series

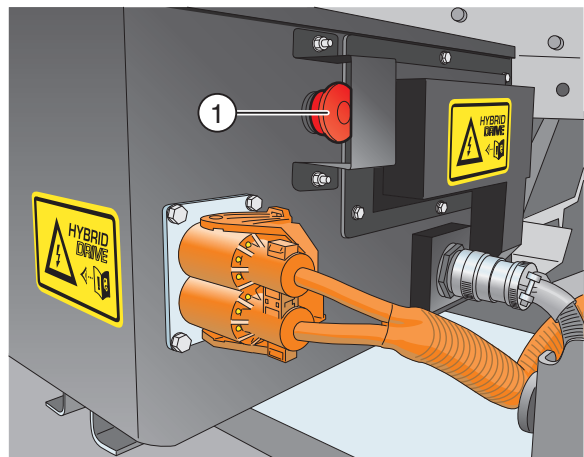
### Emergency shutdown procedure 3

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In case it is not possible to enter the cab and disconnect the vehicle batteries (24V), push the red service switch (1) on the hybrid battery box.



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## 8. VEHICLE TOWING AND JUMP-STARTING

### 8.1 VEHICLE TOWING AND JUMP-STARTING

#### Towing

It is possible to tow the hybrid vehicle.

- For short distance towing: The vehicle can be towed by another vehicle.
- For long distance towing: tow the vehicle using a breakdown truck if the differential is damaged.

When towing, fault messages may appear in the master display when the ignition is switched on.



*NOTE: The maximum permissible vehicle speed, weight and distance can vary per country.*



**WARNING! Towing a fully loaded vehicle can result in unstable vehicle behaviour for the towing and/or towed vehicle during critical driving situations. This can lead to very dangerous situations. High forces and tensions in the chassis and driveline of the vehicles can also cause damage to the vehicles.**

- **Do not tow the vehicle when it is fully loaded.**

#### Being towed by another vehicle



**WARNING! The towed vehicle can be located asymmetrically (left or right) behind the towing vehicle. Towing with the vehicle in the centre at an angle larger than 20° can result in unstable vehicle behaviour for the towing and/or towed vehicle during critical driving situations. This can lead to very dangerous situations. High forces and tensions in the chassis and driveline of the vehicles can also cause damage to the vehicles.**

- **Towing may not take place with the vehicle in the centre at an angle larger than 20°.**

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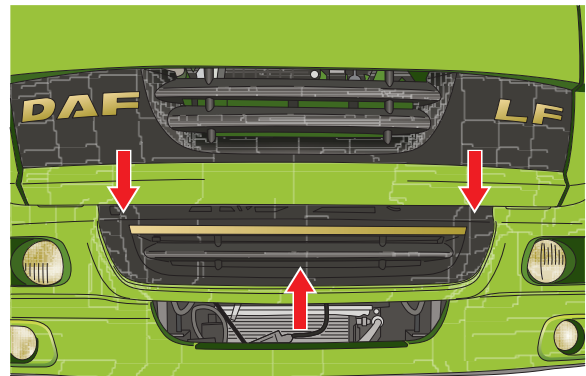


**WARNING!** When the engine is not running during towing and no additional measures are taken, there is no power steering and no air is supplied to the braking system. This results in difficult steering and increased brake pedal force and ultimately leads to automatic engagement of the parking brake. This can lead to very dangerous situations.

- Release the parking brake and adapt the driving style of the towing combination.

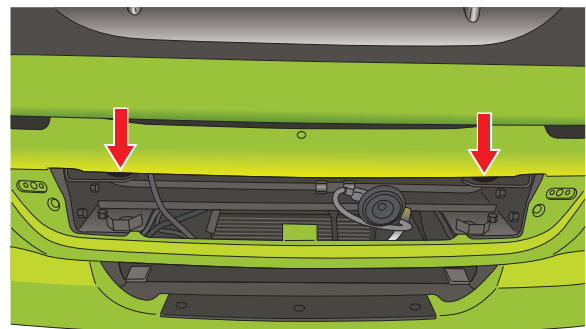
### Towing instructions:

- Always use a towing bar when towing.
- The towing eyes intended for towing are located behind the lower grille. To access the towing eyes, remove the lower grille by turning the attachment screws a quarter turn.



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- Always mount the tow rod with its original attachment pin (part of the vehicle tool kit) in a towing eye.
- Turn the ignition key so that the steering wheel is released.
- If there is insufficient pressure in the air reservoirs, release the parking brake.
- To prevent damage to the hybrid components, always disconnect the propeller shaft from the differential.



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**CAUTION:** If the propeller shaft remains connected during towing, the hybrid components may be seriously damaged.

- Always disconnect the propeller shaft when the vehicle is being towed and the rear axle (drive wheels) is still in contact with the road surface.

### Being towed by a breakdown truck

If the vehicle is being towed by a breakdown truck, the vehicle may only be hoisted under its rear axle. Lock the steering wheel in the straight-ahead position.





**CAUTION:** If the vehicle is being towed by a breakdown truck and the rear axle (drive wheels) is still in contact with the road surface, the hybrid components can be seriously damaged.

- Do not hoist the vehicle under its front axle.



**CAUTION:** When the engine is running and the vehicle is being towed by a breakdown truck, the engine lubrication system can fail to work properly. This can lead to serious engine damage.

- Do not run the engine while the vehicle is being towed by a breakdown truck.

#### Towing another vehicle

Towing another vehicle with a hybrid vehicle is not allowed.

#### Tow starting

Tow starting a hybrid vehicle is not allowed.

#### Jump-starting

When the hybrid battery and the vehicle batteries (24V) state of charge is too low, it is possible to jump-start the engine.

Jump-starting is only possible via the vehicle batteries (24V). The vehicle batteries are located underneath a plastic cover.



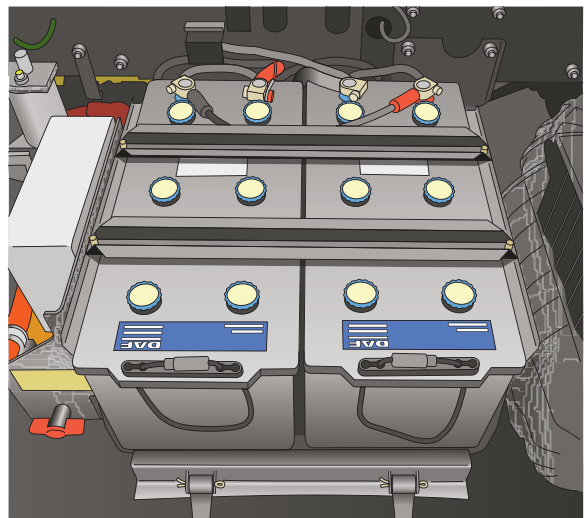
**WARNING!** This vehicle is also equipped with a hybrid battery box containing high-voltage components. Exposure to high voltage can result in serious personal injury or death.

- Never open the hybrid battery box.
- Never remove any of the orange high-voltage cables.



**CAUTION:** Starting the vehicle using a starting aid with too high a voltage can cause damage to the electrical components.

- Never jump-start the engine with a fast charger.
- Never jump-start the vehicle with a voltage higher than 28 V.



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**CAUTION: Disconnecting the battery leads while the engine is running can cause damage to the electrical components.**

- **Do not disconnect the battery leads while the engine is running.**

The engine may be started with the aid of jump leads that use power from separate auxiliary batteries (approximately 24 V) or from another vehicle with a running engine (approximately 28 V). **When this starting procedure is followed, the battery leads of the vehicle must not be disconnected.**

1. Connect the jump leads to the positive terminal (+).
2. Connect the jump leads to the negative terminal (-).
3. Start the vehicle.

When the batteries are fully discharged and the engine is running, it is important that the jump leads are not immediately disconnected. The engine must run for at least 2 to 3 minutes before the jump leads are disconnected to prevent damage to the electrical system (peak voltage!).

Proceed as follows as soon as the engine starts running:

1. Switch on as many power consumers as possible (for example: headlights, fog lamps, heater fan, etc.).
2. Remove the jump leads from the negative terminal (-) after the engine has run for 2 to 3 minutes.
3. Remove the jump leads from the positive terminal (+).
4. Switch off the consumers.

### Charging the vehicle batteries (24V)



**WARNING! Sparks and open flames in the vicinity of a battery can lead to an explosion which can cause serious injury.**

- **Always charge batteries in a properly ventilated area.**
- **Avoid sparks and open flames in the vicinity of batteries.**

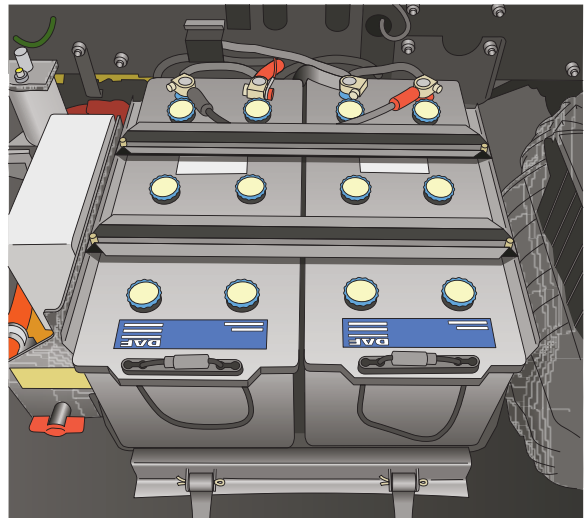


**WARNING! Charging frozen batteries can lead to an explosion which can cause serious injury.**

- **Always thaw out batteries before charging them.**
- **Remove all battery filler caps before charging.**

It is only possible to charge the vehicle batteries (24V).

Connect the positive lead (+) of the battery charger to the positive terminal (+) of the vehicle battery first and then connect the negative lead (-) to the negative terminal (-). After charging, switch off the battery charger and then disconnect the negative terminal (-) and subsequently the positive terminal (+). During charging, the battery leads must remain in place. Do not charge the vehicle batteries using fast charging.



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### Hybrid battery



**WARNING!** This vehicle is also equipped with a hybrid battery box containing high-voltage components. Exposure to high voltage can result in serious personal injury or death.

- Never open the hybrid battery box.
- Never remove or touch any of the orange high-voltage cables.
- Never charge the hybrid battery with an outside source (like a charging station).

# EMERGENCY RESPONSE GUIDE

Vehicle towing and jump-starting

LF45IV series

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