
User manual

LOW CAB



Translation of the document

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	NOTICE
	Supplement to the Operating Manual This Operator's Manual is a supplement to the Mercedes-Benz Operating Manual. It describes the features of the electric powertrain. Please read the Mercedes-Benz Operating Manual and this User manual carefully before operating the E-Truck. Read this document carefully and follow the information contained in it. Failure to follow this instruction may result in injury, death, damage to the unit and the surrounding area. Keep this document for future reference.

Validity

This manual only applies to the units listed in the following table:

Typ	Modell	Version
E-LKW	LOW CAB	MK1
E-LKW	LOW CAB	MK2
E-LKW	LOW CAB	MK3

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1 Foreword

Thank you for purchasing the Designwerk E-Truck, a very powerful and versatile product. Since it is a product with high-performance electronics und thus dangerous voltages and currents, specific technical skills are required for the use and handling of the unit.

Please read this manual carefully – particularly the chapter “Safety Notices and Warnings” – before using or working on the truck.

2 Safety Notices and warnings

This chapter contains safety notices for this unit. These pertain to initial use and ongoing use in the vehicle. Please read and always observe these notices for safety reasons and to prevent loss of life and unit damage.

2.1 Symbols and their meanings

This manual uses various symbols. The following chart contains a list and their meanings:

2.1.1 Hazard and warning symbols

Symbol	Designation	Symbol	Designation
	Open fire prohibited		General warning of a danger zone
	Warns of high voltage		Warns of fire hazard
	Warns of hot surfaces		Warns of explosion hazard

2.1.2 Commandment and information symbols

Symbol	Designation	Symbol	Designation
	Important information to avoid potential property damage		Important information

2.2 Safety notices and risk levels

	DANGER Danger To indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.
	WARNING Warning To indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.
	CAUTION Caution To indicate a potentially hazardous situation which, if not avoided, could result in a minor or moderate injury.
	NOTICE Notice To indicate important information to avoid possible damage to property.
	INFORMATION Information To indicate important information for the reader.

2.3 General safety notices

	DANGER High voltage / Danger to life • Work on the vehicle's high-voltage system may only be carried out by authorised personnel! • There is a danger to life if live parts are touched! • Do not unplug any high-voltage cables! • Do not open any covers of high-voltage components. • Damaged cables or housings must be inspected immediately by qualified personnel.
	WARNING Other motorists may not hear you very well! Due to its electric powertrain, the E-Truck is much quieter than your conventional E-Truck. You can barely hear any noise, especially when the E-Truck is stationary or at walking speed. Other road users such as pedestrians or cyclists may not hear the E-Truck as well. Therefore, take extra care in traffic and pay close attention to other road users.
	INFORMATION Labelling of high-voltage components: • All high-voltage cables are orange in colour.
	INFORMATION Power loss at outside temperatures below 0 °C The vehicle must be preconditioned if it is parked for more than 12 hours and the outside temperature is below 0 °C. This is the only way to guarantee the full function of the high-voltage batteries. To do this, connect the vehicle to an AC charger and leave it connected while the vehicle is parked. Failure to observe this can result in faster ageing effects in the battery and, above all, a lack of continuous braking power.

3 General information

3.1 Operating fluids, specifications and filling capacities

3.1.1 Motor

Motor configuration	2 LD-motors
Arrangement	Front left and right
Numbering of motors	AL, AR
Maximum power	220 kW (2*110 kW)
Maximum torque	450 Nm (2*225 Nm)
Maximum recuperation power	280 kW (2*140 kW) (depending on the general conditions, e.g. battery temperature and configuration)
Motor configuration	2 HD-motors
Arrangement	Back left and right
Numbering of motors	BL, BR
Maximum power	250 kW (2*125 kW)
Maximum torque	500 Nm (2*250 Nm)
Maximum recuperation power	280 kW (2*140 kW) (depending on the general conditions, e.g. battery temperature and configuration)

3.1.2 Gearbox traction drive

Model	Single-speed gearbox
Oil specification with 50.000 km interval	Roxor TECSYNTH 68
Oil specification with 100.000 km interval / 1 year	ON EV Transmission Fluid BOT 352 B1 BEV
Viscosity	SAE 75W / 80
Oil filling capacity min. (without filter)	5.8 litres
Oil filling capacity max. (without filter)	9.2 litres
Oil filling capacity sight glass (difference min/max)	3.4 litres
Oil filter type (50.000 km interval)	IKRON Spin-on Suction HF20.135 P025
Oil filter type (100.000 km interval)	IKRON Spin on HE20.135 P010

3.1.3 Power steering pump (steering system)

Model	1-circuit power steering with electro-hydraulic trailing axle
Oil specification	According to Mercedes Benz Original
Oil filter type	According to Mercedes Benz Original

3.1.4 Gearbox PTO

Maximum torque 62kW PTO	without gearbox	220/110 Nm (Peak/Continuous)
Maximum torque 120kW PTO	without gearbox	300/135 Nm (Peak/Continuous)
Maximum rotation speed	without gearbox	7'500 U/min
	with gearbox (i=~3) (V2.1)	2500 U/min
	with gearbox (i=~4) (V2.2)	1875 U/min
Coolant	Korrosion-/Frostschutzmittel MB325.5 (Ethylenglykol Basis) (Farbe Pink) Gemäss Mercedes-Benz	
Oil change	PTO 60 kW / 120 kW	every 1500 h / after 2 years at the latest
	PTO 180 kW	every 1500 h / after 1 year at the latest
Oil specification	Roxor TECSYNTH 68	

3.1.5 Cooling system

Antifreeze type	Mercedes-Benz anticorrosion / antifreeze MB325.5 (ethylene glycol based) (pink)
Freezing point	-37 °C
Maximum pressure cooling system	The cooling system is pressure-free

3.1.6 Air compressor

Type	GD Hydrovane rotary compressor
Compressor type	Type TX02-2-331C
Oil specification	Fluid Force HPO198-5N
Filling capacity	1.5 litres
Air filter type	IQORON-V 7
Oil filter type	CC1046088
Maximum pressure	13.5 bar

3.1.7 Air conditioning

Ambient operating temperature	-25 °C - +120 °C
Compressor type	Scroll (Continuously variable speed controlled)
Displacement	33 cc/rev
Inverter/ motor cooling	Suction gas cooling
Refrigerant	R134a
Oil specification	SP-A2 (PAG oil)
Filling capacity refrigerant	600 g +/- 10 g
Compressor weight	6.4 kg (incl. 120 g oil)

3.2 Electrical system

3.2.1 24 V system (12 V battery)

Battery type	Original Mercedes Benz
Number of batteries on the vehicle	2

3.2.2 400 V system (400 V battery)

Battery type	Li-Ion NMC
Stored energy	375 - 500 kWh
Nominal voltage	400 V
Number of batteries on the vehicle	2, parallel

4 Technical Structure

4.1 Low-voltage circuit diagram

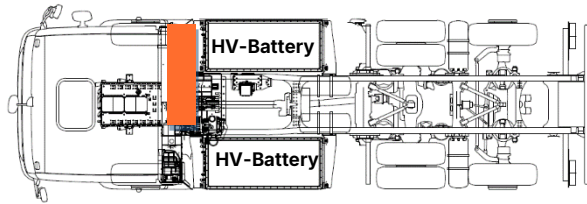
The low-voltage circuit diagram is available on request.

4.2 LV-Supply

This section describes the position, as well as the existing fuses on the vehicle.

4.2.1 Position

The LV-batteries are positioned on the right-hand side, above the yoke.

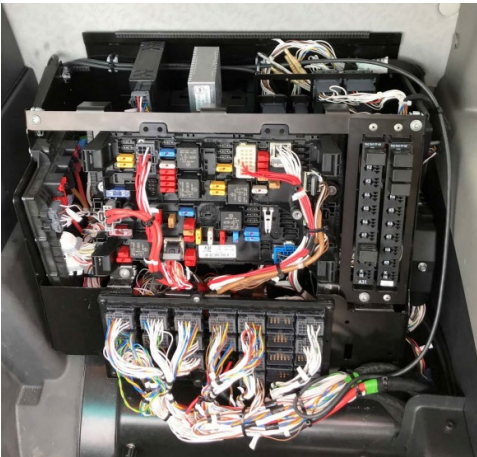


4.2.2.3 Fuse box within the E-compartment

The LV fuse box is located in a screwed plastic box, behind the driver's seat.



After removing the cover:



DW DESIGN WERK

Sicherungsbelegung

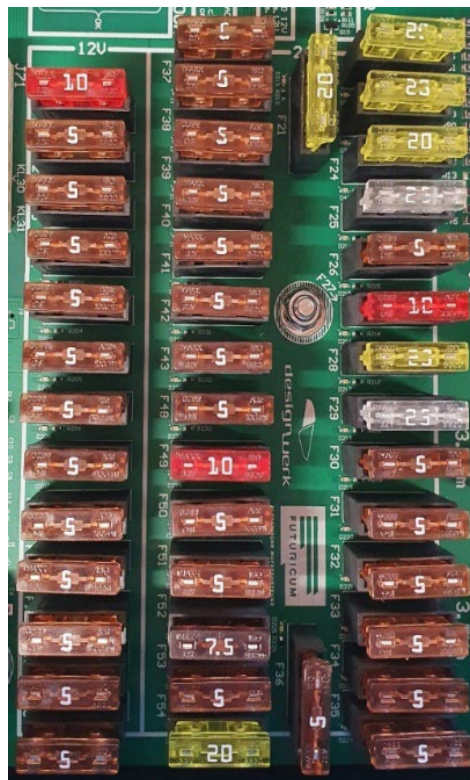
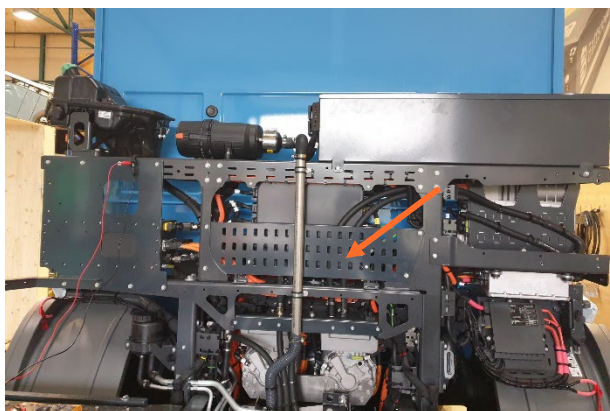
PDM CAB		A31		A33	
F1 5A	Wake up Steuerung DW	K2	Arbeitslampe von Relaisplatz A33/K2	K2	Arbeitslampe auf A31/K2 verschoben
F2 20A	Aufbau KI.15				

A1					
Aufbau FAUN					
F1 15A	Aufbau KI.30	F5 5A	Koco KI.30	F9	F13
F2 15A	Beleuchtung KI.30	F6 15A	Aufbau KI.15	F10	F14
F3 15A	Beleuchtung KI.30	F7 5A	Aufbauoption KI.15	F11	
F4 5A	Aufbauoption KI.30	F8 5A	Koco KI.15	F12	

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4.2.2.4 LVDU

Designwerk components are protected in the LVDU. The LVDU is only accessible from the front. For access, the cabin must be tilted forward.



4.2.2.5 LVDU fuse arrangement plan

Fuse	Name	Description	Value	Model
F1	IOM	I/O Module	10 A	ATO 12 V
F2	CBD	CAN Bus Distribution	5 A	ATO 12 V
F3	EPO 12 V	Emergency Power Off Circuit 12 V	5 A	ATO 12 V
F4	HPP	Heat Pump	5 A	ATO 12 V
F5	DMC AL	Digital Motor Controller AL	5 A	ATO 12 V
F6	DMC AR	Digital Motor Controller AR	5 A	ATO 12 V
F7	DMC BL	Digital Motor Controller BL	5 A	ATO 12 V
F8	DMC BR	Digital Motor Controller BR	5 A	ATO 12 V
F9	OBC	On Board Charger	5 A	ATO 12 V
F10	ACP	Air Compressor	5 A	ATO 12 V
F11	Spare	KL 30	5 A	ATO 12 V
F12	PTO A	Power Take-off A	5 A	ATO 12 V
F13	PTO B	Power Take-off B	5 A	ATO 12 V
F21	FAN A	Fan A	20 A	ATO 24 V
F22	FAN B	Fan B	20 A	ATO 24 V
F23	FAN C	Fan C	20 A	ATO 24 V
F24	FAN D	Fan D	20 A	ATO 24 V
F25	WPBR	Water Pump Brake Resistor	25 A	ATO 24 V
F26	CBD	CAN Bus Distribution	5 A	ATO 24 V
F27	VBI	Vehicle Body Interface	10 A	ATO 24 V
F28	EPO 24 V	Emergency Power Off Circuit 24 V	20 A	ATO 24 V
F29	VCU	Vehicle Control Unit	25 A	ATO 24 V
F30	BAT A	HV Battery A	5 A	ATO 24 V
F31	BAT B	HV Battery B	5 A	ATO 24 V
F32	BAT C	HV Battery C	5 A	ATO 24 V
F33	BAT D	HV Battery D	5 A	ATO 24 V
F34	HPP	Heat Pump	5 A	ATO 24 V
F35	Diag	Diagnosis Interface	5 A	ATO 24 V
F36	Spare	KL 30	5 A	ATO 24 V
F37	WP E	Water Pump E	5 A	ATO 24 V
F38	WP F	Water Pump F	5 A	ATO 24 V

Fuse	Name	Description	Value	Model
F39	WP G	Water Pump G	5 A	ATO 24 V
F40	WP H	Water Pump H	5 A	ATO 24 V
F41	WP A	Water Pump A	5 A	ATO 24 V
F42	WP B	Water Pump B	5 A	ATO 24 V
F43	WP C	Water Pump C	5 A	ATO 24 V
F48	WP D	Water Pump D	5 A	ATO 24 V
F49	SPB	Serial Parallel Box	10 A	ATO 24 V
F50	OBC	On Board Charger	5 A	ATO 24 V
F51	ACP	Air Compressor	5 A	ATO 24 V
F52	VCCU	Vehicle Charge Control Unit	7.5 A	ATO 24 V
F53	DCDC	DCDC Converter HV to 24 V	5 A	ATO 24 V
F54	DCDC 12 V	DCDC Converter 24 V to 12 V	20 A	ATO 24 V

4.2.2.6 LVDU spare fuse arrangement plan

Fuse	Name	Description	Value	Model
F44		Spare fuse	5 A	
F45		Spare fuse	10 A	
F46		Spare fuse	20 A	
F47		Spare fuse	25 A	

4.3 Controls

4.3.1 LV-battery disconnect switch

	NOTICE
	Fault or damage if the battery disconnect switch is activated too early The battery disconnect switch must not be removed until one minute after the vehicle has been completely switched off. Failure to do so may result in faults or damage.
	INFORMATION
	No troubleshooting by pressing the battery disconnect switch Actuating the battery disconnect switch is not intended to rectify faults.

The LV-battery disconnect switch is located on the yoke, on the right-hand side. It disconnects the supply to the drive system. Charging and driving does not work with the battery disconnect switch switched off. However, power is still supplied to individual Mercedes-Benz control units. To disconnect the LV-mains completely, the battery must be disconnected mechanically.



If the vehicle is not used for a longer period of time, the LV-battery disconnect switch must be activated, so that the continuous supply to the LV-Designwerk system is disconnected. This minimises energy consumption when the vehicle is not in use and protects the LV-batteries. If the LV-battery disconnect switch is not actuated when the vehicle is not used for a longer period of time (several days), this can lead to a deep discharge of the LV-batteries. If the LV-batteries are discharged too deeply, the vehicle cannot be started or charged and must be bypassed.

4.3.2 Conventional ignition lock

The following ignition key positions are important:

Parked, Living, Accessory (0, 1)

In these positions, the electric powertrain is deactivated. All functions work as described in the Mercedes-Benz Operating Manual.

Driving (2)

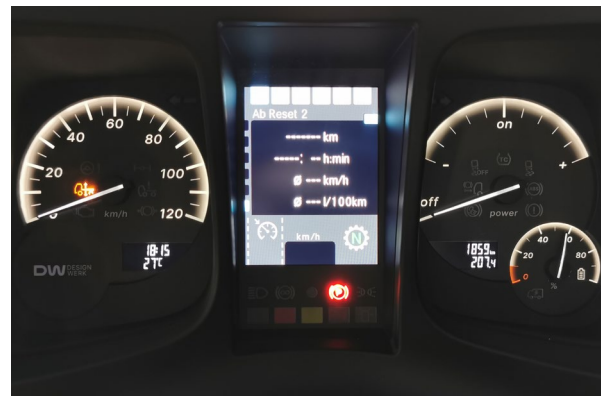
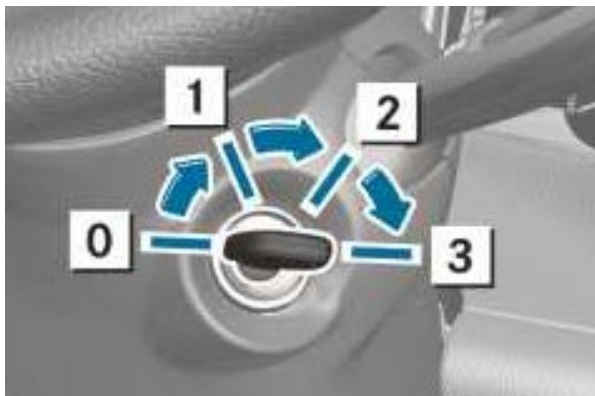
Ignition key position 2 activates all LV systems and the ignition is on. Electrical power components such as the DC converter, power steering, air conditioning or the air compressor are initially out of operation in this key position.

Start (3)

To start the vehicle, turn the multifunction lever to N, so that it is in neutral position. If this is not the case, HV cannot be switched on.

The start position (3) is used to trigger the starting process for the electric powertrain. The ignition key should be held in the start position for approx. 1-2 seconds similarly to starting a combustion engine.

After the start signal appears, the key moves back to the Driving position (2). Now the electrical power components are switched on, and all high-voltage devices are active. The vehicle is now in Driving mode similarly to a running combustion engine. The tachometer in the dashboard indicates that the vehicle is in driving mode by the pointer of the power scale jumping to "on".



4.3.3 Electronic ignition lock



- Press the start/stop button (1), some consumers are turned on.
- Press the start/stopp button (1) again and wait until the HMI has started up completely.
- Apply the foot brake and press the start/stop button, until the high-voltage tick appears on the HMI (HV ✓) and the pointer of the power scale points to "on".
- To select a gear, the service brake must be applied.

4.3.4 Multifunction lever for selecting the driving direction

The driving direction can only be selected if:

1. The vehicle is ready to drive
2. The brake pedal is applied
3. The accelerator pedal is not pressed down
4. The speed is below 8 km/h
5. The charging cable is unplugged

Display at driving direction change

When the driving direction is changed, a pop-up window appears briefly in the HMI with the driving direction inserted.

The selected driving direction is permanently displayed in the upper area of the HMI.

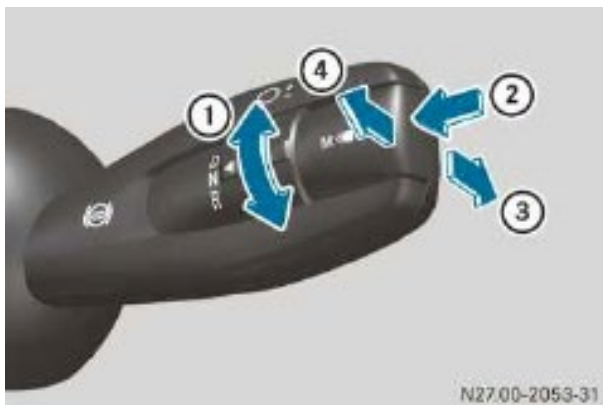
If the driving direction has not been selected

1. Make sure the vehicle is ready to drive
2. Select Neutral (N)
3. Push the brake pedal
4. Select the desired driving direction (D, R)

Selecting the driving direction

The desired driving direction can be selected using the multifunction lever.

- | | | |
|---|---|-------------|
| ① | D | Drive |
| ① | N | Neutral |
| ① | R | Reverse |
| ② | A | No function |
| ② | M | No Function |
| ③ | - | No function |
| ④ | + | No function |



If the neutral position has been selected, the neutral position symbol is visible on the dashborad.



4.3.5 Permanent brake and positions of the multifunction lever for recuperation

	WARNING Danger of slipping! Avoid using the permanent brake on slippery surfaces, as there is a risk of the drive wheels locking and the E-Truck skidding. The permanent brake only operates the drive axle. Only the brake pedal should be used on slippery surfaces, as this braking system acts on all wheels. If the wheels are blocked (e.g., due to a temporary change of surface or zebra crossing), the recuperation is released and slowly engaged again.
	CAUTION Limited permanent brake If the vehicle's SoC rises above 90%, the vehicle's continuous braking may be limited, depending on the battery configuration. In this case, the unusable recuperation power is displayed in orange in the power scale of the HMI. External conditions (e.g. temperature) can also lead to reduced continuous braking power.

The permanent brake is designed as a recuperation brake. The drive motors convert the kinetic energy into electrical energy during braking (recuperation). The level of recuperation can be modified using the multifunction lever on the right or the optional recuperation pedal.

The vehicle is equipped with five brake levels:

Position 0

Recuperation is switched off. No energy is required or generated for drive motors during the roll phase. Due to the very low drag power of the drive train, the kinetic energy can be optimally utilised.

Position 1 to 5

Recuperation can be selected in five stages. The recuperation performance depends on many different factors.

The recuperation is optionally increased, where 1 represents a low braking effect and 5 an increased braking effect.



Anti-lock braking system (ABS)

As soon as the ABS has to intervene during braking, the permanent brake is deactivated.

4.3.6 Recuperation pedal

The electric truck can be optionally equipped with a recuperation pedal (1). The recuperation pedal is located in the footwell on the left under the steering column and is operated with the left foot. It offers the option of infinitely variable control of recuperation. A fully depressed recuperation pedal corresponds to position 5 on the multifunction lever. The recuperation pedal and the multifunction lever can be operated simultaneously. If the selected recuperation intensity differs, the higher level is always used.



4.4 Left and centre dashboard display

The following section notes deviations from the conventional Mercedes-Benz vehicle. All other procedures must be taken from the original Mercedes-Benz Operating Manual.

- ① Speedometer
- ② Board computer
- ③ Power scale
- ④ Loading status HV-battery
- ⑤ Total distance and daily distance
- ⑥ Time and outside temperature display

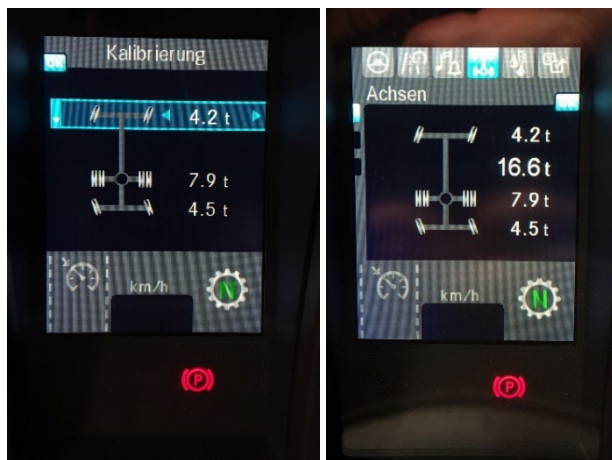


4.4.1 Speedometer

The speedometer functions according to the original equipment. See paragraph 4.4.

4.4.2 Calibration vehicle weight

	INFORMATION
	Vehicle weight in the axle load display should be set to actual weight The vehicle has an axle load display. If the axle load display shows differences to weighing results from calibrated scales, the axle load display should be adjusted. (See Mercedes-Benz Operating Manual). If the displayed weight and the weighed weight differ, this may affect the driving dynamics of the vehicle.



4.4.3 Cooling temperature

The coolant indicator on the board computer shows the temperature of the coolant in the cooling cycle of the drive module.

Since the Low Cab's power electronics operate at very high efficiency, the coolant temperature will remain at a very low value.



4.4.4 Power scale

The power scale (no. 3 in the illustration in section 4.4) indicates whether the vehicle's HV system is switched on. If the display is set to "on", the vehicle is ready to drive. If the display is set to "off", the HV system is switched off. During the journey, the display shows whether energy is being consumed (+) or fed in (-).

4.4.5 Loading status HV-battery

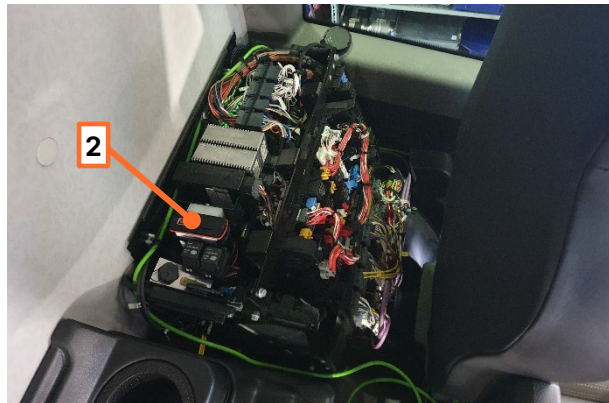
No. 4 in the figure in section 4.4 shows the charge level of the HV battery (SoC) in percent.

4.5 Data logger

The data logger (2) is located in the LV fuse box (1) behind the driver's seat.

The data logger is used to record signals from the vehicle to support troubleshooting. The data is stored on an SD card. The SD card is continuously overwritten with new data. If a fault is to be recorded on the SD card, the SD card must be replaced with a new card. The replacement must take place no earlier than 10 minutes and no later than two hours after the error.

The exact procedure is described in the Read out logging data instructions.



5 Turn-off assistant

Vehicles with a wheelbase of 3450 can be equipped with a turn-off assistant at the customer's request.

The turn-off assistant can be used throughout the day and in all weathers.

It monitors the area next to the vehicle on the passenger side. The radar sensor is mounted in the side panelling on the right behind the front axle. The turning assistant supports you when turning and changing lanes. The indicator display in the A-pillar draws your attention to a detected object in the monitored area. If there is an imminent risk of collision, an additional warning tone sounds. The turning assistant is not active when reversing.

For the turning assistant to function, the vehicle must be travelling at a speed of at least 30 km/h. It has no influence on the brakes. It has no influence on the brakes, steering or other systems in the vehicle.

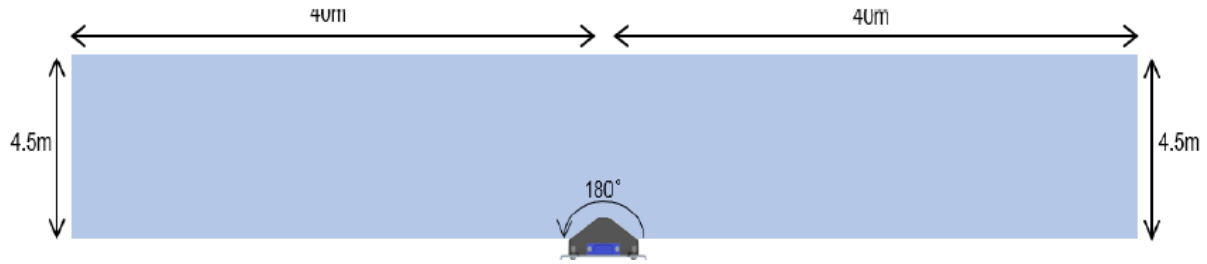
	WARNING
	Risk of accident due to limited detection of the turn-off assistant If detection is limited, the turn-off assistant may not warn you or may warn you too late. In these cases, detection may be limited in particular due to • dirty, icy or covered sensors • very wide lanes • crash barriers or similar road boundaries • Always observe the traffic situation carefully and keep a sufficient safety distance to the side.
	INFORMATION
	System limits Depending on the system, unfounded warnings may occur at crash barriers or similar structural limitations. Depending on the situation, the turn-off assistant may warn too early or not at all. Make sure that the cover of the radar sensors is free of dirt, ice or slush. The radar sensors must not be painted or covered, e.g. by stickers or film.

5.1 Position turn-off assistant

The turn-off assistant is on the right in the direction of travel.



The lateral zone of surveillance is 80 x 4.5 m and covers a radius of 0°-180°.



5.2 Display turn-off assistant

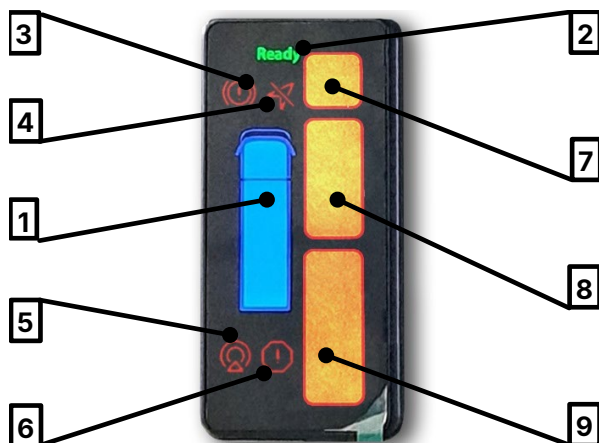


The screen is located on the right-hand A-pillar.

The screen is activated automatically when the ignition key is turned.

The warning targets of the turn-off assistant include:

- Dynamic road users such as pedestrians, bicycles, electric bicycles, etc. faster than 3 km/h.
- Dynamic cars, trucks, etc. faster than 10 km/h.



1	Vehicle model	6	Malfunction light (Warnanzeige)
2	Operation and status indicator	7	Upper warning light
3	Brake indicator (warning indicator)	8	Center warning light
4	GPS-error (warning indicator)	9	Lower warning light
5	Radar status (warning indicator)		

The e-truck is shown by a blue symbol (1).

If the status indicator (2) is on, the turn assist lights up.

The driver can get the approximate position of the warning target based on the section of warning light LEDs that are on or flashing.

5.3 Warning light

The warning light is divided into three areas. It lights up as soon as a warning target appears. Depending on the position of the hazard, the corresponding area of the warning light (7, 8, 9) lights up.

If the indicator is activated and the turn is initiated, the corresponding warning light starts flashing. The detailed description of each warning light on the display is as follows:

- ▶ Warning level 1
 - The steering wheel angle is less than 30° and the target enters the warning area.
 - A section of warning light LEDs then illuminates. Warning light top, middle or bottom.
- ▶ Warning level 2
 - The vehicle turns to the right.
 - The steering wheel angle is more than 30° or the indicator is switched on.
 - The vehicle and the target are expected to collide soon.
 - Then a section of warning light LEDs starts flashing.
 - Warning light top, middle or bottom.
- ▶ Warning level 3
 - The vehicle is turning to the right.
 - The steering wheel angle is greater than 30° and the indicator is switched on.
 - The vehicle and the target are about to collide.
 - Then the warning light starts flashing and a warning tone sounds.

5.4 Warning tone

A warning tone sounds when a collision is imminent due to the initiated turn.

5.5 Warning displays

Display	Description
3 – Brake indicator	The brake indicator starts flashing when braking is active.
4 - GPS-error indicator	The GPS error indicator lights up when the signal to the GPS sensor is temporarily interrupted.
	The GPS error indicator starts flashing when the GPS signal is faulty. Contact a partner workshop.
5 – Radar status	The radar status lights up when the radar temporarily fails. Possible causes are a blockage due to snow, mud, etc. on the radar or bad weather conditions.
	The radar status flashes permanently when there is a radar failure. The solution is a professional repair.
6 – Fault light	The malfunction light indicator lights up when there is a malfunction in the entire system. Contact a partner workshop.

5.6 Troubleshooting

Error description and troubleshooting of the operating and status display.

Status display	Error description	Repair instruction
Operating and status display of the warning module	Does not light up after switching on	Restart after power off If the error persists, contact one of our partner workshops.
Radar status display	Fault light is always on	Possible reasons: • Obstructed by objects such as snow, mud, etc. • Extreme weather, heavy rain and snow, etc. • The installation angle is greater than 5°
Radar status display	Fault light flashes	Contact one of our partner workshops.
System error display	Fault light flashes	Contact one of our partner workshops.
GPS error display	Fault light flashes	Restart after power off If the error persists, contact one of our partner workshops.

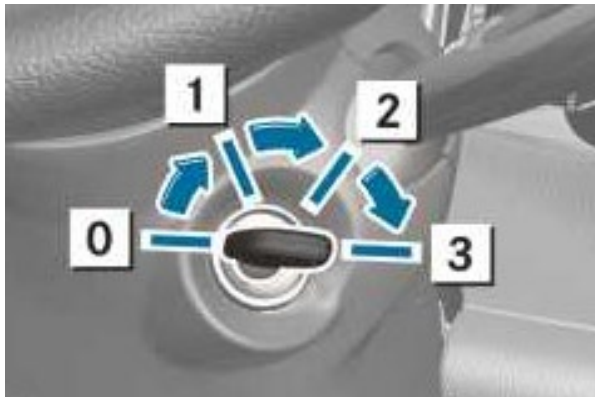
6 Operation

The following section only contains variations from the conventional Mercedes-Benz vehicle. Please refer to the original Mercedes-Benz Owner's Manual for all other instructions.

6.1 Starting the vehicle

As with a conventional vehicle, the ignition key is used to start the Low Cab. The different operating stages have already been detailed under "Controls" in section 4.3. To drive the vehicle, the ignition key must be briefly turned to position 3 (start position), which activates all high-voltage components.

The readiness of the vehicle is indicated via the display (Status, see chapter 5.2 Home Screen) and via the tachometer (chapter 4.4.2 Speedometer).



6.2 Driving

	NOTICE
	Damage to the gearbox and traction motors due to exceeding the maximum speed. When driving downhill, make sure that the technically maximum permissible speed of 90 km/h is not exceeded. The gearbox and traction motors can be damaged. Reduce the speed with the service brake or by recuperating.

The ignition key remains in position 2 after the vehicle has been started and is ready to drive.

To select a driving direction, the brake pedal must be applied.

6.3 Kickdown function

The kickdown function releases the maximum available driving power.

To use the kickdown function, the accelerator pedal must be fully depressed and pressed again beyond an additional resistance. A clicking sound is audible when the function is activated.

6.4 Switching off the vehicle

To turn off the vehicle, the ignition key must be moved from position 2 to either position 1 or 0.



6.5 High Voltage Off switch

The High Voltage Off switch is used for safety in emergencies.

	NOTICE
	Only operate in an emergency
	Actuating the High Voltage Off switch does not help to reset or rectify a fault on the vehicle.
	Actuating the High Voltage Off switch while driving or charging can cause considerable damage to the vehicle. However, the driver's safety always comes first.

In an emergency, press the High Voltage Off switch in the driver's cab and switch off the ignition.

The High Voltage Off switch interrupts the power supply to the HV contactors (main relays) in the batteries directly and without the intervention of the software. In this way, the high-voltage system is disconnected deliberately and in an emergency.



6.6 Charging the vehicle

 	WARNING Risk of explosion When charging the HV batteries, the LV batteries are also charged in parallel. The charging process for the LV batteries can produce explosive oxyhydrogen gas. Only charge batteries in well-ventilated rooms. Avoid sparking! Do not handle fire, open flames or smoke in the vicinity of the battery.
	WARNING Fire hazard! Connection cables that are incorrectly dimensioned or not properly designed can overheat due to the prolonged charging period and become a fire hazard! Make sure your charging station is installed and tested by your utility company!
	NOTICE Regulation based on electromagnetic compatibility (EMC) The vehicle should only be charged using the wallboxes with integrated EMC filters provided by the manufacturer. The electrical impedance of the mains connection must not exceed $Z_{max} \leq 0.388 + 0.242 \text{ j}\Omega$. The DC charging cable of the quick charging station must be shorter than 30 m.
	INFORMATION Heating and cooling during charging process During 800 V charging the cabin cannot be heated or cooled.

The E-truck is equipped with a Type2 charging socket in accordance with standard IEC 62196-1. The Low Cab comes in standard with one or two 22kW on-board chargers. For safety reasons, a suitable charging station (EVSE, Electric Vehicle Supply Equipment) must be used.

An example of a suitable charging station is the Juice Booster 2. This can be connected to any common sockets using various adapters and is designed for mobile use.

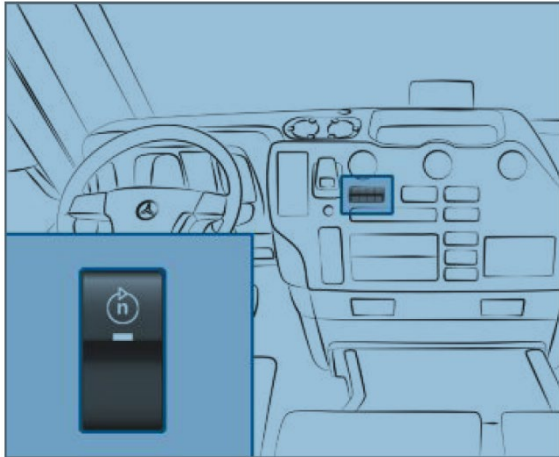
To ensure fast charging of the Low Cab e-truck, a 3-phase 32A socket combined with the Juice Booster is recommended. Contact your utility company or electrician to ensure your charging station has the correct socket.

For a detailed description of the charging process, see the separate Instruction sheet Charging.

6.7 Power Take-Off (PTO)

The vehicle can be equipped with one or two HV-motors for the power take-off. Hydraulic pumps, for example, can be flange-mounted to the motors to drive a superstructure.

The power take-off A, which is installed as standard, can be switched on via the power take-off switch (illustration). The switch-on conditions depend on the individual body. The power take-offs can also be activated and monitored individually via the superstructure or other operating elements. To operate the superstructure, use the separate instructions for the superstructure.



7 Maintenance

The "Maintenance" section contains information on preventive work required to keep the E-Truck in roadworthy condition and ensure maximum reliability. The instructions in this section are not exhaustive. Additional items will be covered during servicing at an approved Mercedes-Benz workshop.

For exact lubrication points, oils and fluids, servicing plans and service contracts, consult an approved Mercedes-Benz workshop. For specifications and filling capacities, see chapter 3.1 Operating fluids, specifications and filling capacities.

7.1 Routine maintenance

Regular maintenance work must be carried out by an authorised specialist workshop in accordance with the service schedule.

The first maintenance service must be carried out by an authorised specialist workshop after 6 months of operation.

The maintenance interval thereafter is every 50.000 km or every 12 months at the latest. The work must always be carried out by an authorised specialist workshop.

7.2 Cleaning rules

7.2.1 General information:

Regular cleaning maintains the value of your E-Truck. Remember to wash your E-Truck more often in winter or in other very dirty driving conditions.

7.2.2 Pressure washing

	NOTICE Considerable damage to the truck possible Be careful when washing with high pressure. Penetrating water and dirt can cause damage. Some of the damage only appears over time and the connection with washing is not obvious. The minimum distance between the high-pressure nozzle and the washing surface must be approx. 70 cm with a round full jet and 30 cm with a flat wide jet.
	NOTICE These parts must not be rinsed off. Otherwise they may be damaged: • Electrical components • Battery • Cable glands, electrical plug connections • Universal joint • Support bearing • Seals • Ventilation components for gearboxes, oil tanks, etc. • Fittings, electrical connectors • Air inlets

	INFORMATION
	Reference to detailed cleaning instructions Further cleaning instructions on the subject of high-pressure cleaning can be found in the Mercedes-Benz Operating Manual.

7.2.3 Cleaning the turn-off assistant sensor

	NOTICE
	Keep a distance between the high-pressure nozzle and the vehicle When cleaning the turn-off assistant with high pressure, a distance of at least 30 cm must be maintained to avoid possible damage.

The sensor must be cleaned regularly with water, detergent and a soft cloth.

7.3 Operating fluids

Lubrication is very important when it comes to E-Truck service and maintenance. Please see important information on oils, greases and coolants below. Further information can be found in chapter 3.1 Operating fluids, specifications and filling capacities. Never mix operating fluids of any kind.

Never mix operating fluids of any kind (oils, lubricants und coolants).

7.3.1 Coolants

	NOTICE
	Using the wrong coolant can cause damage Coolant that does not comply with the Mercedes-Benz Coolant Specification (VCS) Standard 418-0001 can affect corrosion protection. The wrong coolant may also damage the motor, battery or other cooling and heating systems.

The cooling level should be between the MIN- and the MAX marking.

Tighten the cover of the expansion tank firmly by hand. The coolant level should only be checked and topped up when the coolant pumps are running. As soon as the pressure in the system decreases, the coolant may leak out of the expansion tank.

7.3.1.1 Checking and topping up

	WARNING Burn hazard Do not remove the expansion tank cover while the motor is hot. If the motor is hot, the coolant inside the radiator is also hot and may be under pressure. Contact with pressurised coolant causes burns and skin damage.
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	INFORMATION The cooling system of the battery and drive module circuit is depressurised. Pressure in the cooling system can damage or destroy the components.
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1. Allow the motor cool down for at least 30 minutes.
2. Remove the expansion tank cover.
3. Top up the coolant level until it is between the minimum and maximum markings.

7.3.2 Gearbox oil

	NOTICE Increased gearbox wear Operating the truck with too little, too old or contaminated gearbox oil leads to increased gearbox wear and can cause damage to the gearbox.
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For the gearbox to function properly, it is important to check the lubricant level and top it up as necessary. The gearbox is located between the motors and the driveshaft.

7.3.2.1 Oil specifications

See chapter 3.1 Operating fluids, specifications and filling capacities, specifications and filling capacities.

7.3.2.2 Checking the oil level

	INFORMATION
	Oil level display The actual oil level is shown when the vehicle is on a level surface.
	NOTICE
	Avoid leaking oil Leaking oil can damage the gearbox and non-oil-resistant parts.

Keep the gearbox oil level within the indicated range to ensure correct functioning of the gearbox and change the oil and oil filter according to the service schedule.

1. Drive the vehicle a short distance to allow the oil to pass through the gearbox.
2. Switch off the vehicle and then wait at least three minutes to allow the oil to settle.
3. Check the oil level on the sight glass. The level should be between the upper and lower markings; ideally, the oil level should be within the optimum range.



7.3.2.3 Topping up the oil level

	NOTICE
	Avoid a too low oil level The oil level should not be below the minimum mark. If a loss of oil or a repeated lack of transmission oil is detected, the cause must be localised and rectified. Contact an authorised Designwerk workshop for this purpose.

1. Check the oil level.
2. Remove the filler cap and top up the gear oil until the oil level is between the lower and upper markings.
3. Screw the oil filler cap back on.

7.3.3 Air compressor

The HV air compressor has a maximum working pressure of 13.5bar (GD). The compressor is directly connected to the electric motor.



7.3.3.1 Specifications

See chapter 3.1 Operating fluids, specifications and filling capacities.

7.3.3.2 Checking the oil level

Keep the compressor oil level within the optimum range to ensure the compressor functions properly and change the oil and oil filter according to the service schedule.

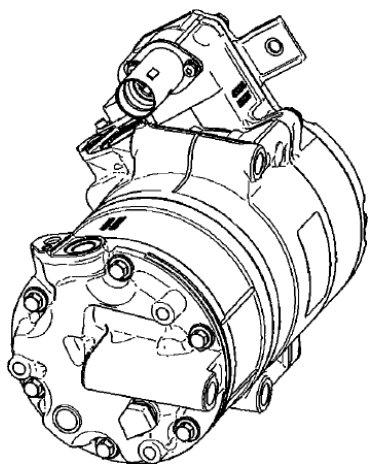
	WARNING
	Risk of accident due to leaking air brake system If the compressed air brake system is leaking or the reservoir pressure is too low, it is not possible to brake the vehicle. • Do not set the vehicle in motion until the required reservoir pressures have been reached. • In the event of a loss of pressure while travelling, stop immediately in accordance with traffic regulations. • Secure the vehicle with the parking brake. • Contact a qualified specialist workshop immediately.

7.3.3.3 Topping up the oil level

If the oil level is below the marking, top up with suitable oil. The oil can be topped up to the desired level via the filler plug.

7.3.4 Air conditioning compressor

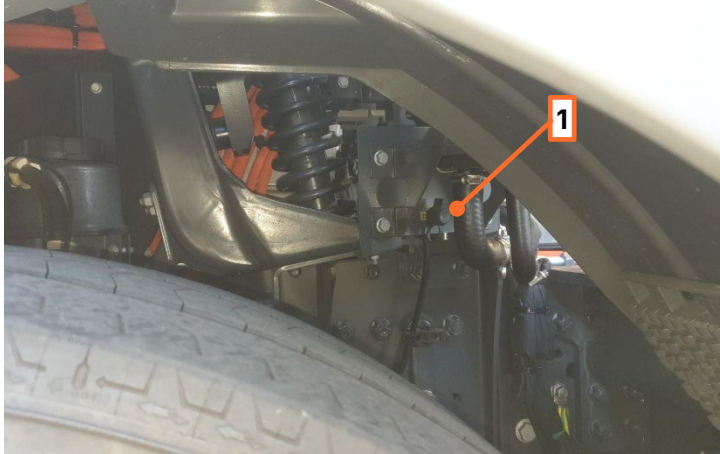
The air conditioning compressor is located under the driver's cab centered behind the coolant radiator. The compressor is powered by the HV system and can only be used in drive mode. All other ventilation components work as originally designed.



8 Breakdown assistance

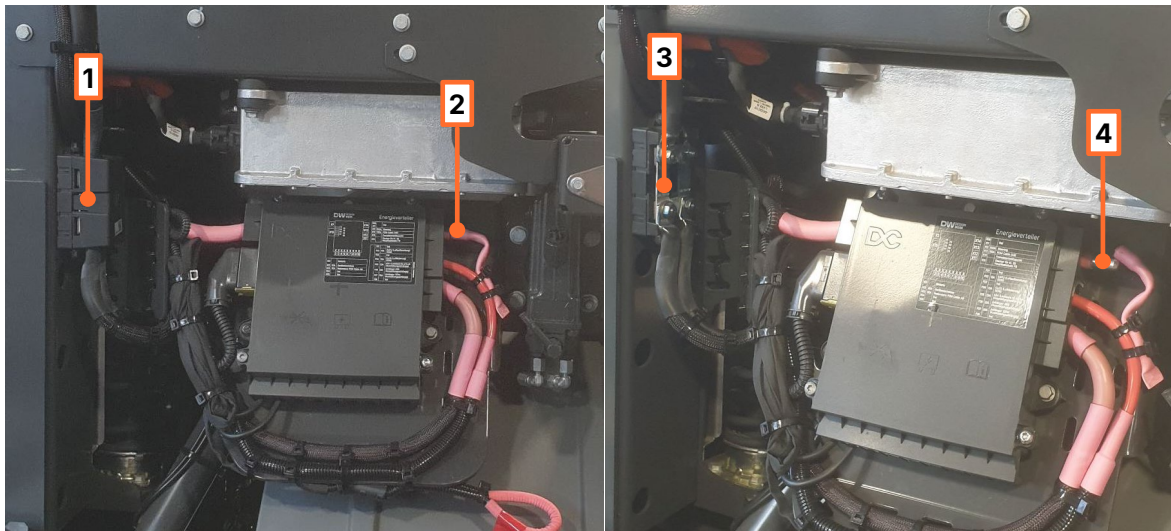
8.1 Filling the compressed air system

Some vehicle versions of the electric truck are equipped with an easily accessible compressed air connection (1), which is located behind the left front wheel slightly above, see illustration below:



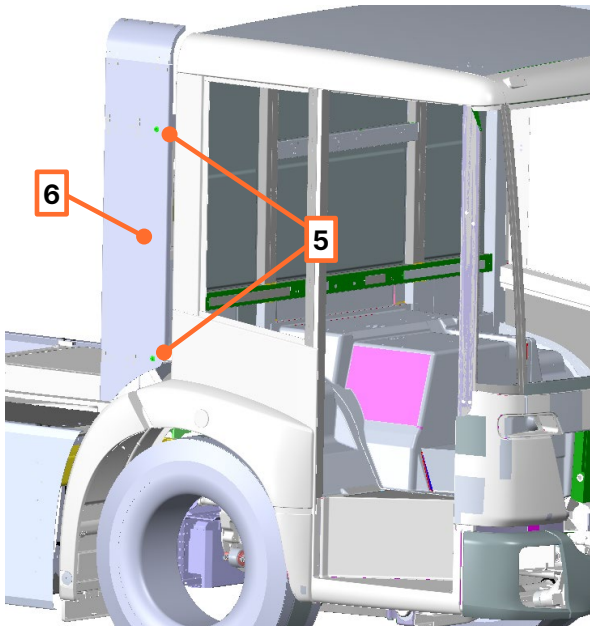
The procedure for filling the compressed air system is described in the Mercedes-Benz Operating Manual.

8.2 Jump start



Proceed as follows for a jump start:

- First connect the positive terminal of the jump-start cable to the positive terminal of the third-party battery.
- Now remove the rubber cover from the positive terminal of the battery at the top right of the LVDU-box (2) on your own truck and connect the positive terminal to the positive terminal (4). The LVDU-box is located at the top right behind the cab. If access through the body is not possible, the two cam locks (5) must be released and the side flap (6) opened (see image below).



- First connect the negative terminal of the jump-start cable to the negative terminal of the external battery.
- Now remove the black plastic cover on the fuse box yoke (1) on your own truck and connect the negative terminal to the negative terminal.
- If the third-party truck is bypassed, now connect the HV on your own truck.



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Information

If your own truck is being bypassed, the helping truck does not have to use full throttle, it only needs to use idle speed.

9 Work on the vehicle

For safety-critical work, the manufacturer recommends taking the vehicle out of service, carrying out the maintenance work, and then putting the vehicle back in service. The vehicle must be taken out of service, especially when working on the electrical system. The steps for this can be found in the documents Commissioning and Decommissioning and must be carried out by an appropriately trained specialist.

9.1 Welding

When welding work is being carried out, the vehicle must be taken out of service, which means that the HV batteries must be disconnected as specified in separate instructions. The steps for this can be found in the document Decommissioning. Other requirements as per Mercedes-Benz safety regulations must be fulfilled. Batteries must be specially protected, especially against flying sparks.

9.2 Towing the vehicle

If the vehicle must be towed in the event of a breakdown, the driveshaft must be disconnected.

All steps for towing and recovering the vehicle are described in the Mercedes-Benz towing instructions.

9.3 Braking – emergency release system

The handbrake has an emergency release for towing. There are two methods for this:

- Mechanical release of the spring-loaded brake
- Compressed air feed at the designated connection on the air dryer (AMP)

10 Glossary - Terms related to the electric vehicle

This chapter explains some of the terms, functions and processes that are used in connection with this and other electric vehicles. We recommend that you read this chapter carefully to avoid any misunderstandings.

10.1 SOC – State of Charge

SOC is the term used to describe the current state of charge of electric vehicles. The vehicle software has been designed in such a way that the battery capacity can be fully utilised between 0 and 100 % as displayed on the screen. To extend the battery life, the maximum SOC reached during charging can be limited using the settings menu. For more information on limiting the maximum SOC see the separate HMI Manual.

10.2 Recuperation

Unlike conventional vehicles with combustion engines, electric vehicles can recover a large portion of braking energy. This is known as recuperation. Essentially, the drive motors are used as generators. This converts kinetic energy into electrical energy, which is then stored in the battery to be reused by the drive. This happens, for example, when stopping at traffic lights or driving downhill.

10.3 Batteries and voltage levels

To power the various devices needed to operate the vehicle, there is a 24 V low-voltage network and a 400 V high-voltage network. When the vehicle is connected to the external mains, the two high-voltage batteries are charged. The low-voltage batteries mounted on the yoke are powered by the high-voltage battery via a DC/DC voltage converter. Only the high-voltage level is dangerous for humans. All high-voltage components and their supply lines have special safety devices to protect against contact.

10.4 Interlock

For personal protection, all high-voltage components are connected to an interlock circuit. The interlock circuit is a loop which is run in series from the central control unit through all relevant components and the loop is broken immediately as soon as a high-voltage plug is connected. If the interlock circuit is open, the vehicle cannot start driving and the high-voltage batteries cannot be connected.

10.5 Power Take-Off (PTO)

As with a diesel truck, Designwerk electric trucks also have the option of installing a power take-off (PTO). The difference to a diesel truck is that in an electric truck, the PTO is not operated via the combustion engine or the manual gearbox. In an electric truck, an additional electric motor is installed for this purpose, that supplies the vehicle body.

10.6 Inverter

Inverters are the electrical components that convert the direct current stored in the battery into alternating current, which the motors can then convert into kinetic energy.

11 Recycling / Disposal / Scrapping

	INFORMATION
	For the proper disposal of batteries, please contact Designwerk Technologies AG.

12 List of abbreviations

Abbreviation	Designation German	Designation English
ACP	Hochspannungs-Luftkompressor	Air Compressor
AKS	Aktiver Kurzschluss	
AUXM	Nebenaggregate-Modul	Auxiliary Module
AVAS	Fussgänger Warnsystem	Acoustic vehicle alerting systems
BAT	Hochspannungsbatterie	Battery
BR	Bremswiderstand	Brake Resistor
CAB	Fahrerhaus	Cabin
CCP	Hochspannungs-Klimakompressor	
CP	Ladeschnittstelle	Charging Port
CP-CCS	CCS-Ladeschnittstelle	Charging Port Combined Charging System
DCDC	DC-Wandler für 24 V Bordnetz	
DMC	Umrichter	Digital Motor Controller
HV	High Voltage	Hochspannung 400V
HVDU	Hochvolt-Verteilung	High Voltage Distribution Unit
HVH	Hochspannungs-Heizung	High Voltage Heater
LV	Low Voltage	Bordspannung 24 V
LVDU	Niederspannungs-Verteileinheit	Low Voltage Distribution Unit
OBC	Netzladegerät	On Board Charger
PTO	Nebenantrieb Aufbau	Power Take Off
SoC	Aktueller Füllstand der HV-Batterie	State of Charge
VCU	Steuerung	Vehicle Control Unit

Notizen