
Commissioning

LOW CAB



Translation of the document

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NOTICE

Read document

Read this document carefully and follow the information contained in it.

Failure to follow this instruction may result in death, injury, damage to the product and the environment.

Always use the latest document version.

Validity

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

Type	Model	Version
E-LKW	Low Cab	6x2R

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1 Foreword

Thank you for purchasing the Daimler Low Cab, a very powerful and versatile product. Since it is a high-performance electronics product with 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 charger.

1.1 General Information

This document includes instructions for the safe commissioning of the Daimler Low Cab by trained professionals. Additional information on the vehicle can be found in the operating manual.

The version of the vehicle can be found in the display under “settings”.

1.2 List of abbreviations

Abbreviation	Meaning
AC	Alternating Current
DC	Direct Current
E-Truck	Electro-Truck
HV	High Voltage (> 60V)
LV	Low Voltage

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.

	NOTICE
	Required qualification for commissioning The work described in this document may only be carried out in instructed partner workshops.

2.1 Symbols and their meaning

Various symbols are used throughout this document. An overview and their meaning can be found in the following tables:

2.1.1 Prohibition signs

Symbol	Designation	Symbol	Designation
	Switching prohibited		Touching prohibited

2.1.2 Fire protection signs

Symbol	Designation
	Fire extinguisher

2.1.3 Warning signs

Symbol	Designation	Symbol	Designation
	General warning of a danger zone		Warning of electrical voltage
	Warning of laser beams		Warning of electrical arc

2.1.4 Commandment signs

Symbol	Designation	Symbol	Designation
	Important information to avoid potential property damage		Gebrauchsanweisung beachten
	Wear protective goggles!		Wear protective clo
	Wear protective gloves!		Wear face shield!
	Wear protective shoes!		Antistatisches Schuhwerk benutzen

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 information

	DANGER Danger caused by electrical discharge The incorrect handling of the high voltage system can cause electrical shocks and electric arcs, which may result in severe burns or death. • The process may only be conducted by authorized professionals. • Carefully read the safety instructions • Wear Personal Protective Equipment according to the instructions.
	NOTICE Required qualification for commissioning The work described in this document may only be carried out in instructed workshops and by trained personnel.
	INFORMATION Marking of high-voltage components All high-voltage cables are orange in colour.
	INFORMATION The figures may slightly deviate from the vehicle being serviced. However, the key components listed in this informational document are illustrated as accurately as possible.

3 Preparation

3.1 Tools and Auxiliary Materials



NOTICE

Have all your measuring device calibrated and certified regularly.

3.1.1 Test devices

Designwerk recommends the measuring device by the brand Fluke **175 true RMS**.

Minimum requirements (measuring device AND measuring cables)

- IEC 61010-1 for overvoltage categories CAT IV
- 600V/CAT III 1000V tested
- True-RMS measurements for voltage
- Basic accuracy of approx. 0.09 %
- Max. Voltage resolution 0.1 mV
- Max. resistance resolution 0.1 Ω
- max. measured resistance 50 M Ω



Designwerk recommends the use of the 2-pole test device **«DusPol»**.

The testing device needs to meet the following specifications:

- EN 61243-1, EN 61243-2, EN 61243-3 und EN 61243-5
- AC « TRUE RMS » 1-1000 V
- DC « TRUE RMS » 1-1200 V
- CAT IV 600V, CAT III 1000V
- IP 65



3.1.2 Resistance measuring device

Designwerk recommends the use of the resistance measuring device **Fluke 1507**.

The measuring device needs to meet the following specifications:

- EN 61557-1: 2007 Electrical safety in low voltage systems; General
- EN 61557-2: 2007 Electrical safety in low voltage systems; Insulation resistance
- EN 61557-4: 2007 Electrical safety in low voltage systems; Resistance of earth connections
- Test voltage for insulation resistance: 250 V / 500 V / 1000 V
- Continuity test: 200 mA
- Measurement category: CAT IV 600 V



3.1.3 Measuring adapter

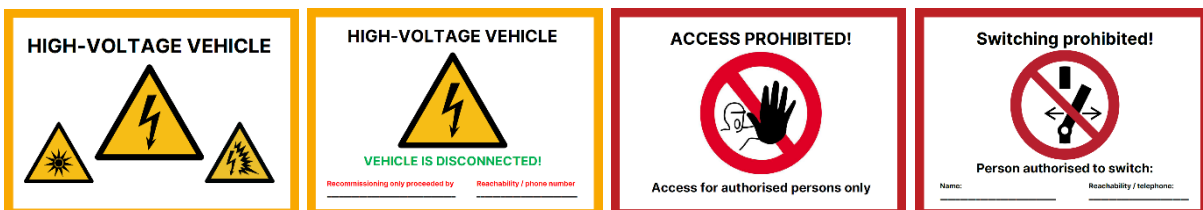
Measuring adapter with HV plug and HV socket.

Designwerk article: 105150



3.1.4 Barrier materials and warnings

For securing the vehicle against unauthorized access.



3.1.5 Fire extinguisher

	NOTICE
	Use of different fire extinguishers according to fire type • Vehicle fires: ◦ Category A or ABC multi-purpose powder, extinguishing effect with anticatalytic effect. • Li-ion battery fires: ◦ Special Li-ion fire extinguisher (gel or Vermiculit).



3.2 Personal Protective Equipment (PPE)

	WARNING
	Serious injuries, even death, can occur if PPE is not worn • Suitable Protective Class 2 Personal Protective Equipment is mandatory while working directly on high-voltage components. • Working directly on high-voltage systems also requires that long-sleeved professional clothing made of natural fibres (e.g., cotton) is worn. • Clothing made from polyester or polyamides is not suitable.
	CAUTION
	A specialist for the selection of suitable protective equipment is required Special risks exist for working with electricity. For this reason, expert advice is indispensable. Additionally, the company's internal safety guidelines must be observed. A personal basic training for working on HV-vehicles is strongly recommended.

The following list pertaining to Personal Protective Equipment should be regarded as a possible selection.

3.2.1 Gloves

	NOTICE
	Insulated gloves • Approved for working with up to 1000 volts • In line with European Standard EN 60903 • Arc flash protection (class 0) in line with European Standard EN 61482-1-2. • Length approx. 400 mm • Check expiry date • Test for tears (air test), replace regularly It is recommended to wear Kevlar gloves underneath (to protect against burns)



3.2.2 Face shield

	NOTICE
	• Complete protection of the entire face and unlimited visibility • Shatterproof • Resistant to acid and basic solutions • EN 166 8-1B • EN 170 2-1.2 • Class 0 (1500 VDC / 1000 VAC) • GS-ET-29 – Classe 1 (4kA)



3.2.3 Protective clothing (min. Protection Class 2)

	NOTICE
	Safe protection against sparks, light arcs, and flames Jacket or shirt, long-sleeved, made of flame-retardant protective fabric according to Standard EN 61482-1-2. Disconnecting does not count as live working (SN EN 50110-1). The mentioned equipment is only valid in situations where the danger of an arc is high and constant over time. For decommissioning and commissioning, long-sleeved cotton work clothing and the wearing of electrician's gloves and suitable face protection are sufficient to protect against electric shock and arcing phenomena.

3.2.4 Safety footwear

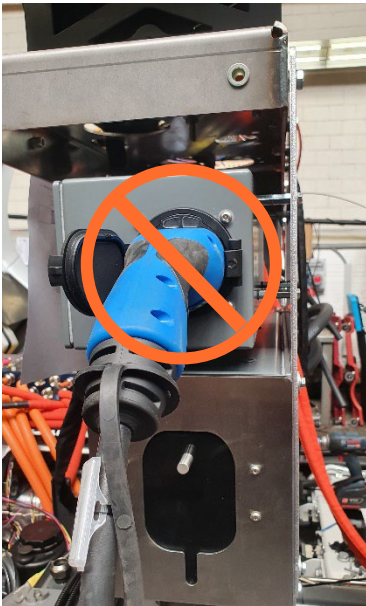
	NOTICE
 	• With protective cap • Antistatic insole and outsole resistant to oil and gasoline with non-slip profile • Category S3, according to Standard EN ISO 20345

4 Steps for Commissioning

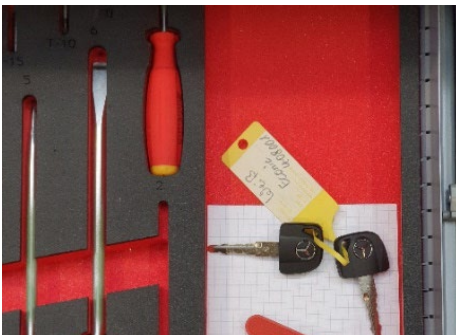
	NOTICE
	For commissioning, the vehicle must be in a dry, dust-free and level location. The structure must be in drive mode. The spring mechanism must be activated, and the vehicle must be secured against rolling. Completely read the instructions before starting to work.

4.1 Preparation

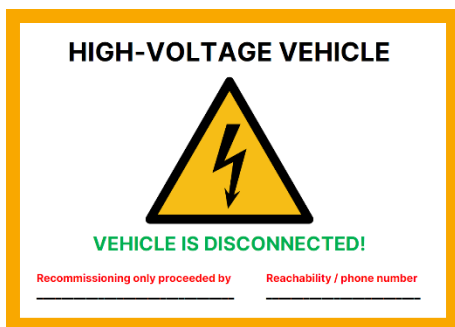
- 1
 - Ensure that the vehicle has been disconnected from all charging cables (AC and DC).
 - Attach the safety notices on BOTH SIDES, as shown in the illustration below.



	NOTICE
	Ensure that the battery switch of the 24V battery and the ignition key have been removed and cannot be used while work is in progress. Lock up ignition key and battery switch respectively to prevent third-party access.



- 2 Remove the sign "Vehicle is **disconnected**".



4.2 Checking of testing and measuring devices

1. Set the measurement device to resistance measuring.



2. Attach the test cables and check the function of the multimeter by short-circuiting the test cables.



The multimeter must display 0 Ω (tolerance $\pm 0.2 \Omega$) during the test.

- Check the measuring adapter for short circuit, thereby checking all three connections against each other. The multimeter must indicate “Open Load” for all three tests.



- Check the resistance of the positive terminal in the measuring adapter. To do this, plug a test contact from the multimeter into the + test socket and plug the other test contact into pin A of the test socket on the measuring adapter and then into pin A of the high-voltage plug on the cable.

The resistances must each be in the range $100 \text{ k}\Omega \pm 10 \text{ k}\Omega$.



- Check the resistance of the negative terminal in the measuring adapter. To do this, plug a test contact from the multimeter into the measuring socket - and plug the other test contact into pin B of the test socket on the measuring adapter and then into pin B of the high-voltage plug on the cable.

The resistances must each be in the range $100 \text{ k}\Omega \pm 10 \text{ k}\Omega$.



6. Check the resistance of the earth terminal in the measuring adapter. To do this, insert a test contact from the multimeter into the measuring socket  and hold the other test contact to the housing of the measuring socket on the measuring adapter and then to the housing of the high-voltage connector on the cable.

The resistances must each be in the range $100 \text{ k}\Omega \pm 10 \text{ k}\Omega$.



If one or more resistances are outside of the indicated range, implement the following steps:

- Check the settings on the multimeter
- Check the connections
- Check the cables

If an error was found: Correct the error, repeat the measurements.

If no error is found, the measuring adapter must be replaced.

7. Take the 2-pole voltage tester and test it on a safe voltage source of the same type as the measurement to be made (AC or DC voltage).



NOTICE

Check the DusPol functioning

Check the function of the DusPol tester.



4.3 Measuring the connections

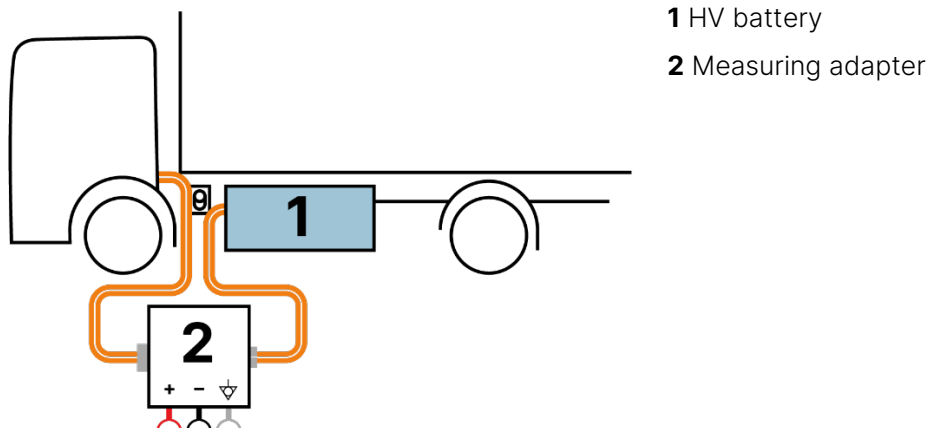


WARNING

Risk of injury from electric shock

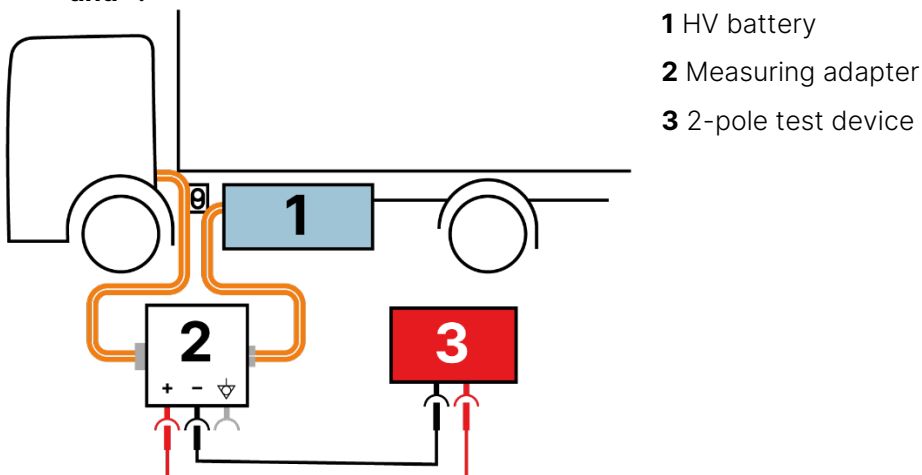
If the condition of the HV components is unclear, we recommend wearing 3.2 described Personal Protective Equipment while handling HV plugs.

1. Disconnect the outer (most accessible) vehicle HV plug on the HV battery. Connect this plug to the measuring adapter socket.
2. Connect the measuring adapter plug to the now free socket of the HV battery.

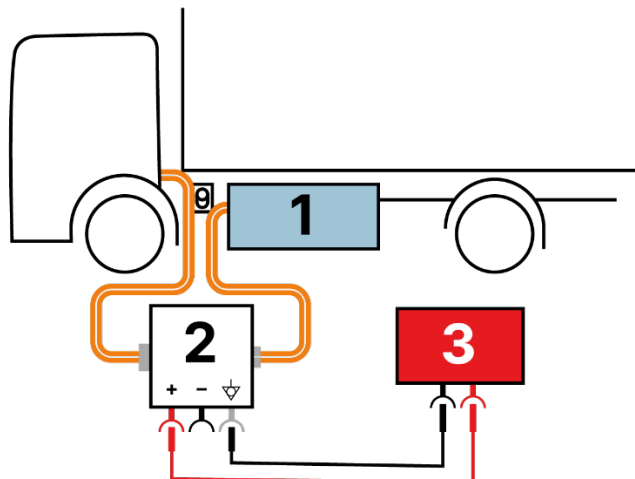


3. Measure the voltage between the following contacts on the measuring adapter using the "DusPol" type tester for one minute or until the voltage is < 50 VDC.

- + and –:

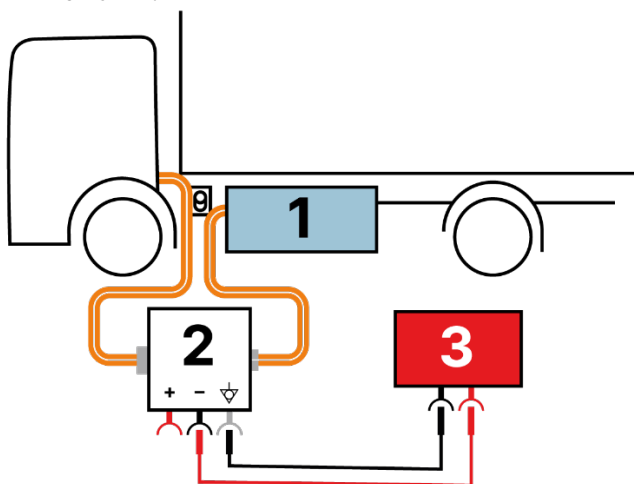


- + and :



- 1 HV battery
- 2 Measuring adapter
- 3 2-pole test device

- - and :



- 1 HV battery
- 2 Measuring adapter
- 3 2-pole test device

If there is still residual voltage (> 50 VDC) after 1 minute of testing, wait 10 minutes and repeat the process.

If a residual voltage (> 50 VDC) is still present during a new measurement, contact technical support.

4. Remove the measuring adapter from the high-voltage battery.
5. Check the function of the DusPol test device.



6. Check the high-voltage cable connections for contamination.
 - If necessary, blow out with compressed air.

7. Connect the tested HV plug to the battery.

- Check that the HV plug is correctly seated.



8. Repeat points 1 to 6 for all HV sockets on the batteries.

4.4 Insulation resistance test before recommissioning the high-voltage system

- 1 Remove the covers of the HVDU (HVDU_A und HVDU_B, if applicable also HVDU_C und HVDU_D)



- 2 Use the insulation resistance meter for this purpose.

- Set the test voltage to 500 VDC.



3 Perform the insulation check on all HVDUs:

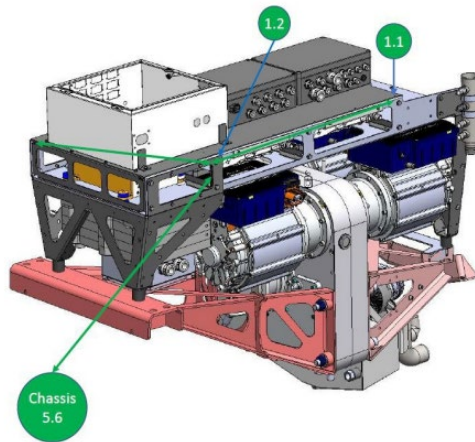
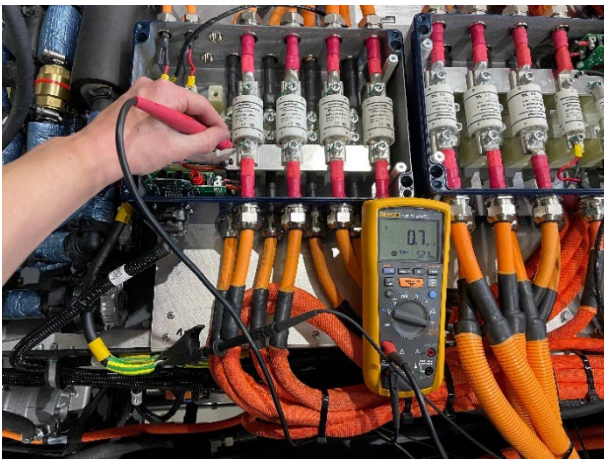
- between HV + and the mass point 1.2
- between HV and ground point 1.2

The measured value must be greater than 0.2 MΩ and the device must display a test voltage of at least 500 VDC.

- If the value is too low:
 - Start removing the HV battery plugs.

Then perform a new series of insulation resistance measurements.

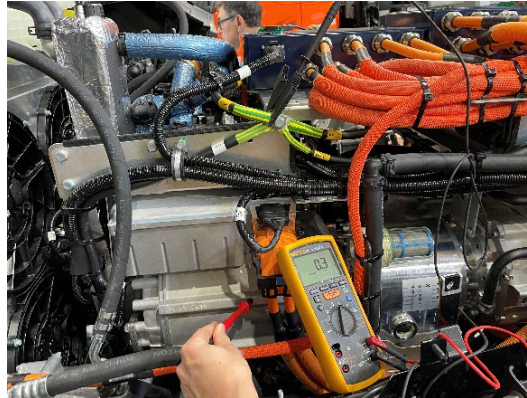
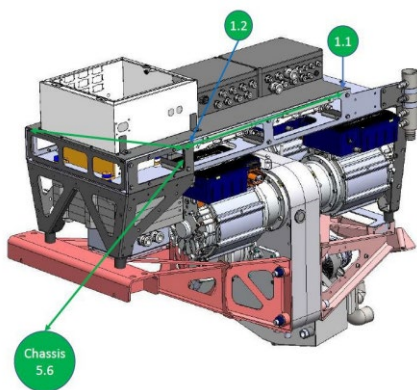
- If the value is still too low:
 - Remove the mains fuse of a high-voltage circuit.
 - Perform another series of measurements for freedom from insulation.
 - • Continue this way until you find the faulty circuit.



- 4**
 - If the insulation resistance is correct, check the HVDUs (A and B, in case of four HVDUs also C and D) for impurities.
 - Close and seal them afterwards with two guarantee seals each.
- 5** Check both low voltage connections for impurities.
 - If necessary, remove impurities with compressed air.
- 6** Connect the low-voltage connectors to the battery.
 - Check that the plug is properly connected.



- 7 Check the equipotential bonding of all components that have been worked on.
- 8
 - Set the insulation resistance tester to continuity test.
 - Place the reference tip on the ground point 1.2 (minus cable from meter).

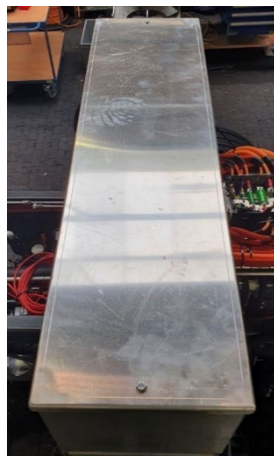


- 9 Check the continuity of all high-voltage components with the measuring tip.
 - Measurement value: $< 0.1 \Omega$
 If a value is not correct, check the corresponding earth cable.

4.5 Commissioning of the E-Truck

 	CAUTION Possibility of short circuits, sparking and light flashes! Protective goggles are required during the following work on the LV battery.
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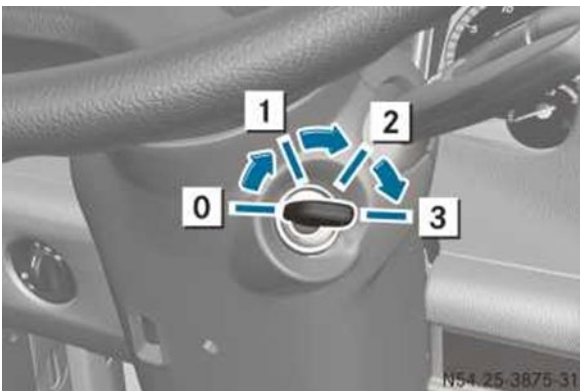
- 1 Reconnect the battery cable to the negative terminal.
 - Check that the battery cable is properly connected.
- 2 Close the battery cover of the vehicle.



- 3 Insert the battery disconnect switch and activate the ignition.



- 4 Tilt the cab back.
Follow the instructions in the Mercedes-Benz Econic 956 Owner's Manual.
- 5 Close the side flaps.
Remount the fixing screws on both sides.
- 6 Unlock (reset) the "High-Voltage-Off" switch in the cabin.
- 7 Switch on ignition and add HV:
 - Turn the key to position 2
 - Briefly (1-2 s) keep the key in position 3
 - The key will automatically return to position 2



- 8 Check the display in the driver cabin for error codes.
- 9 Commissioning is now complete.

5 Brief overview of commissioning

Nr.	To Do / Designation	Check
1.	Check safety notices	☐
2.	Unlock the key and battery isolation switch	☐
3.	Check measuring equipment	☐
4.	Connect measuring adapter to the right HV battery/HV plug	☐
5.	Measure voltage on the measuring adapter	☐
6.	Check measuring equipment	☐
7.	Connect the tested HV plug to the battery	☐
8.	Repeat steps for all HV connections	☐
9.	Connect all LV plugs to the HV batteries	☐
10.	Reconnect the 24 V battery cable to the negative terminal	☐
11.	Tilt the cap back	☐
12.	Unlock the "High Voltage Off"-switch, switch on battery isolation switch, turn on HV using the ignition key	☐
13.	Check the display for error codes	☐