User manual

Mobile DC Fast Charger

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Translation of original document

Legal notice

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Updates	Due to technical improvements to our products we reserve the right to make design changes. Any changes will be indicated in the individual manuals by replacing the respective pages or revision of the electronic data medium.

	**NOTICE**
	Read and keep this document! 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:

Model	Code 1	Code 2
MDC44	19	3.0
MDC22	19	3.0

Table of content

1 Foreword 6
2 Safety notices and warnings 6
2.1 Symbols and their meanings 6
2.1.1 Hazard and warning symbols 6
2.1.2 Commandment and information symbols 6
2.2 Safety notices and risk levels 7
2.3 General safety notices 8
2.3.1 Mechanical system safety notices 8
2.3.2 Electrical system safety notices 8
2.3.3 Safety notices for handling and operation 8
2.3.4 Safety notices for electrical systems 9
2.4 Safety units / power limitations 9
2.4.1 Coded CEE cables 9
2.4.2 Mains excess voltage protection 9
2.4.3 Input current main fuse 9
2.4.4 Overload protection (derating) 10
2.4.5 Active discharge 10
2.5 User requirements 10
2.6 Disposal 11
3 General 12
3.1 Contents and scope of this manual 12
3.2 Scope of the complete documentation 12
3.3 Scope of delivery 12
3.4 Optional items 13
3.5 Manufacturer contact information 14
3.6 Applied standards 14
3.7 CE Declaration of Conformity 15
4 Product use and limits 17
4.1 Intended use 17
4.2 Improper use / product limits 17
5 About this unit 18
5.1 Technical data 18
5.2 Technical properties 19
5.3 Basic functions 19
5.4 Transport and storage information 19
5.5 Operating position 20
5.6 Inspection 20
5.7 Service 20

5.8 Cleaning 21
5.9 Spare parts 22
5.10 Product description 22
5.11 Nameplate 23
6 Use and operation 24
6.1 Initial state 24
6.2 Preparing the charger 24
6.3 Charging the vehicle 25
6.4 Menu structure 25
6.5 Stopping charging 32
6.6 Storing the charger after use 32
7 Warranty 33
7.1 Warranty claims 33
7.2 Exclusion of warranty 33
8 Notes 33
9 Appendix 34
9.1 Errors and warnings 34

1 Foreword

Dear Customer,

The MDC44 / MDC22 mobile DC fast charger is 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.

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

2.3.1 Mechanical system safety notices

	**DANGER** **Explosive environment!** **Life threatening!** Do not store highly flammable substances or flammable liquids in the direct vicinity of the unit! Sparks at the unit connections may ignite these and result in explosions.

	**CAUTION** **Hot surfaces and hot exhaust air.** **Danger of burns!** The unit produces high temperatures during operation! Therefore, always be careful and cautious when handling the unit!

2.3.2 Electrical system safety notices

	**CAUTION** **Touch currents > 3.5 mA** This unit may produce touch currents greater than 3.5mA under certain fault conditions. The industrial socket must be properly earthed to ensure safe equipment operation.

2.3.3 Safety notices for handling and operation

	**NOTICE** **HV battery damage** Only use the charger on electric vehicles in good technical conditions. Do not use the unit, if the vehicle reports errors before connecting it to the charger.

	**NOTICE** **Damage to cable connections** Check the AC and DC cable for defects before every use. Verify the cables are properly plugged in and locked. When using AC or DC cables not included with the unit, check the quality of the cables. Do not use inferior cables or cables not manufactured to standards.

2.3.4 Safety notices for electrical systems

DANGER

Mains voltage or supply voltage!
Life threatening!

Never connect the unit to a socket without earth conductor! The supply line must be equipped with a residual current device (RCD) Type B!

CAUTION

Cables overheating!
Fire hazard!

When using a cable reel as an extension to the mains, it may ignite due to heat build-up! Therefore, always completely unwind the cable reels!

NOTICE

Do not open device without authorization

Never open the unit unauthorised! Opening the unit (sealed housing) will immediately void any warranty and guarantee claims against Designwerk Technologies AG!

2.4 Safety units / power limitations

2.4.1 Coded CEE cables

When using the power cables supplied, the unit automatically detects the cable and limits the current to the maximum permissible current.

NOTICE

Use only supplied AC cables

Only use the included AC cables. Connecting standard CEE Extension cables after the included AC cables is permissible.

2.4.2 Mains excess voltage protection

The charger has a built-in excess voltage protection. When the excess voltage lasts too long or is too high, the surge protection triggers the fuses integrated in the unit. Should this occur, the charger must be returned to Designwerk Technologies AG!

2.4.3 Input current main fuse

In the charger, each phase (L1, L2, L3) is protected by one (MDC22) or two (MDC44) 50 A fuses to protect the electrical installations from damage in the event of an internal fault. Should one of these fuses be triggered, the charger must be returned to Designwerk Technologies AG!

2.4.4 Overload protection (derating)

This unit is designed to work without reduced charging power (derating) up to an outside air temperature of 30°C. In the event of extreme continuous operation or in outside air temperatures over 30°C, the unit automatically reduces the charging power to protect the charger from damage due to overheating. Power is reduced proportional to the temperature rise until the unit temperature is within the target range again.

2.4.5 Active discharge

The unit features active discharge of the circuits. As soon as the unit is disconnected from the HV voltage, the internal HV circuits discharge through internal discharge resistors.

2.5 User requirements

Operation of the unit is only permitted by a qualified electrician or a person specially instructed for this purpose.

A qualified electrician or trained person is defined as a person with

- professional training or instruction,
- knowledge and experience in electrical or electromobility,
- as well as knowledge of the relevant regulations and hazards

and is able to provide verification. They must also be able to independently assess their assigned tasks, recognise potential hazards, and determine the necessary safety measures.

	**INFORMATION**
	Using industrial or country-specific sockets - Check the cables and plugs being used for damage - Check the mains installation for adequate fusing (MCB) and residual current device (RCD) - Completely unwind the connecting cables to avoid heat build-up - Insert plugs correctly and fully - Avoid disconnecting under load

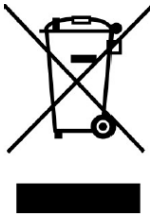
	**INFORMATION**
	Manual reduction of the unit current All power cables supplied have a coding that limits the maximum current. If connections (e.g., worksite distribution boards) are unable to safely handle the rated current for any reason, the maximum current can also be manually limited in the menu.

2.6 Disposal

This unit is marked in accordance with directive 2012/19/EU on Waste Electrical and Electronic Equipment – WEEE. The directive provides the framework for the EU-wide take-back and recycling of waste equipment.

Disposal through regular household waste is not permitted. The unit must be returned to Designwerk Technologies AG or an electrical retailer to ensure proper disposal.

This charger is made of recyclable materials. Local regulations may require separate disposal of electrical and electronic products, including cables, plugs and accessories.

	**INFORMATION**
	Never dispose of old units with household waste. The unit must be returned to Designwerk Technologies AG or an electrical retailer to ensure proper disposal. **WEEE Registration Nr. DE 42721147**

3 General

3.1 Contents and scope of this manual

This documentation provides the reader with an overview of all steps required to install and operate the charger and the necessary safety mechanisms.
It further contains technical data, application information and a basic description of the charger and its functions.
The operating information and safety notices must be followed exactly to ensure proper charger function long-term and to observe the warranty requirements of Designwerk Technologies AG.

3.2 Scope of the complete documentation

The operating instructions contain the following documents:

- Technical documentation
- EU Declaration of Conformity
- Use and operation
- Warranty terms

3.3 Scope of delivery

Designation	Article No.	Illustration
Fast charger MDC44-920	300142	
Fast charger MDC22-500	300197	

3.4 Optional items

	Designation	Article No.		Illustration
		MDC22-500	MDC44-920	
1	DC cable CHAdeMO 4m	300209	300204	
2	DC cable CCS Type2 4m	300207	300144	
3	DC cable CCS Type1 4m	300208	300203	
4	DC cable GB/T 4m	300210	300205	
5	Tesla CHAdeMO adapter	300010	300010	
6	AC cable CEE 32A 5m	300212	300212	
8	AC cable CEE 63A 5m	-	300145	
9	Trolley	300143	300143	

3.5 Manufacturer contact information

Designwerk Technologies AG
Wülflingerstrasse 147
CH-8408 Winterthur
Ph +41 44 515 48 58

info@designwerk.com

3.6 Applied standards

The unit is designed in accordance with the 2006/95/EC Low Voltage Directive on the mains side and IEC 62196-3 direct current charging on the HV side.

The unit is approved solely for the European region.

This manual is prepared under application and observance of the EC directives, national laws and harmonised standards (EN) concerning the fast charger product and valid at the time.

3.7 CE Declaration of Conformity

EG-Konformitätserklärung

CE-Declaration of conformity

Déclaration de conformité CE

Dichiarazione di conformità CE

CE

Wir We Nous Noi	Designwerk Products AG Wülflingerstrasse 147 8408 Winterthur Schweiz Tel: +41 44 515 48 58

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hereby declare in our sole responsibility, that the product
déclarons de notre seule responsabilité, que le produit
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Mobiles DC Schnellladegerät
MDC44-920 SN4000-4999

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which is the subject of this declaration, is in conformity with the following standards or normative documents.
Auquel cett déclaration se rapporte, est conforme aux normes ou aux documents normatifs suivants.
Al quale si fa riferimento in questa dichiarazione, é conforme alle norme o ai documenti normativi seguenti.

2006/42/EG	Maschinenrichtlinie Machinery Directive Directive Machines Direttiva Maccine	**2006/95/EG**	Niederspannungsrichtlinie Low Voltage Directive Directive pour basses tensions Direttiva per bassa tensione
IEC 62196-3 **IEC 61851-1,** **-24**	Gleichstromladung Direct current charge Rechargez courant continu Caricare corrente continua	**EN 61000-6-2,** **-4**	EMV Störfestigkeit, -aussendung, Grenzen EMC Immunity, emission, limits EMC Immunité, émis, limite EMC immunità, emessa, limiti

Anbringung der CE-Kennzeichnung: **2020**
Placing the CE-Mark:
Application de la marque CE:
Applicazione del marchio CE:

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Winterthur	**2. Juli 2020**	

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EG-Konformitätserklärung
CE-Declaration of conformity
Déclaration de conformité CE
Dichiarazione di conformità CE

CE

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hereby declare in our sole responsibility, that the product
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Mobiles DC Schnellladegerät
MDC22-500 SN3000-3999

auf das sich diese Erklärung bezieht, mit den folgenden Normen oder normativen Dokumenten übereinstimmt.
which is the subject of this declaration, is in conformity with the following standards or normative documents.
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4 Product use and limits

4.1 Intended use

The DC fast charger is generally designed for charging a variety of electric and hybrid vehicles with DC fast charge connector. Should it be intended for any other purposes, please contact Designwerk Technologies AG with any questions.
The user must ensure the specific operating limits of the connected vehicle and the fast charger are not exceeded during all charging phases.

Only use the charger within the limits specified in the next sub-chapter.

4.2 Improper use / product limits

Improper means any use in conditions and under requirements which do not observe with those specified by the manufacturer in the technical documentation and data sheets.
The following limits are defined for operating the fast charger. Operation outside these specified limits may result in damage to the unit and subsequently life-threatening situations and is therefore prohibited!

Limit type	Compliance Values	Unit
3-phase input voltage	200-460	VAC (ph-ph)
Ambient temperature for storage	-20 to +70	°C
Ambient temperature for operation	-25 to +45	°C
Max. unit operating height	4000	above sea level

NOTICE

Comply with operating limits

The operating limits of the connected vehicle must also be observed.

5 About this unit

5.1 Technical data

AC input	Value		Unit
	MDC22-500	MDC44-920	
3-phase input voltage	200-460	200-460	VAC (ph-ph)
Maximum 3-phase input voltage	32	63	A
Input frequency	45-65	45-65	Hz
Max. input power	22	44	kW
Power factor	> 0.99	> 0.99	-
Power Factor Correction (PFC)	yes	yes	-
Mains fuse all phase	50	2x50	A
X capacity	6.9	13.8	µF
Y capacity L1 ->PE	450	900	nF

DC output	Value		Unit
	MDC22-500	MDC44-920	
Voltage range with reduced power	250-333	250-333, 500-667	VDC
Voltage range at full power	333-500	333-500, 667-1000	VDC
Maximum charging current	60	120	A
Maximum charging capacity	20	40	kW

Thermal / cooling system	Value		Unit
	MDC22-500	MDC44-920	
Ambient temperature for storage	-20 to +70	-20 to +70	°C
Ambient temperature for operation	-25 to +45	-25 to +45	°C
Max. unit operating height	4000	4000	above sea level

Basic mechanical data	Value		Unit
	MDC22-500	MDC44-920	
Weight (without cables)	34	58	Kg
Housing material	Aluminium	Aluminium	-
Housing volume	55.2	85.4	L
IP rating	54	54	-
Height	475	735	mm
Width	237	237	mm
Length	490	490	mm

Safety and protection functions	Value		Unit
	MDC22-500	MDC44-920	
Isolation between mains input and DC output	LV123 / IEC61851	LV123 / IEC61851	-
Mains input excess voltage protection (ph-PE)	275	275	VAC
Mains input excess voltage protection (ph-PE)	460	460	VAC
Open circuit protection	yes	yes	-
Internal excess voltage protection	yes	yes	-
Temperature sensor	various	various	-
Charging cable plug lock	yes	yes	-

5.2 Technical properties

The DC fast charger is characterised by its small size and low weight despite its considerable output power. This allows both mobile as well as stationary use of the unit.

The built-in power factor correction (PFC) and the galvanic isolation between the mains and HV battery ensure the unit offers both maximum power as well as maximum safety when charging electric and hybrid vehicles.

The unit has a low battery current ripple for particularly battery-friendly charging, even at high charging powers.

The fast charger is particularly suitable for vehicles with no or very weak on-board charger.

5.3 Basic functions

The fast charger charges electric and hybrid vehicles with DC connection such as CCS Combo Type 2, GB/T and CHAdeMO.

5.4 Transport and storage information

The charger is designed to be transported lying down (on its side) or upright. It is not recommended to transport the unit upside-down or on the frontside on the cable connections. Always ensure the unit cannot shift during transport.

The optimum storage position is upright.

5.5 Operating position

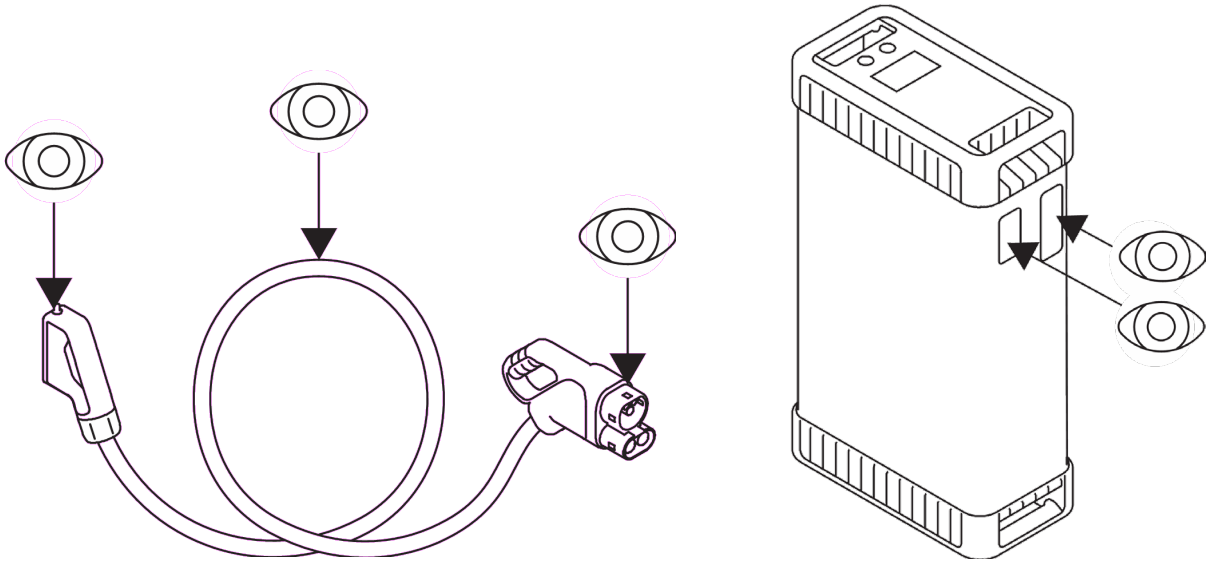
If possible, the unit should be operated upright, with the display facing upwards. In principle, other operating situations are possible, but then a significant thermal derating must be expected.

	NOTICE
	Optimal air circulation It is important that the air inlet and outlet are free from objects so that the cooling air circulates optimally.

	NOTICE
	Damage due to falling over Should the standing unit fall to the side, then hardware damage must be assumed. In this case, the unit should be returned to Designwerk Technologies for inspection. A proper fault-free function is no longer guaranteed.

5.6 Inspection

The AC and DC cables and their connectors are subject to wear over time depending on the environment and handling. It is therefore important to check the condition of the cables and the plug contacts with every connection cycle.



5.7 Service

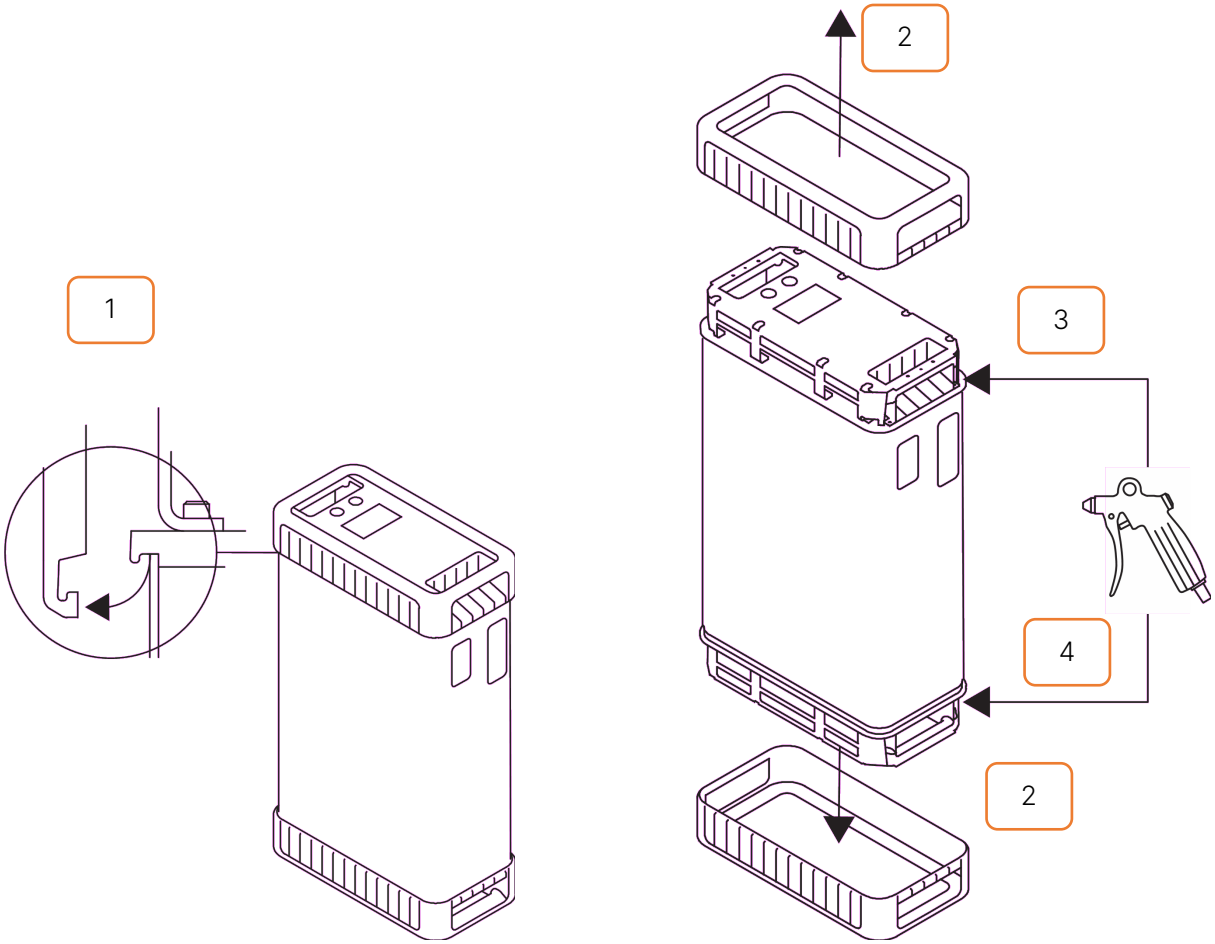
No regular maintenance is required due to the air cooling and particularly through the air inlet situated in the upper part of the unit.

Should however the unit be used in an extremely dusty environment, the cooling channel in the middle of the unit may become blocked over time. As a result, the fans run at higher speeds and the unit starts derating at lower temperatures.

In this case the cooling channel should be cleaned with a cranked compressed-air gun. Proceed then as follows:

1. Remove the upper and lower rubber cover
2. Remove the upper and lower rubber cover
3. Blow the foreign matter through the cooling channel with the compressed air gun

4. Blow out the foreign matter sideways at the foot of the unit



Should this procedure not eliminate the problem, then more extensive cleaning is necessary.

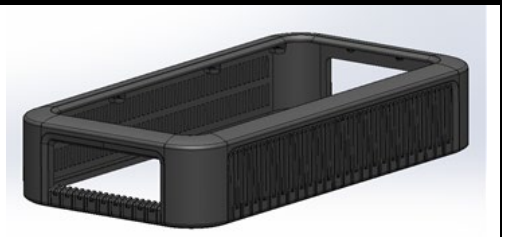
Please contact our customer service.

5.8 Cleaning

Use a damp cloth to clean the unit. Should performance be impaired due to contamination in the cooling channel of the unit, proceed as described in Section 5.7.

	NOTICE
	No cleaning with high pressure cleaner Never use a high-pressure cleaner to clean the unit.

5.9 Spare parts

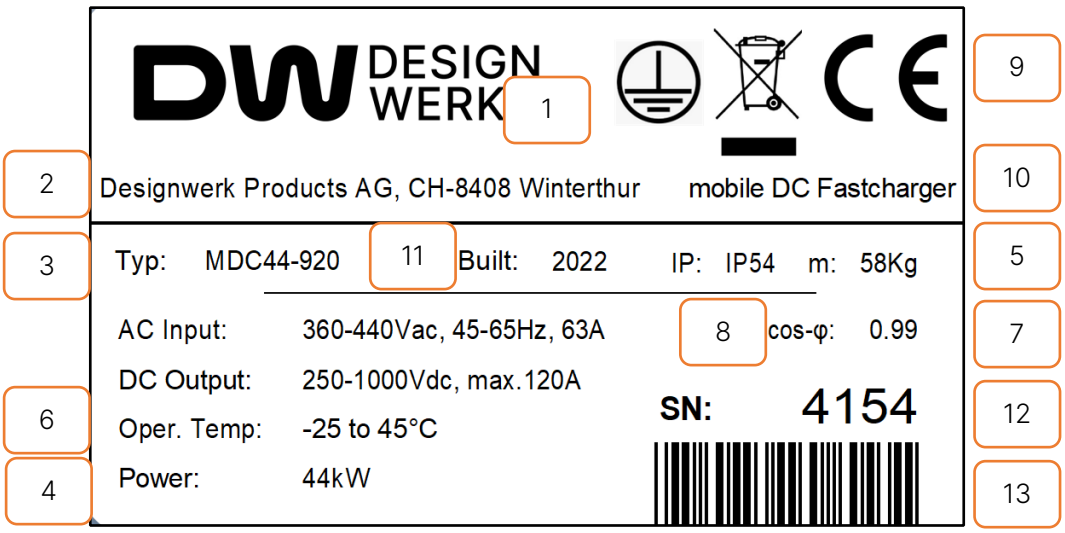
Designation	Article No.	Illustration
Rubber cover for charger	101159	
Castor wheel for trolley	502642	
Castor wheel with brake for trolley	502643	
Spare cable	see chapter 3.4	

Various other components of the charger are available as spare parts and are available for replacement independently in consultation with our customer service.

5.10 Product description

1	Display	7	Air intake
2	Control buttons	8	Air outlet
3	USB port	9	AC mains connections
4	Trolley	10	Nameplate
5	Cable rewind wing	11	DC cable connection
6	Product identification	12	Carrying handles

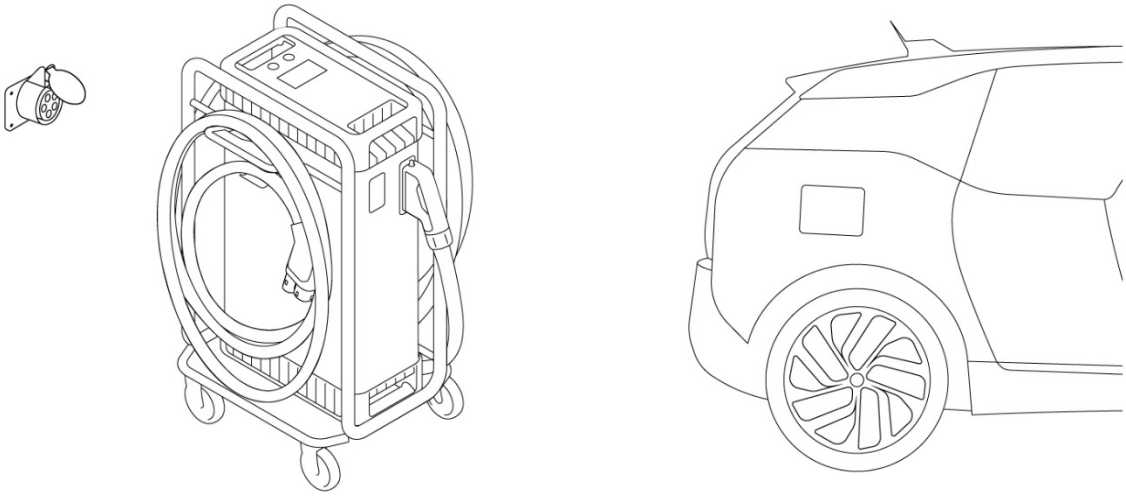
5.11 Nameplate



1	Company logo	8	IP rating
2	Company address	9	CE mark
3	Type designation	10	Voice unit designation
4	Input power range	11	Year of manufacture
5	Unit weight	12	Serial number
6	Permissible temperature range during operation	13	Barcode
7	Power factor correction (PFC)		

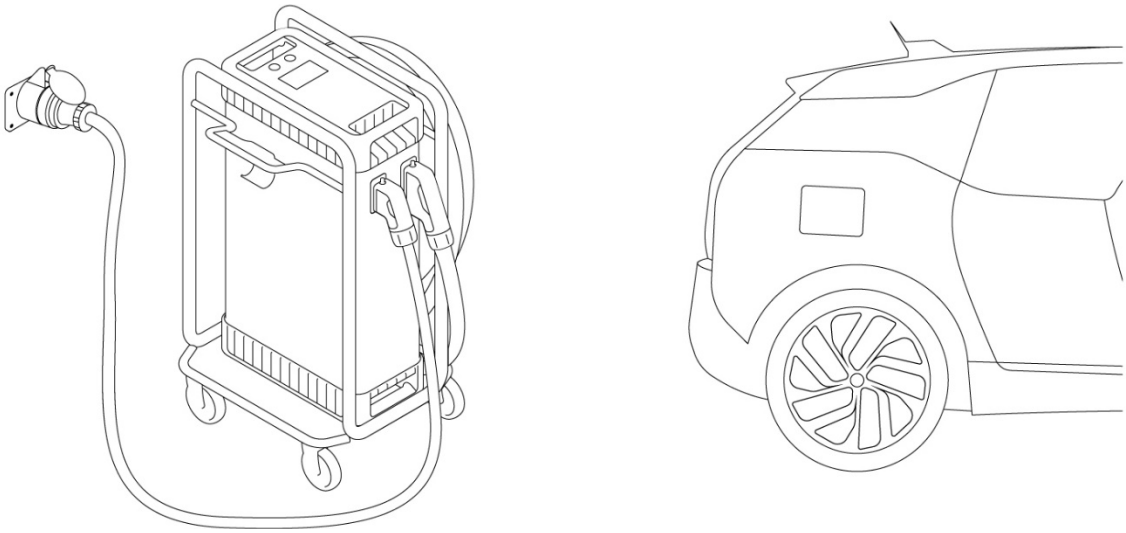
6 Use and operation

6.1 Initial state



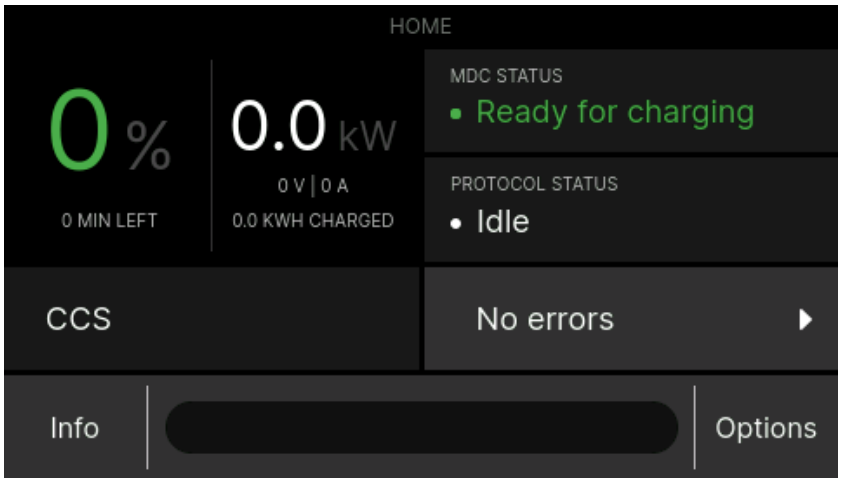
A CEE63A/400V or CEE32A/400V industrial socket is required for fast charging. Park your vehicle so that the quick charger reaches the mains connection with the supplied cables and the cables lie on the ground and are not under tension.

6.2 Preparing the charger



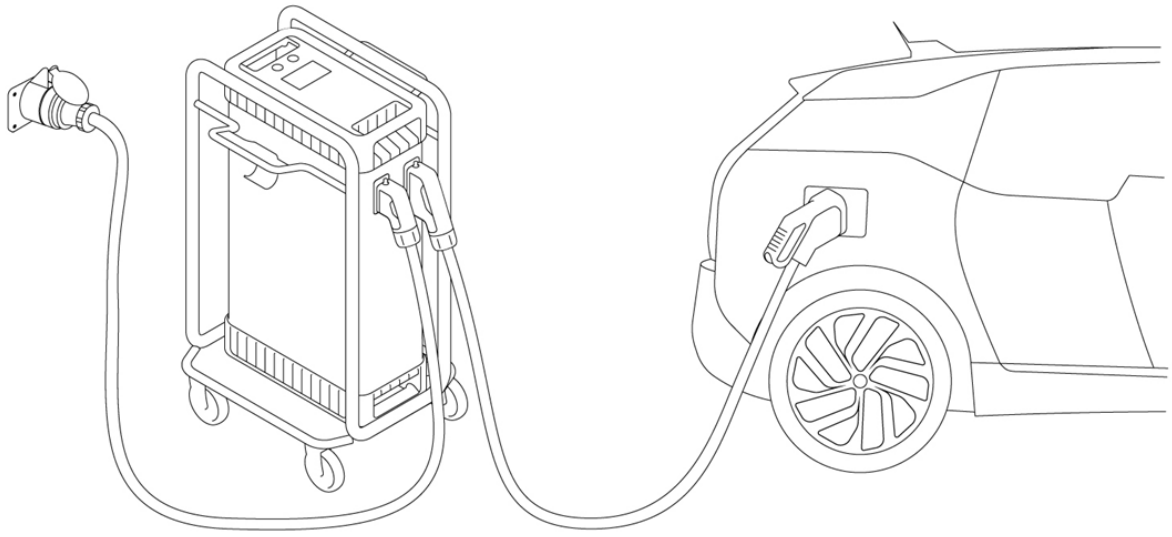
Plug the DC cable and the AC cable into the fast charger. Now connect the AC cable to the mains.

6.3 Charging the vehicle



The unit runs an initialisation depending on the protocol. As soon as the unit is ready for operation, the message 'Waiting for Vehicle' appears on the display. Now plug the DC plug into your vehicle. The fast charge starts automatically or press the start button on the fast charger, depending on the charging protocol. The menu structure provides you with a variety of information during the charging process.

	INFORMATION
	The Start button has no function when operating with CCS. The charging process starts automatically when the CCS plug is connected.



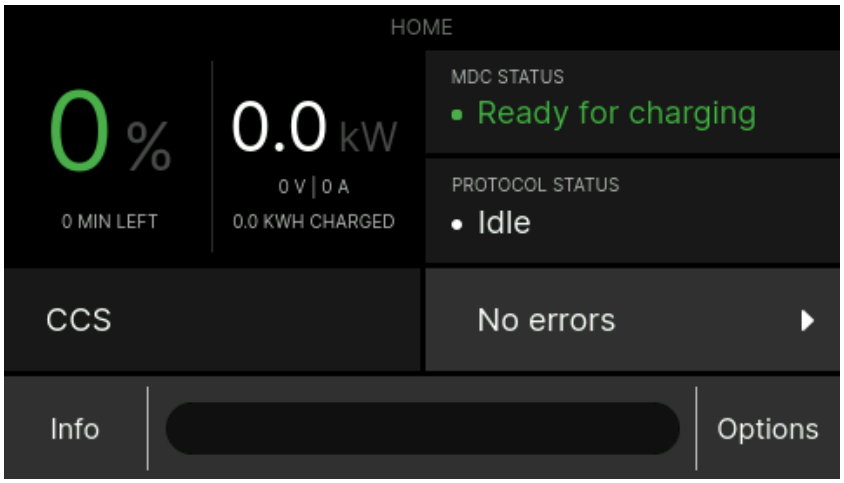
6.4 Menu structure

Home screen

This displays all the information necessary for the user during normal operation.

This screen allows access to the following:

- Options screen
- Info screen
- Error message screen

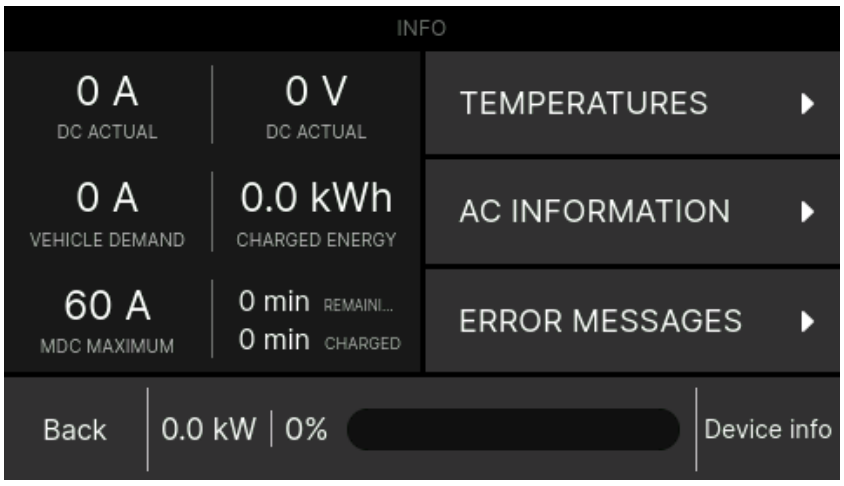


Info screen

This screen provides additional information on the current charging process.

This screen allows access to the following:

- Back to Home screen
- Device info screen
- Temperatures screen
- AC information screen
- Error message screen

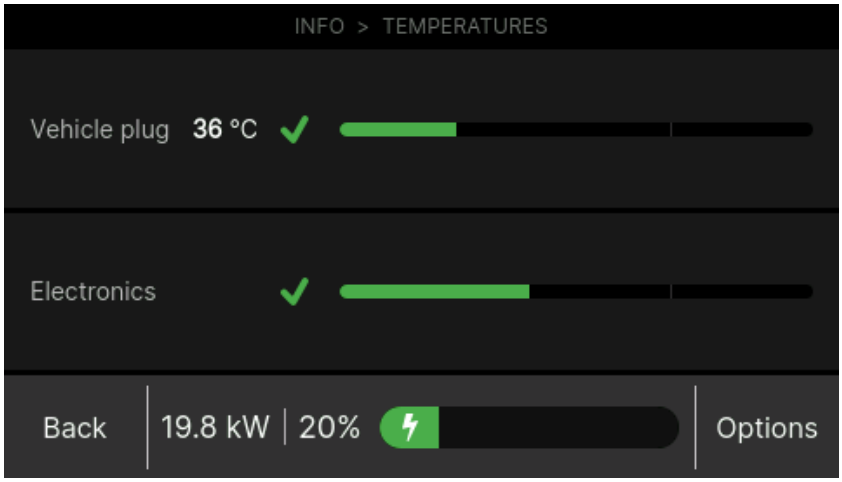


Temperatures screen

This displays the current temperatures for the respective measuring points.

This screen allows access to the following:

- Return to Info screen
- Options screen

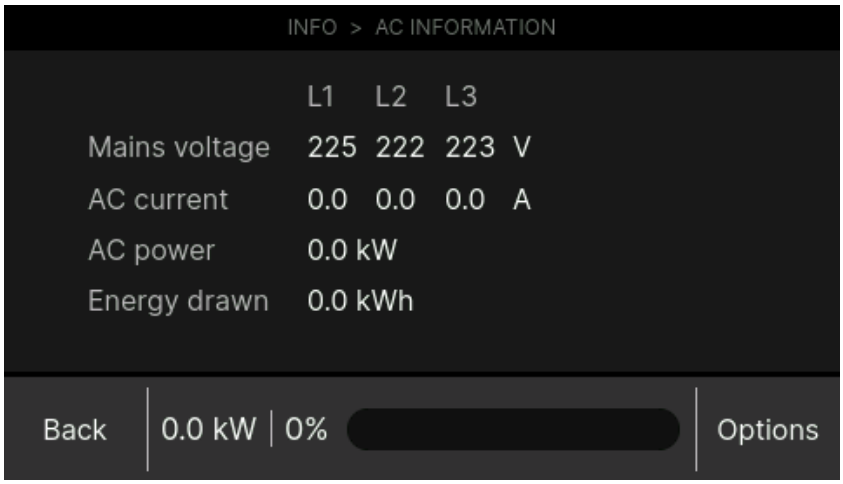


AC information screen

This screen displays information about the current status of the mains connection.

This screen allows access to the following:

- Return to Info screen
- Options screen

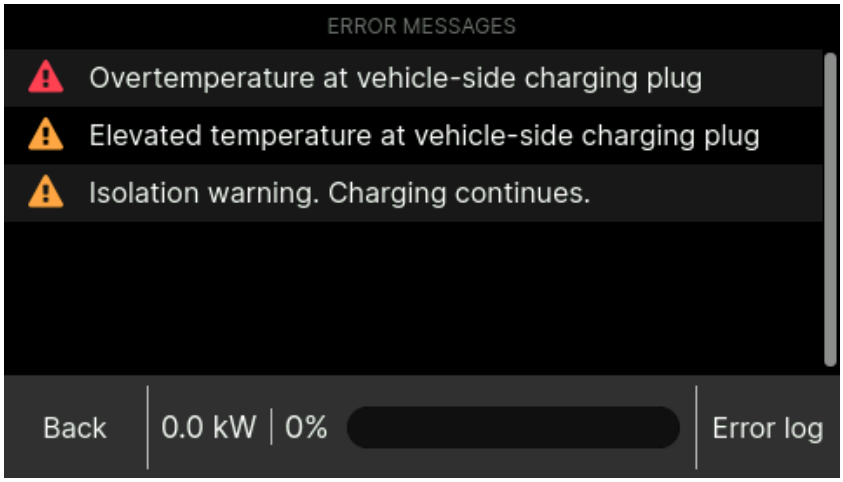


Error message screen

Any errors and warnings are displayed here.

This screen allows access to the following:

- Return to Info screen / Home screen
- Error log screen

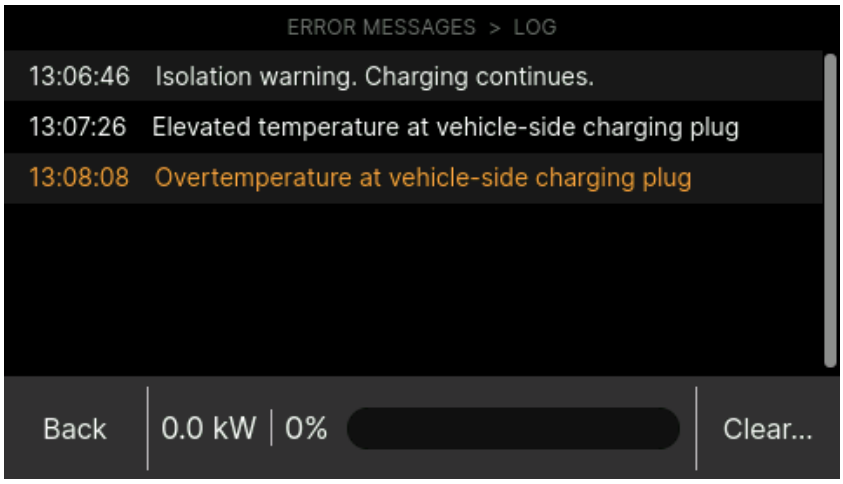


Error log screen

This lists current and past errors and warnings.

This screen allows access to the following:

- Back to Error Messages screen

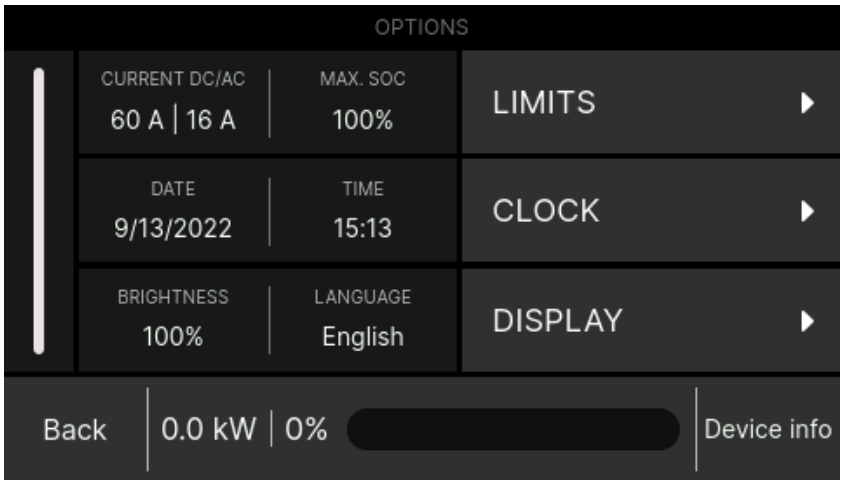


Options screen

This screen allows you to change settings and parameters.

This screen allows access to the following:

- Limits screen
- Clock screen
- Display screen
- Device info screen
- Back to previous screen



Limits screen

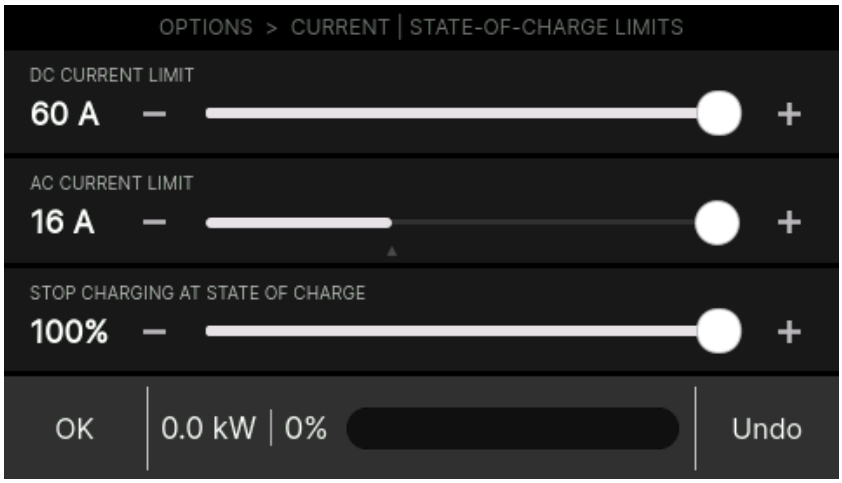
The power limits on the input and output end are set here. The option limit is limited by the coded AC connection cable inserted on the mains side.

It is also possible to set up the SoC for the vehicle being charged.

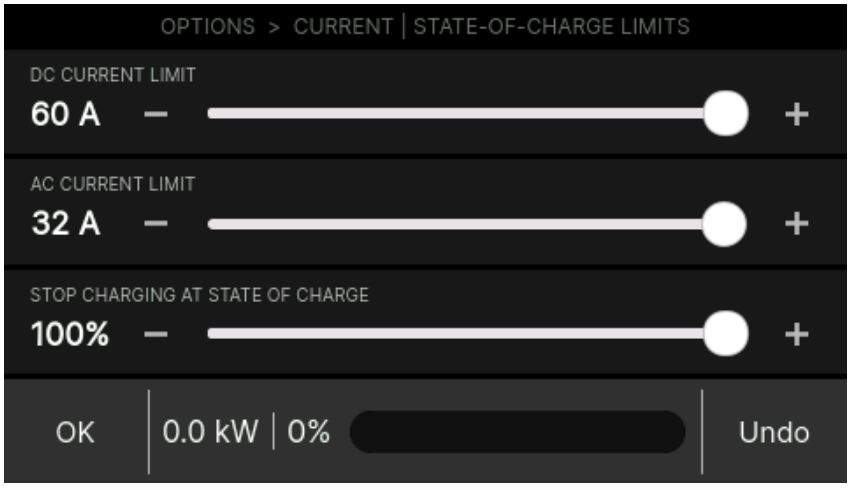
This screen allows access to the following:

- Return to Options screen

The slider bar "AC Current Limit" takes into account the maximum current of the AC cable currently plugged in. If an AC cable is used that supports a smaller maximum current than the charger, the slider bar shows an arrow at the cable limit position and is thinner to the right of it. The adjustment knob can still be pushed past the cable limit with the current limit indicator remaining there. The charger remembers the visible position of the adjustment knob. When changing to a stronger AC cable, only this position determines the new current limit, the maximum current of the previous cable has no influence on it.



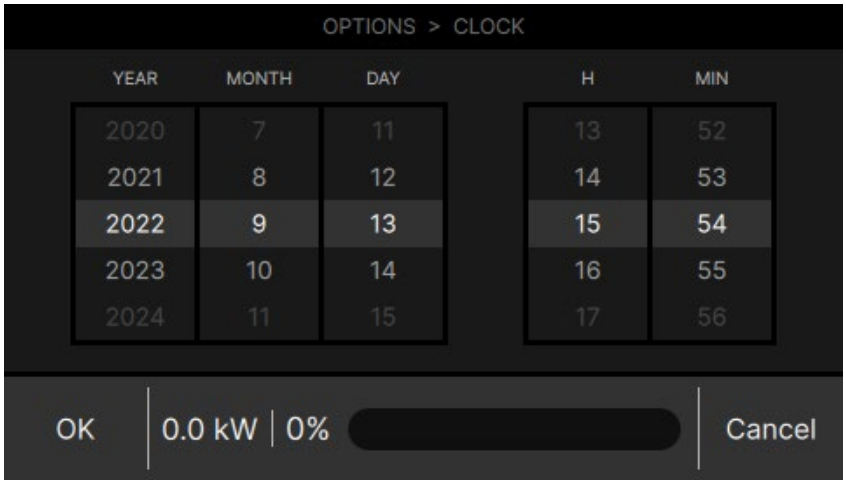
16 A cable, adjustment knob to 32 A, effective current limit 16 A.



Change to 32 A cable (without new setting) results in effective current limit of 32 A.

Clock screen

The date and time can be set here by scrolling. The highlighted numbers in the middle are valid. Press OK to confirm and save the entries and Cancel to return to the Options screen without saving.

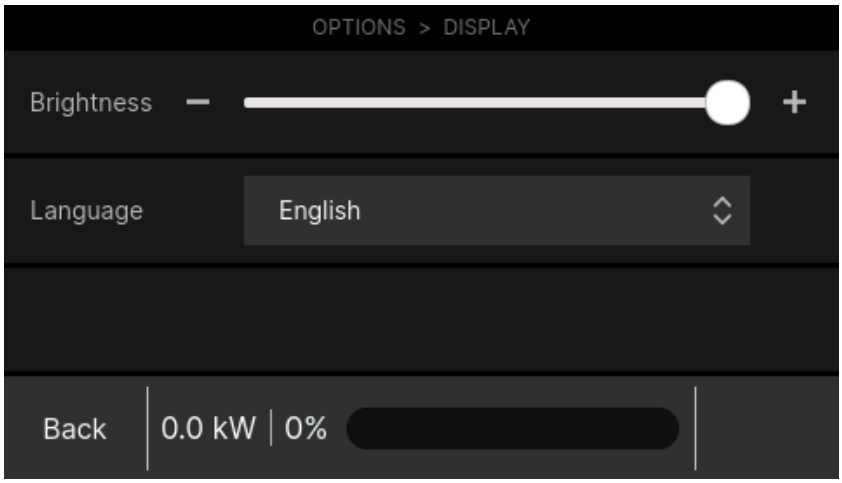


Display screen

This screen allows you to select the language.

This screen allows access to the following:

- Return to Options screen



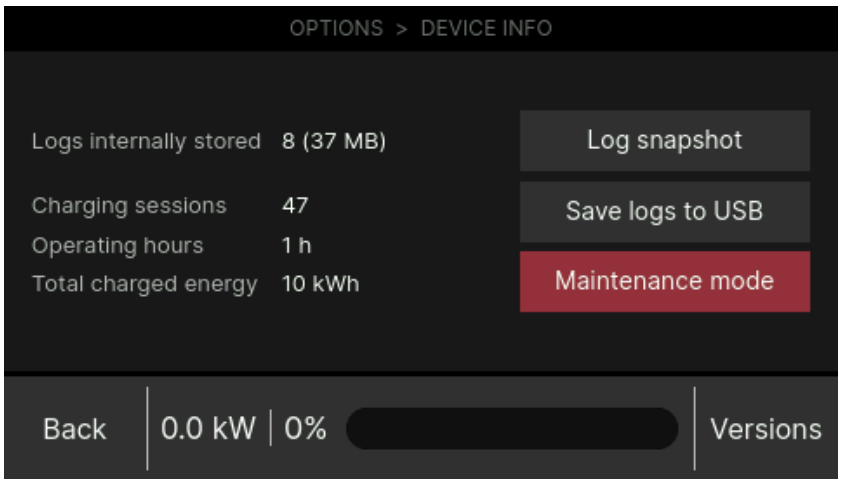
Device info screen

This screen displays the software versions and the operating data since being commissioned.

The internal logs can be stored on a USB stick.

This screen allows access to the following:

- Return to Options screen
- Versions screen



Technical changes to the menu structure are reserved.

6.5 Stopping charging

Charging automatically ends when the battery is full. Depending on the vehicle you will then merely need to disconnect the DC plug from the vehicle or first unlock the charging port in the vehicle or with the keyless remote.

When you want to stop charging before charging is complete, press the STOP button. Other vehicles may now be charged or store the unit away.

6.6 Storing the charger after use

The cooling system of the unit cooling may continue after charging stops at full power. However, the unit can still be unplugged and packed up. Please note though that the unit may be hot.

You should first finish. You can then unplug both ends of the AC cable. To store the unit away, you will now merely need to disconnect the DC cable from the unit.

NOTICE

Close open plug connections

If you unplug the AC or DC cable, you must close the open connectors with the cover. Otherwise, the IP protection cannot be guaranteed.

When storing the unit away, please note the transport and storage information in chapter 5.5.

7 Warranty

Designwerk Technologies AG offers a 24-month warranty from the date of purchase for obvious defects in function, material and manufacture. The warranty is valid within the European Union and the EFTA countries and is designed as a bring-in warranty.

7.1 Warranty claims

- Please always contact us before sending in the product. We will then discuss further proceedings with you.
- If the defect is covered by our warranty, you will receive a repaired or new unit.

7.2 Exclusion of warranty

The warranty is immediately void if the seal on the housing is damaged due to unauthorised opening or missing entirely. Designwerk Technologies AG further assumes no liability for damages due to handling or using the unit improperly or incorrectly.

Designwerk Technologies AG assumes no liability for personal injury due to failure to observe the general and/or product-specific safety notices.
Designwerk Technologies AG assumes no liability for damage to peripherals associated with this unit. Should you be unsure about using this product, please contact our support team PRIOR to use.

8 Notes

We reserve the right to make changes in the interest of technical advancements. Designwerk Technologies AG cannot guarantee that all requirements, regulations and standards are free of third-party industrial property rights.

9 Appendix

9.1 Errors and warnings

Event		Description
Charging protocol error		An error has occurred in the communication with the vehicle. This may be caused by an incompatible or faulty implementation of the loading protocol on the vehicle side. Please contact our customer service in this case.
Installation error	Phase L1 is not connected.	No voltage is detected on the respective phase. Please check the electrical installation. Damage may also be caused by excess voltage in certain circumstances. Please contact our customer service if voltage is present on all three phases and the fault persists.
	Phase L2 is not connected.	
	Phase L3 is not connected.	
	Mains voltage too low	The mains voltage is too low, please check the electrical installation
	Mains frequency not permissible	The mains frequency is outside the specified range, please check the electrical installation.
Internal error		There is an internal error. Please contact our customer service in this case.
Insulation error		An insulation error is detected on the DC side. Please check the charging cable and the vehicle.
Increased temperature at the vehicle's charging plug		The charging power is reduced because the temperature at the DC contacts of the vehicle charging plug is too high. Please check the contacts and replace the charging cable if necessary.
Excessive temperature at the vehicle's charging plug		The charge is interrupted as the temperature at the DC contacts of the vehicle charging plug is too high. Please check the contacts and replace the charging cable if necessary.