hypercharger User Guide

hypercharger HYC_150 / HYC_300
(75kW – 300kW)
ultra-fast charging system for electric vehicles

hypercharger User Guide

Version

Version 1-5 of hypercharger User Guide

Original English version

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Attention

If the installation instructions described in this document are not adhered to, any warranty claim will be void.

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1. Product description

The hypercharger product line allows you to choose between two different housings, which can be configured with various options as shown in the following table:

Model	Options: DC Power	Options: Charging interfaces (see chapter 1.1)
HYC_150	- 1 power stack → 75 kW - 2 power stacks → 150 kW	- 1 DC charging cable - 2 DC charging cables - AC socket or AC cable
HYC_300	- 1 power stack → 75 kW - 2 power stacks → 150 kW - 3 power stacks → 225 kW - 4 power stacks → 300 kW	- 1 DC charging cable - 2 DC charging cables - 3 DC charging cables - AC socket or AC cable

Table 1: Overview DC power and options for the hypercharger product family

Note

The sequence of the charging points (when facing the charging cable door) is always from left to right, AC – if available – is in last place.

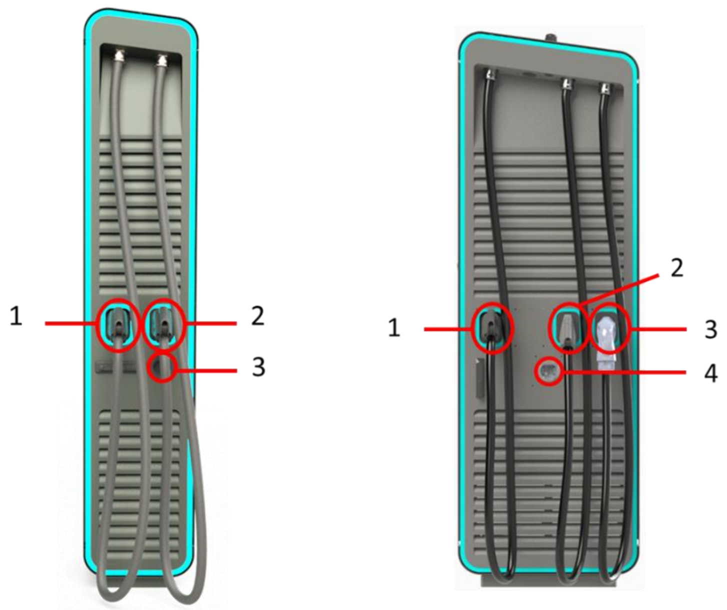


Figure 1: Sequence of charging points HYC_150 and HYC_300

1.1. Charging interfaces

The following charging interfaces are available for the hypercharger:

Charging interfaces				
	Voltage capability [V]		**Current capability [A]**	
Charging interface	**Min.**	**Max.**	**Min.**	**Max.**
CCS Combo 2 (not liquid-cooled)	150V DC	1,000V DC	6.5 A	200 A / 250 A / 400 A (500 A Boost) DC
CCS Combo 2 HPC (liquid-cooled)	150V DC	1,000V DC	6.5 A	500 A DC
CHAdeMO (not liquid-cooled)	150V DC	500V DC	6.5 A	125 A DC / 200 A DC
22 kW type 2 AC socket (with shutter) or AC cable	3 x 230 / 400 V AC		0.25 A	20 A AC (1 phase) 32 A AC (3 phase)

Table 2: Charging interfaces

Depending on the configuration of the hypercharger, both DC charging and AC charging are available. Both charging processes can also take place at the same time. If the hypercharger is configured with at least two power stacks and two charging cables, two vehicles can be charged with DC at the same time, with one power stack being assigned to each vehicle and charging cable. If at least two power stacks are available, more than one power stack can be assigned to one vehicle.

1.2. Exterior view

The following figure shows the different elements of the device from the outside.

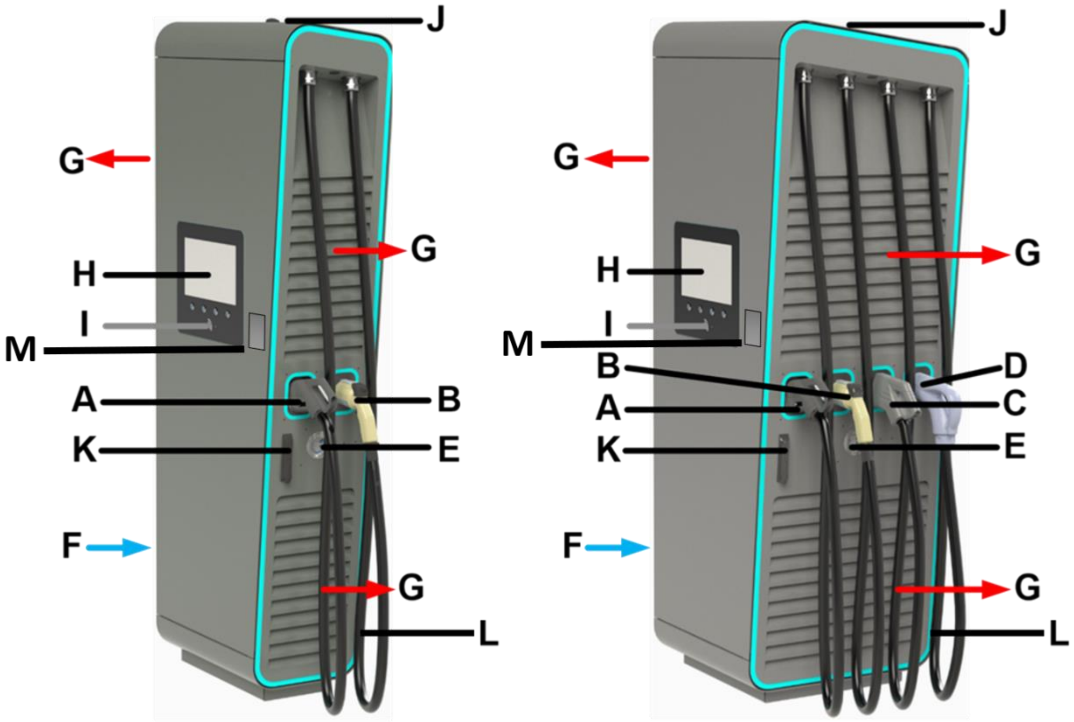


Figure 2: Elements of the HYC_150 and HYC_300 charging stations

A	DC charge outlet 1
B	DC charge outlet 2 (optional)
C	DC charge outlet 3 (optional)
D	DC charge outlet 4 (optional)
E	AC charging socket | attached AC cable (optional)
F	Air inlet
G	Air outlet
H	Display / HMI
I	RFID card reader
J	GSM / LTE antenna
K	Door handle
L	Nameplate
M	Credit card terminal (optional)

1.2.1. Nameplate

The nameplate is located opposite the display door in the lower right-hand corner. It includes the CE marking, serial number and electrical properties of the charger.

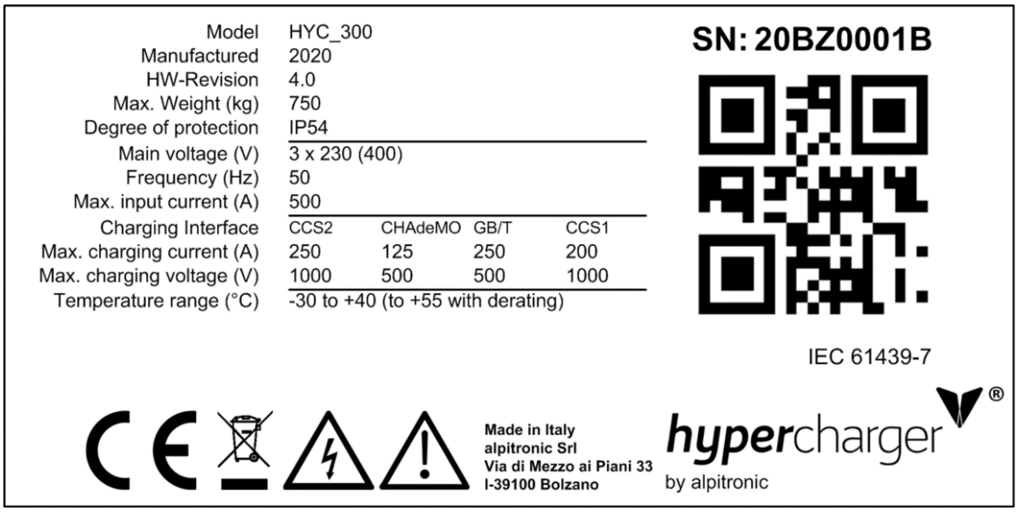


Figure 3: Example of nameplate for hypercharger HYC_300

2. Start charging session

2.1. Authentication options

Figure 4: Overview of the authentication options

2.2. Authentication

You can use, for example, your user card / credit card / operator app (connected via backend system) / vehicle for authorization by doing one of the following:

- Tap your user card on the RFID reader (contactless symbol below the screen).
- Tap your credit card on the credit card reader.
- Start your operator app and follow the instructions on your smart device.
- Connect your vehicle to the charging station (plug in charging plug).

Note

Detailed user instructions for the charging process will appear on the charging station’s screen for the chosen authentication medium and charging cable.

Figure 5: Authentication

Figure 6: Position of RFID reader

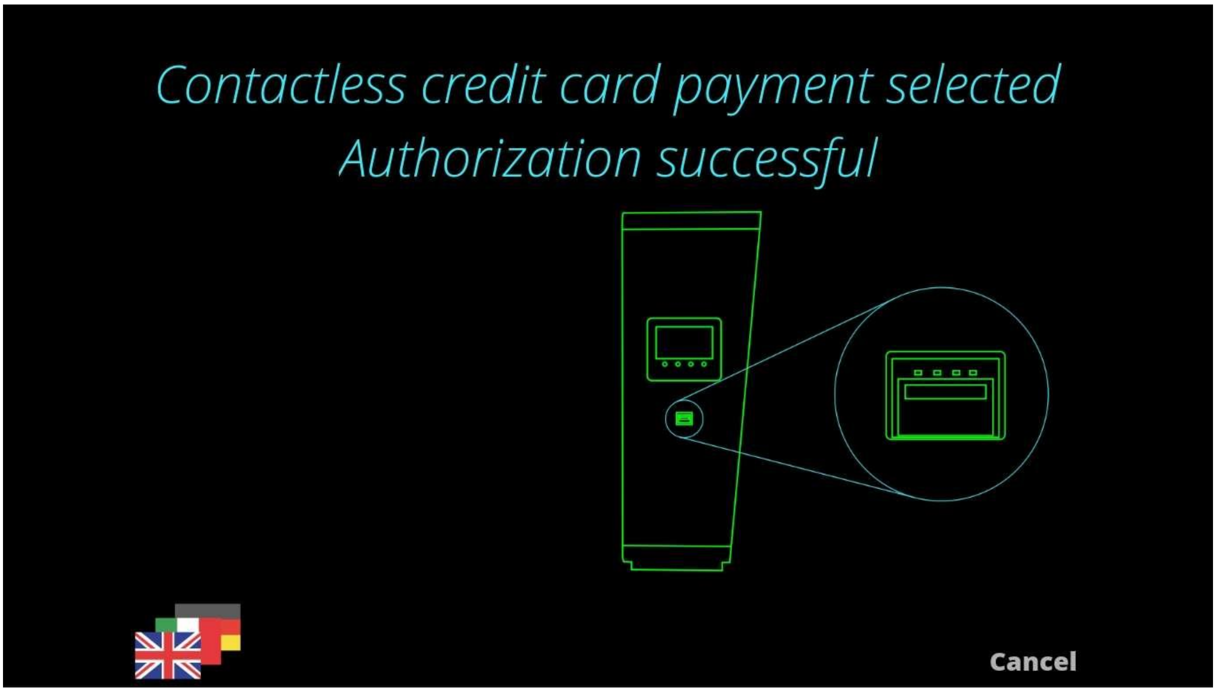


Figure 7: Position of credit card terminal

Note

If the charging station runs in the so-called kiosk mode, no authentication is necessary. In this case you can directly start a new charging process by pressing the buttons below the new session label on the screen.

Figure 8: Kiosk Mode

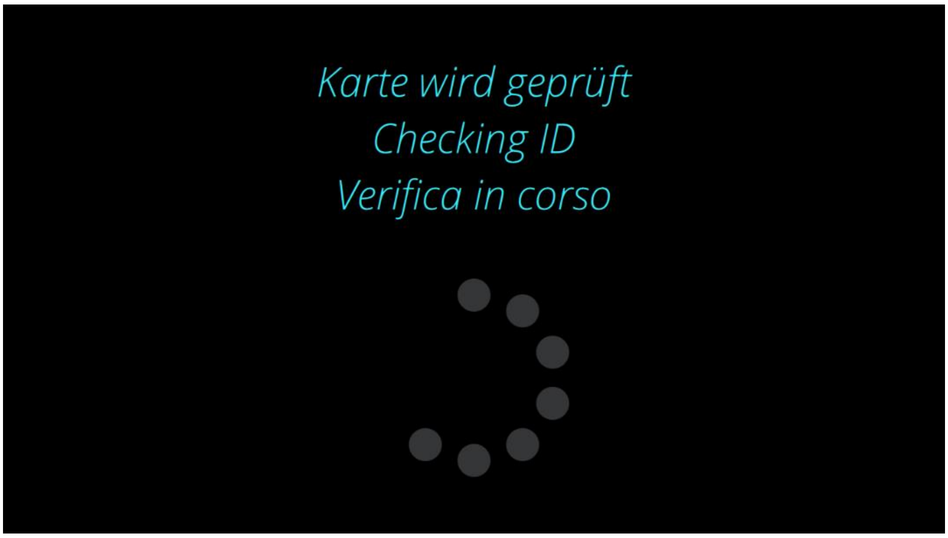


Figure 9: Checking ID

2.3. Select the charging plug

Please select the charging plug with which you would like to charge your electric vehicle. You can navigate in the menu by pressing the four buttons below the display window.

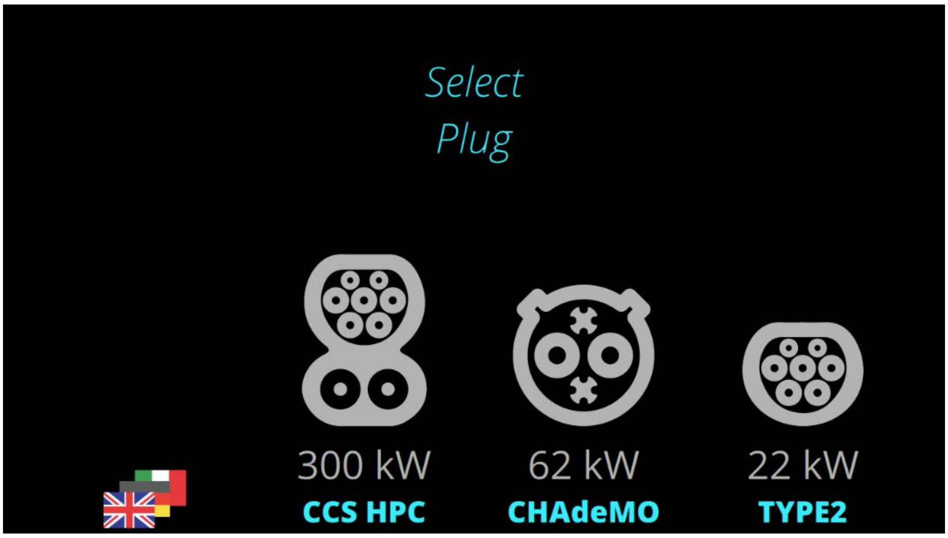


Figure 10: Select plug

Figure 11: Buttons for navigation

Note

Depending on the configuration of the charging station, other symbols may be displayed, as other charging plugs are installed.

"HPC" refers to a liquid-cooled charging cable.

If you want to change the language, press the button on the far left. You will then be taken to the language selection.

Figure 12: Language selection

2.4. Connect the plug

After you have selected the plug type, the display will ask you to connect the appropriate charging cable. Connect the charger cable, which begins to flash blue, to the socket provided on your vehicle.

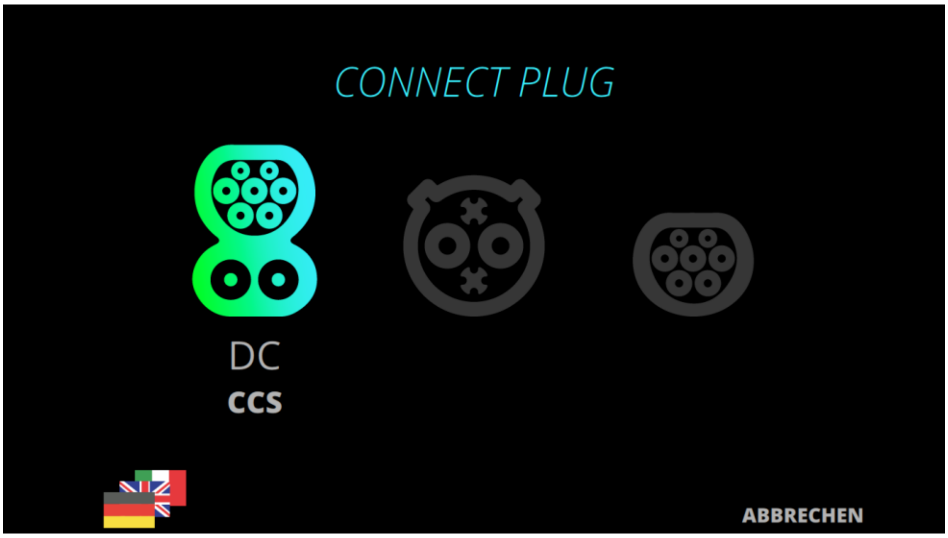


Figure 13: Plug connection

Note

When using CHAdeMO cables, make sure that they engage correctly.

3. During the charging process

3.1. Charging overview

Now an overlay of the active charging process appears.

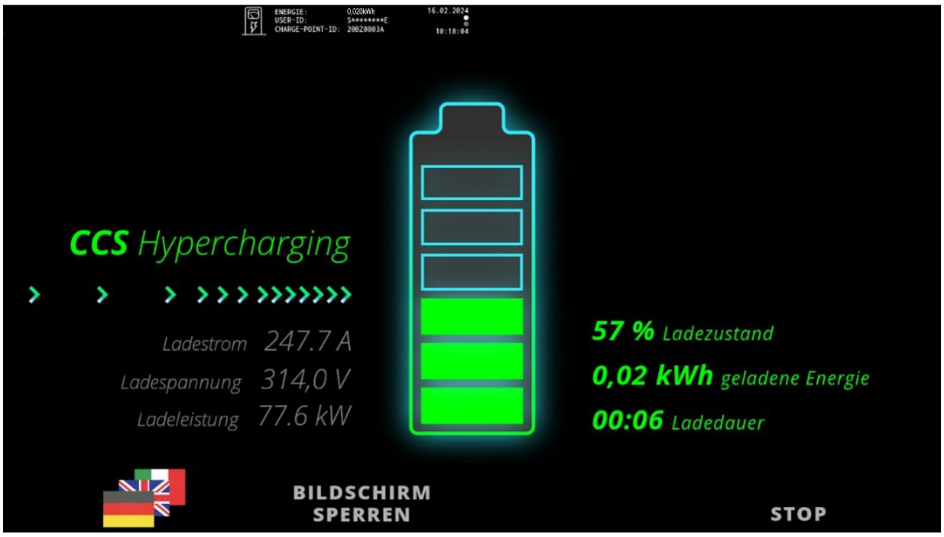


Figure 14: Charging overview

On the left half of the screen you will find information about the charging current, the voltage and the resulting charging power.

On the right half of the screen you can see the current state of charge (SoC) and the energy and charging time already charged as well as the estimated time until you reach the bulk SoC (80%) or full SoC (100%).

In the upper area you can see the overlay to the German calibration law, which is described in chapter 4.3.

If two vehicles are charged simultaneously, the overlay is displayed as follows.

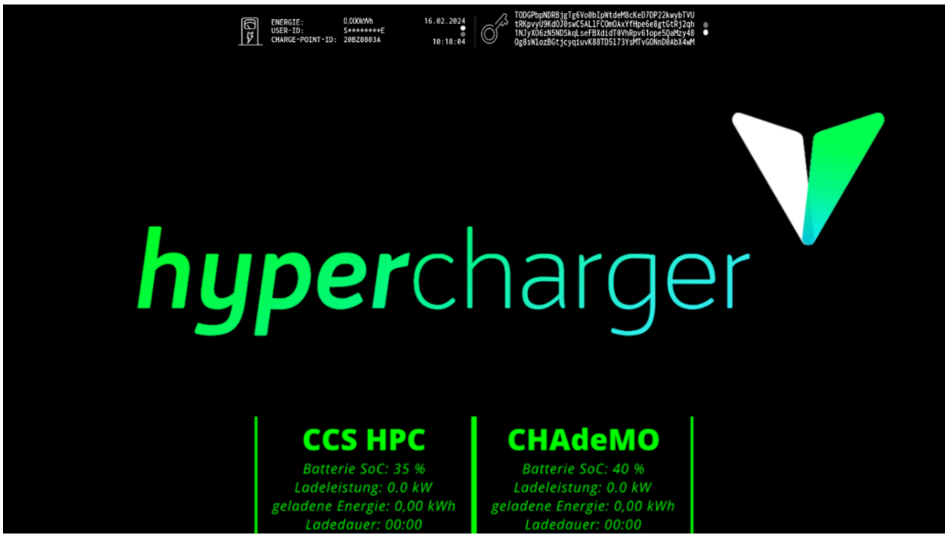


Figure 15: Charge overview with two active charging processes

Note

Please note that the display may vary from operator to operator. Some operators hide this information. In this case you can check the SoC inside your vehicle.

4. Terminate charging session

4.1. Leaving screen saving mode

After a certain time the screen saver of the display is activated. To leave this mode, hold your user card again against the RFID reader (see chapter 2.2)

4.2. Charging stop

You can terminate the ongoing charging session at any time by pressing the Stop button at the bottom of the overlay.

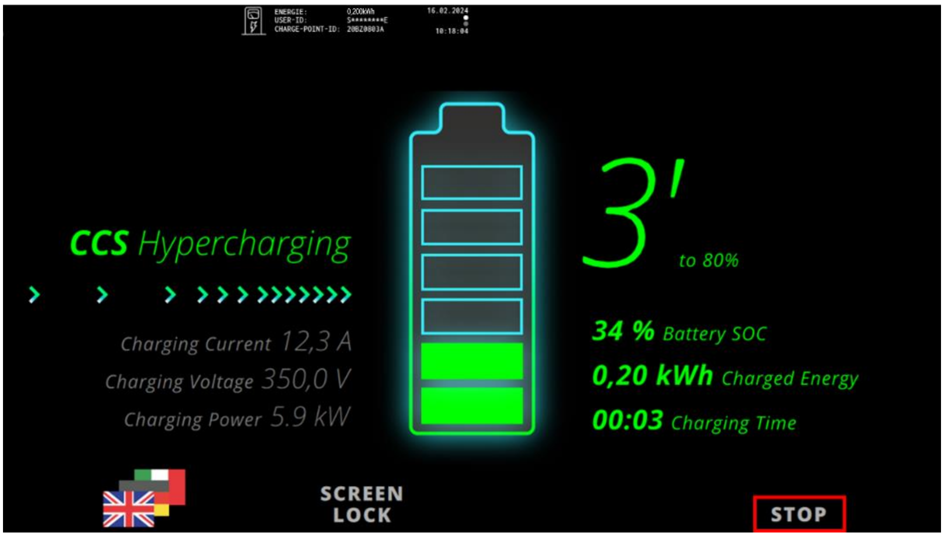


Figure 16: Charging stop

Once you've pressed the button, you need to unplug the charging cable from your car. Please reconnect it properly to the cable plug holder of the charging station.

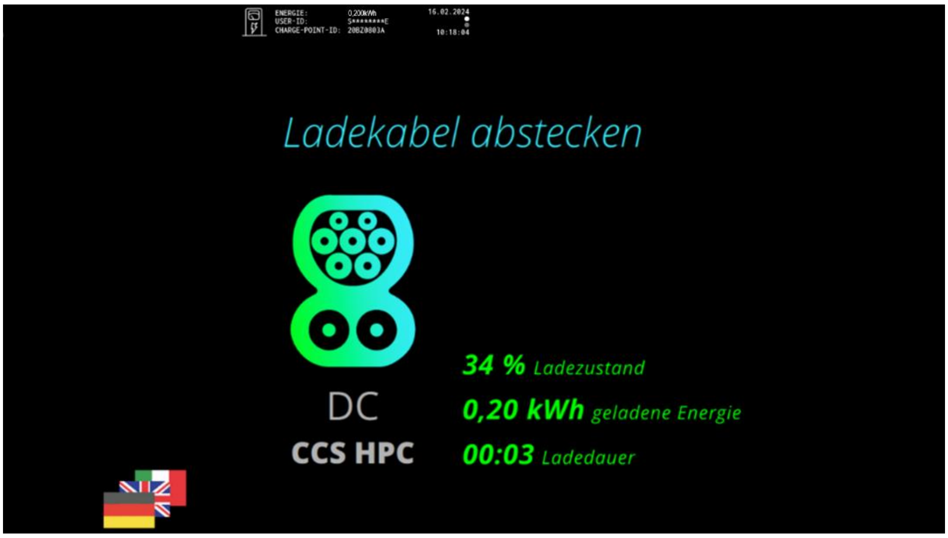


Figure 17: Disconnect Plug

4.3. Write down Public Key (German calibration law)

In Germany, the billing of EV-charging is regulated by the Measurement and Calibration Act (MessEG). The hypercharger ultra-fast charging system is in conformity with this law. The law guarantees consumption-based cost accounting for the charging of electric vehicles, i.e. users are only charged for exactly the amount of power they actually take. **The charging station can thus be used for billing by the kWh in accordance with German calibration law.**

After the charging process is completed, the charging station generates a digitally signed data record from the start and end values, which enables the often time-delayed invoice to be checked afterwards. This signature confirms that the measured values were collected in conformity with German calibration law.

In the upper part of the screen all relevant information is displayed (see Figure 14 and Figure 15). Two “pages” of the overlay are shown alternately, switching every 10/5 seconds. Once the charging process is complete, the overlay remains on the display until the charging cable is disconnected (however, at least for five seconds).

The “charging data” overlay shows the following information:

- ENERGY: Energy used in kWh
- USER ID: Identification number of the authentication medium. For reasons of data protection, only the first and last digits are displayed in plain characters.
- CHARGE POINT ID: ID of the charging station. The letter Y at the end is a placeholder for the charging interface number (e.g., charging cable 2).
- Date and time of the charging process.

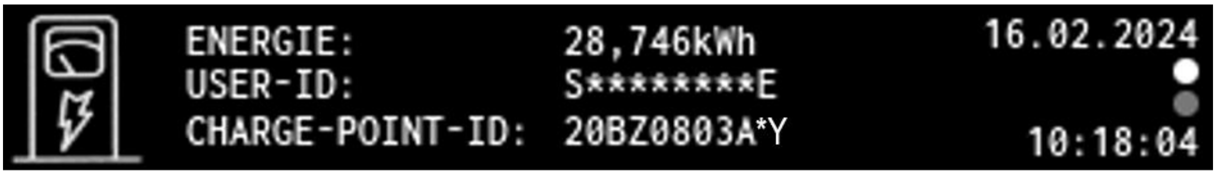


Figure 18: Charging data overlay

The “public key” overlay shows the public key of the AC adapter or DC meter. You should note this down so that you can check the readings later on.

Figure 19: Public key overlay

In the case of an error, a third overlay is activated:

Figure 20: Error overlay

You can check the charging session with a so-called transparency software. As part of the S.A.F.E. initiative[1], a manufacturer-independent transparency software has been developed for electromobility. With this application, you can carry out the signature checks for digital measured values in conformity with calibration law.

The transparency software is currently only available as a desktop version[2] and can be downloaded together with the operating instructions from the S.A.F.E. website: https://www.safe-ev.de/de/transparenzsoftware.php

[1] The S.A.F.E. initiative is an association of various German and international manufacturers, charging station operators and mobility service providers with the aim of achieving a uniform solution for ensuring legal compliance with German calibration law. You can find more information on https://www.safe-ev.de/en/.
[2] The currently permissible and certified version of the transparency software by the S.A.F.E. initiative is version 1.0 (as of 1 June 2021).

5. Error messages

5.1. Authorization failed

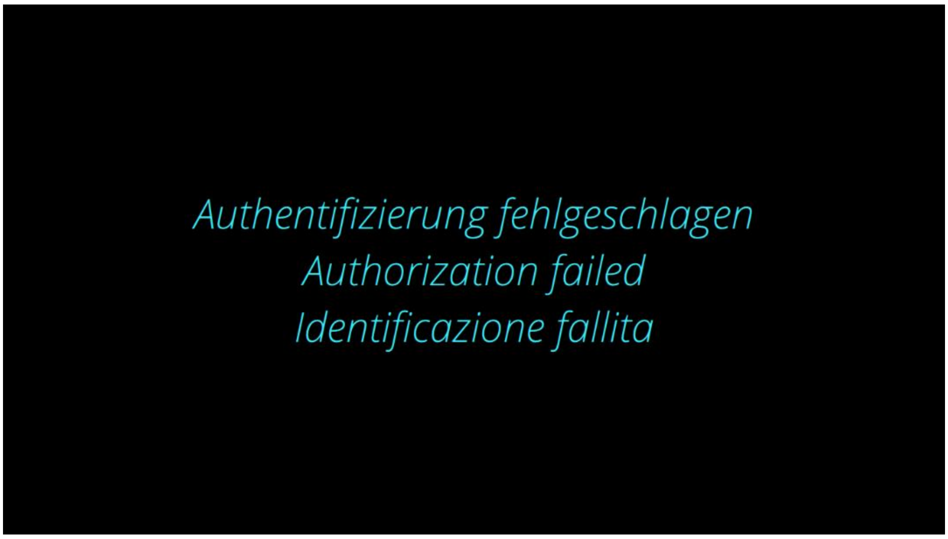


Figure 21: Authorization failed

If this error message appears, retry to hold your card against the RFID reader.

5.2. No connector available

Figure 22: No connector available

All charging points are currently occupied. Please wait until a charging plug becomes free again.

5.3. Connector damaged

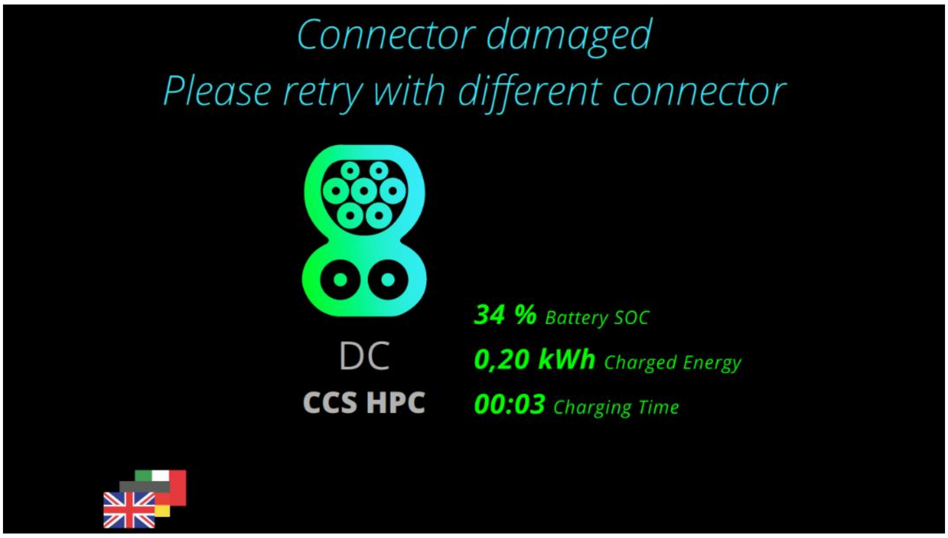


Figure 23: Connector damaged

If this message appears, the operator is already informed about the defect and will correct the fault as soon as possible. In the meantime, switch to another charging plug (if possible).

5.4. Communication error with vehicle

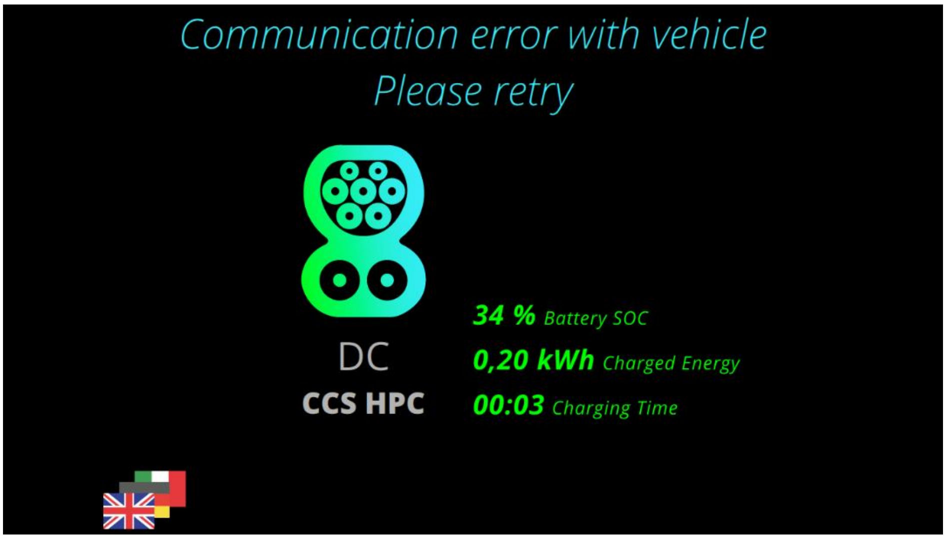


Figure 24: Communication error

The vehicle was not able to establish a connection to the charging station. Retry to start a charging session on the charger. It that won't help, try to move the car forward and backwards a little, in order to wake it up from a possible Standby.

5.5. Failed to lock connector

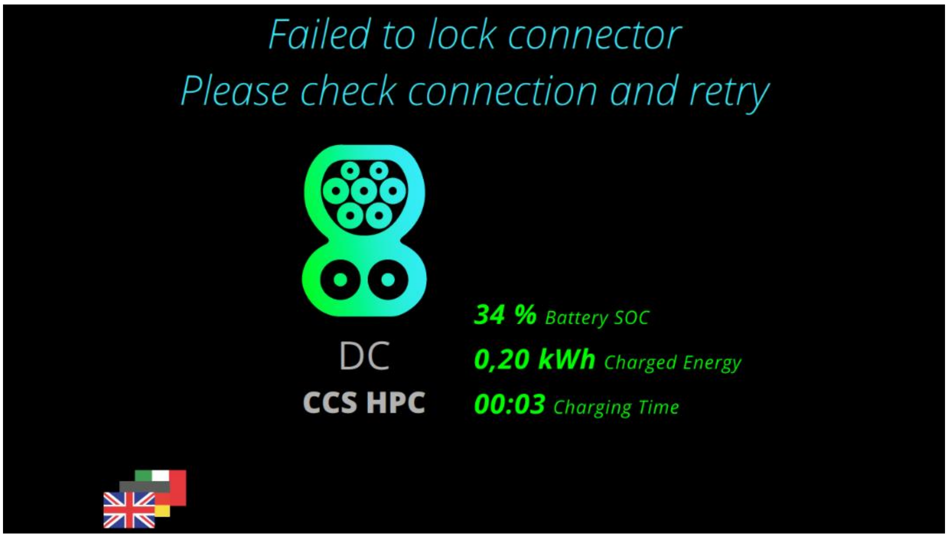


Figure 25: Failed to lock connector

In this case the connector could not be locked correctly by the car. Hold the cable in the socket until you can hear the locking mechanism of the car and the charging process is starting.

5.6. The car signalized an error

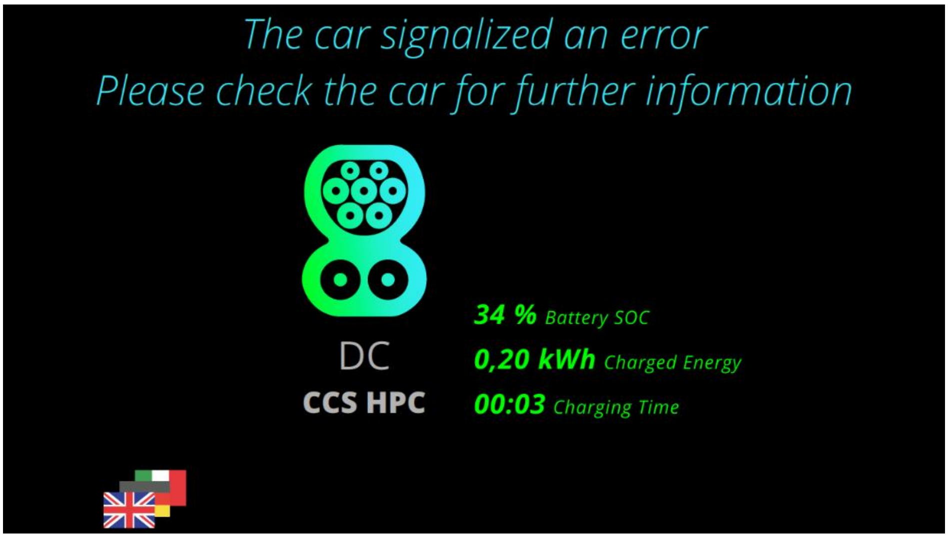


Figure 26: Vehicle Error

The car signalizes a charging error. Retry to start a charging session, otherwise try to move the car forward and backwards a little, in order to wake it up from a possible Standby.

5.7. Emergency Stop

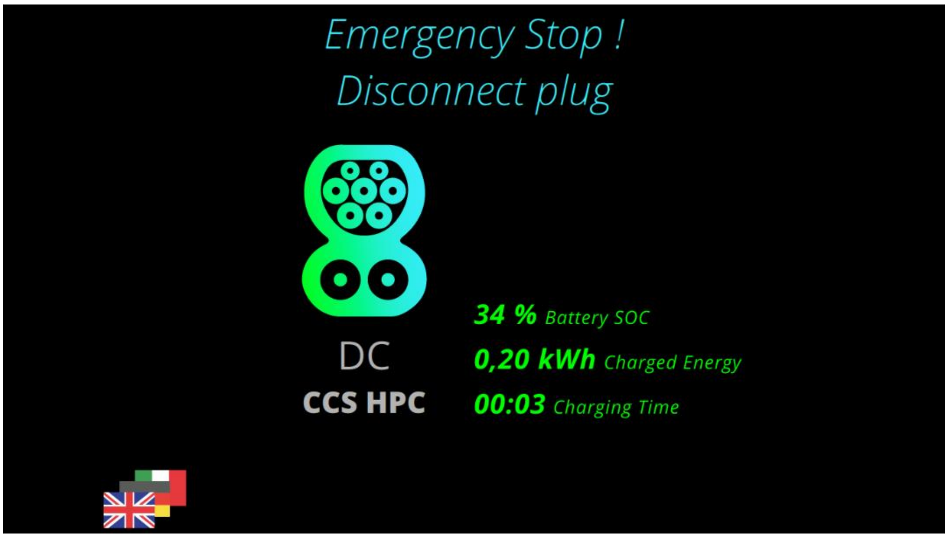


Figure 27: Emergency Stop

Emergency button was pressed. Try to unlock the emergency button and to restart a charging session.

5.8. Charging station temporarily unavailable

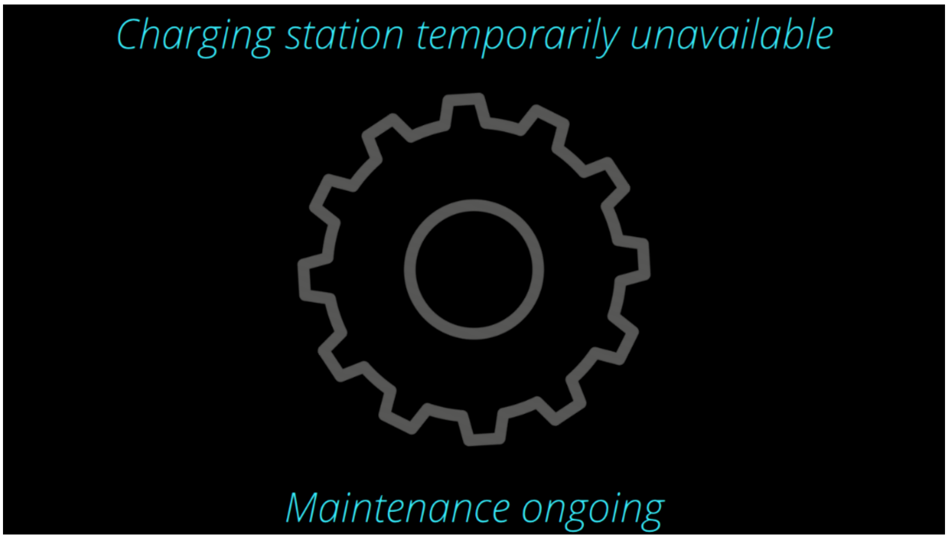


Figure 28: Maintenance ongoing

A software update is being carried out and you will have to wait a little until the charging station is available again. Please do not switch off the station!

Note

For further questions and problems please contact the charging station operator!

S.A.F.E. End User Manual
Transparency Software 1.1.0

In this documentation you will find all relevant information required for the use of the S.A.F.E. transparency software. Please read the instructions carefully before using the software for the first time.

1. Access to the transparency software

1.1. System requirements

To operate the transparency software, your system must meet at least the following system requirements:

A Java Runtime or the Java Development Kit (JDK) of version 16 or higher must be installed. This software may already be installed on the PC. If not, a version can be downloaded here: https://jdk.java.net/16/

At least 50 MB of free memory (RAM) is required to run the software.

The other system requirements can be found on the OpenJDK or Oracle website https://jdk.java.net or https://www.oracle.com/java/.

1.2. Downloading the S.A.F.E. transparency software

The transparency software is a computer application that can be operated on a stationary or mobile PC system. The application is also based on Java, which requires Java to be installed on the PC system.

For installation and set-up of the application, please proceed as follows:

1. Download the latest version of the transparency software to your computer, and unzip it into a folder of your choice.
   https://www.safe-ev.de/en/transparency_software.php
2. Make sure that Java is installed in a current version. If you cannot start the transparency software, Java is probably not installed.
3. Open the transparency software with a double click.

2. Creating the data tuple in the recharging point

During a charging procedure at publicly accessible recharging point, different values/attributes are recorded that are required for staggered invoicing. In addition to date and energy meter information, these data consist primarily of the Contract ID/Session ID/Transaction ID, which uniquely links an invoice recipient to the measured values. These values are combined into a so-called data tuple. The current requirements for the content of a data tuple in the sense of the German Measures and Verification Act are currently defined in REA document 6 A of the PTB (Physikalisch-Technische Bundesanstalt, the National Metrology Institute of Germany).

https://oar.ptb.de/files/download/58d8ffad4c9184f55a2f94e3

The data tuples are created in the recharging point in compliance with calibration law and transferred to a billing server via OCPP. This is where the long-term storage of user data and invoicing of the recharging point user are performed by a Mobility Service Provider (MSP). The invoice recipient receives access to this data tuple in the invoicing procedure.

The data tuples are digitally signed so that no changes/manipulations of the attributes recorded in compliance with the calibration law occur when transferring the data tuples from the recharging point to the billing server and from there to the recharging point user for invoicing. With the public signature key of the data tuple, the user has the option of checking the signature for authenticity. If attributes have been changed or falsified, then no positive signature verification can occur – transparency is thus created between the logging and invoice. User-friendly signature verification is the purpose of the transparency software, and the procedure for this is presented here.

3. **Access to public key data tuple**

To be able to check digitally signed data tuples, you need the following information:

- Digitally signed data tuple (as hexadecimal code or file)
- Public key of the recharging point

Public keys are numerical sequences printed on measuring devices that are relevant to calibration law and are assigned uniquely for each recharging point. They enable recharging point users to check the correctness of remotely read measured values. The public key may be part of the digitally signed data tuple provided to you by your EMP. If the public key is not included in the data tuple, you can gain access through the following means:

- From the labelling of the recharging point (on site)
- Directly from the corresponding MSP
- From the PKI database of the Bundesnetzagentur (Federal Network Agency): https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/E-Mobilitaet/Ladesaeulenkarte/start.html

When performing signature verification in the transparency software, please make sure that you are able to verify the public key of the recharging point and that you trust the source of the key. Public keys printed on the invoice or contained directly in the data tuple may not be correct and must be checked again by the user for a match.

4. Checking the data tuple

4.1. User interface of Transparency Software 1.1.0

The following interface appears when opening the Transparency Software 1.1.0 application – initially without data tuple content.

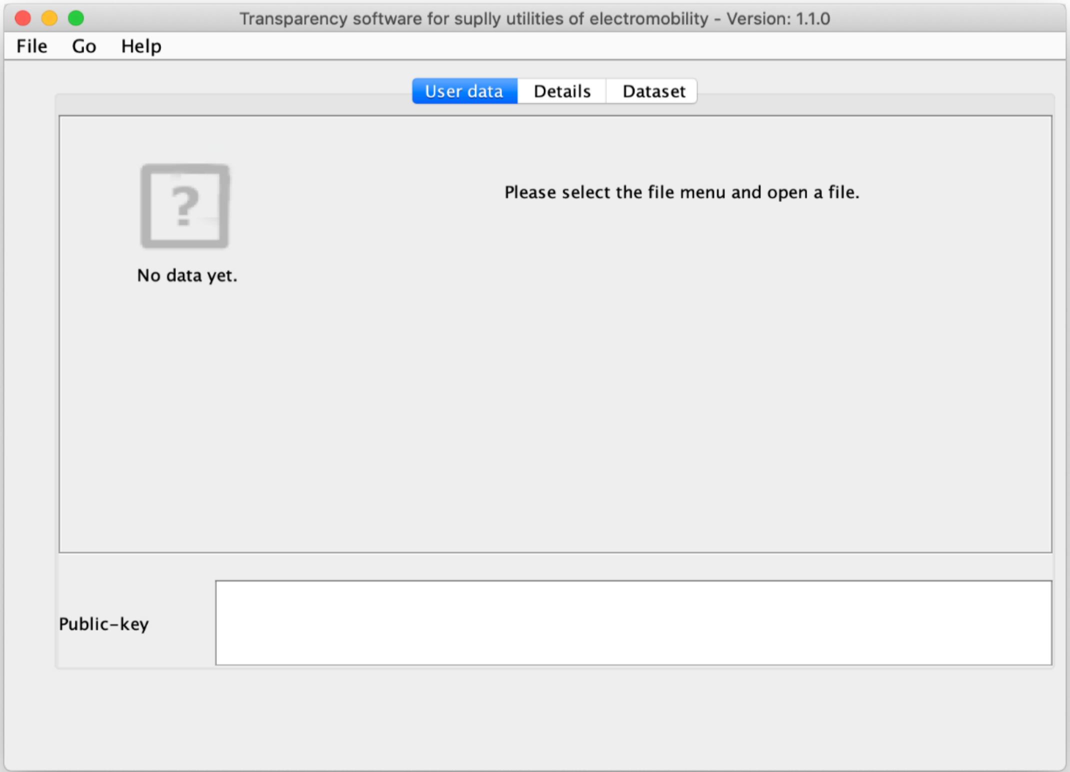


Figure 4.1.1: Transparency software interface without data tuple content

The File menu offers the option of either opening a saved file or manually entering the dataset values in hexadecimal form to perform the check:

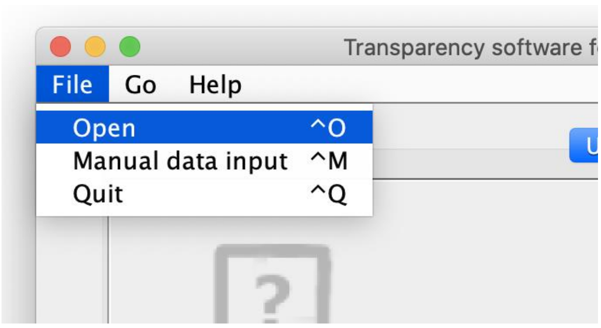


Figure 4.1.2.: Data entry in the transparency software.

With the subsequent display of the measurement data, the invoice items can then be compared – transparency is established.

4.2. Loading a data tuple from a saved file

Select File ➞ Open [Ctrl + O] to load the XML file or Porsche Charging Data file previously saved on the PC. If the live medium is used, external drives such as USB sticks are listed in the directory /run/media/root. This is the default directory that is displayed on launch.

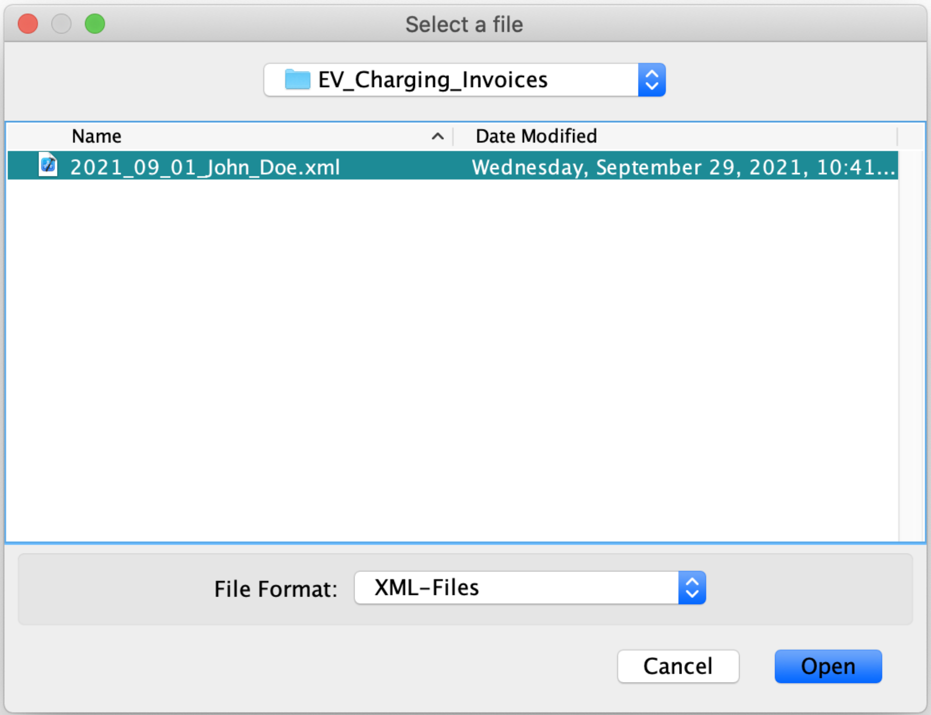


Figure 4.2.1.: Dialogue window for opening a file.

After opening the file, the following view appears:

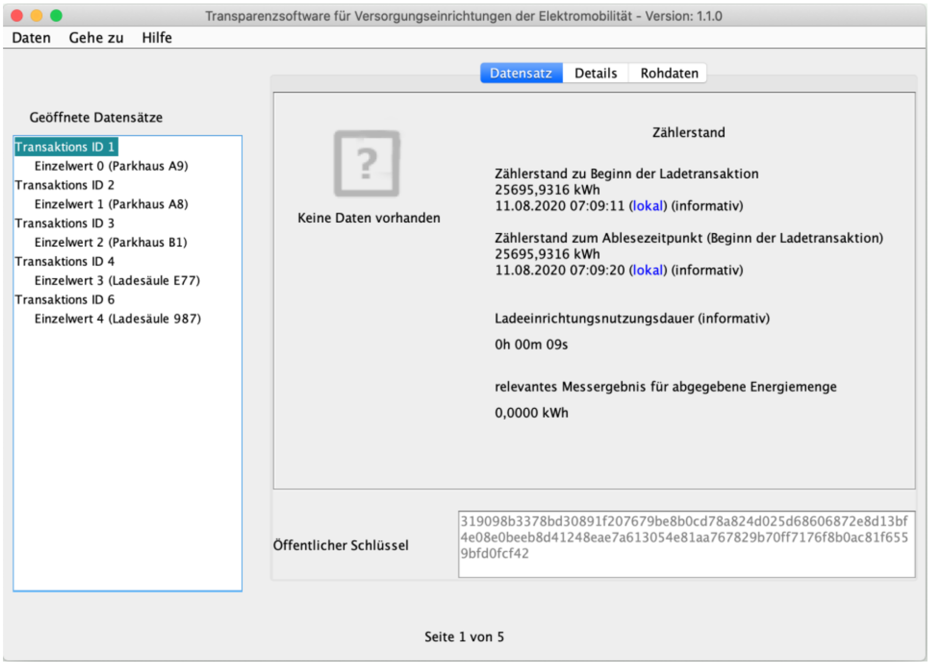


Figure 4.2.2.: Transparency software interface with open XML datasets (left).

The content of the dataset for the first transaction as well as the public key are already presented to the user unchecked. The Transaction ID/Contract ID/Session ID enables the charging procedure in the data tuple to be uniquely associated with a charging location, charging date and invoice recipient. This ID is displayed to the invoice recipient next to the corresponding invoice item and can then be selected accordingly in the single value display in the left column of the user interface. Upon selection, the transparency software carries out the signature verification directly. Figure 4.2.3. illustrates with a green tick that the verification was successful. The attributes of the data tuple are still in the state as originally signed on the recharging point, and the signing took place in conformity with the German Measures and Verification Act.

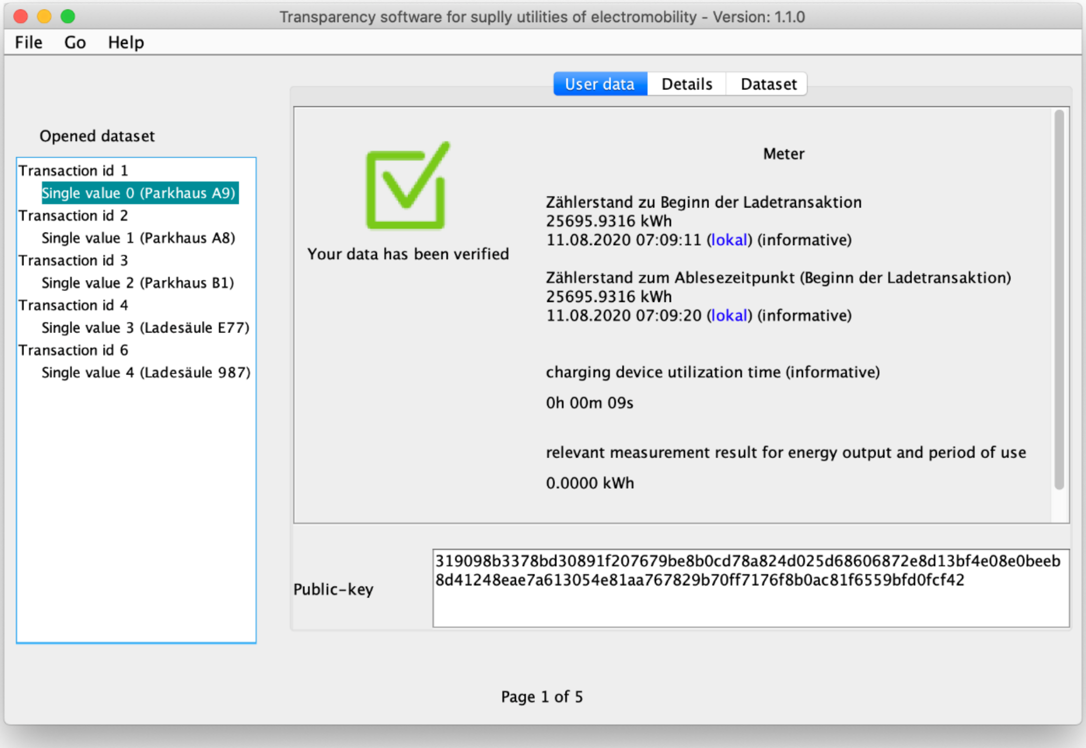


Figure 4.2.3.: Transparency software interface with open XML datasets (left).

The content of the hexadecimal data tuple is translated and shown to the user as the information relevant to the charging procedure, such as start/end time or quantity of the charging session. This information naturally includes the corresponding timestamps for the access time as well as the charging duration. These items can be checked by the user directly against the respective invoice items.

Important: The file may also contain only a single dataset, in which case no multiple selection – left column – is possible, and a signature verification takes place immediately after opening.

Important: There are different data tuple formats on the market, which is why the representation of the content may differ slightly.

Important: The public key of the data tuple can always be checked as a hexadecimal representation – see lower box of the view.

The Details tab allows the user to display additional information about the content of the signed data tuple.

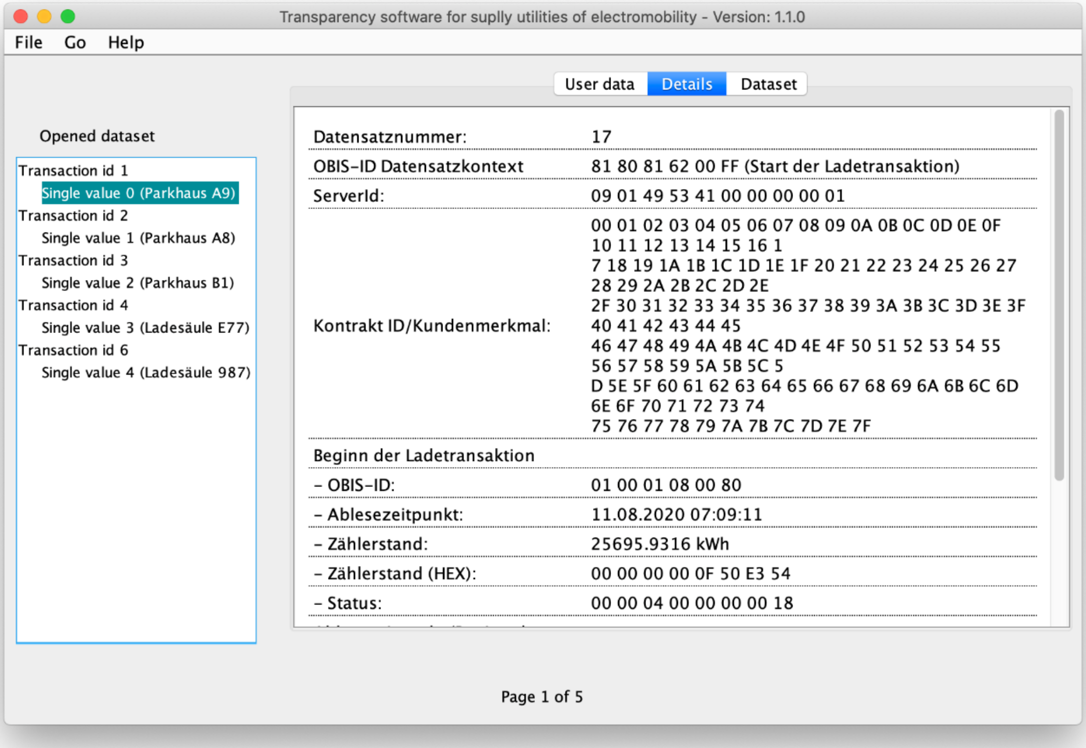


Figure 4.2.4.: Transparency software interface with additional information on the verified dataset.

The Dataset tab again displays the hexadecimal representation of the data tuple as a complete string.

4.3. Data tuple entry via manual input

File → Manual data input [Ctrl + M] opens a dialogue window.

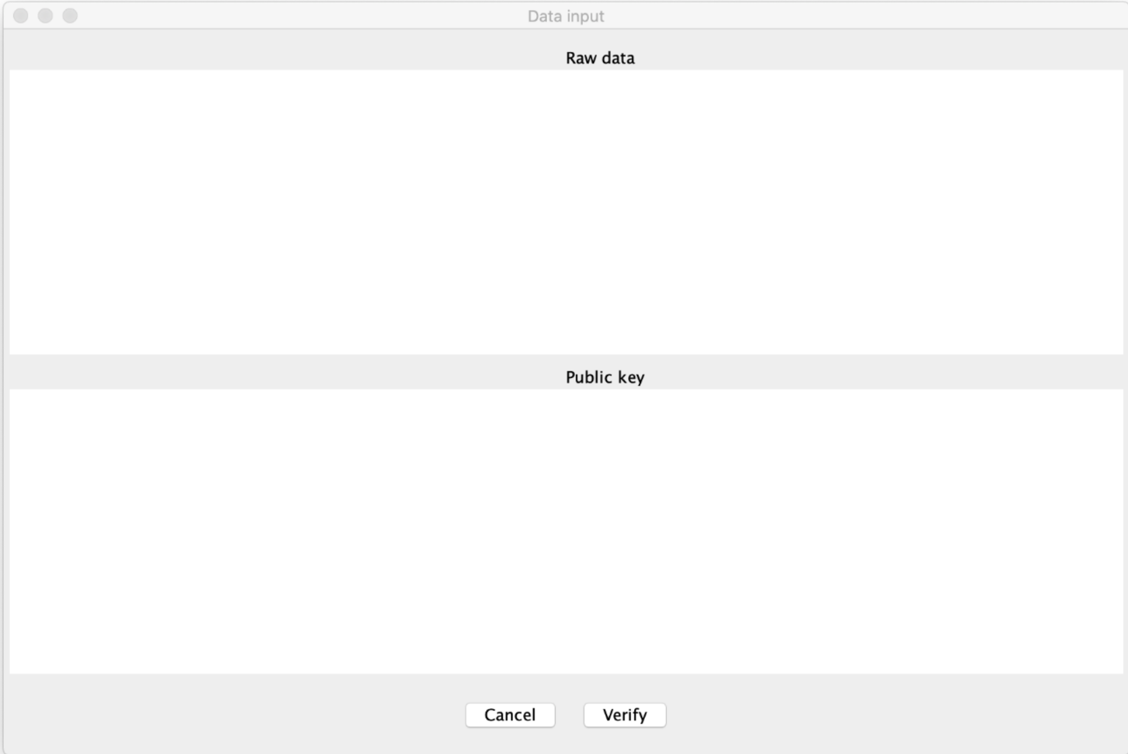


Figure 4.3.1: Dialogue window for manual data input – without data.

The hexadecimal values for the data tuple can now be entered with the copy/paste function under "Raw data" and "Public key".

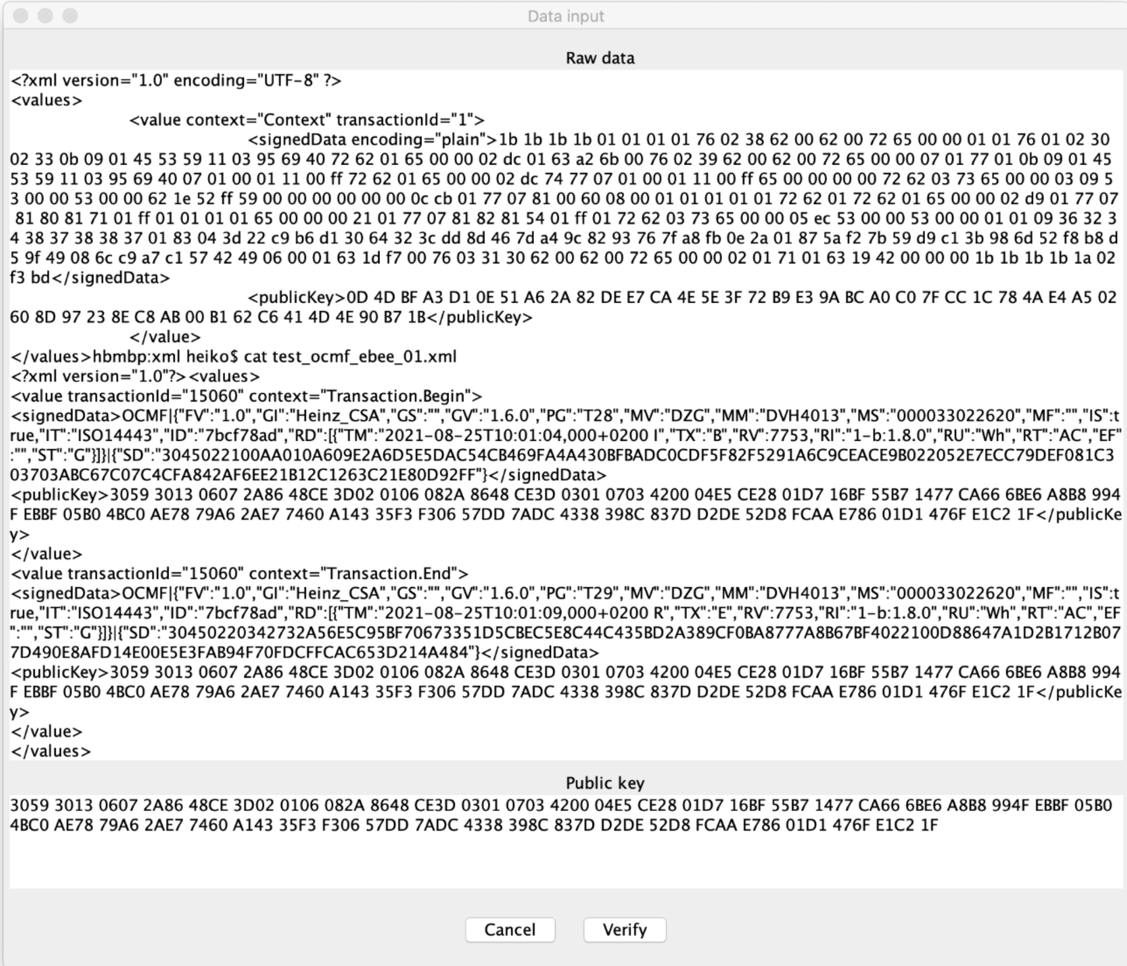


Figure 4.3.2.: Dialogue window for manual data input – with data.

Clicking on Verify now initiates a signature verification and display of the translated signed data tuple – see Chapter 4.2.

4.4. Error messages in the transparency software

If there are errors in the imported data, an error code and an error message with a red background are displayed. This basically means that an error occurred in the signed measurement data or the signature, and no transparent invoice verification is possible. The error message is always displayed in the same place on all three tabs.

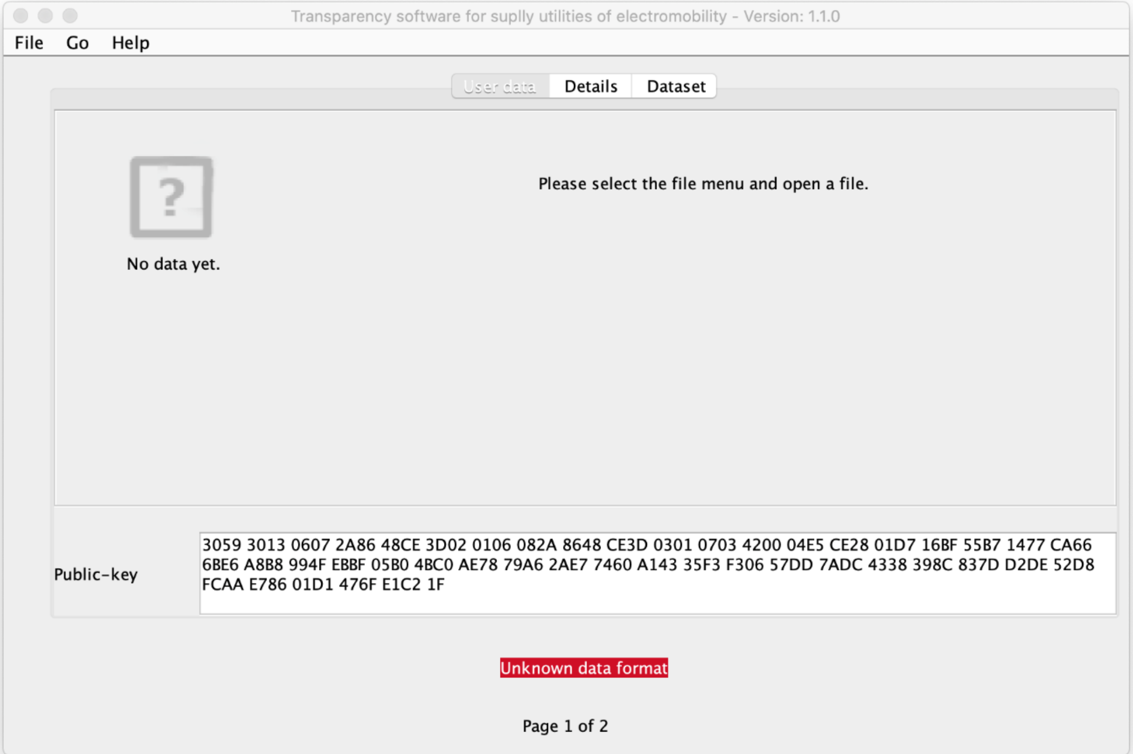
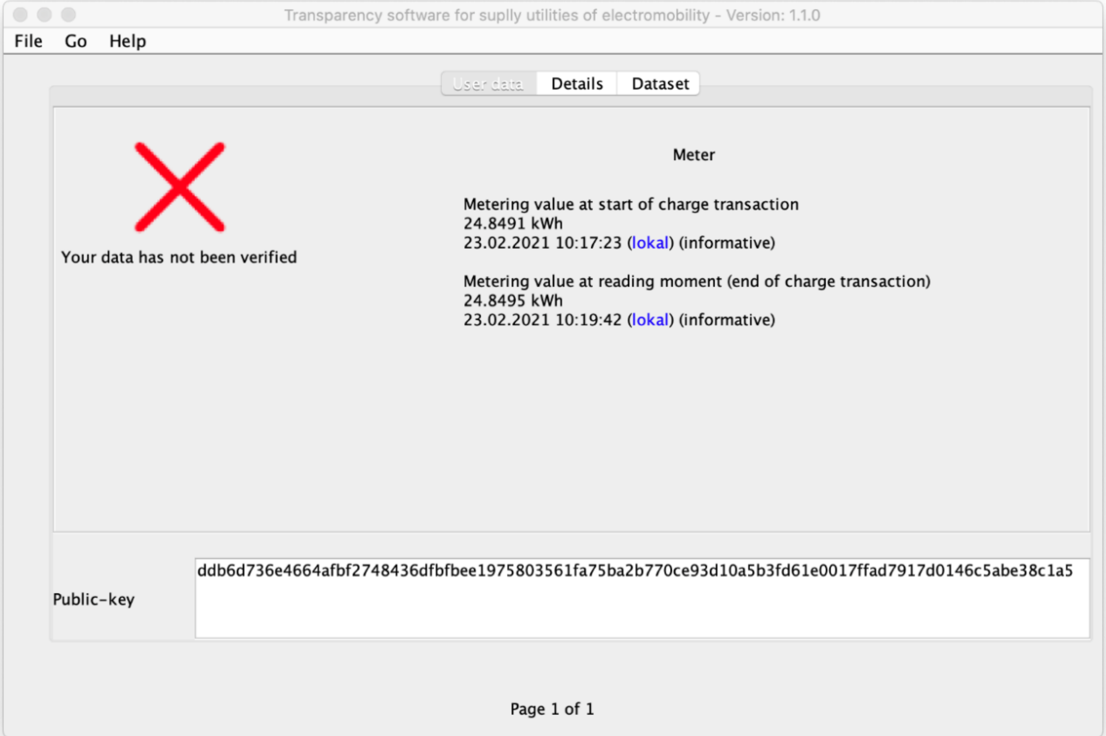


Figure 4.4.: Display of error messages in the transparency software interface.

If the signature could not be verified because of an incorrect key or changed data, a red X and the error "Your data has not been verified" is displayed instead of the green tick:



Important: In this case, contact your EMP (biller) immediately and state the error code in the communication. The matter will then be clarified by a clearing office.

4.5. Additional functions of the transparency software

Version information can be called up with the menu item "Help / About". There you can see which version of the software is currently being used, a checksum (SHA-256) for the software and a list of various libraries used in the software.

The functions "Go / Next entry" (or Ctrl + N) and "Previous entry" (or Ctrl + P) can be used to switch between different transactions if the file or data contains multiple transactions. If no list or tree structure with transactions is displayed on the right-hand side, only one transaction is included and the functions for switching are not activated.

The menu item "Help / Help" offers a link to the website of the S.A.F.E. Association.

The programme can be terminated with the menu item "File / Quit".

List of error codes:

Error code	Error text
Error 1101	Invalid length for Alfen datasets
Error 1102	Invalid data in Alfen format
Error 1201	Output file %s cannot be created
Error 1202	Output file %s could not be written
Error 1203	Error when creating output format
Error 1301	Invalid base 32 data
Error 1302	Invalid base 64 data
Error 1303	Invalid hex data
Error 1304	Unknown encoding type
Error 1305	Unknown data format
Error 1306	The input data is not a valid XML format
Error 1307	Invalid curve name
Error 1308	Input parameters could not be read
Error 1309	Invalid embedded public key
Error 1310	Invalid public key
Error 1311	Invalid signature data length
Error 1401	No input file was specified
Error 1402	No public key could be found to verify the data (this can also occur when data cannot be read)
Error 1403	Invalid signature algorithm for OCMF

Error 1404	Invalid OCMF version
Error 1405	Invalid data in OCMF format
Error 1204	Output file cannot be created because it already exists.
Error 1406	User data could not be parsed
Error 1407	The specified path does not point to a file
Error 1501	The file cannot be read
Error 1502	PCDF invalid, signature missing
Error 1503	Settlement not allowed
Error 1504	Charging meter is invalid
Error 1505	Charging duration is invalid
Error 1506	Consumption data are invalid
Error 1507	Missing fields in the data tuple
Error 1508	Invalid DCMeter type
Error 1509	Data tuple does not contain an end marker
Error 1510	<ETX> missing
Error 1511	Formatting of charging data is incorrect
Error 1512	Hardware serial number has an incorrect length
Error 1513	Incorrect OBIS code
Error 1514	Charging ID is invalid
Error 1515	Charging ID length is invalid
Error 1516	Software checksum has an incorrect length
Error 1517	Settlement not allowed

Error 1518	<STX> missing
Error 1519	Corrupt time information
Error 1520	Time information length is invalid
Error 1521	Time signal is invalid
Error 1522	PCDF signature invalid
Error 1601	The SML data is not complete for a check
Error 1602	Invalid unit for measured value in SML dataset
Error 1603	An invalid value was passed as server ID
Error 1604	Invalid signature in XML file
Error 1605	No measured values were transferred in XML
Error 1606	No timestamp was indicated in the measured value
Error 1607	No timestamp was indicated in the measured value
Error 1608	Invalid SML, missing customer ID
Error 1609	Invalid SML, missing logbook entry index
Error 1610	Invalid SML, missing meter reading
Error 1611	Invalid SML, missing OBIS code
Error 1612	Invalid SML, missing pagination
Error 1613	Invalid SML, missing seconds index
Error 1614	Invalid SML, missing server ID
Error 1615	Invalid SML, missing signature
Error 1616	Invalid SML, missing timestamp
Error 1617	Invalid SML, missing timestamp of customer ID

Error 1618	Invalid data in SML format
Error 1701	Unknown encoding
Error 1702	Validation error when processing the data
Error 1703	The data entered does not contain a public key
Error 1704	The data entered does not contain signed data
Error 1705	Transaction start value does not contain any measured values
Error 1706	Transaction does not contain a start value
Error 1707	Transaction stop value does not contain any measured values
Error 1708	Transaction does not contain a stop value
Error 1709	The selected file does not contain any value fields
Error 1710	The specified public key cannot be decoded
Error 1711	The specified public key does not contain any data
Error 1712	The specified public key is in an unknown format
Error 1713	The specified signature cannot be decoded
Error 1714	The specified signed data does not contain any information
Error 1715	The specified signed data contains an unknown encoding format
Error 1716	The specified signed data contains an unknown format
Error 1717	Transaction contains more than one start value
Error 1718	Transaction contains more than one stop value
Error 1719	Data could not be verified
Error 1720	The Mennekes input format could not be transformed.