USER MANUAL

ABB Terra HP user manual
High power EV charging system
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Glossary

**AC**
Alternating Current.

**CCS**
Combined Charging System, also referred to as “Combo”. DC fast charging method for electric vehicles.

**CHAdeMO**
DC fast charging method for electric vehicles.

**DC**
Direct Current.

**EV**
Electric Vehicle.

**HMI**
Human Machine Interface: the screen on the charger.

**Owner**
The legal owner of the charger.

**OCPP**
Open Charge Point Protocol. Open standard for communication with charge stations.

**PE**
Protective Earth: ground connection for safety and functional purposes.

**RCBO**
Residual-current Circuit Breaker with Overload protection. Breaks the connection if a residual current or overload is detected.

**RCD**
Residual Current Device. Breaks the connection if a residual current is detected.

**RFID**
Radio-Frequency Identification is a communication technology utilizing radio frequency electromagnetic waves to transfer data over a very short distance between the reader and an electronic tag or card.

**Site operator**
Person or company that controls the charge station. The site operator could be the owner, but not necessarily.

**User**
The driver of an EV who uses the charge station.
1. Introduction

1.1. Preface

This manual describes the general usage and daily operation instructions of the Terra HP charging station. Terra HP is a modular high power DC charging system with high output current capability, supporting both 400 VDC and 800 VDC vehicles. A single power cabinet system can deliver up to 375 A and 160 kW continuously, and 175 kW peak. With two power cabinets the system delivers up to 500 A and 350 kW.

1.2. Intended use of this document

This document serves:
- As a reference for site operators who are responsible for the charger’s operation on site, performing daily inspection and maintenance activities and who are able to perform simple trouble shooting activities, after instruction of a certified ABB technician.
- As a reference to the operator’s customers, the EV drivers who will mainly use the pictograms and texts on the display of the charger. The user interface design was thoroughly evaluated with user groups to optimize understandability and to get the best user experience. Besides the screens needed for the charging process, the interface has help screens available to provide additional information.

1.3. Intended use of the charger

A Terra HP system consists of at least one power cabinet and one charge post. The outlets of the charge post are solely used to charge electric vehicles that are compatible with the supported charging standards.

1.4. Owner responsibilities

The owner and site operator are required:
- To prepare the site where the charge station will be installed, according to the requirements described in this guide.
- To make sure that there is enough space around the charger to carry out maintenance work.
- To make sure all protective devices are correctly installed after carrying out installation or maintenance.
- To operate the charge station with the protective devices installed.
- To write an emergency plan that instructs people what to do in case of emergency.
- To appoint a person responsible for the safe operation of the charge station and for the coordination of all work. This person should be properly instructed by ABB or an ABB trained service partner.

The owner is cautioned that changes or modifications not expressly approved by ABB could void the owner’s authority to operate the equipment or ABB’s warranty. Neither ABB nor its affiliates shall be liable to the purchaser of this product or third parties for damages, losses, costs or expenses incurred by purchaser or third parties as a result of: an accident, misuse or abuse of this
Notes on measurement accuracy according to the type examination certificate

I. Requirements for the operator of the charging device, which he must meet as a prerequisite for proper operation of the charging device.

The operator of the charging facility is the user of the measuring device within the meaning of Section 31 of the Measurement and Calibration Act.

1. The charging device is only considered to be used as intended and in compliance with calibration law if the meters built into it are not exposed to environmental conditions other than those for which their type examination certificate was issued.

2. When registering the charging points with the Federal Network Agency, the user of this product must also register the PK specified on the charging device for the charging points in its registration form! Without this registration, it is not possible to operate the charging device in compliance with calibration law.

Weblink:

https://www.bundesnetzagentur.de/DE/Sachgebiete/ElektrizitaetundGas/Unternehmen_Institutionen/HandelundVertrieb/Ladesaeulen/Anzeige_Ladepunkte_node.html

3. The user of this product must ensure that the calibration validity periods for the components in the charging device and for the charging device itself are not exceeded.

4. The user must store the signed data packets read from the loading device - in accordance with the pagination, permanently (also) on hardware dedicated to this purpose in his possession ("dedicated memory"), - keep them available for authorized third parties (operational obligation of the memory.) . Permanent means that the data not only have to be stored until the business transaction is completed, but at least until the expiry of the legal deadlines for legal redress for the business transaction. No substitute values may be created for non-existent data for billing purposes.

5. The user of this product must provide users of measured values who receive measured values from this product from him and use them in business transactions with an electronic form of operating instructions approved by the conformity assessment body. The user of this product must in particular point out No. II "Requirements for the user of the measured values from the charging device"
6. The user of this product is obliged to notify according to § 32 MessEG (excerpt): Section 32 Obligation to notify (1) Anyone who uses new or renewed measuring devices must notify the competent authority under state law no later than six weeks after commissioning.

7. Insofar as it is considered necessary by the authorized authorities, the measuring device user must provide the complete content of the dedicated local memory or of the memory at the CPO with all data packets of the accounting period.

II. Requirements for the user of the measured values from the charging device (EMSP)

The user of the measured values must observe Section 33 of the MessEG

§ 33 MessEG (quote)

§ 33 Requirements for using measured values

(1) Values for measured variables may only be specified or used in business or official traffic or for measurements in the public interest if a measuring device was used as intended for their determination and the values can be traced back to the respective measurement result, as far as in the ordinance according to § 41 number 2 nothing else is determined. Other federal regulations that serve comparable protection purposes continue to apply.

(2) Anyone who uses measured values must ensure, within the scope of their possibilities, that the measuring device fulfills the legal requirements and has to be confirmed by the person using the measuring device that they are fulfilling their obligations.

(3) Anyone who uses measured values has

1. to ensure that invoices, insofar as they are based on measured values, can be easily understood by the person for whom the invoices are intended for checking the measured values given and
2. if necessary, provide suitable aids for the purposes mentioned in number 1.

For the user of the measured values, this regulation gives rise to the following specific obligations for the use of measured values in accordance with calibration law:

1. The contract between EMSP and the customer must clearly stipulate that only the delivery of electrical energy and not the duration of the charging service is the subject of the contract.
2. The time stamps on the measured values come from a clock in the charging device that is not certified in accordance with measurement and calibration law. They must therefore not be used to rate the measured values
3. EMSP must ensure that the e-mobility service is sold by means of charging devices that enable the ongoing charging process to be monitored if there is no corresponding local display on the charging device. At least at the beginning and end of a charging session, the measured values must be available to the customer in a trustworthy manner under calibration law.
4. The EMSP must provide the customer with the billing-relevant data packages including signature as a data file at the time of invoicing in such a way that they can be checked for authenticity using the transparency and display software. They can be made available via channels that have not been verified under calibration law.
5. The EMSP must make available to the customer the transparency and display software belonging to the charging device for checking the data packets for integrity.
6. The EMSP must be able to show in a verifiable manner which means of identification was used to initiate the charging process associated with a specific measured value. This means that he must be able to prove for every business transaction and measured value billed that he has correctly assigned the personal identification data. The EMSP has to inform its customers about this obligation in an appropriate form.
7. The EMSP may only use values for billing purposes that are available in any dedicated memory in the charging device and / or the memory of the operator of the charging device. Substitute values may not be created for billing purposes.

8. The EMSP must make appropriate agreements with the operator of the charging facility to ensure that the data packets used for billing purposes are stored for a sufficient length of time in order to be able to complete the associated business transactions.

9. In the event of a justified request for verification, the EMSP has to enable the authentication of the copies of the product belonging to these operating instructions by providing suitable identification means for the purpose of carrying out calibrations, diagnostic tests and usage monitoring measures.

10. All of the above obligations apply to the EMSP as the user of measured values in the sense of Section 33 MessEG even if it obtains the measured values from the charging facilities via a roaming service provider.
Signs

The following signs are used on the equipment and in this manual:

**DANGER**
**Hazardous voltage**
Identifies a hazard that could result in severe injury or death through electrocution.

**WARNING**
**Various**
Identifies a hazard that could result in severe injury or death, as well as damage to the machine, other equipment, and/or environmental pollution.

**WARNING**
**Pinch Hazard**
Identifies a hazard that could result in injuries, in which some body parts are pinched or crushed.

**NOTICE**
Contains remarks, suggestions or advice.

Safety regulations

**WARNING**
If a charge outlet is damaged, take the following steps:
1. Do not use the damaged charge outlet.
2. Contact the owner / site operator.

**WARNING**
**Operation after damage or accidents**
- If there is a fire in or nearby the charger;
- If the charger was immersed in water, or any other fluid;
- If the charger is damaged in any way.
Do not use the charger. Contact the owner / site operator.
CAUTION
Connector locked
Do not apply force to a locked charging cable during charging. This might damage the inlet and locking mechanism in the car or damage the charger.

NOTICE
When connecting or disconnecting a connector
1. Handle cables and connectors with care. Do not drop the cables or connectors. Place them back in their respective holders.
Only insert a connector into a suitable car inlet. Never use excessive force.

CAUTION
No User serviceable parts inside
Do not allow any user to repair or manage the electronics inside.
2. Description of the product

2.1. Charge post overview

A. Antenna.
B. Touchscreen display.
C. RFID card reader with (optional) payment terminal.
D. CCS and/or CHAdeMO connectors, depending on the charge post configuration.
E. Ventilation grill.

2.2. Charge post configurations

The Terra HP charger supports the following DC charging protocols:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>CCS outlet with liquid cooled cable. Up to 375 A and 175 kW with one power cabinet, and up to 500 A and 350 kW with two power cabinets.</td>
</tr>
<tr>
<td>J</td>
<td>CHAdeMO outlet with conventional cable. Up to 125 A or 200 A depending on the cable type.</td>
</tr>
</tbody>
</table>
2.3. System configurations

Static system

In a static system a charge post is paired with one or two power cabinets.

![Static System Diagram]

- **175 kW**
  - 350 A

- **350 kW**
  - 500 A

Dynamic DC

With unique ABB Dynamic DC power sharing technology two charge posts can be powered by just two instead of four power cabinets, whereby available power is dynamically shared between the charge posts. This is a cost effective solution for sites with multiple charge posts.

Please note that Dynamic DC is only supported on Terra HP175D power cabinets, whereby the D indicates suitability for Dynamic DC.

![Dynamic DC Diagram]

- **350 kWp**
  - high-end car

- **175 kWp**
  - normal cars

- **175 kWp**
  - high-end car

- **350 kWp**
  - high-end car
2.4. Authorization to charge

Operation of the charger is possible with or without authorization. The authorization to charge can be based on RFID or credit card payment methods. Operating a charger with authorization requires a subscription to a back office. Authorization can either be an ABB supplied standard solution, or from an external company offering authorization solutions via OCPP.

2.5. Payment terminal

Optionally the charge post can be equipped with a payment terminal. This is a field-installable option. ABB offers multiple models with multiple payment service providers / acquirers. The EV driver is guided in the use of a payment terminal via the touchscreen display and payment terminal display.

2.6. Energy Meter Readout

For the German market, charge post is equipped with energy metering relating to Deutsche Messe EV regulation for the measuring device calibration law. This is a field-installable upgrade.

A. Hour [hh:mm:ss]
B. Data [YY-MM-DD]
C. DC Energy delivered [kWh]
3. Charging

To charge an electric vehicle (EV):

1. Park the EV with the charge inlet within reach of the connector, and turn it off.
2. Connect the charger’s connector to the vehicle’s charge inlet.
3. Authorize using your phone or by PIN code, or with a credit card payment.
4. Wait for verification.

5. Preparing: the charger and the vehicle perform a handshake and the necessary safety tests. Charging will start automatically when successful.
6. During charging the user is informed about the progress. Wait until the charging process is done or press the stop button to cease the charging session.

Energy Meter display show following:
7. Charging is finished.

8. Unplug the outlet from the vehicle and place it on the plug holder.
To stop charging:
1. Select stop on the touchscreen.
2. Potentially you have to authorize again to stop, using the same authentication method as was used to start. Note that for:
   3. Take the connector out of the car and put it back in the connector holder on the charger.

**NOTICE**

**Locked connector**
In CCS charging the EV locks the connector. If the user wants to take the connector out of the car, it may be necessary to unlock all doors of the EV, or use the ‘unlock charge connector button’ on the car key, if present.
In CHAdeMO charging the lock is operated by the charger.

**NOTICE**

**Session end**
Charging will stop without user interaction:
- When the EV indicates to the charger that charging is completed.
- When the maximum charge time set by the operator/owner has been reached.
If the battery is not full, a new charge session can be started. In general, topping up the battery is slow-charging.
4. Operator Instructions

4.1. Cleaning the enclosures

The Power Cabinet and Charge Post are powder coated. This coating must be kept in good condition.

The customer facing charge post is coated in RAL 9003, which is a fresh bright white. It gives a modern appearance and matches well with branding stickers in all kinds of colors. RAL 9003 (signal white) is also used in Terra 53. RAL 9003 needs periodic cleaning to remove dirt. To limit maintenance costs the power cabinet’s default color is RAL 9002 (grey white) on which dirt is less visible.

Clean the Power Cabinet and Charge Post at least three times a year in the following way:

- Remove rough dirt by spraying with low-pressure tap water.
- Apply a neutral or weak alkaline cleaning solution and let it soak.
- Remove dirt by hand with a non-woven nylon hand pad.
- Rinse thoroughly with tap water.
- Optionally, apply wax on the front for extra protection and gloss.
- Check the coating for damage.

NOTICE

Ordinary cleaning
Keep the air inlets clean and free from snow and leaves or from any other ma

Notice

Rust forming
When the charger is placed in a corrosion sensitive environment, the forming of superficial rust is possible on the welding points. This rust is merely visual, there is no risk for the cabinet’s integrity. The rust can be removed with the cleaning procedure described above. To prevent the rust from reappearing; prime the areas with a transparent or color-like priming finish (separate Service Instructions are available).

NOTICE

When the Terra HP Charger is exposed to rain, it is sufficient to clean it twice a year.

CAUTION

Do not apply high-pressure water jets. Water may leak into the Power Cabinet. If a high-pressure water jet has been used, make sure that the inside of the Power Cabinet is dry.
- Only use cleaning agents with a pH value between 6 and 8.
- Do not use cleaning agents with abrasive components.
- Do not use abrasive tools.
4.2. Preventive maintenance

The charger must be inspected and serviced yearly by an ABB trained/certified technician.

4.2.1. Service inspection of the cabinets

The following points must be checked regularly:

- Internal RCDs and RCBOs need to be tested on correct functioning on a regular basis. During the yearly maintenance visit a check is advised, to be executed by a certified ABB technician.
- Cable and connector
  - Check for cracks or ruptures on the connector or cable, check whether no internal wires of the cable are visible.
- Display screen
  - Check for damage and cracks.
- Powder coating
  - Look for damage, cracks or ruptures.

4.2.2. Special inspections

In the following cases the Charger must be checked by ABB service personnel before further use:

- If it was struck by lightning.
- If it is damaged due to an accident or fire.
- If its location has been flooded.

Do not power on until the charger has been inspected and approved.
4.3. Problem resolving

The site operator or helpdesk is the first response to a customer call. The helpdesk can remotely solve simple problems for the customer.

In special cases the site operator with knowledge of the charger can be asked by ABB Service to report about the status of some internal components of the charger. Therefore, a brief description of the position and function of these components is described on the next pages.

DANGER
Hazardous voltage
Do not open any cabinet if you are not certified to work with high voltage and high current. Risk of electric shock causing severe injury or death.

WARNING
Note that the charge post is powered from the power cabinet.

4.3.1. Overview of the charge post

The front door can be opened by opening the key lock (C).

The key lock is covered with a lid to protect it from water and dirt. To open the lid, a Philips nr. 1 screw has to be removed.
4.3.2. Charge Post component view

A. CPI (Charge Protocol Interface) CCS / CHAdeMO
B. Cooling unit
C. CCB (Core Control Board)
D. Ethernet switch
E. 24 V power supply
F. SPD (Surge Protection Device)
G. Circuit breaker
H. Heater
I. RFID reader
J. HMI touchscreen unit
K. GPIO LED strip driver board
4.4. Troubleshooting

What to do in case of:

- **Vehicle crash or Fire**
  - Do not use the charger.
  - Make sure charger cannot be approached by anyone.
  - Turn off the power from the distribution panel upstream.
  - Contact your local ABB Service organization.

- **Damage of the connector or charge cable**
  - Do not use the charger.
  - Contact your local ABB Service organization in order to arrange a replacement of the cable.

- **Fluid leakage from the cooled CCS cable**
  The cable cooling system in the Terra HP Gen II charge post makes use of Huber and Suhner CP3-002 coolant. This is a biodegradable, nonhazardous synthetic oil. In short summary of the Huber and Suhner material safety data sheet:
    - CP3-002 is readily biodegradable according OECD criteria (>80%, tested according OECD 301B).
    - German Water Hazard Class (WGK) is 1 (according VwVwS), which is the lowest class: “slightly hazardous to water”.
    - There is no indication of bioaccumulation potential.
    - Mobility in soil is low.

  The cooling system reservoir contains approximately 2 liters of CP3-002, and the cable contains approximately 0.4 liters.

  Charge posts produced as of September 2018 are equipped with an internal spill containment reservoir. This will capture coolant leaking inside the charge post, and can be emptied during maintenance visits.

  The cooling system is equipped with a fluid level sensor in the reservoir, and a pressure drop sensor. In case a leak emerges it will be detected by either causing a pressure drop or a drop of the fluid level in the reservoir, after which the pump it switched off immediately and the system cannot be operated until it is repaired. This means that any potential spills outside the charger will be of limited volume.
    - Be careful to avoid slipping on leaked/spilled product.
    - Take up with a liquid absorbing material (e.g. sand, diatomaceous earth, acid-or universal binding agents) and proceed according to the waste disposal regulations. Do not discharge into the sewage system/surface water/ground water/subsoil as well as the soil. In case of entry into waterways, soil or drains, inform the responsible authorities.
5. Contact information

Please contact your local ABB Service organization or Service partner for first line problem analysis and solving. In case they cannot solve the problem, they will contact the second line Service organization.