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USER MANUAL

# Terra 54 / 54HV charger

## User and Operation Manual



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# Glossary

## AC

Alternating Current.

## CCS

Combined Charging System. A universal AC and DC charging system

## CHAdeMO

DC fast charging method for electric vehicles.

## DC

Direct Current.

## EV

Electric Vehicle.

## Owner

The legal owner of the charger.

## OCPP

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

## PE

Protective Earth.

## 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. RFID is a communication technology by means of radio waves to transfer data over a very short distance between a 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

ABB's Terra DC charging station of the 4<sup>th</sup> generation is a multi-standard Electric Vehicle charging station supporting a variety of charging standards and power ratings.

This manual describes the general usage and daily operation instructions of the entire product family of ABB's Terra 54 and 54HP chargers.

## 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

The Terra charger is a stand-alone DC and AC fast charger for EVs. The outlets of the charger must solely be used to charge electric vehicles 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 product, or unauthorized modifications, repairs or alterations to this product, or failure to strictly comply ABB operating and maintenance instructions.

## 1.5 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.



**WARNING**

**Rotating parts**

Identifies a hazard that could result in injury due to the presence of rotating or moving parts.



**WARNING**

**Pinch Hazard**

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



**CAUTION**

**Various**

Identifies a hazard that could result in damage to the machine, other equipment, and/or environmental pollution



**NOTICE**

Contains remarks, suggestions or advice.

## 1.6 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

**If there is an emergency**

1. Push the emergency stop.
2. Contact the owner / site operator.
3. Act according to the emergency procedure of 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.



### 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.
2. Only insert a connector into a suitable car inlet. Never use excessive force.



### CAUTION

**Connector locked**

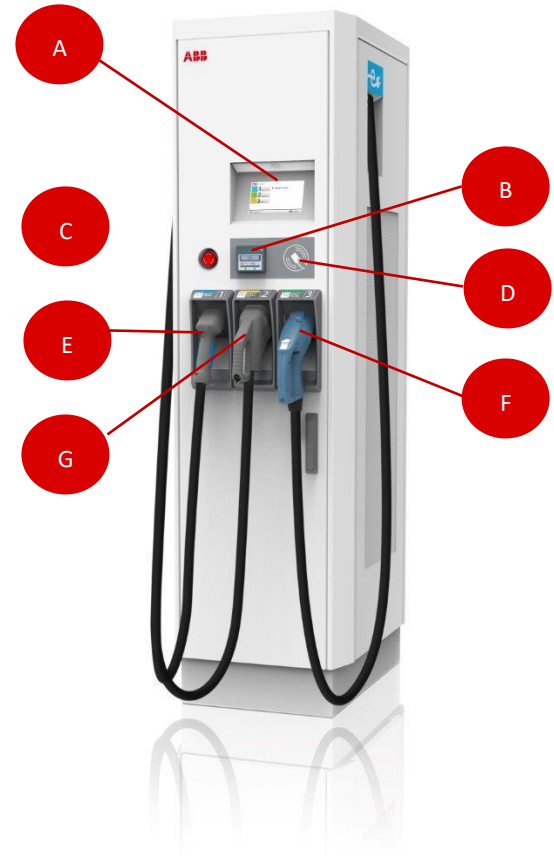
Do not apply a force on the locked cable during the charging process. This might damage the inlet and locking mechanism in your car or damage the charger.

## 2 Description of the product

### 2.1 Overview of the system

The user operated components are indicated on **Error! Reference source not found..**

- A. Touchscreen display
- B. Payment terminal
- C. Emergency button
- D. RFID reader
- E. AC charging connector and connector holder
- F. CHAdeMO charging connector and connector holder
- G. CCS charging connector and connector holder



The charger is equipped with at least one DC charging cable with CCS connector. Your charger can be equipped with multiple charging standard outlets (example below).

### 2.2 Charger configurations

The charger is built up with a modular architecture.

Supported charging standards in a charger configuration are described by a letter:

Indicator	Description
C	CCS up to 50 kW DC output
J	CHAdeMO version 1.0 up to 50 kW DC output
G	Type 2 AC power over a connected cable up to 43 kW and 3 phases
T	Type 2 AC power over a socket up to 22 kW and 3 phases

The maximum power each outlet can deliver depends on the charger type. This is indicated on the product label with the indication T24 respectively T54.



Charger Type	CCS/CHAdeMO	AC cable (G)	AC socket (T)
T24	20 kW	22 kW	22 kW
T54	50 kW	43 kW	22 kW

Power ratings are configurable and are restricted by the available grid fuse. Depending on the fuse and the type of charger, the DC outlet (CCS/CHAdeMO) and AC outlet can or cannot be used at the same time. Simultaneous DC charging is never possible.

Example: T53 CJG is a Terra charge station with 3 outlets (CCS, CHAdeMO and AC 43 kW cable), which – if connected on a 160 A external fuse – can charge 50 kW DC and 43 kW AC simultaneously.

## 2.3 Authorization to charge

Operation of the charger is possible with or without authorization. The authorization to charge can be based on RFID, PIN or mobile authentication 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.

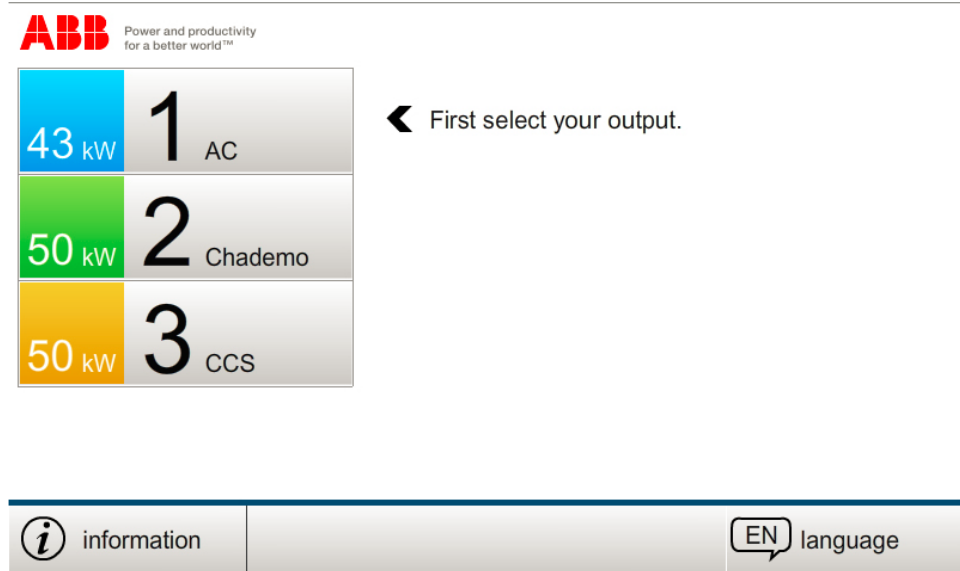
## 2.4 Payment terminal

The integrated payment terminal (as an option) enables an EV driver to authorize to charge using a credit card, or NFC device (e.g. smartphone). The EV driver will be guided in the use of a payment terminal on the touch display and payment terminal display. In order to use the payment terminal and set some parameters including the pricing, the ABB Payment Web tool is required.

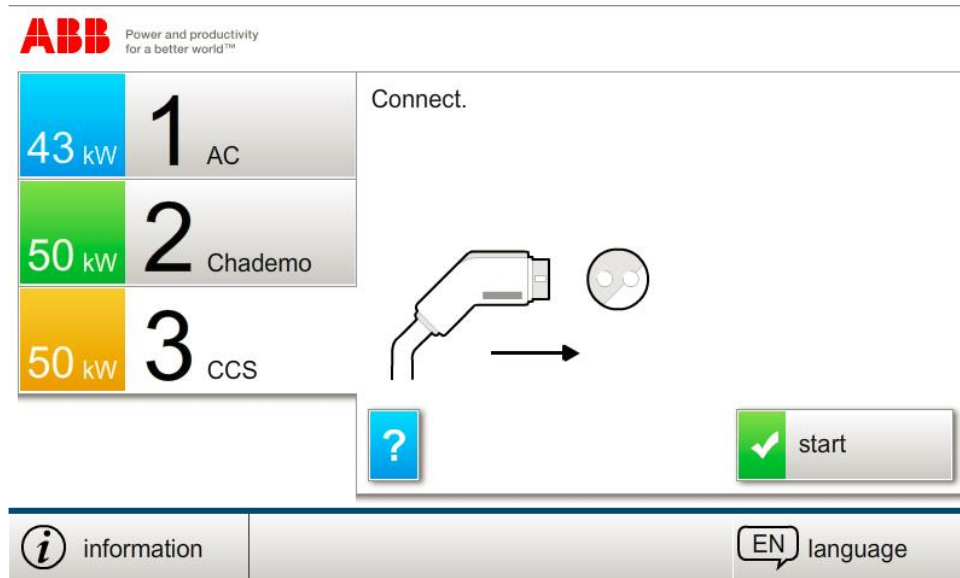
### 3 Quick instruction charging

To charge an electric vehicle (EV):

1. Park the EV with the charge inlet within reach of the connector, and turn it off.
2. Select the charging protocol on the display and follow the instructions on the screen. In case you first insert the charger's connector into the EV's inlet, the correct outlet is selected automatically.



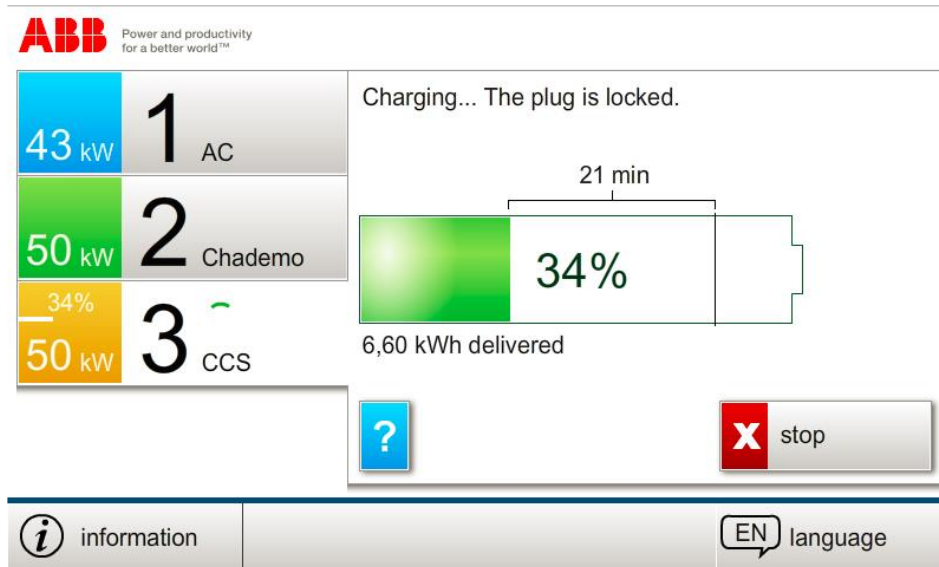
3. Connect the charger's connector to the vehicle's charge inlet



4. On the touchscreen, press start.
5. If applicable, scan the RFID card for authorization, or use PIN, or use a mobile payment method.
6. The charger charges the vehicle after the preparation phase, and will indicate the progress on the screen.

**NOTICE****Limited information during AC charging**

When AC charging, there is limited information available on the display. Only charged energy (kWh) and elapsed time are shown. Due to the nature of the AC charging protocol it is not possible to show more information.

**Stop charging:**

7. Select stop on the touchscreen.
8. Potentially you have to authorize again to stop, using the same authentication method as was used to start.
  - Charging stops and the connector is unlocked by the car for CCS and AC charging, or by the charger for CHAdEMO charging.
9. Take the connector out of the car and put it back in the connector holder on the charger.

**NOTICE****Locked connector**

For AC and 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.

**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.

**NOTICE****Stop by emergency button**

The charger stops the charge session when the emergency stop is pushed. Only push the emergency stop if there is an emergency!

### 3.1 Emergency stop

If there is an emergency:

1. Push the emergency stop button (B in **Error! Reference source not found.**).

The charger stops all ongoing charging sessions and displays a message.

2. Contact the Site operator.

**NOTICE****Emergency button is pressed accidentally**

If the emergency stop button is accidentally pushed:

1. Verify that the situation is safe.
2. Turn the emergency button clockwise.
  - The emergency button is released and the charger is reactivated.
  - After a few seconds the message disappears from the screen and the charger returns to normal operation.

## 4 Operator Instructions

### 4.1 Cleaning of the cabinet



#### **DANGER**

##### **Electrical components**

- Do not apply high-pressure water jets. Water may leak into the charge station.
- 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.

The charger cabinet is made from powder coated, high quality stainless steel. The coating must be kept in good condition.

Clean the charger three times a year in the following way:

- Remove rough dirt by rinsing 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 on damage.



#### **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).

### 4.2 Service inspection of the cabinet

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.

#### 4.2.1 Emergency stop inspection

It is advised to test the emergency button every time the operator or service organization visits the location of the charger. This test needs to be done at least once a year e.g. during a preventive maintenance visit.

Perform the test only when the charger is in idle mode and ready to charge:

1. Press the emergency button.
  - The screen immediately indicates the emergency button is pressed.
2. Reset the emergency button by turning the knob clockwise.
  - After a few moments, the charger returns to its idle state.

#### 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.

### 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.

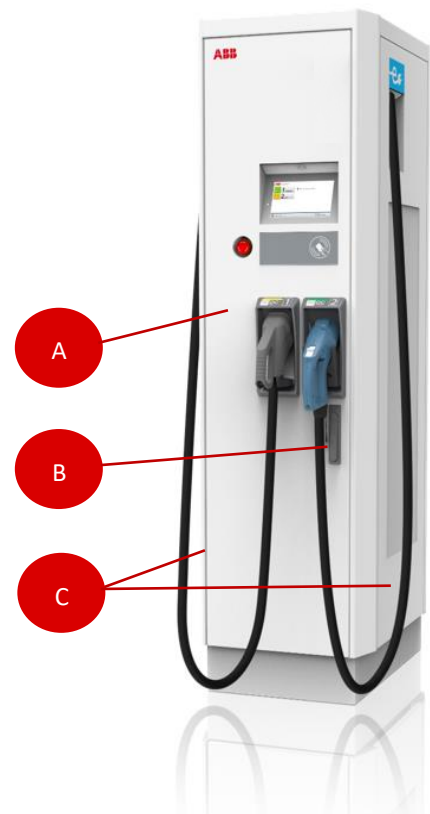
In special cases the site operator with knowledge of the charger can be asked by ABB Service to report about the status of some internal components of the charger. Therefore a brief description of the position and function of these components is described on the next pages.

#### 4.3.1 Overview of the cabinet

- A. Front door
- B. Key lock (unique system key per charger)
- C. Side doors, AC (left) and DC (right) side

The front door can be opened by opening the key lock (B). This is a half cylinder lock, opened by a numbered system key, unique per charger. The side doors (C) can be opened by unlocking from the inside after the front door is opened.

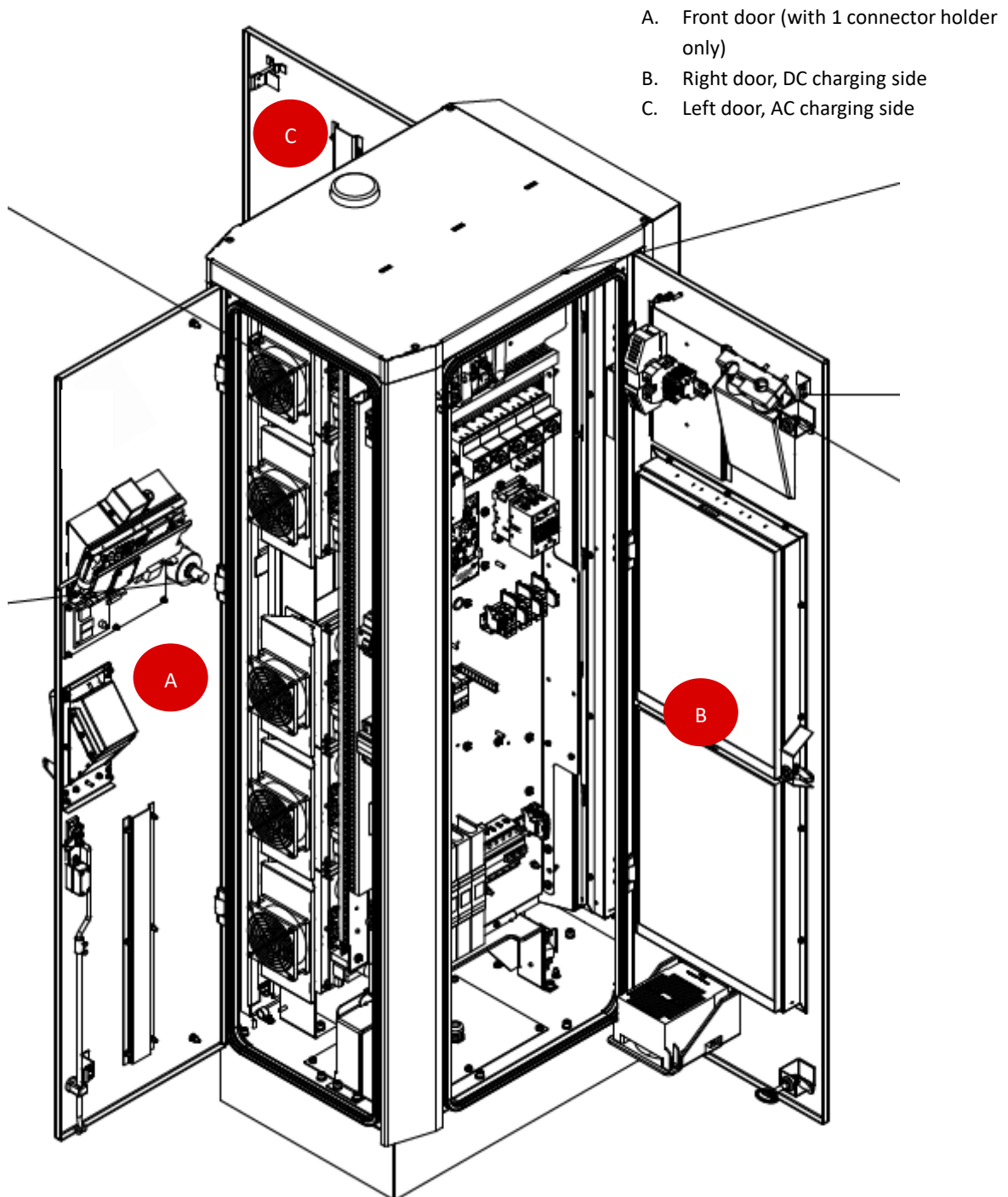
The key lock is covered with a lid to protect it from water and dirt. To open the lid, a Philips nbr1 screw has to be removed.



#### WARNING

Do not open the cabinet if you are not certified to work with high voltage and high current.

### 4.3.2 Cabinet with open doors



### 4.3.3 Component view open front door

The main components as can be seen with an open front door, which is hold by a lever with hook.

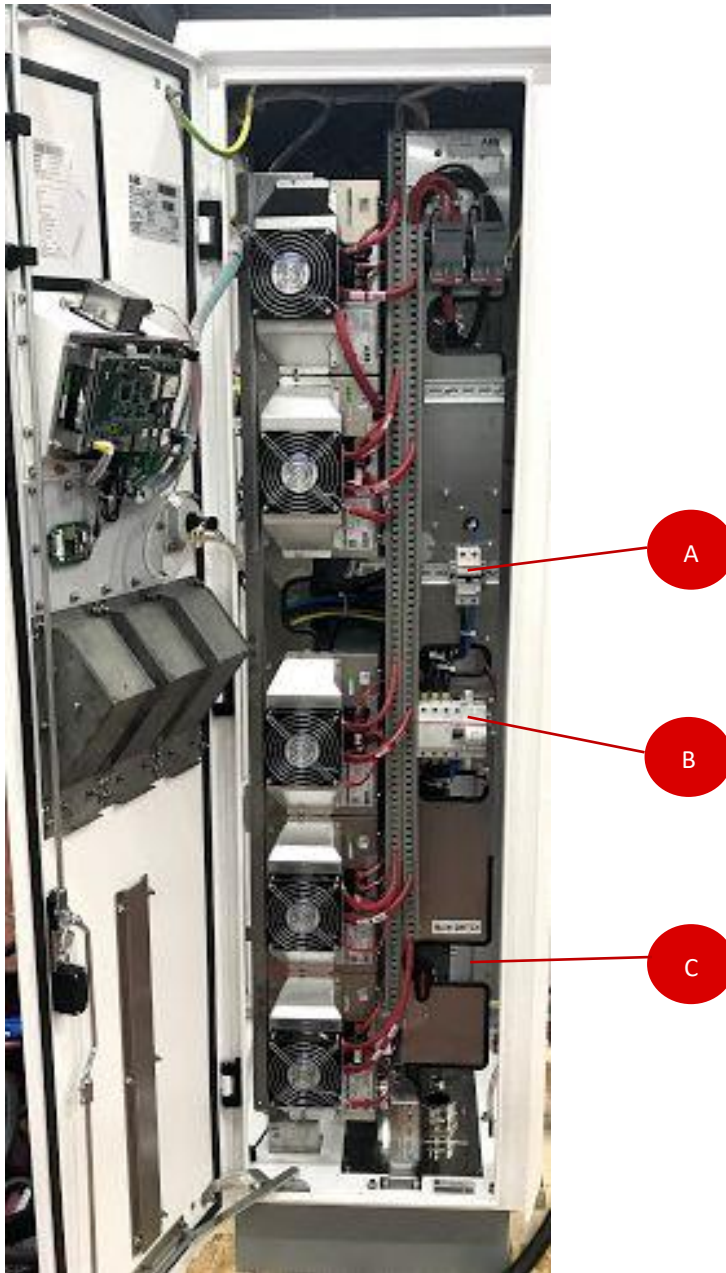


Figure 2 Charger front side component view

- A RCBO control group
- B DC power modules RCD group
- C Main switch (mains isolator)



#### 4.3.4 Component view right side door, DC side

The side doors can only be opened from the inside. From the front side, the right side door can be opened by turning a single lever, located at half height.

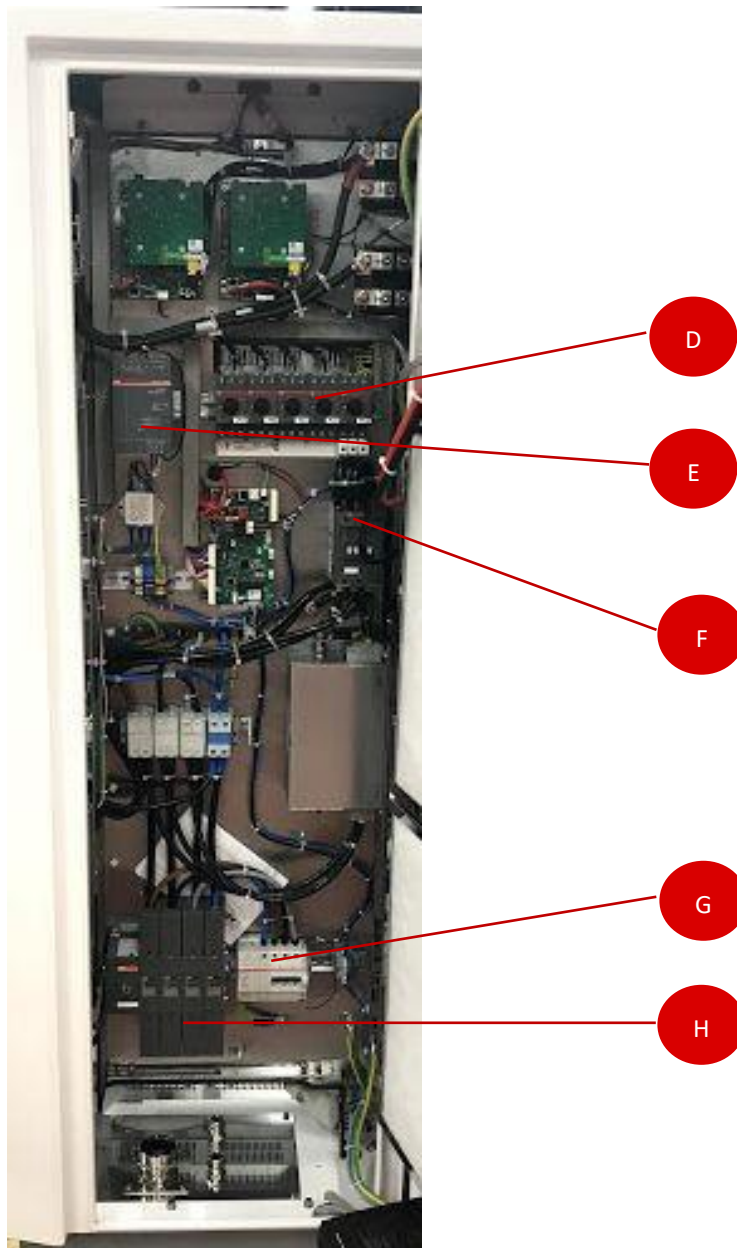


Figure 3 Charger right side component view

- D Power module circuit breakers (5x)
- E 24 V power supply
- F AC relay
- G Overvoltage protection
- H Mains isolator, cable connection

### 4.3.5 Component view open left side door, AC side

The side doors can only be opened from the inside. From the front side, the left side door can be opened by turning a single lever, located at half height.

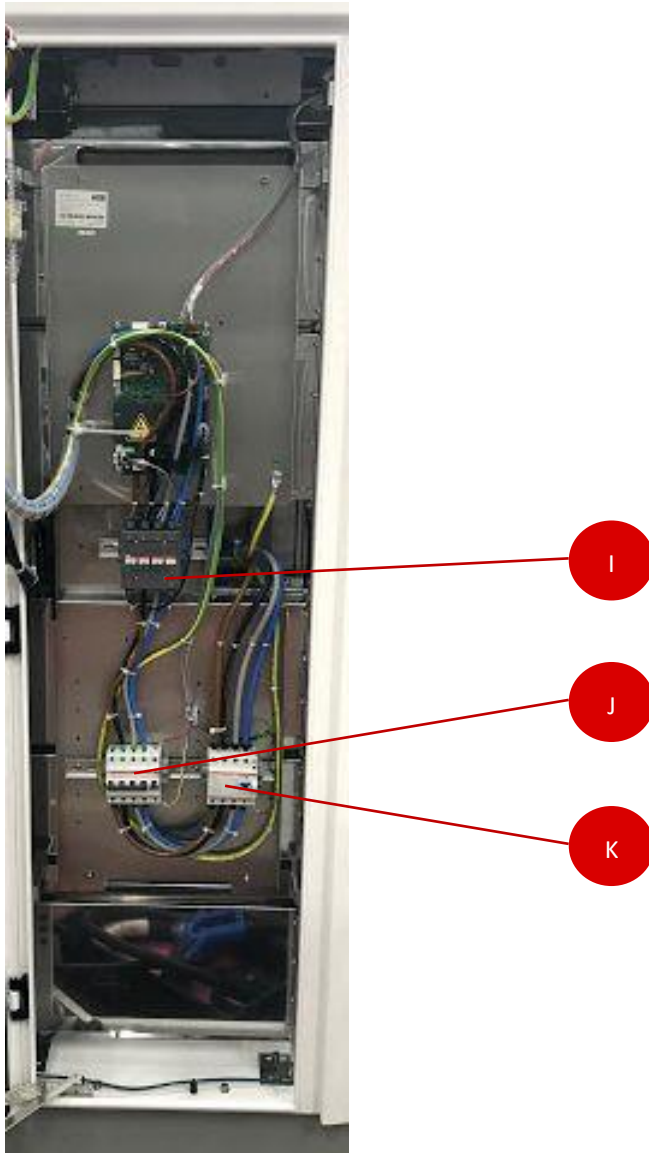


Figure 4 Charger left side component view

- I AC relay
- J MCB, 32 A or 63 A
- K AC charging Type B RCD

## 4.4 Technical functioning

### 4.4.1 Normal operation

When the charger is in operation (when idle; not charging), the default positions of the different switches and breakers are as follows:

Front panel

- RCBO control group (A): up.
- DC charge power RCD group (B): up.
- Main switch (C): vertical ('1')

Right side panel (controls and DC charging):

- Circuit breakers power modules (D, 5x): vertical ('1')
- Overvoltage protection (G): up

Left side panel (AC charging):

- MCB (J): up
- RCD (K): up

### 4.4.2 Power distribution

The main power can be switched off using the main switch (C). This switch is accessible when opening the front door. When the main switch is off, the grid voltage is removed from all components in the charger. Only the grid cable below the main switch is still connected/live (H).

From the main switch, the power is divided into groups. The charger has two (in case of only DC charging) or three (in case of DC and AC charging) power groups:

- Control power group; feeds power to all electronic components in the cabinet.
- DC charge power group; feeds power the power modules needed for DC charging.
- AC charge power group; feeds the AC charging.

The control group is protected by an RCBO (A).

The DC charge power group is protected for earth faults by a high immunity RCD (B).

An AC relay (F) switches the power to the individual circuit breaker (D, 5x) of each power module. This relay is controlled via a safety circuit by the:

- Emergency stop button
- RCD
- Door switch
- Software

The AC charge power group is protected for earth faults by a type B RCD (K). The maximum current, which can be used by the car is protected by an MCB (J).

An AC relay (I) switches the power to the car. This relay is controlled via a safety circuit by the:

- Emergency stop button
- RCD
- Door switch
- Software

## 4.5 Switch the charger on/off

In case it is necessary to switch off the charger, this can be done by turning off the main switch (C in **Error! Reference source not found.**):

1. Open the front door.
2. Locate the main switch (C).
3. Turn the handle counterclockwise to the horizontal position, marked with '0'.
4. You may check whether the charger is really off with a voltage tester.

To switch the charger back on, turn the handle clockwise to the vertical position, marked with '1'. After about a minute the charger should be showing the normal screen ('Connect your car').



### NOTICE

Operating the main switch is quite arduous. Use both hands if needed and be careful not to injure yourself.

## 4.6 Climate control precautions

Condensation inside the cabinet can cause damage to the charger, especially when charging. For this reason the cabinet has a climate control. The climate control is inactive when the power is off. When the charger has been without power for several hours (when switched off or due to an external power outage), it is important to activate the climate control before a car is charged to prevent damage to the charger. This can be ensured by following these steps:

1. Do not charge a car!
2. Open the front door of the cabinet
3. Open the left side door in case the charger has AC charging capability (G/T type)
4. Switch off the RCD for AC charging (J) by pushing the switch down.
5. Switch off the RCD for DC charging (B) by pushing the switch down.
6. Verify whether the Utility group RCBO (A) is switched on (upper position).
7. Switch on the main switch (C)
8. Close the door
9. Let the climate control function for at least 4 hours
10. Open the doors
11. Switch on the RCDs (B, J).
12. Close the door

The Charger is now ready to charge an EV.

In idle mode and when switched on, the charger consumes around 75 W of power.

A 1000 W heater is built into the charger for climate control inside the cabinet. This keeps the components functioning within the charger's temperature and humidity specifications and prevents condensation. This heater will switch on to full power when:

- The temperature inside the cabinet gets below -20 °C.
- The humidity gets above 90% relative humidity.

The heater switches off when:

- The inside of the charger is heated to -12 °C
- The humidity is below 80%.

## 4.7 Preventive maintenance

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

## 5 Contact information



### NOTICE

#### In case of problems

Contact the site operator. The contact data of the site operator are usually shown on the charger.

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