EV CHARGING INFRASTRUCTURE

User Manual (EU version)
HVC-R 107/160 V2 E-Bus Charger
Depot Box GEN2
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Version control
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<th>Date</th>
<th>Remarks</th>
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<td>V0.1</td>
<td>06/02/2022</td>
<td>First draft</td>
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<td>V0.2</td>
<td>07/12/2022</td>
<td>Updated cover page and layout of the document. Added “version control” table</td>
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Glossary

CCS
Combined Charging System. A universal AC and DC charging system, also referred to as ‘Combo’.

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.

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

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

1.1 Preface

The HVC-R product line is the new ABB solution for Overnight Charging of Heavy Vehicles. The product line allows 107kW and 160kW charging with up to 3 charging outlets per one charger. The charging of the vehicles is done sequentially following the first come, first serve principle.

A. First Bus 1 starts charging with 160kW full power, using Depot box 1. When bus 1 is full it stops charging.
B. Then Bus 2 charges with 160kW until full using Depot box 2. Charging stops.
C. Then Bus 3 charges with 160kW until full using Depot box 3. Charging stops.
D. Finally Bus 4 charges with 160kW until full using Depot box 4. Charging stops.

This manual describes the general usage and daily operation instructions of the HVC-R product family.

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 HVC-R product is a stand-alone DC high power charger for electric buses and trucks. The outlets of the charger must not be used to charge any other equipment than electric vehicles compatible with the supported charging standards.
1.4 Owner responsibilities

The owner and site operator are required:

- To operate the charge station with the protective devices installed, and to make sure all protective devices are correctly installed after carrying out installation or maintenance.
- To write an emergency plan that instructs people what to do in case of emergency.
- 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 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.
3. It is not permitted to operate the whole system if at least one of the Depot Charge Box Boxes GEN2 shows severe malfunction. Please contact ABB Service department for more information of error condition.

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.

NOTICE
Connector locked
The DC connector will be locked during the charging process to prevent it from dropping or being pulled out. Do not apply a force on the cable during the charging process as it 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

A. Charge cabinet 107-160kW
B. Depot Charge Box Boxes GEN2 (up to 4 per charger with sequential charging)

2.2 Charge cabinet

A. Door
B. Door handle / lock
C. 3G/4G Antenna
D. Air inlets (also on the left and back side)
E. Air outlet

CAUTION

The Power Cabinet has air inlets (D) and an air outlet (E) to control the temperature inside the cabinet. Do not install or place any objects near or against these air inlets and outlet. If necessary, take precautions to prevent snow or any other objects from blocking the air inlets and outlet.
2.3  Depot Charge Box GEN2

The user operated components are indicated on below:
A. LED beacon
B. Emergency button
C. Stop button
D. Door handle & lock
E. Connector holder
F. CCS charge cable
G. External connections

Overview LED colors and state:

<table>
<thead>
<tr>
<th>LED color</th>
<th>LED state</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[Image of bus]</td>
<td>Idle</td>
</tr>
<tr>
<td></td>
<td>[Image of bus]</td>
<td>Waiting / Getting ready to charge</td>
</tr>
<tr>
<td></td>
<td>[Image of bus]</td>
<td>Charging</td>
</tr>
<tr>
<td></td>
<td>[Image of bus]</td>
<td>Charge complete</td>
</tr>
<tr>
<td></td>
<td>[Image of bus]</td>
<td>Error</td>
</tr>
</tbody>
</table>
2.4 Charger configurations

The charger is built up with a modular architecture. Supported charging standards in a charger configuration are described by a letter:

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HVC-107R V2 CE</td>
<td>107kW charge cabinet configuration with 1 to 4 Depot Charge Box Boxes GEN2, supporting CCS2 with CE certification</td>
</tr>
<tr>
<td>HVC-160R V2 CE</td>
<td>160kW charge cabinet configuration with 1 to 4 Depot Charge Box Boxes GEN2, supporting CCS2 with CE certification</td>
</tr>
</tbody>
</table>

For each product configuration (107 or 160kW) it is possible to connect 1 up to 4 Depot Charge Box Boxes GEN2.

2.5 Authorization to charge

The standard setting is without authorization. This means that every vehicle supporting CCS is able and allowed to start a charge session. Operating a charger with authorization requires a subscription to a back office. Authorization can only be done based on the Vehicle ID and requires a subscription to a back office. This product does not support a RFID reader.

3 Charging instruction

3.1 Charging with 1 Depot Charge Box GEN2

Start charging:
1. Park the electric vehicle with the charge inlet within reach of the connector.
2. Turn off the electric vehicle.
3. Connect the charger’s connector to the vehicle’s charge inlet.
4. The charger will automatically start to charge the vehicle after the preparation phase, and will indicate the progress by the LED state (see in figure 3).

Stop charging:
5. The charge session will automatically stop after completing the bulk charge mode (standard setting is 99% SOC for this setup but this can be customized).
6. The charge session can also be stopped manually by either pushing the stop button on the Depot Charge Box GEN2 or the stop button on the bus (not available on every bus).
7. Charging stops
8. The connector is unlocked by the vehicle for CCS when the Depot Charge Box GEN2 beacon light changes color to green
9. Take the connector out of the vehicle and put it back in the connector holder on the Depot Charge Box GEN2.

3.2 Charging with 2, 3 or 4 Depot Charge Boxes GEN2
The main principle of the sequential charging is to complete the bulk charge for all the buses that are connected to the charger, before they leave the depot in the morning. The sequence will be based on the principle first come, first serve.

Start charging:
1. Park the electric vehicle with the charge inlet within reach of the connector.
2. Turn off the electric vehicle.
3. Connect the charger’s connector to the vehicle’s charge inlet.
4. When there is no other bus already connected that requires bulk charging:
   • The charger will automatically start to charge the vehicle after the preparation phase, and will indicate the progress by the LED state (see figure 3).
5. When there is another bus already connected that is being charged:
   • The LED state will turn to green and start blinking until the other charge sessions are complete. After completing the other charge session(s) the charger will automatically start to charge the vehicle after the preparation phase, and will indicate the progress by the LED state (see figure 3).

Stop charging:
6. The charge session will automatically stop after completing the bulk charge mode (standard setting is 99% SOC for this setup but this can be customized).
7. If there is another bus connected to the charger that requires bulk charging the charger will stop the session and automatically switch to the next bus in line.
8. The charge session can also be stopped manually by either pushing the stop button on the Depot Charge Box GEN2 or the stop button on the bus (not available on every bus).
9. If the stop button is pressed and there is another vehicle connected that requires bulk charging, the charging will automatically switch to the next bus in line.
10. When the charging is stopped automatically or by pressing the stop button, the connector is unlocked by the vehicle for CCS.
11. Take the connector out of the vehicle and put it back in the connector holder on the Depot Charge Box GEN2.

NOTICE
Session end
Charging will stop without user interaction:
• When the EV indicates to the charger that charging is completed.
• When the charger completed the bulk charge.
If the battery is not full, a new charge session can be started.
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!

3.3 Emergency stop
If there is an emergency:
1. Push the emergency stop button (B in figure 2).

The Charger stops the operation and the LED beacon from each connected Depot Charge Box GEN2 will be red.

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. Pull the emergency out.
   • The emergency button is released and the charger is re-activated.
   • After a few seconds the charger returns to normal operation.
4 Operator Instructions

4.1 Cleaning of the cabinet and Depot Charge Box GEN2

**DANGER**

**Electrical components**
- Do not apply high-pressure water jets. Water may leak into the cabinet.
- 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 cabinet of the Power Cabinet and Depot Charge Box GEN2 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 on the side grills. This rust is merely visual, there is no possibility this will form a risk on the cabinets integrity. The rust can be removed with the cleaning procedure above. To prevent the rust from reappearing; prime the areas with a transparent or color-like priming finish.

4.2 Preventive maintenance

Maintenance is done according to the maintenance schedule. The charger must be inspected and serviced yearly by a 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 round that is advised to be executed by a certified ABB technician, this will be checked.
- Powder coating: look for damage, cracks or ruptures.
4.2.2 Emergency stop inspection

It is advised to test the emergency button every time someone of 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 round.

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

1. Press the emergency button.
   - The indicator light (beacon) will turn red.
2. Reset the emergency button by turning the knob clockwise.
   - After a few moments, the charger returns to its idle state.

4.2.3 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 support 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 Power Cabinet

A Door
B Door handle / lock (per Power Cabinet Unique system key)

WARNING

Do not open the Power Cabinet door if you are not familiar with working with high voltage and high current.
4.3.2 Overview of the Depot Charge Box GEN2

A Front door Depot Charge Box GEN2
B Door handle / lock (per Depot Charge Box GEN2
Unique system key)

WARNING
Do not open the Depot Charge Box GEN2 door if you are not familiar with working with high voltage and high current.

4.3.3 Component overview Power Cabinet

The main components as can be seen with an open front door:

A Main switch
B MCB (Q17) AC power supply for ACM
C RCD (Q13) control
D RCD (Q12) redundant control
E Display
4.3.4 Component overview Depot Charge Box GEN2

The main components as can be seen with an open front door:

A  SPD (F4) AC Power Supply
B  MCB (F5) AC Power Supply
C  Fuse (F1,F2) DC Circuit
D  SPD (F3) DC Power Circuit

4.4 Technical functioning

4.4.1 Normal operation

Normal positions of the different switches and breakers when the charger is in operation (idle; not charging):

**Power Cabinet**
- Main switch (A): Vertical (“1”)
- MCB (Q17) AC power supply for ACM (B): up
- RCD (Q13) control (C): up
- RCD (Q12) redundant control (D): up

**Depot Charge Box GEN2**
- SPD (F2) AC Power Supply: green
- MCB (F1) AC Power Supply: up
- Fuse (F3,F4) DC Precharge Circuit: not blown
- SPD (F5) DC Power Circuit: green

4.4.2 Switch the charger system on/off

In case it is necessary to switch off the charger system, this can be done by turning off the main switch (A in Power Cabinet, see section Component overview Power Cabinet on page 15):
1. Open the front door.
2. Locate the main switch (A).
3. Turn the handle counterclockwise to the horizontal position, marked with “0”.

<table>
<thead>
<tr>
<th>WARNING</th>
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<tbody>
<tr>
<td>Switching off the charger does not switch off Depot Charge Box GEN2. Each box has its own power supply. To turn off the Depot Charge Box GEN2 see chapter 0</td>
</tr>
</tbody>
</table>

To switch the charger back on, turn the handle clockwise to the vertical position, marked with “1”. After about a minute the indicator light (beacon) will turn green.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating the main switch is quite arduous. Use both hands if needed and be careful not to injure yourself.</td>
</tr>
</tbody>
</table>

4.4.3 Switch the Depot Charge Box GEN2

In case it is necessary to switch off the Depot Charge Box GEN2, this can be done by turning off the main switch:
1. Open the front door.
2. Locate the main switch (B).
3. Move the MCB switch down (OFF position). Green painting on the switch should be visible

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every box has its own power supply line. Following procedure should be performed for every box which should be powered off.</td>
</tr>
</tbody>
</table>
5 Contact information

**NOTICE**

In case of problems
Contact the site operator.

**ABB in your country**
Please contact ABB in your country for delivery and service information.

**ABB EV Infrastructure global**
ABB EV Infrastructure

Address
Heertjeslaan 6
2629 JG Delft
The Netherlands

Telephone  +31 88 440 46 00

Mail  info.evi@nl.abb.com

Write down here your local ABB contact details:
Appendix: A. WEEE disposal – 2012-19/EU

European Directive 2012/19/EU on waste electrical and electronic equipment (WEEE) applies to products placed on the market after 17 August 2013. The directive aims to reduce the amount of waste and promote the recycling of waste electrical and electronic equipment (WEEE).

Users are required to dispose of WEEE products at the end of their usable life by returning them to authorized collection points.

For more information, please contact your local government waste disposal authority or visit the website of the European Commission’s Waste Electrical and Electronic Equipment (WEEE) and Energy Using Equipment (EUE) departments.

Reference: European Commission's Official Journal (L 181/1, 26/7/2012).