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Version control

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<th>Date</th>
<th>Remarks</th>
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<td>02-06-2021</td>
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<td>11-06-2021</td>
<td>Altered following first review commentary.</td>
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<td>17-06-2021</td>
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<td>21-06-2021</td>
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Glossary

AC
Alternating Current.

CAF
Customer Acceptance Form.

CCS (Combo)
Combined Charging System (also called Combo) is the charging protocol for North America and European OEMs.

Contractor
Entity hired by the Owner / site operator to do engineering, civil and electrical installation work.

DC
Direct Current.

Grid provider
Company responsible for the transportation and distribution of electricity.

HMI
Human Machine Interface; the screen on the charger.

HVC
Heavy Vehicle Charger.

Power Cabinet
Intermediate unit that provides 150 kW of DC power to the Charge control set. Gets its power from a power distribution board.

Interlock
The Interlock is an isolated current loop and is a feature that makes the state of two mechanisms or functions mutually dependent.

LAN
A computer network that interconnects computers systems within a limited area.

NOC
ABB Network Operating Centre; remotely checks the correct functioning of the charger.

Owner
The legal Owner of the charger.

PE
Protective Earth.

PPE
Personal Protective Equipment. Equipment such as safety shoes, helmet, glasses, gloves.

RCD
Residual-Current Device.

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
The entity is responsible for the day to day control of the charger. The site operator can be the Owner, but not necessarily.

User
The Owner of an electric vehicle, who uses the Charge Station to charge that vehicle.

WiFi
A technology that allows electronic devices to connect to a wireless LAN (WLAN) network.
1. Introduction

1.1. Preface

This guide describes the planning and physical installation of the HVC-R 100/150 E-Bus Charger at its location.

The HVC-R 100/150 E-Bus Charger is a DC fast charger system for hybrid or electrical buses that can be used for overnight charging which is based on the CCS Charging standard. It is not permitted to use the HVC-R 100/150 E-Bus Charger to charge any other equipment, or to use the HVC-R 100/150 E-Bus Charger for any other purposes. The HVC-R 100/150 E-Bus Charger uses high-amperage electric currents. Therefore, the installation must be planned carefully and must be done by certified personnel only (according to local standards\(^1\)).

**Before installing the HVC-R 100/150 E-Bus Charger, read this Installation Guide carefully and attentively. Follow the instructions presented in the Installation Guide. ABB is not responsible for any damage that could be caused by not or incorrectly following and executing the instruction described in this manual.**

1.2. Intended document users

This document is intended to be used by:

- Customers who purchased an HVC-R 100/150 E-Bus Charger or currently are in the process of ordering and wish to know installation details.
- Contractors who are responsible for site preparation and/or installation of the HVC-R 100/150 E-Bus Charger.

1.3. Signs

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

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous voltage</td>
</tr>
<tr>
<td>Identifies a hazard that could result in severe injury or death by electrocution.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Various</td>
</tr>
<tr>
<td>Identifies a hazard that could result in severe injury or death.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rotating parts</td>
</tr>
<tr>
<td>Identifies a hazard that could result in injury due to the presence of rotating or moving parts.</td>
</tr>
</tbody>
</table>

\(^1\) Local regulations shall take precedence if they list different installation requirements than prescribed in this Installation Manual.
### Safety regulations

#### 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 prepare a plan containing instructions on actions to be taken in case of an 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 works.
- All works have to be carried out by qualified personnel. All qualified personnel have to estimate their designated works in order to identify and avoid hazards. They must possess experience and adequate knowledge of: safety regulations and labor medical regulations, accident prevention regulations, guidelines and approved safety regulations, and special instructions concerning possible occurrence of dangers.
- You are not allowed to modify the charge system without the permission of ABB. The Owner is cautioned that changes or modifications not expressly approved by ABB could void the Owner’s authority to operate the equipment and ABB’s warranty policy.
- Neither ABB nor its affiliates shall be liable to the purchaser of this product or third parties for damages, losses, costs or expenses borne by the Purchaser or third parties as a result of: an accident, misuse or abuse of the product or unauthorized modifications, repairs or alterations to the product, or failure to strictly comply to the ABB operating and maintenance instructions.

1.4.2. Tilting and handling

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
</table>
| **Heavy equipment**  
Handling instructions:  
1. Use crane or forklift truck when lifting or moving the Power Cabinet.  
2. Do not drop parts of the HVC-R 100/150 E-Bus Charger.  
3. Do not exceed the tilting angle of 30° while moving or performing works on the Power Cabinet.  
4. Read and follow the ABB *Guidance on the requirements for safe operation of mobile cranes* (ML-03, 9Akk104941D0113). |

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
</table>
| **Personal safety (PPE)**  
Always wear a safety helmet, safety gloves and safety shoes when you perform the work that involves lifting and tilting the equipment. |

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that personnel cannot be crushed or become trapped during lifting and tilting work.</td>
</tr>
</tbody>
</table>

Lifting activities

It is a legal requirement that all activities involving lifting equipment are planned and that they are conducted under effective supervision and managed based on the risk, complexity of the activity and the work environment (EU directive 2009/104/EEG, appendix II, chapter 3.2.5).

It is of great importance, regardless of location, that any lifting activity is performed safely (refer to the guide below).

- It must be carried out within the framework of an effective management system;
- It must be properly planned;
- Its risks have to be assessed;
- Supervision must be performed over it;
- It must be performed by skilled personnel and with the appropriate means.

All lifting activities must be performed under the ABB *Guidance on the requirements for safe operation of mobile cranes* (ML-03, 9Akk104941D0113). When applying this Standard, local laws and regulations must be taken into account at all times. In the event of conflicts, local laws and regulations prevail over this Standard.
1.4.3. Electric hazards

**DANGER**

**Hazardous voltage**
The HVC-R 100/150 E-Bus Charger conductors are under hazardous electrical voltages. The grid terminals on the internal DIN rail may carry hazardous voltages, even if all circuit breakers are switched off.

1.4.4. Installation safety

**WARNING**

**Personal safety (PPE)**
Always wear a safety helmet, safety gloves and safety shoes when you do the lifting and tilting work.

**WARNING**

Visually examine the package for damage. See section Before unpacking on Page 54 and section Before unpacking on Page 81. If there is damage, do not install the system.

**DANGER**

**Hazardous voltage**

Instructions:
1. Always switch off the external group switch and the main switch in the cabinet, before performing any installation, disassembly, repair or replacement of components.
2. Do a voltage check and make sure that the electrical power is disconnected from the system.
3. Only ABB certified technicians are permitted to commission the HVC-R 100/150 E-Bus Charger.
4. When the system is in an open or dangerous state, do not allow unqualified personnel near it. Instruct and warn people in the vicinity about the potential harmful high voltages.
5. The installation and maintenance personnel must be supplied with their own lighting equipment, since the HVC-R 100/150 E-Bus Charger has no lights inside the cabinet.
6. Always connect the Protective Earth (PE) first, before connecting the neutral (N) and Phase (P) wiring.
7. Correctly lock the door after completing installation or service operations.

**WARNING**

Make sure that there is a minimum free space of 1000 mm in front of the door of the Power Cabinet. The minimum space is necessary to allow service personnel to quickly move away from the Power Cabinet in case of an emergency while the door remains open.
1.5. Environment and disposal of waste

**CAUTION**
Always refer to the local rules and regulations on processing (non-reusable) parts of the HVC-R 100/150 E-Bus Charger.

1.6. Cyber Security Disclaimer

This product is designed to be connected to and to exchange information and data via a network interface. It is customer's sole responsibility to provide and continuously ensure a secure connection between the product and customer network or any other network (as the case may be). Customer shall establish and maintain any appropriate measures (such as, but not limited to, the installation of firewalls, application of authentication measures, encryption of data, installation of anti-virus programs, etc.) to protect the product, the network, its system and the interface against any kind of security breaches, unauthorized access, interference, intrusion, leakage and/or theft of data or information.

ABB Ltd and its affiliates are not liable for damages and/or losses related to such security breaches, any unauthorized access, interference, intrusion, leakage and/or theft of data or information.
1.7. Contact information

**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:
2. Description of the product

2.1. Overview of the system

Example of a complete installation

A Low voltage power distribution cabinet provided by the Owner
B Power Cabinet – 100 or 150 kW (HVC-R 100/150)
C Dual Depot Charge Box (up to 3 per Power Cabinet)
D Cables connecting Power Cabinet and Dual Depot Charge Box inside cable conduits
E Electric hybrid and/or full electric Bus
F Parking space designated for Bus charging

The HVC-R 100/150 kW E-Bus Charger consists of multiple components and it may require additional elements depending on the project’s circumstances and location of installation which dictates whether these elements are needed.

ABB offers four standard delivery system configurations:

1. Standard HVC-R 100 E-Bus Charger with one Dual Depot Charge Box.
2. Standard HVC-R 100 E-Bus Charger with two or three Dual Depot Charge Boxes.
3. Standard HVC-R 100 V2 E-Bus Charger with one Dual Depot Charge Box.
4. Standard HVC-R 100 V2 E-Bus Charger with two or three Dual Depot Charge Boxes.
5. Standard HVC-R 150 E-Bus Charger with one Dual Depot Charge Box.
6. Standard HVC-R 150 E-Bus Charger with two or three Dual Depot Charge Boxes.
7. Standard HVC-R 150 V2 E-Bus Charger with one Dual Depot Charge Box.
8. Standard HVC-R 150 V2 E-Bus Charger with two or three Dual Depot Charge Boxes.

If necessary, additional components can be ordered separately and are not part of the standard delivery. See section Accessories on Page 18.

2.1.1. Standard HVC-R 100 E-Bus Charger with one Dual Depot Charge Box

The following components are provided for this system configuration:

- 1x HVC-R 100 Power Cabinet (ABB6AGC100793)
- 1x Dual Depot Charge Box (ABB6AGC102131)
2.1.2. Standard HVC-R 100 E-Bus Charger with two or three Dual Depot Charge Boxes
- 1x HVC-R 100 Power Cabinet (ABB6AGC100793)
- 2x or 3x Dual Depot Charge Box (ABB6AGC102131)

2.1.3. Standard HVC-R 100 V2 E-Bus Charger with one Dual Depot Charge Box
The following parts are provided for this system configuration:
- 1x HVC-R 100 V2 Power Cabinet (ABB6AGC102603)
- 1x Dual Depot Charge Box (ABB6AGC102131)

2.1.4. Standard HVC-R 100 V2 E-Bus Charger with two or three Dual Depot Charge Boxes
- 1x HVC-R 100 V2 Power Cabinet (ABB6AGC102603)
- 2x or 3x Dual Depot Charge Box (ABB6AGC102131)

2.1.5. Standard HVC-R 150 E-Bus Charger with one Dual Depot Charge Box
The following parts are provided for this system configuration:
- 1x HVC-R 150 Power Cabinet (ABB6AGC100794)
- 1x Dual Depot Charge Box (ABB6AGC102131)

2.1.6. Standard HVC-R 150 E-Bus Charger with one Dual Depot Charge Box
- 1x HVC-R 150 Power Cabinet (ABB6AGC100794)
- 2x or 3x Dual Depot Charge Box (ABB6AGC102131)

2.1.7. Standard HVC-R 150 V2 E-Bus Charger with one Dual Depot Charge Box
The following parts are provided for this system configuration:
- 1x HVC-R 150 V2 Power Cabinet (ABB6AGC102602)
- 1x Dual Depot Charge Box (ABB6AGC102131)

2.1.8. Standard HVC-R 150 V2 E-Bus Charger with one Dual Depot Charge Box
The following parts are provided for this system configuration:
- 1x HVC-R 150 V2 Power Cabinet (ABB6AGC102602)
- 2x or 3x Dual Depot Charge Box (ABB6AGC102131)
2.1.9. HVC Power Cabinet

Outside view of the HVC 100\textsuperscript{2}/150 Power Cabinet

![Overview of the closed Power Cabinet]

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

Inside view of the HVC 100/150 Power Cabinet

![Overview of the open Power Cabinet]

- A Main switch
- B AC Power connection
- C Guidance plate of the cables
- D Data/communication connection
- E Display
- F Power Modules (only two are installed in the HVC 100)

\textsuperscript{2} Two 50 kW Power Modules installed in the cabinet instead of three.
2.1.10. Dual Depot Charge Box

Outside view of the Dual Depot Charge Box

A  Charge state indicator light 1 (beacon)  G  Hanging bracket for charge cable 2
B  Door  H  CCS DC plug and cable 2
C  Stop button 1  I  Stop button 2
D  Emergency stop button (EMO)  J  Lock and door handle
E  CSS DC plug and cable 1  K  Charge state indicator light 2 (beacon)
F  Hanging bracket for charge cable 1
Inside view of the Dual Depot Charge Box

A Communication connection
B Connection block
C Protection cover for DC contactors
2.2. Accessories

The following parts can be ordered at the time of the initial order or afterwards. Contact ABB Sales department (see Contact information on Page 12 for contact details).

2.2.1. Foundation of Power Cabinet

Concrete foundation

The concrete foundation can be used to install the Power Cabinet on soil.

Elements of Power Cabinet's concrete foundation

A  Foundation  
B  Top cover plate  
C  Front cover plate

<table>
<thead>
<tr>
<th>Amount</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABB6AGC069029</td>
<td>HxC power cabinet foundation &amp; front cover plate</td>
</tr>
<tr>
<td>1</td>
<td>ABB6AGC067780</td>
<td>HxC power cabinet foundation top cover plate</td>
</tr>
</tbody>
</table>

Metal frame foundation

The metal frame foundation can be used to install the Power Cabinet on a solid surface.

Elements of Power Cabinet's metal frame foundation

A  Foundation  
B  Front border cover  
C  Rear border cover

<table>
<thead>
<tr>
<th>Amount</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4EPY420133R1</td>
<td>HxC power cabinet metal foundation</td>
</tr>
</tbody>
</table>
2.2.2. Pedestal of the Dual Depot Charge Box

The pedestal can be used to attach the Dual Depot Charge Box in the open when it is not being mounted on a wall.

![Overview of Dual Depot Charge Box's pedestal](image)

<table>
<thead>
<tr>
<th>Amount</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABB6AGC102301</td>
<td>HVC-R pedestal charge box</td>
</tr>
</tbody>
</table>
2.2.3. **Foundation of the pedestal**

The concrete foundation must be used to install the pedestal on soil.

![Overview of pedestal's concrete foundation](image)

**Overview of pedestal's concrete foundation**

<table>
<thead>
<tr>
<th>Amount</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABB6AGC103612</td>
<td>HVC-R concrete foundation Dual Depot Charge Box</td>
</tr>
</tbody>
</table>
2.2.4. Wall-mounting brackets for Dual Depot Charge Box safe wall fixing

The Dual Depot Charge Box (A) can be easily mounted onto a wall with wall mounting brackets (B).

![Wall mounting bracket](image)

<table>
<thead>
<tr>
<th>Amount</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ABB6AGC083492</td>
<td>Standard wall-mounting bracket (ABB)</td>
</tr>
</tbody>
</table>

(*) pack quantity is 4

2.2.5. Communication ethernet cable

The CAN/Ethernet communication between the Power Cabinet and Dual Depot Charge Boxes is achieved via an Ethernet cable.

If the cable is not supplied by ABB, then gland dimensions listed in section *Gland layout of the Dual Depot Charge Box* on Page 89 must be followed. Please note that special precautions should be taken, so that pre-fabricated the cable could pass through the gland (for example order cable with M25 gland assembled on it). Another alternative could be to crimp the cable on site after passing through the gland.

Cable length must be defined by the Contractor performing installation during site survey.

<table>
<thead>
<tr>
<th>Amount</th>
<th>Part number</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Contact ABB for details</td>
<td>Ethernet (S/FTP, CAT6) with RJ45 connectors</td>
</tr>
</tbody>
</table>
3. **Preparation**

3.1. **Project planning**

Careful project planning is necessary before an HVC-R 100/150 E-Bus Charger is purchased and put into operation. The different phases of the full project plan are shown in the figure below:

![Diagram of the project's phases](image)

**A. Preparation**
The Owner / Site Operator has ordered an HVC-R 100/150 E-Bus Charger. In this phase all preparation work must be completed before the Contractor can perform the civil and electrical works. See *About preparation* on Page 23.

**B. Construction**
The Contractor performs all civil and electrical works. See *About construction* on Page 37.

**C. Placement and Connection**
The location is mechanically and electrically ready to receive the HVC-R 100/150 E-Bus Charger. See *About placement and connection* on Page 52.

**D. Commissioning**
The delivery department will bring the HVC-R 100/150 E-Bus Charger into operation. See *Commissioning preparation* on Page 113.

**E. Service and Maintenance**
The HVC-R 100/150 E-Bus Charger is operational. There are various options for service and maintenance. See *About Service and Maintenance* on Page 115.
3.2. About preparation
The planning steps for the preparation phase are shown in the figure below:

Diagram of preparation phase’s steps

A1 **Ordering**
Order the HVC-R 100/150 E-Bus Charger.

A2 **Engineering**
The Owner / Site Operator selects a Contractor to perform the civil and electrical installation works. The Contractor is responsible for all construction documentation of the site, i.a.: drawings, calculations, certifications, licenses and test reports. The location of the HVC-R 100/150 E-Bus Charger must be selected. See section *Location* on Page 27 and section *Geometry of infrastructure* on Page 28.

A3 **Get permits**
Make sure that all the permits required by local regulations had been acquired. See section *Required permits* on Page 24.

A4 **Upgrade grid**
If required, upgrade the electrical grid connection to 3-phase 400 V AC. See section *Adapting the grid* on Page 26.

A5 **Transport foundation(s) on request**
If it is necessary to order the foundation(s), transport of the foundation(s) must be arranged with the ABB Delivery department. See *Contact information* on Page 12 for contact.
3.3. Required permits

The installation of an HVC-R 100/150 E-Bus Charger will require a number of permits, depending on national and local laws. This section lists a number of points of attention.

3.3.1. Power connection

The HVC Power Cabinet requires high current (400 V AC 238 A for 150 kW) connections. A domestic or small business power connection will not be sufficient. For each Dual Depot Charge Box a standard one phase AC connection (L-N + PE) is required.

Measure, check and report the position of the cables connecting the power distribution board and the Power Cabinet, and the cables connecting the Power Cabinet and the ACS Control Module.

Contact your electricity Retailer and/or Grid Owner if a grid upgrade is required. Ask about the work that is needed to upgrade the connection to meet the requirements described in section Electrical installation on Page 33.

3.3.2. Construction permit

The installation of the HVC-R 100/150 E-Bus Charger requires performing the following actions in regard to construction works:

- Obtaining the necessary work permits.
- Construction of a solid base.
- Placing cable conduits for cable connections between the power distribution board and the Power Cabinet. Usually, these cable conduits are installed below ground.
- Placing cable conduits for cable connections between the Power Cabinet and the ACS Control Module.
- Designation of parking spaces for the buses to be charged.
- Placing information signs, on the road or on its side, in order to position the buses in the desired manner.

Contact your local government representatives to obtain information about the necessary permits.
3.3.3. Internet access

The HVC-R 100/150 E-Bus Charger requires a connection to the Internet. This connection is necessary in order to maintain serviceability and grant remote access to the ABB Service department.

There are two available options for the Internet connection:

- Wireless, which requires coverage of a 3G network at the location. This is the preferred connection. A 3G modem with active SIM card is included with the HVC-R 100/150 E-Bus Charger (a customer SIM card is not required).
- Ethernet (RJ45). If there is no 3G signal available, a wired internet connection must be available at the location. For this option, contact ABB Sales department (see Contact information on Page 12 for contact details).
3.4. Adapting the grid

The HVC 100 or 150 Power Cabinet can be connected directly to the electrical grid or to an existing customer low voltage power distribution cabinet. In both cases a 177 A (for the HVC 100) or 265 A (for the HVC 150), 400 V AC, 50 Hz, 3P+PE connection to the Power Cabinet is necessary that meets the following requirements:

- Fuse (gG type) 3 x 315 A AC or 3 phase 285 A circuit breaker.
- Main switch.
- PE connected to the main PE rail.
- The components used in the HVC 100 and the HVC 150 are suited for a short circuit capacity of 25 kA.
- A TN-C earthing system. Possibly an extra 0.9 Ω earth electrode is required, consult the grid Owner.
- EMC filter is required to meet EMC conducted emission class B: Schaffner type FN 3359HV-400-99. When EMC conducted emission class A is required there is no filter required.
- Specifications of the following parts must be determined by your electrical engineer. They depend on local laws, safety and electrical regulations:
  - Adjustable RCD in the range of 30 mA up to 300 mA. The Power Cabinet has an integrated 300 mA RCD (Type A) for the power section.
  - Class 1 Surge Protection Device (SPD).

The Dual Depot Charge Box can be connected directly to the electrical grid or to an existing customer low voltage power distribution cabinet. In both cases a 2.17 A, 230 V AC, 50 Hz, 1P+PE connection is required. For each Dual Depot Charger Box, the following requirements apply:

- 1 phase 16 A type A (30 mA) residual current circuit breaker.
- Main switch.
- PE connected to the main PE rail.
- A TN-S earthing system. Possibly an extra 0.9 Ω earth electrode or local GND is required, consult the grid Owner.
- Specifications of the following parts must be determined by your electrical engineer. They depend on local laws, safety and electrical regulations:
  - Class 1 Surge Protection Device (SPD).
- If circuit breaker is used in distribution cabinet, then specification of inrush current of Dual Depot Charge Box must be taken into account during sizing of protection. Maximum inrush current: 100 A < 5 ms.
3.5. Location

The location of the HVC-R 100/150 E-Bus Charger must meet the following requirements:

- The height is not more than 2000 m above sea level.
- The HVC-R 100/150 E-Bus Charger must not be immersed in water, or any other fluid.
- The operational temperature of the HVC-R 100/150 E-Bus Charger is between -35 and 55 °C.
  - For locations where the Power Cabinet will be exposed to direct sunlight and high ambient temperatures for most of the day, it is recommended to install protection from direct sunlight. Otherwise, the temperature inside the cabinet might exceed the maximum temperature.
- Do not install or use the HVC-R 100/150 E-Bus Charger in areas where there is an explosion hazard. You must provide information about the HVC-R 100/150 E-Bus Charger to the fire brigade.
- The protection rating of the housing of the Power Cabinet is IP54 and the Dual Depot Charge Box is IP65 (excluding charge cable) and designed for outdoor use.
- It is recommended to provide good lighting around the charge system to increase safety.
- Design and arrange the location around the HVC-R 100/150 E-Bus Charger on a matter that the Dual Depot Charge Box and the Power Cabinet are hit by a vehicle is as small as possible. For example, bollards can be installed (see picture below) around the Power Cabinet and crash protection elements can be fitted to the concrete foundation (see section Concrete foundation for the pedestal on Page 43).

![Power Cabinet secured with bollards](image-url)
3.6. Geometry of infrastructure

3.6.1. Space required for the Power Cabinet

A single HVC 150 Power Cabinet requires a minimum space of 1170 x 2070 mm (W x D) or 1370 x 1970 mm (W x D). This space is calculated as follows:

- A cabinet footprint of 1170 x 770 mm.
- The unoccupied space around the cabinet regarding the following:
  - 100 mm at the rear side or 0 mm at the rear side when both left and right side have a minimum free space of 100 mm.
  - 100 mm or 0 mm at the left side, if another Power Cabinet is placed next to it.
  - 100 mm or 0 mm at the right side, if another Power Cabinet is placed next to it.
  - 1200 mm at the front side in order to open the front door. If the cabinet is placed indoors, consider designating additional free space in front of the open door (escape way for service people).

CAUTION

The cabinet needs at least the opening area of the front and rear side with a minimum free distance of 100 mm. This means that cabinets can stand in a row with one or both side entries blocked (distance on left/right side is 0 mm). It is also possible for the cabinets to stand back-to-back (distance on the rear side is 0 mm). In this case both side entries must have a minimum free distance of 100 mm. If this is not the case, then the air supply is not sufficient.

Overview of Power Cabinet's ventilation system

The HVC 150 is equipped with 4 air inlets (A) on all sides of the cabinet and an air outlet (B) at the front to allow airflow inside the cabinet. Do not place any objects that may obstruct the airflow near the air inlets or outlet (see also Caution above). If necessary, take precautions to prevent snow, sand or dust from blocking the inlets or outlet.
Specifications for indoors installation of the Power Cabinet

- Airflow required for one cabinet = 1450 m³/h.
- Maximum allowed pressure drop = 300 Pa. If the pressure drop of the room is higher than 300 Pa an extra fan should be placed. Contact ABB Sales department (see Contact information on Page 12 for contact details).

3.6.2. Placement of multiple Power Cabinets

There are two possible configurations for the placement of multiple HVC 150 systems, see picture below:

![Possible placements of multiple Power Cabinets](image)

The Power Cabinets can be placed back-to-back or next to each other with their doors facing the same direction.
3.6.3. Space required for the Dual Depot Charge Box

The Dual Depot Charge Box requires a minimum space of 1600 x 1150 mm (W x D). This space is calculated as follows:

- Dimensions of a Dual Depot Charge Box’s footprint: 600 x 250 mm (W x D).
- The unoccupied space of following dimensions:
  - 0 mm at the rear side when the Dual Depot Charge Box is mounted directly to a wall or a minimum of 100 mm at the rear side when the Dual Depot Charge Box is in front of a wall and mounted to the pedestal.
  - 500 mm on the left and right sides to allow operation of the charger plugs.
  - 900 mm on the front side to allow the door to be opened.

![Space required by a Dual Depot Charge Box](image)

* when placed in front of a wall and using the pedestal, recommended to keep 100 mm of space.
3.7. Parking space arrangement

A site for EV charging can be designed in many different setups. This section is intended to give some useful information about the placement of a charger with respect to parking spaces and the different vehicle inlets for the charging cable.

3.7.1. Cable reach

The DC charge cable of the Dual Depot Charge Box is about 7 meters long. The picture below shows an indication of the reach of one of the outlet cables with respect to the Dual Depot Charge Box (located in the center of the picture).
3.7.2. Various alignment possibilities

The charge inlets on a bus can be located on various positions. The most common buses have their inlets located at the front or the back of the vehicle, either on one of the sides or centrally (as indicated below).

![Diagram of bus charge inlets](image)

*Most common locations of a bus’s charge inlets*

This makes some positions of the charger more favorable than others, regarding the desired arrangement of the parking space. Please keep this in mind when designing a site. Some possible situations are shown in the picture below.

![Examples of bus charging sites](image)

*Examples of bus charging sites*
3.8. Electrical installation

The electrical installation must be completed according to the local safety and electrical regulations, and laws. See section *Adapting the grid* on Page 26 for the requirements of the electrical connection. A one-line diagram for the electrical connection for the Power Cabinet is shown in the figure below. The diameter of the electrical conductor (maximum cross section is 240 mm$^2$) in the AC power cable depends on the length and method of installation. This must be determined by your Contractor.

![Diagram of the Power Cabinet's electrical connection](image)

There are two options of connection of the AC auxiliary power supply for the Dual Depot Charge Boxes to the electrical grid.

First option is an individual electrical connection for the Dual Depot Charge Box(es). The one line diagram is shown below.

![Diagram of the Dual Depot Charge Boxes' individual electrical connection](image)
The second option is to daisy-chain the electrical connection through each of the Dual Depot Charge Boxes, as shown in the one line diagram below.

![Diagram of the Dual Depot Charge Boxes' daisy-chain electrical connection](image)

Grounding of the Dual Depot Charge Box can be connected the Power Cabinet’s or to another available ground connection, such as buried ground electrode. This should be taken into consideration while preparing civil works.

### 3.9. Civil installation

**NOTICE**

The instruction presented in this section assumes that the cable connections between the Power Cabinet and the Dual Depot Charge Box are located below the ground. Depending on the location - e.g. If the HVC-R 100/150 E-Bus Charger is located indoors, the cables can be led above the ground level. In this case the presence of cables trays is required to protect the cables. The most suitable option should be chosen by the Contractor performing the works, as this matter is not resolved in this Installation Guide.

DC power cables, PE wire and data cables must be routed between the Power Cabinet and the Dual Depot Charge Box. Therefore, two flexible cable conduits with an outer diameter of maximum 120 mm must be installed between the foundation of the Power Cabinet and the foundation of the Dual Depot Charge Box.

The DC power cables must be installed inside separate cable conduits with respect to the PE wire, AC auxiliary power and data cables. The maximum length of the cables between the Power Cabinet and the Dual Depot Charge Box is 100 m. Both conduits must be at least 600 mm deep in the ground and must be in one-piece.

The AC power cable from the distribution boards can also be installed in a cable conduit (not mandatory).
Example of civil installation when the Dual Depot Charge Box is mounted on the pedestal

A  Foundation of the Power Cabinet
B  Foundation of the Dual Depot Charge Box
C  Flexible conduit for DC power cables
D  Flexible conduit for AC auxiliary power, PE wire and data cables
E  AC power cable for the Power Cabinet

Example of civil installation when the Dual Depot Charge Box is mounted on a wall

A  Foundation of the Power Cabinet
B  Wall on which the Dual Depot Charge Box will be mounted
C  Flexible conduit for DC power cables
D  Flexible conduit for AC auxiliary power, PE wire and data cables
E  AC power cable for Power Cabinet

NOTICE

Document the location of all the cables placed in the ground between the Power Cabinet and the Dual Depot Charge Box. The routing of the cables must be known to prevent damage caused, e.g. by excavation works.
3.10. Lightning protection

One electrode (ground rod) of maximum 10 Ω must be placed in to the earth near the foundation of the Power Cabinet. In some cases, additional grounding is required at the Dual Depot Charge Box’s side. This depends on the local regulations and should be determined by the Contractor.

If the grid is TT based, consult the grid Owner. It is possible that an extra 0,9 Ω electrode will be required. This requirement must be determined by the Contractor.
Consult a local specialist for the options of lightning protection. The charge system has to be within the protection angle of the lightning distraction. This requirement must be determined by the Owner and a local specialist (according to NEN-EN-IEC 62305).

The implementation of the lightning protection depends on the local laws, safety and electrical regulations. This requirement must be determined by the Contractor and Owner of the site / HVC-R 100/150 E-Bus Charger.
4. Construction

4.1. About construction

The construction phase includes all works required to prepare the location and make it ready for the placement and connection of the HVC-R 100/150 E-Bus Charger. The construction phase can start when:

- All engineering work is done.
- All permits are granted.
- The grid connection is available.

The planning steps for the construction phase are shown in the figure below:

![Indication of Construction phase on the planning diagram](image)

**B1 Civil engineering works**


**B2 Electrical engineering works**

See section *Electrical installation* on Page 33 and section *Adapting the grid* on Page 26.

**B3 Internet access (optional)**

This step can be ignored if the location has sufficient 3G coverage. Otherwise, an Ethernet (RJ45) connection has to be installed - see section *Internet connection* on Page 51.
B4  Transport
Arrangement for the delivery of the HVC-R 100/150 E-Bus Charger with the ABB Delivery department - see Contact information on Page 12 for contact details. The delivery time is at least four months.

4.2. Providing foundation for the Power Cabinet

4.2.1. Available options
Use the appropriate foundation for the type of surface that the Power Cabinet will be installed on:

- **Soil**
  Use a concrete foundation to get a firm fixation on soil.
  A concrete foundation can be ordered separately. See section Accessories on Page 18. For detail drawings see Appendix C Dimensions of the Power Cabinet’s Concrete Foundation.

- **Solid floor**
  1. Use a metal frame foundation to guide the cables from the cabinet to the cable duct. This foundation can be ordered separately. See section Accessories on Page 18. For detail drawings see Appendix D Dimensions of the Power Cabinet’s Metal Foundation.
  2. The Power Cabinet is installed directly on a solid floor, through which the floor is accessible from below (related to the feed through of the cables). For detail drawings see Appendix A Dimensions of the Power Cabinet.

The cables must be embedded in the ground within cable conduits. See section Cable routing on Page 46 and section Civil installation on Page 34.

<table>
<thead>
<tr>
<th>NOTICE</th>
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<tbody>
<tr>
<td>It is advised to install traction wires into the conduits to install the electrical cabling afterwards.</td>
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<tr>
<th>NOTICE</th>
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<tbody>
<tr>
<td>Be aware of the bending radius of the AC power input cables when using the metal frame foundation. This metal frame foundation has a height of 180 mm.</td>
</tr>
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</table>
4.2.2. Concrete foundation

**WARNING**

Make sure that personnel cannot be crushed or become trapped while moving the foundation. Be aware that the weight of the concrete foundation is about 1300 kg.

**CAUTION**

Before you lower the foundation, remove sharp edges of the cable holes (B) in the foundation to protect the cables.

1. Make a hole in the ground with a minimum depth of 885 mm, shown in the figure above.
2. Fill the hole with (minimum) 200 mm lean concrete (C), see figure above.
3. Make sure that the conduits are routed to one of the indicated positions (B). The conduits must come out of the foundation with a length of about 250 mm.
4. Make sure that the AC power cable is routed to one of the indicated positions (B).
5. Lower the foundation (A) into the hole.
6. Make sure that the front top surface of the foundation is at least 15 mm above ground level (see figure above).
7. Make sure that the top surface of the foundation is leveled.
8. Route the conduits through one of the eight holes (B).

**NOTICE**

Make sure that the end of the cable conduits is 300 to 500 mm above the top of the foundation.

9. The conduits must be installed with a curve inside the foundation in order to prevent water from entering the conduits, and seal the space between the conduits and all open holes.
10. Route the AC power cable through one of the eight holes (B). Make sure that a cable length of 1000 mm is available above the surface of the foundation for internal routing in the cabinet.
NOTICE

This extra cable length is required to connect the AC power cable with the connectors in the Power Cabinet without problems.

11. Place both cover plates in the designated locations of the foundation.

12. Secure the top cover plate with M16 bolts (4x) and the front cover plate with M12 bolts (4x).

WARNING

These cover plates are required to prevent people from falling into the foundation.

13. Fill the open space in the ground around the foundation and the channels for the conduits with filling material (e.g. sand). Filling material is packed 2 – 3 times with a packing machine until the desired ground level is obtained. Avoid having filling material enter the foundation.
4.2.3. Metal frame foundation

1. Place the frame (A) in the desired position and mark the position of the holes for drilling.

**NOTICE**

The hole distance of 655mm on either side of the metal frame foundation is not equal to the hole distance (680 mm) from the HVC 150(S) cabinet. See also the mechanical drawing in Appendix D Dimensions of the Power Cabinet’s Metal Foundation.

2. Remove the frame.
3. Drill and tap holes at the marked positions. The holes must be suitable for bolt size M16.
4. Route the cables tray through one of the cable openings (B).
5. Align the frame (A) with the tapped holes.
6. Insert the bolts (C) fitted with the washers (D) into the holes (4x).
7. Tighten the bolts.
8. Route the AC power cable through the left cable opening (B). Make sure that a cable length of 1000 mm is available above the floor for internal routing in the cabinet.

**NOTICE**

This extra cable length is required to connect the AC power cable with the connectors in the Power Cabinet without problems.
4.2.4. Mounting Power Cabinet directly on a floor

1. Drill and tap holes in the floor at the indicated locations (A). The holes must be suitable for bolts size M16.
2. Make rectangular holes on the indicated locations (B) and (C). For detailed drawings of the bottom view of the Power Cabinet see Appendix A Dimensions of the Power Cabinet.
3. Make sure that the AC power cable and the other cables come out of the floor within the marked area (B).
4. Make sure that the DC power cables come out of the floor within the marked areas (C).
5. For the AC and DC power cable, make sure that a cable length of 1 m is available above the floor for internal routing inside the cabinet.
6. For the other cables, make sure that a cable length of 3 m is available above the floor for internal routing inside the cabinet.

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<tr>
<th>NOTICE</th>
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<tr>
<td><img src="info.png" alt="Info" /></td>
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<tr>
<td>This extra cable length is required to connect the cables to the connectors inside the Power Cabinet without any problems.</td>
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<th>NOTICE</th>
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<tbody>
<tr>
<td><img src="info.png" alt="Info" /></td>
</tr>
<tr>
<td>To prevent dust from entering the tapped holes, it is recommended that you cover them until you are ready to do the placement.</td>
</tr>
</tbody>
</table>
4.3. Mounting of the Dual Depot Charge Box

4.3.1. Available options

There are two options to install the Dual Depot Charge Box:

- **Soil**
  
  Use the concrete foundation to get a firm fixation on soil in combination with the pedestal. The concrete foundation and pedestal can be ordered separately. See section *Accessories* on Page 18.

- **Wall mounting**
  
  The Dual Depot Charge Box can be mounted on a solid wall.

4.3.2. Concrete foundation for the pedestal

*Dimensions necessary for civil installation of the foundation. (All dimensions given in [mm])*

<table>
<thead>
<tr>
<th>WARNING</th>
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<tbody>
<tr>
<td>Make sure that personnel cannot be crushed or become trapped while moving the foundation. Be aware that the weight of the concrete foundation is about 535 kg.</td>
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<table>
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<tr>
<th>CAUTION</th>
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<tbody>
<tr>
<td>Before you lower the foundation, remove sharp edges of the cable holes (B) in the foundation to protect the cables.</td>
</tr>
</tbody>
</table>

1. Prepare a hole in the ground with a minimum depth of 850 mm, as shown in the figure above.
2. Fill the hole with (minimum) 200 mm of lean concrete (C), see figure above.
3. Make sure that the conduits are routed to the indicated positions (B).
4. Use the provided VP-covers for those holes on the foundation sides that will not be in use.
5. Lower the foundation (A) into the hole.
6. **IMPORTANT**: Place the foundation (A) in the correct position. Mind the desired location of the Dual Depot Charge Box’s door.
7. Make sure that the front top surface of the foundation is at least 15 mm above ground level (see figure above).
8. Make sure that the top surface of the foundation is leveled.
9. Route the conduits through the foundation’s holes (B).
10. Fill the space surrounding the foundation in the ground and the channels for the conduits with filling material (e.g. sand). Filling material should be packed 2 – 3 times with a packing machine until the desired ground level is obtained. Avoid having filling material enter the foundation’s interior.
4.3.3. Wall mounting

**Prerequisites:**
- Tools: mark tools, level tool, drilling machine, drill bit (Ø10 mm or Ø7.5 mm), 4x wall plugs (Ø10 mm, L = 50 mm)

**NOTICE**
The Dual Depot Charge Box must be mounted levelly in order to work properly.

There are two options for mounting the Dual Depot Charge Box onto a wall:

- Utilizing the mounting holes located on the back side of the Box.

![Diagram showing wall mounting options](image)

- Using external wall-mounting brackets, see section Wall-mounting brackets for Dual Depot Charge Box safe wall fixing on Page 21.

1. Drill holes in the wall at the indicated locations (A) of one of the chosen mounting options (see pictures above). For a concrete or stone wall, the holes must be suitable for a wall plug 10 mm diameter. For a wooden wall, the holes must be suitable for wood-wire-bolt size M8.
2. In case of a concrete or stone wall, insert wall-plugs (4x) into the holes.

**NOTICE**

The activities regarding the installation of cable ducts, that are to contain the cables connecting the Dual Depot Charge Box, are entirely dependent on the installation location and may differ between specific locations. Due to this reason, the installation of those cable ducts is out of scope of this Installation Guide. The installation, as well as previous preparation of a routing plan, of the cable ducts is a responsibility of the Contractor.

### 4.4. Cable routing

#### 4.4.1. Charge system configuration

There are various cabling solutions, depending on the installation.
4.4.2. AC power cable

For the Power Cabinet:

- Cable type: 3P+PE (optional shielded).
- The cable shielding (if present) must be attached to the PE Rail at both ends of the cable.
- The cross section of the cable conductor must be determined by your Contractor.
- The maximum cross section is 240 mm\(^2\).
- The PE conductor of the power cable must have the same cross section as the phase conductors.

For the Dual Depot Charge Box:

- Cable type: 1P+N+PE.
- The PE conductor of the power cable must have the same cross section as the phase conductors.
- 1x GND cable (optional, local GND or lighting protection, see section Cables connecting the Dual Depot Charge Boxes)
- 1x or 2x AC auxiliary power cable (in case daisy-chain option is applied),
- 2x DC power cables,
- 1x Interlock cable,
- 1x Ethernet cable,

- Grounding of the Dual Depot Charge Box on Page 48.
- This cable can be connected directly from AC distribution to each Dual Depot Charge Box or can be routed in daisy-chain mode.

4.4.3. Cables connecting the Power Cabinet and the Dual Depot Charge Box

- 2x DC power cables,
- 0 – 3x PE cable (refer to section Cables connecting the Dual Depot Charge Boxes)
- 1x or 2x AC auxiliary power cable (in case daisy-chain option is applied),
- 2x DC power cables,
- 1x Interlock cable,
- 1x Ethernet cable,

- Grounding of the Dual Depot Charge Box on Page 48,
- 1x Interlock cable,
- 1x communication cable; Ethernet (S/FTP, CAT6).

Use local regulations and datasheet of the manufacturer to determine the cross section for the DC power cables:

- The maximum cross section of the cable conductor is 185 mm\(^2\).
- Recommended cable for a 150 kW system is 120 mm\(^2\) for a distance of 50 m, and 185 mm\(^2\) for a distance of 150 m (both with a reinforced isolation > 5400 V DC).

4.4.4. Cables connecting the Dual Depot Charge Boxes

- 1x or 2x AC auxiliary power cable (in case daisy-chain option is applied),
- 2x DC power cables,
- 1x Interlock cable,
- 1x Ethernet cable,

4.4.5. Grounding of the Dual Depot Charge Box

- PE must be connected to each of the Dual Depot Charge Boxes by 35 mm² cable as described in the IEC 61851-23.
- Grounding scheme is dependent on the layout of the specific installation site and contracted electrical company should define detailed design of grounding installation. Local legal requirements must be met. Following options of providing PE to the Dual Depot Charge Box are proposed:
  - PE may be connected from locally available ground connection in the vicinity of the Dual Depot Charge Box
  - PE may be routed from Power Cabinet or distribution board via cable conduits. In that scenario each Dual Depot Charge Box should have dedicated PE cable.
- There are two 35 mm² glands in Dual Depot Charge Box used for guiding PE cables to PE connection points inside the box. Daisy-chaining of ground signal through Dual Depot Charge Boxes is **not** allowed.
- If the Dual Depot Charge Box is installed on the pedestal or any other metal construction which must be grounded, there are two 16 mm² glands available to connect PE of the Dual Depot Charge Box enclosure to the metal frame.

**NOTICE**

For the overview of the grounding of the system, see Appendix G *Ground overview of the system.*
4.4.6. Optional external interface cables

There is a possibility to connect an external Beacon light, stop button and/or Emergency stop button (EMO) to the Dual Depot Charge Box.

<table>
<thead>
<tr>
<th>Optional external interface</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beacon light</td>
<td>24VDC</td>
</tr>
<tr>
<td></td>
<td>Three colors</td>
</tr>
<tr>
<td></td>
<td>Common +24VDC (NPN control)</td>
</tr>
<tr>
<td></td>
<td>Max 300mA per one color</td>
</tr>
<tr>
<td>Stop button</td>
<td>1x NO (Normally Open) contact</td>
</tr>
<tr>
<td></td>
<td>Contacts &lt;1A; 24VDC is sufficient (control purposes)</td>
</tr>
<tr>
<td></td>
<td>Momentary action</td>
</tr>
<tr>
<td></td>
<td>Can be equipped with background light (24VDC)</td>
</tr>
<tr>
<td>Emergency stop button (EMO)</td>
<td>1x NC (Normally closed) contact</td>
</tr>
</tbody>
</table>

- 1x Ext. Beacon cable,
- 1x Ext. Stop button cable,
- 1x Ext. EMO cable.
4.4.7. Cable specification list

Tables below provide general specifications of the required cables. Use these tables to select cables, taking into account local installation environment, cable length, cable temperature rating, losses and local regulations.

### AC and DC power cables

<table>
<thead>
<tr>
<th>Functional description</th>
<th>DC Power cable</th>
<th>PE cable</th>
<th>AC auxiliary power cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cores</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Cross section</td>
<td>95 – 185 mm²</td>
<td>35 mm²</td>
<td>2.5 mm²</td>
</tr>
<tr>
<td>Min – Max external</td>
<td>22 – 32 mm</td>
<td>6 – 12 mm</td>
<td>6 – 12 mm</td>
</tr>
<tr>
<td>diameter to fit through gland</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shielding</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Conductor</td>
<td>Tinned copper or aluminum conductor, fine wire stranded acc. to VDE 0295 Cl.5/IEC Cl.5</td>
<td>Fine strand copper wire acc. to VDE 0295 Cl.5/IEC 60228 Cl.5</td>
<td>Bare copper, fine wired, bunch stranded acc. to VDE 0295 Cl.5/IEC Cl.5</td>
</tr>
<tr>
<td>Insulation</td>
<td>Special rubber or PVC (outdoor use, UV-protected, oil resistant)</td>
<td>Special PVC (outdoor use, UV-protected, oil resistant)</td>
<td>Special PVC (outdoor use, UV-protected, oil resistant)</td>
</tr>
<tr>
<td>Minimum Nominal Voltage</td>
<td>600/1000 Vac 900/1500 Vdc</td>
<td>450/750 Vac</td>
<td>450/750 Vac</td>
</tr>
<tr>
<td>Minimum Test Voltage [AC]</td>
<td>6 kV</td>
<td>4 kV</td>
<td>4 kV</td>
</tr>
<tr>
<td>Ambient Temperature range</td>
<td>-40°C to 80°C</td>
<td>-40°C to 70°C</td>
<td>-40°C to 80°C</td>
</tr>
<tr>
<td>Core identification</td>
<td>gn/ye</td>
<td>Acc. to IEC 60446</td>
<td></td>
</tr>
</tbody>
</table>

### Data cables

<table>
<thead>
<tr>
<th>Functional description</th>
<th>Interlock cable</th>
<th>Ethernet (S/FTP, CAT6)</th>
<th>Ext. Beacon cable</th>
<th>Ext. Stop button cable</th>
<th>Ext. EMO cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of cores</td>
<td>4</td>
<td>8</td>
<td>4</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Twisted pairs</td>
<td>Yes (2 x 2)</td>
<td>Yes (4 x 2)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Cross section</td>
<td>0.75 – 2.5 mm²</td>
<td>0.25 – 0.75 mm²</td>
<td>0.5 – 0.75 mm²</td>
<td>0.5 – 0.75 mm²</td>
<td>0.5 – 0.75 mm²</td>
</tr>
<tr>
<td>Min – Max external</td>
<td>8 – 9 mm</td>
<td>5 – 10 mm</td>
<td>5 – 6 mm</td>
<td>5 – 6 mm</td>
<td>5 – 6 mm</td>
</tr>
<tr>
<td>diameter to fit through gland</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shielding</td>
<td>Yes (tinned copper braid)</td>
<td>Yes (tinned copper braid)</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Conductor</td>
<td>Fine strand copper wire</td>
<td>Fine strand copper wire</td>
<td>Fine strand copper wire</td>
<td>Fine strand copper wire</td>
<td>Fine strand copper wire</td>
</tr>
<tr>
<td>Insulation</td>
<td>PVC or other material that can be used outdoor and are UV-protected</td>
<td>PVC or other material that can be used for industrial and outdoor applications, and are UV-protected</td>
<td>PVC or other material that can be used for industrial and outdoor applications, and are UV-protected</td>
<td>PVC or other material that can be used for industrial and outdoor applications, and are UV-protected</td>
<td>PVC or other material that can be used for industrial and outdoor applications, and are UV-protected</td>
</tr>
<tr>
<td>Characteristic impedance</td>
<td>120 Ω ± 10%</td>
<td>100 Ω</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minimum Test Voltage [AC]</td>
<td>1.5 kV</td>
<td>700 V</td>
<td>2 kV – 4 kV</td>
<td>2 kV – 4 kV</td>
<td>2 kV – 4 kV</td>
</tr>
<tr>
<td>Ambient Temperature range</td>
<td>-40°C to 70°C</td>
<td>-40°C to 70°C</td>
<td>-40°C to 70°C</td>
<td>-40°C to 70°C</td>
<td>-40°C to 70°C</td>
</tr>
<tr>
<td>Core identification</td>
<td>Acc. to DIN 47100</td>
<td>TIA/EIA-568-B.1-2001 T568A</td>
<td>Numbering or color</td>
<td>Numbering or color</td>
<td>Numbering or color</td>
</tr>
</tbody>
</table>
- Important: all cables must be resistant to being placed in the ground, inside a conduit.
- All cables must have an isolation that is self-extinguishing and flame retardant according to DIN VDE 0482-332-1-2, DIN EN 60332-1-2, IEC 60332-1-2.
- All cables must correspond to the VDE, CE and EAC Low Voltage Directive and must meet the RoHS compliance.
- The identity and/or function of the cable must be marked every 2000 mm of the cable’s length and on its both ends.

4.5. Internet connection

In most cases the integrated 3G modem is used for wireless internet access. A customer SIM card is not required. If there is no 3G signal available, a standard wired internet connection is required. For this option, contact ABB Sales department (see Contact information on Page 12 for contact details).
5. Placement and Connection

5.1. About placement and connection

When the construction phase is finished, the HVC-R 100/150 E-Bus Charger can be placed and connected.
The planning steps for the placement and connection phase are shown in the figure below. Usually, the procedure can be done within one day.

![Planning Diagram]

**Indication of Placement and Connection phase on the planning diagram**

- **C1**  *Routing the cables* on Page 53.
- **C2**  *Unpacking Power Cabinet* on Page 54.
- **C3**  *Moving the Power Cabinet* on Page 56 and *Installing the Power Cabinet onto a foundation* on Page 59.
- **C4**  *Connecting AC power cables and PE wires to the Power Cabinet* on Page 67, *Connecting the Power Cabinet’s DC power cables* on Page 73 and *Connecting the communication cable to the Power Cabinet* on Page 78.
- **C5**  *Unpacking the Dual Depot Charge Box* on Page 81.
- **C6**  *Installing the Dual Depot Charge Box onto a** on Page 82 or *Mounting the Dual Depot Charge Box onto a wall* on Page 86.
- **C7**  *Cable connections of the Dual Depot Charge Box* on Page 89.
5.2. Routing the cables

1. Unpack the cables. See *Cable routing* on Page 46 for details on which cables are needed.

2. Remove the top cover plate (B) and the front cover plate (C) from the foundation (A) by
   loosening the bolts (D).

3. Put the front cover plate (C) and its bolts (D) in a safe location as it will be installed again
   later on.

**NOTICE**

Step 2 and 3 are only applicable when the Power Cabinet is placed on a concrete foundation.
The top cover plate is not needed any more after the cabinet is placed on the foundation.

5. Route the DC power cables through the cable conduit.
6. Route the AC auxiliary power, PE wire, Interlock cable and Ethernet cable (if required)
   through the other cable conduit.
7. Route the communication Ethernet cable through the extra 40 mm cable conduit.
8. For the DC power cables, make sure that a cable length of 1000 mm and 1500 mm is available above the surface for internal routing respectively in the Power Cabinet and in the Dual Depot Charge Box.
9. For the other cables, make sure that a cable length of 3000 mm is available above the surface for internal routing in the Power Cabinet and the Dual Depot Charge Box.

**NOTICE**

This extra cable length is required to connect the cables with the connectors in the Power Cabinet and the Dual Depot Charge Box without any problems.
5.3. Unpacking Power Cabinet

5.3.1. Before unpacking

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Unloading Power Cabinet</strong></td>
</tr>
<tr>
<td>The delivery truck only unloads the pallet carrying the Power Cabinet. The delivery truck will not move the Power Cabinet to its final location. The placement of the Power Cabinet to its final location is the responsibility of the Contractor. Upon request it is possible to order a truck with a crane.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not pollute the environment with plastic and cardboard packing. Dispose of the package elements according to the regional applicable regulations regarding the environment.</td>
</tr>
</tbody>
</table>

**Prerequisites:**
- All construction work is completed.
- The product is delivered by a transport company at the confirmed date of delivery.

 Meaning of SchockWatch’s indicator

Make sure that the Power Cabinet has not been shaken or tilted over 30°.
5.3.2. Remove packaging

Prerequisites

- Tools: spanner (size 24).

Unpacking of the Power Cabinet

1. Remove the packaging material from the Power Cabinet.
2. Remove the bag which contains the keys, cover caps and mounting material that are attached with tape on one of the lifting eyebolts at the top of the cabinet.
3. Keep the bag containing the indispensable parts in a safe place.

Disconnecting Power Cabinet form the pallet

4. Remove the nuts (A) at the four corners.
5.4. Moving the Power Cabinet

There are two options to move the Power Cabinet from the delivery truck to the location.

- Use a hoist to lift the cabinet from the top. See *Moving the Power Cabinet with a hoist* on Page 57.
- Use a forklift truck to lift the cabinet from the bottom. See *Moving the Power Cabinet with a forklift truck* on Page 58.

**Prerequisites:**
- All packaging material is removed from the Power Cabinet.
- The two cover plates are removed from the foundation.
- The tapped holes of the foundation are free from dust. If necessary, clean the holes with a vacuum cleaner. Use a thread tap to make sure that the bolts will go in smoothly.

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that the main switch of the power supply group for the product is set to the <strong>OFF</strong> position. <strong>Do a voltage check</strong> to make sure that the electrical power is disconnected from the system. Secure against resetting.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that personnel cannot be crushed or become trapped while moving the Power Cabinet.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranty</td>
</tr>
<tr>
<td>Any damage caused during the process of moving the Power Cabinet to its position is not covered by the warranty.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not use a compressor to clean the Power Cabinet. Use a vacuum cleaner.</td>
</tr>
</tbody>
</table>

1. Use one of the two options to move the Power Cabinet to the foundation.
2. When the Power Cabinet is about 500 mm above the desired location, continue the installation procedure with *Installing the Power Cabinet onto a foundation* on Page 59.
5.4.1. Moving the Power Cabinet with a hoist

Moving the Power Cabinet with a hoist

- A Swivel eye bolts (standard delivered with the cabinet)
- B Lifting loops
- C Hoisting equipment

Prerequisites:
- A minimum of two qualified workers are required: one person to operate the hoisting equipment, the other to guide the Power Cabinet to its location.
- Use M16 swivel eye bolts (A) or M16 bolts with lifting loops (B).

1. Insert the bolts (A) or (B) into the holes at the opposite corners of the cabinet, if not placed upon delivery.
2. Tighten the bolts.
3. Connect the hoisting equipment (C).

CAUTION

Keep the hoisting angle below 60°.

4. Move the Power Cabinet to the foundation.
5.4.2. Moving the Power Cabinet with a forklift truck

Prerequisites:

- A minimum of two qualified workers are required: one person to operate the forklift truck, the other to guide the Power Cabinet to its location.

1. Place wooden slats with a thickness of about 10 to 15 mm and a width equal to the width of the fork of the forklift truck on both forks.
2. Move the forks of the forklift truck to the gaps at the rear of the Power Cabinet.
3. Move the Power Cabinet to the foundation.

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>The use of the fork slides is mandatory. The distance between the outer side of the forks needs to be 930 mm, lifting the cabinet outside the fork slides is NOT allowed and will cause damage to the cabinet.</td>
</tr>
</tbody>
</table>
5.5. Installing the Power Cabinet onto a foundation

5.5.1. Connecting Power Cabinet to a foundation

**Prerequisites:**
- Tools: spanner (size 24).
- Cover caps (4x) that were removed from the Power Cabinet (bag with parts).
- The Power Cabinet is about 500 mm above its location.

<table>
<thead>
<tr>
<th><strong>DANGER</strong></th>
<th>Make sure that the main switch of the power supply group for the product is set to the <strong>OFF</strong> position. <strong>Do a voltage check</strong> to make sure that the electrical power is disconnected from the system. Secure against resetting.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WARNING</strong></td>
<td>Make sure that personnel cannot be crushed or become trapped while moving the Power Cabinet.</td>
</tr>
</tbody>
</table>

*Placing the Power Cabinet on concrete foundation*

A   Foundation  
B   Power Cabinet  
C   Cables  
D   Tapped holes
Placing the Power Cabinet on metal frame foundation

A  Foundation
B  Power Cabinet
C  Cables
D  Tapped holes

1. Carefully lower the Power Cabinet (B) onto the foundation (A).
2. Make sure that you do not trap the cables (C).
3. Make sure that the cabinet is aligned with the tapped holes (D).

Connecting the Power Cabinet with its foundation

4. Insert the M16 bolts (A) fitted with the washers into the holes in the corners (4x).

NOTICE

A minimum of three M16 bolts are need to applied to securely mount the Power Cabinet onto the foundation. In case of placing two Power Cabinets next to each other and (100 mm distance) against the wall, then one Power Cabinet can be secured by three M16 bolts on to the foundation.
5. Tighten the bolts with a tightening torque of 200 Nm.

6. Remove the swivel eye bolts or lifting loops (A).
7. Place the cover caps (B) in the holes (4x).

5.5.2. Opening the door of the Power Cabinet

Prerequisites:
- The key previously removed from the Power Cabinet (bag containing parts).

1. Unlock the handle (B)
2. Use the handle (B) to open the door (A).
5.5.3. Loosening the sliding plate of the guidance plates

Prerequisites:
- Tools: spanner (size 13).

1. Loosen the bolts (A).
2. Move the sliding plate (B) of the 2 guidance plates.

5.5.4. Routing cables through the guidance plates

1. Route the cables (A) through the right guidance plates (B).
2. Make sure that there is sufficient cable length to reach the connectors at the top of the cabinet.
NOTICE

A minimum length of 3000 mm is required, as the cable connectors are located in the middle of the Power Cabinet.

5.5.5. Tightening sliding plates of the guidance plates

Prerequisites:
- Tools: spanner (size 13).

Securing the cables with the guidance plates

1. Move the sliding plates (B).
2. Tighten the bolts (A).
5.5.6. Installing border covers of the Power Cabinet

**NOTICE**

Only applicable when the Power Cabinet is placed on a concrete foundation.

**Prerequisites:**
- Tools: torx screwdriver (size 2163TX-T30).
- M5 bolts (8x) previously removed from the Power Cabinet (bag containing parts).

**Attaching border covers to the Power Cabinet**

1. Put the front cover (A) against the bottom front of the Power Cabinet by aligning the four bolts at the back side of the front cover (A) with the holes in the bottom front.
2. Put the rear cover (B) against the rear front of the Power Cabinet.
3. Insert the M5 bolts (C) into the holes (8x).
4. Tighten the bolts.
5.5.7. Installing border covers of the metal frame foundation

**NOTICE**

Only applicable when the Power Cabinet is placed on a metal frame foundation. The supplied front and rear cover on the Power Cabinet are not to be used in this case.

**Prerequisites:**
- Tools: torx screwdriver (size 2163TX-T30).

1. Put the front border cover (A) against the bottom front of the Power Cabinet.
2. Put the rear border cover (B) against the rear front of the Power Cabinet.
3. Insert the M5 bolts (C) into the holes (8x).
4. Tighten the bolts.

*Attaching border covers to the Power Cabinet’s metal frame foundation*
5.5.8. Installing front cover plate on the foundation

<table>
<thead>
<tr>
<th>NOTICE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only applicable when the Power Cabinet is placed on a concrete foundation.</td>
</tr>
</tbody>
</table>

Prerequisites:
- Tools: spanner (size 19)

1. Place the front cover plate (B) on the foundation (A).
2. Make sure that the front cover plate (B) is aligned with the tapped holes within the foundation.
3. Insert the M12 bolts (C) into the holes (4x).
4. Tighten the bolts.
5.6. Connecting AC power cables and PE wires to the Power Cabinet

5.6.1. Removing the protection covers

Prerequisites:
- Tools: cross-head screwdriver

Removing the protection plate

1. Remove the protection plate (A) by loosening the screws (B).
2. Put the protection plate and screws in a safe location as they will be installed back later on.

Removing protection covers from the connector block

3. Remove the 3 protection covers (D) from the connector blocks (C).
4. Put the protection covers in a safe location as they will be installed back later on.
5.6.2. Connecting the PE wire of the AC power cables

**Prerequisites:**
- Tools: wire cutter, wire stripper pliers, wire-end ring, spanner (size 19), torque wrench (size 19).

---

**DANGER**

Make sure that the main switch of the power supply group for the product is set to the **OFF** position. **Do a voltage check** to make sure that the electrical power is disconnected from the system. Secure against resetting.

---

**Method of connecting the PE wire**

1. Make a loop on the PE wire.

---

**NOTICE**

For safety, it is recommended to make a loop in the PE wire so it is longer than the phase wires. This loop ensures that the PE wire is not the first wire that is disconnected if the Power Cabinet is moved by a collision.

---

2. Cut the PE wire of the AC power cable to the proper length to reach the PE rail. Do not make the wire routing neither too tight nor too loose.
3. Strip 20 mm of the insulation from the end of the PE wire.
4. Attach a wire end ring (A) to the end of the PE wire (B).
5. Remove the M12 bolt, nut and washers from the PE rail.
6. Fit the bolt (C) with toothed washer (D), the PE wire (B) and the contact washer (E).
7. Insert the bolt fitted with the PE wire into the PE rail.
8. Screw from the bottom of the PE rail a toothed washer (D) and a nut (F) on the bolt (C).
9. Tighten the bolt/nut connection with a tightening torque of 30 Nm.
5.6.3. Connecting the AC power cables

Prerequisites:
- Tools: wire cutter, wire stripper pliers, spanner (size 19), torque wrench (size 19).

**DANGER**

Make sure that the main switch of the power supply group for the product is set to the **OFF** position. Do a voltage check to make sure that the electrical power is disconnected from the system. Secure against resetting.

Method of connecting the AC power cables

1. Cut the wires of the AC power cable to the proper lengths to reach the connectors. Do not make the wire routing neither too tight nor too loose.
2. Strip 20 mm of the insulation from the ends of the wires (B).
3. Attach wire end rings (A) at the end of the wires.
4. Remove the nuts and washers (C) from the bolts (M12) of connector block (D).
5. Insert the 3 wires (B) with the nuts and washers onto the bolts of connector block (D).
   - From left to right:
     - L1 (brown),
     - L2 (black),
     - L3 (grey or black).
6. Tighten the nuts (C) with a tightening torque of 30 Nm.
5.6.4. Installing the protection covers

Prerequisites:
- Tools: cross-head screwdriver

1. Take the 3 protection covers (previously removed in Removing the protection covers on Page 67).
2. Place the protection covers (D) back on the connector blocks (C).

3. Take the protection plate and the screws (previously removed in Removing the protection covers on Page 67).
4. Place the protection plate (A) back over the main switch and connector blocks and secure the plate with the screws (B).
5.6.5. Installing lightning protection (optional)

**Prerequisites:**
- Tools: wire cutter, wire stripper pliers, wire-end ring, spanner (size 19), torque wrench (size 19).

**Method of connecting the lightning protection wire**

1. Cut the wire of the lightning protection cable to the proper length to reach the PE rail. Do not make the wire routing neither too tight nor too loose.
2. Strip 20 mm of the insulation from the end of the wire.
3. Attach a wire end ring (A) to the end of the lightning protection wire (B).
4. Remove the M12 bolt, nut and washers from the PE rail.
5. Fit the bolt (C) with toothed washer (D), the lightning protection wire (B) and the contact washer (E).
6. Insert the bolt fitted with washers and the lightning protection wire into the PE rail.
7. Screw from the bottom of the PE rail a toothed washer (D) and a nut (F) on the bolt (C)
8. Tighten the bolt/nut connection with a tightening torque of 30 Nm.
5.6.6. Attaching PE wire connecting the Dual Depot Charge Box

Prerequisites:
- Tools: wire cutter, wire stripper pliers, wire-end ring, spanner (size 19), torque wrench (size 19).

Method of connecting the PE wire connecting the Dual Depot Charge Box

1. Cut the PE wire of the power cable to the proper length to reach the PE rail. Do not make the wire routing neither too tight nor too loose.
2. Strip 20 mm of the insulation from the end of the PE wire.
3. Attach a wire end ring (A) to the end of the PE wire (B).
4. Remove the M12 bolt, nut and washers from the PE rail.
5. Fit the bolt (C) with toothed washer (D), the PE wire (B) and the contact washer (E).
6. Insert the bolt fitted with the PE wire into the PE rail.
7. Screw from the bottom of the PE rail a toothed washer (D) and a nut (F) on the bolt (C).
8. Tighten the bolt/nut connection with a tightening torque of 30 Nm.
5.7. Connecting the Power Cabinet’s DC power cables

Prerequisites:
- Tools: wire cutter, wire stripper pliers, cable lugs (6x), spanner (size 19), torque wrench (size 19), cross-head screwdriver.

<table>
<thead>
<tr>
<th>DANGER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that the main switch of the power supply group for the product is set to the OFF position. <strong>Do a voltage check</strong> to make sure that the electrical power is disconnected from the system. Secure against resetting.</td>
</tr>
</tbody>
</table>

5.7.1. Removing the protection cover

1. Remove the protection plate (A) by loosening the screws (B) (4x).
2. Put the protection plate and screws in a safe location as they will be installed back later on.

Removing the protection cover
5.7.2. Connecting the DC power cables

1. Cut the wires of the DC power cable to the proper lengths to reach the connectors. Do not make the wire routing neither too tight nor too loose.
2. Strip the insulation on the required length specified by the lug applied at the end of the wire (B).
3. Attach cable lug (A) at the end of the wires.
4. Remove the nuts and washers (C) from the bolts (M12) of connector block (D) and (E).
5. Insert the DC+ wire (marked by red heat-shrink) with the nuts and washers onto the bolts of pin 1 of the connector block (D).
6. Insert the DC- wire with the nuts and washers onto the bolts of pin 1 of the connector block (E).
7. Tighten the nuts (C) with a tightening torque of 30 Nm.
5.7.3. Installing the protection cover

1. Take the protection plate (previously removed in Removing the protection cover on Page 73).
2. Place the protection plate (A) back over the DC connector blocks and secure the plate by the screws (B) (4x).
5.8. Connecting Interlock cable to the Power Cabinet

Prerequisites:
- Tools: wire cutter, wire stripper pliers, screwdriver, ferrules, crimp pliers.

**DANGER**

Make sure that the main switch of the power supply group for the product is set to the **OFF** position. **Do a voltage check** to make sure that the electrical power is disconnected from the system. Secure against resetting.

- Route the cable to the terminal blocks:

![Preferred cable route](image)

Route the Interlock cable to the terminal block (A). Refer to the figure for the preferred cable route inside the cabinet.
Location of required terminal blocks

A  Terminal block
B  Interlock cable

1. Move the cable towards the terminal block (A).
2. Strip 11 mm of the insulation from the ends of the **White and Brown wires only!**
3. Crimp a ferrule onto the ends of the White and Brown wires.
4. Ensure that the unused wires (green and yellow) are secured so that they cannot touch metal parts.
5. Loosen the connector screws.
6. Insert the wires into the connectors, see table below:

<table>
<thead>
<tr>
<th>Functional description</th>
<th>Connector</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlock In</td>
<td>X8-14</td>
<td>Brown</td>
</tr>
<tr>
<td>Interlock Out</td>
<td>X8-7</td>
<td>White</td>
</tr>
<tr>
<td>Interlock GND</td>
<td>X8-Shield</td>
<td>Shield</td>
</tr>
</tbody>
</table>

See also Appendix F *Signal connection diagram*.

7. Tighten the connector screws with a tightening torque of 1.3 Nm.
5.9. Connecting the communication cable to the Power Cabinet

Prerequisites:
- Tools: ty-raps

5.9.1. Routing the cable to the terminal blocks

Preferred cable route

Route the communication fiber cable to module D1 (B) and D2 (A). Refer to the figure for the preferred cable route inside the cabinet.
5.9.2. Connecting the Ethernet cable to the Power Cabinet

1. Route the Ethernet communication cable (A) to the CAN2ETH board (B).
2. Connect the RJ45 plug to the terminal J1 (C).
5.10. Closing the door of the Power Cabinet

Closing the Power Cabinet's door

Prerequisites:
- The key previously removed from the Power Cabinet

1. Close the door (A).
2. Lock the handle (B).
5.11. Unpacking the Dual Depot Charge Box

5.11.1. Before unpacking

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not pollute the environment with plastic and cardboard packaging. Dispose of the packaging elements according to the regionally applicable regulations regarding the environment.</td>
</tr>
</tbody>
</table>

Prerequisites:
- All construction works are completed.
- The product is delivered by a transport company at the confirmed date of delivery.

Check the box for damages.

5.11.2. Removing packaging

Prerequisites:
- The installation work must be carried out by, at least, two people.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that personnel cannot be crushed or become trapped while moving the Dual Depot Charge Box (and pedestal) out of the box.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranty</td>
</tr>
<tr>
<td>Any damage caused during the process of moving the Power Cabinet to its position is not covered by the warranty.</td>
</tr>
</tbody>
</table>

1. Unpack the Dual Depot Charge Box.
2. Remove the bag which contains the keys, cover caps and mounting materials. The bag is attached with tape to one of the cable holders.
3. Lift the Dual Depot Charge Box out of the box.
4. Place the Dual Depot Charge Box on the ground with its top facing up.
5. Remove all protective foam from the Dual Depot Charge Box.
Next steps are only applicable if the Dual Depot Charge Box is to be installed on a pedestal.

6. Unpack the pedestal.
7. Remove the cover of the wooden box.
8. Lift the pedestal out of the box.
9. Place the pedestal on a secure surface with its top facing up.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>To prevent damage to the paint layer of the pedestal, always place the pedestal on a secure surface that provides sufficient protection against scratches and other damage. ABB is not responsible for any damage caused to the pedestal during its unpacking.</td>
</tr>
</tbody>
</table>

10. Remove all protective foam from the pedestal.

5.12. Installing the Dual Depot Charge Box onto a Pedestal

5.12.1. Connecting the Pedestal to the Foundation

Prerequisites:
- All packaging material is removed from the Pedestal.
- A minimum of two people is required.
- Tools: torx screwdriver (size T30), spanner (size 19).

1. Remove the front cover plate (A) from the Pedestal (B) by loosening the bolts (C) (8x).
2. Put the front cover plate (A) and the bolts (C) in a safe location as they will be installed back later on.

3. Remove the rear cover plate (H) from the Pedestal (B) by loosening the bolts (G) (6x).
4. Put the rear cover plate (H) and the bolts (G) in a safe location as they will be installed back later on.
5. Carefully position the Pedestal (B) next to the foundation (D).
6. Pull the cables (E) through the opening (F).
7. Erect the Pedestal (B).

**NOTICE**

This must be carried out by two people, one of whom will tilt the pedestal on one of the sides.

8. Make sure that the pedestal’s base (K) is aligned with the mounting holes of the foundation (D).

9. Insert M12 bolts (minimum length of the bolts is 35 mm) (I) fitted with washers (J) into the holes (6x).

10. Tighten the bolts with a tightening torque of 10 Nm.
5.12.2. Mounting the Dual Depot Charge Box onto the Pedestal

Prerequisites:
- All packaging material is removed from the Pedestal.
- A minimum of two people is required.
- Tools: torx screwdriver (size TT20).

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that personnel cannot be crushed or become trapped while moving the Dual Depot Charge Box.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warranty</td>
</tr>
<tr>
<td>Any damage caused during the process of moving the Dual Depot Charge Box to its position is not covered by the warranty.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not use a compressor to clean the Dual Depot Charge Box. Use a vacuum cleaner.</td>
</tr>
</tbody>
</table>

Mounting the Dual Depot Charge Box onto the Pedestal

1. Carefully place the Dual Depot Charge Box against the Pedestal.
2. Make sure that the Dual Depot Charge Box is aligned with the holes in the metal plate of the Pedestal.
3. Insert the M6 bolts (C), washers (B) and spring washers (A) into the holes on the back side of the Pedestal (4x).
4. Tighten the bolts/nuts with a tightening torque of 10 – 15 Nm.
5.13. Mounting the Dual Depot Charge Box onto a wall

**Prerequisites:**
- All packaging material is removed from the Dual Depot Charge Box.
- A minimum of two people is required.
- Tools: spanner (size 13).

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Make sure that personnel cannot be crushed or become trapped while moving the Dual Depot Charge Box.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Warranty</strong></td>
</tr>
<tr>
<td>Any damage caused during the process of moving the Dual Depot Charge Box to its position is not covered by the warranty.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not use a compressor to clean the Dual Depot Charge Box. Use a vacuum cleaner.</td>
</tr>
</tbody>
</table>
5.13.1. Using the wall-mounting brackets

**NOTICE**

Make sure that the wall, onto which the Dual Depot Charge Box is to be installed, will support the weight of the device.

The Dual Depot Charge Box can be easily mounted by using the wall-mounting brackets, see "Wall-mounting brackets for Dual Depot Charge Box" safe wall fixing on Page 21.

**Attaching wall-mounting brackets to the Dual Depot Charge Box**

1. Determine whether the wall-mounting brackets (D) should be mounted horizontally or vertically, see also section "Wall mounting" on Page 45.
2. Put the wall-mounting brackets (D) (4x) against the back side of the Dual Depot Charge Box.
3. Insert M6 bolts (A), washers (B) and spring washers (C) into the holes of the back side and into the wall-mounting brackets (D) (4x).
4. Tighten the bolts with a tightening torque of 10 – 15 Nm.
5. Drill 4 holes (G) in the wall with a 12 mm drill following the diagram in section "Wall mounting" on Page 45.
6. Place the 12x60 wall plugs (H) inside the holes (G).
7. Carefully place the Dual Depot Charge Box against the wall.
8. Make sure that the Dual Depot Charge Box is aligned with the drilled holes (G) in the wall.
9. Insert the M8 wall screw (E) fitted with the washers (F) into the holes of the wall-mounting brackets (D) (4x).
10. Tighten the wall screws with a tightening torque of 10 – 15 Nm.
Mounting the Dual Depot Charge Box onto a wall
5.14. Cable connections of the Dual Depot Charge Box

<table>
<thead>
<tr>
<th>Gland #</th>
<th>Clamping range ØF</th>
<th>Cable</th>
</tr>
</thead>
<tbody>
<tr>
<td>00</td>
<td>9-16 mm</td>
<td>Spare</td>
</tr>
<tr>
<td>01</td>
<td>5-10 mm</td>
<td>Interlock Out</td>
</tr>
<tr>
<td>02</td>
<td>5-10 mm</td>
<td>AC In</td>
</tr>
<tr>
<td>03</td>
<td>5-10 mm</td>
<td>Interlock In</td>
</tr>
<tr>
<td>04</td>
<td>5-10 mm</td>
<td>AC Out</td>
</tr>
<tr>
<td>05</td>
<td>22-32 mm</td>
<td>DC+ In</td>
</tr>
<tr>
<td>06</td>
<td>22-32 mm</td>
<td>DC+ Out</td>
</tr>
<tr>
<td>07</td>
<td>22-32 mm</td>
<td>DC- In</td>
</tr>
<tr>
<td>08</td>
<td>22-32 mm</td>
<td>DC- Out</td>
</tr>
<tr>
<td>09</td>
<td>3x7 mm</td>
<td>Ext. EMO, Ext. Beacon 1, Ext. Stop button 1</td>
</tr>
<tr>
<td>10</td>
<td>3x7 mm</td>
<td>Ext. EMO, Ext. Beacon 2, Ext. Stop button 2</td>
</tr>
<tr>
<td>11</td>
<td>10-14 mm</td>
<td>PE</td>
</tr>
<tr>
<td>12</td>
<td>10-14 mm</td>
<td>PE</td>
</tr>
<tr>
<td>13</td>
<td>18-25 mm</td>
<td>Spare</td>
</tr>
<tr>
<td>14</td>
<td>18-25 mm</td>
<td>Spare</td>
</tr>
<tr>
<td>15</td>
<td>9-16 mm</td>
<td>Ethernet In</td>
</tr>
<tr>
<td>16</td>
<td>9-16 mm</td>
<td>Ethernet Out</td>
</tr>
</tbody>
</table>

Description of glands’ functions and clamping ranges.

---

DANGER

Make sure that the main switch of the power supply group for the product is set to the **OFF** position. **Do a voltage check** to make sure that the electrical power is disconnected from the system. Secure against resetting.

5.14.1. Gland layout of the Dual Depot Charge Box

Gland layout at the Dual Depot Charge Box's bottom.
5.14.2. Opening the door of the Dual Depot Charge Box

Prerequisites
- The key previously removed from the Dual Depot Charge Box.

1. Unlock the handle (B).
2. Use the handle (B) to open the door (A).

5.14.3. Removing the protection cover

Prerequisites:
- Tools: cross-head screwdriver

1. Remove the protection plate (A) by loosening the four screws and their respective washers (B).
2. Mind the cables connected to the fans. They must be unplugged before moving the cover plate.
3. Put the protection plate (A), the screws and the washers (B) in a safe location as it will be installed back later on.

### WARNING

It is **not** allowed to remove the connector plates (marked in the picture below), **nor** to loosen their mountings.
5.14.4. Connect the external PE wire

- PE may be connected from locally available ground connection in the vicinity of the Dual Depot Charge Box
- PE may be routed from Power Cabinet or distribution board via cable conduits. In that scenario each Dual Depot Charge Box should have dedicated PE cable.

Prerequisites:
- Tools: wire cutter, wire stripper pliers, ferrule, crimp pliers, screwdriver

1. Loosen and remove the cable gland’s (#11) nut for the PE wire.
2. Slide the cable gland’s nut over the PE wire.
3. Route the PE wire (B) through gland #11 to the PE connector block X8-1. Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Cut the PE wire to the correct length to reach the PE connector block X8-1. Do not make the wire routing too tight, or too loose.
5. Tighten the nut of the gland to secure the PE wire.
6. Strip 11 mm of the insulation from the end of the PE wire (B).
7. Crimp a ferrule (A) to the end of the PE wire (B).
8. Loosen the connector screw of the PE connector block X8-1.
9. Insert the PE wire (B) into the PE connector block X8-1.
10. Tighten the screw of the connector block with a tightening torque of 1.3 Nm.
5.14.5. Install lighting protection (optional)

**NOTICE**

When using this option, the PE wire between the Power Cabinet and the Dual Depot Charge Box doesn’t have to be installed. For more details see section *Cables connecting the Dual Depot Charge Boxes*

- 1x or 2x AC auxiliary power cable (in case daisy-chain option is applied),
- 2x DC power cables,
- 1x Interlock cable,
- 1x Ethernet cable,

Grounding of the Dual Depot Charge Box on Page 48.

**WARNING**

In case the Pedestal is used, the lighting protection wire must be connected first to the GND point of the Pedestal. See section *Connecting the PE or lighting protection wire onto the pedestal* on Page 94.

**Prerequisites:**

- Tools: wire cutter, wire stripper pliers, ferrule, crimp pliers, screwdriver

![Location of the PE connector block X8-2.](image)

1. Loosen and remove the cable gland’s (#12) nut for the PE wire.
2. Slide the cable gland’s nut over the PE wire.
3. Route the PE wire (B) through gland #12 to the PE connector block X8-2. Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Shorten the PE wire to the correct length - allowing to reach the PE connector block X8-2. Do not make the wire routing too tight or too loose.
5. Tighten the nut of the gland to secure the PE wire.
6. Strip 11 mm of the insulation from the end of the PE wire (B).
7. Crimp a ferrule (A) to the end of the PE wire (B).
8. Loosen the connector screw of the PE connector block X8-2.
9. Insert the PE wire (B) into the PE connector block X8-2.
10. Tighten the screw of the connector block with a tightening torque of 1.3 Nm.
5.14.6. Connecting the PE or lighting protection wire onto the pedestal

Prerequisites:

- Tools: wire cutter, wire stripper pliers, cable lugs (2x), spanner (size 13), torque wrench (size 13).

Instructions on connecting PE or lightning protection wire to the pedestal.

In case the Dual Depot Charge Box is mounted on a pedestal, it is crucial that the pedestal is connected to the Dual Depot Charge Box’s PE or lightning protection system with a wire.

**NOTICE**

For safety, it is recommended to make a loop on the PE wire so it is longer than the phase wires. This loop ensures that the PE wire is not the first wire that is disconnected if the Dual Depot Charge Box is moved by a collision.
1. Make a loop on the PE wire that is coming from the Power Cabinet or ground electrode (F).
2. Cut the PE wire from the Power Cabinet or ground electrode to the correct length - allowing to reach the GND point on the pedestal (I).
3. Loosen and remove the cable gland’s (#11 or #12) nut for the PE wire.
4. Route the PE wire from the GND point (I) through the gland to the X8-1 PE connector block (if the lightning protection is not applied) or X8-2 PE connector block (if lightning protection is applied) within the Dual Depot Charge Box. See also section Connecting the PE wire of the AC power cables on Page 68 or Installing lightning protection (optional) on Page 93. Do not make the wire routing too tight or too loose.
5. Shorten the PE led to the Dual Depot Charge Box to the correct length - allowing to reach the GND point (I).
6. Tighten the nut of the gland to secure the PE wire.
7. Strip 11 mm of the insulation from the ends of the PE wire inside the Dual Depot Charge Box.
8. Crimp a ferrule (J) to the end of the PE wire (K).
9. Loosen the connector screw of the PE connector block X8-1 or X8-2.
10. Insert the PE wire into the PE connector block X8-1 or X8-2.
11. Strip 20 mm of the insulation from the ends of the PE wires (B, F).
12. Attach a wire end ring (G) to the ends of the PE wires (B, F).
13. Place the contact washer (E), both PE wires (B, F) and the toothed washer (D) onto the GND point (I).
14. Screw the M8 nut (C) onto the GND point (I).
15. Tighten the nut with a tightening torque of 15 Nm.
5.14.7. Connecting the DC power in- and output cables

**Prerequisites:**
- Tools: wire cutter, wire stripper pliers, cable lugs, spanner (size 17), torque wrench (size 17).

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td>It is not allowed to remove the connector plates (I - in the picture below), nor to loosen their mountings.</td>
</tr>
</tbody>
</table>

**Location of the DC power input connectors.**

**Instructions on preparing the DC wires.**
Connection of the DC inputs:
1. Loosen and remove the cable gland’s (#05 and #07) nuts for the DC power input cables.
2. Slide the cable gland’s nuts over the DC power cables.
3. Insert the DC power cables into the cable gland (#05 and #07).
4. Strip the length of the insulation specified by the size of the wire end ring (J).
5. Attach wire end rings (J) at the ends of the wires.
6. Fit a M10 bolt (C) with washer (D) and the DC cable (A).
7. Insert the bolt fitted with the DC- cable into the corresponding connection point (H) of the rail.
8. Place the contact washer (E), the DC- cable (A) and the toothed washer (D) onto the contact point (C).
9. Tighten the bolt/nut (F) connections with a tightening torque of 20 Nm.
10. Insert the bolt fitted with the DC+ cable into the corresponding connection point (G) of the rail.
11. Place the contact washer (E), the DC cable (A) and the toothed washer (D) onto the contact point (C)
12. Tighten the bolt/nut (F) connections with a tightening torque of 20 Nm.
13. Tighten the cable glands’ nuts to secure the DC power cables.

Connection of the DC outputs:
1. Loosen and remove the cable gland’s (#06 and #08) nuts for the DC power output cables.
2. Slide the cable gland’s nuts over the DC power cables.
3. Insert the DC power cables into the cable gland (#06 and #08).
4. Strip the length of the insulation specified by the size of the wire end ring (J).
5. Attach wire end rings (J) at the ends of the wires.
6. Fit a M10 bolt (C) with washer (D) and the DC cable (A).
7. Insert the bolt fitted with the DC- cable into the corresponding connection point (K) of the rail.
8. Place the contact washer (E), the DC- cable (A) and the toothed washer (D) onto the contact point (C).
9. Tighten the bolt/nut (F) connections with a tightening torque of 20 Nm.
10. Insert the bolt fitted with the DC+ cable into the corresponding connection point (L) of the rail.
11. Place the contact washer (E), the DC cable (A) and the toothed washer (D) onto the contact point (C)
12. Tighten the bolt/nut (F) connections with a tightening torque of 20 Nm.
13. Tighten the cable glands’ nuts to secure the DC power cables.
NOTICE

The connections presented below should be executed by leading the required cables through the conduit (A) located behind the connections bars (B). Utilize tie wraps to attach the cables to the holders (C).

Location of the cable conduit and holders.
5.14.8. Connecting the AC auxiliary power cable

**Prerequisites:**

- Tools: wire cutter, wire stripper pliers, ferrule, crimp pliers, screwdriver

1. Loosen and remove the cable glands’ (#02 and #04) nuts for the AC auxiliary power Input and Output cables.
2. Slide the cable glands’ nuts over the AC auxiliary power cables.
3. Route the AC auxiliary power cables through glands #02 and #04 to terminal block X4. Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Cut the AC auxiliary power cables to the correct length - allowing to reach the terminal block X4. Do not make the cable routing too tight or too loose.
5. Tighten the nuts of the glands to secure the AC auxiliary power cables.
6. Strip 11 mm of the insulation from the ends of the wires (B).
7. Crimp ferrules (A) to the ends of the wires (B).
8. Loosen the connector screws of terminal blocks: X4-33, X4-34, X4-35, X4-36, X4-37 and X4-38 (refer to the picture above).
9. Insert the wires of the AC auxiliary power cable into the connectors of the terminal block X4. Refer to the table below:

<table>
<thead>
<tr>
<th>Functional description</th>
<th>Connector</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>AC aux Line Input</td>
<td>X4-33</td>
<td>Brown</td>
</tr>
<tr>
<td>AC aux Line Output</td>
<td>X4-34</td>
<td>Brown</td>
</tr>
<tr>
<td>AC aux Neutral Input</td>
<td>X4-35</td>
<td>Blue</td>
</tr>
<tr>
<td>AC aux Neutral Output</td>
<td>X4-36</td>
<td>Blue</td>
</tr>
<tr>
<td>AC aux PE Input</td>
<td>X4-37</td>
<td>Green/yellow</td>
</tr>
<tr>
<td>AC aux PE Output</td>
<td>X4-38</td>
<td>Green/yellow</td>
</tr>
</tbody>
</table>

10. Tighten the connector screw of the terminal blocks with a tightening torque of 1.3 Nm.
5.14.9. Connecting the InterLock cable from the Power Cabinet or the Dual Depot Charge Box

Prerequisites:
- Tools: wire cutter, wire stripper pliers, screwdriver, ferrules, crimp pliers

Location of terminal blocks X3 and the preferred cable route.

Positions of terminal blocks X3 required for connection of InterLock.

1. Loosen and remove the cable gland’s (#03) nut for the Interlock cable.
2. Slide the cable gland’s nut over the Interlock cable.
3. Route the Interlock cable through gland #03 to the terminal blocks X3. Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Shorten the InterLock cable to the correct length – allowing to reach the terminal block X3. Do not make the cable routing too tight, or too loose.
5. Tighten the nut of the gland to secure the InterLock cable.
6. Strip 11 mm of the insulation from the ends of the wires.
7. Tighten the shield of the Interlock cable into a thread and slide a shrink tubing over the it.
8. Crimp ferrules to the ends of the wires.
9. Loosen the connector screws.
10. Insert the wires of the InterLock cable into the connectors of the terminal block X3. Refer to the table below:
<table>
<thead>
<tr>
<th>Functional description</th>
<th>Connector</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlock In (*)</td>
<td>X3-2</td>
<td>White</td>
</tr>
<tr>
<td>Interlock Out (**)</td>
<td>X3-3</td>
<td>Brown</td>
</tr>
<tr>
<td>DC Guard A</td>
<td>X3-6</td>
<td>Green</td>
</tr>
<tr>
<td>DC Guard A GND</td>
<td>X3-7</td>
<td>Yellow</td>
</tr>
<tr>
<td>Interlock GND</td>
<td>X3-1</td>
<td>Shield</td>
</tr>
</tbody>
</table>

(*) Interlock Out in Power Cabinet.
(**) Interlock In in Power Cabinet.

See also Appendix F Signal connection diagram.

12. Tighten the connector screws of the terminal blocks with a tightening torque of 1.3 Nm.

5.14.10. Connecting the InterLock cable to the next Dual Depot Charge Box

Location of terminal blocks X4 and the preferred cable route.

Positions of terminal blocks X4 required for connection of InterLock.

1. Loosen and remove the cable gland’s (#01) nut for the Interlock cable.
2. Slide the cable gland's nut over the Interlock cable.
3. Route the Interlock cable through gland #01 to the terminal blocks X4. Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Shorten the InterLock cable to the correct length – allowing to reach the terminal block X4. Do not make the cable routing too tight, or too loose.
5. Tighten the nut of the gland to secure the InterLock cable.
6. Strip 11 mm of the insulation from the ends of the wires.
7. Tighten the shield of the Interlock cable into a thread and slide a shrink tubing over the it.
8. Crimp ferrules to the ends of the wires.
9. Loosen the connector screws.
10. Insert the wires of the InterLock cable into the connectors of the terminal block X4. Refer to the table below:

<table>
<thead>
<tr>
<th>Functional description</th>
<th>Connector</th>
<th>Wire color</th>
</tr>
</thead>
<tbody>
<tr>
<td>Interlock In</td>
<td>X4-4</td>
<td>White</td>
</tr>
<tr>
<td>Interlock Out</td>
<td>X4-5</td>
<td>Brown</td>
</tr>
<tr>
<td>DC Guard A</td>
<td>X4-8</td>
<td>Green</td>
</tr>
<tr>
<td>DC Guard A GND</td>
<td>X4-9</td>
<td>Yellow</td>
</tr>
<tr>
<td>Interlock GND</td>
<td>X4-1</td>
<td>Shield</td>
</tr>
</tbody>
</table>

See also Appendix F Signal connection diagram.

5.14.11. Connecting the communication Ethernet cable (input)

Information in this chapter refers to the communication cables connecting the Dual Depot Charge Box to the Power Cabinet or a preceding Dual Depot Charge Box.

1. Loosen and remove the cable gland’s (#15) nut for the communication Ethernet cable.
2. Insert the communication cable into the cable gland (#15) and tighten the cable gland’s nut to secure the cable(s).
3. Route the Ethernet cable to the terminal X11 (refer to the picture above for the preferred cable route). Do not make the cable routing too tight, or too loose.
4. Plug the cable’s RJ45 connector into the terminal X11’s socket.
5. Tighten the nut of the gland to secure the Ethernet cable.
5.14.12. Connecting the communication Ethernet cable (output)

Information in this chapter refers to the communication cables connecting the Dual Depot Charge Box to the next Dual Depot Charge Box.

1. Loosen and remove the cable gland’s (#16) nut for the communication Ethernet cable.
2. Insert the communication cable into the cable gland (#16) and tighten the cable gland’s nut to secure the cable(s).

3. Route the Ethernet cable to the terminal X12 (refer to the picture above for the preferred cable route). Do not make the cable routing too tight, or too loose.
4. Plug the cable’s RJ45 connector into the terminal X12’s socket.
5. Tighten the nut of the gland to secure the Ethernet cable.

Location of terminal X12 and instructions on the connection.
5.14.13. Connecting external EMO, Beacon and Stop button cables (optional)

**NOTICE**

There is a possibility to connect an external Beacon light, Stop button and/or Emergency Stop Button(s) (EMO) to the Dual Depot Charge Box, see for more details section *Optional external interface cables* on Page 49.

**Prerequisites:**
- Tools: wire cutter, wire stripper pliers, screwdriver, ferrules, crimp pliers

Location of terminal blocks X3 and X4, and the preferred cable route.

Positions of terminal blocks X3 and X4 required for connection of external devices.
The cable connections for external devices mentioned in this chapter should be led through glands #09 and/or #10. It is recommended leading all the necessary external device cables through the glands simultaneously, as up to three cables may pass through a gland.

External EMO(s):

If required, it is possible to connect up to two external Emergency Stop Buttons (EMOs).

1. Loosen and remove the cable gland’s (#09 or #10) nut for the Ext. EMO 1 cable.
2. Loosen and remove the cable gland’s (#09 or #10) nut for the Ext. EMO 2 cable.
3. Slide the cable glands’ nuts over the cables.
4. Route the cables through glands #09 and/or #10 to the terminal blocks X4. Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
5. Shorten the cables to the correct length - allowing to reach the terminal block X4. Do not make the cable routing too tight or too loose.
6. Tighten the nuts of the gland(s) to secure the cables.
7. Strip 11 mm of the insulation from the ends of the wires.
8. Crimp ferrules to the ends of the wires.
9. Loosen the connector screws.
10. The red wire connecting pins X4-28 and X4-29 **must be removed** if the Ext. EMO 1 is applied.
11. The black wire connecting pins X4-30 and X4-31 **must be removed** if the Ext. EMO 2 is applied.
12. Insert the wires of the cables into the corresponding connectors of the terminal block X4 (refer to the table below).
13. Tighten the connector screws of the terminal blocks with a tightening torque of 1.3 Nm.

External Beacon:

It is possible to connect an external LED beacon for each of the charge lines.

1. Loosen and remove the cable gland’s (#09 or #10) nut for the Ext. Beacon cable.
2. Slide the cable gland’s nuts over the cable.
3. Route the cable through gland #09 and/or #10 to the terminal blocks X3 (for CCS 1) or X4 (for CCS 2). Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Shorten the cable to the correct length - allowing to reach the terminal block X3 or X4. Do not make the cable routing too tight or too loose.
5. Tighten the nut of the gland to secure the cable.
6. Strip 11 mm of the insulation from the ends of the wires.
7. Crimp ferrules to the ends of the wires.
8. Loosen the connector screws.
9. Insert the wires of the cables into the corresponding connectors of the terminal block X3 or X4 (refer to the table below).
10. Tighten the connector screws of the terminal blocks with a tightening torque of 1.3 Nm.
External Stop Button:

It is possible to connect an external stop button for each of the charge lines.

1. Loosen and remove the cable gland’s (#09 or #10) nut for the Ext. Beacon cable.
2. Slide the cable gland’s nuts over the cable.
3. Route the cable through gland #09 and/or #10 to the terminal blocks X3 (for CCS 1) or X4 (for CCS 2). Refer to the figure above for the preferred cable route through the cable duct inside the cabinet.
4. Shorten the cable to the correct length - allowing to reach the terminal block X3 or X4. Do not make the cable routing too tight or too loose.
5. Tighten the nut of the gland to secure the cable.
6. Strip 11 mm of the insulation from the ends of the wires.
7. Crimp ferrules to the ends of the wires.
8. Loosen the connector screws.
9. Insert the wires of the cables into the corresponding connectors of the terminal block X3 or X4 (refer to the table below). Pins X3-14/ X4-14 (External stop button +24 V) and X3-15/X4-15 (External stop button 0 V) provide power supply of 24VDC. Their connection is necessary only if the applied button requires additional power supply (e.g., to highlight it with a LED).
10. Tighten the connector screws of the terminal blocks with a tightening torque of 1.3 Nm.

<table>
<thead>
<tr>
<th>Functional description</th>
<th>Connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>External stop button + (CCS 1)</td>
<td>X3-10</td>
</tr>
<tr>
<td>External stop button – (CCS 1)</td>
<td>X3-11</td>
</tr>
<tr>
<td>External stop button +24 V (optional) (CCS 1)</td>
<td>X3-14</td>
</tr>
<tr>
<td>External stop button 0 V (optional) (CCS 1)</td>
<td>X3-15</td>
</tr>
<tr>
<td>External stop button + (CCS 2)</td>
<td>X4-10</td>
</tr>
<tr>
<td>External stop button - (CCS 2)</td>
<td>X4-11</td>
</tr>
<tr>
<td>External stop button +24 V (optional) (CCS 2)</td>
<td>X4-14</td>
</tr>
<tr>
<td>External stop button 0 V (optional) (CCS 2)</td>
<td>X4-15</td>
</tr>
<tr>
<td>External emergency button S1-1 (EMO 1)</td>
<td>X4-28</td>
</tr>
<tr>
<td>External emergency button S1-2 (EMO 1)</td>
<td>X4-29</td>
</tr>
<tr>
<td>External emergency button S2-1 (EMO 2)</td>
<td>X4-30</td>
</tr>
<tr>
<td>External emergency button S2-2 (EMO 2)</td>
<td>X4-31</td>
</tr>
<tr>
<td>External beacon light Red (CCS 1)</td>
<td>X3-21</td>
</tr>
<tr>
<td>External beacon light Green (CCS 1)</td>
<td>X3-20</td>
</tr>
<tr>
<td>External beacon light Blue (CCS 1)</td>
<td>X3-17</td>
</tr>
<tr>
<td>External beacon light +24 V (CCS 1)</td>
<td>X3-16</td>
</tr>
<tr>
<td>External beacon light Red (CCS 2)</td>
<td>X4-21</td>
</tr>
<tr>
<td>External beacon light Green (CCS 2)</td>
<td>X4-20</td>
</tr>
<tr>
<td>External beacon light Blue (CCS 2)</td>
<td>X4-17</td>
</tr>
<tr>
<td>External beacon light +24 V (CCS 2)</td>
<td>X4-16</td>
</tr>
</tbody>
</table>

See also Appendix F Signal connection diagram.

Prerequisites:
- Tools: cross-head screwdriver

1. Take the protection cover, the screws and the washers that were previously removed in Removing the protection cover on Page 73.
2. Place the protection cover (A) back over the DC contactors and secure it with the screws (B) combined with the washers (C).
3. Reconnect the plugs of the fans’ power supply cables.
5.14.15. Closing the door of the Dual Depot Charge Box

**Prerequisites**
- The key previously removed from the Dual Depot Charge Box

1. Close the door (A).
2. Lock the handle (B).
5.14.16. Reattaching rear cover plate of the Pedestal

**Prerequisites:**
- Tools: torx screwdriver (size T30), wire cutter, wire stripper pliers, cable lugs (2x), spanner (size 10), torque wrench (size 10).

*Reattaching the pedestal’s rear cover plate*

*Overview of the pedestal after reattaching the rear cover plate*
Instructions on preparing and connecting the PE wire

1. Place the front cover plate (B) against the back side of the Pedestal (A).
2. Insert the M6 bolts (C) into the holes (6x) and tighten them.
3. It is necessary to connect the cover plate and the pedestal with a PE wire. Prepare a wire of appropriate length – no longer than allowing to open the rear cover plate.
4. Strip the length of the insulation specified by the size of the wire end rings (G) at both ends of the wire.
5. Attach wire end rings (G) at the ends of the wire.
6. Place the contact washers (J), the ends of the PE wire (L) and the toothed washers (I) onto the GND points (E, F).
7. Screw the M8 nuts (K) onto the GND points (E, F).
8. Tighten the nuts with a tightening torque of 15 Nm.
5.14.17. Reattaching front cover plate of the Pedestal

Prerequisites:
- Tools: torx screwdriver (size T30), wire cutter, wire stripper pliers, cable lugs (2x), spanner (size 10), torque wrench (size 10).

Reattaching the pedestal’s front cover plate

Overview of the front cover plate's connection from inside the pedestal
Instructions on preparing and connecting the PE wire

1. It is necessary to connect the cover plate and the pedestal with a PE wire. Prepare a wire of appropriate length – no longer than allowing to open the rear cover plate.
2. Strip the length of the insulation specified by the size of the wire end rings (G) at both ends of the wire.
3. Attach wire end rings (G) at the ends of the wire.
4. Place the contact washers (J), the ends of the PE wire (L) and the toothed washers (I) onto the GND points (E, F).
5. Screw the M8 nuts (K) onto the GND points (D, E).
6. Tighten the nuts with a tightening torque of 15 Nm.
7. Place the front cover plate (A) against the front side of the Pedestal (B).
8. Insert the M6 bolts (C) into the holes (8x) and tighten them.
6. Commissioning

6.1. Commissioning preparation

Commissioning is the last phase necessary to get the HVC-R 100/150 E-Bus Charger into operation. The planning steps for the commissioning phase are shown in the figure below.

**Indication of Commissioning phase on the planning diagram**

**D Commissioning**

The commissioning of the HVC-R 100/150 E-Bus Charger needs to be performed by a service engineer from the ABB Delivery department and/or a certified local ABB service engineer. Both will need the support from the local Contractor. Before the service engineer can begin, the following conditions must be met:

- All installation works are completed.
- Power grid is available.
- A local technician is present for assistance and to switch the power on.
- An electric or hybrid bus available to perform the functional tests.

**CAUTION**

**Warranty**

It is not permitted to move the entirety or any elements of the HVC-R 100/150 E-Bus Charger after the commissioning. If the entirety or any parts of the HVC-R 100/150 E-Bus Charger are moved without contacting the ABB Service department, the warranty will be considered void.
6.2. Customer Acceptance Form (CAF)

After the commissioning is completed, the Owner / Site Operator will sign the Customer Acceptance Form (CAF). In certain circumstances ABB will be represented by a project engineer.

The CAF contains information about:

- the project (number, location, charger type);
- a checklist regarding the delivery;
- the commissioning SAT checklist;
- A list of remaining items.

Once the CAF is signed, the customer support will be handled by the ABB Service department. If there are any remaining items, they can be listed on the CAF document, together with the agreed solution and the expected date of completion.
7. Service and Maintenance

7.1. About Service and Maintenance

Indication of Service and Maintenance phase on the planning diagram

E Service and Maintenance
Maintenance is done according to the maintenance schedule, which is outside of the scope of this document.

DANGER

Any service and maintenance work on the charger system has to be only executed on powered-off device. Make sure that the main switch of the power supply group for the product is set to the OFF position. Do a voltage check to make sure that the electrical power is disconnected from the system. Secure against resetting.

7.2. Cleaning of the cabinet

The Power Cabinet and the Dual Depot Charge Box are powder coated. The coating must be kept in good condition. Clean the Power Cabinet and the Dual Depot Charge Box 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 manually 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 any damage.
NOTICE
If the HVC-R 100/150 E-Bus Charger is exposed to rain, it is sufficient to clean it twice a year.

CAUTION
Do not use 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 pH value between 6 and 8.
- Do not use cleaning agents with abrasive components.
- Do not use abrasive tools.
8. Technical specification

8.1. Electrical specification of a complete 100 kW system

<table>
<thead>
<tr>
<th>AC Input Power Cabinet</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
</tr>
<tr>
<td>Input voltage range</td>
</tr>
<tr>
<td>Input frequency range</td>
</tr>
<tr>
<td>Maximum power dissipation</td>
</tr>
<tr>
<td>Power factor (cos φ)</td>
</tr>
<tr>
<td>Standby power consumption</td>
</tr>
<tr>
<td>Efficiency</td>
</tr>
<tr>
<td>Maximum input current</td>
</tr>
<tr>
<td>Nominal input current</td>
</tr>
<tr>
<td>Earth Leakage Current Protection</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Short Circuit Capacity</td>
</tr>
<tr>
<td>AC power connection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AC Input Dual Depot Charge Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>Supply voltage</td>
</tr>
<tr>
<td>Input voltage</td>
</tr>
<tr>
<td>Input frequency range</td>
</tr>
<tr>
<td>Nominal input current</td>
</tr>
<tr>
<td>Earth Leakage Current protection</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>DC output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum output power</td>
</tr>
<tr>
<td>Output voltage range</td>
</tr>
<tr>
<td>Maximum output current</td>
</tr>
</tbody>
</table>
### 8.2. Electrical specification of a complete 150 kW system

<table>
<thead>
<tr>
<th>AC Input Power Cabinet</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply voltage</strong></td>
<td>3-phase, 400 V AC: PE, L1, L2, L3</td>
</tr>
<tr>
<td><strong>Input voltage range</strong></td>
<td>400 V AC ± 10%</td>
</tr>
<tr>
<td><strong>Input frequency range</strong></td>
<td>50 Hz ± 4%</td>
</tr>
<tr>
<td><strong>Maximum power dissipation</strong></td>
<td>174 kVA</td>
</tr>
<tr>
<td><strong>Power factor (cos ( \phi ))</strong></td>
<td>≥ 0.95</td>
</tr>
<tr>
<td><strong>Standby power consumption</strong></td>
<td>&lt; 60 W</td>
</tr>
<tr>
<td><strong>Efficiency</strong></td>
<td>94% and 96% in power spectrum between 20% and 100% of full power</td>
</tr>
<tr>
<td><strong>Maximum input current</strong></td>
<td>265 A AC</td>
</tr>
<tr>
<td><strong>Nominal input current</strong></td>
<td>238 A AC</td>
</tr>
<tr>
<td><strong>Earth Leakage Current Protection</strong></td>
<td>AC 300 mA (RCD integrated in HVC150(S))</td>
</tr>
<tr>
<td></td>
<td>AC 30 mA (RCD integrated in ACS Control Module)</td>
</tr>
<tr>
<td><strong>Short Circuit Capacity</strong></td>
<td>25 kA</td>
</tr>
<tr>
<td><strong>AC power connection</strong></td>
<td>240 mm² (max)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>AC Input Dual Depot Charge Box</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supply voltage</strong></td>
<td>1-phase: GND, L, N</td>
</tr>
<tr>
<td><strong>Input voltage</strong></td>
<td>230 V AC ± 10%</td>
</tr>
<tr>
<td><strong>Input frequency range</strong></td>
<td>47 - 63 Hz ± 1%</td>
</tr>
<tr>
<td><strong>Nominal input current</strong></td>
<td>2.17 A AC</td>
</tr>
<tr>
<td><strong>Earth Leakage Current protection</strong></td>
<td>AC 30 mA</td>
</tr>
<tr>
<td><strong>DC output</strong></td>
<td>150 kW</td>
</tr>
<tr>
<td><strong>Output voltage range</strong></td>
<td>150 – 850 V DC</td>
</tr>
<tr>
<td><strong>Maximum output current</strong></td>
<td>200 A DC (limited by CCS cable)</td>
</tr>
</tbody>
</table>

### 8.3. Mechanical data

#### Mechanical specification of the Power Cabinet

<table>
<thead>
<tr>
<th>Dimensions (H x W x D)</th>
<th>2092 x 1170 x 770 mm (including swivel eye bolts)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td>1340 kg</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>1.87 m³</td>
</tr>
<tr>
<td><strong>Dimensions including packaging (H x W x D)</strong></td>
<td>2250 x 1200 x 800 mm</td>
</tr>
<tr>
<td><strong>Weight including packaging</strong></td>
<td>1400 kg</td>
</tr>
<tr>
<td><strong>Weight concrete foundation</strong></td>
<td>1300 kg</td>
</tr>
<tr>
<td><strong>Mechanical impact protection</strong></td>
<td>IK10</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td>Stainless steel 430</td>
</tr>
</tbody>
</table>

#### Mechanical specification of the Dual Depot Charge Box

<table>
<thead>
<tr>
<th>Dimensions (H x W x D)</th>
<th>964x 784 x 265 mm (excluding charge cables)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Weight</strong></td>
<td>80 kg (excluding charge cables)</td>
</tr>
<tr>
<td></td>
<td>110 kg (with two 7m charge cables)</td>
</tr>
<tr>
<td><strong>Volume</strong></td>
<td>0.12 m³</td>
</tr>
<tr>
<td><strong>Dimensions including packaging (H x W x D)</strong></td>
<td>1250 x 900 x 530 mm (including pallet)</td>
</tr>
<tr>
<td><strong>Weight including packaging</strong></td>
<td>102 kg</td>
</tr>
<tr>
<td><strong>Mechanical impact protection</strong></td>
<td>IK10</td>
</tr>
<tr>
<td><strong>Housing</strong></td>
<td>Stainless steel 304</td>
</tr>
</tbody>
</table>
8.4. Environment

Environment specification Power Cabinet

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingression protection</td>
<td>IP54</td>
</tr>
<tr>
<td>Temperature range – Operation</td>
<td>-35 °C to +45 °C</td>
</tr>
<tr>
<td>Temperature range – Storage</td>
<td>-10 °C to +70 °C</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95%, RH – non-condensing</td>
</tr>
<tr>
<td>Airflow</td>
<td>1450 m³/h</td>
</tr>
<tr>
<td>Pressure drop</td>
<td>300 Pa</td>
</tr>
<tr>
<td>Altitude</td>
<td>2000 m (max.)</td>
</tr>
<tr>
<td>Storage conditions</td>
<td>Indoors, dry</td>
</tr>
</tbody>
</table>

Environment specification for the Dual Depot Charge Box

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ingression protection</td>
<td>IP65 (excluding charge cable)</td>
</tr>
<tr>
<td>Temperature range – Operation</td>
<td>-35 °C to +55 °C</td>
</tr>
<tr>
<td>Temperature range – Storage</td>
<td>-10 °C to +70 °C</td>
</tr>
<tr>
<td>Humidity</td>
<td>5% to 95%, RH – non-condensing</td>
</tr>
<tr>
<td>Altitude</td>
<td>2000 m (max.)</td>
</tr>
<tr>
<td>Storage conditions</td>
<td>Indoors, dry</td>
</tr>
</tbody>
</table>

**CAUTION**

Warranty

Warranty will be considered void if the HVC-R 100/150 E-Bus Charger is damaged due to being stored inappropriately by the Customer.

8.5. Certifications

Certifications for complete system

<table>
<thead>
<tr>
<th>Certification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CE</td>
<td>Declaration of Conformity HVC150: 20160609</td>
</tr>
</tbody>
</table>

Class of protection 1 with PE connection
9. **Appendices**

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<th></th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
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<td>A</td>
<td>Dimensions of the Power Cabinet</td>
<td>121</td>
</tr>
<tr>
<td>B</td>
<td>Dimensions of the Dual Depot Charge Box</td>
<td>123</td>
</tr>
<tr>
<td>C</td>
<td>Dimensions of the Power Cabinet’s Concrete Foundation</td>
<td>124</td>
</tr>
<tr>
<td>D</td>
<td>Dimensions of the Power Cabinet’s Metal Foundation</td>
<td>126</td>
</tr>
<tr>
<td>E</td>
<td>Power Cabinet – Outline with the Foundation</td>
<td>127</td>
</tr>
<tr>
<td>F</td>
<td>Signal connection diagram</td>
<td>128</td>
</tr>
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<td>G</td>
<td>Ground overview of the system</td>
<td>129</td>
</tr>
<tr>
<td>H</td>
<td>WEEE disposal – 2012-19/EU</td>
<td>130</td>
</tr>
</tbody>
</table>
A. Dimensions of the Power Cabinet
B. Dimensions of the Dual Depot Charge Box
C. Dimensions of the Power Cabinet’s Concrete Foundation
D. Dimensions of the Power Cabinet’s Metal Foundation

[Diagram of the Power Cabinet’s Metal Foundation]
E. Power Cabinet – Outline with the Foundation

![Diagram of power cabinet outline with the foundation]

- **Excavated Earth**: 
  - **Front View**: Construct on shallow foundation
  - **Side View**: Construct on shallow foundation

- **Foundation on soil improvement**
  - **Front View**
  - **Side View**
F. Signal connection diagram
G. Ground overview of the system