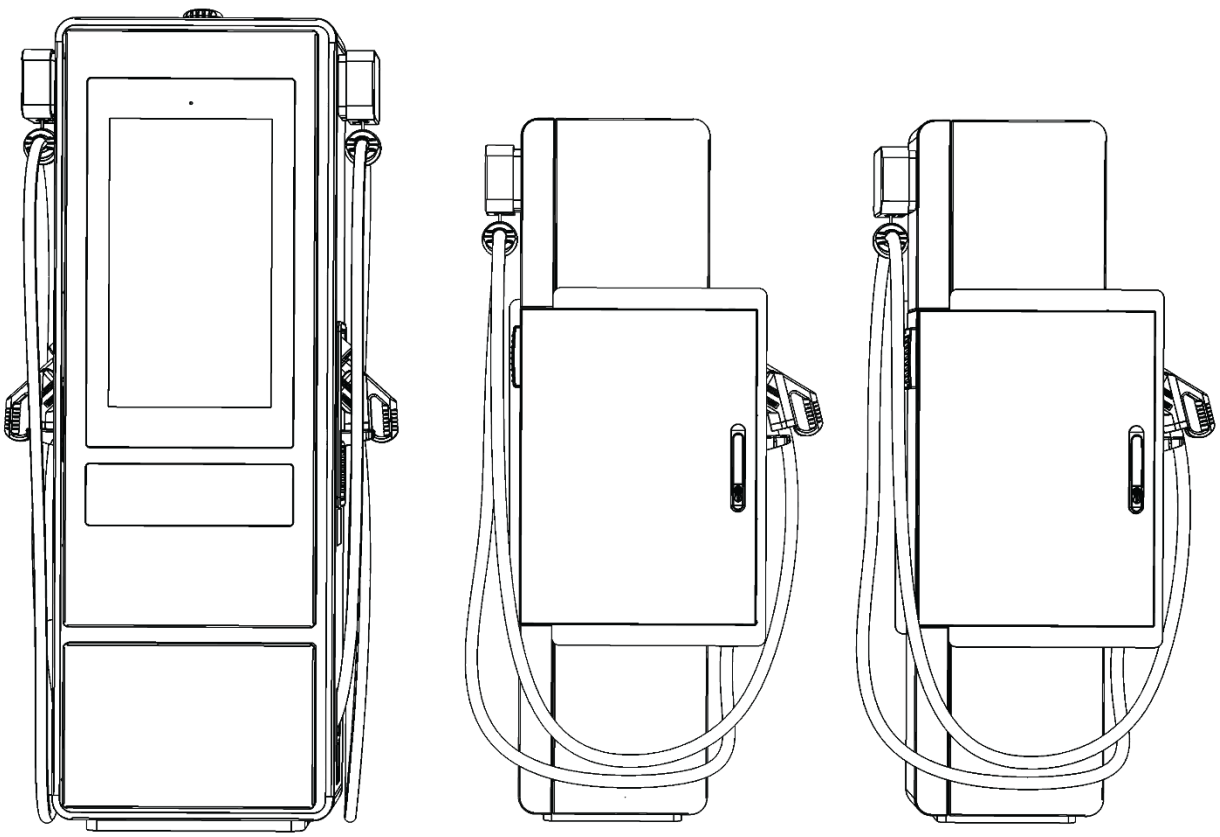
blueberry
CLUSTER

Maintenance Manual



PRODUCT DOCUMENTATION R2 3.0

Powered by i-charging

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blueberry
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1. ABOUT THE MANUAL

The purpose of this manual is to provide maintenance personnel with guidance on how and when to conduct maintenance activities in blueberry CLUSTER.

Please make sure that this manual is carefully read and ensure that all safety notices given are followed.

All technical details, specifications and design characteristics of the product may change without prior notice. The content of this document was carefully checked, however, in case of any inaccuracy, the user is asked to report it to i-charging. This manual should be saved for future reference.

2. IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS

This manual must be read carefully before performing any maintenance action in blueberry CLUSTER. Incorrect operation because of non-compliance with the instructions provided by this manual may lead to severe injuries or damages.

The working steps described must only be carried out by qualified personnel who, based on their knowledge and experience, can assess, and carry out all steps described in this installation manual and recognize potential hazards.

The user must under no circumstances make any changes to the blueberry CLUSTER charging station or use it in a manner that was not designed for. Any disregard of this instruction represents a safety risk and will void the warranty with immediate effect.

BEFORE CHARGING

Before operating the blueberry CLUSTER charging station, make sure that the surrounding environment is free from hazards, that the blueberry CLUSTER does not have any error message on the display and that the charging cable(s) are not damaged.

SAFE CHARGING SESSION

Perform the charging process as described in the User Manual. Once the process is completed, the plug must be placed in the correspondent holder.

IN CASE OF FIRE

In case of an emergency, the main switch of the switchboard power supply shall be turned off.

In case of fire, the main switch of the switchboard power supply shall also be turned off and the source of the flame must be eliminated with a class C fire extinguisher. All components of blueberry CLUSTER charging station are self-extinguishable which means that in case of fire, once the source of the flame has been removed, it will cease burning.

End of Life Disposal

Do not dispose blueberry CLUSTER charging station at public landfill sites. According to the European directive 2012/19/EU (WEEE2) on waste electrical and electronic equipment, the device is excluded from the scope of application, being classified as a large-scale fixed installation. Act in accordance with the local waste utilization regulations. The equipment should be dismantled by specialized companies.

Parts Replacement Waste

At the end of replacement activities ensure that all packaging waste, namely plastics (EWC 15 01 02), wood (EWC 20 01 38) and cables (EWC 17 04 11), is correctly segregated and sent to a waste collection. For proof purposes, documented evidence must be requested and maintained according to local legal requirements.

2.1. Safety Notices

Special warnings and safety measures may appear throughout this document or on the equipment to warn of potential hazards or to call attention.

The symbols carry the following meanings:

RISK OF ELECTRIC SHOCK!

Procedures marked with this symbol must not be carried out under any circumstances before following the “DANGER” instructions.
Actions contrary to these safety notices may lead to severe injury and death.

WARNING!
Procedures marked with this symbol should be carried out with special care.
Hazards that may lead to personal injuries.

CAUTION!

Procedures marked with this symbol must be carried out with special care.
Hazards that may lead to damage in the equipment itself or to other electric devices.

PLEASE NOTE!

Sections marked with this symbol are intended to draw attention to important information that is necessary for the reliable operation of the blueberry charging station.

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3. PREVENTIVE MAINTENANCE

Preventive actions are important to minimize the down time of the blueberry CLUSTER charging station and to guarantee that the equipment is operating correctly. For that, i-charging recommends a time-based approach schedule according with the following plan:

#	Maintenance Actions	Interval
1	Check if site complies with clearance conditions	Every year
2	Verify if the equipment has any kind of physical or structural damage	
3	Confirm that the branding is in good condition	
4	Check cabinets locking system	
5	Check the condition of sealing parts	
6[1]	Clear Air inlets and outlets of any blockage and verify the status and need for ventilation system filters replacement	
7[2]	Painted surfaces cleaning	
8	Verify torque of DC, AC and ground cables	
9	Verify if all cable glands are properly tightened	
10	Confirm that the touch screen is operating correctly	
11	Verify that door sensors are operating correctly	
12	Check if the fast stop button is working properly	
13	Test the cable management system	
14	Verify if the status LEDs are on	
15	Test Residual current device	
16	Execute electrical measurements	
17	Execute charger performance test	

PLEASE NOTE!

If local legal requirements, mandate additional maintenance requirements or shorter intervals, these should be taken in account.

[1]The filters wear out depends on the installation environment conditions. On the first year it is recommended a filter inspection after 6 months to understand if a yearly maintenance is enough.

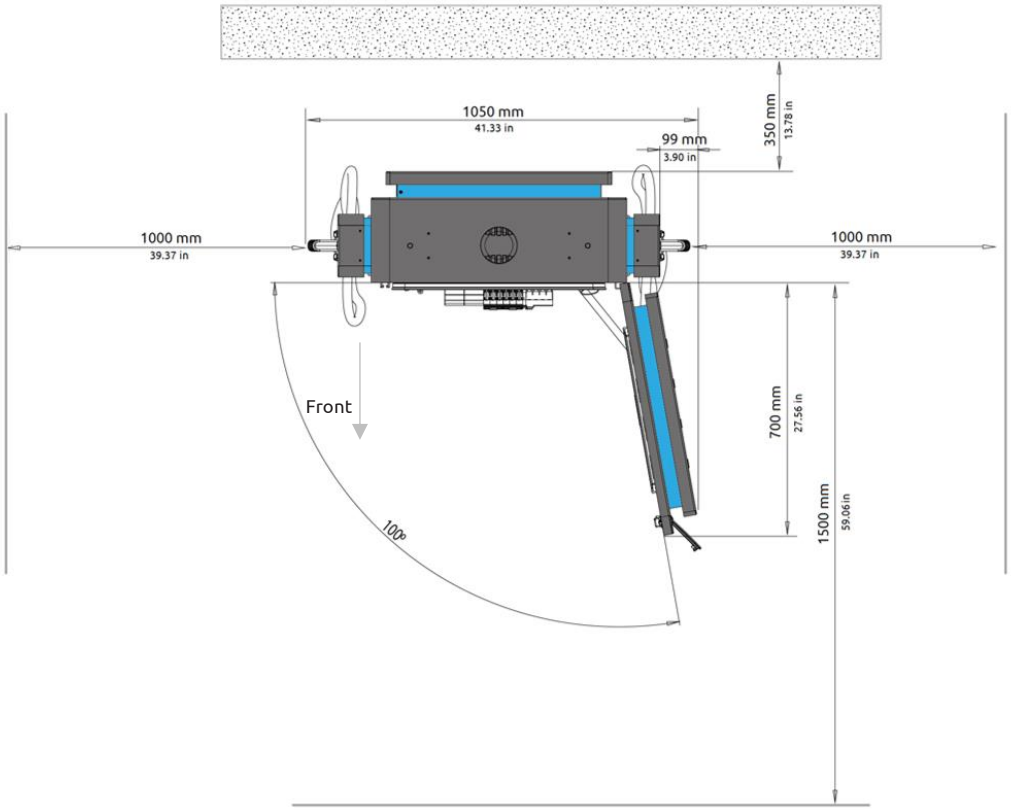
[2]Painted surfaces cleaning frequence must be defined according to the environmental conditions and proximity to the coastline. See chapter 3.1.7.

3.1. Preventive Actions: Step by step

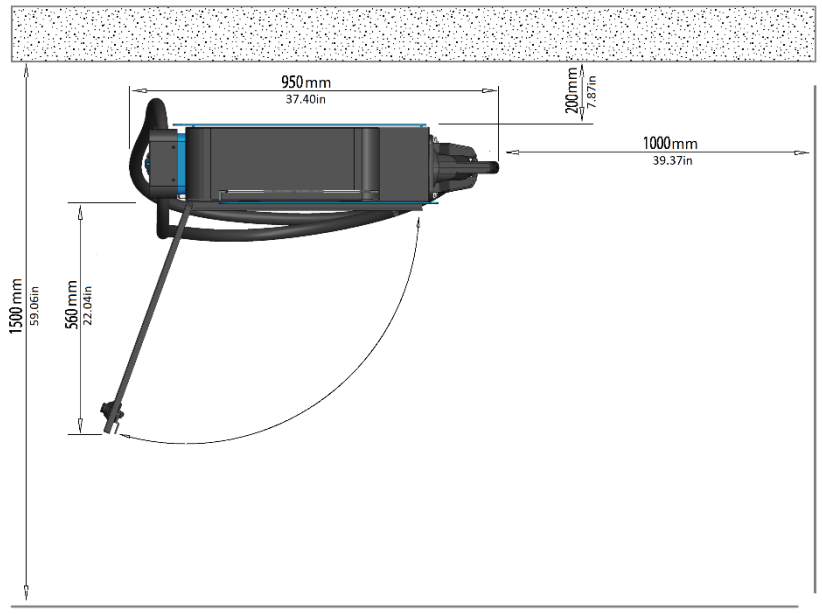
3.1.1. Action 1: Clearance conditions

Please make sure that the distances presented below are satisfied and that there are no road barriers that prevent the door from opening or the ventilation system to work properly.

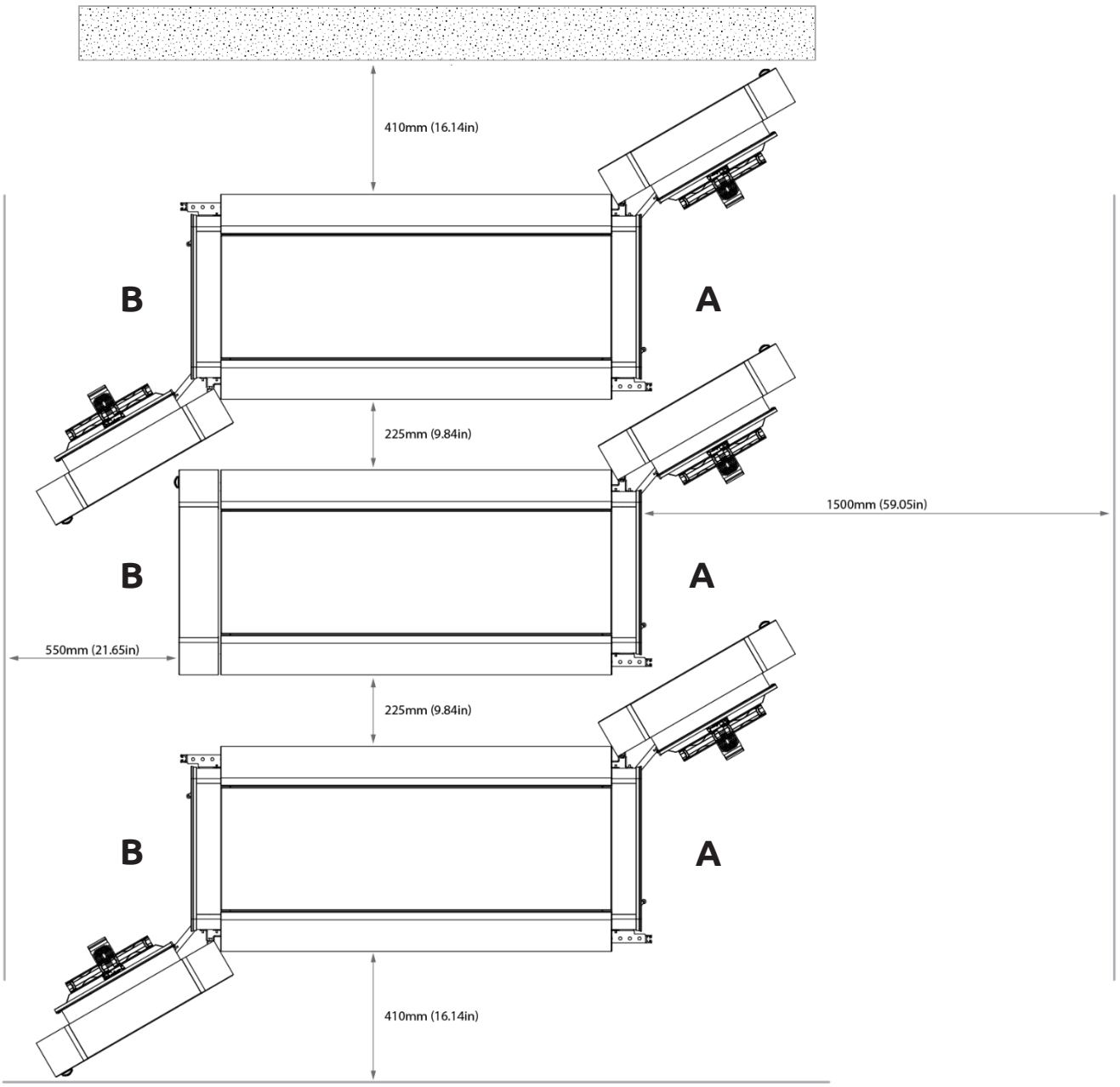
blueberry PLUS - Central Unit



blueberry SATELLITE



Power Unit


410mm (16.14in)
B
A
225mm (9.84in)
1500mm (59.05in)
B
A
550mm (21.65in)
225mm (9.84in)
B
A
410mm (16.14in)

3.1.2. Action 2: blueberry CLUSTER exterior integrity

Check if the equipment is in good condition and unharmed. It is important to verify doors and joints between different materials to make sure that the IP55 is not compromised. Verify also if there is any point of corrosion on the painted metal parts.

3.1.3. Action 3: Branding

Check if the branding is in good condition. The blueberry PLUS – Central Unit must have two blueberry PLUS logos, on in the front and another in the back, the blueberry SATELLITE must have one i-charging logo and one output identifier and the Power Unit shall have two i-charging logos, one in each side.

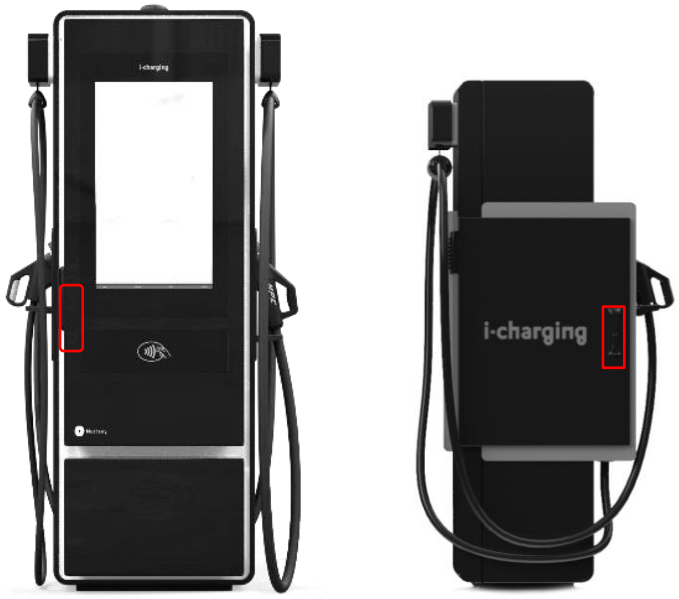
PLEASE NOTE!

For equipment with customized branding, please ensure that it is good conditions and according to the drawings.

3.1.4. Action 4: Locking system

DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

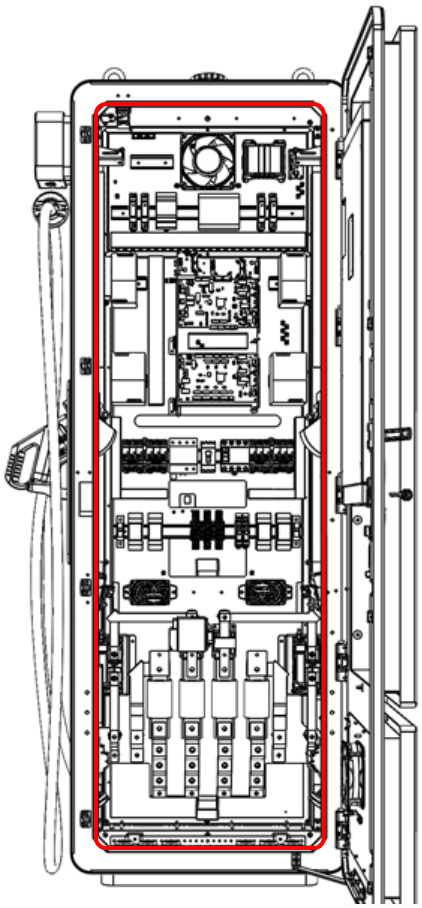
Check if the lock (marked in red) is not damaged and if it is possible to open and close the door without any effort. On the inside, verify if there is no damage in the rod, rod guides and rod support and if when closing the door, the rods go through the rods supports.



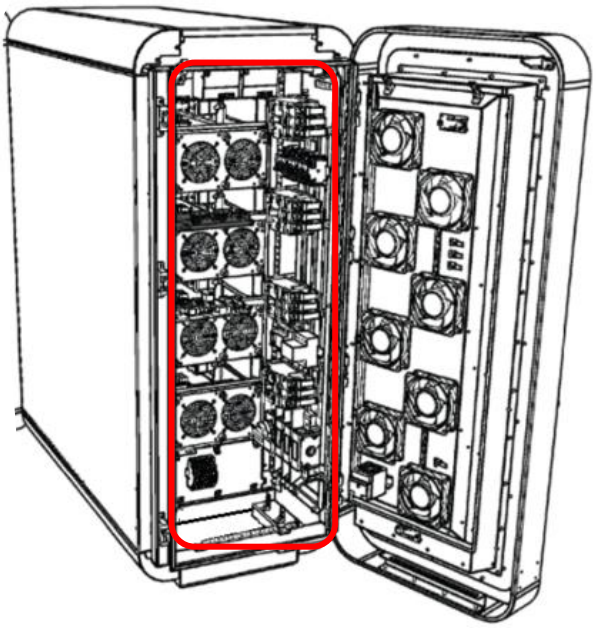
3.1.5. Action 5: Sealing Parts

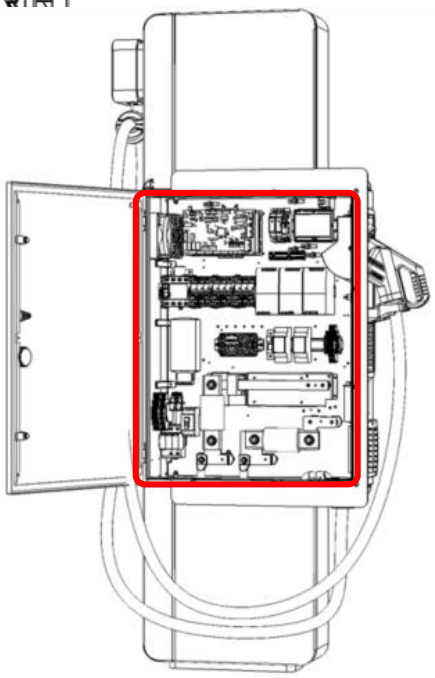
DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

Check if the rubber around the blueberry structure is in good condition and has no damage.



(Both sides)





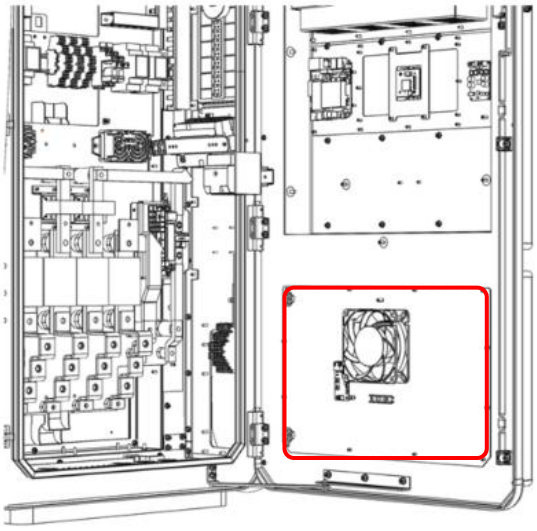
3.1.6. Action 6: Air Inlets and Outlets

DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

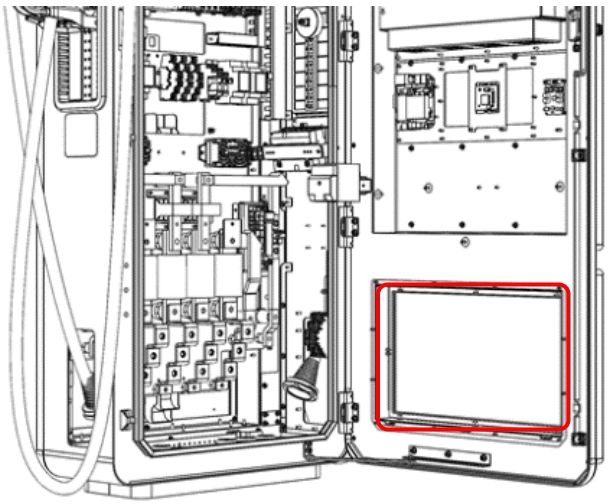
Make sure that there are no objects blocking the inlet and outlet area on the blueberry PLUS Central Unit. Clean the filters and verify if they are in good conditions.

Front (Air Inlet)

1 - Open the door



2 – Remove the fan plate

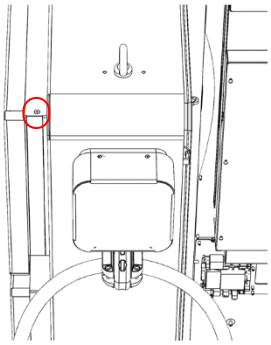


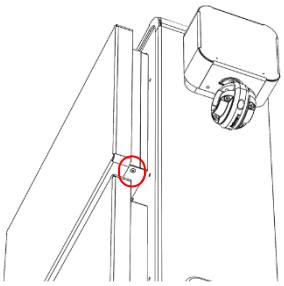
3 – Remove the filter plate

DANGER!

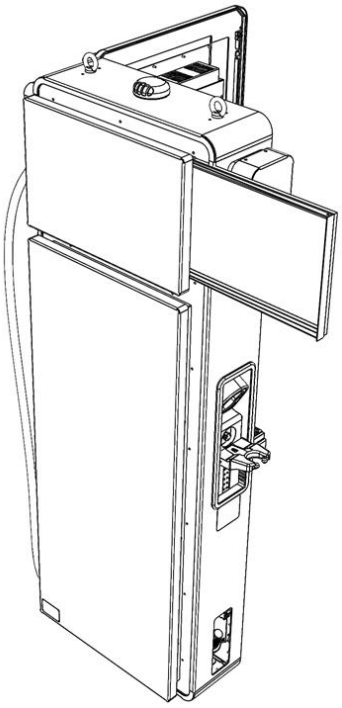
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

Back (Air Outlet)





1 – Untighten the screws on top and bottom of the back of the kiosk



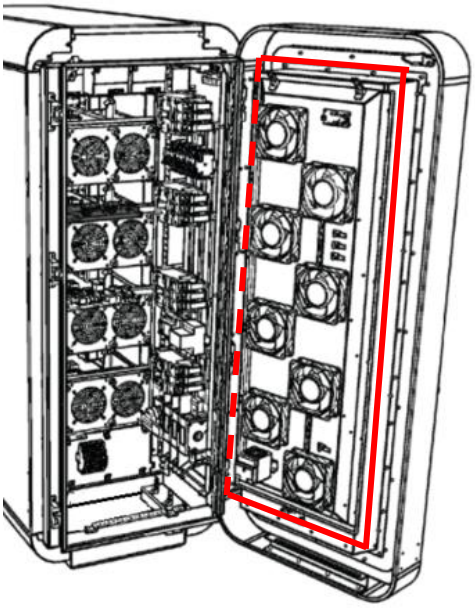
2 – Remove the filter plate and ensure that the EPDM is in good conditions

DANGER!

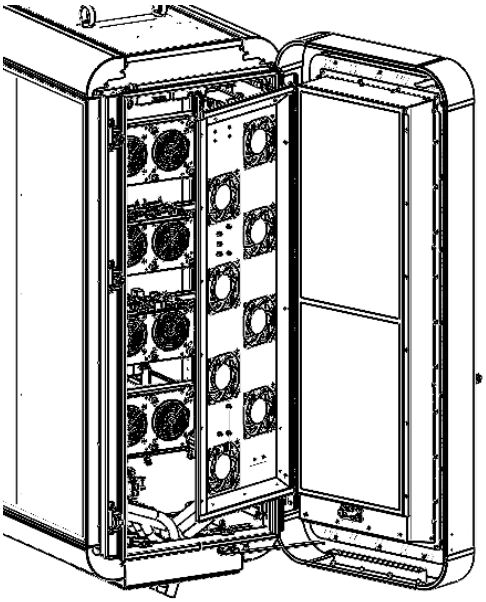
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

Make sure that there are no objects blocking the inlet and outlet area on the Power Unit.

Clean the filters and verify if they are in good conditions.

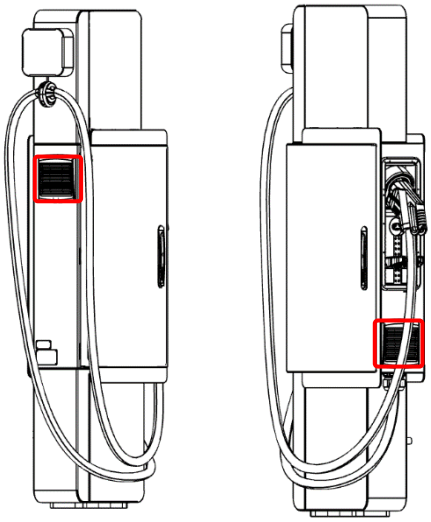


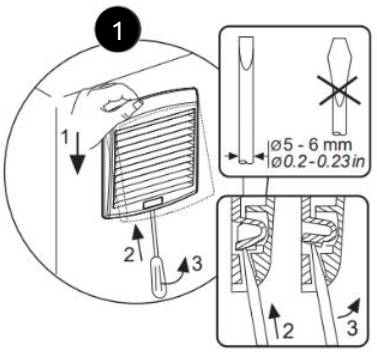
1 – Remove the fan plates on both sides of the power unit



2 – Remove the filter plate and clean the filter

Make sure that there are no objects blocking the inlet and outlet area on the blueberry SATELLITE. Clean the filter and verify if it is in good conditions.





1 – Remove the outlet grill and clean the filter

3.1.7. Action 7: Painted surfaces cleaning

Powder-coated surfaces need to be cleaned and maintained regularly to ensure that the decorative and protective properties of the coating are retained over time. If the coating is not cleaned properly - or is not cleaned regularly - deposits can build up on the surface and prolonged contact could cause damage to the coating. This may include surface defects (such as corrosion) and loss of decorative effect (for example staining, chalking).

Method

The best method of cleaning painted surfaces is by regular washing of the coating using a solution of warm water and non-abrasive, pH neutral detergent solution. Surfaces should be thoroughly rinsed after cleaning to remove all residues.

All surfaces should be cleaned using a soft cloth or sponge or nothing harsher than a soft natural bristle brush.

Cleaning products

Before cleaning, attention must, without exception be paid to the cleaning agent's datasheet. Usual maintenance can be done using water with mild detergent (pH 5 to 8).

If the atmospheric pollution has resulted in heavy soiling of the coating, some stains or marks may require stronger domestic products. In such cases, they should always be diluted, and small inconspicuous test areas cleaned first. In no circumstance should any abrasive cleaner or polish, or any cleaner containing ketones, esters be used.

Frequency

Cleaning frequency specifications are shown in the table below (in months):

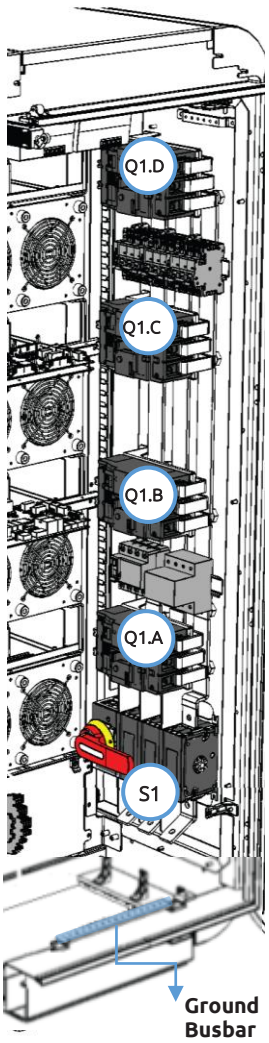
		Temperate and Arid	Tropical
Inland	-	12	9
Coastal	2000 to 5000m from coastline	12	9
	500 to 2000m from coastline	6	6
	50 to 500m from coastline	3	3
	Less than 50m from coastline	Not recommended	
Industrial	2000 to 5000m from source of pollution	12	9
	500 to 2000m from source of pollution	6	6
	50 to 500m from source of pollution	3	3
	Less than 50m from source of pollution	Not recommended	

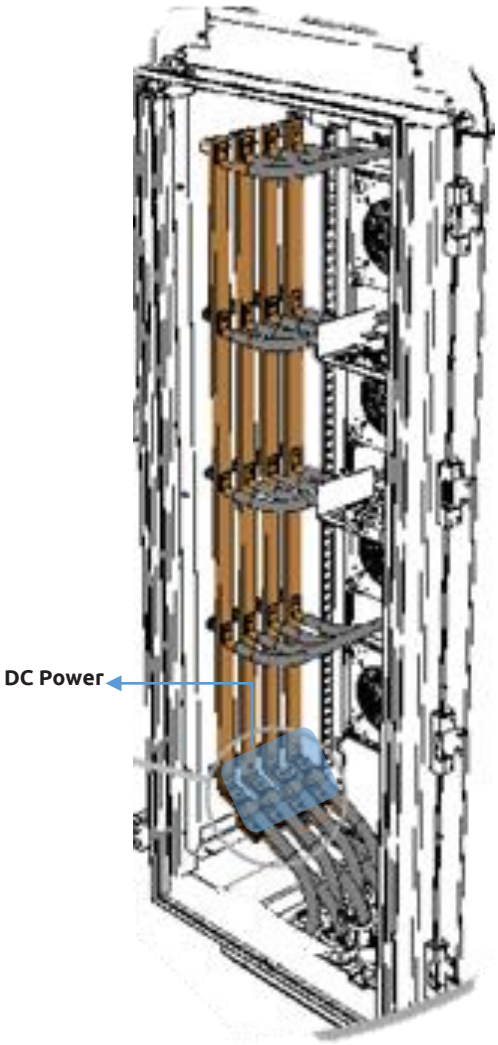
3.1.8. Action 8: Tightening torque AC power, DC power and ground cables

DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

Check the torque of ground cables, AC and DC power cables on Power Unit. The torques shall be as specified below:

S1 – between **30 N.m and 37 N.m**
Q1 – between **8 to 12 N.m**
DC Power - **28 N.m**
Ground – **28 N.m**





DANGER!

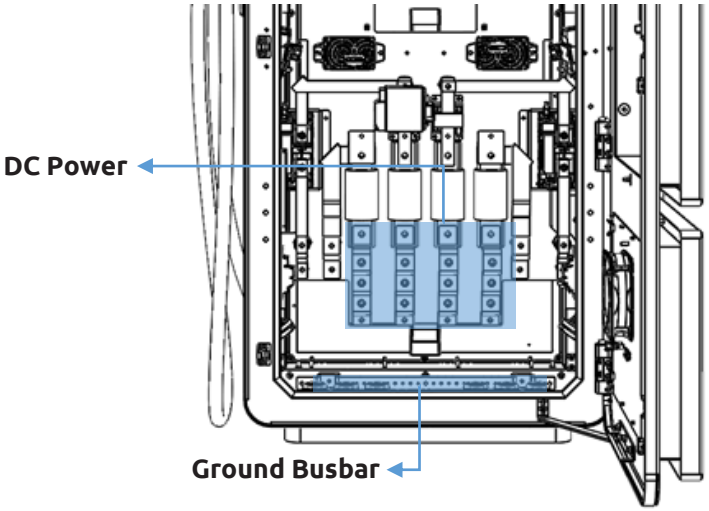
Make sure that the main switch of the Switchboard power supply that feeds the blueberry charger product is set to the off position.

Check the torque of DC power cables and ground cables on blueberry PLUS – Central Unit:

The torques shall be as specified below:

Ground – **28 N.m**

DC Power - **28 N.m**

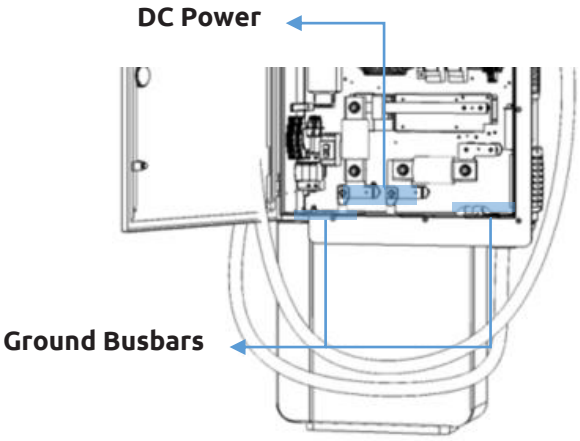


Check the torque of DC power cables and ground cables on blueberry SATELLITE:

The torques shall be as specified below:

Ground – **28 N.m**

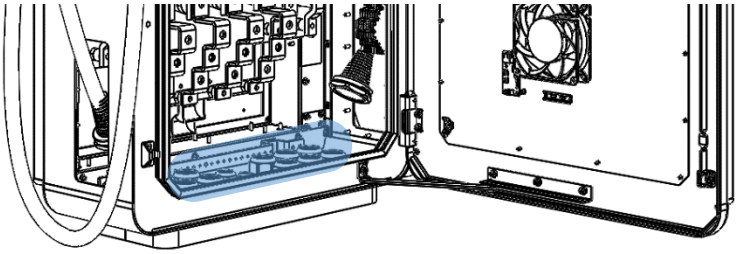
DC Power - **28 N.m**



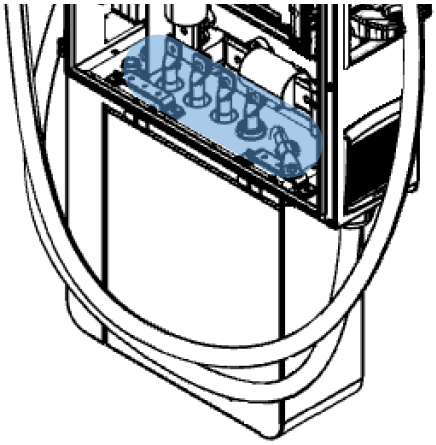
3.1.9. Action 9: Cable Glands

Make sure that the cable glands are tightened on the blueberry PLUS – User Unit and blueberry SATELLITE.

blueberry PLUS – Central Unit



blueberry Satellite

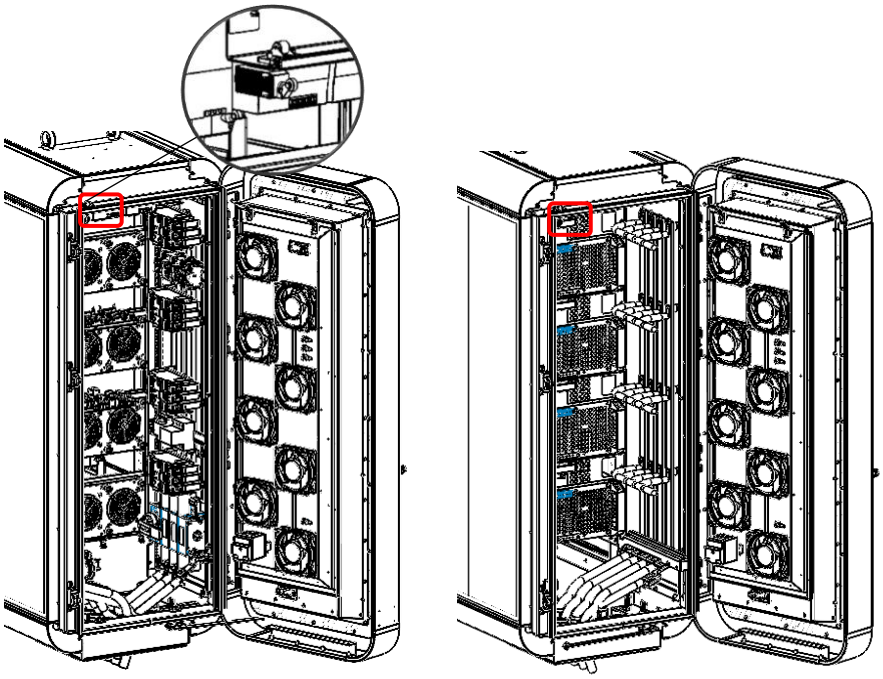


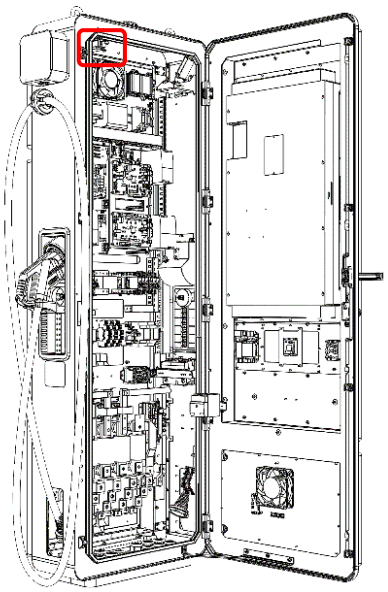
3.1.10. Action 10: Touch Screen

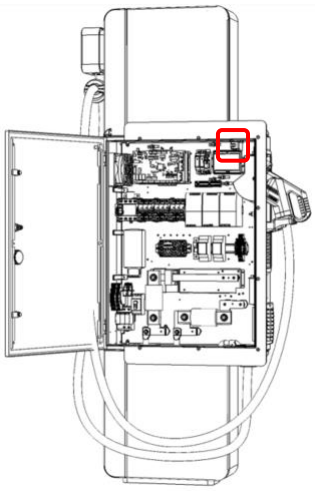
Navigate through the menus on the touch screen and check if the response time to the touch is immediate and if there is no problem on selecting each menu.

3.1.11. Action 11: Door Sensor

Make sure that the door sensor on the equipment doors is working correctly. For that, check if the display is showing an error when the door is open and vice versa (with the door close should not appear any door sensor error on the maintenance menu). When the door is open the LED above each cradle should be in red.

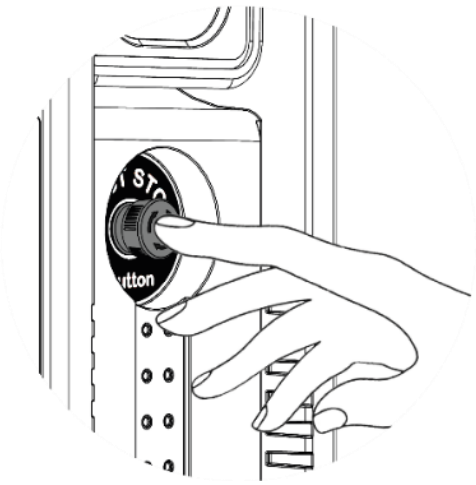




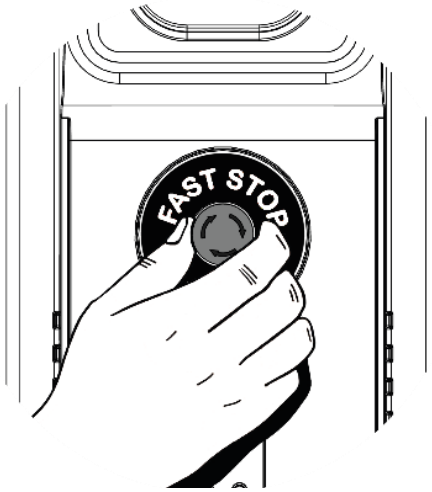


3.1.12. Action 12: Fast Stop Button

Press the fast button (one per output) and verify if the screen displays “Fast stop button pressed”. Release the fast button to be possible to initiate a session again.



1 – Pressing the fast stop button

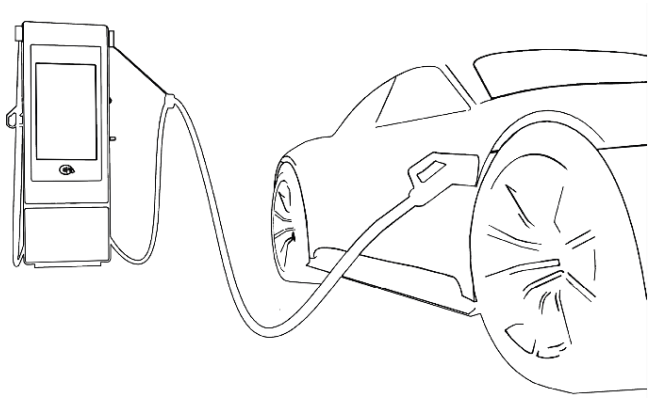


2 – Releasing the fast stop button

3.1.13. Action 13: Cable Management System

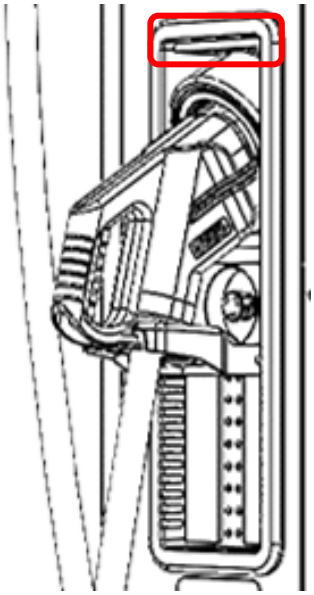
Verify if the cable management system is operating correctly. After authentication, remove the connector from the support and walk away from the charger. The system must give the cable without any effort.

After that, place the connector on the support and verify if the cable is retracted again.



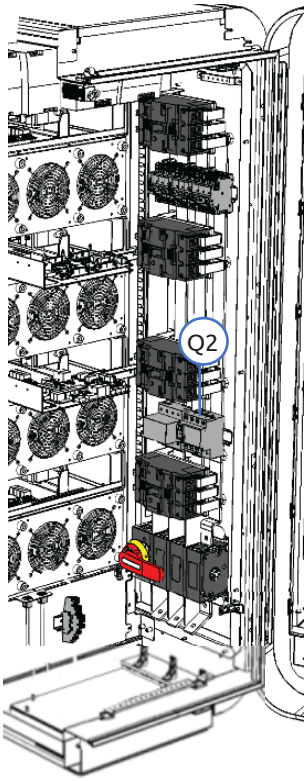
3.1.14. Action 14: Output LEDs

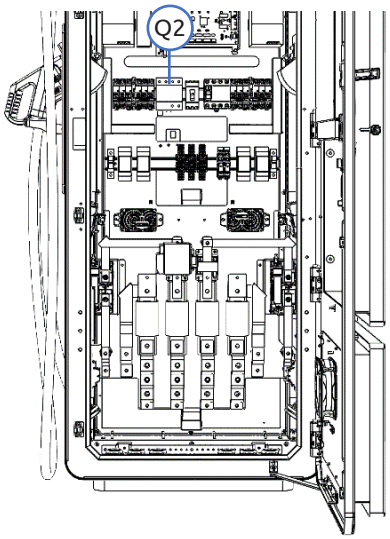
Check if the LEDs of each output is working. The LEDs should have a green color when the blueberry PLUS is ready to charge, red when the door is open, and blue when the equipment is in use.

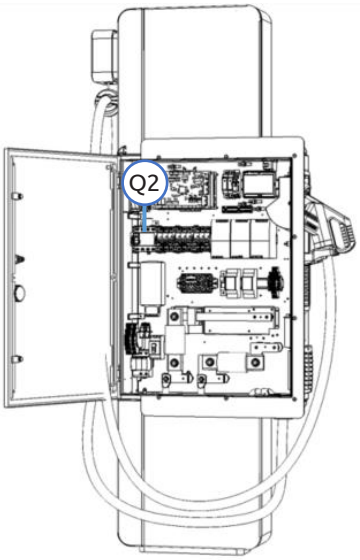


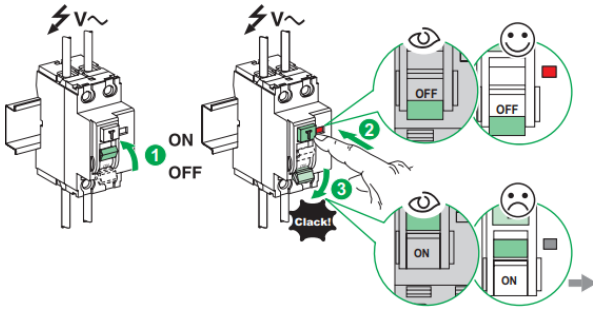
3.1.15. Action 15: Residual Current Device

Test the RCD by pressing the 'test' button on the front of the device quickly and then release it. The button will only test the RCD if an electricity supply is connected.









3.1.16. Action 16: Electrical Measurements

PLEASE NOTE!

This step is only applied for blueberry CLUSTER chargers that are installed in sites where the local regulations require periodic electrical measurements.

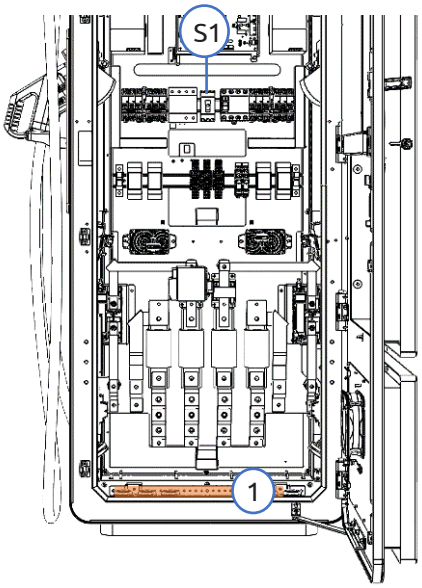
DANGER!

Make sure that the main switch of the Switchboard power supply that feeds the blueberry charger product is set to the off position.

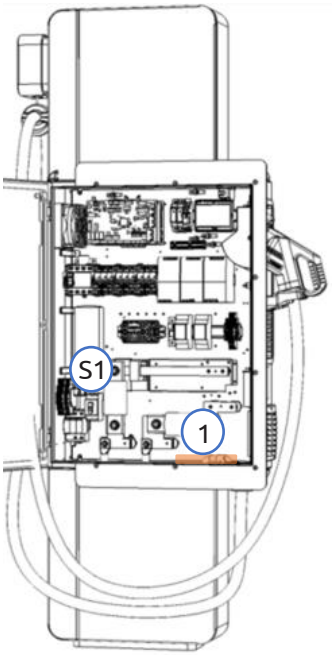
Measurement of the continuity of protective conductors on blueberry PLUS - Central Unit, blueberry SATELLITE and Power Unit:

- Switch off the switch disconnector S1
- Connect the low reader ohmmeter[1] between busbar (1) and a point on the exposed conductive part (e.g. – the door hinge)
- Measurement result must be lower than 0,1Ω

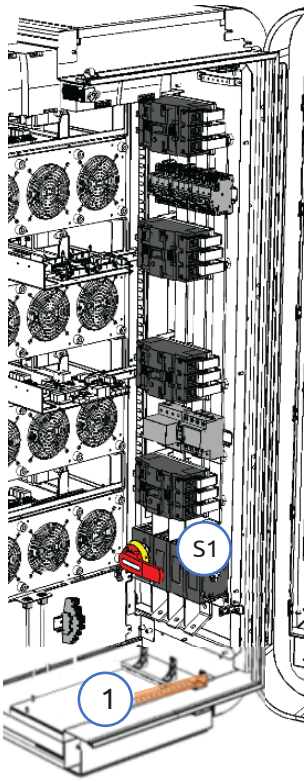
blueberry PLUS – Central Unit



blueberry SATELLITE



Power Unit



[1] Measure in accordance with the manual of the measuring instrument.

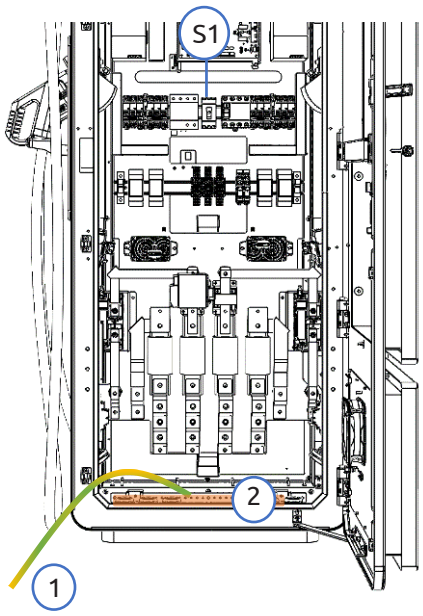
DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry charger product is set to the off position.

Measurement of the insulation resistance of electric cables on blueberry PLUS - Central Unit, blueberry SATELLITE and Power Unit:

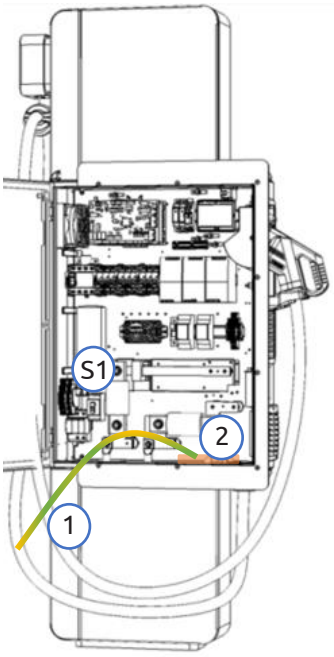
Switch off the switch disconnector S1

- Disconnect the 3 phases conductors of S1
- Disconnect ground conductor (1) from the busbar (2)
- For each phase L1, L2, L3 connect the insulation resistance device[1] between the ground end loose (1) and one AC phase (L1/ L2/ L3) and 500V d.c. must be applied
- Measurement results must be R > 1MΩ
- After the test reconnect the ground conductor with 28 N.m torque and each AC phase with torque between 1.8 N.m and 2 N.m on blueberry PLUS – User Unit and a torque between 30 N.m to37 N.m on Power Unit.

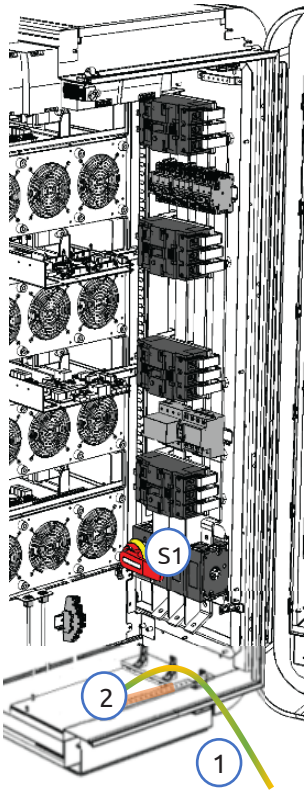
blueberry PLUS – Central Unit



blueberry SATELLITE



Power Unit



[1] Measure in accordance with the manual of the measuring instrument.

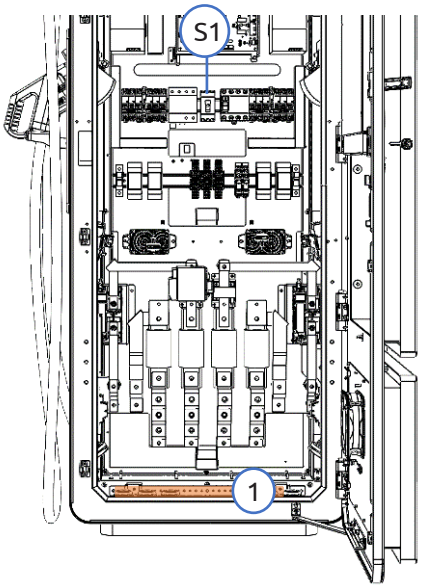
DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

Measurement of operational earthing resistance on blueberry PLUS - Central Unit, blueberry SATELLITE and Power Unit:

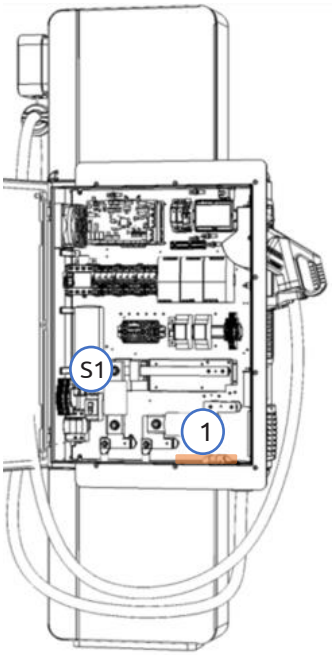
PLEASE NOTE!
This check only applies if grounding via bolt on the plinth has been realized close to blueberry CLUSTER charging station.

- Switch off the switch disconnector S1
- Ensure that the ground conductor is connected to the busbar (1)
- Connect the earth tester tool[1] between the busbar (1) and the earth electrode.
- Measurement results must be less than 5Ω

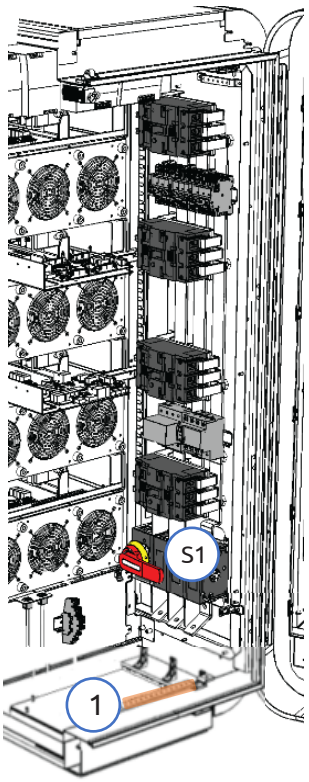
blueberry PLUS – Central Unit



blueberry SATELLITE



Power Unit



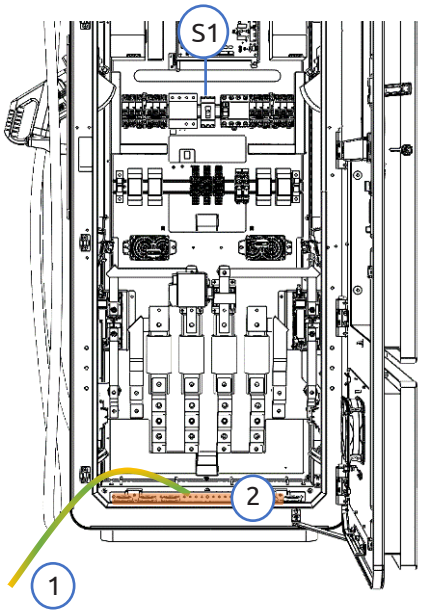
[1] Measure in accordance with the manual of the measuring instrument.

DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

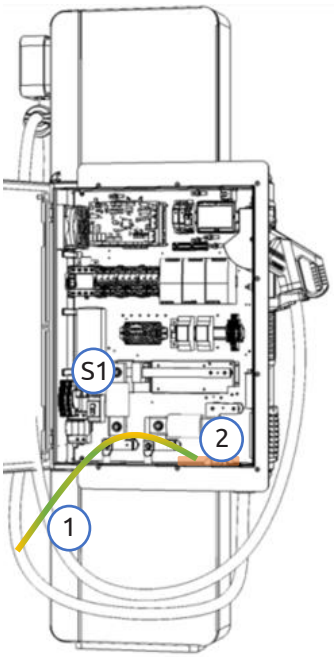
Measurement of earth fault loop impedance on blueberry PLUS - Central Unit, blueberry SATELLITE and Power Unit

- Switch off the switch disconnector S1
- Use an Earth Fault Loop Tester[1] or select the Earth Fault Loop Test option on a multifunctional tester[1] and for each phase L1, L2, L3 connect the device between the ground end loose (1) and one AC phase (L1/ L2/ L3)
- Press the TEST button on the tester
- The impedance (Zs) must be at most 0,33 Ω.

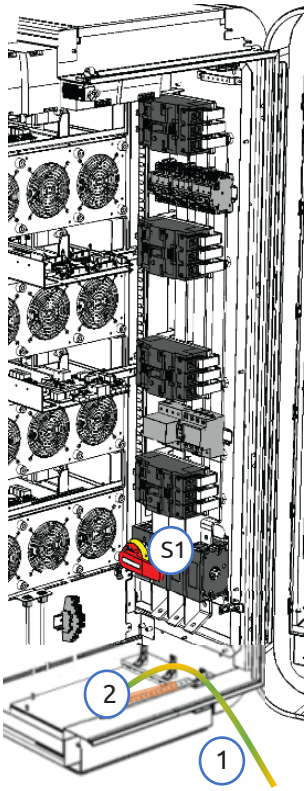
blueberry PLUS – Central Unit



blueberry SATELLITE



Power Unit



Description and tripping criteria for the insulation monitoring device on blueberry PLUS:

The isolation monitor device performs insulation monitoring between DC+ and PE and DC- and PE while the charger is in idle and during all the supply process, and communicate the current state (Invalid, Valid, Warning, Fault) of the system periodically to the EV.

In case of fault during this process (impedance < 100Ohm / V), the charging process is stopped, and the charge is interrupted / Not possible.

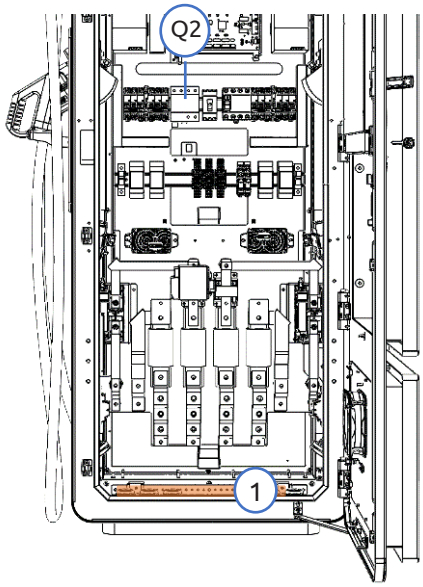
[1] Measure in accordance with the manual of the measuring instrument.

DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry CLUSTER charger product is set to the off position.

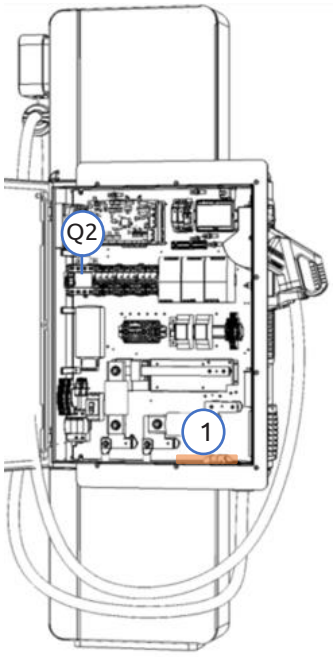
Measurement of the effectiveness of protection against electric shock on blueberry PLUS - Central Unit, blueberry SATELLITE and Power Unit:

- Switch off the switch disconnector S1
- Use a RCD tester device[1] and for each phase L1, L2, L3 connect the device between the ground busbar (1) and one AC phase (L1/ L2/ L3) on the load of RCD Q2.
- Start the type A RCD test
- Check that if the response time is less than 40ms when a 5x In (nominal current) is applied.
- Restart RCD using the lever button.

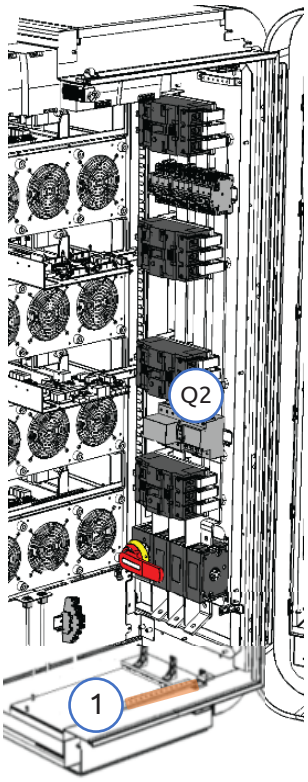
blueberry PLUS – Central Unit

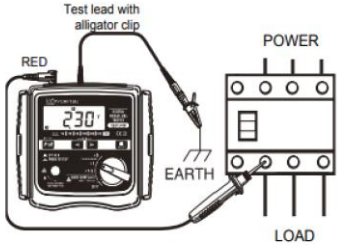


blueberry SATELLITE



Power Unit





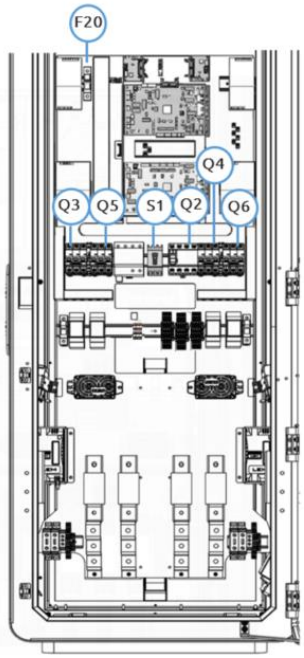
[1] Measure in accordance with the manual of the measuring instrument.

3.1.17. Action 17: Performance Test

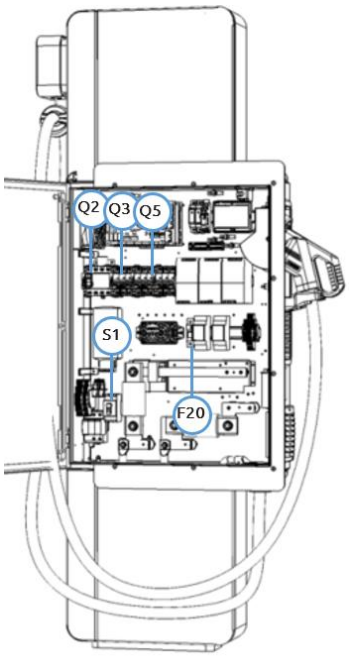
To check the proper operation of blueberry PLUS a charging session must be performed.

- Please make sure that the switch disconnector S1 all circuit breakers and fuses are switched ON.

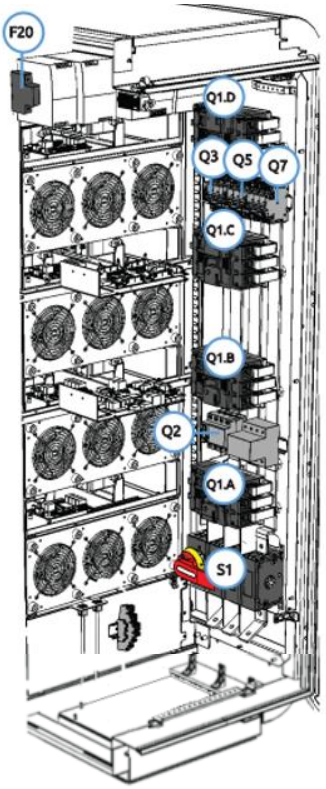
blueberry PLUS – Central Unit



blueberry SATELLITE



Power Unit



- Close the doors
- Make sure that the main switch of the Switchboard power supply is switched ON
- Blueberry CLUSTER charging station will initiate the startup process that will be completed within 2 minutes:
    - Output LEDs will turn from red to green and after a few seconds the HMI will have completed its setup
- Blueberry CLUSTER charging station is now ready
- Tap an authorized RFID card to authenticate
- After successfully authentication please choose an output and press start
    - Chosen output LED will flash blue
- Connect the correspondent cable to an EV or an EV simulator
    - Chosen output LED will turn blue
- The charging will start. The session is successful if the field “Power” increases its value.

This test should be repeated for the other cable output.

To see more details on screen sequences, consult the Installation and User Manual – chapter 8.

4. CORRECTIVE MAINTENANCE

4.1. Parts replacement

DANGER!
Make sure that the main switch of the Switchboard power supply that feeds the blueberry charger product is set to the off position.

4.1.1. Controllers Replacement

1. **On blueberry PLUS - Central unit:**

To easily identify each controller, their boards are in different colours. The controllers are in two layers (see image below):

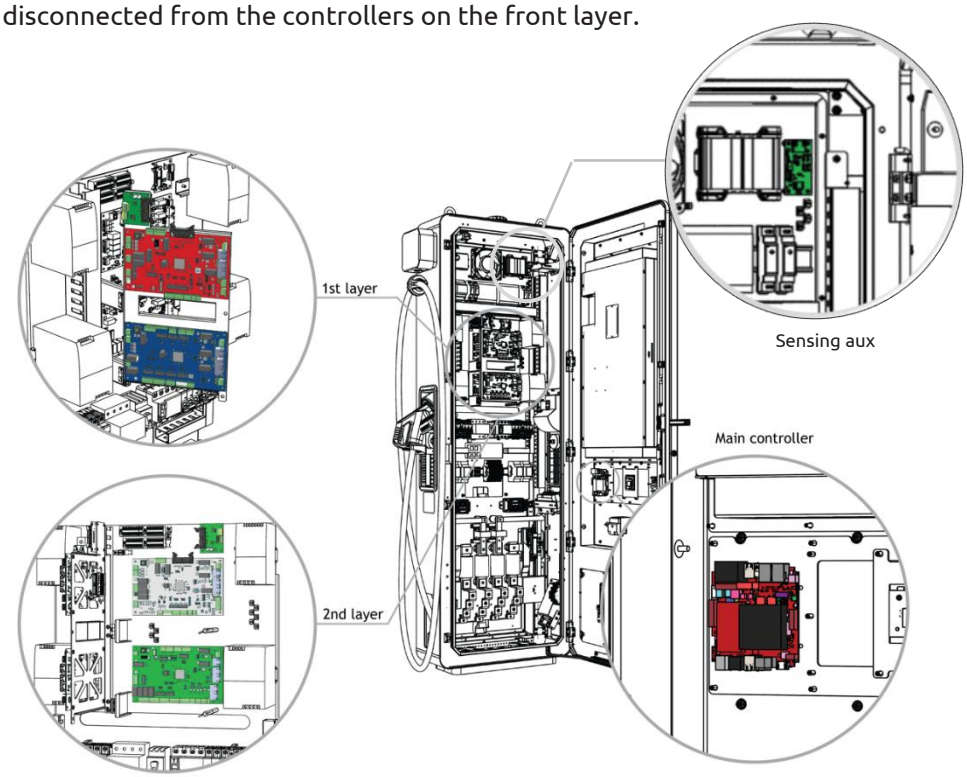
1st layer:

- Red board: CCS output controller
- Blue board: CCMD controller

2nd layer:

- White board: CHadeMO output controller
- Green board: Sensing controller

In the door there is also another controller, named Main controller.
Main controller and the 2 controllers on the 1st layer have an instant access to be swapped.
To access to the back layer, 2 hand screws must be untight and few connectors disconnected from the controllers on the front layer.



2. On blueberry SATELLITE:

The controllers are in three layers (see image below). If the board that is going to be swapped is in a bottom layer, the ones that are above must also be disconnected and connected again in the end.

1st layer:

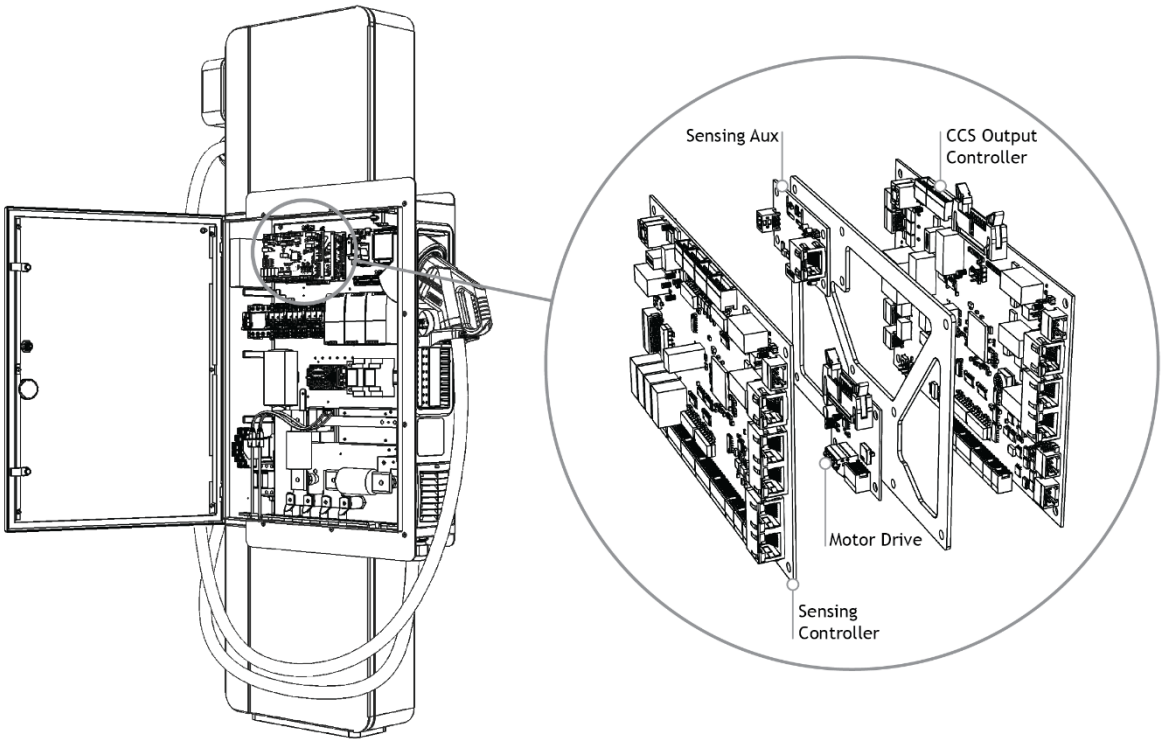
- Sensing controller

2nd layer:

- Motor drive
- Sensing aux

3rd layer:

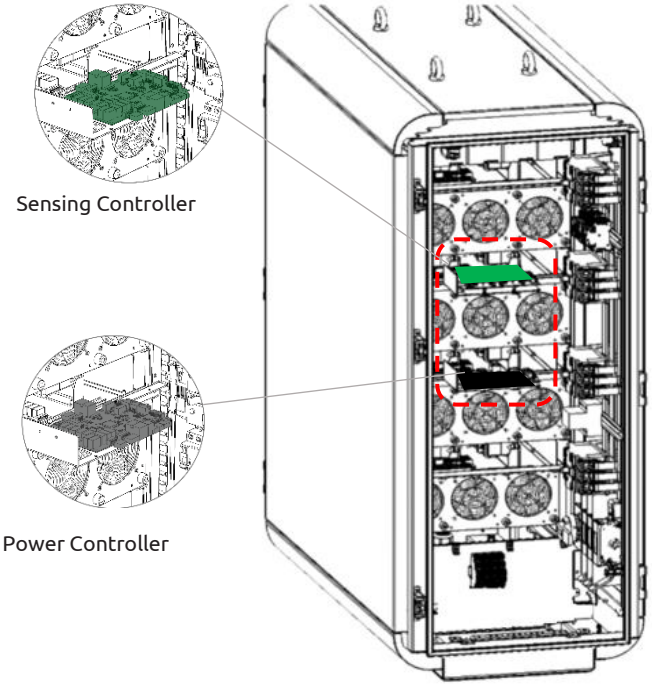
- CCS output controller

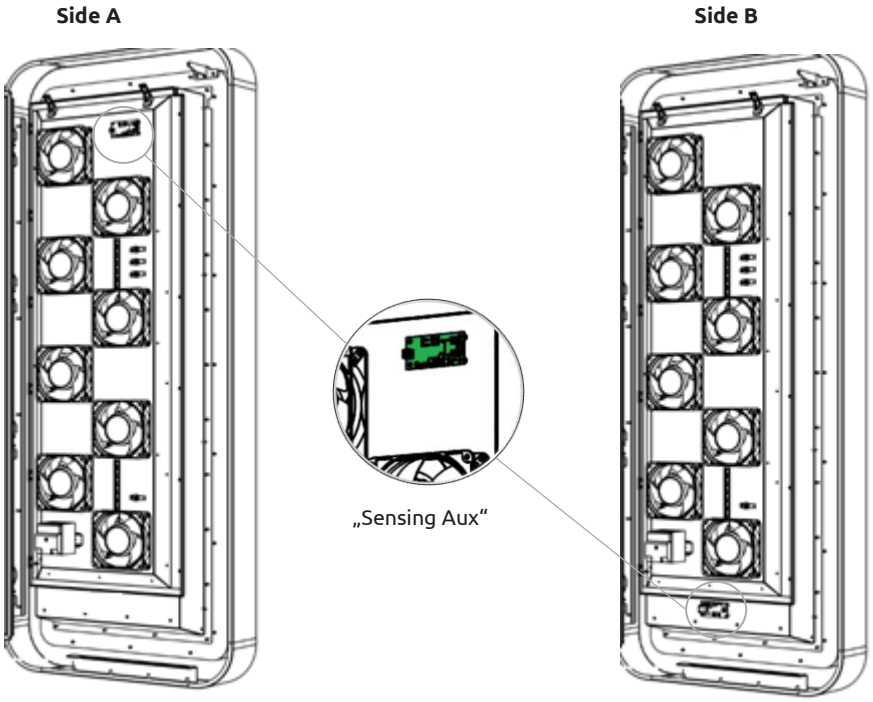


3. On Power Unit:

To easily identify each controller, their boards are in different colours. There are 2 controllers (see image below) in the Power Unit with instant access to be swapped:

- Green boards: Sensing controller and Sensing Aux (on the doors)
- Black board: Power controller

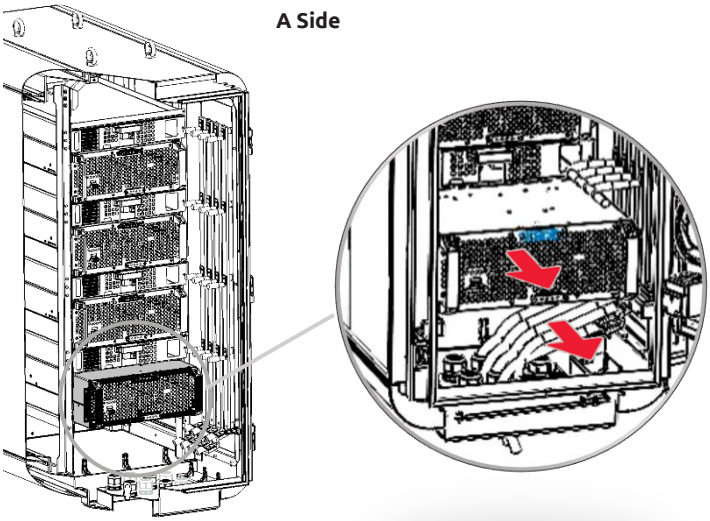




4.1.2. Power module Replacement

Each Power Unit can have up to 4 power modules. To swap the power modules, the following tasks must be performed:

1. Disconnect AC connector on the module
2. Disconnect DC connector on the module
3. Disconnect CAN adapter (E30) from the module
4. Unscrew the power module (4 screws)
5. Swap power module (due to its weight, must be done by two persons)

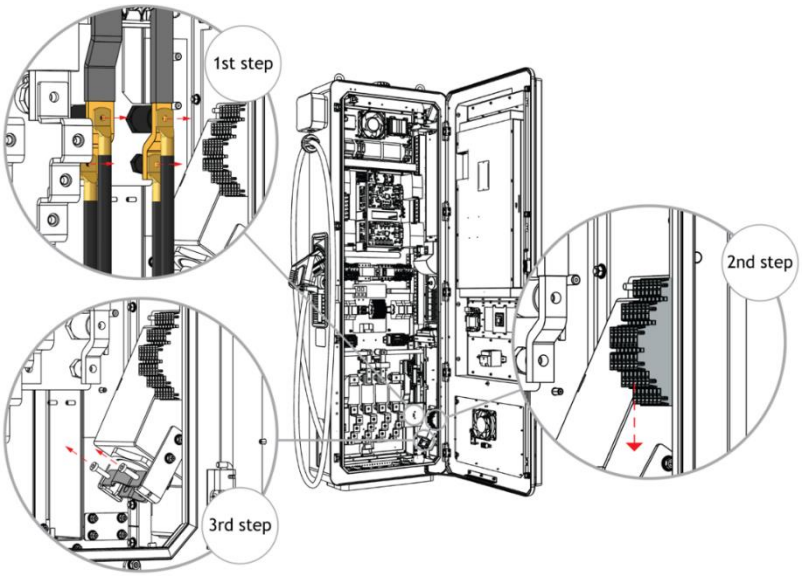


4.1.3. Charging Cable Replacement

1. On blueberry PLUS - Central unit:

Here the steps to swap any charging cable on Blueberry PLUS (see image below):

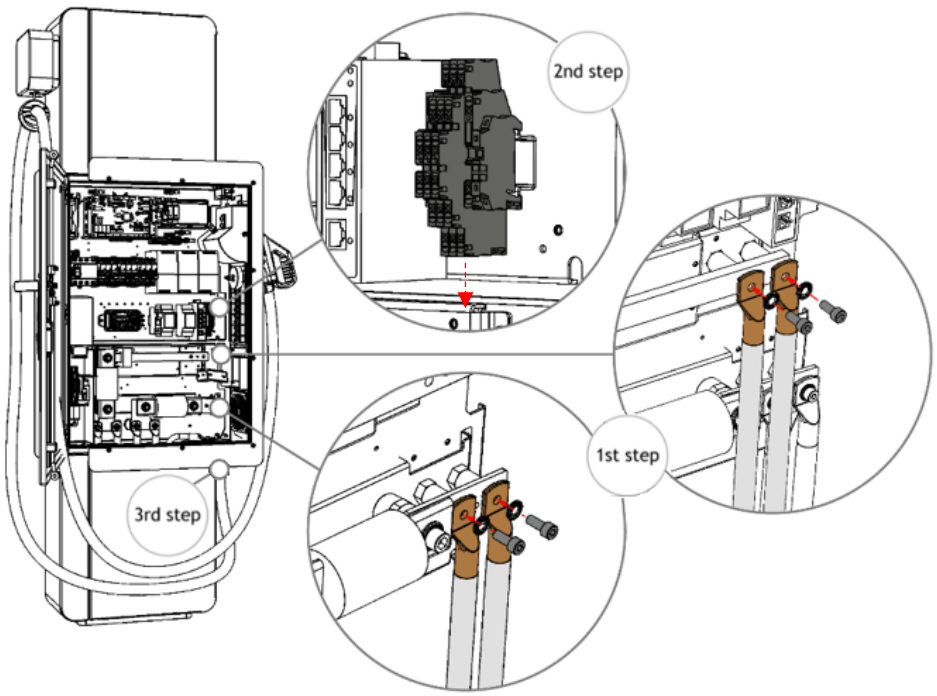
1. Disconnect DC cables and earth
2. Disconnect signal cables
3. Unscrew the charging cable relief and then remove the cable from the outside



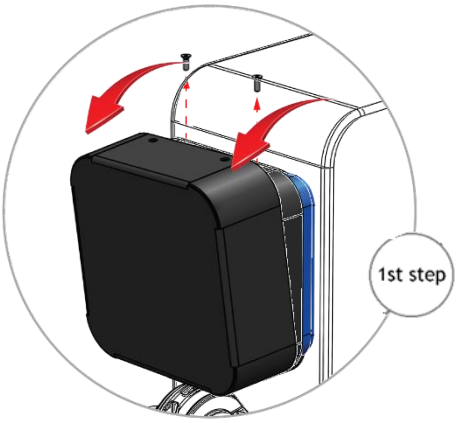
2. On blueberry SATELLITE:

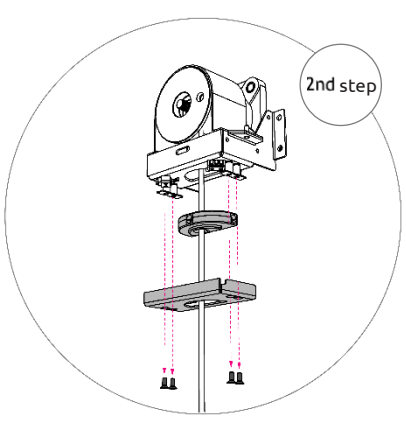
Here the steps to swap any charging cable on blueberry SATELLITE (see image below):

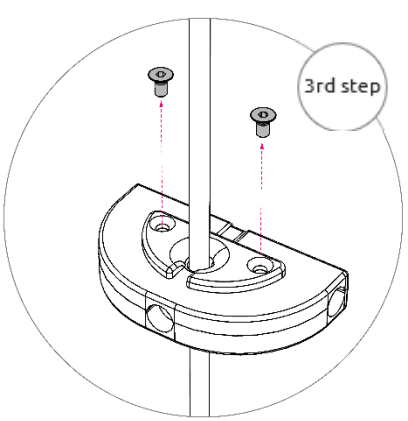
1. Disconnect DC cables and earth
2. Disconnect signal cables
3. Untight the charging cable gland and then remove the cable

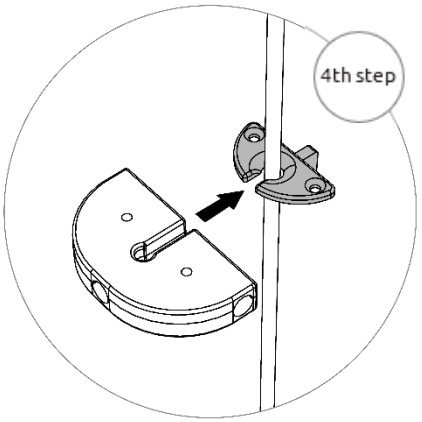


4.1.4. Cable Management – Half Circle Polymer Replacement









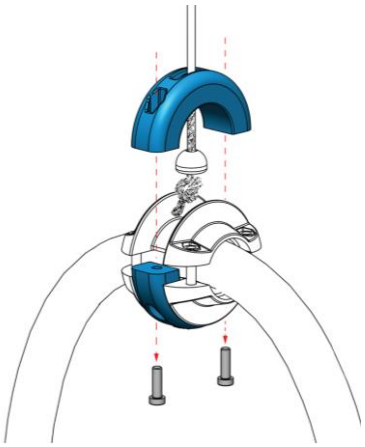
Below the steps needed to swap plastic half circle of the cable management:

1. Unscrew and remove the retractor case.
2. Remove the 4 screws as exemplified.
3. On the plastic half circle remove the 2 screws.
4. Remove the part showed in this step and then the part is free to be swapped.

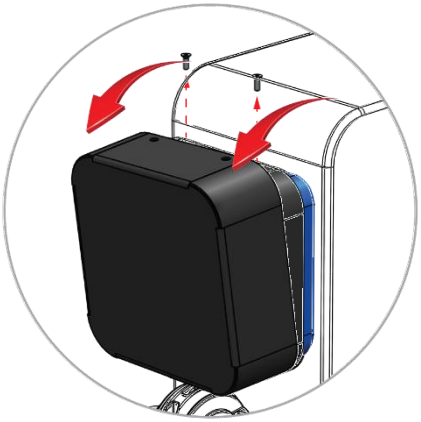
Perform the reverse activities 4, 3, 2 and 1.

4.1.5. Cable Management - Rope Replacement

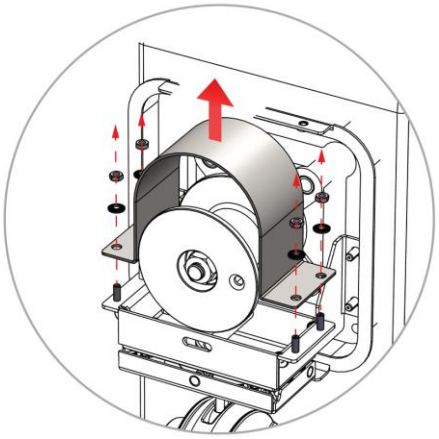
Here the steps to swap the cable management' rope:



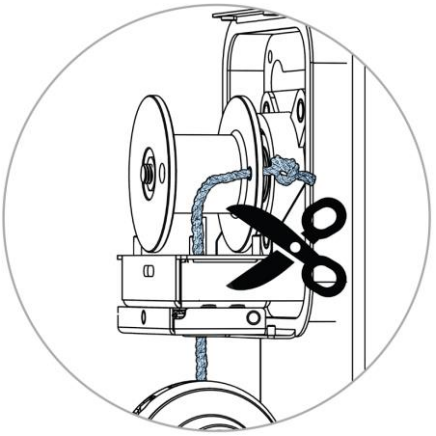
1. Unscrew the cable gland and cut the knot.



2. Unscrew and remove the retractor case.



3. Unscrew the rope cover (4x nuts and matching washers).



4. Unwind the rope and cut the other end knot.

To add a new rope:

5. Make sure that the system is on the retracted position (with the unit switched on, plug the cable on the inlet)
6. Wind the rope on the polyamide and leave 12 cm on the bottom
7. Perform the reverse activities 3, 2 and 1.