

Energy Storage System

SUNSYS HES L



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1. GENERAL INFORMATION

This document concerns the SUNSYS HES L range.

It is a preliminary document with general information. Socomec will provide a complete User Manual at the system delivery.

The illustrations of this document are schematic and could be different from the real product.

1.1. SUNSYS HES L description

SUNSYS HES L System is composed of an assembly of up to 4 types of cabinets:

C-Cab

- Bidirectional power converter
- 100 to 300 kVA / cabinet. Based on 50kVA power modules.
- Automation functions
- AC/DC distribution and protection
- Battery management system
- IoT connected cabinet
- Possible to put up to 3 units in parallel per system to reach 850 kVA (system design limit)

B-Cab

- Lithium-ion battery
- LFP technology
- 186 kWh nameplate / rack - 176 kWh useable / rack
- Liquid cooling thermal management
- Integrated fire safety detection and extinguishing system included
- Possible to put up to 9 units in parallel per system to reach 1674 kWh nameplate / 1584 kWh useable

DC-Cab (option)

- DC distribution panel
- Required for systems with 7 to 9 B-Cabs
- Battery protection
- AC auxiliaries distribution for C-Cab
- DC auxiliaries distribution for B-Cab chiller & control box
- UPS

AC-Cab (option - engineered to order, specific design depending on the project)

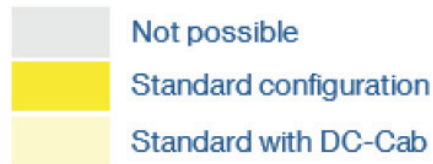
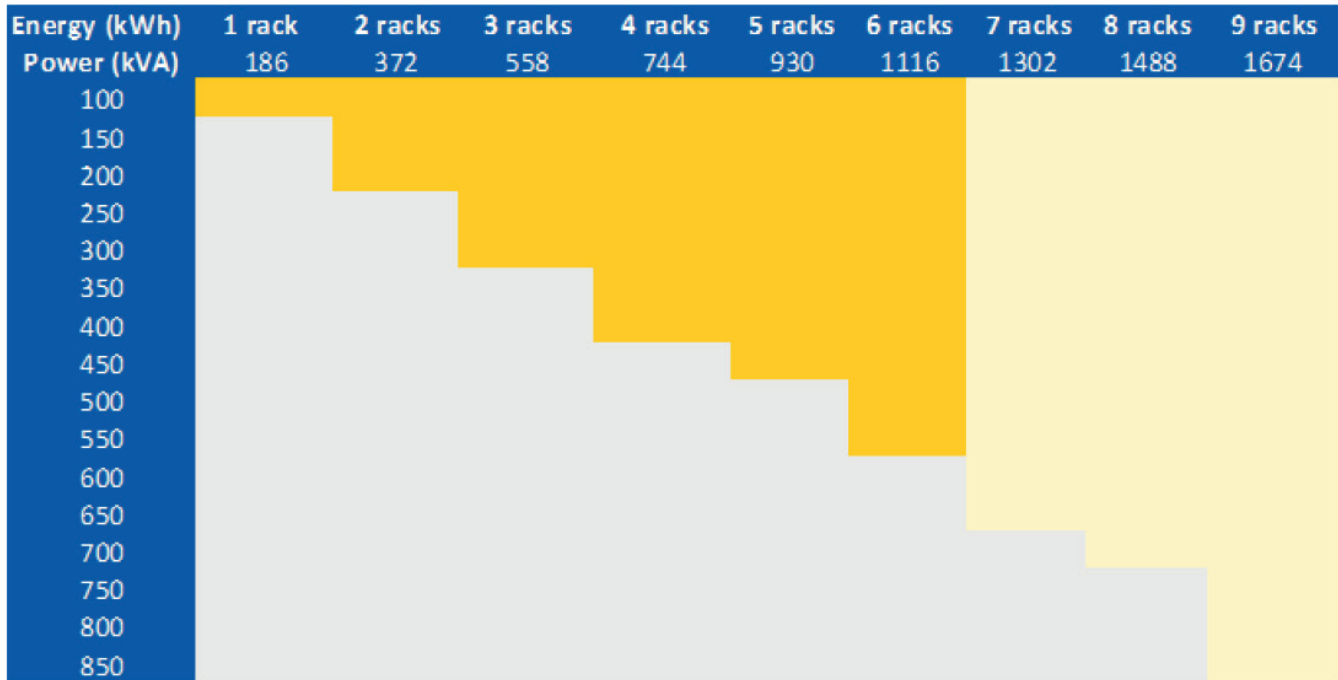
- AC power distribution panel
- Multi-source paralleling with circuit breakers
- Load connection for chiller & control box auxiliary distribution
- UPS
- Metering devices
- Islanding function with short interruption transition
- Synchronisation after mains return

SUNSYS HES L Configurations

SUNSYS HES L system is available with different combinations of power and energy.

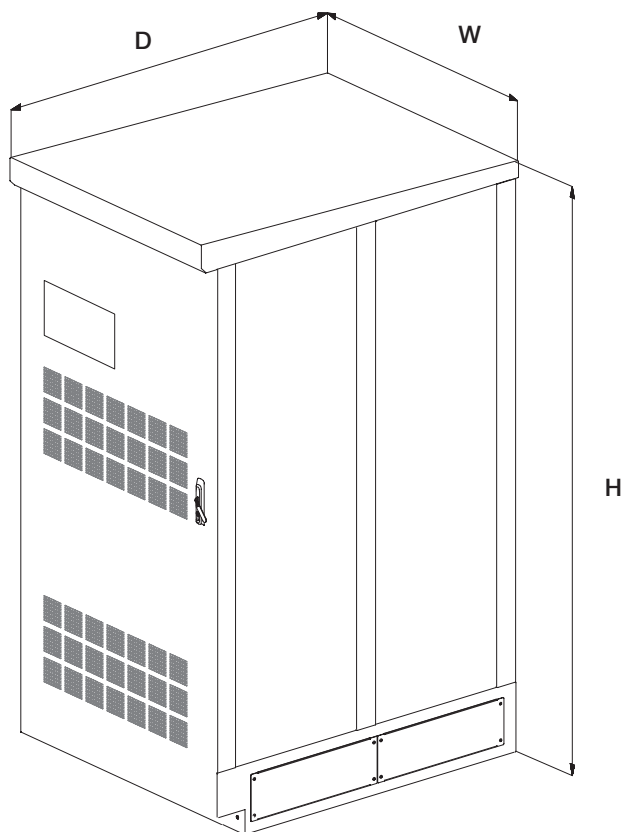
The table below shows all these configurations with the quantity of cabinets you will get for each configuration. AC-Cabs are not shown in this table, however you can get such a cab for each configuration, depending on your application.

Shall you wish to get higher power and energy, you will need to install several of the systems shown below in parallel.



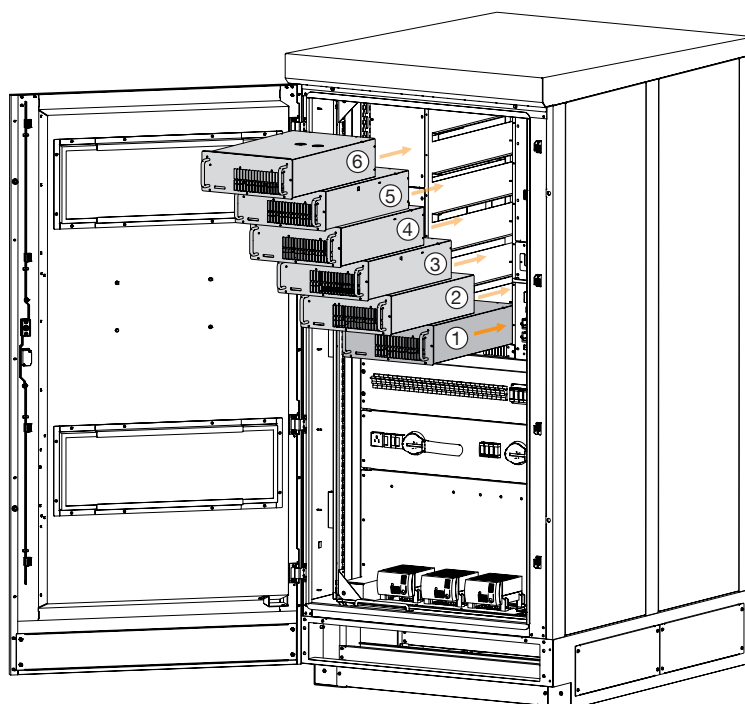
1.2. Dimensions and weights

- C-Cab

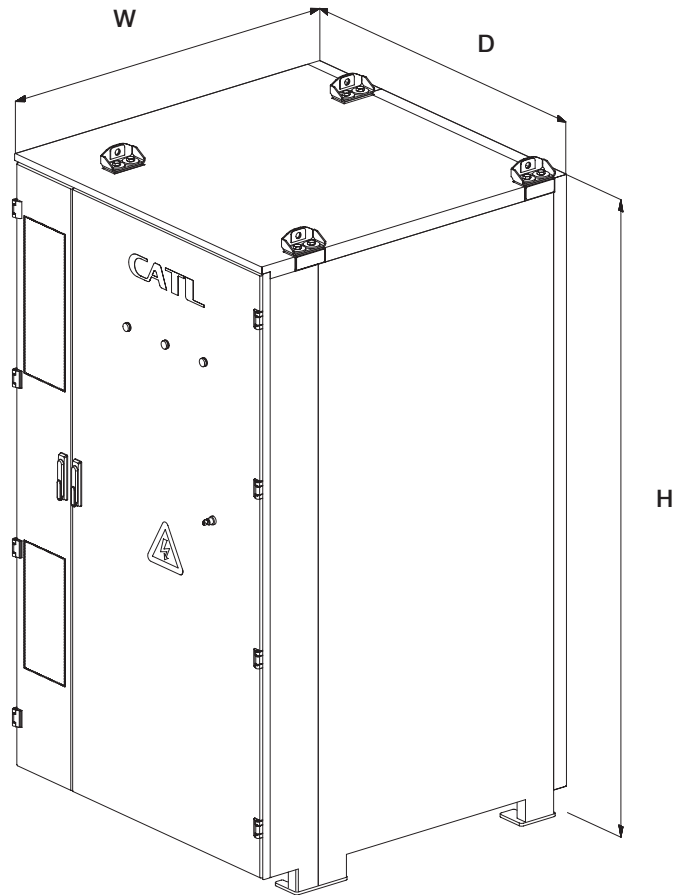


	100 kVA	150 kVA	200 kVA	250 kVA	300kVA
Width x Depth x Height	1000 x 1300 x 2160 mm / 39.4 x 51.2 x 85 inches				
Width x Depth x Height (with packaging)	1100 x 1400 x 2500 mm / 43.3 x 55.1 x 98.4 inches				
Module weight	22.5 kg / 49.6 lbs				
Cabinet weight (400Vac version)	915 kg 2017 lbs	937,5 kg 2066 lbs	960 kg 2116 lbs	982,5 kg 2165 lbs	1005 kg 2216 lbs

The 50kVA power modules will be delivered separately. They are easily mounted inside the cabinet during installation with a Plug & Play approach, the modules being mounted starting from the bottom.



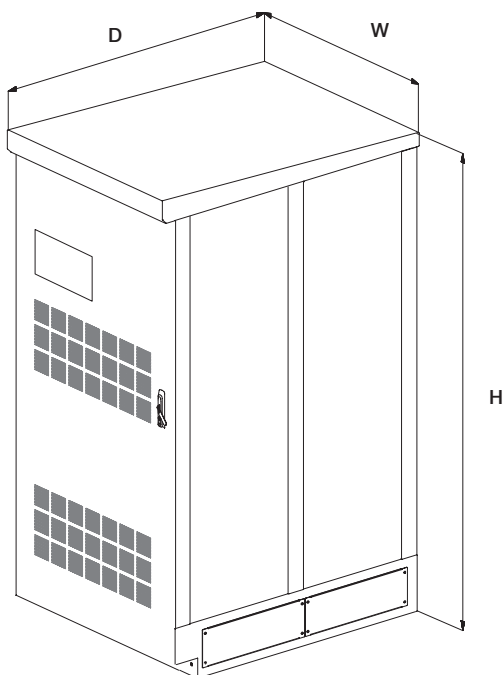
- B-Cab



186 kWh	
Width x Depth x Height	1300 x 1300 x 2280 mm / 51.2 x 51.2 x 89.8 inches
Width x Depth x Height (with packaging)	1350 x 1350 x 2480 mm / 53.1 x 53.1 x 97.6 inches
Weight	2180 kg / 4806 lbs
Weight (with packaging)	2230 kg / 4916 lbs

The batteries are delivered with the modules already mounted.

- DC-Cab & AC-Cab



Width x Depth x Height	1000 x 1300 x 2160 mm / 39.4 x 51.2 x 85 inches
Width x Depth x Height (with packaging)	1100 x 1400 x 2500 mm / 43.3 x 55.1 x 98.4 inches
Cabinet weight	>700 kg / >1543 lbs

1.3. Transportation and handling

1.3.1. Transport



Customers have the responsibility of the transportation of **all the parts** from our sites to the final installation site. SOCOMEC declines all responsibility on any damage caused during the transport. The choice of the type of transport is the responsibility of the customer, but needs to follow our requirements below and shall be decided in accordance with transport laws of the country crossed during the travel.

To ensure optimal conditions during the transport, you must transport the system in a High Cube container: equipment rigging, packing, etc.

Note that for transport, the batteries have to travel in a separated container, for security reasons. This container has to respect the following requirement: Transport for hazardous material.

The transport and storage temperature must be between -30°C and +60°C.

A forklift shall do the unloading of the container.

1.3.2. Handling



WARNING!

The packaging guarantees the stability of the unit during shipping and physical transfer. The unit must remain in a vertical position during all shipping and handling operations. Ensure that the floor is strong enough to support the weight of the unit. Carry the packaged unit as close as possible to the installation site.



WARNING!

Move the unit using a fork lift truck taking the utmost caution at all times. At least two people must handle the unit. The people **MUST** take position at the sides of the cabinet with respect to the direction of movement. Do not move the unit by putting pressure on the front door nor back plate. When moving the unit on even slightly sloping surfaces, use the locking equipment and braking devices to ensure that the unit does not fall over.



WARNING!

Provide vertical support while moving the unit due to its height and relatively high centre of gravity; move slowly with care to avoid tipping.

All cabinets are shipped individually mounted on individual pallets.

If you need to transport through a building the minimum opening, with the roof installed, must be 1050mm x 2170mm for the C-Cab, DC-Cab and AC-Cab and 1350mm x 2330mm for the B-Cab.

1.3.2.1. Forklift or pallet truck handling

Prior to use the Gradall forklift with the C-Cab, DC-Cab and AC-Cab remove the front and rear panels (as shown below).

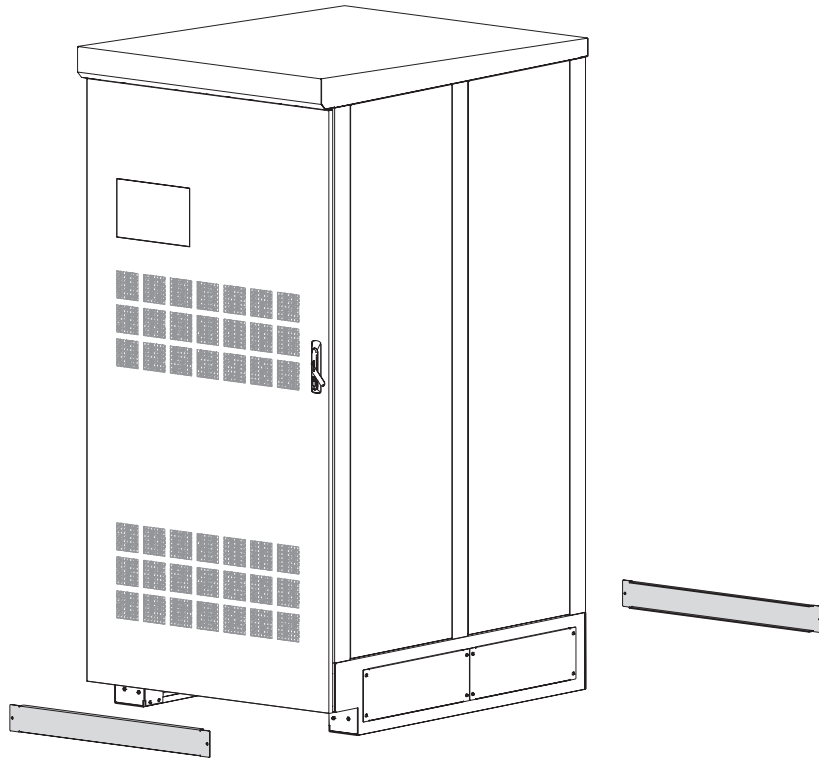


Figure 1 - Handling of the unit using pallet truck with 1.30m long forks
(screen shall be at the back, if not possible it can be at the front, but then take care of the screen)

1.3.2.2. Overhead lifting

If a crane is available on site, it is possible to handle the unit from above.

- **B-Cab**

4 lifting lugs are on the top of the unit.

The radius of the hole on the lifting lug is 11mm.

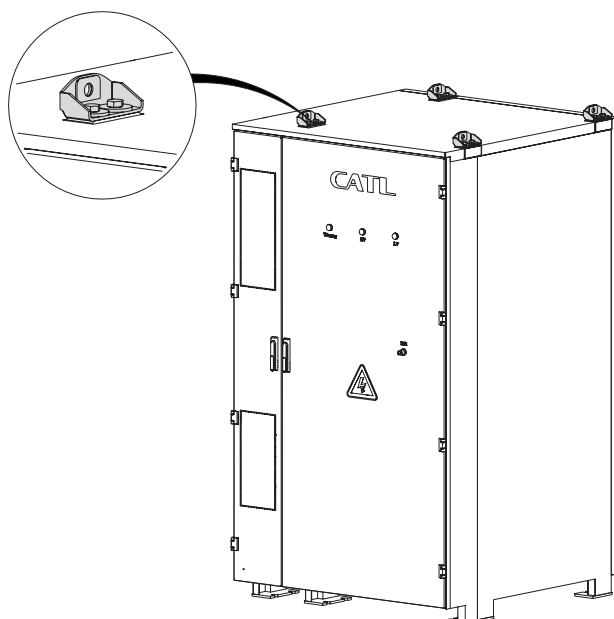
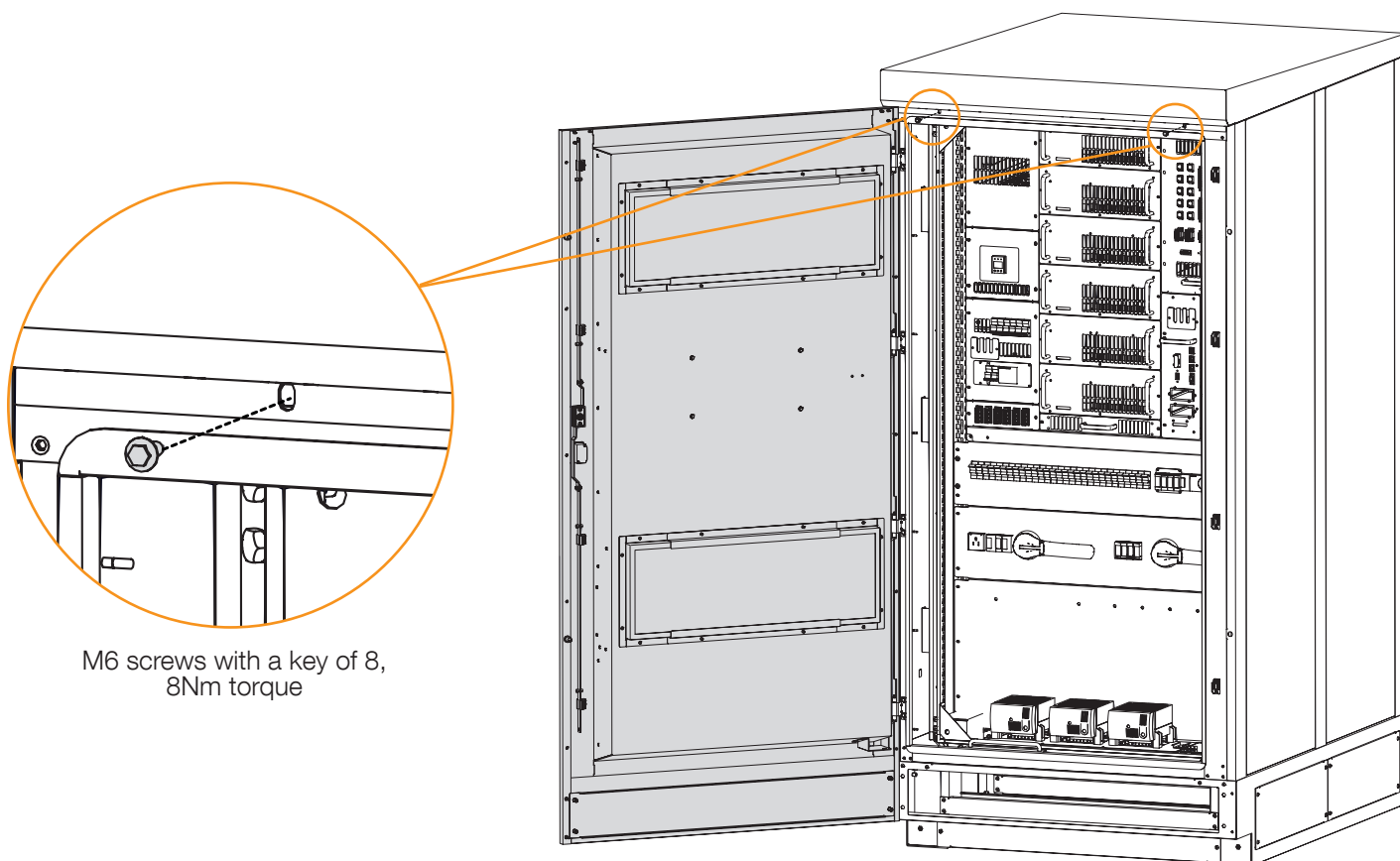


Figure 2 - Lifting lug on the top of the rack

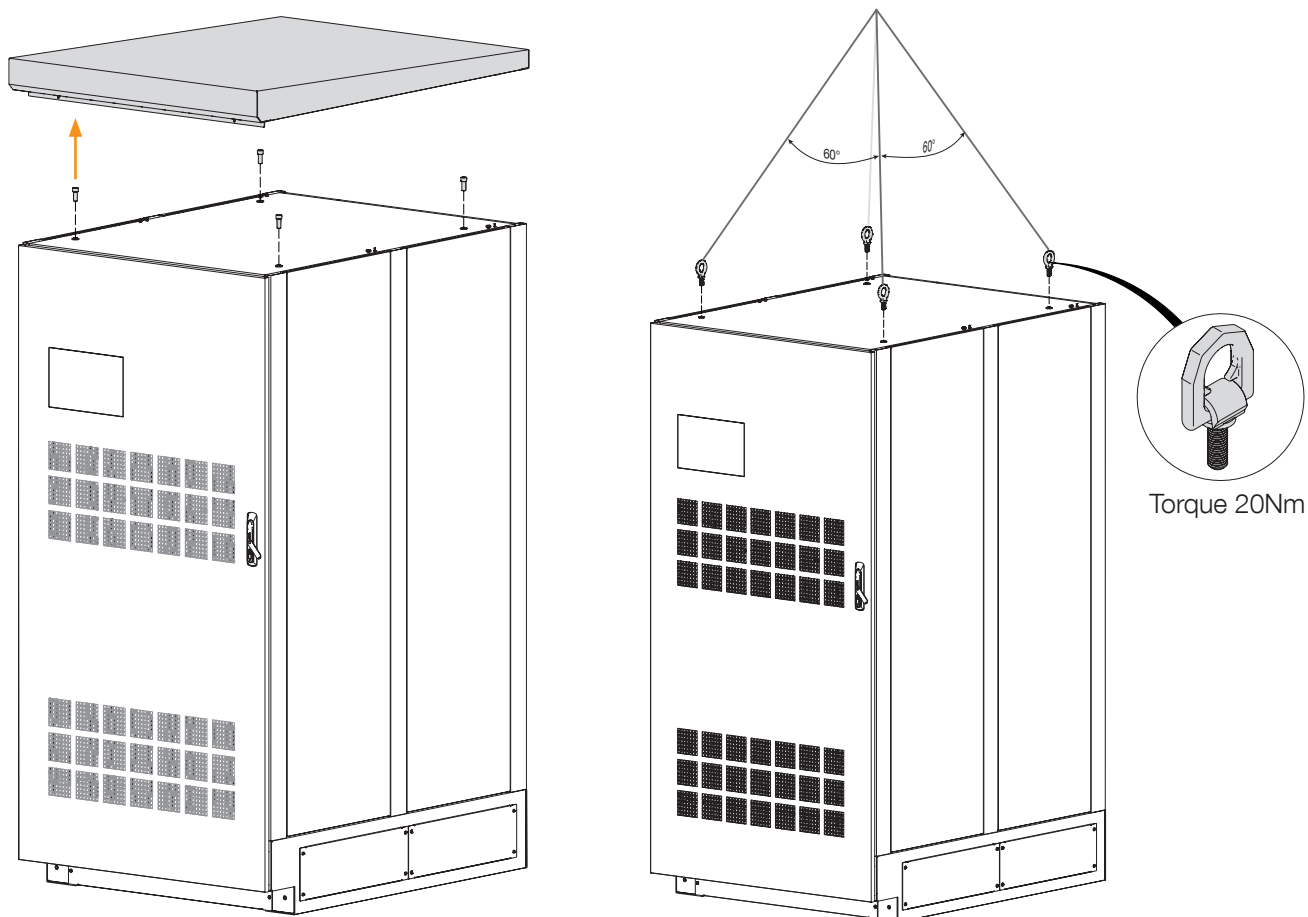
- **C-Cab**

- Open the door and remove the front screws:

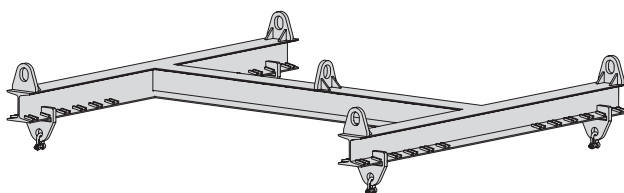


M6 screws with a key of 8,
8Nm torque

- Remove the roof and replace the 4 screws by M12 lifting rings, we recommend you to use double swivel rings (not supplied):



- Should you not use double swivel rings but basic ones; you will need to use a vertical load spreader, not supplied (as illustrated below) for handling.



CAUTION!

While lifting it is important to ensure that even vertical load, distribution on all the lifting eyes and slowly lift and move into a prepared location while observing standard safety protocols. Do not use slings or straps without spreaders to lift the units from above. No tilting is permitted. The unit cannot be laid.

2. LAYOUT AND ENVIRONMENTAL REQUIREMENTS

2.1. Civil and foundation requirements

SUNSYS HES L must be installed on a concrete pad that must:

- be of a suitable size, minimum:
 - 150mm deep – for SDS* (Numeric seismic design value 0.2s) 1.5g;
 - 203mm deep – for SDS* 2.5g;
 - 508mm around the equipment.
- be free from conductive, inflammable and corrosive items;
- support the weight of the units and guarantee their stability, it shall be of a minimum capacity of 3000psi or 20.68MPa,
- respect a solid and perfectly levelled ground, in order to ensure the correct evacuation of the water and avoid its stagnation
- respect the flatness / unevenness values in respect to DIN 18202: table 3, line 4.

The anchor rod must be of the following embedment length:

- 3.25in for both C6Cab and B-Cab for SDS 1.5g
- 3.25in for the C-Cab and 6.5in for the B-Cab for SDS 2.5g

For more info, you can have a look at the Anchorage report joined in Annex.

To carry out the foundation calculations, it is necessary to take into account the loads that influence the ambient conditions, as per the country regulations.

*0.4 SDS (FMEA) is equivalent to aN (PS92)

Dimensions in/mm

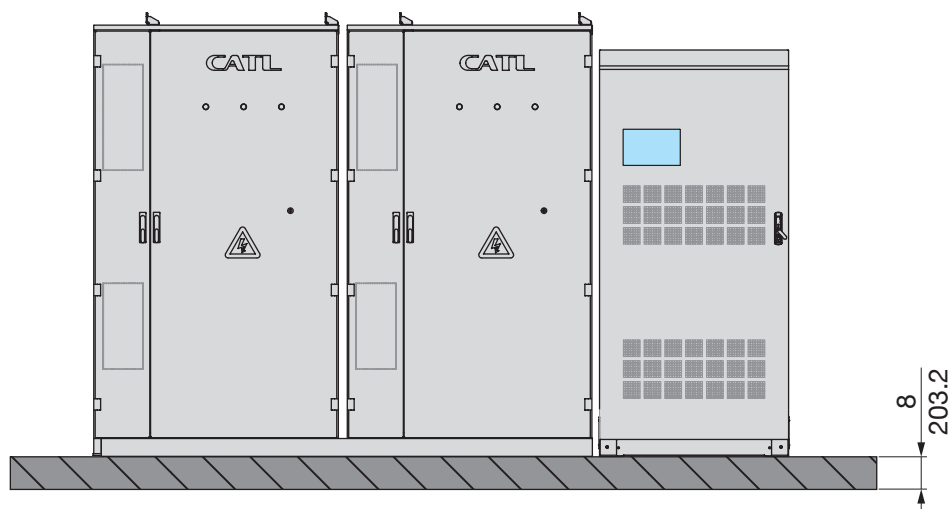


Figure 3 - Concrete depth – SDS 2.5

Dimensions in/mm

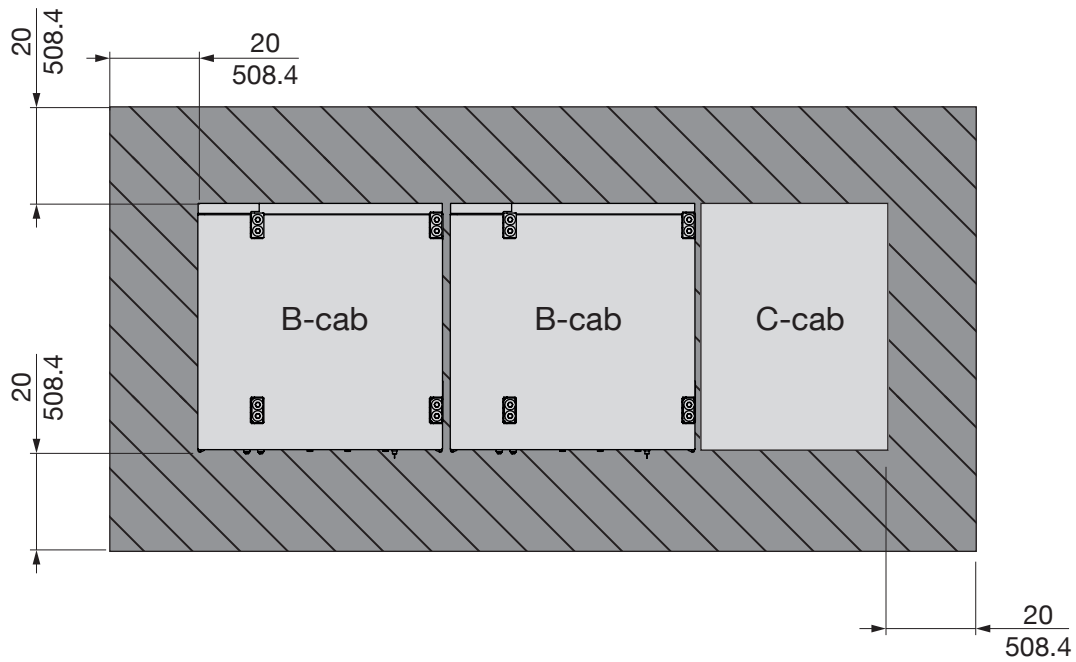


Figure 4 - Concrete space around the equipment

2.2. Clearance distances

To ensure enough space for ventilation and allow the access for any intervention, the following clearance distances shall be respected in addition to any other local laws.

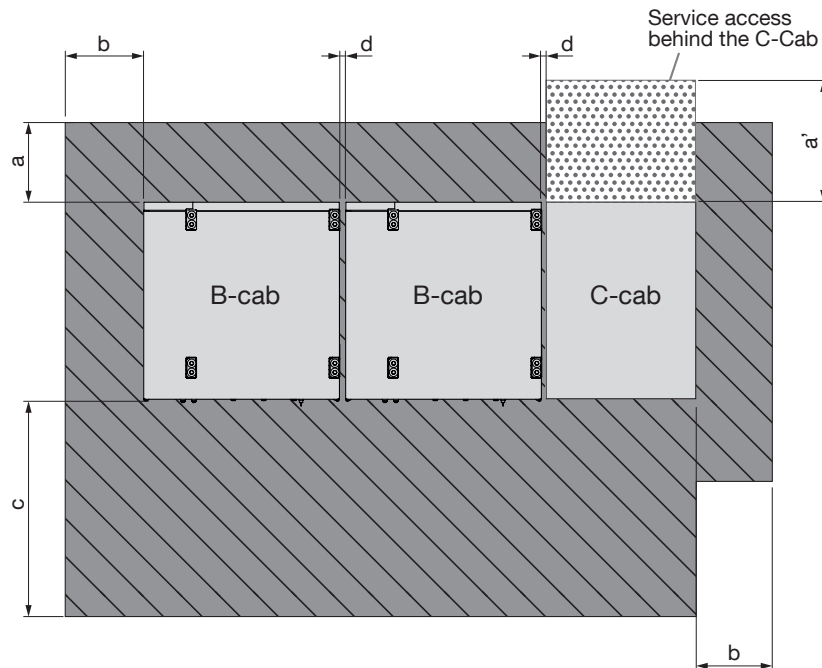


Figure 5 - Clearance distances

	Distance a rear clearance	Distance a' rear clearance	Distance b side clearance	Distance c front access	Distance d between 2 units
Minimum clearance distance	Min. for the access 500 mm / 20 in* Min. for the airflow 100 mm / 4 in	700mm / 27.6 in**	500 mm / 20in	1500 mm / 59.1in	25,4 mm / 1in To enable the installation of the cable gutter please leave 25.4 +/-6mm / 1+/-0.04in.

*500mm / 20in is the minimum of space needed to operate. In case of removable back fence this fence can be installed at 100mm / 4in, enough for the ventilation, and once removed, we should have again the requested space to operate.

**700mm / 27.6in is the minimum of space needed to operate. In case of removable back fence this fence can be installed at 500mm / 20in, enough for the ventilation, and once removed, we should have again the requested space to operate.

2.3. Positioning

There are two types of installation possible: in line (side-to-side) and back-to-back. Concerning the back-to-back installations, only the B-Cabs are back-to-back, there is free space behind the other cabinets. You must respect the correct layout to ensure cable connections are sufficient.

You will find two examples of these installations below:

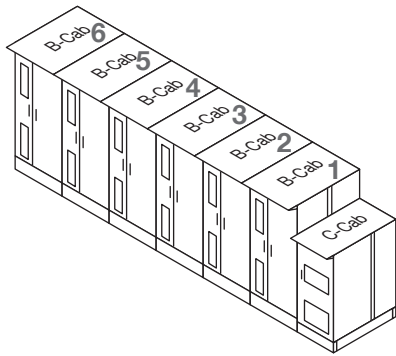


Figure 6 - In line installation

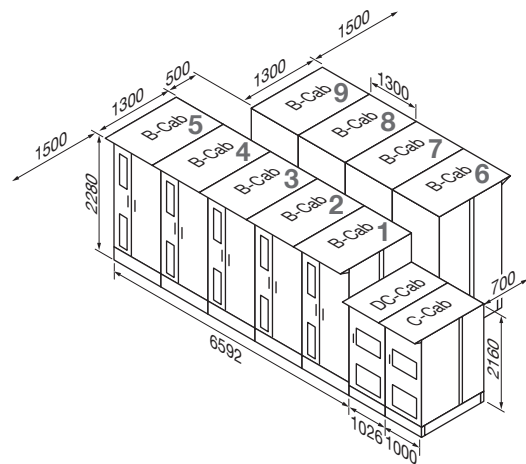


Figure 7 - Back-to-back installation

The C-Cab, DC-Cab, AC-Cab and B-cab anchoring holes in the floor of the concrete base must be pre-drilled using the template provided and the mechanic anchoring installed before putting the cabinet in place.

Positioning of all cabinets is critical to ensure proper installation with the cable troughs from each battery cabinet.

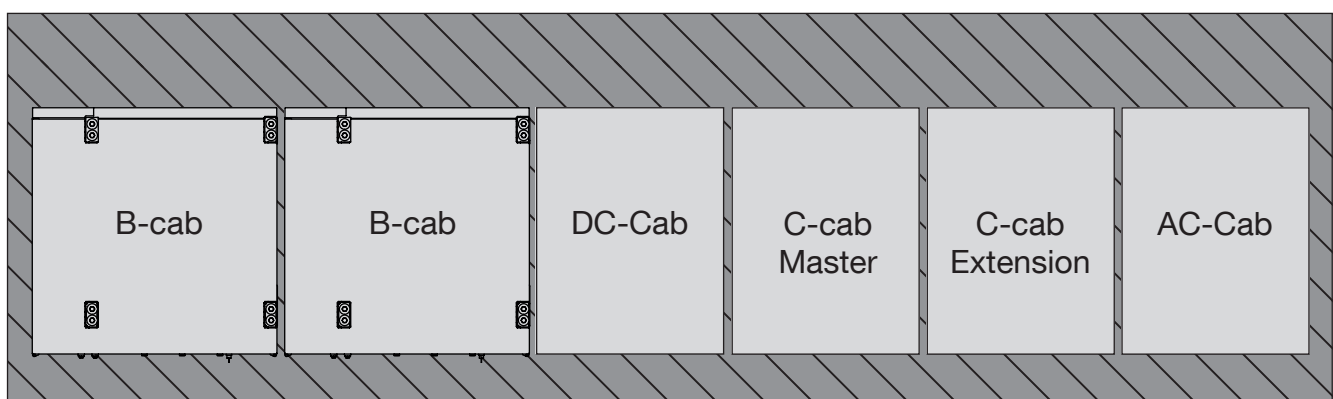
Refer to the template provided to prepare the mounting location and install the cabinets into the designated place.

Drilling templates along with outline drawing dimensions will define the location of the cabinets. The drilling templates provided are an overlapping modular set, you will need to attach the 4 parts of the template together before starting.

Follow the procedure described below to prepare the mounting location as detailed in the template.

2.3.1. Cabinets order

From top view, the cabinets always have to be positioned as follows: the C-CAB on the right side and the B-CAB on the left side – from front face of the products. Installation must be started from the cabinet on the right (view below):



← Installation direction

Figure 8 - Cabinets order

2.3.2. Marking of the C-Cab

Pay attention to the mounting direction of the top and bottom template. The numbers must be legible upright.

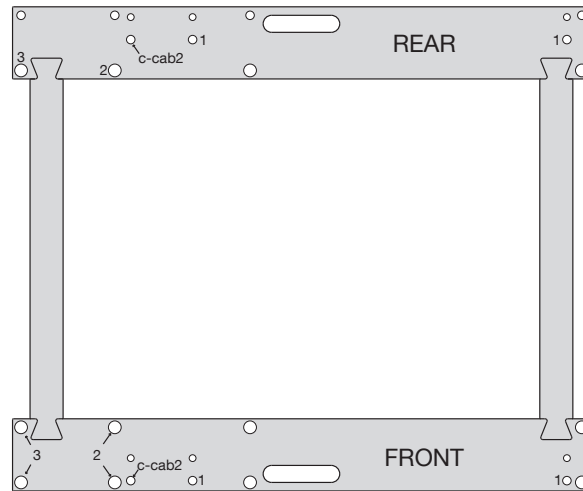


Figure 11 - Top view of the drilling template mounted

2.3.2.1. Installation with only 1 C-Cab (no extension)

Mark the 4 holes shown below – note “1” .

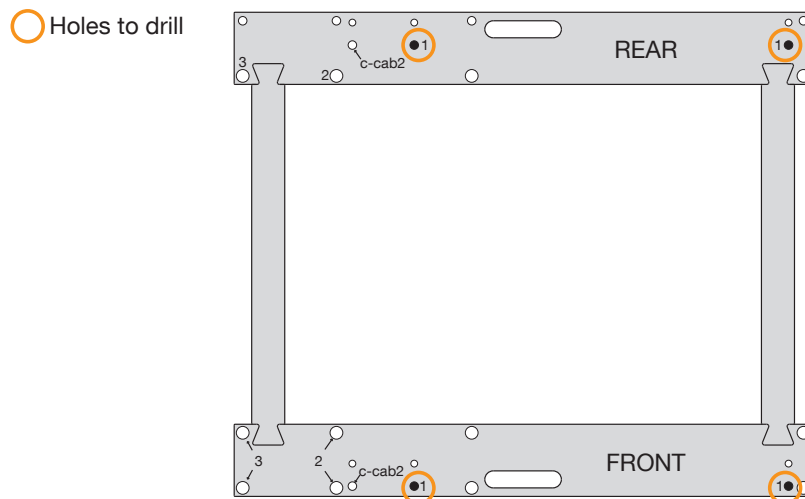


Figure 12 - Holes to drill for 1 C-Cab installation

Then prepare the B-Cab installation by marking 3 more holes -note “2”, as shown in Figure 13.

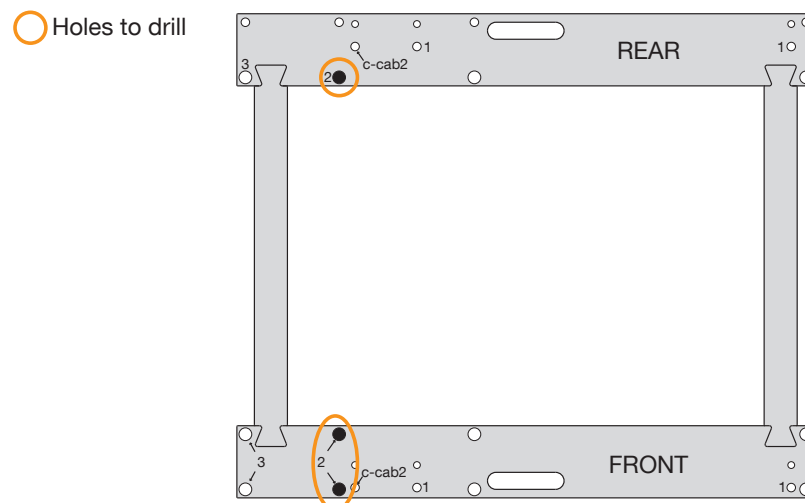


Figure 13 - Holes to prepare B-Cab installation next to the C-Cab

2.3.3. Marking of the B-Cab

Move the drilling template kit and install it overlapping the 3 holes already drilled – note "2" – as shown on the Figure 13.

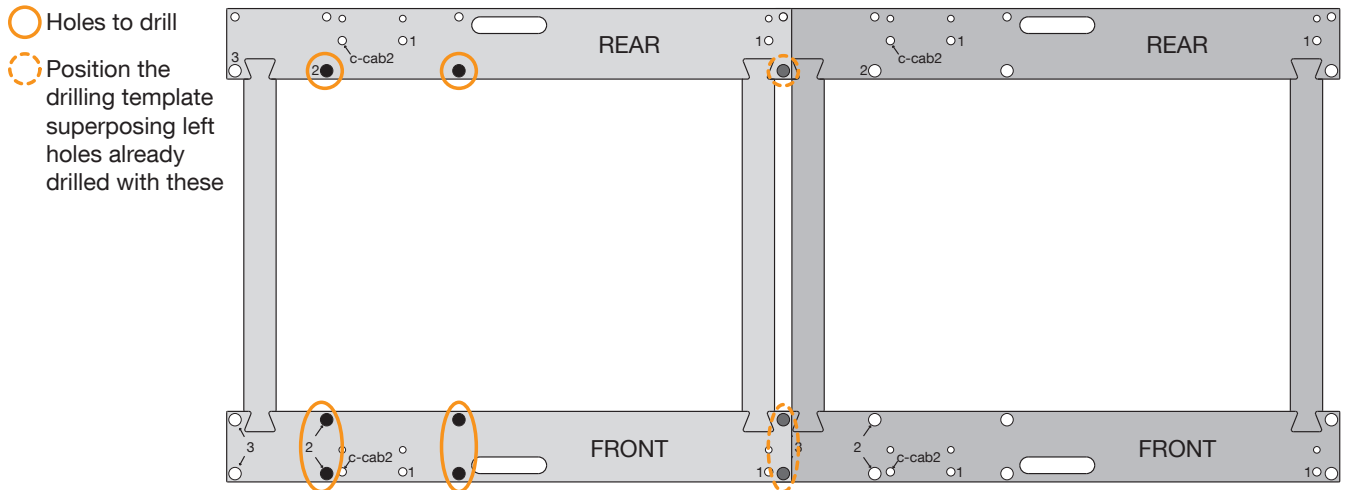


Figure 9 - Holes to drill for the B-Cab installation

If the battery is not the last one to be installed on the left side, you need to directly prepare the holes for the next battery, by marking 3 more holes –note "3" – as shown in Figure 14, and then go back to previous step.

If it is the last one, the marking is over.

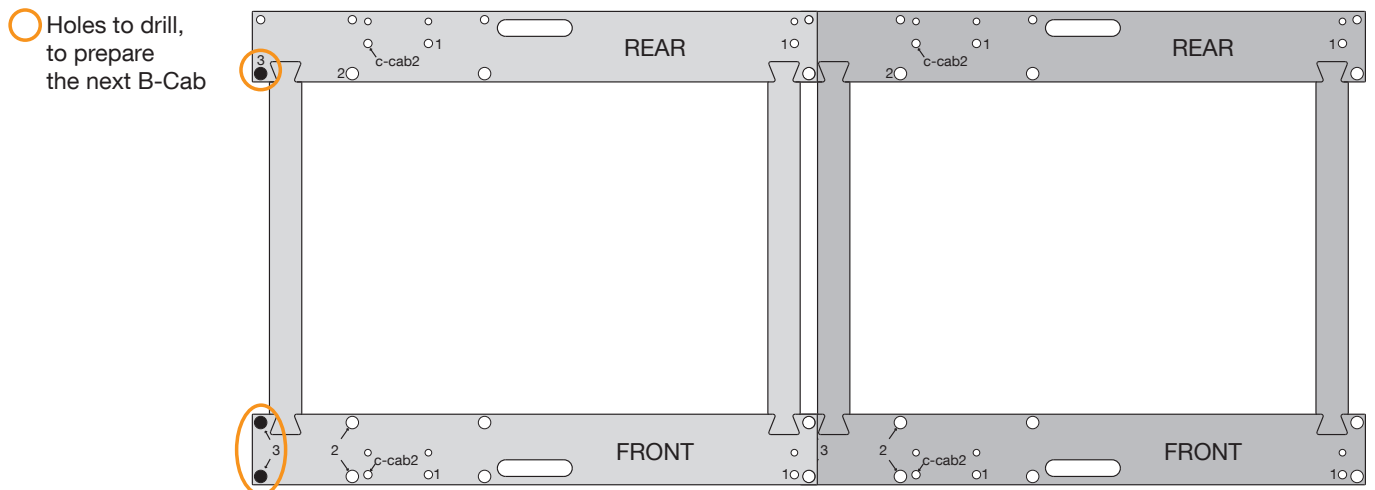


Figure 10 - Holes to drill to prepare next B-cab installation

2.3.4. Installation with more than 1 C-Cab (one Master and one Extension) and/or when there is also a DC-Cab and/or an AC-Cab

Start from the cabinet on the right, position the drilling template of the C-Cab and mark the 6 holes – 4x note “1” and 2x note “c-cab2” - as shown in Figure 14.

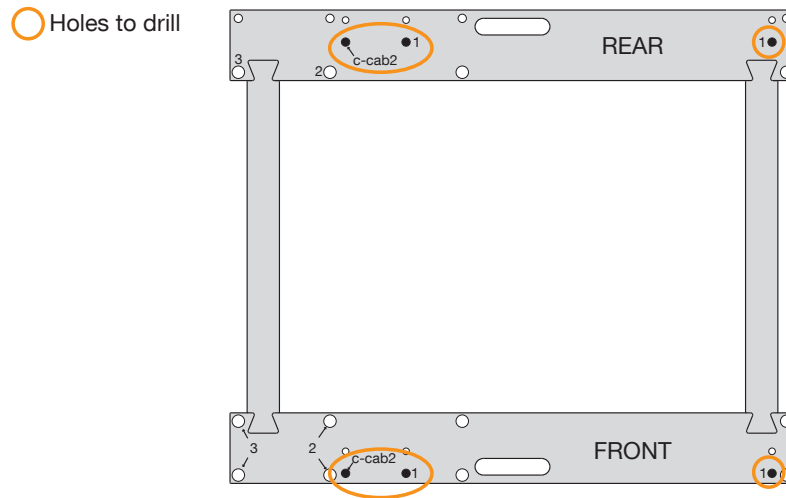


Figure 14 - Holes to drill for more than 1 Cab other than B-Cab

Then put the drilling plate as shown below, overlapping 2 holes – note “1” - that you already marked and mark 2 note “1” additional ones:

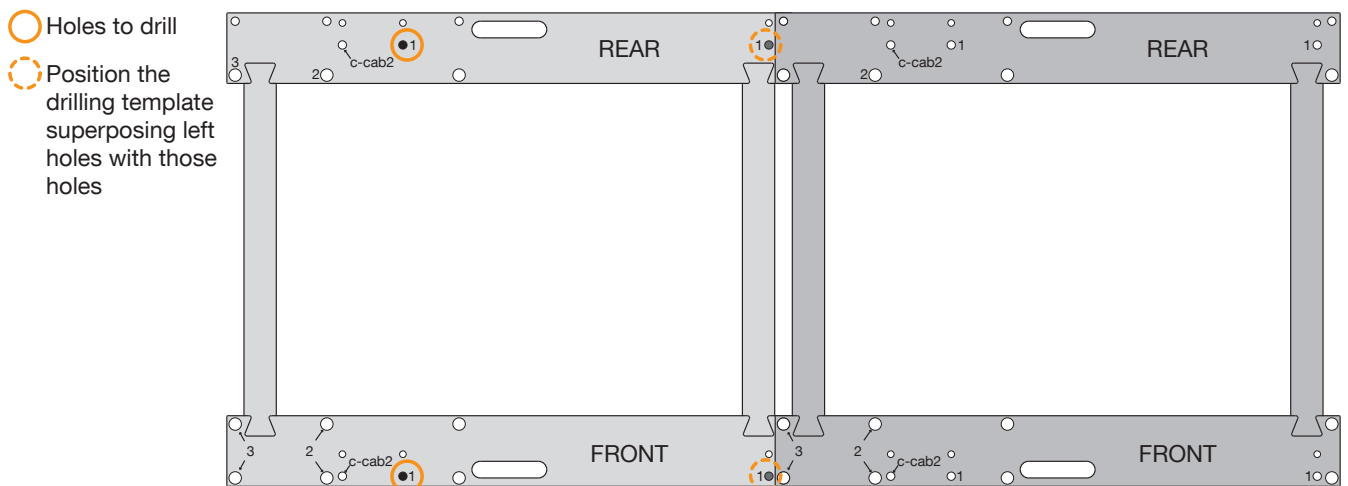


Figure 15 - Holes to drill for the C-Cab installation

Then prepare the next C-Cab, DC-Cab installation if applicable (go back to figure 14) or the B-Cab installation by marking 3 more holes -note “2”, as shown in Figure 16.

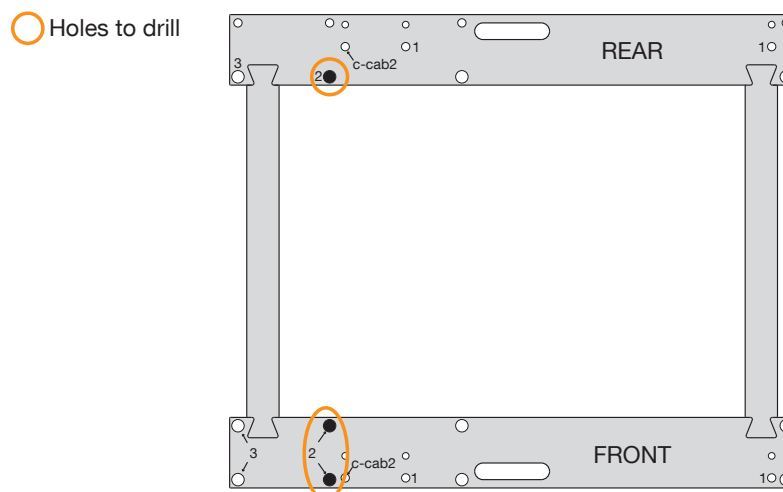


Figure 16 - Holes to prepare B-Cab installation next to the C-Cab.


2.3.5. Drilling

Drill all the holes marked:

- Dia ½ inch for the C-Cab, DC-Cab and AC-Cab
- Dia 5/8 inch for the B-Cab

2.3.6. Putting cabinets in place

Before installing on the floor, level the floor using provided shims. Maximum allowed deviations must be in the following range: 0.06in for vertical direction, plus/minus 0.25in for horizontal direction (left to right), and plus/minus 0.25in for horizontal direction (front to back).

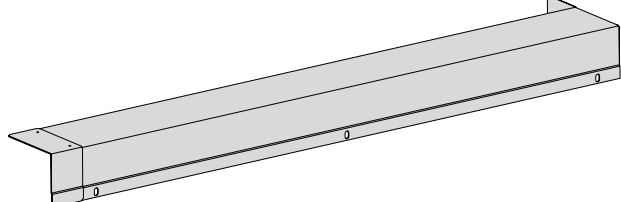
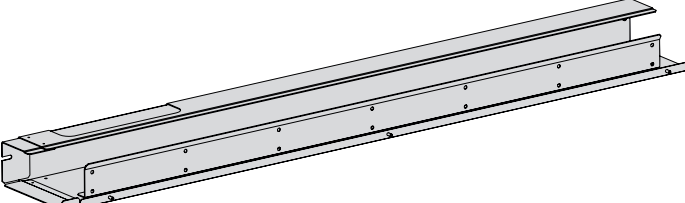
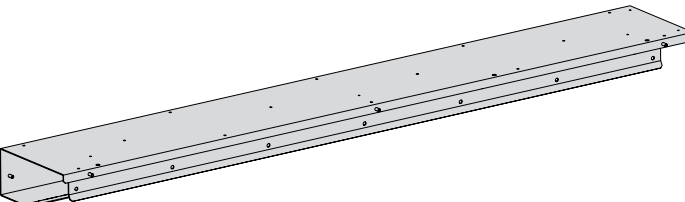
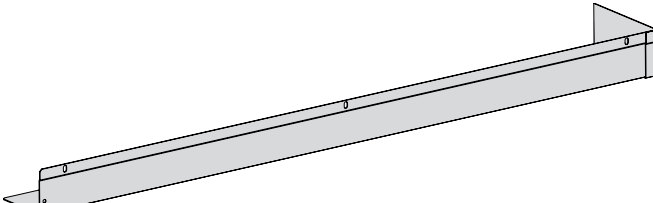
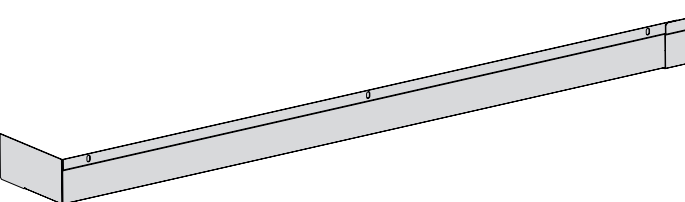
 Note: It is important for the unit to be leveled to ensure proper installation with the cable troughs from each battery cabinet.

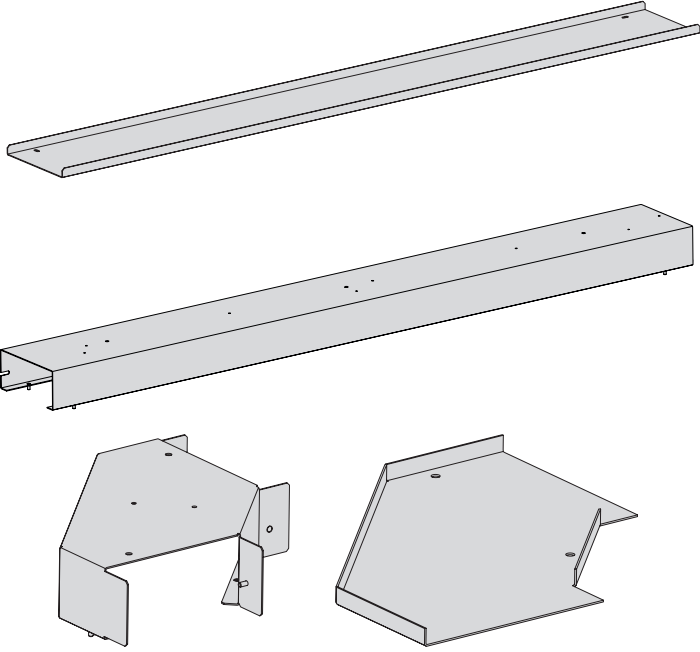
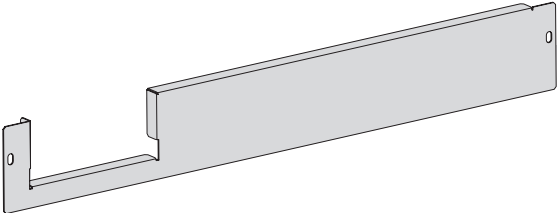
Put the cabinets in place, starting from the right, and make sure to remove the side panels to have access to the bolts.

Once fixed with a 54Nm torque, put the side panels back, with a 8N.m torque. Then put the B-Cabs in place.

2.4. DC connecting kit installation

2.4.1. List of parts

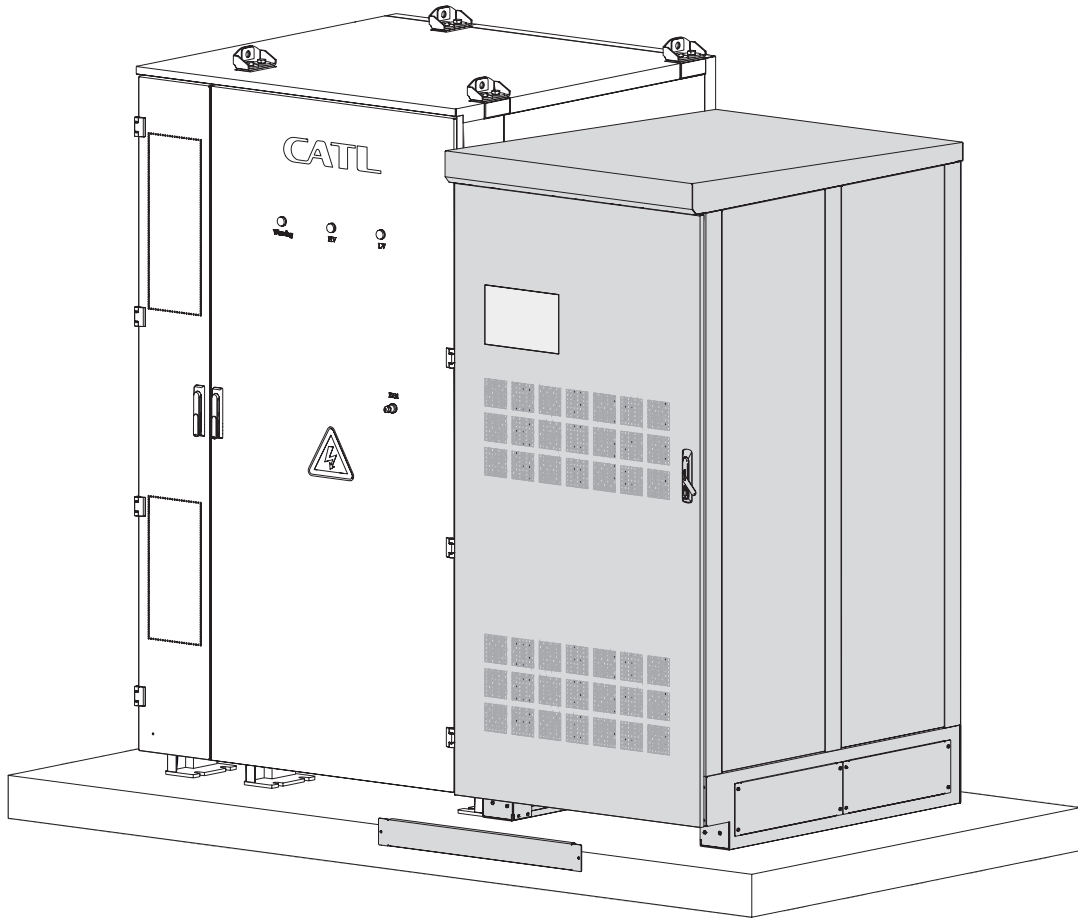
Item 1	C-Cab connection kit – back part	
Item 2	C-Cab connection kit – cover part	
Item 3	B-Cab connection kit – middle and right back part	
Item 4	B-Cab connection kit – cover part	
Item 5	B-Cab connection kit – left back part	
Item 6	B-Cab connection kit – left cover part	
Item 7	B-Cab connection kit – right cover part	

Item 8	Straight + angle bottom parts and covers for back batteries	
Item 9	Back plate for C-Cab for back-to-back installations	

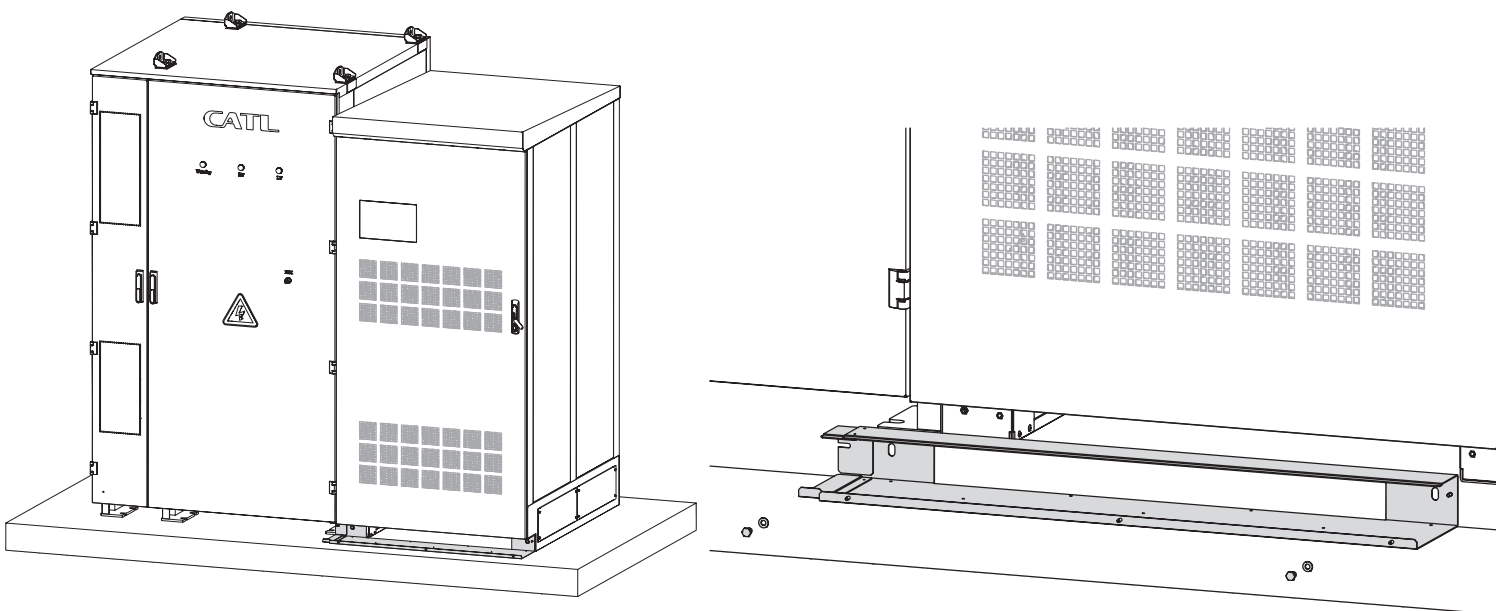
2.4.2. Mounting details

Once all cabinets are installed, shimmed (if necessary) and bolted to the concrete pad, you can install the connecting kit.

Step 1: Remove the front panel of the base of the C-CAB (DC-Cab if applicable).



Step 2: Place the C-Cab connection kit – back part, item 1, under the C-Cab. Put it on top of the shims or directly on the concrete pad, whichever applies, and screw it on the cabinet with two screws M8, as shown below.



In case of back-to-back installation, as shown on the picture below, you need some specific parts, item 8 of the table.

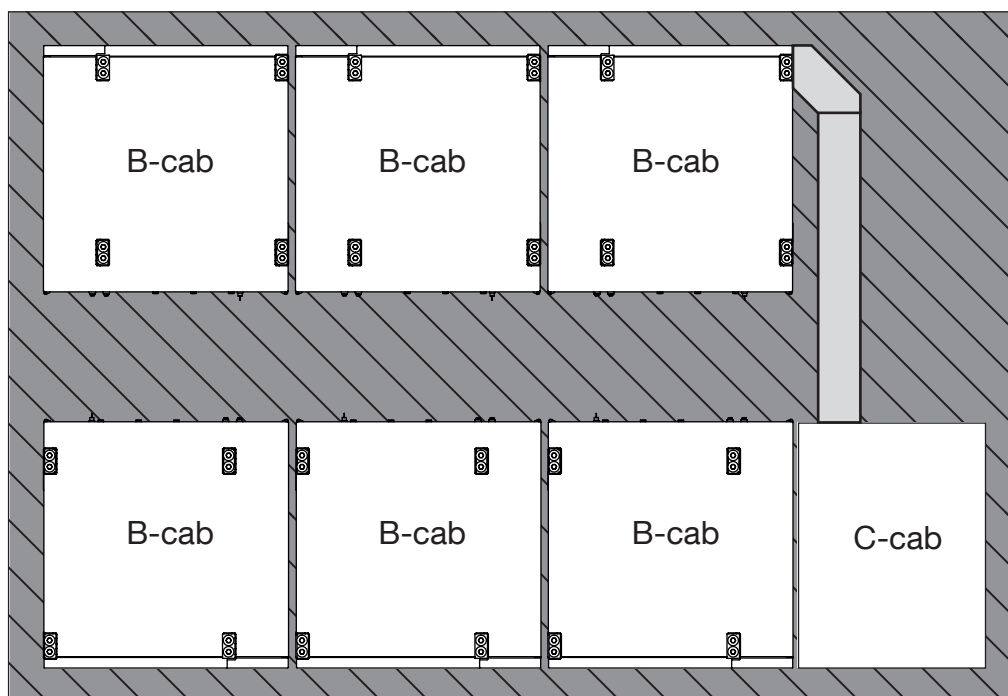

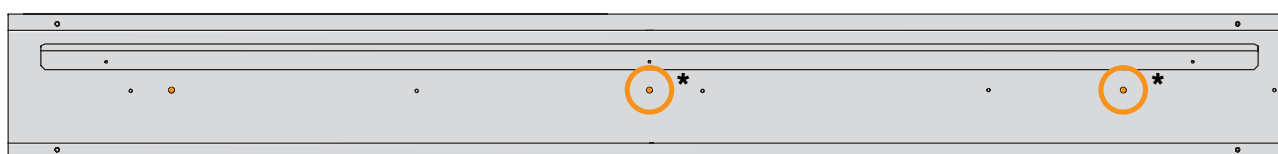
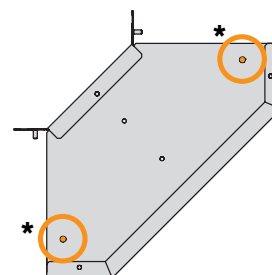


Figure 17 - Specific connection parts for back-to-back installations

This connection is composed of 4 parts. Fix them on the floor using 1/4" Tapcon® bolts.

 * Use 1/4" Tapcon® bolts



Start with the straight bottom part, then add the angle bottom part.

The C-Cab will also be closed on the bottom using a specific plate: item 9.

Step 3: Place the B-Cab connection kit – back part, item 3, under every B-Cab. Put it on top of the shims or directly on the concrete pad, whichever applies, and screw every notch with stud M6.

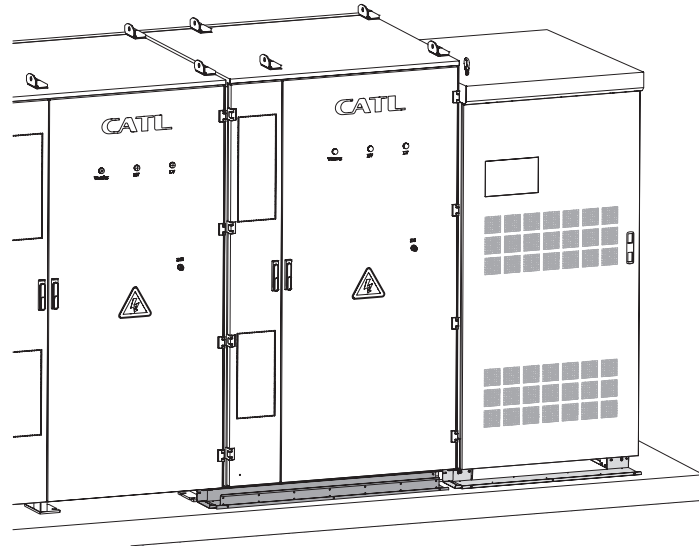


Figure 18 - Installation of the B-Cab back part connection kit

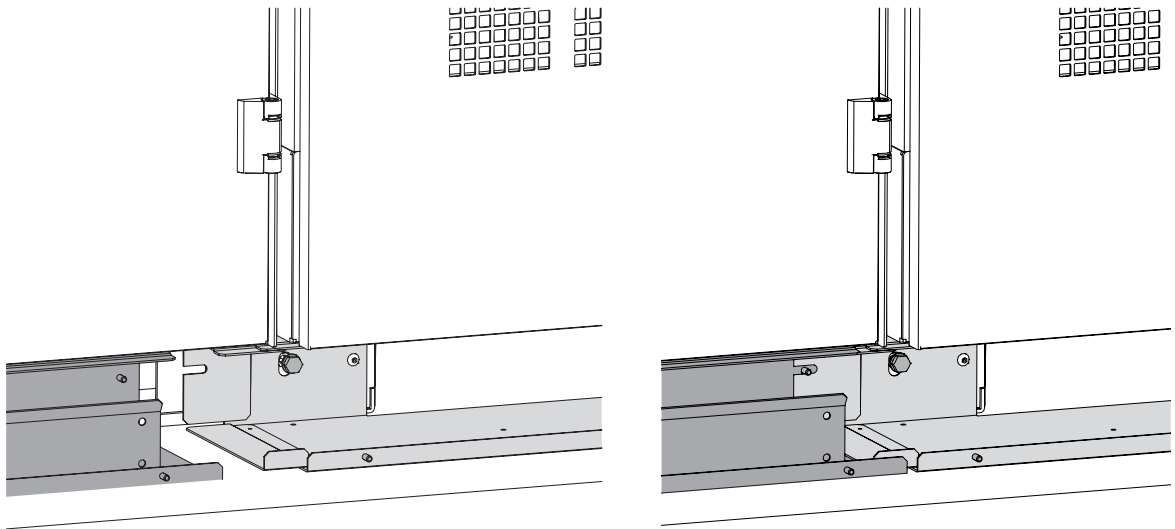


Figure 19 - Connection of C-Cab and B-Cab parts

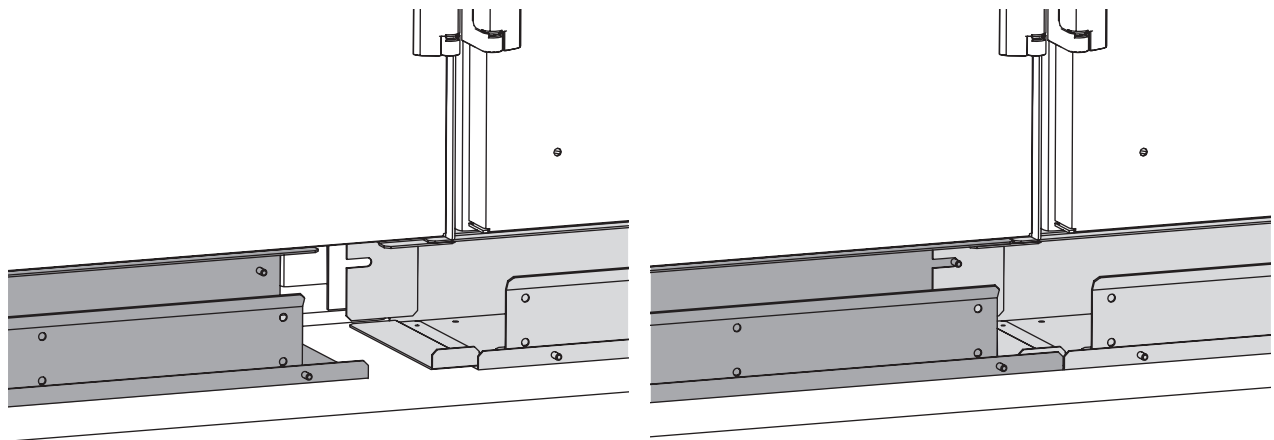
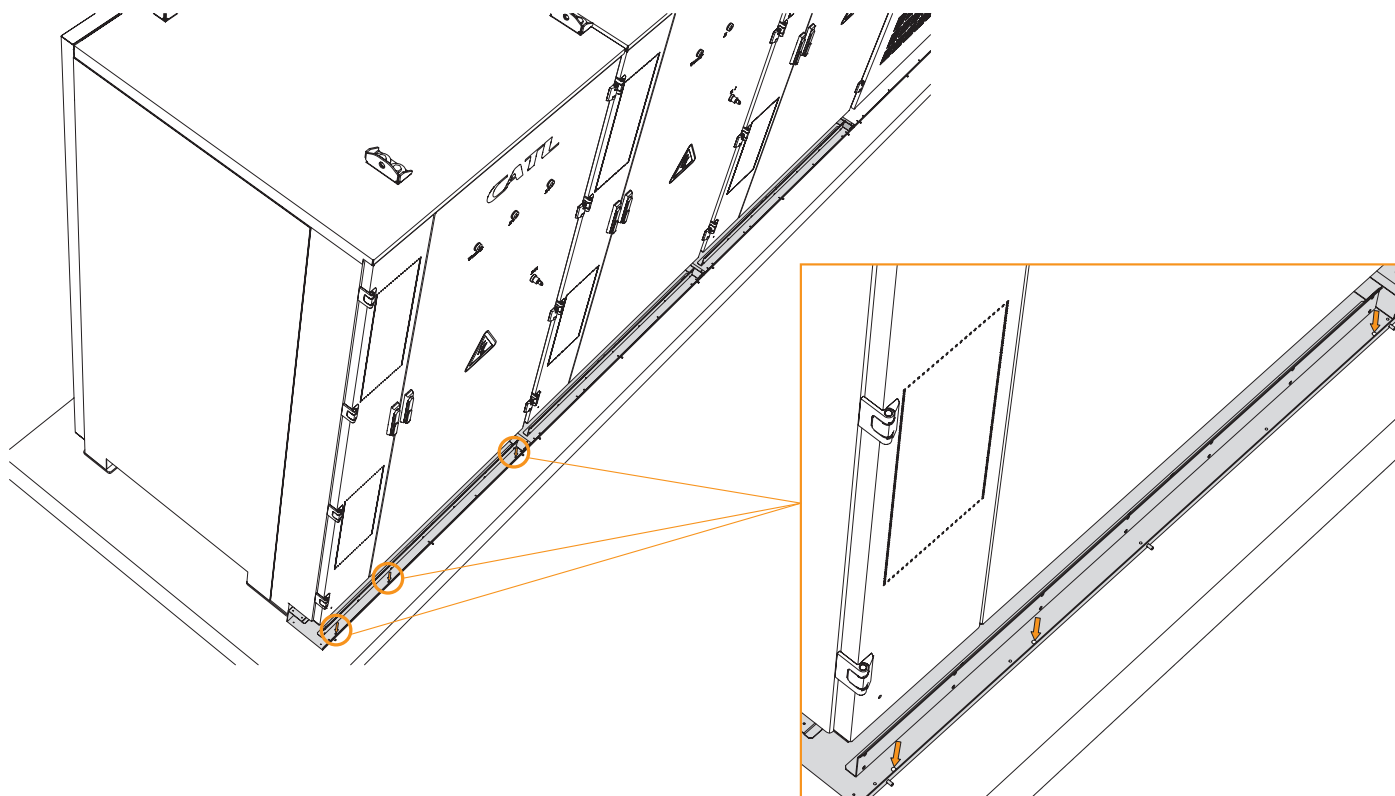


Fig 20 - Connection of two B-Cab parts



Note: For the last B-cab of the front row, use item 5, left back part, instead of item 3.

Step 4: Lock in place all cable connection kits by using 1/4" Tapcon® bolts to secure them into the concrete floor in the 3 locations - through the shims (if they are present). Refer to Tapcon® for proper pilot hole sizes.



Step 5: Proceed with the wiring of the DC cables, the internal Ethernet communication and the battery communication cables and chiller and auxiliaries power supply cables. All these cables are supplied with the system.

Start from the C-Cab and connect the batteries from the nearest to the furthest.

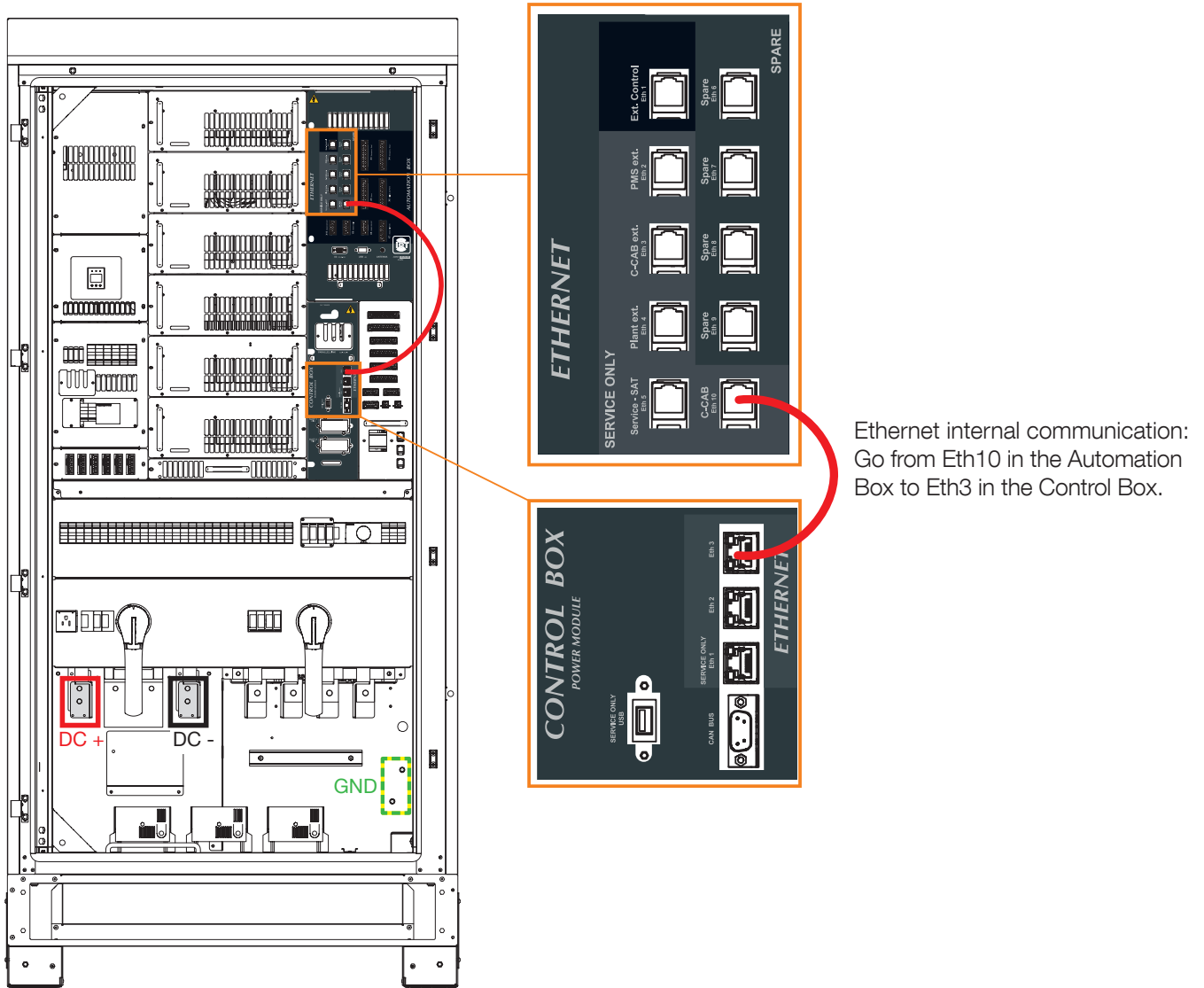
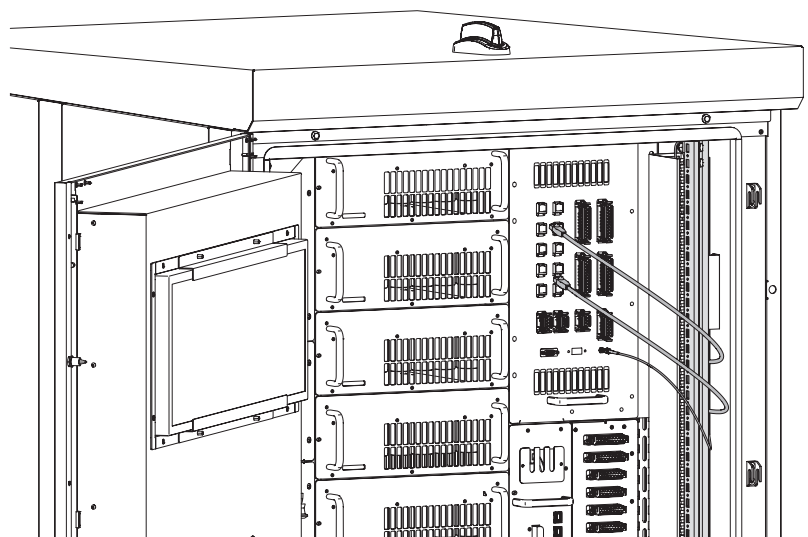


Figure 21 - Battery DC power cables connections

DC battery connection: Up to 6 batteries with 95mm² cables for the + and - of each of them. If you have a DC-Cab, all DC battery connection will come from this Cab, that will be connected to the C-Cabs.

Ground connection: 95mm² cables daisy chained from C-Cab master to DC-Cab, then from DC-Cab to B-Cab 1, then from B-Cab 1 to B-Cab 2...

The Ethernet cables need to go through the cable duct on the side wall of the machine, as shown on this drawing:



- Battery communication connection. On the last B-cab, JX2 is connected to the terminal resistor connector.
- Battery Aux power supply (in case of the presence of a DC-Cab, the aux power supply goes from XB in the DC-Cab to the B-Cab).

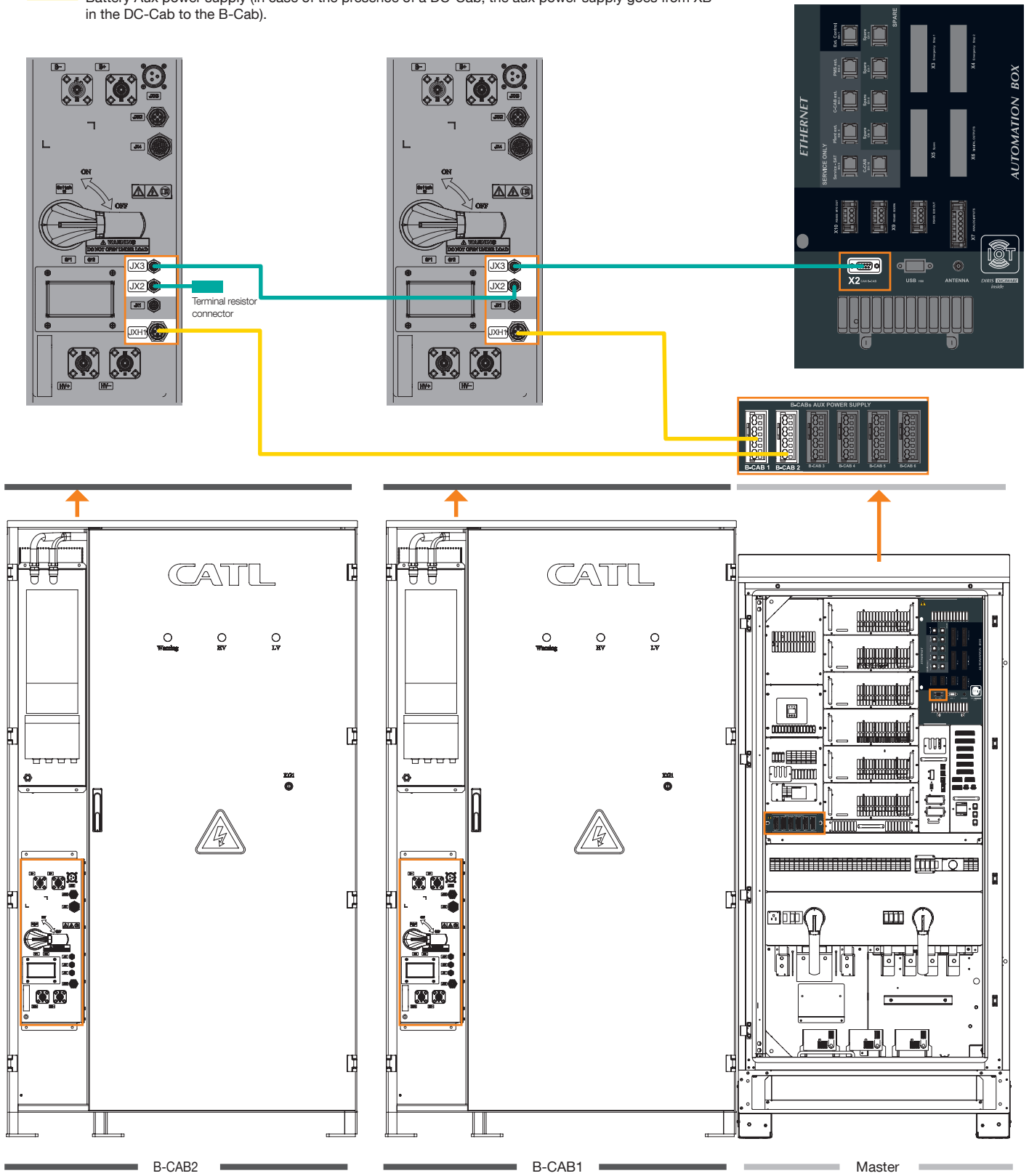


Figure 22

B-Cab position

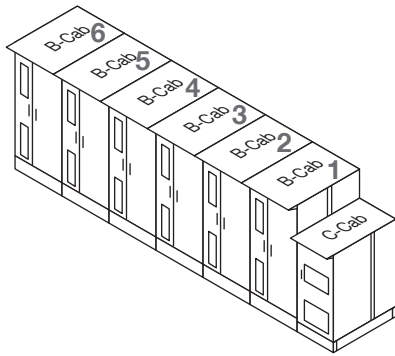


Figure 23 - In line installation

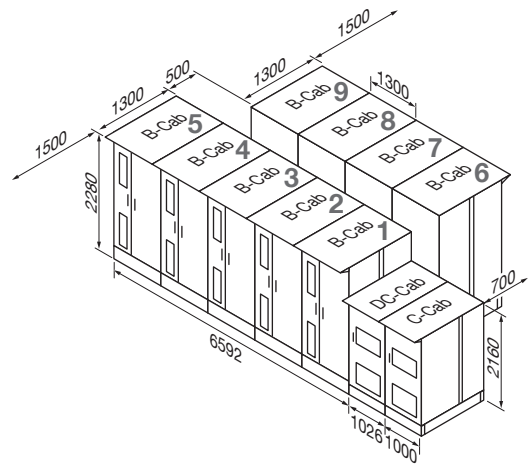


Figure 24 - Back-to-back installation

Dimensions *in*/mm

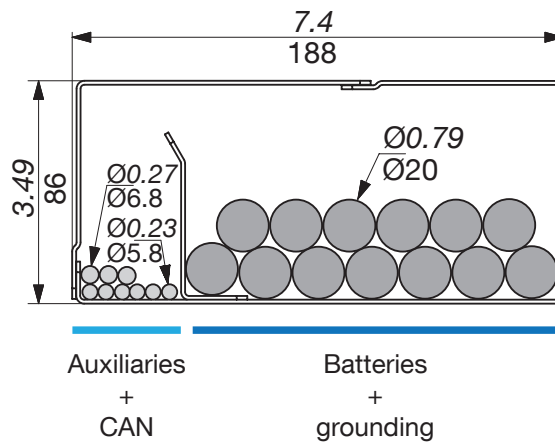


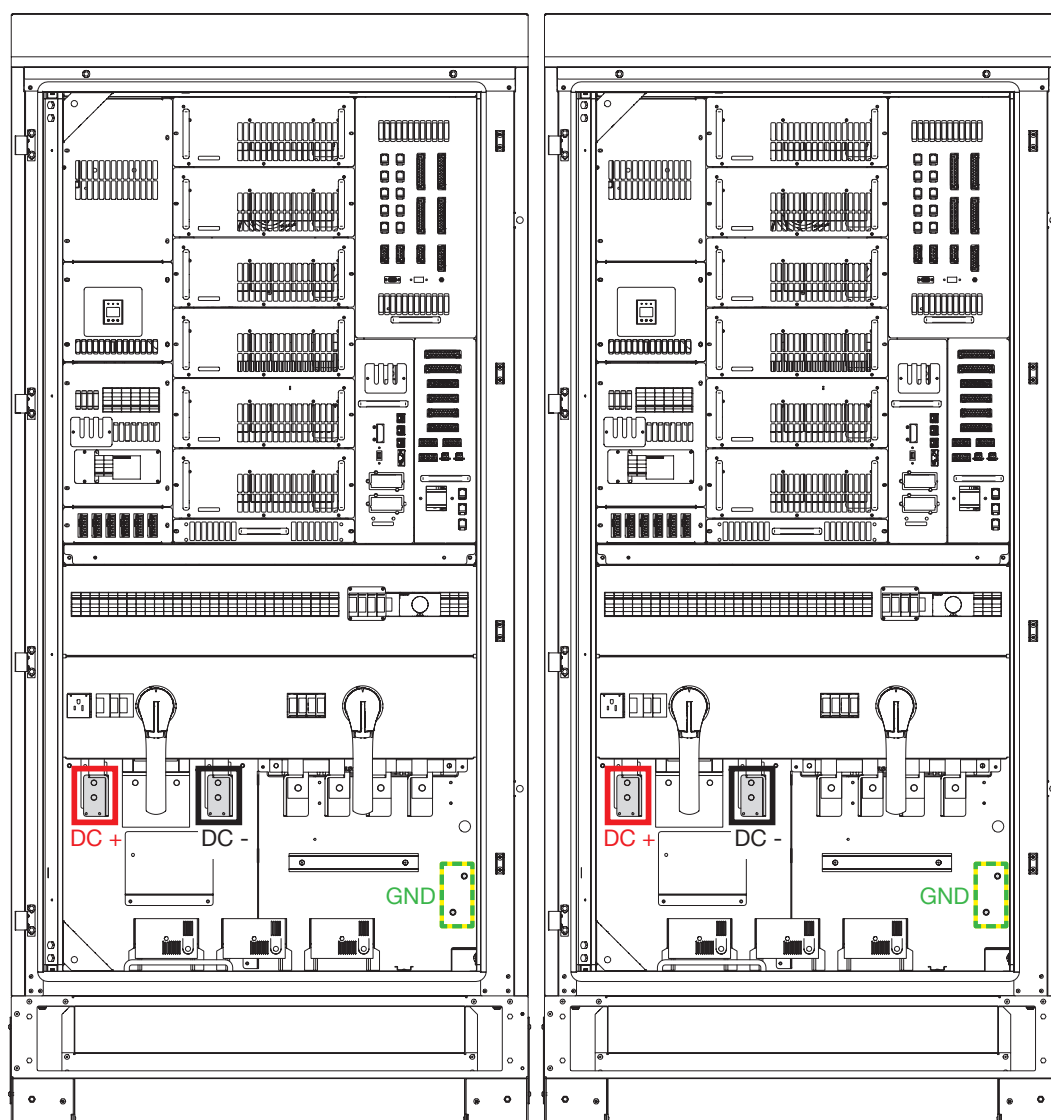
Figure 25 - Cables organization inside the cable gutter

Info about the cables provided:

Cable usages	Section	Lugs battery side	Lugs C-Cab side
DC cables	3/0 AWG	Specific CATL	M12 – 3/0 AWG
Communication cables	2x22 AWG shielded	-	-
Aux power supply	5 x 14 AWG	-	-
Earth connection	3/0 AWG	M8 – 3/0 AWG or M10 – 3/0 AWG	M10 – 3/0 AWG

Shall you have a system with 1 C-Cab Master + 1 C-Cab Extension, the cabling will be as follows:

Start from the C-Cab Master then the C-Cab extension and connect the batteries from the nearest to the furthest.



Master: To B-Cab 2, 4 and 6 and to C-Cab ext Extension: To B-Cab 1, 3 and 5 and to C-Cab master

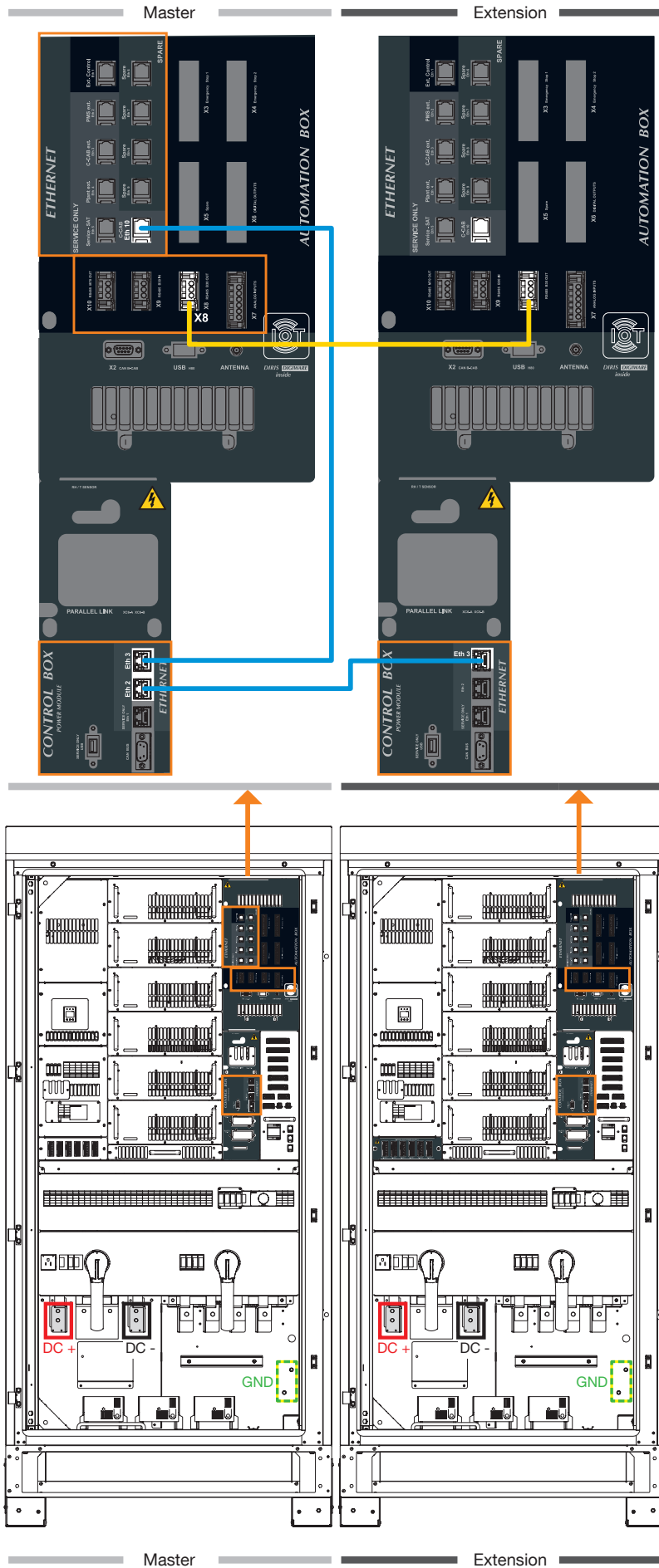
Figure 26 - Battery DC power cables connections - example for 6 B-Cabs

DC battery connection: Up to 3 batteries per C-Cab with 3/0AWG cables for the + and – of each of them.

DC converter connection: The Master and the Extension C-Cabs need to be connected using 3x 4/0AWG /pole.

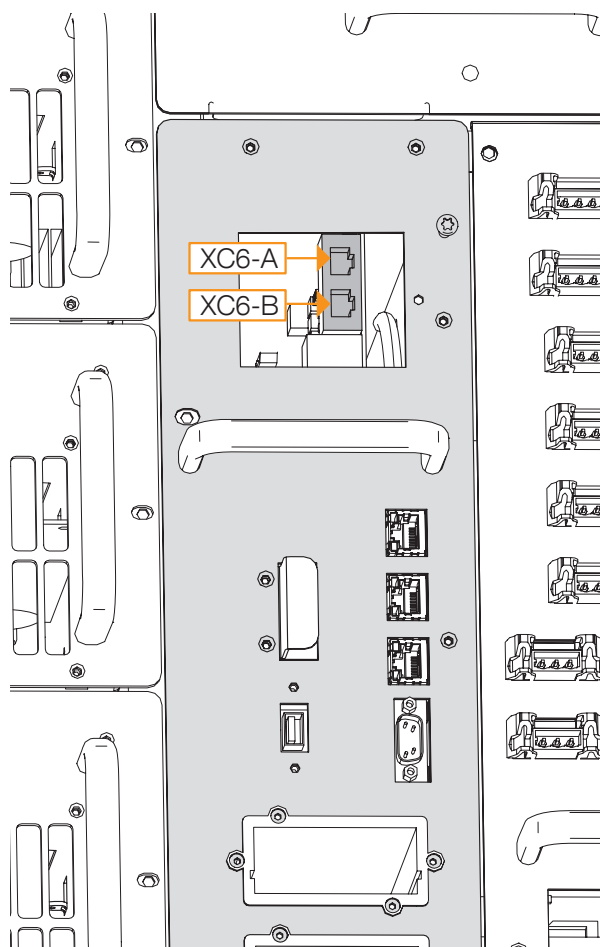
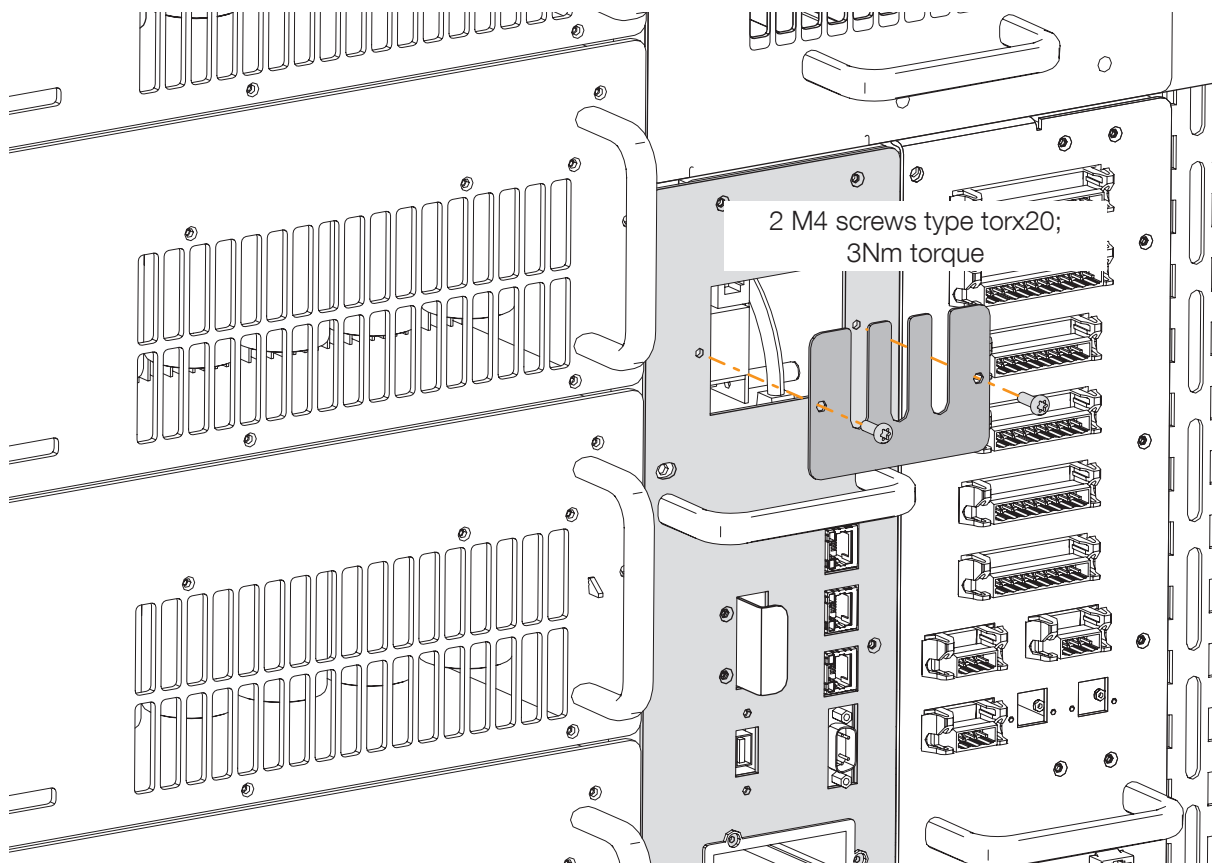
Ground connection: daisy chained cables 300MCM from C-Cab extension to C-Cab master, then 3/0 AWG C-Cab master to B-Cab 1, then from B-Cab 1 to B-Cab 2...

- Ethernet
- RS485

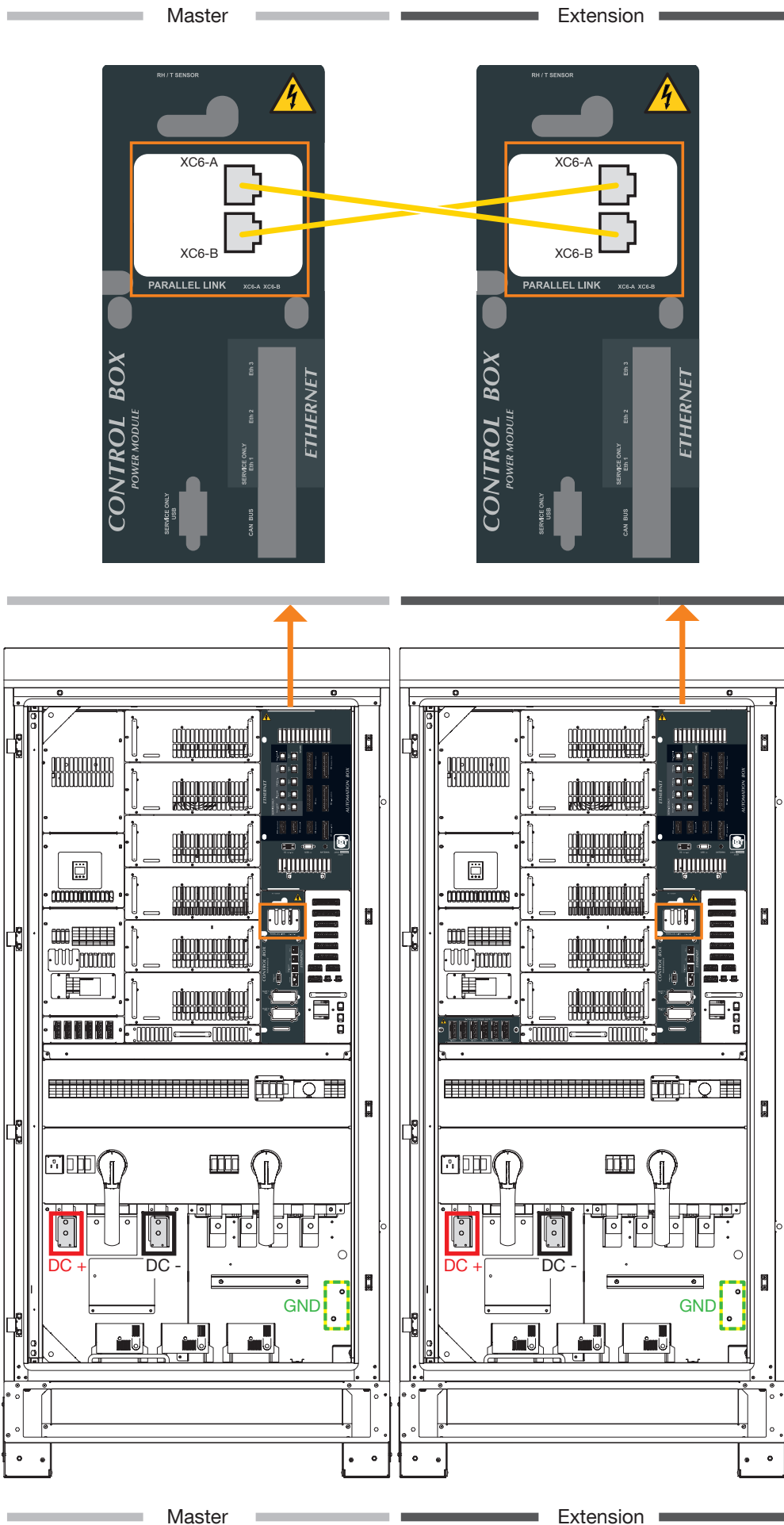


Battery communication and auxiliaries power supply connections are connected on the C-Cab Master (cf. fig. 22).

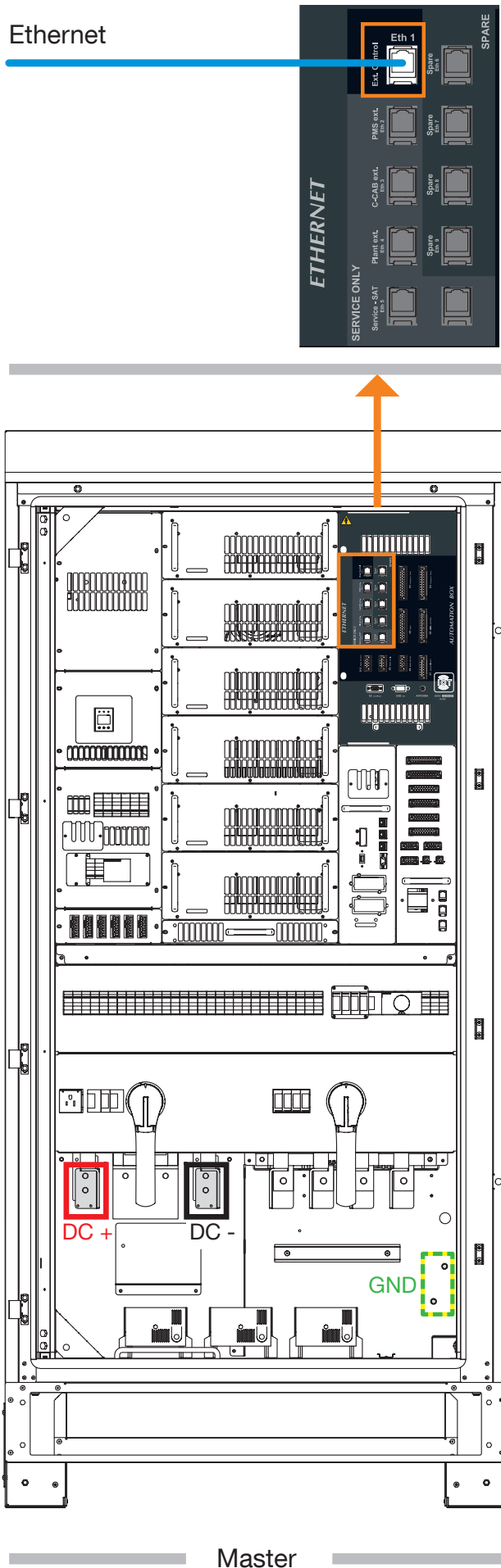
Some additional communication connections between both C-Cabs need to be added, as detailed below:



— C-Cab paralleling connection



Step 6: If your system is used with an EMS, proceed with the connection to the connector Eth1 of the automation box.



Then please communicate your IP address to the Socomec team.

Step 7: Snap the B-cab connection kits covers starting from left to right and screw them with M5 screws.

Use item 6, left cover part, for the battery at the left end – front line -, item 7, right cover part for the battery at the right end – back line - and item 4, cover part, for other batteries.

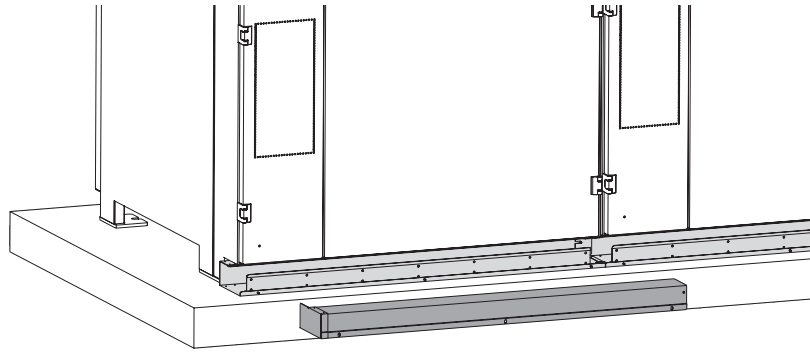
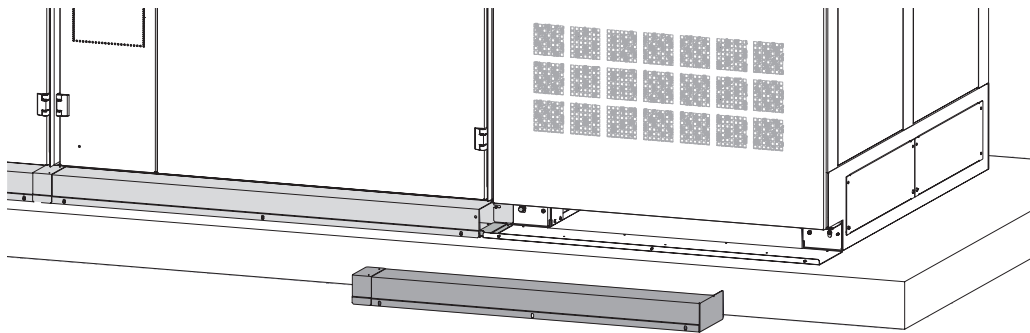


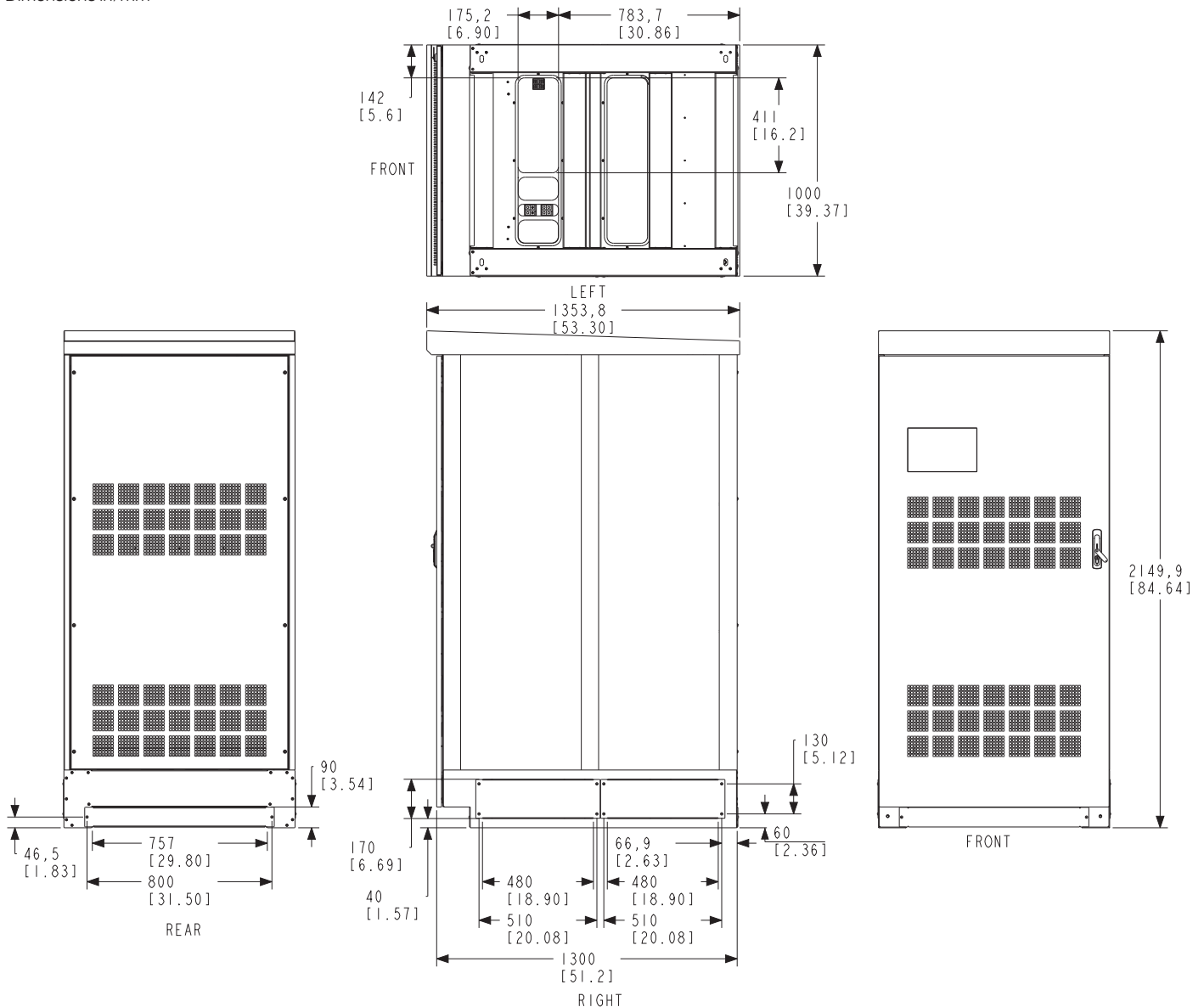
Figure 27 - Screwing of the covers

Step 8: Finish with the C-Cab connection kit cover, item 2, using M5 bolts and nuts, torque 6Nm.



2.5. AC connection

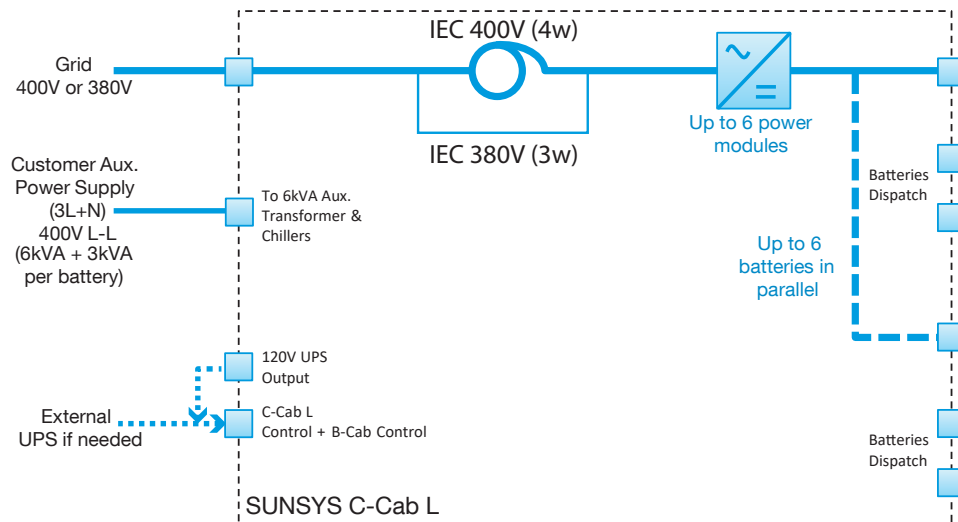
Dimensions in/mm



On the AC side of the connection between the C-Cab and the grid or microgrid you need three connections:

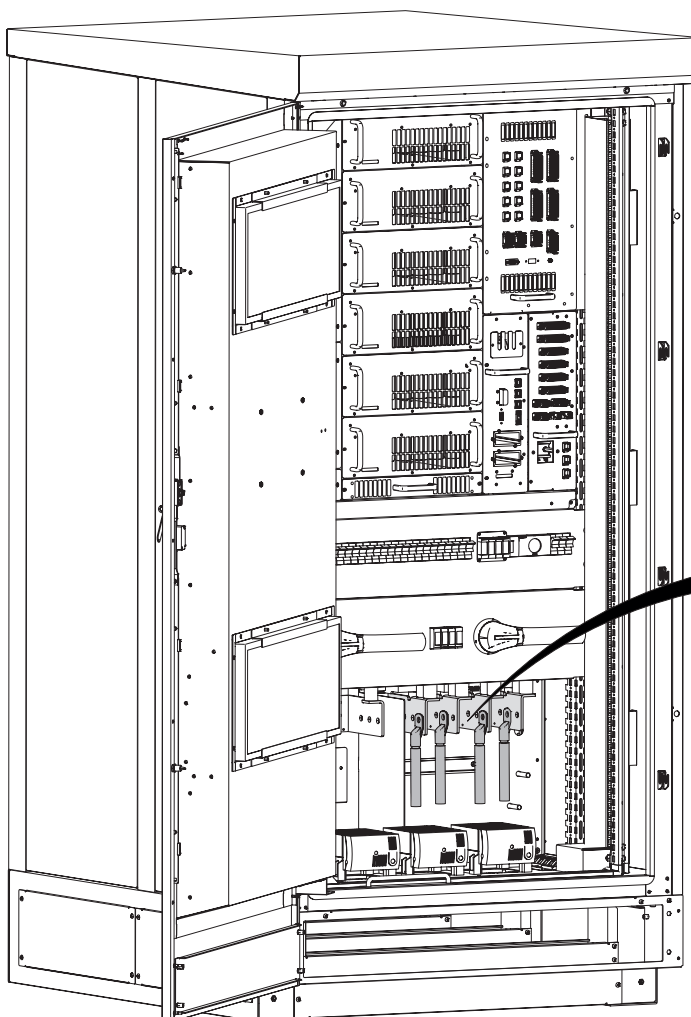
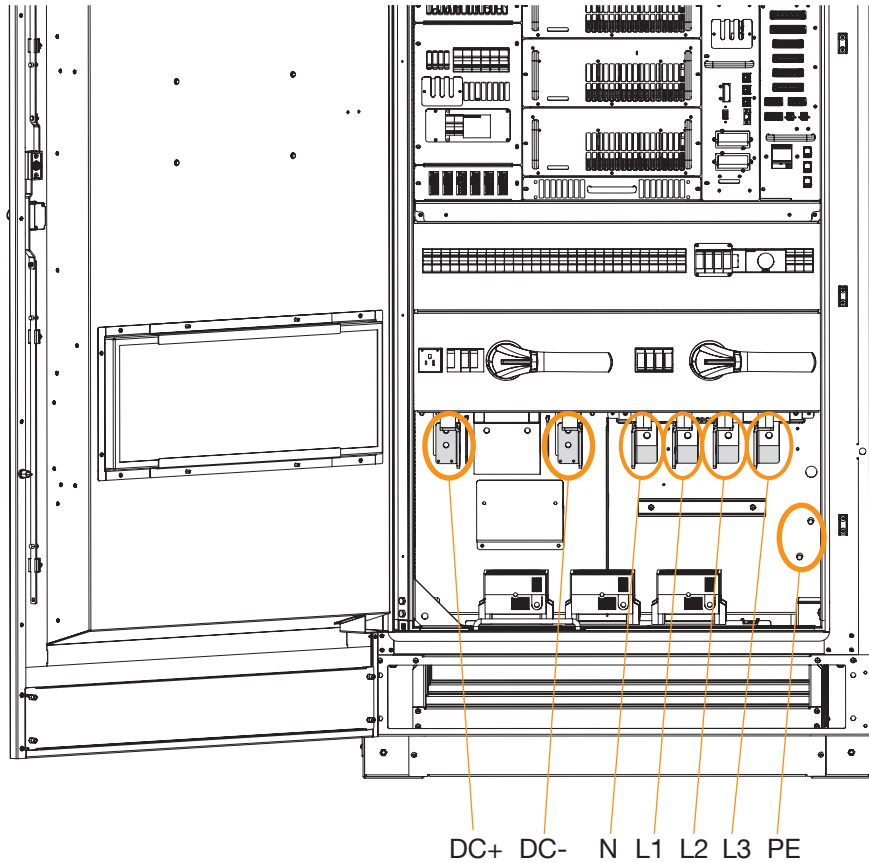
- The 400Vac 4wire connection, 380Vac 3wire connection.
- An auxiliary 400Vac L-L 3wire connection to enable the supply of the C-Cab & B-Cab auxiliaries.
- Grounding, at least half of one phase cross-section.

An optional additional connection for an external UPS is also possible. This information is given in the diagram below.

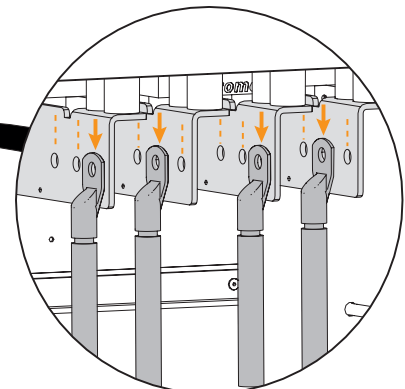


2.5.1. Connection of the 400 or 380Vac

Concerning the AC connection, there is enough space inside the C-Cab to connect up to $2 \times 185\text{mm}^2$ / $2 \times 350\text{MCM}$ on each pole. The lugs needed are M12.



For ease of connection, if possible - depending on the number of cables you are using - connect the phases in quincunx. As shown on the drawing.

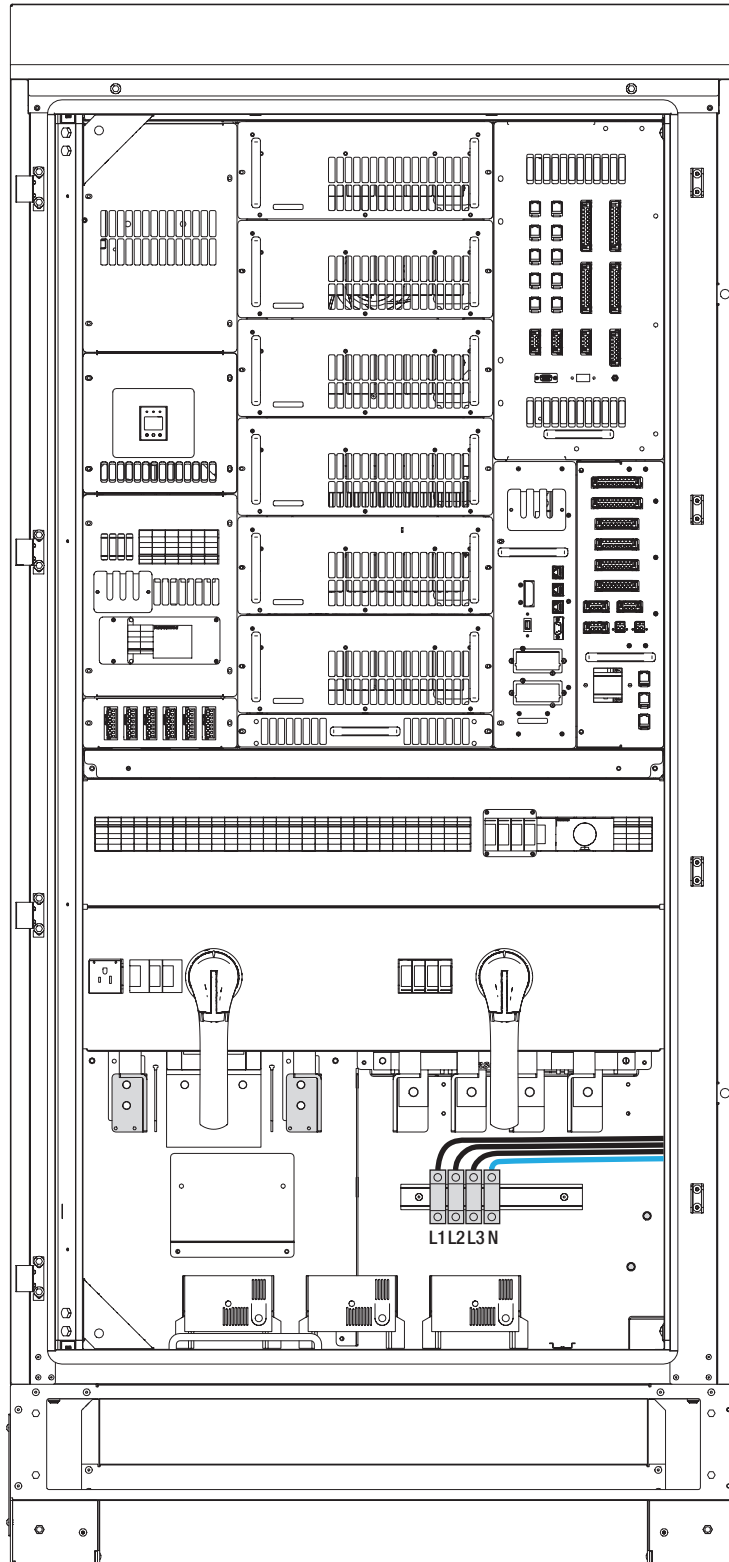


2.5.2. Connection of the 400Vac auxiliary supply

The terminals for main auxiliary supply are located in the bottom right side of the machine, as shown below.

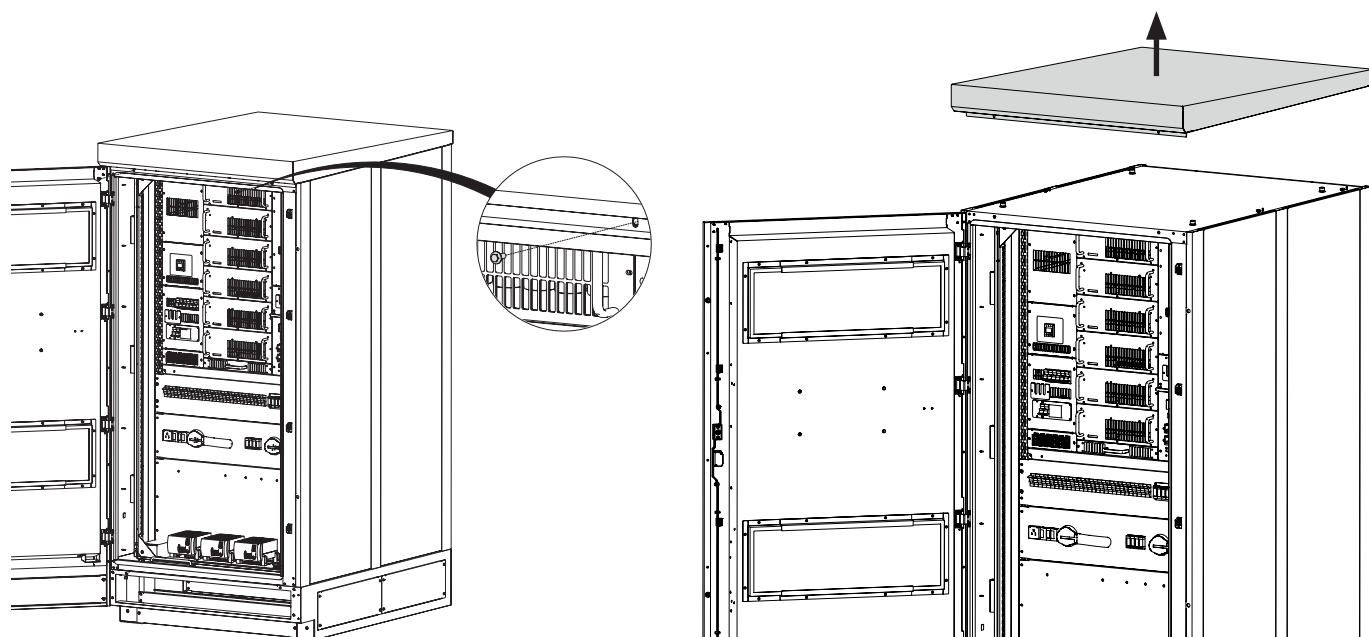
The maximum possible size of the cables is AWG 1 or 42.4mm².

For information, for 6 B-cabs the minimum size is AWG 2 or 33.6mm².

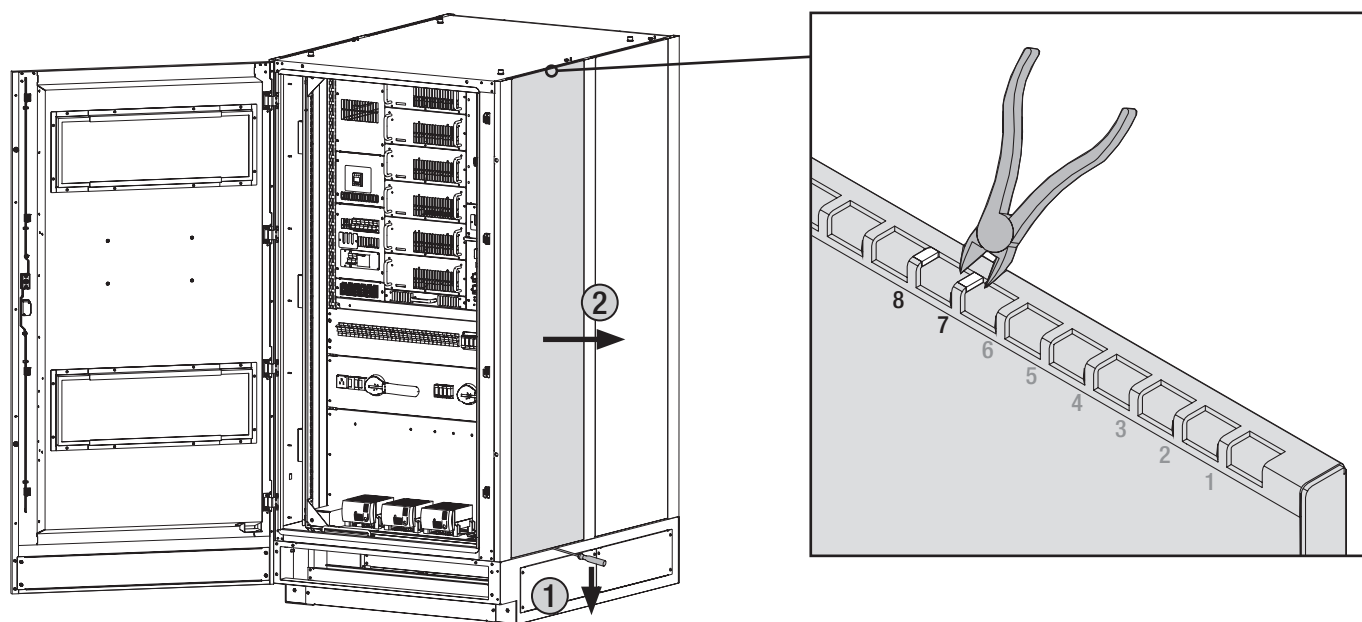


2.6. 4G Antenna Installation

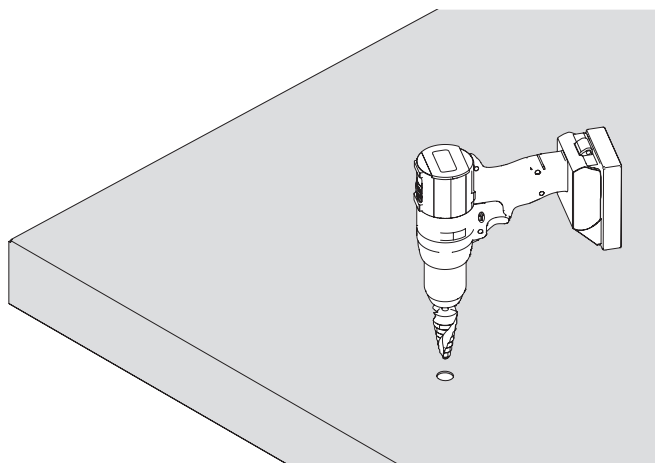
Step 1: Remove the roof of the C-Cab.



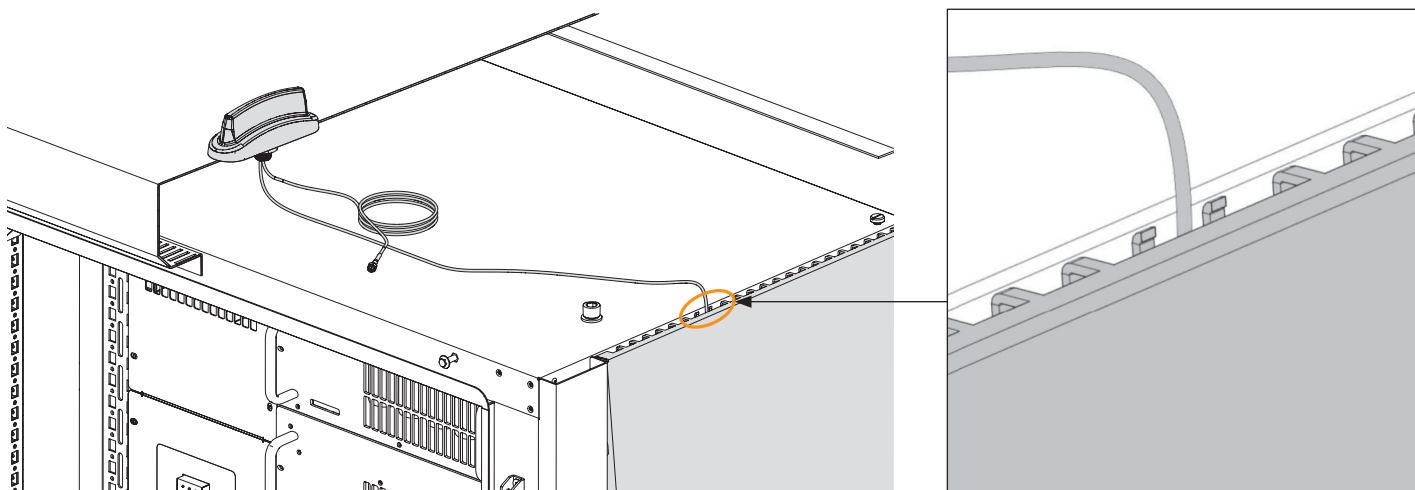
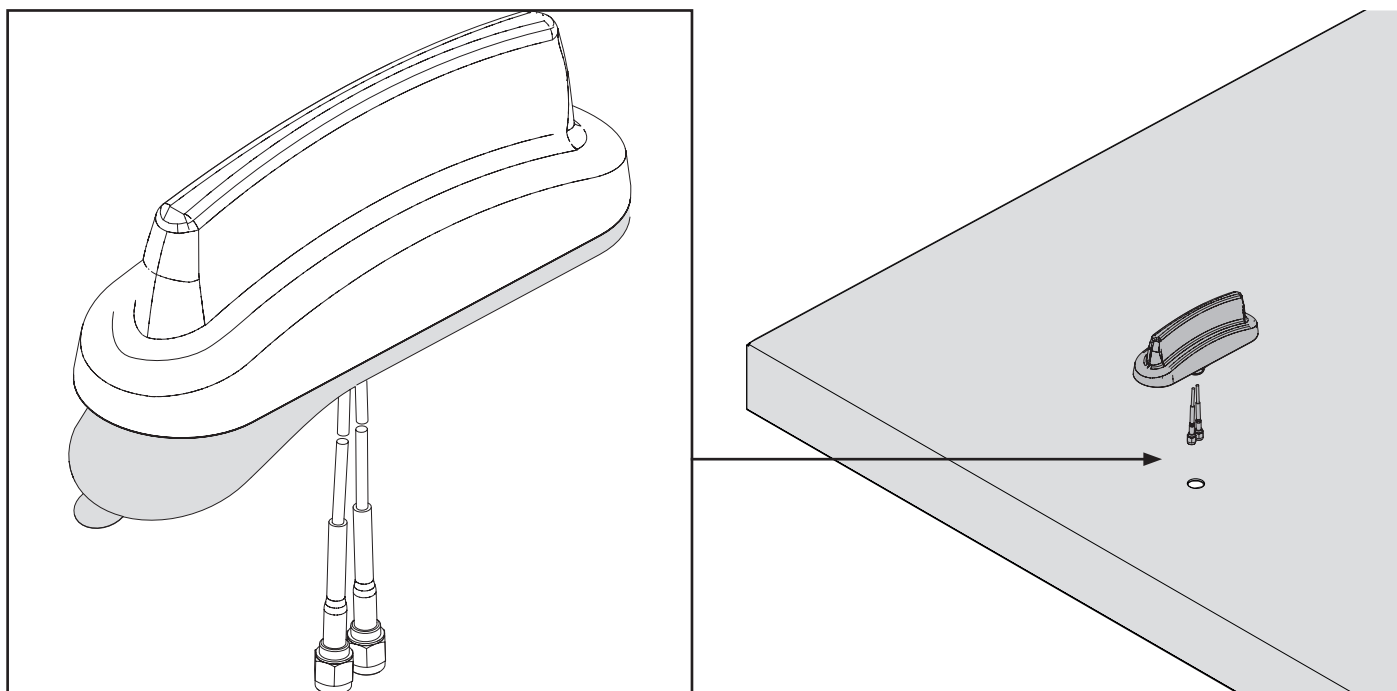
Step 2: Open the right side door and cut the 7th and 8th dividers.



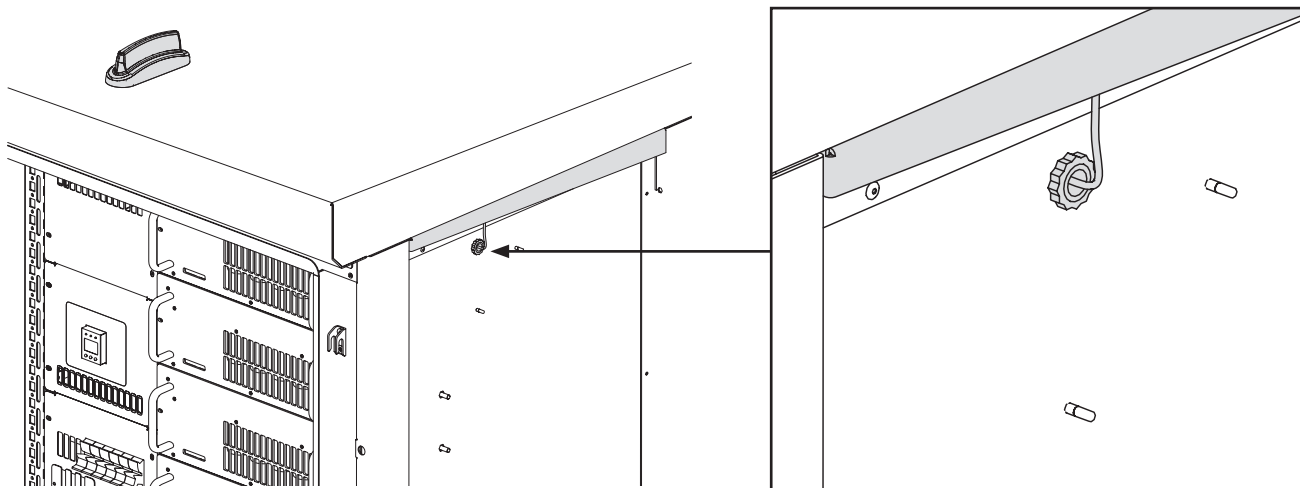
Step 3: Drill a hole in the front part of the roof - 19mm / 3/4in.



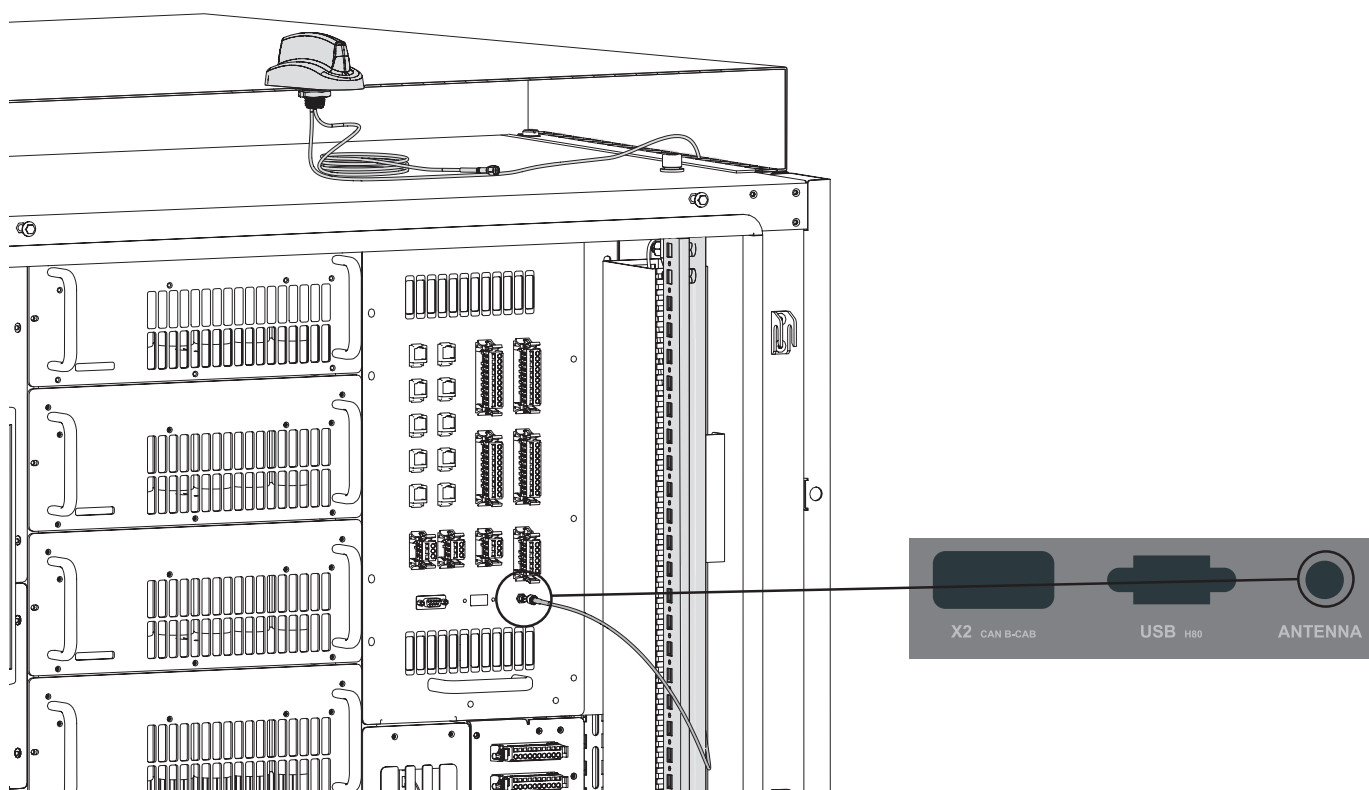
Step 4: Install the antenna and glue it by removing the sticker, pass the cable on the right side at 310mm from the end.



Step 5: Reinstall the cover by passing the cable inside the top hole.



Step 6: Connect the cable to the antenna input of the automation box.



2.7. Environmental conditions

SUNSYS HES L has been designed to be installed in the following environmental conditions.

External Operating Condition		
Temperature range	-20°C / +45°C without derating	
Relative Humidity (non-condensing)	4-100 %	
Max. altitude above sea level	1000 m without derating	
Max. snow load	< 250 kg/m ²	
Solar Radiation *	< 1090 W/m ²	IEC 60721
Saline environment **	> 2km from sea (Class C3)	ISO 9223
Polluted environment (dust)	Pollution degree 3 4S13	IEC 60664-1 IEC 60721-3-4:2019
Max. Seismic zone	Zone 4	UBC 1997

*According to the standard IEC 60721, SUNSYS HES L is designed to solar radiation up to 1090W/m². Above this level, a protection cover shall be installed on the cabinet to reduce solar radiation exposition.

**SUNSYS HES L is designed to be installed in a non-salt air site without any corrosion risk. If the implantation is less than 2km from the sea, please contact SOCOMEC for a specific version.

Please contact SOCOMEC to discuss a specific integration possibility for harsher environments.

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