INSTALLATION AND OPERATING MANUAL

EN

Energy Storage System

SUNSYS HES XXL

UL

socomec
Innovative Power Solutions

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1. INTRODUCTION

1.1. Glossary

For the purpose of this document, the following abbreviations are use:

AC:	Alternating Voltage/Current
B-Cab XXL:	Battery Cabinet
BESS:	Battery Energy Storage System
BMS:	Battery Management System
C-Cab XXL:	Conversion Cabinet
C-Trough:	Cable Trough
EMC:	Electro Magnetic Compatibility
EMS:	Energy Management System
ESS:	Energy Storage System
FSS:	Fire Suppression System
HMI:	Human Machine Interface
HVAC:	Heating Ventilation and Air Conditioning
IM:	Islanding Mode
IoT:	Internet of Things (internet-connected devices)
IP:	Internet Protocol
PCS:	Power Conversion System
LFP:	Lithium Iron Phosphate (LiFePo4)
NEC:	National Electric Code
RCD:	Residual Current Device
SOC:	State of Charge
SOH:	State of Health
SPD:	Surge Protection Device
THDI:	Total Harmonic Distortion of Current
THDV:	Total Harmonic Distortion of Voltage
TÜV:	Technischer Überwachungsverein (Certification Agency)
UL:	Underwriter Laboratory
UPS:	Uninterruptible Power System

1.2. Concerned products

This manual covers the SUNSYS HES XXL range.

SUNSYS HES XXL System is composed of an assembly of 3 types of cabinets:

C-Cab XXL

- Bidirectional power converter
- 500 kVA, 750 kVA, 1 MVA, 1.25MVA or 1.5 MVA / Cabinet
- Hybrid liquid / Air cooling system
- AC/DC Distribution and Protection

B-Cab XXL

- Lithium-ion battery
- LFP technology
- 407.4 kWh Nameplate / Rack at 0.5CP
- Liquid cooling thermal management
- Integrated Fire Safety System including Fire Detection and Suppression (smoke detector and heat sensor, aerosol canister, dry pipe and deflagration vent).
- Possible, up to 15 units in parallel per C-Cab XXL to reach 6.1 MWh.

M-Cab XXL

- Battery management system
- ESS control cabinet
- Devices for remote management
- Auxiliaries power supply
- PLC for automation functions (or connection to an external EMS)
- Battery data logging

SUNSYS HES XXL Configurations

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

1.3. Revision history

Rev A – March 2025

2. IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE INSTRUCTIONS- This manual contains important instructions for the XXL series product for the installation and maintenance of the product.

A potential **Shock and Injury Hazard** exists when working on or around electrical systems which could lead to serious injury or even death. Only qualified competent personnel who have been trained in and are familiar with the **Risk of Electric Shock** and **Plasma Arc Flash Hazards** may perform installation and maintenance on electrical systems. It is the sole **responsibility of the personnel** doing the work to be fully cognizant of all necessary safety regulations and procedures and **be familiar with the installation instructions detailed in this manual**.
Failure to follow safety instructions can result in damage to equipment, injury or death.

	DANGER! LIVE DEVICE! RISK OF ELECTRIC SHOCK: Basic electrical precautions must be followed by all personnel when working on electrical systems. Equipment damage, injury or death can occur as a result of failure to follow these instructions or by installation done by unqualified personnel.
	CAUTION! Any work carried out on the equipment must be performed by skilled, qualified technicians.
	CAUTION! Each power supply line must be provided with overcurrent protection according to the indication contained in the present manual.
	Before performing any installation or maintenance work: 1. Clearly identify the location of the work. 2. Ensure that all sources of power have been disconnected. 3. The C-Cab contains capacitors which require several minutes to discharge after removing power. Verify that system and component voltages are at or near 0V by measuring with a voltmeter. 4. All electrical installations must comply with the electrical standards applicable on-site.
	Before carrying out any operations read this user manual and its safety instructions carefully, in order to work under safe conditions. Keep this manual safe for future reference.
	If the Battery is not supplied by SOCOMEC, overcurrent protection for the battery has to be provided by the installer.
	DANGER! Failure to observe safety standards could result in fatal accidents or serious injury, and damage equipment or the environment.
	CAUTION! If the unit is found to be damaged externally or internally, or any of the accessories are damaged or missing, contact SOCOMEC. Do not operate the unit if it has suffered a violent mechanical shock of any kind.
	CAUTION! Install the unit in accordance with the minimum distances from near walls in order to guarantee sufficient ventilation and access to handling devices (see Environmental requirements chapter).
	CAUTION! Only use accessories recommended or sold by the manufacturer.
	CAUTION! The tightening torque for DC and AC terminals must be in accordance with the indication of the present manual.
	WARNING! The unit must operate within the ambient temperature range specified. Refer to relevant sections of this manual for limits and additional notes.

	NOTICE A hipot test has been performed at the factory and is not permitted to be performed in the field by the user.
	CAUTION! The inverter has air vents. Debris should not be allowed to fall into the venting, including metallic chips from drilling, weld splatter, etc. as it may result in damage to the C-Cab. Covering the vents is a good practice if there is a chance of debris falling. The covers MUST be removed prior to operation to provide adequate ventilation.

2.1. Symbols Used on the equipment labels and plates

The words «CAUTION», «WARNING» or «DANGER" are used for cautionary marking.

Symbols	Description
	General WARNING or CAUTION – Important safety information.
	Risk of Electric Shock and/or ARC Flash Hazard: Life threatening voltages may be present with the risk of ARC Flash in the event of an inadvertent short circuit.
	Risk of explosion! Avoid short circuits!
	The switch is ON
	The switch is OFF
	Waiting time before operating
	Protective earth terminal.
	Authorised personnel only.
	No smoking.
	Read the user instructions carefully. Read the user manual before performing any operations.
	Wear protective gloves.
	Wear safety shoes.
	Wear protective goggles.

Symbols	Description
	In the event of contact with the eyes, wash immediately with plenty of water and call a doctor. Call a doctor immediately in the event of accidents or illness.
	Do not dispose of in normal waste stream (symbol waste electrical and electronic equipment).

2.2. Important safety instructions for batteries

	WARNING! a battery can present a risk of electrical shock and burn from high short-circuit current. Observe proper precautions.
	WARNING! When replacing batteries use only batteries approved by Socomec. Do not connect the C-Cab to batteries that are not approved; this may cause serious damage to the equipment. For any further information, contact Socomec.
	WARNING! Proper disposal of batteries is required. Refer to your local codes for disposal requirements.
	WARNING! The characteristics of the batteries must be compatible with the ratings of the C-Cab XXL. Do not mix batteries. For any further information, contact Socomec.
	WARNING! Warning! Fire Resistance, no matter where the combustion source is from (outside or inside) is an hour.

2.3. Important Risks Associated With BESS

The primary risks associated with BESS systems. Battery Energy Storage Systems (BESS) are crucial for the future as they can optimize wind & solar generation, and enhance the grid's capacity to deal with surges in energy demand. However, there are several risks associated with BESS:

2.3.1. Hazardous Voltage

Hazardous Voltage

- High AC voltages at MV Switchgear, Isolation Transformers.
- High AC voltages at PCS input.
- High DC voltages, 1500 VDC at PCS output, 1500 VDC at Battery output terminals

Consequence

- Electric shock or Electrocution, Fire, Explosion

Avoidance

- Access should be restricted and only granted to individuals who are both qualified and authorized.
- The guards and barriers for the equipment should always be kept in their designated positions.
- The Personal Protective Equipment (PPE) used should be suitable for both the task at hand and the equipment being used.

2.3.2. Arc Flash Fault

An arc fault is a dangerous electrical problem that occurs when electrical current unintentionally flows through an unintended path, creating an electric arc. This arc generates high levels of heat, which can easily ignite surrounding materials, such as insulation, and could result in an electrical fire.

Arc Fault

- An arc fault occurs when there is a breakdown in insulation or an unintended contact between high-voltage conductors. This causes an electrical discharge to travel through the air gap between the conductors.

Consequence

- Arc fault creates an electrical explosion.
- An arc fault creates intense light and heat referred to as arc flash, that is produced during an electrical explosion.
- Pressure wave caused by the tremendous temperatures of the arc flash is known as arc blast.

Avoidance

- Access should be restricted and only granted to individuals who are both qualified and authorized.
- Restricted access.
- The guards and barriers for the equipment should always be kept in their designated positions.
- The Personal Protective Equipment (PPE) used should be suitable for both the task at hand and the equipment being used.

2.3.3. Arc Flash Hazard Boundary

The Arc Flash Hazard Boundary is a safety guideline used in electrical systems. It establishes the closest safe distance that one can be from conductors or circuit parts that are energized and could potentially cause an arc flash. This boundary is a key part of electrical safety protocols, as it helps to pinpoint areas that could be dangerous and ensures that workers are informed about these risks. This means that this boundary is designed to keep people at a safe distance from any parts of the system where an arc flash could occur, thereby reducing the risk of electrical accidents.

The boundary is calculated based on the incident energy that could be released during an arc flash, measured in calories per square centimeter (Cal/cm^2). The higher the incident energy, the greater the potential for injury and the larger the arc flash boundary see Figure 1.

The National Fire Protection Association (NFPA) recommends defining three boundaries to minimize risk of electrical injuries:

Arc Flash Boundary: This is the furthest boundary from the exposed equipment. It's the distance where a worker without appropriate Personal Protective Equipment (PPE) would receive second-degree burns. It's calculated to 1.2 calories/cm^2 of incident energy.

Limited Approach Boundary: This is the boundary closer to the energized equipment. Within this boundary, it is still possible to be exposed to a shock hazard. Appropriate PPE should be worn by qualified workers in this space.

Restricted Boundary: This is the area closest to the live, exposed equipment. In order to pass this boundary, you must be a qualified worker with the proper training and PPE.

These boundaries are crucial for ensuring safety when working with or around energized electrical equipment.

See Figure 1 for a pictorial view of the arc flash boundaries.

	WARNING! Reduce the risks, **do not work** on live equipment or live parts.

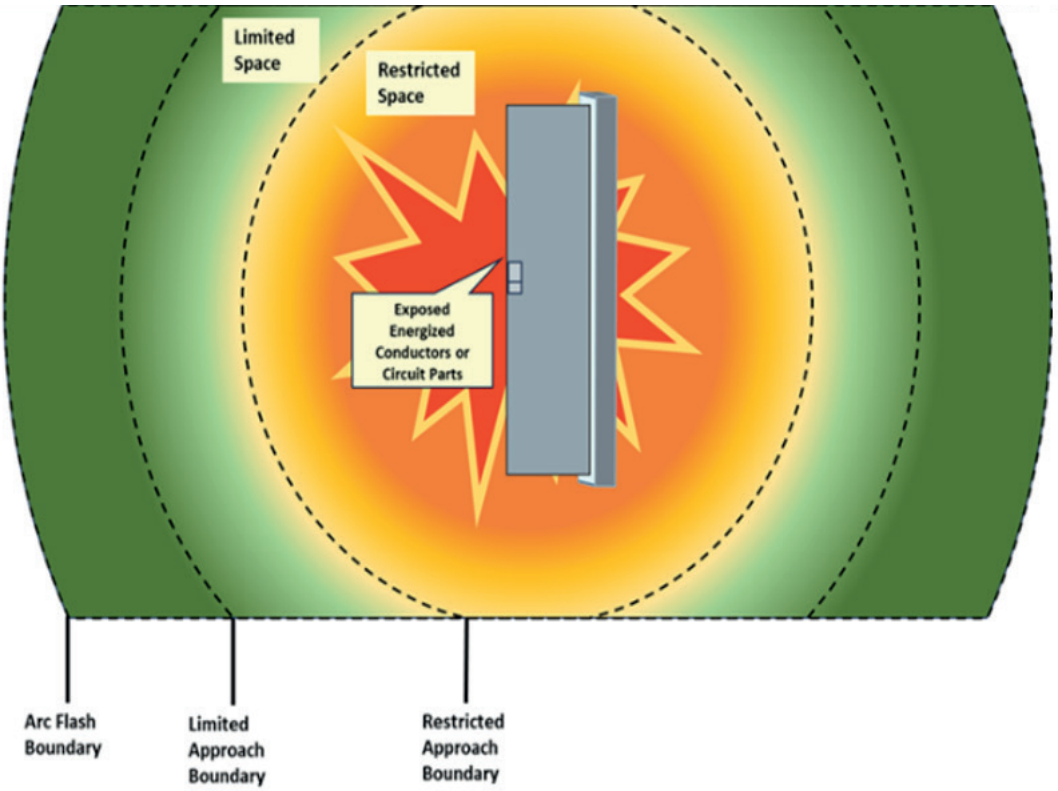


Figure 01. Arc Flash Hazard Boundary

2.4. Arc Flash

The diagram above Figure 1 illustrates the arc flash hazard boundary. This boundary indicates the potential for high energy development in the event of a fault. It's crucial to adhere to safety protocols when operating around electrical equipment. This includes turning off and applying a lockout to all power sources before working on the equipment.

Without the correct Personal Protective Equipment (PPE), you should not cross the restricted approach boundary. According to the National Fire Protection Association (NFPA) 70E standard, the arc flash boundary is estimated based on the incident energy level that could cause second-degree burns to personnel. The hazard boundary is then defined based on this estimation.

2.4.1. C-Cab AC Power Arc Flash

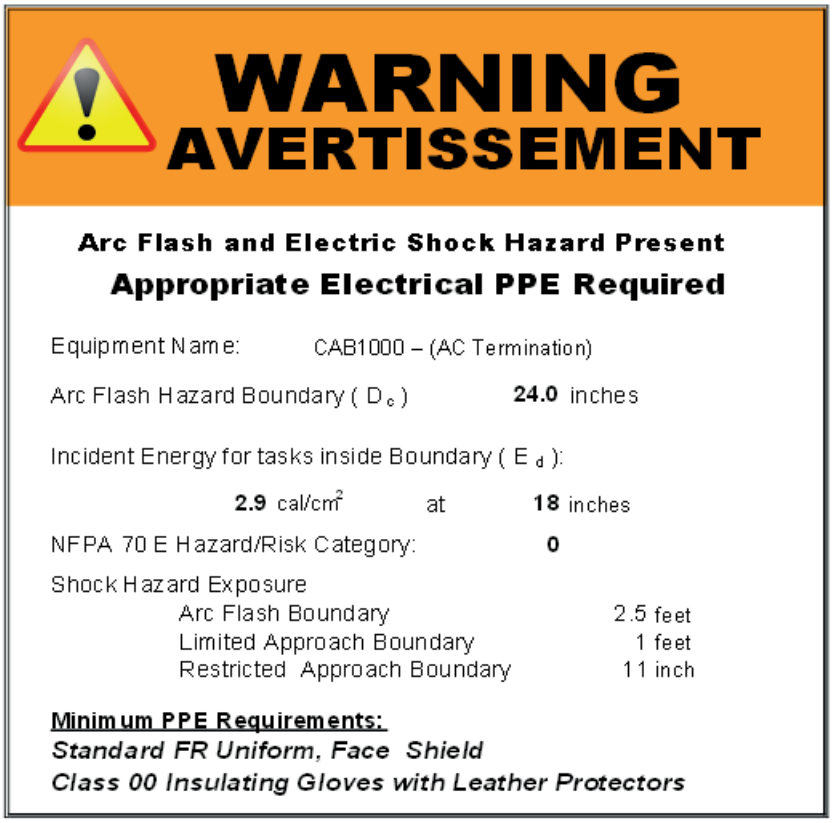


Figure 02. C-Cab XXL AC Arc Flash Warning

WARNING! Arc Flash
Only authorized, adequately trained Energy Storage personnel with proper Personal Protective Equipment (PPE) should access the system. Do not open or remove protective guards unless you are a qualified person.
Reduce the risks, **do not work** on live equipment or live parts.

2.4.2. M-Cab XXL AC Power Arc Flash

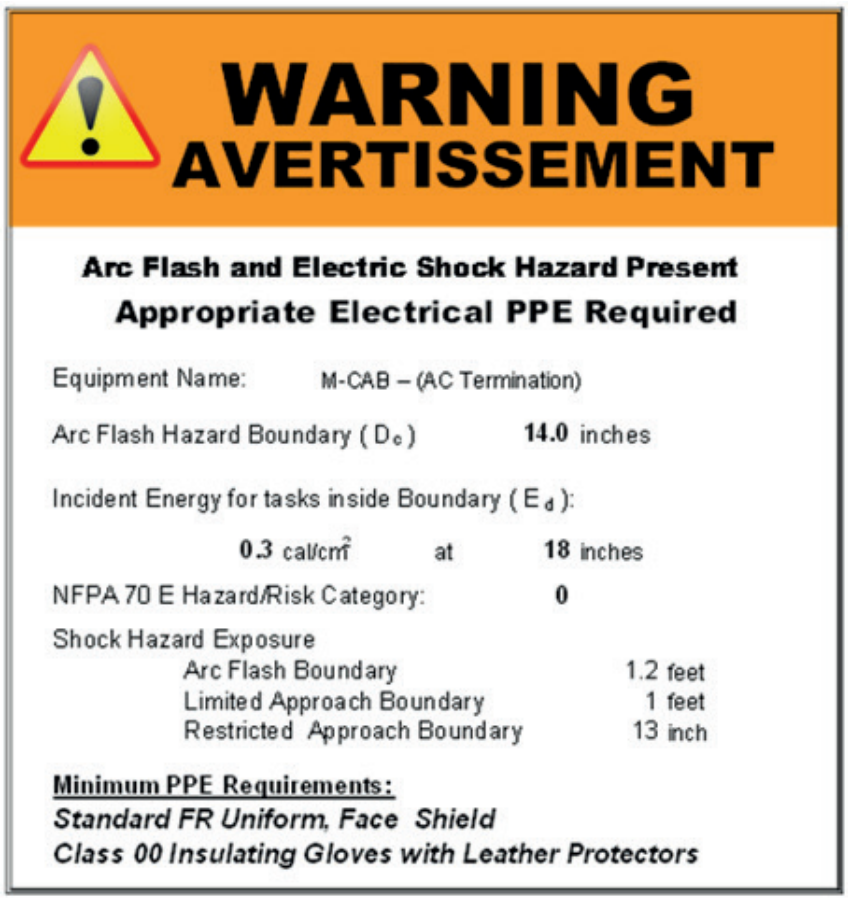


Figure 03. C-Cab XXL AC Arc Flash Warning

	WARNING! Arc Flash Only authorized, adequately trained Energy Storage personnel with proper Personal Protective Equipment (PPE) should access the system. Do not open or remove protective guards unless you are a qualified person. Reduce the risks, **do not work** on live equipment or live parts.

2.4.3. DC Power Arc Flash & B-Cabs Grouping

The amount of incident energy produced by a DC arc flash is directly influenced by the number of battery cabinets, or B-Cabs, integrated into the system. As the number of B-Cabs increases, so does the potential for a more intense arc flash. This relationship is crucial in understanding the safety measures needed when configuring the system.

The provided table illustrates this relationship in detail. It quantifies the arc flash energy associated with various quantities of connected B-Cabs, offering a clear view of how system configuration impacts arc flash intensity. By studying this table, one can make informed decisions about system configuration and safety protocols to minimize the risk and impact of DC arc flash incidents.

Table 1 - DC Arc Flash & B-Cabs

Number of B-Cab XXLs	Arc Flash incident Energy [Cal/cm²]	Arc Flash Protection Boundary [mm/inch]	PPE Category Recommended
1	1.21	309/12.2	1
4	4.82	618/24.2	1
8	9.65	874/34.5	2
10	12.06	977/38.5	3
15	18.09	1197/48.0	3

Ensure that you are equipped with the appropriate level of protective gear suitable for the task at hand. This includes not only physical protection but also mental preparedness. Thoroughly plan the task, anticipate all possible scenarios, and be prepared to respond effectively.

It's crucial to avoid working on a system while it's live or operational. This is a fundamental safety rule to prevent exposure to dangerous levels of energy. However, in situations where working on a live system is unavoidable, extra caution is necessary, especially when in close proximity to live components. In such cases, the energy exposure can surpass the listed arc flash boundary, posing a significant risk.

Understanding these guidelines and adhering to them can significantly reduce the risk.

Do not work on a live system.

Without the correct Personal Protective Equipment (PPE), you should not cross the restricted approach boundary. According to the National Fire Protection Association (NFPA) 70E standard, the arc flash boundary is estimated based on the incident energy level that could cause second-degree burns to personnel. The hazard boundary is then defined based on this estimation.

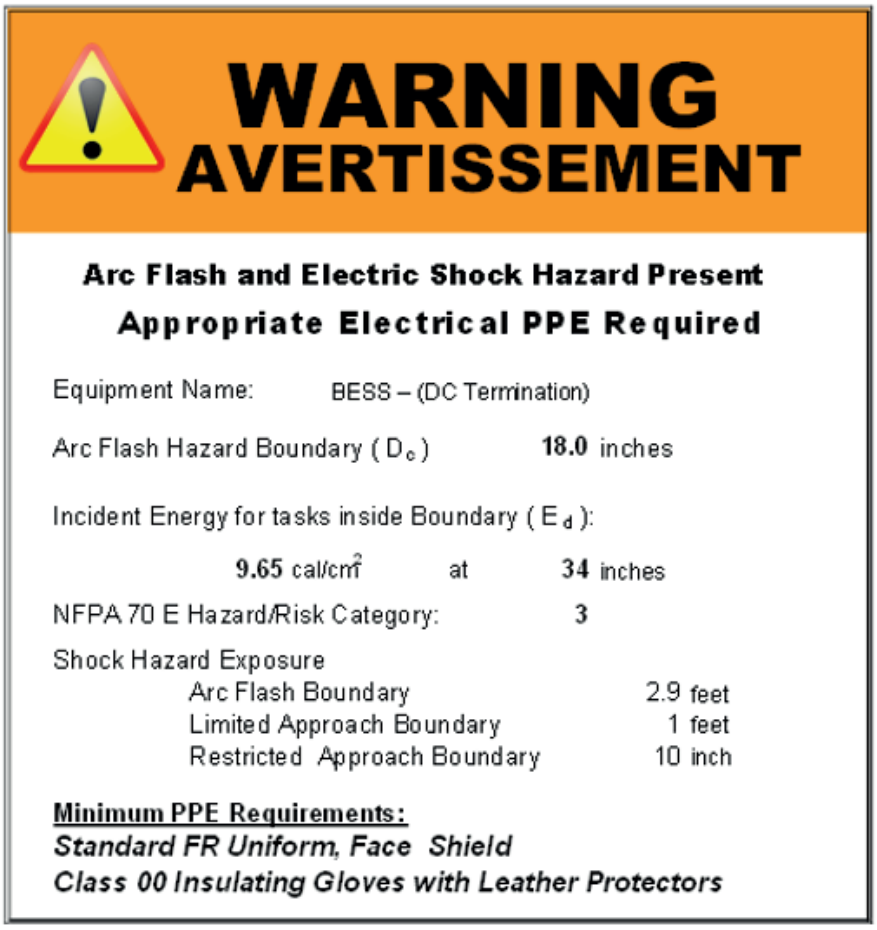


Figure 04. DC Arc Flash Warning

	WARNING! Arc Flash Only authorized, adequately trained Energy Storage personnel with proper Personal Protective Equipment (PPE) should access the system. Do not open or remove protective guards unless you are a qualified person. Reduce the risks, **do not work** on live equipment or live parts.

2.5. Personal Protective Equipment (PPE)

The individual carrying out a task is accountable for that task. If any tasks are being performed that are deemed prohibitive, at the very least, Personal Protective Equipment (PPE) of Category 1 should be utilized. For any task that needs to be done, the authorized personnel should conduct a risk assessment and choose the suitable level of PPE required.

PPE CATEGORY 1	PPE CATEGORY 2	PPE CATEGORY 3	PPE CATEGORY 4
Minimum Arc Rating of 4 cal/cm²	Minimum Arc Rating of 8 cal/cm²	Minimum Arc Rating of 25 cal/cm²	Minimum Arc Rating of 40 cal/cm²
Arc Rated Clothing: • AR long-sleeve shirt and pants, or AR coverall • AR face shield, or AR flash suit hood • AR jacket, parka, rainwear, or hard hat liner (as needed)	**Arc Rated Clothing:** • AR long-sleeve shirt and pants, or AR coverall • AR flash suit hood, or AR face shield and AR balaclava • AR jacket, parka, rainwear, or hard hat liner (as needed)	**Arc Rated Clothing:** • As required: AR long-sleeve shirt, AR pants, AR coverall, AR flash suit jacket, and/or AR flash suit pants • AR flash suit hood • AR gloves • AR jacket, parka, rainwear, or hard hat liner (as needed)	**Arc Rated Clothing:** • As required: AR long-sleeve shirt, AR pants, AR coverall, AR flash suit jacket, and/or AR flash suit pants • AR flash suit hood • AR gloves • AR jacket, parka, rainwear, or hard hat liner (as needed)
			
Protective Equipment: • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Heavy-duty leather gloves • Leather footwear (as needed)	**Protective Equipment:** • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Heavy-duty leather gloves • Leather footwear	**Protective Equipment:** • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Leather footwear	**Protective Equipment:** • Hard hat • Safety glasses or safety goggles • Hearing protection (with inserts) • Leather footwear

Figure 05. PPE Categories and Protection Ratings

2.5.1. Limits of Use for this Equipment

⚠	This equipment is rated for permanent connection to an electrical low voltage power supply according to the ratings reported in the present manual.
⚠	Devices and connections to the ancillary inputs and outputs (other than to external power) have specific limits with regard to voltages and isolation requirement; refer to relevant sections of this manual for limits and additional note.
⚠	Any use other than the specified purpose will be considered improper. The manufacturer/supplier shall not be held responsible for damage resulting from this. Risk and responsibility lie with the system manager.

	Utility interconnection may require approval from the authority having jurisdiction in the local area.

2.6. Electrical Installation Guidelines

1. Size the wire appropriately according to the NEC and use approved lugs appropriately sized for the wires. Bolt holes provided are ½".
2. The maximum normal charge voltage of the lithium battery cabinet is 1500 VDC.
3. The maximum operating ambient temperature of the system is +55 °C.
4. The grounding (PE) terminal in the equipment identified with this symbol must be connected to the facility ground with a suitably sized grounding cable in performance with the local electrical codes.
5. Please refer to the table below and section "8.2.2. Assigning Modbus Addresses", page 152 for information on field-wiring terminals or leads:

Termination markings:

Temperature rating of the mains connection wire	Copper conductors	Aluminum conductors or copper-clad conductors
90°C	Use 90°C copper wire sized for rated current per prevailing electric codes	Use 90°C wire either copper or aluminum sized for rated current per prevailing electric codes

6. The system requires an external overcurrent protection device and should be selected considering the rating of the system.
7. This equipment is intended to be connected to a supply rated to 1.5MVA maximum. For cabling details, refer to Section "7.2.1. C-Cab XXL AC Power Electrical Connections", page 91, Table 16 & Table 17.

2.7. Cybersecurity recommendations and best practices

Like any device connected to an Ethernet network, SUNSYS HES XXL system must be protected against any risk of cyber-attack or loss/destruction of data.

SUNSYS HES XXL provides cybersecurity features to prevent these attacks and help users implement and ensure the most robust IT protection possible. The following paragraphs set out some recommendations. Check that they are part of your company's security policy:

- Awareness of security policy: Users of SUNSYS HES XXL must be made aware of appropriate IT security practices (information and compliance with company security policy, management of authentication procedures, reliability of passwords, online session management, phishing risks, etc…) and be duly trained.
- Network security: The architecture of the computer system must make it possible to preserve resources, by segmenting the network according to the degree of sensitivity and by using different protection devices (firewall, demilitarized zone, VLAN, network antivirus, etc...).

	Contribution of SUNSYS HES XXL to cybersecurity: Interfaces must be accessed using secure versions of standard communication protocols: - FTPS: secure data export - HTTPS: secure browsing on the web server

- Device security: Security depends on the network environment, but also on user behavior. In terms of environment, it is strongly recommended to apply basic protection measures (filtering of authorized stations by MAC address, opening of service ports, choice of authorized applications, etc...). Greater caution should be exercised when handling mobile media (external hard drive, USB key, wireless communication equipment, etc...). Finally, the energy storage system must be protected by controlling and limiting physical access to cabinets that house electronic equipment.

- Data security: Data security covers several aspects, in particular the confidentiality, integrity, authenticity and availability of data. Particular care should be taken with regard to data security and archiving procedures on backup devices, both internal and external to the company.

	Contribution of SUNSYS HES XXL energy storage system to cybersecurity: It is possible to export data, such as energy indexes, load curves and historical measurements, manually or automatically, for backup purposes. Confidentiality is guaranteed by AES 256-bit encryption (AES 256) for personal data. This means that it would take 2^{256} combinations to decipher the encryption key.

- Access and authentication management: Managing access to resources and data is an essential aspect of the IT systems security policy. Each user must have an account and access rights corresponding to their profile.

	SUNSYS HES XXL access: From the web interface, the user has the possibility to reset the alarms and to change the configuration of the local EMS. SUNSYS HES XXL control is carried out in Modbus TCP. Therefore it is highly recommended to limit the hosts allowed to access the system. These access restrictions can be implemented by: - The implementation of firewall rules at the level of the client Ethernet network by limiting the IP addresses or MAC addresses to access the Web interface of the storage system. - When commissioning the energy storage system, Socomec technicians configure it to limit access in accordance with the information provided by the customer.

3. OVERVIEW

The information in this manual is provided to aid in the installation, operation, and maintenance of the SUNSYS HES XXL system which consists of a C-Cab XXL Power Conversion System (PCS), M-Cab XXL Master Cabinet (PMS) and B-Cab XXLs Battey Cabinets. Instructions related to the battery installation are intended as to supplement the battery manufacturer with additional information regarding battery connections and system installation details. It is important to review all the relevant portions of this manual before installing and operating this equipment. To ensure a smooth installation and trouble-free operation, please carefully read, comprehend, and adhere to the outlined procedures.

3.1. General description

The SUNSYS HES XXL represents a comprehensive, AC-connected energy storage system. Its versatility extends to various applications, including enhancing renewable energy production, grid stabilization, energy flow management, asset optimization, and revenue generation. By integrating this system, users gain enhanced control, efficiency, and reliability within the electric grid.

Additionally, the system serves a crucial role in backup power provision during grid failures or power quality disturbances. To fulfil this function, we offer the Island Mode version of the system.

The SUNSYS HES XXL system consists of three primary cabinets: the C-Cab XXL (AC/DC bidirectional converter, depicted in Figure 6), the Battery cabinets (B-Cab XXLS, shown in Figure 8), and the Master cabinet (M-Cab XXL, illustrated in Figure 11 to Figure 12). To link all these components together there is the option of the C-Trough (cable trough) that will efficiently connect the B-Cab XXLs to C-Cab XXL, and M-Cab XXL as an integrated package. These units are specifically designed for outdoor operation, simplifying installation and minimizing the impact on facility cooling and ventilation systems.

The system's unique feature lies in its use of liquid cooling loops for the batteries. By reducing airflow volume within the cabinets, it achieves precise internal environmental control using filtered ambient air. The battery cabinets employ an active chiller to tightly regulate temperature, optimizing battery lifespan and performance.

For the C-Cab XXL, power electronics are liquid-cooled, protecting circuit boards and electronics within a sealed, insulated compartment. Other components utilize air cooling via a salt-fog arresting E12 HEPA filter.

The M-Cab XXL incorporates proper air filtering and an HVAC system to maintain controlled internal ambient conditions. Additionally, active cabinet heating mitigates low temperatures and humidity-related condensation.

The C-Trough XXL allows for efficient connections of the B-Cab XXLs to the rest of the components. Also allows easy configuration options of In-Line or Back-to-Back configurations of the battery cabinet connections.

The overall power flow is controlled and regulated by a Power Management System (PMS), which is integrated within the M-Cab XXL.

Let's look at the individual components that have been described in the general description.

3.1.1. C-Cab XXL

The layout of the C-Cab XXL and main power connections. Notice the layout of the connection terminal inside the cabinet.

Figure 06. C-Cab XXL

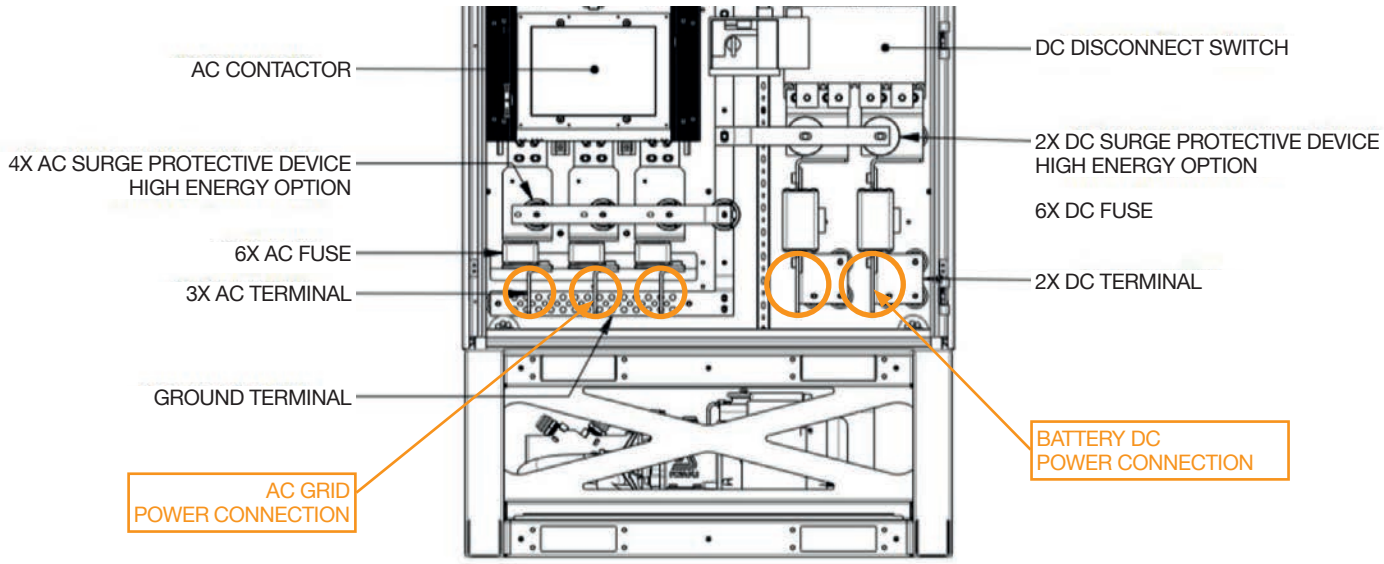


Figure 07. C-Cab XXL Internal AC and DC connections

3.1.2. B-Cab XXL

Figure 08. B-Cab XXL

B-Cab XXL Layout showing the internal components and connections.

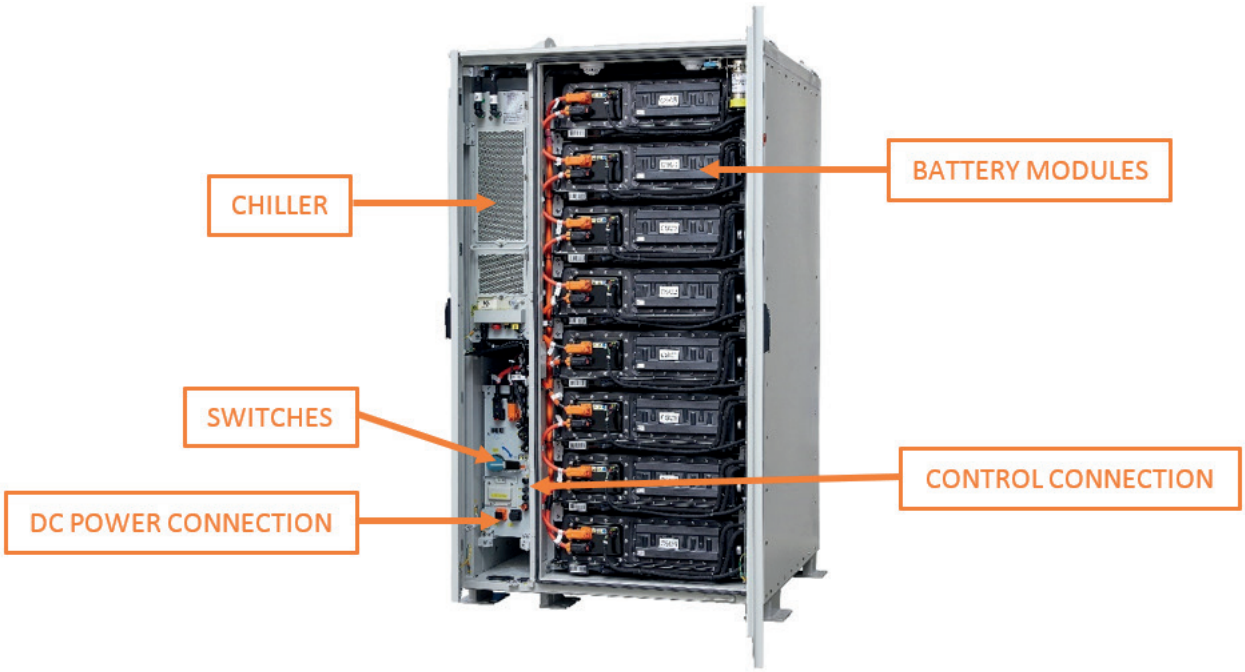


Figure 09. B-Cab XXL Internal shown

3.1.3. M-Cab XXL

Layout of the components for the M-Cab XXL

Figure 10. M-Cab XXL

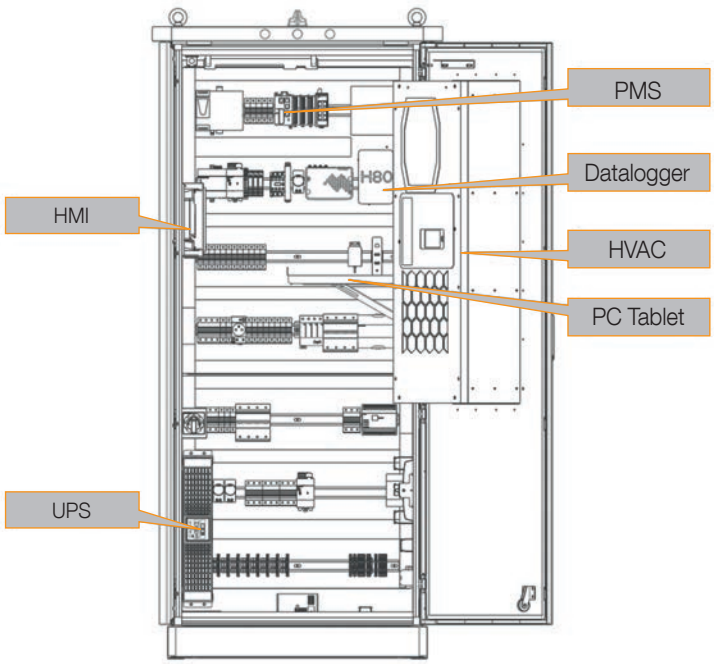


Figure 11. M-Cab XXL Front, internal components shown

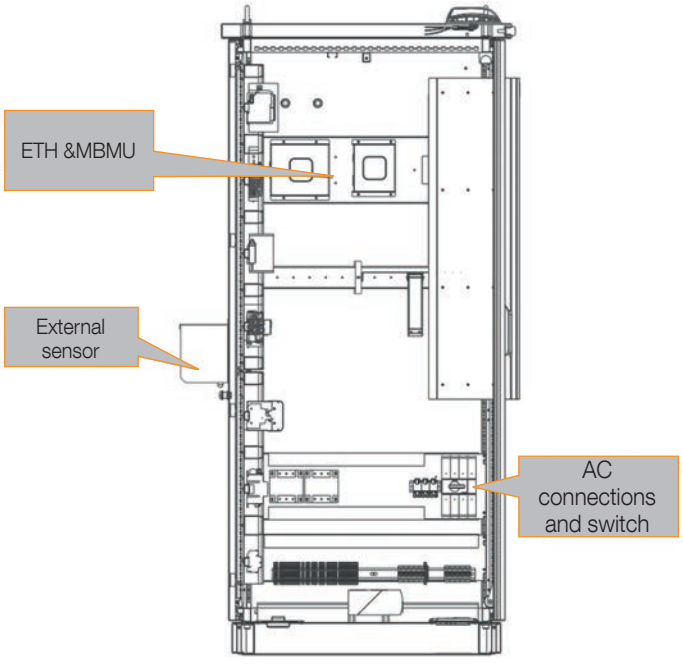


Figure 12. M-Cab XXL Side Section View

3.1.4. C-Trough

C-Trough configuration and layout displaying the different cabling paths.

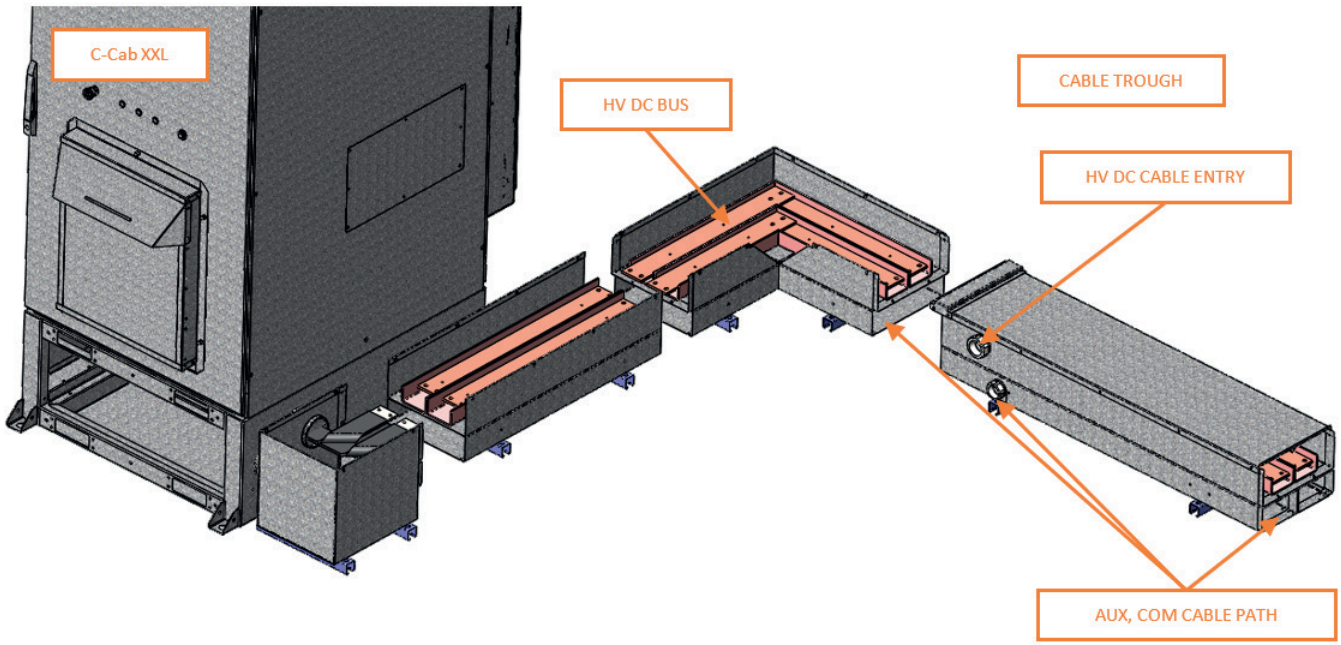


Figure 13. Cable Trough, Showing the Different Cable Paths

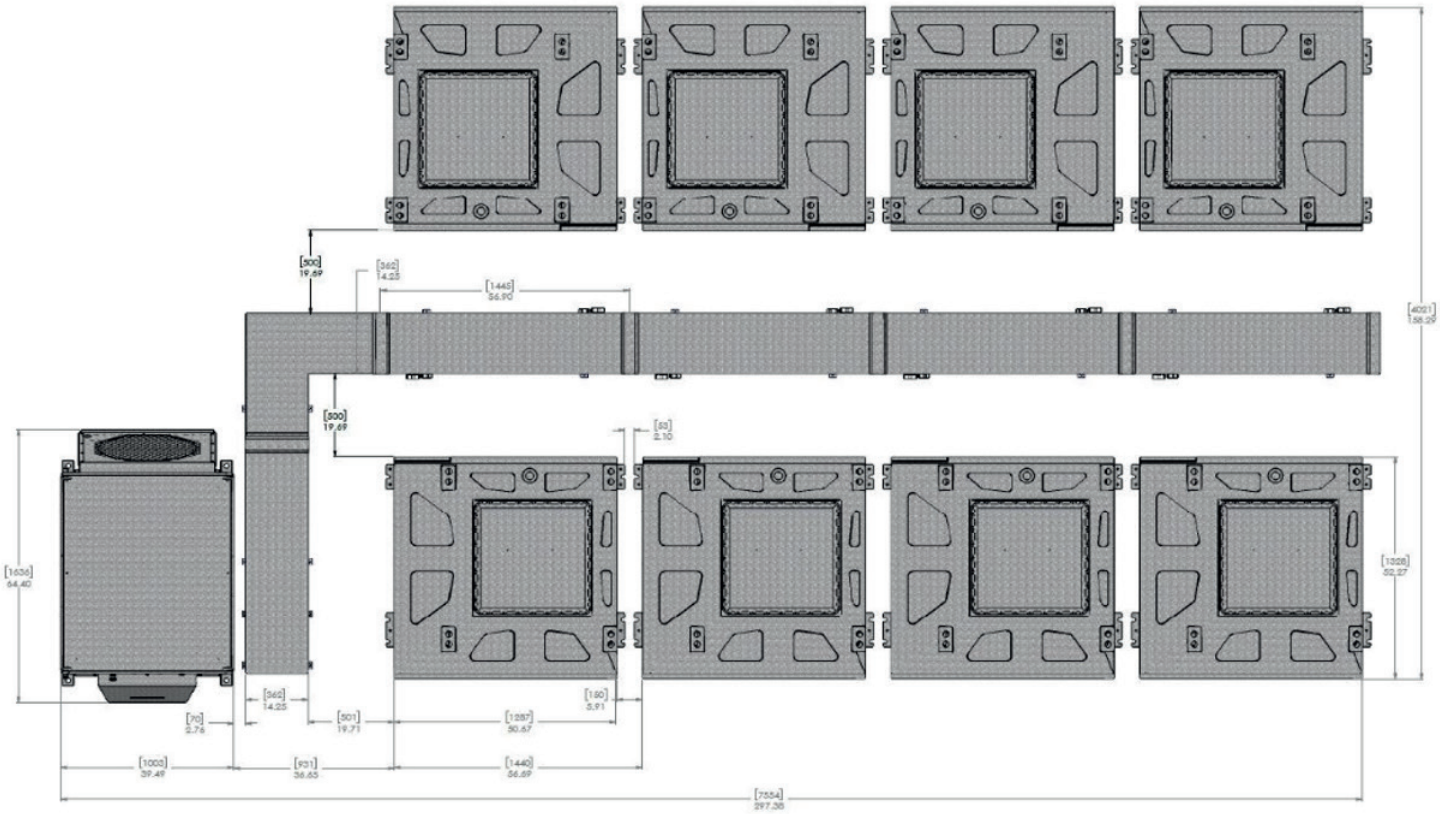


Figure 14. BESS Assembly top view. In-Line or Back-to-Back Possible.

3.1.5. Model Configurations

The SUNSYS HES XXL system can be customized based on your needs. You can choose from various options for storage capacity and cabinet design when you place your order. The final selection is made by the responsible engineer.

The type of outdoor cabinet configuration available is:

1. M-Cab XXL + C-Cab XXL + C-Trough (Cable Trough) + B-CABs XXL

The capacity of the SUNSYS HES XXL system for storing and releasing energy is determined by the total number of battery cabinets (B-Cab XXL) that are connected in parallel. Each battery cabinet contains eight liquid-cooled LFP battery modules, which can store and release up to 407 kWh of energy.

A single C-Cab XXL is designed to manage a minimum of 4 B-Cab XXLs, providing a total capacity of 1629 kWh of energy for 3 hours at 500 kVA, and up to a maximum of 15 battery cabinets, providing a capacity of up to 6110 kWh of energy for 3.8 hours at 1500 kVA.

Furthermore, the SUNSYS HES XXL system can be connected in parallel with up to 4 units on the AC side, which significantly increases the overall capacity of the system.

The Table 3 below lists all the available configurations of the SUNSYS HES XXL system based on storage capacity:

# of B-Cab XXL		4	5	6	7	8	9	10	11	12	13	14	15
Energy Cap. (kWh)		1629	2036	2444	2851	3258	3666	4073	4480	4888	5295	5702	6110
# of C-Cab XXL	Power (kVA)												
1	500	3.0	2.8	4.5									
1	750	2	2.5	3	3.5	4.1							
1	1000		2	2.3	2.6	3	3.4	3.8	4.2				
1	1250			2	2.1	2.4	2.7	3	3.3	3.6	3.9	4.3	
1	1500				2	2	2.3	2.5	2.8	3	3.3	3.5	3.8

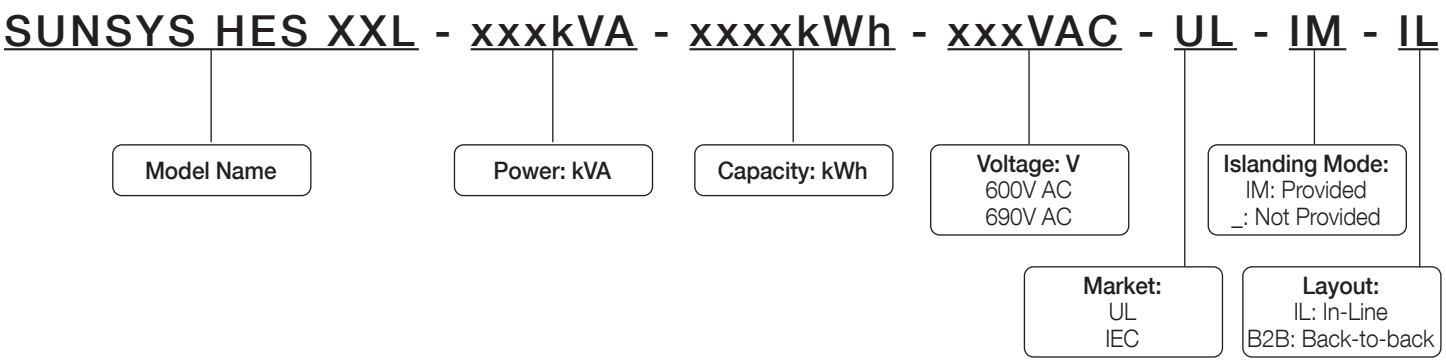


Figure 15. SUNSYS HES XXL Model Configurations

3.1.6. C-Cab XXL Options

Each C-Cab XXL can have different options installed, allowing a very high flexibility of setup to satisfy the user's requirements.

In the table below, you'll find a list of all the optional components that can be installed inside the unit. Please note that installation must be completed at the factory prior to delivery.

Option	Description
Separate UPS input	Requires external 208-240 VAC UPS Backed Supply for control power.
UPS Operation	Requires Remote Sense Board.
Reactive power capability	Reactive power compensation circuit with batteries, requires AC pre-charge.
Statcom	Reactive power compensation circuit without batteries, requires AC pre-charge.
Soft parallel connection	Designed to be connected in a soft parallel configuration; AC side connected together, DC side galvanically separated from each other.
Hard parallel connection	designed to be connected in a hard parallel configuration, AC sides and DC sides connected together.
Extended reactive power capability	Increasing the reactive power capability of the PCS.
Busbar interface for AC connection	AC busbar for the connection of up to 4 C-Cab XXLs with C2 or C5 coating.
Auxiliary contact for fuses	- DC fuses - AC fuses
Surge Protection Device	- High Energy AC SPD - High Energy DC SPD
Coating	C5M degree of protection
Low Temperature	Package for arctic -40°C (-40°F) temperature
Ground Fault Detection	- Ground fault detector - Ground fault fuse

3.2. Topology

The figure below Figure 16, shows a high-level AC/DC bidirectional drawing of the C-Cab XXL. Terminal L1, L2, and L3 connected to customer provided AC protection device. Terminal DC+, DC- connected to battery cabinets (B-Cab XXL).

Other terminals provide interface options.

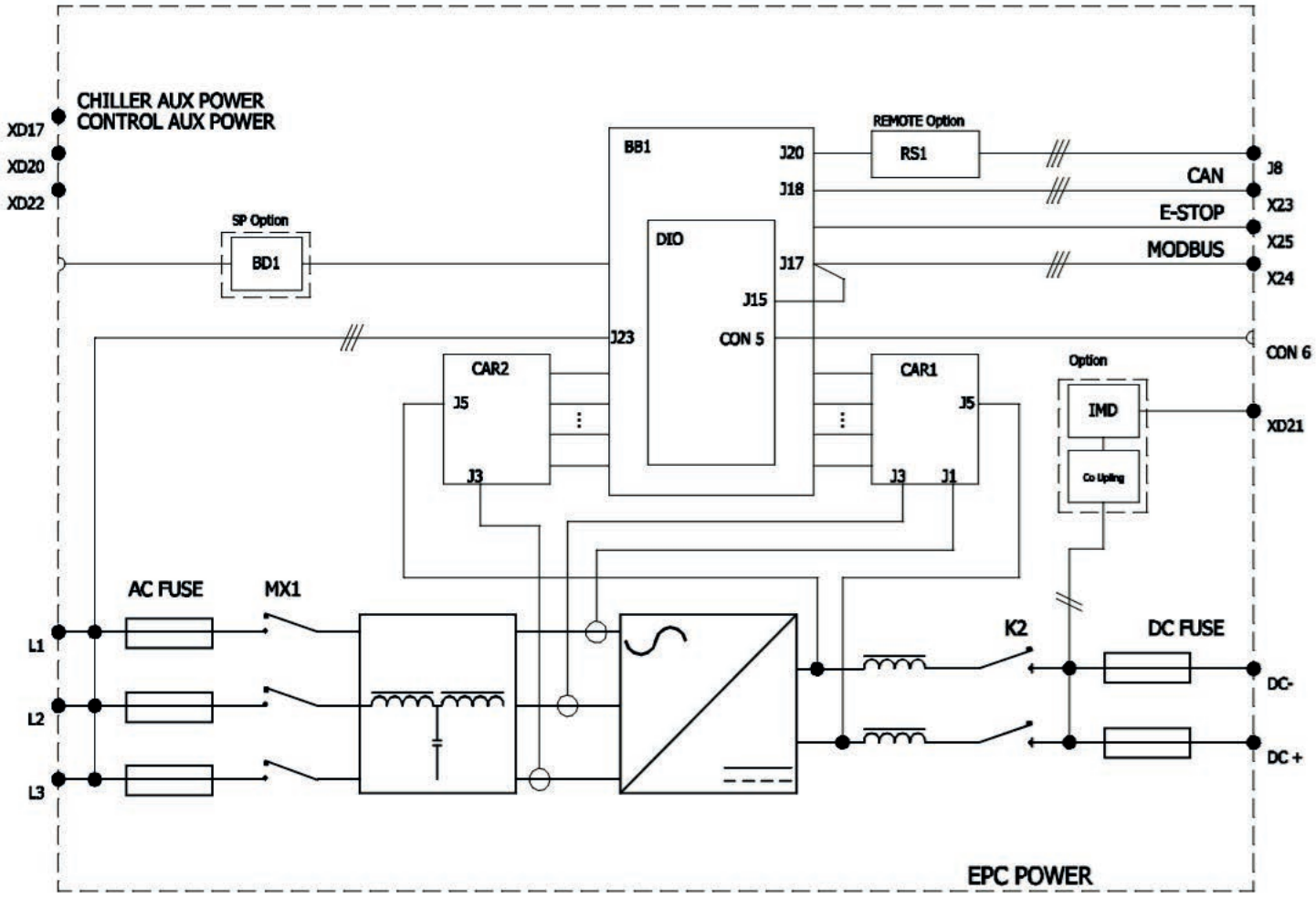


Figure 16. C-Cab XXL XXL Block Diagram

3.2.1. AC – DC Power Flow

3.2.1.1. AC Power Flow Direction

The starting point is the customer-supplied isolation transformer and protection device. These components handle the incoming alternating current (AC) power from the utility grid. This AC power flow is then directed through the bidirectional converter C-Cab XXL, see Figure 17 block diagram. The C-Cab XXL converter acts as a bridge between the AC grid and the energy storage system (batteries). During charging, the bidirectional converter converts the AC power to direct current (DC). This DC power is then stored in the batteries. Conversely, during discharging, the bidirectional converter takes the DC power from the batteries and converts it back to AC power. The final destination for this converted AC power is the load (such as Plant load, microgrid (DER), or other electrical devices).

3.2.1.2. Bidirectional Converter

The C-Cab XXL bidirectional converter plays a crucial role in this process. It can switch between converting AC to DC (during charging) and DC to AC (during discharging). When charging, it ensures that the energy from the grid is efficiently stored in the batteries.

When discharging, it ensures that the stored energy in the batteries is converted back to usable AC power for the load.

3.2.1.3. Battery System

The batteries act as an energy reservoir. They store excess energy during times of low demand (charging) and release it when demand is high (discharging). By converting AC to DC during charging and vice versa during discharging, the battery system helps maintain a stable power supply. In summary, this process allows for efficient energy management, enabling the bidirectional flow of power between the grid, batteries, and the load.

3.2.1.4. Single Line Diagram

As per the single line diagram provided, the primary power components of the SUNSYS HES XXL include a 4-Quadrant controllable Power Converter System (PCS) known as C-Cab XXL, and up to 15 Battery Cabinets (B-Cab XXLs). The system also includes an AC protection breaker located inside the C-Cab XXL. As per national electrical codes, an appropriately rated upstream isolation transformer and an overcurrent protection device (either a breaker or a fused disconnect) are required.
For sizing of the protection device, please refer to the table in the specified Section “7.2.1. C-Cab XXL AC Power Electrical Connections”, page 91 Table 16.

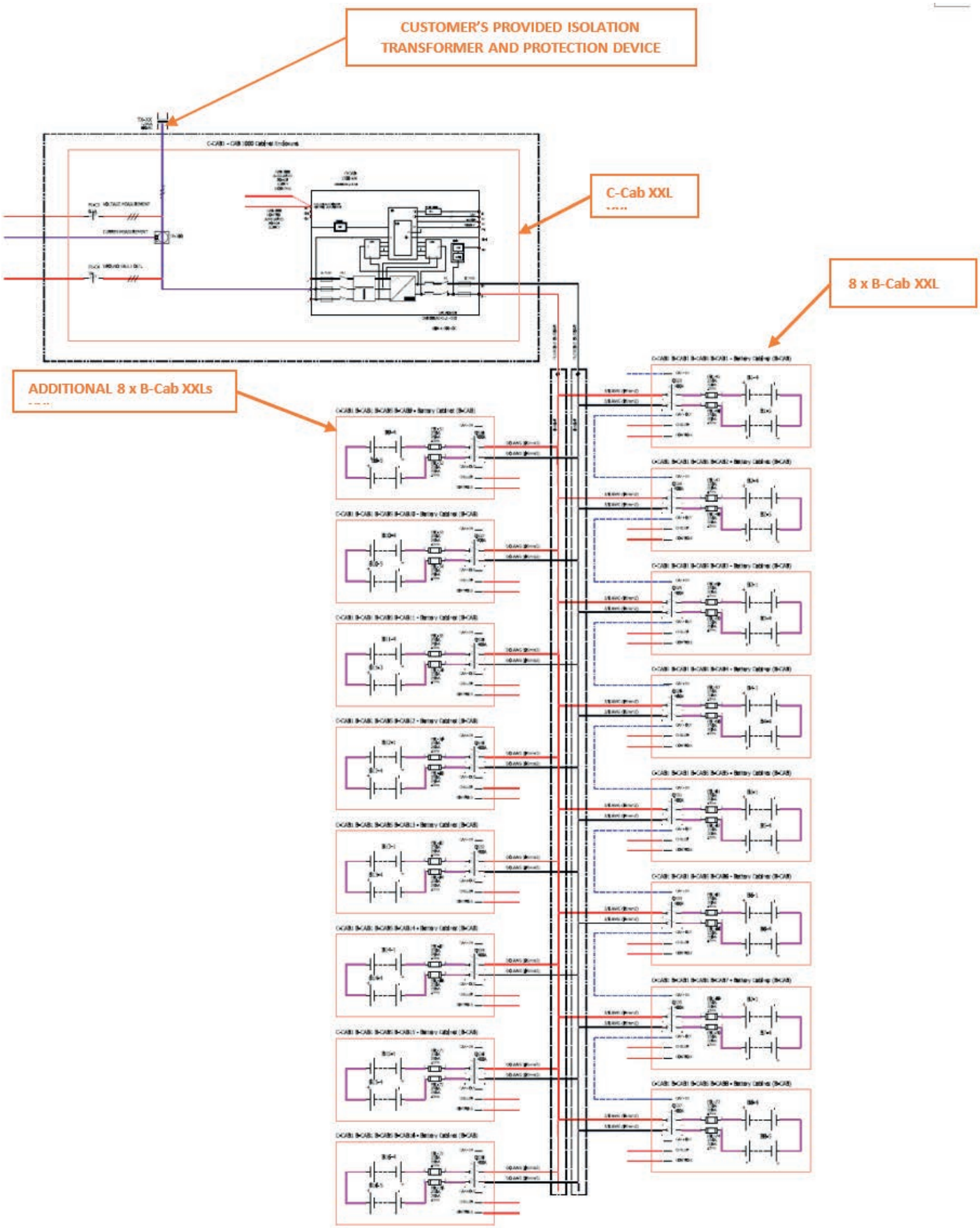


Figure 17. AC to DC Power Flow Diagram

3.3. Modes of operation

For optimal performance and to prevent internal condensation, it is essential to apply control power to the unit promptly after commissioning. This control power must remain active throughout the product's lifespan. Disconnection of control power could lead to condensation forming on critical internal components, potentially impacting the inverter's performance and warranty. The system is designed to operate in the following modes:

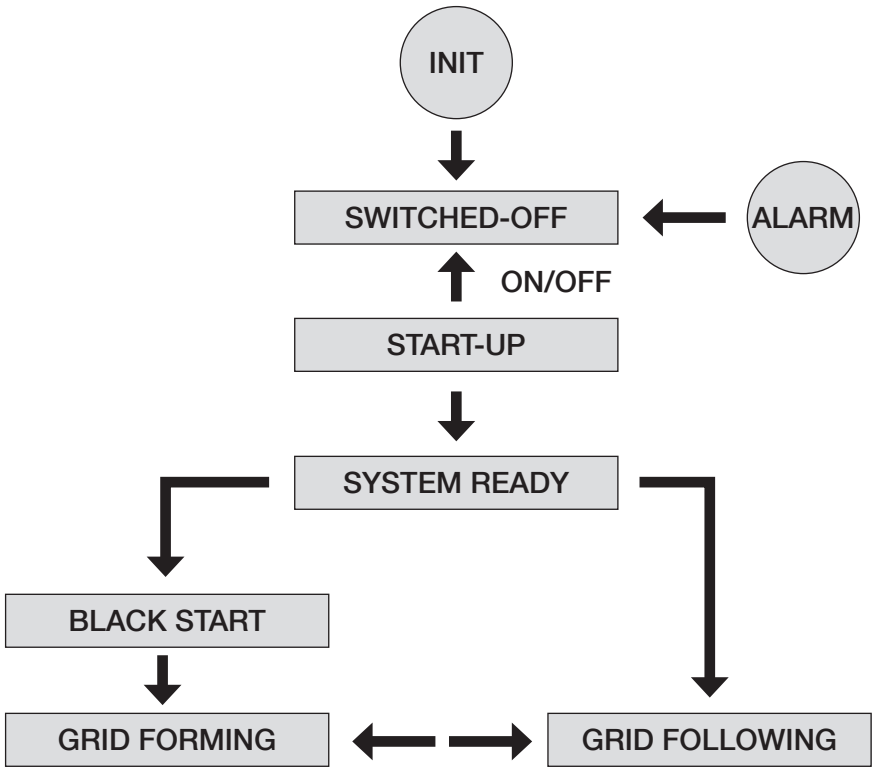


Figure 18. Modes of operation of SUNSYS HES XXL

3.3.1. Start-up

As a standard feature, the C-Cab XXL performs pre-charging on the DC bus, which is the common method employed for Battery Energy Storage Systems (BESS). During its regular startup sequence, the C-Cab XXL initiates this pre-charge sequence automatically. The internal DC capacitors receive their charge from the DC source as part of the startup process. See Figure 19 and Figure 20 below for the complete sequence.

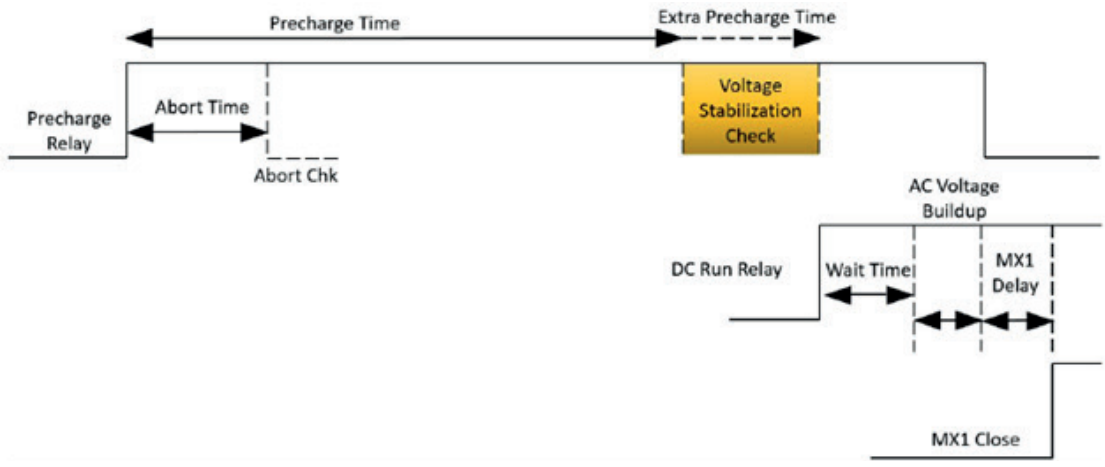


Figure 19. C-Cab XXL Pre-charge Sequence

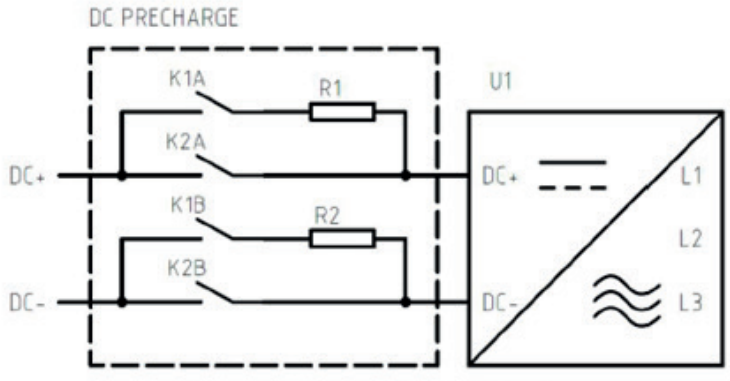


Figure 20. DC Precharge circuit

Note: the pre-charge parameters are appropriately set for the DC pre-charge by default within the C-Cab XXL, parameters can only be changed using the C-Cab XXL communications interface.

3.3.2. Initialization

The sequence for DC pre-charge is as follows;

3.3.2.1. DC Pre-charge

1. The pre -charge contactor, designated as K1A and K1B, closes (as shown in Figure 20).
2. The C-Cab XXL monitors the ramp rate of the DC voltage to ensure a successful pre-charge operation. If the ramp rate is insufficient, the C-Cab XXL will halt the pre-charge sequence and indicate a faulted state.
3. Once the C-Cab XXL's DC voltage stabilizes, the main DC contactor (K2A and K2B) will close, and the pre-charge contactor (K1A and K1B) will open completing the pre-charge sequence.

3.3.2.2. AC Startup

1. If grid voltage is present and the C-Cab XXL will enter as 'grid following' mode, the C-Cab XXL will "spool up" the LCL filter in sync with the grid (matched phase angle and magnitude). Once in sync, the main AC contactor (MX1 see Figure 21) closes and the C-Cab XXL connects to the grid with little to no transient inrush. The C-Cab XXL is now online in a 'grid following' mode.
2. If grid voltage is NOT present and the C-Cab XXL will enter as 'grid forming' mode, once the pre-charge sequence is completed, the C-Cab XXL will first close its AC contactor (MX1 see Figure 21), and then ramp up its output voltage to its commanded setpoint. The C-Cab XXL is now online in a 'grid forming' mode.

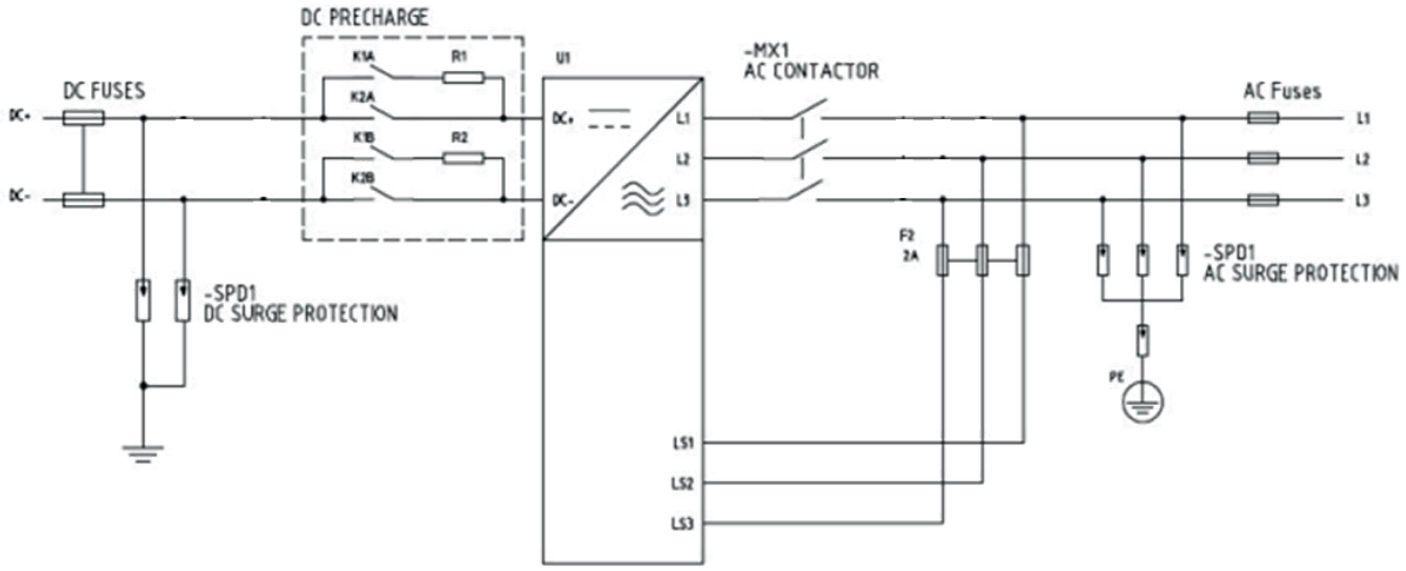


Figure 21. C-Cab XXL Power Diagram

3.3.2.3. System Ready State

In this mode, all modules of the system are energized, and grid synchronized with no energy exchange between the grid and the system except for communication devices and environmental controls such as fans, heaters, chillers etc. to maintain the nominal environmental conditions of the system.

PMS establishes communication with C-Cab XXL & B-Cab XXL and prepares itself to deliver commands to the system on receiving further communication from Energy Management System (EMS). For example, the batteries are ready to charge/ discharge on receiving appropriate commands from the EMS.

3.3.3. Grid Following Mode

The SUNSYS HES XXL operates as a Grid Follower, ensuring that its output voltage and frequency synchronize with those of the main power grid. For proper system operation, it is essential that the main grid is present. The C-Cab XXL fulfills the following essential functions:

3.3.3.1. Active and Reactive Power Exchange

The C-Cab XXL adapts its operation according to the active and reactive power set-points supplied by either the Power Management System (PMS) or the Energy Management System (EMS). It has the capability to exchange both active and reactive power with the main grid, whether it is injecting or absorbing energy.

3.3.3.2. Real and Reactive Current Control

In the Grid Following Operation Mode, the SUNSYS HES XXL adjusts its operation based on set-points for real and reactive current. During this mode, it adheres to all criteria outlined in the Grid Codes, ensuring compliance with both Interface Protection Requirements and support for Grid Support Functionalities

3.3.4. Grid Forming Mode

During the Grid Forming Mode, the SUNSYS HES XXL operates with the C-Cab XXL taking charge of the output voltage and frequency. In this mode, the C-Cab XXL acts as a Voltage Source, and the exchange of active and reactive power with the bus is dependent on the connected loads and generators within the AC microgrid.

The C-Cab XXL operates independently, managing microgrid parameters such as voltage, frequency, and phases with precision. This operational state is also commonly referred to as the off-grid mode.

3.4. C-Trough Interface

The SUNSYS HES XXL system ensures efficient connections between the battery cabinets and the other components. This is achieved through a smart cable management trough. Let's break down the key features:

3.4.1. C-Trough Structure:

The C-Trough consists of two separate compartments see Figure 22 for visual representation. Each compartment serves a specific purpose.

Top Compartment: This section of the C-Trough is dedicated to the battery DC voltage bus. It houses the terminations for the battery connections to the final destination of the C-Cab XXL.

Flexibility: The design allows for versatility in handling various configurations. Whether you have 4 B-Cabs XXL or a more extensive setup with 15 B-Cabs XXL, the C-Trough adapts seamlessly.

Inline and Back-to-Back Configurations: The C-Trough is also compatible with both Inline and Back-to-Back arrangements of B-Cabs XXL.

Bottom Compartment:

The bottom compartment of the C-Trough serves a different purpose.

Communication Cables: It houses the communication cables that facilitate data exchange between components within the system. The communication cables terminate from the M-Cab XXL to the B-Cab XXL, to provide monitoring systems, or other essential functions.

Auxiliary Power: Additionally, this section contains the auxiliary power cables to satisfy the power requirements of the battery cabinets. These power needs include control circuits power and chiller power requirements of the B-Cab XXL.

In summary, the smart cable management trough ensures organized and efficient connections, allowing the SUNSYS HES XXL system to function seamlessly. It's a critical component that streamlines both power distribution and communication. It provides protection against the elements, rodents and similar hazards.

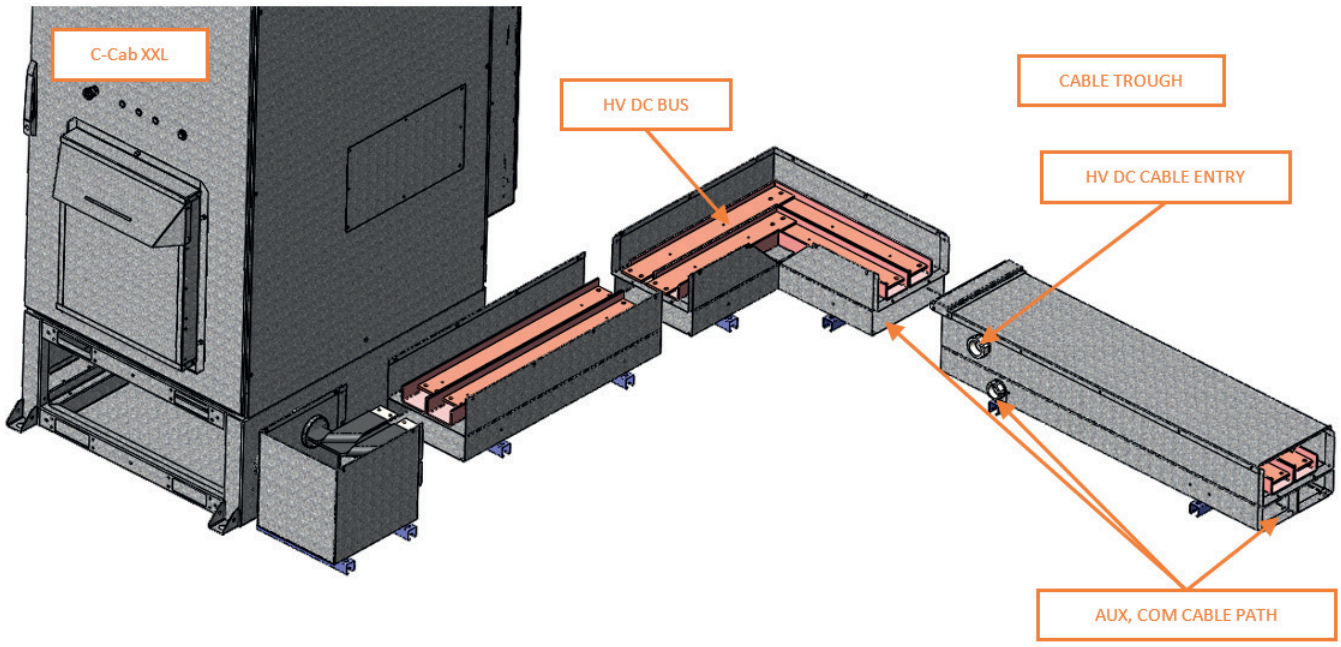


Figure 22. C-Trough, Showing the Different Cable Paths

3.5. Environmental controls

The SUNSYS HES XXL system is designed to meet stringent enclosure requirements for outdoor operation. It adheres to both IP54 and NEMA 3R standards, ensuring robust performance even in challenging environmental conditions. Here are the key features related to environmental control:

Distinct environmental control strategies are employed for the C-Cab XXL, M-Cab XXL, and B-Cab XXL systems, outlined as follows :

3.5.1. C-Cab XXL

The C-Cab XXL system employs distinct compartments for environmental control, as illustrated in the diagram Figure 23. While power electronic components benefit from liquid cooling, other system elements rely on air cooling. It can withstand relative humidity levels spanning from 5% to 100% without condensation. Additionally, a salt fog kit is available for installations in coastal regions.

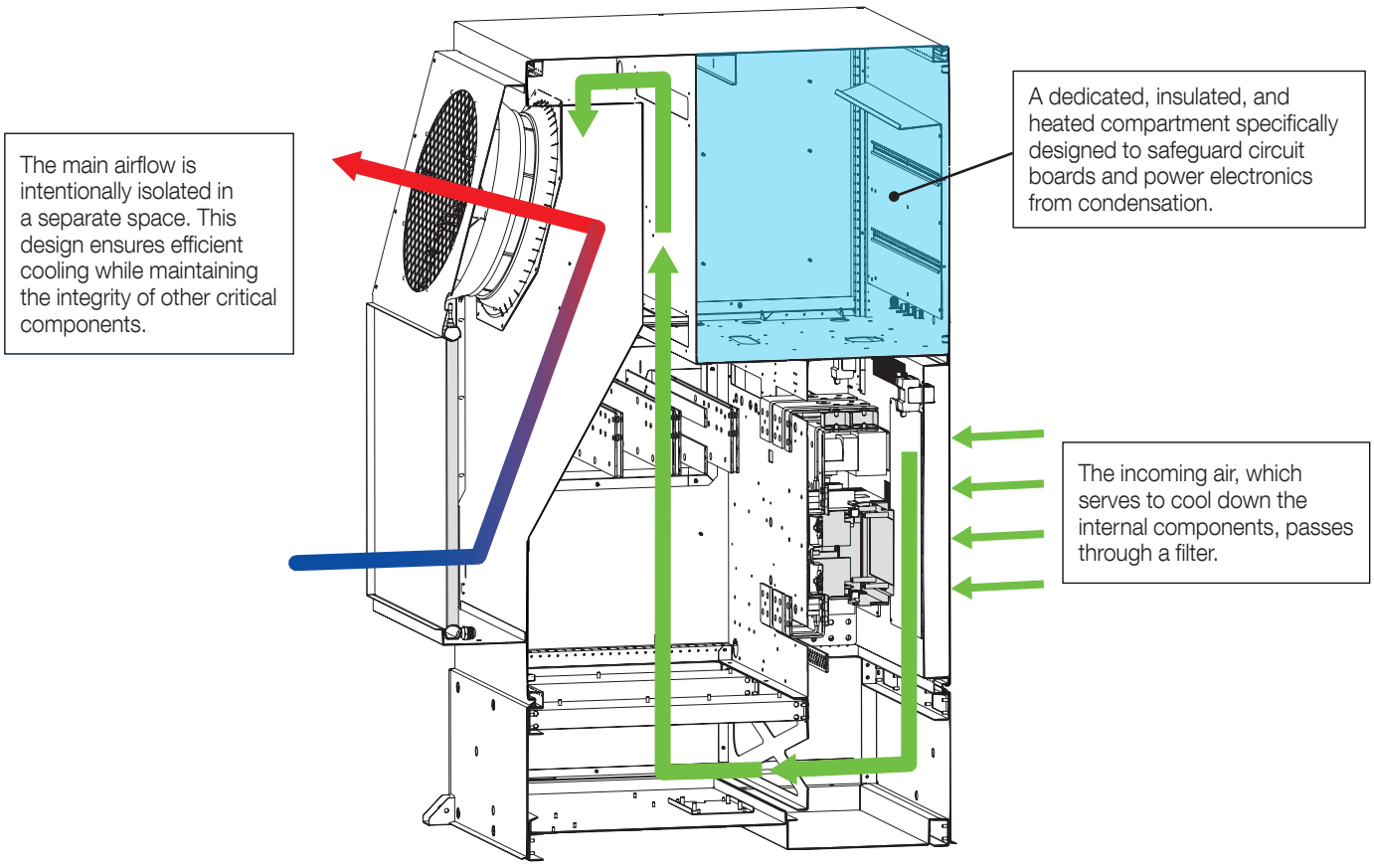


Figure 23. Airflow inside the C-Cab XXL

3.5.2. B-Cab XXL

The B-Cab XXL focuses on maintaining an optimal environment for battery performance, ensuring better battery performance and extended lifespan. Its environment control include Figure 24 an autonomous controlled chiller system utilizing an air-to-liquid cooling loop.

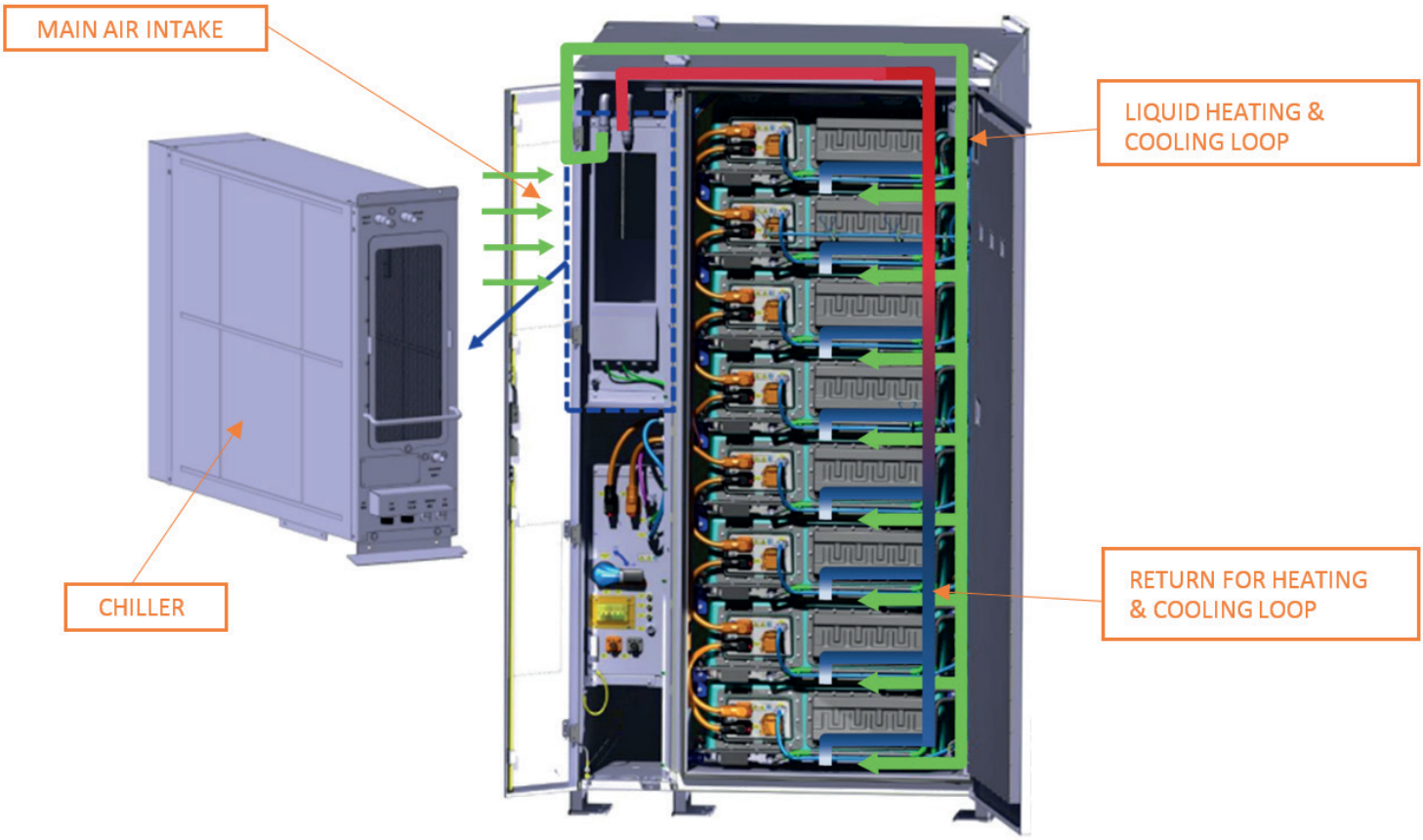


Figure 24. Air, and Coolant flow inside the B-Cab XXL

3.5.3. M-Cab XXL

The M-Cab XXL has an IP55 rating, allowing it to function in environments with up to 95% relative humidity (non-condensing). Its thermal regulation operates as a closed-loop system. Cooling is handled by an HVAC system, while heating is provided by self-contained fan driven heaters.

The start-up environment requirements Figure 25 for the M-Cab XXL:

- The normal inside operating temperature range is between 0°C (32°F) and 55°C (131°F).
- During the heat-up cycle, the system could start from as low as -20°C (-4°F) and gradually reaches 0°C (32°F).
- Once the temperature rises to and above 25°C (77°F), the air conditioning cycle is initiated.
- The system automatically manages humidity levels, maintaining them between 0% and 70% (non-condensing).
- Alarm when outside of the normal operating range.
- The airflow inside the M-Cab XXL ensures efficient cooling and operation.

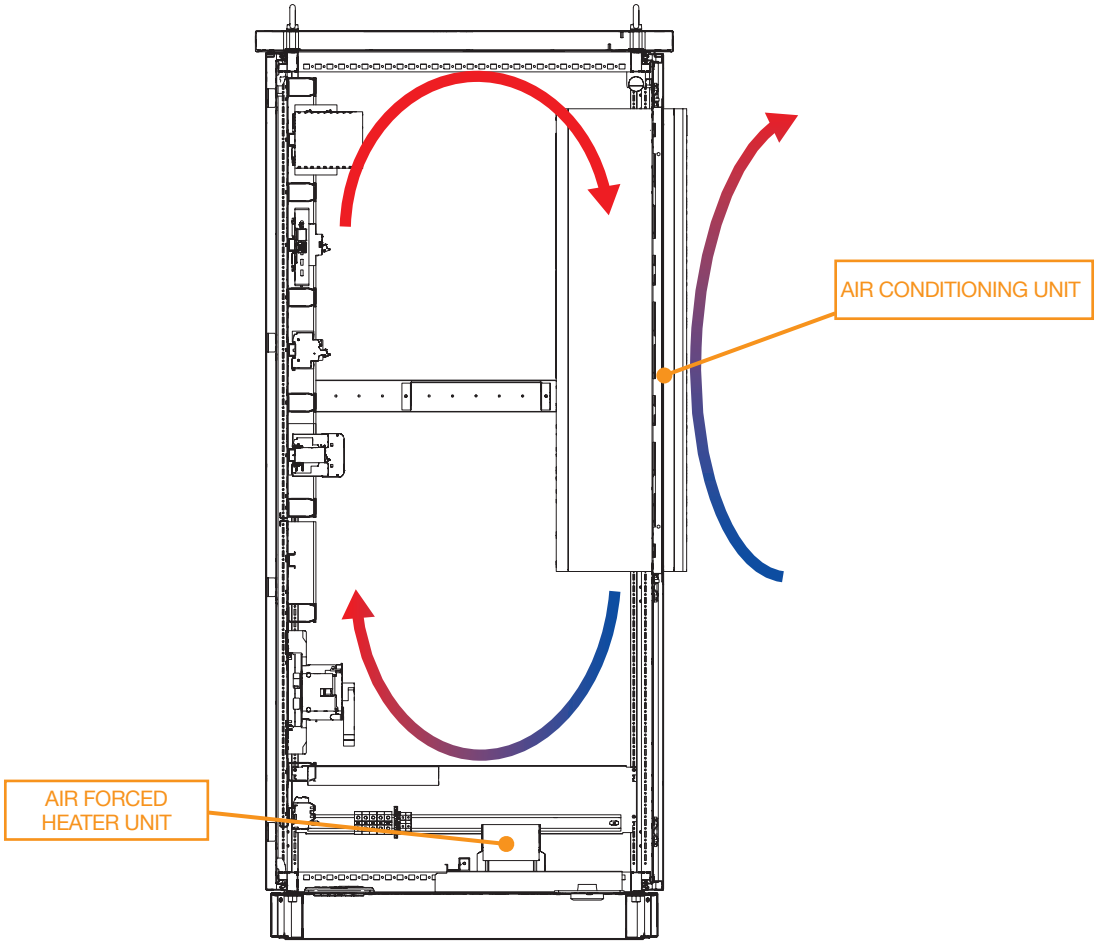


Figure 25. Airflow inside the M-Cab XXL

The M-Cab XXL is a critical component within the SUNSYS HES XXL high-power energy storage system. Its primary purpose is to regulate the environmental conditions necessary for the efficient operation of the entire system.

Let's break down its functionality step by step:

Temperature and Humidity Management:

The M-Cab XXL is equipped with both a mechanical thermostat and a mechanical hydrostat. These built-in sensors continuously monitor the ambient temperature and humidity levels. When the external environment is either very cold or highly humid, these controls kick into action. Their goal is to ensure that the initial conditions for the SUNSYS HES XXL system are favorable.

Start-Up Conditions

During the initial start-up phase, the M-Cab XXL samples the temperature and humidity conditions inside the M-Cab XXL enclosure. If these conditions are not within the desired range, the system takes precautionary measures. Specially, all power to components other than the heaters inside the M-Cab XXL is disabled. This prevents any potential damage due to unfavorable conditions.

The heaters are automatically activated to create a controlled environment within the M-Cab XXL. This ensures that the system is ready for the subsequent start-up of the SUNSYS HES XXL.

Environmental readiness, once the internal conditions meet the specified criteria (temperature and humidity), the M-Cab XXL signals that it's time to proceed. At this point, power is provided to all other components of the SUNSYS HES XXL system. The fully automatic controls then take over, managed by the Power Management System (PMS).

From this moment onward, the SUNSYS HES XXL operates within its full range of environmental capability. Whether it's extreme heat, bitter cold, or varying humidity levels, the SUNSYS HES XXL with its on board HVAC adapts seamlessly to ensure reliable performance.

The M-Cab XXL acts as the protector of environmental conditions, allowing the SUNSYS HES XXL to function optimally regardless of external challenges. Its integration ensures the safety, efficiency and longevity of this high-power energy storage solution.

Alarm Conditions

When operating outside of the normal conditions, an alarm will be triggered and operations will be suspended.

3.6. System communication

3.6.1. Communication with external EMS

The SUNSYS HES XXL facilitates energy exchange—both charging and discharging—via an Energy Management System (EMS). This EMS handles remote operations such as active and reactive power control, peak shaving, and power factor correction. Typically, a third party provides the EMS function, but its detailed functionality lies outside the scope of this manual.

The Energy Management System (EMS) establishes communication with the Power Management System (PMS) housed within the M-Cab XXL, utilizing the Modbus TCP / SunSpec protocol. This standardized communication protocol facilitates smooth data exchange between system components. Subsequently, the relevant values are transmitted from the EMS to the C-Cab XXL via an Ethernet RJ45 cable. During the commissioning process, the IP addresses of both the M-Cab XXL and C-Cab XXL are configured to enable effective communication

Socomec is a member of the SunSpec organization. SunSpec's commitment to interoperability and adherence to open standards aligns with Socomec's vision. For detailed specifications, you can explore the SunSpec site: https://sunspec.org/.

Table 5 following is a list of supported SunSpec models to allow Energy Management System (EMS) operations.

Model	Label	Description
1	Common	All SunSpec compliant devices must include this as the first model
701	DER AC Measurement	DER AC measurement model.
702	DER Capacity	DER capacity model.
703	Enter Service	Enter service model.
704	DER AC Controls	DER AC controls model.
705	DER Volt-Var	DER Volt-Var model.
706	DER Volt-Watt	DER Volt-Watt model.
713	DER Storage Capacity	DER storage capacity.
715	DER Ctl	DER Control
802	Battery Base Model	Battery Base Model
803	Li-ion Battery Bank Model	Lithium Ion Battery Model
64901	Socomec PMS	Vendor model providing PMS states, warnings and alarms details
64902	Socomec PMS islanding	Vendor model providing PMS commands for off grid features
64904	Socomec FSM	Vendor model Socomec FSM

3.6.2. EMS Usage Example

EMS example usage Table 6 of the SunSpec models:

1. To ensure communication integrity, a heartbeat value is recorded in the Model 715. This value should update every second, serving as an indicator of an active communication link.
2. For managing ON/OFF controls related to Distributed Energy Resources (DER), we employ the Model 715. This model allows you to oversee the operational state of the DER.
3. Model 704 defines the DER setpoints, which play a crucial role in determining critical parameters for the DER's behavior, including power output, voltage, and frequency.
4. To control the battery system, we rely on Model 802. This model provides the necessary commands and parameters for battery charging and discharging.
5. Lastly, Model 701 grants access to states, alarms, and measurements.

Table 6 - Start Sequence Models:

Model	Offset	Name	Value	Action	Description
715	7	AlarmReset	1		Reset the alarm
715	7	AlarmReset	0		After a delay of 1 second
802	50	SetOp	1	CONNECT	Connect the battery, you have to wait the pre-charge before starting the PCS
715	8	OpCtl	1	START	Start the PCS
704	22	WSetEna	1	ENABLED	Enable the active power control
704	23	WSetMod	1	WATTS	Not a percentage but a value (can be another value)
704	24	WSet	W	Active Power Value	Active power setpoint
704	35	VarSetEna	1	ENABLED	Enable the reactive power control
704	36	VarSetMod	4	VARS	Not a percentage but a value (this setting can have another value)
704	38	VarSet	W	Reactive Power Value	Reactive power setpoint

Table 7 - Stop Sequence Models:

715	8	OpCtl	0	STOP	Stop the PCS
802	50	SetOp	2	DISCONNECT	Disconnect the battery, you have to wait 5 minutes before switching it on again

3.6.3. System Module Overview and Interfaces

For the purposes of the following control description, the components of the system are described from a functional perspective.

The Power Management System (PMS) serves as the central controller for both the C-Cab XXL converter and the B-Cab XXL's battery cabinets. Its interface is shown in the M-Cab XXL diagram Figure 26 The PMS utilizes its operational intelligence to efficiently manage the SUNSYS HES XXL, by connecting to the following M-Cab XXL terminal:

Terminal port marked as, ETH3 on device A1012 – designated as Modbus TCP communication to external power meter for voltage, current and power measurement.

Terminal port marked as, ETH10 (DMZ) on device A1004 – designated as Modbus TCP / SunSpec communication with the EMS for remote control.

Terminal port marked as, C0709 connector on the door – is for Socomec use only.

For a complete communication arrangement, refer to Figure 27.

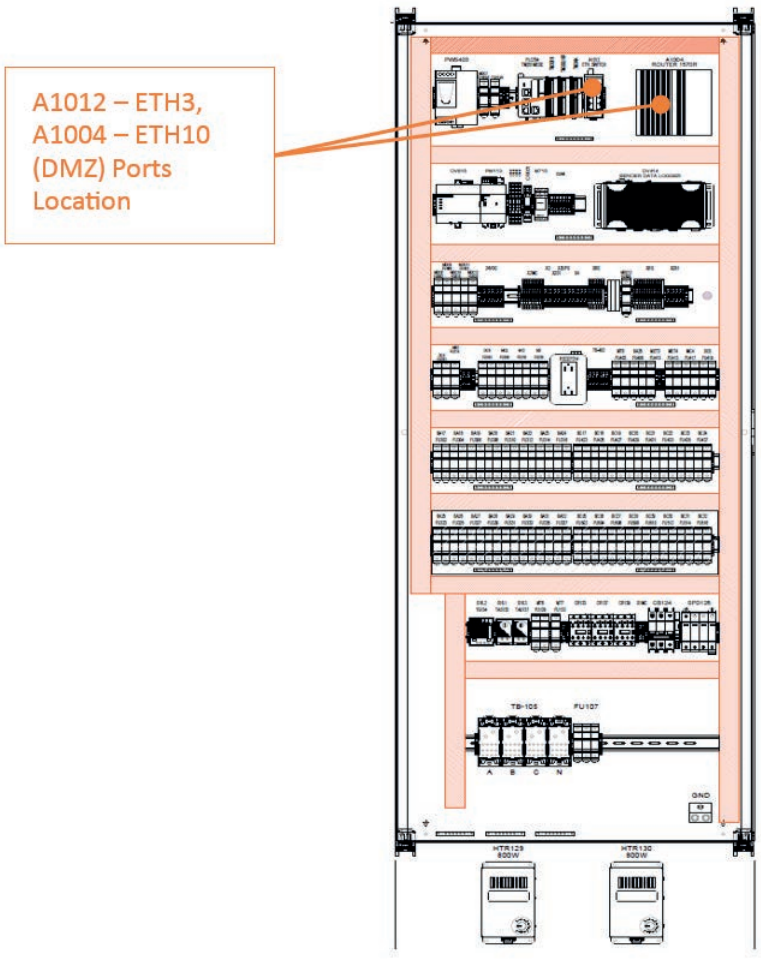


Figure 26. M-Cab XXL Location of Ethernet connection ports

Note: Modbus TCP communication is supported through the Ethernet router.

- Modbus TCP communication to the converter for control & operational data. Modbus TCP communication translation to CAN, from the batteries for control & operational data.
- RS 485 communication (Modbus RTU) to external Digiware power meter through the Digiware M70 module. Modbus TCP communication to the Insulation Monitoring Device (IMD) device.
- Broadband communication (LTE modem) to the data logger for continuous logging of selected parameters.
- Modbus TCP port for communication with the external EMS for remote control; a network bridge to facilitate independent IP addressing.
- Sensors in the C-Cab XXL for internal temperature monitoring and external temperature. Controls for the C-Cab XXL cabinet heater and Cooling.
- For servicing, port is provided.

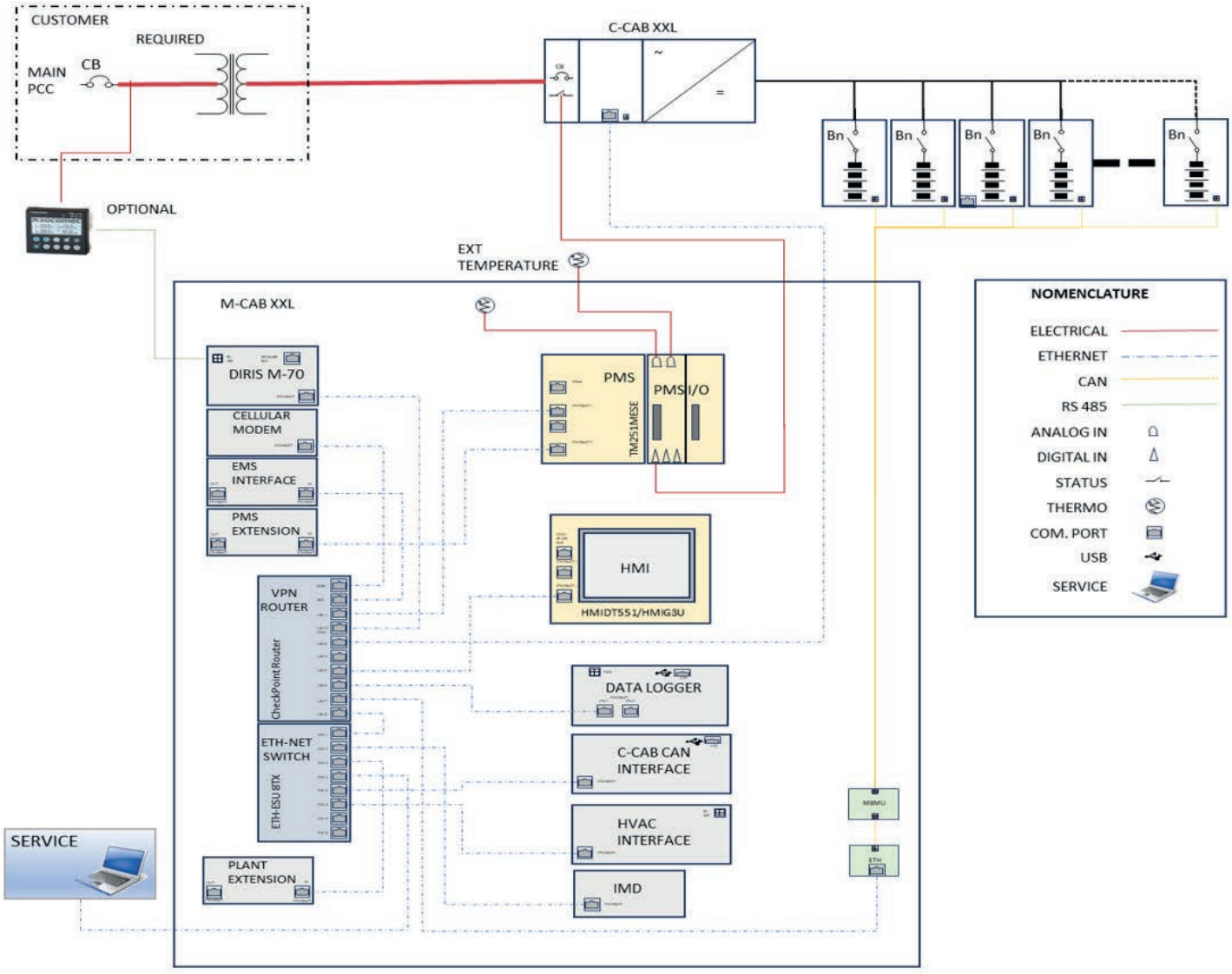


Figure 27. System Control and Communication architecture

4. SITE PREPARATION

4.1. General recommendations

The SUNSYS HES XXL system, designed specifically for outdoor installation, requires protection against various environmental risks to ensure optimal performance and longevity. While the following precautions are recommended, please note that this list is not exhaustive:

- It is advisable to avoid from installing the system in areas prone to natural hazards such as **water flooding, forest fires, or exposure to strong winds**.
- Choose installation locations away from trees and other potential sources of pollution that can clog filters and natural air flow.
- Implement protective measures such as fences, bollards, and steps to prevent vandalism or accidents in the vicinity.
- Ensure that C-Trough and ducts remain free from water accumulation.

Take precautions to prevent small animals (such as mice, rats, and snakes) from entering the cabinets C-Trough and ducts. A safe environment for SUNSYS HES XXL is crucial for its entire lifespan.

4.2. Civil and foundation requirements

4.2.1. Site Location

Make sure that Site Selection Requirements are in Compliance with Local Laws and Regulations:

- **Elevation and Water Level:**
  - The system installation position must not be in a low-lying area. The site should be higher than the highest historical water level in the area or region.
- **Soil Conditions:**
  - The soil where the concrete pad will be made must be in good condition and the ground must be solid. Avoid areas with unfavorable geological conditions such as clay soil or soft soil layers that could lead to water accumulations and sinking.
- **Ventilation and Environmental:**
  - Choose a well-ventilated location.
  - Keep away from areas of strong vibrations, electrical noise sources, and electromagnetic interference. Avoid places with existing underground facilities.
- **Hazard Avoidance:**
  - Stay clear and avoid locations where dust, fumes, harmful gases, or corrosive, flammable, and explosive materials are present.
  - Maintain a minimum distance of 500 meters from airports, landfills, river banks, shores or dams.
- **Residential Areas:**
  - To prevent noise from disturbing people, maintain a minimum distance of at least 50 meters from residential areas.
- **Obstacle-Free Location:**
  - Choose an open location without obstacles in the surrounding area.
- **Limited Access Area:**
  - The C-Cab XXLs are to be installed in a limited access closed electrical operating area. People working on or close to the unit should be made aware of the safety risks involved with electricity.

- **Clearance Standards and Maintenance Considerations:**
  - Ensure that actual clearances comply with local code standards and regulations while considering maintenance feasibly.
  - Ensure a front clearance of 3,000mm (118.1in) for the B-Cabs XXL . This clearance is crucial for proper installation and maintenance.
  - For in-line arrangements of the B-Cab XXLs, ensure that there is a minimum clearance of 150mm between the sides of each B-Cab XXL enclosure. This clearance is crucial for proper installation and maintenance.
  - For back-to-back arrangements of the B-Cab XXLs, ensure that there is a minimum clearance of 500mm from the back of each B-Cab XXL. This clearance is essential for proper installation and maintenance, allowing sufficient space for access and ventilation.
  - A minimum clearance distance of 650mm (25.6in) must be maintained above the B-Cab XXL. This space is essential to ensure the proper functioning of the deflagration panel located on top of the battery cabinets, allowing for safe and effective operation.

4.2.2. Foundation Requirement

Before installing any components or enclosures, a foundation and trench must be built on the selected site. The requirements for foundation constructions are as follows:

- **Foundation Size and Load-Bearing Capacity:**
  - Ensure the foundation size meets the requirements for B-Cab XXL installations.
  - It must be capable of supporting a load of 3.7 tons.
- **Level Surface Installation:**
  - The Cabinets units require a level surface. The surface deviation should not exceed 0.25% (which translates to ≤±4mm/2 meters).
  - The surface shall not exceed a slope of 0.5% within the inverter footprint.
- **Anchoring and Clearance:**
  - Follow the provided anchoring information in the installation instructions section.
  - Maintain relevant clearances around the cabinets as outlined in the installation instructions.
  - Consider conduit entry requirements.
- **Secure Fastening:**
  - Use appropriate hardware to fasten the enclosure cabinets securely to the surface pad.
  - Select hardware based on the specific site conditions.
- **Do not span construction joints or control joints over the footprint of the inverter.**
- **Take local requirements such as possible wind load and seismic requirement into account on the installation and foundation construction.**

Table 8 - Concreate Pad Specification:

Ground Type	Condition Requirements	Note
Concreate Pad	The concreate pad should be able to bear 3.7 ton load.	Level deviation ≤±10mm
Flat land surface		Flatness deviation ≤±4mm/2m

4.2.3. Site Preparation Guidelines for installation: Ensuring Stability and Safety

The designated **Engineer of Record** overseeing site installation, it is the role and responsibility to ensuring the successful deployment of equipment or structures. To achieve this, thorough attention to site preparation details is essential.

- **Attachment Means:**
  - **Concreate Pad:** Considered a robust foundation, a concrete pad provides stability and load-bearing capacity. The recommended depth the must align with local regulations and building codes.
- **Cabling:**
  - Proper cabling is critical for seamless functionality. Specify the type, routing, and protection of cables. Account for factors like weather exposure, strain relief, and C-Troughs.
- **Seismic Anchorage:**
  - Given the seismic activity in some regions, anchoring systems are crucial. Consult seismic design codes and guidelines to determine the appropriate anchorage method. Ensure that equipment remains secure during tremors or vibrations.
- **Concrete Pad Depth Compliance:**
  - The recommended depth for the concrete pad must adhere to local jurisdictional requirements and industry standards. Verify this against the specific project location and relevant codes.
- **Appendix Reference:**
  - For detailed anchorage guidelines (these are only guidelines), refer to Table 38 in the appendix section. This table provides valuable insights into anchoring methods, load capacities, and safety factors.

Remember, meticulous site preparation not only ensures safety but also contributes to the longevity and reliability of the installation. **As the Engineer of Record, will significantly influence the project's success.**

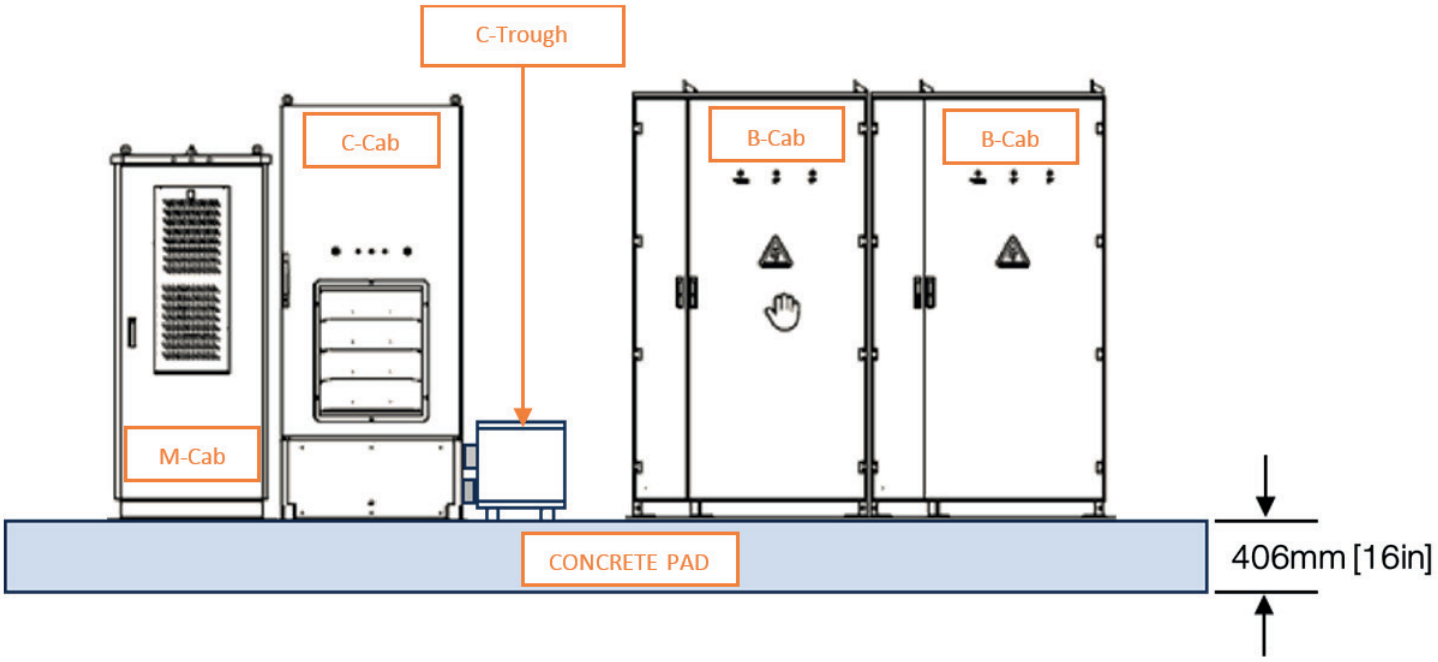


Figure 28. Concreate Pad Depth – SDS Level 2.5g

Dimension mm [for in divided by 25.4]

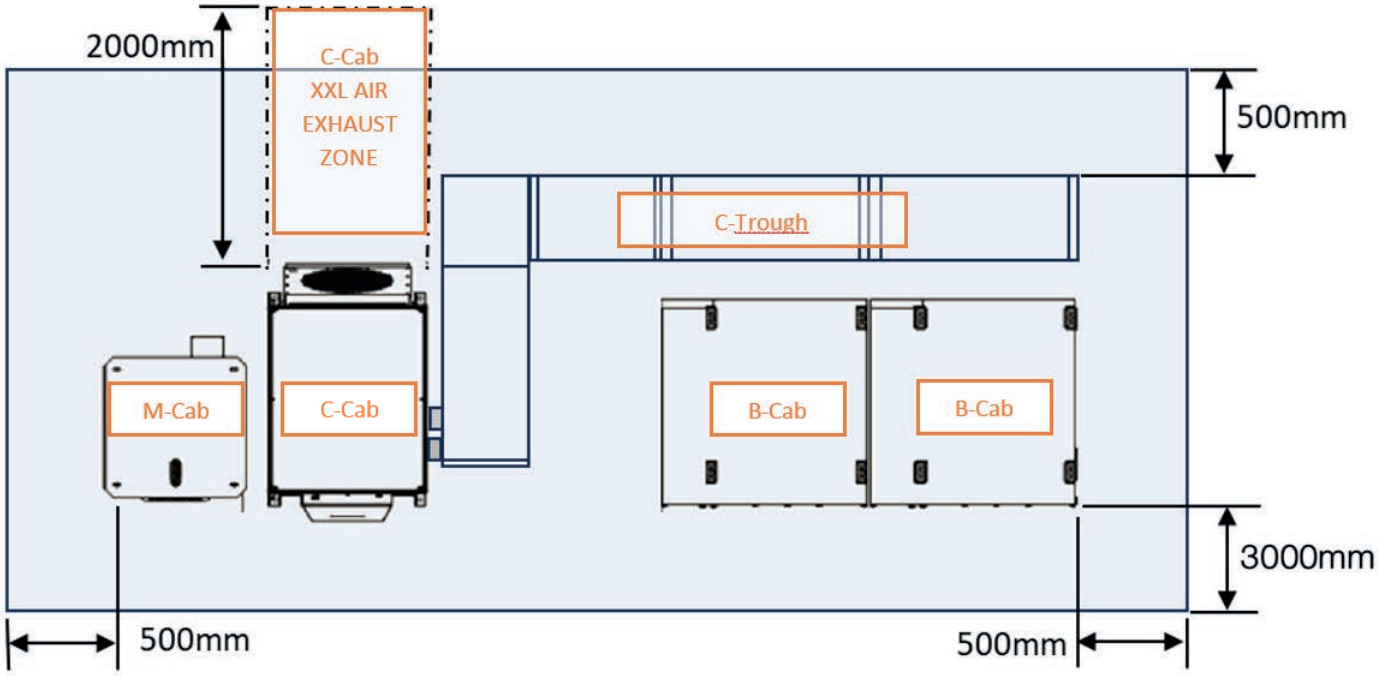


Figure 29. Concrete Pad Clearance

5. TRANSPORT, STORAGE & HANDLING

These instructions serve as a guide for transporting, storing, and handling the units. For detailed dimensions and connection information, please consult the outline drawings and electrical schematics included with the unit. If you require additional assistance, feel free to reach out to Socomec.

5.1. Transportation

	Customers are responsible for transporting all Cabinets/Parts from receiving sites to the final installation location. SOCOMEC denies any liability for damage occurring during transportation. The customer is responsible for selecting the appropriate type of transport, ensuring compliance with our specified requirements, and adhering to the transport laws of the local jurisdiction during the journey.

Please adhere to these guidelines to ensure safe and efficient transportation:

The system should be transported in a High Cube container, ensuring proper conditions for equipment rigging and packing.

	Batteries must be transported separately in a dedicated container due to safety reasons. This container must comply with requirements for transporting hazardous materials.

Maintain a transport and storage temperature range between -30°C (-22°F) and +60°C (+140°F).

Unloading of the container should be done using a suitable load rated forklift.

5.2. Inspection

The units and component are transported on a wooden pallet.

Upon receiving the equipment, promptly inspect for any damage that may have occurred during transit. If any damage is found, file a claim with the carrier and report it to Socomec, providing the serial number information and carrier details.

Additionally, verify that the content is complete and includes:

- 1 User Manual.
- 1 JXH1 cable for each B-Cab XXL.
- 1 JX1 cable for each B-Cab XXL.
- 1 JX2 cable for each B-Cab XXL.
- 1 Plus + polarity cable for each B-Cab XXL.
- 1 Minus - polarity cable for each B-Cab XXL.

In the unfortunate event of equipment damage of the C-Cab XXL, please submit an RMA (Return Merchandise Authorization) to EPC Power, accompanied by appropriate pictures of the damaged equipment.

If in the unfortunate event that the M-Cab XXL or B-Cab XXL equipment is damaged, please submit an RMA (Return Merchandise Authorization) with Socomec.

5.3. Storage

Place the cabinets in a dry and tidy area, shielded from outdoor conditions and any potential harm. Make sure to keep the ventilation openings covered to prevent moisture or dust from getting inside. Additionally, prohibit the storage of harmful gases, flammable or explosive items, and corrosive chemicals within the battery warehouse. Ensure that the cabinets are shielded from animals and rodents, and that all packaging remains intact until installation. Additionally, make sure that the doors and panels remain securely in place and closed.

Store the battery within a temperature range of approximately 20°C ± 3°C (68°F ± 5.4°F), with a daily average storage temperature not exceeding 25°C (77°F). This prolongs the battery's lifespan and minimize self-discharge. The allowable temperature range for storage is from a temperature -25°C to +55°C (-13°F to +131°F).

The C-Cab XXL should be kept in their original packing as long as possible. Once the C-Cab XXLs are removed from their factory vacuum packaging, they could potentially be exposed to damaging humidity from the external environment. All reasonable measures should be taken to apply auxiliary power to the inverter within two weeks of their removal from factory packaging, so that the inverters can regulate their internal temperature and prevent internal condensation.

1. During this period of time, the system must be stored in the following conditions: A safe pace free from risk of damage.
2. Protected against animal/rodents.
3. All packaging to remain intact until installation.
4. Doors and panels to remain in place and closed.

The C-Cab XXL has two heaters which are located, in the following areas.

- One heater inside the Powerstage
- And the next one in the coolant tank (rear side).

Procedure for a short time storage if no suitable liquid is available to fill the coolant tank:

1. First feed the control aux. power supply to the Inverter terminals, it will energize the power stage heater.
2. If there is no coolant fluid inside the tank the heater in the coolant tank, should be disconnect by disconnecting the plug on the cooling tray. See picture below.

If the storage duration exceeds the recommended 2-weeks period, please contact Socomec.

5.4. Handling and Moving

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

WARNING!
Transport the unit using a forklift truck, exercising extreme caution at all times.
Utilize lifting eyes (eyebolts) and straps as needed.
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 push the unit by putting pressure on any door panels.
When moving the unit across any type of sloped surface, make sure to secure it and apply the brakes cautiously to prevent unintended tipping or toppling

WARNING!
Ensure vertical stability while moving the unit due to its height and elevated center of gravity. Proceed cautiously, moving at a cautious pace to prevent any tipping incidents.

All components shipped individually on separate pallets, SUNSYS HES XXL includes:

- 1. Pallet M-Cab XXL.
- 1. Pallet C-Cab XXL.
- N. Pallets B-Cab XXL depending on configuration.
- N. Pallets C-Trough depending on configuration.
- 1. Pallet with Connection Cables Kit

5.5. Forklift or Pallet truck handling

CAUTION!
At all times when moving objects, to observe the objects center of gravity.

The equipment can be moved using either a Gradall lifting device or a forklift. The choice between the two depends on the condition of the ground where the equipment needs to be transported. If the ground is uneven or has varying levels, the Gradall lifting device is preferable. On the other hand, if the ground is flat and stable, a forklift can be used for transportation. Additionally, consider the following precautions:

Stable Positioning: Ensure that the B-Cab XXL is placed on a stable surface before attempting any lifting or relocation. Uneven or slippery surfaces can compromise stability.

Lifting Techniques: When lifting the B-Cab XXL, use proper lifting techniques. If manipulation with your body is required, keep you back straight, engage your leg muscles. Avoid twisting your body during lifting.

Team Communication: If multiple individuals are involved in moving the B-Cab XXL, establish clear communication. Coordinate movements and ensure everyone is aware of their roles.

Weight Distribution: Be mindful of the weight distribution within the B-Cab XXL. Heavy items should be evenly distributed to maintain balance and secured from movement.

Remember that safety is paramount when handling equipment like the B-Cab XXL. By following these guidelines, you can minimize risks and ensure efficient and secure handling.

Figure 30. GRADALL forklift

Figure 31. Forklift

5.5.1. B-Cab XXL Forklift Handling

To safeguard against potential damage caused by forklift forks and to prevent inadvertent scraping of the cabinet base, it is essential to implement protective measures. When handling the B-Cab XXL, approach it from the side, as depicted in Figure 33. Prior to lifting or relocating the B-Cab XXL, ensure a thorough understanding of its center of gravity. Another alternative method of transporting and placing the B-Cab XXL in positions as in Figure 32 at final position.

Figure 32. Transporting B-Cab XXL by Forklift

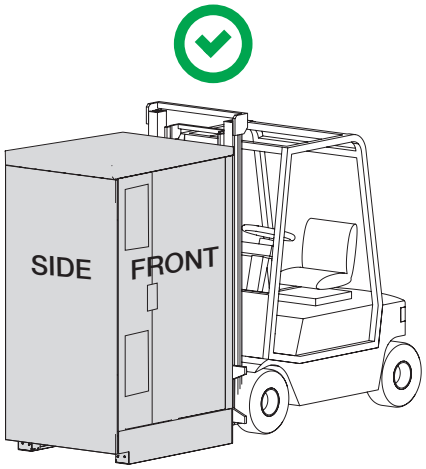


Figure 33. Handling the B-Cab XXL

Observe the B-Cab XXL center of gravity as shown on Figure 34. This is especially crucial if moving the B-Cab XXL around by forklift.

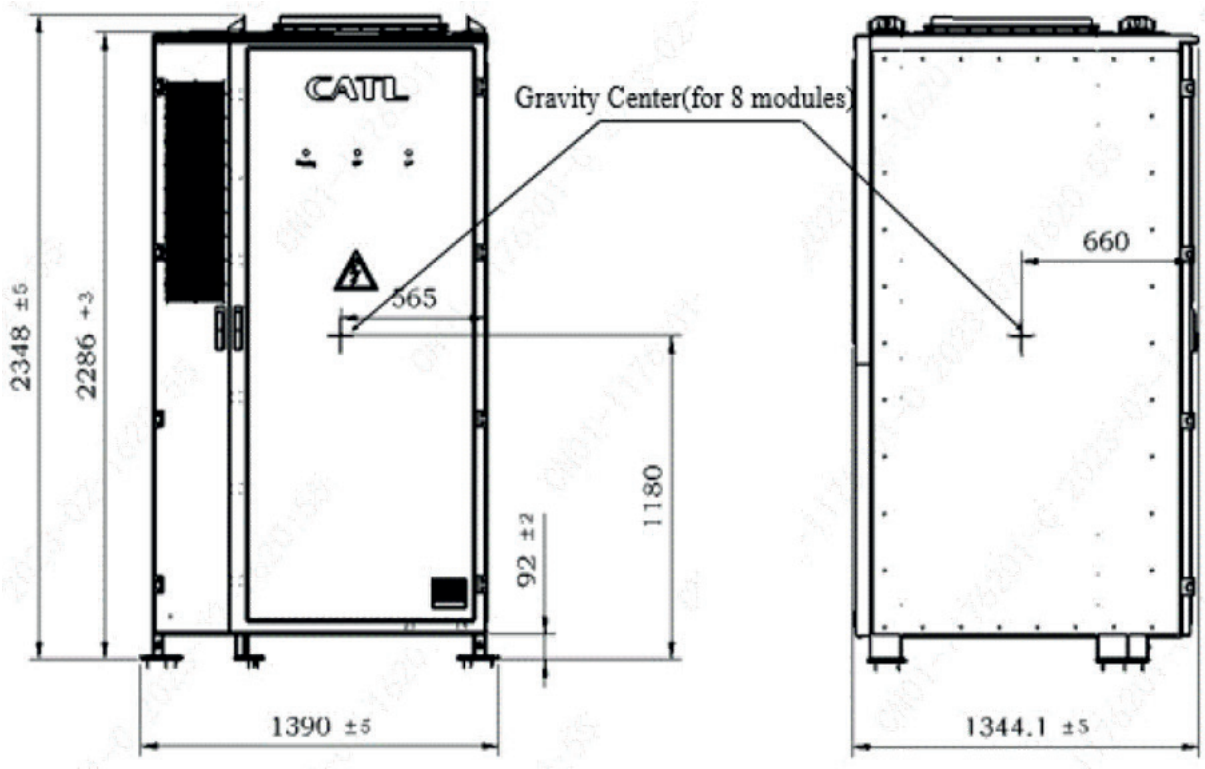


Figure 34. B-Cab XXL Center of Gravity.

5.5.2. M-Cab XXL Forklift Handling

Getting the M-Cab XXL ready for handling, remove the front and rear panels as shown in Figure 35 below.

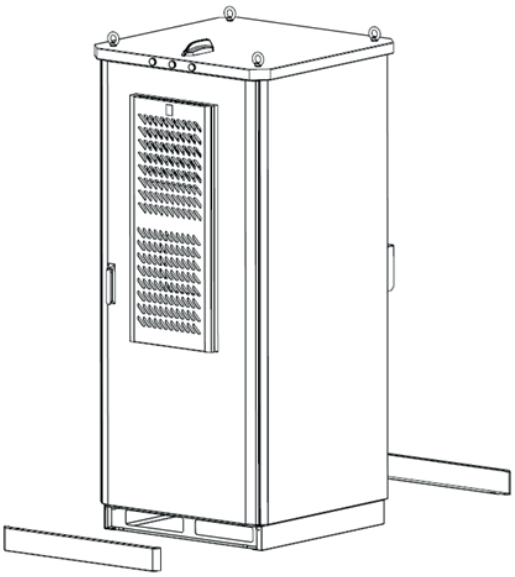


Figure 35. M-Cab XXL removable panels

The front of the M-Cab XXL is where the Air Conditioning unit is located and mounted, if possible do not remove the wrapping around the unit until it is placed in the final destination. Before lifting or moving the M-Cab XXL make sure to understand and observe the center of gravity. See Figure 36 for recommended handling diagram.

The Air conditioning screen should be protected, so as to remain damaged free.

Center of Gravity: Front 1,067.5 (42 in) Side 396 (15.5)

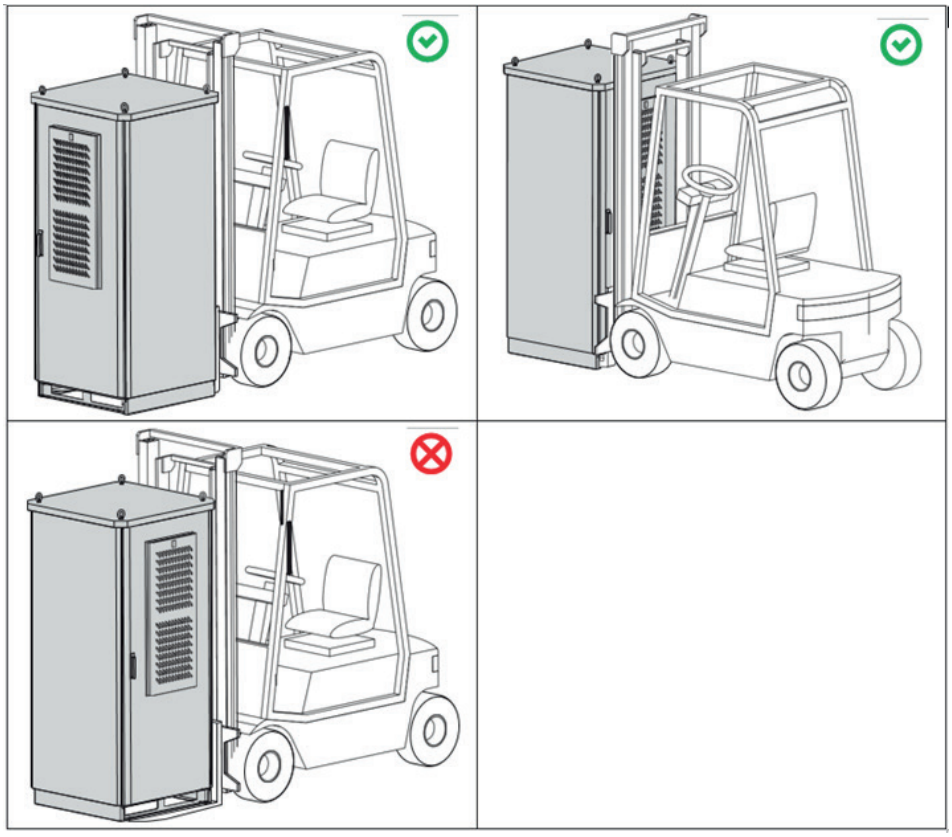


Figure 36. Forklift handling, use 1.3m forks min.

5.5.3. Overhead Lifting

CAUTION!

While lifting it is important to ensure that even vertical load distribution on all the lifting eyes (eyebolts) 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.

On the construction site, having either a Crane or a Gradall with hoist capability is essential for safely handling the C-Cab XXL unit. Additionally, this equipment proves highly advantageous for efficiently managing other units such as C-Cab XXL, M-Cab XXL and B-Cab XXL.

In summary, having the right equipment on-site not only ensures safety but also enhances overall efficiency in handling various construction components.

5.5.3.1. C-Cab XXL Handling

The presence of a Crane or Gradall with hoist capability is mandatory for handling the C-Cab XXL unit. This specialized equipment ensures safe lifting, positioning, and movement of the C-Cab XXL during construction activities.

Versatility: Beyond its primary role in C-Cab XXL handling, this equipment offers versatility. It can also be effectively utilized for managing other units, specifically the B-Cab XXL and M-Cab XXL. Whether it's lifting, transferring, or positioning these units, the Crane or Gradall proves to be a valuable asset.

When transporting and relocating the C-Cab XXL, it is advisable to keep the packing materials in place. Doing so is essential for the purpose of protection from damage. The original packing materials are designed to safeguard the C-Cab XXL during transit. The packing materials also help maintain the structural integrity of the C-Cab XXL. They prevent the components from rubbing against each other while placing them in the final installation station.

WARNING!

When handling the C-Cab XXL, observe the following precautions to ensure safe operation and prevent damage. The C-Cab XXL should never tip over during transport or use. Maintain a stable base and avoid sudden movements that could lead to imbalance. Tipping can cause equipment malfunction, potential injury, or damage to the unit.

The inverters can be moved using an overhead lift. Prior to lifting inspect eyebolts to make sure they are free from defects, they are fully threaded in perpendicular to the roof of the cabinet, and torque marks are aligned. The center of gravity is located as follows:

Table 9 - The C-Cab XXL center of gravity locations:

	Front Left [kg (lbs)]	Front Right [kg (lbs)]	Rear Left [kg (lbs)]	Rear Right [kg (lbs)]	Total [kg (lbs)]	CoG from Front [mm (in)]	CoG from Left [mm (in)]
C-Cab XXL Only	339 (748)	357 (786)	368 (811)	344 (758)	1551 (3420)	510 (20.1)	600 (23.6)
C-Cab XXL & Crate	402 (886)	405 (893)	407 (898)	403 (888)	1838 (4052)	643 (25.3)	348 (13.7)

The center of gravity is located 1, 447 mm (57”) vertically from the base of the C-Cab XXL.

Install the four lifting eyes (eyebolts) on the top of the C-Cab XXL. The rings specifications are Ø29mm (Ø1.14in.) see Figure 40 page 58 for the locations. Using a combination of spreader bars, lift the C-Cab XXL ensuring only a vertical force on each eyebolt. Side loading can damage the lift points.

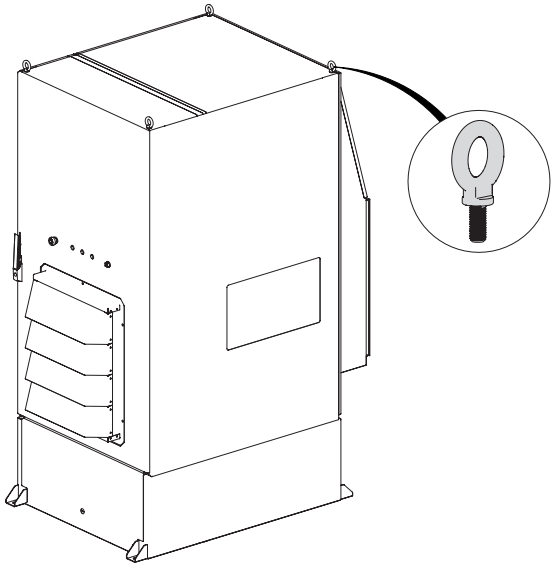


Figure 37. C-Cab XXL Lifting Eye (Eyebolt) location

5.5.3.2. M-Cab XXL Handling

Install the four lifting eyes (eyebolts) on the top of the M-Cab XXL. The rings specifications are Ø30mm (Ø1.18in.) see Figure 41 for the locations. Using a combination of spreader bars, lift the M-Cab XXL ensuring only a vertical force on each eyebolt. Side loading can damage the lift points.

WARNING!

When handling the M-Cab XXL, observe the following precautions to ensure safe operation and prevent damage. The M-Cab XXL should never tip over during transport or use. Maintain a stable base and avoid sudden movements that could lead to imbalance. Tipping can cause equipment malfunction, potential injury, or damage to the unit.

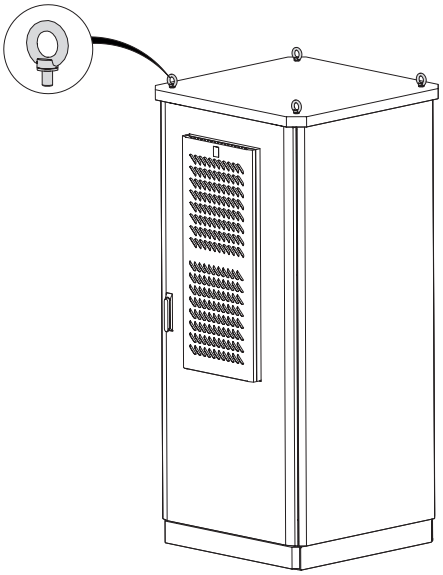


Figure 38. M-Cab XXL Lifting Eye (Eyebolt) location

5.5.3.3. B-Cab XXL Handling

At the top of the B-Cab XXL, there are a total of four lifting eye points. These eye points consist of 22mm (approximately 7/8 inch) diameter holes specifically designed for lifting purposes. See Figure 37.

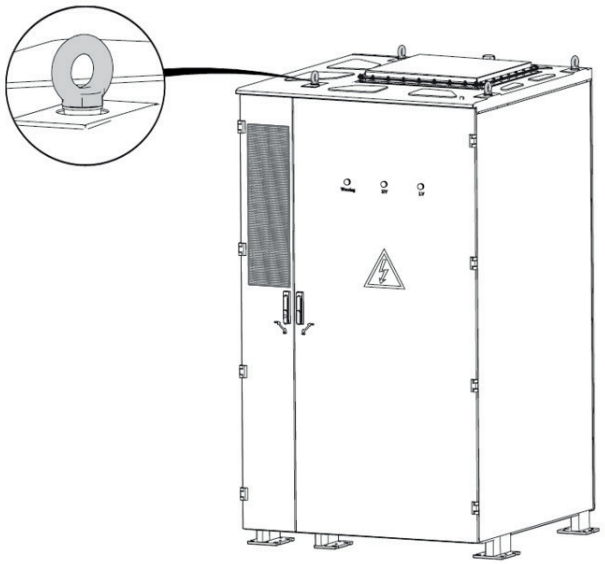


Figure 39. Lifting Eye location on the top of B-Cab XXL

WARNING!
When lifting from the lift points it is highly recommended to use a vertical spreader.
Do not use slings or straps without a spreader to lift from above. Keep the tilt angle smaller than 5° during hoisting.

WARNING!
The tilt angle should be no greater that 5° during hoisting

5.5.3.4. Examples of a vertical spreader

A vertical spreader hoisting device is a mechanical piece of hardware designed for lifting and positioning heavy loads in a vertical direction. It typically comprises a robust frame, sturdy cables or chains, and a mechanism for controlled rise and decline of the load. The spreader hoist ensures that the load remains stable and evenly distributed during lifting operations, promoting safety and efficiency in material handling tasks.

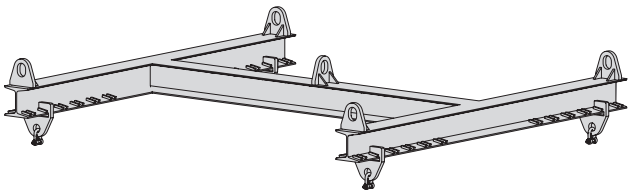


Figure 40. Vertical spreader hoist frame

Figure 41. Vertical adjustable spreader hoist

6. SYSTEM INSTALLATION

The instructions provided here are intended as a guide to the installation of the unit. Please review and become familiar with the requirements for the installation of the equipment in this section before proceeding with the actual installation. For further support, please contact Socomec.

	**HAZARD OF ELECTRIC SHOCK OR ARC FLASH** The system shall be installed in accordance with local electrical, building, fire and other codes or utility requirements as applicable to the installation and equipment, by qualified service personnel in accordance with the installation instructions and appropriate practices. Before working on this equipment ensure that all power is off and locked out following safe lock-out procedures Use appropriate personal protective equipment (PPE) and follow safe electrical work practices (see NFPA 70E) when working in close proximity to live electrical circuits Ensure all covers and doors are in a closed condition prior to applying power.
	**DANGER OF TIPPING IF NOT PROPERLY HANDLED** Provide vertical support while moving the unit due to its height and relatively high center of gravity; move slowly with care to avoid tipping Ensure that lifting devices evenly distribute the load over the base or lifting eyes (eyebolts) if used.

6.1. Installation guidelines and considerations

The unit to be installed in accordance with the prevailing local and National Electric Codes such as National Electric Code (NEC) in the USA or Canadian Electric Code in Canada. The the AHJ (Authority having jurisdiction). Requirements may include, but not limited to:

1. The unit is intended for connection to a 3-phase 4-wire system with Neutral bonded to the facility ground. The unit neutral is not internally bonded to the enclosure and relies on the electrical system bonding.
2. Input upstream overcurrent protection will be required by code specified by the engineer of record for the site for the protection of the input power cabling even though the unit has integrated overcurrent protection.
3. Minimum access front aisle clearance: typically 48” (1.2 m), refer to codes
4. Side clearance: No obstruction on the left side of the unit (M-Cab XXL) for a minimum 6» inches away
5. Appropriately rated feeder and load conductors
6. Grounding: Chassis Safety Grounding of the enclosure is mandatory (Electric Code requirements); # 2/0 minimum recommended
7. AC cabling:
    a. Cable entry: Bottom. Refer to outline drawing.
    b. Method of routing: Conduit.
    c. Conduits and hubs must be rated for the insulation environment.
    E.g.: Type 3R for outdoor installations.
8. Battery connections:
    a. Cable entry: Back bottom. Refer to outline drawing.
    b. Method of routing: Using provided auxiliary cable gutter/Trough.
9. Torque all connections using tables in Section 6.1.2 as a guide (or per specific manufacturer instructions)
10. The batteries in this equipment have been tested to UL 9540A; refer to the UL 9540A test reports for cell test Project No. 4790838636.3 dated 2023-08-24, module test done by CSA Group: Project No. 4790880512.1 dated 2023-11-10, and unit test done by CSA Group: Project No. 4790880512.2 dated 2023-12-28. Contact Powersmiths for the copy of this report.

The following additional points should be considered in choosing a location:

- Location: The unit cannot be installed outdoors within 1.24 miles (2 kms) from the sea. Contact factory to install the unit at distance less than mentioned above.
- Ventilation Clearance: Refer to Section “6.2.1. Ventilation Clearance Requirement”, page 62
- Heat Load: Heat load must be considered for indoor applications. Refer to the specifications.
- Operational, Maintenance and Wiring Access: Check that the required access is available at the installation site.

Note: wiring access on the right side and bottom of the unit and see section on cabling (Refer outline drawings given below).

6.1.1. Environmental Conditions

The SUNSYS HES XXL is engineered to operate under the specified environmental conditions. This means that it's been designed with certain environmental factors in mind, and it should perform optimally when installed in environments that meet these conditions.

The unit is suitable for installation outdoors, Type 3R rated within the limits of its temperature rating. The table defining its required environment is listed below:

Table 10 - Environmental Conditions for the System:

External Operating Condition		
Parameter	**Unit**	**Specification limits**
Environment Installation		Outdoor
Operating Temperature	M-Cab XXL, C-Cab XXL (PCS)	-20°C to +40°C without derating; 60°C with derating
	B-Cab XXL	-30°C to +55°C
Storage Temperature	M-Cab XXL, C-Cab XXL (PCS)	-30°C to +55°C
	B-Cab XXL	-30°C to +60°C
Relative Humidity	SUNSYS HES XXL	5-95% (non-condensing)
Max. altitude above sea level	SUNSYS HES XXL	1000 m (3280ft) without derating 10% derating per 1000 m (3280ft) up to 3000 m (9840ft)
Degree of protection	SUNSYS HES XXL	UL Type 3R – IP55
Saline environment	SUNSYS HES XXL	Class C3
Seashore distance	SUNSYS HES XXL	> 500m (inferior distance on demand)
Seismic	SUNSYS HES XXL	ASCE/SEI 7-22 with Sds 0.8g / 1.6g / 2.5g
Noise level dB(A)	SUNSYS HES XXL	< 75 dBA @ 3m

6.1.2. Torque Reference Table

Refer to the following tables for guidance and recommended torques for mechanical fasteners, electrical terminals and mechanical lugs.

Table 11 - Recommended Torques for metric (dry zinc) bolted class 8.8 fasteners:

Bolt Nominal dia. (mm)	Pitch	Clamp load (lbs.)	Torque (ft-lbs.)
4	0.7	858	1.9
5	0.8	1387	3.9
6	1	1968	6.6
7	1	2822	11.0
8	1.25	3580	16.0
10	1.5	5671	31.6
12	1.75	8240	55.1
14	2	11289	88.1
16	2	15320	137
18	2.5	18822	189
20	2.5	23938	267

Table 12 - Recommended Torques for imperial (dry zinc plated) bolted class 5 fasteners:

Bolt Nominal dia. (in.)	Threads per inch	Tensile stress area (sq. in.)	Clamp load (lbs.)	Torque (in-lbs.)		
				K=0.15	K=0.17	K=0.20
1/4	20	0.0318	2029	76	86	101
5/16	18	0.0524	3342	157	178	209
3/8	16	0.0775	4940	23 ft-lbs.	26 ft-lbs.	31 ft-lbs.
7/16	14	0.1063	6777	37	42	49
1/2	13	0.1419	9046	57	64	75
9/16	12	0.1819	11599	82	92	109
5/8	11	0.2260	14408	113	128	150
3/4	10	0.3345	21322	200	227	267

Table 13 - Recommended Torques for electrical mechanical lugs:

Wire Size	Torque Inch/lbs.	Wire Size	Torque Inch/lbs.	Wire Size	Torque Inch/lbs.
14	75	6	110	2/0	180
12	75	4	110	3/0	250
10	75	2	150	4/0	250
12	75	1	150	250/350 mcm	325
8	75	1/0	180	500 mcm	375

6.2. Clearance Distances

6.2.1. Ventilation Clearance Requirement

The C-Cab XXL is equipped with two intake vents and an exhaust fan at the back to facilitate air circulation. When installing the C-Cab XXL, it's crucial to ensure that these vents are not blocked in any way. Additionally, there should be a minimum space of 2 meters behind the C-Cab XXL, extending both upwards and sideways. This clearance is necessary to maintain proper airflow.

6.2.2. Maintenance Clearance Requirement

The doors of the cabinet should be able to open completely without obstructions or any obstacles. The back of the C-Cab XXL cabinet houses the cooling unit, the cooling unit should be easy to remove. This needs to be accessible for maintenance of the C-Cab XXL cooling unit. For the B-Cab XXL, there must be an open area in front of the cabinet. This space is essential for installing and removing battery racks using either a forklift or Gradall with a hoisting capabilities.

Note: make sure to adhere to local code regulations regarding clearances when opening the doors of all enclosures (M-Cab XXL, C-Cab XXL, and B-Cab XXLs) for maintenance purposes.

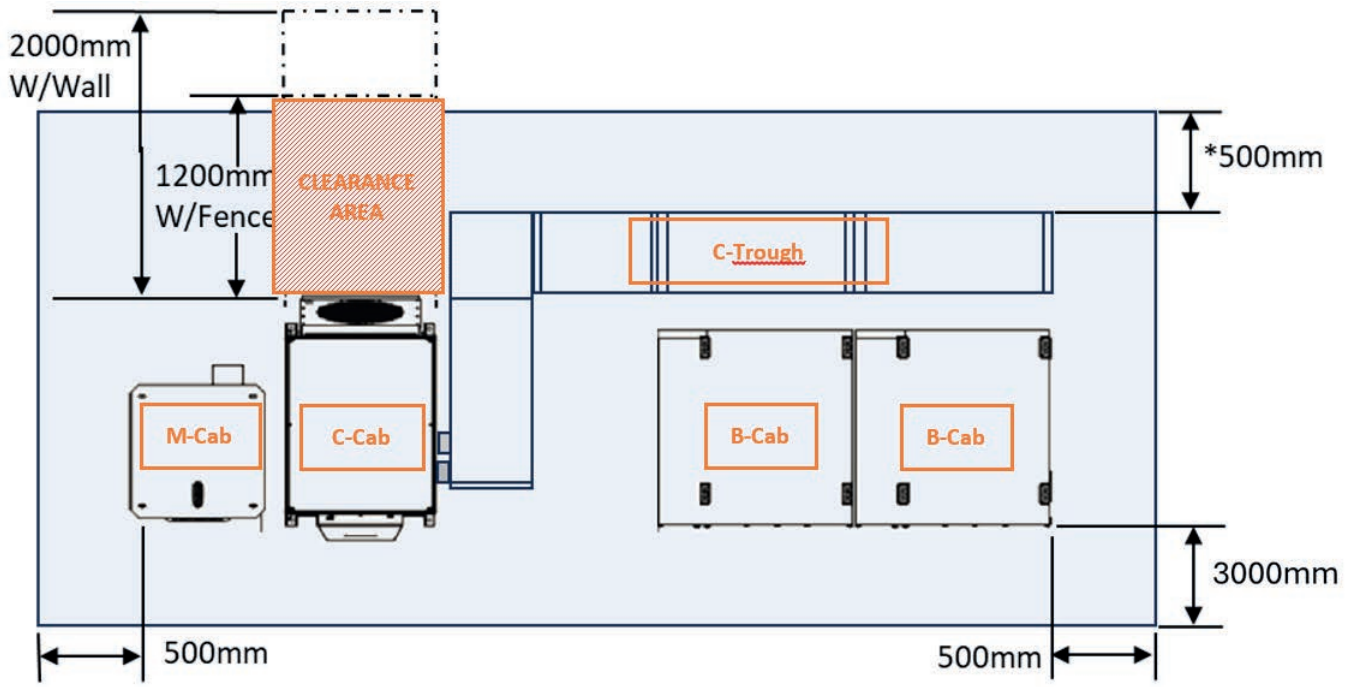


Figure 42. Maintenance Clearance Distances In-Line Configuration

Note: 20mm clearance is needed between all live metal components with each other and ground in the DC and AC area for throated and non-throated units.

* You need at least 500mm (20in) of space to operate. If there's a back fence that can be taken off and does not block air circulation, you can set it up with a gap of 100mm (4in) for proper air circulation. When you take away the fence, you'll regain the needed space for maintenance operations.

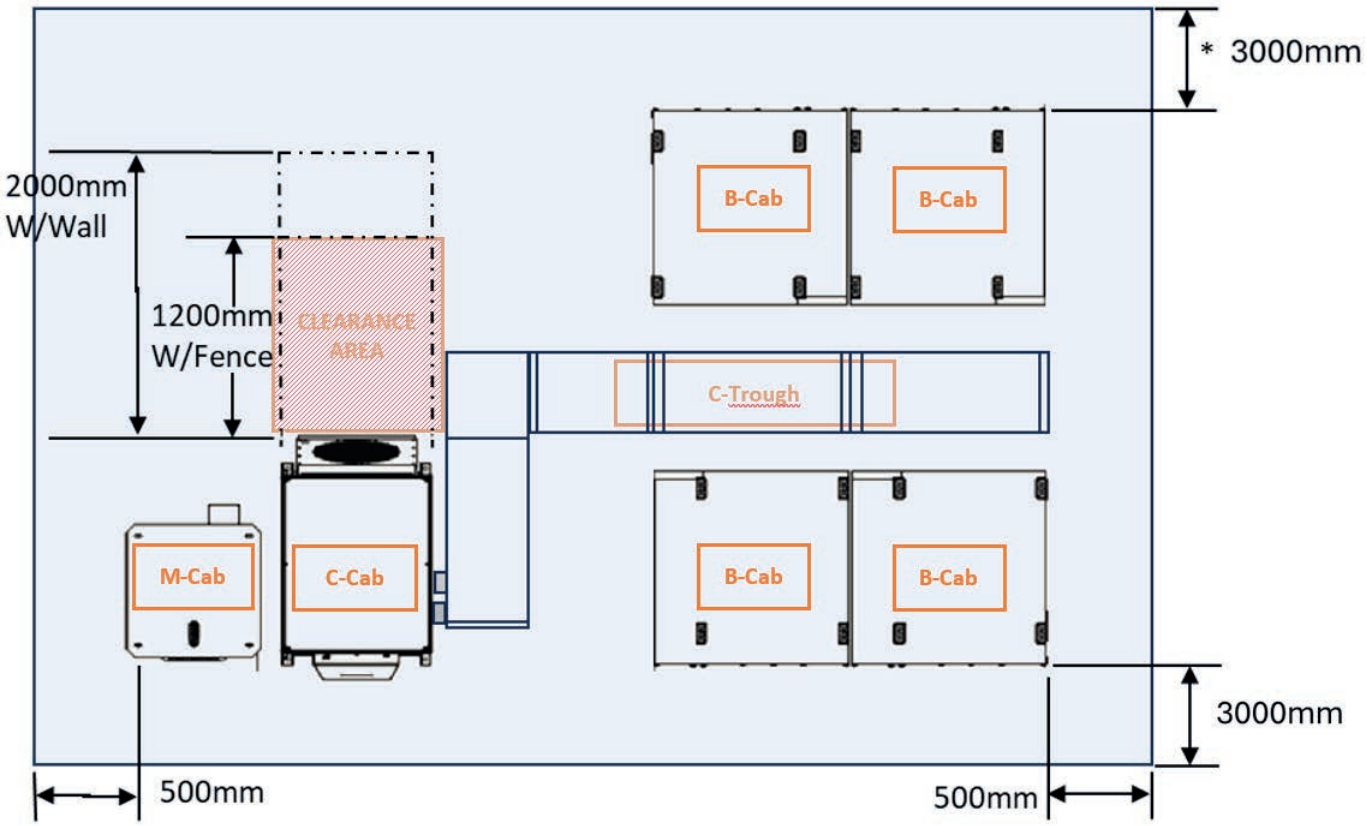


Figure 43. Maintenance Clearance Distances Back-to-Back Configuration

Note: 20mm clearance is needed between all live metal components with each other and ground in the DC and AC area for throated and non-throated units.

* You need at least 3000mm of space to operate. If there's a back fence that can be taken off and does not block air circulation, you can set it up with a gap of 100mm (4in) for proper air circulation. When you take away the fence, you'll regain the needed space for maintenance operations.

6.2.3. Installation of Several C-Cab XXLs

When you're setting up multiple C-Cab XXLs, it's important to adhere to certain guidelines. These recommendations are designed to ensure a smooth installation process and optimal performance of the systems. Let's delve into these recommendations in more detail. Follow the recommendations of the specified dimensions in Figure 44.

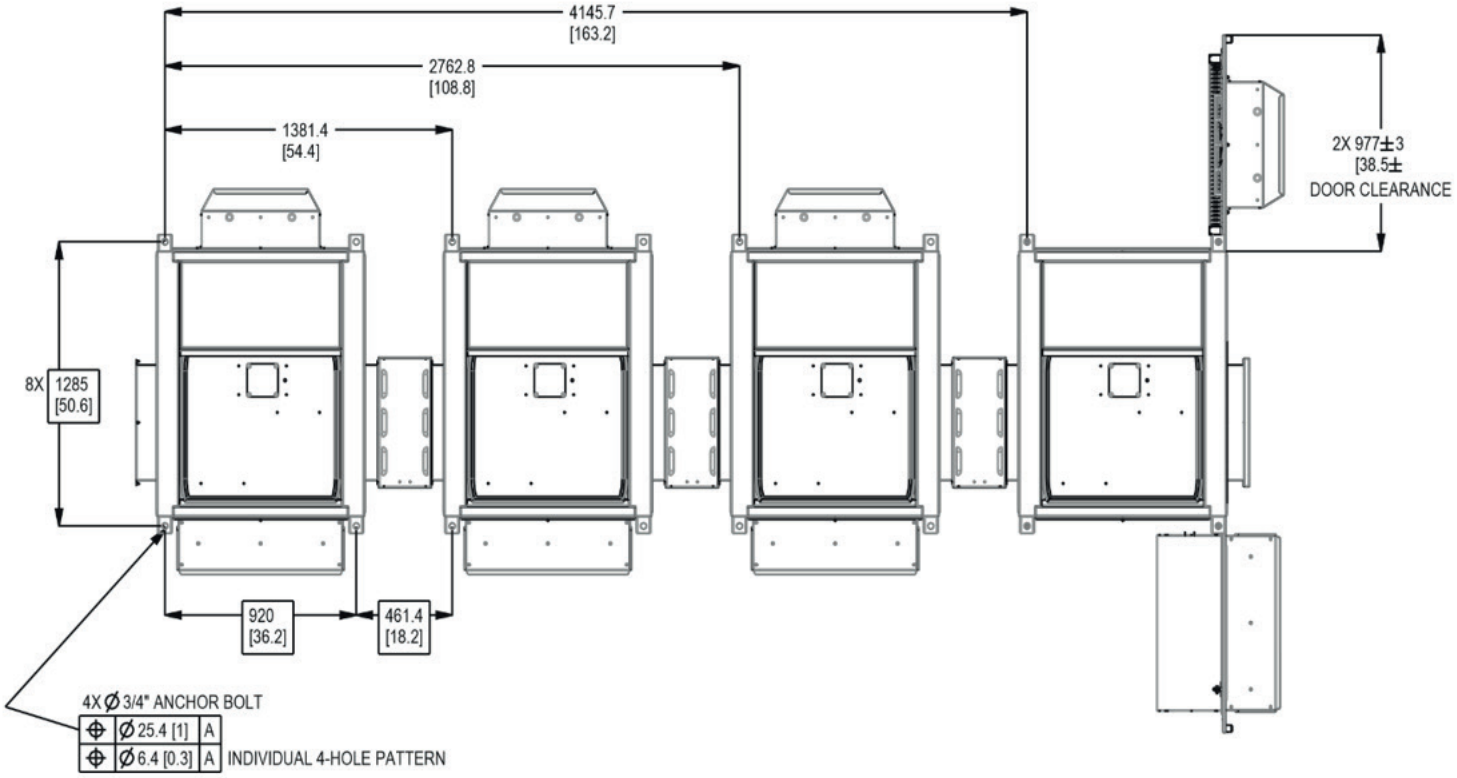


Figure 44. C-Cab XXL to C-Cab XXL installation Clearance

WARNING!

The system should be positioned at least 3 meters (or 10 feet) away from the specified exposures. This means there should be a clear space of 3 meters or 10 feet between the system and these exposures. This is to ensure safety and proper functioning of the system. The term "exposures" here refers to any objects or areas that could potentially affect or be affected by the system. It's important to maintain this distance to prevent any interference or potential hazards. The system shall be separated from:

- Property lines, boundary lines, or parcel of land, or Public access ways.
- Buildings, or Stored combustible materials.
- Hazardous materials, or Hazards that are not related to the electrical grid infrastructure.
- Stacked inventory (items exceeding 3m/10ft high).

Contact factory in case of specific needs.

6.3. Positioning the M-Cab XXL, C-Cab XXL and B-Cab XXLs

When planning the site, you need to carefully consider the arrangement of the M-Cab XXL and C-Cab XXL in relation to the B-Cab XXL (which are the battery cabinets) and the conduit cabling connected to them. You should refer to the outline drawing that comes with the unit. This drawing will show you where everything should be placed relative to each other and where the cables should enter. It will also indicate if there is a cable gutter used for DC interconnections.

Note: if you don't have the drawings at hand, you can get the necessary ones by reaching out to Socomec.

The engineer responsible for the site installation needs to provide all the necessary details for preparing the site. This includes how to attach everything (like using a concrete pad or screw piles), how to handle the cabling, and how to secure everything against seismic events.

Note: an anchorage study can be found in Appendix 2, but it's only for reference. The engineer responsible for the project must verify the site and local requirements.

A set of drilling templates for the M-Cab XXL, C-Cab XXL, and battery cabinets, which are meant to be drilled in place, should have been included in the shipment with the units. These templates are designed to help ensure the units and the cable gutter for the DC interconnections are accurately positioned relative to each other.

The templates come as strips that can be interlocked. Each strip is numbered to help you place them correctly on the prepared mounting spot. Together with the outline drawing, these templates will show you the precise location for each cabinet. Please remember that all cabinets are designed to be drilled in place only.

Instructions described below are as viewed from the top of the system, with M-Cab XXL, C-Cab XXL placed to the left-hand side and B-Cab XXLs to the right-hand side of the complete layout.

WARNING!
Thoroughly review the complete installation instructions and be sure the process is clearly understood before attempting the installation of the system.

Here are some suggested layout options. You can arrange the units in either an In-Line Figure or a Back-to-Back Figure 45 configuration. Please adhere to the provided recommendations, as these are the configurations that are supported.

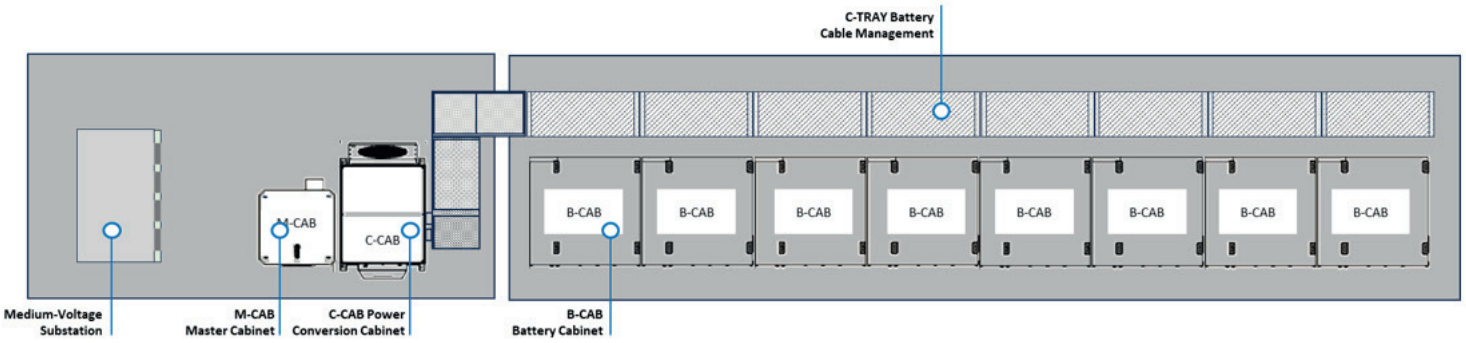


Figure 45. Up-to 8 B-Cab XXL In-Line configuration

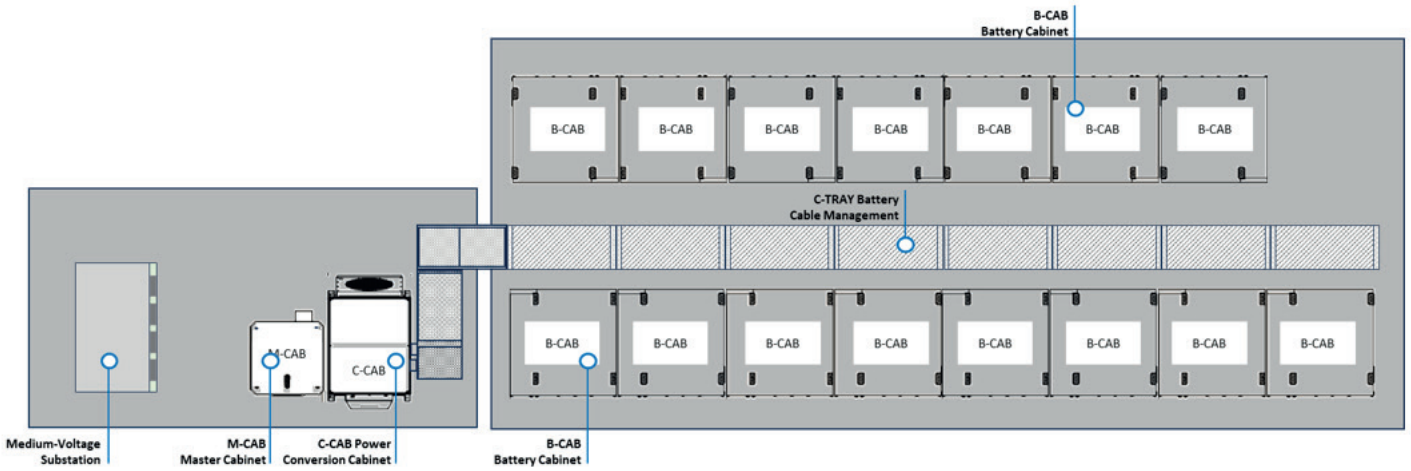


Figure 46. Up-to 15 B-Cabs XXL Back-to-Back configuration

Before you place the C-Cab XXL, remember to consider where the conduit entry points are and make sure there's enough space for ventilation. Also, you should use the provided template to pre-drill the holes for anchoring the M-Cab XXL and B-Cab XXL in the concrete pad. Once that's done, you can install the mechanical anchors before you position the cabinet. Note that the C-Cab XXL is designed to be drilled in place at least 4 legs of the B-Cab XXL is designed to drill in place also.

Utilize the template that was provided with the system to get the mounting location ready and to place the cabinets where they're supposed to go. Make sure to follow the instructions given in the template to properly prepare the mounting location.

6.3.1. Recommended Cabinet Order

The cabinets should always be arranged in this order: first the C-Cab XXL, then the B-Cab XXL, and finally the C-Cab XXLs. Whether you start arranging them from the left or the right, the order is up to the installer.

See Figure 47, the recommended layout.

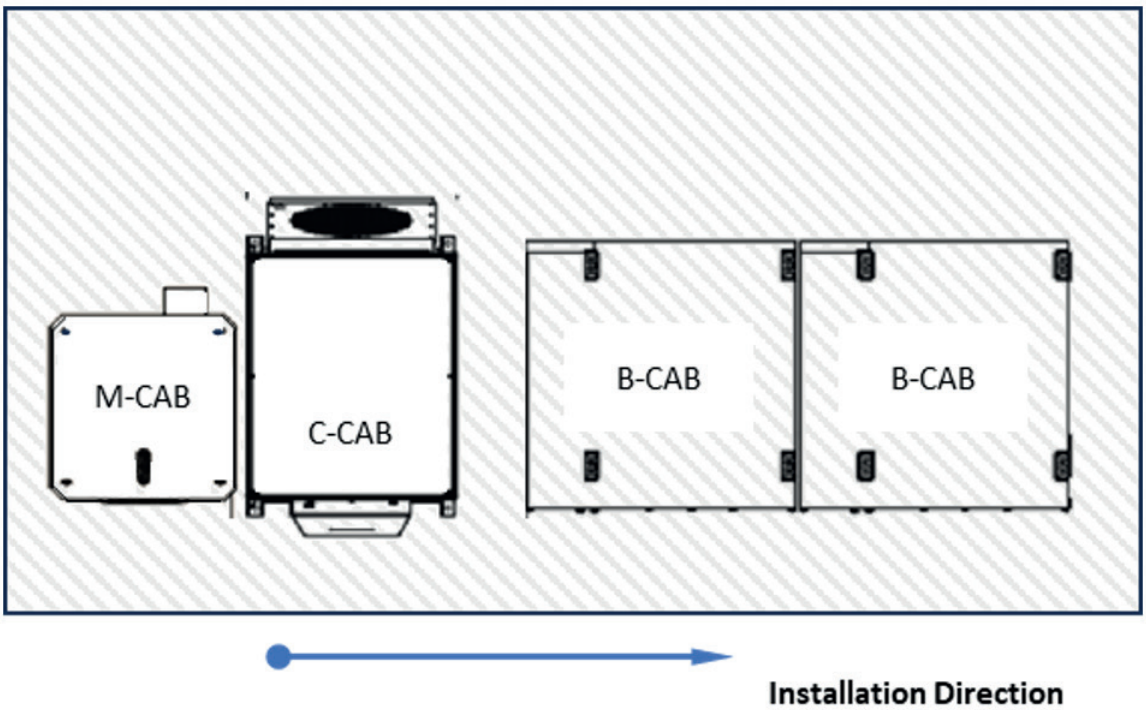


Figure 47. Recommended Layout Orientation

6.3.2. Drilling and Marking

Begin by identifying all the locations that have been marked for drilling. These marks indicate where the anchor rods need to be installed. The anchor rods are crucial components that ensure the stability and security of the structure of all the cabinets.

For the M-Cab XXL, use anchor rods that have a diameter of M12 or ½ inch. These dimensions are specifically suited for the M-Cab XXL, providing the necessary strength and fit.

For the B-Cab XXL and C-Cab XXL, the anchor rods required have a larger diameter of M16 or 5/8 inch. The increased diameter provides additional strength and stability needed for these structures.

Remember, using the correct diameter for each type of cabinet is essential for the safety and effectiveness of the installation. Always double-check your measurements before drilling and installing the anchor rods.

6.3.3. Positioning the Cabinets in Place

Prior to the installation process, it's crucial to ensure that the base for the cabinets is level. This can be achieved by using shims, which are thin pieces of material used to fill gaps or spaces between objects. Shims help in adjusting the level of the base to make it perfectly horizontal.

However, it's important to note that there are maximum allowable deviations for the levelness of the base. These deviations are measured in two directions: vertical and horizontal.

In the vertical direction (up and down), the maximum deviation allowed is 2mm or 0.06 inches. This means the difference in height between any two points on the floor should not exceed this limit.

In the horizontal direction, there are two measurements to consider: left to right, and front to back. For both these measurements, the maximum deviation allowed is plus or minus 7mm or 0.25 inches. This means the difference in level between any two points on the base, either from left to right or from front to back, should not exceed this limit.

By adhering to these guidelines, you can ensure a level and stable base for the installation. Remember, a properly leveled floor is key to a successful and secure installation.

Begin the installation process by positioning the cabinets, starting with the C-Cab XXL in the right location. Follow these steps for a successful installation:

1. A**ccess Panel Removal:** Start by removing the front, rear and side access panels. These panels are typically secured with screws or latches.
2. **Ventilation Hood Removal:** If your cabinet has a front ventilation hood, remove it. This might not be applicable to all models. Skip this step if it does not apply to your unit.
3. **Floor Panel Removal:** Next, remove the conduit entry base panel. This is where your wiring will enter the cabinet. This step can be skipped if installing the AC power runs from the left side of the C-Cab XXL.
4. **Positioning the C-Cab XXL:** Now, carefully position the C-Cab XXL in its designated location.
5. **Throat Connection:** (If paralleling the C-Cab XXLs follow this step, or else go to the next step). If your installation includes a throat connection, complete this step before proceeding. Refer to the 'Throat Connection' section of your manual for detailed instructions.
6. **Securing the C-Cab XXL:** Secure the C-Cab XXL to the ground using the four pre-installed 5/8 inch anchor bolts. Each bolt goes into one of the four pad mounting holes.
7. **Preparing for Conduit Entry:** Measure the position of the bottom entry metal base panel removed in step 3 for conduits locations and cut holes in the provided bottom conduit entry plate. These holes should be slightly larger than the conduits to allow for trade conduit sizes. For the AC cables, ensure the phases are balanced going through each conduit as per local NEC code requirements.
8. **Floor Panel Installation:** Install the floor panel and seal the entry points. Make sure there are no gaps between the floor panel and conduits entry. As this will allow rodents and other animals to enter into the live parts.
9. **Reinstalling Panels and Hood:** Reinstall the access panels and the ventilation hood, if applicable.
10. **Paint Check:** Inspect the entire surface of the C-Cab XXL for any defects in the paint. Fill any defects and repair any damage to the paint once installation is complete. This is crucial to prevent corrosion.
11. **Door Closure:** Ensure that both the front and rear doors are fully closed and secure.

After the C-Cab XXL is installed, proceed with the installation of the M-Cab XXL, and finally, the B-Cab XXLs. Each cabinet should be installed using the same detailed steps.

Note: on sealing the conduit entry:

1. Once the conduit entry floor panel is reinstalled the conduit must be sealed around its outer surface to prevent moisture, dust, air and debris from entering the cabinet.
2. Once the power lines are installed and are in their final position any excess space in the conduit must be sealed with an expansion foam or sealant to prevent moisture, dust, air and debris from entering through the conduit. Ensure that the chemistry of the foam/sealant used to seal the interior of the conduit is compatible with insulation used in the power cables and that the maximum expected temperature of the cables does not exceed that of the degradation temperature of the foam/sealant. Improper sealing could compromise the enclosure.

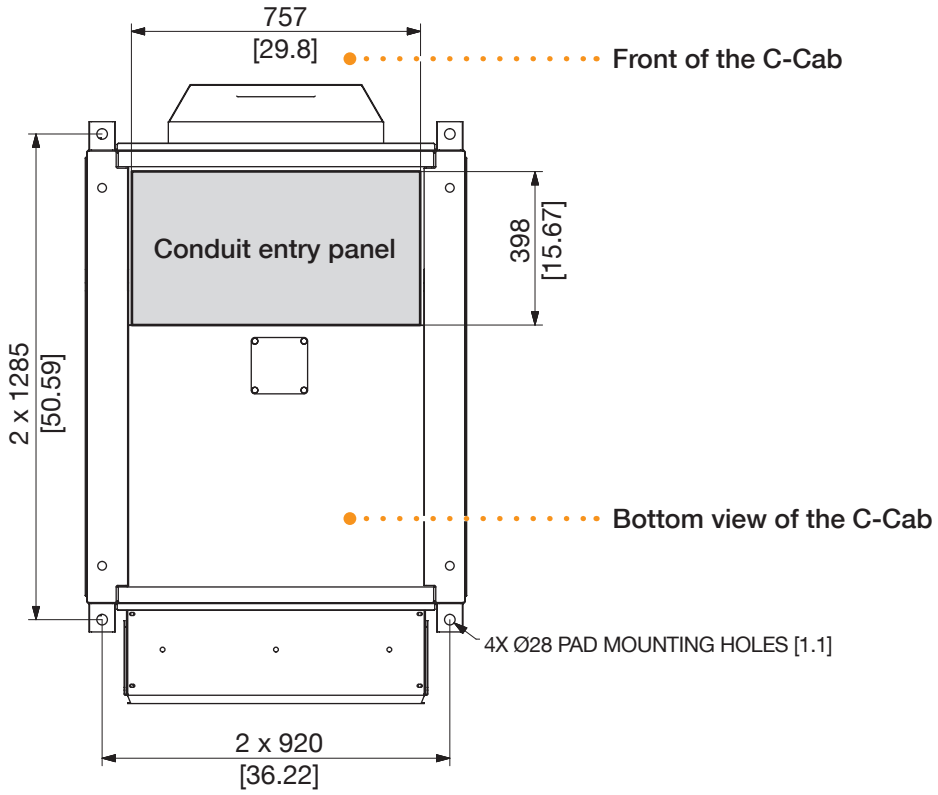
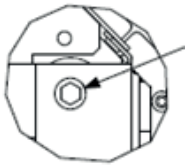
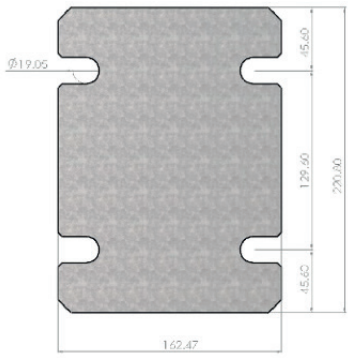
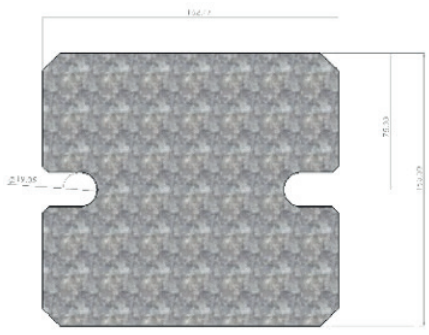


Figure 48. C-Cab XXL with cable entry dimensions

Table 14 - Fastner recommendation

Enclosure Type	Anchoring Holes	Anchor bolt size	Torque**
C-Cab XXL		M16 / 5/8 inch	120Nm / 88 ft-lb
M-Cab XXL		M12 / ½ inch	75 Nm / 55 ft-lb
B-Cab XXL		M16 / 5/8 inch	120Nm / 88 ft-lb
		M16 / 5/8 inch	120Nm / 88 ft-lb

** Follow the torque specifications of anchor means used.

6.3.4. Positioning the System

6.3.4.1. The layout of the System

The system's reference layout is illustrated in Figure 49. This diagram serves as a guide for arranging the system. To assist with the precise placement of each component, we will utilize the provided template. These templates ensures that all parts are correctly positioned according to the design specifications.

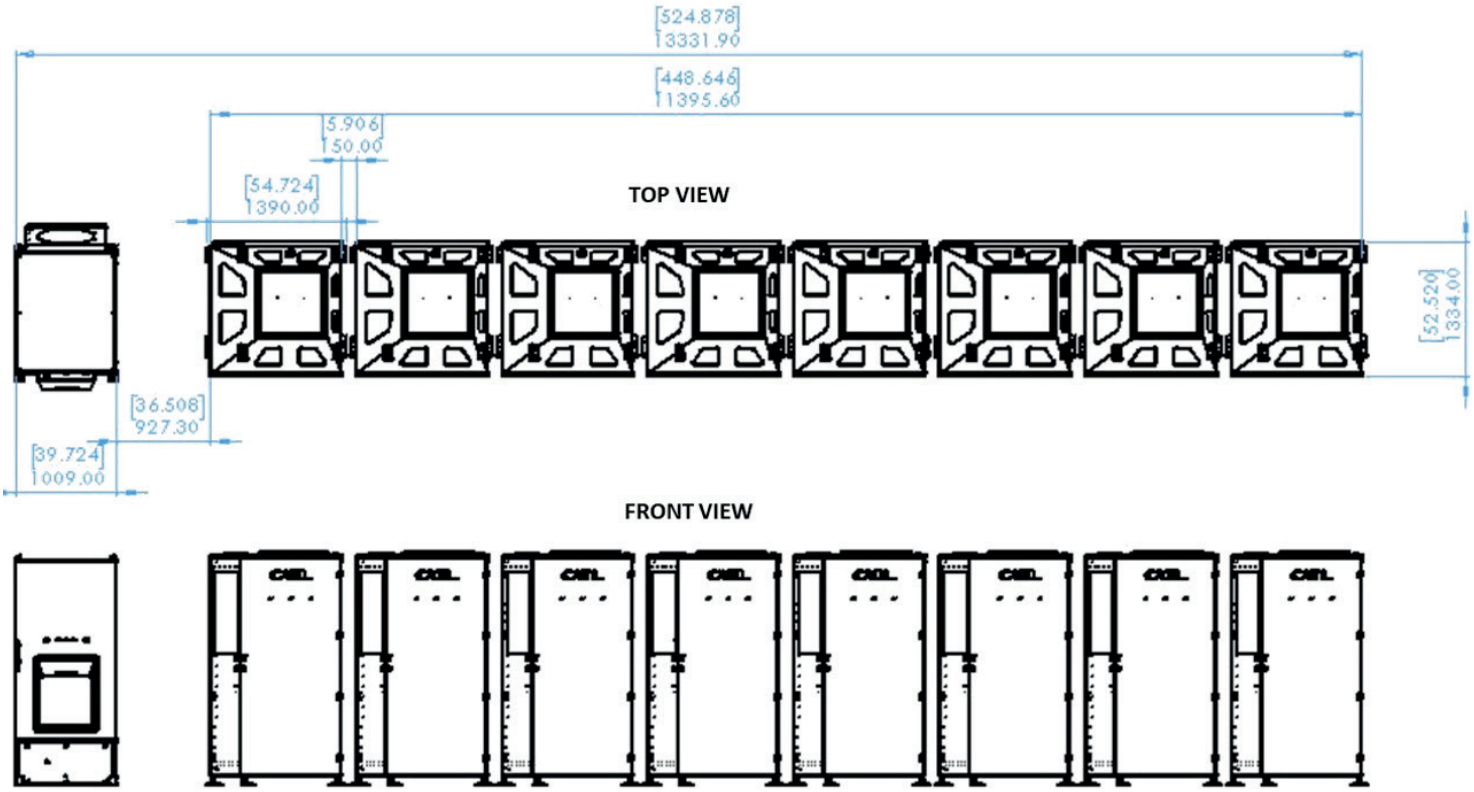


Figure 49. C-Cab XXL with 8 B-Cab XXL Layout with Dimensions

6.3.5. Positioning the C-Cab XXL

The C-Cab XXL is designed with installation in mind, as it already includes a built-in drilling solution as Figure 53. This eliminates the need for a separate drilling template, simplifying the installation process. However, it's crucial to ensure that there's ample floor space for the C-Cab XXL to be installed between the M-Cab XXL and B-Cab XXL.

Maintain a minimum gap of 100mm between the C-Cab XXL and M-Cab XXL. This is not just to allow the doors of the cabinets to open without obstruction, but also to provide room for future installations. This space will be utilized later for the installation of cables and harnesses that establish a connection between the M-Cab XXL and C-Cab XXL.

The B-Cab XXLs, which house the batteries, are strategically positioned to the right of the C-Cab XXL when looking from the front of the C-Cab XXL. But it's the space between the C-Cab XXL and B-Cab XXL that's particularly important. This is where the C-Trough is installed. The C-Trough serves a vital role in connecting the B-Cab XXLs to the C-Cab XXL, ensuring a seamless flow of power.

In summary, the installation process requires careful planning and precise measurements. By following these guidelines, you can ensure a successful and efficient setup of your SUNSYS HES XXL system. Remember, the key to a smooth installation is understanding the spatial requirements of each component and their relation to each other.

For location of the anchor points see Figure 50 circled in red are the drill points locations.

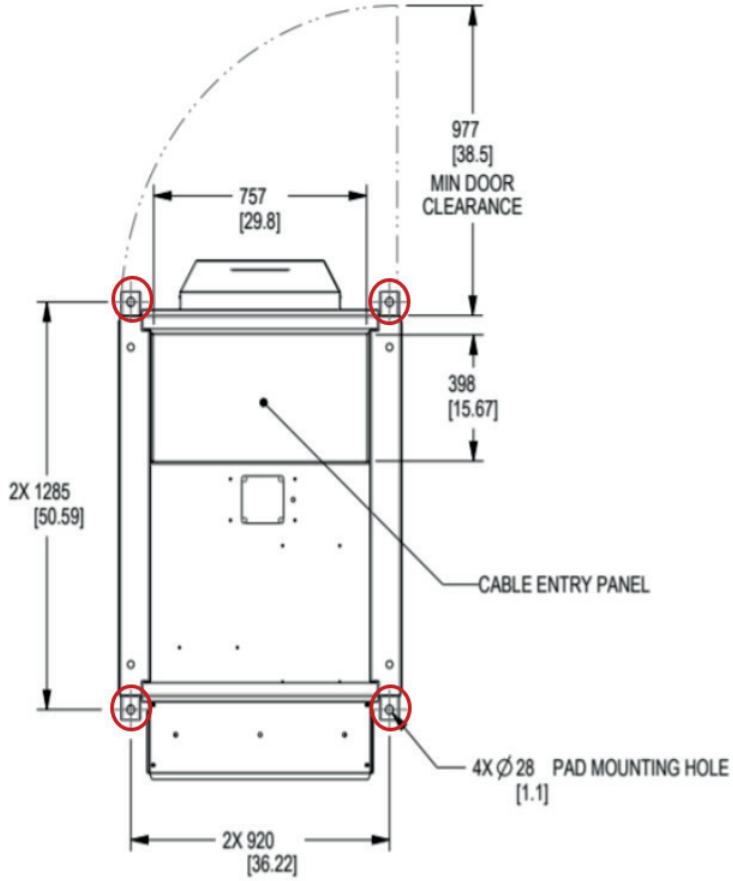


Figure 50. C-Cab XXL Anchor Foot Dimensions (units in mm [in])

6.3.5.1. Positioning the C-Cab XXL with Template

To prepare the mounting locations of the cabinets as shown in the outline drawing (refer to Figure 52), follow these steps:

1. **Gather and Position Templates:** Locate the templates #1, #2, #3 & #4. Position them as illustrated in Figure 54. Make sure that they are properly assembled and fit together correctly.
2. **Mark Mounting Holes for C-Cab XXL:** Place the assembled template on concrete pad. Mark the holes highlighted in red for the mounting location of the C-Cab XXL. Do not remove the template, keep the template in place and follow the next step.

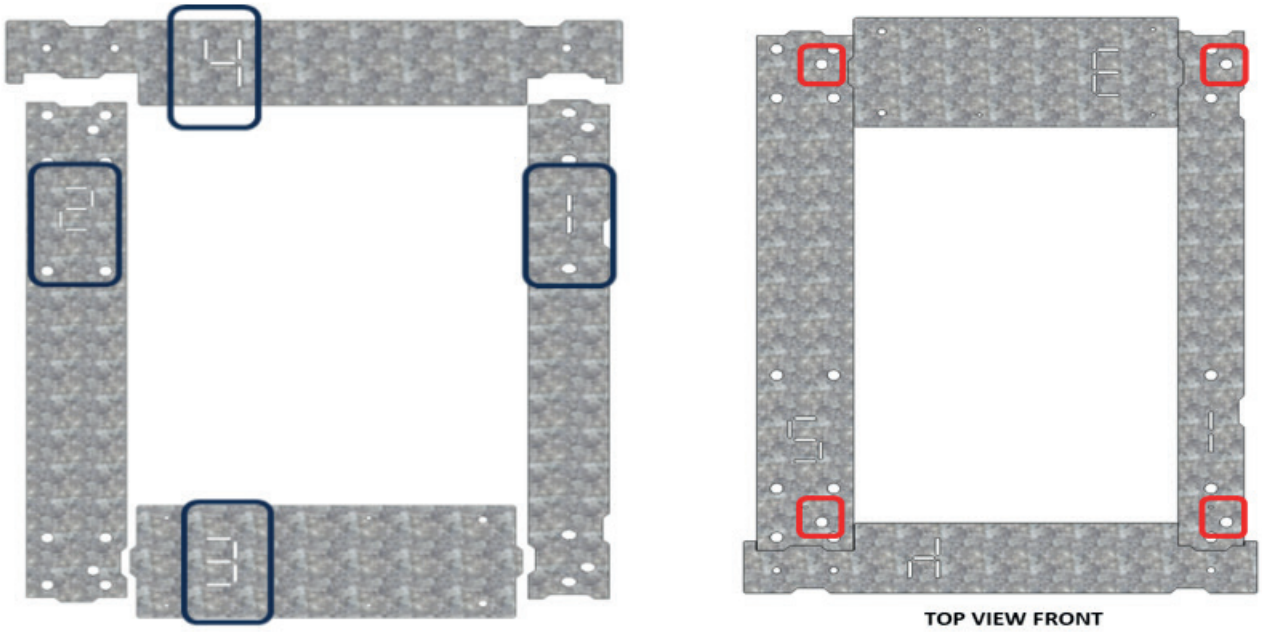


Figure 51. C-Cab XXL Positioning Drilling Template

3. **Position Next Template**: Find the second #3 template and position the template in the notch beside the #1, as shown in yellow in Figure 52.
4. **Mark Mounting Holes for C-Trough**: Mark the holes highlighted in red for the mounting location of the C-Trough. Do not remove the template.

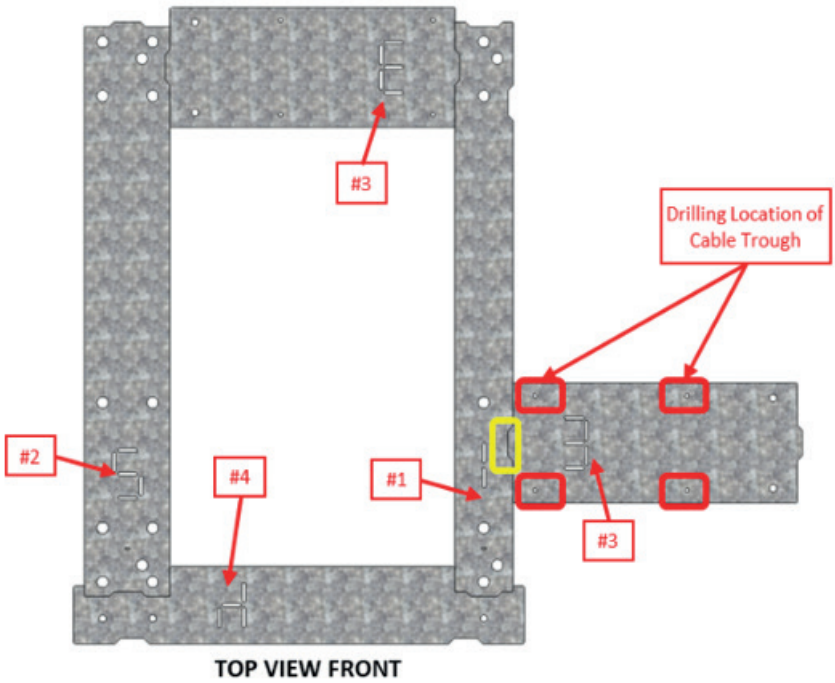


Figure 52. C-Cab XXL Positioning with Cable Trough Positioning Drilling Location

5. **Reassemble another Template with New Orientation**: Locate another set of templates #1, #2, #3 & #4. Assemble them as before, but this time orient the assembly 90 deg to the C-Cab XXL drilling template and also flip it top to bottom. The template should be as shown as in Figure 53 for the correct positioning.
6. **Mark New Drilling Locations**: Mark the drilling location as shown in red in Figure 53.

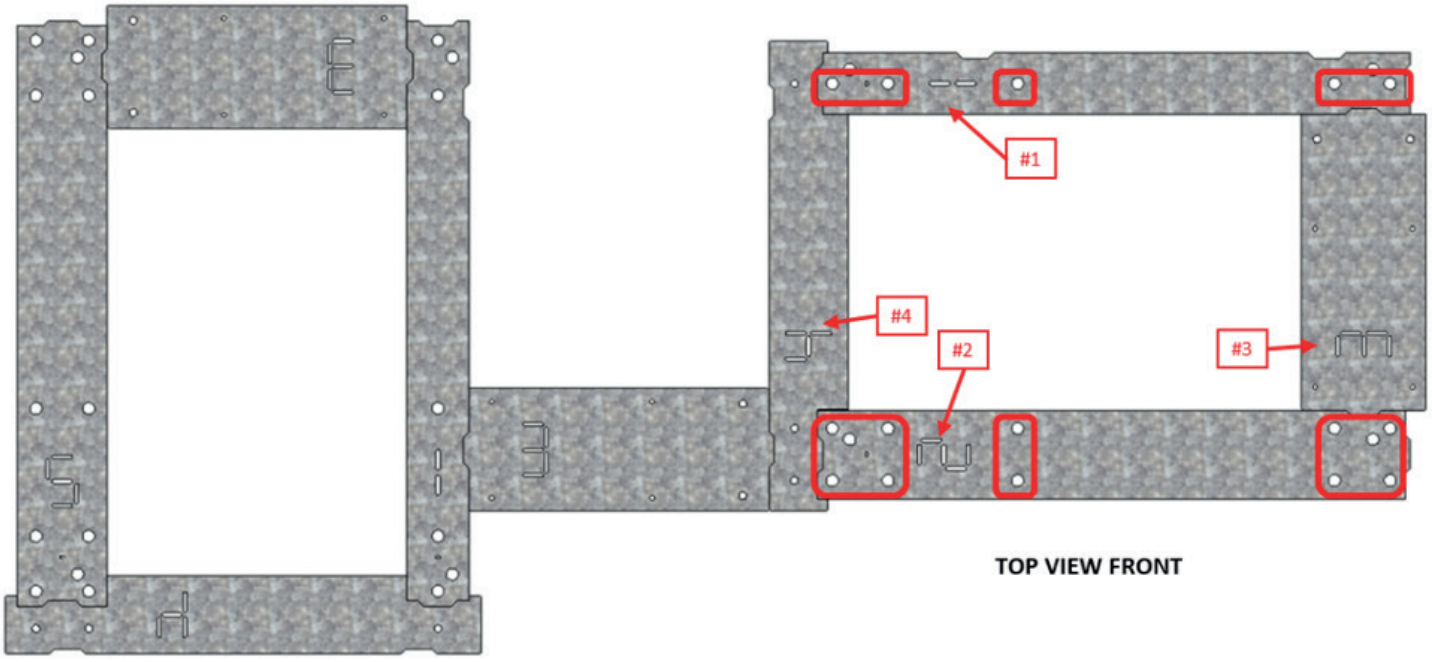


Figure 53. Drilling Template with C-Cab XXL Template Location and 1st B-Cab XXL Drilling Template

7. Align C-Cab XXL Template with B-Cab XXL Template: Without removing the B-Cab XXL template, move the previous assembled C-Cab XXL template and align it with the right side of the 1st B-Cab XXL template for clear steps follow with the installation of the B-Cab XXL in section “6.3.6. Positioning the B-Cab XXL”, page 74.
8. Position the C-Cab XXL: Remove packaging materials. Remove the C-Cab XXL template as specified in step 7, then position the C-Cab XXL in the marked position.
9. Drill and Install Bolts: On the concrete pad, drill and install 5/8 inch Hilti bolts in the marked locations. For other mounting means, drill the mounting holes suitable with the selected hardware. Torque the bolts as per manufacturer’s instructions.
10. Leveling Shims for C-Cab XXL: Install shims as required for leveling the C-Cab XXL. Refer to Figure 54 for shim details.

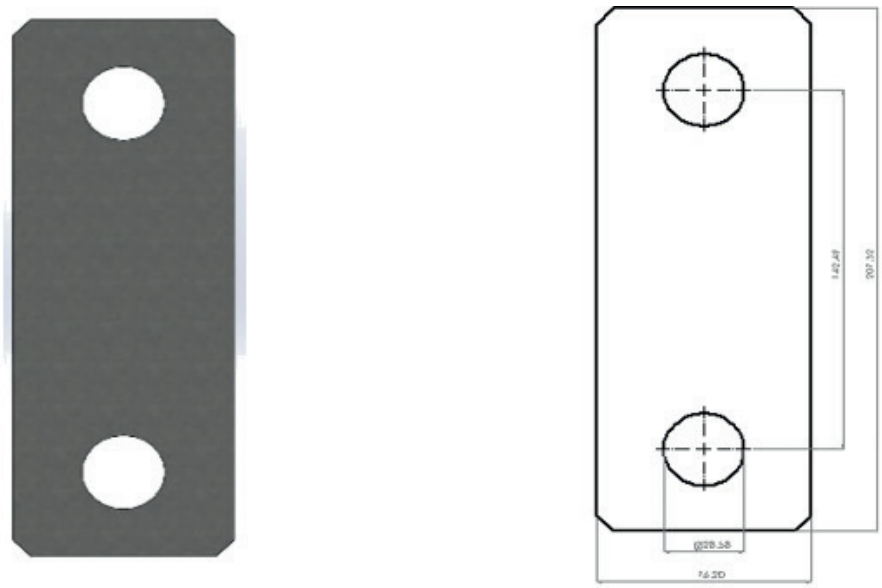


Figure 54. C-Cab XXL Leveling Shims

6.3.6. Positioning the B-Cab XXL

The site must be carefully planned considering the layout of the M-Cab XXL, C-Cab XXL, C-Trough relative to the B-Cab XXL (battery cabinets) and associated conduit cabling. References to be made with the outline drawing provided with the unit and referenced in Figure 49 the relative positions and cable entry locations including any C-Trough used for DC and B-Cab XXL interconnections.

Note: if drawings are not readily available, please contact Socomec to acquire a copy of the necessary drawings.

The engineer of record for site installation will have provided the details of the site preparation including attachment means (concrete pad, screw piles etc.), cabling, seismic anchorage etc.

Note: for reference only. An anchorage study has been provided in Appendix 2 for reference.

The units come with a set of templates for the C-Cab XXL, C-Trough (which is a Cable Trough), and B-Cab XXL (which are battery cabinets). These templates are designed to help you accurately position the units relative to each other and to correctly locate the C-Trough for interconnections with the B-Cab XXL.

The templates come as strips that can be interlocked. Each strip is numbered to ensure it can be accurately placed on the pre-prepared mounting spot. The template, together with a detailed drawing Figure 49, will specify the precise location for the cabinets. However, please be aware that not all cabinets are designed to be pre-drilled and permanently fixed in one place.

Instructions described below are as viewed from the top of the system, with the M-Cab XXL, C-Cab XXL placed to the left-hand side and B-Cab XXLs to the right-hand side of the assembly.

WARNING!
Thoroughly review the complete installation instructions and be sure the process is clearly understood before attempting the installation of the system.

6.3.6.1. Positioning the B-Cab XXL with Template

To prepare the mounting locations of the B-Cab XXLs as detailed in the outline drawing (refer to Figure 49), follow these steps:

Note: it is recommended to start with the C-Cab XXL. See step 1.

1. Locate the C-Cab XXL: If installing with the C-Cab XXL, begin by positioning the C-Cab XXL as described in Section “6.3.5. Positioning the C-Cab XXL”, page 71.
2. Position the Templates: Identify templates #1, #2, #3 & #4. Assemble them as shown in Figure 55, ensuring they are properly aligned using the features highlighted in yellow in the figure. See the alignment features highlighted in Figure 55 in yellow.

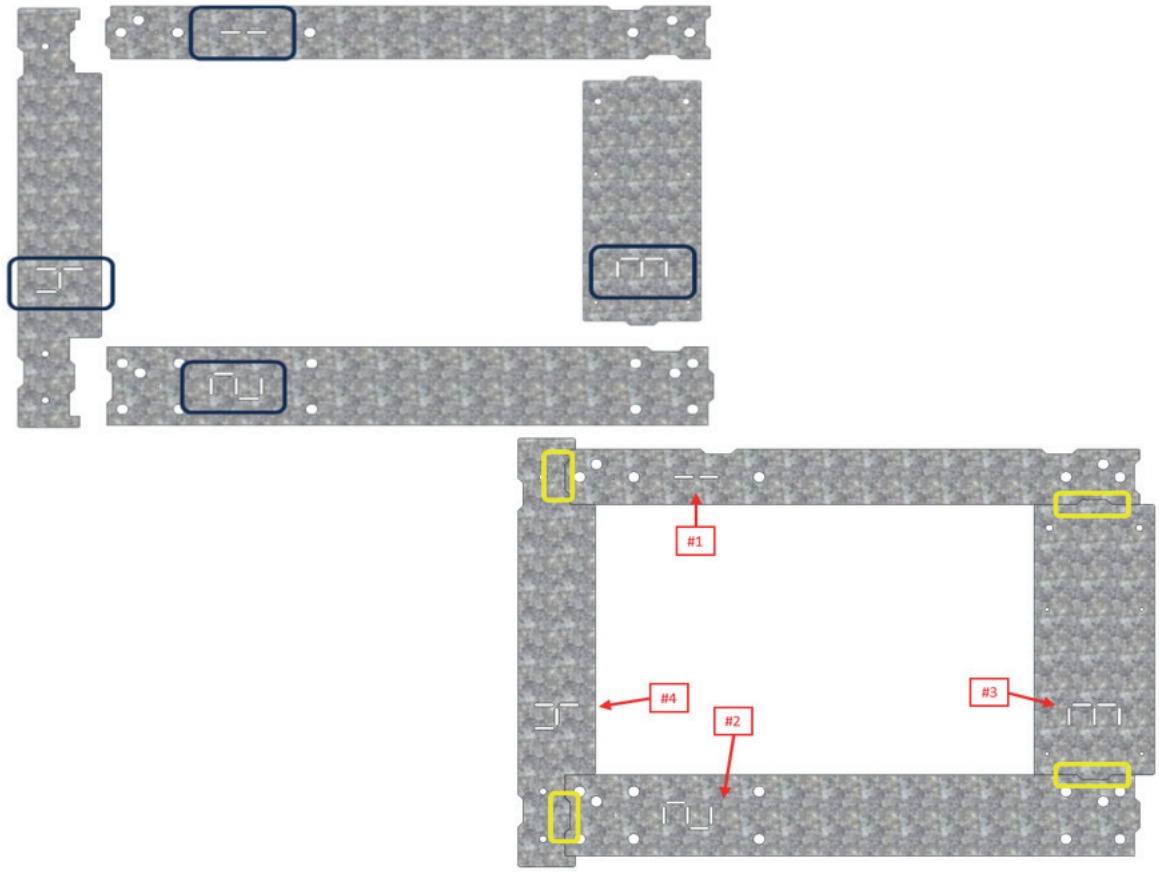


Figure 55. Templates 1, 2, 3 & 4 in the final assembly

3. **Position the 1st B-Cab XXL Template**: Use the C-Cab XXL template as a reference to position the B-Cab XXL template. The template assembly is represented in Figure 56.
4. **Mark the Holes**: Place the assembled templates on the concrete pad. Mark the holes highlighted in red for the 1st B-Cab XXL mounting locations. Drill holes as per the selected hardware specifications.

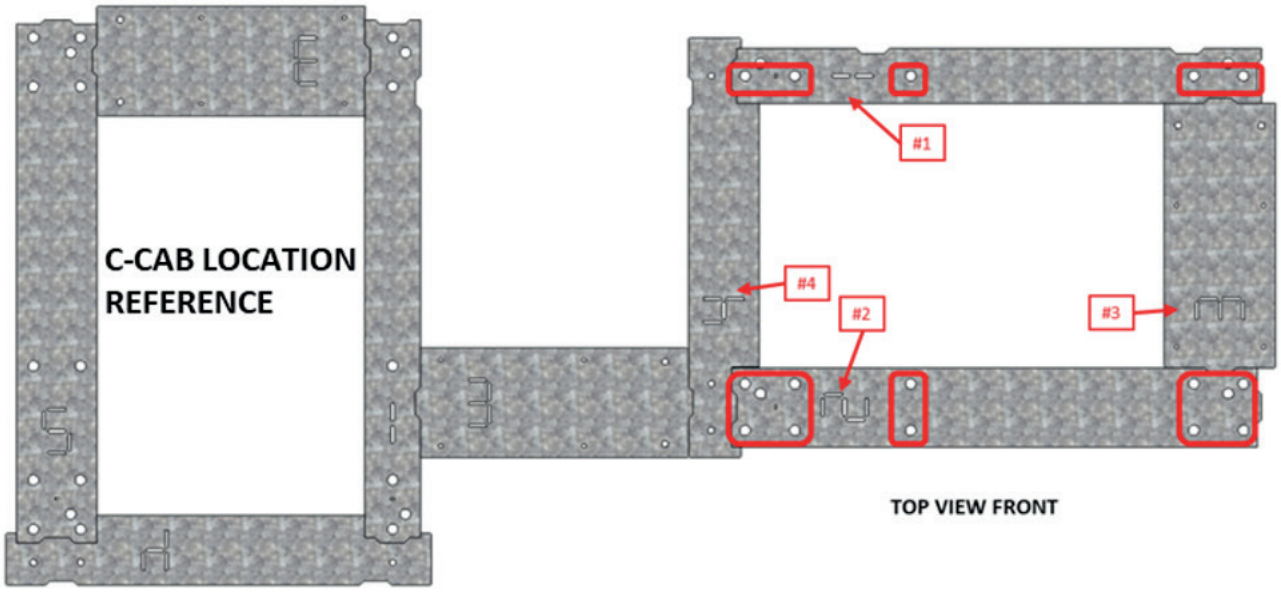


Figure 56. 1st B-Cab XXL Drilling Template Location

5. **Reposition template for the 2nd B-Cab XXL**:
   - Leave the 1st B-Cab XXL template in place.
   - Move the C-Cab XXL template to the right side of the 1st B-Cab XXL template to mark the position of the 2nd B-Cab XXL.
   - Move template #1 to the end of template #1 from the 1st B-Cab XXL locations. (refer to Figure 57 a).
   - Move template #2 to the end of template #2 from the 1st B-Cab XXL locations. (refer to Figure 57 b).

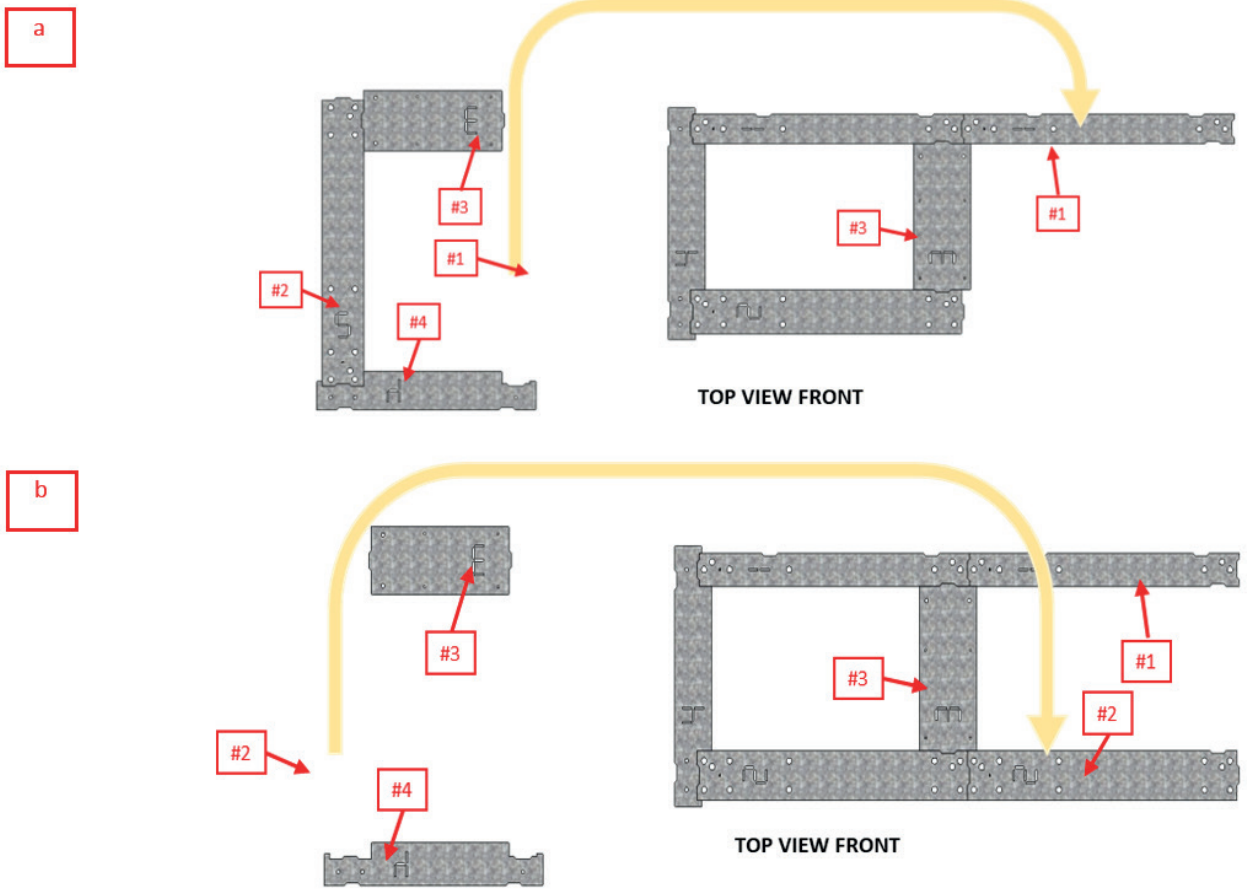


Figure 57. Locating the Next B-Cab XXL Template

- Move template #3 to the end and join template #1 and template #2. Template #4 is no longer used (refer to Figure 58 c).

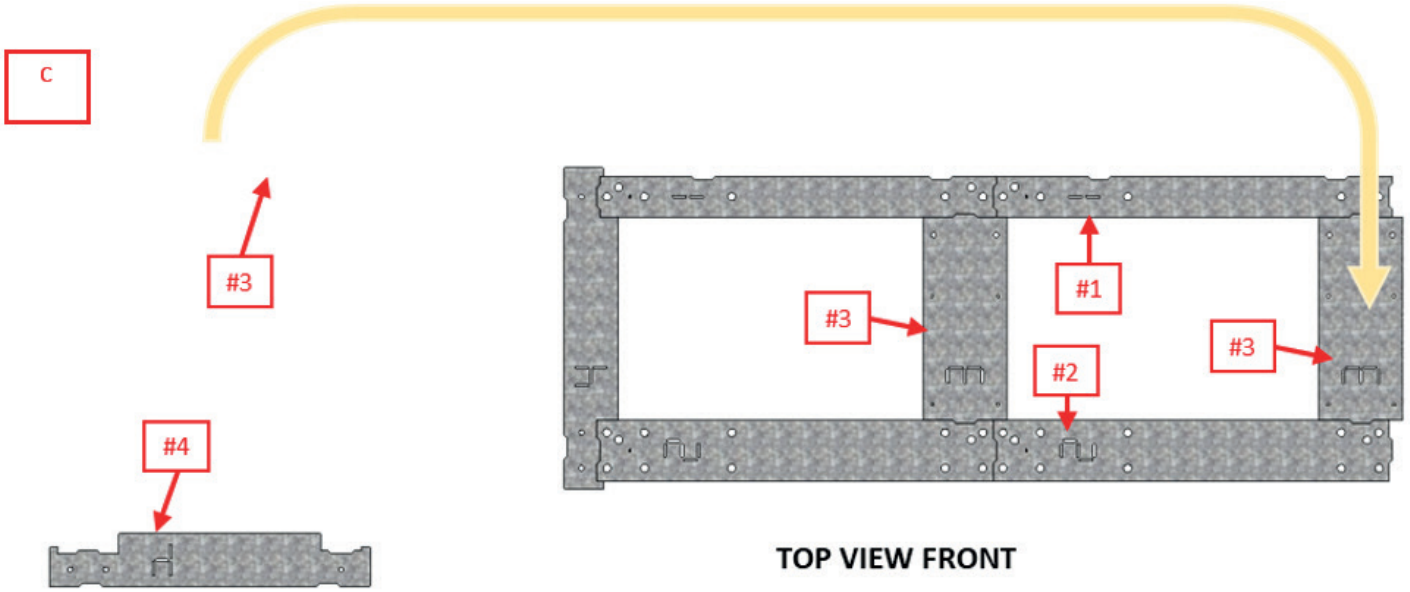


Figure 58. 2nd C-Cab XXL Template Location.

6. Mark and Drill the 2nd B-Cab XXL Holes: Mark the location of the 2nd B-Cab XXL template holes as shown in red (refer to Figure 59). Drill the required holes as per the selected hardware.

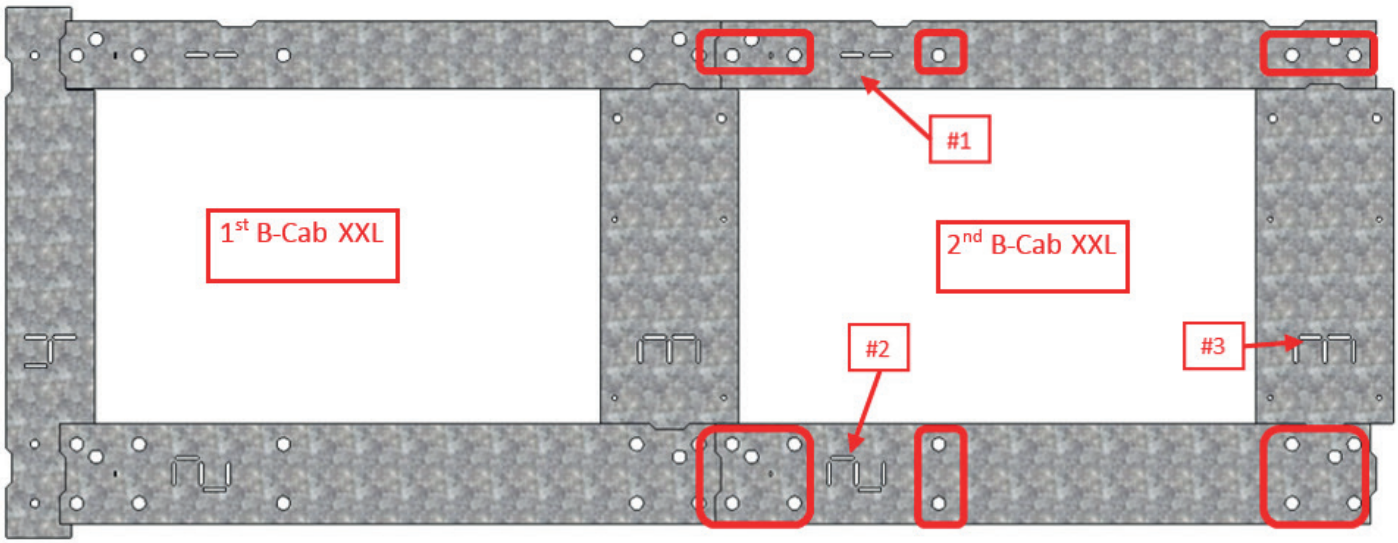


Figure 59. 2nd B-Cab XXL Drilling Mark Location

7. Drill and Install Bolts: On the concrete pad, drill and install 5/8 inch Hilti bolts (or your chosen hardware) in the marked locations. For other mounting means, drill the mounting holes suitable for the selected hardware. Torque the bolts as per manufacturer's instructions.
8. Position the B-Cab XXL: Remove the B-Cab XXL template, then position the B-Cab XXL in the marked position. Prepare the B-Cab XXL for installation by removing the protective packaging and wooden pallets.
9. Mount the B-Cab XXL: Locate and mount while simultaneously levelling the first B-Cab XXL using the provided shims. Maximum allowed deviations must be in the following range: 0.06 in for vertical directions, ± 0.25 in for horizontal direction (left to right), and ± 0.25 in for horizontal direction (front to back). Refer to Figure 60 for Shim locations
10. Repeat for Additional B-Cab XXLs: Continue by moving the 1st B-Cab XXL template to the side of the 2nd B-Cab XXL template as many times as required, depending on the number of B-Cab XXLs.

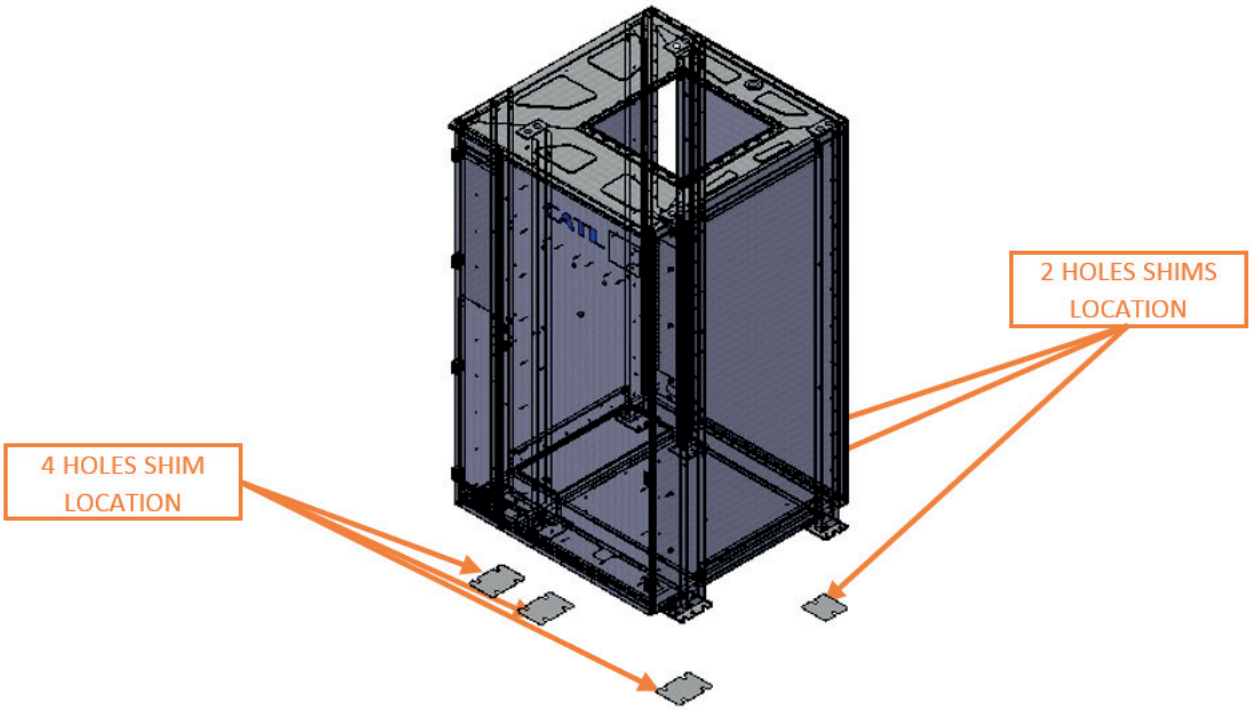


Figure 60. B-Cab XXL Shim Locations

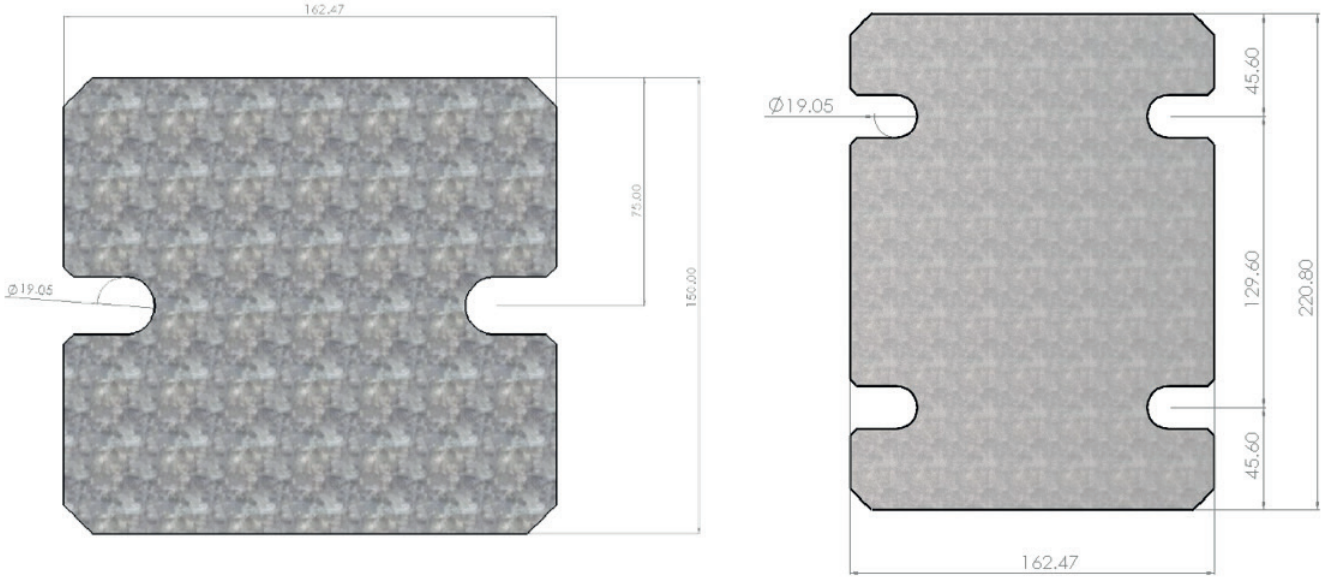


Figure 61. B-Cab XXL Shims

6.3.7. Positioning the M-Cab XXL

Begin by locating the drilling template for the M-Cab XXL that was included in your package. This template is crucial as it will guide you in setting up the equipment correctly. Place the template exactly as depicted, see Figure 62 in the instructions provided below. Ensure that it aligns perfectly with the markings. This step is important for the successful installation of your equipment. Once you have positioned the template correctly, you can proceed with the drilling process. Remember to follow safety precautions while handling tools and the drill.

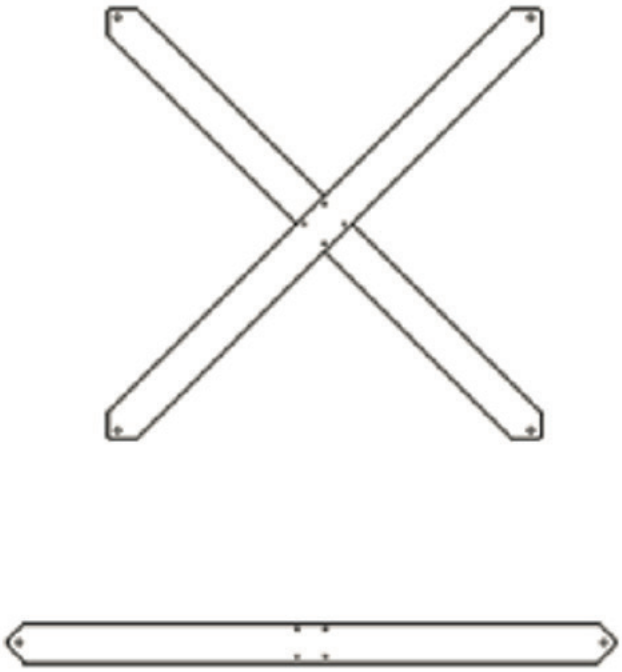


Figure 62. Top view of the assembled drilling template

6.3.8. Positioning the C-Trough

The C-Trough serves an important role in the battery system by interconnecting all the batteries to form a continuous DC power circuit. This DC power is routed through the C-Trough and ultimately terminated at the C-Cab XXL.

Additionally, the bottom section of the C-Trough provides protection and routing for the auxiliary power cables, which are essential for battery controls and the chiller system. The C-Trough also houses the battery communication cables, ensuring seamless data transmission between the batteries and the control systems.

This ensures both the electrical integrity and physical protection of the power and communication pathways within the battery system.

6.3.8.1. Installation of C-Trough interface to C-Cab XXL and B-Cab XXLs

The C-Trough interface termination compartment and C-Trough section for the B-Cab XXL are shipped separately on pallets with the SUNSYS HES XXL for the terminations of the B-Cab XXLs.

Follow these detailed steps to endure proper installation:

Note: proceed to installation of C-Trough and interface only after M-Cab XXL, C-Cab XXL and all B-Cab XXLs are installed in place. **Read and understand clearly all these steps before attempting the installation.**

Objective

The objective is to install the C-Trough components into a complete assembly, enabling the connection of B-Cab XXLs (battery cabinets) for full system integration.

Procedure

1. **Component Identification**:
   a. Refer to Figure 66 for a detailed layout of the C-Trough assembly.
   b. Figure 66 also outlines the individual components required for the assembly.
2. **Assembly Process**:
   a. Begin by gathering all components listed in Figure 66.
   b. Follow the step-by-step instructions to assemble the C-Trough.
   c. Ensure each component is securely fitted to form a complete assembly.
3. **System Integration**:
   a. Once the C-Trough assembly is complete, proceed to connect the battery cabinets (B-Cab XXLs).
   b. Verify all connections are secure and correctly aligned.
4. **Final Checks**:
   a. Inspect the entire assembly for any loose connections or misalignments.
   b. Ensure water, snow or pests cannot enter the C-Trough.
5. **Required Tools:**
   a. In addition to hand tools for drilling and fastening, a conduit punch set for 4-inch holes is required to create two 4-inch holes.

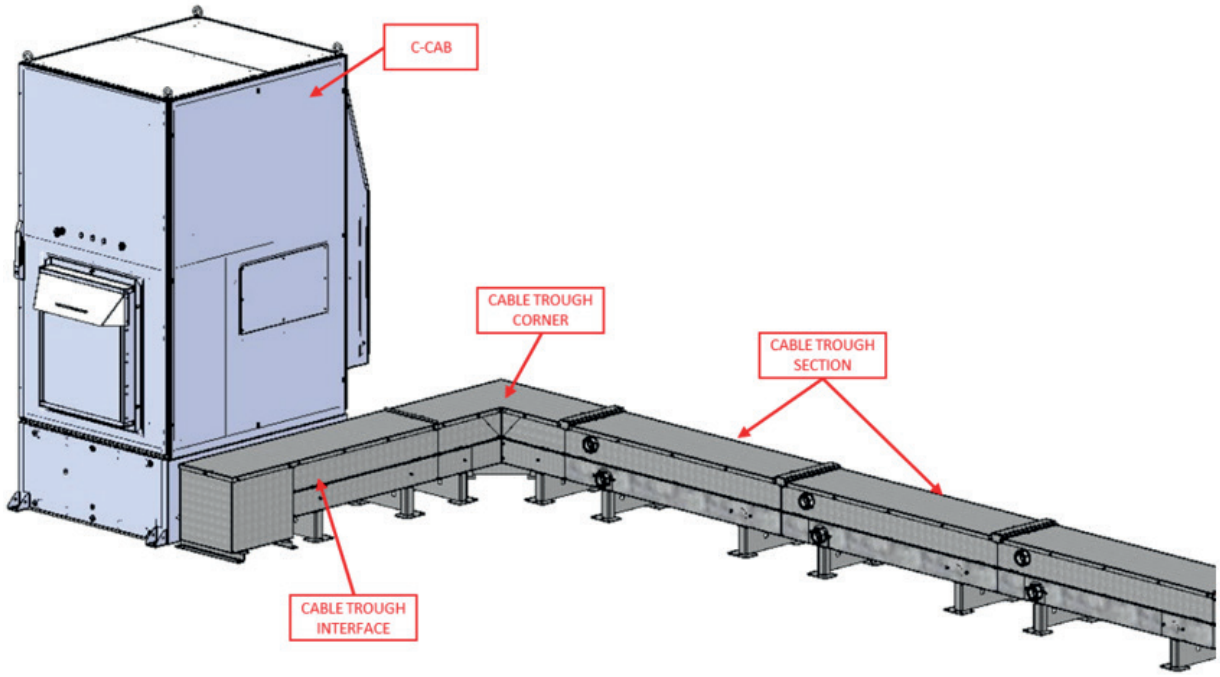


Figure 63. Cable Trough Components

1. C-Trough Interface Unit Installation:

- **Step 1**: Begin with the interface unit that connects to the C-Trough to the C-Cab XXL.

  a. Remove the front cover of the C-Cab XXL as in Figure 64.

  b. This is an important step for the alignment of the C-Trough installation.

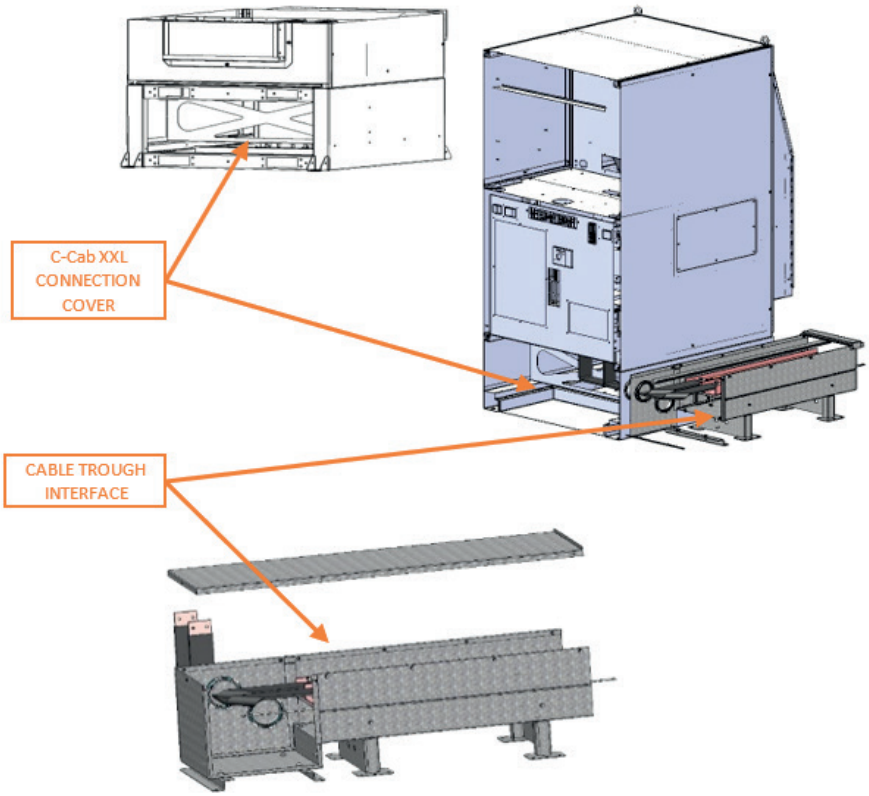


Figure 64. Installation of Cable Trough C-Cab XXL Interface

2. Positioning the C-Trough interface Unit:

- **Step 2**: Place C-Trough interface Unit next to the C-Cab XXL.

  a. Remove the top cover from the C-Cab XXL interface section.

  b. Remove the side panel as indicated in Figure 65.

  c. Ensure the front bottom cover of the C-Cab XXL is removed, as explained in the previous step, while checking the space under the C-Cab XXL.

  d. Create two 4-inch holes to pass through the DC Power connections and the B-Cab XXL auxiliary cable harnesses. Wait until the rest of the C-Trough is in place to allow for fine alignment adjustments.

  e. Make one of the 4-inch holes so that the auxiliary cable harnesses stay towards the back of the C-Cab XXL and follow the X-brace. Ensure the holes allow the main AC power connections to the C-Cab XXL without crossing or interfering with the B-Cab XXL auxiliary cables harnesses that need to connect with the M-Cab XXL.

  f. Once all the clearances are satisfied the proceed with using the 4-inch punch tool and create the 2 4-inches required holes. Refer to figure below:

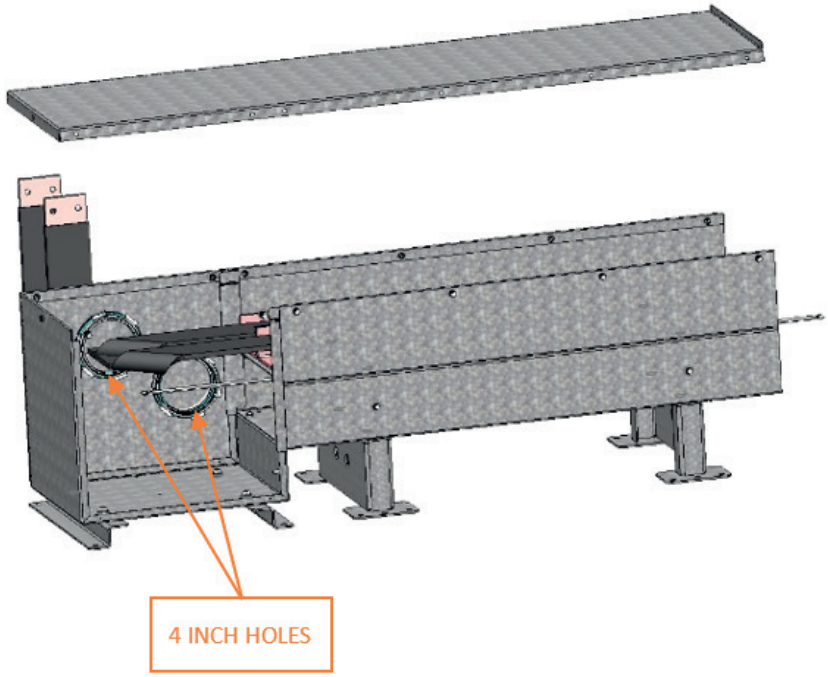


Figure 65. C-Cab XXL Holes Location

3. Installing the C-Trough Corner Section:

- **Step 3**: Install the C-Trough corner section as shown in Figure 66.

  a. Place the unit in front of the C-Cab XXL interface module positioned in the previous step as in Figure 67.

  b. Remove the cover to interlock and mate with the C-Cab XXL interface module.

  c. Push the corner module forward, allowing the front of the corner module to enter the expanded portion of the module (C-Trough interface Unit) in front.

  d. Ensure the C-Trough corner module is fully mated into the C-Cab XXL interface.

  e. Using the Busbar block connect the busbar together.

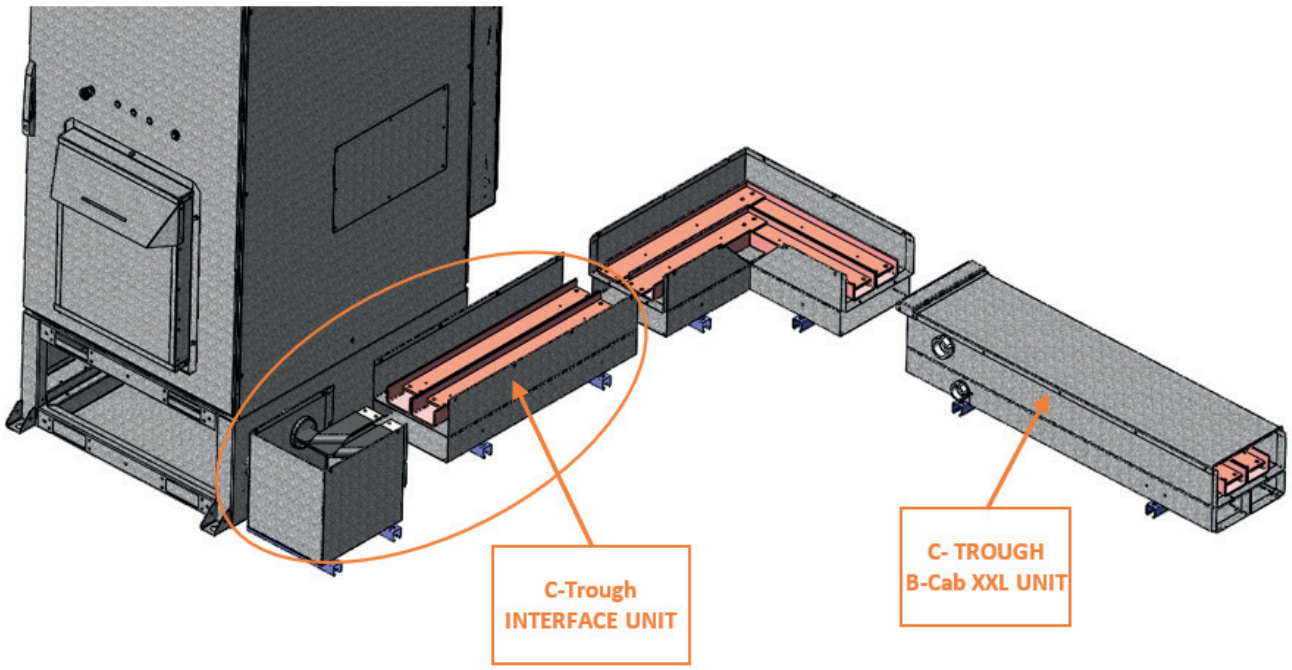


Figure 66. C-Trough Components C-Cab XXL interface

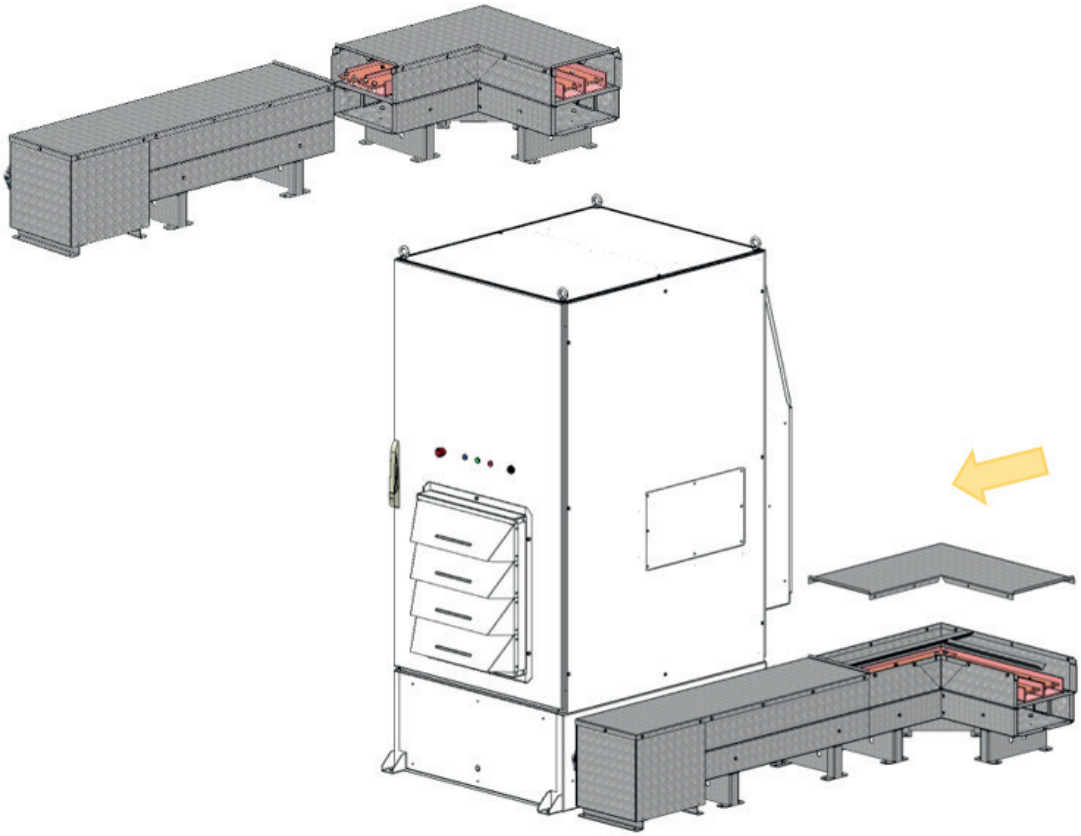


Figure 67. Placing the C-Trough Corner Module

4. Installing the B-Cab XXL Interface C-Trough Module:

- **Step 4**: Place the B-Cab XXL interface C-Trough module as shown in Figure 68.
  - a. Position it close to the C-Trough corner module.
  - b. Remove the cover and slide it forward to mate with the C-Trough corner module.
  - c. Push it forward until it fully mates with the corner module, utilizing the interlocking feature.
  - d. Ensure it is fully seated with the previous module.

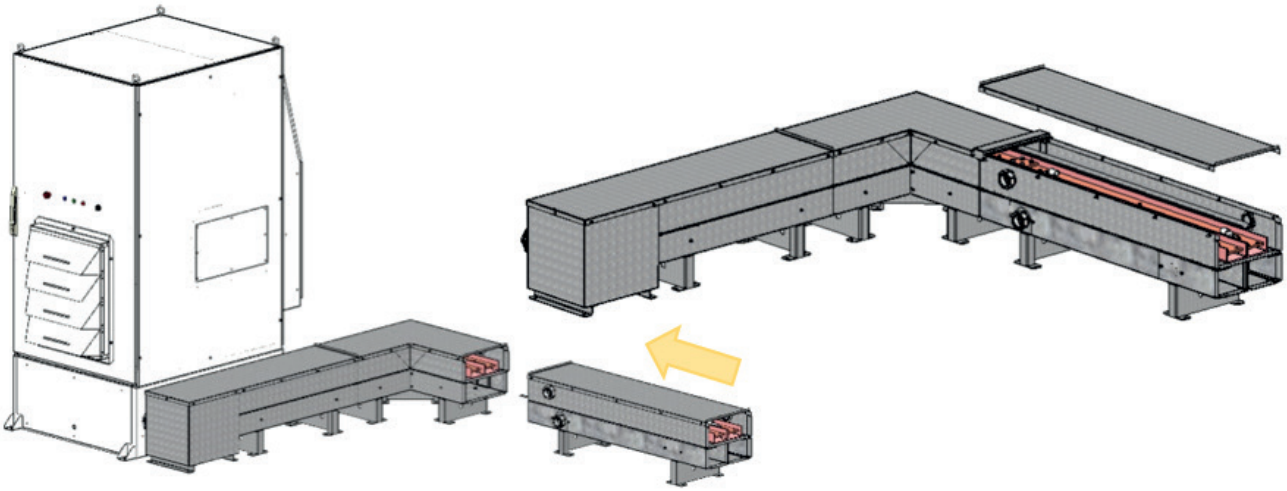


Figure 68. C-Trough B-Cab XXL Interface Module

5. Continuing with Additional B-Cab XXL Interface C-Trough Modules:

- **Step 5**: Continue placing the next B-Cab XXL interface C-Trough module.
  - a. Position it close to the B-Cab XXL module and remove the cover.
  - b. Slide it forward to mate with the previous B-Cab XXL module.
  - c. Push it forward until it fully mates with the previous B-Cab XXL module.
  - d. Ensure it is fully seated with the previous module.
  - e. Use the Busbar plate to connect the busbar together.

6. Repeating for All B-Cab XXLs:

- **Step 6**: Repeat Step 5 for all remaining B-Cab XXLs that were installed.

7. Installing the Last B-Cab XXL Interface C-Trough Module:

- **Step 7**: For the last B-Cab XXL interface C-Trough module which is a bit different, it has an end cover refer to Figure 69:
  - a. Position it close to the previous module. Place the end with the mating feature in the position that will mate with the previous module.
  - b. The last B-Cab XXL interface module can only be mated in one position.
  - c. If mating is not possible, flip it 180 degrees.
  - d. If the orientation is correct, mate it securely with the previous module.
  - e. Install the Busbar plate and connect the busbars together.

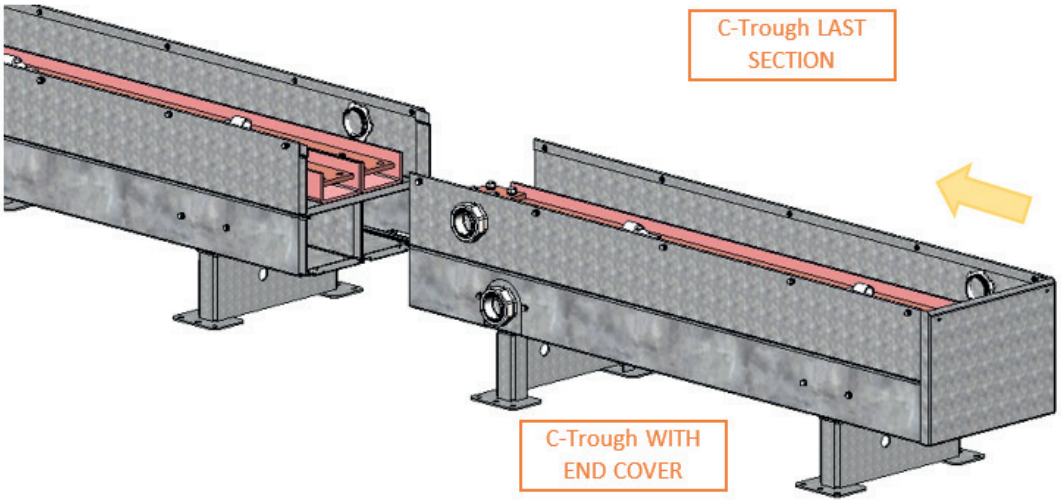


Figure 69. C-Trough Last Section

8. Aligning and Securing the C-Trough Modules:

- **Step 8**: Once all the C-Trough modules are in place, align and ensure everything lines up correctly.
- **Step 9**: Install the provided hardware to secure all the C-Trough units to each other.

9. Creating Holes for Attachment:

- **Step 10**: Locate the two holes to be installed onto the side panel of the C-Cab XXL. Using the interface unit as a template (highlighted in red in Figure 73), mark the holes required for attachment to the C-Cab XXL. Use a 4-inch conduit punch to create the marked holes.

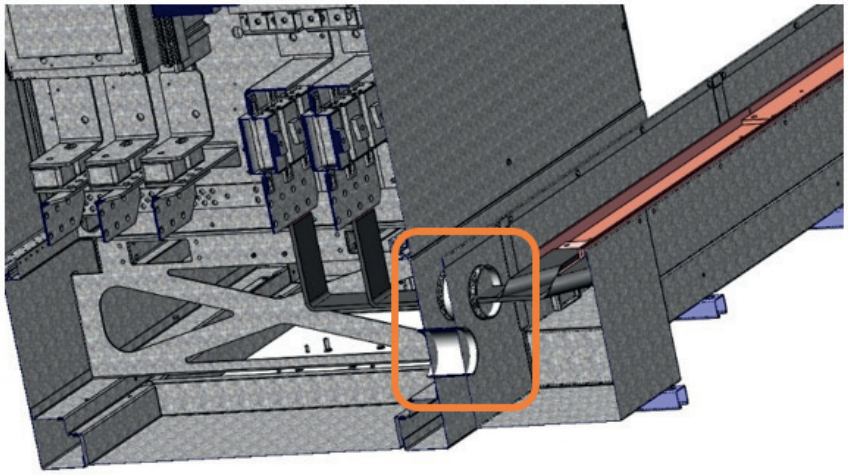


Figure 70. C-Cab XXL interface unit installation location

10. Connecting the Interface C-Trough:

- **Step 11**: Connect the interface C-Trough to the C-Cab XXL with the provided hardware. Install and secure the two 4-inch threaded nipples.

11. Dry Fitting and Securing the Covers:

- **Step 12**: Dry fit all the covers and ensure all the sections are secured together. Once all the covers are secured and every section is aligned, secure the completed C-Trough to the concrete pad.

12. Connecting Flexible Busbars to C-Cab XXL:

- **Step 13**: Connect the pre-formed flexible busbars, refer to Figure 70.

  a. Remove the cover to the C-Trough C-Cab XXL interface section.

  b. Two pre-formed flexible busbars, one for the positive connection and the second for the negative.

  c. Connect the flexible busbar and torque as specified for electrical connections use as a reference Table 13. Refer to Figure 71 for flexible busbar connections terminals inside the C-Cab XXL. The right side is the (+) positive terminal.

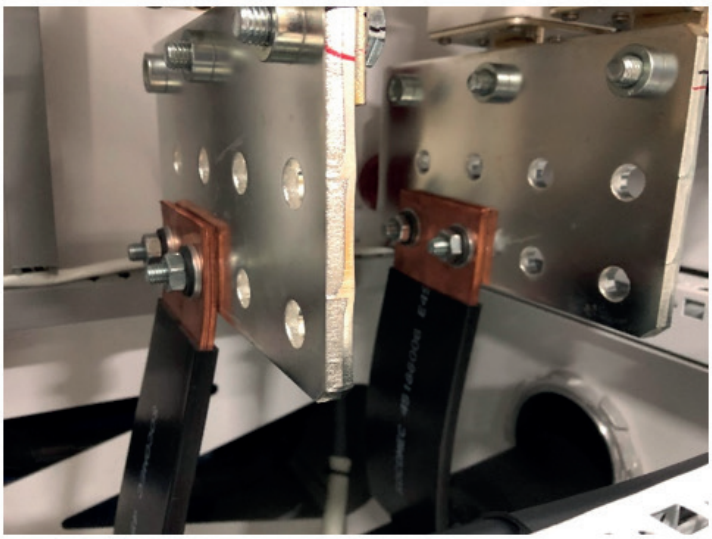


Figure 71. Flexible Busbar to C-Cab XXL Terminal Connection

d. Connect all the ground straps so that all the C-Trough's are bonded together.

e. Install a 8AWG ground wire from the last strap beside the flexible busbar and rigid busbar. Terminate the other end to the C-Cab XXL grounding point.

13. Final Appearance:

- **Step 13**: The completed C-Trough should appear as shown in Figure 72.

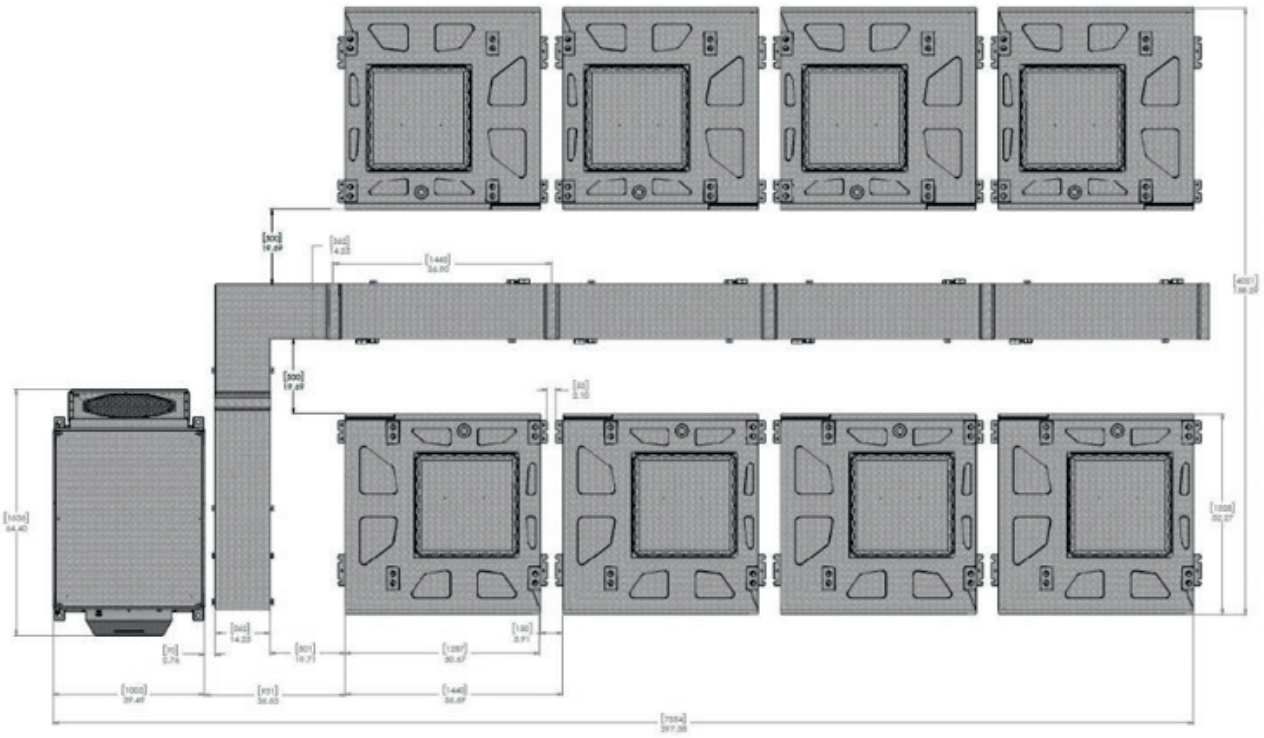


Figure 72. BESS Assembly top view

14. Preparing for Cable and Harness Installation:

- **Step 14**: Remove all the covers to proceed with the installation of all the B-Cab XXL conduits that house the cabling and harnesses. Refer to Figure 73 for visual details.

a. Remove Covers:

- Remove all covers to access the installation area for the B-Cab XXL conduits, which will house the cabling and harnesses. Refer to Figure 76 for visual guidance.
- Specifically, remove the covers on the C-Trough sides to expose the channels for routing the cables.

b. Attach Conduit Fittings:

- Attach conduit fittings to the C-TROGH at tow designated points. There will be fitting knock-outs to remove. Refer to Figure 76 for the exact attachment locations.
- Secure two additional conduit fittings to the outer B-Cab XXL connection bracket.

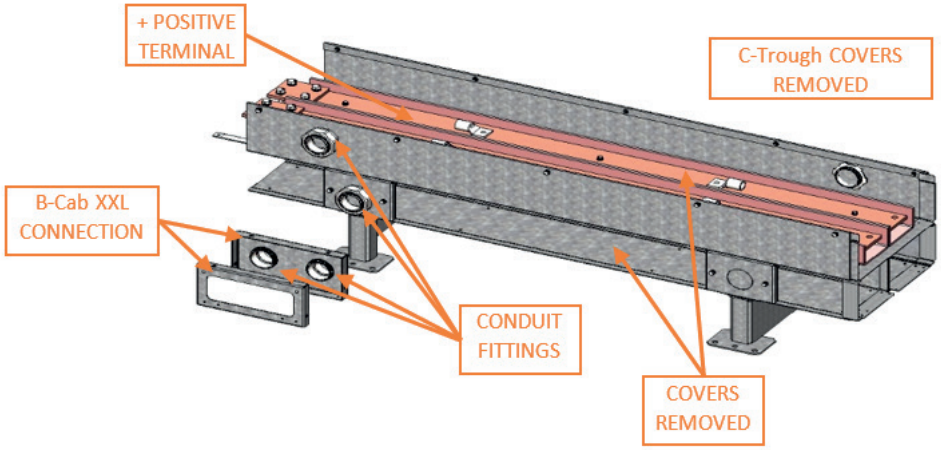


Figure 73. C-Trough Connection to B-Cab XXLs

c. Install B-Cab XXL Bracket:

- Attach the mating part of the B-Cab XXL bracket to the back of the B-Cab XXL unit.

d. Add Flexible Conduit:

- Install flexible conduit int the conduit fittings. Refer to Figure 74 for detailed visual instructions.

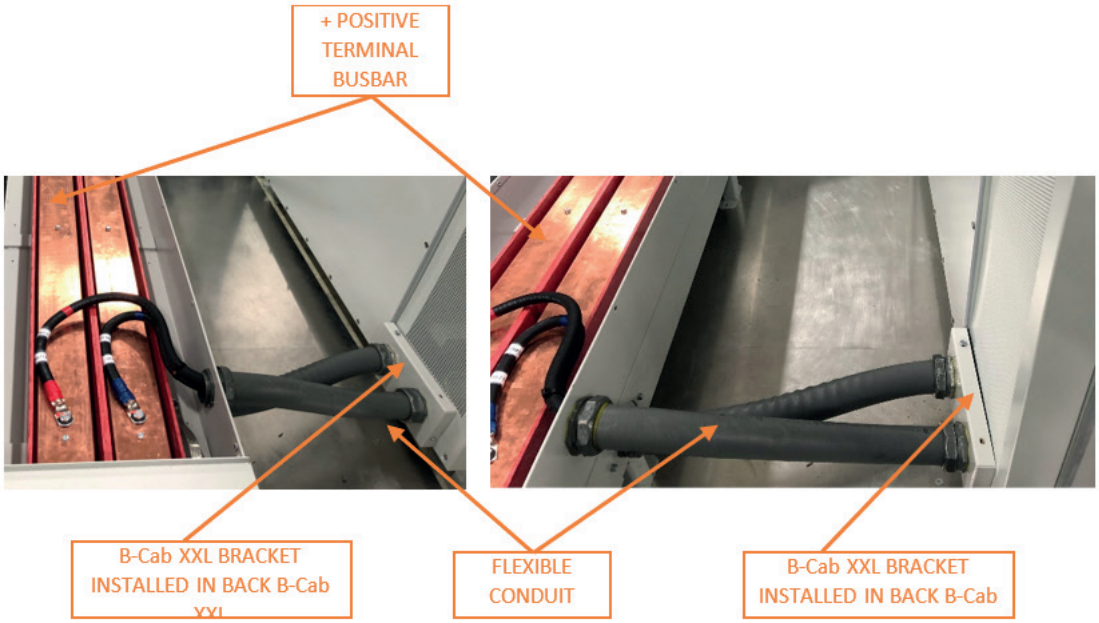


Figure 74. B-Cab XXL to C-Trough Flexible Conduit Installation.

e. Repeat for Remaining Connections:

- Repeat the previous steps all remaining B-Cab XXL connections to ensure uniform installation.

f. Proceed with Cable and Harness Installation:

- Once all conduit fittings and flexible conduits are installed, continue with the installation of all cabling and harnesses as described in Section “7.4. C-Cab XXL Cable Harness Connections”, page 124.

7. CONNECTIONS

When making electrical connections it is important to follow lock out tag out procedures as outlined in NFPA 70E standards or local OSHA regulations. Listed are some guidelines.

7.1. Cables Installation Best Practices

When you're routing the cables, it's important to adhere to best practices for installation. This will help you avoid issues related to electromagnetic interference (EMI) or inductive heating. Here are some key points to keep in mind:

Separate Routes: Install the DC power cables, AC power cables, and control and communication cables along different paths. This separation helps prevent interference between different types of cables.

Electrical Bonding: If you're using C-Troughs or other conductive materials, ensure that these are electrically bonded. This means they're interconnected to create a conductive path that can safely conduct any fault current.

Distance from Power Cables: Control and communication cables should be installed at least 500 mm (or 20 inches) away from the power cables. This distance helps prevent the power cables from interfering with the data signals in the control and communication cables.

Crossing at Right Angles: If the control cables need to cross the power cables, make sure this is done at a 90° angle. This reduces the amount of electromagnetic interference between the cables.

Balancing Phases: If you're using single-phase cables, route all phases and the same amount of each phase ((A)R, (B)S, and (C) T) along the same path. This is especially important when the cables are going through conductive surfaces or are installed on a conducting surface. Balancing the phases helps reduce electromagnetic fields, which can cause inductive heating and EMI.

By following these guidelines, you can ensure a safe and efficient cable installation.

7.2. AC Power Electrical Connections

The C-Cab XXLs needs to be connected to both AC and DC power sources. The customer is responsible for providing the AC connections. The DC power supply is linked to the B-Cab XXLs via the C-Trough. The C-Trough is designed to connect multiple B-Cab XXLs in parallel, which allows for the run time chosen by the customer at the time of purchase.

	DANGER! RISK OF ELECTRICAL SHOCK INCLUDING HIGH SHORT-CIRCUIT CURRENT. LOCK OUT AND TAG OUT PROCEDURES SHOULD BE FOLLOWED WHEN SERVICING THE EQUIPMENT.
	CAUTION! INADVERTENT SHORT CIRCUITS ARE THE MAJOR CAUSE OF FAILURES FOR BATTERIES. RISKS ASSOCIATED WITH SHORTING AS WELL AS OTHER HAZARDOUS CONDITIONS CAN BE MITIGATED BY CAREFULLY FOLLOWING THE LISTED GUIDELINES BELOW.

Note: read and understand this section clearly, it outlines the electrical connections.

This gives a complete picture of the system, including the layout of the ducts. The placement of these ducts is determined by the type of signals used to create connections within the system. If the system is used with the C-Trough, it is arranged so that the ducts are positioned based on the kind of signals they transmit. These signals play a vital role in connecting various components of the system.

Main Power 690VAC 1.5MVA + GND 8 B-CAB

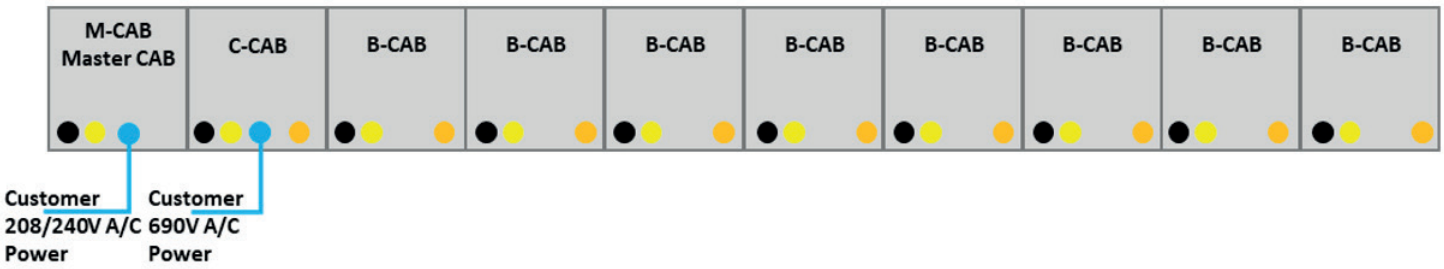


Figure 75. Cable Connection Legend

Table 15 Cable Signal Legend

- 208-240V AC for the C-Cab XXL, B-Cab XXL controls, distributed from M-Cab XXL.
- Separate Duct/Conduit.
- 24V DC power & communication for C-Cab XXL, B-Cab XXL provided from M-Cab XXL.
- Separate Duct/Conduit.
- Customer supplied Main AC Power 690Vac at 1.5MVA – 600 Vac at 0.5 | 0.75 | 1 | 1.25 MVA, in separate Duct/Conduit.
- Customer supplied Main AC Power 208-240VAC for Control Power, separate Duct/Conduit.
- High Voltage DC Power (1500V DC).
- Separate Duct/Conduit.

Figure 75 provides a detailed view of all the cables and connections needed to run and operate the BESS system. The connection marked in blue in Figure 75 and Table 15 are the customer's responsibility. This includes the sizing of the cables and the installation of conduits. The customer's engineer must adhere to the NEC and local codes when determining the size of the wiring and the conduit/ducting for the main power connections, as outlined in the legend.

	DANGER! RISK OF ELECTRICAL SHOCK INCLUDING HIGH SHORT-CIRCUIT CURRENT AS BATTERIES ARE A SOURCE OF ELECTRICAL ENERGY. USE ONLY INSUALTED TOOLS AROUND THE MODULES AND BATTERIES AND CAREFULLY AVOID SHORTING THE BATTERY TERMINALS OR CONNECTIONS.
	CAUTION! INADVERTENT SHORT CIRCUITS ARE THE MAJOR CAUSE OF FAILURES FOR BATTERIES. RISKS ASSOCIATED WITH SHORTING AS WELL AS OTHER HAZARDOUS CONDITIONS CAN BE MITIGATED BY CAREFULLY FOLLOWING THE LISTED GUIDELINES BELOW

7.2.1. C-Cab XXL AC Power Electrical Connections

Two AC connections need to be established in the system. The task of making these connections falls under the customer's responsibilities. The engineer assigned to this task, often referred to as the 'engineer of record', is required to prepare and supply the reference for the AC supply connection. It's crucial that the engineer of record adheres to the National Electrical Code (NEC) and any local code requirements. This adherence is not only a legal requirement but also a safety measure to ensure that the electrical connections are safe and up to standard. See Figure 76 - SUNSYS HES XXL Mains AC Power Customer Connections, for the two supply connections.

Main Power 690VAC & GND 1.5MVA + 208-240VAC GND

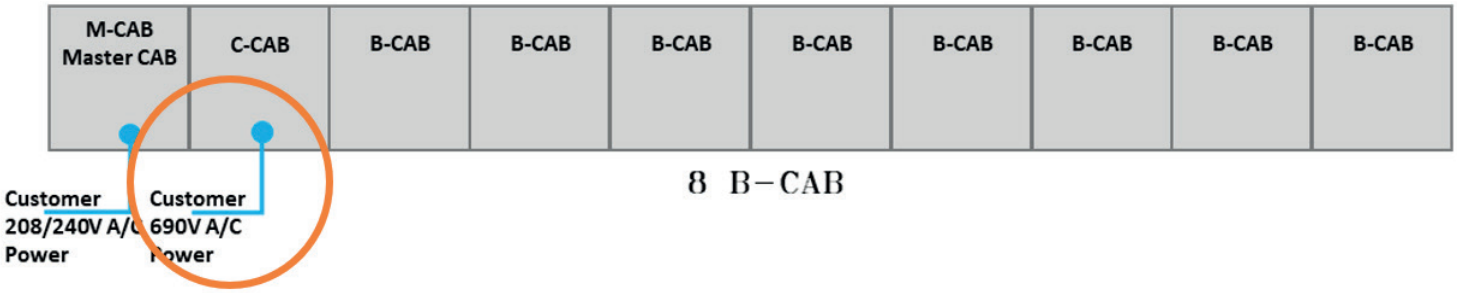


Figure 76. SUNSYS HES XXL Mains AC Power Customer Connections

7.2.1.1. C-Cab XXL AC Power Connection Cabling

When supplying the C-Cab XXL AC power connections through the concrete pad please refer to Figure 77 for the designated entry point of the main AC cable conduit. This is the specific spot where the conduit, which protects the electrical cables, enters the system. Accurate identification and referencing of this point are vital for correct installation and maintenance.

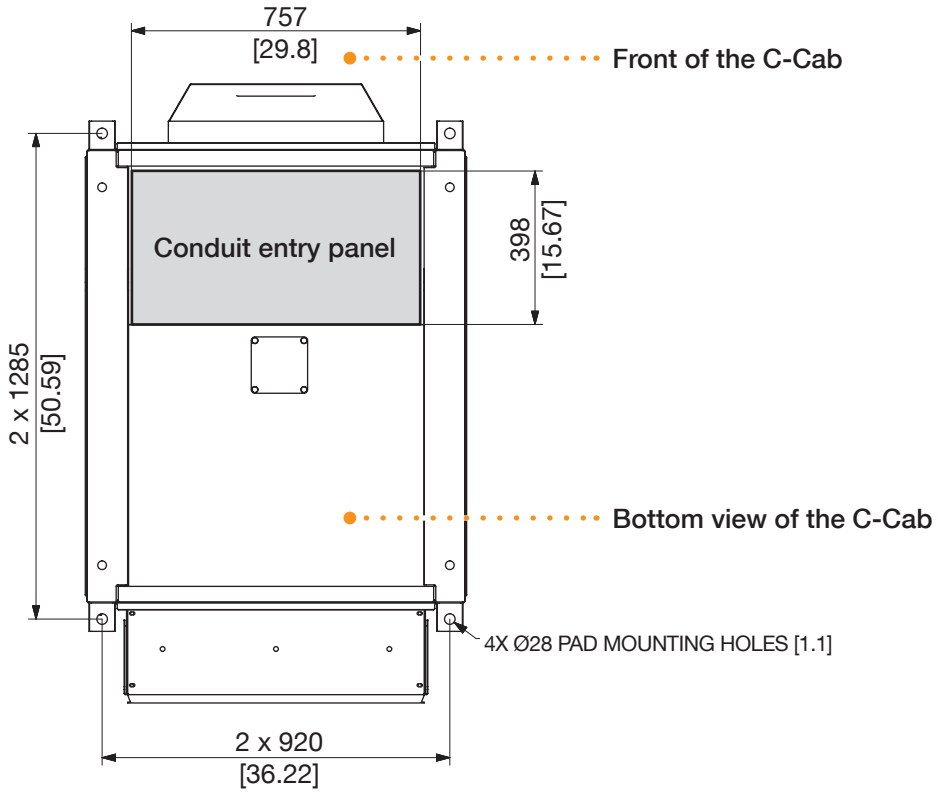


Figure 77. C-Cab XXL Conduit Entry Point

All power connections originating from the ground must go through these conduit entry points. These entry points should be accurately cut through the conduit entry bottom panel, located at the base of the C-Cab XXL.

Before you begin the cabinet installation, it's important to remove the conduit entry panel to avoid any potential damage. Prior to installing the conduit entry base plate, ensure that you measure and create conduit holes as required for the selected conduit in the bottom base plate.

Once the installation is complete, the panel will be reinstalled. This panel is a crucial part of the enclosure's structure, contributing to its overall stability and safety. Hence, it's essential to handle and reinstall this panel properly.

	WARNING! Cable glands, which are devices that attach and secure the end of an electrical cable to the equipment, play a crucial role in the normal operation of the product. They should remain intact and not be removed during the product's regular use. For the installation process, it's important to use only the cable glands that come with the C-Cab XXL. These are specifically designed for this purpose and ensure a proper, safe connection. Using other types or brands of cable glands may not provide the same level of safety or functionality.
	WARNING! During and after the installation of cables, it's crucial to ensure that all cable glands are securely in place. These components are essential for maintaining the integrity of the connections and the safety of the system. Additionally, it's important to verify that there are no uncovered holes remaining. Any such openings could compromise the system's safety and performance. Therefore, a thorough check is necessary after the installation process to confirm that every cable gland is properly positioned and every hole is adequately covered.

When terminating connections to the C-Cab XXL in the field, it is crucial to adhere to the NEC codes and any applicable local regulations (code) or standards. The C-Cab XXL phase identification system are using the labels L1/L2/L3 to identify phases. These labels correspond to other commonly used phase identifiers, with L1 equating to R(A) or U(A), L2 to S(B) or V(B), and L3 to T(C) or W(C).

While the phases can be connected in any sequence, it is essential to maintain the correct phase rotation as specified by the C-Cab XXL. The phase rotation should be A, B, C. This is because the accuracy of power measurements when the system is connected to the grid depends on the correct observation of the C-Cab XXL phase rotation. Misalignment in phase rotation could lead to inaccurate power measurements, which could impact the performance and efficiency of the system. Therefore, always ensure the correct phase rotation when connecting to the C-Cab XXL.

7.2.1.2. C-Cab XXL Connection Protection and Cabling

The main AC power connections to the C-Cab XXL has a set of 3 AC terminals and a ground located at the left side of the C-Cab XXL behind the dead front. Additionally the AC cables used, it is recommended using a cable with an insulation system rated at ~1.5x the maximum DC bus voltage or greater. The maximum output of the C-Cab XXL is 1.5MVA at 690VAC and requires the capability of a protection device to handle this. Other configurations are available depending the chosen options.

Table 16 and Table 17 below are power requirements for AC power connections. These two tables are added as a starting of as a guide. The customer's engineer is responsible for selecting the suitable protection device as per NEC and local code requirements.

Note: read and understand this section clearly, it outlines the electrical connections.

Table 16 C-Cab XXL AC Input Protection.

Model/Rating	Max. Current	100% Rated Circuit Breaker Required Protection
0.5 MVA	481 A @ 600 VAC	722 A @ 600VAC
0.75 MVA	722 A @ 600 VAC	1083 A @ 600 VAC
1.0 MVA	962 A @ 600 VAC	1443 A @ 600 VAC
1.25 MVA	1203 A @ 600 VAC	1805 A @ 600 VAC
1.5 MVA	1255 A @ 690 VAC	1883 A @ 669 VAC

Table 17 C-Cab XXL Main AC Power Connections

Description	Connections	Terminations	Location
Main Power	L1	NEMA 2-Hole pattern, ½ inch Bolt. 6 x 600 MCM Cables per phase. Rated 2000 volts or higher.	Termination Compartment (left side corner).
	L2		
	L3		
Grounding		Rated at 1/3 of the current rating of the main conductors.	Behind main power connections.

CAUTION!
FAILURE TO OBSERVE GROUNDING RULES MAY LEAD TO THE RISK OF ELECTRICAL SHOCK, OR RISK OF FIRE DURING A GROUND FAULT.

CONNECT THE GROUND AT THE MARKED POINT

GROUND CONNECTIONS MUST BE IN COMPLIANCE WITH LOCAL REGULATIONS AND APPLICABLE STANDARDS.

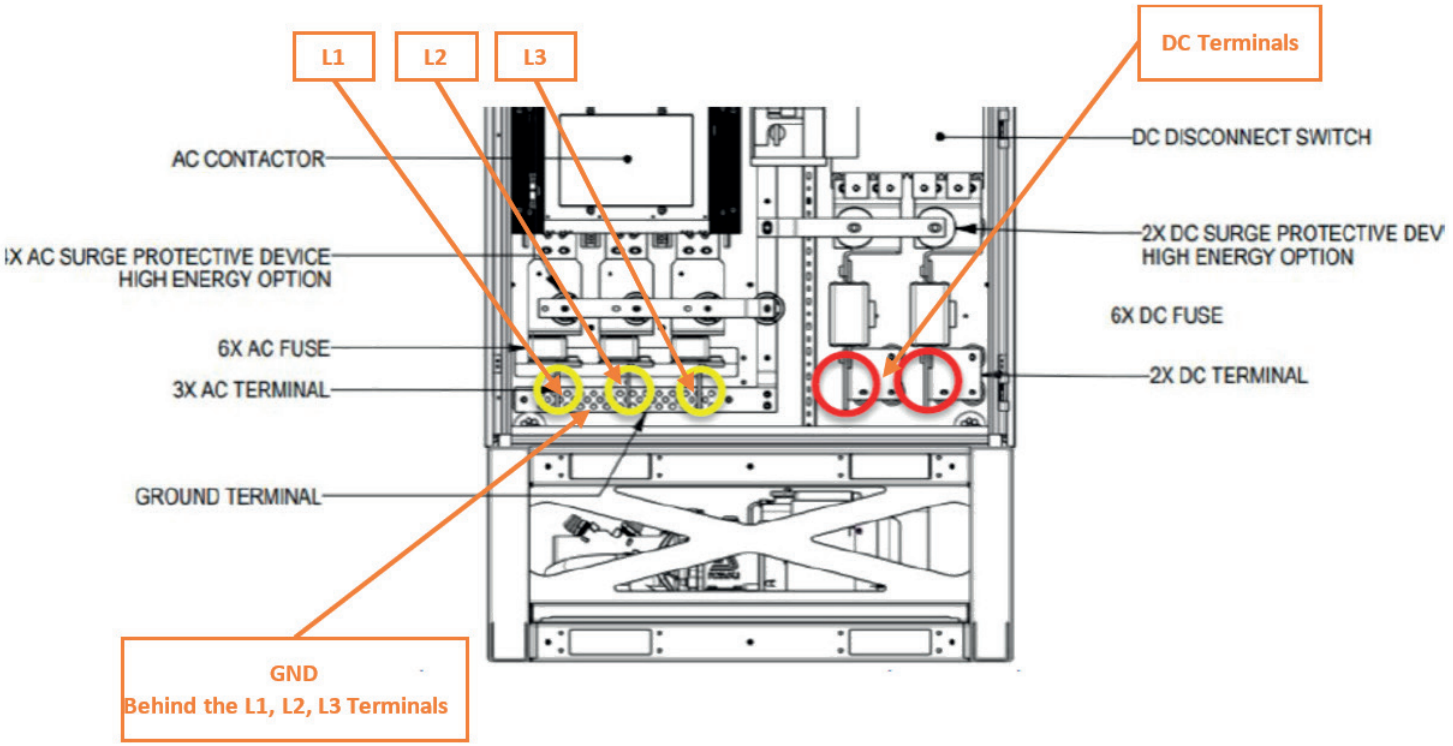


Figure 78. C-Cab XXL Power connection locations

The equipment power conductors shall be sized based on the upstream overcurrent protection per the NEC. Busbars provided are copper bars which accommodate standard NEMA 2 patterns per connection. To avoid issues with bending and cross-wiring, plan the conduit connections relative to the diagrams below. Cables can be installed from the bottom of the unit within the area illustrated in Figure 78.

7.2.1.3. Making the C-Cab XXL AC Connections

The figures provided illustrates the specific area allocated for the AC connection cabling. See Figure 79, Figure 80, and Figure 81. This designated space is essential for establishing the necessary connections. The dimensions indicated in the figure are expressed in millimeters [mm] and inches [in]. These measurements offer a clear understanding of the size and space requirements for the AC connection cabling setup.

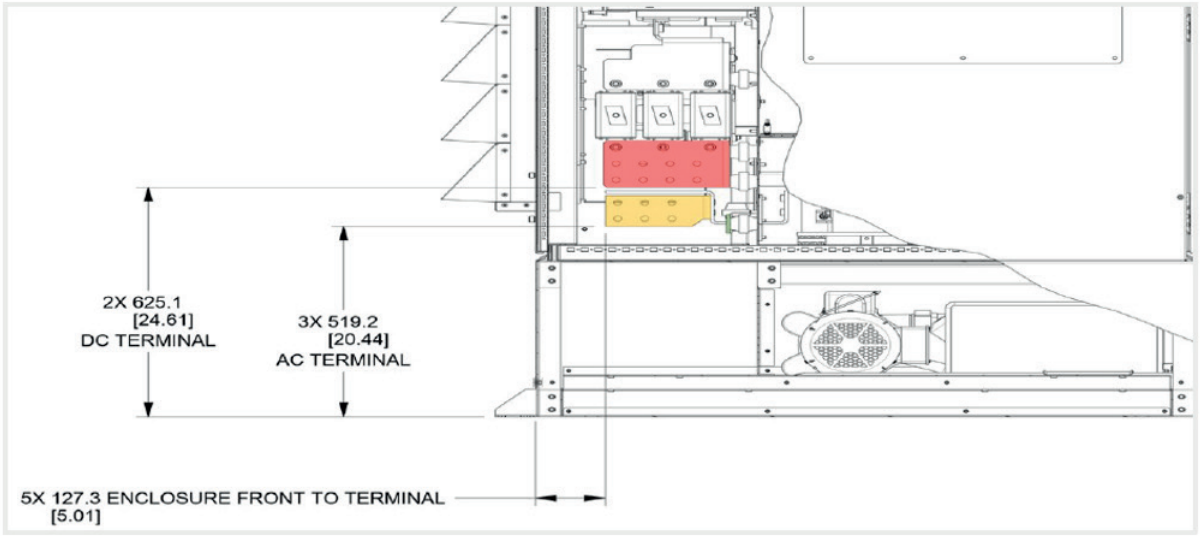


Figure 79. C-Cab XXL Terminal Connection Dimensions (mm[in])

The following figure presents the arrangement of the C-Cab XXL terminals, complete with additional dimensions. These dimensions are crucial in ensuring the correct configuration of the installation site. By following the layout depicted in the figure, one can accurately set up the C-Cab XXL terminals in the designated area.

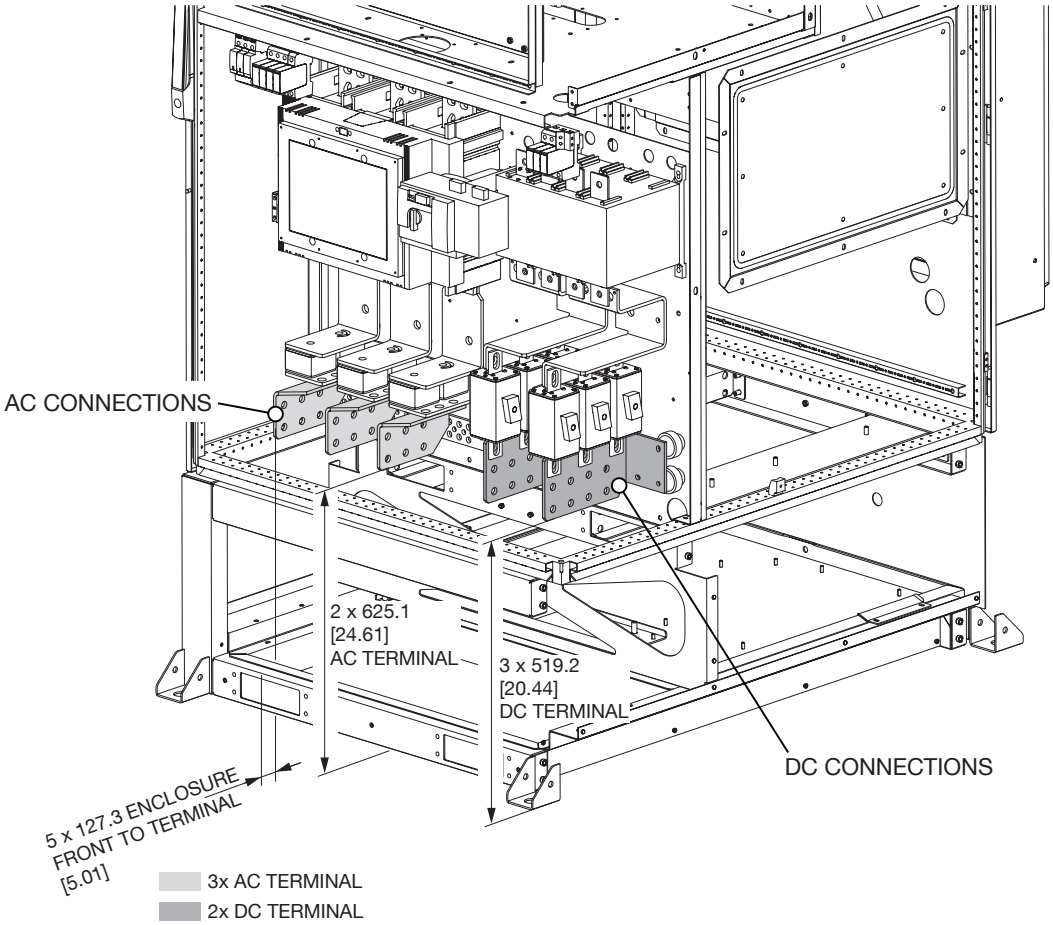


Figure 80. C-Cab XXL Terminals with Hight dimensions (mm[in])

7.2.1.4. C-Cab XXL AC Busbar Connection

The configuration and positioning of the C-Cab XXL AC Connection busbar are outlined here. This layout is crucial for the efficient operation of the system. The design ensures that each connection allows ease of installation and maintenance.

Note: read and understand this section clearly, it outlines the electrical connections.

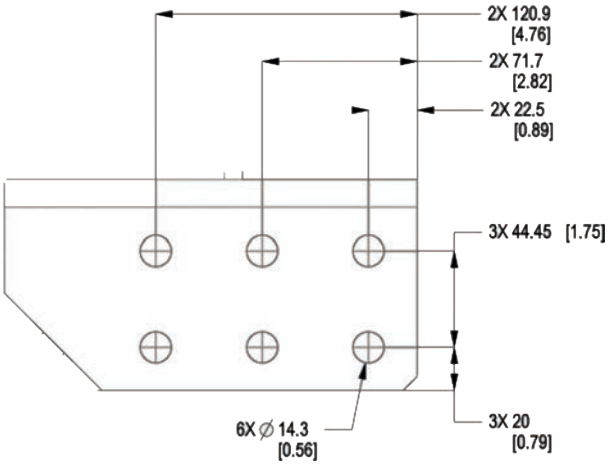


Figure 81. C-Cab XXL AC Busbar arrangement with Dimensions (mm[in])

Care must be taken during design and installation to ensure that the AC cables do not apply undue stresses or torques to the AC bus bars. Conduit entries for the AC cabling must therefore be made directly below the AC bus bars to eliminate any significant cabling bend. The AC cabling without fasteners installed should align with AC bus bars. Under no circumstances should the fasteners between the AC bus bars and the AC cables be used to force the cables into alignment. Any inverter damage caused by failure to follow these instructions is non-warrantable and must be repaired at cost.

7.2.1.5. C-Cab XXL Ground Busbar

Arrangement and layout of the C-Cab XXL Grounding terminals

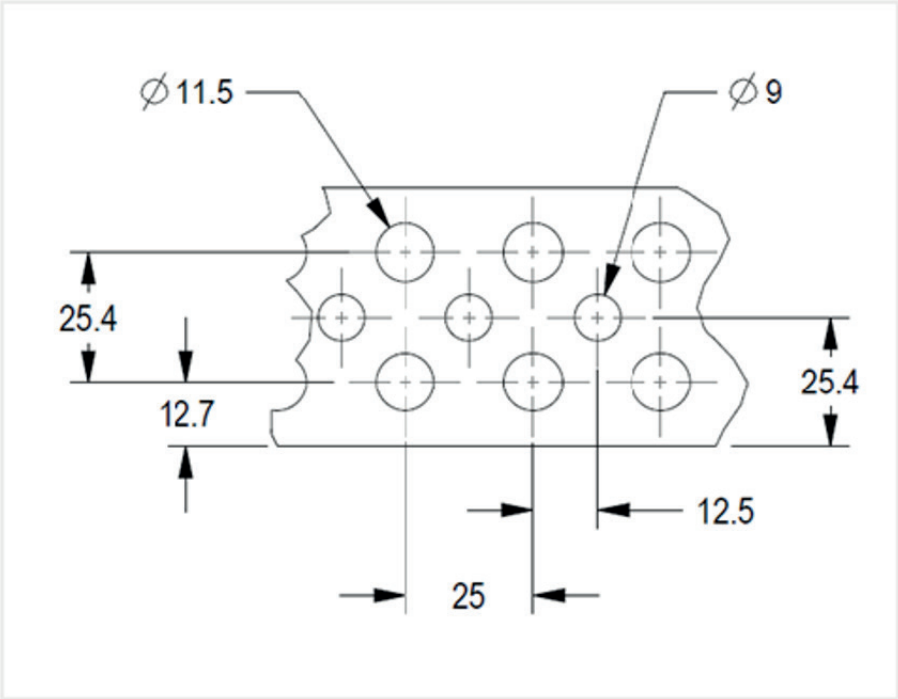


Figure 82. C-Cab XXL Gound Terminal Details Dim (mm)

7.2.1.6. Connecting C-Cab XXL AC Terminals

Note: read and understand this section clearly, it outlines the electrical connections.

1. Prepare the cables for connections.
   a. Remove and clean the cables insulation for the compression lugs that will be installed (provided by customer NEMA 2 pattern).
   b. Use and compress the compression lugs to the proper specification for the compression lugs selected.
2. Install cables with compression lugs onto the busbar terminal of the C-Cab XXL.
   a. Torque the bolts to the proper torque value as per the fastener used, and make sure to have good clearance from the other terminals.
3. Connect the Gound cables and torque to the proper values per the fastener use.

7.2.2. M-Cab XXL AC Power Electrical Connections

The M-Cab XXL figures provided illustrates the specific area allocated for the AC Auxiliary and Control power connection cabling. This designated space is essential for establishing the necessary connections. These offer a clear understanding of the size and space requirements for the AC connection cabling setup

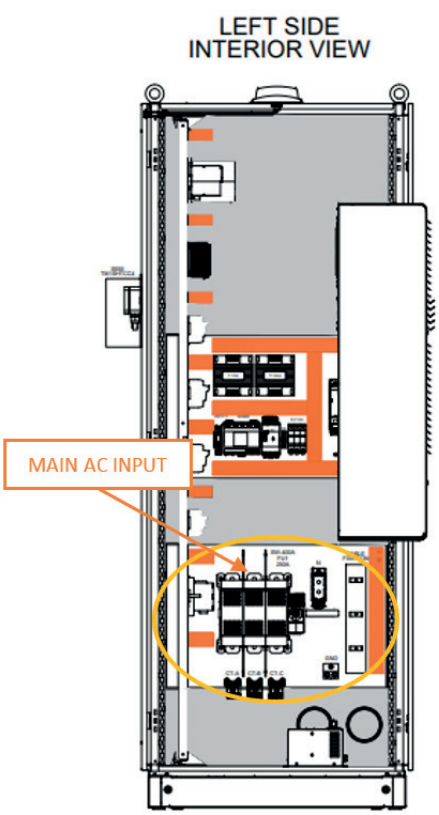


Figure 83. M-Cab XXL Left Side Section

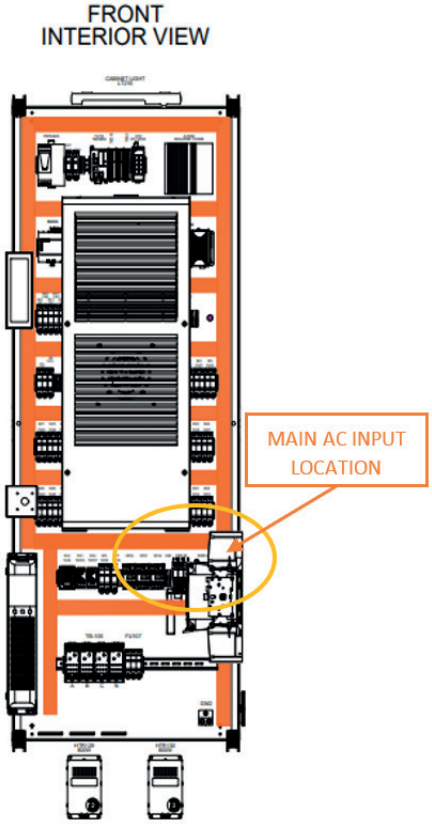


Figure 84. M-Cab XXL Front Interior View Section

The main AC connection point for the M-Cab XXL is located at the top of the switch, specifically labeled as “DISC 102”. See Figure 83, Figure 84 and Figure 85 for locations of the disconnect switch. This positioning facilitates efficient power distribution. In addition, the neutral wire has its own dedicated connection point, which is clearly marked with an “N” label. This labeling system ensures a clear and error-free connection process.

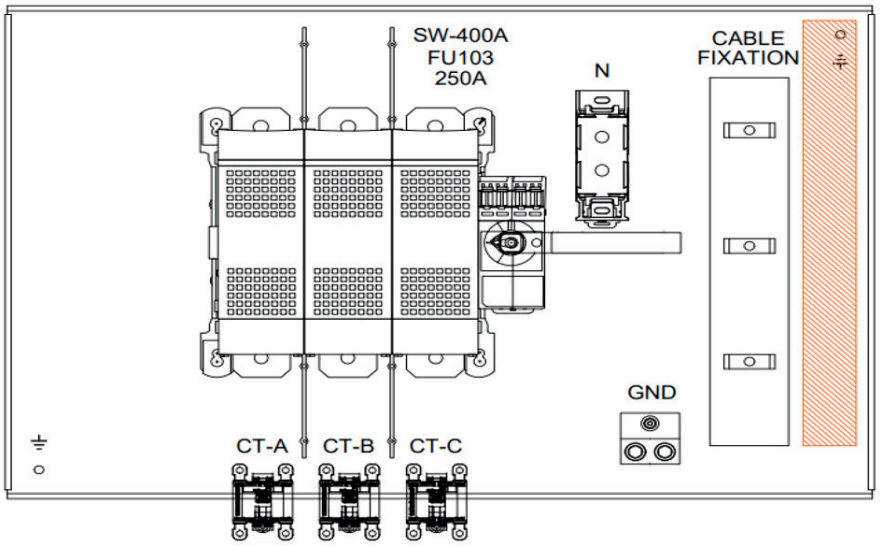


Figure 85. M-Cab XXL Main Incoming AC Disconnect Connection

7.2.2.1. M-Cab XXL Connection Protection and Cabling

The reference Table 18 provides an overview of the power ratings necessary for the M-Cab XXL main AC supply. It is the customer's responsibility to ensure the provision of AC power for the M-Cab XXL Auxiliary and Control power systems. This responsibility includes the selection of appropriately sized cables but also the installation of conduits.

The customer's engineer is responsible for this process. They must strictly adhere to the National Electrical Code (NEC) and local codes when determining the size of the wiring and the conduit/ducting for the main power connections. These guidelines are clearly outlined in the legend provided. By following these standards, the engineer can ensure the safety and efficiency of the power connections.

Table 18 - M-Cab XXL Main AC Power Requirement

Model/Energy Rating	Power Supply Rating	Comment
≤ 3259kWh	30-45kVA @ 208-240 VAC with Neutral	Can be supplied from Delta/Wye or Split phase system. Customer to provide proper protection device as per NEC Code.
≥3667kWh – 6111kWh	60-75kVA @ 208-240 VAC with Neutral	Can be supplied from Delta/Wye or Split phase system. Customer to provide proper protection device as per NEC Code.

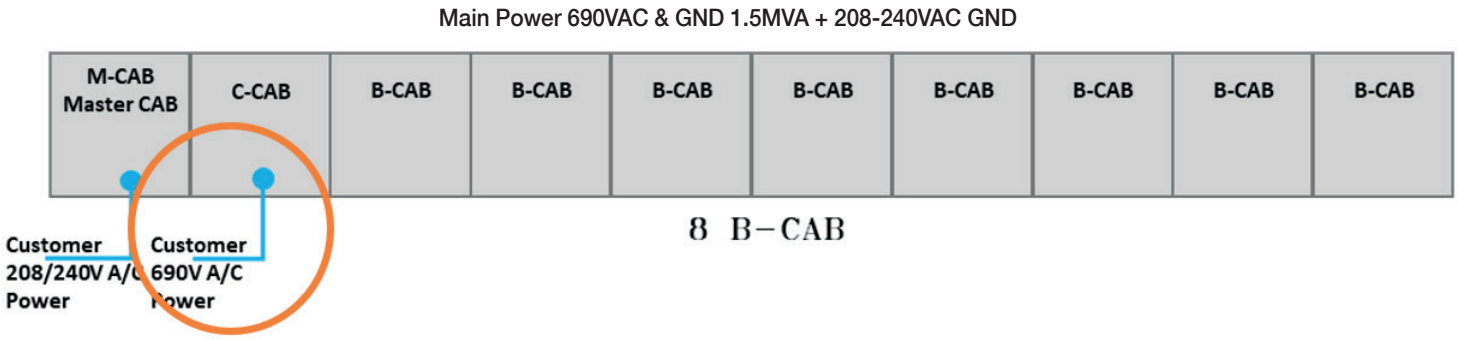


Figure 86. SUNSYS HES XXL Mains AC Power Customer Connections

7.2.2.2. Connecting M-Cab XXL AC Terminals

Note: read and understand this section clearly, it outlines the electrical connections.

1. Prepare the cables for connections.
   a. Route AC cable inside the M-Cab XXL, keep cable away from the low voltage cables.
   b. Use the compression lugs that are part of the disconnect switch.
   c. Remove suitable amount of insulation. Add ferrules to the stranded wire ends.
2. Install cables onto the disconnect terminal of the M-Cab XXL.
   a. Install L1, L2, L3 and the Neutral cables onto the respective locations.
   b. Torque the bolts to the proper torque value as per the fastener used, and make sure to have good clearance from the other terminals.
3. Connect the Gound cables and torque to the proper values per the fastener use.

7.3. B-Cab XXL Electrical Connections

In order to operate properly, the batteries must be linked together. The need for these batteries to be interconnected is crucial for a few key reasons. Firstly, it allows for the supply of Direct Current (DC) power, which is required for power conversion. In addition, other connections are required such as communication, allowing the system to exchange information effectively, and auxiliary power for the chiller and controls (BMS) power. Lastly, grounding, which is a safety measure that prevents electrical faults and reduces the risk of electrical shocks.

To facilitate these connections, the system is provided with specific cables. Each of these cables is designed for a particular type of connection, and they are clearly labeled to avoid confusion. The length of these cables can vary, and this is primarily determined by the configuration of the battery cabinet to which they are connected.

The process of interconnecting the batteries is made simpler by the use of a C-Trough. This is a piece of equipment provided with the system that helps organize the cables and ensure they are connected in the correct manner. By using the cable through, you can ensure a neat and efficient setup, reducing the risk of errors or complications.

DANGER!

- FOR YOUR SAFETY, IT'S CRUCIAL TO ENSURE THAT ALL POWER SOURCES, BOTH AC AND DC, ARE CONFIRMED TO BE DISCONNECTED BEFORE YOU START ANY WORK OR MAKE ANY PHYSICAL CONTACT WITH ELECTRICAL CIRCUITS. THIS IS A NECESSARY PRECAUTION TO PREVENT ANY POTENTIAL HARM OR ACCIDENTS.
- DON'T MAKE ASSUMPTIONS. INSTEAD, USE A RELIABLE VOLTMETER TO CHECK THE VOLTAGE ACROSS THE LINES AND TO THE GROUND. ALSO, MAKE SURE THAT THE DEVICES USED TO DISCONNECT THE POWER SOURCE ARE SECURELY LOCKED OUT. THIS IS TO ENSURE SAFETY WHILE WORKING WITH ELECTRICAL CIRCUITS.
- THE MANUAL SWITCH DISCONNECT IN EACH BATTERY CABINET SHOULD BE IN THE OFF POSITION.

LOCK OUT AND TAG OUT PROCEDURES SHOULD BE FOLLOWED WHEN SERVICING THE EQUIPMENT.

Every battery cabinet is equipped with a special switch, known as QS. This switch's main function is to cut off the high voltage DC output from the battery. Additionally, there are two circuit breakers, named QF1 and QF2. These are hidden behind a protective cover and are used to stop the power flow to the chiller and the controls of the battery system.

You can find these switches and breakers in the control box, which is positioned on the left side of each B-Cab XXL, as shown in Figure 87.

Before you begin any electrical work, it's crucial to ensure that the QS isolation switch and the QF1 & QF2 breakers in the battery cabinets are switched to the OPEN (or OFF) position. The steps that follow will illustrate this process.»

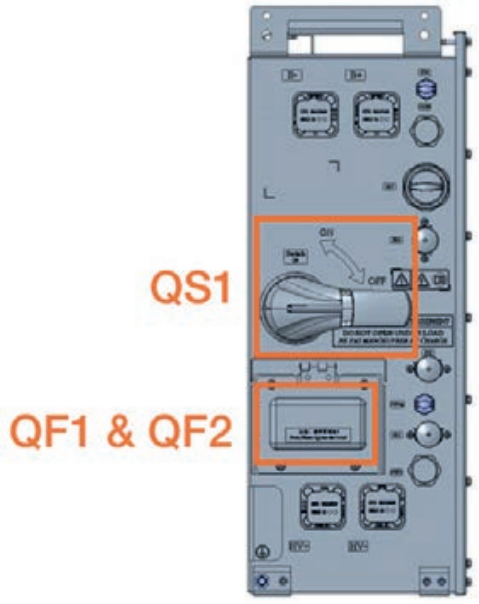


Figure 87. Location of QS disconnect and QF1, QF2 circuit breakers

Safety Measures and Instructions for Handling Batteries:

- Use suitable Personal Protective Equipment (PPE), ensuring you have eye protection and insulated gloves.
- Take off any metal items you're wearing (like watches or jewelry) that could accidentally touch the battery's live terminals.
- Make sure all tools used near the battery assembly are insulated or covered with a material that doesn't conduct electricity.

The batteries need to be interconnected for DC power, auxiliary power, communication, and grounding. Cables for each of these connections are included. They are labeled and vary in length depending on the specific battery cabinet connections. You can install the battery interconnections using the cable gutter provided by the factory.

7.3.1. B-Cab XXL DC Power Connections

Each power cable set comes with pre-installed termination connectors. The high voltage DC power cable set includes a positive with an orange connector and a negative with a black connector cable.

	DANGER! DO NOT MIX THE CONNECTIONS. MAKE SURE POSITEVE CABLE CONNECTS TO POSITIVE BUSBAR AND NEGATIVE CABLE CONNECTS TO NEGATIVE BUSBAR.

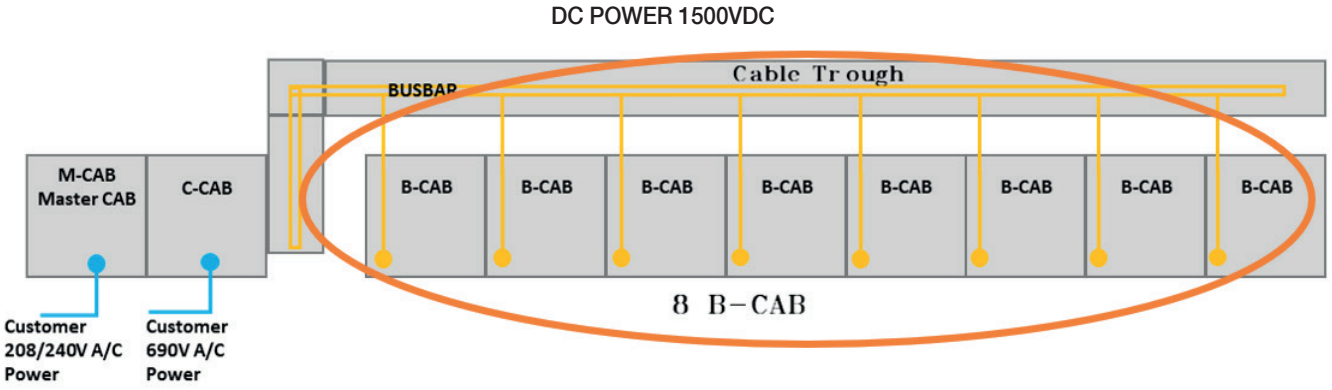


Figure 88. -Cab XXL DC Power Cable Connections

7.3.1.1. Steps for Installing B-Cab XXL DC Power Cables

Print these steps, at the end of this step is a check list that can be marked off when completed.

Note: read and understand this section clearly, it outlines the electrical connections.

Table 19 - DC CABLE Installation Points

DEPARTURE			WIRE NUMBER / COLOR	ARRIVAL		COMPLETE ASSMBLY	Installed ?
TERMINAL MARK	CABINET	CABLE MARK		CABINET	TERMINAL MARK	P/N	Yes/No
C-Cab XXL BUSBAR / DC -	HES-XXL C-Cab XXL 1	HES-XXL1/BAT/P1	Black (Blue Sleeve)	ALL B-Cab XXL CATL BATTERY	B-Cab XXL "X"/ DC -	407-006820-111	
C-Cab XXL BUSBAR / DC +		HES-XXL1/BAT/P2	Black (Red Sleeve)		B-Cab XXL "X" / DC +	407-006820-112	

1. Turn “OFF” all sources of energy.
   a. Disconnect connections to the C-Cab XXL if already connected or Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89.

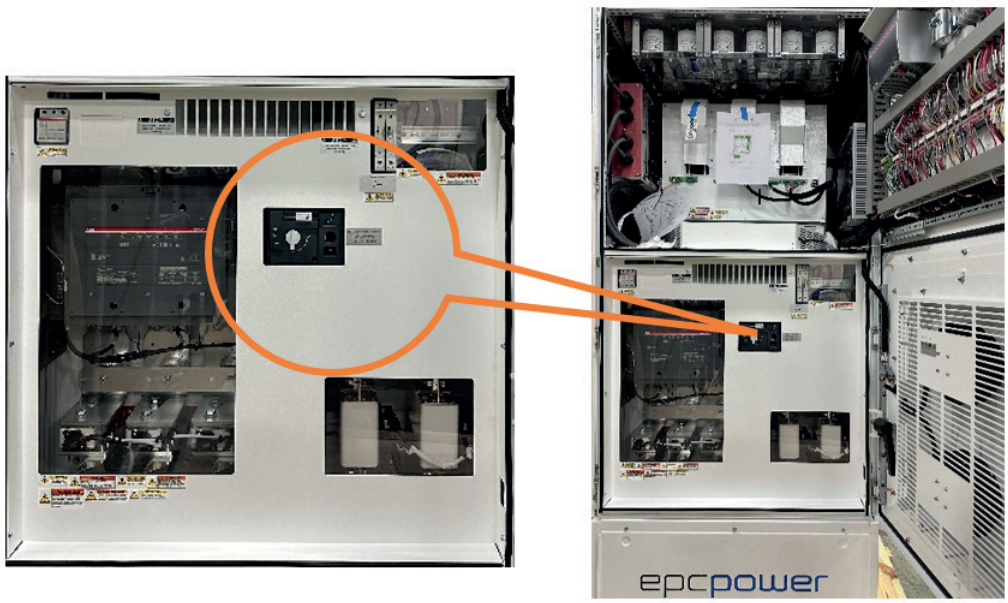


Figure 89. C-Cab XXL DC Disconnect Location

   b. Turn B-Cab XXL switch QS to the “OFF” position. As per Figure 87.

   c. Also remove the cover and expose access to QF1 and QF2.

2. These cables start from the B-Cab XXL connector and are directed to the back of the cabinet. From there, they pass through a liquid-tight conduit and end at a pair of busbars. One busbar is for the positive rail and the other is for the negative rail. See Figure 90 and Figure 91.
3. Identify the cable for the positive power connection this is the cable with the “Orange” connector on one end of the cable. The negative power connection will have “Black” connector on the end of the cable. Route the cable from the front of the battery cabinet to the back exit gland.

Figure 90. B-Cab XXL Positive Power Cable

Figure 91. B-Cab XXL Negative Power Cable

a. Start with one power cable at a time. Standing in front of the battery cabinet with the left side door open as in Figure 92.

b. Start with the compression lug end and not with the high voltage battery connector. Guide the cable to the back of the battery cabinet. Push it through the hole in the back of the battery cabinet.

c. Move to the back of the battery cabinet to where the compression lug and cable should be visible. Pull more of the cable and create enough slack on the cable to feed it through the flexible conduit that was installed in the section of putting all the equipment into position.

d. Feed the cable through the flexible conduit until the cable comes out of the other end and is visible in the C-Trough.

e. Terminate the cable onto the busbar. Pay close attention to the polarity of the connection point, or a short circuit will be created.

f. Connect the cable to the busbar with the hole in the compression lug and torque the fastener to the busbar. For a list of torque values see the provided table in previous equipment positioning section. Make sure to use the table for electrical connections.

g. Now repeat for the second of the two cables that are to be terminated.

h. Do not connect battery connections until all battery cabinets are completed.

4. Repeat from step 1 for each of the B-Cab XXLs.
5. After all B-Cab XXLs have been completed, and without connecting the battery cabinet connections. Megger each connection to the ground connections of the C-Trough.

Final installation shown in this picture

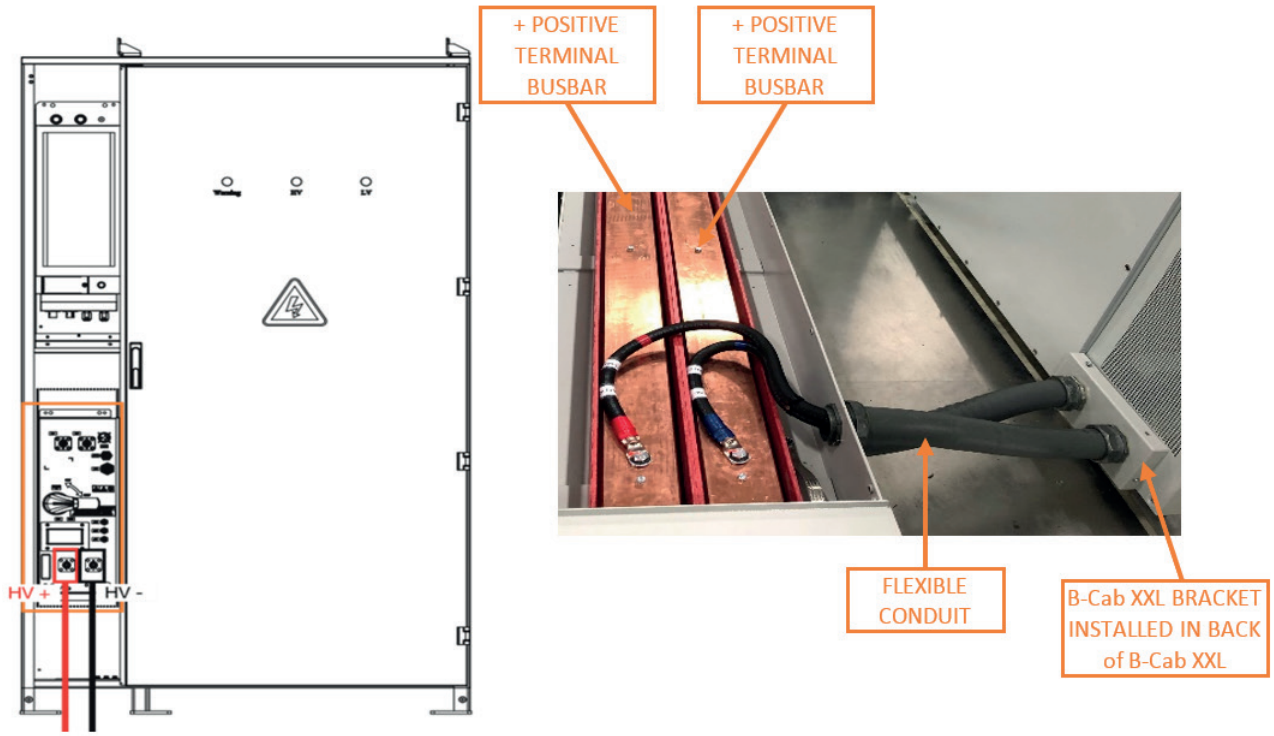


Figure 92. High Voltage DC Connection

Table 20 - B-Cab XXL DC Power Cable Check List

Battery Cabinet	Cable	Completed
B-Cab XXL 1	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 2	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 3	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 4	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 5	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 6	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 7	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	
B-Cab XXL 8	Negative Cable – (HES-XXL1/BAT/P1)	
	Positive Cable -- (HES-XXL1/BAT/P2)	

Repeat this table if there are more than 8 B-Cab XXLs.

7.3.2. B-Cab XXL AC Auxiliary & DC Power and Communication Cable Connections

Each B-Cab XXL requires the installation of two cable harnesses. The first harness (round connector) Figure 94 is dedicated to providing auxiliary power to the chiller. The second harness (oval shaped connector) Figure 95 and Figure 96, on the other hand, is designed for DC power and communication purposes.

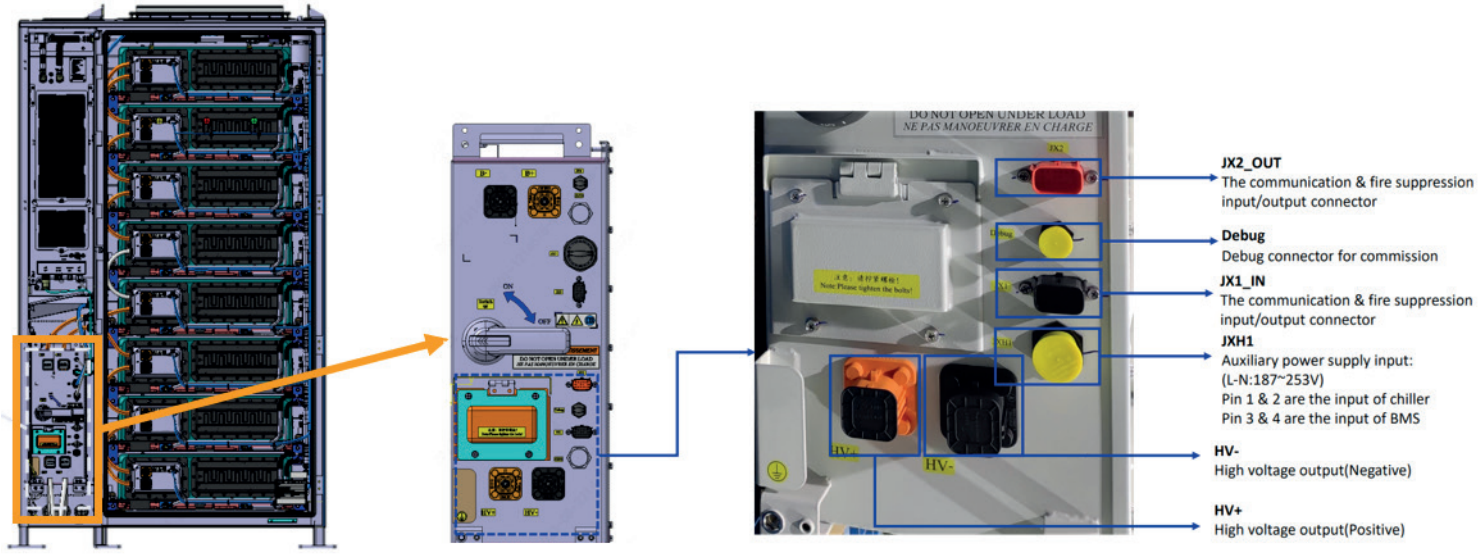


Figure 93. B-Cab XXL AUX & COM Connections

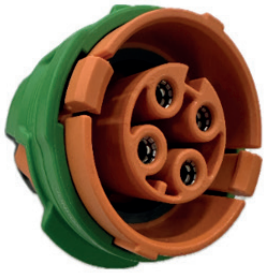


Figure 94. Auxiliary Harness Connector

Figure 95. COM Harness Connector Type 1

Figure 96. COM Harness Connector Type 2

7.3.2.1. B-Cab XXL AC Auxiliary Connections

The auxiliary AC power cable set depicted in Figure 98, come with connectors Figure 94 already installed. The cable harness begins at the B-Cab XXL, travels through the C-Trough and the C-Cab XXL, and finally ends terminated in the M-Cab XXL.

The auxiliary components within the B-Cab XXL which include the Chiller and Control, receive their power from the M-Cab XXL. The process for installing the cable is detailed in the steps provided in this chapter.

	**WARNING!** DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN WIRE WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED IN THE BOTTOM PORTION OF THE C-TROUGH.

Auxiliary AC 230VAC 30kVA (60kVA for 15 B-CABS)

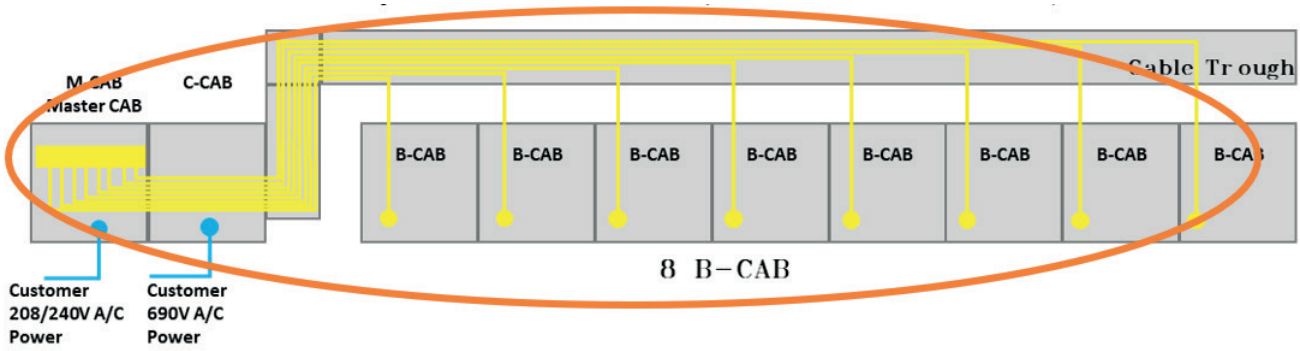


Figure 97. B-Cab XXL Auxiliary AC Power Connections

Auxiliary AC 230VAC 30kVA (60kVA for 15 B-CABS)

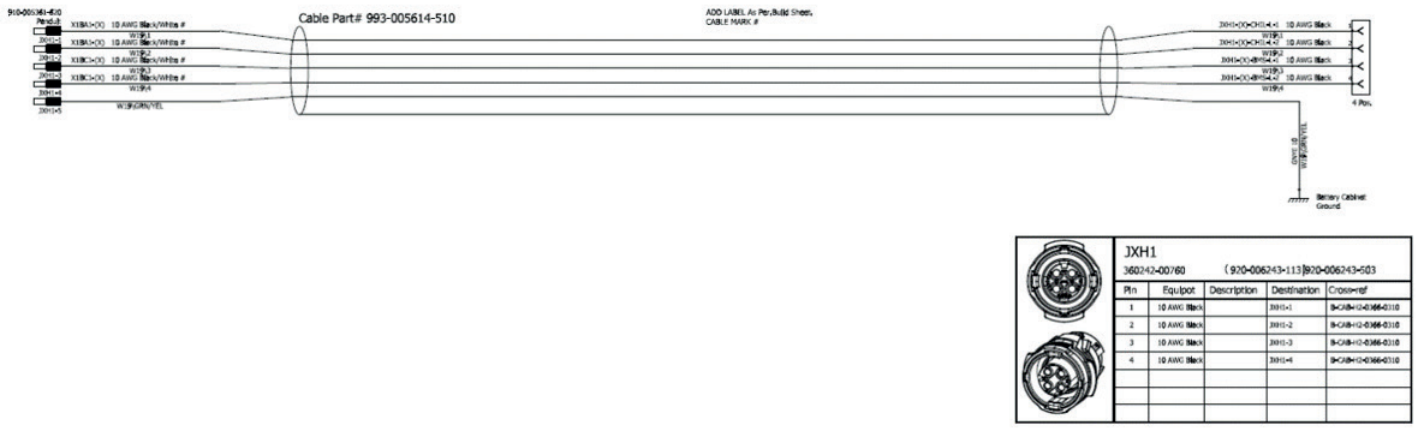


Figure 98. B-Cab XXL Auxiliary Cable

7.3.2.2. Steps for Installing the B-Cab XXL Auxiliary Cable harnesses

Print these steps, at the end of this step is a check list that can be marked off when completed.

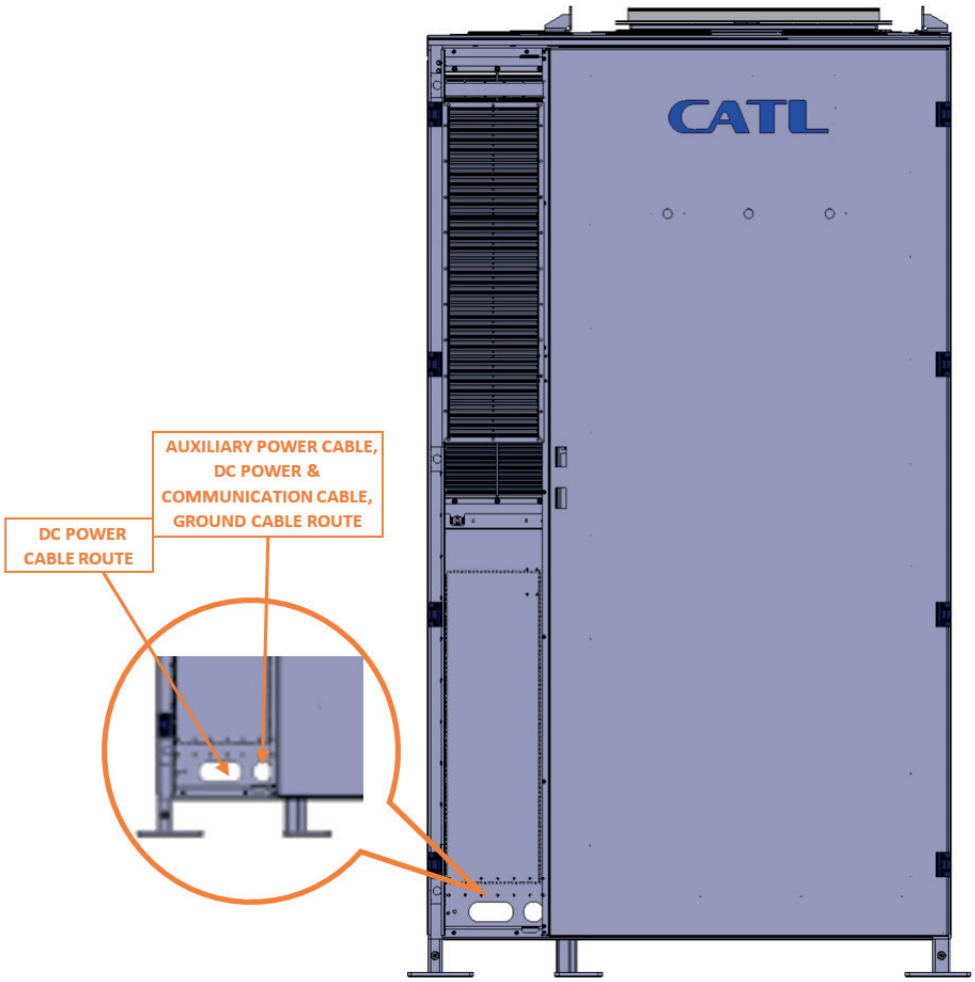


Figure 99. B-Cab XXL Cable Harness Routing

Note: read and understand this section clearly, it outlines the electrical connections.

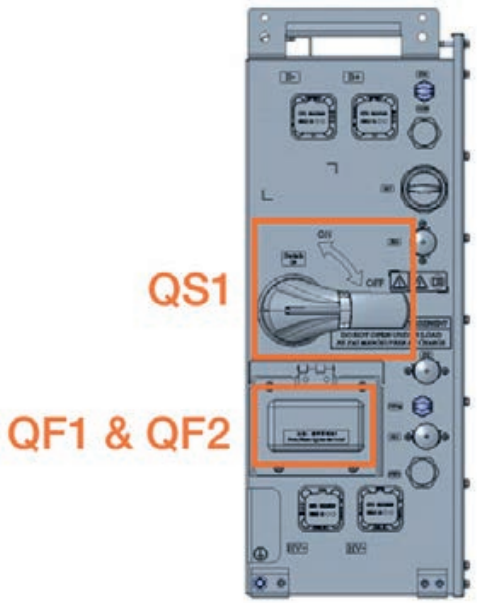


Figure 100. Location of QS disconnect and QF1, QF2 circuit breakers

1. Turn “OFF” all sources of energy.

   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.

   b. Turn M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.

   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. Figure 100.

2. Start by identifying the Auxiliary power harnesses. These cable will be marked as “HES-XXL1/BAT1/AUX” for the first B-Cab XXL, “HES-XXL1/BAT2/AUX” for the next B-Cab XXL and so on.

WARNING!
DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN WIRE WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED IN THE BOTTOM PORTION OF THE C-TROUGH.

3. Once the cables have been identified, the cable needs to be routed from the front of the battery cabinet through the back gland of the battery cabinet. Route the auxiliary power cable from the front of the battery cabinet to the back exit gland. Do not install or route the auxiliary power cable in the same opening as the DC power cables.
4. Start with the end of the cable that does not have a connector on it.

   a. The Auxiliary Power cable has no connector on one of the cable harness and a connector as in Figure 97 on the other end. See Figure 101, for a schematic representation.

   b. With the end that has loose wires push the cable towards the back of the battery cabinet and through the circular opening at the battery cabinet. See Figure 101.

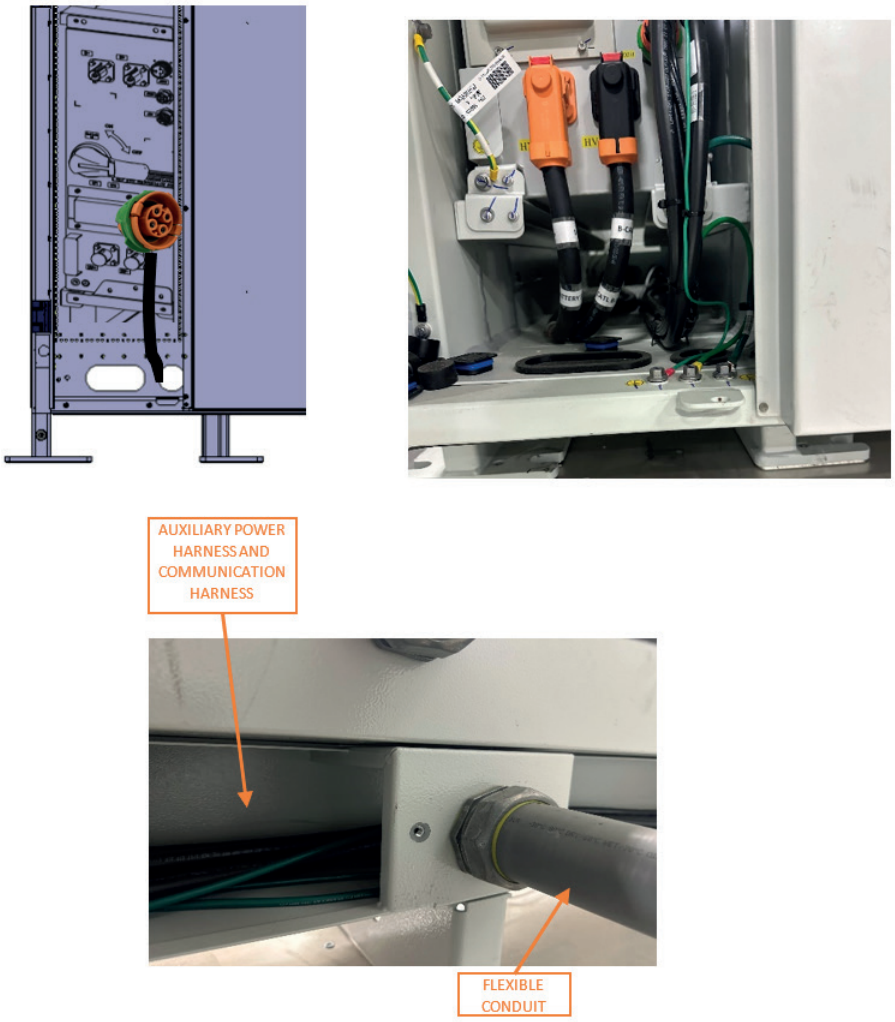


Figure 101. B-Cab XXL Auxiliary Power Cable Harness Routing

c. Keep the Auxiliary cable harness to the right side and away from the DC power cables.

d. Then proceed to the back of the battery cabinet and pull the cable harness trough until there is only enough cable harness remaining to connect the connector to the battery connection JXH1.

e. Carefully push and route the cable harness trough the flexible conduit and into the bottom portion of the C-Trough and then continue to pull the cable through the C-Trough until it reaches the C-Cab XXL entry point.

f. Now push and route the cable harness through the four inch diameter designated for the Auxiliary cable and NOT THE DC cable hole. Push and route that cable harness all the way to the other side of the C-Cab XXL and into the M-Cab XXL.

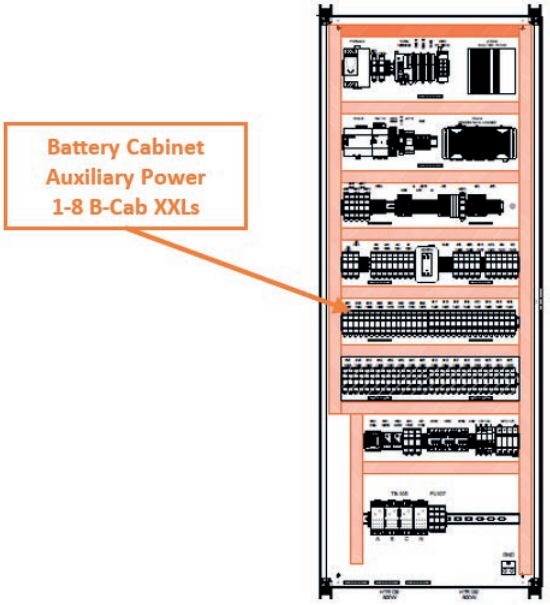


Figure 102. M-Cab XXL Back Pannel Component Layout

g. Terminate the loose wire end onto the bottom of the fuse holder, see Figure 105 for location within the M-Cab XXL. Match the "TERMINAL MARK" specified on Table 21 with the fuse holder reference as shown in Figure 103.

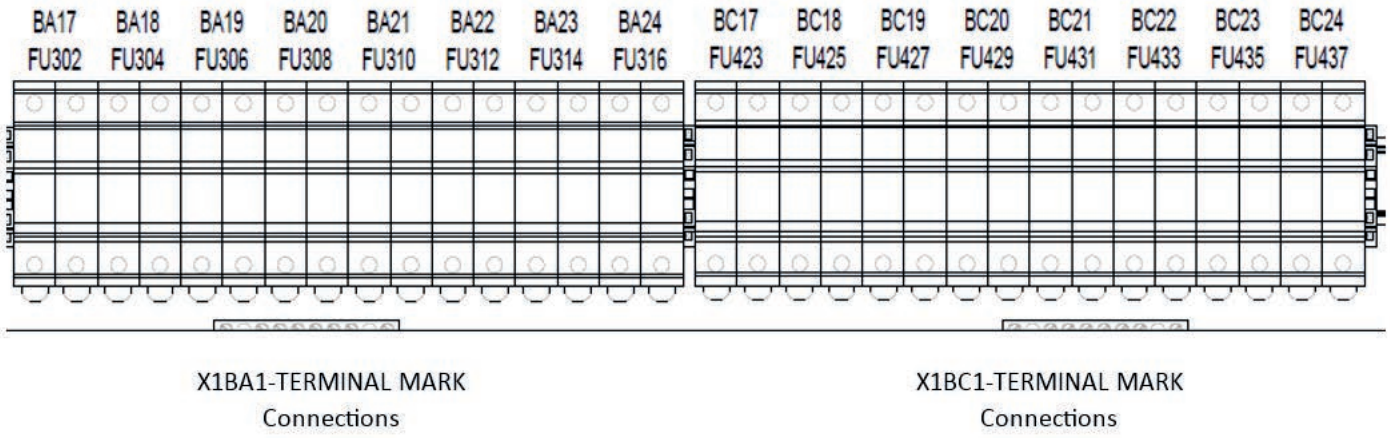


Figure 103. B-Cab XXL Auxiliary Harness Termination Point

h. Terminate the Ground wire onto the ground bus below the terminals.

5. Repeat all the steps outlined beginning from step 1 for all other battery cabinets.

6. Repeat this table if there are more than 8 B-Cab XXLs. Also, print this section and check off the cables on Table 21 as they are completed.

Table 21 B-Cab XXL Auxiliary Power Cables

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY	Installed ?
CABINET	CABLE MARK	FUSE CONNECTION	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT1/AUX	BA17 FU302	X1BA1-17A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 1	407-006820-210	
			X1BA1-17B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC17 FU423	X1BC1-17A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-17B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT2/AUX	BA18 FU304	X1BA1-18A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 2	407-006820-211	
			X1BA1-18B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC18 FU425	X1BC1-18A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-18B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT3/AUX	BA19 FU306	X1BA1-19A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 3	407-006820-212	
			X1BA1-19B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC19 FU427	X1BC1-19A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-19B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT4/AUX	BA20 FU308	X1BA1-20A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 4	407-006820-213	
			X1BA1-20B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC20 FU429	X1BC1-20A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-20B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT5/AUX	BA21 FU310	X1BA1-21A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 5	407-006820-214	
			X1BA1-21B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC21 FU431	X1BC1-21A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-21B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT6/AUX	BA22 FU312	X1BA1-22A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 6	407-006820-215	
			X1BA1-22B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC22 FU433	X1BC1-22A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-22B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT7/AUX	BA23 FU314	X1BA1-23A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 7	407-006820-216	
			X1BA1-23B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC23 FU435	X1BC1-23A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-23B	Bk/Wh # 4, Or Grey	JXH1 - 4				
HES-XXL M-Cab XXL 1	HES-XXL1/ BAT8/AUX	BA24 FU316	X1BA1-24A	Bk/Wh # 1, Or Blue	JXH1 - 1	JXH1	B-Cab XXL 8	407-006820-217	
			X1BA1-24B	Bk/Wh # 2, Or Brown	JXH1 - 2				
		BC24 FU437	X1BC1-24A	Bk/Wh # 3, Or Black	JXH1 - 3				
			X1BC1-24B	Bk/Wh # 4, Or Grey	JXH1 - 4				

7.3.2.3. B-Cab XXL DC Power and Communication Cable harnesses

The DC power and communication harness cable set are depicted in Figure 107, Figure 108 and Figure 109, come with connectors Figure 104 and Figure 105 already installed. The cable harness begins at the B-Cab XXL, travels through the C-Trough and the C-Cab XXL, and finally ends terminated in the M-Cab XXL.

The DC power and communication within the B-Cab XXL which include the power for sensors and CAN communication, receive their power and status and communication from the M-Cab XXL. The process for installing the cable is detailed in the steps provided in this chapter.

WARNING!
DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN WIRE WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED IN THE BOTTOM PORTION OF THE C-TROUGH.

Figure 104. COM Harness Connector Type 1 (JX1)

Figure 105. COM Harness Connector Type 2 (JX2)

These two connectors serve as the interface to the B-Cab XXLs (Battery Cabinets). They carry the signals necessary to power internal sensors within the battery cabinet. Additionally, they establish a bidirectional data link between the system controllers, enabling effective system operations.

1. **Cable Harnesses and Connectors:**
   a. The connectors are combined to create functional cable harnesses.
   b. There are two types of cable harnesses:
      i. The first one interfaces with the M-Cab XXL (Master Control Cabinet) to deliver power and signals to the B-Cab XXLs (Battery Cabinets).
      ii. The second type is duplicated for each B-Cab XXL in a daisy chain configuration.
      iii. The last B-Cab XXL is fitted with a Termination connector.

2. **Routing and Avoiding High Voltage:**
   a. These cable harnesses must be routed through the C-Trough.
   b. Coincidently, they share the same conduit used for Auxiliary power harnesses.
   c. This design choice helps avoid the high voltage connection cables.

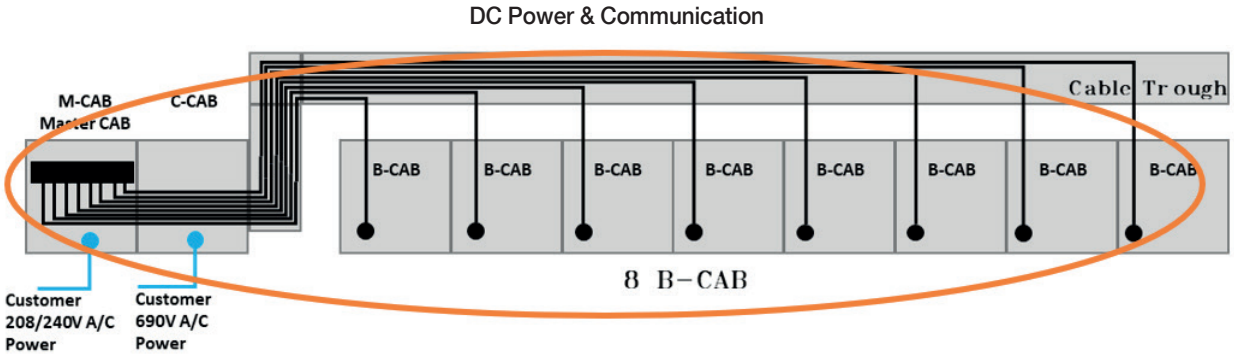


Figure 106. B-Cab XXL DC Power & Communications

The purpose of this harness:

- Supplies DC power to the smoke and heat sensors located in the B-Cab XXDCL.
- The power originates from the M-Cab XXL.
- Harness also facilitates CAN communication between the B-Cab XXL and the M-Cab XXL.

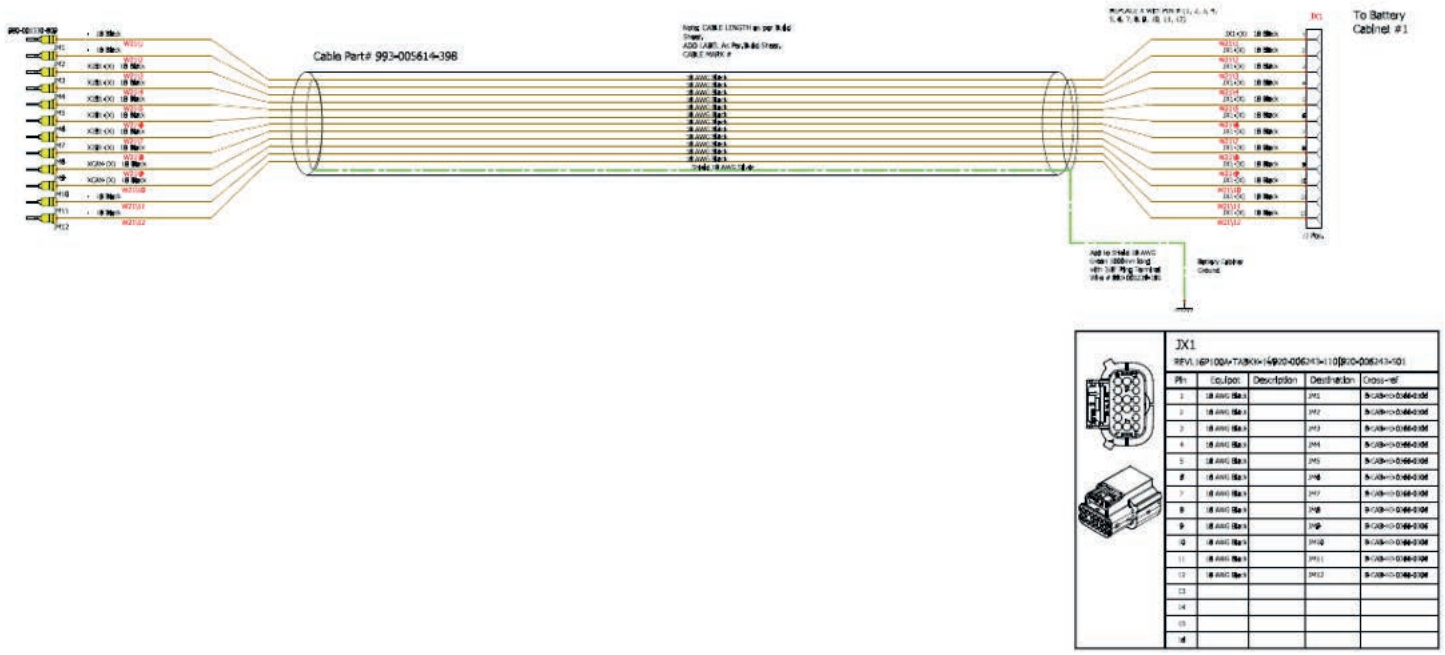


Figure 107. B-Cab XXL 1 to M-Cab XXL DC Power & COM Cable Harness

The purpose of this harness:

- Supplies DC power to the smoke and heat sensors from B-Cab XXL to B-Cab XXL.
- The power originates from the M-Cab XXL.
- Harness also facilitates CAN communication between the B-Cab XXL to B-Cab XXL and the M-Cab XXL.

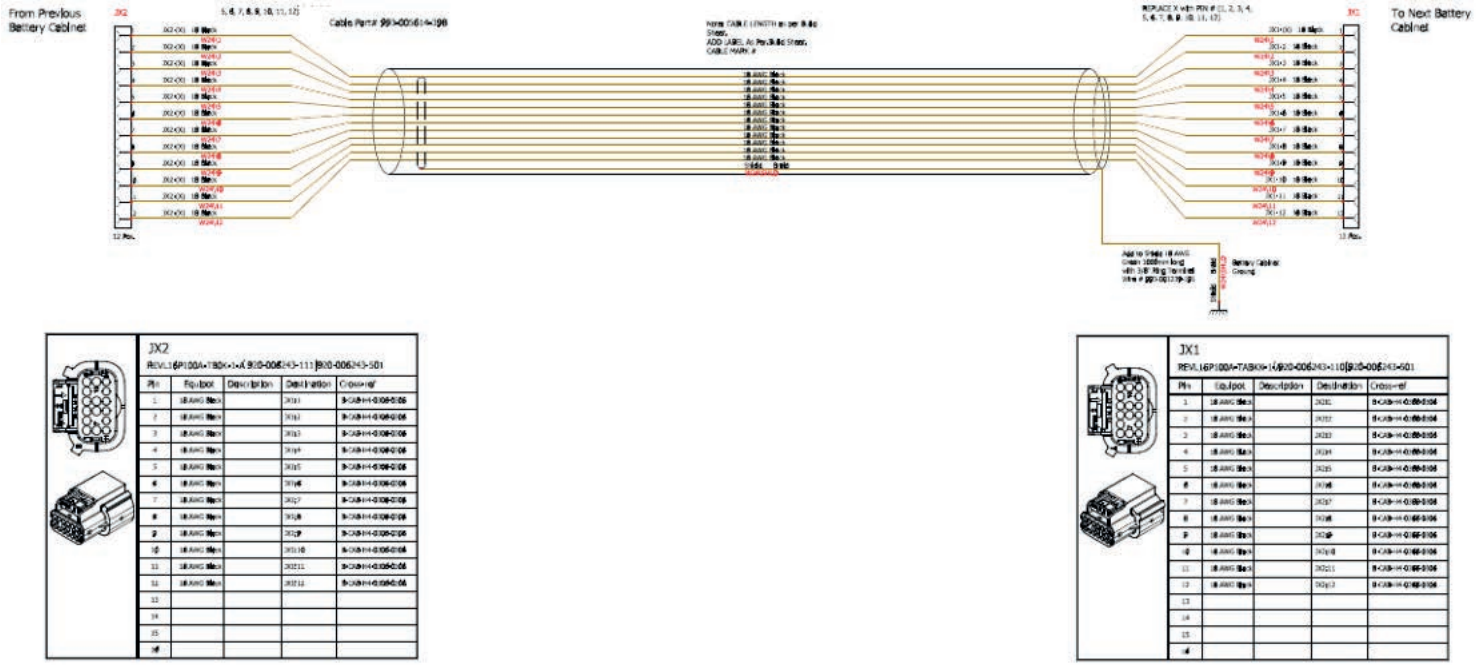


Figure 108. B-Cab XXL to B-Cab XXL DC Power & COM Cable Harness

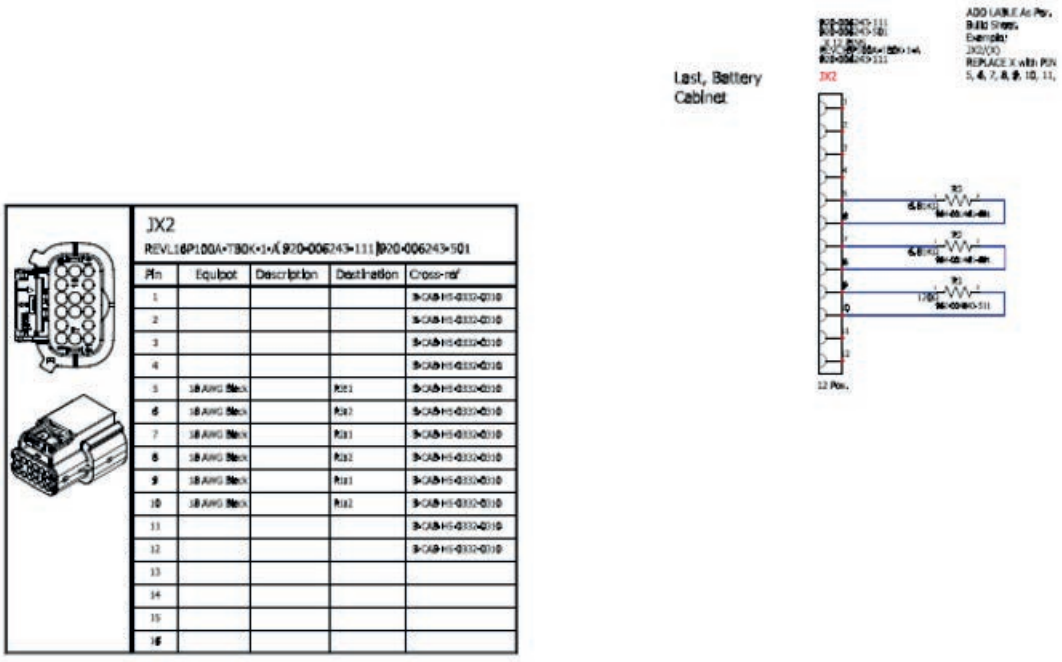


Figure 109. B-Cab XXL Last Cabinet Termination

7.3.2.4. Steps for Installing the B-Cab XXL DC Power and Communication Cable harnesses

Print these steps, at the end of this step is a check list that can be marked off when completed.

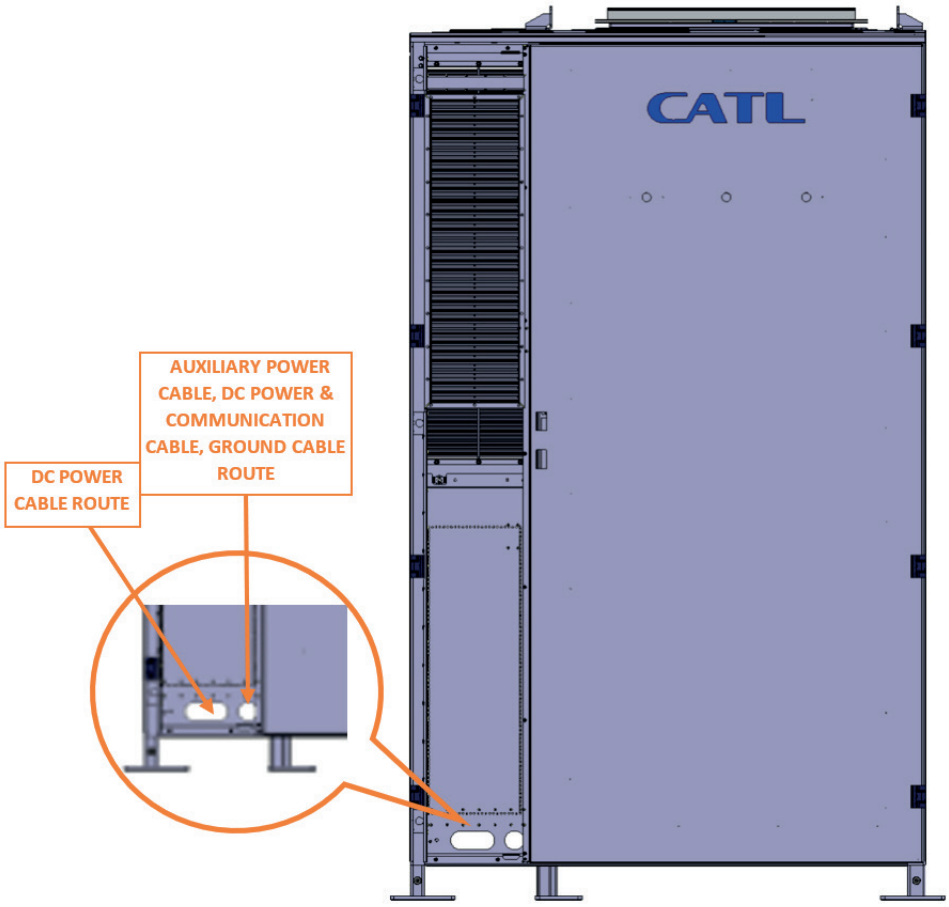


Figure 110. B-Cab XXL Cable Harness Routing

Note: read and understand this section clearly, it outlines the electrical connections.

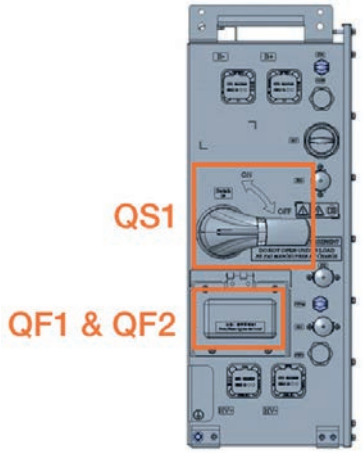


Figure 111. Location of QS disconnect and QF1, QF2 circuit breakers

1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. Figure 121.
2. Start by identifying the DC power and communication harnesses. These cable will be marked as “HES-XXL1BAT1/CAN/FS” for the first B-Cab XXL, “HES-XXL1BAT2/CAN/FS” for the next B-Cab XXL and so on.

WARNING!
DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN WIRE WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED IN THE BOTTOM PORTION OF THE C-TROUGH.

3. Once the cables have been identified, the cable needs to be routed from the front of the battery cabinet through the back gland of the battery cabinet. Route the “HES-XXL1BAT1/CAN/FS” cable from the front of the battery cabinet to the back exit gland. Do not install or route the “HES-XXL1BAT1/CAN/FS” cable in the same opening as the DC power cables.
4. Start with the end of the cable that does not have a connector on it.
   a. The “HES-XXL1BAT1/CAN/FS” cable has no connector on one of the cable harness and a connector as in Figure 107 on the other end. See Figure 110, for a schematic representation.
   b. While positioned in the front of the first battery cabinet (B-Cab XXL #1) . With the end that has loose wires push the cable towards the back of the battery cabinet and through the circular opening at the battery cabinet. See Figure 113.

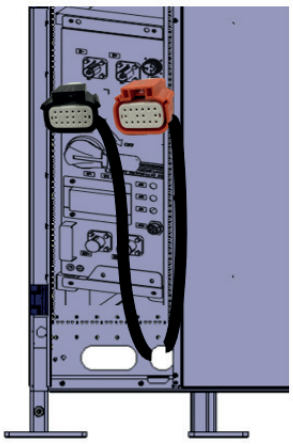


Figure 112. B-Cab XXL JX1 & JX2 Cable Harness Routing

c. Keep the DC power and Communication cable harness to the right side and away from the DC power cables. Push enough slack to be able to pull from the back of the battery cabinet.

d. Then proceed to the back of the battery cabinet and pull the cable harness trough until there is only enough cable harness remaining to connect the connector to the battery connection JX1.

e. Carefully push and route the cable harness trough the flexible conduit and into the bottom portion of the C-Trough and then continue to pull the cable through the C-Trough until it reaches the C-Cab XXL entry point.

f. Now push and route the cable harness through the four inch diameter designated for the Auxiliary and DC power and Communication cable and NOT THE DC cable hole. Push and route that cable harness all the way to the other side of the C-Cab XXL and into the M-Cab XXL.

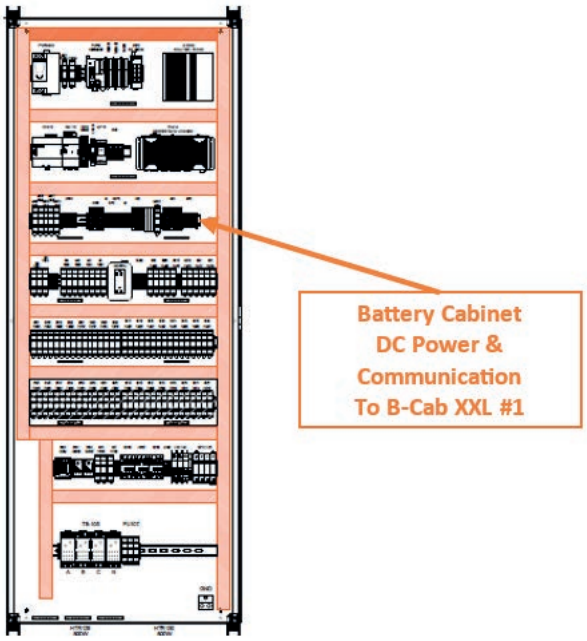


Figure 113. M-Cab XXL Back Pannel Component Layout

g. Terminate the loose wire end onto the bottom of the Terminal Block X2B1, see Figure 113 for location within the M-Cab XXL. Match the "TERMINAL MARK" specified on

h. Table 22 with the Terminal Block reference as shown in Figure 114.

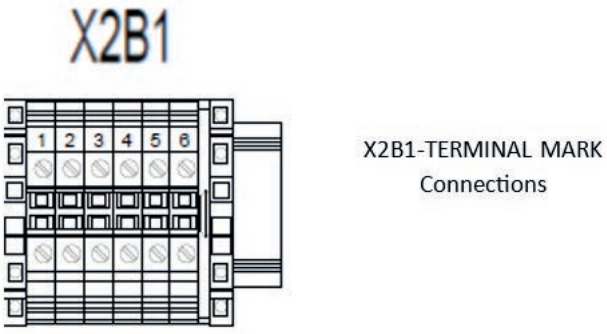


Figure 114. B-Cab XXL DC Power & Communication Harness Termination Point

i. Terminate the Ground wire onto the ground bus below the terminals.

5. Next install the cable harness that connects the rest of the B-Cab XXLs together. This will daisy chain all the rest of the B-Cab XXLs together. Start with the same B-Cab XXL as the previous step.

6. Locate B-Cab XXL cable harness, “HES-XXL1BAT2/CAN/FS” and find the end that is marked with JX1.

   a. While in front of the battery cabinet. Carefully push the JX1 connector to the back end of the battery and guide it through the same way that the previous cable was pushed through. Push it through till you have enough slack at the back of the battery cabinet to be able to pull from the back of the battery cabinet. Leave enough slack to be able to connect connector JX2 to the battery cabinet connection point JX2.

   b. Proceed to the back of the battery cabinet. Locate the cable with JX1 connector then push it through the conduit as the previous cable harness.

   c. Once the cable enters the C-Trough. Then pull the cable harness through and guide it to the next battery cabinet.

   d. Locate the conduit that will connect to the next battery cabinet. Push the JX1 connector all the way through the conduit until it is visible at the other end of the conduit. Push enough slack to be able to pull the cable harness through and into the next battery cabinet.

   e. Push the connector into the battery cabinet so that it can be reached and pulled from the front of the battery cabinet.

   f. Proceed to the front of the battery cabinet and keep the cable harness to the right side of the cabinet so that it is away from the high voltage DC Cables. Pull it towards the front of the battery cabinet and reaches the JX1 connection point.

7. Repeat from Step 5 until all battery cabinets are completed.
8. On the last battery cabinet install the terminator Connector to JX2.

Repeat this

Table 22 if there are more than 8 B-Cab XXLs. Also, print this section and check off the cables on Table 21as they are completed.

Table 22 - B-Cab XXL DC Power & COM Cable Harness

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY	Installed ?
CABINET	CABLE MARK	FUSE CONNECTION	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL M-Cab XXLINET 1	HES-XXL1BAT1/ CAN/FS		-	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 1	407-006820-320	
			-	Bk/Wh #2	JX1-2				
		M-Cab XXL-X2B1-2	X2B1-2	Bk/Wh #3	JX1-3				
		M-Cab XXL-X2B1-1	X2B1-1	Bk/Wh #4	JX1-4				
		M-Cab XXL-X2B1-4	X2B1-4	Bk/Wh #5	JX1-5				
		M-Cab XXL-X2B1-3	X2B1-3	Bk/Wh #6	JX1-6				
		M-Cab XXL-X2B1-6	X2B1-6	Bk/Wh #7	JX1-7				
		M-Cab XXL-X2B1-5	X2B1-5	Bk/Wh #8	JX1-8				
		M-Cab XXL-XCAN-1	XCAN-1	Bk/Wh #9	JX1-9				
		M-Cab XXL-XCAN-2	XCAN-2	Bk/Wh #10	JX1-10				
			-	Bk/Wh #11	JX1-11				
			-	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				
CATL BATTERY 1	HES-XXL1BAT2/ CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 2	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				
CATL BATTERY 2	HES-XXL1BAT3/ CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 3	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY	Installed ?
CABINET	CABLE MARK	FUSE CONNECTION	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
CATL BATTERY 3	HES-XXL1BAT4/CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 4	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				
CATL BATTERY 4	HES-XXL1BAT5/CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 5	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				
CATL BATTERY 5	HES-XXL1BAT6/CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 6	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY	Installed ?
CABINET	CABLE MARK	FUSE CONNECTION	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
CATL BATTERY 6	HES-XXL1BAT7/CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 7	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				
CATL BATTERY 7	HES-XXL1BAT8/CAN/FS	JX2	JX2-1	Bk/Wh #1	JX1-1	JX1	B-Cab XXL 8	407-006820-321	
			JX2-2	Bk/Wh #2	JX1-2				
			JX2-3	Bk/Wh #3	JX1-3				
			JX2-4	Bk/Wh #4	JX1-4				
			JX2-5	Bk/Wh #5	JX1-5				
			JX2-6	Bk/Wh #6	JX1-6				
			JX2-7	Bk/Wh #7	JX1-7				
			JX2-8	Bk/Wh #8	JX1-8				
			JX2-9	Bk/Wh #9	JX1-9				
			JX2-10	Bk/Wh #10	JX1-10				
			JX2-11	Bk/Wh #11	JX1-11				
			JX2-12	Bk/Wh #12	JX1-12				
			-	SHIELDING	B-Cab XXL 1-GND				
CATL BATTERY 8	HES-XXL1BAT-T/CAN/FS TERMINATOR	JX2	JX2-1					407-006820-304	
			JX2-2						
			JX2-3						
			JX2-4						
			JX2-5		R3-1				
			JX2-6		R3-2				
			JX2-7		R2-1				
			JX2-8		R2-2				
			JX2-9		R1-1				
			JX2-10		R1-2				
			JX2-11						
			JX2-12						
			-						

7.3.3. B-Cab XXL Grounding

The following instructions describe the method of routing ground cables from each B-Cab XXL to the termination compartment, these are supplied with the system. In the instructions below, B-Cab XXLs are referenced relative to their position from the C-Cab XXL. The ground cables are to be routed through the C-Trough. See Figure 115.

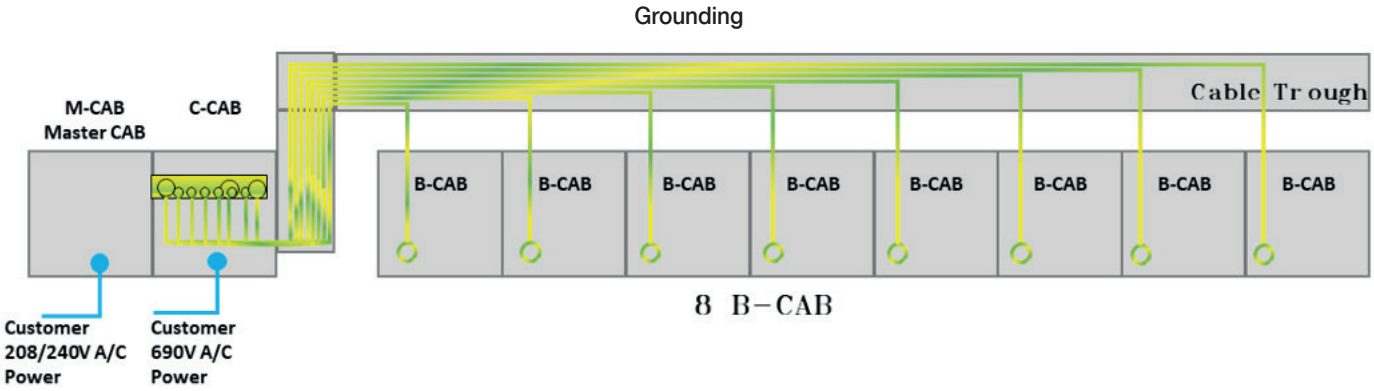


Figure 115. B-Cab XXL Grounding

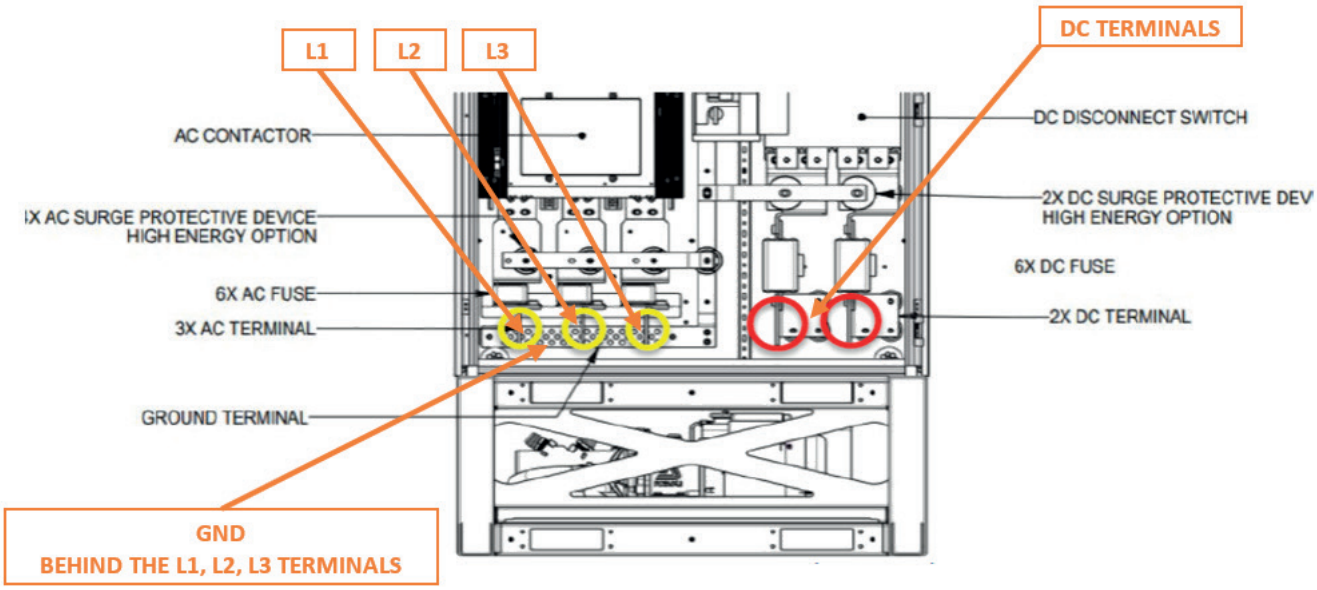


Figure 116. C-Cab XXL Ground Connection Location

C-Cab XXL Grounding bar configuration and dimensions (mm).

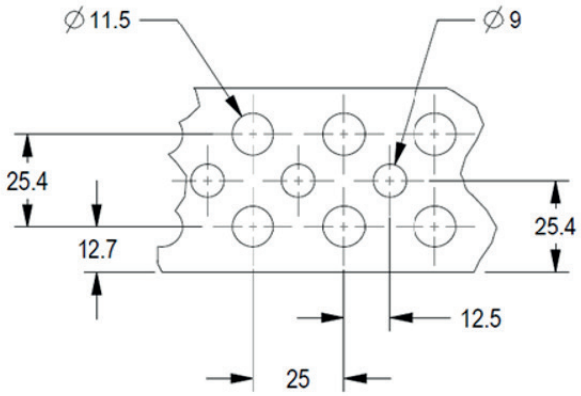


Figure 117. C-Cab XXL Gound Terminal Details Dim (mm)

B-Cab XXL Grounding locations, connect to the marked location.

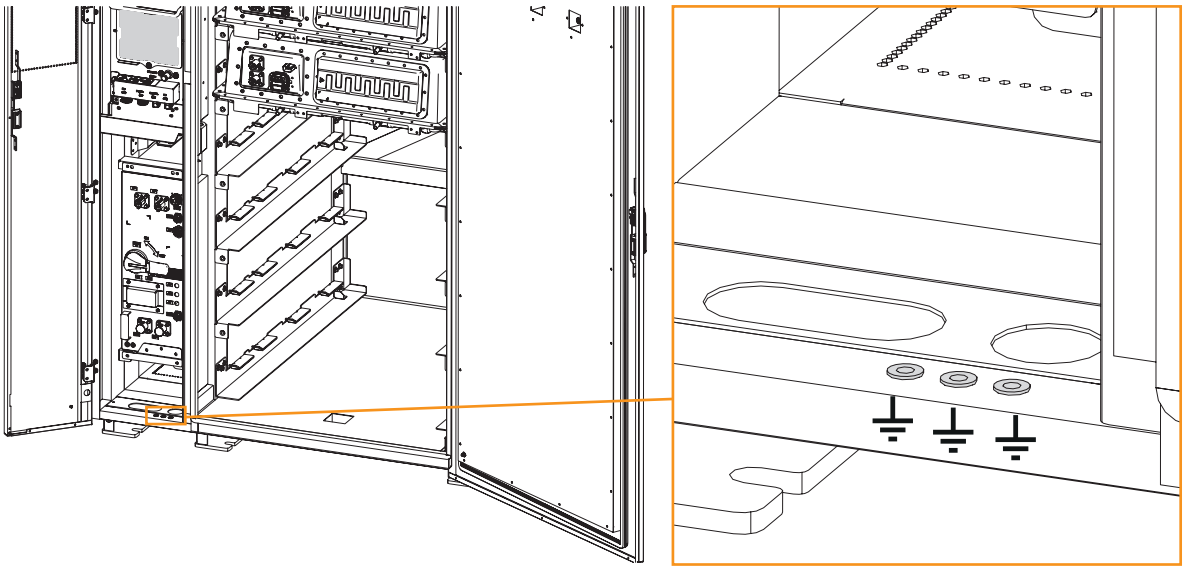


Figure 118. B-Cab XXL Grounding Location

The purpose of this harness:

- To create a reference point to the same ground point.
- To create a ground point for electrical safety.

Figure 119. B-Cab XXL Ground Cable Assembly

Reference of the B-Cab XXL with the cable entry point.

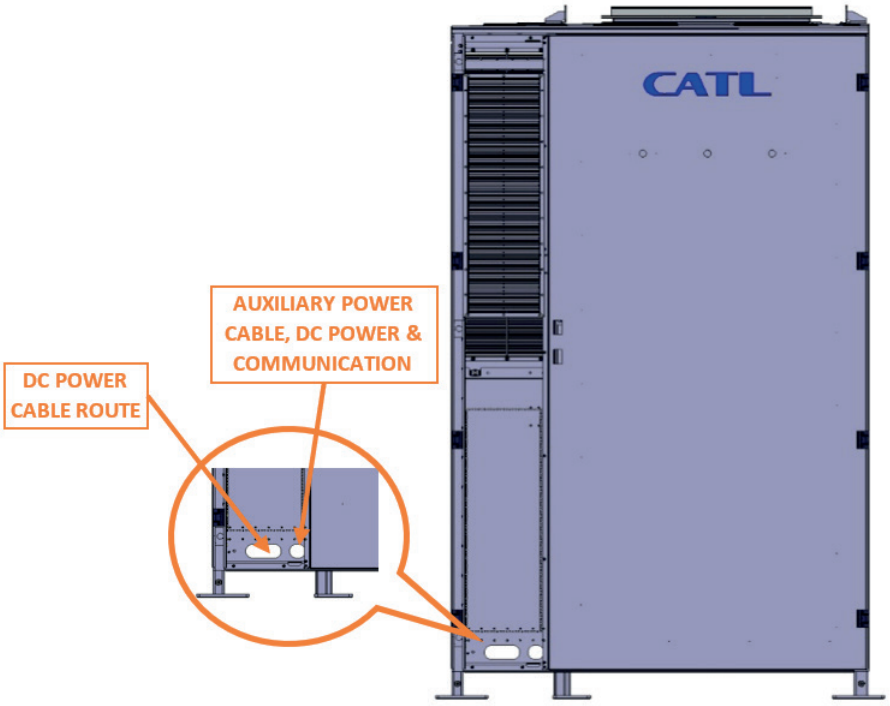


Figure 120. B-Cab XXL Cable Harness Routing

Note: read and understand this section clearly, it outlines the electrical connections.

7.3.3.1. Steps for Installing the B-Cab XXL Grounding Cables

Print these steps, at the end of this step is a check list that can be marked off when completed

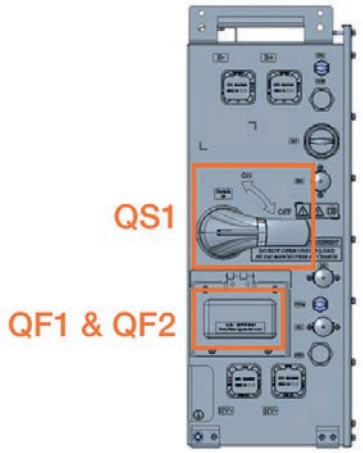


Figure 121. Location of QS disconnect and QF1, QF2 circuit breakers

1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. Figure 121.
2. Start by identifying the DC power and communication harnesses. These cable will be marked as “PE/HES-XXL1/BAT1” for the first B-Cab XXL, “PE/HES-XXL1/BAT2” for the next B-Cab XXL and so on.

WARNING!
DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN WIRE WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED IN THE BOTTOM PORTION OF THE C-TROUGH.

3. Once the cables have been identified, the cable needs to be routed from the front of the battery cabinet through the back gland of the battery cabinet. Route the “PE/HES-XXL1/BAT1” cable from the front of the battery cabinet to the back exit gland. Do not install or route the “PE/HES-XXL1/BAT1” cable in the same opening as the DC power cables.
4. Start with any one end of the cable, both ends of the ground cable have same size connectors.
   a. The “PE/HES-XXL1/BAT1” ground cable have crimped connectors for ease of installation. See Figure 119, for a schematic representation.
   b. While in positioned in the front of the first battery cabinet (B-Cab XXL #1) . With the end that has loose wires push the cable towards the back of the battery cabinet and through the circular opening at the battery cabinet. See Figure 120.

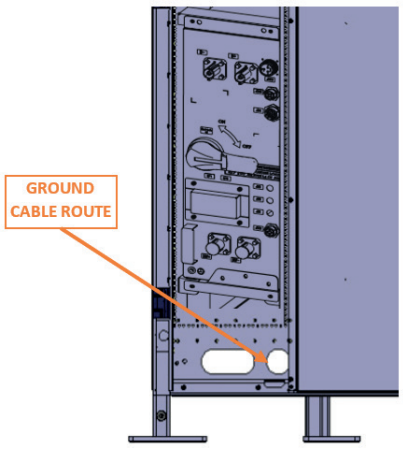


Figure 122. Ground Cable Routing

c. Keep the ground cable assembly to the right side and away from the DC power cables. Push enough slack to be able to pull from the back of the battery cabinet.

d. Then proceed to the back of the battery cabinet and pull the ground cable through until there is only enough cable remaining to connect the ground cable to the battery ground connection.

e. Carefully push and route the ground cable through the flexible conduit and into the bottom portion of the C-Trough and then continue to pull the cable through the C-Trough until it reaches the C-Cab XXL entry point.

f Now push and route the cable harness through the four inch diameter designated for the Auxiliary and DC power and Communication cable and NOT THE DC cable hole. Push and route the ground cable all the way and connect to the C-Cab XXL ground connections.

g. Go back and connect the ground cable to the grounding point on the battery cabinet.

5. Repeat all the steps for the remaining B-Cab XXLs.

Print Table 23, and check of as the connections are completed.

Table 23 - B-Cab XXL Ground Cable Harness

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY	Installed ?
CABINET	CABLE MARK	CONNECTION	TERMINAL		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT1	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 1 - GND	CRIMP LUG	B-Cab XXL 1	407-006820-130	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT2	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 2 - GND	CRIMP LUG	B-Cab XXL 2	407-006820-131	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT3	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 3 - GND	CRIMP LUG	B-Cab XXL 3	407-006820-132	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT4	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 4 - GND	CRIMP LUG	B-Cab XXL 4	407-006820-133	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT5	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 5 - GND	CRIMP LUG	B-Cab XXL 5	407-006820-134	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT6	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 6 - GND	CRIMP LUG	B-Cab XXL 6	407-006820-135	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT7	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 7 - GND	CRIMP LUG	B-Cab XXL 7	407-006820-136	
HES-XXL C-Cab XXL 1	PE/HES-XXL1/ BAT8	C-Cab XXL GND	C-Cab XXL 1 / GND	Green (Gr/Ye Sleeve)	B-Cab XXL 8 - GND	CRIMP LUG	B-Cab XXL 8	407-006820-137	

7.4. C-Cab XXL Cable Harness Connections

The Converter Cabinet (C-Cab XXL) requires an auxiliary power supply to initiate its operations. This auxiliary power supply is responsible for energizing various components within the C-Cab XXL, which include:

1. Controls: These are the mechanisms that manage the operations of the C-Cab XXL.
2. Cooling Fan: This component helps in maintaining the temperature within the C-Cab XXL.
3. Coolant Pump: This pump circulates the coolant to prevent overheating of the system.
4. Heaters: These are used to maintain a certain temperature within the C-Cab XXL.

The connections for this auxiliary power supply are terminated at the C-Cab XXL terminals, specifically at terminal group marked as XD17. The power needed for these connections is sourced from the Master Cabinet (M-Cab XXL).

In scenarios involving black start applications, it's recommended to separate the auxiliary power input into two sections: Uninterruptible Power Supply (UPS) and non-UPS. This division helps in reducing the power demand on the UPS. The High Energy System XXL (HES XXL) is already equipped with these separated connections.

This chapter further discusses the various cable harnesses that need to be connected. These include:

1. C-Cab XXL Auxiliary Power Supply Harness: This harness connects the auxiliary power supply to the C-Cab XXL.
2. C-Cab XXL E-Stop Harness: This harness is connected to the emergency stop (E-Stop) system of the C-Cab XXL.
3. C-Cab XXL CAN Communication Harness: This harness is used for the Controller Area Network (CAN) communication within the C-Cab XXL.

For the Converter Cabinet (C-Cab XXL), there are three key cable harnesses that need to be connected. These include: Auxiliary Power Cable Harness, E-Stop Cable Harness, and the CAN Cable Harness.

When it comes to routing and establishing these connections, it's advisable to route all these cable harnesses simultaneously. This approach can help streamline the process and ensure proper organization of the cables.

Figure 123 provides a visual guide to the cable harnesses that need to be connected. These harnesses will establish a connection from the Master Cabinet (M-Cab XXL) to the C-Cab XXL.

Table 24, on the other hand, offers a comprehensive list of all the cable harnesses along with their respective connection points. This table severs as a handy reference during the connection process.

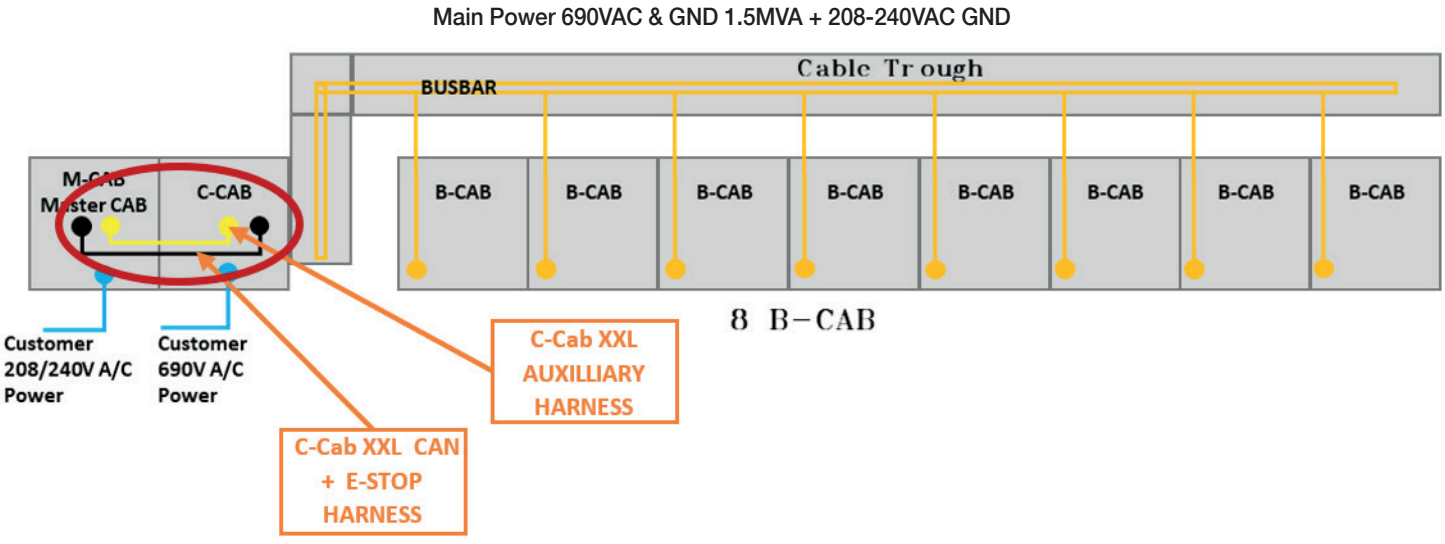


Figure 123. C-Cab XXL Auxiliary + COM Harness

7.4.1. C-Cab XXL Auxiliaries Power Supply

Installing the Auxiliary Power Supply harness that will go from the M-Cab XXL and the C-Cab XXL.
Refer to Figure 124 and Figure 125 for a suggested routing path.

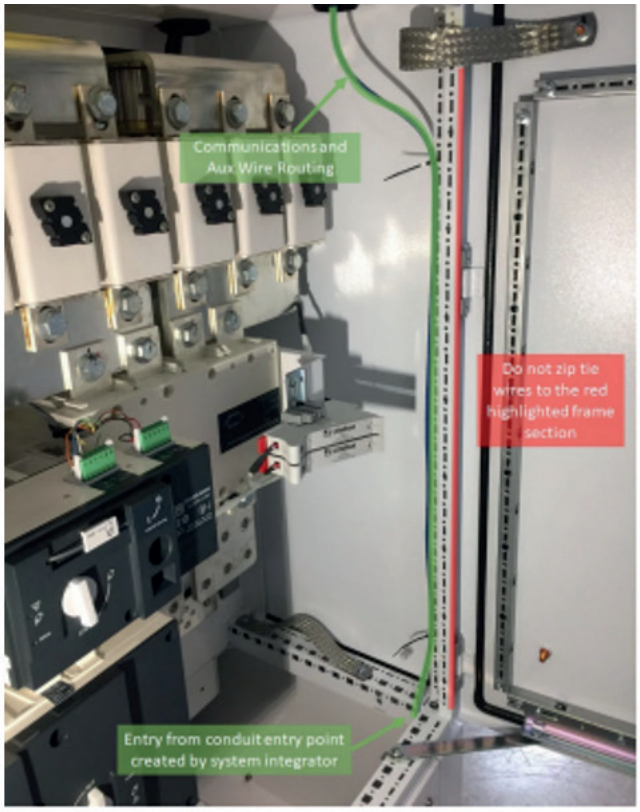


Figure 124. C-Cab XXL Lower Cabinet Auxiliary and Communication wire routing to the User Interface

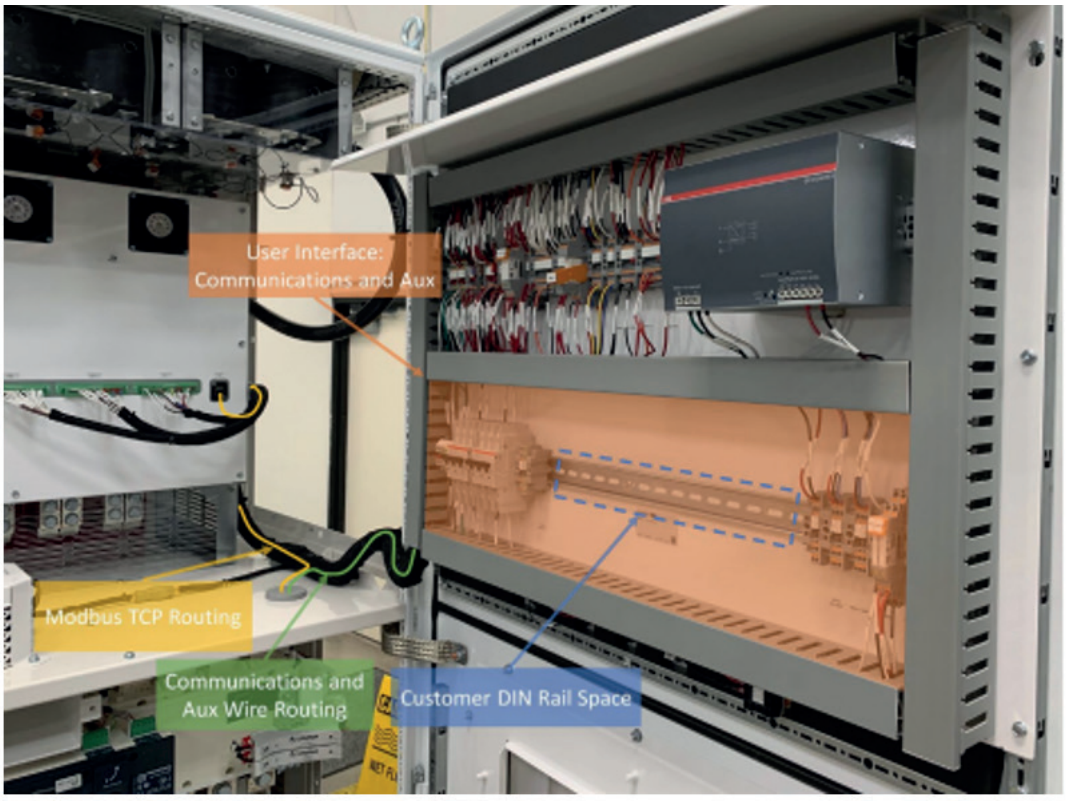


Figure 125. C-Cab XXL Upper Cabinet Auxiliary and Communication wire routing to the User Interface

7.4.2. Steps for Installing the C-Cab XXL Auxiliary Power Cable Harness

Print these steps, at the end of this step is a check list that can be marked off when completed.

Note: read and understand this section clearly, it outlines the electrical connections.

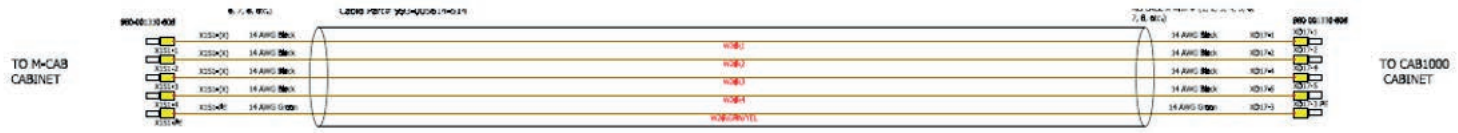


Figure 126. C-Cab XXL Auxiliary Power Cable Harness

1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. Figure 121.
2. Start by identifying the Auxiliary Power Cable Harnesses. The cable will be marked as “HES-XXL1M1/C-Cab XXL1-PWR” Figure 129.

WARNING!
DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN PATH WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED FROM THE BOTTOM SECTION OF THE C-CAB XXL AND KEPT AWAY FROM THE HIGH VOLTAGE CABLES.

3. Once the cable has been identified, the cable needs to be routed as shown in Figure 124 and Figure 125 behind the high voltage dead front. The routing should avoid contact with the high voltage cables.
   a. Then route the “HES-XXL1M1/C-Cab XXL1-PWR” Figure 126 cable harness along the right side of the C-Cab XXL through the gromet shown on Figure 127 and up to the control part of the C-Cab XXL.
   b. Once in the cable is in the control portion of the cabinet using the path outlined in Figure 125 to terminal block XD17.

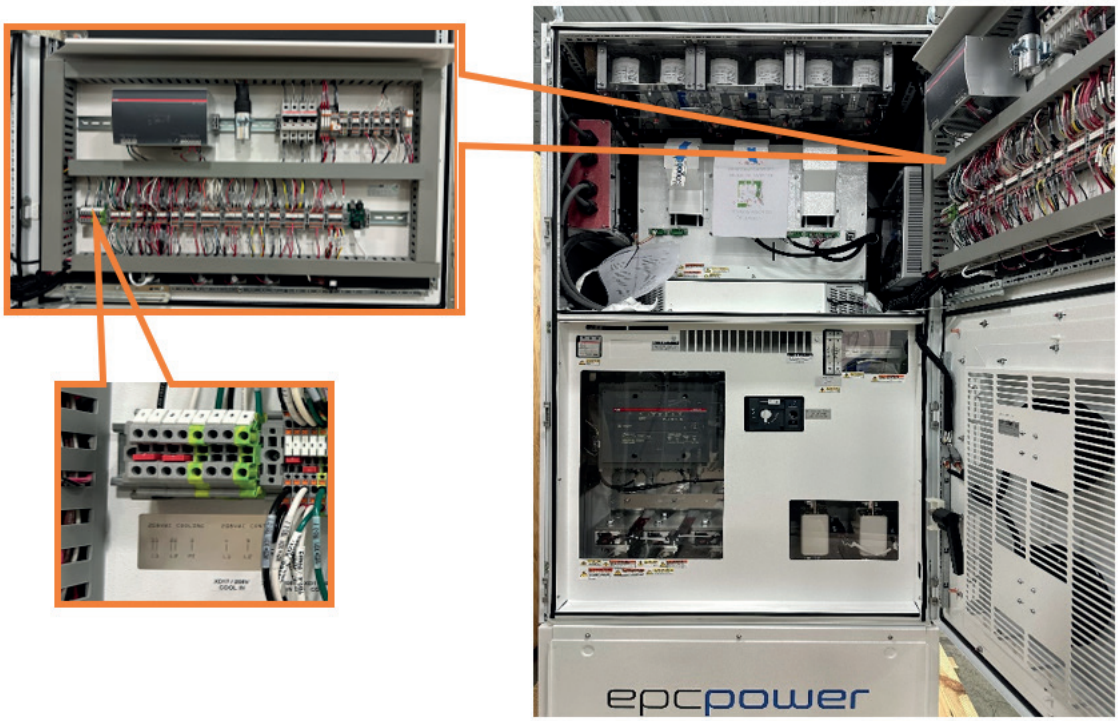


Figure 127. C-Cab XXL Auxiliary Power Terminal Location - XD17

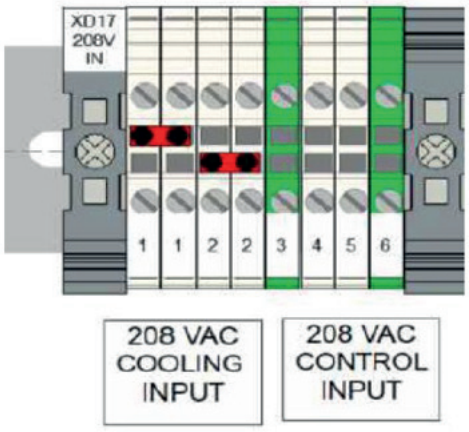


Figure 128. C-Cab XXL XD17 Terminal Connection

c. Terminate the individual wires as defined in Table 24.

d. As aid for the location reference use Figure 128 and Figure 129 as a guide.

4. The other end of “HES-XXL1M1/C-Cab XXL1-PWR” Figure 129 cable harness needs to be routed through the bottom of the M-Cab XXL.

a. Route the cable harness as per Figure 129.

b. Terminate the individual wires as defined in Table 24.

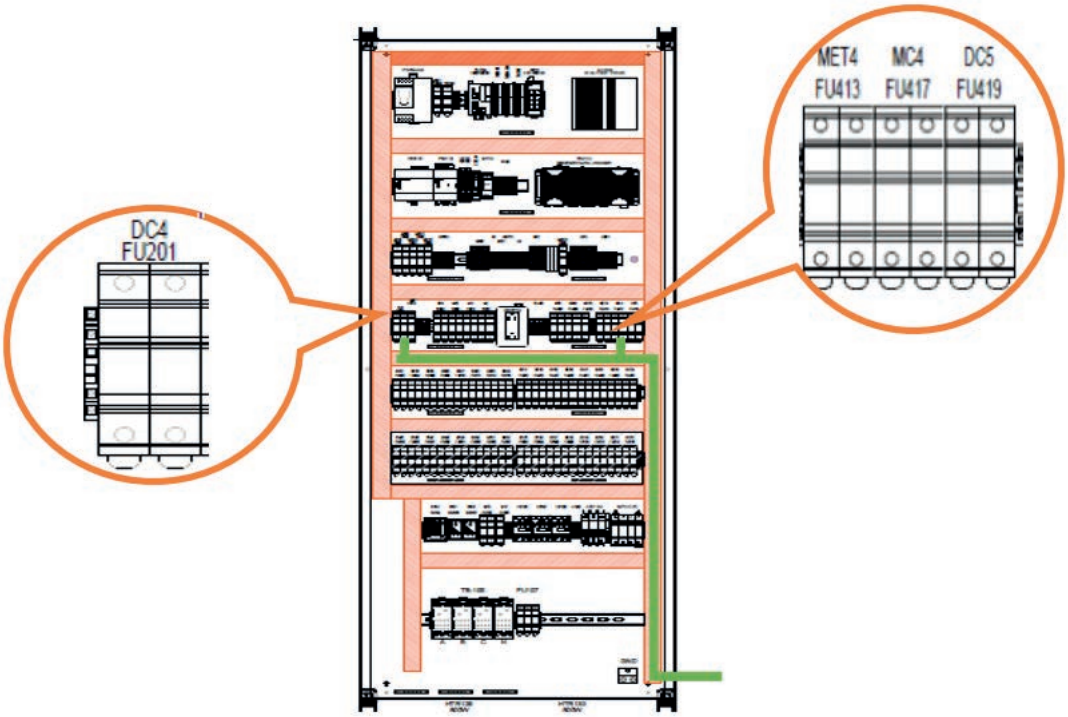


Figure 129. M-Cab XXL Location of C-Cab XXL Auxiliary Power Connection

Table 24 - C-Cab XXL Cable harnesses

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY	Installed ?
CABINET	CABLE MARK	SIGNAL NAME	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL M-Cab XXLINET 1	HES-XXL1M1/ C-Cab XXL1-PWR	220VAC -1 – DC4	X1S1-1	Bk/Wh # 1, Or Blue	XD17-1	ferrule	HES-XXL C-Cab XXL1	407-006820-410	
		220VAC -2 – DC4	X1S1-2	Bk/Wh # 2, Or Brown	XD17-2				
		220VAC-4 - MC4	X1S1-7A	Bk/Wh # 3, Or Black	XD17-4				
		220VAC-5 – MC4	X1S1-7B	Bk/Wh # 4, Or Grey	XD17-5				
			X1S1-G	Green/Yel	XD17-3				
HES-XXL M-Cab XXLINET 1	HES-XXL1M1/ C-Cab XXL1-CNL	Common	X2S1-1	Bk/Wh # 1, Or Blue	XD25-1	ferrule	HES-XXL C-Cab XXL1	407-006820-414	
		F-Stop	X2S1-2	Bk/Wh # 2, Or Brown	XD25-2				
			X2S1-PE	Green/Yel	XD20-3				
HES-XXL M-Cab XXLINET 1	HES-XXL1M1/C-Cab XXL1-CAN	CAN H	XCAN-5	Red	XD23-1	ferrule	HES-XXL C-Cab XXL1	407-006820-420	
		CAN G	XCAN-6	Black	XD23-3				
		CAN L	XCAN7	Shield	XD23-2				

7.4.3. Steps for Installing the C-Cab XXL E-Stop Cable Harness

Print these steps, at the end of this step is a check list that can be marked off when completed.

Note: read and understand this section clearly, it outlines the electrical connections.

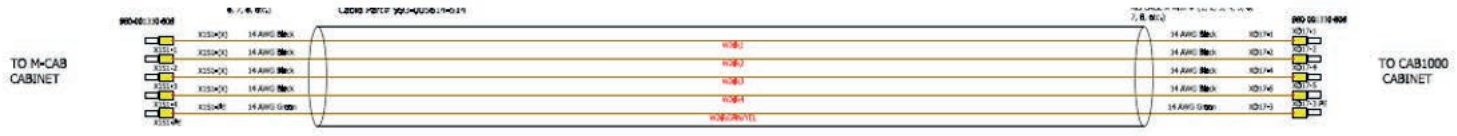


Figure 130. C-Cab XXL E-Stop Control Cable Harness

When installing wires on the terminal blocks of the C-Cab XXL. Use a small flat type screw driver or similar tool to open the terminal block clamps when installing wires onto the terminals see Figure 131.

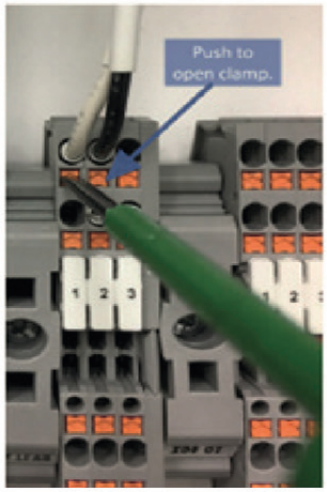


Figure 131. Operating C-Cab XXL Terminal Blocks

Wire on the cable harness come with ferrules.

Installation Steps

1. Turn “OFF” all sources of energy.

   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 92. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.

   b. Turn off the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.

   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. See Figure 124.

2. Start by identifying the Auxiliary Power Cable Harnesses. The cable will be marked as “HES-XXL1M1/C-Cab XXL1-CNL” Figure 133.

	**WARNING!** DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN PATH WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED FROM THE BOTTOM SECTION OF THE C-CAB XXL AND KEPT AWAY FROM THE HIGH VOLTAGE CABLES.

3. Once the cable has been identified, the cable needs to be routed as shown in Figure 127 and Figure 128 behind the high voltage dead front. The routing should avoid contact with the high voltage cables.

   a. Then route the “HES-XXL1M1/C-Cab XXL1-CNL” cable harness along the right side of the C-Cab XXL through the gromet shown on Figure 127 and up to the control part of the C-Cab XXL.

   b. Once in the cable is in the control portion of the cabinet using the path outlined in Figure 125 to terminal block XD25.

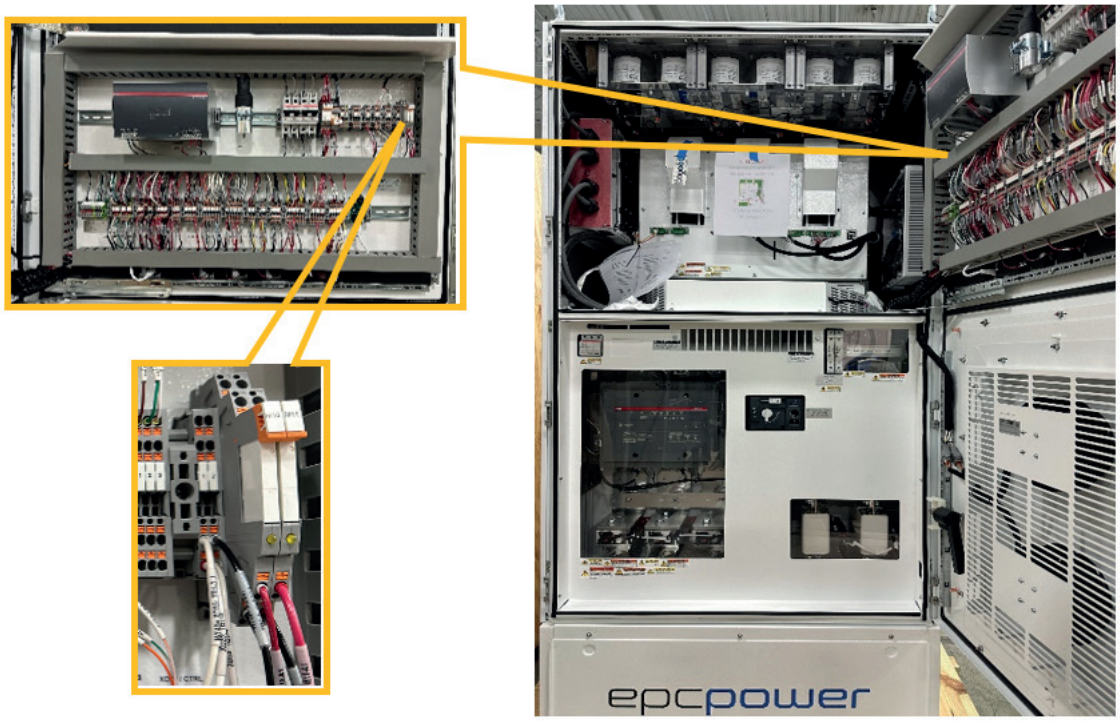
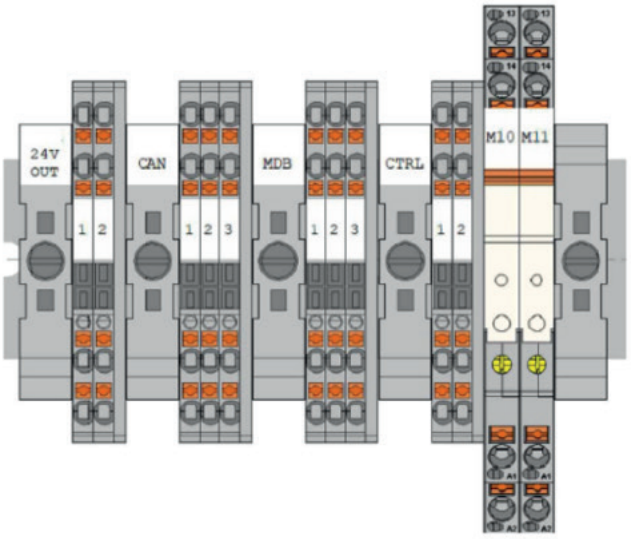


Figure 132. C-Cab XXL Auxiliary Power Terminal Location – XD23 & XD25



Interface	Section	Block #	Function
CAN Bus interface	XD23	1	CAN High
		2	CAN Gnd
		3	CAN Low
Modbus	XD24	1	Modbus D1 (Hi)
		2	Modbus Gnd
		3	Modbus D0 (Lo)
Control	XD25	1	Common
		2	F-stop
		M10 (NO)	AC Disconnect Status
		M11 (NO)	DC Disconnect Status

Figure 133. C-Cab XXL XD23 + XD25 Terminals

c. Terminate the individual wires as defined in Table 24.

d. As aid for the location reference use Figure 132 and Figure 133 as a guide.

4. The other end of “HES-XXL1M1/C-Cab XXL1-CNL” Figure 130 cable harness needs to be routed through the bottom of the M-Cab XXL.

a. Route the cable harness as per Figure 134 to Terminal Block “X2S1”.

b. Terminate the individual wires as defined in Table 24 for cable harness “HES-XXL1M1/C-Cab XXL1-CNL”.

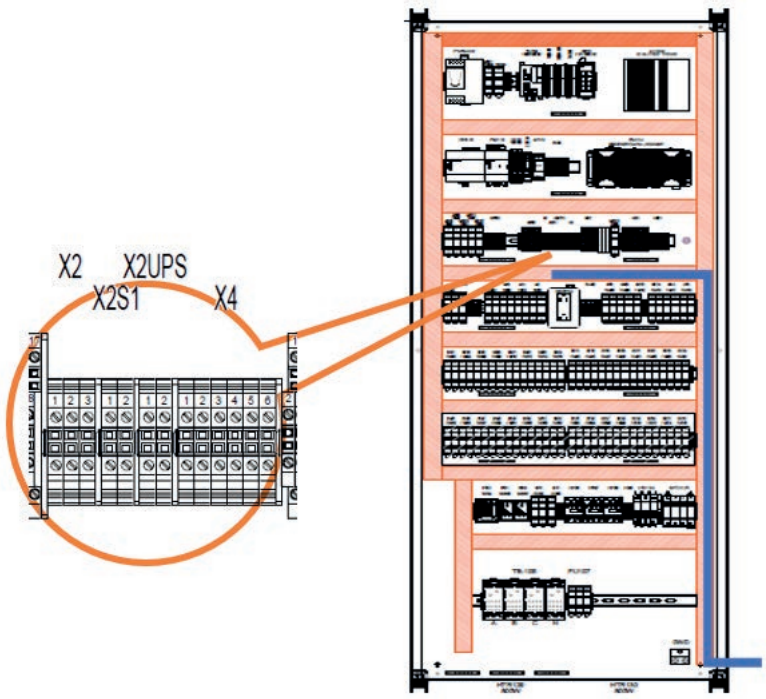


Figure 134. M-Cab XXL Location of C-Cab XXL Auxiliary Power Connection

7.4.4. Steps for Installing the C-Cab XXL CAN Bus Cable Harness and Modbus TC/IP Cable.

Print these steps, at the end of this step is a check list that can be marked off when completed.

Note: read and understand this section clearly, it outlines the electrical connections.

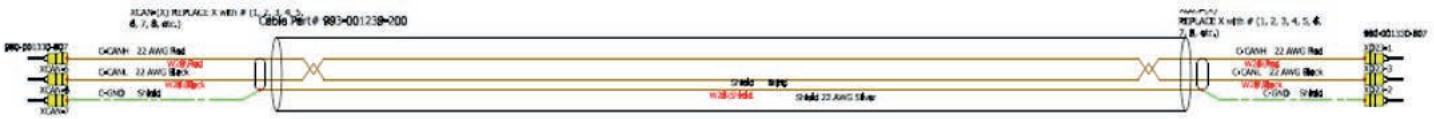


Figure 135. C-Cab XXL CAN BUS Cable Harness

When installing wires on the terminal blocks of the C-Cab XXL. Use a small flat type screw driver or similar tool to open the terminal block clamps when installing wires onto the terminals see Figure 136.

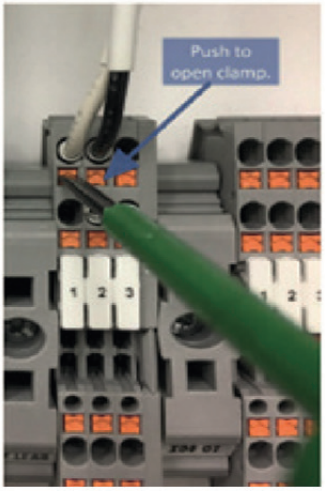


Figure 136. Operating C-Cab XXL Terminal Blocks

Wire on the cable harness come with ferrules.

Installation Steps

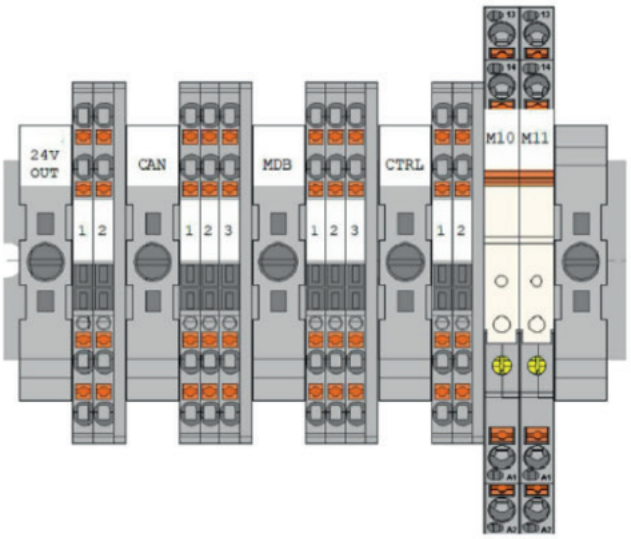
1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn off the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. See Figure 121.
2. Start by identifying the Auxiliary Power Cable Harnesses. The cable will be marked as “HES-XXL1M1/C-Cab XXL1-CAN” Figure 135.

WARNING!
DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN PATH WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED FROM THE BOTTOM SECTION OF THE C-CAB XXL AND KEPT AWAY FROM THE HIGH VOLTAGE CABLES.

3. Once the cable has been identified, the cable needs to be routed as shown in Figure 127 and Figure 128 behind the high voltage dead front. The routing should avoid contact with the high voltage cables.

   a. Then route the “HES-XXL1M1/C-Cab XXL1-CAN” cable harness along the right side of the C-Cab XXL through the gromet shown on Figure 127 and up to the control part of the C-Cab XXL.

   b. Once in the cable is in the control portion of the cabinet using the path outlined in Figure 128 to terminal block XD23 located near XD25.



Interface	Section	Block #	Function
CAN Bus interface	XD23	1	CAN High
		2	CAN Gnd
		3	CAN Low
Modbus	XD24	1	Modbus D1 (Hi)
		2	Modbus Gnd
		3	Modbus D0 (Lo)
Control	XD25	1	Common
		2	F-stop
		M10 (NO)	AC Disconnect Status
		M11 (NO)	DC Disconnect Status

Figure 137. C-Cab XXL XD23 + XD25 Terminals

   c. Terminate the individual wires as defined in Table 24.

   d. As aid for the location reference use Figure 135 and Figure 138 as a guide.

4. The other end of “HES-XXL1M1/C-Cab XXL1-CAN” Figure 133 cable harness needs to be routed through the bottom of the M-Cab XXL.

   a. Route the cable harness as per Figure 138 to Terminal Block “XCAN”.

   b. Terminate the individual wires as defined in Table 24 for cable harness “HES-XXL1M1/C-Cab XXL1-CAN”.

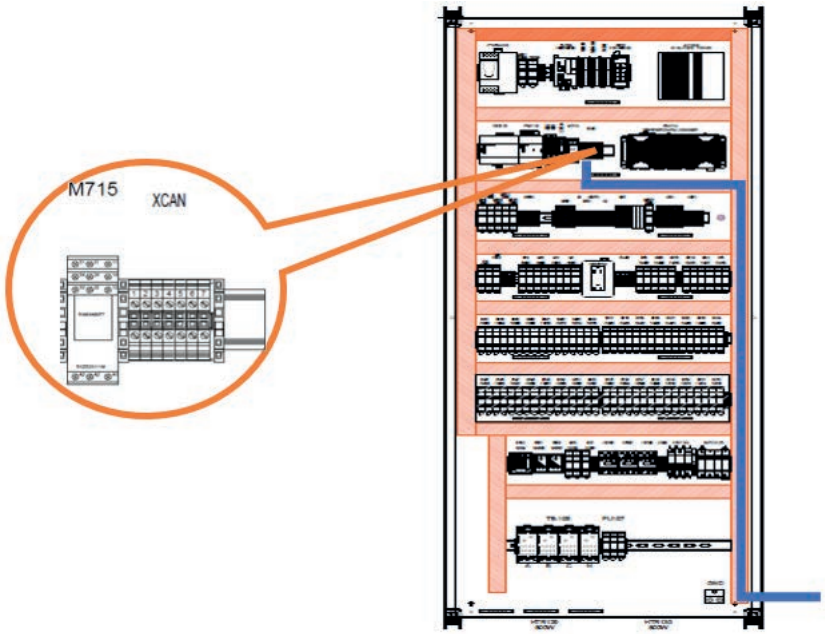


Figure 138. M-Cab XXL Location of C-Cab XXL Auxiliary Power Connection

7.4.5. Steps for Installing the Modbus TC/IP

Installation Steps

1. Begin by locating the Modbus TC/IP Cable. This cable can be identified by the marking “HES-XXL1M1/C-Cab XXL1-MB”.

   a. The cable we use is a pre-purchased item, specifically a shielded CAT 6 Ethernet cable. We provide a cable that is 6.1 meters (20ft) long. If a longer cable is needed, customers have the option to provide their own. However, it’s important to ensure that the cable is a Shielded CAT 6 Ethernet type.

⚠	**WARNING!** DO NOT MIX THE CONNECTIONS. MAKE SURE THESE HARNESSES ARE ROUTED IN THEIR OWN PATH WAY. THESE HARNESSES ARE TO BE INSTALLED/ROUTED FROM THE BOTTOM SECTION OF THE C-CAB XXL AND KEPT AWAY FROM THE HIGH VOLTAGE CABLES.

2. Once the cable has been identified, the cable needs to be routed as shown in Figure 127 and Figure 128 behind the high voltage dead front. The routing should avoid contact with the high voltage cables. The cable can routed along the same path as the E-Stop Cable, Auxiliary Power Cable harness, and CAN Cable harness.

   a. Then route the “HES-XXL1M1/C-Cab XXL1-MB” cable harness along the right side of the C-Cab XXL through the gromet shown on Figure 127 and up to the control part of the C-Cab XXL.

   b. Once the cable is through the gromet and in the top part of the cabinet.

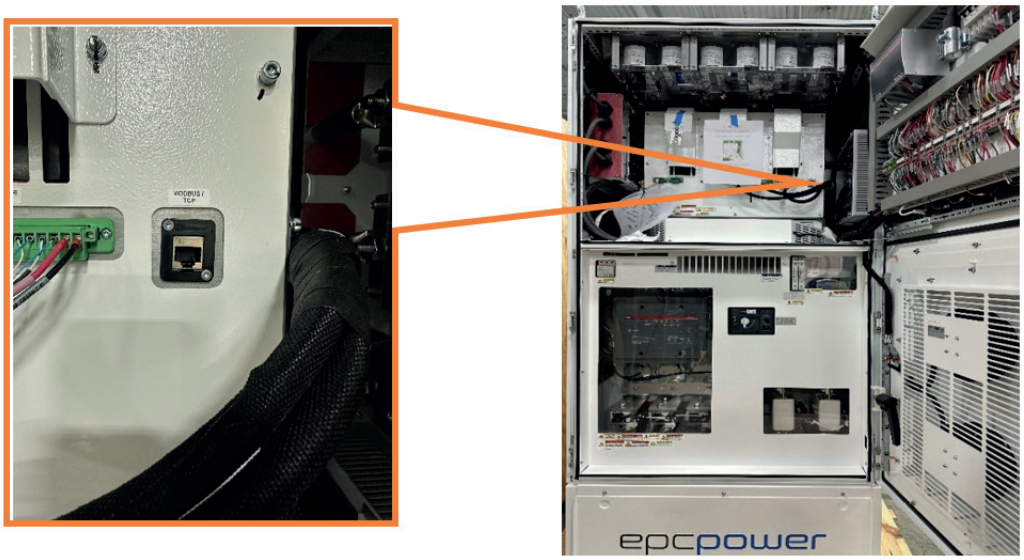


Figure 139. C-Cab XXL Modbus TC/IP Connection Location

   c. Terminate the shielded CAT 6 Ethernet cable in the location show in Figure 139.

3. The other end of “HES-XXL1M1/C-Cab XXL1-MB” shielded CAT 6 Ethernet cable, needs to be routed through the bottom of the M-Cab XXL.

   a. Route the shielded CAT 6 Ethernet cable as per Figure 140 to Ethernet router 1570R “ETH3” port.

   b. Terminate the shielded CAT 6 Ethernet cable as defined in Table 25 for the Ethernet cable “HES-XXL1M1/C-Cab XXL1-MB”.

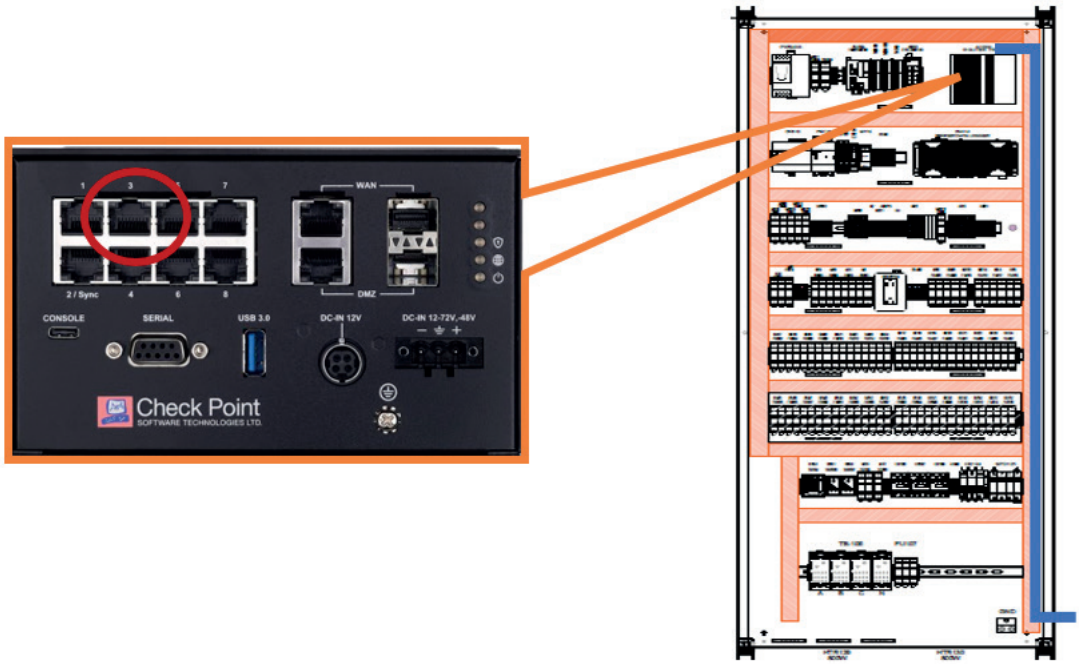


Figure 140. M-Cab XXL Location of C-Cab XXL Auxiliary Power Connection

Table 25 - C-Cab XXL to M-Cab XXL Modbus Connection

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY P/N	Installed ?
CABINET	CABLE MARK	SIGNAL NAME	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL M-Cab XXLINET 1	HES-XXL1M1/ C-Cab XXL1-MB	RJ45	1570R-ETH3	Yel	MODBUS/ TCP	RJ-45	HES-XXL C-Cab XXL1	910-001058-158	

7.5. Installation of the System Measurement

7.5.1. C-Cab XXL Current Sensing Installation

The power measurement for the SUNSYS HES XXL system is taken from the C-Cab XXL with the reference point taken from the main AC power connections. Additionally, the SUNSYS HES XXL System are supplied with Rogowski Probes (TF-300) which require installation.

Figure 141. C-Cab XXL Current Sensing Probe TF-300

Inside the M-Cab XXL, there are three current probes that are ready for connection. These probes are specifically designed to measure the current in the three phases (L1, L2, L3) of the C-Cab XXL main power AC-Side, which operates at voltages of up to 690VAC.

The unique feature of these probes is that they are of the “Rogowski” type, allowing them to be opened and installed even after the main AC power cables have been connected.

7.5.1.1. Steps for Installing the C-Cab XXL Main AC Measurement

Installation Steps

1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn off the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. See Figure 121.
2. Locate Cable Marked “XXL M_C C_I-MEAS Cable” and Unlock the probe:
   a. Start by releasing the probe’s locking system to open it.
3. Position the probe: Inside the C-Cab XXL Main AC Power Cable Connection.
   a. Place the probe around the main AC power cables. Each probe should encompass all the cables of its corresponding phase. See Figure 145 and Figure 146.
   b. CT-A (TF-300) corresponds to phase L1
   c. CT-B (TF-300) corresponds to phase L2
   d.CT-C (TF-300) corresponds to phase L3

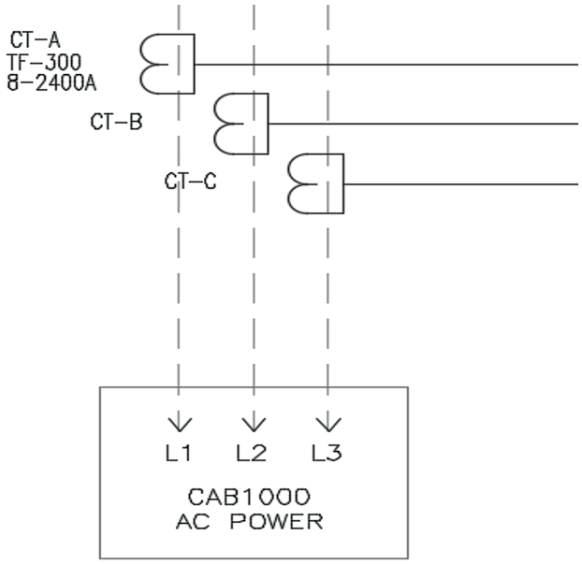


Figure 142. C-Cab XXL Measurement CT

Table 26 - C-Cab XXL Current Measurement Cables

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY P/N	Installed ?
CABINET	CABLE MARK	SIGNAL NAME	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL M-Cab XXLINET 1	XXL M_C C_I-MEAS Cable	RJ12	A-PM1113	Grey	L1	CT-A -TF-300	HES-XXL C-Cab XXL1	947-005466-470	
		RJ12	B-PM1113	Grey	L2	CT-B -TF-300		947-005466-470	
		RJ12	C-PM1113	Grey	L3	CT-C -TF-300		947-005466-470	

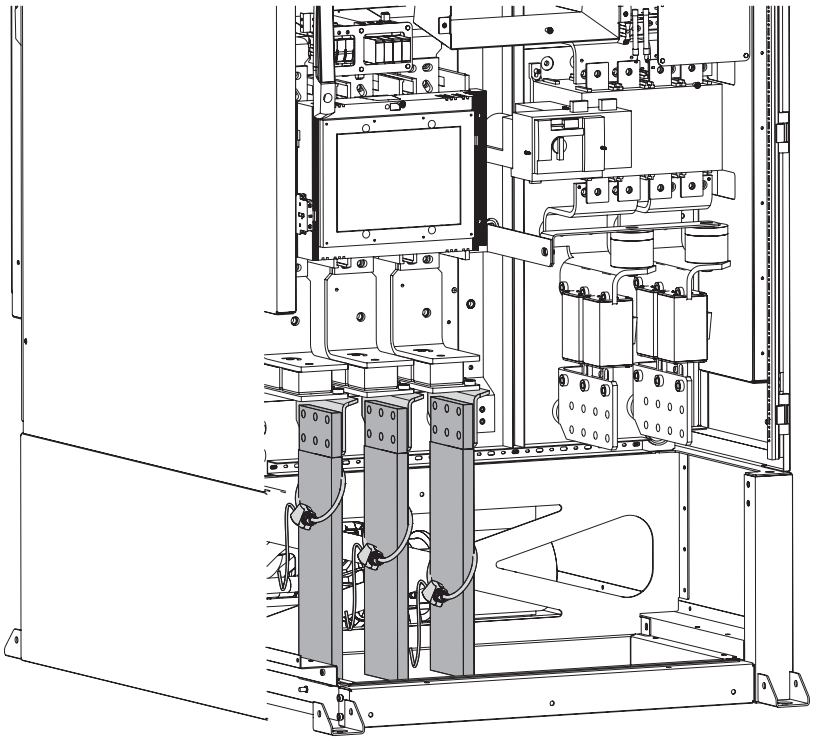


Figure 143. C-Cab XXL Rogowski Coils and Voltage Sensing Location Connection

7.5.1.2. Voltage Sensing

Installation Steps

1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. See Figure 89. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn off the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
   c. Turn “OFF” QS, QF1 and QF2 in all the Battery cabinets. See Figure 121.
2. Install the AC Voltage Measurement Cables
   a. Locate the cable marked “XXL M_C C_V-MEAS Cable” then with the end of the wire with the Ring terminal.
   b. Attach it the Ring terminal to the phase connection.
   c. Attach one on each of the phases as marked on the cable end.
3. Terminate the other end of the wires into the M-Cab XXL.
   a. Run the voltage measurement cable into its own conduit as to not cause interference with the other signal cables.
   b. Follow Table 27 for termination location.

Table 27 - C-Cab XXL Voltage Measurement Cables

DEPARTURE				WIRE NUMBER / COLOR	ARRIVAL			COMPLETE ASSMBLY P/N	Installed ?
CABINET	CABLE MARK	SIGNAL NAME	TERMINAL MARK		TERMINAL MARK	CONNECTOR	CABINET		Yes/No
HES-XXL M-Cab XXLINET 1	XXL M_C C_V-MEAS Cable	L1-BKR1104	L1	Black	L1	Ring Terminal	HES-XXL C-Cab XXL1	407-006820-430	
		L2-BKR1104	L2	Black	L2				
		L3-BKR1104	L3	Black	L3				

7.6. Connections for the FSS (Fire Suppression System)

The fire suppression system, also known as the FSS system, is a sophisticated safety mechanism designed to detect signs of fire. This system is equipped with a variety of sensors strategically placed within each battery cabinet, also known as B-Cab XXLs. These sensors are designed to detect any indications of fire, such as sudden increases in temperature or the presence of smoke.

Upon detecting any signs of fire, the FSS system activates a series of indicators and alarms.

The B-Cab XXLs are specifically outfitted with this fire suppression system, enhancing their safety features. The B-Cab XXL FSS system comprises several components, each playing a crucial role in fire detection and suppression. A detailed list of these components is provided in the accompanying table. This list can help users understand the efficiency of the FSS system, and realize the safety measures in place.

Table 28 - Components in the B-Cab XXL main FSS system

System	Sub Components	Description
FSS	Smoke detector	Detect early signs of Smoke.
	Heat detector	Detect a rise in heat in the B-Cab XXL.
	Aerosol	Compatible to extinguish fire.
	Dry pipe	Connects to an external fire suppression system.
	Deflagration Panel	Upward deflagration vent panel

WARNING!
THE CONNECTION OF THE “DRY PIPE” IS THE RESPONSIBILITY OF THE SYSTEM OPERATOR, AND SHOULD BE INSTALLED IN ACCORDANCE OF THE LOCAL AUTHORITIES AND FIRE CODES.

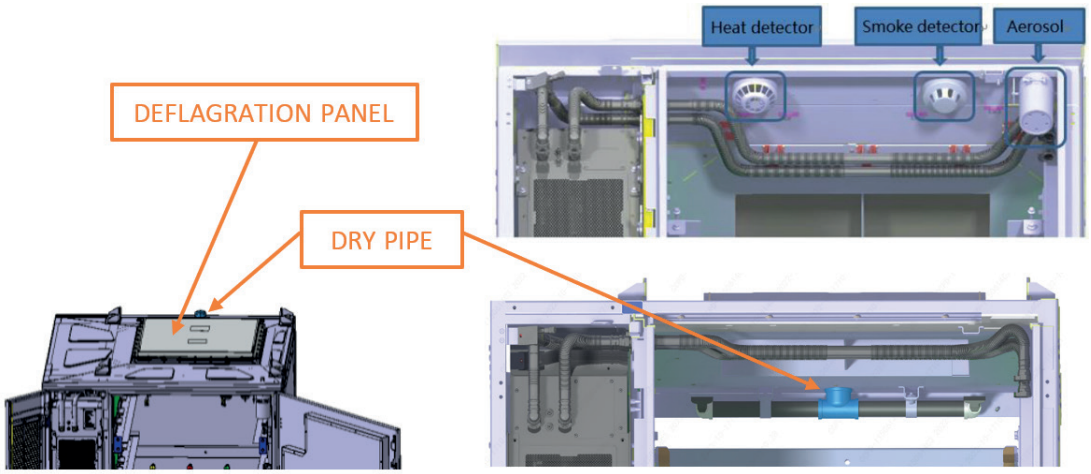


Figure 144. B-Cab XXL, FSS Component Location

7.6.1. FSS Control Logic

The fire suppression system is designed to identify fire occurrences, and it does so by categorizing them into two distinct levels. This two-tiered approach allows for a more refined response, ensuring that the system can effectively handle a variety of fire scenarios. The first level is early detection, while the second level is for more advanced fire situations. This structure allows the system to respond appropriately, potentially preventing incidents from escalating and ensuring a rapid response to incidents. More details about what constitutes each level and how the system responds at each level would provide a more comprehensive understanding of the system's operation.

The fire suppression system operates on a two-tier classification system to identify and respond to fire incidents:

1. First-Level Fire Alarm: This level is activated when any single detector senses a potential fire and triggers an alarm. The responses at this level include:

   a. Activation of sound and light alarms to alert the personnel.

   b. Transmission of the fault signal, followed by the opening of the contactors after a delay of 10 seconds.

2. Second-Level Fire Alarm: This level is triggered when alarms are activated by two different types of detectors. The responses at this level are more immediate and include:

   a. Activation of sound and light alarms to provide an urgent alert.

   b. Immediate transmission of the fault signal and the contactors are opened without delay.

In addition to these, the system has an automatic response when the temperature reaches 70°C. At this temperature, an aerosol is automatically triggered to extinguish the fire. If the fire reignites, the on-site personnel have the ability to manually activate the dry pipe system to put out the fire. This comprehensive system ensures a robust and effective response to various fire scenarios.

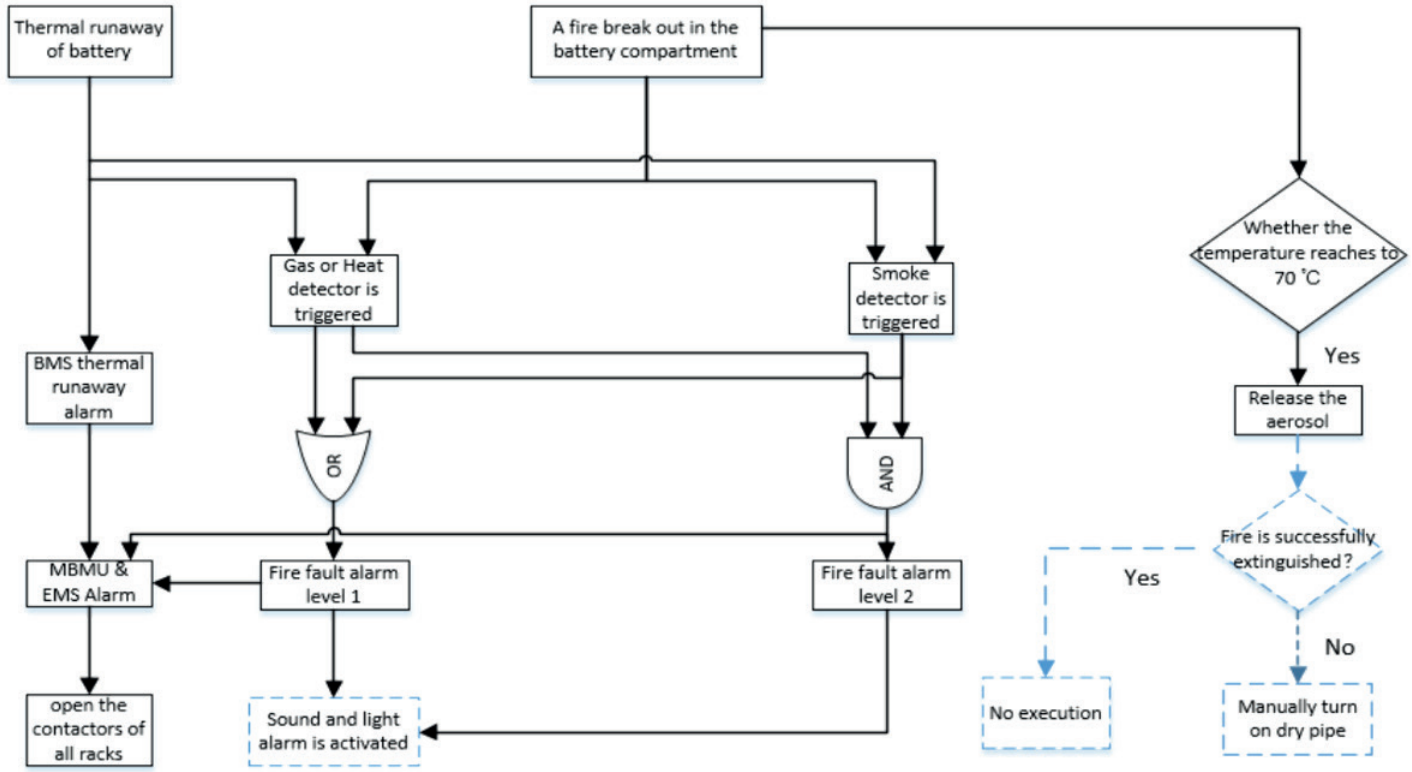


Figure 145. Fire Safety System Control Logic

7.6.2. FSS - Installation

The system provides two distinct methods for connecting the Fire Suppression System (FSS) signal reference. These methods provides different needs for local code and site installation requirements.

1. **Simplified Signal Scheme**: This is more straightforward approach, designed for ease of use and implementation. The customer connects to the provided maintained dry contact, and must be manually reset once the event investigation is completed.
2. **Comprehensive Approach**: This method requires the use of a Fire Control Panel, and allows for a greater degree of customization and control.

7.6.3. Simplified FSS Signal Connection

This method allows for the integration of a dry contact, which can be linked to a scheme provided by the customer. In the event of an alarm being activated, it will remain on without interruption. The alarm will continue to sound until it is manually reset by an operator. This process ensures that any issues are addressed promptly and effectively, minimizing potential risks. The dry contact is located within the M-Cab XXL and is designed for external connections. It's the customer's responsibility to provide the necessary wiring and alarm systems. The dry contact acts as a bridge in the M-Cab XXL for making outside connections, but the customer must supply the wires and the means to trigger an alarm. This setup allows for flexibility and customization based on the customer's specific needs and preferences.

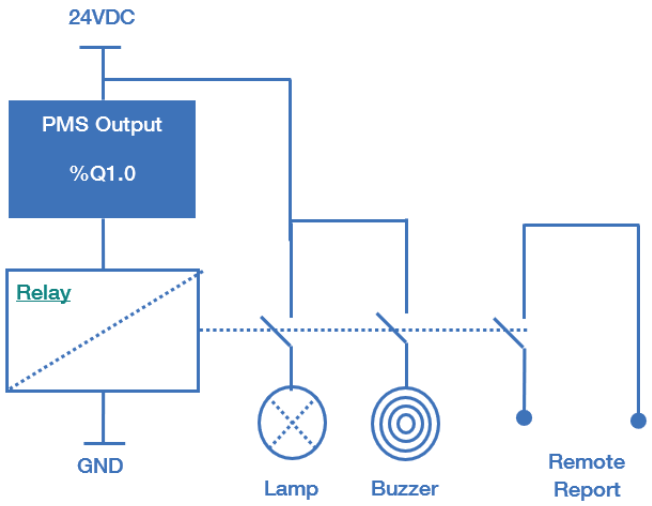


Figure 146. EWCS FSS External Connection

Installation Steps

1. Turn "OFF" all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to "OFF" position. Also make sure that the customer AC Power connection is turned "OFF" and "LOCKED OUT".
   b. Turn off the M-Cab XXL customer supplied AC to "OFF" and is "LOCKED OUT".
2. Install the cable as indicated in Figure 149 terminating the wires on terminal block XRS-1 and XRS-2.
   a. The terminals are from a latched relay contact and can be provided with 24 VDC or up-to 240 AC 2 A maximum.
   b. Once the alarm is triggered it must be manually reset.

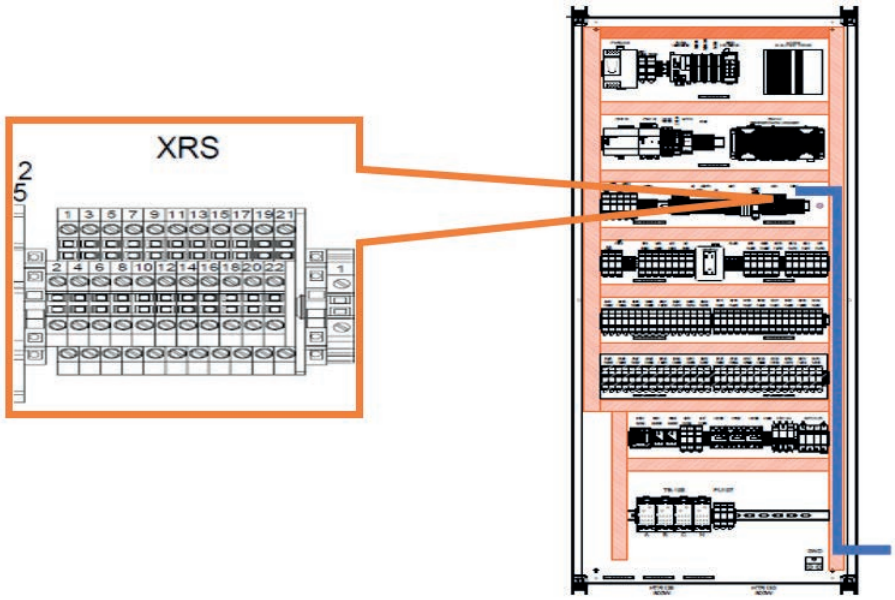


Figure 147. EWCS Dry Contact Connection Location

7.6.4. Comprehensive FSS Signal Connection

This method requires the installation of an approved fire control panel. The fire control panel provides separate connections to all of the sensors located inside the battery cabinet (B-Cab XXL). The fire control panel provides its own power supply for the sensors in the battery cabinet. Follow the instructions provided with the specific fire control panel. The customer needs to provide a UPS if required by local jurisdictions and fire codes.

Installation Steps

1. Turn “OFF” all sources of energy.
   a. Turn C-Cab XXL DC Disconnect to “OFF” position. Also make sure that the customer AC Power connection is turned “OFF” and “LOCKED OUT”.
   b. Turn off the M-Cab XXL customer supplied AC to “OFF” and is “LOCKED OUT”.
2. Inside the M-Cab XXL, Locate terminal block marked as X2B1 see Figure 150.
   a. Remove power supply jumper wires marked as #635 from terminal X2B1-2, X2B1-4 and X2B1-6.
   b. This will expose all the individual sensor terminals.
   c. Sensor type and terminal allocation see Table 29.

Table 29 - FSS Sensor Type and Connection Terminals

Sensor Type	Power Required [24 VDC]	Terminal Connection
AEROSOL	24 W	X2B1-1 Negative terminal
		X2B1-2 Positive terminal
SMOKE DETECTOR	1.25 W	X2B1-3 Negative terminal
		X2B1-4 Positive terminal
HEAT DETECTOR	1.25 W	X2B1-5 Negative terminal
		X2B1-6 Positive terminal

3. Route cable for the sensor as shown on Figure 147, to terminal block X2B1.
   a. Customer to supply the wiring and cables required for installation of fire control box.
   b. Follow the installation recommendation for sensor connection as outlined on the installation section of the fire control box that was selected.

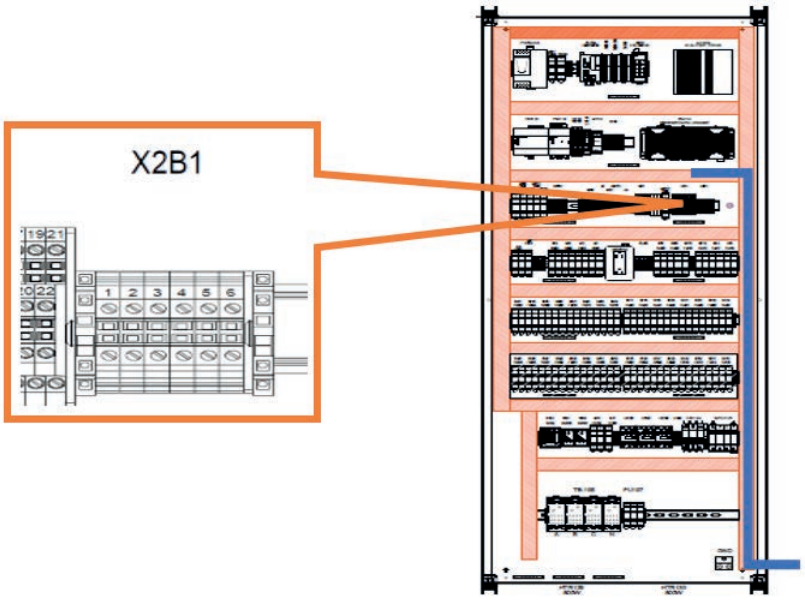


Figure 148. EWCS B-Cab XXL FSS Fire Control Sensor Connection Location

WARNING!
THE CONNECTION OF THE “DRY PIPE” IS THE RESPONSIBILITY OF THE SYSTEM OPERATOR, AND SHOULD BE INSTALLED IN ACCORDANCE OF THE LOCAL AUTHORITIES AND FIRE CODES.

Fire control panel

Device	Image Reference.
Extinguishant Control Panel	 SIGMA A-XT
Extinguishant Control Panel	 SIGMA A-XT

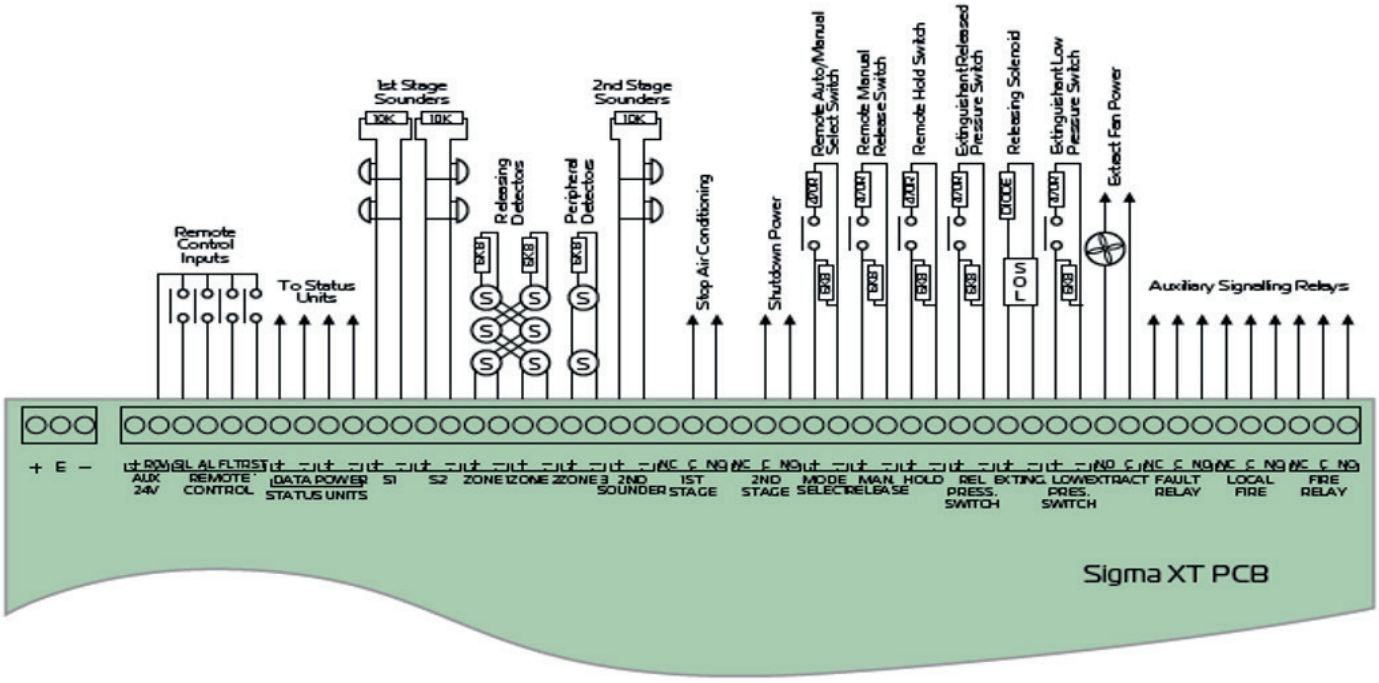


Figure 149. Fire Control Box Connection Reference

7.7. EWCS External Warning Communication System

The External Warning Communication System (EWCS) plays a crucial role in maintaining the safety and efficiency of the Energy Storage System (ESS). It receives information inputs from various devices within the ESS, which are designed to detect potential issues that could lead to hazardous conditions.

Key sources of this critical information include:

Battery Management Systems (BMS): These systems monitor the health and performance of the batteries, detecting issues such as overcharging, overheating, or other anomalies that could pose safety risks.

Power Management System (PMS): This system oversees the distribution and regulation of power within the ESS, identifying any irregularities or faults that could impact the system's stability and safety.

The EWCS communication interface consolidates the range of information from the ESS. By doing so, it provides a centralized access point for monitoring and responding to any emerging faults in a timely and effective manner. This ensures that any potential hazards are quickly identified and indicated, maintaining the overall safety and reliability of the energy storage system.

In summary, the EWCS is essential for the proactive management of the ESS, leveraging data from the BMS and PMS to safeguard against potential faults and ensure smooth operation.

7.7.1. EWCS Control Logic

The logic of the External Warning Communication System (EWCS) is divided into two main components:

1. **Local Indicator System:**
   - The local part of the EWCS is communicated through a stack light and buzzer combination, which serves as the local indicator. This indicator is mounted on top of the M-Cab XXL (Main Cabinet).
   - Due to shipping restrictions, the stack light and buzzer combo must be installed at the time of system commissioning.
   - Additionally, the stack light and buzzer combo can be mounted up to 30 meters away from the ESS (Energy Storage System). However, this is an optional configuration that requires a separate purchase.

2. **Communication System:**
   - The second component of the EWCS ensures that communication remains active for up to 5 hours in the event of a power outage or other disruptions.
   - To achieve this, the customer must supply an Uninterruptible Power Supply (UPS). The specifications for the required UPS are listed in the Table 30 below.

By dividing the EWCS logic into these two parts, the system ensures both local and extended communication capabilities, enhancing the overall safety and reliability of the ESS. The local indicator provides immediate visual and auditory alerts, while the communication system ensures continuous monitoring and response capabilities, even during power interruptions.

Table 30 - EWCS UPS Requirement

Required UPS Size	Number of B-Cabs XXL
3.0 kVA 40Ah	8 or 15

7.7.2. EWCS installations

During commissioning, the stack light indicator must be installed on top of the M-Cab XXL at the provided mounting point. Additionally, the required UPS, which meets the 5-hour communication requirement, must be installed.

7.7.2.1. Installation of EWCS local indicator

Figure 150 illustrates the stack indicator in its operational position. The mounting points for the stack indicator are marked and available, allowing for straightforward installation.

Figure 150. EWCS Indicator location

7.7.2.2. EWCS External UPS installation

To connect the external EWCS UPS, you will need to follow these steps:

1. **Remove the Jumpers**: Begin by removing two jumpers. This is necessary to make space for wiring the external EWCS UPS.
2. **Locate the Terminals**: The terminals for connecting the external EWCS UPS are located inside the M-Cab XXL. Refer to Figure 150 for the exact connection points.
3. Identify the Terminal Block: Find the terminal block labeled as X1U1, X1U2, X1U3, and X1U4.
4. **Remove Specific Jumpers**:
   - First, remove the jumper between terminals X1U1 and X1U2.
   - Next, remove the jumper between terminals X1U3 and X1U4.
5. **Connect the External EWCS UPS**:
   - Wire the output phase 1 of the external EWCS UPS to terminal X1U2.
   - Then, wire the output phase 2 to terminal X1U4.

By following these steps, you will successfully connect the external EWCS UPS. If you need further assistance, please refer to the detailed diagram in Figure 151 for additional guidance.

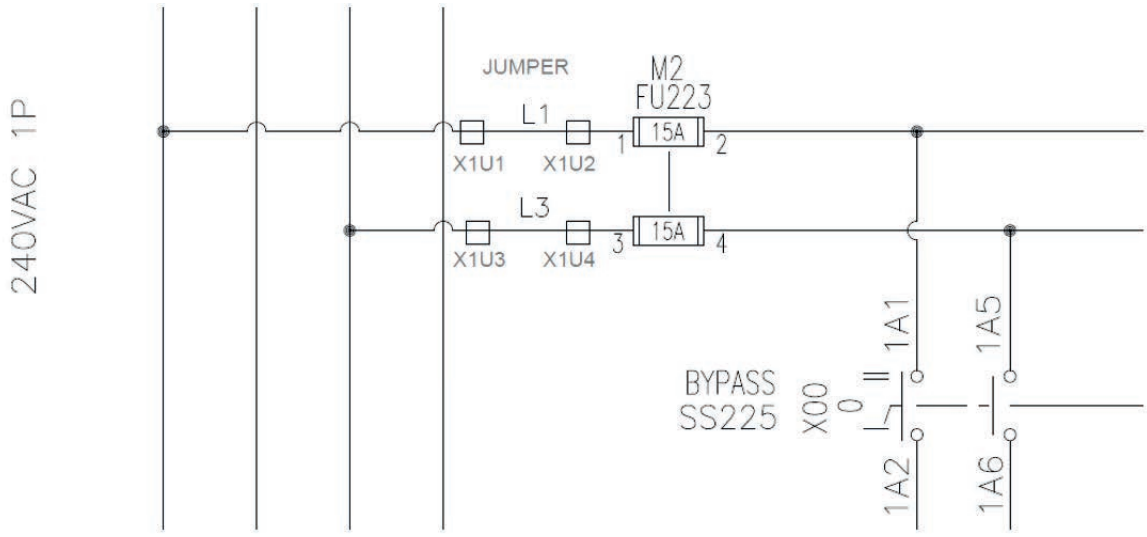
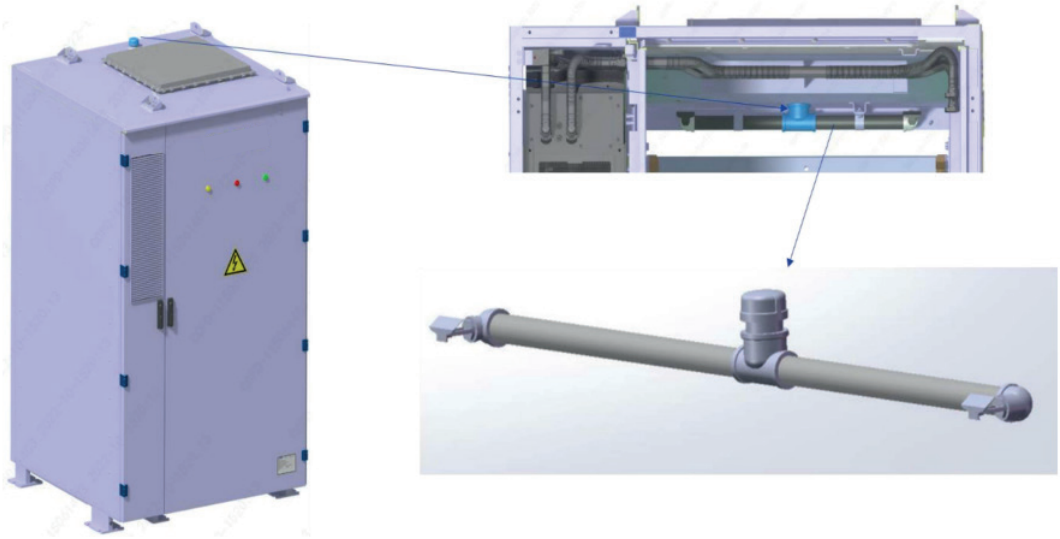


Figure 151. EWCS UPS Connection Terminals

7.8. Dry Pipe Installation

7.8.1. Overview

The Dry Pipe System is a critical component of the Fire Suppression System (FSS) designed to provide fire protection for the SUNSYS HES XXL. This system ensures that water is delivered to the fire-affected area only when necessary, preventing unintended damage due to leaks or accidental discharge. The pipe is a dry pipe, meaning it remains empty until activated.



7.8.2. System Components

The Dry Pipe System consists of the following main components:

- **Dry Pipe Valve** – Controls water flow into the system and remains closed under normal conditions.
- **Open Nozzles** – SUNSYS HES XXL battery cabinets (B-Cabs) use open nozzles without glass plugs. These nozzles allow immediate water discharge when activated.
- **Piping Network** – Connects the water supply to the sprinkler heads through a controlled dry system. (outside of Socomec scope).
- **Activation Mechanism** – Manually operated in case of fire to release water into the system (outside of Socomec scope).

7.8.3. Installation Guidelines

- **Pipe Configuration**: The main pipe should be installed without pre-stored water. This ensures that water enters the system only upon manual activation.
- **Valve Installation**: Each battery cabinet should have a separate water valve to ensure localized suppression in case of fire.
- **Connection Size**: The system connection size is **1”1/2 inch BSP**.

7.8.4. Operation

7.8.4.1. Normal State

- The main pipe remains dry under normal conditions, with dedicated valves (outside of Socomec scope) preventing water entry.
- The open nozzles remain ready for activation.

7.8.4.2. Dry Pipe System Activation

- In case of a fire, the system operator must manually open the valve to allow water to enter the dry pipe system.
- Water is distributed through the nozzles, covering the affected area.
- If multiple cabinets are present, only the affected cabinet's system should be activated to avoid unnecessary water exposure to operational cabinets.
- In the event of a fire in the electric cabinet, it is necessary to manually open the water pipe control valve to activate the system. Please note that Socomec does not provide control valves or external piping.

7.8.5. Water Flow Rate and Distribution

- **Total Main Pipe Flow**: The nominal flow for the system is 219 L/min.
- **Nozzle Flow Rate**: The total flow should be divided by two for each nozzle's expected discharge rate : 109,5 L/min
- **Design vs. Actual Water Spray Intensity**: The system is designed per NFPA 855 guidelines, with actual flow rates exceeding the design minimum to meet regulatory requirements.

7.8.6. Maintenance and Inspection (outside of Socomec scope)

- **Regular Valve Inspection**: Ensure that the dry pipe valve is in proper working condition and remains closed under normal circumstances.
- **Pipe Integrity Checks**: Conduct routine inspections to prevent leaks or obstructions.
- **Nozzle Functionality Testing**: Verify that nozzles are clear of debris and in the correct open position.

7.9. Digiware Metering Connection Kit

The SUNSYS HES XXL is designed for seamless integration with external Socomec Digiware product kits. The external connection is facilitated using the standard RS485 protocol. The terminals for this connection are located inside the M-Cab XXL, as illustrated in the figure below. These terminals are labeled as RS+ and RS-.

To ensure proper operation, follow the standard daisy chain configuration for RS485 connections. It is crucial to terminate the last device in the daisy chain with a 120Ω resistor. This termination is necessary to maintain signal integrity and ensure reliable communication across the network.

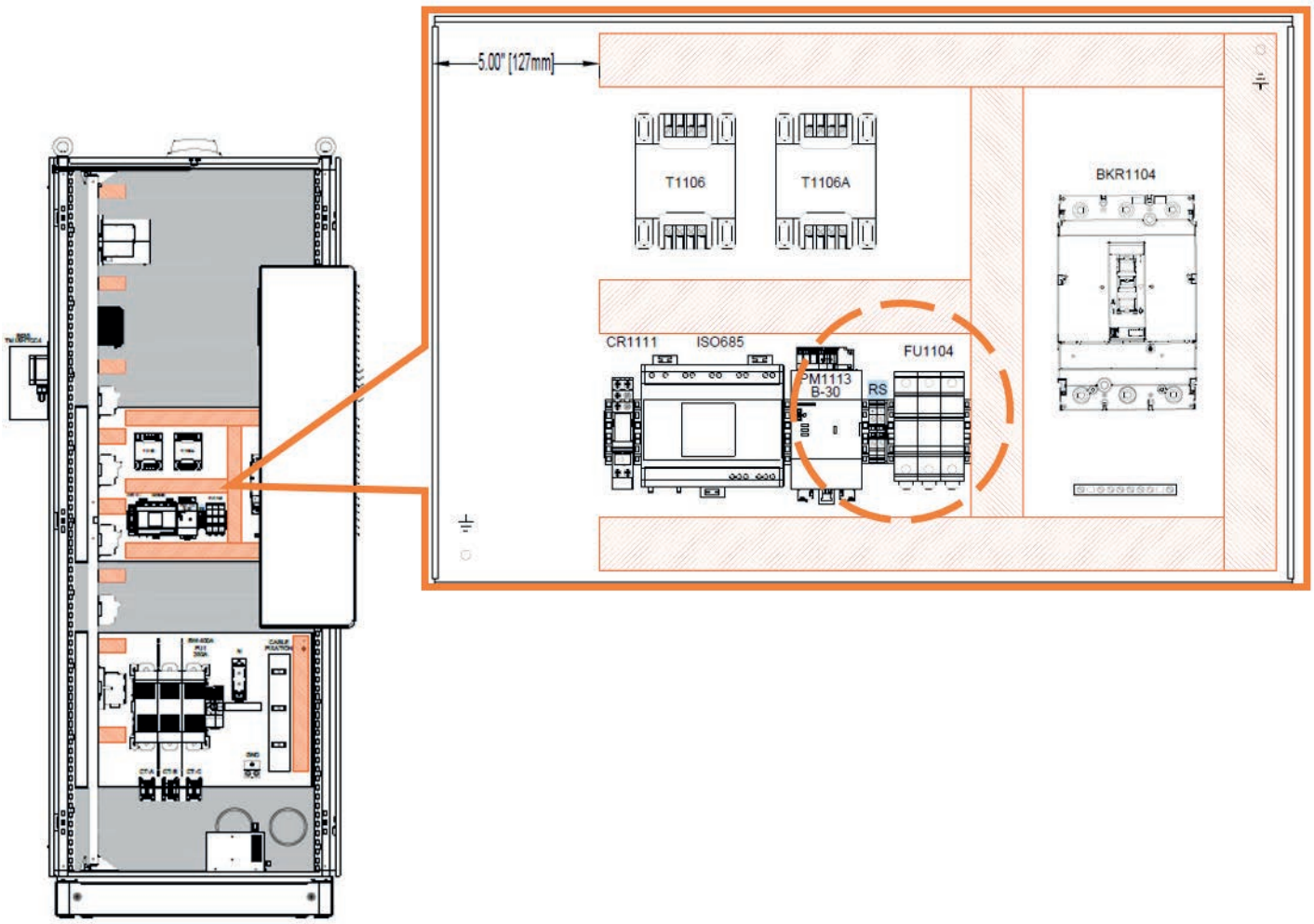


Figure 152. Digiware Metering Connection Kit location

8. COMMISIONING

8.1. Commissioning Prerequisite

The following table outlines a comprehensive checklist of requisite tasks to be executed upon the arrival and installation of the equipment at the designated site. It is imperative that all these tasks are accomplished prior to the initial start of the equipment. The responsibility of powering up the equipment should be entrusted to the commissioning team. It is strongly advised to print this checklist and utilize it as a reference to ensure all prerequisites have been satisfactorily met prior to the commencement of the system commissioning process. Please print and check off when complete.

8.1.1. Integration prerequisite

General	
1.	Please verify that the product number and rating of the components exactly match your order.
2.	Battery energy storage system includes a user manual.
Integration check	
1.	Please verify that M-Cab XXL, C-Cab XXL and all the B-Cab XXLs have been installed on the concrete pad as specified. To verify that there is no inclination, kindly provide a photo of the concrete pad with a spirit level.
2.	The distance area around the system is at minimum as required by SOCOMEC (please find distance required in chapter «Clearance distances»).
3.	Please share a photo of the entire installation. (overview - front side).
4.	Please share a photo of the entire installation. (overview - back side).
5.	Verify the attachment of all cabinets to the concrete pad.
Installation Environement inspection and setting check	
1.	The area around the whole system is clear and accessible.
2.	Is the area is secured? No further civil work activities, The ground is level and stable, etc.…

8.1.2. Connection prerequisite

Grounding	
1.	Ensure that all conductive metal Enclosure (M-Cab XXL, C-Cab XXL, all B-Cab XXLs), or metal troughs are properly connected to an equipment grounding conductor. Also to one common grounding point.
2.	Equipment grounding conductor is properly identified as either bare, green, or green with continuous yellow stripe(s).
3.	Check that ground interconnection of all the B-Cab XXLs are connected to the common ground.
4.	Check ground connection on the C-Cab XXLs and M-Cab XXL are connected to the common ground.
Interconnection / Electrical cable visual inspection	
1.	Please make sure that the connection cables for all devices in the system, both for power and communication, are connected as outlined in the single line diagram and the user manual provided by SOCOMEC.
2.	Inspect the Emergency Stop loop connection if it's installed. Note: If it's not installed, then bypass it with a jumper.
3.	Please provide a photo of the AC Cable connections to the C-Cab XXL.
4.	Please provide a photo of the Auxiliaries Cable connections at the M-Cab XXL terminations.
5.	Please provide a photo of the DC and auxiliaries Cable connection at each B-Cab XXL.
6.	The phase rotation for both the AC connection and the Auxiliaries connection should be in the clockwise rotation. Please verify proof that this is true (photo of the instrument or other means).
7.	For islanding systems. Check all connections with devices required by SOCOMEC, as outlined in the Resiliency package (PMS extension, SEL relay, CRE card, etc...).
Internet Connection (if no Modem 4G option)	
1.	Please provide an Ethernet connection to your site to the M-Cab XXL connection.

8.1.3. IoT (Internet of Things) Communication prerequisite

Note: planning and assigning the Ethernet communication addresses, as outlined in this section, ahead of time can streamline the process of getting the system up and running. This proactive approach can help avoid potential complications and ensure a smoother setup. It's an effective way to manage network resources and prevent conflicts that could disrupt system operations. So, it's highly recommended to allocate these addresses in advance.

IP addresses for communication	
1.	Please provide and allocate an IP address that will communicate with the PMS (Power Management System).
2.	Please provide and allocate an IP address that will communicate with the M70 (Measurement Central device).
3.	Please provide and allocate the IP address range where the ESS system should be accessible (communication with the router of the ESS).
4.	Please be aware that the IP range 192.168.20.0/24 and above is reserved. Therefore, avoid connecting the ESS system to an IP within the 192.168.20.0/24 range or any higher range (such as 192.168.0.0/16).
5.	Please provide and allocate an IP address to communicate with the HMI, if present.
Network access	
1.	Please provide the network IP address range where the ESS system will be connected.
2.	Please give the NTP server (1 and 2) IP address (this optional if the customer doesn't want to open a NTP access).
3.	Please provide an IP address for the gateway with the ESS or provide DHCP server. If a static IP address is used, please provide a subnet mask and a default gateway.
4.	Please provide DNS server (1, 2 and 3) IP address - optional.
5.	Minimum requirements to ensure remote maintenance and battery data push: - Minimum requested speed: 1600 kbit/s (3.5G). - Latencies: 1500 ms towards the Socomec server.
Different access	
1.	Following access need to be open by the customer to configure security policy and customer network adaptation (NAT): Open security-policy-ess.socomec.com with following protocols (In/Out): - TCP port 18264 - TCP port 257 - TCP port 18191 - TCP port 18192 Following access need to be open by the customer for remote access Open remote-access-ess.socomec.com with following protocols (In/Out): - UDP port 500 - UDP port 1701 - UDP port 4500 - UDP port 259 Open smbrelaylb-1.smbrelay.checkpoint.com with following protocols (In/Out): - TCP Port 22 - TCP port 443 Following access need to be open by the customer for datalogger - TCP port 443 to https://storage.iot.socomec.com (Out) - TCP port 443 to ca.iot.socomec.com (In/Out) No stream re-encryptions https (no proxy) - TCP port 443 to https://connect.socomec.com (In/Out) - TCP port 80 to ctldl.windowsupdate.com (Out) - SNTP to time.windows.com Following access need to be open by the customer for Meter and system data logging (Out): - MQTTS port 8883 to streams-mqtt.iot.socomec.com (94.125.105.191, 94.125.105.192, 94.125.105.193) - TCP port 443 to https://activate.iot.socomec.com (94.125.109.122) - TCP port 443 to streams-api.iot.socomec.com (94.125.105.191, 94.125.105.192, 94.125.105.193) For all (not neededd if customer gives DNS and NTP server) - DNS: UDP port 53 to 1.1.1.1, 8.8.8.8, 9.9.9.9 (Out) - NTP: UDP port 123 to 0.pool.ntp.org , 1.pool.ntp.org (Out)

8.2. Socomec Internal Network

As depicted in Figure 151, the architecture of the BESS Socomec Network is outlined. This network is composed of devices that are interconnected via Ethernet, a topology for local area networks (LANs).

Ethernet, a networking system, connects devices within a local area network (LAN). It enables these devices to effectively communicate and share resources and data. Rather than operating independently, the devices in the network are interconnected, creating a robust and efficient network.

In the BESS Socomec Network, communication happens through the Modbus protocol. Modbus is a communication protocol designed for use with programmable logic controllers (PLCs) and other control devices (PCS, HMI, Meters). Specifically, in this context, Modbus acts as the communication layer, enabling information exchange between the Ethernet-connected devices.

This setup ensures efficient data exchange and provides a solid foundation for the network's operations. The use of Ethernet and Modbus together is this architecture allows for a high degree of interoperability, making the BESS Socomec Network a versatile and adaptable system.

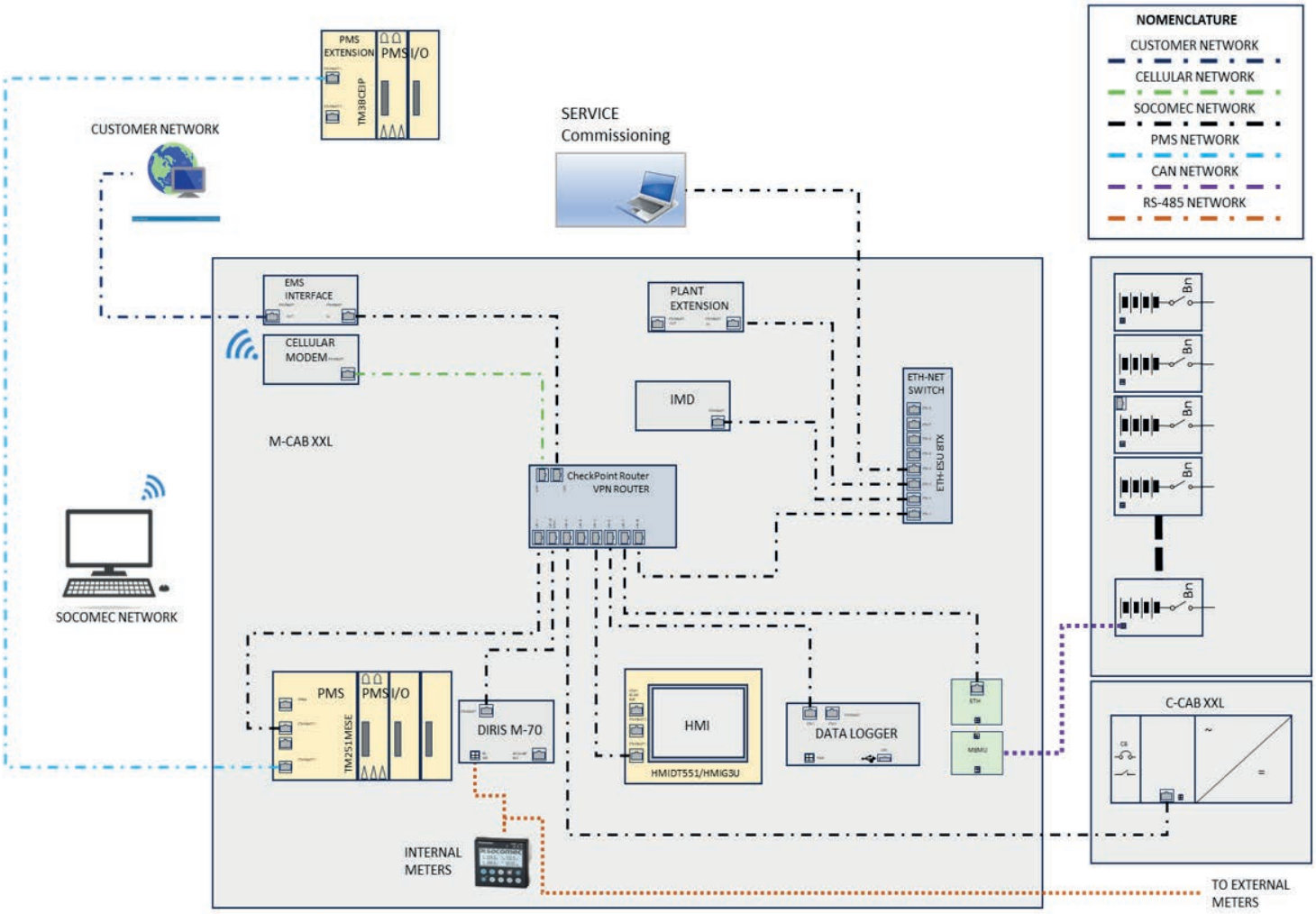


Figure 153. SOCOMEC NETWORK

8.2.1. Assigning IP Addresses

Listed in Table 31 are the I/P used within the Socomec Network along with the devices that use those I/P addresses. For example:

- The **Router** is assigned to **192.168.20.1**.
- The I/P address of the **Datalogger** is assign to **192.168.20.2**.

For a comprehensive view of all the pre-defined Socomec Network addresses, refer to Table 31.

In section “8.1.3. IoT (Internet of Things) Communication prerequisite”, page 150, the customer required to assign the addresses listed in Table 31 for their **Customer Network**. While it’s optional, it is recommended that the YYY values highlighted in the table match those of the **Socomec Network**. For instance:

- The **PMS** is assigned the IP address **192.168.20.11** in the Socomec Network.
- The customer network could assign **192.168.000.11** to directly communicate with the **PMS** controller in the BESS.

This should clarify the process.

Table 31 - IP Address allocations

CUSTOMER NETWORK		
@IP		SUB NET MASK
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY
192.168.XXX.	YYY	255.255.XXX.YYY

DEVICES
ROUTER
DATA LOGGER
MODEM 3/4G
SOCOMEC SERVICES
PLC/PMS
HMI #1
M70
ISLANDING CONTROLLER
PCS #1

SOCOMEC NETWORK	
@IP 192.169.20. XXX	255.255.255.000
192.168.20.001	255.255.255.000
192.168.20.002	255.255.255.000
192.168.20.014	255.255.255.000
192.168.20.010	255.255.255.000
192.168.20.011	255.255.255.000
192.168.20.012	255.255.255.000
192.168.20.015	255.255.255.000
192.168.20.5	255.255.255.000
192.168.20.21	255.255.255.000

8.2.2. Assigning Modbus Addresses

The Modbus addresses in the BESS have already been set and should remain as they are. This setup simplifies the process of integrating and commissioning the unit. Customers have the flexibility to assign any Modbus addresses that haven’t been pre-set and listed in the Table 32.

Table 32 – BESS Pre-defined Modbus Addresses

MODBUS @		
ROUTER		1
PLC/PMS		1
M70	DIGIWARE GATE	1
IMD	BESS	2
U30	MICROGRID	6
B30	AUXILIARY	7
B30	STORAGE	8
B30	LOAD	9
B30	PV	10
B30	GENSETS	11
B30	GRID	12
	RESERVE	13
	RESERVE	14
	RESERVE	15

	RESERVE	16

Table 32 presents a variety of potential metering devices, including the B30, which is part of the extensive range of Digiware Meters offered by Socomec. These meters are highly recommended for tasks such as monitoring and managing power loads, generator power, and PV power generation. When used in conjunction with various accessories, they can monitor all power measurement requirements. For information on other compatible devices and options, please contact the Socomec Digiware team.

8.3. Care During Winter Operations

This section is dedicated to offering guidance on how to handle snow and ice, including the necessary cleaning procedures for the SUNSYS HES XXL. The system may face distinct difficulties during the winter season, necessitating particular actions to guarantee its efficient functioning and safety.

8.3.1. Impact of Snow and Ice

The effects of snow and ice on the SUNSYS HES XXL system can be significant and diverse.

- The efficiency of the ventilation can be reduced if the air inlets become obstructed by snow or ice. This means that the system's ability to circulate air properly can be compromised.
- The weight of accumulated snow and ice on the system's components and structures can increase the likelihood of structural damage. This is because these environmental elements can exert a lot of pressure on the system.
- Maintenance operations can become more challenging due to difficult access to the system's components. This is because snow and ice can make it harder to reach and work on these parts.

In essence, winter conditions like snow and ice can pose several challenges to the operation and maintenance of the SUNSYS HES XXL system.

8.3.2. Monitoring Snow and Ice

It's crucial to consistently check the weather conditions and the buildup of snow and ice near the system. Utilize suitable weather forecasting tools to identify any alterations.

8.4. Cleaning Operations in Case of Snow and Ice

8.4.1. Safety Precautions

WARNING!
Prior to initiating cleaning tasks in snowy and icy conditions, adhere to these safety measures:
- Switch off all power to the system's electrical cabinets (M-Cab XXL, C-Cab XXL).
- Confirm that the all personnel carrying out the cleaning and clearing tasks have received adequate training and are well-equipped for the winter environments and conditions.

8.4.2. Snow and Ice Removal

When confronted with snow or ice, follow these cleaning instructions:

1. Turn off power to the system following the correct procedure.
2. With caution, eliminate snow and ice from the surroundings and top of the electrical cabinets (M-Cab XXL, C-Cab XXL, B-Cab XXL), components, and structures using suitable tools. Make sure not to inflict any harm to the paint and air intake grills.
3. Make sure that the ventilation air intakes are clear to allow sufficient airflow.
4. Inspect hinges, handles and locks, and door seals for any snow or ice that could hinder their functionality.
5. Clear away snow to enable the opening of both front and rear doors (if present).

8.4.3. Ice Prevention

Beyond the cleaning procedures, think about ways to stop ice from forming. For instance, you could consider using a heat tracing system, or other means which can help maintain a temperature above freezing and prevent ice formation.

9. C-CAB XXL COOLANT FILLING

WARNING!
The C-Cab XXL cooling tank contains heating element within.
If power is applied to the unit prior to filling the tank with coolant, the heating element may be damaged.
Running the cooling pump without primming it will damage it

1. If the unit was shipped pre-filled with coolant, the pump has been primed and is ready to run. Skip ahead to Step 5.
2. Remove the cover on the Schrader connection of the cooler, see Figure 154:

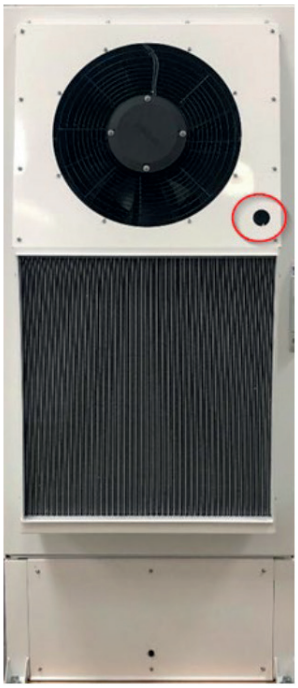


Figure 154. C-Cab XXL Coolant Schrader Valve Location

3. An automotive radiator pressurizing kit is needed to bleed any air from the system and get the coolant flowing. The pressurizing kit is a hand pump that can be connected to the coolant tank in place of the filling cap. The tank should be pressurized to 4psi.
4. Depress the Schrader valve and remove any air in the system.
5. Note the fluid level in the level monitoring gauge, connected to the coolant tank, as a reference point for comparison later.
6. Command the pump on in EPyQ as follows:

   a. Open Parameters tab -> Hardware -> I/O configuration -> Digital I/O Inversions -> Outputs.

   b. Set ManageDIO:InvertDO3 to [0] Normal by clicking the value column to view other options.

   c. Right click on the parameter and select 'Write To Inverter' to turn the pump on.
7. Check the fluid level again. If the level has dropped, then the pump has primed successfully.
8. Let the pump run for a few minutes, checking for leaks on the connections in the coolant Trough and on either side of the power stage (located in the front compartment of the inverter).
9. If the pump does not prime, turn the pump off immediately and contact EPC Customer Service for assistance. (Pump will be damaged if turned on without any coolant flowing through).

10. C-CAB XXL STARTUP AND COMMISSIONING

Two type of C-Cab XXL commissioning are required, Cold Commissioning and Hot Commissioning.

10.1. Cold Commissiong

Commissioning shall be done only by Socomec trained personal.

The following procedures outline the task associated with commissioning the unit up until the point where it is “Ready to Run” but does not include actual operation of the unit. Operation will be outlined in the Hot Commissioning section of this manual.

10.1.1. Disconnect system level controller

Turn off AC grid mains and DC power from the batteries.

CAUTION!
RUNNING THE COOLING PUMP WITHOUT PRIMING IT WILL DAMAGE IT. REMOVING THE SYSTEM LEVEL CONTROLLER WILL ENSURE A COMMAND IS NOT INADVERTENTLY SENT FROM THE SYSTEM LEVEL CONTROLLER ALSO.

10.1.2. Applying Auxiliary Power

1. Ensure that the Control power (5 Amp) and Aux power (10 Amp) circuit breakers located in the control panel on the inside of the cabinet door are in the Open position.
2. Turn on Aux power, bringing the power into the cabinet, up to the circuit breakers.
3. Using a DMM, measure the voltage at the aux power input, ensuring the voltage expected is on L1 and L2, while there is no voltage on the ground.
4. Once confirmation of the proper voltage at the terminals, close the 5 Amp and 10 Amp circuit breakers.

Once AUX power is applied, confirm that the system powers up.

10.2. Hot Commissioning

Hot Commissioning shall be done only by Socomec trained personal.

	**CAUTION!** RBEFORE COMMISSIONING, CHECK THE LABEL INSIDE THE C-CAB XXL. THIS LABEL INDICATES THE HUMIDITY LEVEL. IF THE HUMIDITY IS EQUAL TO OR ABOVE 30%, THE CABINET SHOULD BE DRIED BEFORE COMMISSIONING.

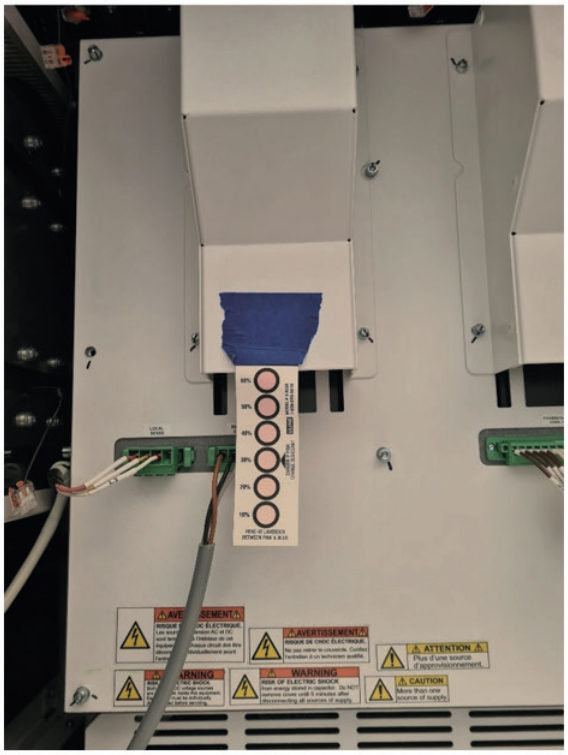


Figure 155. C-Cab XXL Humidity Checker

It's advisable to store the system for a maximum of 2 weeks between cold commissioning and hot commissioning.

If you need to extend this period, please get in touch with Socomec for additional details.

11. SUNSYS HES XXL STATUS LIGHTS

11.1. The lamps on the M-Cab XXL

Table of M-Cab XXL listed functions:

Table 33 - M-Cab XXL Lamp Status Function

M-Cab XXL Lamps	
System State	**Meaning**
Green ON	The system is working and turned ON, no alarms present.
Yellow ON	There is a Warning present.
Red ON	An Alarm is present and the system will shutdown operations.
No Lamps Present	System is OFF, with no alarms of warning.

11.1.1. The lamps on the B-Cab XXL

Table of B-Cab XXL listed functions:

Table 34 - B-Cab XXL Lamp Status Function

B-Cab XXL Lamps			
System State	**Green Lamp**	**Red Lamp**	**Yellow Lamp**
Power OFF	OFF	OFF	OFF
Failure	ON	OFF	ON
Control Circuit ON	ON	OFF	OFF
High Voltage ON	ON	ON	OFF
Charge/Discharge	ON	ON	OFF

12. SYSTEM OPERATION

The instructions provided in this section serve as a guide for two scenarios: powering up the unit from a non-operating state and for the initial power up. Accessing the breakers and switches requires the equipment doors to be open, which is a standard operating procedure. However, before powering up, always make sure that the dead fronts are properly secured in place.

DANGER!
WHEN WORKING NEAR ACTIVE INSTALLATIONS, ADHERE TO ALL SAFETY PROTOCOLS. THIS INCLUDES THE USE OF PERSONAL PROTECTIVE EQUIPMENT (PPE) SUCH AS PROTECTIVE CLOTHING, INSULATED GLOVES, AND SAFETY GOGGLES. ADDITIONALLY, IT IS ADVISED TO AVOID WEARING ANY METAL JEWELRY, INCLUDING BUT NOT LIMITED TO METAL RIMMED GLASSES, WRISTBANDS, WATCH CHAINS, RINGS, BRACELETS, NECKLACES, AND BODY JEWELRY, WHILE WORKING ON THE ELECTRICAL INSTALLATION.
AVOID WORKING ON LIVE EQUIPMENT WHENEVER POSSIBLE.

WARNING!
ENSURE THAT ALL DEAD FRONT PANELS ARE SECURED IN THEIR PLACE DURING SYSTEM OPERATION. LEAVING THESE PANELS OPEN CAN EXPOSE THE OPERATOR TO SIGNIFICANT RISKS ASSOCIATED WITH HIGH ARC FLASH ENERGY.

12.1. Initial System Power On

1. Check and ensure that all B-Cab XXL disconnect switches “QS” is in the ON position, refer to Figure 156.

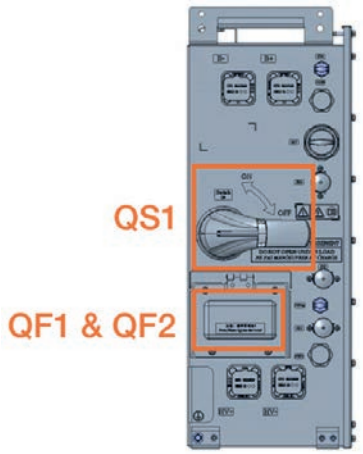


Figure 156. Location of B-Cab XXL QS Disconnect Switch

2. **Turn on M-Cab XXL**: Turn ON main power DISC-102, this provides all auxiliary power to B-Cab XXL, C-Cab XXL and M-Cab XXL. Refer to Figure 156.
3. **Switch on the UPS**: UPS unit located inside the M-Cab XXL selector switch SS-225. UPS selector switch has 3 positions. Left side of switch is for UPS mode, Center of switch is OFF, and Right side of switch is BYPASS. If the UPS is powered for the first time or the unit does not turn on automatically, the UPS may require and extra step to turn on the UPS power switch. Refer to Figure 157.

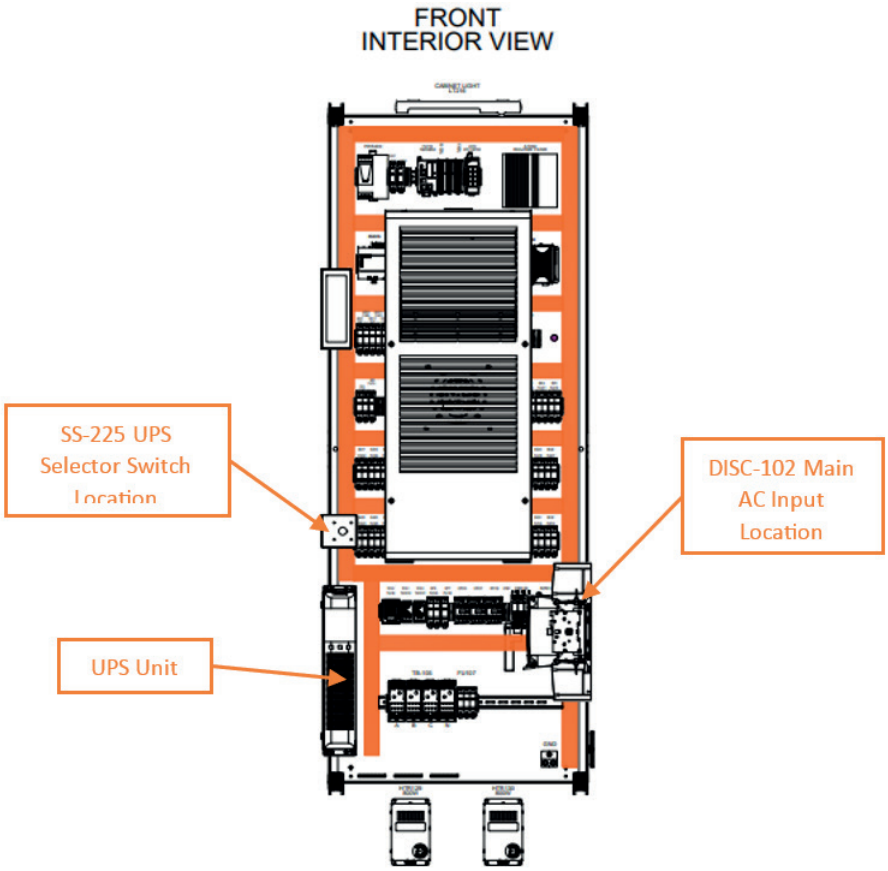


Figure 157. Location of M-Cab XXL Main Disconnect Switch and UPS

4. Turn on C-Cab XXL: Open cabinet front door, located inside is a handle to manually turn on the DC power. Refer to Figure 156 for details.

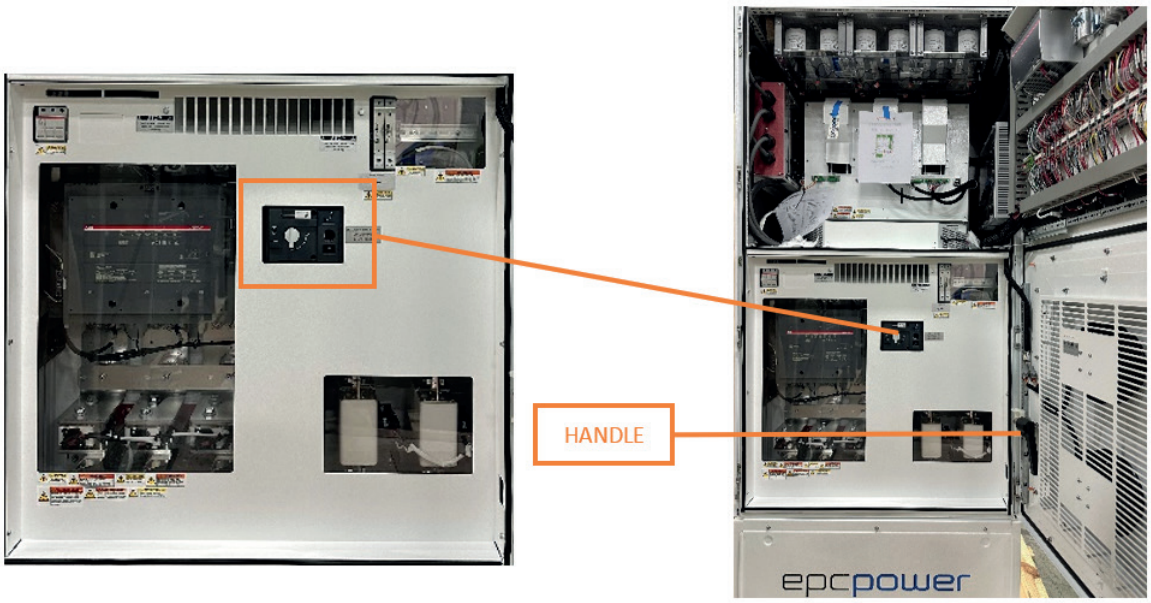


Figure 158. C-Cab XXL DC Disconnect Location

WARNING!
WARNING! ENSURE T0 READ THIS NOTE.

Note: as long as the UPS power switch is in ON position, the UPS will remain operational in the event of a power loss.
If the climate conditions (temperature, humidity inside the C-Cab XXL) are not within the specified range, the system will initiate a drying process upon power up. This step can only be performed when all cabinet doors are closed and it cannot be bypassed. Ensure that there are no active alarms before proceeding. Once these checks are complete, the system is ready for use.

12.2. System Power Off

A. Remote System Power Off
EMS sends the power off command to PMS.

B. Manual System Power Off (If required)

WARNING!
IF YOU NEED TO SERVICE THE UNIT AND ACCESS ITS INTERNAL COMPONENTS, FOLLOW THESE STEPS:
POWER OFF: TURN OFF THE UNIT COMPLETELY. **LOCK OUT TAG OUT ALL SOURCER OF ENERGY**.
COMPLETE INTERNAL ISOLATION: ENSURE ALL INTERNAL SYSTEMS ARE ISOLATED. THIS IS DONE BEFORE REMOVING THE DEAD FRONTS.
WAIT: AFTER POWERING OFF THE UNIT, WAIT FOR AT LEAST 5 MINUTES. THIS ALLOWS THE UNIT TO REACH A SAFE STATE FOR SERVICING.
ACCESS INTERNAL COMPONENTS: NOW YOU CAN SAFELY OPEN THE CONTROL SWITCHES AND BREAKERS TO ACCESS THE INTERNAL COMPONENTS.
REMEMBER, THESE STEPS ARE CRUCIAL FOR YOUR SAFETY AND THE PROPER FUNCTIONING OF THE UNIT.

To manually power down the system, follow the following procedure:

Note: by following this procedure, the load will be disconnected from the system.

1. Prepare for Shutdown: Ensure all ongoing operations have been completed or paused to prevent any data loss or system damage. Ensure the system is in standby mode (no active discharge/charge command).
2. Identify the Power Switch: Locate the main power switch on the system. It's typically marked with an 'I' for on and an 'O' for off. Refer to Figure 157, and Figure 158.
3. Switch Off: Turn the power switch to the 'Off' position. The system should begin its shutdown process.

   a. Switch off the UPS: To completely turn OFF the system, it is necessary to disconnect the UPS from the circuit.

      i. Turn selector switch SS-225 to the center position. See Figure 159.

Figure 159. SS-225, UPS BYPASS Selector Switch

ii. This center position ensures that UPS backed auxiliary power, is OFF.

b. Switch OFF M-Cab XXL: Move DISC-102 disconnect switch to OFF position. See Figure 161 for reference.

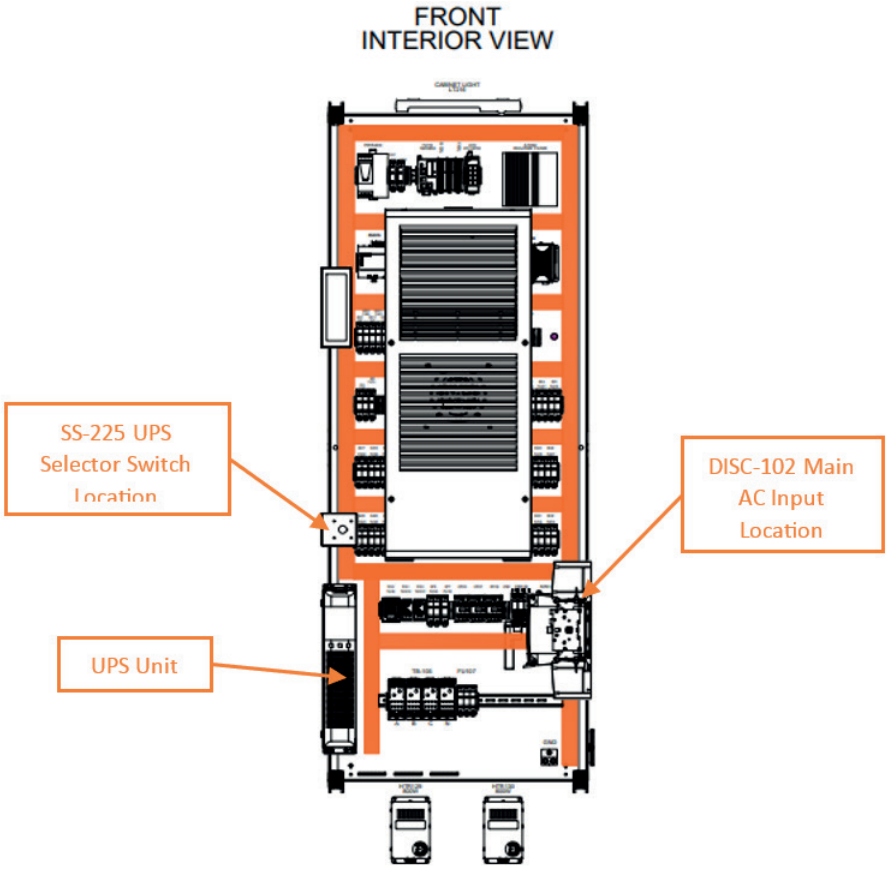


Figure 160. M-Cab XXL Disconnect Locations

c. **Switch OFF C-Cab XXL**: Open the C-Cab XXL front cabinet door, inside there is a handle used to switch off the C-Cab XXL DC power. Follow handle instructions.

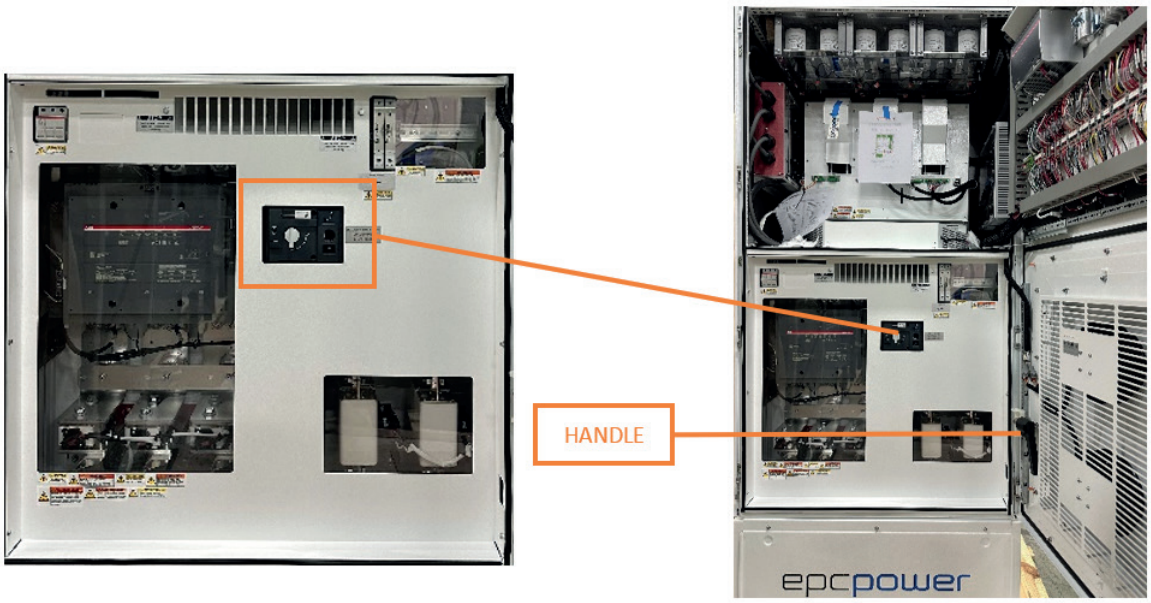


Figure 161. C-Cab XXL DC Disconnect Location

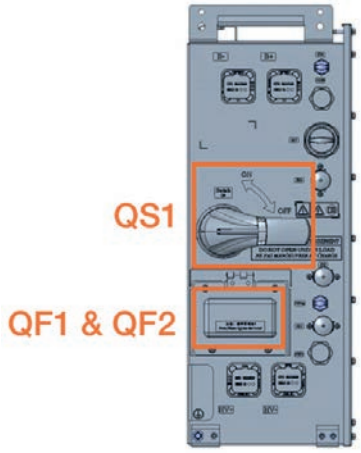


Figure 162. B-Cab XXL Power Disconnect Locations

4. **Confirm Shutdown**: Check that all lights and sounds from the system have ceased, indicating a successful shutdown.

Note: remember, it's important to follow these steps to ensure the safety and longevity of your system. Always refer to your system's specific user manual for more detailed instructions, as procedures can vary between different models.

The unit is now isolated and is ready for service and maintenance. The relevant protective covers can now be carefully unscrewed and taken off. However, it's crucial to ensure that all reachable terminals are confirmed to be without electrical power before initiating any work on the unit. This is to ensure safety during the maintenance process.

Follow proper lockout tag out procedures.

After powering down and before working on the inverter follow these steps:

1. Ensure that all power sources are disconnected or switched off. This includes the main AC power (1 a), the main DC power (1 b). There may be other power sources for all parallel inverters (1 c), and any optional auxiliary power. It's important to lock out these power sources to prevent accidental reconnection during the maintenance process.

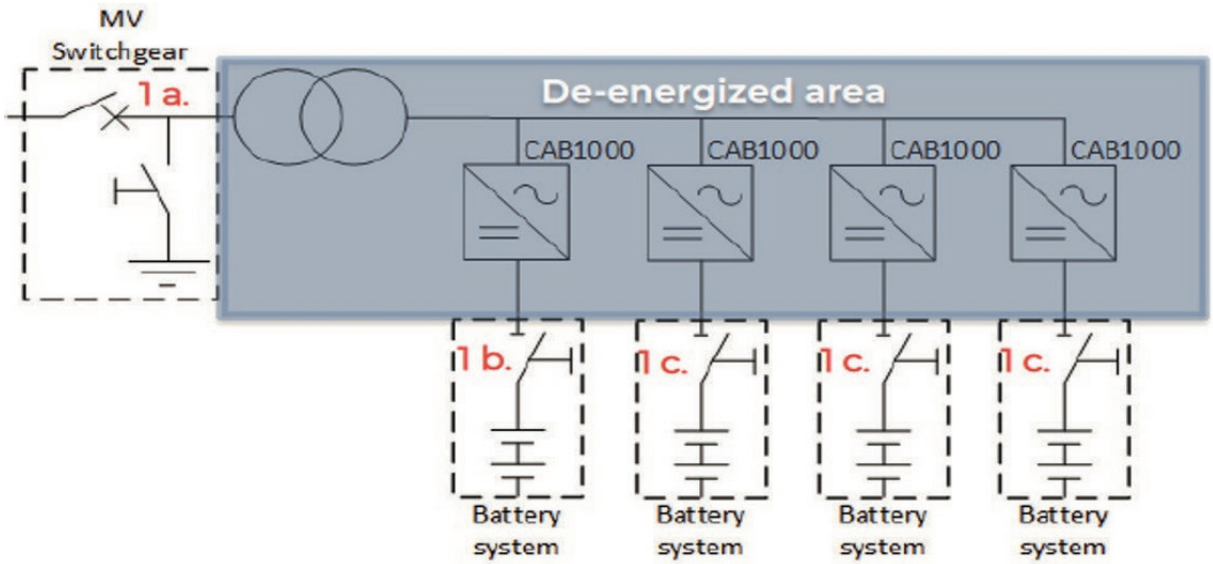


Figure 163. Isolating High Voltage Sources

2. Ensure that power cannot be re-applied while working on the equipment by following proper lockout procedures for all power sources.
3. After disconnecting power to the C-Cab XXL, wait and allow at least 5 minutes (or as specified on the C-Cab XXL label). This waiting period is necessary for the capacitors to release any stored energy. This is an important safety measure to prevent any electrical discharge during the maintenance process.

4. Remove the dead front panel.
5. Use a Digital Multimeter to take voltage measurements. Make sure that these measurements are below approximately 5 volts. The multimeter should be capable of handling up to 1500V. Please note that the measurements listed here are just the minimum recommended set for this procedure.

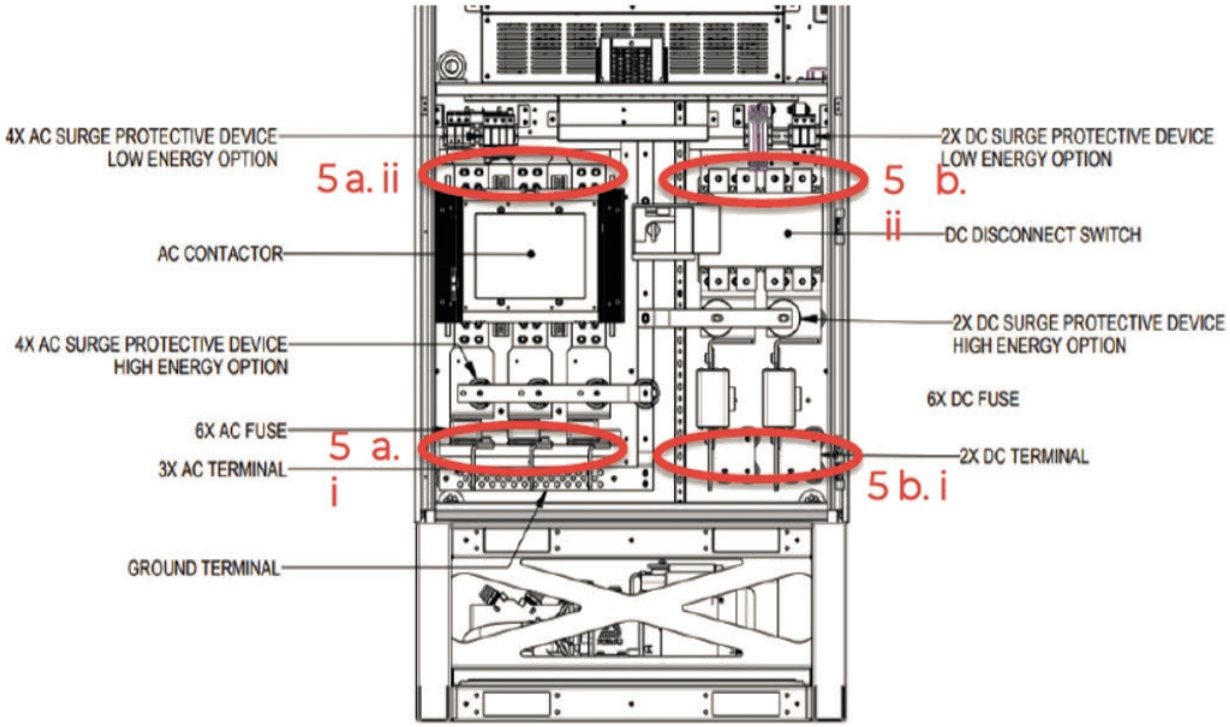


Figure 164. C-Cab XXL Measurement Points

a. Suggested AC measurements – using the digital multimeter in AC measurement mode.

   i. On the incoming side of the AC contactor point 5 a, I, below the contactor, from main power source (1a); measure from L1 to L2; L2 to L3; L3 to L1; L1 to N; L2 to N; L3 to G; L1 to G; L2 to G; L3 to G.

   ii. On the converter side of the AC contactor point 5 a, ii, above the contactor; measure from L1 to L2; L2 to L3; L3 to L1; L1 to N; L2 to N; L3 to G; L1 to G; L2 to G; L3 to G.

b. Suggested DC measurements – using the digital multimeter in DC measurement mode.

   i. On the incoming side of the DC contactor point 5 b, i, below the contactor; measure from + to -; + to N; - to N; + to G; - to G.

   ii. On the converter side of the DC contactor point 5 b, ii, above the contactor; from + to -; + to N; - to N; + to G; - to G.

6. Install safety grounding as appropriate

12.3. Operations

The SUNSYS HES XXL with the aid of the C-Cab XXL allows the operator to specify the power level for charging and discharging of batteries.

• Charging mode

During the charging mode, the C-Cab XXL power converter converts grid AC power into DC power to charge the battery or batteries. The M-Cab XXL manages the charging profile for the SUNSYS HES XXL during the battery charging process.

Once the battery reaches its full charge at the top of the state of charge (SOC) range or maximum voltage, the battery energy storage system (BESS) transitions into standby mode and automatically stops charging.

• Discharging mode

In the discharge mode, the SUNSYS HES XXL when commanded, the C-Cab XXL converts DC power to an AC power output. The SUNSYS HES XXL (BESS) remains in this mode until it receives a command to stop discharging, go to standby mode, or until the battery reaches its minimum allowed state of charge (SOC).

Once the battery is fully discharged and reaches the minimum state of charge (SOC), the BESS returns to standby mode.

• Reactive power mode

When the SUNSYS HES XXL system receives a command related to reactive power, set-point values are sent to the C-Cab XXL and adjusts the power factor and reactive power percentage by either injecting or absorbing reactive power from the grid. In other words, it manages the exchange of active and reactive power with the mains.

• Stable output voltage and frequency

When the SUNSYS HES XXL operates in on-grid mode, it instructs the C-Cab XXL to maintain stable output voltage and frequency by managing both reactive power and active power in on-grid applications. In other words, it ensures that the system maintains consistent performance while connected to the grid.

12.4. IMD Setup

The IMD (Isolation Monitoring Device) located within the SUNSYS HES XXL M-Cab XXL XX, comes with predefined settings.

During commissioning, qualified service personnel have the option to adjust these settings based on the specific installation configuration (such as the number of C-Cab XXLs XXL, B-Cab XXLs XXL, etc.).

Importantly, no setup is needed from the end user.

13. MAINTENANCE

CAUTION!
DANGEROUS ELECTRICAL VOLTAGES ARE PRESENT INSIDE THE M-CAB XXL, C-CAB XXL, C-TROUGH, AND B-CAB XXL DURING REGULAR USE, MAINTENANCE, AND SERVICING. BEFORE WORKING INSIDE ANY OF THE UNIT, ENSURE ALL POWER SOURCES ARE DISCONNECTED AND SECURED TO PREVENT ACCIDENTAL RECONNECTION. USE APPROPRIATE LOCK OUT TAG OUT PROCEDURES.

FOR YOUR SAFETY, IT'S CRUCIAL TO VERIFY THAT ALL ACCESSIBLE TERMINALS ARE ELECTRICALLY INACTIVE. DON'T JUST ASSUME THIS - MAKE SURE THERE'S NO ELECTRICAL POTENTIAL BETWEEN ANY CONNECTIONS OR BETWEEN CONNECTIONS AND THE GROUND. THIS APPLIES TO ALL TERMINALS, NOT JUST THE ONES YOU'RE WORKING WITH.

CAUTION!
BEFORE CARRYING OUT ANY OPERATIONS ON THE UNIT READ THE "IMPORTANT SAFETY INSTRUCTIONS" CHAPTER CAREFULLY.

CAUTION!
SUNSYS HES SPECIFIC MAINTENANCE SHOULD BE PERFORMED ONLY BY SOCOMEC TRAINED AND QUALIFIED SERVICE PERSONNEL.
SUNSYS HES ROUTINE MAINTENANCE SHOULD BE PERFORMED ONLY BY PERSONNEL TRAINED AND QUALIFIED, AS PER LOCAL REGULATIONS.

The SUNSYS HES XXL system needs regular care and maintenance to operate smoothly. The maintenance process is divided into the following stages:

1. Prompt Inspection and Remedial Measures: This is guided by automated alerts and warnings.
2. Preventative Maintenance:
   a. Routine Check-ups: These are annual inspections that include necessary follow-up actions and maintenance of certain components.
   b. Targeted Visits: These involve regular maintenance of specific components at set intervals.
3. End-of-Life Overhaul Maintenance.

Before starting any maintenance work, it's essential to turn off the system and isolate it as per the procedure outlined in the 'Manual System Power Off' chapter.

Timely inspections and corrective actions

Inspections should be carried out promptly and any necessary corrective actions should be based on the alarms and warnings generated by the system. You can find a list of potential alarms and warnings in the 'Troubleshooting' section of this manual.

Note: remember, it's important to follow these steps to ensure the safety and longevity of your system. Always refer to your system's specific user manual for more detailed instructions, as procedures can vary between different models.

13.1. Preventive Maintenance

Maintenance involves thorough checks of the various electronic and mechanical components to ensure they're functioning correctly. If needed, parts that are prone to wear and tear, such as filters, fans, and capacitors, should be replaced.

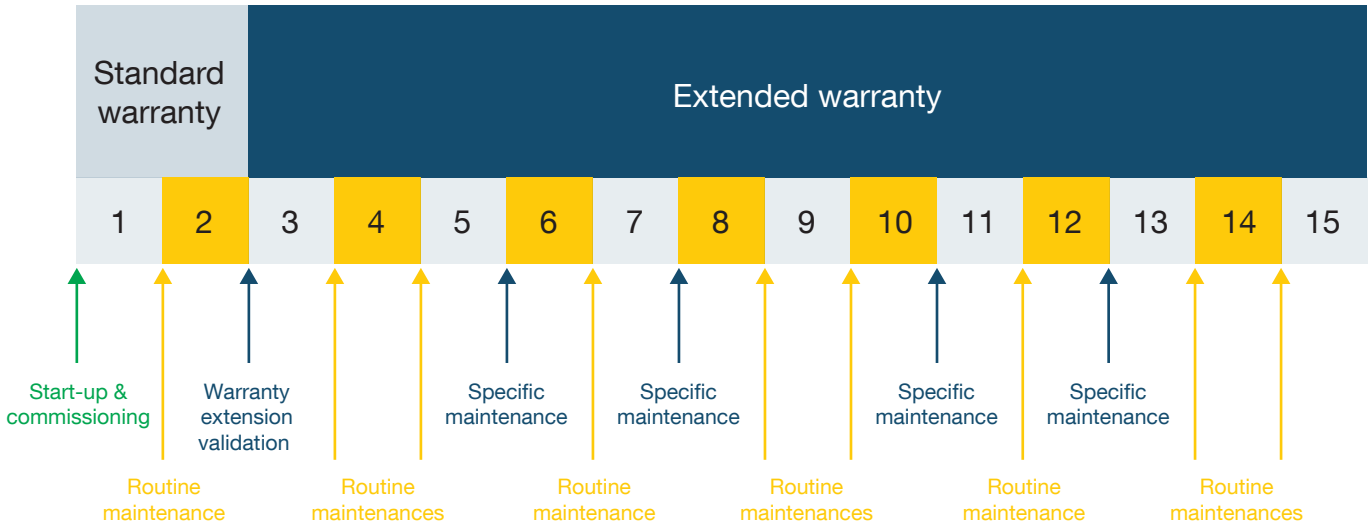
To maintain the equipment's optimal efficiency and prevent potential damage or risks that could lead to downtime, it's recommended, and even mandatory in the case of warranty extensions, to perform preventative maintenance annually.

Maintenance tasks include replacing parts and checking the functionality of:

- Electronic and mechanical components
- Dust removal processes
- Software updates (which can only be performed by Socomec's teams)
- Environmental conditions

The following table outlines the schedule for routine and specific maintenance visits. The type of maintenance contract you choose will determine who can perform the routine maintenance visits. If you're qualified to do such work in your local jurisdiction, you can carry out these visits yourself. However, you'll be responsible for them, and Socomec will require you to submit a maintenance report after each visit. Please note that only Socomec or an authorized third party can perform the specific maintenance visits.

Table 35 – Warranty



For details on the necessary operations, please consult the specific document titled "Preventive Maintenance".

⚠	**WARNING!** BEFORE CARRYING OUT MAINTENANCE OPERATIONS, ENSURE THAT THE ENVIRONMENT AND SYSTEM ARE IN A SAFE STATE, AND THAT THERE ARE NO ALARMS OR FAULTS. ONCE THE BATTERY MAINTENANCE FOR THE ENERGY STORAGE SYSTEM (ESS) IS FINISHED, FEEL FREE TO INFORM OUR AFTER-SALES ENGINEER, WHO WILL CONDUCT A DATA ANALYSIS AT NO EXTRA COST.

The battery needs to be calibrated every 15 days (14 cycles) to reset the SoC level.

Please refer to document "Calibration Procedure" for more information on the process.

14. TROUBLESHOOTING

Alarm messages provide an instant diagnosis of any issues, malfunctions, or failures in the batteries. They indicate the following events:

- **Warning**: This represents an unusual condition that doesn't cause the unit to stop. It can be reset automatically.
- **Alarm**: These are more serious alarm conditions that cause the unit to stop. These conditions require a manual reset.

Alarms and warnings are divided into two categories:

- **System Alarms/Warnings**: These are related to the external parts of the unit (like the mains power network, output line, ambient temperature, etc.). The user (system installer or operator) or the Service team can activate corrective actions.
- **Unit Alarms/Warnings**: These are related to the parts of the unit. The Support Service carries out corrective actions for these.

This system helps to maintain the proper functioning of the unit and ensures any issues are addressed promptly.

15. RECYCLING INFORMATION

Please don't throw away your electrical appliances with your regular trash.

Instead, utilize the designated collection facilities for this purpose. Adherence to your local council's waste regulations is crucial for the appropriate disposal of these items. This practice significantly mitigates the environmental damage caused by waste from electrical and electronic equipment. For information regarding available collection arrangements, please consult your local government.

The disposal of electrical appliances in landfills or dumps can result in harmful substances contaminating our groundwater. This contamination can infiltrate our food supply, thereby posing a significant risk to our health and wellbeing. Note that batteries at End of Life, are categorized as hazardous waste. When battery replacement is required, we strongly advise that you entrust your finished batteries only to certified and licensed waste disposal companies. In accordance with local legislation, it is strictly prohibited to dispose of batteries alongside other industrial waste or household refuse.

The symbol of a trash bin with a cross through it on this product is a reminder to users to recycle parts and units whenever feasible. We urge you to act responsibly towards the environment and ensure this product is recycled at your local facility when it reaches the end of its lifespan.

If you have any queries about how to dispose of this product, please reach out to your local distributors or retailers.

15.1. Battery Disposal Instructions

15.1.1. General Requirements

- Battery disposal must adhere to CATL battery disposal instructions as well as local codes and regulations.

15.1.2. CATL Disposal Guidelines

- **Pre-Decommissioning**: Before decommissioning or removing any system, contact CATL Service.
- **End-of-Life Management**: CATL equipment is designed for end-of-life management through recycling and materials reclamation. These tasks should be performed by CATL-qualified partners.
- **Qualified Partners**: CATL Energy Storage can provide a list of qualified partners in your area to ensure proper disposal of retired equipment.

15.1.3. Additional Information

- For further details or assistance, please reach out to CATL Service. They can guide you through the disposal process and connect you with certified recycling and reclamation services.

CAUTION!
ENSURE THE BATTERIES ARE FULLY DISCHARGED BEFORE ATTEMPLTING FOR DISPOSAL.

When it comes to disposing of the batteries, they need to be completely drained of power first. Then, they should be packed and transported following the current transportation rules and regulations. A licensed or certified lithium-ion battery recycler should handle the disposal, ensuring it aligns with local and national laws. If you need more help with this process, don't hesitate to reach out to Socomec.

16. TECHNICAL DATA

16.1. Dimensions and weights

16.1.1. B-Cab XXL

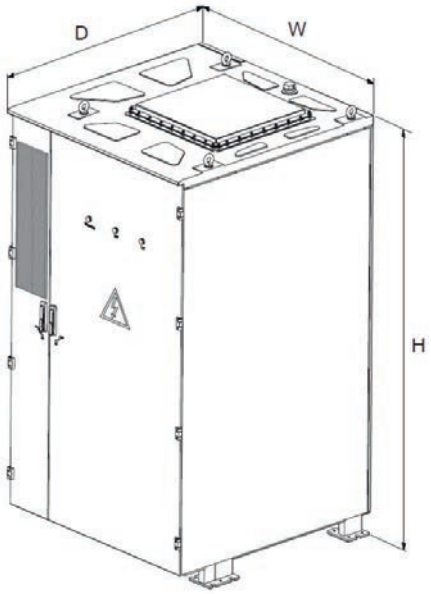


Figure 165. B-Cab XXL Dimensions

0.5C battery

Width x Depth x Height	1390 x 1344 x 2348 mm / 54.7 x 52.9 x 92.4 in
Width x Depth x Height (with packaging)	1450 x 1500 x 2500 mm / 57.1 x 59.1 x 98.4 inches
Weight	3650 kg / 8047 lbs
Weight (with packaging)	3750 kg / 8267 lbs

16.1.2. C-Cab XXL

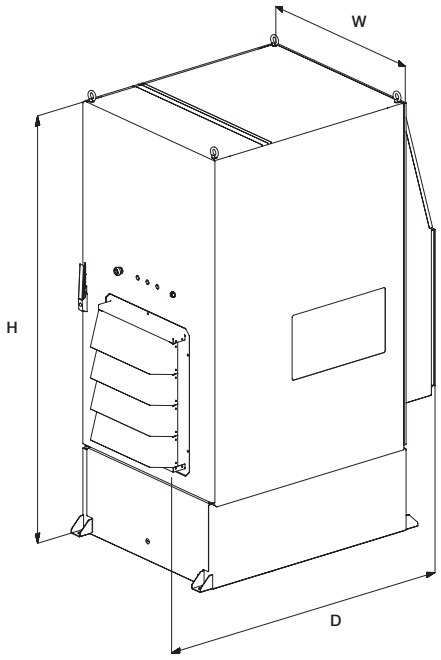


Figure 166. C-Cab XXL Dimensions

Width x Depth x Height	1009 x 1634 x 2281 mm / 39.7 x 64.3 x 89.8 inches
Width x Depth x Height (with packaging)	1422 x 1829 x 2490 mm / 56 x 72 x 98 inches
Weight (with no options installed)	1340 kg / 2954 lbs
Weight (with packaging)	1545 kg / 3407 lbs

16.1.3. M-Cab XXL

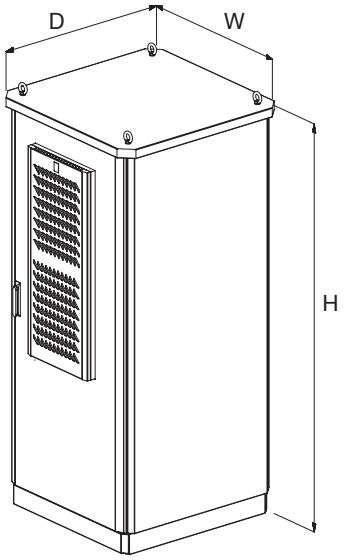


Figure 167. M-Cab XXL Dimensions

Width x Depth x Height	805 x 805 x 2095 mm / 31.67 x 31.67 x 82.49 inches
Width x Depth x Height (with packaging)	1100 x 975 x 2200 mm / 43.3 x 38.4 x 86.6 inches
Weight	250 kg / 551 lbs.
Weight (with packaging)	300 kg / 661 lbs

16.2. SUNSYS HES XXL

DC Section	
Maximum DC voltage range	900 - 1500VDC
Minimum recommended DC voltage	1.65 x nominal AC voltage
Maximum DC deviation voltage between parallel units	150VDC
Maximum DC current	1400A
Maximum DC fault current allowed	180 kA (with internal DC fuses per input)
Number and section of DC cables inputs	8 B-CAB XXL max, 2x95mm² per B-Cab XXL
DC disconnection	Motorized disconnect
DC fuses in C-Cab XXL	3x 750A, 210 kAIc (20kA SC min)
DC surge protection (SPD) in C-Cab XXL	Type 1 heavy duty

AC Section					
Operating voltage range	600VAC - 690VAC				
Nominal voltage (3 ph.)	600VAC	600VAC	600VAC	600VAC	690VAC
Maximum AC Power	500kW	750kW	1000kW	1250kW	1500kW
Nominal current	481A	722A	962A	1203A	1255A
Maximum short circuit current from AC source	100kA (throated version) | 180kA (non-throated version)				
Number and section of AC cables inputs	6x300mm² per phases and neutral				
Rated frequency	50Hz / 60Hz				
Export power overload capacity @40°C, starting from 66% full load	120% for 3 seconds to 116% for 5 minutes				
Power factor (reactive power capacity)	0.8 - 1 leading/lagging				
Harmonic distortion THD	UL1741 / IEEE, <2% THDi at rated power per IEEE 519 <3% according to VDE-AR-N 4110/4120				
Efficiency @ 690V	98.8% peak | 98.4% CEC | 98.5% Euro				
AC disconnection	Contactor				
AC fuses in C-Cab XXL	2 x 1000A, 200kAIc (24kA SC min)				
AC surge protection (SPD) in C-Cab XXL	Type 2 (optionally type 1 heavy duty)				
Safety features	F-stop, AC/DC overvoltage, AC timed overvoltage, inst & timed overcurrent, overtemperature (both instantaneous and time-overload), condensation, etc.				
Ground fault detection (optional)	IMD				

Parallel operation	
On-grid mode	With other HES XXL C-Cab XXL units or any kind of third party generator (voltage or current type).
Off-grid mode	With other HES XXL C-Cab XXL units | With generic current/power generators. Not operated in parallel with other isochronous voltage generators

Control and auxiliaries	
Control interface	CAN, Modbus TCP/IP
Command latency	1ms (CAN) |3ms (Modbus TPC/IP)
Respond time (to accomplish a full power step)	2ms adjustable longer via parameters
Auxiliaries voltage	208V at 60Hz | 240V at 50Hz
Self-consumption per C-Cab XXL	2400W Abs. max | 1500W Typ. 100% load | 1200W 50% load, standby
Max B-Cab XXL control circuits consumption	366W
Max B-Cab XXL heating/cooling consumption (extreme climatic conditions)	3.0kW for 0.5P (per rack)

Environmental	
Operating ambient temperature	-20°C to +55°C / -4°F to +131°F (derated above +40°C / +104°F)
Temperature derating	1.7% per °C from 40°C to 55°C / 104°F to 131°F
SectionStorage ambient temperature	-30°C to +60°C / -22°F to +140°F
Relative humidity	5% to 95% non condensing
Environmental Control	C-Cab XXL: Hybrid Liquid/Air Cooling | B-Cab XXL: Liquid Cooling/Heating | M-Cab XXL: HVAC and Heaters
Maximum altitude	3000m / 9840ft (consult Socomec for higher elevation)
Altitude derating current	10% per 1000m / 3280ft above 1000m / 3280ft elevation
Airborne noise	<75 dBA at 3m / 10ft
Seismic	ASCE/SEI 7-22 with Sds 0.8g / 1.6g / 2.5g
Ingress protection / enclosure ratings	Outdoor IP54 / NEMA 3R
Environmental Category	Outdoor Class C3

16.2.1. Certifications & Compliances

Certifications & Compliances	
Safety	ANSI/CAN/UL 9540:2023
	UL 1741:2021
	CSA C22.2 No. 107.1-16
	UL 1973
	UL 9540A
EMC	FCC Part 15, Subpart A/B - Class A. Radio frequency devices: measurement of disturbance voltage.
Grid Code	UL 1741 Suplement SB
	IEEE 1547-2018
	IEEE 1547a-2020
	IEEE 1547.1-2020
	Hawaiian Electric's SRD V2.0
Installation	NFPA 855
	NFPA 68
Software	UL 1998
Other Standards	UN 38.3

UL 9540A

The SUNSYS B-Cab XXL was tested according to UL 9540A - Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, 4th edition.

FCC Part 15 - level “A”

Caution: If the user changes or implements modifications not expressly approved by the party responsible for compliance could void the user’s authority to operate the equipment.

Note: this equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

California proposition 65 warning:

Product range: Energy storage system

CAUTION!
This product can expose you to chemicals including lithium ions, Styrene and glycol which are known to the State of California to cause cancer and birth defects or reproductive harm. For more information go to:
P65Warnings.ca.gov

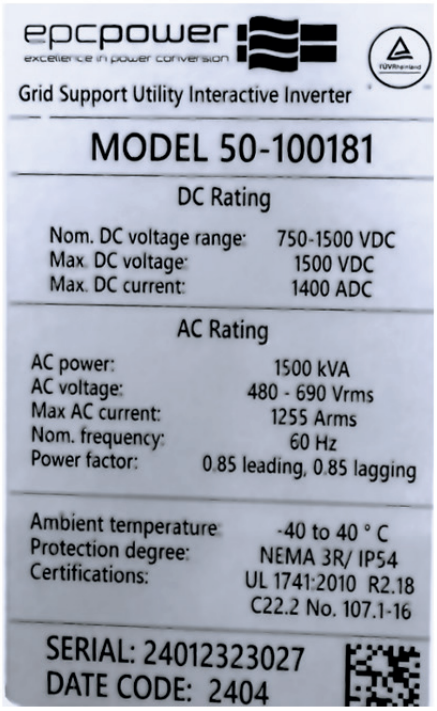
17. APPENDICES

17.1. Appendix 1 - Nameplates

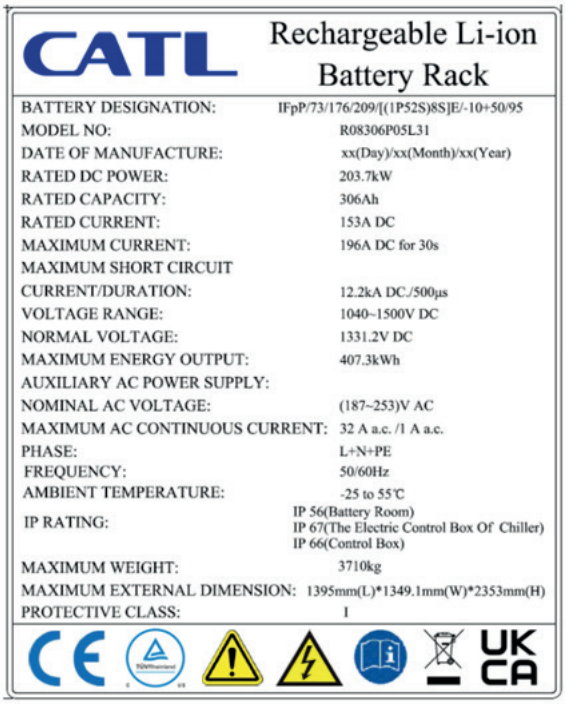
17.1.1. System Nameplate

Manufacturer :	socomec Innovative Power Solutions		SOCOMEC, Inc. 9 Galen Street WATERTOWN MASSACHUSSETS Tel : +1 617-245-0447 info.us@socomec.com		
Function :	Lithium-Ion (Lifepo4) Battery Energy Storage System				
Type :	SUNSYS HES XXL	Outdoor	AC Coupled	On & Off Grid	
System Model :	1500KVA / 3258kWh / 690VAC		**Part #:**	244-006820-122	
PCS Model :	1	CAB1000 / AC-3L.2 (50-100181)	**Part #:**	244-006868-116	
Batteries Model :	8	EnerOnePlus - 306Ah - (R08306P05L31)	**Part #:**	244-006820-903	
Control Model :	1	Master Cabinet + Power Mgt Sys.	**Part #:**	244-006892-113	
Serial # :	*** Define during manufacturing ***		**Date :**	*** YYYY - MM - DD ***	
AC :					
	Wiring :	3 phase / 4 wires + Ground			
	Nominal AC Voltage :	690 VAC (Range: +/-10%)			
	Nominal Frequency :	60 Hz			
	Max Continous Current (Import & Export) :	1,255 A			
	Overcurrent protective device ratings:	1,883 A			
	Short circuit contribution (peak):	4.2 kA	320 µs		
	Max. fault current from AC source :	100 kA (AC RMS)			
	Rated Power (Import & Export) :	1,500 kVA			
DC :					
	Storage Capacity :	3,258 kWh			
	DC Voltage Range :	1,040 VDC (Min)	1,500 VDC (Max)		
	DC Max Continuous Current :	1,224 A			
Aux. Power :					
	Wiring :	L+L+PE (PCS) / L+N+PE (Batteries)			
	Nominal AC Voltage Range :	208 VAC (Min)	240 VAC (Max)		
	Nominal Frequency :	60 Hz			
	Rated Current :	20 AC (Continuous)	109 AC (Peak)		
Dimensions & Weights :					
PCS :	**Dimensions (H / W / D) :**	2,281 / 1,000 / 1,636 mm	89.8 / 39.4 / 64.4 in		
	Weight	1,370 kg	3,020 lb		
Batteries Rack :	**Dimensions (H / W / D) :**	2,353 / 1,395 / 1,349 mm	92.63 / 54.92 / 53.11 in		
	Weight	3,710 kg	8,179 lb		
Enviroment :					
	Ambient Operating Temperature :	-20 °C (Min)	40 °C (Max w/o derating)		
		The derating between 40°C and 55°C curves is linear 1,7%/°C			
	Protection Degree :	NEMA 3R			
	Fire Safety Protection :	Smoke and heat sensor Aerosol canister + Deflagration vent mechanism			
Safety Certifications :					
	System :	UL9540:2023			
	PCS :	UL1741 SB			
	Bateries :	UL1973 / UL9540A / UN38.3			

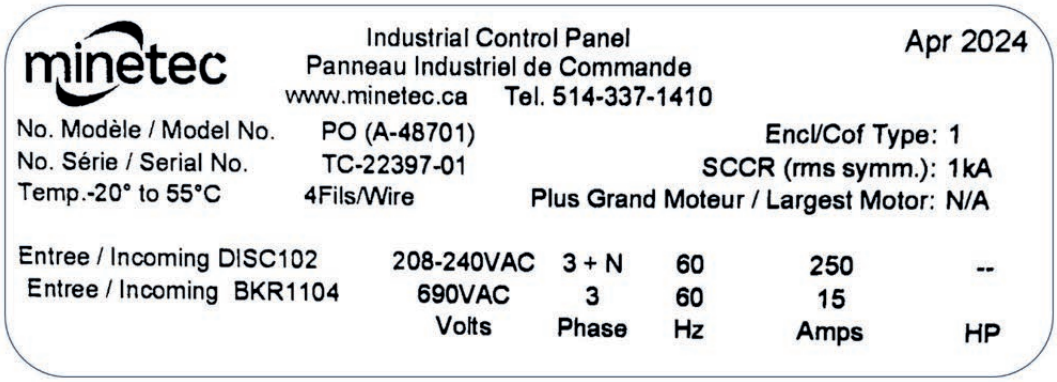
17.1.2. C-Cab XXL Nameplate



17.1.3. B-Cab XXL Nameplate



17.1.4. M-Cab XXL Nameplate



17.2. Appendix 2 - System anchorage summary

Table 38 - Anchorage Summary

SDS Level	Cabinet Type	Anchor Type	Diameter (in)	# of Anchors	Embedment hef (in)	Minimum Edge Distance to Anchor (in)	Minimum Pad Thickness (in)
2.5g	B-Cab XXL	HIT-HY 200 V3+ HAS-E-105 (ASTM F1554 Gr. 105) 5/8	5/8	15	12 1/2	24	16
	C-Cab XXL	HIT-HY 200 V3+ HAS-B-55 (ASTM F1554 Gr. 55) 5/8	5/8	4	8	10	10
	M-Cab XXL						
	C-Trough						
1.6g	B-Cab XXL	HIT-HY 200 V3+ HAS-E-105 (ASTM F1554 Gr. 105) 5/8	5/8	15	8	18	10
	C-Cab XXL	HIT-HY 200 V3+ HAS-B-36 (ASTM F1554 Gr. 36) 5/8	5/8	4	6	10	8
	M-Cab XXL						
	C-Trough						
0.8g	B-Cab XXL	Kwik Bolt TZ2 - CS 1/2	1/2	15	3 1/4	10	6
	C-Cab XXL	Kwik Bolt TZ2 - CS 1/2	1/2	4	2 1/2	6	5
	M-Cab XXL						
	C-Trough						

Note:

- Installation should be from left to right, as seen from the front of the cabinets.
- High-Level Seismicity Design Short Period Spectral Acceleration SDS = 2.5g
- Mid-Level Seismicity Design short Period Spectral Accelerations SDS = 1.6g
- Low-level Seismicity Design short Period Spectral Accelerations SDS = 0.8g

17.3. Appendix 3 – Spare Parts List

Table 39 - C-Cab XXL Spare Parts

EPC P/N	Description	Quantity / Inverter	Recommendation on Hand
20-101205	Filter for clean compartment	1	1 for every 1 inverter
20-101151	Salt Fog Filter for clean compartment	1	1 for every 1 inverter
31-100424	AC fuses	6	1 set of (6) for every 20 inverters, when utilized
30-100230	DC fuses	6	1 set of (6) for every 20 inverters, when utilized
31-100489	AC measurement fuses	3	1 set of (6) for every 20 inverters

17.4. Appendix 4 – List of fuses

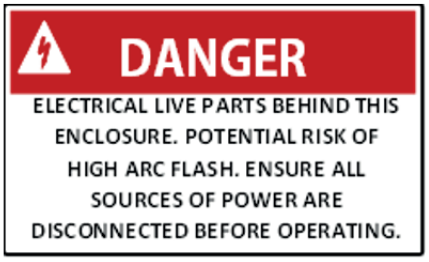
M-Cab XXL					
MARK	**RATING**	**QUANTITY**	**SUPPLIER REFERENCE**	**DESIGNATION**	**MANUFACTURER**
FU107	0.5 A	3	FNQ-R-1/2	CLASS CC TIME DELAY	BUSSMANN
FU129	10 A	2	FNQ-R-10	CLASS CC TIME DELAY	BUSSMANN
FU133	0.5 A	2	FNQ-R-1/2	CLASS CC TIME DELAY	BUSSMANN
FU201-203	8 A	2	FNQ-R-8	CLASS CC TIME DELAY	BUSSMANN
FU212	5 A	1	FNQ-R-5	CLASS CC TIME DELAY	BUSSMANN
FU206	10 A	2	FNQ-R-10	CLASS CC TIME DELAY	BUSSMANN
FU223	15 A	2	FNQ-R-15	CLASS CC TIME DELAY	BUSSMANN
FU302-337	20 A	32	FNQ-R-20	CLASS CC TIME DELAY	BUSSMANN
FU403	4 A	2	FNQ-R-4	CLASS CC TIME DELAY	BUSSMANN
FU406	1 A	2	FNQ-R-1	CLASS CC TIME DELAY	BUSSMANN
FU403A	10 A	1	FNQ-R-10	CLASS CC TIME DELAY	BUSSMANN
FU410	4 A	1	FNQ-R-4	CLASS CC TIME DELAY	BUSSMANN
FU413-417	4 A	4	FNQ-R-4	CLASS CC TIME DELAY	BUSSMANN
FU419	10 A	2	FNQ-R-10	CLASS CC TIME DELAY	BUSSMANN
FU423-437	5 A	16	FNQ-R-5	CLASS CC TIME DELAY	BUSSMANN
FU502 -516	5 A	16	FNQ-R-5	CLASS CC TIME DELAY	BUSSMANN
FU602	1 A	1	FNQ-R-1	CLASS CC TIME DELAY	BUSSMANN
FU606-623	4 A	2	FNQ-R-4	CLASS CC TIME DELAY	BUSSMANN
FU610-635	2 A	1	FNQ-R-2	CLASS CC TIME DELAY	BUSSMANN
FU823-825	100 mA	2	BUS-S506-100-R	S506 100mA BUSS TD 5-IN BOX -R	SCHNEIDER
FU922	1 A	1	FNQ-R-1	CLASS CC TIME DELAY	BUSSMANN
FU1110	1 A	3	FNQ-R-1	CLASS CC TIME DELAY	BUSSMANN
B-Cab XXL					
MARK	**RATING**	**QUANTITY**	**SUPPLIER REFERENCE**	**DESIGNATION**	**MANUFACTURER**
-	250 A	2	RSZ307-3-RAZ-250A1500V	RSZ307-3-RAZ 1500V High Speed Fuse	SINOFUSE
B-Cab XXL					
MARK	**RATING**	**QUANTITY**	**SUPPLIER REFERENCE**	**DESIGNATION**	**MANUFACTURER**
-	1000 A	4	31-100424	CLASS aR	EPC
-	1100 A	4	30-100662	CLASS aR	EPC

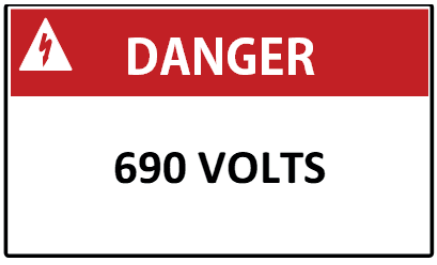
17.5. Appendix 5 – Battery Safety Sensor Recommended Service

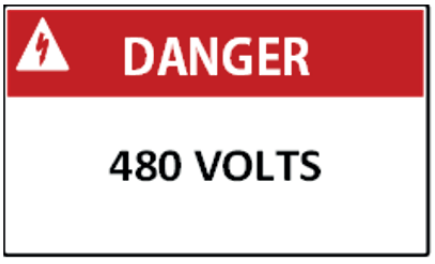
Smoke detector	- Utilize the smoke temperature tester to activate the smoke sensor. - Verify that the BMS monitor system and the fire control panel (if installed) report a fault. - After testing, use the clear fault command to reset the system status. - Reset the smoke sensor on the control panel.	Annual
Temperature detector	- Use the temperature tester to activate the temperature sensor. - Confirm that the BMS monitor system and the fire control panel (if installed) report a fault. - After testing, reset the system status using the clear fault command. - Reset the temperature sensor on the control panel.	Annual
Connectors	- Ensure that both the smoke and temperature sensors are properly installed and secured. - Inspect the wiring harness for any signs of damage.	Annual
Aerosol	- Check the aerosol trigger line for any damage. - Verify that the aerosol is securely installed and the canister is free from physical damage. - Ensure the aerosol device has not expired.	Annual

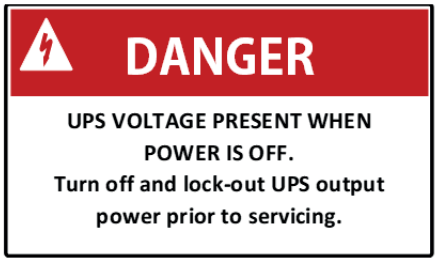
17.6. Appendix 6 – Cautionary Markings

17.6.1. Danger Markings

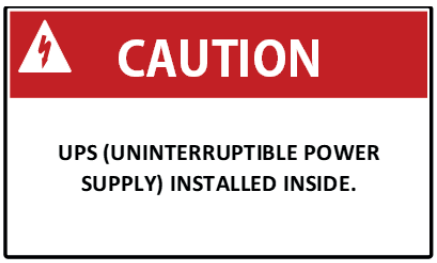


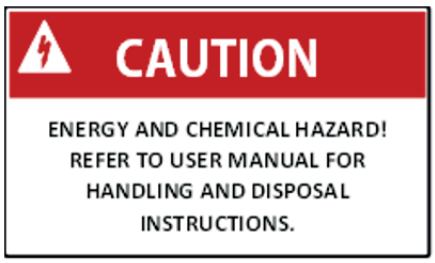




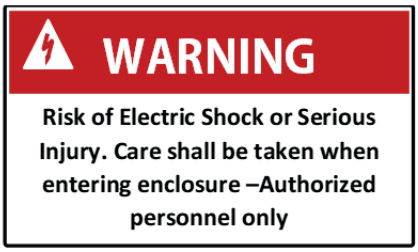


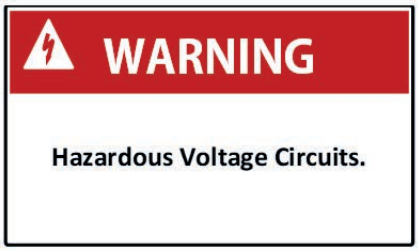
17.6.2. Caution Markings

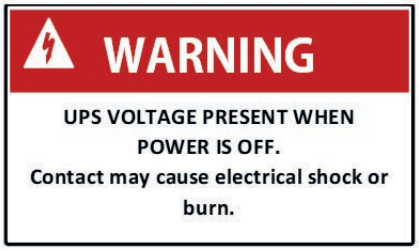




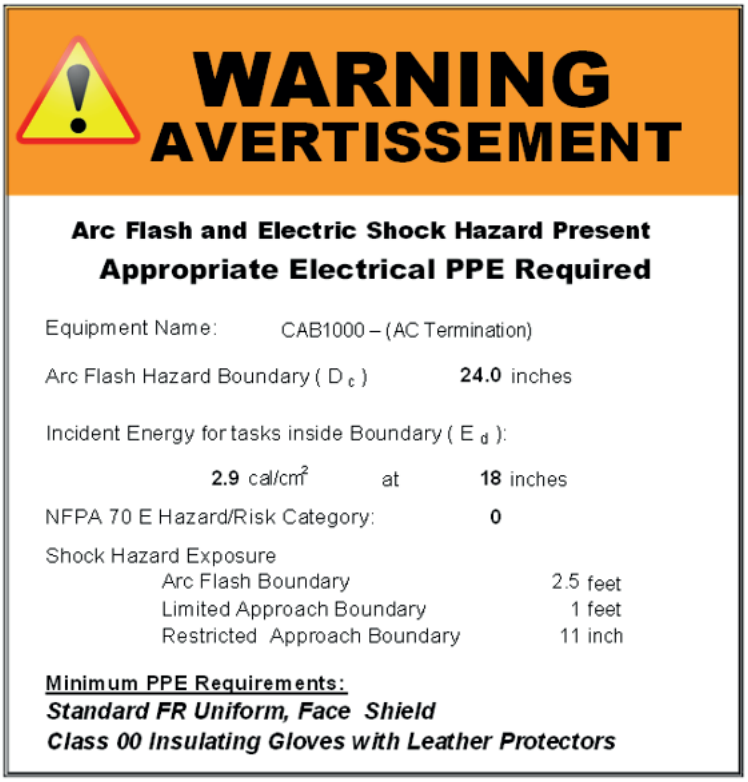
17.6.3. Warning Markings







17.7. Appendix 7 – Arc Flash Labels



WARNING
AVERTISSEMENT

Arc Flash and Electric Shock Hazard Present
Appropriate Electrical PPE Required

Equipment Name: CAB1000 – (AC Termination)

Arc Flash Hazard Boundary (D_c) **24.0** inches

Incident Energy for tasks inside Boundary (E_d):

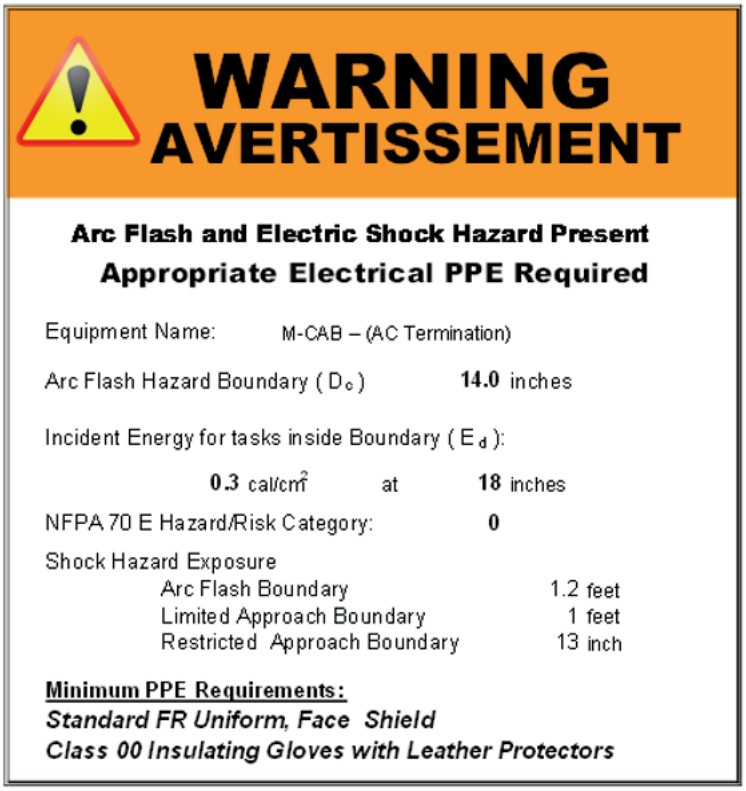
2.9 cal/cm^2 at **18** inches

NFPA 70 E Hazard/Risk Category: **0**

Shock Hazard Exposure

Arc Flash Boundary	2.5 feet
Limited Approach Boundary	1 feet
Restricted Approach Boundary	11 inch

Minimum PPE Requirements:
Standard FR Uniform, Face Shield
Class 00 Insulating Gloves with Leather Protectors



WARNING
AVERTISSEMENT

Arc Flash and Electric Shock Hazard Present
Appropriate Electrical PPE Required

Equipment Name: M-CAB – (AC Termination)

Arc Flash Hazard Boundary (D_c) **14.0** inches

Incident Energy for tasks inside Boundary (E_d):

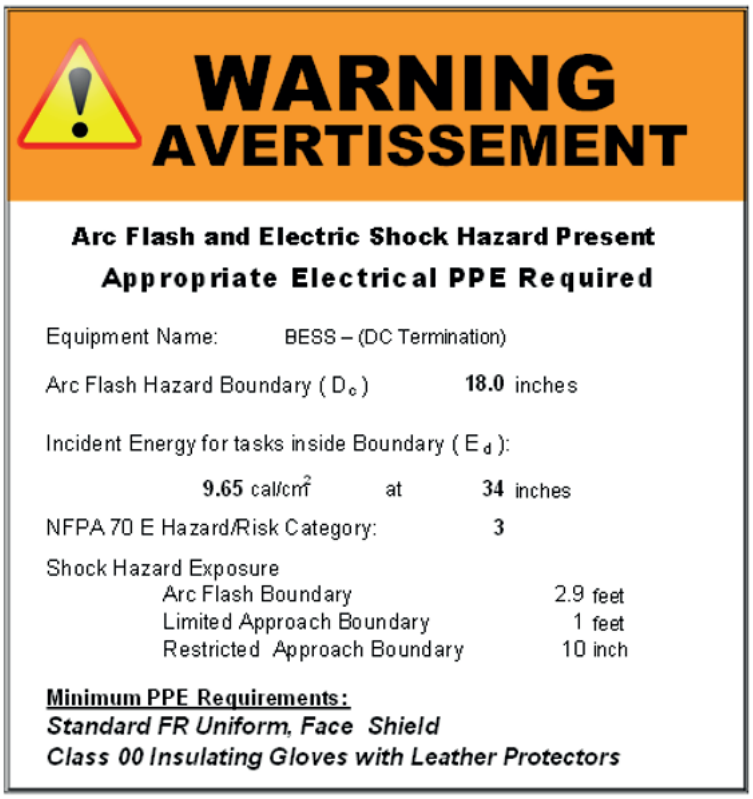
0.3 cal/cm^2 at **18** inches

NFPA 70 E Hazard/Risk Category: **0**

Shock Hazard Exposure

Arc Flash Boundary	1.2 feet
Limited Approach Boundary	1 feet
Restricted Approach Boundary	13 inch

Minimum PPE Requirements:
Standard FR Uniform, Face Shield
Class 00 Insulating Gloves with Leather Protectors


WARNING
AVERTISSEMENT
Arc Flash and Electric Shock Hazard Present
Appropriate Electrical PPE Required
Equipment Name: BESS – (DC Termination)
Arc Flash Hazard Boundary (Dc) 18.0 inches
Incident Energy for tasks inside Boundary (Ed):
9.65 cal/cm2 at 34 inches
NFPA 70 E Hazard/Risk Category: 3
Shock Hazard Exposure
Arc Flash Boundary 2.9 feet
Limited Approach Boundary 1 feet
Restricted Approach Boundary 10 inch
Minimum PPE Requirements:
Standard FR Uniform, Face Shield
Class 00 Insulating Gloves with Leather Protectors

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