

CEGASA

Energy you can trust



E/Bick LV

User Manual

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Control of revisions

VERSION	DESCRIPTION
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1 INTRODUCTION

1.1 PURPOSE

This complete manual provides the description, configuration, operation and maintenance of the energy storage system made up of the following products.

Table 1-1. Glossary.

Term	Definition
Module	LV EBick Module.
Master	Master Box MCS unit.
PDC	PDC distribution and protection cabinets.
Inverter	Hybrid inverter.
Tower	Group of Modules stacked high.
Battery System	Group of Modules connected in series and controlled by a Master Box MCS unit.
EViewer web app	Battery system monitoring platform.
CEGASA Cloud	Cloud platform.

1.2 TARGET

The instructions contained in this document can only be carried out by qualified people with the following skills:

- Knowledge of how Battery Systems work.
- Knowledge of how an inverter works and is operated.
- Knowledge of and compliance with applicable requirements, standards and connection requirements.
- Knowledge of and compliance with this document and associated system documentation, including all safety instructions.
- Training to address the risks associated with the installation and operation of electrical equipment and batteries.
- Training in installation and commissioning of electrical equipment.

If this is not observed, the manufacturer's warranty and/or liability will be null and void unless it can be proven that the damage is not related to failure to comply with this requirement.

1.3 PAGE FORMAT

Each page of this manual has the following information:

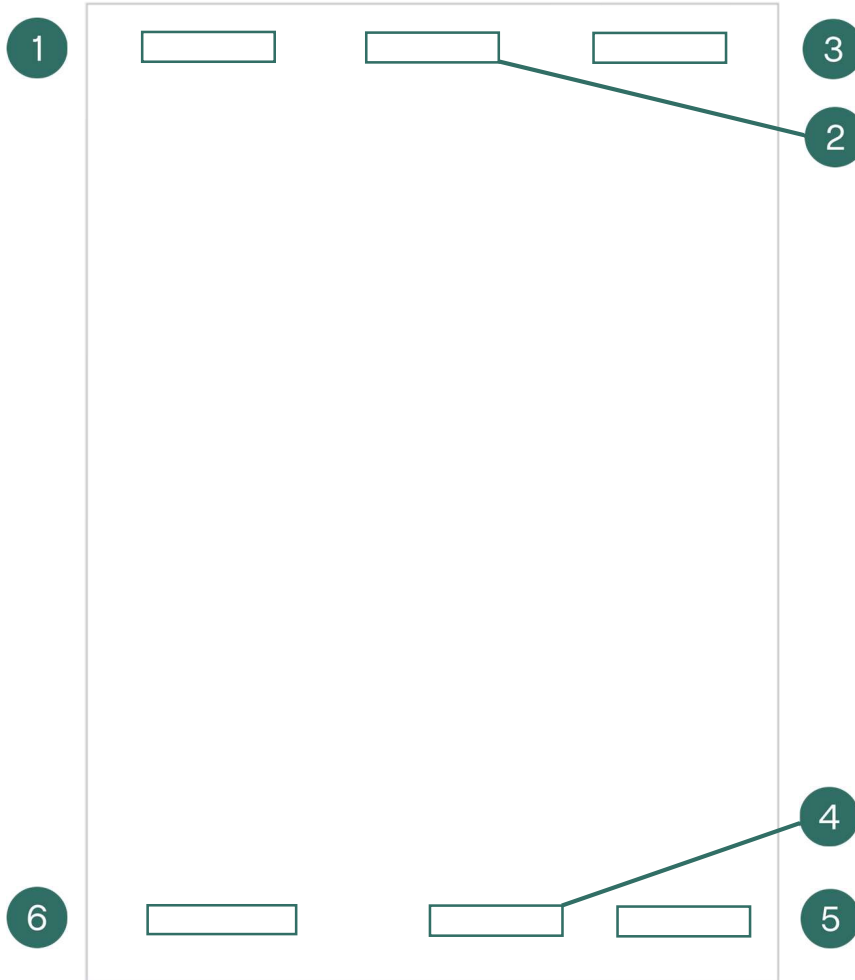


Figure 1-1. Page format.

Table 1-2. Page format.

Item	Description
1	Product name.
2	Manual name.
3	Revision of the manual.
4	Brand slogan.
5	Page number.
6	CEGASA logo.

1.4 SYMBOLS USED

The following information tables are used throughout this manual:

 DANGER!

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

 WARNING!

Indicates a hazardous situation which, if not avoided, may result in death or serious injury.

 CAUTION!

Indicates a hazardous situation which, if not avoided, may result in moderate or minor injuries.

 NOTICE

Information related to conditions, practices or procedures that may pose a risk to machine integrity.

 INFORMATION

Information to bear in mind.

 ENVIRONMENTAL


Information related to conditions, practices or procedures that may pose a risk to the environment.

The following short notes can also be used to replace full-size notes:

 **Danger: Information related to conditions, practices or procedures that pose a risk to individual safety.**

 **Warning: Information related to conditions, practices or procedures that pose a risk to machine integrity.**

 **Caution: Information related to conditions, practices or procedures that pose a risk to machine integrity.**

 **Notice: Information related to conditions, practices or procedures that may pose a risk to machine integrity.**



Information: Information to bear in mind.



Environmental: Information related to conditions, practices or procedures that may pose a risk to the environment.

1.5 ACRONYMS

Table 1-3. Acronyms.

	Meaning
LFP	LiFePo4
BMS	Battery management system
SoC	State of charge
SoH	State of health
SoP	State of power
EMS	Energy Management System
CB	Circuit breaker

1.6 LANGUAGE

The original language of the equipment manufacturer is Spanish. Any other language in which the user manual is written is considered a translation from Spanish to the language used by the end user.

If any section or part of the translated manual is not clearly expressed or is not correctly understood, users have the manual in the original language of the manufacturer supplied together with the translated manual.

1.7 DECLARATION OF CONFORMITY

The Battery System described in this document complies with applicable European directives.

1.8 LIMITATION OF WARRANTIES AND LIABILITY

The limitation of warranties and liability will be described in the contractual agreements between CEGASA ENERGIA SLU and the purchaser (see Annex A1 *Warranty document*”).

The information included in this manual has been written to provide users with the highest degree of detail and clarity on all the content. However, CEGASA ENERGIA SLU reserves the right to modify the content of this manual through future revisions at any time and without prior notice.

This document does not replace nor does it aim to replace any local, state, provincial, federal or national laws, regulations and codes applicable to the installation, electrical safety and use of the Battery System. CEGASA ENERGIA SLU assumes no liability for compliance or non-compliance with such laws or codes in relation to the installation of the Battery System.

1.9 CONFIDENTIALITY

All the information provided by CEGASA ENERGIA SLU by virtue of this manual and any data or aspects that may become known as a result thereof will be absolutely confidential, and may not be provided to third parties or used for any purpose other than that intended, without the prior and express written authorisation of CEGASA ENERGIA SLU, (hereinafter CEGASA).

1.10 MANUFACTURER INFORMATION

Contact CEGASA with any questions or queries at the following address:

Parque Tecnológico de Álava
Marie Curie 1, CP 01510 Miñano, Álava (Spain)
+34 945 228 469
info@cegasa.com
cegasa.com

2 SAFETY



DANGER!

The person responsible for the use of the system must ensure that anyone who operates the Battery System reads, understands and follows everything indicated in this user manual.

The Battery System has been designed and tested in accordance with international safety standards. Nonetheless, to avoid personal injury and property damage and ensure long-term operation of the system, please read this section carefully and follow all recommended safety measures.

2.1 INTENDED USE

The intended use of the Battery System is described below.

- It must only be used as stationary equipment.
- It can operate in on-grid and off-grid mode with exclusively compatible inverters. Consult with CEGASA for the list of compatible inverters.
- It can be connected to the internet via a network cable for monitoring, maintenance and firmware update tasks.
- It is suitable for indoor use, never outdoors.
- Alterations to any of the components that make up the Battery System, for instance, changes or modifications, are not permitted without prior written authorisation from CEGASA. Unauthorised modifications will void the warranty and rights over it. CEGASA will not be responsible for any damage caused by such changes to the equipment.



DANGER!

The Battery System cannot be used for any other purpose than that described in this manual.

2.2 RATING PLATES

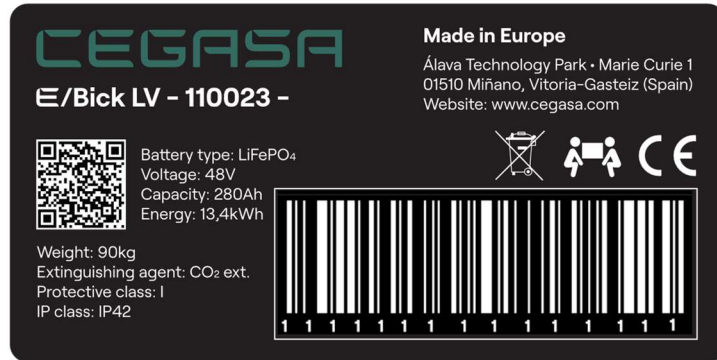


Figure 2-1. LV EBick Module - Rating plate 1.



Figure 2-2. Master Box MCS control unit - Rating plate 1.

2.3 GENERAL INFORMATION

The entire Battery System has a high energy capacity. To minimise the risk of electric shock, short-circuit, explosion and/or fire, follow the relevant procedures and local guidelines, as well as the instructions set out in this manual.

To ensure that the Battery System is safe, all direct connections and terminals must be covered. Systems with visible electrical connections must also be isolated from public access.

Please read, understand and carefully apply the requirements indicated in this section.

2.4 SAFETY INSTRUCTIONS

NOTICE

Failure to follow safety instructions could result in serious injury, death or property damage.

DANGER!

The Modules must always be used with a CEGASA Master unit. Never connect the Modules without this unit.

To avoid high energisation currents, pre-charge the bus. A direct connection could damage the system. This pre-charge is managed from the Modules.

DANGER!

Before connecting the Battery System to the inverter, check that the voltage of the system formed by Modules connected in parallel (48 Vdc) is within the working range of the inverter.

DANGER!

Never open and eliminate, bypass or modify the cutting and protection systems included in the Modules.

DANGER!

Use safety tools (EN 60900) and protective equipment during installation and service to avoid short-circuits and electric shock.

DANGER!

Do not expose the Battery System to room temperatures higher than 50°C. The equipment must not be operational above these temperatures. In fact, even when the equipment is not operational, the exposure of the cells to high temperatures can cause fire and/or explosion.

⚠ DANGER!

Never drop or knock the Modules or the Master unit.

⚠ DANGER!

If using inverters, only use those authorised by CEGASA. Misuse of the Battery System during charging or discharging can cause premature ageing of the equipment or even fire and/or explosion. The communications of both units are complex and must be run by authorised specialised personnel.

⚠ DANGER!

Do not open the covers of the Modules. Do not place or drop conductive objects inside the Module or between its terminals.

⚠ DANGER!

Do not short-circuit the terminals (positive and negative) of the Modules. The short-circuit current can be several thousand amperes, generating a dangerous electrical arc.

⚠ DANGER!

Do not bring into contact or fully or partially submerge the Module in water or any other liquid.

⚠ DANGER!

In case of fire, turn off the circuit breaker (CB) located on the front left of the Modules by removing the cover and pressing the red button with a screwdriver or similar pointed object. Next, press the Transport&Storage Switch on the rear of the Module to the TRIP position (middle down position). Use a CO₂ extinguisher or extinguishing agent recommended by local regulations to extinguish the fire. Do not try to put out the fire with water. The Modules contain flammable materials. Always notify firefighters about the installed Battery System.

**⚠ CAUTION!**

The above steps must be carried out in the order specified.

2.4.1 General

- The area around the Battery System must be kept clear and free of combustible materials, petrol and/or other flammable vapours and liquids.
- Any air inlet or outlet in the room must be clear and free of obstacles.
- There must be no signs of deterioration in any component of the Battery System. Contact CEGASA with any questions.
- Since it is a Battery System, whenever the buttons on the Modules are in the ON position, there will be voltage in the system (40–53 Vdc).
- Do not use the Modules if any of their parts have been totally or partially submerged in water or any other liquid. A water-damaged lithium cell is potentially dangerous. Attempts to use the Module could cause a fire or an explosion. In this case, contact CEGASA for an equipment inspection.
- Do not access the interior of the Master unit or the Modules, or manipulate any internal components.
- Do not use or manipulate the Battery System components if your feet or hands are wet.
- In the event of a fault or incident, cut off the power to the inverter as an initial measure.
- When a Module is not installed in the system, ensure that the circuit breaker (CB) on the front left of the Module is disabled in the TRIP position (middle down position) and that the Transport&Storage Switch on the rear of the Module is in the 'O' (OFF) position. At the same time, the power terminals must be protected with the corresponding caps to avoid accidental contact.
- Ensure that there is no short-circuit between positive and negative terminals at any point in the system.
- Follow the specifications proposed by CEGASA for the power and communications cables of the installation.
- Do not use, manipulate, install or store any of the components of the Battery System in locations with high humidity levels or subject to adverse weather conditions.
- Furthermore, a Battery System should never be installed in locations at an altitude of more than 2000 metres above sea level.

2.4.2 Mechanical

- The floor must be capable of holding the weight of the entire Battery System made up of one or multiple towers. The floor must be in optimal condition.
- Due to the weight of the Modules (>90 kg), they must be installed by several people.
- Do not stack more than 4 Modules per tower. Always stack them on top of their base and feet, which must be fixed to the floor and levelled according to the instructions (see "*LV EBick Installation Manual*").
- Modules may only be stacked without a base if the tower contains ONE or TWO Modules (see "*LV EBick Installation Manual*").
- The Modules may only be stacked on a base with casters and moved if the tower contains ONE or TWO Modules (see "*LV EBick Installation Manual*").
- Brace/fix the tower to the wall at a height according to the instructions (see "*LV EBick Installation Manual*").
- Always connect the Modules to each other (front/rear plates).

2.4.3 Fire prevention measures

- Ensure that a CO₂ extinguisher or extinguishing agent recommended by local regulations is nearby.
- Do not use water to extinguish the fire.
- Full protective clothing and self-contained breathing apparatus are required for firefighters to extinguish the fire.

2.4.4 Anti-electrolyte measures

If the Module loses electrolyte due to a Battery System malfunction, avoid contact with the leaking liquid or gas.

Electrolyte is corrosive and contact can cause skin irritation and chemical burns. In case of exposure to this substance, proceed as follows:

- Inhalation: Evacuate the contaminated area.
- Contact with eyes: Rinse eyes with cold water for 15 minutes.
- Contact with skin: Thoroughly wash the affected area with cold water and soap.
- Ingestion: Induce vomiting.

In any of the above cases, seek immediate medical assistance.

3 DESCRIPTION OF THE SYSTEM

3.1 DESCRIPTION

The LV EBick line is a European-manufactured Battery System for the stationary environment with LFP technology, providing optimum quality, service, safety and cyclability.

The line consists of the following parts:

Parts	Measurements (cm)	Weight (kg)
LV EBick Module	78x41x48	94
Master Box MCS unit	19X18X8	1.2
Base with feet	76x35x9	7
Base with casters	76x35x12.5	8

1. LV EBick Module (48 V–280 Ah; 13.4 kWh)

Designation according to standard (IEC 62620:2014); IFpP73/175/208[1p15s]M/-20+55/90



Figure 3-1. LV EBick Module.

2. Master Box MCS unit

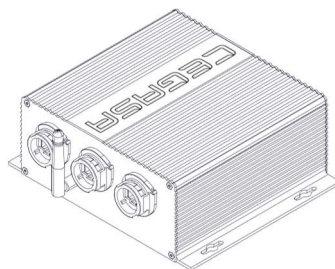


Figure 3-2. Master Box MCS unit.

3. Base with feet

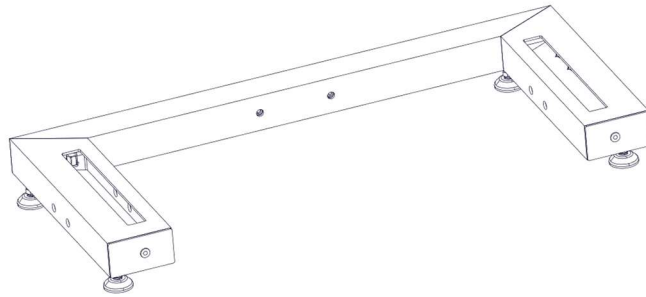


Figure 3-3. Base with feet.

4. Base with casters

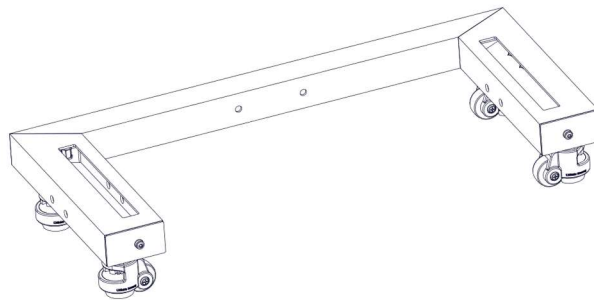


Figure 3-4. Base with casters

3.2 LINE ARCHITECTURE

The LV EBick line is based on two connection levels:

1. Tower:

Up to a maximum of 4 Modules can be stacked in a tower (always on the corresponding base, see “LV EBick Installation Manual”). The tower is not operational or functional without the corresponding Master unit.

NOTICE

Towers may not be directly connected to each other in parallel under any circumstances.

NOTICE

The current flowing through each tower must not exceed 350 A under any circumstances. If the tower is only made up of one Module, the maximum current is 175 A.

2. System:

This is a set of Modules (between 1 and 20 Modules) installed in different towers and controlled by a Master Box MCS control unit. This unit also provides the connectivity required for communication with CEGASA’s inverters and monitoring platforms.

Up to a maximum of 10 inputs can be connected in parallel through an electrical cabinet (CEGASA has its own PDC references, please enquire if required).

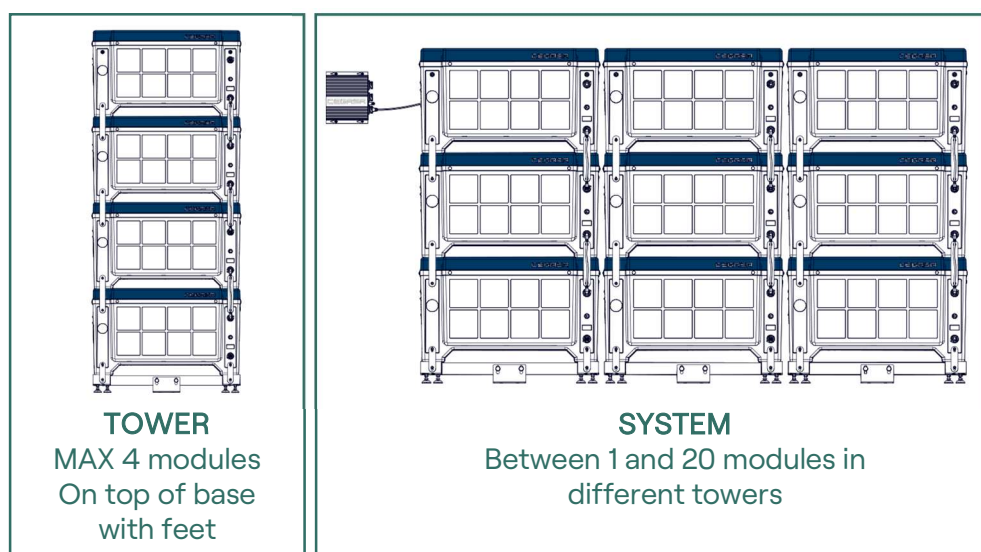


Figure 3-5. Architecture of the line.

3.3 MAIN FEATURES

- Modular design, a System can be made up of 1 to 20 Modules, connected in parallel and controlled by a Master.
- Communications connections are made on the front, while power connections are made on the rear (close to the wall) with quick and safe connectors (without the need for tools).
- Compatible with the most relevant 48 Vdc inverters (single-phase and three-phase) on the market. Communications (CAN Bus and Modbus)
- Automatic recognition of Modules in the installation by the Master unit.
- Start and stop with ON/OFF button on the front, which has a controlled DC bus pre-charging system in each of the Modules.
- Circuit breaker (CB) on the front, which provides the System with short-circuit protection and also makes it possible to cut off the two poles (positive and negative) in the event of overcurrent (automatically) or maintenance work (manually).
- General protections for overcurrent, voltages, temperatures...
- Simple system designed to facilitate the disassembly and repair of electronic components.
- Wi-Fi module to facilitate local communications with its own application for configuration, management, data analysis, etc.
- Remote diagnosis with the EViewer web app developed by CEGASA.

3.4 CONTROL ARCHITECTURE

CEGASA's LV EBick line offers a modular and scalable system that adapts to the power and energy needs required by the end application.

For this, the System has a two-level control architecture: Module (BMS) and System (Master MCS).

Below are some generic, representative examples of systems with the components detailed in the installation manual.

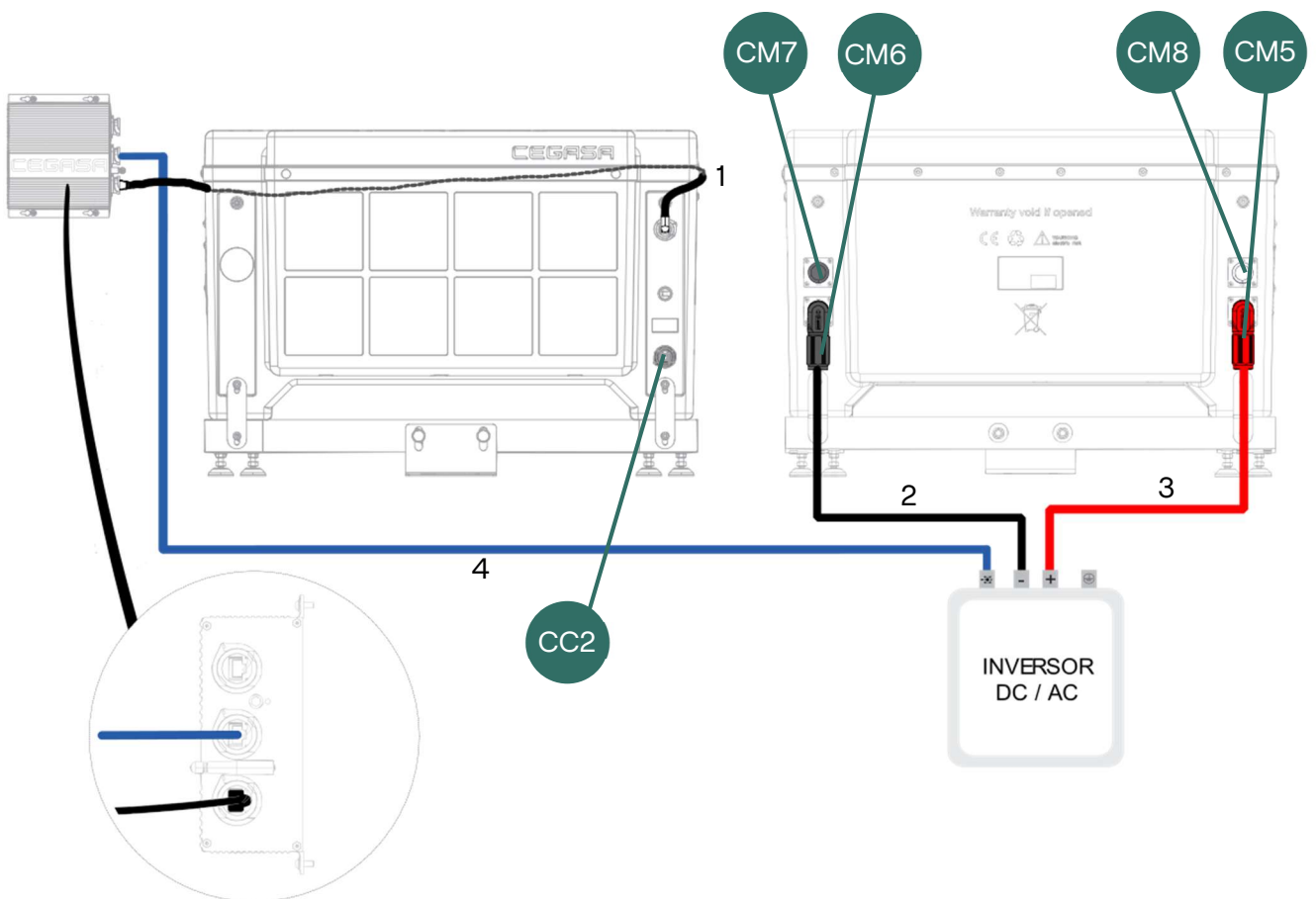


Figure 3-6. Connections of systems with a single Module.

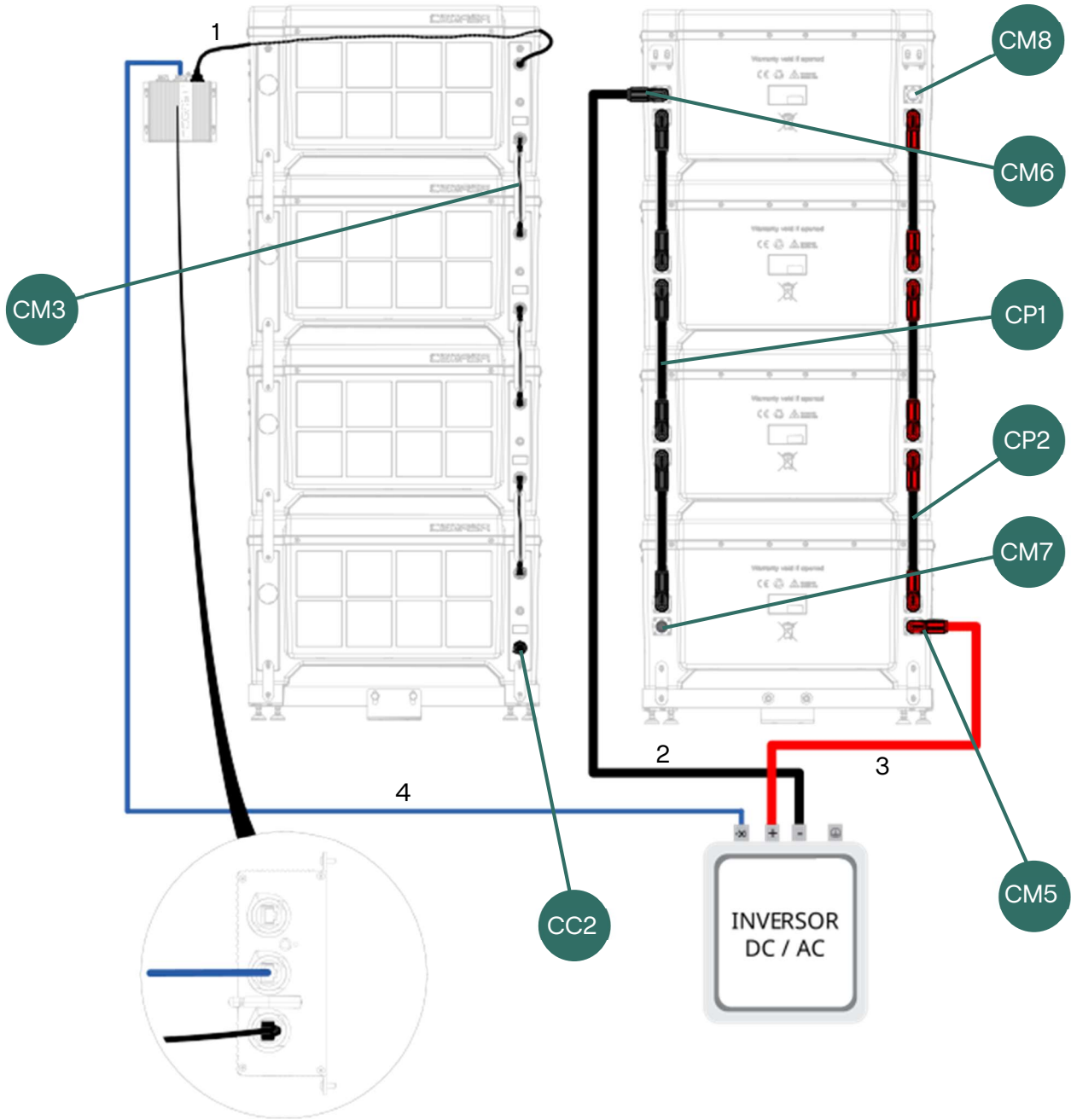


Figure 3-7. Connections of systems with 2, 3 or 4 Modules/tower;
Sized for **ENERGY** solutions (A single +/- output for each tower).

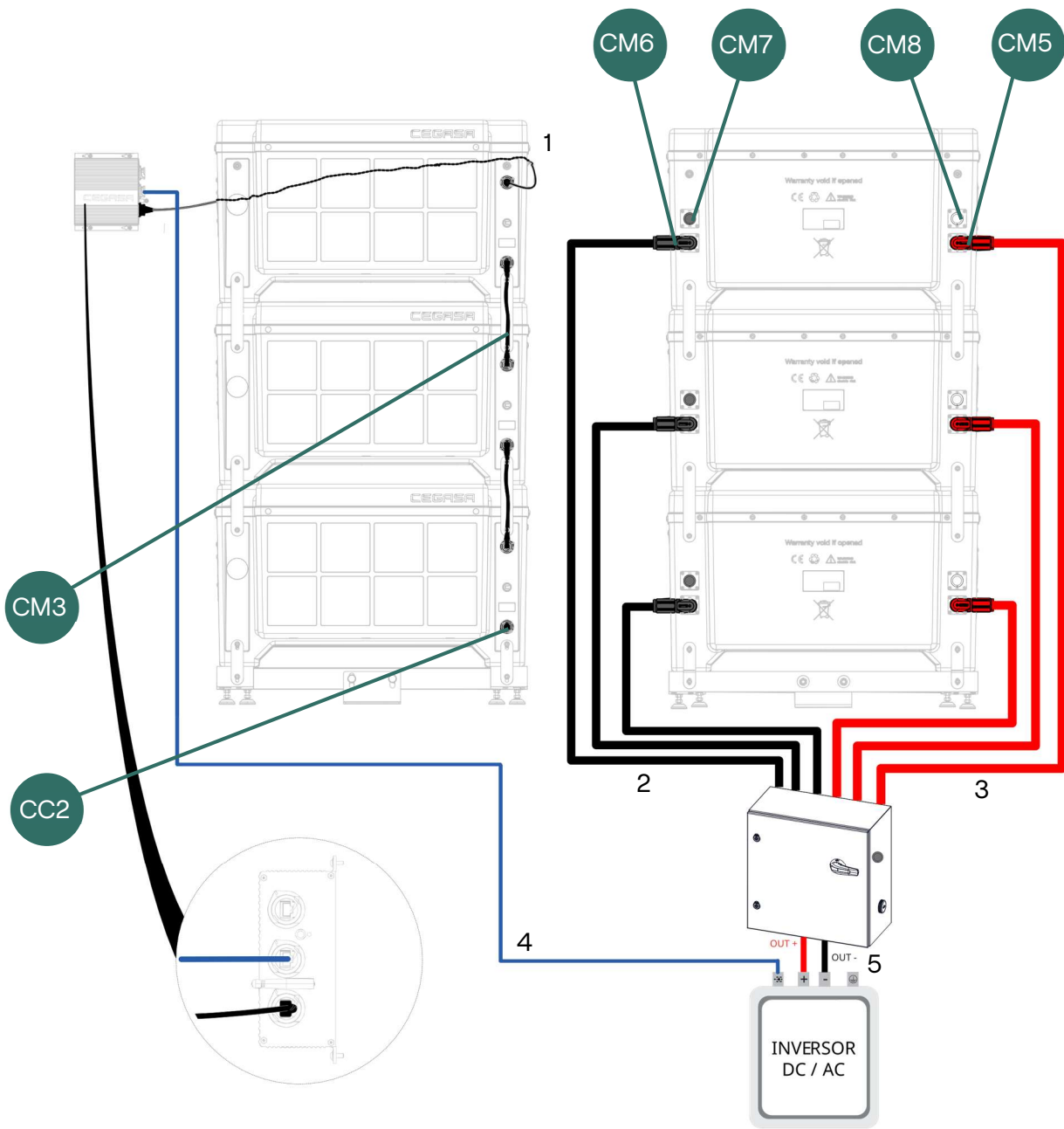


Figure 3-8. Connections of systems with 3 modules/tower;
Sized for **POWER** solutions. (Several +/- outputs for each tower).

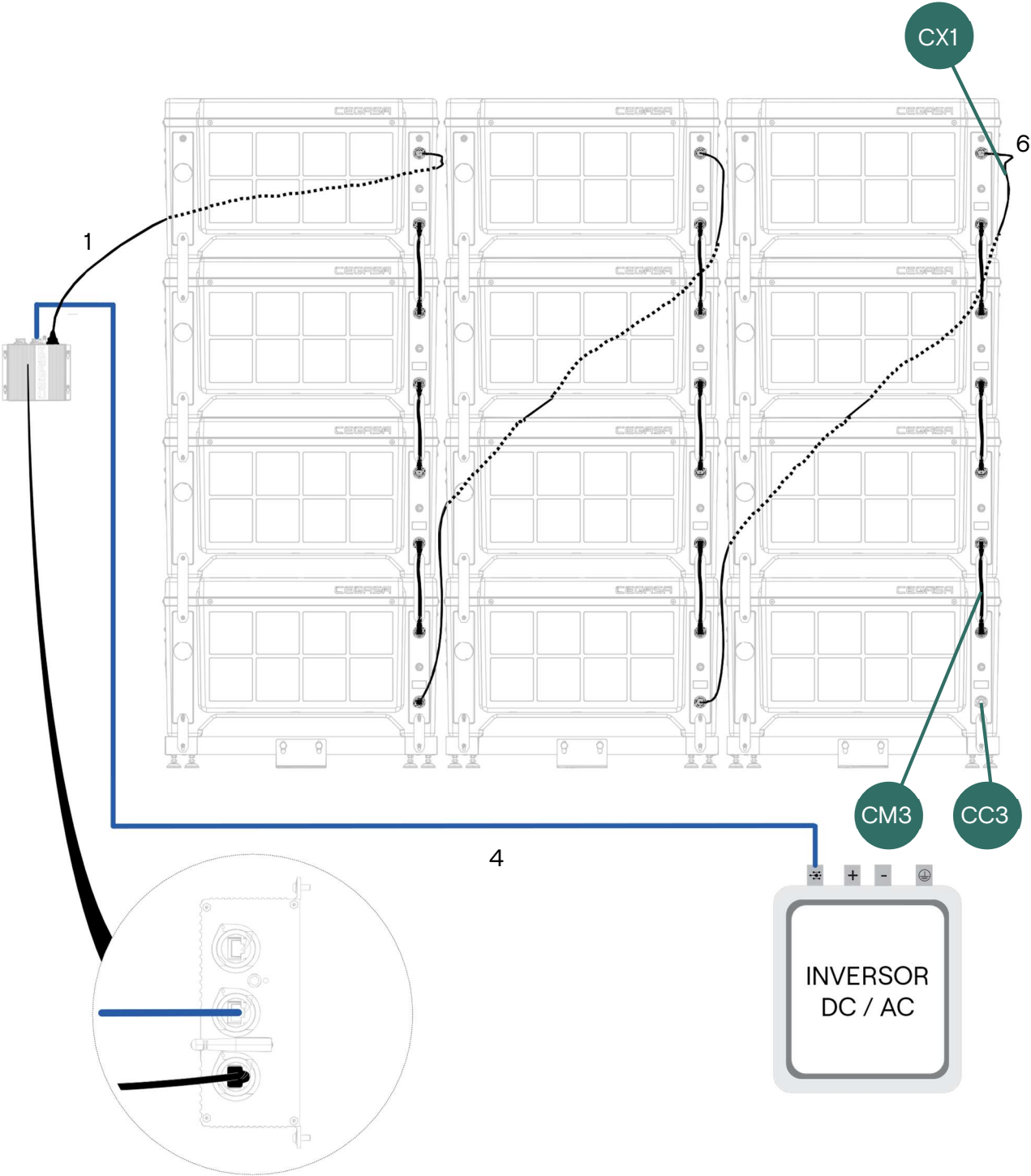


Figure 3-9. Example of communications connections for 3 towers with 4 Modules.

Table 3-1. Connection cables.

Item	Type of cable	Features
1	COMMS cable to Master BOX MCS	Cat5e UTP network cable (PARALLEL)
2	Inverter negative cable	120 mm ² 60 Vdc power cable
3	Inverter positive cable	120 mm ² 60 Vdc power cable
4	COMMS cable from Master BOX MCS to inverter	See specifications in the manual of the selected inverter
5	Positive and negative cables to Inverter	Depends on the project (single-phase, three- phase, No. of inputs on the inverters, etc.)
6	COMMS cable between towers	Cat5e UTP network cable (PARALLEL)
CC2	Termination resistor	-
CM3	External CB RJ45	-
CM5	Positive female module connector	-
CM6	Negative female module connector	-
CM7	Negative connector cap	-
CM8	Positive connector cap	-
CP1	Negative parallel cable	-
CP2	Positive parallel cable	-

3.4.1 BMS – Module

At this level, the unit voltages of each cell and their temperatures at various points are recorded and sent via a CAN Bus communication bus to the next higher control level (Master BOX MCS control unit).

At this level, each BMS unit in the Module is equipped with protection systems to open the circuit during charging or discharging processes if any problems arise (voltage, temperature, overcurrent, etc.).

For additional safety redundancy in the Module, the BMS commands the front internal circuit breaker (CB), which makes it possible to cut off both poles (+/-) in the event of overcurrent problems or short-circuits. In such cases, the circuit breaker must be reset manually.

3.4.2 Master Box MCS – Battery System

The second level in the control architecture is the Master Box MCS unit. Electronics that enable System connectivity and allow communication between the inverter, CEGASA Cloud, EViewer platform and EMS.

The Master unit has two communication protocols to communicate with different inverters and EMS: CAN Bus and Modbus TCP/IP.

Connection with the CEGASA Cloud and the EViewer web app can be made by both using the ETHERNET port (cable) and wirelessly via Wi-Fi connectivity.

In addition to providing the corresponding external connectivity, in these parallel Module Systems the Master unit manages the different Modules, using the CAN bus to connect to them.

3.5 INTERFACE – LV EBICK

3.5.1 LV EBick front face

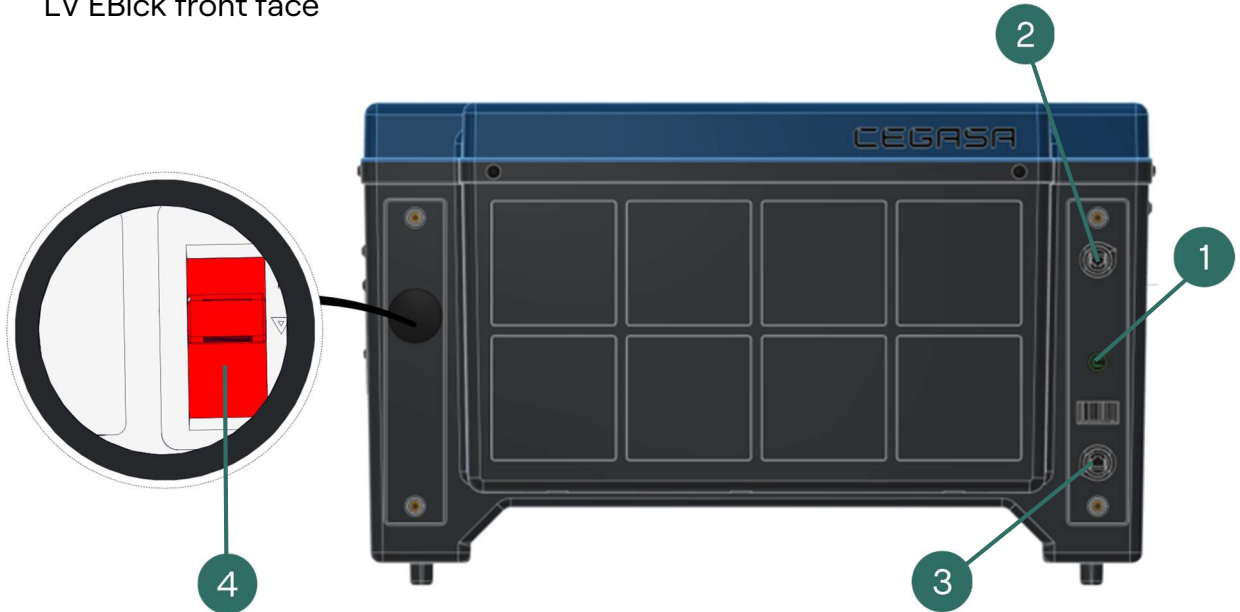


Figure 3-10. LV EBick front face.

3.5.2 LV EBick rear face

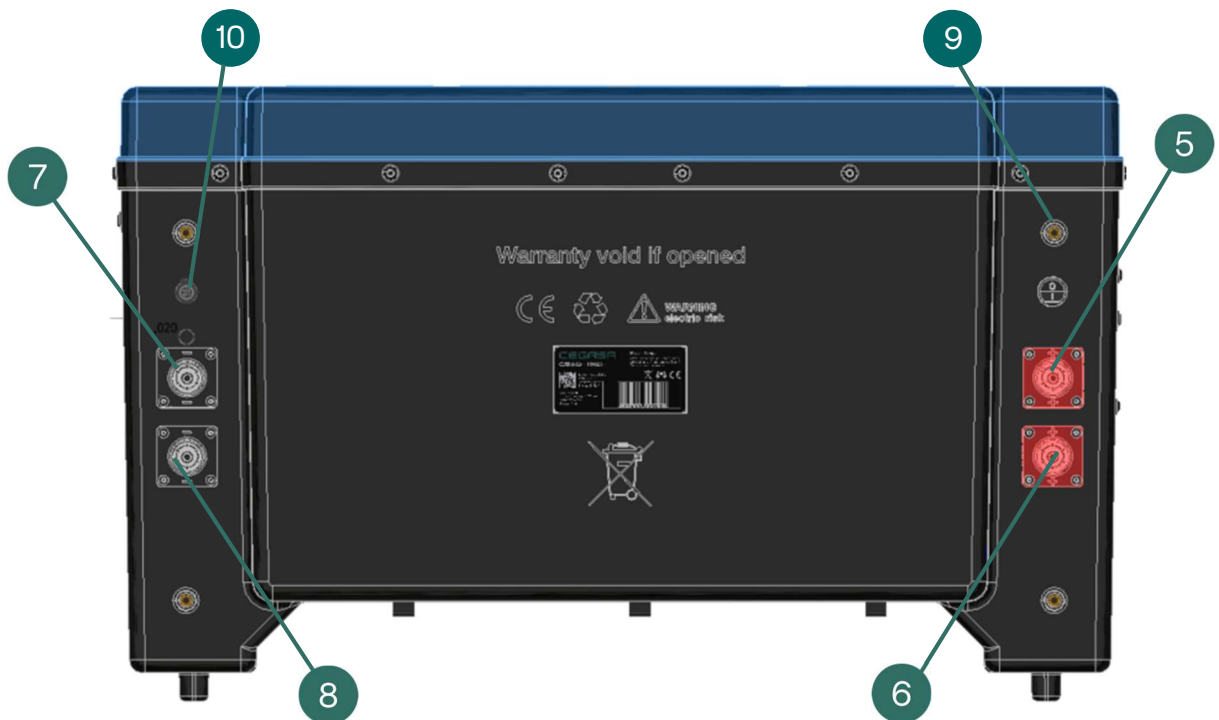


Figure 3-10. LV EBick rear face.

Table 3-2. Front and rear interface.

Item	Name	Description
1	Start/stop button	Button to start up, switch on (including the pre-charging process) or turn off the Module. It includes a two-colour (red/green) LED to indicate the Module status.
2	CAN Bus (Out)	CAN Bus output connector.
3	CAN Bus (In)	CAN Bus input connector.
4	Circuit breaker (CB)	Thermal magnetic circuit breaker. To connect/disconnect the Module for long shutdowns. It adds short-circuit and extreme overdischarge protection.
5	OUT+	Positive-pole power output connection.
6	IN+	Positive-pole power input connection.
7	OUT-	Negative-pole power output connection.
8	IN-	Negative-pole power input connection.
9	Switch	Transport&Storage switch.
10	2P connector	Test point (Battery Voltage) and recovery charge.

3.6 INTERFACE – MASTER BOX MCS

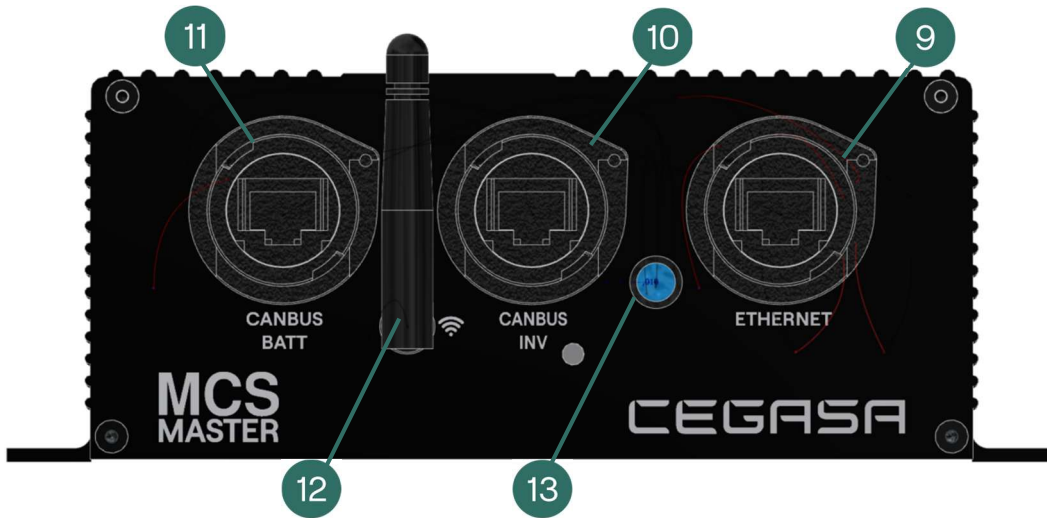


Figure 3-11. Master Box MCS front face.

Table 3-3. Master unit interface.

Item	Name	Description
9	ETHERNET	Ethernet and Modbus TCP/IP connector.
10	CANBUS INVERTER	CAN Bus connector to connect to the inverter.
11	CAN Bus Module	CAN Bus connector to connect the Modules.
12	ANTENNA	MCS Wi-Fi connection antenna
13	Mode LED	LED indicating the operating mode of the Master.

3.7 DISTRIBUTION AND PROTECTION CABINETS (PDC)

CEGASA has three models of electrical cabinets to be able to connect and protect up to 10 200 A inputs each. The design of these cabinets and all their components comply with the applicable safety regulations for energy storage systems.

All cabinets have fast-acting fuses (*gBat*) that are specifically for Battery Systems, with the ability to automatically cut off the current flow of both poles (positive and negative) of each of the inputs to protect against overcurrent and short-circuit.

The fuses are placed in quick connection and disconnection fuse holders (always under no-load condition, ensuring that there is no current flowing through any of the inputs). Contact CEGASA if you require any spare parts for these fuses.

A manual isolation device is also included in the cabinet door to isolate (under no-load condition) the entire Battery System so that disconnections can be carried out for maintenance tasks in the final installation.

These are metal cabinets with an IP55 protection rating to be placed and fixed on the floor, with cable entry at the bottom (socket always included).

CAUTION!

Before disconnecting the System using the indicated protection elements, make sure that the Battery System is turned off (see point 6.2 “*System Shutdown*”).

Customers can use the EViewer platform to check if the Battery System is connected and each of the Modules is being charged/discharged correctly.

If any of the Modules does not reach this state, see chapter 8 “*Troubleshooting*”.

System shutdown

The references of the PDC cabinets for the LV EBick line are as follows:

3.7.1 110039 PDC LV EBick 600 A 3E

- For Battery Systems composed of several towers, each connected individually in parallel (max. 600 A).
- Measurements 1000x900x300 mm.
- Weight: 265 kg

3.7.2 110040 PDC LV EBick 1000 A 5E

- For Battery Systems composed of several towers, each connected individually in parallel (max. 1000 A).
- Measurements 800x1300x400 mm.
- Weight: 320 kg

3.7.3 110041 PDC LV EBick 2000 A 10E

- For Battery Systems composed of several towers, each connected individually in parallel (max. 2000 A).
- Measurements 800x1300x400 mm.
- Weight: 396 kg

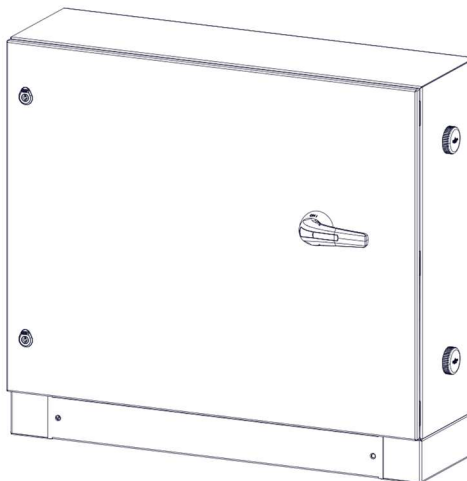


Figure 3-12. PDC Cabinet.

INFORMATION

Please contact CEGASA if you require more technical information.

4 PROCESSES AND MODES OF OPERATION

4.1 STATE MACHINE DESCRIPTION

The Battery System has different ways to show the state it is in at all times. Users will be able to connect to the system through the EViewer web app where they will find detailed information about it. The Module also integrates light indicators with different codes detailed below.

4.1.1 Working state

The Battery System passes through different states depending on the work mode. The light indicator on the start/stop button modifies its emission code depending on the state of the Module.

Each of the possible states is described below.

INFORMATION









The LED flashes slowly.



The LED flashes quickly.

Table 4-1. State

LED button	State	Description
	Start-up	Power up the Module by first pressing the Transport&Storage switch in the 'I' (ON) position and then enabling the circuit breaker (CB) on the front left (up position). The Module will go into Start-up state while initialising (several seconds). Once started and enabled by the Master, the System shifts to the next state, Ready .
	Ready	From the Ready state, users can close the BMS contactor by pressing the start/stop button for 5 seconds and shifting to the Connecting state.
	Connecting	Contactor closure is executed by performing a pre-charge to protect the BMS contactor and the inverter, an action that is carried out automatically in this state. Once the pre-charging process is completed, the System will automatically shift to the Run state. This process can take several seconds depending on the inverter.
	Run	Once in the Run state, the BMS contactor will be closed and therefore current will be able to flow through the Module. (*)




LED button	State	Description
	Shutdown	The Battery System should preferably be switched off from the Ready state. To shift to this Ready state, press the Module's start/stop button for 5 seconds. From this state you can definitively turn off the Module by disabling the circuit breaker (CB) on the front left in the TRIP position (middle down position).
<div style="background-color: #0070c0; color: white; padding: 5px; display: flex; align-items: center;">  NOTICE </div> <p>If it is to be transported or stored for a long period of time (more than 2 weeks), the Transport&Storage Switch on the rear of the Module must be left in the 'O' (OFF) position.</p>		

() If the Module cannot reach this state, see chapter 8 "Troubleshooting".*

4.1.2 States of protection

The Modules also have three protection levels: **Caution**, **Warning** and **Alarm**.

Table 4-2. States of protection.




LED button	State	Description
	Caution	The first protection level is Caution . In this state, the Master limits the corresponding current setpoint to 0 (Charge and/or Discharge) depending on the event. (*)
	Warning	If the Battery System exceeds any Warning level, the BMS of the corresponding Module will shift to the Ready state of operation and the contactor will open to protect the Module. (**)
	Alarm	Finally, at the Alarm level, the BMS of the corresponding Module shifts to the alarm state and the affected BMS will need to be reset manually via the circuit breaker (CB) on the front left. Check the cause of entry into this alarm state with the help of the EViewer web app.

() If the event conditions are restored, the BMS will perform up to 6 automatic resets for 1 hour in case of **Caution**. If the problem persists, the Module's BMS will shift to the alarm state.*

*(**) If the event conditions are restored, the BMS will perform up to 3 automatic resets for 1 hour in case of **Warning**. If the problem persists, the BMS will shift to the alarm state.*

4.1.3 Master Box MCS operating modes

Table 4-3. Operating modes.

Mode LED	Operating modes	Description
	Start-up	If the System has not been configured, the Master Box MCS blue mode LED will flash slowly.
	Disabled	If the System has been configured correctly, the blue mode LED will remain on.
	Enabled	If the Master Box MCS is turned off, the LED will also be off.

4.2 EQUALISATION

Each of the Modules that make up the Battery System is equipped with a passive equalisation system with the objective of balancing the state of capacity of the cells of each Module.

5 SYSTEM CONFIGURATION AND START-UP

NOTICE

The installation work has been completed in accordance with the LV EBick Installation Manual.

5.1 EVIEWER CONNECTION

The Battery System has a web app called EViewer that helps the user and/or installer to configure, monitor and update the equipment. This app runs on any web browser and therefore can be used with any device that has a browser installed, such as a smartphone, laptop or tablet.

To run the EViewer web app, the first step is to turn on the Battery System to power the Master unit and achieve connectivity.

5.2 POWERING THE SYSTEM

The steps to follow to power the Master unit and achieve connectivity are described below.

INFORMATION

Check the configuration of the Master unit, see chapter 6 of the LV EBick Installation Manual called *"Configuration of the Master BOX MCS unit"*.

INFORMATION

Check the Battery System's power and communications connections.

NOTICE

Do not connect the Battery System to the inverter until configuration is completed.

1. BMS Power-Up Procedure for Modules Connected in Parallel.

To ensure proper power supply to all Battery Management System (BMS) units in the modules connected in parallel within the system, the following procedure must be carried out **for each individual module**, strictly adhering to the sequence outlined below:

- a) At the rear of the module, set the Transport & Storage Switch to the "I" (ON) position. This action will activate the module's LED indicator, which will illuminate in amber color, indicating that the system is powered.
- b) Next, at the front of the module, remove the protective cover of the circuit breaker (CB) and **engage** it (switch to the upward/ON position) using a flathead screwdriver.

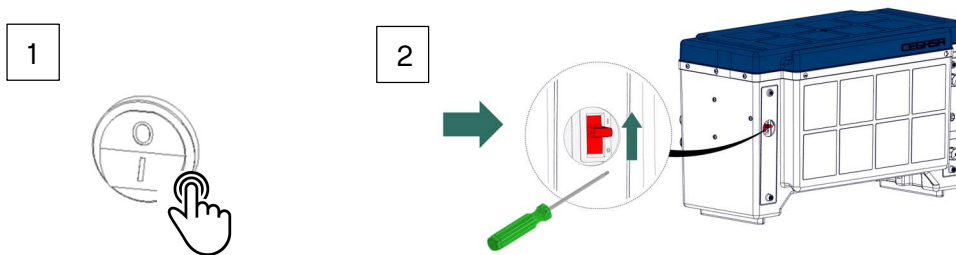


Figure 5-1. "Engage the switch and set the circuit breaker (CB) to the ON position.

⚠ CAUTION!

The above steps must be carried out in the order specified.

i NOTICE

To enable the circuit breaker, the two steps shown below must be followed. Firstly, put the circuit breaker down into the 'O' position (A) and then put it up into the 'I' position (B).

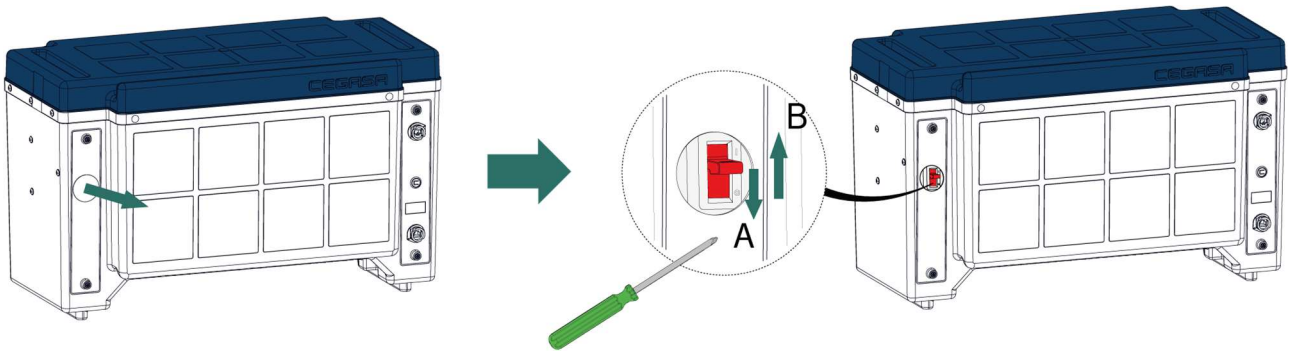
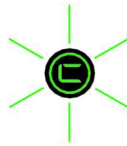


Figure 5-2. Connect the circuit breakers (CB).

Check that the LED (slow flashing green) of all the buttons on the front of the Modules light up. This process can take several seconds.

**i** NOTICE

DO NOT PRESS the front buttons until the final System configuration is complete.

2. Connect the system via the EViewer platform for configuration.

a) Connection via Ethernet cable. (*Recommended for laptops*)

- Connect an Ethernet cable between the laptop and the ETHERNET port on the Master unit. A Cat5e or higher parallel network cable is recommended.

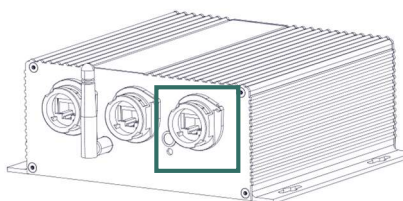


Figure 5-3. Master Box MCS unit.

- Configure the IP of the device connected to the Master to adjust the IP range to the 192.168.55.XXX network (when in doubt, see Annex 5 “*IP configuration of PC devices*”).
- Open a web browser on the device and enter the following IP address: <http://192.168.55.180>.

b) Wi-Fi connection. (*Recommended for mobile devices*)

- Open the Wi-Fi network configurator on the terminal.
- Find the Wi-Fi network called “MCS_XXXXXX” (Where XXXXX corresponds to the serial number of the Master) and connect using the following password: Cegasa24
- Open a web browser on the device and enter the following IP address: <http://10.0.0.1>

INFORMATION

If you are using a mobile device, disconnecting the mobile data connection is recommended.

Wi-Fi connection only available for mobile devices that use the Android operating system.

INFORMATION

From this point, continue with the system configuration as explained in **Annex A4 System configuration with the EViewer** web app *EViewer*”.

In case of connection problems, see Chapter 8, Troubleshooting.

6 SYSTEM OPERATION

Once the Battery System is powered, configured and connected to an inverter, users can charge or discharge the System through the inverter.

INFORMATION

Fully charging the system at the start to calibrate the system's SoC value is recommended.

6.1 SYSTEM START-UP

When the system has been configured in the EViewer platform, the Modules' buttons will be lit in the **Ready** state (slowly flashing green) waiting to be initiated.

To start up the Battery System, press the front start/stop button of one of the Modules for 5 seconds. This initiates the DC bus pre-charging process to prevent any damage to the Modules' safety components. In this process, the System passes through the **Connecting** state (green LED flashing quickly).

Once the pre-charging process is completed, the System enters the **Run** state and the Modules can receive or deliver current from the inverter if it demands it.

In this **Run** state the LED of the button on all Modules remains in a **fixed green state**.

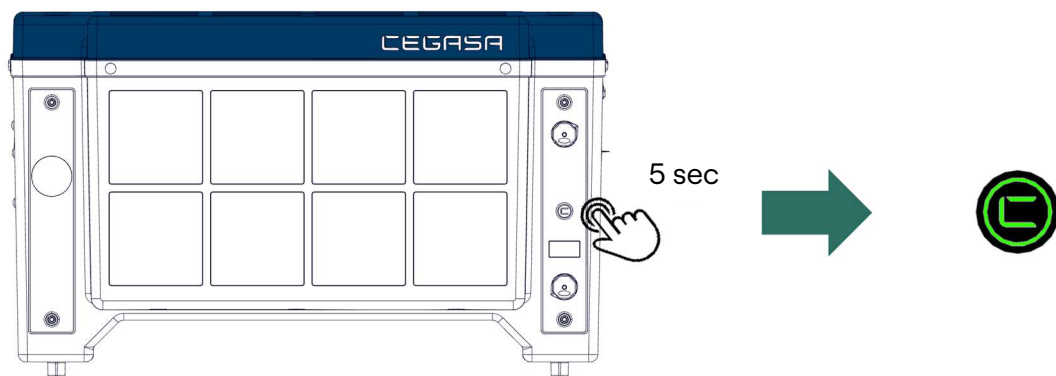


Figure 6-1. System start-up.

Customers can use the EViewer platform to check if the Battery System is connected and each of the Modules is being charged/discharged correctly.

If any of the Modules does not reach this state, see chapter 8 *"Troubleshooting"*.

6.2 SYSTEM SHUTDOWN

To shut down the Battery System, users must first ensure that no charging or discharging current is circulating through the Modules. This can be checked using the EViewer Platform, viewing the current passing through the System and its state.

Once the circulating current has stopped, press the start/stop button (5 seconds) on any of the Modules until all the contactors open. This will cause each of the Modules comprising the system to go from the **Run** state to the **Ready** state.

In this **Run** state the LED of the button on all Modules remains in a slow **flashing green state**. If any of the Modules does not reach this state, see chapter 8 "Troubleshooting".

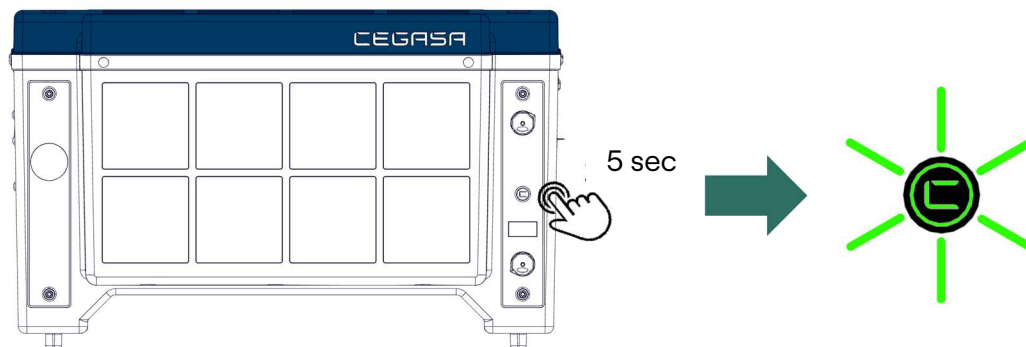


Figure 6-2. System shutdown.

Once in this state, the Battery System can be turned off by disabling the circuit breaker (CB) in the TRIP position (middle down position) and then pressing the Transport&Storage Switch in the 'O' (OFF) position of each of the Modules that make up the System.



Figure 6-3. Disconnect the circuit breakers (CB) and leave the switch in the 'O' (OFF) position.

⚠ CAUTION!

The above steps must be carried out in the order specified.

i NOTICE

Remember to disable the circuit breakers (CB) by putting all the Modules in the TRIP position (middle down position) and leave the Transport&Storage Switch in the 'O' (OFF) position if the Battery System is not going to receive any charge for a period of time longer than two weeks, since the internal consumption of the electronics could consume the energy of the System.

6.3 RECOMMENDATIONS FOR USE (CHARGING AND DISCHARGING)

The Master adjusts the voltage and current setpoints depending on the working point and the state of each of the Modules.

Table 6-1. Recommendations for use.

Working point	Recommendations for use
Charging	The Battery System must be charged respecting the limits specified in the technical information.
	The Master will reduce the current limit by regulation both in the final charge and in case of temperatures exceeding 45°C or temperatures lower than 20°C in the cell.
Discharging	As with charging, the Battery System must be discharged respecting the limits specified in the technical information.
	The Master will gradually reduce this limit in the event of temperatures above 50°C or below 10°C in the cell.
	It must be taken into account that inverters in off-grid Systems do not respect the discharge setpoint limits sent by the Master and operations may be affected if the final application is not correctly sized.

If these usage recommendations are not followed, the Master has event recording tools to ensure fulfilment of the warranty. See Annex A1 *“Warranty document”*.

To guarantee the cyclability of the Modules, deep discharges to the System (>80% DoD) are not recommended.

INFORMATION

If you require more technical information, please contact CEGASA.

7 SYSTEM SCALABILITY

This chapter describes the steps to take to increase the number of Modules connected in parallel in the Battery System in order to increase the useful capacity.

To do this, the following checks must first be carried out:

- Ensure that the SoH of the old System is not less than 75%. A system interconnection with disparate SoH can cause an imbalance in the circulation of charge or discharge currents and therefore loss of capacity of the entire System since the SoH is related to the internal resistance of the Battery System.
- Ensure that the maximum number of parallels CEGASA recommends for its System is not exceeded.
- Study the connection of the new Modules in parallel. A bad, unbalanced connection can cause unwanted current circulation between parallels and therefore generate significant imbalances in the Modules.
- Ensure there is sufficient space to allow the minimum distance between Modules as recommended by CEGASA.
- Bring the current installed System to a 100% SoC and then lower it to 65% (+/-2%) since the new Battery Systems received will be in said SoC. When installing Modules with different SoC, imbalances can be generated in the currents and in the System's SoC.
- Shut down the inverters connected to the Battery System. If there is a PDC cabinet, switch the isolation device lever to the OFF position to isolate the Battery System.
- Shut down the Battery System (See Point 6.2 "*System shutdown*").

Once these checks have been completed, users can expand the System. After installing and reconnecting the power and communications of the new Modules in parallel following the steps described in the LV EBick installation manual, users must reconfigure the System using the EViewer platform.

To do this, follow the steps below:

1. If necessary, connect the new Modules to the PDC cabinet (with the isolation device lever still in the OFF position).
2. Access the Transport&Storage Switch and press it to the 'I' (ON) position. Next, remove the cover on the front left of the Module to access the circuit breaker (CB) and reset it (up position) by using a screwdriver to lever against the bottom of the opening. Perform this operation on all Modules.

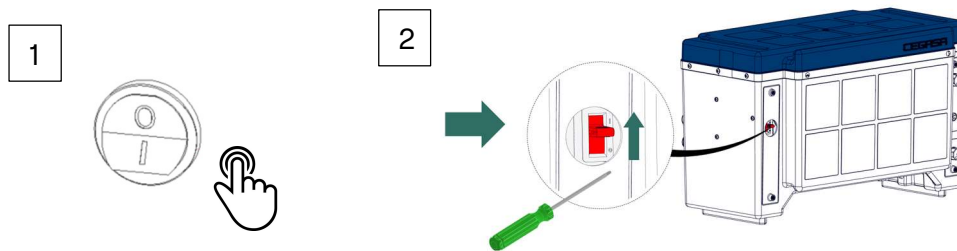


Figure 7-1. Press the Switch and reset the circuit breaker.

⚠ CAUTION!

The above steps must be carried out in the order specified.

3. Put the covers back on all the Modules.
4. Reconfigure the System (See Point 5 "*System Configuration*").
5. Start the System back up (See Point 6.1 "*System Start-up*").
6. In the EViewer web app, check that the Master unit communicates with all Modules connected to the System.
7. If the installation includes a PDC cabinet, put the isolation device lever in the ON position.
8. Switch on the inverters connected to the Battery System and check communications between the Master unit and the inverters on the viewing platform.
9. Confirm that the System is operating correctly (charging/discharging) by checking the communications and currents of the new Modules that have been connected.
10. The Master unit will automatically update the new Battery System's SoH.

8 TROUBLESHOOTING

If due to any problem the System is in an alarm state, it issues the following notices.

- The start/stop button LED, located on the right side of the Module, emits a solid red light.
- The Master unit sends the alarm to the inverter via communications and it can therefore be viewed on the inverter's monitoring platform.
- The alarm can also be viewed using the EViewer web app (see Annex A4 System *configuration with the EViewer web app*”).
- The event is recorded in the Master's log files.

NOTICE

If you are not able to start the System and check the error, please contact CEGASA after-sales.

Possible failures that may occur in the Battery System are described below.

Table 8-1. List of failures.

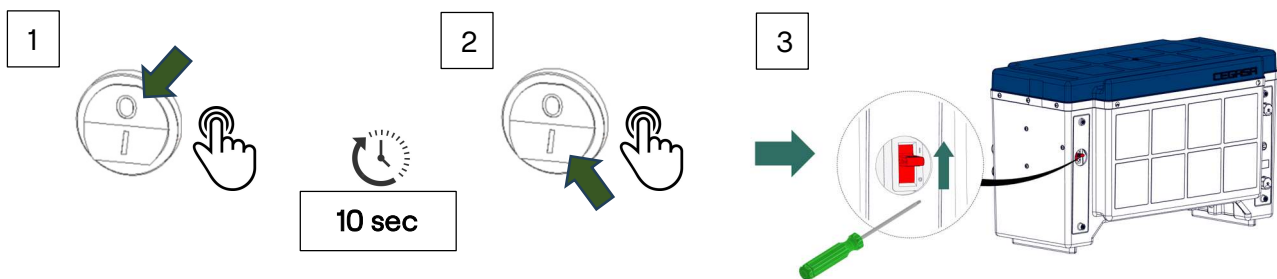
Code	Error	Description	Solution
324	Connection error in BMS	Problem in pre-charge or BMS contactors	1. Contact CEGASA after-sales service
313	Failure in BMS	BMS internal problem	2. Contact CEGASA after-sales service
321	BMS communications error	Master does not communicate with one or several BMS	3. Check the wiring between the Master and the Modules 4. Check correct configuration of number of Modules in the EViewer web app 5. Contact CEGASA after-sales service

443	Inverter communication error	Master is not communicating with inverter	<ol style="list-style-type: none"> 6. Check communications wiring between inverter and Master 7. Check pinout configuration in Master is correct 8. Check that the inverter has been configured correctly in the EViewer web app 9. Contact CEGASA after-sales service
-	Button LED off	The Module is not on or the LED has failed.	<ol style="list-style-type: none"> 10. Check the circuit breaker (CB) is enabled (up position) 11. Check that the voltage is correct at the Module terminals. Use a multimeter 12. Contact CEGASA after-sales service
-	Current sensor failure	A Module is not measuring current.	<ol style="list-style-type: none"> 13. Check current using a current clamp 14. Check contactor closure is correct by measuring the voltage at the Module terminals 15. Contact CEGASA after-sales service
-	EViewer web app does not load	When entering the appropriate IP address in the browser, the EViewer web app does not load	<ol style="list-style-type: none"> 16. If the connection is via ETH cable, check IP is configured correctly on PC 17. If the connection is via Wi-Fi and PC, check that the antivirus software does not block the connection. Try with ETH cable

i NOTICE

If the circuit breaker protection has been triggered (down position) in any of the System's Modules, it must be reset by following the steps described in the next point.

- a) Access the Transport&Storage Switch on the rear and place it in the 'O' (OFF) position.
- b) Wait **10 seconds**
- c) Return it to the 'I' (ON) position.
- d) Next, remove the cover on the front to access the circuit breaker and reset it (up position) by using a screwdriver to lever against the bottom of the opening.

**⚠** CAUTION!

The above steps must be carried out in the order specified.

9 SYSTEM DISASSEMBLY

CAUTION!

The Battery System must be disassembled by qualified personnel.

CAUTION!

Risk of injury due to the weight of the Modules.

Injuries can occur if Modules are lifted incorrectly or dropped during transportation or installation.

- Transport and lift the Modules carefully. Take their weight into account.
 - Wear appropriate personal protective equipment for all work on the Battery System.
-

To disassemble the System, please follow the procedure below:

1. Turn off all inverters connected to the System.
2. Turn off all circuit breakers and/or protection elements between the inverter and the Battery System in the PDC cabinet.
3. Press the ON/OFF switch of one of the Modules for 5 seconds to shut down the System.

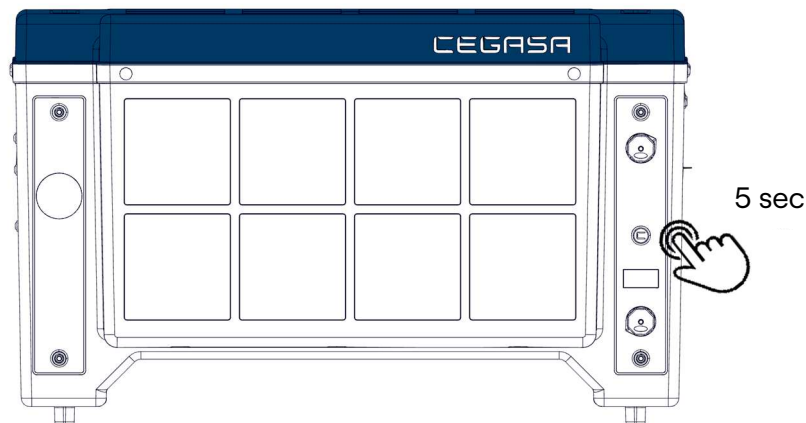


Figure 9-1. Press the ON/OFF button.

4. Remove the cover on the left side of the Module to access the circuit breaker (CB) and turn it off (down position) by pressing on the red box with a screwdriver. Next, access the Transport&Storage Switch and press it to the 'O' (OFF) position.

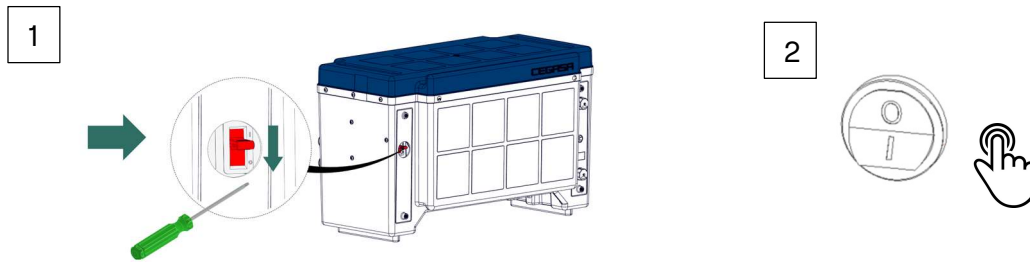


Figure 9-2. Disconnect the circuit breakers (CB) and press the Switch to the 'O' (OFF) position.

⚠ CAUTION!

The above steps must be carried out in the order specified.

5. Disconnect the communication cables between all the Modules, including the Master.
6. Disconnect the communications cable between the inverter and the Battery System (Master).
7. Disconnect the positive and negative power cables of each Module. Press the connector to remove it.

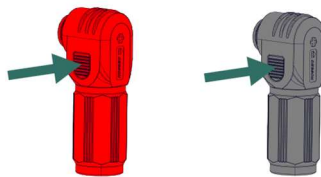


Figure 9-3. Press the sides to release the cable.

8. If there is a PDC cabinet, disconnect the input and output power cables to the PDC.
9. If the Modules are mounted on the wall, loosen the screws of the brackets between the Modules and the wall. Remove the wall mounting plates.
10. Loosen the screws and remove the connection plates (front and rear) between the Modules and between the base and the lower Modules. Before lifting the Module, make sure you remove the screws and plates on both sides.
11. Loosen the screws on the brackets between the bases and the floor. Then remove the connection plates to the floor and the bases.
12. If the Battery System is to be stored or shipped, it must be packaged. Use the original packaging or packaging that is suitable for its weight and dimensions.
13. Dispose of or recycle the Battery System according to locally applicable disposal regulations.

10 DISPOSAL SYSTEM

- The Battery System can only be disposed of in accordance with current local regulations on used batteries. If the Battery System is damaged, contact the manufacturer to receive appropriate instructions.
- You must contact the installer or distributor before disposing of it.



ENVIRONMENTAL

Do not dispose of the Battery System with household waste under any circumstances.

- Ensure that the Battery System is not exposed to moisture or direct sunlight once uninstalled.
- Used Battery Systems may contain harmful substances that can harm the environment or health if not stored or disposed of properly.
- Battery Systems contain important raw materials such as iron, zinc, manganese, copper, cobalt and nickel, which can be recycled.

11 TRANSPORT AND STORAGE REQUIREMENTS AND RECOMMENDATIONS

Battery Systems contain hazardous substances categorised as class 9 by the ADR 2013 document identified by number UN3481.

11.1 SHIPMENT

- Ship the Modules in packaging group 1, with approved boxes. Recommendation: do not discard the original shipping boxes.
- Transport with ADR authorisation to move Battery Systems.
- Smoking is prohibited in the vehicle during journeys and also in the vicinity during loading and unloading.
- It is prohibited for the carrier or any unqualified third party not associated with the installation to open the outer packaging of the Battery System.
- When transporting the Modules, make sure that the Transport&Storage Switch on the rear of the Module is in the 'O' (OFF) position and that the front circuit breaker is in the TRIP position (middle down position).

11.2 ENVIRONMENTAL REQUIREMENTS FOR USE

The area where the System is installed must be equipped with an air conditioning unit in order to carry out the System charging and discharging process within the recommended operating temperature.

- Operating temperature range for charging: **0°C to 45°C**
- Operating temperature range for discharging: **-10°C to 55°C**
- Recommended operating temperature range: **15°C to 25°C**
- Operating humidity range (HR): **15% to 90%**

The Battery System control has an internal algorithm to modulate the charge and discharge current depending on the SoC and the temperature of the cells.



INFORMATION

Working outside the recommended temperature range may cause the Battery System to enter alarm or temperature protection state (over or under). It can also lead to a reduction in the life of the System, also affecting the terms of the system warranty (see Annex A1 *Warranty* document).

11.2.1 Storage recommendations:

- If storing the Modules for more than 2 weeks, make sure that the Transport&Storage Switch on the back of the Module is in the 'O' (OFF) position.
- Do not expose the Battery System to areas where it is exposed to direct sunlight or rainfall.
- Do not expose to saline and/or highly corrosive environments.
- Recommended storage SoC (30%-70%).
- Recommended storage temperature (15°C to 25°C).
- Recommended storage humidity range (HR): 15% to 90%.
- Do not exceed 6 months of storage without performing a charge/discharge cycle (*).

11.2.2 Deviations:

- Do not store the Battery System below -5°C.
- Do not store the Battery System above 50°C.
- The Battery System can be stored for 6 months between 0°C and 25°C.
- The Battery System can be stored for 3 months between -10°C and 35°C.
- The Battery System can be stored for 1 month between -20°C and 45°C.

(* Recommended Module charging cycle: **Ask CEGASA.**

INFORMATION

If the above instructions for storing the Battery System are not followed, the lifecycle will be reduced drastically (see Annex A1 *Warranty document*”).

12 MAINTENANCE PLAN

12.1 MAINTENANCE PLAN

The Battery System requires low maintenance. However, a System maintenance procedure must be performed to ensure optimal operation.

This procedure provides the guidelines to follow to ensure proper maintenance, maximising performance and prolonging the lifetime of the Battery System. Follow these instructions to keep the System in optimal condition. Not following these instructions may lead to the reduced life of the System, also affecting the terms of the system warranty (see chapter 1.8 *“Limitation of warranties and liability”*).

12.1.1 Training and Safety

Ensure that the personnel responsible for maintaining the Battery System are adequately trained in maintenance and safety procedures. Use suitable personal protective equipment when handling Battery Systems and follow all relevant safety regulations.

12.1.2 Cleaning

It is recommended to periodically clean all the equipment comprising the energy storage Battery System. If the casing is dirty, use a soft dry cloth or a vacuum cleaner to remove dust. Do not use liquids such as solvents, abrasive products or corrosive liquids.

12.1.3 Storage

A System charge/discharge cycle must be carried out depending on the storage conditions (temperature and storage time), see Section 11 *“Transport and storage requirements and recommendations”*.

12.1.4 Temperature

In storage, keep the Modules in an environment with an appropriate and stable temperature. Install in a well-ventilated place protected from direct exposure to sunlight and severe weather conditions. See Section 11 *“Transport and storage requirements and recommendations”*.

When in use, ensure that the Modules are working within the temperature range specified by CEGASA (see chapter 11.2 *“Environmental requirements for use”*). Otherwise, have the necessary resources available (isolation, air conditioning, etc.).

12.1.5 Regular Visual Inspection

Carry out periodic visual inspections to detect any physical damage to the System. Pay special attention to the terminals and connections.

12.1.6 Voltage control

Regularly check that the Battery System voltage is within the limits specified by CEGASA on the EViewer platform (Annex 4 *“Config. Web App System”*).

12.1.7 Full charge

Fully charge the battery system at least once a month to update possible deviations from the SoC calculation algorithm, see Annex A1 *Warranty document*".

12.1.8 Deep discharges

Avoid discharging the Battery System below an SoC of 10%. Deeper discharges will significantly affect the lifetime. If the Battery System is overdischarged, its protection will be triggered, but it is important to ensure the following:

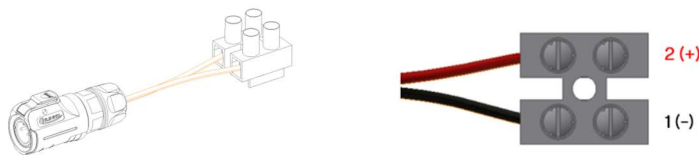
- Charge the overdischarged Battery System within 7 days if the room temperature is equal to or greater than 25°C, see Annex A1 *Warranty document*".
- Charge the overdischarged Battery System within 15 days if the room temperature is below 25°C, see Annex A1 *Warranty document*".

If the Module is in a state of deep discharge and there is no voltage at the terminals, a controlled recovery charge can be carried out by following the steps below:

- Access the 2P connector located at the rear by removing its cover.



- Connect the 'EBICKLV_CB_External Power Connector' (223907) included in the Master BOX MCS to an external power supply as follows. (Respect the polarity.)



- Without switching on the power supply, connect the above cable to the module's 2P contactor.

- Connect the external power supply and program a **50 V recovery charge with a maximum current of 5 A**.

⚠ CAUTION!

Respect the 50 V // +5 A recovery charge conditions to avoid damaging the Module.

12.1.9 Checking notices and alarms

Regularly check for the absence of any notices and/or alarms on the EViewer web app, (see Section 8 *“Troubleshooting”*).

12.1.10 Log and documentation

Keep a detailed log of all maintenance activities performed on the energy storage Battery System, including inspection dates, voltage measurements, cleaning and any other actions taken. Keep these logs up-to-date to make it easier to track the System status.

12.1.11 Updating firmware

Make sure your System is updated with the latest FW version.



INFORMATION

Please contact CEGASA if you require more technical information.



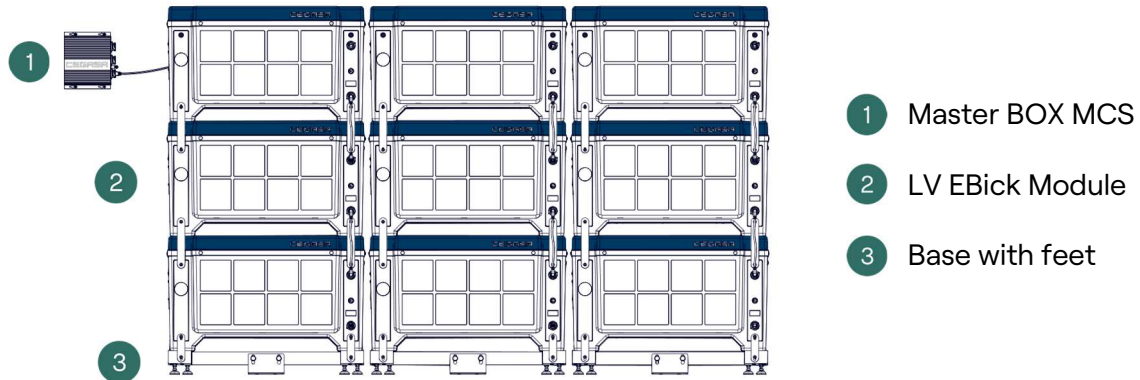
INFORMATION

This maintenance plan must be followed to make the product warranty effective.

12.2 CORRECTIVE MAINTENANCE PLAN

In the event of a breakdown and you need to replace any unit of the Battery System, please contact CEGASA's technical team (SAT) for assistance. Under no circumstances should you manipulate or open any unit; if you do, the equipment warranty will be fully void.

13 TECHNICAL DATA SHEET (TDS)



No. Modules	Energy (kWh)	Rated Voltage	Voltage Range	Rated Current (A)	Maximum Current (A)	Peak Current	Rated Power	Dimensions (mm)	Weight (kg)
1	13	48	44-52	140	175	280	8	770x405x470(*)	90
2	27			250	313	500	15	770x405x985	180
3	40			300	375	600	18	770x405x1435	270
4	54			400	500	800	24	1585x405x985	360
5	67			500	625	1000	30	1585x405x1435	450
6	81			600	750	1200	36	1585x405x1435	540
8	107			750	938	1500	45	1585x405x1880	720
9	121			800	1000	1600	48	2400x405x1435	810
12	161			1000	1250	2000	60	2400x405x1880	1080
15	202			1200	1500	2400	72	4020x405x1435	1350
16	215			1250	1563	2500	75	4020x405x1880	1440
20	269			1500	1875	3000	90	4020x405x1880	1900

(*) Without base. All other configurations include the base with feet.

14 SPECIFIC ANNEXES

A1 WARRANTY DOCUMENT

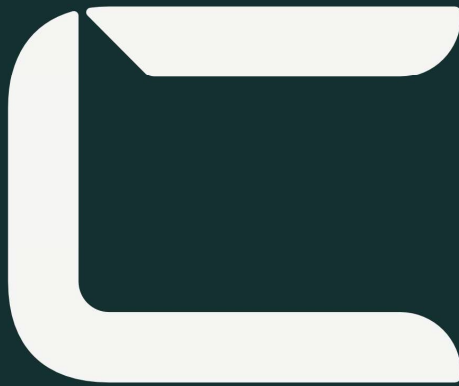
A2 CAN BUS COMMUNICATIONS PROTOCOL

A3 MODBUS COMMUNICATIONS PROTOCOL

A4 SYSTEM CONFIGURATION WITH THE EVIEWER WEB APP

A5 IP CONFIGURATION OF PC DEVICES

Energy you can trust



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