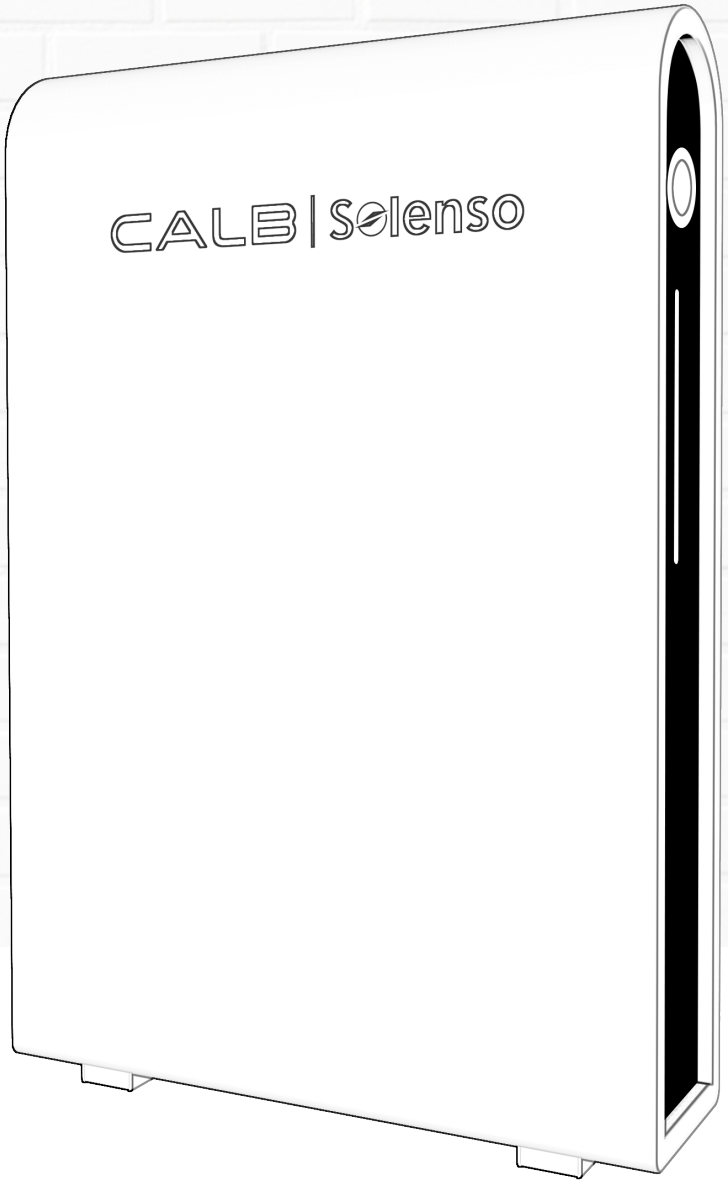
CALB | Solenso



USER MANUAL

Cal-Box-LV5.12/10.24

Ver 1.7.2

IMPORTANT SAFETY INSTRUCTIONS

SAVE THESE IMPORTANT SAFETY INSTRUCTIONS

This manual contains important instructions for the Lithium Battery that must be followed during installation and maintenance of the system.

Lithium Battery installation and service require knowledge of high voltage electricity and should only be performed by Certified Installers. These warning and cautions must be followed when using Lithium Battery.

Symbols Used

These symbols indicate important safety information in this guide or on the equipment:

 **WARNING:** indicates a hazardous situation which, if not avoided, could result in injury or death.

 **CAUTION:** indicates a hazardous situation which, if not avoided, could result in minor injury or damage to the equipment.

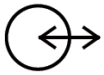
NOTE: indicate an important step or tip that leads to best results, but is not safety or damage related.

 **REFER TO OPERATING INSTRUCTIONS:** indicates that user should refer to operating or installation instructions before proceeding.

 **RISK OF ELECTRIC SHOCK:** indicates components that present risk of electrical shock.



CAUTION, RISK OF ELECTRIC SHOCK, ENERGY STORAGE TIMED DISCHARGE, Discharge time is 5 minutes from de-energization.

 **BIDIRECTIONAL TERMINIAL:** indicates location of combined input/output connector on the equipment.

 **PROTECTIVE CONDUCTOR TERMINAL:** indicates location of grounding connection on the equipment.

General Information:

WARNING: Reading this entire document before installing or using Lithium Battery. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death or can damage Lithium Battery, potentially rendering it inoperable.

WARNING: A battery can present a risk of electrical shock, fire, or explosion from vented gases. Observe proper precautions.

WARNING: Lithium Battery installation must be carried out only by Battery Supplier Certified Installers who have been trained properly.

WARNING: Lithium Battery is heavy. Use of Lift equipment is recommended.

WARNING: Use Lithium Battery only as directed.

WARNING: Do not use Lithium Battery if it is defective, appears cracked, broken, or otherwise damaged, or fails to operate.

WARNING: Before beginning the wiring portion of the installation, ensure that Lithium Battery is switched off, and open any associated circuit breakers and disconnect switches (if applicable for the installation).

WARNING: Do not attempt to open, disassemble, repair, tamper with, or modify Lithium Battery. Lithium Battery and its components are not user serviceable. Batteries in Lithium Battery are replaceable. Contact the Battery Supplier Certified Installer who installed the system for any repairs.

WARNING: To protect Lithium Battery and its components from damage when transporting, handle with care. Do not impact, Pull, drag, or step on Lithium Battery. Do not subject Lithium Battery to any strong force. To help Prevent damage, leave Lithium Battery in its shipping packaging until it is ready to be installed.

WARNING: Do not insert foreign objects into any part of Lithium Battery.

WARNING: Do not expose Lithium Battery or its components to direct flame.

WARNING: Do not install Lithium Battery near heating equipment.

WARNING: Do not immerse Lithium Battery or its components in water or other fluids.

CAUTION: Do not use solvents to clean Lithium Battery, or expose Lithium Battery to flammable or harsh chemicals or vapors.

CAUTION: Do not use fluids, parts or accessories other than those specified in this manual including use of non-genuine Lithium Battery parts or accessories, or parts or accessories not

purchased directly from supplier or a supplier-certified party.

CAUTION: Do not place Lithium Battery in a storage condition for more than one (1) month, or permit the electrical feed on the Lithium Battery to be served for more than one (1) month, without placing Lithium Battery into a storage condition in accordance with storage specification of battery.

CAUTION: Do not paint any part of Lithium Battery, including any internal or external components such as the exterior shell or casing.

CAUTION: Do not connect Lithium Battery directly to photo voltaic (PV) solar wiring.

CAUTION: When installing Lithium Battery in a garage or near vehicles, keep it out of the driving path. If possible, install Lithium Battery on a side wall and/or above the height of vehicle bumpers.

Environmental Conditions

WARNING: Install Lithium Battery in a location that prevents damage from flooding.

WARNING: Operating or storing Lithium Battery in temperatures outside its specified range might cause damage to Lithium Battery.

WARNING: Do not expose Lithium Battery to ambient temperature above 50 ℃ or below -10 ℃.

CAUTION: Ensure that no water sources are above or near Lithium Battery, including downspouts, sprinklers, or faucets.

CAUTION: Ensure that snow does not accumulate around Lithium Battery.

Revision History:

Date	Revision	Description	Owner
	V1.0	Initial Release	
	V1.1	Add the cable definition	
	V1.2	Add 5.12kwh parameters and power capacity for parallel application	
	V1.21	Update 5.12/10.24 parameters sheet	
	V1.22	Update 5.12/10.24 communication interface definition	
	V1.23	Add 4G optional	
	V1.24	Delete 16mm2 cable	
	V1.3	Change the Multiple Units Connection	
	V1.4	Add 5.2 Powering On and Off the Energy Storage System	
	V1.5	Box for three phase AC Coupler connection	
	V1.6	Revise 4.5 DC Cable Connection	
	V1.7	Revise 4.5 DC Cable Connection	

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1. Specification

Dimensions and appearance of Lithium Battery is shown below:

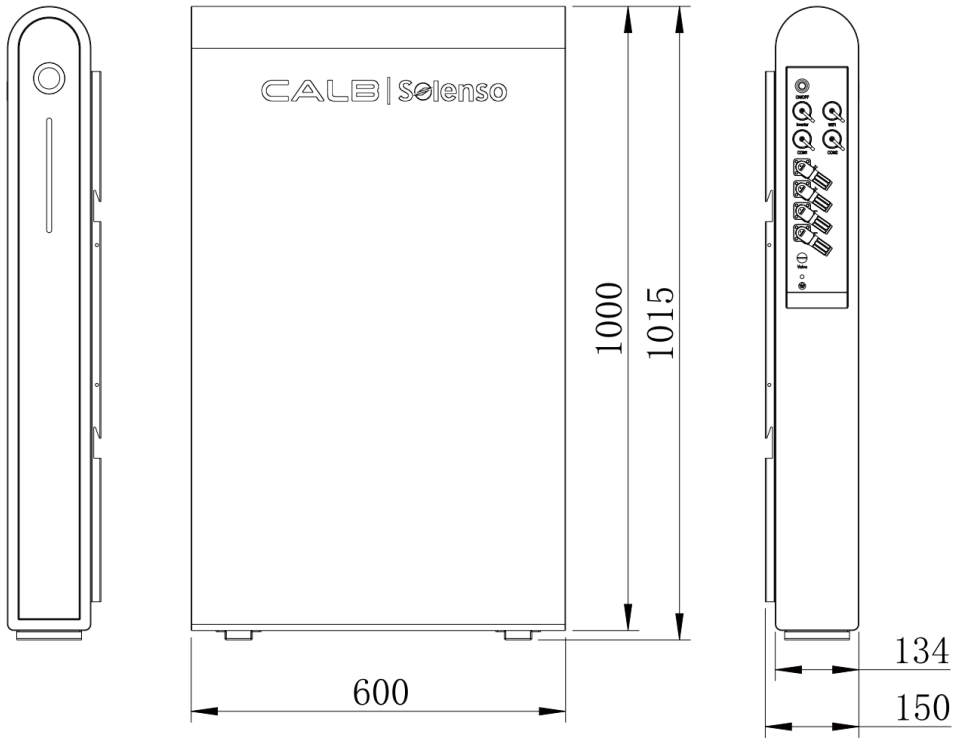


Figure 1.1 for 10.24kwh

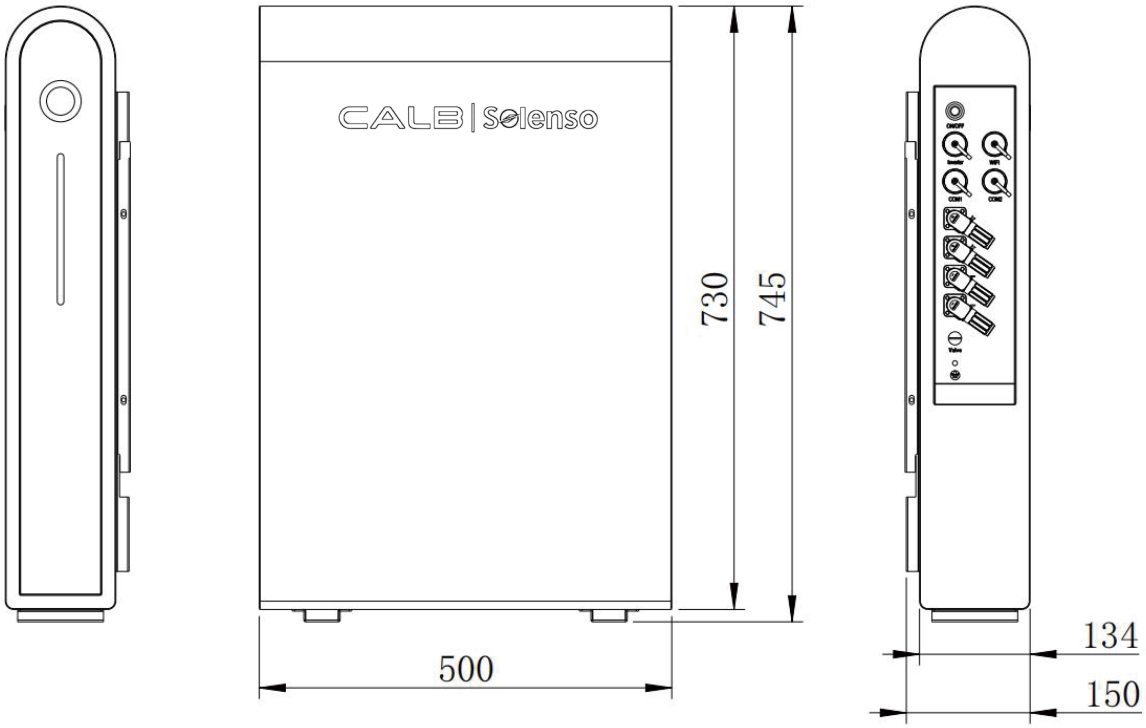


Figure 1.2 for 5.12kwh

Commercial Name	Cal-Box-LV5.12	Cal-Box-LV10.24
Produet model	C160F100A-1P16SA	C160F100A-2P16SA
Cell manufacture	CALB	CALB
Cell Model	L160100A	L160100A
Cell Type	LFP	LFP
Cell Capacity	100Ah	100Ah
Battery		
Rated Battery Energy	5.12 kWh	10.24 kWh
Nominal Voltage	51.2 V	51.2 V
Working Voltage Range	44.8-56.8 V	44.8-56.8 V
Nominal Charge Current	50A	100A
Nominal Discharge Current	100A	100A
Nominal Charge Power	2.56kW	5.12kW
Nominal Discharge Power	5.12kW	5.12kW
SOC Range	5% ~ 95%	5% ~ 95%
SOC Transportation (Recommended) [2]	50%	50%
Charging Temperature Range	-5°C~50°C	-5°C~50°C
Discharge Temperature Range	-20°C～55°C	-20°C～55°C
Storage Temperature[3]	-10°C ~ 45 °C	-10°C ~ 45 °C
Working Humidity	5~95%RH	5~95%RH
IP Grade	IP65	IP65
Recommended Usage	Indoor/Outdoor	Indoor/Outdoor
Weight	~55Kg	~100Kg
Dimensions [W*D*H]	500*150*745mm (Not included connector)	600*150*1015mm (Not included connector)
Communication	CAN/RS485/WiFi	CAN/RS485/WiFi
4G Communication	Optional	Optional
Calendar Life[4]	10 Years	10 Years
Cable Specification		
Battery Cable Rating	100A or 200 A, each cable	100A or 200 A, each cable
Battery Cable Type	25 mm^2 cable	25 mm^2 cable

*Note:

Battery ΔV should be less than 0.5V at first Parallel installation,or BMS has a potential failure risk if ΔV＞0.5V , please Dis/Charge the batteries to meet ΔV≤0.5V, or consult our engineers;

[1]: For more parallel, please contact the engineer of supplier

[2]: Performance may be de-rating in extreme ambient environmental conditions

[3]: Recommended storage temperature：10-30℃

[4]: Working Condition 0.25 C @ 25 deg C, 80% DoD, 1 cycle per day

2. Technical parameters

2.1 Lithium Battery Panel Interface

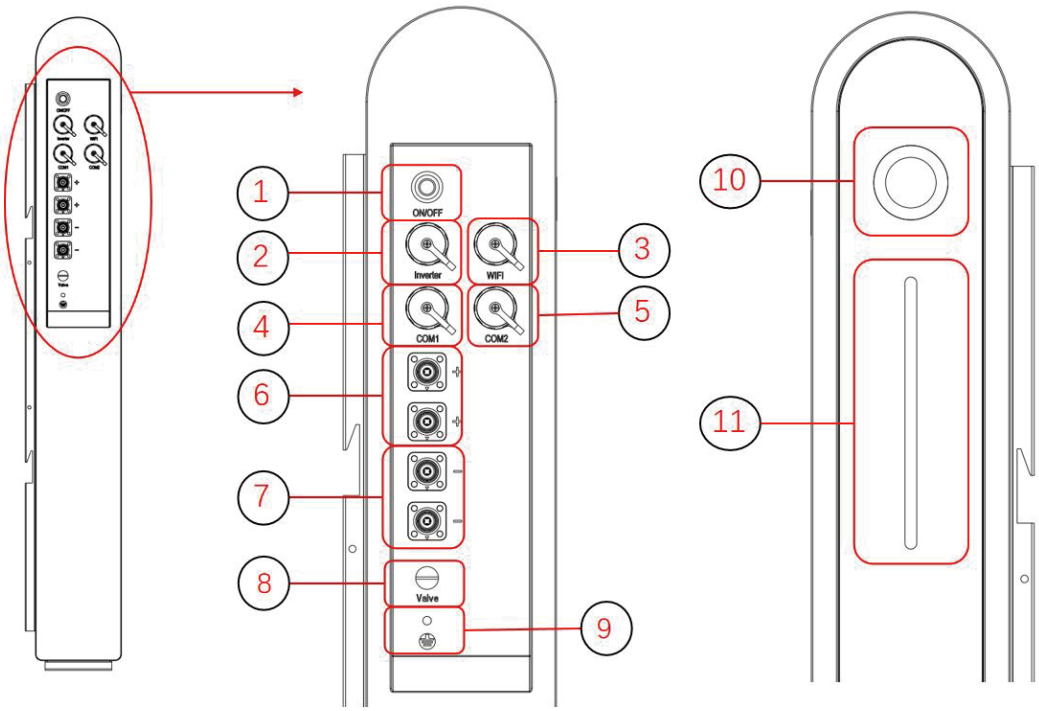


Fig. 2.1 Lithium Battery Panel Interface

Item	Name	Model	Remarks
1	Power On/Off Switch		
2	Communication port	RJ45	Single RS485 and CAN for inverter and app
3	WIFI Socke		
4	Communication port	RJ45	Parallel CAN for COM1
5	Communication port	RJ45	Parallel CAN for COM2
6	Port Positive x2		Orange , 25 mm2
7	Port Negative x2		Black , 25 mm2
8	Breathing Valve		
9	GND	M6	Yellow-Green, 10 AWG
10	RUN LED		
11	SOC LED		

2.2 Lithium Battery internal battery unit communication interface definition

Lithium Battery communication interface

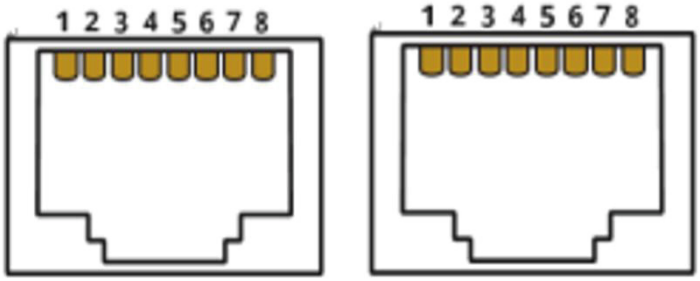


Figure 2.2 RS485 and CAN connections

Item	Description
Single RS485 and CAN For inverter and APP	Pin 1: RS485-A Pin 2: RS485-B Pin 3: CAN1H Pin 4: CAN1L Pin 5: CAN1L Pin 6: CAN1H Pin 7: RS485-B Pin 8: RS485-A
Parallel CAN for COM1 and COM2	Pin 1, 2: / Pin 3: CANH Pin 4: CANL Pin 5: CANL Pin 6: CANH Pin 7, 8: /

3. Installation preparation

3.1 Requirements for Installation Location

- ✧ A solid support surface must be available (e.g., concrete or masonry).
- ✧ The installation location must be inaccessible to children.
- ✧ The installation location must be suitable for the weight and dimensions of the Lithium Battery.
- ✧ The installation location must not be exposed to direct solar irradiation.
- ✧ Keep away from metal conductive dust.
- ✧ Keep away from water source, heat source and inflammable and explosive articles.

- ✧ The installation location must not be close to the fire.
- ✧ The altitude of the installation location should be less than 3000m.
- ✧ The operating temperature should be between -20 °C ~ +55 °C.
- ✧ The ambient humidity should be between 5-95%.

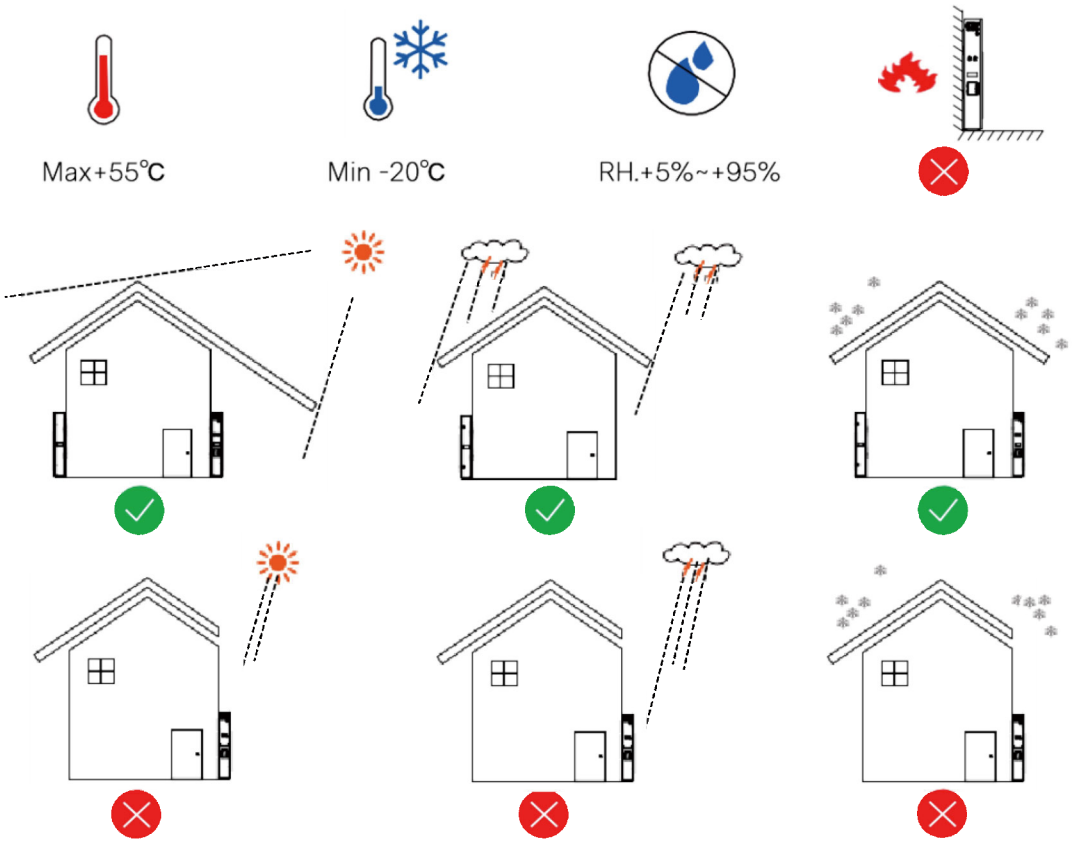
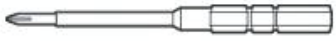


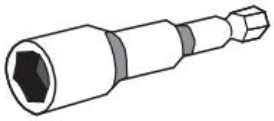
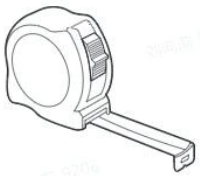
Figure 3.1

⚠ **Note:** Lithium Battery includes a mounting bracket , that supports the unit in both floor- and wall-mount configuration, and includes shims to level the unit in floor-mount configurations. Do not use other hardware to anchor Lithium Battery to the wall or floor.

3.2 Tools

The tools in the following table could be needed during the installation

		
Torque screwdriver	Phillips-screwdriver bit	Hex-key bit
		

Phillips-head screwdriver	Torque wrench	Wrench
		
Cylinder screwdriver bit	Scissor	tie
		
level	Electric Drill	Tape measure
		
Hammer	Twist drill	Marker pen

3.3 Safety Gear

Wear the following safety gear when dealing with the battery system.Installation personnel must meet the relevant requirements of international standards.

		
Insulated gloves	Safety goggles	Safety shoes

3.4 Dimensions and Space Requirements

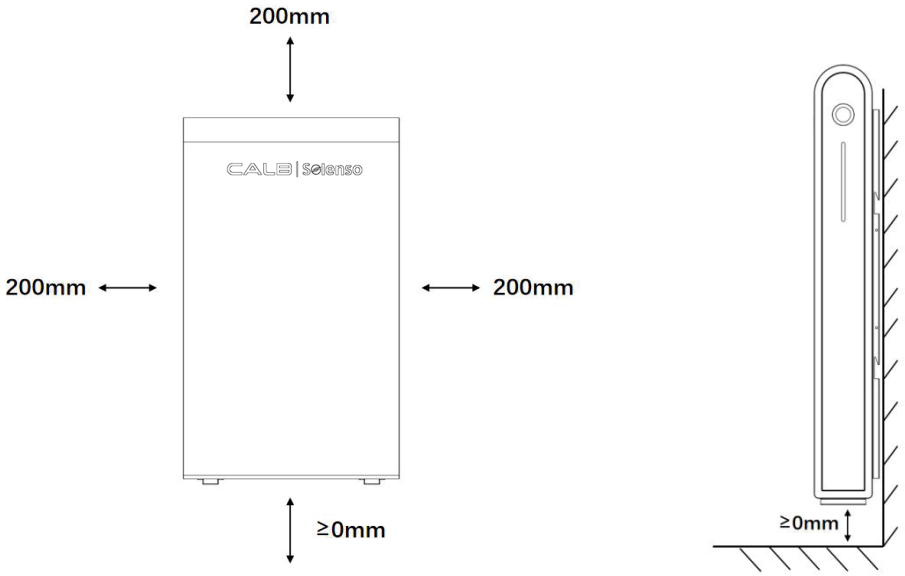


Figure 3.4

Space Requirements	
Min. clearance from left side	200mm
Min. clearance from right side	200mm
Min. clearance above Lithium Battery	200 mm
Min. clearance between side-by-side Lithium Battery	200mm
Min. clearance at the bottom	≥0 mm
Max. slope	+/- 2 degree side-to-side +/- 5 degree front-to-back

4. Installation

4.1 Unpacking inspection

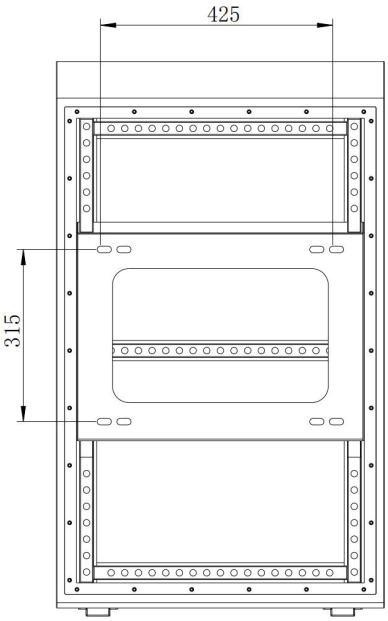
- When the equipment arrives at the installation site, loading and unloading should be carried out according to the rules and regulations, to prevent from being exposed to sun and rain.
- Before unpacking, the total number of packages shall be indicated according to the shipping list attached to each package, and the case shall be checked for good condition.
- In the process of unpacking, handle with care and protect the surface coating of the object.
- Open the package, the installation personnel should read the technical documents, verify the list, according to the configuration table and packing list, ensure objects are complete and intact, if the internal packing is damaged, should be examined and recorded in detail.

Packing list is as follows（Actual shipment reference Packing List）

Item	Specification	Quantity	Figure	Note
Battery System	Lithium Battery	1		Standard
Wall -mount	Bracket	1		Standard
Accessory Bag	Expansion Bolts:M6x80	4		Standard
	Hexagonal Wrench	1		
	Screw	4		
Output Cable	Power Cable Positive: Red plug,25mm² /L1.5m Negative: Black plug,25mm² /L1.5m	2		Option
	Communication cable to Inverter Black/L1.5m/Double RJ45 Plug	1		
	Ground Cable Yellow,Green/L1m/Double OT M6	1		
Parallel Cable	Power Cable Positive: Red plug,25mm² /L1.5m Negative: Black plug,25mm² /L1.5m	2		Option
	Communication cable to Inverter Black/L1.5m/Double RJ45 Plug	1		

4.2 Battery fixation

4.2.1 Determine the installation position of the battery, and draw the installation hole position on the installation surface according to the drawing:



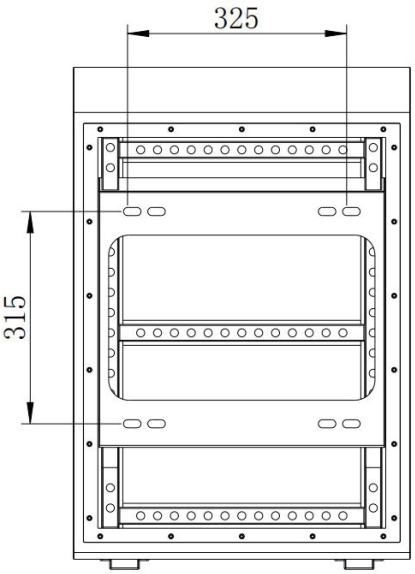


Figure 4.2.1 for 10.24kwh Figure 4.2.2 for 5.12kwh

4.2.2 Drill holes on the mounting holes of 4pc expansion bolts(M6x80) with an electric drill, and then install the four expansion bolts into the mounting holes.

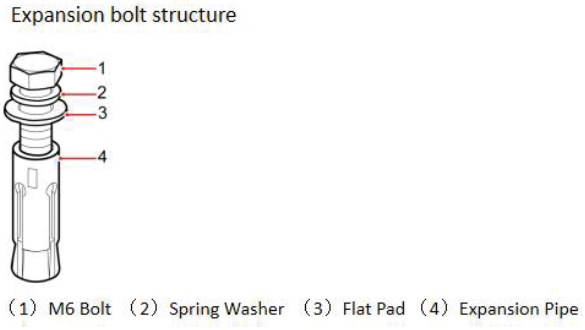


Figure 4.2.2

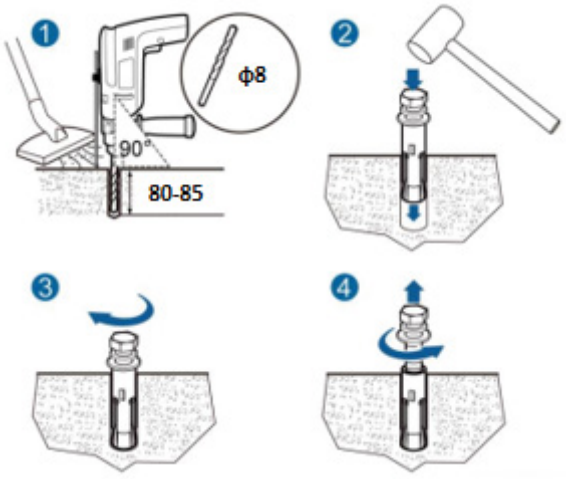


Figure 4.2.2

(1)Use an impact electric drill to drill holes on the cement floor, and the drilling depth is between 80mm and 85mm.

(2)Tighten the expansion bolt slightly and put it vertically into the hole. Knock the expansion bolt with a rubber hammer until all the expansion pipes enter Into the hole.

(3)Pre tighten the expansion bolt.

(4)Screw out the bolts and remove the spring washer and flat washer.

4.2.3 Fix the bracket with 4 bolts.

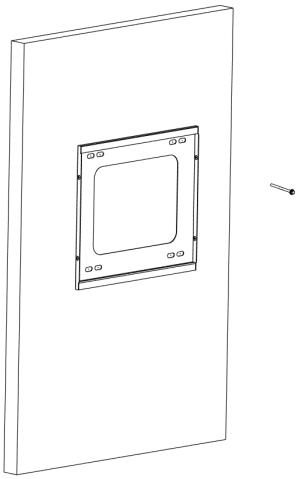


Fig.4.2.3

⚠ **Note:** Please ensure that the bracket is horizontal after installation.

4.2.4 Lift the battery and hang it on the bracket

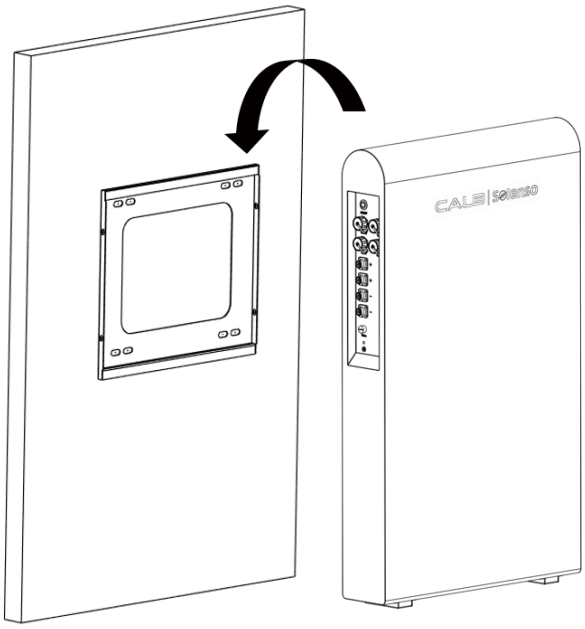


Fig.4.2.4 Assembling Demo

4.3 DC Cable Requirements

Size	Outer Diameter	Max. Voltage	Max. Current
21-33 mm²	10-12 mm	1000 V	200 A

Caution
DC cable must be a multicore wire.

4.4 DC Cable

Danger
Turn off system before doing electrical connection
Ensure all the cables are in electrical safe condition

4.4.1 Material List



Plug



Isolation Cap



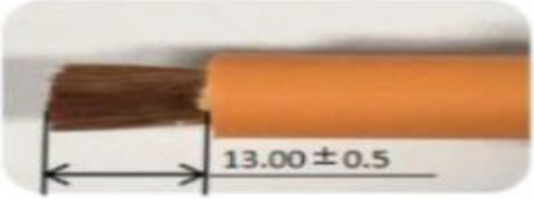
Tail-hood

4.4.2 Steps

1. Put wire through isolation cap and Tail-Hood.



2. Swipe outer isolation layer of DC cable.



3. The red is used for the positive, and the black is used for negative, the end of the cable is bunched at the terminal using a wire clamp.




4. Tighten the isolation cap and plug contact.




5. Put the positive and negative plug on to the system and tighten it.

6. Use isolation cap for unused DC plug.

4.5 DC Cable Connection

4.5.1 Single Unit

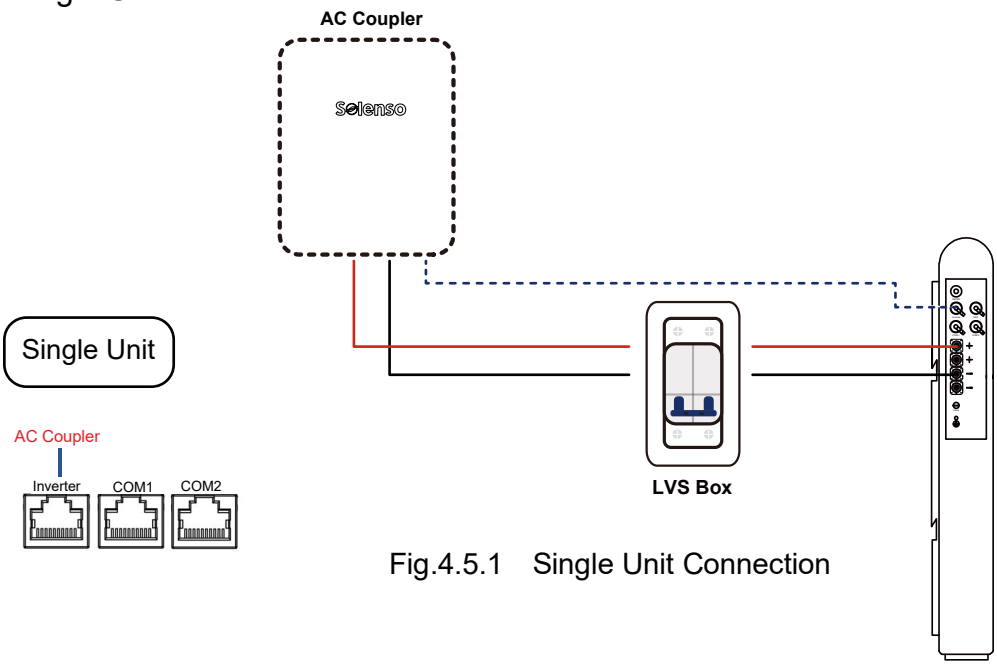


Fig.4.5.1 Single Unit Connection

Single unit charge/discharge power with LVS Box

		Charge power (kW)		Discharge power (kW)	
AC Coupler	Breaker	5.12kWh	10.24kWh	5.12kWh	10.24kWh
Sowave-SL6	125A	2.56	5.12	5.12	5.12
Sowave-TL12	125A	2.56	5.12	5.12	5.12

We have two kinds of LVS Box. LVSB-C for SoWave-SL6 AC Coupler. LVSB-CL for SoWave-TL12 AC Coupler.

4.5.2 Multiple Units Connection

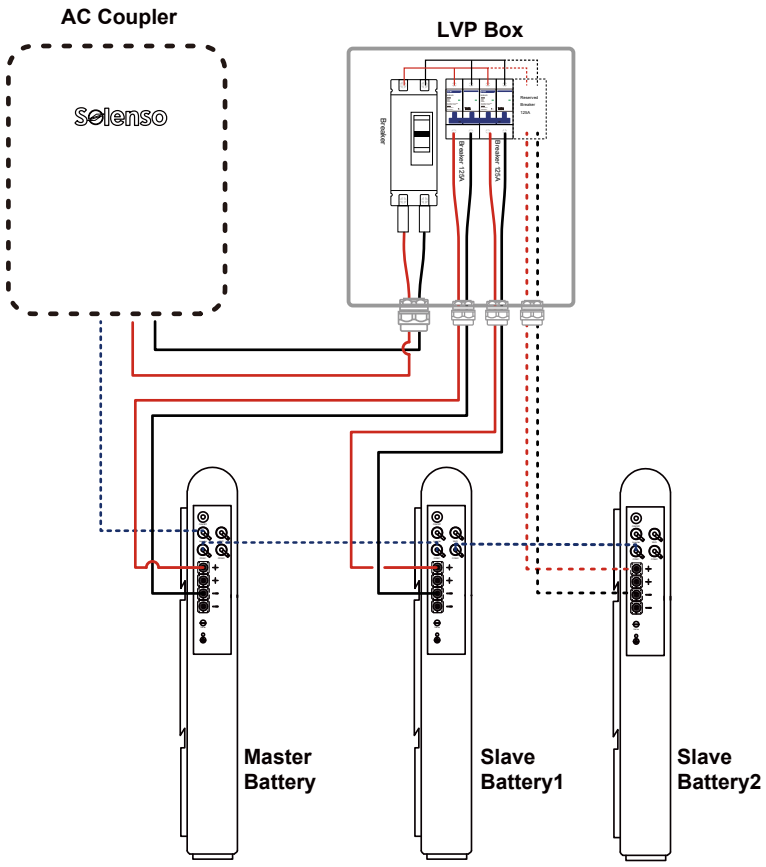
> ⚠ ***Parallel Connection Requirement:***
> *CALB lithium batteries with different capacities (e.g. 5.12 kWh and 10.24 kWh) must NOT be connected in parallel. Parallel connection of batteries with different capacities may cause uneven current sharing, inconsistent SOC behavior, premature BMS protection, and accelerated aging of the smaller-capacity battery. Only CALB batteries of the same model, capacity, and voltage are permitted for parallel connection.*

Before connecting the batteries in parallel. Please ensure that the battery voltage difference is less than 1V.

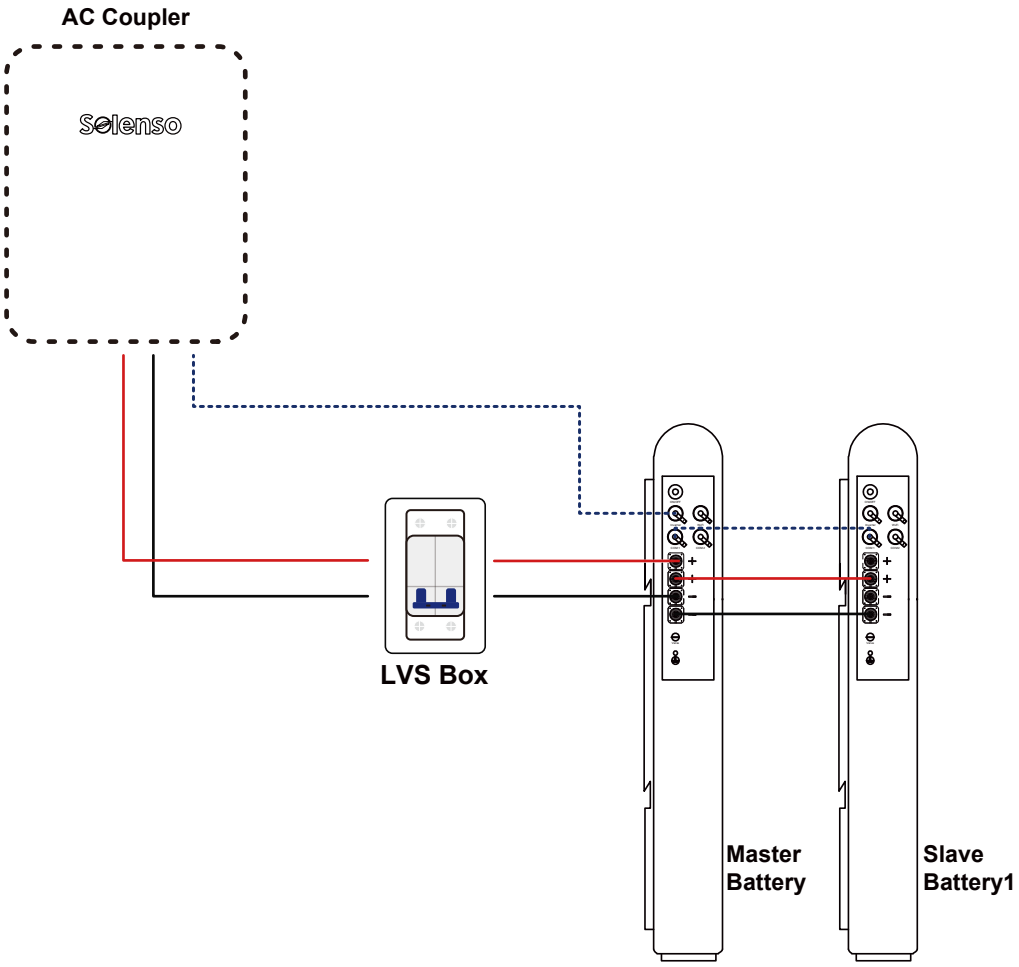
① Method 1: Bus Cable Parallel. For the Sowave-TL12 AC Coupler, multi-battery connections shall be implemented using the LVP box wiring configuration.

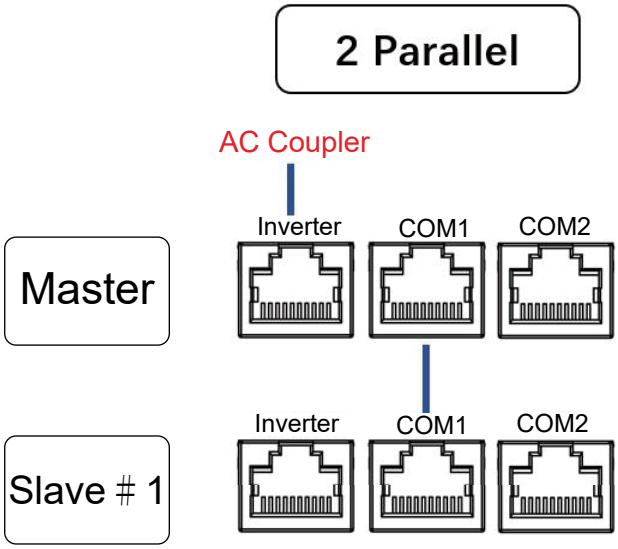
Multiple units charge/discharge power with LVP Box

				Charge power (kW)		Discharge power (kW)	
LVP Box	AC Coupler	Battery quantity	Main Breaker	5.12kWh	10.24kWh	5.12kWh	10.24kWh
① SALVPB-CA160-N	Sowave-SL6	2pcs	160A	5.12	6	6	6
		3pcs	160A	6	6	6	6
② SALVPB-CA315	Sowave-TL12	2pcs	315A	5.12	10.24	10.24	10.24
		3pcs	315A	10.24	13.31	13.31	13.31



② Method 2: Master and Slave Parallel. Due to current limitations, Method 2 is only applicable to the Sowave-SL6 AC Coupler.In this configuration, a maximum of two batteries can be connected.





Two units charge/discharge power with LVS Box

			Charge power (kW)		Discharge power (kW)	
AC Coupler	Battery quantity	Breaker	5.12kWh	10.24kWh	5.12kWh	10.24kWh
Sowave-SL6	2pcs	125A	5.12	6	6	6

4.5.3 Set up Master Pack and Slave Pack

The power system can be used as a single system or multiple systems. When used as multiple systems, there is no need to set up a host and a slave, and after merging, a battery will be randomly assigned as the host, which can be identified by software. The CAN bus is designed as a ring network, allowing any battery to communicate with the inverter.

Master/Slave Pack communication connection diagram:

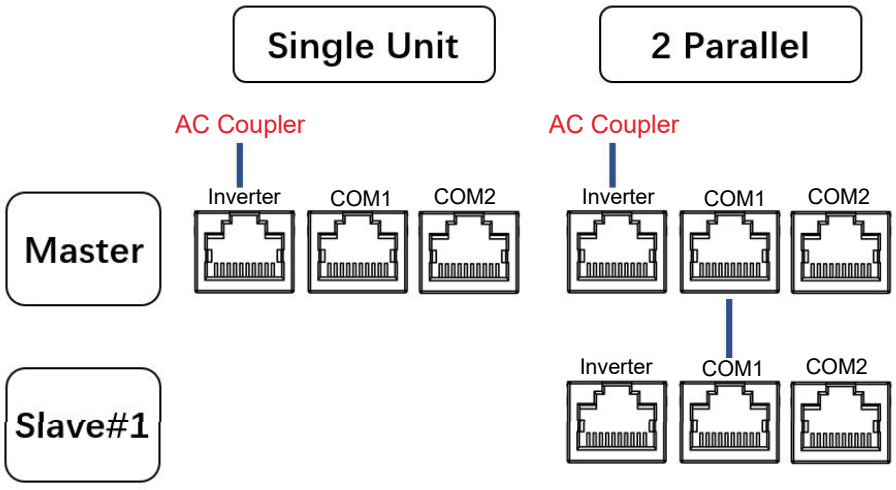


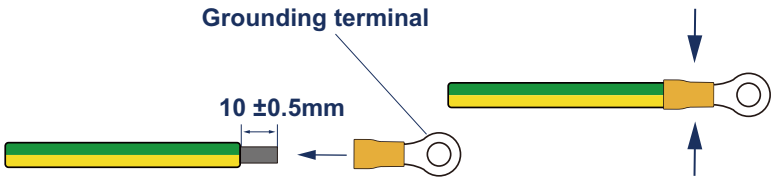
Fig.4.5.3 Master/Slave Pack communication connection

4.6 Battery Earth Connection

⚠ **Note:**

A protective earth (PE) terminal should be connected to the Battery.The ground cable can ensure the safety of the equipment.

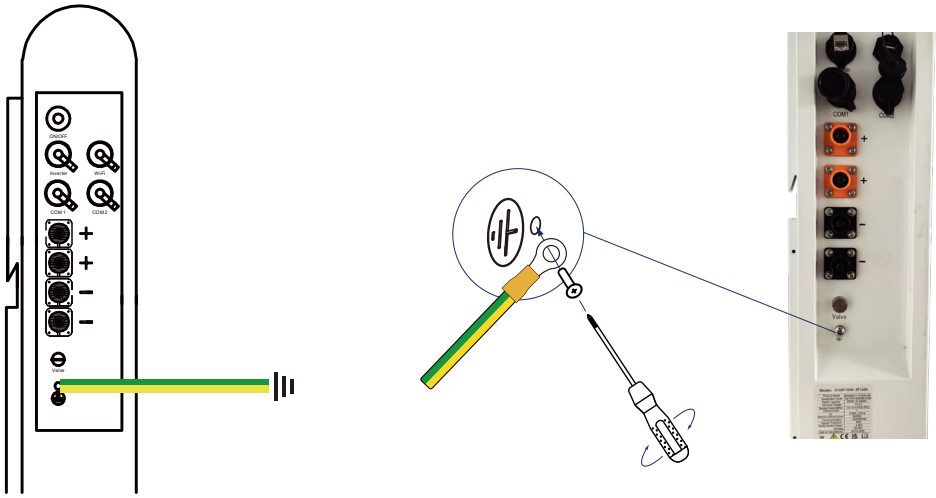
Step: 1



⚠ **Note:**

You can find the ground cable in the battery package.
Ground Cable: Yellow,Green/L1m/Double OT M6.

Step: 2



Fix the grounding screw to the grounding connection of the machine housing.

5. Power ON and OFF

5.1 Instruction

Please double check the Precautions for use.

⚠ 5.2 Powering On and Off the Energy Storage System

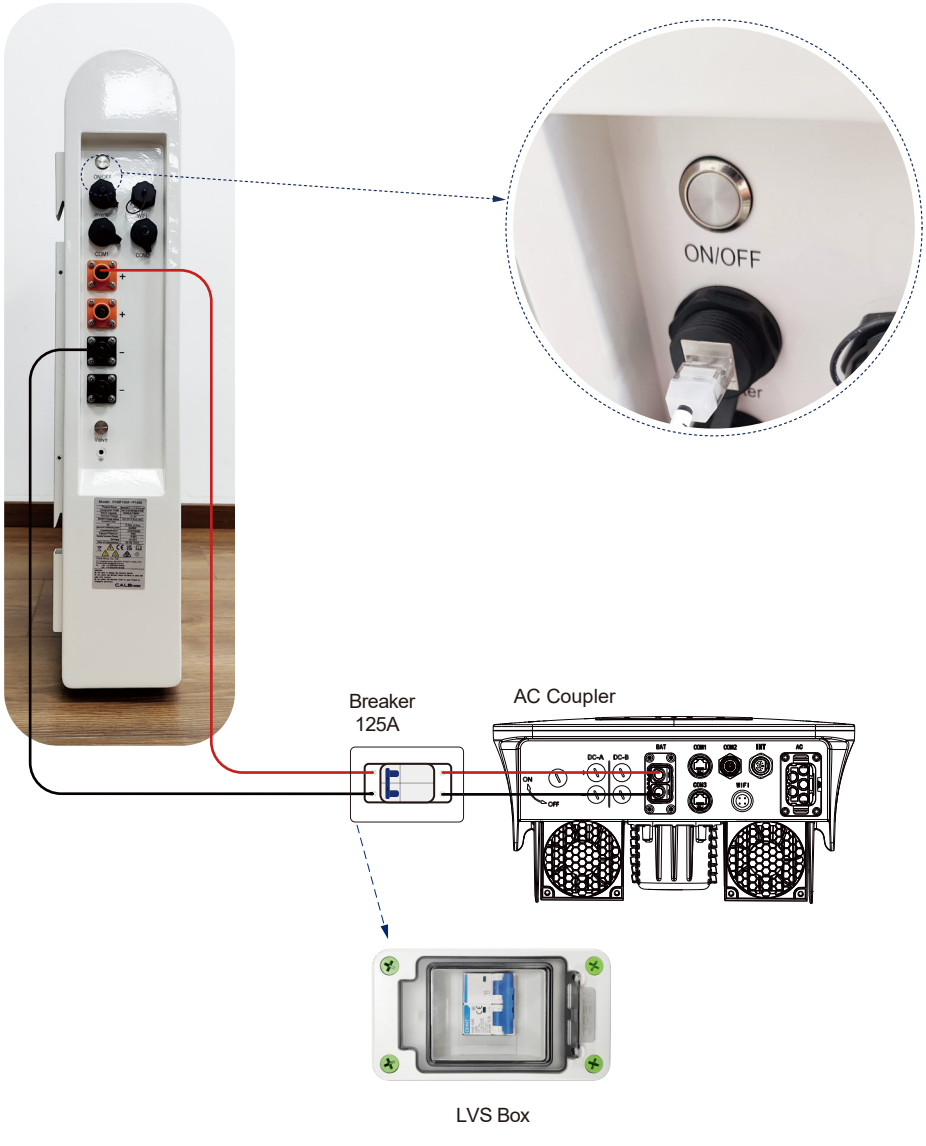
System Operation Notice:

- When turning ON the energy storage system:

1. Switch ON the circuit breaker first
2. Then turn ON the battery power

- When turning OFF the energy storage system:

1. Remove the communication cable from the AC coupler first
2. Turn OFF the battery power
3. Then switch OFF the circuit breaker



5.3 Sleep and Wake-up Function

When any of the following conditions are met, the system enters low-power mode:
1. The minimum unit voltage is lower than the sleep voltage and the duration reaches the sleep delay time (while meeting the requirements of no communication, no protection
No balance, no current).
2. Before entering sleep, it is necessary to ensure that the input terminal is not connected to external voltage, otherwise it will not be able to enter low-power mode.

When the system is in low-power mode and meets any of the following conditions, the system will exit low-power mode and enter normal operation mode:
1. Connect the charger, and the output voltage of the charger must be greater than 48V.
2. Communication activation.

5.4 System Status Instruction

There are 2 LED indicator, 1 strip LED gives status of SoC, 1 circular LED displays the battery status (indicating charging, discharging etc.)

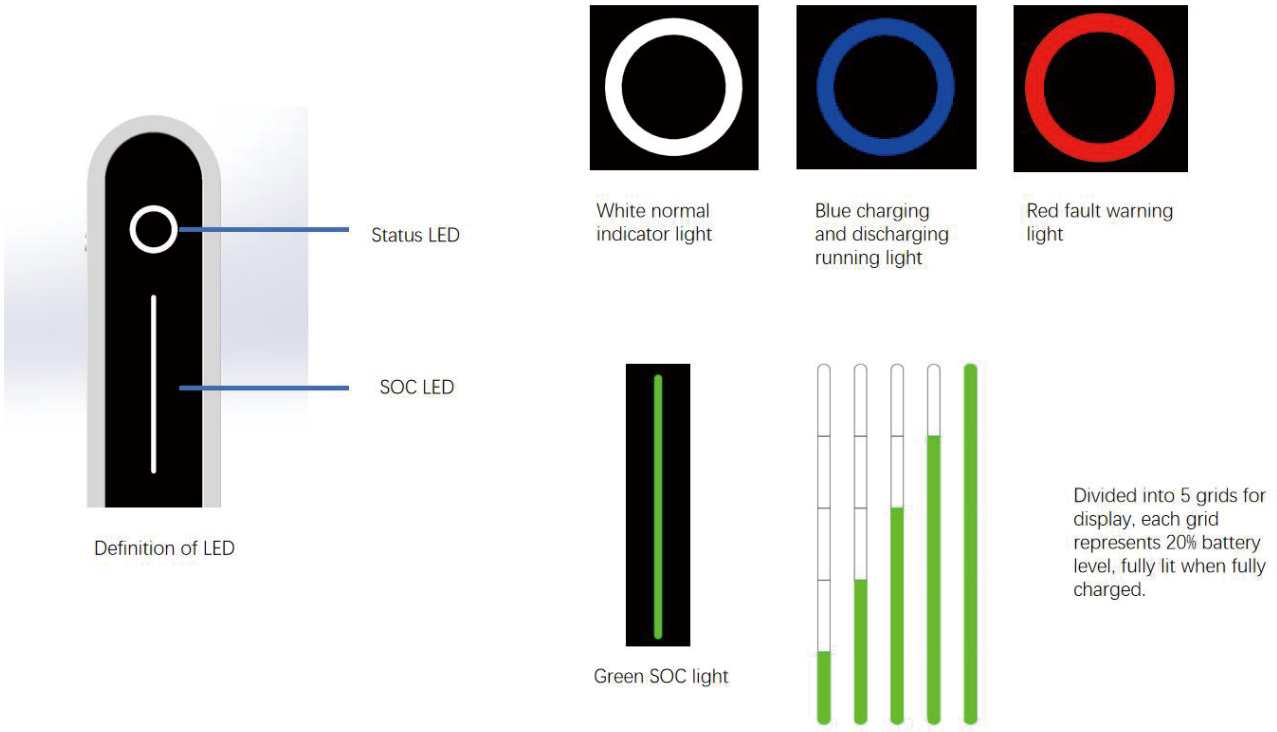


Fig.5.5 Definition of LED

6. Transportation and Storage

6.1 Transportation

It is forbidden to encounter serious vibration and shock during transportation.

6.2 Storage

If the system is not placed to use, the system must be properly stored. Otherwise, if any issues, CALB ENERGY shall not be liable.

- It should be stored at ventilation environment, Temp. < 35 °C, ROH <65%.
- It should be stored avoiding humid condition.
- It should be stored in place where they can be monitored by professionals.

⚠ **Note:**

A proper inspection shall be conducted every 3 months, to ensure no over-discharge of the battery (SoC is long time less than 0%) occurs. At over-discharge status, the battery would behavior as:
1. The battery could not start-up when turning the power switch to the ON position;
2. The battery output voltage is less than 40V when turned on;
3. Indicators are off and battery can not communicate to the upper computer via RS485/USB converter.

Please contact the technical person where you purchase the battery from immediately once the above abnormal issues occur. And actions in terms of re-charging the battery (to the SoC 50%) is required before the field installation.