

# Li<sup>+</sup>HUB E Series

## User Manual



**⚠ DANGER**

Prior to installation and use, read and understand product safety information. Failure to follow the instructions may result in Electric Shock, Explosion, or Fire, which may result in Serious Injury, Death, Damage to Device or Property. Do not discard this information.

## Table of Contents

<b>1 Safety Precautions</b> .....	<b>4</b>
1.1 General Safety.....	4
1.2 Personal Requirements.....	4
1.3 Electrical Safety.....	4
1.4 Battery Safety.....	4
1.5 Storage and Transportation.....	6
1.6 Installation Safety.....	7
1.7 Maintenance and Replacement.....	8
<b>2 Product Specifications</b> .....	<b>9</b>
2.1 Overview.....	9
2.2 Model.....	9
2.3 Technical Specifications.....	10
2.4 Appearance.....	12
2.5 Working Mode.....	13
2.6 Label Description.....	13
<b>3 Function</b> .....	<b>14</b>
3.1 Self-consumption Mode.....	14
3.2 Time-of-Use Mode.....	14
3.3 Backup Mode.....	15
<b>4. System Installation</b> .....	<b>17</b>
4.1 Checking Before the Installation.....	17
4.2 Preparing Tools and Instruments.....	17
4.3 Installation Positioning.....	18
4.4 Wall Mount Installation.....	19
4.5 Stackable Installation.....	23
<b>5. Electrical Connection</b> .....	<b>27</b>
5.1 Cables and Busbars.....	27
5.2 Electrical Connections of Battery Modules.....	28
5.2.1 Install Internal Ground Cables.....	28
5.2.2 Install Internal Busbars.....	29
5.2.3 Install Internal Signal Cables.....	30
5.3 Electrical Connections with Inverter.....	31
5.3.1 Install External Ground Cable.....	31
5.3.2 Install External Power Cables.....	32
5.3.3 Install External Signal Cable.....	33
<b>6. Operating the Energy Storage System</b> .....	<b>34</b>
6.1 Power On the Energy Storage System.....	34
6.2 Power Off the Energy Storage System.....	35
6.3 Install the Cover.....	36
<b>7. Customer Portal</b> .....	<b>39</b>
7.1 Download and Install LiHUB App.....	39
7.2 Log In To the Customer Portal.....	40
7.3 Add MagicPack1.0 To Cloud Service.....	41
7.4 Configure Host of LiHUB Battery.....	42

---

7.5 Configure Inverter.....	43
7.6 Historical Data.....	44
7.7 Alerts.....	45
7.8 Personalising LiHUB Account.....	48
7.9 Changing LiHUB Account.....	49
<b>8. Maintenance.....</b>	<b>50</b>
<b>9. Uninstallation &amp; Disposal.....</b>	<b>51</b>
9.1 Uninstallation.....	51
9.2 Disposal.....	51

# 1. Safety Precautions

## 1.1 General Safety

Before installing, operating, and maintaining the BESS, read this document and observe all the safety instructions on the BESS and in this document.

The "NOTICE", "WARNING", and "DANGER" statements in this document do not cover all the safety instructions. They are only supplements to the safety instructions. LiHUB Energy will not be liable for any consequence caused by the violation of general safety requirements or design, production, and usage safety standards.

Ensure that the BESS is used in environments that meet its design specifications. Otherwise, the BESS may become faulty, and the resulting malfunction, component damage, personal injuries, or property damage are not covered under the warranty.

Follow local laws and regulations when installing, operating, or maintaining the BESS. The safety instructions in this document are only supplements to local laws and regulations.

## 1.2 Personal Requirements

Personnel who plan to install or maintain LiHUB Energy Bess must receive thorough training, understand all necessary safety precautions, and be able to correctly perform all operations.

Only qualified professionals or trained personnel are allowed to install, operate, and maintain the BESS.

Only qualified professionals are allowed to remove safety facilities and inspect the BESS.

Personnel who will operate the BESS, including operators, trained personnel, and professionals, should possess the local national required qualifications in special operations such as high-voltage operations, working at heights, and operations of special equipment.

Only professionals or authorized personnel are allowed to replace the BESS or components (including firmware).

## 1.3 Electrical Safety

Before connecting busbars, cables, ensure that the BESS is intact. Otherwise, electric shocks or fire may occur.



- Do not connect or disconnect busbars, power cables with power-on. Transient contact between the core of the busbars, or power cable and the conductor will generate electric arcs or sparks, which may cause fire or personal injury.

When routing cables, ensure that a distance of at least 30 mm exists between the cables and heat-generating components or areas. This prevents damage to the insulation layer of the cables.

Bind cables of the same type together. When routing cables of different types, ensure that they are at least 30 mm away from each other.

## 1.4 Battery Safety

Do not expose batteries at high temperatures or around heat-generating sources, such as sunlight, fire sources, transformers, and heaters. The battery may catch a fire if overheated.

To avoid leakage, overheating, or fire, do not try to disassemble, diagnose, or repair batteries without authorization. Do not insert objects into batteries or get liquids into batteries.

### DANGER

The fire hazard of the lithium-ion battery energy storage system is high. Consider the following safety risks before handling batteries:

- Battery electrolyte is combustible, toxic, and volatile.
- Battery thermal runaway can generate flammable gas and harmful gas such as CO and HF.
- The concentration of flammable gas generated from battery thermal runaway may cause deflagration and explosion.

Do not perform welding or grinding work around batteries to prevent fire caused by electric sparks or arcs.

Do not use damaged batteries (such as damage caused when a battery is dropped, bumped, or dented on the enclosure). Damaged batteries may release flammable gases. Do not store damaged batteries near undamaged products.

Do not short-circuit wiring terminals of batteries. Short circuits can cause a fire.

### DANGER

Batteries may cause electric shocks and high short-circuit currents. When using the battery, pay attention to the following points:

- Remove any metal objects from yourself, such as watches and rings.
- Use tools with insulated handles.
- Wear rubber gloves and boots.
- Do not place tools or metal parts on top of batteries.
- Before connecting or disconnecting battery terminals, power off the battery first.
- Do not use water to clean electrical components inside or outside of the BESS.

During installation, ensure that the screws are tightened properly using a torque wrench and check them regularly.

### **Battery Emergency Measures:**

- Avoid contact with leaked liquids or gases in the case of battery leakage or abnormal odor. Do not approach the battery. Contact professionals immediately. Professionals must wear safety goggles, rubber gloves, gas masks, and protective clothing.
- Electrolyte is corrosive and can cause irritation and chemical burns. Should you come into direct contact with the battery electrolyte, do as follows:
  - Inhalation: Evacuate contaminated areas, get fresh air immediately, and seek immediate medical attention.
  - Eye contact: Immediately flush your eyes with water for at least 15 minutes, do not rub your eyes, and seek medical attention immediately.
  - Skin contact: Wash the affected areas immediately with soap and water and seek medical attention immediately.
  - Ingestion: Seek immediate medical attention.

**Fire Emergency Measures:**

- If a fire occurs, power off the system if it is safe to do so.
- Extinguish the fire with carbon dioxide, FM-200 or ABC dry powder fire extinguishers.
- Ask firefighters to avoid contact with high-voltage components during firefighting to prevent the risk of electric shock.
- Overheating may cause batteries to deform and leak corrosive electrolyte or toxic gas. Keep away from the batteries to avoid skin irritation and chemical burns.

**Flood Emergency Measures:**

- Power off the system if it is safe to do so.
- If any part of the batteries is submerged in water, do not touch the batteries to avoid electric shock.
- Do not use batteries that have been soaked in water. Contact a battery recycling company for disposal.

**Dropped Battery Emergency Measures:**

- If a battery pack is dropped or violently impacted during installation, internal damage may occur. Do not use such battery packs; otherwise, safety risks such as cell leakage and electric shock may arise.
- If a dropped battery has obvious damage or abnormal odor, smoke, or fire occurs, evacuate the personnel immediately, call emergency services, and contact the professionals. The professionals can use fire extinguishing facilities to extinguish the fire under safety protection.
- If a dropped battery has no obvious deformation or damage and no abnormal odor, smoke, or fire occurs, contact the professionals to transfer the battery to an open and safe place, or contact a recycling company for disposal.

**Battery Recycling**

- Dispose of used batteries in accordance with local laws and regulations. Do not dispose of batteries as household waste.
- If the batteries leak or are damaged, contact technical support or a battery recycling company for disposal.
- If the batteries are out of service life, contact a battery recycling company for disposal.
- Do not expose batteries to high temperatures or direct sunlight.
- Do not expose batteries to high humidity or corrosive environments.

## 1.5 Storage and Transportation

The batteries must be stored in a clean, dry, and well-ventilated place and be protected from dust and water vapor corrosion. The batteries must be protected against rain and water.

Ambient temperature is -10-40°C, relative humidity is 5%-90%. Keep batteries away from direct sunlight.

Do not store batteries for extended periods. Storing lithium batteries for extended periods may cause capacity loss. Generally, the irreversible capacity loss is 3% to 5% after lithium batteries are stored at the recommended storage temperature range for 12 months.

**NOTICE**

- The product passes the certifications of the UN38.3 (UN38.3: Section 38.3 of the sixth Revised Edition of the Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria) and SN/T 0370.2-2009 (Part 2: Performance Test of the Rules for the Inspection of Packaging for Exporting Dangerous Goods). This product belongs to Class 9 dangerous goods.

- Load and unload the batteries in compliance with local laws, regulations, and industry standards. Reckless handling may cause short circuits or damage to batteries in the container, which may result in battery leakage, rupture, explosion, or fire.

#### NOTICE

#### In Transportation:

- The batteries cannot be transported by rail or air.
- Maritime transport must comply with the International Maritime Dangerous Goods Code (IMDG Code).
- Road transport must comply with the International Carriage of Dangerous Goods by Road (ADR) or JT T617.
- Comply with the requirements of the transportation regulatory authorities in the countries of departure, route, and destination.

## 1.6 Installation Safety

#### WARNING

#### ● **INDOOR USE ONLY**

The installation and use environment must meet relevant international, national, and local standards for lithium batteries, and are in accordance with the local laws and regulations.

When installing the battery in a garage, keep it away from the drive way.

When installing the battery in a basement, keep good ventilation. Do not place flammable or explosive materials around the battery.

Install the battery in a dry and well-ventilated environment. Secure the battery on a solid and flat surface.

Install the battery in a clean environment that is free from sources of strong infrared radiation, organic solvents, and corrosive gases.

For areas prone to natural disasters such as floods, debris flows, earthquakes, and typhoons/hurricanes, take corresponding precautions for installation.

Keep the battery away from fire sources. Do not place any flammable or explosive materials around the battery.

Keep the battery away from water sources such as taps, sewer pipes, and sprinklers to prevent water seepage.

Do not expose the battery to flammable or explosive gas or smoke. Do not perform any operation on the battery in such environments.

Do not install the battery outdoors in salt-affected areas because it may corrode. A salt-affected area refers to the region within 500 meters from the coast or prone to sea breeze. The regions prone to sea breeze vary with weather conditions (such as typhoons and monsoons) or terrains (such as dams and hills).

In backup power scenarios, do not use the battery for situations like medical devices substantially important to human life, control equipment such as trains and elevators, computer systems of social and public importance, locations near medical devices, or other devices similar to those described above.

When drilling holes into a wall or floor, wear goggles and protective gloves when drilling holes.

Be cautious to avoid injury when moving heavy objects, and 2-3 workers are required to install the BESS.

When moving the BESS by hand, wear protective gloves to prevent injuries.

## 1.7 Maintenance and Replacement

### DANGER

- Prior to maintenance, power off the equipment and strictly comply with the safety precautions in this document and relevant documents. Improper operation may cause an electric shock, which could result in death, serious injury, or serious property damage.

Maintain the BESS with sufficient knowledge of this document and using proper tools and testing equipment.

Place temporary warning signs or erect fences to prevent unauthorized access to the maintenance site.

The BESS can be powered on only after all faults are rectified. Failing to do so may escalate faults or damage the equipment.

Do not open the cover without authorization. Otherwise, electric shocks may occur, and the resulting faults are beyond warranty scope.

Installation personnel, maintenance personnel, and technical support personnel must be trained to operate and maintain the equipment safely and correctly, take comprehensive precautionary measures, and be equipped with protective instruments.

Battery maintenance should be carried out or supervised by personnel who are familiar with batteries and the precautions required.

### NOTICE

- When replacing batteries, replace them with batteries or battery strings of the same type.
- If the equipment is not used for a long time, store and recharge batteries according to this document.
- If the equipment is faulty, contact your dealer.



## 2. Product Specifications

### 2.1 Overview

LiHUB E series Battery Energy Storage System (BESS) is designed for home use. Its safest Lithium Iron Phosphate (LiFePO<sub>4</sub>) battery chemistry provides energy storage for solar self-consumption, time-of-use, and back up.

LiHUB E series is convenient connection to any home or building. Its modular design achieves fast scalable to 10kWh, 15kWh, 20kWh, 25kWh, 30kWh by connecting up more MagicPack1.0 units.

### 2.2 Model

LiHUB E series includes 7 models to meet energy demands of houses.



E5 – 5.0kWh



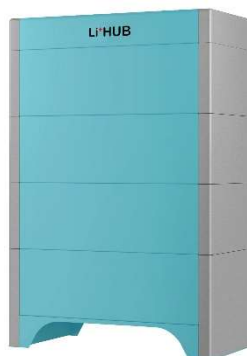
E10 – 10.0kWh



E15 – 15.0kWh



E15F – 15.0kWh



E20 – 20.0kWh



E25 – 25.0kWh



E30 – 30.0kWh

## 2.3 Technical Specifications

Technical Specifications	E5	E10	E15
Battery Chemistry	Lithium Iron Phosphate (LiFePO <sub>4</sub> )		
Battery Module	MagicPack1.0		
Battery Module Rated Energy	5.0 kWh		
Number of Battery Module	1	2	3
Rated Energy	5.0 kWh	10.0 kWh	15.0 kWh
Useable Energy* <sup>1</sup>	4.8 kWh	9.6 kWh	14.4 kWh
Continuous Output Power	3 kW	6 kW	8 kW
Peak Output Power* <sup>2</sup>	4 kW	8 kW	10 kW
Continuous Input Power	3 kW	6 kW	6 kW
Nominal Voltage (single phase system)	51.2 V		
Operating Voltage Range (single phase system)	48 V ~ 58.4 V		
Input/Charge Voltage* <sup>3</sup>	56.8 V ~ 57.6 V		
Charge Cut-off Voltage	58.4 V		
Output/Discharge Cut-off Voltage* <sup>3</sup>	48 V		
Round Trip Efficiency	90%		
Number of Cycles	5,000 @ 90% DOD		
Operating Temperature	-10°C ~ 60°C		
Ambient Temperature in Charge	0°C ~ 40°C		
Ambient Temperature in Discharge	-10°C ~ 45°C		
Enclosure Protection	IP 43		
Cooling	Natural Convection		
Dimensions (W x D x H)	685 x 205 x 516 mm 27 x 8.1 x 20.3 inch	685 x 205 x 833 mm 27 x 8.1 x 32.8 inch	685 x 205 x 1150 mm 27 x 8.1 x 45.3 inch
Weight	56 kg/123 lb	106 kg/234 lb	156 kg/344 lb
Environment	Indoor Use Only		

\*1 It is calculated by 90% depth of discharge (DoD) after BESS is fully charged at 25°C.

\*2 The duration is 30 seconds.

\*3 Set up battery voltage value on inverter will be changed depend on battery management strategy.

Technical Specifications	E15F	E20	E25	E30
Battery Chemistry	Lithium Iron Phosphate (LiFePO4)			
Battery Module	MagicPack1.0			
Battery Module Rated Energy	5.0 kWh			
Number of Battery Module	3	4	5	6
Rated Energy	15.0 kWh	20.0 kWh	25.0 kWh	30.0 kWh
Useable Energy* <sup>1</sup>	14.4 kWh	19.2 kWh	24 kWh	28.8 kWh
Continuous Output Power	8 kW	10 kW	10 kW	10 kW
Peak Output Power* <sup>2</sup>	10 kW	12 kW	12 kW	12 kW
Continuous Input Power	6 kW	8 kW	8 kW	8 kW
Nominal Voltage (single phase system)	51.2 V			
Operating Voltage Range (single phase system)	48 V ~ 58.4 V			
Input/Charge Voltage* <sup>3</sup>	56.8 V ~ 57.6 V			
Charge Cut-off Voltage	58.4 V			
Output/Discharge Cut-off Voltage* <sup>3</sup>	48 V			
Round Trip Efficiency	90%			
Number of Cycles	5,000 @ 90% DOD			
Operating Temperature	-10°C ~ 60°C			
Ambient Temperature in Charge	0°C ~ 40°C			
Ambient Temperature in Discharge	-10°C ~ 45°C			
Enclosure Protection	IP 43			
Cooling	Natural Convection			
Dimensions (W x D x H)	685 x 316 x 816 mm 27 x 12.5 x 32.1 inch	685 x 316 x 1022 mm 27 x 12.5 x 40.3 inch	685 x 316 x 1227 mm 27 x 12.5 x 48.3 inch	685 x 316 x 1433 mm 27 x 12.5 x 56.4 inch
Weight	162 kg/357 lb	212 kg/467 lb	262 kg/578 lb	312 kg/688 lb
Environment	Indoor Use Only			

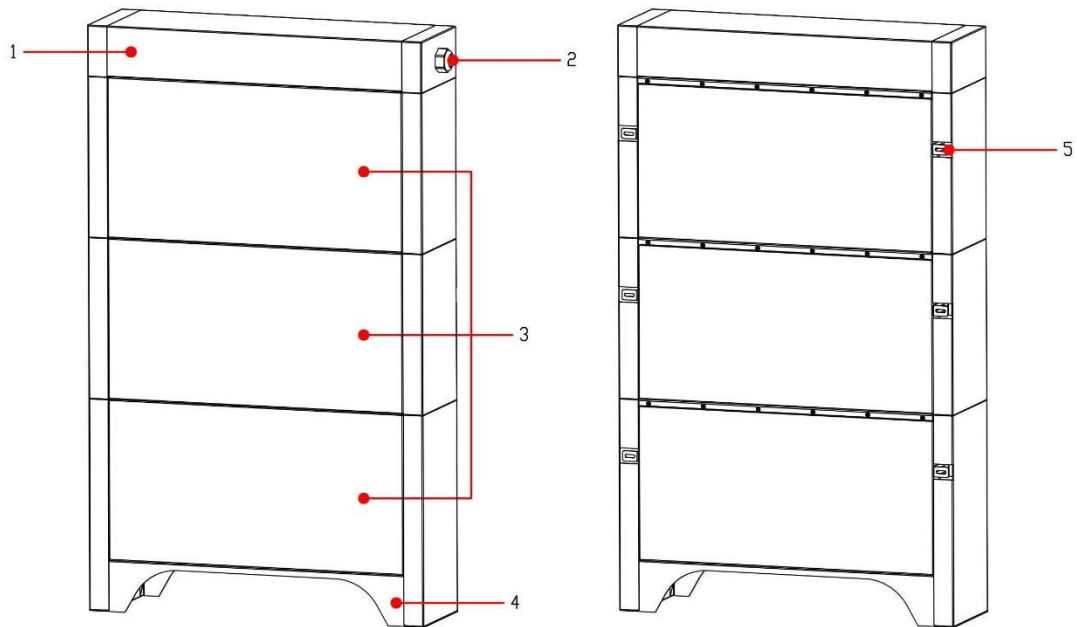
\*1 It is calculated by 90% depth of discharge (DoD) after BESS is fully charged at 25°C.

\*2 The duration is 30 seconds.

\*3 Set up battery voltage value on inverter will be changed depend on battery management strategy.

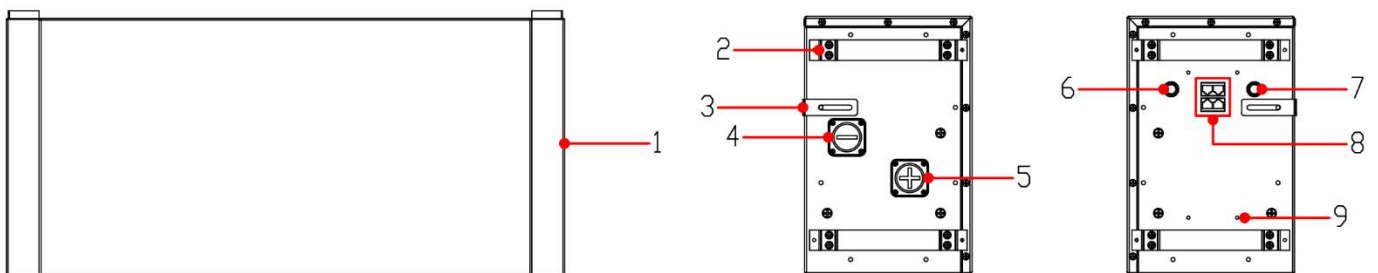
## 2.4 Appearance

Figure 2-1 Battery energy storage system (BESS). Take E15 for an example.



- |                     |                      |                |
|---------------------|----------------------|----------------|
| 1 Cover             | 2 DC Input/Output    | 3 MagicPack1.0 |
| 4 Installation base | 5 T connection plate |                |

Figure 2-2 MagicPack1.0 battery module



- |                               |                               |                      |
|-------------------------------|-------------------------------|----------------------|
| 1 Side cover                  | 2 Handle                      | 3 T connection plate |
| 4 Battery negative terminal - | 5 Battery positive terminal + | 6 Reset button       |
| 7 DC switch                   | 8 COM port                    | 9 Ground point       |

## 2.5 Working Mode

The LiHUB E series store electric energy from solar PV, grid, or generator through independent hybrid inverter. It can output electric energy to power home loads or grid through the independent hybrid inverter too.

The LiHUB E series can work in operating, standby, or sleep mode.

Working Mode	Description	Power Consumption
Operating mode	Battery management system (BMS) runs in full-featured mode. Battery input, or output is opened.	≤25mA
Sleep mode	Battery management system (BMS) gets into shut down mode. Battery output is closed, but input is opened.	≤800uA

## 2.6 Label Description

Figure 2-4 Label on MagicPack1.0 battery module

Li+HUB

Model: MagicPack1.0

Name: Energy Storage Module

---

Battery Chemistry: Lithium Iron Phosphate (LiFePO4)

Nominal Voltage: 51.2 V

Rated Energy: 5.35 kWh





Input Voltage: 56.8V - 57.6 V

Output Cut-off Voltage: 48 V

Enclosure Protection: IP30

Environment: Indoor use only

Weight: 50 kg

S/N:

---

LiHUB Energy

MADE IN CHINA

## 3. Function

LiHUB E series is an intelligent residential battery energy storage system that monitors and controls energy production, consumption, and storage in the house. The storage system is connected to the grid via the main distribution board.

The LiHUB E series can work with existing or newly installed PV systems. The PV array does not connect to the storage system directly. The storage system monitors PV power generation and energy consumption in the house.

The LiHUB E series offers three modes of operation: Self-consumption, Time of Use, and Backup.

### 3.1 Self-consumption Mode

Self-consumption is the part of the generated PV power that has been either consumed at home or stored in the battery.

#### Generation > Consumption

If the generation of PV power is higher than the consumption such as at midday, there is a surplus of electrical energy. In this case the surplus energy is used to charge the battery of the storage system.

If the entire portion of the surplus cannot be charged into the battery, then fed it into the power grid.

#### Consumption > Generation

If the consumption is higher than the generation of PV power such as in the evening, there is a deficit of electrical energy. In this case the battery of the storage system is discharged to even out as much of the deficit as possible. If the entire deficit cannot be compensated by discharging the battery, the remaining deficit is covered by power grid.

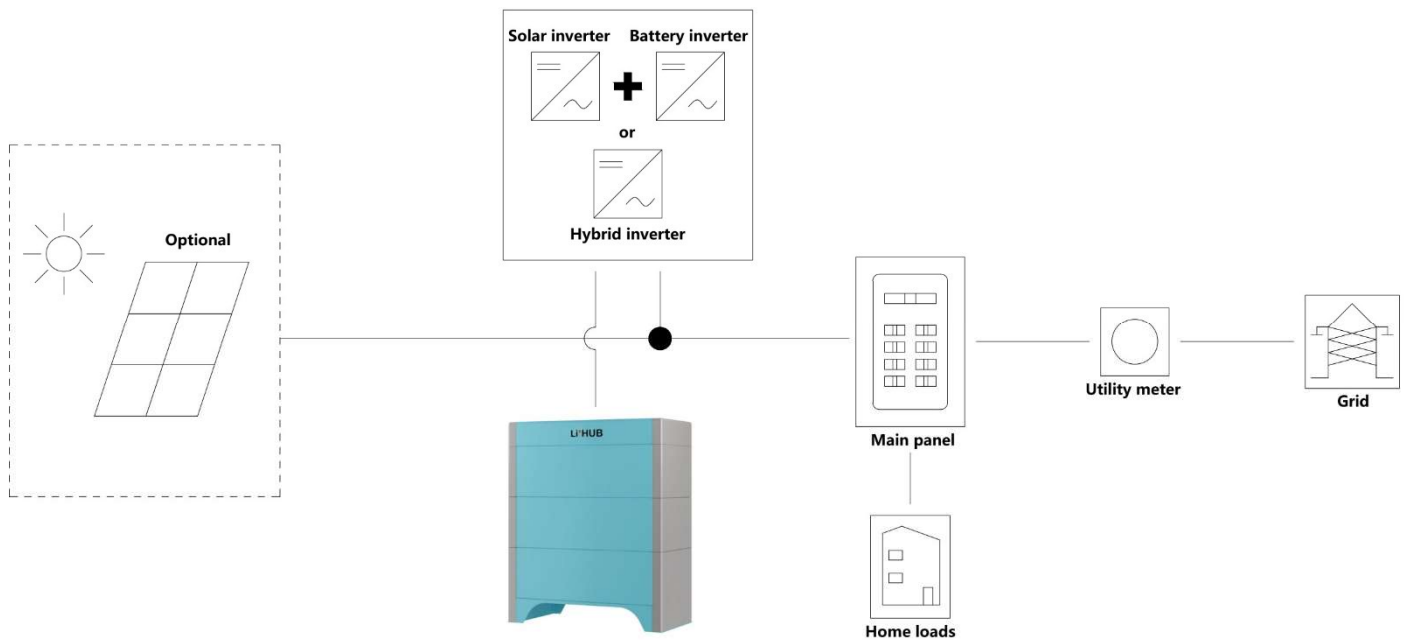
### 3.2 Time-of-Use Mode

This mode is similar in function to self-consumption except that the storage system will charge the batteries from the grid during the specific time windows selected by the customer. By setting the storage system to time of use mode, customers can store electricity in the battery when electricity prices are low, and then use this stored electricity to supply the household appliances at times of peak rate. The batteries are prevented from discharging during the selected windows of time of use.

If your electricity provider company offers you time of use electricity tariffs, in which there is a price difference between the peak and off-peak rates, you may consider setting the storage system to time of use mode.

Please contact your LiHUB Energy support team to set up the ToU mode.

Figure 3-1 Self-consumption, ToU connection diagram



### 3.3 Backup Mode

LiHUB E series also acts as a backup power supply, meaning that if the utility grid goes out, your appliances will be powered by the batteries of the storage system conditioned upon installer connection of back up function.

LiHUB E series automatically switches from grid to backup operation and vice versa. In the event of a grid failure, the storage system automatically detects the grid outage and will disconnect itself from the public electrical mains and will create a micro-grid using the power from the batteries. Appliances connected to backup loads circuit in the house will be supplied with electrical power. Appliances connected to normal loads circuit in the house will not be supplied with electrical power.

During the backup operation, the micro-grid produces grid-quality voltage and frequency so that any grid-connected PV inverter in the micro-grid will continue to operate. Therefore, during backup operation, the backup loads circuit will be powered by the energy stored in the battery modules and the PV energy generated from the PV array. The generated PV power will also charge the battery modules, depending on generation and consumption levels.

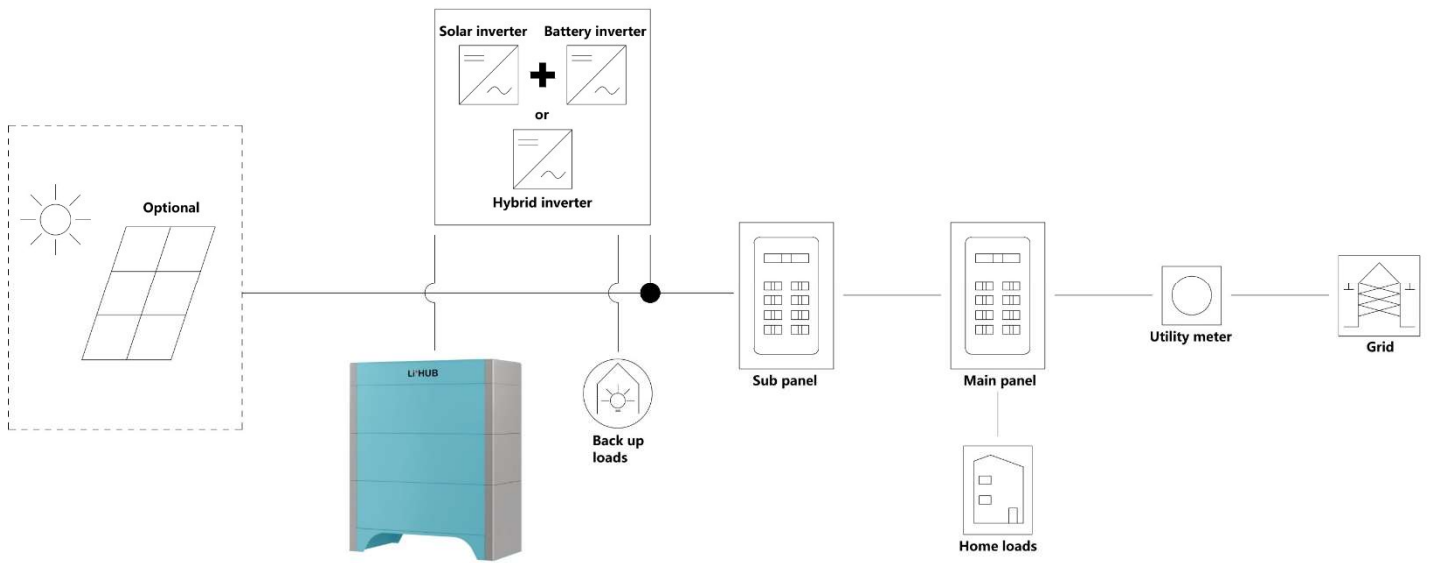
The PV array will first power the loads on the backup load circuit, with any excess energy charging the batteries in the storage system. If there is insufficient PV to cover the loads, the storage system will discharge its batteries to meet the demand.

#### Microgrid Operation

1. If the battery SOC drops to a minimum threshold during backup mode. The microgrid will be deactivated, and the system will go to 'sleep mode'. The backup loads and the external PV inverter on the micro-grid will disconnect consequently.
2. The system will remain in 'sleep mode' till there is sufficient excess PV energy to recharge the battery, the micro-grid will back to operating mode (Refer to 2.5 Working Mode).

3. Otherwise, the microgrid will keep in “sleep mode” to prevent battery over-discharge event.

Figure 3-2 Backup mode connection diagram






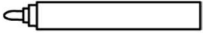
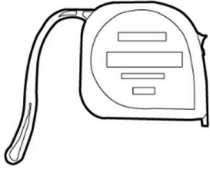


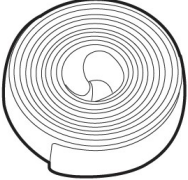
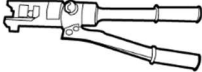




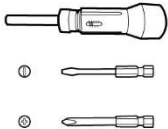
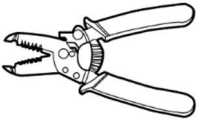
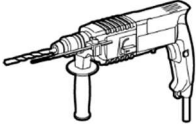
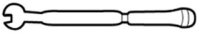
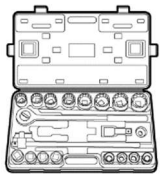




## 4. System Installation

### 4.1 Checking Before the Installation

Before unpacking the battery, check the outer packing for damage, such as holes and cracks, and check the battery modules. If any damage is found or the battery modules are not what you requested, do not unpack the product and contact your dealer as soon as possible.

After unpacking the battery, check that the deliverables are intact and complete, and free from any obvious damage. If any item is missing or damaged, contact your dealer.

### 4.2 Preparing Tools and Instruments

Type	Tools and Instruments			
Installation				
	Level ruler	Marker	Tape measure	Cable tie
				
	Heat gun	Heat shrink tubing	Hydraulic pliers	Multimeter
Installation				
	Open-end-wrench	Cord end terminal crimper	Cable cutter	Screwdriver
				
Wire strippers	Hammer drill	Torque wrench	Torque socket wrench	
Personal protective equipment (PPE)				
Safety gloves	Safety goggles	Dust mask	Safety boots	

## 4.3 Installation Positioning

### NOTICE

#### Network Requirements

- In order to use cloud services, the product needs to be installed where is covered by WI-FI network.

#### Installation Angle Requirements

- The battery can be wall-mounted, or stackable. Do not install the battery at forward tilted, back tilted, side tilted, or upside down.

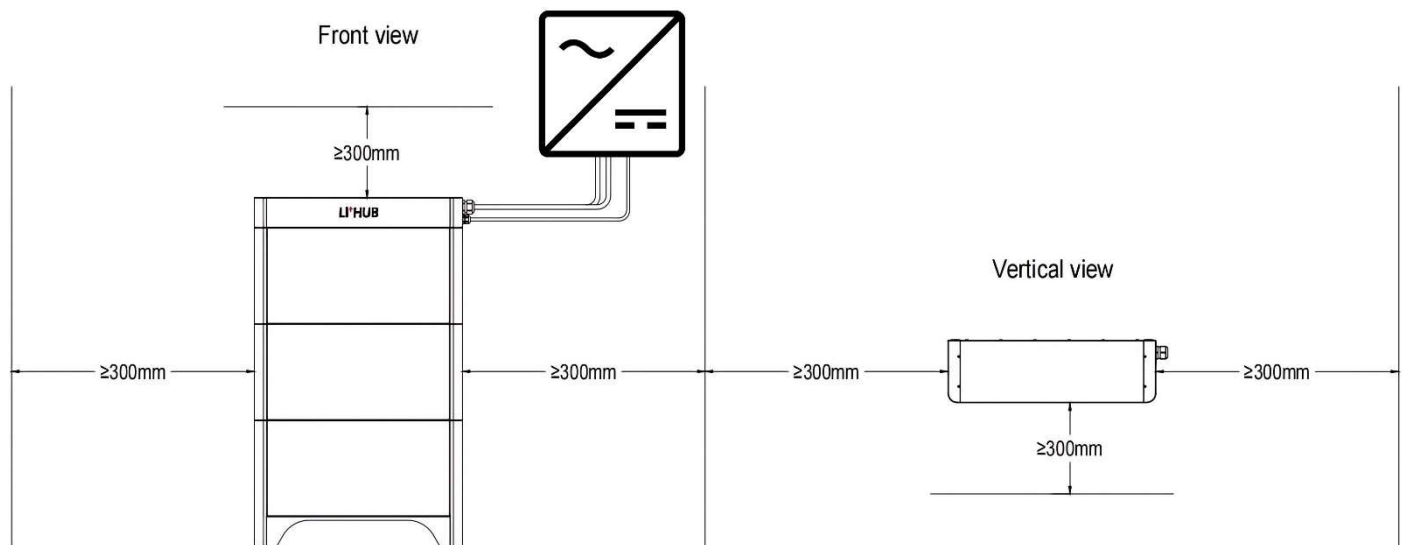
#### Installation Position Requirements

- Install the battery on a solid brick-concrete structure or concrete wall or floor. If other types of walls and floors are used, they must be made of fire-retardant materials and meet the load-bearing requirements of the energy storage.

#### Installation Space Requirements

- During installation, ensure that there is no other devices or flammable or explosive materials around the batteries. Reserve adequate space for heat dissipation and safety isolation.

Figure 4-1 Installation space. Take E15 for an example.



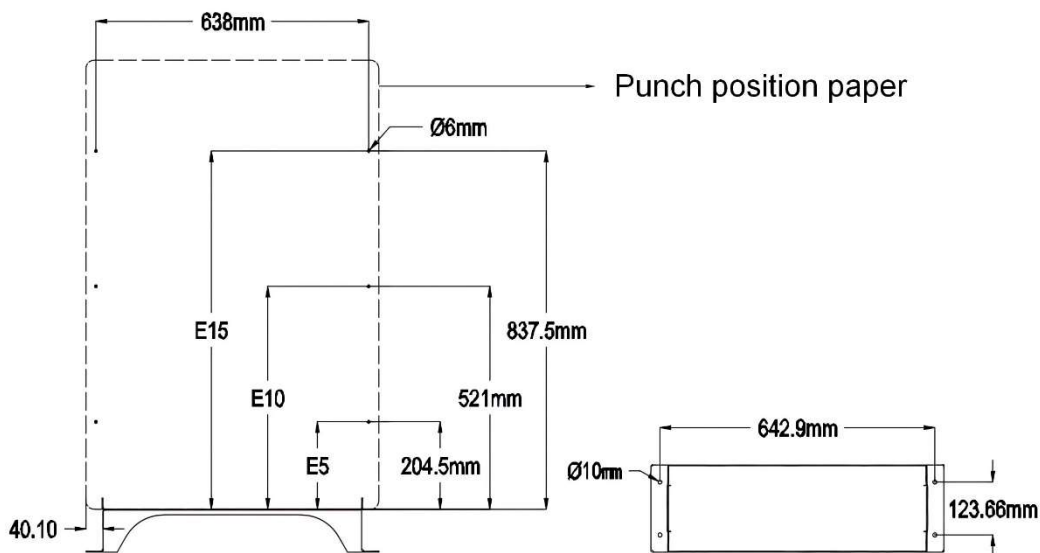
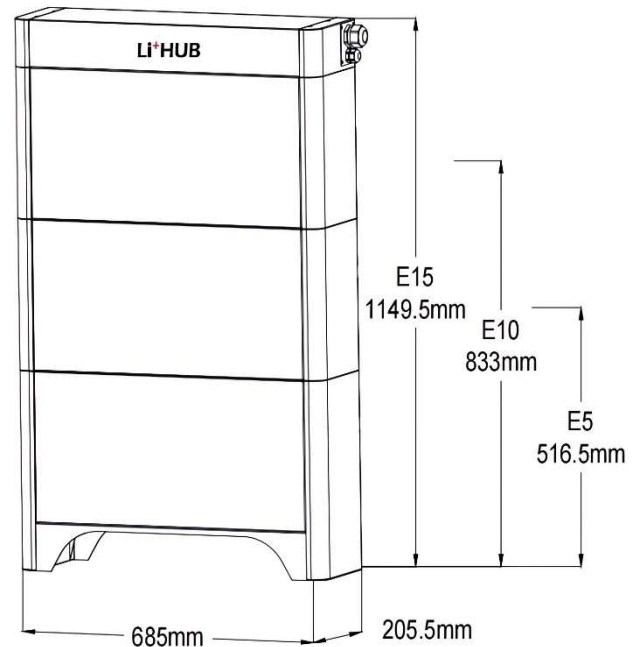
## 4.4 Wall Mount Installation

### NOTICE

- Wall mount installation apply to E5, E10, and E5 models.

Figure 4-2 Dimensions of mounting holes

\*After installing the installation base, put the punch position paper on the base to position mounting holes.



## Operation

1. Align the installation base with the wall surface and keep the base 10 mm to 15mm away from the wall surface. Level the hole positions using a level ruler, and mark the hole positions for installing by a marker.

Align the marking-off template with the surface of the installation base, determine the drilling hole positions on the wall for securing all MagicPack1.0 battery modules, and mark the positions using a marker.

## 2. Install the installation base.

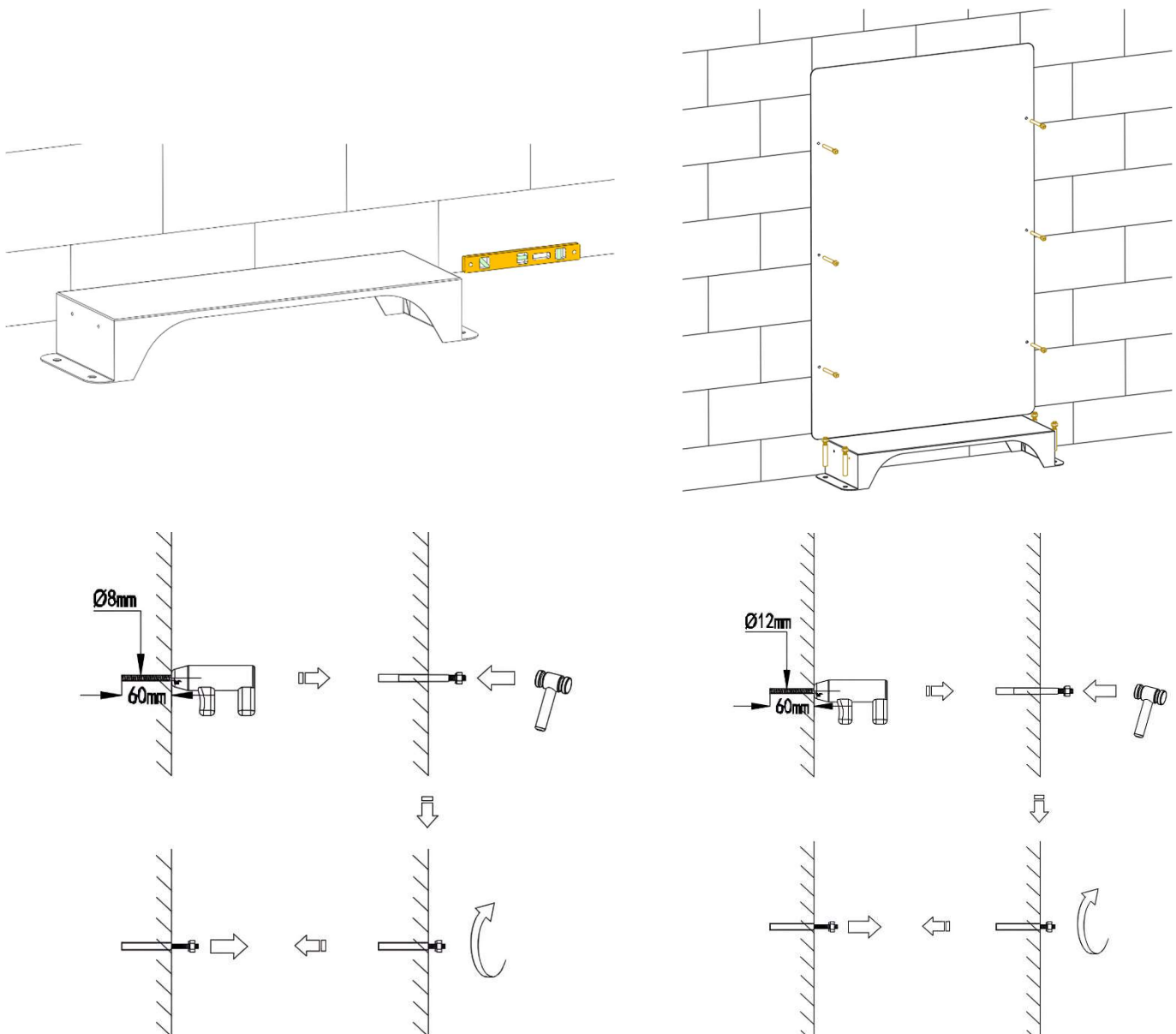
### **⚠ DANGER**

- When drilling holes, avoid the water pipes, power cables buried in the wall or floor.

### **NOTICE**

- The expansion bolts delivered with the battery are mainly used for solid concrete walls and concrete floors. If other types of walls, or floors are used, ensure that the walls, or floors meet the load-bearing requirements (one MagicPack1.0 weighs 50 kg) and select the bolts by yourself.
- M12x60 expansion bolts delivered with the battery are used to fix the installation base. If the length and quantity of the bolts do not meet installation requirements, prepare expansion bolts by yourself.
- M8x60 expansion bolts delivered with the battery are used to fix all MagicPack1.0 battery modules. If the length and quantity of the bolts do not meet installation requirements, prepare expansion bolts by yourself.

Figure 4-3 Installing expansion bolts

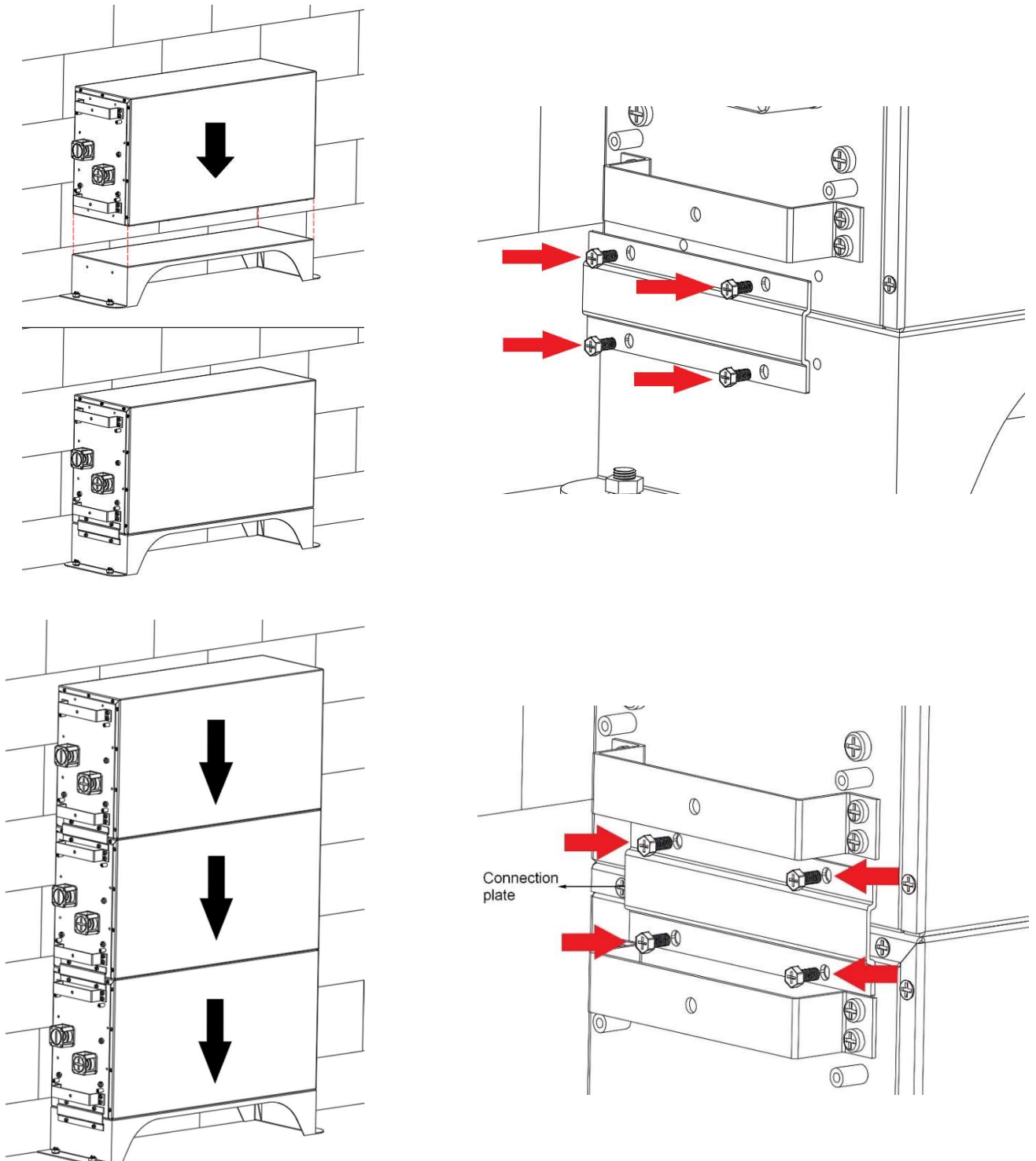


3. Place the first MagicPack1.0 (E5) on the installation base, install the left and right connective pieces, install the second MagicPack1.0 (E10) or third MagicPack1.0 (E15) when necessary, and cover from bottom to top.

**⚠ WARNING**

- After installing a MagicPack1.0, install and tighten the connecting pieces and screws on the left and right sides of it, and then install the next one.

Figure 4-4 Installing MagicPack1.0 battery modules. Take E15 for an example.

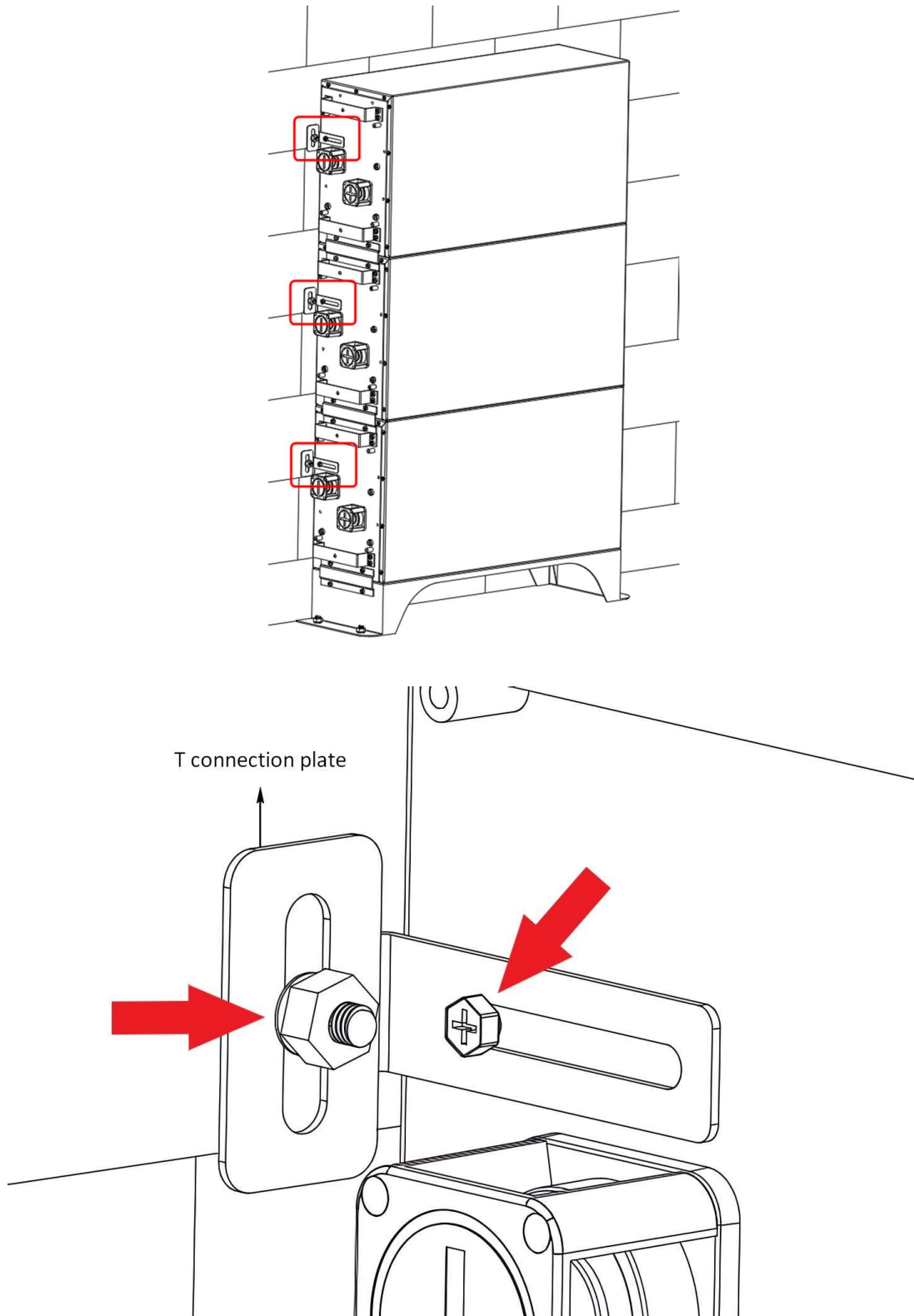


4. Secure all MagicPack1.0 battery modules to the wall using wall mount brackets.

**WARNING**

- All MagicPack1.0 battery modules must be fixed on the wall to prevent them from falling down.

Figure 4-5 Fixing MagicPack1.0 battery modules by T connection plate. Take E15 for an example.



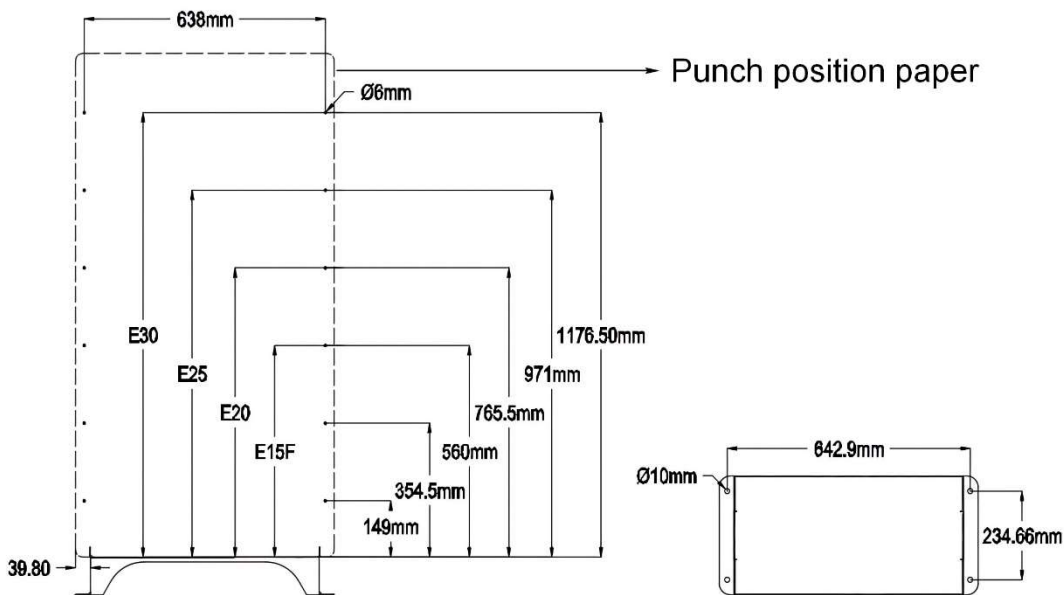
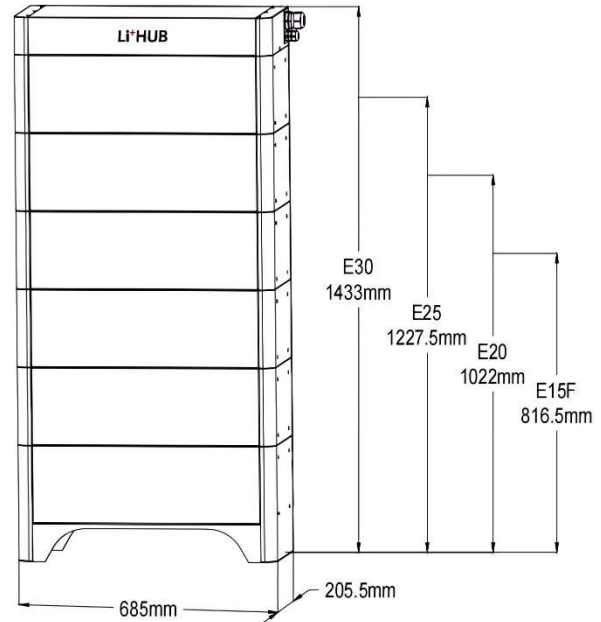
## 4.5 Stackable Installation

### NOTICE

- Stackable installation applies to E15F, E20, E25, and E30 models.

Figure 4-6 Dimensions of mounting holes

\*After installing the installation base, put the punch position paper on the base to position mounting holes.



## Operation

- Align the installation base with the wall surface and keep the base 10 mm to 15mm away from the wall surface. Level the hole positions using a level ruler, and mark the hole positions for installing by a marker.

Align the marking-off template with the surface of the installation base, determine the drilling hole positions on the wall for securing all MagicPack1.0 battery modules, and mark the positions using a marker.

## 2. Install the installation base.

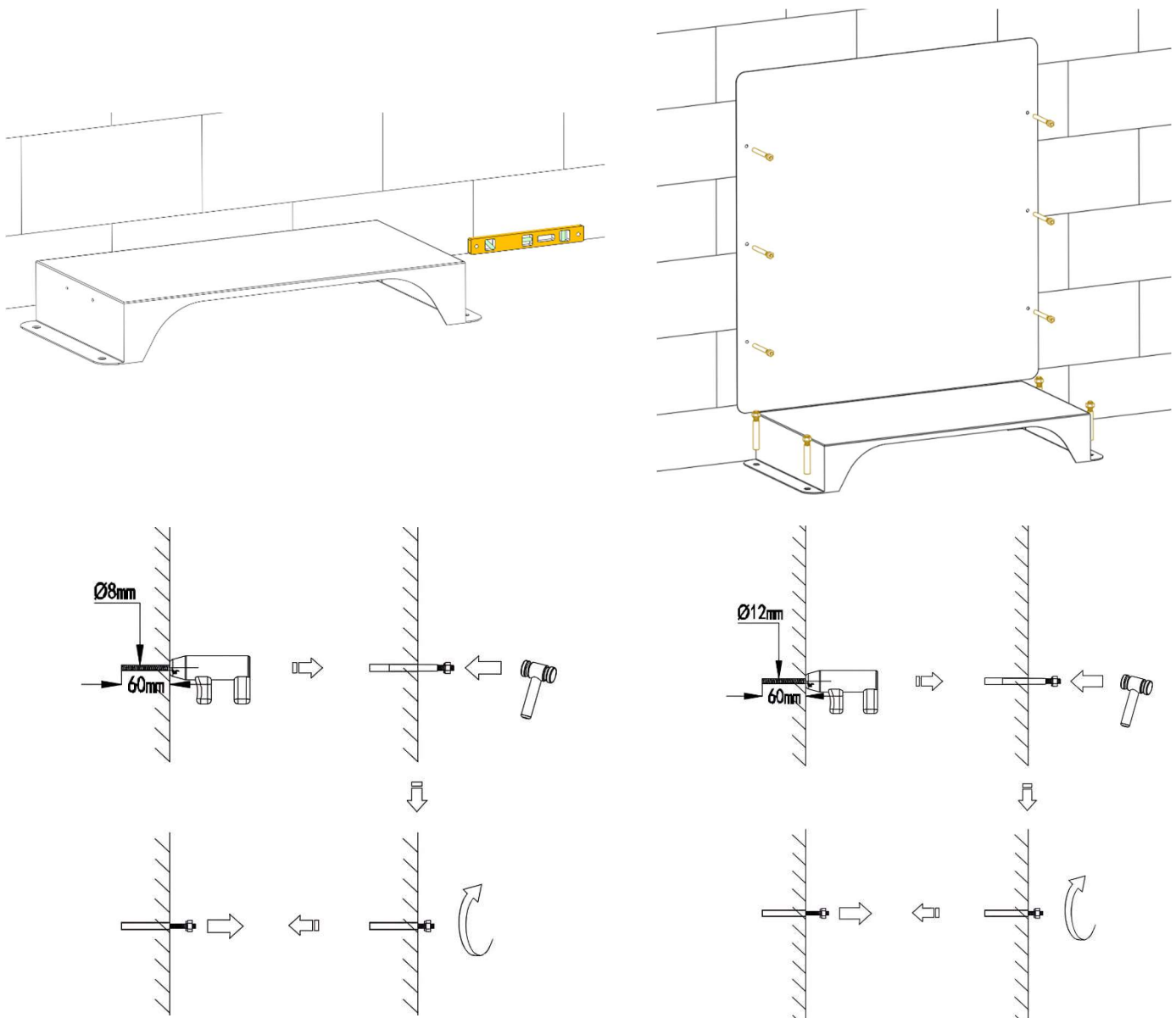
### **DANGER**

- When drilling holes, avoid the water pipes, power cables buried in the wall or floor.

### **NOTICE**

- The expansion bolts delivered with the battery are mainly used for solid concrete walls and concrete floors. If other types of walls, or floors are used, ensure that the walls, or floors meet the load-bearing requirements (one MagicPack1.0 weighs 50 kg) and select the bolts by yourself.
- M12x60 expansion bolts delivered with the battery are used to fix the installation base. If the length and quantity of the bolts do not meet installation requirements, prepare expansion bolts by yourself.
- M8x60 expansion bolts delivered with the battery are used to fix all MagicPack1.0 battery modules. If the length and quantity of the bolts do not meet installation requirements, prepare expansion bolts by yourself.

Figure 4-7 Installing expansion bolts. Take E15F for an example.



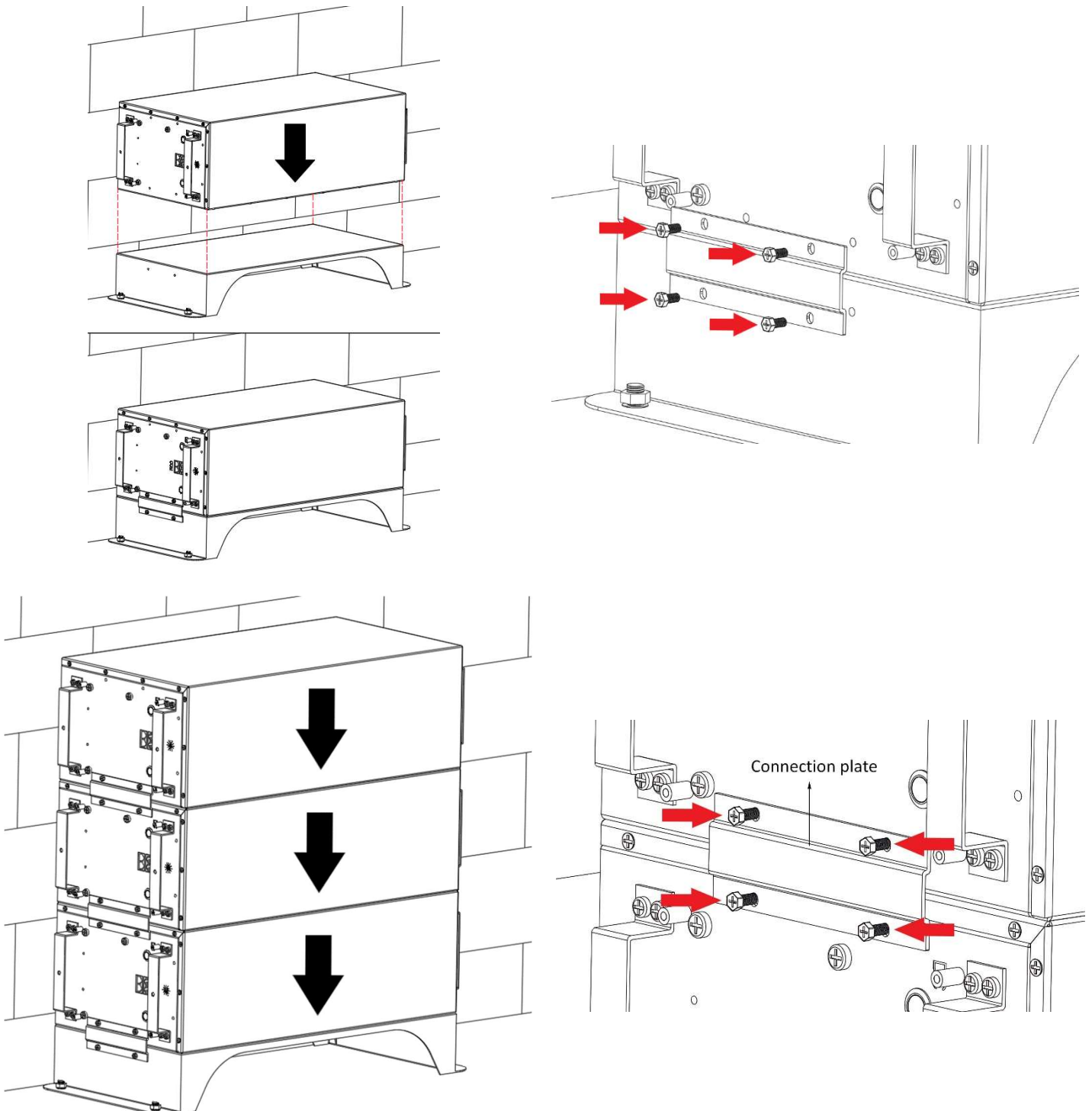


3. Place the 3 pieces MagicPack1.0 (E15F) on the installation base, install the left and right connective pieces, install more MagicPack1.0 battery modules to get E20, E25, or E30 when necessary, and cover from bottom to top.

**⚠ WARNING**

- After installing a MagicPack1.0, install and tighten the connecting pieces and screws on the left and right sides of it, and then install the next one.

Figure 4-8 Installing MagicPack1.0 battery modules. Take E15F for an example.

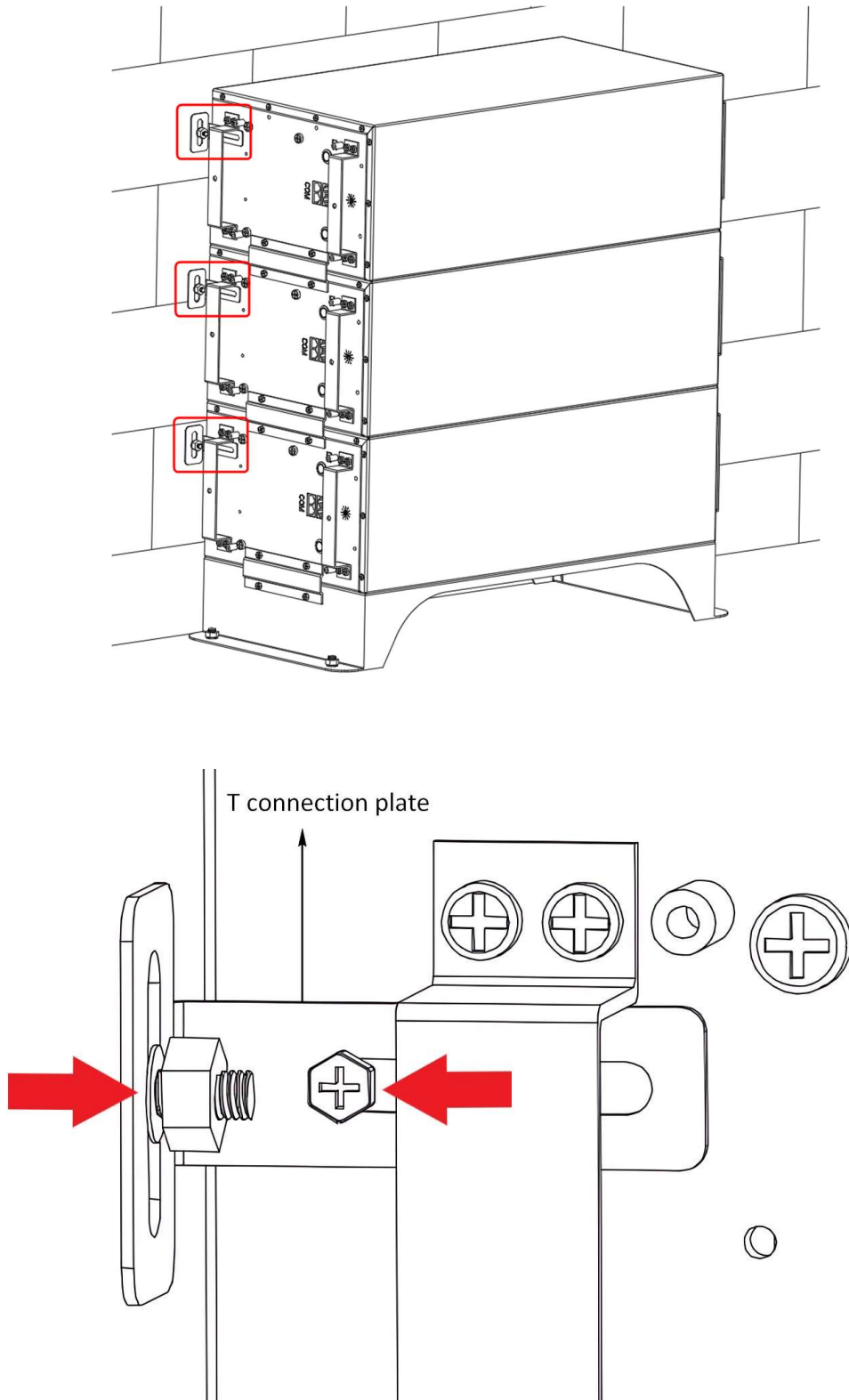


4. Secure all MagicPack1.0 battery modules to the wall using wall mount brackets.

**⚠ WARNING**

- All MagicPack1.0 battery modules must be fixed on the wall to prevent them from falling down.

Figure 4-9 Fixing MagicPack1.0 battery modules by T connection plate. Take E15F for an example.



## 5. Electrical Connection

### Precautions

#### DANGER

- Before connecting cables, or busbars, ensure that the DC switch on the battery and all the switches connected to the battery are set to OFF. Otherwise spark, or electric shock maybe happened.

#### WARNING

- The equipment damage caused by incorrect busbar, or cable connections is not covered under any warranty.
- Only certified installers are allowed to connect cables.
- Operation personnel must wear proper PPE when connecting cables, or busbars.

### 5.1 Cables and Busbars

Busbars are delivered with the product, please choose the correct busbars to connect all MagicPack1.0 battery modules. DC input/output power cables and signal cables between (hybrid) inverter and the product should be prepared by the customer.

Table 5-1 Cables and busbars

No.	Cable and Busbar	Specification	Source
1	DC Input/Output power cable between the product and (hybrid) inverter	<ul style="list-style-type: none"> <li>● Common outdoor PV cable</li> <li>● Conductor cross-sectional area: 25-35 mm<sup>2</sup></li> </ul>	Prepared by the customer
2	Signal cable between the product and (hybrid) inverter	<ul style="list-style-type: none"> <li>● Outdoor shielded twisted pair cable (8 cores)</li> <li>● Conductor cross-sectional area: 0.2-1 mm<sup>2</sup></li> </ul>	Prepared by the customer
3	Busbars to connect MagicPack1.0 battery modules	<ul style="list-style-type: none"> <li>● Nickel-plated cooper</li> <li>● Conductor cross-sectional area: 30 mm<sup>2</sup></li> </ul>	Delivered with the product
4	Signal cable to connect MagicPack1.0 battery modules	Outdoor shielded twisted pair cable	Delivered with the product
5	Ground cable	Single-core outdoor copper cable	Delivered with the product

**NOTICE**

- The minimum cable diameter must comply with local cable standards.
- The factors that affect cable selection include the rated current, cable type, routing mode, ambient temperature, and maximum expected line loss.
- The DC Input/Output power cable and signal cable between the product and (hybrid) inverter must be less than or equal to 5 m.

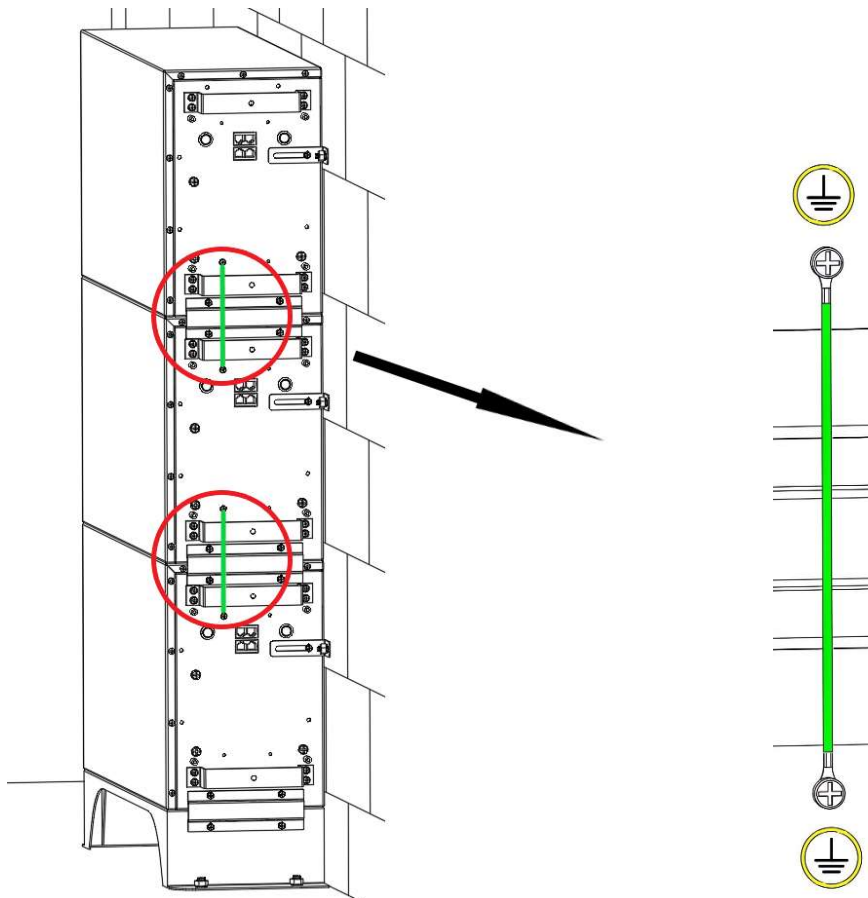
## 5.2 Electrical Connections of Battery Modules

**NOTICE**

- All LiHUB E series need to install correct busbars except E5 model.
- Check all cables and busbars before installation. If broken is found, do not use them.
- Ground cables need to well connected. Although LiHUB E series is low voltage (LV) energy storage system.

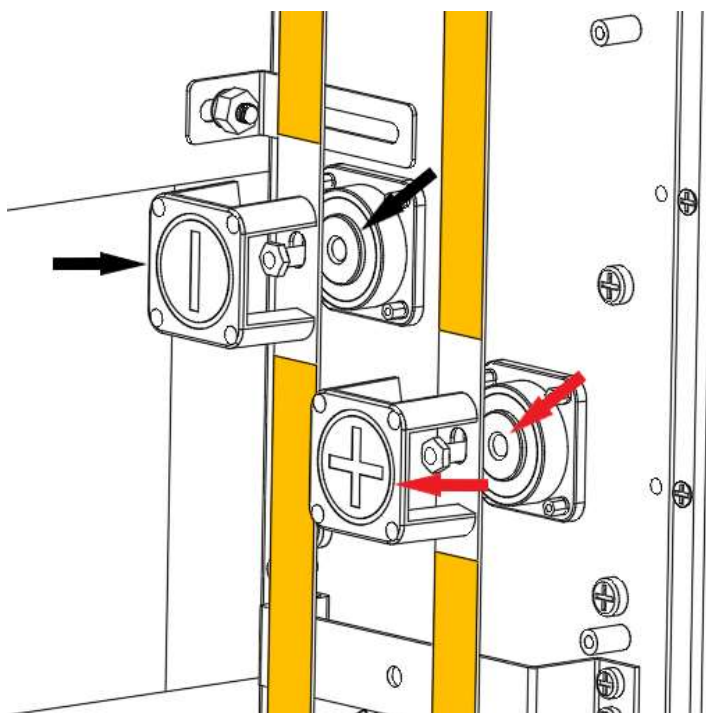
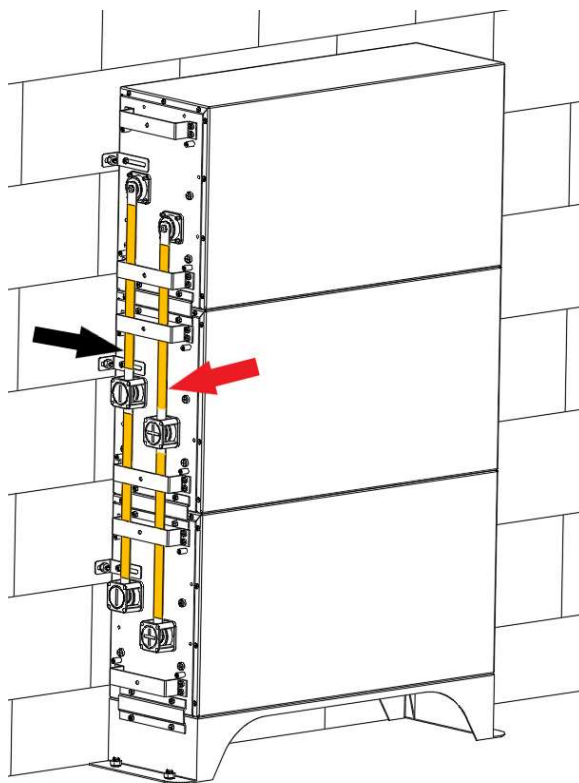
### 5.2.1 Install Internal Ground Cables

Figure 5-1 Install ground cables. Take E15 for an example.



### 5.2.2 Install Internal Busbars

Figure 5-2 Install busbars. Take E15 for an example.



### 5.2.3 Install Internal Signal Cables

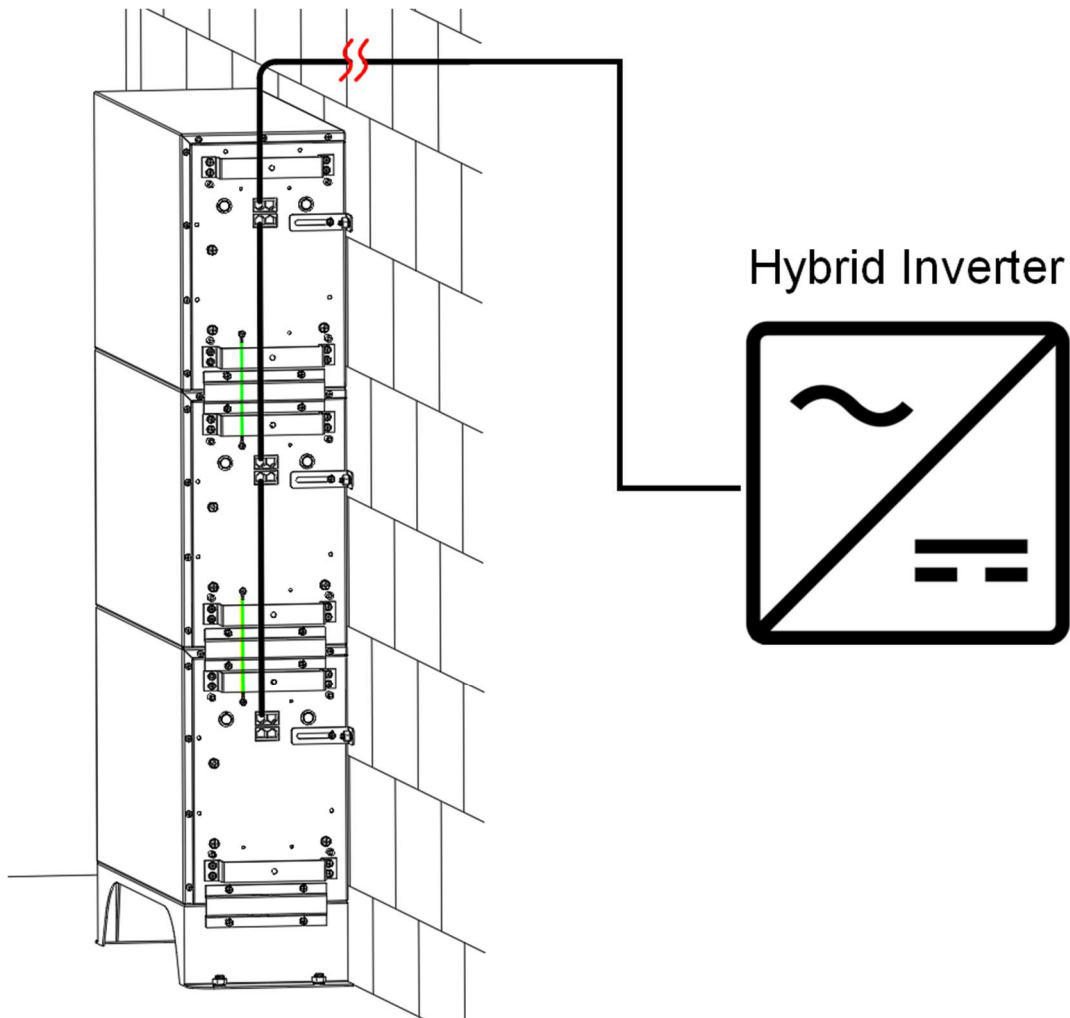
#### NOTICE

- RJ45 X 4 port is reserved on MagicPack1.0 battery module. Port definition is same.
- All LiHUB E series need to connect signal cables except E5 model.
- Signal cables connection through RJ45 port among MagicPack1.0 battery modules are random.

Table 5-2 RJ45 port definitions

Pin	Definition	Diagram
1, 8	485B	
2, 7	485A	
3	TX	
6	RX	
4	CANH	
5	CANL	

Figure 5-3 Install signal cables. Take E15 for an example.



## 5.3 Electrical Connections with Inverter

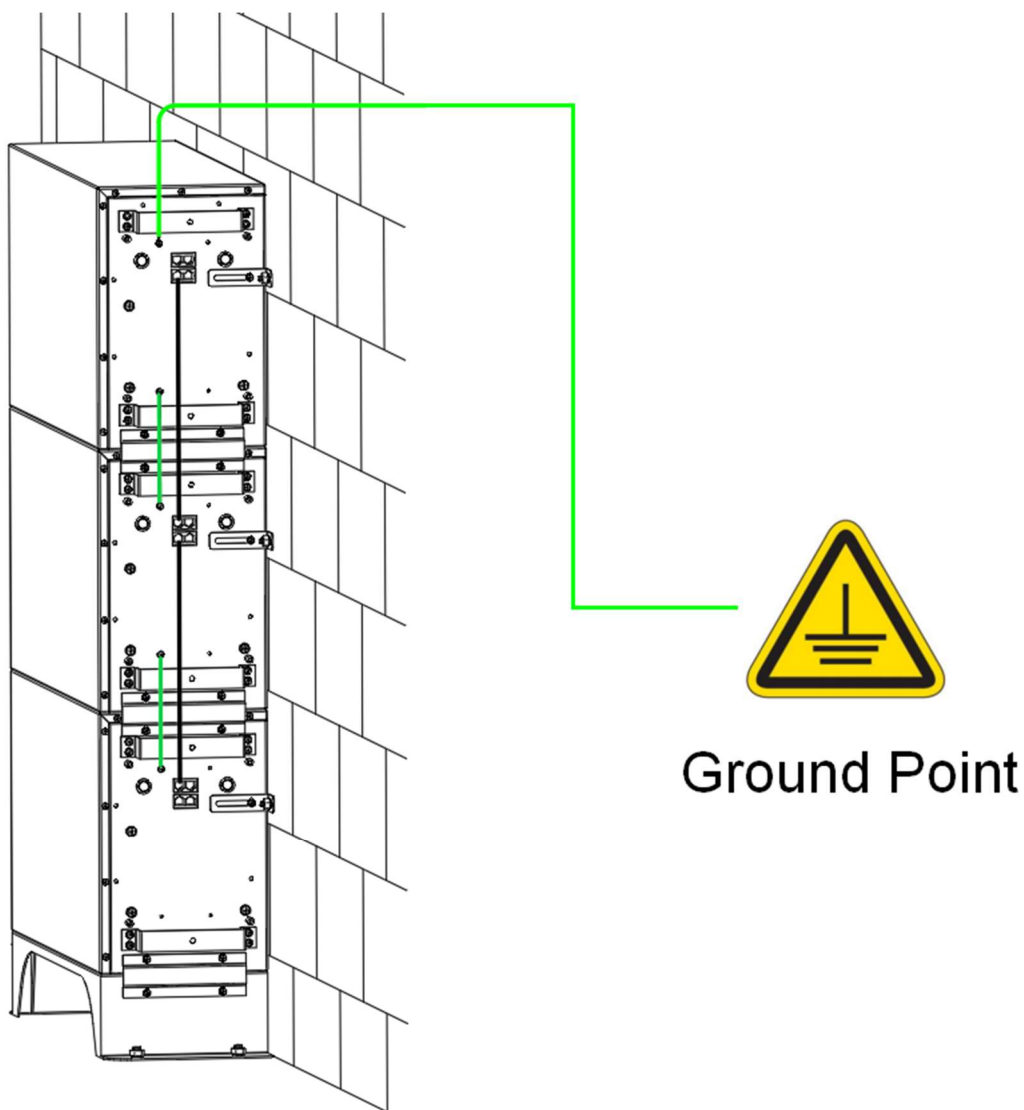
### WARNING

- When performing this operation, read user manual of (hybrid) inverter first. If necessary, ask the user manual from dealer of (hybrid) inverter. LiHUB Energy does not provide any technical documents about (hybrid) inverters.

### 5.3.1 Install External Ground Cable

External ground cable is delivered with the product. Re-work the OT terminal if it is not compatible with external ground point.

Figure 5-4 Install external ground cable. Take E15 for an example.



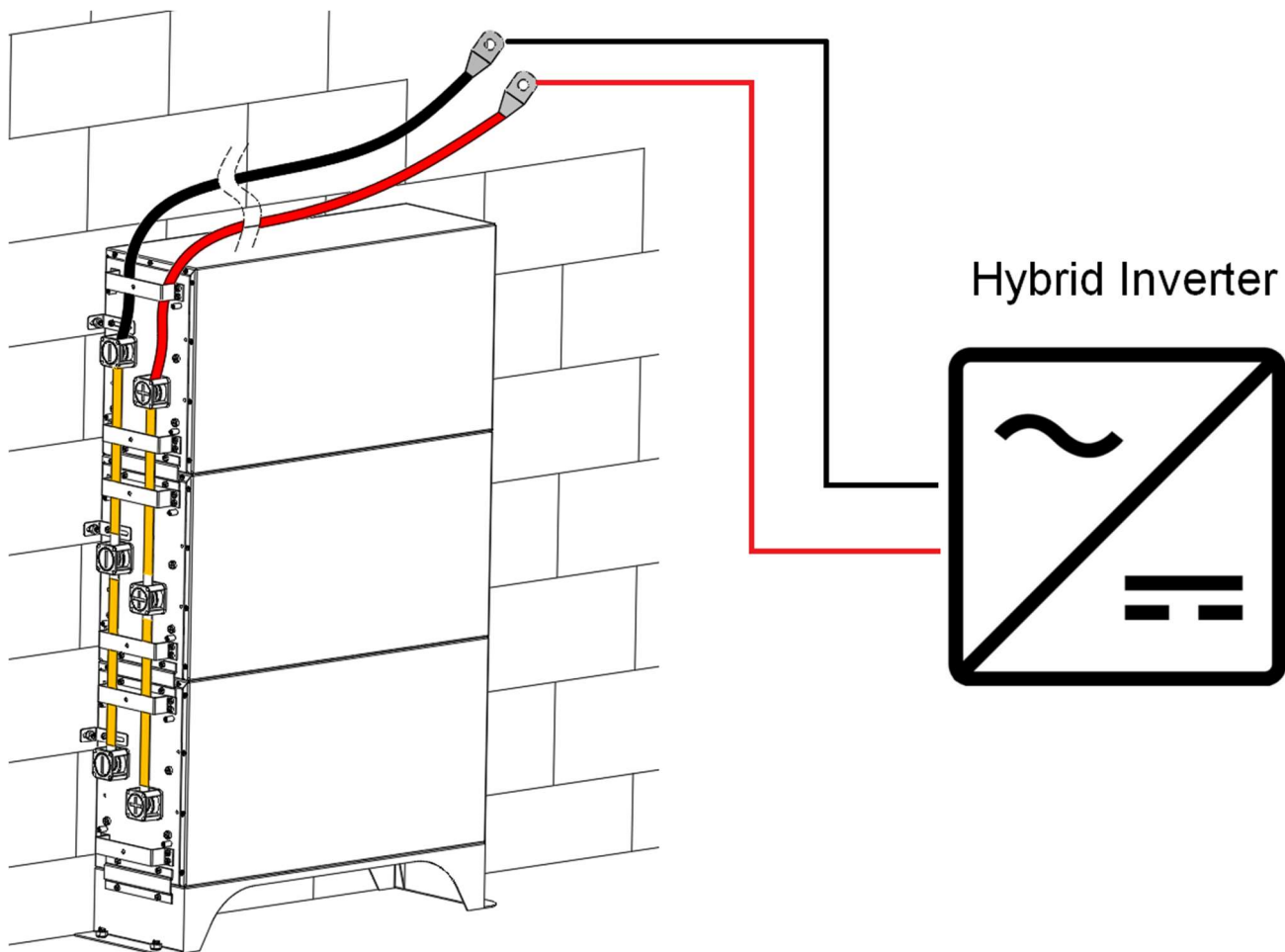
### 5.3.2 Install External Power Cables

External power cables are not delivered with the product. Two types OT terminals are in packing case can be used to make external power cables. T35-8 OT terminal is suggested to crimp with 25 mm<sup>2</sup> power cable, and T50-8 OT terminal is suggested to crimp with 35 mm<sup>2</sup> power cable.

#### NOTICE

- Avoid scratching the core wire when stripping a power cable.
- The cavity formed after the conductor crimp strip of the OT terminal is crimped must wrap the core wires completely. The core wires must contact the OT terminal closely.
- Wrap the wire crimping area with heat shrink tubing or insulation tape.
- When using a heat gun, protect the equipment from being scorched.

Figure 5-5 Install external power cables. Take E15 for an example.





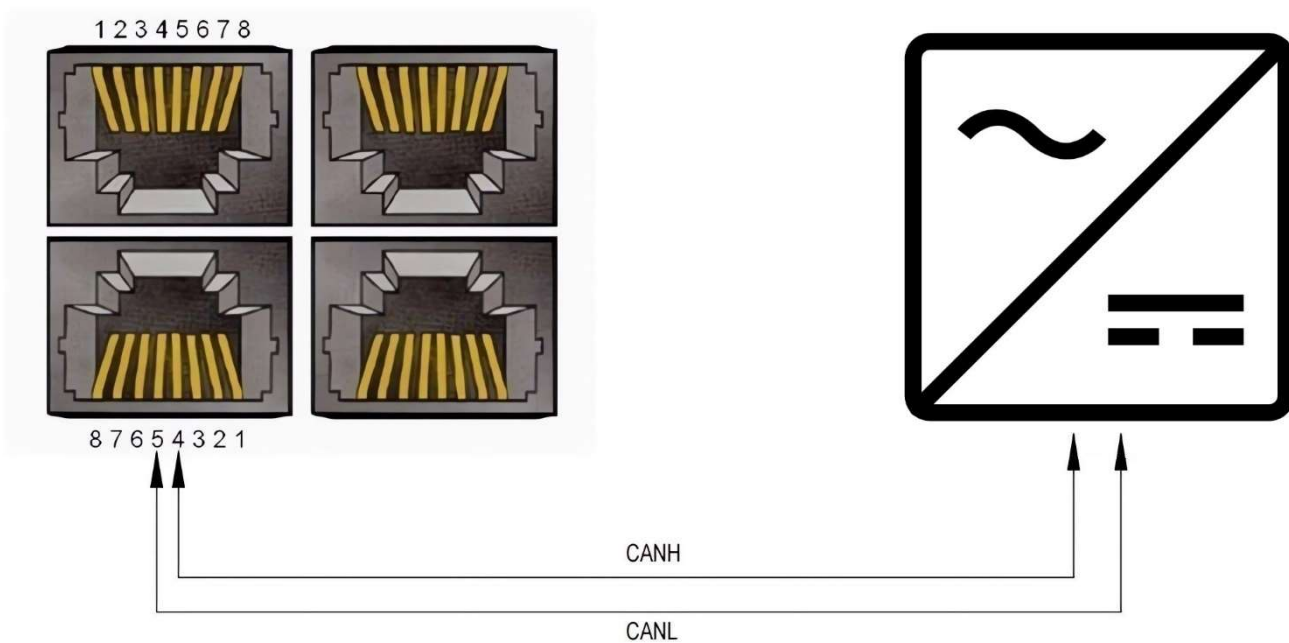
### 5.3.3 Install External Signal Cable

Connect the external signal cable between the product and (hybrid) inverter.

#### NOTICE

- When laying out a signal cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.
- The COM port definitions on MagicPack1.0 battery module are the same. Any idle COM port on MagicPack1.0 battery modules can be randomly used to connect with (hybrid) inverter.
- Refer to Table 5-2 to check COM port definitions.

Figure 5-6 Install external signal cable



## 6. Operating the Energy Storage System

Authorized electricians need to check all installation, cable routing, and connection are correct, secure, and reliable before power on the energy storage system.

### NOTICE

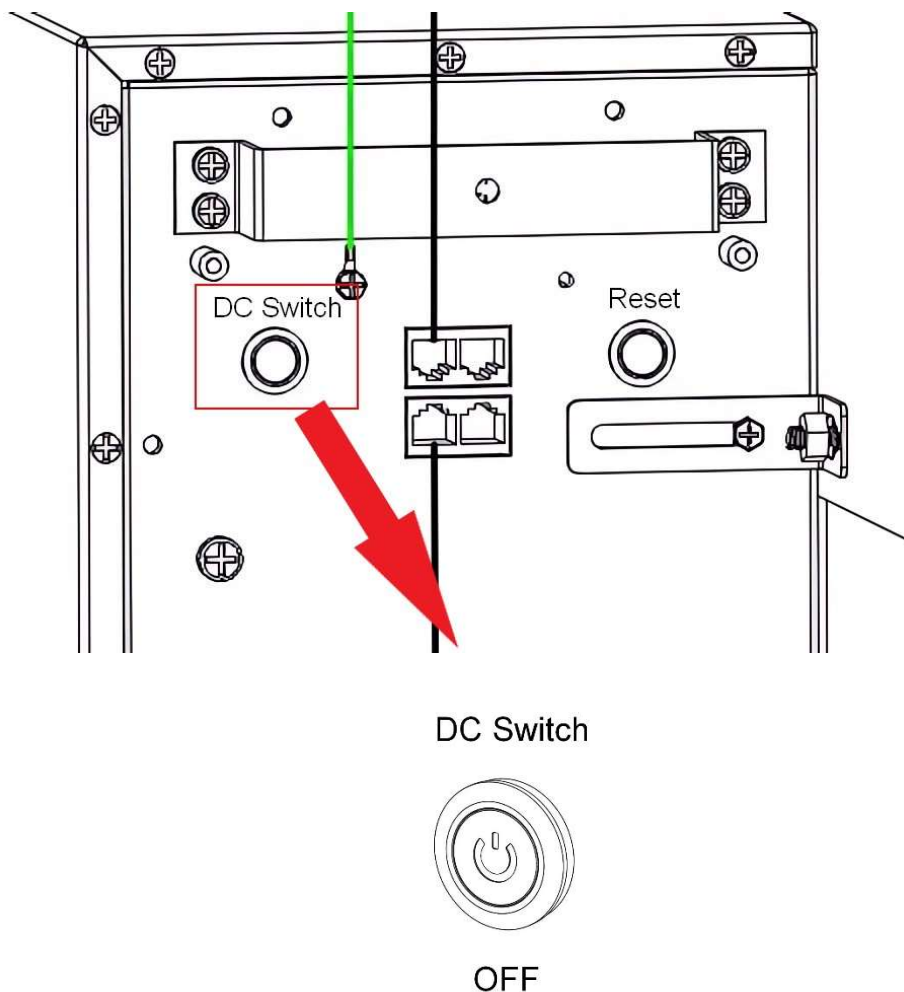
- The energy storage system must only be opened by authorized electricians.
- Electrical work on the energy storage system and the associated electrical distributor must only be carried out by authorized electricians.

### 6.1 Power On the Energy Storage System

To power on the energy storage system. Please follow the sequence below:

1. Switch on the energy storage system Main Switch located in the switchboard.
2. Switch on the Main Switch for backup supply located in the switchboard or dedicated sub board.
3. Switch on the energy storage system AC isolator adjacent to the system (if available).
4. Switch on the energy storage system Backup isolator adjacent to the system (if available).
5. Switch on all MagicPack1.0 battery modules using the DC switch located on the left side of the enclosure.

Figure 6-1 Startup MagicPack1.0 battery modules. Take E15 for an example.



## 6.2 Power Off the Energy Storage System

To avoid battery deep discharge. Power off the energy storage system if charging from PV, grid, or generator is not available for long periods of time.

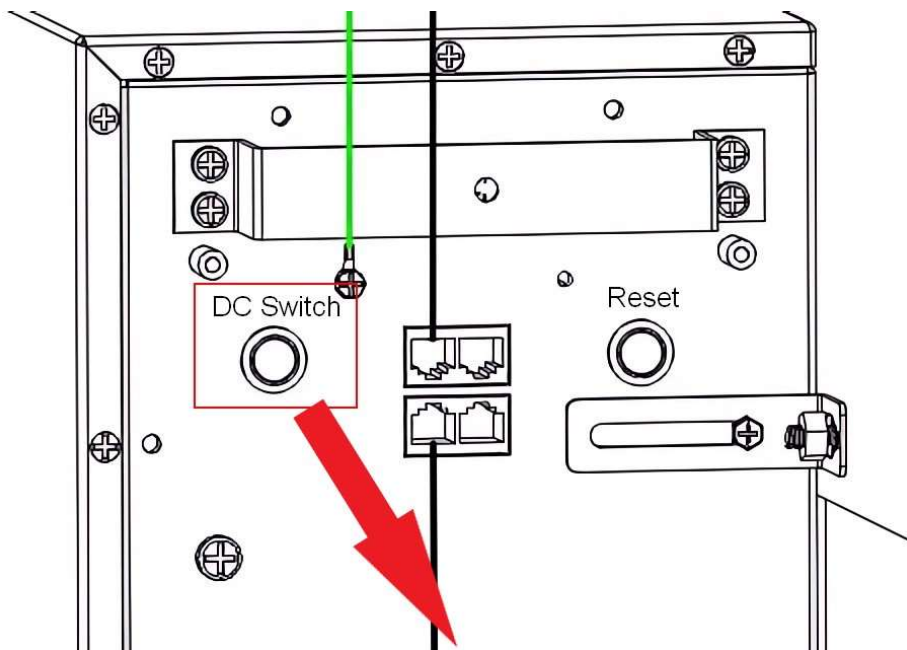
### NOTICE

- Deep discharge will damage battery modules. Never continue to operate battery modules which have been deep-discharged.

To power off the energy storage system. Please follow the sequence below:

1. Switch off all MagicPack1.0 battery modules using the DC switch located on the left side of the enclosure.
2. Switch off the energy storage system AC isolator adjacent to the system (if available).
3. Switch off the energy storage system Backup isolator adjacent to the system (if available).
4. Switch off the Main Switch for backup supply located in the switchboard or dedicated sub board.
5. Switch off the energy storage system Main Switch located in the switchboard.

Figure 6-2 Shutdown MagicPack1.0 battery modules. Take E15 for an example.



DC switch



ON

### 6.3 Install the Cover

After the energy storage system commissioning test is done, and external protective covers can be installed then.

Figure 6-3 Install top cover. Take E15 for an example.

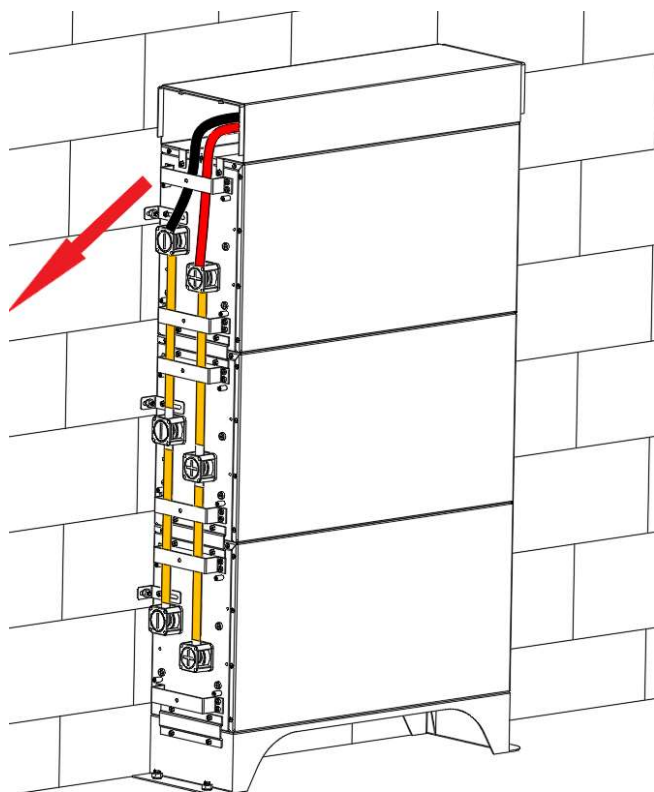
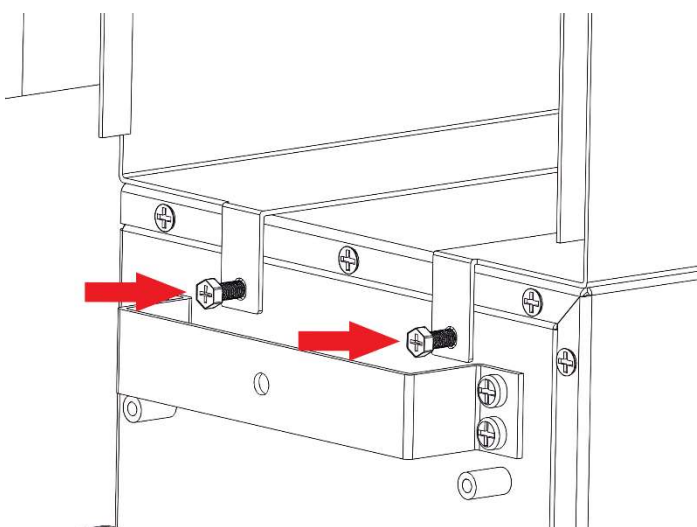
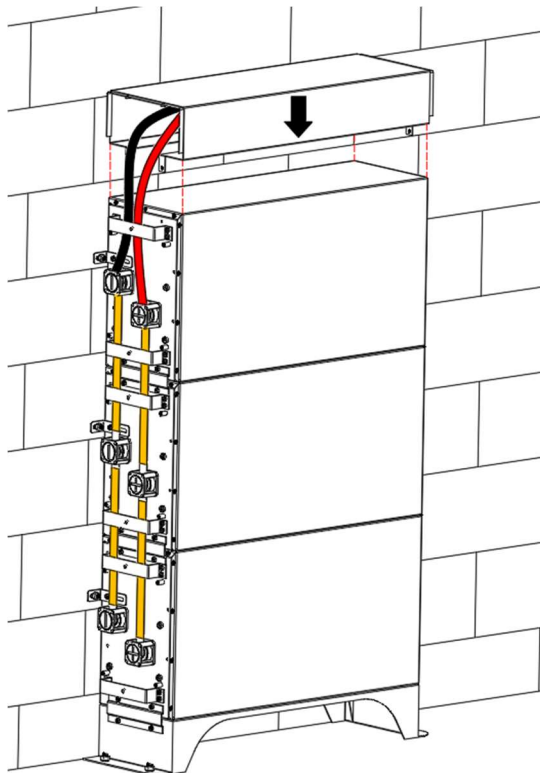
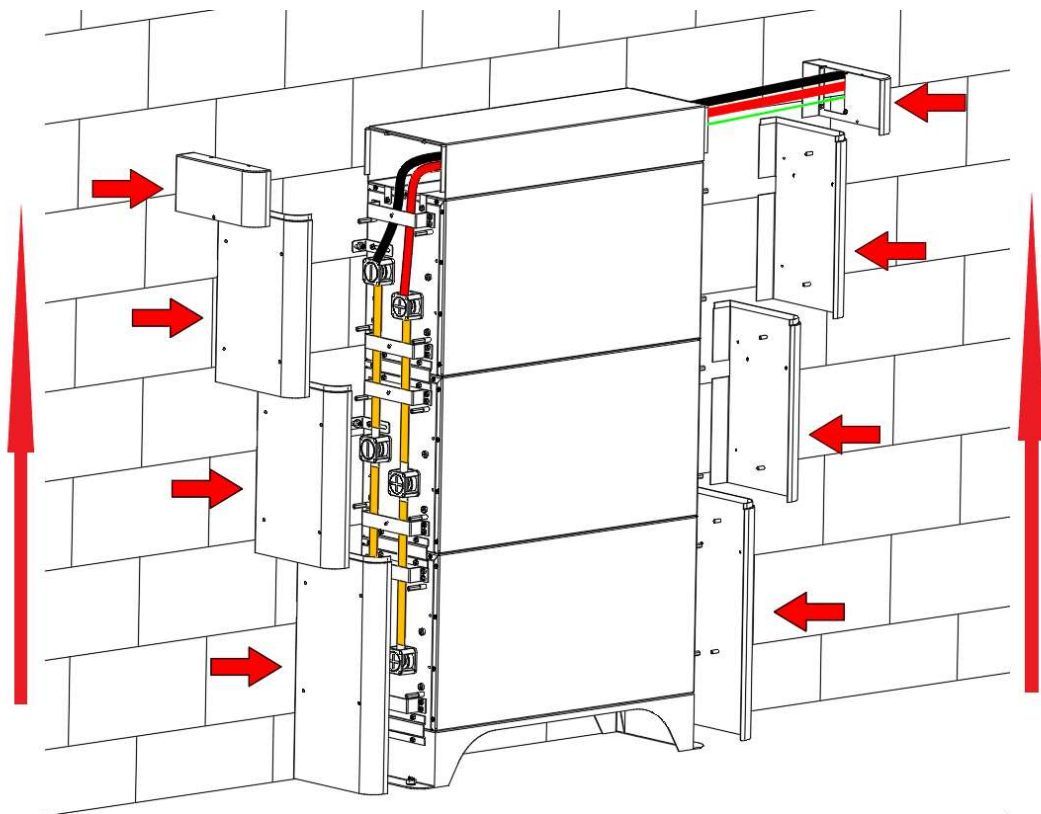
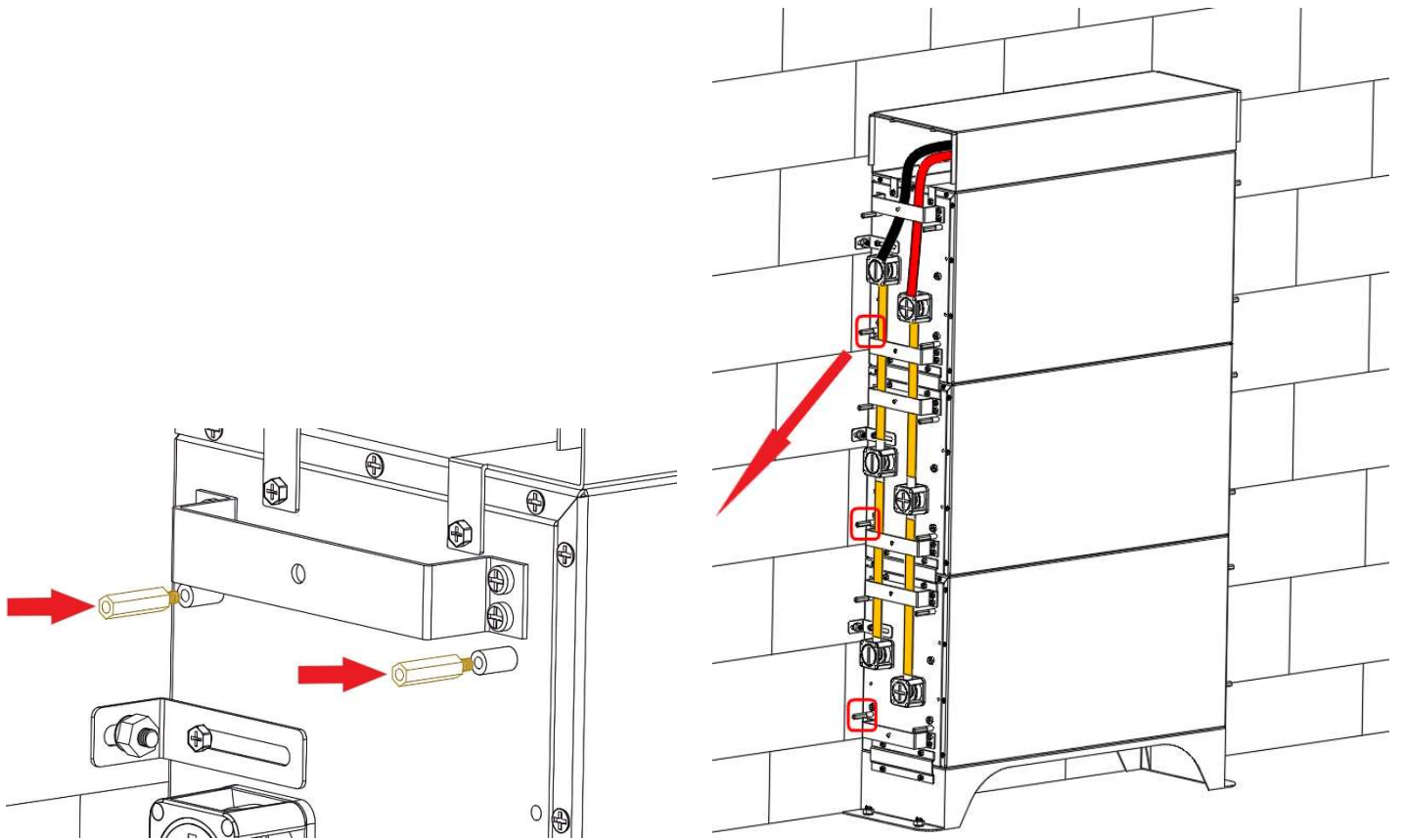
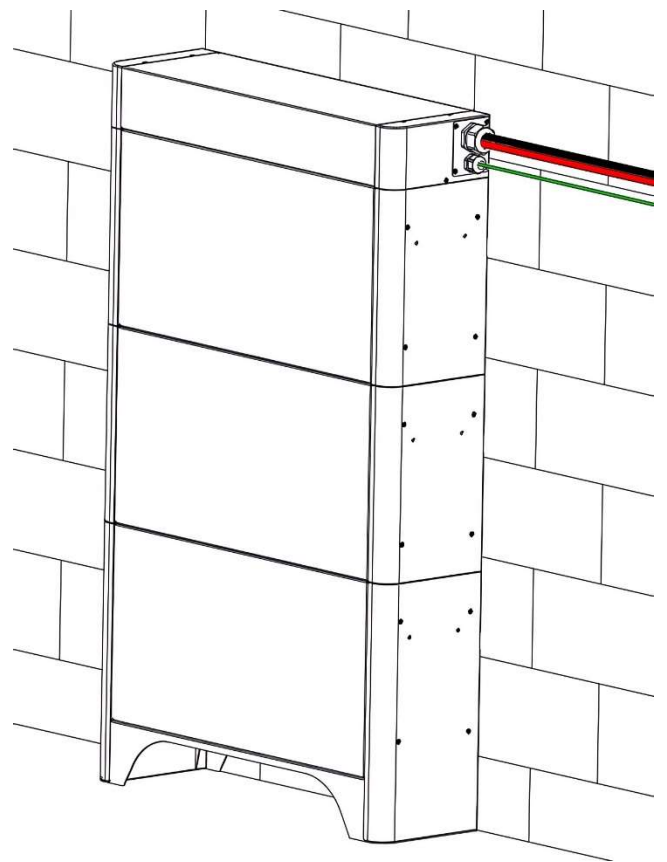
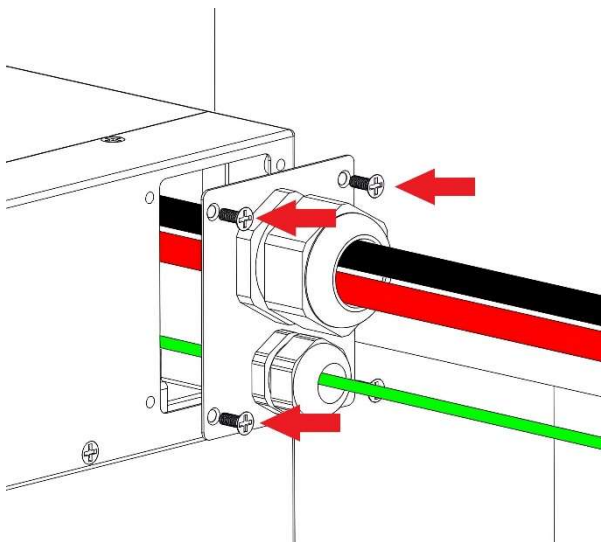
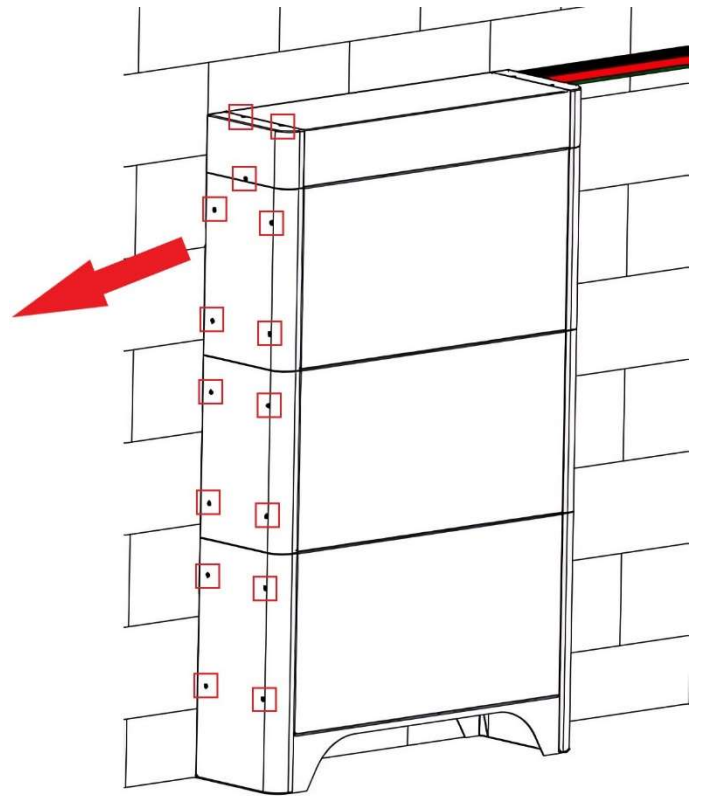
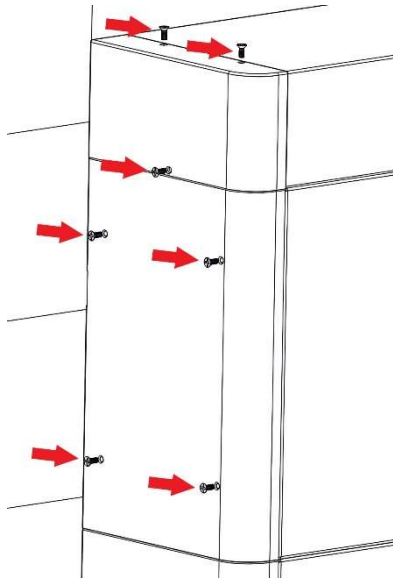


Figure 6-4 Install side cover. Take E15 for an example.



Side cover installation from bottom up



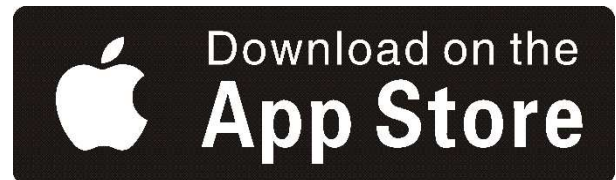
## 7. Customer Portal

The LiHUB customer portal is used to monitor real-time and historical data of the energy storage system and configure settings. You can access the customer portal on your smart device whenever, wherever through LiHUB Energy's free cloud service.

### 7.1 Download and Install Li+HUB App

To use the customer portal, you need to download and install Li+HUB App first. There are two options to download and install the App from Google Play, or App Store.

Option 1: Search for "lihub" on Google Play, or App Store. Or click below icon.



Option 2: Scan the following QR code.

Android



iOS



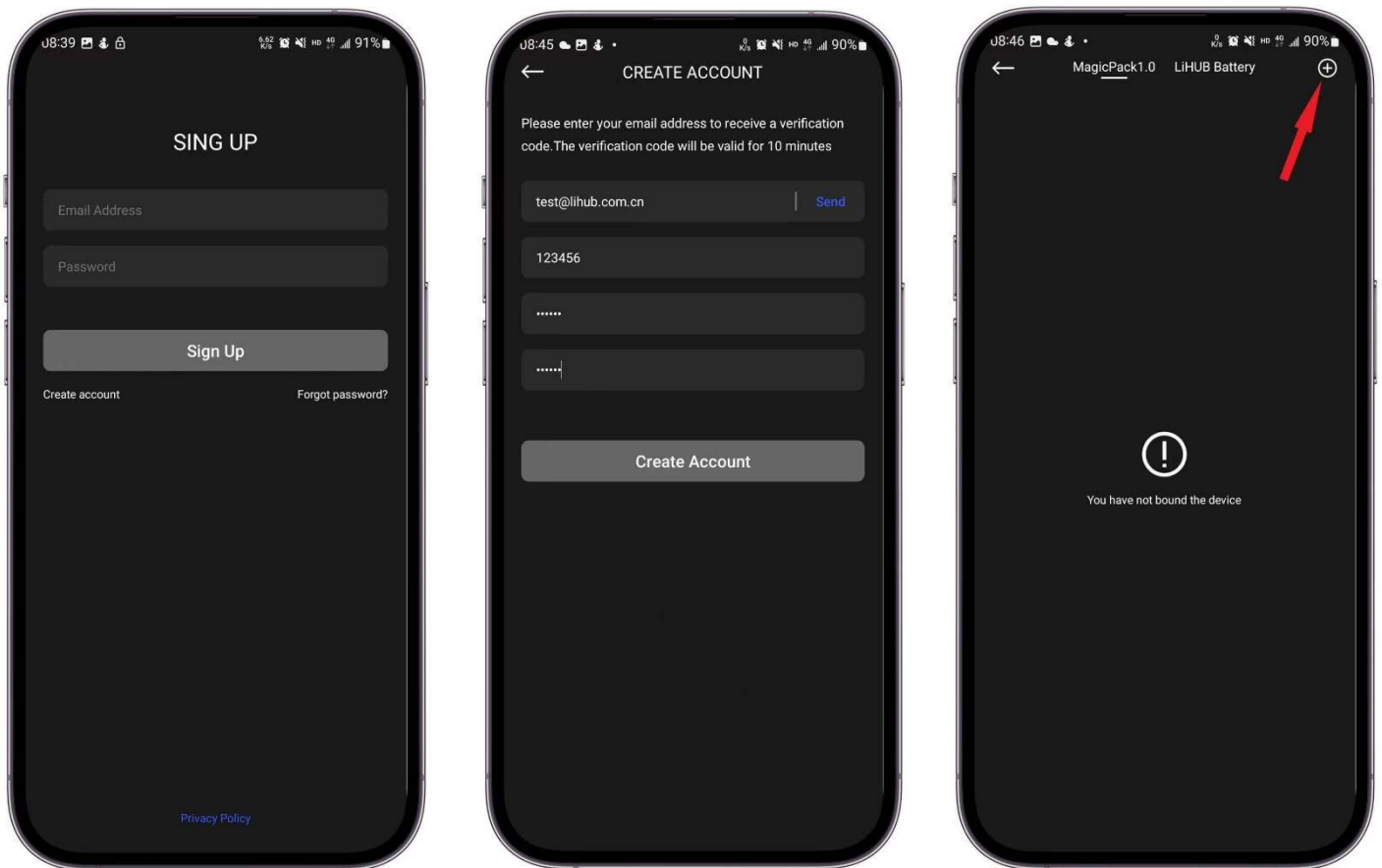
## 7.2 Log In To the Customer Portal

You can access the customer portal using the Li+HUB App on your smart device like phone, or tablet.

To use the customer portal, you need a LiHUB account. If you already have a LiHUB account, you can log into the customer portal directly. If not, you can create a personal LiHUB account as follows:

1. Start LiHUB app on your smart device.
2. Click on the corresponding button to register and create a LiHUB account.
3. After creating the LiHUB account you can use it to log in and access all LiHUB energy storage systems.

Figure 7-1 Log in to the customer portal





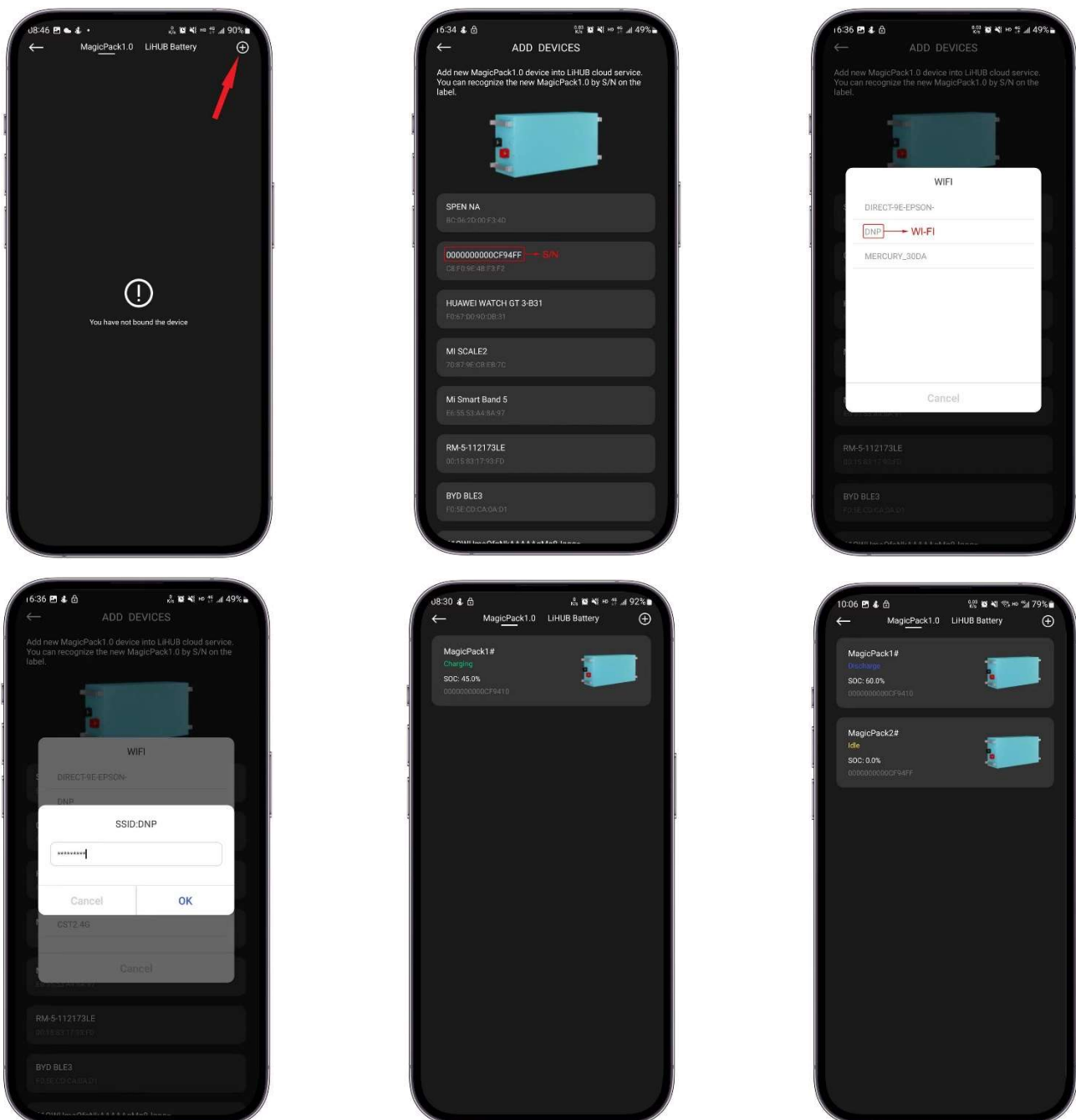
## 7.3 Add MagicPack1.0 To Cloud Service

To use LiHUB cloud service, you need to add all your MagicPack1.0 battery modules to cloud service in turn.

### NOTICE

- Firstly, you need to Turn On Bluetooth and Wi-Fi on your phone. Make sure both MagicPack1.0 and the phone are in coverage of your home Wi-Fi network.
- Power On MagicPack1.0 to activate its built-in Bluetooth, and Wi-Fi function. In order to use Bluetooth, and you need to keep your phone and MagicPack1.0 within 10 meters.
- If you have more than one MagicPack1.0, you need to repeat the operation until all MagicPack1.0 battery modules are added successfully.

Figure 7-2 Add MagicPack1.0 to cloud service



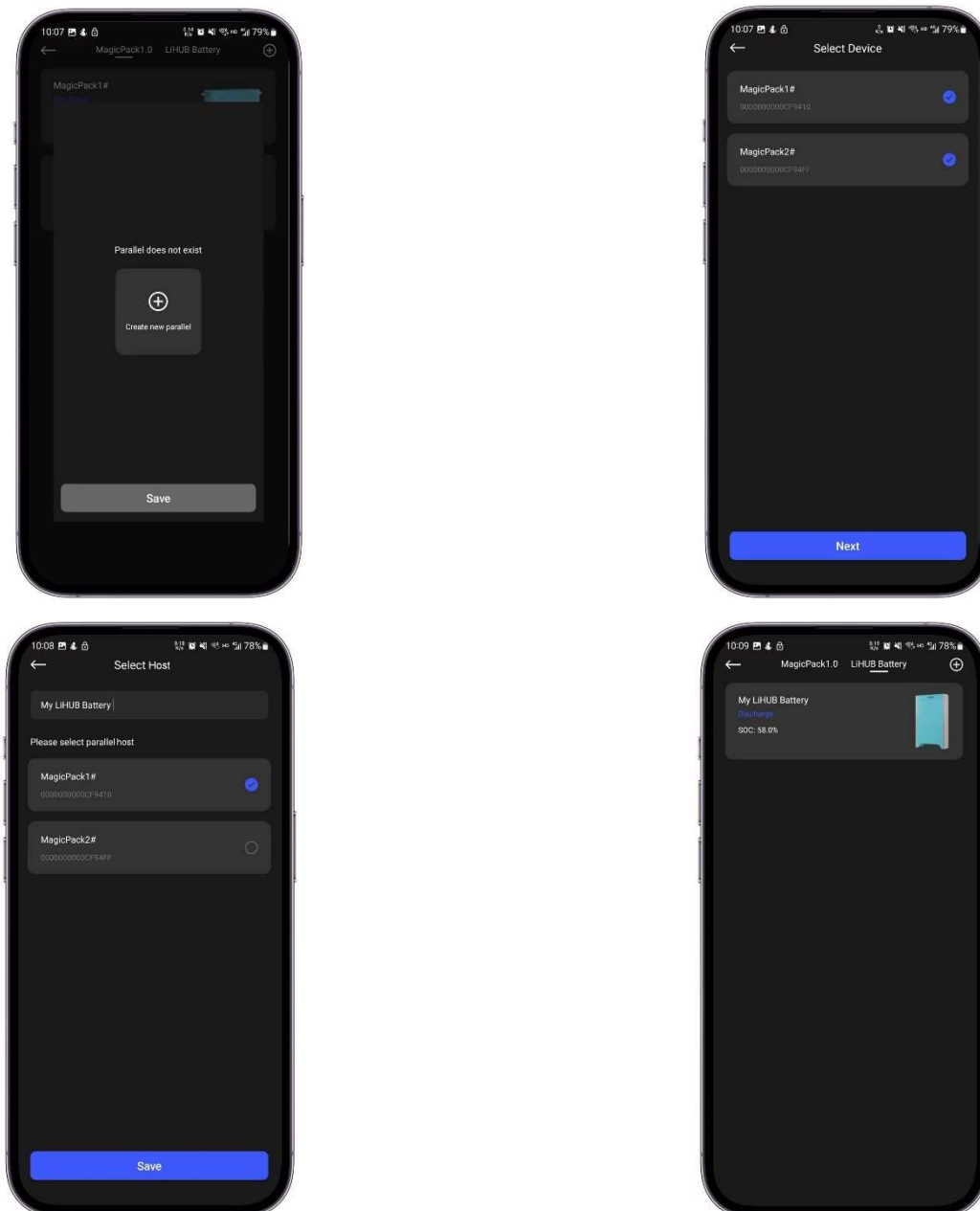
## 7.4 Configure Host of LiHUB Battery

You need to configure host among MagicPack1.0 battery modules even if you are deploying Li+HUB E5 model. The configuration of host is mandatory to enable LiHUB Energy cloud service and communication between Li+HUB battery with the (hybrid) inverter.

### NOTICE

- To configure host for the first time. You need to turn on Bluetooth of your phone, and keep your phone and LiHUB battery are in the same home wireless networks.
- It is necessary to select all MagicPack1.0 included in your LiHUB battery to configure host. After successful configuration of host, you can track your LiHUB battery on the LiHUB Battery page, or track every MagicPack1.0 on the MagicPack1.0 page.
- LiHUB battery is scalable. If you need to add a new MagicPack1.0 into existing LiHUB battery, you only need to select it on the MagicPack1.0 page and add it to the LiHUB battery then.

Figure 7-3 Configure host of LiHUB battery



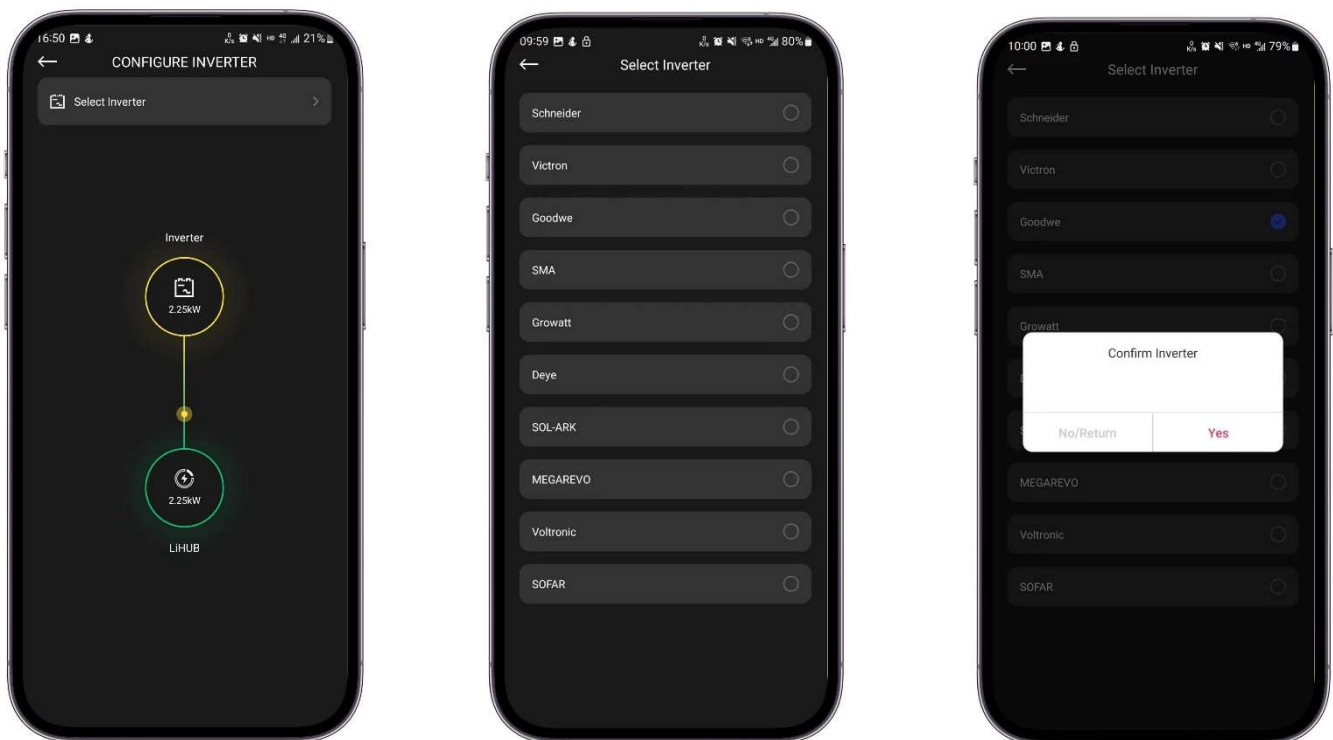
## 7.5 Configure Inverter

LiHUB E series energy storage system is designed to compatible with most of 48V low voltage (hybrid) inverters on the market. Tab **Configure Inverter** on the Li<sup>+</sup>HUB App home screen to select correct (hybrid) inverter brand.

### NOTICE

- LiHUB Energy will keep updating (hybrid) inverter communication protocol as possible as we can, however LiHUB Energy cannot guarantee the communication protocol is the latest version.
- Configure inverter is mandatory to enable communication between LiHUB E series energy storage system with the inverter.

Figure 7-4 Configure inverter



If (hybrid) inverter to be matched is not in the checklist. You can follow the sequence below to enable (hybrid) inverter.

1. Operating (hybrid) inverter dashboard to display **Battery Setting** (Refer to user manual of inverter).
2. Selecting battery chemistry as lead acid category.
3. Configure charging voltage 56.8V-57V.
4. Configure discharging under voltage 48V.
5. Configure battery capacity 100Ah x quantity of MagicPack1.0 in Li<sup>+</sup>HUB battery.

### NOTICE

- Selecting lead acid category will not affect LiHUB E series performance, or life cycle.
- The LiHUB customer portal is still can be used to monitor real-time and historical data of the energy storage system and configure settings.

## 7.6 Historical Data

You can easily track current, or historical energy consumption flowed by the energy storage system via this feature.

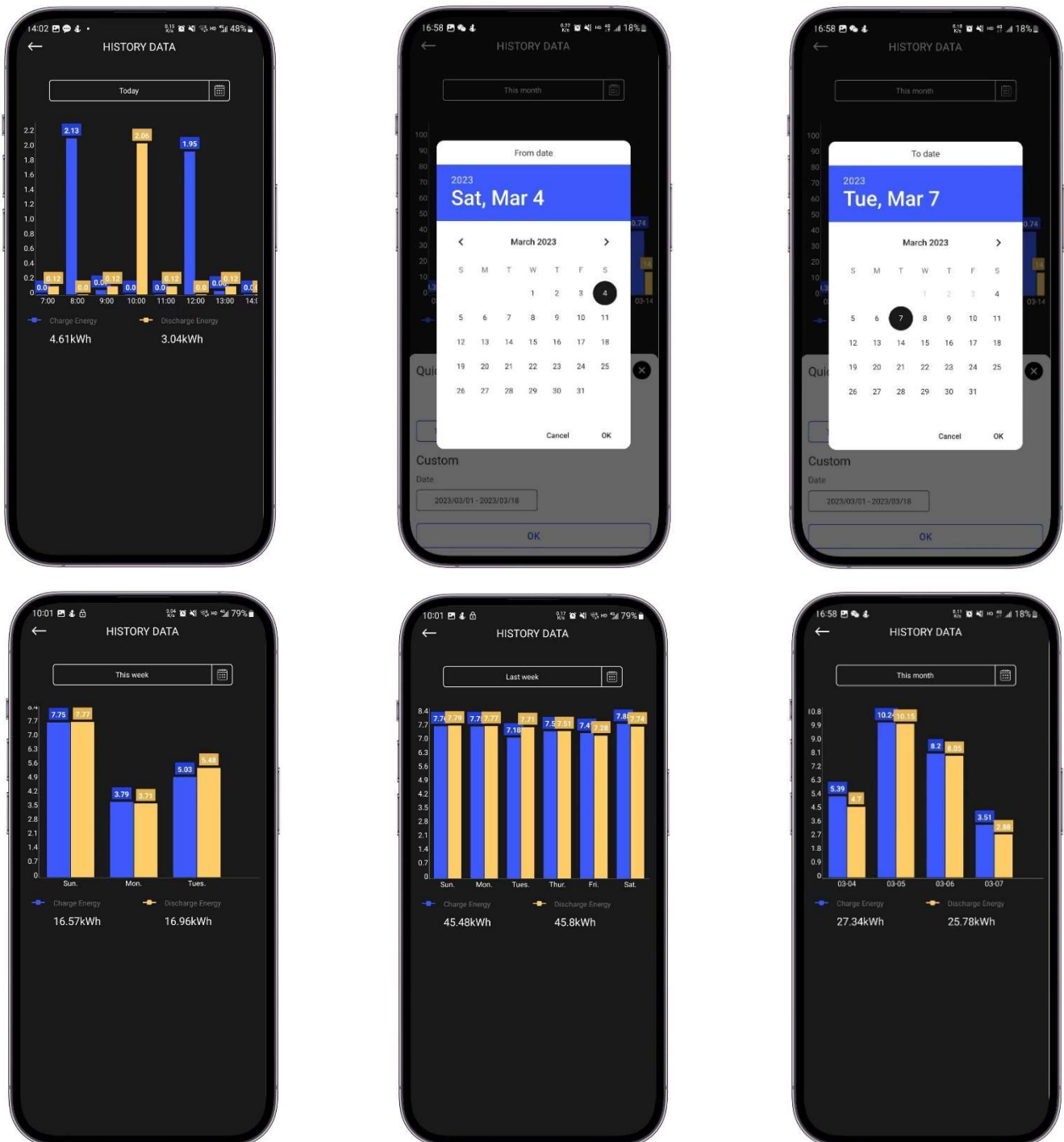
### Quick Ranges

This section provides simplified daily, weekly, monthly, or yearly statistics.

### Custom

This section can be customized date to date.

Figure 7-5 Historical data



## 7.7 Alerts

### Settings

Privacy permissions can be accessed in My Account - Settings section. The ‘Service function’ under Privacy permission is activated by default. With this function activated, you give permission that LiHUB Energy is able to monitor your energy storage system online. This allows LiHUB Energy to alert in case of technical issues of your energy storage system.

Figure 7-6 Privacy permissions

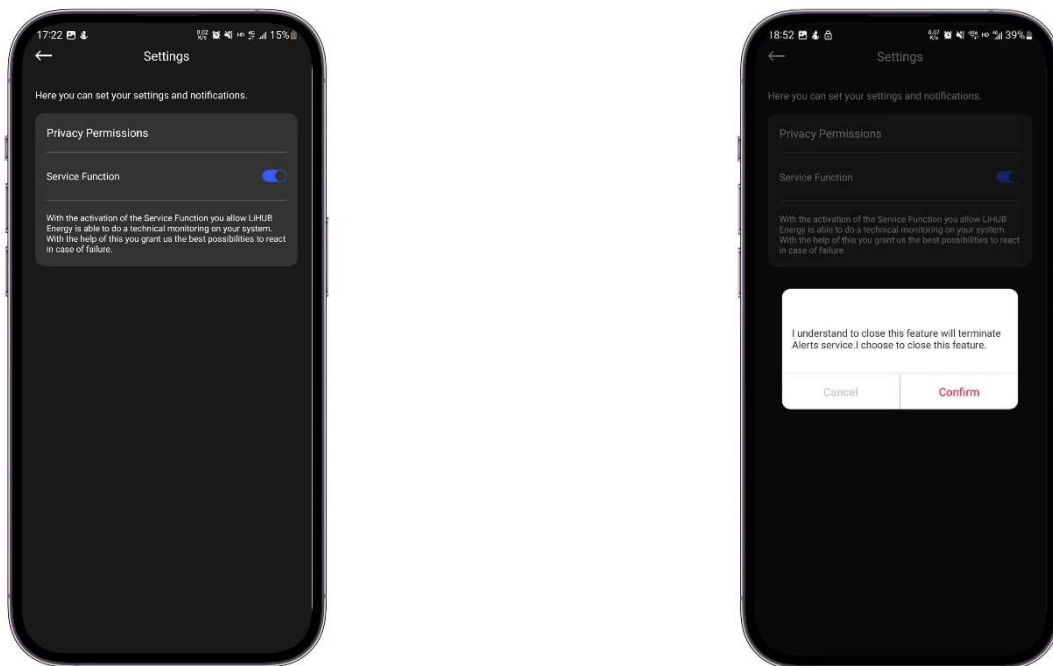


Figure 7-7 Alerts

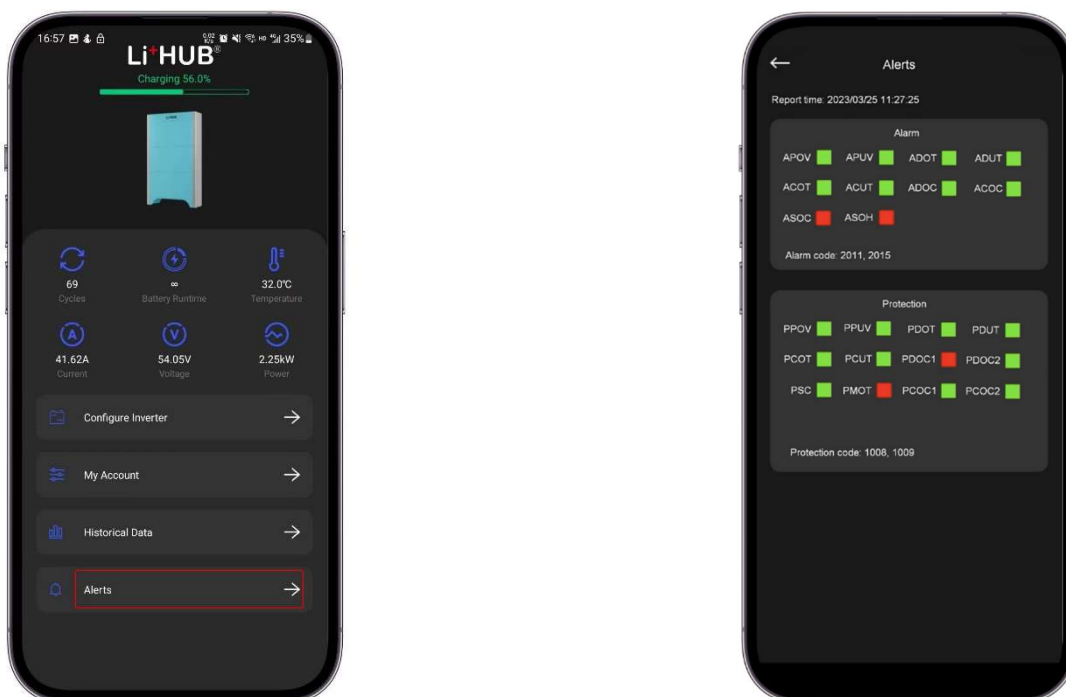


Table 7-1 Alerts and troubleshooting

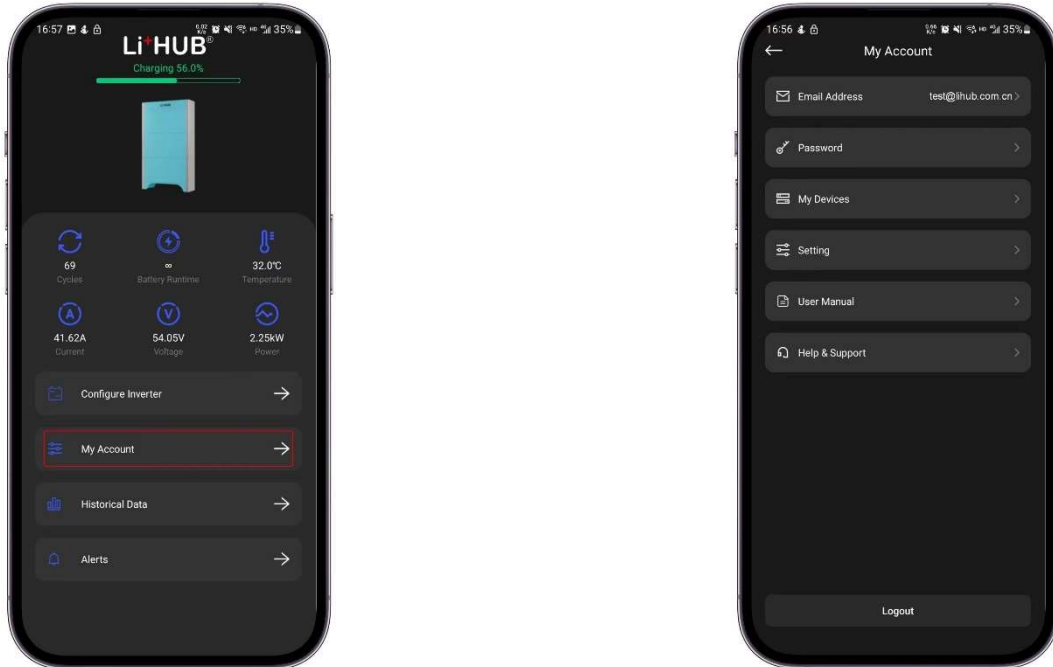
Alerts Code	Alerts Name	Alerts Grade	Description	Troubleshooting
2003	APOV	Minor	Battery over voltage alarm	Configure correct battery charge voltage in inverter setting. (Refer to section 7.5)
1003	PPOV	Major	Battery over voltage protection	Configure correct battery charge voltage in inverter setting. (Refer to section 7.5)
2002	APUV	Minor	Battery under voltage alarm	Configure correct battery discharge cut-off voltage in inverter setting. (Refer to section 7.5)
1002	PPUV	Major	Battery under voltage protection	<ol style="list-style-type: none"> <li>1. Configure correct battery discharge cut-off voltage in inverter setting; (Refer to section 7.5)</li> <li>2. Charging the energy storage system as soon as possible.</li> </ol>
2004	ADOT	Minor	Discharge over temperature alarm	<ol style="list-style-type: none"> <li>1. Check all (backup) loads to ensure their rating power does not exceed energy storage system upper limit; (Refer to section 2.3)</li> <li>2. Check ambient temperature and ventilation do not exceed criteria. (Refer to section 2.3, and section 4.3)</li> </ol>
1004	PDOT	Major	Discharge over temperature protection	<ol style="list-style-type: none"> <li>1. Check all (backup) loads to ensure their rating power does not exceed energy storage system upper limit; (Refer to section 2.3)</li> <li>2. Check ambient temperature and ventilation do not exceed criteria. (Refer to section 2.3, and section 4.3)</li> </ol>
2005	ADUT	Minor	Discharge under temperature alarm	Check ambient temperature does not exceed lower limit. (Refer to section 2.3)
1005	PDUT	Major	Discharge under temperature protection	Check ambient temperature does not exceed lower limit. (Refer to section 2.3)
2006	ACOT	Minor	Charge over temperature alarm	<ol style="list-style-type: none"> <li>1. Check input power from inverter does not exceed energy storage system upper limit; (Refer to section 2.3)</li> <li>2. Check ambient temperature and ventilation do not exceed upper limit. (Refer to section 2.3)</li> </ol>
1006	PCOT	Major	Charge over temperature protection	<ol style="list-style-type: none"> <li>1. Check input power from inverter does not exceed energy storage system upper limit; (Refer to section 2.3)</li> <li>2. Check ambient temperature and ventilation do not exceed upper limit. (Refer to section 2.3)</li> </ol>

2007	ACUT	Minor	Charge under temperature alarm	Check ambient temperature does not exceed lower limit. (Refer to section 2.3)
1007	PCUT	Major	Charge under temperature protection	Check ambient temperature does not exceed lower limit. (Refer to section 2.3)
2009	ADOC	Minor	Discharge over current alarm	Check all (backup) loads to ensure their rating power does not exceed energy storage system upper limit. (Refer to section 2.3)
1008	PMOT	Major	MOSFET over temperature protection	<ol style="list-style-type: none"> <li>1. Check all (backup) loads to ensure their rating power does not exceed energy storage system upper limit; (Refer to section 2.3)</li> <li>2. Check ambient temperature and ventilation do not exceed upper limit; (Refer to section 2.3)</li> <li>3. Contact your dealer or LiHUB Energy for technical support.</li> </ol>
1009	PDOC1	Major	Discharge over current protection level 1	Check all (backup) loads to ensure their rating power does not exceed energy storage system upper limit. (Refer to section 2.3)
1010	PDOC2	Major	Discharge over current protection level 2	Check all (backup) loads to ensure their rating power does not exceed energy storage system upper limit. (Refer to section 2.3)
2010	ACOC	Minor	Charge over current alarm	Check input power from inverter does not exceed energy storage system upper limit. (Refer to section 2.3)
1012	PCOC1	Major	Charge over current protection level 1	Check input power from inverter does not exceed energy storage system upper limit. (Refer to section 2.3)
1013	PCOC2	Major	Charge over current protection level 2	Check input power from inverter does not exceed energy storage system upper limit. (Refer to section 2.3)
1011	PSC	Warning	Short circuit protection	<ol style="list-style-type: none"> <li>1. Turn off the energy storage system; (Refer to section 6.2)</li> <li>2. Contact your dealer or LiHUB Energy for technical support.</li> </ol>
2011	ASOC	Minor	Low State of Charge	Charging the energy storage system as soon as possible.
2015	ASOH	Warning	Low State of Health	The energy storage system has reached the end of its lifespan. Contact the local recycling agency to dispose of it in compliance with local laws and regulations as well as applicable standards.

## 7.8 Personalising LiHUB Account

To access your account settings, click on “My Account” on dashboard.

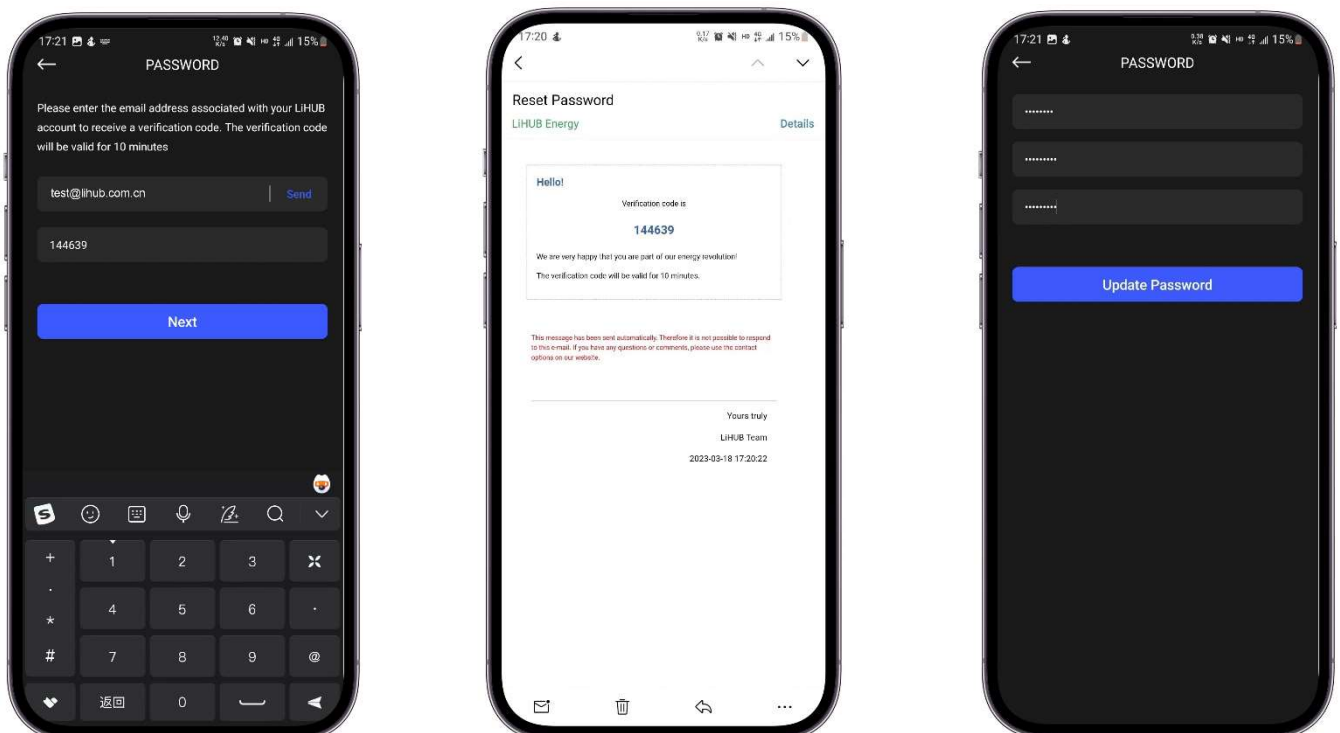
Figure 7-8 Access LiHUB account



### Password

You can change your LiHUB account password by clicking on the Password section under “My Account” menu.

Figure 7-9 Change your password

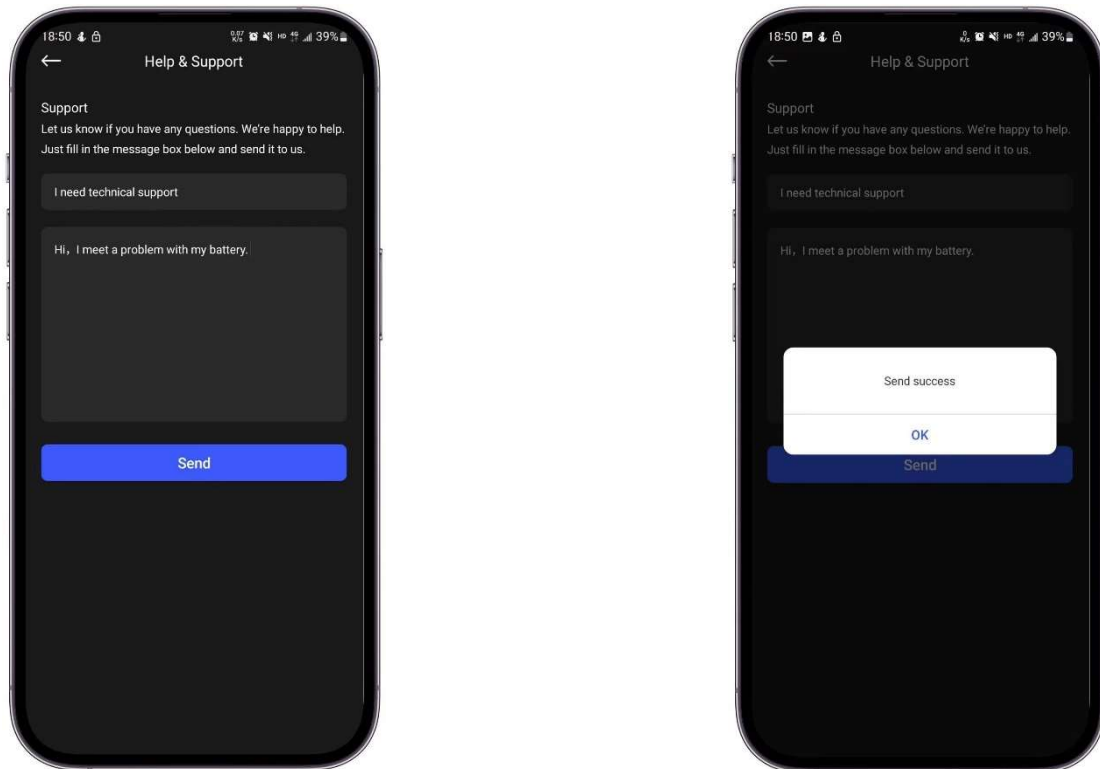




## Help & Support

If you meet difficulty when reaching your dealer. You are able to send out a service request to LiHUB Energy service directly from the Customer Portal.

Figure 7-10 Help & support



## 7.9 Changing LiHUB Account

The original customer of the energy storage system, or a person to whom the title to a properly registered the energy storage system has been transferred have the rights to change the LiHUB account to follow the sequence below:

1. Power Off the energy storage system with instruction of section 6.2. **NOTE** that charging has the highest priority, you cannot power off the battery while it is charging. Please choose to Power Off the battery when it is in idle, or in discharge.
2. Power On the energy storage system with instruction of section 6.1.
3. Creating a new LiHUB account with instruction of section 7.2.

### NOTICE

- After the new LiHUB account is successfully created, the old LiHUB account will be invalid then.
- You have 20 minutes to create a new LiHUB account. If out of time, you need to repeat above steps again.

## 8. Maintenance

For fault-free, safe, reliable, and long-lasting operation of the energy storage system, it is essential to carry out regular function checks and cleaning.

Table 8-1 Function checks and cleaning

Interval	Actions
Every 2 weeks	Check for any functional errors of the energy storage system in the customer portal.
Every 3 months	Carefully observe the energy storage system for any visible damage.
	Carefully listen to any abnormal noise during operation of the energy storage system.
	Ensure the ground dry and the enclosure is clean.
	Check for any loose or damaged connections, wires, and conduit.
	Carefully clean the outside of the energy storage system with a clean, moist cloth. For tougher dirt, use a small amount of household dishwashing detergent on a moist cloth.

### Battery Storage with Low SOC

After the energy storage system is powered off, static power consumption and self-discharge loss would occur in battery modules. Therefore, charge battery modules in a timely manner and do not store the energy storage system in low state of charge (SOC). Otherwise, the battery modules may be damaged due to over discharge, and they need to be replaced then.

Storing the energy storage system with low SOC may occur in the following scenarios:

- The energy storage system power cables or signal cables are not connected.
- The energy storage system cannot be charged due to a system fault after discharge.
- The energy storage system cannot be charged due to incorrect configurations in the system.
- The energy storage system cannot be charged due to no PV, or grid input. Or long-term mains failure.

Regardless of scenarios, the energy storage system must be charged within the maximum interval corresponding to the SOC when the energy storage system is powered off. If the energy storage system is not charged beyond the maximum interval, it may be damaged due to over discharge.

Table 8-2 SOC vs charge interval

Power-Off SOC Before Storage	Maximum Charge Interval
SOC > 10%	30 days
0% < SOC ≤ 10%	7 days

## 9. Uninstallation & Disposal

### 9.1 Uninstallation

**DANGER**

- Improper uninstallation of the energy storage system may cause catch fire, or electric shock.
- The energy storage system must be only uninstalled by an authorized electrician.

### 9.2 Disposal

**NOTICE**

- Improper transport of battery modules may cause catch fire, or emission of toxic substances.
- Transport the battery modules in their original packaging only. If you no longer have the original packaging, new packaging can be requested from LiHUB Energy.
- Never transport damaged battery modules.
- Improper disposal of battery modules may cause catch fire, explosion, or emission of toxic substances.
- Do not dispose of battery modules in fire.
- The energy storage system and the batteries it contains must not be disposed of as domestic waste!
- Dispose of the energy storage system and the batteries it contains in an environmentally friendly way through suitable collection systems.

