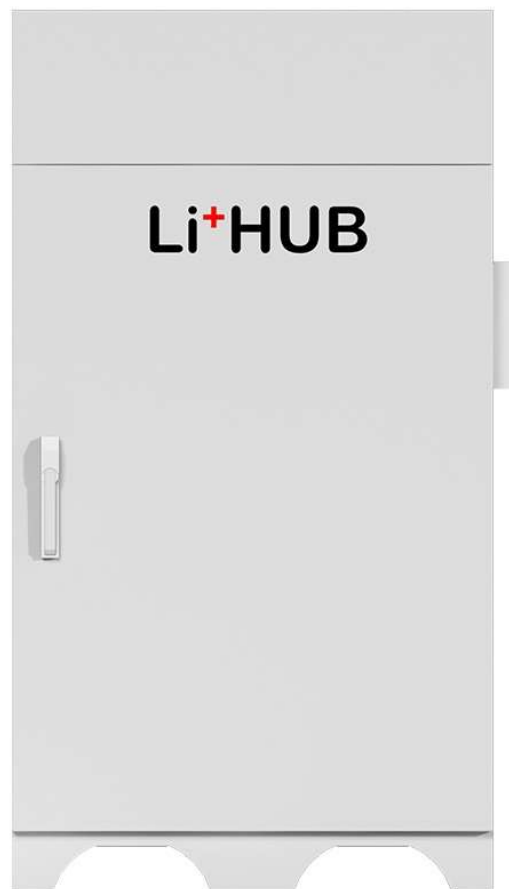


Li+HUB HV20

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

1 Safety Precautions	3
1.1 General Safety.....	3
1.2 Personal Requirements.....	3
1.3 Electrical Safety.....	3
1.4 Battery Safety.....	4
1.5 Storage and Transportation.....	5
1.6 Installation Safety.....	6
1.7 Maintenance and Replacement.....	7
2 Product Specifications	8
2.1 Overview.....	8
2.2 Technical Specifications.....	9
2.3 Appearance.....	10
2.4 Working Mode.....	12
2.5 Label Description.....	12
3 Function	13
3.1 Self-consumption Mode.....	13
3.2 Time-of-Use Mode.....	13
3.3 Backup Mode.....	14
4. System Installation	16
4.1 Checking Before the Installation.....	16
4.2 Preparing Tools and Instruments.....	16
4.3 Installation Positioning.....	17
4.4 Wall Mount Installation.....	18
5. Electrical Connection	22
5.1 Cables.....	22
5.2 Electrical Connections with Inverter.....	22
5.2.1 Install External Ground Cable.....	23
5.2.2 Install External Power Cables.....	24
5.2.3 Install External COM Cable.....	25
6. Operating Energy Storage System	26
6.1 Start-Up Energy Storage System.....	26
6.2 Shutdown Energy Storage System.....	27
7. Maintenance	28
8. Uninstallation & Disposal	29
8.1 Uninstallation.....	29
8.2 Disposal.....	29

1. Safety Precautions

1.1 General Safety

Before installing, operating, and maintaining the high voltage (hereinafter the “HV”) 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 HV BESS is used in environments that meet its design specifications. Otherwise, the HV 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 HV 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 HV BESS.

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

Personnel who will operate the HV 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 HV BESS or components (including firmware).

1.3 Electrical Safety

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

DANGER

- 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 HV 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, OR OUTDOOR USE**

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 HV BESS.

When moving the HV 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 HV 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 HV 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, distributor, or installer.

2. Product Specifications

2.1 Overview

LiHUB high voltage, liquid cooled HV20 BESS is designed for residential use. Its safest Lithium Iron Phosphate (LiFePO₄) battery chemistry combining with advanced active liquid cooled device to provide the safest energy storage so far for solar self-consumption, time-of-use, and back up.

LiHUB HV20 is convenient connection to any home or building. Its modular design achieves fast scalable to 40kWh, 60kWh, 80kWh, 100kWh by connecting up more HV20 units.

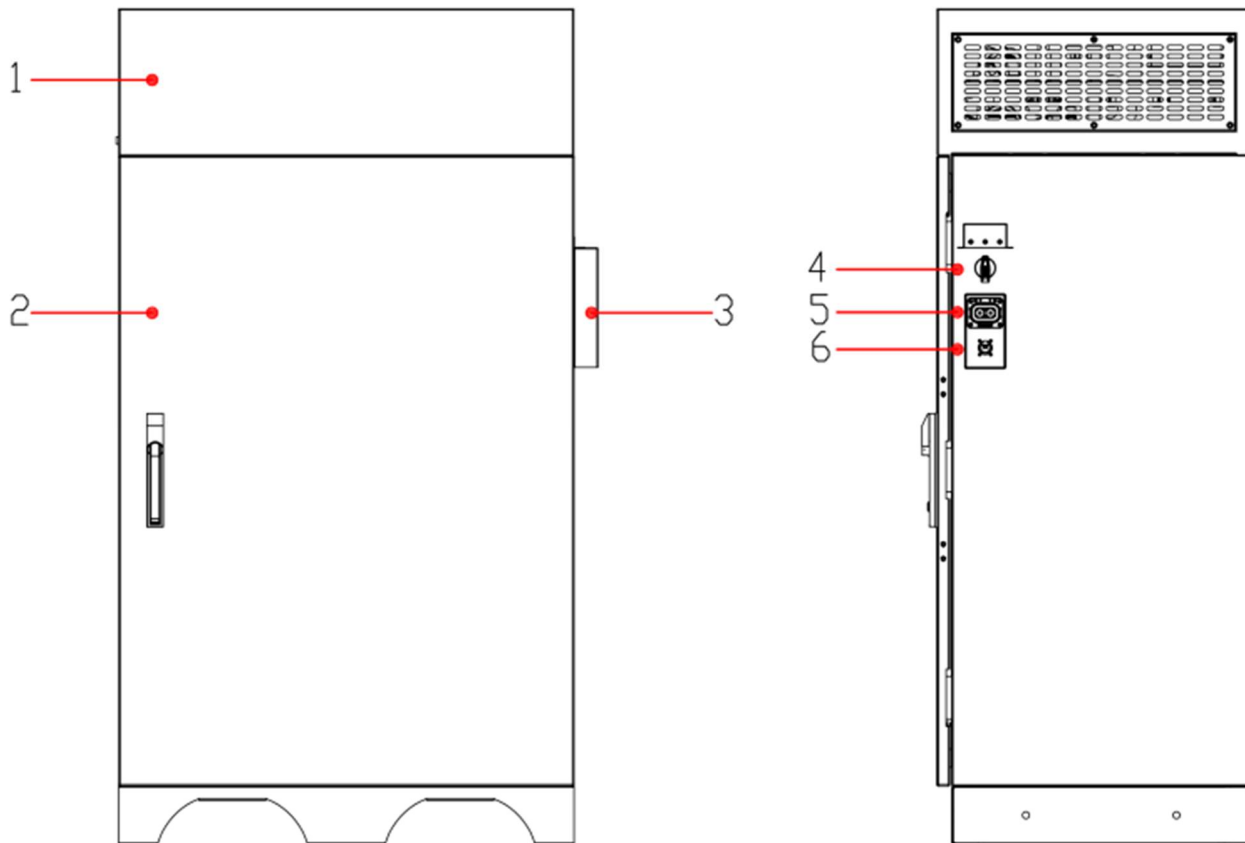
2.2 Technical Specifications

Technical Specifications	
Battery Energy Storage System (BESS) Model	HV20
Battery Chemistry	Lithium Iron Phosphate (LiFePO ₄)
Battery Module	MagicPack 2.0
Battery Module Rated Energy	5.0 kWh
Number of MagicPack 2.0	4
BESS Rated Energy	20.0 kWh
Useable Energy	19.0 kWh
Continuous Output Power	10.0 kW
Peak Output Power	12.0 kW
Nominal Voltage (DC)	204.8 V
Operating Voltage Range (DC)	192.0 V ~ 233.6 V
Input/Charge Voltage (DC)	227.2 V ~ 230.4 V
Charge Cut-off Voltage (DC)	233.6 V
Output/Discharge Cut-off Voltage (DC)	192.0 V
Output AC Voltage Range	380/400 VAC
	3 phase hybrid inverter (not included)
Output AC Power	10 kVA for continuous
	11 kVA for peak
Frequency Range	50/60 Hz
Round Trip Efficiency @ AC coupled	90%

Round Trip Efficiency @ DC coupled	95%
Number of Cycles	10,000 @ 80% DOD
Warranty	10 years limited warranty
Communication Interface	RS485, or CAN
Operating Temperature	-20°C to 50°C (-4°F to 122°F)
Storage Conditions	-20°C to 30°C (-4°F to 86°F)
	State of Charge (50% SoC)
Relative Humidity (RH)	Up to 100%, condensing
Ingress Rating	IP56
Cooling	Active Liquid Cooled
Cooling Power (W)	500 W
Heating Power (W)	1,000 W
Noise @ 1m distance	<60bdA @ 25°C
Dimensions (W x D x H)	828 x 568 x 1442 mm
	32.6 x 22.4 x 56.8 inch
Weight	360 kg / 794 lb
Environment	Indoor and outdoor
Altitude	2000 m
Installation	Floor mount
Environmental	RoHS Directive 2011/65/EU
Certifications (pending)	UL 1973, UL 9540
	EN62619, EN62477-1, EN61000-6-1/3
Shipping	UN38.3
	UN3480, Class 9

2.3 Appearance

Figure 2-1 HV20 Drawing



1 Liquid Cooling Device

2 HV20 Cabinet

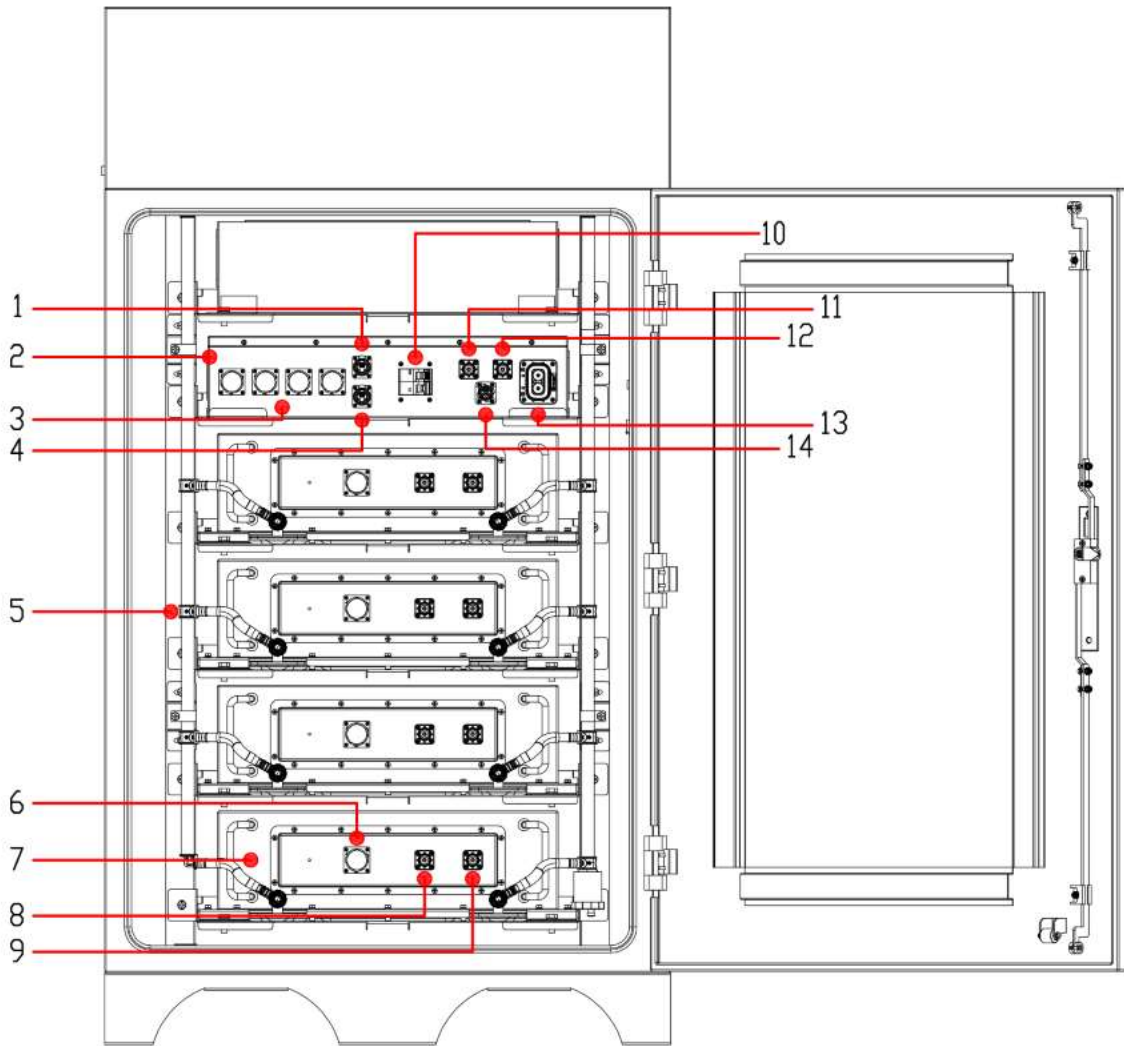
3 Protective Cover

4 DC Switch

5 Power Connector -
input/output

6 COM Port

Figure 2-2 HV20 Control Panel



- | | | | | | |
|----|--|----|--|----|--|
| 1 | COM 1/RJ45 - battery monitoring & update | 2 | BCU - battery control unit | 3 | Battery module signal input connector |
| 4 | COM 2/RJ45 - RS485, or CAN bus | 5 | Liquid cooling pipe | 6 | Battery module signal output connector |
| 7 | Battery module ground point | 8 | Battery module negative output | 9 | Battery module positive output |
| 10 | Shunt trip circuit breaker | 11 | Battery module positive input | 12 | Battery module negative input |
| 13 | Power connector - input/output | 14 | Liquid cooling device power supply + COM | | |

2.4 Working Mode

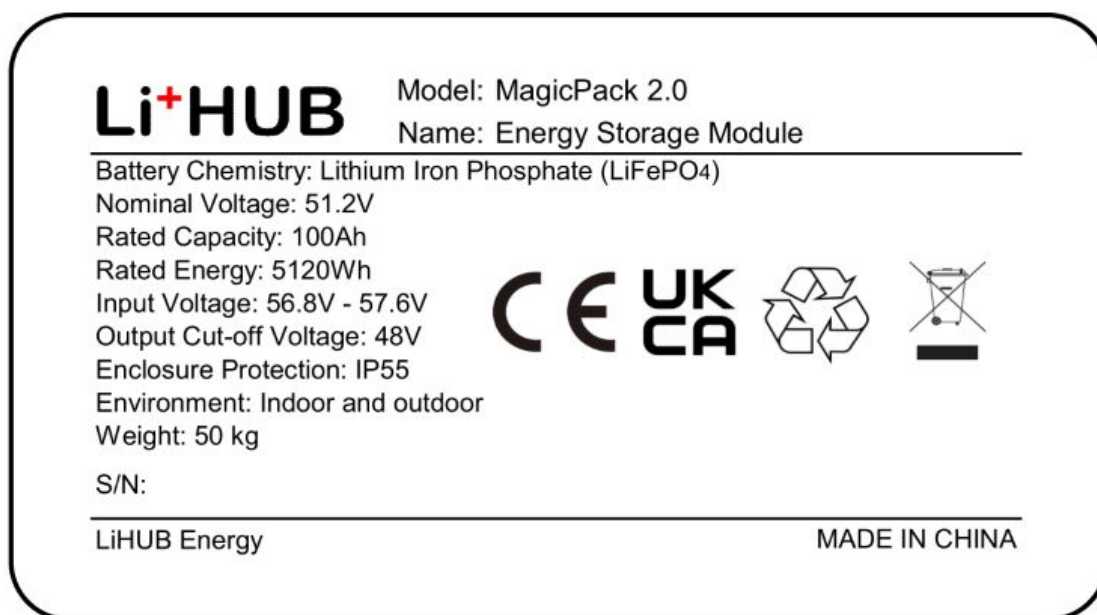
The LiHUB HV20 stores electric energy from solar PV, grid, or generator through independent hybrid inverter. It can output electric energy to power home loads or grid through the independent hybrid inverter too.

The LiHUB HV20 can work in operating, standby, or sleep mode.

Working Mode	Description	Power Consumption
Operating mode	Battery control unit (BCU) runs in full-featured mode. HV20 input, or output is opened.	≤80mA
Standby mode	Battery control unit (BCU) runs in essential featured mode. HV20 output is closed, but input is opened.	≤10mA
Sleep mode	Battery control unit (BCU) gets into shut down mode. HV20 output is closed, but input is opened.	≤500uA

2.5 Label Description

Figure 2-4 Label on MagicPack 2.0 Battery Module



3. Function

LiHUB HV20 is an intelligent residential BESS combining with PCS, EMS to monitor and control energy production, consumption, and storage in the house. The storage system is connected to the grid via the main distribution board.

LiHUB HV20 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.

LiHUB E HV20 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.

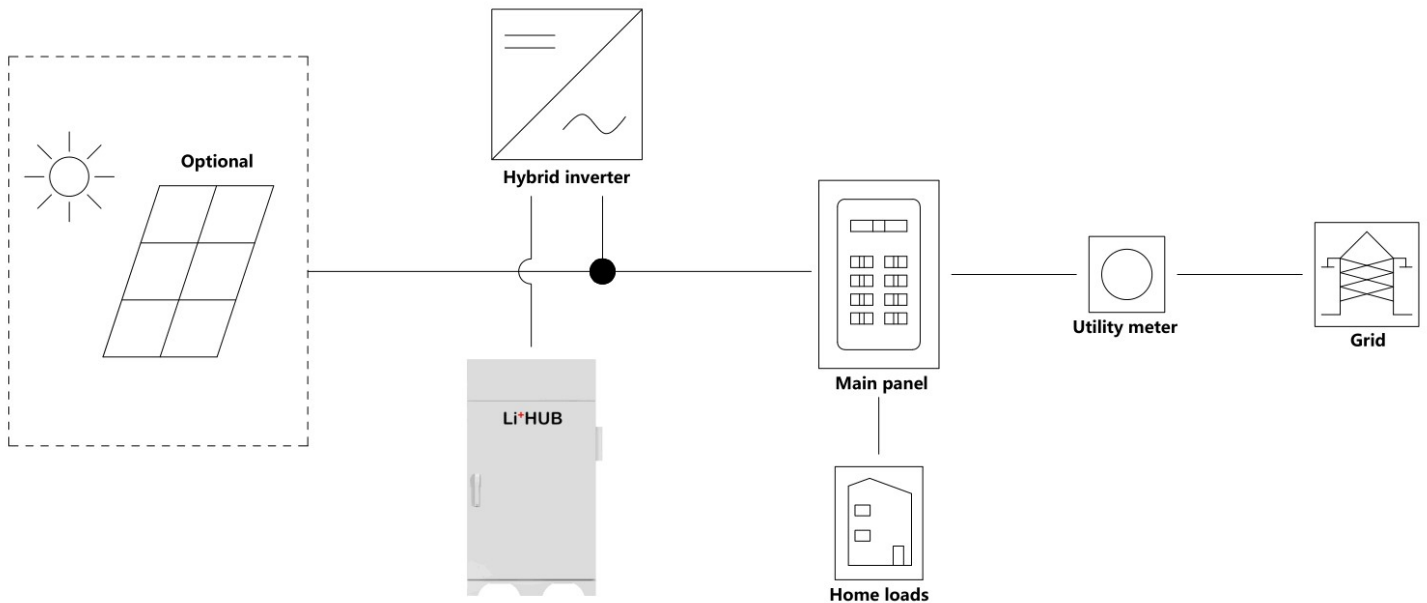
3.2 Time-of-Use Mode

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 local support team to set up the ToU mode.

Figure 3-1 Self-consumption, ToU Connection Diagram



3.3 Backup Mode

LiHUB HV20 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 HV20 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 Partial Home Backup

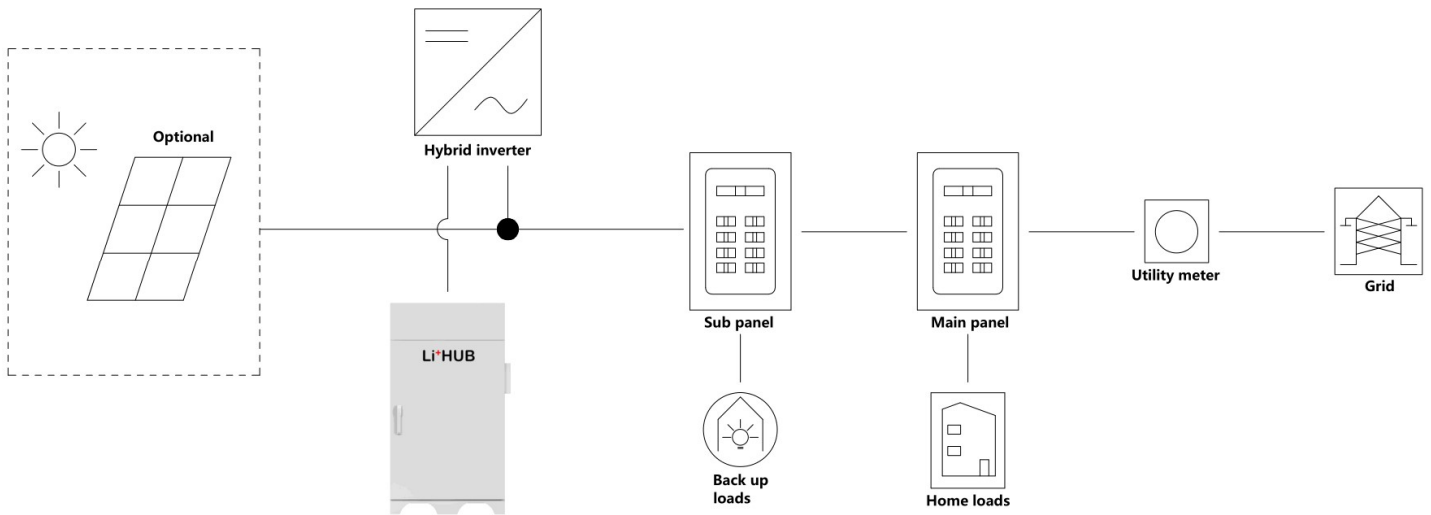
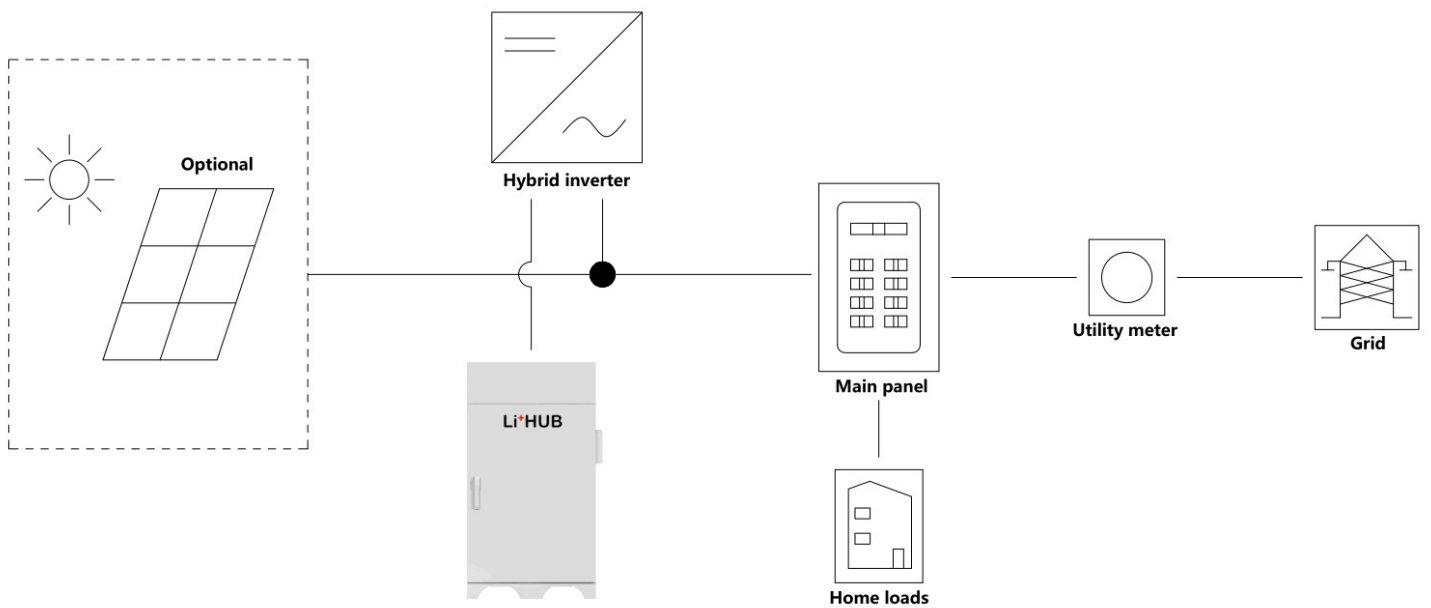


Figure 3-3 Whole Home Backup





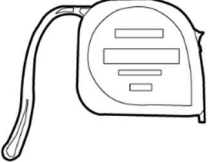

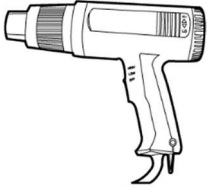
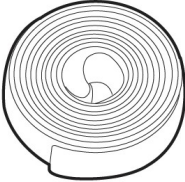
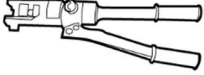




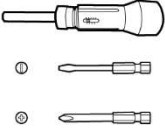
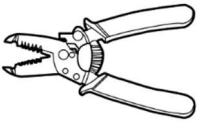
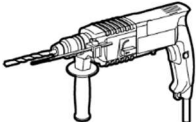






4. System Installation

4.1 Checking Before the Installation

Before unpacking the HV20, check the outer packing for damage, such as holes and cracks. If any damage is found, do not unpack the product and contact your dealer, distributor, or installer as soon as possible.

After unpacking the HV20, check that the deliverables are intact and complete, and free from any obvious damage. If any item is missing or damaged, contact your dealer, distributor, or installer.

4.2 Preparing Tools and Instruments

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

4.3 Installation Positioning

NOTICE

Network Requirements

- In order to use cloud services, HV20 and hybrid inverter are suggested to be installed where is covered by WI-FI network.

Installation Angle Requirements

- HV20 can only be floor mount. Do not install HV20 at forward tilted, back tilted, side tilted, or upside down.

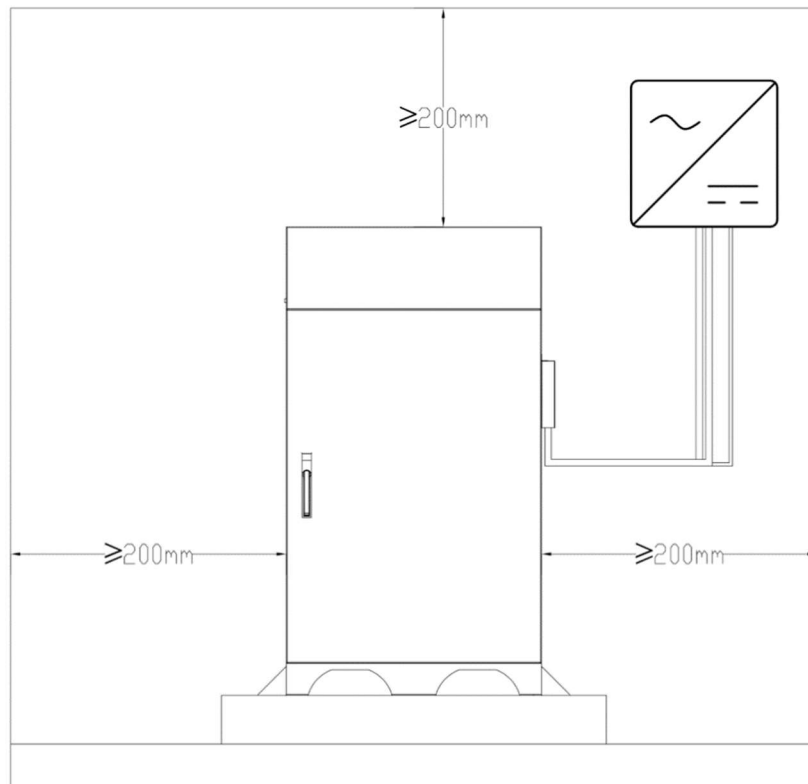
Installation Position Requirements

- Install HV20 on a solid, flat concrete base for outdoor installation, or concrete floor for indoor installation. If other types of 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 HV20. Reserve adequate space for heat dissipation and safety isolation.

Figure 4-1 Installation Space.

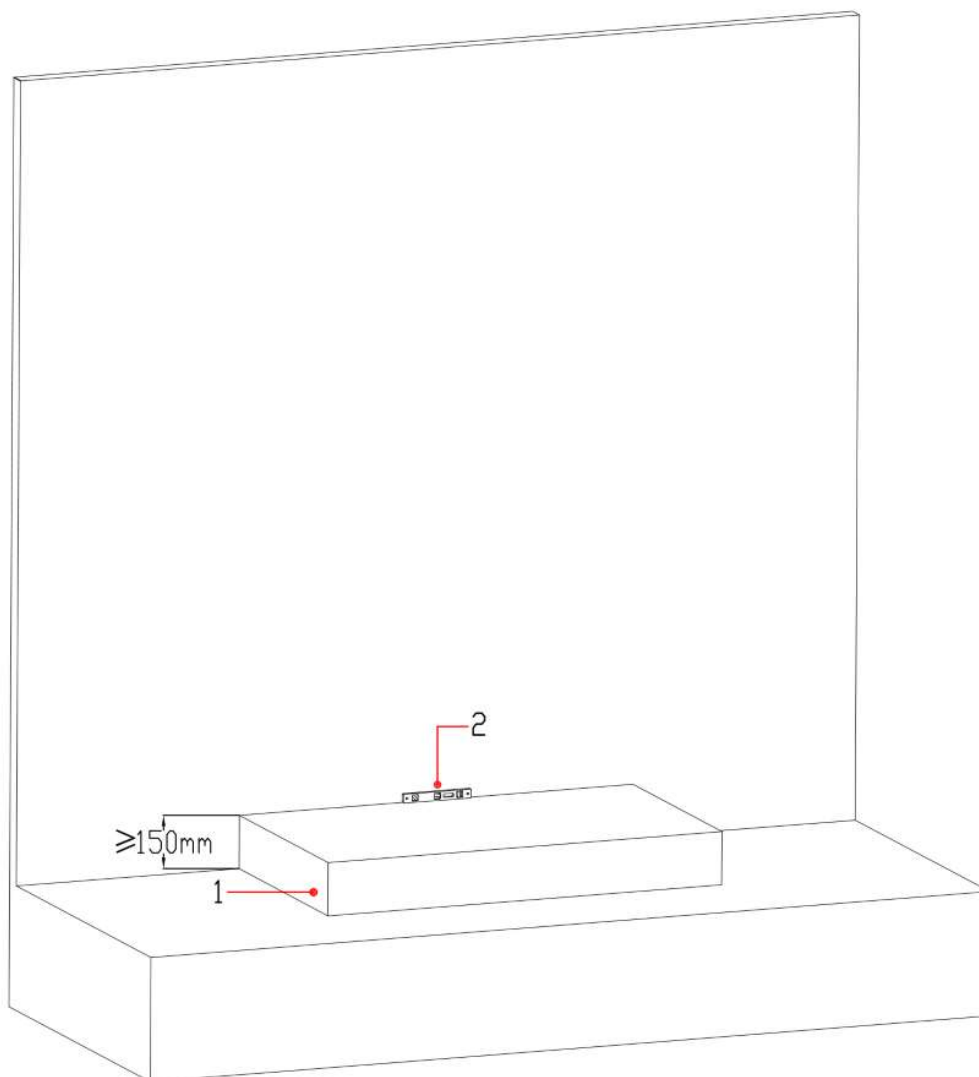


4.4 Floor Mount Installation

NOTICE

- Build a concrete base for HV20 outdoor installation.
- The concrete base suggested dimension is more than 1200mm/L x 800mm/D x 150mm/H.
- It is necessary to use forklift to place the HV20 on the concrete base.
- The forklift needs to be operated by certified personnel, and any impact on the HV20 should be avoided during operation.

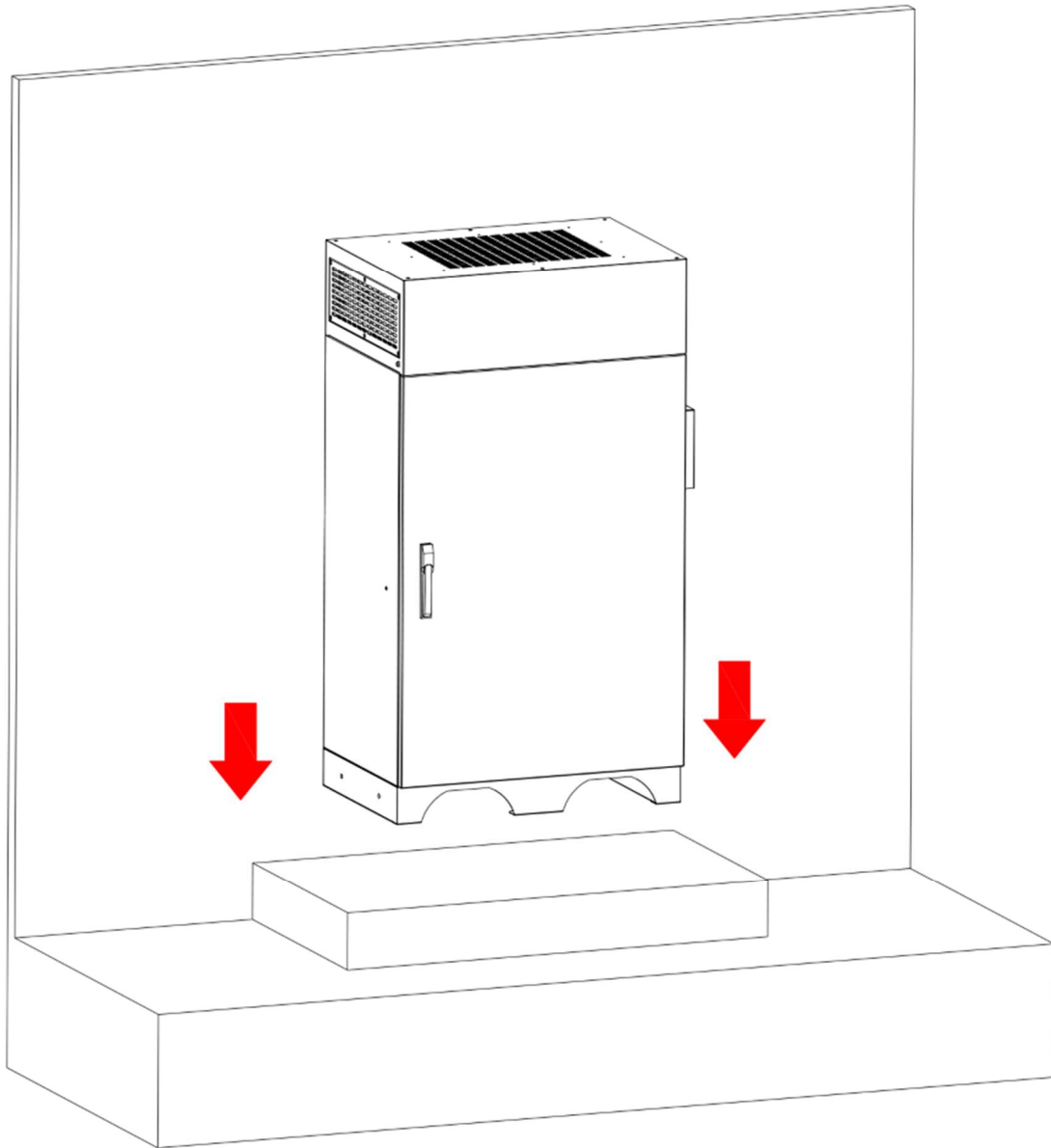
Figure 4-2 Concrete Base



1 Concrete base height is $\geq 150\text{mm}$

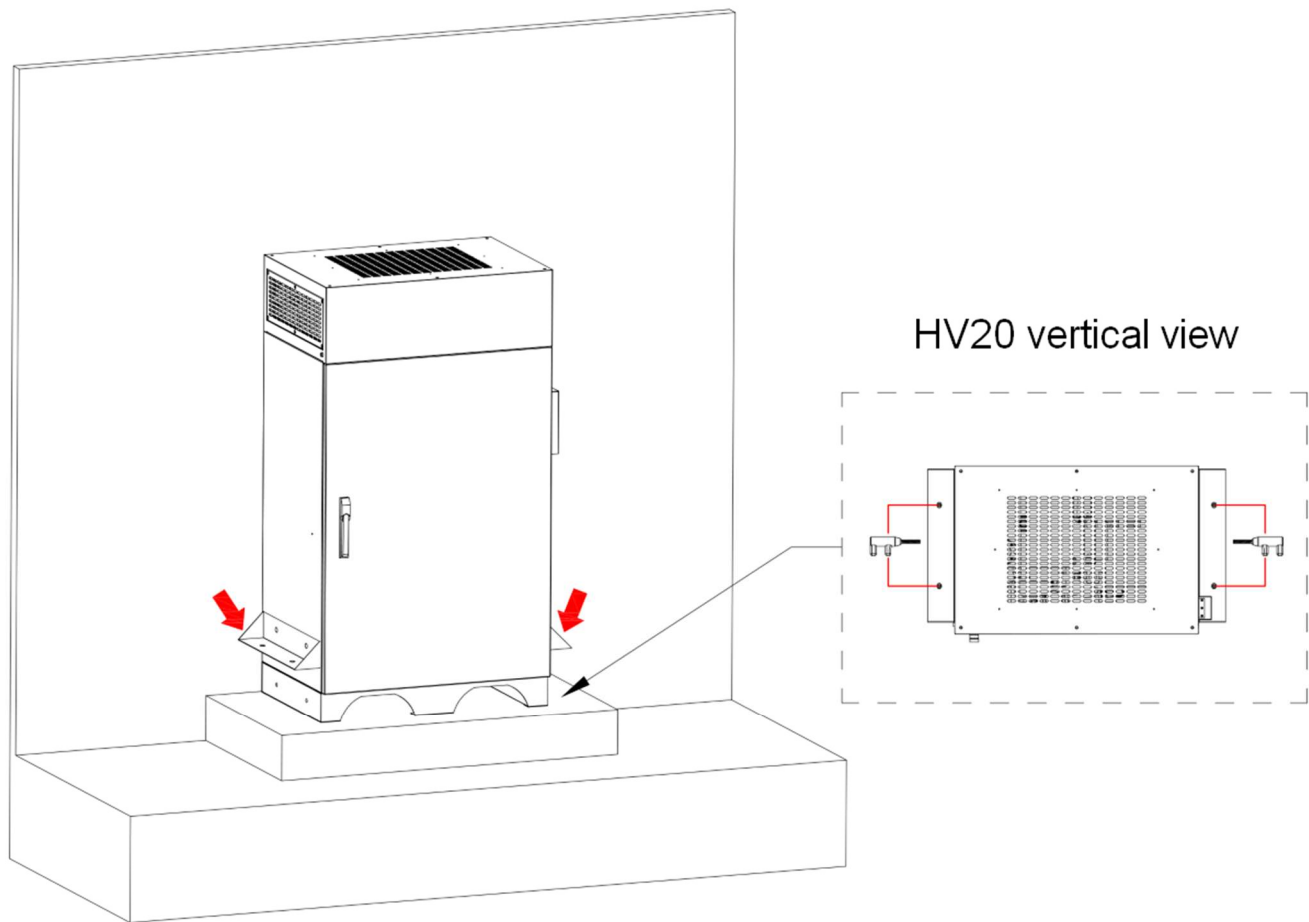
2 User level ruler to check surface is flat

Figure 4-3 Placing HV20 On Concrete Base

**NOTICE**

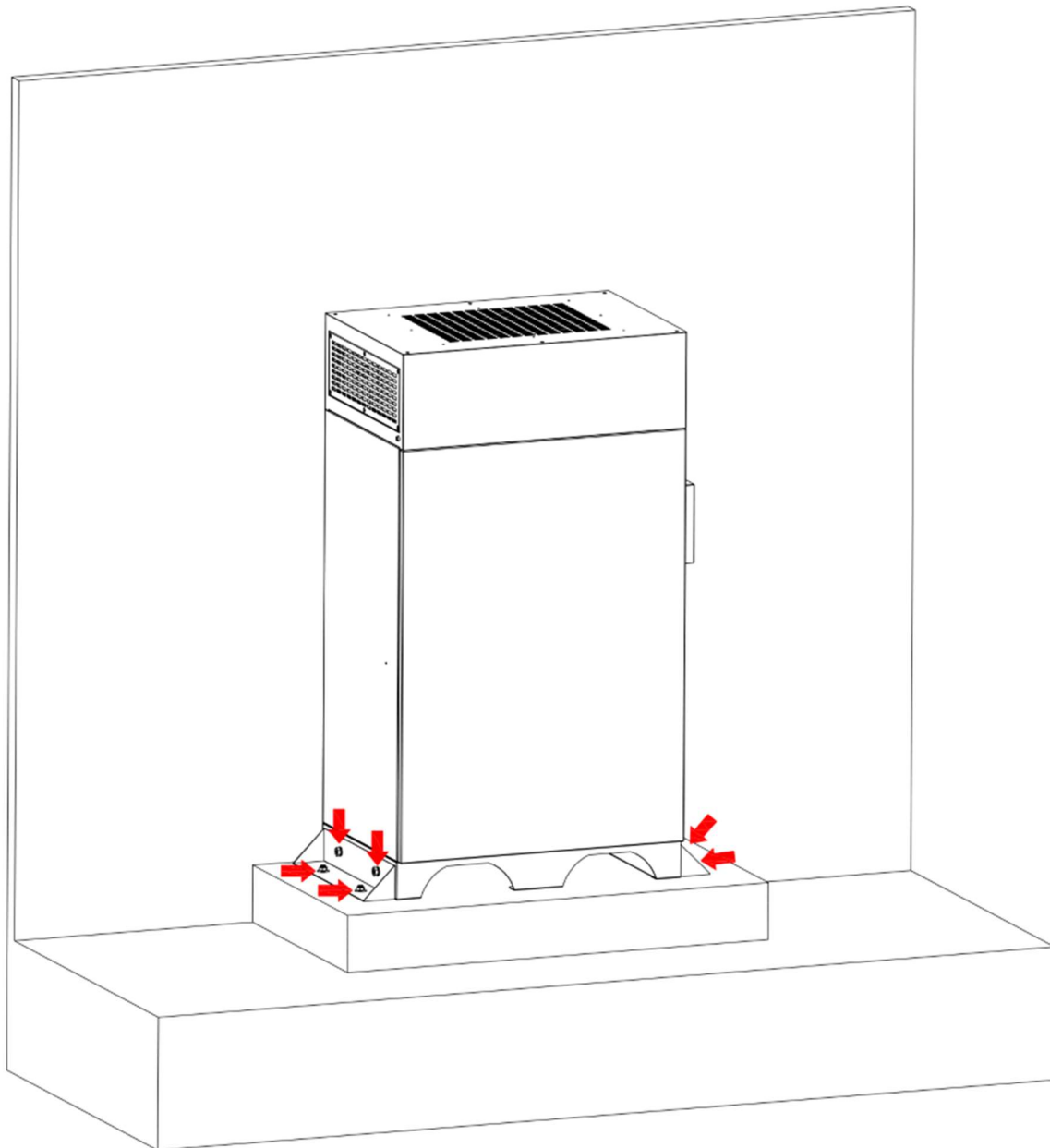
- Align HV20 with the concrete base surface and keep it more than 5cm away from the wall surface.
- It is necessary to use forklift to place HV20 on the concrete base.
- The forklift needs to be operated by certified personnel, and any impact on HV20 should be avoided during operation.

Figure 4-4 Install Corner Code - Part 1

**NOTICE**

- Use corner code to position the drilling hole on the concrete base for securing HV20, and mark the positions using a marker.
- The expansion bolts delivered with HV20 are mainly used for solid concrete base, or concrete floors. If other types floors are used, ensure that the floors meet the load-bearing requirements (HV20 weighs 350 kg) and select the bolts by yourself.
- M12x60 expansion bolts delivered with HV20 are used to fix the corner code. If the length and quantity of the bolts do not meet installation requirements, prepare expansion bolts by yourself.

Figure 4-5 Install Corner Code - Part 2

**NOTICE**

- Screws and nuts delivered with HV20 are used to fix the corner codes.
- Install and tighten all the screws, nuts on the left and right corner codes.
- If specification, or quantity of the screws, nuts do not meet installation requirements, prepare them by yourself.

5. Electrical Connection

Precautions

DANGER

- Before connecting cables, 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 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.

5.1 Cables

DC input/output power cables are delivered with the product. COM cable between (hybrid) inverter and the HV20 should be prepared by the customer.

Table 5-1 Cables

No.	Cable and Busbar	Specification	Source
1	DC Input/Output power cable between the product and (hybrid) inverter	<ul style="list-style-type: none"> ● Common outdoor PV cable ● Conductor cross-sectional area: 25 mm² 	Delivered with the product
2	COM cable between the product and (hybrid) inverter	<ul style="list-style-type: none"> ● Outdoor shielded twisted pair cable (8 cores) ● Conductor cross-sectional area: 0.2-1 mm² 	Prepared by the customer
3	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 COM cable between the product and (hybrid) inverter must be less than or equal to 5 m.

5.2 Electrical Connections with Inverter

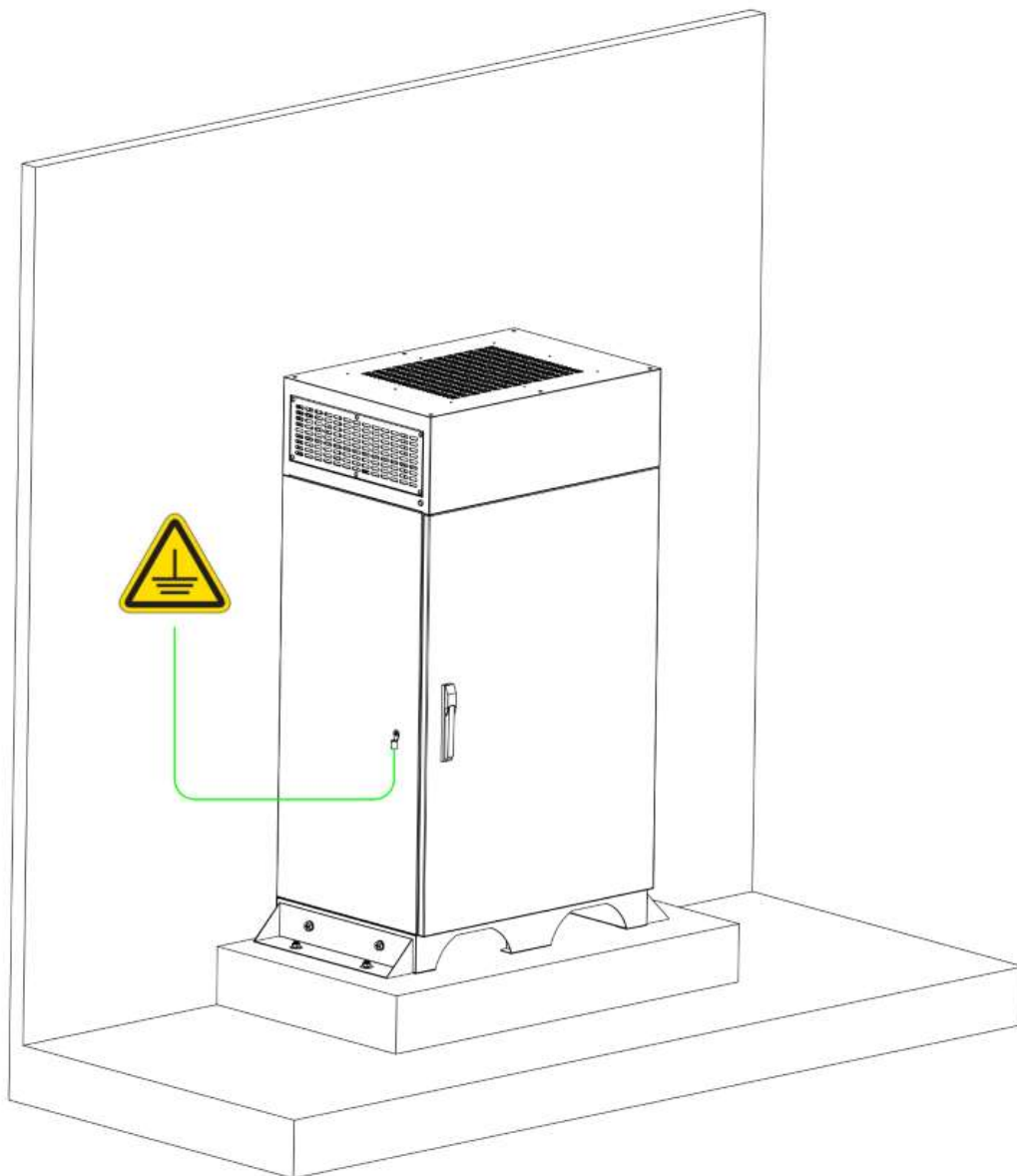
⚠ WARNING

- 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.

5.2.1 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 5-1 Install External Ground Cable.



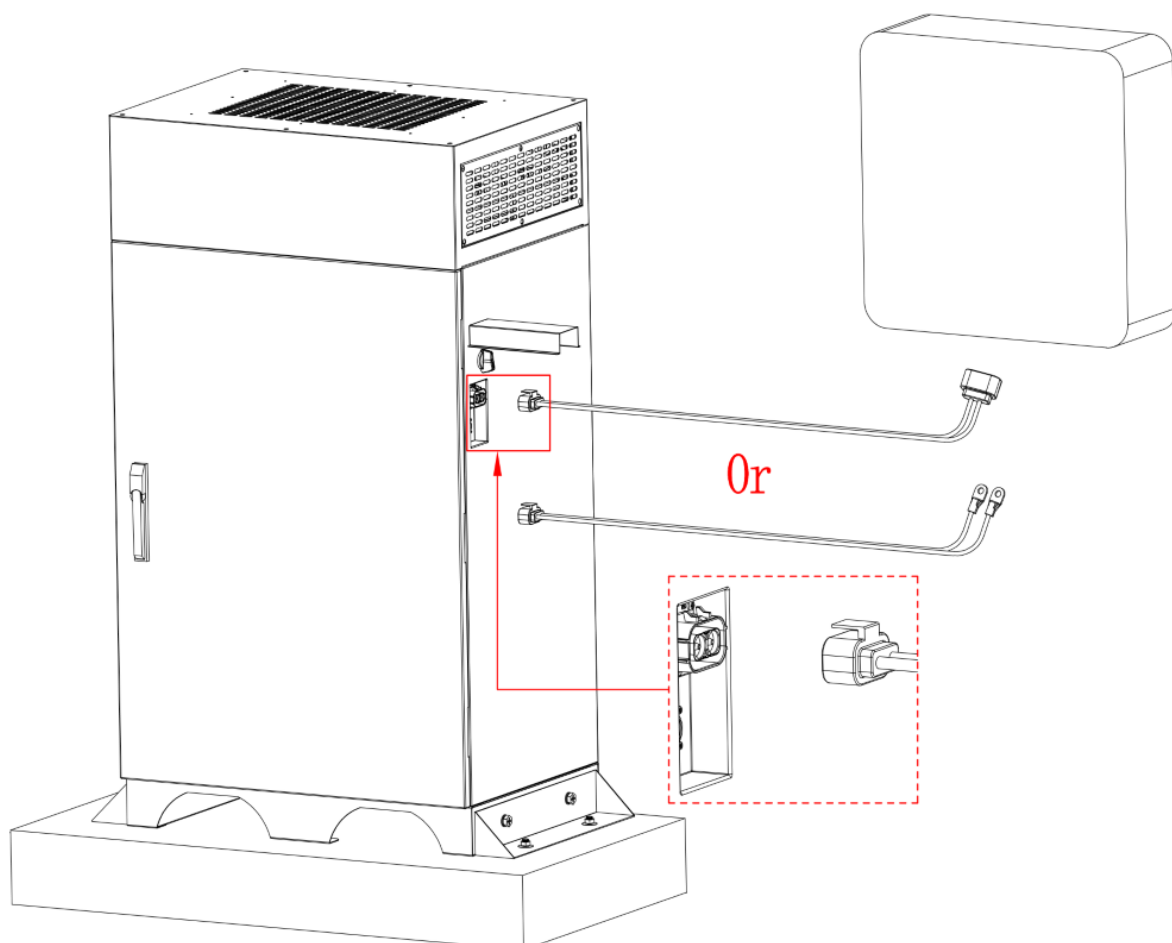
5.2.2 Install External Power Cables

External power cables are delivered with the product. If the connector is not compatible with the hybrid inverter, OT terminals in the packing case can be used to make external power cables. T35-8 OT terminal is suggested to crimp with 25 mm² 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 5-2 Install External Power Cables.



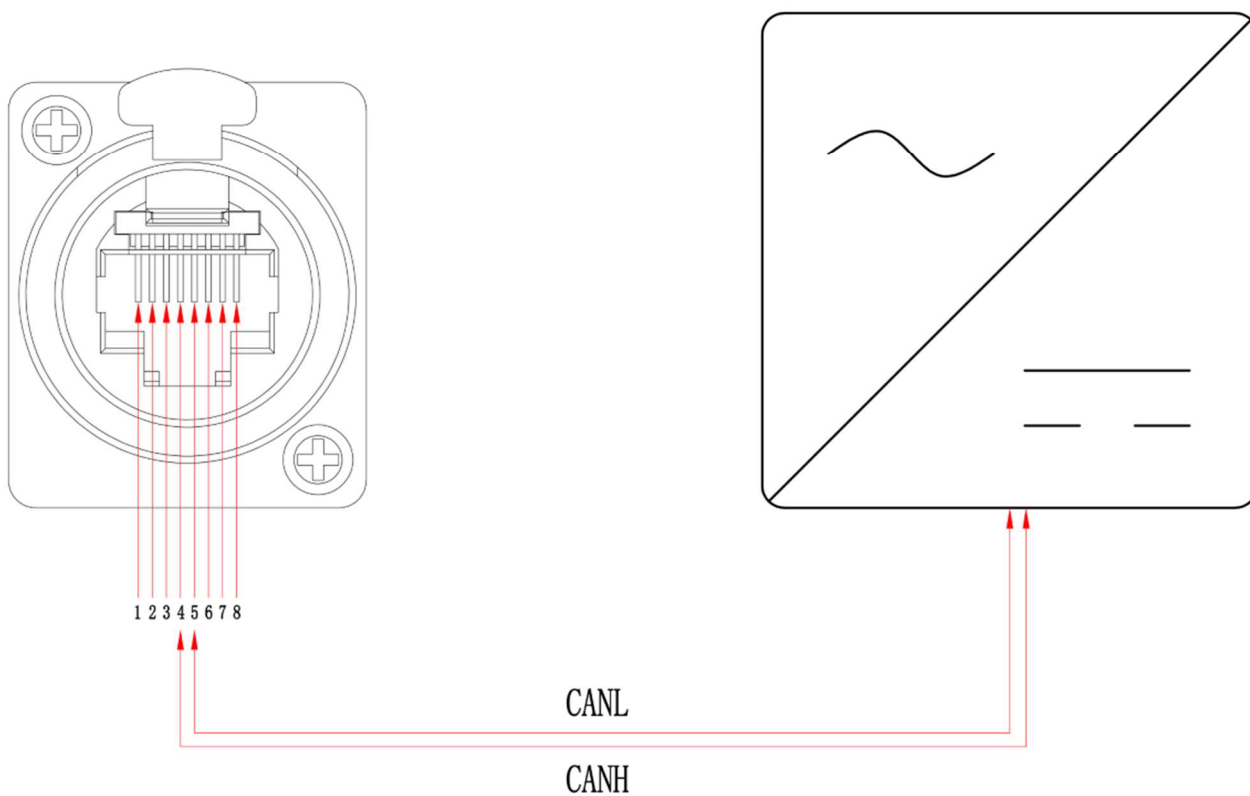
5.2.3 Install External Com Cable

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

NOTICE

- When laying out a COM cable, separate it from power cables and keep it away from strong interference sources to prevent communication interruption.
- Refer to Figure 5-3 to check COM port definitions.

Figure 5-3 Install External COM Cable



6. Operating Energy Storage System

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

NOTICE

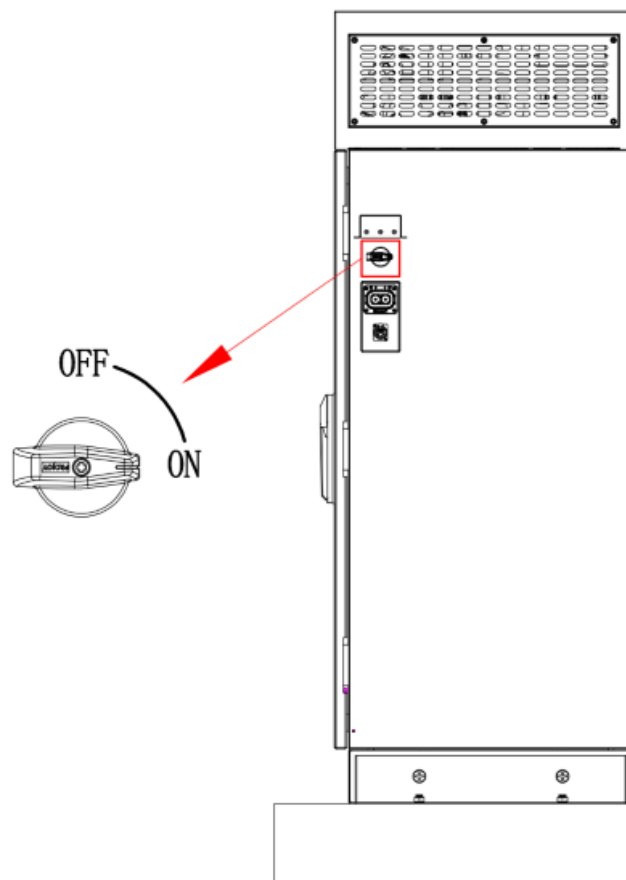
- Energy storage system must only be opened by authorized electricians.
- Electrical work on energy storage system and the associated electrical distributor must only be carried out by authorized electricians.

6.1 Start-Up Energy Storage System

Start-Up the energy storage system. Please follow the sequence below:

1. Connect the AC circuit breaker to ensure the system is powered and commissioned.
2. Turn on PV switch on hybrid inverter if available.
3. Turn on HV20 shunt trip circuit breaker.
4. Turn on HV20 DC switch.

Figure 6-1 Power ON HV20



6.2 Shutdown Energy Storage System

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

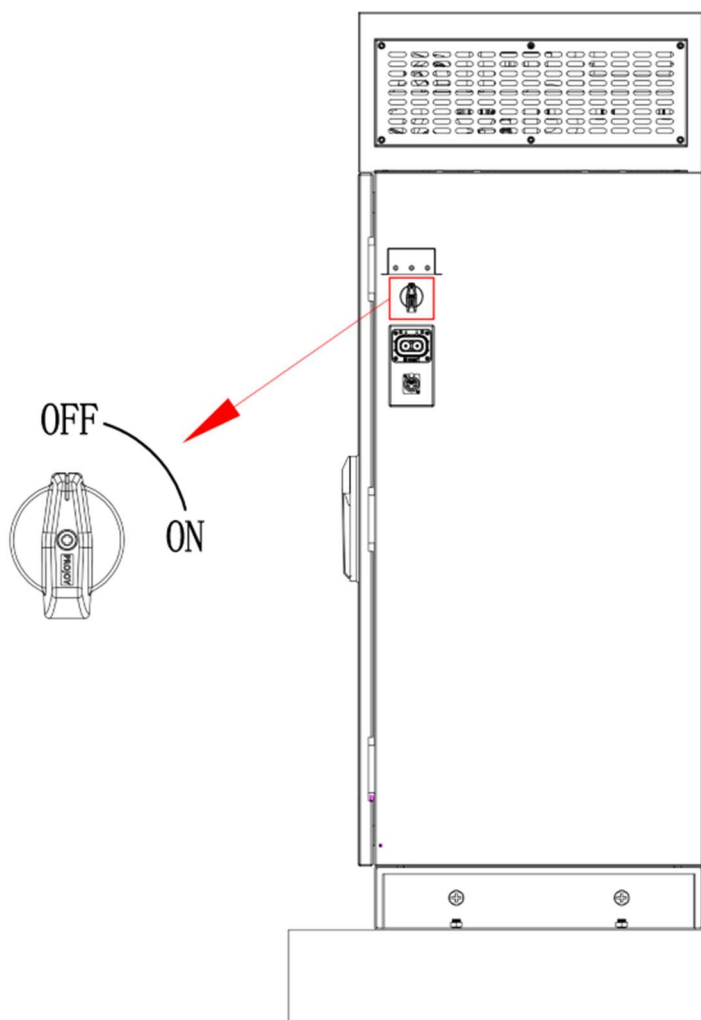
NOTICE

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

Shutdown the energy storage system. Please follow the sequence below:

1. Turn off HV20 DC switch.
2. Disconnect the AC circuit breaker to prevent it from being reactivated.
3. Turn off HV20 shunt trip circuit breaker.
4. Turn off PV switch on hybrid inverter if available.

Figure 6-2 Power OFF HV20



7. 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 7-1 Function checks and cleaning

Interval	Actions
Every 2 weeks	Check for any functional errors of the energy storage system.
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 HV20 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 HV20 with low SOC may occur in the following scenarios:

- The HV20 power cables or signal cables are not connected.
- The HV20 cannot be charged due to a system fault after discharge.
- The HV20 cannot be charged due to incorrect configurations in the system.
- The HV20 cannot be charged due to no PV, or grid input. Or long-term mains failure.

Regardless of scenarios, the HV20 must be charged within the maximum interval corresponding to the SOC when the energy storage system is powered off. If the HV20 is not charged beyond the maximum interval, it may be damaged due to under discharge.

Table 7-2 SOC vs charge interval

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

8. Uninstallation & Disposal

8.1 Uninstallation

⚠ DANGER

- Improper uninstallation of the HV20 may cause catch fire, or electric shock.
- The HV20 must be only uninstalled by an authorized electrician.

8.2 Disposal

NOTICE

- Improper transport of HV20 may cause catch fire, or emission of toxic substances.
- Transport the HV20 in their original packaging only. If you no longer have the original packaging, new packaging can be requested from LiHUB Energy.
- Never transport damaged HV20.
- Improper disposal of HV20 may cause catch fire, explosion, or emission of toxic substances.
- Do not dispose of HV20 in fire.
- The HV20 and the batteries it contains must not be disposed of as domestic waste!
- Dispose of the HV20 and the batteries it contains in an environmentally friendly way through suitable collection systems.

