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USER MANUAL

Model

FLH-E60

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Contents

Quick Start Guide 2
1.Safety, Responsibility & Compliance 4
1.1 Intended Audience 4
1.2 Personnel Qualification Requirements 4
1.3 Safety Symbol Definitions 5
1.4 Electrical Safety 5
1.5 Battery Safety 6
1.6 Responsibility Boundary & Disclaimer 6
2. Product Description & System Architecture 7
2.1 System Overview 7
2.2 System Architecture Description 7
2.3 External Structure and Interfaces 8
2.4 Thermal Management System 9
2.5 Internal Functional Layout 10
2.5.1 Internal Equipment 10
2.5.2 Battery Modules and Battery Control Unit Battery Module 12
2.5.3 Fire Detection and Suppression System 16
2.5.4 Indicators and System Status Definition 17
3. Transportation & Storage 18
3.1 Transportation Requirement 18
3.2 Storage Conditions 20
4. Mechanical Installation 21
4.1Pre-installation Inspection 21
4.1.1 Transportation 21
4.1.2 Open the package 24
4.1.3 Equipment accessory list 27
4.2 Installation Environment 30
4.3 Site Requirements 30
4.4 Foundation and Clearance 30
4.5 Installation Spacing Requirement 31
4.6 Foundation requirements 32
4.7 Transportation and lifting 34
4.7.1 Hoisting Equipment 34
4.7.2 Hoisting 36
4.8 Installation of inverters and BESS 37
4.8.1 Battery Pack Installation Diagram 37
4.8.2 Inverter Installation Diagram 38
4.9 Fixing Methods 39
5.Electrical Installation 40
5.1 Preparation before connection 41

5.2 Cable connection 43
5.2.1 Cable connections inside BESS 43
5.2.2 Auxiliary power supply 44
5.2.3 Cable connection between BESS 48
5.2.4 Cable connection between the inverter and BEES 49
5.3 Operation after cable connection 50
6.Activate BESS 51
6.1 Power-on procedure 51
6.2 Power-off procedure 52
6.3 PCS Settings 53
6.4 Unplanned (emergency) shut down 53
7. Fire Suppression system 53
7.1 Fire Suppression equipment 53
7.1.1 Aerosol fire suppression system 53
7.1.2 Fire suppression water pipe system 55
7.2 Exhaust system 57
8.Troubleshooting 58
9. Inspection, cleaning and maintenance 63
9.1 Basic Information 63
9.2 Maintenance item and perio 63
9.3 Battery Maintenance 66
9.4 Disassembly and installation 69
9.4.1 Disassemble and install the battery pack 69
9.4.2 Disassemble and install the BCU 71
10. Decommissioning and Recycling 73
10.1 Battery Recycling 73
10.2 Metal and Electronic Components 73
10.3 Non-Recyclable Components 73
Appendix 74
Technical Specifications 74

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The manufacturer shall not be liable for personal injury, property loss, product damage and subsequent losses under the following circumstances:

- Damages caused by force majeure, including earthquake, flood, volcanic eruption, mudslide, lightning, fire, war, military conflict,typhoon, hurricane, and so on.
- Failure to comply with the provisions of this manual.
- The installation, operation and storage environment does not meet the relevant international, national or regional standards.
- Incorrect use of this product.
- Unauthorized or unqualified personnel repair the product, disassembly the rack and perform other operations.
- Use of unapproved spare parts.
- Unauthorized modifications or technical changes to the product or software.
- Incorrect shipment by yourself or the third party commissioned by you.
- Unsatisfactory materials and tools from you own that do not meet the relevant international, national or regional standards.
- Damage caused by yourself or the third party's negligence, intent, gross negligence, or improper operation.

Quick Start Guide

Abbreviation：

Complete designation	Abbreviations
Battery Module	Module
Battery Pack	Pack
Battery Control Unit	BCU
Accessory box	/
Energy Storage System	BESS

1. System Overview

The FLH-E60 is a floor-mounted, high-voltage lithium iron phosphate ($LiFePO_4$) Battery Energy Storage System designed for commercial and industrial (C&I) applications. The system integrates battery modules, Battery Control Unit (BCU), thermal management, fire suppression, and protection systems within a single enclosure.

This Quick Start Guide provides a high-level reference for installers and commissioning engineers to understand the overall workflow before reading the full manual.

2. Installation & Commissioning Flow

Delivery & Storage
→ Site & Foundation Preparation
→ Mechanical Installation & Fixing
→ Internal Battery & BCU Installation
→ Electrical Wiring (DC / Auxiliary / Grounding)
→ Pre-Commissioning Inspection
→ Power-On & Commissioning
→ Normal Operation

All steps shall be completed in sequence. Skipping or re-ordering steps may result in equipment damage, safety hazards, or commissioning failure.

3. Power-On Checklist (Quick Reference)

Before powering on the system, confirm:
☐ Cabinet is securely fixed to foundation
☐ All internal wiring completed and torque-checked
☐ Grounding resistance meets local code requirements
☐ Emergency stop button is released
☐ No tools or foreign objects remain inside the cabinet
☐ Air inlets and outlets are unobstructed
☐ Cabinet doors are closed and locked

4. Emergency Shutdown (Quick Reference)

In case of fire, electric shock risk, or abnormal behavior:

Evacuate all personnel from the area immediately.
Disconnect external power sources if safe to do so.
Do not open the cabinet under fire conditions.
Contact local emergency services and Felicity Solar technical support.

1.Safety, Responsibility & Compliance

1.1 Intended Audience

This manual is intended for:

- Qualified electrical technicians
- Certified installers and EPC contractors
- Commissioning and maintenance engineers
- System integrators

End users without professional electrical training shall not install, operate, or service this product.

1.2 Personnel Qualification Requirements

All transportation, installation, wiring, commissioning, operation, and maintenance activities shall be performed only by qualified personnel who:

- Are trained in electrical and mechanical safety
- Are familiar with lithium battery characteristics and hazards
- Understand local electrical, fire, and occupational safety regulations

Unqualified operation may result in serious injury, death, or property damage.

1.3 Safety Symbol Definitions

	Indicates a hazardous situation which, if not avoided, will result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, could result in death or serious injury.
	Indicates a hazardous situation which, if not avoided, may result in minor or moderate injury.
	Indicates important information related to property damage or equipment protection.

1.4 Electrical Safety

Danger!

High-voltage DC electricity is present inside the system.

- Live voltage may remain even after the system is powered off.
- Always wait at least 10 minutes after shutdown and verify zero voltage before performing any operation.

Failure to follow electrical safety procedures may result in serious injury or death.

1.5 Battery Safety

- Use only battery modules supplied or approved by Felicity Solar.
- Do not mix batteries of different brands, capacities, or specifications.
- Do not short- circuit, disassemble, crush, or modify battery modules.
- After deep discharge, recharge the battery within 48 hours.
- During long- term storage, recharge the battery every 6 months and keep SOC ⩾ 50%.

Improper battery handling may cause fire, explosion, or chemical hazards.

1.6 Responsibility Boundary & Disclaimer

Felicity Solar shall not be liable for any damage, loss, or injury resulting from:

- Failure to follow this manual
- Installation or operation not compliant with local regulations
- Unauthorized modification or repair
- Use of unapproved spare parts
- Improper transportation or storage

Local laws, electrical codes, and fire regulations **shall always take precedence** over this manual.

2. Product Description & System Architecture

Notice: The descriptions in this section are intended to provide system-level understanding. Detailed installation, wiring, operation, and maintenance procedures are provided in subsequent sections of this manual.

2.1 System Overview

The FLH-E60 Battery Energy Storage System (BESS) is an integrated, floor-mounted energy storage solution designed for commercial and industrial applications. The system combines lithium iron phosphate ($LiFePO_4$) battery modules, a Battery Control Unit (BCU), power interfaces, thermal management, fire suppression, and monitoring components within a single enclosure.

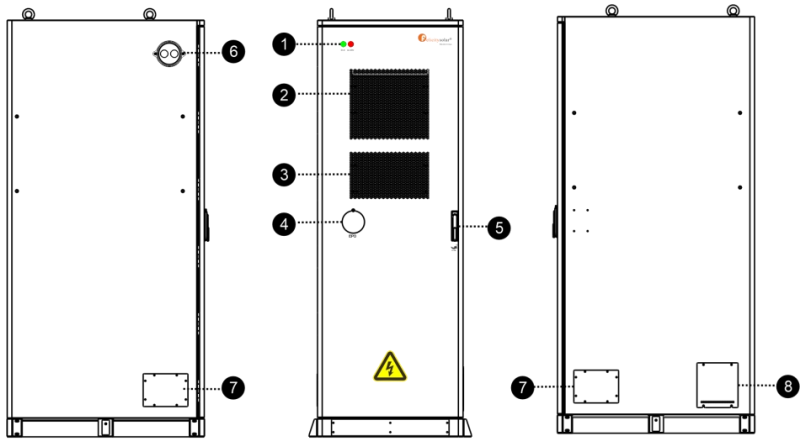
The system is intended to operate in grid-connected or off-grid scenarios and may be expanded through parallel connection of multiple BESS units, subject to site conditions and local regulations.

2.2 System Architecture Description

At a system level, the FLH-E60 BESS consists of the following functional subsystems:

- **Energy Storage Subsystem:** Battery modules assembled into battery packs to store electrical energy.
- **Battery Management & Control Subsystem:** BCU and BMUs responsible for battery protection, monitoring, balancing, and communication.
- **Power Interface Subsystem:** DC busbars, protection devices, and interfaces for connection to the Power Conversion System (PCS).
- **Thermal Management Subsystem:** Integrated air-conditioning system maintaining battery operating temperature.
- **Fire Detection & Suppression Subsystem:** Aerosol fire suppression, smoke detection, temperature detection, and pressure relief.
- **Auxiliary Power & Monitoring Subsystem:** Auxiliary AC power, indicators, sensors, and communication interfaces.
- Each subsystem is designed to work together to ensure safe, stable, and efficient operation of the energy storage system.

2.3 External Structure and Interfaces



No.	Description
① Status Indicator Light	Displays system operating and alarm status.Green indicates operational status; red indicates fault status.
② Air Conditioning Outlet	Hot air in the air conditioner comes out from this outlet.
③Air Conditioning Inlet	Outdoor air enters air conditioner through this opening.
④ Emergency Stop Button	Allows immediate shutdown during emergency conditions.
⑤ Cabinet Door and Lock	Restricts access to authorized personnel only.
⑥Pressure Relief Breather	Releases internal gas pressure during abnormal conditions.
⑦ Cable Entry Ports	For DC power cables, auxiliary power cables, and communication cables.
⑧ Firefighting Interface	Reserved interface for external firefighting water connection.

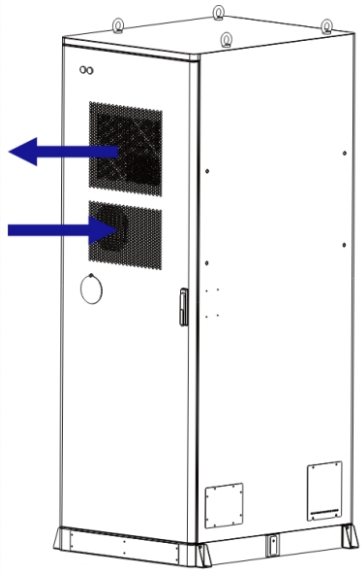
2.4 Thermal Management System

The FLH-E60 BESS is equipped with an integrated air-conditioning system designed to maintain the internal cabinet temperature within the specified operating range.
Proper thermal management is critical to:

- Battery performance
- Battery lifespan
- System safety

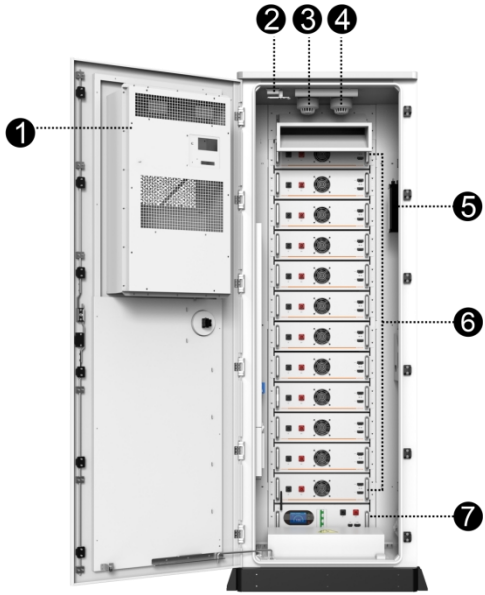
Air inlets and outlets **shall remain unobstructed at all times.** Blocking airflow may result in overheating, derating, or system shutdown..

Energy storage Air Conditioner	
Rated Voltage	AC 230V
Rated Frequency	50/60Hz
Rated Cooling Capacity	2000W
Rated Heating Capacity	1000W
Rated Cooling Power Input	1000W/1300W
Rated Heating Power Input	1200W/1300W
Rated Cooling Current	4.6A/5.7A
Rated Heating Current	5.3A/5.6A
Max.Power	1610W
Max.Current	7A
Air Flow Volume	800m³/h
Refrigerant	R134a
Water-proof Class	IP55
Dimension（W×H×D）	483×220×833 mm
Net Weight	≈38kg

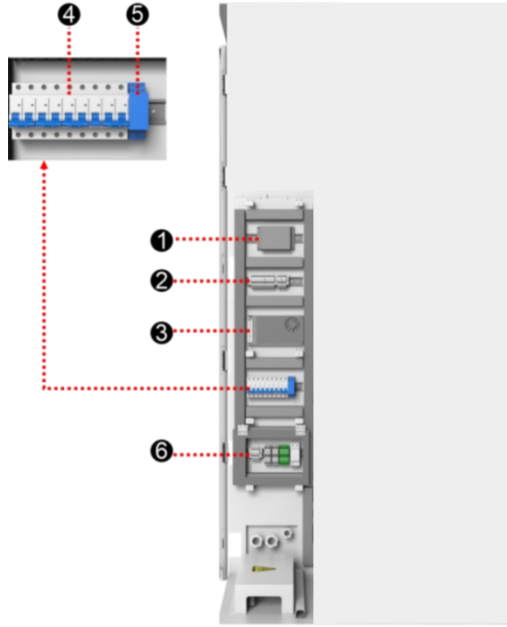


2.5 Internal Functional Layout

2.5.1 Internal Equipment



No.	Description
①Air-conditioning unit	Cooling the BESS.
②Travel switch	When the BESS is detected to be on fire, aerosol is emitted to extinguish the fire. Check whether the BESS's door is closed.
③Smoke detector	A device used to detect smoke in a fire and sound an alarm when smoke is detected.
④Heat detector	A device used to measure temperature and sound an alarm if it detects excessive temperature.
⑤aerosol suppression devices	When the BESS is detected to be on fire, aerosol is emitted to extinguish the fire.
⑥PACK1~12	It is a battery assembly in which battery cells are Connected in series with a pair of positive and negative terminals for external output. It contains a BMU (battery management unit) .
⑦Battery Control Unit （BCU）	Manages and maintains individual battery cells against overcharging and over-discharging and monitors battery status.



No.	Description
①Serial relay	Control system
②Terminal line	For connecting cables
③Switching Mode Power Supply	Power source
④Miniature circuit breaker	Controlled power-on and power-off
⑤Water immersion sensor	Check the BESS for water leakage
⑥Terminal line	Connect external cables

2.5.2 Battery Modules and Battery Control Unit Battery Module

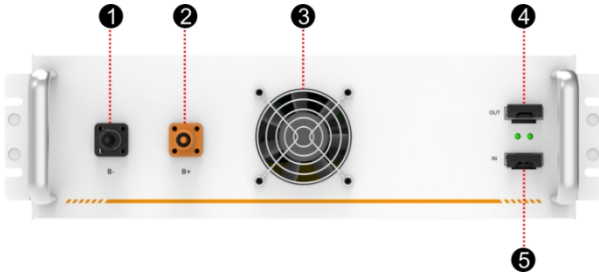
The system uses lithium iron phosphate ($LiFePO_4$) battery modules characterized by high safety, long cycle life, and thermal stability.

Each battery module:

- Provides DC energy storage
- Is monitored by an internal Battery Management Unit (BMU)
- Communicates operating data to the BCU

Battery modules are connected in series to form a high-voltage battery cluster.

Model	FLH48100UMG3
Battery Type	LiFePO4(LFP)
Nominal Voltage	51.2Vdc
Rated Capacity	100Ah
Rated Energy	5.12kWh
Nominal Charge/Discharge Current	100A
Charge Temperature	0~55°C
Discharge Temperature	-20°C～55°C
Storage Temperature	0°C～35°C
Ingress Protection	IP20
Dimension (W/D/H)	482.6x565x133mm
Weight Approximate	42kg



No.	Description
①Battery Negative-	Negative terminal of the battery module
②Battery Positive+	Positive terminal of the battery module
③Fan	Promote internal and external air flow
④OUT	Communication line output terminal
⑤IN	Communication line input terminal

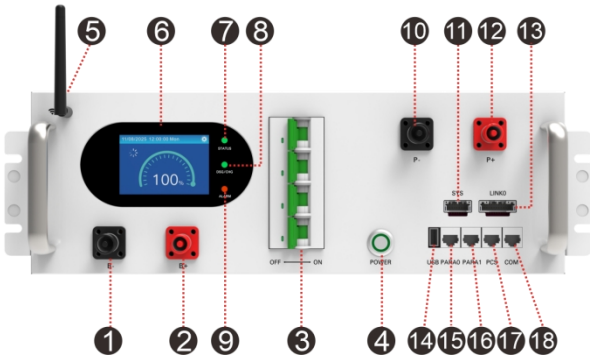
Battery Control Unit

The BCU is the central control component of the battery system and performs the following functions:

- Monitors voltage, current, temperature, and system status
- Protects against overvoltage, undervoltage, overcurrent, and thermal faults
- Balances battery modules to extend service life
- Communicates with PCS and external monitoring systems
- Controls system startup, shutdown, and protection logic

The BCU status indicators provide visual information regarding system operation, charging, discharging, and fault conditions.

Model	FLH48100UCG3
Operating Voltage	232～691.2Vdc
Nominal Charge/Discharge Current	100A
Working Temperature Range	Charge: 0°C~+55°C
	Discharge: -20°C~+55°C
Ingress Protection	IP20
Dimension (W/D/H)	482.6*565*150mm
Weight Approximate	10.3kg



No.	Description
①B-	Connection position of the common negative pole of the battery
②B+	Connection position of the common positive pole of the battery
③Air switch	Used to manually control the connection between the battery rack and external devices
④START	A start switch of 12VDC power inside the high-voltage control box
⑤WIFI	WIFI antenna interface
⑥LCD display	Display battery information
⑦Status	Battery system status indicator
⑧DSG/CHG	Charging indicator and discharging indicator. Flashing indicates charging, and constant illumination indicates discharging.
⑨Alarm	Battery system fault alarm indicator
⑩P-	Connection position of PCS negative pole
⑪SYS	Communicative connection with the cabinet and fan power supply
⑫P+	Connection position of PCS positive pole
⑬LINK0	Communicative connection with the first battery module; and providing 24VDC power for the first battery module.
⑭USB	BMS upgrade interface and storage expansion interface
⑮PARA0	Connection position with previous FLH-E-BCU communication input
⑯PARA1	Connection position with next FLH-E-BCU communication output
⑰PCS	Communication interface with charging and discharging equipment
⑱COM	Reserve

2.5.3 Fire Detection and Suppression System

The system integrates multiple fire protection measures, including:

- Smoke detectors
- Temperature sensors
- Aerosol fire suppression devices
- Pressure relief breather

When abnormal conditions are detected, the system will generate alarms and activate fire suppression functions as designed.

External firefighting interfaces are provided as a secondary safety measure and **shall be used only in accordance with the procedures defined in this manual and local fire regulations.**

2.5.4 Indicators and System Status Definition

System status indicators provide real-time information on operating conditions:

- **RUN Indicator:** Indicates normal system operation
- **ALARM Indicator:** Indicates alarm or fault condition
- **Alarm State:** The system may continue operating with warnings displayed.
- **Fault State:** The system stops operation to prevent damage or safety hazards.

Refer to the Troubleshooting section for detailed alarm and fault descriptions.

3. Transportation & Storage

Fsolar assumes no liability for any damage, property loss, personal injury, or adverse consequences resulting from improper product transportation or storage.

3.1 Transportation Requirement

The FLH-E60 BESS is classified as a lithium battery energy storage product and shall be transported in accordance with applicable international and local transportation regulations.

The following conditions should be met for the transportation of BESS:

- Transportation shall be performed by qualified logistics personnel.
- The product shall remain in its original factory packaging during transportation.
- Do not tilt, overturn, or subject the cabinet to severe impact or vibration.
- Lifting points marked on the cabinet shall be used at all times.
- Ensure that the door is locked.
- Select appropriate crane or lifting tool according to the site conditions. The lifting tool used shall have a sufficient load bearing capacity, boom length and radius of rotation.
- Additional traction may be required if ESS needs to be transported on slopes.
- Remove all obstacles that exist or may exist on the way, such as tree branches, cables, etc. The BESS should be transported and moved under good weather conditions.
- Be sure to set up warning signs or warning area to prevent non-staff from entering the lifting area to avoid accidents.
- When transporting by road, it is important to use ropes to secure the top ring of the equipment to the transport vehicle to avoid excessive tilt during transportation.
- The battery products should be transported after packaging and during the transportation process, severe vibration, impact, or extrusion should be prevented to prevent sun and rain. It can be transported using vehicles such as cars, trains, and ships.
- Always check all applicable local, national, and international regulations before transporting a Lithium Iron Phosphate battery.
- Transporting an end-of-life, damaged, or recalled battery may, in certain cases, be specially limited or prohibited.
- The transport of the Li-Ion battery falls under hazard class UN3480, class 9. For transport over water, air and land, the battery falls within packaging group PI965 Section I.
- Use Class 9 Miscellaneous Dangerous Goods and UN Identification labels for transportation of lithium-ion batteries which are assigned Class 9. Refer to relevant transportation documents.

Class 9 Miscellaneous Dangerous Goods and UN Identification Label

3.2 Storage Conditions

If the system is not installed immediately after delivery, it shall be stored under the following conditions:

- Storage temperature: −20° C to +45° C
- Relative humidity: ⩽ 85% (non-condensing)
- Indoor, dry, and well-ventilated environment preferred
- Protect from direct sunlight, rain, flooding, and corrosive gases.

NOTICE

- To ensure battery life, keep the storage temperature of the battery module between 0 ° C and 35 °C
- If the battery energy storage system is not used for a long time, After charging is complete, turn off all switches of the battery energy storage system to ensure the lowest power consumption of the system.
- The relative humidity should be between 0 and 95% without condensation.
- The inlet and outlet of BESS should be effectively protected to prevent rain, sand and dust from penetrating into. Check equipment regularly for damage.
- Recommended storage State of Charge (SOC): 40% – 60%
- Recharge the system every 6 months during long-term storage
- Do not store the system in a fully discharged state

Failure to follow storage requirements may reduce battery life and void warranty.

4. Mechanical Installation

4.1Pre-installation Inspection

Before installation, inspect the following:

- Cabinet exterior for damage or deformation
- Internal components for looseness or foreign objects
- Completeness of accessories against the packing list

If any abnormalities are found, stop installation and contact the supplier.

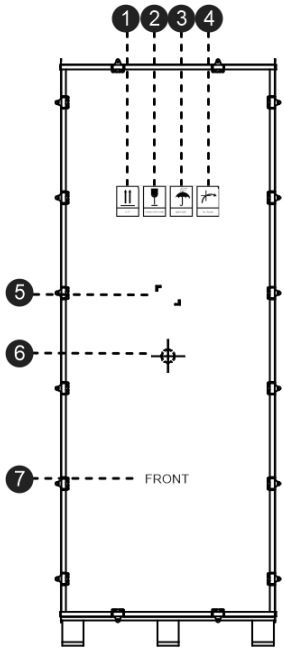
4.1.1 Transportation

Forklift Transportation

- If the installation site is level, stable, and capable of supporting the load, the battery cabinet **shall be transported using a forklift.**
- The battery cabinet is **equipped with dedicated forklift pockets at the base of the enclosure.**
- A forklift with a **minimum rated load capacity of 1500 kg (3300 lb) must be used.**
- The forklift forks **must be inserted only at the locations indicated in the diagram below.**
- The **center of gravity is marked and must be strictly observed** during lifting and transport.
- Before lifting, ensure the battery cabinet is in a **powered-off state and that all electrical connections are disconnected.**
- Do not tilt, drop, or subject the cabinet to impact or shock during transportation.
- The load **must be kept level, stable, and fully supported at all times.**
- Forklift operation **must comply with local regulations and standard industrial forklift safety practices.**

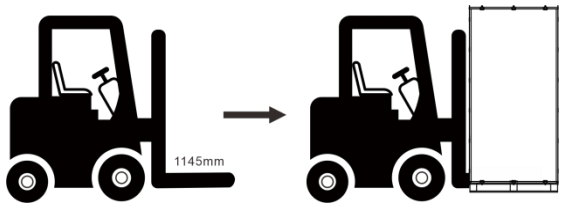
WARNING

Improper handling of the high-voltage battery cabinet may result in electric shock, fire, equipment damage, serious injury, or death.



No.	Description
①	Wooden case should be placed face up
②	Fragile
③	Product should be stored against moisture
④	Prohibit to turn over product packaging during operation
⑤	Product information
⑥	Center of gravity location
⑦	Distinguish the front and back of the cabinet

If a forklift is used, the following requirements must be met: The forklift should be equipped with sufficient load capacity. The foot length of a forklift truck should meet the equipment requirements.



Caution! : Heavy unbalanced load when lifted
REFERTO MARKINGS FOR CENTER OF GRAVITY LOCATION

NOTICE

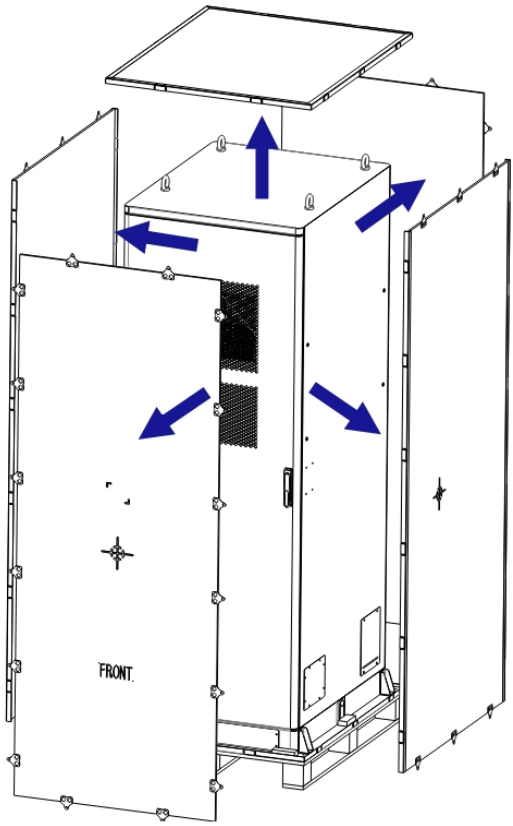
1. Remain at least 6 ft away from the forklift during operation.
2. Before reversing, the forklift operator must check behind them and ensure it is safe to proceed.
3. When reversing in confined spaces a spotter should direct the forklift operator.
4. No passengers are permitted to stand on or be lifted by forklifts.
5. Do not overload forklifts or raise loads too high, as this can affect overall stability.
6. Avoid sharp turns when transporting this equipment.
7. Maintain speeds below 3mph when moving this equipment.
8. Use caution and assess ground inclination before lifting this load on uneven surfaces or floors with slopes ≥ 5 degrees.

4.1.2 Open the package

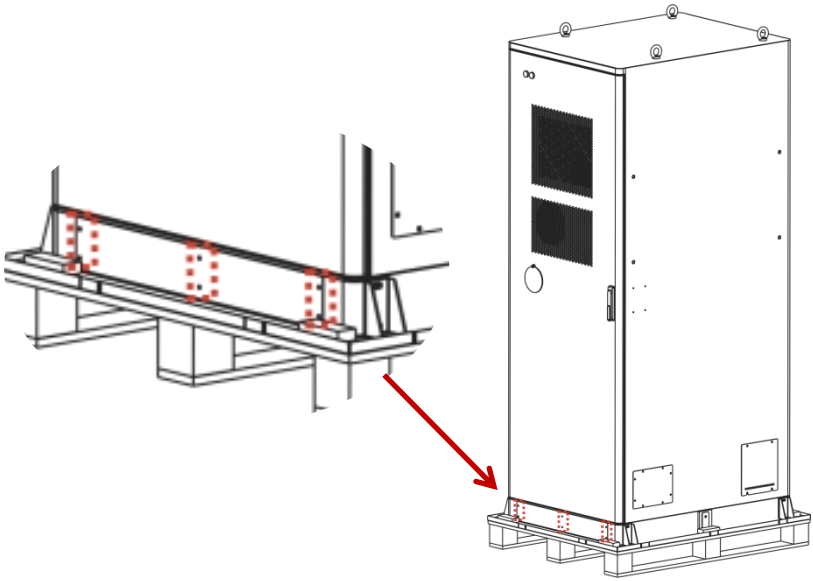
1. Find a claw hammer(or flat head screwdriver) to pry open the nail (refer to the following picture to operate).

2.Pry it open and hammer it flat.

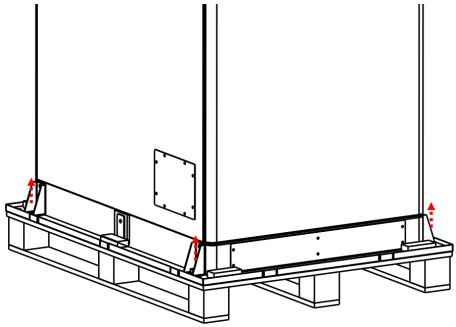
3. First, pry out all the nails, then disassemble the top plate, and disassemble the surrounding plate.



4.Unscrew the two decorative panels at the bottom of the cabinet.



5.Unscrew the front and back four fixing screws, you can use the forklift truck transport.

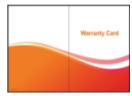


4.1.3 Equipment accessory list

Check whether deliverables are complete against the packing list.

Battery Module Accessories (The pack and the pack connecting cable are shipped separately)				
NO.	Description	Model	Quantity	Picture
1	Pack:5.12 kWh Battery Module	FLS,FLH48100UMG3,1P 16S,CCS	12	
2	Screws: For installing battery pack modules.	M5*12	48	
3	Slave control communication Cable: For communication connections between battery modules.	AWG#24, IMSA-13065S-2-24A+IMSA-13065S-2-24A,RED,L=150	11	
4	Power Cable:From the slave battery negative to the slave battery positive	ES08-25S-02-RD & ES08-P25S-02-BK,4AWG (1000V), red，L=60mm	11	
System Accessories				
NO.	Description	Model	Quantity	Picture
1	Cabinet	FLH-E60	1	
2	Power Cable:Busbar positive to PCS BAT+	AWG#4+1950mm, RED，SC25-8+SC25-6, FLH-E60-P15	2	
3	Power Cable:Busbar negative to PCS BAT-	AWG#4+1950mm, BLACK，SC25-8+SC25-6, FLH-E60-P15	2	

4	Communication line:The communication line from the "PCS" port of the main control to the "BMS" port of the PCS	Category 6A network cable,L=2100mm,RJ45 +RJ45	1	
5	Power cable: From the "LOAD" of PCS to the system auxiliary power terminal block XT1-1/XT2-1	AWG#10+3350/3350,UL1015, RED+BLACK，E6012+E6012,FLH-E60-P17	1	
6	PCS fixing screws	M12*25	4	
7	Cabinet fixing screws	M12*80	4	
8	Bellows:External cabinet wiring protection tube	PA nylon plastic corrugated pipe,AD54.5mm	1	
9	Communication Line : Used for communication connection between battery control unit and the first PACK	AWG#24, IMSA-13065S-2-24A+IMSA-13065S-2-24A,RED,L=220	1	
10	Cluster terminal communication plug: Used for matching resistors at the para11e1 terminals of the battery cluster.	Terminal Resistor（120Ω）	1	
11	Slave Terminal Communication Plug：Used for the matching resistor of the last BMU communication terminal.	Terminal Resistor（120Ω）	1	

12	Power cord : 6 meters, 4AWG Used for the positive pole of the cabinet clustered busbar to the positive pole of the busbar(Red)	AWG#4+6000(1000V), SC25-8+SC25-8, RED	1	
13	Power cord : 6 meters, 4AWG Used for connecting the negative pole of the cabinet busbar cluster to the negative pole of the busbar (black)	AWG#4+6000(1000V), SC25-8+SC25-8, BLACK	1	
14	Main Control Parallel Cluster Communication Cable:6 meters, used for the connection from one BCU to another BCU	CAT.5E UTP 7*012BC*8C	1	
15	Host computer debugging cable: 3 meters. It enables communication between the battery and the computer host through an RS485 adapter. At the same time, it can flexibly match communication cables for different inverters.	CAT.5E UTP 7*012BC*8C L=3000mm	1	
16	RJ45 connector: For making custom communication cables.	RJ45 connector	2	
17	12V debugging plug: External 12VDC Power Supply Debugging Harness	22AWGx2C,400mm	1	
18	Terminal SC25-8: For inverter battery terminals; connects to the combiner box during installation.	SC25-8	2	
19	Warranty card	Warranty card	1	
20	User Manual	User Manual	1	

4.2 Installation Environment

4.3 Site Requirements

The installation site shall meet the following conditions:

- Flat, solid foundation capable of supporting system weight
- Adequate clearance for ventilation, operation, and maintenance
- Free from flooding risk and combustible materials
- Accessible for installation and emergency response
- The environment around the installation site should be dry and well-ventilated.
- The installation site should be far away from the concentration of toxic and harmful gases, and away from flammable, explosive and corrosive materials.
- The installation site should be far away from residential areas to avoid noise.

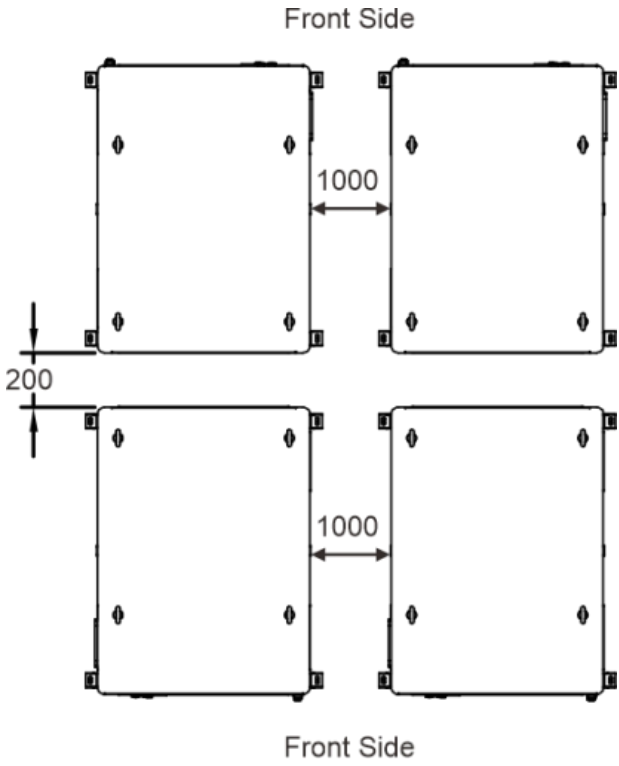
4.4 Foundation and Clearance

- The soil at the installation site should be compact.
- Compact and fill the foundation pit to provide sufficient and effective support for the cabinet.
- Raise the foundation to prevent the cabinet base and the interior from rain erosion.
- The cross-sectional area and height of the foundation should meet the requirements. It is recommended that the base height be greater than or equal to 300mm.
- Construct corresponding drainage in conjunction with local geological conditions.
- The foundation height is determined by the construction party according to the site geology.
- Consider cable routing when building the foundation.
- Built a maintenance platform around the foundation to facilitate later maintenance.
- During the foundation construction, reserve enough space for the AC/DC side cable trench according to the position and size of the cable inlet and outlet holes of the BESS and PCS, and pre-embed the cable conduit.
- Determine the specifications and quantity of the perforating gun according to the model and quantity of the cables.
- A drainage system is necessary to prevent the bottom or internal equipment of the BESS from being soaked in water during the rainy season or during heavy rainfall.
- Both ends of all embedded pipes should be temporarily sealed to prevent impurities from entering and causing troubles to later wiring.
- After all cables are connected, cable inlet and outlet and connector should be sealed with fireproof mud or other suitable materials to prevent rodent access.

NOTICE

The dregs excavated during the foundation construction should be removed immediately to avoid affecting the hoisting in the later stage.

4.5 Installation Spacing Requirement



Installation spacing drawing（Unit: mm）

4.6 Foundation requirements

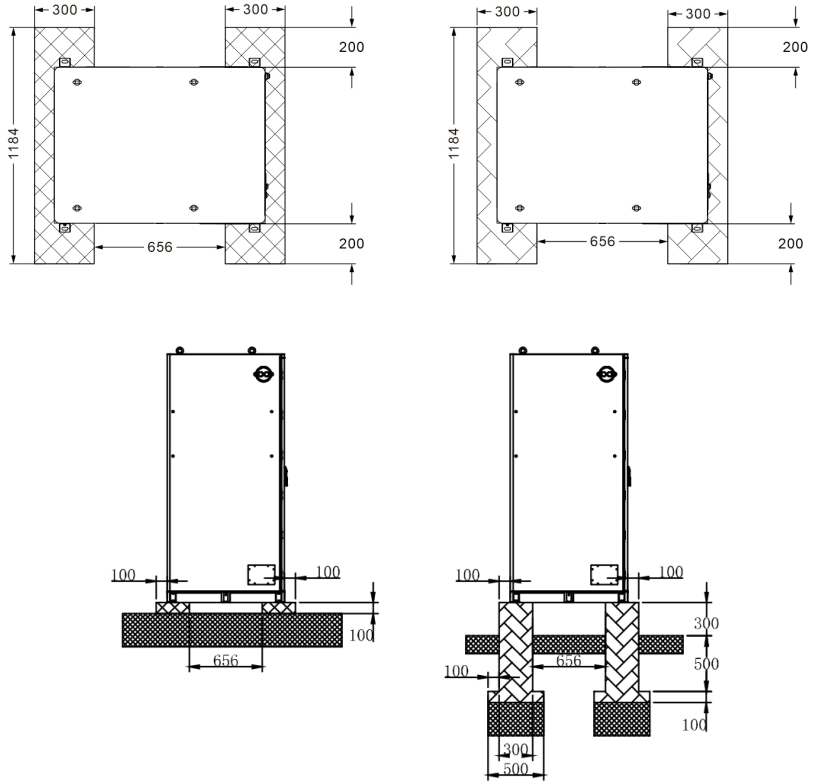
1. Surface Material: Install cabinets on concrete or other non-combustible surfaces.
2. Surface Condition: Ensure the surface is level, secure, flat, with sufficient load-bearing capacity, and free of depressions or tilts.
3. Concrete Specifications: Default to C30 grade concrete with a thickness of 200mm if not specified.
4. Extension Beyond Cabinet: Extend each side 300mm beyond the cabinet edges.
5. Reinforcing Steel Bars: Use HRB400 (Grade III) steel bars, 12mm diameter, spaced 150mm apart.
6. Anti-Corrosion Measures: Apply anti-corrosion treatments to steel bars after rust removal as per standards.
7. Bedding Layer: Use a 100mm thick C15 grade bedding layer under the slab.
8. Bearing Stratum: Foundation bearing stratum must be undisturbed soil with a characteristic bearing capacity ≥100Kpa.
9. Dewatering Measures: Implement dewatering during construction to prevent waterlogging in the foundation pit.
10. Excavation Safety: Ensure proper safety measures for excavation support.
11. Water Prevention: After excavation, the foundation pit must not be soaked in water. If disturbed by water, further excavation and replacement filling are required.
12. Height Requirement: The foundation must be higher than the local historical highest water level and at least 300mm above the ground level.
13. Drainage System: Build drainage facilities according to local geology and municipal drainage requirements to ensure no water accumulation occurs at the equipment foundation. It should meet the drainage needs for the largest rainfall in local history. Discharged water from the drainage system must be treated in accordance with local laws and regulations.
14. Surface Leveling: The levelness error between the equipment foundation and the cabinet contact surface must be ≤3mm.
15. Pit Compaction: The bottom of the equipment foundation pit must be compacted and leveled before proceeding with construction.
16. Weight Bearing: The equipment foundation is configured according to the total weight of the equipment. If the bearing capacity of the foundation does not meet requirements, re-verification is necessary.
17. Cable Management: When building the foundation, consider the cable outlet of the energy storage system and reserve trenches or inlet holes accordingly.
18. Sealing: Both the reserved holes of the equipment foundation and the inlet holes at the bottom of the equipment should be sealed after installation.

Cable Trench Requirements: For energy storage cabinets adopting the bottom cable entry method, a trench must be pre-installed on-site since no side cable inlets are provided to prevent foreign objects from entering. The following requirements apply to the trenches:

1. **Dust-proof and Rodent-proof Design:** To avoid foreign objects entering the energy storage cabinets, the trench must have an effective dust-proof and rodent-proof design.
2. **Waterproof and Moisture-proof Measures:** In order to prevent cable aging and short circuits that could impact the normal operation of the energy storage cabinets, the trench needs waterproof and moisture-proof measures
3. **Sufficient Cable Bending Radius:** Considering the larger power rating of the energy storage cabinets and the requirement for thicker cables, the trench design must take into account the cross-sectional area of the cables and provide a sufficient bending radius.

WARNING

The foundation drawing cannot be used as the final construction drawing but only for reference. Users must verify the design parameters of the energy storage system foundation based on the installation environment, ground bearing capacity, geological conditions, and seismic requirements of the project site.



Load-bearing surface non-load-bearing surface

4.7 Transportation and lifting

4.7.1 Hoisting Equipment

WARNING

Comply with crane safety procedures at all times.
Do not stand within 500-1000mm of the lifting area! During the whole lifting process, no one is allowed to stand under the boom or the work station.
The lifting work must be stopped in bad weather. For example, in the case of strong winds, heavy rain or thick fog.
Improper hoisting may result in load instability, equipment damage, serious injury, or death

When hoisting the battery cabinet, a **25-ton rated crane must be used.**
The crane **boom length shall be between 38.5 m and 40.5 m,** depending on site conditions.

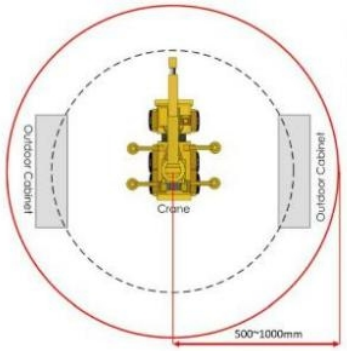
Ensure that the crane capacity, boom configuration, and lifting radius are **verified and adequate for the actual load** before lifting.

All hoisting operations **must be performed by qualified personnel** and **in accordance with applicable local regulations and standard crane safety practices.**

..

When lifting the device, at least the following requirements must be met:

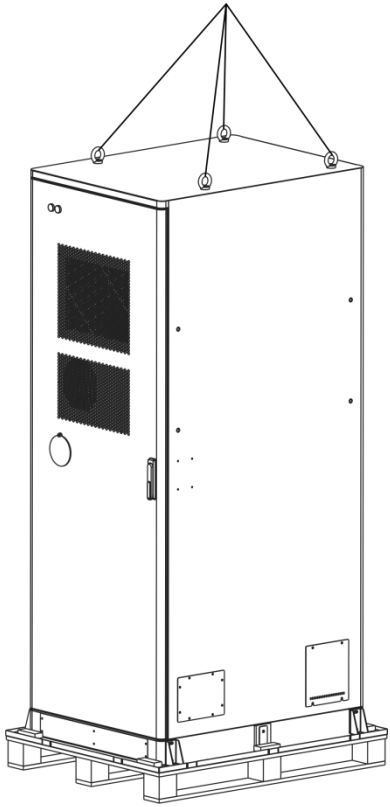
- All safety requirements must be met.
- A professional instructor is needed in the whole hoisting process.
- The strength of the sling used should be able to withstand the weight of the devices.
- Ensure that all sling connections are safe and reliable, and that the lengths of the slings connected tothe corner fittings are equal.
- The length of the sling can be adjusted appropriately according to the actual requirements of the site.
- During the lifting process, the devices must be stable and not skewed.
- Please lift the devices from the bottom.
- Take all necessary auxiliary measures to ensure the safe and smooth lifting of the devices.
- The following figure shows the crane operation during lifting the devices. In the figure, the dashed circleon the inner layer represents the crane operating range. When the crane is working, it is strictly forbidden to stand inside the solid circle on the red outer layer!



4.7.2 Hoisting

In the process of lifting the devices, each operation link should be carried out according to the following requirements:

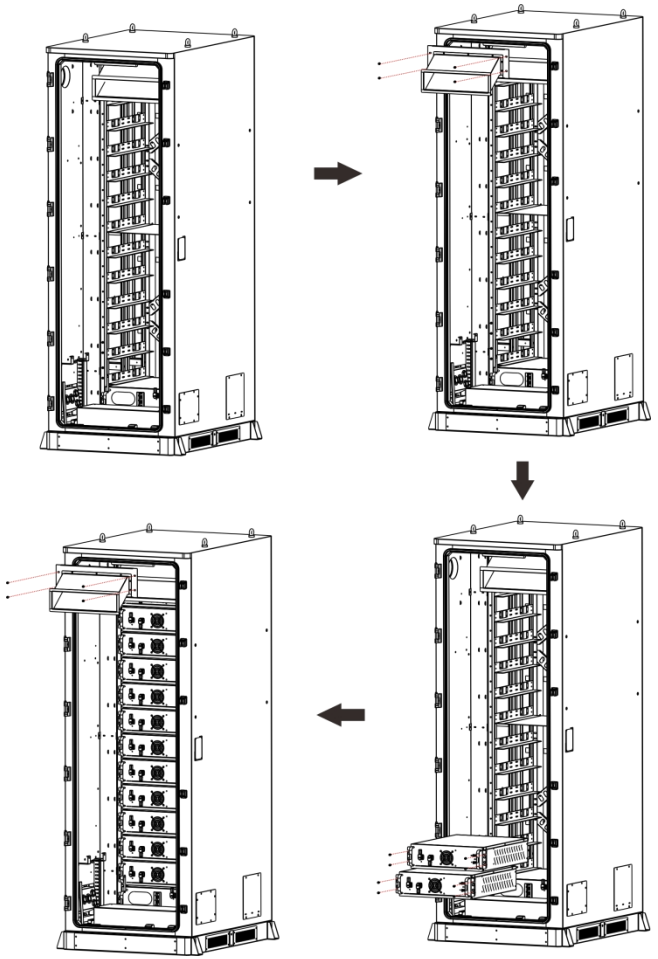
- The equipment should be hoisted vertically and should not be dragged on any surface during hoisting.
- Check the connection between the lifting tool and the device before hoisting.
- Only lift it after confirming that the connection is secure. Once in place, the device should be gently and smoothly lowered. Do not place the device vertically and do not shake the lifting tools.
- The place where the devices are placed should be solid and flat, with good drainage, without obstacles or protrusions.



4.8 Installation of inverters and BESS

4.8.1 Battery Pack Installation Diagram

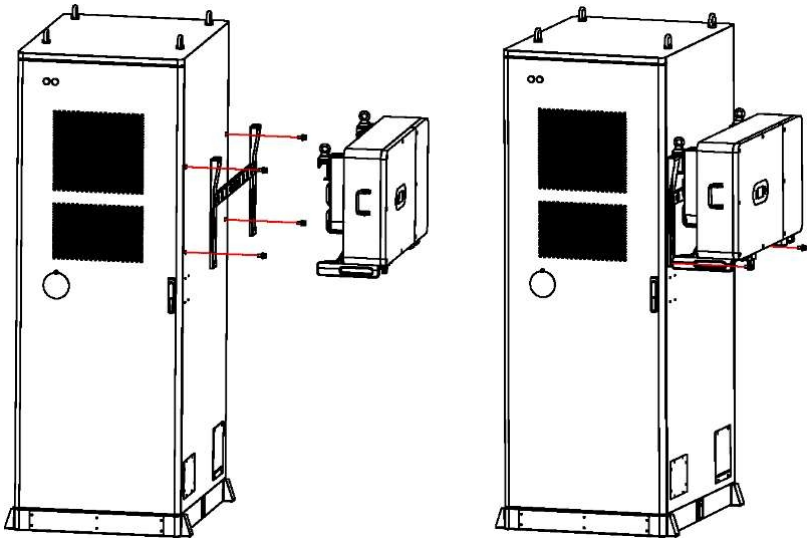
1. Open the cabinet door.
2. Remove the air guide component.
3. Install the battery packs sequentially from bottom to top and secure them with screws
4. Reinstall the air guide component and tighten the screws.



4.8.2 Inverter Installation Diagram

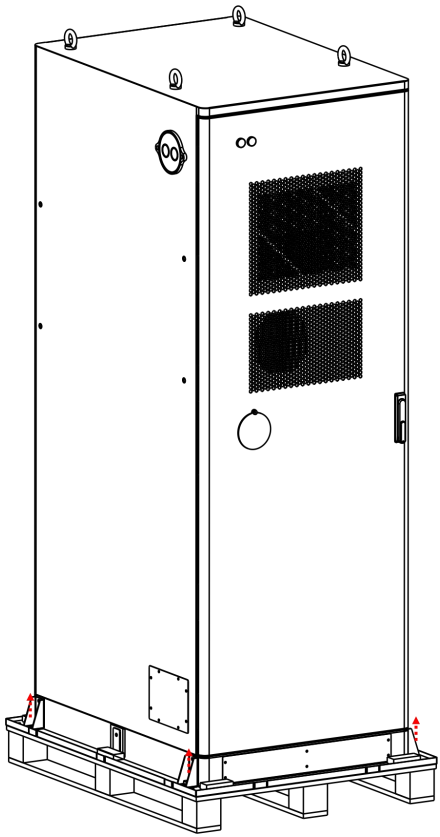
WARNING **Ensure the BESS is powered off and secure before beginning installation.**

1.Install the Mounting Bracket: Using an M12 wrench, remove the specified pre-installed screws from the BESS cabinet. Secure the inverter mounting bracket to the cabinet using the provided hardware.
2.Mount the Inverter: Place the inverter onto the installed bracket. Secure it by tightening the bottom mounting screws on both sides using a Phillips screwdriver. Refer to the provided torque specifications if available.
3.Final Check: Ensure the inverter is firmly fixed and all connections are accessible.



4.9 Fixing Methods

The following figure shows the positions for fixing the cabinet bottom.Unscrew the two decorative panels at the bottom of the cabinet. Use expansion screws (M12 x 80) to secure the cabinet. Due to the uncertainty of drilling accuracy and bit material, it is recommended to choose φ16.5 ~ φ17 bits.



5.Electrical Installation

NOTICE	**Notice! :** ● High voltage! Shock! ● Do not contact live parts directly without protection! ● Before installation, ensure that there is no voltage on the AC side and DC side. ● Do not place the BESS on a flammable surface.
⚠ WARNING	**Warning!** Sand and moisture infiltration can damage the electrical equipment in the container or affect its operating performance! Do not perform electrical connections during sandstorms or when the relative humidity of the surrounding environment is greater than 95%. Make electrical connections when there is no wind or sand and when the weather is clear and dry. Before connecting cables, check that the polarity of all input cables is correct. Do not pull wires and cables forcibly during electrical installation. Otherwise, the insulation performance may be affected. Make sure all cables and wires have enough room to bend. Take necessary auxiliary measures to reduce the stress on cables and wires. After each connection is complete, carefully check whether the connection is correct and secure.

⚠ WARNING

All electrical connections must be made in strict accordance with the wiring schematic.
All electrical connections must be made when the equipment is completely powered off.
Only qualified electrical engineers can carry out work related to electrical connections. Please comply with the requirements in "1 Safety Precautions" of this manual.
Fsolar shall not be liable for any injury or loss of life or property caused by ignoring these safety instructions.

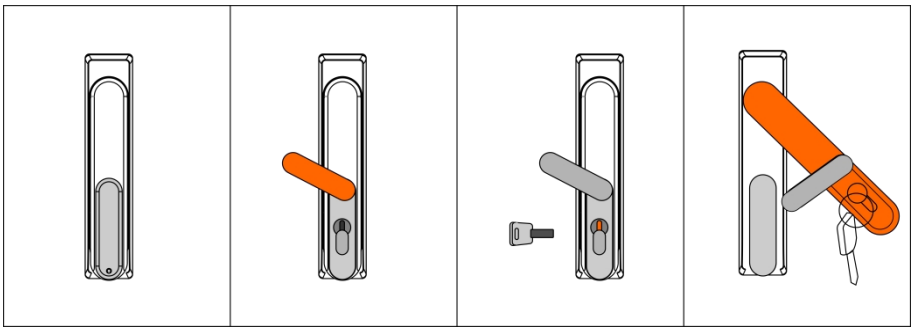
5.1 Preparation before connection

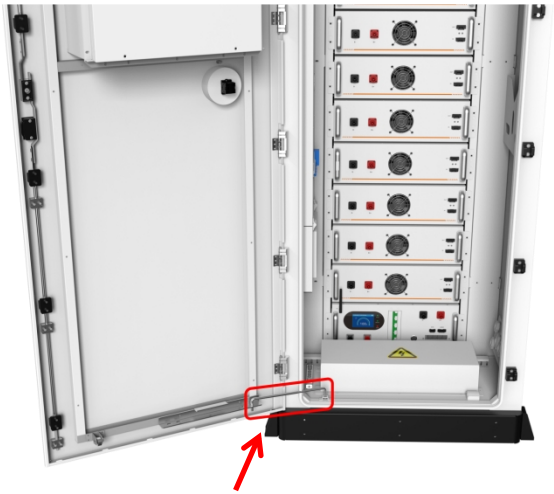
Installation preparation tool

Item	Name and Graphics		
Installation Tools	Torque screwdriver 	Wire stripper 	Hydraulic pliers 
	Heatt gun 	Multimeter 	Torque wrench 
Protective Tools	Safety gloves 	Goggles 	Safety shoes 

Door Opening Procedure

1. The door is locked
2. Move the cover above the keyhole upward
3. Insert the door key and turn it clockwise to eject the handle
4. Turn the handle clockwise to the position shown in the picture to open the front door.





Door panel limit

CAUTION

1. Please take care to lift this part when closing the door.
2.When maintaining the cabinet with the door open for a long time, the door panel Limit in grod needs to be installed.

5.2 Cable connection

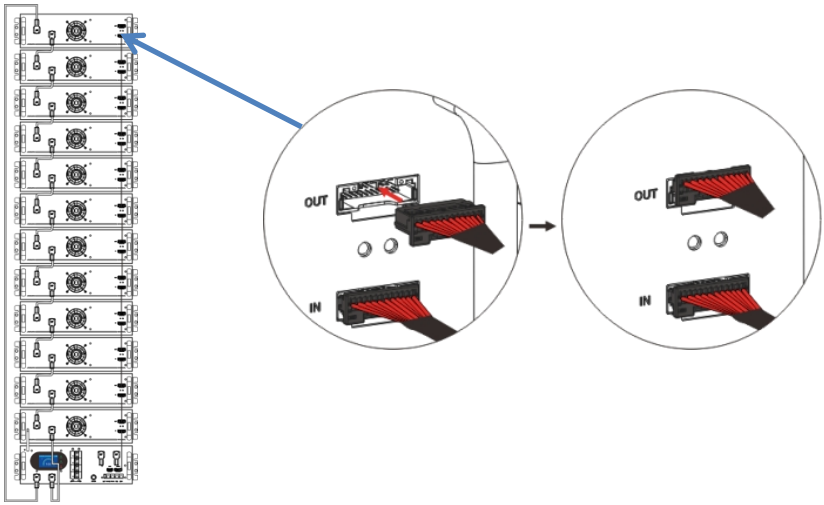
5.2.1 Cable connections inside BESS

Power Cable Connections

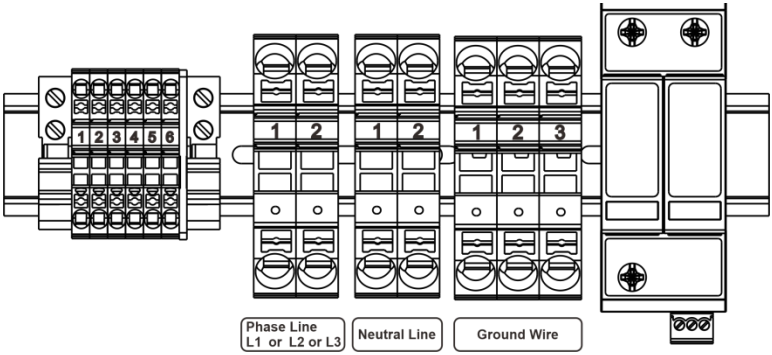
A 60 mm power cable is used to connect battery module to battery module.
The 2000 mm BCU negative power cable is used to connect the battery module to the BCU.
The 400 mm BCU positive power cable is used to connect the battery module to the BCU.
Ensure correct polarity before connection. Improper connection may result in equipment damage or safety hazards.

Communication Cable Connections

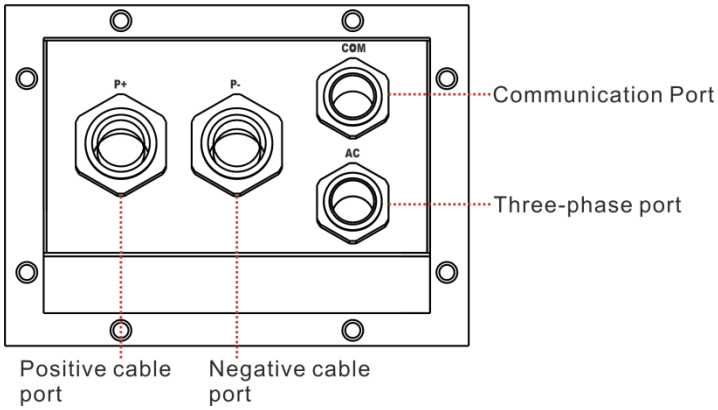
A 150 mm communication cable is used to connect battery module to battery module.
A 220 mm communication cable is used to connect the battery module to the BCU.
The communication cables are marked with IN and OUT directions.
The cables must be connected in the correct orientation.
Do not reverse or force the connection, as this may cause communication failure or system malfunction.



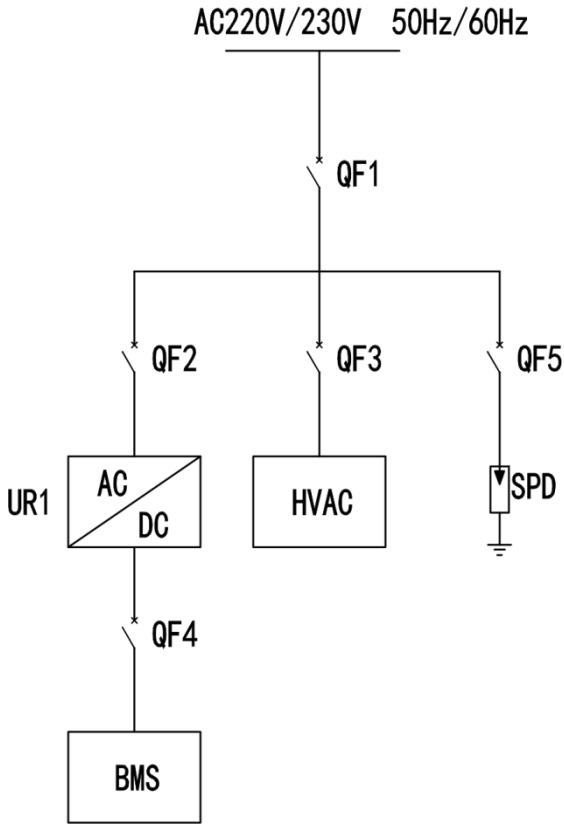
5.2.2 Auxiliary power supply



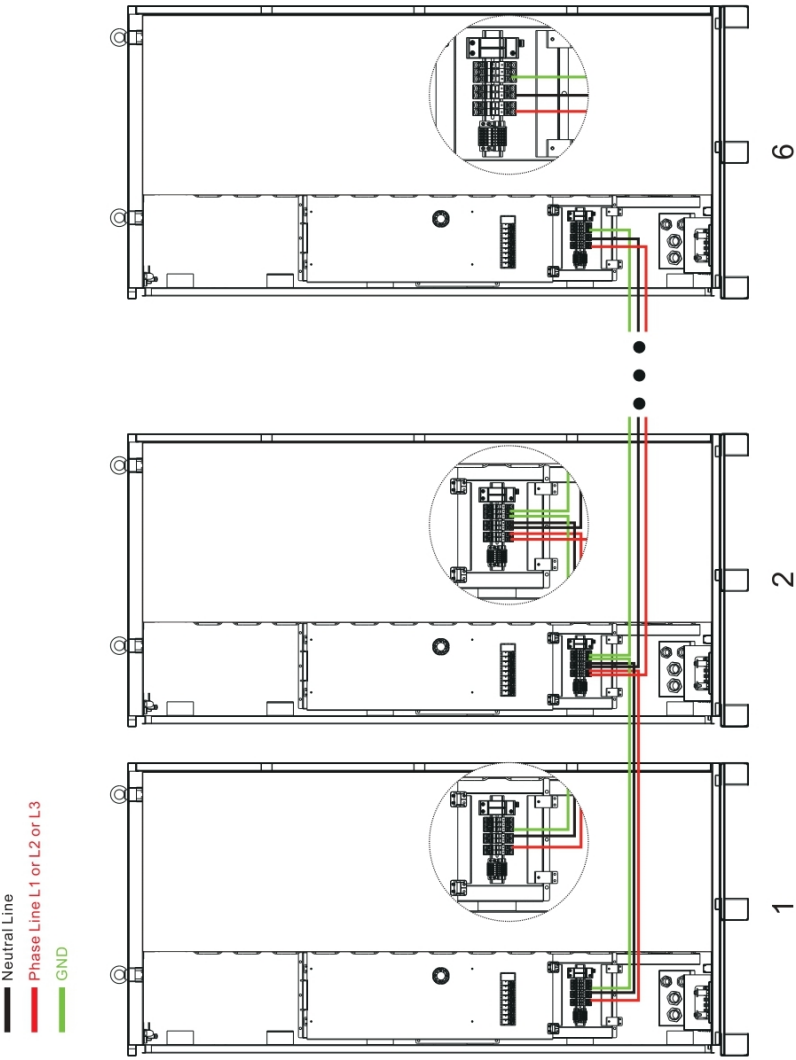
Ground cable requirements＞12AWG	
Phase cable L1 or L2 or L3 and Neutral cable requirements	
1 BESS	12AWG
2 BESSs	10AWG
3 BESSs	8AWG
4 BESSs	7AWG
5 BESSs	6AWG
6 BESSs	5AWG

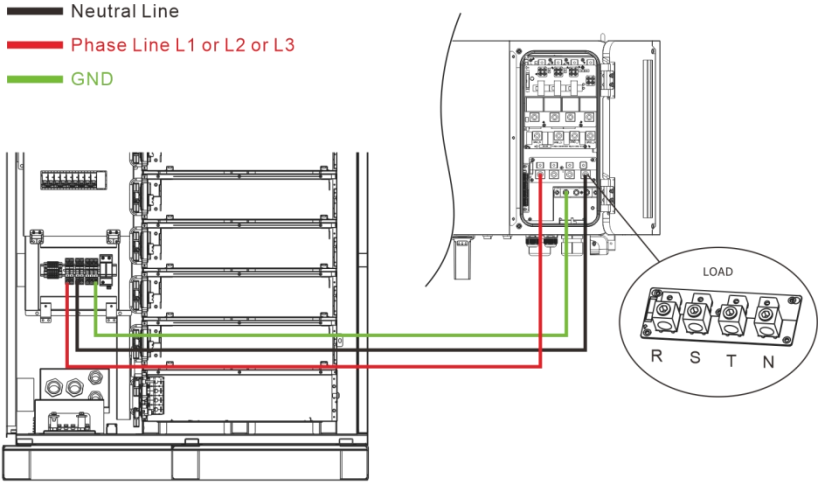


Auxiliary distribution diagram40



Auxiliary power supply diagram





Connection of Auxiliary Power Cables between Inverter and BESS

1.Access Terminals: Open the BESS cabinet door and the inverter's terminal compartment cover.

2.Make Connections: Refer to the wiring diagram below and connect the auxiliary power cables as follows:

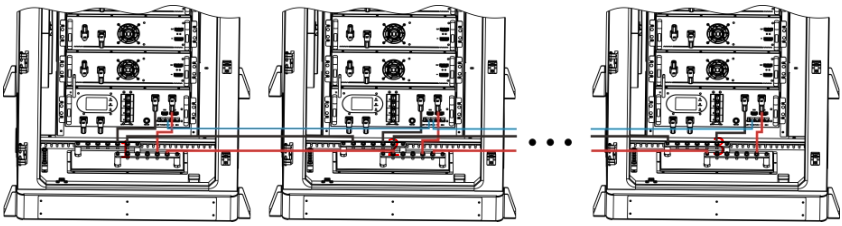
- **L (Line) conductor:** Connect from terminal XT1 (BESS) to terminal L1/L2/L3 (Inverter).
- **N (Neutral) conductor:** Connect from terminal XT2 (BESS) to terminal N (Inverter).
- **PE (Protective Earth) conductor:** Connect from terminal XT3 (BESS) to terminal PE (Inverter).
- **Secure and Verify:** Ensure all connections are tight and correct before re-closing the panels.

5.2.3 Cable connection between BESS

It can be connected to one to six BESS.

It is recommended that each BESS be connected to power distribution separately. If the power distribution is not connected separately, follow the method recommended by Felicity solar.

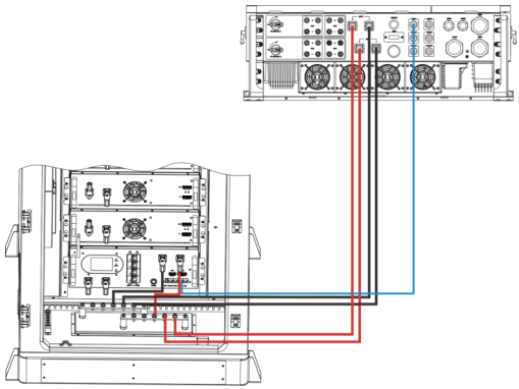
(Note: Other cables are also connected, which is not shown in the drawing)



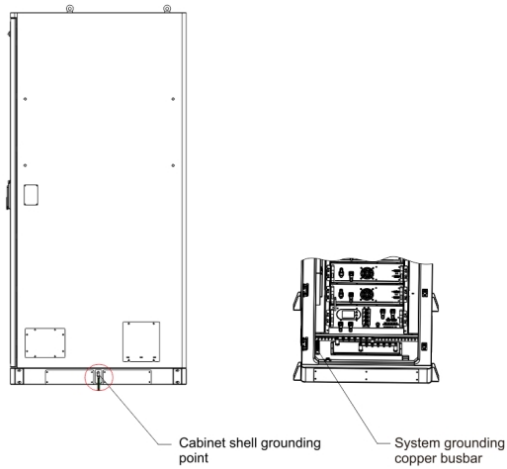
5.2.4 Cable connection between the inverter and BEES

Cable connection between the inverter and BESS

1.Open the cabinet door and connect according to the diagram below. The negative copper busbar is connected to BCU P- and the inverter's BAT1- and BAT2-. The positive copper busbar is connected to BCU P+ and the inverter's BAT1+ and BAT2+ to ensure maximum output power. One end of the communication cable is connected to the BCU PCS through the cabinet, and the other end is connected to the inverter's BMS1 interface.



(Note: Other cables are also connected, which is not shown in the drawing)



5.3 Operation after cable connection

When all electrical connections are complete, check the wiring thoroughly and carefully. In addition, you need to do the following:

• Check all air intakes and outlets for blockage
• Seal the gap around the cable inlet hole.
Lock the door operation
Procedure Step 1 Reinstall the cable protection cover in the reverse sequence.
Step 2 Lock the cabinet door, remove the key, and keep it secure.
——Take care to ensure that the seal around the cabinet door does not curl when the door is closed!

WARNING

• If improperly sealed, moisture may enter the product.
• If the product is not properly sealed, rodents may enter.

Lock the door operation

- Step 1. Reinstall the cable protection cover in the reverse sequence.
- Step 2. Lock the cabinet door, remove the key, and keep it secure.

——Take care to ensure that the seal around the cabinet door does not curl when the door is closed!

NOTICE

- When installing hazardous voltage equipment, comply with relevant regulations and local installation safety guidelines.
- Follow the rules for the proper use of tools and personal protective equipment.
- All connections must be made under clear guidance. Any attempt at speculation and ambiguity must be prohibited.
- Tools with an insulating protective coating must be used.

6.Activate BESS

WARNING

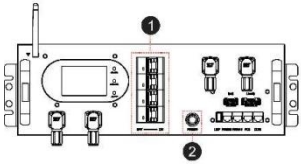
BESS needs to be confirmed by professionals and approved by the local power department before it can be put into operation.
For BESS with a long downtime, check the equipment thoroughly and carefully before powering on to ensure that all indicators are normal.

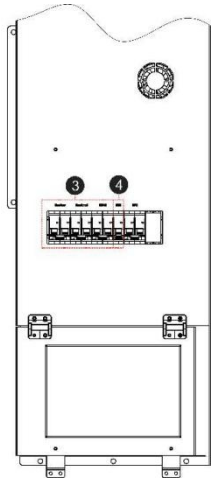
Before powering on the device, check the following items:

- Check whether the wiring is correct.
- Check whether the emergency stop button is released.
- Check and confirm that there is no ground fault.
- Use a multimeter to check whether the AC voltage and DC voltage meet the starting conditions and ensure that there is no overvoltage.
- Check and make sure there are no left tools or parts inside the equipment.
- Check all air intakes and outlets for blockage.

6.1 Power-on procedure

After the cables are connected,
①Open the Air switch
②Press the Start button to turn on the BCU.
③Turn on the Miniature circuit breaker of MASTER, CONTROL, HVAC, SPD in turn.
④Open the miniature circuit breaker of the BMS





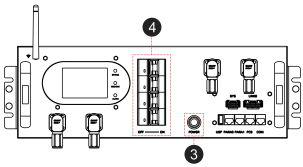
6.2 Power-off procedure

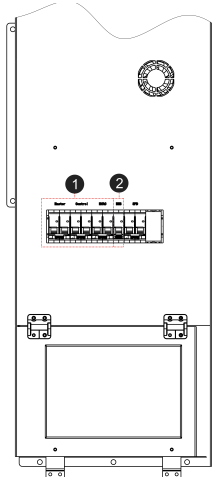
①First turn off the miniature circuit breaker of the BMS

②Turn off the Miniature circuit breaker of HVAC, CONTROL, MASTER, SPD in turn.

③Press the Start button to turn off the BCU.

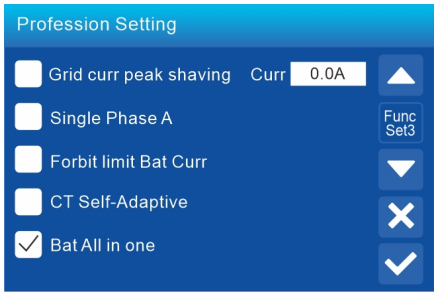
④Close the Air switch





6.3 PCS Settings

①The "Bat All in One" option on the inverter screen must be checked. If it is not checked, the function of reporting system faults to the APP terminal will not take effect.



6.4 Unplanned (emergency) shut down

In case of fire, electric shock risk, or abnormal behavior:

- Evacuate personnel
- Disconnect external power sources
- Contact local emergency services

Unplanned downtime (downtime due to failure) : Contact Felicity solar.

7. Fire Suppression system

7.1 Fire Suppression equipment

CAUTION **Caution:**The battery is equipped with fire suppression equipment .

Please comply with the fire laws and regulations of the country/region where the project is located.

Regular inspection and maintenance of fire suppressing equipment to ensure its normal operation.

7.1.1 Aerosol fire suppression system

The battery system uses **lithium iron phosphate ($LiFePO_4$) batteries.**

The equipment is equipped with an **aerosol fire suppression system, as well as smoke detectors and temperature sensors.**

If abnormal conditions are detected, the battery system **will activate an audible and visual alarm and simultaneously discharge aerosol fire suppressant to suppress the fire** at an early stage.

WARNING

Fire Emergency

If the fire cannot be controlled or continues to spread, evacuate the area immediately and contact local fire emergency services.

Do not attempt to fight a large or uncontrolled fire.

7.1.2 Fire suppression water pipe system

Backup Fire Protection System

- In addition to the onboard fire suppression system, the ESS is equipped with a **backup fire protection interface.**
- This backup system is intended for use **only if the fire continues to spread after the primary fire suppression system has been activated.**
- If the fire is not controlled by the primary fire suppression system, the **backup fire protection system may be activated only after the ESS has been completely powered off.**

Reserved Firefighting Interface

- The ESS is provided with a **reserved DN65 pipe connection for external firefighting use.**
- The **external piping system shall be designed, installed, and maintained by the customer and properly connected to the reserved interface on the ESS.**
- The design of the external piping system shall be based on **actual site conditions and applicable local fire codes.**

External Firefighting System Options

Depending on site conditions, the external firefighting system may be configured in one of the following ways:

1. Manual Firefighting Mode

This mode is suitable for sites **where fire trucks or other mobile firefighting equipment are available.**

A water supply piping system shall be installed in advance:

- One end connected to the **reserved DN65 interface on the ESS**
- The other end connected to a **fire truck or other mobile water supply**

In the event of a fire, **authorized personnel or fire department responders** shall manually open the water supply to extinguish the fire.

2. Automatic Firefighting Mode

This mode is suitable for sites equipped with a **dedicated fire water pond or fixed water source.**

The water supply piping system shall be connected:

- On one side to the **reserved DN65 interface on the ESS**
- On the other side to the **fire water pond or fixed water source**

A shut-off valve must be installed on the pipe connected to the ESS reserved interface.

Under normal operating conditions, **no water shall be present inside the ESS piping.** In the event of a fire, water from the pond will automatically flow into the piping system for fire suppression.

Fire Department Intervention

During a fire emergency, **fire department personnel shall ensure their own safety first.**

After confirming safe operating conditions, responders may connect a fire hose to the reserved firefighting interface and **open the water valve to introduce water into the cabinet for fire suppression,** in accordance with local firefighting procedures.

NOTICE	**Notice! :** When connecting to the fire water hose for water immersion, be aware of the hazards to personal safety, such as explosions and electric shock.
DANGER	**Danger!** If the fire is too large, flee as soon as possible and call the fire police.

7.2 Exhaust system

When the gas inside the chassis reaches a certain pressure, the ① Breather will actively open to release the gas pressure.

8.Troubleshooting

lf the Energy Storage System (ESS) has any abnormal conditions, please troubleshoot according to the solutions in the table below.

If the problem persists or you have other questions, please contact after-sales service.

If you can provide the following information, it will help solve the problem:

The model and serial number of the energy storage system and its internal equipment firmware version, fault time, and fault frequency.

Fault information and a brief description of the fault.

If possible, please also provide photos of the fault site.

Battery fault code

Code	Fault Description	Recommended Action
F01	Battery Voltage High	Battery overvoltage fault & Battery undervoltage fault. Please check whether the power cables and communication cables of the battery system are connected correctly. After checking the wiring harness connections and restarting the system, if the fault is not eliminated, please contact the battery supplier.
F02	Battery Voltage Low	
F03	Cell Voltage High	Battery cell overvoltage fault & Battery cell undervoltage fault. If the same fault is reported multiple times, please contact the battery supplier.
F04	Cell Voltage Low	
F05	Battery Charge Current High	Battery charge overcurrent & Battery discharge overcurrent. If the same fault is reported multiple times, please contact the battery and converter supplier.
F06	Battery Discharge Current High	
F07	BCU Temperature High	BCU over temperature. The battery system may have been exposed to extremely high ambient temperatures for an extended period while operating at high power continuously. Please let it stand idle for a while before continuing to use it. If the same fault is reported multiple times, please contact the battery supplier.
F08	TBD	The F08 code has not been assigned a specific fault yet. Please ignore it.
F09	Cell Temperature High	Cell over temperature. The battery system may have been exposed to extremely high ambient temperatures for an extended period while operating at high power continuously. Please let it standidle for a while before continuing to use it. If the same fault is reported multiple times,please contact the battery supplier.
F10	Cell Temperature Low	Cell under temperature. Please note the installation and usage environmental temperatures. If the same fault is reported multiple times, please contact the the battery supplier.
F11	AFE Communication Fault	The chip operation is stuck. Please try to restart the battery. If the same fault is reported multiple times, please contact the battery supplier.
F12	Soft Start Fault	Battery soft start fault. Please confirm whether there is a short circuit on the P+/P-. After checking it and restarting the system, if the fault is not eliminated, please contact the batterysupplier.
F13	BMU Device Communication Fault	BMU communication fault. Please confirm whether the BMUs communication harness

Code	Fault Description	Recommended Action
		are well connected. After checking it and restarting the system, if the fault is not eliminated, please contact the battery supplier.
F14	Insulation Resistance Low Fault	Insulation resistance low fault. Please turn off the battery system and contact the battery supplier.
F15	TBD	The F15 code has not been assigned a specific fault yet. Please ignore it.
F16	TBD	The F16 code has not been assigned a specific fault yet. Please ignore it.
F17	Parallel Fault	Batteries in parallel fault. Please confirm whether the parallel battery system has been set up correctly in accordance with the requirements, such as the 120R terminal resistor, parallel cluster network cable, the parallel cluster addresses on the LCD must be inconsistent, and the number BMUs in each cluster's battery system, etc. After checking them and restarting the system, if the fault is not eliminated, please contact the battery supplier.
F18	Relay Self-diagnosis Fault	Please turn off the battery system and contact the battery supplier.
F19	PCS Voltage fault	PCS voltage measurement fault. Please try to restart the battery. If the same fault is reported multiple times, please contact the battery supplier.
F20	Fuse Fault	Fuse fault. Please turn off the battery system and check the fuse status.
F21	Insulation Function Fault	BCU insulation function fault. Please try to restart the battery. If the same fault is reported multiple times, please contact the battery supplier.
F22	BMU Address Fault	BMU Address Fault Please try to restart the battery and check the blinking status of the BMU's status indicator lights. If the same fault is reported multiple times, please contact the battery supplier.
F23	Cell Temperature Harness Shortage Fault	Cell temperature harness shortage fault. If the same fault is reported multiple times, please contact the battery supplier and check the BMU temperature harness state.
F24	Cell Temperature Harness Open Fault	Cell temperature harness open fault. If the same fault is reported multiple times, please contact the battery supplier and check the BMU temperature harness state.

Code	Fault Description	Recommended Action
F25	Cell Voltage Harness Open Fault	Cell Voltage Harness Open Fault If the same fault is reported multiple times, please contact the battery supplier and check the cell voltage harness state.
F26	Heating Power Over Fault	Heating power over fault. Please turn off the battery system and contact the battery supplier.
F27	Heating Circuit Fault	Heating circuit fault. Please turn off the battery system and contact the battery supplier.
F28	Module Balance Relay Fault	Module balance relay fault.Please turn off the battery system and contact thebattery supplier.
F29	Delta Voltage Fault	Excessive voltage difference fault.If the same fault is reported multiple times, pleasecontact the battery supplier and check the cell voltage harness state.

System fault code

Code	Fault Description	Recommended Action
F106	CB1_EPO	Shut down and troubleshoot the fault.
F107	CB1_WIS_Fault	Cut off the power supply of the power grid and check if there is water in the cabinet before entering.
F108	CB1_SmokeS_Fault	Shut down the machine and check if the smoke concentration inside the cabinet is too high.
F109	CB1_TemS_Fault	Shut down the machine, check if the temperature inside the cabinet is too high, or if the battery has thermal runaway.
F110	CB1_Aerosol_Fault	Cut off the power supply of the power grid and check whether the battery has thermal runaway.

System alarm code

Code	Fault Description	Recommended Action
W24	CB1_Door_Alarm	Check if the cabinet door is not closed
W25	CB1_HVAC_Hum_Alarm	Check if the humidity inside the cabinet is greater than 95%RH
W26	CB1_HVACComm_Alarm	Check if the air conditioner's power supply is disconnected or if the air conditioner's communication connection is loose.
W27	CB1_HVAC_L1_Alarm	Check if the air conditioner screen displays the following alarm: 1).Excessively high temperature inside the cabinet 2)..Excessively low temperature inside the cabinet 3).Excessively low humidity 4).Coil anti-freezing 5).High pressure alarm 6).Low pressure alarm 7).Phase sequence alarm
W28	CB1_HVAC_L2_Alarm	Check if the air conditioner screen displays the following fault information: 1).Defrost probe Fault 2).Condensation temperature probe Fault 3).Cabinet temperature probe Fault 4).Air outlet temperature probe Fault 5).Humidity probe Fault 6).Internal fan Fault 7).Compressor Fault

9. Inspection, cleaning and maintenance

9.1 Basic Information

- The battery is not fully charged. It is recommended to complete the installation within 3 months after the arrival of goods.
- Do not disassemble any battery in the battery product, do not dissect the battery;
- After the battery is over-discharge, charge the battery within 48 hours. Battery products can also be charged in parallel. After the battery products are connected in parallel, the charger only needs to connect the output port of any product battery.
- Do not attempt to open or remove the battery! The battery contains no internal repairable parts.
- Before cleaning and maintaining the battery, disconnect all load and charging devices.

9.2 Maintenance item and perio

Every half a year to once a year

Item	Check method
Safety function	• Check whether the shutdown key on the Inverter and the emergency stop button work normally. • Simulate shutdown.
Internal components inspection	• Check the temperature of the radiator and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary. • Notice: It is necessary to check ventilation of the air inlet. Otherwise, fault may occur due to overheating if the module cannot be cooled effectively.
Device maintenance	• Carry out regular inspection for corrosion of all metal components • Check the running parameters (especially voltage and insulation).

Maintenance (Once a year)

Item	Check method
Outside the BESS	Check the following items, and correct immediately those failing to meet relevant requirements: ● Check whether there are flammable objects on the top of the BESS. ● Check whether there is any damage, flaking paint or sign of oxidization on the enclosure. ● Check whether the lock of the cabinet door can be unlocked flexibly. ● Check whether the sealing strip is fixed properly.
Inside the BESS	Check whether there are foreign objects, dust, dirt, and condensed water inside the BESS.
Air inlet and outlet	Check the temperature of the radiator and the amount of dust accumulated. Clean heat-dissipation modules with a vacuum cleaner if necessary
Wiring and cable layout	Completely power off the devices inside the ESS before checking. For any non-conformances found during inspection, correct them immediately. ● Check whether the cable layout is normal and whether there is a short circuit. For any non-conformances found during inspection, correct them immediately. ● Check whether all cable entry is well sealed. ● Check whether there is water seepage inside the BESS. ● Check whether the power cables are loose, and fasten them again by the torque specified previously. ● Check whether the power cables and control cables are damaged, especially if the surface contacting the metal surface is cut.
Ground connection and equipotential connection	● Check whether the insulation tapes on the power cable terminals fall off. ● Check whether the ground connection is correct and the grounding resistance shall be no more than 0.4Ω. ● Check whether the equipotential connection inside the integrated BESS is correct.
Screw	Check whether internal screws fall off.

Every two years

Item	Check method
System status and cleaning	Check the following items, and correct immediately those failing to meet the relevant requirements: ● Check whether there is any damage or deformation of the container and internal devices. ● Check if there is abnormal noise during operation of internal devices. ● Check whether the temperature in the container is excessively high. ● Check whether the humidity and the amount of dust inside the container are within the normal range. Clean the equipment if necessary. ● Check whether the air inlet and outlet of the BESS are blocked.
Warning marks	Check whether the warning labels and marks are clearly visible and free of stains and damage. Replace them if necessary.
Surge protection device and fuse	Check whether the SPD and fuse are properly fastened.
Corrosion	Check whether there is oxidation or rust inside the container.

9.3 Battery Maintenance

For the latest system software updates, please contact Felicity customer support: https://www.felicitysolar.com/

Below is the recommended maintenance cycle. The actual maintenance cycle should be adjusted according to the specific installation environment of this product. In sandy or dusty environments, it is necessary to shorten the maintenance cycle and increase the frequency of maintenance.

Once every six months

Inspection item	Inspection method
Ambient temperature and humidity inspection	● Check whether the temperature in the ambient temperature record is within the operating range. ● Check whether the humidity in the ambient humidity record is within the operating range.
Function inspection	● Check the operating status of the DC contactor: Send the Start/Stop command in the power-off status and check whether the system works properly. ● Measure whether the output voltage is within the range in the specification. ● Check whether the current, voltage and temperature in the operation record of the battery cluster are within the operating ranges.

Once a year

Inspection item	Inspection method
Switchgear and battery module	Please check the following items and take corrective action immediately if you find any non-conformity: ● Check the top of the battery cluster for combustibles. ● Check whether battery clusters are fixed on the baseplate and corroded. ● Check the box for damage, peeling paint, oxidation, etc. ● Check the battery cluster for foreign bodies, dust, dirt, and condensate.
Wire and cable layout	The inspection must not be carried out until all internal devices of the battery cluster are powered off! In case of nonconformity found in inspection, take corrective actions immediately: ● Check the cable layout for short circuit and compliance with the specifications. If case of any abnormality, take corrective actions immediately. ● Check whether all wire inlets and outlets of the battery cluster are sealed properly. ● Check the battery cluster for internal seepage of water. ● Check whether the power cables and copper busbars are loose,and tighten them according to the aforesaid torque. ● Check the power cable and communication cable for damage, especially cut marks on the surface exposed to the metal surface.
Grounding	Check whether the grounding is correct. The grounding resistance should not be greater than 4Ω.
Fan	● Check the fan for faults (e. g. locked rotor and stalling). ● Check the fan for abnormal noise during operation.
Screw	Check whether screws inside the battery cluster fall off or are rusted.

Once every two years

Inspection item	Inspection method
Battery cluster status and cleanliness	● Check the following items. In case of nonconformity, take corrective actions immediately: ● Check the battery cluster and internal devices for damage or deformation. ● Check the internal devices for abnormal noise during operation. ● Check whether the temperature inside the battery cluster is too high. ● Check whether the internal humidity and dust of the battery cluster are within the normal ranges. If necessary, clean the battery cluster. ● Check whether the air inlet and outlet of the battery cluster are blocked.
Warning sign	Check whether the warning sign and label are legible and dirty. If necessary, replace them.
Wire and cable	Check whether the switch gear and battery module are connected correctly and whether the battery modules are also connected correctly.
Corrosion	Check the battery cluster for internal oxidation or rust.

Maintenance Safety Requirements

To ensure safe and efficient operation, all maintenance work on the energy storage system (ESS) shall be performed in accordance with the following requirements.

1. Qualified Personnel Only

Maintenance personnel must be properly trained and certified electrical technicians, qualified in accordance with local regulations and applicable safety standards.

2. Personal Protective Equipment (PPE)

All required safety procedures must be followed. Appropriate tools and personal protective equipment (PPE) shall be used at all times.

3. Removal of Metal Objects

Jewelry, watches, rings, and any other metal objects must not be worn during maintenance.

4. High-Voltage Contact Prohibition

Under no circumstances shall personnel touch the high-voltage positive and negative terminals simultaneously. Direct contact with live high-voltage components is strictly prohibited.

5. Power Isolation

Before performing any maintenance, all high-voltage and low-voltage switches must be turned off, and the system shall be fully de-energized.

6. Cleaning Restrictions

Do not clean the product with water or liquid directly. If cleaning is required, use a vacuum cleaner or dry cleaning methods only.

7. Cable Handling

Cables must be connected and disconnected in accordance with specified procedures. Violent, forced, or improper operations are strictly prohibited.

8. Post-Maintenance Inspection

After maintenance is completed, all tools and materials must be removed, and a thorough inspection shall be performed to ensure no metal objects or foreign materials remain inside or on top of the cabinet.

9. Unauthorized Operation Prohibited

If there are any questions regarding operation or maintenance, contact the Felicity Solar Customer Service Center.

Do not perform unauthorized operations or modifications.

9.4 Disassembly and installation

If the battery pack or BCU is faulty, follow the steps below to disassembly and installation it.

9.4.1 Disassemble and install the battery pack

Step1

Turn off all power. Refer to 6.2 Power-off Procedure.

Step 2

Disassemble all cables.

Step3

If you are disassembling the first through tenth battery pack, unscrew the battery pack to disassemble the pack.

After the repair is complete, re-screw the screw to complete the installation.

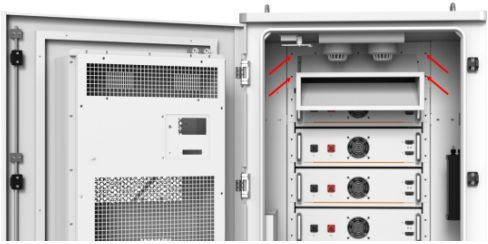
Step 4

If you are disassembling the eleventh and twelfth battery pack.

Unscrew the air duct to disassemble it

i. Unscrew the battery pack and then disassemble the battery pack.

ii. After repair, reinstall the battery pack and fix it with screws. Then install the air duct to complete the installation.



9.4.2 Disassemble and install the BCU

Step1

Turn off all power. Refer to 6.2 Power-off Procedure.

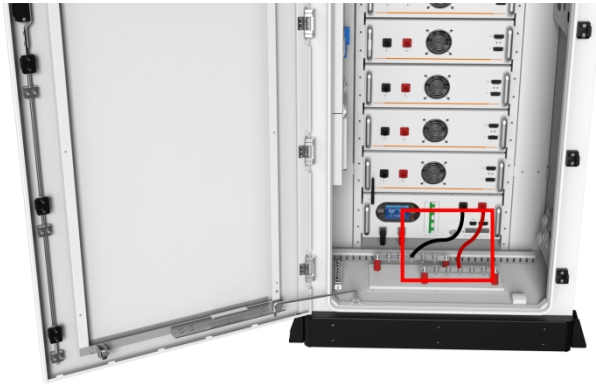
Step 2

Disassemble all cables.

Step 3

Disassemble the metal cover

i. Disassemble cables connecting the bronze



ii. Disassemble bronze and insulation columns

iii. Unscrew the BCU to disassemble the BCU.

After the repair is complete, re-screw the screw to complete the installation.

10. Decommissioning and Recycling

At the end of the service life, the energy storage system and its components shall not be disposed of as general household waste

- Batteries and electronic components should be collected and recycled through qualified recycling channels
- Recycling and disposal shall comply with local environmental protection regulations and waste management requirements
- Do not dismantle or recycle batteries by yourself

Improper disposal or unauthorized dismantling may cause fire, chemical hazards, environmental pollution, or personal injury.
For recycling support, contact Felicity Solar or local authorized recycling partners.

10.1 Battery Recycling

Lithium iron phosphate ($LiFePO_4$) batteries contain recyclable materials and must be handled by trained and qualified personnel.

Battery dismantling and material recovery should be performed by professional recycling facilities only.

10.2 Metal and Electronic Components

Metal parts such as copper and aluminum may be recycled according to local recycling practices.
Electronic components should be handled in accordance with local e-waste regulations.

10.3 Non-Recyclable Components

Some non-metallic components, such as insulation materials or diaphragms, may not have recycling value and shall be disposed of in accordance with local regulations.

Appendix

Technical Specifications

Model	FLH-E60
System Specification	
Nominal Input/ Output Power	50kW
AC Input/ Output	50/60Hz; 3L+N+PE ;220/380, 230/400Vac
System Energy	61.44kWh
System Usable Energy	55.3kWh
Module Capacity	100Ah
AC Input/Output Rated Current	72.5A
System Operating Voltage	556.8~691.2V
Number of Battery Modules	12
Humidity	5%~95%
Altitude	≤3000 m
IP Rating of Enclosure	IP55
Dimension (W x D x H)	780*1056*2235mm(no contain inverter)
Weight Appr.	949kg(no contain inverter)
Installation Style	Floor-Mounted
Warranty	10 years
Battery Technical Specification	
Battery Chemistry	LiFePO4
Battery Module Energy	5.12kWh
Battery Module Nominal Voltage	51.2V
Recommend Charge/Discharge Current	50A
Max.continuous Charge/Discharge current	100A
BMS Communication	RS485/CAN
Storage Temperature	0~35°C
Working Temperature Range	Charge: 0~55°C
	Discharge: -20~55°C
Depth of Discharge	90%
Cycle Life	≥6000(0.5C Charging/Discharging@25±2°C, EOL70%)
Battery Module Certification	CE, IEC62619, UN38.3

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