

Household energy storage series  
product (HV48100)

## **OPERATING MANUAL**



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# 1. Information on this Document

## 1.1. Validity

This document is valid for the OKEPS HV 48100 Stackable Battery Box (High Voltage Battery System) from firmware version BMU and BCU.

## 1.2. Target Group

The instructions in this document may only be performed by qualified persons who must have the following skills:

- Knowledge of how batteries work and are operated
- Knowledge of how an inverter works and is operated
- Knowledge of, and adherence to the locally applicable connection requirements, standards, and directives
- Knowledge of, and adherence to this document and the associated system documentation, including all safety instructions
- Training in dealing with the hazards associated with the installation and operation of electrical equipment and batteries
- Training in the installation and commissioning of electrical equipment

Failure to do so will make any manufacturer's warranty, guarantee or liability null, and void unless you can prove that the damage was not due to non-compliance.

## 1.3. Content and Structure of this Document

This document contains safety information and instructions, scope of delivery, system overview, installation, electrical connection, commissioning, decommissioning, expansion, troubleshooting, maintenance and storage, disposal, and technical data. Please finish reading this document before taking any actions on the battery system.

## 1.4. Declaration of Conformity

The battery system described in this document complies with the applicable USA directives.

## 1.5. Levels of Warning Messages

The following levels of warning messages may occur when handling the battery system.

 <b>DANGER</b>
<b>Indicates a hazardous situation which, if not avoided, will result in death or serious injury.</b>
 <b>WARNING</b>
<b>Indicates a hazardous situation which, if not avoided, could result in death or serious injury.</b>


 **CAUTION**

**Indicates a hazardous situation which, could result in minor or moderate injury.**

**NOTICE**

**Indicates a situation which, if not avoided, can result in property damage.**

## 1.6. Symbols in the Document

 <b>QUALIFIED PERSON</b>	<b>Sections describing activities to be performed by qualified persons only.</b>
---	--

## 1.7. Designation in the Document

Designation in this document	Complete designation
battery system	Stackable Battery Box
BCU	Battery Control Unit
BIC	Battery Information Collector
BMS	Battery Management System
BMU	Battery Management Unit
OKEPS	OKEPS INC
SOC	State of Charge

## 2. Safety

### 2.1. Intended Use

The battery system is for residential and works with a photovoltaic system. It is a high voltage Li-ion battery storage system, with the control module on itself. It could be operated in on-grid, off-grid and backup modes with compatible inverters.

The battery system could be connected to the internet through network cable for maintenance and firmware updating.

The battery system must only be used as stationary equipment.

The battery system is suitable for indoor and outdoor use under the conditions mentioned in Section 5.1.

The battery system must only be operated in connection with a compatible inverter.

The battery system is not suitable for supplying life-sustaining medical devices. Please ensure that no personal injury would lead due to the power outage of the battery system.

Alterations to the battery system, e.g., changes or modifications are not allowed unless the written permission of OKEPS is achieved. Unauthorized alterations will void the guarantee and warranty claims. OKEPS shall not be held liable for any damage caused by such changes.

The type label should always be attached to the battery system.

### 2.2. IMPORTANT SAFETY INSTRUCTIONS

The battery system has been designed and tested in accordance with international safety requirements. However, in order to prevent personal injury and property damage and ensure long-term operation of the battery system, please do read this section carefully and observe all safety information at all times.

#### 2.2.1. Battery Module Leakage

If the battery modules leak electrolytes, contact with the leaking liquid or gas should be avoided. The electrolyte is corrosive, and the contact may cause skin irritation and chemical burns. If one is exposed to the leaked substance, do these actions:

**Inhalation:** Evacuate the contaminated area, and seek medical help immediately.

**Eye contact:** Rinse eyes with flowing water for 15 minutes and seek medical help immediately.

**Skin contact:** Wash the affected area thoroughly with soap and water and seek medical help immediately.

**Ingestion:** Induce vomiting and seek medical help immediately.

### **2.2.2. Firefighting Measures**

The battery modules may catch fire when it is put into the fire. In case of a fire, please make sure that an ABC or carbon dioxide extinguisher is nearby. Water cannot be used to extinguish the fire.

Full protective clothing and self-contained breathing apparatus are required for the firefighters to extinguish the fire.

### **2.2.3. Battery Modules Handling and Storage Guide**

- The battery modules and its components should be protected from damage when transporting and handling.
- Do not impact, pull, drag, or step on the battery modules.
- Do not insert unrelated objects into any part of the battery modules.
- Do not throw the battery module into a fire.
- Do not soak the battery modules in water or seawater.
- Do not expose to strong oxidizers.
- Do not short circuit the battery modules.
- The battery modules cannot be stored at high temperatures (more than 122 °F).
- The battery modules cannot be stored directly under the sun.
- The battery modules cannot be stored in a high humidity environment.
- Do not use the battery modules if it is defective, or appears cracked, broken or otherwise damaged, or fails to operate.
- Do not attempt to open, disassemble, repair, tamper with, or modify the battery modules. The battery modules are not user-serviceable.
- Do not use cleaning solvents to clean the battery modules.



#### 2.2.4. Warning of Electric Shock



**Danger to life due to electric shock when live components or DC cables are touched**

**The DC cables connected to an inverter may be live. Touching live DC cables results in death or serious injury due to electric shock.**

- **Disconnect the battery system and inverter from voltage sources and make sure it cannot be reconnected before working on the device.**
- **Do not touch non-insulated parts or cables.**
- **Do not remove the terminal block with the connected DC conductors from the slot under load.**
- **Wear suitable personal protective equipment for all work on the battery system.**
- **Observe all safety information of the inverter manufacturer.**

#### 2.2.5. Warning of Overvoltages



**Danger to life due to electric shock in case of overvoltages and if surge protection is missing**  
**Overvoltages (e. g. in the event of a flash of lightning) can be further conducted into the building and to other connected devices in the same network via the network cables or other data cables if there is no surge protection. Touching live parts and cables results in death or lethal injuries due to electric shock.**

- **Ensure that all devices in the same network and the inverter are integrated into the existing surge protection.**
- **When laying the network cables or other data cables outdoors, it must be ensured that a suitable surge protection device is provided at the transition point of the cable from the battery system or the inverter outdoors to the inside of a building.**
- **The Ethernet of the inverter is classified as "TNV.1" and offers protection against overvoltage of up to 1.5kV.**

#### 2.2.6. Caution of Weight



**Risk of injury due to weight of the battery module**

**Injuries may result if the battery module is lifted incorrectly or dropped while being transported or installed.**

- **Transport and lift the battery module carefully. Take the weight of the battery module into account.**
- **Wear suitable personal protective equipment for all work on the battery system.**

## 2.2.7. Notice of Property Damage

### NOTICE

Damage to the BCU due to sand, dust and moisture ingress

**Sand, dust and moisture penetration can damage the BCU and impair its functionality.**

- **Only open the BCU if the humidity is within the thresholds and the environment is free of sand and dust.**

### NOTICE

Damage to the battery system due to under voltages

- **If the battery system doesn't start at all, please contact OKEPS local after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.**

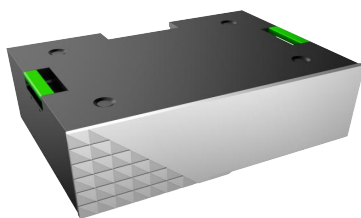
### 3. Scope of Delivery

BCU and Base Package



High voltage battery control box

Battery Modulepackage

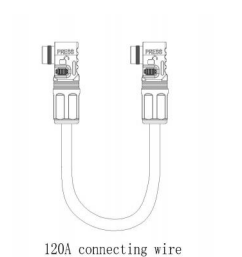


HV48100 battery module

Base



Maximum bearing capacity of pallet: 500KG



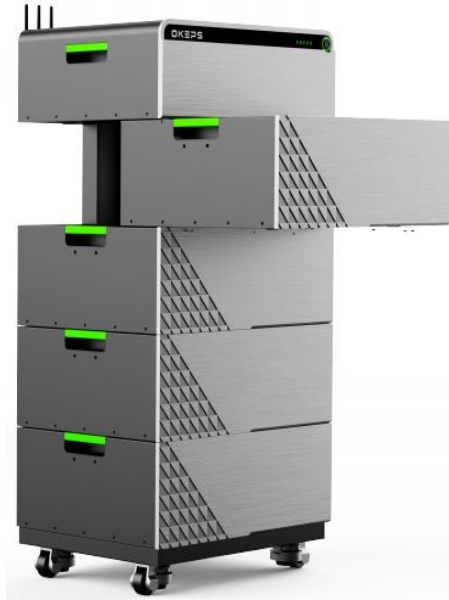
120A connecting wire

A	BCU
B	Battery Module
C	Base

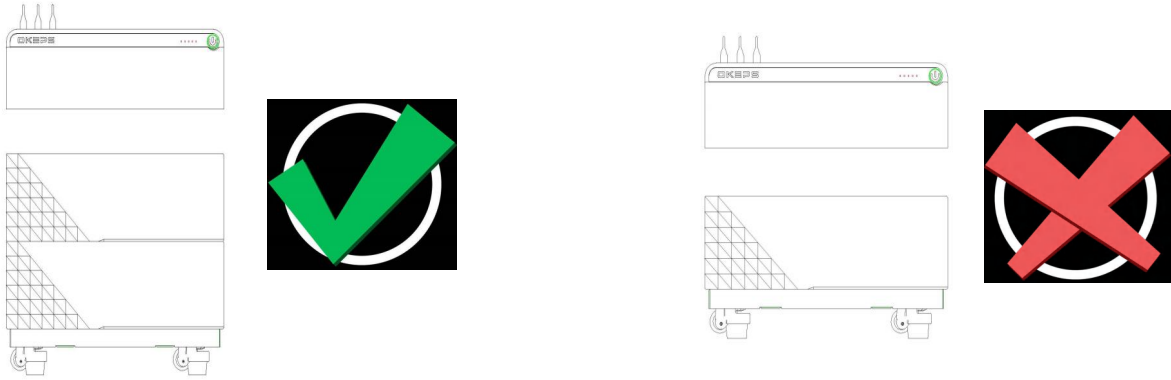
## 4. Battery System Overview

### 4.1. Battery System Description

The Stackable Battery Box is used as a connected battery for the intermediate storage of excess PV energy in an inverter system.



A	BCU
B	Battery Module
C	Base



Please perform series combination according to the input voltage range of the inverter

\* 2 to 10 modules could be stacked in one tower , 4 to 8 battery packs are preferred.

## 4.2. Interface

### **OKEPS**

OKEPS is an app for Android and iOS system devices. You can download it from Google Play or App Store.(Search O K E P S or scan the QR code on the cover of this document)

With O K E P S ,you can update the firmware, configure the battery system,read the battery status, events, upload logs to the server, etc.

### **OKEPS power station**

OKEPS power station (OKEPS) is a PC app. You can download from our website (<https://www.okeys.us/downloads>).












With OKEPS, you can configure and diagnose the battery system,

read the general battery status information, events,update the firmware,download historical events,etc.

### **O K E P S Monitoring**

The battery system is equipped with an Ethernet port as as tandard. When your battery system is linked with the Internet, it will join the OKEPS Monitoring.OKEPS Monitoring is a platform that OKEPS service could diagnose the battery system and update firmware remotely for customers. It is highly recommended you to make the Internet connection available to have a better service.

### 4.3. Symbols on the System

Symbol	Explanation
	Observe the documents Observe all documents supplied with the system.
	Grounding conductor This symbol indicates the position for connecting a grounding conductor.
	Disposal Do not dispose of the system together with household waste, please contact BYD US Service (contact information at the end of this document) to dispose of it in accordance with regulations for electronic waste and used batteries.
	FCC marking The system complies with the requirements of the applicable FCC Rules.
	This side up.
	Handle with care.
	Keep dry.
	Keep the battery modules away from open flame or ignition sources.
	Beware of electrical voltage.
	Beware of a danger zone This symbol indicates that the system must be additionally grounded if additional grounding or equipotential bonding is required at the installation site.
	Keep the battery modules away from children.

## 5. Installation

### 5.1. Requirements for Installation

#### 5.1.1. Requirements for Installation Location

- a) A solid support surface must be available (e.g., concrete or masonry).
- b) The installation location must be inaccessible to children.
- c) The installation location must be suitable for the weight and dimensions of the battery system.
- d) The installation location must not be exposed to direct solar irradiation.
- e) The installation location must not be close to the fire.
- f) The altitude of the installation location should be less than 9843 ft.
- g) The ambient temperature should be between 14 to 122°F.
- h) The ambient humidity should be between 5-95%.



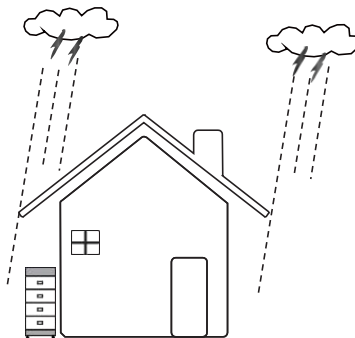
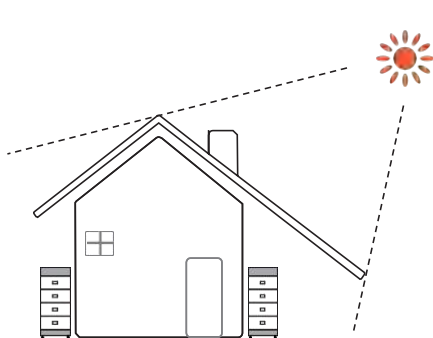
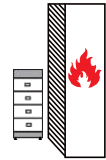
Max +50° C

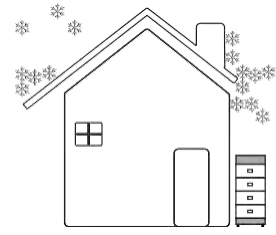
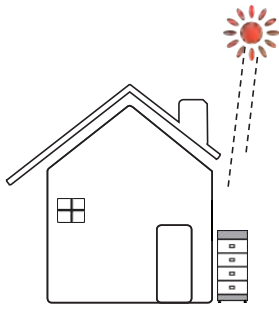


Min -10° C



RH. +5% ~ +95%





### 5.1.2. Tools

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



**Network Wire Clamp**



**Pen**



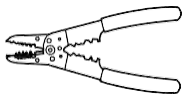
**Phillips Screwdriver Bit**



**Flat-Head Screwdriver**



**Torque Wrench**



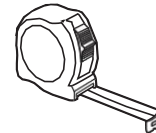
**Wire Stripper**



**Crimping Plier**



**Wrench**



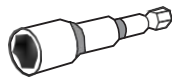
**Tape Measure**



**Drill**



**Hair Dryer**



**Cylinder Screwdriver**

### 5.1.3. Safety Gear

Wear the following safety gear when dealing with the battery system.



**Insulated gloves**



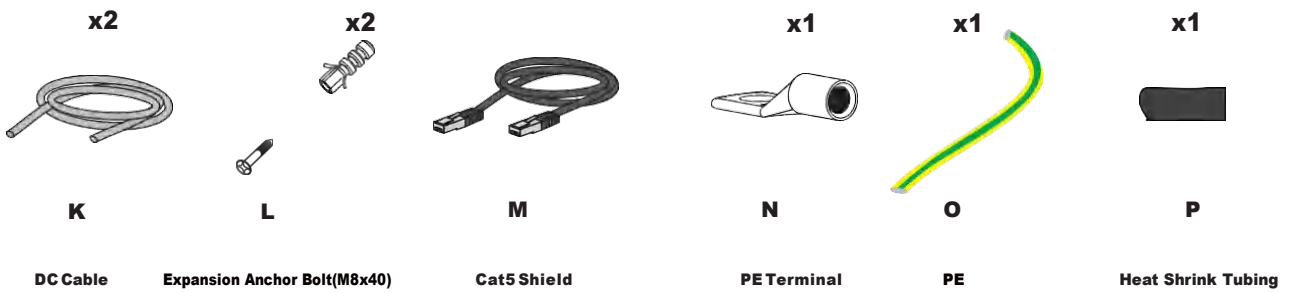
**Safety goggles**



**Safety shoes**



### 5.1.4. Additionally Required Installation Material



### 5.2. Installation

#### ⚠️ QUALIFIED PERSON

#### ⚠️ CAUTION

Danger to life from electric shock due to live DC cables or connectors at the battery system  
**The DC cables connected to the battery system may be live. Touching the DC conductors or the live components leads to lethal electric shocks.**

- Do not touch non-insulated cable ends.
- Ensure that the inverter is disconnected from all voltage sources.

#### ⚠️ CAUTION

Risk of injury due to weight of the battery module  
**Injuries may result if the battery module is lifted incorrectly or dropped while being transported or installed.**

- Transport and lift the battery module carefully. Take the weight of the battery module into account.
- Wear suitable personal protective equipment for all work on the battery system.

Additionally required installation material (not included in the scope of delivery):

#### NOTICE

Damage to the battery system due to under voltages

- If the battery is installed, it should be set into operation within a month, or checked regularly, otherwise there might be damage to the batteries.

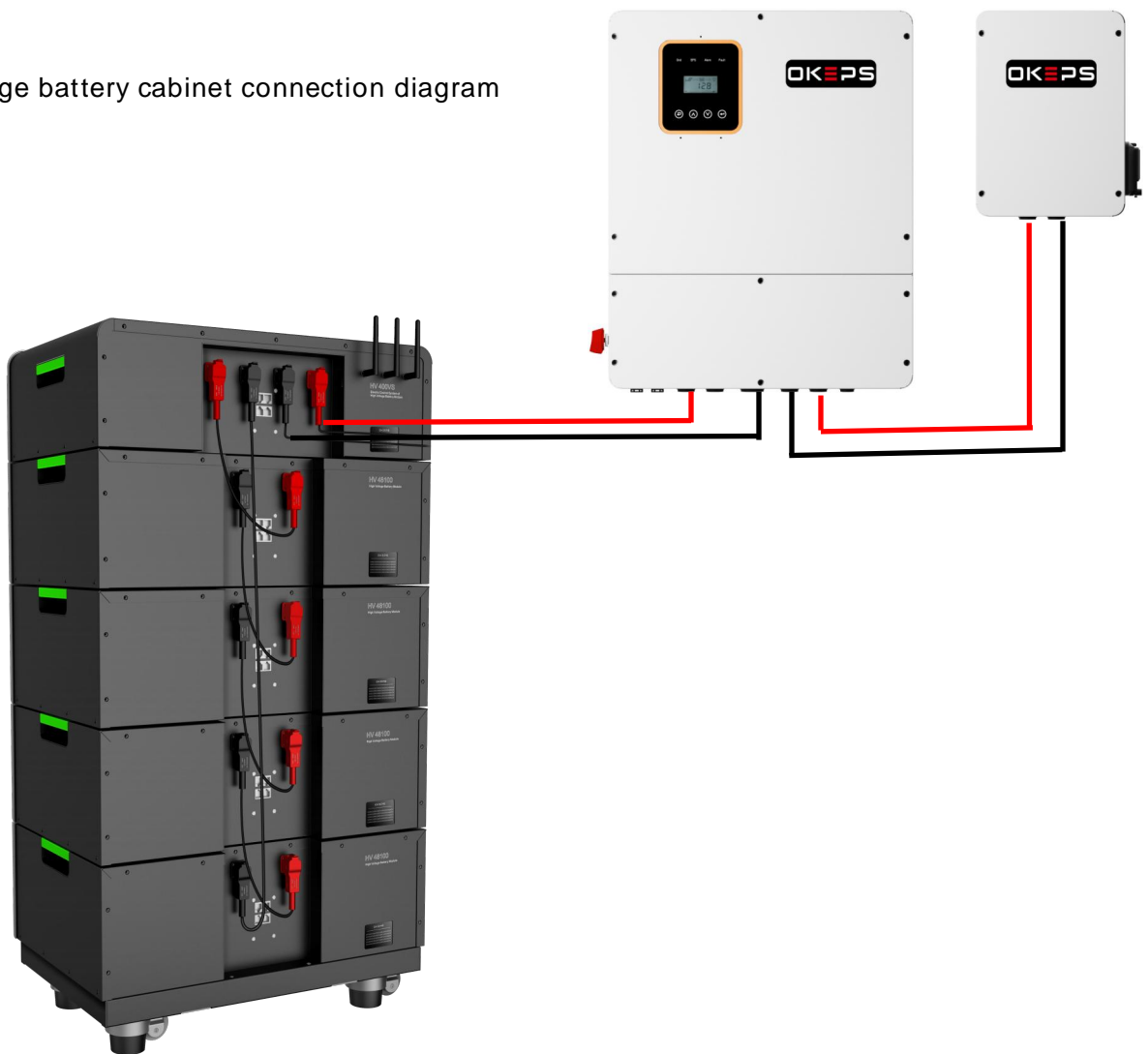
# 6. Electrical Connection

## 6.1. Overview of the Connection Area

Exterior view



High voltage battery cabinet connection diagram



pin terminal blocks for connecting an inverter`s data cable. (CAN or RS485 protocol)

## 6.2. The Data Cable Connection to Inverter

### 6.2.1. Connection Options

The connection options with different inverters could be read in the Appendix.

### 6.2.2. Connecting the Data Cable of the Inverter

#### QUALIFIED PERSON

**Additionally required mounting material (not included in the scope of delivery):**

- a) One data cable
- b) Rigid Conduit (3/4" conduit size punch)

#### **Data cable requirements:**

The cable length and quality affect the quality of the signal. Observe the following cable requirements.

Cable category: Cat5, Cat5e or higher

Plug type: Metal shielded RJ45 of Cat5, Cat5e or higher

Shielding: Yes

UV-resistant for outdoor use

Straight- through wired cables

Maximum cable length: 10 m/ 32.8 ft.

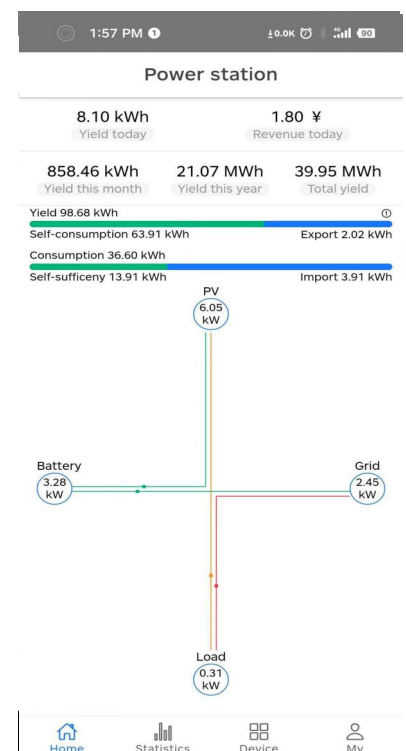
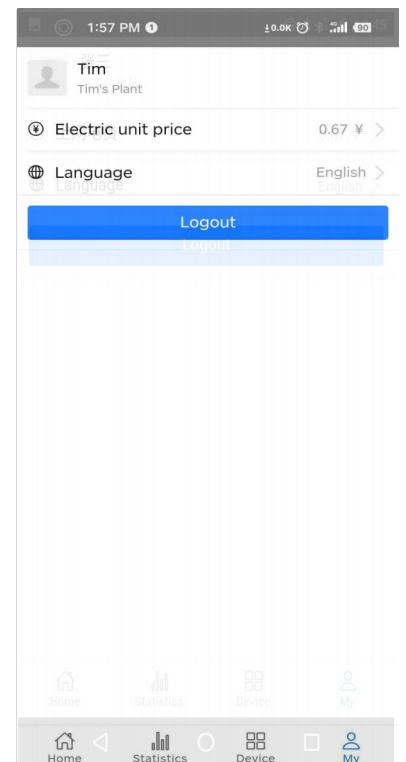
**For connection with some inverters, if the data cable goes together with the power cable, it should be 22 AWG, 600V insulated.**

## 7.1. Configure the Battery System

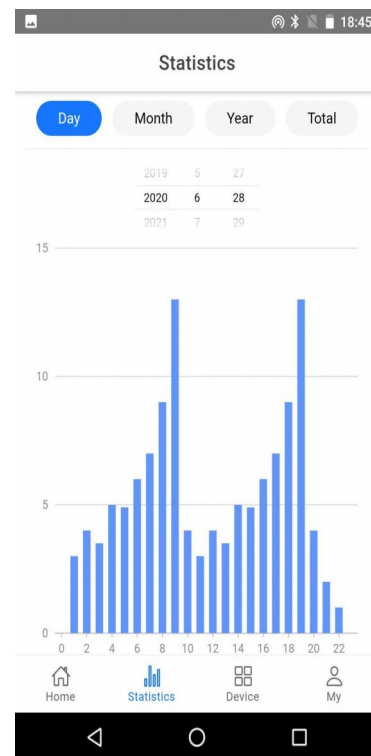
### ⚠ QUALIFIED PERSON

#### Procedure:

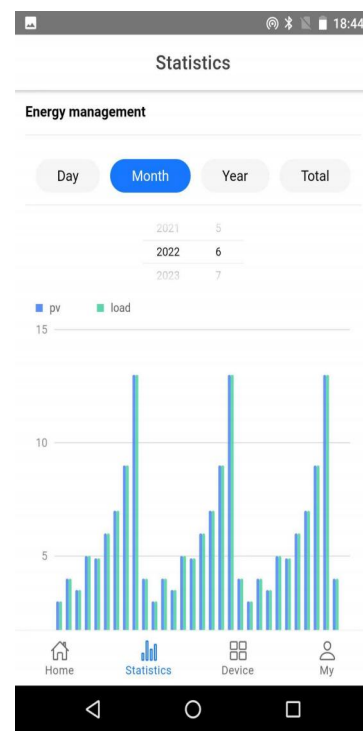
1. Download **OKEPS** from Google Play or App Store. The battery system requires the latest version firmware to operate. So please make sure you either have downloaded the latest firmware in your device (cell phone, Ipad, etc.), or your device could access the Internet during configuration.
2. Tick the box in front of “I agree to the Privacy Policy” , and then press the "Start" button.
3. The app will check the firmware, and download if needed when Internet is available. If there is no Internet available, you can press "Skip" to skip the firmware check.
4. After the firmware downloaded,press the button “Check WIFI Settings” to connect the battery WLAN, which begins with “OKEPS-” and the full name could be found at the BCU label near the Air Switch.



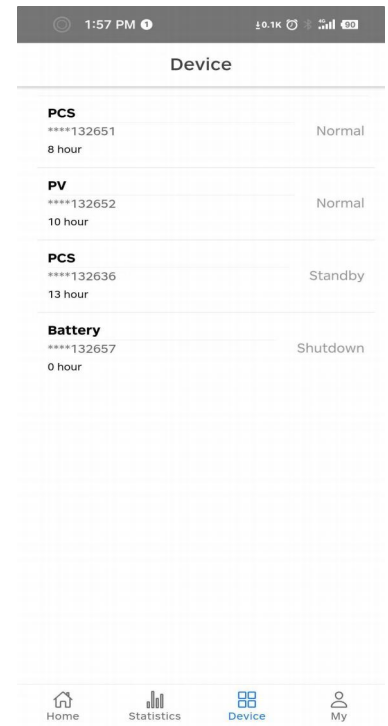
5. Choose “Yes” to configure the battery system. And then press the “Next” button to confirm the time.



6. Choose the inverter brand that the battery system is operated together.



7. Choose the battery system model, HVL.(HVL is only available for the US market.) And then, set how many battery modules are installed per tower.



8. Check the summary of the configuration information, tick the sentence, and press the button "Next".

Restart the O K E P S if it was stuck somewhere.

Please note that the SOC of the battery may not be accurate before a full charge or discharge after the configuration.

## 7.2. Switch on and Commission the Inverter

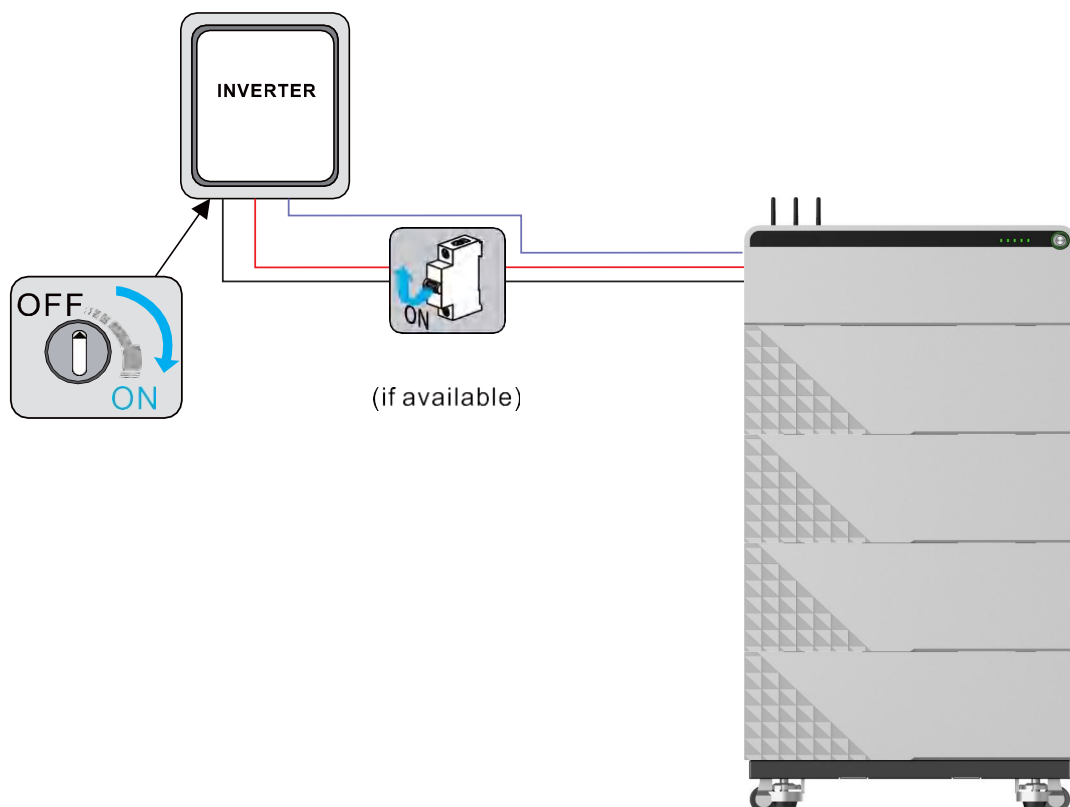
### ⚠ QUALIFIED PERSON

#### Procedure:

1. Mount and connect the inverter according to the inverter manufacturer`s instruction.
2. Commission and configure the inverter according to the inverter manufacturer`s instruction.

If the battery information could be read correctly, it means the connection between the battery system and the inverter is all right. Normally, The LED of the battery is on , and the battery system is ready to work.

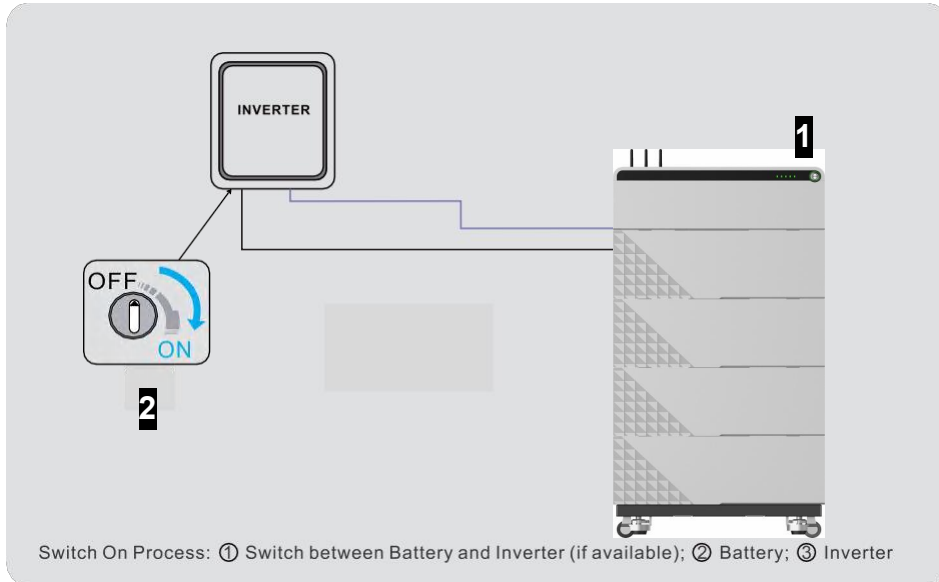
If the LED of the BCU is still off, and/or there are some battery errors shown at the inverter, go to the Trouble Shooting Chapter of this manual.



## 8. Operation

### 8.1. Switch on the Battery System

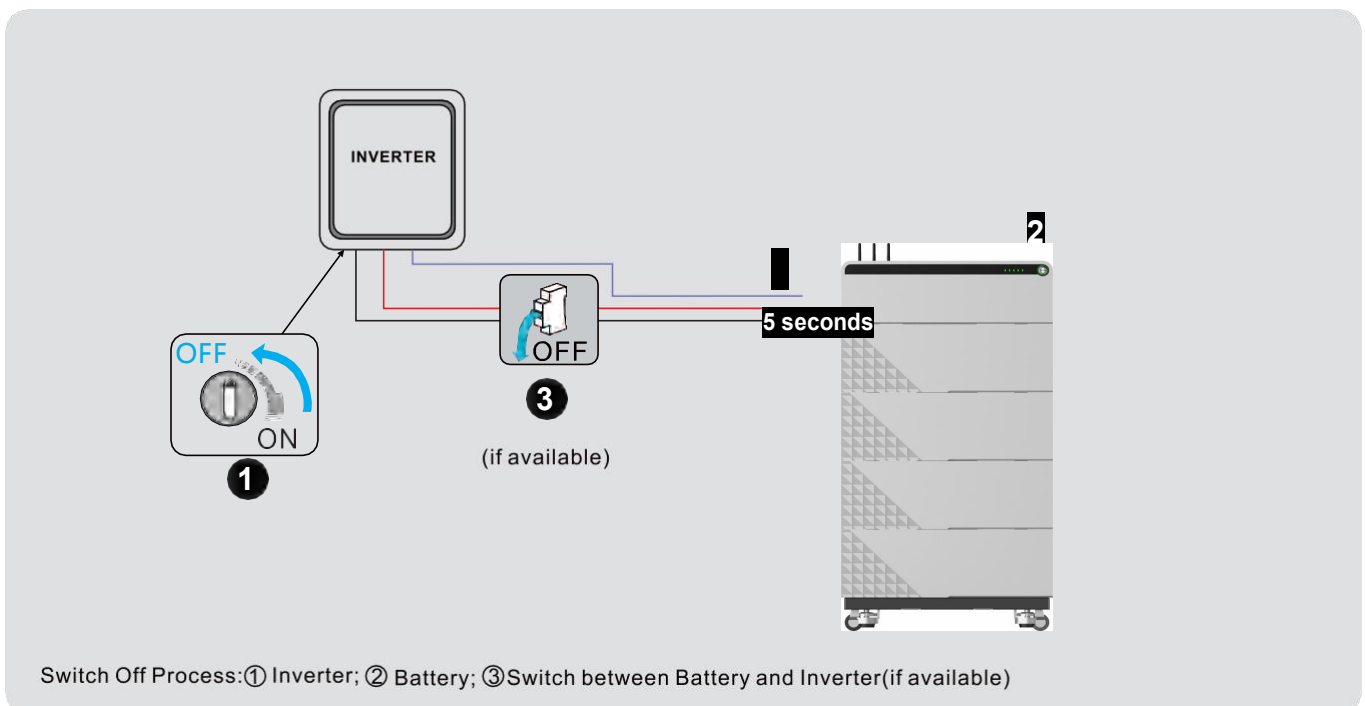
To make sure the battery system can work well with the inverter, please follow the right procedure to start them. The procedure is: 1) turn on the switch between the inverter and battery if there is any; 2) switch on the battery system; 3) switch on the inverter.



### 8.2. Switch off the Battery System

The procedure to switch off the battery system is: 1) switch off the inverter; 2) switch off the battery; 3) switch off the air switch between the battery and the inverter if there is any.

The correct way to switch off the battery system is to press the LED Button for 5 seconds on the BCU, but not to pull down the air switch of BCU.





### **8.3. Safety Design**

The battery system cannot be turned on when the Operating Panel is removed.

The system will switch off automatically if there is no communication with an inverter for 30 minutes during commissioning.

### **8.4. WLAN Activation**

The WLAN of the battery will turn off automatically after the battery is switched on for 5 hours.

Press the LED button for around 1 second when the battery is on, the WLAN could be activated again.

### **8.5. Black Start Function**

The battery system could support the black start function of compatible inverters. The ways to trigger this function are different when the battery systems are operated with different inverters.

## 9. Decommissioning

### QUALIFIED PERSON

**To decommission the inverter completion of its service life, proceed as described in this Section.**

#### CAUTION

Risk of injury due to weight of product

**Injuries may result if the product is lifted incorrectly or dropped while being transported or attaching it to or removing it from the wall mounting bracket.**

- **Transport and lift the product carefully. Take the weight of the product into account.**
- **Wear suitable personal protective equipment for all work on the product.**

#### CAUTION

Danger to life from electric shock due to live DC cables at the battery system.

**The DC cables connected to the battery system may be live. Touching the DC conductors or the live components leads to lethal electric shocks.**

- **Do not touch non-insulated cable ends.**
- **Ensure that the inverter is disconnected from all the voltage sources.**

#### **Procedure:**

1. Shut off the inverter.
2. Switch off the battery system.
3. Switch off the breaker between the inverter and the battery system if there is any.
4. Loose the screws on Operation Panel, and put the Operation Panel on the top of the BCU.
5. Remove all cables and conduits from the battery system.
6. Loosen the screws on hangers between BCU and the wall. And then take off the hangers.
7. Install the plastic covers of the holes on the Operation Panel.
8. Fix the Operation Panel on the BCU.
9. Take the BCU from battery modules and battery modules from the base.  
Before lifting the battery module, ensure that the screws on both sides of them are removed.
10. Remove the hangers (BCU part).

If the battery system is to be stored or shipped, pack the system. Use the original packaging or packaging that is suitable for the weight and dimensions of the system.

Dispose of the battery system in accordance with the locally applicable disposal regulations for electronic waste.

## 10. Extension

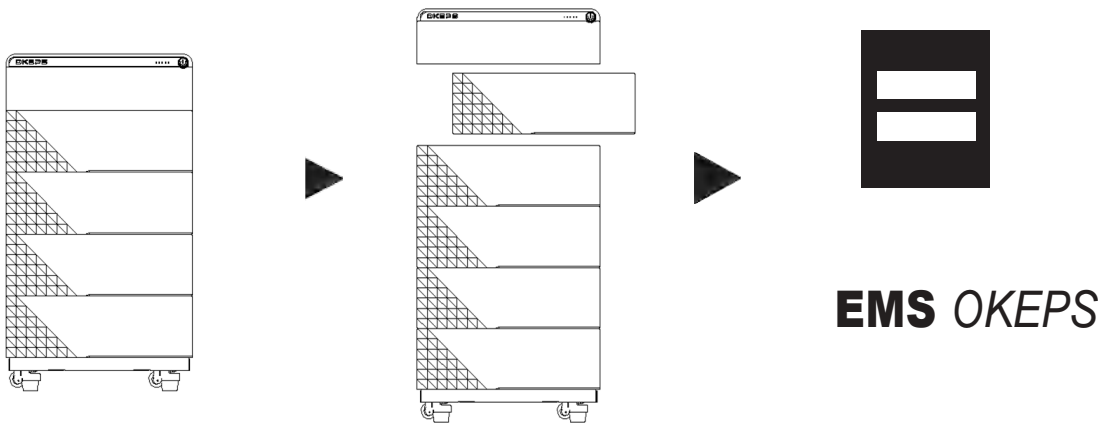
The SOC of the existing system and the module to be added should be similar before the module adding on the existing system.

### Procedure:

1. Charge or discharge the existing system to an SOC of around 30%. Note: New modules have an SOC of around 30%
2. Shut off the inverter.
3. Switch off the battery system.
4. Switch off the breaker between the inverter and the battery system if there is any.
5. Take the BCU off.
6. Add the new module on top of other battery modules.
7. Put BCU back on top of the new battery module.
8. Configure the battery system.
9. Start the inverter.

New Battery  
SOC  $\approx$  30%

Original Battery  
SOC  $\approx$  30%



### NOTICE

#### Damage to the battery system due to under voltages

- **If the battery system doesn't start at all, please contact OKEPS local after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.**

# 11. Maintenance and Storage

## Cleaning

It is recommended that the battery system be cleaned periodically. If the enclosure is dirty, please use a soft, dry brush or a dust collector to remove the dust. Liquids such as solvents, abrasives, or corrosive liquids should not be used to clean the enclosure.

## Maintenance

The battery module should be stored in an environment with a temperature range between 14 to 122 °F, and charged regularly according to the table below with no more than 0.5 C (A C-rate is a measure of the rate at which a battery is discharged relative to its maximum capacity. ) to the SOC of 40% after a long time of storage.

Storage environment temperature	Relative humidity of the storage environment	Storage time	SOC
Below 14 °F	/	Not allowed	/
14~77°F	5%~70%	≤ 12 months	25%≤SOC≤60%
77~95°F	5%~70%	≤ 6 months	25%≤SOC≤60%
95~122°F	5%~70%	≤ 3 months	25%≤SOC≤60%
Above 122°F	/	Not allowed	/

### NOTICE

#### Damage to the battery system due to under voltages

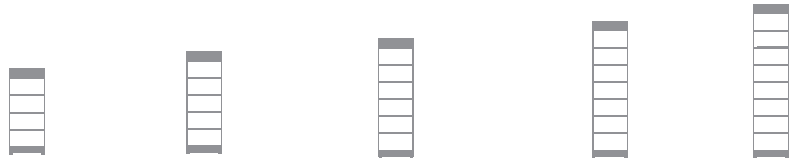
- **If the battery system doesn't start at all, please contact O K E P S local after-sales service within 48 hours. Otherwise, the battery could be permanently damaged.**

## **12. Disposal of the Battery System**

Disposal of the system must comply with the local applicable disposal regulations for electronic waste and used batteries.

- Do not dispose of the battery system with your household waste.
- Avoid exposing the batteries to high temperatures or direct sunlight.
- Avoid exposing the batteries to high humidity or corrosive atmospheres.
- For more information, please contact O K E P S.

### 13. Technical Data



HV 4 8 1 0 0 Stackable Series					
Battery Module	PACK (5.12KWH/51.2V/100AH) 108 lb/49KG				
Number of Modules	4 Packs	5 Packs	6 Packs	7 Packs	8 Packs
Usable Energy[1]	20.48KWH	256KWH	30.72KWH	35.84KWH	40.96KWH
Max Output Current[2]	50A	50A	50A	50A	50A
Peak Output Current[2]	75A.3S	75A.3S	75A.3S	75A.3S	75A.3S
Nominal Voltage	204.8V	256V	307.2V	358.4V	409.6V
Operating Voltage	160V-230V	200V-288V	240V-345V	280V-403V	320V-460V
Dimensions(H/W/D) mm	925*580*360	1113*580*360	1300*580*360	1489*580*360	1677*580*360
Weight	468 lb/212KG	576 lb/261KG	684 lb/310KG	792 lb/359KG	900 lb/409KG
Operating Temperaturue	14°F to 122°F				
Battery Cell Technology	Lithium Iron Phosphate(cobalt-free)				
Communication	CAN/RS485				
Enclosure Protection Rating	IP55				
Round-trip Efficiency	≥96%				
Certification	UL1973/IEC660730/FCC/UN38.3				
Applications	ON Grid / ON Grid ■ Backup /OFF Grid				
Warranty[3]	10Years				
Compatible Inverters	OKEPS HV48100				

[1] DC Usable Energy, Test conditions: 100% DOD, 0.2C charge & discharge at 77°F. System Usable Energy may vary with different inverter brands.

[2] Charge derating will occur between 14 °F and 41°F.

[3] Condition apply. Refer to OKEPS HV48100 Stackable Battery Box Limited Warranty.