NEOVOLTA

# 16kWh Battery

## NVPlus-16

Headquartered in Poway,
California since 2018




# User Manual

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V1.11162026

## Compliance Notice — UL 9540 Third Edition · Clause 46.14

The NV16KAC Hybrid Inverter is designed and validated for use as the Power Conversion Equipment (PCE) in a DC Energy Storage System (DC ESS) as defined under UL 9540, Third Edition. The NVPlus-16-H battery system holds a standalone UL 9540 Third Edition DC ESS listing and has been confirmed compatible with the NV16KAC through manufacturer interoperability testing (Renon Technology, Report FM-RD-DQA-014-017, Rev. A01, April 2026).

In accordance with UL 9540 Third Edition Clause 46.14, this section of the installation manual constitutes the required manufacturer documentation establishing a valid and compliant DC ESS pairing. The following sections define the requirements that must be met for this combination to remain within the scope of the UL 9540 Third Edition DC ESS listing:

### Validated Compatible Inverter Model

| Parameter | Value |
|---|---|
| **Brand** | NeoVolta |
| **Model** | **NV16KAC** |
| **Inverter certification** | UL 1741 SA / SB · IEEE 1547-2018 · Certificate No. [XXXXX] |
| **ARM firmware version** | 1.0706 (230205) |
| **DSP firmware version** | 1.0806 (100011) |
| **HMI firmware version** | 1.0301 (3.09) |
| **Interoperability test report** | FM-RD-DQA-014-017 Rev A01 · Renon Technology (Shenzhen) Co., Ltd. · 2026-04-30 |
| **Test summary** | 35 tests · 34 PASS · 1 N/A (inverter-side forced charging not applicable to NV16KAC) |

### Electrical Interface Requirements

| Parameter | Specification |
|---|---|
| **Battery chemistry** | LiFePO4 (Lithium Iron Phosphate) |
| **Rated battery voltage** | 51.2 V DC (nominal) |
| **Battery voltage operating range** | 40 V – 58 V DC |
| **Charge cutoff voltage** | 56.8 V (CAN frame 0x351) |
| **Maximum charging current** | 157 A (BMS-requested; CAN frame 0x351) |
| **Maximum discharging current** | 190 A (BMS-requested; CAN frame 0x351) |

### Communication and Control Interface Requirements

| CAN Frame | BMS Fault Condition | Required Inverter Response | Verified |
|---|---|---|---|
| 0x359 | Cell undervoltage protection | Battery powers off; inverter shuts down | **PASS** |
| 0x359 | Discharge high-temperature protection (grid-tied) | Displays A03-Bat Disconnect + A23-Bat Over Temp | **PASS** |
| 0x359 | Discharge high-temperature protection (off-grid) | Inverter shuts down | **PASS** |
| 0x359 | Discharge low-temperature protection (grid-tied) | Displays A03-Bat Disconnected + A25-Under Temp | **PASS** |
| 0x359 | Discharge low-temperature protection (off-grid) | Inverter shuts down | **PASS** |
| 0x359 | Discharge overcurrent protection (grid-tied) | Displays A04-Bat Under Volt | **PASS** |
| 0x359 | Discharge overcurrent protection (off-grid) | Inverter shuts down | **PASS** |
| 0x359 | Charging high-temperature protection | Displays A24-Bat Over Temp | **PASS** |
| 0x359 | Charging low-temperature protection | Displays A25-Bat Under Temp | **PASS** |
| _ | BMS communication loss (grid-tied charging) | Stop within 18 s; report A28-BMS Comm Fail; resume within 125 s | **PASS** |
| _ | BMS communication loss (off-grid discharging) | Stop within 20 s; resume within 60 s after restoration | **PASS** |

### Protection Coordination Requirements

| CAN Frame | BMS Fault Condition | Required Inverter Response | Verified |
|---|---|---|---|
| 0x359 | Cell undervoltage protection | Battery powers off; inverter shuts down | **PASS** |
| 0x359 | Discharge high-temperature protection (grid-tied) | Displays A03-Bat Disconnect + A23-Bat Over Temp | **PASS** |
| 0x359 | Discharge high-temperature protection (off-grid) | Inverter shuts down | **PASS** |
| 0x359 | Discharge low-temperature protection (grid-tied) | Displays A03-Bat Disconnected + A25-Under Temp | **PASS** |
| 0x359 | Discharge low-temperature protection (off-grid) | Inverter shuts down | **PASS** |
| 0x359 | Discharge overcurrent protection (grid-tied) | Displays A04-Bat Under Volt | **PASS** |
| 0x359 | Discharge overcurrent protection (off-grid) | Inverter shuts down | **PASS** |
| 0x359 | Charging high-temperature protection | Displays A24-Bat Over Temp | **PASS** |
| 0x359 | Charging low-temperature protection | Displays A25-Bat Under Temp | **PASS** |
| — | BMS communication loss (grid-tied charging) | Stop within 18 s; report A28-BMS Comm Fail; resume within 125 s after restoration | **PASS** |
| — | BMS communication loss (off-grid discharging) | Stop within 20 s; resume within 60 s after restoration | **PASS** |

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# 1 Safety Instructions

*For safety reasons, installers and users are responsible for familiarizing themselves with the contents of this document and all warnings before installation and usage.*

## 1.1 General Safety Precautions

- Please carefully read this manual before any work is carried out on the product and keep it located near the product for future reference.
- All installations and operations must comply with local electrical standards.
- Please ensure the electrical parameters of the product are compatible with related equipment.
- Do not open or dismantle the battery module. Electrolyte is very corrosive. In normal working conditions contact with the electrolyte is impossible. If the battery casing is damaged, do not touch the exposed electrolyte or powder because it is corrosive.
- The electronics inside the product are vulnerable to electrostatic discharge.
- Do not place items or tools on the product.
- Do not damage the product by dropping, deforming, impacting, or cutting.
- Keep the product away from liquids. Do not touch the product if liquid spills on it as there is a risk of electric shock.
- Do not expose the product to flammable products, harsh chemicals, or vapors.
- Do not paint any part of the product, including any internal or external components.
- Do not change any part of the product, especially the battery and cell.
- Besides connections indicated by this manual, any other foreign object is prohibited from being inserted into any part of the product.
- The warranty claims are excluded for direct or indirect damage due to items above.
- Batteries must not be mixed with domestic or industrial waste.
- Batteries marked with the recycling symbol must be processed via a recognized recycling agency.
- By agreement, batteries may be returned to the manufacturer.

## 1.2 Transportation and Storage Precautions

- The batteries must be transported according to UN3480; they must be packed according to packaging requirements of Special Regulation 230 of IMDG CODE (40-20 Edition) for maritime transport, and P965 IA for air transport (SOC less than 30%). The original packaging complies with these instructions.

- The product must be transported in its original packaging or equivalent
- The modules are heavy and may require multiple people to lift. Ensure adequate and secure mounting and always use suitable handling for equipment during transportation.
- If the product is in its package, use soft slings to avoid damage.
- Do not stand below the product when it is hoisted.
- During transportation, severe impact, extrusion, direct sunlight, and rain should be avoided.
- Store in a cool, dry place.
- Store the product in a clean environment, free of dust, dirt and debris.
- Store the product out of reach from children and animals.
- Don't store the battery under 50% SOC for a period of over one month. This may result in permanent damage to the battery and void the warranty.
- During long term storage, it is required to charge the battery module every 3 months, and the SOC should be no less than 90%.

## 1.3 Installation Precautions

- Do not install the product in an airtight enclosure or in an area without ventilation.
- Do not install the product in living areas of dwelling units or in sleeping units other than utility closets and storage or utility spaces.
- If the product is installed in a garage or carport, ensure there is adequate clearance from vehicles.
- While working on the product wear protective eyeglasses and clothing.
- Use insulated gloves for handling the battery.
- Use insulated tools. Do not wear any metallic items such as watches, bracelets, etc.
- Turn-off related circuit breakers before and during the installation to avoid electric shock.
- Do not connect any AC conductors or photovoltaic conductors directly to the battery pack. These are only to be connected to the inverter.
- Wiring must be accurate; do not mistake the positive and negative cables and ensure no short circuit with the external device.
- Over-voltages or wrong wiring could damage the battery pack and cause combustion, which may be extremely dangerous.
- Make sure the product is well grounded and complies with local specifications.
- The recommended grounding resistance is less than 1Ω.
- Handle with care as the Li-ion Battery is sensitive to mechanical shock.
- In case of ingestion of electrolyte or other battery parts, induce vomiting and seek medical attention.

## 1.4 Usage Precautions

- Before starting the system, the operator must check the connection terminals to ensure a secure connection.
- If there is a circuit breaker between the battery and inverter, the breaker is supposed to be on before powering on the battery.
- Do not open the product, connect, or disconnect any wires while in operation to avoid electric shock.
- Battery needs to be recharged within 12 hours after fully discharging.
- The default temperature range over which the battery can be discharged is -4℉ (-20℃) to 122℉ (50℃). Frequently, discharging the battery at a high or low temperature may deteriorate the performance and life of the battery pack.
- The default temperature range over which the battery can be charged is 32℉ (0℃) to 122℉ (50℃). Frequently, charging the battery at a high or low temperature may deteriorate the performance and life of the battery pack.
- Do not charge or discharge a damaged battery.
- Please contact the supplier within 24 hours if you notice something abnormal with your products.

## 1.5 Response to Emergency Situations

- Damaged batteries are dangerous and must be handled with extreme care. They are not suitable for use and may cause danger to people or property. If the battery pack appears to be damaged, place it in the original container and return it to an authorized dealer.
- If the battery pack is wet or submerged in water, do not allow anyone to touch the water, and then contact the authorized dealer for technical support.
- In case of fire, use carbon dioxide, FM-200 or an ABC dry powder fire extinguisher; if possible, move the battery pack to a safe area before it catches fire.
- If a user is exposed to the internal materials of the battery cell due to damage on the outer casing, the following actions are recommended:
  - In case of inhalation: Leave the contaminated area immediately and seek medical attention. In case of contact with eyes: Rinse eyes with running water for 15 minutes and seek medical attention.
  - In case of contact with skin: Wash the contacted area with soap thoroughly and seek medical attention.
  - If the product needs to be moved or repaired, the power must be completely shut off.

## 1.6 Qualified Personnel

The installation guide part described herein is intended for use by skilled staff only. Skilled staff are defined as trained and qualified installers or technicians who have all the following skills and experience:

- Knowledge of battery specification and properties
- Knowledge of the installation of electrical devices
- Knowledge of torsion and screw drivers for different types of screws
- Knowledge of local installation standards
- Electrical license for battery installation required by the country or state
- Knowledge of the dangers and risks associated with installing and using electrical
- devices and acceptable mitigation methods Knowledge of and adherence to this guide
- Knowledge of and adherence to this guide and all safety precautions and best practices
- For safety reasons, installers are responsible for familiarizing themselves with the contents of this document and all warnings before performing installation and usage

# 2 Preparation Before Installation

## 2.1 Safe Handling Guide

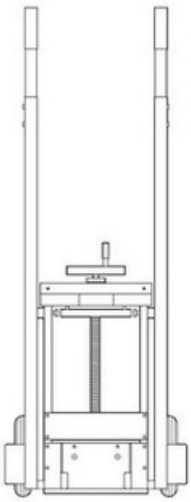
**2.1.1 Familiarize Yourself with the Battery:** Be careful when unpacking the system. Every module of the product is heavy. Don't lift them with a pole. The weight of the modules can be found in the chapter **"Specifications."** Familiarize yourself with the battery. The battery poles are located on the top and bottom sides of the battery module. It's designed for fast mounting and simplicity. No need to recognize the positive and negative poles but be sure to take care of them, especially the bottom one.

**2.1.2 Precautions:** Before installation, be sure to read the contents in chapter **"Safety Precautions,"** which details the operation safety of installation personnel; be sure to review these carefully.

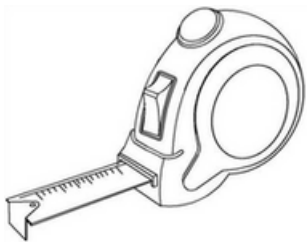
**2.1.3 Tools** The following tools are required to install the product:



Cordless Drill



Dolly



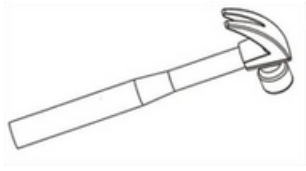
MeasuringTape



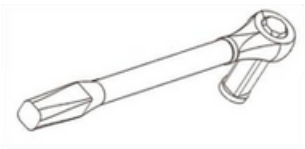
Flathead Screwdriver



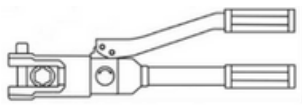
Phillips Screwdriver



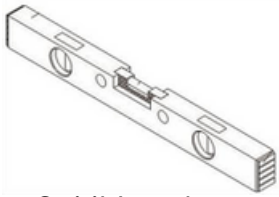
Hammer



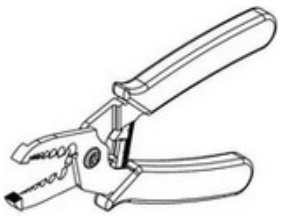
Torque Wrench



Hydraulic Clamp



Spirit Level



Crimping Pliers

Use properly insulated tools to prevent accidental electric shock or short circuits. If insulated tools are not available, cover all exposed metal surfaces of the available tools, except their tips, with electrical tape.

**2.1.4 Safety Gear** It is recommended to wear the following safety gear when handling the product:



Insulated Gloves



Safety Goggles



Safety Shoes

## 2.2 System Premeasurement

The battery requires adequate clearance for installation and airflow. The minimum clearance for system configuration is given below. The cable connected between the battery pack and the inverter should be in accordance with the inverter installation manual. Leave at least 6 in (152.4 mm) between batteries. See Section 3.4.4

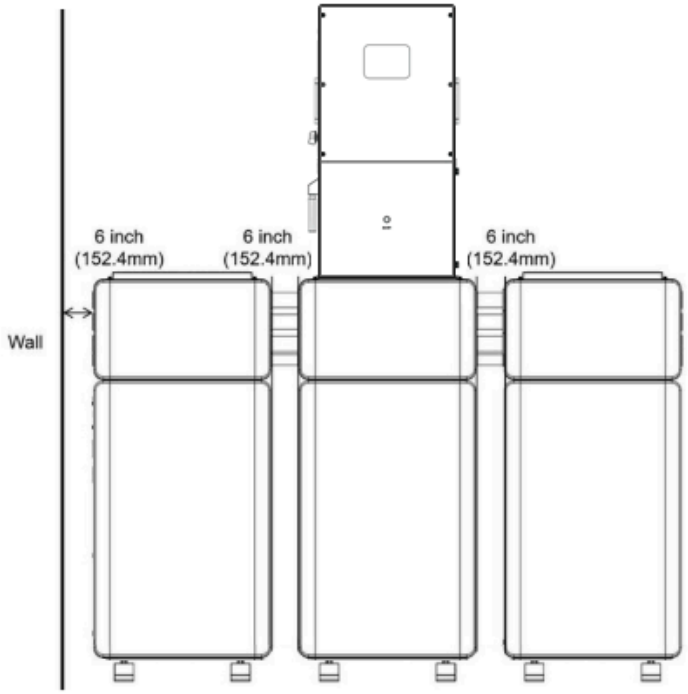



*Figure 2.2.1. Installation distance*

## 2.3 Installation Location

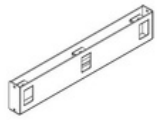
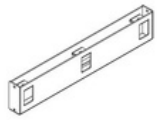
Make sure that the installation location meets the following conditions:

- The surface of the wall is smooth and perpendicular to the ground, which can bear the weight
- The area is completely waterproof (Recommended)
- The area shall avoid direct sunlight (Recommended)
- There are no flammable or explosive materials
- The distance from any heat source is more than 80 in (2m)
- The ambient temperature should not exceed the range of the battery usage temperature
- The humidity should not exceed the range of the battery usage humidity
- Minimal dust or dirt present
- Avoid installation in a confined area or one with high salinity
- Do not place in an area accessible to children or pets

## 2.4 Package Items

After receiving the product, unpack all boxes and check the product and packaging list.
If the product is damaged or lacks parts, please contact the local retailer.
NVPlus-16 Packing List:

| No. | Item | Specification | Qty | Usage | Diagram |
|---|---|---|---|---|---|
| 1 | NVPlus-16 | NVPlus-16-H | 1 | Battery |  |
| 2 | QR code to User manual | NVPlus-16 | 1 | Digital User manual |  |
| 3 | Embedded Screw | M6*16 | 7 | Secure mounting panel on the wall |  |
| 4 | Embedded Screw | M5*1 2 | 7 | Secure holder to the battery |  |
| 5 | Embedded Screw | M8*80 | 6 | Secure holder to the battery |  |
| 6 | Leveling Feet | ⌀ 60-M10- 95 | 4 | Support or use for adjusting height |  |
| 7 | Connector | Amphenol SurLok Plus connector, black (negative) | 4 | For battery-to-battery cables |  |
| 8 | Connector | Amphenol SurLok Plus connector, orange (positive) | 4 | For battery-to-battery cables |  |
| 9 | Connector | RJ45 | 1 | Use for wiring |  |
| 10 | OT Terminal | RNB3.5-5 | 2 | Use for wiring |  |

| | | | | | |
|---|---|---|---|---|---|
| 11 | Mounting Panel | 20*12.85*0.79in (508*326.4*20mm), T=3.0, SGCC | 1 | Mounting battery on the wall |  |
| 12 | Holder 1 | 19.69*3.65*0.24in (500*92.7*39.6mm), T=3.0, SPCC, SGCC | 1 | Install onto the battery |  |
| 13 | Holder 2 | 19.69*3.65*0.24in (500*92.7*39.6mm), T=3.0, SPCC, SGCC | 1 | Install onto the battery |  |
| 14 | Communication Cable | RJ45, 35.43 in (900mm) | 1 | Parallel communication cable |  |
| 15 | Communication Cable | RJ45, 27.56 in (700mm) | 1 | Battery communication cable to inverter |  |
| 16 | Positioning Cardboard | 3mm, 82.68x22.05 in (2100x560mm) | 1 | Use for locating the mounting hole positions. |  |
| 17 | Power cable | SC50-8, L = 22.0 in (559 mm), 1 AWG, Black, UL AWM 1015, 105 °C, 600 V | 1 | Battery-to-inverter (B-) only |  |
| 18 | Power cable | SC50-8, L = 32.5 in (826 mm), 1 AWG, Red, UL AWM 1015, 105 °C, 600 V | 1 | Battery-to-inverter (B+) only |  |
| | | | | | |

***Note:*** Supplied power cables are for battery-to-inverter only. Battery-to-battery cables are installer-supplied. See Section 3.4.4.

# 3 Installation

## 3.1 Device Installation

**3.1.1 Method 1:** Floor Mounted - Battery
Step 1:

1. Make sure the wall is sufficient to support the weight of the device. For product weight, check section 5.2. Specifications for details.
2. Pre-drill the holes in the wall according to the diagram, including the locations for the battery. Before drilling, use a spirit level to make sure the drilling template is perfectly horizontal.
   a. The mounting hole locations can be identified using the marking on the lower left positioning cardboard, with detailed positions shown in right side diagram.
   b. Use the cardboard template provided with the NVPlus-16 Battery to mark the mounting holes for the battery wall bracket.

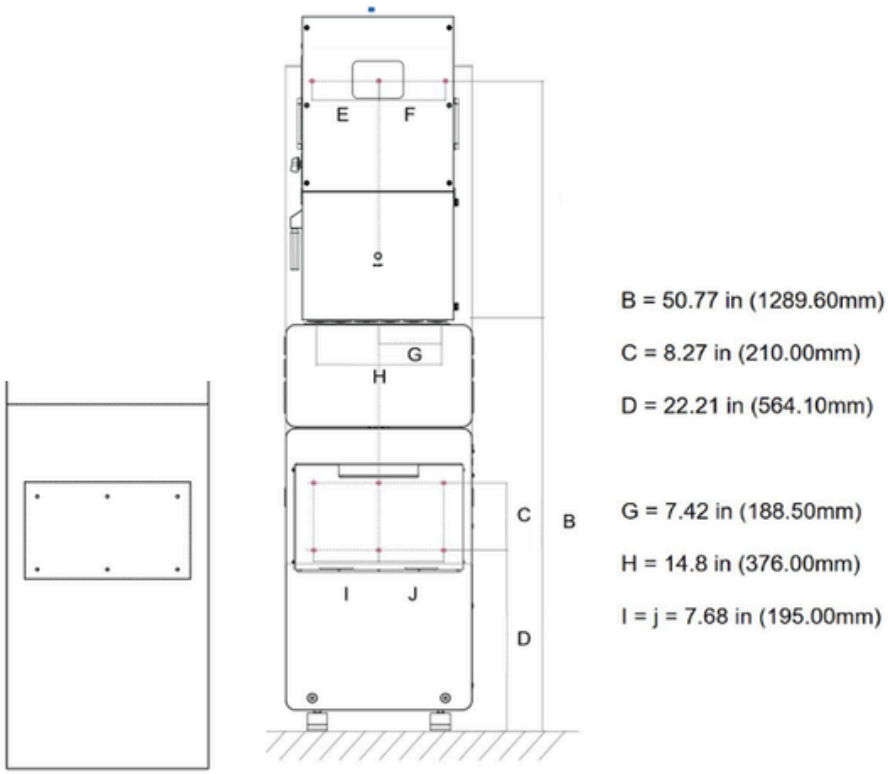



*Figure 3.1.1. Positioning cardboard & Mounting hole position*

3. Secure the mounting panel using 6*M8x80 expansion screws.

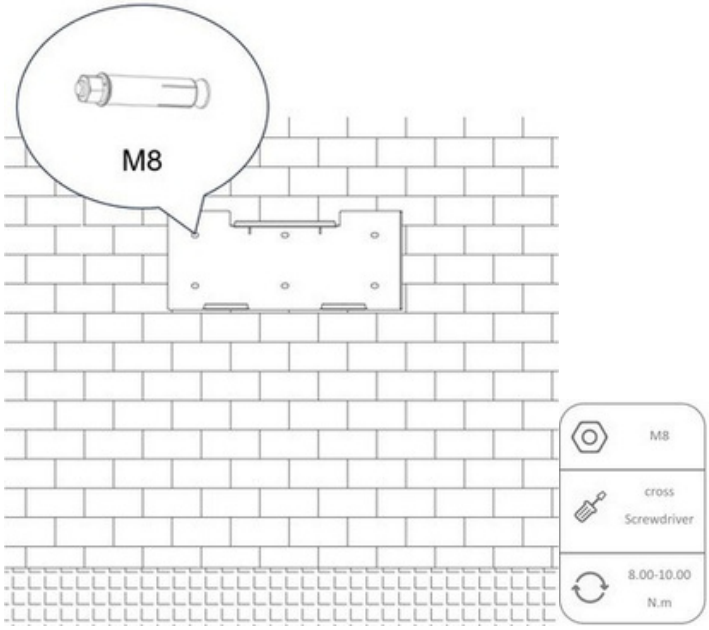



*Figure 3.1.2. Mounting panel*

4. Mount leveling feet.

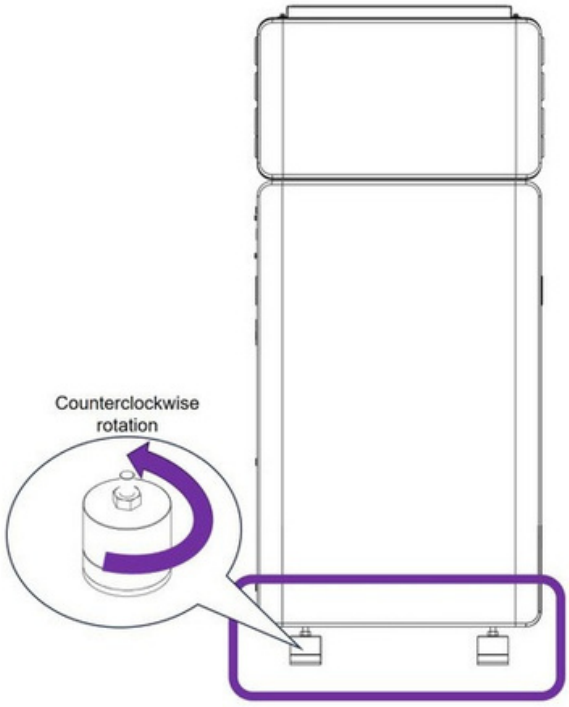



*Figure 3.1.3. Leveling feet*

5. Attach holder 1 and holder 2 using 6*M6x16 and 4*M5x12 screws.

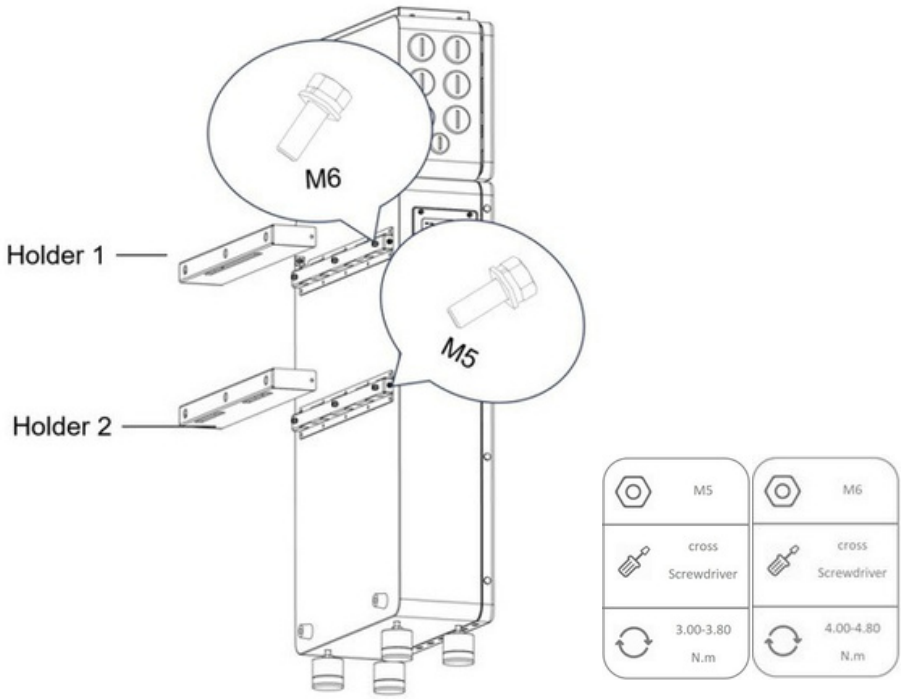



*Figure 3.1.4. Holder installation*

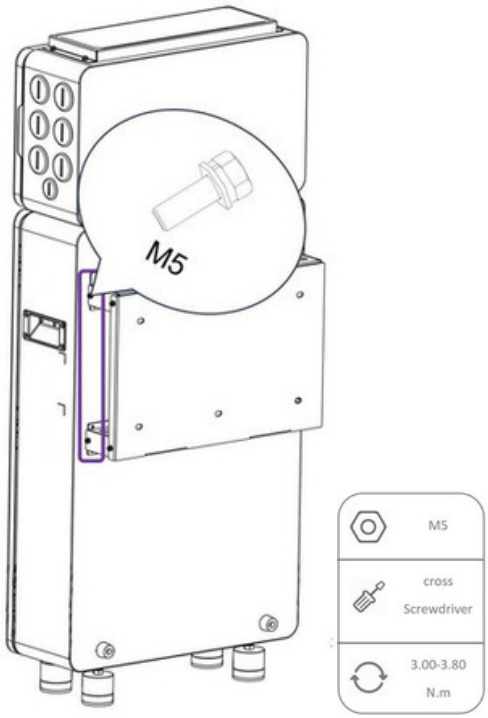



*Figure 3.1.5. Left side screws*

6. Secure the battery to the mounting panel using 2*M5x12 screws.

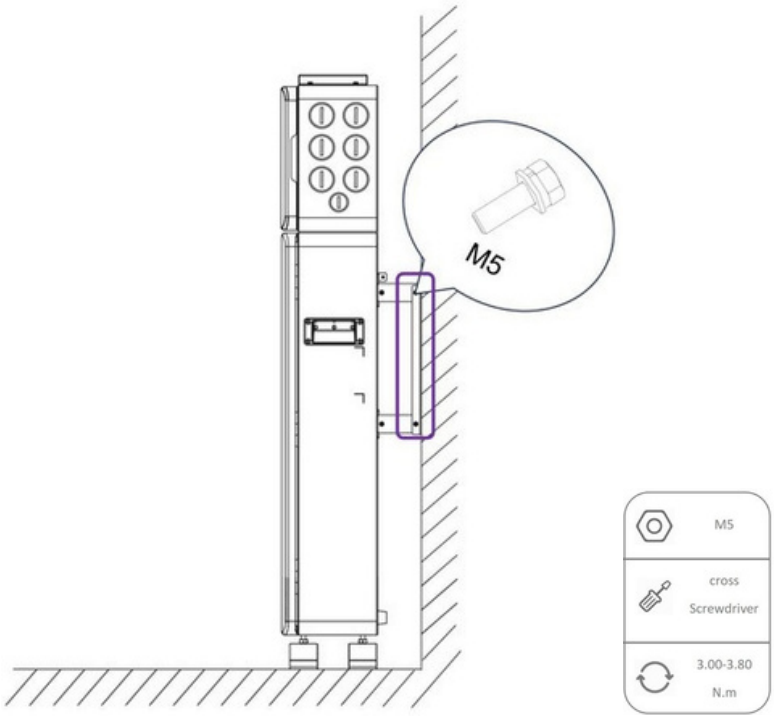



*Figure 3.1.6. Install battery to the mounting panel*

7. If the mounting holes are slightly misaligned after installation, adjust the leveling feet to achieve a flush installation.

***Note:*** The leveling feet can support the battery and be adjusted upward by 0.2 in (5mm).

Step 2:
Remove the cover of the junction box to connect to the inverter above the battery.

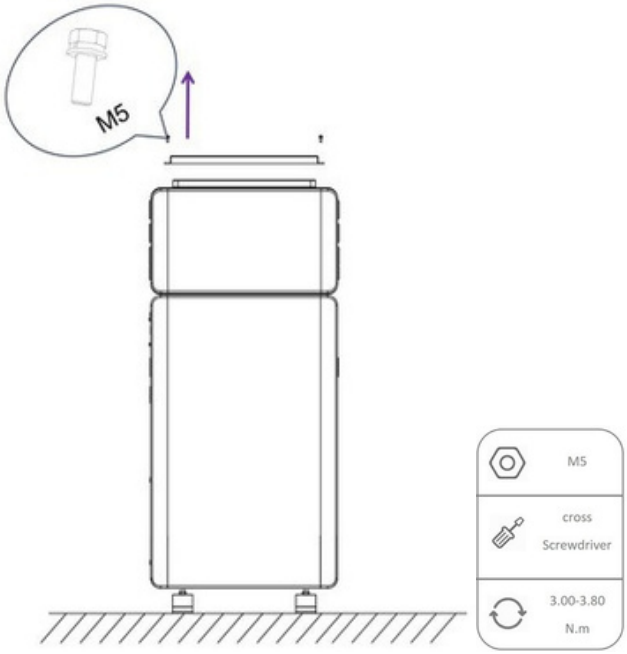



*Figure 3.1.7. Remove the cover of the junction box*

Step 3:
Mount the inverter directly to the pre-drilled holes to ensure a secure installation. Reference the NV16KAC inverter and the NV16KAC adapter bracket installation manual for details

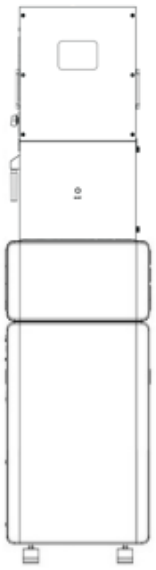


*Figure 3.1.8. Battery*

**3.1.2 Method 2:** Wall Mounted Battery
Step 1:

1. Make sure the wall is sufficient to support the weight of the device. To find the product weight, check section 5.2. Specifications for detail.
2. Pre-drill the holes in the wall according to the diagram, including the locations for the battery and inverter. Before drilling, use a spirit level to make sure the drilling template is perfectly horizontal.
   a. The mounting hole locations can be identified using the marking on the lower left positioning cardboard, with detailed positions shown in right side diagram.
   b. For wall-mounted installation, measure the desired installation height from the floor. Then, adjust this measurement based on the data provided by the positioning cardboard.
   c. Use the cardboard template provided with the NVPlus-16 Battery to mark the mounting holes for the battery wall bracket.

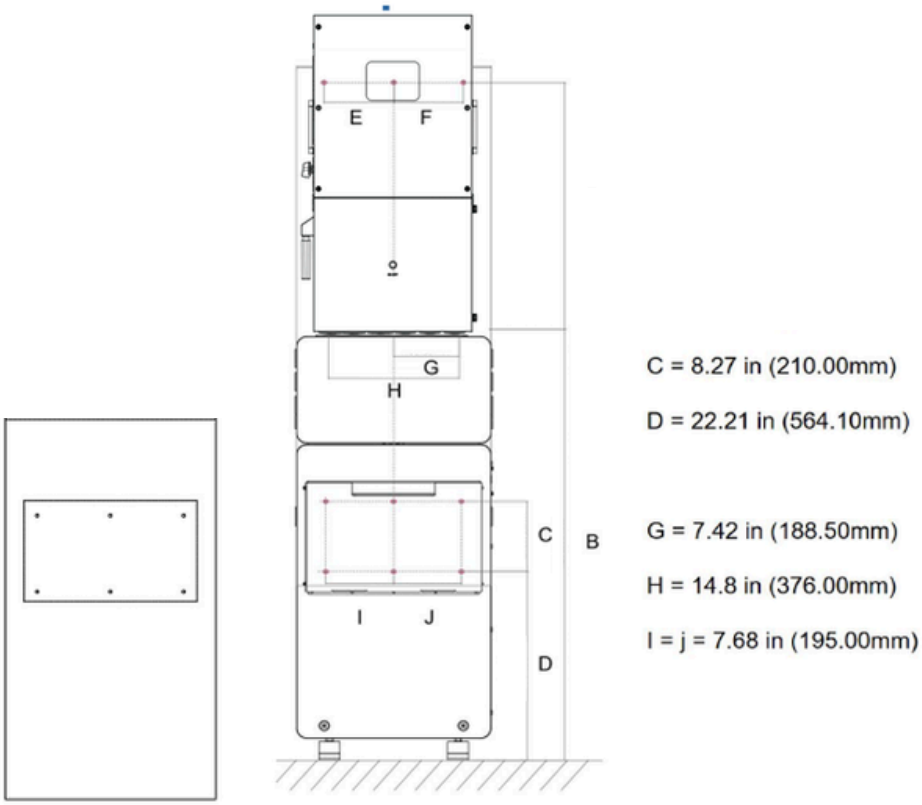



*Figure 3.1.9. Positioning cardboard & Mounting hole position*

3. Secure the mounting panel using 6*M8x80 expansion screws.

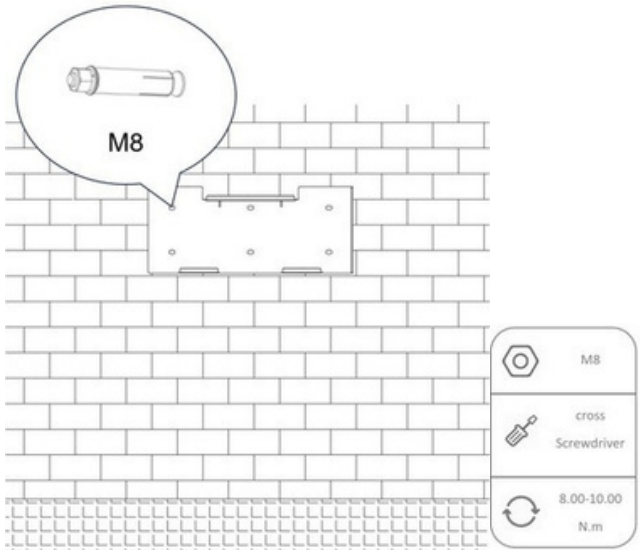



*Figure 3.1.10. Mounting panel*

4. Attach Holder 1 and Holder 2 using 6*M6x16 and 4*M5x12 screws.

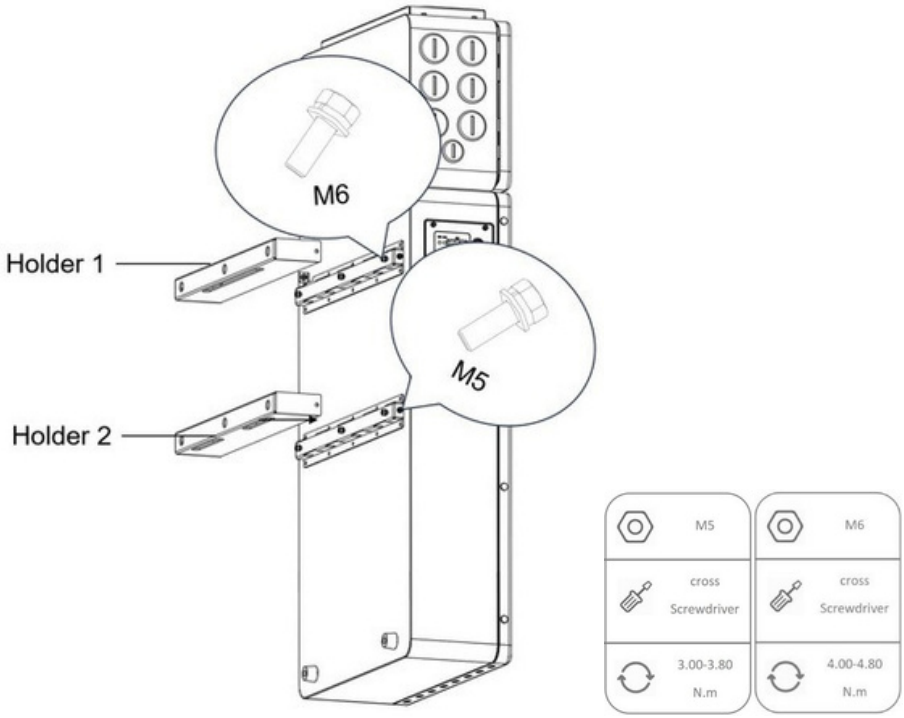



*Figure 3.1.11. Holder installation*

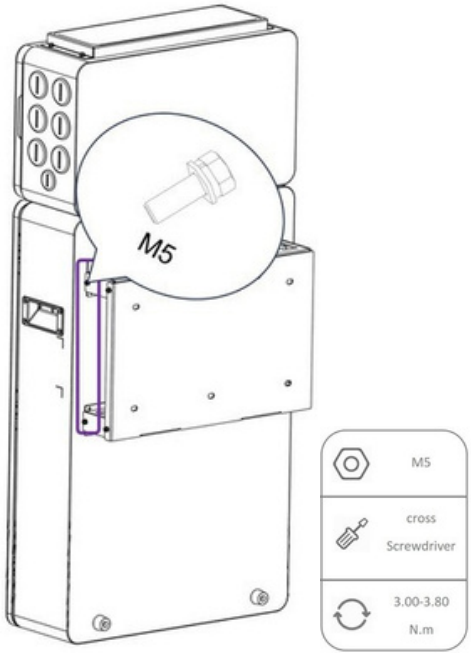



*Figure 3.1.12. Left side screws*

5. Secure the battery to the mounting panel using 2*M5x12 screws.

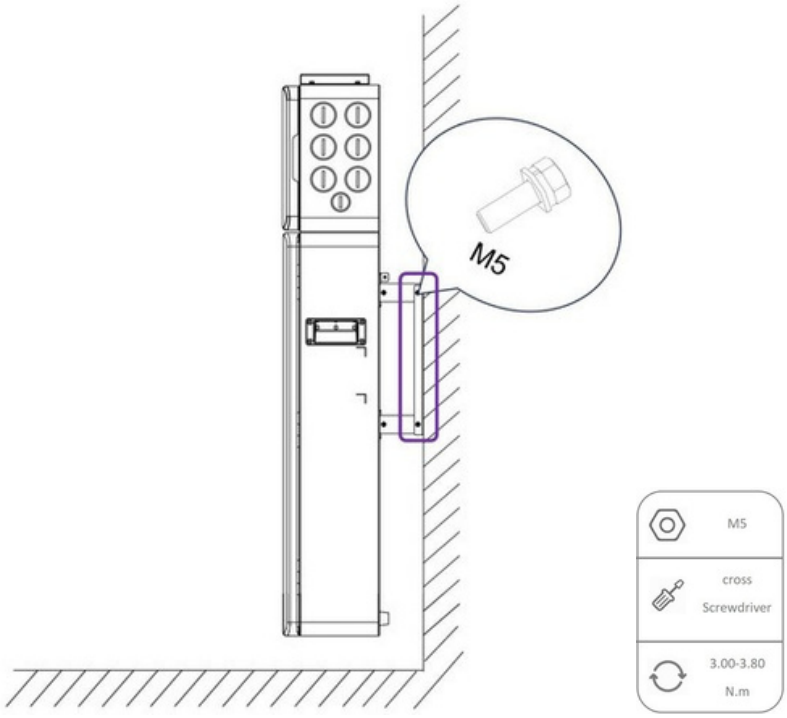



*Figure 3.1.13. Install the battery to the mounting panel*

Step 2: Remove the cover of the junction box to connect to the inverter above the battery.

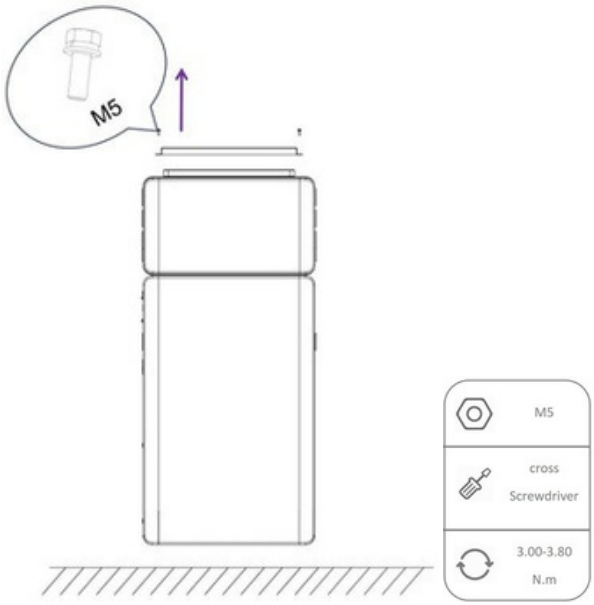



*Figure 3.1.14. Remove the cover of the junction box*

Step 3: Mount the inverter directly to the pre-drilled holes to ensure a secure installation.  Reference the NV16KAC inverter and the NV16KAC adapter bracket installation manual for details

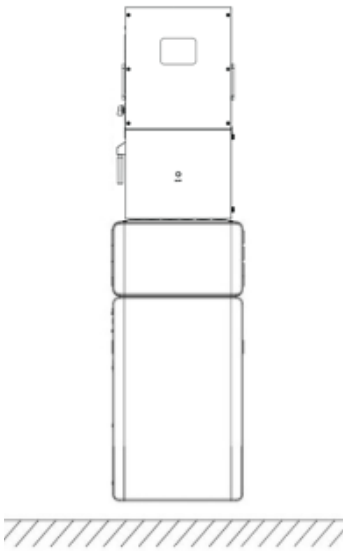


*Figure 3.1.15. Battery*

## 3.2 Connection

Cable Color Coding Specification:




1. Unlock the waterproof cover of junction box.

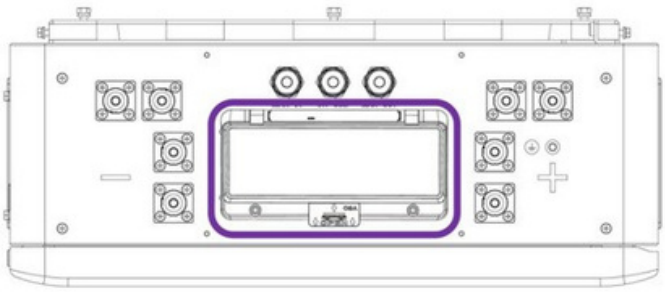


*Figure 3.2.1. Unlock waterproof cover*

2. Connect to the inverter's power cable, communication cable and ground cable.
Power cable: 1 AWG (supplied, battery-to-inverter only)

1. Connect the battery's negative terminal to the inverter's negative terminal.
2. Connect the battery's positive terminal to the inverter's positive terminal.
3. Connect the INV COM of the battery to the BMS port of the inverter.
4. Connect the ground cable of the battery to the inverter.

***Note:*** For actual dial code settings, refer to section 5.5.5. Inverter Dial Switch.

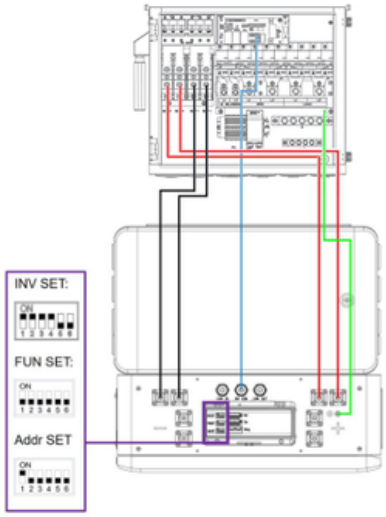



*Figure 3.2.2. Single stack*

3. If there is a generator, load, or grid that needs to be connected, connect the inverter through the junction box to the corresponding external device directly.

4. Lock the waterproof cover of the junction box and tighten the retention screws at both ends.

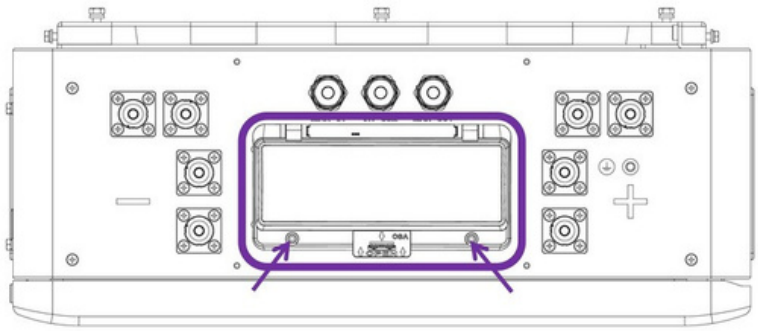


*Figure 3.2.3. Lock waterproof cover of junction box*

## 3.3 Power On

***Note:*** To ensure proper power-up of the equipment, follow the operating steps below.

Step 1: Turn on the DC switch of the inverter. To locate the DC breaker position on your inverter refer to the product's installation or user manual.

Step 2: Press the power button.

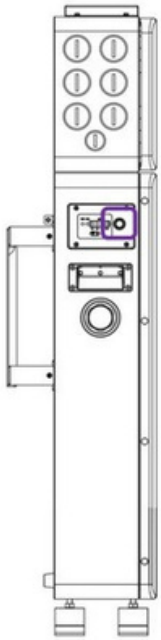


*Figure 3.3.2. Power button*

## 3.4 Application Scenarios

***Note***: If multiple battery units need to be connected in parallel, simply repeat the installation procedure described in Step 1 on both sides. Battery-to-battery power cables are not supplied. See Section 3.4.4.

### 3.4.1 Two Batteries

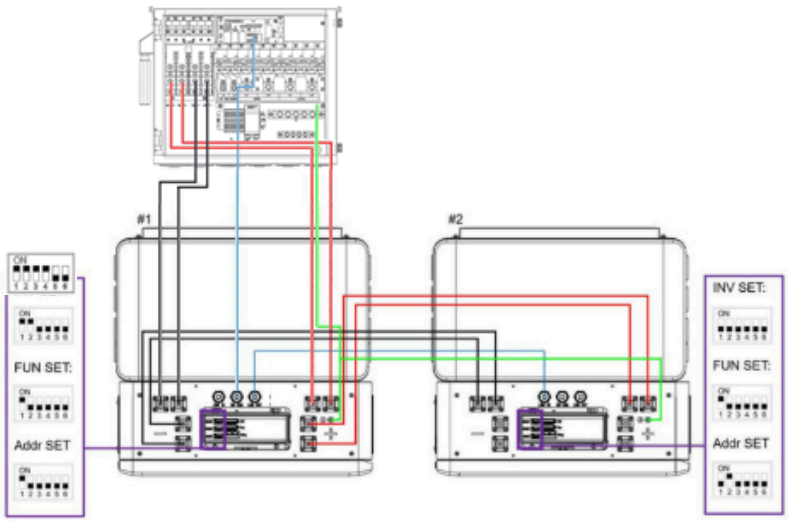



*Figure 3.4.1. Two batteries connected in parallel with the inverter*

### 3.4.2 Multiple Parallel Batteries

***Note:*** Only batteries connected to the inverter need to be set to the inverter dial code.

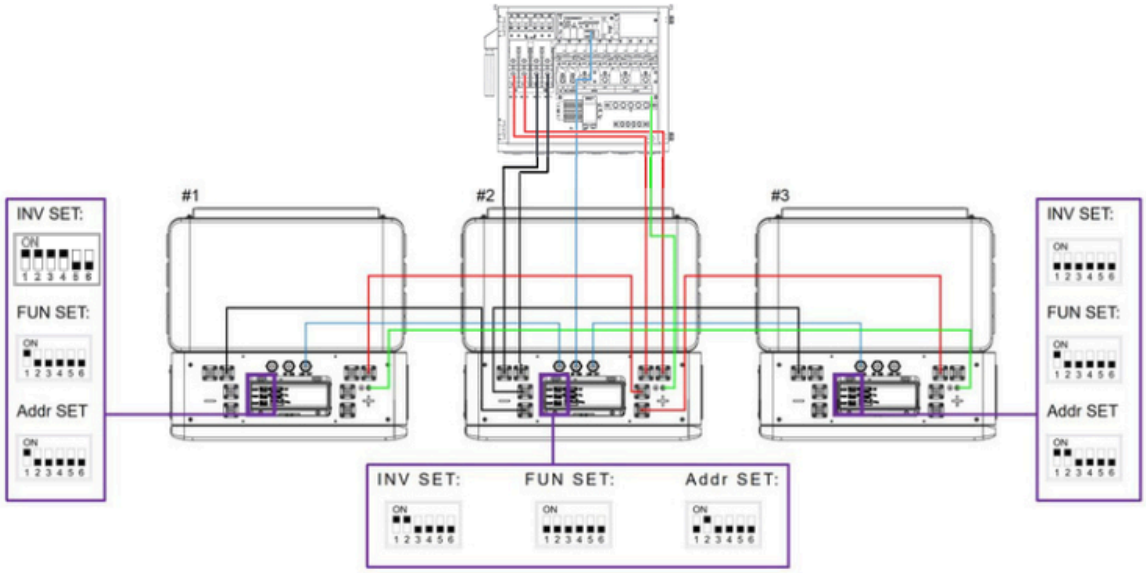
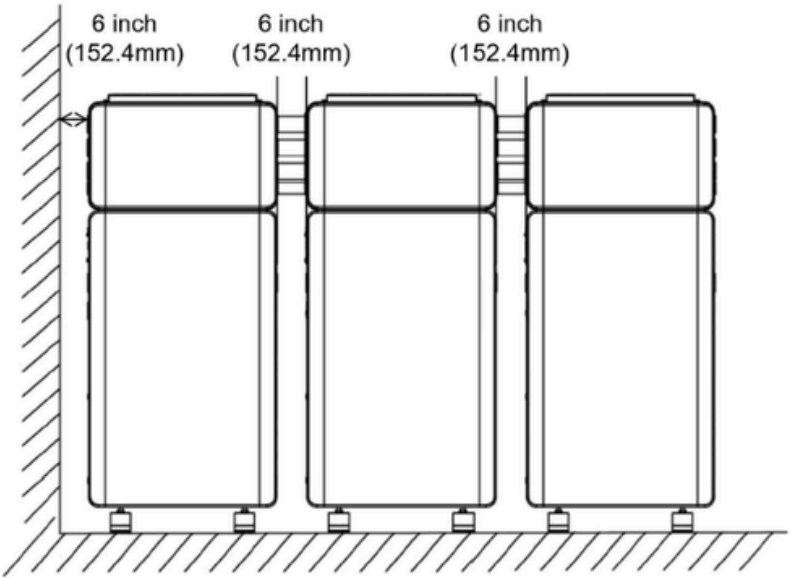



*Figure 3.4.2. Multiple batteries in parallel connect with inverter*

### 3.4.3 Multiple Parallel Batteries - Spacing

**Battery Spacing requirements for multiple batteries**

Leave at least 6 in (152.4 mm) between batteries.



### 3.4.4 Battery Power Cables and Spacing

The two power cables supplied with the NVPlus-16 are for the battery-to-inverter connection only: positive (B+) 32.5 in (826 mm) and negative (B-) 22.0 in (559 mm). They must not be used between batteries. Each kit includes 8 Amphenol SurLok Plus connectors (orange = positive, black = negative) for fabricating battery-to-battery cables on site. Each additional battery requires four battery-to-battery cables. The installer supplies UL-listed 1 AWG battery cable suitable for the application and determines the cable length for the site layout. Leave at least 6 in (152.4 mm) between batteries.

# 4 Cloud Platform Configuration

1) **Download App** Download and install the Renon app from Google Play or Apple App Store by searching “Renon Smart”

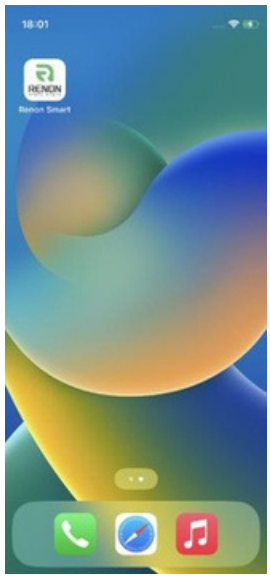


*Figure 4.1.1. Install Renon App*

*Figure 4.1.2. Android QR code*

*Figure 4.1.3. IOS QR code*

2) Register for a new account, and retrieve the Registration Code from your installer. Existing users may log in directly, while new users must create an account.

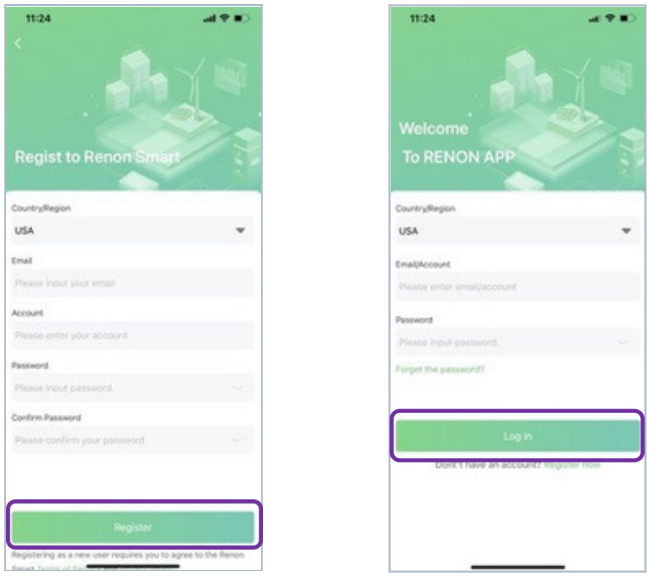



*Figure 4.1.4. Register and Log in*

3) **Log in.** This is a general user account.

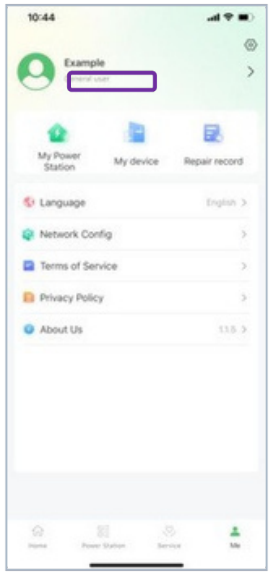



*Figure 4.1.5. General user*

4) Binding Method 1:

A. Distribution To register as an end user, scan the binding QR code provided by your installer, then request device assignment to your account.

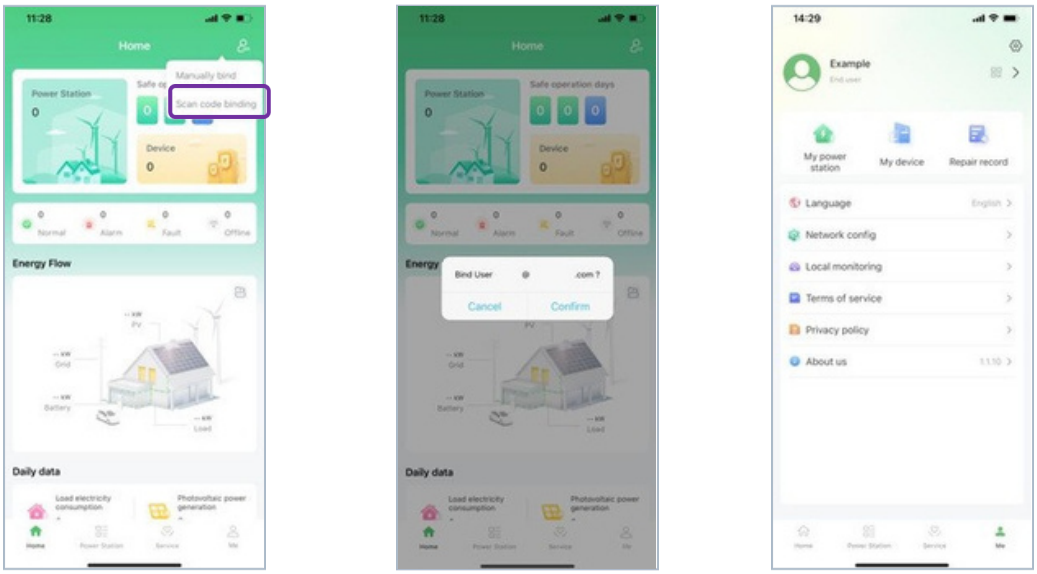



*Figure 4.1.6. Scan upper-level account, confirm binding and become an end user*

B. **Scan the QR code**. Select "Scan code binding" and scan the QR code using your device camera. Contact your installer if unsuccessful.

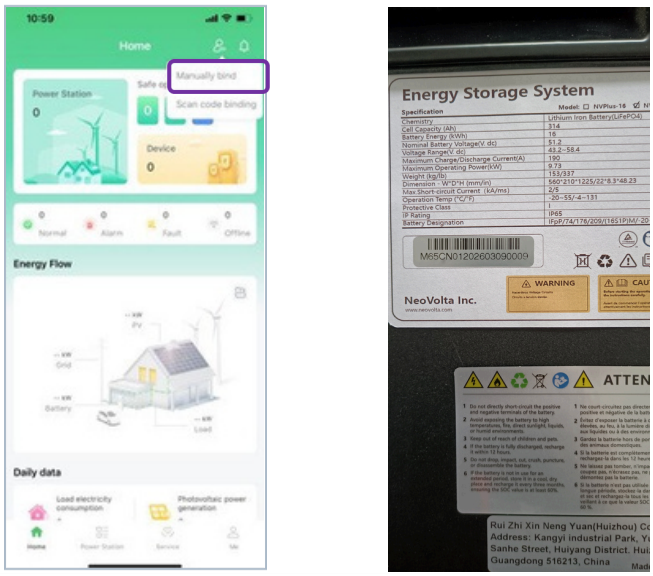



*Figure 4.1.7. Scanning QR code*

Method 2: Click "My device" to enter the “Add a device” page, scan the QR code as illustrated, then select an upper-level account to complete binding.

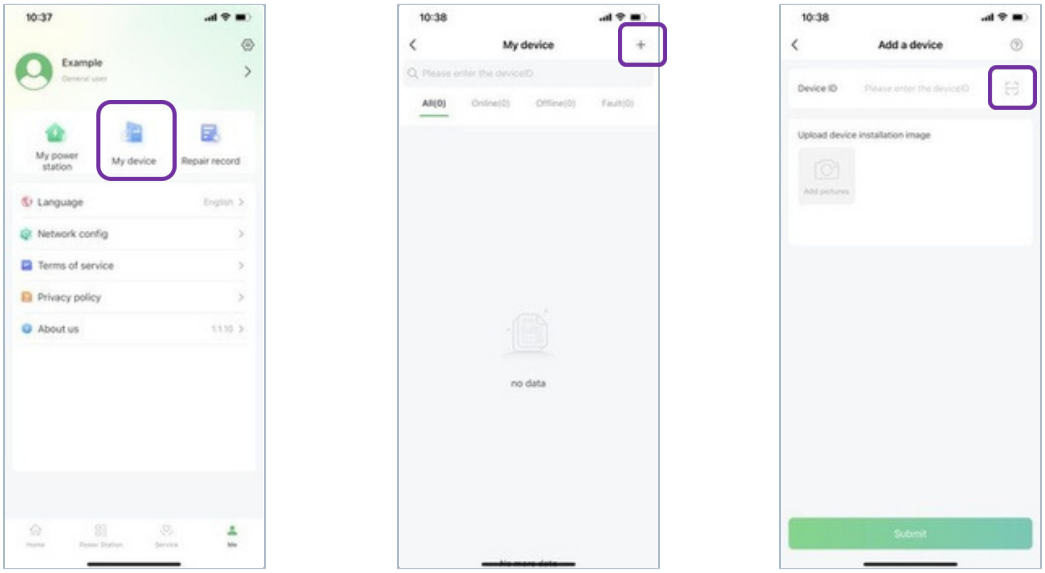



*Figure 4.1.8. My device, add and scanning*

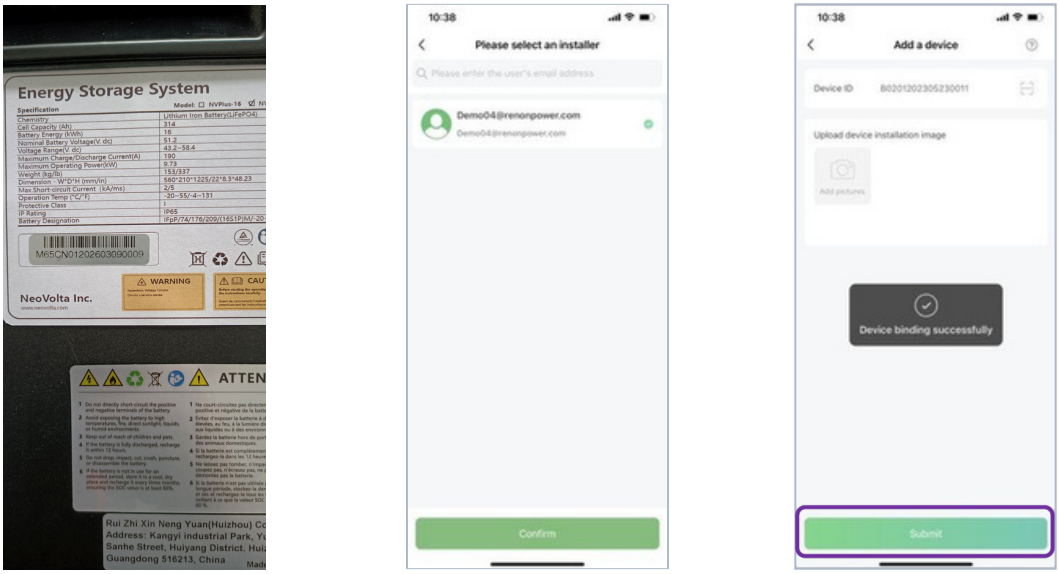
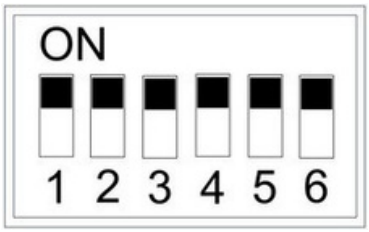



*Figure 4.1.9. QR code, upper-level account and binding successfully*

If the above methods are not successful, please contact NeoVolta via email: support@neovolta.com, or contact support by phone: +1 800.364.5464. Be sure to indicate your account name/email address and device serial number clearly.

5) Wi-Fi configuration - Set the inverter dial code to 63 (111111) as shown below before Wi-Fi configuration.

***Note***: In a system with multiple batteries operating in parallel, you only need to configure the master battery unit (set to Address 1). Once configured, all other units will automatically retrieve network settings and connect seamlessly without manual intervention.




Turn to the “Me” page, click “Network Configuration,” then click “Bluetooth,” followed by “Wi-Fi configuration.”

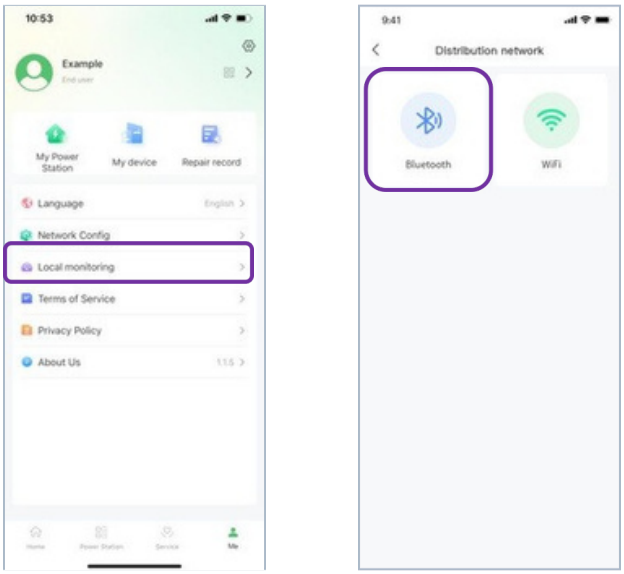



*Figure 4.1.10. Bluetooth network setting*

Enable Bluetooth on your mobile device, then select the detected device to access its Bluetooth network configuration page




*Figure 4.1.11. Connect battery Bluetooth*

Enter your private WiFi credentials (SSID and password) to connect the master controller.

***Note*:** Devices assigned to end-users will auto-populate the authentication key.

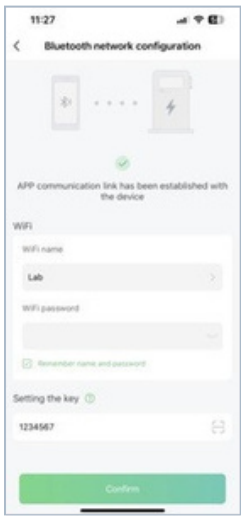



*Figure 4.1.12. Connecting private Wi-Fi*

6) **Create a power station**. Navigate to the “Power Station” page on the app, create a new station by setting its name, type, pricing, superior view, address, and uploading station images.

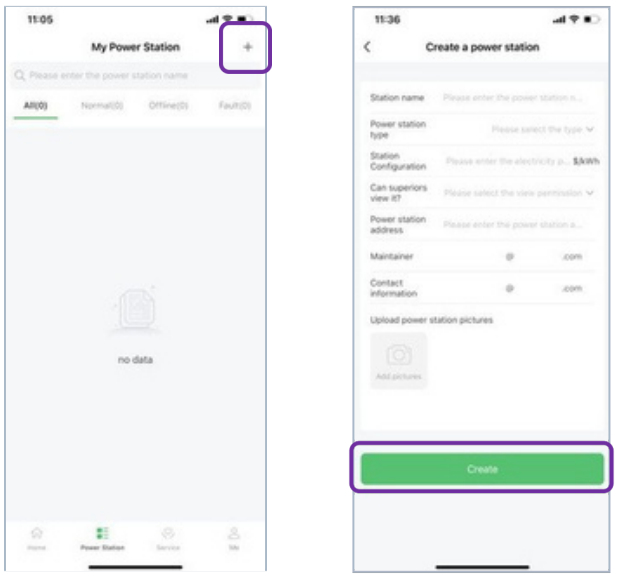



*Figure 4.1.13. Create a new power station*

After successful power station creation, select the newly created station to view its details, then tap "+" on the Binding Device page to add your desired device.

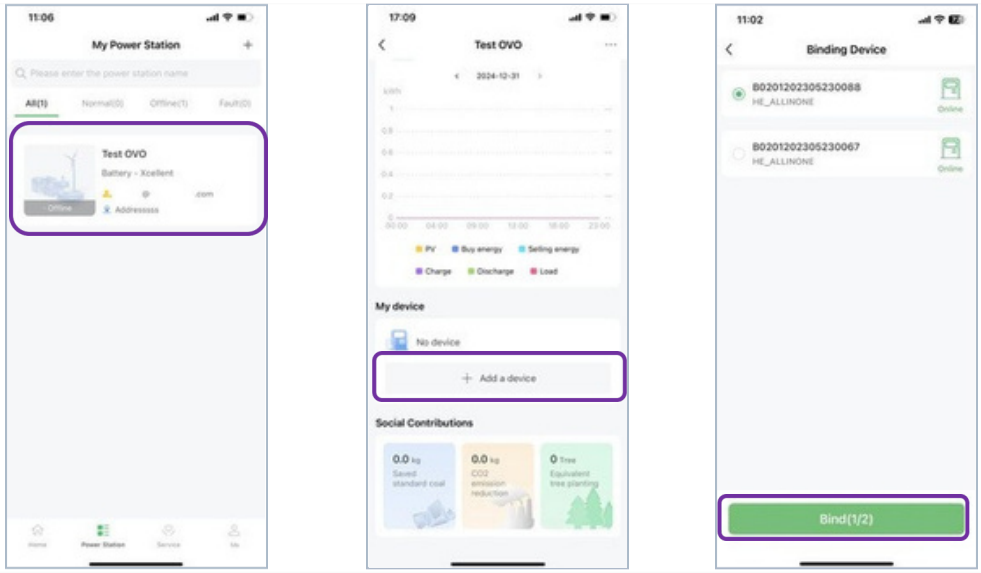



*Figure 4.1.14. Manage your power station and confirm your device*

The device can be managed both through the app and the web portal.  Contact your installer for the website URL.




*Figure 4.1.15. Manage your device*

Once Wi-Fi is connected, the device enables real-time monitoring of operational status, instantaneous power, and energy consumption (daily/cumulative) via the network platform or mobile app, while also supporting remote parameter configuration.

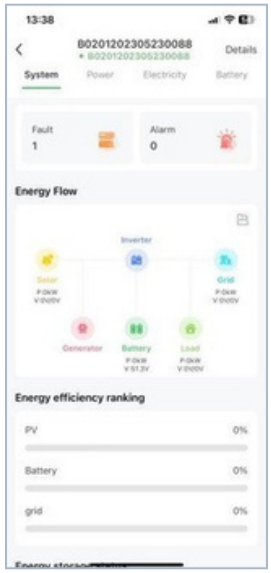



*Figure 4.1.16. Monitoring device*

Set the inverter dial code to match the inverter brand after Wi-Fi configuration is complete (Please refer to the chapter **5.5.5 Inverter Dial Switch**).

7) Lock the waterproof cover. After completing the grid connection, lock and securely fasten the waterproof cover of the junction box. For detailed steps, refer to section 3.2. Connection.

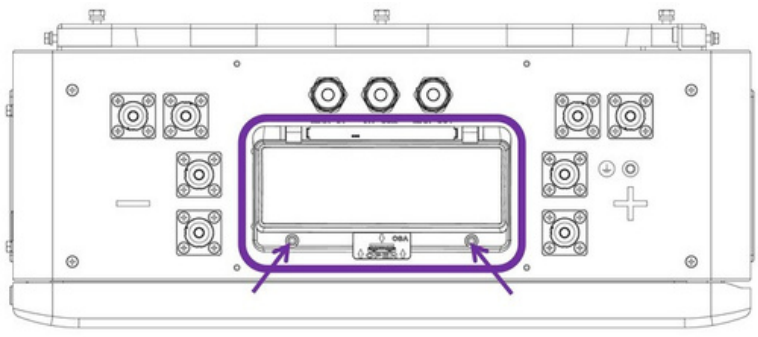


*Figure 4.1.17. Lock the waterproof cover of junction box*

# 5 Battery Specifications

The NVPlus-16 is a lithium iron phosphate LFP battery-based energy storage product; it can supply reliable power for nearly all kinds of household appliances and equipment.

The NVPlus consists of a built-in BMS battery management system, which can manage and monitor cells information including voltage, current, and temperature. The NVPlus-16 can be used to limit the balance of current between different batteries when in parallel use to expand capacity and power to meet the requirements of longer use, supporting longer duration and higher power consumption. It is suspended on the wall in daily usage.

## 5.1 Product Features

- With a DC-DC converter inside, users can extend or change battery modules whenever they want; no need to consider the quality or SOC of old modules.
- The whole product is non-toxic, pollution-free and environmentally friendly.
- The cathode material is made from LiFePO4 with safety, performance, and a long cycle life.
- The battery is small in volume, has light weight, plug-in embedded design module and is easy to install and maintain.
- Working temperature range is from -4℉ and 122℉ (-20℃ to 50℃) with excellent discharge performance and life cycle.
- The battery management system (BMS) has protection functions including over-discharge, over-charge, and over-current and high/low temperature.
- The battery can self-discharge for up to 3 months without charging and offers excellent performance of shallow charge and discharge.
- The system can automatically manage battery charge and discharge state, and save energy costs with various automation options.

## 5.2 Specifications

| Item | NVPlus-16 |
|---|---|
| Battery Chemistry | LiFePO4 |
| Nominal Energy (kWh) | 16 |
| Nominal Capacity (Ah) | 314 |
| Max. Charging/Discharging Current (A) | 190 |
| Nominal Voltage (V) | 51.2 |
| Recommend Charging Voltage (V) | 56.8 |
| Max. Charging Voltage (V) | 58.4 |
| Discharge Cut-off Voltage (V) | 43.2 |
| Heating Power(W) | 300 |
| Heating Start Temperature (℉ / ℃) | 41/5 |
| Operating Temperature (℉ / ℃) | Discharge: -4~131 / -20~55<br>Charge: 32~131 / 0~55 |
| Safety Function | Over-charge, Over-discharge, Over-current,<br>Low/High-temperature, Short-circuit Protection |
| Parallel Capacity | Maximum 31 |
| Communication | RS485/CAN |
| Weight (lbs/kg) (Approx.) | 337.31/153 |
| Physical Dimensions (in/mm) (W*D*H) | 22* 8.3 *48.3/560*210*1（2±252）<br>(Leveling feet not included) |
| Level of Protection | IP65 |
| Altitude | ⩽4000m |

*This product contains a heating film and has a heating film function.*

## 5.3 External Introduction

### 5.3.1 Explosion-Proof Valves



*Figure 5.3.1. Explosion-Proof valves*

**5.3.2 Power Button** The power button is used to power the device on and off. The power button is located on the right corner of the device.

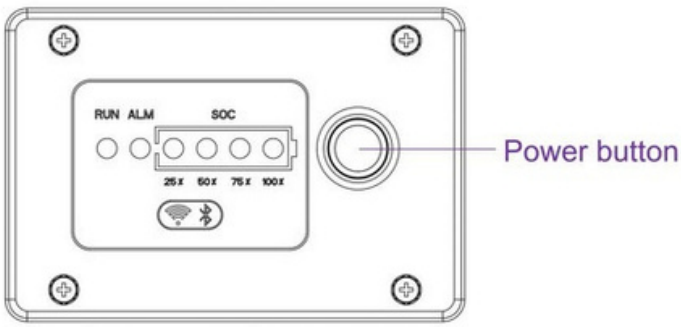



*Figure 5.3.2. Button*

**5.3.3 LED.**

The LEDs are used to display the current state. The LEDs are located on the right side of the device.

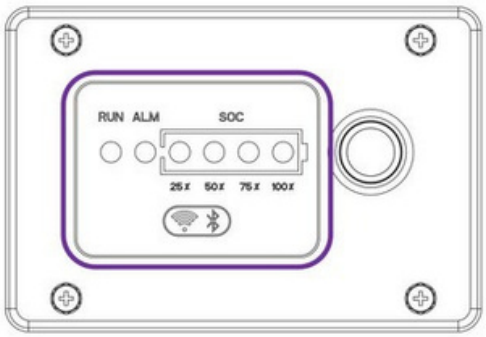



*Figure 5.3.3. Light*

<table>
<tr><th>No.</th><th>Item</th><th colspan="9">Specification</th></tr>
<tr><td rowspan="4">1</td><td rowspan="4">RUN (Blue)</td><td colspan="9">Shut down: Off</td></tr>
<tr><td colspan="9">Wi-Fi disconnect router: On</td></tr>
<tr><td colspan="9">Wi-Fi has connected router: 0.5s on, 0.5s off</td></tr>
<tr><td colspan="9">Wi-Fi has connected cloud: 0.5s on, 1.5s off</td></tr>
<tr><td rowspan="4">2</td><td rowspan="4">ALM (Red)</td><td colspan="9">No protection, alarm, fault: off</td></tr>
<tr><td colspan="9">Alarm: 0.5s on, 1.5s off</td></tr>
<tr><td colspan="9">Protection: 0.5s on, 0.5s off</td></tr>
<tr><td colspan="9">Fault: On</td></tr>
<tr><td rowspan="8">3</td><td rowspan="8">Fault (Green)</td><td></td><td colspan="4">Charging State</td><td colspan="4">Discharging State/Idle</td></tr>
<tr><td>SOC (%)<br>LED</td><td>SOC - 25%</td><td>SOC - 50%</td><td>SOC - 75%</td><td>SOC - 100%</td><td>SOC - 25%</td><td>SOC - 50%</td><td>SOC - 75%</td><td>SOC - 100%</td></tr>
<tr><td>SOC=0</td><td>Blinking</td><td>Off</td><td>Off</td><td>Off</td><td>Off</td><td>Off</td><td>Off</td><td>Off</td></tr>
<tr><td>0<SO≤C25</td><td>Blinking</td><td>Off</td><td>Off</td><td>Off</td><td>On</td><td>Off</td><td>Off</td><td>Off</td></tr>
<tr><td>25<SO≤C50</td><td>On</td><td>Blinking</td><td>Off</td><td>Off</td><td>On</td><td>On</td><td>Off</td><td>Off</td></tr>
<tr><td>50<SO≤C75</td><td>On</td><td>On</td><td>Blinking</td><td>Off</td><td>On</td><td>On</td><td>On</td><td>Off</td></tr>
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</table>

* Blinking: 0.5s on, 0.5s off

## 5.4 Function Introduction

**5.4.1 Protection.** The battery system is equipped with comprehensive protection features, including but not limited to: overcharge/over discharge protection, high/low temperature protection during charging/discharging, overcurrent protection during charging/discharging, and short circuit protection. This ensures the safety and stability of the battery under various usage conditions.

**5.4.2 Heating.** The battery is equipped with a heating film, the system will continuously monitor cell temperature. If the lowest cell temperature is below 41℉ (5°C), the system will automatically activate the heating function to enhance battery performance. The heating function requires the inverter to be connected to the grid for continuous operation; otherwise, heating will only operate for 5 minutes. Once the highest cell temperature exceeds 59℉ (15°C), the heating function will automatically deactivate to prevent overheating.

**5.4.3 Forced Discharge.** When the system enters Sleep Mode due to undervoltage, users can manually activate the forced discharge mode by pressing the power button. Additionally, the system will automatically wake up at scheduled intervals to enter forced discharge mode, thereby activating the charger or inverter (the inverter requires grid connection) to provide necessary supplemental charging to the battery, ensuring its continued availability.

**5.4.4 Full Charge.** To ensure long-term battery health, the system monitors the battery's charging status. If the system detects that the battery has not reached a full charge for 30 consecutive days, it will automatically initiate a full charge process, charging the battery to its maximum capacity to maintain optimal performance.

**5.4.5 Charging Self-Adaptation Control.** The system will automatically reduce charging power when the battery is in low/high temperature conditions or low/high SOC.

**5.4.6 Safety Lock.** This device is equipped with a safety lock function. If the lock is triggered and cannot be resolved after self-attempts, promptly contact technical support personnel for unlocking assistance.

## 5.5 Interface Information

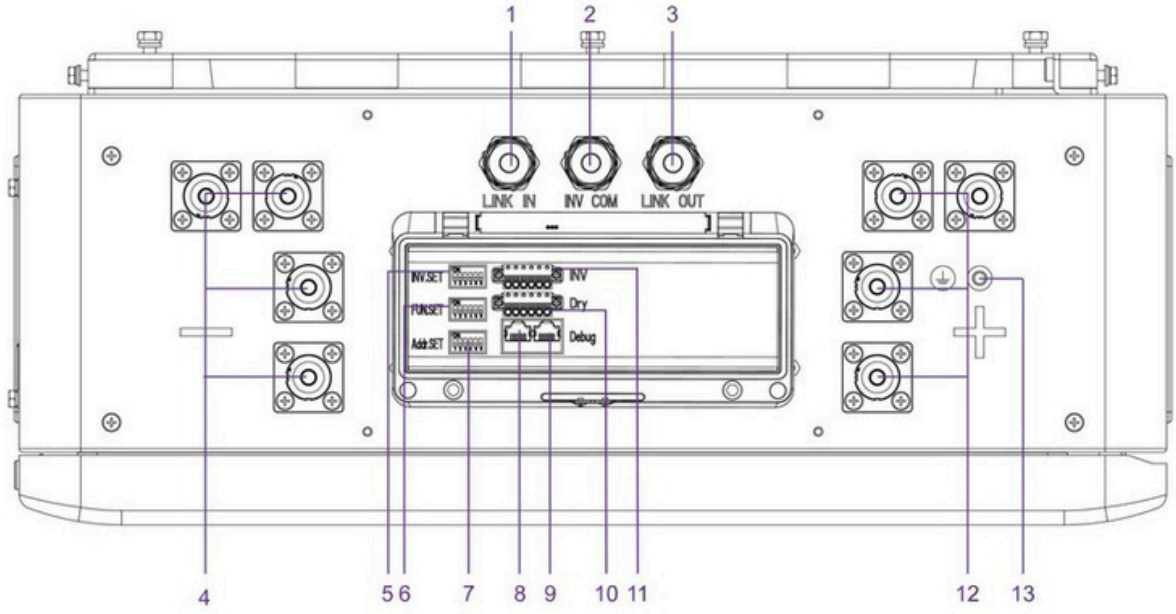


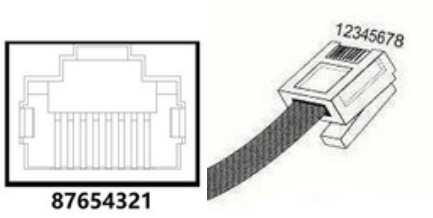

*Figure 5.5.1. Battery Ports*

| No. | Instructions | No. | Instructions |
|---|---|---|---|
| 1 | LINK IN | 8 | Inverter Port |
| 2 | INV COM | 9 | Debug Port |
| 3 | LINK OUT | 10 | Dry Contact |
| 4 | Power Negative | 11 | INV |
| 5 | INV.SET | 12 | Power Positive |
| 6 | FUN.SET | 13 | Ground |
| 7 | Addr.SET | | |

### 5.5.1 LINK IN Parallel Communication Port

Terminal type: RJ45

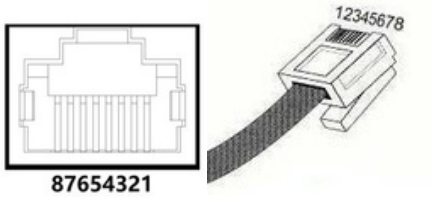
Usage: Communicates with the last battery when parallel is used.

| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | BMS_CAN1L |
| | 2 | BMS_CAN1H |
| | 3 | BMS_CC_GND |
| | 4 | BMS_CC_GND |
| | 5 | BMS_PW_IN1 |
| | 6 | BMS_CC_GND |
| | 7 | BMS_XUNZIN- /Emergency stop node 1 |
| | 8 | BMS_XUNZIN+/Emergency stop node 2 |

### 5.5.2 INV COM Port

Terminal type: RJ45

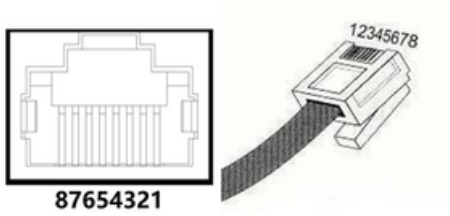
Usage: Communicates with the inverter.

| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | RS485_2A |
| | 2 | RS485_2B |
| | 3 | COM_SGND |
| | 4 | CAN2H |
| | 5 | CAN2L |
| | 6 | COM_SGND |
| | 7 | RS485_2A |
| | 8 | RS485_2B |

### 5.5.3 LINK OUT Parallel Communication Port

Terminal type: RJ45

Usage: Communicates with the next battery when parallel is used.

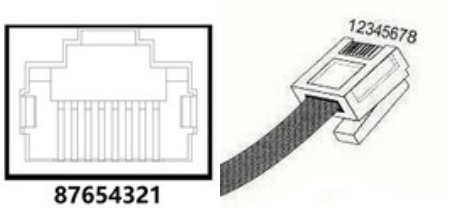
| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | BMS_CAN1L |
| | 2 | BMS_CAN1H |
| | 3 | BMS_CC_GND |
| | 4 | BMS_PW_OUT2 |
| | 5 | BMS_PW_OUT1 |
| | 6 | BMS_CC_GND |
| | 7 | BMS_XUNZOUT- |
| | 8 | BMS_XUNZOUT+ |

### 5.5.4 Inverter Communication Port

Terminal type: RJ45

Usage: Communicates with the inverter.

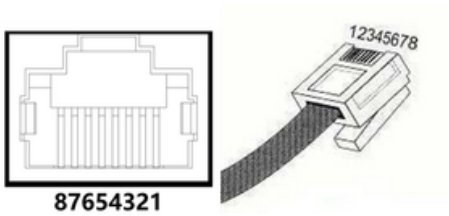
Definition of battery side as below:

| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | RS485_2B |
| | 2 | RS485_2A |
| | 3 | COM_SGND |
| | 4 | WAKEUP + |
| | 5 | WAKEUP - |
| | 6 | COM_SGND |
| | 7 | CAN2H |
| | 8 | CAN2L |

### 5.5.5 Debug Port

Terminal type: RJ45

Usage: Debug port of the system which used by technician only.

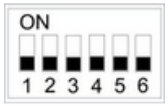
| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | BMS_CAN1L |
| | 2 | BMS_CAN1H |
| | 3 | BMS_RS232_RX |
| | 4 | BMS_CC_GND |
| | 5 | BMS_CC_GND |
| | 6 | BMS_RS232_TX |
| | 7 | IN_CANL |
| | 8 | IN_CANH |

### 5.5.6 Inverter Dial Switch

Codes 0~26 of this Dial Switch are used to match the brand of inverter being used. The definitions of code 0~26 are shown on the Inverter Dial Code table.

| Code | Dial Switch Position | Brand | Logo |
|---|---|---|---|
| 15 |  | NeoVolta | NEOVOLTA |

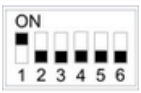
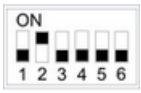
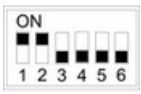
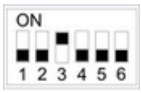
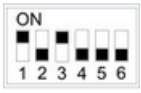
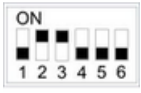
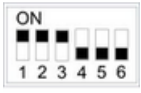
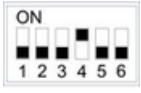
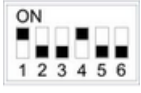
**5.5.7 Function Dial Switch** The dial switch settings for a single are as follows:

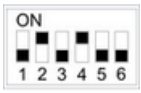
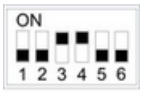
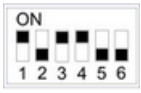
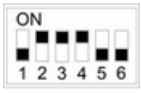
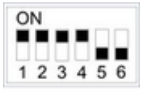
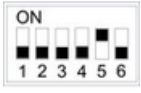
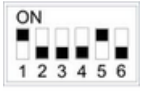
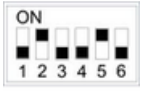
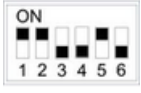
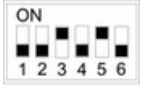
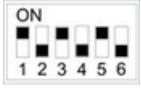
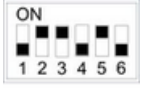
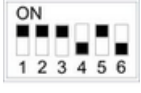
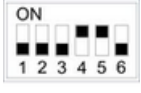
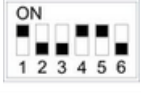
| Single device | Usage |
|---|---|
| Code |  |

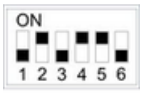
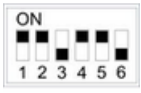
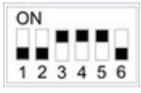
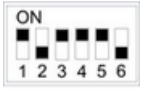
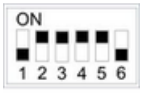
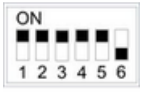


**5.5.8 Address Dial Switch**

1. Use this Dial Switch to set the address of each battery, then turn on to activate the system when it needs to be in parallel with other battery units.
2. When the system only has one battery, dial the address to 1.
3. When the system is used in Parallel Mode, set the address starting from 1, and increase by the number of battery units to communicate with other batteries.
4. Only the battery with address of 1 is able to communicate with the inverter.
5. The illustration of dialing is shown in the Address Dial Code table:

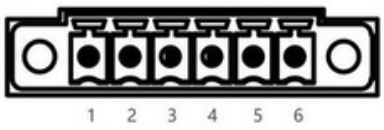
| Code | Dial Switch Position | Definition |
|---|---|---|
| 1 |  | Set as battery 1 (communicate with inverter by this battery) |
| 2 |  | Set as battery 2 |
| 3 |  | Set as battery 3 |
| 4 |  | Set as battery 4 |
| 5 |  | Set as battery 5 |
| 6 |  | Set as battery 6 |
| 7 |  | Set as battery 7 |
| 8 |  | Set as battery 8 |
| 9 |  | Set as battery 9 |

| | | |
|---|---|---|
| 10 |  | Set as battery 10 |
| 11 |  | Set as battery 11 |
| 12 |  | Set as battery 12 |
| 13 |  | Set as battery 13 |
| 14 |  | Set as battery 14 |
| 15 |  | Set as battery 15 |
| 16 |  | Set as battery 16 |
| 17 |  | Set as battery 17 |
| 18 |  | Set as battery 18 |
| 19 |  | Set as battery 19 |
| 20 |  | Set as battery 20 |
| 21 |  | Set as battery 21 |
| 22 |  | Set as battery 22 |
| 23 |  | Set as battery 23 |
| 24 |  | Set as battery 24 |
| 25 |  | Set as battery 25 |

| | | |
|---|---|---|
| 26 |  | Set as battery 26 |
| 27 |  | Set as battery 27 |
| 28 |  | Set as battery 28 |
| 29 |  | Set as battery 29 |
| 30 |  | Set as battery 30 |
| 31 |  | Set as battery 31 |

**5.5.9 Dry Contact.** Terminal type: 6-Pin terminal block This is for General-purpose input & output (GPIO) which is reserved for future communication and used for an uncommitted digital signal pin on an integrated circuit or electronic circuit (e.g. MCUs/MPUs) board, which may be used as an input or output, or both, and is controllable by software.

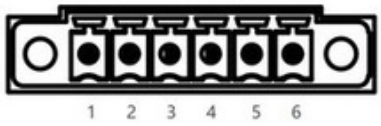
Defined as below:

| 6pin Terminal | Pin | Usage |
|---|---|---|
|  | 1 | BMS_NO1 |
| | 2 | BMS_COM1 |
| | 3 | BMS_NO2 |
| | 4 | BMS_COM2 |
| | 5 | WAKEUP + |
| | 6 | WAKEUP - |

### 5.5.10 INV Communication Port

Terminal type: 6-Pin terminal block

Usage: Reserved for direct connection with the inverter, the same function as the RJ45 port (see the section " Inverter Communication Port (RJ45)"), only one of these two need to be used; leave open if not used.
Defined as below:

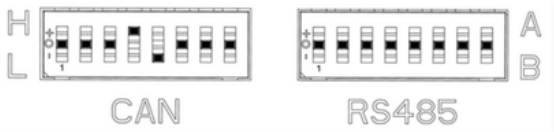
| 6pin Terminal | Pin | Usage |
|---|---|---|
|  | 1 | RS485_2B |
| | 2 | RS485_2A |
| | 3 | COM_SGND |
| | 4 | CAN2L |
| | 5 | CAN2H |
| | 6 | COM_SGND |

### 5.5.11 Power Positive and Negative

Positive and negative terminals use Amphenol SurLok Plus connectors (orange = positive, black = negative). See Section 3.4.4.

### 5.5.12 Dial Code Switch

If you are using the pin order select box, please refer to the table below to set the dial switch, according to the inverter brand. If the inverter brand is not shown on this table, please refer to that inverter's manual, or consult with NeoVolta's support team.

| Dail switch position | Inverter brand | Comm Mode |
|---|---|---|
|  | NeoVolta | CAN |

### 5.5.13 Emergency Stop

The first battery (Address 1)'s LINK IN port (Pins 7-8) can be connected to the Normally Open (NO) contacts of an external emergency stop button. When activated, this will disconnect all battery outputs. When multiple batteries are connected in parallel, the ESS disconnect only needs to be connected to the master battery.

If the inverter is equipped with Rapid Shutdown (RSD) capabilities, the emergency stop feature can initiate this function. It is recommended to check with the local Authority Having Jurisdiction (AHJ) and the National Electrical Code (NEC) for compliance.

# 6 Troubleshooting and Maintenance

## 6.1 Regular Maintenance

1) Check the battery modules every 3 months to verify whether there is damage.
2) Check the battery modules every 3 months to verify that the operating parameters are normal and there is no abnormal heating.
3) Fully charge and discharge the battery system every 3 months.
4) Clean the battery modules with a dry rag once a month.

## 6.2 Troubleshooting

| Phenomenon | Possible Causes of Failure |
|---|---|
| Unable to power on the battery | Try to charge the battery with the activation charging function on the inverter while the power is on. |
| Unable to find the battery on the app or the Cloud | 1. Make sure the Wi-Fi antenna is tightened properly;<br>2. Make sure the SSID & PASSWORD of your private Wi-Fi are correct, please enter case-sensitively without spaces;<br>3. Make sure the signal is strong enough;<br>4. Make sure it's working;<br>5. Make sure the installer has added your products to your account;<br>6. Try to restart the router. |
| No output after powering on. | 1. Make sure the address dial code setting is correct, refer to the chapter of address dial code;<br>2. Make sure SOC is not 0%. If it is, charge battery. |
| Unable to communicate with the inverter | 1. Make sure the connection of communication cable and power cable is secure, refer to the chapter about connection of cable and power;<br>2. Make sure the address dial code of the master controller is connected to the inverter is 1;<br>3. Make sure the inverter dial code of the master controller is connected to the inverter correctly, refer to the chapter about inverter dial code;<br>4. If you are using a pin order select box, please verify that the dialing switch is configured correctly. |

| Phenomenon | Possible Causes of Failure |
|---|---|
| Unable to be charged by inverter | 1. Make sure the power cable connection is correct;<br>2. Check if the inverter has faults;<br>3. Check if the grid or PV is available;<br>4. Make sure the Time of Use setting is correct;<br>5. Make sure the charging voltage and charging current setting of the inverter match the parameters of the battery;<br>6. Check the battery for the low or high temperature protection alarm;<br>7. Check the over current protection alarm;<br>8. Make sure the SOC value is below 96% (default value). |
| Unable to discharge while SOC is not zero | 1. Make sure the connection of cables is secure and circuit breaker is ON;<br>2. Check if the inverter has faults;<br>3. Make sure the inverter setting is not set to Back Up mode;<br>4. Check whether SOC is lower than the shutdown value of the inverter;<br>5. Check the battery low or high temperature protection alarm;<br>6. Check the overcurrent protection alarm. |
| SOC Value Change Suddenly | 1. It is normal that the SOC value will change when the number of parallel modules changes;<br>2. It is normal that the SOC value will be calibrated when the battery has been fully charged or deeply discharged. |

## 6.3 Status Code

The following status codes are displayed on the cloud platform.

### 6.3.1 Warning Codes

| Code | Warning type | Investigation & troubleshooting |
|---|---|---|
| W1 | Battery cell undervoltage alarm | Low voltage level and the battery needs to be charged. |
| W2 | Charge overcurrent alarm | 1. Restore to factory settings;<br>2. Make sure the inverter setting of max current does not exceed the max charge current of the battery. |
| W3 | Discharge overcurrent 1 alarm | Make sure the power of the load does not exceed the power of battery. |
| W4 | High charge temp alarm | Make sure the battery temperature shown on the inverter or the app is below 131℉ (55℃), otherwise turn off the battery until the temperature is below 131℉ (55℃), then retry charging the battery. |
| W5 | High discharge temp alarm | Make sure the battery temperature shown on the inverter or the app is below 131℉ (55℃), otherwise turn off the battery until the temperature is below 131℉ (55℃), and then try to discharge battery. |

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|---|---|---|
| W6 | Low charge temp alarm | Make sure the battery temperature shown on the inverter or the app is above 32 ℉ (0 ℃), otherwise turn off the battery until the temperature is above 32 ℉ (0 ℃), and then try to charge battery. |
| W7 | Low discharge temp alarm | Make sure the battery temperature shown on the inverter or the app is above -4 ℉ (-20 ℃), otherwise turn off the battery until the temperature is above -4 ℉ (-20 ℃), and then try to charge battery. |
| W8 | High ambient temp alarm | Make sure the ambient temperature of the battery is below 122 ℉ (50 ℃). |
| W9 | High voltage difference alarm | Restart the battery, and if the error code W9 still remains or reappears, contact your installer. |
| W13 | Low total voltage alarm | Low voltage level and the battery needs to be charged |
| W14 | Low ambient temp alarm | Make sure the ambient temperature of the battery is above -13 ℉ (25 ℃). |
| W15 | High MOS temp alarm | Reduce the ambient temperature and restart the battery. |
| W16 | Battery cell overvoltage alarm | High voltage level and the battery needs to be discharged. |
| W17 | High total voltage alarm | High voltage level and the batttery needs to be discharged. |
| W18 | Low SOC alarm | Low SOC and the battery needs to be charged. |
| W22 | Positive connector high temp alarm | Restart the battery, and if error code W22 still remains or reappears, contact your installer. |
| W23 | Negative connector high temp alarm | Restart the battery, and if error code W23 still remains or reappears, contact your installer. |
| W31 | Heating film activation failure fault | Restart the battery, and if error code W31 still remains or reappears, contact your installer. |
| W32 | Heating film deactivation failure fault | Restart the battery, and if error code W32 still remains or reappears, contact your installer. |
| W400 | PCS disconnection | Restart the battery, and if error code W400 still remains or reappears, contact your installer. |

### 6.3.2 Error Codes

| Code | Error Type | Investigation & troubleshooting |
|---|---|---|
| F102 | Battery cell fault | Restart the battery, and if error code F102 still remains or reappears, contact your installer. |
| F103 | NTC fault | Restart the battery, and if error code F103 still remains or reappears, contact your installer. |
| F104 | Current sensor fault | Restart the battery, and if error code F104 still remains or reappears, contact your installer. |
| F106 | Short circuit fault | 1. Make sure the external connection for both battery and inverters are proper;<br>2. Disconnect all external connections and restart the battery; if error code F106 remains, contact your installer. |
| F108 | Heating fault | Restart the battery, and if error code F108 still remains or reappears, contact your installer. |
| F109 | Battery module conflict | Restart the battery, and if error code F109 still remains or reappears, contact your installer. |
| F111 | Charge MOS fault | Restart the battery, and if error code F111 still remains or reappears, contact your installer. |
| F112 | Discharge MOS fault | Restart the battery, and if error code F112 still remains or reappears, contact your installer. |
| F114 | Pre-charge fault | Restart the battery, and if error code F114 still remains or reappears, contact your installer. |
| F116 | Battery Reverse Connection Fault | Restart the battery, and if error code F116 still remains or reappears, contact your installer. |
| F118 | Address non-1 fault | Restart the battery, and if error code F118 still remains or reappears, contact your installer. |
| F119 | Address break-sign failure | Restart the battery, and if error code F119 still remains or reappears, contact your installer. |
| F120 | Pack disconnect fault | Restart the battery, and if error code F120 still remains or reappears, contact your installer. |
| F123 | Microelectronic fault | Restart the battery, and if error code F123 still remains or reappears, contact your installer. |

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| F130 | Master and EMS communication lost | Restart the battery, and if error code F130 still remains or reappears, contact your installer. |
| F131 | Pack disconnect fault | Restart the battery, and if error code F131 still remains or reappears, contact your installer. |
| F132 | EMS SN is empty | Restart the battery, and if error code F132 still remains or reappears, contact your installer. |
| F135 | Pack SN is empty | Restart the battery, and if error code F135 still remains or reappears, contact your installer. |
| F200 | Battery cell undervoltage safety lock | Restart the battery, and if error code F200 still remains or reappears, contact your installer. |
| F201 | Battery cell high voltage safety lock | Restart the battery, and if error code F201 still remains or reappears, contact your installer. |
| F202 | Charge high temp safety lock | Restart the battery, and if error code F202 still remains or reappears, contact your installer. |
| F203 | Charge low temp safety lock | Restart the battery, and if error code F203 still remains or reappears, contact your installer. |
| F204 | Discharge high temp safety lock | Restart the battery, and if error code F204 still remains or reappears, contact your installer. |
| F205 | Discharge low temp safety lock | Restart the battery, and if error code F205 still remains or reappears, contact your installer. |
| F206 | Charge overcurrent safety lock | Restart the battery, and if error code F206 still remains or reappears, contact your installer. |
| F207 | Discharge overcurrent safety lock | Restart the battery, and if error code F207 still remains or reappears, contact your installer. |

### 6.3.3 Protection Codes

| Code | Error Type | Investigation & Troubleshooting |
|---|---|---|
| P1 | Battery cell undervoltage protection | Low voltage level and the battery needs to be charged. |
| P2 | Overcurrent charge protection | 1. Restore to factory settings;<br>2. Make sure the inverter's max current does not exceed the max charge current of the battery. |
| P3 | Overcurrent discharge protection | Make sure the power of the load does not exceed the power of battery. |
| P4 | High charge temp protection | Make sure the battery's temperature shown on the inverter or the app is below 125.6 °F (52 °C), otherwise turn off the battery until the temperature is below 125.6 °F (52 °C), then retry to charge the battery. |
| P5 | High discharge temp protection | Make sure the battery's temperature shown on the inverter or the app is below 125.6 °F (52 °C), otherwise turn off the battery until the temperature is below 125.6 °F (52 °C), then retry discharging the battery. |
| P6 | Low charge temp protection | Make sure the battery's temperature shown on the inverter or the app is above 32 °F (0 °C), otherwise turn off the battery until the temperature is above 32 °F (0 °C), then retry to charge the battery. |
| P7 | Low discharge temp protection | Make sure the battery's temperature shown on the inverter or the app is above -4 °F (-20 °C), otherwise turn off the battery until the temperature is above -4 °F (-20 °C), then retry charging the battery. |
| P8 | High ambient temp protection | Make sure the ambient temperature of the battery is below 122 °F (50 °C). |
| P9 | Excessive voltage difference protection | High voltage level, and the battery needs to be discharged. |
| P13 | Low total voltage protection | Low voltage level, and the battery needs to be charged. |
| P14 | Low ambient temp protection | Make sure the ambient temperature of the battery is above -13 °F (-25 °C). |
| P15 | High MOS temp protection | Reduce the ambient temperature, and restart the battery. |
| P16 | Battery cell overvoltage protection | High voltage level and needs to be discharged. |
| P17 | High total voltage protection | High voltage level and needs to be discharged. |

| | | |
|---|---|---|
| P18 | Low SOC protection | Low voltage level and needs to be charged. |
| P19 | Overcurrent discharge 2 protection | Make sure the power of the load does not exceed the power of the battery. |
| P22 | Positive connector high temp protection | Reduce the ambient temperature and restart the battery. |
| P23 | Negative connector high temp protection | Reduce the ambient temperature and restart the battery. |
| P30 | Charger overvoltage protection | Restart the battery, and if error code P30 still remains or reappears, contact your installer. |