# USER MANUAL OF

FC-J2 | A08

OUR ENERGY WORKS FOR YOU


Zhongrui Green Energy Technology (Shenzhen) Co., Ltd.

# Zhongrui Green Energy Technology (Shenzhen) Co., Ltd.

ZRGP is a national high-tech enterprise with a global vision. With independent research and development capabilities and focus on ESS solutions, ZRGP is becoming a world leading supplier of BMS, ESS, modules and monitoring systems. Our business scope integrates R&D, design, production and sales.

Headquartered in China, with multiple sales offices, product centers, factories, and wholly-owned subsidiaries around the world, ZRGP is committed to providing you with safe, lightweight and long-life green energy products.


ZRGP's industrial park boasts comprehensive facilities, including automated intelligent production lines, testing and aging sections, warehouse areas, office spaces, employee dormitories, cafeteria etc. A majority of the production and testing equipment possessed by the company is imported from Germany, whose advanced level and automation level are on the cutting edge of the industry.

**21000 ㎡**
Factory Area

**3GWh**
Per Year

**90+**
Countries We Export To

## Company Advantages

- Years of research and development experience
- Sales and after-sales outlets all over the world
- Highly information-based automated factory
- Scientific production process control ability

To produce world-class energy storage products
To serve the consumers in the global market

**Table of Contents**

# 1. Safety Precautions

It is very important and necessary to read the user manual carefully (in the accessories) before installing or using battery. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or can damage battery, potentially rendering it inoperable.

Work on a Li-ion Battery should be carried out by qualified personnel only.

Observe these instructions and keep them located near the Li-ion Battery forfuture reference.

For more information about this product, please contact the installer.

## 1.1. General Warnings

Do not expose battery to flammable or harsh chemicals or vapors.

Do not paint any part of battery; include any internal or external.

Do not drop, deform, impact, cut or spearing with a sharp object.

Do not wet the battery and avoid of direct sunlight.

Do not use a damaged battery.

Please contact the supplier within ***24 hours*** if there is something abnormal.

It is prohibited to put the batteries working with faulty or incompatible inverter.

It is prohibited to disassemble the battery (QC tab removed or damaged).

Please do not open, repair, or disassemble the battery except trained technicians. We do not undertake any consequences or related responsibility which, because of violation of safety operation, or violation of design, production, and equipment safety standard.

Any foreign object is prohibited to insert into any part of battery.

While working on the Li-ion Battery wear protective eyeglasses.

Any uncovered battery material such as electrolyte or powder on the skin or in the eyes must be flushed with plenty of clean water immediately. Then seek medical assistance. Spillages on clothing should be rinsed out with water.

Explosion and fire hazard. Terminals of the Li-ion Battery are always alive; Therefore, do not place items or tools on the Li-ion Battery, Avoid short circuits, too deep discharges, and high charge currents. Use insulated tools. Do not wear any metallic items such as watches, bracelets,etc. In case of fire, you must use a type S, foam, or $CO_2$ fire extinguisher.

Do not open or dismantle the battery. 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.

Li-ion batteries are heavy. If involved in an accident, they can become a projectile! Ensure adequate and secure mounting and always use suitable handling equipment for transportation.

Handle with care because an ion battery is sensitive to mechanical shock.

Do not expose cable outside, all the battery terminals must be disconnected.

Please use caution when it’s placed around children or pets.

Do not use cleaning solvents to clean battery.

The warranty claims are excluded for direct or indirect damage due to items above.

Recharge and maintain the battery pack regularly every three months to ensure the battery is in the best condition.
Do not store the battery at 0% SOC for over one month, this may result in permanent damage to the battery and violent the warranty.

It is prohibited to connect the battery with different type of battery.

## 1.2. Charge and Discharge Warnings

If the battery is stored for a long time, it is required to charge them every three months, and the SOC should be no less than 90%.

Battery needs to be recharged within ***12 hours***, after fully discharged.

Do not connect battery with PV solar wiring directly.

Use only with BMS approved by the supplier.

If charged after the Lithium Battery was discharged below the “Discharge cut-off voltage”, or when the Lithium Battery is damaged or overcharged, the Lithium Battery can release a harmful mixture of gasses such as phosphate.

The temperature range over which the battery can be charged is 0°C to 50°C. Charging the battery at temperatures outside this range may cause severe damage to the battery or reduce battery life expectancy.

The temperature range over which the battery can be discharged is -20°C to 50°C. Discharging the battery at temperatures outside this range may cause severe damage to the battery or reduce battery life expectancy.

## 1.3. Transportation Warnings

If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shut down; The battery must be transported in its original or equivalent package and in an upright position. If the battery is in its package, usesoft slings to avoid damage.

Do not stand below a battery when it is hoisted.

Never lift the battery at the terminals or the BMS communication cables, only lift the battery at the handles.

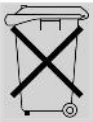
Battery packs need to be packed before they can be shipped, during transportation, severe impact, extrusion, direct sunlight and rain should be avoided.

***Note:***

- *Batteries are tested according to UN Handbook of Tests and Criteria, part III, sub section 38.3 (ST/SG/AC.10/11/Rev.5).*
- *For transport the batteries belong to the category UN3480, Class 9, Packaging Group II and must be transported according to this regulation. This means that for land and sea transport (ADR, RID & IMDG) they must be packed according to packaging instruction P903 and for air transport (IATA) according to packaging instruction P965. The original packaging complies with these instructions.*

## 1.4. Disposal of Lithium Batteries

Batteries marked with the recycling symbol must be processed via a recognized recycling agency. By agreement, they may be returned to the manufacturer.



Batteries must not be mixed with domestic or industrial waste.

Do not throw a battery into fire.

## 1.5. Before Connecting

◆ After unpacking, please check product and packing list first, if product is damaged or lacks parts, please contact the local retailer.

◆ Before installation, be sure to cut off the grid power and make sure the battery is in the turned-off mode.

◆ Wiring must be correct, do not mistake the positive and negative cables, and ensure no short circuit with the external device.

◆ It is prohibited to connect the battery and AC power directly.

◆ The embedded BMS in the battery is designed for 48V DC, please DO NOT connect battery in series.

◆ Battery system must be well grounded, and the resistance must be less than 1oumu.

◆ Make sure the grounding connection set correctly before operation.

◆ Please ensure the electrical parameters of battery system are compatible with related equipment.

◆ Keep the battery away from water and fire.

## 1.6. In Using

◆ If the battery system needs to be moved or repaired, the power must be cut off and the battery is completely shut down.

◆ It is prohibited to connect the battery with different types of battery.

◆ It is prohibited to put the batteries working with faulty or incompatible inverter.

◆ It is prohibited to disassemble the battery (QC tab removed or damaged).

◆ In case of fire, only dry powder fire extinguishers can be used, liquid fire extinguishers are prohibited.

◆ Please do not open, repair, or disassemble the battery except staff from ZRGP or authorized by ZRGP. We do not undertake any consequences or related responsibilities because of violation of safety operation or violating of design, production, and equipment safety standards.

## 1.7. Qualified Personnel

The installation guide part described herein is intended for use by skilled staff only. A skilled staff is defined as a trained and qualified electrician or installer who has all the following skills and experience:

◆ Knowledge of battery' specification and properties.

◆ Knowledge of the installation of electrical devices.

◆ Knowledge of torsion and screwdrivers 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 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

## 2.1. Schematic Diagram of Solution

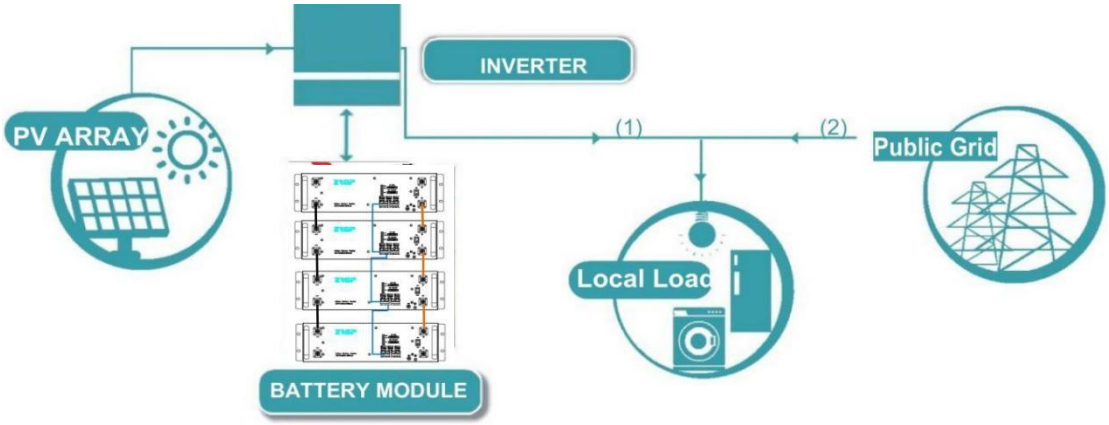



*Figure 2.1. Schematic diagram of solution*

## 2.2. Familiarize yourself with batteries

Be careful when opening the battery package. The battery is heavy. Do not lift it with a pole. There are two handles on both sides of the battery. The weight of the battery can be found in the chapter “Specifications".

Familiarize yourself with batteries. The battery polarity is displayed on both sides of the battery. The positive pole is represented by "+" and the negative pole by "-".

## 2.3. Precautions before Installation

Before installation, be sure to read the contents in Chapter 1 Safety Precautions, which is related to the operation Safety of installation personnel, please pay attention to.

## 2.4. Tools

The following tools are required to install the battery pack:

Wire Cutter

Crimping Modular Pliers

Screwdriver

***NOTE:***

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

Safety Gear

It is recommended to wear the following safety gear when dealing with the battery pack:


Insulated Gloves

Safety Goggles

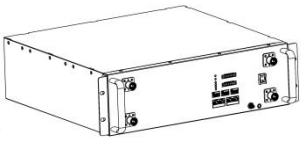
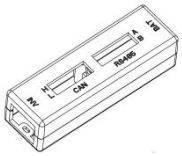
Safety Shoes

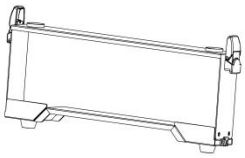
## 2.5. Package Item

Unpacking and check the Packing List:

1) Packing list:

After receiving the complete system, please check to ensure that all the following component are not lost or damaged broken.

| | | |
|---|---|---|
|  Whole machine system*1 |  Connector*2 (orange and black) |  User manual*1 |
|  Antenna*1 |  Power cable 4 AWG*2 |  Communication cable RJ45 (2m) (optional) (Inverter)*1 |
|  Power cable red 160mm (optional) (Parallel)*1 |  Power cable black 160mm (optional) (Parallel)*1 |  Communication cable RJ45 (2m) (Parallel)*1 |
|  Pin order select box (optional)*1 |  Communication cable RJ45 (200mm) (optional) (Inverter)*1 |  Communication cable RJ45 (2m) (optional) (Inverter)*1 |

| | | |
|---|---|---|
|  <br>Class six network cable (250mm) (optional) (Parallel)*1 |  <br>Trestle (optional)*1 | |

2) Connector:

Each battery set **includes a complementary pair of** a positive connector and a negative connector, the two connectors are not connected to the cable, and the user can be wired according to the actual application needs.

Positive connector

Negative connector

**Connector Technical Specifications:**

- **Rated Voltage:** 1500 V
- **Rated Current:** 125 A (25 mm²); 80 A (16 mm²); 65 A (10 mm²)
- **Withstanding Voltage:** 4260 V
- **Insulation Resistance:** 100 MΩ
- **Protection Level:** IP67
- **Ambient Temperature:** -40 ℃ ~ +85 ℃

**For other application requirements,** please assemble the DC connector onto the cable following the cable assembly process (including cable crimping).

① Disassemble the connector to confirm that the parts are intact.

② As shown in the diagram, slip the parts onto the cable.

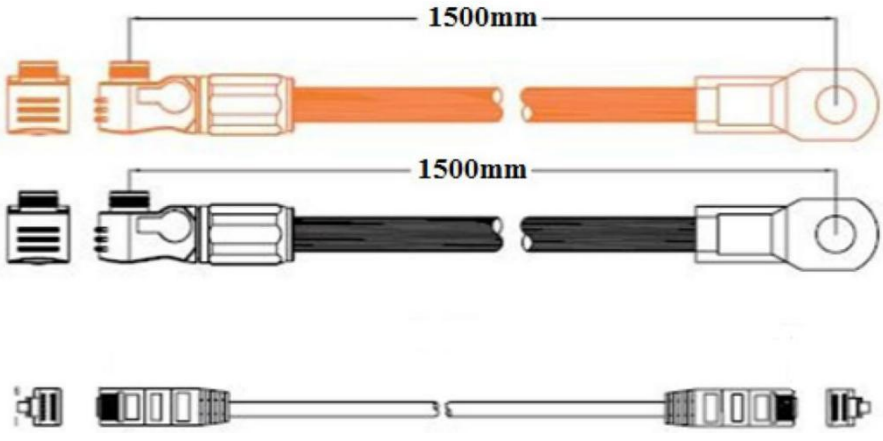
③ Perform cable insulation stripping, with a length of 12mm ± 1mm.

④ Fully insert the conductor into the terminal cavity and crimp. After crimping, the connection must withstand a pull force not less than the values specified in the table below. The crimping dimensions are for reference only.

| Cable Specification | Pull-out Force (N) | Crimping Dimension (H) |
|---|---|---|
| 10mm² | 840 | 4.8 |
| 16mm² | 1300 | 6.4 |
| 25mm² | 1650 | 7.4 |

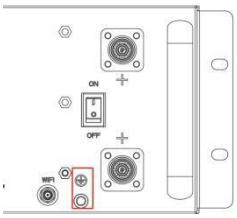
3) Connector for battery module package:

Two long power cables (**current capacity 120A**) and one communication cable for each battery package (1500mm):




***Please note:*** *The DC cable provided with each battery set has been pre-assembled with the DC connector.*

4) Grounding:




Install a grounding cable to the grounding point of the modules.

**Note: The grounding cable is not provided. Installers must prepare the grounding conductor according to the requirements below to comply with Australian installation standards:**

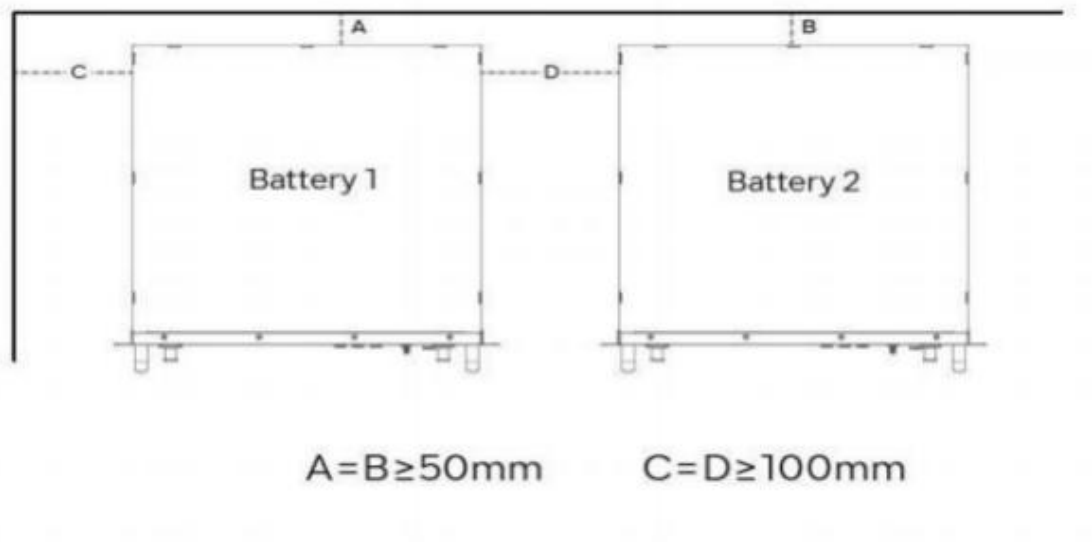
- **Recommended Ground Cable Size:** 12AWG
- **Recommended Ground Screw Specification:** M6 stainless-steel screw
- **Recommended Tightening torque:** 4.00 – 4.80 N·m
- Connect the grounding conductor securely to the designated grounding point on the battery enclosure.
- Ensure the grounding conductor is routed separately from power cables and connected to a reliable earth grounding system in accordance with local electrical regulations and AS/NZS 3000.

5) Pin order selection box (optional):

Set the pin order of the communication cable of battery and inverter, cooperate with 2 standard network cable.

# 3. Installation

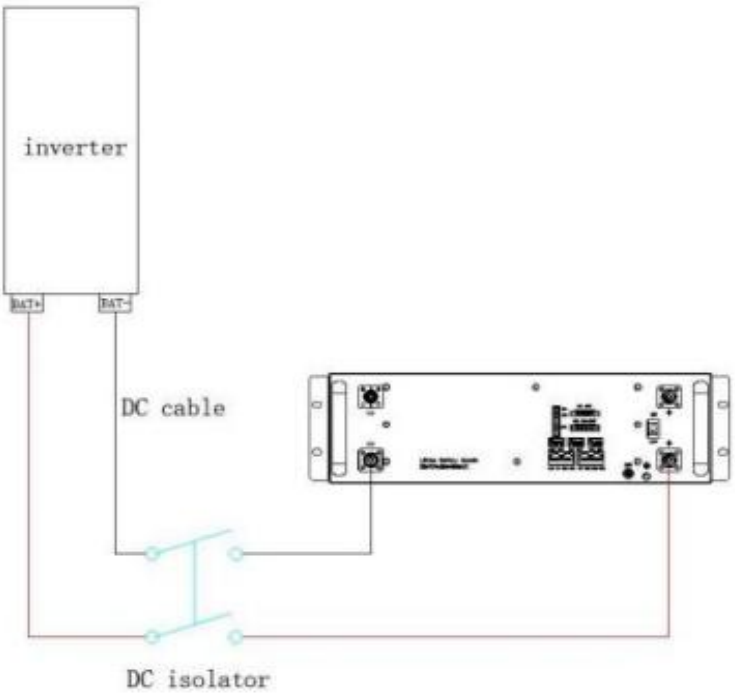
## 3.1. System Premeasurement




***NOTE:*** *The battery should be at least 600mm away from the top of the ceiling.*

## 3.2. Installation between the battery and inverter

Connect both the positive and negative power lines of the inverter and battery, according to the setting of the circuit breaker (Refer to the picture as below).



• Please note, the cable from circuit breaker to inverter is not provided.

• Please note, the grounding cable is not provided.

• For Australian Market an overcurrent protection and isolation device that isolates both positive and negative conductors simultaneously is required between the battery and the inverter.

## 3.3. Installation Location

Make sure that the installation location meets the following conditions:
The area is completely waterproof.

- The floor is flat and level.
- There are no flammable or explosive materials.
- The ambient temperature should not exceed the range of battery usage temperature.
- The humidity should not exceed the range of battery usage humidity.
- There is minimal dust and dirt in the area.
- The distance from heat source is more than 2 meters.
- The distance from air outlet of inverter is more than 0.5 meters.
- Do not install outside directly.
- Do not cover or wrap the battery case or cabinet.
- Do not place at a child or pet touchable area.
- The installation area should avoid direct sunlight.
- There are no mandatory ventilation requirements for battery module, but please avoid installation in confined areas. The aeration shall avoid high salinity, humidity, or temperature.
- ADC isolator is recommended to be added on the power circuit between inverter and battery, recommended rating at 120Amps per set of external power cable.

**CAUTION**

If the ambient temperature is outside the operating range, the battery pack stops operating to protect itself. The optimal temperature range for the battery pack to operate is 0°C to 50° C. Frequent exposure to harsh temperatures may deteriorate the performance and life of the battery pack.

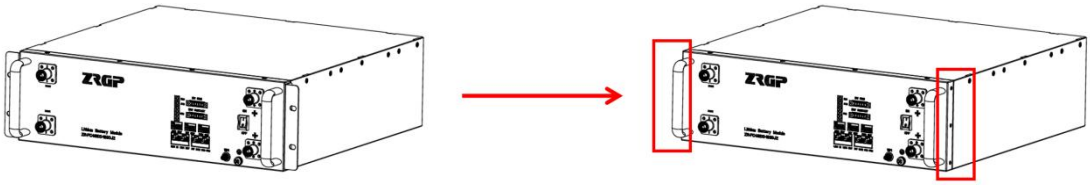
## 3.4. Battery Installation

If the battery system is installed in a stacked configuration, mounting brackets must be used to securely fix each battery.

Rack bracket brand: ZRGP

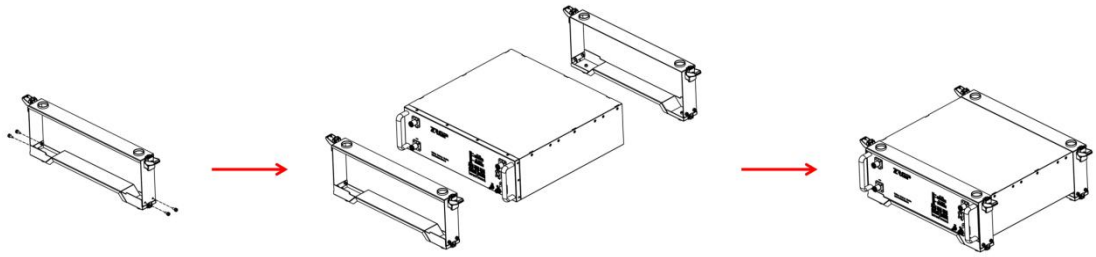
Model: ZR-FC-BF1

1) Remove the screws with a screwdriver and disassemble both sides of the handle.



2) Tighten all the screws on the brackets, assemble the brackets, and attach them to the battery and fix them to all battery modules.

***Note:*** Furthermore, since the brackets are not included in the product supply scope, please contact an approved local retailer or supplier if purchasing is required."



3) When using more than one battery in parallel, repeat the above steps and stack them one by one. The racks support up to 4 batteries stacked together, and do not put anything else on the top the battery.

4) Connect the power cable and parallel communication cable between the battery modules.

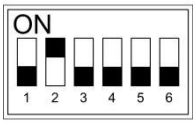
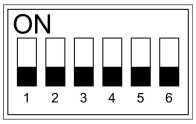
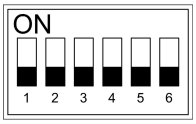
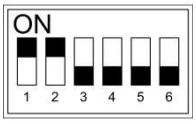
5) Install the Wi-Fi antenna.

6) Setting function, address and inverter dip code.

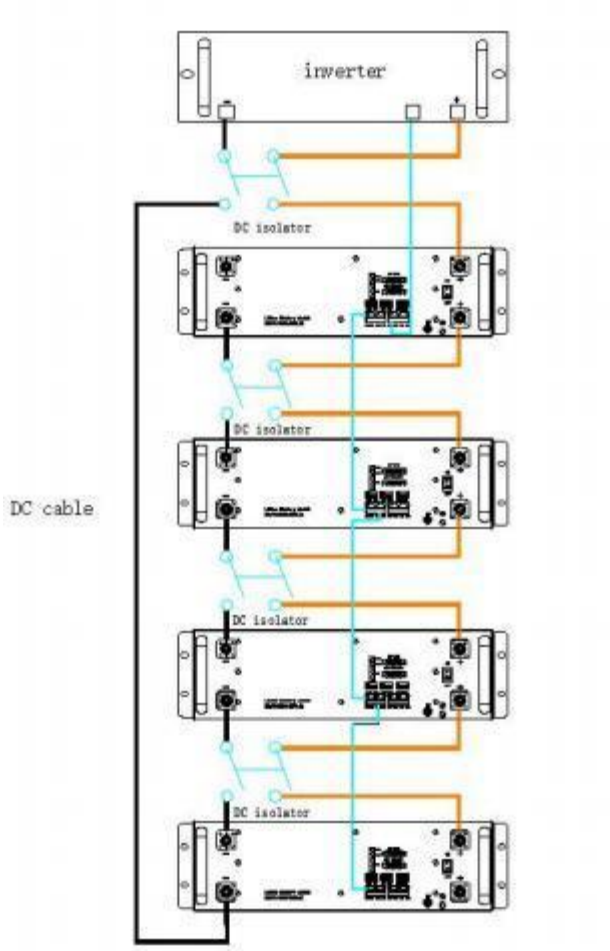
Single:

| NO. | Address | Inverter | Function |
|---|---|---|---|
| First |  | Please base on the actual usage |  |

Parallel:

| NO. | Address | Inverter | Function |
|---|---|---|---|
| First |  | Please base on the actual usage |  |
| Middle |  |  |  |
| Last |  |  |  |

7) Connect the cable to the inverter.



***NOTE:***

- ***Cable Not Provided***: The DC cable connecting the circuit breaker to the inverter is not included.
- ***Australian Compliance Requirement:*** *Installation in the Australian market must include an overcurrent protection and isolation device for each battery in a parallel configuration, as mandated by standard AS/NZS 5139.*
- ***Battery Safety Features:*** *Each battery is equipped with a Battery Management System (BMS) that performs critical safety functions such as current monitoring, temperature monitoring, and active protection.*

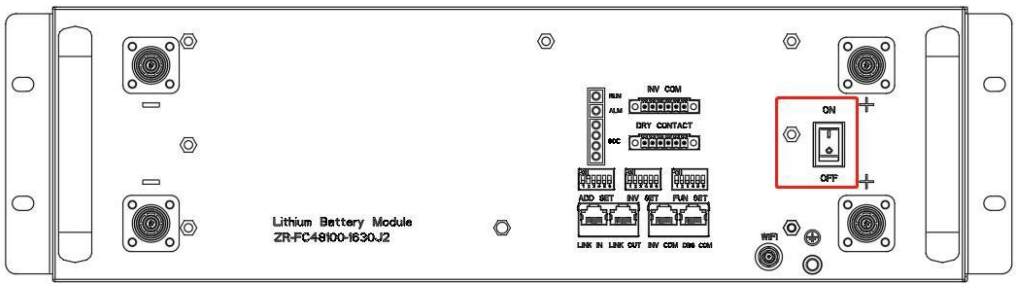
## 3.5. Power On

1) The module with the dip switch of 1 is the master battery module, and the other modules are the slave battery module (one master battery module can be configured with up to 30 slave battery modules). The inverter must communicate with the battery module with the address of 1.

2) Switch power on

A: Parallel operation: Address dip switch from large to small turn on the battery, and finally turn on battery 1

B: One battery




*NOTE: After installation, do not forget to register online for full warranty:*
*http://www.zruipower.com*

***NOTE:***

- *To avoid current pulse of the inverter, add on the battery bank. Shall start inverter first or switch on breaker between battery and inverter after all connected batteries turned on.*
- *Between battery bank and inverter should install breakers to protect system safety.*
- *All the installation and operation must follow local electrical standards.*

## 3.6. Startup and Shutdown Procedure

### 3.6.1. Single Battery System:

**A. Startup Sequence**

**Step 1**: Verify Safety Conditions:

1. Ensure all wiring connections are secured and there are no exposed conductors.

2. Confirm all external DC breakers/isolators are in the **OFF** position.

3. Make sure that no personnel are performing electrical work around the system.

**Step 2:** Power On the Battery:

1. Switch the battery module power button to **ON**.

2. Wait 30–60 seconds to allow all batteries to stabilize and reach normal output voltage.

**Step 3:** Close the External DC Isolator:

1. Close the DC breaker/isolator between the battery and the inverter.

2. Note: Ensure the isolation device complies with local standards for simultaneous disconnection of both poles.

**Step 4:** Power On the Inverter

1. Press the inverter power button to start the unit.

2. Allow the inverter to complete its internal self-test and transition to standby or operating mode.

**B. Shutdown Sequence**

**Step 1**: Turn Off the Inverter:

1. Press the inverter power button to shut down the unit.

2. Wait for the display to turn off and ensure the inverter has fully stopped output

**Step 2:** Open the External DC Isolator:

1. Switch the DC breaker/isolator between the battery and the inverter to the **OFF** position.

**Step 3:** Power Off the Battery:
1. Switch the battery module power button to the **OFF** position.

**Step 4:** Wait for Discharge & Verify:
1. Wait at least **5 minutes** to ensure the system is fully de-energized.

2. Use a multimeter to confirm the DC bus shows zero voltage before any maintenance.

### 3.6.2 Parallel Battery System (Multiple Modules)

*(Please refer to below picture Parallel Battery System Wiring Diagram for the location of individual and main isolators)*

**A. Startup Sequence**

**Step 1:** Verify Safety Conditions:

1. Ensure all wiring connections (including parallel cables) are secured and there are no exposed conductors.
2. Confirm that the **Main DC Isolator** and **all Individual Module DC Isolators** (shown in the below picture) are in the **OFF** position.
3. Make sure that no personnel are performing electrical work around the system.

**Step 2:** Power On Each Battery Module:

1. Switch each battery module power button to **ON** one by one.

2. Wait 30–60 seconds to allow the battery bank to stabilize and reach normal output voltage.

**Step 3:** Close Individual Module DC Isolators:

1. **Close the external DC isolator for each individual battery module** to connect each unit to the parallel busbar.

**Step 4:** Close the Main System Isolator:

1. Close the **Main DC Isolator** located between the battery bank and the inverter.

**Step 5:** Power On the Inverter:

1. Press the inverter power button to start the unit.

2. Allow the inverter to complete its internal self-test and transition to operating mode.

**B. Shutdown Sequence**

**Step 1**: Turn Off the Inverter:

1. Press the inverter power button to shut down the unit.
2. Wait for the display to turn off and ensure the inverter has fully stopped output.

**Step 2:** Open the Main System Isolator:

1. Open the **Main DC Isolator** (between the inverter and the battery bank).

**Step 3:** Open Individual Module DC Isolators:

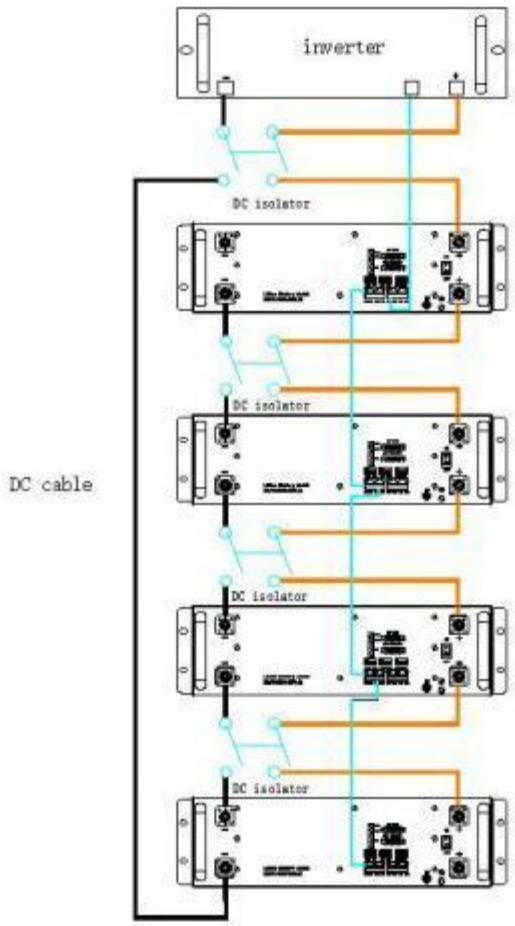
1. Open the **external DC isolator for each individual battery module**. to physically isolate each module from the parallel circuit.

**Step 4:** Power Off All Battery Modules:

1. Switch each battery module power button to the **OFF** position one by one.

**Step 5:** Wait for Discharge & Verify:

1. Wait at least **5 minutes** to ensure the system is fully de-energized.
2. Use a multimeter to confirm the DC bus shows zero voltage before any maintenance.




## *Important Note:*
## *For Australian Market*

- *An over-current protection and isolation device that disconnects both positive and negative conductors simultaneously must be installed between the battery bank and the inverter.*
- *The external DC breaker must be installed between the battery system and the inverter to ensure system safety.*

## *To Prevent Current Surge*

- *Always turn on all battery modules before closing the external breaker to avoid inverter inrush current.*
- *A suitable DC breaker must be installed between the battery and inverter for system protection.*
- *All installation and operation must comply with local electrical regulations. All installation and operation must comply with local electrical regulations.*

## 3.7. Cable Safety Instructions

### 3.7.1 Cable Safety Routing Instructions

**Step 1:** Plan Cable Routing

1. Route cables along walls or behind equipment, avoiding walkways or high-traffic areas.

2. Avoid sharp bends, twisting, and areas where heavy objects could crush cables.

**Step 2:** Secure Cables Using Approved Fixing Materials

1. Cable clips, cable ties, PVC conduits, plastic or metal trucking, wall-mounted brackets.

2. Ensure cables are firmly attached and supported at regular intervals.

**Step 3:** Provide Mechanical Protection

1. Use conduits or trucking for exposed areas.

2. Reinforce protection at corners, doors, and equipment edges.

**Step 4:** Clearly Label All Cables

1. Label positive, negative, and communication lines using durable markers.

**Step 5:** Keep Cables Away From Heat Sources

1. Maintain at least 200 mm clearance from heat-emitting devices.

**Step 6:** Ensure No Tension Is Applied to the Cables

1. Leave enough slack to prevent stretching.

2. Ensure connectors are not under mechanical load.

***Note: Safety Warnings***

- *WARNING: Do not pull, bend, or apply force to exposed cables.*
- *WARNING: Always turn off all battery modules and the external DC isolator before touching any cables.*
- *WARNING: Only qualified personnel may perform installation or maintenance.*
- *CAUTION: Use protective conduits or trucking to avoid accidental contact with high-voltage DC cables.*
- *CAUTION: Ensure the system is fully de-energized (0 V confirmed) before working on electrical components.*

# 4. WiFi Configuration

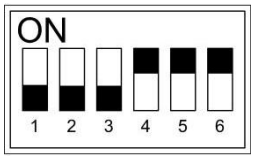
## 4.1. Commissioning Steps

After all the battery packs are installed, follow these steps to put it into operation.

- Verify the batteries communication cable connection is correct.
- Verify the batteries power connection is correct.
- Verify the batteries dip switch setting is correct
- Press the Power button on the master battery to turn on all of the batteries.
- Check the Battery's screen to confirm the batteries working normal.
- Power on the Inverter and other electronic devices.

## 4.2. WIFI Configuration

1. Screw the antenna into the antenna connection port firmly before WiFi configuration.
2. Set the inverter dip switch of the battery to 56 to enable battery WiFi.




Step 1: Download the Smart Energy APP on phone

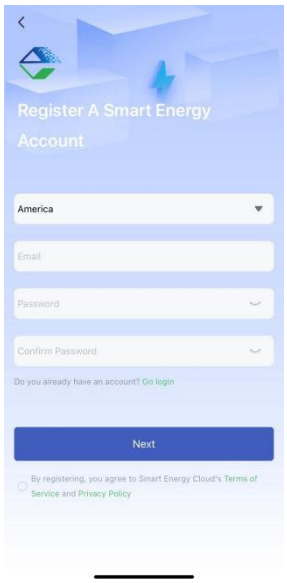
Search the keyword "Smart Energy" from AppStore or Google play on Android phone, download APP and finish installation. If users fail to upgrade the latest APP version or to install the APP on phone, please contact Smart Energy technical support for advice.

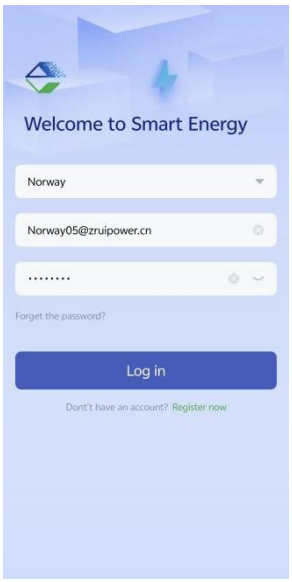

Android QR code

IOS QR code

Step 2: Create APP user account

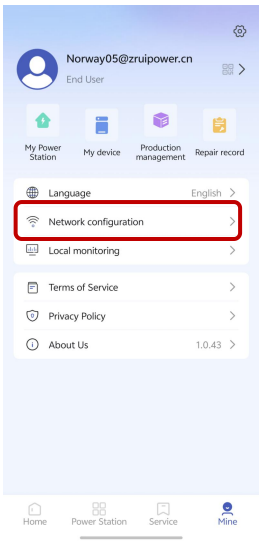
Select the area where you live. Click Register button and type in account and password. If you already have an account, you may use it to log in the APP directly otherwise you need to create an account.

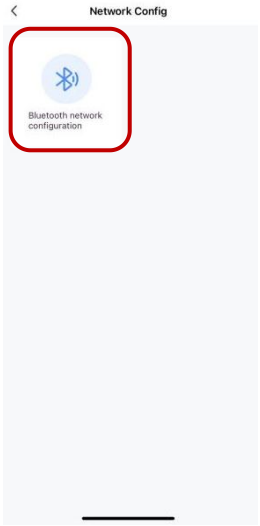



Step 3: Create AP for APP parameter settings

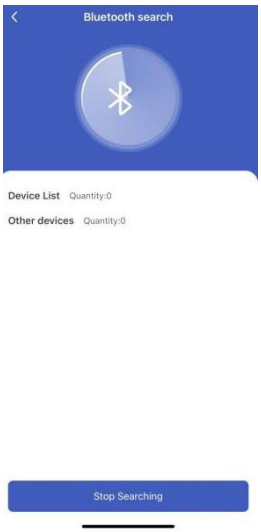
Turn to the page Mine, click the Network configuration, then click Bluetooth Model, and follow by the instruction of network setting for WIFI configuration.




Step 4: Bluetooth setting

Connect your mobile phone to Bluetooth from the master controller which SSID is same as controller's serial number (SN).

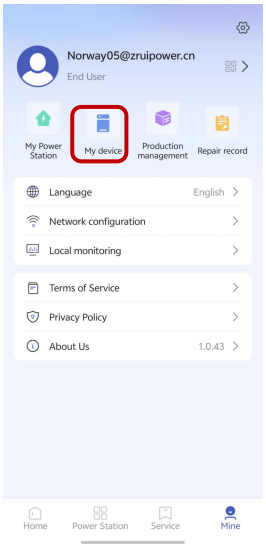


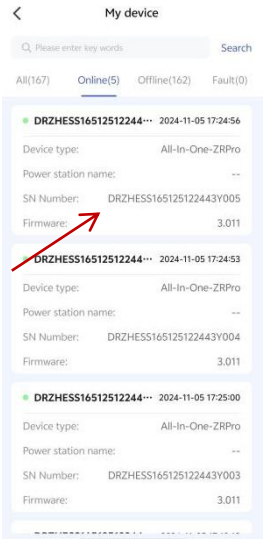

Step 5: Bluetooth network configuration

Please link the WiFi and enter the password. If this device already exists, there will be a Device key automatically generated and please do not modify it. If users have trouble connecting to the product WIFI, please contact Smart Energy FAE for further help.


Step 6: Find the device verification code on APP

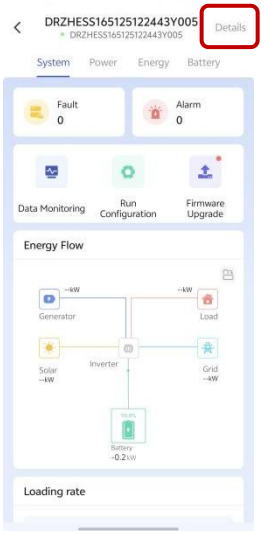
Click my device at page Mine and make sure your SN number.

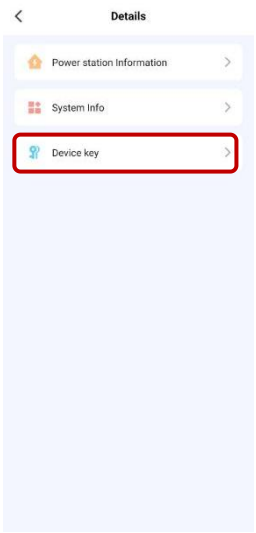


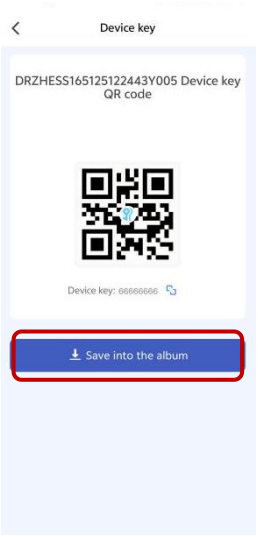




Step 7: Enter my device and find the device key

Click the device and click the “details” in the upper right corner of the interface, and then click “Device key”. It will show the verification code. For example, “123456” shown in the picture.

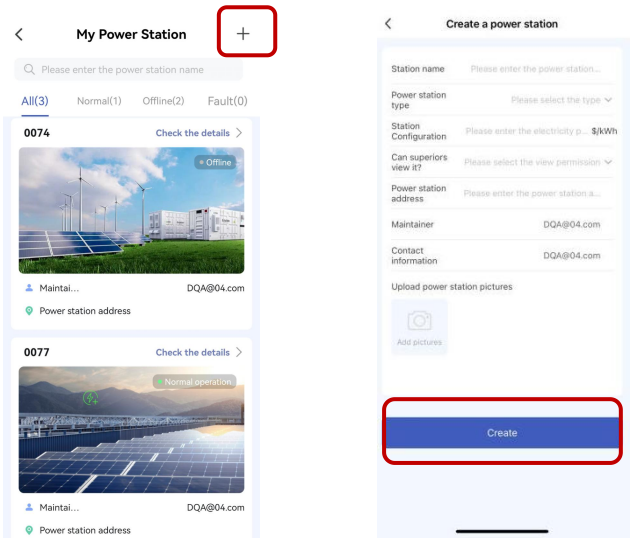


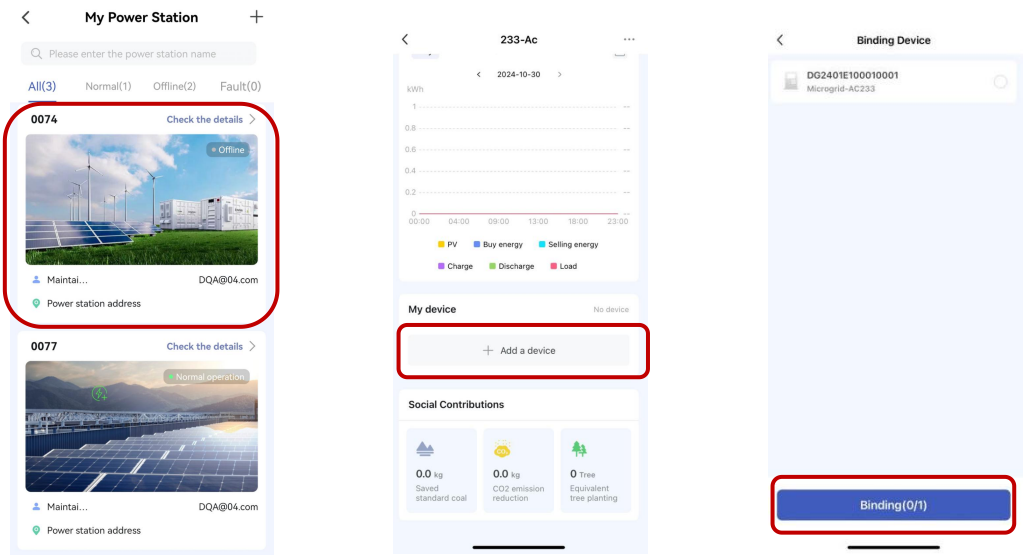

Step 8: Create a new power station

Turn to main page of the APP, create a plant, and set a power station name, power station type, grid price configuration, superiors view and power station address for it.



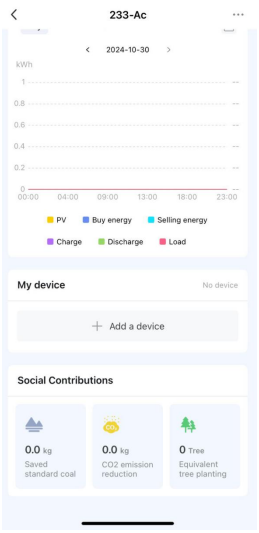

Step 9: Binding the device

Click the device and enter the page to add a device to your plant and all your products will show up as their SN, select proper products and confirm.




Step 10: Manage your product

Now you can manage your products in the APP, and you can also manage them in Website, ask your installer for the site URL.




Step 11: Set the inverter dip code (INV.SET)

Set the INV.SET as 0, and drop out distribution mode of battery, after configuring WiFi. Wait a minute, if the cloud platform displays information about the battery online, the network has been configured successfully.

Step 12: Monitor all real-time data

After the product is connected to WiFi, the running status, real-time power, daily power consumption and cumulative power of the product can be monitored in real time on the network platform or mobile APP. It can also be used to configure parameters.

# 5. Introduction

ZR-FC series lithium iron phosphate battery is one of new energy storage products developed and produced by ZRGP, it can be used to support reliable power for various types of equipment's and systems. ZR-FC series is especially suitable for application scene of high power, limited installation space, and restricted load-bearing and long cycle life.
ZR-FC series has built-in BMS battery management system, which can manage and monitor cells information including voltage, current and temperature. What is more, BMS can help extend cycle life by balancing cells during charging and discharging.
Multiple batteries can be connected in parallel to expand capacity and power to meet the requirements of longer power supporting duration and higher power consumption.

## 5.1. Lithium Iron Phosphate Battery

The lithium iron phosphate battery (LiFePO4 or LFP) is the safest of the mainstream lithium battery types.
A single LFP cell has a nominal voltage of 3.2V.
A 51.2V LFP battery consists of 16 cells connected in series.
Some of LFP features are:

- Rugged - It can operate in deficit mode during long periods of time.
- High round trip efficiency.
- High energy density - More capacity with less weight and volume.
- High charge and discharge currents - Fast charge and discharges are possible.
- Flexible charge voltages.

The lithium iron phosphate battery is therefore the chemistry of choice for a range of very demanding applications.

## 5.2. ZR-FC Features

- The whole module is non-toxic, non-polluting, and environmentally friendly.
- Cathode material is made from LiFePO4 with safety performance and long cycle life.
- Battery management system (BMS) has protection functions including over-discharge, over-charge, and over-current and high/low temperature.
- The system can automatically manage charge and discharge state and balance current and voltage of each cell.
- Flexible configuration, multiple battery modules can be in parallel for expanding capacity and power, up to 31 batteries in parallel.
- Adopted self-cooling mode rapidly reduced system entire noise.
- The module has less self-discharge, up to 3 months without charging it on shelf, no memory effect, excellent performance of shallow charge and discharge.
- Working temperature range is from -20 to 50℃, (Charging 0~50℃, discharging -20~50℃) with excellent discharge performance and cycle life.
- Small size and light weight, standard of 19-inch embedded designed module is easy for installation and maintenance.

## 5.3. Specifications

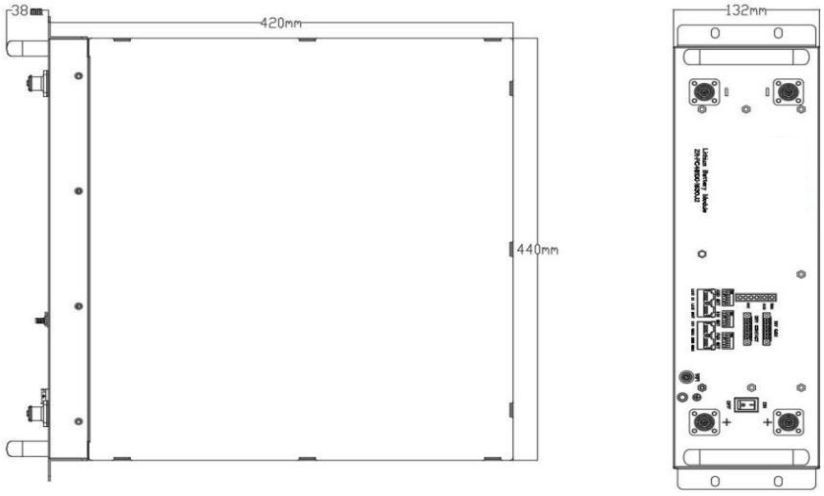



*Figure 5.3.1. Outline dimensional drawing*

| NO. | Items | ZR-FC48100-1630J2 / ZR-FC4810-1630J2-H |
|---|---|---|
| 1 | Battery Chemistry | LiFePO4 |
| 2 | Rated Capacity | 100Ah |
| 3 | Rated Energy | 5. 12KWH |
| 4 | Nominal Voltage | 51.2V |
| 5 | Maximum Charge Voltage | 58.4V |
| 6 | Charge Cut-off Voltage | 59.2V |
| 7 | Discharge Cut-off Voltage | 43.2V |
| 8 | Max. Charging/Discharging Current | 95A |
| 9 | Max. Charging/Discharging Power (MCDR) | 5kw |
| 10 | Recommend Charging Voltage | 56.8V |
| 11 | Heating Film Resistance(Ω ) | 16 (-H model only) |
| 12 | Heating Start Temperature (℉/℃) | 41/5 (-H model only) |
| 13 | Operation Temperature | Charging Temperature: 0℃~+50℃,<br>Discharge Temperature: -20℃~+50℃ |
| 14 | Shell Type | Painted metal |
| 15 | Weight | 43±1Kg |
| 16 | Size | 420(L)*440(W)*132(H)mm |
| 17 | Level of protection | IP20 |
| 18 | Installation Environment | Indoor |
| 19 | Designed Calendar Life | 10 years |
| 20 | Cycle Life | 8000 cycles , @77℉(25℃),0.2C, 70%DOD, 70%EOL |
| 21 | Safety Function | Over-charge, Over-discharge, Over-current,<br>Low/High-temperature, Short-circuit Protections |
| 22 | Communication | RS485/CAN/Wi-Fi |

| NO. | Items | ZR-FC48100-1530J2 / ZR-FC4810-1530J2-H |
|---|---|---|
| 1 | Battery Chemistry | LiFePO4 |
| 2 | Rated Capacity | 100Ah |
| 3 | Rated Energy | 4. 8KWh |
| 4 | Nominal Voltage | 48 V |
| 5 | Maximum Charge Voltage | 54.75V |
| 6 | Charge Cut-off Voltage | 55.5V |
| 7 | Discharge Cut-off Voltage | 40.5V |
| 8 | Max. Charging/Discharging Current | 95A |
| 9 | Max. Charging/Discharging Power (MCDR) | 4. 8kw |
| 10 | Recommend Charging Voltage | 53.25V |
| 11 | Heating Film Resistance (Ω ) | 16 (-H model only) |
| 12 | Heating Start Temperature (℉/℃) | 41/5 (-H model only) |
| 13 | Operation Temperature | Charging Temperature: 0℃~+50℃,<br>Discharge Temperature: -20~ +50℃ |
| 14 | Shell Type | Painted metal |
| 15 | Weight | 41±1Kg |
| 16 | Size | 420(L)*440(W)*132(H)mm |
| 17 | Level of protection | IP20 |
| 18 | Installation Environment | Indoor |
| 19 | Designed Calendar Life | 10 years |
| 20 | Cycle Life | 8000 cycles , @77℉(25℃),0.2C, 70%DOD, 70%EOL |
| 21 | Safety Function | Over-charge, Over-discharge, Over-current,<br>Low/High-temperature, Short-circuit Protections |
| 22 | Communication | RS485/CAN/Wi-Fi |

## 5.4. Equipment Interface Instruction

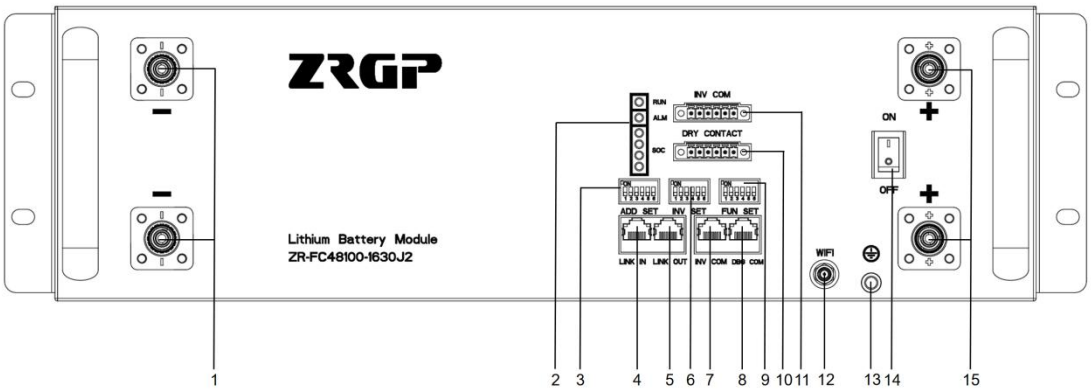


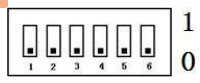

*Figure 2.4.1. Interface definition*

| NO. | Instructions | NO. | Instructions |
|---|---|---|---|
| 1 | DC power negative | 9 | FUN SET: Function dip switch |
| 2 | Status indicator | 10 | Dry contact: Reserved |
| 3 | Address dip switch | 11 | Communication interface of the inverter |
| 4 | LINK IN (Multi-device parallel connection) | 12 | WiFi port |
| 5 | LINK OUT (Multi-device parallel connection) | 13 | GND |
| 6 | INV.SET: Inverter dip switch | 14 | ON/OFF button |
| 7 | INV.COM: Inverter interface | 15 | DC power positive |
| 8 | DEBUG interface port | | |

### ON/OFF buuton

Power switch: to turn ON/OFF the battery. When it is off, BMS standby, no power output.

### Address dip switch




ADD Switch: 6 ADD switches, “0” and “1”, refer to picture right. The settings will be active only after restart the battery.

When the battery communicates with the inverter, the address of the battery pack must beset to 1, and the address of the slave should be greater than 1.

When the battery pack is connected in parallel, cascading communication is required.

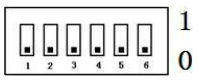
Thedefinition of the switch refers to the table below.

| Address Coding | Dip Code Switch Position | | | | | | Definition |
|---|---|---|---|---|---|---|---|
| | #1 | #2 | #3 | #4 | #5 | #6 | |
| 1 | ON | OFF | OFF | OFF | OFF | OFF | Set the master pack, and the inverter communicates with the battery at that address |
| 2 | OFF | ON | OFF | OFF | OFF | OFF | Set to the slave Pack 1 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 3 | ON | ON | OFF | OFF | OFF | OFF | Set to the slave Pack 2 |
| 4 | OFF | OFF | ON | OFF | OFF | OFF | Set to the slave Pack 3 |
| 5 | ON | OFF | ON | OFF | OFF | OFF | Set to the slave Pack 4 |
| 6 | OFF | ON | ON | OFF | OFF | OFF | Set to the slave Pack 5 |
| 7 | ON | ON | ON | OFF | OFF | OFF | Set to the slave Pack 6 |
| 8 | OFF | OFF | OFF | ON | OFF | OFF | Set to the slave Pack 7 |
| 9 | ON | OFF | OFF | ON | OFF | OFF | Set to the slave Pack 8 |
| 10 | OFF | ON | OFF | ON | OFF | OFF | Set to the slave Pack 9 |
| 11 | ON | ON | OFF | ON | OFF | OFF | Set to the slave Pack 10 |
| 12 | OFF | OFF | ON | ON | OFF | OFF | Set to the slave Pack 11 |
| 13 | ON | OFF | ON | ON | OFF | OFF | Set to the slave Pack 12 |
| 14 | OFF | ON | ON | ON | OFF | OFF | Set to the slave Pack 13 |
| 15 | ON | ON | ON | ON | OFF | OFF | Set to the slave Pack 14 |
| 16 | OFF | OFF | OFF | OFF | ON | OFF | Set to the slave Pack 15 |
| 17 | ON | OFF | OFF | OFF | ON | OFF | Set to the slave Pack 16 |
| 18 | OFF | ON | OFF | OFF | ON | OFF | Set to the slave Pack 17 |
| 19 | ON | ON | OFF | OFF | ON | OFF | Set to the slave Pack 18 |
| 20 | OFF | OFF | ON | OFF | ON | OFF | Set to the slave Pack 19 |
| 21 | ON | OFF | ON | OFF | ON | OFF | Set to the slave Pack 20 |
| 22 | OFF | ON | ON | OFF | ON | OFF | Set to the slave Pack 21 |
| 23 | ON | ON | ON | OFF | ON | OFF | Set to the slave Pack 22 |
| 24 | OFF | OFF | OFF | ON | ON | OFF | Set to the slave Pack 23 |
| 25 | ON | OFF | OFF | ON | ON | OFF | Set to the slave Pack 24 |
| 26 | OFF | ON | OFF | ON | ON | OFF | Set to the slave Pack 25 |
| 27 | ON | ON | OFF | ON | ON | OFF | Set to the slave Pack 26 |
| 28 | OFF | OFF | ON | ON | ON | OFF | Set to the slave Pack 27 |
| 29 | ON | OFF | ON | ON | ON | OFF | Set to the slave Pack 28 |
| 30 | OFF | ON | ON | ON | ON | OFF | Set to the slave Pack 29 |
| 31 | ON | ON | ON | ON | ON | OFF | Set to the slave Pack 30 |

## FUN.SET

Function Switch: Six dip codes, “0” and “1”, refer to picture right.

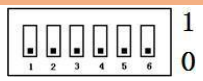



① In the case of a single machine, dip switches must be dipped 000001.

② For parallel use, use dip switch to set the address: The first and last need to be set as 000001, the middle battery is set as 000000.

## INV.SET

INV Switch: Six dip codes, “0” and “1”, refer to picture right.

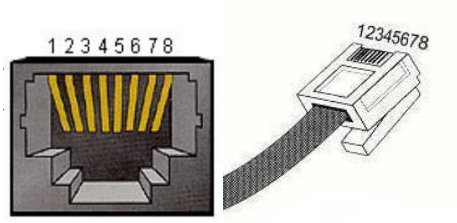



When the battery connects to the inverter, the battery needs to communicate. Inverter can set the dip switch on the board to configure hardware address. The inverter communication protocol can be changed directly by setting the dip switch, the definitions are shown in the following.

| Address Coding | Dip Code Switch Position | | | | | | Definition |
|---|---|---|---|---|---|---|---|
| | #1 | #2 | #3 | #4 | #5 | #6 | |
| 0 | OFF | OFF | OFF | OFF | OFF | OFF | Monitoring Software setting mode |
| 1 | OFF | ON | OFF | OFF | OFF | OFF | Studer_Xtender |
| 2 | ON | ON | OFF | OFF | OFF | OFF | Sofar_ LV |
| 3 | OFF | OFF | ON | OFF | OFF | OFF | Solis_ LV |
| 4 | OFF | ON | ON | OFF | OFF | OFF | Victron_color control |
| 5 | ON | ON | ON | OFF | OFF | OFF | SMA_ LV |
| 6 | OFF | OFF | OFF | ON | OFF | OFF | Sermatec_LV |
| 7 | ON | OFF | OFF | ON | OFF | OFF | Reserved |
| 8 | OFF | ON | OFF | ON | OFF | OFF | Growatt_SPF |
| 9 | OFF | OFF | ON | ON | OFF | OFF | Schneider Gateway |
| 10 | ON | OFF | ON | ON | OFF | OFF | SOL-ARK_ LV |
| 11 | OFF | ON | ON | ON | OFF | OFF | Phocos-AnyGrid |
| 12 | ON | OFF | OFF | OFF | ON | OFF | DEYE |
| 13 | OFF | ON | OFF | OFF | ON | OFF | Growatt_SPH |
| 14 | ON | ON | OFF | OFF | ON | OFF | Reserved |
| 15 | OFF | OFF | ON | OFF | ON | OFF | Reserved |
| 16 | ON | OFF | ON | OFF | ON | OFF | SAJ-LV |
| 17 | ON | ON | ON | OFF | ON | OFF | Reserved |
| 18 | ON | OFF | OFF | ON | ON | OFF | Lux |
| 19 | OFF | ON | OFF | ON | ON | OFF | Reserved |
| 20 | OFF | OFF | ON | ON | ON | OFF | Reserved |
| 21 | ON | OFF | ON | ON | ON | OFF | Must |

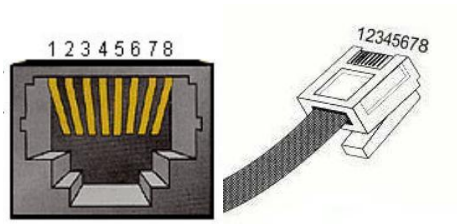
## LINK IN

Connect this port with LINK OUT port of the previous battery when parallel use.

| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | CAN1L |
| | 2 | CAN1H |
| | 3 | CAN1GND |
| | 4 | GND |
| | 5 | PW-OFF_SW |
| | 6 | CAN1GND |
| | 7 | XUNZIN- |
| | 8 | XUNZIN+ |

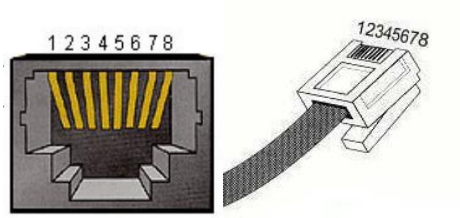
## LINK OUT

Connect this port with LINK IN port of the previous battery when parallel use.

| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | CAN1L |
| | 2 | CAN1H |
| | 3 | CAN1GND |
| | 4 | PW_ON2 |
| | 5 | PW_ON1 |
| | 6 | CAN1GND |
| | 7 | XUNZOUT- |
| | 8 | XUNZOUT+ |

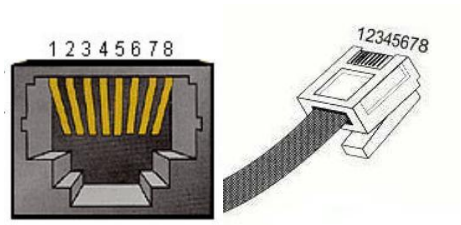
## INV.COM

Device supply inverter communication connection: RS485 & CAN Interface. CAN/RS485 communication port: (RJ45 port) follow CAN protocol and RS485 protocol, for output batteries information, the battery uses this interface to communicate with external inverters, PCS, and other devices.

| Port definitions | RJ45 Pin | Function |
|---|---|---|
|  | 1 | RS485_2B |
| | 2 | RS485_2A |
| | 3 | RS485_2GND |
| | 4 | CAN2GND |
| | 5 | CAN2GND |
| | 6 | RS485_2GND |
| | 7 | CAN2H |
| | 8 | CAN2L |

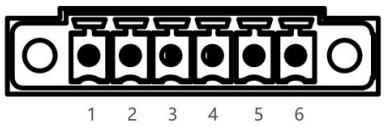
## DEBUG port

The device supply CAN communication connection, for manufacturers or professional engineers debugging or service.

| Port definitions | RJ11 Pin | Function |
|---|---|---|
|  | 1 | CAN1L |
| | 2 | CAN1H |
| | 3 | GND |
| | 4 | CAN1GND |
| | 5 | CAN1GND |
| | 6 | GND |
| | 7 | IN_CANL |
| | 8 | IN_CANH |

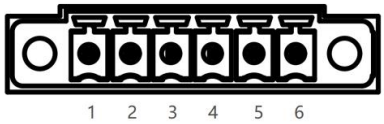
## Dry contect

Dry contact: provided 2 ways output dry contact signal.

| Port definitions | RJ11 Pin | Function |
|---|---|---|
|  | 1 | DRY1_NO |
| | 2 | DRY1 |
| | 3 | DRY1_NC |
| | 4 | DRY2_NO |
| | 5 | DRY2 |
| | 6 | DRY2_NC |

## INV COM

Inverter CAN/RS485 communication port: Follows CAN protocol and RS485 protocol. For the output system information, the system master uses this interface to communicate with External inverter PC and other equipment.

| Port definitions | RJ11 Pin | Function |
|---|---|---|
|  | 1 | RS485_1B |
| | 2 | RS485_1A |
| | 3 | RS485_1G |
| | 4 | CANL |
| | 5 | CANH |
| | 6 | CANGND |

## Battery anode and Battery cathode

Battery anode and battery cathode: there are two pair of terminals with same function, one connects to equipment, the other one paralleling to other battery module for capacity expanding. For each single module, each terminal can achieve charging and discharging function. For power cables uses water-proofed connectors. It must keep pressing this Lock Button while pulling out the power plug.


## Function features

a. Alarm indicator: Red LED flashing to show the battery has alarm, and always- on to show the SOC indicator: Indicates SOC status and charging status.

b. Alarm indicator: Indicating fault status.

c. Run indicator: Indicates the network status.

**Table 1 LED flashing instructions**

| Flashing way | ON | OFF |
|---|---|---|
| Flash 1 | 0.25S | 3.75S |
| Flash 2 | 0.5S | 0.5S |
| Flash 3 | 0.5S | 1.5S |

**Table 2 LED RUN status instructions**

| State | Running state |
|---|---|
| **The network status** | **Run●** |
| Shutdown | Off |
| WiFi is not connected to the router | On |
| WiFi is connected to the router | Flash 2 |
| WiFi connection to the cloud platform | Flash 3 |

***See the definition for Flash 1/2/3 on the following page.**

**Table 3 LED ALM working state indication**

| State | Running state |
|---|---|
| **The alarm light status** | **Alarm●** |
| No protection/alarm/fault | Off |
| Alarm | Flash 3 |
| Protection | Flash 2 |
| Fault | On |

| State | Normal protect | ALM<br>● | Indicate |
|---|---|---|---|
| Shutdown | Power down | OFF | All off |
| Standby | Normal | OFF | Standby |
| | Warning | Flash 3* | Low voltage |
| Charging | Normal | OFF | Overcharge alarm ALM lightdoes not flash |
| | Warning | Flash 3* | |
| | Protect | Flash 2* | Stop charging |
| | Temperature, overcurrent, failure protection | ON | Stop charging |
| Discharging | Normal | OFF | / |
| | Warning | Flash 3* | |
| | Protect | Flash 2* | Stop discharging |
| | Temperature, overcurrent, Short, failure protection | ON | Stop discharging |
| Failure | Failure | ON | Stop charging and discharging |
| Parallel | Address >1 and not connected | / | The slave waits for a parallel state |

**Table 4 LED SOC status instructions**

| State | | Charging | | | | Standby/Discharging | | | |
|---|---|---|---|---|---|---|---|---|---|
| Capacity indication light | | L4● | L3● | L2● | L1● | L4● | L3● | L2● | L1● |
| Capacity (%) | 0% | OFF | OFF | OFF | Flash 2 | OFF | OFF | OFF | OFF |
| | 0 ~ 25% | OFF | OFF | OFF | Flash 2 | OFF | OFF | OFF | ON |
| | 25 ~ 50% | OFF | OFF | Flash 2 | ON | OFF | OFF | ON | ON |
| | 50 ~ 75% | OFF | Flash 2 | ON | ON | OFF | ON | ON | ON |
| | 75 ~ 100% | Flash 2 | ON | ON | ON | ON | ON | ON | ON |

## 5.5. Sleep and wake up

### 5.5.1. Sleep

When any of the following conditions is met, the battery enters the low-power mode:

1) Under voltage protection is not released within 30 seconds.
2) The lowest cell voltage is lower than the sleep voltage, and the duration reaches the sleep delay time (while meeting the requirements of no communication, no protection, no equilibrium, and no current).
3) Standby mode lasts for more than 24 hours (no communication, no charge and discharge, no mains power, minimum cell is less than 3.2V).
4) Forced shutdown from the ZRGP Ems Tools.

Before entering sleep, make sure no charger is connected, otherwise, it will not be able to enter low-power mode.

### 5.5.2. Wake up

When the system is in the low-power mode and any of the following conditions is satisfied, the system will exit the low-power mode and enter the normal operating mode:

1) Connect the charger, and the output voltage of the charger must be greater than 48V.
2) Connect the communication line and open the ZRGP Ems Tools (if enters sleep mode due to over-release protection, and this method cannot wake up the battery).
3) Use the power software switch.

***NOTE:***

- *After battery over-discharge protection, it enters the low-power mode, wakes up at a regular time every 4 hours, and starts open switch to charging or discharging. If it can be charged, it will exit the sleep mode and enter the normal charging state. If the auto wakes up fails to charge for 10 consecutive times, it will no longer auto wake up. When the system is defined as the end of charging, and the recovery voltage is still not reached after 2 days /48h standby time (standby time set value), it is forced to resume charging until the end of recharging.*

## 5.6. Protection

The battery system is equipped with comprehensive protection features, including but not limited to overcharge/overdischarge protection, high/low temperature protection during charging/discharging, overcurrent protection during charging/discharging, and short circuit protection, ensuring the safety and stability of the battery under various usage conditions.

## 5.7. Heating

When the battery is equipped with a heating film, the system will continuously monitor cell temperature. If the lowest cell temperature is below 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 15°C, the heating function will automatically deactivate to prevent overheating.

## 5.8. 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.

## 5.9. 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.

## 5.10. Charging Self-Adaptation Control

The system will automatically reduce charging power when the battery is in low/high temperature conditions or low/high SOC.

## 5.11. 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.

# 6. How to Match Communication with Inverter

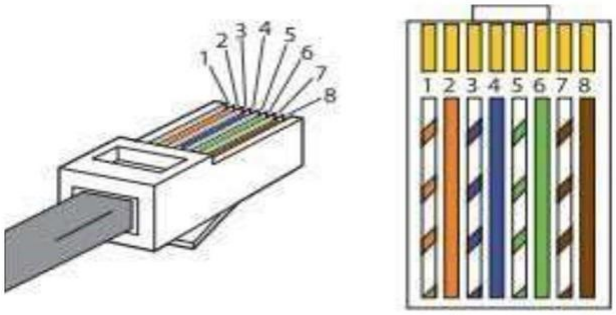
## 6.1. Supported Brands

At present, the energy storage products of our company have completed matching tests with some series of inverters of the following brands, and we will continue matching tests with inverters of other companies. Please check our official website for the latest list of supporting brands. http://www.zruipower.com.

## 6.2. Inverter Matching List

The list tab only lists the inverter manufacturers one of the same series products, general inverter manufacturers in the same series of other products, the communication protocol are the same, so our battery can be communicated with the other products of same series inverter, if encounter a series of products can't communicate, please contact us.
The following inverter matching list may not be up to date. The list may change according to the software version upgrade, and the reference manual may does not change immediately according to the software version upgrade. Therefore, if the user wants to get the latest inverter matching support, please browse the official website to check the relevant documents, http://www.zruipower.com.
The inverter manufacturer may upgrade its software version, which may cause problems in communication between our battery and the inverter. Therefore, before communicating with the inverter, please confirm whether the software version of the inverter is consistent with the list. If not, please contact us.

## 6.3. Making the BMS Communication Cable

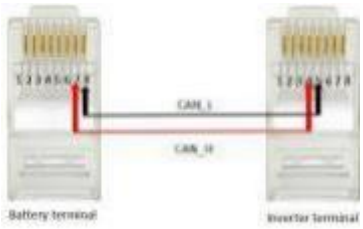
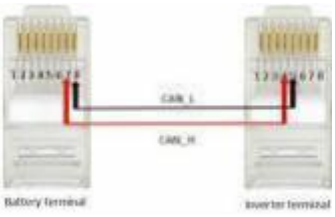
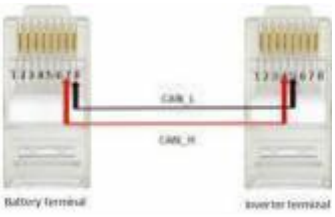
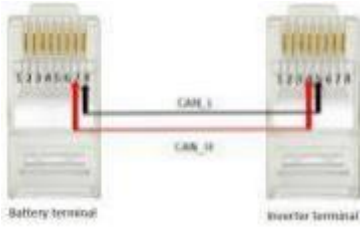
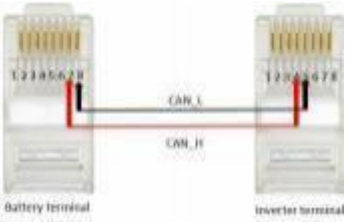
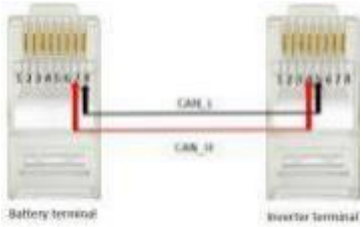
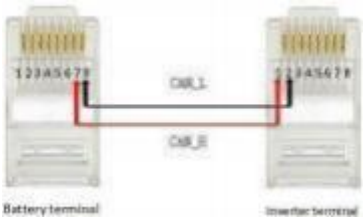


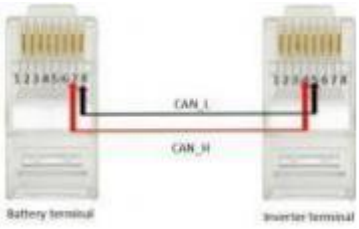
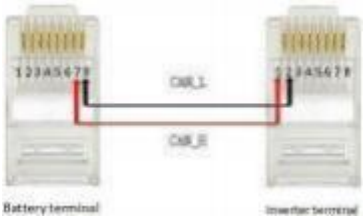
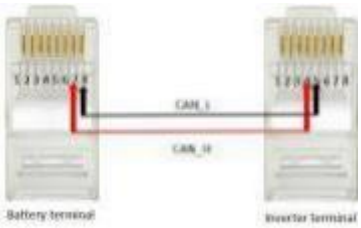
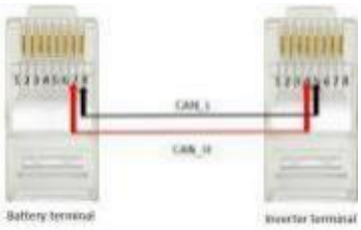

1) Cut network cable to the needed length.
2) Strip 2.5 to 5 cm of the outer sheath at one end of the cable.
3) Untwist and separate each pair of wires.
4) Arrange the wires in this order.
5) Keep only the cables you need.
6) Bring the sorted wires together and trim them to about 1.4 cm in length.
7) Hold the RJ45 plug with the copper contacts facing up, and insert the wires into the plug, making sure that they stay aligned and each color goes into its appropriate channel.
8) Put the plug into a cable crimper and squeeze the handles thoroughly.

Connection with inverter

This section will introduce how to hardware connect ZR-FC series products with the 8.2 section "Inverter Matching List". Inverters manufacturers may upgrade their products, resulting in hardware communication interface changes. If communication is not possible in the application according to the following wiring method, please contact us.

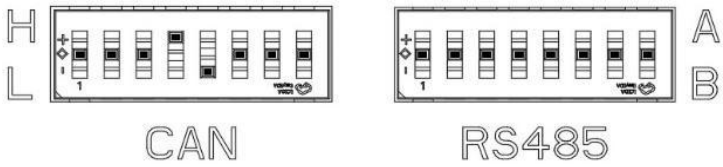
The CAN/RS485 communication port of ZR-FC relates to the communication interface of inverter.

| **Connect to the DEYE / SUNSYNK inverter** | **Connect to the Solis inverter** |
|---|---|
|  |  |
| **Connect to the Growatt-SPF inverter** | **Connect to the Growatt-SPH inverter** |
|  |  |
| **Connect to the LUX inverter** | **Connect to the Must inverter** |
|  |  |
| **Connect to the Sol-ark-12k inverter** | **Connect to the Sofar inverter** |
|  |  |

| Connect to the Sermatec inverter | Connect to the Studer inverter |
|---|---|
|  |  |
| **Connect to the SAJ inverter** | **Connect to the Victron inverter** |
|  |  |
| **Connect to the SMA inverter** | |
|  | |

a. If you are using the pin order select box, please refer to the table above to set the dip switch, according to the inverter brand.

b. For example, if you want to match a Deye inverter, you should dip 4 high and 5 low on the CAN side as shown in the following figure.




c. If the inverter brand is not shown in the table, please refer to the inverter manual or consult ZRGP's engineer.

***NOTE:***

- *The above CAN and RS485 communication connections are not connected the ground wire, in the application of relatively large interference, it is recommended to connect the ground wire, the ground wire connection method is a single-ended shielding line.*

- *If you want to view inverter matching and dip details, please visit our website https://zruipower.com/wp-content/uploads/2023/09/Inverter-Matching-Guide-ZRGP-battery1.pdf.*

# 7. Trouble Shooting Steps

## 7.1. Problem Determination Based on

1) Whether the system can be opened.

2) If the system is turned on, check whether the display is on.

3) If the display goes off, check whether the system can be charged/discharged.

## 7.2. Status Codes

The following status codes are displayed on the cloud platform.

### 7.2.1. Warning Codes

| Code | Warning type | Solution |
|---|---|---|
| W1 | Battery cell overvoltage alarm | 1. High voltage level and needs to be discharged. |
| W2 | Battery cell undervoltage alarm | 1. Low voltage level and needs to be charged. |
| W3 | Charge overcurrent alarm | 1. Restore to factory setting.<br>2. Make sure the inverter's max current setting does not exceed the max charge current of the battery. |
| W4 | Discharge overcurrent 1 alarm | 1. Make sure the power of load does not exceed the power of battery. |
| W6 | High charge temp alarm | 1. Make sure the battery temperature shown on the inverter or the app is below 50℃, otherwise turn off the battery until the temperature is below 50℃. |
| W7 | High discharge temp alarm | 1. Make sure the battery temperature shown on the inverter or the app is below 50℃, otherwise turn off the battery until the temperature is below 50℃. |
| W8 | Low charge temp alarm | 1. Make sure the battery temperature shown on the inverter or the app is above 5℃, otherwise turn off the battery until the temperature is above 5℃. |
| W9 | Low discharge temp alarm | 1. Make sure the battery temperature shown on the inverter or the app is above -15℃, otherwise turn off the battery until the temperature is above -15℃. |
| W11 | High ambient temp alarm | 1. Make sure the ambient temperature of the battery is below 50℃. |

| | | |
|---|---|---|
| W12 | High voltage difference alarm | 1. Restart the battery, and if the error code W12 still remaining or reappears, contact your installer. |
| W13 | Low SOC alarm | 1. Low SOC and needs to be charged. |
| W51 | High total voltage alarm | 1. High voltage level and needs to be discharged. |
| W52 | Low total voltage alarm | 1. Low voltage level and needs to be charged. |
| W53 | Low ambient temp alarm | 1. Make sure the ambient temperature of the battery is above -25℃. |
| W54 | High MOS temp alarm | 1. Reduce the ambient temperature and restart the battery. |
| W58 | Positive connector high temp alarm | 1. Restart the battery, and if error code W58 still remains or reappears, contact your installer. |
| W59 | Negative connector high temp alarm | 1. Restart the battery, and if error code W59 still remains or reappears, contact your installer. |
| W400 | PCS disconnection | 1. Restart the battery, and if error code W400 still remains or reappears, contact your installer. |

### 7.2.2. Protection Codes

| Code | Warning type | Solution |
|---|---|---|
| P1 | Battery cell overvoltage protection | 1. High voltage level and needs to be discharged. |
| P2 | Battery cell undervoltage protection | 1. Low voltage level and needs to be charged. |
| P3 | Overcurrent charge protection | 1. Restore to factory setting.<br>2. Make sure the inverter's setting of max current does not excess the max charge current of the battery. |
| P4 | Overcurrent discharge protection | 1. Make sure the power of load does not exceed the power of battery. |
| P6 | High charge temp protection | 1. Make sure the battery temperature shown on the inverter or the app is below 52℃, otherwise turn off the battery until the temperature is below 52℃, and then try to charge battery. |
| P7 | High discharge temp protection | 1. Make sure the battery temperature shown on the inverter or the app is below 52℃, otherwise turn off the battery until the temperature is below 52℃, and then try to discharge battery. |
| P8 | Low charge temp protection | 1. Make sure the battery temperature shown on the inverter or the app is above 0℃, otherwise turn off the battery until the temperature is above 0℃, and then try to charge battery. |
| P9 | Low discharge temp protection | 1. Make sure the battery temperature shown on the inverter or the app is above -20℃, otherwise turn off the battery until the temperature is above -20℃, and then try to discharge battery. |
| P11 | High ambient temp protection | 1. Make sure the ambient temperature of the battery is below 52℃. |
| P12 | Excessive voltage difference protection | 1. Restart the battery, and if error code P12 still remains or reappears, contact your installer. |
| P13 | Low SOC protection | 1. Low voltage level and needs to be charged. |
| P51 | High total voltage protection | 1. High voltage level and needs to be discharged. |
| P52 | Low total voltage protection | 1. Low voltage level and needs to be charged. |
| P53 | Low ambient temp protection | 1. Make sure the ambient temperature of the battery is above -25℃. |
| P54 | High MOS temp protection | 1. Reduce the ambient temperature and restart the battery. |

| | | |
|---|---|---|
| P55 | Overcurrent discharge 2 protection | 1. Make sure the power of load does not exceed the power of battery. |
| P58 | Positive connector high temp protection | 1. Reduce the ambient temperature and restart the battery. |
| P59 | Negative connector high temp protection | 1. Reduce the ambient temperature and restart the battery. |
| P66 | Charger overvoltage protection | 1. Restart the battery, and if error code P66 still remains or reappears, contact your installer. |

### 7.2.3. Error Codes

| Code | Warning type | Solution |
|---|---|---|
| F5 | 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, and if the error code F5 still remains or reappears, contact your installer. |
| F13 | The main control discharge relay is faulty | 1. Restart the battery, and if error code F13 still remains or reappears, contact your installer. |
| F14 | The main control charge relay is faulty | 1. Restart the battery, and if error code F14 still remains or reappears, contact your installer. |
| F15 | Battery cell failure | 1. Restart the battery, and if error code F15 still remains or reappears, contact your installer. |
| F16 | NTC fault | 1. Restart the battery, and if error code F16 still remains or reappears, contact your installer. |
| F18 | Current sensor fault | 1. Restart the battery, and if error code F18 still remains or reappears, contact your installer. |
| F26 | Microelectronic fault | 1. Restart the battery, and if error code F26 still remains or reappears, contact your installer. |
| F28 | Heating fault | 1. Restart the battery, and if error code F28 still remains or reappears, contact your installer. |
| F30 | Precharge fault | 1. Restart the battery, and if error code F30 still remains or reappears, contact your installer. |
| F41 | Battery module conflict | 1. Restart the battery, and if error code F41 still remains or reappears, contact your installer. |
| F42 | Battery reverse connection fault | 1. Restart the battery, and if error code F42 still remains or reappears, contact your installer. |
| F43 | Address non-1 fault | 1. Restart the battery, and if error code F43 still remains or reappears, contact your installer. |
| F44 | Address break-sign failure | 1. Restart the battery, and if error code F44 still remains or reappears, contact your installer. |
| F45 | Pack disconnect fault | 1. Restart the battery, and if error code F45 still remains or reappears, contact your installer. |
| F47 | Battery cell undervoltage safety lock | 1. Restart the battery, and if error code F47 still remains or reappears, contact your installer. |

| | | |
|---|---|---|
| F48 | Battery cell high voltage safety lock | 1. Restart the battery, and if error code F48 still remains or reappears, contact your installer. |
| F49 | Charge high temp safety lock | 1. Restart the battery, and if error code F49 still remains or reappears, contact your installer. |
| F50 | Charge low temp safety lock | 1. Restart the battery, and if error code F50 still remains or reappears, contact your installer. |
| F51 | Discharge high temp safety lock | 1. Restart the battery, and if error code F51 still remains or reappears, contact your installer. |
| F52 | Discharge low temp safety lock | 1. Restart the battery, and if error code F52 still remains or reappears, contact your installer. |
| F53 | Charge overcurrent safety lock | 1. Restart the battery, and if error code F53 still remains or reappears, contact your installer. |
| F54 | Discharge overcurrent safety lock | 1. Restart the battery, and if error code F54 still remains or reappears, contact your installer. |
| F55 | Master drop-off fault | 1. Restart the battery, and if error code F55 still remains or reappears, contact your installer. |
| F56 | Pack disconnect fault | 1. Restart the battery, and if error code F56 still remains or reappears, contact your installer. |
| F57 | EMS SN is empty | 1. Restart the battery, and if error code F57 still remains or reappears, contact your installer. |
| F58 | Master SN is empty | 1. Restart the battery, and if error code F58 still remains or reappears, contact your installer. |
| F60 | Pack SN is empty | 1. Restart the battery, and if error code F60 still remains or reappears, contact your installer. |

# 8. Storage, Transportation and Emergency Situations

## 8.1. Storage

Recharge and maintain the battery pack regularly ***every 3 months*** to ensure the battery is in the best condition.

## 8.2. Transportation

Battery packs need to be packed before they can be shipped, during transportation, severe impact, extrusion, direct sunlight, and rain should be protected.

## 8.3. Emergency Situation

1) Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If one is exposed to the leaked substance, immediately perform the actions described below.
Inhalation: Evacuate the contaminated area and seek medical attention.
Contact with eyes: Do not rub your eyes. Rinse eyes immediately with flowing water for 15 minutes and seek medical attention.
Contact with skin: Wash the affected area thoroughly with soap and water and seek medical attention.
Ingestion: Induce vomiting and seek medical attention.

2) Fire

***NO WATER!*** Only ***dry powder*** fire extinguisher can be used; if possible, move the battery pack to a safe area before it catches fire.

3) Wet Batteries

If the battery pack is wet or submerged in water, do not allow any person access, and then contact an authorized dealer for technical support.

4) Damaged Batteries

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.

***NOTE:***

- *Damaged batteries may leak electrolytes or produce flammable gas.*
- *In case a damaged battery needs recycling in Australia, it shall be processed in compliance with all applicable state and territory regulations, such as the Product Lifecycle Responsibility Bill in New South Wales. The handler must use the best available techniques to achieve high recycling efficiency and meet all safety and environmental obligations.*
- *Any further questions, please contact ZRGP: support@zruipower.com*

P/N: 118.601.00.0027

# OUR ENERGY WORKS FOR YOU

Website

LinkedIn

www.zruipower.com

support@zruipower.com

+86(0755)2833 9703