

POWER[®]
QUEEN

Power Queen



www.ipowerqueen.com

Product Manual

**Lithium Iron Phosphate
(LiFePO₄) Battery**

51.2V

90Ah

(90A BMS)

 service@ipowerqueen.com

 technicalsupport@ipowerqueen.com

PRODUCT OVERVIEW

BATTERY

Combination: 51.2V 90Ah

Dimension: L17.4*W16.54*H7 inch

Plastic Shell Color: Khaki + Dark Grey

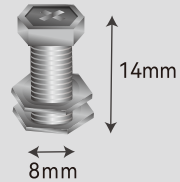


TERMINAL & POST BOLTS

Terminal Size: M8 * 14mm Metric Thread

Post Bolts: M8 * 1.25mm Metric Thread
* 14mm Bolt Length

(The bolts can be replaced with M8 bolts of other lengths based on actual needs.)



GENERAL INFORMATION

Operating Voltage: 51.2V

Charging Voltage: 57.6±0.8V

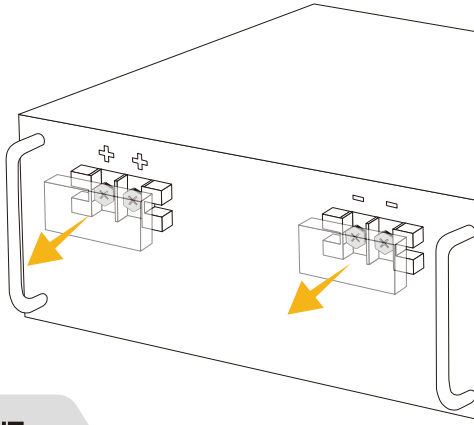
Max Continuous Load Power: 4608W

Max Continuous Charging/Discharge Current: 90A

NOTICE

BEFORE USING

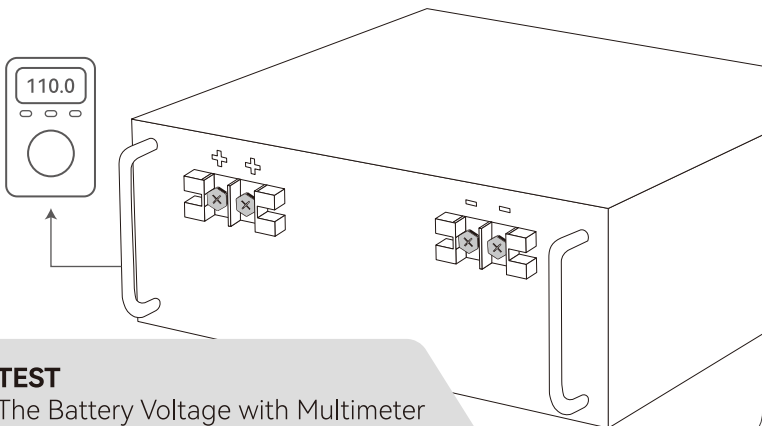
- 1 **CONTACT US** at service@ipowerqueen.com to activate the warranty



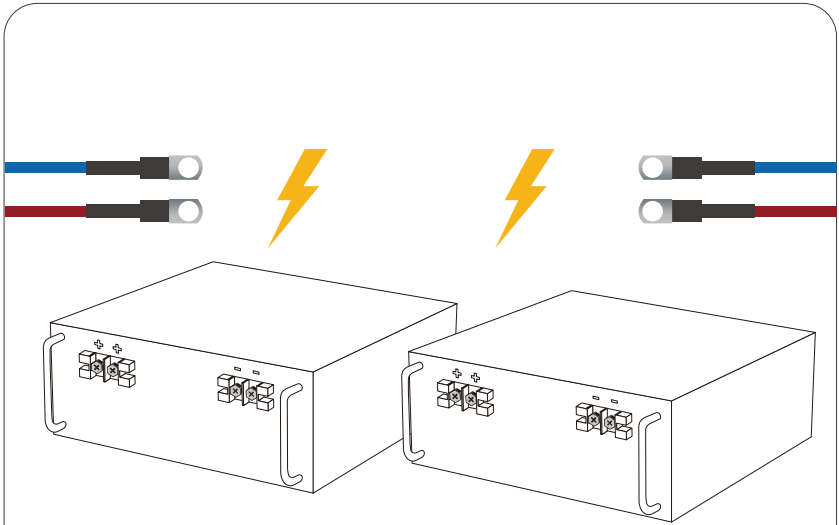
- 2 **PULL OUT**
Protection Cover

≥48V To Step 4

<48V Contact us at service@ipowerqueen.com to help solve the problem.



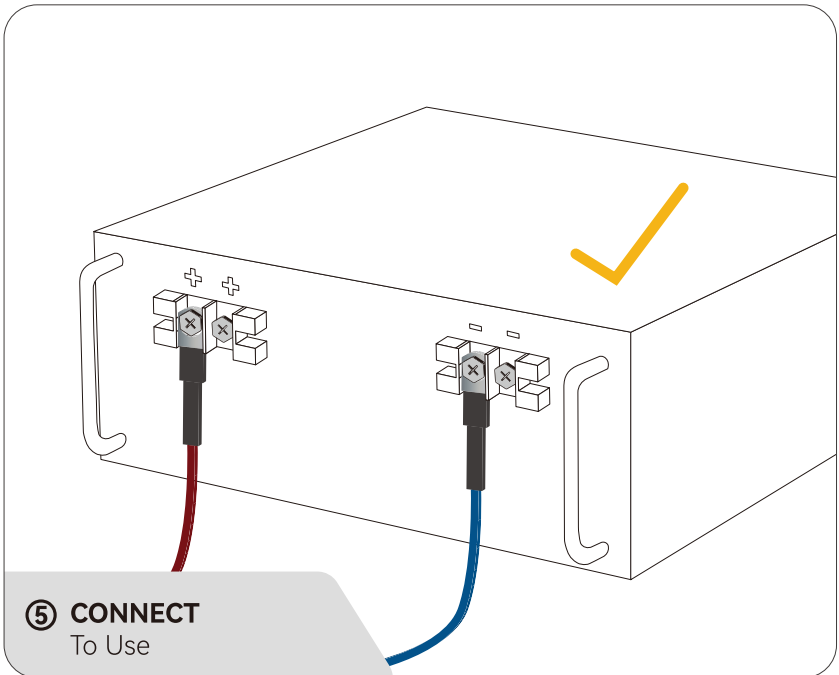
- 3 **TEST**
The Battery Voltage with Multimeter



④ FULLY CHARGE

The Battery Separately

(Refer to Page 04 for battery charging methods)



⑤ CONNECT

To Use

CONTENTS

01 BATTERY PARAMETERS

03 THINGS TO KNOW BEFORE USING

Page 03 Long Term Storage

04 CHARGING METHODS

Page 04 The Voltage When Charging & Discharging

Page 05 Battery Charging Logic

LiFePO4 Battery Charging Mode

Lead Acid Battery Charging Mode

Background
Information

Page 07 Solar Panel(s) & Controller

Solar Panel

Controller

Controller Settings

Method I

Page 08 Battery Charger

Method II

Page 08 Alternator / Generator

Method III

09

HOW TO ESTIMATE THE BATTERY CAPACITY

Page 09

State of Charge (SOC)

10

PARALLEL CONNECTIONPAGE

Page 10

The Premise of Connection

Page 10

Limitation for Series/Parallel Connection

Page 11

How to Connect Batteries

Accessory Recommendation

Step 1 Wear Insulating Gloves

Step 2 Voltage Balancing Before Connection

Step 3 Battery-to-Battery Connection

Step 4 Rebalancing Every Six Months

16

INVERTER SETTINGS

17

WHAT TO DO WHEN THE BATTERY STOPS WORKING?

MAIN PARAMETERS

Item	Parameter
Cell	Prismatic LiFePO4 Battery
Nominal Capacity	90Ah
Usable Capacity	90Ah
Nominal Voltage	51.2V
Energy	4608Wh
Charge Method	CC/CV
Charge Voltage	57.6V±0.8V
Recommend Charge Current	18A (0.2C)
Battery Management System (BMS) Board	90A
Max. Continuous Charge / Discharge Current ^①	90A
Max. Discharge Current 5 Seconds	200A
Max. Continuous Load Power ^②	4608W

①The maximum continuous current that the battery can withstand.

②The maximum continuous output power that the battery can support.

Item	Parameter
Internal Impedance	≤40mΩ
Battery Pack Case	Steel Plate Cold Common (SPCC)
Dimension	L17.4*W16.54*H7 inch
	L442*W420*H178 mm
Temperature Range	Charge:0°C to 50°C / 32°F to 122°F
	Discharge: -20°C to 60°C / -4°F to 140°F
	Storage:-10°C to 50°C / 14°F to 122°F

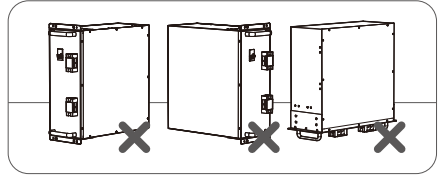


THINGS TO KNOW

BEFORE USING

⏏ Please take care to avoid metal or conductive objects touching the positive and negative terminals of the battery at the same time during your operation, otherwise it is likely to cause a short circuit.

⏏ **DO NOT** install or mount the battery by its left or right side, or with its post bolts facing down. If you are not sure about the installation direction, please contact service@ipowerqueen.com to confirm the direction.



⏏ **Tightly screw in the post bolts.** Having loose battery terminals will cause the terminals to build up heat resulting in damage to the battery.

⏏ This battery is not intended to be used to start any devices, please **DO NOT** use it as a starting battery.

⏏ Suggestions for Long-term Storage

Temperature

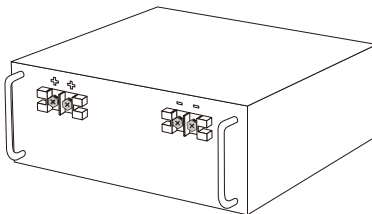
The battery can be operated at a temperature of -20°C to 60°C / -4°F to 140°F , and a temperature between **10°C to 35°C / 50°F to 95°F** is ideal for long-term storage. Store in a fireproof container and away from children.

Capacity

For a longer-lasting product, it is best to store your battery **at a 50% charge** level and recharge every three months if it is not going to be used for a long time.



$10^{\circ}\text{C}\sim 35^{\circ}\text{C}$
Recharge
Every 3 Months

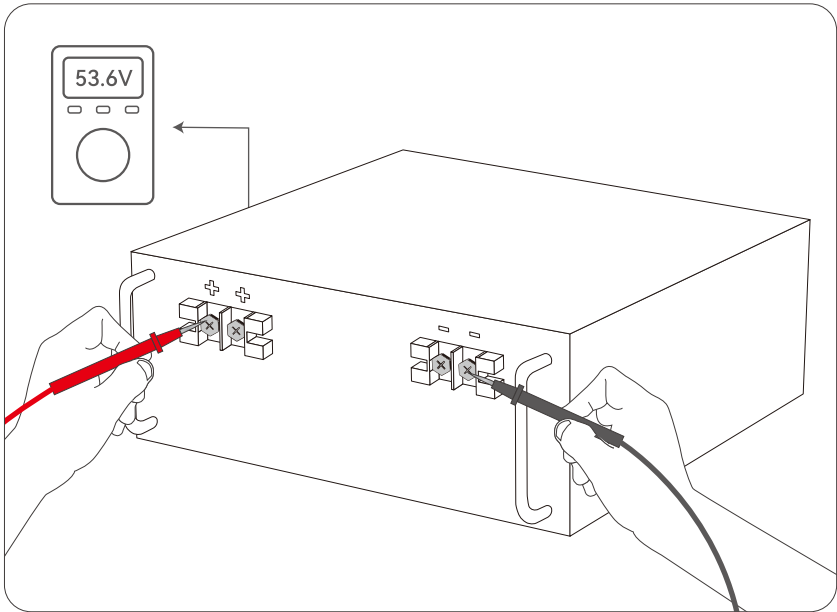


CHARGING METHODS

THE VOLTAGE WHEN CHARGING & DISCHARGING

Based on the characteristics of Lithium Iron Phosphate (LiFePO₄) batteries, the voltage measured by all LiFePO₄ batteries **during charging/discharging is not the real voltage of the battery**. Therefore, after charging/discharging and disconnecting the battery from the power source, the voltage of the battery will gradually drop/increase to its real voltage.

If you need to test the real voltage of the battery, please disconnect all the connections to the battery and test its voltage after putting it aside for over 30 mins.



Tips When Testing The Battery Voltage by A Multimeter

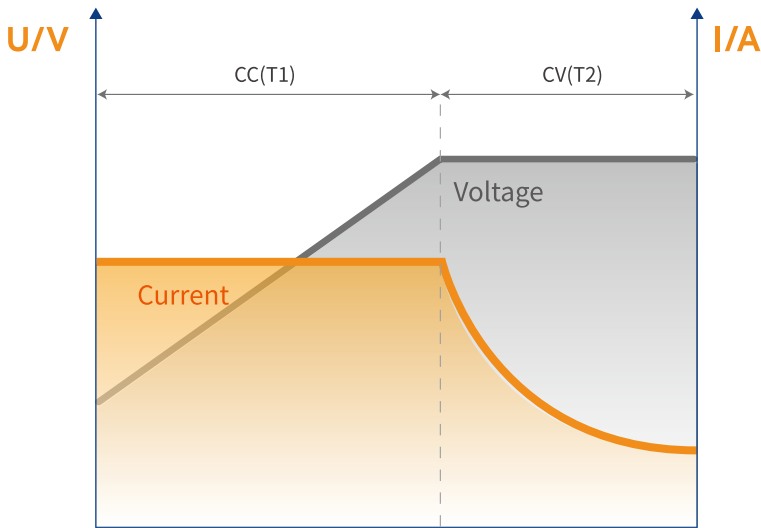
- ① 1. Put the red probe (+) tightly on the tightly screwed positive post bolt, and the black probe (-) on the tightly screwed negative post bolt.
- ② Do not touch the metal part of the probes with your hands during use.

BATTERY CHARGING LOGIC

The material characteristics of the LiFePO₄ battery determine that **its charging curve is obviously different from that of a lead-acid battery**. Compared with a lead-acid battery, the LiFePO₄ battery has a simpler charging process and mode. Therefore, it is recommended to select LiFePO₄ for your charging mode.

If LiFePO₄ mode is not available, please refer to the recommended parameters on Page 07–08 for setting.

LiFePO₄ Battery Charging Mode



LiFePO₄ Battery Charging Curve

CC (Constant Current) Phase (T1)

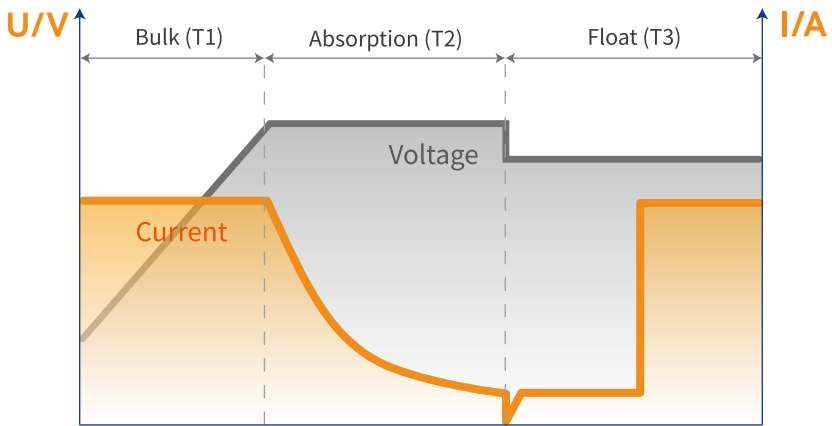
In the beginning, a discharged battery will be charged with a constant current and voltage will be climbing steadily until reaching the constant voltage setpoint which varies for different charging methods.

CV (Constant Voltage) Phase (T2)

The battery maintains a constant voltage during this phase while the current gradually decreases to 1.8A (0.02C) which is also known as tail current^①. At this point, the charging is cut off and the battery is fully charged.

^① Tail Current (A) = Battery Capacity * 0.02C. E.g., 90Ah*0.02C= 1.8A tail current.

Lead Acid Battery Charging Mode



Lead Acid Battery Charging Curve

Bulk / Boost Phase (T1)

In the beginning, a discharged battery will be charged with maximum current and voltage will be climbing steadily until reaching the absorption voltage setpoint.

(This phase is basically equivalent to the CC phase of LiFePO₄ battery charging.)

Absorption Phase (T2)

The battery reaches the absorption voltage setpoint and holds the voltage constant while the current gradually decreases until the battery is becoming full (within 10-20%). Generally, absorption will not exceed 3 hours to prevent overcharging.

(This phase is basically equivalent to the CV phase of LiFePO₄ battery charging.)

Float Phase (T3)

After the absorption stage, the voltage of the battery will reduce to the float voltage setpoint and the current will also reduce to a low maintenance mode to prevent the battery from discharging and offsetting any self-discharge. Heavier battery discharge may set the controller back to Bulk/Boost or Absorption to replenish energy lost while energy is available.

(LiFePO₄ battery does not have this charging phase.)

SOLAR PANEL(S) & CONTROLLER

Solar Panel

Recommend Power: $\geq 1500\text{W}$

- The battery can be fully charged in one day (with effective sunshine 4.5hrs/day) by 1500W solar panels.
- It may take more than one day to fully charge the battery by $\geq 1500\text{W}$ solar panels since the duration and intensity of light would be a great factor for their charging efficiency.

Controller

Recommend Charging Mode: 48V (58.4V) LI (LiFePO4)

Recommend Charging Current:

18A (0.2C) The battery will be fully charged in around 5hrs to 100% capacity.

45A (0.5C) The battery will be fully charged in around 2hrs to around 97% capacity.

Controller Settings

Refer to the below parameters if you need to manually set up your controller.

As different types of batteries have different charging modes (refer to Page 05-06), **it is recommended to set only the following parameters for LiFePO4 batteries.** The settings for other types of batteries do not apply to LiFePO4 batteries except for the following settings

CHARGING	Charge /Bulk /Boost Voltage	57.6V / 58.4V
	Absorption Voltage	57.6V / 58.4V
	Over Voltage Disconnect	60V
	Over Voltage Reconnect	56.8V
	Tail Current	1.8A (0.02C)

DIS-CHARGING	Under Voltage Warning	46.4V
	Under Voltage Recover	48V
	Low Voltage Disconnect	43.2V
	Low Voltage Reconnect	49.6V

BATTERY CHARGER

Use 58.4V lithium iron phosphate (LiFePO₄) battery charger to maximize the capacity.

Recommend Charging Voltage:Between **56.8V to 58.4V**

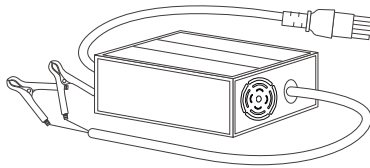
Recommend Charging Current:

18A (0.2C) The battery will be fully charged in around 5hrs to 100% capacity.

45A (0.5C) The battery will be fully charged in around 2hrs to around 97% capacity.

Tips

- ① Connect the charger to the battery before connecting it to the grid power in case of sparks.
- ② It's recommended to disconnect the charger from the battery after fully charging.



ALTERNATOR / GENERATOR

Power Queen battery can be charged by an alternator or generator.

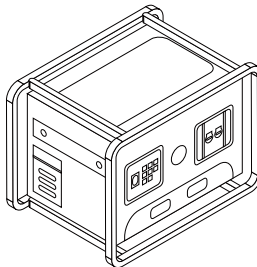
If the alternator/generator **supports DC output**, a DC-to-DC charger needs to be added between the battery and the generator; if the alternator/generator **supports AC output**, please refer to the recommendations in "Battery Charger" above to add a suitable battery charger between the battery and the generator

Recommend Charging Voltage:Between **56.8V to 58.4V**

Recommend Charging Current:

18A (0.2C) The battery will be fully charged in around 5hrs to 100% capacity.

45A (0.5C) The battery will be fully charged in around 2hrs to around 97% capacity.



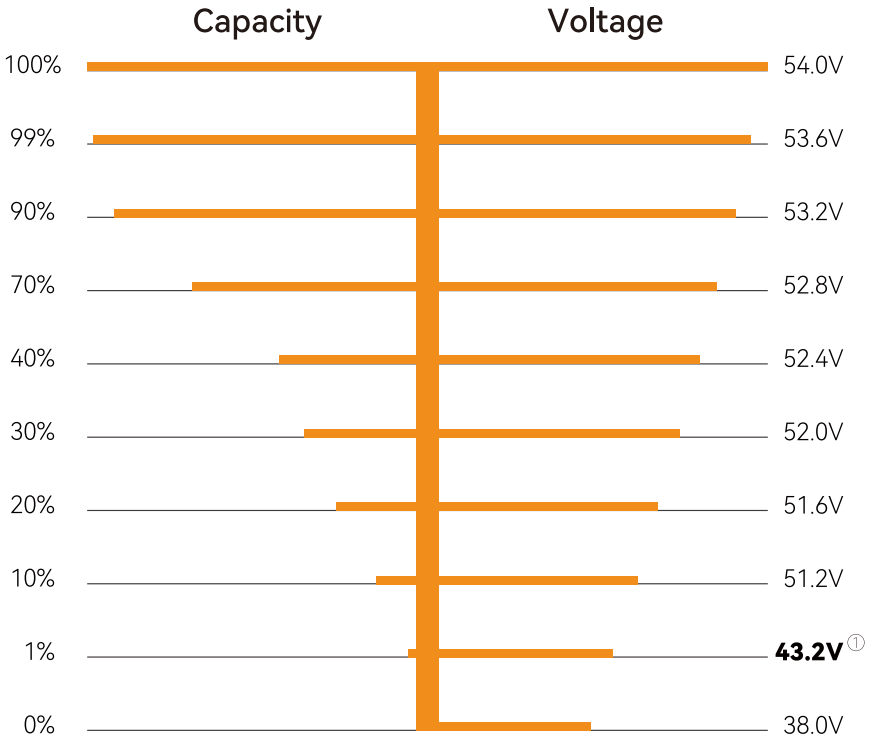
HOW TO ESTIMATE

THE BATTERY CAPACITY

📦 STATE OF CHARGE (SOC)

The battery capacity could be roughly estimated by its **rest voltage (not charging/discharging voltage)**. As there are subtle differences in the voltage of each battery, the below parameters are for reference only.

Rest Voltage: The voltage needs to be tested at rest (with zero current) after 30 mins of disconnecting from the charger & loads.



* ① Recommend low voltage disconnect voltage.

PARALLEL CONNECTION

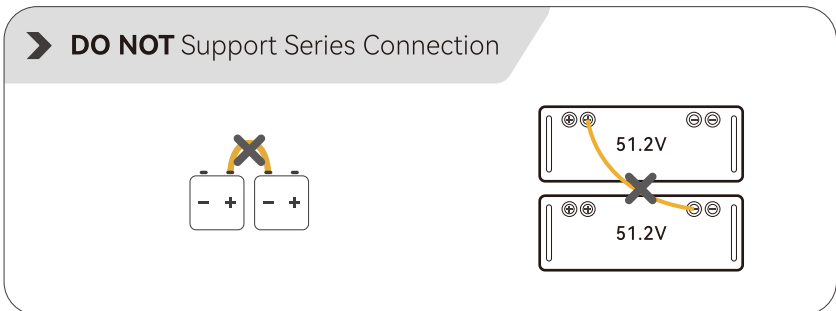
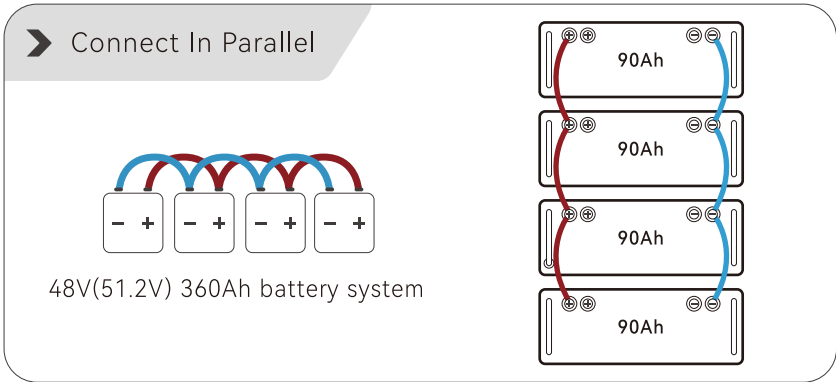
THE PREMISE OF CONNECTION

To connect in parallel, batteries should meet the below conditions:

- a. identical batteries with the same battery capacity (Ah) and BMS (A);
- b. from the same brand (as lithium battery from different brands has their special BMS);
- c. purchased in near time (within one month).

LIMITATION FOR SERIES/PARALLEL CONNECTION

Support connecting up to 4 identical batteries in parallel for up to 48V (51.2V) 360Ah battery system.



HOW TO CONNECT BATTERIES

Step1 Wear Insulating Gloves

Wear insulating gloves before connecting.
Please pay attention to operation safety in the process of connection.

➤ Connection Methods

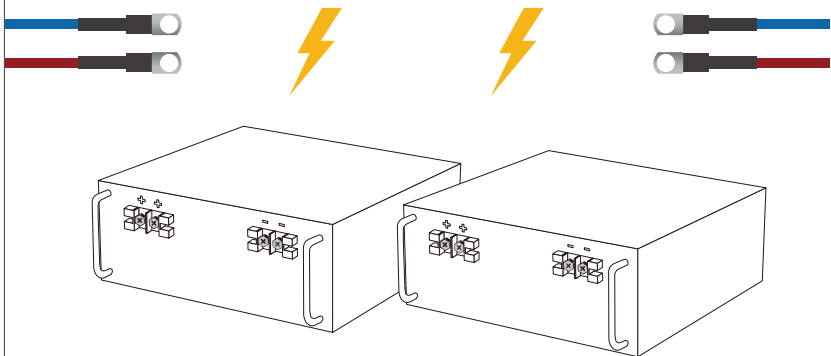


Step2 Voltage Balancing Before Connection

Below two steps are necessary to reduce the voltage difference between batteries and let the battery system perform the best of it in parallel.

➤ Step①

Fully charge the batteries separately.
(voltage at rest: $\geq 53.6V$)



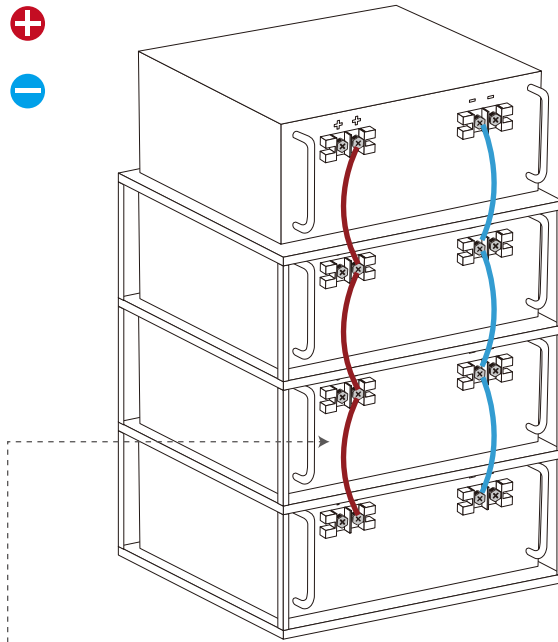
➤ Step②

Connect the batteries one by one **in parallel**, and leave them together for **12~24hrs**. After the battery voltages have been balanced, the paralleled battery system can be connected to the load referring to Step 3 on Page 13.

Connect Batteries in Parallel

+ to **+**

- to **-**



Recommend Battery-to-Battery Connection Cable:
6AWG Copper Cable.

After parallel connection, the **capacity** of the battery system will be doubled according to the number of batteries you connect.

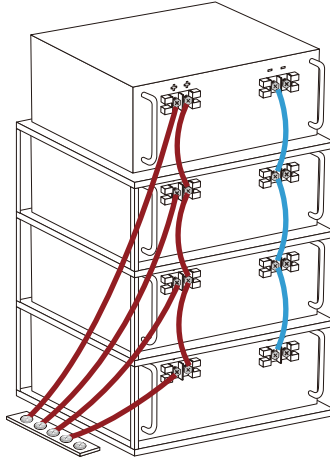
E.g. If two 48V (51.2V) 90Ah batteries are connected in parallel, the battery system will be 48V (51.2V) 180Ah.

Step3 Total Input & Output Connection

Adding two copper bars[®] to connect the paralleled system to the load.

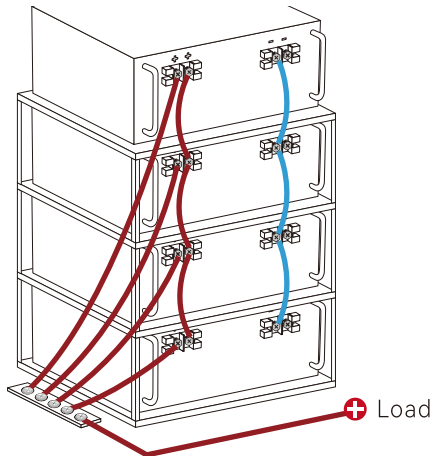
➤ Step①

Connect all the positive output cables of the batteries to one copper bar.




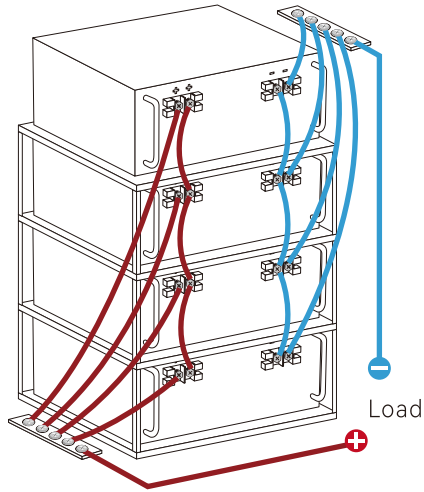
➤ Step②

Connect the **+** of the load to the copper bar. The cable gauge used in this step should be able to support the total input & output current of the entire battery system.



Step ①

The  of the battery system and load are also connected to another copper bar following the above steps.

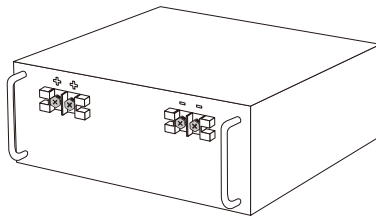


①Copper Bar: Flat metal made of copper. It can help ensure the input & output currents of each battery are balanced.

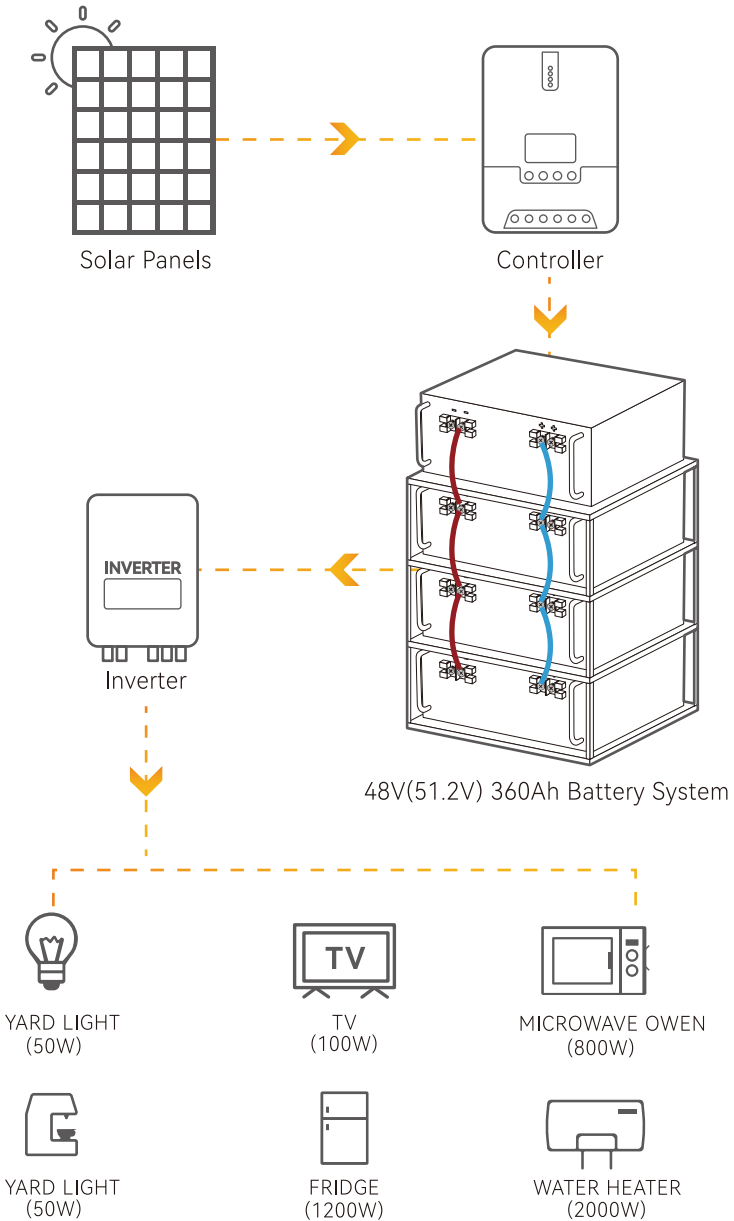
Copper is recommended as it has better conductivity, and the conversion efficiency of the input & output currents for the battery will be higher.

STEP 4 REBALANCING EVERY 6 MONTHS

It is recommended to rebalance the battery voltage every six months following Step 2 on Page 12 if you're connecting multiple batteries as a battery system, as there might be voltage differences after six months of the battery system running.



48V(51.2) 400AH BATTERY SYSTEM



Various Loads
Supporting Max. **18,432W** Load Power

INVERTER SETTINGS

📦 METHOD ONE (RECOMMEND)

Select “48V (58.4V) LI (LiFePO4) Mode”

📦 METHOD TWO

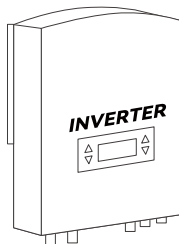
If method one is not available, select “User Mode” to enter values according to below parameters.

CHARGING	Charge Voltage	58.4V
	Over Voltage Disconnect	60V
	Over Voltage Reconnect	56.8V

DIS-CHARGING	Under Voltage Warning	46.4V
	Under Voltage Recover	48V
	Low Voltage Disconnect	43.2V
	Low Voltage Reconnect	49.6V

The above setting parameters **apply to common inverters on the market** (such as Victron, Renogy, Growatt, Xantrex, Go Power, Lux Power, etc.). Different brands have slightly different descriptions or naming methods for each parameter. **Please directly set the parameters with the same meaning.**

If the inverter parameters to be set are special or cannot correspond to one of the above items, please contact service@ipowerqueen.com for confirmation.



WHAT TO DO

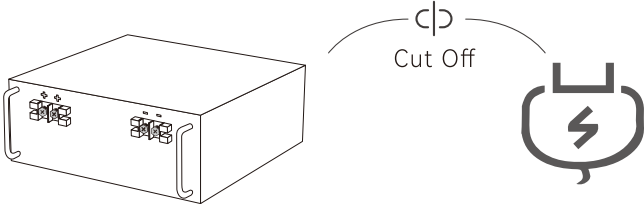
WHEN THE BATTERY STOP WORKING?

When the battery **① can't work**; **② can't be charged**; **③ voltage < 36V**, it has 85% chances that BMS has shut it off for protection, and you could try **one of below ways** to activate the battery.

📦 GENERAL STEPS

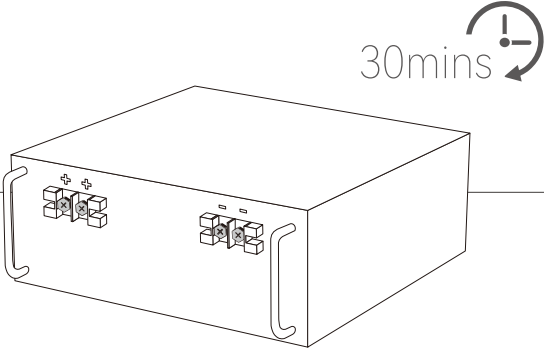
If the BMS has cut off the battery for protection, follow the below steps to activate it.

➤ Step① **Cut off** all the connections from the battery



The diagram shows a perspective view of a rectangular battery pack with two sets of terminals on the front face. To the right of the battery is a circular icon containing a lightning bolt, representing a battery. A curved line with a vertical bar in the middle (a switch symbol) connects the battery pack to the battery icon. Below this symbol, the text "Cut Off" is written.

➤ Step② **Leave the battery aside for 30mins**
Then the battery will automatically recover itself to normal voltage (>40V) and can be used after fully charged.



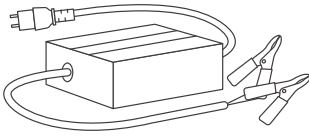
The diagram shows a perspective view of the same rectangular battery pack. Above the battery is a circular icon with a lightning bolt and an exclamation mark, representing a warning or error state. A curved arrow around the icon indicates a 30-minute duration. The text "30mins" is written next to the icon.

If the battery is unable to recover itself after the above steps, please try activating by  **ONE OF THE BELOW TWO METHODS.**

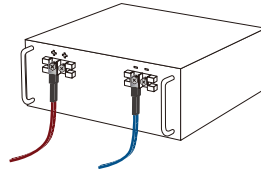
After activated (voltage > 40V) and fully charged by the normal charging method, it can be used normally.

➤ Method①

Use a **charger with a 0V charging function**^① to fully charge the battery.



0V Charging Function
Charger



Fully Charge

① The charger can charge the battery starting from 0V.

ATTENTION

CAUTION: RISK OF FIRE, EXPLOSION OR BURNS

DO NOT Short circuit

DO NOT Heat above 70°C

DO NOT Reverse connections from charger to battery

DO NOT Disassemble

DO NOT Throw into fire or incinerate

WARNING

BATTERY DISPOSAL

The electrodes of the waste battery should be wrapped with insulating paper to prevent fire and explosion.

PROHIBITION OF DISASSEMBLY

Never disassemble the cells.

The disassembling may generate an internal short circuit in the cell, which may cause gassing, firing, explosion, or other problems.

The electrolyte is harmful.

Li-Fe battery should not have liquid from electrolyte flowing, but in case the electrolyte comes into contact with the skin, or eyes, physicians shall slush the electrolyte immediately with fresh water and medical advice is to be sought.

PROHIBITION OF DUMPING OF CELLS INTO WATER

Do not soak the battery in which the liquid, like water, seawater and non-alcoholic drinks, fruit juice, coffee or other drinks.

PROHIBITION OF USE OF DAMAGED CELLS

If any abnormal features of the cells are found such as damages in a plastic envelope of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used anymore. The cells with a smell of the electrolyte or a leakage shall be placed away from the fire to avoid firing or explosion.

PROHIBITION OF USING IN BELOW PLACES

Do not use the battery in a place with strong static electricity and a strong magnetic field, otherwise, it is easy to damage the battery safety protection device and bring hidden danger.



POWER[®] QUEEN

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