

ROCKSOLAR[®]

Lithium iron phosphate battery
user manual

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Features of LiFePO4 Battery

- **Longer Cycle Life:** Offers up to 20 times longer cycle life and five times longer float/calendar life than lead acid battery, helping to minimize replacement cost and reduce total cost of owner.
- **Lighter Weight:** About 40% of the weight of a comparable lead acid battery. A 'drop in' replacement for lead acid batteries.
- **Higher Power:** Delivers twice power of lead acid battery, even high discharge rate, while maintaining high energy capacity.
- **Wider Temperature Range:** -20°C ~+60°C .
- **Superior Safety:** Automatic protection with internal battery management system. Lithium Iron Phosphate chemistry eliminates the risk of explosion or combustion due to high impact, overcharging or short circuit situation.
- **Increased Flexibility:** Modular design enables deployment of up to four batteries in series and up to ten batteries in parallel.

Application

RV, Electric vehicles, Boat ; Solar/wind energy storage system; UPS, backup power ; Telecommunication; Medical equipment; Lighting.



Warranty

Limited Warranty

ROCKSOLAR LLC. provides a non-transferable warranty to the purchaser of ROCKSOLAR product purchased from an authorized ROCKSOLAR reseller. ROCKSOLAR LLC. warrants to the original consumer purchaser that the ROCKSOLAR product will be free from defects in workmanship and material under normal consumer use during the applicable warranty period identified in the 'Warranty Period' section below, subject to the exclusions set forth below. This warranty statement sets forth ROCKSOLAR's total and exclusive warranty obligation. We will not assume, nor authorize any person to assume for us, any other liability in connection with the sale of our products.

Warranty Period

The warranty period for portable power stations is 12 months, while the warranty period for LiFePO4 batteries is 11 years. In each case, the warranty period is measured starting on the date of purchase by the original consumer purchaser. The sales receipt from the first consumer purchase, or other reasonable documentary proof, is required in order to establish the start date of the warranty period.

Remedy

ROCKSOLAR's entire liability and your exclusive remedy for any ROCKSOLAR product that is not operating in accordance with its published technical specifications are at ROCKSOLAR's discretion: replace the product at ROCKSOLAR's expense. This warranty obligation is conditioned upon the hardware being returned to the original place of purchase, or another place as directed by ROCKSOLAR, with the original sales receipt attached. You may be required to pay shipping and handling charges, as well as any applicable tariffs, duties, taxes, or other fees. ROCKSOLAR may, at its discretion, provide new or refurbished products.

Limited to Original Consumer Buyer

The warranty on ROCKSOLAR's product is limited to the original consumer purchaser and to any subsequent owner.

LIMITATION OF LIABILITY

ROCKSOLAR shall not be liable for any special, incidental, indirect, or consequential damages whatsoever, including, but not limited to loss of profits, revenue, or data (whether direct or indirect) or commercial loss for breach of any express or implied warranty on your product even if ROCKSOLAR has been advised previously of the possibility of such damages. Some local laws do not allow the exclusion or limitation of special, indirect, incidental, or consequential damages, so this limitation or exclusion may not apply in your jurisdiction.

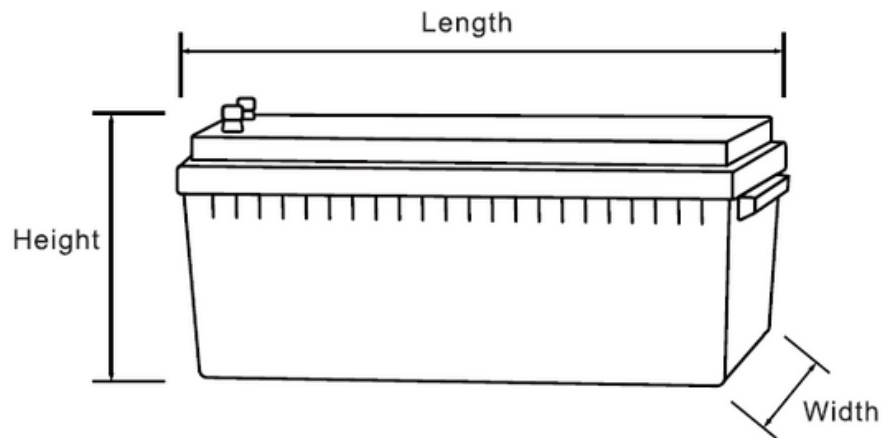
Exclusions

The warranty does not cover failures resulting from incorrect handling, product modifications, installation, conversion or additions, supplements, operation, natural elements (weather), excessive or deficient energy supply, chemicals, the effect of solid bodies, or deliberate damage. If the Warrantor determines that the problem with the ROCKSOLAR product(s) is not due to a manufacturing defect in the Warrantor's workmanship or materials, or otherwise does not qualify for warranty repair, then the Purchaser will be responsible for all costs incurred by the Warrantor necessary to repair, replace and transport the ROCKSOLAR product(s). ROCKSOLAR's warranty does not apply to the battery cell unless the battery cell is fully charged by you within seven days after you purchase the product and at least every 3 months thereafter.

How to Receive Service

To obtain warranty service, contact our customer service team at support@rocksolars.com.

Battery Specification



MODEL	48-50	48-100
Nominal Voltage	51.2V	
Nominal Capacity	50Ah	100Ah
Nominal Energy	2560Wh	5120Wh
Standard Charge Voltage	57.6(58.4V Max.)	
Standard Charge Current	10A	20A
Allowed Max. Charge Current	50A	100A
Max. Discharge Current	50A	100A
Peak Discharge Current @10S	100A	200A
Terminal	F12 M8	F12 M8
Dimensions L*W*H	20.5*9.4*8.6 in	20.5*10.6*8.6 in
Temperature	Charge temperature:0°C~+45°C / Discharge temperature -20°C~+60°C	
Cycle Life	>2000 cycles @1C 100%DOD / > 8000 cycles @0.5C 50%DOD	

BMS - Battery Management System

Protection		Protection Condition		Recovery
Current	Charging	< 1.0C	Temperature Protection	a. Cut Charging 15±5S or b. Discharge > 2A or c. < +50°C and > 0°C or d. Charge Current < 0.5C
		1.0~1.5C	Delay 3~10S	
		1.5~3.0C	Delay 1~3S	
		> 3.0C	Delay 50~150mS	
	Discharging	< 1.0C	Temperature Protection	a. Cut Discharge 15±5S or b. Charge > 2A or c. < +65°C and > -20°C or d. Discharge Current < 0.5C
		< 2.0C	Temperature Protection	
		3.0~4.0C	Delay 50~150mS	
		4.0~10C	Delay 5~15mS	
		> 10C	Delay 300~800uS	
Voltage	Charging	Battery	≥59.2V, Delay 1~2S	a. ≤56.0V or b. Discharge > 2A
		Single Cell	≥3.65V, Delay 1~2S	a. ≤3.5V or b. Discharge > 2A
	Discharging	Battery	≤38.4V, Delay 1~2S	a. ≥45.6V or b. Charge > 2A
		Single Cell	≤2.3V, Delay 1~2S	a. ≥2.7V or b. Charge > 2A
temp- erature	Battery	Charging	≤0°C or ≥+50°C	≥+5°C or ≤+45°C
		Discharging	≤-20°C or ≥+70°C	≥-10°C or ≤+60°C
	BMS	≥+90°C		≤+80°C
Balance for single cell		Voltage	≥3.55V, Delay 1~10S	a. Cut Charging or b. Voltage ≤3.5V
		Current	36±10mA	

Explain: "C" represents the Battery Nominal Capacity.

Charging Tips

About Charging Voltage

Based on the characteristics of Lithium Iron Phosphate(LiFeP04) batteries, the voltage measured by all LiFeP04 batteries during charging is not the real voltage of the battery. Therefore, after charging and disconnecting the battery from the power source, the voltage of the battery will gradually drop to its real voltage. If you need to test the real voltage of the battery, please charge and disconnect the power supply and test its voltage after putting it aside for over 15 mins.

Charging Methods

Use 58.4V lithium battery charger to maximize the capacity.

Recommend Charging Voltage: Between 56.8V to 58.4V

Recommend Charging Current:

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

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

Inverter/Controller

·Select"48V(58.4V)LI(LiFeP04) Mode" or

·Select "User Mode" to enter values according to below parameters:

CHARGING	Charging Limit Voltage	58.4V
	Over Voltage Disconnect Voltage	60.0V
	Over Voltage Reconnect Voltage	56.8V
	Equalizer Charging Voltage	56.0V
	Float Charging Voltage	55.2V
	Boost Charging Voltage	55.2V
	Boost Reconnect Charging Voltage	52.8V
DISCHARGING	Low Voltage Disconnect Voltage	43.2V
	Low Voltage Reconnect Voltage	49.6V
	Under Voltage Warning Voltage	46.4V
	Under Voltage Warning Reconnect Voltage	48.0V
	Discharging Limit Voltage	41.6V
	Over Discharge Disconnect Voltage	41.6V
	Over Discharge Reconnect Voltage	46.4V
OTHERS	Over-Discharge Delay Time	0.8S
	Equalize Duration	120min
	Boost Interva	Not Suitable for Lithium Batteries
	Boost Duration	120min

State of Charge(SOC)

The battery capacity could be roughly estimated by its voltage. As there are subtle differences in the voltage of each battery, below parameters are for reference only. The voltage needs to be tested at rest (with zero current) after 15 mins of disconnecting from charger & loads.

Capacity	Voltage
100%	54.00V
99%	53.60V
90%	53.20V
80%	53.00V
70%	52.80V
60%	52.70V
50%	52.55V
40%	52.40V
30%	52.00V
20%	51.60V
10%	51.20V
1%	43.20V (recommend low voltage disconnect voltage)
0%	38.00V

Long-Term Storage

- The battery can be operated in temperature of -20°C to $+60^{\circ}\text{C}$, and a temperature between $+10^{\circ}\text{C}$ to $+35^{\circ}\text{C}$ is ideal for long-term storage. Store in a fireproof container and away from children.
- For a longer-lasting product, it is best to store your battery at 100% charge level and recharge every three months if it is not going to be used for a long period of time.

Parallel Batteries

Connection Tips

Check as below before connecting :

- connect batteries with same capacity(Ah) ONLY.
- connect batteries with the same brand ONLY.

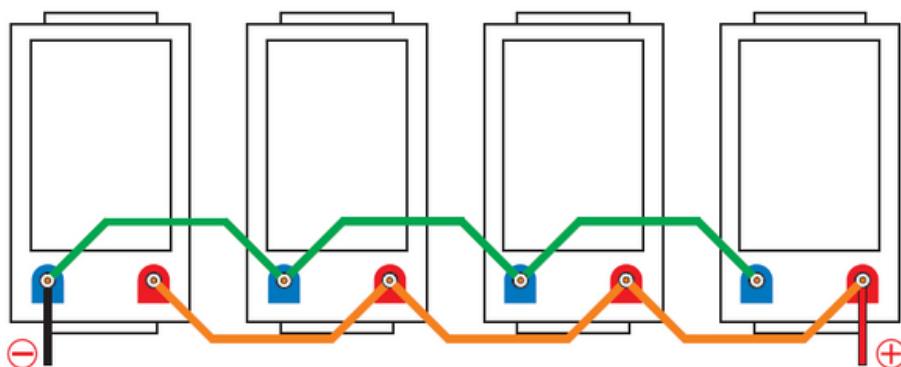
Two Necessary Steps Before Connecting:

These two steps are necessary in order to reduce the voltage difference between batteries, and through these, the battery system can perform the best of it in parallel.

Step 1: Fully charge your batteries separately.

Step 2: Connect your batteries one by one in parallel.

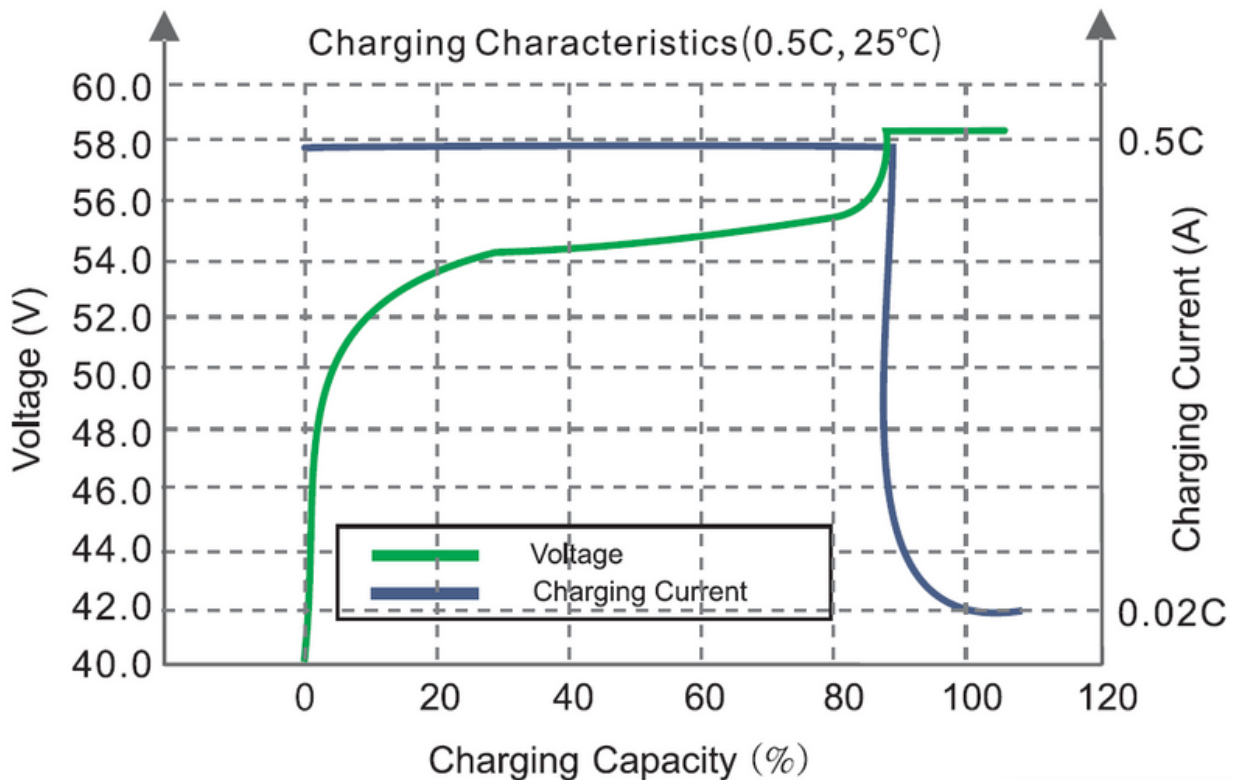
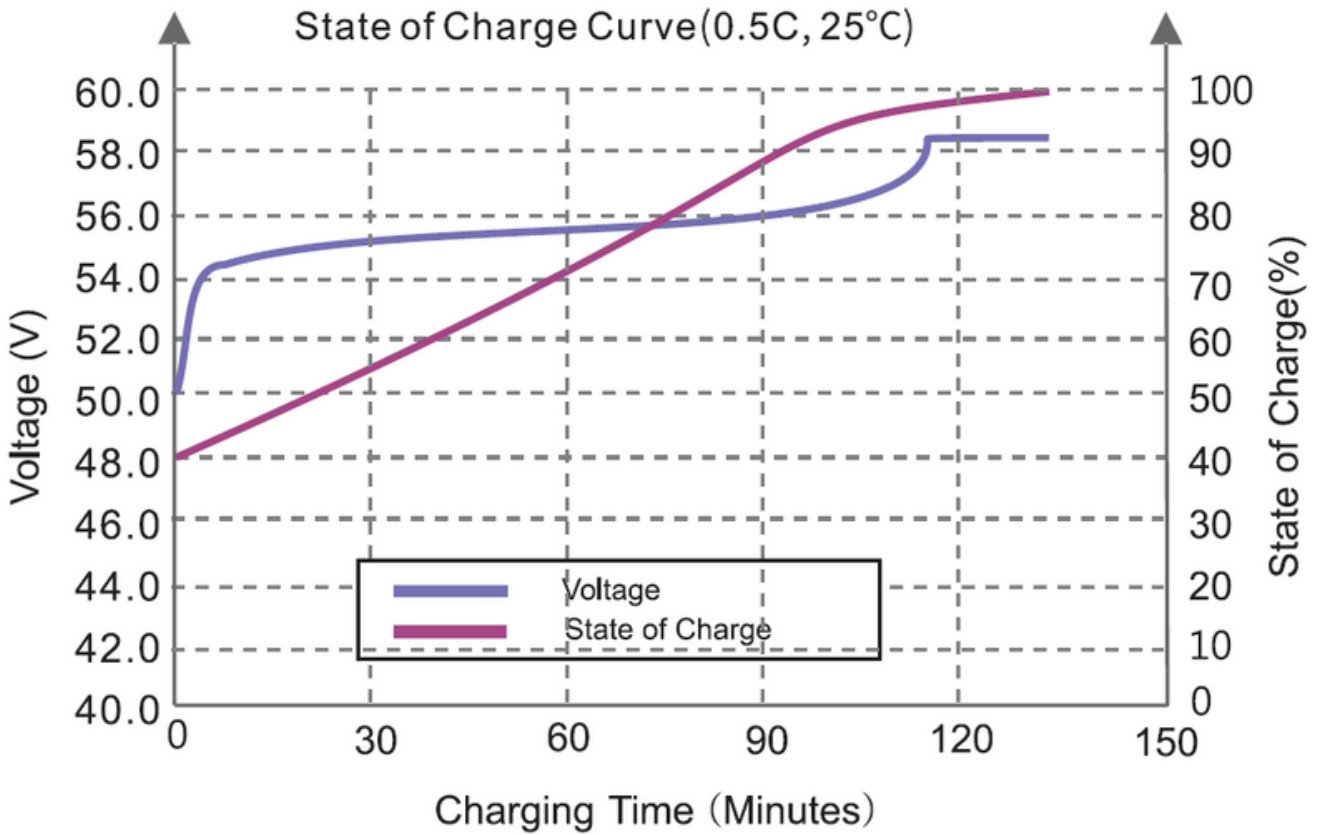
Parallel connection of batteries



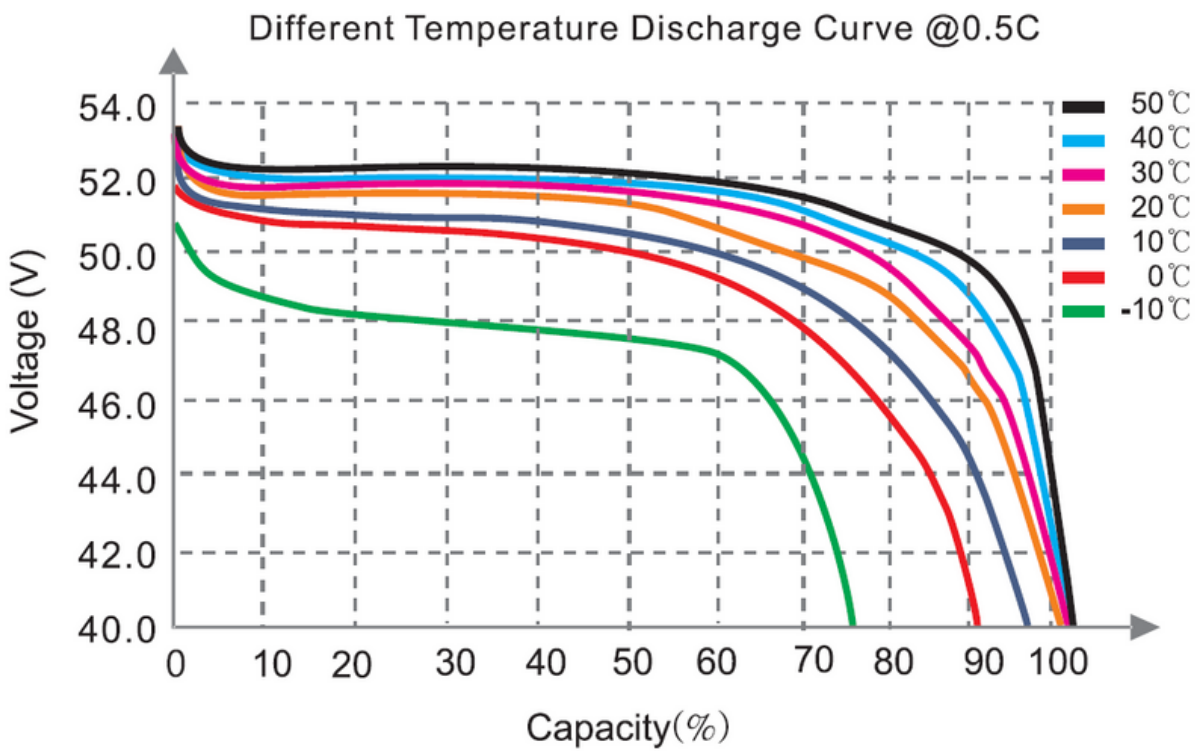
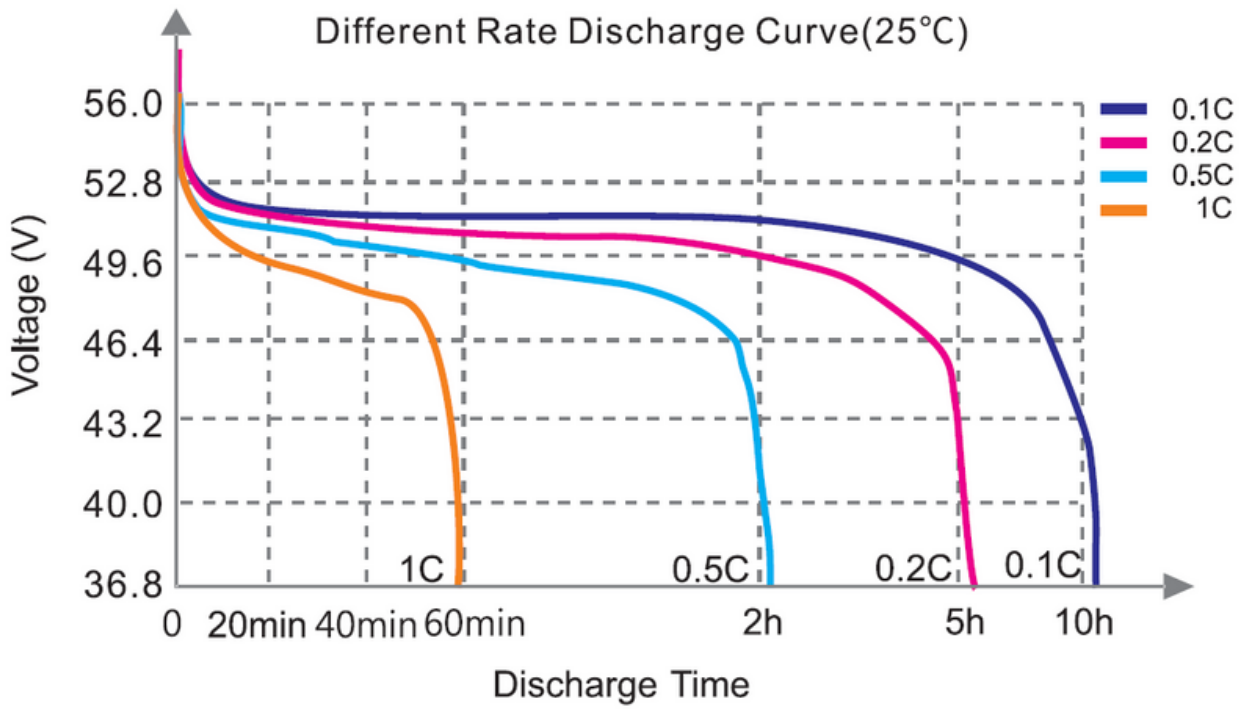
Capacity of parallel battery	Battery Numbers	Limited Charge Voltage	Discharge Cut-off voltage
12.8V/Capacity*1	1PCS	58.4V	43.2V
12.8V/Capacity*2	2PCS	58.4V	43.2V
12.8V/Capacity*3	3PCS	58.4V	43.2V
12.8V/Capacity*n	n≤10PCS	58.4V	43.2V

Curve Of Lithium Iron Phosphate Battery

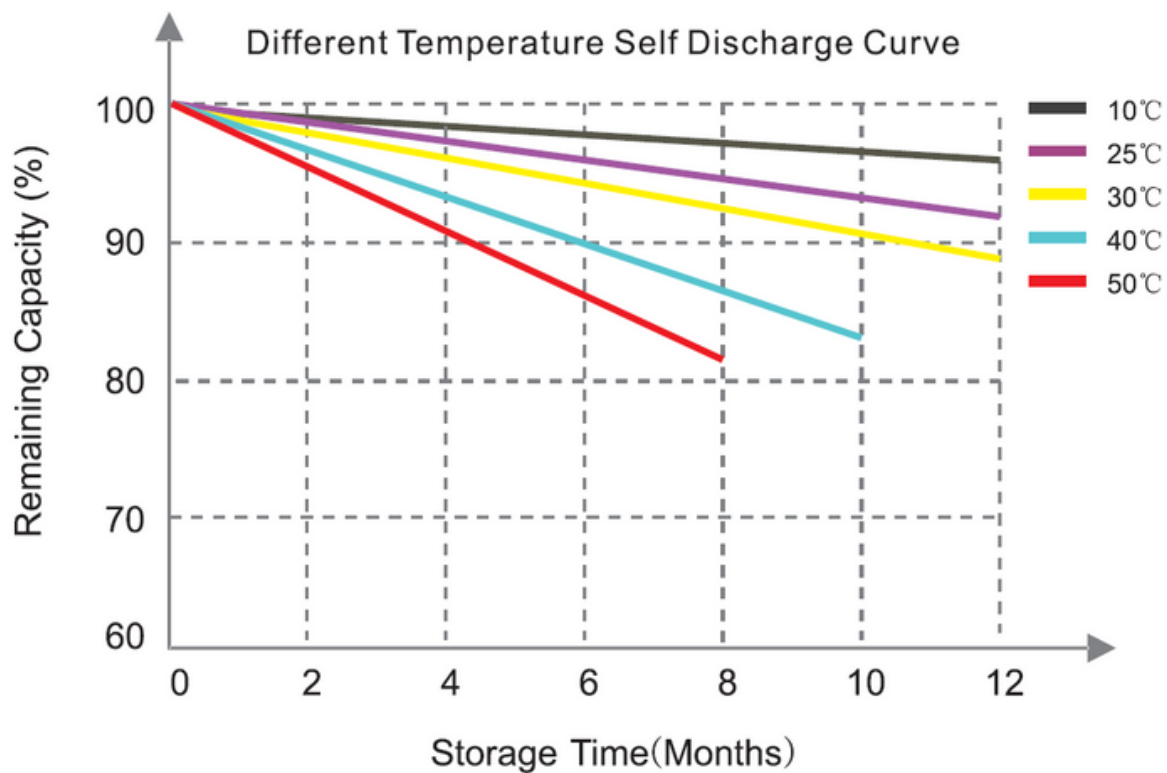
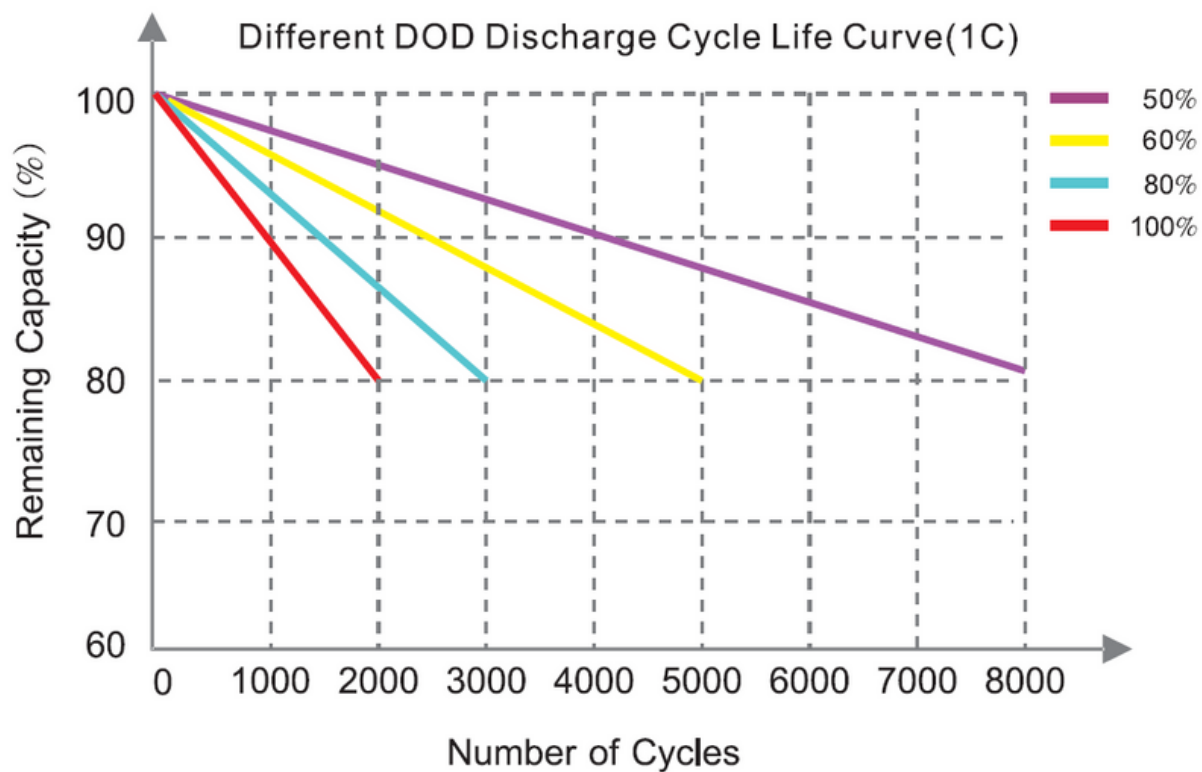
Charging curve



Discharge Curve



Discharge Cycle Life Curve / Self Discharge Curve



How To Activate The Battery

If the BMS has cut-off the battery for protection, you need to cut off the load of the battery and put the battery aside for 30mins. Then the battery will automatically recover itself to normal voltage and can be used after fully charged.

If the battery is unable to recover itself and its voltage is too low to hold a charge, you can activate it in below two ways:

1. Use the charger with 0V charging function (it can charge the battery starting from 0V) to charge the battery. After fully charged, the battery can be used normally.
2. Use another 48V lithium battery to connect in parallel with the battery for a minute to activate the battery (lead-acid battery at voltage between 48V and 58.4V will also work). After that, fully charge the battery and it can be used normally.



Warning & Tips.

1. DO NOT disassemble or alter the battery.
2. DO NOT reversely connect or short-circuit the positive and negative poles of the battery.
3. DO NOT soak the battery in water, especially sea water.
4. DO NOT throw the battery into fire.
5. DO NOT Heat above 70°C/158°F.
6. DO NOT use the wrong charger with output below 54.0V or over 60.0V.

Troubleshooting

Can not discharge.

1. Check whether the battery is securely connected.
2. Check whether the positive and negative battery terminals are correctly connected.
3. Check whether the battery voltage is greater than 48V. If it is less than 48V, charge the battery first.
4. Check whether the load voltage matches the battery.
5. Check whether the load current is greater than the battery discharge current, Make sure it is less than the battery discharge current.
6. Ensure that the ambient discharge temperature ranges from -15°C to $+55^{\circ}\text{C}$.

Can not charge

1. Check whether the battery is securely connected.
2. Check whether the positive and negative battery terminals are correctly connected.
3. Check the charging voltage matches the battery , the charging parameters are set correctly.
4. Check whether the charging current is greater than the maximum charging current of the battery, Make sure it is less than the maximum charging current of the battery.
5. Check whether the battery voltage is less than 36V. If it is less than 36V, use the charger with 0V charging function to charge.
6. Ensure the charging environment temperature ranges from 0°C to $+45^{\circ}\text{C}$.
7. After the battery is protected by over-discharge, disconnect the load and wait for the battery to recover the voltage before charging, or use the charger with 0V charging function to charge.

Battery heats up

1. Check whether the battery is securely connected. The connecting wire should be in contact with the battery terminal. Do not clamp screws to discharge.
2. Check whether the battery cable matches the working current. 6AWG-100A, 4AWG-150A, 2AWG-200A cable is recommended.
3. Check whether the load power exceeds the battery discharge power, ensure the load power is lower than the required battery power.
4. Ensure the working temperature is lower than 55°C .

Contact us

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48V BATTERY