

Battery



SMART LITHIUM IRON PHOSPHATE

48V 50Ah

Version A1



Important Safety Instructions

Please save these instructions.

This manual contains important installation, operation, and maintenance instructions for the Smart Lithium Iron Phosphate Battery. Please observe these instructions and keep them located near the battery for further reference. The following symbols are used throughout the manual to indicate potentially dangerous conditions or important safety information.

 **WARNING**

Indicates a potentially dangerous condition. Use extreme caution when performing this task.

 **CAUTION**

Indicates a critical procedure for the safe and proper installation and operation of the battery.

 **NOTE**

Indicates a procedure or function that is important to the safe and proper installation and operation of the battery.

Disclaimer

The manufacturer accepts no liability for any damage caused by:

- Force majeure including fire, typhoon, flood, earthquake, war, and terrorism.
- Intentional or accidental misuse, abuse, neglect or improper maintenance, and use under abnormal conditions.
- Improper installation, improper operation, and malfunction of a peripheral device.
- Contamination with hazardous substances, diseases, vermin, or radiation.
- Alterations to the product without express written consent from the manufacturer.

General Safety Information

 **WARNING**

- Please keep the battery away from water, heat sources, sparks, and hazardous chemicals.
- DO NOT puncture, drop, crush, burn, penetrate, shake, or strike the battery.
- DO NOT open, dismantle, or modify the battery.

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- DO NOT touch any terminals or connectors.
 - Uncovered electrolyte or powder that has contacted the skin or eyes MUST be flushed out with plenty of clean water immediately. Seek medical attention afterwards.
 - Please make sure any battery charger(s) or charge controller(s) are disconnected when working on the battery.
 - DO NOT connect or disconnect terminals from the battery without first disconnecting loads.

CAUTION

- DO NOT place tools on top of the battery.
- Please keep the battery out of the reach of young children.
- Please wear proper protective equipment when working on the battery.
- Please use insulated tools when working on battery.
- DO NOT wear jewelry or other metal objects when working on or around the battery.
- Please ensure adequate and secure mounting of the battery.
- Please use suitable handling equipment for safe transportation of the battery.
- DO NOT dispose of the battery as household waste. Please use recycling channels in accordance with local, state, and federal regulations.

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General Information

The Renogy Smart Lithium Iron Phosphate Battery is the perfect option for off-grid energy storage systems. The 48V nominal voltage ensures low heat generation and high efficiency during high power transmission. The modular design easily scales to meet a range of configurations—making it simple to tailor your energy requirements to specific projects. The battery meets the highest safety standards and has an exceptional lifecycle, optimized with proprietary manufacturing processes and cell architecture. The state-of-the-art battery management system (BMS) enables comprehensive protection features and real-time monitoring. With built-in intelligent self-heating, the battery is rechargeable even in low-temperature conditions.

■ Key Features

- **Modular Design**

Easily connect multiple batteries in parallel with the auto-balancing function to meet the power and energy requirements of different system setups.

- **Reliable System**

The battery management system (BMS) and high-performance dual-processors provide comprehensive protection features and real-time monitoring.

- **Uncompromised Quality**

The battery features an exceptional lifespan of more than 4500 cycles (80% DOD), a 50A maximum discharge current, and a wide range of operating temperatures.

- **Communication Port**

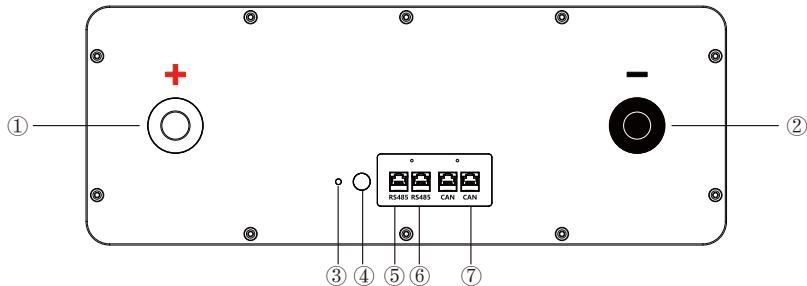
The battery features communication ports—enabling communication between connected batteries, external devices, and host computers.

- **Self-Heating**

The intelligent self-heating feature keeps the battery charged in cold environments.

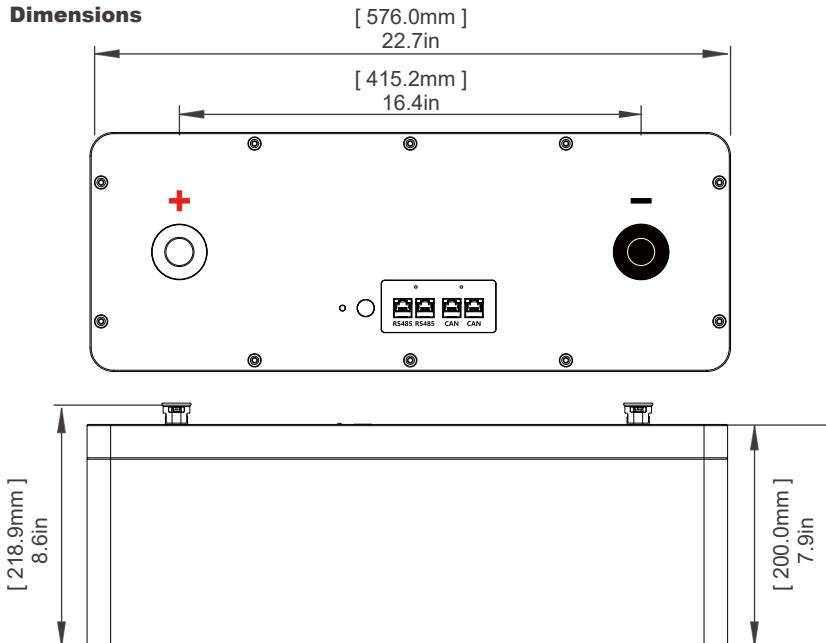
Product Overview

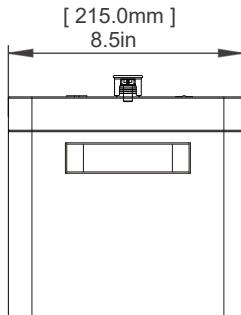
■ Identification of Parts



- ①Positive Terminal (w/ Terminal Cover)
②Negative Terminal (w/ Terminal Cover)
③LED Indicator
④Power Button
⑤RS485 UP Communication Port
⑥RS485 LINK Communication Port
⑦CAN Communication Port

■ Dimensions

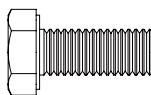




■ Additional Components

Long Terminal Bolts (2)

The Long Terminal Bolts (M8x1x20mm) are used to secure multiple cable lugs on one battery terminal.



Preparation

Before the installation and operation of the battery, it is recommended to have the following equipment or tools available:

- Proper protective equipment
- Insulated tool(s)
- Multimeter
- Battery cable
- Battery charger / charge controller

Battery Installation

Safe and reliable installation requires trained and certified technicians. Therefore, the purpose of this section is only to serve as a guideline as all scenarios cannot be covered.

WARNING

- DO NOT short-circuit the battery terminals. Doing so can cause bursts in amperage and lead to irreversible damage to the system and the battery.
- Please verify the polarity before connecting wiring. Reversing polarity can and will destroy the battery.
- Please use circuit breakers, fuses, or disconnects appropriately sized by a certified electrician, licensed installers, or regional code authorities to protect all electrical equipment.

■ Inspection

Please check for visible damage including cracks, dents, deformation, and other visible abnormalities. The top of the battery and terminal connections should be clean, free of dirt and corrosion, and dry. If any problems are detected with the battery, please contact us for assistance. Refer to the last page of the manual for contact information.

■ Cable Sizing

Battery cables (sold separately) should be appropriately sized to handle the expected load. Please refer to the following table for the ampacities of copper cables with different gauge sizes.

Copper Cable Gauge Size (AWG/mm²)	Ampacity (A)
14 (2.08)	20
12 (3.31)	25
10 (5.25)	35
8 (8.36)	50
6 (13.3)	65
4 (21.1)	85
2 (33.6)	115
1 (42.4)	130
1/0 (53.5)	150
2/0 (67.4)	175
4/0 (107)	230

The above values are from NEC Table 310.15(B)16 for copper cables rated at 35°C (167°F), operating at an ambient temperature of no more than 30°C (86°F). Lengths in excess of 6 feet (1829 mm) may require heavier gauge cable to avoid unacceptable voltage drop.

■ Connecting Batteries in Banks

WARNING

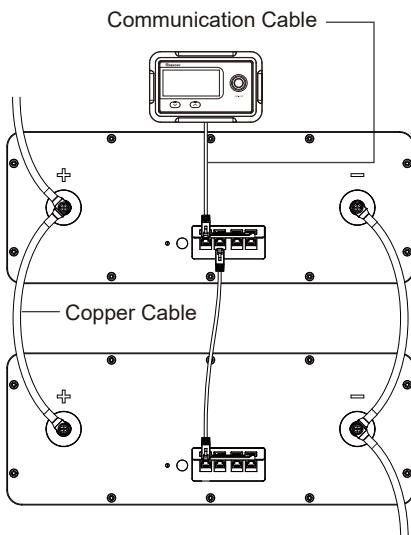
- DO NOT string the battery in series. Doing so can cause catastrophic failure.

CAUTION

- DO NOT string different types of batteries, batteries with different rated capacity, or batteries from different manufacturers in parallel.
- Please avoid too high a voltage difference between paralleled batteries, despite the auto-balancing function, to avoid triggering the over-current protection.
- In parallel battery banks, the cables between each battery should be of equal length to ensure that all batteries in the system can work equally together.
- It is not recommended to connect more than 4 batteries in parallel if taking advantages of the auto-balancing function.

To string multiple batteries in parallel, first connect the positive terminals of batteries to each other. Then do the same with the negative terminals. Finally, connect the positive and negative terminals of the first battery to the system. This type of arrangement is used to increase the overall battery capacity while keeping the voltage the same.

To enable the communication between paralleled batteries, please connect the LINK ports of former ones to the UP ports of latter ones using communication cables (not included).



■ Securing Cable Connections

CAUTION

- Please secure all cable connections to the proper specification in order to ensure good contact between the cable lugs and the terminals. Over-tightening cable connections can cause terminal breakage and loose cable connections can cause terminal meltdown or fire.
- Please use an insulated Philips screwdriver to tighten the cable connections.
- To ensure good contact between the cable lugs and the terminals, please use the appropriate number of washers to allow for as much thread engagement as possible without bottoming out the terminal bolt. The correct number of washers can be determined by hand-tightening the terminal bolt with just the cable lug in place and observing the gap that is present. Use the number of washers needed so that the washer stack is slightly larger than the observed gap.
- It is very important to ensure the cable lug contacts the top surface of the terminal and that a washer is placed on top of the lug. Do not place a washer between the battery terminal and the cable lug as this can cause high resistance and cause excessive heating of the connection.

NOTE

- Please use the included Long Terminal Bolts when needed to secure multiple cable lugs on one battery terminal.

■ Installation Environment

The battery should be installed in a clean, cool, and dry place, keeping water, oil, and dirt away from the battery. The accumulation of these materials on the battery can cause current leakage, resulting in self-discharge and a possible short-circuit. Sufficient air flow must be provided to prevent excessive heat build-up and to minimize temperature variation between the batteries.

Battery Operation

CAUTION

- DO NOT over-charge or over-discharge the battery.
- DO NOT discharge the battery at high temperatures above 140 °F (60 °C).

Power Button Operation

The battery can be switched between active mode and shelf mode with the Power Button. When the battery is in shelf mode, long press the Power Button for 1 second to switch the battery to active mode. The LED Indicator will illuminate after 1~2 seconds of software initialization to indicate that the battery has been successfully switched to active mode. Please check the battery voltage to validate an active battery.

Prior to long periods of storage, disconnect the battery from the system and long press the Power Button for 3 seconds to switch the battery to shelf mode. The LED Indicator will go out to indicate that the battery has been switched to shelf mode. In shelf mode, the battery has a low self-discharge rate and can hold the charge for a longer period of time.

CAUTION

- Please leave the battery in shelf mode during installation. DO NOT activate the battery until making sure that all the connections are correct and secure. Connecting active batteries to the system may trigger the short circuit protection of the battery.

NOTE

- The battery leaves the factory in shelf mode. Please switch the battery to active mode by charging it or using the Power Button after connecting the battery to the system for the first time.
- Paralleled batteries can be switched to active mode simultaneously by charging them or using the Power Button on any battery. To switch paralleled batteries to shelf mode simultaneously, please enable the communication between paralleled batteries and use the Power Button on the first battery. Otherwise, please disconnect paralleled batteries and use the Power Button to switch each battery to shelf mode.

Identifying Battery Operation Status

- The LED Indicator indicates the battery operation status. Please refer to the following table for more details.

Protection	Condition
Slow Flashing Green	Standby
Fast Flashing Green	Normal Discharging
Solid Green	Normal Charging / Fully Charged
Solid Yellow	Charge Over-current Warning / Discharge Over-current Warning
Flashing Yellow	Battery Under-voltage Warning / Battery Cell Under-voltage Warning
Solid Red	Charge Over-current Protection / Discharge Over-current Protection / Battery High Temperature Protection / Battery Low Temperature Protection / Short Circuit Protection
Flashing Red	Battery Under-voltage Protection / Battery Cell Under-voltage Protection /Battery Over-voltage Protection

NOTE

- The warning status will not affect the normal use of the battery. But it is recommended to pay closer attention to the battery to prevent it from entering the protection mode.

Self-heating Function Operation

The normal operation of the self-heating function requires a stable charge current greater than 3A for each battery in the parallel battery bank. The self-heating function will start operating automatically once the battery and the battery temperature drops below 41 (5) and stop operating automatically once the battery temperature rises above 50 (10).

The battery leaves the factory with the self-heating function enabled. To disable the self-heating function, please switch the battery to shelf mode and long press the Power Button for 8 seconds. The LED indicator will flash red, yellow, and green 3 times respectively* to indicate that the self-heating function has been disabled. To re-enable the self-heating function, please repeat the previous steps. The LED indicator will flash red, yellow, and green in sequence for 3 times** to indicate that the self-heating function has been re-enabled. The battery will switch to active mode automatically after disabling or re-enabling the self-heating function. When the self-heating function is disabled, the LED indicator will flash red, yellow, and green 3 times respectively* every time the battery is switched to active mode.

* Red-Red-Red-Yellow-Yellow-Yellow-Green-Green-Green

** Red-Yellow-Green-Red-Yellow-Green-Red-Yellow-Green

CAUTION

- The self-heating function MUST be disabled or enabled uniformly on all the batteries in the parallel battery bank.

NOTE

- The self-heating function needs to be disabled or enabled individually on each battery in the parallel battery bank.
- The self-heating function will not be able to operate normally if a PWM charge controller or a small current battery charger is used to charge the battery at low temperatures. It is recommended to disable the self-heating function to prevent it from starting and stopping operation frequently and consuming the battery.

■ Charging Batteries

CAUTION

- DO NOT exceed the maximum charge current to the battery.
- ONLY charge the battery with a battery charger or charge controller that is compatible with lithium iron phosphate batteries.

NOTE

- Depending on the length of time between manufacturing and shipping, the battery may be received at a partial state of charge. Please fully charge the battery prior to the initial use.

During the standard charging process, the battery is first charged at a constant current of 10A until the battery voltage reaches 54V. Then, the battery is charged at a constant voltage of 54V while tapering the charge current. The standard charging process is considered complete when the charge current is less than 1A. However, leaving the battery on float will continue to balance the battery cells and will not damage the battery. The standard charging process normally takes 7 hours. Safe charging requires battery temperatures below 131° (55°). If the self-heating function is disabled or unable to work normally, battery temperatures above 32° (0°) is also required for the safe charging.

■ Discharging Batteries

CAUTION

- DO NOT exceed the maximum discharge current to the battery.
- DO NOT connect large loads to the battery when it is running low.
- If the battery shuts off due to low state of charge (SoC), please disconnect the battery from the discharge equipment to eliminate potential parasitic loads and charge the battery as soon as possible. Failure to do so may cause irreversible damage to the battery.

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- It is recommended to pair the battery with discharge equipment featuring low voltage disconnect in the system.

During the standard discharging process, the battery is discharged a constant current of 10A until the battery voltage reaches 41.62V. Safe discharging requires battery temperatures between -4 and 140 (-20 and 60).

Battery Maintenance

■ Inspection

Please perform regular visual inspections by following these steps:

- Examine the external appearance of the battery. The top of the battery and terminal connections should be clean, dry, and free of corrosion.
- Check battery cables and connections. Replace any damaged cables and tighten any loose connections.

CAUTION

- Terminal corrosion may adversely affect the battery performance and present a safety hazard. Please keep terminals free of corrosion.

■ Cleaning

Please clean the battery at regular intervals by following these steps:

- Disconnect the battery from the charging source or electric load.
- Switch the battery to shelf mode using the Power Button.
- Clean the top of the battery and terminals with a damp cloth or non-metallic brush. A household cleaner may be used if the battery is extremely dirty.
- Dry the battery with a clean cloth and keep the area around the battery clean and dry.
- Ensure the battery is completely dry before switching it to active mode and/or reconnecting it to the charging source or electric load.

■ Checking Voltage

Please check the battery voltage periodically to assess battery health. If the battery resting voltage is under 41.62V in active mode at room temperature, the battery may have been over-discharged due to self-discharge or parasitic loads. Please stop using the battery until the fault can be corrected and the battery can be charged.

Battery Storage

Please follow these tips to ensure that your battery emerges from storage in good condition:

- Charge the battery to 30%~50% and put the battery into shelf mode using the included Activation Switch before long periods of storage.
- Disconnect the battery from equipment to eliminate any potential parasitic loads that may discharge the battery.
- Store the battery in an open, well ventilated, dry, clean area in temperature between -13 °F~149°F (-25°C~65°C).
- Handle the battery carefully to avoid sharp impacts or extreme pressure on the battery casing.
- Charge the battery at least once every 3 months to prevent over-discharge.
- When the battery is taken out of storage, it should be given a full charge prior to use.

CAUTION

- DO NOT expose the battery to the extreme temperatures over 65°C (149°F).
- DO NOT expose the battery to heat sources.
- DO NOT expose the battery to direct sunlight, moisture, or precipitation.

Battery Management System

■ Warning and Protection

The battery contains a battery management system (BMS) that warns you and protects the battery from over-voltage, under-voltage, over-current, short circuit, high temperature, and low temperature. Please refer to the following table for the triggering and recovery condition of each warning and protection.

Battery Operation Status		Condition	
		Triggering	Battery Voltage≥55.5V
		Recovery	Battery Voltage≤51V / Discharge Current≥1A
Battery Over-voltage	Protection	Triggering	Battery Cell Voltage≥3.75V
Battery Cell Over-voltage	Protection	Recovery	Battery Cell Voltage≤3.4V / Discharge Current≥1A
Battery Under-voltage	Warning	Triggering	Battery Voltage≤45.75V
Battery Under-voltage	Warning	Recovery	Battery Voltage≥50V / Charge Current≥1A
Battery Under-voltage	Protection	Triggering	Battery Voltage≤41.62V
Battery Under-voltage	Protection	Recovery	Battery Voltage≥50V / Charge Current≥1A
Battery Cell Under-voltage	Warning	Triggering	Battery Cell Voltage≤3.05V
Battery Cell Under-voltage	Warning	Recovery	Battery Cell Voltage≥3.2V / Charge Current≥1A
Battery Cell Under-voltage	Protection	Triggering	Battery Cell Voltage≤2.8V
Battery Cell Under-voltage	Protection	Recovery	Battery Cell Voltage≥3.2V / Charge Current≥1A
Battery Low Temperature (Charging)	Warning	Triggering	Battery Temperature≥122°F (50°C)
Battery Low Temperature (Charging)	Warning	Recovery	Battery Temperature≤113°F (45°C)
Battery Low Temperature (Charging)	Protection	Triggering	Battery Temperature≥131°F (55°C)
Battery Low Temperature (Charging)	Protection	Recovery	Battery Temperature≤122°F (50°C)
Battery Low Temperature (Discharging)	Warning	Triggering	Battery Temperature≥131°F (55°C)
Battery Low Temperature (Discharging)	Warning	Recovery	Battery Temperature≤122°F (50°C)
Battery Low Temperature (Discharging)	Protection	Triggering	Battery Temperature≥140°F (60°C)
Battery Low Temperature (Discharging)	Protection	Recovery	Battery Temperature≤131°F (55°C)
Battery low Temperature (Charging)	Warning	Triggering	Battery Temperature≤37.4°F (3°C)
Battery low Temperature (Charging)	Warning	Recovery	Battery Temperature≥42.8°F (6°C)
Battery low Temperature (Charging)	Protection	Triggering	Battery Temperature≤32°F (0°C)
Battery low Temperature (Charging)	Protection	Recovery	Battery Temperature≥37.4°F (3°C)
Battery low Temperature (Discharging)	Warning	Triggering	Battery Temperature≤14°F (-10°C)
Battery low Temperature (Discharging)	Warning	Recovery	Battery Temperature≥23°F (-5°C)
Battery low Temperature (Discharging)	Protection	Triggering	Battery Temperature≤-4°F (-20°C)
Battery low Temperature (Discharging)	Protection	Recovery	Battery Temperature≥5°F (-15°C)

Battery Operation Status		Condition	
Charge Over-current	Warning	Triggering	Charge Current \geq 51A
		Recovery	Charge Current \leq 40A
	Primary Protection	Triggering	Charge Current \geq 55A (Delay 15s)
		Recovery	Charge Current \leq 40A (Delay 1min) / Discharge Current \geq 1A
	Secondary Protection	Triggering	Charge Current \geq 120A
		Recovery	Charge Current \leq 40A (Delay 1min) / Discharge Current \geq 1A
Discharge Over-current	Warning	Triggering	Discharge Current \geq 51A
		Recovery	Discharge Current \leq 45A
	Primary Protection	Triggering	Discharge Current \geq 55A (Delay 15s)
		Recovery	Discharge Current \leq 40A (Delay 1min) / Charge Current \geq 1A
	Secondary Protection	Triggering	Discharge Current \geq 120A
		Recovery	Discharge Current \leq 40A (Delay 1min) / Charge Current \geq 1A
Short Circuit	Protection	Triggering	Discharge Current \geq 400A (Delay 300 μ s)
		Recovery	Remove Short Circuits / Charge Current \geq 1A

■ Battery Cell Balancing

The battery employs bypass circuit to maintain the balance between each battery cell group. Each battery cell group is connected with a bypass resistor and a switch in parallel. During the charging process, if the highest-voltage battery cell group reaches the set balancing starting voltage and the voltage difference between the highest-voltage and the lowest-voltage battery cell group exceeds the set voltage difference, the switch connected to the highest-voltage battery cell group will be closed to shunt the charge current around the highest-voltage battery cell group through the bypass resistor until the voltage difference drops below the set value. To avoid excessive energy loss, the battery cell balancing is only performed during the charging process.

Troubleshooting

If any problems occur during battery operation, please refer to the following instructions or contact us for assistance:

- If the Power Button is not able to switch the battery to active mode or the battery resting voltage is under 41.62V in active mode at room temperature, the battery may have been severely over-discharged due to self-discharge or parasitic loads. Please revive the battery using a battery charger or charge controller with the lithium battery activation function.
- If the battery terminal voltage shows 0V in active mode, the battery internal fuses may have blown due to severe over-current. Please contact us for assistance.
- If the battery voltage gets too low to reliably power electric loads or triggers the battery under-voltage protection, please disconnect the battery from electric loads and charge the battery as soon as possible.
- If the battery temperature gets too high/low during the operation and triggers the battery high/low temperature protection, please disconnect the battery from the charging source and electric loads and cool down/warm up the battery to room temperature. The battery will automatically recover from the battery high/low temperature protection.
- If too high a current passes through the battery and triggers the charge/discharge over-current protection, please disconnect the battery from the charging source/electric load immediately. The battery will automatically recover from the charge/discharge over-current protection after 1 minute. If the charge/discharge over-current protection is triggered 3 times in a row, the battery will no longer recover automatically. Please discharge/charge the battery with a current greater than 1A to recover the battery from the charge/discharge over-current protection.
- If the battery is short circuited and triggers the short circuit protection, please remove the short circuit immediately and charge the battery with a current greater than 1A to recover the battery from the short circuit protection.

Specifications

General	
Cell Type	LiFePO4
Rated Capacity (0.2C)	50Ah
Nominal Voltage	48V
Voltage Range	142V~55.5V
Cycle Life (0.2C, 25 °C)	4500 Cycles (80% DOD)
Insulation Resistance	<20mΩ
Dimension	22.7 x 8.5 x 7.9 inch / 576 x 215 x 200 mm
Weight	60.8 lb. / 27.6 kg
Communication Port	RJ45 (RS485 Protocol, CAN Protocol)
Connection Method	Parallel
Terminal Bolt Size	M8 x 1 x 15 mm
Recommended Terminal Torque	62.0-70.8 inch·lb / 7-8 N·m
Certifications	UN38.3, MSDS, UL1642 (Battery Cell)
Operation Parameters	
Charging Voltage	54V
Maximum Continuous Charging Current	50A
Standard Operation Temperature	77°F±9°F (25°C±5°C)
Charging Temperature Range	32°F~131°F / 0°C~55°C
Discharging Temperature Range	-4°F~140°F / -20°C~60°C
Storage Temperature Range	-13°F~149°F / -25°C~65°C
Relative Humidity	5%-95%



Renogy reserves the right to change
the contents of this manual without notice.

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