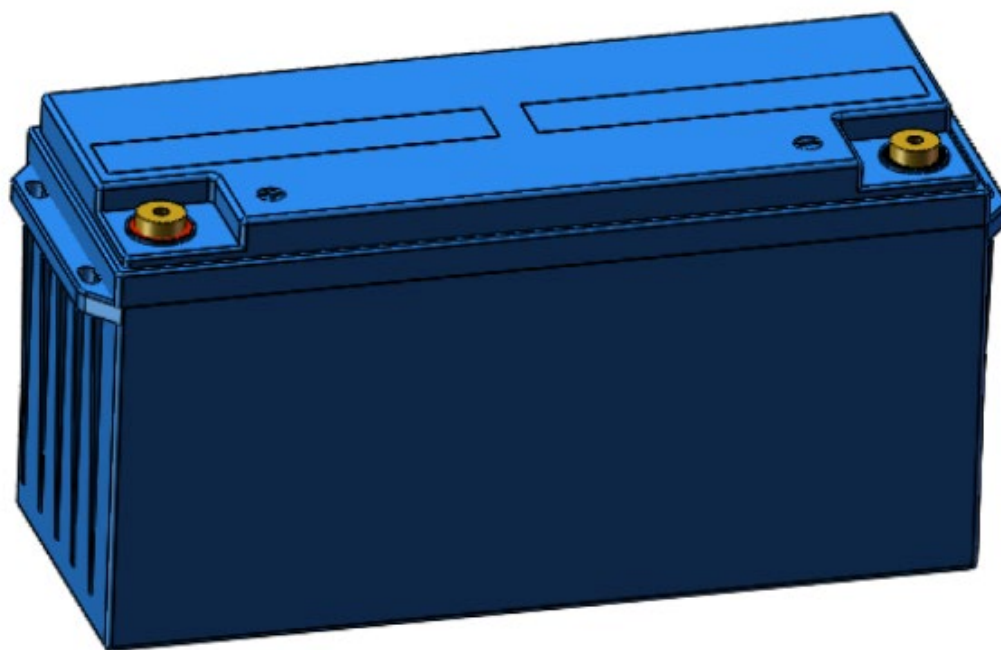


Product Manual LX 51-45HE1




Product Name: 51.2 V 45.6 Ah LiFePO4 Battery Pack

Product Reference: LX 51-45HE1

Revision: 1.0



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Quality Statement

Proper use and maintenance will ensure that the battery (or battery system) will operate reliably and consistently for long periods of time.

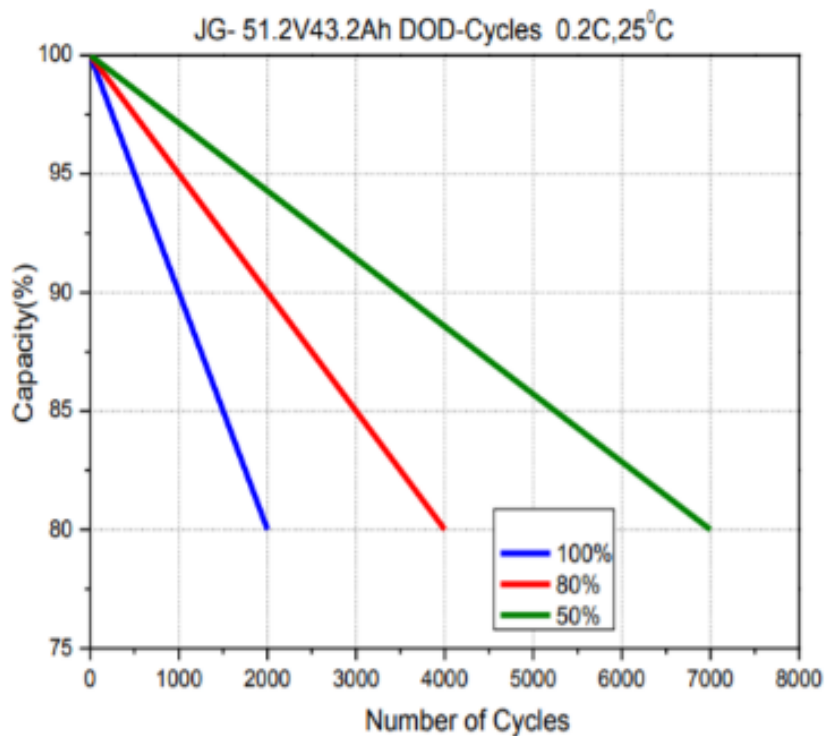
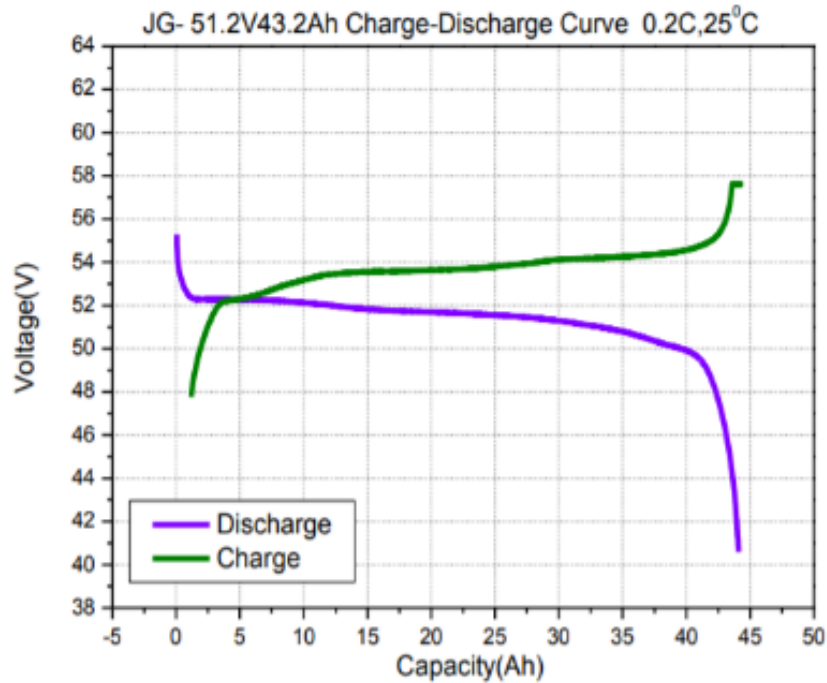
- ✓ After receiving the product, please check if the packaging is in good condition. If the packing is broken, it may cause damage to the product. If there is any damage, please contact our after-sales or sales staff within five working days.
- ✓ Anyone who does not use or maintain the battery according to the manual shall be deemed to give up the warranty right. Suppliers and its service station have the right to no longer guarantee the warranty, and will not compensate for any losses arising from it. However, the corresponding paid service can be provided according to the situation.

1. Product Index

1.1. Product Parameter

No.	Items	Parameter	
1	Product Reference	LX 51-45HE1	
2	Normal Voltage	51.2 V	
3	Rated Capacity	45.6 Ah (C5)	
4	Min Capacity	41.2 Ah (C5)	
5	Energy	About 2334.72 Wh	
6	Internal Resistance	≤80 mΩ	
7	Size	(483±3) mm *(170±2) mm *(235±3) mm	
8	weight	19.5±0.4 kg	
9	Shell material	Plastic	
10	Charge Voltage	57.6±0.2 V	
11	Standard Cutoff Voltage	About 40 V	
12	Charge Current	≤8.64 A	
13	Charging cut-off current	432 mA~864 mA	
14	Discharge Current	Normal Current	20 A
		Max Continuous Current	20 A-40 A (≤5min)
15	Passive Protection	Over charge protection, Over discharge protection, Temperature protection, Balanced function	
16	Positive	M8 hole	
	Negative	M8 hole	
18	Charge Retention	After charging according to standard 3.2, placing the battery for 28 days under the standard test conditions, then discharge it under standard 3.3, and the charge retention rate is ≥80 %.	
19	Cycle time	The cycle life is not less than 2000, the capacity retention rate is ≥80 %. (Charging according to 3.2 standard, leaving 0.5~1h; discharging according to 3.3 standard, leaving 0.5~1h, counting 1cycle time).	

1.2. Characteristics Curve



2. Battery Usages

2.1. Charge

Charging terminal of battery is connected to charger appropriate with it, and then charge. Charging voltage is 57.6 ± 0.2 V. Do not reverse.

2.2. Discharge

Note that the positive and negative (poles are not reversed as indicated by the battery case logo), then connect to thematching load.

3. Battery Test

Single cell and Protection board specification are only results of standard test, this is for reference.

3.1. Standard Test Requirements

Battery tested must be done within 1 month after production. If the battery is not tested on time due to transportation or other reasons, the battery can be recharged and discharged for testing.

All tests in this specification should be done in standard atmospheric conditions. (Temperature: 25 ± 2 °C; relative humidity: 65 ± 20 %).

Standard charge voltage is 57.6 ± 0.2 V, standard discharge cut-off voltage is about 40.0 V; standard current is I_5 (when $I_5 >$ the normal work current, test according to the normal current).

3.2. Standard Charge

Charge the battery with Lithium ion battery special test cabinet, with standard charging voltage, standard current, constant current and constant voltage charging to the current dropping to $0.05 I_5$.

3.3. Standard Discharge

Discharge the battery with Lithium ion battery special test cabinet, discharge to standard discharge cut-off voltage with standard current, constant discharging or until the battery stops.

4. Battery Service Environment

Battery discharge ambient temperature is $-20\text{ °C} \sim +60\text{ °C}$ (When the ambient temperature $>45\text{ °C}$, please pay attention to the ventilation and heat dissipation), Charging temperature is $0\text{ °C} \sim +45\text{ °C}$. Ambient humidity RH is $\leq 85\%$. Pay attention to waterproof when ambient humidity is $> 85\%$, at the same time the battery surface condensation phenomenon should be avoided.

5. Special Attentions

In order to make full use of the energy efficiency of the battery and prevent accidents such as leakage or heat generation, please prohibit the followings;

- ✓ Do not immerse the battery in the water. Once it is in the water or water enters the battery, isolate it immediately and ask a professional to deal with it.
- ✓ Do not charge, discharge and leave the battery at temperatures over 60 °C . Also keep away from fire, heater or corrosive materials. Otherwise, it can cause overheat, fire, or function failure, shortened life, or even danger happening.
- ✓ Do not charge the battery at temperature below 0 °C .
- ✓ Do not reverse the positive and negative terminals. Do not short the positive and negative of the battery.
- ✓ Do not combine the battery in series or in parallel.
- ✓ Do not reverse polarity charging. Do not connect the battery electrodes to an electrical outlet.
- ✓ Do not transport or store the battery together with metal objects such as hairpins, necklaces, etc.
- ✓ Do not strike, trample, throw, fall and shock the battery.
- ✓ Do not directly weld the battery and pierce the battery with a nail or other sharp objects.
- ✓ Do not reverse polarity charging. Do not connect the battery electrodes to an electrical outlet.
- ✓ Do not transport or store the battery together with metal objects such as hairpins, necklaces, etc.

Lithium cells and custom-designed lithium battery packs

- ✓ Do not strike, trample, throw, fall and shock the battery.
- ✓ Do not directly weld the battery and pierce the battery with a nail or other sharp objects.
- ✓ Do not use the battery in the location where static electricity and magnetic field is strong. Otherwise the battery protection circuit may be damaged.
- ✓ Do not overload the battery.
- ✓ Do not machine the circuit board, which may damage the internal circuit and cause function failure.
- ✓ Do not deform the product under pressure, which may cause electronic components or part of the circuit damage, and make the product unstable.
- ✓ Do not remove the case, in case of unnecessary damage.
- ✓ Do not overcharge or over discharge the battery.
- ✓ Please use special charger for charging.
- ✓ Please charge the battery within 12 hours after using. If the battery is not charged for more than 12 hours after using, please test the battery voltage before charging. If the voltage of the battery is $< 32.0V$, do not charge, need to place isolation. Meanwhile please contact our technical staffs.
- ✓ If the battery leaks and liquid splashes into the eyes or skin, do not rub, wash it with clean water, and immediately seek medical attention.
- ✓ In case of accidental fire, dry powder fire extinguisher or sand should be used.
- ✓ If the battery gives off strange odor, generates heat, becomes discolored or deformed, or any abnormality appears during use, storage, or charging, stop charging and using immediately, remove and isolate it from the device in the safe way.
- ✓ The electrode of the discarded battery terminal should be covered with insulating paper to reduce the safety hazard when laying inside.
- ✓ Reversing the Positive and negative charging terminal will burn the internal circuit board, so pay attention to it.

6. Battery Using and Maintenance

6.1. Battery Storage

Storage temperature 0°C~40 °C (Optimum storage temperature 15 °C~25 °C, dry preservation).

Battery performance is affected by temperature, the most obvious is the change in battery capacity, this is normal phenomenon. Avoid condensation caused by temperature changes during storage, otherwise it will lead to the rust of batteries or metal parts.

6.2. Battery Checking Before Using

- ✓ After receiving the battery, first check the packing carefully, please ensure there's no shock on the battery during the handling process.
- ✓ Please check the battery case and accessories if there's any damage or leakage, if so, please contact us immediately.
- ✓ Please check the output connector is correct or not, measure whether the positive and negative is reversed and whether the voltage is within the normal standard. In case the battery terminals are dirty or rust, clean the terminals with a dry cloth before use. Otherwise poor performance may occur due to the poor connection with the instrument.

6.3. Battery Installation Notes

- ✓ Please clean up the installation position of the battery to ensure no dust, metal or other foreign materials. No smoking or fire during installation to avoid short-circuit of battery and prevent equipment damage or personal injury.
- ✓ The battery should be installed under the condition with well-ventilated and no sunlight. Don't put it under place with possible flooding. The using and storage of the battery should be kept away from inflammable and explosive materials.
- ✓ When fastening battery terminals, please don't use excessive force, or the terminals could be damaged.
- ✓ After installation, please check whether the terminal fastening is in place and whether there are sundries on the surface of the battery. Clean the surface of battery with dry cloth, please don't use oil or other volatile organic solvents to clean, or it may damage it.

- ✓ Please make sure that the positive (+) & negative (-) polarity is correctly connected, or it may fire or damage the battery and electrical appliances.
- ✓ Test to run the equipment, observe whether the equipment and battery are abnormal.

6.4. Battery Working Requirements

- ✓ Charge current shall not exceed the specified maximum charge current, which may affect the service life of the battery or damage the internal circuit, or even cause danger.
- ✓ Discharge current shall not exceed the specified maximum discharge current, which may affect the service life of the battery or damage the internal circuit, or even cause danger.
- ✓ When the battery is short of power, it should be charged in time, which is beneficial to extend the battery life. If the battery is not charged in time, battery is in the state of power shortage for a long time, battery life will be affected
- ✓ The lithium-ion battery charge and discharge shallow is beneficial to improve the cycle life. Suggest user each discharge be put to 80 % of the nominal capacity.

6.5. Battery Using and Maintenance

- ✓ The battery would be possible to be at the over-discharged state by its self-discharge characteristics in case the battery is not used for long time. In order to prevent over-discharging, the battery shall be charged periodically to maintain a certain voltage range: 53.28 V~54.4 V, 2 months one cycle. (for battery with communication function, please maintain it once in 1 month) What's more, the SOC/ capacity calibration shall be performed. The calibration method is to charge fully with charger, then discharge to over-discharged protection state.
- ✓ Don't use organic solvents to clean the battery case.
- ✓ Battery is a consumable product with limited cycle life. Please change it in time when the capacity can't reach the requirement to avoid any loss of the user.

- ✓ In order to prevent the safety problem caused by the failure of the protection board overcharge protection function, do not charge for a long time. After the battery is fully charged, remove it. In addition, use the original charger or the one attached to the battery and operate it according to the instructions. Otherwise, the battery may be damaged or cause danger.
- ✓ The shallow charge and discharge of the battery ensures that the battery can be used economically. Overcharge and over discharge may cause the battery overheat, fire or function failure, shorten life, or other dangerous.
- ✓ The battery switch, battery display board and USB are consumed components, we could offer valuable after sales service.
- ✓ Waste lithium batteries should be recycled and disposed in accordance with local laws.

6.6. Battery Common Troubles and Solutions

- ◆ Battery voltage is too low after fully charged.
 - ✓ Battery is in long-term storage with no usage, and not maintenance in accordance with the provisions.
Solution: Please test the battery voltage. If the battery voltage is <32.0 V, it can't be charged and need to be isolated. Please consult the technicians. If the voltage is ≥ 32.0 V, the battery can be isolated to charge, and periodically check to see if it can be charged normally.
 - ✓ Battery Disconnection
Solution: remove the battery to check whether the line is broken or not, the welding joints come off or not, nickel belt breaks or not, and then repair according to the damage situation.
 - ✓ Protection Board not work
Solution: first, make sure the cable line is contact with the protection board well, then, observe welding is off or not. If the above conditions are normal, please check the voltage between B+/B- and P+/P- , the protection board has been broken if the voltage difference is very high. Then please do testing in details on protection board, if not pass, please change another new protection board.

- ✓ Battery suffered fierce collision, with character-external battery case damaged or with electrolyte odour.

Solution: It's not in the scope of maintenance generally. If needing maintenance, we need the confirmation of the problem whether on the output line or the battery itself.

First, open the battery case, check whether the battery P + / C + and P- / C- lines or joints damaged or not. If damaged, it needs to be replaced. Then, instigating smell odours method to determine the battery, if there is irritation electrolyte odour, indicate that the battery has been leaking, and need to test the battery voltage of each series. If the voltage of one series is quite different from others or much lower than others, then this series needs to be replaced.

- ◆ Insufficient capacity

Solution: To charge and discharge the battery with 3~5 cycles generally.

- ◆ Batterie voltage instability or cannot charge or discharge normally

- ✓ Faulty welding

Solution: To test the resistance with the internal resistance tester, and confirm the internal resistance of the battery exceeding a predetermined value or not. If not, the battery would be in faulty welding condition, the battery needs to be unpacked and be welded again.

- ✓ Protection board abnormal

Solution: replace the protection board.

- ✓ Connector or terminals in poor connecting condition

Solution: Change the terminals or connectors

- ✓ Battery works properly in charging but could not discharge or discharging well but could not charge.

Solution: The protection board is damaged; need to change the protection board.

7. Other Technical Indicators

If battery protection parameters and other related parameters are needed, please contact our sales or technical staff, we will provide the information as soon as possible. Your understanding is highly appreciated.

8. Products Disclaimer

Before using the battery, please read the specifications, usage instruction and some attentions carefully. Suppliers are not responsible for the incident caused by not obeying the Manual. The phenomenon such as incorrect using method or wrong circuit connection, or input power data, working index are inconsistent with the Manual, cause damage to product, over load and its accessories, we are not responsible for it.