

CHARACTERISTICS INTRODUCTIONS

For LiFePO₄ Power Lithium Battery

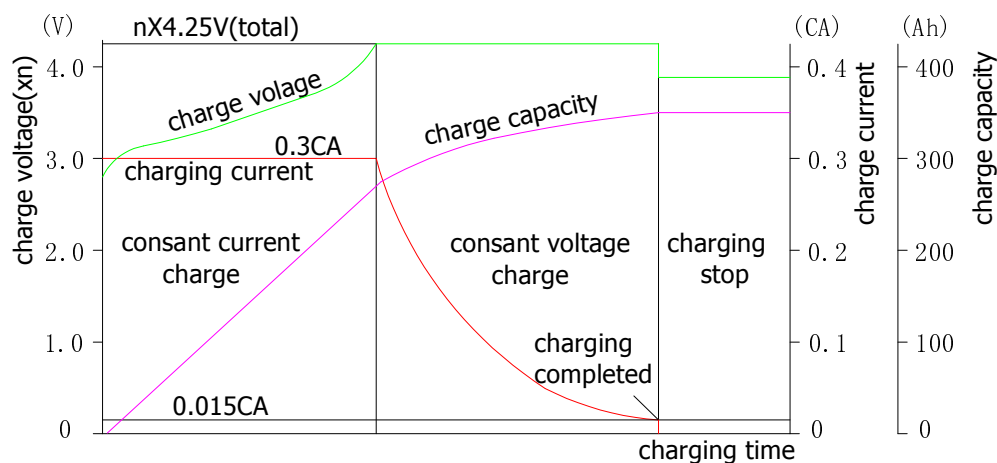
As a new type of high-energy, high-density, high-operating-voltage, environment-friendly battery, Dynamic Li-ion rechargeable battery not only can be used as traction power for environment-friendly transportation means, but also can be designed as battery packs composed of multiple serial-connected or parallel-connected batteries to serve as standby power supply to meet the needs of such facilities as communication, power and control, or serve as power supply for electric appliances and lighting in remote regions, sentries and field worksites. This product features low cost, safety, reliability and resistance to shock, and can work under the temperature range of -30~75°C.

1. Charging/discharging modes

1.1 Charging

Dynamic Li-ion rechargeable batteries are charged using dedicated Dynamic Li-ion rechargeable battery chargers in constant current and restricted voltage mode. The positive electrode of the charger is connected with the positive electrode (red) of the battery, and its negative electrode is connected with the negative electrode of the battery.

Charging is completed in two stages: constant current charging and constant voltage charging. In the stage of constant current charging, initial current is kept at or under the current of 1C charging (optimal charging current is 0.3 times rated capacity). (Charging current of our high-power pulse charging equipment can reach 10C). When battery voltage reaches charging cutoff voltage (4.15V maximum), constant current charging converts to constant voltage charging and it stops charging when charging current is below 100mA.



1.2 Discharging

For single battery, discharging current is strictly kept at 2.8V lower limit (optimal constant discharging current is 0.3-0.8 times rated capacity). If durability is not taken into consideration, this battery can reach instant high-current discharging with current 3 times higher than rated capacity. As a type of high-capacity batteries, dynamic Li-ion rechargeable battery can be combined into battery packs of different power to serve as power source for various types of electric applications.

2. Maintenance

2.1 Day-to-day check for batteries

Check for battery breakage and replace them if breakage is found.

2.2 Voltage measurement

a) Voltage for standard single battery: 2.6~4.1 V

b) Use multi-meter to check the voltage for each battery. When finding the voltage for any single battery is low ($\leq 2.6V$), just charge that battery (don't unload the battery by removing the pressing plate).

c) When finding any single battery with zero-voltage, it is recommended to consult manufacturer for help or ask battery dealer close to replace such battery.

3. Combination

3.1 User can combine single battery into battery packs via serial connection or parallel connection, depending on specific working requests.

3.2 For smaller capacity battery, it is preferred to use nickel rod to spot weld (i.e., ultrasonic, laser or resistance welding) its serial/parallel lead wires and it is strongly recommended not to directly weld them with electric iron.

4. Storage

4.1 Dynamic Li-ion rechargeable battery should be stored when fully charged with charging voltage of 4.15V. Due to self-discharging at the rate of 5% per month, Dynamic Li-ion rechargeable battery capacity may drop below 50% after storage for 12 months. It is necessary to check and recharge it before further storage. If Dynamic Li-ion rechargeable battery is stored when half charged, it should be checked and recharged after storage for 6 months. Failure to check and recharge may cause battery voltage to drop to 0~2V due to discharging voltage drop, which may result in battery damage. In this case, it is recommended to charge the battery slowly using 0.1CA constant current and 4.15V constant voltage. If volt. increases gradually and battery casing does not get hot, it

indicates the battery may restore normal status. Otherwise, it is recommended to consult manufacturer or dealer close to you.

4.2 It is preferred to store Dynamic Li-ion rechargeable battery in a dry, clean, well-ventilated warehouse at 5~40°C.

4.3 Keep Dynamic Li-ion rechargeable battery away from direct sunlight and at least 2m away from heat source.

4.4 Protect Dynamic Li-ion rechargeable battery from mechanical shock or pressure.

5. Transportation

5.1 In transportation, it is required to protect Dynamic Li-ion Rechargeable Battery from violent mechanical shock, strong sunlight and rain.

5.2 Care should be taken when loading and unloading the product, and it is required to avoid drop, rolling and heavy pressure on it.

6. Fire extinguishing

In case of fire due to improper handling, Dynamic Li-ion Rechargeable Battery casing may dissolve and give off thick smoke. In this case, you may use tap water to sprinkle on it or dip it in water for 30 minutes.

7. Disposal

In case Dynamic Li-ion rechargeable battery capacity is below 50% after repeated use, it is strongly recommended to return it to manufacturer to collect it for unified disposal. To prevent environmental pollution, never throw it away.

8. Warning

8.1 Avoid short circuit to Dynamic Li-ion rechargeable battery, whether it is caused by needle penetration, pressing or any other reason. In any case, it is prohibited to directly short circuit the battery. Improper operation, violent shock and pressing may cause short circuit, which may cause fire for Dynamic Li-ion rechargeable battery (but will not cause explosion). To extinguish fire caused by short circuit, it is allowed to use ordinary fire extinguishing facilities or directly sprinkle tap water on the battery.

8.2 Battery and battery packs may operate under the temperature range of -20~75°C. Forced ventilation is required when operation beyond this upper limit. Under low temperature, discharging current tends to be low and voltage drops fast, which may affect power output. In this case, battery may discharge at lower power for about 3 minutes and resume normal discharging after temperature rises to 30°C.

8.3 To use this product in extremely cold environment, it is preferred to design insulating casing for battery. If external heating is provided, it may further ensure normal discharging.

8.4 To serial or parallel connect single battery, it is recommended to select batteries with consistent voltage and internal resistance value. Otherwise, it may result in overcharging or over discharging and thus cause drop in production capacity and voltage, and even result in zero voltage due to inconsistent charging and discharging by individual batteries.

8.5 In actual use, in addition to serial or parallel connection of batteries with consistent voltage and internal resistance value, it is also required to ensure each single battery is evenly charged. Generally, it is normal charging status when voltage difference between individual serial/parallel-connected batteries is $\leq 50\text{mv}$ and it is saturated status when the voltage for individual batteries is $4.1\sim 4.15\text{V}$. Now, battery charging should be stopped.

8.6 The self-discharging rate for Dynamic Li-ion rechargeable battery is $\leq 5\%$ per month. After storage for a year, capacity and voltage tend to be low. Now, charge and discharge single batteries 2~3 times at low current (0.1CA constant current and 4.15V constant voltage for charging, and 0.1CA constant current and 2.6V constant voltage for discharging), and such batteries can be activated and restore activation.

8.7 The greatest advantage for Dynamic Li-ion rechargeable battery is that it does accept long-time discharging at constant current multi-power ($\geq 3\text{CA}$). Before using this product, it is required to strictly ensure bearing power matches the capacity of the battery pack. Otherwise, it may result in quick deterioration in battery capacity and shorten cycle life.

8.8 To use battery pack in other mode of serial or parallel connection, it is recommended to consult manufacturer or dealer and conduct connection only after fully understanding the performance of batteries. Never charge or discharge serial or parallel-connected untested batteries.

9. Other characteristics

9.1 The discharge voltage of LiFePO_4 battery can be $2.0\sim 2.5\text{V}$, which is not harmful to it.

9.2 If keep the charging voltage not higher than 4.15V and discharging voltage not lower than 2.5V at normal temp., the cycle life should be more than 2000 time.

9.3 LiFePO_4 battery will not cause accident when overcharged or overdischarged, it will not get fire when circuit short unless the user destroy it on purpose.

9.4 LiFePO_4 battery is an optimum mobile power source.

9.5 Battery Management System(BMS) is the best device for battery pack that to balance and protect the cells from overcharging or overdischarging.