

# Battery Instructions

## For LiFePO<sub>4</sub> battery

Welcome to use Dynamic Li-ion rechargeable battery as power source for electric projects.  
(for example, electric car)

To make proper use of your selected Dynamic Li-ion rechargeable battery, please read through these instructions before use.

### ■Foreword

As a type of high-capacity batteries, the Dynamic Li-ion rechargeable battery can be combined into battery piles of different power to serve as power source for various types of electric cars. In day-to-day transportation operation, it is necessary to satisfy the following prerequisites no matter what type of traction power is used as power source for vehicles such as engines and fuel tanks for fuel vehicles, and reactors and hydrogen cylinders for hydrogen-battery vehicles:

- ① Shock resistance (providing output power while vehicles are driving on different types of roads).
- ② Resistance to high/low temperature environments.
- ③ Instant high-power output (performance to meet climbing, accelerating and continuous driving).
- ④ Free from explosion when driving on roads or in time of parking or occurrence of traffic accidents.

In case of traffic accident such as collision and overturn, the consequence may vary for a Dynamic Li-ion rechargeable battery electric car, a fuel car or a hydrogen FC (fuel cell) car:

- ① For a Dynamic Li-ion rechargeable battery electric car, the consequence arising from the most serious accident (i.e., battery pile breakage or short circuit) is fire and thick smoke without explosion. Such fire can be extinguished by rainwater or you may use general fire extinguishing facilities or tap water to put it out.
- ② For a fuel car, when engine or fuel tank is broken by collision, it may immediately cause a big fire or even cause explosion.
- ③ For a hydrogen FC car, if hydrogen cylinder is broken by collision or hydrogen-oxygen reactor is pressed, it may cause violent explosion.

Artificial misconduct such needle penetration, pressing or ignition on Dynamic Li-ion rechargeable battery, fuel tank, hydrogen FC reactor or hydrogen cylinder may cause three different results: Big explosion for fuel tank; Big explosion for hydrogen fuel cell too; Only combustion without explosion for lithium iron phosphate battery.

## ●Features for Dynamic Li-ion rechargeable battery:

- 1) Complies with charging/discharging requirements for various types of road vehicles as well as European CE Standards.
- 2) Can be regenerated and complies with environment protection regulations.
- 3) Possible to charge each single battery with 0.5A~3A constant current.
- 4) Possible to charge/discharge multiple serial/parallel connected single batteries with consistent performance.
- 5) Possible to charge/discharge batteries randomly and from time to time, without causing charging/discharging memory drawback.
- 6) Suitable for discharging at  $-31^{\circ}\text{C}\sim 75^{\circ}\text{C}$  and charging at  $-18^{\circ}\text{C}\sim 75^{\circ}\text{C}$ .
- 7) Under 0.08CA irregular discharging current, 80%DOD life span is greater than 2000 cycles. For an electric bus equipped in compliance with our specifications, a repeated charging battery pile can enable it to drive more than 300,000km.
- 8) Self-discharging rate per month is below 5% under ambient temperature.
- 9) Rainwater or sunlight on discarded or waste battery casing will not cause explosion.

## ●Intrinsic charging/discharging characteristics of Dynamic Li-ion rechargeable battery

- 1) Batteries can be charged using different constant voltage/constant current charging/discharging modes depending on changes in environment. Under ambient temperature, charging voltage for single batteries is 4.00V and lowest discharging voltage should not be lower than 2.6V. At  $0\sim 10^{\circ}\text{C}$ , charging voltage for single batteries can be set at 4.2V and lowest discharging voltage should not be lower than 2.5V. At  $-1\sim -18^{\circ}\text{C}$ , charging voltage for single batteries can be set at 4.25V and discharging voltage can be set at 2.0V.
- 2) When overcharged or overdischarged under ambient temperature, single batteries may be damaged or disabled.
- 3) For serial-connected battery pile,  $\leq 50\text{mV}$  voltage difference between single batteries is allowed. This will not affect the charging or discharging life of the battery pile.
- 4) Positive/negative pulse current can be used to charge batteries in  $>3\text{CA}$  quick-charge mode.
- 5) Batteries are difficult to charge at low temperature (below  $-20^{\circ}\text{C}$ ). In this case, heating battery casing may help restore normal charging. When discharging at low temperature (above  $-35^{\circ}\text{C}$ ), it is also necessary to heat battery casing or discharge batteries using lower current (below 0.1CA), but this will result in low discharging voltage (about 2.0V). After discharging for about 3 minutes, it will restore normal discharging performance.

## ● How to make Dynamic Li-ion rechargeable battery match electric cars?

- 1) First, you have to determine the mileage and motor parameters of the car as well as normal and maximum output power of its controller and then, you can determine how to configure the battery pile. It is prohibited to use low-power battery pile to drive a high-horsepower car, which may reduce batteries' service life due to overload. Also, it is prohibited to use high-power battery pile to drive a low-horsepower car, which may cause waste, increase dead weight, affect design requirement and result in hazards.
- 2) Matching battery pile with car in a scientific and rational manner not only can extend battery life but also can enable motors to achieve high performance, safety and reliability.
- 3) Example 1  
To design a 12m-long low-floor air-conditioned coach which is required to drive 250km after one charging with highest speed at  $\geq 80\text{km/h}$  and where the maximum output current and DC operating voltage for motor controller are 400A and 320~460V respectively, it is necessary to equip the coach with 600Ah 108 serial-connected single batteries. (A configuration of lower than 600Ah 108 Dynamic Li-ion Rechargeable Battery cannot meet the requirement of driving mileage with one charging and meanwhile, it will accelerate battery pile capacity deterioration and reduce service life)
- 4) Example 2  
To design a 12m-long deluxe air-conditioned tourist coach which is required to drive 300km after one charging (air-conditioner working) with highest speed at  $\geq 100\text{km/h}$  and where the maximum output current and DC operating voltage for motor controller are 500A and 270~387V respectively, it is necessary to equip the coach with 1000Ah 90 serial-connected single batteries. This configuration not only can keep batteries in normal discharging status and ensure long-term high efficiency but also enable the electric coach to achieve its designed performance and specifications.
- 5) Combined batteries  
First, it is necessary to serial or parallel-connect selected batteries into groups for each electric car and then use clamping plates, backstays and screws to fix each group of serial or parallel-connected batteries. Never charge or discharge single batteries that are not fixed with clamping plates!  
It is required to strictly comply with ex-factory test standards for new batteries. It is prohibited to combine unmatched batteries into one group or install them on the same electric car.  
Combined batteries should be installed at a proper position on electric car, preferably on the beam at the chassis. This may reduce the consequence arising from shock or press. Also, it is preferred to design natural ventilation to radiate heat for batteries.

## ● How to maintain and care for batteries?

- 1) It is required to check the voltage of individual batteries. When finding voltage difference between single batteries is  $> 50\text{mV}$ , such batteries should be recharged or replaced.
- 2) Keep battery surface clean and maintain natural ventilation in summer and insulation in winter.
- 3) Keep voltage for single batteries above 3.2. Before startup, check overall voltage of the battery pile. When finding voltage for any single battery is below 3.2V, get it fully charged before driving.
- 4) Immediately charge batteries that have been fully discharged.
- 5) Every time before charging, it is required to check whether the voltage at charger terminal complies with the requirements of charging voltage, and it is required to measure output current and ensure it complies with requirements while charging.
- 6) For long-term use, it is required to fully charge and discharge batteries 3 times per year (4.15V charging voltage and 2.6V discharging voltage for single batteries under ambient temperature environment) in order to effectively activate internal active substances for batteries and better achieve their electrochemical properties.
- 7) In case of thick smoke or fire caused by unexpected accidents, the most effective approach to put out such fire is to sprinkle with tap water or use power or foam extinguishers to spray at fire.
- 8) Once fire on electric car caused by unexpected accidents may affect batteries. when batteries are burned by external fire, flammable substances inside them may catch fire (but will not explode). In this case, batteries may give off small amount of hydrogen fluoride or CO or CO<sub>2</sub> gas, but will not give out electrolytes. Normally, rescuers only need to wear ordinary protection equipment.

*We have only one earth where petroleum and natural gas are exhausted. A type of new environment-friendly energy source has become a common goal. We wish LiFePO<sub>4</sub> Dynamic Li-ion rechargeable battery would become an ideal power source to propel the development of environment-friendly transportation means.*