# Drypower Series LiFePO4 Battery

# Technical Handbook

V 1.0

Drypower

Rechargeable Lithium LiFePO4

# Contents

# 1 Introduction

Welcome to the comprehensive technical handbook for Drypower LiFePO4 batteries. This handbook has been carefully prepared to provide you with important information on the correct use, maintenance, and safety precautions of batteries. Whether you are using it for the first time or seeking review, this guide is designed to help you maximize the performance and lifespan of your battery. In this handbook, you will find detailed instructions, safety guidelines, and valuable tips to ensure that your use of our LiFePO4 battery is both fault free and rewarding. Please take the time to read and familiarize yourself with the content provided, as this will enable you to fully utilize your investment and use your battery with confidence.

# 2 Safety Precautions

- Carefully read these instructions and place them near the lithium battery for future reference.
- All work on lithium batteries should be carried out by qualified personnel.
- Ensure that lithium batteries are always kept out of reach of children.
- When using lithium batteries, always wear appropriate protective glasses and clothing.
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- Pay attention to any warning signs or labels fixed on the battery. Do not remove or damage these warning labels.
- Be extra careful when handling lithium batteries.
- Before use, verify that the selected battery is suitable for the intended application and meets the power/load requirements.
- Ensure that the battery is securely and correctly installed, and always use suitable transportation equipment.
- Keep LiFePO4 batteries dry and clean if possible.
- Prevent any form of damage, including falls, impacts, drilling, scraping, compression, etc.
- Pay attention to the positive (+) and negative (-) terminals of LiFePO4 batteries and always connect them with the correct polarity to avoid irreversible damage.
- Pay attention to the correct connection with the load.
- Do not short-circuit the LiFePO4 battery.
- Avoid extremely deep discharge and high charging current. Please make sure to refer to the battery data sheet or battery label.
- Do not attempt to disassemble the battery as it may cause overheating, smoking, ignition, or explosion. Always seek guidance from manufacturers.

- The LiFePO4 battery pack is a non-repairable component. If any abnormal situations occur, please contact the after-sales department for assistance.

## 2.1 General safety guidelines


**WARNING**

- Please note that the lithium battery terminals carry voltage. Do not place any conductive objects or tools on the battery to prevent short circuits. Be sure to use insulated tools when necessary.
- Keep the battery away from heat sources, open flames, flammable materials, and any areas with explosive gases or liquids.
- If you notice any of the following issues with the battery - abnormal odor, overheating, deformation, or any other irregularities - please stop using the battery immediately. Please contact our after-sales department for further guidance.

- In case of battery fire, please use foam or carbon dioxide extinguisher to extinguish the fire.

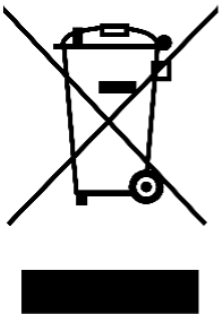
- These guidelines are crucial for ensuring the safe and reliable operation of LiFePO4 batteries. Your safety and optimal battery performance depend on strict adherence to these instructions.

## 2.2 Identification

| | |
|---|---|
|  | Follow the instructions for safe use. Follow the instructions on the battery and in the technical handbook. |

| | |
|---|---|
|  | Work with high attention! |
|  | Electrical equipment, risk of electrical shock! |
|  | Fire, open light and smoking are prohibited! Avoid sparks when handling cables and short circuits |
|  | Misusing or mishandling a lithium-ion battery may cause fire or explosion, which can result in personal INJURY or DEATH and property damage! |
|  | This product or parts of this product may be recycled. |

## 2.3 Recycling



Before sending LiFePo4 batteries for recycling, make sure to cover the terminals with a protective cap or non-conductive tape. Properly dispose of LiFePo4 batteries in certified lithium recycling facilities. After consulting with the dealer, you can also return the battery to them for recycling. Please do not dispose of these batteries in household or industrial waste to support responsible and environmentally friendly recycling practices.

# 3 Installation of the battery

## 3.1 Receiving and unpacking

- Check the packaging for any signs of damage during transportation. If you notice obvious damage to the packaging, please take photos for record before

continuing with the operation.

- Check for any visible damage to the battery, such as dents, punctures, or leaks. If any damage is detected, do not use the battery and immediately contact the manufacturer or supplier.
- Handle packaging materials according to local regulations or recycling guidelines.
- Before installing the battery, ensure that you have the necessary equipment and tools for safe and correct installation.

## 3.2 Location and mounting

- Install LiFePO4 batteries indoors or in controlled environments as much as possible
- Protect them from extreme temperatures, humidity, and direct sunlight.
- Ensure that the installation area has sufficient ventilation to dissipate any heat generated by the battery. Appropriate airflow helps to maintain the battery at its optimal operating temperature.
- Use appropriate brackets or mounting hardware to securely install the battery on a stable, horizontal, and vibration resistant surface. Ensure that the installation structure can withstand the weight of the battery.
- Place the battery away from sources of excessive vibration or mechanical impact to prevent damage.
- Place the battery in a way that facilitates maintenance, inspection, and routine inspection.
- Ensure that appropriate terminal covers or insulation materials are used to protect the battery terminals from accidental short circuits.
- Arrange cables and wiring neatly and safely to avoid strain, pinching, or damage. Use cable management solutions to organize and secure wiring.
- Comply with all local regulations and building codes related to battery installation and safety.
- If you are unsure about the installation process, please consider hiring a qualified professional with battery installation experience!
- Install the battery in an upright position. Unless explicitly permitted in the manufacturer's handbook, avoid installing it sideways or upside down. Please refer to the details as below.

| Battery Model | Installation Direction | | |
|---|---|---|---|
| | Upright | sideways | upside down |
| 6LFP3.8 | √ | √ | ✗ |
| 6LFP6 | √ | √ | ✗ |
| 6LFP7.6 | √ | ✗ | ✗ |
| 6LFP11.4 | √ | ✗ | ✗ |
| 12LFP3.8 | √ | ✗ | ✗ |
| 12LFP7.2 | √ | √ | ✗ |
| 12LFP7.6 | √ | ✗ | ✗ |
| 12LFP11.4 | √ | √ | ✗ |
| 12LFP15.2 | √ | √ | ✗ |
| 12LFP21 | √ | √ | ✗ |
| 12LFP24 | √ | √ | ✗ |
| 12LFP28 | √ | ✗ | ✗ |
| 12LFP30 | √ | ✗ | ✗ |
| 12LFP36 | √ | ✗ | ✗ |
| 12LFP45 | √ | ✗ | ✗ |
| 12LFP42HR | √ | ✗ | ✗ |
| 12LFP48 | √ | ✗ | ✗ |
| 12LFP50P | √ | ✗ | ✗ |
| 12LFP75 | √ | √ | ✗ |
| 12LFP100PS | √ | ✗ | ✗ |
| 12LFP150PS | √ | ✗ | ✗ |
| 12LFP200P | √ | ✗ | ✗ |
| 12LFP200PHR | √ | ✗ | ✗ |
| 12LFP300P | √ | ✗ | ✗ |
| 24LFP4 | √ | ✗ | ✗ |
| 24LFP20 | √ | ✗ | ✗ |
| 24LFP50P | √ | ✗ | ✗ |
| 24LFP100P | √ | ✗ | ✗ |
| 24LFP150P | √ | ✗ | ✗ |
| 36LFP100P | √ | ✗ | ✗ |
| 12LFP18TB | √ | √ | ✗ |
| 12LFP25TB | √ | √ | ✗ |
| 12LFP32 | √ | ✗ | ✗ |

"√" means allowed. "✗" means not allowed.

## 3.3 Electrical connections

- Select appropriately sized cables and connectors based on the specifications of the battery, including current and voltage requirements.
- Carefully check and ensure that the polarity of the battery terminals is correctly aligned with the system requirements.

**Warning! Reverse polarity connection can cause irreversible damage to the BMS system of the battery! The equipment may also be damaged!**

- Use a torque wrench to tighten cable connections to the manufacturer's specified torque values. Proper torque ensures secure connections and minimizes the risk of overheating.

- Use proper crimping or soldering techniques for cable terminations, following industry best practices and guidelines.

- Install overcurrent protection devices, such as fuses or circuit breakers, in line with the battery to safeguard against excessive current draw.

- When connecting multiple LiFePO4 batteries in series if they are allowed, please follow manufacturer recommended guidelines for achieving balanced voltage and current distribution. Please refer to the battery label if it is allowed for series connection. If you want to connect the battery in parallel, please consult with the dealer for help before operation. Usually, the batteries are not allowed for parallel use.

- Regularly inspect and tighten cable connections to prevent loosening due to vibrations or temperature variations.

- Comply with relevant electrical codes and standards applicable to your installation.

# 4 Operation

## 4.1 Charging

- Please use a dedicated charger approved by Drypower for LiFePO4 batteries that meet specific battery parameters.
- The appropriate continuous charging current is 0.2CA to 0.5CA.
- The battery is equipped with overcharging protection, which will be triggered when the battery reaches 100% charging.
- After initial charging, perform a capacity check to ensure that the battery operates within the expected parameter range.
- Charge the battery within the ambient temperature range of 0 ° C to 45 ° C. Try to maintain the temperature around 25 ° C for optimal performance/lifespan ratio. Charging below 0 ℃ is prohibited.
- Suggestions on charging rate at different temperatures as below. However, it should not exceed the max limit of the BMS. Please refer to the data sheet or battery label for detail.

| Environment Temperature | Standard charge | Maximum Charge |
|---|---|---|
| ＜0℃ | Prohibited | |
| 0-10℃ | 0.2C | 0.2C |
| 10-20℃ | 0.2C | 0.5C |
| 20-45℃ | 0.5C | 1C |
| ＞45℃ | Prohibited | |

Note: “C” is the charge rate of the battery. For a 100Ah battery, 1C means 100A.

## 4.2 Discharging

- Ensure that the connected load or device is compatible with the voltage and current output specifications of the battery.
- Please refer to your battery data sheet or label for the maximum discharge rate of a specific battery model.

- LiFePO4 batteries can discharge up to 100% of their capacity. However, in order to optimize the performance of LiFePo4 batteries and avoid BMS disconnection, we recommend limiting discharge to 80%.

- Set a voltage cutoff threshold to disconnect the load or device from the battery when it reaches the predetermined minimum voltage. This can prevent excessive discharge.

- Discharge the battery under the environment temperature range from -20°C to 60°C. Try to keep the temperature close to 25°C for best performance/lifespan ratio.

- The battery is equipped with over discharge protection, which will be triggered when the battery voltage reaches a certain value.

- After discharging the LiFePO4 battery to a safe DOD level, immediately recharge it. Avoid keeping the battery in a deep discharge state for a long time.

## 4.3 Storage

Store the battery in a clean and dry environment, with a temperature range of -10 ° C to 45 ° C. Avoid storing at temperatures exceeding 50 ° C as this can cause overheating, potential fire hazards, or shortened lifespan. Ideally, maintain the temperature close to 25 ° C for optimal performance and lifespan.

The recommended charging state for battery storage is about 50% SOC. Avoid long-term storage with remaining capacity below 10% SOC or above 90% SOC, as this may lead to irreversible damage.

**Warning! If the battery remains in a 0% charging state for a long time, the battery voltage may drop to a level where the Battery Management System (BMS) cannot function. In this situation, the battery will not function. Please note that such damage is not covered by the warranty!**

- If unused batteries are connected to the device but not in use, the storage period will be limited to a maximum of 3 months. After this period of time, the battery may degrade and should be recharged.

- For new batteries charged to 50% capacity, the recommended maximum storage period is 6 months. After this period of time, the battery may be degraded and should be recharged.

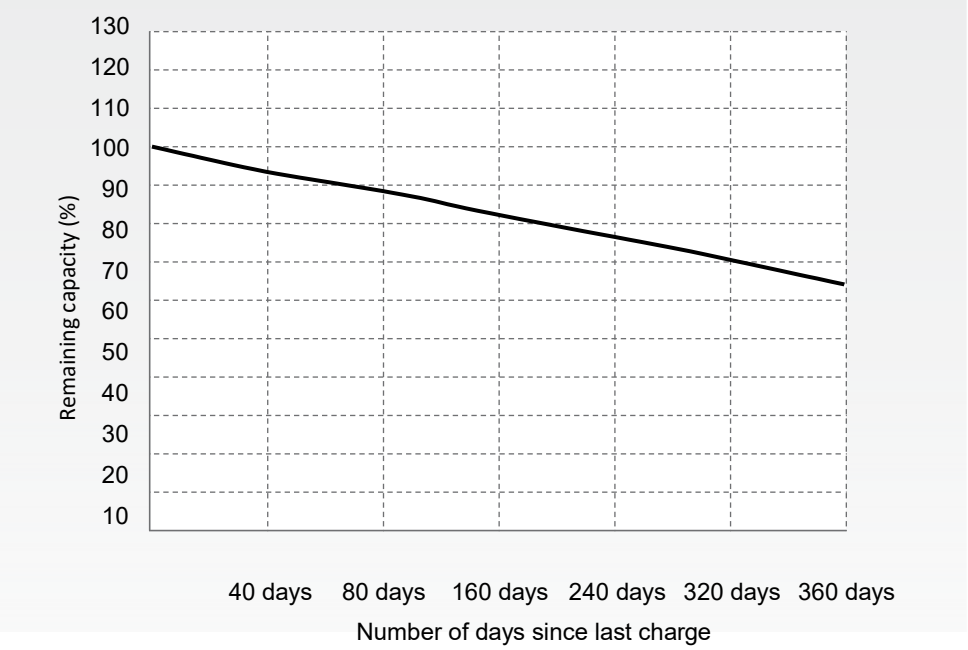
- Ensure that the battery is kept away from areas where it may fall off. Falling can cause internal damage and potential leaks, even leading to overheating, smoking, fire or explosion.

- Avoid using or storing batteries in areas with strong static electricity or magnetic fields. These environments may damage the safety protection devices of batteries, causing safety hazards.

- If the battery is stored outside the original packaging, please cover the terminals with insulation material to prevent accidental short circuits.

## 4.4 Self discharge

Most LiFePO4 batteries have a very slow rate of self-discharge. It is therefore possible to store them for a long time following the initial charge. Below chart is for reference. But the result may vary a lot at different environment.



### 4.5 State of charge via voltage checking.

| SOC 25℃ | Voltage (V) | | | |
|---|---|---|---|---|
| | 6.4V Series | 12.8V Series | 25.6V Series | 38.4V Series |
| 100% | 7.053 | 14.106 | 28.211 | 42.317 |
| 90% | 6.651 | 13.302 | 26.604 | 39.906 |
| 80% | 6.649 | 13.297 | 26.594 | 39.891 |
| 70% | 6.648 | 13.296 | 26.592 | 39.888 |
| 60% | 6.605 | 13.209 | 26.418 | 39.627 |
| 50% | 6.576 | 13.152 | 26.304 | 39.456 |
| 40% | 6.574 | 13.147 | 26.294 | 39.441 |
| 30% | 6.560 | 13.119 | 26.238 | 39.357 |
| 20% | 6.494 | 12.988 | 25.976 | 38.964 |
| 10% | 6.406 | 12.812 | 25.624 | 38.436 |
| 0% | 5.605 | 11.209 | 22.418 | 33.627 |

Since there are subtle differences between the voltages of individual batteries and characteristics of the LFP chemistry, the above parameters are for reference only.

## 5 Transportation

- Always transport batteries in their original packaging or approved battery shipping containers. Secure the battery to prevent movement during transportation.

- Avoid exposing the battery to extreme temperatures during transportation. High temperatures can cause overheating, while extreme cold can affect performance. The maximum temperature during transportation should be below 50 ° C.

- Be careful when handling batteries during loading and unloading to prevent physical damage or collision.

- Ensure that you have the necessary documents for transporting lithium batteries, including compliance with transportation regulations and safety standards.

- Be prepared for emergency situations. Appropriate fire-fighting equipment (such as D-type, foam fire extinguisher or carbon dioxide fire extinguisher) shall be provided for use in case of battery related accidents.
  Keep all relevant product documents, including technical handbooks and safety information, easily accessible during transportation.

# 6 Technical Support

Our top priority is to provide excellent technical support. If you encounter any problems or need assistance while using LiFePO4 batteries, please refer to the following resources:

13 Sheridan Close, Milperra NSW 2214 Sydney, Australia
Ph: +61 2 9519 1200
Fax: +61 2 9519 4604
Mail: info@master-instruments.com

- Start by referring to the product documentation provided with your battery, including the battery label, technical handbook. These documents contain valuable information about usage, maintenance, and troubleshooting. Battery datasheets are available in our website: www.master-instruments.com.au

- If your battery is covered under warranty, review the warranty terms and conditions provided with your purchase. Ensure that any potential issues fall within the scope of warranty coverage.

- Our dedicated customer support team is available to assist you with technical inquiries and concerns. You can reach us via phone, email, or our online support portal during regular business hours. Our contact details are available below or on our website.

13 Sheridan Close, Milperra NSW 2214 Sydney, Australia
Ph: +61 2 9519 1200
Fax: +61 2 9519 4604
Mail: info@master-instruments.com.au
Web: www.master-instruments.com.

# 7 Notes to handbook users

- This technical handbook aims to safely and effectively operate Drypower LiFePO4 batteries. Before installation and use, please carefully read and understand the content of this handbook.
- Adhering to the safety precautions and operating guidelines outlined in this handbook is crucial for ensuring battery life and performance, as well as preventing accidents.
- Any maintenance or service procedures should be carried out by qualified personnel.
- For detailed information and compatibility of specific products, please refer to the battery data sheet or battery label.