MILA NORDIC

USER MANUAL

FOR LITHIUM BATTERY PACKS FROM MILA NORDIC

2024

Revision

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www.milanordic.dk

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PREFACE

Dear Customer

Welcome to MILA Nordic

This manual contains essential information for the installation, use, and maintenance of your new lithium-iron-phosphate ($LiFePO_4$) battery pack(s) (hereafter referred to as "battery") from MILA Nordic.

We urge customers to read this user manual carefully before using the batteries to ensure safe and proper operation.

Please note that we cannot be held responsible for accidents or damage resulting from incorrect use.

Your safety is our priority

GENERAL USE

Batteries from MILA Nordic must only be used under the conditions specified in the user manual and product specifications. Failure to follow these guidelines may cause serious damage to the product and/or harm to the user.

Always use the battery in a dry, clean, dust-free, and well-ventilated area, and keep it away from fire, chemicals, and direct sunlight.

To ensure optimal performance and longevity of the battery, please adhere to the following temperature and storage guidelines:

• Recommended charge temperature range:	0 ^{0}C to +45 ^{0}C
• Discharging operating temperature range	-5 ^{0}C to +45 ^{0}C
• Short term (<1 month) storage temperature range:	-5 ^{0}C to 35 ^{0}C
• Long term (>month) storage temperature range	15± 5 ^{0}C
• Relative humidity: 10 to 90%	10% to 90%

OPERATION MODE

CHARGE

Charging occurs when the battery terminals receive a voltage higher than the battery's voltage. Ensure the voltage never exceeds the maximum charging voltage specified for the battery.

Follow the "Battery Use" guidelines for charging instructions.

Exceeding the charge specifications will void all warranties.

DISCHARGE

Discharge occurs when the battery supplies power. Ensure the power drawn and discharge current never exceeds the specified limits for the battery.

After discharging, always charge the battery to at least a voltage equivalent to 20% SoC, if it is to be used soon or to 40% SoC for prolonged storage.

Exceeding the discharge specifications will void all warranties.

DEEP DISCHARGE

If the battery's voltage falls below a certain level, it can suffer irreversible damage, known as deep discharge. To prevent this, the **B**attery **M**anagement **S**ystem (BMS) monitors the cell voltages and stops discharge if they drop below the under-voltage threshold.

Please note that the under-voltage protection is a safety measure, not a feature. It is always the user's responsibility to ensure the battery voltage does not fall below this threshold.

Leaving the battery in an under-voltage state can deplete it beyond recharging capability, necessitating disposal.

Reaching the under-voltage threshold voids all warranties.

SLEEP MODE

If the battery detects no charge, discharge, or active communication, it will enter sleep mode to preserve power. The time it takes to enter sleep mode varies by model. In sleep mode, the battery will only use 1-2% of the current it uses during normal operation.

INSTALLATION

PRE-INSTALLATION

 Warning! Do not use the battery if it has been dropped, excessively handled, or damaged in any way!

When installing the battery, it's crucial to follow these guidelines to prevent injury and ensure optimal performance. Please adhere to the following precautions:

- Wear protective gear such as gloves and protective glasses during installation.
- Do not touch battery terminals directly as these present a hazard in terms of electrical shock.
- Do not mix batteries of different manufacture, capacity, size, or type within a device.
- Do not connect batteries in series or parallel unless authorized in writing by MILA Nordic.
- Do not reverse the power cables. Ensure correct polarity by matching the + and - marks.

If the battery is in an enclosed space without air circulation, it’s best to create two ventilation holes, each measuring 100 mm by 100 mm, to avoid heat buildup.

POST-INSTALLATION

After installation, verify the battery's basic functions including voltage, charging, discharge, and display. If any anomalies are found, stop the installation, and notify us immediately.

After installing the battery, ensure it is fully charged before using it for the first time.

SAFETY PROTOCOL FOR DAMAGED BATTERIES

 Warning! If a battery is dropped or damaged in any way, do not use it. Place it in a safe location to prevent any fire propagation and monitor it for 30 minutes. Check for signs such as heat buildup or smoke.

The warranty is void after a battery has been dropped or damaged.

You can ship the battery to MILA Nordic for inspection. If no internal damage is found, the warranty can be reinstated. All expenses are the responsibility of the customer.

BATTERY USE

IN GENERAL

Always follow the guidelines in the product datasheet to safely use the battery. Do not disassemble the battery, as this may cause internal short circuits, leading to the decomposition of its materials and potential hazards like fire or explosion.

Additionally, dismantling can result in leakage of battery electrolytes. If electrolytes encounter skin, eyes, or other body parts, rinse immediately with clean water and seek medical attention promptly.

CHARGING

 Warning! Always make sure the charger is compatible with the battery and operates within the specified limits. If you have any doubts, contact your reseller or MILA Nordic.

When charging your battery, it is essential to follow these important guidelines to ensure safety and maintain optimal performance:

- Make sure to disconnect the load (i.e., turn off the electrical equipment) during charging.
- When charging, ensure that the negative (-) terminal on the charger is connected to the negative (–) terminal on the battery and that the positive (+) terminal on the charger is connected to the positive (+) terminal on the battery.

- Only use the Constant Current/Constant Voltage (CC/CV) charging method.
- The charger must stop the charging process once the tail current reaches 5% of the battery's nominal capacity in amps.
- Do not connect multiple chargers to the same phase.
- Disconnect the charger if not used for a long time.
- Mini-cycles and high voltage holds must be prevented by ensuring the battery is not recharged until the voltage has dropped below the equivalent of 80% SoC.
- Recharge the batteries to 40% SoC every 3 months.

Please be aware that certain chargers may not start charging if they cannot detect a voltage from the battery. This situation typically arises when the Battery Management System (BMS) has already disabled discharging. To activate the BMS, a charger equipped with a wake-up function is necessary.

The wake-up voltage 'pulse' should be applied only once, typically >5 seconds for most chargers employing this function. Following this, the battery cell voltage must be checked for the following:

Imbalance: No cell voltage should differ by more than 300mV from each other.
Low Voltage: No cell voltage should be lower than 2.7V.

If either of these conditions is not met, the battery should be discarded immediately for safety reasons.

CHARGING LOCATION REQUIREMENTS

To safely and effectively charge please follow these installation and location requirements:

- Always follow the charging manufacturer's User Manual and Installation Guide.
- Install the charger on a dedicated electrical circuit matching its voltage and current specifications.
- Place the charger in a well-ventilated, dry, and accessible location.
- Ensure the installation includes ground fault and overcurrent protection, and complies with IEC 60364-7-722.
- Charge the vehicles in a space that is free from obstacles, within the specified temperature range, and equipped with appropriate safety signage and fire safety equipment.
- Adhere to local building codes, electrical regulations, and occupational safety standards.

SAFETY AND EMERGENCY GUIDE

 Warning! Do not use the battery if it has been dropped, excessively handled, or damaged in any way!

In the event of a battery-related emergency, follow these crucial steps to ensure safety:

- In case of fire, call your country's fire emergency.
- If the battery starts to emit smoke, disconnect the load or charger.
- If possible, without touching the battery directly or inhaling the fumes, move the battery outside to a place where a possible fire cannot spread.
- If the battery cannot be moved, use a fire blanket, or other appropriate extinguishing methods to prevent the fire from spreading. Do not use carbon dioxide to extinguish the fire; instead, use carbon tetrachloride or sand to extinguish it.

INSPECTION, CLEANING AND MAINTENANCE

GENERAL INFORMATION

Never attempt to dismantle, repair, modify, crush, puncture, open, or shred the battery. The battery do not contain serviceable parts. Disconnect from loads or charger before inspection.

INSPECTION

Regularly check the battery's state of charge, as it will consume a small amount of power when not in use or during storage.
Consider replacing the battery if run time drops below 80% of initial run time or charging time increases significantly.

CLEANING

Clean with a soft, dry cloth. Avoid liquids, solvents, or abrasives.

DISPOSAL

Before disposal, ensure to fully discharge the battery and cover the connectors with electrical tape. Dispose of the battery in compliance with relevant laws and regulations. Users have the option to return the battery to MILA Nordic, though they will be responsible for associated expenses.

CONTACT INFORMATION

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