

RIM DRIVE TECHNOLOGY

48 Volt series | 6800 Wh and 13600 Wh - Lithium Battery



Manual

Battery 48V

Version 1.0 – English

Rim Drive Technology

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Congratulations and thank you for purchasing a Rim Drive Technology 48 Volt Lithium Iron Phosphate battery. At Rim Drive Technology it is our goal to give our customers the best performing, most reliable and safest battery system possible. To achieve this, we need your help during installation and operation. Please read these instructions carefully to maintain our lofty standards during installation and operation of the battery.

Also, reading the manual will teach you how you can get the best out of your system and increase its longevity!

If you have any questions or remarks regarding this manual or the battery itself, please feel free to contact us at:

Info@rimdrivetechology.nl
or visit www.rimdrivetechology.nl

We hope you enjoy your battery!

*Technical changes and errors in the manual are reserved. Always use the latest version of the manual available at www.Rim Drive Technology.nl

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1.Introduction

1.1 General information on the instructions

The instructions in this document describe all functions and provide safety information on the Rim Drive Technology 48 Volt 6800 Watt-hours and 48 Volt 13600 Watt-hours Lithium Iron Phosphate batteries.

It is our goal to make the use of our batteries as easy as possible by providing all the information needed to understand, install and operate the battery. This instruction manual ensures you can operate the battery safely in compliance with its intended use. If by any chance you feel information is not clear or is not certain how to install or operate the battery, please contact our customer service for your safety and the safety of the battery.

Always use the most recent version of these instructions which can be downloaded on our website:

<https://rimdrivetechology.nl/>

By reading and following these instructions you will:

- Avoid dangers to yourself and your surroundings.
- Reduce outage times and repairs.
- Increase the lifetime of your battery and the reliability of your system.

1.2 Safety information

In this instruction manual safety information will be presented using symbols and hazard classes. The hazard classes are subdivided into categories based on severity of the consequences and the likelihood of occurrence. The hazard classes are depicted below:

Hazard classes

Danger!

Direct hazard with elevated risk.
Death or severe physical injuries may result if the risk is not avoided.

Warning!

Potential danger
Severe physical injuries may result if the instructions are not followed properly.

Caution!

Danger with minimal risk
Physical injuries may result when the instructions are not followed

Advice

Mandatory instructions
Use these instructions for safety and correct installation of your battery.

2. Product delivery details

2.1 Overview of components

Rim Drive Technology 48V-3400Wh, 48V-6800Wh or 48V-13600Wh lithium battery

The following components are included in the product package:

- 1x 48 Volt battery
- 1x User manual
- 2x M8 spring washer
- 2x M8x16 bolt

2.2 Overview and controls of Rim Drive Technology 48V series



Negative terminal

The black negative terminal (-) (M8 screw F) needs to be connected to the negative (-) terminal of your system

Data port

The data port is only used for service and needs to trouble shoot when any issues with the battery may occur.

Power on/off

Use the power button to remove voltage over the battery terminals. When the switch is pressed in the battery is turned on and it will have 51.2 V (nominal) over its terminals. When the switch is pressed again and the button is level with the enclosure the battery is turned off and will not have voltage over the output terminals. When the battery is turned off the battery can still be charged.

Expansion valve

The expansion valve regulates air pressure between the inside of the battery and its outside environment. The valve is waterproof if it is not damaged. Make sure that during installation the expansion valve is safe from damage and is free from obstacles.

Positive terminal

The red positive terminal connector (+) needs to be connected to the positive (+) terminal of your system.

Specifications

The most important specifications to consider are engraved in the enclosure. Make sure these are not damaged and can be read by the user.

T-Slots

The type 30 T-Slots in the aluminum battery enclosure enable attaching accessories to the enclosure. Rubber supports are pre-installed on the bottom T-slots. (standard m6 flange nuts fit in the type-30 slots)

Serial number

The serial number can be found on the front of the battery. An example of the serial number is: 8721082427005.0001 or 8721082427012.0001

Please charge the battery!

Due to safety regulations the battery charged between 15%-30% upon delivery. You are required to charge the battery to at least 50% SoC within 3 months of the battery delivery date mentioned on the packaging otherwise permanent damage to the battery may result.

3. Safety

3.1 General safety instructions



Advice!

Read the instructions in this user manual carefully before operating the battery system. Always comply with safety warnings stated in this user manual. Always stay alert while working with and installing of the battery and other electric components

3.2 Safety introduction

The battery and its components are designed with safety and user-friendliness as a top priority and has been extensively evaluated. However, dangerous situations may occur when the battery is not managed properly or misused. This can result in physical harm to people or property. Always follow the guidelines stated in this user manual as well as local safety and accident prevention regulations.

3.3 Intended use

The Rim Drive Technology 48-volt series lithium batteries can be used as a stand-alone battery. The maximum discharge current of the battery is 150A. The battery will turn off automatically greater power is drawn from the battery to prevent damage to the battery (excl. short cranking situations, see spec sheet). Despite this safety mechanism, it is important to avoid this situation. The system in which the battery is installed must always meet the specifications of the battery. If more power is required, the batteries can be connected in parallel up to 8P.

3.4 Unintended use

The manufacturer accepts no liability when the battery is used as anything that is not specifically defined as its “intended use” as defined in this user manual. All other use cases that are not described in this manual are defined as “unintended use.” The battery operator is solely responsible for any harm or danger arising from such unintended use.

Amongst others, the following are deemed unintended use:

- Permanent contact with water
- Use of third-party battery chargers (Victron excluded)
- Use of cable sets that do not have a master switch or sufficient fuses

3.5 Before use

Before use check the condition and functioning of the battery. The battery may only be managed and operated by adults.

3.6 General safety information

Please read the following carefully

Danger!

Risk of fatal electric shock!

Contact with uninsulated or damaged parts may lead to electric shock resulting in death or severe physical injuries.

- Never do any repair work to any part of the system yourself. This leads to dangerous circumstances and voids the warranty.
- Never touch any uninsulated or broken wiring or any other damaged/defective parts.
- When you suspect a problem never touch any metal components and switch off the main system switch and after switching off the battery immediately.
- Prevent any electrical components from encountering water.
- Always have the battery switched off during installation or during any form of managing the battery.

Danger!

Fire Hazard! Danger to life

Never charge the battery when it is damaged.

Danger!

Fire Hazard! Danger to life

Always use appropriate conductive electric cable with the right cross-section when connecting loads. If you are not sure what cross section is needed, please contact your dealer or another professional.

Danger!

Fire Hazard! Danger to life

never use flammable gases, solvent, or vapors on the system.

Danger!

Risk of death or severe physical injuries from electromagnetic radiation

Persons with a cardiac pacemaker must maintain a 50 cm distance from any Rim Drive Technology battery or charger.

 Warning!

Danger injury by electric shock as result of short circuit

- Remove all metal jewellery before handling or installing the battery or any other electrical equipment.
- Never leave tools in contact with the battery but store them away at a safe distance.
- Always be aware of the polarity of the battery terminals. Make sure you connect the battery at the correct polarity.
- Make sure the battery terminals are clean and free of corrosion.

 Caution!

Never open the battery

Opening the battery will void warranty and will lead to permanent damage to the battery. A certified Rim Drive Technology professional may only do maintenance and repairs.

 Caution!

Fluids or gases leaking from a damaged battery can cause injuries and other harm

- Avoid contact with any fluids spilling from the battery.
- Avoid contact with skin and eyes.
- Never inhale gases from the battery.
- Contact your dealer or a professional in case of leakage from the battery.

 Caution!

Damage to the battery from heat

- Make sure the battery is never near external heat sources.
- Never store flammable objects near the battery.
- Store the battery in a well-ventilated area.
- Never place the battery in direct sunlight. Especially during summer or high ambient temperatures.

 Advice!

Increase the lifetime of your battery by reducing its exposure to extreme temperatures, moisture, and direct sunlight.

4. Installation of the battery

Important! Please charge your batteries before use.

Danger!

Danger to life from electric shock

- Avoid touching the battery terminals.
- Never undertake repair work on the battery yourself.
- Never touch any defective components
- Prevent any external forces from working on the battery and the cables.
- If you detect any defect, shut down your system and the battery immediately

Caution!

Damage to the battery and your system can result from incorrect installation. Please read the instructions carefully.

- Always make sure to turn the battery off during installation using the main switch.
- Make sure to always first connect the red positive cable to the red positive terminal then connect the black negative cable to the black negative terminal.
- When disconnecting the battery make sure to first disconnect the black negative terminal before disconnecting the red positive terminal.
- Never transpose the polarities!

4.1 Connecting multiple batteries in parallel

Danger!

Never connect the batteries in series! Fire and damage to the battery and your system may result.

- Make sure to never connect multiple batteries in series.
- Never series connect the battery with any other third-party batteries.

Advice!

- Up to 8 batteries can be connected in parallel.

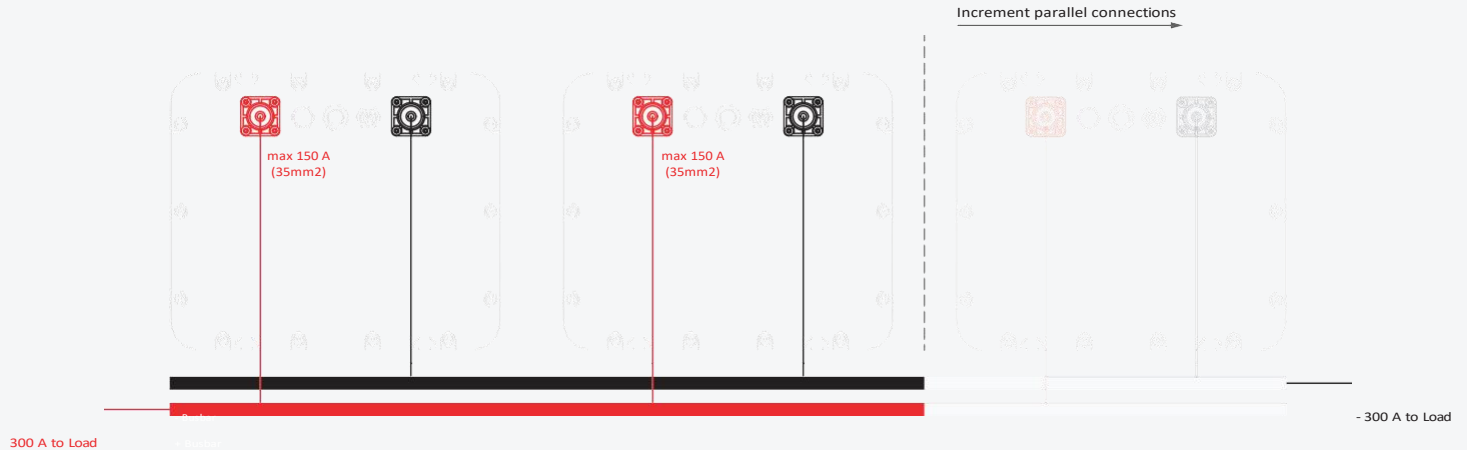
Important! It is especially important that the batteries are all at the same voltage before connecting them in parallel. Please check the voltage difference between the batteries is below 0.5 Volts. If not, please charge or discharge the batteries to equal voltage.

Important! Check your system for short circuits by measuring the resistance of the system before connecting your batteries.

Important! When installing the battery on a metal surface make sure to isolate the battery enclosure to prevent galvanic corrosion. Use rubber feet or some other insulation material.

Connecting multiple batteries in parallel can be done in the following way:

Using a positive and a negative busbar to connect the batteries makes it easier to manage the currents. **IMPORTANT:** make sure each battery has equal cable length between the busbar and the battery for both the negative and the positive sides.



42 Installation

Caution!

Damage to the battery and your system can result from incorrect installation. Please read the instructions carefully.

- Install the battery in a dry location that cannot be flooded.
- Do not install the battery near any heat emitting components.
- Choose a well-ventilated location for installation of the battery.
- Make sure to always fasten the battery tightly to a base to avoid any damage to the battery and its surroundings from vibrations or shaking of the battery.
- Do not place the battery where it is in direct contact with dissimilar metal.

Installation using the T-slots of the battery enclosure

1. Place the battery in your chosen location and make sure the location complies with the requirements mentioned above.
2. Use the T-slot to secure the battery to a solid base with bolts of your choosing. It is also possible to strap the battery into place using lashing straps.
3. Check if the battery is fastened securely.

Advice!

- Make sure the battery terminals and data port are easily accessible and are not in contact or close near any other objects that can damage the components.
- Make sure the vent plug on the battery is not obstructed from functioning properly.

5.3 Wiring

Warning!

Danger injury by electric shock as result of short circuit

- Remove all metal jewellery before handling or installing the battery or any other electrical equipment.
- Never leave tools in contact with the battery but store them away at a safe distance.
- Always be aware of the polarity of the battery terminals. Make sure you connect the battery at the correct polarity.
- Make sure the battery terminals are clean and free of corrosion.

Always use cables with appropriate thickness to manage the currents associated with your system.

Important: Always install a fuse in line with each battery. Use a 200 A fuse in line with each battery for continuous discharge. In case of cranking purposes use a larger appropriate fuse.

5.4 Ventilation

Caution!

Make sure the vent plug is free of obstacles and can operate without obstruction

To prevent the battery from overheating please make sure the battery is in a ventilated space. Positioning your battery in a well ventilated and cool space will increase battery health and product lifetime. The heat fins on the enclosure function as a heat sink. Allowing airflow over the enclosure will cool down the battery and increase performance and product lifetime. Also make sure that the battery is not in direct sunlight to prevent the battery from overheating and extending its life.

5.5 Checking your system

Before turning on your batteries please check your system for any mistakes. Check your system for short circuits using your multimeter.

Make sure your system does not draw any small residual currents $<1A$ per battery. Loads under 50 Watt will not be detected by the BMS and can over longer periods of time affect the State of Charge (SoC) presentation. By charging the battery to 100% the SoC presentation is recalibrated. If there are any small loads in your system, make sure to charge your batteries 100% more frequently.

5.6 Switching the battery on and off

To turn on the battery push the switch(es) on the battery(s) using the on/off switch on the front of the battery. The system needs some time to start up. Note: the battery is turned on when the switch is clicked inwards. The battery is turned off when the switch is level with the surface.

5. Protection mode

The battery will go in protection mode (shut off) when the battery is operating outside its specification limits. There are two levels of protection. The first level protects the battery against minor limit breach- es. The second level protects the battery from extreme conditions.

Both protections will reset automatically.

6.Charging the battery

Danger!

Fire hazard!

- Never charge a damaged battery.
- Do not use the charger near flammable or explosive materials and provide ventilation.
- The output voltage of the battery charger must be the same as the specified charging voltage of the battery.
- Position the charger so that the fan can rotate properly and blow air freely through the heat fins.
- Place the charger in a dry location where it will not be in permanent contact with water.
- Do not open the charger to avoid electric shock

For optimal battery life, we recommend using a Rim Drive Technology lithium iron phosphate battery charger to charge the Rim Drive Technology 48 V series battery.

When using a third-party battery charger, it should always be a CC/CV lithium charger with the correct charging voltage.

Warning!

- Always use Rim Drive Technology approved LFP battery chargers.
- Make sure the charger relates to the correct polarity.
- Make sure the battery terminals are clean and free of corrosion.
- The battery charger needs to be compatible with the battery

6.1 Connecting the charger to the battery

Always be aware of the polarity of the battery. Make sure the positive terminal of the battery is connected to the positive terminal of the charger, and the negative terminal of the battery is connected to the negative terminal of the charger.

Never exceed the maximum charging current as stated in the battery specifications. Charging overcurrent will cause the battery to go into protection mode and charging will stop. When multiple batteries are connected in parallel the maximum allowed charging current is the sum of the individual max charging currents of the batteries. In this case multiple chargers can be connected to the batteries in parallel to achieve higher charge rates.

7. Storage and maintenance



Caution!

Never clean the battery using a high-pressure cleaner.
Never use corrosive cleaning agents on the battery

7.1 Storage

Before long term storage (3 weeks +) always make sure to charge the battery to at least 50%. Switch off the battery before storage

Optimal storage temperatures range from 5-30 degrees Celsius.

7.2 Maintenance

Maintenance by user

Make sure the battery is protected from any harsh environment that may damage/wear the battery down over time.

Maintenance by Rim Drive Technology dealer/Rim Drive Technology

The battery has an extraordinarily long lifetime during which minimal service is needed. However, it is recommended that every 5 years regardless of use intensity the battery is checked by your service dealer on the following points:

- Watertightness of the waterproof seal
- BMS error memory
- Battery cell status
- Overall safety of the system

8. Error problem solving

The following errors may result in temporary shut down of your battery due to built in protection mechanisms

Overtemperature

The battery temperature is higher than allowed according to the specifications. Let the battery cool down before using it again. When the battery has cooled down sufficiently, it will switch on again by itself.

Under temperature

The battery temperature is lower than allowed according to the specifications. Allow the battery to warm up before using it again. When the battery has warmed up sufficiently, it will switch on again by itself.

Overcurrent

The battery has been exposed to an excessive discharge current and has entered protection mode. Unplug the load and wait 30 seconds. The battery will turn back on by itself. Note: The battery has been disabled for protection. Prevent this from happening again by checking that the system meets the specifications of the battery before reconnecting the battery to the system.

Undervoltage

The battery voltage has dropped below the minimum voltage. This means the battery is empty. Recharge the battery within 72 hours to avoid damage/degradation to the battery.

9. Transportation guidelines

Lithium batteries are classified as class 9 products. This means that the battery must be treated according to UN3480 standards. For that reason, the battery must be packed according to UN code. For transport by road, train and by ship, use the original packaging as it meets all standards. Please note that the original packaging does not meet the requirements set for air freight. For this, the battery must be repacked with suitable packaging. For air freight, the battery must be charged a maximum of 30%.

10. End of life and disposal

The battery is considered at the end of its life when the capacity is below 60% of its original capacity. When disposing of the battery please send the battery back to Rim Drive Technology or your Rim Drive Technology dealer for recycling. Or dispose of the battery according to EU legislation 2002/96/CE, according to US legislation or to an official recycling facility. Most parts of the battery and its enclosure can be recycled.

11. Tips to increase battery lifetime

The battery is protected by the settings in the Rim Drive Technology battery management system and the settings of the Rim Drive Technology charger. This ensures a long battery life and safe operation. However, there are additional actions one can take to extend the lifetime of your battery even further. Since we want you to enjoy your battery for as long as possible and since a longer battery life reduces waste and strain on the environment. We put together a tips and tricks section to maximize battery life of your Rim Drive Technology battery. Note, the following are guidelines:

1. Try not to expose the battery to extreme temperatures. Especially elevated temperatures will shorten the lifetime of the battery. Installing your battery in a well-ventilated place is highly recommended. The optimal temperature conditions for the battery are between 5 - 30 degrees Celsius.
2. Try not to push your battery to the charge limits. Ideally a battery is cycled between 10% and 90% state of charge. Although it is very well possible to fully discharge the battery, try to minimize discharging your battery below 10% to increase the lifetime of your battery.
3. Your battery will degrade faster when a lot of energy is drawn from or put in in a short amount of time. Try lowering the load on the battery by sailing slower or simply using more batteries in parallel. This will improve your battery lifetime.
4. Minimize vibrations and shocks on the battery as much as possible.

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Electric Motors**

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