

## MOLL special Li

### Lithium-ion batteries user manual



### General information

In order to ensure proper and safe use of the lithium-ion battery, please read this user manual carefully and completely. Keep this user manual accessible to any person involved in installing, using or maintaining the lithium-ion battery and make sure that this user manual is completely read, understood and observed before starting any work on the lithium-ion battery.

This manual contains all information necessary to install, use and maintain lithium-ion batteries in lithium iron phosphate (LFP) and nickel manganese cobalt (NMC) technology. Both technologies will be referred to as lithium-ion battery in this user manual. All specified safety instructions and directives are prerequisites for safe work and must be observed. The illustrations in this user manual are provided for basic understanding and may differ from the actual version. The original version of this user manual was prepared in German. Any edition that is not written in German is merely a translation of the German user manual.

## Exclusion of liability

Akkumulatorenfabrik MOLL GmbH + Co. KG cannot be held responsible for any damage caused by improper use of the lithium-ion battery or for any damage arising by failure to comply with the provisions of this user manual. These damages shall include personal injuries, material damage, product damages as well as consequential damages, repair damages and other detrimental actions taken by unqualified personnel. This limitation of liability shall also apply for the usage of non-original spare parts.

It is prohibited to carry out arbitrary conversions or technical modifications to the product.

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Please consult our website for the latest version of the user manual (under “Downloads”).

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# 1 Introduction

## 1.1 Product description

In the first place, the lithium-ion battery is designed as power supply battery, e.g. for Caravans. The battery must not be used for any applications other than those described in this user manual. Any other use of the lithium-ion battery constitutes improper use resulting in invalidation of product warranty. MOLL assumes no liability for damages caused by improper use, wrong application or careless handling of the lithium-ion battery. Please read this user manual carefully and completely prior to unpacking and using the product.

A technical data sheet and a material safety data sheet are available from MOLL as additional documents. The provisions specified in both these data sheets must be strictly observed at all times.

### The lithium-ion battery complies with the following directives:

- Directive **2006/66/EC** of the European Parliament
- EMC Directive **2004/108/EC** (electromagnetical compatibility)
- CE, Richtlinie 2014/30/EU, electromagnetical compatibility
- EMV: emitted interference: EN 61000-6-3;
- Interference immunity: EN 6100-6-2
- DIN EN / IEC 62133, Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications
- DIN EN / IEC 62619, Safety requirements for secondary lithium cells and batteries, for use in industrial applications
- UN38.3, Transportation test for lithium-ion batteries
- DIN EN / IEC 62281, Safety of primary and secondary lithium cells and batteries during transport
- CE, Richtlinie 2014/35/EU, low voltage directive

Depending on the type of battery, the above mentioned directives are valid.



In order to ensure correct and safe use of the lithium-ion battery, this user manual must be available for the user at any time. For this reason the user manual must be kept in a readily accessible and safe location near to the lithium-ion battery.


## 1.2 Terminology

Service life	Expected battery lifespan if all provisions specified in this user manual are observed
SoC	State of Charge [%]
BMS	Battery Management System

### 1.3 Hazard warnings

Following hazard symbols are used in this user manual:



  **Warning!** Non-observance of the provisions specified in this user manual may damage the lithium-ion battery, the environment of the lithium-ion battery and may cause personal injuries.

 **Caution!** Non-observance of the provisions specified in this user manual may cause malfunctions. This hazard symbol is intended to remind the user to handle the lithium-ion battery and the system the battery is connected to with care.

## 2 Technical information

See also appendix „Technical data sheet“

### 2.1 Environmental conditions

  **Warning!** The lithium-ion battery may only be used under the conditions specified in this user manual. Using the lithium-ion battery under conditions outside the limits specified in this user manual may result in personal injuries and damage to the battery.

The lithium-ion battery must always be kept in a well ventilated, dry, clean and dust-free environment. Never expose the battery to fire, water or solvents.

In case the lithium-ion battery is installed and used in an enclosed housing, it is advisable to provide ventilation holes with a minimum area of 100 cm<sup>2</sup> in order to allow sufficient exchange of air and to avoid heat build-up.

Operating temperature range during charging:	0°C to + 55°C
Operating temperature range during discharging:	- 20°C to + 55°C*
Storage temperature range:	- 20°C to + 45°C**
Recommended relative humidity during storage:	45% to 85%
Vibration and impact resistance:	Tested according to UN38.3

\* At very low temperatures, battery capacity / performance may be reduced.

\*\* Long-term storage outside recommended temperature range may reduce the battery service life.

## 2.2 Battery components and dimensions

- Battery box with carrying handles
- Positive terminal with M6 screw thread
- Negative terminal with M6 screw thread
- CAN connection port

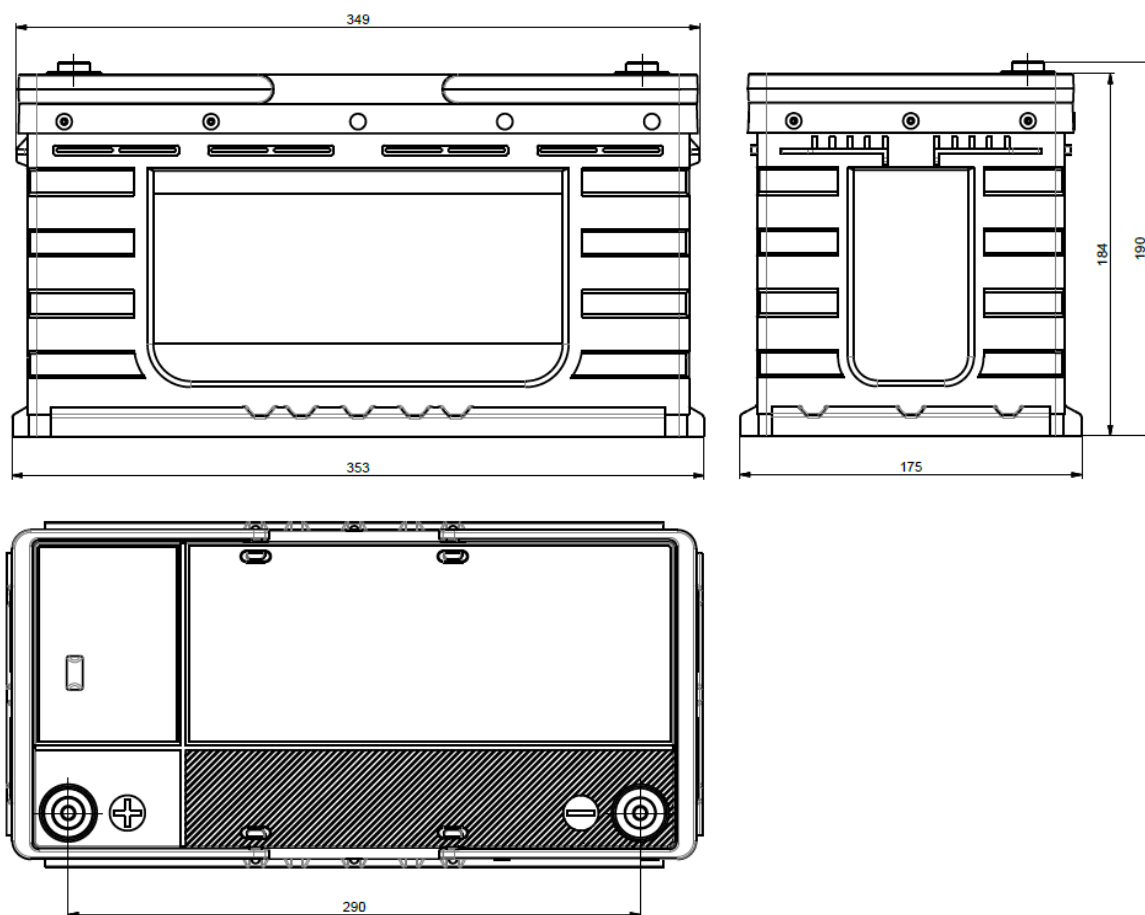


Figure 1. Dimensions of the lithium-ion battery with M6 screw threads

## 3 Safety instructions and safety precautions during installation


### 3.1 General information

For reasons of safety, any installer or user must become familiar with following safety instructions and safety precautions before using the lithium-ion battery:


- Overvoltage, wrong wiring, reverse polarity of the terminals or short circuits between the terminals may damage the lithium-ion battery which can be extremely dangerous.
- The lithium-ion battery must not be installed on flammable material or flammable ground as well as in places where flammable materials are stored or in other environments that are liable to catch fire.
- Before starting to work on the lithium-ion battery or make measurements, the vehicle ignition must be turned off. The connecting terminals of the vehicle must be disconnected from any electric load.
- The hazard symbols and safety instructions on the battery label must be observed and must never be removed from the battery.
- The safety instructions specified in the user manual must be observed.
- Lithium-ion batteries must never be opened, dismantled or mechanically damaged in any way.
- Lithium-ion batteries must not be exposed to heat or fire. During storage, lithium-ion batteries must be protected from direct sunlight.
- In case of exceptional heat development during operation, the lithium-ion battery must be disconnected and removed from the vehicle. Inform your dealer immediately.
- The lithium-ion battery must never be short-circuited. If several lithium-ion batteries are stored in a compartment, it must be ensured that the batteries cannot short-circuit each other. It must also be ensured that the batteries cannot be short-circuited by any other electroconductive objects.
- The lithium-ion battery must be kept in the original package until being used.
- Lithium-ion batteries must be protected from mechanical impacts.
- In case of battery leakage, the leaking electrolyte must never come into contact with skin or eyes. In case of skin contact, the affected area has to be cleaned with water and soap immediately. In case of eye contamination, the affected eye must be thoroughly rinsed with clean water immediately. In both cases, a doctor must be consulted without delay.
- In case of swallowing of leaking electrolyte, a doctor must be consulted immediately.
- The lithium-ion battery is usually charged by the electrical system of the vehicle. If the battery is charged outside of the vehicle, only those chargers can be used that are recommended by the battery distributor. Alternatively, the battery can be charged by specially skilled personnel.



- Please note the markings of the polarities on battery terminals and connection terminals of the vehicle to ensure safe use: Positive terminals (+) are marked in red colour, negative terminals (-) are marked in blue or black.
- Lithium-ion batteries of different brands, capacity, size or type must not be connected with each other.
- As a matter of principle, solely the lithium-ion battery type recommended by the vehicle manufacturer must be installed.
- Lithium-ion batteries must always be kept dry and clean.
- Dirty battery terminals must be cleaned with a dry and clean cloth.
- Corroded battery terminals must never be used.
- Lithium-ion batteries are delivered in a low state of charge. The full capacity of the lithium-ion battery is available as soon as the battery has been fully charged. In principle, the correct charger must be used. For correct charging, the instructions of the vehicle manufacturer must be observed.
- The original product documents (such as this user manual) must be kept until the lithium-ion battery is disposed of properly.
- The lithium-ion battery must be used for the designated application only.
- During longer periods of non-use, the lithium-ion battery should be removed from the vehicle to reduce self-discharge. In doing so, the provisions of the vehicle manufacturer must be observed. It must also be noted that the terminals of the lithium-ion battery have to be covered with protective caps or with any other appropriate insulating material (e.g. insulating tape) in order to prevent short circuits.
- At the end of its service life, the lithium-ion battery must be disposed of according to legal provisions.

 **Warning!** It must be ensured that no water can enter the lithium-ion battery and that the battery is not soiled.

 **Warning!** The lithium-ion battery must not be mechanically damaged.

 **Warning!** The battery terminals must not come into contact with electroconductive objects.

### 3.2 Correct behaviour in emergency situations

For correct behaviour in emergency situations, the information in the separately provided safety data sheet must be observed.

In the event that a user comes into contact with substances from inside the battery, the following measures are recommended:

**Inhalation:** Leave the contaminated area and consult a doctor without delay!

**Eye contamination:** Rinse affected eye for 15 minutes with clean water and consult a doctor without delay!

**Skin contact:** Clean the affected area with water and soap and consult a doctor without delay!

**Swallowing:** Consult a doctor without delay!

### 3.3 Correct behaviour in case of fire

#### 3.3.1 Fire extinguishing

In case of a burning lithium-ion battery any type of extinguisher can be used, preferably an ABC powder extinguisher. This type of extinguisher can be used to extinguish other burning materials involved in the fire as well. In addition, the fire can also be extinguished with plenty of water (cooling effect).

#### 3.3.2 Fire fighting instructions

In case of fire, the vehicle ignition must be turned off if possible without risk for the user. Lithium-ion batteries must be removed from the fire area if possible without risk. Water is useful to cool down the lithium-ion batteries and the fire area. In case of a burning lithium-ion battery, the fire department must be alerted in any case, even if the fire could be successfully extinguished since a renewed flare-up of the fire cannot be excluded. If possible, the extinguished lithium-ion battery should be observed until the fire department arrives. Attention must be paid to the fact that new substances are created in the event of a fire and therefore the fire residues must be inspected by a specialist and disposed of accordingly.

Only carry out fire fighting measures if there is no danger to life and limb. Otherwise leave the danger zone immediately and inform the fire department.

### 3.4 Effective handling of an accident


Persons must be taken out of the danger zone immediately. In any case the fire department / police must be alerted. First responders and emergency services must be informed of the presence of a lithium-ion battery in the vehicle.


If the lithium-ion battery has been flooded or immersed in water, the following measures are recommended:

In case of flooding, first switch off the power supply to the lithium-ion battery. The flooded lithium-ion battery must not be reused and must be disposed of in accordance with legal requirements.

## 4 Installation

### 4.1 General information

 **Warning!** Under no circumstances may the lithium-ion battery be opened or mechanically damaged.

 **Warning!** A damaged lithium-ion battery must never be installed or used.

Before each connection of several batteries, check in the technical data sheet of the battery variant whether and how many batteries may be connected in series or parallel.

If several lithium-ion batteries are connected in parallel or serially, only lithium-ion batteries of the same manufacturer, battery type, capacity, state of charge and age may be used.

### 4.2 Check after unpacking

Immediately after unpacking, check the lithium-ion battery for damage. If the lithium-ion battery is damaged, please contact your dealer. Never install or use a damaged lithium-ion battery.

### 4.3 Preparing the lithium-ion battery for use

The Moll *special* Li types with a Bluetooth connection are shipped in sleep-mode by default. To activate the battery a charge voltage has to be applied by the internal charge controller (e.g. in the vehicle) or by an external charger.

Before using the lithium-ion battery, ensure that it is secured in the designated area in the vehicle so that it cannot move. The fixing devices available in the vehicle must be used for installation.

### 4.4 Connection cable

The connection cables available in the vehicle must be used. If these do not fit the terminals of the lithium-ion battery, adapters are available for connection after consultation with the vehicle manufacturer.

### 4.5 Parallel connection of lithium-ion batteries

If a particular application requires parallel connection of the lithium-ion batteries (if permitted by the technical data sheet), connect the lithium-ion batteries as shown in Figure 2 to ensure even power distribution.

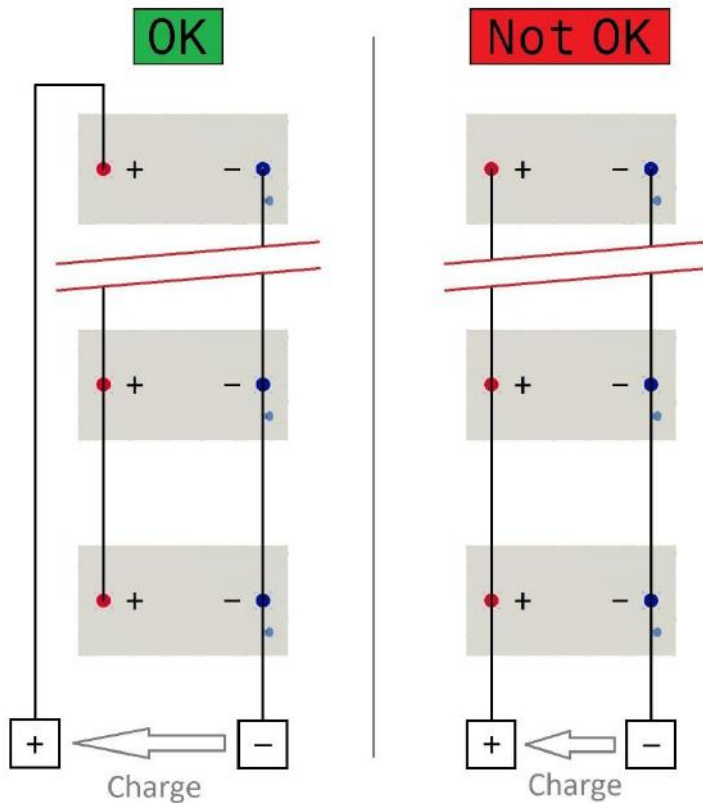


Figure 2. Parallel connection of lithium-ion batteries

**OK:** Even power distribution

The lithium-ion batteries supply the electrical consumers in equal parts.

**Not OK:** Uneven power distribution

The lithium-ion batteries that are closest to the electrical consumers emit the most current and therefore have a shorter service life. The lithium-ion batteries that are further away from the electrical consumers emit less current.


#### 4.6 Disconnecting the lithium-ion battery

If the lithium-ion battery is suspected to be damaged or if you do not use the lithium-ion battery for a longer period, please disconnect it as described below:

1. First disconnect the negative connection cable from the negative terminal of the lithium-ion battery. Either put a protective cap on the negative terminal or tape the negative terminal with a suitable, non-electroconductive material (e.g. insulating tape) to protect the lithium-ion battery against short circuits.
2. Then disconnect the positive connection cable from the positive terminal of the lithium-ion battery. Either put a protective cap on the positive terminal or tape the positive terminal with a suitable, non-electroconductive material (e.g. insulating tape) to protect the lithium-ion battery against short circuits.



## 4.7 Installing the lithium-ion battery in the vehicle

1. Remove the protective cap from the positive battery terminal only immediately before installing the lithium-ion battery in the vehicle. Place the battery in the recess provided in the vehicle.
2. First connect the positive terminal to the cable lug of the connection cable provided for this purpose in the vehicle and marked (+) and screw it on with an insulated M6 screw with a torque of 20 Nm.
3. Remove the protective cap from the negative battery terminal only immediately before installing the lithium-ion battery in the vehicle.
4. Then connect the negative battery terminal to the cable lug of the connection cable provided in the vehicle and marked with (-) and screw it on with an insulated M6 screw with a torque of 20 Nm. Take care not to cause a short circuit.
5. The lithium-ion battery must be secured against slipping and tipping over. To do this, secure the battery with the aids provided in the vehicle.
6. Connect the CAN connection cable to the CAN port on the top of the lithium-ion battery. Finally, close the battery compartment cover to protect the lithium-ion battery against short circuit. Make sure that there are sufficient ventilation openings on the housing of the lithium-ion battery.



 **Caution!** Never connect the connection cables with reversed polarity. Observe the markings (+) for positive and (-) for negative.



## 5 Using the battery


### 5.1 General information

  **Warning!** External charging of the lithium-ion battery may only be carried out using the chargers recommended by the battery manufacturer.



  **Warning!** The lithium-ion battery must never be short-circuited.



  **Warning!** When using the lithium-ion battery, the parameters for the use of lithium-ion batteries stated on the corresponding data sheet must always be observed.



  **Warning!** The safety regulations and safety precautions from chapter 3 must be followed.


 **Caution!** In the event of shutdown due to undervoltage, the lithium-ion battery must be recharged as quickly as possible.


## 5.2 Charging the battery


  **Warning!** A lithium-ion battery must never be overcharged, as this will permanently damage the lithium-ion battery. Only chargers with an automatic charge stop function may be used.

  **Warning!** If the lithium-ion battery becomes too hot during charging, the charging process must be interrupted.

  **Warning!** The charging current must not be higher than the maximum charging current specified in the technical data sheet.

 **Caution!** The lithium-ion battery must be charged before use.

 **Caution!** When the charger is no longer in use, disconnect the lithium-ion battery from the charger.

 **Caution!** To ensure safety and a long service life of the lithium-ion battery, a charger must be used on which the parameters specified in the technical data sheet can be set. Other charging devices may only be used if it is ensured that the charging voltage does not exceed the charging voltage limits of the lithium-ion battery in any charging phase.

In order to guarantee the longevity of the battery, only a reduced charging current is accepted at very high and very low temperatures or the charging process is even completely stopped.

The temperature limits for the charge currents can be found on the technical datasheet.

## 5.3 LED state of charge display

The battery has an LED display on the top to indicate the state of charge. By pressing the LED function key, the LED display lights up and shows the corresponding state of charge of the battery:

State of charge	LED 1	LED 2	LED 3	LED 4	LED 5
0 %	Flash (5 s)	Off	Off	Off	Off
20%	On (5 s)	Off	Off	Off	Off
40%	On (5 s)	On (5 s)	Off	Off	Off
60%	On (5 s)	On (5 s)	On (5 s)	Off	Off
80%	On (5 s)	On (5 s)	On (5 s)	On (5 s)	Off
100%	On (5 s)	On (5 s)	On (5 s)	On (5 s)	On (5 s)

In addition to the LED display on the battery, an external display for indicating the state of charge (available separately from MOLL) can be connected via the CAN connector on the battery.

Furthermore, the LED function key can be used to activate the battery's sleep mode. To do this, press the function key for at least 3 seconds. The LEDs then light up in sequence to confirm that the sleep mode has been activated. Pressing the LED function key again for 1 second returns the battery to the active mode.

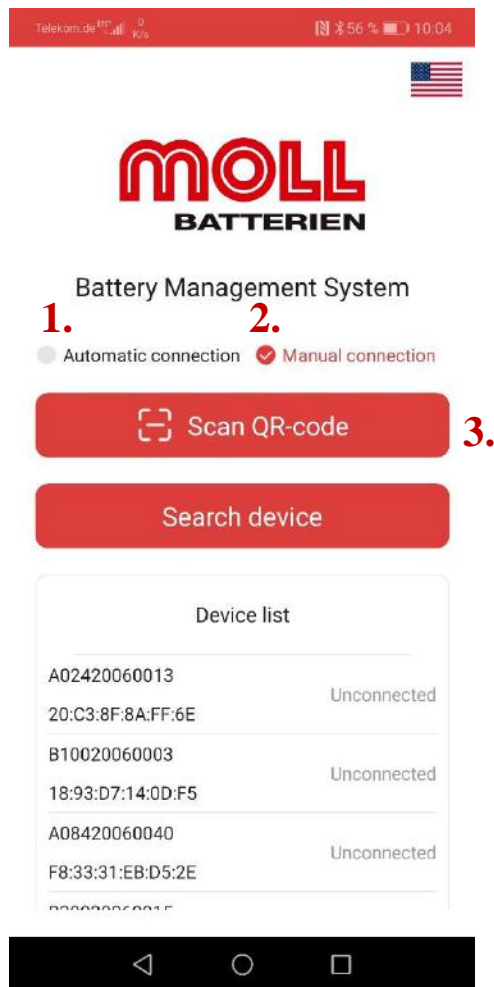
#### 5.4 Bluetooth data connection\*

The Lithium ion battery features a Bluetooth connection to display various battery parameters (e.g. SOC, Current, Voltage, and Temperature) on a suitable device.

For this an app is available for android and iOS devices, which can be downloaded on the MOLL homepage or the respective app stores (Note: The MOLL-bluetooth-app can only be used with the Moll *special* Li battery types, the use with batteries of other manufacturers is not possible). The MOLL-bluetooth-app is available in German or in English. The language can be selected via the main menu of the app by selecting the flag symbol in the upper right corner (a restart of the app might be necessary).

*\*type dependent*

After installation of the app there are several options how to connect a battery via Bluetooth:

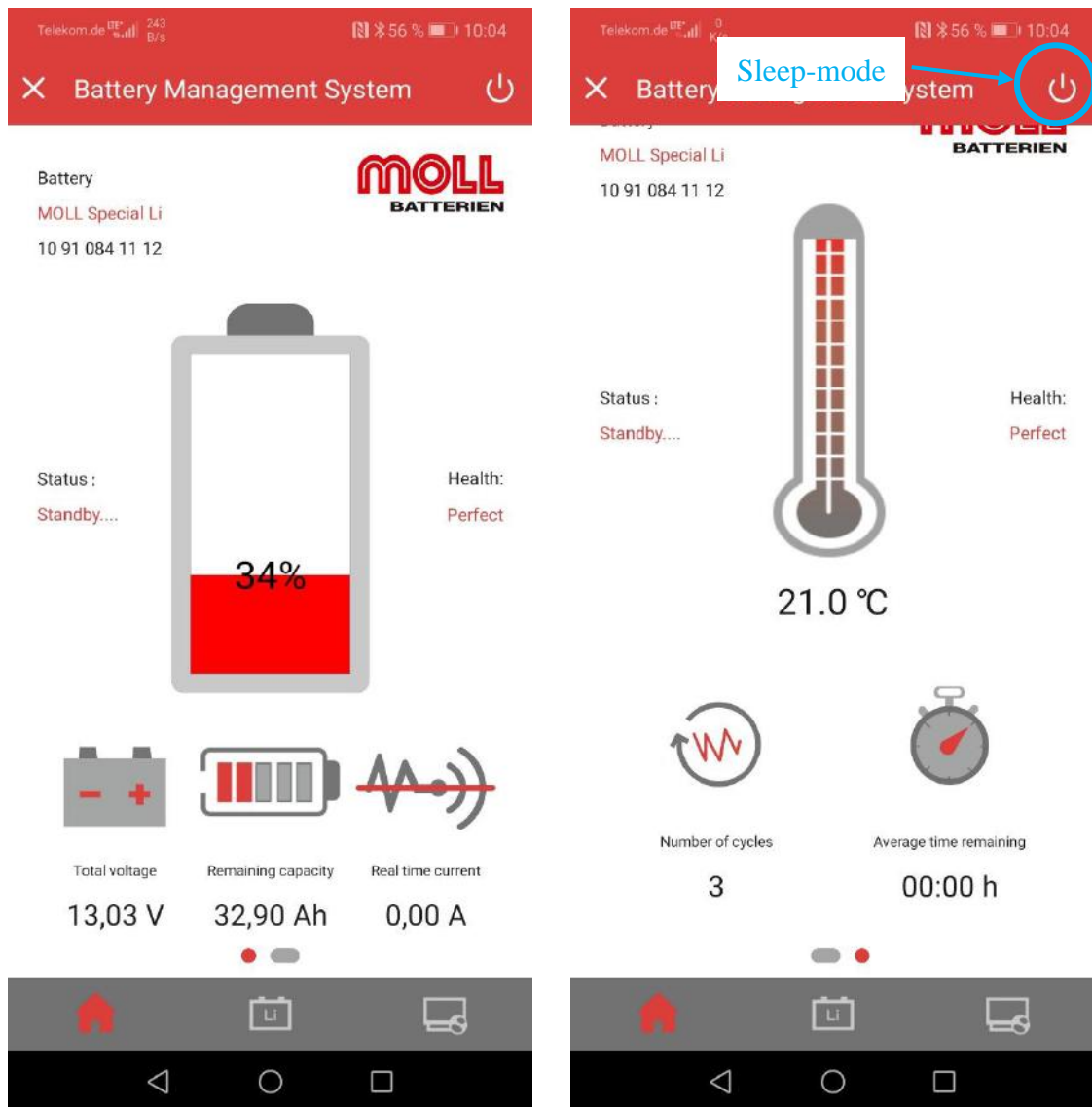


- 1. Automatic connect:** After selecting this option the app connects automatically to the nearest battery that supports Bluetooth. If more than one battery is nearby with activated Bluetooth, the app will connect randomly to one of the batteries.
- 2. Manual connection:** By selecting the manual connection the nearby batteries with Bluetooth are display via “search-device”. A connection to can be established by selecting the battery via the list (Note: The name of the battery is identical to the serial number that can be found under the QR-code on the top of the battery)
- 3. Scan QR-Code:** Also the Bluetooth connection can be established by scanning the QR-Code on top of the battery. For this select the option in the app and scan the QR-code with the camera of your smartphone.

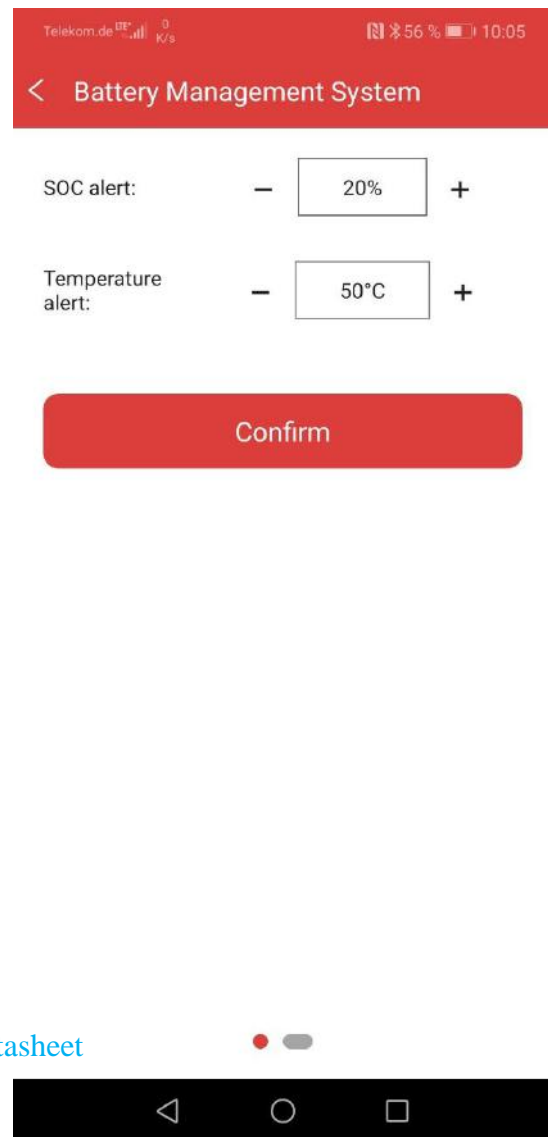
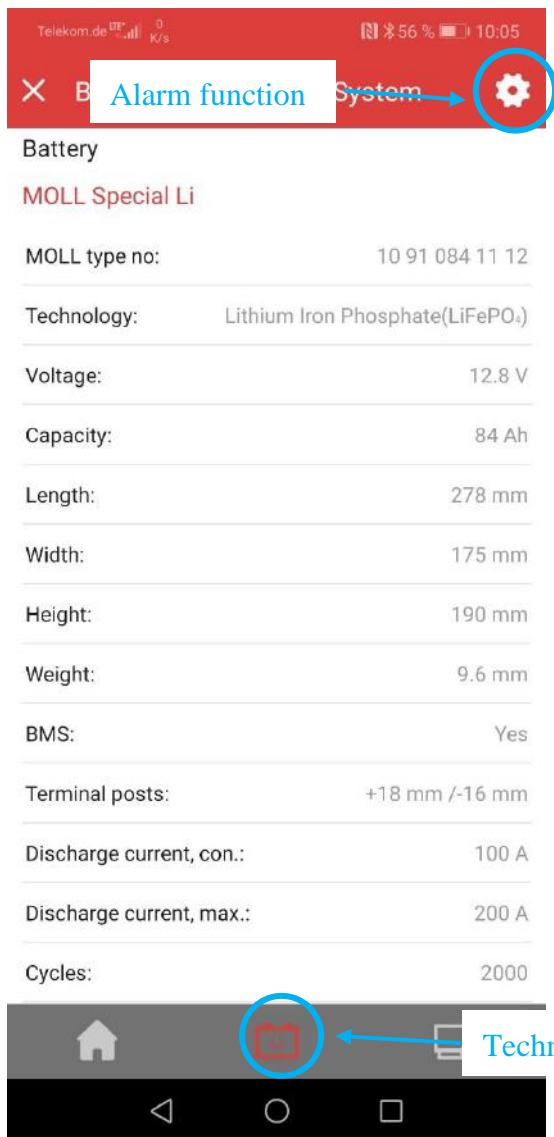
After successfully establishing a connection, the current status of the battery is displayed automatically (Voltage, Current, Temperature, Cycle life). By swiping to the left or right and scrolling up/down, the different Status windows can be selected.

If the battery is not being used for a longer period of time, it is recommended to put the battery into sleep-mode. To decrease the self-discharge the Bluetooth-connection is disabled in sleep-mode and a discharge of the battery is not possible. The sleep-mode can be activated via the “Off-button” (top right) and by confirming the info-message. By applying a charge voltage the battery can be reactivated.





Moreover, the technical datasheet of the battery can be displayed by via the Li-battery symbol (toolbar bottom). In this menu the alarm function can be used via the “gear-symbol” (top right). With this function a customized alarm for the state-of-charge (SOC) and the upper temperature limit of the battery can be set. As soon as the set parameter is reached, the app sends a notification to the user via a separate message.



## 6 Inspection and cleaning

### 6.1 General information

**⚠️⚠️ Warning!** Never try to open or disassemble the lithium-ion battery! There are no parts inside the battery case that require maintenance.

1. The lithium-ion battery must be disconnected from all electrical consumers and chargers before cleaning activities (see section 4.6).
2. To avoid touching the battery terminals, please put protective caps on the terminals or cover them with a non-conductive material.

### 6.2 Inspection

1. The lithium-ion battery must be inspected regularly for poorly attached and damaged wiring and connections, as well as cracks and deformation of the case, leaks or other damage. For this purpose, the specifications of the vehicle manufacturer regarding the maintenance

intervals must be observed. As soon as damage is detected, contact the specialist workshop to replace the lithium-ion battery. A damaged lithium-ion battery must never be used.

2. The general condition and state of charge (SoC) of the lithium-ion battery must be checked regularly. Lithium-ion batteries are partially self-discharged if they are stored or not used for a longer period of time.

### 6.3 Cleaning

The surface of a lithium-ion battery should be cleaned with a soft, dry cloth made of non-electroconductive material. Under no circumstances should liquids, cleaning agents or solvents be used to clean a lithium-ion battery.

### 6.4 Maintenance

The lithium-ion battery is basically maintenance-free.

## 7 Storage

In order to achieve the longest possible service life, all the following instructions for storing the lithium-ion battery must be followed. If these instructions are not followed, the battery may be damaged. If no voltage can be measured when checking the lithium-ion battery, the battery is probably in sleep mode and can be activated as described in section 5.3. If this is not possible, it must be assumed that the battery is damaged. In this case, do not attempt to recharge and use the lithium-ion battery. The battery must then be replaced with a new lithium-ion battery.

- Disconnect the lithium-ion battery from all electrical consumers and from the charger if applicable.
- During storage of the lithium-ion battery, the battery terminals must be covered with suitable, non-electroconductive material (e.g. insulating tape).
- For storage, the minimum and maximum storage temperatures listed in section 2.1 must be observed.
- The lithium-ion battery may only be stored in a clean, dry, well ventilated place on level ground.
- The lithium-ion battery must be stored on non-flammable materials or non-flammable surfaces and under no circumstances in areas where flammable materials are present or in any other flammable environment.
- The lithium-ion battery must be stored at least 50 cm away from the wall or other objects.
- The lithium-ion battery must be out of reach of children and animals.

- Storage in direct sunlight must be avoided by all means.
- If possible, the lithium-ion battery should be brought to a state of charge of 30 - 70% of its nominal capacity when stored.

## 8 Transport

The lithium-ion battery has been safety packed by the manufacturer. It may only be unpacked at the installation site, immediately before installation.

Before transporting the lithium-ion battery, familiarize yourself with all applicable national transport regulations.

The transport of a used battery or a damaged or defective lithium-ion battery may be subject to restrictions or may not be permitted at all.

The lithium-ion battery is subject to the requirements of the hazardous goods law. The transport of the lithium-ion battery is subject to the hazard classification UN3480, Class 9. For water, land and air transport, the packaging instruction PI 965 Section 1A must also be observed.

For the transport of lithium-ion batteries belonging to Class 9 above, identification labels for various hazardous substances and UN3480 Class 9 labels must be attached to the package.

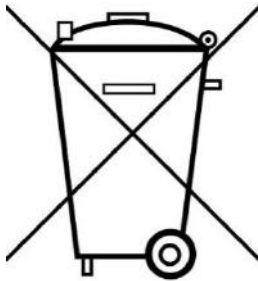


*Figure 3. Identification label UN3480 Class 9*

When shipping lithium-ion batteries, please also refer to the ZVEI leaflet "Shipping of lithium-ion batteries", which is available on the ZVEI website.

## 9 Disposal and recycling

### 9.1 General information



The lithium-ion battery must be disposed of in accordance with the applicable national regulations and must not be disposed of with household waste (see figure 4). The lithium-ion battery must be returned to the dealer or a qualified disposal facility. Before disposal, tape the terminals of the lithium-ion battery to protect it from short circuits.

Figure 3. Marking "crossed-out wheeled bin"

### 9.2 Disposal of a non-critical lithium-ion battery

Before disposal, the lithium-ion battery must be discharged. To prevent short circuits, the terminals of the lithium-ion battery must be electrically insulated either with non-electroconductive plastic adhesive tape or with another electrically non-conductive material suitable for this purpose.

According to the European Directive 2006/66/EC, defective or used lithium-ion batteries must be collected separately and recycled in an environmentally friendly manner. The lithium-ion batteries can be returned to the dealer.

### 9.3 Disposal of a critical lithium-ion battery

In the case of a damaged lithium-ion battery, the battery must be protected against short circuits and embedded in a separate package with inert material (e.g. sand or vermiculite). According to ADR SP 376 packing and / or carriage conditions may be authorized by the competent authority.

The disposal of lithium-ion batteries within the EU must be carried out in accordance with current EU directives and national, regional and local environmental protection regulations. For disposal within the EU, the appropriate code of the European Waste Catalogue must be used to identify waste and classify waste according to its hazardousness

## 10 Safety symbols on the lithium-ion battery label

The lithium-ion battery carries various safety and warning symbols, see below. These must never be removed from the lithium-ion battery.

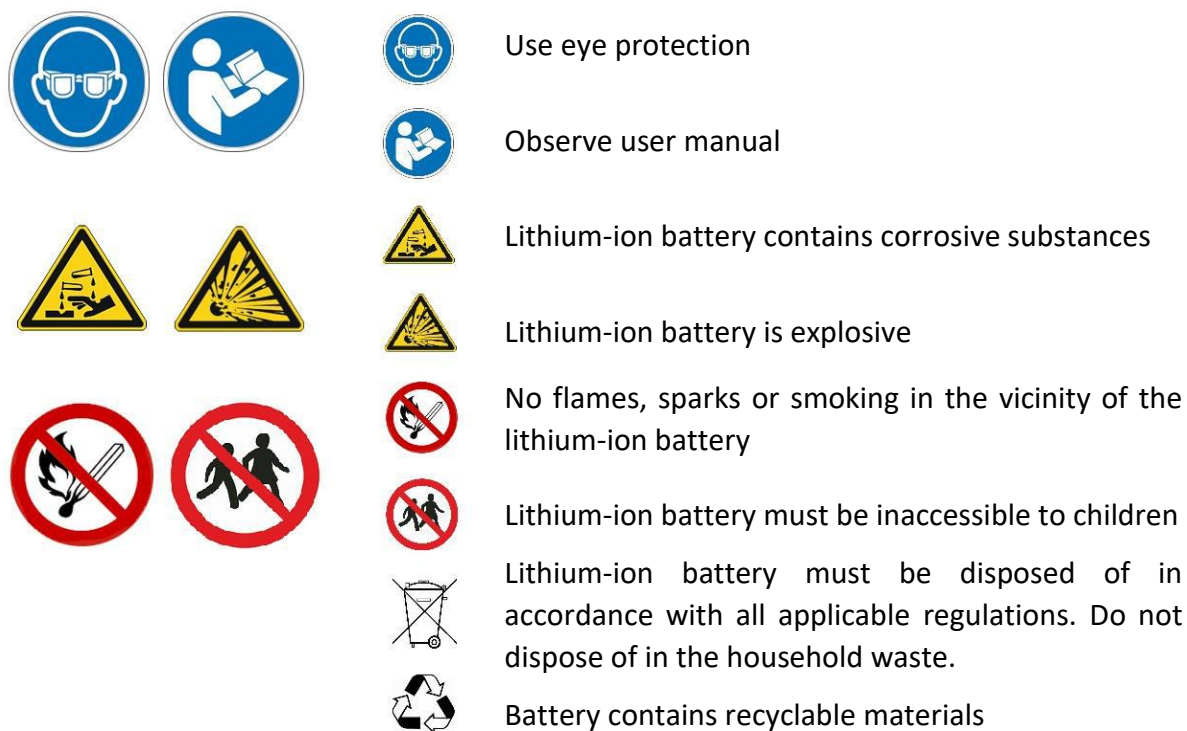


Figure 4. Safety symbols

## 11 General terms and conditions

The General Terms and Conditions can be found in the document "General Terms and Conditions of Sale and Delivery" provided on the MOLL website:

[https://moll-batterien.de/dateien/pdfs/MOLL\\_Verkaufs\\_Lieferbedingungen\\_de.pdf](https://moll-batterien.de/dateien/pdfs/MOLL_Verkaufs_Lieferbedingungen_de.pdf)

## 12 Further information

The following additional documents must be observed:

Technical data sheet, safety data sheet, MOLL data sheets, general terms and conditions