



Information Brochure



Powered by  
**Li-Ion**  
battery technology

HIGHLY DURABLE  
EXCELLENT RANGE  
LIGHTWEIGHT DESIGN

Lithium ion batteries



## Information about lithium ion battery packs



### What is a lithium ion battery?

The battery pack supplied with your wheelchair contains a set of maintenance-free, rechargeable lithium ion cells with very high energy density. The electronics integrated in the battery pack allows you to use it safely and ensures a long battery life. As lithium ion batteries have a higher energy density than conventional batteries, they offer a large range while being compact and lightweight.

On the following pages, you'll find some useful tips on using lithium ion battery packs from Alber and how to optimise their range and life.

### Benefits at a glance

- Long life
- Large range
- Low weight
- Close to zero self-discharge
- No memory effect



### Long life

Under optimum conditions, a lithium ion battery pack can be used for up to five years or up to 1,200 charge/discharge cycles!

The life of a battery pack depends on its age and how much demand is placed on it as well as the number of charge/discharge cycles. Obviously, a battery continues to age even when it is not in use. Partially charging and discharging the battery will not damage it. However, you should not allow the battery to become fully discharged! To look after your battery pack, charge it regularly.



### Large range

The very high energy density of the battery gives your wheelchair a large range. The range of an Alber product with a lithium ion battery pack depends on several factors. For more information, refer to 'What affects the range?'

## Benefits at a glance



### Low weight

Take for example the e-fix battery:  
ULTRA-LIGHT – battery only weighs 2 kg!



### Close to zero self-discharge

Like any battery, a lithium ion battery pack gradually loses energy. This is known as self-discharge. The amount of self-discharge from a lithium ion battery pack is very small. It depends on the power consumption of the integrated electronics and the ambient temperature.



### No memory effect

The battery pack can be charged after each use. This will not damage the battery.

### What affects the battery life?

#### Factors that positively affect battery life:

- Low power demand on mainly even terrain
- Storage at a temperature between 0 °C and 20 °C
- Storage with a charge level of approx. 60–80 %.

#### Factors that reduce battery life:

- High power demand on steep and rough terrain or when negotiating obstacles
- Storage at an ambient temperature above 30 °C
- Storage for an extended period when fully charged or discharged
- Exposure to strong sunlight

# Handling the battery



## Charging

First plug the battery charger's plug into a power socket. Then connect the charger to the battery pack. Once the batteries have been fully charged, the charge algorithm automatically switches to charge conservation mode. This prevents the batteries from being overcharged. The battery pack should be charged at a temperature of around 20 °C. Charging is not possible at temperatures below 0 °C or above 40 °C.



## Storage

If you intend to store a battery pack for an extended period, you should first charge or discharge it to a level of at least 60 % and a maximum of 80 %. Charge the battery pack if necessary before putting it into storage and check the charge level once a month. Recharge it when the charge level falls below 60 %.

- The EN 62281 standard includes these general recommendations on storing lithium ion battery packs:
- Store in a dry, cool and well-ventilated place
- Do not store a battery pack where it is exposed to direct sunlight or rain
- Store in the original packaging
- The optimum charge level is 60–80 %



## Transport

Alber battery packs are approved for air transport according DOT and IATA requirements. **The transport and shipping of the battery pack is subject to legal requirements which must be strictly observed!**

As transport regulations can change from one year to the next, and individual airlines may apply additional rules, we recommend that you contact the tour operator, airline or shipping company before your trip in order to inform yourself about the current regulations. You can download the latest battery certificates for air passengers and our product safety data sheets from our website.

# Handling the battery

If possible, present these documents to the airline before travelling. You can find the documents here: <http://www.alber.de/en/alber-service/travelling-with-alber-products.html>.

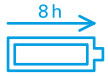


## Disposal

**A lithium ion battery pack must be treated as special waste!** A lithium ion battery pack must be disposed of properly, for example through an authorised battery recycling and disposal authority. **The battery pack must never be disposed of with normal household waste.** If you have any questions, please contact your specialist dealer.



## Charging the battery pack



### Charging behaviour

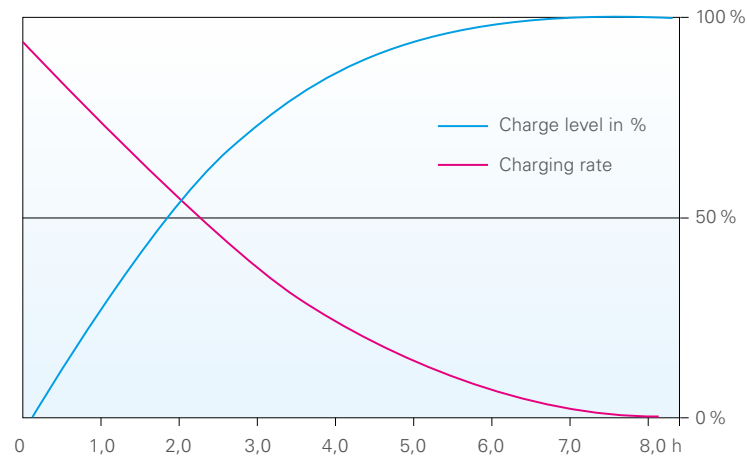
After a quarter of the total charging time, the battery pack is already 50% charged. After half of the charging time a level of 80 % is reached.

Example:

It takes about 8 hours to fully charge a battery pack from 0 % to 100 %. After less than 2 hours, the battery pack is already charged to 50 % and after about 4 hours, it is 80 % charged.

One charge cycle refers to the complete charging of the battery pack through one single charge or multiple charging procedures.

### Charge time and status: example of a battery/charger with a total charge time of 8 hours



## Charging the battery pack



### Conservation charging

Alber battery chargers have a feature which ensures that the battery pack will retain a full charge as long as the charger is connected. As soon as a battery pack is fully charged, the charger switches to conservation charging. After complete charging, the charge level gradually falls again due to self-discharge and is then topped up.

This means the battery pack may not be 100 % charged when the charger is removed.



### Self-discharge

Like any battery, a lithium ion battery pack gradually loses energy. This is known as self-discharge.

The self-discharge of a lithium ion battery pack is very small, but varies depending on design and the ambient temperature.



### What affects the range?

#### How the range is measured:

According to the ISO 7176-4 standard, the range is the distance that an electric wheelchair can cover on even ground under constant travel conditions and with a fully charged battery at around 20 °C.

Normally, these ideal conditions do not apply in everyday life. Uneven roads, unfavourable wind conditions, hilly terrain etc. cause the wheelchair to consume more power, which consequently reduces its range.

The stated range may also be affected by frequent acceleration, braking, steering corrections, the actual topography and other factors.

#### Roll resistance:

Roll resistance is a very important factor. For example, if the roll resistance is 6 % instead of 3 %, the range is reduced by half. Please note the information below on tyre pressure.

#### Slopes:

The range is also reduced by half if the wheelchair is climbing a 3 % slope instead of travelling on even terrain. On a 12 % slope, the range is only 1/5 of the range which is possible on level terrain.

In reality, of course, a journey will always include a combination of upward slopes, downward slopes and level stretches. When going downhill, only some of the generated energy can be fed back to the battery.

The maximum possible range can only be achieved with full batteries and full capacity.

As user, you can also increase the range by adapting your driving style.



### Tips for optimising the range

#### Weight:

Range is affected by the total weight of the wheelchair, baggage and user. Excess weight on the wheelchair, such as backpacks, should be avoided as much as possible.

#### Wheelchair geometry and dimensions:

The I camber incline, wheelbase, diameter of the front castor wheels, front/rear load distribution and left/right wheel alignment also have a significant effect on a wheelchair's roll resistance.

#### Ideal conditions:

- 0° wheel camber incline
- Front/rear load distribution of 20:80
- Symmetrical wheel alignment Long wheelbase
- Front wheels as large as possible with solid rubber tyres

#### Starting and braking:

As with a car, frequent start and stop, steering and braking is less economical than driving constantly at the same speed.

#### Tyre pressure:

The roll resistance can be optimised by the correct tyre pressure.

**Tip:** To maximise the range, use the maximum permissible tyre pressure.

#### Temperature:

The battery performance decreases as the temperature falls, because the electrical resistance is increased. Therefore in winter, the usual range is likely to be reduced.

## Service



### When service is needed

The transport of faulty lithium ion batteries is strictly regulated. If a fault develops, we therefore recommend that you contact your specialist dealer.

### Maintenance

The high energy density of a lithium ion battery requires complex monitoring over its entire lifetime. This is provided by an electronic module in the battery which ensuring a controlled charging and discharging process throughout the lifetime of the battery. For this reason, it is not possible to replace individual cells or the complete set of cells. However, it is usually possible to have the battery pack reconditioned in the Alber factory.

## Validity



### Scope of validity

This document is intended to provide general information and tips on your lithium ion battery pack. It does not replace technical information or recommendations found in product-specific operating instructions. Information and recommendations relating to charging and discharging, storage or lifetime may vary depending on the individual product. Technical changes reserved.

■ ■ ■ MADE IN GERMANY



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