

## INFORMATION FOR THE SAFE HANDLING OF LITHIUM BATTERIES

### 1. Identification of Product and Company

Trade Name:

Manufacturer

Company:

Address:

Phone:

### 2. Hazards Identification

When handled properly and in accordance with the parameters specified by the manufacturer, lithium batteries are safe during use. Improper handling or conditions leading to improper operation can cause leakage of battery substances and products of decomposition and reactions associated with these, which can cause personal injury and environmental damage.

Since a wide variety of chemical substances are used, always follow the manufacturer's directions for immediate measures and first-aid measures in the event of an accident.

Lithium batteries have a gas-tight seal and are safe insofar as they are used and handled in accordance with the manufacturer's specifications.

#### 2.1 Warning

- When recharging batteries, never use chargers which are unsuitable for the battery type.
- Do not short-circuit them. Do not inflict mechanical damage (puncturing, deforming, disassembling etc.).
- Do not heat them above the permitted temperature or burn them.
- Keep batteries away from small children.
- Always store batteries in a dry and cool place.
- In general, contact with leaking battery substances can pose a danger to personal health and the environment. For this reason, when coming into contact with batteries with a conspicuous appearance (leaking substances, deformed, discoloured, dented or the like), sufficient body and breathing protection is required. Lithium batteries can, for example, react very strong in combination with fire. This can result in battery components being ejected with considerable force.

#### 2.2 Handling and operational safety

Lithium batteries are always to be handled in accordance with the manufacturer's specifications. This is true particularly for complying with the limits for maximum current load, charging and end-point voltages, and mechanical and thermal loads.

Usually product packages are marketed that have already been matched. Such products are in no wise to be modified or tampered with, since that could result in substantial safety hazards.

Use the charging process tailored to the respective cell type of a rechargeable battery.

#### 2.3 Danger

As with other batteries, so also for lithium batteries it is true that even when thought to be discharged, they can still

represent a source of danger. On the one hand, they can deliver a very high short-circuit current. On the other hand, even in the state of the minimum permitted end-point voltage lithium batteries with a high voltage (over 75 Volts) can pose a danger of a lethal electric shock.

For most products, too deep a discharge leads to permanent damage. Deep-discharged lithium batteries are no longer permitted to be charged or operated.

In all cases, avoid excessive charging voltages and overcharging. They can lead directly to critical situations, but also have a negative impact on battery life. For this reason, some manufacturers recommend gentle charging processes, which reduce the currently available energy, but by means of the lower charging voltage lead to a significantly lengthened product life.

*If additional instructions are needed at this point, they can be taken, for example, from DIN EN 62133*

*"Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements*

*for portable sealed secondary cells, and for batteries made from them, for use in portable applications" as well as DIN EN 60086-4 "Primary batteries, Part 4: Safety of lithium batteries".*

### 3. Composition and Information on the main Ingredients

#### 3.1 Battery Cells

The following components are found inside the sealed Li-ion battery. Cells have been further combined as larger modules and systems using mechanical parts.

Component	Chemical name	CAS number
Cathode Lithium-Metal oxide	LFP: Lithium-Iron -Phosphate	15365-14-7
	NMC: Lithium Nickel Manganese Cobalt oxide	182442-95-1
Anode	Graphite	7782-42-5
Binder	Polyvinylidene difluoride	24937-79-9
Electrolyte	Ethyl acetate	141-78-6
	Ethylene carbonate	96-49-1
	Dimethyl carbonate	616-38-6
Cu	Copper	231-159-6
Al	Aluminum	231-072-3

#### 3.2 Li-ion cell chemistry

The following Li-Ion cell chemistries are available from GNB:

Trade name	Cathode	
	LFP	NMC
Sonnenschein Lithium	X	
Sonnenschein Lithium Material Handling Batteries		X
Sonnenschein@home Lithium		X
Light Traction Block LTB1		X
Light Traction Block LTB2	X	
Exide Marine & Leisure	X	

#### 3.3 Battery Management System (BMS)

Electronic Components (Contactor,...)

### 3.4 Battery case

Steel (Tray)  
ABS plastic (battery / module)

## 4. First Aid measures

When handled and stored properly, lithium batteries do not represent as source of danger.

The chemicals listed in item 3 are enclosed in a sealed housing so that they cannot escape during normal use.

### 4.1 Skin or eye contact

If the substances come into contact with the skin or eyes thoroughly rinse the affected areas with water for at least 15 minutes. In the event of eye contact, in addition to thoroughly rinsing with water, always contact a doctor.

### 4.2 Burns

If burns are caused, treat them accordingly. Likewise, we urgently recommend contacting a doctor.

### 4.3 Respiratory tract

Leave the room immediately if there is an intensive smoke build-up or release of gas. Call in a doctor if there are large quantities and irritation of the airways. If possible, provide for sufficient ventilation.

### 4.4 Swallowing

Rinse out the mouth and around the mouth with water. Immediately call for the help of a doctor.

## 5. Firefighting measures

Fires from lithium batteries in use (such as in a laptop or electric vehicle) can in principle be fought with water.

Differentiating between various systems of lithium batteries at the time of a fire is generally not possible and is unnecessary.

Due to the design and the battery properties, no additional or special extinguishing agents need to be available, since the batteries are protected accordingly. Fire surrounding the batteries is to be fought with conventional extinguishing agents. The fire of a battery cannot be considered separately from the surrounding fire.

The cooling effect of water effectively impedes fire from spreading to battery cells which still have not reached the critical ignition temperature ("thermal runaway").

Use of water is also favourable in light of its wide availability. Hybrid or fully electric vehicles pose no greater risk with the high-voltage batteries switched off than conventional vehicles.

As with all fires, inhalation of the gases produced by the fire can harm one's health. For this reason, provide for sufficient ventilation.

## 6. Measures to be taken in case of accidental release

If the battery housing gets damaged, electrolyte can leak out. Seal batteries in an airtight plastic bag, having added dry

sand, chalk powder (CaCO<sub>3</sub>) or vermiculite. Traces of electrolyte can be soaked up with dry paper towels. When doing so, prevent direct contact with skin by wearing safety gloves.

Thoroughly rinse with water.

Use personal safety equipment appropriate for the situation (safety gloves, protective clothing, safety mask, breathing protection). For specific information about personal safety equipment, refer to the manufacturer and product-specific information.

Always proceed in accordance with the manufacturer's instructions. If required, obtain information from the manufacturer

## 7. Handling and Storage

### 7.1 Handling

In each case, carefully observe the warnings on batteries and the operating instructions for devices and other applications. Use only the recommended battery types.

Do not open the battery. Do not crush, disassemble, drop or solder. Incorrect handling can lead to explosion or fire.

Effectively prevent a short circuit of the battery poles by using suitable insulation. (e.g.: taping the terminals with insulation tape).

### 7.2 Storage

Lithium batteries are preferably to be stored at room temperature and in a dry location (for details, refer to the manufacturer's specifications concerning the storage temperature range); large temperature fluctuations are to be avoided. (For example, do not store in the vicinity of heating elements, do not expose to sunshine for long periods). If substances leak out due to damage or improper handling, be sure to comply with the manufacturer's instructions. This particularly includes the use of personal safety equipment.

When storing great quantities of lithium batteries, make an arrangement with the local authorities.

In general, and independent of batteries: A building permit is required for storage buildings.

## 8. Exposure limits and personal protective equipment

Lithium batteries are products from which no substance is released under normal and reasonably foreseeable conditions of use.

**Skin protection:** Not necessary under normal conditions.

**Hand Protection:** Wear nitrile, neoprene, or natural rubber gloves when handling an open or leaking battery.

**Eye protection:** Not necessary under normal conditions.

**Respiratory protection:** Not necessary under normal conditions. In the event battery case ruptured inside an enclosed space, use a self-contained breathing apparatus.

**Ventilation:** Not necessary under normal conditions

## 9. Physical and Chemical properties

Appearance form: solid Battery

Colour: n.a.

Odour: n.a. If leaking smells of medical ether

pH: n.a.

Flash point: n.a.

Flammability: n.a.

Density: n.a.

Solubility in Water: not soluble

Stability: stable

Chemical properties: see point 3

## 10. Stability and Reactivity

**Chemical Stability:** The product is chemically stable under normal conditions. Do not expose the batteries to fire or other high temperature sources.

**Conditions to avoid:** Do not disassemble batteries, avoid turning, twisting puncture or break batteries. Do not short circuit batteries. Excess temperatures  $T > 50^{\circ} \text{C}$  must be avoided in order to avoid damage of the battery.

Comply during discharge and charge with the voltage limits defined for the battery. If the limits are exceeded, the battery may burst or even explode

Likewise, the end-point voltage must not be undershot. Here as well, there is a danger of bursting.

**Hazardous decomposition Products:** Exposure to fire may cause emission of flammable and highly toxic gases.

**Reactivity:** n.a

## 11. Toxicological Information

### 11.1 Acute toxicity

Unbroken cells or batteries do not represent toxicity

### 11.2 Irritation and corrosion

In an extremely rare case, a very strong impact may break open the tray and modules and electrolyte maybe run out of the battery. In conditions of normal use tray should never break, as stated in section 4.

In extremely rare cases risk of thermally or electrically abuse may also cause cells to open. Electrolyte is corrosive. It causes chemical burns on contact with skin. Inhalation of fine mist or vapors is irritating to the respiratory system. Prolonged contact with the skin or mucous membranes may cause serious irritation. Prolonged contact of electrolyte with skin and electrolyte vapors with respiratory system may cause damages to teeth, bones and kidneys.

In case of an open battery catching fire, electrolyte may decompose himself into liquid corrosive for metal and plastic, causes heavy burns on skin and eyes and may be deadly if inhaled. Do not under any circumstances approach a battery fire without face and respiratory protective gear.

- Sensitization: No information is available at this time.
- Carcinogenicity: No information is available at this time.
- Reproductive toxicity: No information is available at this time.
- Teratogenicity: No information is available at this time.
- Mutagenicity: No information is available at this time

## 12. Ecological Information

### 12.1 Eco-toxicity

Not applicable for undamaged product. Data in case of damaged cells or battery not available May 2020

### 12.2 Persistence and degradability

Not applicable

### 12.3 Bio-accumulative potential

Not applicable

### 12.4 Mobility in soil

Not applicable

### 12.5 Results from PBT –and vPvB assessment

Not applicable

Note: (P) persistent; (B) bioaccumulative; (T) toxic; (vP) very persistent; (vB) very bioaccumulative

### 12.6 Other adverse effects

In case of an accident emissions may be harmful to environment

## 13. Disposal Considerations

In accordance with EU Battery Directive and the respective national legislation, Lithium-Ion batteries are labelled by a crossed-oust dust bin together with the ISO return/recycling symbol.



The symbol reminds the end user that batteries are not permitted to be disposed of with household waste, but must be collected separately.

To prevent short circuits and associated heating up, lithium batteries are never permitted to be stored or transported in bulk form and unprotected. Suitable measures against short circuits include:

- Placing the batteries in original packaging or a plastic bag
- Masking the poles
- Embedding in dry sand

Spent Lithium batteries (EWC 160605, other batteries and accumulators) are subject to recycling at the end of their useful life.

## 14. Transport Information

### Important note!

**Commercial transport of lithium batteries is subject to dangerous goods regulations. Transport preparations are exclusively to be carried out by appropriately trained persons and/or the process has to be accompanied by corresponding experts or qualified companies.**

### 14.1 Transport regulations

Lithium batteries are subject to the following dangerous goods regulations and exceptions to them - in the version applicable in each case:

Class 9

UN 3090: LITHIUM METAL BATTERIES

UN 3091: LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT, or  
LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT

UN 3480: LITHIUM ION BATTERIES (including lithium-ion-polymer batteries)

UN 3481: LITHIUM ION BATTERIES CONTAINED IN EQUIPMENT, or  
LITHIUM ION BATTERIES PACKED WITH EQUIPMENT  
(including lithium-ion-polymer batteries)

Tunnel category E

Special provisions and packing instructions:

ADR, RID:188, 230, 310, 348, 360, 376, 377, 636, P903, P908, P909, LP903, LP904

IATA: A88, A99, A154, A164, A181, A182, A183, A185, A201, P965, P966, P967, P968, P969, P970

Note: For the IATA Guidance Document on lithium batteries, see

[www.iata.org/whatwedo/cargo/dgr/Pages/lithium-batteries.aspx](http://www.iata.org/whatwedo/cargo/dgr/Pages/lithium-batteries.aspx)

IMDG Code:188, 230, 310, 360, 376, 377, P903, P908, P909, LP903, LP904

EmS: F-A, S-I

Stowage category A

### 14.2 Test and inspection specifications

In accordance with the dangerous goods regulations for lithium batteries, each new type of cell or battery must have passed all tests listed in the UN Manual of Tests and Criteria, Part III, Section 38.3. This particularly applies also if multiple cells or batteries have been assembled into new batteries

(battery packs or battery assemblies).

The Manual of Tests and Criteria for lithium batteries can be downloaded from

[http://www.unece.org/trans/danger/publi/manual/Rev5/ManRev5-files\\_e.html](http://www.unece.org/trans/danger/publi/manual/Rev5/ManRev5-files_e.html)

and

<http://www.unece.org/trans/danger/publi/manual/rev5/manrev5-amendments.html>

Used batteries are also subject to these regulations. In the case of used batteries which are intact and undamaged, usually the regulations for new batteries can be applied.

Defective or damaged batteries are subject to more stringent regulations, ranging all the way to complete prohibition of transport. The prohibition of transport applies to air transport carriers (ICAO T.I., IATA DGR - special provision A154).

However, for the transport of used — but not damaged — batteries, refer also to the corresponding special regulations (636, 377), and/or packaging instructions (P909 for road transport (ADR), rail (RID) and sea (IMDG-Code).

Waste batteries and batteries which are sent for recycling or disposal are prohibited from air transport (IATA Special provision A 183).

Exceptions are to be approved by the competent authority of the country of origin and the respective country of the airline.

## 15. Regulatory Information

Batteries, regardless of shape, volume, weight and use, are subject to the scope of the respective national transposition of the European Batteries Directive (2006/66/EC). This includes provisions on placing on the market, collection, treatment and recycling of batteries.

Furthermore, all batteries need to be marked with the "symbol of the separate collection" (crossed-out wheeled bin - cf. Section 13, Disposal) and, if the respective limit is exceeded, with the chemical symbol underneath for lead (Pb), cadmium (Cd) and / or mercury (Hg) (see article 21 Batteries Directive).

Independent of this, a general designation of the battery system, with e.g. "Li-ion", is not excluded.

The battery manufacturer or, respectively, the importer is responsible for application of the required marking.

## 16. Other Information

### 16.1 Safety Data Sheet

The European Directive 91/155/EEC which described the requirements for Material Safety Data Sheets had been repealed by the Regulation concerning the Registration, Evaluation, Authorization and Restriction of Chemicals on June 1<sup>st</sup>, 2007 (REACH-Regulation 1907/2006/EC, Art. 31). **The requirement to publish a Safety Data Sheet applies to all suppliers of substances and preparations.**

**As already defined under the former Directive there is no requirement to develop and maintain a Safety Data Sheet for products such as Batteries.**

### 16.2 GHS labels

Among others the European GHS regulation describes classification and labelling of chemicals and preparations. GHS is not a regulation that describes labelling requirements for products such as Batteries.

### 16.3 General

The information given above is provided in good faith based on existing knowledge and does not constitute an assurance of safety under all conditions. It is the user's responsibility to observe all laws and regulations applicable for storage, use, maintenance or disposal of the product. If there are any queries, the supplier should be consulted.

However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

