

# Safe Handling of Lithium Batteries

According to REACH regulation (EC 1907/2006, Art 31) and to OSHA regulation (29 CFR 1910.1200), batteries are ARTICLES with no intended release. As such, they are not covered by legal requirements to generate and supply an SDS or an MSDS. This leaflet is provided solely as an informational document for the purpose of assisting our customers.

## 1. PRODUCTS

Lithionator- and LionTec labelled batteries

**Nominal voltage: n x 3.2 Volt**

Electrochemical system: Lithium-Ion

Anode: Carbon/Graphite

Cathode: Iron phosphate (LiFePO<sub>4</sub>)

**Nominal voltage: n x 3.6 or 3.7 Volt**

Electrochemical system: Lithium-Ion

Anode: Carbon/Graphite

Cathode: Nickel-Manganese-Cobaltdioxide (NiMnCoO<sub>2</sub>)

**Emergency call: +49 6051 916679-0**

Note: This bulletin is related to rechargeable batteries. The number of in series connected cells (=n) is part of the datasheet.

## 2. HAZARDS IDENTIFICATION

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

### **! WARNING!**

Do not charge batteries if they are not rechargeable battery systems.

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.

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.

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 severely in combination with fire. This can result in battery components being ejected with considerable force.

### **Handling and operational safety:**

Lithium batteries are always to be handled in accordance with the manufacturer's specifications. This is particularly true 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.

### **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.

### 3. COMPOSITION / INFORMATION ON INGREDIENTS

#### For batteries with a nominal voltage of n x 3.2 Volt

Substance	CAS-No.	Wt.ht %	GHS-code	R-phrase	H-phrase
Lithium-Ironphosphate	15365-14-7	20 - 50	--		
Carbon (Graphite, proprietary)	7782-42-5	15 - 35	--		
PVDF (Polyvinylidene fluoride)	24937-79-9	< 8	--		
Aluminium	7429-90-5	3 - 12	--		
Styrene-butadien-rubber	N/A	<2	--		
Sodium-carboxylatomethyl-cellulose	9000-11-7	< 2	--		
Copper		3 - 12	--		
Electrolyte	EC: 96-49-1 EMC: 623-53-0 LiPF <sub>6</sub> : 21324-40-03	10 - 20	GHS05	R24 R26 R34	H314
Aluminium film	N/A	< 5			

#### Für Batterien mit einer Nennspannung von n x 3,6 oder 3,7 Volt

Substance	CAS-No.	Wt. %	GHS-code	R-phrase	H-phrase
Lithium-Manganese-Cobalt dioxide	18442-95-1	20 - 50	--	R22 R43	H314
Carbon (Graphite, proprietary)	7782-42-5	15 - 35	--		
PVDF (Polyvinylidene Fluoride)	24937-79-9	< 8	--		
Aluminium	7429-90-5	3 -12	--		
Copper	7440-50-8	3 -12	--		
Electrolyte	EC: 96-49-1 EMC: 623-53-0 LiPF <sub>6</sub> : 21324-40-03	10 - 20	GHS05	R21 R22 R41 R42 R 43	
Aluminium film	N/A	< 5	--		

- R21 Harmful in contact with skin.
- R22 Harmful if swallowed.
- R24 Toxic in contact with skin.
- R34 Causes burns.
- R35 Causes severe burns.

- R41 Risk of serious damage to eyes.
- R42 May cause sensitization by inhalation.
- R43 May cause sensitization by skin contact.

GHS05 Corrosive

**Note:** Lithium batteries are products which release no substances when used properly.

#### 4. FIRST AID MEASURES

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

Since, depending on the manufacturer, various ingredients are used, in the case of damage always follow the instructions in the respective manufacturer's product-specific data sheets.

**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.

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

**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.

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

#### 5. FIRE-FIGHTING 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. ACCIDENTAL RELEASE MEASURES

If the battery housing gets damaged, electrolyte can leak out. Seal batteries in an airtight plastic bag, having added dry sand, chalk powder ( $\text{CaCO}_3$ ) 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

In each case, carefully observe the warnings on batteries and the operating instructions for devices and other applications. Use only the recommended battery types. Usually only cells of the same type and design can be used. Thus, for example, lithium cells and NiMH cells or cells with a different capacity and voltage are never permitted to be used together.

Effectively prevent a short circuit of the battery poles by using suitable insulation.

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 CONTROLS / PERSONAL PROTECTION

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

## 9. STABILITY AND REACTIVITY

If an upper temperature limit is exceeded (see product-specific data sheets of the manufacturer), the batteries are in danger of bursting.

When charging a rechargeable system, always be sure to comply with the upper voltage limit. If the limits are exceeded, the battery may burst or even explode. Charging a non-rechargeable system, which is not permitted, may cause the battery to burst or explode.

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

## 10. TOXICOLOGICAL INFORMATION

See 3.

## 11. DISPOSAL CONSIDERATIONS

Lithium batteries are marked with the symbol of the crossed-out wheeled bin (see figure).



The symbol reminds the end user that batteries are not permitted to be disposed of with household waste, but must be collected separately. Spent batteries have to be returned free of charge to collection schemes or distributors.

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

For portable lithium batteries, collection and recycling targets are defined as part of the European battery legislation.

Based on the European battery directive and as specified in Germany by the German Battery Act, all battery manufacturers and importers have to register with the German Federal Environment Agency before placing batteries on the market. The organisation of the take-back of spent batteries must be specified at the time of registration. Acceptance of the producer obligations has to be clearly defined for all batteries before initially placing them on the market.

However, Member States may dispose of collected portable batteries or accumulators in landfills or underground storage when no viable end market is available.

Disposal of waste industrial and automotive batteries by incineration or in landfills is prohibited. However, residues of any batteries and accumulators that have undergone both treatment and recycling may be disposed of in landfills or by incineration.

## 12. TRANSPORT INFORMATION

### **! IMPORTANT NOTE !**

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

#### **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)

Packing group: II, Tunnel category E

Special provisions and packing instructions:

ADR, RID: 188, 230, 310, 636, P903, P903a, P903b

Note: For ADR, see

<http://www.unece.org/trans/danger/publi/adr/adr2011/11contentse.html>

IATA: A88, A99, A154, A164, P965, P966, P967, P968, P969, P970

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

[www.iata.org/whatwedo/cargo/dangerous\\_goods/Pages/lithium\\_batteries.aspx](http://www.iata.org/whatwedo/cargo/dangerous_goods/Pages/lithium_batteries.aspx)

IMDG Code: 188, 230, 310, P903

EmS: F-A, S-I

Stowage category A

#### **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).

Note: For the UN Manual, see

[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)

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), and/or packaging instructions (P903a and P903b / ADR).

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.

### **13. REGULATORY INFORMATION**

In Germany, the law governing the sale, return and environmentally sound disposal of batteries and secondary cells (Batteries Act – Batteriegelgesetz, BattG) from 25 June 2009 applies. This law serves to implement the directive 2006/66/EC (battery directive).

Note: In other countries specific regulations are to be considered as appropriate.

### **14. OTHER INFORMATION**

The instructions provide help for complying with legal specifications, but do not replace them.

The foregoing information was compiled to the best of our knowledge and belief.

It does not represent any guarantee of properties. Distributors and users of the product have their own responsibility for observing applicable laws and regulations