

# BATTERY INFORMATION FACTSHEET : Lithium-Ion (Li-Ion) Batteries

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## FOREWORD

***This document is addressed to Battery Manufacturers and Original Equipment Manufacturers as well as to those professionals who are storing, handling and transporting Li-Ion batteries.***

- *This document is intended to provide information for the safe handling , storage and transport of lithium batteries by professionals. It offers Good Practice Guidance and Emergency Response Guidance while considering the hazards offered by Lithium-ion batteries.*
- *Original Equipment Manufacturers (OEMs) may use this information to communicate further down the supply chain. It is not targeting the end user of equipments where batteries are integrated. Usually the information for end-users is supplied by OEMs in their users manual.*
- *Other actors of the Battery Value Chain may also use this information.*
- *The BIF has been simplified in order to avoid any confusion with a Safety Data Sheet (SDS) which is mandatory for a chemical substance ( according to REACH -Regulation (EC) No 1907/2006). According to this Regulation, Batteries are identified as “articles with no intended release of the substances they contain” therefore they do not require a specific SDS.*
- *This document can be used as a BIF template for companies manufacturing or placing Lithium –Ion batteries on the market. It’s content can be used to prepare Good Practice Guidance or Emergency Response Guidance for those who will be handling such batteries.*

### ***Warning.***

***The reader will find at the end of the document a Table with correspondences between the Chapters of this BIF and a Safety Data Sheet. This document is not legally binding. It is prepared with the best information available to the authors at the time of its preparation. The information contained in this BIF may be updated without notice.***

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**WARNING:** According to REACH (Regulation (EC) No 1907/2006) batteries are identified as articles with no intended release of the substances they contain. Therefore providing a Safety Data Sheet is not mandatory for articles. This document provides some relevant information for Good Practice Guidance and Emergency Response Guidance as well as some complementary information regarding the Transport & Environment Protection Legislation. The information contained in this document is not legally binding.

## PRODUCT AND COMPANY REFERENCES

Product name	Lithium-Ion Battery / example: 18650 cell of the LCO type = Cathode type is made of Lithiated Cobalt Oxide (LCO)
Product code	N°: XXXXXXXXXX
Company reference	Name: YYYYYYYYYY Address: YYYYYYYY Telephone: YYYYYYYY E-mail: YYYYYYYYYY
	Emergency contact: ZZZZZZZZ

## PART 1. GOOD PRACTICE GUIDANCE

### 1. GOOD PRACTICE GUIDANCE

A Li-ion battery cell is a sealed article, with a typical voltage of 3.6V DC per cell.

A Li-ion battery is an article with no intended release of its substances.

Under normal conditions of use, the battery does not release its content as it is sealed. In case of accidental release of the batteries components, please refer to the emergency response guidance (PART 2 below)

In case of large electrical serial assembly, modules and full battery may offer high Voltage hazard (> 36 Volts).  
The presence of the High Voltage warning sign requires dedicated intervention equipment: see PART 2.2. below.



#### 1.1. Handling.

##### - Safe handling advice

When handling the batteries (cells), use personal protective equipment (gloves), specifically to avoid short-circuits between the battery poles.

##### - Technical measures/precautions.

- Follow the instructions reported in the users manual prepared by the manufacturer.
- Do not short (+) or (-) battery terminals with conductors, do not allow battery terminals to contact each others.
- Do not reverse the polarity,
- Do not mix different types of batteries or mix new and old ones together e.g. in a power pack,
- Do not open the battery system or modules,
- Do not use the unit without its electronic management system,
- Do not submit to static electricity risks to avoid damages to the protecting electronic circuit,
- Do not submit to excessive mechanical stress,
- Do not expose the battery to water or humidity (avoid water condensation),
- Do not expose to heat, solder or throw into fire. Such unsuitable use can cause leakage or evacuate through a safety valve gaseous electrolyte fumes that may cause fire,
- Immediately disconnect the batteries if, during operation, they emit an unusual smell, develop heat, change shape/geometry, or behave anormally. Contact the manufacturer if any of these problems are observed.

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## 1.2. Storage

- Keep in a dry, cool and well-ventilated place, check the recommended storage temperature usually reported in the users manual prepared by the manufacturer, (e.g. 35°C),
- Keep away from heat sources (max 60°C) and sources of ignition. Protect from direct exposure to sunlight.
- Keep away from water and condensation.
- Store in closed container and packaging, in such a way to prevent short circuits and damages during storage or transportation.
- In case of mixed storage of goods and articles, organize separate storage area for lithium-ion batteries. E.g. by maintaining a distance of 2.5 meters between the Lithium-ion batteries storage area and other goods.
- Store in limited quantities and in isolated area under external surveillance.

It may be advisable to store limited quantities in a given area, such as for a 60 m<sup>2</sup> area, the quantity should not be larger than 6 euro palets or an equivalent of 6.0 m<sup>3</sup> of batteries or equipment containing batteries. The storage of the palets should not be higher than 2 meters.

Safety measures for storage shall be organized with the relevant safety team at the plant. It shall be adapted to the local Emergency Response Capacity (see PARA 3 below).

## 1.3. Transport.

Lithium Ion batteries are classified as Dangerous Goods for the Transport by Road/Rail, Sea and Air. It is important to conform to the requirements of the UN Regulation on the Transport of Dangerous Goods. Some of these are detailed in PART 4 of this BIF.

### 1.3.1. Inside a plant.

Internal transfer of Lithium-Ion batteries should follow the minimum safety rules imposed by the local legislation/regulation regarding the handling of Dangerous Goods (See PART 4). Infra-Red cameras may be used to detect any excessive temperature raise in stored quantities, e.g. > 85°C.

### 1.3.2. Shipment outside a plant.

The Shippers of Lithium-ion batteries packed with Equipment to an outside facility should be aware that these batteries before being offered for transport have to be tested according to UN Tests and Manual Requirements Chapter 38.4. Please refer to PART 4 of this BIF. The Shipper is responsible for the implementation of the UN Regulation and may be subject to heavy penalty in case of infringement to the UN Transport Regulation.

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## PART 2 EMERGENCY RESPONSE GUIDANCE

### 2. EMERGENCY RESPONSE GUIDANCE

In normal conditions of use, the Lithium-Ion battery is a sealed article.

Lithium-ion Batteries are manufactured in accordance with very strict quality and safety standards. Access to these quality standards can be obtained by contacting directly the battery manufacturer.

The information below is aiming at delivering guidance to respond to an emergency situation in case of ,

- Accidental release of the battery content,
- Exposure to high voltage,
- Exposure to a fire.

This may happen in case of damage to the battery or in case of not-foreseeable use or misuse of the battery or of the equipment containing the battery.

#### 2.1. Lithium-ion Battery main components.

In case of accidental release of the battery content, the operator may be exposed to one or more of the battery constituents. A list of generic constituents of a Lithium-Ion battery is presented below.

Components	CAS Number	Content (wt. %)
Lithiated Metal Oxide	12190-70-13	10-25
Organic Electrolyte	96-49-1/108-32-7/..	10-35
Inorganic salt in the electrolyte	21324-40-3	1-5
Carbon, as Graphite	7440-44-0	10-25
Copper (current collector)	7440-50-8	1-10
Aluminium (Outer Jacket)	7429-90-5	1-10

NB. This composition may vary significantly between manufacturers. Please address your inquiry for more specific compositions to the manufacturer. RECHARGE can supply addresses of manufacturers on request.

#### 2.2. Measures in case of accidental release of the battery content (spillage in absence of fire)



The potential hazard offered by damaged lithium batteries in absence of fire is mainly the release of a electrolyte containing a corrosive salt. Measures should also be taken to protect operators from inhalation of volatile organic substances. Reaction of the electrolyte with water/humidity may generate hydrofluoric acid and irritate the eyes, nose, throat and skin.

#### Personal precautions

Use personal protective equipment. Avoid contact with skin and eyes. Ventilate the area. Position yourself in the wind direction and not upfront.

The information below refers to exposure to the substances contained in the battery.

- **Respiratory track protection**

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Protective mask for acidic vapours or Self Contained Breathing Apparatus (SCBA).

- **Hand protection**

Neoprene gloves (EN 374) or equivalent.

- **Eye protection**

Safety glasses with side-shields conforming to EN166 or equivalent.

- **Skin and body protection**

Boots, apron, long sleeved clothing.

- **Hygiene measures**

General industrial hygiene practice.

## Human intervention: first aid and measures.

- **-Inhalation in non fire situations.**

Immediate medical attention is required. Move to fresh air. If symptoms persist, call a physician.

- **Skin contact**

Immediate medical attention is required. Wash off immediately with plenty of water for at least 15-20 minutes, as necessary. Remove and wash contaminated clothing before re-use. If skin irritation persists, visit a physician.

- **-Eye contact**

Immediate medical attention is required. Remove contact lenses.

Rinse immediately with plenty of water for at least 15-20 minutes, as necessary.

- **-Ingestion**

Immediate medical attention is required. Gently wipe or rinse the inside of the mouth with water. Give small amounts of water to drink. Do not induce vomiting. Never give anything by mouth to an unconscious person.

Call a physician or a Poison Control Centre immediately.

## Environmental precautions

Eliminate all possible sources of heat or ignition.

Prevent further leakage or spillage if safe to do so ( use absorbent cloth or other inert absorbent non-conductive material mineral such as sand, sodium bicarbonate, alumina or vermiculite).

Dry clothes can also be used as a absorbent material in absence of fire.

Do not allow material to contaminate ground water system.

## Treatment of Waste Water

Confine the effluent or the contaminated material and collect it for further as hazardous waste (water) for appropriate treatment.

Pick up and transfer to properly labelled containers.

Dispose of in accordance with local waste management legislation and emissions regulations (PART 3 below).



## 2-2 Exposure to High voltage.

Lithium-Ion batteries used in Hybrid and full Electric Vehicles may have Voltage larger than 60V. Therefore the approach of a battery used in an EV should consider the hazard of Electrical Shock which characterize these batteries.

The following prevention measures should be taken when approaching a high voltage battery or rescue a victim.



Use insulating gloves or protections.

**Turn off the source of electricity, if possible.** If not, move the source away from you and the person (victim), using a dry, nonconducting object made of cardboard, plastic or wood.

**Check for signs of life (breathing, coughing or movement).** If absent, begin cardiopulmonary recovery (CPR) immediately.

**Prevent shock.** Lay the person down and, if possible, position the head slightly lower than the body with the legs elevated.

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**After coming into contact with electricity, the person should see a doctor to check for internal injuries, even if he or she has no obvious signs or symptoms.**

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## 2-3 Fire fighting measures.

In case of small confined fire, use dry media, if you can approach the source of fire. Dry media shall be used to avoid oxygen to access the batteries under fire.

In case of large fire, use plenty of water. Water shall be used in all cases as a cooling agent to prevent heat propagation from the burning cells to neighbourhoods.

By-products of combustion may be toxic.

### **Suitable extinguishing media.**

1. Dry powder, carbon dioxide (CO<sub>2</sub>), sand, sodium bicarbonate, vermiculite, foam (non combustible),...
2. Water (see below).

### **Dry media.**

Use dry-powder extinguisher only in case of size-limited local fire. CO<sub>2</sub> extinguishers, or copious quantities of water or water-based foam can be used to cool down burning Li-Ion cells and batteries.

Use dry materials to reduce access of oxygen to the combustible materials.

### **Caution for the use of water**

- Use water to cool down cells or batteries adjacent to the ones that have caught fire (maintain low temperature).
- If water is used on active batteries, caution should be taken to avoid the electrical hazard that may be present (in case of high voltage battery (> 36 Volts)).
- On large quantity of batteries taking fire, control the temperature of the surroundings by abundant flow of water to cool the batteries.

### **Special issue.**

- In case of risk of mixes between **Primary Li metal** batteries and **Lithium-Ion rechargeable** batteries, avoid the use of water but use abundantly dry media (sand, vermiculite,...) as recommended above (suitable extinguishing media).

Request complementary information for firefighting tools to the battery manufacturer.

### **Treatment of Waste Water.**

Confine the effluent or the contaminated material and collect it for further as hazardous waste (water) for appropriate treatment. Pick up and transfer to properly labelled containers.

Dispose of in accordance with local waste management legislation and emissions regulations (PART 3 below).




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## PART 3. REGULATORY and LEGISLATIVE INFORMATION

### 3.1 Regulatory information

Marking Requirements for Lithium –Ion batteries placed on the European Union market. In accordance with the Batteries Directive 2006/66/EC, the batteries have to be marked with the crossed wheel bin symbol. 

Lithium-ion batteries, which contain electronic modules and which are subject to the EMC directive 93/97/EEC, must be approved and must wear the CE marking.

According to the document "QUESTIONS AND ANSWERS ON THE BATTERIES DIRECTIVE (2006/66/EC) » published by the EU Commission (page 23), the Batteries Directive applies also to battery packs.

### 3.2 Environmental Legislation applicable.

#### Waste treatment.

Directive 2006/66/EC on batteries and accumulators, and waste batteries and accumulators, applies. Dispose of waste batteries in accordance with national legislation. When collected waste batteries must undergo recycling to comply with national regulations. Batteries should not be disposed of into the environment. Clean packing material may be recycled according to local and national regulations.

#### Further information

According to the European Waste Catalogue (EWC), Waste Codes are not product specific, but application specific. Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities.

Suggested EWC-codes according waste disposal are

Nº: 16 06 05, other batteries & accumulators, and

Nº: 20 01 34, unsorted batteries and accumulators containing these batteries

## PART 4. TRANSPORT INFORMATION

**Li-ion batteries** are classified as Dangerous Goods for transport according to the UN Model regulation for the Transport of Dangerous Goods.

They are classified under CLASS 9 Dangerous Goods due to their dual hazard properties associated with their chemical and electrical content.

UN 3480 : Lithium-Ion Batteries

UN 3481 : Lithium-Ion Batteries contained in equipment or packed with equipment.

Prior to any shipment, the compliance of the following points must be checked:

**-The Transport of Li-ion batteries (Dangerous Goods) is organized by appropriately trained persons and/or** the shipment is accompanied by corresponding experts or qualified companies.

**-The Lithium-Ion battery is of the type proved to meet the requirements of each test in the UN Manual of Tests and Criteria, Part III, sub-section 38.3 ;**

<http://www.unece.org/fileadmin/DAM/trans/danger/publi/manual/Rev5/English/ST-SG-AC10-11-Rev5-EN.pdf>

-In accordance with the requirements of the UN Model Regulation, Chapter 2.9.4, the manufacturer of the battery or the battery pack shall made available on request of the Competent Authority the evidences that a Quality Certification program is in place in its manufacturing facility for Lithium-ion batteries.

**UN-No: 3480 or 3481      Lithium-Ion Batteries and Lithium-Ion batteries contained in equipment or packed with equipment**

#### ADR/RID

Class      9

Packing group      II, tunnel category E

ADR/RID-Labels

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Proper shipping name Lithium-Ion batteries, UN 3480

ADR SP 188, 230,310, 636 will apply and Packing Instruction P903, P903a and P903b.

Note: For ADR, see the following address

[www.unece.org/trans/danger/publi/adr/adr2011/11contentse.html](http://www.unece.org/trans/danger/publi/adr/adr2011/11contentse.html)

## IMO

Class Packing group II IMO-Labels 9  
Proper shipping name Lithium-Ion batteries, UN 3480  
IMDG Code: 188, 230, 310, P903  
EmS: F-A, S-I  
Stowage category A

## IATA-DGR

Class Packing group II ICAO-Labels 9  
Proper shipping name Lithium-Ion batteries, UN 3480  
IATA: A88, A99, A154, A164, P965, P966, P967, P968, P969, P970

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

<http://www.iata.org/whatwedo/cargo/dgr/Pages/lithium-batteries.aspx>

Please, keep updated on the Transport Regulation by contacting your National Competent Authority.

## WARNING / DISCLAIMER ON LIABILITY ( to be adapted according company policy).

The information provided in this Battery Information Factsheet is indicative and only valid at the date of its publication. The information given is designed only **as a guidance for safe handling, storage and transportation of these batteries. It is not to be considered as a warranty or quality specification.**

It is the responsibility of each individual handling these batteries to obtain from the supplier of the batteries the most appropriate information in order to complement, adapt or correct the content of this BIF.

## ADDITIONNAL SOURCE OF INFORMATION

Detailed chemical information is available separately from each individual Battery Manufacturer. RECHARGE can supply addresses of manufacturers on request.

## BATTERY INFORMATION FACTSHEET – BIF.

### 1. Targeted Audiences

	<b>Generic Information</b>		<b>Generic Information and additional Information</b>
<b>1</b>	<i>Purchasing Department (OEM)</i>	<b>7</b>	<i>EHS officers</i>
<b>2</b>	<i>Battery assemblers and users in industrial environment (OEMs)</i>	<b>8</b>	<i>Collectors (waste batteries)</i>
<b>3</b>	<i>Warehouses</i>	<b>9</b>	<i>Recyclers</i>
<b>4</b>	<i>Carriers (new batteries)</i>	<b>10</b>	<i>Handling of damaged battery</i>
<b>5</b>	<i>Insurance Companies</i>	<b>11</b>	<i>Intervention Crew (Fire Brigade)</i>
<b>6</b>	<i>Customs agents</i>		

### 2. Type of Information (Equivalence between BIF Chapters and Chapters of an SDS)

	<b>BIF</b>	<b>Equivalent paragraphs of a SDS</b>
<b>PART 1</b>	<i>Good Practice Guidance</i>	<i>7;9</i>
<b>PART 2</b>	<i>Emergency Response Guidance</i>	<i>3;4;5;6;8</i>
<b>PART 3</b>	<i>Basic Regulatory and Legislative Information</i>	<i>13;15</i>
<b>PART 4</b>	<i>Transport</i>	<i>14</i>

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