

## Instructions for the safe handling of Lithium-Ion accumulators (Lithium-Ion batteries based on Lithium Iron Phosphate cells)

### 1. Identification of the article and the company

Data on the product: **Low voltage Li-Ion battery**

Rechargeable lithium-ion battery pack

Americas	Europe, Middle East, Africa
Clarios 5757 N. Green Bay Avenue Florist Tower Milwaukee, WI 53209 US  Contact: Industrial Hygiene & Safety Department Telephone: (800)-333-2222 ext. 2267  Emergency: CHEMTREC: 800-424-9300 (For US & Canada use only)	Clarios Advanced Solutions GmbH Am Leineufer 51 D-30419 Hanover  Contact: Dr. Axel Lesch, Director, Environment & Facility Management  Telephone: ++ 49 / 511/975-2690 Fax: ++ 49 / 511/975-2696 Emergency: ++ 49 / 511/975-2680 Email: <a href="mailto:Axel.Lesch@clarios.com">Axel.Lesch@clarios.com</a>

### 2. Hazard identification:

No hazards in case of an intact battery and observation of the instructions for use.

Lithium-Ion batteries contain organic electrolyte. In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Exposure and/or contact with organic electrolyte solution/mist may lead to acute irritation of the skin, corneal damage of the eyes and irritation of the mucous membranes of the eyes and upper respiratory system, including lungs.

For this reason, batteries are marked with the following hazard symbols <sup>1)</sup>



Prohibition sign P003: *No Fire, No Smoking*



Mandatory action sign M004: *Use protective eyewear*



Warning sign W023: *Corrosive substances*



Mandatory action sign M002: *Refer to instruction manual/booklet*



Warning sign W021: *Combustible and flammable materials*



Prohibition sign P036: *No children allowed*

<sup>1)</sup> The hazard symbols correspond to ISO 7010. A marking of batteries according GHS CLP-regulation is not required.

Note: Do not clean batteries with dry cloth, use only damp cloth, due to electrostatic charge

### 2.1 Electrolyte - Mixed Organic solvents and electrolyte Salt

H226 – Flammable liquid and vapor.  
H290 – May be corrosive to metals.  
H302 – Harmful if swallowed.  
H311 – Toxic in contact with skin  
H312 – Harmful in contact with skin.  
H314 – Causes severe skin burns and eye damage  
H319 – Causes serious eye irritation.  
H332 – Harmful if inhaled

### 2.2 Electrode paste – Mixed metals and Lithium Iron Phosphate:

H251 – Self-heating: may catch fire  
H302 – Harmful if swallowed.  
H315 – Causes skin irritation.  
H317 – May cause allergic skin reaction.  
H319 – Causes serious eye irritation.  
H335 – May cause respiratory irritations.  
H350i – May cause cancer by inhalation.  
H372 – Causes damage to organs through prolonged or repeated exposure.  
H413 – May cause long lasting harmful effects to aquatic life.

## 3. Composition / Information on Ingredients:

Chemical Name	CAS No.	Battery Weight % <sup>1</sup>	Classification 1272/2008 (CLP) GHS hazard statements
Lithium Iron Phosphate	15365-14-7	10 - 20	H413
Mixed Organic Solvents	Mixture (623-53-0 ; 616-38-6 and others)	10 - 15	H226, H302, H312, H315, H319, H332
Electrolyte Salt (Lithium Hexafluorophosphate)	21324-40-3	1 - 3	H290, H302, H311, H314
Aluminum Oxide	1344-28-1 (1318-23-6)	5 - 10	H335, H372, H413
Aluminum Metal	7429-90-5	20 - 30	
Copper Metal	7440-50-8	5 - 10	H413
Graphite, Carbon	7782-42-5 (1333-86-4) (1333-86-4)	5 - 10	H251, H315, H319, H335, H350, H372
Plastic (var.) <sup>2</sup>		10 - 20	
Steel		1 - 5	

<sup>1</sup> Content may vary

<sup>2</sup> Composition of the plastic may vary due to different customer requirements.

#### 4. First aid measures:

The information below is of relevance only, if the battery is damaged and direct contact to the contained compounds takes places.

According EC 1272/2008 (CLP) the contained compounds are classified as hazardous.

Inhalation	<p><b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b></p> <p>However, if organic electrolyte is released due to overcharging or abuse of the battery, remove exposed person to fresh air. If breathing is difficult, oxygen may be administered. In severe cases obtain medical attention immediately.</p>
Skin contact	<p><b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b></p> <p>However, if organic electrolyte contacts skin, wash off skin thoroughly with water. Remove contaminated clothing and wash before reuse. If irritation develops or in severe cases obtain medical attention immediately. Seek medical attention as soon as possible for all burns regardless of how minor they may appear initially</p>
Eye contact	<p><b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b></p> <p>However, if organic electrolyte enters eyes, thoroughly flush eyes with water for a minimum of 15 minutes. Obtain medical attention immediately.</p>
Ingestion	<p><b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b></p> <p>However, if internal components are ingested, rinse out mouth thoroughly with water and give plenty of water to drink. Do not induce vomiting. Obtain medical attention immediately.</p>

#### 5. Fire-fighting measures:

Flash Point	Not applicable unless individual components exposed.
Auto ignition Temperature	No data available.
Flammable Limits in Air, % by volume	Not applicable unless individual components exposed.
Extinguishing Media	Dry chemical, foam, or CO <sub>2</sub> extinguishers. CO <sub>2</sub> extinguishers, generous amounts of water spray, copious quantities of water or water-based foam can be used to cool down burning Li-ion cells and batteries.
Special Fire Fighting Procedures	Use positive pressure, self-contained breathing apparatus. Wear protective clothing to prevent potential body contact with the electrolyte solution or its by-products.
Unusual Fire and Explosion Hazard	The sealed battery is not considered flammable, but it will vent and burn if involved in a fire. The organic electrolyte reacts with moisture/water to produce hydrogen fluoride (HF). Decomposition products may include metal oxides/oxides.

## 6. Accidental release measures:

<b>Protective Measures to be Taken if Material is Released or Spilled</b>	Remove personnel from area until fumes dissipate. Use recommended personal protective equipment. Cover battery or spilled substances with an absorbing material, place in approved sealed container and dispose in accordance with applicable local, state and federal regulations.
<b>Waste Disposal Method</b>	Dispose of in accordance with applicable local, state and federal regulations.

## 7. Handling and storage:

<b>Handling</b>	Do not crush, pierce, short circuit (+) and (-) battery terminals with conductive (i.e. metal) goods. Do not directly heat or solder. Do not throw into fire. Do not mix batteries of different types and brands. Do not mix new and used batteries. Keep batteries in non-conductive (i.e. plastic) trays. Cells or batteries that have been dropped or experienced mechanical shock should be isolated and monitored for approximately 5 days to identify a possible internal short circuit and resulting fire.
<b>Storage</b>	Store in a cool (preferably below 30°C) and ventilated area, away from moisture, sources of heat, open flames, food and drink. Keep adequate clearance between walls and batteries. Temperature above 70°C may result in battery leakage and rupture. Since short circuit can cause burn, leakage and rupture hazard, keep batteries in original packaging until use and do not expose them to unnecessary or excessive handling. Recommended storage range: -30 to +40 Deg C. Cells may experience short temperatures from + 41 to 60 Deg C for total accumulated excursion not exceeding 7 Days. Never store cells above 60 Deg C.
<b>Other</b>	Follow Manufacturers Recommendations regarding maximum recommended currents and operating temperature range. Do not overcharge beyond the recommended upper charging voltage limit. Applying pressure or deforming the battery may lead to disassembly followed by eye, skin and throat irritation.

Additional Information about handling and storage of lithium-ion batteries can be requested from Clarios Advanced Solutions GmbH.

## 8. Exposure controls / personal protection:

- 8.1 No exposure caused by mixed metals, electrolyte containing solvent and electrolyte salt when handling properly.
- 8.2 In case of a damaged battery and with direct contact to the contained organic electrolyte.

## Occupational exposure limits

US OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)				
Ingredient	CAS Number	Type	Value	Form
Mixed Metal ( <i>May include iron, phosphorus, lithium, copper, nickel and/or aluminum oxide compounds</i> )	Mixture	TWA	Al – 5.0 mg/m <sup>3</sup>	Dust
Carbon Solids	1333-86-4 7782-42-5	TWA	3.5 mg/m <sup>3</sup> 15 C/m <sup>3</sup> 5 Cg/m <sup>3</sup>	Dust Total Graphite Respirable Dust
Lithium Hexafluorophosphate	21324-40-3		2.5 mg/m <sup>3</sup>	Dust

Clarios

## 9. Physical and chemical properties:

Appearance and Odor	Plastic housing containing battery cells and electronics components. Cells: Solid metal cylinder, rectangular pouch or solid container, containing mixed metal oxides, carbon solids and organic electrolyte. Metallic odor.
Odor Threshold	Not applicable.
pH	Not applicable
Boiling Point	Not applicable unless individual components exposed.
Melting Point	Plastic pack container (SLS Polymer) ASTM E1640 Glass transition: 50°C
Specific Gravity (H <sub>2</sub> O = 1)	Not applicable unless individual components exposed.
Flash Point	Not applicable
Evaporation Rate (Butyl Acetate = 1)	Not applicable unless individual components exposed.
Vapor Pressure (mm Hg @ 20 deg C)	Not applicable unless individual components exposed.
Flammability	Plastic pack container (SLS Polymer) – UL94 HB
Upper/lower flammability or explosive limits	Not applicable.
Vapor Pressure	Not applicable.
Vapor Density (Air = 1)	Not applicable unless individual components exposed.
Relative Density	Not applicable.
Solubility	Not applicable unless individual components exposed.
% Volatile by Weight	Not applicable unless individual components exposed.
Partition coefficient (n-octanol/water)	Not applicable
Auto-ignition temperature	Not applicable
Decomposition temperature	Not applicable
Viscosity	Not applicable

## 10. Stability and reactivity:

Stability	The sealed battery is considered stable.
Conditions to Avoid	Sparks and other sources of ignition; high temperature; over charging.
Incompatibility (materials to avoid)	Organic electrolyte – reacts with water to produce hydrogen fluoride.
Hazardous Decomposition Products	Carbon monoxide, carbon dioxide, phosphorous oxides. <i>Mixed metal oxide</i> – nickel, cobalt, and manganese oxides can be released. <i>Organic electrolyte</i> – reacts with water to produce hydrogen fluoride (HF).
Hazardous Polymerization	Will not occur.

## 11. Toxicological information:

**NOTE:** Under normal conditions of use, this product does not present a health hazard. The following information is provided for organic electrolyte and the mixed metal oxide exposure that may occur due to container breakage or under extreme conditions such as fire.

Organic electrolyte – reacts with moisture/water to produce hydrofluoric acid in trace quantities. Hydrofluoric acid is extremely corrosive and toxic. In severe exposures it acts as a systemic poison and causes severe burns. The reaction may be delayed. Any contact with this material, even minor, requires immediate medical attention.

### ***ROUTES AND METHODS OF ENTRY***

<b>Inhalation</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Extreme exposures to the organic electrolyte can be severely corrosive to the respiratory tract and may cause sore throat, coughing, labored breathing and lung congestion/inflammation. Overcharging or seepage of electrolyte from broken batteries may present inhalation exposure in a confined area.
<b>Skin Contact</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Extreme exposures to the organic electrolyte can be corrosive to the skin. Skin contact can cause serious skin burns which may not be immediately apparent or painful. Symptoms may be delayed 8 hours or longer. The fluoride ion readily penetrates the skin causing destruction of deep tissue layers and even bone.
<b>Skin Absorption</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Extreme exposures to the organic electrolyte can be absorbed through the skin.
<b>Eye Contact</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Extreme exposures to the organic electrolyte can be corrosive to the eyes and can cause severe irritation, burns, and cornea damage. Symptoms of redness, pain, blurred vision, and permanent eye damage may occur.
<b>Ingestion</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Extreme exposures to the organic electrolyte can be corrosive and may cause sore throat, abdominal pain, diarrhea, vomiting, severe burns of the digestive tract, and kidney dysfunction. Hands contaminated by contact with internal components of a battery can also cause ingestion of mixed metal oxides and carbon solids. Hands should be washed thoroughly prior to eating, drinking, or smoking.

### ***SIGNS AND SYMPTOMS OF OVEREXPOSURE***

<b>Acute Effects</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Exposure and/or contact with organic electrolyte solution/mist may lead to acute irritation of the skin, corneal damage of the eyes and irritation of the mucous membranes of the eyes and upper respiratory system, including lungs.
<b>Chronic Effects</b>	<b>EXPOSURE IS NOT EXPECTED FOR PRODUCT UNDER NORMAL CONDITIONS OF USE.</b> In the event of overcharging or damage to the unit, exposure to organic electrolyte solution/mist is possible. Contact with the organic electrolyte may lead to skin burns/ulceration, scarring of the cornea, and chronic respiratory conditions. Extreme exposures – intake of more than 6 mg of fluorine per day may result in fluorosis, bone and joint damage. Hypocalcemia and hypomagnesemia can occur from absorption of fluoride ion into blood stream.

### POTENTIAL TO CAUSE CANCER

Carbon black has been identified by the International Agency for Research on Cancer (IARC) as possible carcinogenic to humans (Group 2B).

**California Proposition 65:** This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require warning under the statute –Carbon Black

### MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Contact with or exposure to the organic electrolyte may aggravate skin diseases such as eczema and contact dermatitis, respiratory disorders such as lung injuries and asthma, and kidney function.

#### Toxicological Data

Constituents	Species	Test Results
Carbon Solids (CAS 7782-42-5)		
<b>Acute</b>		
<i>Inhalation</i>		
LC50	Rat	> 2000 mg/m <sup>3</sup> , 4 hours
<i>Oral</i>		
LD50	Rat	> 1000 mg/kg

#### 12. Ecological information:

<b>Mammalian effects</b>	None known if used/disposed of correctly.
<b>Eco-toxicity</b>	None known if used/disposed of correctly.
<b>Bioaccumulation potential</b>	None known if used/disposed of correctly.
<b>Environmental fate</b>	None known if used/disposed of correctly.
<b>Mobility in Soil</b>	None known if used/disposed of correctly.

#### 13. Disposal considerations:

Lithium-Ion batteries (EWC 16 06 05) are subject to the regulation of EU (Battery Directive) and its adoptions into national legislation on the composition and end-of-life management of batteries. They are marked with the recycling / return symbol and with a crossed-out roller container.


Redemption of batteries exclusively via the workshops of the vehicle manufacturer. Please contact the vehicle manufacturer for more information.

14. Transport information:



The rules and regulations described below are extracts from the applicable UN regulations (ADR/RID / IMDG / IATA) as of August 2019. Updated regulations always supersede the information in this document. It is the responsibility of the shipper to execute any transportation of dangerous goods in conformance with the applicable regulations. Appropriate training is required for the shipper.

The information below applies to Lithium Ion batteries that have successfully passed testing according to Manual of Tests and Criteria Part III, chapter 38.3 and are not defective and/or carried for disposal or recycling.

If transport of prototypes, defective batteries or carriage for disposal or recycling is required, please contact Clarios for further assistance and information.

Land Transport	Land Transport (ADR/RID 2019)					
	UN N°: UN3480					
	Classification ADR/RID: Class 9					
	Proper Shipping Name: LITHIUM ION BATTERIES					
	Packing Group ADR: Packagings shall conform to the Packing group II performance level					
	Packaging instructions: P903					
	Batteries shall be packed in packagings so that the batteries are protected against damage that may be caused by the movement or placement of the batteries within the packaging.					
	Batteries shall be protected against short circuit.					
	Label required: 9A					
	<table><tr><td>9A</td><td>-</td><td>7 vertical stripes in upper half black; battery group, one broken and emitting flame in lower half black</td><td>White</td><td>9 underlined (black)</td></tr></table> 	9A	-	7 vertical stripes in upper half black; battery group, one broken and emitting flame in lower half black	White	9 underlined (black)
9A	-	7 vertical stripes in upper half black; battery group, one broken and emitting flame in lower half black	White	9 underlined (black)		



Sea Transport	<p>Sea Transport (IMDG Code 2019)</p> <p>UN N°: UN 3480</p> <p>Classification: Class 9</p> <p>Proper Shipping Name: LITHIUM ION BATTERIES</p> <p>Packing Group IMDG: Packagings shall conform to the Packing group II performance level</p> <p>Packaging instructions: P903</p> <p>Batteries shall be packed in packagings so that the batteries are protected against damage that may be caused by the movement or placement of the batteries within the packaging.</p> <p>Batteries shall be protected against short circuit.</p> <p>EmS: F-A, S-I</p>
Air Transport	<p>Air Transport (IATA-DGR 2018)</p> <p>UN N°: UN 3480</p> <p>Classification: Class 9</p> <p>Proper Shipping Name: LITHIUM ION BATTERIES</p> <p>Packing Group: Packing group II</p> <p>Packaging instructions: PI965, Section IA</p> <p>IMP: RBI</p> <p>Label required:</p> <div style="display: flex; align-items: center;">   </div> <p>Restrictions / Conditions: Batteries &gt;100Wh Max SoC = 30% Pax A/C = Forbidden CAO = 35kg (limit per package)</p>

## 15. Regulatory information:

In accordance with Battery Directive and national laws lithium-ion batteries have to be marked by a crossed out refuse bin, together with the return/ recycling symbol, clearly marked as Li-Ion according IEC 62902.



The manufacturer, respectively the importer of the batteries shall be responsible for labelling batteries with the symbols. In addition, a consumer / user information on the significance of the symbols has to be attached.

## 16. Other information:

### 16.1 Key or legend to abbreviations and acronyms:

- AF - Assessment factor
- CLP - Regulation (EC) No 1272/2008 of the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures.
- DNEL - Derived no-effect level
- DSD - Council Directive 67/548/EEC (Dangerous Substances Directive)
- EC50 - Concentration of the substance that causes 50 % reduction of a certain effect on test organisms
- EWC - European Waste Catalogue
- LC50 - Concentration of the substance that causes 50 % mortality of the test population
- NOAEC - No observed adverse effect concentration
- NOAEL - No observed adverse effect level
- OECD - Organisation for Economic Co-operation and Development
- PBT/vPvB - Persistent, bioaccumulative and toxic/ very persistent and very bioaccumulative
- PNEC - Predicted no-effect concentration
- REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals
- STOT RE - Specific Target Organ Toxicity, Repeated Exposure
- STOT SE - Specific Target Organ Toxicity, Single Exposure
- STP - Sewage treatment plant

## 16.2 Emergency telephone numbers:

For **US & Canada:** CHEMTREC: +1 800-424-9300

**Europe-wide** emergency number: 112

Contact a poison control center. List of phone numbers:

**AUSTRIA** (Vienna Wien) +43 1 406 43 43; **BELGIUM** (Brussels Bruxelles) +32 70 245 245; **BULGARIA** (Sofia) +359 2 9154 409; **CZECH REPUBLIC** (Prague Praha) +420 224 919 293; **DENMARK** (Copenhagen) 82 12 12 12; **ESTONIA** (Tallinn) 112; **FINLAND** (Helsinki) +358 9 471 977; **FRANCE** (Paris) +33 1 40 0548 48; **GERMANY** (Berlin) +49 30 19240; **GREECE** (Athens Athinai) +30 10 779 3777; **HUNGARY** (Budapest) 06 80 20 11 99; **ICELAND** (Reykjavik) +354 525 111, +354 543 2222; **IRELAND** (Dublin) +353 1 8379964; **ITALY** (Rome) +3906 305 4343; **LATVIA** (Riga) +371 704 2468; **LITHUANIA** (Vilnius) +370 5 236 20 52 or +370 687 53378; **MALTA** (Valletta) 2425 0000; **NETHERLANDS** (Bilthoven) +31 30 274 88 88; **NORWAY** (Oslo) 22 591300; **POLAND** (Gdansk) +48 58301 65 16 or +48 58 349 2831; **PORTUGAL** (Lisbon Lisboa) 808 250 143; **ROMANIA** (Bucharest) +40 21 3183606; **SLOVAKIA** (Bratislava) +421 2 54 77 4166; **SLOVENIA** (Ljubljana) + 386 41 650500; **SPAIN** (Barcelona) +34 93 227 98 33 or +34 93 227 54 00 bleep 190; **SWEDEN** (Stockholm) 112 or +46 833 12 31 (mon-fri 9.00-17.00); **UNITED KINGDOM** (London) 112 or 0845 4647 (NHS Direct).

## 16.3 Disclaimer of Liability:

The information in this data sheet for safe handling of lithium-ion batteries is provided in good faith based on existing knowledge. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use or disposal of the article are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the article. This data sheet was prepared and is to be used only for this article.

Articles such as batteries are not in the scope of any regulation which requires the publication of a Safety Data Sheet according (EC) No. 1907/2006 (REACH), as amended by Annex I to Commission Regulation (EU) No. 453/2010.

More information is available:

<http://www.clarios.com/>