

Material Data Safety Sheet

LiFePO₄ – Lithium Iron Phosphate Batteries

Section 1. Identification of the Substance/Preparation and of the Company/Undertaking

Product name: Li-Ion Cells or Battery Pack

Product description: Lithium Iron Rechargeable Chemistry

Product Size: Large Format Prismatic Type Cell (for all sizes)

Product codes: With Prefix. 1/LP/38, 2/LP/38, 4/LP38, 3/LP48 & 6/LP48

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Section 2. Composition/Information on Ingredients

Common Chemical Name/General Name	CAS #	Percent or Content (%)	Classification and Hazard Labelling
Lithium Iron Phosphate (LiFePO ₄)	15365-14-7	26-30	Eye, Skin, Respiratory Irritant
Carbon, as Graphite	7440-44-0	13-16	Eye, Skin, Respiratory Irritant
Aluminium	7429-90-5	6-7	Inert
Copper	7440-50-8	9-77	Inert
Electrolyte			
Ethylene Carbonate	96-49-1	18-22	Mixture: Flammable: Reactive: Sensitizer: Eye: Skin & respiratory irritant
Dimethyl Carbonate	616-38-6		
Ethyl Methyl Carbonate	623-53-0		
Lithium Hexafluorophosphate	21324-40-3		

Section 3. Hazardous Identification

Lithium Ion batteries described in this MSDS data sheet are hermetically sealed and designed to withstand temperatures and pressures encountered during normal use. Under normal conditions of use, there is no physical danger of ignition, explosion or chemical danger of hazardous materials leakage. The materials contained in this battery may only represent a hazard if the integrity of the battery is compromised or if the battery is mechanically, thermally or electrically abused.

Caution: Do not open or disassemble the batteries. Do not expose the batteries to fire or open flame. Do not mix batteries of varying sizes or chemistries. Do not short circuit, puncture, incinerate, crush, over-charge, over discharge, or expose the batteries to temperatures above the declared limit. Abuse of the batteries will result in the risk of fire or explosion, which could release hydrogen fluoride gas.

Human Health Hazard: Electrolyte may irritate skin and eyes. Electrolyte steam has an anaesthesia action and irritates the respiratory tract.

Section 4. First Aid Measures

General information: Warning! Normal safe handling of this product will not result in health affects known or anticipated. If contained material is released due to mechanical damage of the outer battery housing, following measures are advised: Symptoms of poisoning may occur several hours later. After an accident occurred medical observation of at least 48 hours shall be sought.

Inhalation:

If contents of an opened cell are inhaled, remove source of contamination or move victim to fresh air.

- Obtain medical advice.
- Rinse mouth and nose with water.
- Immediately seek medical attention.
- Do not execute mouth-to-mouth or mouth-to-nose respiration.
- Respiration via bag or mask.

Eye contact: Contact with the contents of an opened cell can cause burns. If eye contact with contents of an open cell occurs, immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 30 minutes while holding the eyelids open. Neutral saline solution may be used as soon as it is available. If necessary, continue flushing during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto face. Quickly transport victim to an emergency care facility.

Skin contact: Contact with the contents of an opened cell can cause burns. If skin contact with contents of an open cell occurs, as quickly as possible remove contaminated clothing, shoes and leather goods. Immediately flush with lukewarm, gently flowing water for at least 30 minutes. If irritation or pain persists, seek medical attention. Completely decontaminate clothing, shoes and leather goods before reuse or discard.

Swallowing: Contact with the contents of an opened cell can cause burns. If ingestion of contents of an open cell occurs, NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility. Give milk or water to drink.

Notes for the physician: Treat according to symptoms.

Most relevant acute or delayed symptoms: Respiratory irritation

Section 5. Fire Fighting Measures

Flammable Properties: Lithium-Ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C / 302 °F), when damaged or abused (e.g. mechanical damage or electrical overcharge). Burning cells can ignite other batteries in close proximity.

Suitable extinguishing Media: Small Fires - Dry chemical, CO2, water spray or regular foam. Large Fires - Water spray fog or regular foam. Move containers from fire area if you can do it without risk.

Unsuitable extinguishing Media: Water

Explosion Data:

- **Sensitivity to mechanical impact:** Extreme mechanical abuse will result in rupture of the individual battery cells.
- **Sensitivity to static discharge:** Electrostatic discharges imposed directly on the spilled electrolyte may start combustion.

Special hazards arising from the substance or mixture: In the event of fire dangerous smoke and vapours may be formed. Smoke or hydrogen gas can be built due to overheating.

Special protective equipment: Breathing apparatus independent of circulating air. Full body protective suit.

Further information: If the battery is charged, disconnect supply. In case of fire, cordon off and remove all people from the surrounding of the incident. Do not take actions that get along with a personal risk or were not properly trained. Get close to the fire in the same direction as the wind blows to avoid vapours and toxicological decomposition products.

Remove product out of the fire area if possible without risk.
Keep extinguishing water away from groundwater and surface water.

Section 6. Accidental Release Measures

Personal Precautions: When mechanically damaged, the product can leak material (electrolyte). Keep away from contact with skin and eyes. As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed areas before entering. Wear adequate personal protective equipment as indicated in Section 8.

Environmental Precautions: Collect leaked material with a plastic coated container. Do not let spilled material get into sewer system/groundwater/surface water.

Methods for Containment: Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up spills immediately.

Methods for Clean-up: Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of according to directions in Section 13. Scrub the area with detergent and water; collect all contaminated wash water for proper disposal. Dispose the material according to applicable regulations.

Section 7. Handling and Storage

Handling/Transportation:

- Do not open or disassemble the batteries.
- Do not expose the batteries to fire or store near open flame.
- Do not mix batteries of varying sizes or chemistries.
- Do not connect the positive and negative battery terminals with conductive material or throw into fire.
- Do not heat or solder the batteries. Keep the batteries in plastic or non-conductive trays.
- Do not expose batteries to direct sun light for a prolonged time.
- Do not expose cell to temperatures outside the range of -40 °C to 80 °C
- The product has to be used in accordance to workplace hygiene standards and legal provisions.
- Eating, drinking and smoking in the area where the material is used, stored or handled is prohibited.
- Keep away from eyes and skin. Hands, forearms and face have to be washed properly after the handling of the chemical product before eating, drinking, smoking or after finishing work.
- Do not electrically or mechanically abuse.
- A short circuit (more than a short term short circuit) leads to heating of the battery and to a reduced lifetime.
- Do not change polarity inside the battery arrangement.
- If the battery breaks open, rubber gloves have to be worn for handling the components.
- Do not throw into fire, mix or store with other battery types, do not wrongly connect, do not short circuit: can lead to overheating, explosion or leakage of the material.
- Large battery container, coins, metal jewellery, metal workstations, metal conveyors, or other metal equipment used to handle the battery can be the source of short circuits.
- Use anti-short circuit measures.
- Do not use organic solvents other chemical cleaning products.
- Do not expose to direct sunlight.
- Avoid contact with water.
- Precautions against fire and explosion: keep away from sources of ignition – no smoking.

Storage:

- Batteries should be stored in a well ventilated, cool area with sufficient clearance between batteries and walls.
- Store the batteries in a cool (below 30 °C) area and away from moisture.
- Prevent water from condensation on product. Store in a cool, dry and ventilated area.
- Keep the batteries away from sources of heat, open flames, food and drink.
- Do not store the batteries above 55 °C or below -30 °C. Storing at elevated temperatures may reduce the life of batteries.
- High temperatures can decrease the performance of the product and lead to leakage and rusting of the cell.
- Elevated temperature storage such as 100 °C may result in battery venting flammable liquid and gases.
- Prevent from physical damage and short circuits.
- To prevent the risk of fire, keep the battery away from sparks and other ignition sources.
- Do not store batteries on conductive material.
- The batteries have to be packed so that a short circuit and movement that can lead to short circuit is not possible.
- Do not store together with flammable, oxidizing, or explosive material. Keep batteries away from strong oxidizers and acids.

Section 8. Exposure Controls/Personal Protection

No engineering controls are required for normal operation. In case of cell leakage, increase the ventilation and use self-contained full-face respiratory equipment.

Common Chemical Name/General Name	OSHA PEL-TWA	ACGIH (2010) and TLV-TWA
Lithium Iron Phosphate (LiFePO4)	10.0mg/m3 (as iron fume)	10.0mg/m3 (metal coarse particulate) 5mg/m3 (inflammable powder) 5mg/m3 (weld fume)
Carbon, as Graphite	5mg/m3 (respirable fraction)	2.0mg/m3 (respirable fraction)
Electrolyte	Not Established	Not Established

PEL-TWA: Permissible exposure limits-time weighted average concentration.

ACGIH: American Council of Government Industrial Hygienist.

TLV-TWA: Threshold Limit Value-Time Weighted Average Concentration

Personal Protective Equipment

Not required during normal use of the battery

In the event of a ruptured battery or fire:

- **Respiratory protection:** Self-contained full-face respiratory equipment.
- **Hand protection:** Chemical protective gloves.
- **Eye protection:** Self-contained full-face respiratory equipment.
- **Skin and body protection:** Chemical protective clothing.

Section 9. Physical and Chemical Properties

Physical State:	Solid	Vapour Pressure (mm Hg @ 20 °C):	N/A
Appearance:	Cell	Vapour Density:	N/A
Ph:	N/A	Solubility in Water:	N/A
Relative Density:	N/A	Water/Oil Distribution Coefficient:	Insoluble
Boling Point:	N/A	Odor Type:	Odorless
Melting Point:	N/A	Odor Threshold:	N/A
Viscosity:	N/A	Evaporative Rate:	N/A
Oxidising Property:	N/A	Auto Ignition Temperature (°C):	N/A
Flashpoint & Method °C:	N/A	Flammability Limits (%):	N/A

Section 10. Stability and Reactivity

Stability: Stable

Suitable extinguishing Media: Avoid exposing the cell to fire or temperatures above 80°C.
Do not disassemble, crush, short or install with incorrect polarity. Avoid mechanical or electrical abuse.

Incompatible Materials: Do not immerse in seawater or other high conductivity liquids.

Hazardous Decomposition Products: This material may release toxic fumes if burned or exposed to fire. Breaching of the cell enclosure may lead to generation of hazardous fumes which may include extremely hazardous HF (hydrofluoric acid).

Possibility of Hazardous Reactions: Not available.

Section 11. Toxicological Information

Acute Toxicity Data/ Other Toxicity Data: Acute oral, dermal and inhalation toxicity data are not available for this article.

Irritation: Risk of irritation occurs only if the cell is mechanically, thermally or electrically abused to the point of compromising the enclosure. If this occurs, irritation to the skin, eyes and respiratory tract may occur.

Corrosivity:	Not applicable
Sensitization:	Not applicable
Neurological Effects:	Not applicable
Genetic Effects:	Not applicable
Reproductive Effects:	Not applicable
Developmental Effects:	Not applicable
Target Organ Effects:	Not applicable

Carcinogenicity: Normal safe handling of this product will not result in exposure to substances that are considered human carcinogens by IARC (International Agency for Research on Cancer), ACGIH (American Conference of Governmental Industrial Hygienists, OSHA or NTP (National Toxicology Program).

Conditions to avoid: No breaking down under normal conditions.

Possibility of dangerous reactions: If a battery is exposed to external short circuit, high temperature or open flames or breaks open or is modified, heat can be built up and an ignition is possible.

Situations to avoid:

- Heat and flame.
- External short circuit, overcharging, breaking, modification or incompatible material.
- High humidity.
- Direct sunlight.

Dangerous break down products: Carbon dioxide, Carbon monoxide.

This product does not contain mercury, cadmium or Polymer-metal.

Section 12. Ecological Information

Mammalian effects: None known at present
Eco-toxicity: None known at present
Bioaccumilation potential: Slowly biodegradable
Environmental fate: No known environmental hazards at present

Section 13. Disposal Considerations

Batteries should be discharged fully prior to disposal. The battery terminals should be capped to prevent a short circuit. Dispose the batteries in accordance with applicable local laws. Li-ion batteries may be subject to federal, state or local regulations. Do not incinerate or subject cells to temperatures in excess of 70°C

Section 14. Regulatory Information

The transport of rechargeable lithium-ion batteries is regulated by various bodies (IATA, IMO and ADR, DS-DOT) that follow the United Nations "Recommendation on the Transport of Dangerous Goods, Model regulations, 59th revised edition-2009-Ref. STSG/AC.10/11 Rev. 5 A1" Liteplan Limited products are assigned to UN3480 and are restricted by this regulation.

15. Transportation information

Lithium-ion batteries containing no more than 20 Wh/cell and 100 Wh/battery pack can be treated as "Non-dangerous goods" under the United Nations Recommendations on the Transport of Dangerous Goods, Special Provision 188, if packaging is strong, suitable, limited weight and prevents the products from short-circuit. Also concerned mark or label should appear on each outer box.

With regard to air transport the following regulations are cited and considered:

- The International Civil Aviation Organization (ICAO) Technical Instructions (2017 Edition)
- The International Air Transport Association (IATA) Dangerous Goods Regulations (58th Edition), Section II of PI967: lithium-ion batteries contained in equipment; or Section II of PI966: lithium-ion batteries packed with equipment; or Section II of PI965: lithium-ion batteries (if > 2 pcs./carton, it meets Section IB of PI965);
- The International Maritime Dangerous Goods (IMOG) Code (2014 Edition) with SP188
- The US Hazardous Materials Regulation (HMR) pursuant to a final rule issued by RSPA (Part 49 CFR Sections 100-185)
- The Office of Hazardous Materials Safety within the US Department of Transportation's (DOT) Research and Special Programs Administration (RSPA)
- The UN Recommendations on the Transport of Dangerous Goods Model Regulations and the Manual of Tests and Criteria (UN 38.3)

Our products are properly classified, described, packaged, marked and labeled and are in proper condition for transportation according to all the applicable international and national governmental regulations, not limited to the above mentioned. We further certify that the enclosed products have been tested and fulfilled the requirements and conditions in accordance with UN Recommendations (T1 ~ T8) on the Transport of Dangerous Goods Model Regulations.

It is suitable for ocean transfer and no danger.

Testing


Manual of Test and Criteria (38.3 Lithium-ion Battery)		
No.	Test Item	Test Result
T1	Altitude Simulation	Pass
T2	Thermal Test	Pass
T3	Vibration	Pass
T4	Shock	Pass
T5	External Short Circuit	Pass
T6	Impact	Pass
T7	Overcharge	Pass
T8	Forced Discharge	Pass

Section 16. Other Information/Disclaimer

The information contained in this material data sheet has been compiled from sources considered to be dependable and is to the best of the knowledge and belief of Liteplan Limited, accurate and reliable as of the date of compilation. However, no representation, warranty (either expressed or implied) or guarantee is made to the accuracy, reliability or completeness of the information obtained herein. This information relates to the specific materials designated and may not be valid for such materials used in combination with any other materials or in any process. It is the user's responsibility to satisfy him as to the suitability and completeness of this information for his particular use.

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On Behalf of Liteplan Limited	Signature	Date
Stephen Green Managing Director		09 th January 2024