Victron Energy
MATERIAL SAFETY DATA SHEET
LiFePO4 - Lithium Iron Phosphate Batteries

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SECTION 1 - GENERAL INFORMATION

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Battery type: LiFePO4 Battery, Li-ion Battery Common name (used on label): Lithium, Smart LiFePO4, Lithium SuperPack, LiFePO4 Battery, NG-LiFePO4	

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Common Chemical Name/General Name	CAS #	Percent or Content (%)	Classification and Hazard Labelling
Lithium Iron Phosphate (LiFePO4)	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	9-70	Inert
Electrolyte			
Ethylene Carbonate	96-49-1	18-22	Mixture: flammable & reactive Eye, Skin & respiratory irritant
Dimethyl Carbonate	616-38-6		
Ethyl Methyl Carbonate	623-53-0		
Lithium Hexafluorophosphate	21324-40-3		

SECTION 3 -- HAZARD IDENTIFICATION

Signs and Symptoms of Exposure	1. Acute Hazards	Do not open battery. Avoid contact with internal components. Internal components include electrolyte. Electrolyte is corrosive and skin contact may cause skin irritation. Electrolyte causes severe irritation and burns of eyes, nose and throat. Ingestion can cause severe burns and vomiting. A shorted lithium battery can cause thermal and chemical burns upon contact with the skin.	
	2. Sub-chronic and Chronic Health Effects	Electrolyte - Repeated contact with electrolyte causes irritation and skin burns. Repeated exposure to mist may cause erosion of teeth, chronic eye irritation and/or chronic inflammation of the nose, throat and lungs.	
Medical Conditions Generally Aggravated by Exposure	Contact with internal components if the battery is broken or opened, Persons with the following medical conditions must take precautions: pulmonary edema, bronchitis, emphysema, dental erosion and tracheobronchitis.		
Routes of Entry	Inhalation - YES Ingestion – YES	Eye Contact- YES	

SECTION 4 - FIRST AID MEASURES

Emergency and First Aid Procedures	
1. Inhalation	Move to fresh air and provide medical oxygen/CPR if needed. Seek medical attention.
2. Eyes	Immediately flush with water for at least 15 minutes, hold eyelids open. Seek medical attention.
3. Skin	Flush contacted area with large amounts of water for at least 15 minutes. Remove contaminated clothing and seek medical attention if necessary.
4. Ingestion	Do not induce vomiting. If conscious drink large amounts of water/milk. Seek medical attention. Never give anything by mouth to an unconscious person.

SECTION 5 - FIREFIGHTING MEASURES

Extinguishing media: dry chemical, CO2, water spray or regular foam. Large Fires - Water spray fog or regular foam

SECTION 6 - ACCIDENTAL RELEASE MEASURES

In case of battery rupture, 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.
Personal precautions: Acid resistant aprons, boots and protective clothing. ANSI approved safety glasses with side shields/face shield recommended.

SECTION 7 - HANDLING AND STORAGE

1. Handling	Do not crush or pierce. Do not short circuit the positive and negative battery terminals. Do not connect the positive and negative battery terminals with conductive material. Do not soak battery in water and seawater. Do not expose to strong oxidizers.
2. Storage	Avoid direct sunlight, high temperature, and high humidity. Store in a cool (optimum temperature +25 ±5°C) and ventilated area. Keep adequate clearance between walls and batteries. Do not mix batteries of different types and brands. Do not mix new and used batteries, Store batteries on non-conductive or plastic trays. If case of long-term storage, do not store upside down, charge the batteries to 40-60% at first, and check open circuit voltage monthly. Charge the batteries immediately if the voltage is under 3.0V/cell. The average self-discharge rate is about 3%/month. Charge the batteries at least once per half year.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION

1.	Keep out of reach from children.
2.	Avoid contact with skin when the battery leak or rupture.
3.	Skin protection: Not necessary under normal use. Use rubber apron and protective working in case of handling of a ruptured battery.
4.	Eye protection: Not necessary under normal use. Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery.
5.	Respiratory protection: Not necessary under normal use. In case of battery rupture, use self- contained full-face respiratory equipment.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance and odor	N/A
Flash point (°C)	N/A
Melting point (°C)	N/A
Boiling point (°C)	N/A
Relative density (water=1)	N/A
Relative Vapour density (air=1)	N/A
Vapour pressure (KPa)	N/A
Heat of combustion (KJ/mol)	N/A
Auto-ignition temperature (℃)	N/A
Solubility	Insoluble in water
Lower explosive limits % (V/V))	N/A
Upper explosive limits % (V/V)	N/A

SECTION 10 - STABILITY AND REACTIVITY

Stability	Product is stable under storage conditions described in Section 7.
Incompatibilities	Strong oxidizing agents, acids.

SECTION 11 - TOXICOLOGICAL INFORMATION

None unless internal materials are exposed. In case of internal gas released or electrolyte spilled, electrolyte and organic solvents have low toxicity and may cause irritation of skin or eyes. Released gas may also cause irritation of skin of eyes.

SECTION 12 - ECOLOGICAL INFORMATION

No pollution under normal conditions of use. Recycling recommended when end of life is reached.

SECTION 13 - DISPOSAL CONSIDERATIONS

1. Dispose in accordance with applicable regulations, which vary from country to country.
2. Lithium-Ion batteries should have their terminals insulated and be preferably wrapped in individual plastic bags prior to disposal.

SECTION 14 – TRANSPORT INFORMATION

UN Number: UN3480 - UN3481

ARD /RID
Class 9 Packing Group II ADR/RID-Labels
Proper shipping name: Lithium-ion batteries, UN3480 – UN3481

IMO
Class 9 Packing Group II IMO-Labels
Proper shipping name: Lithium-ion batteries, UN3480 – UN3481

IATA-DGR
Class 9 Packing Group II ICAO-Labels
Proper shipping name: Lithium-ion batteries, UN3480 – UN3481

2. Victron Energy B.V. declares that UN Manual of Tests and Criteria, Part III, sub-section 38.3 is met.
3. In airfreight, small Lithium-ion batteries (cells<20WH or packs>100WH) are considered as “Expected Lithium-ion Batteries”, when they meet the requirements of Ed. 63 of IATA regulations (UN3480) and ICAO Packing Instruction 965 section II, specifying less than 10kg gross per package. Caption shipment can move as normal cargo under current IATA.
4. In other cases (mainly for large cells >20WH or packs > 100WH), they are considered as Class 9 (See Packing Instruction 965 section I for airfreight).
5. In Seafreight, sealed Lithium-ion batteries are considered as “Lithium-ion Batteries-Not Restricted”, when they meet the requirements of IMDG of IMO Dangerous Goods Regulations (UN3480 and UN3481).
6. The transport of rechargeable lithium-ion batteries is regulated by various bodies, refer to: IATA, IMO, ADR/RID.

SECTION 15 – REGULATORY INFORMATION

Major applicable regulations for the transportation of lithium-ion cells and batteries are as follows:
The UN Model Regulations, United Nations ST/SG/AC.10/1/Rev 16. Recommendations on the Safe Transport of Dangerous Goods
The International Civil Aviation Organization (ICAO) Technical Instructions for the Safe Transport of Dangerous Goods by Air Transport
The International Air Transport Association (IATA) Dangerous Goods Regulations (57th Edition 2016)
International Maritime Organization (IMO) International Maritime Dangerous Goods Code (IMDG Code SP188) Amdt. 01-01 2014
OSHA Hazard communication standard (29 CFR 1910)

SECTION 16 – OTHER INFORMATION

The information contained in this safety data sheet is based on the present state of knowledge and current legislation. This safety data sheet provides guidance on health, safety and environmental specifications of the product and should not be construed as any guarantee of technical performance or suitability for particular applications. Victron Energy makes no warranty of merchantability or any other warranty, expressed or implied, and assumes no liability resulting from the information. Users should make their own investigations to determine the suitability of the information for their particular purposes.