



SAFETY DATA SHEET

PRODUCT NAME: Flux Power Pac Advanced Lithium Battery Pack – S8, M24, M36, X36, X48 and GSE

1 - PRODUCT IDENTIFICATION

Chemical Trade Name

Lithium-Ion Battery

Manufacture's Name / Address

Flux Power Inc.

2685 South Melrose Drive, Suite A

Vista, CA 92081 United States

Company Phone: 1-877-505-3589

Document Number: 990924

Emergency contact:

CHEMTREC Phone: 1-800-424-9300

2 - HAZARDS IDENTIFICATION

3.1 Physical

The Lithium-Ion rechargeable batteries described in this Material Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer. The battery is considered an article under OSHA regulations, and an MSDS is not required but provided as a courtesy. Under normal conditions of use, the solid electrode materials and liquid electrolyte they contain are non-reactive provided the battery integrity is maintained and seals remain intact. The batteries can become flammable in cases of abuse (mechanical, thermal, electrical), which leads to the activation of the safety valve and/or the rupture of the battery container. Electrolyte leakage, electrode materials reaction with moisture/water or battery vent/fire may follow, depending upon the circumstances.

In case of excessive internal pressure and/or temperature, batteries are fitted with a safety vent for protection and/or rupture of the cell case.

3.2 Chemical

Classification of dangerous substances the product may contain as per directive 67/548/EEC

Substance		Melting point	Boiling point	Classification			
CAS	Chemical Symbol			Exposure Limit	Indication of danger	Special risk (1)	Safety advice (2)
15365-14-7	LiFePO ₄	> 1000 ° C	N/A			R22 R43	S2 S22 S24 S26 S36 S37 S43 S45
EC: 96-49-1 DMC: 616-38-6 DEC: 105-58-8 EA: 141-78-6	Carbonates (DC-DMC DEC-EA)	EC: 38°C DMC: 4°C DEC: -43°C EA: -84°C	EC: 243° C DMC: 90° C DEC: 127°C EA: 77°C	None Established OSHA	Flammable	R21 R22 R41 R42/R43	S2 S24 S26 S36 S37 S45
21324-40-3	LiPF ₆	N/A (decomposes at 160°C)	N/A	None Established OSHA		R14 R21 R22 R41 R43	S2 S8 S22 S24 S26 S36 S37 S45

3.2.1 - Special risks

R14 Reacts with water.

R21 Harmful in contact with skin.

R22 Harmful if swallowed.

R41 Risk of serious damage to the eye.

R42/43 May cause sensitization by inhalation and skin contact.

R43 May cause sensitization by skin contact.

3.2.2 - Safety advice

S2 Keep out of reach from children.

S8 Keep away from moisture.

S22 Do not breathe dust.

S24 Avoid contact with skin.

S26 In case of contact with eyes, rinse immediately with plenty of water and seek medical attention.

S36 Wear suitable gloves.

S45 In case of incident, seek medical attention.

3- INGREDIENT INFORMATION

Lithium Iron Phosphate Cells			
Ingredient	Molecular Formula	CAS Number	Weight %
Lithium Iron Phosphate	LiFePO ₄	15365-14-7	31
Graphite	C	7782-42-5	18
Copper	Cu	7440-50-8	12
Aluminum	Al	7429-90-5	8
Lithium Hexafluorophosphate	LiPF ₆	21324-40-3	4
Carbonate	--	--	8
Polypropylene	(C ₃ H ₆) _n	9003-07-0	19

4 - FIRST AID MEASURES

In case of battery rupture, fuming or fire, evacuate personnel from contaminated area and provide maximum ventilation to clear away fumes/gases. In all cases, seek medical attention.

Eye contact: Flush with plenty of water (with eyelids held open) for at least 15 minutes.

Skin contact: Remove all contaminated clothing and flush affected areas with plenty of water and soap for at least 15 minutes. Do not apply greases or ointments.

Ingestion: Dilute by giving plenty of water and get immediate medical attention. Assure that the victim does not aspirate vomited material by use of positional drainage. Assure that mucus does not obstruct the airway. Do not give anything by mouth to an unconscious person.

Inhalation: Remove to fresh air and ventilate the contaminated area. Give oxygen or artificial respiration if needed.

5 - FIRE-FIGHTING MEASURES

Fire and fume hazard: Batteries can leak and/or spout vaporized or decomposed and combustible electrolyte fumes in case of exposure above 150°C resulting from inappropriate use, abuse, or from the environment. There is a possibility of formation of hydrogen fluoride (HF) and phosphorous oxides during fire. The LiPF_6 salt contained in the electrolyte releases hydrogen fluoride (HF) when in contact with water.

Extinguishing media: Type D extinguishers, CO_2 , Dry chemical or foam extinguishers can be used.

Special hazards: Following cell overheating due to external source or due to improper use, electrolyte leakage or battery container rupture may occur and release inner component/material in the environment.

Eye contact: The electrolyte solution contained in the battery is irritant to ocular tissues.

Skin contact: The electrolyte solution contained in the battery causes skin irritation.

Ingestion: The ingestion of electrolyte solution causes tissue damage to throat and gastro/respiratory tract.

Inhalation: Contents of a leaking or ruptured battery can respiratory tract, mucus, membrane irritation and edema.

Special protection: Use self-contained breathing apparatus to avoid breathing irritant fumes. Wear protective clothing and equipment to prevent body contact with electrolyte solution.

6 - ACCIDENTAL RELEASE MEASURES

The material contained within the batteries would only be expelled under abusive conditions.

If the internals are exposed and clear the area and open doors so the fumes can dissipate. Any liquid should be wiped up with absorbent wipes and everything placed in a metal box for disposal, in accordance with local regulations.

7 - HANDLING AND STORAGE

The batteries should not be opened, destroyed or incinerated since they may leak or rupture.

Handling: Do not crush, pierce, short (+) and (-) battery terminals with conductive (i.e. metal) objects. Do not directly heat or solder. Do not throw into fire.

Storage: 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 100°C may result in battery leakage and rupture. Since short circuit can cause a fire, leakage and battery container rupture hazard, keep batteries in their original packaging until use, and do not jumble them.

Other: Follow manufacturer recommendations regarding maximum recommended currents and operating temperature range.

Applying pressure or deforming the battery may lead to the rupture of the battery container and disassembly followed by eye, skin and throat irritation.

Do not completely discharge the battery and then let it sit for an extended period of time. Complete discharge of a lithium-ion battery will damage the battery and may completely destroy the lithium-ion cells.

8 - FIRE CONTROLS / PERSONAL PROTECTION

Respiratory protection: Not necessary under normal use. In case of battery rupture, use self-contained full-face respiratory equipment.

Hand protection: Not necessary under normal use. Use Viton rubber gloves if handling a leaking battery.

Eye protection: Not necessary under normal use. Wear safety goggles or glasses with side shields if handling a leaking or ruptured battery.

Skin protection: Not necessary under normal use. Use rubber apron and protective clothing in case of handling of a ruptured battery.

9 - PHYSICAL AND CHEMICAL PROPERTIES

9.1 Appearance

Black or white steel box, the lithium-ion cells inside are plastic prismatic cases with ribs, hermetically sealed and fitted with metallic terminals/connections.

9.2 Temperature ranges

	Continuous	Occasional
During Storage	-20°C / +20°C	-20°C / +45°C
During Discharge	-20°C / +55°C	
During Charge	0°C / +45°C	

9.3 Specific energy:

Note: Wh = Nominal voltage x rated Ah; kg = Average battery weight

9.4 Specific pulse power:

600-1200W/kg (Varies depending upon battery size)

9.5 Mechanical resistance:

As defined in relevant IEC standard

9.6 Information on basic physical and chemical properties:

LiFePO ₄ - Lithium Iron Phosphate			
Appearance:	Grey, Metallic, Powder, Granules, Pellets	Water Solubility:	Insoluble
Odor Type:	Odorless	Flash Point:	N/A
Odor Threshold:	N/A	Auto Ignition Temperature (°C):	N/A
pH:	N/A	Density:	N/A
Boiling Point/Boiling Range:	N/A	Flammability (solid, gas):	N/A
Melting Point:	> 300 °C	Evaporation Rate:	N/A
Vapor Pressure:	N/A	Vapor Density:	N/A

LiPF ₆ - Lithium Hexafluorophosphate			
Appearance:	White to pale brown, Powder	Water Solubility:	Soluble
Odor Type:	Odorless	Flash Point:	N/A

Odor Threshold:	N/A	Auto Ignition Temperature (°C):	N/A
pH:	N/A	Density:	1.5 g/cm ³
Boiling Point/Boiling Range:	N/A	Flammability (solid, gas):	N/A
Melting Point:	200 °C	Evaporation Rate:	N/A
Vapor Pressure:	N/A	Vapor Density:	N/A

C3H4O3- Ethylene Carbonate (EC: 96-49-1)			
Appearance:	White crystalline powder	Water Solubility:	Soluble
Odor Type:	Odorless	Flash Point:	143 °C
Odor Threshold:	N/A	Auto Ignition Temperature (°C):	N/A
pH:	5.5-7.0	Density:	1.32 g/cm ³
Boiling Point/Boiling Range:	243 °C	Flammability (solid, gas):	N/A
Melting Point:	38 °C	Evaporation Rate:	N/A
Vapor Pressure:	N/A	Vapor Density:	N/A

C3H6O3- Dimethyl Carbonate (DMC 616-38-6)			
Appearance:	Liquid	Water Solubility:	Slightly Soluble
Odor Type:	Odorless	Flash Point:	18 °C
Odor Threshold:	N/A	Auto Ignition Temperature (°C):	465 °C
pH:	N/A	Density:	N/A
Boiling Point/Boiling Range:	90 °C	Flammability (solid, gas):	N/A
Melting Point:	2 °C	Evaporation Rate:	N/A
Vapor Pressure:	5.6 kPa (@25 °C)	Vapor Density:	3.1 (Air=1)

C5H10O3- Diethyl Carbonate (DEC 105-58-8)			
--	--	--	--

Appearance:	Liquid	Water Solubility:	Soluble
Odor Type:	Odorless	Flash Point:	25 °C
Odor Threshold:	N/A	Auto Ignition Temperature (°C):	N/A
pH:	N/A	Density:	.0975 g/cm ³
Boiling Point/Boiling Range:	126 °C	Flammability (solid, gas):	N/A
Melting Point:	-43 °C	Evaporation Rate:	N/A
Vapor Pressure:	1.4 kPa (@25 °C)	Vapor Density:	4.07 (Air=1)

C4H8O2- Ethyl Acetate (EA 141-78-6)			
Appearance:	Liquid, Clear	Water Solubility:	Soluble
Odor Type:	Odorless	Flash Point:	-2.99 °C
Odor Threshold:	N/A	Auto Ignition Temperature (°C):	427 °C
pH:	N/A	Density:	N/A
Boiling Point/Boiling Range:	76.5-77.5 °C	Flammability (solid, gas):	Flammable
Melting Point:	-84 °C	Evaporation Rate:	N/A
Vapor Pressure:	N/A	Vapor Density:	N/A

10 - STABILITY AND REACTIVITY

Conditions to avoid:

- Heat above 95°C
- Incineration
- Deformation
- Mutilation
- Crush
- Piercing
- Disassembly
- Short circuit
- Prolonged exposure to humid conditions.

Materials to avoid: N/A

Hazardous decomposition products: Corrosive/Irritant hydrogen fluoride (HF) is produced in case of reaction of lithium hexafluorophosphate (LiPF₆) with water. Combustible vapors and formation of hydrogen fluoride (HF) and phosphorous oxides can occur during fire.

11- TOXOLOGICAL INFORMATION

None, unless battery ruptures. In the event of exposure to internal contents, corrosive fumes will be very irritating to skin, eyes and mucous membranes.

12 - ECOLOGICAL INFORMATION

When properly used or disposed, lithium ion batteries can be recycled and do not present an environmental hazard during their lifetime.

13 - DISPOSAL CONSIDERATIONS

Dispose in accordance with applicable regulations, which vary from state to state.

Lithium-Ion batteries should have their terminals insulated and be preferably wrapped in individual plastic bags prior to disposal.

13.1 Incineration

Incineration should never be performed by battery users but eventually be performed by trained professionals in authorized facilities with proper gas and fume treatment.

13.2 Recycling

Send to authorized recycling facility.

14-TRANSPORT INFORMATION

UN-No.3480

ARD/RID

Class 9	Packing Group II	ADR/RID-Labels	9
---------	------------------	----------------	---

Proper shipping name	Lithium-ion batteries, UN3480
----------------------	-------------------------------

IMO

Class	Packing Group II	IMO-Labels	9
-------	------------------	------------	---

Proper shipping name	Lithium-ion batteries, UN3480
----------------------	-------------------------------

IATA-DGR

Class	Packing Group II	ICAO-Labels	9
-------	------------------	-------------	---

Proper shipping name	Lithium-ion batteries, UN3480
----------------------	-------------------------------

Manufacturer declares that UN Manual of Tests and Criteria, Part III, sub-section 38.3 is met.

In airfreight, small Lithium-ion batteries (cells<20WH or packs<100WH) are considered as "Excepted Lithium-ion Batteries", when they meet the requirements of Ed. 60 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 regulation.

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).

Batteries must be placed in inner packaging that completely enclose the battery; batteries must be protected to prevent short circuits. Batteries must be secured against movement within the outer packaging. UN approved packaging (Packing Group II: e.g. UN/4G/Y30/...)

Sea freight (IMDG): (language English) IMO-DANGEROUS GOODS DECLARATION

15 - REGULATION INFORMATION

The transport of rechargeable lithium-ion batteries is regulated by various bodies: IATA, IMO, ADR/RID.

16 - OTHER INFORMATION/DISCLAIMER

This information has been compiled from sources considered to be dependable and is to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty (either expressed or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein including, but not limited to, the complete chemical composition of the product.

This information relates to the specific materials designated and may not be valid for such material used in combination with any other materials or in any process. It is the user's responsibility to satisfy himself as to the suitability and completeness of this information for his particular use.

Crown Equipment Corporation does not accept liability for any loss or damage that may occur whether direct, indirect, incidental or consequential, from the use of this information. Crown Equipment Corporation does not offer any warranty against patent infringement.