

MATERIAL SAFETY DATA SHEET

LITHIUM-ION BATTERIES



Series No: 9990920160120-001

ACCORDING TO ISO 11014-2009

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SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Lithium-ion Battery- TRLiF Series (LFePO₄) and TRLiN Series (Li(NiCoMn)O₂).

LFEP04 Battery

S/N	Model	Nominal Voltage (V)	Nominal capacity 43.2V/25°C (AH)	Dimension (mm)				Dimension (Inch)			
				L	W	H	TH	L	W	H	TH
1	TRLiF-4810R	48	10	442	330	44	/	17.40	12.99	1.73	/
2	TRLiF-4820R	48	20	442	320	88	/	17.40	12.60	3.46	/
3	TRLiF-4830R	48	30	442	310	133	/	17.40	12.20	5.24	/
4	TRLiF-4840R	48	40	442	360	133	/	17.40	14.17	5.24	/
5	TRLiF-4850R	48	50	442	360	133	/	17.40	14.17	5.24	/
6	TRLiF-4860R	48	60	442	385	155	/	17.40	15.16	6.10	/
7	TRLiF-4880R	48	80	442	385	177	/	17.40	15.16	6.97	/
8	TRLiF-48100R	48	100	442	385	221	/	17.40	15.16	8.70	/

NCM Li-ion Battery

S/N	Model	Nominal Voltage (V)	Nominal capacity 39.2V/25°C (AH)	Dimension (mm)				Dimension (Inch)			
				L	W	H	TH	L	W	H	TH
9	TRLiN-4810R	48	10	442	330	44	/	17.40	12.99	1.73	/
10	TRLiN-4820R	48	20	442	320	88	/	17.40	12.60	3.46	/
11	TRLiN-4830R	48	30	442	310	133	/	17.40	12.20	5.24	/
12	TRLiN-4840R	48	40	442	360	133	/	17.40	14.17	5.24	/
13	TRLiN-4850R	48	50	442	360	133	/	17.40	14.17	5.24	/
14	TRLiN-4860R	48	60	442	385	155	/	17.40	15.16	6.10	/
15	TRLiN-4880R	48	80	442	385	177	/	17.40	15.16	6.97	/
16	TRLiN-48100R	48	100	442	385	221	/	17.40	15.16	8.70	/

Name of Company:

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SECTION 2 - HAZARDA IDENTIFICATION

For the battery cell, chemical materials are stored in a hermetically sealed Aluminum laminated case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, there is no physical danger of ignition or explosion and chemical danger of hazardous materials' leakage.

However, if exposed to a fire, added mechanical shocks, decomposed, added electric stress by miss-use, the gas release vent will be operated. The battery cell case will be breached at the extreme, hazardous materials may be released.

Moreover, if heated strongly by the surrounding fire, acrid gas may be emitted. · Most important hazard and effects

▪ Human health effects:

Inhalation: The steam of the electrolyte has an anesthesia action and stimulates a respiratory tract.

Skin contact: The steam of the electrolyte stimulates a skin. The electrolyte skin contact causes a sore and a stimulation on the skin.

Eye contact: The steam of the electrolyte stimulates eyes. The electrolyte eye contact causes a sore and a stimulation on the eye. Especially, substance that causes a strong inflammation of the eyes is contained.

Environmental effects: Since a battery cell remains in the environment, do not throw out it into the environment.

▪ Specific hazards:

If the electrolyte contacts with water, it will generate detrimental hydrogen fluoride. Since the leaked electrolyte is inflammable liquid, do not bring close to fire.

SECTION 3 - COMPOSITION / INFORMATION ON INGREDIENTS

IMPORTANT NOTE : The battery cell should not be opened or exposed to heat because exposure to the following ingredients contained within could be harmful under some circumstances.

TRLiR Series (LiFePO₄ Cell)

Weight %	Component	CAS No.	PEL	TLV
40	Lithium Iron Phosphate (LiFePO ₄)		None Established	None Established
30	Graphite (C)	7782-42-5	2.5mg/m ² (As dust)	2.5mg/m ² (As dust)
10	Organic Electrolyte	N.A	None Established	None Established
5	Polyvinylidene Fluoride (PVDF)	24937-79-8	None Established	None Established
5	Aluminium	7429-90-5	None Established	None Established
5	Copper	7440-50-8	None Established	None Established

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TRLiN Series (Li(NiCoMn)O₂ Cell)

<u>COMPONENTS</u>	<u>PERCENT OF TOTAL WEIGHT (%)</u>
ALUMINUM	2-10
COPPER	5-15
CARBON	10-30
POLYVINYLIDENE FLUORIDE (PVDF)	<2
NICKEL AND COBALT MANGANESE COMPOUNDS	25-50
Li	2-3
NICKEL PLATING STEEL SHELL	5-15
ELECTROLYTE	10-20
NICKEL	0.5-5

SECTION 4 - FIRST AID MEASURES

Spilled internal cell materials

▪ Inhalation:

Make the victim blow his/her nose, gargle. Seek medical attention if necessary.

▪ Skin contact:

Remove contaminated clothes and shoes immediately. Wash extraneous matter or contact region with soap and plenty of water immediately.

▪ Eye contact:

Do not rub one's eyes. Immediately flush eyes with water continuously for at least 15 minutes. Seek medical attention immediately.

A battery cell and spilled internal cell materials

▪ Ingestion:

Make the victim vomit. When it is impossible or the feeling is not well after vomiting, seek medical attention.

SECTION 5 - FIRE FIGHTING MEASURES

▪ **Suitable extinguishing media:** Plenty of water, carbon dioxide gas, nitrogen gas, chemical powder fire extinguishing medium and fire foam.

▪ **Specific hazards:** Corrosive gas may be emitted during fire.

▪ **Specific methods of fire-fighting:** When the battery burns with other combustibles simultaneously, take fireextinguishing method which correspond to the combustibles. Extinguish a fire from the windward as much as possible.

▪ **Special protective equipment for firefighters:**

Respiratory protection: Respiratory equipment of a gas cylinder style or protection-against-dust mask.

Hand protection: Protective gloves

Eye protection: Goggle or protective glasses designed to protect against liquid splashes
Skin and body protection: Protective cloth

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SECTION 6 - ACCIDENTAL RELEASE MEASURES

Personal Precautions:

Wear appropriate personal protective equipment as specified in Section 8.

Environmental Precautions:

This material may be non-hazardous in ordinary use and may be discarded in accordance with applicable governmental regulations and take order with the demands of the environmental protection section.

Methods of Clean up:

Spill and leaks are unlikely because cells are contained in a sealed case. In the event of a battery rupture, prevent skin contact and collect all released material in a plastic lined metal container. Prevent spill from entering drinking water supplies or streams. Any product recovery or disposal must comply with local, state, federal, international or country specific regulations.

SECTION 7 - HANDLING AND STORAGE

Handling: It can be use normally under the temperature of -20~40 All connections should be connected accurately to avoid the possibility of shorting connections. Do not let oil and water or other contaminations drop on the top of battery while working. Be sure to have logical discharge electricity and terminate voltage setting while working. Use only in the well-ventilated areas. Keep away from heat, sparks and open flames. Makeavailable in the work area emergency shower and eyes wash. Avoid contact with skin and eyes. Use of full-length sleeves and pants; boots or work shoes are recommended for manufacturing operations.

Storage: Store in cool, dry, well-ventilated area and away from combustible materials, sources of ignition, excessive heat and direct sunlight. Do not store in sealed areas.

Warning: Not for use on children under 5 years old.

SECTION 8 - EXPOSURE CONTROLS AND PERSONAL PROTECTION

▪ Engineering measures:

Storing in a dry place and keeping away from a heat source such as fire or heater. No engineering measure is necessary during normal operation. In case of internal cell materials' leakage, operate the local exhaust or improve ventilation.

▪ Personal protective equipment

Respiratory protection: Respirator with air cylinder, dust mask

Hand protection: Protective gloves

Eye protection: Goggle or protective glasses designed to protect against liquid splashes

Skin and body protection: Working clothes with long sleeve and long trousers

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

• Appearance

Physical state: Solid

Form: Prismatic

Color: Metallic color (without tube)

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Odor: No odor

- PH: NA
- Specific temperatures/temperature ranges at which changes in physical state occur:
There is no useful information for the product as a mixture.
- Flash point: NA
- Explosion properties: NA
- Density: NA
- Solubility ,with indication of the solvent(s): Insoluble in water

SECTION 10 - STABILITY AND REACTIVITY

- Stability: Stable under normal use
- Hazardous reactions occurring under specific conditions
- Conditions to avoid:When a battery cell is exposed to an external short-circuit, crushes, deformation, high temperature above 100°C, it will be the cause of heat generation and ignition.

Do not put it under sunlight and high humidity directly.

- Materials to avoid: Conductive materials, water, seawater, strong oxidizers and strong acids.
- Hazardous decomposition products: Acrid or harmful gas is emitted during fire.

SECTION 11 - TOXICOLOGICAL INFORMATION

There is no available data on the product itself. The information of the internal cell materials is as follows.

Lithium cobaltate – LiFePO_4

- Acute toxicity: No applicable data.
- Local effects: Unknown.
- Sensitization: The nervous system of respiratory organs may be stimulated sensitively.
- Chronic toxicity/Long term toxicity: No applicable data.
- Skin causticity: Although it is very rare, the rash of the skin and allergic erythema may result.

Aluminum

- Local effects: Aluminum itself has no toxicity. When it goes into a wound, dermatitis may be caused.
- Chronic toxicity/Long term toxicity: By the long-term inhalation of coarse particulate or fume, it is possible to cause a lung damage (aluminum lungs).

Graphite

- Acute toxicity: Unknown.
- Local effects: When it goes into one' s eyes, it stimulates one' s eyes; conjunctivitis, thickening of corneal epithelium or edematous inflammation palpebra may be caused.
- Chronic toxicity/Long term toxicity: Since the long-term inhalation of high levels of graphite coarse particulate may become a cause of a lung disease or a tracheal disease.
- Carcinogenicity: Graphite is not recognized as a cause of cancer by research organizations and natural toxic substance research organizations of cancer.

Copper

- Acute toxicity: 60-100mg sized coarse particulate causes a gastrointestinal disturbance with nausea and inflammation. TDLo, hypodermic - Rabbit 375mg/kg
- Local effects:Coarse particulate stimulates a nose and a tracheal. When it goes into one' s eyes, the symptom of the reddening and the pain is caused.
- Sensitization: Sensitization of the skin may be caused by long-term or repetitive contact.
- Reproductive effects: TDLo, oral - Rat 152mg/kg

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Organic Electrolyte

- Acute toxicity: LD50, oral - Rat 2,000mg/kg or more
- Local effects: Unknown.
- Skin irritation study: Rabbit – Mild
- eye irritation study: Rabbit - Very severe

SECTION 12 - ECOLOGICAL INFORMATION

- Persistence/degradability: do not bury or throw out into the environment.

SECTION 13 - DISPOSAL CONSIDERATIONS

- Recommended methods for safe and environmentally preferred disposal:

Product(waste from residues)

Do not throw out a used battery cell. Recycle it through the recycling company.

Contaminated packaging

Neither a container nor packing is contaminated during normal use. When internal materials leaked from a battery cell contaminates, dispose as industrial wastes subject to special control.

SECTION 14 - TRANSPORT INFORMATION

In the case of transportation, avoid exposure to high temperature and prevent the formation of any condensation. Take in a cargo of them without falling, dropping and breakage. Prevent collapse of cargo piles and wet by rain. The container must be handled carefully. Do not give shocks that result in a mark of hitting on a cell. Please refer to Section 7-HANDLING AND STORAGE also.

- Codes and classification according to:

International regulations for transport Air IATA-GR: PI965/966/967, Cargon only.

International regulations for transport Sea IMO IMDG CODE (36-12 Edition)

National regulations for transport and GB12268-2005

The UN classification number: Class 9, 3480

In the USA: Code of Federal Regulations 49 CFR Ch. 1§ 173-185

However, since it corresponds to special provision PI965/966/967 of IATA-DGR, of IMDG CODE, GB12268-2005 of land regulation, this battery cell can be conveyed normally.

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SECTION 15 - REGULATORY INFORMATION

Regulations specifically applicable to the product:

IATA-DGR (air transportation)

IMO-IMDG Code (sea transportation)

US Department of Transportation 49 Code of Federal Regulations [USA]

Wastes Disposal and Public Cleaning Law [Japan]

Law for Promotion of Effective Utilization of resources [Japan]

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 aspects of the product and should not be construed as any guarantee of technical performance or suitability for particular applications.
- Reference

Chemical substances information: Japan Advanced Information center of Safety and Health

International Chemical Safety Cards (ICSCs):

International Occupational Safety and Health Information Centre (CIS)

2002 TLVs and BEIs: American Conference of Governmental Industrial Hygienists (ACGIH) New Dangerous Goods Best Practice 008--in the 51st Edition IATA DGR(2010)(with effect from 01 January 2010)

IMDG Code – 2008 Edition: International Maritime Organization (IMO)

RTECS(CD-ROM)

MSDS of raw materials prepared by the manufactures