Safety Data Sheet for M-Series Batteries

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Table of Contents

1 Product and Company Identification 5
1.1 Product Identification 5
1.2 Product Part Numbers 5
1.3 Company Identification 5
1.4 Table of Acronyms 6
2 Hazards Identification 7
2.1 Classification of Product 7
2.2 Labels and Marking (examples) 7
2.3 Potential Health Effects 8
3 Composition 9
4 First-Aid Measures 10
5 Fire-Fighting Measures 11
5.1 Fire Hazards 11
5.2 Extinguishing Media 11
5.3 Special Exposure Hazards 11
5.4 Special Protection Equipment 12
6 Accidental Release Measure 13
6.1 Personal Precautions 13
6.2 Environmental Precautions 13
6.3 Methods for Clean UP 13
6.4 Precautions to Prevent Secondary Hazard 13
7 Handling and Storage 14
7.1 Precautions for Safe Handling 14
7.2 Conditions for Safe Storage 14
7.3 Preferred Storage Conditions 14
8 Exposure Controls and Personal Protection 15
8.1 Precautions for Safe Handling 15
8.2 Personal Protective Equipment 15
9 Physical and Chemical Properties 16
10 Stability and Reactivity 17
10.1 Reactivity 17
10.2 Chemical Stability 17
10.3 Possibility of hazardous Reaction 17
10.4 Conditions to Avoid 17
10.5 Incompatible Materials 17
10.6 Hazardous Decomposition Products 17
11 Toxicological Information 18
11.1 Information on Toxicological Effects 18
11.2 Acute Toxicity 18

11.3 Skin Corrosion or Irritation 18
11.4 Eye Damage or Irritation 18
11.5 Sensitization 18
11.6 Mutagenicity 18
11.7 Carcinogenicity 18
11.8 Reproductive Toxicity 18
12 Ecological Information 19
12.1 Ecotoxicity 19
12.2 Persistence and Degradability 19
12.3 Bio Accumulative Potential 19
12.4 Mobility in Soil 19
13 Disposal Considerations 20
14 Transportation Information 21
14.1 United Nations 21
14.2 International Conventions 21
14.2.1 ADR/RID - Transportation by Road/Rail 21
14.2.2 IMDG – Transportation by Sea 21
14.2.3 IATA – Transportation by Air 21
14.3 USA Code of Federal Regulation 22
15 Regulatory Information 23
16 Other Information 24

List of Tables

Table 1-1 Product Part Numbers 5
Table 3-1 Ingredients[a] 9
Table 3-2 Heavy Metals and RoHS Relevant Substances 9
Table 3-3 SVHC substances according to REACH (Article 33) 9

1 Product and Company Identification

1.1 Product Identification

This Safety Data Sheet (SDS) applies to M-Series Secondary Lithium-Ion Battery Packs. Each M-Series battery pack is assembled from one of the following rechargeable Lithium-Ion battery modules:

1. M46LINMD20001 Varta LI Module G3 24V 62.7AH
2. M46LINMD30001 Varta LI Module G3 36V 62.7AH

1.2 Product Part Numbers

Table 1-1 list the part numbers of the M-Series battery packs covered by this SDS along with the number of modules contained within each battery pack.

Table 1-1 Product Part Numbers

Part Number	Number of M46LINMD20001 Modules	Number of M46LINMD30001 Modules
M920308H24063N109855	24	-
M920208H24063N109935	12	-
M920108H36063N110008	-	8
M920204H48063N109994	10	-
M920307H80063N110019	21	-

1.3 Company Identification

Company Name:	Stryten Energy LLC.
Address:	5925 Cabot Parkway, Alpharetta, GA 30005
Telephone Number:	+1 678-566-9000
Emergency Telephone Number (North America):	+1-800-255-3924 (VelocityEHS)
Emergency Telephone Number (International):	+1 813-248-0585 (VelocityEHS)

1.4 Table of Acronyms

Ah	Ampere-Hour
CFR	Code of Federal Regulations
N/A	Not Applicable
SOC	State of Charge
UN	United Nations
SDS	Safety Data Sheet
PBB	Polybrominated Biphenyls
PBDE	Polybrominated diphenyl ethers
RoHS	Restriction of Hazardous Substances
SVHC	Substances of Very High Concern
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
LI	Lithium Ion
ADR/RID	Accord Dangereux Routier/ Regulations Concerning the International Carriage of Dangerous Goods by Rail
IMDG	International code for the Maritime transport of Dangerous Goods
IATA	International Air Transport Association

2 Hazards Identification

2.1 Classification of Product

The secondary battery packs are enclosed in a steel enclosure designed to withstand temperatures and pressures encountered during normal use. The hazardous component in battery packs are the lithium-ion cells. Under normal use the battery cells present no physical danger of ignition or explosion, or chemical danger of hazardous materials leakage. If the battery is damaged, exposure to product components may cause eye, skin and respiratory tract irritation. Combustion products from a fire involving batteries may be harmful.

2.2 Labels and Marking (examples)

The transport of rechargeable Lithium-ion batteries are regulated by the United Nations and require safety labels and/or marks per UN3480 (See Section 15). The safety labels are placed on a container to identify dangerous goods and the type of hazard they present. Some examples of labels are shown below as a guide for trained individuals.









2.3 Potential Health Effects

- **Eyes:** None anticipated under normal product use and handling conditions. If battery is damaged, exposure may cause severe irritations or burns.
- **Skin:** None anticipated under normal product use and handling conditions. If battery is damaged, exposure may cause severe irritations or burns.
- **Ingestion:** Not considered likely route of exposure under normal product use and handling conditions. Ingestion of material from a damaged battery may cause serious burns to mouth, esophagus, and gastrointestinal tract.
- **Inhalation:** None anticipated under normal product use and handling conditions. If battery is damaged, exposure to vapors or mist may cause respiratory irritation.

3 Composition

Table 3-1 Ingredients[a]

Contents	CAS Number	Material
2 - 10%	7429-90-5	Aluminum foil
20 - 50%	Confidential	Metal oxide (proprietary)
0 - 5%	Confidential	Binder
2 - 10%	7440-50-8	Copper foil
10 - 30%	Confidential	Carbon (proprietary)
10 - 20%	Confidential	Electrolyte (proprietary)
Remainder	N/A	Inert materials

[a] *During the charging process a lithium intercalation phase is formed, which is highly flammable and corrosive, but not released under the circumstances of normal use.*

Table 3-2 Heavy Metals and RoHS Relevant Substances

Contents	CAS Number	Material
< 1 mg/kg	7440-43-9	Cadmium
< 10 mg/kg	7439-92-1	Lead
< 1 mg/kg	7439-97-6	Mercury
< 5 mg/kg	-	Hexavalent Chromium (Cr6+)
< 5 mg/kg	-	PBB
< 5 mg/kg	-	PBDE

Table 3-3 SVHC substances according to REACH (Article 33)

Contents	CAS Number	EC Number	Material
> 0.1%	1120-71-4	214-317-9	1,3-Propanesultone

4 First-Aid Measures

In the event of cell rupture and ejection of materials, evacuate personnel from contaminated area and provide maximum ventilation to clear out fumes/gases. In all cases, seek immediate medical attention.

- **Eye Contact:** Flush with plenty of water (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 grease or ointments.
- **Ingestion:** Dilute by drinking plenty of water and seek immediate medical attention. If substances are swallowed, be sure that aspiration of vomit does not occur. Ensure that mucus does not obstruct the airway. Do not provide oral medication to an unconscious person.
- **Inhalation:** Ventilate the contaminated area and evacuate affected personnel. Provide oxygen or artificial respiration, if necessary.

5 Fire-Fighting Measures

5.1 Fire Hazards

- The cell is not flammable but internal organic material will burn if the cell is incinerated. Combustion products include, but are not limited to hydrogen fluoride, carbon monoxide and carbon dioxide.
- The cell can leak and/or release vaporized or decomposed and combustible electrolyte fumes when exposed to temperatures above 130°C, stored for long periods above 60°C, when improperly handled, abused, or due to the environment.
- Cells may flame or leak potentially hazardous vapors if exposed to excessive heat or fire. Fire, excessive heat, or over voltage can potentially be hazardous and lead to decomposition of products.
- Damaged or opened cells can result in rapid heating and the release of flammable vapors.
- Vapors may be heavier than air and may travel on ground or be moved by ventilation to an ignition source and flash back.
- Use a positive pressure self-contained breathing apparatus if cells are contained in a fire in an enclosed space.
- Full protective clothing is necessary at high smoke concentration levels.
- During water application, caution is advised as burning pieces of flammable particles may be ejected from the fire.

5.2 Extinguishing Media

Do not let used extinguishing media contaminate surface water or ground water. If necessary, thicken water or foam with suitable solids. Dispose of properly.

- **Suitable:** Water, in large amounts. Metal fire extinction powder, rock salt or dry sand shall be used.
- **Unsuitable:** CO_2**,** Oxidizing agents, reducing agents, acids, alkalis.

5.3 Special Exposure Hazards

If cells overheat due to an external source or improper use, electrolyte leakage or battery container rupture may occur and release inner component/material into the environment. At contact of electrolyte with water traces of hydrofluoric acid may be formed. In this case avoid contact and take care for good ventilation. At contact of charged anode material with water extremely flammable hydrogen gas is generated.

- **Eye Contact**: The electrolyte solution contained in the cell is an irritant and can damage ocular tissues.
- **Skin Contact:** The electrolyte solution contained in the cell 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 cell can cause respiratory tract mucus, membrane irritation and edema.

5.4 Special Protection Equipment

Use self-contained breathing apparatus to avoid breathing irritant fumes. Wear adequate personal protective equipment:

- **Hand protection**: Protective Gloves
- **Eye Protection:** Full Face Breathing Apparatus or Goggles
- **Body Protection:** Protective Uniform

6 Accidental Release Measure

If battery packs internal cells become damaged, they could possibly leak contaminants. The following procedures list precautions and steps for cleaning these contaminants.

6.1 Personal Precautions

Quarantine contaminated area. Don protective equipment and clothing listed in Section 8.2.

6.2 Environmental Precautions

Cover spilled materials with absorbent, non-reactive material (i.e. vermiculite). Bind released ingredients with powder (rock salt, sand). Dispose of according to the local law and rules. Do not allow leached substances to penetrate into the earth. Keep contaminated non-reactive material away from soil, sewers or waterways. Inform appropriate authorities if contamination occurs.

6.3 Methods for Clean UP

Quarantine contaminated area. Don protective equipment and clothing listed in Section 8. Do not touch spilled material. Use only non-sparking tools and equipment. Do not expose spilled material to moisture. Seal all possible locations where contaminants might migrate into the environment. Clean up solids and place them into a waste container safe for disposing of contaminated trash. Clean up spilled liquids with vermiculite and place them into the same container. Appropriately transport contaminated material to a waste facility capable of handling contaminated materials.

6.4 Precautions to Prevent Secondary Hazard

Avoid the release of collected materials. Do not bring the collected materials near open flame. Seal contaminants into a waste container safe for disposing of contaminated trash. Transport contaminants to an appropriate waste facility.

7 Handling and Storage

7.1 Precautions for Safe Handling

Avoid shorting the battery. Do not immerse in water. Do not disassemble or deform the battery. Do not expose to, or dispose of, the battery in fire. Avoid excessive physical shock or vibration. Use for specified product applications only. Store in a cool, dry and well-ventilated area. Never use a battery that has suffered abuse. Refer to data sheet for safe operating instructions.

7.2 Conditions for Safe Storage

Store battery packs at 50% SOC @ -40°C to +49°C, in a dry and well ventilated area. Do not store battery packs near heat, high humidity, open flame, sunlight, water, seawater, strong acids, strong oxidizers, strong reducing agents or strong alkalis.

7.3 Preferred Storage Conditions

Store battery packs at room temperature in a dry and well ventilated area. Battery life may be reduced if stored above 35°C for long periods of time.

8 Exposure Controls and Personal Protection

Under routine operation none of these safety procedures or equipment are required. Take the following safety measures only if the internal cells are compromised and leak or vent.

8.1 Precautions for Safe Handling

- Exposure Limit Values - Not applicable.
- Biological Monitoring - Not Applicable.
- Control Banding - Not Applicable.
- Recommended Monitoring Procedures - Follow standard monitoring procedures.
- Derived no-effect level - Not Applicable.
- Derived minimal effect level - Not Applicable.
- Predicted no-effect concentrations - Not Applicable.

8.2 Personal Protective Equipment

- **Engineering Controls** - Special ventilation is only required if cell venting occurs.
- **Eye and Face Protection** - Wear chemical resistant safety googles or face shield.
- **Hand Protection** - Wear chemical resistant gloves.
- **Skin Protection** - Wear long sleeved clothing. Solid clothing should be washed with detergent.
- **Respiratory Protection** - Wear an approved half face inorganic vapor, gas, acid and particulate respirator.
- **Thermal Protection** - Not Applicable.
- **Hygiene Measures** - Do not eat, drink or smoke in work areas.
- **Environmental Exposure Controls** - Do not release into the environment.

9 Physical and Chemical Properties

- **Physical State:** Solid
- **Odour:** N/A
- **Odour threshold:** N/A
- **pH:** N/A
- **Melting point/Freezing point:** N/A
- **Boiling point/boiling range:** N/A
- **Flash point:** N/A
- **Evaporation rate:** N/A
- **Flash Point:** N/A
- **Vapour pressure:** N/A
- **Vapour density:** N/A
- **Relative density:** N/A
- **Solubility in water:** Insoluble
- **Specific Gravity:** N/A
- **Density:** N/A
- **Viscosity:** N/A

10 Stability and Reactivity

10.1 Reactivity

The product is stable and non-reactive under normal conditions of use, storage and transport. The internal cells within the battery packs may become unstable due to abusive conditions.

10.2 Chemical Stability

Product is stable under normal conditions

10.3 Possibility of hazardous Reaction

No dangerous reaction known under conditions of normal use.

10.4 Conditions to Avoid

Avoid shorting the battery. Avoid elevated temperatures. Avoid prolonged exposure to humid conditions. Do not immerse in water for prolonged time. Do not open, disassemble, crush, burn or deform the battery. Do not expose to, or dispose of, the battery in fire. Avoid excessive physical shock or vibration.

10.5 Incompatible Materials

Do not immerse in water, seawater or other high conductive liquids.

10.6 Hazardous Decomposition Products

Thermal decomposition or combustion may produce: carbon oxides, metal oxides, hydrogen fluoride.

11 Toxicological Information

11.1 Information on Toxicological Effects

The battery packs present no toxicological effects under normal use. The hazardous components of the battery packs are within the internal cell. Within recommended conditions, the electrode materials and liquid electrolytes do not react when the cell remains sealed. Exposure to these hazardous components is only possible if the battery leaks or vents. The following toxicology data is in respect to a person coming into contact with exposed electrolyte of the cell.

11.2 Acute Toxicity

Swallowed - The electrolyte contained within the cells of the battery pack is a corrosive material. Ingestion of this electrolyte would be harmful. Swallowing may result in nausea, vomiting, diarrhea, abdominal pain and chemical burns in the gastrointestinal tract. During normal usage ingestion of a battery pack is physically impossible.

11.3 Skin Corrosion or Irritation

The electrolyte contained within the cells of the battery pack is a corrosive liquid. If this corrosive liquid makes contact with skin it could cause irritation or even severe chemical burns. Under normal conditions a battery presents no danger to a person’s hand or skin.

11.4 Eye Damage or Irritation

The electrolyte contained within the cells of the battery pack is a corrosive liquid. If this electrolytes makes contact with the eye it could cause irritation or even irreversible damage to the eye. Undamaged battery presents no danger to eyes or skin.

11.5 Sensitization

No information is available at this time.

11.6 Mutagenicity

No information is available at this time.

11.7 Carcinogenicity

No information is available at this time.

11.8 Reproductive Toxicity

No information is available at this time.

12 Ecological Information

12.1 Ecotoxicity

A sealed battery pack does not pose any ecotoxicity hazard. The internal cells under normal use and conditions pose no ecotoxicity hazard. In the rare case the cells seal is broken or damaged the cell could leak electrolyte. If this electrolyte reacts with water it could potentially cause damage to flora and fauna. Follow the steps under Section 13 to ensure cells are disposed of properly.

12.2 Persistence and Degradability

No data available.

12.3 Bio Accumulative Potential

Not applicable.

12.4 Mobility in Soil

No data available.

13 Disposal Considerations

- Batteries should be completely discharged prior to disposal and/or the terminals must be taped or capped to prevent short circuit.
- Disposal of large quantities of batteries containing Lithium-ion cells may be subject to Federal, State, or local regulations.

14 Transportation Information

14.1 United Nations

- UN3480
- Class 9
- Proper shipping name: Lithium Ion Batteries

14.2 International Conventions

14.2.1 *ADR/RID - Transportation by Road/Rail*

- UN3480
- Class 9
- Proper shipping name: Lithium Ion Batteries
- Packing instruction P903
- Special Provisions: 34, 123, 137, 138, 149, 159

14.2.2 *IMDG – Transportation by Sea*

- UN3480
- Class 9
- Proper shipping name: Lithium Ion Batteries
- Packing instruction: P903, P908, P909, P910, P911, LP903, LP904, LP905, LP906
- Emergency Schedule: F-A, S-I
- Marine pollutant: NO
- Special Provisions: 188, 230, 310, 348, 376, 377, 384, 387

14.2.3 *IATA – Transportation by Air*

- UN3480
- Class 9
- Proper shipping name: Lithium Ion Batteries
- Section 1A
- Packing instruction 965
- Special Provisions: A88, A99, A154, A164, A183, A201, A206, A213, A331, A334, A802

14.3 USA Code of Federal Regulation

- 49 CFR Ch. 1 § 173-185
  - All listed provisions may not apply. Product listed under this SDS will conform to various sections of PI 965 based on the contents and packaging of the shipment. Please see the shipping documents for complete details for individual shipments. This document is not intended to replace or authorize shipments of lithium-ion batteries/cells; it is intended as a guide for use by trained individuals.

15 Regulatory Information

The transport of rechargeable Lithium-ion batteries are regulated by the United Nations as detailed in the "UN Recommendations on the Transport of Dangerous Goods – Model Regulations, ST/SG/AC.10/1/Rev.17". Batteries conform to "UN Recommendations on the Transport of Dangerous Goods - Manual of Tests and Criteria, ST/SG/AC.10/11/Rev.5/Amend.2, Chapter 38.3".

16 Other Information

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 (ether expressed or implied) or guarantee is made to the accuracy, reliability or completeness of the information contained herein.

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