PRODUCT SAFETY DATA SHEET

Form # EHS-HQC-SDS-012608
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1. IDENTIFICATION

Product Identifier used on the label:
CN MODULE GEN 1.5

Chemical Family/Classification:
Lithium based Rechargeable Battery (Module)

Other Means of Identification:
Industrial Battery

Recommended Use and Restrictions on Use:
For use as a rechargeable battery (module).

Manufacturer's Name/Address:

EnerSys SARL
Rue Alexander Fleming - Zl Est
CS 40962
62033 Arras Cedex

EnerSys Inc.
2366 Bernville Rd
Reading, PA 19605
USA

Telephone:
For information and emergencies, contact EnerSys' Environmental, Health & Safety Dept. at 610-208-1996

24-Hour Emergency Response Contact:
CHEMTREC DOMESTIC: 800-424-9300 CHEMTREC INT'L: 703-527-3877

2. HAZARD IDENTIFICATION

Lithium ion batteries and products they power are often considered “articles” and therefore exempt from the U.S. Hazard Communication Standard (HCS) in accordance with 29 CFR § 1910.1200(b)(6)(v). This Safety Data Sheet is being provided for those situations where the lithium ion battery may not qualify for the exemption.

The chemical constituents of the lithium ion battery only represent a hazard if the integrity of the intact battery is compromised. Listed below are the hazards if the battery is subject to significant physical, thermal, or electrical abuse and the battery casing is compromised.

Hazard Classifications: Flammable, respiratory health hazard, eye damage.

Hazard Symbols:

HEALTH	PHYSICAL
	

Signal Word: DANGER!

Hazard Statements

If the integrity of the intact product is physically, thermally, or electrically compromised, flammable vapors and toxic gases may be liberated; may cause damage to respiratory system; may cause severe eye damage.

Precautionary Statements

Protect from heat, flames, hot surfaces, and sparks.
Do not breathe dust, fumes, gas, mists, or vapors.
Do not eat, drink, or smoke when exposed to contents.
Wear protective gloves, clothing, and eye protection.
Wash thoroughly after handling.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Composition		Chemical Formula	CAS Number	Approximate % by Weight
Cobalt		Co	7440-48-4	3 - 7%
Manganese		Mn	7439-96-5	3 - 7%
Nickel		Ni	7440-02-0	10 - 30%
Graphite		C	7782-42-5	10 - 30%
Electrolyte	Lithium Hexafluorophosphate	LiPF6	21324-40-3	1 - 5%
	EC (Ethylene carbonate)	C3H4O3	96-49-1	1 - 5%
	DMC (Carbonic acid, dimethyl ester)	C3H6O3	616-38-6	3 - 7%
	EMC (Ethyl methyl carbonate)	C4H8O3	623-53-0	3 - 7%
Polyvinylidene fluoride (PVDF)		(CH2CF2)n	24937-79-9	0.1 - 1%
Aluminum		Al	7429-90-5	10 - 30%
Copper		Cu	7440-50-8	3 - 7%
Polyethylene		(C2H4)n	9002-88-4	0.1 - 1%

Aluminium Oxide	**Al2O3**	**1344-28-1**	**0.1 - 1%**

In accordance with paragraph (i) of §1910.1200, the exact percentage (concentration) of composition of the mixture ingredients has been withheld as a trade secret.

4. FIRST AID MEASURES

Intact lithium ion batteries do not represent an immediate health hazard. Exposure to the chemical constituents inside the battery caused by significant physical, thermal, or electrical abuse resulting in the battery casing being compromised may cause severe eye irritation with symptoms such as stinging, tearing, redness, swelling and blurred vision. Dusts, mists or vapors may irritate the respiratory tract, skin and eyes or cause coughing. Skin irritation, redness and pain may also occur.

Inhalation:
Provide fresh air and seek medical attention. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Ingestion:
Seek medical attention immediately. Do not induce vomiting or give food or drink.

Skin:
Remove contaminated clothing and wash skin with soap and water. If a chemical burn occurs or if irritation persists, seek medical attention.

Eyes:
Flush immediately with large amounts of water for at least 15 minutes while lifting lids until no evidence of the chemical remains. Seek medical attention.

Most important symptoms/effects, acute and delayed:
Any additional important symptoms and effects are described in Section 11: Toxicological Information

Immediate medical attention and special treatment needed:
Treat symptomatically.

5. FIRE FIGHTING MEASURES

Intact lithium ion batteries do not represent an immediate fire hazard. If the battery is subject to significant physical, thermal, or electrical abuse a thermal runaway event can occur resulting in a fire. During a thermal runaway event, a lithium ion battery can reach temperatures of 700 ºC (1292 ºF) resulting in a rapid disassembly of the battery that may include fractured battery cells being ejected from the battery.

First responders:
Wear self-contained breathing apparatus and protective suit. ANSI rated eyewear to avoid exposure to liquid splashes, mists, dust or flying particles and components.

Special protective equipment and precautions for fire-fighters:
Wear self-contained breathing apparatus and chemical resistant clothing and gloves. Exposure to excessive heat may lead to venting or rupture of the sealed lithium ion battery case liberating flammable and toxic gases and fractured battery cells being ejected from the battery. If an ignited battery is in multi-stack module configuration extinguish to minimize heat transfer between battery cells and modules.

Suitable extinguishing media in this order:
Use excess of water spray or foam. Complete immersion into water can be used to effectively impede fire from spreading to battery cells which still have not reached the critical ignition temperature (thermal runaway). Dry chemicals and CO_2 extinguishers are least effective in controlling a lithium ion battery fire.

Large lithium ion batteries or large quantities of smaller batteries may reignite after the initial fire has been suppressed. Batteries should be stored in a safe place outside (access restriction, hazard indications) for a minimum of 72 hours. It is recommended to monitor the temperature frequently to detect any potential new heat generation. In the instance that a thermal event reoccurs, follow the same firefighting methods.

Specific hazards arising from the product:
Burning battery (module) and batteries may produce highly toxic carbon monoxide, suffocating carbon dioxide, and lithium oxide fumes.
Fumes may cause dizziness or suffocation.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment, and emergency procedures:
For compromised lithium ion battery evacuate surrounding area and prohibit entry. Eliminate ignition sources and heat generation. Use NIOSH approved respiratory protection. Wear protective clothing, boots, gloves, and face shield. Avoid exposure to and contact with contents of compromised lithium ion battery.

Measures for environmental protection:
Prevent dispersal of spilled material and runoff to soil, waterways, drains and sewers. Absorb liberated materials with non-combustible absorbent material.

Methods and materials for containment and cleaning up:
Place material into suitable containers and call the local fire/police department. Minimize dust generation—do not dry sweep.

7. HANDLING AND STORAGE

Precautions for safe handling of intact lithium ion batteries:

Lithium ion batteries are designed to be recharged. Use only approved chargers and procedures. Do not charge above specified rate. Improper charging may cause the battery to catch fire and/or vent flammable and toxic gases.

Do not expose battery to excesive physical shock or vibration, immerse in water. Do not open, destroy or incinerate

Do not allow conductive material to touch the battery terminals. A dangerous short circuit may occur and cause battery failure and fire. Do not open, disassemble, crush, or burn batteries. Do not expose to extreme heat or fire. Protect case from puncture and damage.

In case of rupture, handle in accordance with good industrial hygiene and safety practices. Avoid contact with skin, eyes or clothing. Use appropriate personal protection equipment.

Conditions for safe storage of intact lithium ion batteries:

Store battery (module) in cool, dry areas away from heat and incompatible materials (see Section 10). Cover the terminals with protective case when not in use. Avoid damage to containers. Keep below 70°C (158°F). Keep above -40°C (-40°F).

Keep away from fire, sparks and heat. Avoid excessive physical shock or vibration.

Battery (module) should be stored at between 25% and 75% of full charge during long-term storage.

See also following codes and standards:

- 2024 International Fire Code
- 2024 International Building Code
- SAE J3235 - Best-Practices for Storage of Lithium ion Batteries

Safe storage and handling of compromised intact lithium ion batteries:

Wear appropriate PPE as release of dangerous substances and flammable and toxic gases are possible. Isolate batteries from other materials and place in designated containers, packages and/or rooms. Batteries may be submerged in water during storage to mitigate energy discharge and rupture. Rooms and containers should include early detection, mitigation, and suppression systems that are designed to accommodate specific lithium ion battery sizes and chemistries.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits:

Components with limit values that require monitoring at the workplace:

The following constituents are the only constituents of the product which have a PEL, TLV or other recommended exposure limit. At this time, the other constituents have no known exposure limits.

INGREDIENTS		OSHA PEL	ACGIH TLV	US NIOSH REL
Nickel	CAS 7440-02-0	Long-term value: 1 mg/m³	Long-term value: 1.5* mg/m³ elemental, *inhalable fraction, A5, BEI	Long-term value: 0.015 mg/m³ as Ni; See Pocket Guide App. A
Graphite	CAS 7782-42-5	Long-term value: 15 mppcf* mg/m³ *impinger samples counted by light field techn.	Long-term value: 2* mg/m³ all forms except graphite fibers; *resp. fraction	Long-term value: 2.5* mg/m³ *respirable dust
Aluminum	CAS 7429-90-5	Long-term value: 15*; 5** mg/m³ *Total dust; ** Respirable fraction	Long-term value: 1* mg/m³ as Al; *as respirable fraction, A4	Long-term value: 10* 5** mg/m³ as Al*Total dust**Respirable/pyro powd./welding f.
Copper	CAS 7440-50-8	Long-term value: 1* 0.1** mg/m³ as Cu *dusts and mists **fume	Long-term value: 1* 0.2** mg/m³ *dusts and mists; **fume; as Cu	Long-term value: 1* 0.1** mg/m³ as Cu *dusts and mists **fume
Manganese	CAS 7439-96-5	Ceiling limit value: 5 mg/m³ as Mn	Long-term value: 0.02* 0.1** mg/m³ as Mn; A4, *respirable **inhalable fracti	Short-term value: 3 mg/m³ Long-term value: 1 mg/m³ fume, as Mn
Cobalt	CAS 7440-48-4	Long-term value: 0.1* mg/m³ as Co; *for metal dust and fume	Long-term value: 0.02* mg/m³ *inh. fraction; DSEN, RSEN, BEI, A3	Long-term value: 0.05 mg/m³ as Co; metal dust & fume
Aluminum oxide	CAS 1344-28-1	Long-term value: 15*; 5** mg/m³ *Total dust; ** Respirable fraction	Long-term value: 1* mg/m³ as Al; *as respirable fraction, A4	Long-term value: 10* 5** mg/m³ as Al*Total dust**Respirable/pyro powd./welding f.

Engineering controls for intact lithium ion battery:

Use with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below recommended or statutory limits.

Engineering controls for compromised lithium ion battery:

Explosion proof exhaust ventilation with rates appropriate for conditions.

General protective and hygienic measures:

Wash thoroughly after handling and before eating, drinking and smoking. Remove potentially contaminated clothing and wash before reuse.

Respiratory protection for compromised lithium ion battery:

Use NIOSH approved respirator, if ventilation is inadequate. SCBA for emergency responders. Must be used in accordance with an OSHA complaint respiratory protection program.

Hand and skin protection for compromised lithium ion battery:

Chemical-resistant, impervious, and thermal rated gloves should be worn when handing. Discard contaminated gloves and wash contaminated clothing before reuse.

Face/Eye protection for compromised lithium ion battery:

ANSI rated eyewear to avoid exposure to liquid splashes, mists, dust or flying particles and components.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Battery (module) product.
Odor:	None.
Odor threshold:	Not applicable.
pH:	Not applicable.
Melting point/freezing point:	Not applicable.
Initial boiling point and boiling range:	Not applicable.
Flash point:	Not applicable.
Evaporation rate:	Not applicable.
Flammability (solid, gas):	Contains flammable substances.
Upper/lower flammability or explosive limits:	Not applicable.
Vapor pressure:	Not applicable.
Vapor density:	Not available.
Relative density:	Not available.
Solubility:	Not applicable.
Partition coefficient (n-octanol/water):	Not available.
Auto-ignition temperature:	Not applicable.
Decomposition temperature:	Not available.
Viscosity:	Not available.

10. STABILITY AND REACTIVITY

Reactivity:
Not considered reactive under normal conditions at ambient temperature.

Chemical stability:
This product is stable under normal conditions at standard temperature. Compromised lithium ion battery may liberate flammable gas mixture.

Possibility of hazardous reactions:
Violent reaction may occur in contact with hot, concentrated acid, strong oxidizers, and water.

Conditions to avoid:
Avoid heat, sources of ignition, and contact with strong acids, strong oxidizers, and corrosive material. Do not puncture, disassemble, or expose to heat or high temperatures above 100C (212F).
Avoid external short circuit, crushes, deformation, direct sunlight, high humidity, immerse in water or over charge.
Keep away from sparks or flames. Do not exceed manufacturer's recommendations for charging or use for applications for which product is not specifically designed.

Incompatible materials:
Avoid contact with acids or oxidizers. Keep compromised/damaged battery away from water due to potential violent reaction and possible flash fire.

Hazardous decomposition products:
Compromised lithium ion batteries may liberate irritating and toxic gases from decomposition by heat and combustion if burned; corrosive or toxic fumes may also be generated.

Hazardous polymerization:
Will not occur.

11. TOXICOLOGICAL INFORMATION

Intact lithium ion batteries do not have known toxicological risks.

Routes of exposure and potential health effects of chemical mixture from compromised lithium ion battery:
Skin:
Causes irritation and/or thermal burn.

Eye:
Irritation, redness, watering, and potential injury resulting in permanent vision impairment or chemical burn.

Inhalation:
Dust, vapor and fumes may irritate the respiratory system. Prolonged inhalation may be harmful.

Ingestion:
Not anticipated to be a route of occupational exposure.

Symptoms related to the physical, chemical and toxicological characteristics:

Effects of overexposure - acute:

battery (module) internal components can cause chemical burns to skin and eyes.

Effects of overexposure - chronic:

Repeated exposure to battery (module) internal component (hexafluorophosphate) can cause fluorosis of bones and teeth.

Delayed and immediate effects and also chronic effects from short- and long-term exposure:

Compromised Lithium Ion batteries may cause skin irritation and/or thermal burns; eye irritation, redness, watering, and potential injury resulting in permanent vision impairment or chemical burn; dust, vapor and fumes may irritate the respiratory system; prolonged inhalation may be harmful.

Numerical measures of toxicity:

Compromised lithium ion batteries may liberate carbon monoxide, carbon dioxide, lithium oxide fumes. No testing has been conducted for chemical mixtures. Individual component information is provided as guidance.

Acute toxicity:

Acute oral toxicity:

Oral LD50 (graphite): > 2000 mg/kg (rat) (OECD 423)

Oral LD50 (nickel): >9,000 mg/kg (rat) (OECD 401)

Oral LD50 (manganese): >2,000 mg/kg (rat)

Oral LD50 (cobalt): 550 mg/kg (rat) (OECD 425)

Oral LD50 (dimethyl carbonate): 13,000 mg/kg (rat)

Oral LD50 (ethylene carbonate): 10,000 mg/kg (rat)

Oral LD50 (aluminium oxide): >10,000 mg/kg (rat) (OECD 401)

Acute inhalation Toxicity:

Inhalative NOAEC (nickel): ≥10.2 mg/L (rat) (66 min)

Inhalative LC50/4h (aluminum oxide): >5.09 mg/L (rat) (OECD 403)

Inhalative LC50/4h (aluminum): >0.888 mg/L (rat) (OECD 403)

Inhalative LC50 (cobalt): ≤0.05 mg/L (rat) (4h analytical OECD 436)

Acute dermal toxicity:

Dermal LD50 (dimethyl carbonate): >5,000 mg/kg (rabbit)

Carcinogenicity:

Intact Lithium Ion Batteries do not have known carcinogenicity risks.

IARC (International Agency for Research on Cancer)		
CAS: 7440-02-0	nickel	2B
CAS: 7440-48-4	Cobalt	2B
CAS: 9002-88-4	Polyethylene low density	3

NTP (National Toxicology Program)		
CAS: 7440-02-0	nickel	R
CAS: 7440-48-4	cobalt	R

OSHA-Ca (Occupational Safety & Health Administration)
None of the ingredients are listed.

12. ECOLOGICAL INFORMATION

Eco toxicity:

The electrolyte from a compromised battery may be toxic to aquatic environment.

Persistence and degradability:

No data on environmental degradation.

Bio accumulative potential:

No data on bio accumulative potential.

Mobility in soil:

No data on mobility in soil.

Other adverse effects:

• No known effects on stratospheric ozone depletion.

• Water Endangering Class (WGK): NA

13. DISPOSAL CONSIDERATIONS (UNITED STATES)

Recycle and dispose of material waste to an approved waste disposal facility in accordance with local, state, and federal requirements. Do not release to sewer or waterways. Do not reuse battery. Following local, State/Provincial, and Federal/National regulations applicable to end-of-life characteristics will be the responsibility of the end-user.

14. TRANSPORT INFORMATION

U.S. DOT:

Proper shipping name: Lithium ion batteries
UN number: UN3480
Hazard Class: 9
Packing group: N/A

IATA:

Proper shipping name: Lithium ion batteries
UN number: UN3480
Hazard Class: 9
Packing group: N/A

IMDG:

Proper shipping name: Lithium ion batteries
UN number: UN3480
Hazard Class: 9
Packing group: N/A

The battery has passed the test items of UN Manual of Test and Criteria section 38.3

Environmental hazards:

Not Applicable

U.S. hazardous materials regulations: See 49 CFR 173.185 and applicable Special Provisions

International Maritime Dangerous Goods Code: See Packing Instructions P903, LP903, Special Provisions 188 and other applicable Packing Instructions and Special Provisions

ICAO Technical and IATA Dangerous Goods Regulations: See Packing Instructions 965, as applicable, and applicable Special Provisions

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code):

Not determined

Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises:
Hazard identification number (Kemler code): -
EMS Number: F-A,S-I
Stowage Category: A
Stowage Code: SW19 For batteries transported in accordance with SP 376 or SP 377 Category C, unless transported on a short international voyage.

15. REGULATORY INFORMATION

UNITED STATES:

EPA SARA Title III:

Section 302 EPCRA Extremely Hazardous Substances (EHS):

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302. For more information consult 40 CFR Part 355.

Section 313 EPCRA Toxic Substances:

This material does contain chemical components that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

TSCA:

TSCA Section 8b – Inventory Status: All chemicals comprising this product are listed as active on the TSCA Inventory.

CANADA:

New Substance Notification Regulations: Lithium hexafluorophosphate and ethyl methyl carbonate are listed on the Non-Domestic Substance List (NDSL).
All other ingredients in the product are listed, as required, on Canada's Domestic Substances List (DSL).

16. OTHER INFORMATION

NFPA 704 rating:

Revision Date **2/17/2026**

USA

SDS's are a subclause of the Hazard Communication Standard 29 CFR section 1910.1200 of the Occupational Safety and Health Administration (OSHA). This standard is not applicable to "articles". Li-Ion batteries are often considered "articles", therefore they may be exempted from the requirements of the Hazard Communication Standard.

DISCLAIMER

This Product Safety Data Sheet is created by the manufacturer according to the OSHA standard of 29 CFR 1910.1200. To the extent allowed by law, the manufacturer hereby expressly disclaims any liability to any third party, including users of this product, including, but not limited to, consequential or other damages, arising out of the use of, or reliance on, this Product Safety Data Sheet.