



# SAFETY DATA SHEET

Prepared to U.S. OSHA 29 CFR 1910.1200 (2012), Canadian WHMIS 2015 (HPR-GHS), European Union CLP EC 1272/2008, REACH, Australian WorkSafe, the Japanese Industrial Standard JIS Z7253, the Korean ISHA (Notice 2009-68), SPRING Singapore, Mexican Workplace Regulations (NOM-018-STPS-2000), New Zealand HNSO and the Global Harmonization Standard

## 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

### 1.1 PRODUCT IDENTIFIER USED ON LABEL

- 1.1.1 **Product Identifier:** BMP-BATT-LI-3 LITHIUM ION BATTERY PACK  
1.1.2 **Other Means of Identification:** Lithium Ion Battery Pack  
1.1.2.1 **Brady Model Number:** BMP-BATT-LI-3

### 1.2 RECOMMENDED USE of the PRODUCT and RESTRICTIONS on USE

- 1.1.4 **Product Use:** Battery Pack Contained within Brady Printer M611 Mobile Printer  
(Lithium, Nickel, Manganese, Cobalt Chemistry)  
1.1.5 **UN Number:** Battery Packed within Equipment: UN 3481  
1.1.6 **Hazchem Code (Australia):** 2Y

### 1.3 NAME, ADDRESS and TELEPHONE NUMBER of CHEMICAL MANUFACTURER, IMPORTER or OTHER RESPONSIBLE PARTY

- 1.3.1 **U.S. Supplier's Name:** Entrusted by Brady Worldwide Inc. Business Phone: (414) 358-6600 [8am – 5pm CT]  
to:  
Inventus Power, Inc.  
1200 Internationale Parkway, Woodridge, IL 60517 USA  
1.3.2 **Manufacturer's Name:** Inventus Power (Malaysia) Sdn. Bhd.:  
1.3.2.1 **Address:** Plot 176 Jalan Cyber 7, Kawasan Perindustrian Senai III, 81400 Senai, Johor Malaysia  
1.3.3 **European Supplier/ Distributor's Name:** WH Brady NV  
1.3.3.1 **Address:** Lindestraat 20, Industriepark C3, B - 9240 Zele, Belgium  
1.3.3.2 **Business Phone:** 0032/(0)52.45.79.05 [9 am to 5 pm]  
1.3.4 **Emergency Phone:** Infotrac: 1-800-535-5053 (U.S. and Canada) [24 hours]  
1.3.5 **Email:** REACH\_Americas@bradycorp.com

### 1.4 DATE OF PREPARATION:

November 30, 2021

### 1.5 DATE OF REVISION:

New

**NOTE 1:** IATA and IMDG information given in Section 14 (Transportation Information) is based on regulations and standards that go into effect January 1, 2022 and are valid until December 31, 2022. Information on shipping regulations for each jurisdiction is given in Section 14, are the most current as of the date of revision of this SDS; specific version references are given in this section.

**NOTE 2:** This product is defined as an "Article" under all jurisdictions. Refer to Section 15 (Regulatory Information) for specific regulatory citations. As an article, this product presents negligible health and physical hazards under reasonably anticipated circumstances of use. Subsequently, a Safety Data Sheet is not required under Standards cited above. This document is prepared to provide persons using this product with additional safety information.

## 2. HAZARD IDENTIFICATION

**2.1 GLOBAL HARMONIZATION LABELING AND CLASSIFICATION:** This product is an article and is not required to be classified under any jurisdiction.

The lithium ion cell ingredients are contained in a hermetically sealed case, designed to withstand temperatures and pressures encountered during normal use. As a result, during normal use, hazardous materials are fully contained inside the battery. The printer and its battery should not be crushed, deformed, punctured, opened or exposed to heat because exposure to the ingredients contained within could be harmful under some circumstances. The following information is provided for the user's information only.

### 2.2 HAZARD OVERVIEW:

- 2.2.1 **Product Description:** This product is a lithium ion battery.  
2.2.2 **Health Hazards:** This product is considered a manufactured article and presents negligible health, physical or reactivity hazards under typical use conditions. If exposure to the battery's electrical solution occurs from puncture, heating or other destruction of the outer case, contact with the solution may be harmful by inhalation, skin or eye contact. Inhalation of fumes from burning electrolyte solution may cause burns to respiratory system. Skin or eye contact with the electrolyte solution may also produce burns, especially if contact is prolonged. Damage to the printer unit may present a hazard of electric shock under certain circumstances.  
2.2.3 **Flammability Hazards:** Batteries can explode during a fire. If involved in a fire, this product can burn and produce toxic gases (e.g., carbon, cobalt, copper, lithium, manganese, phosphorous, nickel oxides and other metal oxides, hydrogen fluoride, phosphine). During a fire involving this product care should be taken to avoid inhalation of fumes. During charging of the battery of this printer, a lithium graphite intercalation phase is formed (where lithium and graphite molecules are combined), which is highly flammable and corrosive, but is not released under normal circumstances.  
2.2.4 **Reactivity Hazards:** If the printer is somehow submerged, allowing water into the battery case, the electrolyte solution can react with water to form hydrofluoric acid. Contact of water with the anodes can produce hydrogen gas.  
2.2.5 **Environmental Hazards:** This product is not expected to cause harm if released to the environment. However, the product must be disposed of properly in order to avoid environmental contamination; breakdown of compounds in this product overtime in the environment may result in the release of materials toxic to aquatic and terrestrial organisms.  
2.2.6 **Other Hazards:** Physical damage to the battery, exposure to rain or water or freezing temperatures can cause battery to fail and may result in fire. Exposure to oils or solvents can damage the case and cause failure.  
2.2.7 **Emergency Response Considerations:** Emergency responders must wear proper personal protective equipment (and have appropriate fire protection) suitable for the situation to which they are responding.

**2.3 PERCENT OF UNKNOWN ACUTE TOXICITY:** Not applicable for articles.

### 3. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	CAS #	EU EINECS #	Japanese ENC #	Australian AICS	Korean ECL #	New Zealand HNSO	% w/w	LABEL ELEMENTS GHS under U.S. OSHA, Canadian WHMIS HPR-GHS & EU Classification (1272/2008), Japanese, Taiwan, Chinese and Korean Regulations Korean ISHA Classification Hazard Statements
The following materials are part of the case of the battery:								
Aluminum (non-pyrophoric solid)	7429-90-5	231-072-3	Mineral-exempt	Listed	KE-00881	HSR001263 (coated, PGII) HSR001471 (coated, PGIII) HSR001472 (uncoated, PGII) HSR001473 (coated, PGIII)	Proprietary	Classification under All Jurisdictions: Not Applicable for solid metal.
Copper	7440-50-8	231-159-6	Mineral-exempt	Listed	KE-08896	HSR002948	Proprietary	Classification under All Jurisdictions: Not Applicable for solid metal.
Iron	7439-89-6	231-096-4	Mineral Exempt	Listed	KE-21059	May be used as a single component chemical under an appropriate group standard	Proprietary	Classification under All Jurisdictions: Not Applicable for solid metal.
Plastic	Mixture	Mixture	Mixture	Mixture	Mixture	Mixture	Proprietary	Classification under All Jurisdictions: Not Applicable.
Inert polymers and other trace compounds:							Balance	Classification under All Jurisdictions: Not Applicable.
The following materials are in the electrolyte mixture in the battery:								
Ethylene Carbonate	96-49-1	202-510-0	5-523	Listed	KE-12028	HSR004476	Proprietary	NOTIFIED EU ECHA CLASSIFICATION Classification under All Jurisdictions: Classification: Acute Oral Toxicity Cat. 4, Eye Irritation Cat. 2A, Specific Target Organ Toxicity (Ingestion-Kidneys) Repeated Exposure Cat. 3 Hazard Statements: H302: Harmful if swallowed. H319: Causes serious eye irritation. H373: May cause damage to kidneys through prolonged or repeated exposure.
Dimethyl Carbonate	616-38-6	210-478-4	2-2853	Listed	KE-11278	HSR001252	Proprietary	HARMONISED EU CLP00 CLASSIFICATION Classification under All Jurisdictions: Classification: Flammable Liquid Cat. 2 Hazard Statements: H225: Highly flammable liquid and vapor.
Lithium Hexafluorophosphate (LiPF <sub>6</sub> )	21324-40-3	244-334-7	Unlisted	Listed	KE-22564	Not Listed	Proprietary	NOTIFIED EU ECHA CLASSIFICATION Classification under All Jurisdictions: Classification: Acute Oral Toxicity Cat. 3, Skin Corrosion/Damage Cat. 2B, Eye Damage Cat. 1, Specific Target Organ Toxicity (Bones, Teeth) Repeated Exposure Cat. 1 Hazard Statements: H301: Toxic if swallowed. H314: Causes severe skin burns and eye damage. H318: Causes serious eye damage. H372: Causes damages to bones and teeth through prolonged or repeated exposure (as a fluoride).
The following materials are for the battery cell electrodes:								
Graphite [negative electrode]	7440-44-0	231-153-3	Mineral-exempt	Listed	KE-04671	May be used as a single component chemical under an appropriate group standard	Proprietary	NOTIFIED ECHA CLASSIFICATION Classification under All Jurisdictions: Classification: Self-Heating Substance Cat. 1, Eye Corrosion/Damage Cat. 2A, Specific Target Organ Toxicity (Inhalation-Respiratory Irritation) Single Exposure Cat. 3 Hazard Statements: H252: Self-heating in large quantities: may catch fire. H319: Causes serious eye irritation.
Cobalt Lithium Manganese Nickel Oxide	182442-95-1	695-690-9	Not Listed	Listed	Not Listed	No Info on Registration Under HNSO	Proprietary	NOTIFIED ECHA CLASSIFICATION Classification under All Jurisdictions: Classification: Carcinogen Cat. 1B, Acute Inhalation Toxicity Cat.2, Specific Target Organ Toxicity (Inhalation-Lungs) Repeated Exposure Cat. 1, Aquatic Chronic Toxicity Cat. 3 Hazard Statements: H350: May cause cancer. H330: Fatal if inhaled. H372: Causes damages to lungs through prolonged or repeated exposure by inhalation.

The specific chemical identity and/or exact percentage (concentration) of composition has been withheld as a trade secret is required.

### 4. FIRST-AID MEASURES

**4.1 PROTECTION OF FIRST AID RESPONDERS:** Rescuers should be taken for medical attention, if necessary. Only trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary.

**4.2 DESCRIPTION OF FIRST AID MEASURES:** Persons using this product should consult a physician or other medical professional if an accident involving this product results in injury. Specific first-aid measures are as follows:

**4.2.1 GHS Precautionary Statements for Eye, Skin, Inhalation or Ingestion:** None applicable for articles.

**4.2.2 Eye or Skin Contact:** If skin or eye contact occurs to electrolyte solution, flush for 20 minutes. Contact physician or other medical health professional.

**4.2.3 Inhalation:** If any adverse effect occurs as a result of inhalation of fumes from thermal decomposition of the electrolyte solution during fire or other heating of battery, remove individual to fresh air. Seek medical attention if adverse effect occurs after removal to fresh air.

**4.2.4 Ingestion:** Not a potential route of exposure.

## 4. FIRST-AID MEASURES

### 4.3 MOST IMPORTANT SYMPTOMS and EFFECTS, WHETHER ACUTE OR DELAYED:

4.3.1 **Acute:** See Section 11.

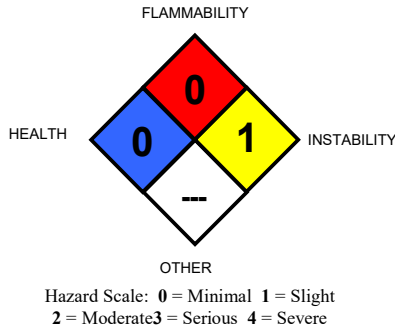
4.3.2 **Chronic:** See Section 11.

4.4 **MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** No medical conditions are known to be aggravated by this product.

4.5 **IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED:** Treat symptoms and eliminate exposure.

## 5. FIRE-FIGHTING MEASURES

### Sealed Product NFPA RATING



5.1 **FLASH POINT:** Not applicable.

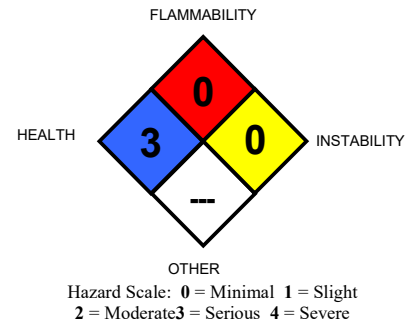
5.2 **AUTOIGNITION TEMPERATURE:** Not applicable.

5.3 **FLAMMABLE LIMITS (in air by volume, %):** Not applicable.

5.4 **FIRE EXTINGUISHING MEDIA:** Fires involving lithium-ion batteries should be extinguished with a Class ABC or BC dry chemical extinguisher.

5.5 **UNSUITABLE FIRE EXTINGUISHING MEDIA:** Water. Class D fire extinguishers consist of a dry powder designed to extinguish metal fires. Due to the small amount of lithium metal in this product, the dry powder may not effectively extinguish a battery fire.

### Electrolyte NFPA RATING



5.6 **SPECIFIC HAZARDS ARISING FROM THE PRODUCT:** Batteries can explode in a fire. Contact with the electrolyte solution and water can produce hydrofluoric acid. Contact with water and the charged anode will produce hydrogen gas. Products of thermal decomposition can include toxic gases (e.g., carbon, cobalt, copper, lithium, manganese, phosphorous, nickel oxides and other metal oxides, hydrogen fluoride, phosphine). Damaged or opened cells or batteries can result in rapid heating and the release of flammable vapors.

5.6.1 **Explosion Sensitivity to Mechanical Impact or to Static Discharge:** Not applicable.

5.7 **SPECIAL PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS:** Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment.

## 6. ACCIDENTAL RELEASE MEASURES

6.1 **PERSONAL PRECAUTIONS AND EMERGENCY PROCEDURES:** Eliminate all sources of ignition before cleanup begins. Use non-sparking tools. The atmosphere must have levels of components lower than those listed in Section 8, (Exposure Controls and Personal Protective Equipment), if applicable, and have at least 19.5 percent oxygen before personnel can be allowed into the area without Self-Contained Breathing Apparatus (SCBA).

6.2 **PERSONAL PROTECTIVE EQUIPMENT:** For clean-up of leaking electrolyte solution, proper protective equipment should be used. In the event of a spill, clear the area and protect people.

6.2.1 **Small Spills:** Wear rubber gloves, splash goggles, and appropriate body protection.

6.2.2 **Large Spills:** Minimum Personal Protective Equipment should be rubber gloves, rubber boots, face shield, and Tyvek suit. Minimum level of personal protective equipment for releases in which the level of oxygen is less than 19.5% or is unknown must be **Level B: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard hat, and Self-Contained Breathing Apparatus.**

6.3 **METHODS FOR CONTAINMENT AND CLEANING-UP:** No special accidental release measures are required for non-damaged product. Damaged product batteries that are not hot or burning should be placed in a sealed container and disposed of according to all disposal regulations. The following information is in the event that the electrolyte solution has somehow escaped the case of the battery.

6.3.1 **Small Spills:** Wipe up spilled liquid with polypads or other suitable absorbent materials. Wash contaminated area with soap and water, absorb with paper towels, and rinse with water.

6.3.2 **Large Spills:** Trained personnel following pre-planned procedures should handle non-incident releases. Absorb spilled liquid with dry sand or other suitable non-reactive absorbent materials. Prevent material from entering sewer or confined spaces, waterways, soil or public waters. Monitor area and confirm levels are below exposure limits given in Section 8 (Exposure Controls-Personal Protection), if applicable, before non-response personnel are allowed into the spill area.

6.3.3 **All Spills:** Place all spill residue in an appropriate container and seal. Decontaminate the area thoroughly. If necessary, discard all stained response equipment or rinse with soapy water before returning such equipment to service. Do not mix with wastes from other materials. Dispose of in accordance with applicable Federal, State, and local procedures (see Section 13, Disposal Considerations). For spills on water, contain, minimize dispersion and collect. Dispose of recovered material and report spill per regulatory requirements.

6.4 **ENVIRONMENTAL PRECAUTIONS:** Prevent any spill residue from entering sewer or confined spaces.

6.5 **REFERENCE TO OTHER SECTIONS:** See information in Section 8 (Exposure Controls – Personal Protection) and Section 13 (Disposal Considerations) for additional information.

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## 7. HANDLING and STORAGE

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**7.1 PRECAUTIONS FOR SAFE HANDLING:** Store away from acids, sources of heat or flame, or other incompatible materials as listed in Section 10 (Stability and Reactivity).

Should the product and/or the permanently installed battery unintentionally be crushed, thus releasing its contents, rubber gloves must be used to handle all battery components. Avoid inhalation of any vapors that may be emitted. In the event of skin or eye exposure to the electrolyte, refer to Section 4, First Aid Measures. The product should be separated from and stored in a noncombustible, well ventilated, sprinkler-protected structure with sufficient clearance between walls and incompatible materials.

**7.1.1** The following information is from the Brady Lithium Battery Instructions and Precautions document:

**7.1.1.1 Lithium-Ion Battery Handling Precautions:**

**Before using the battery pack, read these important instructions. Failure to follow these instructions may result in electric shock, fire, and/or serious personal injury.**

- 1. Do not disassemble, open, or modify this printer.** This may result in the risk of electric shock, fire or exposure to battery chemicals. If it is damaged, dispose of properly according to regulations for products that contain lithium ion batteries.
- 2. Do not short circuit the battery within the printer.** The battery pack contained in this product will short circuit if a metal object makes a connection between the positive and negative contacts on the battery. Do not transport or store the product together with metal objects such as tools, hardware, etc. A short-circuited battery may cause fire and personal injury.
- 3. Do not expose this printer to heat or fire, avoid storage in direct sunlight.** Batteries within this product may explode, causing personal injury or damage. Toxic fumes and materials are created when batteries are burned.
- 4. Do not expose the product to water or rain or allow it to get wet.** Otherwise, the protective features in the battery pack of this product can be damaged; the pack can exhibit extremely high current and or voltage, abnormal chemical reactions may occur in the pack, possibly leading to overheating, smoke emission, bursting and/or ignition.
- 5. Do not crush, drop, or damage this product.** Do not use the printer when it has received a sharp blow, been dropped, run over, or damaged in any way (e.g., pierced with a nail, hit with a hammer, stepped on).
- 6. Observe the plus (+) and minus (-) marks on the battery pack and equipment and ensure correct use.** If you cannot easily connect the product to its designated charger, confirm that the correct AC charger adapter specifically designed for charging is used for charging. Using the improper charger adapter could result in reverse-charging and abnormal chemical reaction may occur, then possibly leading to leakage, overheating, smoke emission, bursting and/or ignition of the battery pack.
- 7. Recharge the battery pack outside the printer using the charger adapter specifically designed for that purpose** and observe the recharging conditions specified by the manufacturer. A recharging operation under non-conforming recharging conditions (beyond the limits of temperature and larger voltage/current than specified) can cause the battery pack to be overcharged, or charged with extremely high current, abnormal chemical reaction can occur in it, possibly leading to overheating, smoke emission, bursting and/or ignition.
- 8. Do not use the product for a purpose other than those specified.** Misuse of the product may damage the battery pack, shorten battery pack life, result in risk of fire, electric shock or personal injury.

**7.1.1.2 GHS Statements for Safe Handling:** None applicable for articles.

**7.2 CONDITIONS FOR SAFE STORAGE INCLUDING ANY INCOMPATIBILITIES:** Do not expose the battery pack or printer to water or rain or allow them to get wet. This may damage the battery pack or printer. Do not use oil or solvents to clean or lubricate the battery. The plastic casing will become brittle and crack, causing a risk of injury. Store the battery pack in a cool, dry place. Do not store battery where temperatures may exceed 60°C (140°F) such as in direct sunlight, a vehicle or metal building during summer. Charger will charge the battery when the battery's internal temperature is between 0°C (32°F) and 45°C (113°F). When the battery pack temperature range is outside that range, charging will not occur. Dispose of Brady Lithium Ion Batteries according to federal, state and local regulations. Contact a recycling agency in your area for recycle locations.

**7.1.1.1 Incompatibilities:** None applicable for articles. The electrolyte solution is incompatible with potassium tert-butoxide, oxidizers, reducing agents, acids and alkalies.

**7.1.1.2 GHS Statements for Safe Storage:** None applicable for articles.

**7.3 SPECIFIC END USE(S):** Handheld mobile printer with a lithium-ion battery.

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## 8. EXPOSURE CONTROLS - PERSONAL PROTECTION

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**8.1 CONTROL PARAMETERS, INCLUDING OCCUPATIONAL EXPOSURE GUIDELINES OR BIOLOGICAL EXPOSURE LIMITS AND THE SOURCE OF THOSE VALUES:**

**8.1.1 Ventilation and Engineering Controls:** No engineering controls are required for handling batteries that have not been damaged.

**8.1.2 U.S. Exposure Limits/Control Parameters:** The following limits are for the components of the electrolyte solution only. Only components that have exposure limits are given.

**8.1.2.1 - Lithium Hexafluorophosphate (exposure limits given are for lithium hydroxide and lithium oxide):**

Lithium Hexafluorophosphate and Lithium Oxide:

AIHA & OARS WEELS STEL: 1 mg/m<sup>3</sup> (ceiling)

**8.1.2.2 - Exposure limits for Potential Decomposition product Hydrogen Fluoride:**

Hydrogen Fluoride:

ACGIH TLV TWA: 0.5 ppm; 0.41 mg/m<sup>3</sup>, skin

OSHA PEL TWA: Vacated 1989 PEL: 6 ppm

NIOSH REL TWA 3 ppm; 2.5 mg/m<sup>3</sup> (ceiling)

NIOSH IDLH: 30 ppm

DFG MAK TWA: 1 ppm; 0.83 mg/m<sup>3</sup>

DFG PEAK: Substances with Systemic Effects: 2•MAK, 15 minutes average value, 4 per shift, 1 hour

ACGIH TLV STEL: 2 ppm (ceiling); 1.64 mg/m<sup>3</sup> (ceiling), skin

OSHA PEL STEL: 3 ppm

NIOSH REL STEL: 6 ppm (ceiling), 15 minutes; 5 mg/m<sup>3</sup> (ceiling) 15 minutes

**8.1.3 Additional International Exposure Limits:** Additional international limits are in place for components. The ones given are related to the Lithium Hexafluorophosphate component, which is part of the electrolyte component, and which poses the most likely compound to present an exposure hazard. Exposure limits can change or be added and should be checked for currency.

Fluorides, as F

	<u>Limit Value - Eight Hours</u>	<u>Limit Value - Short Term</u>
Belgium	2.5 mg/m <sup>3</sup>	
Canada (Ontario)	2.5 mg/m <sup>3</sup>	

## 8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

### 8.1 CONTROL PARAMETERS, INCLUDING OCCUPATIONAL EXPOSURE GUIDELINES OR BIOLOGICAL EXPOSURE LIMITS AND THE SOURCE OF THOSE VALUES (continued):

#### 8.1.3 Additional International Exposure Limits (continued):

##### Fluorides, as F (continued)

	<u>Limit Value - Eight Hours</u>	<u>Limit Value - Short Term</u>
Canada ( <a href="#">Québec</a> )	2.5 mg/m <sup>3</sup>	
Denmark	2.5 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Finland	2.5 mg/m <sup>3</sup>	
France	2.5 mg/m <sup>3</sup>	
Germany (AGS)	1 mg/m <sup>3</sup> Inhalable aerosol	4 mg/m <sup>3</sup> Inhalable aerosol
Germany (DFG)	1 mg/m <sup>3</sup> Inhalable aerosol	4 mg/m <sup>3</sup> Inhalable aerosol
Ireland	2.5 mg/m <sup>3</sup>	
Italy	2.5 mg/m <sup>3</sup>	
New Zealand	2.5 mg/m <sup>3</sup> (1)	
Poland	2 mg/m <sup>3</sup>	
Romania	2.5 mg/m <sup>3</sup> (1)	
Singapore	2.5 mg/m <sup>3</sup>	
South Korea	2.5 mg/m <sup>3</sup>	
Switzerland	1 mg/m <sup>3</sup> Inhalable aerosol	4 mg/m <sup>3</sup> Inhalable aerosol
The Netherlands		2 mg/m <sup>3</sup>

##### Remarks

France	<i>Italics</i> : Indicative of statutory limit values
Germany (AGS)	STV: 15 minutes average value
Germany (DFG)	STV: 15 minutes average value
New Zealand	(1) Exposure can also be estimated by biological monitoring
Romania	(1) Inorganic
The Netherlands	Applies for inorganic, soluble fluorides, as F

##### Hydrogen Fluoride, as F

	<u>Limit Value - Eight Hours</u>	<u>Limit Value - Short Term</u>
Austria	1.8 ppm; 1.5 mg/m <sup>3</sup>	3 ppm (1); 2.6 mg/m <sup>3</sup> (1)
Belgium	1.8 ppm; 1.5 mg/m <sup>3</sup>	3 ppm; 2.5 mg/m <sup>3</sup>
Canada (Ontario)	0.5 ppm	2 ppm (1)
Canada ( <a href="#">Québec</a> )		3 ppm (1); 2.6 mg/m <sup>3</sup> (1)
Denmark	1.8 ppm; 1.5 mg/m <sup>3</sup>	3.6 ppm; 3 mg/m <sup>3</sup>
European Union	<b>1.8 ppm (1); 1.5 mg/m<sup>3</sup> (1)</b>	<b>3 ppm (1)(2); 2.5 mg/m<sup>3</sup> (1)</b>
France	<b>1.8 ppm; 1.5 mg/m<sup>3</sup></b>	<b>3 ppm; 2.5 mg/m<sup>3</sup></b>
Germany (AGS)	1 ppm; 0.83 mg/m <sup>3</sup> (1)	2 (1)(2); 1.66 mg/m <sup>3</sup> (1)(2)
Germany (DFG)	1 ppm; 0.83 mg/m <sup>3</sup>	2 (1) 1.66 mg/m <sup>3</sup> (1)
Hungary	1.5 mg/m <sup>3</sup>	2.5 mg/m <sup>3</sup>
Ireland	1.8 ppm; 1.5 mg/m <sup>3</sup>	3 ppm (1); 2.5 mg/m <sup>3</sup> (1)
Italy	1.8 ppm; 1.5 mg/m <sup>3</sup>	3 ppm; 2.5 mg/m <sup>3</sup>
Japan (MHLW)	0.5 ppm (1)	
Latvia	1.8 ppm; 1.5 mg/m <sup>3</sup>	3 ppm (1); 2.5 mg/m <sup>3</sup> (1)
Norway	0.6 ppm (1); 1.5 mg/m <sup>3</sup> (1)	1.8 ppm (1)(2); 1.5 mg/m <sup>3</sup> (1)(2)
Poland	0.5 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>
Singapore		3 ppm; 2.6 mg/m <sup>3</sup>
South Korea	0.5 ppm	3 ppm (1); 2.5 mg/m <sup>3</sup> (1)
Spain	1.8 ppm; 1.5 mg/m <sup>3</sup>	3 ppm; 2.5 mg/m <sup>3</sup>
Sweden		2 ppm (1); 1.7 mg/m <sup>3</sup> (1)
Switzerland	1 ppm; 0.83 mg/m <sup>3</sup>	2 ppm, 166 mg/m <sup>3</sup>
The Netherlands		1 ppm

##### Remarks

Canada (Ontario)	(1) Ceiling limit value
Canada ( <a href="#">Québec</a> )	(1) Ceiling limit value
European Union	<b>Bold Type</b> : Indicative of Occupational exposure limit Values and Limit values for Occupational Exposure Limit Values – BOELV ~ (1) Calculated as HF; (2) 15 minutes average value
France	<b>Bold Type</b> : Restrictive statutory limit values valid for Hydrogen Fluoride
Germany (AGS)	(1) Skin; (2) 15 minutes average value
Germany (DFG)	(1) 15 minutes average value
Ireland	(1) 15 minutes average value
Japan (MHLW)	(1) Calculated as HF
Latvia	(1) 15 minutes average value
South Korea	(1) Ceiling limit value
Sweden	(1) 15 minutes average value

##### Lithium Hydroxide

	<u>Limit Value - Eight Hours</u>	<u>Limit Value - Short Term</u>
Canada (Ontario)	1 mg/m <sup>3</sup>	
Ireland		1 mg/m <sup>3</sup> (1)
Japan – JOSH	1 mg/m <sup>3</sup>	
	<u>Remarks</u>	
Ireland	(1) 15 minutes reference period	

#### 8.1.3 Australian Hazardous Chemical Information System (HMIS) Exposure Standards:

CHEMICAL NAME	CAS #	EXPOSURE LIMITS IN AIR		
		TWA mg/m <sup>3</sup>	STEL mg/m <sup>3</sup>	Notes
Fluorides, as F	Not Applicable	2.5	NE	Not Applicable
Hydrogen Fluoride	7664-39-3	NE	3 ppm	Ceiling Limit Value

NE = Not Established.

## 8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

### 8.1 CONTROL PARAMETERS, INCLUDING OCCUPATIONAL EXPOSURE GUIDELINES OR BIOLOGICAL EXPOSURE LIMITS AND THE SOURCE OF THOSE VALUES (continued):

#### 8.1.4 UK Minimum Exposure Limits:

CHEMICAL NAME	CAS #	WORKPLACE EXPOSURE LIMIT				Comments
		Long-Term Exposure Limit (8-Hrs TWA Reference Period)		Short-Term Exposure Limit (15-minute Reference Period)		
		ppm	mg.m <sup>-3</sup>	ppm	mg.m <sup>-3</sup>	
Fluorides, as F	16984-48-8	NE	2.5	NE	NE	The Carcin, Sen and Skin notations are not exhaustive. Notations have been applied to substances identified in IOELV Directives
Hydrogen Fluoride	7664-39-3	1.8	1.5	3	2.5	
Lithium Hydroxide	1310-65-2	NE	NE	NE	1	

NE = Not Established.

**8.1.5 ACGIH Biological Exposure Indices (BEIs):** Currently, the following Biological Exposure Indices (BEIs) have been established for fluorides, as F.

CHEMICAL: DETERMINANT	SAMPLING TIME	BEI
Fluorides (as F) • Fluoride in Urine • Fluoride in Urine	• Prior to Shift • End of Shift	• 2 mg/L • 3 mg/L

**8.1.6 UK Biological Monitoring Guidance Values (BMGVs):** Currently, no BMGVs have been established for the components of the electrolyte solution.

**8.2 SAFE WORK AND HYGIENE PRACTICES:** Do not short circuit, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. In event of release of electrolyte fluid, avoid contact by all routes of exposure.

**8.3 INDIVIDUAL MEASURES SUCH AS PERSONAL PROTECTIVE EQUIPMENT (PPE):** The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132), equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-02, U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-02, *Protective Footwear*), standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection), or standards of Australia (including AS/NZS 1715:1994 for respiratory PPE, AS/NZS 4501.2:2006 for protective clothing, AS/NZS 2161.1:2000 for glove selection, and AS/NZS 1336:1997 for eye protection), Australian Standard 1337-Eye Protection for Industrial Applications and Australian Standard 1336-Recommended Practices for Eye Protection in the Industrial Environment, Australian Standard 2161-Industrial Safety Gloves and Mittens, or Japanese Standards JIS T 8147:2003, JIS T 8116:2005 as well as Korean and Singapore Standards. Please reference applicable regulations and standards for relevant details.

**8.3.1 Respiratory Protection:** No special respiratory protection is required for use of this product during normal use.

**8.3.2 Eye Protection:** No special eye protection is required for use of this product. If batteries are damaged or leaking use safety goggles when handling the batteries.

**8.3.4 Hand Protection:** No special hand protection is normally required for use of this product. If batteries are damaged or leaking use wear butyl rubber, polyvinyl alcohol gloves or another appropriate glove.

**8.3.5 Body/Skin Protection:** No special body or skin protection is normally required for use of this product. If a hazard of injury to the feet exists due to falling objects or rolling objects use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-02, *Protective Footwear*.

## 9. PHYSICAL and CHEMICAL PROPERTIES

- 9.1 **FORM:** Manufactured article containing electrolyte solution.
- 9.2 **COLOR:** Various parts have different colors.
- 9.3 **MOLECULAR FORMULA:** Mixture.
- 9.4 **MOLECULAR WEIGHT:** Mixture.
- 9.5 **ODOR:** Not applicable.
- 9.6 **ODOR THRESHOLD:** Not applicable.
- 9.7 **RELATIVE VAPOR DENSITY (air = 1):** Not applicable.
- 9.8 **EVAPORATION RATE:** Not applicable.
- 9.9 **SPECIFIC GRAVITY (water = 1):** Not available.
- 9.10 **MELTING/FREEZING POINT:** Not available.
- 9.11 **SOLUBILITY IN WATER:** Insoluble.
- 9.12 **BOILING POINT:** Not applicable.
- 9.13 **VAPOR PRESSURE:** Not applicable.
- 9.14 **pH:** Not applicable.
- 9.15 **HEAT OF COMBUSTION:** Not available.
- 9.16 **THERMAL CONDUCTIVITY:** Not available.
- 9.17 **FLAMMABILITY:** Not flammable.

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## 9. PHYSICAL and CHEMICAL PROPERTIES (Continued)

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- 9.18 FLASH POINT:** Not applicable.
- 9.19 FLAMMABLE LIMITS (in air by volume, %):** Not applicable.
- 9.20 AUTOIGNITION TEMPERATURE:** Not available.
- 9.21 OXIDIZING PROPERTIES:** Not an oxidizer.
- 9.22 EXPLOSIVE PROPERTIES:** Heating or water contact may cause overpressure of outside casing and possible explosive result.
- 9.23 COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT):** Not applicable.
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## 10. STABILITY and REACTIVITY

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- 10.1 REACTIVITY:** The electrolyte solution can react with water.
- 10.2 CHEMICAL STABILITY:** Stable under normal conditions of use and handling.
- 10.3 DECOMPOSITION PRODUCTS:**
- 10.3.1 Combustion:** Carbon, cobalt, copper, lithium, manganese, phosphorous, nickel oxides and other metal oxides, hydrogen fluoride, phosphine).
- 10.3.2 Hydrolysis:** Contact with the electrolyte solution and water can produce hydrofluoric acid. Contact with water and the charged anode will produce hydrogen gas.
- 10.4 MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:** The electrolyte solution is incompatible with potassium tert-butoxide, oxidizers, reducing agents, acids and alkalis.
- 10.5 POSSIBILITY OF HAZARDOUS REACTION/POLYMERIZATION:** This product and its intact batteries are not reactive. If the electrolyte solution inside the battery contacts water, a reaction generating heat may occur. Polymerization will not occur.
- 10.6 CONDITIONS TO AVOID:** Avoid damaging batteries in any way that could release electrolyte solution. Avoid exposure to heat, flame, or other ignition source. Avoid contact with water. Avoid overcharging of batteries or other conditions as described in Section 7 (Handling or Storage).
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## 11. TOXICOLOGICAL INFORMATION

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- 11.1 SYMPTOMS OF EXPOSURE BY ROUTE OF EXPOSURE:**
- 11.1 Inhalation:** Under normal conditions of use and handling, no inhalation hazard is present. If battery is heated fumes from the electrolyte solution can cause moderate to severe irritation of the respiratory system.
- 11.2 Skin or Eye Contact:** Under normal conditions of use and handling, no skin or eye hazard is present. If the battery case is punctured or otherwise damaged so that contact with the electrolyte solution occurs, contamination of the skin or eyes can be highly irritating or cause burns. Fumes from heated electrolyte solution will cause irritation of the eyes. Contact with the electrodes may result in electric shock under certain circumstances of contact.
- 11.3 Skin Absorption:** Some components of the electrolyte solution may be absorbed via intact skin. Due to the small amount of solution in the battery, significant toxic effect by this route of exposure is not expected.
- 11.4 Ingestion:** Ingestion is not a likely route of exposure to the electrolyte solution.
- 11.5 Injection:** Injection is not a likely route of exposure to the electrolyte solution.
- 11.2 DELAYED AND IMMEDIATE EFFECTS AND CHRONIC EFFECTS FROM SHORT AND LONG-TERM EXPOSURE:**
- 11.2.1 Acute:** There is no health hazard anticipated to occur during routine use of this product. If damage or heating of the battery occurs, contact with the electrolyte solution or fumes from heating of the solution may cause moderate to severe irritation of skin, eyes and respiratory system.
- 11.2.2 Chronic:** None known.
- 11.3 TARGET ORGANS:**
- 11.3.1 Acute:** Respiratory system, skin, eyes (fumes from thermal decomposition).
- 11.3.2 Chronic:** None.
- 11.4 TOXICITY DATA FOR PRODUCT, INCLUDING ATEs:** Not applicable for an article.
- 11.5 TOXICITY DATA FOR COMPONENTS OF THE ELECTROLYTE SOLUTION:** The following toxicity data are presented for components of the electrolyte solution only.
- |  |  |
|--|--|
| <b>Diethyl Carbonate:</b><br>LD <sub>50</sub> (Oral-Rat) 4876 mg/kg<br>LC <sub>50</sub> (Inhalation-Rat) 4 hrs: > 19.5 mg/L  | <b>Lithium Hexafluorophosphate:</b><br>LD <sub>50</sub> (Oral-Rat) 50-300 mg/kg<br>(Skin-Human) Causes Severe Burns; Skin Corrosion: Human skin model test<br>(In Vivo Assay-Mouse) Does not cause skin sensitization under OECD Test Guideline 429<br>Germ Cell Mutagenicity (Ames test- <i>S. typhimurium</i> ) Negative |
| <b>Ethylene Carbonate:</b><br>Open Irritation Test (Skin-Rabbit) 660 mg: Mild<br>LD <sub>50</sub> (Oral-Rat) > 10,000 mg/kg<br>LD <sub>50</sub> (Skin-Rabbit) > 3000 mg/kg<br>LC <sub>50</sub> (Inhalation-Rat) 4 hrs: 8.76 mg/L |  |
- 11.6 CARCINOGENICITY:** No components of the electrolyte solution are listed by agencies tracking the carcinogenic effect of chemical compounds. Some components of the case material are listed. Due to the physical nature of this product, carcinogenicity is not a hazard for this product.
- 11.7 IRRITANCY OF PRODUCT:** This product is not irritating under normal circumstances of use or handling. Fumes from thermal decomposition are irritating by inhalation, skin or eye contact.
- 11.8 SENSITIZATION TO THE PRODUCT:** Contact with this product does not pose a hazard of sensitization.
- 11.9 ENDOCRINE TOXICITY:** No component of the electrolyte solution is known to cause adverse effects on the endocrine system in humans. Copper is under investigation for potential endocrine disrupting properties; however, in this product, in metal form, it is not expected to cause adverse endocrine effects.
- 11.10 REPRODUCTIVE TOXICITY INFORMATION:** As an article, this product is not expected to cause mutagenic, embryotoxic, teratogenic, or reproductive effects in humans.
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## 12. ECOLOGICAL INFORMATION

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ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

- 12.1 MOBILITY IN SOIL:** Due to the form of this product, it is unlikely that it will be mobile in the soil.
- 12.2 PERSISTENCE AND BIODEGRADABILITY:** This product has not been tested for persistence or biodegradability. The case of this product will not biodegrade.
- 12.3 BIO-ACCUMULATION POTENTIAL:** This product has not been tested for bio-accumulation potential. Some materials within the cell are bio-accumulative. Under normal conditions, these materials are contained and pose no risk to persons or the surrounding environment.
- 12.4 ECOTOXICITY:** This product is not expected to cause significant harm to plant and animal-life in its current form; however, all disposal should be according to current regulations. This product has not been tested for aquatic toxicity. All release of this product into an aquatic or terrestrial environment should be prevented.
- 12.5 ENDOCRINE DISRUPTING PROPERTIES:** No component of the electrolyte solution is known to be an endocrine disruptor. Endocrine disruptors that find their way into the environment can cause adverse effects on aquatic and terrestrial organisms. Copper is under investigation as a potential endocrine disruptor; however, in the solid metal form of this product, this hazard is not expected to be a significant hazard.
- 12.6 RESULTS OF PBT and vPvB ASSESSMENT:** No data available. PBT and vPvB assessments are part of the chemical safety report required for some substances in European Union Regulation (EC) 1907/2006, Article 14. No component is known to present a PBT or vPvB hazard
- 12.7 ENVIRONMENTAL EXPOSURE CONTROLS:** Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.
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## 13. DISPOSAL CONSIDERATIONS

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- 13.1 WASTE TREATMENT AND DISPOSAL METHODS:** Dispose of in accordance with applicable International, Federal, State, and local procedures and standards. Batteries should be completely discharged prior to disposal and/ or the terminals taped or capped to prevent short circuit. When completely discharged it is not considered hazardous. Lithium ion batteries must be handled in accordance with all applicable state and federal laws and regulations.
- 13.1.1 U.S. and Canadian Battery Disposal:** In the U.S. Lithium ion batteries are recyclable in the U.S. through the Rechargeable Battery Recycling Corporation's (RBRC) *Charge Up to Recycle! Program*. For information call 1-800-8-BATTERY or see their website at [www.rbrc.org](http://www.rbrc.org).
- 13.1.2 EU Battery Disposal:** In the EU manufacturing, handling and disposal of batteries is regulated under Directive 2006/66/EC. Specific information on disposal of batteries by country can be found at website of the European Portable Batteries Association ([http://www.epbaeurope.net/legislation\\_national.html](http://www.epbaeurope.net/legislation_national.html)).
- 13.2 PRECAUTIONS TO BE FOLLOWED DURING WASTE HANDLING:** Do not mix different types of batteries with different chemistries in the same containers for disposal. Electrodes of each battery should be covered to prevent contact with other batteries, if packed together, to prevent possible fire.
- 13.3 U.S. EPA WASTE NUMBER:** Lithium-ion Batteries may fall into the EPA 'Universal Waste Regulations' category (40 CFR 273.2). Before a battery generated from a business or other non-household facility would be subject to the universal waste rules, it must meet the definition of a hazardous waste. If a lithium battery does not exhibit any characteristic of a hazardous waste (ignitability, corrosivity, reactivity, reactivity, or toxicity), you are not required to manage it as a universal waste or a hazardous waste.
- Some lithium batteries can be hazardous for the toxicity characteristic, due to the presence of heavy metals. In addition, some lithium batteries could be reactive hazardous waste (which carry a D003 hazardous waste code) if sufficient unreacted or unconsumed lithium remains in the spent battery.
- Under Universal Waste Regulation rules, the batteries can be sent to another universal waste handler, including a recycler, many of which accept lithium batteries, or to a permitted universal waste destination facility. If you manage such batteries as universal waste, you must:
- Package any batteries that show signs of leakage, spillage or damage in closed containers;
  - Mark the universal waste batteries or their containers with the words "Universal Waste Battery(ies)," "Waste Battery(ies)" or "Used Battery(ies);"
  - Develop a method that clearly demonstrates the length of time the batteries have been accumulated from the date they became a waste or are received; and
  - Ensure delivery of the batteries to another universal waste handler or a permitted destination facility.
- 13.3.1 Labeling/Marking Requirements for Universal Waste Batteries per 40 CFR 273.14**
- A small quantity handler of universal waste must label or mark the universal waste to identify the type of universal waste as specified below:
- 13.3.1.1 (a)** Universal waste batteries (i.e., each battery), or a container in which the batteries are contained, must be labeled or marked clearly with any one of the following phrases: "Universal Waste -- Battery(ies)," or "Waste Battery(ies)," or "Used Battery(ies)."
- 13.4 EWC WASTE CODE:** 16 06 05: Other batteries and accumulators. 16 06 06: Electrolyte from batteries and accumulators. 17 04 07 Mixed metals.



## 14. TRANSPORTATION INFORMATION

**14.1 OVERVIEW OF U.S. DOT SHIPPING OF LITHIUM BATTERIES:** The following is general information on requirements for U.S. DOT shipping requirements of lithium ion batteries, based on size and weights.

Secondary Lithium Ion Cells and Batteries Equivalent Lithium <sup>1</sup> Content Limits (Cell/Battery)	Battery Size <sup>2</sup>	Shipping Classification	Special Packaging/Markings Required
≤1.5 grams/≤8.0 grams	Small	Excepted	Yes <sup>3</sup>
Between 1.5g and 5g/ Between 8g and 25g	Medium	Class 9 <sup>4</sup>	Yes <sup>4</sup>
>5.0 g/ >25.0 g	Large	Class 9	Yes <sup>5</sup>

**Notes:**

- 1 – Equivalent Lithium Content (ELC) = 0.3 x rated capacity (Ah) x # of cells (for packs)  
 2 – The sizes noted here are based solely on U.S. DoT definitions in 49CFR. These are not the same as ICAO/IATA size definitions, or UN Manual of Tests size definitions.  
 3. – Packages containing more than 12 batteries or 24 cells must meet certain packaging, marking and shipping paper requirements.  
 4 – Must be shipped as Class 9 hazardous materials unless transported by motor vehicle or rail.  
 5 – Requires Class 9 markings, label, specified packaging and appropriate shipping papers.

**14.2 OVERVIEW OF INTERNATIONAL REGULATIONS:** International regulations vary over U.S. DOT shipping regulations and have only two size categories, as outlined in the following table.

Secondary Lithium Ion Cells and Batteries Watt-hour <sup>1</sup> Limits (Cell/Battery)	Shipping Classification	Special Packaging/Markings
20Wh / 100Wh	Excepted	Yes
>20Wh / >100Wh	Class 9	Yes

**Notes:**

- 1 – Watt-hours = rated capacity (Ah) X nominal operating voltage (V).

**14.3** For all shipments by all modalities, the illustrated hazard label and marking for all packagings must be used. The need for an additional document to accompany the consignments is no longer required. The following label must be included on outer packaging.



\* Replace with UN number(s)

\*\* Replace with telephone number for additional information (in Canada the CANUTEC Emergency number cannot be used)

Each outer package must display the lithium battery mark except when a contains button cell batteries installed in equipment (including circuit boards), or no more than four lithium cells or two lithium batteries contained in equipment, where there are not more than two packages in the consignment.

(i) The mark must indicate the UN number: “UN3480” for lithium ion cells or batteries. Where the lithium cells or batteries are contained in, or packed with, equipment, the UN number “UN3481,” must be indicated. Where a package contains lithium cells or batteries assigned to different UN numbers, all applicable UN numbers must be indicated on one or mor marks. The package must be of such size that there is adequate space to affix the mark on one side without the mark being folded.

**14.4 U.S. DEPARTMENT OF TRANSPORTATION 49 CFR 172.101:** This product is classified as Dangerous Goods, per regulations of the DOT. All provisions of 40 CFR 173.185 must be met, including markings and labels. The following classification is for lithium ion batteries packed or contained within equipment:

- |  |  |
|--|--|
| <b>14.4.1 UN Identification Number:</b>                              | UN 3481  |
| <b>14.4.2 Hazard Materials Description and Proper Shipping Name:</b> | Lithium ion batteries contained in equipment or lithium ion batteries packed within equipment (including lithium ion, polymer batteries) |
| <b>14.4.3 Hazard Class or Division:</b>                              | 9 (Miscellaneous Lithium Battery)  |
| <b>14.4.4 Packing Group:</b>   | II   |
| <b>14.4.5 Label Codes:</b>   | Class 9 (Miscellaneous Lithium Battery)  |
| <b>14.4.6 Special Provisions:</b>                                    | 181, 388, 422, A54   |
| <b>14.4.7 Packaging:</b>   | Exceptions: 185; Bulk: 185; Non-Bulk: 185  |
| <b>14.4.8 Quantity Limitations:</b>                                  | Passenger Aircraft: 5 kg; Cargo Aircraft Only: 35 kg   |

## 14. TRANSPORTATION INFORMATION (Continued)

### 14.4 U.S. DEPARTMENT OF TRANSPORTATION 49 CFR 172.101 (continued):

14.4.9 Vessel Storage: Location: A; Other: None

14.4.10 Emergency Response Guidebook Number (2020): 147

14.4.11 Marine Pollutant: This product does not meet the criteria of a Marine Pollutant (as defined by 49 CFR 172.101, Appendix B).

14.5.1 Under U.S. DOT Hazardous Material Regulations (HMR), Special Provisions 181 and 182 may be applicable.

14.6.1 SP181: When a package contains a combination of lithium batteries contained in equipment and lithium batteries packed with equipment, the following requirements apply:

14.6.1.1 a. The shipper must ensure that all applicable requirements of §173.185 of this subchapter are met. The total mass of lithium batteries contained in any package must not exceed the quantity limits in columns (9A) and (9B) for passenger aircraft or cargo aircraft, as applicable;

14.6.1.2 b. Except as provided in §173.185(c)(3) of this subchapter, the package must be marked "UN 3091 Lithium metal batteries packed with equipment", or "UN 3481 Lithium ion batteries packed with equipment," as appropriate. If a package contains both lithium metal batteries and lithium ion batteries packed with and contained in equipment, the package must be marked as required for both battery types. However, button cell batteries installed in equipment (including circuit boards) need not be considered; and

14.6.1.3 c. The shipping paper must indicate "UN 3481 Lithium ion batteries packed with equipment," as appropriate. If a package contains both lithium metal batteries and lithium ion batteries packed with and contained in equipment, then the shipping paper must indicate both "UN 3091 Lithium metal batteries packed with equipment" and "UN 3481 Lithium ion batteries packed with equipment."

14.6.2 SP182 Equipment containing only lithium ion batteries must be classified as UN 3481.

14.7 TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: Under SOR/2014-306, s. 24 and SOR/2017-137, s. 26, 2.43.1(1) A person must not handle, offer for transport or transport lithium cells and batteries under any of the following shipping names unless the cells and batteries meet the conditions set out in subsection (2) see below:

(2) The conditions are as follows:

(a) the cell or battery type passes each test set out in subsection 38.3 of Part III of the Manual of Tests and Criteria;

(b) each cell or battery has a safety venting device or is designed to prevent a violent rupture under normal conditions of transport;

(c) each cell or battery is equipped to prevent external short circuits; and

(d) each battery containing cells or a series of cells connected in parallel is equipped with diodes, fuses or other devices that prevent dangerous reverse current flow.

If these provisions are met, the following classification is applicable.

This product is classified as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following information is applicable. The following classification is for lithium ion batteries packed or contained within equipment:

14.7.1 UN No.: 3481

14.7.2 Name and Description: Lithium ion batteries contained in equipment or lithium ion batteries packed within equipment (including lithium ion, polymer batteries)

14.7.3 Hazard Class Number and Description: Class 9 (Miscellaneous Lithium Battery)

14.7.4 Packing Group: None

14.7.5 Hazard Label(s) Required: Class 9 (Miscellaneous Lithium Battery)

14.7.6 Special Provisions: 34, 123, 137, 138, 159

14.7.7 Explosive Limit and Limited Quantity Index: 0

14.7.8 Excepted Quantities: E0

14.7.9 ERAP Index: None

14.7.10 Passenger Carrying Ship Index: None

14.7.11 Passenger Carrying Road or Rail Vehicle Index: 5 kg

14.7.12 Marine Pollutant: This product does not meet the criteria of a Marine Pollutant under Transport Canada regulations, as per TDG 2.7.

In addition, Special Provision 123 (1) requires The testing requirements in subsection 38.3 of Part III of the Manual of Tests and Criteria do not apply to production runs consisting of not more than 100 cells and batteries or to pre-production prototypes of cells and batteries that are transported on a road vehicle, a railway vehicle or a vessel on a domestic voyage if:

(a) the cells or batteries are imported, offered for transport, handled or transported in accordance with Packing Instruction P910 of the UN Recommendations; and

(b) the pre-production prototypes of cells and batteries are in transport for the purpose of testing.

And: (2) Despite paragraph (1)(b), batteries that have a total mass of 12 kg or more and that have a strong, impact-resistant outer casing, or assemblies of them, may be packed in an outer means of containment or protective enclosure designed, constructed, filled, closed, secured and maintained so that under normal conditions of transport, including handling, there will be no release of the dangerous goods that could endanger public safety. The batteries or battery assemblies must be protected from short-circuit.

Shipments of recycled batteries must meet requirements under Special Provision 138: 138(1) When transported for disposal or recycling, lithium ion cells or batteries and lithium metal cells or batteries, or equipment containing those cells or batteries:

(a) are not subject to subsection 2.43.1(2) of Part 2 (Classification); and

(b) must be packed in accordance with Packing Instructions P909 or LP904 of the UN Recommendations, as applicable, whether packed with or without non-lithium cells or batteries or equipment containing those cells or batteries; and

(c) must be in a means of containment or an overpack that is marked legibly and visibly on a contrasting background with the words "Lithium batteries for disposal", "Piles au lithium destinées à l'élimination", "Lithium batteries for recycling" or "Piles au lithium destinées au recyclage", as appropriate; and

(d) are forbidden for transport by aircraft.

## 14. TRANSPORTATION INFORMATION (Continued)

### 14.7 TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS (continued):

- (1) This shipping name applies to lithium ion cells or batteries, and lithium metal cells or batteries, that are damaged or defective and do not conform to subsection 2.43.1(2) of Part 2 (Classification).
- (2) Lithium ion cells or batteries and lithium metal cells or batteries that are damaged or defective, include, but are not limited to, cells or batteries that have leaked or vented, or have sustained physical or mechanical damage, and cannot be diagnosed prior to transport, or that have been identified as being defective for safety reasons.
- (3) Lithium ion cells or batteries and lithium metal cells or batteries that are damaged or defective must be packed in accordance with Packing Instructions P908 or LP904 of the UN Recommendations, as applicable.
- (4) As applicable, the outer means of containment or the overpack must be marked legibly and visibly on a contrasting background, with the words “Damaged/Defective Lithium Ion Batteries”, “piles au lithium ionique endommagées/défectueuses”, “Damaged/Defective Lithium Metal Batteries” or “piles au lithium métal endommagées/défectueuses”.
- (5) It is forbidden to transport lithium ion cells or batteries and lithium metal cells or batteries that are damaged or defective and that, under normal conditions of transport, are liable to disassemble rapidly, react dangerously, produce a flame or a dangerous evolution of heat, or produce a dangerous emission of toxic, corrosive or flammable gases or vapours.
- (6) It is forbidden to transport by aircraft lithium ion cells or batteries and lithium metal cells or batteries that are damaged or defective.

### 14.8 INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA) per the 63rd Edition Valid

**Jan 1, 2022 to Dec. 31, 2022:** This product is classified as dangerous goods, per the International Air Transport Association. Effective April 1, 2016, lithium ion cells and batteries must be offered for transport **at a state-of-charge (SoC) not exceeding 30% of their rated design capacity**. The following classification is for lithium ion batteries packed with equipment:

- |  |   |
|--|---|
| 14.8.1 UN Identification Number:   | UN 3481   |
| 14.8.2 Proper Shipping Name/Description:   | Lithium ion batteries packed with equipment (including lithium ion, polymer batteries)  |
| 14.8.3 Hazard Class or Division:   | 9 (Miscellaneous Lithium Battery)   |
| 14.8.4 Hazard Label(s) Required:   | Class 9 (Miscellaneous Lithium Battery)   |
| 14.8.5 Packing Group:  | None  |
| 14.8.6 Excepted Quantities:  | E0  |
| 14.8.7 Passenger and Cargo Aircraft Packing Instruction:                                     | Forbidden   |
| 14.8.8 Passenger and Cargo Aircraft Packing Maximum Net Quantity per Pkg.:                   | Forbidden   |
| 14.8.9 Passenger and Cargo Aircraft Packing Limited Quantity Packing Instruction:            | 966 (applies only to shipments prior to 01-01-22)<br>967 (applies only to shipments after 12-31-21)   |
| 14.8.10 Passenger and Cargo Aircraft Packing Limited Quantity Maximum Net Quantity per Pkg.: | 5 kg  |
| 14.8.11 Cargo Aircraft Only Packing Instruction:   | 966 (applies only to shipments prior to 01-01-22)<br>967 (applies only to shipments after 12-31-21)   |
| 14.8.12 Cargo Aircraft Only Maximum Net Quantity per Pkg.:                                   | 35 kg   |
| 14.8.13 Special Provisions:  | For Packing Instruction 966: A88, A99, A154, A164, A181, A185, A206, A213, A802 (see above)<br>For Packing Instruction 967: A48, A88, A99, A154, A164, A181, A185, A206, A213, A220 (see above) |
| 14.8.14 ERG Code:  | 12FZ  |

### 14.9 INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO) per Edition 40-20 (V15) 2020-

**2022:** This product is classified as dangerous goods, per the International Maritime Organization. The following classification is for lithium ion batteries packed or contained within equipment:

- |                              |  |
|------------------------------|--|
| 14.9.1 UN No.:               | 3481   |
| 14.9.2 Proper Shipping Name: | Lithium ion batteries contained in equipment or lithium ion batteries packed within equipment (including lithium ion, polymer batteries) |
| 14.9.3 Hazard Class Number:  | 9 (Miscellaneous Lithium Battery)  |
| 14.9.4 Hazard Label:         | Class 9 (Miscellaneous Lithium Battery)  |
| 14.9.5 Packing Group:        | None   |
| 14.9.6 Special Provisions:   | 188, 230, 310, 348, 360, 376, 377, 384, 387, 390   |
| 14.9.7 Limited Quantities:   | 0  |
| 14.9.8 Excepted Quantities:  | E0   |
| 14.9.9 Packing Instructions: | Instructions: P903, P908, P909, P910, P911, LP903, LP904, LP905, LP906; Provisions: None   |
| 14.9.10 IBC Information:     | Instructions: None, Provisions: None   |
| 14.9.11 Tanks:               | Instructions: None, Provisions: None   |
| 14.9.12 EmS:                 | F-A, S-I   |
| 14.9.13 Stowage Category:    | Category A, SW19   |
| 14.9.14 Segregation:         | None   |
| 14.9.15 Marine Pollutant:    | No component is a Marine Pollutant under UN criteria or is specifically listed in the MARPOL 73/78 Annex III.                            |

### 14.10 EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY

**ROAD (ADR) as of January 2021 ECE/TRANS/300:** This product is classified by the Economic Commission for Europe to be dangerous goods. The following classification is for lithium ion batteries packed in or contained within equipment:

- |                               |  |
|-------------------------------|--|
| 14.10.1 UN No.:               | 3481   |
| 14.10.2 Name and Description: | Lithium ion batteries contained in equipment or lithium ion batteries packed within equipment (including lithium ion, polymer batteries) |
| 14.10.3 Class:                | Class 9 (Miscellaneous Lithium Battery)  |
| 14.10.4 Classification Code:  | M4   |
| 14.10.5 Packing Group:        | None   |
| 14.10.6 Labels:               | 9A   |

## 14. TRANSPORTATION INFORMATION (Continued)

### 14.10 EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR) as of January 2021 ECE/TRANS/300 (continued):

14.10.7	Special Provisions:	188, 230, 310, 348, 360, 376, 377, 387, 390, 670
14.10.8	Limited Quantities:	0
14.10.9	Excepted Quantities:	E0
14.10.10	Packing Instructions:	Instructions: P903, P908, P909, P910, P911, LP903, LP904, LP05, LP-6
14.10.11	Special Packing Provisions:	None
14.10.12	Mixed Packing Provisions:	None
14.10.13	Portable Tanks and Bulk Containers:	None
14.10.14	Transport Category (Tunnel Restriction Code):	2(E)
14.10.15	Hazard Identification No.:	None

Lithium batteries are not subject to the provisions of ADR if they meet the requirements of Special Provision 188 of Chapter 3.3. Refer to the ADR regulations for full information on this provision.

### 14.11 AUSTRALIAN FEDERAL OFFICE OF ROAD SAFETY CODE FOR THE TRANSPORTATION OF DANGEROUS GOODS BY ROAD OR RAIL, Edition 7.7, 2020: This product is classified as dangerous goods under the Australian Dangerous Goods Code.

#### 14.11.1 2.9.4 LITHIUM BATTERIES

Cells and batteries, cells and batteries contained in equipment, or cells and batteries packed with equipment, containing lithium in any form must be assigned to UN Nos. 3090, 3091, 3480 or 3481 as appropriate. They may be transported under these entries if they meet the following provisions:

- Each cell or battery is of the type proved to meet the requirements of each test of the Manual of Tests and Criteria, Part III, sub-section 38.3; Cells and batteries manufactured according to a type meeting the requirements of sub-section 38.3 of the Manual of Tests and Criteria, Revision 3, Amendment 1 or any subsequent revision and amendment applicable at the date of the type testing may continue to be transported, unless otherwise provided in this Code. Cell and battery types only meeting the requirements of the Manual of Tests and Criteria, Revision 3, are no longer valid. However, cells and batteries manufactured in conformity with such types before 1 July 2003 may continue to be transported if all other applicable requirements are fulfilled.

**NOTE:** Batteries are to be of a type proved to meet the testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3, irrespective of whether the cells of which they are composed are of a tested type.

- Each cell and battery incorporates a safety venting device or is designed to preclude a violent rupture under conditions normally incident to transport;
- Each cell and battery is equipped with an effective means of preventing external short circuits;
- Each battery containing cells or series of cells connected in parallel is equipped with effective means as necessary to prevent dangerous reverse current flow (e.g., diodes, fuses, etc.);
- Cells and batteries must be manufactured under a quality management programme that includes:
  - A description of the organisational structure and responsibilities of personnel with regard to design and product quality;
  - The relevant inspection and test, quality control, quality assurance, and process operation instructions that will be used;
  - Process controls that should include relevant activities to prevent and detect internal short circuit failure during manufacture of cells;
  - Quality records, such as inspection reports, test data, calibration data and certificates. Test data must be kept and made available to the competent authority upon request;
  - Management reviews to ensure the effective operation of the quality management programme;
  - A process for control of documents and their revision;
  - A means for control of cells or batteries that are not conforming to the type tested as mentioned in (a) above;
  - Training programmes and qualification procedures for relevant personnel; and
  - Procedures to ensure that there is no damage to the final product.

**NOTE:** In house quality management programmes may be accepted. Third party certification is not required, but the procedures listed in (i) to (ix) above must be properly recorded and traceable. A copy of the quality management programme must be made available to the competent authority upon request.

- Lithium batteries, containing both primary lithium metal cells and rechargeable lithium ion cells, that are not designed to be externally charged (see special provision 387 of Chapter 3.3) shall meet the following conditions:
  - The rechargeable lithium ion cells can only be charged from the primary lithium metal cells;
  - Overcharge of the rechargeable lithium ion cells is precluded by design;
  - The battery has been tested as a lithium primary battery;
  - Component cells of the battery shall be of a type proved to meet the respective testing requirements of the Manual of Tests and Criteria, part III, sub-section 38.3.

#### 14.11.2 The following classification is for lithium ion batteries contained or packed in equipment:

14.11.2.1	UN No.:	3481
14.11.2.2	Name and Description:	Lithium ion batteries contained in equipment or lithium ion batteries packed within equipment (including lithium ion, polymer batteries)
14.11.2.3	Class or Division:	9 (Miscellaneous Lithium Battery)
14.11.2.4	Packing Group:	None
14.11.2.5	Labels:	Class 9 (Miscellaneous Lithium Battery)
14.11.2.5	Special Provisions:	188, 230, 310, 348, 360, 376, 377, 384, 387
14.11.2.6	Limited Quantities:	0
14.11.2.7	Packing and IBCs:	Instructions: P903, P908, P909, P910, P910, P911, LP903, LP904; LP906 Special Packing Provisions: None
14.11.2.8	Portable Tanks and Bulk Containers:	Instructions: None, Special Provisions: None
14.11.2.9	Hazard Identification No.:	None
14.11.2.10	HazChem Code:	2Y
14.11.2.11	HIN Code:	(1)

14.12 IN BULK ACCORDING TO THE IBC CODE: See the information under the individual jurisdiction listings for IBC information.

14.13 ENVIRONMENTAL HAZARDS: This product and its components do not meet the criteria of environmentally hazardous according to the criteria of the UN Model Regulations (as reflected in the IMDG Code, ADR, RID, and ADN);

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## 14. TRANSPORTATION INFORMATION (Continued)

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**14.14** This lithium ion battery pack is shipped according to the applicable transportation regulations listed on this SDS:

- ❖ U.S. Department of Transportation (DOT) Subchapter C of the Hazardous Materials Regulations,
- ❖ UN Recommendations on the Transport of Dangerous Goods,
- ❖ International Civil Aviation Organization (ICAO) Technical Instruction for the Safe Transport of Dangerous Goods by Air,
- ❖ International Aviation Transportation Association (IATA) Dangerous Goods Regulations,
- ❖ International Maritime Organization (IMO),
- ❖ Transport Canada Transportation of Dangerous Goods Regulations (TDG),
- ❖ European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR),
- ❖ Singapore Standard 286: Part A, and
- ❖ Australian Federal Office of Road Safety Code for the Transportation of Dangerous Goods by Road or Rail.

**14.15** This lithium ion battery pack may be shipped according to the special provisions, exceptions and exemptions specified in the regulations listed above. Always refer to the latest transportation regulations prior to shipping this product as regulations may have changed.

**14.15.1 LITHIUM ION BATTERY PACK (Li-Ion BP) CHARACTERISTICS FOR TRANSPORTATION CLASSIFICATION:**

Li-Ion BP is a Small Secondary Rechargeable Battery containing 3 Lithium ion cells:

1. Energy Rating
  - a. Nominal (Li-Ion BP) Amp Hour rating is 2.300Ahr
  - b. Nominal (Li-Ion BP) energy is 24.42 Wh.
  - c. Li-Ion BP Wh rating is marked on the outside of each individual battery case
2. Li-Ion BP Cell Chemistry is not Lithium Metal
  - a. Li-Ion BP cell chemistry is Lithium ion
  - b. Li-Ion BP is rechargeable
  - c. Li-Ion BP Equivalent Lithium Content (ELC) is 1.98 gram/battery
  - d. ELC of each cell within battery is 0.66 g.
3. Weight
  - a. Li-Ion BP weight is 205 grams without packaging or booklet
4. UN Manual of Tests and Criteria, Part III, Subsection 38.3
  - a. Li-Ion BP Assembly has passed Tests 1 through 8.
  - b. Li-Ion BP Cells have passed Tests 1 through 8
  - c. Documentation confirming the batteries have been so tested is available on Brady website.
5. Li-Ion BP has Built-In Safety Features
  - a. Li-Ion BP has internal short-circuit protection circuit
  - b. Li-Ion BP has internal circuitry designed to prevent reversed polarity current flow
6. Li-Ion BP has passed 1.2 M Drop Test
  - a. Individual batteries have passed 1.2 M Drop Test
  - b. Fully packed carton as shipped from manufacturer has passed 1.2 M Drop Test
7. Li-Ion BP is not considered a marine pollutant
8. Li-Ion BP has solid cathode.

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## 15. REGULATORY INFORMATION

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**15.1 INTERNATIONAL CHEMICAL INVENTORIES:** This product is considered an article under the chemical inventories listed below and consequently is exempt from listing on these inventories:

- U.S. EPA Toxic Substance Control Act (TSCA)
- Canadian DSL Inventory
- Canadian Chemical Registration Regulations (NDSL/DSL)
- European Inventory of Existing Chemical Substances (EINECS/ELINCS)
- Singapore Code of Practice on Pollution Control Requirements
- Australian Inventory of Chemical Substances (AICS)
- Japanese Existing and New Chemical Substance List (ENCS)
- Korean Existing Chemicals List (ECL)
- Chinese Inventory of Existing Chemicals List (IECSC)

However, based on the rules enforced with regards to the marketing and use of chemicals to manufacture this product, each chemical component of this finished product has been listed or exempt from the listed chemical inventories.

**15.2 OTHER INTERNATIONAL REGULATIONS:** As an article this product has no requirements under the following U.S. and International regulations:

- U.S. SARA Reporting & Threshold Planning Quantity (TPQ) Requirements
- U.S. CERCLA Reportable Quantity (RQ)
- California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)
- Canadian WHMIS Regulations (Hazardous Products Act, 6&7, Part II (Sections 11 and 12)).
- Canadian Environmental Protection Agency (CEPA) Priorities Substances Lists
- European Union CLP EC 1272/2008: Labeling and Classification
- European Union REACH
- Australian Workplace Standard
- Australian Standard for the Uniform Scheduling of Drugs and Poisons
- Japanese Minister of International Trade and Industry (MITI).
- Japanese Poisonous and Deleterious Substances Control Law
- Singapore Code of Practice on Pollution Control Requirements
- New Zealand HNSO Regulations

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## 15. REGULATORY INFORMATION (Continued)

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### 15.3 EUROPEAN UNION REGULATIONS:

- 15.3.1 Chemical Safety Assessment:** No Data Available. The chemical safety assessment is required for some substances according to European Union Regulation (EC) 1907/2006, Article 14.
- 15.3.2 Substances of Very High Concern (SVHC) Status:** Undetermined.
- 15.3.3 EU RoHS Directive 2011/65/EU:** Internal circuitry of Li-ion BP is RoHS compliant.
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## 16. OTHER INFORMATION

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**16.1 REFERENCES AND DATA SOURCES:** Contact the supplier for information.

**16.3 METHODS OF EVALUATING INFORMATION FOR THE PURPOSE OF CLASSIFICATION:** Bridging principles were used to classify this product.

### 16.3 REVISION DETAILS:

October 2020: Review all sections for current formatting under UN GHS European Union CLP EC 1272/2008 & the 8<sup>h</sup> ATP 2016/918. Addition of required headings, subheadings under Canadian WHIMIS 2015. Addition of calculated ATE toxicity values for the electrolyte solution in Sections 1 and 11. Review exposure limits in place for components of the electrolyte solution in Section 8. Review and up-date of EPA waste disposal categories. Review and up-date of all shipping classifications by all modalities.

November 2021: Up-date SDS for changes in component formulations. Review of GHS component classifications and up-date as necessary, Section 3. Review for changes in exposure limits, Section 8. Review of shipping regulations; up-date IATA, Section 14. Review of country regulations, Section 15. Up-date of Section 16.

**16.4 PREPARED BY:** CHEMICAL SAFETY ASSOCIATES, Inc. • PO Box 1961, Hilo, HI 96721 • (800) 441-3365 • (808) 969-4846

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