ThermoFisher SCIENTIFIC

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March 18, 2015

Subject: Li-Ion Batteries in Thermo Scientific Model First Defender RM and RMX Series Instruments

To Whom It May Concern:

The Model First Defender RM and RMX series instruments manufactured by Thermo Fisher Scientific use both Lithium Ion Batteries and Lithium Metal Batteries.

The Lithium Ion Batteries are Model 990456D battery packs manufactured by Microsun Technologies LLC of Lisle Illinois who is now owned by Palladium Energy of Lisle Illinois. These Model 990456D battery packs use ICP103450CA cells manufactured by Molicel of Maple Ridge, B.C, Canada. For these cells, Molicel provides the attached SDS information and Microsun Technologies supplies certification of successful completion of the required UN tests for li-ion battery transport.

The Lithium Metal Batteries are Model A123 Batteries by SureFire. SureFire repackages these batteries from Panasonic's Model CR123A battery. Panasonic has provided Product Safety information which also contains certification of successful completion of the required UN tests for Lithium Metal Battery transport.

If you have any further questions about these batteries, please contact the following

- Palladium Energy at (630)-328-1961 or their contact form webpage at http://www.palladiumenergy.com/contact-palladium-energy.html .
- SureFire at 1-714-545-9444
- Molicel at (604) 466-6654 or by email at molicel@molienergy.com.
- Panasonic North and Latin America at 1-800-211-PANA (7262)
- Thermo Fisher Scientific Customer Support at 978-670-7460.

Sincerely,

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SAFETY DATA SHEET

This Safety Data Sheet meets or exceeds the requirements of the Canadian Controlled Product Regulations (WHMIS), the United States Occupational Safety and Health Administration (OSHA) hazard communication standard, the Australian National Occupational Health and Safety Commission (NOHSC), the Taiwan Bureau of Standards, Metrology & Inspection (BSMI), the Japan Ministry of Economy, Trade and Industry (METI), the General Administration of Quality Supervision, Inspection and Quarantine of the People's Republic of China(GB/T 16483-2008) and the European Union Commission Regulation (EC) No 1907/2006.

1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1. Product Identifier

Name of the substance: Molicel Rechargeable Lithium-ion cells and multi-cell battery packs.

Product Codes:
IBR18650*, ICR18650*, IMR18650*, INR18650*, IHR18650*, ICP103450*, ICP1003450*, IBR26700*, IMR26700*, MCR1821*, ME202*.
*Product codes can be followed by letters and/or numbers (A -ZZ, 0-9) which denote model designations.
List of models can be found in section 16 of this SDS.

Identification Number: Not applicable
Registration Number: Not applicable

Synonyms: Lithium-ion Cell, Lithium-ion Pack, Lithium-ion Battery, Li-Ion Cell, Li-Ion Pack, Li-Ion Battery. Synonyms may be preceded by the brand name Molicel and followed by the product code and model designation. For example: Molicel Lithium-ion Battery ME202C, Molicel Lithium-ion Cell ICR18650J.

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Version number: AE
Revision Date: 08-May-2015
Supersedes Date: 04-May-2015

1.2. Relevant identified uses of the substance or mixture and uses advised against.

Identified uses: Rechargeable Lithium-ion cell for single cell or Multi-cell lithium-ion battery packs.
Restrictions on Use: For use as a battery-based power supply only. Do not rupture or expose solution inside of the cell or pack.

1.3. Details of the supplier of the safety data sheet.

Supplier Name: E-One Moli Energy (Canada) Ltd.	**Factory Name: E-One Moli Energy Corp. (Taiwan)**
Address: 20,000 Stewart Crescent Maple Ridge, B.C., Canada, V2X9E7	**Address: No.10 Dali 2nd Road, Tainan Science Park Shan-Hwa, Tainan County, 741, Taiwan**
E-Mail: molicel@molienergy.com	**E-Mail: service@molicel.com**
Telephone: (604) 466-6654	**Telephone: 886-6-5050666**

1.4. Emergency telephone number

24 hour emergency number within North America: CANUTEC (613) 996-6666, collect calls accepted. (*666 on a cellular phone In Canada Only).

1.5 Details of the local distributor or agent of the products listed on the safety data sheet.

Distributor/Agent Name: **Telephone:**
Address: **Email:**
Other Information:

2. Hazards Identification

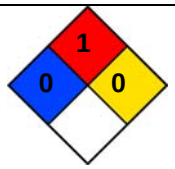
Protective Clothing	NFPA Rating (USA)	EC Classification	WHMIS (Canada)	SafeWork (Australia)
Not required with normal use.		Not classified as hazardous	Not applicable with normal use.	Not classified as hazardous
GHS Hazard Symbol	**IATA**	**JIS (Japan)**	**Taiwan**	**China**
Not applicable with normal use.		Not classified as hazardous	Not classified as hazardous	Not classified as hazardous

Table 1

2.1. Classification of the substance or mixture.

2.1.1. Preparation Hazards and Classification: The product is a Lithium ion cell or battery and is therefore classified as an article and is not hazardous when used according to the recommendations of the manufacturer. The hazard is associated with the contents of the cell or battery. Under recommended use conditions, the electrode materials and liquid electrolyte are non-reactive provided that the cell or battery integrity remains and the seals remain intact. The potential for exposure should not exist unless the cell or battery leaks, is exposed to high temperatures or is mechanically, electrically or physically abused/damaged. If the cell or battery is compromised and starts to leak, based upon the battery ingredients, the contents are classified as Hazardous.

2.1.2. Classification according to Directive 67/548/EEC or 1999/45/EC as amended: Not applicable.

2.1.3. Classification according to Regulation (EC) No. 1272/2008 as amended: Not applicable.

2.1.4. Hazard Summary

Physical hazards: Not classified for physical hazards.
Health hazards: Not classified for health hazards.
Environmental hazards: Not classified for hazards to the environment.
Specific hazards: Exposure to contents of an open or damaged cell or battery: contact with this material will cause burns to the skin, eyes and mucous membranes.
May cause sensitization by skin contact.
Main Symptoms: Symptoms include itching, burning, redness and tearing.

2.2. Label elements

2.2.1. Label according to Regulation (EC) No. 1272/2008 as amended.

Identification Number: Not applicable.
Hazard pictograms: Not applicable.
Signal word: Not applicable.
Hazard statements: Not applicable under normal use in accordance with United Nations Conference on Environmental and Development (UNCED) and Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1200. The article does not meet the criteria for classification.

Precautionary Statement(s) Prevention	P102: Keep out of reach of children. P103: Read label prior to use. P202: Do not handle until all safety precautions have been read and understood. P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking. P234: Keep only in original container. P254: Wash hands thoroughly after handling.
Response (If cell/battery leaks)	P260: Do not breathe vapor or spray. P280: Wear protective gloves/protective clothing/eye protection/face protection. P301/330/331: IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. P303/361/353: IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P304/340: If INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. P305/351/338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310: Immediately call a POISON CENTER or doctor/physician. P363: Wash contaminated clothing before reuse. P370: In case of fire: Use carbon dioxide, dry chemical or water extinguisher.
Storage (Store as indicated in Section 7)	P402: Store in a dry place. P405: Store locked up. P410: Protect from sunlight.
Disposal	P406: Store any spilled/leaking electrolyte material in a corrosive resistant container with a resistant inner liner. P501: Dispose of batteries in accordance with applicable hazardous waste regulations.

Table 2

Supplemental label information: None.

2.3. Other Hazards.

2.3.1. Appearance, Color and Odor: Solid object with no odor.

2.3.2. Primary Routes(s) of Exposure: These chemicals are contained in a sealed enclosure. Risk of exposure occurs only if the cell or pack is mechanically, thermally, electrically or physically abused to the point of compromising the enclosure. If this occurs, exposure to the electrolyte solution contained within can occur by inhalation, ingestion, eye contact and skin contact.

2.3.3. Potential Health Effect(s):

2.3.3.1. Acute (short term): see Section 8 for exposure controls.

In the event that this cell or pack has been ruptured, the electrolyte solution contained within the cell would be corrosive and can cause burns to skin and eyes.

Inhalation: Inhalation of materials from a sealed cell is not an expected route of exposure. Vapors or mists from a ruptured cell may cause respiratory irritation.

Ingestion: Swallowing of materials from a sealed cell is not an expected route of exposure. Swallowing the contents of an open cell can cause serious chemical burns to mouth, esophagus, and gastrointestinal tract.

Skin: Contact between the cell and skin will not cause any harm. Skin contact with the contents of an open cell can cause severe irritation or burns to the skin.

Eye: Contact between the cell and the eye will not cause any harm. Eye contact with the contents of an open cell can cause severe irritation or burns to the eye.

2.3.3.2. CHRONIC (long term): see Section 11 for additional toxicological data.

2.3.4. Medical Conditions Aggravated by Exposure: Not Available.

2.3.5. Interactions with other chemicals: Immersion in high conductivity liquids may cause corrosion and breaching of the cell or battery enclosure. The electrolyte solution inside of the cells may react with alkaline (basic) materials and present a flammability hazard.

2.3.6. Potential Environmental Effects: Not Available.

3. Composition/information on ingredients

3.1. As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use.

Canada: This is not a controlled product under WHMIS. This product meets the definition of a “manufactured article” and is not subject to the regulations of the Hazardous Products Act.

USA: This cell or battery is an article pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement. The information contained in this Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

Australia: The product is a Lithium-ion cell or battery and is therefore classified as an article and is not hazardous when used according to the recommendations of the manufacturer. The hazard is associated with the contents of the cell or battery. If the cell or battery is compromised and starts to leak, based upon the battery ingredients, the contents are classified as Hazardous according to the criteria of the National Occupational Health and Safety Commission (SafeWork Australia).
EU: This product is an article according to the REACH Regulation (1907/2006).
Taiwan: This product is not classified as a dangerous good.
Japan: This product is not classified as a dangerous good.
China: This product is not classified as a dangerous good.

Cell Component	Chemical Name	CAS No.	EINECS	*Concentration range in electrolyte (w/w %)	*Mass range in cell (g/g %)	GHS Classification
Electrolyte	Contains Electrolyte salt and solvents.				5-20	Skin Corr 1B – H314
Electrolyte salt	Lithium hexafluorophosphate	21324-40-3	244-334-7	5-30	1-5	-
Electrolyte solvents	Includes one or more of the following; Ethylene Carbonate Propylene Carbonate Diethyl Carbonate Dimethyl Carbonate Ethyl Methyl Carbonate	 96-49-1 108-32-7 105-58-8 616-38-6 623-53-0	 202-510-0 203-572-1 203-311-1 210-478-4 Not Listed	70-95	5-20	-
PVDF	Polyvinylidenfluoride	24937-79-9	Not Listed	-	<1	-
Copper	Cu	7440-50-8	231-159-6	-	9-18	-
Aluminium	Al	7429-90-5	231-072-3	-	17-27	-
Cathode	Includes one or more of the following; Lithium Cobaltite Manganese Nickel Aluminum	 12190-79-3 7439-96-5 7440-02-0 7429-90-5	 235-362-0 231-105-1 231-111-4 231-072-3	-	0-50	-
Anode	Includes one or more of the following; Graphite Carbon Black	 7782-42-5 1333-86-4	 231-955-3 215-609-9	-	13-18	-
Steel, Nickel, and inert components		Various	Various	-	Balance	-

Table 3

*Quantities may vary depending on cell or battery model.

4. First Aid Measures

4.1. Description of first aid measures

The hazardous components of this cell or battery are contained within a sealed unit. The following measures are only applicable if exposure has occurred to components when a cell or battery leaks, is exposed to high temperatures or is mechanically, electrically or physically abused/damaged. The hazardous contents are caustic alkaline electrolytes contained in cells with lithium metal oxide cathodes, graphite and carbon anodes and Polyvinylidenfluoride binders.

Ingestion: Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. Quickly transport victim to an emergency care facility.
EYE: If eye contact with contents of an open cell occurs, immediately flush the contaminated eye(s) with water. Quickly transport victim to an emergency care facility.
Skin Contact: Immediately flush with water. If irritation or pain persists, seek medical attention.
Inhalation: Remove the patient from exposure into fresh air, seek medical attention.

PROTECTION FOR FIRST AIDERS: Do not enter corrosive vapor contaminated areas without a respirator or Self Contained Breathing Apparatus. Wear adequate personal protective equipment as indicated in Section 8.

FIRST AID FACILITIES: Eye wash bottle, fountain, safety showers or at least a source of running water are required in the area where the product is used.

4.2 MOST IMPORTANT SYMPTOMS & EFFECTS, ACUTE & DELAYED, CAUSED BY EXPOSURE:

ACUTE: The contents of the battery are rated as corrosive. Ingestion of the electrolyte could lead to severe gastrointestinal tract irritation with nausea, vomiting and potentially burns. Inhalation of vapors may lead to severe irritation of the mouth and upper respiratory tract with a burning sensation, pain, burns and inflammation in the nose and throat; there may also be coughing or difficulty breathing. Eye contact may lead to severe eye irritation or in worst case scenario irreversible damage and possible eye burns. Skin contact may lead to irritation and possible skin burns.

CHRONIC: Skin contact may aggravate/exacerbate existing skin conditions, such as dermatitis. Chronic inhalation may lead to the same symptoms as listed for acute inhalation above.

4.3 Indication of any immediate medical attention and special treatment needed

ADVICE TO DOCTOR: Treat symptomatically if the person comes into contact with the corrosive electrolyte liquid contents of a damaged battery.

5. Fire Fighting Measures

5.1 Extinguishing media

- **5.1.1 Suitable extinguishing media:** Dry chemical, carbon dioxide and foam. Water acts as a cooling agent.
- **5.1.2 Unsuitable extinguishing media:** Strong oxidizing agents, strong reducing agents, strong acids and strong alkalis. **Despite water incompatibility, water is the most effective firefighting tool to control the spread of fire to other cells and batteries and combustibles.**
- **5.1.3 Explosion Data:** Closed containers may explode, burst, rupture or vent when exposed to temperatures above 120°C (248°F).
- **5.1.4 Hazchem Code (**Australia, New Zealand, UK and Malaysia**): 4W**
- **5.1.5 Sensitivity to Mechanical Impact:** Extreme mechanical abuse will result in rupture of the individual battery cells.
- **5.1.6 Sensitivity to Static Discharge:** Electrostatic discharges imposed directly on the spilled electrolyte may start combustion.

5.2 Special hazards arising from the Chemical:

The interaction of water vapor and exposed lithium hexafluorophosphate (LiPF6) may result in the generation of hydrogen and hydrogen fluoride (HF) gas. Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes. Thermal degradation may produce hazardous fumes of lithium, cobalt and manganese, hydrofluoric acid, hydrogen and oxides of carbon, aluminum, lithium, copper and cobalt as well and smoke and irritating, corrosive and/or toxic gases. Fumes may cause dizziness or suffocation.

5.3 Advice for firefighters:

In case of fire where lithium-ion cells and batteries are present, flood the area with water. If any cells or batteries are burning, water may not extinguish them, but will cool the adjacent cells or batteries and control the spread of fire. Carbon Dioxide, dry chemical and foam extinguishers may be preferred for small fires, but also may not extinguish burning lithium-ion cells or batteries. Burning cells or batteries will burn themselves out. Virtually all fires involving lithium-ion cells and batteries can be controlled with water. When water is used, however, hydrogen gas may be evolved which can form an explosive mixture with air. LITH-X (powdered graphite) or copper powder fire extinguishers, sand, dry ground dolomite or soda ash may also be used. These materials act as smothering agents.

5.4 Protective Equipment and Precautions for firefighters:

In the case of a fire and the release of hydrogen fluoride, it is critical to protect the skin from any contact. Fire fighters should wear a self-contained breathing apparatus. Burning lithium-ion cells and batteries can produce toxic fumes including hydrogen fluoride (HF), oxides of carbon, aluminum, lithium, copper and cobalt. Volatile phosphorous penta fluoride may form at temperatures above 110°C (230°F). Wear adequate personal protective equipment as indicated in Section 8.

6. Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures:

6.1.1. As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed areas before entering. Wear adequate personal protective equipment as indicated in Section 8.

6.2. Environmental precautions

6.2.1. Absorb spilled material with non-reactive absorbent such as vermiculite, clay or earth. Prevent from migration into soil, sewers and natural waterways – inform local authorities if this occurs.

6.3. Methods and material for containment and cleaning up

6.3.1. Evacuate spill area immediately and remove sources of ignition. Do NOT touch spilled material. Cleanup personnel must be trained in the safe handling of this product. Spills may be absorbed on non-reactive absorbents such as vermiculite. Place cells or batteries into individual plastic bags and then place into appropriate containers and close tightly for disposal. Ensure that cleanup procedures do not expose spilled material to any moisture. Immediately transport closed containers outside. Lined steel drums are suitable for storage of damaged cells or batteries until proper disposal can be arranged.

6.4. Reference to other sections

6.4.1. For information on Hazards, see Section 2 of the SDS.
6.4.2. For information on personal protective equipment, see Section 8 of the SDS.
6.4.3. For information on physical and chemical properties, see Section 9 of the SDS.
6.4.4. For information on stability and reactivity, see Section 10 of the SDS.
6.4.5. For information on environmental effects, see Section 12 of the SDS.
6.4.6. For waste disposal, see section 13 of the SDS.

7. Handling and Storage

7.1. Precautions for safe handling

Do not short circuit, open, disassemble, crush, puncture or burn cells or batteries.
Do not expose cells or batteries to extreme heat or fire.
Do not directly heat or solder cells.
Do not mix cells of different types and brands. Do not mix new and used cells or batteries.
Do not immerse cell or battery in liquids as there is a danger of short circuiting the cells or batteries.
Do not incinerate the cells or batteries as there is a danger of explosion.
Do not use or charge damaged, defective or deformed cells or batteries.
Observe good industrial hygiene practices. Wash hands thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities

7.2.1. Conditions for safe storage: Store in a cool, dry, well-ventilated area, out of direct sunlight and away from heat and ignition sources. To minimize any adverse effects on cell and/or battery performance, it is recommended that the cells and/or batteries be kept at room temperature (25°C +/- 5°C). Elevated temperatures can result in shortened cell and/or battery life. Keep out of reach of children. Store away from incompatible materials, see Section 10 of the SDS.
7.2.2. Incompatibilities: Water, strong oxidizing agents, strong reducing agents, strong acids and strong alkalis.

7.3. Specific end use(s)

7.3.1. Lithium-ion battery pack.

7.4. Links to other Sections

7.4.1. For information on recommended uses, see Section 1 of this SDS.
7.4.2. For information on accidental release measures, see Section 6 of this SDS.
7.4.3. For information on personal protective equipment, see Section 8 of this SDS.
7.4.4. For information on physical and chemical properties, see Section 9 of this SDS.
7.4.5. For information on stability and reactivity, see Section 10 of this SDS.
7.4.6. For information on toxicological information, see Section 11 of this SDS.
7.4.7. For information on environmental effects, see Section 12 of this SDS.
7.4.8. For information on transport hazard classes, see Section 14 of this SDS.

8. Exposure Controls, Personal Protection

8.1. Exposure Control Measures

8.1.1. Exposure Limit Values: Airborne exposures to hazardous substances are not expected when the cells or batteries are used for their intended purposes. Exposure standards are not applicable to the sealed articles.
8.1.2. Biological Monitoring: Not applicable.
8.1.3. Control Banding: Not applicable.
8.1.4. Recommended monitoring procedures: Follow standard monitoring procedures.
8.1.5. Derived no-effect level (DNEL): Not applicable.
8.1.6. Derived minimal effect level (DMEL): Not applicable.
8.1.7. Predicted no-effect concentrations (PNECs): Not applicable.

8.2. Engineering Controls

8.2.1. Engineering Controls: Special ventilation is not required when using these products in normal use scenarios. Ventilation is required if there is leakage from the cell or battery.

8.2.2. Individual Protection Measures

8.2.2.1. Eye and Face protection: Eye protection is not required when handling cells or batteries during normal use. Wear safety glasses/goggles if handling a leaking or ruptured cell or battery.

8.2.2.2. Skin (Hand) protection: Hand protection is not required when handling the cell or battery during normal use. PVC gloves are recommended when dealing with a leaking or ruptured cell or battery.

8.2.2.3. Skin (clothing) protection: Skin protection is not required when handling the cell or battery during normal use. Wear long sleeved clothing to avoid skin contact if handling a leaking or ruptured cell or battery. Soiled clothing should be washed with detergent prior to re-use.

8.2.2.4. Respiratory protection: During routine operation, a respirator is not required. However, if dealing with an electrolyte leakage and irritating vapors are generated, an approved half face inorganic vapor and gas/acid/particulate respirator is required.

8.2.2.5. Thermal Protection: Not applicable.

8.2.2.6. Other Protective Equipment: Have a safety shower or eye wash station readily available

.

8.2.3. Hygiene Measures: Do not eat, drink or smoke in work areas. Avoid storing food, drink or tobacco near the product. Practice and maintain good housekeeping.

8.2.4. Environmental exposure controls: Avoid release to the environment.

Respiratory Protection	Hand Protection	Eye Protection	Other
			
In all fire situations, use self-contained breathing apparatus.	In the event of leaking or ruptured cells or batteries, wear gloves.	Safety glasses are recommended in case of leaking or ruptured cells or batteries.	In the event of leaking or ruptured cells or batteries, wear protective clothing.

Table 4

9. Physical and Chemical Properties

Physical State:	Solid, Sealed Unit	**Vapor Pressure (mm Hg @ 20°C):**	Not Applicable
Appearance:	Cell or Battery Pack	**Vapor Density:**	Not Applicable
pH:	Not Applicable	**Solubility in Water:**	Insoluble
Relative Density:	Not Applicable	**Water/Oil distribution coefficient:**	Not Applicable
Boiling Point:	Not Applicable	**Odor Type:**	Odorless
Melting Point:	Not Applicable	**Odor Threshold:**	Not Applicable
Viscosity:	Not Applicable	**Evaporation Rate:**	Not Applicable
Oxidizing Properties:	Not Applicable	**Auto Ignition Temperature (°C):**	Not Applicable
Flash Point and Method (°C):	Not Applicable	**Flammability Limits (%):**	Not Applicable
Octanol/Water Partition Coefficient:	Not Applicable	**Decomposition Temperature:**	90°C

10. Stability and Reactivity

10.1. Stability and Reactivity

10.1.1. Reactivity: The cells or batteries do not pose any further reactivity hazards other than those listed in the following sub-sections.

10.1.2. Chemical Stability: The cells or batteries are stable under normal conditions of use, storage and transport.

10.1.3. Possibility of hazardous reactions: Keep away from water, strong oxidizing agents, strong reducing agents, strong acids and strong alkalis. Reaction of the leaking electrolyte materials with water may produce flammable and explosive hydrogen gas as well as corrosive hydrogen fluoride gas. Hazardous polymerization does not occur.

10.1.4. Conditions to avoid: Avoid exposing the cells or batteries to fire or temperatures above 80°C. Do not disassemble, crush, short circuit, puncture, immerse in liquid, burn, expose to flame or install with incorrect polarity. Avoid mechanical, physical or electrical abuse.

10.1.5. Incompatible materials: Do not immerse in water or other high conductivity liquids.

10.1.6. Hazardous decomposition products: May decompose to produce hydrogen fluoride, phosphorus oxides, sulfur oxides, sulfuric acid, lithium hydroxide, carbon monoxide and carbon dioxide.

10.2. Links to other Sections

10.2.1. For information on Hazards, see Section 2 of this SDS.

10.2.2. For information on fighting fires, see Section 5 of this SDS.

10.2.3. For information on accidental release, see Section 6 of this SDS.

10.2.4. For information on handling and storage, see Section 7 of this SDS.

10.2.5. For information on disposal, see Section 13 of this SDS.

11. Toxicological Information

11.1. Information on toxicological effects:

The hazardous components of the cell or battery are contained within a sealed unit. Under recommended use conditions, the electrode materials and liquid electrolyte are non-reactive provided that the cell or battery integrity remains and the seals remain intact. The potential for exposure should not exist unless the battery leaks, is exposed to high temperature or is mechanically, electrically or physically abused/damaged. **The following toxicology data is in respect to if a person comes into contact with the electrolyte.**

11.2. Acute Toxicity:

11.2.1. Swallowed: The electrolyte contained within the cell or battery is a corrosive liquid. Ingestion of this electrolyte would be harmful. Swallowing may result in nausea, vomiting, diarrhea, abdominal pain and chemical burns to the gastrointestinal tract. During normal usage ingestion should not be a means of exposure.

11.2.2. Eye: The electrolyte contained within the cell or battery is a corrosive liquid and it is expected that it would cause irreversible damage to the eyes. Contact may cause corneal burns. Effects may be slow to heal after eye contact. Correct handling procedures incorporating appropriate eye protection should minimize the risk of eye irritation.

11.2.3. Skin: The electrolyte contained within the cell or battery is a corrosive liquid and it is expected that it would cause skin burns or severe irritation to the skin if not washed off immediately. Correct handling procedures should minimize the risk of skin irritation. People with pre-existing skin conditions, such as dermatitis, should take extreme care so as not to exacerbate the condition.

11.2.4. Inhaled: Inhalation of vapors from a leaking cell or battery is expected to cause severe irritation of the mouth and upper respiratory tract with a burning sensation, pain, burns and inflammation in the nose and throat; there may also be coughing or difficulty breathing.

11.3. Skin Corrosion/Irritation: The electrolyte contained within the cell or battery is classified as a corrosive liquid and is expected to exhibit Dermal Corrosivity/Irritation.

11.4. Serious Eye Damage/Irritation: The electrolyte contained within the cell or battery is classified as a corrosive liquid and is expected to exhibit serious Damage/Corrosivity.

11.5. Respiratory or Skin Sensitization: The electrolyte contained within the cell or battery is not expected to be a skin sensitizer according to OECD test 406, based on the available data and the known hazards of the components. The electrolyte contained within the battery is not expected to be a respiratory tract sensitizer, based on the available data and the known hazards of the components.

11.6. Germ Cell Mutagenicity: The electrolyte contained within the cell or battery is not expected to be mutagenic according to test such as OECD tests 471, 475, 476, 478 and 479, based on the available data and the known hazards of the components.

11.7. Carcinogenicity: The electrolyte contained within the cell or battery is not expected to be a carcinogen. The cathode contains Cobalt and Nickel components. These components are classified as IARC 2B – possibly carcinogenic to humans, however they do not pose a threat when contained in the cell or battery sealed unit.

11.8. Reproductive Toxicity: The electrolyte contained within the cell or battery is not expected to be a reproductive hazard according to test such as OECD tests 414 and 421, based on the available data and the known hazards of the components.

11.9. Specific Target Organ Toxicity (STOT) – Single Exposure: The electrolyte contained within the cell or battery is corrosive and is expect to cause respiratory irritation by inhalation. Inhalation of vapors may lead to severe irritation of the mouth and upper respiratory tract with a burning sensation, pain, burns and inflammation in the nose and throat; there may also be coughing or difficulty breathing.

11.10. Specific Target Organ Toxicity (STOT) – Repeated Exposure: The cells or batteries are not expected to cause organ damage from prolonged or repeated exposure according to tests such as OECD tests 410 and 412, based on the available data and the known hazards of the components.

11.11. Aspiration Hazard: The cells or batteries are not classified as an aspiration hazard, based on the available data and the known hazards of the components. However, due to the corrosive nature of the product if swallowed, do NOT induce vomiting. If vomiting has occurred after ingestion the person should be observed to ensure that aspiration into the lungs has not occurred and assessed for chemical burns to the gastrointestinal and respiratory tracts.

11.12. Other Information: No additional data is available.

11.13. Links to other sections.

11.13.1. For information on hazards, see Section 2 of this SDS.
11.13.2. For information on first aid, see Section 4 of this SDS.
11.13.3. For information on accidental release, see Section 6 of this SDS.
11.13.4. For information on handling and storage, see Section 7 of this SDS.
11.13.5. For information on exposure controls and personal protection, see Section 8 of this SDS.
11.13.6. For information on the physical and chemical properties, see Section 9 of this SDS.
11.13.7. For information on disposal, see Section 13 of this SDS.
11.13.8. For information on transport hazard classes, see Section 14 of this SDS.
11.13.9. For information on regulatory, see Section 15 of this SDS.

12. Ecological Information

12.1. Ecotoxicity: The sealed cell or battery does not pose an Ecotoxicity hazard. Cells or batteries under normal use conditions pose no ecotoxicity hazard. In the case of a broken or damaged cell or battery and leakage of the electrolyte, it will react with water and potentially cause damage to flora and fauna if not disposed of properly. See Section 13 of this SDS for proper disposal considerations.
12.2. Persistence and degradability: There is currently no data available.
12.3. Bio accumulative potential: There is currently no data available.
12.3.1. Partition coefficient n-octanol/water (log Kow): Not applicable.
12.3.2. Bio concentration factor (BCF): Not available.
12.4. Mobility in soil: There is currently no data available.
12.5. Results of PBT and vPvB assessment: Not a PBT or vPvB substance or mixture.
12.6. Other adverse effects: Solid cells and batteries released into the natural environment will slowly degrade and may release harmful or toxic substances. Cells and batteries are not intended to be released into water or on land but should be disposed or recycled according to local regulations. See section 13 of this SDS for Disposal Considerations.
12.7. Links to other Sections.

12.7.1. For information on accidental release, see Section 6 of this SDS.
12.7.2. For information on disposal, see Section 13 of this SDS.
12.7.3. For information on transport hazard classes, see Section 14 of this SDS.

13. Disposal Considerations

13.1. Waste treatment methods: Cell and battery recycling is encouraged. Cells and batteries should not be released into the environment, do **NOT** dump into any sewers, on the ground or into any body of water. Do not dispose of in fire. Used cells and batteries should be stored in their original packaging, a plastic bag or with their terminals/contacts taped, to minimize the potential for short-circuiting to occur. Cells and batteries should be fully discharged before being sent for recycling. Do not store used cells or batteries near heat sources, chemicals or food. Do not store or transport used lithium-ion cells or batteries with lead acid batteries as they have different regulatory requirements. Do not break open or damage lithium-ion cells or batteries prior to disposal. Care should be taken at all times to ensure that used cells or batteries are not damaged during storage or transport. Store material for disposal as indicated in Section 7 Handling and Storage.

13.2. Classification of the waste to comply with Waste Regulations.

13.2.1. Canada: Spent cells and batteries are not considered hazardous waste. Cells and batteries involved in a fire may be considered to be hazardous waste. Dispose of in accordance with local, provincial and federal laws and regulations. Consult the Canadian Environmental Protection Act for additional details.

13.2.2. USA: Spent cells and batteries are not considered hazardous waste. Cells and batteries involved in a fire may be considered to be hazardous waste. Dispose of in accordance with local, state and federal laws and regulations. Consult universal/hazardous waste regulations for further information regarding disposal of spent batteries. If a cell or battery is leaking/broken open, consult hazardous waste regulations under US Environmental Protection Agency's Resource Conservation and Recovery Act (RCRA). Also, consult state and local regulations for further disposal requirements.

13.2.3. Australia: Spent cells and batteries must be taken for recycling or disposal at an appropriate collection depot by suitably licensed contractors in accordance with government regulations.

13.2.4. EU: Waste must be disposed of in accordance with relevant EC Directives and national, regional and local environmental control regulations. For disposal within the EC, the appropriate code according to the European Waste Catalogue (EWC) should be used.

13.2.4.1. EU Waste Code: 16 06 05 – other batteries and accumulators.

13.2.5. Taiwan: Cells and batteries are not considered hazardous waste. Cells and batteries should be recycled at an appropriate collection site in accordance with government regulations.

13.2.6. Japan: Recycling of spent lithium-ion cells and batteries is regulated by the Wastes Disposal and Public Cleaning Law and the Law for Promotion of Effective Utilization of Resources, cells and batteries should be recycled at a JBRC (Japan Battery Recycling Center) approved facility.

13.3. Classification of the waste to comply with Transport Regulations: Spent lithium-ion cells and batteries are not considered hazardous waste. Lithium-ion cells and batteries involved in a fire may be considered to be hazardous waste and should be classified as such. Damaged lithium-ion cells and batteries are explicitly prohibited from transport by air.

13.4. Classification of Packaging materials: Unsoiled excess packaging should be disposed of according to any applicable recycling regulations and is not considered hazardous waste. Soiled packaging or packaging exposed to the interior of a lithium-ion cell or battery pack should be considered hazardous waste and disposed of according to local hazardous waste rules and regulations.

14. Transport Information

Lithium-ion cells and batteries are regulated for land, sea and air transportation. It is recommended that Lithium-ion cells and batteries should not be fitted to equipment during transportation. Note: Cells and Batteries must always be protected against short-circuiting during transport. Special precautions should be undertaken when damaged or defective cells and batteries are transported. You must contact the manufacturer before transporting damaged or defective cells and batteries. It is prohibited to carry defective or damaged cells and batteries by air.
E-One Moli Energy cells and batteries are designed to comply with all applicable shipping regulations as prescribed by industry and legal standards which include compliance with the UN Recommendations on the Transport of Dangerous Goods, IATA Dangerous Goods Regulations, U.S. DOT regulations for the safe transport of lithium-ion batteries, the International Maritime Dangerous Goods Code and the Canadian Transport of Dangerous Goods regulations.

14.1. UN Number: **3480 or 3481**

14.2. UN Proper Shipping Name:
3480 – Lithium Ion Batteries.
3481 – Lithium Ion Batteries Contained in Equipment
3481 – Lithium Ion Batteries Packed with Equipment

14.3. Transport Hazard Class(es):

Class:	9
Subsidiary Risk:	-
Label(s):	9
Hazard No. (ADR):	-
Tunnel Restriction code:	E

14.4. Packing Group: II

14.5. Environmental hazards:
Marine Pollutant: No

14.6. Special Precautions for user: Read safety instructions, SDS and emergency procedures before handling.

14.7. Hazchem Code: 4W

14.8. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not Applicable

14.9. Modal Information

14.9.1. Land (ADR): 3480 – 188, 230, 310, 348 (Special packaging instruction P903 applies).
3481 – 188, 230, 248, 360 (Special packaging instruction P903 applies).

14.9.2. Land (RID): 3480 – 188, 230, 310, 348 (Special packaging instruction P903 applies).
3481 – 188, 230, 248, 360 (Special packaging instruction P903 applies).

14.9.3. Land (ADN): 3480 – 188, 230, 310, 348 (Special packaging instruction P903 applies).
3481 – 188, 230, 248, 360 (Special packaging instruction P903 applies).

14.9.4. Sea (IMDG): 188, 230, 310 (Special packaging instruction P903 applies).
EmS: F-A, S-I; Stowage Category A
IMDG Code: 9033

14.9.5. Air (IATA): A88, A99, A154, A164, A183 (Packing Instruction 965, 966, 967).
ERG Code: -
Lithium ion cell or batteries - Lithium ion batteries in compliance with Section of PI 965.
Lithium ion cell or batteries packed with equipment - Lithium ion batteries in compliance with Section of PI 966.
Lithium ion cell or batteries contained in equipment - Lithium ion batteries in compliance with Section of PI 967.
The consignment is not classified as Dangerous Goods under the current edition of the IATA 56th Edition, Dangerous goods regulation and all applicable carrier and government regulations.

15. Regulatory Information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture:

15.1.1. International Information

15.1.1.1. Montreal Protocol: Not applicable
15.1.1.2. Stockholm Convention: Not applicable
15.1.1.3. Rotterdam Convention: Not applicable
15.1.1.4. Basel Convention: Not applicable
15.1.1.5. Marpol Convention: Not applicable
15.1.1.6. UN Transportation of Dangerous Goods: All cells and batteries have passed the applicable testing.

15.1.2. Canadian Federal Regulations:

These products have been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.
WHMIS Classification: Not Controlled, manufactured article.
New Substance Notification Regulations: Lithium hexafluorophosphate is 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).
National Pollutant Release Inventory (NPRI) Substances: These products do not contain any NPRI chemicals.

15.1.3. United States Federal and State Regulations:

TSCA Status: All ingredients in these products are listed on the TSCA inventory.
OSHA: These products do not meet criteria as per Part 1910.1200, manufactured article.
SARA EPA Title III: None.
Sec. 302/304: None.
Sec. 311/312: None.
Sec. 313: None.
CERCLA RQ: None.

15.1.4. Australia and New Zealand

SUSMP: Not applicable
AICS: All ingredients are on the AICS list.
HSNO Approval number: Not applicable
HSNO Group Title: Not applicable
NOHSC:10008 Risk Phrases: R34 - Causes Burns.
NOHSC:1008 Safety Phrases:
S1 – Keep locked up.
S2 – Keep out of reach of children.
S23 – Do not breathe vapor.
S24/25 – Avoid contact with skin and eyes.
S26 – In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S27/28 – After contact with skin, take off immediately all contaminated clothing and wash immediately with plenty of water.
S36/37/39 – Wear suitable protective clothing, gloves and eye/face protection.
S56 – Dispose of this material and its container at hazardous waste or special waste collection point.
S62 – If swallowed, DO NOT induce vomiting: seek medical advice immediately and show this container or label.

S64 – If swallowed, rinse mouth with water (Only if the person is conscious).

15.1.5. EC Classification for the Substance/Preparation:

These products are not classified as hazardous according to Regulation (EC) No. 1272/2008.
Keep out of the reach of children.

15.1.5.1. EU Regulations:

Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex I: Not listed.
Regulation (EC) No. 1005/2009 on substances that deplete the ozone layer, Annex II: Not listed.
Regulation (EC) No. 850/2004 on persistent organic pollutants, Annex I as amended: Not listed.
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 1 as amended: Not listed.
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 2 as amended: Not listed.
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex I, part 3 as amended: Not listed.
Regulation (EC) No. 689/2008 concerning the export and import of dangerous chemicals, Annex V as amended: Not listed.
Regulation (EC) No. 166/2006, REACH Article 59(10) Candidate List as currently published by ECHA: Not listed.

15.1.5.2. EU Authorizations:

Regulation (EC) No. 1907/2006, REACH Annex XIV Substances subject to authorization, as amended: Not listed.

15.1.5.3. EU Restrictions on use:

Regulation (EC) No. 1907/2006, REACH Annex XVII Substances subject to restriction on marketing and use as amended: Aluminium (CAS 7429-90-5)
Directive 2004/37/EC: on the safety and health of pregnant workers and workers who have recently given birth or are breastfeeding: Not listed.

15.1.5.4. Other EU Regulations

Directive 96/82/EC (Seveso II) on the control of major accident hazards involving dangerous substances: Not listed.
Directive 94/33/EC on the protection of young people at work: Not listed.
This Safety Data Sheet complies with the requirements of Regulation (EC) No. 1907/2006.

15.1.6. Japanese Regulations

Japanese Industrial Standards (JIS) JIS Z 7253:2012
Waste disposal and public cleaning law
Law for Promotion of Effective Utilization of Resources

15.1.7. Taiwanese Regulations

Regulation of Labelling and Hazard Communication of Dangerous and Harmful Materials: Labeling requirements and other relevant provision of chemicals, this product is not classified as dangerous goods.
Toxic Chemicals Substance Control Law: Not Listed.
CNS 1030016 Safety of primary and secondary lithium cells and batteries during transport.

15.1.8. Chinese Regulations

General Rule for Classification and Hazard Communication of Chemicals (GB 13690-2009): Specifies the classification, labeling and hazard communication of chemicals in compliance with the GHS standard for chemical production sites and labeling of consumer goods.
General Rule for Preparation of Precautionary Labels for Chemicals (GB 15258-2009): Specifies the relevant application methods of precautionary labels for chemicals.
Safety Data Sheet for Chemical Products Content and Order of Sections (GB/T 16483-2008)

15.1.9. Other Regulations

None Listed.

15.2. Chemical Safety Assessment: Not applicable.

16. Other Information

Preparation Date: May 1st, 2015
Prepared by: E-One Moli Energy (Canada) Limited. 20,000 Stewart Crescent, Maple Ridge, British Columbia, Canada V2X 9E7.

Revisions:

AA: (October 2014) First Release
AB: (January 2015) Document wide: Minor corrections to formatting and tab spacing. Section 1.3, added factory address. Section 1.4, indicated collect number to call.

Section 2.0, Table 1 – added IATA, Taiwan, Japan and China entries. Section 3.1, added Taiwan, Japan and China entries. Section 13.2, added Taiwan and Japan disposal information subsections. Section 13.4, added classification of packaging materials. Section 15, added Japanese, Taiwanese and Chinese regulatory information. Section 16, updated Acronyms, added Japanese, Taiwanese and Chinese references to the disclaimer.
AC: (March 2015) Section 14.9.5 , added the transport by air detail information.
AD: (May 2015) Section 3.1, Table 3, spelling and CAS number correction.
AE: (May 2015) Section 16, added cell and pack capacity table to include watt hour rating and ELC.

Cell and pack capacities and watt hour ratings:

Model Number	Nominal Voltage (V)	Typical Capacity (Ah)	Watt Hour Rating (Wh) (Volts x Ah)	Equivalent Lithium Content (g) (cell Ah x 0.3 x #cells)
IBR18650B/BB/BC	**3.60V**	**1.50Ah**	**5.40Wh**	**0.45g**
IBR26700A	**3.75V**	**2.80Ah**	**10.50Wh**	**0.84g**
ICP1003450B	**3.70V**	**1.80Ah**	**6.66Wh**	**0.54g**
ICP103450CA	**3.70V**	**1.96Ah**	**7.25Wh**	**0.59g**
ICP103450DA	**3.70V**	**2.20Ah**	**8.14Wh**	**0.66g**
ICR18650H	**3.70V**	**2.20Ah**	**8.14Wh**	**0.66g**
ICR18650J	**3.70V**	**2.37Ah**	**8.77Wh**	**0.71g**
ICR18650K	**3.70V**	**2.60Ah**	**9.62Wh**	**0.78g**
ICR18650M	**3.70V**	**2.80Ah**	**10.36Wh**	**0.84g**
IHR18650B	**3.60V**	**2.25Ah**	**8.10Wh**	**0.68g**
IHR18650BL	**3.50V**	**2.00Ah**	**7.00Wh**	**0.60g**
IHR18650BN	**3.60V**	**2.20Ah**	**7.92Wh**	**0.66g**
IHR18650C	**3.60V**	**2.05Ah**	**7.38Wh**	**0.62g**
IMR18650E	**3.80V**	**1.40Ah**	**5.32Wh**	**0.42g**
IMR26700A	**3.80V**	**2.90Ah**	**11.02Wh**	**0.87g**
INR18650A	**3.60V**	**2.55Ah**	**9.18Wh**	**0.77g**
MCR1821J	**7.40V**	**2.40Ah**	**17.76Wh**	**1.44g (2 cells)**
ME202CJ	**11.10V**	**7.20Ah**	**79.92Wh**	**6.48g (9 cells)**
ME202EK	**11.10V**	**7.80Ah**	**86.58Wh**	**7.02g (9 cells)**

Acronyms:

SUSMP	Standard for the Uniform Scheduling of Medicines and Poisons
CAS Number	Chemical Abstracts Service Registry Number
EINECS	European Inventory of Existing Commercial Chemical Substances
UN	Number United Nations Number
OSHA	Occupational Safety and Health Administration
ACGIH	American Conference of Governmental Industrial Hygienists
IMDG	International Maritime Dangerous Goods
IATA	International Air Transport Association
IUCLID	International Uniform Chemical Information Database
RTECS	Registry of Toxic Effects of Chemical Substances
R-Phrase	Risk Phrases
S-Phrase	Safety Phrases
%W/W	Percent weight for weight
OECD	Organization for Economic Co-Operation and Development
ADG Code	Australian Code for the Transport of Dangerous Goods by Road and Rail
HAZCHEM Code	Emergency action code of numbers & letters which gives information to emergency services
NOHSC	National Occupational Health and Safety Commission
AICS	Australian Inventory of Chemical Substances
TWA	Time-Weighted Average
STEL	Short term Exposure Limit
HSNO	Hazardous Substances and New Organisms Act 1996
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
METI	Japanese Ministry of Economy, Trade and Industry

BSMI	Taiwan Bureau of Metrology and Inspection
JIS	Japanese Industrial Standard

Literature References and Sources of Data:

OECD Guidelines for Testing of Chemicals
Annex I: OECD Test Guidelines for Studies Included in SIDS
Manual for the Assessment of Chemicals Chapter 2 Data Gathering
International Toxicity Testing Guidelines
Hazardous Substance Information System - Guidance Material for Hazard Classifications
Preparation of Safety Data Sheets for Hazardous Chemicals Code of Practice.
Model Work Health and Safety Regulations.
Model Work Health and Safety Regulations - Transitional Principles
Workplace Exposure Standards for Airborne Contaminants
Australian Dangerous Goods Code 7th Edition
Approved Criteria for Classifying Hazardous Substances [NOHSC:1008 (2004)]
Guidance on the Classification of Hazardous Chemicals under the WHS Regulations
Assigning a Hazardous Substance to a Group Standard
User Guide to the HSNO Thresholds and Classifications
Summary User Guide to the HSNO Thresholds and Classifications of Hazardous Substances
Correlation between GHS and New Zealand HSNO Hazard Classes and Categories
HSNO Control Regulations
Record of Group Standard Assignment
Labelling of Hazardous Substances Hazard and Precautionary Information
Thresholds and Classifications under the Hazardous Substances and New Organisms Act 1996
Workplace Exposure Standards and Biological Exposure Indices
Handheld Battery Recycling - Guidelines for Lithium Batteries (Australian Battery Recycling Initiative)
Handheld Battery Recycling - Guidelines for Transport (Australian Battery Recycling Initiative)

Disclaimer: This Safety Data Sheet was prepared in accordance with criteria and requirements of the Hazardous Products Act and the Controlled Products Regulations (Canada), SafeWork Australia (Australia), European Union Commission Directives (EU/EC), Japanese Industrial Standard (JIS), Taiwan Bureau of Metrology and Inspection (BSMI), China Regulation GB/T 16483-2008 and the Occupational Safety and Health Administration (OSHA) using information provided by the manufacturer and other sources. The information in the Safety Data Sheet is offered for your consideration and guidance when exposed to these products.

E-One Moli Energy (Canada) Limited expressly disclaims all expressed or implied warranties and assumes no responsibilities for the accuracy or completeness of the data contained herein. The data in this Safety Data Sheet does not apply to use with any other product or in any other process.

This Safety Data Sheet may not be changed or altered in any way without the expressed knowledge and permission of E-One Moli Energy (Canada) Limited.

April 11, 2011

Certificate of Compliance

Microsun Technologies LLC
1925 Ohio Street
Lisle, IL 60532

Phone: 630-968-5000
Fax: 630-968-5050
www.microsuntech.com

The following product have been tested in accordance with the UN document titled 'AMENDMENTS TO THE THIRD REVISED EDITION OF THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS, MANUAL OF TESTS AND CRITERIA (Refer to ST/SG/AC.10/27/Rev.4, Part III, Sub Section 38.3)' and found to comply with the stated criteria:

IATA/UN test for MicroSun P/N 990456 & 990456D is waived as its design is similar to the design of MicroSun P/N 990072, which passed all 8 tests required per UN manual test and criteria Part III sub section 38.3 (reference Report # 12103). Both products use cell from Moli-ICP103450CA and same protection IC.

Product Description: **Ahura, 1S1P, 3.7V, 2.0Ah, 7.4Wh**
Distribution, 1S1P, 3.7V, 2.0Ah, 7.4Wh

Product P/N: **990456 & 990456D**

Lithium Equivalent Content: **0.6gm**

All testing records are maintained in file at Microsun Technologies LLC.

Prepared By:

Salabat Khan
Test Technician

Approved By:

Jim Do
R & D Testing Manager

Test Description and Results

Test Item	Test Condition	Test Performed By	Results
T1 - Altitude Simulation Test	Stored at a pressure of 11.6 kPa for 6 hrs at 20 ± 5 °C.	MicroSun Technologies (Elite Test Lab)	Pass
T2 - Thermal Test	Cycle between 75 ± 2 °C (6hrs) to -40 ± 2 °C (6hrs) in 30 mins, 10 times.	MicroSun Technologies (Elite Test Lab)	Pass
T3 - Vibration Test	7Hz <=> 200Hz <=> 7Hz in 15mins. 12 cycles for a total of 3hrs per direction, 3 directions	MicroSun Technologies (Elite Test Lab)	Pass
T4 - Shock Test	A half-sine shock of peak acceleration of 150g, Pulse duration of 6ms, 3 shocks (+) and 3 shocks (-) per direction, 3 directions for a total of 18 shocks.	MicroSun Technologies (Elite Test Lab)	Pass
T5 - External Short Circuit	1. Test was performed as per Spec ST/SG/AC.10/27/Add.2, Para 38.3.4.5.2. Battery packs were soaked till the temperature reached at 55±2ºC and then the packs were short circuited using 0.1Ohm resistance for one hour. 2. Upon completion of the test packs were observed for six hours.	MicroSun Technologies (MST Test Lab)	Pass
T6 - Impact Test	A 15.8 mm bar across the centre of the sample A 9.1 kg mass is to be dropped on sample From a height of 61 ± 2.5 cm height.	Cell Manufacturer	Pass
T7 - Overcharge Test	1. Measured mass, OCV, visually inspected for leakage and rupture 2. Test was performed as per Specs ST/SG/AC.10/27/Add.2, Para 38.3.4.7. 8 units were tested for overcharge test. Units 17 – 20 was tested for capacity for 1 cycle at fully charge state. And units 21 – 24 was tested for capacity for 50 cycles at fully charge state. 3. Test Procedure: Packs were charged @4A to 8.4V for 24 hours on Circuit specialist CSI3005X5 DC power supply. 4. Storage: After completion of the overcharge test, the packs were stored for 7 days. 5. Measured mass, OCV, visually inspected for - leakage and rupture	MicroSun Technologies (MST Test Lab)	Pass
T8 - Forced Discharge Test	1.2 times V (max), when V (max)>18V Test time: 24hrs at 20 ± 5 °C.	Cell Manufacturer	Pass
Test-9 Package Drop Test	Package Drop Test: Perform package drop test from a height of 1.2m on any orientation.	MicroSun Technologies (MST Test Lab)	Pass

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Automotive & Industrial Systems Company
Panasonic Corporation

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570-8511, Japan
Tel +81-6-6991-1141
http://panasonic.net/ec/

This product is a consumer product which is used in a hermetically sealed state. So, it is not an object of the SDS system. This document is provided to customers as reference information for the safe handling of the product. The information and recommendations set forth are made in good faith and are believed to be accurate at the date of preparation. Panasonic Corporation makes no warranty expressed or implied.

PRODUCT SAFETY DATA SHEET

1 Product and Company Identification

Name of Product	: Manganese dioxide lithium battery
Name of Company	: Panasonic Corporation, Automotive & Industrial Systems Company
Address	: 1-1 Matsushita-cho, Moriguchi City, Osaka, 570-8511, Japan
Division	: Energy Device Business Division
Department	: Product Engineering Group
Telephone number	: +81-6-6994-4537
For emergency	: +81-6-6991-1141

2 Hazards Identification

GHS Classification : Not applicable

Hazard : Electrolyte and lithium metal are inflammable.
Risk of explosion by fire if batteries are disposed in fire or heated above 100 degrees C.
Stacking or jumbling batteries may cause external short circuits, heat generation, fire or explosion.

Toxicity : Vapor generated from burning batteries, may make eyes, skin and throat irritate.

3 Composition/Information of Ingredients

Component	Material	CAS No.	Content
Positive electrode	Manganese dioxide	1313-13-9	25～45wt%
Negative electrode	Lithium metal	7439-93-2	2～ 5wt%
Electrolyte	1,2-dimethoxyethane	110-71-4	3～ 5wt%
	Organic electrolyte	-	5～17wt%

Lithium content per cell

Model Number	Lithium content(g)	Model Number	Lithium content(g)	Model Number	Lithium content(g)	Model Number	Lithium content(g)
CR2	0.33	CR-2/3A	0.6	CR-AAZ	0.6	CR-AG	0.8
CR2J	0.33	CR-2/3AZ	0.6	CR-AAP	0.6		
		CR-2/3AK	0.6	CR-AAS	0.6		
CR123A	0.6	CR-2/3AG	0.5	CR-AAK	0.6		
				CR-AAH	0.6		

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4 First Aid Measures

The product contains organic electrolyte. In case of electrolyte leakage from the battery, actions described below are required.

Eye contact	: Flush the eyes with plenty of clean water for at least 15 minutes immediately, without rubbing. Take a medical treatment. If appropriate procedures are not taken, this may cause an eye irritation.
Skin contact	: Wash the contact areas off immediately with plenty of water and soap. If appropriate procedures are not taken, this may cause sores on the skin.
Inhalation	: Remove to fresh air immediately. Take a medical treatment.

5 Fire Fighting Measures

Extinguishing method	: Since vapor, generated from burning batteries may make eyes, nose and throat irritates, be sure to extinguish the fire on the windward side. Wear the respiratory protection equipment in some cases.
Fire extinguishing agent	: Alcohol-resistant foam and dry sand are effective.

6 Accidental Release Measures (in case of electrolyte leakage from the battery)

- Take up with absorbent cloth.
- Move the battery away from the fire.

7 Handling and Storage

- When packing the batteries, do not allow battery terminals to contact each other, or contact with other metals. Be sure to pack batteries by providing partitions in the packaging box, or in a separate plastic bag so that the single batteries are not mixed together.
- Use strong material for packaging boxes so that they will not be damaged by vibration, impact, dropping and stacking during their transportation.
- Do not recharge batteries. Do not deform batteries.
- Do not mix different type of batteries.
- Do not solder directly onto batteries.
- Do not let water penetrate into packaging boxes during their storage and transportation.
- Do not store the battery in places of the high temperature or under direct sunlight or in front of a stove. Please also avoid the places of high humidity. Be sure not to expose the battery to condensation, water drop or not to store it under frozen condition.
- Fire fighting apparatus should be installed.

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8 Exposure Controls and Personal Protection (in case of electrolyte leakage from the battery)

Acceptable concentration	: Not specified in ACGIH.
Facilities	: Provide appropriate ventilation system such as local ventilator in the storage place.
Protective clothing	: Gas mask for organic gases, safety goggle, and safety glove.

9 Physical and Chemical Properties

Appearance	: Cylindrical shape
Voltage	: 3 volts

10 Stability and Reactivity

Since batteries utilize a chemical reaction they are actually considered a chemical product.
As such, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, the various usage conditions such as discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage.

11 Toxicological Information (in case of electrolyte leakage from the battery)

Acute toxicity	: Oral(rat) LD50 ＞ 2,000mg/kg (estimated)
Irritation	: Irritating to eye and skin.
Mutagenicity	: Not specified.
Chronic toxicity	: Not specified.

12 Ecological Information

In case of the worn-out battery was disposed in land, the battery case may be corroded, and leak electrolyte. But, we have no ecological information.

13 Disposal Considerations

When the battery is worn out, dispose of it under the ordinance of each local government or the law issued by relating government.

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14 Transport Information

During the transportation of a large amount of batteries by ship, trailer or railway, do not leave them in the places of high temperatures and do not allow them to be exposed to condensation.

During the transportation do not allow packages to be fallen down or damaged.

UN Number : UN3090 (only for the Air transport, over 8-cells per package)
: Even though the cells are classified as lithium metal batteries(UN3090/UN3091), they are exempted from Dangerous Goods because they meet the following:
1. for cells, the lithium content is not more than 1g;
2. each cell is of the type proven to meet the requirements of each test in the UN Manual of Tests and Criteria, PartⅢ, sub-section 38.3.
3. each cell is manufactured in ISO9001 certified factory.

Proper shipping Name : Lithium metal batteries

UN Class : Class9 (only for the Air transport, over 8-cells per package)
: Not Applicable

Please refer to the following reference information about concrete ways of transportation. Actual content of packaging label and shipping documents varies by shipping companies. Make sure to confirm in advance with your shipping company.

Information of reference

	Reference (Reference number)	Special provision	Note
Air transport	IATA (2)	Packing Instruction 968 Section Ⅰ A	Cells, Net quantity per package Cargo Aircraft only; Max. 35kg
		Packing Instruction 968 Section Ⅰ B	Cells, Net quantity per package Cargo Aircraft only; Max. 2.5kg
		Packing Instruction 968 Section Ⅱ	Cells, on Cargo Aircraft only Maximum number of cell per package; 8 cells
		Packing Instruction 969 Section Ⅱ	Cells packed with equipment
		Packing Instruction 970 Section Ⅱ	Cells contained in equipment
Marine transport	IMDG (3)	Special provision 188	

15 Regulatory Information

IATA Dangerous Goods Regulations
IMO International Maritime Dangerous Goods Code

Energy Device Business Division
Automotive & Industrial Systems Company
Panasonic Corporation

1-1 Matsushita, Moriguchi City, Osaka
570-8511, Japan
Tel +81-6-6991-1141
http://panasonic.net/ec/

16 Other Information

This PSDS is provided to customers as reference information in order to handle batteries safely.
It is necessary for the customer to take appropriate measures depending on the actual situation such as the individual handling, based on this information.

References

(1) UN Recommendations on the Transportation of Dangerous Goods, Model Regulations 18th revised edition
(2) IATA Dangerous Goods Regulations 56th Edition（2015）
(3) IMO International Maritime Dangerous Goods Code 2012 Edition
(4) UN Recommendations on the Transportation of Dangerous Goods, Manual of Tests and Criteria

(END)