

MATERIAL SAFETY DATA SHEET

LITHIUM MANGANESE DIOXIDE BATTERIES

1 Product Identification and Company

Company ULTRALIFE BATTERIES (UK) LTD
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Product Lithium Manganese Dioxide Cells (Batteries)

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Product sizes:	U3360	D	33.3mm Ø x 60.5mm high
	U3356	(USA) "D"	33.3mm Ø x 56.0mm high
	U2560	1¼C	25.7mm Ø x 60.5mm high
	U2550	C	25.7mm Ø x 50.0mm high

Electrochemical system: Manganese dioxide / lithium metal

Cell voltage: 3V nominal

2 Composition & Information on Components

Each cell consists of a hermetically sealed metallic container containing a number of chemicals and materials of construction of which the following could potentially be hazardous upon release.

Ingredient	Approximate % Content	CAS No	CHIP Classification
Lithium (Li)	3%	7439-93-2	F; R14/15 C; R34 R14/15, R34 S(1/2), S8, S43 S25
Manganese Dioxide (MnO ₂)	35-40%	1313-13-9	R20, R22 S25
Lithium Perchlorate (LiClO ₄)	1%	7791-03-9	R8, R36/37/38 S17, S26/27, S36/37/38
Tetrahydrofuran (C ₄ H ₈ O)	5%	109-99-9	F; R11, R19 Xi; R36/37 R11, R19 R36/37

			S2, S33
Propylene Carbonate (C ₃ H ₆ CO ₃)	6%	108-32-7	R3
1,2 Dimethoxyethane (CH ₃ OCH ₂ CH ₂ OCH ₃)	5%	110-71-4	R11, R19/20 S24/25
Carbon (C _n)	2%	1333-86-4	Non Known

3 Hazards Identification

Do not short circuit, recharge, puncture, incinerate, crush, force discharge or expose to temperatures above the specified range. Upon severe mechanical, electrical or thermal abuse, the cell may vent with the expulsion of some of the content.

4 First Aid Measures

Inhalation	Remove from exposure, rest and keep warm. In severe cases obtain medical attention.
Skin Contact	Wash off skin thoroughly with water. Remove contaminated clothing and wash before reuse. In severe cases obtain medical attention.
Eye Contact	Irrigate thoroughly with water for at least 10 minutes. Obtain medical attention.
Ingestion	Wash out mouth thoroughly with water and give plenty of water to drink. Obtain medical attention.
Further Treatment	All cases of eye contamination, persistent skin irritation and casualties who have swallowed this substance or been affected by breathing its vapours should be seen by a Doctor.

5 Fire Fighting and Explosion Measures

A. Extinguishing media

- **Recommendation is copious quantities of water based foam.**
- Copious cold water is an effective extinguishing medium for lithium batteries. (Do not use warm or hot water).
- Lith-X (Class D extinguishing media), CO₂ and dry powder type extinguishers have limited extinguishing potential.
- Do not use Halon type extinguishers or fire blankets.

B. Fire fighting procedures

- Use a positive pressure self-contained breathing apparatus if cells or batteries are involved in a fire.
- Full protective clothing is necessary.
- During a fire caution is advised as burning pieces of lithium may be ejected.

- If possible and with appropriate handling equipment available, move burning cells or batteries away from other flammable materials.

C. Unusual fire and explosion hazards

- Cells and batteries may flame or leak potentially hazardous organic vapours if exposed to excessive heat or fire.
- Fire or excessive heat may produce hazardous decomposition products.
- Damaged or opened cells can produce rapid heating and release flammable vapours. Vapours are heavier than air and may travel along the ground or be moved by ventilation to an ignition source and flash back.
- Leaked electrolyte should be washed away and not allowed to dry in contact with combustible material to avoid fire or explosion hazard.

6 Accidental Release Measures

Do not breathe vapours or touch liquid with bare hands. If the skin has come into contact with the electrolyte it should be washed thoroughly with water. Earth or sand should be used to absorb the exudation, seal leaking battery and earth/ sand in a heavy duty polythene bag and dispose of as Special Waste.

7 Handling and Storage

A. Cell or battery charging

- Ultralife high rate primary cells are not designed to be recharged. Charging may result in electrolyte leakage and/or cause flaming.
- Cells will withstand a blocking diode leakage current of 100µA maximum.

B. Cell or battery disassembly

- Never disassemble a cell or battery.
- Should a cell or battery unintentionally be damaged, releasing its contents, rubber gloves must be worn to handle all components. Avoid inhalation of any vapours that may be emitted.
- Contact Ultralife for advice on disposal of damaged cells or batteries.
- In the event of skin or eye exposure to the electrolyte, refer to Section 4, First Aid information.

C. Cell or battery short circuit - PTC protected

- Unless otherwise agreed with the customer, cells and batteries supplied by Ultralife Batteries are fitted with resettable PTC devices. These prevent damage by overcurrent or overheating but the short circuit should be removed as soon as possible to avoid discharge.
- PTC devices will revert to the low resistance state after cooling and the cell or battery will be fully functional, provided sufficient capacity remains.

D. Cell or battery short circuit - fuse protected

- If a replaceable fuse is fitted, trace the short circuit and remove it before replacing the fuse with a fuse of the same rating. Do not repeatedly subject the cell or battery to overcurrent conditions as overheating and venting may occur.

E. Cells with no individual fuses

- If, by agreement with Ultralife, cells have been supplied without short circuit protection the customer must provide such protection in the circuit, as close as possible to the cell terminal. Subminiature fuses and PTCs are suitable for the purpose.
- If a cell or battery is shorted out, very high currents can flow. The short should be removed immediately or overheating and venting will occur in 2 to 30 minutes depending on the resistance of the short.

F. Polarity

- Avoid reversing cell or battery polarity within equipment.

G. Multi-cell arrangements

- Never use Ultralife lithium cells with other cell types. Never mix cell lots and never use cells together which are in different states of charge.
- If two or more cells are to be connected in series or parallel, consult Ultralife in advance. For parallel connection of strings of cells, protection diodes must be connected in series with each string.

H. Overheating and Safety vent operation

- Under no circumstances should the cell case temperature exceed 90°C during operation. If operated at high currents and/or at high ambient temperature, there is a danger of the cell overheating and venting. See cell data sheets for maximum recommended currents.
- At least 1mm clearance must be available for the safety vent to operate correctly. Do not place potting or other material on top of the vent and ensure that the lead connected to the cell terminal does not impede the vent.

I. Storage Precautions

- Store cells and batteries in their original packaging until used. Do not allow the terminals to short circuit or contact conductive materials.
- Store cells and batteries in an area which is dry, cool (below 70°F / 21°C) and subject to little temperature change.
- Do not place near heating equipment nor expose to direct sunlight for long periods. Elevated temperatures can result in reduced battery service life.
- Provide Extinguishing media in the near vicinity as recommended in Section 5A.

8 Exposure Controls & Personal Protection

Respiratory Protection	In all fire situations, use self-contained breathing apparatus
Hand Protection	In the event of leakage, wear gloves
Eye Protection	Wear safety glasses during handling leaking battery
Skin Protection	In the event of leakage, wear protective clothing

9 Physical and Chemical Properties

Appearance	Cylindrical can
Odour	If leaking, smells of medical ether
pH	Not applicable as supplied
Flash Point	Not applicable unless individual components exposed
Flammability	Not applicable unless individual components exposed
Relative Density	Not applicable unless individual components exposed
Solubility (Water)	Not applicable unless individual components exposed
Solubility (Other)	Not applicable unless individual components exposed

10 Stability and Reactivity

Product is stable under conditions as described in Section 7.

Hazardous reactions Lithium metal reacts vigorously with water emitting flammable gas (hydrogen).

Hazardous decomposition reactions Toxic fumes and may form peroxides

11 Toxicological Information

Signs & Symptoms None, unless battery ruptures. In the event of exposure to internal contents, corrosive fumes will be very irritating to skin, eyes and mucous membranes. Over exposure can cause symptoms of non-fibrotic lung injury and membrane irritation.

Inhalation Lung irritant

Skin Contact Skin irritant

Eye Contact Eye irritant

Ingestion Poisoning if swallowed

Medical Conditions In the event of exposure to internal contents, eczema, skin allergies, lung injuries, asthma and other respiratory disorders may occur.

Generally aggravated by exposure

12 Ecological Information

Mammalian Effects None known at present

Eco-toxicity None known at present

Bioaccumulation**Potential** Slowly bio-degradable**Environmental fate** None known environmental hazards at present**13 Disposal Considerations**

- Cells and batteries should be disposed of only in accordance with local current regulations.
- Cells and batteries where possible, should be completely discharged prior to disposal and have their terminals taped over.
- Dispose of discharged cell and batteries by incineration or burial only at permitted waste treatment and/or disposal sites.

14 Transport Information

Label for Conveyance Cargo Aircraft only, Class 9 Miscellaneous Dangerous Goods, UN Identification Number

UN Number UN3090

Shipping name Lithium batteries

Hazard Classification Class 9 (Miscellaneous)

Packing Group II

EmS No 4.1-06

Marine Pollutant No

ADR Class Class 9

15 Regulatory Information

Risk Phrases	Lithium	R14/15	Reacts violently with water, liberating extremely flammable gases.
		R34	Causes burns
	Manganese Dioxide	R20/22	Harmful by inhalation and if swallowed
	Lithium Perchlorate	R8	Contact with combustible material may cause fire
		R36/37/38	Irritating to eyes, respiratory system and skin
	Tetrahydrofuran	R11	Highly flammable
		R19	May form explosive peroxides
		R36/37	Irritating to eyes and respiratory system
	Propylene Carbonate	R36	Irritating to eyes
	1,2 Dimethoxyethane	R11	Highly flammable
		R19	May form explosive peroxides
		R20	Harmful by inhalation
	Lithium	S1/2	Keep locked up and out of reach of children
		S8	Keep container dry
		S43	In case of fire, use Lith-X

			(graphite based) fire extinguisher. Never use water
		S45	In case of accident or if you feel unwell, seek medical advice immediately
	Manganese Dioxide	S25	Avoid contact with eyes
	Lithium Perchlorate	S17	Keep away from combustible materials
		S26	In case of contact with eyes, rinse immediately with plenty of water and seek medical advice
		S27	Take off immediately all contaminated clothing
		S36/37	Wear suitable protective clothing and gloves
		S38	In case of insufficient ventilation, wear suitable respiratory equipment
	Tetrahydrofuran	S2	Keep out of reach of children
		S16	Keep away from sources of ignition – No Smoking
		S29	Do not empty into drains
		S33	Take precautionary measures against static discharges
	Propylene Carbonate	S24/25	Avoid contact with skin and eyes
	1,2 Dimethoxyethane	S24/25	Avoid contact with skin and eyes
UK Regulatory References	Classified under CHIP		

16 Other information

The information contained herein is furnished without warranty of any kind. Users should consider this data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to ensure proper use and disposal of these materials and the health and safety of employees and customers.