FRIEMANN & WOLF
Batterietechnik GmbH
Industriestrasse 22
D-63654 Büdingen

Distribution Class 1

Material/Product Safety Data Sheet
(MSDS-PSDS)

M **products**	**Lithium Manganese dioxide** **single cells and multi-cell battery packs**
Revision c Date 11/2009	

1. Identification of the Substance or Preparation and Company

Product	Lithium Manganese Dioxide single cells and multi-cell battery packs **(Li-MnO_2)**
Production sites	Friemann & Wolf Batterietechnik GmbH Industriestrasse 22 D-63654 Büdingen Germany Phone: +49(0)6042/954-150, Fax: 490
www.friwo-batterien.de (section "Contact")	
Emergency contact	**+49(0)6042/954-599**

2. Hazards Identification

Do not short circuit, recharge, puncture, incinerate, crush, immerse, force discharge or expose to temperatures above the declared operating temperature range of the product. Risk of fire or explosion. The Lithium-Manganese dioxide batteries described in this Product Safety Data Sheet are sealed units which are not hazardous when used according to the recommendations of the manufacturer.

Under normal conditions of use, the electrode materials and electrolyte they contain are not exposed to the outside, provided the battery integrity is maintained and seals remain intact. Risk of exposure only in case of abuse (mechanical, thermal, electrical) which leads to the activation of safety valves and/or the rupture of the battery containers. Electrolyte leakage or battery vent/explosion/fire may follow, depending upon the circumstances.

3. Composition & Information on Ingredients

Ingredient	Content	CAS No.	CHIP Classification		
Lithium *(Li)*	3-4%	7439-93-2			R14/15, R34 S1/2, S8, S43, S45

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Manganese dioxide *(MnO_2)*	40-45%	1313-13-9			R20/22 S25
Lithium perchlorate *($LiClO_4$)*	< 2.00%	7791-03-9			R8, R22, R36/37/38 S17, S26, S36/37/39
Tetrahydrofurane *(C_4H_8O)*	6-10%	109-99-9			R11, R19, R36/37 S16, S29, S33
Propylene Carbonate *($C_3H_6CO_3$)*	6-10%	108-32-7			R36
1,2 Dimethoxyethane *($CH_3OCH_2CH_2OCH_3$)*	1-4%	110-71-4			R60-61-11-19-20 S53-45
Carbon (C_n)	2.2%	1333-86-4			NONE KNOWN
Amount vary depending on cell size					

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 tap water. Remove contaminated clothing and wash before reuse. In severe cases obtain medical attention.
Eye contact	Irrigate thoroughly with water for at least 15 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 Measures	
CO_2 extinguishers or, even preferably, copious quantities of water or water-based foam can be used to cool down burning Li-MnO_2 cells and batteries, as long as the extent of the fire has not progressed to the point that the lithium metal they contain is exposed (marked by deep red flames). Do not use for this purpose sand, dry powder or soda ash, graphite powder or fire blankets. **Use only metal (Class D) extinguishers on raw lithium.**	
Extinguishing Media	Use water or CO_2 on burning Li-MnO_2 cells or batteries and class D fire extinguishing agent only on raw lithium.

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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.

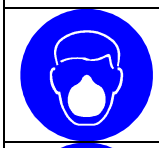
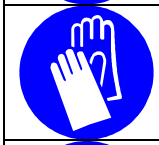
Earth or sand should be used to absorb the exudation, seal leaking battery and earth in a heavy duty polythene bag and dispose of as Special Waste in accordance with local regulations.

7. Handling and Storage

Handling	Do not short circuit or expose to temperatures above the temperature rating of battery. Do not recharge, over-discharge, force discharge, immerse, puncture or crush.
Storage	Store in a cool place but prevent condensation on cells and batteries. Elevated temperatures can result in shortened battery life and degrade performance. Do not store batteries in high humidity environments for long periods of times.
Other	Lithium-Manganese dioxide batteries are not rechargeable and should not be tentatively charged. Follow Manufacturers recommendations regarding maximum recommended currents and operating temperature range. Applying pressure on deforming the battery may lead to disassembly.

8. Exposure Controls & Personal Protection

	Compound	8hr TWA	15min TWA	SK
Occupational exposure standard	Tetrahydrofurane	50 ppm	100 ppm	
	1,2 Dimethoxyethane	5 ppm	-	**

	**Respiratory protection**	In all fire situations, use self-contained breathing apparatus.
	**Hand protection**	In the event of leakage wear gloves.
	**Eye protection**	Safety glasses are recommended during handling
	**Other**	In the event of leakage, wear chemical apron.

*** Can be absorbed through broken skin*

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9. Physical and Chemical Properties	
Appearance	Cylindrical shape
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 described in Section 7.	
Conditions to avoid	Heat above 70°C or incinerate. Deform. Mutilate. Crush. Pierce. Disassemble. Recharge. Short circuit. Expose over a long period to humid conditions.
Materials to avoid	Oxidising agents, alkalis, water.
Hazardous reactions	Lithium metal reacts with water to produce highly flammable gasses.
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, vapour fumes may be very irritating to the eyes and skin.
Inhalation	Lung irritant.
Skin contact	Skin irritant
Eye contact	Eye irritant.
Ingestion	Poisoning if swallowed.
Medical conditions aggravated by exposure	In the event of exposure to internal contents, moderate to severe irritation, burning and dryness of the skin may occur. Target organs nerves, liver and kidneys.

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

- Dispose by incineration or burial at permitted waste treatment and/or disposal sites.
- Batteries do not contain hazardous materials according to EC directives 91/157/EEC and 93/86/EEC.
- EC battery directive 2006/66/EC is currently being implemented by EC member states.
- For large quantities a disposal service is offered on request.

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14. Transport Information	
Class 9 UN 3090: UN 3091:	LITHIUM METAL BATTERIES LITHIUM METAL BATTERIES CONTAINED IN EQUIPMENT, or LITHIUM METAL BATTERIES PACKED WITH EQUIPMENT
Packing group:	II
Special provisions and packing instructions:	ADR, RID: 188, 230, 310, 636, P903, P903a, P903b IATA: A88, A99, A154, A164, P968, P969, P970 IMDG-Code: 188, 230, 310, P903 EmS: F-A, S-I Storage and segregation: Category A
For more information see www.friwo-batterien.de > download	

15. Regulatory Information			
Risk phrases	Lithium	R14/15 R34	Reacts violently with water, liberating extremely flammable gases. Causes burns.
	Manganese Dioxide	R20/22	Harmful by inhalation and if swallowed.
	Lithium Perchlorate	R8 R22 R36/37/38	Contact with combustible material may cause fire. Harmful if swallowed. Irritating to eyes, respiratory system and skin.
	Tetrahydrofurane	R11 R19 R36/37	Highly flammable. May form explosive peroxides. Irritating to eyes and respiratory system.
	Propylene Carbonate	R36	Irritating to the eyes.
	1,2 Dimethoxyethane	R11 R19 R20 R60 R61	Highly flammable. May form explosive peroxides. Harmful by inhalation. May impair fertility. May cause harm to the unborn child.
Safety phrases	Lithium	S1/2 S8 S43 S45	Keep locked up and out of reach of children. Keep container dry. In case of fire, use Lith-X (Graphite based) fire extinguisher. Never use water. In case of accident or if you feel unwell, seek medical advice immediately.
	Manganese Dioxide	S25	Avoid contact with eyes.
	Lithium Perchlorate	S17 S26 S36/37/39	Keep away from combustible material. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection.
	Tetrahydrofuran	S16 S29 S33	Keep away from sources of ignition - No Smoking. Do not empty into drains. Take precautionary measures against static discharges.
	1,2 Dimethoxyethane	S53-45	Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell seek medical advice immediately (show the label where possible).
UK regulatory references	Classified under CHIP		

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16. Other Information

Friemann & Wolf $LiMnO_2$-cells are registered by Underwriters Laboratories, Northbrook, USA under File-No. MH 46385, Project-No.: 08CA08489.

This information has been compiled from sources considered to be dependable and is, to the best of our knowledge and belief, accurate and reliable as of the date compiled. However, no representation, warranty (either expressed or implied) or guarantee is made to the accuracy, reliability, or completeness of the information contained herein.

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Visit our web site under www.friwo-batterien.de

Battery packs:

The design and assembly of battery packs require special skills, expertise and experience. Therefore it is not recommended that the end user attempt to self-assemble battery packs. It is preferable that any battery using lithium cells be fabricated by Friemann & Wolf to ensure proper battery design and construction. A full battery assembly service is available from Friemann & Wolf who can be contacted for further information. If for any reason, this is not possible, Friemann & Wolf can review the pack design in confidence to ensure that the design is safe (in assembly and use) and capable of meeting stated performance requirements.

Edition c – November 2009