Manganese Dioxide Lithium Battery

Welding Guns of Australia Pty Ltd

Chemwatch Hazard Alert Code: **0**

Chemwatch: **5236-20**
Version No: **2.1.1.1**
Safety Data Sheet according to WHS and ADG requirements

Issue Date: **14/12/2016**
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L.GHS.AUS.EN

SECTION 1 IDENTIFICATION OF THE SUBSTANCE / MIXTURE AND OF THE COMPANY / UNDERTAKING

Product Identifier

Product name	Manganese Dioxide Lithium Battery
Synonyms	Model No'.s: CR1025,CR1216, CR1220, CR1612, CR1616, CR1620, CR1632, CR2012, CR2016, CR2025, CR2032, CR2050B, CR2330, CR2354, CR2412, CR2430, CR2450, CR2450A, CR2477, CR3032
Proper shipping name	LITHIUM METAL BATTERIES (including lithium alloy batteries)
Other means of identification	Not Available

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

Relevant identified uses	Battery. NOTE: Chemical materials are stored in sealed metal case. The toxic properties of the electrode materials are hazardous only if the materials are released by damaging the cell or if exposed to fire.The sealed battery is not hazardous in normal use. The chemical hazards are related to the leaked battery contents. If Transport Code Special Provision 188 applies the batteries will be unregulated for transport.

Details of the supplier of the safety data sheet

Registered company name	Welding Guns of Australia Pty Ltd
Address	112 Christina Road Villawood NSW 2163 Australia
Telephone	+61 2 9780 4200
Fax	Not Available
Website	Not Available
Email	sales@unimig.com.au

Emergency telephone number

Association / Organisation	Not Available
Emergency telephone numbers	1800 039 008 (24 hours)
Other emergency telephone numbers	+61 3 9573 3112 (24 hours)

SECTION 2 HAZARDS IDENTIFICATION

Classification of the substance or mixture

Poisons Schedule	Not Applicable
Classification	Not Applicable

Label elements

GHS label elements	Not Applicable

SIGNAL WORD	**NOT APPLICABLE**

Hazard statement(s)

Continued...

Not Applicable

Precautionary statement(s) Prevention

Not Applicable

Precautionary statement(s) Response

Not Applicable

Precautionary statement(s) Storage

Not Applicable

Precautionary statement(s) Disposal

Not Applicable

SECTION 3 COMPOSITION / INFORMATION ON INGREDIENTS

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
		sealed metal case containing
1313-13-9	12-50	manganese dioxide
7439-93-2	0.5-6	lithium
110-71-4	1.5-3.5	1,2-dimethoxyethane
7791-03-9	0.2-0.7	lithium perchlorate
Not Available	2.5-7	organic electrolyte

SECTION 4 FIRST AID MEASURES

Description of first aid measures

Eye Contact	▸ Generally not applicable. If content come in contact with eye, wash away with much water for more than 15 minutes immediately, without rubbing. Seek medical attention.
Skin Contact	If skin contact occurs: ▸ Immediately remove all contaminated clothing, including footwear. ▸ Flush skin and hair with running water (and soap if available). ▸ Seek medical attention in event of irritation.
Inhalation	Remove patient to fresh air and seek medical attention.
Ingestion	▸ Not considered a normal route of entry. ▸ For advice, contact a Poisons Information Centre or a doctor at once. ▸ Urgent hospital treatment is likely to be needed. ▸ If swallowed do **NOT** induce vomiting. ▸ If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration. ▸ Observe the patient carefully. ▸ Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious. ▸ Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink. ▸ Transport to hospital or doctor without delay.

Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

Both dermal and oral toxicity of manganese salts is low because of limited solubility of manganese. No known permanent pulmonary sequelae develop after acute manganese exposure. Treatment is supportive.

[*Ellenhorn and Barceloux: Medical Toxicology*]

In clinical trials with miners exposed to manganese-containing dusts, L-dopa relieved extrapyramidal symptoms of both hypo kinetic and dystonic patients. For short periods of time symptoms could also be controlled with scopolamine and amphetamine. BAL and calcium EDTA prove ineffective.

[*Gosselin et al: Clinical Toxicology of Commercial Products.*]

SECTION 5 FIREFIGHTING MEASURES

Continued...

Extinguishing media

|
Use dry chemical powder, alcohol-resistant foam, carbon dioxide, or water as a fine spray.
Alcohol-resistant foam and dry sand are effective.

Special hazards arising from the substrate or mixture

Fire Incompatibility	None known.

Advice for firefighters

Fire Fighting	Slight hazard when exposed to heat, flame and oxidisers. ▸ Use fire fighting procedures suitable for surrounding area. ▸ **DO NOT** approach containers suspected to be hot. ▸ Cool fire exposed containers with water spray from a protected location. ▸ If safe to do so, remove containers from path of fire. ▸ Equipment should be thoroughly decontaminated after use.
Fire/Explosion Hazard	▸ Non combustible. ▸ Not considered to be a significant fire risk. ▸ Heating may cause expansion or decomposition leading to violent rupture of containers. ▸ May emit acrid smoke. May emit corrosive and poisonous fumes.
HAZCHEM	Not Applicable

SECTION 6 ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

See section 8

Environmental precautions

See section 12

Methods and material for containment and cleaning up

Minor Spills	Clean up all spills immediately. Avoid contact with skin and eyes. Place in suitable containers for disposal.
Major Spills	▸ Clean up all spills immediately. ▸ Wear protective clothing, safety glasses, dust mask, gloves. ▸ Secure load if safe to do so. Bundle/collect recoverable product. ▸ Use dry clean up procedures and avoid generating dust. ▸ Vacuum up (consider explosion-proof machines designed to be grounded during storage and use). ▸ Water may be used to prevent dusting. ▸ Collect remaining material in containers with covers for disposal. ▸ Flush spill area with water.

Personal Protective Equipment advice is contained in Section 8 of the SDS.

SECTION 7 HANDLING AND STORAGE

Precautions for safe handling

Safe handling	| Use good occupational work practice. Observe manufacturer's storage and handling recommendations contained within this SDS. Avoid physical damage to containers. Risk of explosion by fire if batteries are disposed in fire or heated above 100 degrees. Stacking or jumbling batteries may cause external short circuits, heat generation, fire or explosion.
Other information	▸ Store away from incompatible materials. ▸ Keep dry. ▸ Store under cover. ▸ Protect containers against physical damage. ▸ Observe manufacturer's storage and handling recommendations contained within this SDS. Keep out of reach of children. Store out of direct sunlight

Continued...

Conditions for safe storage, including any incompatibilities

Suitable container	▸ Packaging as recommended by manufacturer.
Storage incompatibility	None known

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Control parameters

OCCUPATIONAL EXPOSURE LIMITS (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
Australia Exposure Standards	manganese dioxide	Manganese, dust & compounds (as Mn)	1 mg/m3	Not Available	Not Available	Not Available

EMERGENCY LIMITS

Ingredient	Material name	TEEL-1	TEEL-2	TEEL-3
manganese dioxide	Manganese dioxide	4.7 mg/m3	7.9 mg/m3	690 mg/m3
manganese dioxide	Manganese oxide; (Manganese tetroxide)	4.2 mg/m3	6.9 mg/m3	41 mg/m3
lithium	Lithium	3.3 mg/m3	36 mg/m3	220 mg/m3
1,2-dimethoxyethane	Dimethoxyethane, 1,2-	13 ppm	140 ppm	840 ppm
lithium perchlorate	Lithium perchlorate, anhydrous	1.2 mg/m3	13 mg/m3	79 mg/m3

Ingredient	Original IDLH	Revised IDLH
manganese dioxide	N.E. mg/m3 / N.E. ppm	500 mg/m3
lithium	Not Available	Not Available
1,2-dimethoxyethane	Not Available	Not Available
lithium perchlorate	Not Available	Not Available
organic electrolyte	Not Available	Not Available

MATERIAL DATA

Exposure controls

Appropriate engineering controls	None under normal operating conditions. Provide adequate ventilation in warehouse or closed storage areas.
Personal protection	
Eye and face protection	None under normal operating conditions. **OTHERWISE:** ▸ Safety glasses.
Skin protection	See Hand protection below
Hands/feet protection	None under normal operating conditions. **OTHERWISE:** ▸ Rubber Gloves
Body protection	See Other protection below
Other protection	None under normal operating conditions. **OTHERWISE:** ▸ Overalls. ▸ PVC Apron. ▸ PVC protective suit may be required if exposure severe. ▸ Eyewash unit. ▸ Ensure there is ready access to a safety shower.
Thermal hazards	Not Available

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the:

Respiratory protection

Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

Continued...

***"*Forsberg Clothing Performance Index".**
The effect(s) of the following substance(s) are taken into account in the ***computer-generated*** selection:
Manganese Dioxide Lithium Battery

Material	CPI
BUTYL	C

* CPI - Chemwatch Performance Index
A: Best Selection
B: Satisfactory; may degrade after 4 hours continuous immersion
C: Poor to Dangerous Choice for other than short term immersion
NOTE: As a series of factors will influence the actual performance of the glove, a final selection must be based on detailed observation. -
* Where the glove is to be used on a short term, casual or infrequent basis, factors such as "feel" or convenience (e.g. disposability), may dictate a choice of gloves which might otherwise be unsuitable following long-term or frequent use. A qualified practitioner should be consulted.

Where the concentration of gas/particulates in the breathing zone, approaches or exceeds the "Exposure Standard" (or ES), respiratory protection is required.
Degree of protection varies with both face-piece and Class of filter; the nature of protection varies with Type of filter.

Required Minimum Protection Factor	Half-Face Respirator	Full-Face Respirator	Powered Air Respirator
up to 10 x ES	A-AUS P3	-	A-PAPR-AUS / Class 1 P3
up to 50 x ES	-	A-AUS / Class 1 P3	-
up to 100 x ES	-	A-2 P3	A-PAPR-2 P3 ^

^ - Full-face
A(All classes) = Organic vapours, B AUS or B1 = Acid gasses, B2 = Acid gas or hydrogen cyanide(HCN), B3 = Acid gas or hydrogen cyanide(HCN), E = Sulfur dioxide(SO2), G = Agricultural chemicals, K = Ammonia(NH3), Hg = Mercury, NO = Oxides of nitrogen, MB = Methyl bromide, AX = Low boiling point organic compounds(below 65 degC)

- **Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.**
- **The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).**
- **Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory protection. These may be government mandated or vendor recommended.**
- **Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.**
- **Use approved positive flow mask if significant quantities of dust becomes airborne.**
- **Try to avoid creating dust conditions.**

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Appearance	Coin shaped battery. Voltage: 3 volts

Physical state	Manufactured	**Relative density (Water = 1)**	Not Available
Odour	Not Available	**Partition coefficient n-octanol / water**	Not Available
Odour threshold	Not Available	**Auto-ignition temperature (°C)**	Not Available
pH (as supplied)	Not Applicable	**Decomposition temperature**	Not Available
Melting point / freezing point (°C)	Not Available	**Viscosity (cSt)**	Not Available
Initial boiling point and boiling range (°C)	Not Available	**Molecular weight (g/mol)**	Not Applicable
Flash point (°C)	Not Available	**Taste**	Not Available
Evaporation rate	Not Available	**Explosive properties**	Not Available
Flammability	Not Available	**Oxidising properties**	Not Available
Upper Explosive Limit (%)	Not Available	**Surface Tension (dyn/cm or mN/m)**	Not Applicable

Continued...

Lower Explosive Limit (%)	Not Available	**Volatile Component (%vol)**	Not Available
Vapour pressure (kPa)	Not Available	**Gas group**	Not Available
Solubility in water (g/L)	Immiscible	**pH as a solution (1%)**	Not Applicable
Vapour density (Air = 1)	Not Available	**VOC g/L**	Not Available

SECTION 10 STABILITY AND REACTIVITY

Reactivity	See section 7
Chemical stability	Product is considered stable and hazardous polymerisation will not occur.
Possibility of hazardous reactions	See section 7
Conditions to avoid	See section 7
Incompatible materials	See section 7
Hazardous decomposition products	See section 5

SECTION 11 TOXICOLOGICAL INFORMATION

Information on toxicological effects

Inhaled	| Not normally a hazard due to physical form of product. Vapor generated from burning batteries may cause throat irritation.
Ingestion	Considered an unlikely route of entry in commercial/industrial environments Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual. Poisonings rarely occur after oral administration of manganese salts as they are generally poorly absorbed from the gut (generally less than 4%) and seems to be dependent, in part, on levels of dietary iron and may increase following the consumption of alcohol. A side-effect of oral manganese administration is an increase in losses of calcium in the faeces and a subsequent lowering of calcium blood levels. Absorbed manganese tends to be slowly excreted in the bile. Divalent manganese appears to be 2.5-3 times more toxic than the trivalent form.
Skin Contact	| Not normally a hazard due to physical form of product. Battery contents cause irritation upon contact with the skin.
Eye	| Not normally a hazard due to physical form of product. Eye contact with the content of an open battery can cause severe eye irritation.
Chronic	| Not normally a hazard due to physical form of product. Since chemicals are contained in a sealed can, there are no hazards. Exposure to battery content causes severe eye irritation, skin irritation and harmful effect if swallowed.

Manganese Dioxide Lithium Battery	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
manganese dioxide	**TOXICITY**	**IRRITATION**
	Oral (rat) LD50: >3478 mg/kg[2]	Not Available
lithium	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
1,2-dimethoxyethane	**TOXICITY**	**IRRITATION**
	dermal (rat) LD50: >5000 mg/kg[1]	Not Available
	Inhalation (rat) LC50: 3000 ppm/4hr[2]	
	Oral (rat) LD50: 775 mg/kg[2]	

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lithium perchlorate	**TOXICITY**	**IRRITATION**
	Not Available	Not Available
Legend:	*1. Value obtained from Europe ECHA Registered Substances - Acute toxicity 2.* Value obtained from manufacturer's SDS. Unless otherwise specified data extracted from RTECS - Register of Toxic Effect of chemical Substances*	

1,2-DIMETHOXYETHANE

For ethylene glycol monoalkyl ethers and their acetates (EGMAEs):
Typical members of this category are ethylene glycol propylene ether (EGPE), ethylene glycol butyl ether (EGBE) and ethylene glycol hexyl ether (EGHE) and their acetates.
EGMAEs are substrates for alcohol dehydrogenase isozyme ADH-3, which catalyzes the conversion of their terminal alcohols to aldehydes (which are transient metabolites). Further, rapid conversion of the aldehydes by aldehyde dehydrogenase produces alkoxyacetic acids, which are the predominant urinary metabolites of mono substituted glycol ethers.
Acute Toxicity: Oral LD50 values in rats for all category members range from 739 (EGHE) to 3089 mg/kg bw (EGPE), with values increasing with decreasing molecular weight. Four to six hour acute inhalation toxicity studies were conducted for these chemicals in rats at the highest vapour concentrations practically achievable. Values range from LC0 > 85 ppm (508 mg/m3) for EGHE, LC50 > 400ppm (2620 mg/m3) for EGBEA to LC50 > 2132 ppm (9061 mg/m3) for EGPE. No lethality was observed for any of these materials under these conditions. Dermal LD50 values in rabbits range from 435 mg/kg bw (EGBE) to 1500 mg/kg bw (EGBEA). Overall these category members can be considered to be of low to moderate acute toxicity. All category members cause reversible irritation to skin and eyes, with EGBEA less irritating and EGHE more irritating than the other category members. EGPE and EGBE are not sensitisers in experimental animals or humans. Signs of acute toxicity in rats, mice and rabbits are consistent with haemolysis (with the exception of EGHE) and non-specific CNS depression typical of organic solvents in general. Alkoxyacetic acid metabolites, propoxyacetic acid (PAA) and butoxyacetic acid (BAA), are responsible for the red blood cell hemolysis. Signs of toxicity in humans deliberately ingesting cleaning fluids containing 9-22% EGBE are similar to those of rats, with the exception of haemolysis. Although decreased blood haemoglobin and/or haemoglobinuria were observed in some of the human cases, it is not clear if this was due to haemolysis or haemodilution as a result of administration of large volumes of fluid. Red blood cells of humans are many-fold more resistant to toxicity from EGPE and EGBE *in vitro* than those of rats.
Repeat dose toxicity: The fact that the NOAEL for repeated dose toxicity of EGBE is less than that of EGPE is consistent with red blood cells being more sensitive to EGBE than EGPE. Blood from mice, rats, hamsters, rabbits and baboons were sensitive to the effects of BAA *in vitro* and displayed similar responses, which included erythrocyte swelling (increased haematocrit and mean corpuscular hemoglobin), followed by hemolysis. Blood from humans, pigs, dogs, cats, and guinea pigs was less sensitive to haemolysis by BAA *in vitro*.
Mutagenicity: In the absence and presence of metabolic activation, EGBE tested negative for mutagenicity in Ames tests conducted in *S. typhimurium* strains TA97, TA98, TA100, TA1535 and TA1537 and EGHE tested negative in strains TA98, TA100, TA1535, TA1537 and TA1538. *In vitro* cytogenicity and sister chromatid exchange assays with EGBE and EGHE in Chinese Hamster Ovary Cells with and without metabolic activation and in vivo micronucleus tests with EGBE in rats and mice were negative, indicating that these glycol ethers are not genotoxic.
Carcinogenicity: In a 2-year inhalation chronic toxicity and carcinogenicity study with EGBE in rats and mice a significant increase in the incidence of liver haemangiosarcomas was seen in male mice and forestomach tumours in female mice. It was decided that based on the mode of action data available, there was no significant hazard for human carcinogenicity
Reproductive and developmental toxicity. The results of reproductive and developmental toxicity studies indicate that the glycol ethers in this category are not selectively toxic to the reproductive system or developing fetus, developmental toxicity is secondary to maternal toxicity. The repeated dose toxicity studies in which reproductive organs were examined indicate that the members of this category are not associated with toxicity to reproductive organs (including the testes). Results of the developmental toxicity studies conducted via inhalation exposures during gestation periods on EGPE (rabbits -125, 250, 500 ppm or 531, 1062, or 2125 mg/m3 and rats - 100, 200, 300, 400 ppm or 425, 850, 1275, or 1700 mg/m3), EGBE (rat and rabbit - 25, 50, 100, 200 ppm or 121, 241, 483, or 966 mg/m3), and EGHE (rat and rabbit - 20.8, 41.4, 79.2 ppm or 124, 248, or 474 mg/m3) indicate that the members of the category are not teratogenic.
The NOAELs for developmental toxicity are greater than 500 ppm or 2125 mg/m3 (rabbit-EGPE), 100 ppm or 425 mg/m3 (rat-EGPE), 50 ppm or 241 mg/m3 (rat EGBE) and 100 ppm or 483 mg/m3 (rabbit EGBE) and greater than 79.2 ppm or 474 mg/m3 (rat and rabbit-EGHE).
For 1,2-dimethoxyethane (monoglyme):
Monoglyme, an ethylene glycol ether, demonstrates a low order of toxicity with an oral LD50 of greater than 4000 mg/kg in rats. The acute inhalation toxicity of monoglyme was determined in a two-dose study in which the six-hour inhalation LC50 was found to be between 20 and 63 mg/L. The vapors produced some irritation and anesthesia at the high level. All high dose animals survived the exposure but died within 72 hours post-exposure.
A great deal of information is available on the repeated-dose toxicity of the biologically indicated metabolite of monoglyme, 2-methoxyethanol (2ME). In one study testicular degeneration was a prominent finding in rats even at the lowest dose tested (750 ppm, about 70 mg/kg/day) and in females, at this level, thymic atrophy was a finding. Thus, a NOEL was not found for rats of either sex. In the case of mice, the NOAEL for testicular degeneration and increased haematopoiesis in the spleen was 2000 ppm in males. A NOAEL was not reached for female mice since adrenal gland hypertrophy and increased haematopoiesis in the spleen occurred at the lowest concentration administered (2000 ppm, about 300 mg/kg/day).
Repeated-dose studies Repeated dose exposure in the drinking water was also associated with progressive anemia in rats and mice and increased mortality in rats at the two highest doses. The target organs can be identified as testes, bone marrow, spleen (hematopoiesis), thymus and adrenal. In general, the testes is considered a sensitive, if no the most sensitive, target organ.
A complete spectrum of toxicity can be confidently predicted from monoglyme's metabolism and studies on related compounds by all routes of exposure. Toxic responses include thymic atrophy, bone marrow suppression and testicular degeneration. Although direct chemical evidence identifying the primary and secondary metabolites of monoglyme was not

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	found, the metabolic pathways for this class of chemicals are well known. Additionally, there is very strong biological evidence linking adverse effects of monoglyme with a common active metabolite of methoxy glycol ethers. It has been demonstrated that most of the toxic effects of the monoalkyl glycol ethers arise as a result of the metabolic conversion of the glycol ether into a substituted acetic acid derivative. In humans it is established that 2-methoxyacetic acid is the defining toxic metabolite and studies have shown that the level of 2-methoxyacetic acid in urine is an excellent. marker for exposure Demethylation by mixed-function oxidases, a relatively slow reaction, accounts for some metabolic conversion to ethylene glycol which is converted to oxalate. Dehydrogenase enzymes initially convert the free alcohol to the aldehyde and then the carboxylic acid . This is a very rapid conversion and it is known that a teratogenic dose of 2-methoxyethanol is completely oxidised, to 2-methoxyacetic acid, in a period of one-hour in rats. The competing reaction, demethylation of 2-methoxyethanol to ethylene glycol is comparatively slow as it is accomplished by the mixed-function oxidase system. There is general agreement that 2-methoxyacetic acid is the proximate toxin. It is also established the clearance of 2-methoxyacetic acid is relatively slow as compared to its formation and the clearance in man may be much longer than in rats. **Genotoxicity** has been evaluated using multiple *in vitro* experimental procedures covering both mutation and chromosomal aberration. Results of genotoxicity studies are mixed. In *in vitro* studies, positive results are cited for the A *S. typhimurium* reverse mutation assay . Monoglyme is known to be cytotoxic to Salmonella typhimurium (30) at concentrations as low as 500 microliters per plate. Monoglyme produced no evidence of genotoxicity in the presence or absence of S9 metabolic activation in mammalian cell point mutation tests using the HGPRT assay in CHO cells Clastogenic activity was assessed *in vitro* using the Sister Chromatid Exchange in Chinese Hamster Ovary Cells Test (SCE). In this test, the material produced numerous indications of statistically significant effects on the frequency of SCE over the range of concentrations tested with and without addition of an active S9 metabolic system. A high number of cells were also observed with significant types of chromosomal aberrations suggesting that material was a clastogenic agent, especially in the presence of S9 activation DNA damage was assessed using an *in vitro* unscheduled DNA synthesis (UDS) Assay. rat hepatocytes were treated with a wide concentration range of monoglyme up to concentrations demonstrating cytotoxicity in the assay system. Treatment did not produce either statistically significant or dose-related increases in the amount of UDS activity as measured by radioactive thymidine uptake **Reproductive toxicity:** Adverse effects to reproduction are based on metabolism of monoglyme to 2-methoxy acetic acid, a compound that is known to interfere with sperm production. Adverse effects on the conceptus, including embryo lethality are also caused by this metabolite. Direct specific effects on female reproduction are not known to result from 2-methoxyacetic acid and thus are not expected from monoglyme exposure **Developmental toxicity:**, Monoglyme appears to be a specific developmental toxin in rats and mice. Results in rats show that 120 mg/kg/day or more was associated with 100% foetal death and doses of 30 or 60 mg/kg were foetotoxic but did not produce major malformations . This suggests that monoglyme is a specific developmental toxin as would be anticipated based on its metabolism to 2-methoxy acetic acid. Studies with some ethylene glycol ethers and their esters indicate reproductive changes, testicular atrophy, infertility and kidney function changes. The metabolic acetic acid derivatives of the glycol ethers (alkoxyacetic acids), not the ether itself, have been found to be the proximal reproductive toxin in animals. The potency of these metabolites decrease significantly as the chain length of the ether increases. Consequently glycol ethers with longer substituents (e.g diethylene glycols, triethylene glycols) have not generally been associated with reproductive effects. One of the most sensitive indicators of toxic effects observed from many of the glycol ethers is an increase in the erythrocytic osmotic fragility in rats. This appears to be related to the development of haemoglobinuria (blood in the urine) at higher exposure levels or as a result of chronic exposure. Ethylene glycol ethers and acetates are mainly metabolised to alkoxyacetic acids but there is also a minor pathway through ethylene glycol to oxalic acid. The main pathway of ethylene glycol ethers is associated with significant clinical or experimental health effects, but the minor pathway is also interesting because formation of urinary stones depends principally upon urinary concentration of oxalate and calcium. In one study (1) the tendency to form urinary stones was 2.4 times higher amongst silk-screen printers exposed to ethylene glycol ethers, than among office workers. (1) Laitinen J., et al: Occupational Environmental Medicine 1996, 53 595-600 Animal testing shows material is a reproductive effector:
MANGANESE DIOXIDE & LITHIUM & LITHIUM PERCHLORATE	No significant acute toxicological data identified in literature search.
LITHIUM & LITHIUM PERCHLORATE	Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Acute Toxicity	⊘	**Carcinogenicity**	⊘
Skin Irritation/Corrosion	⊘	**Reproductivity**	⊘

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Serious Eye Damage/Irritation	⊘	**STOT - Single Exposure**	⊘
Respiratory or Skin sensitisation	⊘	**STOT - Repeated Exposure**	⊘
Mutagenicity	⊘	**Aspiration Hazard**	⊘

Legend: ✗ *– Data available but does not fill the criteria for classification*
✓ *– Data required to make classification available*
⊘ *– Data Not Available to make classification*

SECTION 12 ECOLOGICAL INFORMATION

Toxicity

Ingredient	Endpoint	Test Duration (hr)	Species	Value	Source
manganese dioxide	EC50	48	Crustacea	>0.0219mg/L	2
manganese dioxide	NOEC	48	Crustacea	0.0219mg/L	2
lithium	EC50	24	Crustacea	1492mg/L	5
lithium	NOEC	816	Fish	2.87mg/L	2
1,2-dimethoxyethane	LC50	96	Fish	628.256mg/L	3
1,2-dimethoxyethane	EC50	96	Algae or other aquatic plants	4042.840mg/L	3
1,2-dimethoxyethane	EC50	384	Crustacea	143.231mg/L	3
lithium perchlorate	LC50	96	Fish	2.69955mg/L	3
lithium perchlorate	EC50	96	Algae or other aquatic plants	9139.75871mg/L	3
lithium perchlorate	EC50	384	Crustacea	84.72886mg/L	3
Legend:	*Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 3. EPIWIN Suite V3.12 - Aquatic Toxicity Data (Estimated) 4. US EPA, Ecotox database - Aquatic Toxicity Data 5. ECETOC Aquatic Hazard Assessment Data 6. NITE (Japan) - Bioconcentration Data 7. METI (Japan) - Bioconcentration Data 8. Vendor Data*				

DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
1,2-dimethoxyethane	LOW	LOW
lithium perchlorate	HIGH	HIGH

Bioaccumulative potential

Ingredient	Bioaccumulation
1,2-dimethoxyethane	LOW (LogKOW = -0.21)
lithium perchlorate	LOW (LogKOW = -4.6296)

Mobility in soil

Ingredient	Mobility
1,2-dimethoxyethane	HIGH (KOC = 1)
lithium perchlorate	LOW (KOC = 48.64)

SECTION 13 DISPOSAL CONSIDERATIONS

Waste treatment methods

Product / Packaging disposal	▸ Recycle wherever possible or consult manufacturer for recycling options. ▸ Consult State Land Waste Management Authority for disposal. ▸ Bury residue in an authorised landfill. ▸ Recycle containers if possible, or dispose of in an authorised landfill.

SECTION 14 TRANSPORT INFORMATION

Continued...

Labels Required

	
Marine Pollutant	NO
HAZCHEM	Not Applicable

Land transport (ADG)

UN number	3090
UN proper shipping name	LITHIUM METAL BATTERIES (including lithium alloy batteries)
Transport hazard class(es)	Class: 9 Subrisk: Not Applicable
Packing group	Not Applicable
Environmental hazard	Not Applicable
Special precautions for user	Special provisions: 188 230 310 376 377 Limited quantity: 0

Air transport (ICAO-IATA / DGR)

UN number	3090
UN proper shipping name	Lithium metal batteries (including lithium alloy batteries)
Transport hazard class(es)	ICAO/IATA Class: 9 ICAO / IATA Subrisk: Not Applicable ERG Code: 9FZ
Packing group	Not Applicable
Environmental hazard	Not Applicable
Special precautions for user	Special provisions: A88 A99 A154 A164 A183 A201 Cargo Only Packing Instructions: See 968 Cargo Only Maximum Qty / Pack: See 968 Passenger and Cargo Packing Instructions: Forbidden Passenger and Cargo Maximum Qty / Pack: Forbidden Passenger and Cargo Limited Quantity Packing Instructions: Forbidden Passenger and Cargo Limited Maximum Qty / Pack: Forbidden

Sea transport (IMDG-Code / GGVSee)

UN number	3090
UN proper shipping name	LITHIUM METAL BATTERIES (including lithium alloy batteries)
Transport hazard class(es)	IMDG Class: 9 IMDG Subrisk: Not Applicable
Packing group	Not Applicable
Environmental hazard	Not Applicable
Special precautions for user	EMS Number: F-A, S-I Special provisions: 188 230 310 376 377 Limited Quantities: 0

Transport in bulk according to Annex II of MARPOL and the IBC code

Continued...

Not Applicable

SECTION 15 REGULATORY INFORMATION

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

MANGANESE DIOXIDE(1313-13-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Exposure Standards
Australia Inventory of Chemical Substances (AICS)
Australia Hazardous Substances Information System - Consolidated Lists

LITHIUM(7439-93-2) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Hazardous Substances Information System - Consolidated Lists
International Air Transport Association (IATA) Dangerous Goods Regulations - Prohibited List Passenger and Cargo Aircraft
Australia Inventory of Chemical Substances (AICS)

1,2-DIMETHOXYETHANE(110-71-4) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Hazardous Substances Information System - Consolidated Lists
Australia Inventory of Chemical Substances (AICS)

LITHIUM PERCHLORATE(7791-03-9) IS FOUND ON THE FOLLOWING REGULATORY LISTS

Australia Inventory of Chemical Substances (AICS)

National Inventory	Status
Australia - AICS	Y
Canada - DSL	Y
Canada - NDSL	N (lithium perchlorate; manganese dioxide; lithium; 1,2-dimethoxyethane)
China - IECSC	Y
Europe - EINEC / ELINCS / NLP	Y
Japan - ENCS	N (lithium)
Korea - KECI	Y
New Zealand - NZIoC	Y
Philippines - PICCS	N (lithium perchlorate)
USA - TSCA	Y
Legend:	*Y = All ingredients are on the inventory* *N = Not determined or one or more ingredients are not on the inventory and are not exempt from listing(see specific ingredients in brackets)*

SECTION 16 OTHER INFORMATION

Other information

Ingredients with multiple cas numbers

Name	CAS No
manganese dioxide	1313-13-9, 301678-04-6
lithium perchlorate	7791-03-9, 13453-78-6

Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.
A list of reference resources used to assist the committee may be found at:
www.chemwatch.net
The SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

Definitions and abbreviations

PC—TWA: Permissible Concentration-Time Weighted Average
PC—STEL: Permissible Concentration-Short Term Exposure Limit
IARC: International Agency for Research on Cancer
ACGIH: American Conference of Governmental Industrial Hygienists
STEL: Short Term Exposure Limit
TEEL: Temporary Emergency Exposure Limit。
IDLH: Immediately Dangerous to Life or Health Concentrations
OSF: Odour Safety Factor

Continued...

NOAEL :No Observed Adverse Effect Level
LOAEL: Lowest Observed Adverse Effect Level
TLV: Threshold Limit Value
LOD: Limit Of Detection
OTV: Odour Threshold Value
BCF: BioConcentration Factors
BEI: Biological Exposure Index