

Document No:	147-6440	Rev:	A	Issue Date :	10/31/23	Page:	1 of 24
Title:	SDS-BATTERY, LI-ION, HAVENRM1, UN3480				Originator :	T. ROTH	
Confidential Property of  Bloomington, Minnesota	Approx Weight:	.001	lbs	Originating Location:		LYNDALE	
	Similar To:				Supersedes:		
Release/Change Authorization Number:	ECM 5195499 – RELEASE WITHOUT CHG FROM REV 1						

SEE ATTACHED DRAWING

Haven RM1 Battery Pack (UN3480)

The Toro Company

Chemwatch: 5631-19
Version No: 4.1
Safety Data Sheet according to OSHA HazCom Standard (2012) requirements

Chemwatch Hazard Alert Code: 4

Issue Date: 04/10/2023
Print Date: 05/10/2023
S.GHS.USA.EN

SECTION 1 Identification

Product Identifier

Product name	Haven RM1 Battery Pack (UN3480)
Chemical Name	Not Applicable
Synonyms	147-6442; 147-6443; 145-5847; 145-5848
Proper shipping name	Lithium ion batteries including lithium ion polymer batteries
Chemical formula	Not Applicable
Other means of identification	Not Available

Recommended use of the chemical and restrictions on use

Relevant identified uses	Lithium-ion batteries Note: Hazard statement relates to battery contents. Potential for exposure should not exist unless the battery leaks, is exposed to high temperatures or is mechanically, physically or electrically abused. Use according to manufacturer's directions.
--------------------------	--

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party

Registered company name	The Toro Company
Address	8111 Lyndale Avenue South, Bloomington MN 55420 United States
Telephone	+1-952-888-8801
Fax	+1-952-887-8258
Website	www.toro.com
Email	HealthAndSafety@toro.com

Emergency phone number

Association / Organisation	CHEMTEL	CHEMWATCH EMERGENCY RESPONSE (24/7)
Emergency telephone numbers	1-800-255-3924	+1 855-237-5573
Other emergency telephone numbers	+1-813-248-0585	+61 3 9573 3188

Once connected and if the message is not in your preferred language then please dial 01

Una vez conectado y si el mensaje no está en su idioma preferido, por favor marque 02

SECTION 2 Hazard(s) identification

Classification of the substance or mixture

Chemwatch Hazard Ratings

	Min	Max
Flammability	0	
Toxicity	4	
Body Contact	2	
Reactivity	2	
Chronic	3	

NFPA 704 diamond



0 = Minimum
1 = Low
2 = Moderate
3 = High
4 = Extreme

Note: The hazard category numbers found in GHS classification in section 2 of this SDSs are NOT to be used to fill in the NFPA 704 diamond. Blue = Health Red = Fire Yellow = Reactivity White = Special (Oxidizer or water reactive substances)

Classification	Oxidizing Solids Category 3, Acute Toxicity (Oral) Category 1, Acute Toxicity (Dermal) Category 4, Skin Corrosion/Irritation Category 2, Sensitisation (Skin) Category 1, Serious Eye Damage/Eye Irritation Category 2A, Acute Toxicity (Inhalation) Category 2, Sensitisation (Respiratory) Category 1, Specific Target Organ Toxicity - Single Exposure (Respiratory Tract Irritation) Category 3, Specific Target Organ Toxicity - Single Exposure (Narcotic Effects) Category 3, Germ Cell Mutagenicity Category 1A, Carcinogenicity Category 1A, Reproductive Toxicity Category 1B, Specific Target Organ Toxicity - Repeated Exposure Category 1, Hazardous to the Aquatic Environment Long-Term Hazard Category 2
----------------	--

Label elements

Hazard pictogram(s)	
---------------------	--

Haven RM1 Battery Pack Battery (UN3480)



Signal word **Danger**

Hazard statement(s)

H272	May intensify fire; oxidiser.
H300	Fatal if swallowed.
H312	Harmful in contact with skin.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H335	May cause respiratory irritation.
H336	May cause drowsiness or dizziness.
H340	May cause genetic defects.
H350	May cause cancer.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure.
H411	Toxic to aquatic life with long lasting effects.

Hazard(s) not otherwise classified

Not Applicable

Precautionary statement(s) Prevention

P201	Obtain special instructions before use.
P210	Keep away from heat.
P221	Take any precaution to avoid mixing with combustibles/organic material.
P260	Do not breathe dust/fume.
P261	Avoid breathing dust/fumes.
P271	Use only outdoors or in a well-ventilated area.

Precautionary statement(s) Response

P301+P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor/physician/first aider.
P304+P340	IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P308+P313	IF exposed or concerned: Get medical advice/ attention.
P310	Immediately call a POISON CENTER/doctor/physician/first aider.
P330	Rinse mouth.
P342+P311	If experiencing respiratory symptoms: Call a POISON CENTER/doctor/physician/first aider.

Precautionary statement(s) Storage

P405	Store locked up.
P403+P233	Store in a well-ventilated place. Keep container tightly closed.

Precautionary statement(s) Disposal

P501	Dispose of contents/container to authorised hazardous or special waste collection point in accordance with any local regulation.
------	--

SECTION 3 Composition / information on ingredients

Substances

See section below for composition of Mixtures

Mixtures

CAS No	%[weight]	Name
Not Available		sealed metal can, containing,
12031-65-1	25-35	<u>lithium nickel oxide</u>
7782-42-5	20-30	<u>graphite</u>
7439-89-6	10-20	<u>iron</u>
7440-50-8	5-15	<u>copper</u>

Haven RM1 Battery Pack Battery (UN3480)

CAS No	%[weight]	Name
12190-79-3	1-5	<u>lithium cobaltate</u>
554-12-1	1-5	<u>methyl propionate</u>
7429-90-5	1-5	<u>aluminium</u>
21324-40-3	1-3	<u>lithium fluorophosphate</u>
114435-02-8	1-3	<u>fluoroethylene carbonate</u>
616-38-6	1-3	<u>dimethyl carbonate</u>
9002-88-4	1-3	<u>polyethylene</u>
1309-37-1	0.1-1	<u>ferric oxide</u>
1318-23-6	0.1-1	<u>boehmite</u>
1333-86-4	0.1-1	<u>carbon black</u>
7440-02-0	0.1-1	<u>nickel</u>
872-50-4	0.1-0.3	<u>N-methyl-2-pyrrolidone</u>
12003-67-7	0.1-0.3	<u>lithium aluminate</u>
7440-47-3	0.1-0.3	<u>chromium</u>
554-13-2	0.1-0.3	<u>lithium carbonate</u>
100-41-4	0.1-0.3	<u>ethylbenzene</u>

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

SECTION 4 First-aid measures

Description of first aid measures

Eye Contact	<p>If battery is leaking and material contacts the eye. If this product comes in contact with the eyes:</p> <ul style="list-style-type: none"> ▶ Immediately hold eyelids apart and flush the eye continuously with running water. ▶ Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes. ▶ Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids. ▶ Seek medical attention without delay.
Skin Contact	<p>If battery is leaking and material contacts the skin. Remove all contaminated clothing, including footwear. Wash thoroughly all affected areas with water and soap. Seek medical attention if swelling/redness/blistering or irritation occurs.</p>
Inhalation	<p>If battery is leaking, contents may be irritating to respiratory passages. Remove patient to fresh air and seek medical attention.</p>
Ingestion	<p>If poisoning occurs, contact a doctor or Poisons Information Centre.</p>

Most important symptoms and effects, both acute and delayed

See Section 11

Indication of any immediate medical attention and special treatment needed

Clinical effects of lithium intoxication appear to relate to duration of exposure as well as to level.

- ▶ Lithium produces a generalised slowing of the electroencephalogram; the anion gap may increase in severe cases.
- ▶ Emesis (or lavage if the patient is obtunded or convulsing) is indicated for ingestions exceeding 40 mg (Li)/Kg.
- ▶ Overdose may delay absorption; decontamination measures may be more effective several hours after cathartics.
- ▶ Charcoal is not useful. No clinical data are available to guide the administration of catharsis.
- ▶ Haemodialysis significantly increases lithium clearance; indications for haemodialysis include patients with serum levels above 4 meq/L.
- ▶ There are no antidotes.

[Ellenhorn and Barceloux: Medical Toxicology]

Following acute or short term repeated exposure to hydrofluoric acid:

- ▶ Subcutaneous injections of Calcium Gluconate may be necessary around the burnt area. Continued application of Calcium Gluconate Gel or subcutaneous Calcium Gluconate should then continue for 3-4 days at a frequency of 4-6 times per day. If a "burning" sensation recurs, apply more frequently.
- ▶ Systemic effects of extensive hydrofluoric acid burns include renal damage, hypocalcaemia and consequent cardiac arrhythmias. Monitor haematological, respiratory, renal, cardiac and electrolyte status at least daily. Tests should include FBE, blood gases, chest X-ray, creatinine and electrolytes, urine output, Ca ions, Mg ions and phosphate ions. Continuous ECG monitoring may be required.
- ▶ Where serum calcium is low, or clinical, or ECG signs of hypocalcaemia develop, infusions of calcium gluconate, or if less serious, oral Sandocal, should be given. Hydrocortisone 500 mg in a four to six hourly infusion may help.
- ▶ Antibiotics should not be given as a routine, but only when indicated.
- ▶ Eye contact pain may be excruciating and 2-3 drops of 0.05% pentocaine hydrochloride may be instilled, followed by further irrigation

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
1. Methaemoglobin in blood	1.5% of haemoglobin	During or end of shift	B, NS, SQ

B: Background levels occur in specimens collected from subjects **NOT** exposed.

NS: Non-specific determinant; Also seen after exposure to other materials

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

- ▶ Chronic exposures to cobalt and its compounds results in the so-called "hard metal pneumoconiosis" amongst industrial workers. The lesions consist of nodular conglomerate shadows in the lungs, together with peribronchial infiltration. The disease may be reversible. The acute form of the disease resembles a hypersensitivity reaction with malaise, cough and wheezing; the chronic form progresses to cor pulmonale.
- ▶ Chronic therapeutic administration may cause goiter and reduced thyroid activity.
- ▶ An allergic dermatitis, usually confined to elbow flexures, the ankles and sides of the neck, has been described.
- ▶ Cobalt cardiomyopathy may be diagnosed early by changes in the final part of the ventricular ECG (repolarisation). In the presence of such disturbances, the changes in carbohydrate metabolism (revealed by the glucose test) are of important diagnostic value.
- ▶ Treatment generally consists of a combination of Retabolil (1 injection per week over 4 weeks) and beta-blockers (average dose 60-80 mg Obsidan/24 hr). Potassium salts and diuretics have also proved useful.

BIOLOGICAL EXPOSURE INDEX (BEI)

Determinant	Sampling time	Index	Comments
Cobalt in urine	End of shift at end of workweek	15 ug/L	B
Cobalt in blood	End of shift at end of workweek	1 ug/L	B, SQ

B: Background levels occur in specimens collected from subjects NOT exposed

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

SECTION 5 Fire-fighting measures

Extinguishing media

- ▶ There is no restriction on the type of extinguisher which may be used.
- ▶ Use extinguishing media suitable for surrounding area.

Special hazards arising from the substrate or mixture

Fire Incompatibility	▶ Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result
-----------------------------	--

Special protective equipment and precautions for fire-fighters

Fire Fighting	<ul style="list-style-type: none"> ▶ Alert Fire Brigade and tell them location and nature of hazard. ▶ Wear breathing apparatus plus protective gloves. ▶ Prevent, by any means available, spillage from entering drains or water courses. ▶ Use water delivered as a fine spray to control fire and cool adjacent area. ▶ DO NOT approach containers suspected to be hot. ▶ Cool fire exposed containers with water spray from a protected location. <p>Slight hazard when exposed to heat, flame and oxidisers.</p>
Fire/Explosion Hazard	<ul style="list-style-type: none"> ▶ Non combustible. ▶ Not considered a significant fire risk ▶ Heating may cause expansion or decomposition leading to violent rupture of containers. ▶ Decomposes on heating and produces toxic fumes of carbon monoxide (CO). ▶ May emit acrid smoke and poisonous, corrosive fumes <p>Decomposition may produce toxic fumes of: carbon dioxide (CO2) carbon monoxide (CO) metal oxides hydrofluoric acid</p>

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	<ul style="list-style-type: none"> ▶ Clean up all spills immediately. ▶ Secure load if safe to do so. ▶ Bundle/collect recoverable product. ▶ Collect remaining material in containers with covers for disposal.
Major Spills	<ul style="list-style-type: none"> ▶ 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).

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

SECTION 7 Handling and storage

Precautions for safe handling

Safe handling	<ul style="list-style-type: none"> ▶ Limit all unnecessary personal contact. ▶ Wear protective clothing when risk of exposure occurs. ▶ Use in a well-ventilated area. ▶ When handling DO NOT eat, drink or smoke. ▶ Always wash hands with soap and water after handling. ▶ Avoid physical damage to containers.
Other information	▶ Store in original containers.

Haven RM1 Battery Pack Battery (UN3480)

- ▶ Keep containers securely sealed.
 - ▶ Store in a cool, dry, well-ventilated area.
 - ▶ Store away from incompatible materials and foodstuff containers.
 - ▶ Protect containers against physical damage and check regularly for leaks.
 - ▶ Observe manufacturer's storage and handling recommendations contained within this SDS.
 - ▶ Store away from incompatible materials.
- Keep out of reach of children.

Conditions for safe storage, including any incompatibilities

Suitable container	▶ Packaging as recommended by manufacturer.
Storage incompatibility	<ul style="list-style-type: none"> ▶ Avoid strong bases. ▶ Avoid strong acids, acid chlorides, acid anhydrides and chloroformates. ▶ Avoid reaction with oxidising agents ▶ Keep dry

SECTION 8 Exposure controls / personal protection

Control parameters

Occupational Exposure Limits (OEL)

INGREDIENT DATA

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US NIOSH Recommended Exposure Limits (RELs)	lithium nickel oxide	Nickel metal and other compounds (as Ni)	0.015 mg/m3	Not Available	Not Available	Ca; See Appendix A [*Note: The REL does not apply to Nickel carbonyl.]
US OSHA Permissible Exposure Limits (PELs) Table Z-1	graphite	Graphite, synthetic- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	graphite	Graphite, synthetic- Respirable Fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	graphite	Graphite (Natural)	15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	graphite	Graphite (natural)	2.5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	iron	Particulates Not Otherwise Regulated (PNOR)- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	iron	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	iron	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	iron	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	iron	Particulates not otherwise regulated	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	copper	Copper- Dusts and mists (as Cu)	1 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	copper	Copper- Fume (as Cu)	0.1 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	copper	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	copper	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	copper	Copper (dusts and mists, as Cu)	1 mg/m3	Not Available	Not Available	[*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.]
US OSHA Permissible Exposure Limits (PELs) Table Z-1	lithium cobaltate	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	lithium cobaltate	Particulates Not Otherwise Regulated (PNOR)- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	lithium cobaltate	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available

Haven RM1 Battery Pack Battery (UN3480)

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Limits (PELs) Table Z-3	lithium cobaltate	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	lithium cobaltate	Particulates not otherwise regulated	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	aluminium	Aluminum Metal (as Al)-Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	aluminium	Aluminum Metal (as Al)-Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	aluminium	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	aluminium	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	aluminium	Aluminum - respirable	5 mg/m3	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	aluminium	Aluminum (pyro powders and welding fumes, as Al)	5 mg/m3	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	aluminium	Aluminum - total	10 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	lithium fluorophosphate	Particulates Not Otherwise Regulated (PNOR)-Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	lithium fluorophosphate	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	lithium fluorophosphate	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	lithium fluorophosphate	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	lithium fluorophosphate	Particulates not otherwise regulated	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	polyethylene	Particulates Not Otherwise Regulated (PNOR)-Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	polyethylene	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	polyethylene	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	polyethylene	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	polyethylene	Particulates not otherwise regulated	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	ferric oxide	Iron oxide- (fume)	10 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	ferric oxide	Rouge- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	ferric oxide	Rouge- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	ferric oxide	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	ferric oxide	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	ferric oxide	Iron oxide dust and fume (as Fe)	5 mg/m3	Not Available	Not Available	Not Available

THE TORO COMPANY : CONFIDENTIAL NAME : 147 - 6440 REV : A AUTH : 5195499 SHEET : 7

Haven RM1 Battery Pack Battery (UN3480)

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US NIOSH Recommended Exposure Limits (RELs)	ferric oxide	Rouge	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	boehmite	alpha-Alumina- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	boehmite	alpha-Alumina- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	boehmite	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	boehmite	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	boehmite	alpha-Alumina	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	carbon black	Carbon black	3.5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	carbon black	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	carbon black	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	carbon black	Carbon black	3.5 mg/m3	Not Available	Not Available	Ca; TWA 0.1 mg PAHs/m3 [Carbon black in presence of polycyclic aromatic hydrocarbons (PAHs)] See Appendix A See Appendix C
US OSHA Permissible Exposure Limits (PELs) Table Z-1	nickel	Nickel, metal and insoluble compounds (as Ni)	1 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	nickel	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	nickel	Particulates Not Otherwise Regulated (PNOR)- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	nickel	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	nickel	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	nickel	Particulates not otherwise regulated	Not Available	Not Available	Not Available	See Appendix D
US NIOSH Recommended Exposure Limits (RELs)	nickel	Nickel metal and other compounds (as Ni)	0.015 mg/m3	Not Available	Not Available	Ca; See Appendix A [*Note: The REL does not apply to Nickel carbonyl.]
US OSHA Permissible Exposure Limits (PELs) Table Z-1	lithium aluminate	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	lithium aluminate	Particulates Not Otherwise Regulated (PNOR)- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	lithium aluminate	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	lithium aluminate	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	lithium aluminate	Particulates not otherwise regulated	Not Available	Not Available	Not Available	See Appendix D
US OSHA Permissible Exposure Limits (PELs) Table Z-1	chromium	Chromium metal and insol. salts (as Cr)	1 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	chromium	Particulates Not Otherwise Regulated (PNOR)- Respirable fraction	5 mg/m3	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-1	chromium	Particulates Not Otherwise Regulated (PNOR)- Total dust	15 mg/m3	Not Available	Not Available	Not Available

Haven RM1 Battery Pack Battery (UN3480)

Source	Ingredient	Material name	TWA	STEL	Peak	Notes
US OSHA Permissible Exposure Limits (PELs) Table Z-3	chromium	Inert or Nuisance Dust: Total Dust	15 mg/m3 / 50 mppcf	Not Available	Not Available	Not Available
US OSHA Permissible Exposure Limits (PELs) Table Z-3	chromium	Inert or Nuisance Dust: Respirable fraction	5 mg/m3 / 15 mppcf	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	chromium	Chromium metal	0.5 mg/m3	Not Available	Not Available	See Appendix C
US OSHA Permissible Exposure Limits (PELs) Table Z-1	ethylbenzene	Ethyl benzene	100 ppm / 435 mg/m3	Not Available	Not Available	Not Available
US NIOSH Recommended Exposure Limits (RELs)	ethylbenzene	Ethyl benzene	100 ppm / 435 mg/m3	545 mg/m3 / 125 ppm	Not Available	Not Available

Emergency Limits

Ingredient	TEEL-1	TEEL-2	TEEL-3
graphite	6 mg/m3	330 mg/m3	2,000 mg/m3
iron	3.2 mg/m3	35 mg/m3	150 mg/m3
copper	3 mg/m3	33 mg/m3	200 mg/m3
lithium fluorophosphate	7.5 mg/m3	83 mg/m3	500 mg/m3
dimethyl carbonate	11 ppm	120 ppm	700 ppm
polyethylene	16 mg/m3	170 mg/m3	1,000 mg/m3
ferric oxide	15 mg/m3	360 mg/m3	2,200 mg/m3
boehmite	15 mg/m3	170 mg/m3	990 mg/m3
carbon black	9 mg/m3	99 mg/m3	590 mg/m3
nickel	4.5 mg/m3	50 mg/m3	99 mg/m3
N-methyl-2-pyrrolidone	30 ppm	32 ppm	190 ppm
lithium aluminate	28 mg/m3	310 mg/m3	1,800 mg/m3
lithium aluminate	37 mg/m3	400 mg/m3	2,400 mg/m3
chromium	1.5 mg/m3	17 mg/m3	99 mg/m3
lithium carbonate	3.1 mg/m3	34 mg/m3	210 mg/m3
ethylbenzene	Not Available	Not Available	Not Available

Ingredient	Original IDLH	Revised IDLH
lithium nickel oxide	10 mg/m3	Not Available
graphite	1,250 mg/m3	Not Available
iron	Not Available	Not Available
copper	100 mg/m3	Not Available
lithium cobaltate	Not Available	Not Available
methyl propionate	Not Available	Not Available
aluminium	Not Available	Not Available
lithium fluorophosphate	Not Available	Not Available
fluoroethylene carbonate	Not Available	Not Available
dimethyl carbonate	Not Available	Not Available
polyethylene	Not Available	Not Available
ferric oxide	2,500 mg/m3	Not Available
boehmite	Not Available	Not Available
carbon black	1,750 mg/m3	Not Available
nickel	10 mg/m3	Not Available
N-methyl-2-pyrrolidone	Not Available	Not Available
lithium aluminate	Not Available	Not Available
chromium	250 mg/m3	Not Available
lithium carbonate	Not Available	Not Available
ethylbenzene	800 ppm	Not Available

Occupational Exposure Banding

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
methyl propionate	E	≤ 0.1 ppm

Notes: Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.

Haven RM1 Battery Pack Battery (UN3480)

Ingredient	Occupational Exposure Band Rating	Occupational Exposure Band Limit
fluoroethylene carbonate	E	≤ 0.1 ppm
N-methyl-2-pyrrolidone	E	≤ 0.1 ppm
lithium carbonate	E	≤ 0.01 mg/m ³
Notes:	Occupational exposure banding is a process of assigning chemicals into specific categories or bands based on a chemical's potency and the adverse health outcomes associated with exposure. The output of this process is an occupational exposure band (OEB), which corresponds to a range of exposure concentrations that are expected to protect worker health.	

Exposure controls

Appropriate engineering controls	General exhaust is adequate under normal operating conditions.
Individual protection measures, such as personal protective equipment	
Eye and face protection	<ul style="list-style-type: none"> ▶ Safety glasses with side shields. ▶ Chemical goggles. [AS/NZS 1337.1, EN166 or national equivalent] ▶ Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. <p>None under normal operating conditions. OTHERWISE:</p>
Skin protection	See Hand protection below
Hands/feet protection	<p>NOTE:</p> <ul style="list-style-type: none"> ▶ The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact. ▶ Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed. <p>None under normal operating conditions. OTHERWISE:</p> <ul style="list-style-type: none"> ▶ Wear chemical protective gloves, e.g. PVC. ▶ Wear safety footwear or safety gumboots, e.g. Rubber
Body protection	See Other protection below
Other protection	<p>No special equipment needed when handling small quantities otherwise use</p> <ul style="list-style-type: none"> ▶ Overalls. ▶ P.V.C apron. ▶ Barrier cream. ▶ Skin cleansing cream. ▶ Eye wash unit.

Recommended material(s)

GLOVE SELECTION INDEX

Glove selection is based on a modified presentation of the: "Forsberg Clothing Performance Index". The effect(s) of the following substance(s) are taken into account in the **computer-generated** selection:
Haven RM1 Battery Pack Battery (UN3480)

Material	CPI
BUTYL	C
NATURAL RUBBER	C
PE/EVAL/PE	C
PVA	C
TEFLON	C
VITON	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.

Respiratory protection

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

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	AK-AUS P2	-	AK-PAPR-AUS / Class 1 P2
up to 50 x ES	-	AK-AUS / Class 1 P2	-
up to 100 x ES	-	AK-2 P2	AK-PAPR-2 P2 ^

^ - 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.

Haven RM1 Battery Pack Battery (UN3480)

- Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU)
- 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	Solid battery Battery-System: Lithium-ion (Li-ion) Nominal Voltage: 3.6 V Rated Capacity: 4.0 Ah Wh rating: 14.4 Wh Anode (negative electrode): based on intercalation graphite Cathode (positive electrode): based on lithiated metal oxide (Cobalt, Nickel)		
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 Available	Decomposition temperature (°C)	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
Lower Explosive Limit (%)	Not Available	Volatile Component (%vol)	Not Available
Vapour pressure (kPa)	Not Available	Gas group	Not Available
Solubility in water	Immiscible	pH as a solution (1%)	Not Available
Vapour density (Air = 1)	Not Available	VOC g/L	Not Available

SECTION 10 Stability and reactivity

Reactivity	See section 7
Chemical stability	
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	Inhalation of vapors or fumes released due to heat or a large number of leaking batteries may cause respiratory and eye irritation. Not normally a hazard due to physical form of product.
Ingestion	Contents of a cell if opened destructively or leaking may be harmful if swallowed. Not normally a hazard due to physical form of product. 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.
Skin Contact	Contact with battery contents will cause irritation. A shorted lithium battery can cause thermal and chemical burns upon contact with skin. Not normally a hazard due to physical form of product.
Eye	Contact with battery contents will cause irritation.
Chronic	The chemicals in this product are contained in a sealed can and exposure does not occur during normal handling and use. Overexposure can cause symptoms of non-fibrotic lung injury and membrane irritation. [Manufacturer] Studies show that inhaling this substance for over a long period (e.g. in an occupational setting) may increase the risk of cancer. Long-term exposure to respiratory irritants may result in airways disease, involving difficulty breathing and related whole-body problems. Inhaling this product is more likely to cause a sensitisation reaction in some persons compared to the general population. Skin contact with the material is more likely to cause a sensitisation reaction in some persons compared to the general population. There is ample evidence to presume that exposure to this material can cause genetic defects that can be inherited. Based on experiments and other information, there is ample evidence to presume that exposure to this material can cause genetic defects that can be inherited.

Haven RM1 Battery Pack Battery (UN3480)	TOXICITY	IRRITATION
	Not Available	Not Available
lithium nickel oxide	TOXICITY	IRRITATION

Haven RM1 Battery Pack Battery (UN3480)

	Oral (Rat) LD50: >2000 mg/kg ^[1]	Not Available
graphite	TOXICITY	IRRITATION
	Inhalation(Rat) LC50: >2 mg/L4h ^[1]	Not Available
	Oral (Rat) LD50: >200 mg/kg ^[1]	
iron	TOXICITY	IRRITATION
	Oral (Rat) LD50: 98600 mg/kg ^[2]	Not Available
copper	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Inhalation(Rat) LC50: 0.733 mg/l4h ^[1]	Skin: no adverse effect observed (not irritating) ^[1]
lithium cobaltate	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Not Available
	Inhalation(Rat) LC50: 5.05 mg/l4h ^[1]	
methyl propionate	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >5000 mg/kg ^[2]	Skin (rabbit):500 mg/24h-moderate
	Inhalation(Rat) LC50: >22.7 mg/l4h ^[1]	
aluminium	TOXICITY	IRRITATION
	Inhalation(Rat) LC50: >2.3 mg/l4h ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (Rat) LD50: >2000 mg/kg ^[1]	Skin: no adverse effect observed (not irritating) ^[1]
lithium fluorophosphate	TOXICITY	IRRITATION
	Oral (Rat) LD50: 50-300 mg/kg ^[1]	Not Available
fluoroethylene carbonate	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Not Available
dimethyl carbonate	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Inhalation(Rat) LC50: >5.36 mg/l4h ^[1]	Skin: no adverse effect observed (not irritating) ^[1]
polyethylene	TOXICITY	IRRITATION
	dermal (rat) LD50: >2000 mg/kg ^[1]	Not Available
	Oral (Rat) LD50: >2000 mg/kg ^[1]	
ferric oxide	TOXICITY	IRRITATION
	Oral (Rat) LD50: >5000 mg/kg ^[1]	Not Available
boehmite	TOXICITY	IRRITATION
	Inhalation(Rat) LC50: >2.3 mg/l4h ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
carbon black	TOXICITY	IRRITATION
	dermal (rabbit) LD50: >2000 mg/kg ^[1]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (Rat) LD50: >2000 mg/kg ^[1]	Skin: no adverse effect observed (not irritating) ^[1]
nickel	TOXICITY	IRRITATION
	Oral (Rat) LD50: 5000 mg/kg ^[2]	Eye: no adverse effect observed (not irritating) ^[1]
N-methyl-2-pyrrolidone		Skin: no adverse effect observed (not irritating) ^[1]

Haven RM1 Battery Pack Battery (UN3480)

	TOXICITY	IRRITATION
	Dermal (rabbit) LD50: 8000 mg/kg ^[2]	Eye (rabbit): 100 mg - moderate *[Manufacturer]
	Inhalation(Rat) LC50: 3.1-8.8 mg/l4h ^[2]	
	Oral (Rat) LD50: 3914 mg/kg ^[2]	
lithium aluminate	Not Available	Not Available
chromium	Inhalation(Rat) LC50: >5.41 mg/l4h ^[1]	Not Available
	Oral (Rat) LD50: >5000 mg/kg ^[1]	
lithium carbonate	dermal (rat) LD50: >2000 mg/kg ^[1]	Eye (rabbit) : Moderate *
	Inhalation(Rat) LC50: >0.8 mg/L4h ^[2]	Skin (rabbit) : Mild *
	Oral (Rat) LD50: 525 mg/kg ^[2]	
ethylbenzene	Dermal (rabbit) LD50: 17800 mg/kg ^[2]	Eye (rabbit): 500 mg - SEVERE
	Inhalation(Rat) LC50: 17.2 mg/l4h ^[2]	Eye: no adverse effect observed (not irritating) ^[1]
	Oral (Rat) LD50: 3500 mg/kg ^[2]	Skin (rabbit): 15 mg/24h mild
		Skin: no adverse effect observed (not irritating) ^[1]
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	

COPPER	<p>WARNING: Inhalation of high concentrations of copper fume may cause "metal fume fever", an acute industrial disease of short duration. Symptoms are tiredness, influenza like respiratory tract irritation with fever.</p> <p>for copper and its compounds (typically copper chloride):</p> <p>Acute toxicity: There are no reliable acute oral toxicity results available. In an acute dermal toxicity study (OECD TG 402), one group of 5 male rats and 5 groups of 5 female rats received doses of 1000, 1500 and 2000 mg/kg bw via dermal application for 24 hours. The LD50 values of copper monochloride were 2,000 mg/kg bw or greater for male (no deaths observed) and 1,224 mg/kg bw for female. Four females died at both 1500 and 2000 mg/kg bw, and one at 1,000 mg/kg bw. Symptom of the hardness of skin, an exudation of hardness site, the formation of scar and reddish changes were observed on application sites in all treated animals. Skin inflammation and injury were also noted.</p>
LITHIUM COBALTATE	<p>Allergic reactions involving the respiratory tract are usually due to interactions between IgE antibodies and allergens and occur rapidly. Allergic potential of the allergen and period of exposure often determine the severity of symptoms. Some people may be genetically more prone than others, and exposure to other irritants may aggravate symptoms. Allergy causing activity is due to interactions with proteins. Attention should be paid to atopic diathesis, characterised by increased susceptibility to nasal inflammation, asthma and eczema. Exogenous allergic alveolitis is induced essentially by allergen specific immune-complexes of the IgG type; cell-mediated reactions (T lymphocytes) may be involved. Such allergy is of the delayed type with onset up to four hours following exposure.</p>
FLUOROETHYLENE CARBONATE	<p>A study was performed to assess the skin sensitisation potential of Monofluoroethylene carbonate in the CBA/Ca strain mouse following topical application to the dorsal surface of the ear. The test material was considered to be a sensitiser under the conditions of the test. An inverse dose response relationship was noted in the Stimulation Index results. The reason for this is unknown but could be due to decreased bioactivity of the test material with increasing concentrations in dimethyl formamide, or due to immunosuppression at higher concentrations of test material. Genetic toxicity: in vitro Significant increases of revertant colonies were observed in Salmonella typhimurium TA98 in the presence of metabolic activation system and Salmonella typhimurium TA 100 in the absence and presence of metabolic activation system. It is concluded that Monofluoroethylene carbonate exhibited mutagenic activity in Salmonella typhimurium TA98, TA 100 under the conditions employed for this test. Genetic toxicity: in vivo Monofluoroethylene carbonate was cytotoxic to bone marrow cells, but did not show any indication of chromosomal damage and/or damage to the mitotic apparatus of the bone marrow target cells in female mice, treated intraperitoneally with it is concluded that Monofluoroethylene carbonate was cytotoxic to the bone marrow cells, but did not show any indication of chromosomal damage and/or damage to the mitotic apparatus of the bone marrow target cells in female mice, treated intraperitoneally with monofluoroethylene carbonate, up to 100 mg/kg bw., up to 100 mg/kg bw. *REACH Dossier</p>
POLYETHYLENE	<p>polyethylene pyrolyzate</p> <p>For poly-alpha-olefins (PAOs):</p> <p>PAOs are highly branched, isoparaffinic chemicals produced by oligomerisation of 1-octene, 1-decene and/or 1-dodecene. The crude polyalphaolefin mixture is then distilled into appropriate product fractions to meet specific viscosity specifications and hydrogenated. In existing data, there appears to be no data to show that these structural analogs cause health effects. In addition, there is evidence in the literature that alkanes with 30 or more carbon atoms are unlikely to be absorbed when given by mouth. The physical and chemical properties make it unlikely that significant absorption into the body will occur. There are also no functional groups on PAO molecules that are biologically active.</p> <p>Inclusion of polyethylene in the diet of rats at 8 g/kg/day did not result in treatment-related effects. Polyethylene implanted into rats and mice has reportedly caused local tumorigenic activity at doses of 33 to 2120 mg/kg, but the relevance to human exposure is not certain.</p>
CARBON BLACK	Inhalation (rat) TCLo: 50 mg/m3/6h/90D-I Nil reported
NICKEL	Oral (rat) TDLo: 500 mg/kg/5D-I Inhalation (rat) TCLo: 0.1 mg/m3/24H/17W-C Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogen [National Toxicology Program: U.S. Dep. of Health & Human Services 2002]
N-METHYL-2-PYRROLIDONE	For N-methyl-2-pyrrolidone (NMP): Acute toxicity: Animal testing shows NMP is quickly absorbed after inhalation, swallowing and administration on skin, distributed throughout the body, and eliminated mostly by hydroxylation to polar compounds, which are excreted in the urine. In animal testing NMP has a low potential for skin irritation and a moderate potential for eye irritation. Repeated daily doses of high amounts on the skin have caused severe, painful bleeding and eschar formation. In general, animal testing suggests NMP has low acute toxicity. Exposure to toxic amounts caused

THE TORO COMPANY : CONFIDENTIAL NAME : 147 - 6440 REV : A AUTH : 5195499 SHEET : 13

	<p>functional disturbances and depression of the central nervous system. Local irritation of the airway occurred after inhalation, and irritation of the gastrointestinal tract occurred after swallowing in animals.</p> <p>Repeat dose toxicity: There is no clear toxicity profile for NMP after multiple administration.</p> <p>A substance (or part of a group of chemical substances) of very high concern (SVHC) - or product containing an SVHC:</p> <p>It is proposed that use within the European Union be subject to authorisation under the REACH Regulation. Indeed, listing of a substance as an SVHC by the European Chemicals Agency (ECHA) is the first step in the procedure for authorisation or restriction of use of a chemical. The criteria are given in article 57 of the REACH Regulation. A substance may be proposed as an SVHC if it meets one or more of the following criteria:</p> <ul style="list-style-type: none"> ▶ it is carcinogenic *; ▶ it is mutagenic *; ▶ it is toxic for reproduction *; ▶ it is persistent, bioaccumulative and toxic (PBT substances); ▶ it is very persistent and very bioaccumulative (vPvB substances); ▶ there is "scientific evidence of probable serious effects to human health or the environment which give rise to an equivalent level of concern"; such substances are identified on a case-by-case basis. <p>* Collectively described as CMR substances</p> <p>The "equivalent concern" criterion is significant because it is this classification which allows substances which are, for example, neurotoxic, endocrine-disrupting or otherwise present an unanticipated environmental health risk to be regulated under REACH]</p> <p>Simply because a substance meets one or more of the criteria does not necessarily mean that it will be proposed as an SVHC. Many such substances are already subject to restrictions on their use within the European Union, such as those in Annex XVII of the REACH Regulation SVHCs are substances for which the current restrictions on use (where these exist) might be insufficient. There are three priority groups for assessment:</p> <ul style="list-style-type: none"> ▶ PBT substances and vPvB substances; ▶ substances which are widely dispersed during use; ▶ substances which are used in large quantities.
<p>LITHIUM ALUMINATE</p>	<p>For aluminium compounds:</p> <p>Aluminium present in food and drinking water is poorly absorbed through the gastrointestinal tract. The bioavailability of aluminium is dependent on the form in which it is ingested and the presence of dietary constituents with which the metal cation can complex Ligands in food can have a marked effect on absorption of aluminium, as they can either enhance uptake by forming absorbable (usually water soluble) complexes (e.g., with carboxylic acids such as citric and lactic), or reduce it by forming insoluble compounds (e.g., with phosphate or dissolved silicate).</p> <p>Considering the available human and animal data it is likely that the oral absorption of aluminium can vary 10-fold based on chemical form alone. Although bioavailability appears to generally parallel water solubility, insufficient data are available to directly extrapolate from solubility in water to bioavailability.</p> <p>For oral intake from food, the European Food Safety Authority (EFSA) has derived a tolerable weekly intake (TWI) of 1 milligram (mg) of aluminium per kilogram of bodyweight. In its health assessment, the EFSA states a medium bioavailability of 0.1 % for all aluminium compounds which are ingested with food. This corresponds to a systemically available tolerable daily dose of 0.143 microgrammes (µg) per kilogramme (kg) of body weight. This means that for an adult weighing 60 kg, a systemically available dose of 8.6 µg per day is considered safe.</p> <p>Based on a neuro-developmental toxicity study of aluminium citrate administered via drinking water to rats, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) established a Provisional Tolerable Weekly Intake (PTWI) of 2 mg/kg bw (expressed as aluminium) for all aluminium compounds in food, including food additives.</p>
<p>CHROMIUM</p>	<p>Gastrointestinal tumours, lymphoma, musculoskeletal tumours and tumours at site of application recorded.</p> <p>On skin and inhalation exposure, chromium and its compounds (except hexavalent) can be a potent sensitiser, as particulates. Studies show that they have a complex toxicity mechanism with hexavalent chromium associated with an increased risk of lung damage and respiratory cancers (primarily bronchogenic and nose cancers). However, there is no evidence that elemental, divalent, or trivalent chromium compounds causes cancer or genetic toxicity.</p> <p>Tenth Annual Report on Carcinogens: Substance known to be Carcinogenic <i>[National Toxicology Program: U.S. Dep. of Health and Human Services 2002]</i></p>
<p>LITHIUM CARBONATE</p>	<p>Lacrimation, altered sleep times, hallucinations, distorted perception, toxic psychosis, excitement, ataxia, respiratory depression, allergic dermatitis (after sytemic administration), foetotoxicity and foetoletality and specific development abnormalities recorded. Non-sensitising guinea pig * * FMC SDS</p> <p>The material may trigger oculogyric crisis. The term "oculogyric" refers to the bilateral elevation of the visual gaze.</p> <p>Initial symptoms include restlessness, agitation, malaise, or a fixed stare. Then comes the more characteristically described extreme and sustained upward deviation of the eyes. In addition, the eyes may converge, deviate upward and laterally, or deviate downward. The most frequently reported associated findings are backwards and lateral flexion of the neck, widely opened mouth, tongue protrusion, and ocular pain. However, the condition may also be associated with intensely painful jaw spasm which may result in the breaking of a tooth.</p>
<p>ETHYLBENZENE</p>	<p>Liver changes, uteral tract, effects on fertility, foetotoxicity, specific developmental abnormalities (musculoskeletal system) recorded.</p> <p>The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.</p> <p>Ethylbenzene is readily absorbed when inhaled, swallowed or in contact with the skin. It is distributed throughout the body, and passed out through urine. It may irritate the skin, eyes and may cause hearing loss if exposed to high doses. Long Term exposure may cause damage to the kidney, liver and lungs, including a tendency to cancer formation, according to animal testing. There is no research on its effect on sex organs and unborn babies.</p> <p>NOTE: Substance has been shown to be mutagenic in at least one assay, or belongs to a family of chemicals producing damage or change to cellular DNA.</p>
<p>LITHIUM NICKEL OXIDE & COPPER & LITHIUM COBALTATE & FLUOROETHYLENE CARBONATE & NICKEL</p>	<p>The following information refers to contact allergens as a group and may not be specific to this product.</p> <p>Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's oedema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type. Other allergic skin reactions, e.g. contact urticaria, involve antibody-mediated immune reactions. The significance of the contact allergen is not simply determined by its sensitisation potential: the distribution of the substance and the opportunities for contact with it are equally important. A weakly sensitising substance which is widely distributed can be a more important allergen than one with stronger sensitising potential with which few individuals come into contact.</p>
<p>LITHIUM NICKEL OXIDE & GRAPHITE & LITHIUM FLUOROPHOSPHATE & FERRIC OXIDE & N-METHYL-2-PYRROLIDONE & LITHIUM CARBONATE</p>	<p>Asthma-like symptoms may continue for months or even years after exposure to the material ends. This may be due to a non-allergic condition known as reactive airways dysfunction syndrome (RADS) which can occur after exposure to high levels of highly irritating compound. Main criteria for diagnosing RADS include the absence of previous airways disease in a non-atopic individual, with sudden onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. Other criteria for diagnosis of RADS include a reversible airflow pattern on lung function tests, moderate to severe bronchial hyperreactivity on methacholine challenge testing, and the lack of minimal lymphocytic inflammation, without eosinophilia. 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. On the other hand, industrial bronchitis is a disorder that occurs as a result of exposure due to high concentrations of irritating substance (often particles) and is completely reversible after exposure ceases.</p>
<p>GRAPHITE & LITHIUM COBALTATE & ALUMINIUM &</p>	<p>No significant acute toxicological data identified in literature search.</p>

THE TORO COMPANY : CONFIDENTIAL NAME : 147 - 6440 REV : A AUTH : 5195499 SHEET : 14

Haven RM1 Battery Pack Battery (UN3480)

LITHIUM FLUOROPHOSPHATE & BOEHMITE & CARBON BLACK & LITHIUM ALUMINATE & CHROMIUM	
LITHIUM COBALTATE & LITHIUM ALUMINATE & LITHIUM CARBONATE	<p>Goitrogenic: Goitrogens are substances that suppress the function of the thyroid gland by interfering with iodine uptake, which can, as a result, cause an enlargement of the thyroid (a goitre). Goitrogens include: - Vitexin, a flavonoid, which inhibits thyroid peroxidase, contributing to goitre - Thiocyanate and perchlorate, which decrease iodide uptake by competitive inhibition and consequently increase release of TSH from the pituitary gland - Lithium, which inhibits thyroid hormone release - Certain foods, such as soy and millet (containing vitexins) and vegetables in the genus Brassica (which includes broccoli, Brussels sprouts, cabbage, cauliflower and horseradish). - Caffeine (found in coffee, tea, cola and chocolate), which acts on thyroid function as a suppressant.</p>
METHYL PROPIONATE & ETHYLBENZENE	The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
POLYETHYLENE & CHROMIUM	The substance is classified by IARC as Group 3: NOT classifiable as to its carcinogenicity to humans. Evidence of carcinogenicity may be inadequate or limited in animal testing.
CARBON BLACK & NICKEL & ETHYLBENZENE	WARNING: This substance has been classified by the IARC as Group 2B: Possibly Carcinogenic to Humans.
Acute Toxicity	✓
Skin Irritation/Corrosion	✓
Serious Eye Damage/Irritation	✓
Respiratory or Skin sensitisation	✓
Mutagenicity	✓
Carcinogenicity	✓
Reproductivity	✓
STOT - Single Exposure	✓
STOT - Repeated Exposure	✓
Aspiration Hazard	✗

Legend: ✗ – Data either not available or does not fill the criteria for classification
✓ – Data available to make classification

SECTION 12 Ecological information

Toxicity

	Endpoint	Test Duration (hr)	Species	Value	Source
Haven RM1 Battery Pack Battery (UN3480)	Not Available	Not Available	Not Available	Not Available	Not Available
lithium nickel oxide	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
	EC50	72h	Algae or other aquatic plants	>100mg/l	2
	EC50	48h	Crustacea	>100mg/l	2
	NOEC(ECx)	48h	Crustacea	>=100mg/l	2
graphite	EC50	72h	Algae or other aquatic plants	>100mg/l	2
	EC50	48h	Crustacea	>100mg/l	2
	NOEC(ECx)	48h	Crustacea	>=100mg/l	2
	LC50	96h	Fish	>100mg/l	2
iron	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	18mg/l	2
	EC50	48h	Crustacea	>100mg/l	2
	LC50	96h	Fish	0.00499-0.00819mg/l	4
copper	NOEC(ECx)	48h	Algae or other aquatic plants	0.1-4mg/l	4
	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	0.011-0.017mg/L	4
	EC50	48h	Crustacea	0.0006-0.0017mg/l	4
	EC50	96h	Algae or other aquatic plants	0.03-0.058mg/l	4
lithium cobaltate	LC50	96h	Fish	0.003mg/L	2
	NOEC(ECx)	48h	Fish	0.00009mg/l	4
	Endpoint	Test Duration (hr)	Species	Value	Source
lithium cobaltate	EC50	72h	Algae or other aquatic plants	0.029mg/L	2

Haven RM1 Battery Pack Battery (UN3480)

	EC50	48h	Crustacea	0.241mg/L	2
	EC50	96h	Algae or other aquatic plants	23.8mg/l	2
	LC50	96h	Fish	0.8mg/l	2
	EC10(ECx)	168h	Crustacea	0.001mg/L	2
methyl propionate	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	>500mg/l	4
	EC50	96h	Algae or other aquatic plants	>500mg/l	4
	NOEC(ECx)	504h	Crustacea	3.2mg/L	5
aluminium	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	0.017mg/L	2
	EC50	48h	Crustacea	0.736mg/L	2
	EC50	96h	Algae or other aquatic plants	0.005mg/L	2
	LC50	96h	Fish	0.078-0.108mg/l	2
	NOEC(ECx)	48h	Crustacea	>100mg/l	1
lithium fluorophosphate	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	62mg/l	2
	EC50	48h	Crustacea	98mg/l	2
	EC50	96h	Algae or other aquatic plants	43mg/l	2
	NOEC(ECx)	528h	Fish	0.2mg/l	2
fluoroethylene carbonate	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	6.3mg/l	2
	EC50	48h	Crustacea	8.4mg/l	Not Available
	LC50	96h	Fish	6-60mg/l	Not Available
dimethyl carbonate	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	>57.29mg/l	2
	EC50	48h	Crustacea	>74.16mg/l	2
	EC50	96h	Algae or other aquatic plants	166.6-211mg/l	2
	LC50	96h	Fish	>=100mg/l	2
polyethylene	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
	EC50	72h	Algae or other aquatic plants	18mg/l	2
	EC50	48h	Crustacea	>100mg/l	2
ferric oxide	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	18mg/l	2
	EC50	48h	Crustacea	>100mg/l	2
	LC50	96h	Fish	0.05mg/l	2
boehmite	Endpoint	Test Duration (hr)	Species	Value	Source
	NOEC(ECx)	504h	Fish	0.52mg/l	2
	EC50	72h	Algae or other aquatic plants	0.2mg/l	2
	EC50	48h	Crustacea	1.5mg/l	2
	EC50	96h	Algae or other aquatic plants	0.024mg/l	2
carbon black	Endpoint	Test Duration (hr)	Species	Value	Source
	LC50	96h	Fish	0.078-0.108mg/l	2
	EC50	72h	Algae or other aquatic plants	>=0.004mg/l	2
	EC50	48h	Crustacea	33.076-41.968mg/l	4

Haven RM1 Battery Pack Battery (UN3480)

	LC50	96h	Fish	>100mg/l	2
	NOEC(ECx)	24h	Crustacea	3200mg/l	1
nickel	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	0.18mg/l	1
	EC50	48h	Crustacea	>100mg/l	1
	EC50	96h	Algae or other aquatic plants	0.174-0.311mg/l	4
	LC50	96h	Fish	0.06mg/l	4
	EC50(ECx)	72h	Algae or other aquatic plants	0.18mg/l	1
N-methyl-2-pyrrolidone	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	>500mg/l	1
	EC50	48h	Crustacea	ca.4897mg/l	1
	NOEC(ECx)	504h	Crustacea	12.5mg/l	2
lithium aluminate	Endpoint	Test Duration (hr)	Species	Value	Source
	Not Available	Not Available	Not Available	Not Available	Not Available
chromium	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	0.026-0.208mg/L	4
	EC50	48h	Crustacea	<0.001mg/l	2
	EC50	96h	Algae or other aquatic plants	36mg/L	4
	LC50	96h	Fish	0.106mg/L	4
lithium carbonate	Endpoint	Test Duration (hr)	Species	Value	Source
	NOEC(ECx)	672h	Fish	0.00019mg/l	4
	LC50	96h	Fish	30.3mg/l	Not Available
	EC50	72h	Algae or other aquatic plants	>400mg/l	2
ethylbenzene	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	48h	Crustacea	33.2mg/l	Not Available
	EC50(ECx)	48h	Crustacea	33.2mg/l	Not Available
	EC50	96h	Algae or other aquatic plants	1.7-7.6mg/l	4
Legend:	Endpoint	Test Duration (hr)	Species	Value	Source
	EC50	72h	Algae or other aquatic plants	2.4-9.8mg/l	4
	EC50	48h	Crustacea	1.37-4.4mg/l	4
	LC50	96h	Fish	3.381-4.075mg/L	4
	EC50(ECx)	24h	Algae or other aquatic plants	0.02-938mg/l	4

Legend: Extracted from 1. IUCLID Toxicity Data 2. Europe ECHA Registered Substances - Ecotoxicological Information - Aquatic Toxicity 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

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
DO NOT discharge into sewer or waterways.

Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
methyl propionate	LOW	LOW
dimethyl carbonate	HIGH	HIGH
polyethylene	LOW	LOW
N-methyl-2-pyrrolidone	LOW	LOW
lithium carbonate	LOW	LOW
ethylbenzene	HIGH (Half-life = 228 days)	LOW (Half-life = 3.57 days)

Bioaccumulative potential

Haven RM1 Battery Pack Battery (UN3480)

Ingredient	Bioaccumulation
methyl propionate	LOW (LogKOW = 0.84)
dimethyl carbonate	LOW (LogKOW = 0.2336)
polyethylene	LOW (LogKOW = 1.2658)
boehmite	LOW (BCF = 231)
N-methyl-2-pyrrolidone	LOW (BCF = 0.16)
lithium carbonate	LOW (LogKOW = -0.4605)
ethylbenzene	LOW (BCF = 79.43)

Mobility in soil

Ingredient	Mobility
methyl propionate	LOW (KOC = 6.423)
dimethyl carbonate	LOW (KOC = 8.254)
polyethylene	LOW (KOC = 14.3)
N-methyl-2-pyrrolidone	LOW (KOC = 20.94)
lithium carbonate	HIGH (KOC = 1)
ethylbenzene	LOW (KOC = 517.8)

SECTION 13 Disposal considerations

Waste treatment methods

Product / Packaging disposal	<ul style="list-style-type: none"> ▶ 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

Labels Required

	
Marine Pollutant	

Shipping container and transport vehicle placarding and labeling may vary from the below information. Products that are regulated for transport will be packaged and marked as Dangerous Goods in Limited Quantities according to US DOT, IATA and IMDG regulations. In case of reshipment, it is the responsibility of the shipper to determine the appropriate labels and markings in accordance with applicable transport regulations.

Land transport (DOT)

14.1. UN number or ID number	3480	
14.2. UN proper shipping name	Lithium ion batteries including lithium ion polymer batteries	
14.3. Transport hazard class(es)	Class	9
	Subsidiary Hazard	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Environmentally hazardous	
14.6. Special precautions for user	Hazard Label	9
	Special provisions	388, 422, A54, A100

Air transport (ICAO-IATA / DGR)

14.1. UN number	3480	
14.2. UN proper shipping name	Lithium ion batteries (including lithium ion polymer batteries)	
14.3. Transport hazard class(es)	ICAO/IATA Class	9
	ICAO / IATA Subsidiary Hazard	Not Applicable

Haven RM1 Battery Pack Battery (UN3480)

	ERG Code	12FZ
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Environmentally hazardous	
14.6. Special precautions for user	Special provisions	A88 A99 A154 A164 A183 A201 A213 A331 A334 A802
	Cargo Only Packing Instructions	See 965
	Cargo Only Maximum Qty / Pack	See 965
	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)

14.1. UN number	3480	
14.2. UN proper shipping name	LITHIUM ION BATTERIES (including lithium ion polymer batteries)	
14.3. Transport hazard class(es)	IMDG Class	9
	IMDG Subsidiary Hazard	Not Applicable
14.4. Packing group	Not Applicable	
14.5. Environmental hazard	Marine Pollutant	
14.6. Special precautions for user	EMS Number	F-A, S-I
	Special provisions	188 230 310 348 376 377 384 387
	Limited Quantities	0

14.7.1. Transport in bulk according to Annex II of MARPOL and the IBC code
Not Applicable

14.7.2. Transport in bulk in accordance with MARPOL Annex V and the IMSBC Code

Product name	Group
lithium nickel oxide	Not Available
graphite	Not Available
iron	Not Available
copper	Not Available
lithium cobaltate	Not Available
methyl propionate	Not Available
aluminium	Not Available
lithium fluorophosphate	Not Available
fluoroethylene carbonate	Not Available
dimethyl carbonate	Not Available
polyethylene	Not Available
ferric oxide	Not Available
boehmite	Not Available
carbon black	Not Available
nickel	Not Available
N-methyl-2-pyrrolidone	Not Available
lithium aluminate	Not Available
chromium	Not Available
lithium carbonate	Not Available
ethylbenzene	Not Available

14.7.3. Transport in bulk in accordance with the IGC Code

Product name	Ship Type
lithium nickel oxide	Not Available
graphite	Not Available
iron	Not Available
copper	Not Available
lithium cobaltate	Not Available
methyl propionate	Not Available
aluminium	Not Available

Haven RM1 Battery Pack Battery (UN3480)

Product name	Ship Type
lithium fluorophosphate	Not Available
fluoroethylene carbonate	Not Available
dimethyl carbonate	Not Available
polyethylene	Not Available
ferric oxide	Not Available
boehmite	Not Available
carbon black	Not Available
nickel	Not Available
N-methyl-2-pyrrolidone	Not Available
lithium aluminate	Not Available
chromium	Not Available
lithium carbonate	Not Available
ethylbenzene	Not Available

SECTION 15 Regulatory information

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

lithium nickel oxide is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List	US EPCRA Section 313 Chemical List
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs	US National Toxicology Program (NTP) 15th Report Part A Known to be Human Carcinogens
International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Group 1: Carcinogenic to humans	US National Toxicology Program (NTP) 15th Report Part B. Reasonably Anticipated to be a Human Carcinogen
US - California Hazardous Air Pollutants Identified as Toxic Air Contaminants	US NIOSH Recommended Exposure Limits (RELs)
US - California Proposition 65 - Carcinogens	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US - California Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65 List	US TSCA New Chemical Exposure Limits (NCEL)
US Clean Air Act - Hazardous Air Pollutants	US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements
US CWA (Clean Water Act) - Priority Pollutants	US TSCA Section 5(a)(2) - Significant New Use Rules (SNURs)
US CWA (Clean Water Act) - Toxic Pollutants	

graphite is found on the following regulatory lists

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)	US NIOSH Recommended Exposure Limits (RELs)
US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5	US OSHA Permissible Exposure Limits (PELs) Table Z-1
US - Massachusetts - Right To Know Listed Chemicals	US OSHA Permissible Exposure Limits (PELs) Table Z-3
US DOE Temporary Emergency Exposure Limits (TEELs)	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

iron is found on the following regulatory lists

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)	US OSHA Permissible Exposure Limits (PELs) Table Z-1
US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5	US OSHA Permissible Exposure Limits (PELs) Table Z-3
US DOE Temporary Emergency Exposure Limits (TEELs)	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US NIOSH Recommended Exposure Limits (RELs)	

copper is found on the following regulatory lists

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)	US EPA Integrated Risk Information System (IRIS)
US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5	US EPCRA Section 313 Chemical List
US - Massachusetts - Right To Know Listed Chemicals	US NIOSH Recommended Exposure Limits (RELs)
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	US OSHA Permissible Exposure Limits (PELs) Table Z-1
US CWA (Clean Water Act) - Priority Pollutants	US OSHA Permissible Exposure Limits (PELs) Table Z-3
US CWA (Clean Water Act) - Toxic Pollutants	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
US DOE Temporary Emergency Exposure Limits (TEELs)	

lithium cobaltate is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List	US EPCRA Section 313 Chemical List
International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)	US National Toxicology Program (NTP) 15th Report Part B. Reasonably Anticipated to be a Human Carcinogen
US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5	US NIOSH Recommended Exposure Limits (RELs)
US - California Hazardous Air Pollutants Identified as Toxic Air Contaminants	US OSHA Permissible Exposure Limits (PELs) Table Z-1
US Clean Air Act - Hazardous Air Pollutants	US OSHA Permissible Exposure Limits (PELs) Table Z-3
US EPA Integrated Risk Information System (IRIS)	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

methyl propionate is found on the following regulatory lists

US - Massachusetts - Right To Know Listed Chemicals	US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
---	---

aluminium is found on the following regulatory lists

--	--

THE TORO COMPANY : CONFIDENTIAL NAME : 147 - 6440 REV : A AUTH : 5195499 SHEET : 20

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5

US - Massachusetts - Right To Know Listed Chemicals

US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)

US Department of Homeland Security (DHS) - Chemical Facility Anti-Terrorism Standards (CFATS) - Chemicals of Interest

lithium fluorophosphate is found on the following regulatory lists

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5

US DOE Temporary Emergency Exposure Limits (TEELs)

US NIOSH Recommended Exposure Limits (RELs)

fluoroethylene carbonate is found on the following regulatory lists

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

dimethyl carbonate is found on the following regulatory lists

US - Massachusetts - Right To Know Listed Chemicals

US DOE Temporary Emergency Exposure Limits (TEELs)

polyethylene is found on the following regulatory lists

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Not Classified as Carcinogenic

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5

US DOE Temporary Emergency Exposure Limits (TEELs)

ferric oxide is found on the following regulatory lists

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Not Classified as Carcinogenic

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5

US - Massachusetts - Right To Know Listed Chemicals

US DOE Temporary Emergency Exposure Limits (TEELs)

boehmite is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5

US - Massachusetts - Right To Know Listed Chemicals

US DOE Temporary Emergency Exposure Limits (TEELs)

carbon black is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Group 2B: Possibly carcinogenic to humans

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)

US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5

US - California Proposition 65 - Carcinogens

US - California Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65 List

nickel is found on the following regulatory lists

US EPCRA Section 313 Chemical List

US NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Limits (PELs) Table Z-1

US OSHA Permissible Exposure Limits (PELs) Table Z-3

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US OSHA Permissible Exposure Limits (PELs) Table Z-1

US OSHA Permissible Exposure Limits (PELs) Table Z-3

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Limits (PELs) Table Z-1

US OSHA Permissible Exposure Limits (PELs) Table Z-3

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Limits (PELs) Table Z-1

US OSHA Permissible Exposure Limits (PELs) Table Z-3

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US EPCRA Section 313 Chemical List

US NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Limits (PELs) Table Z-1

US OSHA Permissible Exposure Limits (PELs) Table Z-3

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US - Massachusetts - Right To Know Listed Chemicals

US DOE Temporary Emergency Exposure Limits (TEELs)

US NIOSH Carcinogen List

US NIOSH Recommended Exposure Limits (RELs)

US OSHA Permissible Exposure Limits (PELs) Table Z-1

US OSHA Permissible Exposure Limits (PELs) Table Z-3

US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

Chemical Footprint Project - Chemicals of High Concern List
 International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
 International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Group 2B: Possibly carcinogenic to humans
 International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)
 US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5
 US - California Proposition 65 - Carcinogens
 US - California Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65 List
 US - California Substances Identified As Toxic Air Contaminants
 US - Massachusetts - Right To Know Listed Chemicals
 US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
 US Clean Air Act - Hazardous Air Pollutants

N-methyl-2-pyrrolidone is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List
 US - California Proposition 65 - Maximum Allowable Dose Levels (MADLs) for Chemicals Causing Reproductive Toxicity
 US - California Proposition 65 - Reproductive Toxicity
 US - California Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65 List
 US - Massachusetts - Right To Know Listed Chemicals
 US AIHA Workplace Environmental Exposure Levels (WEELs)

lithium aluminate is found on the following regulatory lists

International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)
 US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5
 US DOE Temporary Emergency Exposure Limits (TEELs)
 US NIOSH Recommended Exposure Limits (RELs)

chromium is found on the following regulatory lists

International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Not Classified as Carcinogenic
 International WHO List of Proposed Occupational Exposure Limit (OEL) Values for Manufactured Nanomaterials (MNMS)
 US - Alaska Air Quality Control - Concentrations Triggering an Air Quality Episode for Air Pollutants Other Than PM-2.5
 US - Massachusetts - Right To Know Listed Chemicals
 US Clean Air Act - Hazardous Air Pollutants
 US CWA (Clean Water Act) - Priority Pollutants
 US CWA (Clean Water Act) - Toxic Pollutants

lithium carbonate is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List
 US - California Proposition 65 - Reproductive Toxicity
 US - California Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65 List
 US - Massachusetts - Right To Know Listed Chemicals

ethylbenzene is found on the following regulatory lists

Chemical Footprint Project - Chemicals of High Concern List
 International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs
 International Agency for Research on Cancer (IARC) - Agents Classified by the IARC Monographs - Group 2B: Possibly carcinogenic to humans
 US - California Hazardous Air Pollutants Identified as Toxic Air Contaminants
 US - California Proposition 65 - Carcinogens
 US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens
 US - California Safe Drinking Water and Toxic Enforcement Act of 1986 - Proposition 65 List
 US - Massachusetts - Right To Know Listed Chemicals
 US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)
 US Clean Air Act - Hazardous Air Pollutants

US CWA (Clean Water Act) - Priority Pollutants
 US CWA (Clean Water Act) - Toxic Pollutants
 US DOE Temporary Emergency Exposure Limits (TEELs)
 US EPCRA Section 313 Chemical List
 US National Toxicology Program (NTP) 15th Report Part B. Reasonably Anticipated to be a Human Carcinogen
 US NIOSH Carcinogen List
 US NIOSH Recommended Exposure Limits (RELs)
 US OSHA Permissible Exposure Limits (PELs) Table Z-1
 US OSHA Permissible Exposure Limits (PELs) Table Z-3
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US DOE Temporary Emergency Exposure Limits (TEELs)
 US EPCRA Section 313 Chemical List
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
 US Toxicology Excellence for Risk Assessment (TERA) Workplace Environmental Exposure Levels (WEEL)
 US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements
 US TSCA Section 4/12 (b) - Sunset Dates/Status

US OSHA Permissible Exposure Limits (PELs) Table Z-1
 US OSHA Permissible Exposure Limits (PELs) Table Z-3
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US DOE Temporary Emergency Exposure Limits (TEELs)
 US EPA Drinking Water Treatability Database
 US EPCRA Section 313 Chemical List
 US NIOSH Recommended Exposure Limits (RELs)
 US OSHA Permissible Exposure Limits (PELs) Table Z-1
 US OSHA Permissible Exposure Limits (PELs) Table Z-3
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

US DOE Temporary Emergency Exposure Limits (TEELs)
 US EPCRA Section 313 Chemical List
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory
 US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements

US CWA (Clean Water Act) - List of Hazardous Substances
 US CWA (Clean Water Act) - Priority Pollutants
 US CWA (Clean Water Act) - Toxic Pollutants
 US DOE Temporary Emergency Exposure Limits (TEELs)
 US EPA Integrated Risk Information System (IRIS)
 US EPCRA Section 313 Chemical List
 US NIOSH Recommended Exposure Limits (RELs)
 US OSHA Permissible Exposure Limits (PELs) Table Z-1
 US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory

Federal Regulations

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Section 311/312 hazard categories

Flammable (Gases, Aerosols, Liquids, or Solids)	No
Gas under pressure	No
Explosive	No
Self-heating	No
Pyrophoric (Liquid or Solid)	No

Haven RM1 Battery Pack Battery (UN3480)

Pyrophoric Gas	No
Corrosive to metal	No
Oxidizer (Liquid, Solid or Gas)	Yes
Organic Peroxide	No
Self-reactive	No
In contact with water emits flammable gas	No
Combustible Dust	No
Carcinogenicity	Yes
Acute toxicity (any route of exposure)	Yes
Reproductive toxicity	Yes
Skin Corrosion or Irritation	Yes
Respiratory or Skin Sensitization	Yes
Serious eye damage or eye irritation	Yes
Specific target organ toxicity (single or repeated exposure)	Yes
Aspiration Hazard	No
Germ cell mutagenicity	Yes
Simple Asphyxiant	No
Hazards Not Otherwise Classified	No

US. EPA CERCLA Hazardous Substances and Reportable Quantities (40 CFR 302.4)

Name	Reportable Quantity in Pounds (lb)	Reportable Quantity in kg
copper	5000	2270
nickel	100	45.4
chromium	5000	2270
ethylbenzene	1000	454

State Regulations

US. California Proposition 65

WARNING: This product can expose you to chemicals including **lithium nickel oxide, carbon black, nickel, ethylbenzene**, which are known to the State of California to cause cancer, and **N-methyl-2-pyrrolidone, lithium carbonate**, which are known to the State of California to cause birth defects or other reproductive harm. For more information, go to www.P65Warnings.ca.gov

National Inventory Status

National Inventory	Status
Australia - AIC / Australia Non-Industrial Use	No (lithium nickel oxide; fluoroethylene carbonate)
Canada - DSL	No (lithium nickel oxide; lithium fluorophosphate; fluoroethylene carbonate; lithium aluminate)
Canada - NDSL	No (lithium nickel oxide; graphite; iron; copper; lithium cobaltate; methyl propionate; aluminium; dimethyl carbonate; polyethylene; ferric oxide; carbon black; nickel; N-methyl-2-pyrrolidone; chromium; lithium carbonate; ethylbenzene)
China - IECSC	No (lithium nickel oxide; fluoroethylene carbonate; lithium aluminate)
Europe - EINEC / ELINCS / NLP	No (lithium nickel oxide; polyethylene)
Japan - ENCS	No (graphite; iron; copper; aluminium; lithium fluorophosphate; nickel; chromium)
Korea - KECI	Yes
New Zealand - NZIoC	No (lithium fluorophosphate; fluoroethylene carbonate; lithium aluminate)
Philippines - PICCS	No (lithium nickel oxide; lithium cobaltate; fluoroethylene carbonate; lithium aluminate)
USA - TSCA	Yes
Taiwan - TCSI	Yes
Mexico - INSQ	No (lithium nickel oxide; lithium cobaltate; lithium fluorophosphate; fluoroethylene carbonate; lithium aluminate)
Vietnam - NCI	No (lithium aluminate)
Russia - FBEPH	No (lithium nickel oxide; lithium cobaltate; lithium fluorophosphate; lithium aluminate)
Legend:	<i>Yes = All CAS declared ingredients are on the inventory No = One or more of the CAS listed ingredients are not on the inventory. These ingredients may be exempt or will require registration.</i>

SECTION 16 Other information

Revision Date	04/10/2023
Initial Date	30/08/2023

SDS Version Summary

Version	Date of Update	Sections Updated
---------	----------------	------------------

Haven RM1 Battery Pack Battery (UN3480)

Version	Date of Update	Sections Updated
3.1	14/09/2023	Hazards identification - Classification, Identification of the substance / mixture and of the company / undertaking - Synonyms, Name
4.1	04/10/2023	Hazards identification - Classification, Identification of the substance / mixture and of the company / undertaking - Synonyms, Name

Other information

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.

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
 ES: Exposure Standard
 OSF: Odour Safety Factor
 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
 AIIC: Australian Inventory of Industrial Chemicals
 DSL: Domestic Substances List
 NDSL: Non-Domestic Substances List
 IECSC: Inventory of Existing Chemical Substance in China
 EINECS: European INventory of Existing Commercial chemical Substances
 ELINCS: European List of Notified Chemical Substances
 NLP: No-Longer Polymers
 ENCS: Existing and New Chemical Substances Inventory
 KECI: Korea Existing Chemicals Inventory
 NZIoC: New Zealand Inventory of Chemicals
 PICCS: Philippine Inventory of Chemicals and Chemical Substances
 TSCA: Toxic Substances Control Act
 TCSI: Taiwan Chemical Substance Inventory
 INSQ: Inventario Nacional de Sustancias Químicas
 NCI: National Chemical Inventory
 FBEPH: Russian Register of Potentially Hazardous Chemical and Biological Substances

This document is copyright.

Apart from any fair dealing for the purposes of private study, research, review or criticism, as permitted under the Copyright Act, no part may be reproduced by any process without written permission from CHEMWATCH.

TEL (+61 3) 9572 4700.