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MATERIAL SAFETY DATA SHEET


PART NUMBER 430971

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AMENDMENT RECORD

Issue	Date	Author/s	Change Details (include reference to CCBs etc.)	Pages
1	27-11-07	JHO	First Issue of Document	All
2	06-01-09	J. Orr	ECR3807, New Class 9 requirements.	All

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SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Foster Miller Lithium Battery
Product Identification 430971
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SECTION 2 - COMPOSITION AND INFORMATION ON INGREDIENTS

Ingredient	CAS No.	Weight % *	CHIP Classification	Risk Phrase **
Lithium Cobalt (III) Oxide (as bound solid)	12190-79-3	23.63	Mark as: Harmful, may cause sensitisation	R42/43, S36
Carbon (as bound solid)	1333-86-4	12	Mark as: Irritating	R36/37, S22
Ethylene Carbonate (liquid)	96 – 49 – 1	1.82	Xi	R36,R41, S26,S36/37/39
Ethyl Methyl Carbonate (liquid)	623 – 53 – 0	5.82	Xi, F	R10, R36/37/38 S26
Lithium hexafluorophosphate (as dissolved solid)	21326-40-3	1.45	T	R20/21/22,R24, R34,R36/38, S26, S36/37/39,S45

* Nominal Battery Weight 7950 Grams


** See Section 15 for full details of R(Risk) and S(Safety) phrases


Nominal Cell Weight 144 Grams

AGM ICR34600HC K2

Nominal: Voltage / Capacity / Watt hours

Cell
3.7V / 6.0Ah / 22.2Wh
Pack
37V / 24Ah / 888Wh

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SECTION 3 - HAZARD IDENTIFICATION

Each cell is hermetically sealed, but has a vent that will open under extreme mechanical, electrical or thermal abuse. In the event that a cell vent is activated, exposure to harmful ingredients may occur.

The batteries should not be short-circuited, force discharged, overcharged, punctured, crushed, heated or incinerated.

SECTION 4 - FIRST AID MEASURES

In the event of electrolyte leakage or escape of electrolyte:


Eyes	Flush with copious amounts of water for 15 minutes. Seek medical assistance if required.
Skin	Remove any excess material and wash skin with soap and copious amounts of water.
Inhalation	Remove to uncontaminated area, rest and keep warm. Seek medical assistance if required
Ingestion	Wash out mouth thoroughly with water and then give plenty of water to drink. Obtain medical assistance.
Further Treatment	Eye contamination, persistent skin irritation and casualties who have swallowed electrolyte or been affected by inhalation of vapour should be examined by a doctor.

SECTION 5 - FIRE FIGHTING MEASURES

Flammability	Battery electrolyte is a flammable liquid and may be ignited by heat, sparks or flame.
Means of Extinguishing	Dry chemical, CO ₂ or copious water spray (no lithium metal is present).
Hazardous Combustion Products	Carbon monoxide, carbon dioxide, lithium and cobalt oxides, hydrogen fluoride.
Special Protective Equipment	For fires involving large quantities of product, use self-contained breathing apparatus and full protective clothing.

SECTION 6 – ACCIDENTAL RELEASE MEASURES

Ruptured or vented cells are likely to release electrolyte which may then leak from the battery enclosure. Avoid inhaling vapours and increase ventilation. Avoid eye or skin contact. Any leaking batteries should be stored in an appropriate container containing an absorbent material e.g. Vermiculite.

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SECTION 7 – HANDLING AND STORAGE

Handling	Do not short circuit, force discharge, overcharge, puncture, crush, heat or incinerate.
Storage	Store in a cool place but prevent condensation forming on cells. Elevated storage temperatures (eg. above 40°C) will result in reduced cell life and degraded performance. Store such that mechanical damage cannot occur.

SECTION 8 – EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure	No exposure can occur during normal usage.
Personal Protection	For fires involving large quantities of product, use self-contained breathing apparatus and full protective clothing. In the event of leakage, wear gloves, safety glasses and chemical apron.


SECTION 9 - PHYSICAL DATA

1	Physical State	Solid – materials in section 2 contained within a metal casing.
2	Odour and Appearance	N/A
3	Flashpoint (C)	N/A
4	Vapour Pressure (mm Hg)	N/A
5	Vapour Density	N/A
6	Volatility	N/A
7	Boiling Point(C)	N/A
8	Freezing Point (C)	N/A
9	pH	N/A
10	Spec. Gravity	N/A
11	Coefficient of water oil distribution	N/A

N/A = Not applicable unless individual components exposed

SECTION 10 – STABILITY AND REACTIVITY

Thermal Decomposition	Cells will vent and release hazardous decomposition products when exposed to fire.
Hazardous Combustion Products	Carbon monoxide, carbon dioxide, lithium and cobalt oxides, hydrogen fluoride.
Explosion	Each cell is fitted with a pressure release safety device, which will release electrolyte rendering the cell inactive and preventing an explosion.

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SECTION 11 - TOXICOLOGICAL PROPERTIES

Signs and Symptoms	None unless cell ruptures.
Route of Entry	If electrolyte released – Anticipated routes of entry, eye, skin contact and inhalation.
Effect of Acute Exposure	Electrolyte vapour is irritating to the pulmonary tract
Effect of Chronic Exposure	Electrolyte vapour in large volumes may cause suffocation and pulmonary oedema
Irritancy	Yes
Carcinogenicity	Cobalt compounds possible human carcinogens
Teratogenicity	N/A
Reproductive Toxicity	N/A
Mutagenicity	N/A
Synergistic Products	N/A

N/A = Not Applicable

SECTION 12 – ECOLOGICAL INFORMATION

No known environmental hazards at present.


SECTION 13 – DISPOSAL CONSIDERATIONS

Dispose of as hazardous waste and in accordance with appropriate local waste regulations.

SECTION 14 – TRANSPORT INFORMATION


The 430971 Battery is Class 9 - Miscellaneous Dangerous Goods as defined by the UN Recommendations on the Transport of Dangerous Goods Model Regulations, as its more than 20Wh per cell/100Wh per pack.

Shipping Name	Lithium Ion Batteries
Hazard Classification	Class 9
UN Number	3480
Marine Pollutant	No
Packing Group	II

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SECTION 15 – REGULATORY INFORMATION

	CHIP Classification	EC Risk Phrases	
Lithium Cobalt (III) Oxide	Mark as: Harmful, may cause sensitisation	R42/43	May cause sensitisation by inhalation and skin contact
		S36	Wear suitable protective clothing
Carbon	Mark as: Irritating	R36/37	Irritant to eyes & respiratory system.
		S22	Do not breathe dust
Ethylene carbonate (1,3 dioxalan-2-one)	Xi	R36	Irritating to eyes
		R41	Risk of serious damage to eyes
		S26	In case of contact with eyes, rinse immediately with plenty of water, seek medical advice
		S36/37/39	Wear suitable protective clothing, gloves & eye/face protection
Ethyl methyl carbonate	Xi,F	R10	Flammable
		R36/37/38	Irritating to eyes, skin, respiratory system
		S26	In case of contact with eyes, rinse with plenty of water, seek medical advice
Lithium hexafluorophosphate	T	R20/21/22	Harmful by inhalation, in contact with skin and if swallowed
		R24	Toxic in contact with skin
		R34	Causes burns
		R36/37/38	Irritating to eyes, skin, respiratory system
		S26	In case of contact with eyes, rinse immediately with plenty of water & seek medical advice
		S36/37/39	Wear suitable protective clothing, gloves & eye/face protection
		S45	In case of accident, or if you feel unwell, seek medical advice immediately (show label if possible)

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SECTION 16 – OTHER INFORMATION

ABSL believes that the information contained in this material safety data sheet (including data and statements) is accurate as of the date first mentioned. The information provided in each data sheet relates ONLY TO THE SPECIFIC PRODUCT DESIGNATED HEREIN AND IS NOT VALID FOR ANY OTHER PRODUCT MANUFACTURED BY ABSL OR ANY OTHER PRODUCT MANUFACTURED BY ANY OTHER PARTY. It should be clearly understood that, the material safety data sheet may not be valid where such ABSL product is used in combination with any other materials or in any process. As the conditions and methods of use of the product and information referred to in such data sheet are beyond the control of ABSL, the material safety data sheet is provided for your consideration, investigation and verification. The information contained in this material safety data sheet herein is provided free of charge and on the understanding that those using it will fully satisfy themselves that their particular conditions of use or operation present no health or safety hazards. ABSL expressly disclaims any and all loss, damage, liability or expense arising out of or in any way connected with any use of the product or such information. No statement made shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE OR ANY OTHER WARRANTY, EXPRESS OR IMPLIED, IS MADE AS CONCERNS THE INFORMATION PROVIDED BY ABSL OR ABSL'S AGENTS.

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SECTION 16.1 – GENERAL PRECAUTIONS


Lithium-ion batteries contain safety and protection devices. However batteries may leak fluid, generate heat, explode or ignite and cause serious injury if exposed to abuse conditions. The following general precautions must be taken when handling lithium-ion batteries:

- Do not short circuit batteries.
- Do not connect with reverse polarity.
- Do not store, use or charge batteries near flammable materials.
- Do not open, disassemble, modify or otherwise mechanically interfere with batteries.
- Do not crush, incinerate, penetrate, puncture, strike or otherwise subject batteries to strong impacts or shocks.
- Do not use batteries in environments out with the specified operating environment.
- Do not place batteries in fire, heat batteries (e.g. by placing on heater, in microwave/oven, in direct sunshine etc.).

Do not continue charging a battery if it does not recharge within the specified charging time. Do not charge at temperatures out with the specified charging temperature range.

Immediately discontinue use of a battery if, while storing, charging, or discharging the battery, the battery emits an unusual smell, feels hot, changes colour, changes shape, or appears abnormal in any other way.

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Do not discharge batteries using any device except for the specified host equipment. If a battery is used in devices other than those it is designed to operate then the battery may become damaged and its life expectancy reduced. If the equipment causes an abnormal current to flow, it may cause the battery to leak fluid, generate heat, explode or ignite and cause serious injury.

SECTION 16.2– STORAGE REQUIREMENTS

Due to the fact that batteries utilize a chemical reaction, performance will deteriorate over time even if stored for long periods without use. In addition, if parameters such as charge, discharge and ambient temperatures are not maintained within the specified limits, then the life expectancy of the batteries will be reduced. To minimize the deterioration the guidelines below should be followed:

- Batteries should be stored in an environment that is dry, cool and well ventilated.
- Batteries should be stored in their original packaging until used or charged for maintenance purposes.
- Do not store batteries near heating equipment or expose to direct sunlight for long periods.
- Do not store batteries in areas where they can get wet.
- Batteries should be stored by type and not mixed with other lithium chemistry derivatives.
- Batteries should be stored on materials that are non-flammable and the area shall be clearly marked as containing flammable materials.
- Batteries should be stored at temperatures of between 10°C and 30°C for optimum performance.
- Storage between -20°C and +50°C is possible, but will result in performance losses and should be avoided.
- Batteries must not be stored at temperatures greater than 50°C.

SECTION 16.3 – RECOMMENDED CHARGING REGIME


The recommended charging regime for Li-Ion battery packs is conducted using constant current followed by constant voltage. Charge termination is based upon a current taper limit or a time limit whichever occurs first.

Constant current 6.9A ± 0.1A
Constant voltage 42.3V ± 0.1V
Termination
Current taper limit 0.4A Max
Time limit 5hrs ± 10mins

The temperature range over which the battery can be charged is recommended at 10°C to 30°C. Charging batteries at temperatures outside this range can cause damage to the battery and will reduce battery life expectancy.

As batteries age and their capacities fade the internal resistance of the cells increases such that batteries will take longer to become fully charged.

Batteries will be shipped with a relative state of charge of 70% +5% -10%

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SECTION 16.4 – BATTERIES IN MAIN DEPOT STORAGE

As long as the environment in which the batteries are stored is not subject to extreme variations in temperature or humidity and meets the following guidelines, then the batteries will not require any maintenance for timescales given in Table 1.

Table 1 – Battery Maintenance Free Periods in Storage

Initial State of Charge	Recovered Capacity	Expected Storage Period (Maximum)
	Ah	Months
80%	18	12
40%	9	7
10%	2	2
0%	0	1

After the indicated timescales, the batteries have to be boost-charged to keep them in good condition. This is achieved by charging at the recommended charging regime, or equivalent.

The batteries should then be returned to their original packaging and can be stored for another maintenance free period before requiring another boost-charge.

For general purposes clean the batteries using a clean, damp cloth, taking special care not to get the terminals wet and then dry the battery before it goes back into storage.

Prior to use batteries should be charged to full capacity using the recommended charging regime, or equivalent.

Batteries that are not in main depot storage are considered to be in use and as such do not require long periods of boost charging as long as they are not being left in a fully discharged state.

Batteries should not be left fully discharged or connected to host equipment unless the host equipment is in use as electrical discharge of each battery should not be continued below its normal end point voltage or beyond its rated capacity.

If a battery is not going to be recharged and reused in the following 2 weeks after it has been fully discharged then it should be a boost-charged in line with batteries in main depot storage.