

Material Safety Data Sheet

For

GreenPower Tesseract 5K14

Supplied by GreenPower Investment Pty Ltd

1. Product & Company Identification

Product Description	Lithium Ion Battery Storage System	Model Name:	Tesseract 5K14
Manufacturer	GreenPower Investment Pty Ltd	Approximate Weight:	110kg
Capacity	271Ah	Nominal voltage	51.2V
Energy	13.88KWh		
Address	136 Sir Donald Bradman Drive Hilton 5033 SA Australia		
Telephone:	+61 8 8876 3888		

2. Hazardous Identification

2.1 CAS-No/EINECS NO.:N/A

INCI CTF A-Description: Lithium ion polymer rechargeable battery series.

2.2 The product is classified and labeled according to Regulation (EC) No 1272/2008

- Hazard pictograms



GHS05 GHS07 GHS08

Signal word: Danger

- Hazard statements

H301 Poisoning by swallowing

H314 Causes severe skin burns and eye damage.

H317 May cause an allergic skin reaction.

- Precautionary statements

P101 If medical advice is needed, have product container or label at hand.

P102 Keep out of reach of children.

P103 Read label before use.

P260 Do not breathe dust/fume/gas/mist/vapors/spray.

P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P310 Immediately call a POISON CENTER/doctor.

P405 Store locked up.

P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazards:





Results of PBT and vPvB assessment





PBT: Not applicable.

vPvB: Not applicable

3. Composition /Information on Ingredients

Important note: The battery should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful.

MATERIAL OR INGREDIENT	PEL (OSHA)	TLV (ACGIH)	%/wt.
Graphite	CAS# 7782-42-5 EC#231-955-3	None established	7-25
Lithium iron Phosphate	CAS# 15365-14-7 EC# 476-700-9	None established	15-40
Hexafluoropropylene-vinylidene fluoride Copolymer	CAS# 9011-17-0 EC# 618-470-6	 Hazardous, H411	3-15
Lithium Hexafluorophosphate	CAS# 21324-40-3 EC#235-362-0	Acute Tox. 3, H311;  Skin Corr. 1B, H314;  Acute Tox. 4, H302	0-5
Acetylene Black	CAS# 1333-86-4 EC#215-609-9	None established	0-2
Diethyl Carbonate	CAS# 105-58-8 EC#203-311-1	 Flam. Liq. 3, H226	0-15

Dimethyl Carbonate	CAS# 616-38-6 EC# 210-478-4	 Inflammable, H225	0-15
Ethyl Methyl Carbonate	CAS# 623-53-0 EC# 433-480-9	 Inflammable, H225	0-15
Propylene Carbonate	CAS# 108-32-7 EC#203-572-1	 Eye Irrit. 2, H319	0-15
Ethylene Carbonate	CAS# 96-49-1 EC#202-510-0	 Eye Irrit. 2, H319	0-15

4. First Aid Measures

Under normal conditions of use, the battery is hermetically sealed.

Ingestion: Swallowing a battery can be harmful

Contents of an open battery can cause serious chemical burns of mouth, esophagus, and gastrointestinal tract. If battery or open battery is ingested, do not induce vomiting or give food or drink. Seek medical attention immediately.

Inhalation: Contents of an open battery can cause respiratory irritation. Inhalation of vapors may cause irritation of the upper respiratory tract and lungs. Provide fresh air and seek medical attention.

Skin Absorption: Ethylene carbonate, diethyl carbonate and dimethyl carbonate may be absorbed through the skin causing localized inflammation.

Skin Contact: Contents of an open battery can cause skin irritation and/or chemical burns. Remove contaminated clothing and wash skin with soap and water. If a chemical burn occurs or if irritation persists, seek medical attention.

Eye Contact: Contents of an open battery can cause severe irritation and chemical burns. Immediately flush eyes thoroughly with water for at least 15 minutes, lifting upper and lower lids, until no evidence of the chemical remains. Seek medical attention.

5. Fire Fighting Measures

5.1 Hazard Analysis (electrical shock, fire, explode, population)

There was no electrical shock Hazard for single cell, or battery module which voltage was less than 50V DC (the safety voltage). But if the pack had the voltage was bigger than 50V DC, the

electrical shock shall be protected.

During the shipment or testing process for LIB Pack or Module, there was danger factors like drop, crush, broken, metal short circuit, liquid immersion, the factors would lead the Hazard like electrical shock, catch fire. If pack was in well sealed box, there was gas exploding Hazard; if the pack was in big room or fans, there was not explode Hazard. The released liquid was the environment population Hazard.

5.2 Material prepare & people training

- 1) **Water based sprayer fire extinguish**: 1 set of 9L or 2 sets of 6L water spray fire extinguishers per each 500KWh LIB pack or Modules. The water based spray fire extinguisher could be used for fire type ABCE = solid (A), flash point $>60^{\circ}\text{C}$ liquid (B), gas (C), $<36\text{Kv}$ electrical (E) fire.
- 2) **Water protection sets**: raincoat, galoshes, and rubber gloves. Plastic rollers. Rags.
- 3) **PPE**: breathing mask, safety glass, face mask, gloves for high temperature.
- 4) **Smoke escape**: fans in wall one per 20m or portable fans in rooms. Keep gas exchange hole in trucks.
- 5) **Gases explode tools**: open condition for devices & rooms. Some devices like high or low temperature ovens must be sealed; there was one copper film with the diameter 200mm & thickness 8um as the safety vent. The wall should have one fan per 20m, $\geq 5000\text{m}^3$ per hour for flow rate.
- 6) **Neutralized material**: prepare 10kg $\text{Ca}(\text{OH})_2$ powder per 500KWh LIB pack or modules, it was used for neutralized for release electrolyte. Because electrolyte met with water, 8% HF would be created.
- 7) **Voltage measure**. Multimeter. Please physical block the current measure function, the mistake would lead instrument exploding.
- 8) **People training**: (a) turn on fans or portable fans for smoke escape. (b) Wear the water protection sets use water spray fire extinguishers dry by cloths with rubber gloves insulated by plastic film. (c) Neutralized by $\text{Ca}(\text{OH})_2$ or NaOH for released electrolyte. (d) Use multimeter to measure voltage. Take care of the mistake.

5.3 Fire Extinguisher Flow Chart

- 1) Alarm if you found the smoking or burning.
- 2) Wear PPE. (Breath mask, face mask. If using water, PPE should include the raincoat, galoshes, and rubber gloves).
- 3) Turn Off power supply in devices or power supply.
- 4) Use any fire extinguishers for solid material fire, the recommended sequence was water or mist water, sand, fire extinguisher blanket, CO_2 , powder.
- 5) Smoke Escape by turn on fans or open air environment.
- 6) Dry and neutralize. Drying by fans, Neutralization by $\text{Ca}(\text{OH})_2$ powder if water was used.



Figure 1 water based fire extinguisher
(Could be used for 36KV electrical fire)



Figure 2 water sprayers to fire extinguisher
(Wear PPE to avoid electrical shock)

6. Accidental Release Measures

On hand: Place material into suitable containers and call local fire/police department.

In water: Low electrical shock Hazard when EV or battery/pack in water, GM also shared the information. But H₂ gas was released by the electrolyzed water, you should keep good air flow to avoid the H₂ gas accumulated to prevent hydrogen explosion in enclosed space. If possible, remove from water and call local fire/police department.

7. Handling & Storage

One of the major Hazards associated with the transport of batteries and battery-powered equipment is short-circuit of the battery as a result of the battery terminals coming into contact with other batteries, metal objects, or conductive surfaces. Packaged batteries or cells must be separated in a way to prevent short circuits and damage to terminals. They must be packed in a strong outer packaging or be contained in equipment.

Handling: Do not expose the battery to excessive physical shock or vibration. Short-circuiting should be avoided; however, accidental short-circuiting for a few seconds will not seriously affect the battery. Prolonged short circuits will cause the battery to rapidly lose energy, could generate enough heat to burn skin. Sources of short circuits include jumbled batteries in bulk containers, coins, metal jewelry, metal covered tables, or metal belts used for assembly of batteries in devices. To minimize Hazard of short-circuiting, the protective case supplied with the battery

should be used to cover the terminals when transporting or storing the battery. Do not disassemble or deform the battery. Should an individual cell within a battery become ruptured, do not allow contact with water. When operators handle the battery which voltage more than 50v, they must wear the insulation protection PPE.

Storage: The lithium ion battery should be between 25% and 75% of full charge when stored for a long period of time. Stored in a cool, dry, and well ventilated area. Elevated temperatures can result in loss of battery performance, leakage, or rust. Do not expose the battery to open flames.

8. Exposure Control/Personal Protection

Engineering Control: Keep away from heat and open flame. Stored in a cool dry place.

Personal Protection:

Respiratory Protection: Not necessary under normal conditions.

Eye/Face Protection: Not necessary under normal conditions. Wear safety glasses with side shields if handling an open or leaking battery.

Gloves: Not necessary under normal conditions. Use neoprene or natural rubber gloves if handling an open or leaking battery.

Foot Protection: Steel toed shoes recommended for large container handling.

9. Physical/Chemical Properties

Physical state	Solid	Solubility in water:	Not Applicable
Color	White	Vapor pressure	Not Applicable
Odor	No Odor	Explosion limit	Not Applicable
Flash point	Not Applicable	Auto flammability	Not Applicable
Solubility in ethanol soluble	Not Applicable	Melting Point	Not Applicable
Boiling Point	Not Applicable	Freezing Point	Not Applicable

10. Stability & Reactivity

Stability: Product is stable under conditions described in Section 7.

Conditions to Avoid: Heat above 70°C or incinerate. Deform. Mutilate. Crush. Disassemble. Overcharge. Short circuit. Expose over a long period to humid conditions. **Materials to avoid:** Oxidising agents, alkalis, water.

Hazardous Decomposition Products: Toxic Fumes, and may form peroxides. **Hazardous Polymerization:** N/A.

If leaked, forbidden to contact with strong oxidizers, mineral acids, strong alkalies, halogenated hydrocarbons.

11. Toxicological information

Signs & symptoms: None, unless battery ruptures.

In the event of exposure to internal contents, vapour fumes may be very irritating to the eyes and skin.

Inhalation: Lung irritant.

Skin contact: Skin irritant.

Eye contact: Eye irritant

Ingestion: Poisoning if swallowed..

Medical conditions generally aggravated by exposure: In the event of exposure to internal contents, moderate to server irritation, burning and dryness of the skin may occur, Target organs nerves, liver and kidneys.

12. Ecological information

Mammalian effects: None known at present.

Eco-toxicity: None known at present.

Bioaccumulation potential: Slowly Bio-degradable.

Environmental fate: None known environmental hazards at present.









13. Disposal considerations

Do not incinerate, or subject cells to temperature in excess of 70°C, Such abuse can result in loss of seal leakage, and/or cell explosion. Dispose of in accordance with appropriate local regulations.

14. Transport Information

14.1 The requirement of air transportation

The lithium battery should accord with the International Air Transport Association (IATA DGR 60edition) requirements for transportation. The battery or cell should be packed and signed as following table. (If the cell's power less than 20Wh or battery's power less than 100Wh and the package according with PI-965 Section II , it is not classified as dangerous cargo) .

UN NO.	Proper Shipping Name	Power	Package requirements	Label which need to paste
UN3480	lithium ion batteries	Cell > 20Wh Battery > 100Wh	PI965 Section IA Limit per package: Pax A/C = Forbidden CAO = 35 kg	Class 9 hazard label 
		Cell ≤ 20Wh Battery ≤ 100Wh	PI965 Section IB NOTE: Use “IB” if package exceeds Section II Limits or more than 1 package Limit per package: Pax A/C = Forbidden CAO = 10 kg Gross	Class 9 hazard label and lithium battery handling label  
		Cell ≤ 20Wh Battery ≤ 100Wh	PI965 Section II (no more than 1 package) Limit per package: ≤ 2.7 Wh = 2.5kg; or cells > 2.7 Wh ≤ 20 Wh = 8 cells; or batteries > 2.7 Wh ≤ 100 Wh = 2 batteries Pax A/C = Forbidden	lithium battery handling label 
UN3481	lithium ion batteries contained in equipment	Cell > 20Wh Battery > 100Wh	PI967 Section I Limit per package: Pax A/C = 5 kg CAO = 35 kg	Class 9 hazard label 
		Cell ≤ 20Wh Battery ≤ 100Wh	PI967 Section II Limit per package: Pax A/C = 5 kg CAO = 5 kg	lithium battery handling label 
UN3481	lithium ion batteries packed with equipment	Cell > 20Wh Battery > 100Wh	PI966 Section I Limit per package: Pax A/C = 5 kg CAO = 35 kg	Class 9 hazard label 
		Cell ≤ 20Wh Battery ≤ 100Wh	PI966 Section II Limit per package: Pax A/C = 5 kg CAO = 5 kg	lithium battery handling label 

Cells and/or batteries at a SOC of greater than 30% of their rated capacity may only be shipped with the approval of the State of Origin and the State of the Operator under the written conditions established by those authorities.

Packages prepared according to Section II of PI965 must be offered to the operator separately from other cargo and must not be loaded into a unit load device before being offered to the operator.

The lithium core and battery goods required by the packaging specification PI965 and PI968 II shall not be packed in the same outer package as other dangerous goods.

Ban lithium ion battery (UN 3480, PI965 Section IA or IB) and lithium batteries (3090, UN PI968 Section IA or IB) with category 1 explosive material (except ammunition) 1.4, 2.1 flammable gas, flammable liquid, 4.1 3 flammable solid, 5.1 class antioxidant and other dangerous goods packaging in the same package.

Do not damage or mishandle this package. If package is damaged, batteries must be quarantined, inspected, and repacked. Cells and batteries identified by the manufacturer as being defective for safety reasons, or that have been damaged, that have the potential of producing a dangerous evolution of heat, fire or short circuit are forbidden for transport. Waste lithium batteries and lithium batteries being shipped for recycling or disposal are prohibited from air transport unless approved by the appropriate national authority of the State of origin and the State of the operator.

The lithium battery should pass the UN38.3 test, if the battery can not pass the testing, it can not transport, should redesign. If the batteries through the test, for the lithium battery only, follow the UN3480 and the packing requirements for PI965, for the lithium battery which installed in equipment, follow the UN3481 and the packing requirements for PI967.

The lithium battery testing meets all requirements under UN Manual of Tests and Criteria Part III, subsection 38.3.

No	ITEMS	RESULT	REMARKS
1	Altitude simulation	Pass	Test 1 to 5 must be conducted in sequence on the same cell or battery
2	Thermal test	Pass	
3	Vibration	Pass	
4	Shock	Pass	
5	External short circuit	Pass	
6	Impact	Pass	
7	Forced Discharge	Pass	Only for Cell

14.2 The requirement of ocean shipping

According to International Maritime Dangerous Goods Code (IMDG 38th) to transport and according to the requirements of UN NO. 3480/3481 to management the goods, and require class II packaging. Firmly installation. Mutual isolation. Avoid short circuits. If the package contain

more than 24 lithium batteries or more than 12 lithium battery packs, must provide the special program if package damage.

The clause 188 of IMDG require the Watt of lithium ion cell less than 20Wh is not classified as dangerous cargo and the Watt of lithium ion battery less than 100Wh is not classified as dangerous cargo but need marked the WHR ratio label. Otherwise, the battery and module should packed in a strong outer packaging or be contained in equipment.

The clause 230 of IMDG 38th requires the lithium battery testing should meets all requirements under UN Manual of Tests and Criteria Part III, subsection 38.3.

15. Regulatory Information

See ACGIH exposure limits information as noted in Section3

US: This MSDS meets/exceeds OSHA requirements.

International: This MSDS conforms to European Union (UN), the International Standards Organization (ISO) and the International Labor Organization (ILO) and as documental in ANSI (American National Standards Institute) Standard Z400.1-1993.

Air transportation: According to Civil aviation industry standard MH/T1020-2018 Lithium Battery Air Transport Standard and IATA DGR and ICAO. The international transport and commodity inspection is used this standard at the moment (IMDG CODE), **Ocean shipping:** According to International Maritime Dangerous Goods Code to transport and According to the requirements of UN NO 3480/3481 to management the goods.

Land transportation: According to List of Dangerous Goods(GB12268).

Avoid electrical shock: According to Standard for Electrical Safety in the Workplace, NFPA-70E.

16. Charging and labeling

Charging: This battery is made to be charged many times. Use an approved battery charger.

Never use a modified or damaged battery charger. A backup charge termination based on time is recommended to prevent overcharging. The charging temperature should be between 0°C and 45°C (32° F and 113°F). The battery pack will be normally warm during charging.

Charging Voltages and Currents: Charging voltages are prevented from exceeding the specified limits by an internal battery protection circuit. Never use a battery that shows signs of a damaged protection circuit or broken case. (Such damage to the protection circuit may be indicated by voltages at the battery terminals outside of their specified ranges.) Adhere to all specified charging and discharging voltages and currents. Do not use battery if its voltage drops below the specified minimum voltage.

Labeling: If the label or package warnings are not visible, it is important to provide a package

and/or device label stating.

If the lithium-ion battery or cell transported by air the labeling according the requirement of IATA 60th, the packages bear the Class 9 hazard label(**Figure 3**) or/and lithium battery handling label(**Figure 4**).



Figure 3 Class 9 hazard label

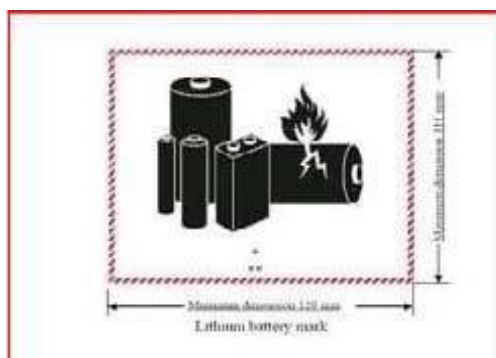


Figure 4 lithium battery handling label

If the lithium-ion battery or cell transported by sea the labeling according to IMDG 38th, the requirement as follow,

- Package, do not any indication.
- Need all the UN No.
- subassembly: Do not any indication.
- Need the *LQ* label.

WARNING: CHARGE ONLY WITH SPECIFIED CHARGERS ACCORDING TO DEVICE MANUFACTURER'S INSTRUCTIONS. DO NOT OPEN BATTERY, DISPOSE OF IN FIRE, OR SHORT CIRCUIT -MAY IGNITE, EXPLODE, LEAK, OR GET HOT CAUSING PERSONAL INJURY.

Disposal: Dispose in accordance with all applicable federal, state and local regulations.

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