

# 5th Generation TBX Series Lithium-ion Aircraft Battery Support Manual



**TRUE BLUE POWER** 

Revision A • April 4, 2025



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## GLOSSARY OF TERMS

- BMS** Battery Management System
- BOL** Beginning of Life
- EOL** End of Life
- GPU** Ground Power Unit
- SOC** State of Charge
- SOH** State of Health



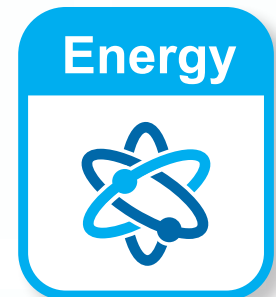
# 1 INTRODUCTION

The True Blue Power 5th Generation (Gen5) TBX Series (TB20, TB30, TB40, TB50, and TB60) Lithium-ion Aircraft Batteries are designed to deliver high current capability to start piston and turbine aircraft engines, and to provide electrical power in the event of generator function loss. Gen5 TBX batteries are sophisticated energy storage and power systems that utilize state-of-the-art lithium-ion battery cell technology to optimize performance, safety, life and weight when compared to traditional aircraft batteries. The design of the battery provides exceptional performance and safety, and meets or exceeds the latest regulatory and industry standards. Key features of the Gen5 TBX batteries include real-time State-of-Charge and capacity reporting, continuous data monitoring, an on-board status indicator, and maintenance-free operation.

Gen5 TBX batteries require minimal service to deliver maximum performance and value. This support manual contains information related to the proper operation, maintenance, and service associated with the care and use of this product.

## What is different about lithium-ion batteries?

- Voltage: 26.4 V compared to 24 V lead acid and NiCad
- Significantly lower weight per equivalent energy
- Low internal resistance — more available power
- Voltage is not a proxy for the battery's health



## Lithium-ion batteries are NOT all the same.

- True Blue Power Gen5 TBX batteries utilize **Lithium Iron Phosphate** chemistry
  - Less reactive
  - Significantly safer
  - In the event of thermal runaway, heat increases at rates slower than an average coffee pot — **just 20°C per minute**
  - **Peak temperature: 240°C**

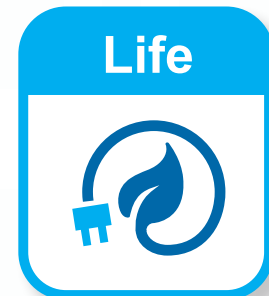
- Other manufacturers utilize **Lithium Metal Oxide** chemistry
  - In the event of a thermal runaway, oxygen is released
  - Heat increases at a rate of **1,800°C per minute**
  - **Peak temperature: 450–550°C**

### How are True Blue Power Lithium-ion Aircraft Batteries different?

- The Battery Management System (BMS) is used to manage the charging and discharging of energy to ensure there are no cell imbalances.
- The BMS monitors each module string, providing extremely accurate and reliable State-of-Charge (SOC) and State-of-Health (SOH) information, which can be exported to the aircraft avionics or to data files for ground evaluation.
- Nominal voltage for a Gen5 TBX lithium-ion battery is 26.4 V compared to 24 V lead-acid or NiCad batteries.
- As the battery discharges, the voltage remains high (+25-volt range) until approximately 85-90% discharged. Therefore, SOC — not battery voltage — should be used to monitor battery status.

### What affects the life of a Gen5 TBX battery?

- Deep discharge below 30% SOC
- Prolonged exposure to high temperatures above 40°C
- 0% SOC for periods of time more than 7–14 days



### What are the operational considerations?

- Gen5 TBX batteries have internal heaters that pre-warm the battery to enable high power discharge below 0°C.
- Depending on the airframe integration, during aircraft operation it is normal for heaters to periodically cycle on and off as needed to maintain optimal operating temperature.

## 2

# BATTERY CARE AND MAINTENANCE

## STORAGE

In normal use, the battery utilizes the aircraft power to maintain the proper charge voltage and sustain the battery cells at peak capacity. Although the cells have an extremely low relative self-discharge rate, all batteries will slowly self-discharge if left unused for extended periods. In addition, self-discharge rates are directly related to the storage temperature. Higher storage temperatures will result in faster self-discharge rates.

### STORAGE LOCATION

Store batteries in a dry, well-ventilated area. They must not be kept in the same area as highly-flammable materials. True Blue Power lithium-ion batteries can be stored in the same area as batteries of other chemistries. True Blue Power lithium-ion batteries do not emit or absorb any gas during storage, transportation, or during normal operating conditions.

### STORAGE TEMPERATURE

Recommended maximum storage temperature is 30°C (86°F). Storage temperatures above 50°C (122°F) are to be avoided.

### SHELF LIFE

Gen5 TBX batteries shall be fully recharged at a minimum every 3 or 6 months when stored. Consult the Gen5 TBX Battery Installation Manual for charging intervals. If the storage time is unknown, a battery should be fully recharged prior to discharging to 10% SOC.



## SAFETY

### HAZARDS

A Gen5 TBX battery will not emit or absorb any gas during normal storage, transportation, or operation. If a battery experiences a thermal event, a white vapor will exit through the vent. This effluent is vaporized electrolyte and is very hot. Further information is provided in the Safety Data Sheet (SDS) incorporated into this manual.

### EMERGENCY ACTIONS

The following are general safe-handling guidelines in the event of an emergency.

- Handle all suspect batteries with heat-resistant gloves. **Do not use rubber gloves.**
- Safely disconnect any power source to the battery.
- Depending on the location of the battery when venting occurs, take the following actions
  - Move the battery on a cart to a well-ventilated area, preferably outdoors. Turn on ventilation system in battery room, or vacate the area and open exterior doors.
  - Allow battery to exhaust all its energy and cool to ambient temperature. Battery casing will withstand event.

OR

- Submerge or douse battery with water. Battery should remain submerged a minimum of four hours, or until completely cooled.



## PERSONAL INJURY OR TREATMENT

See the Safety Data Sheet (Appendix A) for complete information.

If the effluent comes into contact with skin, wash with water and immediately seek medical treatment for potential exposure to dilute of hydrogen fluoride. Treatment could include iced benzalkonium chloride 0.13% soaks or calcium gluconate gel.

If inhalation of the effluent occurs, immediately seek medical treatment for potential exposure to dilute of hydrogen fluoride. Treatment could include oxygen and possibly 2.5% calcium gluconate by nebulizer.

## POST EVENT ACTIONS

Wear appropriate Personal Protective Equipment (PPE)

- Long gloves and dust mask

Clean the immediate affected area with baking soda and water mixture to neutralize possible acidity

- Utilize 1 teaspoon of baking soda to 1 gallon of water

Dispose of water used to submerge battery

- After the battery has cooled, the water must be pH tested to ensure a neutral reading before discarding water in a sanitary sewer (drain, sink, or toilet)

- Water must not be discarded outside the building or in a storm sewer

## MAINTENANCE OPERATIONS

### SUGGESTED EQUIPMENT

- Multi-meter
- Benchtop power supply
- TT28-12 True Blue Charger PRO  
(Part Number ACM-1260-101)
- TT28-2 True Blue Charger Mx  
(Part Number 282-101)
- Electronic load
- Applicable Gen5 TBX Installation Manual





## **AIRCRAFT CONNECTION**

When the battery is installed in an aircraft that is sitting idle for short periods of time there is no need to disconnect the aircraft's main battery connector from the battery. Consult the aircraft manufacturer's AMM/FCOM/AFM and/or the Aircraft Manufacturer's Annex to this manual for long-term parking and storage procedures.

Frequent disconnections and/or over-tightening of the quick-disconnect fitting can lead to failure of the quick-disconnect fitting. If this occurs, refer to True Blue Power Service Information Letter (SIL) TBX-02.

## **CHARGING**

When shipped by air, battery SOC is reduced to 30% or below. Batteries must be fully charged upon receipt. Gen5 TBX batteries that are stored shall be fully recharged at a minimum every 3 or 6 months prior to discharging to 10% SOC. Consult the Gen5 TBX Battery Installation Manual for charging intervals. Always charge with constant potential/voltage.

### **\*\*\* CAUTION \*\*\***

**Contact True Blue Power +1 (316) 630-0101 before proceeding further:**

**If a Gen5 TBX Series battery is below 12 VDC (excluding TB28-12V).**

**If you attempt to charge a Gen5 TBX Series battery and it does not accept charge current.**

***Always charge with constant potential/voltage.***

- Charging should be accomplished using the TT28-12 True Blue Charger PRO (Part Number ACM-1260-101).
- Consult the True Blue Power Gen5 TBX Series Installation Manual and Operating Instructions, Section 5.4.3, and/or the Aircraft Manufacturer's Annex for specific battery model charging instructions.

## **USING A GROUND POWER UNIT**

Some Ground Power Units (GPU) output only 24 V. If a Gen5 TBX lithium-ion battery is connected to the GPU, it will charge the GPU if the battery voltage is greater than the GPU.

True Blue Power recommends a minimum setting of 27.5 V on the GPU when it is connected to the battery.

## **BATTERY HEALTH**

### **STATE OF HEALTH**

SOH is a measure of how much of its original capacity a battery is still able to store, measured in amp-hours (Ah). A battery's capacity decreases at the rate of 2-4% per year under normal conditions.

### **STATE OF CHARGE**

SOC is a measure of how full the battery is relative to its current maximum capacity, provided in percentage.

### **BATTERY MODES**

See Gen5 TBX Installation Manual Section 4.3

## 3 TROUBLESHOOTING

### TOOLS AND EQUIPMENT

- Applicable True Blue Power Gen5 TBX Battery Installation Manual
- TT28-12 True Blue Charger PRO
- USB Stick
  - 16GB or smaller
  - USB 2.0 or previous protocol standard
  - FAT or FAT32 format
  - No other files on the device
  - Load Event Log to the root directory



## TROUBLESHOOTING PROCESS



### 1. Faults or Service Lights? (IM Table 4.1)

- Faults clear (after charge, cool, etc.)
- Service lights usually require return

### 2. Will it Charge?

- If YES, let it charge.
- If NO, probably in under-voltage condition.

### 3. Battery Voltage

- 16 - 24 V Charge battery
- <16 V Try to charge. If not charging, consult the aircraft manufacturer's product support process.

### 4. Software

- Is the latest software installed?

### 5. Download Event Log File

- Download Event Log File as directed by the aircraft manufacturer or STC partner's product support process.
- Refer to the Aircraft Manufacturer or STC Partner Annex for instructions on where to send the Event Log.

### 6. Capacity Check

- Capacity check per the Gen5 TBX Battery Installation Manual Section 5.4.3.

### 7. Aircraft Manufacturer's Annex

- Refer to this document for further troubleshooting steps.

## EVENT LOG FILE

### Log File Download Process

*Also found in Section 5.3.4 of the Gen5 TBX Battery Installation Manual*



1. Place an empty text file named `getlog.cmd` onto the root directory of a USB flash drive. It is recommended that this is the only file (`getlog.cmd`) loaded onto the flash drive. Contact True Blue Power if you have questions regarding creation of the `getlog.cmd` file.
2. Remove the USB access cover on your Gen5 TBX battery.
3. Insert the configured USB flash drive into the USB-A port on the battery.
4. With the battery idle (no charge/discharge current, no active protections), press and hold the blue service button until the service light changes from solid white to blinking white (approximately 3 seconds) and release before the flashing stops (5 seconds).
5. While the battery is reading from or writing to the USB flash drive, the service light will blink yellow. A full Event Log (approximately 32,000 entries; 8MB maximum) may take up to 8 minutes to download to the USB flash drive.
6. Upon completion, the service light will be solid green (if Event Log download completed successfully) or solid red (if Event Log download did not complete successfully).
7. The USB flash drive will now have a file named `eventlog.csv` that can be imported into a spreadsheet for viewing and further analysis.  
**Refer to the Aircraft Manufacturer or STC Partner Annex for instructions on where to send the log file.**
8. Remove the USB flash drive and the battery will reboot into flight mode.
9. Replace the battery's USB access cover securely.



## 4 BATTERY SERVICE

### CAPACITY CHECK

*Also found in section 5.4.3 of the Gen5 TBX Battery Installation Manual*

Most aircraft are certified to use the battery's reserve energy to maintain critical systems in the event of a main power generation loss for a minimum period of time. The required minimum capacity will vary by application. Verify requirements associated with your aircraft. The battery is designed to dynamically compute its capacity at all times, throughout its life. As the battery ages, the accuracy of its reported capacity can change due to a variety of factors associated with its use, environmental conditions, and the characteristics of the cells. Using the procedures in this section, the battery's reported capacity can be recalibrated or verified. This procedure is recommended for improved performance and accuracy, but does not represent required maintenance, nor is required for continued airworthiness by the manufacturer. Consult your aircraft's maintenance procedures for specific requirements.

### SELF-LEARNING CAPACITY CALIBRATION

Using the procedure below, the battery can re-calibrate its capacity measurement to improve its accuracy for ongoing use.

1. Ensure that the unit is charged.
2. Apply a constant current load of 1C to discharge the battery pack. (Capacity check should be conducted at 23°C ±3°C (68–79°F) for best results.)
3. When the battery is nearly depleted, it will turn off its power output and stop discharging.
4. Wait at least one (1) minute in the discharged state before recharging.
5. Charge the battery again per Section 5.4.2 of the Gen5 TBX Battery Installation Manual. The battery's reported capacity will be reset to the actual measured value.

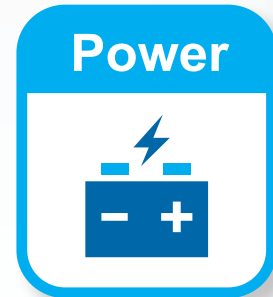
**Note:** If the TT28-12 True Blue Charger PRO is used, select the appropriate battery model and the charger will automatically carry out the correct charging procedure.

## MANUAL CAPACITY CHECK

If there is any reason to suspect the accuracy of the reported capacity, a manually measured capacity check can be performed. Capacity check should be conducted at 23°C ±3°C (68–79°F) for best results.

1. Ensure that the unit is charged.
2. Apply a constant current load of 1C to discharge the battery pack.
3. Monitor the time (in minutes and seconds) from initially applying the constant current load in Step 2 until the battery is nearly depleted and turns off the power output/stops discharging.
4. Calculate the capacity in amp-hours (Ah)
  - Discharge time (in hours) = Discharge minutes / 60
  - Capacity (Ah) = (amps) x (hours) = (1C amps) x (Discharge time)

**Note:** If the TT28-12 True Blue Charger PRO is used, select the appropriate battery model and the charger will automatically carry out the correct charging procedure.



## RETURN TO SERVICE

*Also found in section 5.4.4 of the Gen5 TBX Battery Installation Manual*

1. Recharge the unit per section 5.4.2 of the Gen5 TBX Battery Installation Manual.
2. Measure and verify that the voltage on the unit's power terminals is greater than 27.6 VDC. A unit should never be returned to service if the voltage is less than this value after charging.
3. Re-install the unit in the aircraft, including securing it via proper hold-downs, mating the electrical connections, and verifying proper vent attachment.
4. Record service action in aircraft logbook.

## FURTHER TROUBLESHOOTING AND BATTERY RETURN PROCESS

In the event that your troubleshooting does not lead to a resolution, consult the Aircraft Manufacturer's Annex to this manual for instructions on the troubleshooting process, including 2nd Level Troubleshooting guidance.

## BATTERY RETURN PROCESS

In the event that troubleshooting leads to the determination that the battery must be sent to True Blue Power for inspection and/or repair, follow the Material Return process specified in the Aircraft Manufacturer's Annex to this manual.

## SHIPPING GUIDANCE

True Blue Power lithium-ion battery products are classified as Class 9 HazMat Dangerous Goods and require special processes for shipping.

All True Blue Power lithium-ion batteries can ship via ground or vessel at 100% SOC. To transport a lithium-ion battery by air, IATA regulations must be followed. Lithium-ion batteries are REQUIRED to be at 30% SOC prior to shipping by air. When shipped by air, lithium-ion batteries can only be transported via cargo aircraft (i.e. FedEx, UPS, DHL, etc.). Only discharge the battery to 30% SOC shortly before shipping to avoid potential over-discharge. True Blue Power utilizes UN certified boxes for battery shipment, and recommends that facilities servicing or maintaining True Blue Power Gen5 TBX batteries maintain a stock of such boxes for shipping purposes.

Time is of the essence when shipping batteries. **When sent for service, batteries should arrive at the destination within 10 business days.** After two weeks, the ability to service a recoverable battery is greatly diminished. Procedures for properly discharging a battery in preparation for shipment can be found in the Gen5 TBX Battery Installation Manual and in the Charging Section of this Manual.

## INTERNATIONAL SHIPPING CONSIDERATIONS

- If shipping a battery to True Blue Power from outside the United States, DDP Incoterms must be selected.
- It's important to understand the various tax and duty regulations. Taxes and duties can be affected by HTS codes selected on the paperwork when returning batteries.

## PREPACKAGED RETURN PROCESS

- To make battery returns easier for customers that are not Class 9 HazMat certified, True Blue power has created a Prepackaged Return Process (PRP). The PRP is a kit that includes all packing materials and documents necessary to ship a battery to True Blue Power for service.
- The PRP kit can only be used for shipping within the 48 contiguous United States.



- A charge is assessed to cover the cost of materials, labor, and pre-paid shipping. That charge is currently \$150 (2025).
- To obtain a kit, contact True Blue Power customer support and request a PRP kit for the specific Gen5 TBX battery model being shipped.

## DISPOSAL

Lithium-ion batteries are classified by the United States government as nonhazardous waste and are safe for disposal as normal municipal waste or can be recycled. Options are noted below.

- Do not incinerate.
- Battery should be fully discharged prior to disposal.
- End of life (EOL) batteries should always ship in packaging that complies with related HazMat regulations regarding labeling, and always use ground services to ship.
- For further EOL and disposal information, refer to the Gen5 TBX Battery Installation Manual, Sections 5.7 and 5.8.

## RECYCLING OPTIONS

Lithium-ion batteries contain recyclable materials. Battery recycling options are continually evolving. Requirements in your local area should be considered when disposing of these products. Recycling and disposal are generally regulated at the country, state, and municipal levels.



### UNITED STATES

#### **CIRBA SOLUTIONS**

4930 Holtz Dr  
 Wixom, MI 48393  
 800-852-8127  
[www.cirbasolutions.com](http://www.cirbasolutions.com)

#### **BATTERY RECYCLERS OF AMERICA**

1920 McKinney Ave  
 Dallas, TX 75201  
 866-708-0955  
[www.batteryrecyclersofamerica.com](http://www.batteryrecyclersofamerica.com)

#### **GLOBALTECH ENVIRONMENTAL**

205 N. Depot St  
 Fox Lake, WI 53933  
 800-770-2330  
[www.globaltechenvironmental.com](http://www.globaltechenvironmental.com)

#### **FIRST AMERICA**

1000 E. Armstrong St  
 Morris, IL 60450  
 866-861-3269  
[www.firstamerica.com](http://www.firstamerica.com)

## RECYCLING OPTIONS (CONTINUED)

### EUROPE

#### **ALTILIUM CLEAN TECHNOLOGY**

Plymouth Science Park  
1 Davy Road, Derriford  
Plymouth, PL6 8BX  
United Kingdom  
+44 (0) 175 227 1675  
[www.altilium.tech/actsites/](http://www.altilium.tech/actsites/)

#### **ALTILIUM CLEAN TECHNOLOGY**

Plymouth Road Industrial Estate  
Tavistock, Devon  
PL1 9QN  
United Kingdom  
[www.altilium.tech/actsites/](http://www.altilium.tech/actsites/)

#### **ALTILIUM CLEAN TECHNOLOGY**

10 Estover Road  
Plymouth, Devon  
PL6 7PY  
United Kingdom  
[www.altilium.tech/actsites/](http://www.altilium.tech/actsites/)

#### **ECOBAT SOLUTIONS EUROPE GMBH**

Gewerbering 16  
06333 Hettstedt, Germany  
+49 (0) 3476 55444 10  
[www.ecobat.com](http://www.ecobat.com)

#### **ECOBAT SOLUTIONS UK LTD**

Crescent Work Industrial Park, Willenhall Road  
WS10 8JR Darlaston, West Midlands UK  
+44 121 568 3200  
[www.ecobat.com](http://www.ecobat.com)

### INTERNATIONAL

#### **BATTERY ATLAS**

[www.battery-news.de/en/battery-atlas-europe/](http://www.battery-news.de/en/battery-atlas-europe/)

## 5 SUPPORT

### RESOURCES

#### TRUE BLUE POWER

#### CUSTOMER SUPPORT CONTACTS

AOG Support +1 (316) 634-1AOG (1264)  
Phone +1 (316) 630-0101  
Email productsupport@mcico.com

#### Kansas

9400 East 34th Street N  
Wichita, KS 67226

#### California

9722 Topanga Canyon Blvd  
Chatsworth, CA 91311



#### PRODUCT INFORMATION

[www.mcico.com/truebluepower/resource-center/technical-documents](http://www.mcico.com/truebluepower/resource-center/technical-documents)

- Installation Manual
- Service Bulletins
- Software Updates
- Safety Data Sheets
- Battery Support Manual
- Battery Shipping Procedures



#### PRODUCT TRAINING

[www.thelithiumexperts.com](http://www.thelithiumexperts.com)

- Why Lithium?
- Battery Comparisons
- Battery Chemistries
- Certifications
- Battery Operations
- Safety and Design
- Battery Charging





## **6 APPENDIX A - SAFETY DATA SHEET**

Safety Data Sheet provided on the following pages

# SAFETY DATA SHEET

## Section 1: Identification of the Substance/Preparation and of the Company/Undertaking

**Product Name:** High Power Lithium Ion Cell, Phosphate-Based

**Product Codes:** MD2, MD3, 9016682, 9017185

**Product Use:** Cell, cell packs and batteries

**Synonyms:** High Power Lithium Ion Battery, Phosphate-Based

**Manufacturer:** True Blue Power Division of  
Mid-Continent Instrument Co, Inc  
Wichita, KS, USA

**Phone Number:** (316) 630-0101  
**Fax:** (316) 630-0723  
**24-hour Emergency:** Chemtrec: (800) 424-9300 domestic, 011-1-703-527-3887 international

## Section 2: Hazards Identification

Protective Clothing	NFPA Rating (USA)	EC Classification	WHMIS (Canada)	Transportation	GHS Hazard Symbol
Not required with normal use		Not Classified as Hazardous		See Section 14	 Signal Word: Warning

**Preparation Hazards and Classification:**

Not classified as dangerous or hazardous with normal use. The cell should not be opened or burned. Exposure to the ingredients contained within or their combustion products could be harmful. European Communities (EC): This product is not classified as hazardous according to Regulation (EC) No.1272/2008. This product contains dangerous ingredients however, there is no expected release during use of the product, and there is a barrier preventing exposure of the user and the environment.

**Appearance, Color and Odor:**

Solid object with no odor.

**Primary Route(s) of Exposure:**

These chemicals are contained in a sealed enclosure. Risk of exposure occurs only if the cell is mechanically, thermally, or electrically abused to the point of compromising the enclosure. If this occurs, exposure to the electrolyte solution contained within can occur by Inhalation, Ingestion, Eye contact, and Skin contact.

# SAFETY DATA SHEET

## Section 2: Hazards Identification, continued

<b>Potential Health Effects:</b>	<b>ACUTE (short term):</b> see Section 8 for exposure controls  In the event that this cell has been ruptured, the electrolyte solution contained within the cell would be corrosive and can cause burns to skin and eyes.
<b>Inhalation:</b>	Inhalation of materials from a sealed cell is not an expected route of exposure. Vapors or mists from a ruptured cell may cause respiratory irritation.
<b>Ingestion:</b>	Swallowing of materials from a sealed cell is not an expected route of exposure. Swallowing the contents of an open cell can cause serious chemical burns of mouth, esophagus, and gastrointestinal tract.
<b>Skin:</b>	Contact between the cell and skin will not cause any harm. Skin contact with contents of an open cell can cause severe irritation or burns to the skin.
<b>Eye:</b>	Contact between the cell and the eye will not cause any harm. Eye contact with contents of an open cell can cause severe irritation or burns to the eye.
	<b>CHRONIC (long term):</b> see Section 11 for additional toxicological data  Not applicable
<b>Medical Conditions Aggravated by Exposure:</b>	Not available
<b>Interactions With Other Chemicals:</b>	Immersion in high conductivity liquids may cause corrosion and breaching of the cell enclosure.
<b>Potential Environmental Effects:</b>	Not available

## Section 3: Composition/Information on Ingredients

As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use.

**USA:** This cell is an article pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement. The information contained in this Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

**Canada:** This is not a controlled product under WHMIS. This product meets the definition of a "manufactured article" and is not subject to the regulations of the Hazardous Products Act.



# SAFETY DATA SHEET

## Section 4: First Aid Measures

<b>Inhalation:</b>	If contents of an opened cell are inhaled, remove source of contamination or move victim to fresh air. Obtain medical advice.
<b>Eye Contact:</b>	Contact with the contents of an opened cell can cause burns. If eye contact with contents of an open cell occurs, immediately flush the contaminated eye(s) with lukewarm, gently flowing water for at least 30 minutes while holding the eyelids open. Neutral saline solution may be used as soon as it is available. If necessary, continue flushing during transport to emergency care facility. Take care not to rinse contaminated water into the unaffected eye or onto face. Quickly transport victim to an emergency care facility.
<b>Skin Contact:</b>	Contact with the contents of an opened cell can cause burns. If skin contact with contents of an open cell occurs, as quickly as possible remove contaminated clothing, shoes and leather goods. Immediately flush with lukewarm, gently flowing water for at least 30 minutes. If irritation or pain persists, seek medical attention. Completely decontaminate clothing, shoes, and leather goods before reuse or discard.
<b>Ingestion:</b>	Contact with the contents of an opened cell can cause burns. If ingestion of contents of an open cell occurs, NEVER give anything by mouth if victim is rapidly losing consciousness, or is unconscious or convulsing. Have victim rinse mouth thoroughly with water. DO NOT INDUCE VOMITING. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Have victim rinse mouth with water again. Quickly transport victim to an emergency care facility.

## Section 5: Fire Fighting Measures

<b>Flammable Properties:</b>	Lithium ion batteries contain flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C (302 °F)), when damaged or abused (e.g., mechanical damage or electrical overcharge). Burning cells can ignite other batteries in close proximity.
<b>Suitable extinguishing Media:</b>	Small Fires - Dry chemical, CO <sub>2</sub> , water spray or regular foam. Large Fires - Water spray, fog, or regular foam. Move containers from fire area if you can do it without risk.
<b>Unsuitable extinguishing Media:</b>	Not Applicable
<b>Explosion Data:</b>	
<b>Sensitivity to Mechanical Impact:</b>	Extreme mechanical abuse will result in rupture of the individual battery cells.
<b>Sensitivity to Static Discharge:</b>	Electrostatic discharges imposed directly on the spilled electrolyte may start combustion.

## SAFETY DATA SHEET

### Section 5: Fire Fighting Measures, continued

<b>Specific Hazards arising from the Chemical:</b>	The interaction of water or water vapor and exposed lithium hexafluorophosphate (Li PF <sub>6</sub> ) may result in the generation of hydrogen and hydrogen fluoride (HF) gas. Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes. Fire will produce irritating, corrosive, and/or toxic gases. Fumes may cause dizziness or suffocation.									
<b>Protective Equipment and precautions for firefighters:</b>	Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Fight fire from a safe distance.									
<table border="0" style="width: 100%;"> <tr> <td style="width: 30%;">NFWA:</td> <td style="width: 30%; text-align: right;">Health:</td> <td style="width: 40%;">0</td> </tr> <tr> <td></td> <td style="text-align: right;">Flammability:</td> <td>1</td> </tr> <tr> <td></td> <td style="text-align: right;">Instability:</td> <td>0</td> </tr> </table>	NFWA:	Health:	0		Flammability:	1		Instability:	0	
NFWA:	Health:	0								
	Flammability:	1								
	Instability:	0								

### Section 6: Accidental Release Measures

<b>Personal Precautions:</b>	As an immediate precautionary measure, isolate spill or leak area for at least 25 meters (75 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed areas before entering. Wear adequate personal protective equipment as indicated in Section 8.
<b>Environmental Precautions:</b>	Prevent material from contaminating soil and from entering sewers or waterways.
<b>Methods for Containment:</b>	Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up spills immediately.
<b>Methods for Clean-up:</b>	Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of according to directions in Section 13. Scrub the area with detergent and water; collect all contaminated wash water for proper disposal.

### Section 7: Handling and Storage

<b>Handling/Transportation:</b>	Do not open, disassemble, crush, or burn cell. Do not expose cell to temperatures outside the range of -40°C to 80°C.
<b>Storage:</b>	Store cell in a dry location. To minimize any adverse affects on battery performance it is recommended that the cells be kept at room temperature (25°C +/- 5°C). Elevated temperatures can result in shortened cell life. Keep out of reach of children.



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## **Section 8: Exposure Controls/Personal Protection**

<b>Exposure Limit Values:</b>	Airborne exposures to hazardous substances are not expected when product is used for its intended purpose.
<b>Engineering Controls:</b>	Use local exhaust ventilation or other engineering controls to control sources of dust, mist, fume and vapor.
<b>Personal Protection:</b>	
<b>Respiratory Protection:</b>	Not necessary under normal conditions.
<b>Skin Protection:</b>	Not necessary under normal conditions. Wear neoprene or natural rubber gloves if handling an open or leaking cell.
<b>Eye Protection:</b>	Not necessary under normal conditions. Wear safety glasses if handling an open or leaking cell.
<b>Other Protective Equipment:</b>	Not necessary under normal conditions. Have a safety shower and eye-wash fountain readily available in the immediate work area.
<b>Hygiene Measures:</b>	Do not eat, drink, or smoke in work areas. Maintain good housekeeping.

## **Section 9: Physical and Chemical Properties**

<b>Physical State:</b>	Solid	<b>Vapor Pressure (mm Hg @ 20°C):</b>	Not applicable
<b>Appearance:</b>	Cell	<b>Vapor Density:</b>	Not applicable
<b>pH:</b>	Not applicable	<b>Solubility in Water:</b>	Insoluble
<b>Relative Density:</b>	Not available	<b>Water / Oil distribution coefficient:</b>	Not applicable
<b>Boiling Point:</b>	Not applicable	<b>Odor Type:</b>	Odorless
<b>Melting Point:</b>	Not applicable	<b>Odor Threshold:</b>	Not applicable
<b>Viscosity:</b>	Not applicable	<b>Evaporation Rate:</b>	Not applicable
<b>Oxidizing Properties:</b>	Not applicable	<b>Auto Ignition Temperature (°C):</b>	Not applicable
<b>Flash Point and Method (°C):</b>	Not applicable	<b>Flammability Limits (%):</b>	Not applicable

## **Section 10: Stability and Reactivity**

<b>Stability:</b>	Stable
<b>Conditions to Avoid:</b>	Avoid exposing the cell to fire or temperatures above 80°C. Do not disassemble, crush, short, or install with incorrect polarity. Avoid mechanical or electrical abuse.
<b>Incompatible Materials:</b>	Do not immerse in seawater or other high conductivity liquids.
<b>Hazardous Decomposition Products:</b>	This material may release toxic fumes if burned or exposed to fire. Breaching of the cell enclosure may lead to generation of hazardous fumes which may include extremely hazardous HF (hydrofluoric acid).
<b>Possibility of Hazardous Reactions:</b>	Not available

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## **Section 11: Toxicological Information**

**Acute Toxicity Data**

Acute oral, dermal and inhalation toxicity data are not available for this article.

**Other Toxicity Data**

**Irritation:**

Risk of irritation occurs only if the cell is mechanically, thermally, or electrically abused to the point of compromising the enclosure. If this occurs, irritation to the skin, eyes and respiratory tract may occur.

**Corrosivity:**

Not applicable

**Sensitization:**

Not available

**Neurological Effects:**

Not applicable

**Genetic Effects:**

Not applicable

**Reproductive Effects:**

Not applicable

**Developmental Effects:**

Not applicable

**Target Organ Effects:**

Not applicable

**Carcinogenicity:**

Normal safe handling of this product will not result in exposure to substances that are considered human carcinogens by IARC (International Agency for Research on Cancer), ACGIH (American Conference of Governmental Industrial Hygienists, OSHA, or NTP (National Toxicology Program).

## **Section 12: Ecological Information**

**Ecotoxicity:**

Not available

**Mobility:**

Not available

**Persistence and degradability:**

Not readily biodegradable

**Bioaccumulative potential:**

Not available

**Other adverse effects:**

Solid cells released into the natural environment will slowly degrade and may release harmful or toxic substances. Cells are not intended to be released into water or on land but should be disposed or recycled according to local regulations.

## **Section 13: Disposal Considerations**

**Waste Disposal Method:**

Cell recycling is encouraged. Do NOT dump into any sewers, on the ground or into any body of water. Store material for disposal as indicated in Section 7 Handling and Storage.

**USA:**

Dispose of in accordance with local, state, and federal laws and regulations.

**Canada:**

Dispose of in accordance with local, provincial, and federal laws and regulations.

**EC:**

Waste must be disposed of in accordance with relevant EC Directives and national, regional, and local environmental control regulations. For disposal within the EC, the appropriate code according to the European Waste Catalogue (EWC) should be used.



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## Section 14: Transport Information

True Blue Power lithium-ion cells and batteries are designed to comply with all applicable shipping regulations as prescribed by industry and legal standards which includes compliance with the UN Recommendations on the Transport of Dangerous Goods, IATA Dangerous Goods Regulations, applicable U.S. DOT regulations for the safe transport of lithium-ion batteries, and the International Maritime Dangerous Goods Code. Each of the listed cells in Section 1 has passed the UN Manual of Tests and Criteria Part III Subsection 38.3, which is required by all of the directives listed above.

In the US, Title 49 of the Code of Federal Regulations (CFR), Hazardous Materials Regulations (HMR), Section 172.101 classifies shipments of lithium ion cells and batteries as Class 9, UN3480. Packaging, markings, and documentation requirements are defined in 49 CFR, Section 173.185 of the U.S. HMR. Excepted cells and batteries are allowed to be transported within the US without Class 9 packaging, but must conform to other requirements as stipulated in the 49 CFR, Section 173.185(c).

The International Civil Aviation Organization (ICAO) and the International Maritime Dangerous Goods (IMDG) Code generally classify international shipments of lithium ion cells and batteries as Class 9, UN3480. Packaging, markings, and documentation requirements are defined in the International Air Transport Association (IATA) Dangerous Goods Regulations (DGR) Packing Instructions 965 and Packing Instruction P903 of the IMDG Code. Excepted cells and batteries are allowed to be transported internationally without Class 9 packaging, but must conform to other requirements as stipulated in Packing Instructions 965 of the IATA DGR and Special Provision 188 under the IMDG Code. All cells and batteries must be transported at no more than 30% state of charge after April 1, 2016 and are forbidden on passenger aircraft, they must be transported as cargo only.

## Section 15: Regulatory Information

### USA

<b>TSCA Status:</b>	All ingredients in the product are listed on the TSCA inventory.
<b>SARA Title III:</b>	None
Sec. 302/304:	None
Sec. 311/312:	None
Sec. 313:	None
<b>CERCLA RQ:</b>	
<b>California Prop 65:</b>	This product does not contain chemicals known to the State of California to cause cancer or reproductive toxicity.

### Canada

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and this SDS contains all the information required by the *Controlled Products Regulations*.

<b>WHMIS Classification:</b>	Not Controlled
<b>Substance Notification Regulations:</b>	Lithium hexafluorophosphate is listed on the NDSL. All other ingredients in the product are listed, as required, on Canada's Domestic Substances List (DSL).
<b>NPRI Substances:</b>	This product does not contain any NPRI chemicals.

### **EC Classification for the Substance/Preparation:**

This product is not classified as hazardous according to Regulation (EC) No. 1272/2008. Keep out of the reach of children.

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**EINECS Status:**

<u>Cell component</u>	<u>Chemical Name</u>	<u>CAS No.</u>	<u>EINECS</u>	<u>Concentration range in electrolyte (w/w %)</u>	<u>Mass range in cell (g/g %)</u>
Electrolyte salt	Lithium hexafluorophosphate	21324-40-3	244-334-7	10 - 20	1 - 5
Electrolyte solvents	Includes one or more of the following: Ethylene Carbonate, Propylene Carbonate, Diethyl Carbonate, Dimethyl Carbonate Ethyl Methyl Carbonate	96-49-1 108-32-7 105-58-8 616-38-6 623-53-0	202-510-0 203-572-1 203-311-1 210-478-4 Not Listed	80 - 90	10-20

**Section 16: Other Information**

**Manufacturer Disclaimer:** The information and recommendations set forth are made in good faith and believed to be accurate at the date of preparation.



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