FLUX POWER

GSE Pack

User Guide

Part # 990923 v1.2

Safety Precautions

The GSE Pack is a lithium-ion battery and is classified as Class 9 (miscellaneous) Hazardous Material. Precautions to correctly handle the Flux Power Lithium Battery include:

- The battery should only be handled by authorized personnel familiar with handling, storing and installation of a Lithium Battery.
- Do not open the battery – Only authorized technicians should perform service on a Lithium Battery.
- Do not mount or store the battery upside down or on its side.
- Upon receipt, check the battery for damage during transportation.
- Always use a lifting device when installing a battery.
- Never recycle lithium-ion batteries with lead-acid batteries, please consult Flux Power or your local recycler for more information on how to recycle a Lithium Battery.
- WARNING – Risk of Fire – No User Serviceable Parts

Please also refer to the Safety and Reliability Section of this User manual for more information.

IMPORTANT WARRANTY NOTICE
PROPERLY MAINTAINING THE BATTERIES CHARGE AND STORAGE

Allowing the battery to discharge below 24V, extended use or storage after the low SOC alarm goes off due to non-charging or improper storage will results in an “over-discharge” condition and the battery will no longer charge. **Failure to properly maintain the battery will void the battery’s warranty.**

For technical assistance and additional troubleshooting and technical documentation visit our website at www.fluxpower.com. Support is also available at 877-505-3589 or support@fluxpower.com.

Warranty Notice

This User Guide is not a warranty. Do not use or attempt to use this product until you have read this User Guide in its entirety. Improper installation or usage of this product may be hazardous and may cause damage to other electrical equipment and will void warranty.

Table Of Contents

1. Introduction

This manual is intended to provide information on how to operate a Flux Power GSE battery and maximize its productivity, longevity, and cost saving features.

2. GSE Battery Basics

2.1 Construction

The battery's main components consist of lithium-ion cells, a Battery Management System (BMS) made up of the Battery Control Module (BCM) and Battery Management System Modules (BMSM), a Battery Monitor (BMID), a CAN gateway, and counterweights (if needed). The components are encased in a powder coated steel enclosure. A diagram of the Flux Power GSE battery and its components can be seen in Figure 1.

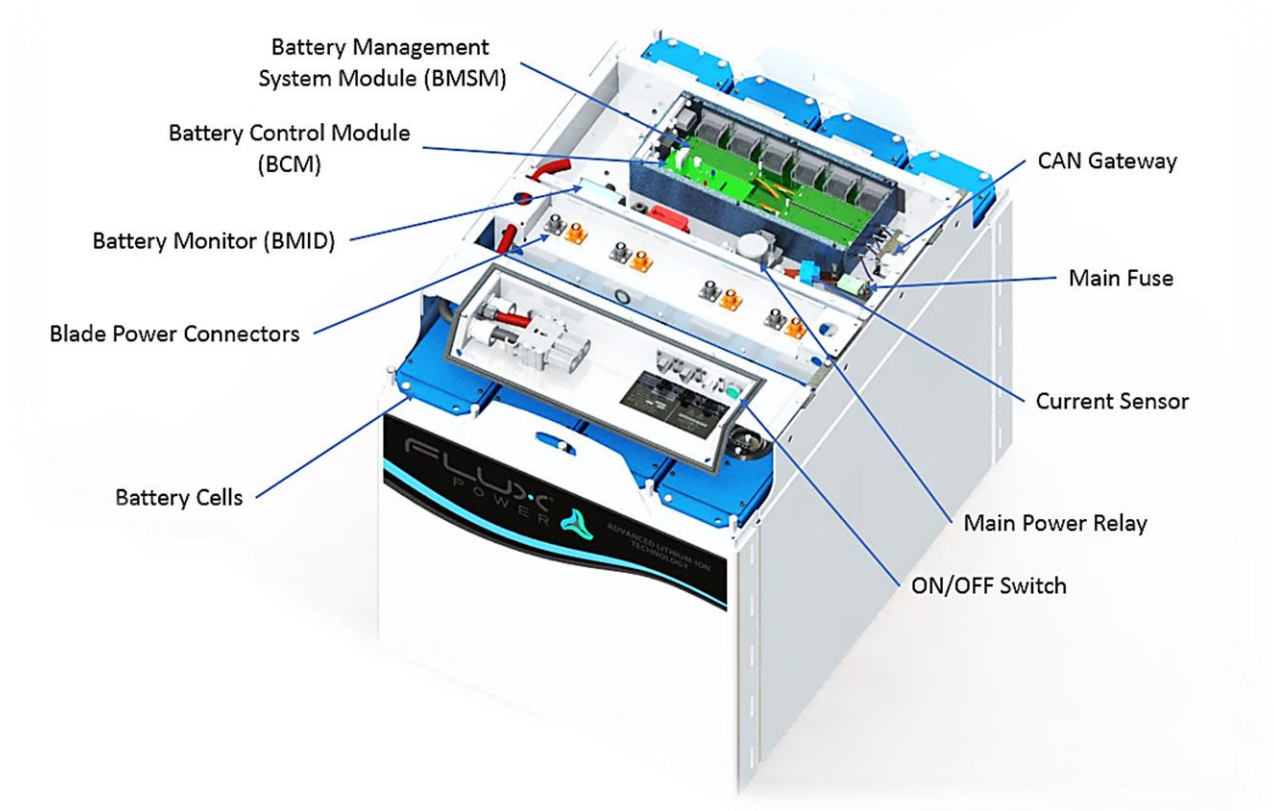

Figure 1: A diagram of the GSE battery and its internal components

The lithium-ion cells are large format lithium iron phosphate (LiFePO4) cells. They are clamped together and restrained to a blade to protect against shock and vibration. The cell interconnections are flexible bus bars providing solid and vibration resistant connections.

Refer to the data plate for the service weight of the battery.

2.2 Initial Startup

To activate the battery, cycle power on the battery by turning the ON/OFF switch to ON. The battery will click and take approximately 1-5 minutes before it can be charged or used.

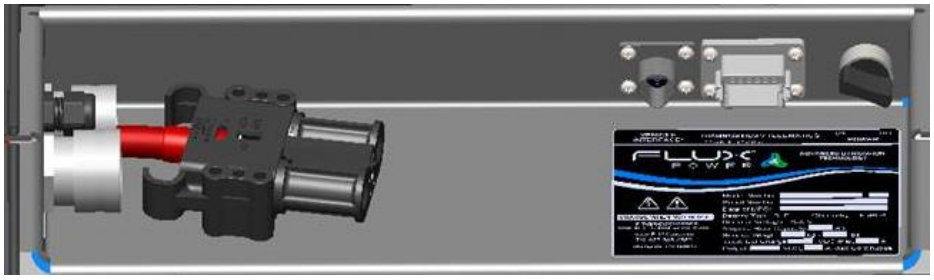

Figure 2: ON/OFF switch located near the battery leads. Turn switch to ON to activate the battery.

The battery should be plugged in until fully charged and should remain plugged in or be turned off until installation and deployment in equipment. There is **no** danger of overcharging the battery as the onboard Battery Management System (BMS) communicates with the external charger and efficiently charges and balances the cells. It is important to turn the battery off if it is not in use and awaiting deployment.

To maintain battery health, keep the battery plugged in whenever it is not in use. Should you completely discharge the battery, plug the battery in for charging **immediately** after use. This will help maintain optimum battery health.

2.2.1 Installation

To install safely:
1. Use an approved lifting device and chains (or straps) to lift the battery using the handle cutouts on each side.
2. Slowly place the battery into the battery compartment with the battery power cables oriented appropriately to the ground support truck.
3. Connect the battery main power cables and communication cable to the truck.

2.3 Charger

Use only a Flux Power approved charger for charging of all GSE batteries. The batteries are compatible with PosiCharge SVS units (see below):

The battery's BMID has been programmed by default. It is recommended to check the settings on the Posicharge unit to match our settings shown below:

Charger Setting	Value
Battery Type	63 (Averest Lithium)
Number of Cells	24
Battery Capacity	Capacity of Pack
Start Current Limit	40
Terminating SOC	100%
Internal Resistance	125 (Default)
Max Ahs before EQ	Largest Possible
Max Days between EQ	Largest Possible
Target Voltage	3.4453

2.3.1 Charging

It is recommended that opportunity charging be performed during breaks, at the end of a shift, or when the truck is not being used. Extended charging will not harm the battery. Check the truck SOC meter for the status of the battery. If the battery is below 10% SOC, charge immediately.

2.4 Battery Management System (BMS)

The Battery Management System (BMS) monitors and protects battery life and ensures the battery is performing as expected by controlling different features including heaters, fans, and charging events as needed.

2.4.1 Cell Balancing

Cell balancing is managed by the BMS and is automatically performed whenever the battery is near the end of the charge cycle.

2.5 Temperature

Flux Power GSE batteries without the heater option have an operational ambient temperature range of 0°C / 32°F to 40℃ / 104°F when discharging. The BMS will prevent operation outside these temperatures, but a heater option is available for cold storage and freezing weather applications. Batteries subjected to low temperatures (0°C / 32°F or lower) may experience decreased performance if not equipped with the heater option.

2.6 Optional Heaters

The GSE battery can be equipped with integrated heaters that increase the low temperature performance. The battery can be discharged in temperatures as low as -30°F / -34°C, and charged in temperatures as low as -10°F. The heaters will keep the cells at a temperature of 40°F for optimal health and operation.

If the battery is left unattended in sub-zero temperatures, the heaters can discharge the battery within 72 hours. The BMS will protect the battery from over discharge by turning off the heaters at 20% SOC and will remain off until the battery is plugged in for charging.

2.7 Storage

Do not store the battery upside down or sideways. The electronics use a small amount of energy to manage the battery, which limits the amount of time it can be stored. Make sure to charge your battery every 6 months while in storage mode.

If the battery is allowed to drain completely, it will damage the lithium-ion cells and void the warranty. It is recommended the battery be left in storage mode when not in use or in equipment waiting for deployment.

Storage Mode

Always plug the battery in or place it in storage mode when not in use for extended periods of time. To place the battery in storage mode, turn the ON/OFF switch to OFF. Storage mode prevents the electronics from draining the battery and increases storage time. It is recommended the battery be plugged in and fully charged every six months when being stored. Batteries should be stored in temperatures above 0°C / 32°F.

Auto-Sleep Mode

If the battery has been left idle for more than 3 days, it will go into a sleep mode to cut power consumption and reduce the risk of over discharge. To return power to the truck, cycle the breaker. If this does not work, the battery must be plugged in for charging.

3. Troubleshooting

3.1 No Power to Truck

If the truck does not have power with the battery switched to On, the battery may be at a low SOC. To wake the battery up:

1. Cycle power on the pack.
2. You should hear an audible click and power returned to the truck. Once powered on, charge pack immediately.
3. Plug the battery in. It may take up to five minutes for charging to begin.

3.2 Over-Discharged

This battery contains advanced electronics which will slowly drain the battery. If not charged regularly, the pack may over-discharge causing the electronics to shut down and the contactor to open. Follow the steps in 3.1 No Power to Truck.

Allowing the battery to discharge below 67V due to extended use or storage will results in an “over-discharge” condition and the battery will no longer charge. Failure to properly maintain the battery will void the battery’s warranty. For technical assistance and additional troubleshooting and technical documentation visit our website at www.fluxpower.com. Support is also available at 877-505-3589 or support@fluxpower.com.

4. Safety And Reliability

The battery is completely sealed and requires no watering. There is no danger of acid spills or explosive vapors during normal use. The battery is UL Listed and passed testing required for UL 2271, UN 38.3, and IP 56.

4.1 Hazardous Material Information

Federal EPA regulations do not consider completely discharged Flux Power GSE Batteries to be hazardous waste. There are also no federal reporting regulations required for Flux Power GSE Batteries (specifically under the Resource Conservation and Recovery Act of 1976 (RCRA) and the Emergency Planning and Community Right-to-Know Act (EPCRA)). There are hazmat regulations when shipping lithium-ion batteries, and the shipper must be trained in the proper packaging and labeling required.

Some state and city regulations differ from federal law. For information on your local regulations contact your local Environmental Protection Agency (EPA).

Federal regulations are very strict when dealing with lead-acid batteries due to the environmental impacts of heavy metals (lead) and the inherent dangers present: acid spills, explosive gases, and lead poisoning. A Flux Power GSE Battery has none of these dangers, so is not subject to the associated regulations.

4.2 What to do if a Cell Breach Occurs

If a cell breach occurs, open the doors and windows to allow ventilation. Do not use water to clean up the electrolyte, but instead use absorbent material. Place the contaminated rags in a metal bin. Avoid breathing the fumes, and in case of fire, do not use water, use a type D, CO2, Dry Chemical or foam fire extinguisher. For more information contact Flux Power or refer to the Material Safety Data Sheet (MSDS) available on the Flux Power website.
The damaged battery and cleaning materials should be placed in a sealed plastic or steel container and disposed of or recycled using the measures required by your local EPA.

4.3 Power Washing and Water Submersion

The battery can be used in applications that require power washing. When power washing the battery, make sure the power inlet plug and the data port plug are both firmly in place. The battery should not be used in equipment where submersion in water for any amount of time is possible. In the event the battery is submerged, please do not attempt to use or charge the battery. Contact Flux Power Product Support.

5. Recycling/Disposal

5.1 Disposal

Lithium-ion batteries are not specifically discussed in the Federal Resource Conservation and Recovery Act (RCRA). However, given the federal requirements for hazardous materials, a completely discharged lithium iron phosphate cell is considered non-hazardous material. States and cities may have more stringent regulations in place, some of which blanket all lithium-ion batteries as hazardous waste, while others classify them as normal waste. The Flux Power GSE Battery End of Life Guide and Guarantee ensures full compliance with laws and the highest environmental standards. The guide is available and can be requested by contacting Flux Power Support.

5.2 Re-Use

When a GSE Pack no longer holds enough charge, there are already several options, such as:

- Cells can be deployed into alternate second life usage, such as grid storage or emergency power.
- The steel case and electronics can be refurbished into a new pack or be recycled.

5.3 Recyle

Lithium-ion batteries are recyclable and there are lithium-ion recycling plants nationwide. Do not include lithium-ion batteries in shipments of lead-acid batteries being sent for recycling. Sending a lithium-ion battery to a lead-acid recycler could cause damage to lead- acid recycling equipment and personnel. Contact Flux Power Support if you need assistance.

6. Shipping Information

When shipping a Lithium-ion Battery, the products are classified as UN 3480 Dangerous Goods - Part II - Class 9 (miscellaneous) Hazardous and can only be shipped ground. The battery must be secured to a pallet or in a wooden crate. There must be nonconductive material between multiple batteries, and they cannot be stacked. If it's being shipped in equipment it must be securely installed and protected against heat, short circuit, movement, and accidental activation of the equipment. Shipping declarations, hazmat shipping documentation, and hazmat shipping training are all required. It is the responsibility of the shipper to obey all regulations when shipping a Flux Power GSE Battery.

7. Contact Information

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Flux Power specifications are subject to change.