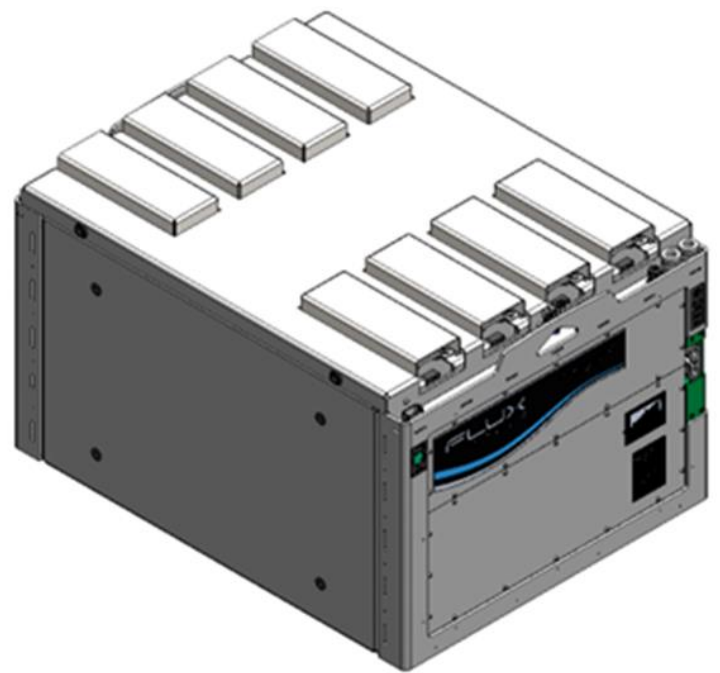




Flux Power X-Series-G1 User Guide



Safety Precautions

The Flux Power Lithium-ion Battery is composed of lithium-ion cells and is classified as Class 9 miscellaneous hazardous material.

Precautions to correctly handle the Flux Power lithium-ion battery include:

- The battery shall only be handled by Flux Power authorized personnel familiar with handling, storing, and the installation of a lithium-ion battery.
- Do not open the battery. – Only Flux Power authorized technicians shall perform service on a lithium-ion battery.
- Do not tamper with the main power Anderson connector.
- 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-ion Battery.
- WARNING – Risk of Fire – No User Serviceable Parts
-  Consider all DC battery cells and circuits to be energized, shorting of circuits may cause a hazardous condition. Remove all metallic jewelry from hands and arms before working on battery cells or circuits.
-  SAFETY - Follow Safety Standards as required; review and follow all Safety Data Sheets “SDS” for chemical use. Follow instructions for the proper use of PPE as required.

For technical assistance on the Flux Power lithium-ion battery, contact your local Flux Power dealer at www.fluxpower.com.

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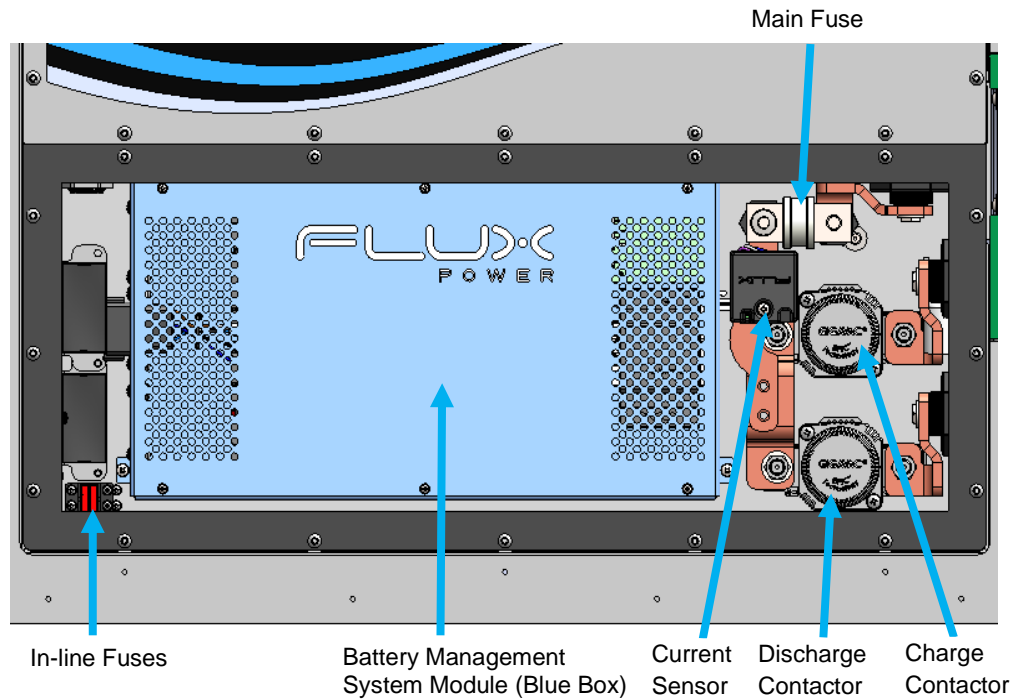
1 Introduction

The LiFT Pack X-Series-G1 batteries are lithium-ion batteries specialized for the material handling industry. This User Guide is intended to provide information on how to operate a Flux Power LiFT Pack X-Series-G1 battery and maximize its productivity, longevity, and cost savings features.

2 LiFT Pack X-Series-G1 Basics

2.1 Construction

The battery's main components consist of lithium-ion cells, a Battery Management System (BMS), a State of Charge (SOC) gauge, and an ON/OFF push button. The components are encased in a steel enclosure. These main components are the same across the X36, X48, and X80. The components inside the battery will vary. A diagram of the Flux LiFT Pack X-Series-G1 can be seen in Figure 1.



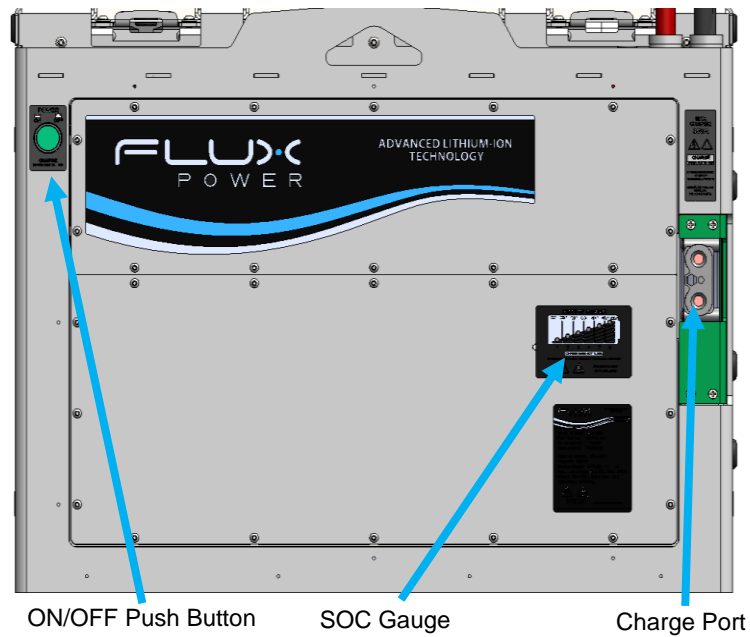


Figure 1: A diagram of the Flux Power LiFT Pack X-Series-G1 Lithium Battery and all major components.

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

2.2 Initial Startup

Connect the external harness, as well as any accessories that may have come with it, to the battery before turning it ON. Use the battery's green ON/OFF push button to turn the battery ON. When turned ON, the battery will close supply power to the truck. Refer to the installation guide for this battery for further information on installing the battery.



Figure 2: Push button to turn the battery ON.

2.3 Charger

There are no internal chargers with this battery. To charge using an external charger plug the external charger into the battery's charge port. The charge port on the battery is a black receptacle which is separate from the connection from the battery to the truck. When the battery detects that is properly connected to a charger, the external SOC gauge will alarm for 10 seconds to indicate that it will cut power to the truck. Once unplugged from charging, it will re-enable power to the truck. This is a safety feature of the battery to avoid a drive-away event.

An X48-G1 battery will suspend charging if cell temperatures are above 55°C (131°F) or below 1°C (34°F) to maintain the optimal cell health. An X36-G1 or X80-G1 battery will suspend charging if cell temperatures are above 45°C (113°F) or below 0.56°C (33°F) to maintain the optimal cell health. If you need to charge in colder conditions, then integrated heaters are an option.

2.3.1 Opportunity Charging

Opportunity charging consists of connecting the battery to an external charger whenever it is not in use and is turned ON. Opportunity charging reduces wear and tear on the battery and increases its the lifetime. The battery has no issues with sulfation and acid stratification; therefore, it can be charged anytime, anywhere.

2.4 Flux Power Battery Management System (BMS)

All of Flux Power's energy storage solutions use our patented BMS which monitors and protects the life of the battery. The BMS is continuously monitoring cell voltages to properly balance them. Cell balancing is automatically performed when the battery is charging, discharging after charge, or in an idle state after charge. The battery cannot properly balance if it is turned OFF. The BMS will use the six LEDs SOC gauge on the front to display the battery's State of Charge (SOC) percentage at all times.

2.5 Temperature

X48-G1 Discharge temperature range: -20°C to 55°C (-4°F to 131°F)

X48-G1 Charge Temperature Range: 1°C to 55°C (34°F to 131°F)

X36-G1 and X80-G1 Discharge temperature range: -20°C to 55°C (-4°F to 131°F)

X36-G1 and X80-G1 Charge Temperature Range: 0.56°C to 45°C (33°F to 113°F)

The BMS will prevent operation outside these limits. Batteries subjected to low temperatures (32°F / 0°C or lower) may experience decreased performance if not equipped with the heater option. Integrated heaters are available for cold storage applications where the ambient temperature can reach up to -20°F.

2.6 Storage

Do not store the pack upside down or sideways. Make sure the battery is turned OFF whenever it is being stored. This dramatically increases the storage time. The following table shows the storage times of a fully charged pack before it needs a recharge. If the pack is partially discharged, storage times are reduced.

LiFT Pack X-Series-G1	All Configurations
Storage Time (ON)	15 days
Storage Time (OFF)	9 months

Table 1: The number of days a fully charged LiFT Pack X-Series-G1 can be stored before needing a recharge. If a LiFT Pack X-Series-G1 battery is allowed to drain completely while in storage, it will damage the lithium-ion cells and void the warranty. For extended storage times, contact a Flux Power Product Support representative.

3 Device Trouble Codes (DTCs) on BDI

The SOC gauge will display Device Trouble Codes which warn the user if there is an issue with the battery. The table below will display certain system conditions. In normal operation, the SOC gauge will display the battery's current state as a percentage with no DTCs present. If a DTC is present, then the SOC gauge will indicate so with a DTC number. DTCs let the user or technician quickly assess why a battery may be disrupting operation. The following list details each DTC. The corresponding Service and Parts Manual for this battery also details the DTCs seen on this battery. The following list details each main DTC.

Table 2: Situations where the Flux Power lithium battery will cut power and display a DTC.

Fault Description	Cause and Required Duration to Trigger	Fault Protection	DTC Number	Service Required?	Fault Resolution
0% State of Charge	<5% State of Charge, Immediate	Buzzer Sounds Periodically	1	No	Connect appropriate charger
Over-temperature	Discharge temperature > 129F(X48) 130F(X36 X80), 60 seconds Discharge temperature > 131F(X36 X48 X80), Immediate Charge temperature > 130F(X48) 112F(X36 X80), 60 seconds Charge temperature > 131F(X48) 113F(X36 X80), Immediate	Contactors opens	2	No	Allow pack to cool, then cycle the circuit breaker OFF, then ON
Under temperature	Discharge temperature < -2F (X36 X48 X80), 60 seconds Discharge temperature < -4F	Contactors opens	2	No	Allow pack to warm, then cycle the circuit breaker OFF, then ON

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	(X36 X48 X80), Immediate Charge temperature < 34F(X36 X80) 35F(X48), 60 seconds Charge temperature < 33F(X36 X80) 34F(X48), Immediate				
High Cell	At least one cell is >3.60V, Immediate	Contactor opens	3	No	Cycle the battery OFF, then ON through the battery's BDI. If fault occurred while charging, allow cells to settle
Current Exceeded	Discharge current <(- 1000A), 10 seconds Discharge current <(- 400A)(X48) (- 450A)(X36 X80), 2 minutes Charge current > 1000A, 10 seconds Charge current > 400A(X48) 450A(X36 X80), 2 minutes	Contactor opens	4	No	Cycle the battery OFF, then ON through the battery's BDI
Hardware Failure	Electronic component failure for more than 10 seconds	Contactor opens	6	Yes	Service
Low Cell	Fixed threshold of <2.8V for cell temp >25C	Contactor opens	9	No	Connect the appropriate charger and cycle the battery through the battery's BDI
Integrity Signal	Communications port missing loop-back or external harness issue	Contactor opens	11	Yes	Ensure that the communications port has a proper loop-back. If an external harness is connected, then ensure that all components of the harness are properly connected and functioning. Contact Product Support if further assistance is needed

4 Safety and Reliability

Flux Power LiFT Packs are completely sealed and require no watering. No electrolyte must be added and there is no danger of acid spills or explosive vapors during normal use. In addition, the Flux Power LiFT Pack X-Series-G1 is designed to pass the UL 2580 standard.

- **WARNING:** Do Not Disconnect the power cables under load.
- Not Suitable for water exposure.
- Not intended for use in a marine environment.
- For indoor use only.
- ALWAYS use proper lifting techniques and equipment when installing the battery.
- The battery does not require regular maintenance but should be plugged in overnight once per week to allow the cells to balance.
- Do NOT attempt to open the battery, unless authorized by a Flux Power representative.
- Do NOT tamper with the main power connector.

4.1 Hazardous Material Information

Lithium-ion batteries are considered HazMat Class 9 - Miscellaneous. There are no reporting regulations required for Flux Power LiFT Packs federally (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.

There are sometimes state or city regulations which differ from federal law, however generally speaking, a Flux Power LiFT Pack X-Series-G1 under normal use has no danger of leakage, spilling, outgassing, or presenting any danger to the end user. Federal regulations are very strict when dealing with lead-acid batteries due to the environmental impacts of heavy metals (lead) and inherent dangers present: acid spills, explosive gases, and lead poisoning.

For more information on local regulations, contact your local EPA and fire department or contact FLUX Power and we will do our best to assist you.

4.2 Cell Exposure

Flux Power battery packs meet tough internationally recognized safety standards to provide one of the safest industrial lithium-ion products available. In the case of an emergency, there are a few types of exposure to be aware of:

- **Inhalation:** when someone inhales fumes or smoke from a battery, remove the exposed person to fresh air as gas may be corrosive to the respiratory tract.
- **Electrolyte on skin:** wash off skin for 30 minutes thoroughly with soap and water.
- **Electrolyte in eyes:** thoroughly flush eyes with water for a minimum of 15 minutes.
- **Ingestion:** rinse out mouth thoroughly with water and give plenty of water to drink.

Proper procedures to each exposure type, and proper PPE per incident, is detailed further in the *Lithium Ion (LFP) Battery Emergency Procedures*.

4.3 Heavy Water Spray

The X-Series-G1 Battery Pack should not be used in equipment where there is water spray, such as applications that require power washing. If an X-Series-G1 Battery Pack is exposed to heavy rainfall or water spraying, then do not attempt to use or charge the pack. Instead contact Flux Power Product Support representative.

5 Recycling/Disposal

5.1 Recycle

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 equipment and personnel. Contact Flux Power if you need assistance. If you are unable to locate a lithium-ion recycler in your area, Flux Power agrees to take back any battery that is at its end of life.

5.2 Re-Use

When a LiFT Pack X-Series-G1 no longer holds enough charge, there are already a number of 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 Disposal

Flux Power is committed to the environment. 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 *End Of Life and Guarantee* ensures full compliance with laws and the highest environmental standards. The guide is available on the Flux Power website at www.fluxpower.com.

6 Shipping Information

When shipping Flux Power LiFT Packs, the products are classified as *UN 3480 Dangerous goods - Part II - Class 9 (miscellaneous)* 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 is 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. Please see the *Shipping and Reporting Guide* for more information. It is the responsibility of the shipper to obey all regulations when shipping a Flux Power LiFT Pack X-Series-G1.

This guide is available on the Flux Power website at www.fluxpower.com.

7 Flux Power Contact Details

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WARNING – Risk of Fire – No User Serviceable Parts

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