



# **GNB LiFTFORCE Material Handling Battery**

## **Operating Instructions**



# 1. Revision Table

Version	Change	Date	Name	Authorised
1.0	Initial Issue	08/01/18	Sledge	

## Contents

- 1. Revision Table ..... 2
- 2. WARNINGS AND GENERAL INFORMATION ..... 3
- 3. GENERAL DATA ..... 4
- 4. SYSTEM OVERVIEW ..... 4
- 5. OPERATING INSTRUCTIONS ..... 6
  - 5.1 Start Up and Normal Running ..... 6
    - 5.1.1 Discharging ..... 6
    - 5.1.2 Balancing charging ..... 7
  - 5.3 Over Discharge Protection ..... 7
    - 5.3.1 Discharge mode: ..... 7
    - 5.3.2 Charge mode: ..... 7
- 6. MAINTENANCE ..... 8
- 7. STORAGE ..... 8
- 8. BUZZER SUMMARY ..... 8
- 9. SYSTEM LED SUMMARY ..... 8

## 2. WARNINGS AND GENERAL INFORMATION



Observe these Instructions and keep them located near the battery for future reference Work on the battery should only be carried out by qualified personnel



Do not smoke  
Do not dispose of the batteries in a fire or normal waste



While working on batteries wear protective eye-glasses and clothing  
Observe the accident prevention rules as well as EN 50272-2 and EN 50110-1



Explosion and fire hazard  
Avoid short circuits  
Avoid electrostatic charges and discharges/sparks



Caution – parts of the battery may be live  
Be careful when handling cables



Lithium Batteries are heavy. Make sure they are installed securely.  
Handle with care, the batteries are sensitive to mechanical shock.  
Do not lift or pull up on the poles or communication cables



Keep children away from  
batteries.



Keep the battery dry



RECYCLE  
Battery may require recycling in accordance with local laws  
Contact Exide or regulatory authorities for further information  
DO NOT include battery with Lead Acid battery recycling

### 3. GENERAL DATA

Voltage	See battery label
Capacity	See battery label
Charger	GNB ELI series supplied (only this charger is to be used) max charge voltage see battery label
Maximum Charge Rate	Not to exceed 0.7 C ( 70 Amps per 100Ah capacity)
Operational Temperature (discharge)	-10°C to 50°C (a low temperature kit is required for operation below 0°C)
Operational Temperature (charge)	0°C to 45°C (a low temperature kit is required for operation below 0°C)
Communication	CAN Communication charger
Display	Curtis Engage II or Opus A3
Logging	When Opus Display is fitted
Weight	See battery label

### 4. SYSTEM OVERVIEW

The LiFTFORCE Lithium battery system is an enclosed tray containing GNB Lithium Battery Modules in various capacities. The Battery Management System (BMS) and contactors are built into the tray and the system is equipped with a Curtis Engage II gauge or Opus A3 display, which shows battery parameters during charge and discharge.

The battery is fitted with an over discharge protection device, which will prevent the battery entering a critical level of discharge. A buzzer is fitted to the vehicle to alert the operator of this situation.

Both the display and the buzzer need to be mounted in a convenient place on the vehicle and this should be done in consultation with the GNB Application Engineer. The GNB Lithium battery system is completely self-contained and can be used as a direct replacement for all current in-use Lead Acid systems.

Figure 1 below shows the cables and connectors on the top of the tray. The power leads exit the tray through glands and are not field replaceable. A CANbus connection lead also runs with the power leads to a REMA plug to connect with the Charger for CAN controlled charging.

A custom lead to the Curtis gauge is provided with a connector to the battery tray. This lead can be replaced in the field. A service port has also been provided for monitoring the modules and cell blocks.

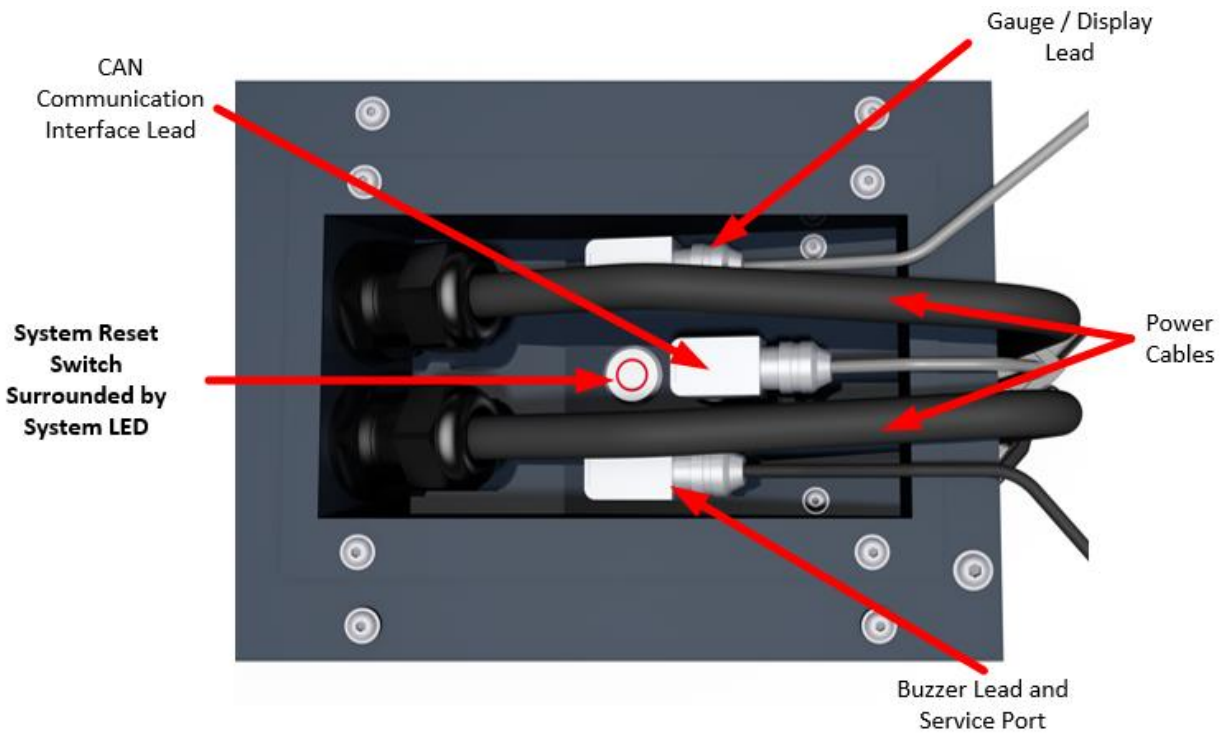


Fig 1

The buzzer can be seen in Figure 2 below



Fig 2

The Curtis display can be seen in Figure 3 below.



Fig 3 Curtis Display

The Curtis display will show both a bar and text value of the State of Charge (SOC) of the battery from 100 to 0%. The LED on the right of the gauge will flash from 20% to 15% SOC and will be permanently on below

15% as an indicator to the operator that he should be ready to charge the battery. If the operator ignores this advice, the battery will automatically shut down at 10% SOC. See below.

The wrench symbol will flash if there is a battery fault. If this occurs please contact an Exide Service Engineer.

The Opus display can be seen in Figure 4, 5, 6 and 7 below. The Opus will only be fitted to systems where GNB or the customer requires data logging to assess the duty cycle of their operation. This allows precise sizing of the battery pack for the most cost effective solution.



Fig 4

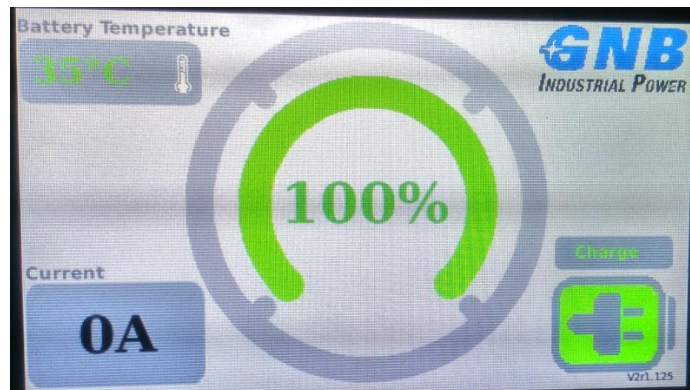


Fig 5

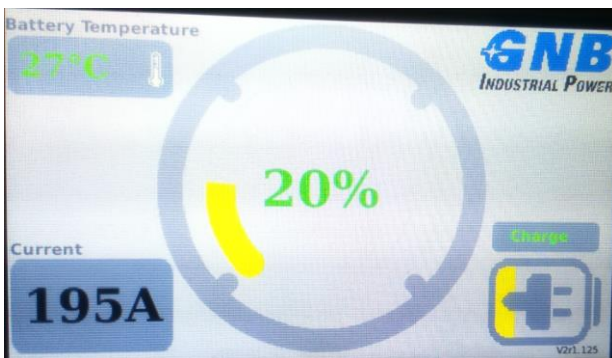


Fig 6

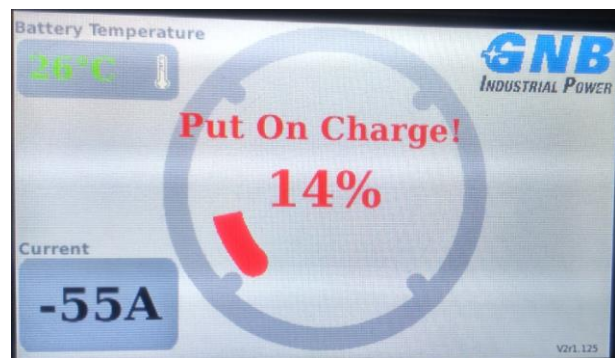


Fig 7

In addition to low SOC warnings, the buzzer will sound on warnings for: Under/Over Voltage, Under/Over Temperature and LMU (internal electronics) Over Temperature. The system will only shut down for low SOC. However, if the warnings indicated escalate further, the Battery Management System may take action by shutting down the battery. If this occurs please contact Exide Service.

## 5. OPERATING INSTRUCTIONS

### 5.1 Start Up and Normal Running

#### 5.1.1 Discharging

At first installation the battery pack should be fully charged and the SOC display should read 100% before vehicle usage. When the battery pack is first connected to the vehicle or charger it enters Self-check Mode and the buzzer will sound briefly.

To achieve optimum life time operating depth of discharge of not more than 80% should be applied.

The system is designed to accept regular opportunity charging. Whenever the system is not in operation, it should ideally be placed on charge.

LiFTFORCE batteries are fitted with Drive Away Protection and separate cables for charger and vehicle. Power to the vehicle is automatically disabled while the battery is charging and therefore does not require an ON/OFF switch.

### 5.1.2 Charging

Only GNB HF Approved Lithium chargers are to be used with the system. Standard Lead Acid chargers are not compatible and may damage the Lithium system.

For maximum charge voltage see battery label.

If you attempt to charge the battery below 0°C then the battery system will disconnect. If the system is required to operate below 0°C then an additional low temperature kit should be supplied with the system.

The system LED is illuminated when the battery is connected to the vehicle or charger.

### 5.1.2 Balancing charging

When not in use the vehicle must be placed on charge. It is strongly recommended that the vehicle is placed on charge for a period of at least 6 hours once every week. Without this “maintenance charge” the system performance will not be optimised. Balancing charge is completed if the charger shows “charge complete” (i.e. all LEDs are shown green)

## 5.3 Over Discharge Protection

**IF THE BUZZER STARTS TO BEEP FOR LOW SOC WHILE THE VEHICLE IS BEING USED, IT SHOULD BE RETURNED TO THE CHARGER AS SOON AS POSSIBLE. IF THE BUZZER SOUNDS CONTINUOUSLY, THE VEHICLE SHOULD BE STOPPED IMMEDIATELY.**

When the SOC of the battery is low, one of the following will happen, depending on the operational mode:

### 5.3.1 Discharge mode:

- A 5 minute timer is started; a buzzer beeps once every 8 seconds and the LED on the battery flashes quickly. This gives the operator sufficient time to take the vehicle to the charger. When 1 minute remains, the buzzer beeps once every 4 seconds and then for the last 10 seconds the buzzer is continuous, indicating that the vehicle will STOP imminently.
- If the 5 minute timer has expired and the vehicle has not been placed on charge the battery will shut down and the LED will pulse slowly.
- The battery pack can be temporarily re-enabled by pressing the reset button on the battery; this allows the vehicle to drive short distances and return to the charger. The reset button will re-enable the battery pack for a certain period of time, which reduces with each reset press.

### 5.3.2 Charge mode:

- If the battery is at a low SOC, a 30 minute timer is started to allow sufficient time for the charger to charge the battery above the threshold. The LED will flash slowly and the buzzer will be off. The operator should not notice any difference from normal charging.

## 6. MAINTENANCE

Do not open the battery pack. There are no user serviceable parts inside and doing so will void the warranty. Please contact qualified GNB technical personnel for service.

The customer should verify the condition of all external cables and connections prior to each operation. In the event of any issues please call your local service engineer.

If there is a malfunction of the battery, please call your local GNB service engineer.

## 7. STORAGE

If batteries are taken out of service they should be stored in a dry and frost free room.

Before being placed in storage, the battery should be fully charged and disconnected from both the vehicle and the charger.

## 8. BUZZER SUMMARY

- **One beep:**

This indicates that the battery pack has been powered up, by being connected to either the charger or the vehicle.

ACTION: No action required this is normal operation.

- **Slow beep: (Once every 8 seconds)**

The battery is at a low SOC and will switch off after 5 minutes.  
Or one or more of the warnings described in Section 4 are active.

ACTION: return the vehicle to the charger as soon as possible.

- **Fast beep: (Once every 4 seconds)**

The battery is at a low SOC and 60 seconds remain before the battery shuts down.

ACTION: Return to the charger immediately.

- **Continuous:**

The battery is at a low SOC and 10 seconds remain before the battery shuts down.

ACTION: STOP driving immediately.

## 9. SYSTEM LED SUMMARY

- **Continuous:**

The battery is activated and operating normally.

- **Fast flash: Once every 0.5 seconds**



The battery is at a low SOC and will shut down within 5 minutes.

ACTION: Return the vehicle to the charger as soon as possible.

- **Slow flash: Once every 3 seconds**

The battery is at a low SOC, but has been connected to the charger.

ACTION: Normal operation

Note: If the battery has not cleared the low SOC warning within 30 minutes the battery pack will shut down, as a safety precaution.

- **Very Slow Flash: (Once per 5 seconds)**

The battery has shut down as it is at a very low SOC.

ACTION: Charge the battery as soon as possible.

gnb.com  
888.563.6300  
Milton, GA 30045  
USA