



**Batteries**



# SERVICE MANUAL

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# INTRODUCTION



The information contained in this document is critical for safe handling and proper use of the Elitra™ iON lithium-ion battery for powering electrical industrial trucks. It contains a global system specification as well as related safety measures, codes of behavior, a guideline for commissioning and recommended maintenance. This document must be retained and available for users working with and responsible for the battery. All users are responsible for ensuring that all applications of the system are appropriate and safe, based on conditions anticipated or encountered during operation.

This service manual contains important safety instructions. Read and understand all instructions before installing, handling or operating the battery. Failure to follow these instructions may result in serious injury, death, destruction of property, damage to the battery and/or void the warranty.

This service manual is not intended as a substitute for any training on handling and operating the industrial truck or Elitra™ iON battery that may be required by local laws, entities and/or industry standards. Proper instruction and training of all users must be ensured prior to any handling of the battery system.

Refer to the Terms and Abbreviations at the end of this document.

**For service, contact your sales representative or visit:**

<https://www.enersys.com/en/sales-services/>  
[www.enersys.com](http://www.enersys.com)

**Your Safety and the Safety of Others is Very Important**

**⚠ WARNING** You may be seriously injured if you don't follow these and other related instructions.

# PRODUCT APPLICATION

## Product Application

Elitra™ iON batteries are designed for industrial truck traction applications. Any other use is not permitted. Only EnerSys®-approved chargers are to be used to charge Elitra™ iON batteries.

The truck harness used between Elitra™ iON batteries and the industrial truck is dictated by the truck OEM. The truck harness shall comply with requirements in relevant standards for

current carrying capability and truck interface requirements. Truck harness compliance with relevant standards shall be confirmed by the truck OEM and/or integrator.

**⚠ WARNING** Installing the battery in a non-compliant truck is a fire risk due to the potential for improperly sized cable harnesses and will void the warranty.

## Battery Architecture

Figure 1: Outer Tray Features

Figure 2: Details of the Electrical Interface

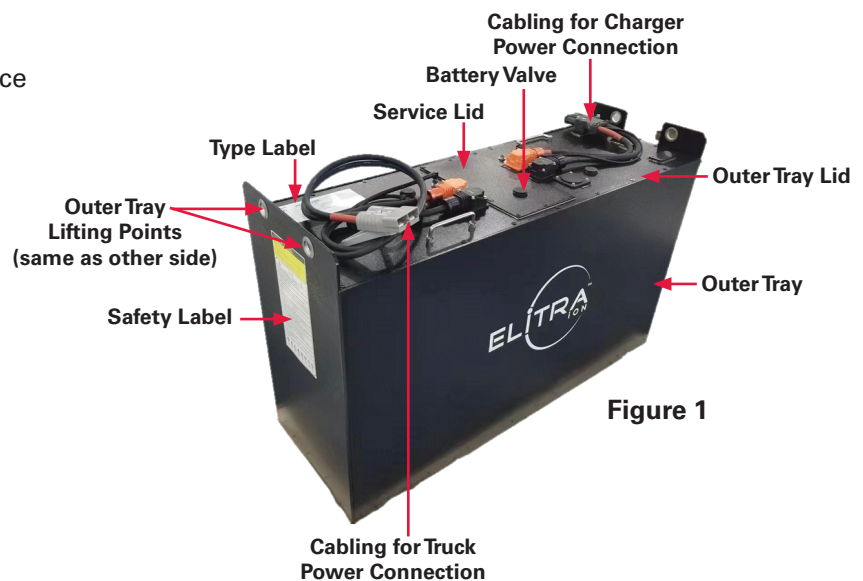


Figure 1

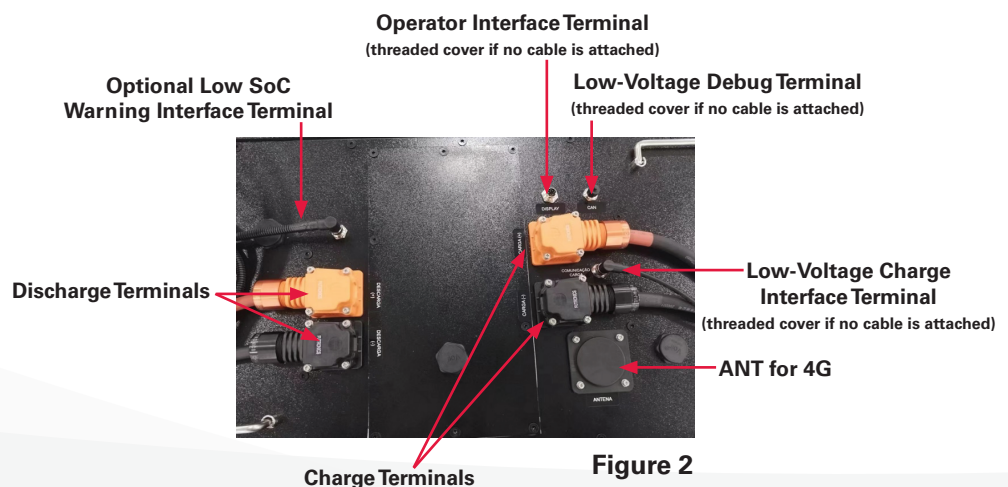


Figure 2



# BATTERY ARCHITECTURE

## Battery Architecture (cont.)

The battery has a modular design. The power modules allow products to be scaled to an application by adding additional power modules to provide more power and energy capability for a given assembly.

The power modules contain lithium-ion cells, which are assembled into various series/parallel configurations depending on the application voltage requirements. The power module contains embedded cell voltage and temperature measurements along with the capability to balance the cells during operation.

The battery is protected by a functional safety-qualified Battery Management System (BMS) which is packaged into a control module. This control module contains safety components and logic to control main contactors, preventing the operation of the battery in unsafe and abusive conditions.

The battery, excluding cable harness, is designed to be rated to IP54.

### **Safety Features:**

- A functional safety-qualified electronic monitoring and control system to ensure safe electrical operation (voltage, current, and temperature limits)
- A safe shutoff strategy to respond if limits have been violated (voltage, current, and temperature)

- A contactor and fusing strategy to minimize the impact of accidents or misusing the battery like short circuits or pulling the charge plug under load
- Ungrounded separated charging circuit
- Dedicated handling/lifting points
- Dedicated venting solution to mitigate the impacts of the resulting outgassing
- A steel power module and outer tray design to provide mechanical protection for the battery

**Low-Voltage Debug Interface Terminal:** Debug interface used for EnerSys® service purposes.

**Low-Voltage Interface Terminals:** There are multiple low-voltage interfaces on the outside of the control module which must be connected during commissioning, depending on the end user requirements.

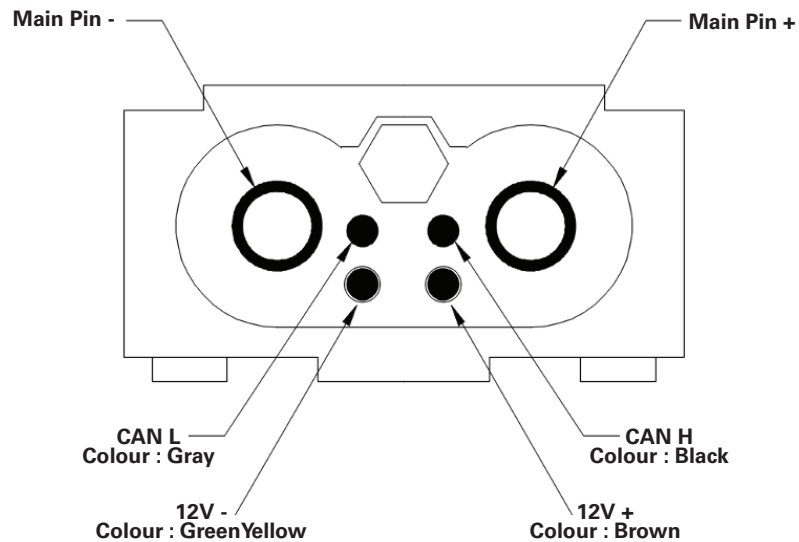
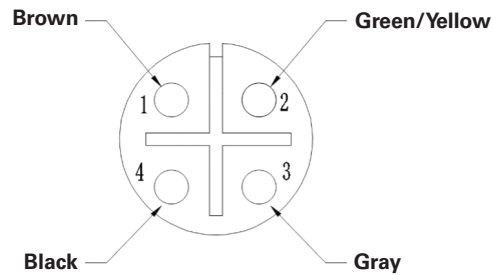
### **Low-Voltage Charge Interface Terminal:**

This is a required connection for all batteries. This interface connects the charge adapter to the control module, allowing for the required CAN communication between the battery and the charger.

**NOTE: For any unused connector, the threaded cover must be fastened in place to prevent the ingress of foreign material.**

# PIN CONFIGURATION

## Pin Configuration



Plug configuration for charge plug

# OPERATOR INTERFACES

## Operator Interfaces

An operator interface is required to be installed into the truck cabin for ease of use and to ensure the operator is alerted to any visual or audible alerts such as low State of Charge (SoC).

This requirement of an in-truck interface can only be eliminated if full industrial truck OEM integration options are utilized, allowing the truck's existing operator interfaces to be utilized. Truck OEM integrations require prequalification and approval from both EnerSys® and the truck manufacturer.

All operator interfaces are equipped with a push button that can activate and deactivate the battery.

During operation as the SoC decreases, the operator interfaces will begin to emit an audible beeping alarm and provide visual warnings when the battery reaches the warning level SoC. After the battery drops below the alert level, the alarm will

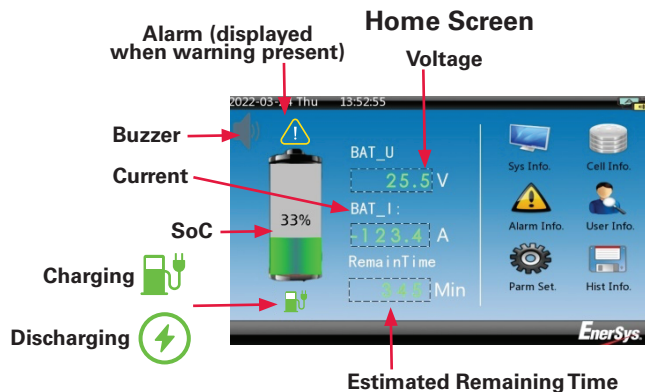
increase in speed. Continuing to run the battery without charging will ultimately result in the battery deactivating due to low SoC.

**Display Interface:** Multi-language display supporting Chinese, English, Portuguese, Spanish, and French, showing the real-time battery status (voltage, SoC, current, estimated remaining time, etc.), system information, unit information, fault information, user information, history information, and parameter settings.

**CAN Bus Connectivity:** The Elitra™ iON battery can be integrated into an OEM industrial truck CAN bus system, which allows full integration of the battery.

Please contact your local EnerSys® Representative for this option.

This option requires engineering consultation between EnerSys® and the industrial truck OEM.



**System Information**

MaxCellVolt(V)	12.345	MaxTemp(°C)	32
MinCellPos	123	MaxTempPos	4
MinCellVolt(V)	12.345	MinTemp(°C)	32
MinCellPos	123	MinTempPos	4
MaxVoltDiff(V)	12.345	MaxTempDiff(°C)	1

**Cell Information**

Cell Volt (V)	001	002	003	004
005	006	007	008	009
010	011	012	013	014
015	016	Cell Temp (°C)	001	002
003	004	005	006	007

**Fault Message (PW: 8888)**

ChgPackOV	ChgUT	DsgPackOV	DsgUT
ChgPackUV	ChgDiffOT	DsgPackUV	DsgDiffOT
ChgCellOV	ChgOC	DsgCellOV	DsgOC
ChgCellUV	SocLow	DsgCellUV	Adhsion
ChgDiffOV	InsuLow	DsgDiffOV	SelfCheckErr
ChgOT		DsgOT	

# SAFETY

## Operator Interfaces (cont.)

User Information (PW: 8888)

ChgTimeSum :	890	h
ChgEnergySum :	890	KWh
ChgCapSum :	890	Ah
ChgTime :	890	h
ChgEnergy :	890	Wh

Setting (High-level PW)

ChgVoltSet : 123.4 V ForcePwrDn :

ChgCurrSet : 123.4 A

ForceChg : OFF

ForceChgTime : 1234 Min

Memo (PW: 8888)

LineNum	TrigDay	TrigTime	RelaDay	RelaTime	Content
1	22/10/09	10:43:09	22/10/09	10:43:09	##



### Buzzer

SoC≤15%, ON 1s/OFF 2s  
SoC≤5%, ON 100ms/OFF 100ms

### Buzzer Turn Off Conditions:

1. Connect charger.
2. Click the symbol to turn off.

## Safety

### Important Safety Instructions

- Read all safety and operation instructions before operating this battery.
- Anybody involved in unpacking, handling, operating, or maintenance of this battery must receive appropriate training and use appropriately rated tools and personal protective equipment.
- Follow all regulatory requirements for handling electrical systems. The voltage of an electrical system may impact what regulations are applicable. To determine the maximum voltage for this battery, see Appendix A: Ratings Table.
- Do not over-discharge or overcharge lithium-ion batteries as this poses a substantial risk of damaging the battery.
- Only store and operate the battery within the limitations given in the sections on operational data and limits, and environmental limits.
- Keep the battery away from heat sources.
- Keep the battery away from ignition sources.
- Do not operate the battery in hazardous environments.
- Store only in monitored areas with suitable fire control and protection per local requirements, including local fire regulations.
- Operate only in monitored areas with suitable fire control and protection per local requirements, including local fire regulations.
- Do not customize the battery hardware or software as supplied by EnerSys®.
- Only operate with EnerSys®-approved interface devices.
- Service of the battery must only be performed by EnerSys®-approved technicians.
- Dismantling the battery is not authorized except by qualified EnerSys® personnel due to the numerous hazards involved with dismantling a lithium-ion battery.
- In the case of any error that cannot be reset, do not attempt to continue the operation of the battery until support and direction is provided by EnerSys®.
- Do not leave the truck idle in temperatures below the battery operating temperature as this may result in the truck becoming non-operational. If the battery's internal temperature is below the operating range, it will not provide power to operate the truck.
- Do not attempt to operate this battery in temperatures above the operating range.
- Do not expose the battery to extended periods of direct sunlight that allow the temperature of the battery to rise above the storage or operating temperatures of the battery.
- Only handle and store the battery in a dry environment.
- Do not operate the battery outdoors without suitable weatherproof protection.
- Do not immerse the battery in water.
- Do not install the battery on the underbody of an electrical industrial truck.
- Do not operate (activated or deactivated), service or store battery in condensing environments.
- Do not clean the battery with pressurized water.



## Safety (cont.)

### Interoperation with Truck and Battery Charger

- The instructions in this service manual do not replace or supersede the instructions for the truck and battery charger.
- The operation limits given in this service manual do not replace or supersede the permissible operation parameters of the industrial truck or battery charger.
- Installation of this battery impacts both the electrical and mechanical safety of the truck. Consult with the industrial truck OEM to ensure this battery is compatible with the truck and complies with the OEM requirements.
- Only charge this battery with EnerSys®-approved chargers for Elitra™ iON batteries.
- The battery must be installed in a truck with appropriately sized cables.

### Risks Posed During Normal Operation

- This battery is designed to be stable and tolerant to the applications within the scope laid out in the operating conditions; however, battery systems are inherently hazardous.
- Do not short the battery terminals. A shorting event with a high current may occur because of the low internal resistance of the lithium-ion battery. A resulting electric arc fault may emit an intense hot flash of infrared, visible, and ultraviolet light. Molten and vaporized metal may be ejected. Toxic fumes may be released. Components may become extremely hot.
- The weight and size of the battery make it cumbersome to handle.
- Always properly restrain the battery. Failure to restrain the battery may result in the battery shifting or dropping. Additionally, this may result in the battery crushing, pinching, or impacting personnel or nearby equipment.

### Damaged Batteries

- Exposure of the battery to conditions outside of its operational and environmental limits poses a substantial risk of damage to the battery. Do not assume that damage to the battery will be apparent.
- If the battery experiences conditions outside of the allowable limits as stated in this document, cease and do not resume operation, and contact your EnerSys® Service Representative.
- If the mechanical integrity of the battery is compromised (e.g., penetration of the case, rupture of case, etc.) cease and do not resume operation of the battery and contact your EnerSys® Service Representative.
- Stop the operation of the battery if there is a crush, pinch, cut or other damage to the power cables or power connectors.
- Damaged lithium-ion batteries may spontaneously catch fire. If this occurs the battery may release jets of hot, flammable, corrosive, and toxic liquids/gases, smoke containing components such as hydrofluoric acid and carbon monoxide.
- In case of battery fire, evacuate all personnel from the area and follow the guidance in the Fire Event Guidance section of this manual.
- If any material from a damaged battery, such as liquid electrolyte, comes into contact with a person's skin or eyes, rinse the affected areas with clean water for at least 15 minutes. Then immediately obtain medical attention.
- If any material from a damaged battery, such as liquid electrolyte, comes into contact with the mouth or is swallowed, rinse out the mouth and the area around the mouth. Then immediately obtain medical attention.
- If gases or vapors produced by a damaged battery are inhaled, move the victim to fresh air. Immediately obtain medical attention.
- Contact with heated gases or components of a damaged battery may cause serious thermal burns. Treat any thermal burns, then immediately obtain medical attention.

Additional information can be found in the Safety Data Sheet for the Lithium-ion Battery (Module) SDS:829515.

# GUIDANCE & LIMITS

## Fire Event Guidance

In the unlikely event of a thermal runaway, which may result in a visible release of gas and/or intensive smoke buildup from the battery, **evacuate the location immediately and contact Emergency Response. Do not attempt to personally address the fire event or approach the product.** If there is an irritation of the respiratory tract, seek immediate medical attention.

Firefighting operations must be performed based on guidance provided in the Lithium-ion Battery (Module) SDS:829515 by trained firefighters with full **personal protective equipment** and self-contained breathing apparatus. Ensure that emergency responders are informed that the battery has lithium-ion chemistry. Any indication of a thermal runaway (gas, heat,

vapors, or smoke) requires fire suppression methods to be applied. The absence of flame is not sufficient to consider the thermal runaway event stopped or extinguished.

Large amounts of spray water can be used effectively to cool the battery and contain a lithium-ion battery thermal runaway.

In the case of the battery outgassing or after the suppression of the fire, store the battery in a safe place outside for a minimum of 24 hours. It is recommended to monitor the temperature frequently to detect any potential new heat generation. In the instance that a thermal runaway reoccurs, follow the same firefighting methods as described above.

## Operational Data and Limits

- Nominal capacity (C1): see Appendix A: Ratings Table.
- Nominal voltage: see Appendix A: Ratings Table.
- Discharge current (continuous): 1xC1, up to a max of 320 A (limited by traction cable harness).
- Max charge current (continuous): up to 1xC1, max 300 A (limited by charger max. output current).
- The permissible truck operation battery temperature range is 14°F (-10°C) to 122°F (+50°C).
- The permissible charge operation battery temperature range is 32°F (0°C) to 122°F (+50°C).
- The BMS safely manages current limits based on temperature.

## Environmental Operation Limits

- The permissible battery storage temperature range is -4°F (-20°C) to 131°F (+55°C).
- The permissible truck operation battery temperature range is 14°F (-10°C) to 122°F (+50°C).
- The permissible charge operation battery temperature range is 32°F (0°C) to 122°F (+50°C).
- The permissible relative humidity range is 0-95% non-condensing.
- EnerSys® Engineering must verify and approve in writing operation of this battery in cold storage applications.

# HANDLING & INSTALLATION

## Handling

### General Handling Considerations

- Unpacking and handling the battery is only allowed by trained personnel that are familiar with the potential risks of lithium-ion batteries and hazardous voltages (voltages greater than 60 volts DC) as applicable for industrial trucks and for lifting heavy loads.
- Avoid sudden accelerations, decelerations, drops, and other mechanical abuse conditions while handling the battery.
- Handling must only be performed after the battery is disconnected from all electrical loads and charge sources and verified in an OFF state. This can be done using one of the operator interfaces by verifying that the screen and lights are all OFF when connected to the battery. Voltage across the traction connector may also be checked to ensure contactors are open.
- Prior to lifting, secure all connectors and cables so that they will not be crushed, pinched, or otherwise damaged during the lift. User interfaces may be removed prior to handling.
- Appropriate PPE must be worn during all lifts.
- Appropriate lifting methods and tools that can safely lift and control the load must be checked prior to all lifts. Tools must be properly rated for weight.
- Attach lifting tools to the outer tray lifting points.
- The battery must only be lifted vertically. Do not allow the battery to swing during lifting.
- The operational and safety instructions of the lifting gear manual must be respected.
- If the battery is being handled while installed on a truck, for instance during the battery installation or removal operation, the truck must be secured to prevent movement.

### NOTES:

- For transportation and storage safety reasons, all Elitra™ iON batteries are shipped at a partial SoC. Before the first operation (refer to page 15: Operation) or further storing the battery (refer to page 19: Storage) it is required to check the SoC (refer to page 10: Operator Interfaces) and recharge the battery if needed (refer to page 16: Battery Charging).

## Installation into Industrial Truck

### Mechanical Installation

- This battery is designed to be a drop-in replacement of a lead-acid battery intended to power an electric industrial truck. Modifications of truck firmware, truck settings, or truck hardware may be necessary to accommodate the lithium-ion battery. Consult with the industrial truck OEM for required modifications. Depending on the intended application, connectors, ballast, tray size, etc., must be customized to ensure the drop-in compatibility.
- Upon receipt of the battery, it must be checked for any obvious signs of damage to both battery and all cables, plugs, and accessories.
- Before installation, check that the battery is supplied with the appropriate cable harness to connect the battery to the industrial truck.
- Ensure that the battery weight and center of gravity requirements per the truck manufacturer are followed. Weight and overall dimensions are listed on the type label located on the battery pack.
- The battery must be handled in a way to mitigate the risk of drop events and crashes. The correct tools, lifting points, and method should be used.

# INSTALLATION & OPERATION

## Installation into Industrial Truck (cont.)

- After placement of the battery into the truck's battery compartment, the technician must ensure that the battery is mechanically fixed in the truck against the movement as specified by the industrial truck manufacturer. After the battery is fixed in the truck's battery compartment, all cabling must be checked once again in order to ensure that no cables, wires, or plugs have been crushed, pinched, or cut.
- Only use EnerSys®-approved fasteners, connectors, cabling, and plugs with this battery.
- The cable dimensioning and DC connecting plug will vary depending on the truck and end-user requirements. The truck harness shall comply with relevant requirements for current carrying capability, voltage, and truck interface requirements. Compliance shall be confirmed by the truck OEM.

### Electrical Installation

- The model number for this battery begins with a 24 or 48 for batteries intended to replace 24 V or 48 V nominal lead-acid batteries respectively.
- The battery must be connected with the appropriate cables and connector to the industrial truck per the truck manufacturer's recommendation.

**NOTE:** Defective cables and connectors can result in functional issues and/or severe safety hazards such as short circuits and/or fire. Cables and connectors must be regularly inspected for any damage or issues. Cables and connectors should only be repaired or replaced by an authorized EnerSys® representative using the correct factory replacement parts. No substitution is allowed.

## Operation

Anybody using this battery must be trained on the aspects of the battery they are responsible for as required by local laws and regulations.

The battery must be handled, operated, stored, maintained, and serviced in accordance with the instructions in this service manual. Failure to follow the instructions in this service manual can result in serious damage to the battery and may result in serious injury. Failure to follow the instructions in this service manual or using parts that are non-original will void the battery warranty.

Opportunity charging is highly recommended to maximize the daily run time capability of the battery. It will also optimize the service life of the battery by decreasing the discharge window of the battery.

The capability of the battery to power the truck decreases at a low State of Charge (SoC). If the truck is operated at a low SoC, this may result in the battery shutting down with or without a 10-second warning. If this occurs, slowly drive the

truck to a matching charger after reactivating the battery.

At very low SoC there is a risk of the battery locking out to prevent permanently damaging the cells.

In contrast to lead-acid batteries, it is beneficial to operate this battery at a partial state of charge.

The battery temperature influences the capacity of the battery. For example, the run time may be reduced at lower temperatures.

Battery temperatures at the extreme ends of the temperature limits as stated in this service manual will influence performance, possibly resulting in an unexpected shutdown.

Respect all visual and audible warnings from the user interface devices.

This battery is designed to be charged indoors in the truck.



# BATTERY

## Activation/Deactivation of Battery

The battery will deactivate automatically when a no-load condition is detected for a default setting of 120 minutes to ensure that an unused battery is not deeply discharged.

### Activation:

Activate the battery for truck operation using the push button on any user interface. Provided the pack is not connected to a charger and there are no battery errors, the battery will automatically switch to the traction state, applying power to the truck. The battery is activated when it is plugged into the charger. This allows battery activation and charging even without previous activation of the battery by other measures above.

### Deactivation:

The battery will deactivate after a default of 120 minutes when there is less than a default of 3 A current draw.

To manually deactivate the battery, press the push button on any user interface for 3 to 5 seconds.

The industrial truck should be shut down prior to deactivating the battery.

**⚠ WARNING** If the battery is locked out due to over-discharge while using (refer to page 15: Operation) or missed charges during storage (refer to page 19: Storage) pressing the push button will re-power on the battery but with limited discharge current for safety purpose. This will discharge the battery even further and may damage the battery irreversibly. Always recharge the battery as soon as possible after reaching low SoC.

## Battery Charging

Please plug in the battery to begin charging when the battery buzzer starts beeping, indicating the State of Charge (SoC) of the battery is low.

For industrial trucks driven by an operator, never charge the battery via the traction connector. For charging, the charging plug must be connected to the EnerSys®-approved charger. Unlike in lead-acid batteries, while the battery is installed in the truck, the traction connector of the battery should remain connected to the truck. Upon plugging in the charge plug, power to the industrial truck is disabled so the truck cannot be operated inadvertently.

This battery must only be charged by EnerSys®-approved chargers for lithium-ion, which are specially designed to allow CAN communication with the battery to control the battery recharge. This ensures a safe and optimal operation of the system. All operating instructions found in the service manual of the charger must be followed. Charging occurs using an ungrounded separated charging circuit.

### NOTES:

- Never attempt to charge using the connector from the battery to the truck.
- Elitra™ iON Li-ion batteries will be shipped at or below 30% State of Charge (SoC) to comply with EnerSys® policy on the handling of lithium-ion systems during transport.

The battery system is equipped with driveaway protection that will disconnect the traction power, disabling the truck if any battery charging plug is connected to a charger. This mitigates the risk of an operator accidentally driving away when the charger is still connected.

Charge the battery only in an appropriate environment. Additionally, follow all environmental requirements from the charger.

### NOTES:

- The CAN-enabled charge connector from the battery must be plugged into the matching CAN-enabled charge connector from the charger. Otherwise, the charging will not start as there will be no CAN communication between the battery and the charger.
- While installed in the industrial truck, the battery should not be disconnected from the industrial truck to charge, nor is it required to open the lids and covers on the battery compartment.

# BATTERY & SERVICE

## Battery Charging (cont.)

- **Charging Sequence**
- Ensure that the battery and charger cables have no damage prior to connecting.
- Ensure that connectors are free of contamination prior to connecting.
- Connect the charger to the battery charging cable.
- Once a charging cable is connected, the traction contactor will open, removing power from the truck for driveaway protection.
- If the battery is OFF, the charger will automatically wake the battery and begin to charge.
- Charging will begin after the CAN communication has started between the battery and the charger, which occurs when the charging cable with CAN is connected. The optimal charge current will automatically be determined based on the battery conditions (SoC, temperature, etc.) and charger conditions (temperature, charger size). The charge level will dynamically change during the charging process, ensuring fast charging and ensuring an optimal lifetime of the product. If the battery detects a fault condition, the charging will stop.
- If required to stop charging prior to completing the charge, such as during opportunity charging, press the ON/OFF button on the charger prior to disconnecting. The battery must not be disconnected while still being charged by the charger.
- After a full charge cycle is complete, the charger screen will indicate that charging is complete. At this point it is no longer supplying current to the battery, and the charge plug should be disconnected from the battery. After completely disconnecting the charge plug, the battery will then automatically open the charge path and close the traction path, which will supply power to the truck.

## Service and Maintenance

The battery has been designed to be virtually maintenance-free. However, external cabling, connectors, etc. (including operator interfaces) must be regularly examined to ensure there is no damage to such parts and to fulfill local regulations. If any of these parts are damaged or show signs of serious wear, they need to be replaced. Please contact your EnerSys® Service Representative for all repairs and replacements. All repairs must be done by an EnerSys® technician trained on lithium-ion products.

All power cables must be checked every time the battery has been exposed to any type of stress, whether it be overvoltage, overcurrent, or mechanical stresses such as crushing.

### Cleaning Instructions

- The exterior of the battery can be cleaned using warm water and an antistatic cloth.
- Ensure the battery is deactivated before cleaning.
- Do not clean the battery with pressurized water.

## Troubleshooting

### Battery does not provide power to the truck.

- Ensure the battery is turned ON using an operator interface.
- Deactivate and reactivate the battery.
- Ensure the battery is not connected to the charger. Power to the truck is turned OFF during charging to prevent driving away while still connected to the charger.
- Confirm there are no active errors listed on the user interface. In case of errors, review error ID checklist (in the next column).
- Inspect power cables to the truck to ensure they are not damaged.
- If the battery has OEM integration, check the communication cables between the truck and the battery.
- Contact your EnerSys® Service Representative for further troubleshooting steps.

### Battery will not charge.

- Ensure the charger is powered and the charger does not display any errors. In case of an error on the charger, follow the instructions in the charger service manual.
- Deactivate and reactivate the battery.
- Ensure charging cables are properly connected to an EnerSys® lithium-ion enabled charger.
- Ensure the charge communication cable is connected to the charge communication port.
- Confirm there are no active errors displayed on the battery user interface. In case of errors, review error ID checklist (in the next column).

- Check connectors, auxiliary pins, and CAN cables for damage.
- Contact your EnerSys® Service Representative for further troubleshooting steps.

### Error ID checklist and recommended actions

#### Premium display

Warning	Solution
Cell Overvoltage	Stop use, disconnect plugs
Cell Undervoltage	Stop discharge, charge the battery
Battery Overvoltage	Stop use, disconnect plugs
Battery Undervoltage	Stop discharge, charge the battery
Large Voltage Differentials	Stop use, consult EnerSys
Discharge Overcurrent	Stop use, consult EnerSys
Charge Overcurrent	Stop use, consult EnerSys
Cell High Temperature	Stop use, cool the battery
Cell Low Temperature	Stop use, move the battery to room temp
Excessive Temperature Differentials	Stop use, consult EnerSys
Low SoC	Charge the battery immediately

#### Basic BDI

Code	Warning	Solution
01AL	Cell Overvoltage	Stop use, disconnect plugs
02AL	Cell Undervoltage	Stop discharge, charge the battery
03AL	Battery Overvoltage	Stop use, disconnect plugs
04AL	Battery Undervoltage	Stop discharge, charge the battery
05AL	Large Voltage Differentials	Stop use, consult EnerSys
06AL	Discharge Overcurrent	Stop use, consult EnerSys
07AL	Charge Overcurrent	Stop use, consult EnerSys
08AL	Cell High Temperature	Stop use, cool the battery
09AL	Cell Low Temperature	Stop use, move the battery to room temp
10AL	Excessive Temperature Differentials	Stop use, consult EnerSys
11AL	Low SoC	Charge the battery immediately

In case any other error ID shows up, please contact your EnerSys® Service Representative for further troubleshooting direction.

# STORAGE & LABELS

## Storage

During storage, it is recommended to turn the pack **ON** at least every six months to confirm SoC has not dropped below 30% SoC. Recharge to greater than 30% SoC if the SoC has dropped below 30% SoC.

The battery must be stored in a dry environment away from fire, sparks, and heat.

The allowable storage temperatures are -4°F (-20°C) to 131°F (55°C). To ensure battery health and maximize service life, the maximum temperature of the long-term storage location should be less than 95°F (35°C).

The storage area must be compliant with local regulations (including fire, safety, and building regulations) for lithium-ion batteries.

The battery must only be stored in an upright position (i.e., installed in the vehicle) with all service lids properly attached.

During storage, it is not necessary to disconnect the power connection between the industrial truck and battery; however, it is highly recommended to disconnect the truck and battery communication connector, as there may be trickle discharge.

If the battery is removed from the industrial truck for storage and one or more of the harnesses is removed from the battery, the battery terminals must be covered with insulation that can only be removed by the use of a tool, or the battery must be stored in a properly labeled, suitable container that can only be opened by use of a tool or key.

For storage of longer than one month, precautions must be taken to ensure the battery is not deeply discharged. The pack must be stored at greater than 30% SoC. In addition, processes and recharge methodology must be in place to ensure that the battery does not discharge to 5% SoC in storage.



## Description of Battery Labels

The label type, located on the side of the inner pack, displays important information about the battery, including:



- Manufacturer Name & Logo
- Part & Serial Number
- Nominal Voltage
- Nominal Capacity
- Nominal Mass

 Li-Ion	<b>锂离子动力电池系统</b> <b>BATERIA LITIO</b>	 Li-Ion	
系统型号 Modelo	HAW-48-26.1	图号 Plano Nro.	CA0211945
额定电压 Tensão Nominal	51.1V	净重 Peso Neto	856 Kg
额定容量 Capacidade	510 Ah	生产日期 Fecha de fabricación	2022.10.17
能量 Potência	26061 Wh	序列号 Nro de Serie	POxxxxx
产品编号 Producto Nro.	980048080400-0402-E		
生产商: 工厂地址:	艾诺斯(扬州)华达电源系统有限公司 EnerSys(Yangzhou) Huada Battery Co., Ltd. 江苏省扬州市高邮经济开发区汤南路8号		

ID Plate – CN/Spanish

 Li-Ion	<b>锂离子动力电池系统</b> <b>Li-ion Battery System</b>	 Li-Ion	
系统型号 Model	HAW-48-26.1	图号 Drawing No.	61225Li
额定电压 Rated Voltage	51.1V	净重 Net Weight	856 Kg
额定容量 Rated Capacity	510 Ah	生产日期 Production Date	2022.10.17
能量 Power	26061 Wh	序列号 Series No.	POxxxxx
产品编号 Product No.	86625006041-0500		
生产商: 工厂地址:	艾诺斯(扬州)华达电源系统有限公司 EnerSys(Yangzhou) Huada Battery Co., Ltd. 江苏省扬州市高邮经济开发区汤南路8号		

ID Plate – CN/EN

 Li-Ion	<b>锂离子动力电池系统</b> <b>Sistema de Bateria de Litio NMC</b>	 Li-Ion	
系统型号 Modelo	HAW-48-26.1	图号 Nº do Desenho	CA0211945
额定电压 Tensão Nominal	51.1V	净重 Peso	856 Kg
额定容量 Capacidade Nominal	510 Ah	生产日期 Data de Fabricação	2022.10.17
能量 Potência	26061 Wh	序列号 Nº de Série	POxxxxx
产品编号 Nº do Produto	980048080400-0402-E		
生产商: 工厂地址:	艾诺斯(扬州)华达电源系统有限公司 EnerSys(Yangzhou) Huada Battery Co., Ltd. 江苏省扬州市高邮经济开发区汤南路8号		

ID Plate – CN/Portuguese



# LABELS

## Description of Battery Labels (cont.)



This symbol is used to show that this battery must be recycled and contains lithium-ion.



This symbol indicates that this battery contains lithium-ion and must not be disposed of as unsorted municipal waste.



This symbol indicates that the user must refer to the instruction manual/booklet before use.



This symbol is used to indicate warning statements.



This symbol indicates the risk of electrical shock.



This symbol indicates the risk of fire.



This symbol indicates the risk of explosion.



This symbol indicates to not expose this battery to naked flames.



This symbol indicates to not place this battery in a high-temperature environment, such as long-term sunlight exposure, etc.



This symbol indicates to not step on the battery.



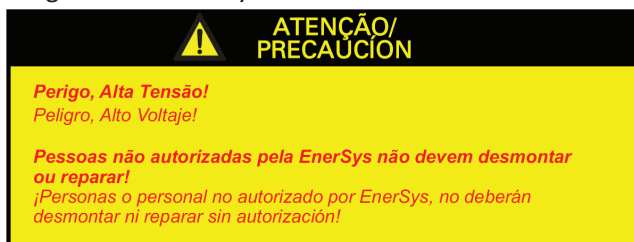
Warning Label Big – CN/EN



Warning Label Big – PT-BR / Spanish

### Warning Label

The warning label, located on the side of the battery, contains warnings critical for the safe usage of the battery.



Warning Label Small – PT-BR/Spanish



Warning Label Small – CN/EN

# SHIPPING & DISPOSAL

## Shipping Lithium-ion Batteries

**All persons involved in shipping batteries must comply with all applicable regulations.**

**All persons involved in shipping batteries must be trained as required by local regulations to ship hazardous goods.**

**Unpacking and packing of batteries shall only be performed by electrically trained personnel.**

Because of their inherent stored energy and flammability, lithium-ion batteries are considered “Dangerous Goods” and must be transported in accordance with all regulations. The classification for the battery is Class 9, according to UN “Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria”, Chapter 38.3 (known as UN 38.3). Air shipment requires competent authority approval according to the local jurisdiction’s department of transportation.

This battery complies with UN 38.3. Test summaries are available upon request.

Damaged batteries must be transported based on all applicable regulations for damaged lithium-ion batteries. These requirements are in addition to the standard UN 38.3 criteria. Contact your EnerSys® Service Representative for assessment and support in transporting damaged batteries.

For further transport and regulatory information (USA and EU; classifications and labeling) refer to Lithium-ion Battery (Module) SDS:829515 instructions or regulations by the International Civil Aviation Organization (ICAO), International Air Transport Association (IATA), International Maritime Dangerous Goods (IMDG), Convention concerning the Carriage of Goods by Rail (CIM), and Annex A: International Regulations concerning the Carriage of Dangerous Goods by Rail (RID) codes. Other laws and regulatory requirements may apply.

## Disposal and Recycling

Dispose of the battery in accordance with all local regulations relating to disposal of lithium batteries. Failure to do so may result in serious harm.

Do not dismantle, incinerate, or crush battery systems.

Dismantling the battery is not authorized except by qualified EnerSys® personnel due to the numerous hazards involved with dismantling a lithium-ion battery.

In case of irreparable failure, the battery must be taken out of operation and your EnerSys® Service Representative contacted.

Due to the risks posed by damaged lithium-ion batteries, damaged lithium-ion batteries require specialized handling and recycling. Do not dispose of this battery as unsorted municipal waste.

EnerSys®, in line with local regulations, will accept Elitra™ iON products at specific facilities for disposal. Contact your local EnerSys® Service Representative for specific recycling instructions for your region.

# APPENDIX

## Appendix A: Ratings Table

Model Number	Voltage	Nominal Voltage (V)	Total Ah Capacity (Ah)	Module (kWh)	Configured (kWh)	Number of Modules
HAW-24-2.6	24	25.55	102	2.6	2.6	1
HAW-24-5.2	24	25.55	204	2.6	5.2	2
HAW-24-7.8	24	25.55	306	2.6	7.8	3
HAW-24-10.4	24	25.55	408	2.6	10.4	4
HAW-24-13	24	25.55	510	2.6	13.0	5
HAW-24-15.6	24	25.55	612	2.6	15.6	6
HAW-48-5.2	48	51.1	102	2.6	5.2	2
HAW-48-7.8	48	51.1	153	2.6	7.8	3
HAW-48-10.4	48	51.1	204	2.6	10.4	4
HAW-48-13	48	51.1	255	2.6	13.0	5
HAW-48-15.6	48	51.1	306	2.6	15.6	6
HAW-48-18.2	48	51.1	357	2.6	18.2	7
HAW-48-20.8	48	51.1	408	2.6	20.8	8
HAW-48-23.5	48	51.1	459	2.6	23.5	9
HAW-48-26.1	48	51.1	510	2.6	26.1	10
HAW-48-28.7	48	51.1	561	2.6	28.7	11
HAW-48-31.3	48	51.1	612	2.6	31.3	12
HAW-48-33.9	48	51.1	663	2.6	33.9	13
HAW-48-36.5	48	51.1	714	2.6	36.5	14
HAW-48-39.1	48	51.1	765	2.6	39.1	15
HAW-48-41.7	48	51.1	816	2.6	41.7	16

Parameter	Value	Unit/Description
Impulse Withstand	500	V
Peak Withstand Current (I <sub>pk</sub> )	2000	A
Short-time Withstand Current (I <sub>cw</sub> )	1600	A @ 1s
I <sub>cc</sub>	100	kA
Relative Humidity	0-95	% Non-Condensing
Type of Construction	Removable	
Form of Internal Separation	Form 1	No Internal Separation
Types of Electrical Connections	DDD	All Disconnectable
EMC Classification	Environment A	Industrial
Macro-environment	Pollution Degree 3	
Designed IP Rating	IP54	

# TERMS & ABBREVIATIONS

## Terms and Abbreviations

Term/Abbreviation	Explanation/Description
<b>BDI</b>	Battery Data Indicator
<b>BMS</b>	Battery Management System
<b>C<sub>1</sub></b>	Capacity at one-hour rate of discharge or charge
<b>DC</b>	Direct Current
<b>HV</b>	High Voltage (DC > 60 V)
<b>IP Rating</b>	Classifies the degree of protection provided by an enclosure for electrical equipment.
<b>LV</b>	Low Voltage (may also refer to communication)
<b>OEM</b>	Original Equipment Manufacturer
<b>PPE</b>	Personal Protective Equipment
<b>SDS</b>	Safety Data Sheet
<b>SoC</b>	State of Charge
<b>SOH</b>	State of Health
<b>Activated</b>	In an ON state
<b>Deactivated</b>	In an OFF state
<b>Cable Harness</b>	DC cable and plug that connects to the industrial truck or battery charger.
<b>Operation</b>	Refers to charging or discharging the battery. Includes idling of the battery while activated.
<b>Storage</b>	Refers to the battery being stored.
<b>Handling</b>	Refers to activities such as lifting, moving, positioning the battery. Includes connecting and disconnecting the charge and power cables.
<b>Maintenance</b>	Cleaning the battery and inspection of the battery and connected components (charging cables and user interfaces) for damage.
<b>Service</b>	Operations performed by Enersys® representatives to restore the battery to full performance.



# NOTES

# NOTES

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