EVOLUTION

LITHIUM ION BATTERY

USER`S MANUAL

VERSION: 201901029

Table of Contents

Introduction

EVOLUTION lithium-ion battery is a type of Lithium iron phosphate battery (LiFePO4), it is a reliable power source that doesn't fade over time. Whether it's a new or five-year-old vehicle, EVOLUTION lithium ion battery vehicles will give you all the acceleration and hill-climbing power they could want.

EVOLUTION lithium-ion battery is controlled by an advanced Battery Management System that monitors efficiency, temperature, state of charge and the health of the batteries.

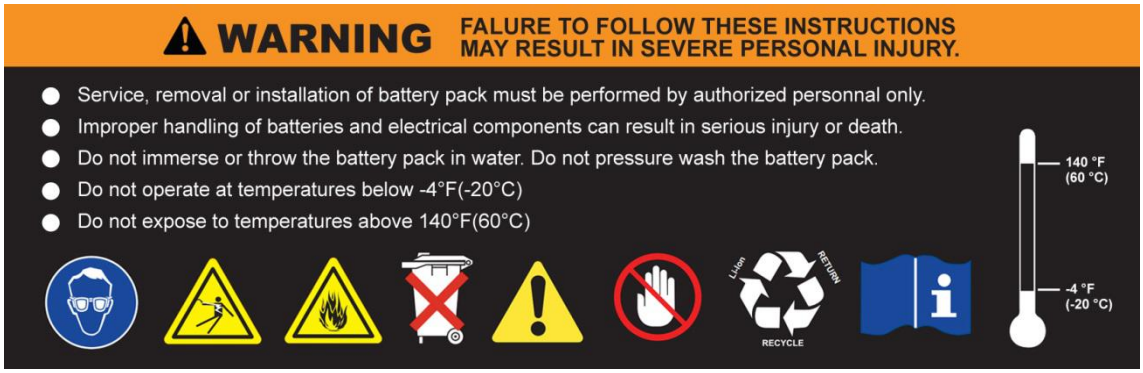
EVOLUTION lithium-ion battery pack is completely protected from the elements in a self-contained, aluminum alloy, water-tight case. These batteries have been used to safely and reliably power electric golf cars.

EVOLUTION lithium-ion battery is completely maintenance-free. Long gone are the days of watering and cleaning your batteries. No matter your plans, you can always expect consistent performance with EVOLUTION lithium-ion battery.

Battery Warning label

Safety and warning labels are on the battery cover for your protection. Read and comply with the instructions on the labels carefully. Do not tear off the warning labels from the battery pack.

Located on the battery pack cover



Safety Operation

Improper handling of batteries and electrical components can result in serious injury or death.

Do not remove the battery pack cover. Do not attempt to remove batteries or battery cables. Do not use the battery pack without the control module installed. All battery and electrical service must be performed by an authorized service facility and personnel.

All tools used in or around the battery pack area should be insulated. Do not intentionally cause a short to the power terminal (B+, B-) with a metallic object.

Do not cut, tear or remove the seal tape. Do not disassemble or modify the design, including the electrical circuit, of the battery pack or control module.

To prevent the risk of battery explosion, keep all flammable materials, open flames or sparks away from the batteries. Do not leave the battery pack near a fire or heat source. Do not throw Lithium-Ion batteries into a fire. Do not apply heat to any part of the battery pack or battery management module with a soldering iron. Do not place the battery pack in a microwave oven, dryer or high-pressure container.

Do not attempt to operate the vehicle or charge the battery pack at temperatures above 140°F (60°C).

Do not immerse or throw the battery pack in water. Do not pressure wash the battery pack.

Do not puncture the battery pack or control module. Do not strike the battery pack with a hammer or heavy weight. Do not step or stand on the battery pack. Do not throw or drop the battery pack on hard surfaces.

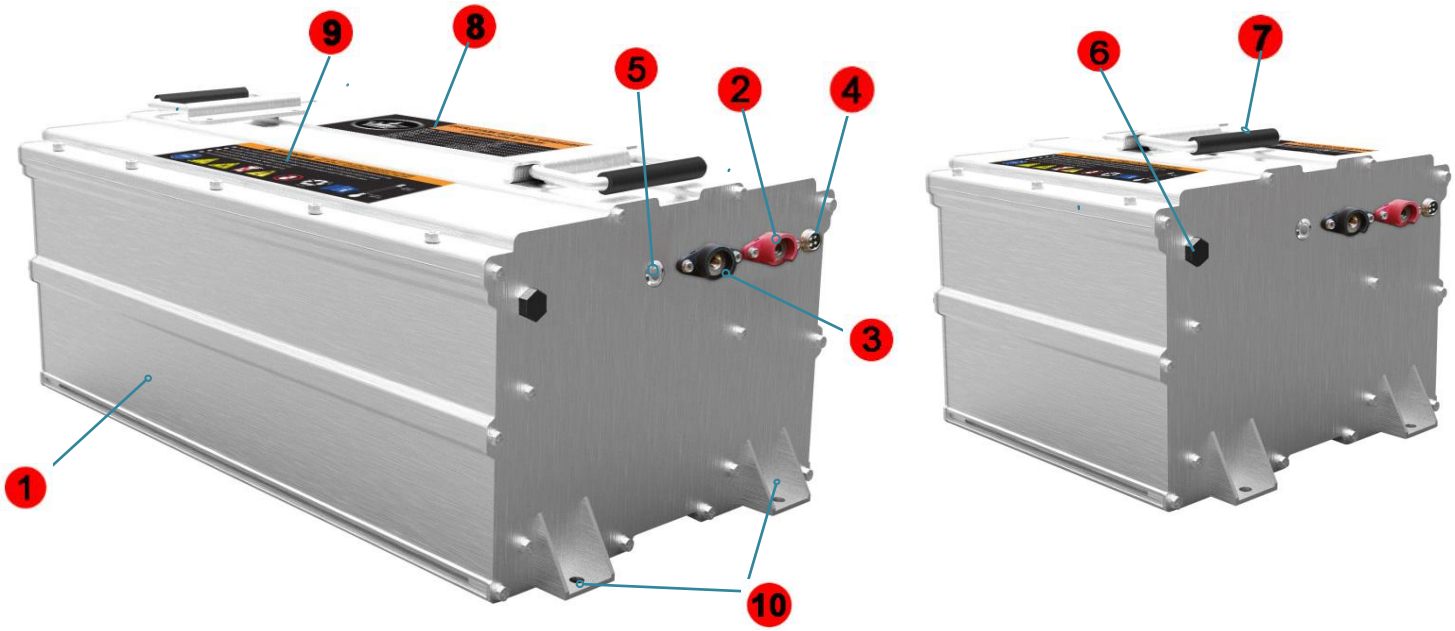
If the battery pack terminals are contaminated or dirty, clean them with a dry cloth before using the battery pack.

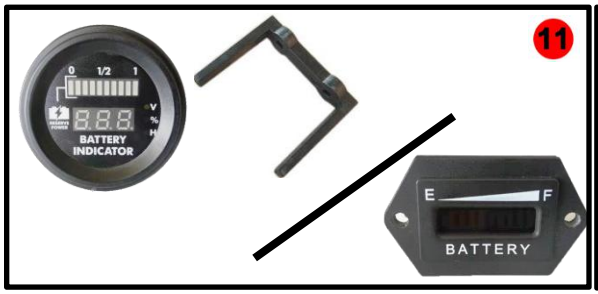
Keep the battery pack and control module away from static electricity.

Battery Specification

Model		EV48-60	EV48-110	EV48-130	EV48-165
General Parameters	Dimension (L x W x H) inch	12 " x 13 " x 9 "	23 " x 13 " x 9 "	23 " x 13 " x 9 "	31 " x 13 " x 9 "
	Casing material	Aluminum alloy	Aluminum alloy	Aluminum alloy	Aluminum alloy
Technical Parameters	Nominal voltage	48V	48V	48V	48V
	Nominal capacity	65AH	110AH	130AH	165AH
	Stored energy	3.12kwh	5.28kwh	6.24kwh	7.92kwh
	Life cycles	⩾3500 cycle times	⩾3500 cycle times	⩾3500 cycle times	⩾3500 cycle times
	Self-discharging rate	⩽5% per month	⩽5% per month	⩽5% per month	⩽5% per month
OEM Charger Parameters	Rated Power	700W	1200W	1200W	1200W
	Standard charge time	4Hr	4Hr	5Hr	5Hr
Environment Parameters	Charge temperature	32°F and 110°F (0°C and 45°C)	32°F and 110°F (0°C and 45°C)	32°F and 110°F (0°C and 45°C)	32°F and 110°F (0°C and 45°C)
	Discharge temperature	-4°F and 140°F (-20°C and 60°C)	-4°F and 140°F (-20°C and 60°C)	-4°F and 140°F (-20°C and 60°C)	-4°F and 140°F (-20°C and 60°C)
	Storage temperature	14°F and 95°F (-10°C and 35°C)	14°F and 95°F (-10°C and 35°C)	14°F and 95°F (-10°C and 35°C)	14°F and 95°F (-10°C and 35°C)

Battery and Accessories Presentation



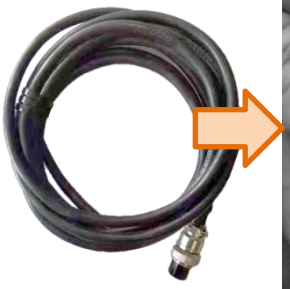


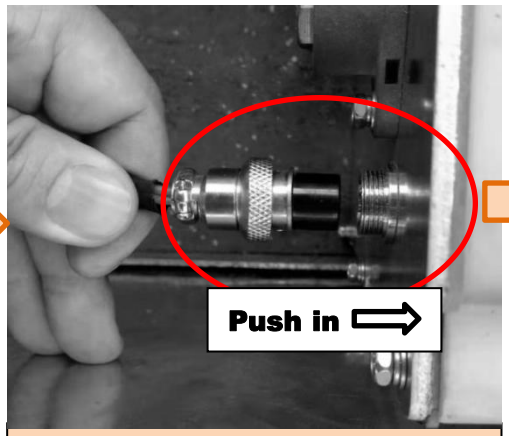
1. LiFePO4 Lithium-ion Batteries Pack with Aluminum Alloy Casing.
2. B+ : Battery Positive Terminal
3. B - : Battery Negative Terminal
4. RS485: Connector Port for Lithium Battery Power Indicator
5. SW: Inspection Light & Button for BMS
6. Vent Valve for Lithium-ion Battery Pack
7. Lifting Handles for Lithium-ion Battery
8. Nameplate for Lithium-ion Battery
9. Battery Warning Label
10. Installation Base Bracket
11. Lithium Battery Indicator （Two Options: Round or Diamond Shape）
12. Connecting Cable for Battery Power Indicator.

Battery Indicator

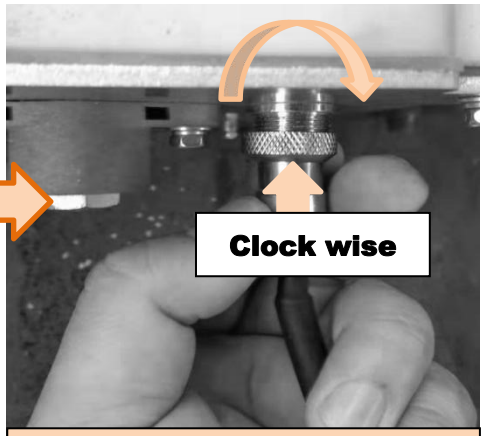
Evolution lithium battery provides two different shape optional battery indicators for customer, round shape and diamond shape. Also provide the connecting cable for the battery indicator.

➢ Connecting cables





Push the battery indictor male plug into the port as following direction.



Rotate clockwise the Lock cap to tighten the connector.

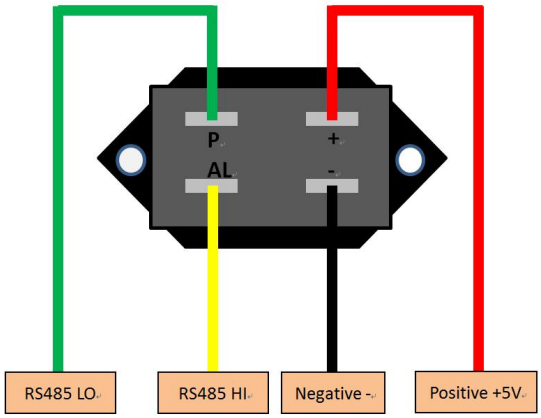
NOTE: While plugging this battery indicator, one should be noted that the grove of male plug must be fit to the boss of female connecting port, otherwise it cannot be pushed in.

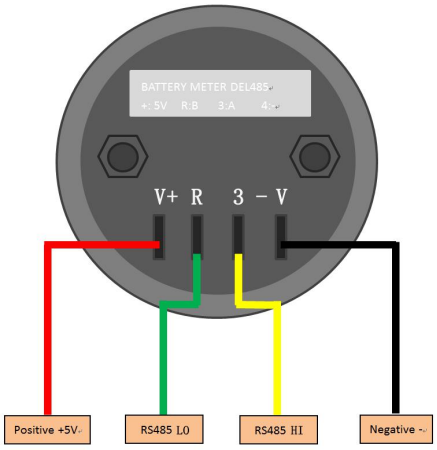
➢ Battery power indicator wiring diagram

Both two kinds of indicators both have four pins:

- Positive +5V—Red Cable
- Negative—Black Cable
- RS485 HI—Yellow Cable
- RS485 LO—Green Cable

Wiring diagram for battery indicator as following:

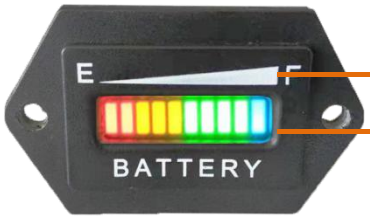




➢ Battery power indicator display introduction

Battery indicator shows the amount of usable power in the battery pack, it should be installed on the dash panel where the place is obvious to check for drivers. Below are displaying:

- Each of LED lights indicates 10% of battery power
- "0", "1/2", "1 ", which are above the LED`s mean empty of battery power, half of power, full power.
- Voltage display means the present voltage of lithium battery pack



- "F" indicates a full charge of battery pack. "E" indicates low charge.
- Each of LED lights indicates 10% of battery power

⚠ CAUTION

When the indicator reaches 0%, all the LED`s will turn off, the lithium battery pack will automatically cut off the main power output to the vehicles, and the vehicles will stop immediately..

We recommend that when the last two red LED`s flashing on the battery indicator, charge the lithium battery immediately, Do not wait until the battery is discharging completely.

Battery Installation

NOTE: It is highly recommended that the vehicle be testing driven before installation of the EVOLUTION lithium battery product to ensure that the vehicles existing systems operate as normal.

- **Step 1**: Remove the seat bottom. Remove the vehicles existing lead acid batteries or other type of batteries.
  Note: Recycle the original lead-acid batteries properly.
- **Step 2**: The battery tray should be thoroughly cleaned of any residual battery acid using a 50/50, mixture of baking soda and water to clean the tray with a soft bristle brush. The tray should be rinsed with water and dried thoroughly before proceeding.
- **Step 3**: Install the special customized base frame for lithium-ion battery (based on the vehicles brand or model) to the vehicle.
- **Step 4**: Two people should team lift the lithium battery into the vehicle. The lithium battery sits down vertically into the battery base frame which has been installed priority in step3. Lock the battery pack to the base frame.
- **Step 5**: Connect positive terminal and negative terminal of the lithium-ion battery to the vehicle original main electric system. Make sure the cables are right tightened.
- **Step 6**: Install the lithium-ion battery power indicator to the reasonable position on the dash panel and (we provide two optional indicators: round and diamond shape and cables).
  Connect the battery power indicator to port on the lithium battery pack.
- **Step 7**: Testing drive the vehicle and battery charging.

Battery Charging

Charging should be performed when ambient temperatures are between 32°F and 110°F (0°C and 45°C). The battery pack may be charged or topped off after every use.

⚠ CAUTION

- Turn the key to the OFF position and remove it.
- Inspect the charger cord for cracks, frayed wires or loose connections, if damaged replace it.
- Inspect the vehicle charger receptacle and charger plug for dirt, debris or damage. Clean if necessary and replace immediately if damage is found.
- Connect the charger to a wall receptacle. Do not use a multi-plug adapter or power strip. Do not connect anything else to the same receptacle.
- When the battery pack is finished charging, disconnect the charger cord from the vehicle. If disconnecting before the charge cycle is complete, it is recommended that the charger be disconnected from the wall receptacle first, then unplug the charger from the vehicle receptacle.

Storage

⚠WARNING Improper storage may damage, destroy or cause permanent loss of battery capacity. Do not exceed storage time or temperature limits. Batteries must be charged to the correct level before storage. Storing fully depleted batteries will make them permanently unusable.

Storage Preparation

The optimum storage temperature range is between 65°F and 82°F (18°C and 28°C)
Charge the battery pack based on climate during storage period:

- In cold climates, fully charge the battery pack. Make sure that the charging operation is complete and there are no faults displayed on the charger. The green light on the charger should be on, indicating the charge cycle is complete.
- In hot climates, store the vehicle with a 80% charge of battery pack capacity.

Turn the key to the OFF position and remove it from the key switch
Turn off all accessories.
The storage time for properly charged Lithium-Ion batteries supplied with this vehicle varies based on the ambient temperature.

During Storage

Check the state of charge every 30 days. If the SOC is below 30%, charge the battery pack until the state of charge reaches 80% in hot climates; charger reaches 100% in cold climates.

Returning Vehicle to Service

At the end of the storage period, charge the battery pack to 100% before operating the vehicle.

Warranty

EVOLUTION Lithium-ion Battery Pack and Battery Management System are warrantied for FIVE years or 80,000KM, whichever comes first, starting from date of delivery to the Purchaser`s location against defective material or workmanship.
We make no warranty other than this limited warranty and expressly exclude any implied warranty including any warranty for consequential damages. This limited warranty is not transferable.
THIS LIMITED WARRANTY MAY BE VOIDED OR LIMITED AT THE SOLE DISCRETION OF COMPANY IF THE BATTERY PACK OR BATTERY CONTROL MODULE:

- shows indications that it has been altered or modified in any way from Company specifications, including but not limited to alterations to the lithium-ion battery pack, battery management system and the system electric circuit.

- shows indication that the battery charger has been modified to charged battery not approved for the charger;
- shows indications that the battery pack was disassembled, opened, or tampered with in any way;
- shows indications that attempts may have been made to intentionally reduce the battery pack life;
- contains lithium battery packs that are not paired with the battery management system as supplied by the Company;
- shows indications that were installed with parts or accessories directly to the battery pack without the company's Express written approval.

This warranty is invalidated if any of the following occurs, but not limited to:

- Failure to follow instruction in the Owner Manual.
- Accidental or unreasonable use, misuse or mishandling, over charging or loading, or normal wear.
- Extended storage without recharging or repairs done by an unauthorized person or modification.
- Damages resulting from an accident or collision, or from the neglect, abuse battery pack system.

This warranty is in lieu of all other express warranties. EVOLUTION will not be liable for consequential or incidental damages.

Lithium-Ion Battery Recycling

⚠WARNING Lithium-Ion batteries must be collected and recycled separately from other waste. Do not discard lithium-ion batteries as municipal waste.
Speak with your dealer or distributor on how to correctly recycle lithium-ion batteries.

APPENDIX A

LITHIUM BATTERY CHARGER
USER`S GUIDE

EVOLUTION CHARGER

This manual contains important safety and operating instructions for Evolution charger, please read this information before using Evolution charger for lithium-ion battery.
Evolution has two models of lithium-ion battery charger.

Evolution Lithium-ion Battery Charger Data Table

Charger Model	**C4815L**	**C4825L**
Input Voltage range(V)	85V~264V	85V~264V
Rated ouput voltage(V)	48V	48V
Max output current(A)	15A	25A
Max power (W)	700W	1200W
Charge Time (Hr)/ Battery Model	4Hr/ L4860	4Hr/ L48110 5Hr/ L48130 5Hr/ L48165

⚠ DANGER

DANGER: TO REDUCE THE RISK OF FIRE OR ELECTRIC SHOCK, CAREFULLY READ AND FOLLOW THESE IMPORTANT SAFETY AND OPERATING INSTRUCTIONS BEFORE INSTALLING OR OPERATING THE CHARGER.

DANGER: RISK OF ELECTRIC SHOCK. DISCONNECT CHARGER FROM BATTERY AND AC POWER BEFORE SERVICING. TURNING OFF THE CHARGER DOES NOT REDUCE THIS RISK.

DANGER: TO PREVENT ELECTRICAL SHOCK, DO NOT TOUCH EITHER AC OR DC UNINSULATED PARTS. MAKE SURE ALL ELECTRICAL CONNECTORS ARE IN GOOD WORKING CONDITION. DO NOT USE CONNECTORS THAT ARE CRACKED, CORRODED OR DO NOT MAKE ADEQUATE ELECTRICAL CONTACT. USE OF A DAMAGED OR DEFECTIVE CONNECTOR MAY RESULT IN A RISK OF OVERHEATING OR ELECTRIC SHOCK.

⚠ WARNING

WARNING: TO REDUCE THE RISK OF FIRE, INSTALL THIS BATTERY CHARGER ON A SURFACE OF NON-COMBUSTIBLE MATERIAL SUCH AS BRICK, CONCRETE, OR METAL.

Operation Instructions

➢ Charger LED Display

LED Light	Indication
Red LED light flashes alternately	Charging
Solid Green light	Indicates when a charge cycle completes successfully
Red and Green flashing in order	Refer to the Troubleshooting table

➢ Troubleshooting Instruction

If a fault occurs, count the number of red flashes between pauses and refer to the table below.

--RED --GREEN

Flashes ("—" means pause 1s)	Cause	Solution
	No load	Check if these happen:the connection of battery and charger is loose, the battery defective, or the battery voltage is too low.
	Over voltage or over current	If the error opens again after restart ,return it to factory repair.
	The ambient temperature is too high or too low	Please check if the ambient temperature is too high and if ventilation is good and the position of battery temperature sensor.
	Charger overheating	Please check whether ambient temperature is too high and if ventilation is good.
	Output Under- Voltage	Please return it to the factory. Replace new charger
	Input AC abnormality	Please check the input voltage and the plug poor contact.
	Anyone of the above-mentioned faults repeats five times, then it appears.	Re-up electricity, match the indicator state to the above-mentioned faults then get the corresponding solution.

EVOLUTION ELECTRIC VEHICLES INC

15830 El Prado Road Unit D,

Chino, CA 91708, USA

Tel: +1(909)-393-6800

Email: info@evolutionelectricvehicle.com

Website: http://www.evolutionelectricvehicle.com