TROJAN BATTERY COMPANY

TROJAN® GC2 48V
LITHIUM-ION BATTERY

FREQUENTLY ASKED QUESTIONS

GENERAL

What is a BMS and its purpose?

Lithium-Ion batteries are made up of multiple small cells connected together to provide the voltage and current needed for the application. The Battery Management System or "BMS" is responsible for keeping these cells working in unison so that they are charged and discharged correctly. Lithium-Ion cells are more sensitive to overcharge and undercharge conditions than many other battery chemistries. The BMS monitors the charge and discharge of the battery to ensure the battery operates safely. For the Trojan GC2 48V Lithium-Ion Battery, Trojan developed a BMS that is able to monitor individual cells, internal battery temperatures, state of charge, state of health plus charging voltage and current to provide the safest and most reliable operation possible.

What Lithium chemistry is used?

The Trojan GC2 48V Lithium-Ion Battery uses Lithium-Iron-Phosphate cells.

My vehicle came with 8V or 12V batteries, but the Trojan GC2 48V Lithium-Ion Battery is 48V, what is the difference?

Most low-speed electric vehicles operate on 36-48V DC, but traditional lead-acid batteries are designed and built to be 6, 8, or 12V for portability and to make them more universal. When they are installed into a 36 or 48V application, these batteries are connected together in series to increase the available voltage to match the requirements of the vehicle. The Trojan GC2 48V Lithium-Ion Battery is designed to work with 48V vehicles without using series connections. This provides increased reliability over configurations that use series connections because each battery can power the vehicle independently, where one bad battery in a series connection can reduce the performance of the entire system.

How do you read the date codes on the batteries?

There is no date code on the Trojan GC2 48V Lithium-Ion Battery. The manufacturing date is marked on the sticker with the serial number on the side of the battery.

GENERAL (CONT.)

How do I select the right number of batteries for my golf car?

Many factors will go into choosing the correct setup for your unique golf car. Factors that must be considered are:

- Motor Controller Size
- Drive Motor Size
- Oversized Tires or Aftermarket Gearing
- Accessories Using Battery Power (Lights, Radios, etc)

The Trojan GC2 48V Lithium-Ion Battery configuration should be matched to each golf car to support the instantaneous load that is dictated by the motor controller and also the continuous load generated by driving at top speed plus the load of any accessories that may be running.

Authorized Trojan Lithium-Ion Dealers can assist you in determining the best configuration for your needs.

PERFORMANCE

How does temperature affect the performance of my batteries?

Generally, the battery performance is directly related to temperature. Charging and discharging minimum and maximum temperatures are listed below. There are additional charging temperature constraints described in the User's Guide.

Is there a maximum temperature for discharging my batteries?

The Trojan GC2 48V Lithium-Ion Battery will disable both charge and discharge functions when the internal battery temperature exceeds 140°F (60°C) or falls below -4°F (-20°C).

If discharge functions are disabled, they will be restored automatically when the internal battery temperature is between 14°F (-10°C) and 131°F (55°C).

How long will this battery last?

The Trojan GC2 48V Lithium-Ion Battery has an expected life of at least eight years or 4,000 cycles to 70% depth of discharge. Expected life is per manufacturer guidelines.

What is the range in miles I can expect on one or more batteries connected in my golf car?

For a standard golf car (3.5 HP motor and 250A motor controller), two batteries will go for 30-45 miles, whereas three batteries are good for up to 60 miles. One battery (not generally recommended except in lite use cases) will go for less than 30 miles with one person in the car and no additional load in the car.

Actual driving range will vary depending on factors including, but not limited to, load, terrain, temperature and equipment.

SAFETY

Are there hazardous materials inside the battery?

The Trojan GC2 48V Lithium-Ion Battery is a sealed battery so there is no risk of contact with the internal components under normal operation. 80% of the cells are solid and only 2% of the contents are corrosive. Refer to the SDS for a breakdown of the components within the battery.

What kind of PPE do I need?

Standard Personal Protective Equipment for installing a golf car battery should also be used when installing the Trojan GC2 48V Lithium-Ion Battery. This includes safety glasses, safety toe shoes and cut-resistant gloves.

Insulated tools should always be used when working around batteries.

Do I need to protect the batteries from water?

The Trojan GC2 48V Lithium-Ion Battery is IP67 rated for water and dust resistance, so the batteries can be exposed to water indirectly without harm. It is not recommended to directly spray batteries with pressurized water or fully submerse them intentionally. While the battery is protected against water ingress, it is important to remember that water with impurities can be conductive and lead to a short circuit if a path is created between terminals.

INSTALLATION

How many batteries can I connect in parallel?

Up to 10 Trojan GC2 48V Lithium-Ion Batteries can be used in parallel.

When do I need to use a spacer battery?

In most applications, you will not need a spacer battery to install Trojan GC2 48V Lithium-Ion Batteries with the existing hold-down brackets. Spacer batteries are needed when a battery hold-down cannot be properly secured to the desired number of battery cases installed. As an example, if three GC2 48V Lithium-Ion Batteries are being installed for a desired application, but the hold-down bracket requires a fourth battery for support, then one additional battery case (spacer battery) is needed to complete the installation.

Is this compatible with all golf cars?

The Trojan GC2 48V Lithium-Ion Battery is compatible with nearly all 48V golf cars that use GC2-sized batteries. The exact configuration of the GC2 48V needed may vary depending on modifications made to the vehicle and the user's intended application.

Golf cars with on-board computers that control charging or voltage may require programming or a separate battery charger for optimum performance.

INSTALLATION (CONT.)

What's different about installing Lithium-Ion batteries versus lead acid?

Installing the Trojan GC2 48V Lithium-Ion Battery is very similar to installing a lead-acid battery with a GC2 case. The most important difference is that the GC2 48V should only be connected in parallel with other GC2 48V batteries. They should never be connected in series and they should not be connected to any other battery type.

When replacing flooded lead acid batteries, ballasts may be needed because of the difference in weight and center of gravity. See the Trojan GC2 48V Lithium-Ion Battery User's Guide.

One unique feature of the GC2 48V is the ability to put the battery into Sleep or Storage mode. This is recommended during installation because it will eliminate voltage to the terminals, making installation safer.

Can I connect 12V accessories to a Lithium-Ion battery?

The Trojan GC2 48V Lithium-Ion Battery is a 48V unit, so 12V accessories cannot be connected directly to it. A Voltage Converter (also known as a Voltage Reducer) should be used to allow the use of 12V accessories on a 48V system. When these converters are used, it is recommended that the 48V connections are made from the first and last battery in the parallel configuration for optimum balance.

MAINTENANCE

Do I need to clean the terminals and/or does Lithium corrode the terminals on the batteries?

Lithium-Ion batteries are sealed and do not accelerate corrosion. Some environmental conditions such as water exposure, saltwater mist or other may still cause corrosion on copper cable lugs, cables or non-stainless steel hardware. It is recommended to regularly inspect the terminals on the battery and clean them as needed.

How do I read out the battery information from the BMS?

Authorized Trojan Lithium-Ion Dealers have Trojan specific cables and software that allow them to interface with the BMS and read alarm and event history as well as view details regarding the battery's current condition.

What CAN BUS cables do I need to connect to the battery?

Connecting to the BMS requires a Trojan Service Cable kit which includes a USB to CAN adapter, (2) CAN Terminators and an M8 to DB9 adapter.

What is the torque setting for the terminal?

The terminal should be torqued to between 80 and 90 inch-pounds using a calibrated torque wrench.

How do I check battery charge status?

When the button on top of the battery is pressed, a number of Blue LEDs indicate the state of charge from 0-25% (1 LED), 26-50% (2 LEDs), 51-75% (3 LEDs) and 76-100% (4 LEDs).

MAINTENANCE (CONT.)

How do I use the battery indicators to troubleshoot the battery?

The battery has six LEDs that help the user determine the battery's condition. When the button on top of the battery is pressed, a number of Blue LEDs indicate the state of charge from 0-25% (1 LED) 26-50% (2 LEDs) 51-75% (3 LEDs) and 76-100% (4 LEDs). In addition, either a red or green LED will also illuminate. A green LED indicates that the battery is operating normally and no faults are present. A red LED indicates there is a fault.

If a fault is present, users can gather an indication of the fault by the present state of the battery. Faults are typically caused by one of four conditions:

High Temperature (While Charging or Driving)
Low Temperature (While Charging or Driving)
High Current (While Driving or Charging)
Low Voltage (While Driving)

Trojan indicates the battery is maintenance-free. Does that mean I DO NOT have to check periodically or what recommended actions should I take?

Maintenance-free indicates that the battery does not require watering, equalizing or maintenance charges, or frequent cleaning of the terminals. We still recommend that you perform a visual inspection of the battery regularly.

Follow storage and maintenance according to the GC2 48V Lithium-Ion User's Guide and warranty.

What do the LEDs mean?

The battery has six LEDs that will help the user determine the battery's condition. When the button on top of the battery is pressed, a number of Blue LEDs indicate the state of charge from 0-25% (1 LED), 26-50% (2 LEDs), 51-75% (3 LEDs) and 76-100% (4 LEDs). In addition, either a red or green LED will also illuminate. A green LED indicates that the battery is operating normally and no faults are present. A red LED indicates there is a fault.

What is a short circuit fault/ condition? Does the recovery DIFFER from other faults?

A short circuit fault occurs when the battery is powered on and a direct conductive path is created between the positive and negative terminals. This fault can also be activated if more than 600A are passed through the battery from an external source.

When the short circuit fault is active, it will not automatically reset. The user must verify that the cause of the fault has been corrected and then perform the same procedure used to bring the battery out of storage mode to clear the short circuit fault.

CHARGING

Is there a maximum temperature for charging my batteries?

Trojan GC2 48V Lithium-Ion Battery will temporarily disable charging function at temperatures above 113°F (45°C) or below 32°F (0°C). At temperatures below 68°F (20°C), charging current is automatically limited. Refer to the user guide for charging current limits.

If charging functions are disabled due to temperature, they will be restored automatically when temperature is within range."

STORAGE & SHIPPING

What are the special packaging requirements?

The Trojan GC2 48V Lithium-Ion Battery arrives in approved packaging that can be saved for future use.

To ship the GC2 48V, the battery must be packaged in a UN Rated and marked 4G Fiberboard Box with Y25 Weight. It must be secured and prevented from moving freely within the box using anti-static bubble wrap or foam.

The box must be labeled as DOT Class 9 with **Lithium Ion Batteries, UN3480** displayed on the outside of the box. For air transport, a **Cargo Aircraft Only** label must be present.

Download Lithium-Ion Repacking Instructions **here** or enter:

www.trojanbattery.com/wp-content/uploads/2022/04/TRO1090_Repacking_LI_Sheet_NoBleed_020722SM.pdf

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Can I ship a battery fully charged?

The Trojan GC2 48V Lithium-Ion Battery is classified as UN3480 and as such must be at or below 50% state of charge when shipped via land or sea and below 30% state of charge when shipped via air.

Can I ship lead acid with Lithium-Ion?

Yes, as long as both battery types are properly packaged and labeled, they can be shipped on the same vehicle.

Wherever possible, putting Lithium-Ion and lead-acid batteries on the same pallet should be avoided. If it cannot be avoided, the pallet must be clearly labeled as containing both.

Lithium-Ion batteries must be individually packed and labeled on the pallet as well.

Are there any restrictions to shipping Lithium-Ion?

A battery subject to UN3480 like the Trojan GC2 48V Lithium-Ion Battery cannot be transported on a passenger aircraft. As long as it is correctly prepared, packaged and labeled, no other restrictions apply. Refer to the GC2 48V Lithium-Ion Battery User's Guide or Packaging Requirements section of this FAQ for details on preparation and packing.

STORAGE & SHIPPING (CONT.)

Do Lithium-Ion batteries require special storage?

Storage requirements for the Trojan GC2 48V Lithium-Ion Battery are the same as other battery types. They should be stored in a clean, cool and dry environment and protected from direct sunlight.

For batteries being stored in a warehouse, it is recommended that they be left in the original packaging for protection and so they can be shipped easily.

The Trojan GC2 48V Lithium-Ion Battery can be stored alongside lead-acid batteries. However, it is recommended that they be clearly labeled as Lithium-Ion to prevent mis-identification.

Follow storage and maintenance according to the GC2 48V Lithium-Ion User's Guide and warranty."

How long can I store the battery?

The Trojan GC2 48V Lithium-Ion Battery is designed to be stored for up to six months when placed into storage mode at a state of charge above 25%.

Temperatures exceeding 77ºF (25ºC) or below 32ºF (0ºC) can reduce the available storage time.

I hear that lithium batteries self-discharge. Is there a concern when storing the batteries in my golf car for long period of time?

A BMS integrated into a battery pack does draw a small amount of current from the batteries to continue running. The Trojan GC2 48V Lithium-Ion Battery features a sleep/storage mode which reduces this draw by 5x.

This allows the GC2 48V to be stored for up to six months as long as it is placed into storage mode with more than 25% state of charge.

If the battery is not put into storage mode, it will automatically enter storage mode after 30 days of inactivity.

How do I turn off the battery?

Press and hold the button on the top of the battery. If it is already in storage mode, the LEDs will illuminate one at a time until they are all illuminated. Continue to hold the button for 2 more seconds and then release. Wait 10 seconds and confirm the battery has powered on by pressing the button for one second to show a Red or Green LED indicating the battery status and a combination blue LEDs indicating the state of charge.

If the battery is powered on, the LEDs will all illuminate and then turn off one by one. Continue to hold the button for an additional two seconds and then release. Wait 10 seconds and press the power button briefly, only a blue LED will flash to indicate that the battery is in storage mode. "

ACCESSORIES

Does Trojan provide an external Battery Charge Indicator or commonly knows as a “Fuel Gauge”?

Yes, Trojan offers an external Battery Charge Indicator separately from the battery to provide end users with the remaining State of Charge % of the batteries in the vehicle. When the display reaches 20%, it will show a low battery notification to let the user know that the battery is approaching its total usable capacity and should be recharged soon. The display will also show if any faults or alarms are present on the batteries.

Authorized Trojan Lithium-Ion Dealers can perform the installation of the external gauge and all necessary cable connections.

PURCHASING

Where can I purchase the battery?

You can find your local Authorized Trojan Lithium-Ion Dealer **here** or at:
www.trojanbattery.com/Lithium-Ion-battery-dealer-locator/

TECHNICAL SUPPORT

Call Trojan Battery Technical Support:
United States and Canada: 800-423-6569, dial ext. 3045
International: +1-562-236-3045

Email: technical@trojanbattery.com

On the web: trojanbattery.com/tech-support/

PN 10000782

UN38.3 PASSED TRANSPORTATION SAFETY CERTIFIED

IEC

TROJAN BATTERY COMPANY WITH QUALITY SYSTEM CERTIFIED BY DNV ISO 9001:2015

48V Lithium

Do not mix with lead-acid batteries when recycling.