

# **USER MANUAL**

## **Group27**

**With SmartTalk™ and VHC™**

**EX-G27-12100-BCH**

**EX-G27-12132-BCH**



## Disclaimer

While every precaution has been taken to ensure the accuracy of the contents of this guide, Expion360 assumes no responsibility for errors or omissions. Note as well that specifications and product functionalities may change without notice. Find the latest updates online at [expion360.com](http://expion360.com).

## Important

Please be sure to read and save the entire manual before using the products. Misuse may result in damaging the products, causing harm, or incurring serious injury. Read this manual in its entirety before using the products. Instead of saving this manual, refer to the digital version of this manual on the Solartex USA website for any updates and future reference.

## About Us

### Safety

Expion360 lithium batteries use lithium iron phosphate (LiFePO<sub>4</sub>/LFP) chemistry, which is the best choice for RV, marine, and off-grid power storage applications because of its high degree of safety and long cycle life.

### Quality

Every Expion360 battery uses cells that are UL 1642 recognized (file no. MH64383) and meets the highest standard in safety and performance. Internal power distribution cables are mechanically connected (bolted), rather than soldered, to lower contact resistance and provide a robust physical connection point. The internal power-distribution plates connecting the cells, battery management system (BMS), and internal terminals are solid copper.

Our proprietary case contains structural elements to protect the battery pack and BMS inside from the effects of vibration and movement. The battery's oversized power terminals provide a large electrical and physical connection point to accommodate high ampacity power cables and our unique and innovative bus bars.

Please Read Each Warning Carefully to Prevent Damage to the Unit and Injury to Operators.

Ignoring Warnings Voids Warranty.

## WARNINGS

- ⚠ DO NOT drop the battery.
- ⚠ DO NOT open the battery.
- ⚠ DO NOT short-circuit the battery.
- ⚠ DO NOT submerge the battery in water.
- ⚠ DO NOT use the battery as a starter battery.
- ⚠ DO NOT use batteries of different ages and/or capacities.
- ⚠ DO NOT connect the batteries in series.
- ⚠ DO NOT connect more than four batteries in one parallel string.
- ⚠ DO NOT attempt to repair the battery if it malfunctions.
- ⚠ DO NOT charge the battery above 14.6VDC.
- ⚠ DO NOT charge the battery at or below 32°F or 0°C.
- ⚠ DO NOT charge the battery above its maximum charge rate.
- ⚠ DO NOT discharge the battery below 10.5VDC.
- ⚠ DO NOT discharge the battery at or below -4°F OR -20°C.
- ⚠ DO NOT discharge the battery above its maximum discharge rate.
- ⚠ DO NOT leave the battery connected when in storage.
- ⚠ DO NOT leave the battery fully discharged for an extended period.

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## Overview

The Expion360 SmartTalk™ CAN Bus VHC™ LiFePO<sub>4</sub> (Lithium Iron Phosphate, LFP) Battery contains the features of Bluetooth, CAN Bus Communication, and internal heating. The brand-new customized case ensures the highest energy density for a cylindrical LFP cell constructed Group 27 battery pack in the market, which weighs less than half of a lead acid battery in the same size but provides more than twice the continuous power output and usable capacity. The Expion360 SmartTalk™ battery Inherits from the quality of the previous generation battery, such as a purposely engineered battery case, solid nickel-plated copper collector plates, oversized solid brass battery terminals, and mechanical connection on all high-power connections to maintain the highest standard for RV, Marine, and overland applications of energy storage.

Expion360 SmartTalk™ technology monitors the battery system's status and reports to users wirelessly or via CAN Bus.

The proprietary Vertical Heat Conduction™ (VHC™) technology utilizes Positive Temperature Coefficient Heating Films (PTCHF) and state-of-the-art heating algorithms. This achieves the industry's most efficient heating method, best heating performance, widest heating application, and safest heating solution. Combined with Expion360 SmartTalk™ technology, the battery will calculate the remaining capacity.

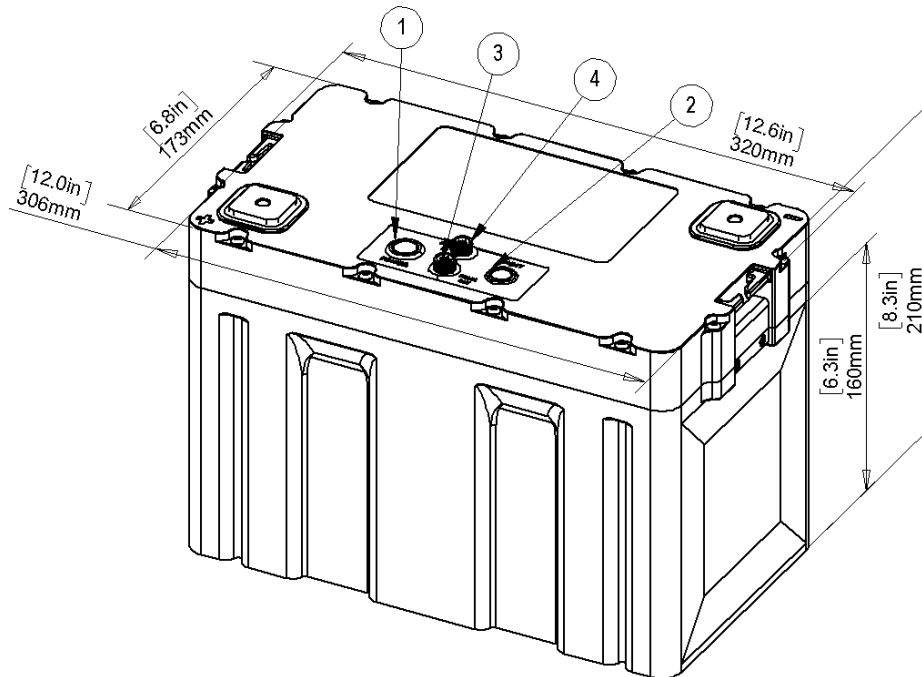


Figure 1: EX-G27-12100-BCH and EX-G27-12132-BCH dimensions.

- |   |                |   |          |
|---|----------------|---|----------|
| 1 | Power On-Off   | 3 | COMM OUT |
| 2 | Heating On-Off | 4 | COMM IN  |

## Installation

### **Improper Battery System Installation Voids the Warranty**

Expion360 recommends installing lithium batteries in a temperature-controlled area. Unlike lead-acid, lithium batteries do not require venting to the outside and may be installed inside a trailer, motorcoach, truck camper, or boat cabin. Installing the batteries within an insulated or conditioned space is always recommended, especially if the batteries could be exposed to temperatures below 32°F. If the batteries must be installed in an outside battery box, be sure to confirm the battery box has drain holes to prevent water from filling the box.

Expion360 custom-molded batterie cases include rigid internal support structures to hold cells in place in any orientation. This allows EX-G27-12100-BCH and EX-G27-12132-BCH batteries to be installed in any position, creating a range of creative mounting solutions that competitors are unable to accommodate. Expion360 recommends using our unique tie-down system with every installation to eliminate unwanted movement and reduce vibration. Check the Expion360 website for more information on tie-down solutions for the Expion360 batteries.

## Battery System Configurations

**Do not mix batteries of different ages and sizes in one battery system. When connecting multiple batteries, use the Expion360 Bus Bars or 4/0AWG cables of the same length. Before installing batteries for use in parallel, all batteries must be charged to 100%.**

### Parallel Installation

Connecting multiple batteries in parallel will increase the available energy (watt-hour), charge and discharge rates (current), and capacity (amp-hour) of the battery system. The voltage will not increase. Up to (4) batteries may be connected in a single parallel string. Additional strings may be connected to a common bus bar with equal-length cables to increase the battery system capacity.

Check the current of each battery pack on the Expion360 App. Make sure the difference between the current of each battery pack and the average current is within the 5% range of the average current. Otherwise, check the battery system wiring and make sure the system is installed correctly.

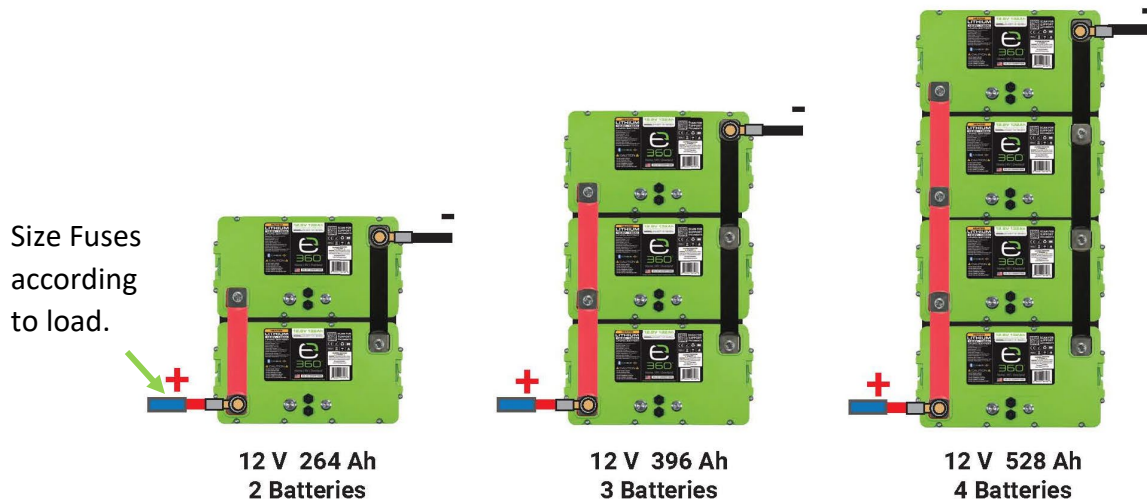
*Important: Any batteries wired in parallel using cables must be connected by cables of equal length and gauge (AWG).*

### Series Installation

**DO NOT connect EX-G27-12100-BCH and EX-G27-12132-BCH batteries in series.**

## Battery System Installations

### Parallel Connection Single String



### Parallel Connection Multi-string

\* Cables (1) and (2) must be equal length to Common Bus Bar.

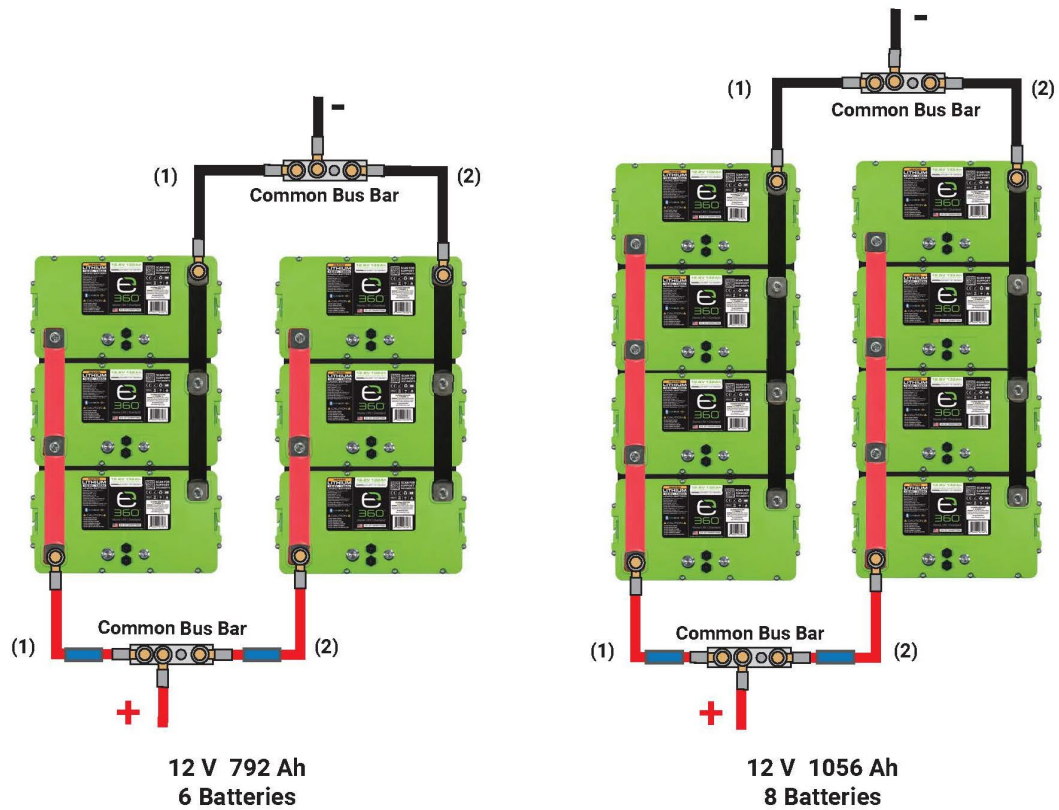


Figure 2: Battery system parallel installations.



## Battery Terminal Connections

Torque to 8lb-ft (96lb-in). Do not finger-tighten. Do not over tighten. Check thread depth vs. bolt length. The female thread depth of the battery terminals is approximately 12mm.

The depths of the battery terminal threads are approximately 12mm. Consider this when determining the proper bolt length to secure bus bars, cable lugs, and any washers that will be affixed to the terminal so that they do not bottom out. A minimum of 3 threads must be engaged before applying 8lb-ft (96lb-in or 10Nm) of torque so as not to damage the threads. If too much torque is applied to a bolt, the threads will be stripped, and the damage will not be covered under warranty due to product misuse.

Do not stack more than 3 power/battery cable terminals to each battery terminal.

Stack the power/battery cables on the bottom and the sensor cables on the top.

Do not undersize the battery cables. Make sure the battery cables are the same gauge. All connections should be well organized and secured to prevent short circuits. Ensure all cables and circuit protection (fuses and/or circuit breakers) are properly sized for the entire system. See details about circuit protection in [Circuit Protection](#).

Use a permanent marker to mark the position of the screws/nuts and battery terminal. Check the mark annually and tighten the screws/nuts if the mark is not aligned.

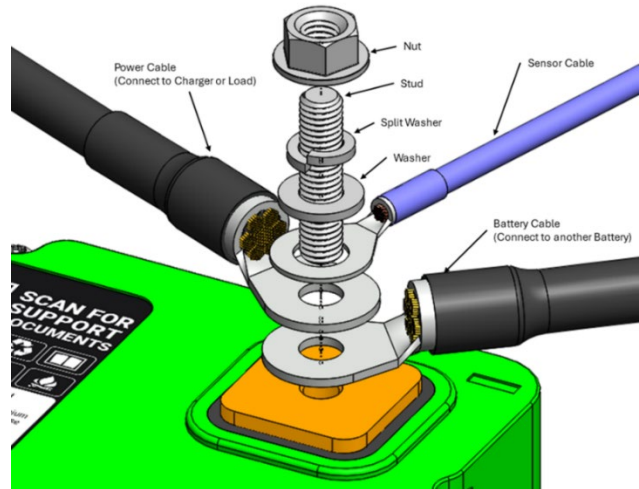


Figure 3: Battery terminal with cable connections, secured by stud and nut.

## Wiring Recommendations

Wiring should meet all local codes and standards and be performed by qualified personnel such as a licensed electrician. The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code) for Canada provide the standards for safe wiring. The NEC/CEC lists requirements for wire sizes, overcurrent protection, and installation methods/standards. There are also standards and requirements specific to Recreational Vehicles (RV) published by RVTI (Recreational Vehicle Training Institute) that should be considered before installing in an RV. Standards and requirements specific to Marine Crafts published by the American Boat and Yacht Council (ABYC) should be considered before installing in a boat.

## RV Installations

As stated in the RVTI Level 2 Electrical Systems material, current-carrying conductors (cables/wires) used in low-voltage wiring systems of an RV are required to be of the stranded copper type. Conductors of sizes 6 through 18AWG or SAE need to be evaluated by a third-party listing agency such as UL or CSA. The identification mark of the listing agency needs to be printed on the wire. Any conductor used needs to be sized according to the load and overcurrent protection provided. Low-voltage conductors used in RV's interior must have a minimum insulation rating of 90°C. Low-voltage conductors in the engine compartment or under the chassis where the conductors are within 10 in. of any exhaust system component must be rated at least 125°C. The temperature rating and other information will usually be printed on the wire. If the temperature rating of the wire cannot be determined, do not use it.

## Marine/Boat Installations

Color	Type of DC conductor
Green or green with yellow stripes	DC grounding conductor
Black or yellow	DC negative conductor
Red	DC positive conductor

Conductors for marine installations have strict guidelines, including the color of the wire that needs to be used for each connection. Per the ABYC Marine Electrical Certification, DC conductors follow the color coding in the table above. Alternative labeling or even color methods for DC conductors are allowed, but the requirements do specify that a wiring diagram and/or wiring legend be created for the boat and included in the boat's documentation.

Wiring should meet all local codes and standards and be performed by qualified personnel such as a licensed electrician. The NEC (National Electric Code, ANSI/NFPA 70) for the United States and the CEC (Canadian Electrical Code) for Canada provide the standards for safe wiring. The NEC/CEC lists requirements for wire sizes, overcurrent protection, and installation methods/standards. The recommendations given by our technical support team are for guidance purposes only. Installers are responsible for independent evaluation and verification of suitability and compatibility. Any reliance on these recommendations is at the installer's own risk.

## Recommended Wire Gauge

Below is an example of Blue Sea System wiring recommendations. Refer to their official website for details.

1. Calculate the circuit's maximum sustained amperage. The easiest way to do this is to use the maximum load drawn by the inverter or converter in the system. If this is measured in watts, divide the maximum watt draw by 12.8. This equals the inverter/converter's amp draw. Measure the distance from the batteries to the inverter/converter and back for the total length of the wire run.
2. Determine if the circuit runs in an engine space or non-engine space. Engine spaces are assumed to be at 125°C, and non-engine spaces are assumed to be at 90°C.
3. Multiply the maximum amp draw by the distance of the circuit to calculate for feet x amps (abbreviated as Famps).
4. Base the wire on the 3% or 10% voltage drop. In general, items that affect the safe operation of the recreational vehicle (running lights, electronics, and distribution panel supply circuits) use 3%; all other loads (cabin lights) use 10%.
5. Now look at the table below.
  - a) Starting in the column that has the correct voltage (12V, 24V, 36V) and voltage drop shown at the top.
  - b) Go down the list of numbers until you arrive at a value greater than the calculated Famps.
  - c) Move left to the Ampacity column to verify that the circuit's total amperage does not exceed that row's maximum allowable amperage of the wire size.
  - d) Finally, move left to the wire size column to select the wire size.

Example:

You have a 200Ah battery system with a 1500W inverter charger, which is 10 feet from the battery system.

10ft \* 2 = 20ft (total circuit to and from the battery)

$$1500W / 12.8V = 117.2A$$

(Maximum amp draw from the inverter) 117.2A \* 20 = 2344 Famps

1. With a 3% voltage drop at 12V, you will go down the column below to the next number that is larger than 2344, which in this case is 2803.
2. Move left across that row from 2803 to the Wire Ampacity non-engine column. The Ampacity listed is 245. This is higher than 117.2; continue to step 3. If 245A was lower than the amp draw you initially found in your calculations, move down the column to an ampacity higher than your amp draw.
3. Move left along that row to the Wire Size AWG. For the 245A row, the wire will be 1AWG. This is the recommended wire size for the wire run from your batteries to the Inverter.

Wire Size AWG	Metric*	Minimum Acceptable CM area	Wire Ampacity non-engine	Wire Ampacity engine	12 Volts Volt Drop		24 Volts Volt Drop		32 Volts Volt Drop	
					3%	10%	3%	10%	3%	10%
16	1	2336	25.0	21.3	86	288	173	576	230	768
14	2	3702	35.0	29.8	138	459	275	918	367	1223
12	3	5833	45.0	38.3	219	729	437	1458	583	1944
10	5	9343	60.0	51.0	348	1159	695	2317	927	3090
8	8	14810	80.0	68.0	553	1843	1106	3686	1474	4915
6	13	24538	120.0	102.0	879	2929	1757	5858	2343	7811
4	19	37360	160.0	136.0	1398	4659	2796	9319	3727	12425
2	32	62450	210.0	178.5	2222	7408	4445	14815	5926	19754
1	40	77790	245.0	208.3	2803	9342	5605	18684	7474	24912
0	50	98980	285.0	242.3	3536	11788	7073	23576	9430	31434
00	62	125100	330.0	280.5	4457	14858	8915	29715	11886	39620
000	81	158600	385.0	327.3	5619	18731	11239	37462	14985	49950
0000	103	205500	445.0	378.3	7086	23620	14172	47241	18896	62988

Note: This chart assumes wire with 105°C insulation rating and AWG wire sizes.  
\*Metric wire sizes may be used if of equivalent circular mil area.

Figure 3: Systems, Blue Sea. "Voltage Drop in Conductor - Wire Sizing Chart." Blue Sea Systems, [www.bluesea.com/resources/535/Voltage\\_Drop\\_in\\_Conductor\\_-](http://www.bluesea.com/resources/535/Voltage_Drop_in_Conductor_-).

Accessed 25 Mar. 2024.

## Circuit Protection

Properly sized circuit protection must consider the battery system’s maximum DC output, the inverter’s maximum DC input, and the size, length, and rating of the cables being used. The fuse or circuit breaker must be able to withstand the maximum continuous current that can be supplied by the battery system and must be located as close to the battery system as is safely possible. Below is an example of a list of Blue Sea System fuse ratings, types, and part numbers for reference only. Refer to their official website for details.

Fuse Rating	Class T Fuse P/N	Fuse Holder	ANL Fuse P/N	Fuse Holder
60 A	N/A		5123	5005
80 A	N/A		5124	5503
100 A	N/A		5125	
110 A	5112	5007100	N/A	
125 A	5113		N/A	
150 A	5114		5127	
175 A	5115	5502100	5128	
200 A	5116		5129	
225 A	5117		N/A	
250 A	5118		5131	
300 A	5119		5133	
350 A	5120	5502	5135	5503
400 A	5121		5136	
500 A	N/A		5137	
600 A	N/A		5161	
750 A	N/A		5163	

*ANL fuse is ignition-protected and safe to use in the engine bay. Class T fuse has an extremely fast short-circuit response and is ignition-protected when using a 5502100/5507100 fuse holder. Use fuse and breakers from the following approved manufacturers to protect against overcurrent events and ensure the safety of the Expion360 battery system: Blue Sea Systems, Littlefuse, Eaton, or Bussman.*

## Single String Battery System

For small battery systems with fewer than four batteries or a single string configuration, circuit protection (fuse or circuit breaker) should be installed close to the battery system’s positive terminal before connecting to the load. The fuse rating is based on the battery system's maximum continuous discharge rate.

### Example:

*If the maximum continuous discharge rate of a 400Ah battery system is 400A, the battery system should be paired with a 400A DC fuse. In this example, any cables connecting the battery system to the inverter must also be properly sized for a 400A continuous current.*

## Multi-string Battery System

For large battery systems with more than 4 batteries in a multiple string configuration, the circuit protection (fuses or circuit breakers) should be installed close to each string's battery system positive terminal before connecting to the common bus bar. The fuse rating is based on the maximum continuous discharge rate of each string of the battery system.

### *Example:*

*If the maximum continuous discharge rate of two strings of parallel-connected batteries is 800A and 400A on each string, the battery system should be paired with a 400A DC fuse on each string. The cables connecting the two strings to the inverter must be sized properly for the maximum 800A current.*

## Communication

### SmartTalk™ and the Expion360 App

SmartTalk™ Bluetooth technology by Expion360® revolutionizes the way energy storage systems are monitored and controlled. Seamlessly integrated into Expion360 batteries, SmartTalk™ offers unparalleled convenience and insight into the battery setup.

The Expion360 App is available for download on both the Apple App Store and Google Play Store.

After being idle for an hour, the battery Bluetooth module enters sleep mode to conserve energy. Charging and discharging the battery system wakes up Bluetooth.

The number of devices that connect to the phone simultaneously will affect the battery life of the phone and the stability of Bluetooth connections. The stability of the Bluetooth connections can also be affected by the surroundings of the batteries. For example, a metal battery enclosure may weaken or disrupt Bluetooth signals.

Due to a limitation within the iOS and Android operating systems, the maximum number of devices that can connect to a cell phone

simultaneously will differ. According to our testing, the iOS system can connect to 8 devices simultaneously, whereas Android is able to connect to 6 devices at a time. If more devices need to be connected, the battery system can be configured as multiple battery sub-systems on the Expion360 App. These different sub-systems can be accessed from the Expion360 App to display sub-system information when needed.

#### Example:

*If you have a battery system containing 16 batteries, your phone cannot connect to them all simultaneously. You can, however, virtually separate the battery system into multiple battery subsystems. Each battery subsystem represents one string of batteries. As depicted below, the battery system is separated into two subsystems: GC Demo 2 and GC Demo 3. Each battery subsystem can be selected from the drop-down battery system list (top left corner) to activate the Bluetooth connections and display the subsystem information.*

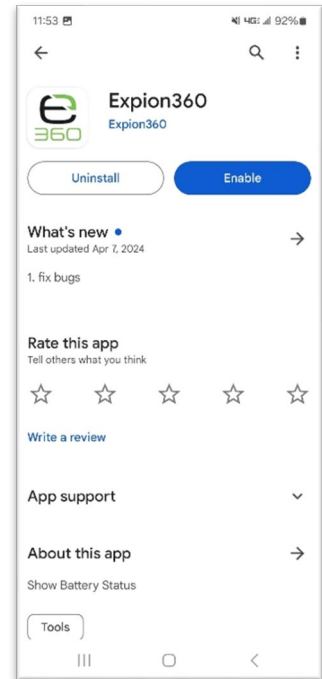


Figure 4: Expion360 App in Google Play Store

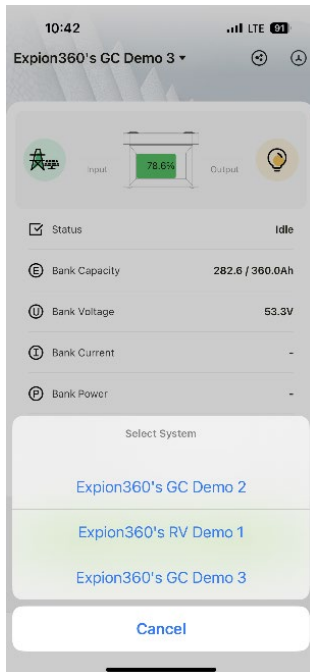


Figure 5: Selecting battery systems in the Expion360 App

## Controller Area Network (CAN) Bus Communication

Expion360 EX-G27-12100/12132-BCH batteries have CAN Bus capabilities, which ensure seamless integration with electrical systems, facilitating reliable and efficient communication between the battery system and monitoring or electrical devices. When connecting EX-G27-12100/12132-BCH batteries to the CAN Bus network:

- a) Chain the battery communication together by connecting the COMM OUT socket of one battery to the COMM IN socket of another battery using a battery-to-battery communication cable. Pay attention to the port orientation; do not use force if the connector port is not aligned with the socket. Battery communication socket damage is not covered by warranty.
- b) Connect the M8 connector of the first battery-to-third-party communication adapter cable to the first battery's COMM IN socket.
- c) Plug the second piece of adapter cable's M8 connector to the last battery's COMM OUT socket.
- d) Terminate the second adapter cable's RJ45 socket with a 120Ohm terminal resistor.
- e) Turn on the first battery's POWER switch by pressing it down for 3 seconds and then releasing it. After 3 to 5 seconds of release, the switch's LED light will turn blue. Then, follow the same procedure for the second, third, ... batteries. The LED light on the switches of the second, third, ... batteries will turn on green.
- f) The maximum number of batteries for communication is 8. For some installations, if the battery-to-battery communication cable can't reach, it can be replaced with 2 pieces of battery-to-third-party communication adapter cable and a piece of Ethernet cable (Do not use Victron VE.CAN Bus BMS cable, neither Type A nor Type B.).

If the battery system needs to power down, press the POWER switch for 5 seconds and then release it. The LED light will turn off. If the battery system needs to power on again, turn on the first, then second, and third batteries in sequence.

## Victron Communication

When connecting EX-G27-12100/12132-BCH batteries to Victron Cerbo GX or Ekrano GX,

- a) Use a piece of regular Ethernet cable at the appropriate length (Do not use Victron VE.CAN CAN Bus BMS cable, neither Type A nor Type B).
- b) Connect one side of the Ethernet cable to the RJ45 socket on the first adapter cable and another side to the Victron Cerbo GX BMS-CAN port or VE. Connect CAN 1 on Ekrano GX.
- c) Terminate the Victron Cerbo GX BMS-CAN port or Ekrano GX VE CAN 1 port with a 120-ohm terminal resistor.
- d) For Victron Cerbo GX users, the battery system information will be displayed on the screen. For Victron Ekrano GX users, go to Settings – Services – VE.CAN 1 port – CAN Bus Profile, and select BMS CAN (500 kbps).

## Battery System Monitor Communications

The battery system monitor is designed to monitor the battery system's voltage, current, and power. State of Charge (SoC) and estimated run time of EX-G27-12100/12132-BCH batteries.

When connecting EX-G27-12100/12132-BCH batteries to Expion360 battery system monitor:

- a) Use a piece of CAT5e or CAT6 Ethernet cable (Do not use Victron VE.CAN Bus BMS cable. Neither Type A nor Type B) with appropriate length.
- b) Plug one side of the Ethernet cable to the RJ45 socket on the 1<sup>st</sup> adapter cable. Plug another side of the Ethernet cable into the RJ45 socket on the battery system monitor.
- c) The battery system information will be displayed on the screen. Press the button on the monitor to activate the LED light for 30 seconds.



## Vertical Heat Conduction Technology™ (VHC™)

Expion360's patent pending VHC™ internal heating technology marks a significant industry breakthrough for battery performance in cold climates. It features a Positive Temperature Coefficient Heating Film (PTCHF) in direct contact with a nickel-plated copper plate for uniform heat distribution. A sophisticated Battery Thermal Management System (BTMS) ensures real-time monitoring and control, promoting operational safety and longevity in cold temperatures. This innovative heating technology intelligently utilizes the combination of external charger and internal battery power to heat the battery pack, whether the chargers fully meet the power demand of the PTCHF or not. VHC™ activation is also available through the Expion360 App only if the chargers cannot power the PTCHF when the battery packs are cold.

### Operation of the VHC™

- Make sure the battery power is turned on.
- Only if the battery temperature is below 0°C (32°F), turn on VHC™ by pressing the HEAT switch on each battery. When the button is depressed, the heater can turn on, but it does not mean the heater is always on. Turn off the HEAT switch if the batteries do not need to be heated. For example, the batteries will not be used for 2 days in winter.
- If the battery system is connected to chargers (the combinations of alternator charger, MPPT charger, inverter charger...), make sure the chargers have more than 10A per battery. For example, a battery system consists of 4 batteries, and the minimum charger current is 40A. Otherwise, VHC™ will combine the external charger and internal battery power to heat the battery, which may drain the battery system if SoC is low. In this case, VHC™ will be activated when the battery system temperature is below 0°C (32°F) and will maintain the battery system temperature between 0°C (32°F) and 15°C (59°F).
- If the battery system is not connected to chargers or the charger can't provide power to the battery, VHC™ can be activated through the Expion360 App. In this case, VHC™ will use battery power to heat the battery system. This is a backup feature and is for emergency use only. The minimum SoC requirement is 30%. Charge the battery system immediately after the minimum temperature of the battery system is above 5°C (41°F).

## Charging

A battery system's optimal and maximum charge rates are equal to the rates of a single battery multiplied by the number of batteries connected in parallel. The optimal charge rate for LiFePO<sub>4</sub> batteries of 0.2C is recommended to prolong the batteries' useful life. The battery system can be charged at the maximum charge rate (0.5C) for rapid power recovery if the temperature conditions listed in the [Battery Specifications](#) section are met. Never charge the battery system above the maximum charge rate. See the [Battery Specifications](#) for each battery's optimal and maximum charge rates for different temperature conditions.

*Example:*

*A battery system has (4) 100Ah batteries connected in parallel. The maximum charge rate of a single Expion360 battery is 50A at 0.5C. The capacity of the battery system is 400Ah, and the maximum charge rate of the battery system is 200A (0.5C). This method also applies to the optimal charge current.*

**If a battery or battery system has been discharged to 0% SoC, it must be recharged within one week to prevent battery damage and voiding the warranty.**

## Charger Profile

### Two-Stage CC-CV Charger

Chargers using a constant current (CC) constant voltage (CV) profile are ideal for charging LiFePO<sub>4</sub> chemistry batteries. We recommend charging Expion360 batteries with a charging voltage of 14.6Vdc.

The CC (bulk or boost) stage charges the battery to 95% SoC at the charger's rated current until the battery reaches the charger's voltage setting. The charger then transitions to the CV (absorption or saturation) stage at the charger's given voltage setting. It tapers the charge current down to zero as the battery reaches the charger's charging voltage. The charger then enters standby mode and charges the battery if a lower voltage is detected.

### Single-Stage CC Charger

A single CC stage charger can charge the battery to nearly 100% SoC. Single-stage CC chargers with target voltage settings of 14.6Vdc may also be used to charge Expion360 batteries. However, a CC-CV charger is advised.

### Multi-Stage Charger

A multi-stage (CC, CV, float, equalization) charger is primarily designed for flooded, AGM, and gel lead-acid batteries and is not an ideal selection for LiFePO<sub>4</sub> batteries. The multi-stage charger slows down the charging process and may not fill the battery to 100% SoC. Expion360 batteries do not require a float stage because of their low self-discharge rates. LiFePO<sub>4</sub> batteries do not require an equalization stage because they do not experience damaging sulfation when left at states of charge lower than 100% for long periods. The charge voltage may also rise above 14.6Vdc during the equalization stage, which would cause the BMS to disconnect due to overvoltage protection.

## Charging Options

Expion360 batteries can be charged by shore power, an inverter charger, solar power, an alternator, or a combination of these.

### Shore Power Charging

Expion360 batteries should be charged by a CC-CV two-stage charger with a voltage set to 14.6Vdc. The rated charge current should never exceed the battery system's maximum charge rate. See [Battery Specifications](#) for individual charge currents for each model.

### Inverter Charger Charging

Expion360 batteries may be configured as an uninterruptible power supply (UPS) with an inverter charger. Inverter chargers must be programmed before a connection to shore power. On the inverter charger controller, under the "Battery Type" menu, choose the "CC-CV" setting in the setup and set the charge voltage to 14.6Vdc. The "Custom" setting on some inverter chargers is not recommended. The additional settings are determined by the design of the power system and different inverter chargers. Please refer to the inverter charger manual or contact Expion360 support for more information.

### Solar Charging

Expion360 batteries can be charged from solar power using a solar charge controller. A maximum power point tracking (MPPT) charge controller is recommended as it is more efficient than a pulse-width modulation (PWM) charge controller. Some PWM charge controllers can cause a voltage spike when cycling on and off. This can potentially damage the battery.

Choose a solar charge controller that can be programmed for two-stage charging or one with a lithium battery setting. If using a programmable solar charge controller, set the charge voltage to 14.6Vdc.

To prevent the solar charge controller from charging the battery system below 32°F, install a disconnect switch between the batteries and the solar charge controller. Match the disconnect switch's size to the maximum voltage and current of the solar array. Some solar charge controllers have a temperature sensor and can be programmed to stop charging at a specific temperature. It is advised to place the temperature sensor close to the battery system and set this temperature to 32°F. Please refer to the solar charge controller manual or contact the Expion360 support department for more assistance.

### Alternator Charging

The Expion360 battery can be charged from an alternator using any DC-to-DC charger equipped with settings for LiFePO<sub>4</sub> batteries. LiFePO<sub>4</sub> batteries cannot be charged directly from the alternator. The Expion360 DC-to-DC charger is a CC-CV two-stage charger designed only to charge LiFePO<sub>4</sub> batteries with a 25A output current. It is simple to install and compatible with any other LiFePO<sub>4</sub> battery. Within the limits of the battery system and alternator specifications, up to two Expion360 DC-to-DC chargers can be used in parallel to achieve a higher charge rate.

## Charger Sizing

Once the battery system has been appropriately sized, the specifications for the chargers can be determined based on the preferred charge rate or time. A minimum 5-hour charge time is recommended to maximize the battery's life span.

### Calculation:

Total charging current =  $N \cdot C / T$  or

Total charging power =  $N \cdot E / T$

The desired charging hour is T hour.

The number of battery packs in the battery system is N.

The rated energy of a single battery pack is E.

The rated capacity of a single battery pack is C.

### Example:

*For a battery system consisting of 4 EX-G27-12100-BCH battery packs, the desired charging time is 5 hours.*

$$C = 100Ah,$$

$$E = 12.8V \cdot 100Ah = 1280Wh,$$

$$N = 4,$$

$$T = 5.$$

$$\text{Total charging current} = N \cdot C / T = 4 \cdot 100Ah / 5h = 80A$$

$$\text{Total charging power} = N \cdot E / T = 4 \cdot 1280Wh / 5h = 1024W$$

The calculated total charging current must be lower than the maximum charging rate of the battery system.

## Discharge

The Expion360 Group27 batteries are designed for deep-cycle use only and should never be used in an engine-starting application. The battery system's maximum continuous discharge rate is equal to that of a single battery multiplied by the number of batteries connected in parallel. Never discharge the battery system above its maximum continuous discharge rate. See the [Battery Specifications](#) page for the optimal, maximum, and pulse discharge rates of each Expion360 battery.

***Example:***

*A battery system consisting of 4 EX-G27-12100-BCH 100Ah batteries connected in parallel. The maximum continuous discharge rate of a single battery is 100A.*

*The capacity of the battery system is 400Ah.*

*The maximum continuous discharge rate of the battery system is 400A.*

## Inverter Sizing

When pairing a battery system with an inverter, the maximum continuous DC current must be considered carefully. The inverter cannot have a higher maximum DC input current than the battery system's maximum DC output current. Otherwise, the BMS may shut off due to discharge overcurrent protection. An oversized inverter may irreversibly damage the battery system in a worst-case scenario. The example below shows minimum battery system capacities for various sizes of 12Vdc inverters with estimated discharge times at full load.

Inverter Size	Number of Battery Packs	EX-G27-12100	EX-G27-12132
1000W (78A at 12.8V)	1	1h 18m	1h 41m
	2	2h 36m	3h 22m
	3	3h 54m	5h 4m
	4	5h 13m	6h 45m
2000W (156A at 12.8V)	1	Not recommended	Not recommended
	2	1h 18m	1h 41m
	3	1h 54m	2h 31m
	4	2h 36m	3h 22m
3000W (234A at 12.8V)	1	Not recommended	Not recommended
	2	Not recommended	Not recommended
	3	1h 18m	1h 41m
	4	1h 44m	2h 15m

Properly size the battery system capacity to the inverter to prevent battery damage. Match the battery system's maximum pulse and continuous discharge current to the inverter's maximum surge and input current, respectively. Use only inverters certified to conform to UL 458 or UL 1741.

## Battery Management System (BMS)

See the [Battery Specifications](#) page for complete BMS protection settings.

### Short Circuit Protection

If a short circuit occurs, the BMS disconnects to protect the battery. When the short circuit condition is corrected, the BMS automatically reconnects. If it does not reconnect, a charge is required to reset it.

### Overvoltage Protection

If the charge voltage is higher than 14.6Vdc, the BMS will disconnect to protect the battery.

### Undervoltage Protection

If the battery reaches the minimum voltage of 10 Vdc, the BMS will disconnect to protect the battery. A charge is required within one week to prevent permanent damage that will void the battery warranty. When the battery voltage rises above 12Vdc, the BMS will reconnect. Some chargers will not charge if an open circuit is detected as the BMS has disconnected. We recommend using the Expion360 DC-DC charger or a conventional AC-DC charger to avoid this open circuit problem.

### Overcurrent Protection

The BMS monitors charge and discharge currents to protect the battery. If the charge or discharge current is too high, the BMS disconnects to protect the battery. When an overcurrent condition is corrected, the BMS automatically reconnects. If the BMS does not reconnect, a charge for discharge overcurrent protection or a discharge for charge overcurrent protection is required to reset the BMS. See the [Battery Specifications](#) page for more details.

### Thermal Protection

If the temperature is too high (130°F charging, 140°F discharging) or too low (32°F charging, -4°F discharging) while charging or discharging the battery, the BMS will disconnect to protect the battery. The BMS will automatically reconnect when the temperature is within the acceptable range. See the [Battery Specifications](#) page for more details.

### Cell Balancing

The BMS monitors and prevents each of the four bricks from overcharging. The BMS automatically balances the brick voltage if the individual brick voltages are outside the acceptable range.

## Battery Life

The battery is considered to reach the end-of-life (EoL) when the remaining available capacity is less than 80% of the original capacity. The cycle life of Expion360 batteries is tested at a charge/discharge rate of 0.2C/1C, 77°F, and 100% depth-of-discharge (DoD). Please note that many factors can affect battery cycle life. Using the recommended charge and discharge rates will offer longer battery life.

## Depth of Discharge (DoD)

The cycle life of Expion360 batteries is tested by discharging them to 100% DoD. The optimal window for operating LiFePO<sub>4</sub> batteries is a DoD between 20% and 80%. To accommodate this, slightly oversize the battery system's capacity so that the DoD is about 80% for each cycle. This benefits the batteries and will help prolong the battery life.

### Example:

*In a 12Vdc system, if 300Ah is required for each cycle, a battery system with a 360Ah capacity is recommended.*

## Operating Temperature Range

Operating LiFePO<sub>4</sub> batteries at extremely low or high temperatures will significantly decrease their cycle life. Please ensure the battery system is well-ventilated or cooled during high temperatures and heated at low temperatures. Maximum battery life can be achieved when operating temperatures are as close to 77°F as possible.

## Charge/Discharge Rate

Charging and discharging the battery at higher than recommended rates will generate more heat within the cells. Since temperature is the primary factor affecting the cycle life, consider the charge/discharge specifications regarding ambient temperature extremes when configuring the battery power system. The specifications page at the end of this manual considers both safety and the maximum life cycle when recommending optimal parameters for the battery system.

## Storage Condition

Most users will see their batteries in storage more often than active daily use. To prolong the battery life during periods of storage of one month or longer, please follow storage instructions.

## Storage

Properly storing the battery system between 50% and 80% state-of-charge (SoC) will prolong the battery. Check the SoC on the battery system monitor or Expion360 App.

Before storing, turn off the battery system disconnect switch, and turn off the battery system by pressing the POWER switch on each battery for 5 seconds. Charge the battery system to full before using it after storage.

Please follow the guidelines below for lengths of storage time.

**1 month:** 13.4Vdc, -4°F to 113°F.

**3 months:** 13.4Vdc, 32°F to 77°F

Charge each battery every 3 to 6 months.

### **IF BATTERIES ARE DISCHARGED TO 0% SoC...**

**Immediately** charge the battery system to 80% SoC and confirm that the battery system disconnect switch is disconnected. All batteries using LiFePO4 chemistry will be permanently damaged if discharged to 0% SoC and left for over one week. The warranty excludes coverage for such damage due to the end-user's neglect of the batteries.



## Accessories

The products listed below are compatible with Expion360's Group27 batteries.

**EX-25DC:** Expion360 DC to DC 25A, 14.6Vdc, 2-stage charger.

**EX-TDS001:** Single battery tie-down system for Group27-BCH batteries.

**EX-G24\_27-BUS01-Set:** Aluminum bus bar (efficient to connect batteries).

**EX-G24\_27-BUS02-Set:** Aluminum bus bar (efficient to connect batteries) Extended Length.

**EX-CA201:** Battery system to Victron CAN Bus communication adapter cable

**EX-CA202:** Battery-to-battery communication cable.

## Battery Specifications

	Parameters <sup>1</sup>	EX-G27-12100-BCH	EX-G27-12132-BCH	
<b>General</b>	Nominal Voltage	12.8 V		
	Rated Capacity (@ 0.2C, 25°C)	102 Ah	132 Ah	
	Rated Energy (@ 0.2C, 25°C)	1306 Wh	1690 Wh	
	Internal Impedance (@ 1kHz AC, 25°C)	≤5 mΩ		
	Self-discharge Rate (@ 25°C)	<5% per month		
	Cycle Life <sup>2</sup> (@ 0.2C / 1C, 25°C, 100% DoD)	>4000		
	Max. Parallel Connections (per string/total)	4 / 8		
	Max. Power / Current (per string)	6 kW / 500 A (Max. terminal rating) <sup>3</sup>		
	Communication	Bluetooth, CAN Bus		
	Size, Dimensions (L. x D. x H.) in(mm)	G27, 12.6 x 6.8 x 8.7 (320 x 173 x 220)		
	Weight	30 lb (15 kg)	34 lb (14.0 kg)	
	Case Material and Rating	ABS, IP66 <sup>4</sup>		
Terminal	Brass, M8x1.25, 8 lb-ft (10 Nm)			
<b>Heating</b>	Minimum current	10 A		
<b>Charge</b>	Method	CC-CV		
	Voltage	Max.	14.6 V	
		Protection	14.6 V	
		Protection Release/Float	13.6 V	
	Current	Optimal	20 A	25 A
		Max @ 32°F to 50°F (0°C to 10°C)	20 A	25 A
		Max @ 50°F to 140°F (10°C to 60°C)	50 A	65 A
		Max. Pulse	60 A (3s), 75 A (1s)	80 A (3s), 95 A (1s)
	Protection Release Condition	Auto-recovery every 10 minutes. Lock after 3 consecutive attempts. Discharge to unlock.		
	Temp.	Operating	32°F to 130°F (0°C to 55°C)	
Protection Release		40°F to 120°F (5°C to 50°C)		
Protection Release Condition		Temperature meets protection release conditions.		
<b>Discharge</b>	Voltage	Optimal Shut-off (resting)	12 V	
		Protection	10 V	
		Protection Release	12 V	
	Current	Optimal	50 A	60 A
		Max. Continuous	100 A	120 A
		Max. Pulse	125 A (3s), 150 A (1s)	150 A (3s), 180 A (1s)
		Protection Release Condition	Auto-recovery every 1min, Lock after 3 consecutive attempts. Charge to unlock.	
	Temp.	Operating	-4°F to 140°F (-20°C to 60°C)	
		Protection Release	5°F to 130°F (-15°C to 55°C)	
Protection Release Condition		Temperature meets protection release conditions.		
<b>Short Circuit</b>	Protection	800 A (0.5 μs)		
	Protection Release Condition	Auto-recovery every 1min, Lock after 3 consecutive attempts. Charge to unlock.		
	1 month	50% to 80% SoC, -4°F to 113°F (-20°C to 45°C)		
	3 months and longer	50% to 80% SoC, 32°F to 77°F (0°C to 25°C)		
	Maintenance	Discharge-charge cycle every 3-6 months.		
<b>Certifications</b>		UL 1642 For Cells, File no. MH64383, UN38.3, UN3480		

<sup>1</sup> Measurement tolerance. Voltage/Current: ± 3%. Temperature: ± 9°F (5°C). Time delay: ± 0.5s.

<sup>2</sup> 80% capacity retention.

<sup>3</sup> Highly depends on the size of the ring terminals, cables, and busbars.

<sup>4</sup> The Expion360 SmartTalk™ G27 Battery is splash, water, and dust resistant and was tested under controlled laboratory conditions. Splash, water, and dust resistance are not permanent conditions, and resistance might decrease because of normal wear. Liquid and dust damage is not covered under warranty.

## Warranty

Expion360 online product registration with proof of purchase is required for warranty coverage.

### 12-Year/4000 Cycle Warranty

Expion360 warrants the EX-G27-12100 and EX-G27-12132 batteries sold by Expion360 or any of its authorized dealers, distributors, and OE manufacturers to be free of manufacturer defects in material and workmanship under normal use for 12 years (or 4000 cycles, whichever comes first) from the date of sale as determined by the customer's sales receipt as proof of purchase. Expion360, at its sole discretion, will only repair or replace the battery and/or parts of the battery in question if it is determined to be defective in material and/or workmanship by the Expion360 Technical Support Team. Expion360 reserves the right to deny a warranty claim if the battery is determined, upon inspection, to be at its normal end of life or used improperly, even if within the Warranty Period. Expion360 online product registration is also required for warranty coverage.

### 0-8 Years/2000 Cycles

Within the first 8 years (or 2000 cycles) of the warranty period, subject to the exclusions listed below, Expion360, at its sole discretion, will repair or replace the battery and/or parts of the battery in question if the Expion360 Technical Support Team determines that they are defective in material and/or workmanship.

### 8-10 Years

After 8 years and up to 10 years, if the batteries in question are determined to be defective in material or workmanship, and Expion360 deems the components to be repairable, the battery will be repaired and returned. If Expion360 deems the components not to be repairable, a new, similar battery will be offered at a discount of 40% off the published market price listed at the time of the offer. The offer is valid for 60 days after a representative from Expion360 has contacted the customer with the repairability decision.

### 10-12 Years

After 10 years and up to 12 years (4000 cycles), if the batteries in question are determined to be defective in material or workmanship, and Expion360 deems the components to be repairable, the battery will be repaired and returned. If Expion360 deems the components not to be repairable, a new, similar battery will be offered at a discount of 20% off the published market price listed at the time of the offer. The offer is valid for 60 days after a representative from Expion360 has contacted the customer with the repairability decision.

## Installation

Expion360 recommends a professional installation by a qualified RV, Marine, Golf Cart, or low voltage technician; however, the total warranty applies whether professionally installed or not if installation instructions are correctly followed in the User Manual.

## Non-Transferable

This Limited Warranty is for the original purchaser with proof of purchase only. It is not transferable to any other person or entity.

## Product Return and Shipping

The Product must be returned to Expion360 before authorizing warranty coverage to determine if it is defective. If the product is faulty and determined to be a warranted item, it may be repaired, returned, or replaced as determined by Expion360. Expion360 will cover Continental US ground/freight shipping of the repaired, replacement, and defective batteries within the 0 to 8-year (2000 cycle) full replacement warranty period. If the battery(s) are found to be in good working condition, the customer, dealer, or distributor will be responsible for the cost of shipping the battery(s) back. After 8 years and up to 12 years (4000 cycle), the customer, dealer, or distributor will be responsible for the cost of Continental US ground/freight shipping of the replacement battery(s).

## Battery Storage

Before storing Expion360 lithium batteries for periods longer than 3 months, ensure the batteries are at 50% to 80% state of charge using the Expion360 battery monitor. If the battery is not equipped with a battery monitor, measure the voltage with a multimeter to confirm the state of charge is not below 50%. Do not store batteries below 50% state of charge. Completely discharge and charge the battery bank to 13.4Vdc every 3 to 6 months. Battery specifications can be found in the battery user manual to confirm the measured voltage is within an acceptable range. For further instructions, see the battery user manual. Damage to the battery(s) will not be covered under warranty if the user has failed to adhere to the storage instructions in the battery user manual.

## Water Submersion

Expion360 lithium batteries are not designed to be submerged in water for any length of time and are not intended for use in environments where prolonged water exposure could be reasonably expected. If damage to the cells or BMS is incurred from water ingress into the battery case, the battery is damaged beyond repair and will not be covered under warranty.

## Warranty Exclusions

Expion360 has no obligation under this Limited Warranty for any battery subject to the following conditions (including but not limited to):

- Damage caused by road debris, dropping the battery, or collision (either while installed or object that was struck).
- Damage due to over/undercharging, over-discharging, under-sizing for application, not using surge limiting device in specific applications, and reverse polarity connections.
- Damage due to improper installations: incorrect wire sizing, loose connections, improper parallel and series connections, short-circuit, not maintaining terminals, and oversizing inverters (see owner's manual for proper inverter sizing).

- A battery that has been opened, tampered with, and/or modified.
- Used in any starting application or other application that deep-cycle batteries are not intended for.
- Environmental damage such as water submersion, fire, and extreme weather conditions.
- Improper storage conditions are defined in the battery storage section of this warranty.

## Warranty Disclaimer

THIS LIMITED WARRANTY REPRESENTS THE TOTAL LIABILITY OF EXPION360 FOR ANY BATTERY. ALL OTHER WARRANTIES IMPLIED BY LAW APPLICABLE TO THE BATTERY SHALL BE LIMITED TO THE WARRANTY PERIOD STATED. EXPION360 MAKES NO OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. EXPION360 SHALL NOT BE LIABLE FOR ANY INDIRECT, SPECIAL, INCIDENTAL, OR CONSEQUENTIAL DAMAGES, INCLUDING REMOVAL, SHIPPING, OR INSTALLATION EXPENSES.

The battery owner must cooperate with Expion360 Technical Support Staff or an Expion360 authorized service provider by chat, email, video call, or telephone when troubleshooting suspected battery issues. This may involve performing routine diagnostic procedures, hardware updates, eliminating possible third-party issues, and/or replacing items known to be incompatible with Expion360 batteries. If assistance is required, contact Expion360 technical support, and a technician will provide assistance using online chat, email, video call, or telephone. Expion360 RMA (Return Merchandise Authorization) documentation will be sent to the customer if the product must be returned to Expion360 for testing unless otherwise stipulated by applicable local law. In cases where it is required to return the product for further testing to Expion360, the product must be shipped to Expion360 within fifteen (15) business days. The product must be returned with the associated documentation in the provided shipping material.

## Legal Rights

Some states do not allow limitations on how long an implied warranty lasts or exclusion or limitation of incidental or consequential damages, so the above limitations may not apply to the end user. This warranty gives the end user specific legal rights, and the end user may also have other rights that vary from state to state. This warranty shall be governed by and interpreted by the laws of Oregon. This warranty is understood to be the exclusive agreement between the parties relating to the subject matter hereof. No employee or representative of Expion360 is authorized to make any warranty in addition to those made in this agreement.

