Note: *Product is limited to Rolls distributors in the UK and European Union only.*

Rolls VB-Series LFP Drop-in Battery Operating Manual

BATTERY ENGINEERING

	Recommended safety, installation, operation and troubleshooting procedures for Rolls VB-Series LFP (Lithium Iron Phosphate) drop-in batteries.

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ROLLS VB-Series LFP DROP-IN BATTERIES

Rolls VB-Series drop-in Lithium Iron Phosphate (LFP/$LiFePO_4$) batteries are an ideal replacement for traditional lead-acid batteries of equivalent size & capacity and offer the same quality, reliability and performance found in other Rolls Battery products.

This manual provides detailed instructions for safe and proper installation, operation, and care of Rolls VB-Series LFP drop-in battery models. Please read carefully to clearly understand the operating instructions and any potential safety risks prior to installation.

Failure to install or use this battery as instructed may result in damage to the product that may not be covered under the manufacturer warranty. See warranty terms and conditions for full details.

Note: This manual offers installation, charging and troubleshooting guidance specific to Rolls VB-Series LFP drop-in lithium batteries.

See Rolls S24-2800LFP & S48-6650LFP ESS Battery Operating Manual for usage instructions specific to Rolls S24-2800LFP ESS and S48-6650LFP ESS (Energy Storage System) models.	
See Rolls S48-100LFP ESS Battery Operating Manual for usage instructions specific to that 19” rack mount ESS model.	
See Rolls S48-100LFP STACK-LV Battery Operating Manual for usage instructions specific to that stackable ESS model.	
See Rolls R-Series, S-Series & G-Series LFP Drop-in Battery Operating Manual for usage instructions specific to R-Series, S-Series, and G-Series drop-in models.	

This document is **NOT APPLICABLE** to the following models	
51.2V LFP ESS Models (S48-100LFP ESS)	**51.2V LFP ESS STACK Models** (S48-100LFP STACK-LV)
	
S-Series LFP, G-Series LFP & R-Series LFP (S_ _-_ _ _LFP), (G_ _-_ _ _LFP) & (R_ _-_ _ _LFP)	
	

Nominal voltage of an LFP battery differs from equivalent lead-acid batteries.

LFP Battery	Lead-Acid Battery
Cell Voltage = 3.2V	Cell Voltage = 2.0V
Battery Nominal Voltage 12.8V (4 cells)	Battery Nominal Voltage 12.0V (6 cells)
Battery Nominal Voltage 25.6V (8 cells)	Battery Nominal Voltage 24.0V (12 cells)
Battery Nominal Voltage 38.4V (12 cells)	Battery Nominal Voltage 36.0V (18 cells)
Battery Nominal Voltage 51.2V (16 cells)	Battery Nominal Voltage 48.0V (24 cells)

VERSION HISTORY/CHANGELOG

Rev.	Changelog	Author/Editor	Date
1.0	Release Version – Initial Release	Jordan Torrealba	2026/01/11
1.1	Web Release - (Storage Updated)	Jordan Torrealba	2026/02/11
1.2	Update following delivery (Gauge Table)	Jordan Torrealba	2026/03/17

WARNING: Explosion, Electrocution, Or Fire Hazard

- A battery can present a risk of electric shock, burns, fire, or explosion.
- Ensure cables are properly sized for the system current and cable runs are as short as possible.
- Ensure cables between batteries are of equal length, reducing line inductance and voltage spikes, which can damage the BMS.
- Ensure adequate airflow around batteries and that they are clear of debris, 2cm/1” spacing is recommended.
- Never smoke or allow a spark or flame near the batteries.
- Always use insulated tools.
- Avoid dropping tools onto batteries or other exposed electrical parts.
- Prolonged exposure to cold temperatures can cause significant damage to batteries, proportional to charge and discharge current:
    - Never bypass the heating controls or BMS temperature protections on a VB-Series LFP drop-in battery to charge it below 0°C (32°F).
    - Never discharge a VB-Series LFP drop-in battery below -20°C (-4°F).
- Never charge a battery with a deformed or bulging case.
- Do not expose a Rolls LFP drop-in battery to heat more than 58°C (137°F) during operation, and do not store for extended periods of time above 60°C (140°F). Do not incinerate or expose to open flame.
- If a battery must be decommissioned, always remove the grounded terminal from the battery first. Make sure all connected devices are shut down.
- When installing, leave adequate clearance between batteries. 2cm/1” is recommended.
- When replacing batteries, use the same make, model, and quantity of batteries.
- Do not mix old and new batteries, or batteries with different nominal voltages.
- Avoid dropping batteries during the installation process.
- Do not dismantle or remove the battery components.
- Battery maintenance should only be carried out by qualified personnel under the guidance of Rolls Battery.

STORAGE

Rolls VB-Series LFP batteries have operating and storage temperature limitations. These should be followed to ensure the battery remains in good working order and to prevent the possibility of cell and component damage or failure. Rolls VB-Series LFP batteries include prismatic cell types as well as various electronic components. As a result, storage temperature limits may vary by battery model as outlined.

For optimal performance, Rolls recommends storing VB-Series LFP batteries in ambient temperatures between -5°C (23°F) and 45°C (113°F).

Rolls manufacturer warranty terms for VB-Series LFP drop-in batteries also require storage in temperatures above -20°C (-4°F) and no higher than 55°C (131°F) in line with battery component limitations. Product damage or failure due to extended exposure to temperatures at or outside this range would not be covered under warranty.

STORAGE	TEMPERATURE RANGE
RECOMMENDED	-5°C (23°F) to 45°C (113°F)
COMPONENT LIMIT	-20°C (-4°F) to 55°C (131°F)

Rolls VB-Series LFP drop-in batteries do self-discharge and should be charged once per year, at minimum, when stored for extended periods. For temperatures above 40°C (104°F) the battery should be charged every 3 months as self-discharge rates increase in warmer temperatures. Do not store Rolls VB-Series LFP batteries at temperatures above 55°C (131°F).

Humidity should be between 10% and 90% (non-condensing).

In cold climates, charge/discharge the battery to between 60-80% state of charge, disconnect from any external system, and store the battery off site, above -20°C (-4°F).

For seasonal applications, Rolls VB-Series LFP batteries should not be left connected to an offline system or disconnected and stored in a space where ambient temperatures may fall below the -20°C (-4°F) or above 55°C (131°F).

NOTE: Ensure the breaker and BMS are **OFF** during storage.

TERMINAL TORQUE

Terminal connections must be properly torqued. Rolls VB-Series LFP drop-in batteries using M8 fasteners should be torqued to **6Nm**.

DO NOT OVERTORQUE: In the event of a damaged terminal, do not attempt to repair the terminal. Do not use the battery if the recommended torque cannot be met.

INSTALLATION

VB-Series LFP drop-in batteries **must** be installed upright and may not be installed on a side or upside down. Rolls LFP drop-in batteries must be installed in an indoor space out of direct sunlight.

All installations should consider the ambient temperature. If installed in a region with freezing temperatures or extreme heat, special care should be given. **Not all -20°C (-4°F) environments are created equally**; heat sinks, airflow and other conditions may limit the effectiveness of internal heaters. Insulation and battery boxes should be used where extreme cold is a concern. Rolls VB-Series LFP drop-in batteries will activate heating when charged below 0°C (32°F) and will not be available for charge until the internal cells have reached a temperature over 0°C (32°F). The batteries cannot be charged or discharged below -20°C (-4°F) and bypassing the BMS to do so will severely degrade the internal cells. Similarly, operation above 55°C (131°F) will negatively impact longevity, performance, and safety.

Waking up the Battery

If you have just received your battery, it may have entered a low power sleep mode during transit. In this state, the Bluetooth receiver will be off, and the apparent voltage will be between 2V-10V, waiting to sense an external device. For VB-Series LFP drop-in models, connect a charger or load (of greater than 1A) to “wake up” that unit and enable charging, discharging, and a Bluetooth connection.

During normal operation, sleep mode will activate if the battery has not detected current for 24 hours, or if a low voltage condition is observed, it will enter sleep after 5 minutes. It is recommended to recharge an overdischarged battery within 24 hours to avoid potentially unrecoverable deep discharge conditions.

CABLE CONNECTIONS

All cable connections should be adequately sized, insulated, and undamaged. Connectors should be clean and properly mated with the battery terminals to ensure a secure and low resistance connection. Terminal connections should be torqued to the recommended specification in TERMINAL TORQUE. Although Rolls VB-Series LFP drop-in batteries do not require maintenance such as cell inspection & watering, routine inspection of cabling and terminal connections should be performed semi-annually. Double check torque specification and that lugs cannot be rotated after installation. If the batteries are installed in a high vibration environment, this should be done more frequently.

AMPERAGE (90°C)	25	30	40	55	75	95	130	150	170	195	260
WIRE GAUGE (AWG)	14	12	10	8	6	4	2	1	1/0	2/0	4/0
WIRE AREA (mm^2) (IEC 60228)	2.5	4	6	10	16	25	35	50	70	70	120

Note: Undersized or improperly insulated cables may lead to cable and/or battery damage, charging issues, terminal heating, or fire. The gauge table above is provided for reference only. Always refer to the connector and wire manufacturers’ specifications prior to purchase and installation. Wire area measurements are rounded down from AWG table as reference. For example, 4/0 AWG has a cross-sectional area of 107mm^2, so the nearest available size is 120mm^2.

Like lead-acid batteries, connecting devices (like batteries, inverters, chargers, MPPTs, etc.) at different voltages can result in large current spikes and arcing. Sparking may occur if you are connecting a power supply or charger with high output capacitance, or a discharged inverter with high input capacitance, as the battery rapidly charges the components in the device. Connecting terminals quickly and decisively is recommended for the least component wear and tear or using in-line overcurrent protection devices such as an open breaker, to eliminate arcing.

BMS PROTECTION SUMMARY

Rolls LFP drop-in batteries include a built-in battery management system (BMS) which offers protection in conditions where the battery voltage, current or operating/cell temperature may be unsafe or damaging for the internal cells. The switch architecture of the BMS allows charge and discharge to be stopped independently. Under these undesirable operating conditions, the internal BMS can independently interrupt charge or discharge, or disconnect it fully, as required.

BATTERY LIMIT	PROTECTION	RESET METHOD	COMMENTS
Cell/Pack Overvoltage	Charge Interruption	Automatic reset after time delay (1 minute) or discharge.	If occurring more than 3 times in 2 minutes, discharge is required.
Cell/Pack Undervoltage	Discharge Interruption	Automatic reset after time delay (1 minute) or charge.	If occurring more than 3 times in 2 minutes, charge is required.
Extended Pack Undervoltage (Stored While Empty)	Battery Cannot be Recovered	Always charge VB-Series Batteries within 24 hours of full discharge	
Pack Overcurrent or Short Circuit	Charge *and* Discharge Interruption	Automatically reset after time delay (1 minute)	If occurring more than 3 times in 2 minutes, charge is required.
High temperature at BMS or Cell*	Charge *and* Discharge Interruption	Automatically reset after cooling	
Low temperature at BMS or Cell*	Charge Interruption	Automatically reset after warming	Heating will be activated. Charge will remain disconnected until internal temperature rise is sufficient.
Extreme low temperature at BMS or Cell	Charge *and* Discharge Interruption	Automatically reset after warming	

*Temperatures outside of the ideal operating range require a reduction in charge/discharge current for optimal battery life.

The BMS also has cell-balancing functionality to balance each internal cell to the same state-of-charge, enabling the full pack capacity. However, this is not sufficient to balance severely imbalanced cells with a substantial state-of-charge (SOC) difference, see BATTERY VOLTAGE – CONNECTING IN SERIES/PARALLEL.

CONNECTION LIMITS

CAUTION

Battery strings must be *independently* fused. Fuse rating must be appropriate for voltage of battery string and current limit of connected components.

VB-SERIES MODEL	MAX UNITS SERIES CONNECTION	MAX UNITS PARALLEL CONNECTION
12 VOLT LFP	4 (48V System)	4
24 VOLT LFP	2 (48V System)	4
36 VOLT LFP	1 (36V System)	4
48 VOLT LFP	1 (48V System)	4

Note: Rolls VB-Series drop-in models **cannot** be mixed. Batteries should only be combined in the same capacity, and voltage, from the same product line.

Note: For lithium batteries, parallel batteries are preferred over series strings. Rolls VB-Series drop-in models perform best when connected in parallel. Choosing drop-in batteries at a voltage to match your external equipment is recommended, especially in colder environments where heating functions will be used.

CONNECTING IN SERIES

Rolls VB-Series 12V and 24V LFP batteries may be combined in series strings to achieve higher operating voltages by connecting the positive terminal of one battery to the negative terminal of the next battery. Don't connect different voltages in series. For example, do not connect a 12V and 24V battery to reach 36V, use three (3) 12V batteries instead, or a single 36V battery.

Note: 36V and 48V models may NOT be connected in series.

Example Series Configurations

For **24V** Applications	12V batteries in series - Two (2)	2 x 12.8V = 25.6V
	24V battery in series - One (1)	1 x 25.6V = 25.6V

For **36V** Applications	12V batteries in series - Three (3)	3 x 12.8V = 38.4V
	36V battery in series – One (1)	1 x 38.4V = 38.4V

For **48V** Applications	12V batteries in series - Four (4)	4 x 12.8V = 51.2V
	24V batteries in series - Two (2)	2 x 25.6V = 51.2V
	48V batteries in series – One (1)	1 x 51.2V = 51.2V

Note: Do not connect batteries in strings above 48V nominal.

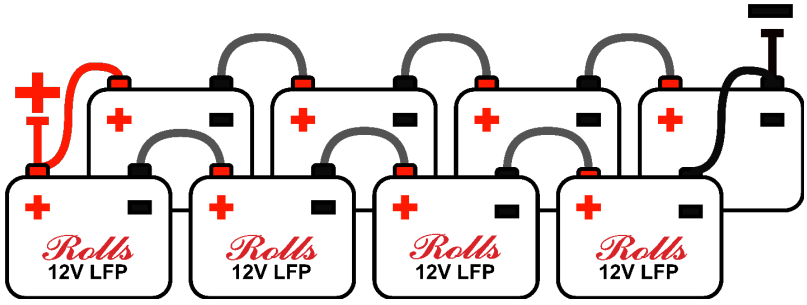
CONNECTING IN PARALLEL

You may combine Rolls VB-Series LFP drop-in batteries of the same model together in up to four (4) parallel strings to increase system capacity.

Refer to the example below showing eight (8) 12V LFP drop-in batteries connected in a 48V configuration; four (4) connected in series and two (2) parallel strings (4S2P). Up to four (4) 48V parallel strings of 12V or 24V LFP drop-in models may be connected. Parallel string configurations greater than 48V in series, four in parallel (4S4P or 2S4P) are not supported currently.

Note: When connecting parallel strings of Rolls VB-Series LFP drop-in batteries of the same model, the recommended current limit increases proportional to the number of parallel strings.

Note: Busbars should be used for all configurations with parallel strings. If an installation cannot accommodate a positive and negative busbar, external connections should be staggered as depicted below:



Note: Strings are independent. External connections should be staggered, i.e., the positive lead is connected to string one, whereas the negative lead is connected to string two.

Note: Keep cabling the same resistance (gauge and length) between batteries and strings to ensure proper current sharing. Attempt to minimize length to reduce the magnitude of inductive voltage spikes at the battery.

Note: Battery strings must be *independently* fused. Fuse rating must be appropriate for voltage of battery string and current limit of connected components.

CAUTION

- Failure to follow the following safety instructions may result in personal injury or damage to the equipment.
- Rolls VB-Series LFP drop-in batteries should be fully charged in parallel before connecting for series cycling, see above.

BATTERY VOLTAGE - CONNECTING IN SERIES/PARALLEL

For initial balancing prior to connecting batteries in series, each battery should be connected in parallel and fully charged (or charged individually) using a 2-stage CC/CV charger at a reduced CV voltage corresponding to the low end of the acceptable charge range (see below), leaving the battery at the absorption/CV voltage for at least 24 hours.

SYSTEM VOLTAGE	12V NOMINAL	24V NOMINAL	36V NOMINAL	48V NOMINAL
RECOMMENDED INITIAL BALANCING VOLTAGE	14.0V	**Balance initially at 12V NOMINAL**		

If you are unable to charge the batteries individually, the voltage of each battery should be within 30mV (0.03V) before putting them in service. This will minimize the severity of a charge imbalance between batteries which results in reduced pack capacity. LFP batteries, even those with similar open circuit voltages may be at drastically different SOC, due to the flat relationship between open circuit voltage and SOC for LFP cells.

Although the BMS provides over-voltage protection to each cell, developing a charge imbalance between batteries is still possible. Disconnecting and fully charging each battery individually once per year if 1 or 2 parallel strings is used, or every 6 months in systems with 3 or 4 parallel strings, is recommended. If the batteries are cycled frequently at high charge/discharge currents this may be done more often.

Absorption time can also help with balancing. For a single string, absorption times of 20-30 minutes is recommended, or up to 60 minutes for 4 strings. See 3-STAGE CHARGING - LEGACY LEAD-ACID SYSTEMS, INVERTER/CHARGER HARDWARE for more information on using legacy chargers with VB-Series LFP.

BLUETOOTH/APP CONNECTIVITY

GET IT ON Google Play

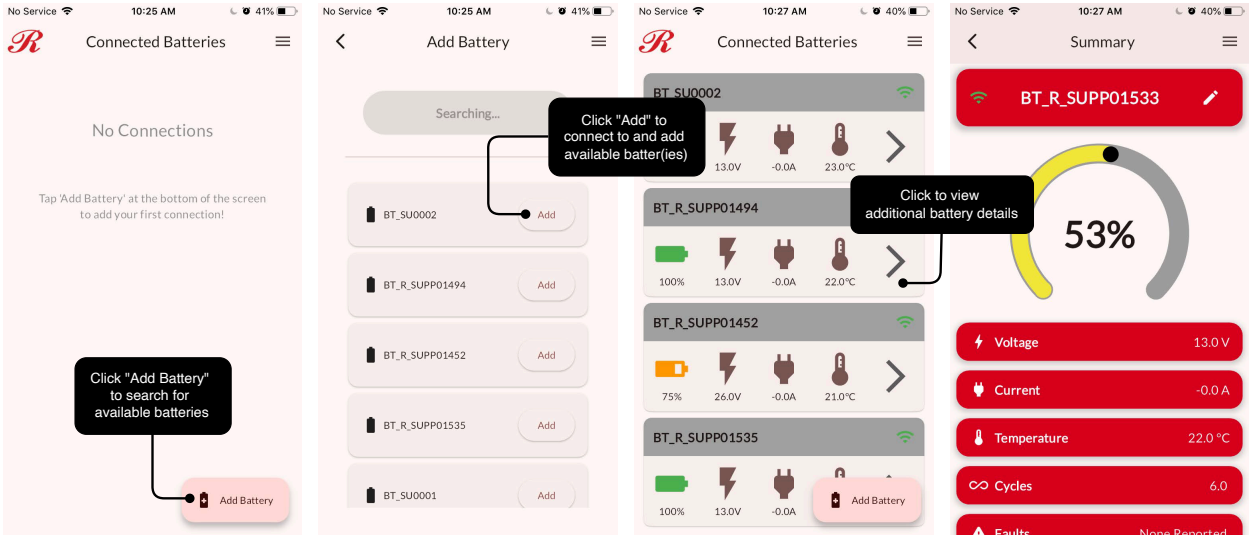
Download on the App Store

Waking up the Battery

This is also discussed above in Waking up the Battery.

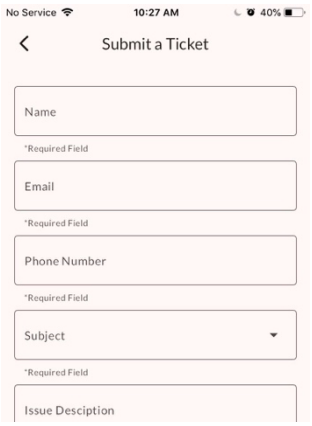
If you have just received your battery, it may have entered a low power sleep mode during transit. In this state, the Bluetooth will not broadcast a signal your device can connect to. For VB-Series LFP drop-in models, connect a charger or load to “wake up” that unit and enable a Bluetooth connection.

Establishing a Connection



Select “Add Battery” to initiate a new battery connection. Using Bluetooth, your device will then search for batteries within signal range. Available batteries will be listed as shown above. If your battery cannot be found, try waking up the battery (above), and ensure no devices which may block or interfere with a wireless signal are nearby. All batteries within range will be listed by the app. If you have multiple batteries to connect to, consult the lasered serial number on the side of the unit to keep track of each battery. Click “Add” for the selected batter(ies). Consider installing them in ascending order, or an order you can easily remember. Bluetooth names may not be sequential but will be unique. Once connected, a battery may be selected from the Connected Batteries list to view additional details.

Dashboard & Support Screens



The main Dashboard screen has a display of estimated state-of-charge (SOC), the connected battery (device ID?), battery voltage, current, internal cell temperature, and any active fault codes.

Using the app, you can also submit a support ticket. When submitted, you will receive email confirmation and be contacted by a member of our Technical Support team regarding your issue. Please provide as much relevant information in your ticket as possible so they can better assist you.

BATTERY CHARGING

Although a lithium-specific charger is recommended, Rolls VB-Series LFP drop-in models are compatible with many common lead-acid battery chargers which operate at the same nominal voltage of the pack. The acceptable charge voltage range and recommended & maximum continuous charge currents are specified on the product label for reference.

Rolls VB-Series LFP drop-in batteries may cycle or be stored in a partial state of charge (PSOC). Rolls VB-Series LFP drop-in batteries should be cycled from 100% state-of-charge (SOC) [0% depth of discharge (DoD)], to 20% SOC [80% DOD] for optimal cycle life. To prevent over-discharge, the BMS will disconnect the battery when the low voltage cut-off is reached, protecting the battery from over-discharge.

Note: Chargers that require the detection of voltage at the battery terminals to charge may fail to wake the VB-Series LFP drop-in battery from a state of under-voltage protection or sleep.

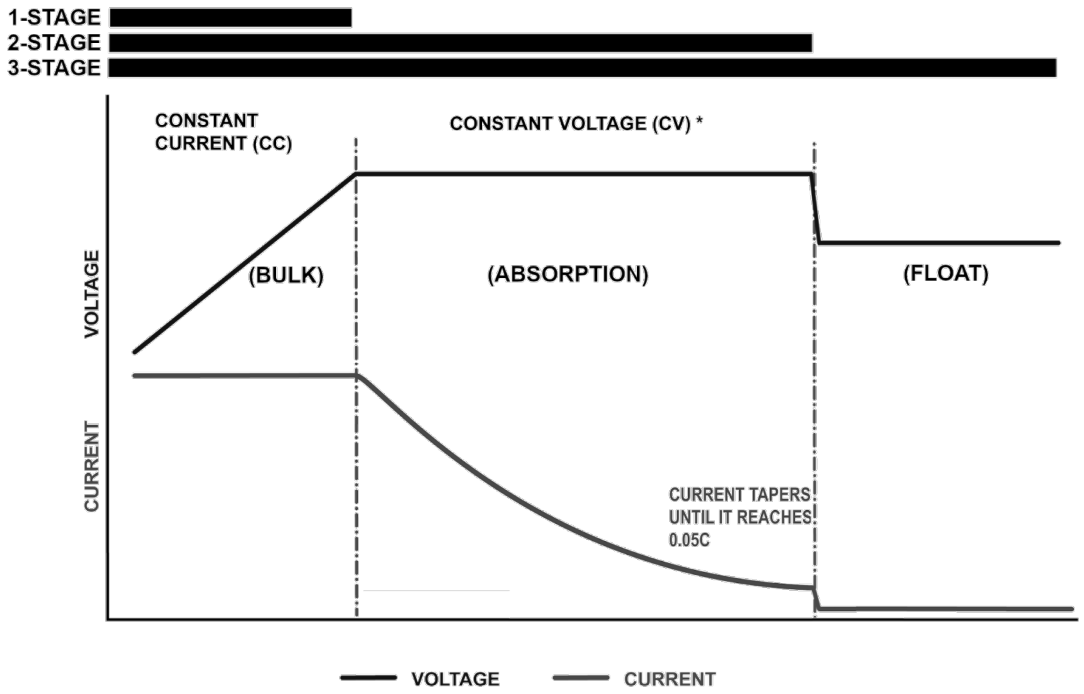
Note: LFP cells do not need maintenance charges like equalization, pulse charge, overcharge, or any others typically recommended or required for lead-acid batteries.

Note: The recommended and maximum continuous charge & discharge currents are specific to each VB-Series LFP drop-in model. These are determined by capacity, cell and BMS technology. Model-specific information is provided on the product label.

CHARGING GUIDELINES

Rolls VB-Series LFP drop-in batteries may be charged in a 1, 2, or 3-Stage charge profile, shown below. The specifics and recommended setpoints for these charge regimes are explained in this section, with the recommended charge profile being a 2-Stage charge.

Representation of 1, 2, and 3-Stage Charging Profiles



Representation of recommended 2-Stage Constant Current/Constant Voltage (CC/CV) charging. The dotted line represents the transition from CC to CV when the voltage limit is reached. Once the battery reaches the constant voltage limit, the battery is held by the charger at this voltage until the current decreases to 0.05C. At this point the battery is at 100% state-of-charge (SOC). Any current continuing to flow in the float stage is attributable to balancing activity of the BMS.

CHARGING SOURCE: ALTERNATOR

Alternators in automotive, marine, and RV applications are typically not designed to tolerate the sudden load changes that can occur during a rapid open-circuit event. This condition may occur if the battery bank disconnects due to a fully charged state, temperature limit, or overcurrent protection triggered by the BMS. When the load is suddenly removed, the alternator's field excitation can produce a high-voltage transient at the output, potentially damaging internal rectifiers or voltage regulation circuitry. To mitigate this risk, it is recommended to install an alternator protection device or intermediary DC charge controller to isolate and protect the alternator in the event of a battery disconnection.

CHARGING SOURCE: LEAD-ACID BATTERY CHARGER

Customers may choose to replace lead-acid batteries with lithium models. Most lead-acid battery chargers may be used to charge Rolls VB-Series LFP drop-in models so long as the charger is properly configured to operate within the recommended charge current and voltage limits.

The pre-programmed voltage settings for AGM or OPzV GEL models may be in line with the recommended LFP drop-in charge voltage settings and may sometimes be used if direct voltage control is not possible for your charger. However, flooded batteries often require higher charge voltage settings than sealed models. If left configured for charging flooded batteries, the higher charge voltage can trigger the BMS to restrict charging to protect the battery, effectively resulting in a 1-stage charge. If this occurs repeatedly, or the charger cannot be configured at a lower charge voltage, it may be necessary to replace the charger for optimal balancing.

1-STAGE CHARGING – CC (CONSTANT CURRENT)

When charging with a single-stage constant current charger, charge at the recommended charge current, by operating temperature, until the battery reaches its termination voltage.

1-STAGE CHARGE PROFILE	
Recommended Charging Current for Optimal Life	
Temperature Range	**Optimal Current**
-20-0°C (-4-32°F)	≤ 0.1C (Parallel only is recommended)
0-10°C (32-50°F)	≤ 0.2C
10-35°C (50-95°F)	≤ 0.5C
35-55°C (95-131°F)	≤ 0.2C

SYSTEM	12V NOMINAL	24V NOMINAL	36V NOMINAL	48V NOMINAL
TERMINATION VOLTAGE	14.4V	28.8V	43.2V	57.6V

Note: 1-Stage CC Charging may be required if charging from a source which is not efficient to run at lower power, such as a generator. However, it may only charge the battery to 90-95% SOC and provide very little time to balance cells. For these reasons, 2-Stage CC/CV charging is recommended to ensure the battery reaches full SOC.

2-STAGE CHARGING – CC/CV (CONSTANT CURRENT/CONSTANT VOLTAGE)

When charging with a two-stage constant current/constant voltage (CC/CV) charger, charge at the recommended charge current, by operating temperature, until the battery reaches the “absorption” voltage or constant voltage (CV) limit. The charger then holds the battery at CV until the charge current decreases to ≤0.05C (termination current).

The recommended absorption (constant voltage) voltage is shown below. If the charger has a pre-set voltage setting or cannot be programmed, an absorption voltage in the range below is also acceptable. Note: lower voltage will lead to longer charge times.

2-STAGE CHARGE PROFILE	
Recommended Charging Current for Optimal Life	
Temperature Range	**Optimal Current**
-20-0°C (-4-32°F)	≤ 0.1C (Parallel only is recommended)
0-10°C (32-50°F)	≤ 0.2C
10-35°C (50-95°F)	≤ 0.5C
35-55°C (95-131°F)	≤ 0.2C

SYSTEM	12V NOMINAL	24V NOMINAL	36V NOMINAL	48V NOMINAL
RECOMMENDED ABSORPTION VOLTAGE	14.4V	28.8V	43.2V	57.6V
ABSORPTION RANGE (ACCEPTABLE)	14.0V – 14.6V	28.0V - 29.2V	42.0V – 43.8V	56.0V - 58.4V
TERMINATION CURRENT	≤0.05C			

Note: If charge time is not a concern within your system architecture, reducing the absorption voltage will increase charge time, but allows the BMS more time to ensure all cells remain balanced. As batteries age, small changes in manufacturing or due to uneven wear may present themselves, requiring more time to maintain balance.

3-STAGE CHARGING - LEGACY LEAD-ACID SYSTEMS, INVERTER/CHARGER HARDWARE

When programming an inverter/charger or charge controller equipment using a 3-stage charge sequence (2-stage with an additional “float voltage” after the charge is terminated), the following charging parameters should be programmed to properly charge Rolls 12V, 24V, 36V & 48V VB-Series LFP drop-in batteries:

3-STAGE CHARGE PROFILE	
Recommended Charging Current for Optimal Life	
Temperature Range	**Optimal Current**
-20-0°C (-4-32°F)	≤ 0.1C (Parallel only is recommended)
0-10°C (32-50°F)	≤ 0.2C
10-35°C (50-95°F)	≤ 0.5C
35-55°C (95-131°F)	≤ 0.2C

SYSTEM	12V NOMINAL	24V NOMINAL	36V NOMINAL	48V NOMINAL
BULK to ABS VOLTAGE	14.4V	28.8V	43.2V	57.6V
ABSORPTION VOLTAGE	14.4V	28.8V	43.2V	57.6V
ABS to FLOAT	≤0.05C	≤0.05C	≤0.05C	≤0.05C
FLOAT VOLTAGE	13.6V	27.2V	40.8V	54.4V

Temperature Compensation: If the inverter/charger or charge controller uses temperature compensation this should be turned off when charging Rolls VB-Series models. Turn off the temperature compensation settings and disconnect the sensor to ensure the correct voltage regulation from the charging device.

Equalization: Equalization should never be used; elevated charge voltages are unacceptable for LFP batteries and will simply lead to the BMS disconnecting the charging path. It should be turned off, or the equalization voltage setpoint should be reduced to the appropriate system float voltage, above.

Some charger models may require additional firmware, programming, or parameters. Please contact your inverter/charger or charge controller manufacturer for assistance with these settings, if required.

CHARGING TEMPERATURE

Due to the chemistry of LFP cells, these batteries cannot accept high charge current at low operating temperatures without cell damage and permanent capacity loss.

Rolls VB-Series LFP drop-in batteries may be safely charged between 0°C to 55°C (32°F to 131°F), and as low as -20°C (-4°F) with heating active (charge may be delayed as the heater warms the battery). However, because cycle wear is accelerated below 10°C (50 °F), the charge should be limited to 0.2C (20% of battery capacity) for optimal longevity. Similarly, at high temperatures, charge current should be limited to 0.2C when operating at temperatures from 35°C to 55°C (95°F to 131°F) as noted below.

Rolls VB-Series LFP drop-in batteries may be charged at lower temperatures due to their internal heating. This allows them to compensate for external temperatures down to as low as -20°C (-4°F). If the batteries are typically charged at low temperatures [-20-0°C (-4-32°F)], proper insulation is required to keep the batteries at their warmed temperature. It is recommended to avoid series configurations when heating will be commonly used or consider auxiliary balancing such as a multibank charger or external charge shuttlers. LFP batteries without battery-to-battery communication always perform better in parallel.

To maintain optimum performance and durability of Rolls VB-Series LFP batteries, the following charge current limits should be followed:

TEMPERATURE	RECOMMENDED CHARGE CURRENT
0-10°C (32-50°F)	≤ 0.2C
10~35°C (50-95°F)	≤ 0.5C
35~55°C (95-122°F)	≤ 0.2C

The recommended and maximum continuous charge current is specified for each VB-Series LFP drop-in model as a function of capacity, cell and internal BMS. This information is noted in the model specifications and on the battery label.

RECYCLING

Rolls VB-Series LFP drop-in batteries should be properly disposed of at an authorized lithium recycling facility. Do not remove product labels and/or recycling information from the battery case.

The battery should be fully discharged before disposal. To prevent a possible short circuit or explosion, the terminals should be covered with a protective cap or non-conductive tape before disposal.

LFP GLOSSARY

Amp, Ampere

Unit of electrical current. Abbreviated “A”.

Amp-Hour

Unit of electrical energy, one amp of current flowing for one hour. Abbreviated “Ah”.

BMS (Battery Management System)

The BMS, or Battery Management System, is an electronic device which protects the cells inside a battery. The BMS used in Rolls LFP batteries protects them from unsafe voltage, current, and temperature conditions. It keeps cells balanced to ensure pack capacity is maintained. A BMS is required for any lithium-ion battery system with series-connected cells due to the safety requirements and performance characteristics of the cells.

C-Rate

Battery charge and discharge rates are often described as a “C-Rate”, defined as:

$$C - Rate = \frac{(Rated\ Capacity)}{(Charge/Discharge\ Current)}$$

For example, if a 100Ah battery was charged at 50A, but discharged at 100A, it would be charged at a rate of C/2 and discharged at a rate of C. This rate is independent of system voltage.

Cell

A single battery, independent of chemistry. Each cell is at the base voltage for the given chemistry; 2.0V for flooded lead-acid, 3.2V for lithium iron phosphate. Many cell form factors exist, resulting in different capacities and performance characteristics. These may be combined in series to form a battery of higher voltage.

CC/CV (Constant Current / Constant Voltage)

The typical charge profile of a LFP battery. CC/CV or Constant Current/Constant Voltage charging is a 2-stage charge, first at constant current until the battery voltage reaches a given limit, and then at constant voltage as the current accepted by the battery naturally reduces until the battery is full.

Cycle

A “cycle” is a somewhat arbitrary term used to describe the process of discharging a fully charged battery down to a particular state of discharge. For Rolls VB-Series Batteries, a cycle is defined as 90% depth of discharge or going from full charge down to 10% state-of-charge.

Cycle Life

The total energy throughput of a battery, defined in terms of the amount of equivalent charge/discharge cycles it can withstand before its effective capacity is reduced to a certain amount, usually 80% of original/rated capacity.

LFP (Lithium Iron Phosphate)

LFP, or Lithium Iron Phosphate is a specific type of Lithium-ion battery chemistry. Referring to the cathode material of the battery, this chemistry is characterized by its long cycle life, long calendar life and safety, in overcharge conditions, compared to other battery chemistries.

SOC (state-of-charge)

State-of-charge (SOC) represents the fullness of the battery from 0%-100%.

Volt

The unit of electrical potential or “pressure”. For the LFP cell chemistry, these are multiples of 3.2V, sometimes simplified to 12V, 24V and 48V to match with compatible lead-acid system.

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