

GREENROCK BATTERY

INSTALLATION & OPERATION MANUAL



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The information in this document is subject to periodic updates and changes. Upon any updates or changes to the above-described material, BlueSky Energy will provide new drawings and/or associated documentation that will supersede those contained in this document. Contents are subject to change without notice.

For the latest product documentation, email us at office@bluesky-energy.eu

Symbols in this Document



WARNING

indicates a hazardous situation that, if not avoided, could result in death, injury, or damage



ATTENTION

indicates information that is important but not critical to safety

INTRODUCTION ABOUT THIS MANUAL

This manual is intended to provide technical information and safe practices regarding receiving, installing, and operating the GREENROCK Saltwater battery.



WARNING

Failure to follow the instructions in this document could result in fire, electric shock, and/or other injury or damage.

CONTACT INFORMATION

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PRODUCT INFORMATION

Product Overview

Saltwater batteries use non-toxic, non-corrosive materials to make one of the world's cleanest and most sustainable electrochemical storage solution. Saltwater batteries provide long-duration, stationary storage for residential solar, off-grid, microgrid, and energy management applications.

Product Specification

Voltage curves, operational efficiency, capacity by charge and discharge currents, standards compliance and certification status, and more information can be found on the Product Specification Sheet for your battery model.

SAFETY INFORMATION

Only qualified individuals are to install and service battery systems.

Electrical Hazards

Never place foreign objects or tools in or on the unit. The metal parts of the battery terminals are always live. Electrical hazards exist in the voltage and current ranges that are found in battery systems and associated electronics.



WARNING

Connecting Saltwater batteries in series can lead to dangerously high voltages. BlueSky must review any series configurations of Saltwater batteries prior to installation. Never connect Saltwater 24V-Stack or 48V-Stacks batteries in series. When connecting Saltwater batteries in parallel, BlueSky recommends placing overcurrent protection devices as close as possible to the DC bus.

Electrical Safety

The batteries must be protected from overcurrent charge and discharge with appropriately rated overcurrent protection devices.

<i>Battery Model</i>	<i>Max. Recommended Charge/Discharge Current</i>
<i>BA-S1-48</i>	20 A
<i>BA-S1-24</i>	40 A
<i>BA-S1-12</i>	20 A

Chemical Hazards

Saltwater battery materials are non-toxic and present no chemical hazards. The electrolyte is sodium-sulfate-based saltwater with a neutral pH. In the unlikely event that the electrolyte comes in contact with eyes or skin, thoroughly wash it out with water.

Electrolyte residue on the battery terminal can be wiped away with a cloth. A collection pan under the battery stack or module is not needed as the electrolyte will not leak during normal operation, and any leaked electrolyte will not damage battery surfaces or equipment. Refer to the Safety Data Sheet (SDS) for more information.

Gas Emissions

The battery may emit trace amounts of gas H₂, O₂, CO₂, and CO during normal operation. These gases do not accumulate in hazardous quantities in typical installations when the batteries are installed and operated in accordance with the guidelines of this document. The battery has fully passed UL 1973 overcharge testing, an abuse test that includes monitoring for combustible vapor concentrations. Overcharging the battery (outside of specified guidelines) will result in venting of some incremental amounts of the gases listed above through the pressure relief valve.

Weight Hazards

Saltwater batteries must be transported and handled with appropriate precautions.

One Stack weights 140kg!

Decommissioning Hazards

GREENROCK batteries are non-toxic and non-corrosive. Do not dump into any sewers, on the ground, or into any body of water where water runs off into open bodies of water. Dispose of according to all federal, state, and local regulations.

Delivery Inspection

Immediately upon delivery, inspect all hard goods for signs of damage or tipping during transit before signing for the delivery. Any of the following may indicate damage during transport:

- Damaged or torn packaging
- Scraped or punctured product components

Leaking electrolyte (clear liquid)

If you find damage, document any signs of damage on the bill of lading before accepting the shipment. Separately document and photograph all damage and make a claim with the carrier as soon as possible. Contact your distributor immediately.

Disassembly Hazards



WARNING

Do NOT attempt to disassemble Saltwater batteries. Do NOT remove the nut on the compression fixture on top of the battery.

Saltwater batteries have been compressed to optimize performance. Releasing this load could result in poor battery performance, permanent damage to battery components, and/or injury.

INSTALLATION



ATTENTION

Saltwater batteries ship at low state of charge and low voltage

Unpacking

Unpack all items carefully and note quantities received. Contact your authorized GREENROCK distributor if any items are missing or damaged.

Site Requirements

Exposure and Enclosure

Saltwater batteries should be installed indoors or enclosed from the elements. A fully sealed enclosure is not recommended.

Install and operate Saltwater batteries out of direct exposure to sunlight. Prolonged exposure to ultraviolet light may damage the polypropylene casing and reduce product lifetime.

Size and Weight

Position Saltwater batteries only on surfaces appropriately rated for the product's weight. Ensure that the installation location is large enough to contain the battery product.

Battery Model	Height	Width	Depth	Weight
BA-S1-48	929 mm	329 mm	313 mm	140 kg
BA-S1-24	929 mm	329 mm	313 mm	140 kg
BA-S1-12	235 mm	321 mm	313 mm	35 kg

Ventilation

In typical residential installations, it is likely that existing household ventilation is adequate for the Saltwater batteries. If existing ventilation is unknown, or for applications where the batteries are installed into smaller or more sealed spaces (enclosures, shipping containers, etc.), BlueSky recommends installing ventilation per regional guidelines for battery rooms. For example, in North America, IBC and/or NFPA 1 guidelines recommend that all battery installations in enclosed spaces include ventilation equal to either six (6) air changes per hour or ventilation at 1 cubic foot per minute (CFM) per square foot of room size. In Europe and other locations, EN 50272 guidelines recommend that batteries be installed in well-ventilated rooms where ventilation corresponds to battery capacity and the exhaust air is discharged outside the building.

Humidity

Install Saltwater batteries in clean, ordinary conditions protected from water exposure. Direct exposure of Saltwater batteries to water may cause shorting. The batteries may be installed in humid or coastal regions with atmospheric salt.

Ambient Temperature

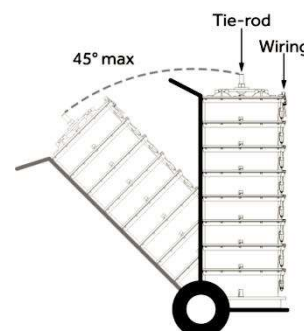
Saltwater batteries must be operated in temperatures between -5°C and +50°C. Operation above or below these limits will cause advanced degradation of the battery chemistry. Saltwater batteries must be stored in temperatures between -5°C and +50°C. Storage above or below these limits may permanently damage the batteries.

Moving

Use proper lifting procedures and personal protective equipment when moving Saltwater batteries. Use a crane, hoist, or similar device of appropriate load-bearing capacity to lift one Saltwater stack at a time by the lifting eye.

NEVER LIFT THE SALTWATER STACK PRODUCTS BY THE TERMINALS OR ANY PART OTHER THAN AN APPROPRIATELY RATED LIFTING EYE THREADED ONTO THE TIE-ROD AS THIS WILL VOID THE WARRANTY AND MAY CAUSE DAMAGE TO THE PRODUCT AND/OR SIGNIFICANT INJURY.

Alternatively, use an appropriately sized hand truck to move the Saltwater batteries. Position the battery on the hand truck so that the wiring faces out, away from the upright frame of the hand truck. During movement to the installation site and during installation, batteries may be tilted up to forty-five (45) degrees for up to one hour. Before moving any Saltwater batteries, ensure that the travel path will not require tipping the battery more than forty-five (45) degrees and that the installation location is level.

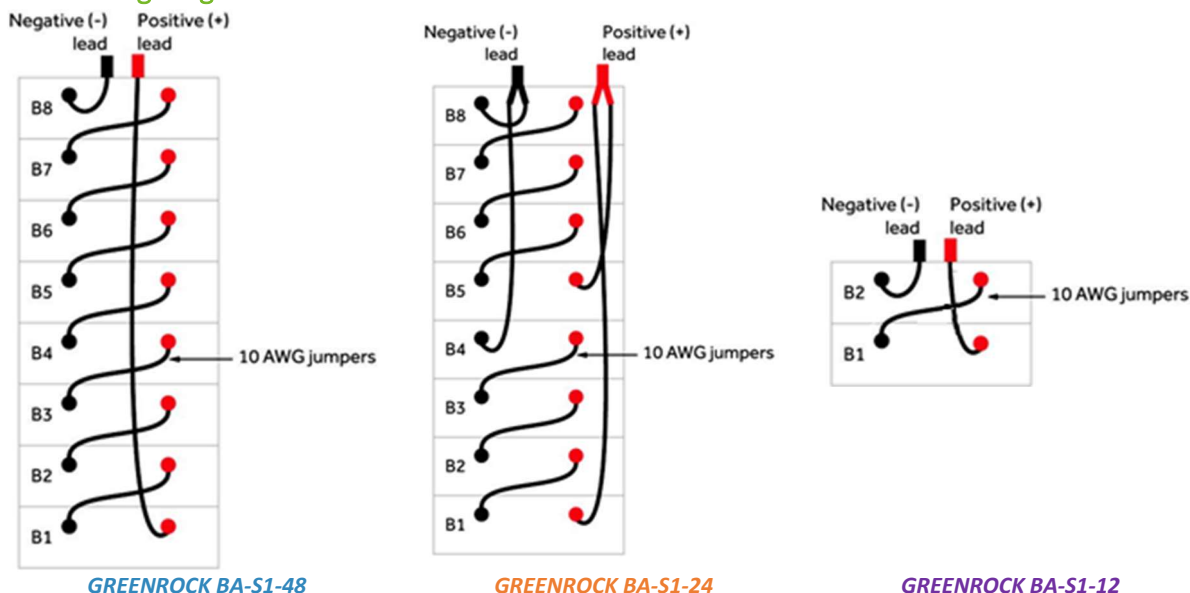


ELECTRICAL INTEGRATION

Electrical Interfaces and Connections

Saltwater 12V, 24V and 48V battery terminals are standard MC4 solar connectors (battery pictured below). BlueSky Energy does not supply their mating connectors. Find details on the battery terminal parts.

Product Wiring Diagrams



Parallel Wiring

Always consult local code and regulations when wiring an electrical system. The following are only select examples of how to wire together Saltwater batteries in parallel. BlueSky strongly recommends fused configurations for battery products in parallel.

48V and 24V Stack

Saltwater 48V and 24V Stack batteries are designed to be connected **only** in parallel configurations with appropriate branch fusing.

12V Stack

Saltwater 12V Stack batteries are designed to be connected in parallel and serial configurations with appropriate branch fusing.

Be aware that the maximum number of serials connected batteries is 4 pcs which correlates to a 48V string voltage.

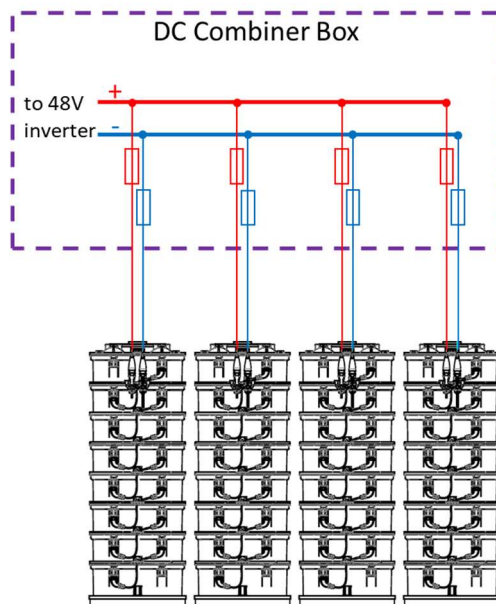
Overcurrent Protection

Systems should be protected in accordance with local codes and regulations and the parameters in the table below:

Battery Model	Continuous Current Limit	Short Circuit Current Interrupt Capability (with installation-appropriate voltage rating)
GREENROCK BA-S1-48	<20 A	140 A
GREENROCK BA-S1-24	<40 A	240 A
GREENROCK BA-S1-12	<20 A	140 A

Wiring Example

Please see below an example on how a DC-combiner box can look like



COMMISSIONING

Initial Charge

Saltwater batteries are shipped with a low state of charge (SOC) and a low voltage. If the initial voltage is insufficient for charging power electronics, the batteries can be charged using a battery charging device set to the operating limits of the Saltwater battery as defined in the latest Product Specification Sheet, available from BlueSky-Energy. Use only power supplies designed to charge batteries. Most DC power supplies are not designed to charge batteries and lack sufficient reverse current protection.

During its initial charge cycles, the battery may accept more energy than its nominal energy capacity before it reaches its maximum voltage. This is the normal conditioning process that occurs in the battery. A specific conditioning procedure is not required.

Voltage Matching

If Saltwater batteries are to be wired in parallel, match the voltages of all batteries within the limits listed below before connecting individual batteries together:

Battery Model	Max. Recommended Voltage Difference
GREENROCK BA-S1-48	5 Vdc
GREENROCK BA-S1-24	2,5 Vdc
GREENROCK BA-S1-12	1,2 Vdc

Take care when “live parallel bussing” batteries with unequal open circuit voltages (OCV). The high impedance of the Saltwater battery limits its short-circuit current. However, connecting batteries with voltage differences greater than those listed above can damage the batteries and unbalance the system.

Configuring Inverters and Charge Controllers

Saltwater batteries work with nearly all off-the-shelf inverters and charge controllers designed for 12 V, 24 V or 48 V residential energy storage systems.

OPERATION

To maximize the performance and longevity of Saltwater batteries, follow the operation guidance presented below. Failure to operate the batteries within these limits may damage the batteries, degrade their performance, shorten their life, and void the product warranty.

Operational Limits

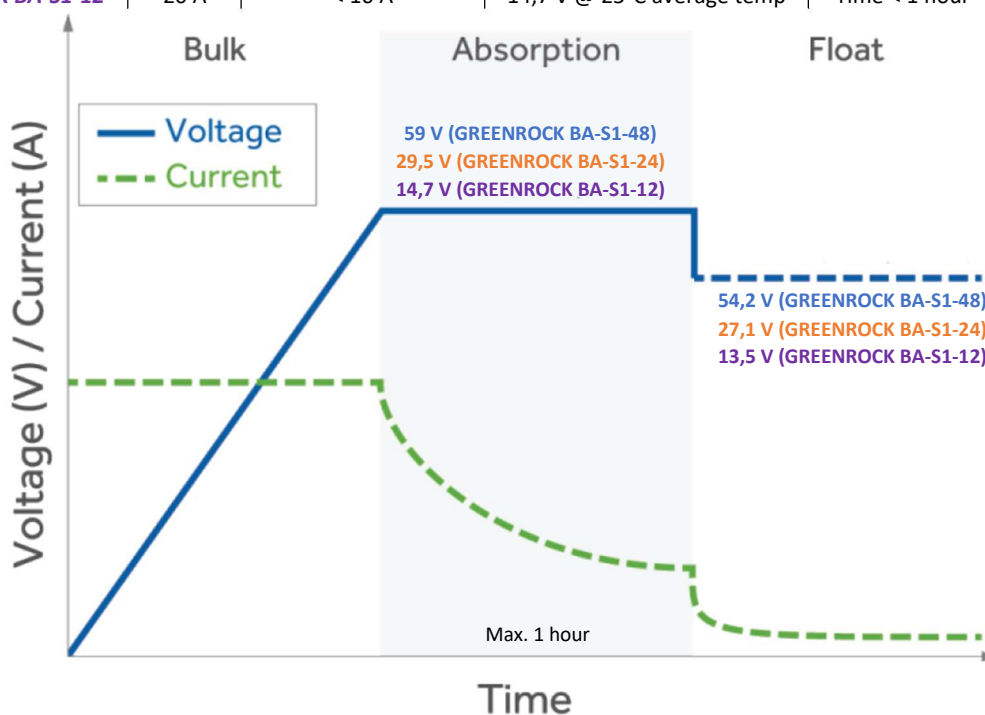
Battery Model	Max. Recommended Charge or Discharge Current	Voltage Range (operation after initial charge)	Ambient Temperature (24-hour average)
GREENROCK BA-S1-48	20 A	36 – 60 V	-5°C to +50°C
GREENROCK BA-S1-24	40 A	17,5 – 30 V	-5°C to +50°C
GREENROCK BA-S1-12	20 A	8,8 – 15 V	-5°C to +50°C

Charge Profiles

For clarity, the charge profiles include the lead acid charge terminology of bulk, absorption, and float, though they are not strictly correct for the GREENROCK chemistry. Please find the charge profile below for clarity.

Recommended Charge Profile

Battery Model	Max. Current	Recommended Bulk Current	Max. Bulk Voltage	Absorption Cut-Off	Float
GREENROCK BA-S1-48	20 A	< 10 A	59 V @ 25°C average temp	Time < 1 hour	54,2 V
GREENROCK BA-S1-24	40 A	< 20 A	29,5 V @ 25°C average temp	Time < 1 hour	27,1 V
GREENROCK BA-S1-12	20 A	< 10 A	14,7 V @ 25°C average temp	Time < 1 hour	13,5 V



Discharge Profiles

Recommended Discharge Profile

Battery Model	Max. Current	Recommended Discharge Current	Min. discharge Voltage
GREENROCK BA-S1-48	20 A	< 10 A	35 V @ +25°C average temp
GREENROCK BA-S1-24	40 A	< 20 A	17,5 V @ +25°C average temp
GREENROCK BA-S1-12	20 A	< 10 A	8,8 V @ +25°C average temp

LONG-TERM STORAGE

If Saltwater batteries are to be stored for an extended period of time, remove all signal and power connections to prevent unintended self-discharge and undetected ground faults. Keep any grounding in place. To avoid permanent damage, store products in the following conditions:

- between -5°C and +50°C
- indoors or protected from sun and water

RECYCLING AND DISPOSAL



ATTENTION

Follow all applicable recycling and disposal regulations.

Saltwater batteries are non-toxic and non-corrosive. Do not dump into any sewers, on the ground, or into any body of water where water runs off into open bodies of water. Dispose of according to all federal, state, and local regulations.

MAINTENANCE

GREENROCK batteries do not require maintenance. BlueSky Energy recommends maintaining proper system documentation records. These include a single-line diagram of the complete system and a log documenting system setting (inverter, charge controller, charge voltages, etc.). However, we recommend keeping the following records:

- Complete AC and DC single-line system diagram
- System component settings for charge voltage and current settings

Record Keeping

BlueSky Energy recommends maintaining proper and regular operating records of battery temperatures, maximum and minimum operating voltages, and maximum currents.

Measurement	Frequency
Battery temperature	Logged at least every hour
Battery voltage	Logged at least every hour
Battery current	Logged at least every hour

TECHNICAL SUPPORT

If you need technical support, visit us on our website at www.bluesky-energy.eu or email us at office@bluesky-energy.eu.

If you purchased your batteries from an authorized GREENROCK dealer, please contact the dealer for assistance.

If you require immediate assistance AND if you purchased your products directly from BlueSky Energy, call our support line at +43 720 01 01 88. Please have your BlueSky Energy order number ready.