Breeze

2023

USER MANUAL
ION BREEZE BATTERIES

VERSION 1.0.2

BREEZE ENERGIES

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Breeze

Contents

1. PRECAUTIONS

- Please follow the instructions in this manual and keep a copy of it near the battery in case you need to use it in the future.
- The Material Safety Data Sheet for hazardous substances can be downloaded from the "Material Safety Data Sheet" menu on the manufacturer's website.
- Only qualified personnel are authorized to carry out work related to the lithium battery. employees.

1.1 GENERAL WARNINGS

- When working with a lithium battery, wear protective glasses and clothing.
- Any battery material, such as electrolyte or powder, that has come into contact with skin or eyes, should be removed immediately using a large amount of clean water. Then seek medical advice. Liquid spilled on clothing should be rinsed with water.
- Explosion and fire hazard. In case of fire, use a D-type powder or CO2 fire extinguisher.
- The battery terminals are live during normal operation, therefore do not place metal objects or tools on the battery.
- Insulated tools should be used.
- Do not wear any metal objects, such as watches, on your hands or wrists. bracelets, etc.
- Short circuits, very deep discharges and excessive charging currents or discharge.
- The battery casing must not be opened or its components disassembled. If the battery casing is damaged, do not touch exposed electronic parts or cells.
- Lithium batteries are heavy. To prevent muscle strain or back injuries, When installing or removing batteries, use lifting equipment and appropriate precautions lifting techniques.
- Ensure proper and safe installation and always use the appropriate equipment for transport.
- Be careful as the lithium battery is sensitive to mechanical damage.
- A damaged battery must not be used.
- Water has a harmful effect on the battery. A damaged battery should be removed from service and further advice should be sought from the manufacturer.

1.2 WARNINGS FOR CHARGING AND DISCHARGE

- Overcharging or over-discharging will cause serious damage to the lithium cell, which may be associated with the fact that its further use will be dangerous. Therefore, it is mandatory to use devices that control the operation of the cells. ION BREEZE batteries are equipped with an integrated BMS system, which protects the battery cells in the normal operating state.
- When charging a lithium battery after it has been discharged to a level below the “voltage discharge cut-off" or if the lithium battery is damaged or overcharged, it may release a harmful mixture of gases, e.g. phosphates.
- The temperature range in which the battery can be charged is from 0 °C to 55 °C. Charging the battery at temperatures outside this range may result in serious damage to the battery or shorten its life.
- The temperature range in which the battery can be discharged is from -10 °C to 55 °C.

Discharging the battery at temperatures outside this range may result in serious damage to the battery or shorten its life.

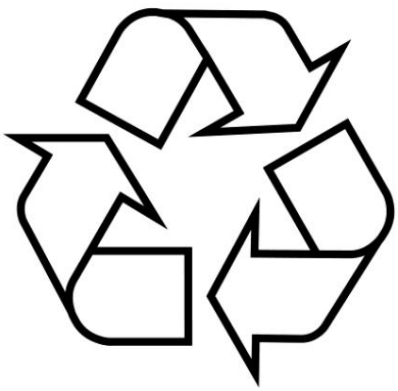
• The temperature range in which the battery can be stored is from -40 °C to 60 °C.
The optimal storage temperature is between 5°C and 15°C.
Storing the battery at temperatures outside this range may result in serious damage to the battery or shorten its life.

1.3 TRANSPORT WARNINGS

• The battery must be transported in its original or equivalent packaging and in an upright position.
If the battery is in a cardboard box, use soft straps to prevent it from damage. Make sure that none of the packaging materials conduct electricity electric.
• Cartons or crates used to transport lithium batteries must be marked approved warning label.
• When lifting the battery, do not stand underneath it.
• Do not lift the battery by holding it by the terminals or cables.
• Batteries are tested in accordance with the UN Manual of Tests and Criteria, Part III, Subsection 38.3 (ST/SG/AC.10/11/Rev.5).
• In terms of transport, batteries belong to the category UN3480, Class 9, Packing Group II and must be transported in accordance with the rules set out in the aforementioned regulation.
This means that for land and sea transport (ADR, RID and IMDG) they must be packed in accordance with packing instruction P903 and for air transport (IATA) in accordance with packing instruction P965.
The original packaging meets the requirements set out in these regulations.

1.4 DISPOSAL OF LITHIUM BATTERIES

• Batteries must not be thrown into fire.
• Batteries must not be disposed of with household or industrial waste.
• Batteries marked with the recycling symbol should be disposed of by a specialized company. recycling company. After agreement, they can be returned to the manufacturer.
• ION BREEZE batteries comply with EU ROHS 2011/65/EU regulations.



2.1 DESCRIPTION

ION BREEZE batteries are lithium iron phosphate (LiFePO4 or LFP) batteries available in nominal voltages of 12.8 V, 25.6 V or 51.2 V with various capacities. This is the safest of the popular lithium battery types, preferred for very demanding applications.

2.2 CHARACTERISTICS

Integrated cell balancing, temperature and voltage control system

The battery is equipped with a battery management system (BMS) in which the balancing, temperature and voltage control system is integrated. The BMS monitors all battery cells individually, balances the cell voltages and generates alarms in the event of high or low cell voltage or high or low cell temperature. This alarm will be displayed in the "Alarms" drop-down menu in the BREEZE BMS mobile application after connecting to the battery. (or in the form of push notifications depending on the application version and the permissions granted to it).

Monitoring and control via Bluetooth and the BREEZE BMS app

- Battery monitoring is performed entirely via Bluetooth and the BREEZE BMS app.
- View battery parameters, e.g. information on cell status, voltage and temperature, is possible in real time.
- ION BREEZE lithium batteries can **only be connected in parallel,** so you can build battery for system voltages of 12 V, 24 V or 48 V. The maximum number of batteries in one system is not limited.

QR link: OS Application Android

QR link: iOS/macOS app

DO NOT CONNECT BATTERIES IN SERIES!

Other information

- More than 3000 charge and discharge cycles (90% DOD).
- High energy density – greater capacity with less weight and volume (three times less weight compared to lead-acid batteries).
- High charge and discharge currents, enabling fast charging and discharging (up to ten times greater charging current compared to lead-acid batteries).

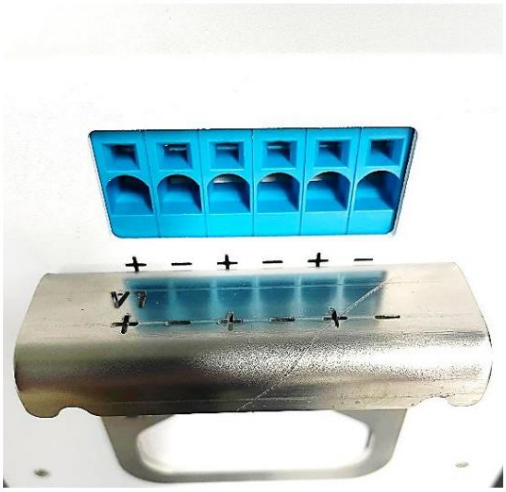
3. ASSEMBLY

3.1 UNPACKING AND HANDLING THE BATTERY

- Be careful when unpacking the battery.
- Batteries are heavy. Do not lift the battery by its terminals or cables.
- The battery is equipped with a carrying handle.
- For information on battery weights, see Chapter 7. “Technical Data”.
- Familiarize yourself with the structure of the battery.
- The main battery terminals are marked with a “+” symbol for the positive terminal and a “-” symbol for the negative terminal of the battery to help ensure correct polarity.
- When working on the battery, take special care not to damage it.
  cause the poles to short-circuit.

CONNECTOR

HANDLE



3.2 YOU NEED TO DOWNLOAD AND INSTALL THE BREEZE BMS APPLICATION

The BREEZE BMS app for Android, iOS or macOS can be downloaded from the respective app stores. For more information about the app, please see the product page. The BREEZE BMS app communicates with the battery via Bluetooth.

QR link: OS Application Android

QR link: iOS/macOS app

3.3 PRE-CHARGING THE BATTERY BEFORE USE

3.3.1 WHAT IS THE PURPOSE OF CHARGING THE BATTERY BEFORE USE?

When shipped from the factory, lithium batteries are only about 50% charged. This is required to ensure safety during transport. However, due to differences in transport times and storage conditions, batteries do not always have the same charge at the time of installation.
The built-in battery cell balancing system is only able to correct small differences in charge. The charge level of individual new batteries may vary significantly.
It is important to remember that differences in the state of charge between batteries are not the same as an imbalance in the voltage of the cells in the battery. This is because the circuits that balance the cells in one battery cannot affect the cells in another battery. For more detailed information on cell balancing, refer to the section "CELL BALANCING".

3.3.2 HOW TO CHARGING THE BATTERIES BEFORE USE

Preload procedure:

1. For charging, please use a dedicated charger or inverter/charger. Only
   A single battery or a set of batteries connected in parallel can be charged as one.

2. Set the charger to the charging profile as described in the "CHARGER SETTINGS" section.
3. Check the battery status: ON/OFF via BREEZE BMS APP.
4. Turn on the charger and check if the charger is charging the battery.
5. Please note that if there is an imbalance between the cells during charging,
   battery, the BMS may repeatedly turn the charger off and on. You may notice that the charger turns off for a few minutes, then turns on again for a short time, and then turns off again.
   This pattern will repeat until the cells are balanced. Once the cells are balanced, the charger will operate continuously until the battery is fully charged.
6. The battery is fully charged when the charger reaches the maintenance charge state
   (FLOAT) and the voltage difference between the individual battery cells will be less than 0.1 V.

3.4 ASSEMBLY

The following requirements must be met during installation:

- The battery must be mounted in a vertical or horizontal position.
- The battery is only suitable for indoor use and must be installed in a
  dry place.
- Batteries are heavy. When carrying the battery to its final location, use an appropriate
  transportation equipment.
- The battery must be installed in a vehicle in a proper and safe manner, because in the event of a collision
  road can move with very high energy.
- Batteries produce some heat when charged or discharged.
  Please maintain a minimum of 20 mm of free space at the top of the battery to allow for free
  air flow.

3.5 CONNECTING THE BATTERY CABLES

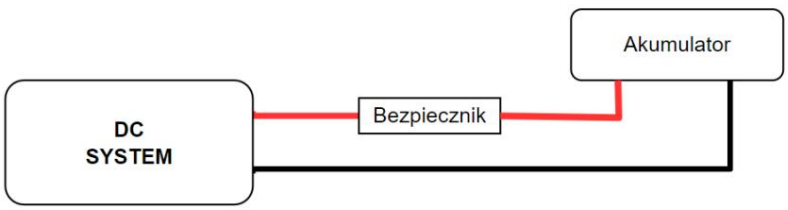
- **When connecting the battery terminals to the DC mains or other batteries, pay attention to the polarity of the battery.**
- **Be careful not to short circuit the battery terminals.**
- The batteries are equipped with an integrated connector with a spring clamp allowing connection of wires with a maximum cross-section of 16 mm2 to each connector terminal.
- Always use insulated tools when connecting cables to the battery and connecting battery banks.

3.5.1 CROSS-SECTION OF WIRES AND FUSE RATINGS

- Copper wires with a cross-section corresponding to the maximum currents to be handled should be used. can be expected in a battery system.
- Batteries can produce very high currents; all electrical connections to the battery must be protected with a fuse.
- The battery connection cables should be selected in such a way that they carry the maximum expected current in the installation. A fuse with parameters appropriate for the maximum expected values of the parameters (I [A] and U [V]) of the system operation should be used.
- When selecting the cross-section of the battery cable, refer to the load capacity table. long-term, taking into account the way the cable is laid.
- The maximum battery discharge level is given in the "TECHNICAL DATA" table.
- The current intensity in the installation, and therefore the fuse rating, should not exceed the values of this rated current.
  The fuse must correspond to the lowest rated current, i.e. the rated current of the cable, the rated current of the battery or the rated current of the installation.

3.5.2 SINGLE BATTERY CONNECTION

- The fuse must be placed on the positive side of the battery.
- Connect the battery to the DC system.



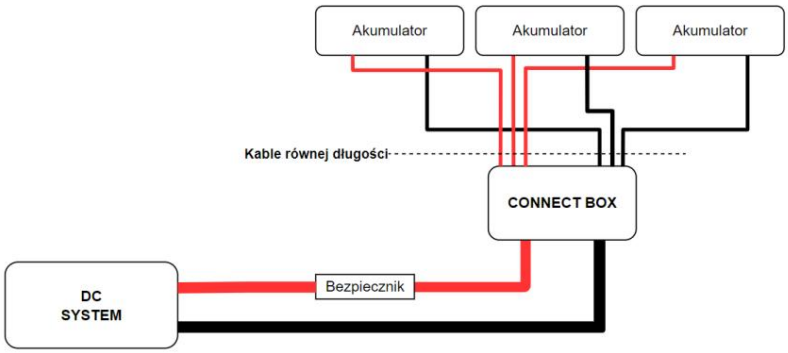
Single battery

3.5.3 CONNECTING MULTIPLE BATTERIES IN PARALLEL

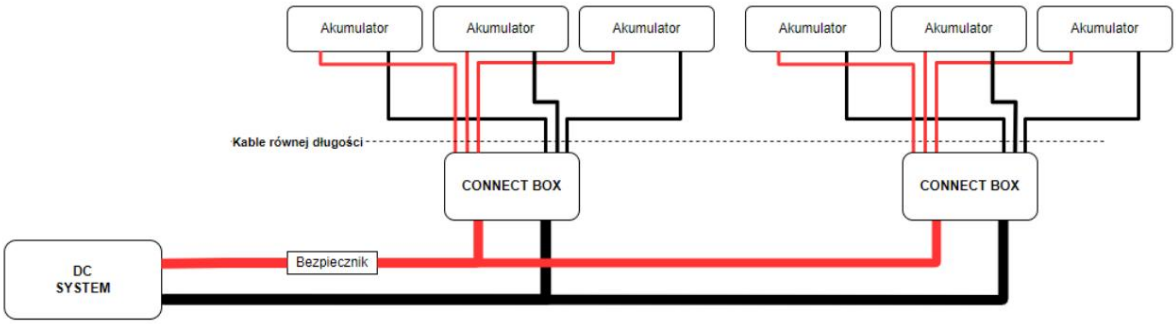
- An unlimited number of batteries can be connected in parallel.
- Dedicated CONNECT BOX parallel connectors must be used.
- Make sure that the cross-sectional area of the system cable is equal to the cross-sectional area of the row cable multiplied by the number of rows.
- Please make sure that the cable lengths between the CONNECT BOX and each battery are equal.

• The fuse must be placed on the plus side of the main cable leading to the battery.

• Connect the battery to the DC installation.



Several batteries connected in parallel, one CONNECT BOX



Several batteries connected in parallel, two or more CONNECT BOXES

3.5.4 RECHARGEABLE BATTERIES COMPOSED OF DIFFERENT ACCUMULATORS

Ideally, when building a battery bank, you should use identical battery models, capacities and ages. However, there are situations where this is not possible, for example, when you need to increase the capacity by adding more batteries or when you need to replace one battery in a battery bank. In such cases, follow the instructions below.

• Is it allowed to connect a battery with a different capacity than the existing battery?
battery? **YES**
• Is it permissible to connect a battery that is different in age from the batteries in the existing battery bank?
YES

3.6 MINIMUM TEMPERATURE FOR CHARGING/DISCHARGE

• **The minimum temperature for charging ION BREEZE batteries is 0 °C.**
• This value defines the lowest temperature at which the BMS allows the battery to be charged.
• If charged at a temperature below 0 °C, the lithium battery cell may be permanently damaged.
damage.
• **The minimum temperature for discharging ION BREEZE batteries is -10 °C.**
• This value defines the lowest temperature at which the BMS allows the battery to discharge.

• If discharged at a temperature below -10 °C, the lithium battery cell may be permanently damaged.
damage.

Placing a working battery outside the specified temperature range
voids the warranty.

3.7 CHARGER SETTINGS

Recommended charging parameters for the following ION BREEZE battery models:

• For 12.8V models: Absorption voltage (bulk) 14.60V, Absorption time 2
hours and a holding voltage (float) of 14.40 V.

• For 25.6V models: Absorption voltage (bulk) 29.20V, Absorption time 2
hours and a holding voltage (float) of 28.80 V.

• For 51.2V models: Absorption voltage (bulk) 58.40V, Absorption time 2
hours and holding voltage (float) 57.60 V.

• The recommended charging currents are given in the section “Charging the battery and recommended charger settings”,
the table in the section “Technical data” and in the catalogue sheets of the individual ION BREEZE batteries.

3.8 START-UP

After all connections have been made, check the system wiring, power up the system, and check the operation of the batteries.
Follow the checklist below:

1. Check the polarity of all battery cables.
2. Check the cross-section of all battery cables.
3. Check that all battery cable terminals are properly crimped.
4. Check that all battery cable connections are properly seated in the connector by pulling lightly on each battery cable.

5. Check that all battery cable connections to the CONNECT BOX are correct.
placed in the connector - pull lightly on each battery cable.
6. Check that all CONNECT BOX cable connections are properly tightened - pull
each cable lightly (do not exceed the maximum torque of 14 Nm).
7. Check the rating of the fuse(s) (if applicable).
8. Install fuse/fuses (if applicable).
9. Check the parameters of the main fuse.
10. Install the main fuse.
11. Verify that all battery charging sources are configured with the correct settings.
12. Connect to each battery using the BREEZE BMS app.
13. Following the interactive instructions in the BREEZE BMS application, you can safely start up all batteries one by one.

14. Turn on all battery chargers and all power receivers.
15. Check the correct operation of the functions of the installed energy storage system.

4. SERVICE

4.1 MONITORING AND CONTROL VIA THE BREEZE BMS APPLICATION

ION BREEZE batteries are monitored and controlled exclusively via Bluetooth using the BREEZE BMS application.

Bluetooth paired connection

Once you have connected to the battery via the BREEZE BMS application, the following parameters will appear:

- Battery charge status expressed in percent. (SOC)
- Battery voltage [V].
- Battery operating status (charging/fault/discharge).
- Alarms.
- Battery min/max temperature
- Voltages of individual cells.
- Session data containing minimum/maximum recorded values of battery performance parameters.

Please note that:

- Warning, alarm or error messages are only displayed when the device is actively connected to the battery via BREEZE BMS.

- The application is not active in the background or when the screen is turned off.
- If your mobile device's display goes dark, you may need to reconnect – even though the battery data screen is visible.

4.2 BATTERY CHARGING AND CHARGER SETTINGS

Recommended Battery Chargers

Check that the charger is supplying the correct current and voltage to the battery.
It is also recommended that the charger has a charging profile/algorithm adapted to the battery chemistry (LiFePO4) or a custom profile that can be adjusted to the appropriate lithium battery charging parameters.

Always check that the correct profile is selected. If in doubt, check the chargers' instructions.

Recommended charger settings

Important charging parameters are the voltage and charging time with constant voltage (absorption) and the maintenance voltage (float).

- **Charging voltage in constant voltage charging phase:** 14.2 V for 14.6 V lithium battery (29.2 V / 58.4.8 V for 24 V or 48 V installations)
- **Charging time:** 2 hours. We recommend a minimum constant voltage charging time of 8 hours per month. This gives the battery BMS enough time to balance the cells correctly. More detailed information on the need for cell balancing and how cell balancing works is given in the “Cell Balancing” section.

- **Float voltage:** 14.4 V for 12.8 V lithium battery (28.8 V / 57.6 V for 24 V or 48 V installations)

- Some profiles also provide a storage mode. This is not necessary for a lithium battery, but if the charger has a storage mode, this option should be set to the same value as the float voltage.

- Some chargers provide the ability to set the constant current charging voltage. In this case, the charging voltage value should be set to the same value as the charging voltage in the constant voltage charging phase.

Recommended charging current

Even though the battery can be charged with a much higher charging current (see "Technical Data" for the maximum continuous charging current), we recommend a charging current of 0.5C, which will fully charge a completely discharged battery within 2 hours. A charging current of 0.5C for a 100 Ah battery corresponds to a charging current of 50 A.

Charging profile

- Once the charger is started, it takes two hours to reach the constant voltage charging phase.
- The constant voltage charging phase lasts for another two hours, giving the BMS time to properly balance the cells.
- After the constant voltage charging phase time has elapsed, the charging voltage is reduced to the maintenance voltage.

4.3 DISCHARGE

Despite the use of BMS, there are still some possible situations where the battery may be damaged due to over-discharge. The following must be strictly observed warnings.

- Lithium batteries may be damaged if over-discharged or over-charged.
- Battery shutdown due to low cell voltage by BMS should always be last resort to prevent inevitable battery damage.
- We recommend that you do not allow this situation to happen at all and use the system switch when the system is left unattended for a longer period of time, or turn off the battery using the BREEZE BMS application and disconnect the positive terminal of the battery.
- Before doing this, however, you should check whether the battery is charged enough to always there was sufficient reserve charge left in it.
- In case of shutdown due to too low cell voltage, immediate action must be taken operation (charge the battery).

Recommended discharge current

We recommend a continuous discharge current: ÿ1C, even if the maximum permissible discharge current is much higher (see "Technical Data").

- If a higher discharge rate is used, the battery will produce more heat than if a lower discharge rate is used. More space should be provided around the batteries for air circulation and, depending on the installation, hot air extraction or forced air cooling may be required.

• Additionally, some cells may reach the low voltage threshold faster than others. This may be due to elevated cell temperature and battery aging.

Depth of Discharge (DoD)

The depth of discharge has a decisive influence on the service life of a lithium battery. The greater the depth of discharge, the lower the number of possible charging cycles. The possible number of charging cycles depending on the depth of discharge is shown in the Technical Data.

4.4 IMPORTANCE OF WORKING CONDITIONS

Please pay attention to the operating conditions when charging and discharging the battery.

• Discharging is only permitted within a temperature range of -10 °C to +55 °C.
• If the temperature is outside the allowable range, check if all load energy receivers are switched off and the batteries are properly prepared for storage.

• Charging is only permissible at temperatures between +0 °C and +50 °C.
• When the lower temperature limit at which the battery is allowed to charge is reached please check that all chargers are turned off and batteries are properly prepared for storage.

4.5 BATTERY CARE

Once your battery is in operation, it is important to take proper care of it to extend its life.

Here are the basic recommendations:

• Always prevent the battery from completely discharging.
• Minimize the time that batteries are deeply discharged.
• The batteries should be charged in charging mode for at least 2 hours each month. voltage at a constant value, which will provide enough time for balancing charging. For details on how the balancing process works, refer to the “Balancing the Cells” section.
• If the system is to be left unattended for some time, ensure that the batteries are either charging or (almost) charged, and then disconnect the DC system from the battery.

5. TROUBLESHOOTING AND SUPPORT

When troubleshooting, first take the actions described in this section on typical battery faults.

If you experience any problems with the BREEZE BMS app or the ION BREEZE battery, first read the user manual, especially the section on troubleshooting. If this does not resolve the issue, contact the retailer from whom you purchased the battery for technical support or fill out the report form located under the "Report a problem" button

in the BREEZE BMS application.

If the place of purchase is not known, please contact Breeze Energies technical support at the following e-mail address: **serwis@breeze-energies.com**

5.1 BATTERY FAULTS

5.1.1 HOW TO RECOGNIZE CELL IMBALANCE

- Battery capacity seems to be smaller than before.
  If the BMS turns off the power consumers significantly earlier than before, even if the overall battery voltage still appears correct, this indicates a battery imbalance.
- There is a noticeable difference between the voltages of the individual cells during the constant voltage charging stage.
  When the charger is in the absorption charging phase, the voltages of all cells should be equal and between 3.50V and 3.65V. If they are not, this indicates an imbalance
  battery.
- Cell voltage slowly drops when the battery is not in use.
  This is not an imbalance, although it may appear that way. A typical example is when all the cells of a battery are initially at the same voltage, but after the battery has not been used for a day or so, the voltage of one of the cells has dropped more than 0.2 volts below the other cells. This cannot be corrected by rebalancing and the cell is considered to be faulty.

5.1.2 CAUSES OF IMBALANCE OR CHANGE IN CELL VOLTAGE

- **The battery was not charged long enough in constant charge mode.**
  voltage.
  This can happen, for example, in an installation that does not supply enough solar energy to fully charge the battery, or in an installation where the generator is not run for long or frequently enough.

  During normal operation of a lithium battery, there are constantly small differences in voltage between cells. These differences are caused by small differences in the internal resistance and self-discharge rate of each cell.
  The constant voltage charging stage eliminates these small differences.
  We recommend a minimum absorption time of 8 hours per month.
  This gives the battery BMS enough time to properly balance the cells.

- **The battery never reaches a float charge (or storage) state.**
  The float (or storage) charging stage follows the constant voltage charging stage. At this stage, the charging voltage drops to 14.4 V / 28.8 V / 57.6 V and the battery can be considered fully charged. If the charger does not proceed to this stage, it may mean that the constant voltage charging stage has not been completed (see previous point).

  The charger should reach this stage at least once a month. This is also needed to calibrate the SoC (state of charge).

- **The battery was discharged too deeply.**
  During a very deep discharge, the voltage in one or more cells of the battery may drop significantly below the threshold value. The battery can be restored by recharging

rebalancing, but there is also a real possibility that one or more cells are now damaged and rebalancing will fail.
Such a link should be considered damaged.
The warranty does not cover this type of damage.

• **The battery is old and is near the end of its service life.**
Approaching the end of service life means that the condition of one or more cells of the battery is deteriorating and its voltage is lower than the voltage of the other cells. This is not an imbalance, although it may appear that way. Such a fault cannot be corrected by rebalancing. Such a cell should be considered a failed cell.
The warranty does not cover this type of damage.

• **The battery has a damaged cell.**
A cell may fail after very deep discharge, at the end of its service life, due to a manufacturing defect or mechanical damage. A faulty cell is not unbalanced (although it may appear so). Such a defect cannot be corrected by rebalancing. The cell should be considered as failed.
The warranty does not cover damage resulting from very deep discharge, loss of efficiency after the end of the operating period or as a result of the consequences of mechanical damage.

5.1.3 HOW TO RESTORE AN UNBALANCED BATTERY

• The battery must be charged using a charger with a charging configuration suitable for LiFePO4 batteries.
• Please note that cell balancing only occurs during the constant voltage charging stage. You will need to manually restart the charger each time the charger enters maintenance charging.

• Restoring the balance may take a long time (even several days) and require many manual actions. charger restarts.
• Please note that while the cells are balancing, it may appear as if nothing is happening.
The cell voltages may remain the same for a long time, and the BMS will repeatedly turn on and off the charge. This is normal.
• Balancing is almost complete when the charging current drops below 1.5A and the voltage cells will approach 3.55 V.
• The battery balancing process is complete when the charging current drops even further, and the voltage of all cells reaches a minimum of 3.55 V.
• This process should be supervised by checking the cell voltages using the BREEZE BMS application.
The voltage of fully charged cells will slowly increase until it reaches 3.7 V. At this
At this point, the BMS will stop charging and the cell voltages will drop again. This process will repeat until balance is restored.

5.1.4 CAPACITY IS LOWER THAN EXPECTED

Reducing the battery capacity below its rated capacity may have the following effects:
causes:

• The battery has a cell imbalance. See the section "How to restore unbalanced battery."

• The battery is old and is near the end of its service life.
Check how long the system has been operating, how many cycles the battery has performed and to what average depth of discharge it has been discharged.
The way to find this information is to check the battery data record (if available).

• The battery has been discharged too deeply and one or more battery cells have failed.
permanent damage.
These damaged cells will show low voltage faster than the rest, causing the BMS to shut down the battery prematurely.

5.1.5 VERY LOW VOLTAGE AT THE BATTERY CONNECTOR

If the battery has been discharged too deeply, the voltage will drop significantly below 12V/24V/48V.
If the battery voltage is less than 10V/20V/40V or the voltage of one of the battery cells is less than 2.5V, the battery will be permanently damaged.
This is grounds for voiding the warranty.

The lower the battery or cell voltage, the more serious the battery damage will be.
If the voltage drops significantly, the battery will no longer communicate via Bluetooth.
The battery Bluetooth module will be turned off.

You can attempt to restore the battery in laboratory conditions at the manufacturer's service center. Please note that this is not a guaranteed process, the restoration may not be successful, and there is a real risk that the battery cell will be permanently damaged, resulting in moderate to severe capacity loss.

5.1.6 THE BATTERY IS AT THE END OF ITS SERVICE LIFE OR HAS BEEN IMPROPERLY USED

• As a battery ages, its capacity will decrease, eventually leading to failure of one or more cells. The age of a battery is related to the number of charge/discharge cycles it has been subjected to.

• As a result of improper use, for example too deep discharge, the battery may exhibit reduced capacity or have damaged cells.
• To check if your battery is nearing the end of its life, find out how many cycles it has the battery has been charged/discharged. The battery life is related to the number of cycles.
• For more information on the battery life cycle, see the "Battery Data" section. "technical."

How to check if the battery has been used incorrectly:

• Are the battery or its terminals mechanically damaged?
Mechanical damage is grounds for voiding the warranty.

• Was the battery operated within the proper ambient temperature ranges?
Charging the battery at temperatures below 0 °C will be recorded in memory and blocked by the BMS system. This is grounds for voiding the warranty.

• Does the battery show signs of flooding or is it wet?
The battery is not waterproof and is not suitable for outdoor use.
Flooding and operation outside enclosed spaces is grounds for voiding the warranty.

• Is there any indication that the battery has been completely discharged?
Complete and very deep discharge is grounds for voiding the warranty.

• Is there any indication that the battery was charged at too high a voltage?
Check charger settings.
Charging with too high a current/voltage will void your warranty.

• How long has it been since the last full charge?
The battery should be fully charged at least once a month.
Improper operation and lack of periodic cell balancing are grounds for voiding the warranty.

5.2 FAULTS, ALARMS AND ERRORS

5.2.1 LOW CELL VOLTAGE ALARM

The voltage of one or more cells is below the configured discharge enable voltage and discharging has been inhibited.

• The response to this alarm is to charge the battery as quickly as possible.

5.2.2 HIGH CELL VOLTAGE ALARM

The voltage of one or more cells is higher than the configured charging enable voltage and charging has been suspended.

• The reaction to this alarm is to stop charging and wait until the battery BMS system will balance the battery cells and restart the battery.

5.2.3 LOW BATTERY VOLTAGE ALARM

The sum of the battery cell voltages is below the configured discharge enable voltage and discharging has been inhibited.

• The response to this alarm is to charge the battery as quickly as possible.

5.2.4 BATTERY VOLTAGE TOO HIGH ALARM

The sum of the battery cell voltages is higher than the configured charging enable voltage and charging has been suspended.

• The reaction to this alarm is to stop charging and wait until the battery BMS system will balance the battery cells and restart the battery.

5.2.5 LOW TEMPERATURE ALARM

The battery has reached the low temperature threshold and charging/discharging has been stopped.

• As soon as the temperature rises above the set threshold, charging/discharging will be stopped.
resumed.

5.2.6 HIGH TEMPERATURE ALARM

The battery has reached a high temperature threshold and charging/discharging has been stopped.

• Provide adequate ventilation and ensure there is enough space around the battery. • Reduce charging current and/or load.

5.2.7 HIGH CHARGING/DISCHARGE CURRENT ALARM

The battery has reached the maximum current threshold and charging/discharging has been stopped.

• Reduce charging current and/or load.

5.2.8 SHORT CIRCUIT ALARM

The battery BMS detected a short circuit on the connector and turned off the battery.

• Once the fault is removed, the battery will resume operation. • Disconnect the cables from the battery connector. • Connect to the battery using the BREEZE BMS app and check if the alarm has been removed.
Check the voltage in the application and at the battery connector.
• Before reconnecting the battery to the system, eliminate the cause of the short circuit.

5.2.9 HARDWARE FAILURE

No voltage at the battery connector despite the voltage value displayed in the ION BREEZE app.

• Check the battery status (on/off). • Check the battery alarm messages in the app.

The battery does not respond to control from the BREEZE BMS application.

• Check if the correct battery has been selected in the application using the battery serial number.
battery.

The battery does not work, does not respond to control from the app, cannot connect to the battery and other faults.

• Please contact your battery supplier to make a warranty claim or contact us directly.
manufacturer of the battery.
• You can send your report in writing to the following address: 05-092 ÿomianki ul. Kolejowa 44. • You can send your report via e-mail to the following address: **serwis@breeze-energies.com**

• In case of problems with the operation of the BREEZE BMS application, please use the contact form in applications.

Do not send the battery to the manufacturer without prior confirmation from the manufacturer's service website.

Such shipments will not be handled by service employees and the sender will be charged the costs of return shipping or storage of the parcel.

5.3 LOST BATTERY PIN

The PIN code is required to connect to the battery using the BREEZE BMS application. It is located:

- In the battery warranty card
- On the battery next to the serial number below the battery model designation.

If you lose your PIN, contact the manufacturer's service center.

6. TECHNICAL DATA

The basic parameters of the individual batteries are presented in the tables below.

Detailed information can be found in the catalog cards of individual products available on the product pages.

Technical specification HYBRID 12V 60Ah 24V 30Ah			
Model name:	ION BREEZE 2430H	ION BREEZE 1260 ION BREEZE 2430	
Terminal type:	4-18AWG	4-18AWG	4-18AWG
Libra:	7.2 kg	6.7kg 6.7kg	
Mounting direction:	vertical/horizontal	vertically/horizontally vertically/horizontally	
Dimensions (D x W x H): Battery	219x94x345	219 x 94 x 321.2 219 x 94 x 321.2	
capacity: Nominal voltage:	30 Ah	60 Ah	30 Ah
Cut-off voltage: Energy	25.6V	12.8V	25.6V
capacity: Maximum	22V	11 V	22V
power: Standard charging	768 Wh	768 Wh	768 Wh
current: Maximum	1024 W	768 W	1024 W
charging current: Standard	10A	20A	10A
discharge current: 30 A **Maximum**	60A	60A	60A
discharge current: 60 A **Internal resistance:**		30A	30A
Number of cycles 90% DOD: Charging:		60A	60A
	< 36 mOhm	< 24 mOhm	< 36 mOhm
	> 3000	> 3000	> 3000
	0°C ÷ 55°C	0°C ÷ 55°C	0°C ÷ 55°C
Discharge:	-10°C ÷ 55°C	-10°C ÷ 55°C	-10°C ÷ 55°C
Storage:	-40°C ÷ 60°C	-40°C ÷ 60°C	-40°C ÷ 60°C

Charging voltage (bulk):	29.2V	14.6V	29.2V
Holding voltage (float):	28.8V	14.4V	28.8V
GEL/AGM battery connection: YES		NO	NO

Technical specifications 12V 120Ah 24V 60Ah 48V 30Ah

Model name:	ION BREEZE 12120	ION BREEZE 2460	ION BREEZE 4830
Terminal type:	4-18AWG	4-18AWG	4-18AWG
Libra:	13.4 kg	13.4 kg	13.4 kg
Mounting direction:	vertical/horizontal	vertical/horizontal	vertical/horizontal
Dimensions (H x W x D): Battery	219 x 170 x 321.2	219 x 170 x 321.2	219 x 170 x 321.2
capacity: Nominal voltage:	120Ah	60 Ah	30 Ah
Cut-off voltage: Energy	12.8V	25.6V	51.2V
capacity: Maximum	11 V	22V	44V
power: Standard charging	1536 Wh	1536 Wh	1536 Wh
current: Maximum	768 W	1536 W	2048 W
charging current: Standard	40A	20A	10A
discharge current: Maximum	60A	60A	30A
discharge current: Internal resistance:	60A	30A	15A
Number of cycles 90% DOD: Charging:	60A	60A	40A
	< 22 mOhm	< 28 mOhm	< 52 mOhm
	> 3000	> 3000	> 3000
	0°C ÷ 55°C	0°C ÷ 55°C	0°C ÷ 55°C
Discharge:	-10°C ÷ 55°C	-10°C ÷ 55°C	-10°C ÷ 55°C
Storage:	-40°C ÷ 60°C	-40°C ÷ 60°C	-40°C ÷ 60°C
Charging voltage (bulk):	14.6V	29.2V	58.4V
Holding voltage (float):	14.4V	28.8V	57.6V
GEL/AGM battery connection:	NO	NO	NO

Technical specifications 12V 200Ah 24V 100Ah 48V 50Ah

Model name:	ION BREEZE 12200	ION BREEZE 24100	ION BREEZE 4850
Terminal type:	4-18AWG	4-18AWG	4-18AWG
Libra:	20kg 20kg	20kg	
Mounting direction:	vertically/horizontally	vertically/horizontally	vertically/horizontally
Dimensions (D x W x H): Battery	219 x 256 x 321.2	219 x 256 x 321.2	219 x 256 x 321.2
capacity: Nominal voltage:	200 Ah	100 Ah	50Ah +/- 1Ah
Cut-off voltage: Energy	12.8V	25.6V	51.2V
capacity: Maximum	11 V	22V	44V
power: Standard charging	2560 Wh	2560 Wh	2560 Wh
current: Maximum	1280 W	2560 W	2560 W
charging current:	35A	35A	20A
	100A	100A	50A

Standard discharge current:	50A	50A	25A
Maximum discharge current:	100A	100A	50A
Internal resistance:	< 21 mOhm	< 24 mOhm	< 36 mOhm
Number of cycles 90% DOD:	> 3000	> 3000	> 3000
Landing:	0°C ÷ 55°C	0°C ÷ 55°C	0°C ÷ 55°C
Discharge:	-10°C ÷ 55°C	-10°C ÷ 55°C	-10°C ÷ 55°C
Storage:	-40°C ÷ 60°C	-40°C ÷ 60°C	-40°C ÷ 60°C
Charging voltage (bulk):	14.6V	29.2V	58.4V
Holding voltage (float):	14.4V	28.8V	57.6V
GEL/AGM battery connection:	NO	NO	NO

7. ATTACHMENTS

7.1 PRELOAD PROCEDURE

To maximize the service life, batteries are stored and transported with a charge level of approximately 50-60%. In the case of long-term storage, the charge level may decrease due to the BMS system's own energy consumption and maintaining the communication capability.

Before connecting the battery to the energy storage system, it is necessary to charge it in advance with a charger with the appropriate settings adapted to charge LFP batteries with settings compatible with ION BREEZE batteries. Charging the battery equally before connecting to the battery bank reduces the risk of an equalizing current - which in extreme cases can damage the battery BMS system. The battery cells are protected against a BMS failure due to the occurrence of an equalizing current, however, this is a basis for excluding the warranty.

7.2 BALANCING THE CELLS

Why is cell balancing necessary?

Despite careful selection during the manufacturing process, battery cells are not 100% identical. Therefore, during the operating cycle, some cells will charge or discharge earlier than others. If the cells are not regularly balanced, these differences will increase over time.

Once fully charged, the current flowing through a lithium cell is almost zero. Cells that do not have time to charge will not be charged any further unless they receive "help" from the cell balancing electronics.

How does cell balancing work?

The battery has built-in "active" and "passive" cell balancing. This ensures that all cells are balanced. The voltage of each cell is monitored and, if necessary, energy is transferred from the highest voltage cell to the lower voltage cell. This process continues until the voltage difference between the cells is no more than 0.01 V.

When does cell balancing take place?

For severely unbalanced batteries, "active" cell balancing starts when the first cell voltage reaches 3.3V or less. "Passive" cell balancing starts when the cell voltage is 3.50V. This can only happen during the constant voltage charging stage, because at this stage the charging voltage (14.4V/28.8V/57.6V) is sufficiently

high so that the cell voltages are also high enough to allow for correction of smaller differences between cells.

The cell balancing process is complete when all cells reach a voltage of 3.55 V and the charging current drops below 1.5 A. Balancing is complete when the charging current drops even further.

How to ensure your battery remains balanced?

For lithium batteries, a constant voltage charge step of 2 hours is recommended to allow enough time for the cells to balance. Regular, full charging of the battery is essential. However, there are situations where the cells will become unbalanced more quickly than usual. This happens when the system is used intensively.

To ensure good battery balance, a weekly full charge is necessary in the following cases:

- Systems loaded/unloaded daily or several times a week.
- Installations characterized by high discharge currents.
- Installations characterized by short charging periods or low charging voltages.

There is no way to speed up the cell balancing process.

It is important to remember that a higher charging voltage will not speed up the cell balancing process. Cell charging is a function of current, not voltage. Applying current to a cell will cause the voltage to increase over time, but this is an invariant process. Applying a higher voltage will not speed up this process.
In addition, the balancing speed is determined by the maximum rated current (1.8 A) of the active and passive balancing circuit.

8.CONTACT

REGISTRATION DATA:

Breeze Energies Sp. z o. o.

Easter Street 6/39

19-300 Elk

NIP: 8481873644

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