qapasity

BETTER ENERGY STORAGE

qapasity - Arctic Series

User Manual version 1.4

Index

1 Safety 6
1.1 General safety 6
1.1.1 Overview 6
1.1.2 General requirements 8
1.2 Personnel requirements 9
1.2.1 Definitions 9
1.3 Electrical Safety 10
1.3.1 Grounding requirements 10
1.3.2 General requirements 10
1.3.3 DC operation 10
1.3.4 Wiring requirements 11
1.3.5 Anti-static requirements 11
1.4 Battery Safety 12
1.4.1 Warranty limitations 12
1.4.2 Basic Requirements 13
1.4.3 Personal safety 14
1.4.4 Battery installation requirements 15
1.4.5 Hazard and toxicity description 15
1.4.6 Emergency measures for abnormal battery 15
1.4.7 Fire emergency measures 16
1.4.8 Flood emergency measures 16
1.4.9 Emergency measures for battery falling 16
1.4.10 Battery recycling 17
1.5 Storage requirements 17
1.5.1 General requirements 17
1.6 Handling and transportation requirements 18
1.6.1 Conditions of departure 18
1.6.2 Transportation requirements 18
1.7 Installation environment requirements 19
1.8 Mechanical safety 20
1.8.1 Safety in handling heavy objects 20
1.9 Maintenance and replacement 21
2 Product Information 22
2.1 Product Specifications 22
2.2 BMS functional characteristics 23

2.3 BMS compatible inverter manufacturers 24
2.4 Performance and Test Conditions 25
2.4.1 Standard Test Conditions 25
2.4.2 Measuring Instrument or Apparatus 25
2.4.3 Appearance 25
3 Application Scenario 26
4 System Installation 27
4.1 Inspection before installation 27
4.2 Scope of Delivery (Included Components) 28
4.3 Preparing Tools and Meters 29
4.4 Select the installation position 30
4.4.1 Installation angle requirements 30
4.4.2 Installation position requirements 30
Installation space requirements 30
4.4.3 Installation instructions 30
4.4.4 Battery precautions 31
4.5 Installation Instructions 32
4.5.1 Installing Battery systems 32
4.5.2 Electrical installation 33
4.5.2.1 Tool Introduction 33
4.5.2.2 Interface definition 34
4.5.2.3 DC Cable Connection 36
4.5.3 System Operation 37
4.5.3.1 Startup inspection 37
4.5.3.2 Pre-startup Self-Check 37
4.5.3.3 System startup 38
4.5.3.4 System shutdown 39
4.5.3.5 System commissioning and monitoring setup 39
5 Fault Handling 40
5.1 Basic Troubleshooting During Commissioning 41
5.1.1 Incorrect CAN bus connection 41
5.1.2 Incorrect RJ45 cable or connector locking 41
5.1.3 Battery module or BDU not properly seated 42

Notes:

A Swedish Quick Guide is available on Senergias website for convenience. However, in case of discrepancies or uncertainties, this English manual must prevail.

Update history

Version	Change history	Author	Update date
1.0		Erik Lindström	2025-06-10
1.1	* Add description of battery heating function in section 2.2. * Add description of CAN-interfaces in section 4.4.2.2.	Erik Lindström	2025-08-29
1.2	* Section 4.1 changed distance to 500 meters for coastal areas (salt water)	Erik Lindström	2025-09-02
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1.4	* Table RJ45 Port Definition Changes to CAN communication pin definitions	Mathias Halén	2026-06-18

1 Safety

1.1 General safety

1.1.1 Overview

Read this manual carefully before installing, operating, or maintaining the battery system. Follow all instructions, safety markings, and precautions provided.

The instructions, warnings, and precautions in this manual do not cover all possible safety situations and are intended as a supplement to general safety practices and applicable standards.

The company is not liable for any damage, injury, or loss resulting from failure to follow this manual or applicable safety requirements.

The battery system must be used in an environment that meets the specified design requirements. Failure to do so may result in system malfunction or component damage, and any resulting personal injury or property damage is not covered by the warranty.

Installation, operation, and maintenance must comply with applicable local laws, regulations, and standards. This manual supplements, but does not replace, these requirements.

The Company shall not be liable for any of the following circumstances.

- Do not operate under the service conditions described in this manual.
- The installation and user environment do not comply with the provisions of relevant international or national and regional standards.
- Unauthorized disassembly, change of product or modification of software code.
- Failing to operate according to the operating instructions and safety warnings in the product and documents.
- Battery system damage caused by abnormal natural environment (force majeure, such as earthquake, fire, storm, flood, debris flow, etc.).
- Transportation damage caused by customer's own transportation.
- Damage caused by storage conditions that do not meet the requirements of product documents. λ Damage to battery system hardware or data due to customer negligence, improper operation or intentional damage.
- System damage caused by third parties or customers, including handling and installation that do not meet the requirements of this manual, and damage caused by adjustment, change or removal of identification marks that do not meet the requirements of this manual.

There are several safety marks in the Manual. The detailed explanation is as follows:

Symbol	Description
DANGER	Indicates a hazard with a high level of risk which. if not avoided, will result in death or serious injury.
WARNING	This instruction indicates a potential hazard during operation. Failure to comply with this warning may result in personal injury or death.
CAUTION	Indicates a potentially hazardous situation which, if not avoided, could result in equipment damage, data loss, performance deterioration, or unanticipated results.
NOTICE	Indicates a hazard with a low level of risk which, if not avoided, could result in minor or moderate injury.
	The battery system must be disposed of at a proper facility for environmentally safe recycling.
	Do not dispose of the battery together with household waste.
	Read the enclosed documentation.
	Keep the battery system away from children
	Keep the battery system away from open flames or ignition sources.
	Caution, risk of danger
	Caution, risk of electric shock.
	Protect the location of the ground wire.

1.1.2 General requirements

General operational requirements:

- Do not install, operate, or handle the system or its cables outdoors during adverse weather conditions, such as lightning, rain, snow, or strong winds ($\geqslant$ 11 m/s).
- Observe the warning signs, warnings and protective measures on the battery system
- Follow the requirements of this manual, use the correct tools, and master the correct use of tools.
- Do not perform installation or maintenance while the system is energized.
- Do not wash the battery system with water.
- Check whether the battery system is free of damage, such as whether there are other signs of damage such as drop, collision or shell dent.
- Before contacting any conductor surface or terminal, measure the voltage at the contact point to confirm that there is no danger of electric shock.
- Paint scratches during battery system transportation and installation must be repaired in time. It is strictly forbidden to expose the scratched part to the outdoor environment for a long time.
- Do not affect the battery terminal parts during handling, and it is not allowed to lift and carry them through the battery terminal bolts.
- In any case, do not change the structure and installation sequence of the battery system without the permission of the manufacturer.
- In case of fire, evacuate the building or battery system area and press the fire alarm bell or dial the fire alarm telephone. Under any circumstances, Do not re-enter the burning building.
- All transportation, handling, installation, wiring, and maintenance must comply with applicable local laws, regulations, and standards.
- The materials provided by the user and the tools needed in the operation process must meet the requirements of the laws, regulations and relevant standards of the country and region where they are located.

1.2 Personnel requirements

- The personnel responsible for the installation and maintenance of the battery system must first receive strict training, understand various safety precautions and master the correct operational methods.
- Only qualified professionals or trained personnel are allowed to install, operate and maintain the battery system.
- Only qualified professionals are allowed to remove safety facilities and repair the battery system.
- Personnel operating the battery system, including operators, trained personnel and professionals, should have special operations required by the local country.
- Qualifications, such as high-voltage operation, climbing, special battery system operation qualifications, etc.
- The replacement of the battery system or components (including software) must be completed by professional or authorized personnel.

1.2.1 Definitions

- Professional personnel: those who have training or experience in operating the battery system and can understand the potential sources and magnitude of various hazards during battery system installation, operation and maintenance.
- Trained personnel: the personnel who have received corresponding technical training and have necessary experience can be aware of the risks that maybe brought to him when carrying out an operation and can take measures to minimize the risks to himself or other personnel.
- Operators: operators who may come into contact with the battery system except for trained personnel and professionals.

1.3 Electrical Safety

1.3.1 Grounding requirements

- For the battery system to be grounded, the protective ground wire must be installed first; When removing the battery system, the protective ground wire must be removed finally.
- Do not damage the grounding conductor.
- Do not operate the battery system without installing the grounding conductor.
- The battery system must be permanently connected to the protective ground. Before operating the battery system, check the electrical connection of the battery system to ensure that the battery system is reliably grounded.

1.3.2 General requirements

DANGER

Before making electrical connections, please ensure that the battery system is not damaged, otherwise it may cause electric shock or fire.

- All electrical connections must meet the national/regional electrical standards.
- You must obtain the permission of the power department of your country/region before you can connect to the grid for power generation.
- User-provided cables must comply with local laws and regulations.
- Use special insulating tools for high-voltage operation.

1.3.3 DC operation

DANGER

Do not install and remove the power line with power. The power cord core will produce electric arc or spark at the moment of contact with the conductor, which may cause fire or personal injury.

- Before electrical connection of the battery system, if it is possible to touch live parts, the corresponding breaking battery system of the previous level of the battery system must be disconnected.
- Before connecting the power cord, make sure that the power cord label identification is correct before connecting.
- If the battery system has multiple inputs, all inputs of the battery system must be disconnected, and the battery system can be operated after the battery system is fully powered off.

1.3.4 Wiring requirements

- The use of cables in a high temperature environment may cause aging and damage of the insulation layer. The distance between the cable and the periphery of the heating battery system or heat source area must be at least 30mm.
- Cables of the same type must be bound together, and cables of different types must be laid at least 30mm apart. Do not wind or cross each other.
- The position of the cable through the pipe or wire hole must be protected to prevent the cable from being damaged by sharp edges, burs, etc.
- When the temperature is too low, severe impact and vibration may cause brittle cracking of the plastic sheath of the cable. To ensure construction safety, the following requirements must be followed:

  – All cables must be laid and installed above 0 ℃. Cables should be handled with care when handling, especially in low temperature environment.

  – If the storage environment temperature of the cable is below 0 ℃, the cable must be moved to room temperature for more than 24h before laying.

1.3.5 Anti-static requirements

NOTICE

The static electricity generated by the human body will damage the static sensitive components on the boards, such as large-scale integrated circuits (LSI).

- Wear anti-static gloves when contacting the battery system. Do not wear clothes that are easy to generate static electricity.

1.4 Battery Safety

1.4.1 Warranty limitations

The company is not responsible for battery system malfunctioning, component damage, personal injury, or property loss caused by the following circumstances:

- The battery is not charged on time due to the customer's reason, which causes the battery to be stored beyond the time limit and causes the capacity loss or irreversible damage to the battery.
- Battery damage, drop, liquid leakage, etc. caused by improper operation or failure to connect the battery as required.
- The battery was installed on site and connected to the system, but due to customer reasons, it was not turned off in a timely manner, resulting in battery over discharge and damage.
- The user did not set the battery operation management parameters correctly.
- The customer or a third party may change the battery use scenario without knowing the company. For example, connect additional load to the battery; Mix the battery provided by the company with other batteries, including but not limited to; mix with other brands of batteries, mix with batteries with different rated capacity, etc.
- Direct damage to the battery due to on-site battery system operation environment or external power parameters failing to meet the environmental requirements for normal operation. Including the actual operating temperature of the battery is too high or too low, and the power grid is unstable, and power failure is frequent.
- Improper maintenance by customers leads to frequent over-discharge of batteries, on-site capacity expansion or long-term inability to fully charge.
- The customer did not properly maintain the battery according to the operation manual of the supporting battery system, including but not limited to; did not regularly check whether the battery terminals were locked.
- The battery is stolen.
- Battery exceeding the warranty period.

1.4.2 Basic Requirements

DANGER

Do not install or remove power cords with electricity. At the moment of contact with the conductor, the power cord core can generate an arc or spark, which can cause fire or personal injury.

- Do not expose the battery to a high temperature environment or heating battery system, such as sunlight, fire source, transformer, heater, etc. The overheated battery may cause fire and explosion.
- Do not disassemble, modify or damage the battery (such as inserting foreign matters, immersing them in water or other liquids), to avoid liquid leakage, overheating, fire or explosion of the battery.
- Lithium-ion battery system has high fire risk.

The following safety risks must be fully considered before battery operation:

- The battery electrolyte is flammable, toxic and volatile.
- The thermal runaway of the battery will produce combustible gas, as well as CO, HF and other harmful gases.
- There is a risk of deflagration and explosion due to the accumulation of combustible gas generated after the thermal runaway of the battery.
- The battery must be stored separately and in the outer package. It should not be mixed with other items, stored in the open air and stacked too high. λ The battery beyond the warranty period must not be used.
- Do not remove the outer package of the battery under normal conditions. If the battery needs to be recharged, it needs to be recharged by professional personnel as required. After the power supply is completed, the battery still needs to be packed back.
- When carrying the battery, it must be carried in the direction required by the battery, and Do not put it upside down or tilt it.
- The battery must avoid impact.
- Do not carry out welding, grinding and other similar work around the battery to avoid fire and other hazards caused by electric sparks and arcs.
- Please use the battery within the operating temperature range specified in this manual.
- Do not use the damaged battery (the battery falls, collides or has other damage such as shell dent). Damaged batteries may cause the release of flammable gases. Do not store damaged batteries near undamaged products.
- The storage location of damaged batteries should not contain flammable materials, and non-professional personnel should not be nearby.

- During the storage of damaged batteries, the damaged batteries must be monitored to ensure that there are no signs of smoke, flame, electrolyte leakage or heat.

1.4.3 Personal safety

- Wear appropriate personal protective equipment (PPE) when operating the battery system. In the event of a fault that may cause personal injury or equipment damage, immediately stop operation, report to the person responsible, and take appropriate safety measures.
- Before using any tools, ensure that they are used correctly to prevent personal injury or equipment damage.
- During operation, the battery system enclosure may become hot and pose a risk of burns. Do not touch the surface.
- Ensure that the battery system is properly grounded before operation.
- In the event of a battery fault, surface temperatures may exceed safe touch limits. Avoid contact.
- Do not open, disassemble, or damage the battery. Released electrolyte is harmful to skin and eyes and must be avoided.
- Do not place any objects on top of the battery system or insert objects into any openings.
- Keep flammable materials away from the battery system.
- Do not expose the battery to fire, as this may result in explosion and personal injury.
- Do not immerse the battery modules in water or other liquids.
- Do not short-circuit the battery terminals, as this may result in fire or equipment damage.
- The battery system can generate high short-circuit currents and poses a risk of electric shock. Observe the following precautions:
    - Remove watches, rings, and other metal objects.
    - Use tools with insulated handles.
    - Wear insulating gloves and protective footwear.
    - Do not place tools or metal objects on top of the battery.
    - Disconnect the power supply before connecting or disconnecting battery terminals.
    - Check whether the battery is unintentionally grounded. If so, disconnect the grounding source before proceeding.
- Do not use water or detergents to clean internal or external electrical components of the cabinet.
- Do not stand, sit, or lean on the battery system.
- Do not damage the battery modules or system components.

1.4.4 Battery installation requirements

- Before installing the battery, check whether the package is intact, and the battery with damaged package cannot be used.
- During the battery installation, pay attention to the positive and negative poles. Do not short the positive and negative poles of the battery.
- During installation, use a torque wrench to ensure that the screws are tightened without looseness, and check regularly.
- After installing the battery system, empty packaging materials in the battery system area, such as cartons, foam, plastics, ties, etc., must be removed.

1.4.5 Hazard and toxicity description

DANGER

- Danger: contact of battery terminals with other metals may cause heat or electrolyte leakage. Electrolytes are flammable. If the electrolyte leaks, avoid contact with high temperatures and open flames.
- Toxicity: The steam generated by battery combustion may irritate eyes, skin and throat.

1.4.6 Emergency measures for abnormal battery

DANGER

- In case of electrolyte leakage or abnormal smell, avoid contact with leaked liquid or gas. Non-professional personnel are not allowed to approach. Please contact professional personnel immediately. Professionals should wear goggles, rubber gloves, gas masks, protective clothing, etc. to prevent the harm caused by electrolyte overflow.
- Electrolytes are corrosive and contact may cause skin irritation and chemical burns. In the case of contact with battery electrolyte, the following measures must be taken.
- Inhalation: evacuate the contaminated area, inhale fresh air immediately, and seek medical help immediately.
- Eye contact: immediately wash the eyes with plenty of water for at least 15 minutes, do not rub them, and seek medical help immediately. Skin contact: immediately wash the contact area with plenty of water and soap and seek medical help immediately.
- Ingestion: Seek medical help immediately.

1.4.7 Fire emergency measures

DANGER

- In case of fire, the system should be powered off under the condition of ensuring safety.
- Use carbon dioxide, FM-200 or ABC dry powder extinguisher to extinguish the fire.
- Firefighters need to avoid contact with high-voltage components during firefighting; otherwise, electric shock risk may be caused.
- If the temperature of the battery is too high, it will lead to deformation and damage of the battery, the electrolyte overflow and the leakage of toxic gas. You should wear respiratory protective the a and keep away from it to avoid skin irritation and chemical burns.

1.4.8 Flood emergency measures

DANGER

- Under the condition of ensuring personal safety, power down the system.
- If any part of the battery is flooded, do not touch the battery to avoid electric shock.
- Do not use the battery that has been flooded by water. Contact the battery recycling company for disposal.

1.4.9 Emergency measures for battery falling

DANGER

- When installing the battery, if the battery falls or is strongly impacted, it may cause internal damage to the battery system. It is strictly prohibited to continue using it, otherwise there will be safety risks (cell leakage, electric shock injury, etc.).
- After the battery falls, if there is obvious odor, damage, smoke, fire, etc., evacuate the personnel immediately, call the police in time, contact the professional personnel, and the professional personnel will use the firefighting facilities for firefighting and other treatment under the condition of ensuring safety.
- After the battery falls, if there is no obvious deformation or damage in the appearance and there is no obvious odor, smoke or fire, contact professional personnel to transport the battery to an open and safe place or contact the recycling company for treatment.

1.4.10 Battery recycling

- Please dispose of waste batteries according to local laws and regulations, and do not dispose of batteries as domestic garbage. Improper disposal of batteries may cause environmental pollution.
- If the battery leaks or is damaged, please contact technical support or battery recycling company for scrapping.
- When the battery becomes unavailable beyond its service life, please contact the battery recycling company for scrapping.
- Avoid exposing waste batteries to high temperatures or direct sunlight.
- Avoid exposing waste batteries to high humidity or corrosive environment.

1.5 Storage requirements

1.5.1 General requirements

Ensure that storage conditions comply with the requirements specified in this manual.

- Long-term storage of batteries is not recommended. Long term storage of lithium-ion batteries may result in capacity loss. After 12 months of storage at the recommended storage temperature, the irreversible capacity loss of lithium-ion batteries is generally 3% to 10%.
- The storage environment must meet local laws and standards.
- Expired storage needs to be checked and tested by professional personnel before put into use.
- When batteries are stored, they should be placed correctly according to the label on the packing case. Do not put them upside down or sideways.
- When stacking battery packing cases, they should comply with the stacking requirements on the outer packaging.
- The battery should be handled with care. It is strictly prohibited to damage the battery. Storage environment requirements:
- Recommended storage temperature: 0 ℃ ~ 25 ℃.
- Relative humidity: 35%RH ~ 85%RH.
- Store in a dry, clean, ventilated place, and prevent dust and water vapor erosion. Do not suffer from rain or water erosion of the ground area.
- Avoid contact with corrosive organic solvents, gases and other substances.
- Avoid direct sunlight.

1.6 Handling and transportation requirements

NOTICE

This product has been tested and complies with UN38.3 requirements for the transport of lithium-ion batteries.

Loading and unloading must be carried out in accordance with applicable local laws, regulations, and industry standards. Rough handling may cause short circuits or damage to the battery system, which may result in leakage, rupture, fire, or explosion.

1.6.1 Conditions of departure

Before shipment, it is necessary to check that the battery is intact and undamaged, and there is no obvious odor, smoke, or fire. Otherwise, shipment is prohibited.

1.6.2 Transportation requirements

The product can be shipped directly to the site, meeting the transportation requirements of vehicles, ships, etc. The transportation packaging box must be firm. During loading, unloading, and transportation, care should be taken, and moisture-proof measures should be taken. Due to external environmental influences (such as temperature, transportation, storage, etc.), the specifications and parameters of the product are based on the date of manufacture. Transportation process requirements:

- Transport must comply with applicable regulations for lithium-ion batteries.
- Maritime transportation must comply with the transportation requirements of IMDGCODE and the International Maritime Dangerous Goods Code.
- Land transportation must comply with ADR or JTT617 transportation requirements.
- Meet the regulatory requirements of transportation regulatory authorities in the country of origin, destination, and destination.
- Comply with international regulations for the transportation of dangerous goods and the regulatory requirements of corresponding national transportation regulatory authorities. During handling or transportation, Do not:
- Direct rain or snow exposure or falling into the water.
- Falling or mechanical impact.
- Invert or tilt.

If the above abnormal situations occur, please handle them according to emergency measures.

1.7 Installation environment requirements

- The installation and operating environment must comply with applicable local laws and regulations, as well as relevant international, national, and regional standards for lithium-based products.
- The installation location must be inaccessible to children and located away from daily work and living areas, including but not limited to: studios, bedrooms, lounges, living rooms, music rooms, kitchens, studies, game rooms, home theaters, sunrooms, bathrooms, shower rooms, laundry rooms, and attics.
- For garage installations, the battery system must be installed away from the direction of vehicle movement.
- For basement installations, adequate ventilation must be ensured. Flammable or explosive materials must not be placed around the battery system.
- The battery system must be installed in a dry, well-ventilated environment and securely fixed to a solid and level support surface.
- A sheltered installation site must be selected, or a suitable sunshade must be provided, to avoid direct exposure to sunlight and rain.
- The area surrounding the installation site must be clean and free from excessive infrared radiation, organic solvents, and corrosive gases.
- In areas prone to frequent natural disasters such as floods, debris flows, earthquakes, or typhoons, appropriate preventive measures must be implemented.
- The installation location must be kept away from fire sources and high-temperature heat sources. Flammable and explosive materials must not be stored around the battery system.
- The installation location must avoid water accumulation and be kept away from water sources such as faucets, drains, sewer pipes, and sprinkler systems to prevent water ingress.
- Do not install or operate the battery system in environments containing flammable or explosive gases or smoke.
- Installation in mobile applications such as ships, trains, vehicles, or similar platforms is prohibited.
- The power supply must not be used, even in standby mode, for the following applications:
    a) Medical battery systems directly related to human life.
    b) Control systems for trains, elevators, or similar equipment where failure may result in personal injury.
    c) Computer systems of critical social or public importance.
    d) Applications in close proximity to medical equipment.
    e) Any applications similar to those listed above.

- Battery systems are susceptible to corrosion in salt-hazard areas. Outdoor installation in such areas is prohibited. Salt-hazard areas are defined as locations within 500 m of the coastline or areas affected by sea spray. The extent of sea spray exposure may vary depending on meteorological conditions (e.g. typhoons, seasonal winds) and terrain features (e.g. hills or barriers).
- The operating performance and service life of the battery system are influenced by ambient temperature. The system should be installed in an environment where the temperature is within or better than the specified operating range.
- The allowable charging temperature range is 5 °C to 50 °C, and the allowable discharging temperature range is –20 °C to 50 °C. When installed in cold environments, the Series will activate its built-in thermal control system to heat the battery and improve performance. This heating process consumes stored energy and may result in a temporary reduction in system efficiency.
- If the Series has been stored in a cold environment (e.g. around 0 °C) prior to installation, a warm-up period of up to 2 hours may be required before charging. It is recommended to place the system in a warmer environment prior to installation to facilitate efficient commissioning and testing.
- When the ambient temperature exceeds 45 °C or falls below –10 °C, the available charging and discharging power of the system will be reduced.

1.8 Mechanical safety

Drilling safety

The following safety precautions should be considered when drilling holes on the wall and ground

- Wear goggles and protective gloves when drilling.
- During drilling, the battery system must be shielded to prevent debris from falling into the battery system, and the debris must be cleaned and cleaned in time after drilling.

1.8.1 Safety in handling heavy objects

- When carrying heavy objects, be prepared to bear weight to avoid being crushed or sprained by heavy objects.
- When handling battery system by hand, wear protective gloves to avoid injury.

1.9 Maintenance and replacement

DANGER

During operation of the battery system, high voltage is present and may cause electric shock, resulting in death, serious personal injury, or significant property damage. Therefore, before performing any maintenance work, the battery system must be powered off and all work carried out in accordance with the safety precautions described in this manual and other relevant documents.

- Perform maintenance only if you are familiar with and understand the contents of this manual and have the appropriate tools and test equipment.
- Before performing maintenance, power off the battery system and follow the instructions on the delayed discharge label. Wait the specified time to ensure that the system is fully de-energized before proceeding.
- During maintenance, prevent unauthorized personnel from entering the work area. Use temporary warning signs or barriers for isolation.
- If a fault occurs, contact your dealer or technical support.
- The battery system must only be powered on again after the fault has been resolved. Otherwise, further damage may occur.
- Do not open the cover without authorization. There is a risk of electric shock, and any resulting damage is not covered by the warranty.
- Operation and maintenance personnel must be adequately trained in safe operation and maintenance of the battery system and must use appropriate preventive measures and personal protective equipment (PPE).
- When moving or re-wiring the system, disconnect the power input. Wait at least 5 minutes for internal discharge, and verify with a multimeter that no hazardous voltage is present on the DC bus or internal components before starting work.
- Maintenance of the battery must be carried out or supervised by personnel familiar with the battery and the required safety precautions.
- When replacing the battery, use the same type of battery or battery pack.
- After maintenance, ensure that no tools or loose parts are left inside the system.
- If the battery system is not used for an extended period, store the battery and maintain its state of charge in accordance with this manual.

2 Product Information

2.1 Product Specifications

Product Model	Qapasity 2 module	Qapasity 3 module	Qapasity 4 module	Qapasity 5 module	Qapasity 6 module	Qapasity 7 module
Electrical Parameter						
Battery Chemistry	Hybrid Electrolyte Solid State LFP					
Module Parameter	5,427 kWh					
Battery Capacity	53Ah					
System Configuration	64S1P	96S1P	128S1P	160S1P	192S1P	224S1P
Total Energy	10,84 kWh	16,28 kWh	21,71 kWh	27,14 kWh	32,56 kWh	37,99 kWh
Nominal Voltage	204,8V	307,2V	409,6V	512V	614,4V	716,8V
Voltage Range(V)	179,2-229,12	268,8-343,68	358,4-458,24	448-572,8	537,6-687,36	627,2-801,92
Max Charge / Discharge current	53A/53A					
Cycle Life	>8000 cycles					
Communication	CAN					
Monitoring Type	Bluetooth/Wi-Fi					
General Parameter						
Size (W*D*H) mm	600 x 435 x 591	600 x 435 x 765	600 x 435 x 939	600 x 435 x 1113	600 x 435 x 1287	600 x 435 x 1461
Weight	<118 kg	<163 kg	<208 kg	<253 kg	<298 kg	<343 kg
Installation Method	Outdoor/ indoor; Floor Mounted					
Cooling Method	Natural Cooling					
Certification	IEC62619; IEC60730-1; EN62477; EN IEC62040-1; CE; UN38.3					
Environment Parameter						
IP Protection	IP65					
Humidity	0~95%RH (No condensation)					
Operating Temperature w/o heating	Charge 5-50℃ Discharge -20-50℃					
Storage Temperature Range	-10℃~35℃					
Altitude	3000m (＞2000m Power Derating)					

2.2 BMS functional characteristics

A battery management system (hereinafter referred to as BMS) is an electronic system that manages a rechargeable battery. A battery module is a type of electrical battery which can charge or discharge loads. In case of one tower, the whole system mainly comprises a BMS, battery module(s) and Base.

1. The operating voltage input range is 9~32V, with typical values of 12V or 24V, catering to the needs of various battery system scenarios.
2. Summarizes individual cell data from battery packs (i.e., cell voltage, temperature), utilizing proprietary comprehensive algorithms to estimate SOC/SOH for both individual cells and battery clusters, achieving excellent accuracy under both dynamic and static conditions of the battery cluster.
3. Capable of acquiring total battery cluster voltage with high precision and speed, ensuring data reliability through comparison between individual cell summation and total voltage acquisition.
4. Equipped with total battery cluster current acquisition, utilizing shunt-based methods for high-precision and fast acquisition.
5. Features precise insulation resistance measurement to ensure the safety and reliability of the battery system, allowing the insulation resistance measurement function to be enabled or disabled based on system configuration requirements.
6. Offers CAN/RS485 communication interfaces for data exchange with external battery systems such as PCS, EMS, 4G cloud platforms, etc.
7. Provides high-side and low-side drive outputs, with continuous load ≥1A and transient load ≥5A@100ms. Internal output voltage diagnosis enables hardware self-testing.
8. Includes dry contact output control, satisfying diverse safety control requirements such as effective isolation of strong and weak electricity.
9. Possesses digital DO/DI functions, enabling high-voltage interlock detection.
10. Supports NTC (10K) temperature acquisition within the high-voltage box, including fault diagnosis for battery temperature acquisition disconnection and short circuits.
11. Enables BCU automatic addressing.
12. Supports real-time SOC/SOH estimation for battery clusters.
13. Incorporates fault detection capabilities, including voltage, current, temperature, SOC, SOH threshold alarm functions, and loop cut-off protection for severe alarm thresholds.
14. Offers data storage functions, supporting local storage and power-off preservation of system operation data.
15. Supports Bootloader upgrades or remote upgrades, as well as firmware upgrades online via the CAN communication bus.

16. Meets the application requirements of 1000V battery systems and possesses IEC/UL certifications.
17. Equipped with battery heating control function.
    Basic parameter: Heating power range 100~200W.
    Trigger logic: Activate heating when the minimum cell temperature is below 5 °C and the battery current is ⩾ 3 A or ⩽ –3 A (during charging or discharging).
    Cut-off logic: Deactivate heating if any of the following conditions is met:
    ① minimum cell temperature ⩾ 10 °C,
    ② cell temperature difference ⩾ 15 °C,
    ③ an active alarm condition is present (except low charging temperature alarm).

    Heating is **only enabled during charging or discharging**.
    During charging, heating power is supplied by the inverter; during discharging, heating power is supplied by the battery.
    Heating during discharging is stopped when **SOC < 10%**, or when the inverter discharge cut-off SOC is reached (if set higher).

    Alarm correlation: Deactivate heating for all level-1 alarms (except "low temperature during charging"); level-2/3 alarms do not affect heating activation (alarm notification same as Item 13).

2.3 BMS compatible inverter manufacturers

Number	CAN type	485 type
1	PYLON	PYLON
2	Growatt	Growatt
3	Victron	SRNE
4	GOODWQ	Deye
5	Solis	Voltronic Power
6	Pace Electronics	Pace Electronics
7	SOFAR	-
8	KSTAR	-
9	SMA	-
10	MEGAREVO	-
11	Afore	-
12	INVT	-

2.4 Performance and Test Conditions

2.4.1 Standard Test Conditions

- The storage environment must meet local regulations and standards. Test should be conducted with new batteries within one week after shipment from our factory and the batteries must not be cycled more than five times before the test. Unless otherwise specified, test and measurement must be done under temperature of 20±5℃ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30℃ and humidity 25~85%RH.

2.4.2 Measuring Instrument or Apparatus

- Dimension Measuring Instrument
  The dimension measurement must be implemented by instruments with equal or more precision scale of 0.01mm.
- Voltmeter
  Standard class specified in the national standard, or a more sensitive class having an inner impedance greater than 10 kΩ/V.
- Ammeter
  Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.
- Impedance Meter
  Impedance must be measured by a sinusoidal alternating current method (1kHz LCRmeter).
- Standard Charge :
  Charge at constant current 53A until any cell reaches 3.55V, then charge at constant current 2.65A until any cell reaches 3.58V.
- Standard Discharge :
  Constant current (53A) discharge to any single cell to 2.85V.
  If not otherwise specified, the rest time between charging and discharging is 30min.

2.4.3 Appearance

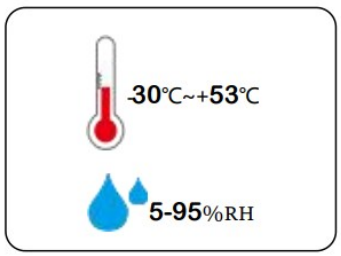
There must be no such defects as crack, rust, leakage, which may adversely affect commercial value of battery.

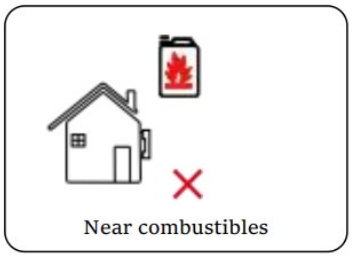
3 Application Scenario

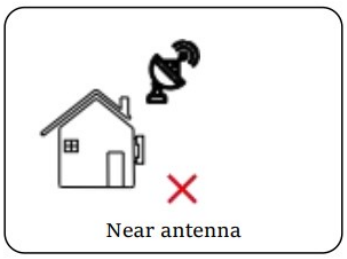
This product is suitable for villas, nomadic areas, farms, and households.

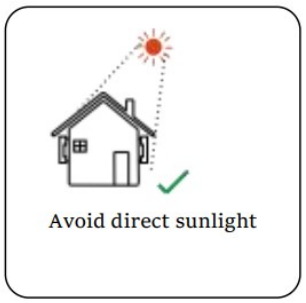
- To prevent fire due to high temperature, ensure that the ventilation vents or heat dissipation system are not blocked when the equipment is running.
- Do not expose the equipment to flammable or explosive gas or smoke. Do not perform any operation on the equipment in such environments.
- Ensure that the area is completely waterproof, and the floor is flat and level.
- Ensure that the temperature and humidity are maintained at a constant level, and there is minimal dust and dirt in the area.

Notice!
• For outdoor installation, precautions against direct sunlight, rain exposure and snow laying up are recommended. • Exposure to direct sunlight raises the temperature inside the battery. This temperature rise poses no safety risks but may impact the battery performance.









4 System Installation

4.1 Inspection before installation

Check the outer packaging

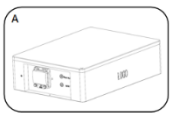
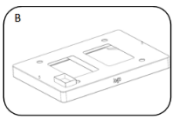
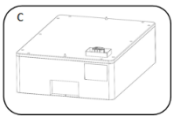
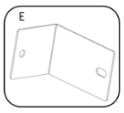
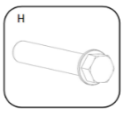
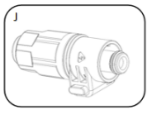
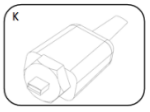
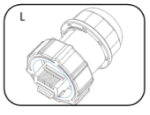
Before disassembling the outer packaging of battery system, check whether the outer packaging has visible damage, such as holes, cracks or other signs of internal damage, and check the battery system model. If there is any abnormal packaging or the battery system model is not consistent, do not disassemble it and contact your dealer as soon as possible.

Check deliverable

After unpacking the outer packaging of battery system, check whether the delivered parts are complete and free of any obvious external damage. If any items are missing or damaged, please contact your dealer. When assembling the system, avoid touching the battery terminals with any metal object or bare hands. According to the design principles, the product will provide safe and reliable energy. Improper operation and equipment damage may cause overheating and electrolyte leakage. Therefore, the above-mentioned safety precautions and warning information mentioned in this part must be strictly observed. If you have any questions, please contact customer service. Before installation, make sure that the installation site meets the following conditions.

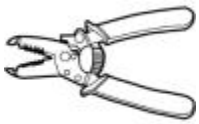
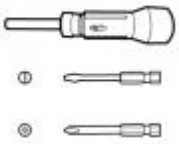
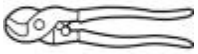
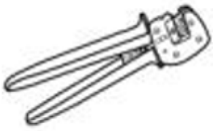
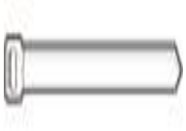
- The building can stand up to earthquakes.
- The site must be over 500 m away from the sea, to avoid damage caused by salt water and humidity.
- The floor must be flat.
- No flammable or explosive materials must be placed within at least 1 m of the battery system.
- The installation area should be shaded and kept cool and avoid heat sources and direct sunlight.
- The temperature and humidity remain at a constant level.
- The installation site requires less dust and dirt.
- There are no corrosive gases, including ammonia and acid vapor.
  If the ambient temperature exceeds the operating range, the battery pack will stop running to protect itself. The optimal temperature range for running is 15°C to 30°C. In the allowable range, the relative humidity range should be between 5% and 95%RH. Frequent exposure to harsh temperatures may deteriorate the performance and lifetime of the battery.

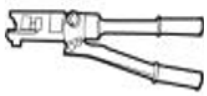
4.2 Scope of Delivery (Included Components)

No.	Name	Quantity	Image
1	High-voltage box (including BMS)	1	
2	Battery base	1	
3	Battery module	1-7	
4	Adjustable feet	4	
5	L-brackets	2	
6	M5 hexagon nuts	6-14	
7	M6 × 12 screws	2	
8	Expansion bolts	2	
9	Documentation	1	
10	DC power cables (5 m)	2	
11	Wi-Fi dongle	1	
12	Communication cable (5 m)	1	

4.3 Preparing Tools and Meters

Installation and maintenance personnel must operate according to applicable federal, state, and local regulations as well as industry standards regarding product installation. Personnel must wear safety gear as indicated below in order to avoid short circuit and personal injury.

Type	Tools and Instruments		
Install	Percussion drill	Torque socket wrench	Open-end wrench (8;10;18mm)
	Diagonal pliers	 Wire stripper	 Torque screwdriver
	Rubber hammer	Tool knife	 Wire nippers
	 Crimping pliers	Cold pressing terminal crimping pliers	Disassembly and assembly tools
	 Cable tie	Vacuum cleaner	A multimeter
	marking pen	Steel tape	Level ruler

	 hydraulic clamp	Heat shrinkable sleeve	Hot air gun
Personal protective equipment	Safety gloves	Protective glasses	
	Safety shoes	Anti-dust masks	

4.4 Select the installation position

4.4.1 Installation angle requirements

Battery system supports floor mounting. Installation angle requirements:

- It is not allowed to install the stored energy battery systems forward, horizontally, upside down, backward and sideways.

4.4.2 Installation position requirements

Please select solid brick-concrete structure, concrete wall and ground for installation. If other types of wall and ground are selected, the wall and ground must be made of flame-retardant materials and can meet the load bearing requirements of the battery system.

Installation space requirements

- When installing the battery system, ensure that no other battery systems or flammable or explosive materials are present nearby, and maintain sufficient clearance for ventilation and safety separation.

4.4.3 Installation instructions

- After unpacking batteries, place them in the required direction. Do not place them upside down, sideways, upright, tilted, or stacked to avoid battery damage or loss caused by impact or fall.
- The battery pack should be moved slowly to prevent collision and bump.

- When installing batteries, align the plug-in holes from bottom to top, and use screws to connect battery containers and the base.

4.4.4 Battery precautions

Warning

The battery system contains high energy, and improper handling may result in personal injury, equipment damage, or system malfunction. Observe the following precautions during handling, installation, and operation of the battery system.

- Never short-circuit the battery terminals. A short circuit may cause excessive current, overheating, fire, or explosion.
- Do not place the battery or battery modules on conductive surfaces where accidental short circuits may occur.
- Avoid dropping, impacting, or subjecting the battery to excessive mechanical stress, as this may cause internal damage.
- Do not disassemble, modify, or repair the battery or BMS. Unauthorized modification may compromise system safety and functionality.
- Ensure correct polarity when installing or connecting battery modules. Reversed polarity may cause permanent damage to the system.
- Use only insulated tools when working or near the battery terminals.
- Keep the battery system away from open flames, sparks, and high-temperature heat sources.
- Do not expose the battery to water, moisture, or conductive liquids.
- If the battery shows signs of abnormal behavior (odor, smoke, deformation, abnormal heat), immediately stop operation, power down the system, and contact technical support.

Improper use or handling of the battery system may prevent correct system operation and can lead to safety risks.

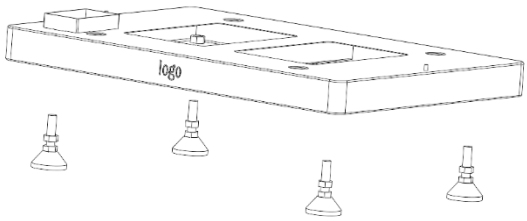
4.5 Installation Instructions

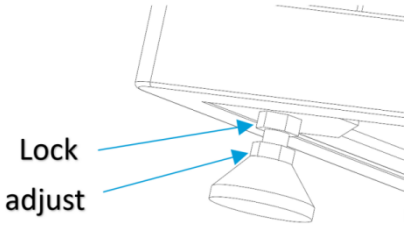
4.5.1 Installing Battery systems

Base mounting

Remove the base from the packaging and place it on a solid, level surface.

Ensure that the ground is stable and adjust the base to a level position using the adjustable feet.





Module installation

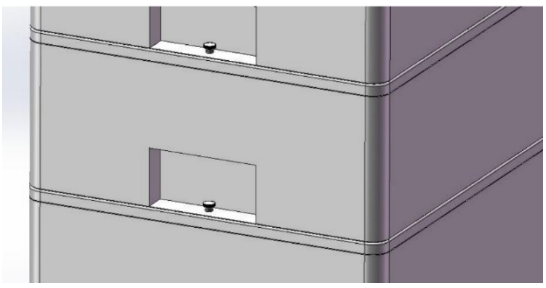
According to the actual conditions at the installation site, use manual or mechanical handling when installing the battery modules. Each battery module is heavy, and it is recommended that at least two people carry and install the modules together. Personnel must wear protective safety shoes and non-slip gloves during installation.

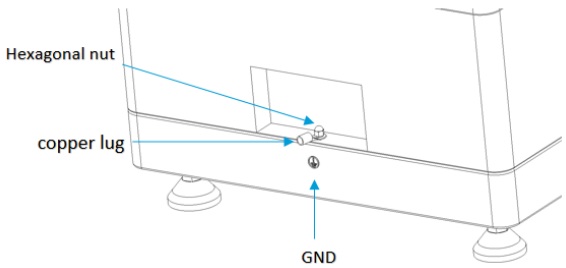
When the system consists of multiple battery modules, install the battery modules layer by layer from the bottom up after the base has been securely positioned and leveled. Align the positioning features of the battery module with the base and carefully lower the module into place.

After installing the bottom battery module, connect the grounding cable to the designated grounding point on the battery using M5 screws.

Ensure that the grounding connection is properly secured before continuing with the installation of additional battery modules.

There is an M5 screw hole located at the handles on both sides of each battery container, which must be used to secure the mechanical connection between adjacent battery modules.





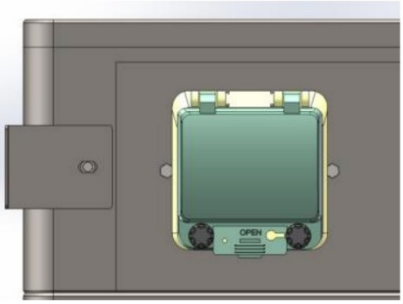
High Voltage BMS installation

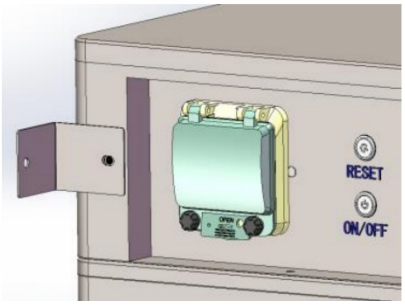
After installing the battery box, mount the High Voltage BMS box on top of the battery stack. Secure the BMS box by tightening the screws on both sides of the handle using an open-end wrench, ensuring all screws are firmly fastened.

To prevent the system from tipping, the High Voltage BMS box may be additionally secured to the wall using metal fixing brackets. Attach the brackets to the BMS box using M6 screws, and fasten the brackets to the wall using M6 expansion bolts.

Use of expansion screws:

1. Make a hole in the wall with a depth of 50mm and a diameter of 8mm.
2. Put the expansion screw into the hole, tighten the screw, and pull the screw out of the hole.
3. Put the metal piece in the hole, then add the gasket, and finally lock the screw.





4.5.2 Electrical installation

4.5.2.1 Tool Introduction

The following tools are required for electrical connections, as shown in Table :

Item	Tool		
Tool	Multimeter	Protective gloves	Flat-head screwdriver
	Electric screwdriver	Phillips screwdriver	Socket wrench

4.5.2.2 Interface definition

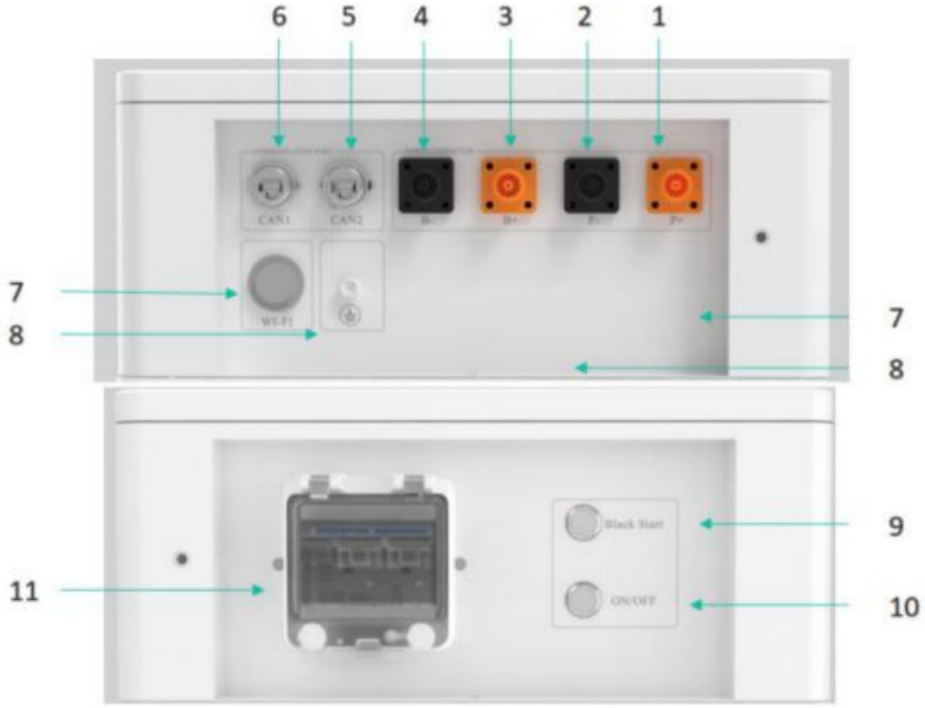


Table Interface definition

Item	Name	Model	Remarks
1/2	PCS connector		1500V/65A
3/4	Battery connector		1500V/65A
5	Communication port (**up-link**)	RJ45	CAN To PCS RS485 Internal Connection
6	Communication port (**down-link**)	RJ45	CAN to Parallel battery stack
7	Wifi		Ø 32.00±0.5 M25
8	Grounding terminal		
9	Black start switch		When the grid loses external power supply, the energy storage system is able to utilize its own stored energy to supply power. Press and hold the Blackstart button for 15–20 seconds until an audible sound is heard, indicating a successful black start.
10	Power switch		
11	Circuit breaker	4P MX+OF	1200V 80A

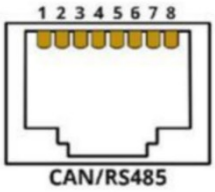


Table RJ45 Port Definition

	Description	
CAN 2	**Pin 1: CAN2-H**	**Pin 2: CAN2-L**
	Pin 3: /	**Pin 4: CAN3_H**
	Pin 5: CAN3_L	**Pin 6: ADDR_DO**
	Pin 7: ADDR_DI	**Pin 8: GND**

Table Communication Cable Requirements

Cable Gauge	Strip Length	Maximum Cable Length
CAT5 or better (22 AWG)	**RJ-45 connector**	**45 m**

Table Power Cable Requirements

Size	Diameter	Max. Voltage	Max. Current	Max. Current Remark
7AWG	**3.665mm**	**1000 V**	**80A**	

Table Output/Internal cable definition

Cable	Type	Recommended Specification	Length(m)	Source
DC output power cable (inverter to battery, Negative)	**Common outdoor DC cable in the industry**	**Conductor cross-sectional area: 7AWG;**	**Depends**	**Prepared by the customer**
DC output power cable (inverter to battery, Positive)			**Depends**	**Prepared by the customer**
Signal cable (inverter to battery)	**Outdoor shielded twisted pair cable**	**CAT5 or better, Conductor cross-sectional area: 0.20–0.35mm2; Cable outer diameter: 6.2–7mm;**	**Depends**	**Prepared by the customer**
Ground cable				**Prepared by the customer**

4.5.2.3 DC Cable Connection

The battery system is equipped with quick-connect DC terminals.
The polarity is color-coded:

- Orange – Positive (+)
- Black – Negative (−)

The DC power cables are connected to the battery using quick-connect plugs and to the inverter using ring terminals.

Connection procedure

1. Ensure that the inverter is switched off and that both the AC mains and PV circuits are disconnected.
2. Ensure that the battery system is powered off.
3. Connect the ring terminals of the DC cables to the corresponding positive (+) and negative (−) DC terminals on the inverter. Tighten all connections securely.
4. Connect the negative (−) quick connector to the negative terminal on the battery.
5. Connect the positive (+) quick connector to the positive terminal on the battery.

Ensure correct polarity before completing the connection.

Warning

Before connecting the DC cables, ensure that both the battery system and inverter are powered off.

Disconnection procedure

1. Disconnect the AC mains and PV circuits from the inverter.
2. Switch off the inverter.
3. Switch off the battery system using the power switch.
4. Disconnect the negative (−) quick connector.
5. Disconnect the positive (+) quick connector.
6. Remove the DC cables from the inverter terminals.

Warning

- Follow the connection procedure carefully. Ensure all connections are secure.
- Installation and disconnection must be performed by qualified personnel only.
- The DC cables may carry high current. Ensure that unauthorized persons cannot access them.

4.5.3 System Operation

Warning

- The battery must be fully charged (100% SOC) during initial commissioning to ensure correct system calibration and optimal performance.
- For extended periods of inactivity (e.g. holidays), it is recommended to charge the battery to approximately 40% state of charge (SOC) and switch off the power supply.

4.5.3.1 Startup inspection

After installation or maintenance, a startup inspection must be performed before energizing the battery system.

Verify the following:

- All wiring harnesses are correctly connected.
- Polarity and connector engagement are correct.
- All electrical connections are tightened according to specifications.

All electrical connections must be completed in accordance with the wiring diagrams provided in this manual.

4.5.3.2 Pre-startup Self-Check

The purpose of this self-check is to verify that the **Battery Management System (BMS) starts correctly** before the system is connected to or started by the inverter.
If the BMS does not start during this self-check, it will also not start when woken up by the inverter, which will result in the system not operating. In such cases, the inverter will most likely generate a **“no battery” fault**.

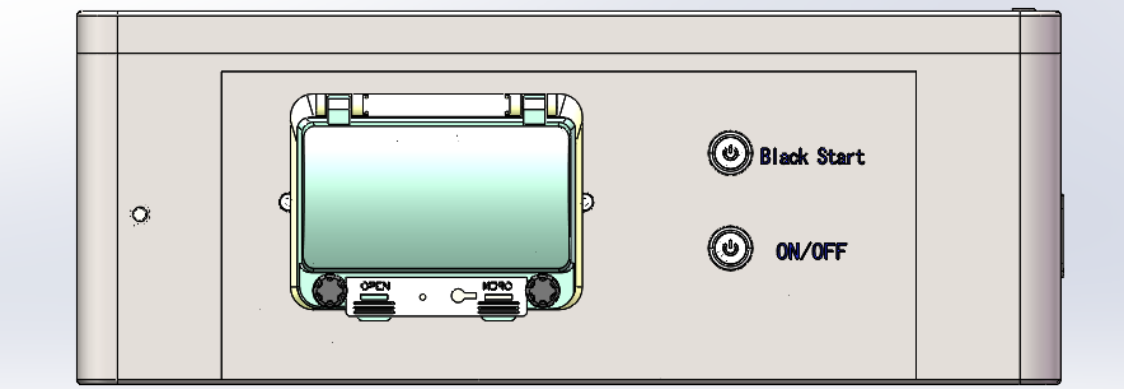
During the self-check, the following is verified:

- The **BMS is powered and running**, indicated by the communication dongle power LED.
- The **internal contactors close**, confirmed by an audible relay click during black start.
- **DC voltage is present at the battery output terminals** (B+/B− or P+/P−).

If DC voltage cannot be measured at the battery output, the system must **not be commissioned**.

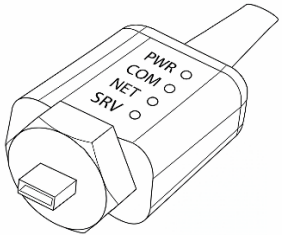
Self-check procedure

1. Open the miniature circuit breaker.	2. Turn on the power switch on the battery system	3. Press and hold the **Blackstart** button for approximately **20 seconds**.



Expected result

- The communication dongle is powered on.
- Audible relay activation (contactors closing) is heard.
- DC voltage can be measured at **B+/B− or P+/P−** terminals.

	 Around 100VDC per battery

If the expected results are not observed, the system must not be connected to or started with the inverter. Contact technical support for further troubleshooting.

4.5.3.3 System startup

1. Open the miniature circuit breaker.
2. Turn on the power switch on the battery system.
3. Turn on the inverter

When the battery system establishes communication with the inverter, the information on the inverter software or its screen should be green.

4.5.3.4 System shutdown

Before performing any maintenance, troubleshooting, or repair, the battery system must be completely shut down.

Shutdown procedure:

1. Turn off the inverter.
2. Turn off the power switch and circuit breaker on the battery system.

Important:

- Disconnecting **only the circuit breaker is not sufficient** to fully power down the energy storage system.
- Maintenance work must **not** be carried out unless the system is fully shut down according to the procedure above.

4.5.3.5 System commissioning and monitoring setup

After successful system startup, the battery system must be registered and commissioned in the monitoring portal.

Registering the system enables:

- system monitoring and diagnostics,
- software updates and configuration management,
- remote support and troubleshooting.

Detailed instructions for system registration and commissioning are available on the Senergia B2B website:

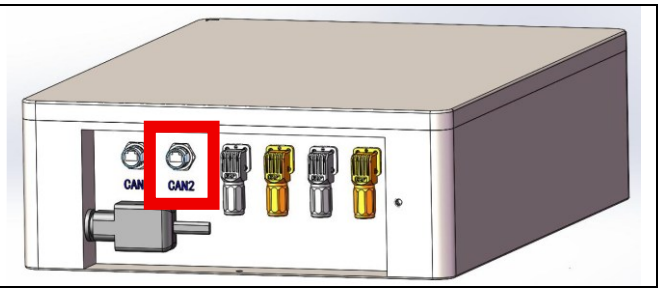
https://b2b.senergia.se/batteries/residential/qapasity

5 Fault Handling

	Fault Type	Reason	Handle
1	Cell Over Voltage	The voltage of the individual cell exceeds the threshold	The system prohibits charging
2	Cell Under Voltage	Single cell voltage below threshold	The system prohibits discharge
3	Delta Cell Voltage	The voltage difference between battery cells is greater than the threshold	The system automatically starts the balancing mechanism
4	Total Over Voltage	The overall system voltage is above the threshold	The system prohibits charging
5	Total Under Voltage	The overall system voltage is below the threshold	The system prohibits discharge
6	Discharge Over Temperature		Reduce system discharge power
7	Discharge Under Temperature		The system prohibits discharge
8	Charge Over Temperature		Reduce system charging power
9	Charge Over Current		Reduce system charging current
10	Discharge Over Current		Reduce system discharge current
11	Low SOC	Insufficient remaining battery in the system	Timely charging
12	Insulation fault	Reduction or loss of insulation resistance	Contact service
13	Communication failure	Communication error with PCS	Check the communication harness
14	Total Positive Relay Fault	Relay adhesion or damage	System shutdown power switch
15	Total Negative Relay Fault	Relay adhesion or damage	System shutdown power switch
16	Pre-charge Relay Fault	Relay adhesion or damage	Check the pre charge circuit relay
17	Individual temperature fault	Temperature sensor malfunction	Contact service

5.1 Basic Troubleshooting During Commissioning

5.1.1 Incorrect CAN bus connection

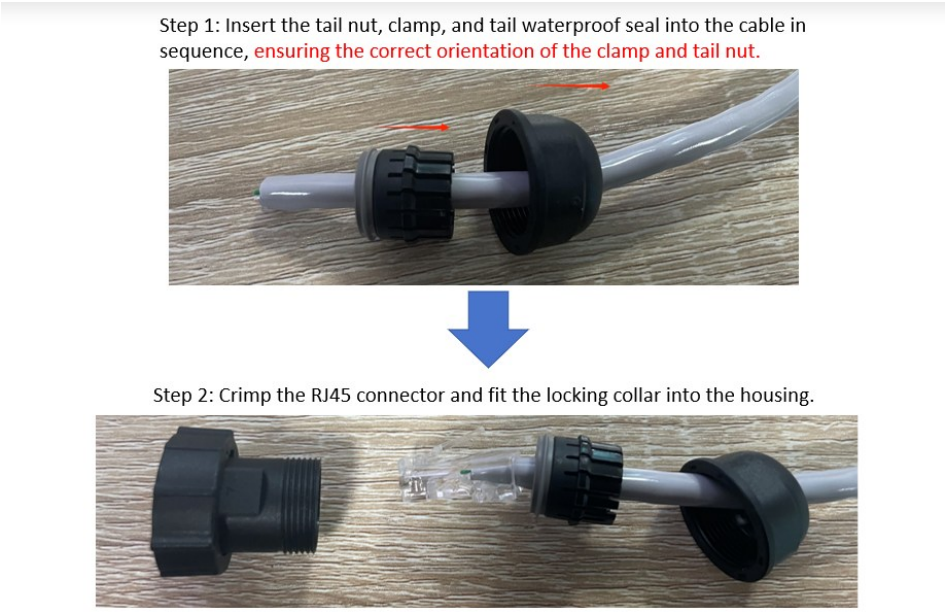
A common installation issue is that the wrong CAN bus port is used. For example, when using a Solis inverter, the correct communication port on the battery system is CAN2.	

5.1.2 Incorrect RJ45 cable or connector locking

The CAN1 and CAN2 ports on the BDU do not use a standard RJ45 locking mechanism. For this reason, the supplied communication cable must be used, as a standard Ethernet cable may not lock properly in the connector.

If a standard Ethernet cable is used, the connection may become loose or intermittent, which can prevent the system from starting or cause a loss of communication.

If the supplied cable is too short, a new straight-through RJ45 cable may be manufactured or extended. In such cases, the locking mechanism from the original supplied cable must be reused to ensure correct fit and reliable contact.



5.1.3 Battery module or BDU not properly seated

If the BDU does not start during a black start, the most common cause is poor electrical or mechanical contact between the battery modules and the BDU.
A single battery module that is not fully seated can prevent the entire system from starting.

In some cases, a small gap between battery modules may be visible. However, improper contact is not always visually detectable.

If black start fails, perform the following:

- Remove one battery module at a time.
- Carefully reinstall the BDU, ensuring correct alignment and full engagement.
- Perform a new black start.
- Repeat the procedure until the module causing the poor contact is identified.

Once the faulty connection has been corrected, retry the black start procedure.

Notes:
A Swedish Quick Guide is available on Senergias website for convenience. However, in case of discrepancies or uncertainties, this English manual must prevail.

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