ALPHA OUTBACK ENERGY

AOESS48V-HP Compact

USER MANUAL

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Content explanation

This manual describes how to install AOESS73.5 electrical energy storage system. Read this manual before you attempt to install the product and follow the instructions throughout the installation process. If you are uncertain about any of the requirements, recommendations, or safety procedures described in this manual, contact AOE immediately for advice and clarification. The information included in this manual is accurate at the time of publication. However, the product specifications are subject to change without prior notice. In addition, the illustrations in this manual are meant to help explain system configuration concepts and installation instructions. The illustrated items may differ from the actual items at the installation location.

1. Safety

1.1. Symbols on product labels

The nameplate and warning labels are attached to the front side of the battery pack.

This battery pack contains high voltage which can cause electric shock resulting in severe injury.

Make sure that the battery polarity is connected correctly.

Keep the battery pack away from open flame or ignition sources.

Keep the battery pack away from children.

Read the manual before installing and operating the battery pack.

The battery pack is heavy enough to cause severe injury.

The battery pack may leak corrosive electrolyte.

The battery pack may explode.

The battery pack should not be disposed with household waste at the end of its working life.

The battery pack should be disposed at a proper facility for environmentally safe recycling.

1.2. Safety instructions

For safety reasons, installers are responsible for familiarizing themselves with the contents of this manual and all warnings before performing installation.

General safety precautions

> **!** WARNING – Failure to observe the precautions described in this section can cause serious injury to persons or damage to property.

Observe the following precautions:

- Risks of explosion
  - Do not subject the battery pack to strong impacts.
  - Do not crush or puncture the battery pack.
  - Do not dispose of the battery pack in a fire.

- Risks of fire
  - Do not expose the battery pack to temperatures in excess of 60°C.
  - Do not place the battery pack near a heat source, such as a fireplace.
  - Do not expose the battery pack to direct sunlight.
  - Do not allow the battery connectors to touch conductive objects such as wires.

- Risks of electric shock
  - Do not disassemble the battery pack.
  - Do not touch the battery pack with wet hands.
  - Do not expose the battery pack to moisture or liquids.
  - Keep the battery pack away from children and animals.

- Risks of damage to the battery pack
  - Do not allow the battery pack to come in contact with liquids.
  - Do not subject the battery pack to high pressures.
  - Do not place any objects on top of the battery pack.

Battery handling guide

- Use the battery pack only as directed.
- Do not use the battery pack if it is defective, appears cracked, broken or otherwise damaged, or fails to operate.
- Do not attempt to open, disassemble, repair, tamper with, or modify the battery pack. The battery pack is not user serviceable.
- To protect the battery pack and its components from damage when transporting, handle with care.
- Do not impact, pull, drag or step on the battery pack. Do not subject it to any strong force.
- Do not insert foreign objects into any part of the battery pack.
- Do not use cleaning solvents to clean the battery pack.

1.3. Response to emergency situations

The AOESS73.5 comprises multiple batteries cells that are designed to prevent hazards resulting from failures. However, AOE cannot guarantee their absolute safety.

Leaking batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. Electrolyte is corrosive and contact may cause skin irritation and chemical burns.
If one is exposed to the leaked substance, do these actions:

Inhalation: Evacuate the contaminated area, and seek medical attention immediately.

Eye contact: Rinse eyes with flowing water for 15 minutes, and seek medical attention immediately.

Skin contact: Wash the affected area thoroughly with soap and water, and seek medical attention immediately.

Ingestion: Induce vomiting, and seek medical attention immediately.

Fire: In case there is a fire, always have an ABC or carbon dioxide extinguisher.

! WARNING – The battery pack may catch fire when heated above 150°C. If a fire breaks out where the battery pack is installed, do these actions:

1. Extinguish the fire before the battery pack catches fire.
2. If it is impossible to extinguish the fire but you have time, move the battery pack to a safe area before it catches fire.
3. If the battery pack has caught fire, do not try to extinguish the fire. Evacuate people immediately.

! WARNING – If the battery catches fire, it will produce noxious and poisonous gases. Do not approach.

Wet batteries

If the battery pack is wet or submerged in water, do not try to access it. Contact AOE or your distributor for technical assistance.

Damaged batteries

Damaged batteries are dangerous and must be handled with extreme caution. They are not fit for use and may pose a danger to people or property.
If the battery pack seems to be damaged, pack it in its original container, and then return it to AOE or your distributor.

! CAUTION – If the battery catches fire, it will produce noxious and poisonous gases. Do not approach.

1.4. Qualified installers

This manual and the tasks and procedures described herein are intended for use by skilled workers only. A skilled worker is defined as a trained and qualified electrician or installer who has all of the following skills and experience:

- Knowledge of the functional principles and operation of on-grid systems.
- Knowledge of the dangers and risks associated with installing and using electrical devices and acceptable mitigation methods.
- Knowledge of the installation of electrical devices.
- Knowledge of and adherence to this manual and all safety precautions and best practices.

1.5. Contact information

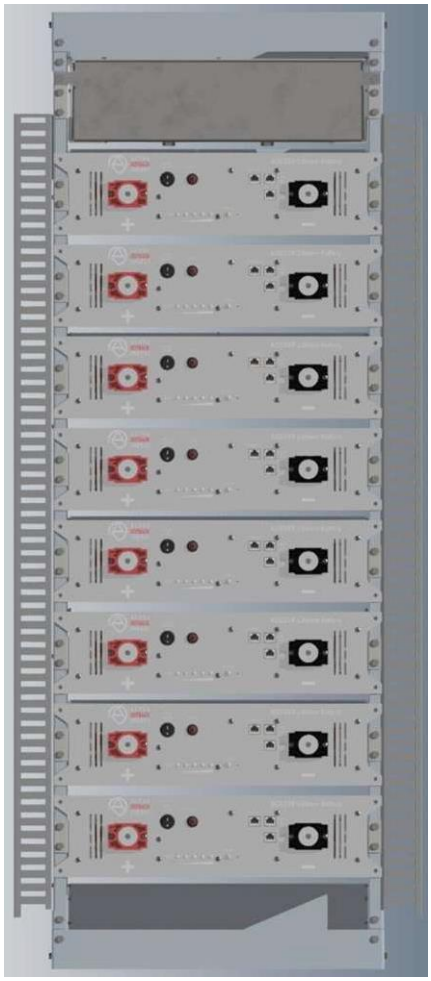
Use the contact below for technical assistance. These phone number is available only during business hours on weekdays.

Email	Phone
RE.Support@alphatechnologies.de	+49 9122 79 889 45

2. Product information

Dimensions and weight

	AOESS73.5
Depth Width Height	975 mm
Weight	626 mm
	1456 mm
	600 kg



Performance

	AOESS73.5
Nominal voltage Operating voltage Nominalcapacity	51.1 V
	42 to 58.8 V
	1440 Ah
Nominal energy Standard power Max. discharge	73.5 kWh
	73.5 kW
Max. charge current	900 A
Peak power	750 A
	84.6 kW

Environmental requirements

	AOESS73.5
Operatingtemperature	0ºC to 50ºC
Recommendedtemperature	15ºC to 30ºC
Storage temperature	-30ºC to 60ºC
Humidity Altitude	5 to 95%
	<2000 m

3. Installation

! WARNING – The battery pack is too heavy for one to carry. Make sure that two or more instructed persons are available.

3.1. Package items

The following table lists the number of each item included.

Battery rack including power distribution box and power cables	1
Battery rack mounting brackets	2
Battery modules	8
Modules fixing screws	36
Rack mounting bracket fixing screws	16
Communication cables (master-slave communication)	7
RJ45 resistor terminations	2
CAN diagnostics cable (blue DB9)	1
Serial diagnostics cable (black DB9)	1

If anything is damaged or missing, contact AOE or your distributor.

3.2. Installation materials

These installation materials shall be prepared by the installers.

- Positive charging cable
- Negative charging cable
- Concrete mounting fixture designed to sustain the loads during usage.
- M8 concrete anchors x 6 pcs

3.3. Installation location

Make sure that the installation location meets the following conditions:

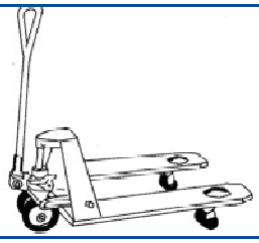
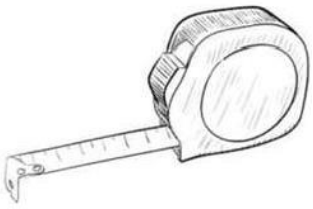
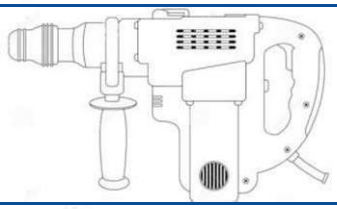
- The building is designed to withstand earthquakes.
- The location is far away from the sea, to avoid salt water and humidity.
- The floor is flat and level.
- There are no flammable or explosive materials nearby.
- The ambient temperature is between 15 and 30°C.
- The temperature and humidity stay at a constant level.
- There is minimal dust and dirt in the area.
- There are no corrosive gases present, including ammonia and acid vapor.

! WARNING – Do not allow the battery pack to be exposed to direct sunlight and moisture.

! WARNING – If the ambient temperature is outside the operating temperature, he battery pack stops operating to protect itself. The recommended temperature range for the battery pack to operate is 15°C to 30°C. Frequent exposure to harsh temperatures may deteriorate the performance and lifetime of the battery pack.

3.4. Tools

The following tools are required to install the battery pack:

No.	Item	Use	Appearance
1.	Forklift	Moving package / unloading	
2	Crowbar	Unpacking	
3	Box cutter	Unpacking	
4	Pallet truck	Positioning	
5	Tape measure	Mounting holes	
6	Concrete drilling machine	Mounting holes	
7	Concrete drill	Mounting holes	

Use adjustable tools and measuring instruments that are certified for precision and accuracy.

3.5. Safety gear

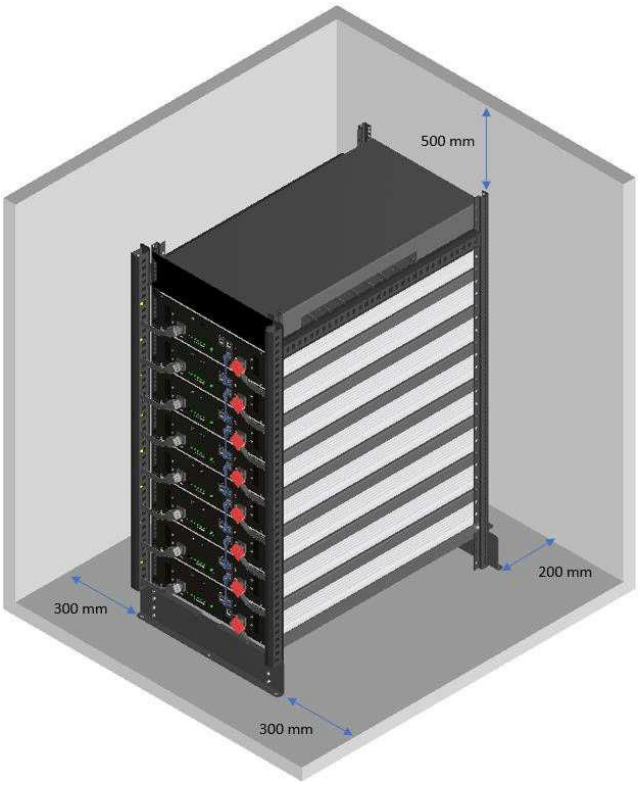
Wear the following safety gear when dealing with the battery pack. Installers must meet the relevant requirements of international standards, such as IEC 60364, or domestic legislation.

Insulated gloves

Safety goggles

Safety shoes

3.6. Installation clearance



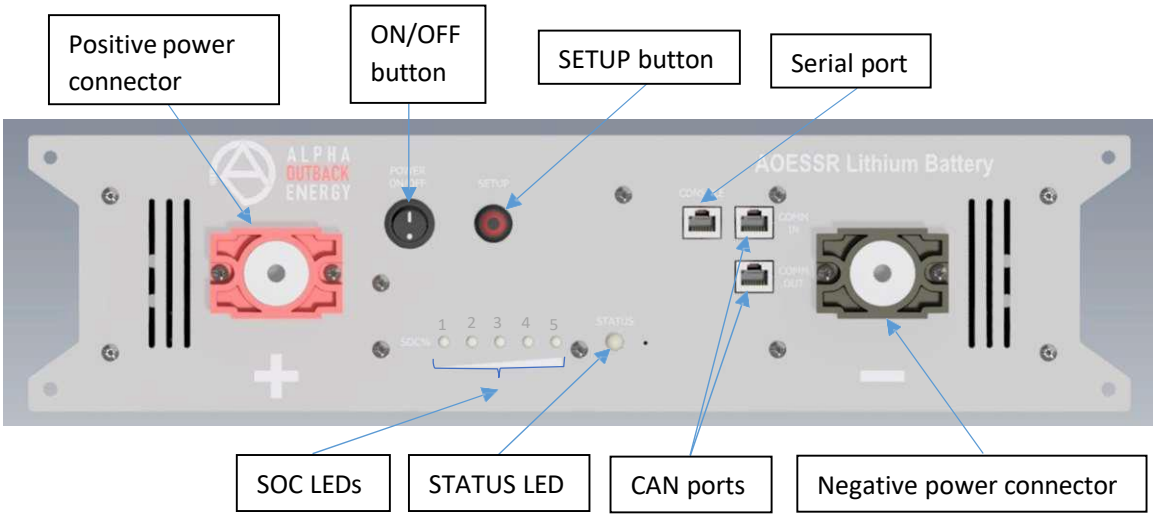
Make sure to leave a space of at least 200mm between the battery pack and the wall. A clearance of at least 300mm must be left around the battery pack for proper cooling.

! CAUTION – Make sure that the battery pack is always exposed to the ambient air. The battery pack is cooled by natural convection. If the battery pack is entirely or partially covered or shielded, it may cause the battery pack to stop operating.

3.7. Checking before installation (for each module)

There are things to check before installing the battery pack to ensure that it has no defects.

3.7.1. Frontal panel specifications



On the frontal panel are mounted the ON/OFF button, the SETUP button and the LED, the SOC (State of Charge) LEDs, the power circuit negative and positive connectors, the serial communication connector - CONSOLE and the CAN communication connectors - COMM_IN and COMM_OUT.

3.7.2. State of charge (SOC) and STATUS LED lights specifications

State of charge (SOC) LEDs

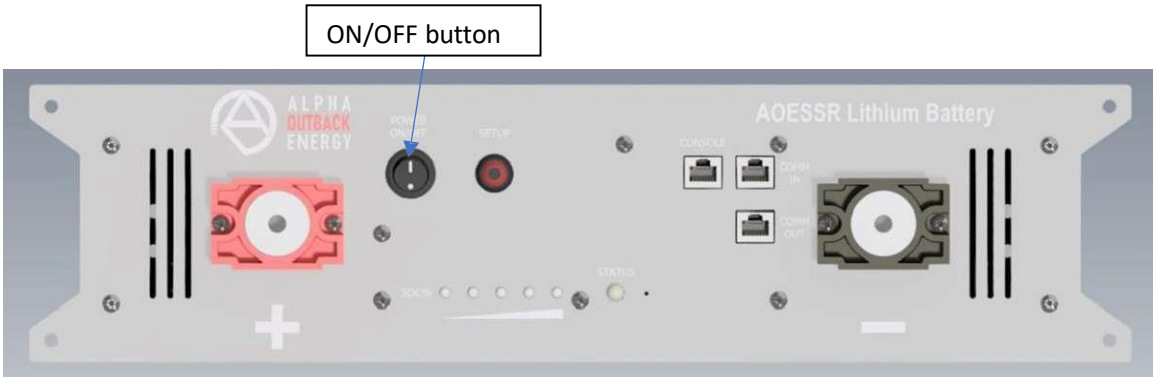
The SOC LEDs (five) are powered by the ON/OFF button.
From left to right, the first **LED 1** will always be ON when the battery module is turned ON and the state of charge will be above zero (SOC > 0 %).
Second **LED 2** will turn ON when the state of charge will surpass 25% of the total charge (SOC ≥ 25%). Third **LED 3** will turn ON when the state of charge will be above 50% (SOC ≥ 50%).
Fourth LED from left to right, **LED 4**, will turn ON when the state of charge will surpass 75% (SOC ≥ 75%). Fifth and last **LED 5** will turn ON when state of charge will be above 90% (SOC ≥ 90%).

STATUS LED

The status LED can be either green if the contactor and the BMS are ON, red if an error has occurred or flashing blue if it entered alternate mode. In normal operation of the battery module the status LED will emit green light. In the case of an error, the LED will be red; if the module is turned OFF and then back ON the status light will maintain the error and will still be red.
To turn the LED to its green nominal state, the SETUP button should be quickly pressed three times and immediately hold for 10 seconds in order to delete the error status. If this procedure is not correctly executed, the LED does not turn green and the SETUP button should be hold for 15 seconds in order to enter the alternate function (blue light will be flashing). Afterwards, the first procedure must then be repeated for the error status to be deleted and the status LED to turn green.

3.7.3. ON/OFF button

At the first installation, make sure that the battery module is turned OFF by checking the status LED – it should be turned OFF.
Switch the ON/OFF button to the ON position to turn ON the battery module. The status LED should turn green.
If the button moves by itself to any other positions, gets stuck in the pressed position or the status light does not light up, do not use the battery pack. Contact AOE or your distributor.



3.7.4. Voltage absence and presence verification

Measure the voltage at the terminal block using a voltmeter.

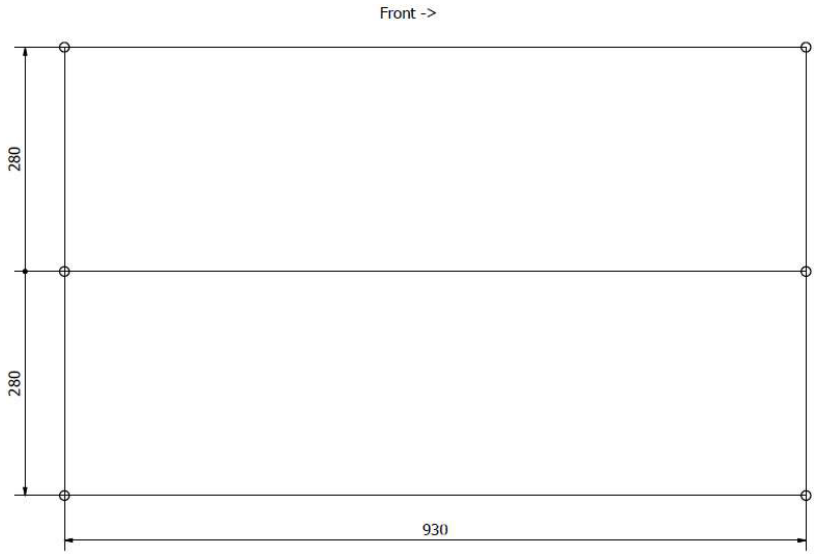
1. Make sure that the ON/OFF button is in the OFF position (the status LED is OFF), and then measure the voltage. If the voltage is higher than 0 V, do not use the battery pack. Contact AOE or your distributor.
2. Switch the ON/OFF button to the ON position to turn ON the module (status LED is green), and then measure the voltage. If the voltage is lower than 38 V, do not use the battery pack. Contact AOE or your distributor.

3.8. Rack installation

! WARNING – Make sure that surface intended to be used for mounting is design to sustain the battery weight.

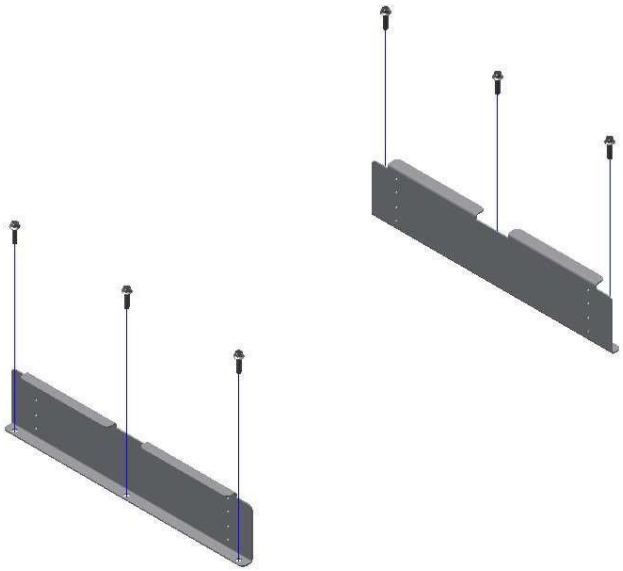
! WARNING – The mounting support for the battery must be concrete / masonry.

1. Drill the holes used for fixing the battery mounting bracket.

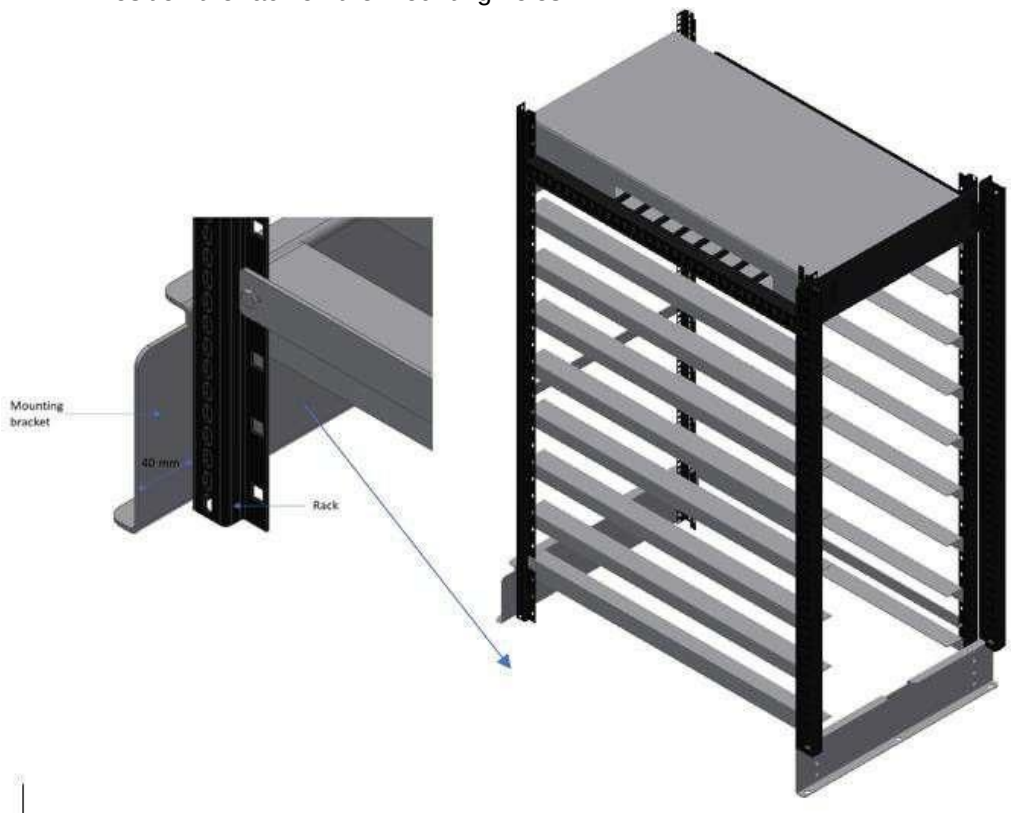


2. Install the concrete anchors.

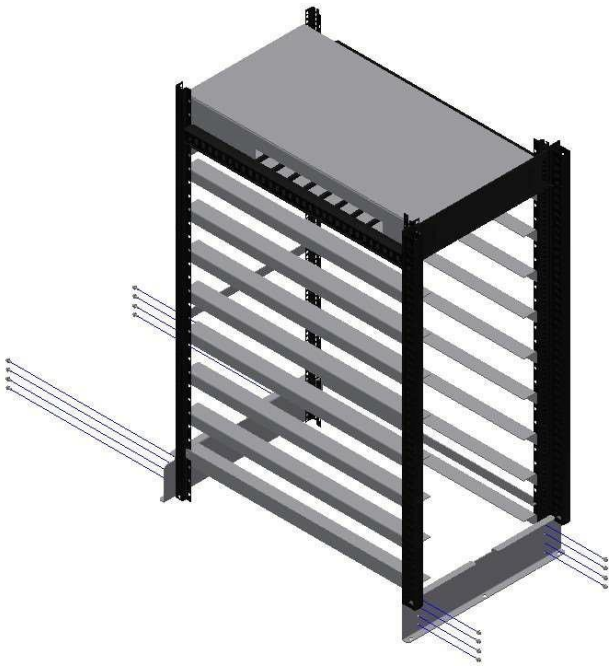
3. Install the mounting brackets.



4. Position the rack on the mounting holes.



5. Install the rack on the mounting brackets.

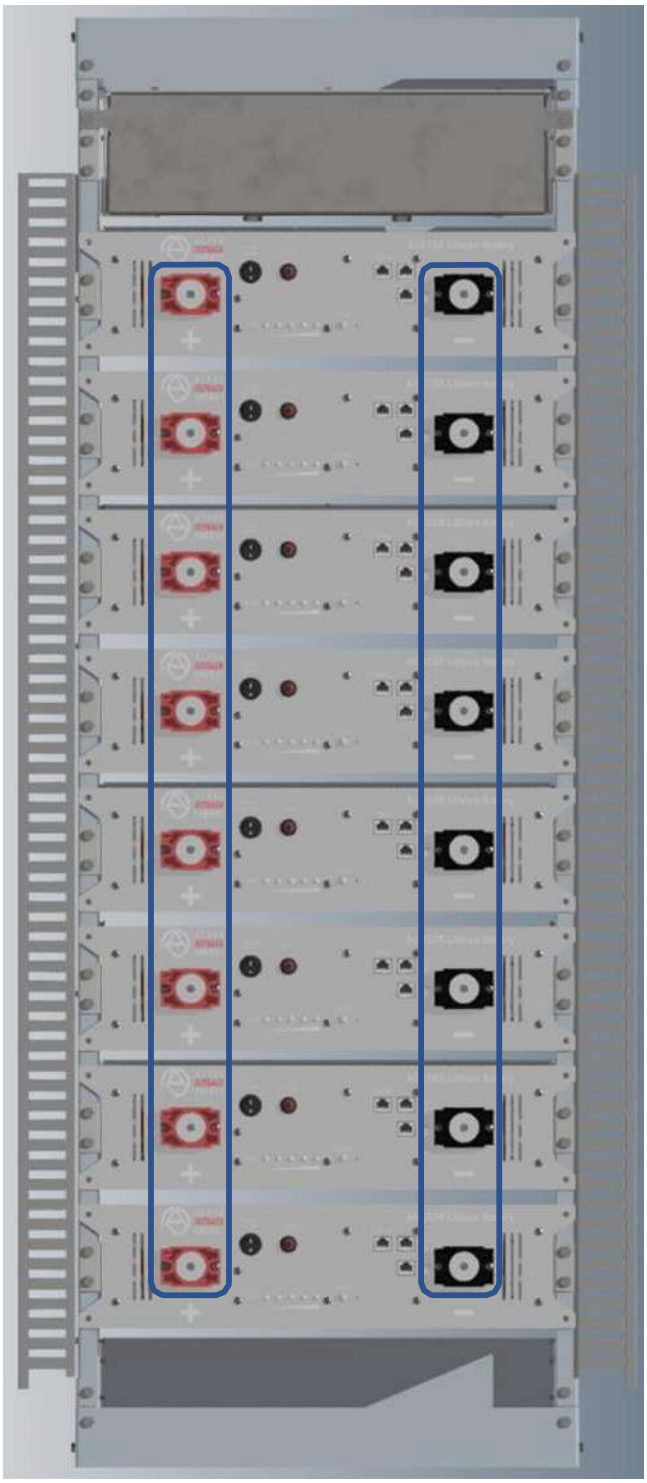


6. Slide the modules in the rack.

Module position after sliding in

7. Fix the modules to the rack.

8. Connect the power cables provided in the rack cable management provision on the sides to the modules.



3.9. Connecting the battery pack to the inverter

! WARNING – Make sure that the inverter is turned off before connecting the battery pack to the inverter.

1. Before connecting the battery pack to the inverter, make sure that each module is turned OFF (status LED is OFF).
2. Make sure that the cross-sectional area of the charging cables is minimum 150 mm^2.
3. Remove the connection box cover.
4. Attach the negative power connector to negative charging cable using the hydraulic crimping press.
5. Attach the positive power connector to positive charging cable using the hydraulic crimping press.
6. Connect the negative charging cable (-) to the battery negative terminal and the positive charging cable to the battery positive terminal in the connection box at the top of the rack.
7. Mount the connection box cover.

3.10. Connecting the battery pack to charger

! WARNING – Make sure each module is turned OFF (status LED is OFF) before establishing the electrical connections between the battery and the charger.

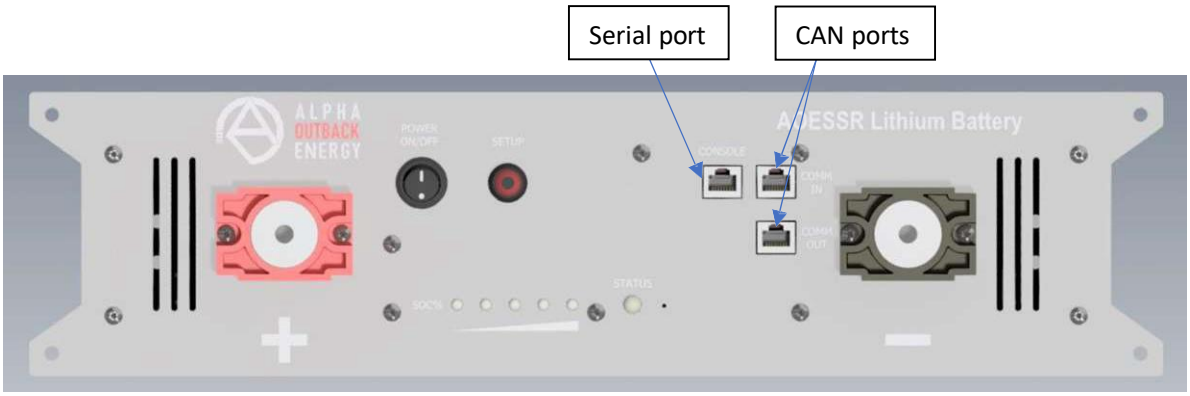
In order to connect the battery pack to charger, one important factor is the equal charging of all modules and cells to prevent cell unbalancing, which could lead to some of the battery cells being over or undercharged. Cell balancing is ensured by always powering the battery pack at its positive and negative power terminal on the collecting bus bars in the connection box at the top of the rack; disassembling the battery modules and powering individual cells must be avoided. Extra caution should be applied when dealing with the power supply to prevent any damage to the operators and the battery pack.

For a proper charging operation of the AOESS73.5 battery pack, full charge will be reached when the battery pack reaches 58.8 V and the current drops to approximately 3 percent of the rated current. Once fully charged, disconnect the battery. Never allow the battery pack to dwell at 58.8 V for more than a few hours.

! WARNING – Always charge the battery pack as intended and connect the charge cables to the battery power terminals to ensure the balanced charging of the battery pack. Do not open the battery modules to charge cells individually under any circumstance.

3.11. Connecting the modules communication cables

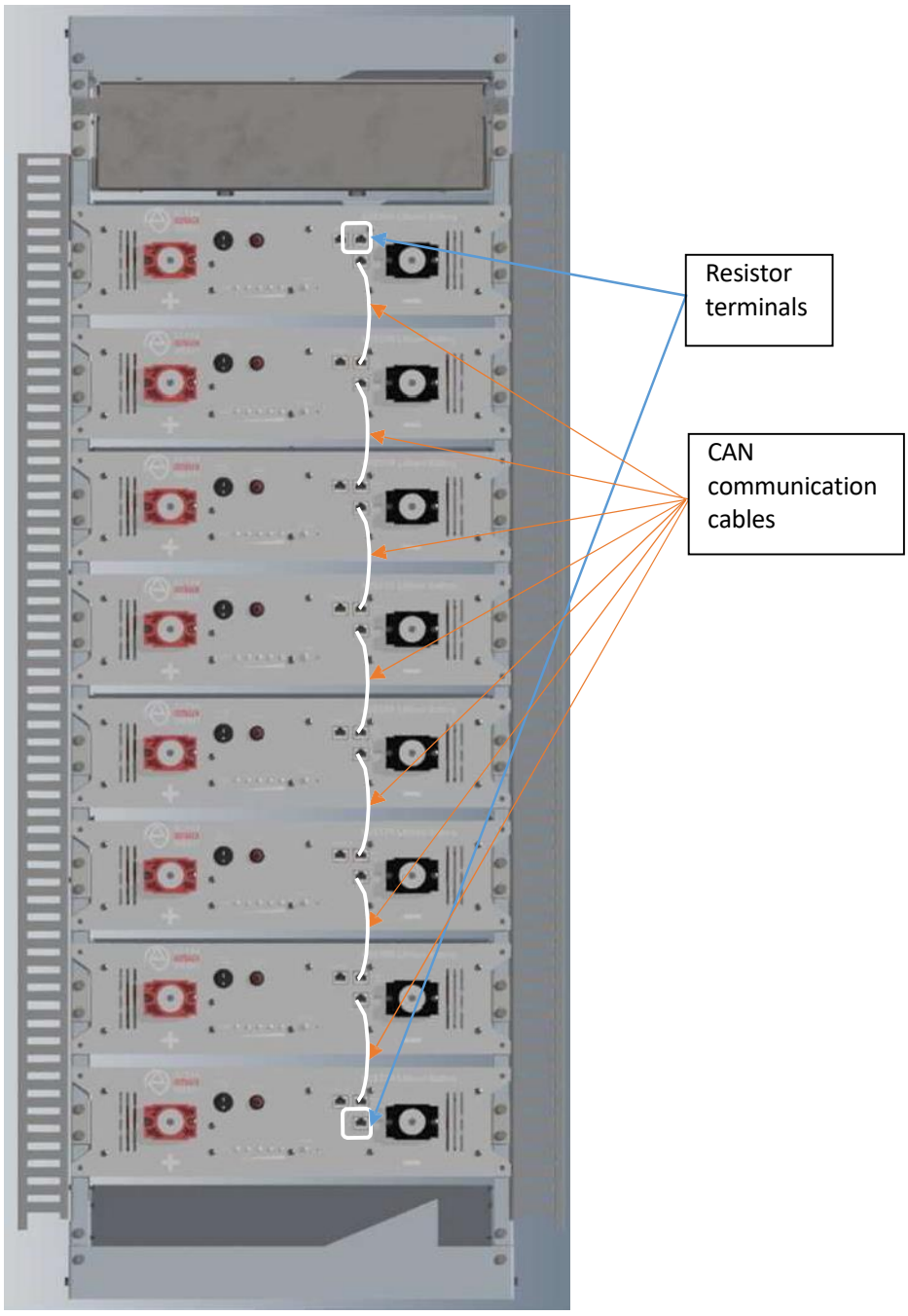
Each of the eight battery modules has three communication ports: one serial communication port – CONSOLE and two CAN communication ports: COMM_IN and COMM_OUT.



3.11.1. Master – slave communication of the battery pack

The top module is considered the master module and it will transmit the ON or OFF signal to the other modules, considered slave modules.
The CAN interface consists of CAN_L and CAN_H, establishing connection with high and low signal lines. In order for the CAN interface to work properly, a resistor of 120 Ω should be installed at both terminations of the CAN bus, this interface being established as followed:

1. One RJ45 connector with an integrated resistor should be inserted in the COMM_IN port of the eighth (top) module;
2. One RJ45 connector with an integrated resistor should be inserted in the COMM_OUT port of the first (bottom) module;
3. Each communication cable will establish the connection between two consecutive modules, connecting the COMM_IN port of the first module with the COMM_OUT port of the second module, etc.



! WARNING – Do not use the CAN signal line with a single resistor at one end, even if it appears to work properly. To ensure a nominal functionality of the CAN signal line, a resistor of 120 Ω should be installed at each termination. The total resistance of the CAN bus (measured between the COMM_IN of the top module and the COMM_OUT of the bottom module) should measure 60 Ω (the resistance of two 120 Ω resistors in parallel equals 60 Ω).

3.11.2. Diagnostics connectors

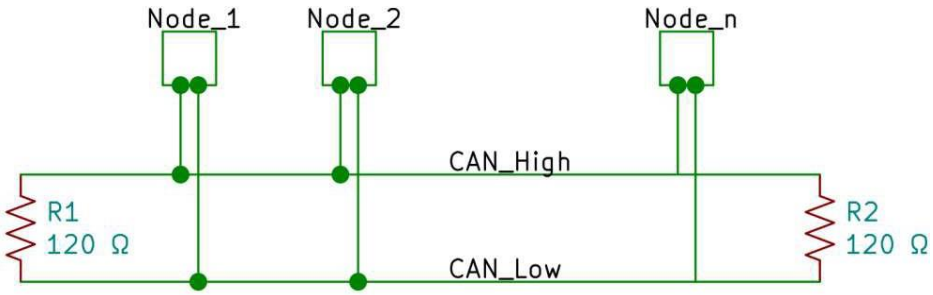


Diagram of a multi-node CAN bus with 120 Ω termination resistors at the ends

The above diagram shows how a multi-node CAN bus can be generically established; by example one of the nodes can be considered the diagnostics node for connecting to the computer software.
The serial connection can also be used to connect an individual module to the software monitoring program through a diagnostics connector, the advantage being that it does not require an extra node (the connection is established directly to the CONSOLE port), but it will only monitor the characteristics of the module to which it has been connected and will also have a lower transfer rate than the CAN communication.
There are two diagnostics cables provided:

- One CAN diagnostics cable has a RJ45 connector at one end to the COMM_IN/OUT port for one of the battery modules (by example the COMM_OUT port of the bottom battery module) and a DB9 connector (**blue**) at the other end for the connection with the computer software through **CAN** communication;
- One serial diagnostics cable has a RJ45 connector at one end for serial connection to one of the battery modules CONSOLE port and a DB9 connector (**black**) at the other end for the connection with the computer software through **serial** communication.

4. Commissioning

4.1. Starting the battery pack

Put the battery pack in operation by taking these steps:

1. Switch the ON/OFF button of each module to the ON position to turn them ON (status LED of each module is green) in order to turn on the battery pack.
2. Turn on the inverter.

4.2. Shutting down the battery pack

To shut down the battery pack, take these steps:

1. Turn off the inverter.
2. Turn off the battery pack by switching the ON/OFF button of each module to the OFF position to turn them OFF (status LED of each module is OFF).

5. Warranty

AOE protects this product under warranty when this product is installed and used as detailed in this manual. Violating the installation procedure or using this product in any way not described in this manual immediately voids all warranties on this product.
AOE does not provide warranty coverage or assume any liability for direct or indirect damages or defects that result from the following causes:

- Improper transportation or storage
- Incorrect installation, wiring or handling
- Non-compliance with AOE's installation or operation manual
- Operating the product in an inappropriate environment
- Incorrect or inappropriate operation
- Insufficient ventilation
- Failure to adhere to safety warnings or instructions
- Repairs or modifications performed by unauthorized personnel
- Inverter failure or overcurrent
- Force majeure events
- External influences, such as unusual physical or electrical stress.

Notes

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