



USER'S MANUAL

AZZURRO
ZCS

BATTERY

AZZURRO LV ZSX5000S



ZUCCHETTI
Centro Sistemi



Battery

AZZURRO LV ZSX5000S

User Manual



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General instructions

This manual contains important safety instructions that must be followed during installation and maintenance of the equipment.

Please keep these instructions!

This manual must be considered an integral part of the equipment, and must be available at all times to everyone who interacts with the equipment. The manual must always accompany the equipment, even when it is transferred to another user or plant.

Copyright statement

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Please check our website at <http://www.zcsazzurro.com> for the latest version.

Technical support

ZCS offers a support and technical consultancy service accessible by sending a request directly from the website <https://www.zcsazzurro.com/it/support>.

The following toll-free number is available for the Italian territory: 800 72 74 64.

General information

This manual introduces AZZURRO LV ZSX5000S Battery. Please read this manual before you use the battery. Any confusion, please contact AZURRO technical support immediately for advice and clarification.

1.1. Validity

This user manual is applicable to AZZURRO LV ZSX5000S Battery.

This user manual contains AZZURRO LV ZSX5000S product information, usage guidance, safety information, installation guide and details on common operating issues and subsequent corrective actions.

1.2. Intended Use

AZZURRO LV ZSX5000S is an energy storage unit that is designed to be used in residential on-grid applications with the capability for short-term backup.

Notes regarding intended use:

AZZURRO LV ZSX5000S is not suitable for supporting life-sustaining medical devices.

This product is intended for use only in accordance with the information provided in the enclosed documentation and with the locally applicable standards and regulations. Any other application may cause personal injury or property damage.

The illustrations in this manual are meant only to help explain system configuration concepts, includes usage guidance, safety precautions, and common operating issues and subsequent corrective actions.

Alterations to the product, e.g. changes or modifications, are only permitted with the express written permission of ZCS Technical Support. Unauthorized alterations will void warranty claims. Zucchetti Centro Sistemi S.p.A. shall not be held liable for any damage caused by such changes. Any use of the product other than that described in the Intended Use section does not qualify as appropriate. The enclosed documentation is an integral part of this product. Keep the documentation in a convenient place for future reference and observe all instructions contained therein. The type label must remain attached to the product.

Please contact ZCS Technical Support or local after-service providers within 1 week once the user decides to cease using their ZCS Battery products.

1.3. Identifying The Product

The type labels were attached on the product, which contain the product identification information. For safe usage, the user must be well-informed of the contents in the type labels.

The type labels include:



**Rechargeable
Li-ion Battery**

IFpP/51/161/120/[1P16S]M/-20+60/90

Model: AZZURRO LV ZSX5000S

Ratings: 5120Wh/51.2V/100Ah

Charge Voltage: 57.76V

Max. Output Power: 2.7KW

AZZURRO STORAGE

Zucchetti Centro Sistemi SpA
Via Lungarno 305/A
52028 Terranuova Bracciolini(AR) , Italy
Manufactured in EXTRA EU

CAUTION !

- Do not disassemble
- Do not short-circuit
- Do not place in fire or near hot source
- Please read user manual carefully

IEC 62040-1 IEC 62619 UN 38.3








DANGER !

**CHEMICAL HAZARD &
SHOCK HAZARD**

- Do not disassemble or repair by yourself.
- Do not drop, deform, impact, cut or spearing with a sharp object.
- Do not place near open flame or incinerate.
- Do not put any objects onto the battery.
- Do not allow to contact with liquid.
- Keep out of reach of children, animals or insects.
- Contact the supplier within 24 hours if anything wrong.








WARNING !




Stop the battery operation immediately to secure the battery safety when environmental temperature is over working temperature (suitable operation temperature is 0~45°C).
If battery is at high temperature usually, it will impact battery performance.

Figure 1 – Labels on the side of the battery

Safety

This section contains safety information that must be observed at all times when working on or with batteries. To prevent personal injury or property damage and to ensure long-term operation of the batteries, read this section carefully and observe all safety information at all times.



WARNING

Environmental Requirement:

- Do not expose the battery to temperature above 50°C.
- Do not place the battery near any heat sources.
- Do not expose the battery to moisture or liquids.
- Do not expose the battery to corrosive gases or liquids.
- Do not expose the battery to direct sunlight for extended periods of time.
- Do not allow the battery power terminals to touch conductive objects such as wires.
- Place battery in secure location away from children and animals.

Operation Precautions:

- Do not disassemble the battery.
- Do not touch the battery pack with wet hands.
- Do not crush, drop or puncture the battery.
- Do not reverse the polarity or connect in series.
- Do not short circuit the terminals, remove all jewelry items that could product a short circuit before installation and handling.
- Always dispose of the product according to local safety regulations.
- Store and recharge battery in a manner in accordance with this user manual.
- Ensure reliable grounding.
- Disconnect battery from power/load and then power off battery before installation and maintenance.
- When storing or handing, do not stack up batteries when outside protective package.
- Packaged batteries should not be stacked more than specified number stipulated on the package.
- Continued operation of a damaged battery can result in dangerous situation that may cause severe injury due to electrical shock.

Technical Items

No.	Terms	Comment
1	Discharge	Battery output power for load
2	Charge	To put electricity into battery by charger
3	Full charge	Battery had been full charged, SOC is 100%.
4	Standby	Ready for charging or discharging
5	Shutdown	Power off
6	SOC	State of Charge(Useable capacity)
7	Battery voltage	The voltage between B+/B-
8	Cell voltage	Single cell voltage
9	Pack voltage	The voltage between P+/P-
10	Alarm	Indicate that the battery is in abnormal status
11	Protect	Battery stops charging or discharging and is recoverable
12	Fault	Battery or BMS is broken, need to be replaced
13	Over discharged	Battery is lack of electricity, and needs to be recharged in time

Product Overview

4.1. Brief Introduction

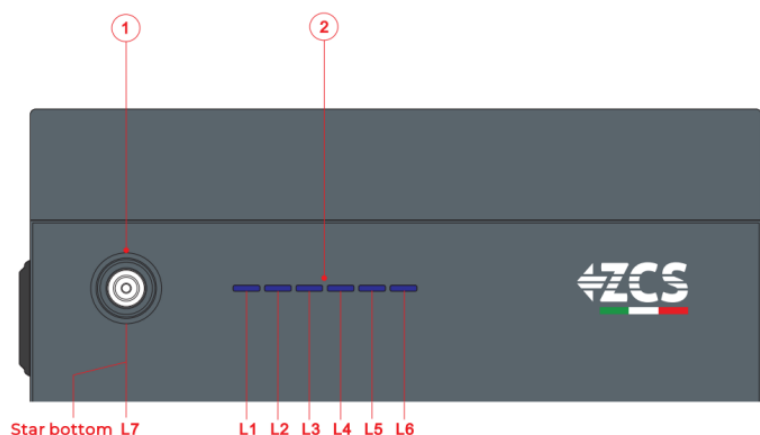


Figure 2 – Product overview

AZZURRO LV ZSX5000S is a battery system with an operating voltage range between 40.8~57.6V. It is utilized in household energy storage applications and works together with a low-voltage PCS to realize the goal of energy storage for the home.

AZZURRO LV ZSX5000S has built-in BMS (battery management system), which can manage and monitor cells information including voltage, current and temperature. What's more, BMS can balance cells charging to extend cycle life. BMS has protection functions including over-discharge, over-charge, over-current and high/low temperature; the system can automatically manage charge state, discharge state and balance state. Multiple batteries can be connected in parallel to expand capacity and power for larger capacity and longer power supporting duration requirements, AZZURRO LV ZSX5000S support up to 4 parallel operation.

4.2. Interface Introduction (Front Side)



No.	Items
1	Start Button Status Indicators
2	Battery Level Indicator

4.2.1. Start Button

Start button integrated LED status Indicators, to show Battery running status or warning status.

1. Press start button more than 3s and then release the button, LED will lights from L7 to L1, and then enters to automatic coding, all LED lights flash and L7 is shown as purple. After the automatic coding, L1 to L6 shows the normal capacity, and L7 shows the running status:

L7: Blue, long lighting when charging and flash when discharging;

L7: Red, long bright if equipment failure or protected.

2. In parallel system, connect the parallel communication wiring, then long press the start button of the **Master PACK**, after normal startup, the battery system will automatically encode and assign ID to each parallel PACK, and then the parallel system will run normally.
3. Press start button of **Master PACK** more than 3s and then release the button, LED will lights from L1 to L7 to shut down the battery module. In parallel system, the master pack will shut down after all slave packs shut down.

4.2.2.LED Indicator Definition

L1 to L6: Blue, show the battery level, each light indicate 16.67% SOC.

L7: Blue or Red, show battery running status, blue is normal, red is abnormal.

LED Indicators Instructions

		RUN	ALM	Battery Level Indicator						Descriptions
Status		L7		L6	L5	L4	L3	L2	L1	
										
Shut down		OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All OFF
Standby		Flash 1	OFF	According to the battery level						Indicates Standby
Charging	Normal	Light	OFF	According to the battery level						The highest capacity indicator LED flashes (flash 2), others lighting
	Full Charged	Light	OFF	Light	Light	Light	Light	Light	Light	Turn to standby status when charger off
	Protection	OFF	Light	OFF	OFF	OFF	OFF	OFF	OFF	Stop charging
Discharging	Normal	Flash 3	OFF	According to the battery level						
	UVP	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
	Protection	OFF	Light	OFF	OFF	OFF	OFF	OFF	OFF	Stop discharging
Fault		OFF	Light	OFF	OFF	OFF	OFF	OFF	OFF	Stop Charging and Discharging

Charging Battery Level Indicators Instructions

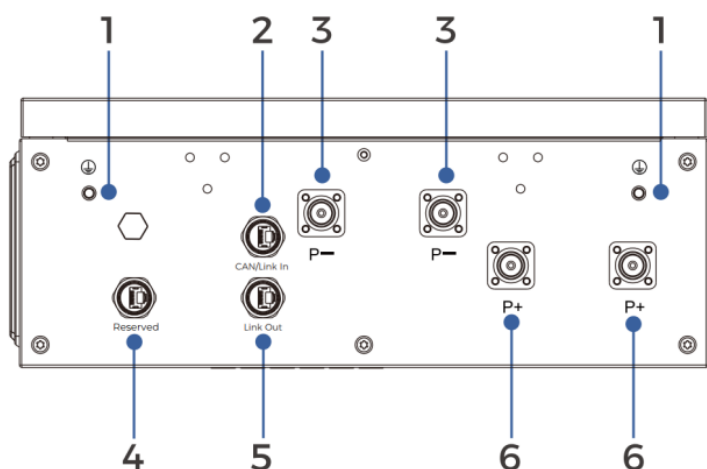
Status		Charging						
Battery Level Indicators		L7	L6	L5	L4	L3	L2	L1
Battery Level (%)	0 ~ 17%	Light	OFF	OFF	OFF	OFF	OFF	Flash2
	18 ~ 33%		OFF	OFF	OFF	OFF	Flash 2	Light
	34 ~ 50%		OFF	OFF	OFF	Flash 2	Light	Light
	51 ~ 66%		OFF	OFF	Flash 2	Light	Light	Light
	67 ~ 83%		OFF	Flash 2	Light	Light	Light	Light
	84 ~ 100%		Flash 2	Light	Light	Light	Light	Light

Discharging Battery Level Indicators Instructions

Status		Discharging						
Battery Level Indicators		L7	L6	L5	L4	L3	L2	L1
Battery Level (%)	0~17%	Flash 3	OFF	OFF	OFF	OFF	OFF	Light
	18 ~ 33%		OFF	OFF	OFF	OFF	Light	Light
	34~50%		OFF	OFF	OFF	Light	Light	Light
	51 ~ 66%		OFF	OFF	Light	Light	Light	Light
	67~83%		OFF	Light	Light	Light	Light	Light
	84~100%		Light	Light	Light	Light	Light	Light

Note: The flashing instructions, flash 1 - light 0.25s / off 3.75 seconds; flash 2 - 0.5s light / 0.5s off; flash 3 - 0.5s light / 1.5s off.

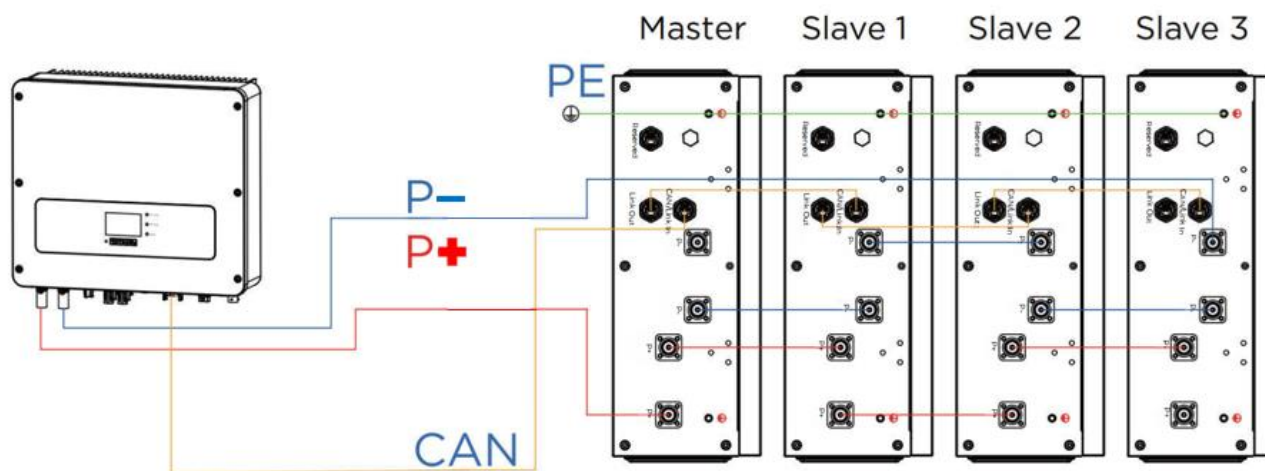
4.3. Interface Introduction



No.	Items	No.	Items
1	Grounding	4	Reserved
2	CAN/Link In	5	Link Out
3	P-	6	P+

4.3.1. Wiring instructions

Suggest Wiring Diagram (except CEC):



1. Power cable wiring instructions

Power cable terminals: there are two pair of power terminals, each pair with same function.

Single module: Any of the terminals of each pair can be used.

Parallel system:

Multiple batteries can be connected in parallel to expand capacity and power for larger capacity and longer power supporting duration requirements.

NOTE: P+ must connect to master pack, and P- must connect to last slave pack.

Master pack: one of the P+ terminals connect to PCS, the other one paralleling to another battery for capacity expanding.

Last slave pack: one of the P- terminals connect to equipment, the other one paralleling to another battery for capacity expanding.

Other slave pack: for each pair terminals, paralleling to another battery for capacity expanding.

2. Parallel communication cable wiring instructions

CAN/Link In and Link Out communication terminal (RJ45 port) is integrated with the signal for automatic coding function, it's can automatic identification the parallel connected slave batteries by internal control software of master battery.

NOTE: The connection order of CAN/Link In and Link Out should not be wrong, otherwise it will lead to the automatic coding failed.

It is required that the CAN/Link In of the master PACK should be connected to the PCS, and the parallel communication wire is connected to the CAN/Link In of the first slave PACK from the Link Out of the master

PACK. Then the Link Out of the first slave PACK is connected to the CAN/Link In of the second slave PACK. The Link Out of the second slave PACK is then connected to the CAN/Link In of the third slave PACK. The parallel system support up to 4 parallel operation, and Link Out of the last slave PACK do not connected to the communication line.

3. PCS communication cable wiring instructions

The CAN/Link In communication port of the **Master pack** is connected to PCS.

4. Grounding wiring instructions

The ground wire of the battery system needs to be connected reliably. Connect the grounding of the parallel system first, and then ground it nearby through the connection point of one of the battery packs.

4.3.2. Link Port and Automatic Coding Function

CAN/Link In and Link Out Communication follow CAN protocol, for communication between multiple parallel batteries.

After confirming the wiring is correct, long press the startup button of the **Master PACK**, after normal startup, the parallel battery system will automatically code and assign ID to each parallel PACK, and then the parallel system will run normally.

4.3.3. Link Port

CAN / RS485 Communication Terminal (RJ45 port) follow CAN protocol / RS485 protocol, connect to communication port.

1. BMS controls the charging current/charging voltage or discharge current/discharge cut-off voltage of the PCS through CAN communication according to the battery voltage and battery temperature.
2. If the battery capacity is less than 8%, BMS controls the PCS to make compulsory recharge through the CAN communication to avoid the damage of the battery due to deep discharge.
3. If SOC was less than 97% for one consecutive month, BMS controlled PCS by CAN communication to full charge the battery to corrected SOC and fully charged capacity.

Note: Through the ZCS PCS, skilled peoples can set the fully charged time period.

PIN	Definition
Pin 1	ID IN/OUT
Pin 2	NC
Pin 3	CANH (to battery)
Pin 4	CANH (to PCS)
Pin 5	CANL (to PCS)
Pin6	CANL (to battery)
Pin 7	NC
Pin 8	GND

4.3.4.RS232 Port

RS232 Communication Terminal(RJ45 port) follow RS232 protocol, for manufacturer or professional engineer to debug or service.

PIN	Definition
Pin 7, Pin 1	GND
Pin 5	RS232_RX
Pin 6	RS232_TX
Pin 2, Pin 3, Pin4, Pin5	NC

Installation Guide

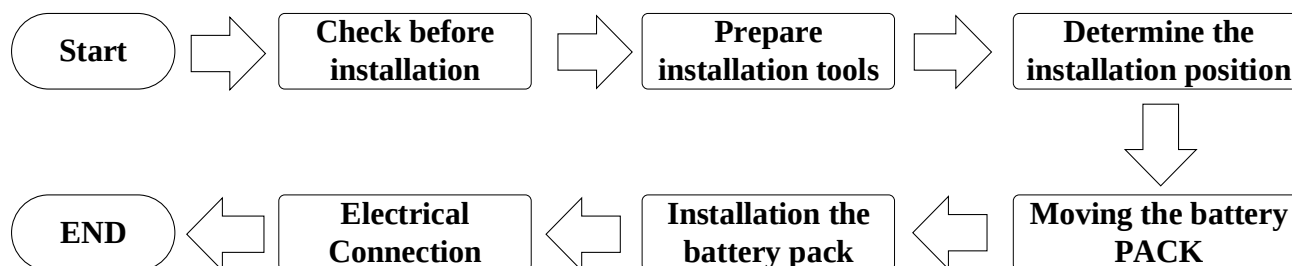


Figure 3 - Installation flow chart

5.1. Checking Before Installation

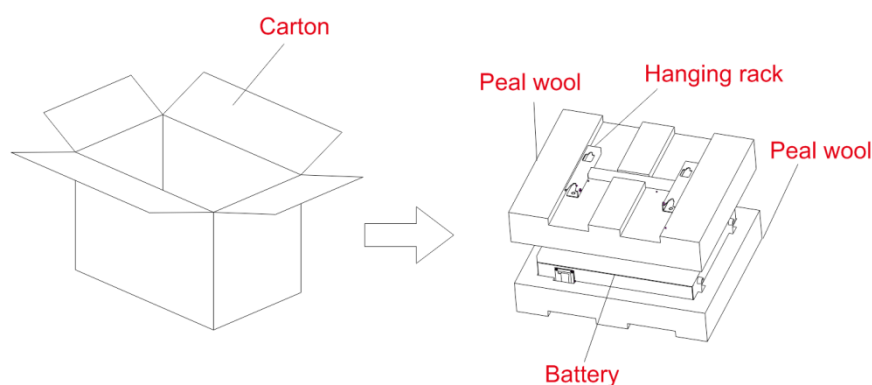
5.1.1. Checking Outer Packing Materials

Packing materials and components may be damaged during transportation. Therefore, check the outer packing materials before installing the battery. Checking the surface of packing materials for damage, such as holes and cracks. If any damage is found, do not unpack the battery and contact the dealer as soon as possible. You are advised to remove the packing materials within 24 hours before installing the battery.

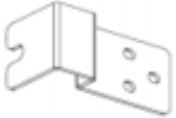
5.1.2. Checking Deliverables

After unpacking the battery, check whether deliverables are intact and complete. If any damage is found or any component is missed, contact the dealer.

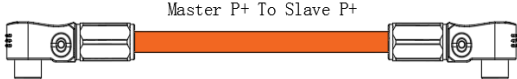
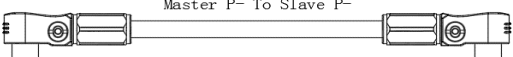
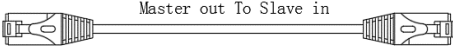
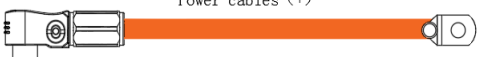
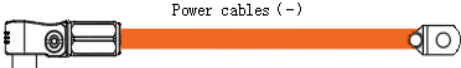
The below table shows the components and mechanical parts that should be delivered.





No.	Pictures	Quantity	Description
1		1PCS	Battery
2		2PCS	Hanging rack 1
3		1PCS	Hanging rack 2
4		1PCS	Hanging rack 3
5		9PCS	M5*12
6		2PCS	M6*14
7		4PCS	M8*80
8		1PCS	Decorative panel
9		1PCS	Manual
10		1PCS	Test report
11		1PCS	The warranty card
12		1PCS	Certificate

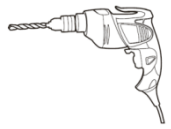
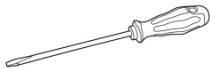
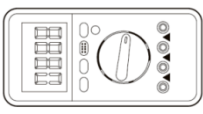
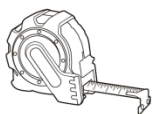
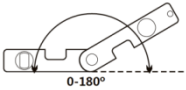
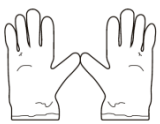
The following accessories are configured according to the number of parallel machines in the battery system. For example:

NO.	Pictures	Quantity	Description
1	 Master P+ To Slave P+	N-1 "*"	Parallel connections cable (P+)
2	 Master P- To Slave P-	N-1 "*"	Parallel connections cable "*" (P-)
3	 Master out To Slave in	N-1 "*"	Parallel communication cable "*" (P-)
4	 Power cables (+)	1pcs	Output Power cables (P+)
5	 Power cables (-)	1pcs	Output Power cables (P-)
6	 Master CAN To communication port	1pcs	Output communication cable

Note:

1. The standard output power cable is optional accessories component part, the customer can be according the actual installation requirements customize the output power cable from ZCS when the product sold in local or importers provide.
2. "*" N is indicate the parallel connections number of battery. The number of power cable and Communication cable is optional accessories according the parallel connection demand for customer.
3. You are advise use the provide standard accessories part from ZCS or customize the identical specification accessories component part from ZCS or importers.

5.2. Tools

No.	Tool		Function
1		Drill Recommended drill bit: 12mm	To drill holes in the wall for fixing the bracket
2		Screwdriver	To screw and unscrew screws for the various connections
3		Rubber hammer	To insert the expansion plugs into the wall holes
4		Socket wrench 10/16 mm	To screw and unscrew screws for the various connections
5		Multi-meter	To check the voltage and current values
6		Marker pen	To mark the wall for better fixing precision
7		Measuring tape	To measure distances
8		Level	To make sure the bracket is level
9		ESD gloves	Protective clothing

10		Safety goggles	Protective clothing
11		Protection mask	Protective clothing

5.3. Installation requirements

5.3.1. Installation environment requirements

- Install the battery in the indoor environment.
- Place battery in secure location away from children and animals.
- Do not place the battery near any heat sources and avoid sparks.
- Do not expose the battery to moisture or liquids.
- Do not expose the battery to direct sunlight.
- As far as installation compliance is concerned, IP65 does not permit outdoor installation. In order to ensure that performance is maintained over time, the product must not be exposed to extreme temperatures.

5.3.2. Installation carrier requirements

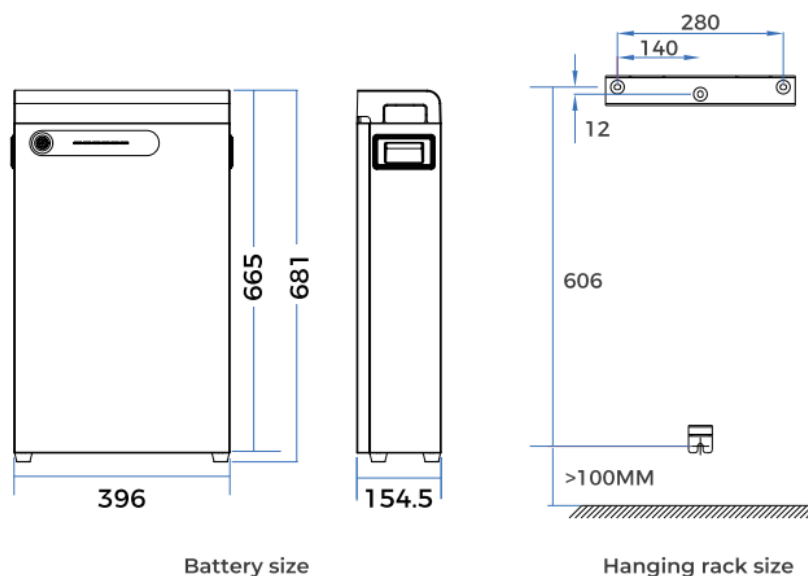
- The mounting carrier shall have fire resistance. Do not install batteries on flammable buildings.
- The mounting carrier surface shall meet the load bearing requirements.



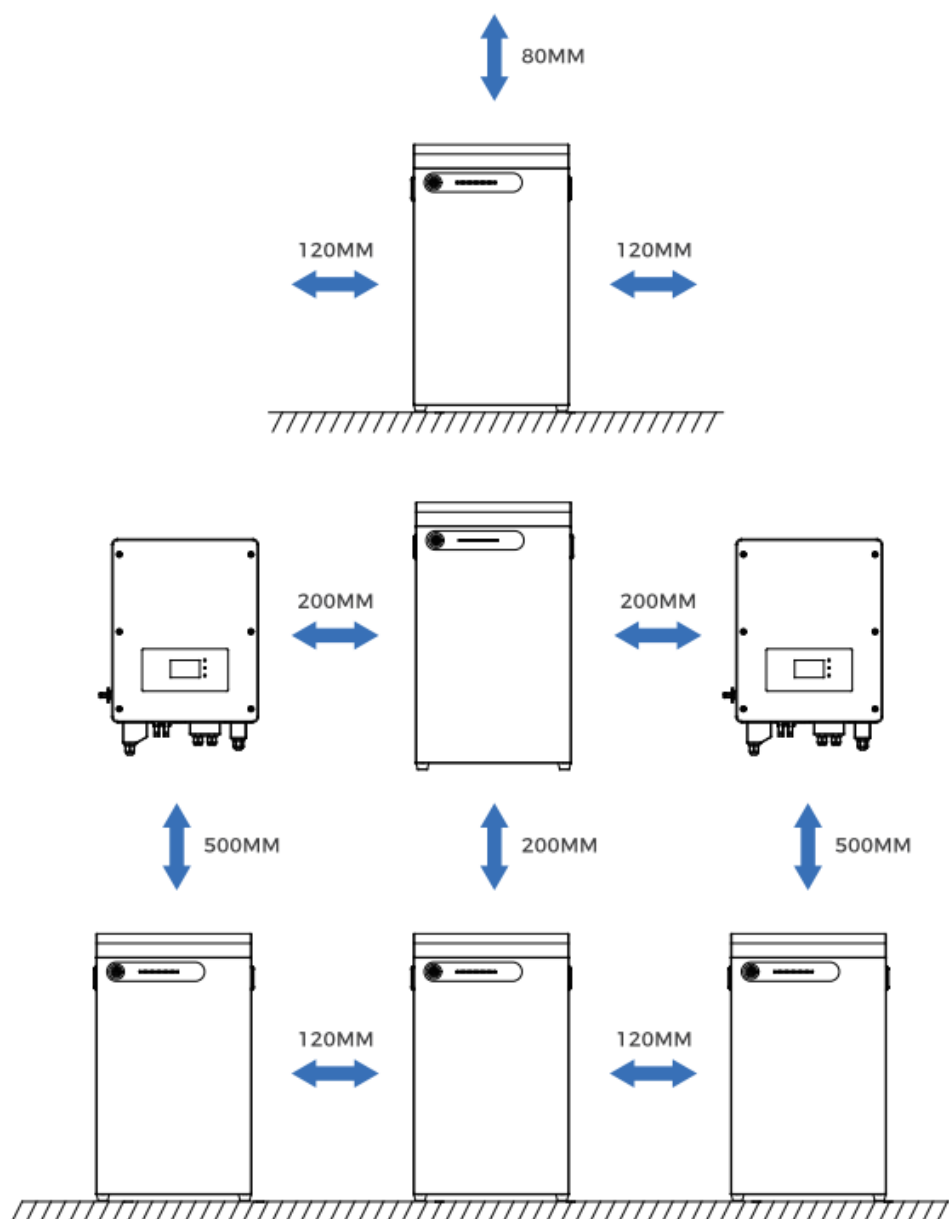
5.4. Installation Instructions

5.4.1. Dimensions

Battery size:



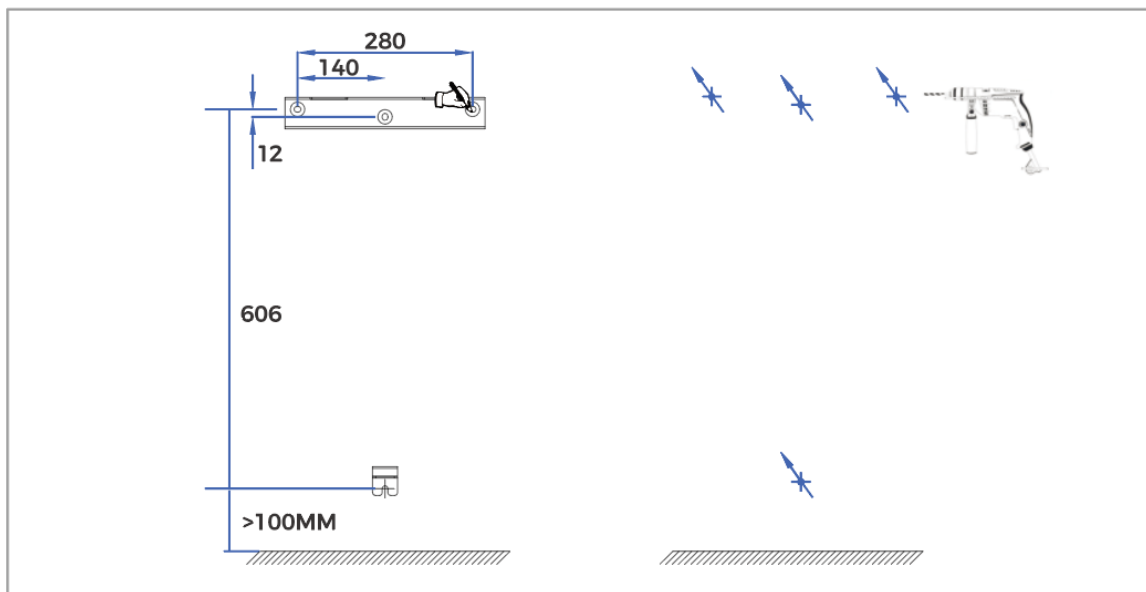
Minimum mounting distance between battery pack and other equipment:



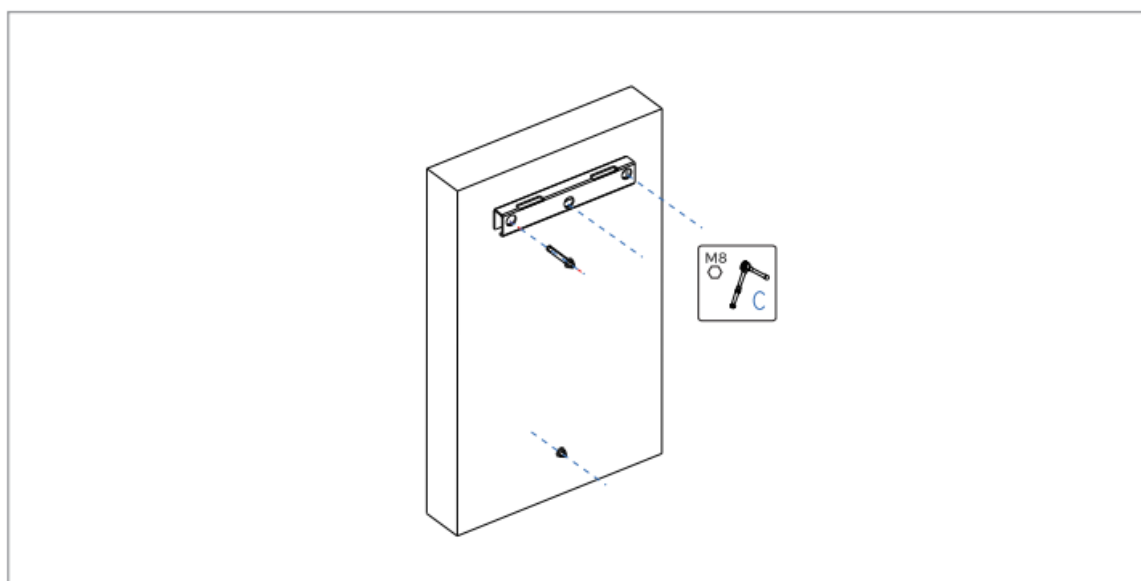
5.4.2. Single Machine Installation Step

5.4.2.1. Single Machine installation step for suspended on wall

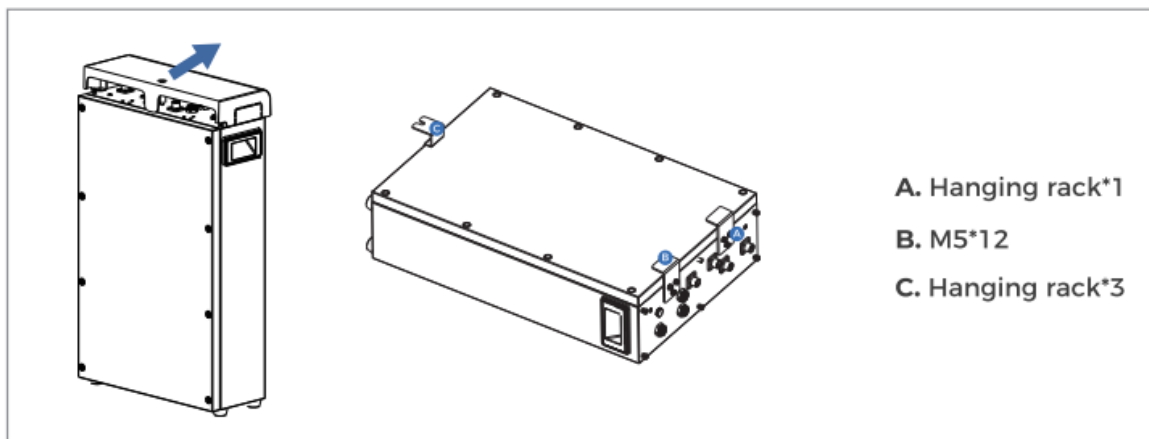
1. To determine the position for drilling holes, and then mark the hole position by using a marker, use the hammer drill to drill hole on the wall. Keeping the hammer perpendicular to the wall, do not shake when drilling, so as not to damage the walls. If the aperture errors, need to reposition.



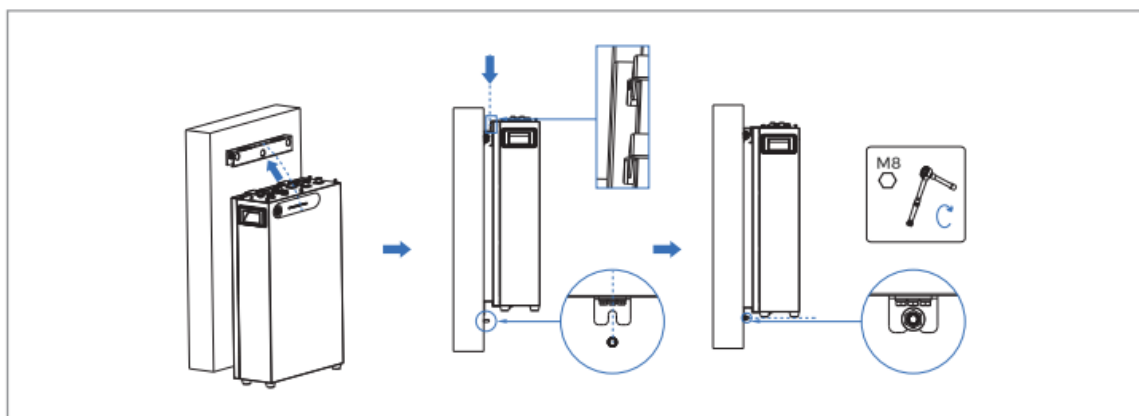
2. Fix the wall Hanging rack 2 with expansion screws.



3. Remove the battery and install the fixed leg.

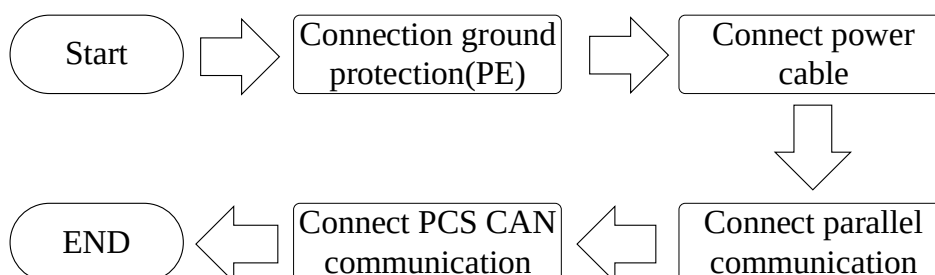


4. Putting the battery hook on the hanging rack, fix the fixing screw to ensure the safety.



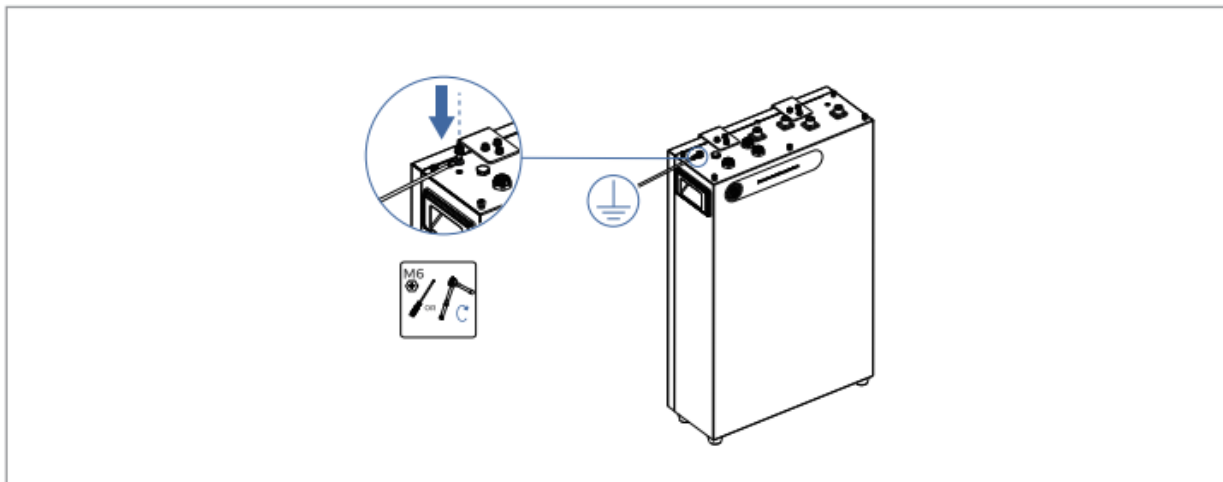
5.5. Electrical Connection

5.5.1. Electrical Connection Process

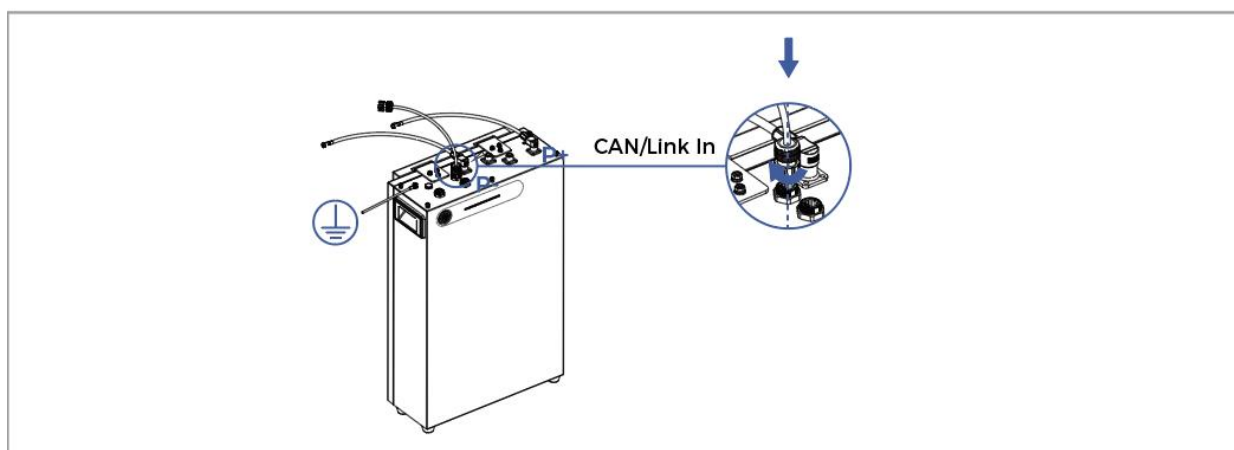


5.5.2. Single machine wiring step

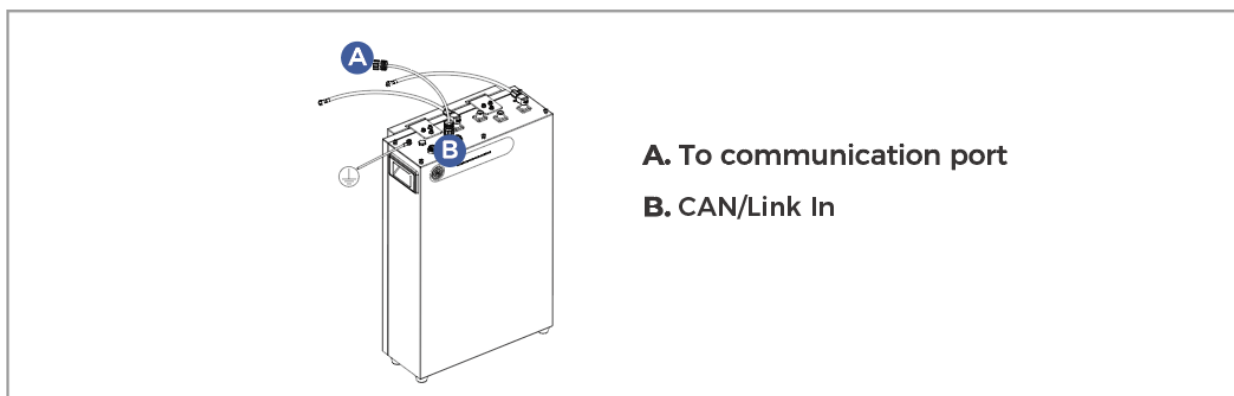
1. Connect PE line



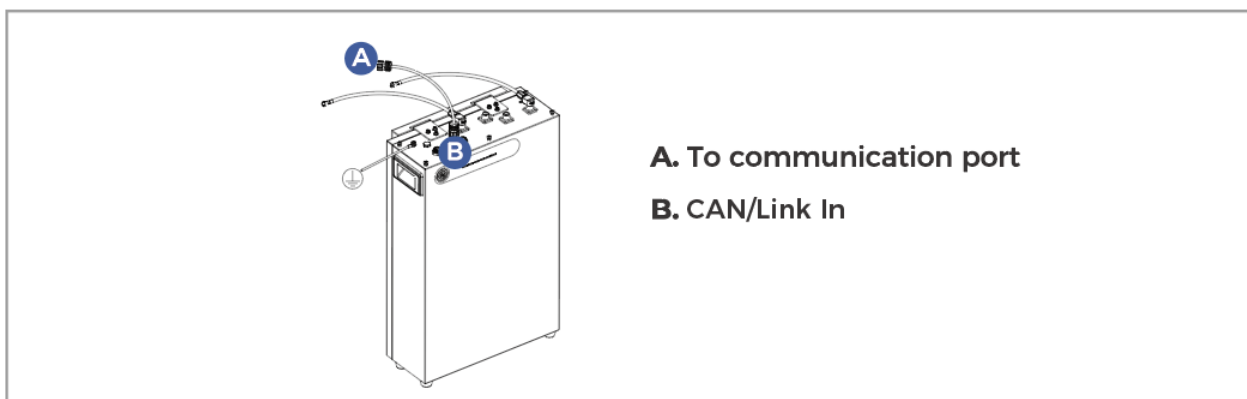
2. Connect Power Cable from battery to isolation device.



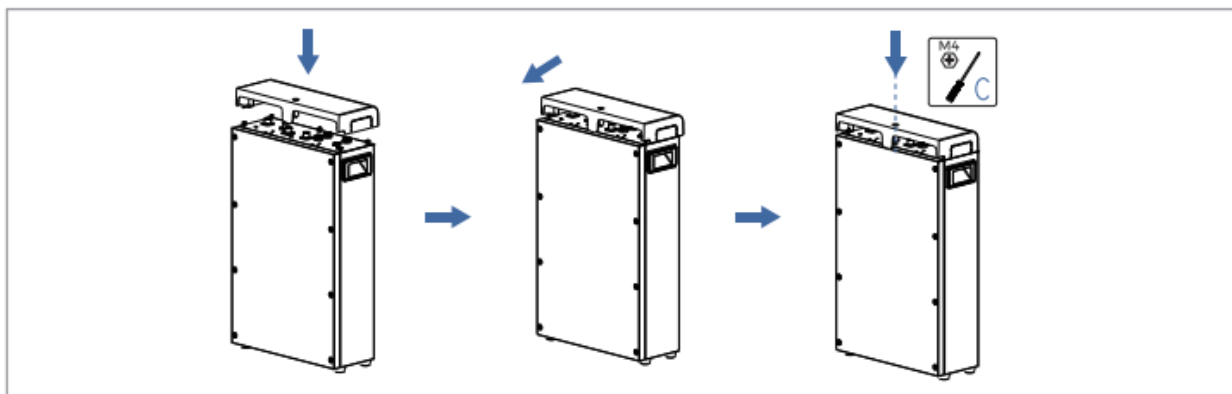
3. Connect CAN/Link In communication line to communication port.



4. Connect CAN/Link communication line to communication port.

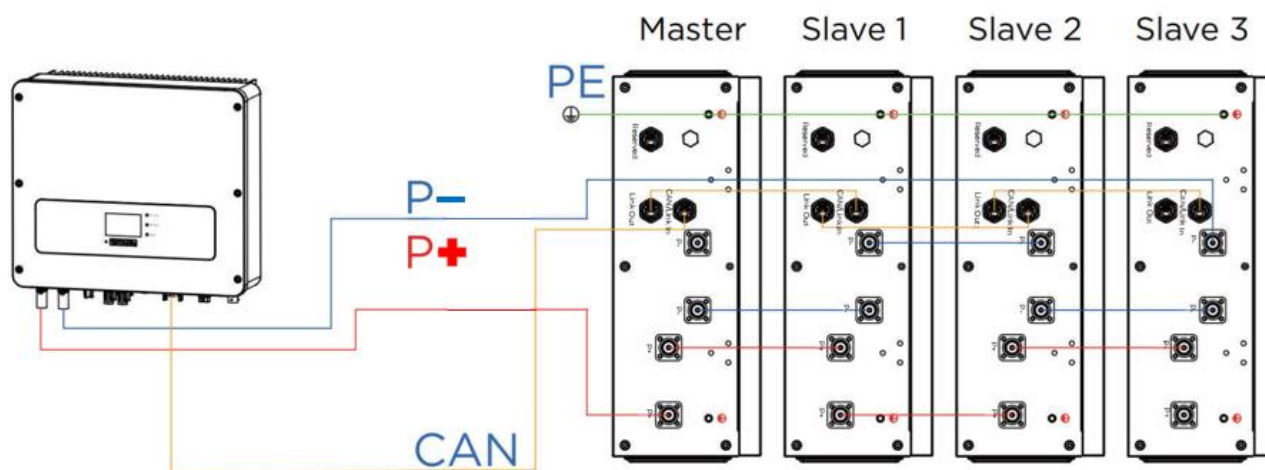


5. Install the Decorative panel.



5.5.3.Parallel machine wiring

1. Select a suitable location to install the battery system.
2. Connect cables as follows.



3. Long press the start button of the Master PACK to start the battery system.

Cleaning and Maintenance

6.1. Cleaning

CAUTION:

Please power off the system before cleaning.

It is recommended that the AZZURRO LV ZSX5000S should be cleaned periodically. If the enclosure is dirty, please use a soft, dry brush or a dust collector to remove the dust. Liquids such as solvents, abrasives or corrosive liquids should not be used to clean the enclosure.

6.2. Maintenance

6.2.1. Recharge Requirements During Normal Storage

Batteries should be stored in an environment with a temperature range between $-10^{\circ}\text{C} \sim +45^{\circ}\text{C}$, and maintained regularly according to the following table with 0.5C (50A) current until 40% SOC after a long time of storage.

Recharge conditions when in storage

Storage Environment Temperature	Relative Humidity of Storage Environment	Storage Time	SOC
Below -10°C	-	prohibit	-
$-10 \sim 25^{\circ}\text{C}$	5% ~ 70%	≤ 12 months	$30\% \leq \text{SOC} \leq 60\%$
$25 \sim 35^{\circ}\text{C}$	5% ~ 70%	≤ 6 months	$30\% \leq \text{SOC} \leq 60\%$
$35 \sim 45^{\circ}\text{C}$	5% ~ 70%	≤ 3 months	$30\% \leq \text{SOC} \leq 60\%$
Above 45°C	-	prohibit	-

6.2.2.Recharge Requirements When Over Discharged

Please recharge the over discharged (90%DOD) batteries in a timeframe that is in accordance to the following table, otherwise the over discharged battery modules will be damaged.

Recharge conditions when battery is over discharged

Storage Environment Temperature	Storage Time	Note
-10 ~ 25°C	≤ 15 days	Battery Pack disconnect to PCS
25 ~ 45°C	≤ 7 days	
-10 ~ 45°C	< 12 hours	Battery Pack connect to PCS

6.2.3.Replacement or expand capacity

The maintenance of batteries requires a person with professional skills.

1. Before replacement or expand capacity, please cut off the whole system, include PCS and Battery system; at the same time, PCS is disconnected from the power grid;
2. After PCS is confirmed to be disconnected from the power grid, turn off the battery power supply and disconnect the connection line between the battery and PCS.
3. Remove or install new battery and then restart.

7.1. Emergency

Please cut off the power supply and turn off the battery in an emergency.

1. Wet Batteries

If the battery pack is wet or submerged in water, do not let people access it, and then contact ZCS Technical Support or an authorized dealer for technical support.

2. Fire

NO WATER! Only dry powder fire extinguisher can be used; if possible, move the battery pack to a safe area before it catches fire.

3. Leaking Batteries

If the battery pack leaks electrolyte, avoid contact with the leaking liquid or gas. If someone is exposed to the leaked substance, immediately perform the actions described below.

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

Contact with eyes: Rinse eyes with flowing water for 15 minutes, and seek medical attention.

Contact with skin: Wash the affected area thoroughly with soap and water, and seek medical attention.

Ingestion: Induce vomiting, and seek medical attention.

4. Damaged Batteries

Damaged batteries are dangerous and must be handled with the utmost care. 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 ZCS or an authorized dealer.

Uninstalling

8.1. Uninstallation steps

- Disconnect the inverter from the AC grid by opening the AC circuit breaker.
- Disconnect the inverter from the photovoltaic strings by opening the DC circuit breaker.
- Wait 5 minutes
- Remove the DC connectors
- Remove the AC terminals.
- Unscrew the fixing bolt of the bracket and remove the product from the wall.

8.2. Packaging

If possible, pack the product in its original packaging.

8.3. Storage

Store the product in a dry place where the ambient temperature is between -25 and +60°C.

8.4. Disposal

Zucchetti Centro Sistemi S.p.a. is not liable for the disposal of the equipment, or parts thereof, that does not take place according to the regulations and standards in force in the country of installation.



The symbol of the crossed-out wheeled bin indicates that the equipment, at the end of its useful life, must be disposed of separately from household waste.

This product must be handed over to the waste collection point in your local community for recycling.

For more information, please contact the waste collection authority in your country.

Inappropriate waste disposal could have negative effects on the environment and on human health due to potentially hazardous substances.

With your cooperation in the correct disposal of this product, you contribute to the reuse, recycling and recovery of the product, and to the protection of our environment.

Technical specifications

ZCS AZZURRO LV ZSX5000S

General data	
Type	ZCS – AZZURRO LV ZSX5000S
Technology	Lithium Iron Phosphate
Dimensions (H*L*W)	681mm*396mm*154.5mm
Weight	45Kg
Protection Class	IP65
Mounting	On ground or wall
Operating temperature while charging	0°C - +55°C
Operating temperature while discharging	-20°C - +60°C
Allowable relative humidity range	5...95% non-condensing
Maximum operative altitude	2000m
Operating cycles under standard conditions *	>6000
Maximum number of batteries that can be installed in parallel on inverters	4
Certifications	IEC62619, IEC62040-1, CE, UN 38.3
Warranty	10 years
Communication	CAN
Capacity data	
Nominal capacity of single module	5.12 kWh / 100Ah
Useful capacity of single module (Depth of Discharge 90%)	4.61 kWh
Nominal voltage	51.2 V
Maximum charge current**	50A
Maximum discharge current**	50A
Maximum Depth of Discharge (DoD)	90%

* Standard operative conditions for batteries: 25°C , 40% humidity, Depth of Discharge (DoD) 80%

** The actual charging and discharging currents of the system may be limited by the inverters to which the batteries are connected, please refer to the inverter datasheets for the actual charging and discharging current

Warranty terms and conditions

To view the Warranty Terms and Conditions” offered by ZCS Azzurro, please refer to the documentation inside the product box and on the website www.zcsazzurro.com.

As far as installation compliance is concerned, IP65 does not permit outdoor installation. In order to ensure that performance is maintained over time, the product must not be exposed to extreme temperatures.



THE INVERTER THAT LOOKS AT THE FUTURE

zcsazzurro.com



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