autarco

Batteries

HVR Syntero Series

Installation and Operation Manual

Information

This manual is an integral part of the unit. Please read the manual carefully before installation, operation or maintenance. Keep this manual for future reference.

Product information is subject to change without notice. All trademarks are recognized as the property of their respective owners.

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5617 BC Eindhoven
The Netherlands

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HVR Syntero series user manual

⚠ Warning

This product is a high-voltage DC battery system, and it should be operated by authorized staff only due to risk of battery system damage or personal injury.

DO NOT disconnect while the system is running!

Keep all power sources off and verify that they are de-energized.

Battery damage may result in electrolyte leakage. If the electrolyte is leaked, do not touch the leaked electrolyte and do not inhale volatile gas. Contact the after-sales service team for help immediately. If leaked material was accidentally touched, please follow the steps below:

- Inhalation of leaked material: Evacuate from the contaminated area and seek medical assistance immediately.
- Eye contact: Flush with clean water for at least 15 minutes and seek medical assistance immediately.
- Skin contact: Wash the contact area thoroughly with soap and clean water and seek medical assistance immediately.
- Ingestion: Induce vomiting and seek immediate medical assistance.
- Do not move the battery system if it is connected with an external expansion module.

  If you need to replace or add a battery, please contact the Autarco support.

⚠ Caution

Before Connecting
Please check the product and packing list after unpacking. If the product is damaged or any parts are missing, please contact Autarco.

Before installation, make sure that the grid is disconnected and the battery is switched off.

Do not invert the positive and negative cables and ensure there is no short circuit to the external device.

It is prohibited to connect the battery to AC power directly.

The battery system must be properly grounded and the resistance must be less than 1Ω.

Ensure that the electrical parameters of the battery system are compatible with the respective equipment.

Keep the battery away from water and fire.

During Use
If the battery system needs to be moved or repaired, the power must be disconnected and the battery must be switched off.

It is prohibited to connect different types of batteries.

It is prohibited to connect the battery to incompatible or faulty inverters.

It is prohibited to disassemble the battery (to avoid the warranty sticker being removed or damaged).

In case of fire, only a dry powder fire extinguisher must be used, foam extinguishers are prohibited.

Please do not open, repair or disassemble batteries; this is reserved for Autarco staff or authorized personnel. We do not take any responsibility caused by violation of safety operation or equipment safety standards.

Maintenance
Please read the user manual carefully.

If batteries are stored for a long time, it is required to charge them every 10 months, and the SOC should be no less than 50%.

Batteries need to be recharged within 12 hours, after being fully discharged.
Do not expose cables outside.

All battery terminals must be disconnected for maintenance.

Please contact the supplier within 24 hours if there is something abnormal.

Warranty claims are excluded for direct or indirect damage due to items above.

Preface

Manual declaration

HVR Syntero Series lithium iron phosphate battery energy storage system can provide energy storage for photovoltaic power generation users through series combination. Our product can store excess PV power into battery and supply stable power to user's equipment at any time. It can improve the efficiency of photovoltaic power generation and increase the electric power efficiency by peak load shifting.

This user manual details the basic structure, parameters, basic procedures and methods of installation and operation and maintenance of the equipment.

1 Introduction

1.1 Brief Introduction

HVR Syntero series is a high-voltage battery storage system based on lithium iron phosphate battery cells, and it is cutting-edge battery energy storage system (BESS) developed and produced by Autarco. It was designed to seamlessly support Autarco hybrid inverters such as: LH-MII, LQH and XLH series. HVR Syntero is especially suitable for application where high power, limited installation space, restricted load-bearing and long cycle life are required.

1.2 Product Properties

LVR Syntero Series energy storage product's positive electrode materials are lithium iron phosphate, battery cells are managed effectively by BMS with better performance, the system's features as below:

- Comply with European ROHS, Certified SGS, employ non-toxic, non-pollution environment-friendly battery.
- Anode materials are lithium iron phosphate (LiFePO4), safer with longer life span.
- Carries battery management system with better performance, possesses protection function like over-discharge, over-charge, over-current, abnormal temperature.
- Self-management on charging and discharging, Single core balancing function.
- Intelligent design configures integrated inspection module.
- Flexible configuration, multiple battery modules can be connected in series for expanding voltage and capacity.
- Self-ventilation with lower system noise.
- Less battery self-discharge, then recharging period can be up to 10 months during the storage.
- No memory effect so that battery can be charged and discharged shallowly.
- With wide range of temperature for working environment, -20°C~ +55°C, circulation span and discharging performance are well under high temperature.
- Less volume, lighter weight.

Battery voltage is higher than safe voltage, direct contact with electric shock hazard.

Inflammable.

Read the user manual before using

The scrapped battery cannot be put into the garbage can and must be professionally recycled.

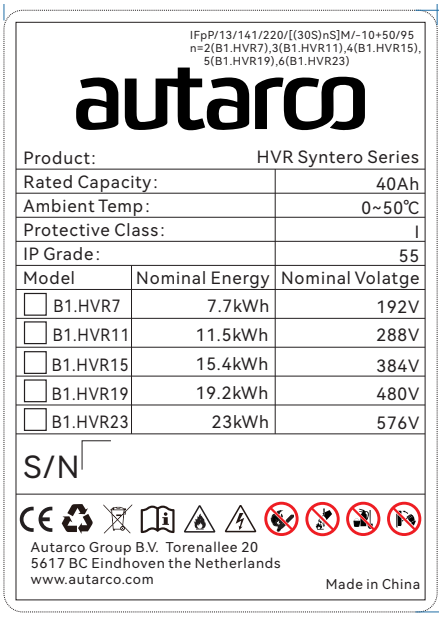
Do not place near open flame or incinerate.

If catch fire, do not put out with water.

If catch fire, do not put out with dry powder fire extinguisher.

Do not cut or spear with sharp objects.

This battery product meets European directive requirements.



IFpP/13/141/220/[(30S)nS]M/-10+50/95
n=2(B1.HVR7),3(B1.HVR11),4(B1.HVR15),
5(B1.HVR19),6(B1.HVR23)

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Product:		HVR Syntero Series
Rated Capacity:		40Ah
Ambient Temp:		0~50℃
Protective Class:		I
IP Grade:		55
Model	Nominal Energy	Nominal Volatge
☐ B1.HVR7	7.7kWh	192V
☐ B1.HVR11	11.5kWh	288V
☐ B1.HVR15	15.4kWh	384V
☐ B1.HVR19	19.2kWh	480V
☐ B1.HVR23	23kWh	576V

S/N

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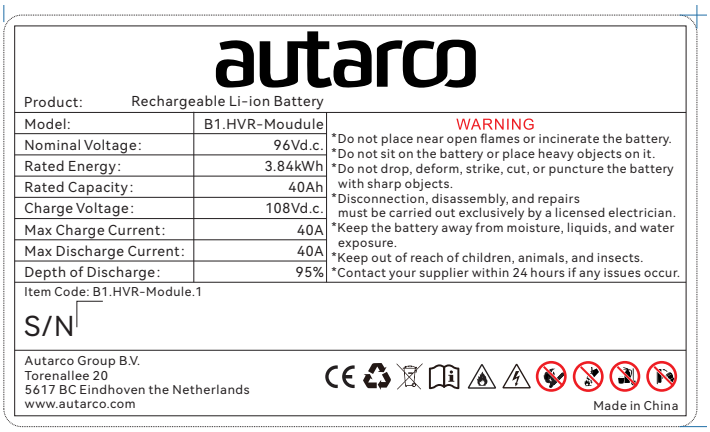
Made in China



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Product: Rechargeable Li-ion Battery

Model:	B1.HVR-Moudule
Nominal Voltage:	96Vd.c.
Rated Energy:	3.84kWh
Rated Capacity:	40Ah
Charge Voltage:	108Vd.c.
Max Charge Current:	40A
Max Discharge Current:	40A
Depth of Discharge:	95%

WARNING
*Do not place near open flames or incinerate the battery.
*Do not sit on the battery or place heavy objects on it.
*Do not drop, deform, strike, cut, or puncture the battery with sharp objects.
*Disconnection, disassembly, and repairs must be carried out exclusively by a licensed electrician.
*Keep the battery away from moisture, liquids, and water exposure.
*Keep out of reach of children, animals, and insects.
*Contact your supplier within 24 hours if any issues occur.

Item Code: B1.HVR-Module.1

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Size and weight

Table 2-1 Parameters of the Tower Pro system

Parameter	HVR23	HVR19	HVR15	HVR11	HVR7
Module type	LFP	LFP	LFP	LFP	LFP
Total energy stored [kWh]	23.04	19.2	15.36	11.52	7.68
Usable capacity [kWh]	21.888	18.24	14.592	10.944	7.296
Recommend depth of discharge	95%	95%	95%	95%	95%
Max depth of discharge	100%	100%	100%	100%	100%
Voltage range [V/DC]	504-648	420-540	336-432	252-324	168-216
Battery system voltage (V/DC)	576	480	384	288	192
Battery system capacity (Ah)	40	40	40	40	40
Battery system charge voltage (V/DC)	648	540	432	324	216
Battery system charge current [A] (normal)	20	20	20	20	20
Battery system charge current [A] (max)	40	40	40	40	40
Battery system discharge minimum voltage (V/DC)	504	420	336	252	168
Battery system discharge current [A] (normal)	20	20	20	20	20
Battery system discharge current [A] (max)	40	40	40	40	40
Battery system max charge & discharge current [A] (when used in communication with the inverter)	40	40	40	40	40
Discharge temperature range [°C]	-20~55°C				
Charge temperature range [°C]	/-20~55°C				
Max discharge power [kW]	23.04	19.2	15.36	11.52	7.68
Max charge & discharge power [kW] (when used in communication with the inverter)	23.04	19.2	15.36	11.52	7.68
Short circuit current [kA]	1.5	1.5	1.5	1.5	1.5
Enclosure Protection (IP)	IP55	IP55	IP55	IP55	IP55
Dimensions [mm]	1672*587*310	1451*587*310	1230*587*310	1009*587*310	788*587*310
Weight [kg]	241.5	206	170.5	135	99.5
Battery module name	B1.HVR-MODULE	B1.HVR-MODULE	B1.HVR-MODULE	B1.HVR-MODULE	B1.HVR-MODULE
Number of battery modules (pcs)	6	5	4	3	2

Battery module performance parameters

Table 2-2 Product parameters

B1.HVR-MODULE	HV960
Cell technology	Li-ion (LFP)
Battery module capacity (kWh)	3.84
Battery module voltage (V/DC)	96
Battery module capacity (Ah)	40
Number of battery module cells (pcs)	30
Battery cell capacity (Wh)	128
Battery cell voltage (V/DC)	3.2
Battery cell voltage (Ah)	40
Number of battery module cells in series (pcs)	30
Battery module charge voltage (V/DC)	109.5
Battery module charge current (standard) [A]	20
Battery module charge current (normal) [A]	40
Battery module charge current (max) [A]	40
Battery module discharge minimum voltage (V/DC)	84
Battery system discharge current (standard) [A]	20
Battery module discharge current (normal) [A]	40
Battery module discharge current (max) [A]	40
Dimensions (W*D*H, mm)	587*310*241
Communication mode	CAN/RS485
Pollution degree (PD)	II
Ambient temperature (°C)	0 to +50
IP protection class	IP55
Weight (kg)	34.5

2.1 Interface definition

2.1.1 Battery Module

This section elaborates the interface functions of the front interface of the device and connections of HVR battery components.

Figure 2-1 The Sketch of Interface

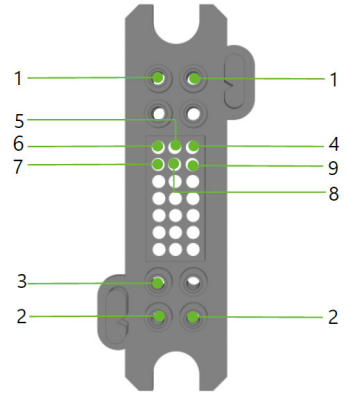


Figure 2-1-1 Male connector, battery top

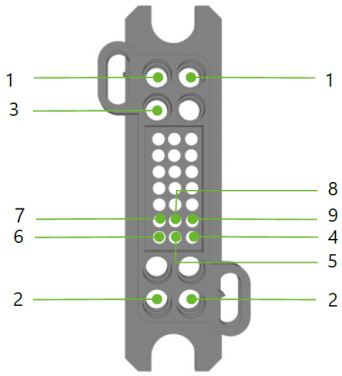


Figure 2-1-1 Female connector, battery bottom

Table 2-3 Connector definition

Item	Name	Definition
1	Composite connector - male	Battery module output and communication interface
2	Composite connector - female	Battery module output and communication interface

Table 2-4 Port defintion

No.	Composite connector - male	Composite connector - female
1	Positive output	Negative output
2	Negative output	Module negative
3	GND	GND
4	IP2	IP1
5	IM2	IM2
6	IP1	IP2
7	IM1	IM1
8	HEAT-	HEAT+
9	HEAT-	HEAT+

2.1.2 BDU

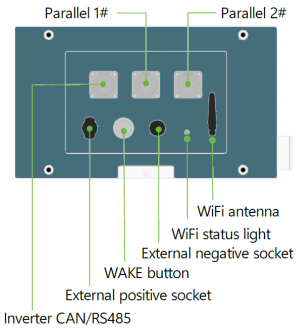


Figure 2-7 BDU right connector

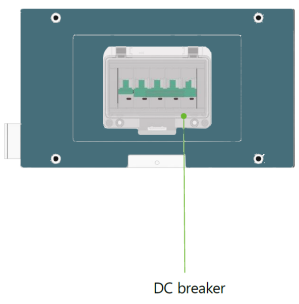


Figure 2-8 BDU left connector

Table 2-5 Connector definition

Item	Name	Definition
1	Parallel 1#	Parallel communication connection of multi cluster systems
2	Parallel 2#	Parallel communication connection of multi cluster systems
3	Inverter CAN/RS485	RJ45 communication port between battery system and inverter
4	External positive socket	Connect battery system to inverter positive terminal
5	WAKE button	Press and hold this button for 5s to start the battery system
6	External negative socket	Connect battery system to inverter negative terminal
7	WiFi status light	Display current WiFi status
8	WiFi antenna	Receiving and sending WiFi signals
9	DC breaker	The master switch of the battery system, you must switch it on before switching on the Power On and Power WAKE switches; short circuit position.

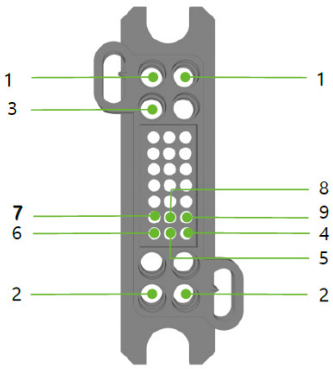


Figure 2-6 BDU ports

Table 2-6 Port definition

Item	Definition
1	Negative input
2	Positive input
3	GND
4	IP1
5	IM2
6	IP2
7	IM1
8	HEAT-
9	HEAT+

Figure 2-6 CAN/485 Interface Definition

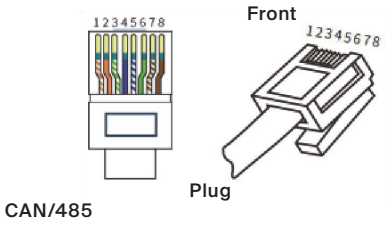


Table 2-3 Interface definition

PIN	Color	Definition
PIN1	Orange/White	485_B
PIN2	Orange	485_A
PIN3	Green/White	Reserved
PIN4	Blue	CANH
PIN5	Blue/White	CANL
PIN6	Green	NC
PIN7	Brown/White	NC
PIN8	Brown	NC

Figure 2-3 COM Interface Definition

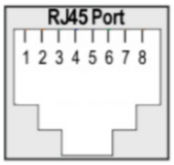


Figure 2-3 BDU front

Table 2-7 LED Status Indicators

Battery Status	SOC(%)	RUN	BAT STATE	COM	FAULT	SOC LED1	SOC LED2	SOC LED3	SOC LED4
Shutdown	off	off	off	off	off	off	off	off	off
Standby	75≤SOC≤100	●	off	●	off	●	●	●	●
	50≤SOC≤75	●	off	●	off	●	●	●	off
	25≤SOC≤50	●	off	●	off	●	●	off	off
	0≤SOC≤25	●	off	●	off	●	off	off	off
	SOC=0	●	off	●	off	off	off	off	off
Charging	SOC=100	●	off	●	off	●	●	●	●
	75≤SOC≤100	●	●	●	off	●	●	●	Flashing
	50≤SOC≤75	●	●	●	off	●	●	Flashing	off
	25≤SOC≤50	●	●	●	off	●	Flashing	off	off
	0<SOC<25	●	●	●	off	Flashing	off	off	off
Discharging	75≤SOC≤100	●	Flashing	●	off	●	●	●	●
	50≤SOC≤75	●	Flashing	●	off	●	●	●	off
	25≤SOC≤50	●	Flashing	●	off	●	●	off	off
	10≤SOC≤25	●	Flashing	●	off	●	off	off	off
	0≤SOC=≤10	●	off	●	off	●	off	off	off
	SOC=0	●	off	●	off	off	off	off	off

●	If the FAULT indicator is always on, it indicates that the battery has a fault alarm.
●	If the COM indicator is always on, it indicates that the communication between inverter and battery is normal.
●	If the RUN indicator is always on, it indicates that the system is operating normally.
●	If the BAT STATE indicator is always on, it indicates that the battery is charging. Flashing indicates that the battery is discharging.
●	The SOC indicator is indicating the current SOC status of the battery. Flashing indicates that the battery is charging.

Danger

Ensure ON/OFF switch is turned on before waking up the battery. Otherwise it will affect the auto test process and cause danger.

DO NOT switch off the ON/OFF switch during normal operation, only in emergencies. Otherwise it will cause the battery current to surge

Caution

If the DC breaker trips because of over-current or short circuit, you must wait for 30 minutes to switch it on again, otherwise it may cause damage to the breaker.

Voltage Protection

Low Voltage Protection in Discharging:
When any battery cell voltage or total voltage is lower than the rated protection value during discharging, the over-discharging protection is activated, and the battery buzzer makes an alarm sound. Then battery system stops supplying power to the outside. When the voltage of each cell back to rated return range, the protection is over.

Over Voltage Protection in Charging:
Battery will stops charging when total voltage or any battery cell voltage reaches the rated protection value during charging stage. When total voltage or all cell back to rated range, the protection is over.

Current Protection

Over Current Protection in Charging:
When the charge current>90A, current limit protection mode is activated, current will be limited to 3A, protection is removed after rated time delaying 10S. Circulate like this until the current is lower than 90A.

Over Current Protection in Discharging:
When the discharge current is higher than 110A, the battery buzzer alarms and the system stops discharging after 15s. After protection, the discharging will restore in 60s delay or immediately when there is charging current.

Temperature Protection

Low/Over temperature protection in charging:
When battery's temperature is beyond range of -20°C~65°C during charging, temperature protection is activated, device stops charging. The protection is over when temperature back to rated working range.

Low/Over temperature protection in discharging:
When battery's temperature is beyond range of -20°C~65°C during discharging, temperature protection is activated, device stops supplying power to the outside. The protection is over when temperature back to rated working range.

Other Protection

Short Circuit Protection:
When the battery is activated from the shutdown state, if a short circuit occurs, the system starts short-circuit protection for 60 seconds.The protection is over when temperature back to rated working range.

Self-Shutdown:
When device connects no external loads and power supply and no external communication for over 72 hours, device will dormant standby automatically.

Caution! Battery's maximum discharging current should be more than load's maximum working current.

3 Installation and Configuration

3.1 Preparation for installation

Safety Requirement
This system can only be installed by personnel who have been trained in the power supply system and have sufficient knowledge of the power system. The safety regulations and local safety regulations listed below should always be followed during the installation.

Make sure that the grounding point for the battery system is stable and reliable before installation. If the battery system is installed in an independent equipment cabin (e.g. container), ensure that the grounding of the cabin is stable and reliable. The resistance of the grounding system must be ≤100mΩ.

- If operating within the power system cabinet, make sure the power system is not charged. Battery devices should also be switched off.
- Distribution cable wiring should be reasonable and has the protective measures to avoid touching these cables while operating power equipment.
- The following protective items must be worn when installing the battery system:bvv

Insulated Gloves	Safety Goggles	Safety Shoes
		

HVR Syntero series working temperature range: -20°C to +55°C;

Optimum temperature:
18°C to 30°C;
Exceeding the working temperature range will cause overtemperature/ under-temperature alarms or protection of the battery system which may lead to the reduction of cycle lives.

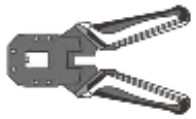
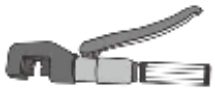
Heating System
If the environment is lower than 2°C, the system will automatically turn on the heating mode. At this time, the heating can be powered by the inverter or the battery itself. The condition for the battery to stop power supply is SOC<20%. When the lowest temperature of the battery is above 5 °C, the heating mode will be exited.

Environmental requirements
Charging temperature range is 0°C~55°C
Charging temperature range is -20°C~55°C
Discharging temperature range is -20°C ~55°C
Storage temperature: -10°C~35°C
Relative humidity: 5% ~ 85%RH
Elevation: no more than 4000m
Operating environment: Indoor installation, sites avoid the sun and no wind, no conductive dust and corrosive gas.

And the following conditions are met:
- Installation location should be away from the sea to avoid brine and high humidity environment.
- The ground for product arrangement shall be flat and level.
- No flammable explosive materials near the installation site.
- Keep away from zones with significant dust generation

3.2 Tools and data

Tools and meters that may be used are shown in Figure 3-2 Installation Tools.

Power Cable Clamp	Pen	Phillips Screwdriver bit	Flat-Head Screwdriver
			
Wire Stripper	**Crimping Pliers**	**Wrench**	**Tape Measure**
			
Hair Dryer	**Cylinder Screwdriver**	**Torque Wrench**	**Drill**
			

Technical preparation

Electrical interface check

Devices that can be connected directly to the battery can be user equipment, power supplies, or other power supplies.

- Confirm whether the user's PV power generation equipment, power supply or otherpower supply equipment has a DC output interface, and measure whether the DC power output voltage meets the voltage range requirements in Table 2-2.
- Confirm that the maximum discharge current capability of the DC power interface of the user's photovoltaic power generation equipment, power supply or other power supply equipment should be less than the maximum charging current of the products used in Table 2-2.
- If the maximum discharge capability of the DC power interface of the user's photovoltaic power generation equipment is higher than the maximum charging current of the products used in Table 2-2, the DC power interface of the user's photovoltaic power generation equipment shall have a current limiting function to ensure the normal operation of the user's equipment.
- Verify that the maximum operating current of the battery-powered user equipment (inverter DC input) should be less than the maximum discharge current of the products used in Table 2-2.

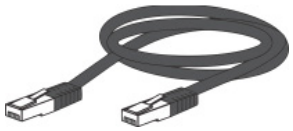
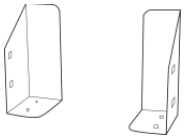
The security check

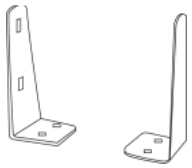
- Firefighting equipment should be provided near the product, such as portable drypowder fire extinguisher.
- No flammable, explosive and other dangerous materials are placed beside the battery.

Unpacking Inspection

- When the equipment arrives at the installation site, loading and unloading should be carried out according to the rules and regulations, to prevent from being exposed to sun and rain.
- Before unpacking, the total number of packages shall be indicated according to the shipping list attached to each package, and the case shall be checked for good condition.
- In the process of unpacking, handle with care and protect the surface coating of the object.
- Open the package, the installation personnel should read the technical documents, verify the list, according to the configuration table and packing list, ensure objects are complete and intact, if the internal packing is damaged, should be examined and recorded in detail. Table 3-1 Packing List.

Table 3.1 Packing list

Item	Specification	Quantity	Figure
Battery	51.2V/100Ah	1	
Power cablepositive	Red /4AWG/L1500mm	1	
Power cablenegative	Black /4AWG/L1500mm	1	
Communication parallel cable	Black /L2000mm/Double RJ45 plug	1	
Communication cable to inverter	Black /L2000mm /Double RJ45 plug	1	
Ground wire	L500mm,4mm²	1	
Hexagon Socket Button Head Screw	M6*10	8	
Expansion Bolt	M6*80	8	
Positioning cardboard	Positioning cardboard	1	
Battery bracket	Battery bracket	1	

Item	Specification	Quantity	Figure
Fixing bracket	Fixing bracket	1	
User Manual	User Manual	1	
Packing list	/	1	

Engineering coordination

- Attention should be paid to the following items before construction:
- Power line specification.
- The power line specification shall meet the requirements of maximum discharge current for each product.
- Mounting space and bearing capacity.
- Make sure that the battery has enough room to install, and that the brackets have enough load capacity.
- Wiring.
- Make sure the power line and ground wire are reasonable. Not easy to short-circuit, water and corrosion.

Please note that the battery should be installed with a minimum safe clearance from the surrounding equipment or battery.

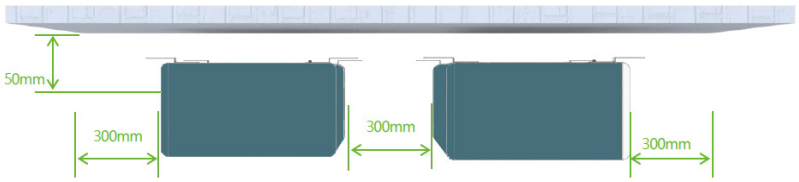


Figure 3-2 Distance batteries

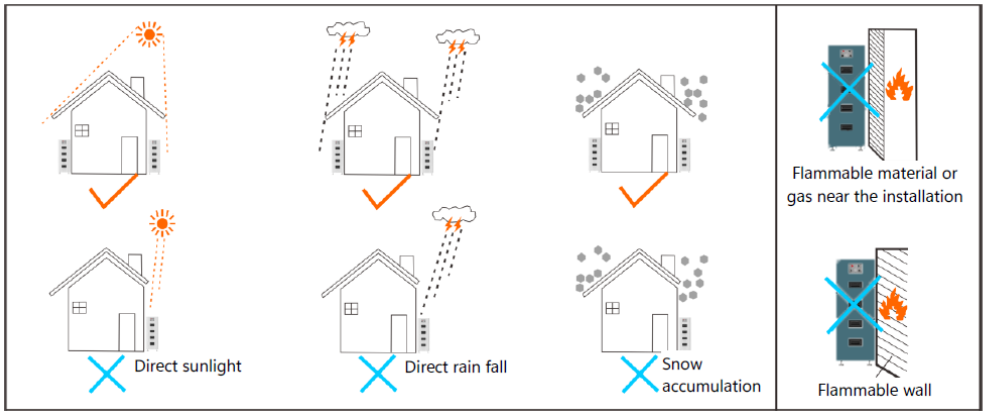


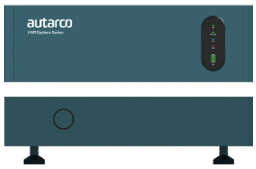
Figure 3-2 Precautions, locations

Equipment installation

Preinstallation requirements

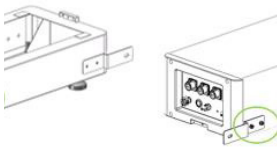
1. Make sure that the environment meets all technical requirements.
2. Prepare equipment and tools for installation.
3. Confirm that the DC breaker is in the OFF position.

Step 1 Separate the BDU from the battery base



Step 2 Install the fixing brakcets

Install the fixing bracket on the base and BDU with M6 bolts.

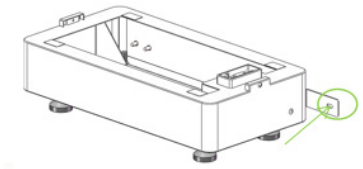


Step 3 Height adjustments

Adjust the height of the battery stack by twisting the legs of the base.

Step 4 Fixing the brackets (BASE)

1. Use the pre made 2 holes in the bracket on each side to drill with diameter of 10mm on the wall.
2. The hole depth shall be greater than 70mm.
3. Fix the expansion bolt M6 into the bottom of the hole on the wall.
4. Use the M6 bolt to fix the bracket to the wall and control the torque at 6NM.

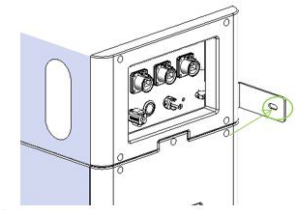


Step 5 Battery stacking

1. Place the battery module on the battery base and fix with 2 screws.
2. Place the remaining battery modules on top of the first one, fix each one with 2 screws.
3. Finish the stack with the BDU on top of the last battery module.

Step 6 Fixing the bracket (BDU)

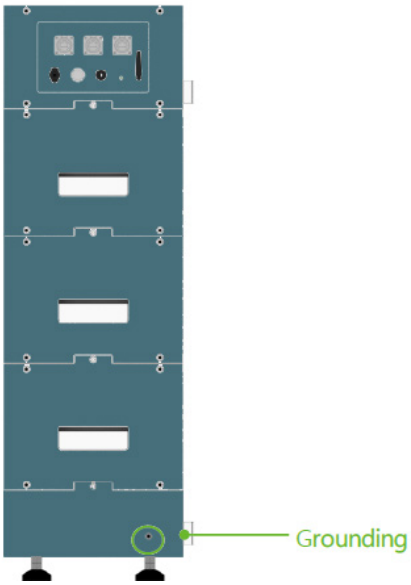
Please repeat the steps from step 4 for the BDU, in order to fix it to the wall same as the BASE.



Warning

A single battery module weighs 34.5kg. It is necessary to install battery modules with more than one person if no lifting equipment is available. Double-check all the power and communication cables. Make sure that the voltage of the inverter is compatible with the battery system.

Step 1 Grounding



Ground the battery stack using the special docking portat the BASE, and the provided grounding cable.

Step 2 Battery system self test

1. Switch the DC breaker of the BDU on.

2. Press and hold the WAKE button for approx 5s, battery power on.

3. Check the system output voltage.
• Use a multimeter to measure the output voltage on the positive and negative ports of the BDU.
• The output voltage should conform to the voltage range in Table “P7 Table 2-1

4. Press and hold the WAKE button for approx 5s, battery shutdown.

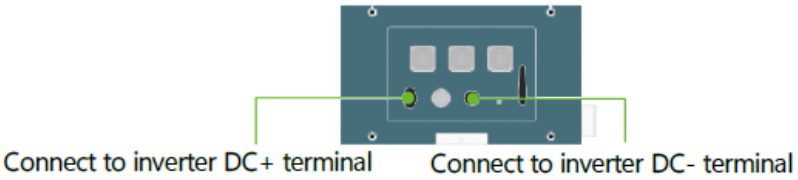
5. Switch the BDU DC BREAKER to OFF position.

Table 3-3 WAKE button status indication

●	If the red light remains on, it indicates a battery failure.
●	If the green light flashing, it indicates that the battery status is normal and the communication connection with the inverter has failed.
●	If the green light remains on, it indicates that the battery and inverter are connected properly and the battery can be used normally.

Step 3 DC connection to the inverter

Use the premade battery cables found in the BDU+BASE box to connect the inverter to the battery.



1. Use the battery side connector (as on the label) to connect + and - DC terminals on the BDU.

2. The other side of the cable shall be connected to the inverter. For details please see the inverter manual.

LH-MII series
Use the pre-made blue connectors to connect directly to the battery ports. In case cable lenght adjustment is required, please use the spare inverter connectors from the inverter box.

LQH series
Cut off the pre-made blue connectors and crimp the OT terminal from the BDU box.

XLH series
Cut off the pre-made blue connectors and strip the cable as explained in the XLH manual.

Step 4 COM connection to the inverter

Please use the COM cable added in the BDU box. Make sure that battery side of the cable is connected to the BDU, not to the inverter. Check the inverter manual for the designed COM cable socket (usually marked as BMS)

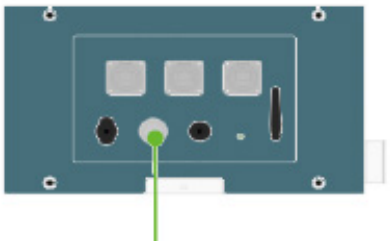


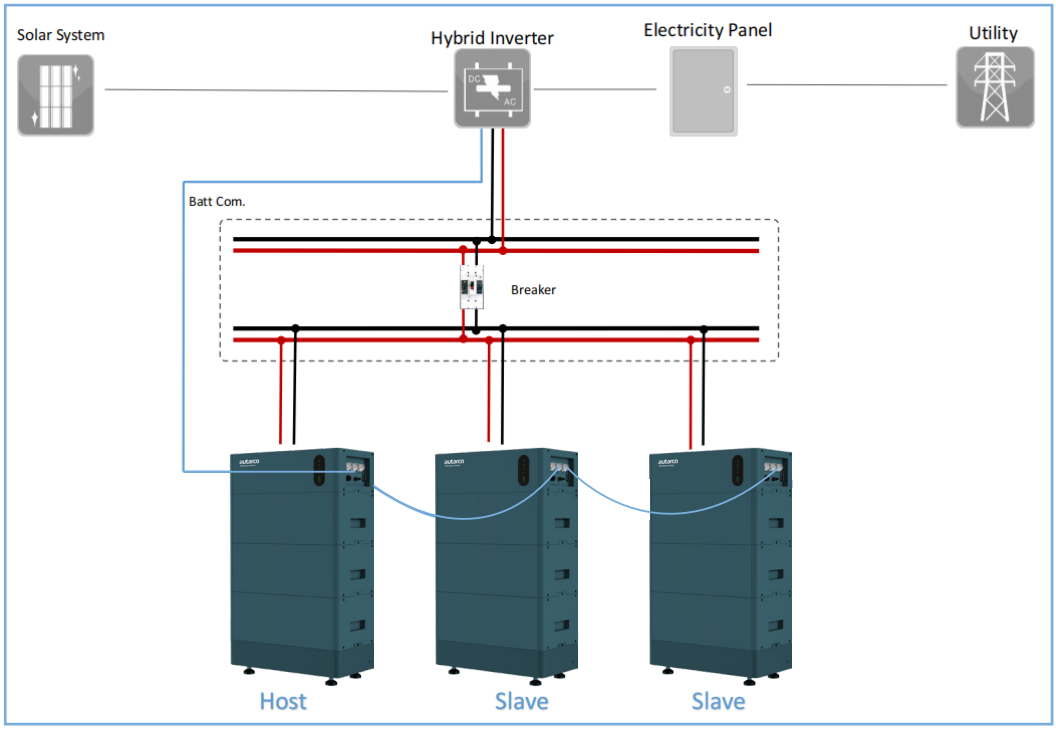
Figure 3-2 BDU COM

The parallel connection of the HVR

Syntero HVR series paralleling is only allowed by professional and qualified electricians. The total voltage difference between stacks should be less than 20V; SOC of each stack should be 100% and time interval between newly added cluster and existing cluster should be less than 6 months. Maximum 12 HVR Syntero stacks are allowed to be connected in parallel.

Parallel wiring

The general configuration diagram of the HVR Syntero in parallel connection is as specified below. Three stack system is used as an example:



For multi stack parallel systems, the communication line connection between stacks is Master's Parallel 2 to the Slave's Parallel 1 and so on. Then connect a 120 Ω CAN resistor to the port of the Master's parallel 1 and the last slave parallel 2 to ensure the stable CAN communication.

Attention

The HVR Syntero in parallel must be of the same model and same capacity.
During capacity expansion, make sure SOC of each module is 100%. Power on sequence of multiple stacks: Start the slave stacks first, then start the master stack.

4 Maintenance and Troubleshooting

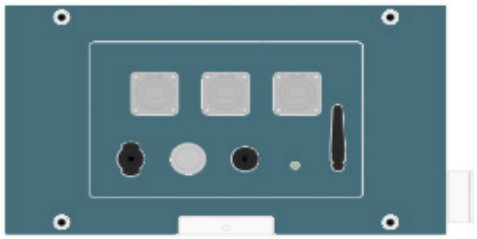
4.1 Troubleshooting

Table 2-3 Interface Definition

No.	Problem	Possible reason	Solution
1	Pressing the “WAKE” button does not turn on the device, and the light remains off.	The BDU DC breaker is not switched on.	Switch the BDU DC breaker on.
		The battery voltage is severely low (<80V) or damaged.	Contact the battery manufacturer for further inspection.
2	Pressing the “WAKE” button turn on the device, the light will turn on, but the display status of the light is red.	Improper placement of batteries and BDU during installation, resulting in misalignment of blind insertion pins.	Check the blind insertion pin and reset the misplaced blind insertion pin.
		Battery system protection.	Charge the battery to leave protection mode, or contact the battery manufacturer for further inspection.
3	The battery has no voltage output.	Battery changes into over-discharged protection.	Charge the battery to leave protection mode.
		Communication failure with inverter.	Check if the connection of the communication cable and PIN definition are correct.
4	Battery shutdown	BDU DC circuit breaker open circuit.	Switch the BDU DC breaker on.
		Battery changes into over-discharged protection.	Charge the battery to leave protection mode.
		Battery is in sleep mode.	
	SOC jump during battery charging and discharging process.	The battery system has not undergone full charge calibration for a long time.	Perform a full charge calibration once.
5		Inconsistent SOC of battery module.	The system performs 10 ~ 30 full charge balancing cycles (depending on the SOC difference of the module, the number of full charge balancing will vary); or fully charge each battery module separately with BDU and DC power supply.
		Differences in battery cell consistency or damage.	Contact the battery manufacturer for further inspection.

4.2 BDU replacement procedure

Turn off the entire battery system. Ensure that there is no voltage on the positive and negative terminals.



1. Press and hold the WAKE button for approx 5s, battery shutdown.

2. Switch the BDU DC BREAKER to OFF position.

3. Remove the two screws on the BDU and remove the BDU from the system.
4. Exchange BDU. Then fix it with two screws.
5. After replacing the new BDU, the battery self-test needs to be performed again. (See P19 Table 3-2 Battery system self-test)

Maintenance

Battery maintenance should only be carried out by professional and authorized persons. Turn off the battery system first carrying out maintenance.

Balancing

The battery system will become unbalanced if it has not been charged fully for a long time. To avoid voltage unbalance in the system, perform balancing maintenance (fully charge) at least every 10 month.

This maintenance process is needed only in case external devices such as the Autarco monitoring and inverter communication were lost for longer than 10 months.

Table 4-2 Analysis and Treatment of Common Faults

No.	Fault phenomenon	Reason analysis	Solution
1	The indicator does not respond after the power on	Total voltage lower than 35V	Check the total voltage
2	No DC output	Battery data status is abnormal. Battery gets into over-discharged protection	Read the battery information on the monitor.
3	The DC power supply time is too short	Battery capacity become smaller	Storage battery replacement or add more modules
4	The battery can't be fully charged to 100%	Charging voltage is too low	Adjust charging voltage at 56.5V or 57V
5	The power cable sparks once power on and ALM light RED	Power connection short-circuit	Turn off the battery, check the cause of the short circuit
6	Communication fault	The DIP setting of the host is wrong/ the battery type of the inverter is wrong/ Communication cable used incorrectly/ The communication cable is incorrectly connected at the battery communication port or the inverter communication port/The	Check these possible causes one by one

If you need any technical help or have any question, please contact the dealer in time.

4.3 Storage

For long-term storage (longer than 3 months) the battery modules should be stored within the temperature range of 5 to 45°C in a dry, clean and well ventilated environment. The battery should be charged to 50-55% SOC before storage.

We recommend activating the battery system (discharge and charge) every 10 months, corresponding to the battery system that has been installed and used normally, it is necessary to regularly fully charge the battery to calibrate the SOC. It is recommended to fully charge and calibrate at least once every 2 weeks.

Caution
The lifespan of the battery will be greatly reduced if you do not follow above instructions to store the battery for a long term.