

Residential Energy Storage System

PowerBase Mate

Reference Manual



Rev 1.60
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Our Energy Works For You

ZRGP



About this manual

- This manual introduces how to install the energy storage system battery pack. Please read this manual before trying to install the product Installation process. If you are not sure about any requirements, please contact ZRGP or your local distributors.
- The information contained in this manual is accurate in publication. The specifications of this product are more than subject to notice. In addition, the illustrations in this manual are intended to help explain the system configuration concepts and installation instructions. The project may be in a project that is in a different location.

Introduction

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1. Safety and Warning

It is very important and necessary to read the user manual carefully (in the accessories) before installing or using battery. Failure to do so or to follow any of the instructions or warnings in this document can result in electrical shock, serious injury, or death, or can damage battery, potentially rendering it inoperable.

1.1 General warnings



Work on a Li-ion Battery should be carried out by qualified person only.



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 of with household waste at the end of its working life.



The battery pack should be disposed of 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.

1.2.1 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 get in contact with liquids.
 - Do not subject the battery pack to high pressures.
 - Do not place any objects on top of the battery pack.



1.2.2 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 battery pack comprises multiple batteries that are designed to prevent hazards resulting from failures. However, ZRGIP cannot guarantee their absolute safety.

1.3.1 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:

1.3.2 Inhalation

Evacuate the contaminated area and seek medical attention immediately.

1.3.3 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



1.3.4 Fire



In case of a fire, make sure that an ABC or carbon dioxide extinguisher is nearby.



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 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.

1.3.5 Wet batteries

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

1.3.6 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 ZRGP or your distributor.



WARNING

Damaged batteries may leak electrolyte or produce flammable gas. If you suspect such damage, immediately contact for advice and information.



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.



2. Installation requirements

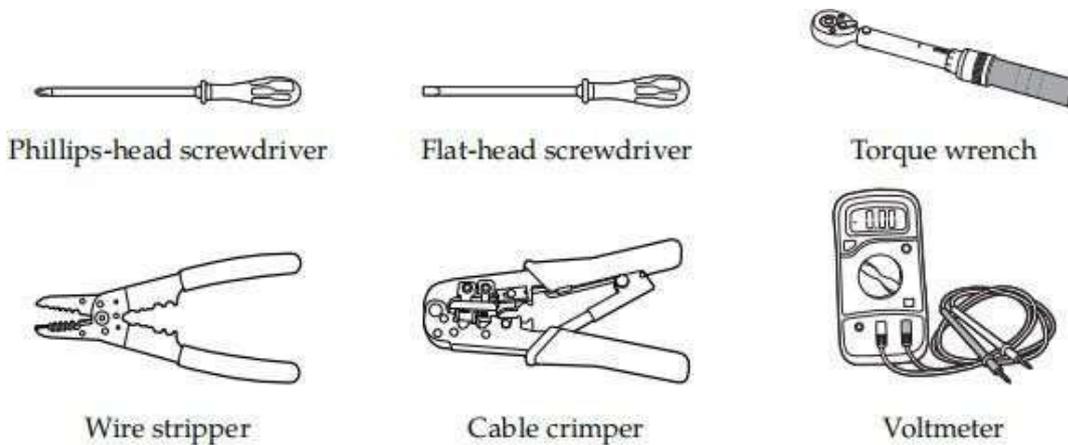
2.1 Installation materials

These installation materials shall be provided by installers.

- Power cable between circuit breaker and inverter
- Circuit breaker (not required for Power Base Max-X All-in-one configuration)
- Network cable
- Ground wire
- Silicone sealant or putty

2.2 Tools

These tools are required to install the battery pack.



Use properly insulated tools to prevent accidental electric shock or short circuits. Use adjustable tools and measuring instruments that are certified for precision and accuracy

2.3 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 the domestic legislation



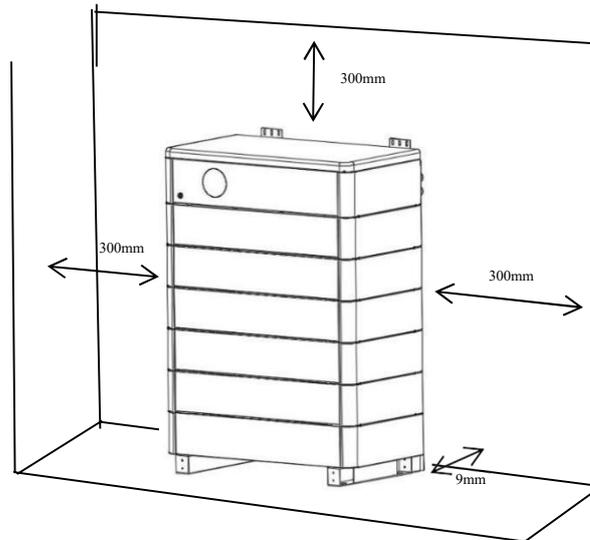


2.4 Installation location

- The floor is flat and level.
- There are no flammable or explosive materials around.
- The ambient temperature is within the range from 15 °C to 30 °C (recommended).
- There is minimal dust and dirt in the area.
- The distance from a heat source is more than 2 meters.
- The distance from air outlet of the battery is more than 0.5 meter.
- Do not cover or wrap the battery case or cabinet.
- Install the battery out of reach of children and pets.
- Do not install the unit where it will be exposed to direct sunlight.
- There are no mandatory ventilation requirements for the battery but avoid installing it in a confined area.
- The area should not be exposed to high salinity, humidity, and temperature.
- The battery is rated IP55.
- The battery can be installed indoor.



2.5 Installation clearance



Make sure to leave a space of at least 9 mm between the battery pack and the wall. A clearance of at least 300 mm must be left around the battery pack for proper cooling.

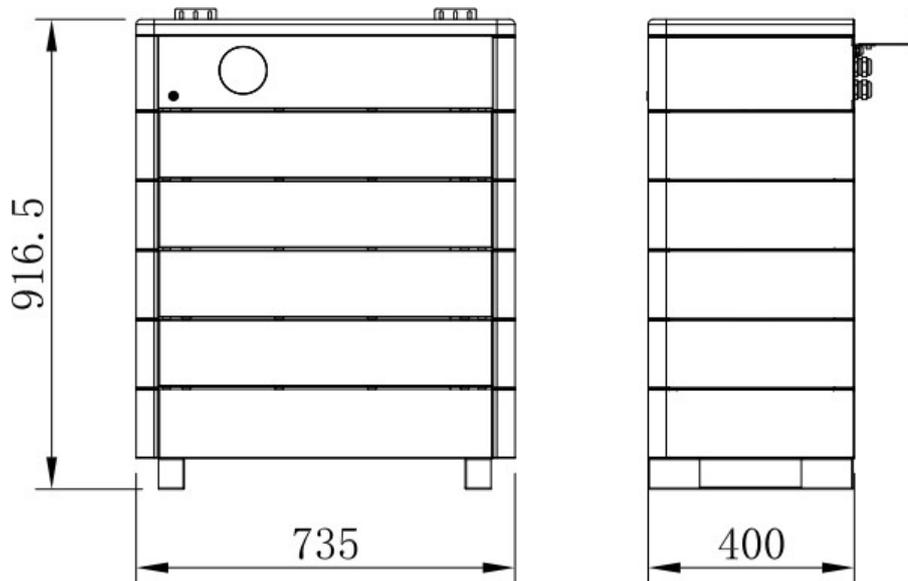
NOTICE

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. Technical data

3.1 Dimensions



3.2 Datasheet

No.	Items	Parameters						
1	Series Name	Mate LV_100 Series						
2	Main Control Module	ZR MC100-200M2						
3	Battery Module Type	ZR-FS48100-16OSJ1						
4	Battery Module Chemistry	LiFePO4						
5	Battery Module QTY	2	3	4	5	6	7	8
6	Model Name	ZR-PBML-10S	ZR-PBML-15S	ZR-PBML-20S	ZR-PBML-25S	ZR-PBML-30S	ZR-PBML-35S	ZR-PBML-40S
7	Nominal Capacity (Ah)	200	300	400	500	600	700	800
8	Nominal Energy(kWh)	10.24	15.36	20.48	25.6	30.72	35.84	40.96
9	Usable Capacity (Ah)	≥197	≥291	≥388	≥485	≥582	≥679	≥776
10	Depth Of Discharge (%)	97						
11	Voltage	Nominal(V)	51.2					
		Recommend Charging(V)	56.88					
		Max. Charging(V)	58.4					



		Recommend Discharge Cut-off(V)	46.88						
12	Current	Max. Charging(A)	180	270	300	300	300	300	300
		Max. Discharging(A)	180	270	300	300	300	300	300
		Peak for 10s(A)	300	300	500	500	500	500	500
13	Short Circuit Current	3100A/12ms							
14	Max. Charge/Discharge Power(kW)	9	13	15	15	15	15	15	
15	Weight (kg) (Approx.)	138	189	240	291	342	393	444	
16	Dimensions (L*H*W))	735*1446 *400mm @40.96 kWh							
17	Inbuilt Communication	RS485, CAN, RS232							
18	IP Code	IP55							
19	Cycle Life	8000 times@25°C							
20	Designed Calendar Life	≥10 years							

3.3 Power cable requirements

Model	Nominal Voltage(Vdc)	Cable specification	
		AWG	mm ²
PF5-LFP04800-2A01	51.2Vdc	4	25
PF5-LFP09600-2A01	51.2Vdc	1/0	50
PF5-LFP14400-2A01	51.2Vdc	4/0	95
PF5-LFP19200-2A01	51.2Vdc	4/0	120

NOTICE

Power cable is supplied with product. Standard with one orange for positive, one black for positive. (1500mm length)



3.4 Grounding cable requirements

Model	Nominal Voltage(Vdc)	Cable specification	
		Length	mm ²
B07BT9TQKD	51.2Vdc	1.5 Meter	4
B07M94L2F8	51.2Vdc	1 Meter	4
B079SBBJD7	51.2Vdc	1.5 Meter	4

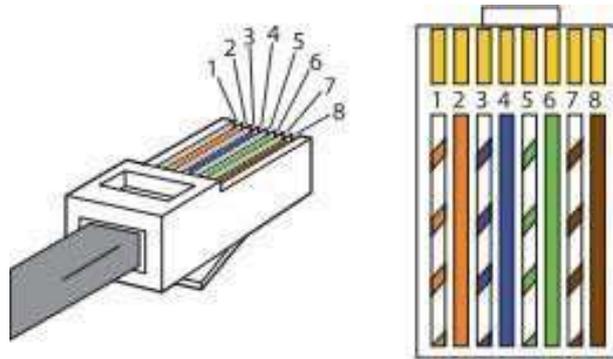
NOTICE

Grounding cable is not supplied with product. When connected to inverter, the grounding cable is not necessary. When using alone with Test Purpose or other situation, please make sure the grounding cable is ready.

3.5 Network cable requirements

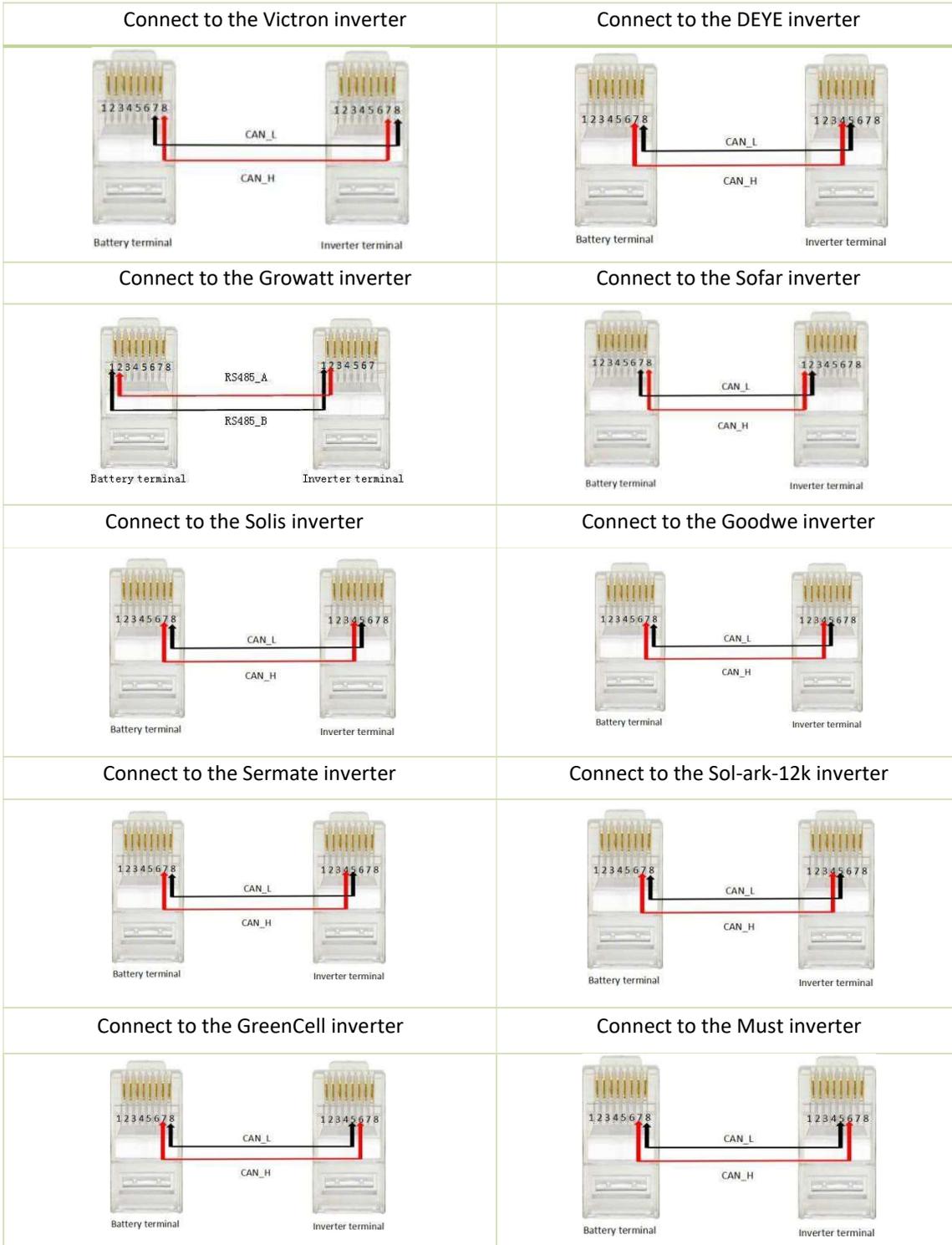
Category	Cat 5e
Connector	8P8C without any kind of boots
Maximum cable length	5 Meter per cable

3.5.1 Making a BMS communication cable



Use this method to make a network cable, which is to be connected between the battery pack and the inverter.

1. Cut network cable to the needed length.
2. Strip 2.5 to 5 cm of the outer sheath at one end of the cable.
3. Untwist and separate each pair of wires.
4. Arrange the wires in this order:



5. Bring the sorted wires together and trim them to about 1.4 cm in length.
6. Hold the RJ45 plug with the copper contacts facing up, and insert the wires into the plug, making sure that they stay aligned and each color goes into its appropriate channel.
7. Put the plug into a cable crimper and squeeze the handles thoroughly.


NOTICE

Network cable is not supplied with product.

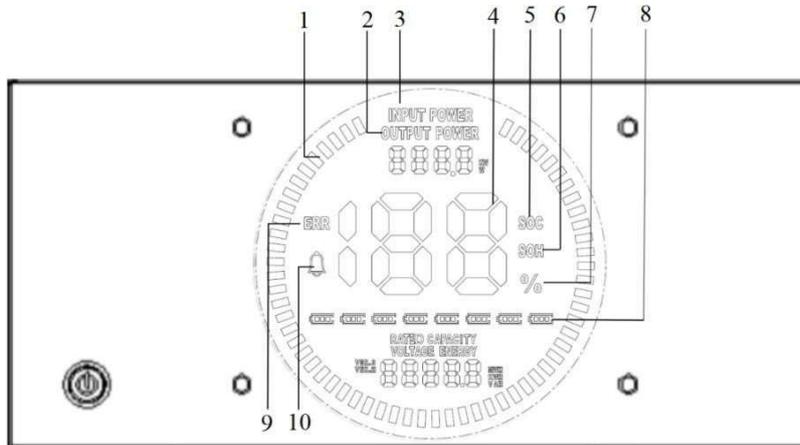
3.6 Environmental requirements

NO.	Items	Parameters
1	Charging Temperature Range	0°C~55°C
2	Discharging Temperature Range	-20°C~55°C
3	Best Operating Temperature Range	15°C~35°C
4	Storage Temperature Range	-20°C~60°C
5	Humidity	10%RH~90%RH
6	Altitude	0~2000m

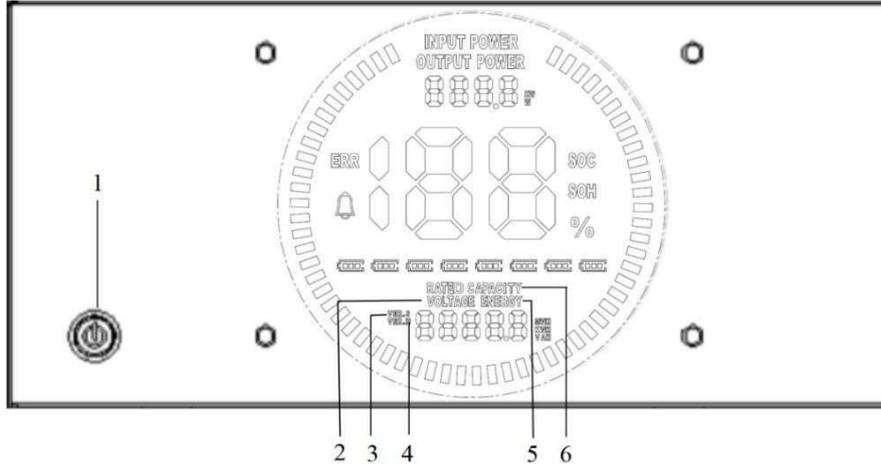
4. Product description

4.1 Display function description

Information displayed on the screen include input and output power, SOC, SOH, rated capacity, voltage, energy, and system status code (alarm and fault indication).



No.	Instructions	NO.	Instructions
1	Animated streamline	6	Battery state of health (SOH)
2	Discharge power	7	Numerical percentage
3	Charging power	8	Number of modules
4	Numerical information	9	Fault (error)
5	Battery state of charge (SOC)	10	Alarm (warning)



No.	Instructions	NO.	Instructions
1	Power switch	4	Hardware version
2	Current voltage level	5	Energy throughput
3	Software version	6	Capacity of a new battery

4.1.1 Display Status Code

When the system status code is displayed as protection (alarm) information, bell symbol and code will be displayed. When the system status code is displayed as fault information, ERR and code value (13 or higher) will be displayed. The explanation of alarm and fault codes is provided in the table:

numerical value	Alarm indication	numerical value	Alarm indication
000	Normal	014	Charging circuit fault
002	Low voltage protection	015	Cell failure
003	Charging over current protection	016	NTC failure
004	Discharge over current protection	019	Communication interruption fault of external equipment
005	Short circuit protection	020	Internal equipment communication interruption fault
006	Charging high temperature	022	Relay over temperature protection

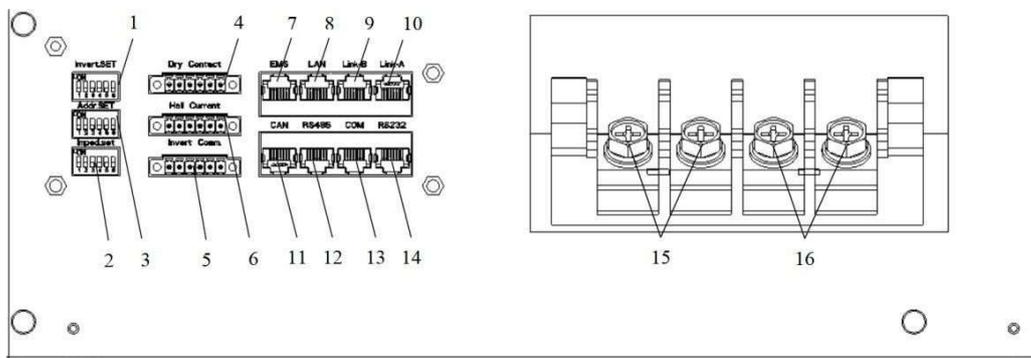


007	High discharge temperature	023	Copper bus over temperature protection
008	Low charging temperature	025	Lost communication between screen and device
009	Low discharge temperature	051	Total pressure overcharge protection
011	High ambient temperature	052	Total pressure over discharge protection
012	Excessive differential pressure	053	Low ambient temperature protection
013	Discharge circuit failure	054	MOS over temperature protection

NOTICE

When the system is charged, the display streamline gathers in the middle, and when it is discharged, the display streamline disperses to both sides.

4.2 Master Controller connections



No.	Instructions	No.	Instructions
1	Inverter protocol dialing switch	9	Parallel communication port B
2	Imped.SET (Reserved)	10	Parallel communication port A
3	Address Dial Switch	11	Inverter CAN communication port
4	Dry Contact (Reserved)	12	Inverter RS485communication port
5	Inverter CAN /RS485communication port	13	CAN upgrade communication port
6	Hall Current (Reserved)	14	RS232 communication interface

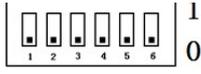


7	Reserved	15	Battery negative terminal
8	Reserved	16	Battery positive terminal

4.2.1 Inverter protocol dialing switch

A battery needs to communicate with an inverter for correct operation. Hardware address configuration is required on the battery, and the hardware address can be set through the Inverter protocol dialing switch (No 1 in above table) on the Master controller.

The Inverter protocol dialing switch has 6 switches that can be toggled between “0” and “1” position. Please refer to

the picture on the right for the switch order. 

The inverter communication protocol can be changed to match the used inverter brand by setting the dial switches as defined in the following table.

Address Coding	Dial Code Switch Position						Definition
	#1	#2	#3	#4	#5	#6	
0	OFF	OFF	OFF	OFF	OFF	OFF	Monitoring Software setting mode
1	ON	OFF	OFF	OFF	OFF	OFF	ZRGP
2	OFF	ON	OFF	OFF	OFF	OFF	Studer_Xtender
3	ON	ON	OFF	OFF	OFF	OFF	Sofar_LV
4	OFF	OFF	ON	OFF	OFF	OFF	Solis_LV
5	ON	OFF	ON	OFF	OFF	OFF	Goodwe_LV
6	OFF	ON	ON	OFF	OFF	OFF	Victron_color control
7	ON	ON	ON	OFF	OFF	OFF	SMA_LV
8	OFF	OFF	OFF	ON	OFF	OFF	Sermatec_LV
9	ON	OFF	OFF	ON	OFF	OFF	Reserved
10	OFF	ON	OFF	ON	OFF	OFF	Growatt_SPF
11	ON	ON	OFF	ON	OFF	OFF	Li_PLUS
12	OFF	OFF	ON	ON	OFF	OFF	Schneider_Gateway
13	ON	OFF	ON	ON	OFF	OFF	SOL-ARK
14	OFF	ON	ON	ON	OFF	OFF	Reserved
15	ON	ON	ON	ON	OFF	OFF	Reserved



16	OFF	OFF	OFF	OFF	ON	OFF	Reserved
17	ON	OFF	OFF	OFF	ON	OFF	DEYE
18	OFF	ON	OFF	OFF	ON	OFF	Growatt_SPH&SPA
19	ON	ON	OFF	OFF	ON	OFF	Reserved
20	OFF	OFF	ON	OFF	ON	OFF	Reserved
21	ON	OFF	ON	OFF	ON	OFF	Reserved
22	OFF	ON	ON	OFF	ON	OFF	Reserved
23	ON	ON	ON	OFF	ON	OFF	Reserved
24	OFF	OFF	OFF	ON	ON	OFF	Reserved
25	ON	OFF	OFF	ON	ON	OFF	Reserved
26	OFF	ON	OFF	ON	ON	OFF	Reserved
27	ON	ON	OFF	ON	ON	OFF	GreenCell
28	OFF	OFF	ON	ON	ON	OFF	Reserved
29	ON	OFF	ON	ON	ON	OFF	Must

4.2.2 Automatic Identification

The master control module has the Automatic identification function. If the Dia switches is set to 50~63 and well connected to inverter. The master control module will identify the inverter when the inverter is power on. Slave machine modules do not need to set the address and quantity.

The switch definitions are shown in the following table:

Address Coding	Dial Code Switch Position						Definition
	#1	#2	#3	#4	#5	#6	
50	OFF	ON	OFF	OFF	ON	ON	Reserved for subsequent extension
51	ON	ON	OFF	OFF	ON	ON	
52	OFF	OFF	ON	OFF	ON	ON	
53	ON	OFF	ON	OFF	ON	ON	
54	OFF	ON	ON	OFF	ON	ON	
55	ON	ON	ON	OFF	ON	ON	
56	OFF	OFF	OFF	ON	ON	ON	
57	ON	OFF	OFF	ON	ON	ON	
58	OFF	ON	OFF	ON	ON	ON	



59	ON	ON	OFF	ON	ON	ON	
60	OFF	OFF	ON	ON	ON	ON	Reserved for subsequent extension
61	ON	OFF	ON	ON	ON	ON	Reserved for subsequent extension
62	OFF	ON	ON	ON	ON	ON	When the dial switch is set to this code, the controller will automatically detect the number of systems installed in parallel. After detection finished, set the dial switch to the respective inverter code.
63	ON	ON	ON	ON	ON	ON	When the dial switch is set to this code, the controller will detect the number of battery modules installed in parallel. After detection finished, set the dial switch to the respective inverter code.

4.3 Battery module



No.	Instructions
1	Battery module programing and debug port
2	Address dial switches
3	Power switch



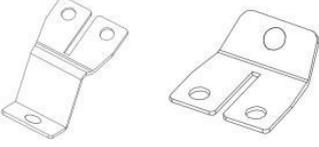
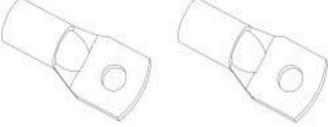
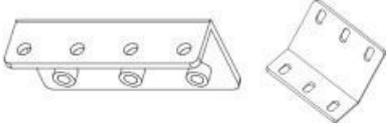
5. Installation instructions

WARNING

The battery pack is too heavy for one to carry. Make sure that two or more people are available to handle.

5.1 Package contents

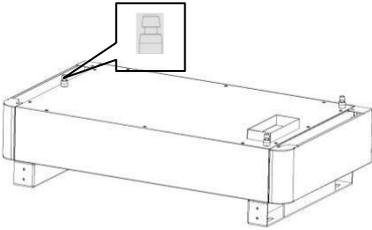
These items are included in the package

 Whole machine system×1	 Terminal bridge plates×2	 Spare cable lugs × 2
 Controller fixing bracket×2	 M8*16×2	 M6*10×6
 M4*10×8	 M3*12×15	User's manualx1
 Power Cable (Positive, Red) x1	 Power Cable (Negative, Black) x1	

Use only the parts included with the battery pack, except for the screw anchors, to ensure proper installation. If anything is damaged or missing, contact ZRGP or your distributor.

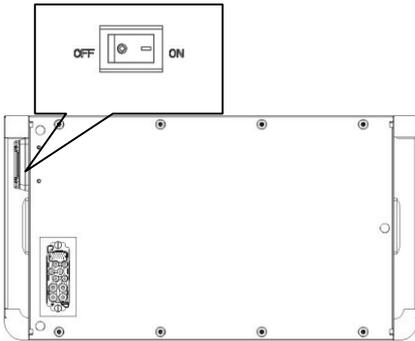


5.2 Mechanical installation

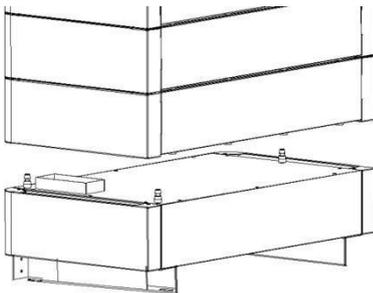


1、 Remove the battery base from the packaging and place it in the intended location. Assure the base is level and stable

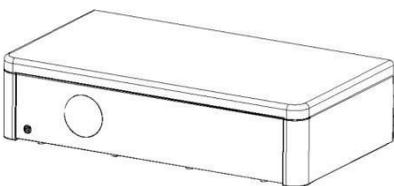
2、 Align the module interface cut-out to the front-right position during installation and remove the protective cover.



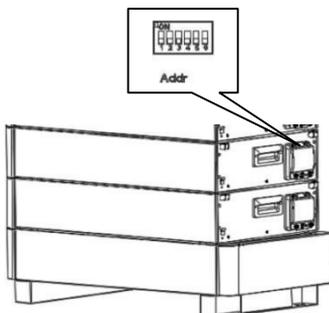
3、 Take a battery module out of the packaging and make sure the power switch is in the OFF position.



4、 Stack the required number of battery modules on the battery base. Mind the alignment of the battery module interface!



5、 Place the Master Controller module at the top of the system



6、 With all battery modules stacked and installed, set the address switches on all modules in ascending order from top to bottom.

5.3 Cable connections



WARNING

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

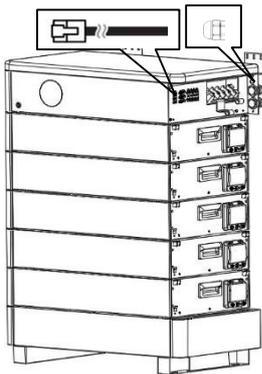
A circuit breaker above C80 shall be installed between the battery system and the inverter for protection.

All installation and operation must comply with local electrical standards.

The system does not require separate grounding; the grounding for battery system can be connected to the inverter and then grounding together.

5.3.1 BMS communication cable

It is required for the battery pack to communicate with the inverter for proper operation. Connect a network cable between the battery pack and the inverter.

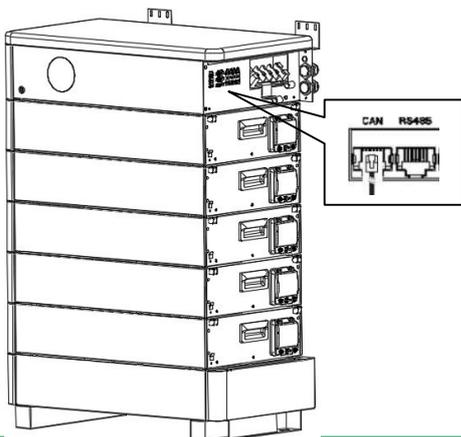


- 1、 Feed a network cable through the small grommet in the back of the Master Controller and fit an RJ45 connector. Please refer to Chapter 3.7 for connection details.

NOTICE



Do not attach any boot to the network cable to keep the connect short. Using a connector longer than 23 mm may prevent the top cover from being reassembled properly.



- 2、 Plug the BMS communication cable to into the communication port with the corresponding communication protocol (CAN, RS485)

Please refer to your inverter installation manual for the correct communication protocol.

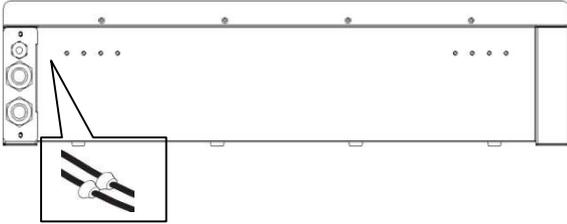
- 3、 Connect the other end to the inverter BMS communication port.

Please refer to your inverter installation manual for the correct communication port.

NOTICE

Select the corresponding CAN \ RS485 for connection communication according to the inverter communication mechanism.

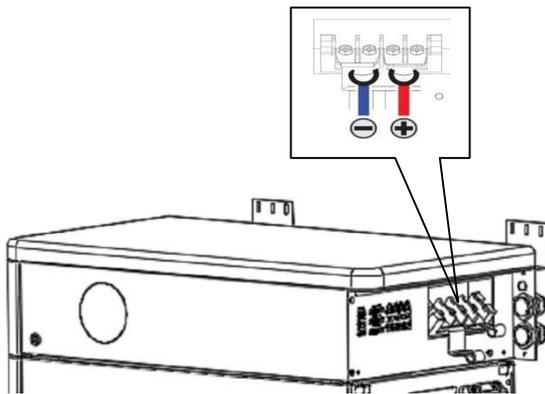
5.3.2 Power cables



- 1、 Feed a pair of power cables through each of the large grommets and then through each of the large cable entries.

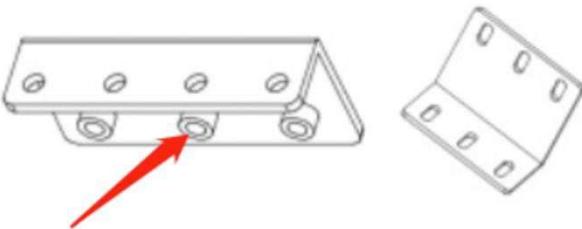
NOTICE

Connection with reversed polarity may cause severe damage to the battery pack.



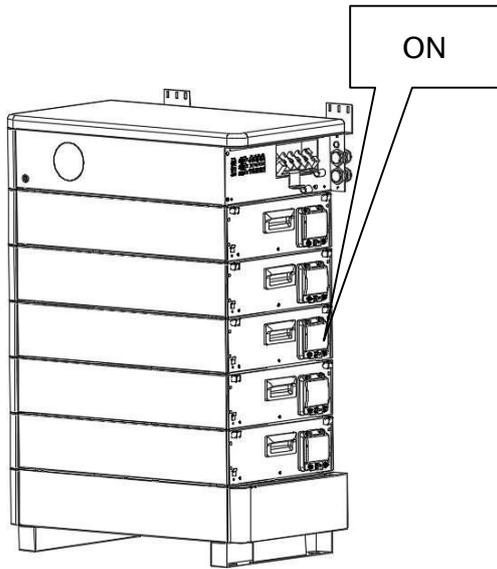
- 2、 Remove the terminal cover plate
Connect the negative cable (black) to the negative terminal and the positive cable (red) to the positive terminal.
Tighten the hexagon screw to a torque of 6Nm.
Place back of the cover on top of the terminals.

5.3.3 Grounding cable

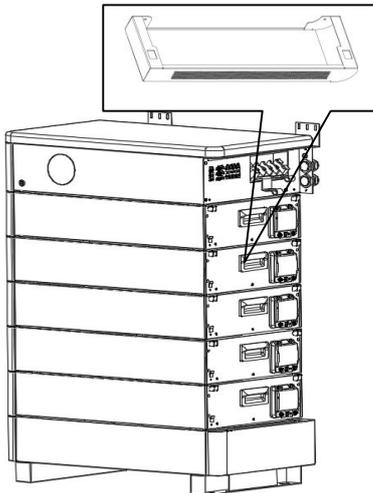


- 1、 Connect this point from controller fixing bracket by using the grounding cable with o-ring terminal to the grounding point in inverter side. If the application is not using inverter, please make sure the grounding cable is connected to the grounding point.

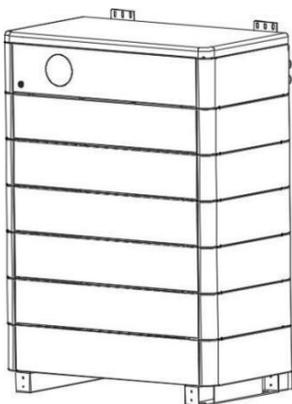
5.4 Finalizing installation and commissioning



1. Fill any unused feedthrough holes using a sealing ring or insulating material.
2. Apply silicone sealant or putty around the cable at each grommet to prevent foreign matters from entering the battery pack.
3. Check whether the configuration switch is set correctly. See inverter protocol dial switch (Chapter 3.4)
4. switch ON all power buttons on the right panel of the battery modules from bottom to top.
5. Assure the Master Controller Module does not indicate any error messages.



6. Install and fasten all side cover plates and tighten the screws to a torque of 5 Nm.



7. Install the Controller top cover and complete the system assembly

6. Startup/Shutdown procedure

6.1 End user Startup/shutdown

Use the power button on the Master Controller to turn the battery ON or OFF.

6.2 Installer Startup/shutdown step

The below mentioned Startup and Shut Down steps are only required when the battery is being (de)commissioned by a licensed electrician. These steps are not normally required to be performed by the owner of the battery system.

Follow these steps to start the device:

- 1、 Set dip all addresses switches based on the number of battery modules
- 2、 Turn on the power switches on battery module from bottom to top
- 3、 Turn on the main power button on the Master controller

Follow these steps to fully shut down the device:

- 1、 Turn off the Master Controller by pushing it's front panel power button.
- 2、 Remove the side cover from the battery modules and turn off all power switches of the battery modules from top to bottom

7. Trouble Shooting

7.1 An error code is shown on the display

Refer to Chapter 4.1 for more information regarding displayed error messages.

Assure the battery is operated within its recommended operating window.

Check the battery's temperature, voltage and current to determine if an external factor is the cause of non-operation of the battery.

- Temperature: Above 55°C or under -20°C, the battery will not operate. Allow the system to warm up or cool down.
- If current is greater than 300A, battery protection will turn on. Reduce the electric load to lower the current demanded from the battery.
- High Voltage: If the battery voltage is above 58.4V, the battery protection will turn on. Check your inverter settings and applied charge voltage. Discharge the battery pack to lower the voltage.
- Low Voltage: When the battery discharges to 46.8V or less, the battery protection will turn on. Charge the battery for some time.
- If the faulty still cannot be located, turn off and on the battery

7.2 The display is dark

- Make sure the external circuit breaker to the inverter is in the ON position.
- Attempt to charge the battery. If the external circuit breaker is turned on and the external power supply voltage exceeds 48V, and the system still cannot be started and operated, please contact the dealer.

7.3 The battery cannot be charged

Disconnect the power cables, measure voltage on power side, if the voltage is 53~54V restart the battery, connect the power cable and try again, if still not work, turn off battery and contact distributor

7.4 The battery cannot be discharged

Disconnect the power cables and measure voltage on battery side, if it is under 44V please charge the battery; if voltage is above 48V and still cannot discharge, turn off battery and contact distributor

8. Maintenance and Storage

The battery is maintenance free and does not have any serviceable parts inside.

Keep the battery surface clean to prolong the life of the battery, clean with a dry cloth. Vacuum any dust which has accumulated on the exterior of the battery. Do not let any foreign impurities fall into the system battery.

Check and calibrate system measuring instrument (such as thermometer, voltmeter, ammeter) regularly, so as not to affect the quality of system maintenance because of inaccurate instrument.

8.1 Storage

If the system will not be used for more than a week, it is recommended to leave the battery in a charged state between 50 and 80% SoC and disconnected it from the inverter.

If it is not used for more than a month, in addition to disconnection and leaving it a charged state, the system should be supplied with electricity once every three months to ensure the normal working status of the system and sufficient charge remains in the battery.

8.2 Transportation

Battery packs needs to be decommissioned and packed before it can be shipped. During transportation, the equipment must be protected from severe impact, extrusion, direct sunlight and rain.

Damaged batteries may leak electrolyte or produce flammable gas.

In case a damaged battery needs recycling, it shall follow the local recycling regulation (i.e. Regulation (EC) N° 1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.

Any further questions, please contact ZRGP: info@zruipower.com

NOTICE



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