MUST®

Residential Energy Storage Battery
(Wall Mounted)
LP28 Series
User Manual

TABLE OF CONTENT

PREGACE

About This Manual

Thank you very much for choosing the product.This manual describes the characteristics, installation, electrical connection, commissioning, operation, trouble shooting and maintenance of LP28 series battery. Please first read the manual and related documents carefully before using the product and store it in a place where installation, operation and maintenance personnel can access it at any time. The illustration in this user manual is for reference only.

Scope

This manual is applicable to following models:

LP28-48100

LP28-48200

LP28-48300

Target Group

- ★ LP28 series should be installed by qualified personnel who have obtained relevant qualifications. Qualified personnel refer to qualified electricians or installation personnel who are trained and have all the following skills and experience:
- ★ Knowledge of how the batteries work and are operated.
- ★ Knowledge of how the inverter works and is operated.
- ★ Knowledge of the installation and commissioning of electrical devices.
- ★ Knowledge of and adherence to the locally applicable connection requirements, standards and directives.
- ★ Knowledge of the dangers and risks associated with installing and using electrical devices and acceptable mitigation methods.
- ★ Knowledge of and adherence to this guide and all safety precautions and best practices.

01 SAFETY PRECAUTION

★ When using this product, the installer must comply with local safety regulations and relevant operating procedures.
★ Before using the battery, please read all instructions and cautionary markings on the unit and manual. Put the instructions where you can take them easily.
★ If the LP28 are stored for a prolonged time, it is required that theyshould be charged every six months, and the SOC should be no less than 50%.
★ All battery terminals must be disconnected before maintenance.
★ Do not use cleaning solvents to clean the battery.
★ Do not expose the battery to flammable or harsh chemicals or vapors.
★ Do not paint any part of the battery; include any internal or external components.
★ Do not connect battery with PV solar wiring directly.
★ Do not install the product in an environment beyond the operating temperature or humidity range listed in the manual.
★ Do not connect power terminals reversely.
★ Any foreign object is prohibited to be inserted into any part of the battery.

1.1 BEFORE CONNECTION

► If the LP28 is defective, cracked, damaged or otherwise damaged or unable to work, do not use it.
► To protect the LP28 and its components from damage during transportation, please handle them carefully.
► Do not attempt to open, disassemble, repair or modify the LP28.
► Do not bump, pull, drag or step on the LP28, and do not let it be under any pressure.
► Do not install the battery in a closed place with poor ventilation.
► Do not mix batteries of different models or manufacturers.
► This product can be installed indoors and outdoors. However, if it is installed outdoors, please do not expose it to sunlight or water, because they may cause performance degradation, shortened warranty period or even product damage.
► Ensure that there is no water source above or near the LP28, including faucet and downpipe.
► This product can only be used with compatible inverters.
► When multiple batteries are used in parallel, it is necessary to correctly connect the communication cable so that the system can correctly identify the master.
► Before installation, be sure to cut off the external power and make sure the battery is in the turned-off mode.
► Wiring must be correct. Do not mix-connect the positive and negative cables, and ensure no short circuit with the external device.

1.2 DURING OPERATION

If the LP28 needs to be moved or repaired, the power must be cut off first and the battery is completely shut down.

It is prohibited to put the LP28 working with different types of batteries and faulty or incompatible inverter.

In case of fire, only dry powder fire extinguisher can be used, liquid fire extinguishers are prohibited.

Please do not open, repair or disassemble the LP28.

In addition, the illustrations in this manual are used to help explain the system configuration and installation instructions and may differ from the actual project.

02 INTRODUCTION TO LP28 SERIES

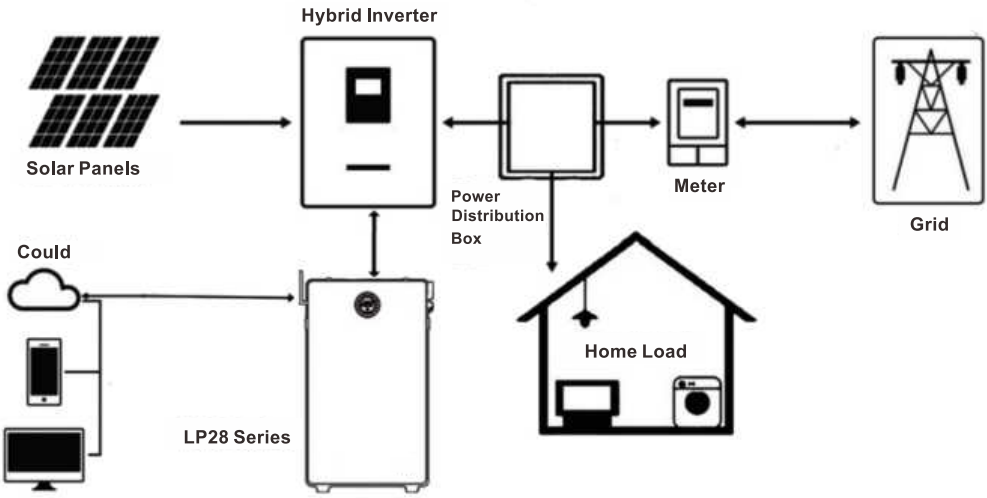
This series lithium iron phosphate battery is one of new energy storage products, it can be used to support reliable power for various types of equipment and systems.This series is especially suitable for application scene of high power, limited installation space, restricted loadbearing and long cycle life.

2.1 KEY FEATURES

LiFePO4 cathode material with excellent safety and life performance.
Simple installation, can be placed indoors or outdoors.
High Safety, Long Lifespan, High power.
Integrated with the most advanced BMS. It can collect battery information such as SOC, voltage, current, temperature, and with built-in balancing function, managing the battery system improves its stability and service life.
Perfectly compatible with 15 conventional brands of inverters.
Adapted to WIFI module, it can achieve remote wireless communication, data cloud reading and monitoring, remote maintenance.
Flexible scalability, supporting fast parallel connection between multiple batteries to improve capacity and output power, and can automatically set addresses..

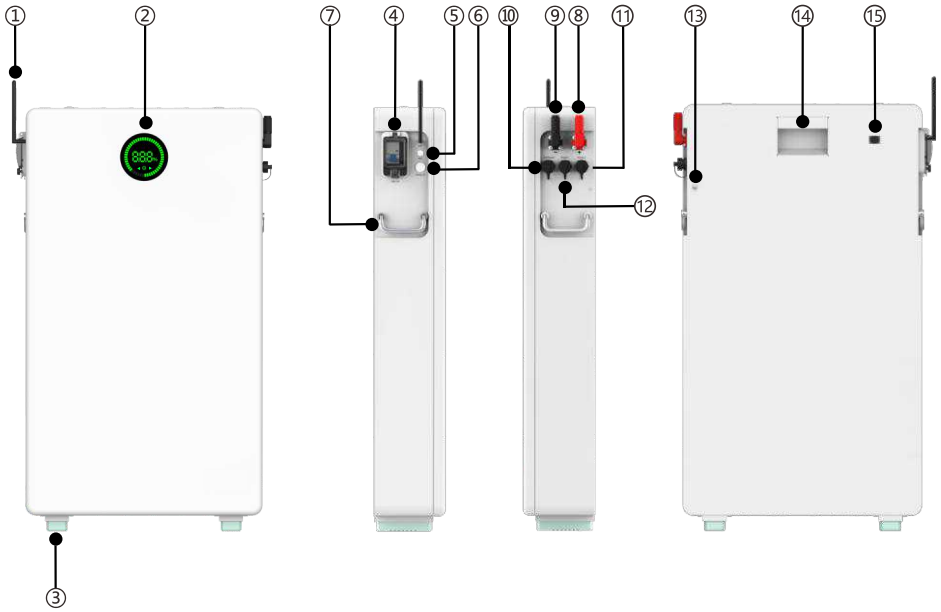
2.2 APPLICATION TOPOLOGY

The following figure shows the common topology of the product in the residential energy storage application.



2.3 INTERFACE INTRODUCTION

Product appearance and interface functions.

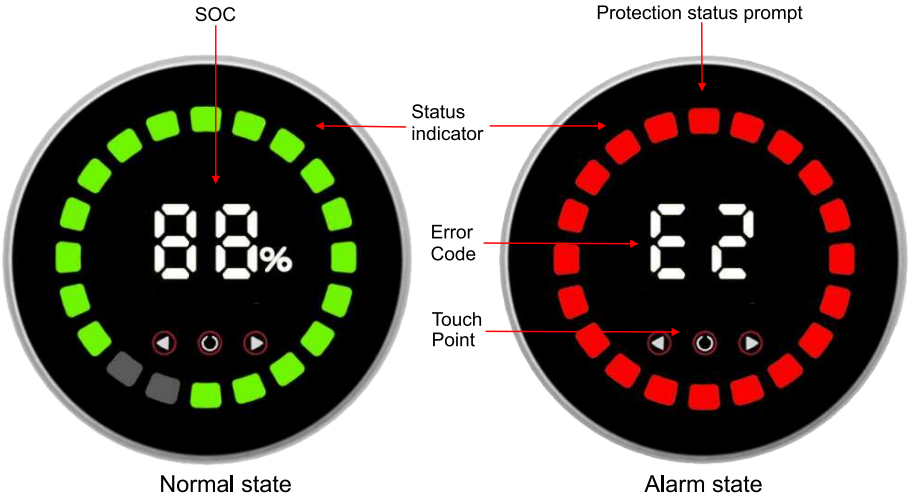


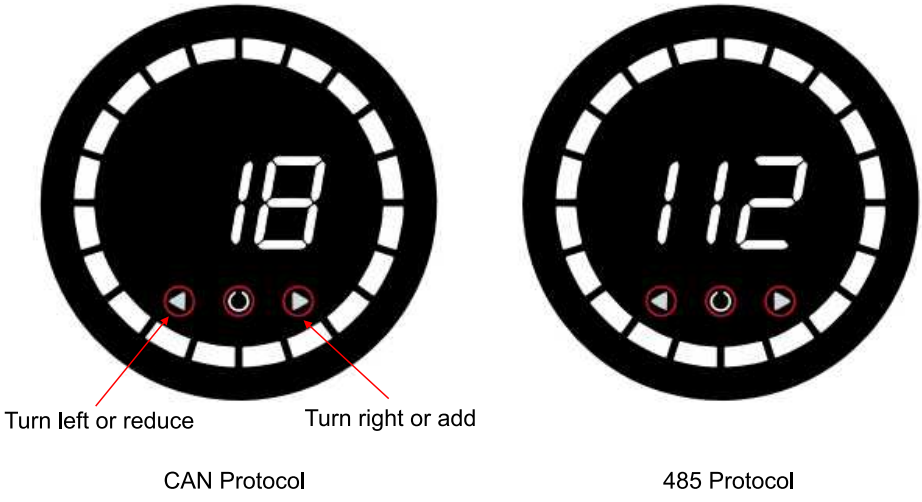
Position	Description
①	WIFI Antenna
②	Display Panel
③	Battery Base
④	DC Circuit Breaker
⑤	Reset Switch
⑥	Wake up Switch
⑦	Handle
⑧	Positive Power Terminal
⑨	Negative Power Terminal
⑩	CAN/RS485
⑪	RS485-1(Parallel communication & maintenance)
⑫	RS485-2(Parallel communication)
⑬	Grounding Point
⑭	Wall Mounted Bracket/Auxiliary Support
⑮	Relief Valve

Display Panel

Display the current battery charging and discharging status, including SOC, alarm, protection status, and other information.

The display panel lights up when the battery is turned on. After 5 minutes, the display panel will turnoff automatically. Press the touch point for 1 second and then release it to make the display panel light up again.





The status indicator has four display states: the green indicator light flashes slowly, the green indicator light flashes quickly, the green indicator light remains on, and the red indicator light remains on.

During the charging process, according to the current SOC, the last green LEDs will flash.
In static or discharge state, the green LEDs will display the current fuel level and present a slow flashing breathing effect, and all lights will flash an alarm in low battery state.
The SOC indicator will display the current SOC of the battery in real time. When the battery has an protection, all red LEDs are on, and the SOC indicator will display an error code.
The screen also has protocol viewing and setting functions. Clicking the left arrow button can view the current CAN protocol status, represented by a two digit code of "1-18". Clicking the right arrow button can view the current RS485 protocol status, represented by a three digit code of "101-110". The protocol brand corresponding to the code is displayed in the following table.
When modifying the protocol, press and hold the middle button for 3 seconds on the current protocol interface until the number flashes. At this point, you can use the left and right arrows to make the modification. After completion, press the middle button to confirm the modification content.

Protocol-Code Comparison table			
CAN Protocol		485 Protocol	
1	Pylontech	101	Pylontech
2	Growatt	102	Growatt
3	VICTRON	103	Voltronic
4	Schneider	104	Schneider
5	LUXPOWER	105	LUXPOWER(V03)
6	SORETEC	106	SRNE
7	SMA	107	MUST(MSL-485)
8	Goodwe	108	Phocos(RTU)
9	Studer	109	MUST
10	Sofar	110	DEF
11	MUST- PV CAN	/	
12	Solis		
13	Senergy		
14	TBB		
15	MEGAREVO		
16	Afore		
17	MUST		
18	DEF		

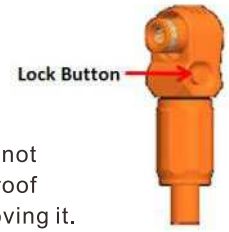
Display description						
Modes	State	Status Indicator				Error Code
		Solid Green	Flashing Green(Slow)	Flashing Green(quick)	Solid Red	
Standby	Normal	-	√	-	-	–
Charge	Normal	√	-	-	-	–
	Low Temp	-	-	-	√	E5
	High Temp	-	-	-	√	E3
	Over Current	-	-	-	√	E7

	Short circuit	–	–	–	√	E0
Discharge	Normal	–	√	–	–	–
	Low Capacity	–	–	√	–	–
	Battery Over Discharge	–	–	–	√	E2
	Cell Over Discharge	–	–	–	√	E1
	Low Temp	–	–	–	√	E6
	High Temp	–	–	–	√	E4
	Over Current	–	–	–	√	E8
	Short circuit	–	–	–	√	E0
ALL	MOS over temperature	–	–	–	√	E9
	Abnormal ambient temperature	–	–	–	√	EE/EF

Wake up Switch
Wake up and shut down the battery system.

Reset Switch
System restart or WIFI network information reset.

DC Circuit Breaker
Circuit Protection



Power Terminals
Divided into positive and negative terminals by color, please do not short-circuit the two terminals directly. The terminal is a waterproof structure, and the lock button needs to be held down when removing it.

CAN/RS485
9600/500 Kbps. 120Ω. For connection to inverter, or LV-HUB.

RS485-1
For multiple parallel communication input and manufacturer or professional engineer debugging or service.

Parallel Com(RS485-2)
For communication output between multiple parallel batteries.

2.4 SPECIFICATIONS

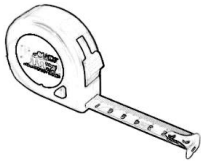
Model	LP28-48100	LP28-48200	LP28-48300
General			
Battery Chemistry	LiFePO4		
Built-in Circuit Breaker	125A 1P, 60Vdc	125A 2P, 60Vdc	
Nominal Voltage (V)	51.2	51.2	51.2
Capacity (Ah)	100	200	300
Nominal Energy (Wh)	5120	10240	15360
Usable Energy (Wh)	5120	10240	15360
Scalability	Max. 15 in parallel (76.8 kWh)	Max. 15 in parallel (153.6 kWh)	Max. 15 in parallel (230.4 kWh)

Recommend Depth of Discharge	90%		
Design Life	10+ Years at 25℃		
Cycles life	≥6000 cycles at 25℃		
Mechanical			
Dimension (W x H x D, mm)	512 x 640 x 150	512 x 895 x 150	512 x 980 x 250
Weight (kg)	~51kg	~98kg	~148kg
Installation	Indoor / Outdoor, Floor / wall mounted	Indoor / Outdoor, Floor	Indoor / Outdoor, Floor
Electrical			
Operating Voltage Range (V)	43.2 ~ 56.8	43.2 ~ 56.8	43.2 ~ 56.8
Max. Charge/Discharge Current (A)	100A	150A	200A
Max. Output Power (kW)	5	7.5	10
Operating			
Charge Temperature (℃)	0-50		
Discharge Temperature (℃)	-20-55		
Storage Temperature (℃)	-20-35		
Humidity	5%-95% RH (No Condensation)		
Altitude	≤ 4000m		
Ingress Protection	IP65		
Communication Interface	CAN / RS485 /WIFI / BLE		
Compatible Inverters	Victron, Goodwe, Growatt, Solis, Must, Sofar, Deye,Voltronic, SMA, etc.		
Certification			
RoHS,MSDS,UN38.3, EN 61000-6-1, EN 61000-6-3, IEC62619, UL1973			

03 SAFE HANDLING GUIDE

3.1 TOOLS

a. The following tools are required to install the LP28:

 Tape measure	 Pencil	 Cross screwdriver
 Multimeter	 Percussion drill (M8)	 Adjustable wrench

b. When handling the LP28, It's required to wear the following safety gears:

 Insulated gloves	 Safety goggles	 Safety shoes

Note:

Use properly insulated tools to prevent accidental electric shock or short circuits.

3.2 LOCATION

The installation position shall meet the following requirements:

There are no inflammable and explosive materials nearby.

It must be installed on the horizontal floor or wall that can support its weight.

The distance from the air outlet of the inverter shall be more than 0.5m.

It shall be installed under the eaves indoors (such as garage or basement) or outdoors to avoid direct sunlight and water immersion.

Suggestion:

The installation area shall be dry, ventilated and free of corrosive gas.
The area has the least dust and dirt.
The product should be installed in a place where children and animals cannot reach.

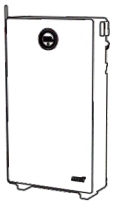
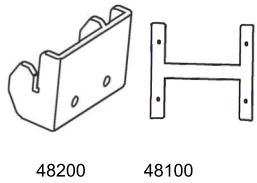
Note:

If the ambient temperature exceeds the operating range, the battery pack stops operating to protect itself. Frequent exposure to harsh temperatures may deteriorate the performance and life of the battery pack.

04 INSTALLATION AND OPERATION

4.1 PACKING LIST

After unpacking, please check the product and packing list first. Contact your supplier within 7 days after delivery if the product is damaged or if parts are missing.

<table>
<tr>
<td> 
Battery</td>
<td> 
User Manual</td>
<td> 
48200 48100
Mounting Bracket</td>
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<tr>
<td> 
Screw</td>
<td> 
Communication Cable</td>
<td> 
Power Cable</td>
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<td> 
WIFI Antenna</td>
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</table>

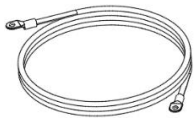
Packing list of LP28

Item	Part Name	Description	Unit	Quantity
1	Battery	LP28	pcs	1
2	User Manual	For LP28 series	pcs	1
3	Mounting Bracket	For LP28	pcs	1
4	Screw	JB/ZQ4763-2006 / M8*60 / Carbon steel / Color-Zinc / Screw	pcs	2or4
5	Communication Cable	Communication cable connecting battery to inverter or between batteries parallel	pcs	1
6	WIFI Antenna	External accessory antenna	pcs	1
7	Power Cable	L=1.0m / Red / UL1015&UL10269	pcs	1
8	Power Cable	L=1.0m / Black / UL1015&UL10269	pcs	1

Optional accessories

Parallel power Cable

Parallel Communication Cable



Grounding Wire

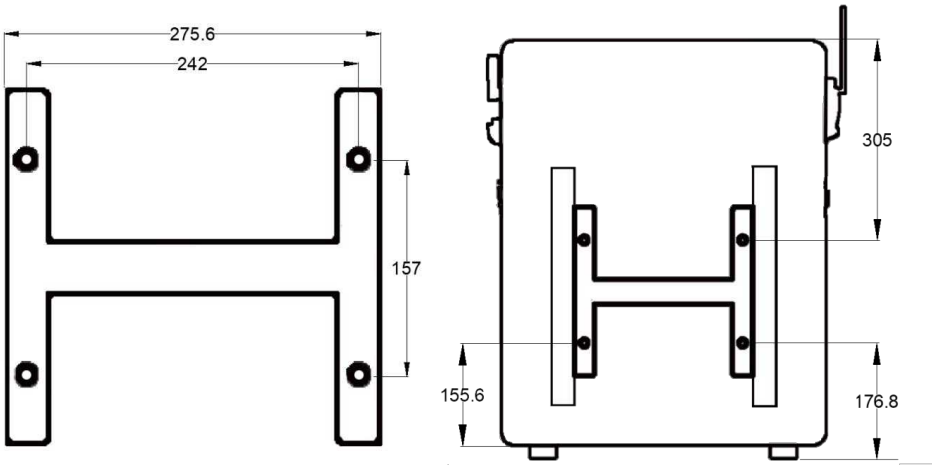
Inverter Communication Cable

Optional accessories for LP28-48100/LP28-48200
The quantity of optional accessories shall be subject to the actual quantity purchased.

Item	Part Name	Description
1	Communication cable	RJ45*2 L=2. 0m Growatt/Deye
2	Communication cable	RJ45*2 L=2. 0m Victron
3	Communication cable	RJ45*2 L=2.0m Victronic
4	Parallel power cable	L=1.0&1.5&2.0m / Red
5	Parallel power cable	L=1.0&1.5&2.0m / Black
6	Parallel communication cable	For master-slave parallel communication RS485 / 2m
7	Grounding Wire	Yellow-Green / 1.5m / 10AWG

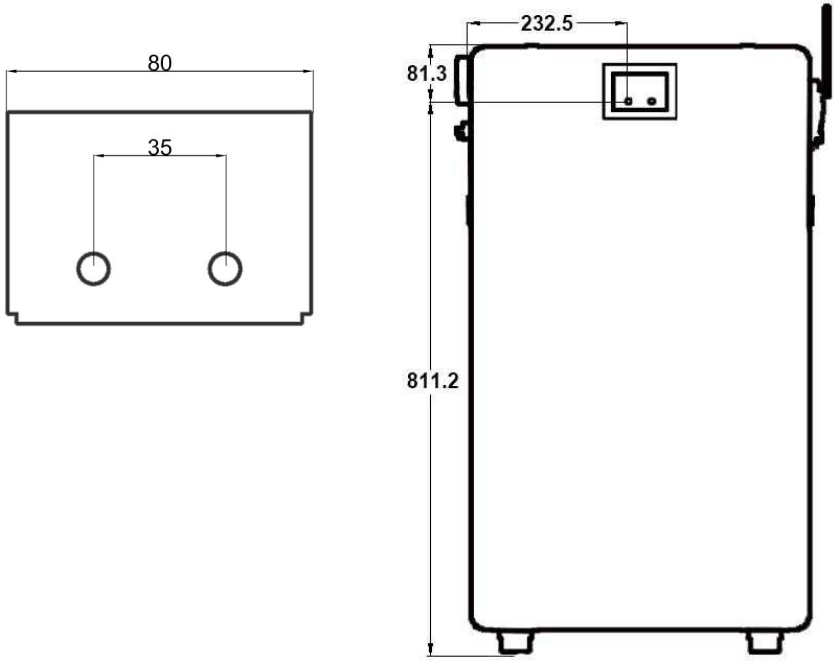
4.2 PHYSICAL REQUIREMENTS

LP28-48100 supports floor and wall mounted installation. When it is installed on the floor, it must also be fixed on the adjacent wall. In these two installation methods, the wall must be able to support the weight of the battery body and its accessories. It is recommended that the minimum strength of the wall shall not be less than 17Mpa (concrete) or 10Mpa (masonry).



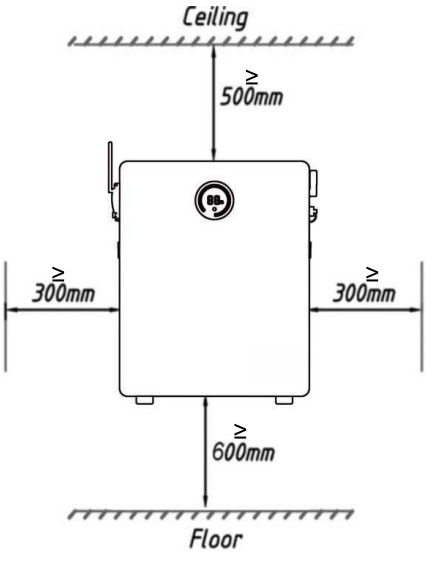
LP28-48100 Mounting Bracket Dimensions(mm)

LP28-48200 only supports floor mounted installation, and the floor must be able to support the weight of LP28-48200 body and its accessories. Its fixing bracket is only used to prevent dumping.

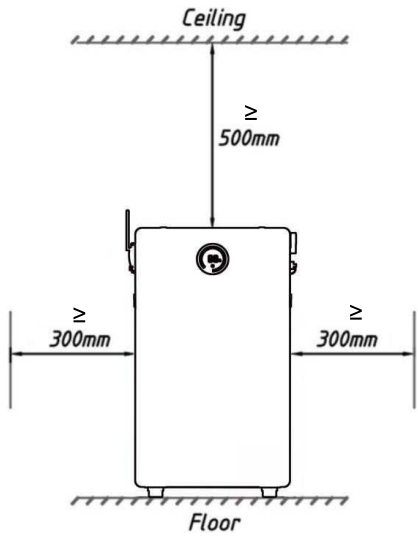


LP28-48200 Mounting Bracket Dimensions(mm)

During the installation process, the left, right, and top distances of the product should be kept for easy installation and ventilation, as shown in the following figure:



Wall mounted installation diagram

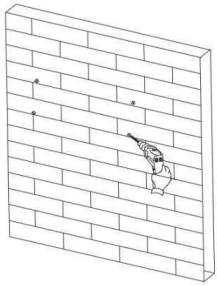


Floor mounted installation diagram

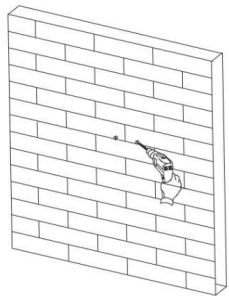
4.3 MOUNTING

Before mounting the LP28, you have to prepare expansion bolts(specification: M8*60; Quantity: 4or2).

1.Select the installation position of the mounting bracket and mark the position to be drilled with a pencil, drill φ10mm holes at the marked positions with an impact drill.

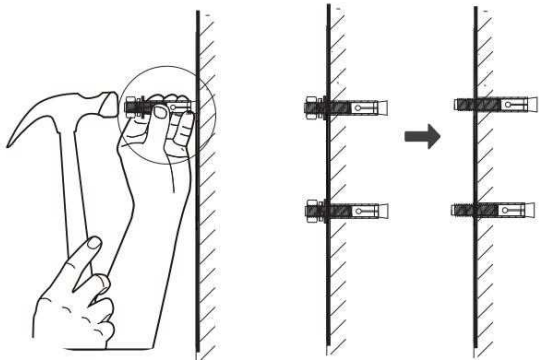


LP28-48100

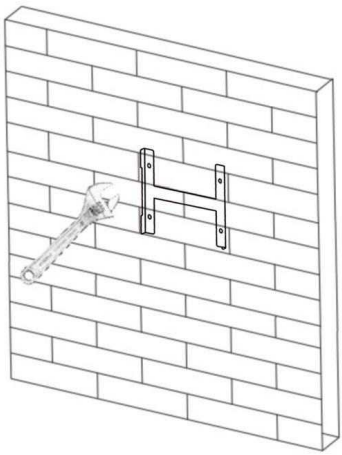


LP28-48200

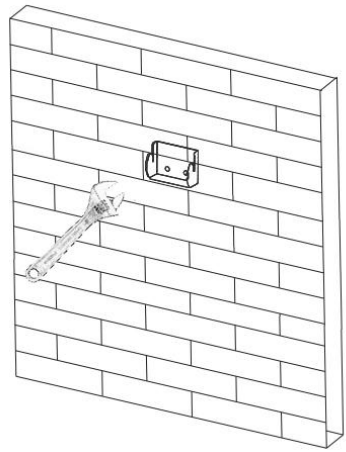
2.Put the M8-60 screws into the hole.



3.Put the M8-60 screws into the hole.

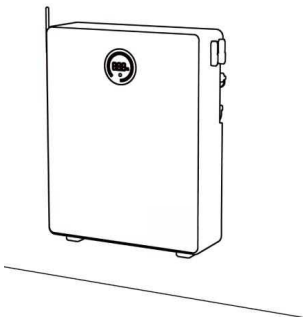


LP28-48100

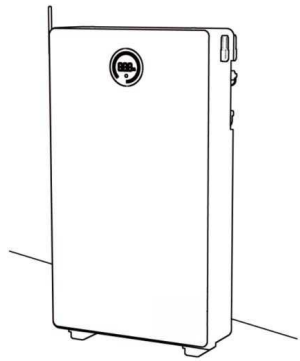


LP28-48200

4.Fix the product on the installation bracket.



LP28-48100



LP28-48200

4.4 ELECTRICAL CONNECTION

Power on Self-test

Press the wake-up button, the display panel will light up, and then measure the open circuit voltage. The voltage range under normal condition should be 43.2V~56.8V, after checking, press the wake-up button to turn off the battery.

Tips：

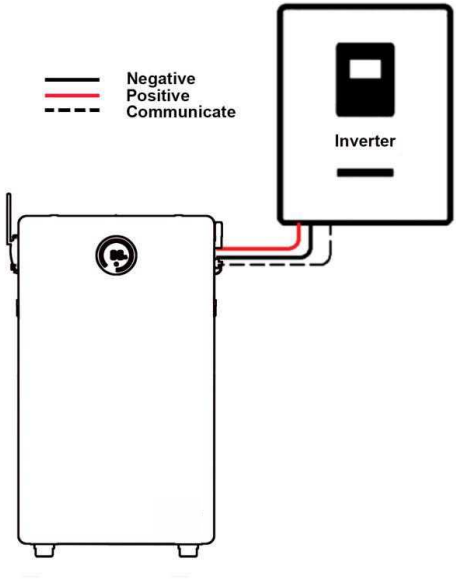
Battery wake-up switch should remain no pressing state during installation, maintenance, and relocation.

Wiring and Setting

Non-parallel connection mode:

Turned off the LP28 and inverter, connect the grounding cable.

- ▶ Connect the LP28 and inverter with quick plug terminal cables and communication cables, communication port selection RS485/CAN.
- ▶ Connect the WIFI antenna.



Parallel connection mode:

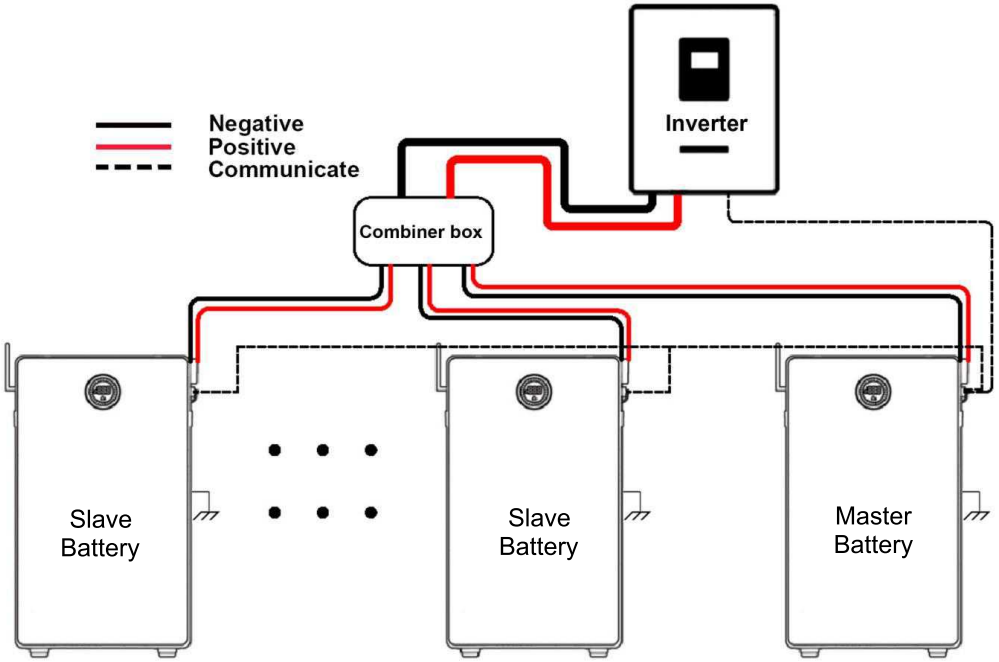
- ▶ Turned off all LP28 and inverter.
- ▶ Connect the grounding cable.
- ▶ Connect all batteries and inverter with power cables.

- All positive and negative terminals of parallel batteries are connected to the combiner box through quick plug terminal cables.
- Choose the appropriate power cable to connect the combiner box and inverter based on the actual current.
- Use the communication cable to connect the master battery and inverter, communication port selection RS485/CAN.
- Connect all LP28 with cascaded communication cables.
- Connect the WIFI antenna.

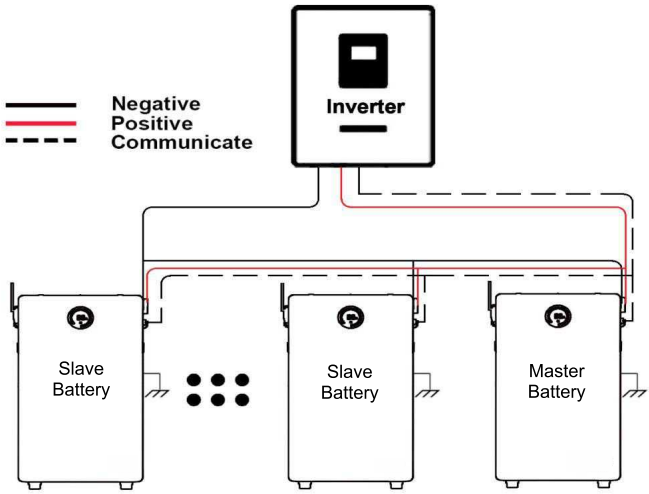
Note:

1) Be sure to use the power cable connector dedicated to MUST to connect the battery, otherwise it may be dangerous due to poor connection.
2) The power cable connected battery and inverter is optional. Please order according to the actual quantity required.
3) Please connect the positive pole after completing the negative pole connection. It is strictly forbidden to insert the positive and negative pole cables into the battery at the same time and then connect the inverter, otherwise it may cause short circuit risk due to overlap- ping.

Parallel connection using combiner box



Parallel Connection Reference



4.5 GROUNDING

A protective earth (PE) terminal is equipped on the back of the battery. Please be sure to connect this PE terminal to the PE bar for reliable grounding. AWG 10 or 12 yellow green lines are recommended.

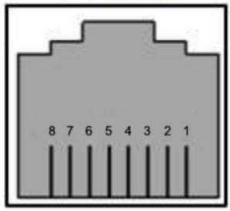
After connection, the resistance from battery grounding point to Ground connection point of room or installed place shall smaller than 0.1Ω.

4.6 COMMUNICATION CONNECTION

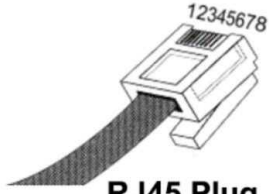
1) When the inverter is in lead-acid battery mode, communication connection is not required, but we recommend using an inverter model that matches LP28 and establishing communication connection for better use of the battery and inverter.

2) The battery has a communication port shared by RS485 and CAN, supporting multiple brands of inverters for CAN or RS485 communication, but only one communication method can be used at a time.

3) The RJ45 communication port is defined as follows.

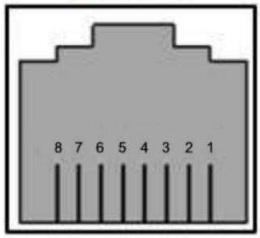


RS485/CAN Port



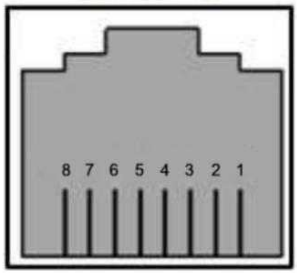
RJ45 Plug

RS485-1/CAN（RJ45）			
RS485-1(9600 bps)		CAN(100kbps)	
Pin	Definition	Pin	Definition
1、8	RS485-B1	4	CAN-H
2、7	RS485-A1	5	CAN-L
6	GND	3	GND



RS485-2

RS485-2 (RJ45)		
Pin	Definition	Baud rate
1	RS485-B2	9600bps
2	RS485-A2	
3	UP_IN (Parallel communication input)	
4	GND(Parallel communication GND)	
5	RX	
6	TX	
7	GND(RS232-GND)	
8	NC	



RS485-3

RS485-3 (RJ45)		
Pin	**Definition**	**Baud rate**
1	RS485-B2	9600bps
2	RS485-A2	
3	DN_OP+ (Parallel communication output)	
4	GND (Parallel communication GND)	
5,6,7,8	NC	

4.7 SUITABLE DISCONNECTION DEVICE

The battery itself has a circuit breaker, and it is also possible to consider installing additional disconnect devices between the following devices for protection between battery system and inverter:

1) The rated voltage shall ≥60V DC. Do NOT use AC breaker.

2) The rated current shall match with system design.

shall consider:

the maximum DC current on inverter side.

the number of power cable: for instance, if only one pair of 4awg cable,

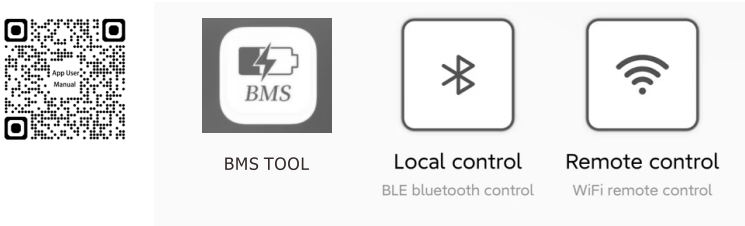
the rated current of breaker shall be 125A or smaller.

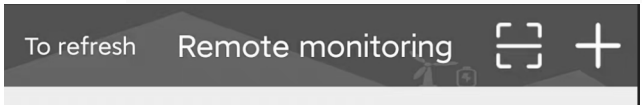
3) If using breaker, the type shall be type C (recommended) or type D.

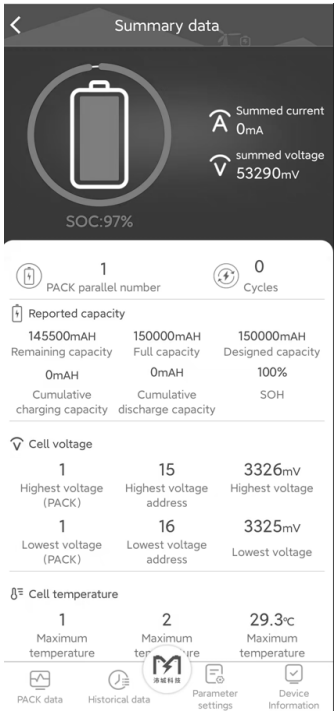
4.8 Wi-Fi CONFIGURATION

Through the BMS TOOL, you can view various information about the battery in real-time, including battery capacity, cell temperature, current, voltage, and more. For first-time use, please install the BMS TOOL on your phone. After installing the APP, follow the steps below to connect to the battery device.

1) Open the BMS TOOL.
2) Select remote control.
3) Scan the QR code on the battery body to connect the device.
4) For detailed operation instructions, please refer to the QR code on the below to obtain the operation manual.







05 OTHERS

5.1 SYSTEM OPERATION

Power On

Step 1. Press the WAKE UP button, and the display panel will light up.

Step 2. Observe whether the display panel of the indicates normal status.

Step 3. Close the breaker or combiner box switch.

Step 4. Turn on the inverter.

Turn off

Step 1. Turn off the inverter.

Step 2. Turn off the breaker or combiner box switch.

Step 3. Press the WAKE UP button and release it, and then the display panel will go out.

5.2 TROUBLE SHOOTING

When the battery fails to work normally due to abnormal conditions, troubleshooting is required. Common battery failures and solutions are as follows:

Fault Generation condition	Possible Causes	Solution
Abnormal communication with the compatible inverter	Case A. RS485 Communication Exception	Check the parallel wiring to confirm if the current battery is the master unit, usethe appropriate communication cable, select the correct communication interface, and confirm that the inverter uses the same baud rate as the battery. Set relevant parameters of inverter.Refer to the inverter user manual for its setting method.
	Case B. CAN Communication Exception	
Unable to turn on	Case A. Press the WAKE UP button, and the display panel will not light up.	The battery capacity may be too low. Press the WAKE UP button, use the charger or inverter to supply more than 51V voltage to the battery. If the battery is turned on automatically, please continue to charge the battery for a period of time.
Unable to charge	Case A. After the battery is turned on, the display panel will display normally. But the battery cannot be charged.	Solution 1: When the battery is fully charged, SOC will display 100%. Do not recharge the battery. Solution 2: The battery SOC is more than 96%, but the battery is not in charging state.No need to deal with it. The battery is normal and will charge normally after a period of time. Solution 3: Possible reason is that the fuse is blown. Turn off the LP28 and contact the dealer for assistance.

Unable to charge	Case B. After the battery is turn on, the status indicator is always red and the battery cannot be charged.	Solution 1: If the error code is E3 or E5, move the battery to an environment with a temperature range of 0 ℃-50 ℃. Solution 2: If the error code is E7, reduce the charging current. Solution 3: If the error code is E0, the short circuit fault should be eliminated immediately.
Unable to discharge	Case A. After the battery is turned on, the display panel displays normally and the battery cannot be discharged.	Possible reason is that the fuse is blown. Turn off the battery and contact the dealer for assistance.
	Case B. After the battery is powered on, the status indicator is red, and the battery cannot be discharged.	Solution 1: If the error code is E4 or E6, move the battery to an environment with a temperature range of -10℃-50℃. Solution 2: If the error code is E8, reduce the battery discharge power. Solution 3: If the error code is E0, the short circuit fault should be eliminated immediately. Solution 4: If the error code is E1 or E2 and the battery is dead, charge the battery immediately.
Error code = E9	/	Stop using the battery immediately and use it after the battery temperature returns to normal.

5.3 EMERGENCY SITUATIONS

Leaking Batteries

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

Wet Batteries

If the battery pack is too wet or submerged in water, do not make contact with it, and then contact us for technical support.

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, contact us immediately.

5.4 REMARKS

Recycle and disposal.

In case a battery (normal condition or damaged) needs disposal or needs recycling, it shall follow the local recycling regulation (i.e. Regulation (EC) Nº1013/2006 among European Union) to process, and using the best available techniques to achieve a relevant recycling efficiency.

Storage, Maintenance and Expansion.

1) It is required to charge the battery at least once every 6 months, for this charge maintenance make sure the SOC is charged to higher than 90%
2) Every year after installation. The connection of power connector, grounding point, power cable and screw are suggested to be checked. Make sure there is no loose, no broken, no corrosion at connection point. Check the installation environment such as dust, water, insect etc. make sure it is suitable for IP65 battery system.
3) A new battery module can be added onto an existing system at any time. Please make sure the new battery is acting as the master. The new module, due to a higher SOH may have a difference on SOC with existing system, but it will not affect the parallel connection system performance

5.5 CONTACT

Please contact us if you need technical support.
You may need to provide the following information:
Item No. of inverter.
Product series.
LED flashing status, fault code and description.
Configuration of your system.