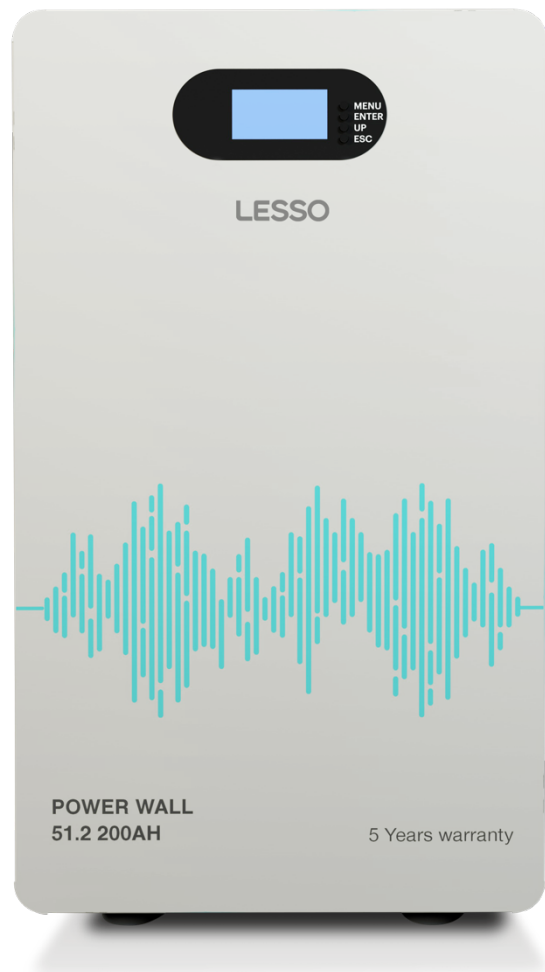


# LESSO

## Residential Wall-mounted Energy Storage User Manual

**LSRW51V205AH-LFP**



Document Revision: V1.0

## About This Product

The material of the LESSO 10kWh battery meets flame retardant requirements. The BMS design features redundant protection. It can support up to 5 units in parallel, forming a 50kWh wall mounted energy storage system.

This installation manual contains information about important programs and functions of LESSO lithium batteries.

Before installation, operation, transportation, storage, and maintenance, please read all the instructions in this manual.

It supports up to 14 parallel units, forming a 50kW hour wall mounted energy storage system.

This installation manual contains information about important programs and functions of LESSO lithium batteries.





Before installation, operation, transportation, storage, and maintenance, please read all the instructions in this manual.

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## 1. Safety Attention

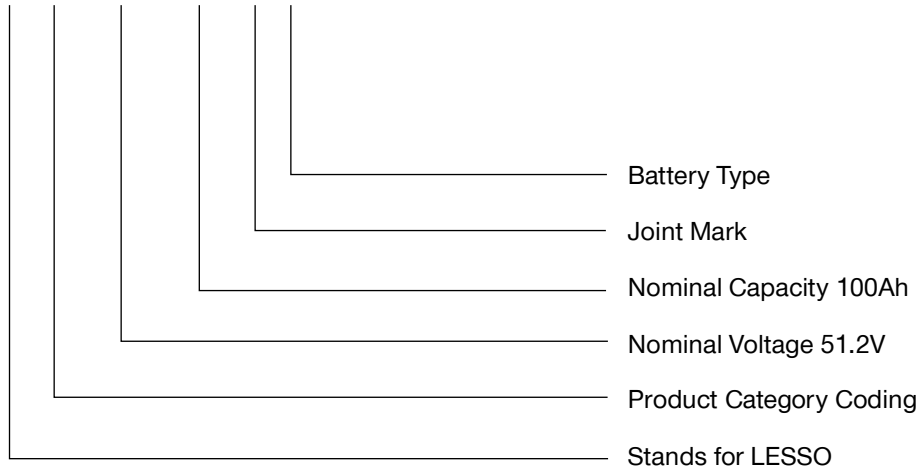
Any improper operation may lead to electrical shocks, burns and other personal injury or equipment damage, please read the important security information and strictly abide by all the safety rules of this manual. The following is a list of the safety rules to be followed in order to operate this product. Please refer to the warning note in the appropriate section for the security instructions during use and maintenance.

 <b>Risk: Violation of the following provisions may result in casualties, or equipment damage.</b>	
<p>Do not touch the live parts of the equipment without confirming the equipment voltage or temperature.</p>	
<p>Only professional electricians or professionally qualified personnel can install, operate, overhaul and maintain the equipment. During maintenance or overhaul, at least two people must wear safety shoes, insulated gloves, and establish warning signs.</p>	
<p>The operation of this product must be carried out in accordance with the safety instructions in this manual.</p>	
 <b>Warning: Violation of the following provisions may result in personnel injury or equipment damage.</b>	
<p>When moving, transporting and placing equipment, the equipment must be placed horizontally.</p>	
<p>The equipment should be installed on fire-retardant objects, do not place flammable materials inside and near the box.</p>	
<p>Do not leave the thread, paper, metal crumbs, tools and other foreign bodies in the product.</p>	
<p>In non emergency cases, operation and stopping of the monitoring system shall not be controlled by connecting and disconnecting the input power.</p>	
<p>The product should be regularly maintained and cleaned.</p>	
<p>A recording equipment operation condition and application maintenance system should be established.</p>	
 <b>Electrostatic warning</b>	
<p>The personnel that come in contact with the printing monitor cabinet and cabinet equipment needs to wear a good grounding anti-static bracelet ring, hand-held printed circuit board, please hold the edge part to prevent static electricity. In addition, electrostaticity can be eliminated by contacting electrically conductive bodies such as metal sheets.</p>	
 <b>Remind</b>	
<p>When the system is ongoing electrical debugging, please pay attention to the warning marks showing on the LCD display.</p>	

## 2. Product Introduction

### 2.1 Product Name

LS RW 51V 100AH - LA



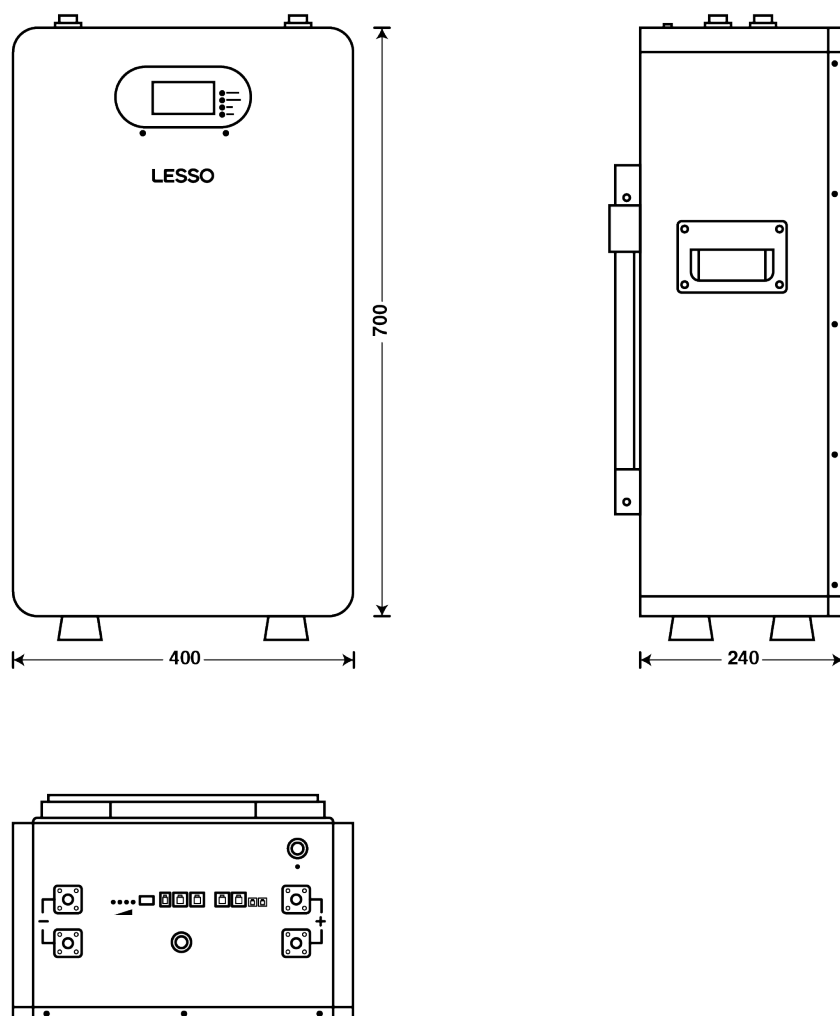
### 2.2 Technical Parameter

Item	Specification
Battery type	LiFePO4
Nominal voltage	51.2V
Nominal capacity	205Ah
Nominal energy	10.496kWh
Usable energy	10.0kWh
Recommended charge current	100A
Max continuous charge current	100A
Max continuous discharge current	150A
Peak discharge current (3s)	200A
Max continuous discharge power	10kW
Standard charge voltage	56.0V
Recommended floating charge voltage	54.0V
End discharging voltage	43.2V
IP rating	IP50
Self-discharge rate (sleep mode)	Residual capacity $\leq 3\%$ / month; $\leq 20\%$ /years
Dimensions (WxHxD) in mm	454x 670x170
Battery module weight	60.7kg

Operation temperature	0 - 45°C (32 - 113°F)
Recommended operation temperature	15 - 30°C (59 - 86°F)
Storage temperature for short time	-10 - 45°C (14 - 113°F)
Storage temperature for long time	10 - 35°C (50 - 95°F)

## 2.3 Product Pictures

Product dimension (Unit: mm):



### 3. Storage & Transport

#### Storage:

Proper environment and timely charging are necessary for the battery.

- Battery should remain in a warehouse that is dry, clean, shade, and well-ventilated. Storage Temperature (Min./Max.): -10 - 30°C, relative humidity (Min./Max.): 45% - 85%RH.
- Deep-discharge could damage the battery modules. Therefore, the battery must be timely charged (within 15days) after over-discharging.
- Prevent the batteries from dropping, turning over and serious stack.
- Store the battery in places away from children and pets.
- Systems should be put into storage at 50% SOC and checked monthly to ensure the system SOC does not fall below 20%. At 20% SOC the battery will self-discharge in approximately 2 months. Also check the voltage every 3 months and recycle every 6 months if the battery is not use for an extended period.

#### Transport:

Lithium-ion batteries are hazardous goods. Therefore, the following points must be observed when transporting the battery modules:

- Observe the general transport regulations based on the mode of transport as well as all legal regulations.
- No fall down, no pile up over 4 layers and keep face up.
- Do not transport battery upside down.
- Do not lift battery by the terminal cables.
- Do not vibrate battery.
- Check the battery immediately after transportation.





## 4. Installation

### 4.1 Installation Preparation

- **Environment requirements**

Application scenarios	Residential energy storage systems
Operating Environment	Indoors or under a dark eave and place away from strong electromagnetic radiation
Recommended salt spray	An area 2km from the coast
Operating Temperature	0 - 45°C (32 - 113°F)
IP grade	IP50
Storage Temperature	-10 - 30°C (14 - 86°F)
Operating Humidity	5% - 95%
Install Altitude	≤ 4000m
Install location	Under the roof

- **Check the packing list**

Parts	QTY	Photo
Inverter communication cable	1pcs	
Expanding screw M8*60	10pcs	
Wall mounting bracket	1pcs	
Modules communication cable	1pcs	

- Check if there is any damage on the battery box.
- Check the battery terminals and connections to make sure they are clean, free of dirt, fluids and corrosion.
- All battery cables and their connections should be tight, intact, and NOT broken or frayed.
- Check torque on terminal bolts.
- Replace any damaged batteries and cables.



• **Tools & materials**

The following insulated tools and materials are required:

- Positive and negative battery cables. We recommend copper cables 2AWG. The battery power cables are not included. Please refer to the published Battery Cable Sizing Chart for the proper size, based on your system specification.
- Screwdriver.
- RJ45 cable.
- Wall Mount hangers.
- OSHA (Occupational Health and Safety Administration) approved personal protective equipment.

		
Insulate gloves	Safety Glasses	Safety Shoes

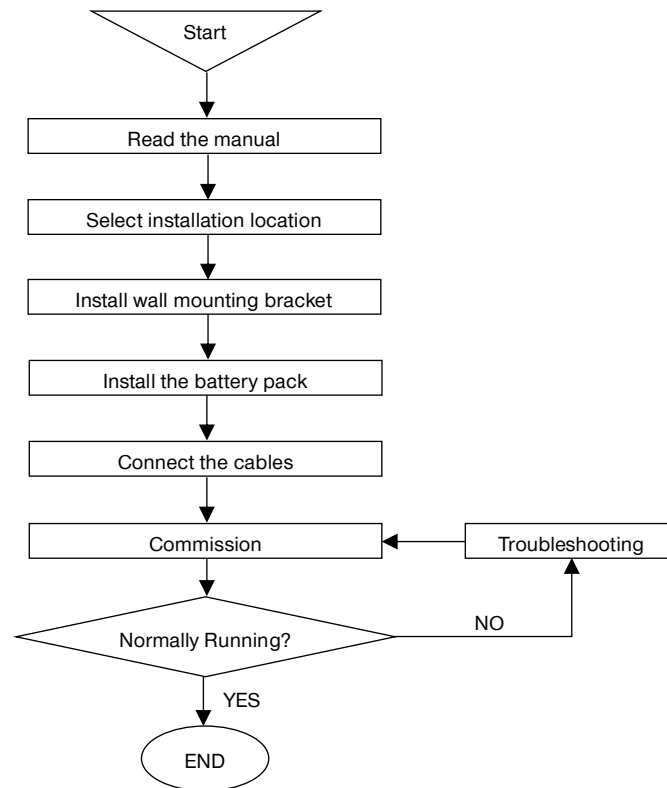


**CAUTION:**

- The ambient temperature exceeds the operating range, the battery pack may stop operating to protect itself. Frequent exposure to harsh temperatures may deteriorate the performance and life of the battery pack.
- This battery pack weighs about 61-83kg. To prevent personal injury, the use of proper lifting equipment during installation is recommended.
- If user discovers shell deformation of the battery pack, please stop installation and contact us.
- The total weight of the battery is about 61kg. Please ensure that the wall is strong enough to withstand the battery.
- Battery system should be installed and ventilated in cool and dry place, to ensure the battery is away from any heat sources, to avoid sunlight, to prevent the battery system cutting off power output or system failure due to over temperature.
- Keep away from the transformer and other strong electromagnetic field environments, to prevent abnormal battery system communication and power supply control.
- Keep away from fire, flammable and explosive items.
- The system is limited to professional maintenance, please ensure that the installation site is away from children and pets.

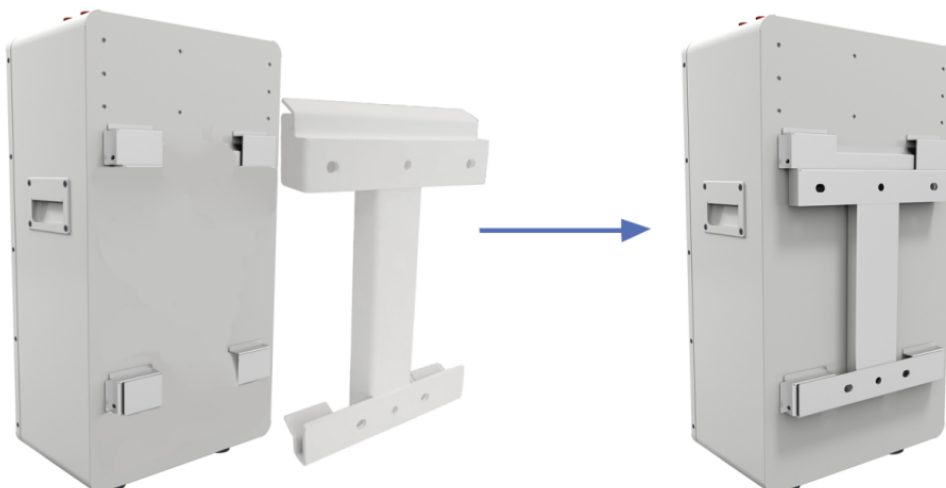
## 4.2 Installation steps

Please follow the flowchart below to install the battery system. For more details, please refer to the 1-3 item.



### 4.2.1 Structure installation

#### a. Install wall mounting bracket



The LESSO LSRW51V205AH-LFP 10kWh is designed for wall mounted installation. The rack should be fixed on wall with an expanding screw. Please refer to the LESSO Lithium Battery Data Sheet for weight and dimension information.

**b. Battery pack installation**

- a) Use two handles on the side of the battery pack to lift the battery out of the wooden case.
- b) Install the wall mounting bracket.
- c) Lift the battery box with lifting equipment and align it with the mounting hole of the wall-mounted bracket and clip it.
- d) Hang the battery pack on the wall bracket.
- e) Lock the wall-mounted bracket and battery box with the marked screws.

**4.2.2 Cable connection****a. Connecting the battery**

The battery terminals are positioned in the bottom of the front cover. Please make sure the breaker on the right side of rack is in the OFF position. Please install the positive cable first and the negative cable second. Please do not cross the positive and negative terminals; also, ensure the terminals are not connected to any metal mounting, fixture, or body part. The recommended terminal torque range is 10.0 – 19.1 N·m (7.4 – 14.1 ft.lb).

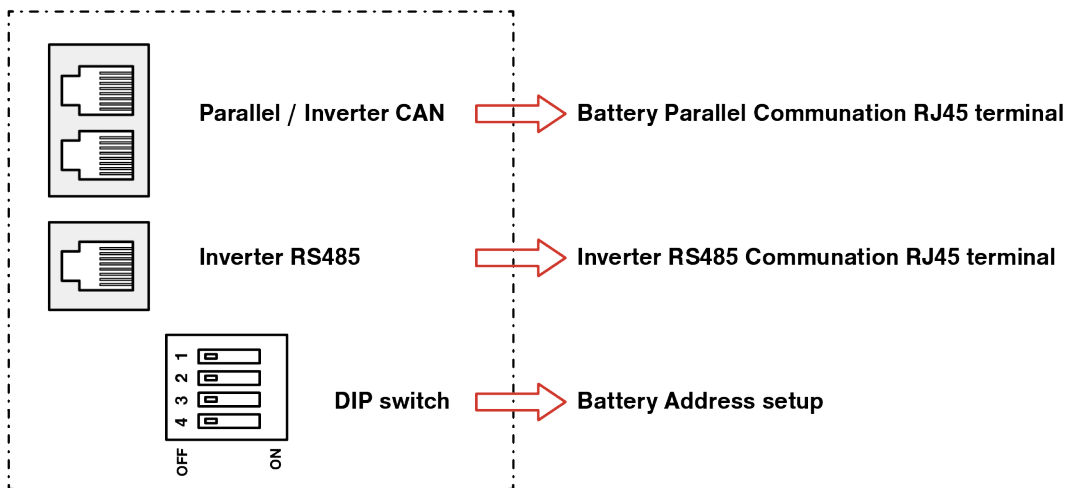
The positive pole of the LESSO lithium battery uses a red wire and is connected to the "+" electrode; Use a black wire for the negative electrode and connect it to the "-" electrode. Do not reverse polarity to invalidate warranty.



**NOTE! Without exception, products experiencing terminal burnout will not be covered under the warranty.**

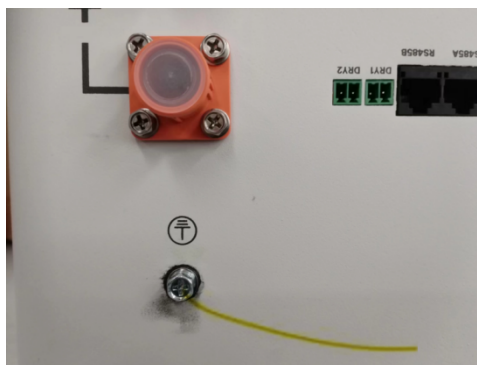
**b. Communication port**

LESSO LSRW series battery has a self-managed Battery Management System (BMS). The Communication board has three ports which are designed to support Inverter RS485 and CAN communication, battery parallel communication (see parallel connection). When batteries need to communicate in parallel, the user needs to set the battery address through the DIP switch, and the CAN communication port of the last battery needs to connect to the terminal resistor.



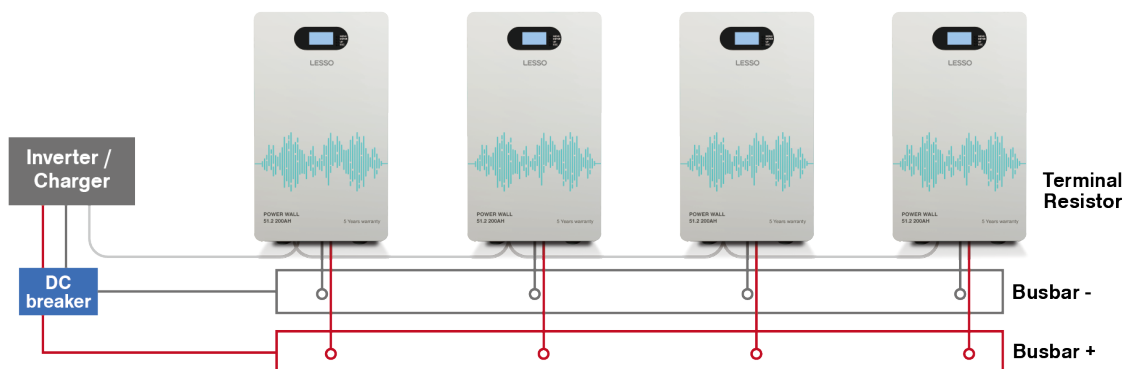
**c. Grounding**

Grounding the battery, if necessary. LESSO LSRW series battery has 1 grounding holes on the bottom of battery case.



**d. Parallel connection**

The following illustration shows how to connect multiple batteries in parallel.



Please follow the procedure to parallel LSRW series batteries:

**1) RS485 Communication**

The BMS can communicate with the upper computer through the RS485 communication interface, and view various information of the battery

through the upper computer, such as voltage, current, temperature, SOC, SOH, operating state, battery production information, and can set parameters, etc. It has an RS485 parallel interface to support up to 15 battery packs in parallel. The default baud rate is 9,600bps.

It has an RS485 interface for upper computer/inverter communication. The default baud rate is 9,600bps;

when the host (DIP switch positions 1-4 are OFF), the RS485 can communicate with the inverter. For the protocol selection, see 4.2.2-e5 DIP Switch Settings (support and parallel selection).

**2) CAN Communication**

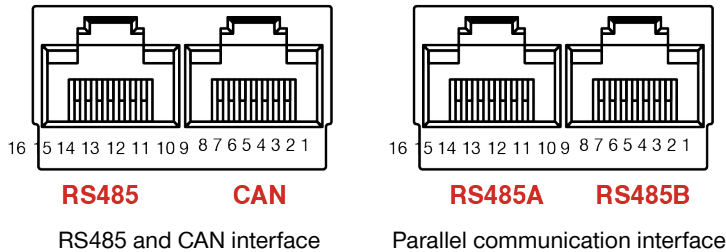
The BMS can communicate with the inverter through the CAN interface, and can upload various information of the battery, such as voltage, current, temperature, SOC, SOH, operating state, and battery production information. The default baud rate is 500Kbps.

Protocol selection for communication between CAN interface and inverter:

When the host (DIP switch positions 1-4 are OFF), the CAN can communicate with the inverter. For the protocol selection, see 4.2.2-e5 DIP Switch Settings (support and parallel selection).

**e. Communication interface definition**

**1) Interface diagram**



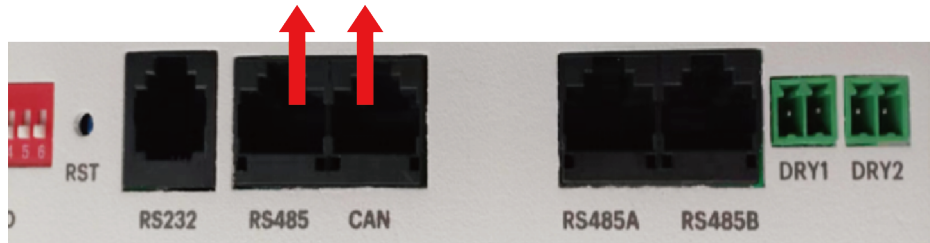
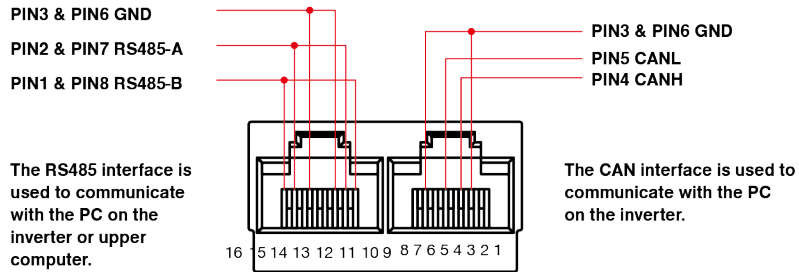
**2) Communication interface definition**

485 interface (which communicates with the upper computer or inverter) supports SRNE, Voltronic Power, and Growatt inverter protocols - Different addresses are selected by DIP		AN interface (which only communicates with the inverter) supports Victron, Pylon, SMA, Goodwe, and Growatt inverter protocols - Different addresses are selected by DIP	
RS485 - adopts 8P8C vertical RJ45 socket		CAN - adopts 8P8C vertical RJ45 socket	
RJ45 pin	Definition description	RJ45 pin	Definition description
9, 16	RS485-B	4	CANH
10, 15	RS485-A	5	CANL
11, 14	GND	3, 6	GND
12, 13	NC	1, 2, 7, 8	NC

Parallel communication interface (for parallel only)			
RS485 - adopts 8P8C vertical RJ45 socket		CAN - adopts 8P8C vertical RJ45 socket	
RJ45 pin	Definition description	RJ45 pin	Definition description
9, 16	RS485B	1, 8	CANH
10, 15	RS485A	2, 7	CANL
11, 14	GND	3, 6	GND
12, 13	NC	4, 5	NC

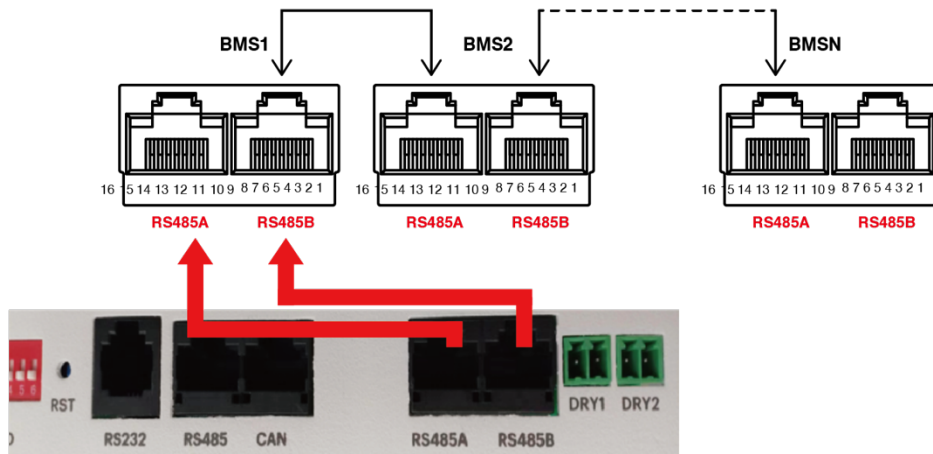
**3) Communication connection mode between the BMS and the PC on the inverter / upper computer**

Communication connection mode between the BMS and the PC on the inverter / upper computer.



**4) BMS Board Parallel Connection Mode**

Computers can be directly connected to each other by ordinary standard network cables.



### 5) DIP switch settings (support parallel and protocol selection)

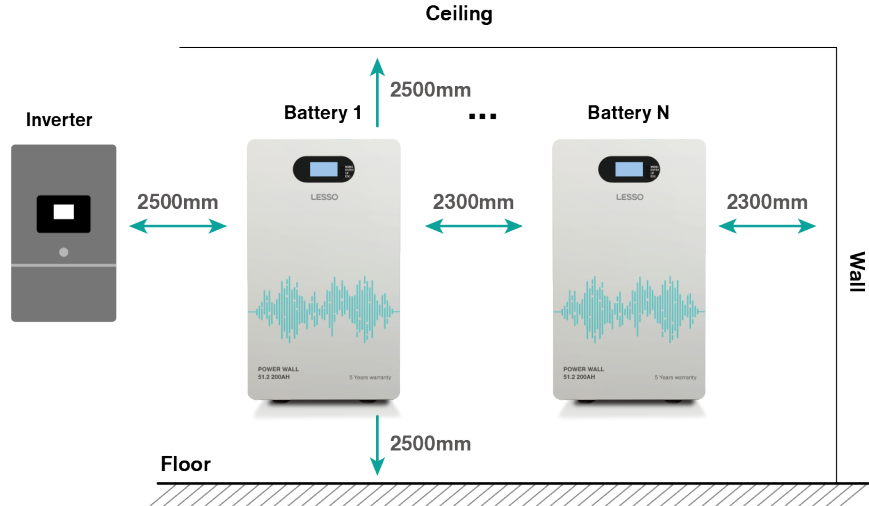
When battery packs are used in parallel, the hardware DIP address is used to distinguish different packs, and the hardware address of each pack in the entire battery stack is unique. The hardware address is set using the DIP switch on the board, as shown in the following table.



Address	DIP switch position				Reserved	Host	Description
	#1	#2	#3	#4			
0	OFF	OFF	OFF	OFF	OFF	OFF	(Host) Pack0
1	ON	OFF	OFF	OFF	OFF	OFF	(Slave) Pack1
2	OFF	ON	OFF	OFF	OFF	OFF	(Slave) Pack2
3	ON	ON	OFF	OFF	OFF	OFF	(Slave) Pack3
4	OFF	OFF	ON	OFF	OFF	OFF	(Slave) Pack4
5	ON	OFF	ON	OFF	OFF	OFF	(Slave) Pack5
6	OFF	ON	ON	OFF	OFF	OFF	(Slave) Pack6
7	ON	ON	ON	OFF	OFF	OFF	(Slave) Pack7
8	OFF	OFF	OFF	ON	OFF	OFF	(Slave) Pack8
9	ON	OFF	OFF	ON	OFF	OFF	(Slave) Pack9
10	OFF	ON	OFF	ON	OFF	OFF	(Slave) Pack10
11	ON	ON	OFF	ON	OFF	OFF	(Slave) Pack11
12	OFF	OFF	ON	ON	OFF	OFF	(Slave) Pack12
13	ON	OFF	ON	ON	OFF	OFF	(Slave) Pack13
14	OFF	ON	ON	ON	OFF	OFF	(Slave) Pack14
15	ON	ON	ON	ON	OFF	OFF	(Slave) Pack15
<b>Select CAN communication as the inverter communication protocol</b> (selected by DIP 5 and 6 in host mode)							
0	OFF	OFF	OFF	OFF	OFF	OFF	PCHNE
32	OFF	OFF	OFF	OFF	OFF	ON	PYLON, Deye, and Korper Besonders
16	OFF	OFF	OFF	OFF	ON	OFF	Victron, SMA, and SOFAR
48	OFF	OFF	OFF	OFF	ON	ON	Growatt
<b>Select RS485 communication as the inverter communication protocol</b> (selected by DIP 5 and 6 in host mode)							
0	OFF	OFF	OFF	OFF	OFF	OFF	SRNE
32	OFF	OFF	OFF	OFF	OFF	ON	Voltronic Power
48	OFF	OFF	OFF	OFF	ON	ON	Growatt

**4.2.3 Wire the battery cables**

For connecting multiple units: Maintain the recommended distance among battery units’s side or wall- at least 12 inches (300mm). Keep battery unit’ side at lease 20inches (500mm) away from Inverter,ceiling or floor.



**CAUTION!** If paralleling the LSRW series batteries without connecting them via RJ45 cable(s), please make sure the voltage difference between the highest voltage and lowest voltage does not exceed 1.0 volts. A large current flow from the higher voltage battery to the lower voltage battery could potentially damage one or both batteries. The resulting damage to the battery will void the warranty.

**4.2.4 System commission**

If you only install single LSRW series battery, please follow the below steps to start up:

- a) Check system connection cables for correct polarity.
- b) Put the battery’s breaker on the “ON” position.
- c) Put inverter breaker in the “ON” position.
- d) Push the power button on the front of the unit for 3 seconds to turn on the battery LCD display.

**4.2.5 Final connection of the installation**

Final installation and operation guidelines will be dictated by your electrician and installer based on the overall properties of and procedures for the equipment in your installation and any code requirements that apply to your region. LESSO technicians and sales staff are available to provide any additional information on the LESSO Lithium Batteries as needed. Please be aware of the potential electrical hazards before interacting with any and all electrical or mechanical devices. Please take all necessary safety precautions in your projects and installations.



## 5. Operation

### 5.1 Operating Environment

See “2.2 Technical Parameter” table on page 5.

### 5.2 Charging



#### CAUTION!

Never attempt to charge a battery without first reviewing and understanding the instructions for the charger being used. Only use a LESSO Approved Lithium Ferro Phosphate (LFP) charger if ancillary charging is required before installation, testing or troubleshooting. Failure to use a LESSO approved LFP charger will damage the battery and void the warranty. **Please follow the specification on LESSO Lithium Battery Datasheet.**

Please follow the following steps to use the charger to charge the battery:

**Step1** - Connect the charger leads to the battery;

**Step2** - Make sure that the charger lead, both at the charger and the battery side, connections are tight;

**Step3** - Turn on the breaker of battery;

**Step4** - Startup the battery by holding the power button of the battery for about 3 second;

**Step5** - Turn the charger on.

### 5.3 Discharging

- Do not discharge battery below operating voltage.
- Do not discharge battery at rates greater than maximum continuous current.
- Do not operate in conditions that will exceed the internal operating temperatures of the battery.

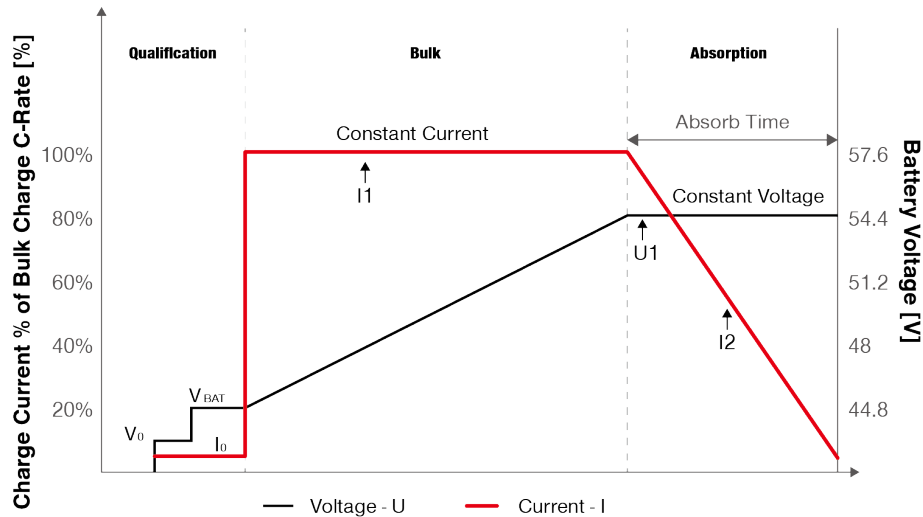
### 5.4 Parameter Set Up Guide in Charger / Inverter

Before commissioning the energy storage system, the appropriate controller and inverter settings must be programmed per the manufacturer’s recommendations. Consult the manufacturer’s manuals and/or access technical support (Schneider, Sol-Ark, Victron, SMA, Growatt, Deye).

Although LESSO Lithium batteries can perform at very high rates and depths of discharge within a very wide temperature range, in order to achieve extended life cycles and to comply with the Warranty, the following guidelines should be followed:

**5.4.1 Understand charge stage**

- Bulk Charge: Charge at Constant Current (CC) to Bulk/Absorb Voltage;
- Absorption Charge: Maintain Constant Bulk/Absorb Voltage (CV);
- Terminate when charge current drops below 0.05C;
- Unlike Lead Acid batteries, Lithium Ferro Phosphate batteries do not require Float Charge.



**5.4.2 Charger / Inverter configuration recommendation for best performance**

- Recommended operating parameters of charger / Inverters for 3,000 cycles: Operating temperature range: 0°C to 49°C (32°F to 118°F)
- Recommended operating parameters of charger / Inverters for 6,000 cycles: Operating temperature range: 10°C to 43°C (50°F to 109°F)



**CAUTION! Do Not Operate LESSO Lithium Batteries at an average temperature exceeding 30°C / 86°F over the life of the battery.**

## 6. Protective Circuit Specification

### 6.1 BMS Alarm & Protection Parameter

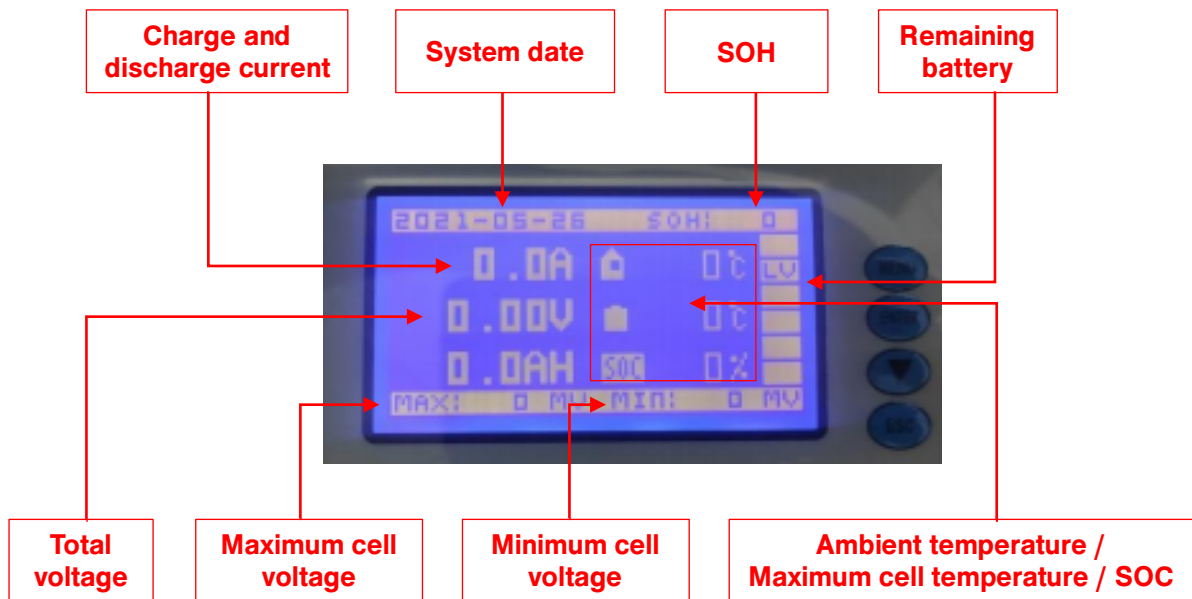
The Battery Management System (BMS) can monitor and optimized each single cell during charge & discharge, to protect the battery pack overcharge, over discharge, short circuit, etc. Overall, the BMS helps to ensure safe and accurate operation.

Items		LSRW51V100AH -LFP
Battery Alarm & Protection		Description
Over voltage	Over-voltage alarm for each cell	3.55±0.03V
	Over-voltage protection for each cell	3.75±0.03V for 1±0.5s
	Over-voltage release for each cell	3.35±0.03V
	Over-voltage alarm for total voltage	57.2V±0.2V
	Over-voltage protection for total voltage	58.4V±0.5V for 1±0.5s
	Over-voltage release for total voltage	53.6V±0.5V
	Over-voltage release method	Under the release voltage
Under voltage	Under-voltage for each cell	2.90±0.03V
	Under-voltage protection for each cell	2.70±0.03V for 1±0.5s
	Under- voltage release for each cell	3. 15±0.03V
	Under-voltage alarm for total voltage	46.4V±0.5V
	Under-voltage protection for total voltage	43.2V±0.5V for 1±0.5s
	Under-voltage release for total voltage	50.4V±0.5V
	Under-voltage release method	Charge to recovery
Over current	Charge over current alarm	135±5A
	Charge over current protection	120±5A
	Protection delay time	5±1s
	Charge over current release method	Auto release after 1 min
	Discharge over current alarm	110±10A
	Discharge over current protection	120±10A
	Protection delay time	5±1s
	Over current release method	Auto release after 1min
Charge over temperature	Charge over temperature alarm	50±3°C
	Charge over temperature protection	55±3°C
	Charge over temperature release	45±3°C

<b>Discharge</b>	Discharge over temperature alarm	60±3°C
	Discharge over temperature protection	65±3°C
	Discharge over temperature release	55±3°C
<b>Charge</b>	Charge under temperature alarm	3±3°C
	Charge under temperature protection	0±3°C
	Charge under temperature release	5±3°C
<b>SOC</b>	Low SOC Alarm	10%
<b>LCD</b>	Battery information display	Voltage, Power, SOC, Cycles, Temperature, Residual energy, Errors alerts
<b>Monitor &amp; Communication</b>		
<b>Communication</b>		Can-bus, RS485 Optional
<b>Series &amp; Parallel connection</b>		No series connection; Support max. 5 sets in parallel.

## 6.2 Battery Information Display

### 6.2.1 Startup interface



### 6.2.2 Press MENU to enter the main menu, as shown below:

- BMS Parameter
- Battery Status
- GYRO Status
- Version number



**6.2.3 Select "BMS Parameter >" and press it to enter, as shown below:**

- Voltage
- Current
- Cell Temp
- Cell Vole



**7. Maintenance**

**7.1 Troubleshooting Referring to Error Marks**

When the battery falls beyond the prescribed range, it enters into fault state by turning on red LED "ALARM" . User can check the status from LCD screen of battery to determine what state the battery is in.

The possible error marks are as follows:

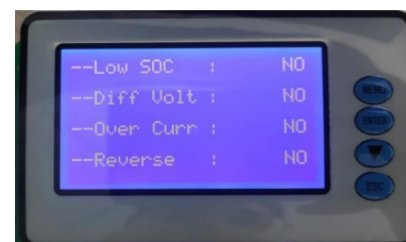
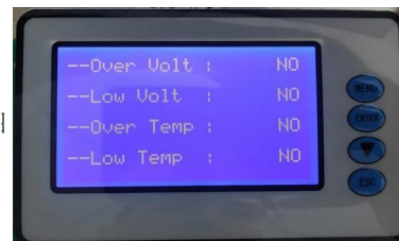
- **Select "Battery Status >" and press OK to enter the battery status information. Then press "▼" to turn the page, as shown below:**

- Status: (IDLE/DISCHG/CHARGE/FULL)
- Alarm Status
- Protect Status
- Failure Alarm



- **Select "Alarm Status >" and press OK to enter the battery alarm information. Then press "▼" to turn the page.**

- Over Volt: YES/NO
- Low Volt: YES/NO
- Over Temp: YES/NO
- Low Temp: YES/NO
- Low SOC: YES/NO
- Diff Volt: YES/NO
- Over Curr: YES/NO
- Reverse: YES/NO



As shown in the right figure:

## 7.2 Other Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without use. In addition, if various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges, the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the discharge time is much shorter than the standard after full charge, even if the battery is charged correctly, this may indicate it is time to change the battery.