



USER MANUAL

RANGER SERIES

LiFePO4 12.8V 100Ah/ 200Ah/ 300Ah

Version 1.0

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2. SAFETY PRECAUTIONS

Thoroughly review this manual before installation, commissioning, or maintenance. It is critical to adhere to all safety labelling and precautionary statements affixed to the equipment. After reading, please retain this manual in a safe place for future reference.

2.1 Symbol Conventions

This manual uses the following symbols to highlight important information that requires special attention during operation.

Symbol	Heading	Description
	ATTENTION / CAUTION / WARNING	Indicates precautions that must be observed during operation.
	DANGER: ELECTRIC SHOCK	Warns of the risk of electric shock and highlights necessary protective measures.
	NOTE / REMINDER	Provides additional explanations or important reminders that require special attention.

2.2 Critical safety information

Before installing, operating, or maintaining the battery, it is essential to read and understand the following instructions.

Pre-Installation Requirements

- Carefully review this user manual before installation or use. Failure to follow the guidelines or safety warnings may result in electric shock, serious injury, or damage to the battery and associated equipment.
- Ensure the battery voltage is compatible with the specifications of the intended device before connection. Non-compliance may cause equipment damage and will void the warranty.

During Installation

- Battery installation must be performed by personnel familiar with the local electrical codes and regulations. For optimal safety, all installation procedures should be carried out in accordance with the steps outlined in this manual.

Battery Operational Safety

1. Do not connect the battery to other types of batteries.
2. Do not use faulty, damaged, or mismatched charging equipment. Use only approved chargers that meet the battery pack's specific requirements.
3. Operate the battery only within the environmental conditions specified in the product specifications.
4. If the battery shows signs of deformation, excessive heat, or unusual odors, immediately disconnect the power and discontinue use.

2.3 Battery maintenance

To maintain optimal battery performance and system safety, the following maintenance procedures must be performed by qualified personnel.

- Charging operations should be performed by trained personnel. Ensure proper contact between the plug and socket, verify that the charging equipment is functioning correctly, and check all connection points on the battery pack. Any abnormalities must be addressed before charging.
- If dust, metal shavings, or other debris accumulate on the battery cover or terminals, clean the surface promptly using a vacuum cleaner. Do not use water or water-soaked objects for cleaning.
- Avoid exposing the battery cover and terminals to water or other conductive materials during charging or discharging, including during use in heavy rain.
- Estimate charging and discharging times according to actual usage. Observe the battery for abnormalities at the end of each cycle, such as unusual voltage differences.
- Every three months, inspect conductive strips, voltage collection terminals, and other connection points for looseness, detachment, rust, or deformation. Ensure that batteries connected in series or parallel are securely fixed and reliable.

2.4 Waste disposal



- Dispose of packaging materials and replacement components in accordance with the local laws and regulations applicable in your country or region.
- Batteries must not be mixed with domestic waste.
- Batteries must be collected and processed separately in accordance with proper recycling or disposal procedures.

3. INSTALLATION

3.1 Tools & Equipment

Before beginning installation, ensure that all necessary tools and equipment are available and in proper working condition.



Insulating gloves



Safety shoes

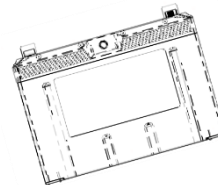
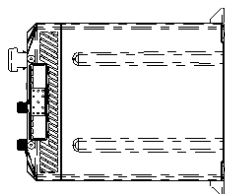
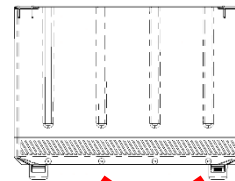
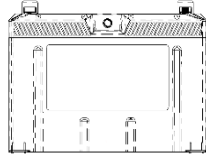


Tools

3.2 Battery Placement and Orientation

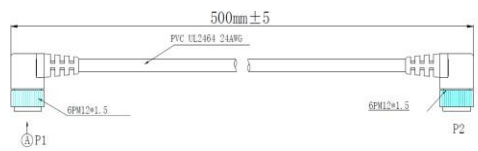
Carefully position the battery pack upright on a stable support surface. Do not position the battery on its side or in an inverted (upside-down) orientation. Avoid placing any objects or covers on top of the pack.

Refer to the schematic diagrams below for the correct visual representation of the placement requirements.



3.3 Battery supporting materials

The following materials are required for proper installation and support of the battery pack. Refer to the table below for a detailed list.

Material	Illustration	Quantity	Specification
Inter-communication Cable		1	500 mm length; M12 circular communication interface at both ends.
Battery		1	12.8V - 100Ah / 200Ah / 300Ah models
Screw		2	M8 × 16 Stainless steel screws

4. INTRODUCTION

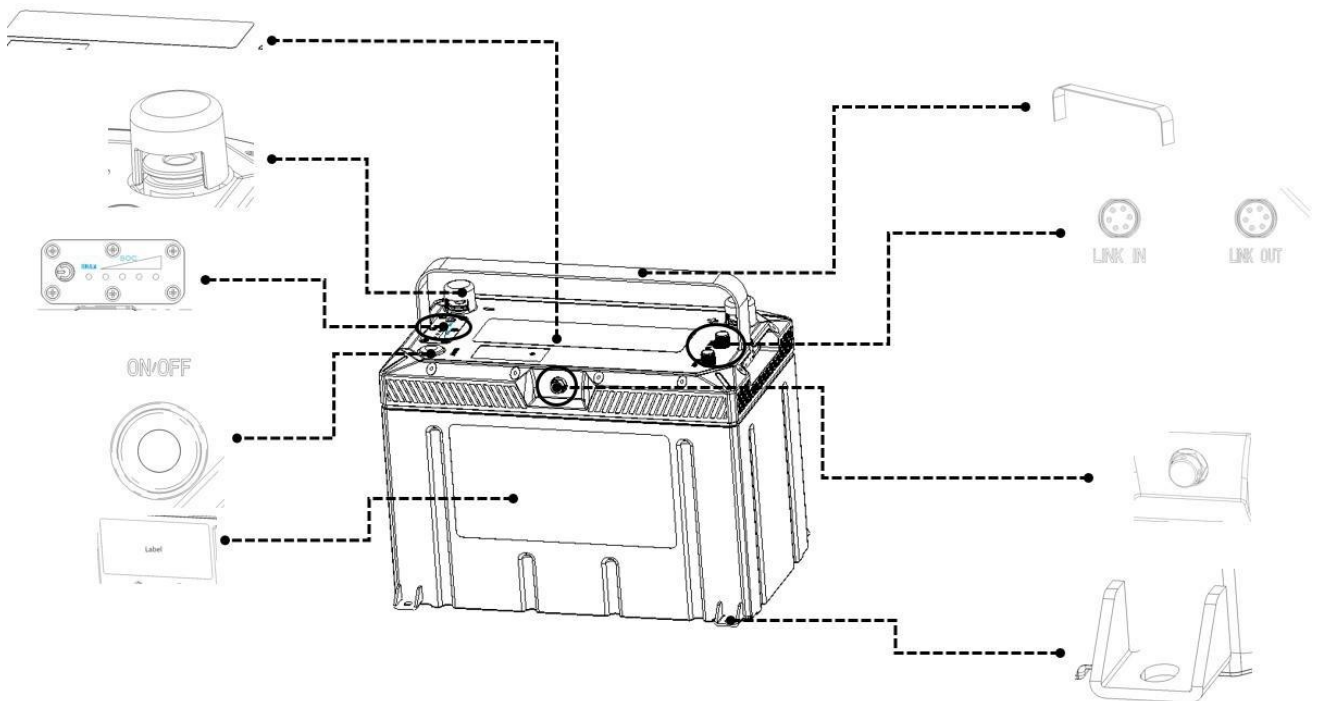
The Kaixentec Ranger series represents a high-performance energy storage solution engineered for reliability, thermal efficiency, and advanced system integration.

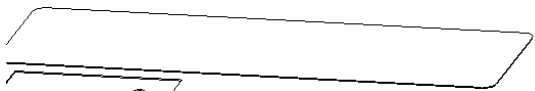
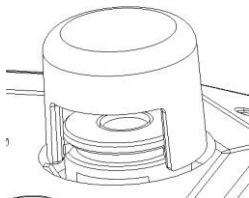
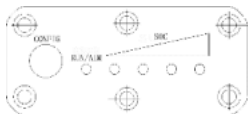
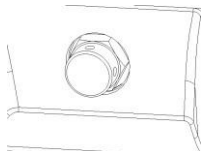
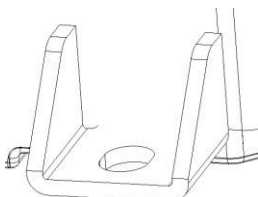
4.1 Main features

- **LiFePO₄ Chemistry:** Provides superior safety, stability, and extended lifespan.
- **High Reliability:** Designed for consistent and dependable operation under various conditions.
- **Wide Temperature Performance:** Maintains stable performance across a broad temperature range.
- **Enhanced Heat Dissipation:** Allows sustained high-current charging and discharging for extended periods.
- **Intelligent Communication:** Equipped with CAN communication, enabling interaction with external devices for improved battery monitoring and management.

4.2 Battery appearance

The Ranger series battery features a robust and compact design, ensuring safe handling and ease of installation. Key components, including the battery terminals, casing, and communication interface, are clearly labelled for convenient operation.



No	Component	Name	Description
1		Fin	Facilitates heat dissipation from the battery. Do not touch during operation.
2		Battery pole	M8 Terminal, an electrical connection terminal for the battery.
3		Display panel	Displays the state of charge (SOC) and operating status through indicator lights.
4		Power switch	Used to disconnect the battery during long periods of inactivity to reduce self-discharge
5		Label	Contains important information; read carefully and operate the battery accordingly.
6		Handle	Designed for convenient handling and transportation of the battery.
7		Port	Enables communication between batteries and with external devices.
8		Pressure relief valve	Protects by releasing internal pressure under abnormal conditions (IP67 rated).
9		Bracket	Used for securely mounting and fixing the battery in place.

4.3 Detailed component functionality

1. Heat sink

The integrated heat sink is a critical cooling component designed to facilitate rapid thermal dissipation. Efficient heat dissipation contributes to extending the battery's service life.

Caution: The heat sink surface may become hot during operation. Do not touch it with your bare hands to avoid burns.

2. Pole terminals

Each battery is equipped with a positive (+) and negative (–) terminal. Ensure correct polarity during connection and avoid reversing the terminals.

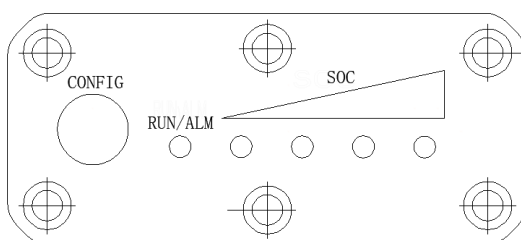
After connecting the power cables, install protective covers over the terminals to prevent short circuits and ensure safe operation.

3. Display panel

The display panel provides real-time visual diagnostics via a multi-LED interface and a configuration button.

The battery is equipped with a display panel consisting of:

- 1 RUN/ALM (Run/Alarm) indicator
- 4 SOC (State of Charge) indicator lights
- 1 CONFIG (Configuration) button



RUN/ALM Indicator function:

Green: Battery operating normally

Red: Battery fault, alarm, or protection state is active

Indicator light 	The battery operates normally during charging or discharging	Flashing during Blink 1
Indicator light 	Indicates a fault condition, alarm, or protection state	

Blinking mode	On time	Off time
Blink 1	0.25 s	3.75 s
Blink 2	0.5 s	0.5 s

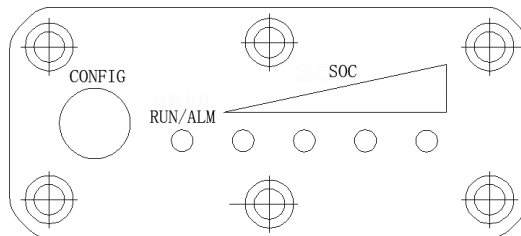
SOC indicator lights:

The battery is equipped with four green indicator lights to display the State of Charge (SOC). Each illuminated indicator represents approximately 25% of the total battery capacity, with different lighting patterns indicating the current SOC level.

Status	Charge				Discharge			
SOC	L1 ●	L2 ●	L3 ●	L4 ●	L1 ●	L2 ●	L3 ●	L4 ●
$0 < \text{SOC} \leq 25\%$	Blink2	off	off	off	on	off	off	off
$25 < \text{SOC} \leq 50\%$	on	Blink2	off	off	on	on	off	off
$50 < \text{SOC} \leq 75\%$	on	on	Blink2	off	on	on	on	off
$75 < \text{SOC} \leq 100\%$	on	on	on	Blink2	on	on	on	on

Configuration Button:

The configuration button is used to check the battery State of Charge (SOC) and to set or match the master address when multiple batteries are connected in a network for communication with external devices.



CONFIG button functional commands:

Press duration	Function	Operational statement
1 second	Status review	Displays the current battery State of Charge (SOC).
3 seconds	Network unlock	Unlocks the networking function. For detailed information, refer to the networking section.
>10 seconds	Address matching	Initiates address matching for battery networking and communication.

4. Battery switch

The power switch serves as the primary control for the Battery Management System (BMS). It is used to turn the battery ON or OFF.

Switch position	System state	Functional capabilities
ON	Active/ Normal	The BMS is fully operational. Supports charging, discharging, and Bluetooth connectivity.
OFF	Shut down/ Sleep	The BMS is inactive. Charging, discharging, and Bluetooth communications are disabled to minimise self-consumption.

The lithium battery is equipped with an intelligent BMS designed to protect the battery cells. When switching from OFF to ON, the BMS performs a self-check process, which typically takes up to 10 seconds. A startup time within this duration is considered normal.

5. Label

The label displays the battery's key performance parameters. During use, it is essential to select chargers and loads that comply with the specifications indicated on the label. Failure to follow these parameters may result in battery damage or reduced performance.

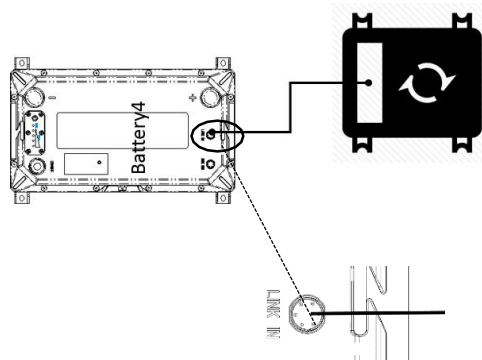
6. Handle

The handle is designed to support the weight of the battery during transportation. Always check that the handle is securely attached and stable before lifting to prevent the battery from falling or causing injury.

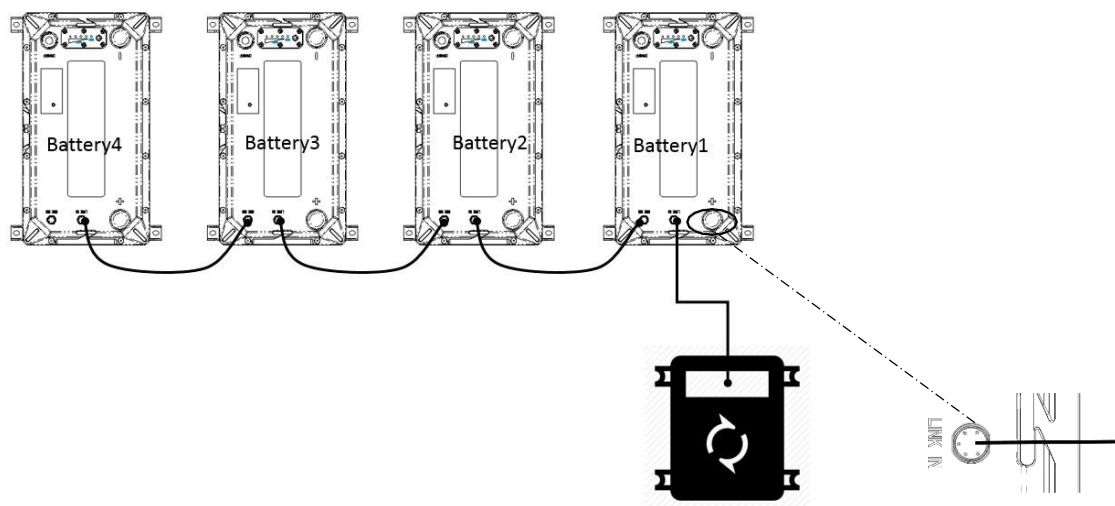
7. Communication port

The battery features two communication ports: **Link In** and **Link Out**. When connecting to external devices, always use **Link In** port to ensure reliable communication.

A. Schematic diagram of single battery usage.



B. For multiple batteries connected in series or parallel, the external device communication line must be connected to the battery's Link In port to ensure proper communication.



8. Pressure relief valve

The battery is equipped with a pressure relief valve and features an IP67 waterproof rating. During charging and discharging, heat generation causes thermal expansion, which increases internal air pressure. The pressure relief valve prevents excessive pressure buildup, reducing the risk of dangerous incidents. Ensure that the area around the valve remains clear of any objects to allow proper operation.

9. Installation bracket (applies to 12.8V 100Ah model only)

The installation bracket is designed to facilitate secure mounting of the battery, particularly in vehicle applications. It is recommended to use M6 stainless steel screws to firmly attach the battery to the bracket and ensure stable installation.



4.4 Functional characteristics

Item	12.8V - 100Ah	12.8V - 200Ah	12.8V - 300Ah
Nominal voltage	12.8 V		
Nominal energy	1280 Wh	2560 Wh	3840 Wh
Nominal capacity	100 Ah	200 Ah	300 Ah
Internal resistance @ 1kHz AC	$\leq 30 \text{ m}\Omega$		
Maximum Allowed Charge Current @ 25°C	100 A	200 A	300 A
Minimum Allowed Discharge Current @ 25°C	150 A	200 A	300 A
Recommended Charge Current	50 A	100 A	150 A
Recommended Discharge Current	100 A	150 A	200 A
Peak / Surge Current Limit	500 A (3 s)	800 A (5 s)	1000 A (5 s)
Short Circuit Current	1000 A (500 μs)	1200 A (500 μs)	1200 A (500 μs)

4.4.1 Initial commissioning

1. Verify that there are no signs of unauthorized disassembly or structural damage to the enclosure.
2. Upon leaving the factory, the battery power switch is set to the OFF position.
3. Before initial use, turn the power switch to the ON position. The LED display will illuminate, indicating that the battery is operational.

4.4.2 Communication port

1. The battery is equipped with two CAN communication ports.
2. Battery firmware updates can be performed via communication ports.
3. The ports also enable communication with external devices, allowing integration into monitoring or control systems.

4.4.3 Power switch

For transportation or long-term storage, the battery can be switched OFF, minimizing self-discharge and ensuring long-term storage without significant power loss. Turning the battery OFF also enhances overall safety during handling and storage.

4.5 Heating function

The battery features a low-temperature heating function to ensure optimal performance in cold environments. A built-in heater automatically activates when a charger is connected, warming the battery to 10°C before initiating the charging process. This function helps maintain battery efficiency and prolongs its lifespan under low-temperature conditions.

5. SERIES AND PARALLEL CONFIGURATION

The Ranger series battery supports flexible configurations, allowing multiple batteries to be connected **in series, parallel, or a combination of both**. This enables the assembly of systems with higher voltage or increased capacity. For example, four 12.8V 200Ah batteries can be connected in series and parallel to form a 25.6V 400Ah system.

In combined series-parallel configurations, **communication lines** should be connected between the batteries in addition to the power lines. In this networked state, one unit is designated as the **Master** to aggregate data from the **Slave** units and facilitate communication with external devices such as inverters, display screens, and MPPTs.

Important precautions before connecting batteries in series or parallel:

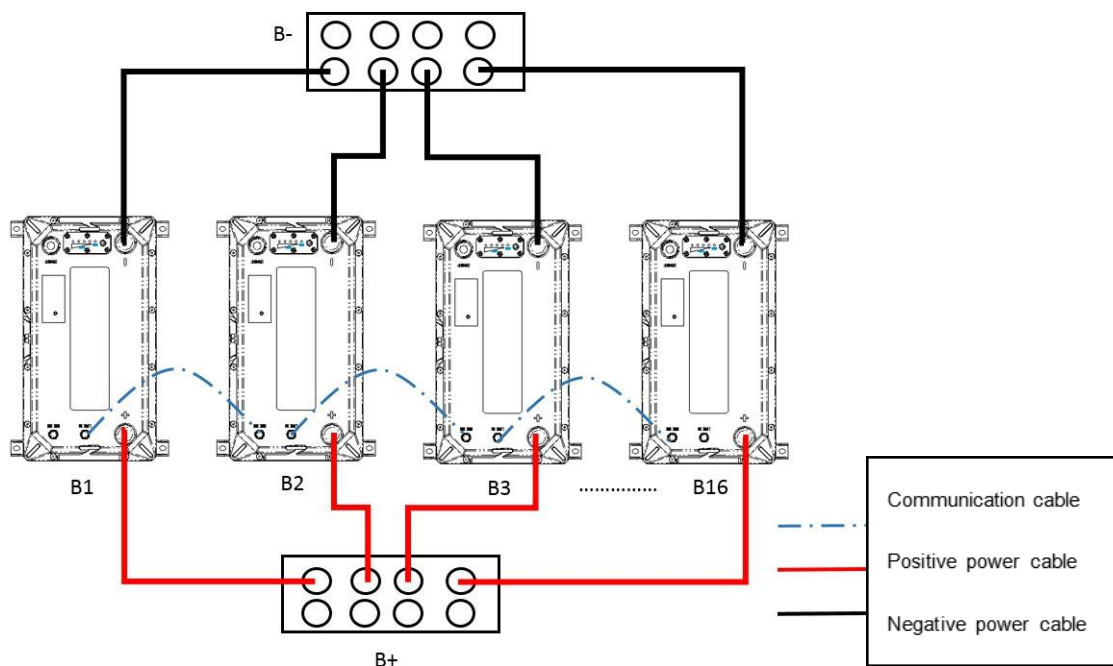
1. Only batteries of the same model may be connected. Batteries with different capacities or voltage ratings must not be combined.
2. All parallel wires must be of identical length to ensure balanced current distribution.
3. A 0.5C charging current is recommended before connection (Charging current = Rated capacity × 0.5C).
4. Ensure that the voltage of each battery pack is highly consistent before connection. The voltage difference between packs should be:

$$\Delta V < 500 \text{ mV}$$

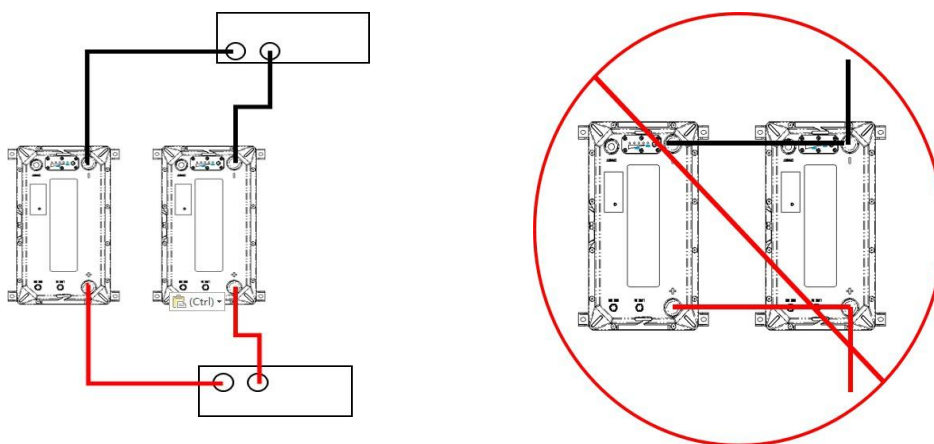
Once connected, the batteries will operate as a single system for charging and discharging.

5.1 Parallel connection of batteries

A **maximum of 16 units** may be connected **in parallel**. Before installation, verify the voltage across the positive and negative terminals of each unit using a multimeter. Alternatively, check battery voltages via the Bluetooth app to confirm that the voltage difference does not exceed 0.5V. If the voltage difference exceeds 0.5V, each battery must be fully charged individually and allowed to rest for 1 hour before being connected in parallel.



Example: parallel connection of two 12.8V 100Ah batteries



System voltage: 12.8V
System capacity: 100Ah + 100Ah = 200Ah

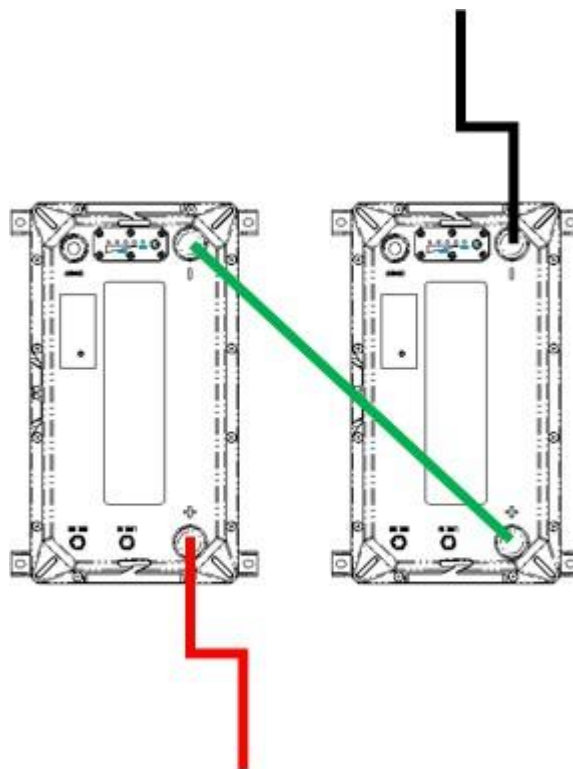
! Do not connect both the positive and negative terminals of the same battery to the output simultaneously, as this may cause battery damage.

5.2 Series connection of batteries

A maximum of 4 batteries can be connected in series. Before making any connections, measure the voltage of each battery using a multimeter or check via the Bluetooth app to ensure the voltage difference between batteries does not exceed 0.5 V. If the voltage difference exceeds 0.5 V, fully charge each battery individually, allow them to rest for 1 hour, and then proceed with the series connection.

Connection method: connect the positive terminal of one battery to the negative terminal of the next battery, continuing this pattern for all batteries in the series. This ensures safe operation and proper voltage balance across the series-connected system.

Example: series connection of two 12.8V 100 Ah batteries.



System voltage: $12.8 \times 2 = 25.6\text{V}$

System capacity: 100Ah

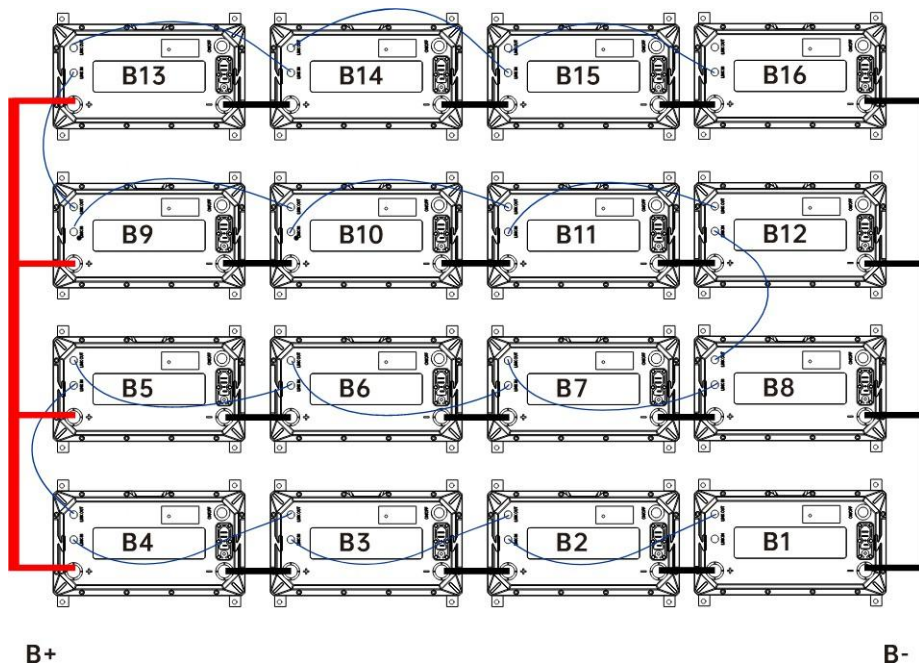
5.3 Simultaneous series and parallel connection

The Ranger series batteries support simultaneous series and parallel connections, with a maximum of 4 batteries in series and 4 batteries in parallel.

Connection method: First, connect the batteries in series to achieve the desired system voltage. Then, connect the series strings in parallel to increase the overall system capacity. This configuration allows for the creation of high-voltage, high-capacity battery systems while maintaining safe and balanced operation.

Series configuration number	Allowed parallel configuration number
1	16
2	4
3	4
4	4

Example: simultaneous connection of 16 12.8V 100 Ah batteries: 4 in series, 4 series strings in parallel



System voltage: $12.8V \times 4 = 51.2V$

System capacity: $100Ah \times 4 = 400Ah$

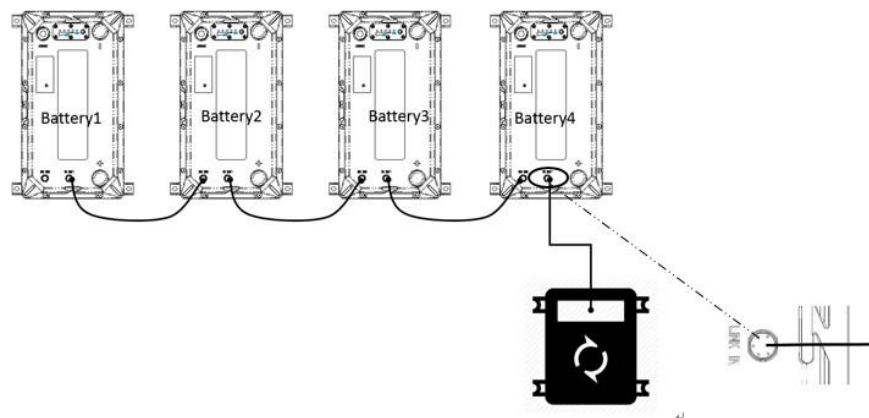
6. BATTERY COMMUNICATION

6.1 Communication terminal connection

The Ranger series batteries support communication networking between multiple units. This function allows a battery system to collect and summarize information, which is especially useful for intelligent devices or systems requiring real-time monitoring. Batteries can operate individually or as part of a network. Proper understanding and adherence to the following instructions are essential for safe and effective operation.

The batteries are equipped with a Controller Area Network (CAN) bus interface, accessible via two circular M8 DIN connectors located on the top of each battery. The **Link In** connector of one battery is connected to the **Link Out** connector of the next battery using a CAN bus cable, typically in a simple daisy-chain configuration.

Communication line connection:



Optional external CAN cables can connect the batteries to other devices such as chargers, loads, or monitoring systems. CAN bus communication enables efficient battery management and allows users to monitor battery status or diagnose faults. For additional technical questions regarding CAN bus implementation, contact Kaixentec technical support.

CAN bus communication is not required for normal battery operation. Each battery can operate independently, performing all protective functions without external devices or networked connections. When not in use, retain the two black protective covers on the M12 connectors to prevent environmental damage.

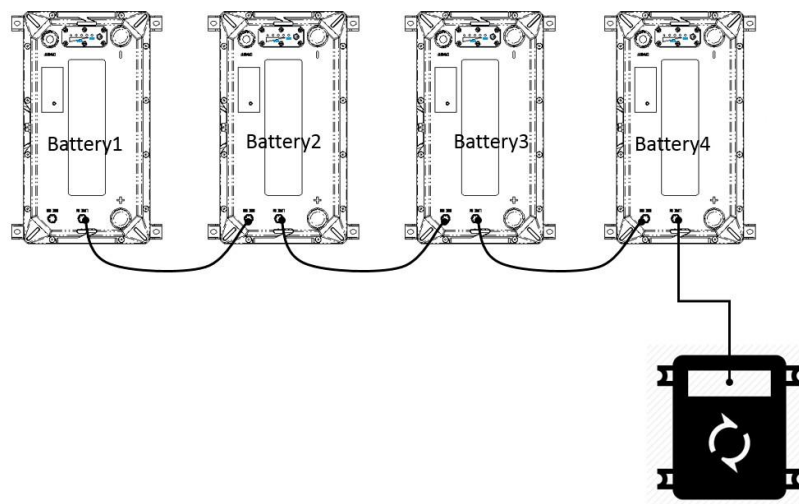
6.2 Networking method

After connecting the batteries with the communication cable, the network setup can be completed using the Bluetooth connection via the Kaixentec Voyager app.

Equipment operation:

- **Wiring:** Ensure all batteries are powered off. Connect the batteries in series and parallel (first in series, then in parallel) using power lines. Follow the instructions in sections 5.1 – 5.3.
- **Master-Slave assignment:** The battery connected to the external device is designated as **Battery 1 (Master)**. All other connected batteries are designated as **Slave batteries**.

Connect the **LINK OUT** port of the **master battery** to the **LINK IN** port of the first slave battery (Battery 2), continuing the daisy-chain connection, connect the **LINK OUT** of **Slave Battery 2** to the **LINK IN** of **Slave Battery 3**, and so on for additional slave batteries.



- **Power on:** Switch each battery power switch from OFF to ON.
- **Address matching:** Press and hold the Config button on the Master battery (Battery 1) for 10 seconds. The indicator lights will start running. Once all indicator lights turn off, the internal address allocation for the battery network is complete.

⚠ ATTENTION!

- When configuring the battery network, connect the power lines in series first, then in parallel.
- The communication lines must first connect the batteries in the first series cluster, then the second series cluster; do not mix clusters.

- For address matching, always select Battery 1 as the Master and press its Config button for 10 seconds. Do not press the Config button on any slave batteries. This step is critical—improper operation may result in networking failure.

7. CHARGING REQUIREMENTS

To ensure optimal performance and long service life of the Ranger series batteries, it is recommended to use a charging source with lithium-specific charging settings that meet the following requirements:

Model	Recommended charge voltage	Recommended float voltage	Maximum charge current	Recommended charge current	Operating temperature range
48V	56.8V	55.2V	1C	0.5C	Charge: 0~60°C Discharge: -20~65°C
36V	42.6V	41.4V			
24V	28.4V	27.6V			
12V	14.2V	13.8V			

Note: Batteries equipped with a heating function must be warmed to the operating temperature before beginning the charging process.

7.1 AC-DC charger

Before use, verify that the AC-DC charger has a dedicated lithium charging mode that complies with the recommended charging parameters. Many standard chargers are designed only for lead-acid batteries and may not provide suitable lithium charging settings.

7.2 Photovoltaic charging

Ensure that the solar charge controller has a dedicated lithium battery charging setting that meets the recommended parameters. The Ranger series batteries can be charged using a solar controller without a dedicated lithium mode, but the charging voltage must not exceed 58.4 V for 4 batteries in series (maximum 14.6 V per single battery). Once the batteries are fully charged, switch the controller to the recommended float voltage to maintain battery health.

7.3 Charging via AC generator through DC-DC charger

Check that the DC-DC charger has a lithium-specific charging setting compatible with the recommended parameters. If using a DC-DC charger without a dedicated lithium mode, the charging voltage must not exceed 58.4 V for 4 batteries in series (maximum 14.6 V per single battery). After the batteries are fully charged, turn off the charger and switch to the recommended float voltage to maintain optimal battery health.

7.4 Recommended charging voltage

For optimal performance and longevity, it is strongly recommended to use a dedicated lithium-ion battery charger to fully charge the Ranger series batteries. In some cases, AGM chargers may also be used depending on availability; however, the charging efficiency and battery performance may vary.

7.5 Passive balancing function

As the battery approaches 100% State of Charge (SOC), the voltage difference between individual cells may increase due to the chemical characteristics of lithium batteries. To ensure uniform cell capacity, the battery employs a passive balancing function, which slightly discharges higher-capacity cells to allow lower-capacity cells to catch up. This helps maintain overall battery health and prolong service life.

8. BATTERY RECYCLING

The Kaixentec Ranger series lithium-ion batteries are recyclable and must not be disposed of as household or landfill waste. To ensure safe and environmentally responsible recycling, please contact your dealer or Kaixentec for guidance on proper collection and recycling procedures.

9. TRANSPORTATION & STORAGE

- During transportation, the battery must be protected from severe vibration, impact, or compression and should be kept away from direct sunlight and rain.
- Handle the battery carefully during loading and unloading; avoid dropping, rolling, or applying excessive pressure.
- For long-term storage, keep the battery in a dry, clean, dark, and well-ventilated indoor environment. The recommended storage temperature is 15–35°C.
- The storage area should be free from harmful gases, flammable or explosive materials, and corrosive chemicals.

- Batteries should be stored and transported at approximately 50% State of Charge (SOC).
- If the battery is not in use for an extended period, it should be recharged every 6 months following the manufacturer's specifications.
- Do not collapse or overturn batteries. Stacking must not exceed 6 layers, and batteries must be placed with the top side facing upward.

10. WARNINGS & REMINDERS

Please carefully read the battery specifications and instructions before use. Improper use may result in overheating, fire, rupture, damage, or reduced capacity.

Kaixentec B.V. is not responsible for any accidents or damages caused by failure to follow these instructions.



WARNINGS

- Keep the battery away from heat sources, high voltage, and direct sunlight.
- Do not immerse the battery in water or expose it to fire.
- Do not reverse the positive and negative terminals.
- Do not connect both the positive and negative terminals to the same conductor.
- Do not strike, throw, or step on the battery.
- Do not disassemble the battery without the manufacturer's authorization and guidance.
- Do not mix batteries of different capacities or brands.



REMINDERS

- Fully charge the battery monthly to maintain accurate SOC.
- Charge the battery promptly if it becomes over-discharged (≤ 2 days).
- Always use a dedicated lithium battery charger.
- Stop using the battery immediately if it emits odour, heat, shows deformation, or exhibits any abnormal behaviour.
- Keep the battery out of reach of children and pets.

Electrolyte leak handling:

In the event of battery electrolyte leakage, avoid contact with liquids or leaked gases. Take the following measures immediately:

1. **Inhalation:** Evacuate the area and seek medical attention immediately.
2. **Eye contact:** Rinse eyes with water for at least 15 minutes and seek medical attention.

3. **Skin contact:** Wash exposed area thoroughly with soap and water; remove any residues and seek medical assistance.
4. **Ingestion:** Induce vomiting if possible and seek medical attention immediately.
5. **Fire:** Use a carbon dioxide fire extinguisher; do not use liquid-based extinguishers.

11. CONTACT & SUPPORT

Kaixentec B.V.

Ridderkerk, The Netherlands

Technical Support: techsupport@kaixentec.com

Web: www.kaixentec.com