



TESS ELECTRIC

# TS5000 (51.2V 100AH) Lithium Iron Phosphate Battery User Manual





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## **1. Notes**

1. It is important and necessary to read the user manual carefully before installing or using the battery. The safety precautions mentioned in this manual do not represent all safety matters to be observed and only complement all safety precautions;
2. When installing, operating and maintaining equipment, local safety regulations shall be observed and followed;
3. Do not wear any conductive objects such as watches, bracelets, and rings when installing, operating and maintaining equipment;
4. If the battery is stored for long before installation, it needs to be charged and discharged every six months, and the battery charge percentage shall not be less than 70%;
5. If the battery is fully discharged, it should be charged within 12 hours;
6. Before maintenance, batteries and equipment must be cut off firstly;
7. Do not use cleaning solvents to clean batteries;
8. Do not expose batteries to flammable or irritating chemicals or vapors;
9. Do not connect batteries directly to photovoltaic solar wires;
10. Our company is not responsible for any loss caused by violation of general safety operation requirements or violation of design, production and use of equipment safety standards.



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## 1.1 Before Installation

1.1.1 After unpacking, please check the product and packing list first, if the product is damaged or missing any parts, please contact the seller;

1.1.2 Before installation, cut off the power supply and ensure the battery is off;

1.1.3 Wiring must be correct, do not mistake positive(+) and negative(-) cables, and ensure the external devices are not short-circuited;

1.1.4 Direct connection of batteries and AC power is prohibited;

1.1.5 Battery protection system is designed for 48V DC, no series connections allowed;

1.1.6 Please ensure that the electrical parameters of the battery system are compatible with the relevant equipment;

1.1.7 Keep the battery away from water and fire.

## 1.2 Usage

1.2.1 If the battery system needs to be moved or repaired, the power must be cut off and the battery completely stops working;

1.2.2 It's prohibited for connecting this battery to other different types of batteries;

1.2.3 It's prohibited for connecting this battery with any faulty or incompatible devices;

1.2.4 When fire occurs, only dry powder fire extinguishers can be used, liquid fire extinguishers are prohibited;

1.2.5 Do not disassemble batteries privately;



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## **2. Introduction**

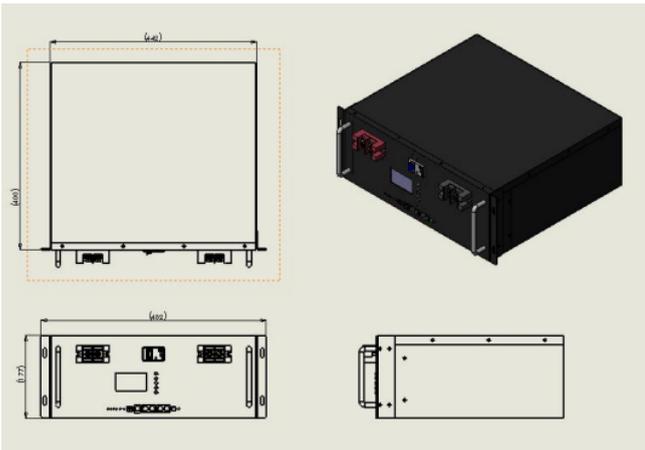
This battery is a new type of energy storage product, which can be used to provide reliable power supply for various equipment and systems. It is especially suitable for applications with large power, limited installation space, limited bearing capacity and long life. Battery built-in BMS -battery management system, battery voltage, current, temperature and other information management and monitoring. In addition, the battery pack can balance the charge and discharge of the battery to prolong the cycle life. Multiple battery packs can be parallel to expand capacity and power, parallel to expand capacity and longer power support time requirements.

## **3. Characteristics**

- ★ Environmental protection and pollution-free: the whole battery module using materials are non-toxic, pollution-free;
- ★ Long safety life: the core cathode material of the battery module is made of LiFeOP<sub>4</sub>, good safety performance and long service life;
- ★ Protection function: battery management system can protect the battery module over discharge, over charge, over current and high / low temperature;
- ★ Equilibrium function: the battery management system has its own passive equalization, can balance the battery module each single string core;
- ★ Expansion: flexible configuration, multiple battery modules can be parallel expansion capacity, applicable to different standby time requirements;
- ★ Low power consumption: the battery has the function of automatic dormancy, when no live equipment is connected, it can enter the low power state by itself and reduce the self-loss;
- ★ No memory: no memory effect, shallow charge and discharge performance is excellent;
- ★ Wide temperature range: working temperature range-20~70, charge 0~60, discharge-20~70, good discharge performance and cycle life;
- ★ Portable: Small, lightweight, standard 19-inch embedded module easy to install and maintain

## 4. Parameter Specifications

### 4.1 Dimensions



### 4.2 Battery Parameters

| Project               | Parameters          |
|-----------------------|---------------------|
| Model                 | TS5000 (51.2V100Ah) |
| Nominal voltage       | 51.2V               |
| Nominal capacity      | 100Ah               |
| Combination mode      | 16 Series           |
| Dimensions W×D×H (mm) | 482×400×177         |
| Weight                | About 45KG          |

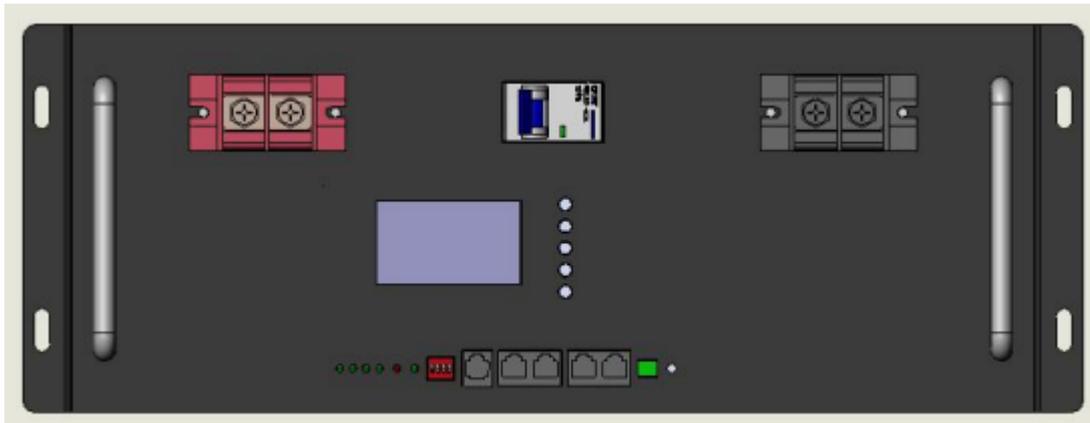


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|                                      |   |
|--------------------------------------|---|
| Working voltage                      | 43.2-58.4V  |
| Charging voltage                     | 56.8--58.4V   |
| Charging current limiting            | 10A(The default charging current is greater than 55A, and the current limiting is on) |
| Standard charging current current    | 20A(0.2C)   |
| Maximum continuous charging current  | 50A(0.5C)   |
| Standard discharge current           | 20A (0.2C)  |
| Maximum continuous discharge current | 100A (1.0C)   |
| Charging temperature range           | 0~50°C  |

|                             |                                |
|-----------------------------|--------------------------------|
| Discharge temperature range | -20~60°C                       |
| Monitoring communications   | RS232, RS485, CAN              |
| Number of cycles            | 3000 Cycles                    |
| Working environment         | Humidity :≤95; Altitude :≤4000 |

## 4.3 Interface Definitions



### 4.3.1 RET: Reset key

When the BMS is dormant, press the reset button for 3 seconds and release, the protection board will be activated, and the LED indicator will light up in 0.5 seconds from the "RUN" button.

When the BMS is active, press the reset button 3 seconds and release, the protection board is dormant, and the LED indicator lights up for 0.5 seconds from the lowest power lamp.

When the BMS is activated, press the reset button for 6 seconds and release, the protection board is reset, and the LED lights are lit for 1.5 seconds at the same time.

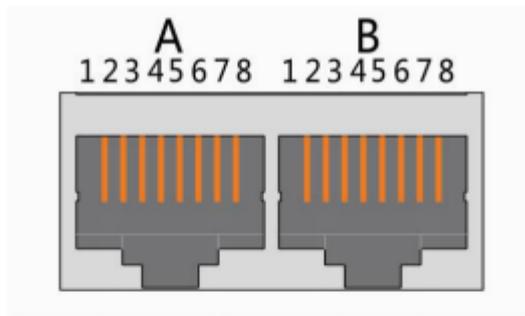


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After the BMS is reset, the parameters and functions set through the upper computer will be retained. To restore to the initial parameters, it can be achieved through the upper computer's "restore default value ", but the relevant running records and storage data will remain unchanged (such as electricity, cycle times, protection records, etc).

### 4.3.2 RS485-1 /CAN

RJ45 interface, is used for external communication of battery pack, such as inverter, computer



X1(双 RJ45)端口

| 接口           | 定义说明           |       | 定义说明  |                     |       |           |
|--------------|----------------|-------|-------|---------------------|-------|-----------|
| X1<br>通讯端口定义 | A 部分<br>CAN 接口 | PIN 1 | CANL  | B 部分<br>RS-485-1 接口 | PIN 1 | RS485-B1  |
|              |                | PIN 2 | CGND  |                     | PIN 2 | RS485-A1  |
|              |                | PIN 3 | NC(空) |                     | PIN 3 | RS485-GND |
|              |                | PIN 4 | CANH  |                     | PIN 4 | RS485-B1  |
|              |                | PIN 5 | CANL  |                     | PIN 5 | RS485-A1  |
|              |                | PIN 6 | NC(空) |                     | PIN 6 | RS485-GND |
|              |                | PIN 7 | CGND  |                     | PIN 7 | NC(空)     |
|              |                | PIN 8 | CANH  |                     | PIN 8 | NC(空)     |

### 4.3.2 RS485-2

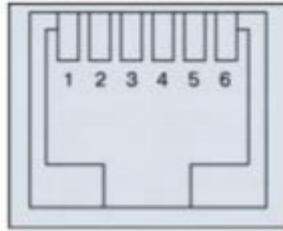
With a dual RS485 interface, the default band rate of bps.9600 can be expanded in a parallel battery pack, communication interconnection.

### 4.3.3 RS232

Default band rate bps .9600



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| RS232--采用 6P6C 立式 RJ11 插座 |           |
|---------------------------|-----------|
| RJ11 引脚                   | 定义说明      |
| 2                         | NC        |
| 3                         | TX ( 单板 ) |
| 4                         | RX ( 单板 ) |
| 5                         | GND       |

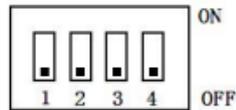
#### 4.3.4 ADD

Address switch: four address switches, used to determine where the different communication address is. The lower position is off, which means 0. The upper position is on, which means 1.

When the PACK is used in parallel, different addresses can be distinguished by the dial switch on the BMS. To avoid setting the address to the same PACK, the definition of the dial switch is referred to in the table below.



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| Address | Dial switch position |     |     |     |
|---------|----------------------|-----|-----|-----|
|         | #1                   | #2  | #3  | #4  |
| 0       | OFF                  | OFF | OFF | OFF |
| 1       | ON                   | OFF | OFF | OFF |
| 2       | OFF                  | ON  | OFF | OFF |
| 3       | ON                   | ON  | OFF | OFF |
| 4       | OFF                  | OFF | ON  | OFF |
| 5       | ON                   | OFF | ON  | OFF |
| 6       | OFF                  | ON  | ON  | OFF |
| 7       | ON                   | ON  | ON  | OFF |
| 8       | OFF                  | OFF | OFF | ON  |
| 9       | ON                   | OFF | OFF | ON  |
| 10      | OFF                  | ON  | OFF | ON  |
| 11      | ON                   | ON  | OFF | ON  |
| 12      | OFF                  | OFF | ON  | ON  |
| 13      | ON                   | OFF | ON  | ON  |
| 14      | OFF                  | ON  | ON  | ON  |
| 15      | ON                   | ON  | ON  | ON  |

## 4.3.5 Indicator

Table 1 LED Working status indicators

| State    | Normal/alert/protection | RUN         | ALM         | Electricity indicator LED              |             |             |             | Note             |
|----------|-------------------------|-------------|-------------|--|-------------|-------------|-------------|------------------|
|          |                         | ●           | ●           | ●                                      | ●           | ●           | ●           |                  |
| Shutdown | Sleep                   | Elimination | Elimination | Elimination                            | Elimination | Elimination | Elimination | Total extinction |
| Standby  | Normal                  | Flash 1     | Elimination | According to the electricity indicator |             |             |             | Standby status   |



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|           | Alarm   | Flash 1       | Flash 3       |  |               |               |               | Module Low Voltage   |
|-----------|---|---------------|---------------|--|---------------|---------------|---------------|--|
| Charge    | Normal  | Always bright | Elimination   | According to the electricity indicator (power indicator maximum LED flash 2) |               |               |               | Maximum power LED flash (flash 2), overcharge alarm ALM no flicker |
|           | Alarm   | Always bright | Flash 3       |  |               |               |               |  |
|           | Overcharge protection   | Always bright | Elimination   | Always bright  | Always bright | Always bright | Always bright | If there is no electricity, the indicator is in standby state      |
|           | Temperature, overcurrent, failure protection                                    | Elimination   | Always bright | Elimination  | Elimination   | Elimination   | Elimination   | Stop charging  |
| Discharge | Normal  | Flash 3       | Elimination   | According to the electricity indicator                                       |               |               |               |  |
|           | Alarm   | Flash 3       | Flash 3       |  |               |               |               |  |
|           | Undercurrent protection   | Elimination   | Elimination   | Elimination  | Elimination   | Elimination   | Elimination   | Stop discharge   |
|           | Temperature, overcurrent, short circuit, reverse connection, failure protection | Elimination   | Always bright | Elimination  | Elimination   | Elimination   | Elimination   | Stop discharge   |
| Failure   |   | Elimination   | Always bright | Elimination  | Elimination   | Elimination   | Elimination   | Stop charging and discharging                                      |

Table 2 Description of capacity indication

| State              |        | Charge      |             |               |               | Discharge   |               |               |               |
|--------------------|--------|-------------|-------------|---------------|---------------|-------------|---------------|---------------|---------------|
| Capacity indicator |        | L4●         | L3●         | L2●           | L1●           | L4●         | L3●           | L2●           | L1●           |
| Electricity (%)    | 0~25%  | Elimination | Elimination | Elimination   | Flash 2       | Elimination | Elimination   | Elimination   | Always bright |
|                    | 25~50% | Elimination | Elimination | Flash 2       | Always bright | Elimination | Elimination   | Always bright | Always bright |
|                    | 50~75% | Elimination | Flash 2     | Always bright | Always bright | Elimination | Always bright | Always bright | Always bright |

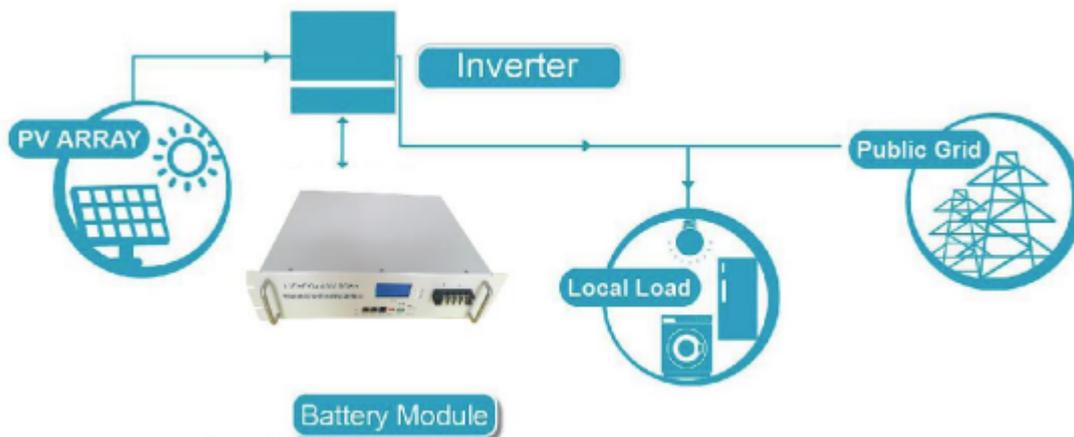


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|                     |         |               |                      |                      |                      |                      |                      |                      |                      |
|---------------------|---------|---------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
|                     | 75~100% | Flash<br>2    | Alwa<br>ys<br>bright |
| ● running indicator |         | Always bright |                      |                      | Flash (flash 3)      |                      |                      |                      |                      |

## 5. LiFePO4 Battery Safety Operating Guidelines

### 5.1 Application Schematic



### 5.2 Tools

The following tools are needed to install batteries



Use insulated tools to prevent accidental electric shock or short circuit. If there is no insulation tool, use insulation tape to cover all exposed metal surfaces of the tool for insulation treatment.

### 5.3 Security equipment

When handling the battery pack, it is recommended to wear the following safety equipment.



## **6. Installation**

### **6.1 Installation location**

Ensure that the installation location meets the following conditions:

- 6.1.1 The area is completely waterproof.
- 6.1.2 The installation wall is flat.
- 6.1.3 No flammable and explosive items in the nearing position
- 6.1.4 Ambient temperature is between 0°C and 50°C, the temperature and humidity remain constant.
- 6.1.5 This area has little dust and dirt.

Attention: If the ambient temperature is out of working range, the battery pack will stop working. The optimal operating temperature of the battery ranges from 0 to 50 degrees Celsius. When often exposed to harsh temperatures, it'd affect the battery's performance and lifetime.

### **6.2 Installation**

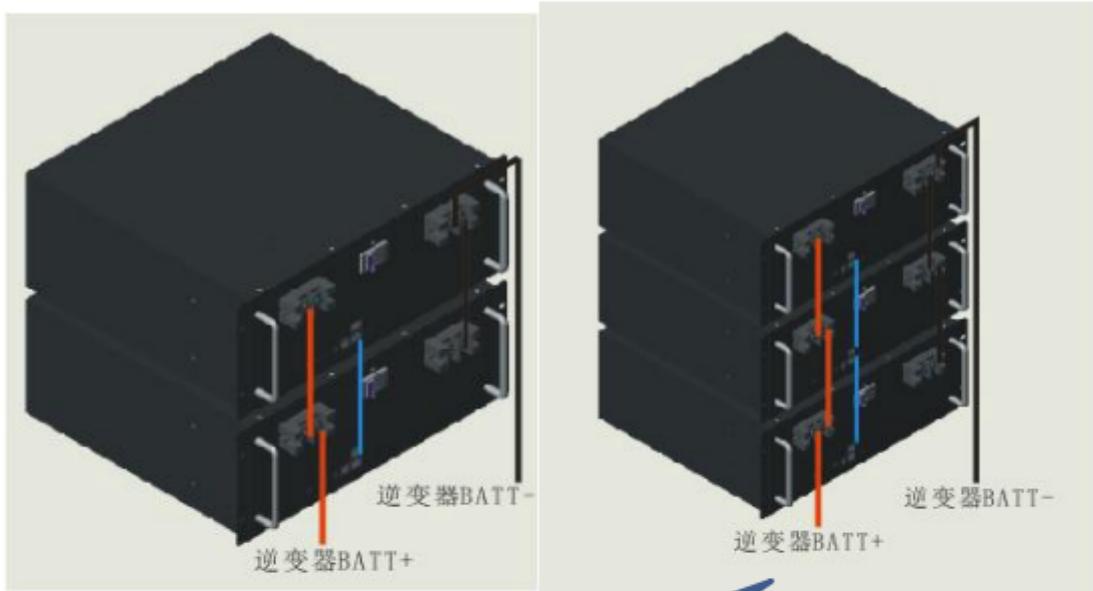
Put the battery module into the mounting cabinet or bracket and connect the wire.





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When multiple batteries are connected in parallel, as shown below:



Note: when connecting the equipment, the battery output positive and negative electrodes should be taken from the first group and the last group of batteries



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## **7. Maintenance Precautions**

In the later stage of installation and use, the iron lithium battery can be simply maintained and inspected, because of its maintenance-free characteristics, the maintenance period can be extended, such as once every 3 months.

- ★ Check whether the pole column and connection lines of LiFePO<sub>4</sub> battery are loose, damaged, deformed or corroded, and whether the battery case is damaged or deformed;
- ★ Observe the state of the battery pack running indicator light, normal state is green light, battery pack CAPACITY light only the last flicker, indicating that the battery power is low, the battery is about to dry off the output;
- ★ When there is a failure, the battery pack flashes ALM the red light and sends out an alarm. Please check whether the battery connection is correct or over-current; then press the RST reset key to see if the failure is eliminated after the battery restarts. If it can not be eliminated, please contact the manufacturer to handle, do not open the battery case;
- ★ For a multi-battery parallel application scenario, if one of the battery fails and needs to be replaced, make sure that the voltage difference between the newly replaced battery and the other batteries to be parallel is within 2V, if the Voltage difference is large, High voltage battery pack charge low voltage battery pack large current, low voltage battery pack charge over-current protection, resulting in unable to charge;
- ★ Record the time and number of power outages, the battery power supply time to do detailed statistics;

## **8. FAQ Analysis and Solutions**

### **8.1 Undervoltage alarm**

ALM indicator lights flicker, RUN operation indicator lights out. Cause analysis: (1) The load current is too large that exceeds the battery's discharge



protection value. (2) Battery protection panel failure. Solution: the protection board will lock the state after entering the over-current state until the charger can be activated at the charging input end.

## **8.2 Discharge over-current protection**

ALM alarm indicator lights flicker, RUN operation indicator lights out. Cause analysis:

(1) The load current is too large that exceeds the battery's discharge protection value.

(2) Battery protection panel failure. Solution: the protection board will lock the state after entering the over-current state until the charger can be activated at the charging input end.

## **8.3 Temperature Protection**

ALM alarm indicator lights flicker, RUN operation indicator lights out.

Cause analysis: Ambient temperature may be too high or too low

Solution: when the temperature at the NTC end returns to normal, the protection board recovers from the temperature protection state and the red ALM lamp goes out.

## **8.4 Battery No Voltage Output**

The power indicator lights out, the voltage at both ends of the battery is 0 V.

Cause analysis: the battery is not activated or the battery management system is abnormal.

Solution: activate the battery or reset the battery through the reset key on the battery panel in the activated state "RST". If there is still no voltage output, contact the manufacturer professional to handle it.