TBB POWER

Version: A1.0

Lithium Battery Module User Manual

M48-100

www. tbbpower. com

DANGER

HIGHVOLTAGEINSIDE

* Do not disconnect, disassemble or repair by yourself.
* Do not drop, deform, impact, cut or spearing with a sharp object.
* Do not place near open flame or incinerate.
* Do no sit or put heavy things on battery.
* Keep away from moisture or liquid.
* Keep out of reach of children, animals or insects.
* Contact the supplier with 24 hours if anything wrong.

Emergency Situations

* If leaking, fire, wet or damaged, switch off the breaker and go away from the battery.
* Do not touch the leaking liquid. Do not use water, sand or dry powder extinguisher is usable.

Introduction

The M48-100 lithium iron phosphate battery system is a standard battery system unit. Customers can connect in parallel a certain number of M48-100 batteries (depending on the specific needs) to form a battery pack with a larger capacity. It has prominent advantages in safety, energy density, service life and environmental protection, and combined with a smart battery management system (SBMS), can provide safe and stable one-stop power supply service for customers.

This user's manual systematically introduces the basic structure, parameters, basic procedures and methods of installation and O&M of the battery equipment.

The installation and O&M of this series of products shall abide by the following requirements:

- Make sure to connect the wire correctly, and take care not to connect the positive pole and negative pole reversely. Do not connect the positive pole and negative pole directly with conductors, to prevent short circuit of the battery.
- Batteries of different manufacturers, types, or models, or new and old batteries shall not be used together.
- M48-100 battery can be connected in parallel; and all series of battery packs shall not be connected in series.
- To ensure normal use, check that the electrical parameters of related equipment are compatible and matched with each other before use.
- During long-term storage, the battery should be recharged once every 3 months to 80%SOC.
- Under any circumstances, apart from the technicians of or authorized by our company, nobody shall disassemble any parts of the system without authorization, to avoid any potential risk or personal injury; otherwise, any equipment failure arising therefrom will not be covered by the warranty service.

The products have been strictly inspected before delivery. For any abnormal phenomena such as bulging of the casing, please contact us immediately. The service environment and preservation method of the products will affect, to some extent, their service life and reliability, and therefore, environmental factors should be fully considered before installation and use to ensure that the system works in an appropriate environment;

Statement: With the constant upgrade and improvement of products and technologies, the contents contained herein may become not 100% consistent with the actual products. Please contact us to get the latest information of the products.

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Chapter 1 Safety Instructions

1.1 Safety instructions

- Please pay attention to the safety signs on the product and the manual.
- During the installation and O&M of the equipment, the electrical safety specifications and related operating procedures must be observed; otherwise, personal injury or equipment damage may be caused. The safety precautions mentioned herein are only a supplement to the safety specifications.
- The manufacturer will not be held liable for any consequences of any violation against the general safety specifications or the safety standards for the design, production and use of equipment.

1.2 General safety specifications

- Please deal with the lithium battery in strict accordance with the requirements of this manual;
- Do not short-circuit the positive (+) and negative (-) poles of the lithium battery;
- Install the lithium batteries in a dry and clean environment; do not expose them to water or fire to avoid explosion or other hazards that may endanger personal safety.
- Do not prick the battery with a needle, or strike it with a hammer, or tread on it, or impact it by any other means. Keep it from direct sunlight;
- Keep the lithium batteries in the original package before they are used.
- Make sure that the positive (+) and negative (-) poles of the lithium battery are correctly connected with the charger and discharger.
- Do not use lithium batteries of different manufacturers, models, capacities or types together;
- When the lithium battery is not in use, do not charge it for a long time.
- When charging the lithium battery, make sure to use a suitable charger and charging voltage. It is recommended to use the power supply equipment manufactured by TBB and set the battery item to TBBLFP.
- During service, if the lithium battery needs to be relocated or re-wired, it must be completely disconnected from the power supply and be completely turned off; otherwise there will be a risk of electric shock.
- Do not put metal tools on the battery, as sparks produced or short circuits may cause explosion.
- To avoid fire and electric shock, ensure that all cables have proper electrical characteristics and wire diameters. Do not use cables that have been damaged or have a too small wire diameter.
- In case of a fire, use a dry powder extinguisher to put out the fire. Using a liquid fire extinguisher may result in secondary danger.

Keep the lithium battery away from water, dust and pollution sources. Install the lithium battery in a well ventilated space.

1.3 End-of-life disposal

When a lithium battery is scrapped, do not throw it away randomly; instead, send it to a professional recycling station for disposal.

Chapter 2 Product Description

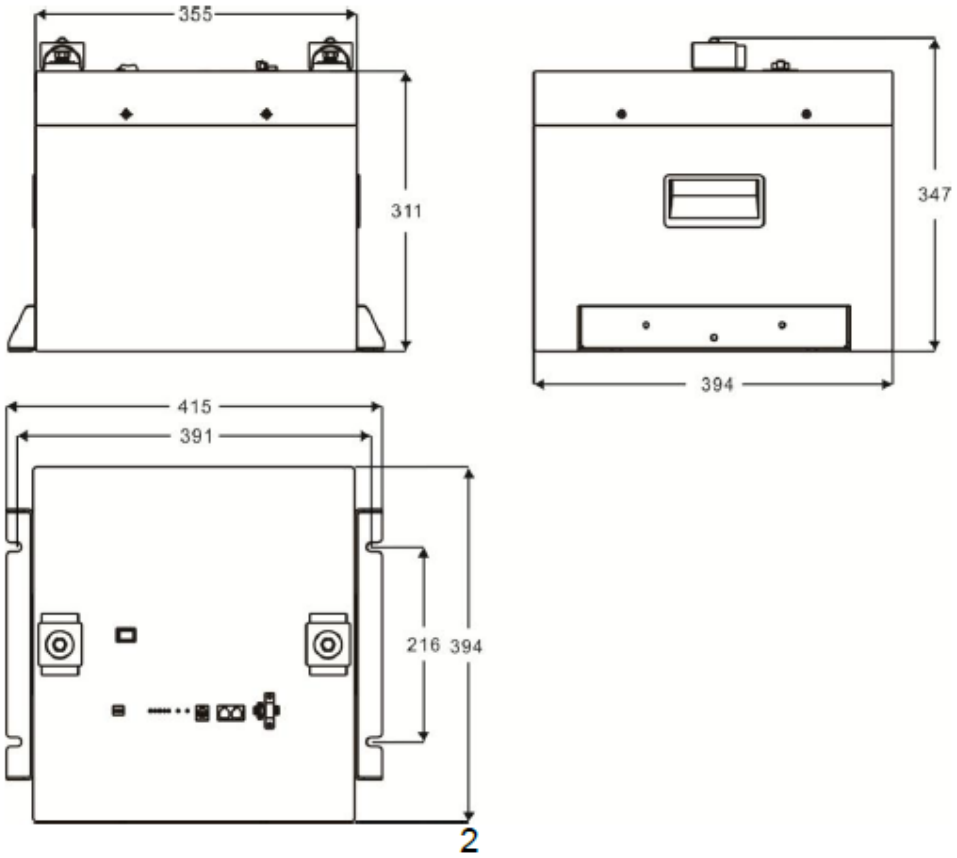
2.1 Product overview

M48-100 is a 48 V lithium battery module with a capacity of 100 Ah. Its positive pole is made of LiFePO4, and it is equipped with a high-performance and reliable BMS to effectively manage the cells, including protection functions against battery cell overvoltage, undervoltage, charging overcurrent, discharging overcurrent, overtemperature, under-temperature, and short circuit. It is built with such functions as battery cell voltage balancing, capacity calculation, SOC calculation, cycle life accumulation, and heating at low temperatures. It is suitable for vehicles, vessels, and other systems.

2.2 Functional characteristics

- The battery complies with the regulations of EU ROHS Directive, has passed SGS certification, and is the optimal environmental-friendly battery that causes no poison or pollution;
- It is made of LiFePO4 at the positive pole, contributing to a high safety performance and a long service life;
- Combined with the high-performance BMS, it can provide protection functions against over-discharge, over-charge, over-current, over-temperature and under-temperature;
- It is capable of automatic charge and discharge management and single cell balancing;
- It allows flexible configuration, and the parallel connection of multiple system units can extend the power supply duration of the system;
- It is self-cooled and generates extremely low noise;
- With low self-discharge, its recharge interval can be as long as six months during storage; and without memory effect, it can be charged or discharged to any SOC;
- It has a wide range of working temperature from -20°C to +55°C, and long life cycle and discharge performance under high temperature;
- It has a small size and light weight.

2.3 Outline dimension drawing



2.4 Definition of external interfaces

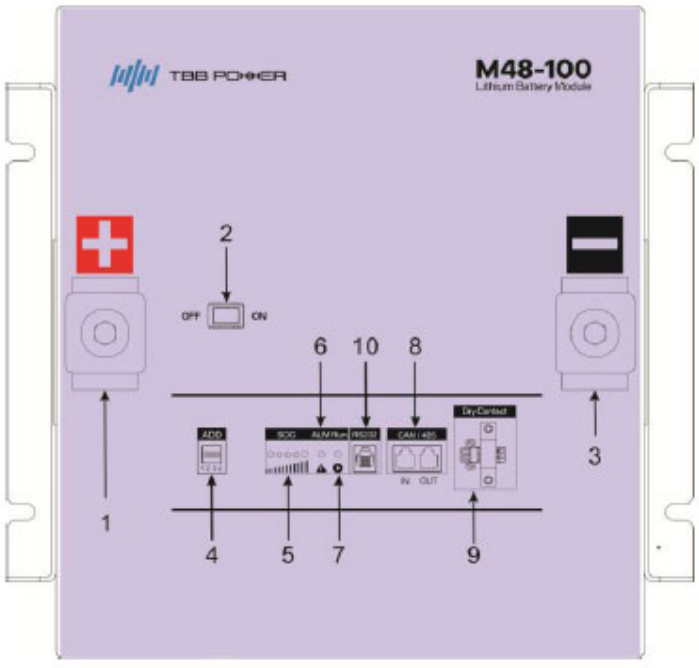


Fig. 2-1 Diagram of M48-100 external interface

Table 2-1 Description of external interfaces

No.	Name	Definition
1	Positive terminal	Positive pole for battery output or for connecting positive pole wire in parallel
2	Power switch	Must be turned to **ON** for working
3	Negative terminal	Negative pole for battery output or for connecting negative pole wire in parallel
4	ADD	DIP switch. See 2.4.1 for details.
5	SOC	The number of green indicators shows the remaining battery power. See 2.4.4 for details.
6	ALM	Red indicator, steady on when an alarm is reported. It can be automatically restored after the conditions triggering the protection are eliminated. See 2.4.4 for details.
7	Run	Green indicator, flashing when in standby, steady on during charging, and flashing during discharging. See 2.4.4 for details.
8	CAN/485	Communication cascade port, which supports CAN and 485 communication. See 2.4.3 for the definition of the interface.
9	Dry Contact	Dry contact. See 2.4.2 for details.
10	COM	RS232 communication interface

2.4.1 Definition and description of ADD DIP switch

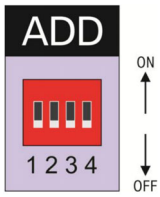


Fig. 2-2 Setting of DIP switch

Table 2-2 Definition of DIP switch setting

No.	Definition
1	Communication protocol selection (standby), normally in OFF state
2	Communication protocol selection (standby), normally in OFF state
3	Code distinguishing the master and slave As the battery module of the master, this DIP switch needs to be set to ON; As the battery module of the slave, this DIP switch needs to be set to OFF;
4	Baud rate selection, generally OFF by default; Upward to ON: CAN 250K RS485 115200 Downward to OFF: CAN 500K RS485 9600

2.4.2 Function description of Dry Contact

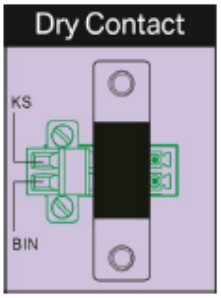


Fig. 2-3 Diagram of Dry Contact

Table 2-3 Description of Dry Contact definition

PIN	Definition
KS and BIN	**OFF**: When the battery is in the working state, if it is detected that the conduction time between KS and BIN pins is more than 3s, the battery output will be turned off. **ON**: When the battery is turned off and the rocker switch is switched to ON, if it is detected that the conduction time between KS and BIN pins is more than 3s and no error is found during the self-inspection of the battery, it will remained on until the battery detects a serious voltage/temperature/current alarm, and then the battery will be cut off or turned off.

2.4.3 Definition of CAN/RS485 interface

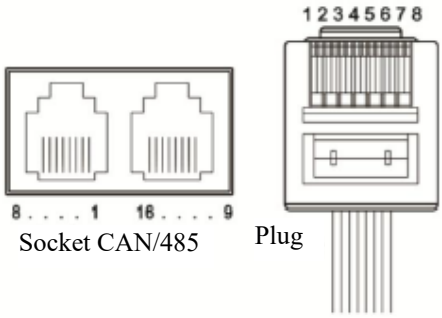


Fig. 2-4 Diagram of CAN/RS485 interface

Table 2-4 Definition of CAN/RS485 interface

PIN port	Color	Definition
PIN1	Orange/white	485B
PIN2	Orange	485A
PIN3	Green/white	XGND
PIN4	Blue	CANH
PIN5	Blue/white	CANL
PIN6	Green	Reserved
PIN7	Brown/white	XIN
PIN8	Brown	Reserved
PIN9	Orange/white	Reserved
PIN10	Orange	Reserved
PIN11	Green/white	XGND
PIN12	Blue	CANH

PIN13	Blue/white	CANL
PIN14	Green	Reserved
PIN15	Brown/white	XOUT
PIN16	Brown	Reserved

2.4.4 Definition of indicator lights

Table 2-5 Definition of indicator lights

Battery state	SOC	LED1	LED2	LED3	LED4	LED5	ALM	RUN
Off		Off	Off	Off	Off	Off	Off	Off
On and standby	80%＜SOC≤100%	Steady on	Steady on	Steady on	Steady on	Steady on	Off	Flash 1
	60%＜SOC≤80%	Steady on	Steady on	Steady on	Steady on	Off	Off	Flash 1
	40%＜SOC≤60%	Steady on	Steady on	Steady on	Off	Off	Off	Flash 1
	20%＜SOC≤40%	Steady on	Steady on	Off	Off	Off	Off	Flash 1
	0%＜SOC≤20%	Steady on	Off	Off	Off	Off	Off	Flash 1
	SOC=0	Off	Off	Off	Off	Off	Steady on/flash	Flash 1
Charging	SOC=100%	Steady on	Steady on	Steady on	Steady on	Steady on	Off	Steady on
	80%＜SOC＜100%	Steady on	Steady on	Steady on	Steady on	Flash 2	Off	Steady on
	60%＜SOC≤80%	Steady on	Steady on	Steady on	Flash 2	Off	Off	Steady on
	40%＜SOC≤60%	Steady on	Steady on	Flash 2	Off	Off	Off	Steady on
	20%＜SOC≤40%	Steady on	Flash 2	Off	Off	Off	Off	Steady on
	0%＜SOC≤20%	Flash 2	Off	Off	Off	Off	Off	Steady on
Discharging	80%＜SOC≤100%	Steady on	Steady on	Steady on	Steady on	Steady on	Off	Flash 3
	60%＜SOC≤80%	Steady on	Steady on	Steady on	Steady on	Off	Off	Flash 3
	40%＜SOC≤60%	Steady on	Steady on	Steady on	Off	Off	Off	Flash 3
	20%＜SOC≤40%	Steady on	Steady on	Off	Off	Off	Off	Flash 3
	0%＜SOC≤20%	Steady on	Off	Off	Off	Off	Off	Flash 3
	SOC=0	Off	Off	Off	Off	Off	Steady on/flash	Flash 3

Flash 1: on for 0.25s, off for 3.75s; **Flash 2**: on for 0.5s, off for 0.5s; **Flash 3**: on for 0.5s, off for 1.5s.

Chapter 3 Product Installation

3.1 General

Only for 48 V system. Do not connect the batteries in series.

Do not install or use damaged lithium batteries.

Make sure that the connections between the lithium battery and the charger and load are correct.

Lithium batteries, if to be connected in parallel, must be of the same brand, model, cycle life, capacity and SOC state.

3.2 Safety preparations

3.2.1 Safety inspection

The system can be installed only by those who have received training in power supply system and fully mastered power supply system knowledge. Throughout the installation, the following safety regulations and local safety regulations shall be observed.

- All external circuits below 48 V connected to the power supply system must meet the SELV requirements defined in IEC 60950.
- If any operation is to be performed inside the cabinet of the power supply system, ensure that the power supply system is not live, and that the battery equipment is turned off.
- Distribution cables shall be routed reasonably and protected to avoid accidental touch of these cables when operating the power supply equipment.
- When installing the battery system, wear the following PPE:

Isolation gloves

Safety goggles

Safety shoes

3.2.2 Inspection of installation environment

- Working temperature: -20°C to +55°C;
- Storage temperature: -10°C to +40°C;
- RH: 5%−85%RH
- Altitude: no more than 4000 m;
- Service environment: installed indoors, exposed to no direct sunlight, wind, conductive dust or corrosive gases; far away from the sea to avoid salt water and high humidity environment; a flat and level floor.

Keep the battery away from fire sources and do not expose it to direct sunlight and rain. Do no store flammable, explosive or corrosive gas or liquid in the service environment of the battery.

3.2.3 Tools and materials

Table 3-1 List of tools

Name	
Flathead (Phillips) screwdriver	Multimeter

Torque wrench	Clip-on ammeter
Diagonal pliers	Insulating tape
Needle-nose pliers	Thermometer
Crimping pliers	Antistatic wrist strap
Wire stripper	Cable tie
Electric drill	Tape measure

3.2.4 Technical preparations

➢ Electrical interface inspection:

The equipment that can be directly connected with the battery can be user's equipment, power supply or other power supply equipment.

- Check whether the user's PV power generation equipment, power supply or other power supply equipment has a DC output interface, and measure whether the output voltage of the DC interface meets the voltage range requirements specified in the technical parameter list in Chapter 8.
- Check that the maximum working current of the user's equipment connected with the battery (inverter DC input) is less than the maximum discharge current of the products used in the technical parameter list in Chapter 8.

➢ Safety inspection:

Keep the battery far away from inflammable, explosive and other hazardous items. Provide fire fighting equipment, such as portable dry powder fire extinguisher, near the equipment. When necessary, provide an automatic fire fighting system.

3.3 Unpacking inspection

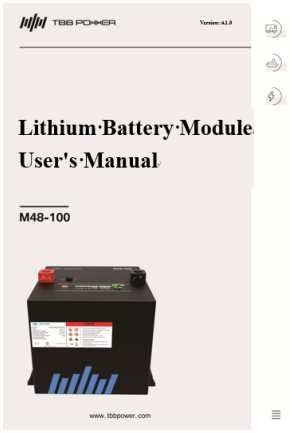
➢ After the equipment arrives at the installation site, load and unload it in accordance with the regulations and protect it from sunlight and rain. Before unpacking, make clear the total number of pieces according to the packing list attached to each packing box, and check whether the packing box is in good condition;

➢ Handle with care during unpacking to protect the surface coating of the contents;

➢ After unpacking the packing box, the installation personnel should first read the technical documents and verify the list, and check whether the contents are complete and intact against the configuration table and packing list. If the internal package of any piece is damaged, check the piece in mode detail and make records. If the accessories are incomplete, please contact your dealer or us.

Table 3-2 Packing list

Component	Specification	Quantity	Attached drawing
Battery	M48-100	1	
Module fixing bracket	L-shaped bracket	2	

Bolt	M6×14 external hexagon internal cross triple combination bolt	6	
Dry contact plug	PLTB1.5-03-BF-3.81	1	
Instruction manual	Instruction manual for M48-100 lithium battery	1	

3.4 Location requirements

Choose a plane, and punch holes according to the requirements for installation hole position in Fig. 3-1.

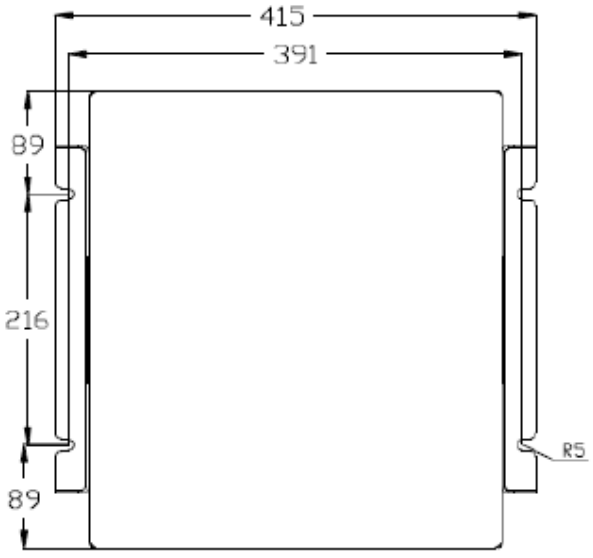


Fig. 3-1 Requirements for installation hole position

3.5 Installation and fixation

- First, fix the base of the battery module to the L-shaped bracket using the bolts M6*14 provided together with the product. Tighten the bolts to the torque of 9−12 N.m. See Fig. 3-2 for the specific fixing position.

Fig. 3-2 Fixation of lithium battery

3.6 Wiring of cells

After connecting the battery power cable to the fuse, connect the communication line with the dry contact line as shown in the figure below, and plug the communication line into the CANOUT interface on the panel (note: not CANIN but CANOUT).

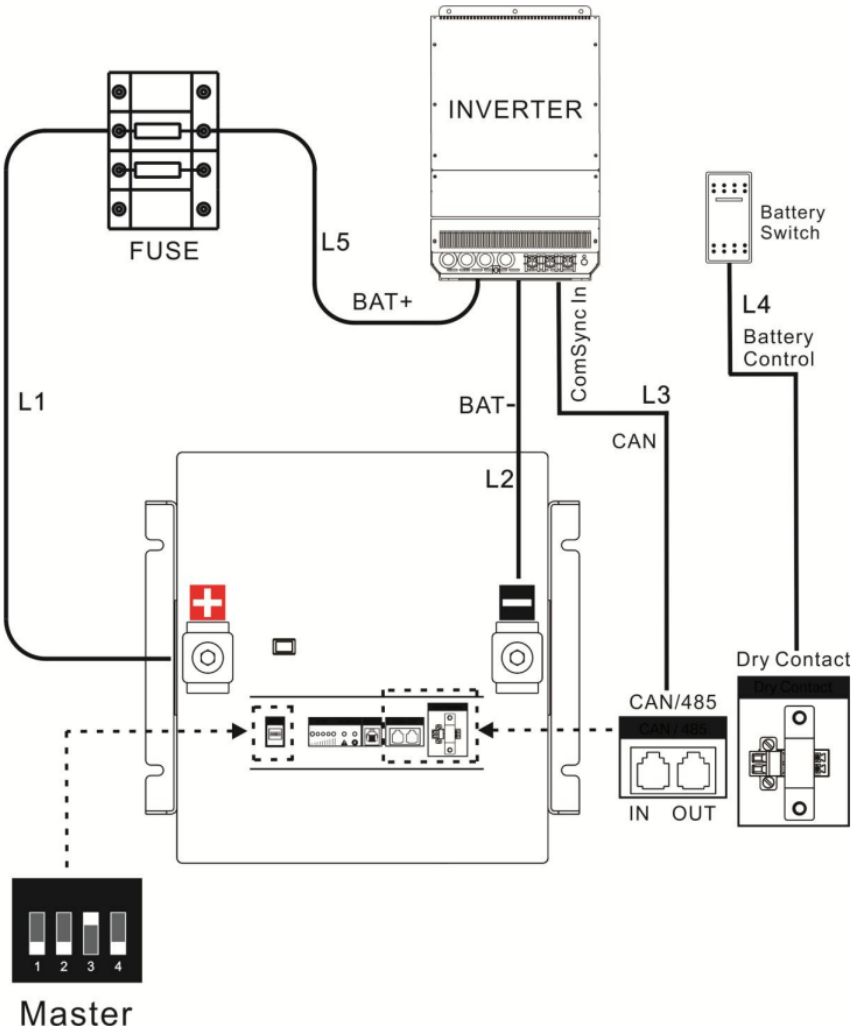


Fig. 3-3 Typical wiring diagram (with TBB inverter)

Table 3-3 Requirements for cable of lithium battery cells

	Recommended cable diameter	Recommended length	Recommended color	Recommended terminal
L1	≥35mm^2	≤0.6m	Red	35-8 copper cable lug
L2	≥35mm^2	≤3.6m	Black	35-8 copper cable lug
L3	UTP standard network cable	≤9m	Black	--
L4	0.75mm^2	--	--	--
L5	≥35mm^2	≤3m	Red	35-8 copper cable lug

3.6.1 Connection of power cables

Prior to wiring, make sure that the rocker switch is turned to OFF and the lithium battery is turned off.

- Step 1: Remove the positive electrode protection cover of the lithium battery;
- Step 2: Connect the cable L5 between the positive terminal of the load or charger and the fuse with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;
- Step 3: Connect the cable L1 between the fuse and the positive terminal of lithium battery with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;
- Step 4: Restore the positive electrode protection cover of the lithium battery;

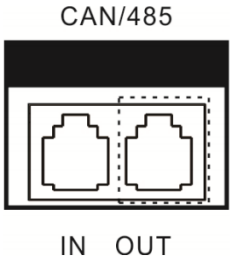
Do not connect the negative terminal first; otherwise, a short circuit may occur.

- Step 5: Remove the negative electrode protection cover of the lithium battery;
- Step 6: Connect the cable L2 between the negative terminal of the load or charger and the negative terminal of lithium battery with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;
- Step 7: Restore the negative electrode protection cover of the lithium battery.

3.6.2 Connection of communication cable and dry contact cable

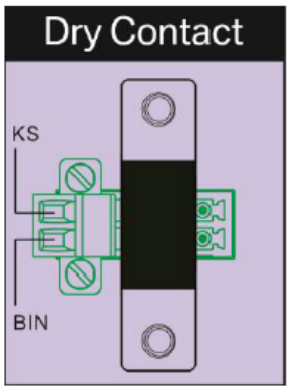
3.6.2.1 Connection of communication cable

Connect the **CAN/RS485** communication interface (OUT) of lithium battery to the corresponding interface of the inverter or system with the UTP standard network cable;



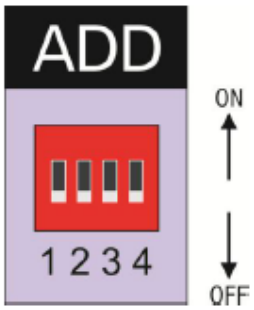
3.6.2.2 Connection of dry contact cable

Connect the wires of the **touch switch** to the KS and BIN plugs of the dry contact, respectively, and then tighten the screws on the terminals with a flathead screwdriver.



3.6.3 On and off of lithium battery

- Check whether each wire harness is connected correctly, and if yes, turn ADD switch 3 to **ON**, press the rocker switch to **ON**, activate the battery through the controller, and the LED indicator on the battery panel will light up.



If, after pressing the power button, the battery status indicator on the front panel is continuously red, please refer to 4.5 "Alarm description" and 4.6 "Fault analysis" for handling. If the fault cannot be eliminated, please contact the distributor in time.

- Use a voltmeter to measure whether the two channels of voltages at the battery end of the circuit breaker are greater than 37 V, and check whether the voltage polarity is consistent with that of the inverter input voltage. If the voltage output at the battery end of the circuit breaker is greater than 37 V, it indicates that the battery has started to work normally;
- After confirming that the battery output voltage and polarity are correct, turn on the inverter, and close the circuit breaker.
- Check whether the indicator lights for the connection between the inverter and battery (communication indicator light and battery connection status indicator light) are normal; if yes, the connection between the battery and the inverter is completed. If the indicator lights are abnormal, find out the reason with reference to the inverter manual or contact the distributor.

3.7 Parallel connection of lithium batteries

3.7.1 Diagram of parallel connection of lithium batteries

To ensure the current sharing among lithium batteries connected in parallel, install and connect the batteries as stated below.

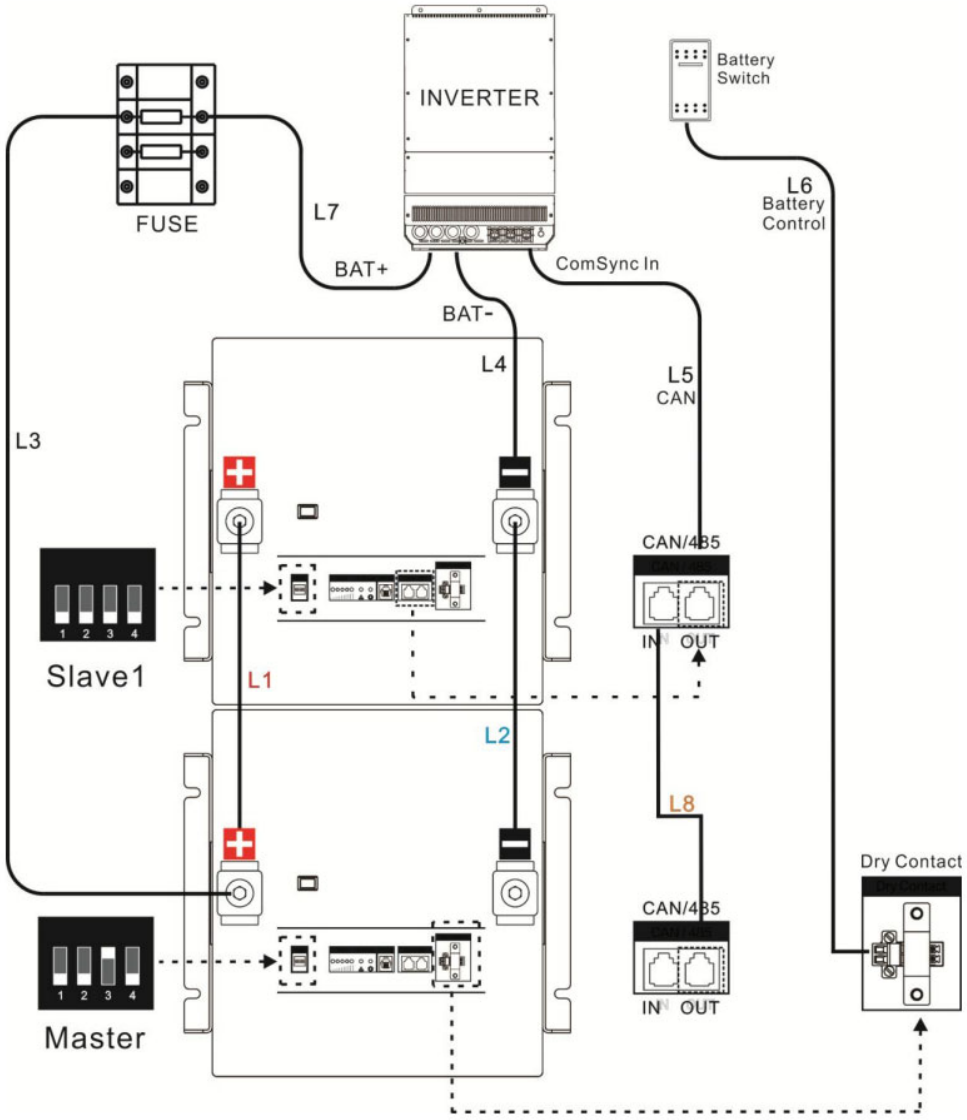


Figure 3-4 Parallel connection wiring diagram (with TBB inverter)

Table 3-4 Requirements for cables for parallel connection of lithium batteries

	Recommended cable diameter	Recommended length	Recommended color	Recommended terminal
L1	≥50mm^2	0.3m	Red	50-8 copper cable lug
L2	≥50mm^2	0.3m	Black	50-8 copper cable lug
L3	≥50mm^2	≤0.6m	Red	50-8 copper cable lug
L4	≥50mm^2	≤3.6m	Black	50-8 copper cable lug
L7	≥50mm^2	≤3m	Red	50-8 copper cable lug
L5	UTP standard network cable	≤9m	Black	--
L8	UTP standard network cable	0.3m	Black	--
L6	0.75mm^2	--	--	--

3.7.2 Connection of power cables

Charge all lithium batteries to 100%SOC before connection. Then check that the rocker switch is turned to OFF and the lithium batteries are all turned off.

Step 1: Remove the positive electrode protection covers of the lithium batteries;

Step 2: Connect the parallel connection cable L1 between the positive terminals of lithium batteries with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;

Step 3: Connect the cable L3 between the fuse and the positive terminal of lithium battery with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;

Step 4: Connect the cable L7 between the positive terminal of the inverter and the fuse with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;

Step 5: Restore the positive electrode protection covers of the lithium batteries;

Do not connect the negative terminal first; otherwise, a short circuit may occur.

Step 6: Remove the negative electrode protection covers of the lithium batteries;

Step 7: Connect the parallel connection cable L2 between the negative terminals of lithium batteries with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;

Step 8: Connect the cable L4 between the negative terminal of the inverter and the negative terminal of lithium battery with a torque of 9−12 N.m, to ensure that the wiring is firm and reliable;

Step 9: Restore the negative electrode protection covers of the lithium batteries.

3.7.3 Connection of communication cable and dry contact cable

3.7.3.1 Connection of communication cable

- Connect the **CAN/RS485-OUT** interface of the lithium battery master with the **CAN/RS485-IN** interface of the slave through the UTP standard network cable L8 (0.3 m).
- Connect the **CAN/RS485-OUT** interface of lithium battery slave with the corresponding interface of inverter or system through the UTP standard network cable L5 (≤9 m).

3.7.3.2 Connection of dry contact cable

Connect the wires of the **touch switch** to the dry contact master (KS and BIN), respectively, and then tighten the screws on the terminals with a flathead screwdriver.

3.7.4 On and off of lithium battery

Check whether each wire harness is connected correctly, and if yes,

- turn the ADD switch 3 of the master to **ON** and all switches of the slave to **OFF**,
- press the rocker switch to **ON**, activate the battery through the switch controller, and the LED indicator on the battery panel will light up.

3.8 Disconnection of lithium battery

Step 1: Turn the **rocker** switches on all lithium batteries to **OFF**;

Step 2: Switch off all devices or chargers connected to the lithium batteries.

Step 3: Disconnect the negative electrode of the lithium battery from the load or charger;

Step 4: Disconnect the positive electrode of the lithium battery from the load or charger.

Chapter 4 Maintenance of Lithium Battery

4.1 General

- Before cleaning and maintenance of the lithium battery, be sure to disconnect all loads and chargers from the lithium battery;
- Before cleaning and maintenance of the lithium battery, close the protective cover on the terminal to prevent the risk of short circuit due to accidental contact of the terminal.

Do not attempt to open or disassemble the lithium battery!

4.2 Safety inspection

- Check the connection points for loose or broken wires, contacts, cracks, deformation, leakage or other types of damage. If any damage to the lithium battery is found, replace it immediately. Do not charge or use a lithium battery that has been damaged. Do not touch the liquid leaked from a broken lithium battery.
- In order for the BMS to calculate the SOC of lithium battery more accurately and eliminate the cumulative error of SOC, it is suggested to fully discharge (to 0%SOC) and fully charge (to 100%SOC) the battery once every three months.

4.3 Surface cleaning

When cleaning the lithium battery, wipe its outer surface with a piece of soft and dry cloth or tissue. Do not use liquids, solvents or abrasives to clean the lithium battery.

4.4 Not in use for a long time

- Press and hold the dry contact **touch switch** for more than 3s, and turn the rocker switch on the lithium battery to **OFF** to turn off the lithium battery to avoid damage to the battery due to over-discharge.
- Regularly charge the battery to 100%SOC, and then discharge it to 80%SOC before storage. The charging interval shall be less than 3 months.

4.5 Alarm description and handling

When the system protection acts or when the system fails, the status indicator light on the front panel will give an alarm, and the specific alarm category can be inquired through the communication interface. In case of such faults as cell overvoltage, charging overcurrent, under voltage protection and temperature protection that affect the output, handle them as described in Table **4-1**.

Table 4-1 Alarm requirements and handling

Status	Alarm category	Alarm indication	Solution
Charging state	Charging overcurrent	ALM red indicator steady on	Stop charging and investigate the reason
	Charging temperature alarm	ALM red indicator steady on	Stop charging
Discharging state	Discharging overcurrent alarm	ALM red indicator steady on	Stop discharging and investigate the reason
	Discharging temperature alarm	ALM red indicator steady on	Stop discharging
	Battery SOC 0%−5%	ALM red indicator flashing	Charge the battery
	Total voltage undervoltage alarm	ALM red indicator steady on	Charge the battery
	Cell undervoltage alarm	ALM red indicator steady on	Charge the battery

Standby state	Short circuit protection	ALM red indicator steady on	Check the circuit connected to the battery output terminal, and check the power ratio between the battery and the inverter (some inverters have a large surge current at the instant of starting, which may trigger the short-circuit protection of BMS).
	Battery SOC 0%−5%	ALM red indicator flashing	Charge the battery
	Serious battery over-discharge	ALM red indicator flashing	Connect the upper computer to measure the voltage of a single cell. If the voltage is lower than 2 V, do not charge and use the battery pack again.

4.6 Analysis of common faults and solutions

The analysis of common faults and solutions are as stated in Table 4-2.

Table 4-2 Analysis of common faults and solutions

No.	Fault	Cause analysis	Solution
1	The indicator light unresponsive after power-on	The power switch fails	Power switch
		No dry contact switch-on signal	Dry contact status
2	No DC output and the red indicator lighting up	The battery data status is abnormal	Connect the network manager to the background to read the battery information
3	DC power supply duration too short	The battery capacity reduces	Replace the battery
4	The battery cannot be fully charged	Charging voltage too low	Adjust the charging voltage to 5.35 V
5	Sparks occurring at the power line port at the instant of power-on, and the red indicator lighting up	The power supply connecting cable is short-circuited	Turn off the battery, investigate the cause of short circuit and eliminate it

Chapter 5 Storage

Please follow the instructions for storage given herein, to extend the service life of lithium battery during storage. Otherwise, the lithium battery may suffer from over-discharge or damage. If the lithium battery is found to have been damaged, do not try to charge or use it.

See Chapter 8 for more details about the environmental conditions for storage.

The self-discharge rate of lithium battery during storage is less than 3% per month.

During the storage of lithium batteries, please turn the rocker switch to OFF.

- Charge the lithium battery to 80%SOC before storage.
- Disconnect all loads and chargers from the lithium battery.
- Press the **rocker** switches of all batteries to **OFF**.
- Close the terminal protection cover.
- Charge the battery regularly to 80%SOC every three months; Upon completion of charging, press the **rocker** switches of all batteries to **OFF**.

Chapter 6 Transportation

First consult all local, national and international applicable laws and regulations before transporting lithium batteries.

In some cases, the transportation of scrapped, damaged or recalled lithium batteries may be specially restricted or prohibited.

Lithium battery is classified as Category 9 hazardous goods for transportation in UN 3480.

Chapter 7 Scrapping or Recycling

Discharge the lithium battery to 0%SOC before scrapping it. Use electrical tape or other insulating tape to wrap the positive and negative poles of the battery to prevent short circuit.

For the scrapping and recycling of lithium battery, the local, state and federal laws and regulations shall apply. The lithium battery can also be sent back to the manufacturer for recycling and disposal.

Chapter 8 Technical Parameter List

Model	M48-100
Cell type	LiFePO4
Rated capacity	100Ah
Rated SOC	4.8kWh
Rated voltage	48V
Charge voltage	52V~54.5V
Maximum charge current	90A
Continuous discharge current	<100A
Maximum pulse discharge current	100A (15S)
	105A (300ms)
Charge temperature range	0°C~55°C
Discharge temperature range	-20°C~55°C
Storage conditions (less than 3 months)	-20°C~40°C, 30%~80%SOC, <65%RH
Storage conditions (less than 6 months)	-20°C~35°C, 30%~80%SOC, <65%RH
Operating RH range	5%~90%RH
Outline dimensions	415 mm*394 mm*347 mm (including the height of bottom mounting bracket and top terminal)
Weight	Net weight: 50 kg; gross weight: 54 kg
Protection level	IP20
Certificate	UN38.3
Shipping grade	UN3480
Life cycle	> 3000 (discharge at 50 A and charge at 50 A, DOD100%, at 25°C)
Maximum allowable number of batteries that can be connected in parallel	4

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