TBB POWER

Version: A1.0

USER MANUAL

LITHIUM BATTERY MODULE

M12-100



www.tbbpower.com



NO OPEN FLAME



DO NOT EXTINGUISH WITH WATER



EXTINGUISH WITH DRY POWDER EXTINGUISHER



PROHIBIT UNAUTHORIZED BREAKER RESET



ELECTRIC SHOCK RISK



FIRE RISK



STUDY MANUAL FIRST



NO RANDOM DISPOSAL

WARNING: PAY ATTENTION TO FIRE PREVENTION, ONLY SUITABLE FOR INSTALLATION ON NON-FLAMMABLE SURFACES

CAUTION: ALL BATTERIES MUST HAVE BEEN TURNED OFF BEFORE SERVICING

MADE IN CHINA

Preface

The M12 series lithium iron phosphate battery system is a standard and high performance lithium battery system. It supports parallel connection. It has obvious advantages in terms of safety, energy density, service life, and environmental protection. With an intelligent battery management system, it provides customers with a safe and stable one-stop guaranteed power supply service.

This user manual introduces the product structure, parameters, basic procedures, installation methods, as well as operation and maintenance in detail.

Please follow below request during the procedure of installation, operation and maintenance:

- Please connect wires properly while installation, do not reverse connect. To avoid short circuit, please do not connect positive and negative poles with conductor (wires for instance).

- Please do not mix batteries from different manufacturers, different types or models, nor old and new together.

- The M12-100 lithium battery supports parallel connection of the same battery type, all series of battery packs are prohibited from being connected in series. Please ensure that the electrical parameters of the related equipment are compatible before use.

- If battery is in storage for over 3 months, or battery is not fully charged for 3 months, maintenance work is required before use by charging the battery to 100% SOC, and keeping the charger ON for more than 8 hours. If the battery continues to be in storage, it is advised to adjust the SOC to 20%~30%.

- For your safety, please do not arbitrarily dismantle any components in any circumstances unless a specialist or an authorized one from TBB Power. Device breakdown due to improper operation will not be covered under warranty.



The product has been strictly inspected before shipment. If you find abnormal phenomena such as swelling of the shell, please contact the sales or TBB Power. The use environment and storage method have a certain impact on the service life and reliability of this product, so environmental factors must be fully considered before installation and use to ensure that the system works in a suitable environment.

Disclaimer: Due to the continuous update and improvement of products and technologies, the content in this document may not completely match the actual product, please understand. For product updates, please contact your sales or TBB Power.

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1. Safety precautions

1.1 Safety precautions

- Please pay attention to the safety signs on this product and manual.
- During product installation, operation and maintenance, electrical safety regulations and related operating procedures must be observed, otherwise it may cause personal injury or product damage. The safety precautions mentioned in the manual are only a supplement to the safety regulations.
- The manufacturer does not assume any responsibility caused by violation of general safety operation requirements or violation of safety standards for design, production and use of equipment.

1.2 General safety precautions

- Please strictly follow the requirements of this manual to dispose of lithium batteries.
- Do not short-circuit lithium batteries.
- Lithium batteries must be installed in a dry and clean environment. It is strictly forbidden to put the battery in water or fire to avoid explosion or other dangers.
- Please do not stab, hit, trample or strike the battery in any other way. Avoid direct sunlight.
- Please do not remove the lithium battery from the original packaging before use.
- Ensure that the positive (+) and negative (-) polarities of the lithium battery and the charging and discharging equipment are correctly connected.
- It is forbidden to use lithium batteries of different manufacturers, models, capacities, and types in parallel.
- Do not charge the lithium battery for a long time when not in use.
- When charging the lithium battery, be sure to use the correct charger and charging voltage. It is recommended to use the power supply equipment manufactured by TBB.
- Before moving or rewiring the system, to avoid a potential risk of electric shock, please CUT OFF the power properly, make sure the system is completely shut down.
- Do not place metal tools on the battery, to avoid sparks or short circuits, which can cause an explosion.
- To avoid fire and electric shock, please ensure that all cables have good electrical characteristics and have suitable wire diameter. Do not use damaged cables.
- When catching a fire, please use a dry powder fire extinguisher to extinguish the fire. Use liquid fire extinguisher may cause secondary hazards.



Lithium batteries should be kept away from water, dust and pollution sources. Please install the lithium battery in a well-ventilated environment.

1.3 Disposal



After the lithium battery is scrapped, it cannot be discarded at will, and should be sent to a special recycling station for disposal treatment.

2. Product introduction

2.1 Brief introduction

M12-100 is a 12V lithium battery with a battery capacity of 105Ah. The positive electrode of the battery is made of lithium iron phosphate (LiFePO4) material. It configures high-performance and high-reliability BMS to effectively manage the cells, including cell overvoltage, under-voltage, charge over-current, discharge over-current, over-temperature, low temperature, short circuit and other protection functions. It also has built-in cell voltage balance, capacity calculation, SOC calculation, cycle life accumulation and low temperature heating functions. It is suitable for energy storage systems of vehicles, ships etc.

2.2 Features

- The positive electrode of the battery is made of lithium iron phosphate (LiFePO4) material, which has good safety performance and long cycle life. 4000 cycles @25℃, 0.5C charge and discharge, 80% DoD.
- High-performance BMS with over-discharge, over-charge, over-current, temperature and other protection functions. With automatic charge and discharge management and single cell balance function.
- Supports up to 8 units in parallel, so that the total capacity can reach 12V 840Ah.
- Self wake-up function, convenient and worry-free. The battery will automatically wake up and enter the charging state, when connected to external charger (>14V), even if the battery is turned OFF.
- It can work with VS28-LS display panel for battery ON/OFF control and battery monitoring (voltage, current, SOC etc.).
- Low self-discharge rate: consumes less than 100mA in standby mode when powered ON. When the battery is turned OFF, the idle consumption drops to less than 0.1mA.
- Wide working temperature range, -30℃ ~ +63℃. Good cycle life and discharge performance at high temperature.
- Low temperature heating unit can realize automatic battery thermal management under low temperature conditions. With external power supply (mains power, solar energy, vehicle engine), the battery temperature can be automatically heated to meet the requirements of charging and discharging under low temperature conditions. It will take about 30 minutes to heat from -20℃ to a temperature that allows charging.
- The battery has small size, light weight and high energy density.
- With one dry contact output which capacity as 2A/30Vdc, and it’s programmable.

2.3 Product dimensions



Figure 2-1 Picture of M12-100

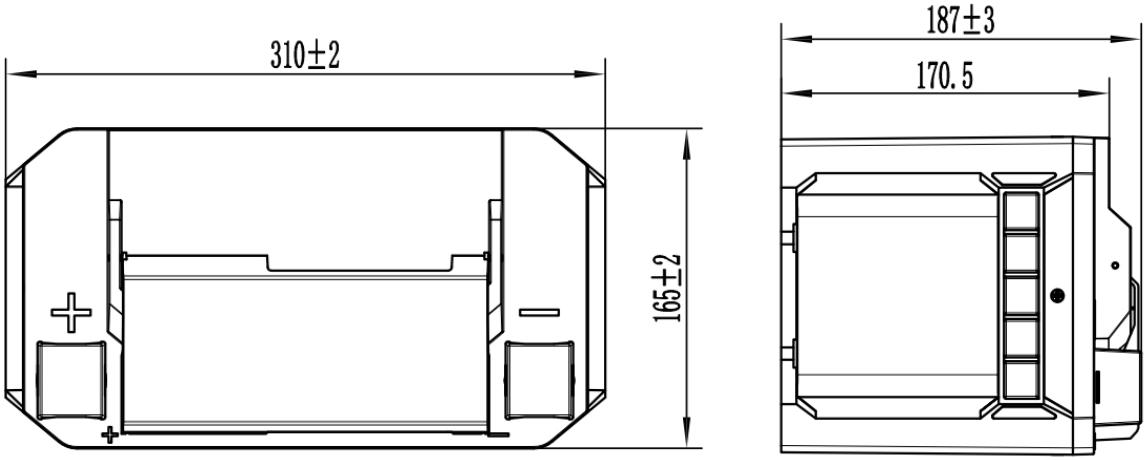


Figure 2-2 Dimensions of M12-100

2.4 External interface definition

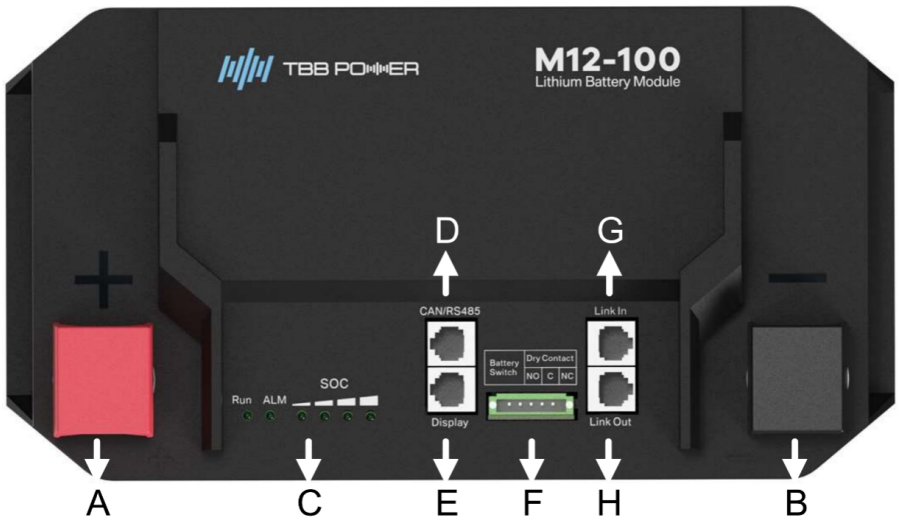


Figure 2-3 M12-100 external interfaces

Table 2-1 External interface description

No.	Silk screen		Name	Definition
A	+		Positive terminal	Battery output positive or parallel positive, M8.
B	-		Negative terminal	Battery output negative or parallel negative, M8.
C	Run		Running indicator	Green light, always on when charging, flashing in both discharge and charge only modes. see 2.4.2 for details.
	ALM		Fault indicator	Red light, flashing when protection. Generally, it can be automatically restored after the condition that triggers the protection is cleared. See 2.4.2 for details.
			SOC indicator	The number of green lights shows the remaining battery power. See 2.4.2 for details.
D	CAN/RS485		External communication port	External communication port, support CAN and RS485 communication.
E	Display		Monitor or display port	For connecting remote switch or VS28-LS display panel.
F	Battery Switch		Remote switch interface	Remote switch interface, connect to Battery Switch to remotely switch ON/OFF the lithium battery.
	Dry Contact	NO	Output dry contact port (support 2A/30VDC)	Relay output normally open contact.
		C		Relay output common end.
		NC		Relay output normally closed contact.
G	Link In		Parallel communication interface	Connect to the Link Out of the previous battery.
H	Link Out			Connect to the Link In of the next battery.

2.4.1 CAN/RS485 interface definition

Table 2-2 CAN/RS485 interface definition

Pin terminal	Color	Definition
PIN1	orange/white	--
PIN2	orange	--
PIN3	green/white	RS485_A
PIN4	blue	CANH
PIN5	blue/white	CANL
PIN6	green	RS485_B
PIN7	brown/white	--
PIN8	brown	--

2.4.2 Indicator light definition

Table 2-3 Indicator light definition

Battery status	SOC	LED1	LED2	LED3	LED4	ALM	Run
Charging	SOC=100%	ON	ON	ON	ON	Flashing during protection and always OFF during normal operation	ON
	75%≤SOC<100%	ON	ON	ON	Flash1		ON
	50%≤SOC<75%	ON	ON	Flash1	OFF		ON
	25%≤SOC<50%	ON	Flash1	OFF	OFF		ON
	0%≤SOC<25%	Flash1	OFF	OFF	OFF		ON
Discharging	75%≤SOC≤100%	ON	ON	ON	ON		Flash2
	50%≤SOC<75%	ON	ON	ON	OFF		Flash2
	25%≤SOC<50%	ON	ON	OFF	OFF		Flash2
	10%≤SOC<25%	ON	OFF	OFF	OFF		Flash2
	0%≤SOC<10%	Flash2	OFF	OFF	OFF		Flash2
Charge only	SOC=100%	ON	ON	ON	ON		Flash1
	75%≤SOC<100%	ON	ON	ON	Flash1		Flash1
	50%≤SOC<75%	ON	ON	Flash1	OFF		Flash1
	25%≤SOC<50%	ON	Flash1	OFF	OFF		Flash1
	0%≤SOC<25%	Flash1	OFF	OFF	OFF		Flash1
Flash 1: Flash quickly. ON for 0.5s, OFF for 0.5s. Flash 2: Flash slowly. ON for 0.5s, OFF for 1.5s.							

2.5 Optional accessories

2.5.1 Typical wiring

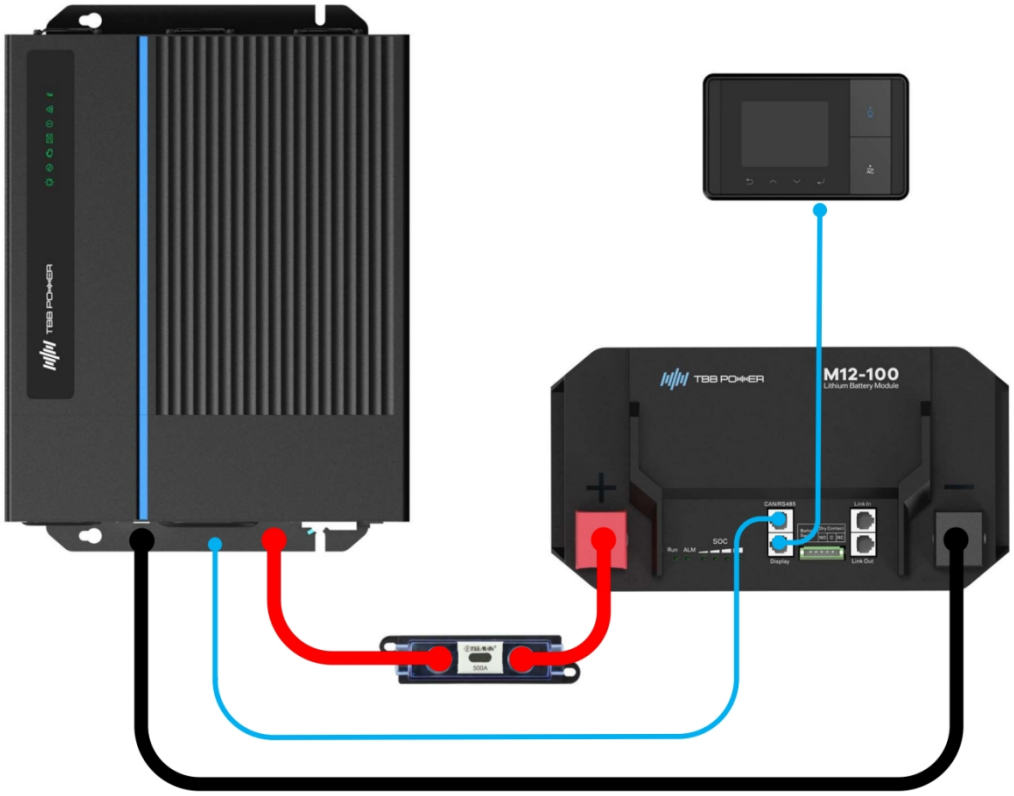


Figure 2-4 Typical wiring diagram

2.5.2 Power cable installation package (optional)

Table 2-4 Power cable installation package list

Name	Model/Specification	Picture	Q'ty
Fuse holder	BANL-B		1
Fuse	ANL350, 350A/32V		1
Power cable	50 mm^2, 0.3m, red. Braided cable, soft and easy to bend, easy to install.		1

To connect the fuse, please follow the steps below:

Step 1: Open the protective cover of the fuse holder, as shown in Figure 2-5.



Figure 2-5 Open the protective cover of the fuse holder

Step 2: Install the fuse and power cable, the recommended torque is 12N.m, as shown in Figure 2-6.



Figure 2-6 Install the fuse and power cable

Step 3: Remove the protective cover of the lithium battery (+) terminal, as shown in Figure 2-7.



Figure 2-7 Remove the protective cover of the lithium battery

Step 4: Connect the other end of the power cable to the lithium battery (+) terminal. The recommended torque is 12N.m, as shown in Figure 2-8.



Figure 2-8 Connect the power cable to the lithium battery (+) terminal

2.5.3 VS28-LS display panel (optional)

An external VS28-LS display panel can be used as the display unit of the lithium battery, which can display the current operating information of the lithium battery. It is connected to the lithium battery through a UTP standard network cable.

The VS28-LS display panel has a built-in Bluetooth module, and the operating status of the lithium battery can be monitored through the APP.

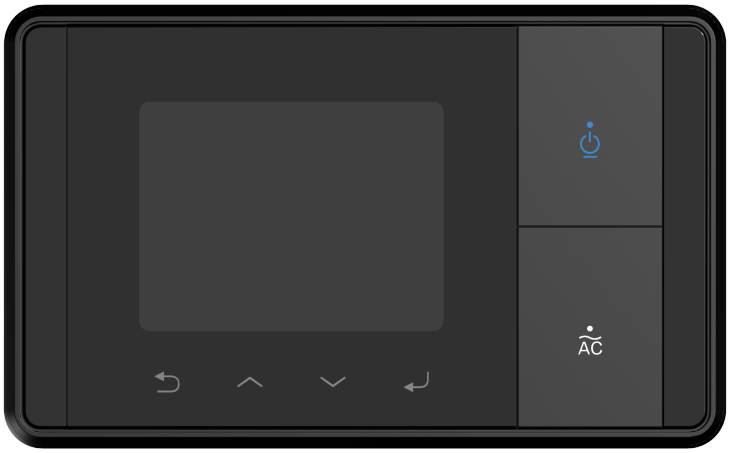


Figure 2-9 VS28-LS display panel

When using VS28-LS as an external display unit of lithium battery, please follow the steps below:

Step 1: Use UTP standard network cable to connect VS28-LS and lithium battery Display interface.

Step 2: You can press the battery button  of VS28-LS display unit to switch ON/OFF the lithium battery.

2.5.4 Remote Battery Switch (optional)

The Remote Battery Switch must be a self-locking switch with a light display, which can be connected to the Display interface. And the battery can be turned ON or OFF through the Battery Switch. Remote switch cable is optional.



Figure 2-10 Remote Battery Switch

To use the Battery Switch, please follow the below steps:

Step 1: Please connect the Battery Switch to the “Display” interface, as shown in Figure 2-11. The lithium battery can be turned ON/OFF through the Battery Switch.



Figure 2-11 Schematic diagram of Battery Switch installation and wiring

When the battery status is different, the light status of the Battery Switch will also change accordingly, as detailed in the table below:

Table 2-5 Indicator definition of Battery Switch

Battery status	The light of the Battery Switch
Shutdown	OFF
Power on	ON
Charge only	Flash（ON for 0.5s, OFF for 1.5s

3. Product installation

3.1 General description



Limited to 12V system use. It is forbidden to install and use in series!
Do not install or use damaged lithium batteries!
Please make sure that the polarity connection between the lithium battery, the charger and load is correct!
When using lithium batteries in parallel, be sure to use lithium batteries of the same brand, model, cycle life, capacity and SOC status.

3.2 Unpacking inspection

Check whether the lithium battery is in good condition after unpacking. If the lithium battery is damaged, please contact your dealer or our company. Do not install or use damaged lithium batteries!

Please check whether the accessories are complete according to the packing list. If the accessories are not complete, please contact your dealer or our company.

Component name	Specification	Q'ty	Picture
Lithium battery	M12-100	1	
Battery Switch short wires	/	1	
User manual	M12-100	1	
Bolt	M6×20	4	

3.3 Positioning and perforation

Please select a sturdy surface and drill holes according to the installation positioning requirements in Figure 3-1.

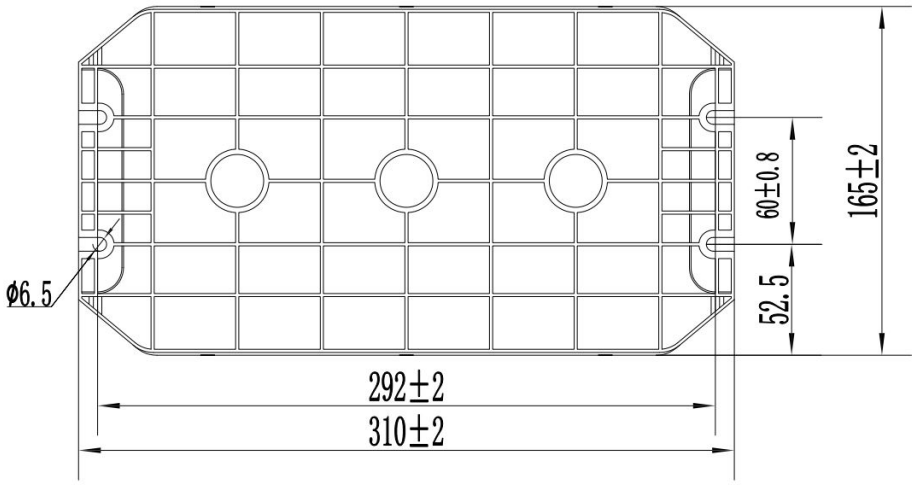


Figure 3-1 Installation positioning requirement

3.4 Installation fixed

Before use, lithium batteries must be effectively fixed. The battery should be installed vertically and cannot be fixed upside down. The fixing bolt is M6 and the fixing torque is 9N.m. The specific fixing position is shown in Figure 3-2.



Figure 3-2 Fixing of lithium battery

3.5 Single lithium battery wiring

3.5.1 Typical wiring diagram of single battery

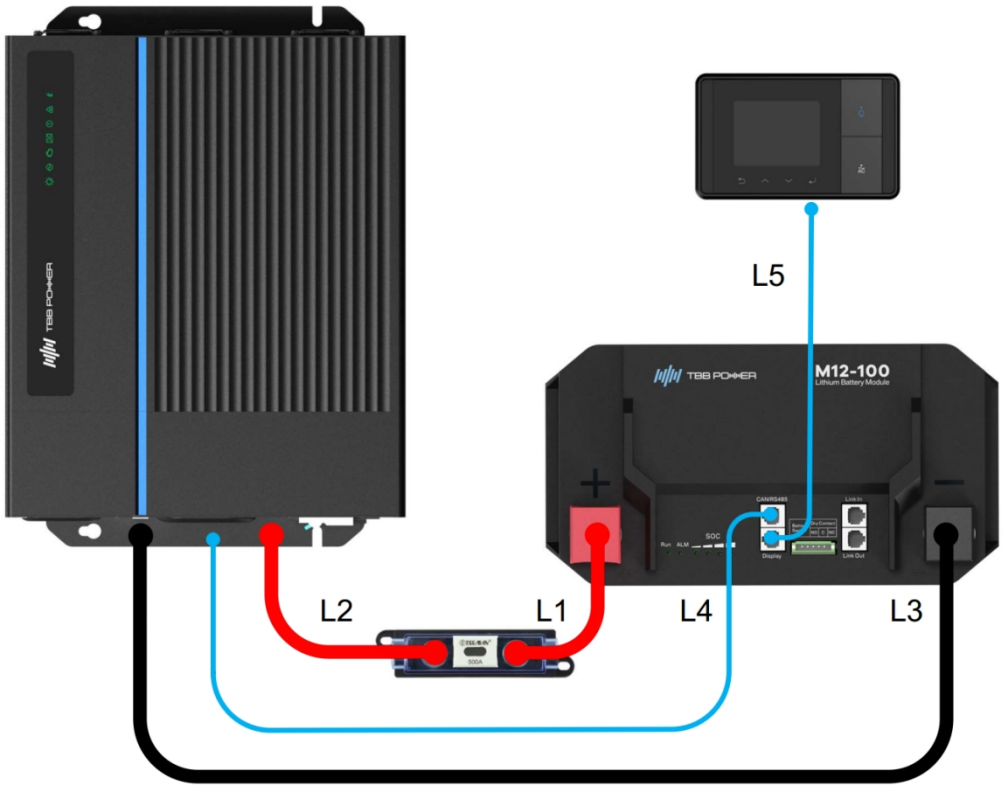


Figure 3-3 Typical wiring diagram

Table 3-1 Cable requirements

	Recommended wire diameter	Recommended length	Recommended color	Recommended terminal
L1	≥50mm^2	≤2.5m	Red	50-8 copper terminal
L2	≥50mm^2	≤0.5m	Red	50-8 copper terminal
L3	≥50mm^2	≤3m	Black	50-8 copper terminal
L4	UTP standard network cable	≤9m	Blue	--
L5	UTP standard network cable	≤9m	Blue	--

3.5.2 Power cable wiring



Please make sure to disconnect the Battery Switch or VS28-LS from the lithium battery before wiring, and the lithium battery is in the OFF state!

Step 1: Remove the protective cover of the lithium battery (+) terminal.

Step 2: Connect the cable L1 between the fuse and the (+) terminal of the load or charger. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 3: Connect the cable L2 between the fuse and the (+) terminal of the lithium battery. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 4: Install the protective cover of the lithium battery (+) terminal.

Step 5: Remove the protective cover of the lithium battery (-) terminal.

Step 6: Connect the cable L3 between the (-) terminal of the load or charger and the (-) terminal of lithium battery. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 7: Install the protective cover of the lithium battery (-) terminal.



Do not connect the (-) terminal first, otherwise it may cause a short circuit!

3.5.3 Communication cable wiring

Step 1: Please use UTP standard network cable to connect the CAN/RS485 communication interface of the lithium battery and the corresponding interface of the inverter or system.

Step 2: Please connect the Display communication interface of the lithium battery to the VS28-LS.

Note: If the VS28-LS display panel is selected, do not connect the Battery Switch wiring (choose either).

3.5.4 Setting of output dry contact

The battery's output dry contact will activate by default when the State of Charge (SOC) drops below 5%. Users can configure the Dry Contact function via VS28-LS or mobile APP.

3.5.5 Lithium battery power ON and OFF

Power ON：Press the Battery button on the VS28-LS to turn ON the lithium battery.

Power OFF：Press the Battery button on the VS28-LS again to turn OFF the lithium battery.

3.6 Connect lithium batteries in parallel

3.6.1 Lithium battery parallel connection diagram

The maximum number of lithium batteries in parallel is 8. To ensure the current balance of lithium batteries in parallel, please follow the installation and wiring requirements below.

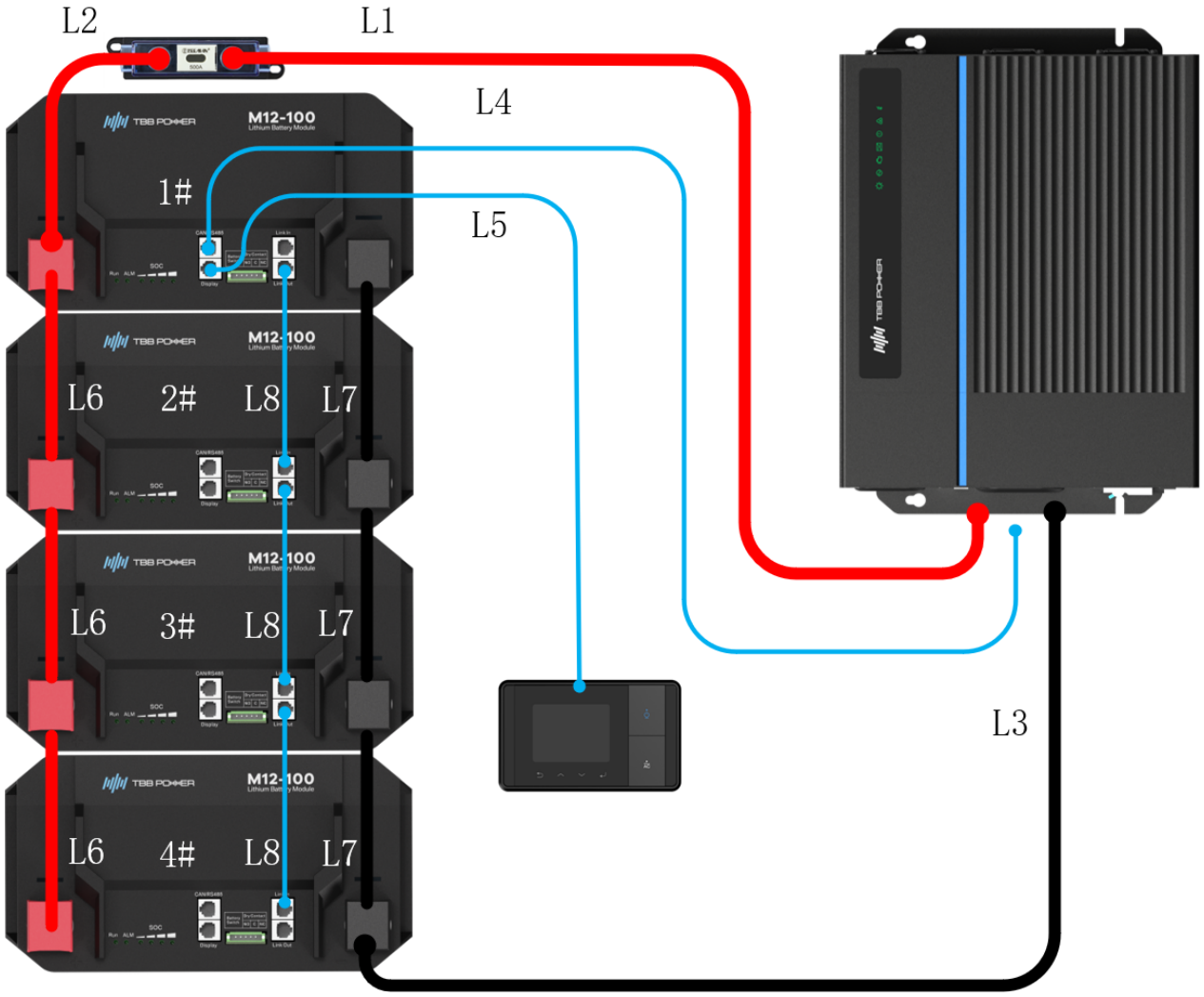


Figure 3-4 Parallel wiring diagram

Table 3-2 Cable requirements

	Recommended wire diameter	Recommended length	Recommended color	Recommended terminal
L1	≥50mm^2	≤2.5m	Red	50-8 copper terminal
L2	≥50mm^2	≤0.5m	Red	50-8 copper terminal
L3	≥50mm^2	≤3m	Black	50-8 copper terminal
L4	UTP standard network cable	≤9m	Blue	--
L5	UTP standard network cable	≤9m	Blue	--
L6	≥50mm^2	0.25m	Red	50-8 copper terminal
L7	≥50mm^2	0.25m	Black	50-8 copper terminal
L8	UTP standard network cable	≤9m	Blue	--

3.6.2 Power cable wiring

Please charge all lithium batteries to 100% SOC before wiring! After charging, make sure to disconnect the Battery Switch or VS28-LS from the lithium battery, and the lithium battery is in the OFF state!

Step 1: Remove the protective cover of the lithium battery (+) terminal.

Step 2: Connect the parallel cables L6 (positive) between the lithium batteries. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 3: Connect the cable L1 between the fuse and the (+) terminal of the load or charger. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 4: Connect the cable L2 between the fuse and the (+) terminal of the lithium battery. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 5: Install the protective cover of the lithium battery (+) terminal.

Step 6: Remove the protective cover of the lithium battery (-) terminal.

Step 7: Connect the parallel cables L7 (negative) between the lithium batteries. Torque requirement: 12N.m. Make sure the wiring is tight and firm.

Step 8: Connect the cable L3 between the (-) terminal of the load or charger and the (-) terminal of lithium battery. Torque requirement: 12 N.m. Make sure the wiring is tight and firm.

Step 9: Install the protective cover of the lithium battery (-) terminal.

Do not connect the (-) terminal first, otherwise it may cause a short circuit!

3.6.3 Communication cable wiring

Step 1: Connect the communication cable L8 between lithium batteries (1#~4#).

Step 2: Please use UTP standard network cable to connect the CAN/RS485 communication interface of the 1# lithium battery and the corresponding interface of the inverter or system.

Step 3: Please connect the Display communication interface of the #1 lithium battery to the VS28-LS.

Note: If the VS28-LS display panel is selected, do not connect the Battery Switch wiring (choose either).

3.6.4 Setting of output dry contact

The battery's output dry contact will activate by default when the State of Charge (SOC) drops below 5%. Users can configure the Dry Contact function via VS28-LS or mobile APP.

3.6.5 Lithium battery power ON and OFF

Power ON: Press the Battery button on the VS28-LS to turn ON the lithium battery.

Power OFF: Press the Battery button on the VS28-LS again to turn OFF the lithium battery.

3.7 Disconnect the lithium battery

Step 1: Please confirm that the battery is in the OFF state first.

Step 2: Please disconnect the VS28-LS or the Battery Switch from the lithium battery.

Step 3: Please turn OFF all devices or chargers connected to the lithium battery.

Step 4: Please disconnect the cables between the negative pole of the lithium battery and the load or charger.

Step 5: Please disconnect the cables between the positive pole of the lithium battery and the load or charger.

4. Battery maintenance

4.1 General description

- Before cleaning and maintaining the lithium battery, be sure to disconnect all loads and charging equipment from the lithium battery.
- Before cleaning and maintenance of the lithium battery, please put a protective cover on the terminal to prevent the risk of short circuit caused by contacting the terminal during cleaning and maintenance.



Do not try to open or disassemble the lithium battery!

4.2 Security check

- Check the battery for cracks, deformations, leaks, or other types of damage. Check if the battery connection points are loose or if the wire skin is damaged. If the lithium battery is found to be damaged, it must be replaced in time. It is forbidden to charge or use damaged lithium batteries. Do not touch the liquid leaked from a ruptured lithium battery.
- In order to enable the BMS to calculate the SOC of the lithium battery more accurately and eliminate the cumulative deviation of the SOC, it is recommended to complete a full discharge (0% SOC) and full charge (100% SOC) every 3 months.

4.3 Surface clean

If you need to clean the lithium battery, please wipe the outer surface of the lithium battery with a soft, dry cloth or paper towel. Do not use liquids, solvents or abrasive tools to clean lithium batteries.

4.4 Not used for a long time

When the battery is not in use for a long time, it needs to be charged to 80% capacity regularly, and the charging cycle is required to be less than 3 months.



If the lithium battery is not used for a long time, please disconnect the VS28-LS or Battery Switch, and confirm that the light on the lithium battery panel is OFF.

4.5 Use the battery in a low temperature environment

When the cell temperature is below 2℃, the lithium battery will report a low temperature fault, and the user cannot directly charge the lithium battery. In the low temperature environment, when the external charger is connected (charging voltage >14V), the lithium battery will automatically turn ON the heating function. After the automatic heating of the lithium battery is completed, the battery can be charged normally and the battery low temperature alarm will be released. It will take about 30 minutes to heat from -20℃ to a temperature that allows charging for M12-100.

When the ambient temperature is lower than -30℃, the battery cannot be discharged and a low temperature fault alarm will be triggered. The user can connect an external charger to heat the battery before discharging.

4.6 Over-discharged battery

When the battery is discharged to low voltage protection, if it continues to wait for 10 minutes without charging, the battery will automatically shut down. At this point, press the Battery Switch or the battery button on the VS28-LS to restart the battery. After restarting the battery, please charge it as soon as possible within 10 minutes!

If the battery cannot be restarted using this method, you can also directly turn ON the charger to

charge the battery. If the charging voltage is greater than 14V, the battery will automatically wake up the power and start charging.



Please charge your battery as soon as you can when battery is in low voltage protection, or it might cause over-discharged (less than 10Vdc) and permanent damage to cells without being rech arged within 3 months. If keep battery used in this case, it will cause hazard like fire, explosion etc.

4.7 Charge only mode

The battery supports a charge-only mode. When the battery is in the OFF state, the charger is allowed to wake up the battery and initiate charging, but the battery will not discharge to the outside. The charging voltage needs to be greater than 14V. When the battery is in charging only mode, the running light on the battery will flash rapidly, as detailed in section 2.4.2.

5. Storage

Please follow the storage instructions in this manual to increase the service life of the lithium battery during storage. If you do not follow the storage instructions in this chapter for storage, the lithium battery may be over-discharged and damaged. If the inspection reveals that the lithium battery is damaged, please do not try to charge or use it.

- The optimum storage conditions of the battery are: 0℃~35℃, 20%~80% SOC, <65%RH.
- The acceptable storage conditions for a short time (within one month) are: -20℃~45℃, 20%~80% SOC, <65%RH.
- If the battery storage condition deviates from the short-term storage condition, the cycle life of the battery will be affected.
- The storage self-discharge rate of lithium battery is less than 3%/month.

For longer storage periods, to optimize battery storage condition and minimize self-consumption, consider the following recommendations:

- For up to 3 months: Adjust the State of Charge (SOC) to 20~30%.
- For over 3 months: It is recommended to perform a full battery maintenance cycle every 3 months: discharge to 0% SOC, then charge to 100% SOC, then discharge to 20~30% SOC.



When storing the lithium battery, please disconnect the Battery Switch or VS28-LS from the lithium battery!

6. Transportation

Before transporting lithium batteries, please check all local, national and international applicable laws and regulations. Lithium battery transportation belongs to the ninth category of dangerous goods in the UN3480 standard. In some cases, the transportation of scrapped, damaged or recalled lithium batteries may be specifically restricted or prohibited.

7. Disposal or recycle

Please discharge the lithium battery to 0% SOC before discarding it. Please use electrical tape or other insulating tape to insulate the positive and negative poles of the battery to prevent short circuits.

Disposal and recycling of lithium batteries should comply with local, state, and federal laws and regulations. Lithium batteries can also be recycled to the manufacturer for disposal.

8. FAQ

8.1 Lithium battery failure quick check

Type	Flash time of fault indicator	Protection type	Suggestion
Protection	1	Output short circuit protection	➢ Please check whether the positive and negative terminals of the lithium battery are connected reversely or short-circuited. ➢ If there is no wiring error, please contact your dealer.
	2	Discharge over current protection	➢ Check whether the discharge current of the lithium battery exceeds the rated discharge current. If it exceeds, turn OFF part of the load. ➢ If the battery discharge current does not exceed the rated discharge current, please contact your dealer.
	3	Charging over current protection	➢ Check whether the charging current of the charger matches the lithium battery. ➢ Check whether the charger is operating normally. ➢ If all the above are normal, please contact your dealer.
	4	Low voltage protection of the battery	➢ The battery capacity is very low, please connect the charger immediately to charge the lithium battery.
	5	Cell low voltage protection	➢ The battery capacity is very low, please connect the charger immediately to charge the lithium battery.
	6	High voltage protection of the battery	➢ Check whether the charging voltage of the charger matches the lithium battery. The charging voltage should be 14.0~14.2V. ➢ Check whether the charger is abnormal. ➢ If all the above are normal, please contact your dealer after turning OFF the charger.
	7	Cell high voltage protection	➢ Check whether the charging voltage of the charger matches the lithium battery. The charging voltage should be 14.0~14.2V. ➢ Check whether the charger is abnormal. ➢ If all the above are normal, please contact your dealer after turning OFF the charger.

	8	Discharge high temperature protection	➢ Please check whether the ambient temperature of the battery installation location is too high. ➢ Please check whether the battery wiring is tight and reliable. ➢ Please check whether the wire diameter of the battery wiring cable meets the requirements of the manual. ➢ Please check whether the discharge current and discharge time of the lithium battery exceed the specified requirements (see the technical parameter table for details). ➢ If the above is normal, please contact your dealer.
	9	Discharge low temperature protection	➢ Please check whether the ambient temperature of the battery installation location is lower than -30℃. If so, please connect the charger and increase the temperature of the lithium battery by heating the internal heating film of the lithium battery. ➢ If the problem still cannot be solved, please contact your dealer.
	10	Charging high temperature protection	➢ Please check whether the ambient temperature of the battery installation location is too high. ➢ Please check whether the battery wiring is tight and reliable. ➢ Please check whether the wire diameter of the battery wiring cable meets the requirements of the manual. ➢ Check whether the charging current of the charger matches the lithium battery.
	11	Charging low temperature protection	➢ Please check whether the ambient temperature of the battery installation location is lower than 2℃. If so, please connect the charger and increase the temperature of the lithium battery by heating the internal heating film of the lithium battery. ➢ If the problem still cannot be solved, please contact your dealer.
	12	BMS circuit high temperature protection	➢ Please check whether the ambient temperature of the battery installation location is too high. ➢ Please check whether the battery wiring is tight and reliable. ➢ Please check whether the wire diameter of the battery wiring cable meets the requirements of the manual. ➢ Please check whether the discharge current and discharge time of the lithium battery exceed the specified requirements (see the technical parameter table for details). ➢ If the above is normal, please contact your dealer.
	13	BMS circuit low temperature protection	➢ Please check whether the ambient temperature of the battery installation location is lower than -40℃. If it is, the battery is not suitable for operation in such a low ambient temperature, and the ambient temperature for battery installation is preferably above -30℃. ➢ If the above is normal, please contact your dealer.

	14	External input overvoltage protection	➢ Check whether the charging voltage of the charger matches the lithium battery. The charging voltage should be 14.0~14.2V. ➢ Check whether the charger is abnormal. ➢ If all the above are normal, please contact your dealer after turning OFF the charger.
	15	BMS internal failure	➢ Please contact your dealer.
	Continuous flashing	Parallel communication failure	➢ Please check whether the parallel communication cable is correctly connected according to the manual (see Chapter 3.6.1 for details). ➢ Please check whether the communication network cable is loose or damaged. You can try to replug the network cable or replace it with a new communication network cable. ➢ If all the above are normal, please contact your dealer.

9. Specification

Model	**M12-100**
Cell type	LiFePO4
Rated capacity	105Ah
Rated power	1.34kWh
Rated voltage	12.8V
Charging voltage	14.2V
Recommended charging current	50A
Maximum charging current	100A
Continuous discharge current	100A
Maximum discharge current	200A-13 minutes
Cell operating temperature (charging)	2℃~63℃
Cell operating temperature (discharging)	-30℃~63℃
Storage temperature range (<1 month)	-20℃~45℃, 20%~80% SOC, <65% RH
Storage temperature range (<6 months)	-20℃~35℃, 20%~80% SOC, <65% RH
Operating humidity range	10%~90% RH
Dimensions	310mm*165mm*187mm
Weight	10.9kg
IP protection	IP20
Certifications	CE, UN38.3, E-mark
Shipping class	UN3480
Cycle life	>4000 (0.5C charge and discharge, 80% DoD, @25℃)
Heating element	YES
Maximum number of parallel	8
Display unit (optional)	VS28-LS, DTU-BLE

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