

Energy Storage System 12V Lithium Battery Installation Guide

Lithium-ion battery

TO BE THE PREFERRED PARTNER FOR THE GLOBAL NEW ENERGY INDUSTRY

12V Battery Installation Guide

CHARGING PARAMETERS

Bulk | Absorption

For Your Bulk | Absorption Stage, The ideal voltage is between 14.2V-14.6V. For full charge and balance, the absorption mode should be set to last for at least 20 minutes per battery for multiple batteries in parallel.

Float

LIFEPO4 batteries do not need a float stage for charging, but a float voltage between 13.4V and 13.8V can be used when connected to shore power.

Equalization

Equalization is not recommended for our batteries. Most chargers will allow you to shut this feature off or use a setting that does not use equalization. If you cannot turn off this mode, then you will need to adjust the equalization voltage to below 14.6v.

Temperature Compensation

Temperature compensation is not needed with our batteries and in some cases, may trigger the built in BMS to go into protect mode. For this reason, we recommend that temperature compensation be shut off or set to 0.

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BMS BASIC FEATURES

All Lithtech Batteries come with a built-in battery management system (BMS) that protects the cells for long-term cycling. The BMS protects against the following conditions:

High voltage: > 14.6V

If an individual cell voltage exceeds a 3.7V during charging, the BMS will prevent a charge current from continuing. Discharge is always allowed under this condition.

Low voltage: < 8.8V

If an individual cell falls below 2.2V during discharge, the BMS will prevent further discharge. Although the battery is in “low-voltage disconnect” mode, it will still allow a charging current.

High temperature: > 65°C

The BMS will not allow a charging or discharging current.

High Current

The BMS allows constant current 100 (+/- 5%) Amps, 110 (+/- 10%) Amps for 10s. For power model, constant current 200 (+/- 5%) Amps, 230 (+/- 5%) Amps for 20s.

A passive balancing process is activated by the BMS at the top of each charge cycle, when the battery voltage exceeds around 13.6V. This ensures that all the cells remain at the same state of charge, which helps for pack longevity and performance.

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BMS BASIC FEATURES

The batteries may be mounted in any orientation. But care must be taken in connecting to the battery terminals. The positive and negative terminals are labeled and color coded (red for +, black/blue for -).

DO NOT REVERSE POLARITY THE BATTERY AS THIS WILL DAMAGE BOTH THE BATTERY AND THE DEVICE BEING CONNECTED!!!

The batteries come standard with a flag style terminal post with a 3/8" hole to accommodate a M8 bolt and lug sizes up to 2 AWT. All batteries ship with 18-8 stainless steel M8 bolts, washers. If multiple lugs are used, the washers may be removed, or longer bolts may be required in order for the bolt to fully seat into the copper pillar.



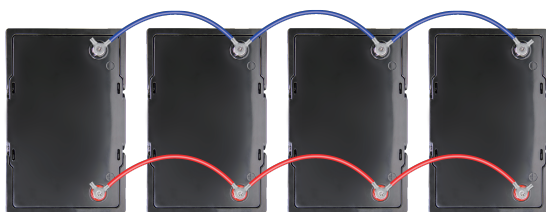
Parallel

12V lead replacement battery series connection supports up to 4 groups in series, and parallel connection has no limit on the number of parallel connections. Please ensure that the length and specifications of the series and parallel power lines are the same. Ensure that the load power is $\leq$ the battery series and parallel power; for example, a group of 12V100Ah battery packs is 1200W, when two are connected in series or parallel, the load power is preferably less than 2400W. When multiple groups are connected in series or parallel, the load operating current must be lower than the allowable operating current of a single battery pack.

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However, all cables and connections MUST be able to accommodate the high currents that can be delivered by the battery. Appropriate fuses and circuit breakers are also highly recommended to protect downstream components from current spikes and short circuits, air breaker is suggested to added.

NOTE: THE VOLTAGE OF EACH BATTERY FOR PARALLEL SHOULD BE SAME BEFORE OPERATION.



Series

Up to 4 units 12V batteries may be connected in series to increase the voltage of the system up to a 51.2V system. When batteries are mounted in series, current capacities remain the same, but the system voltage is additive. Two 12V batteries mounted in series to form a nominally 24V system should be charged using a bulk and absorption voltage of 29.2V. Three 12V batteries mounted in series to form a nominally 36V system should be charged using a bulk and absorption voltage of 43.8V. Four 12V batteries mounted in series to form a nominally 48V system should be charged using a bulk and absorption voltage of 58.4V.



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Batteries to be connected in series should be at the same state-of-charge before they are connected. For best results, fully charge each 12v battery using a 12V charger prior to connecting them in series, in order to ensure that they are at the same state-of-charge.

Series and Parallel

The battery supports up to 4 groups connected in series, forming a maximum of 51.2V system. The 51.2V system can be connected in parallel to increase capacity, and there is no limit on the number of parallel connections.

Batteries to be connected in series should be at the same state-of-charge before they are connected. For best results, fully charge each 12v battery using a 12V charger prior to connecting them in series, in order to ensure that they are at the same state-of-charge. And air breaker should be added to ensure safety.



In above picture, we use P1-P4 to represent the positive line and N1-N4 to represent the negative line. It should be noted that we need to ensure that P1-P4 have the same wire length and thickness to ensure that they have the same resistance. Similarly, N1-N4 should also have the same line length and thickness. Note that all fixing screws need to ensure the same torque.

Why we need to do this? cause it can ensure that the shunting between the batteries is even, and the long-term use has the best effect on the balance of the battery capacity, ensuring the consistency between the batteries..

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American Wire Gauge **AWG** Chart

AWG	Cross Section Area	Current In Amps
0 AWG	53 mm ²	240 A
2 AWG	33 mm ²	151 A
4 AWG	21 mm ²	95 A
6 AWG	13 mm ²	60 A
8 AWG	8 mm ²	38 A
10 AWG	5 mm ²	24 A

WARNINGS

- 1. DO Not throw the battery into water, keep it under dry
- 2. DO Not short circuit the batteries
- 3. DO Not reverse polarity
- 4. DO Not use or keep the battery under the high temperature
- 5. DO Not mishandle, drop, or apply excessive force to the batteries
- 6. DO Not operate with loose terminal connections
- 7. DO Not ship or store the battery together with metal

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SERIES CONNECTION NOTES

1. Maximum series of 4
2. Cell requires the same brand,same batch and same capacity
3. BMS requires the same brand,same material and parameters
4. The initial total pressure difference is less than 0.1Volt
5. The battery pack capacity difference is 1.5%
6. Internal resistance difference in the battery pack is $3m\Omega$
7. The SOC working range is 15% to 95%
8. 4 Series [operating voltage 48V-56V]
3 Series [operating voltage 36V-42V]
2 Series [operating voltage 24V-28V]
9. When facing low voltage turn-off,pls disconnect the power immediately till charge it
10. Separate charge&discharge for 1 cycle every 3 months
11. Once the above conditions are not met all, pls don't series together
12. Each positive circuit should connect with air switch to cut-off the power when emergency
Recommended total current of 4 units in series are as below:
Capacity SOC 30%~95%, Current $\leq 100A$
Capacity SOC 15%~30%, Current $\leq 50A$

PARALLEL CONNECTION NOTES

1. No limit on the maximum number of parallel machines
2. Cell requires the same brand,same batch and same capacity
3. BMS requires the same brand,same material and parameters
4. The initial total pressure difference is less than 0.1Volt
5. The battery pack capacity difference is 1.5%
6. Internal resistance difference in the battery pack is $3m\Omega$
7. The SOC working range is 15% to 95%
8. Parallel Shunt difference of 2A
9. Operating voltage range is 12.6V~14.2V
10. When facing low voltage turn-off,pls disconnect the power immediately
11. Separate charge&discharge for 1 cycle every 3 months
12. Once the above conditions are not met all, pls don't parallel together

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13. Once any air switch is cut-off, all batteries need to be charged separately before parallel again
14. The batteries should charge/discharge together, once any of them cut-off
Separate to charge them all fully and calibrated before parallel them together finally
15. Each positive circuit should connect with air switch to cut-off the power when emergency
16. The recommended total current for parallel connected units is as follows:
Capacity SOC 30%~95%, Current $\leq 100A$, Capacity SOC 15%~30%, Current $\leq 50A$

OTHER NOTES

1. Once occur over / low voltage, over temperature / protection, static if for 10~30 mins before charging and discharging.
2. If you want to charge below 10V~12V, using 0.2C small current for charge 10~30mins, and then switch to 0.5C normal charging. suggest 0.5C Charge, 1C discharge.
3. If you find your battery pack is serious over discharge ($<8V$), pls try to using 1A~2A for charge it, until the total voltage exceed 12V, then you can increase the charge current, Pls refer to note 2.
4. If there is a suspected short circuit, the load needs to be disconnected in time, and the power can be turned on again after the short circuit phenomenon is eliminated to avoid damage or hidden dangers caused by continuous short circuit.
5. If there is a low temperature, charging is prohibited below $0^{\circ}C$, and discharge is prohibited at $-20^{\circ}C$. It must be placed in the room to naturally warm up to release the low temperature recovery. Do not heat near the heat source, which may easily cause accidents.
6. If you are in a low temperature area, please choose the solution of adding a heating system to avoid low temperature damage to the battery or failure to charge.
7. If it is used outdoors, please avoid direct sunlight on the surface of the battery, and try to block, isolate and dissipate heat as much as possible.
8. Note that the battery can not be immersed in water to avoid internal short circuit caused by water.
9. The positive and negative poles of charging and discharging need to be added with a suitable air switch. Disconnect the switch before connecting. At the same time, you must confirm that the positive and negative poles are correct and reliable before closing the switch for external connection. The reverse connection of the positive and negative poles will easily damage the external equipment. and batteries.
10. If you find that the SOC display is inaccurate (or cannot display 100% SOC) during daily use, you can charge the battery until the BMS automatically cuts off the power supply due to full charge, and starts to discharge after standing for 10 minutes. Automatically cut off the power supply, at this time, the SOC automatic calibration system can be triggered, and normal use can be started after standing for 10 minutes

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11. If you find that the SOC display is inaccurate (or cannot display 100% SOC) during daily use, you can charge the battery until the BMS automatically cuts off the power supply due to full charge, and starts to discharge after standing for 10 minutes. Automatically cut off the power supply, at this time, the SOC automatic calibration system can be triggered, and normal use can be started after standing for 10 minutes

If the above solutions do not solve your problem, please contact us in time

STORAGE AND MAINTENANCE

Storage

Simply charge the battery to at least 50% state of charge and disconnect any charging or discharging for easy storage.

Charge once every 3 months, Charge and discharge cycle every six months.

Maintenance

Littech lifepo4 batteries require very little maintenance if any at all. If your batteries are in series and not being charged by a multi-bank charger, it is recommended that you fully charge the batteries individually once a year. This will balance out the entire battery bank to ensure the batteries will reach its expected life span. If your batteries are in parallel this is not necessary. The BMS has a built in passive balancing system that will take care of this.

WARRANTY POLICY

In the unlikely event, you are having an issue with one of our batteries we have developed a straight forward warranty policy to help answer any questions you may have.