

aqua-marina.nl

electric outboards and portable boats

Version: 1.1 ENG

Product Manual

LiFePO4 12V 280Ah

Lithium Iron Phosphate Battery (LiFePO4)



Smart 
BLUETOOTH 5.0



Trolling Motor
and More

 **LTCP**

SUPPORT

If you encounter technical problems and cannot find a solution in this manual, please contact Aqua-Marina.NL for further support.

Phone: +31 227 234235

Web: www.aqua-marina.nl

E-mail: info@aquamarina.nl

CONTENTS

Lithium Battery Safety Warning	
Notes on the Use of Lithium Batteries.....	
Which Use Behaviour Can Damage LithiumBatteries.....	
Charger Charging Instructions	
Lithium Battery Anomaly Treatment	
Considerations for Multiple Lithium Batteries Connected in Series and Parallel.	
Table of Remaining Battery Capacity (SOC) vs Voltage	
Lithium Battery with Inverse Control, Inverter,Controller and Other Devices.	
Long-term Storage Method without LithiumBattery	

Lithium Battery Safety Warning

-  1. It is forbidden to use and leave the battery near sources of heat and heat; e.g. fire, heaters, etc.
-  2. Do not use direct AC power for charging.
-  3. Short circuiting of the positive and negative battery terminals is strictly prohibited.
-  4. Do not throw the battery into a fire or heater.
-  5. No tapping or throwing, stepping on batteries etc.
-  6. It is forbidden to solder the batteries directly and to pierce them with sharp objects.

Notes on the Use of Lithium Batteries

1. When the lithium battery is connected to the inverter, a spark may be generated at the moment of contact (caused by the capacitors inside the inverter needing to be charged first and thus generating a momentary high current). The size of the spark is related to the power rating of the inverter. This is a normal phenomenon and not a short circuit of the battery.

2. Do not connect a small capacity battery to a high power inverter as this will cause the battery to discharge at a high current. Exceeding the rated value can lead to battery damage or even safety accidents. The battery requires a voltage "1C current" inverter power, e.g. if the inverter is 1000W then the battery needs to be at least 12.8V 79AH.

3. Avoid instantaneous discharge current of lithium battery exceeding 3C, which may damage the lithium battery.

4. Lithium battery charging must use a special charger for lithium battery. Check that the charging voltage corresponds to the battery requirements. Charging current should preferably be 0.5C and below.

5.The lithium battery connection cable should be chosen correctly according to the current size. Do not use thin wires to connect high power loads, this can lead to serious safety accidents.

6.When connecting the wires to the lithium battery, crimp the appropriate terminals and choose according to the current size. Do not wrap the wires directly around the positive and negative bolts of the lithium battery.

7.When connecting the lithium battery to the wires, make sure that the positive and negative bolts of the lithium battery are torqued tightly. Otherwise, the bolts will generate a great deal of heat and cause the case as well as the wires to melt, leading to a safety accident.

8.  When connecting multiple lithium batteries in parallel, ensure that the number of parallel connections is less than or equal to 4 and that each battery has the same voltage and capacity. When connecting multiple lithium batteries in series, ensure that the number of series is less than or equal to the specified maximum number that can be connected in series, and that the voltage and capacity of each battery is the same.

9.The BMS in the battery can provide low-temperature protection. If the ambient temperature goes below $-7^{\circ}\text{C} \pm 5^{\circ}\text{C}$ ($19.4^{\circ}\text{F} \pm 9^{\circ}\text{F}$), BMS will cut off charging to protect the battery.

Which Use Behavior Can Damage Lithium Batteries

1.Charging the battery below 0°C (32°F) will cause battery life to decay.

2.Discharging the battery below -20°C (-4°F) will cause battery life to deteriorate.

3. Battery use at ambient temperatures in excess of **55°C (131°F)** can cause battery life to deteriorate.
4. Use in excess of the maximum continuous charge/discharge current of the battery may cause damage to the battery.
5. Using this battery as a car or motorbike starter battery can cause damage to the battery.
6. Charging the battery with more than the specified charging voltage may cause damage to the battery.
7. A short circuit between the positive and negative terminals of the battery may cause damage to the battery.
8. The battery is not used for a long time (more than half a year), at least 50% of the power to ensure. Otherwise, the battery may be over discharged, resulting in battery damage.

Charger Charging Instructions

To charge the battery, use a charger that supports LiFePO₄ charging. Plug the charger into an AC outlet and set the battery to LiFePO₄ mode. Connect the positive and negative leads of the charger output to the positive and negative terminals of the battery to complete the correct connection.

Take charger as an example, please scan the QR code in chapter 8 of this guide to view the instructional video for specific steps.

Lithium Battery Anomaly Treatment

1.Abnormal battery voltage: 0V or < 8V

Reason: When the battery is at a low voltage, the internal BMS will turn off the output and the test positive and negative terminal voltages will then be below 8V or 0V.

Solution: The lithium battery can be activated with the lithium battery charger or solar panel: connect the charger to the positive and negative terminals of the lithium battery or the solar panel to the positive and negative terminals of the lithium battery. Within a few minutes, the lithium battery will be back to normal voltage. If this method does not work, please contact our customer service via your direct purchase platform or our after-sales mailbox.

2.Insufficient battery capacity: battery capacity below rated capacity

Reason: Incorrect test method. lithium battery nominal capacity is the amount of capacity measured by charging to full charge at 0.5C current and discharging to empty at 0.5C current in a 25°C environment. Too low a temperature, too high a charge/discharge current and the accuracy of the measuring instrument will affect the test results.

Solution: Test according to our standard test conditions. If the test capacity is still insufficient under standard test conditions, please contact our customer service promptly via your direct purchase platform or our after-sales email.

Note for "0.5C": For example, for a 100AH battery, the 0.5C current is $0.5 \times 100 = 50$ (Amps)

3.Battery will not charge.

Reason: (1) Mismatch of chargers

The charger voltage may not match the standard charging voltage of the battery, resulting in the battery not being charged; or the charger may not have an activation function. When the battery is in the BMS low voltage protection state, the output port is disconnected and the battery needs to be activated. If the charger does not have an activation function, the battery cannot be charged.

(2) Solar controller without activation function

When the battery is in the BMS low voltage protection state, the output port is disconnected. If the solar controller is not activated, it cannot detect the presence of the lithium battery and therefore cannot charge the lithium battery.

Solution: Activate the lithium battery before charging, or replace the charger (or solar controller) with one that has the activation function. If this method still does not work, please contact our customer service promptly via your direct purchase platform or our after-sales email.

4.Battery cannot be discharged.

Reason: (1) The battery voltage is too low and the BMS low voltage protects it.

(2)The battery temperature is too low or the battery temperature is too high and the BMS is protected by low or high temperature.

(3)The discharge power is too large and the BMS discharge over-current is protected.

Solution: Fill the battery and discharge it again, and make sure that the discharge conditions do not exceed the battery's permissible range. If this method still does not work, please contact our customer service promptly.

5.Battery cannot be charged to nominal maximum voltage.

Reason: (1) Incorrect charging voltage of the charger or incorrect selection of charging voltage and battery type of the solar controller.

(2)Temperature protection or charging over-current protection may have occurred during the charging process.

(3)As the lithium battery is used for more cycles, the consistency between the cells inside the battery will change and the battery may not be charged to its maximum voltage.

Solution: Choose the correct charger or set the charging voltage of the solar controller to a reasonable voltage. Make sure that the charging conditions do not exceed the range allowed by the battery. If this method does not work or if other questions exist, please contact our customer service promptly.

6.Battery cannot be discharged to the nominal minimum voltage.

Reason: (1) The load device may have set a high cut-off discharge voltage, causing the battery to stop operating when discharged to that voltage.

(2)Temperature protection or discharge over-current protection may occur during the discharge process.

(3)As the lithium battery is used for more cycles, the consistency between the cells inside the battery will change and it may not be possible to discharge to the minimum voltage.

Solution: Check that the cut-off voltage of the load device is reasonable; ensure that the discharge conditions do not exceed the battery's permissible range. If the method does not work or if other questions exist, please contact our customer service promptly.

7.The battery is quickly filled and then quickly drained.

Reason: (1) Excessive charging and discharging power, exceeding the rated current range of the battery

(2) The battery has been cycled too many times and the battery capacity has decayed

Solution: Ensure that the charge and discharge conditions do not exceed the battery's allowable range; if the battery is at the end of its life, replace it with a new one. If these are not the reasons, please contact our customer service promptly.

8.Battery voltage exceeding the nominal maximum voltage

Reason: (1) In the solar system, when the battery is full, it may reach the protection voltage of the BMS and the BMS is in the off state. At this time, the voltage displayed by the controller is the voltage of the solar panel, which exceeds the normal voltage of the battery and is not the real voltage of the battery

(2) When several batteries are connected in series, one of the batteries BMS is in a shutdown protection state, the voltage measured from the positive and negative terminals of the battery may exceed the normal voltage. This voltage is not the real voltage of the battery.

Solution: Disconnect the battery from the system or battery pack and test it separately. If the voltage still exceeds the standard maximum voltage, please contact our customer service promptly.

9.Series-connected battery packs with excessive voltage differences between cells

9.Reason: Failure to equalize all cell voltages before connecting the cells in series

Solution: Before connecting the batteries in series, use the charger to fill all the batteries and then connect them in series; or buy an equalizer, connect the equalizer to the battery pack connected in series. Do not connect any load or charger, and let the equalizer equalize for a period of time (1 day is best) before charging and discharging the battery pack.

Considerations for Multiple Lithium Batteries Connected in Series and Parallel

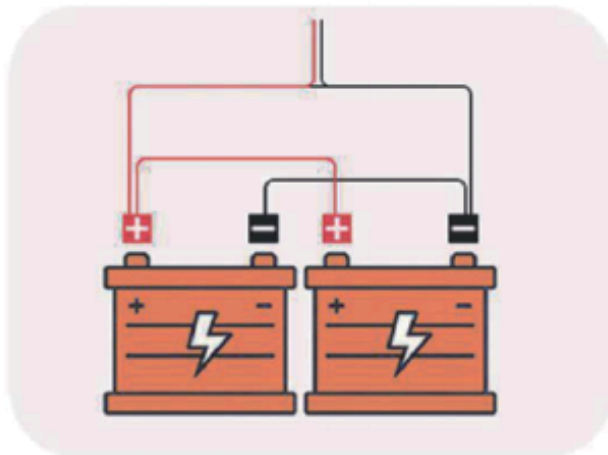
1.If multiple batteries are used in series in parallel, fully charge each battery first and check the voltage difference between each battery to ensure it is within 0.1V; then connect each battery string in parallel and check the battery voltage every 2 months.

2. Please read the instructions carefully before connecting in series and understand the maximum series voltage.

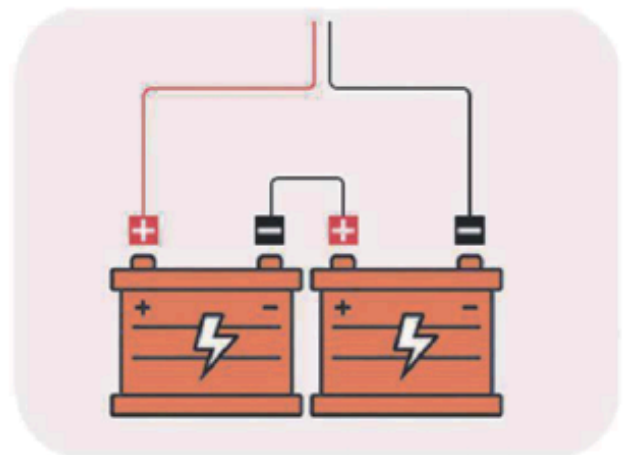
3. Once the series and parallel connections are completed, the total positive and negative wires for connecting the load, controller, inverter, etc. must be calculated to determine the current size of the entire battery pack.

4. Do not connect lithium batteries of different brands, capacities and cycles in series and parallel. Because the internal resistance and capacity of batteries of different brands, capacities and cycles vary greatly, which may cause battery failure.

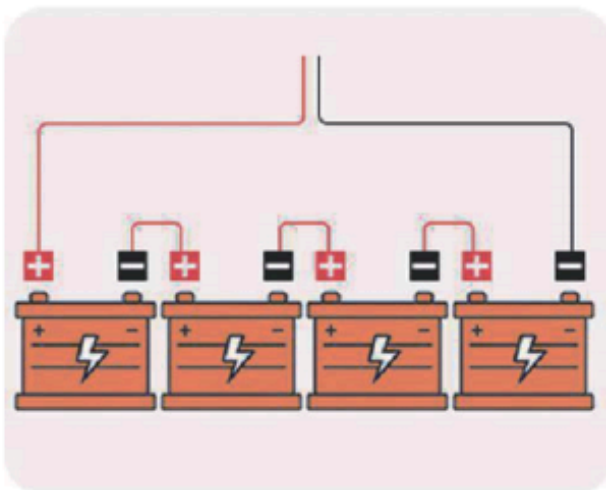
5. Illustration of batteries in series and parallel (e.g. 12V battery):



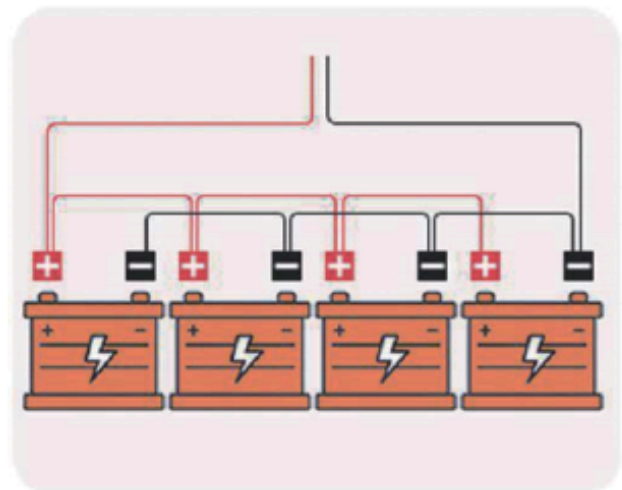
Two in parallel



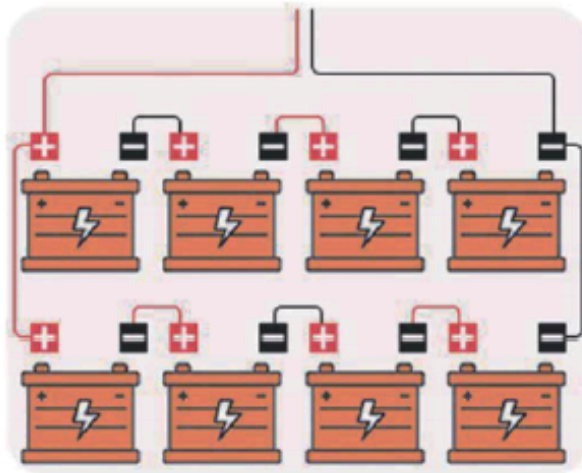
Two in series



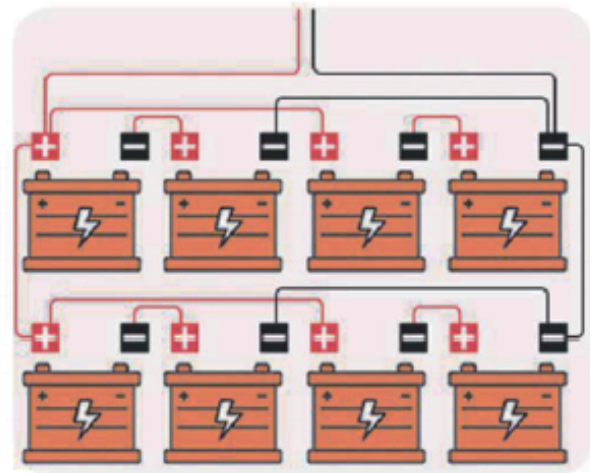
Four strings



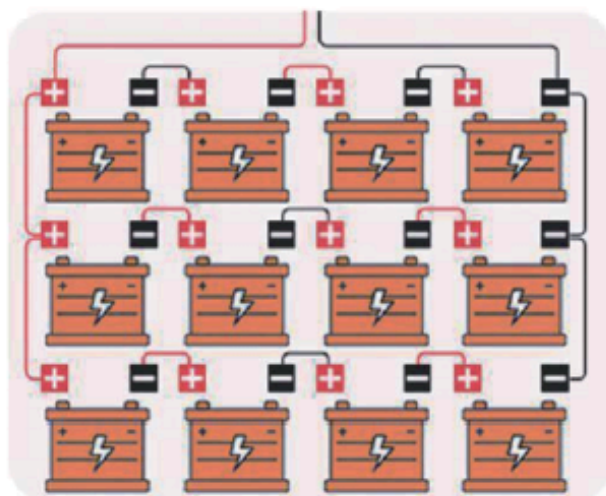
Four parallels



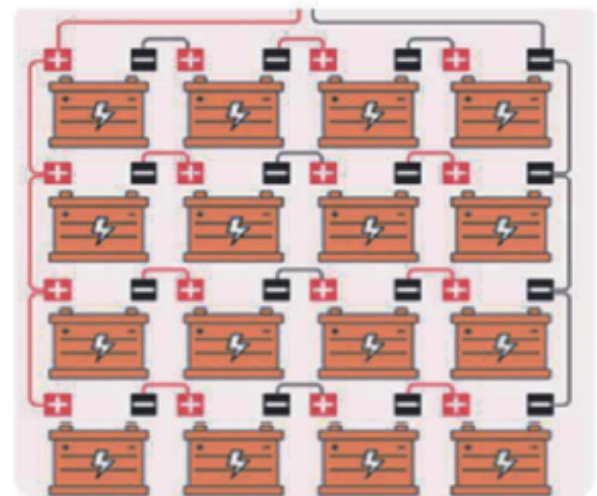
Tow and four strings



Four and two strings



Three and four strings



Four and four strings

6. Selection of the wire diameter for the inter-cell connection

Copper Cable Gauge Size(AWG/MM ²)	Ampacity(A)
14(2.08)	20
12(3.31)	25
10(5.25)	35
8(8.36)	50
6(13.3)	65
4(21.1)	85
2(33.6)	115
1(42.4)	130
1/0(53.5)	150
2/0(67.4)	175
4/0(107)	230

Table of Remaining Battery Capacity (SOC) vs Voltage

12.8V Battery		25.6V Battery		51.2V Battery	
Voltage	SOC	Voltage	SOC	Voltage	SOC
13.46V	100%	26.92V	100%	53.84V	100%
13.37V	90%	26.74V	90%	53.48V	90%
13.35V	80%	26.7V	80%	53.4V	80%
13.33V	70%	26.66V	70%	53.32V	70%
13.28V	60%	26.56V	60%	53.12V	60%
13.23V	50%	26.46V	50%	52.92V	50%
13.22V	40%	26.44V	40%	52.88V	40%
13.21V	30%	26.42V	30%	52.84V	30%
13.06V	20%	25.12V	20%	52.24V	20%
12.85V	10%	25.7V	10%	51.4V	10%

Lithium Battery with Inverse Control, Inverter, Controller And Other Devices

When using a lithium battery with an inverter or controller, make sure that the positive and negative terminals of the battery pack are correctly connected to the battery terminals of the inverter or controller or to the DC terminal. Make sure that the AC input/output and PV input are correctly connected.

Please refer to the instruction manual of the product you are using for the relevant equipment settings.

Long-term Storage Method without Lithium Battery

Lithium Battery Storage Method:

1.Storage temperature: batteries should be stored at a temperature of 5°C to 40°C (39.5°F-104°F) with a relative humidity of $\leq 90\%$, the optimum storage temperature is **20°C to 30°C (68°F-86°F)**. Batteries should be stored in a clean, dry, ventilated, **20°C to 30°C (68°F-86°F)** environment for extended periods of time.

2.Storage capacity: If the battery is to be left unused for a long period of time, remove it from the instrument and charge it to **50%-80%** as well as recharge it **every 3 months for 1 hour**. (As the lithium battery's internal protection plate consumes a small amount of electricity, prolonged storage can permanently damage the battery and prevent it from being charged again)

3.Storage prohibitions: Do not leave the battery in a 100% fully charged state for long periods of time. Do not leave the battery in a deficit state for long periods of time (below 5% power).



·It is forbidden to use and leave the battery near sources of heat and heat; e.g. fire, heaters, etc.

·Es ist verboten, Batterien in der Nähe von Wärmequellen wie Feuer, Heizungen usw. zu verwenden und aufzustellen.

·Il est interdit d'utiliser et de placer des batteries dans ou à proximité de sources de chaleur. Par exemple : feu, chauffage, etc.

·Prohibit the use and placement of batteries near sources of heat or heat sources; e.g. fire, heaters, etc.

·Prohíba el uso y la colocación de pilas cerca de fuentes o focos de calor; por ejemplo, fuego, calefactores, etc.

·Verbied het gebruik en de plaatsing van batterijen in de buurt van hittebronnen of warmtebronnen, zoals vuur, kachels, enz.

·Förbjud användning och placering av batterier i närheten av värmekällor eller värmekällor, t.ex. eld, värmeelement etc.

·Zakaz używania i umieszczania baterii w pobliżu źródeł ciepła lub źródeł ciepła, np. ognia, grzejników itp.



Aqua-Marina.nl, Hoornseweg 17-03, 1775 RB Middenmeer
e-mail: info@aqua-marina.nl