LR51.2 Battery Care Notice

**General warning**:

1, Do not attempt to open or disassemble the battery. The electrolyte inside is highly corrosive. Under normal operating conditions, contact with the electrolyte is not possible. However, if the battery casing is damaged, avoid touching any exposed electrolyte or powder, as they are corrosive.

2, Lithium batteries are heavy. To prevent muscle strain or back injuries, always use lifting aids and proper lifting techniques when installing or removing them.

3, In the event of a vehicle accident, lithium batteries can become projectiles. Ensure they are securely mounted and always use appropriate handling equipment during transportation.

4, Handle lithium batteries with care, as they are sensitive to mechanical shock.

5, Do not use a battery that is damaged.

6, Exposure to water can severely damage the battery. If this occurs, stop using the battery immediately and seek further guidance.

**Recommended charging**

While the battery can handle higher charging currents (up to 100A for the LR51.2-100Ah model and 150A for the LR512.-200Ah model), we recommend using a lower charging current for optimal battery health. Specifically, we suggest 50A for the 100Ah battery and 75A for the 200Ah battery. Using these charging currents, a fully depleted battery will recharge in approximately 2-3 hours.

The battery must be fully charged once a month, until the float charge has been reached, due to cell balancing and SoC calibration purposes. If the batteries are intensively used or frequently deeply discharged, it is recommended to fully charge the batteries once a week.

**Recommended Discharge**

When operating at higher discharge rates, the battery generates more heat compared to lower discharge rates. This necessitates increased ventilation space around the batteries and, depending on the installation, may require hot air extraction or forced air cooling. It is recommended that for a 100Ah battery the continuous current should be set at 50A and a 200Ah battery set at 75A.

Additionally, at higher discharge rates, some cells may reach the low voltage threshold faster than others. This can occur due to a combination of elevated cell temperature and battery aging. To ensure optimal performance and longevity, it is advisable to adhere to the recommended discharge current limits.

Although a BMS is in place, there are still certain situations where the battery may be at risk of damage from over-discharge. Please carefully adhere to the following warning.

Avoid fully discharging the battery. If the system will be left unattended for an extended period, ensure the battery remains charged. Alternatively, fully (or nearly fully) charge the battery and then disconnect the DC system.

**Effect of Temperature on Battery Capacity**

Temperature significantly impacts battery capacity. The nominal capacity figures provided in the datasheet for each battery model are based on a temperature of 25°C and a discharge rate of 1C. At lower temperatures, the capacity decreases noticeably—by approximately 20% at 0°C and by as much as 50% at 20°C.

However, since the State of Charge (SoC) is not measured directly within the battery but rather calculated by the battery monitor, the displayed SoC may not reflect the actual capacity under these conditions. Therefore, when discharging at low temperatures, it is crucial to closely monitor the battery and individual cell voltages rather than relying solely on the SoC reading. This ensures safe and efficient operation while preventing potential damage.

**Operating Conditions for Charging and Discharging**

It is essential to adhere to the specified temperature ranges for both charging and discharging the battery.

These conditions are as follows:

* **Discharging**:

Discharging is only permitted within a temperature range of -10°C to +55°C.

* **Charging**:

Charging is only allowed within a temperature range of +0°C to +45°C.

**Warning**:

Lithium batteries are costly and can sustain damage from over-discharge or overcharge.

Over-discharge damage may occur when small loads—such as alarm systems, relays, standby currents from certain devices, back current drain from battery chargers, or charge regulators—gradually drain the battery while the system is inactive.

While the BMS can shut down the system due to low cell voltage to prevent immediate battery damage, this should only be a last resort. To avoid reaching this critical point, it is important to make sure the system is fully switched off when leaving unattended for extended periods. Even better, consider turning off the circuit breaker or disconnecting the battery's positive terminal when the system is not in use. Before doing so, ensure the battery is sufficiently charged to maintain an adequate reserve capacity.

Residual discharge currents pose a significant risk, especially after the system has been fully discharged and a low cell voltage shutdown has been triggered. In such cases, the battery retains a reserve capacity of less than 5Ah per 100Ah of battery capacity. If this remaining reserve is depleted, the battery can be permanently damaged. For example, a residual current of just 10mA can harm a 200Ah battery if the system remains discharged in one or two weeks.

If a low cell voltage shutdown occurs, immediate action is required: recharge the battery as soon as possible to prevent irreversible damage.

By following these guidelines, you can ensure safe and efficient battery operation while avoiding potential damage caused by operating outside the recommended temperature ranges.

The maintenance record should be complete and routine, so that subsequent verification of management parameters of the battery pack can be tracked.

# Electrical Maintenance

Table A of contents for maintenance

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Items  | The checking points  | Methods  | Repair conditions  | Repair solution  |
| Electrical  | Check if the output of the voltage is normal  | Multi-meter  | Battery voltage should be always within the range of 43.2V-58.4V  | See the following troubleshooting section  |
|  |  |  |  |
| Fault inspection  | Check if lights are normal  | Visual inspection  | Alarm  |  |
| Cable  | Insulation, Terminal  | Visual inspection  | Insulation: Cracks and Aging Exfoliation and Terminal Corrosion | Replace the cable Replace the terminal block  |

Battery Maintenance

Maintenance of the battery may refer to the below table.

Table B maintenance guideline

|  |  |  |
| --- | --- | --- |
| Frequency  | Items  | Solutions  |
| Monthly  | Operating environment  | Keep away from heat sources and avoid direct sunlight.  |
| Visual inspection  | If any breakage, leakage, or deformation is detected, isolate the affected battery pack, take a photograph, and replace the battery. Check if the DIP switch settings as well as battery communication cables are correct and make sure no mis-operation that changed the DIP setting/cable connection.  |
| Quarterly  | Visual inspection  | Use a cotton cloth to clean the surface. Exercise caution during cleaning due to the high voltage.  |
| Connection status  | 1，Inspect each terminal and check if the bolts are loose; tighten them if necessary but also avoid over-torqued. For M6 use 6Nm torque and for M8 use 12Nm. 2，Investigate the cause if the cable temperature exceeds 40℃.  |
| Every 6 months  | PBMS reading check  | Get a screen shot for PBMS reading every half a year to track its status.  |

Trouble Shooting Steps

① Problem determination based on:

1. Whether the battery can be turned on or not.
2. If the battery is ok to turn on, check the run light is off, flashing or lighting; 3) If the run light is off, check whether the battery is ok to charge/discharge or not.

② Preliminary determination steps:

1. The battery is unresponsive; it cannot turn on, and the indicator lights are neither illuminated nor flashing. If the battery external switch is ON, the RUN light is flashing, and the external power supply voltage is 48V or more, the battery is still unable to turn on, please contact Leoch.
2. The battery can be turned on, but red light is lighting, and cannot charge or discharge. If the red light is lighting, that means system is abnormal, please check the value as follows:
3. Temperature: Above 50℃ or under - 10℃, the battery could not work.

Solution: to move battery to the normal operating temperature range between -10℃ ~ 50℃.

1. High voltage: If charging voltage above 58.4V, battery protection will turn on.

Solution: check whether voltage is too high or not, if yes, to change the settings on power supply side.

LOW Voltage: when the battery discharges to 43.2V or less, battery protection will turn on.

Solution: charge the battery for some time when the red light turns off.

Excluding the three points above, if the faulty still cannot be located, turn off battery and contact Leoch.

③ Battery cannot be charged or discharged

1. Unable to charge

Disconnect the power cables, measure voltage on the terminals, if the voltage is 53~54V, restart the battery, connect the power cable and try again, if it still does not work, turn off battery and contact LEOCH.

1. Unable to discharge:

Disconnect the power cables and measure voltage on the battery side, if it is under 44.5V, please charge the battery if voltage is above 48V and still cannot discharge, turn off battery and contact LEOCH.

Appendix:

Checklist to determine if the battery has been misused:

1, Is there any mechanical damage to the battery, its terminals? Please note that mechanical damage will void the warranty.

2, Has the battery been stored and installed in its correct orientation? The battery can be mounted either upright or on its side, but it should not be positioned facing downward.

3, Is the battery wet? Keep in mind that the battery is not waterproof and is not designed for outdoor use. 4, Is there any indication that the battery has been fully discharged? Review the screen data or Pbms tool reading. Check the deepest discharge level, minimum battery voltage, and the number of full discharge cycles recorded in the BMS which was counted as UVP. If constant UVP happens, a root cause analysis is suggested to carry out to prevent reoccurrence.

5, How long has it been since the last full charge? It is essential to fully charge the battery at least once a month to maintain its health.



## Product information

Model number: LR51.2-100 or LR51.2-200

Serial Number:

Installation date:

Fault description:

A, Can the battery turn on by reset?

B, Can the battery be charged?

C, Can the battery be discharged?

D, Running light on?

E, ALM blinking?

F, Access to the battery by PBMS tool?