

Li-ion Battery Care & Safety information IMPORTANT PLEASE READ FULLY

Lithium-Ion Battery Hazards

Lithium batteries have high energy densities. Lithium-ion battery fire hazards are associated with the high energy densities coupled with the flammable organic electrolyte. This creates challenges for use, storage, and handling. Physical damage, electrical abuse such as short circuits and overcharging, exposures to elevated temperature, manufacturer's defects such as imperfections and or contaminants in the manufacturing process can all cause a thermal runaway. This means a rapid self-heating from a chemical reaction that can result in a chain reaction thermal runaway of adjacent cells. The reaction vaporises the organic electrolyte and pressurises the cell casing. If (or when) the case fails, the flammable and toxic gases within the cell are released resulting in combustion and the ignition of the cell(s).

With this in mind it is essential that you read carefully and understand fully the following information.

Best Storage & Use Practices

Procurement

- Purchase batteries from a reputable manufacturer or supplier.
- Avoid batteries shipped without protective packaging.
- Inspect batteries on receipt and safely dispose of damaged batteries.

Handling and Use

- Handle batteries and or battery-powered devices cautiously to not damage the battery casing or connections.
- Keep batteries away from contact with conductive materials, water, seawater, strong oxidisers and strong acids.
- Do not place batteries in direct sunlight, on hot surfaces or in hot locations.
- The cell must stay within the operating temperatures outlined in the cell data sheet

- Inspect batteries for signs of damage before use. Never use damaged cells and promptly dispose of damaged or puffy batteries.
- Keep all flammable materials away from battery operating area.
- Allow time for cooling before charging a battery that is still warm from usage.
- Allow a battery that is still warm from charging to cool before using.
- The cell must not exceed voltage, current, and other ratings in its data sheet.
- Be careful not to short circuit – this is when exposed terminals come into contact with metal objects or from poor wiring practices or abuse. Short circuits discharge very quickly and will heat the battery to high temperatures due to the high current flow.
- Do not keep in the sun in a hot car or anywhere with direct heat
- If you notice an unusual odour, rusty deformation, damaged surfaces or fluid discharge, especially on first use, discontinue use.
- Keep cells away from animals and children.
- If the cell is attached to a PCB, keep it away from high static environments.

Charging

- **DO NOT LEAVE THE CHARGING PROCESS UNATTENDED.**
- Use chargers or charging methods designed to charge in a safe manner Li-Ion cells or battery packs at the specified parameters.
- **Before using a charger or electronic device, read their user manuals.**
- Only charge in an area free from any material which can catch fire. The ideal surface for charging batteries is concrete or ceramic.
- Charge and store batteries in a fire-retardant container when practical.
- Only use the charging method Constant Voltage/ Constant Current CVCC. (The charger limits the amount of current to a pre-set level until the battery reaches a pre-set voltage level. The current then reduces as the battery becomes fully charged).
- Confirm terminals are aligned correctly before inserting cell into charger or device

- Do not exceed either the max charge voltage or max current voltage or charge operating temperatures. Overcharge is greater than 4.2V for most batteries or over-discharge (below 3V) batteries.
- Do not charge near high temperatures or flammable materials.
- Discontinue charging after exceeding charge time outlined in the user manual or data sheet.
- Disconnect batteries immediately if, during operation or charging, they emit an unusual smell, develop heat, change shape/geometry, or behave abnormally. Dispose of the batteries.
- Do not parallel charge batteries of varying age and charge status; chargers cannot monitor the current of individual cells and initial voltage balancing can lead to high amperage, battery damage, and heat generation. Check voltage before parallel charging; all batteries should be within 0.5 Volts of each other.
- If the cell does not increase its charge after a prolonged time in the charger, discontinue use and dispose of the cell.
- Your charger or device should have a warning for over voltage, over current and over temperature, and should also have a control of overcharge and charge timer.
- Remove cells and pack from chargers promptly after charging is complete. Do not use the charger as a storage location.
- Never charge a primary one time use battery.
- Never charge with a cigarette lighter charger or directly by electrical outlet.

Discharging

- Discharge within the recommended temperature range (between -20°C and +60°C)
- Do not exceed maximum continuous discharge current, as detailed in the cell data sheet.
- Do not discharge below 3.0V per cell. Over discharge can damage battery performance
- When nominal capacity after full discharge cycle is less than 80% of rated capacity, discontinue use.

Storage

- Store batteries away from combustible materials.
- If practical, store batteries in a fire-retardant container.

- Store the batteries at temperatures between 5°C and 20°C (41°F and 68°F).
- Separate fresh and depleted cells (or keep a log).
- Store one-time use batteries separately from rechargeable batteries.
- Visually inspect battery in storage weekly.
- Charge batteries in storage to approximately 30-50% of capacity at least once every six months.
- Charge or discharge the battery to approximately 30-50% of capacity before long-term storage.

Disposal

- Dispose of damaged cells and cells that no longer hold a substantial charge. To check the general condition of your cells, charge them, let them rest for an hour, then measure the voltage. If your cells are close to 4.2V, the cells are in good condition.
- Dispose of used batteries by following proper disposal protocols and taking them to a household e-waste collection point or battery-recycling drop off location.
- Cover terminals with insulating tape before disposal

Prohibited

- Do not exceed any of the rated specifications
- Do not charge or discharge near flammable materials or gas
- Do not leave to charge unattended, if a battery becomes puffy, smokes or catches fire you need to be able to immediately handle the situation. Walking away for just 5 minutes can spell disaster.
- Do not let batteries get wet or submerged
- Do not allow the positive or negative poles to connect with conductive materials
- Do not reverse polarity
- Do not insert insulation or other objects between the metal plate, cell or other components
- Do not overheat or overload
- Do not mix different battery brands or models
- Do not solder directly on the cell
- Do not touch a leaking cell
- Do not throw, puncture, or incinerate

- Do not ingest

What to do in an emergency

Follow these steps if there is evidence of a battery malfunction (e.g. swelling, heating, or irregular odours).

- Use personal protective equipment, such as gloves, goggles/safety glasses and lab coat.
- If batteries are showing evidence of thermal runaway failure, be very cautious because the gases may be flammable and toxic and failure modes can be hazardous.
- Disconnect the battery (if possible).
- Remove the battery from the equipment/device (if possible).
- Place the battery in a metal or other container away from combustibles.
- Contact the local fire department and ask for advice on how to proceed.
- If a lithium battery fire occurs, use a CO2 (Class BC) or Dry Powder (Class ABC) fire extinguisher. Lithium batteries do not have actual lithium metal so do not use a Class D fire extinguisher.

Please note

Because batteries utilise a chemical reaction, battery performance will deteriorate over time even if stored for long periods without use. The performance and life expectancy of batteries depends heavily on usage conditions such as charge, discharge and ambient temperature, if the batteries are not maintained within the specified ranges then the life expectancy of the battery will be shortened.