

**Common hints on using Lithium batteries**

- Read the charging/discharging conditions of the battery as well as the instructions in the supplementary handling precautions carefully and observe them at all times.
- Do not disassemble, modify, heat or short-circuit the battery.
- Do not burn the battery or store it in a hot area.
- Do not drop the battery and/or apply excessive mechanical stress to it.
- Do not allow the battery to get wet.
- Use for charging only the **LiPoCard** resp. a charger in conjunction with the **LiPo-Balancer and its activated safety circuit/circuits (*)**.
- During discharging, use suited additional **Schulze** devices to protect the battery. We recommend the **LiPoBalancer** for test series and in your model the **LiPoDiMATIC** and the **LiPoLogger (*)**.

(*) Otherwise the lifetime of the battery can be rapidly reduced.

1 Charging instructions

• Lithium batteries must not be charged and / or operated in any combination with primary cells (dry cells) or other types of rechargeable battery (Nickel, Lead-acid batteries), or other types of Lithium cells (e.g. Li-Io with Li-Po), with cells of different capacity and / or make, and with cells of different maximum load capacity.

• Lithium batteries must not be charged using any charger or charge program which was intended for Nickel batteries (Ni-Cd or NiMH). These batteries must only be charged using a specialised unit such as the **Schulze LiPoCard**, or a charger such as the **Schulze isl 6** or **isl 8 series**; these devices include programs for charging Lithium batteries.

FIRE HAZARD! - if you do not observe the battery manufacturer's charging instructions, you risk damaging and even ruining the batteries (swelling, explosion); this can result in fire.

In particular please remember that the number of cells in the pack must be set correctly on the charger; note: this applies only to the number of cells wired in series. Parallel-wired cells are "seen" by the charger simply as one (1) cell "of large capacity".

- Before charging the cells it is essential to check the cell count setting and the maximum charge voltage on the charger.
- Before charging the cells it is essential to check the maximum charge current setting.
- Keep the battery well away from inflammable materials and volatile gases.
- During any charge / discharge process the balancer, the charger / discharger and the connected batteries must be placed on a non-inflammable, heat-resistant and electrically non-conductive surface. Such surfaces include ceramic dishes and flower pots, and special fireproof plastic or aluminium cases (these must be insulated, e.g. using plaster sheets).
- Don't charge batteries in the car - the seats burn very well ...
- Supervise the charge process constantly - if the battery swells up, disconnect it from the charger immediately.
- Burning batteries should be extinguished with dry sand or a powder fire extinguisher - never with water - explosion hazard!
- Never attempt to recharge dead or damaged cells - this can have particularly disastrous results if these cells are part of a pack which also includes "healthy" cells.
- Protect the cells from mechanical loads!

2 Useful life

- Observe the charge current and discharge current limits stated by the battery manufacturer. Do not exceed the maximum values, as this brings a risk of drastic reduction in the pack's useful life.
- Contrary to much published information, the professional protective circuit for Kokam cells defines the lower and upper limits as 1.0 and 4.5 Volts per cell (<http://www.kokam.com/english/biz/care.html>).
- The most common cause of unbalanced battery packs is not "deep-discharging" to below 3 V / cell, but overloading through excessive discharge currents!



- Be cautious with dealers' statements such as maximum load currents of "15C" or "20C"; often this refers to peak load values, and not continuous currents.
- Lithium cells lose a small amount of capacity every time they are charged, but the loss is much higher if they are overloaded.
- Make sure your batteries are protected from short-circuit at all times! Whether the "short" is caused by a screwdriver in your toolbox or by a house-key in your trouser pocket, the result is the same: overloaded cells, and possibly a fire.
- If you deep-discharge a battery at a high current to a point below 1 V / cell, the result is invariably irreparable damage. In any application where high motor currents are used, the discharge limit for packs of identical cells must be in the range 2.4 ... 3.0 V / cell. If the pack includes cells in different conditions, the discharge limit should be set even higher, to avoid the danger that the weakest cell might fall below the critical 1 V point when being discharged.

Our own experience shows that deep-discharges are not so critical if they are caused by the idle currents of electronic circuits (speed controller not disconnected from the flight battery after the flight, balancer powered by the battery and not removed after discharging the pack). However, if you discover a battery in this condition, charge it initially using a very low current (1/20C or less) until it reaches a voltage within the "working window" of the cells (for Li-Po cells that is 3.0 ... 4.2 Volts).

• Since we are not in a position to ensure the proper use of the cells, the user is deemed to have accepted the responsibility once he opens the sales package. Thereafter he has no claim against the manufacturer, the importer, the dealer or the employees of those companies if an accident occurs in which personal injury or property damage result.

3 Cell handling

- The voltage of brand-new cells and discharged cells is not zero; it is generally more than 3 Volts. Short-circuit hazard!
- Never place cells or batteries on a conductive surface. Note that carbon fibre fuselages and carbon fibre spars are conductive!
- Do not place batteries in a micro-wave oven!
- Schulze LiPoPerfekt battery packs are protected at many points against accidental short-circuit, using cover plates, silicone, fabric tape and heat-shrink sleeving. Take care to avoid short-circuits at any unprotected points, and keep an eye open for abraded areas of the heat-shrink sleeving; if you discover a weak point, insulate it thoroughly.
- Keep individual cells and battery packs well away from youngsters, and store them out of the reach of children at all times. Many cells look rather like chewing gum or chocolate bars, and this is potentially confusing and dangerous.
- Do not open cells. The internal chemicals react with oxygen in the air and / or water, and in some circumstances the reaction can be violent. If a cell should catch fire and you have no suitable extinguishing agent to hand (sand, extinguisher powder), allow it to burn out, taking care not to breathe in the vapours generated by the fire.
- If the chemicals make contact with your eyes, immediately wash it off using plenty of water, and seek the assistance of a specialist doctor.
- The manufacturer's stated maximum discharge rates may be greatly exceeded when the cells are in use (typical of RC usage), which means that the cells are working under experimental conditions. As a result the manufacturer, the importer and the dealer are not liable for any claim under guarantee in respect of capacity, useful life, storage and discharge characteristics.

4 Disposal

- Discharge the cells slowly, ideally using a 1 ... 10 kOhm resistor, which you can leave attached to the empty cells.
- Take the dead, discharged cells to your local battery collection point; packs purchased from us can also be returned to us.