Dear customer,

We have gathered together a few supplementary notes concerning the care and maintenance of your Lithium batteries, as there has clearly been some degree of mis-information and confusion on this subject, especially concerning what are known as “balancers”.

INTRODUCTION

With Nickel batteries there is a limit to the charge voltage. However, one of the special characteristics of Lithium cells is that overcharging causes a further rise in charge voltage.

An excessive voltage, i.e. above the value stated by the manufacturer, damages the cell.

In extreme cases the cell may burst into flames and / or explode.

For this reason, if you are using a Lithium battery pack consisting of several cells wired in series (i.e. not wired in parallel), it is important to check from time to time that all the cells in the pack are at the same voltage.

You can check individual cells if you connect a multi-pole socket to the battery through which the voltage of the individual cells can be checked.

CAUSES

If you discover that individual cells in a pack exhibit different voltages, there may be various reasons for the problem:

1) The cells were at different states of charge when they were soldered together, or were not properly “matched” (selected) when the pack was assembled.

2) The cells are wired in parallel, and a terminal tag of one individual cell breaks. The remainder of the cells in the parallel circuit are then either overcharged or deep-discharged.

REMEDY for 1):

1.1.1 If there are major differences in voltage, charge each cell in the Li-Po pack separately using the Li-Io (!) program until the charger detects the “cell full” state; this saves a little time.

1.1.2 If the differences in voltage are minor, you can save a lot of time by charging the whole Li-Po pack using the Li-Io (!) program until the charger detects the “pack full” state.

1.2 The next step is to use the Battery 2 (Akku 2) output of the isl 6 (Battery 3 output of the isl 8) in order to give a full charge to the cells INDIVIDUALLY, now that they have been given a preparatory charge using the Li-Io program. These outputs should be used because they provide better accuracy. The cells should be charged sequentially (one after the other) by connecting the charger to the cell terminal tags.

1.3 At the end of this process all the cells in the pack will be fully charged, and will be at the same voltage.

REMEDY for 2):

Replace the defective cells with intact cells, and raise their voltage to the same level as the others using the method described under 1).

If you have used the pack properly, i.e. it has not been damaged by excessive discharge currents, our experience shows that individual cell voltages will not drift apart significantly even after quite a long period - assuming that the cells are of identical capacity.

BALANCERS

A balancer is an electronic circuit which can be used with Lithium batteries if the pack consists of series-wired Lithium cells (not necessary when cells are only parallel-wired) .

The purpose of the balancer is to match the voltage of the individual cells to one another, so that all the cells exhibit the same state of charge. This statement applies to A N Y state of charge / charge voltage!

THE PROBLEM

Most of the “balancers” that we have encountered, and which are intended for modelling use, are not capable of carrying out the above stated purpose. The reason for this is that these “balancers” don’t “communicate with each other”.

Most of the devices known as “balancers” work as L I M I T E R S. The “balancer” carries out its task of matching the cells by limiting the cell voltage to the full voltage value of the Lithium cell, as defined by the manufacturer of the “balancer” (when permitted tolerances are taken into account, this voltage may be quite different).

Notes on the maintenance of Li-Po batteries

THE ERROR

All the manufacturers of Li-Po cells of whom we are aware define the “full” voltage of their cells as follows:

APL-Tech:	no stated value	
Golden Peak (GP):	4.2 Volts +/- 0.05 V per cell	That is a maximum of 4.25 V / cell
Kokam:	4.2 Volts +/- 0.03 V per cell	That is a maximum of 4.23 V / cell
MoliCell:	4.2 Volts +/- 0.05 V per cell	That is a maximum of 4.25 V / cell
PowerCell:	4.2 Volts +/- 0.05 V per cell	That is a maximum of 4.25 V / cell

Our chargers with Version 8 software use the upper limit of this approved FULL voltage.
4.23 … 4.25 Volts are P E R M I S S I B L E values!

According to the information we have seen, damage to cells only starts to occur above 4.3 V.

NOTE

In our own experience it is less damaging to overcharge the cells (naturally only to a limited extent - and you should not try this anyway), or deep-discharge them to zero Volts, than to discharge them at an excessive load current! If this happens, your pack must be instantly charged resp. discharged to a permissible (save) voltage level. Short-circuits are extremely damaging - even if they are of very brief duration.

Version 7 of our software drew criticism in some quarters, as it was considered that we were not charging the cells completely full. With Version 8 we really do get the cells fully charged. Of course, the maximum voltage of the charged pack also depends upon correct calibration of the charger, and this only applies if we have re-calibrated it; it does not necessarily apply if the Version 7 software EPROM was simply swapped for one containing Version 8. Within Version 8 we have also implemented an optimisation process which detects and controls the pack voltage even more accurately.

SUMMARY

If your “balancer” goes up in smoke at 4.24 Volts, then it does not deserve the name, and is also incapable of protecting the cells reliably from o v e r c h a r g i n g. All it does is try to l i m i t the a v e r a g e charge voltage of the cells.

METHOD OF WORKING

To prevent the charge current causing a further increase in the cell voltage, the “balancer” diverts the charge current from the charger partially - or even completely - away from the cell. This prevents the cell voltage rising to the charger’s full voltage limit, with the result that the charger - quite rightly - does n o t switch off. It sees no need to reduce the charge current further - despite the fact that this is necessary in order to terminate the charge process. All it does is “feed” your “balancer”.

We are confident: the charger is more capable and more persistent!

Please bear in mind that there is also a danger that the “balancer” will fail, either through a build-up of static charge, or, for example, through excessive voltage; the latter may occur if you do not take the trouble to connect all the individual terminal tags on the battery to the series-wired “balancer” simultaneously.

REMEDY

The charge process naturally works always flawlessly in combination with **Schulze Balancers *LiPoBal14*** resp.***08*.**

If you use a "foreign-balancer" and you select the battery type to "Li-Ion" instead of "Li-Poly", the charge process mostly works perfectly with attached "balancers". The charge amount of the battery will then be a little less (which the "balancers" otherwise would give away).

The only proper use of a “balancer” with Li-Po battery selection, as described here, is as follows: give a pack of Li-Po cells a full charge without the “balancer”, then connect the “balancer” a f t e r the charger has detected the “pack full” state. (Caution: many chargers buffer the battery instead of switching off the charge current, so you should disconnect the pack from the charger first.)

Now observe what the “balancer” does: if it does not balance all the cells evenly then probably it is something wrong with the battery. After several charge processes all the cell voltages should be the same after this “post-processing”.

Best wishes

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