



**Graupner**



Operating Manual

# ULTRA DUO PLUS 45

Order.-No. 6475



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PN.OB-02

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## **A-1. INTRODUCTION**

***Please study these instructions, reading them completely and attentively, before using the unit for the first time. This will guarantee that you will be able to exploit all the facilities of your new battery charger. The warnings and safety notes are particularly important. Please store these instructions in a safe place, and be sure to pass them on to the new owner if you ever dispose of the charger.***

In the ULTRA DUO PLUS 45 you have acquired a mature product with an excellent performance. It incorporates the latest semi-conductor technology, controlled by a high-performance RISC micro-processor, to provide superior charging characteristics combined with simple operation and optimum reliability. These features can normally be expected only from much more expensive units. The ULTRA DUO PLUS 45 represents a reliable method of charging sintered Nickel-Cadmium (NC, Ni-Cd) packs, Nickel-Metal-Hydride (Ni-MH) batteries, Lithium-Polymer (Li-Po), Lithium-Manganese (Li-Mn), Lithium-Ion (Li-Io) and LiFePO<sub>4</sub> (LiFe) batteries, and also lead-gel and lead-acid (Plumbum: Pb) batteries. These sealed, gas-tight batteries have proved excellent for our purposes in RC models. They are mechanically robust, can be used in any attitude and are generally highly reliable. They require no special measures for storage apart from protecting the cells from becoming deep-discharged. The ULTRA DUO PLUS 45 can also be used to discharge your batteries and balance the cells in a pack.

### **Note**

It is important always to observe the charging instructions supplied by the battery manufacturer, and to keep to the recommended charge currents and times. Do not fast-charge batteries unless the manufacturer states expressly that they are suitable for the high currents which flow during these processes. When charging new batteries you may also encounter problems with premature charge termination. Whenever you wish to use a new battery it therefore makes sense to carry out a series of monitored test charges, so that you can check that the automatic charge termination circuit works correctly and reliably with your packs, and charges them to full capacity.



## Replacement parts and Accessoires:

- 6460**     **Power Supply Input: 100-240V AC, Output: 12V DC 25A with docking system**
- 6444.1**    Temperature sensor for sub-C batteries, with magnet
  - .2**    Temperature sensor without magnet, e.g. for tyre heating covers
  - .6**    Battery holder for up to seven sub-C cells with individual cell terminals for side-by-side soldered battery packs, as generally used in competition. Required for balancing cells, e.g. Order No. 98947.6XXL
  - .L**    **Set of two fans** 50x50x10 for 6444.6
  - .USB** Mini-USB / PC-USB interface cable
- 3065.EH**    Balancerr PCB/adapter Graupner EH for 2-7 cells
- 3065.7PQ**   Balanceradapter Polyquest/Graupner for 2-7 cells
- 3065.7TP**   Balanceradapter Thunderpower/Graupner for 2-7 cells
- 3065.7XH**   Balanceradapter JST-XH/Graupner for 2-7 cells
- 3065.7SET** Balanceradapter PQ,TP/XH/EH-Graupner for 2-7 cells
- 3065.14**    Balancer PCB/adapter Graupner EH 2-14 for cells
- 8371        LiPo safety case
- 8375        LiPo Heater for LiPo safety case #8371



## A-2. WARNINGS AND SAFETY NOTES

- This product isn't designed for use by children under the age of 14, it isn't a toy!
- Protect the charger from dust, damp, rain, heat (e.g. direct sunshine) and vibration. It should only be operated in dry indoor conditions.
- The case slots serve to cool the charger, and must not be covered or enclosed; set up the charger with space round it, so that cooling air can circulate unhindered.
- The charger is designed to be powered by a 12 V DC car battery or power supply Order-No. 6460 or 6461. It is not permissible to modify the charger in any way.
- The charger and the battery to be charged should be set up on a heat-resistant, non-inflammable and non-conductive surface before use. Never place the charger directly on a car seat, carpet or similar. Keep all inflammable and volatile materials well away from the charging area. Provide good ventilation. Defective batteries can explode or burn!
- Connect the charger **12DC input directly** to the car battery using the original cables and connectors supplied. *The car's engine must be stopped all the time the ULTRA DUO PLUS 45 is connected to the car's battery.* Do not recharge the car battery at any time when the ULTRA DUO PLUS 45 is connected to it.
- The charge output sockets and connecting leads must not be modified, and must not be inter-connected in any way. There is a danger of short-circuit between the charge outputs and the vehicle's bodywork when the charger is connected to the car battery. The charge leads and connecting leads must not be coiled up when the charger is in use. Avoid short-circuiting the charge output or the model battery with the car bodywork. For this reason the charger must never be placed directly on the vehicle's bodywork.
- **Never** leave the charger running or connected to the car battery unsupervised.
- Only **one** battery may be connected to the unit for charging at any one time.
- The following types of battery must **not** be connected to the charger:
  - Ni-Cd / Ni-MH batteries consisting of more than 30 cells, Lithium-Ion / Li-Mn / Lithium-Polymer / LiFePO<sub>4</sub> (LiFe) batteries of more than 14 cells, or lead-acid batteries with a nominal voltage of more than 12V or 24V.
  - Batteries which require a different charge method from Ni-Cd, Ni-MH, Lithium or lead-acid types.
  - Faulty or damaged cells or batteries.
  - Batteries consisting of parallel-wired cells, or cells of different types.
  - Batteries consisting of old and new cells, or cells of different makes.
  - Non-rechargeable batteries (dry cells). **Caution:** explosion hazard!
  - Batteries which are not expressly stated by the manufacturer to be suitable for the currents which this unit delivers during the charge process.
  - Packs which are already fully charged or hot, or only partially discharged.
  - Batteries or cells fitted with an integral charge circuit or charge termination circuit.
  - Batteries installed in a device, or which are electrically connected to other components.



- To avoid short-circuits between the banana plugs fitted to the charge leads, please always connect the charge leads to the charger first, and only then to the battery to be charged. Reverse the sequence when disconnecting.
- As a basic rule always check that the charge quantity is approximately the same as you expected after the charger has indicated that the pack is fully charged. This is a simple method of detecting a problem reliably and in good time, should the charge process be terminated prematurely for any reason. The likelihood of premature termination varies according to many factors, but is at its highest with deep-discharged packs, low cell counts and particular cell types which are known to cause problems.
- We recommend that you carry out a series of test charges to satisfy yourself that the automatic termination circuit is working perfectly. This applies in particular when you are charging packs consisting of a small number of cells. If the cells feature has a poorly defined voltage peak, the charger may fail to detect the fully charged state.
- **Before charging please check:** have you selected the appropriate charge program for the battery? Have you set the correct charge or discharge current? Have you set the important cut-off voltage when charging Ni-Cd and Ni-MH packs? Are all connections firm, or is there an intermittent contact at any point in the circuit? Please bear in mind that it can be dangerous to fast-charge batteries. For example, if there is a brief interruption due to an intermittent contact, the result is inevitably a malfunction such as a restart of the charge process, which would result in the pack being massively overcharged.
- **Be careful! A battery could explode or burn, if the charger does have a fault or if the user does choose the wrong charging program and parameters.**

### A-3. GENERAL NOTES ON USING THE CHARGER

#### Charging batteries

When a battery is charged, a particular quantity of electrical energy is fed into it. The charge quantity is calculated by multiplying charge current by charge time. The maximum permissible charge current varies according to the battery type, and can be found in the information provided by the battery manufacturer.

It is only permissible to charge batteries at rates higher than the standard (slow) current if they are **expressly** stated to be rapid-charge capable. The STANDARD CHARGE CURRENT is 1/10 (one tenth) of the cells' nominal capacity (e.g. for a 1.7 Ah pack the standard charge current is 170 mA).

- Connect the battery to be charged to the charger output sockets using a suitable charge lead (red = positive terminal, black = negative terminal).
- Be sure to read the information provided by the battery manufacturer regarding charging methods, and observe the recommended charge currents and charge times. Do not attempt to fast-charge batteries unless they are expressly stated to be suitable for the high currents which this charger delivers.
- Please bear in mind that new batteries do not reach their full capacity until they have undergone



several charge / discharge cycles. You should also be aware that the charger may terminate the charge process prematurely when connected to new packs, and batteries which have been deep-discharged.

- A Ni-Cd pack will normally be warm at the end of a rapid-charge process, but if you notice that one cell of the pack is much hotter than the others, this may well indicate a fault in that cell. Such packs could fail completely without warning, and should not be used again. Dispose of the battery safely, preferably taking it to a toxic waste disposal centre.
- Ensure that all connectors and terminal clamps make good, sound contact. For example, if there is a brief interruption due to an intermittent contact, the result is inevitably a malfunction such as a restart of the charge process, which would result in the pack being massively overcharged.
- A common cause of malfunctions is the use of unsuitable charge leads. Since the charger is incapable of detecting the difference between a pack's internal resistance, cable resistance and connector transfer resistance, the first requirement if the charger is to work perfectly is that the charge lead should be of **adequate** conductor cross-section and should be **not be more than 30 cm long**. Good-quality connectors (gold-contact types) must be fitted to both ends.

#### • Charging transmitter batteries

A battery installed in a radio control transmitter can usually be recharged via the integral charge socket which is fitted to the transmitter itself. Transmitter charge sockets generally include a diode which prevents reverse current flow. This prevents damage to the transmitter electronics should the charger be connected with reverse polarity, or if a short-circuit occurs between the bare ends of the charge lead connectors. However, a transmitter battery protected in this way can only be charged by the ULTRA DUO PLUS 45 if the diode is by-passed. Please read your transmitter operating instructions for information on how to do this. The stated maximum charge current for the transmitter battery must **never** be exceeded. To avoid possible damage to the internal transmitter components due to overheating and heat build-up, we recommend that the battery should be removed from the transmitter's battery compartment prior to charging. The transmitter must be set to „**OFF**“ and left in that state for the **whole** period of the charge process.

**Never** switch a radio control transmitter on when it is still connected to the battery charger. The slightest interruption in the charge process may allow the charge voltage to rise to the point where it **immediately** ruins the transmitter.

**Never** attempt to carry out any battery discharge or battery maintenance programs via the transmitter's integral charge socket. The charge socket is **not** suitable for this purpose.

When you set a particular current for charging, the charger only supplies that current if the value does not exceed the unit's technical capacity. If you set a charge current which the ULTRA DUO PLUS 45 cannot deliver because it falls outside its technical limits, the unit automatically reduces the current to the maximum possible value.

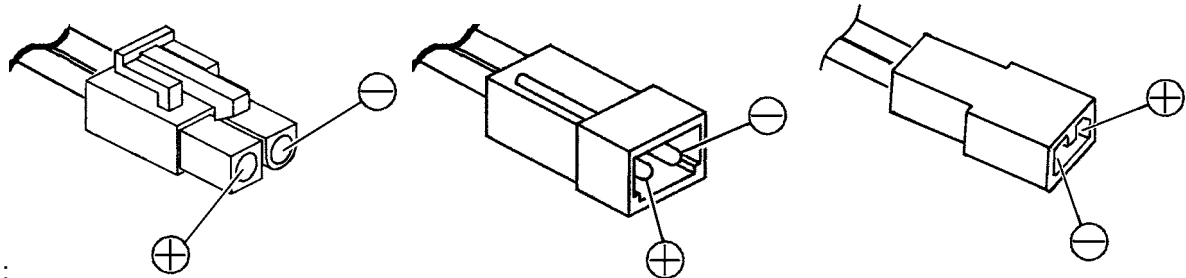


**LIABILITY EXCLUSION**

As manufacturers, we at GRAUPNER are not in a position to ensure that you observe the correct methods of operation when installing, using and maintaining this charger. For this reason we are obliged to deny all liability for loss, damage or costs which are incurred due to the incompetent or incorrect use and operation of our products, or which are connected with such operation in any way. Use only GRAUPNER or GM-Racing charge leads, batteries and accessories.

**A-4. RECOMMENDED CHARGE LEADS/POLARITY**

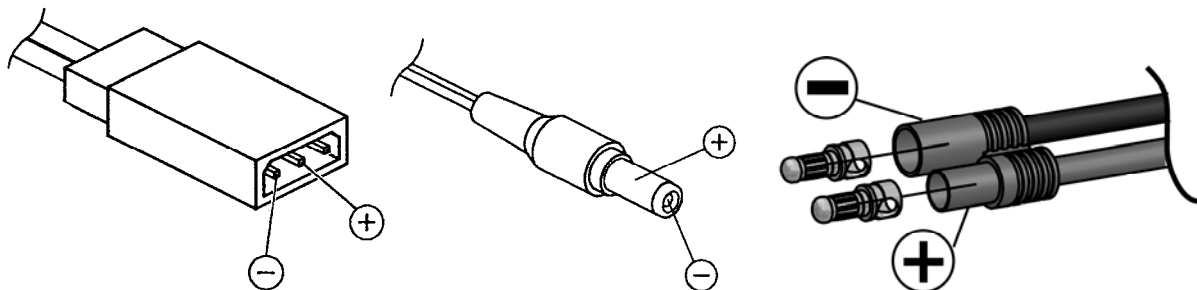
The requirements made on rechargeable batteries vary greatly according to their particular application, and this in turn calls for different types of battery connector. Please note that connectors, connector names and polarities may vary from one manufacturer to another. For this reason we recommend that you always use genuine matching connectors of identical construction. The following charge leads are suitable for battery charging with this unit:



**JAPAN charging cable**  
Order-No. 3371

**G2 charging cable**  
Order-No. 3011

**BEC charging cable**  
Order-No. 3037



**JR-receiver charging cable**  
Order-No. 3021

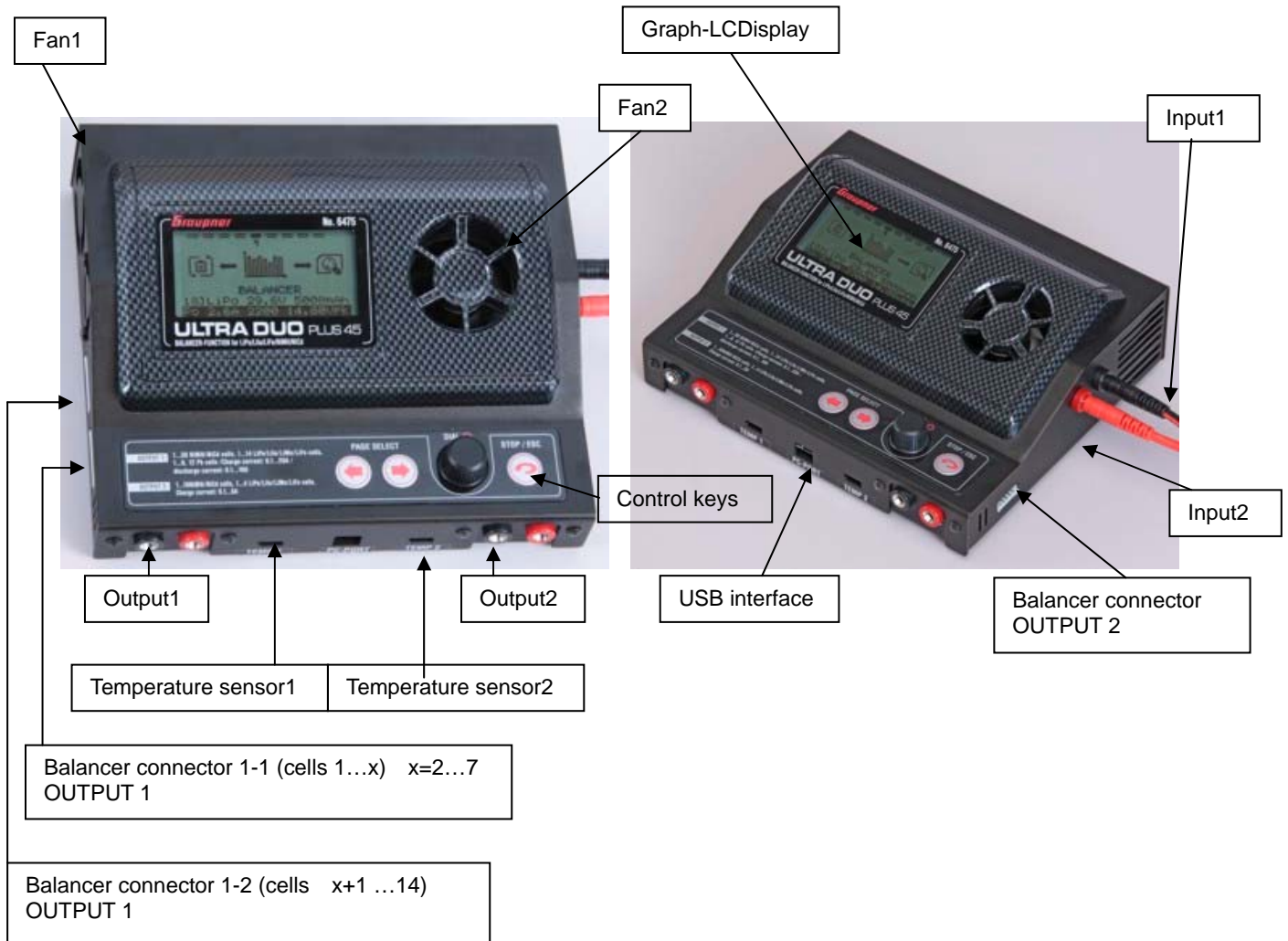
**GRAUPNER/JR-transmitter charging cable**  
Order-No. 3022

**G3,5 charging cable**  
Order-No. 2970.L

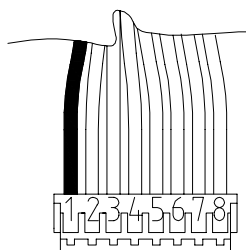
Be sure to use genuine charge leads fitted with cable of adequate conductor cross-section.



## A-5. CHARGER CONTROLS / CONNECTIONS



### BALANCER CONNECTOR:



EHR-8

#### PIN

- 1 = 0V = Ground = battery - = GND
- 2 = 3,7V = + cell 1
- 3 = 7,4V = + cell 2
- 4 = 11,1V = + cell 3
- 5 = 14,8V = + cell 4
- 6 = 18,5V = + cell 5
- 7 = 22,2V = + cell 6
- 8 = 25,9V = + cell 7

Plug in the GRAUPNER-BALANCER CONNECTOR of your battery with 3-8 poles right handed into the BALANCER CONNECTOR of the used OUTPUT.

### GRAUPNER- BALANCER CONNECTOR TYPE EHR-8

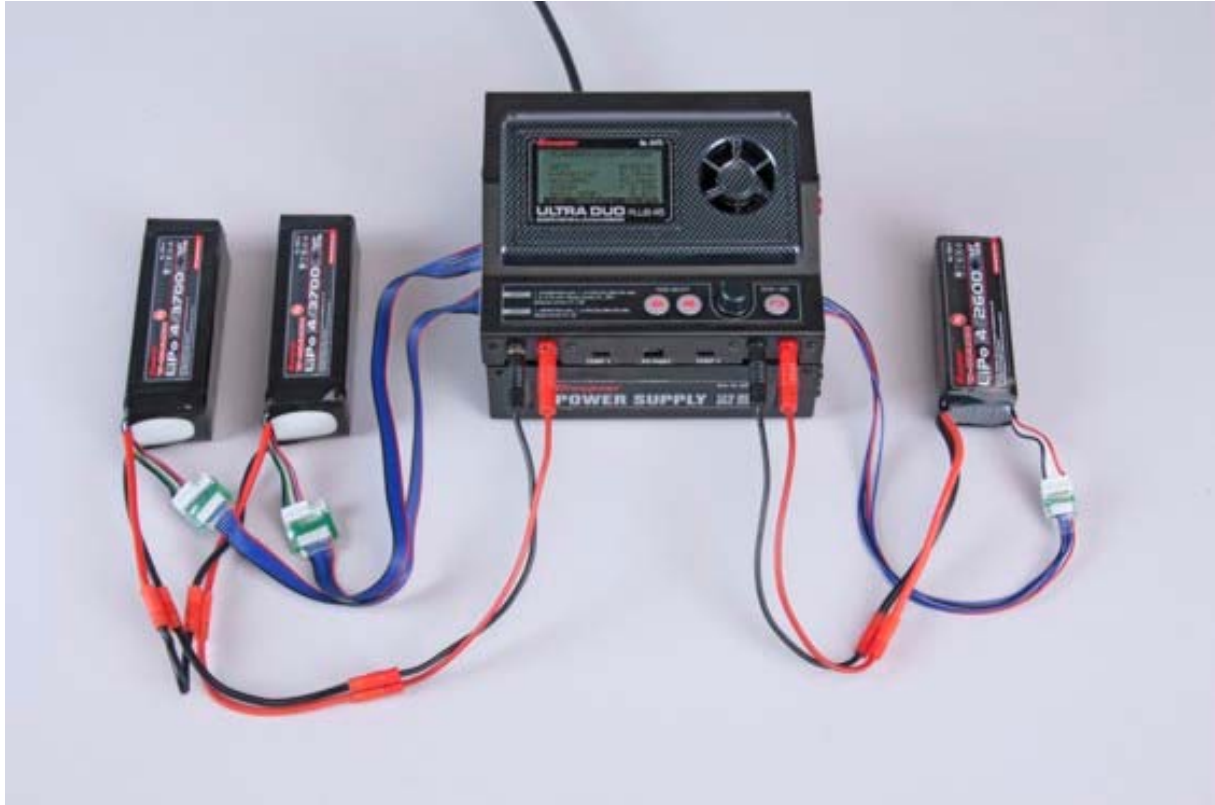
## A-6. USING THE CHARGER FOR THE FIRST TIME

Connect the charger INPUT 12V DC to a 12 V DC car battery min. 50Ah or to the Power Supply Order-No. 6460 25A or 6461 40A.



**A-5: Examples of connections:**

**Two LiPo-Batteries with the same capacity in Serie on OUTPUT 1  
and LiPo-battery on OUTPUT 2**





### **A-7. CLEANING AND MAINTENANCE**

The charger is entirely maintenance-free in use, and requires no servicing of any kind. However, it is in your own interests to protect the unit from dust, dirt and damp.

To clean the charger, disconnect it from the car battery and any other battery, and wipe it clean with a dry cloth (don't use cleaning agents!).

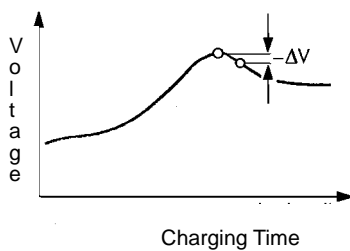
### **A-8. NOTES AND HANDLING OF RECHARGABLE BATTERIES**

- Charging single Ni-Cd or Ni-MH cells, and packs consisting of 1 ... 4 cells, presents the automatic charge termination circuit with a difficult task. The voltage peak is quite small in such cases, and it cannot be guaranteed that the cut-off circuit will work reliably. In such conditions the automatic circuit may not be triggered, or may not terminate the charge at the correct time. For this reason it is important to carry out a series of monitored test charge processes with your packs in order to establish whether the charge process is terminated reliably.
- Warm batteries offer much higher performance than cold ones, so don't be surprised if your batteries don't seem so effective in the winter.
- Overcharging and deep-discharging batteries lead to irreparable damage to the cells, and permanently reduces their maximum performance and effective capacity.
- Never store batteries for a long time in an uncharged, discharged or partially charged state. Charge your batteries before storing them, and check their state of charge from time to time.
- When purchasing batteries we recommend that you buy good quality products exclusively. Start by charging new packs at low rates, and work up gradually towards higher currents.
- Batteries should not be charged until shortly before use, as they are then able to deliver their best performance.
- Do not solder directly to battery cells. The temperatures which occur during soldering can easily damage the seals and safety valves of the cells. If this should happen, the battery may lose electrolyte or dry out, and some of its potential performance will be lost.
- Charging any battery at high currents shortens the life expectancy of the pack. Don't exceed the maximum values stated by the manufacturer.
- Overcharging inevitably reduces the capacity of the battery, so do not recharge a hot pack, or one which has already been charged.
- Charging and discharging any battery at a high current shortens the life expectancy of the pack. Don't exceed the maximum values stated by the manufacturer.
- Lead-acid batteries are not capable of being charged at high currents. Never exceed the maximum charge rate stated by the battery manufacturer.
- Protect batteries from vibration, and do not subject them to mechanical stress or shock.
- Batteries can generate explosive gas (hydrogen) when on charge and when being discharged, so it is important to provide good ventilation.
- Do not allow batteries to come into contact with water - explosion hazard.



- Never short-circuit battery contacts - explosion hazard.
- **Batteries can explode or burn, if they overheat. We suggest to use a LiPo-security hard case Order-No. 8371 with all Li-battery types and with NiCd und NiMH-batteries for charging.**
- Do not open battery cells - corrosion hazard.
- It is best to „balance“, or even up the cells in Ni-Cd and Ni-MH battery packs by first discharging all the cells separately to 0.9...1.1V and then charging up the pack.
- Please don't be surprised if your batteries are not as willing to accept charge in winter as in summer. The ability of a cold cell to accept and store charge is much lower than that of a warm one.
  
- Battery disposal: exhausted batteries are not ordinary household waste, and you must not dispose of them in the domestic rubbish. The retail outlet where you purchase your batteries should have a battery recycling container for proper disposal. Trade outlets are obliged by law to accept exhausted batteries for disposal.

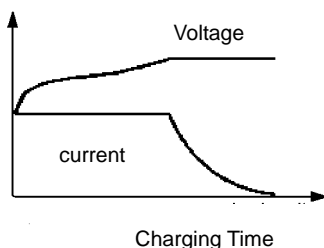
**DELTA PEAK CHARGE TERMINATION for NiCd-/NiMH- Batteries:**



The automatic charge termination circuit (battery full detection) works on the proven Delta Peak principle (also known as the Delta-V process), which is already in use in millions of chargers. The PEAK SENSITIVITY is shown as – delta V in the graph.

**CC-CV CHARGING METHOD FOR LiPo/LiIo/LiFe- Batteries**

These programs are only suitable for charging and discharging LiFePO<sub>4</sub> batteries with a voltage of 3.3 V / Cell, Lithium-Ion batteries with a voltage of 3.6 V / cell, and Lithium-Polymer and Lithium-Manganese batteries with a voltage of 3.7 V / cell. The outstanding feature of Lithium batteries is their much higher capacity compared to other battery types. However, this important advantage is offset by the need to adopt different handling strategies: they must be charged and discharged using specific methods, otherwise they will be damaged, and can be dangerous. The directions in these instructions must be observed at all times when handling these batteries. Specific information and safety notes will also be found in the battery manufacturer's technical information.



The fundamental rule is that Lithium-based batteries may ONLY be charged using special chargers, and the charge program must be set up correctly in terms of final charge voltage and capacity for the battery type in use.



The charge process is fundamentally different to that required for Ni-Cd or Ni-MH batteries, and is termed a constant current / constant voltage method. The charge current required varies according to the battery capacity, and is set automatically by the charger. Lithium batteries are usually charged at the 1C rate (1C charge rate = half capacity as charge current. Example: battery capacity 1500 mAh: 1C charge current = 1500 mA = 1.5 A).

Because some types can be charged with up to 2C or 4C charging current, the charging current and the capacity of the battery must be set separately. When the battery on charge reaches the specific final voltage which is appropriate to the battery type, the charger automatically reduces the charge current in order to prevent the battery exceeding the final permissible voltage. If the battery manufacturer states a charge current lower than the 1C rate, then the capacity (charge current) must be reduced accordingly.

**We recommend the use of the balancer connector, which ensures that your Lithium batteries are charged optimally, and therefore increases safety and their useful life.**

Problems caused by mistreating batteries:

It is very dangerous to overcharge Lithium-Ion batteries, as they tend to react by gassing, overheating and even exploding. If the final charge voltage of 3.6 V / cell (LiFePO<sub>4</sub>), 4.1 V / cell (Lithium-Ion) or 4.2 V / cell (Lithium-Polymer and Lithium-Manganese) is exceeded by more than 1%, the lithium ions in the cell start to change into metallic lithium. This material reacts very violently with the water in the electrolyte, and this can result in the cell exploding. On the other hand it is also important to avoid terminating the charge process before the final charge voltage is reached, since this reduces the effective capacity of the Lithium-Ion cell markedly. Stopping the charge at just 0.1 V under the threshold means a capacity loss of around 7%. Lithium batteries must not be deep-discharged, as this leads to a rapid loss of capacity. This effect is irreversible; it is absolutely vital to avoid discharging the batteries to below 2.5 V / cell.

**Caution: the cell type, cell capacity and cell count set on the charger must always be correct for the battery to be charged; if you make a mistake, the battery could explode and burn! Never connect a Lithium-based battery to the charger if it features an integral charge circuit! Always place your Lithium batteries on a non-flammable surface for charging.**



## **A-9. PC-INTERFACE**

You can download the appropriate USB serial driver CP210x\_Drivers.exe for this battery charger from the Software Download area of [www.graupner.de](http://www.graupner.de) or [www.gm-racing.de](http://www.gm-racing.de).

Install this driver first.

Connect the USB lead to the charger and to a free USB port on your PC.

PC software can be downloaded at [www.graupner.de](http://www.graupner.de), [www.gm-racing.de](http://www.gm-racing.de) or [www.logview.info](http://www.logview.info).

This software enables you to display battery curves and much more.

### **LogView - displays your serial data ...**

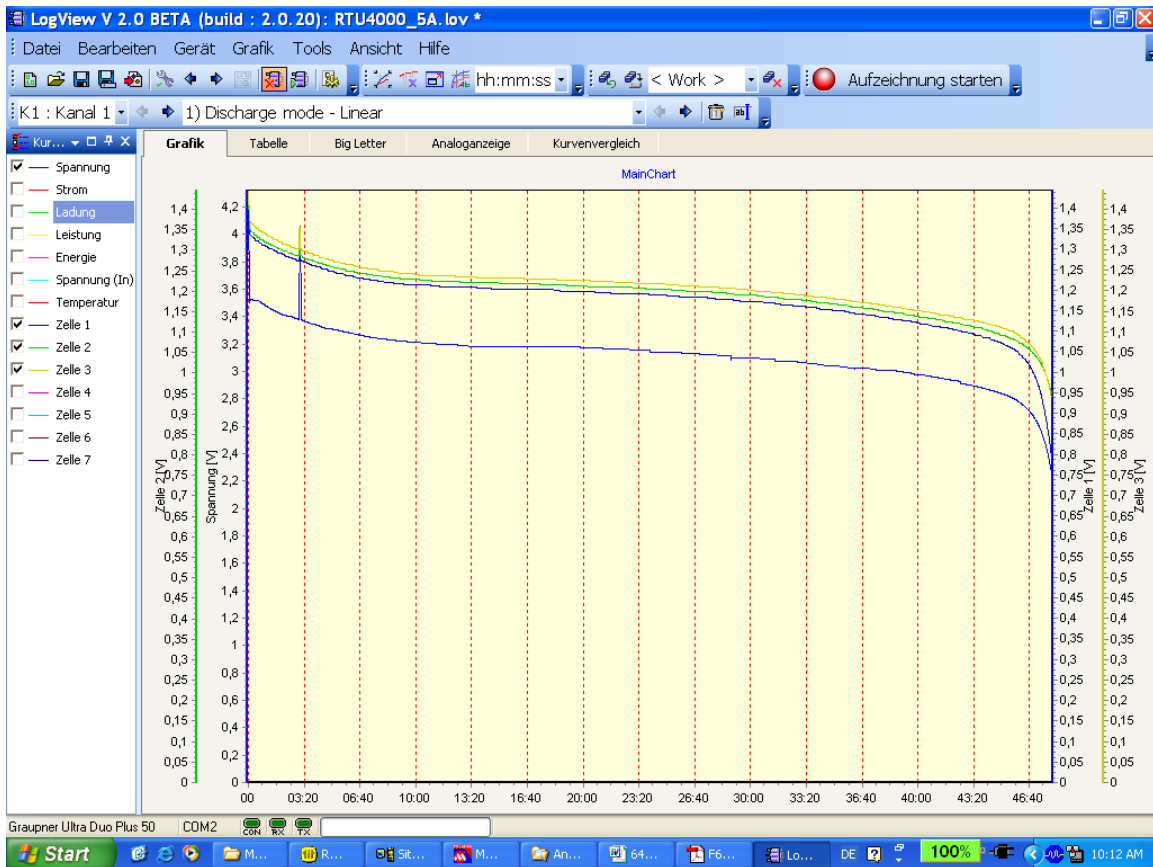
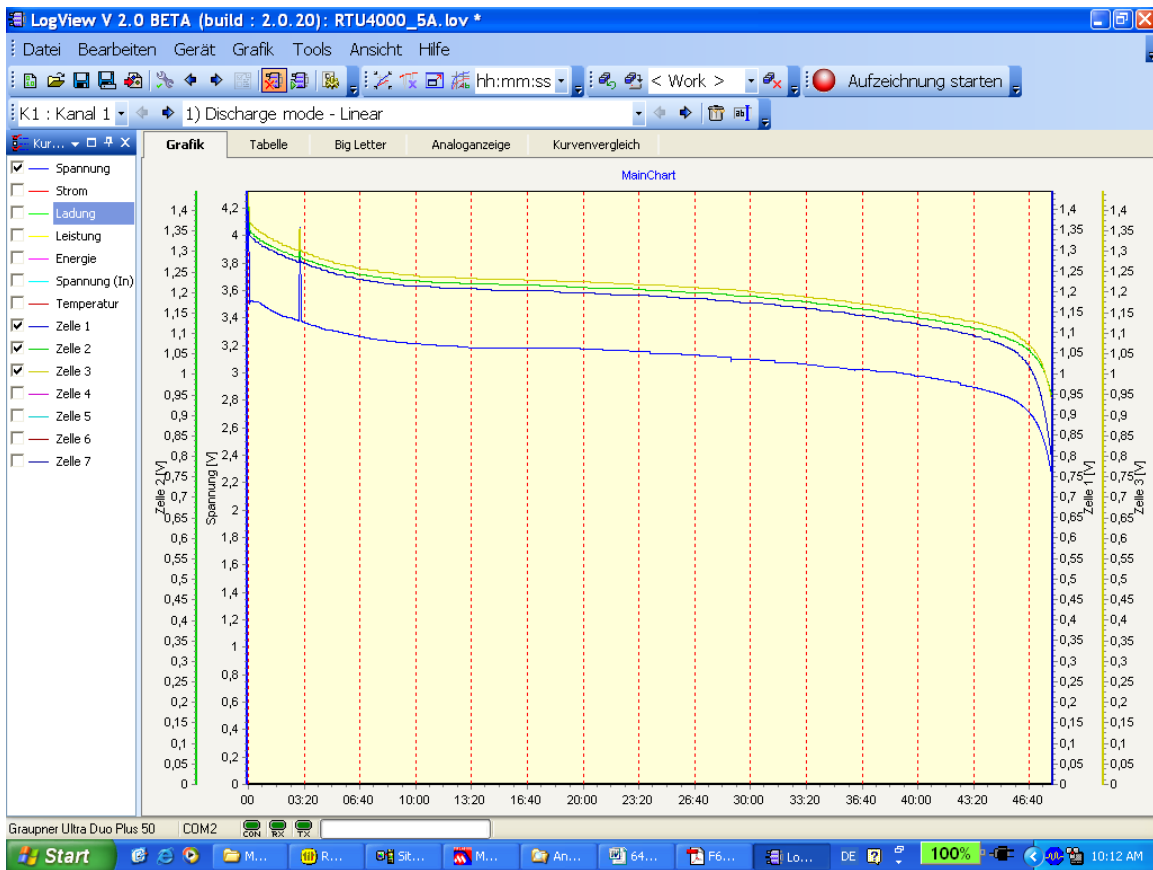
We have been working closely with the manufacturer of the software 'LogView', in order to provide optimum facilities for evaluating the data generated by our ULTRAMAT 16 and ULTRA DUO PLUS 45 battery chargers. With the help of LogView, which we recommend and support, it is possible to visualise and analyse the serial data delivered by these chargers, and if necessary to export the data in a wide variety of forms.

The software is Donationware, and can be downloaded from the following web addresses: [www.graupner.de](http://www.graupner.de) or [www.logview.info](http://www.logview.info). If you enjoy using the software, there is a method of sending a monetary contribution to the developer, but otherwise the program can be used free of charge.

In addition to an intuitive user-friendly interface, LogView offers the opportunity to use a wide range of different equipment. The data received from the devices is always displayed in the same way, which makes it much easier for the user to handle his equipment. The files generated by LogView can also be used directly by any other user, even if he does not have actual physical access to the device in question.

### **Additional software features include:**

- High-performance graphics engine with numerous analysis and measurement functions. Wide-ranging options are available for adjusting the display of the curves to suit individual requirements.
- Analysis functions help to investigate rechargeable batteries more thoroughly.
- The curve comparison functions enable the user to display different charge and discharge processes in graphic form. In this way it is possible in particular to assess the quality and ageing effects of rechargeable batteries very accurately, and to compare them with other rechargeable batteries.
- The object management function provides a means of storing and managing recorded data and information relating to specific batteries.
- Numerous export functions for graphs and tables allow other applications to use the data.
- The label printing function provides a means of printing out labels for applying to individual battery packs.
- The integral Help system is a fast, straightforward method of obtaining information relating to the program's functions. If particular questions arise concerning the use of the software, or if you have suggestions for further improvements to the LogView program, it is possible to contact the developer directly via the LogView forum, or to exchange ideas and experiences with other users.





## 0-1. Features

- Computer-controlled universal fast charger
- With 12 V DC inputs and direct plug system for the switching Power supply 12V/25A Order-No. 6460.
- **Two independent charge outputs**
- **Graupner Balancer socket for 1...14 (OUTPUT 1) and 1...4 (OUTPUT 2) NiCd / NiMH / LiPo / Lilo / LiFe cells, displays single cell internal resistance (only OUTPUT 1)**
- 45 memories for storing all essential battery parameters
- Automatic charge, discharge, capacity measurement, battery maintenance and conditioning programs for all NiMH, NiCd, LiPo, Lilo, LiFe batteries used in modelling
- Ultra-simple to operate, with clearly arranged program structure, three buttons and rotary knob button
- High-contrast LCD screens (128 x 62) with blue backlighting: 21 x 8 characters for displaying all relevant parameters or charge / discharge curves
- Charge / discharge facilities for NiMH, NiCd, LiPo, Lilo, LiMn, LiFe or Pb (lead-acid) batteries (OUTPUT 1)
- Delta-Peak cut-off detector for NiMH and NiCd cells with variable Delta-Peak voltage, ensuring 100% full battery charging
- Capable of charging single cells, therefore ideal for glow energizer batteries and for cell selection processes
- Charges LiPo, Lilo, LiFe and lead-acid cells using constant current / constant voltage method. Declining current curve after final charge voltage, with automatic charge termination.
- Charge processes:
  - NiCd / NiMH: Automatic, normal, linear, GMVIS, IMPULSE, REFLEX, RE-PEAK, staged charging
  - LiPo / Lilo / LiFe: Automatic, CC / CV, CC / FAST-CHG, STORE
- **Special facility for battery storage**
- **Balancer program**
- **Data memory for comparing all important battery data.**
- Lead-acid battery charge programs with optimised charge curve, discharge facility, variable discharge current for determining battery capacity and residual capacity.
- Program for tyre heating covers Order No. 94711 with temperature control or LiPo Heater #8375 for LiPo safety case #8371.
- Motor run-in and test functions for brushed electric motors
- Protected against short-circuit, overload and reversed polarity
- Switchable buzzer, selectable melody
- Variable safety timer
- **Variable max. charge capacity**
- Selectable language: English / German / French / Italian
- Internal battery resistance display
- Individual cell voltage display for 1...14 and 1...4 cells in NiCd / NiMH / Li modes
- PC-USB interface for displaying battery curves on the PC screen and programming battery memories
- Ready to connect

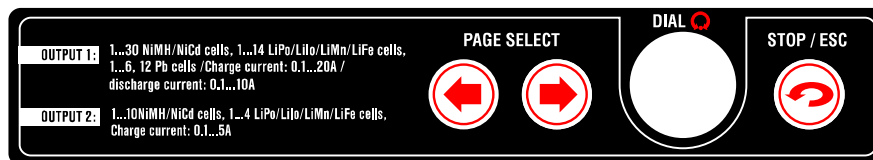


## 0-3. CONTROL KEY SELECT FLOW

Select the main menu with turning the 'DIAL'-button.

In setting status, if ESC button is pressed, it directly moves to a higher menu.

In operating status, if the ESC button is pressed, operating should stop.



With PAGE SELECT the displayed page can be changed.

### 0-3 OUTPUT 2 CHARGE/HEATER

If a battery or a heater is connected to output 2, the OUTPUT 2 MENU will be automatically started.

#### BATTERY MENU:

Warning! The wrong setting for the battery type, voltage or capacity can cause explosion or fire!

#### 0-3.0 Battery selection

- In memory screen, select the memory and press “-> button”
- Set your wanted battery, cell or voltage, and capacity.

#### 0-3.1. CHARGE CURRENT

- Set charge currents. Follow the instruction of the battery. Graupner batteries should be charged with 0.5-1C (f. e. 6N-4200 should be charged with 4.2A). Transmitter batteries must be charge with less then 2A. Follow the instruction of the transmitter battery and transmitter.

#### 0-3.2. PEAK SENS

**WARNING! To high settings of the delta peak sensitivity can cause explosion and fire.**

- Only for NiCd/NiMH. Follow the instruction of your battery or start with 3mV/Cell.



- If battery is 6cells and 3mV/C is set, the charger should finish as  $3\text{mV} * 6\text{cell} = 18\text{mV}$ .
- In case of NIMH battery, charge can be also finished with Zero-peak.
- Set bigger peak sens values if delta-peak often happens.
- "END:DELTA-PEAK " should be shown if charge is finished with delta-peak.
- "END:ZERO-PEAK should be shown if charge is finished with ZERO-peak.

### 0-3.3. TRICKLE

- This current is to compensate battery self discharge after NICD/NiMH fast charging.
- As for Lithium battery, CV ( constant voltage ) is activated instead of trickle charge.

### 0-3.4. CUT-TEMP

- Connect the temp sensor to battery pack and when it reaches the selected temp, charging should stop. Normal settings are 35-50°C.
- This function is likely to be used more to prevent battery pack from being overheating rather than normal charge completion.

### 0-3.5. CHG-VOLTAGE

- This is only for lithium battery.
- Setting charging voltage can be used as battery storage.  
Normally, LiPo battery is charged to 4.2V/cell, for the battery storage, it can be charged to 3.7V/cell with CV charging.
- For charging range per battery type, please refer to "Setup Range sheet" and battery instruction. Normal max. charging voltage settings are for:  
LiFe: 3.6V/cell, Lilo: 4.1V/cell, LiMn = LiPo: 4.2V/cell. For higher cycle life time, use 0.1V less. For storage use 0.4-0.5V less.



**MENU HEATER OUTPUT 2:**

**0-3. TYRE HEATER / BATTERY HEATER SCREEN**

0-3.1. How to use

Using tyre warmer of GM-Racing #94711 or battery heater #8375. Never heat tyres over 80°C and never heat batteries over 50°C.

Insert the temp sensor into the tire warmer or mount the temp sensor with tape on the battery LiPo safety case with heater.

Select SETUP menu

Starting this mode.

Even changed values during operation should be also stored internal memory.

0-3.2. SETUP

- SET T1

Set operation time 1.

When it reaches the selected operation time, operation should stop.

- SET T1

Set tire temperature 1 for the best tyre additive efficiency.

Control output in accordance with temperature.

- DELAY

Set the delay time between heating setting 1 and setting 2, if need for better tyre performance.

- SET T2

Set operation time 2.

When it reaches the selected operation time, operation should stop.

- SET T2

Set tire temperature 2 for the best racing temperature.

Control output in accordance with temperature.

- CURRENT LIMIT

Set max currents which is delivered to tire warmer. The max. current should be limited to 3.0A. Current is not increased any more when it reaches max currents even if tire temperature does not match.



**OUTPUT 1:**

**MEMORY AND BATTERY SETUP MENU SCREEN**

1-1. Memory selection

- Pressing the dial in Memory[00] then rotate the dial to select the wanted memory.
- Memory 0, 1-45 can be selected.

For OUTPUT 1, 0, 1-40 Memory can be selected and copied. Mark your battery with the Memory number you use for it.

- "0" Memory automatic mode can be selected in channel 1.

The datas of Memory [0] are not stored into the data memory. Only the battery type is stored.

In Automatic mode, main screens will be only shown as like order -  
MEMORY → CHARGE → DISCHARGE → DATA VIEW → CONFIG

1-2. Battery selection

- In memory screen, select the memory and press "-> button"
- Set your wanted battery, cell or voltage, and capacity.

If battery type is changed, all setting parameters should be initialized, and TRACE DAT in DAT VIEW mode is clear.

- Input the purchasing date of your battery (day/month/year)

If battery type is changed, the purchasing date on your battery should be automatically changed to present date.

- In "0" memory, if battery type is changed then press the dial, it should move "CHARGE SETUP".

1-3. Battery Name Setting

- You can name your battery pack using up to total 16 letters.

1-4. Auto settings on parameters

- When battery type is changed

It should be clear to battery initial values.

- max. current:

The max. Charge or discharge current should be changed to 1C rate.

Safety timer value is automatically changed.

However, battery type and max. charge current MUST be set correctly.



## 2. CHARGE SETUP MENU FLOW

**Warning: To high settings of charging voltage (Li-batteries), charging current (all types) or delta peak sensitivity (NiMH/NiCd) batteries can cause explosion and fire!**

### 2-1. CHARGE CURRENT

- Set charge currents. Follow the instruction of the battery. Graupner batteries should be charged with 0.5-1C (f. e. 6N-4200 should be charged with 4.2A). Transmitter batteries must be charge with less then 2A. Follow the instruction of the transmitter battery and transmitter.

### 2-2. PEAK SENS

**WARNING! To high settings of the delta peak sensitivity can cause explosion and fire.**

- Only for NiCd/NiMH. Follow the instruction of your battery or start with 3mV/Cell.
- If battery is 6cells and 3mV/C is set, the charger should finish as  $3\text{mV} * 6\text{cell} = 18\text{mV}$ .
- In case of NIMH battery, charge can be also finished with Zero-peak.
- Set bigger peak sens values if delta-peak often happens.
- "END:DELTA-PEAK " should be shown if charge is finished with delta-peak.
- "END:ZERO-PEAK should be shown if charge is finished with ZERO-peak.

### 2-3. PEAK DELAY

- This function is not to detect delta peak which could happen at the initial stage of charging and which could happen due to the chemical reaction internal battery. Normal settings are 3-5min.

### 2-4. TRICKLE

- This current is to compensate battery self discharge after NiCd/NiMH fast charging.
- As for Lithium battery, CV ( constant voltage ) is activated instead of trickle charge.

### 2-5. CUT-TEMP

- Connect the temp sensor to battery pack and when it reaches the selected temp, charging should stop. Normal settings are 35-50°C.
- This function is likely to be used more to prevent battery pack from being overheating rather than normal charge completion.

### 2-6. MAX CAPACITY

- This is to set your wanted charge percentage against the selected battery capacity.
- Set half of the battery capacity ( 50% ) for the purpose of the battery storage. Set 120-125% for fully charging of high current NiCd/NiMH batteries and 100-105% for charging LiPo-, Lilo-, LiFe- batteries and NiMH RTU (Ready to use) batteries.
- If battery capacity is 3000mAh and if you set 10% out of the total max capacity, the charger should stop charging at 300mAh.
- If "OFF" is set, this max capacity function is not activated.
- If charging is finished with MAX CAPACITY, "END:CAPACITY should be shown.



## 2-7. SAFETY TIMER

- If charging is not finished within charging time, this Safety Timer should stop charging.

- When charge current is changed, the Safety Timer is also automatically changed.

Safety Timer per battery type is gained based on Linear charge mode

NiCd, NiMH = (Selected capacity \* 60 / Selected current) \* 1.5

Lilo, LiPo, LiFe, Pb = (Selected capacity \* 60 / Selected current) \* 2.0

Safety Timer should be "OFF" if the safety timer is bigger than 900minutes.

- Expected time can vary depending on input power or AC power (internal) in CONFIG SETUP.

(Refer to the file " watt limit & safe timer.xls" )

## 2-8. FLAT CHECK

- "END : FLAT CHECK " : This message should be shown when the battery voltage is not changed for a specific time during charging.

- Also, when a battery which has BIG capacity is being charged with smaller charge current, this message could be also shown.

f. e. 4800mAh 0.1A Charge

- You can turn on or off for this FLAT CHECK function.

## 2-9. REPEAK CYCLE

- This is to recharge battery pack which is charged.

- This mode should be activated when it moves to "REPEAK" mode from CHARGE PROCESS

- Since this function is to charge again the fully charged battery, this PEAK DELAY should be automatically set to "0". ( PEAK DELAY setting value is not charged )

- Set wanted repeak charge cycle number.

## 2-10. REPEAK DELAY

- Set the delay time between first repeak and second repeak.

## 2-11. CHG-VOLTAGE

- This is only for lithium battery.

- Setting charging voltage can be used as battery storage.

Normally, LiPo battery is charged to 4.2V/cell, for the battery storage, it can be charged to 3.7V/cell with CV charging.

- For charging range per battery type, please refer to "Setup Range sheet" and battery instruction. Normal max. charging voltage settings are for:

LiFe: 3.6V/cell, Lilo: 4.1V/cell, LiMn = LiPo: 4.2V/cell. For higher cycle life time, use 0.1V less. For storage use 0.4-0.5V less.



### 3. DISCHARGE MENU SCREEN

**Warning: Deep discharging cells and too high discharge currents can destroy the battery and can cause explosion and fire!**

#### 3-1. DSCH CURRENT

- Set wanted discharge currents. Check the battery instruction for the max. discharge current.

#### 3-2. DSCH CUTOFF

- Set discharge cutoff voltage per cell.

If it is set to 1.0V/Cell and its battery cell is 6cells, the discharge is finished at 6.0V.

For NiCd/NiMH batteries the cells should be never discharged lower as 1.1V/cell.

LiFe cells should be never discharged lower as 2.5V/cell and LiPo/LiIo cells should be never discharge lower as 3.0V/cell for the highest possible life time.

Deep Discharge can cause capacity loss and in the worst case it can destroy the battery and cause explosion and fire.

- Discharge is finished with smallest voltages with connecting the balancer cable the balancing port of the charger.

Even if the cable is connected during discharging, discharge is not finished with cell voltage.

#### 3-3. CUT-TEMP

- Connect the temp sensor to battery, and discharge is finished when it reaches the selected temp.
- This function is likely to be used more to prevent battery pack from being overheating rather than normal charge completion

#### 3-4. MAX CAPACITY

- This is to set your wanted discharge percentage against the selected battery capacity.
- If "OFF" is set, this max capacity function is not activated.
- If battery capacity is 3000mAh and if you set 10% out of the total max capacity, the charger should stop discharging at 300mAh

#### 3-5. MATCHED VOLT

- This is only for NiCd and NiMH batteries.
- This mode should be activated when it moves to "MATCH" mode from DISCHARGE PROCESS
- To activate this mode, balancing cable MUST be connected to the balancing port of the charger.



- Discharge to selected voltages with selected discharge currents and match each cell voltage.
  - If the discharge cut-off voltage is set to the same voltage as the match voltage, the discharge current will be reduced when the cut-off voltage is reached, to hold the constant voltage at the match/cut-off voltage level.
- High current competition NiMH batteries should be matched before charging. Matching the batteries does increase the life time of the battery.

## 4. CYCLE MENU SCREEN

### 4-1. DIRECTION

- Set cycle direction.
- D:C→D This mode is to first unconditionally discharge then charge to discharge repeatedly.

### 4-2. CYCLE TIME

- Set the cycle repeat time number.

### 4-3. AF-CHG DELAY

- Set pause time before discharging after charging.

### 4-4. AF-DCH DELAY

- Set pause time before charging after discharging, so the battery can cool down after discharging before the next charging starts.

## 5. STEP CHARGE MENU SCREEN

### 5-1. STEP CAPACITY

- This mode is only for NiMH battery, which are discharge before charging. Never charge full batteries in this mode. Use the temperature sensor for safety reasons.
- Set wanted charge capacity in each step.
- Step charge should be finished at the fourth step based on the selected capacity in the fourth step.

Set max possible capacity which can be charged to battery.

If battery is 4300mAh and 4800mAh is charged, set 4900mAh ( 100mAh – tolerance ).

- If you want three step charging, make sure to set same capacity in 2<sup>nd</sup> step and 3<sup>rd</sup> step, then, it should be jumped directly from 2<sup>nd</sup> step to 4<sup>th</sup> step.
- Value can be automatically set pressing the dial long as AUTO SETUP.

### 5-2. STEP CURRENT

- Set wanted charge current in each step.
- Value can be automatically set pressing the dial long as AUTO SETUP.

### 5-3. PEAK SENS



- Set peak sens voltage.
- The selected peak sens voltage is checked in each step.

5-4. CUT-TEMP

- Connect the temp sensor to battery, and charge is finished when it reaches the selected temp.
- This function is likely to be used more to prevent battery pack from being overheating rather than normal charge completion

5-5. TRICKLE CHG

- Set additional current after fast charging.

5-6. DISCHARGE

- Set whether discharge is first activated before step charging.
- If "ON" is set, discharge is done based on selected capacity (max selected capacity) x 4C rate. It is limited to 10.0A if X4C rate is over 10.0A.
- Step charge is basically to charge full discharged battery pack, please make sure to set "ON" always.

5-7. IMPULSE

- Set whether impulse operation is activated or no in 1<sup>st</sup> ~ 3<sup>rd</sup> step.
- Impulse current : Selected current X 1.5 current should be delivered for 0.5 second every 3 seconds. Ex) If 5A is set, 5.0A current for 2.5 seconds, and 7.5A for 0.5 second.
- This IMPULSE is to improve battery power.
- Battery could be damaged if excessive current with impulse operation is set.

5-8. REFLEX

- Set REFLEX operation in 1<sup>st</sup> step ~ 3<sup>rd</sup> step.
- REFLEX is to discharge for a very short time every one second.

**6. BALANCER MENU SCREEN**

6-1. BALANCE <1/6> SCREEN

- This is to show each cell information which is connected to the balancing port of the charger.

BATTCELLS	0CELL	- Connected cell number.
PACK VOLTS	0.000V	- Overall cell voltage
AVG VOLTS	0.000V	- Cell average voltage
GAP VOLTS	0.000V	- Between max and min voltage
MAX NO. 0	0.000V	- Max cell number and voltage
MIN NO. 0	0.000V	- Min cell number and voltage

6-2. CELLS VOLTAGE <2/6> <3/6> SCREENS

- Showing each cell voltage

6-3. CELLS RESISTANCE <4/6> <5/6> SCREENS

- Showing each cell internal resistance



6-4. BALANCE GRAPHIC

- CL, 0N : Showing the selected cell voltage
- A, M : Select Auto or Manual for Y axis of the graph
  - A(Auto) : If Auto is set, Vy and Vc are automatically set.
  - M(Manual) : If Manual is set, Vy and Vc can be manually set.
- Vy : Vy means a scale of voltage in Y axis.
- Vc : Vc means voltage of center position of Y axis.

**7. DATA VIEW SCREEN**

7-1. DATA VIEW <1/4>

- This is to display charge status.

INPUT	0.000V	-Input Voltage
OUTPUT	0.000V	-Output Voltage
TEMPERATURE	0.0`F	-Temp of the temp sensor
HIGH TEMP	0.0`F	-Max temp of the temp sensor
RESISTANCE	0.0mΩ	-Battery internal resistance after operation

7-2. CYCLE DATA <2/4>

- This is to store cycle operation and various status.
  - Total 11 memories ( Memory 0~10)
  - Memory consists of "ROM", even if power is OFF, the data still leaves.
  - Memory "0" is the latest data, and memory 10 is the oldest data.
- Data which happens after 10 times should be removed in order.

CYCLE DATA	0<2/4>	- Cycle number
END.00/00/00	10:00	- Date and Time for the cycle
TIME: 0:00:00		-Charge time after charging
TIME: 0:00:00		-Discharge time after discharging
VOLT: 0.000Vp		- Peak voltage during charging
VOLT: 0.000Vp		- Peak voltage during charging
CAP. 0mAh		- Charged capacity
	0mAh	- Discharged capacity
RES. 0. 0mΩ		- Battery internal resistance at charge
RES. 0. 0mΩ		- Battery internal resistance at discharge

- Memory storage

- CHARGE, DISCHARGE MODE

Data is stored to "0" memory

- CYCLE MODE

If D:C->D mode is activated for 10 times, the first discharge is stored to "10" memory and 1~10 cycles are stored to 9~0 memories.

If C->D, D->C mode is activated for 10 times, 1~10 cycles are stored to 9~0 memories.

The latest data should be stored in Memory "0".



- STEP CHARGE

Initial discharge → "1" memory storage

1<sup>st</sup> ~ 4<sup>th</sup> STEP → "0" memory storage

- REPEAK CHARGE

Since this mode is to recharge charged battery, the previous charged data is already stored to "0" memory.

7-3. TRACE DATA <3/4>

- This is to check battery condition.

- Memory consists of "ROM", even if power is OFF, the data still leaves.

- MEMORY setting

LAST	0mAh	- Last charged capacity
LAST	0mAh	- Last discharged capacity
MAX	0mAh	- Highest charged capacity up to now
MAX	0mAh	- Highest discharged capacity up to now
MIN. RES.	0.0mΩ	- min. internal battery resistance up to now.
TOTAL CHARGES	0	- Charged number up to now
NEW	00/00/2007	- Date of using battery for the first time

7-4. OPERATION GRAPHIC

- Graph does not exist in each memory. Instead, graph is shown for last operation.

- Check graph for voltage, current, and temperature in the graph.

- Memory consists of "ROM", even if power is OFF, the data still leaves.

0x (zoom) - It means time of X axis and 1~43 can be set.  
 Ex) If one screen of X axis of 1X is 2minutes, if 10x is set, 20minutes can be shown in the screen.  
 The more zoom is bigger, the less accuracy of the graph becomes. AT = AUTOZOOM

A,M(auto,manual) - Select Auto or Manual for Y axis.

A(Auto) : If Auto is set, Vy and Vc are automatically set.

M(Manual) ; If Manual is set, Vy and Vc can be man. set

Y axis value - One scale of voltage of Y axis

center value - Voltage of center position of Y axis

position - Location for graph moving

graph type -

V – Voltage graph with indication of Vc and V

I – Current graph with indication of AC and A

T – Temperature graph with indication of Fc and F



## 8. TYRE HEATER / BATTERY HEATER SCREEN AND POWER SUPPLY SCREEN

### 8-1. How to use

Using tyre warmer of GM-Racing #94711 or battery heater #8375. Never heat tyres over 80°C and never heat batteries over 50°C.

Insert the temp sensor into the tire warmer or mount the temp sensor with tape on the battery LiPo safety case with heater.

Select SETUP menu

Starting this mode.

Even changed values during operation should be also stored internal memory.

### 8-2. SETUP

#### - SET T1

Set operation time 1.

When it reaches the selected operation time, operation should stop.

#### - SET T1

Set tire temperature 1 for the best tyre additive efficiency.

Control output in accordance with temperature.

#### - DELAY

Set the delay time between heating setting 1 and setting 2, if need for better tyre performance.

#### - SET T2

Set operation time 2.

When it reaches the selected operation time, operation should stop.

#### - SET T2

Set tire temperature 2 for the best racing temperature.

Control output in accordance with temperature.

#### - CURRENT LIMIT

Set max currents which is delivered to tire warmer. The max. current should be limited to 3.0A. Current is not increased any more when it reaches max currents even if tire temperature does not match.

### 8-3. POWER SUPPLY

- SET VOLTAGE                      Set the voltage limit

- SET CURRENT                      Set the current limit.

- PW. RATE                          Set the Power rate

Connect the user to the output and then start the power supply function with the dial button. If you start the power supply and then connect a user, It can happen, that the power supply will switch-off and cause a reset of the charger. It can also destroy the charger, if more as 10A will be supplied.



**9. MOTOR RUN-IN SCREEN (Warning: only use DC brushed motors or DC fans!)**

9-1. MOTOR Break-In

- This is motor brake in mode.
- Rotate the motor keeping the selected voltage.
- Set voltage and operating time.
- Set 0.1V~24V

**Make sure not to exceed 12V when breaking in motor used for electric power. 12~24V range is for operating range of fan.**

**The motor function can only be started, if the other output is not in use!**

**For racing brushed motors and using the internal power supply, we recommend to use a 1-2 Ohm resistor in series of the motor to reduce the max. current flow.**

**Use voltages of max. 7.2V for 7.2V motors. Never use a higher voltage as the motor is build for.**

**Higher voltages can destroy the motor and the charger. Never run brushless motors!**

9-2. Program Mode

- This mode is to program motor voltages.
- It consists of 4 steps, and user can set operation voltage, operating time and pause time in each step.
- The meaning of "SPEED" is speed which reaches the selected voltage when step is changed.

SPEED can be set to 1~5 and 1 is slowest and 5 is fastest. The slowest speed is recommended for motors.

- Cycle can be set and it can be repeated in 1~4 step.

Cycle can be set to 1~10 times.

9-3. MOTOR Test

- Rotate the motor at 4.8V or 7.2V.
- Showing average currents and peak currents in each step.
- Step operation voltage

1st	- 1.2V
2nd	- 2.4V
3rd	- 3.6V
4th	- 4.8V
5th	- 6.0V
6th	- 7.2V



## 10. CONFIG SETUP SCREEN

### 10-1. CONFIG SETUP <1/4> and <2/4>

- TEMP SCALE → Can be set to either “C” or “F”
- BOTTON SOUND → Button can be set to ON or OFF
  - Even if the button sound is OFF, the charger should beep when error occurs.
- FINISH SOUND → Set operating time for finish sound.
- FINISH MELODY → Select melody for finish sound.
- LCD CONTRAST → Set LCD contrast
- LANGUAGES → set wanted language to be operated.
- DISPLAY → MOVE or LAST. Choose, if you want the moving menu or the last one after power on.
- PC SETUP → DISABLE / ACTIV = read and programm the battery memories with the PC software.
- SUPPLY
  - Set power voltage and current in case of using outside DC power.
  - If voltage and current are set, input power is automatically calculated.
  - Output is limited in accordance with input power (refer to page 13 on operation description)

### 10-3. TIME SETUP

- Set the Date, press the DIAL button to apply the setting.
  - Select RTC (Real Time Clock) and press the down button to confirm. This is ONLY applied when DIAL button is pressed.
  - Time can be formatted as 12h or 24h.
- Present time is shown at the bottom line.

### 10-4. USER NAME SETUP

- Write user name using up to 16 letters.
- This user name is shown at the initial display when the charger is connected to the power.



## 11. START SELECT MENU SCREEN

### 11-1. CHARGE START

#### - CHARGE FLOW

- a. Pressing the dial moves to the Start mode from Charge screen.
- b. Select charge process.
- c. Under RESEVE TIMER "OFF", press the dial in Reserve charge screen.
- d. Check battery and cell connection.
- e. Charge starts.

#### - CHARGE PROCESS

**Make sure to select right battery type before operation.**

**Battery would be damaged and cause explosion and fire, if lithium battery is charged in NiCd/NiMH mode.**

If balancing cable is connected to the balancing port of the charger in NiCD/NiMH mode, it just shows cell voltages, but it should have no influence on charging.

**The only difference is, the delta peak detection does cut-off charging, after the first cell reaches the delta peak voltage.**

#### a. NiCd/NiMh Battery AUTOMATIC

Battery cell and charge current are automatically gained.

Check battery internal resistance every specific time to calculate charge current and continue to charge.

Delta-peak value is NiCd = 8mV/cell and NiMh = 6mV/cell.

Cutoff temp which is applied in charge is used.

#### b. Lilo/Po/Fe Battery AUTOMATIC

Battery cell and charge current are automatically gained.

For safety purpose, make sure to connect the balancing cable to the balancing port of the charger.

Current will be fixed when it reaches constant voltage or when auto measured current becomes smaller.

#### c. NORMAL

This is only for NiCD/NiMH battery.

Charge is off every one minute and measure charge voltage and finished by delta peak.

This charge mode is good to charge old battery or when charging cable is not stably connected

Detect charge completion every one minute and delta peak could be slightly delayed.

#### d. LINEAR



This is only for NiCD/NiMH battery.

Charging has to be NOT "OFF" during charging, this charge has to be continued.

This charge mode is very sensitive to charge cable connection, so if connected cable is touched, charging could be finished.

Since delta peak is detected every second, it is possible to check delta peak accurately.

It is possible to finish charging without increasing battery temperature as ZEROpeak can be detected in this charge mode.

Charging is off 10 minutes after charging and gain battery internal resistance.

#### e. GMVIS

This is only for NiCd/NiMH battery.

Charging every 6 seconds and pause every 2 seconds at the intervals of 8 seconds.

Charging every 2 seconds and pause every 6 seconds at the final stage of charging to prevent battery from being overheated or venting.

#### f. IMPULSE

This is only for NiCd/NiMH battery. Battery power could be improved, mainly with old batteries.

Refer to IMPULSE 5-7 above.

#### g. REPLEX

This is only for NiCd/NiMH battery. Battery power could be improved, mainly with old batteries, but the life time could be reduced.

Refer to REFLEX 5-8 above.

#### h. REPEAK

This is only for NiCd/NiMH battery. REPEAKING can be dangerous, if the battery is still warm.

Refer to REPEAK CYCLE 2-8 above.

#### i. CC/CV

This is only for Lilo/LiPo/LiFe/Pb battery

CC to CV method. (CC = constant current, CV = constant voltage)

If balancing cable is connected to the balancing port of the charger, charging can be very stably proceeded and finished as the charger can use voltage measured at the balancing cable.

#### j. FAST-CHG

This is only for Lilo/LiPo/LiFe battery:

CC to CV method. (CC = constant current, CV = constant voltage)

Charge finished at 20% of the adjusted charge current.

Connect the balancer wires for safety reasons.

#### k. STORE

This is only for Lilo/LiPo/LiFe battery:

CC to CV method. (CC = constant current, CV = constant voltage)

The best store voltage can be adjusted with the 'DIAL' button. (push, dial and push)

(LiPo: 3,8V, Lilo: 3,7V, LiFe: 3,4V). Connect the balancer wires for safety reasons.



## 11-2. DISCHARGE START

### - DISCHARGE PROCESS

#### a. AUTOMATIC

Discharging calculating battery cell and discharge current automatically.

The charger calculates battery internal resistance and discharge currents every specific time.

CUTOFF VOLTAGE:

NiCd=0.9V/cell

NiMh=1.0V/cell

Lilo/Po=3.0V/cell

LiFe=2.5V/cell

Pb=1.8V/cell

Calculating and finish discharging based on above.

Cut-TEMP which is used in charging is used.

#### c. NORMAL

Discharge is OFF every one minute.

Average resistance is gained every one minute.

#### d. LINEAR

Continues to discharge without stopping.

Internal resistance is gained one time only 3 minutes after starting discharge.

#### e. MATCH

refer to 3-5. MATCHED VOLT

“When each cell voltage tolerance is higher as 7mV, discharge is checked, cell balancing is active and ‘CHK: MATCHED’ should be shown on the screen. If the cell voltage tolerance becomes within 7mV it shows ‘END:MATCHED’.

Checking is continued and balanced (it takes time).

User can check cell tolerance and finish MATCH mode.

#### f. LINK

This is only for Lilo/LiPo/LiFe.

This is the same discharge method with CV-LINK charge.

## 11-3. CYCLE START

### - PROCESS SELECT

Select wanted charge process.

Select wanted discharge process.

## 11-4. MOTOR START



- PROCESS SELECT

Select process to be operated.

BREAK-IN, PROGRAM, TEST

- Operation limitation

Motor operation could be only possible, if only one channel is used.

Second output can not be used at the same time.

11-5. DELAY TIME

- This mode is to delay time before CHARGE, DISCHARGE, STEP-CHG

This mode is only available for above modes.

- "EXPECT TIME 000min" is expected operating time.

Expected time can vary in accordance with selected input power in CONFIG SETUP.

- In order to activate delay operation, "DELAY TIMER 000min should be changed.

- This mode is based on the present time to reserve time to be finished.

When expect time is set, "EXP.FINSH am00:00:00 ( Expected finished time ) should be shown on the screen.

EXP. FINISH = DELAY TIME + EXPECT TIME + ACTUAL TIME (RTC)

- If expected time is over 900minutes, the reserve operation screen is not shown.

- Expect time can vary in accordance with selected power in CONFIG SETUP.

- The expected charge time of NiMH/NiCd batteries will be 120% of the battery capacity, except the maximum adjusted charge capacity is lower as 120%.

**12. BATTERY SELECT MENU SCREEN**

12-1. Balancing cable connection

- If balancing cable is not connected to the balancing port of the charger for Lilo/LiPo/LiFe, user should set battery cell number.

If wrong cell number is set to the charger, battery could be damaged.

The present voltage is shown as "OUTPUT [ 0.000V ]"

The charger should beep every 3 seconds to indicate you should set cells.

- When balancing cable is connected to the balancing port of the charger,

The charger shows the connected cell number and user needs to recheck if the correct cell number is shown on the screen.

If cell number shown on the screen is not correct, press the ESC button and recheck battery cell number or selected cell number.

If selected cell number and connected cell number is not matched, "CONNECTION ERROR" display should be shown on the screen.

- If cell number is manually set without connecting the balancing cable to the balancing port of the charger, warn message should be shown on the screen.



### 13. OPERATION MENU SCREEN (OUTPUT 1)

#### 13-1. CHARGE, DISCHARGE OPERATION SCREEN

##### a. OPERATION SCREEN

###### < DISPLAY 1 >

- This is shown during CHARGE, DISCHARGE, STEP-CHARGE, CYCLE operating. (Operation Time, capacity, voltage, current, batt. Temp.)
- Selected current can be changed during operating.  
Current can be changed in NORMAL, LINEAR, REFLEX, CC/CV charge modes.  
Current can be changed in NORMAL, LINEAR discharge mode,

###### < DISPLAY 2 >

- EXP.FINSH  
Expected finished time is indicated.  
This should be not shown in Auto, charge/discharge, cycle, REPEAK CHG operation.
- FINISH TIME  
When operation is finished and END\*\*\*\* is shown, time is indicated.  
This should be not shown during operation.
- CLOCK, DATE  
Showing present time and date.
  
- CHG POWER RATE setting  
Can set wattage rate of two outputs.  
While charging is being proceeded in both outputs, and if wattage is increased in one output, the wattage of the counterpart output is accordingly decreased.  
Delta Peak could be detected due to the sudden wattage change in NiCd/NiMH mode.  
It is also to vary depending on the internal charge wattage.  
ex) INTERNAL POWER LIMITE = 250W  
Using DC POWER 12V / 25A (300W)  
If power rate is set to 84%/16%, CH1=200W, CH2=38W can be used in accordance with internal wattage limitation.

##### b. OPERATING GRAPHIC

- It should be activated like data view menu above pos.7.



c. BALANCER GRAPHIC

- It should be activated like balance menu above pos.6.

13-2. CYCLE OPERATION SCREEN

- It shows an order of cycle operation.

13-3. STEP-CHARGE OPERATION SCREEN

- It shows an order of STEP-CHARGE
- If "DISCHARGE OFF" is set, wait for reserve time then starts charging.
- If "DISCHARGE ON" is set, discharges first then wait for reserve time.
- If "DISCHARGE ON" is set, wait for one minute then starts charging.
- Shows step number being used and status of IMPULSE and REFLEX

13-4. REPEAK CHARGE OPERATION SCREEN

- It shows an order of REPEAK CHARGE

13-5. HEATER and POWER SUPPLY OPERATION SCREEN

- HEATER or POWER SUPPLY is displayed in the first line.
- This should be activated like the setup screen, and "=="OPERATING==" should be shown at the top line of the screen of the HEATER.
- All parameters can be changed during operating.

13-6. MOTOR OPERATION SCREEN

- This should be activated like the setup screen, and "=="OPERATING==" should be shown at the top line of the screen.
  
- All parameters can be changed during operating.



## 15. SPECIFICATION

### **Battery:**

Charge currents / power 100 mA to 20.0 A / max. 250W (OUTPUT 1)  
100 mA to 5.0 A / max. 50 W (OUTPUT 2)

### **Max. 250W overall**

Discharge currents / power 100 mA to 10 A / max. 80 W (OUTPUT 1)

### **Ni-Cd & Ni-MH batteries:**

Cell count 1 - 30 cells (OUTPUT 1), 1 – 10 cells (OUTPUT 2)  
Capacity min. 0.1 Ah to 9.9 Ah

### **Lithium batteries:**

Cell count 1 - 14 cells (OUTPUT 1), 1 – 4 cells (OUTPUT 2)  
Cell voltage 3,3 V (LiFe), 3,6 V (Lilo) / 3,7 V (LiPo/LiMn)  
Capacity min. 0.1 Ah to 20.0 Ah

### **Lead-acid / lead-gel batteries:**

Cell count 1...12, 24 cells (OUTPUT 1)  
Battery voltage 2, 4, 6, 8, 10, 12, 24 V  
Capacity 0.1-45 Ah

### **General:**

Operating voltage range DC input 11,0 to 15 V  
Car battery required 12 V, min. 50 Ah  
Mains PSU required 11-15V, min. 25-40A stabilized<sup>1)</sup>  
No-load current drain approx 0.3...0.6 A  
balancer connector: 2x 1...7, 1x 1...4 NiMH/NiCd/LiPo/Lilo/LiFe cells  
balancing current: NiMH/NiCd: 0.1A, LiPo/Lilo/LiFe: 0.3A  
Low-voltage cut-off approx 11,0 V  
Weight approx. 990g  
Dimensions approx. (W x D x H) 180 x 155 x 62 mm

All data assumes a car battery voltage of 12.7 V.

The stated values are guidelines, and may vary according to battery state, temperature etc.

1) When powered by a main PSU, the charger will only operate correctly if the PSU is suitable in terms of voltage, stability, maximum load capacity etc. You can avoid problems by using only the PSUs which we specifically recommend.



## ■ Environmental Protection Notes

When this product comes to the end of its useful life, you must not dispose of it in the ordinary domestic waste. The correct method of disposal is to take it to your local collection point for recycling electrical and electronic equipment. The symbol shown here, which may be found on the product itself, in the operating instructions or on the packaging, indicates that this is the case.

Individual markings indicate which materials can be recycled and re-used. You can make an important contribution to the protection of our common environment by re-using the product, recycling the basic materials or recycling redundant equipment in other ways.

Remove batteries from your device and dispose of them at your local collection point for batteries. In case of R/C models, you have to remove electronic parts like servos, receiver, or speed controller from the product in question, and these parts must be disposed of with a corresponding collection point for electrical scrap.

If you don't know the location of your nearest disposal centre, please enquire at your local council office.

## EU Conformity Declaration



We hereby declare that the following product: **ULTRA DUO PLUS 45; Order-No. 6475** conforms with the essential protective requirements as laid down in the directive for harmonising the statutory directives of the member states concerning electro-magnetic interference (89/336/EEG) and LVD (73/23/EEG).

This product has been tested for electro-magnetic interference in accordance with the following norms:  
EMV: EN 61000-6-1 / EN 61000-6-3

This declaration was produced by:

Graupner GmbH & Co. KG

Henriettenstr. 94-96

73230 Kirchheim/Teck

and is valid for the manufacturer / importer of the product

73230 Kirchheim/Teck, Germany, on 03.03.10

Hans Graupner

Managing Director



## **Manufacturer's declaration from Graupner GmbH & Co. KG**

Content of the manufacturer's declaration:

If material defects or manufacturing faults should arise in a product distributed by us in the Federal Republic of Germany and purchased by a consumer (§ 13 BGB), we, Graupner GmbH & Co. KG, D-73230 Kirchheim/Teck, Germany, acknowledge the obligation to correct those defects within the limitations described below.

The consumer is not entitled to exploit this manufacturer's declaration if the failure in the usability of the product is due to natural wear, use under competition conditions, incompetent or improper use (including incorrect installation) or external influences.

This manufacturer's declaration does not affect the consumer's legal or contractual rights regarding defects arising from the purchase contract between the consumer and the vendor (dealer).

### Extent of the guarantee

If a claim is made under guarantee, we undertake at our discretion to repair or replace the defective goods. We will not consider supplementary claims, especially for reimbursement of costs relating to the defect (e.g. installation / removal costs) and compensation for consequent damages unless they are allowed by statute. This does not affect claims based on legal regulations, especially according to product liability law.

### Guarantee requirements

The purchaser is required to make the guarantee claim in writing, and must enclose original proof of purchase (e.g. invoice, receipt, delivery note) and this guarantee card. He must send the defective goods to us at his own cost, using the following address: Graupner GmbH & Co. KG, Service Department, Henriettenstr. 94-96, D-73230 Kirchheim/Teck, Germany

The purchaser should state the material defect or manufacturing fault, or the symptoms of the fault, in as accurate a manner as possible, so that we can check if our guarantee obligation is applicable.

The goods are transported from the consumer to us and from us to the consumer at the risk of the consumer.

### Duration of validity

This declaration only applies to claims made to us during the claim period as stated in this declaration. The claim period is 24 months from the date of purchase of the product by the consumer from a dealer in the Federal Republic of Germany (date of purchase). If a defect arises after the end of the claim period, or if the evidence or documents required according to this declaration in order to make the claim valid are not presented until after this period, then the consumer forfeits any rights or claims from this declaration.

### Limitation by lapse of time

If we do not acknowledge the validity of a claim based on this declaration within the claim period, all claims based on this declaration are barred by the statute of limitations after six months from the time of implementation; however, this cannot occur before the end of the claim period.

### Applicable law

This declaration, and the claims, rights and obligations arising from it, are based exclusively on the pertinent German Law, without the norms of international private law, and excluding UN retail law.

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