

Accessory Newsletter – No. 6

Batteries, Chargers & Power Supplies

INTRODUCTION

Obvious requirements for batteries powering a surveying instrument are that they reliably supply power to the instrument for a long period of time, are safe to use and have a long life.

Similarly, chargers should be simple to use and “intelligently” re-charge a battery to maximum power in a minimum space of time.

And if required it should be possible to supply “external” power to an instrument using a mains power supply or 12V DC source.

This newsletter provides some additional information about the technology behind batteries, chargers and mains power supplies which allows you to get the longest and most reliable power supply for all your Leica instruments.

BATTERIES

Leica currently uses a variety of different battery “types” – it is actually the cell inside the battery which defines the battery type.

The cell types which are used are **Lithium Ion (Li-Ion)**, **Nickel-Metal Hydride (NiMH)** and **Nickel-Cadmium (NiCd)** cells. The cell type is clearly marked on each battery.

The table below summarises the cell types of Leica batteries used in the some of the most popular Leica instruments

Instrument	Name	Cell Type
System1200	GEB221	Li-Ion
	GEB211	Li-Ion
TPS800/700 /400	GEB111	NiMH
	GEB121	NiMH
TPS1100	GEB111	NiMH
	GEB121	NiMH
System500	GEB121	NiMH
TPS1000 /2000	GEB187	NiMH
External batteries	GEB171	NiMH
	GEB70	NiCd

All new battery types should be fully discharged and charged before use – a so-called refresh cycle.

The easiest way to perform a refresh cycle is to use the refresh function on the **GKL221 Professional Charging Station** – simply press the Selection Button on the GKL221 charger for longer than 3 seconds (also read the GKL221 User Manual for more information).

For new **NiCd** and **NiMH** batteries this refresh cycle should be performed 3 times.

For new **Li-Ion** batteries, one refresh cycle is sufficient.

MEMORY EFFECT

The **Memory Effect** occurs with NiCd and NiMH batteries if the same charging and partial discharge conditions are continuously applied. This could occur for example if the battery is regularly recharged while it still has remaining capacity.

This then results in a reduction of the operating time. The memory effect can be eliminated with a refresh cycle (as described above) using the GKL221 charger.

For average battery usage, this should be done once per month. Additionally, if it is noticed that the battery life is reduced then the recharge cycle should also be performed.

BATTERY LIFE

Generally speaking, the life of a battery depends on the level of usage, the charging method and the temperature on charging, discharging and storage.

To ensure the maximum life of batteries, always charge using Leica chargers and ensure the batteries are stored in the appropriate conditions.

Li-Ion batteries have a useable life of around 3 years from the time of manufacture - regardless of how often used or charged. There is no memory effect and no scheduled cycling is required to prolong the battery's life.

Li-Ion batteries supplied by Leica have a protection circuit to maintain safe operation, limits the peak voltage during charging, prevent the cell voltage from dropping too low on discharge and additionally, the battery temperature is monitored during charging to prevent temperature extremes.

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NiMH batteries can be recharged up to 800 times, but the capacity is reduced with each charging cycle.

NiCd batteries have a longer life than NiMH with up to 1000 charging cycles.

STORING BATTERIES

To minimize the deterioration of all battery types when not in use, they should be stored in a dry environment between 0°C to 20°C.

To ensure a usable life of 3 years, **Li-Ion** batteries should be stored at 10%-50% charged capacity. They do not require regular charging while stored.

NiMH batteries must always be stored fully charged and then recharged after 180 days at the latest. This is because NiMH batteries slowly discharge over this period and the battery may be damaged if stored in a discharged state for a long period of time.

NiCd batteries can be stored for an unlimited period in any state of charge.

DISPOSAL OF BATTERIES

For environmental and safety reasons, used or defective batteries should not be simply thrown away but must be correctly disposed of following the local regulations in a discharged state.

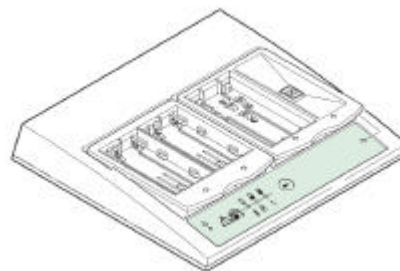
CHARGERS

Leica Geosystems provides intelligent chargers that charge the batteries in the shortest possible time.

The chargers use the latest charging technology and ensure appropriate charging and therefore a long life of the batteries.

GKL221 PROFESSIONAL CHARGING STATION

The **GKL221 Professional Charging Station** uses advanced technology and is suitable for charging all Leica battery types.



Up to 5 batteries can be connected simultaneously. Two batteries are charged at the same time and the rest in the order in which they were connected.

With the optional GDC221 car-adaptor, the charging station can be used in a vehicle.

The microprocessor controlled charging station recognises the type of battery which is connected and uses the appropriate charging parameters - such as time and current.

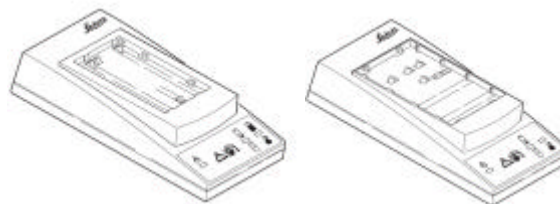
A built-in temperature control continuously monitors the battery temperature and appropriately adjusts the charging current. The batteries are therefore optimally charged, guaranteeing the maximum possible life.

As described above, a regular complete charge and discharge **refresh** cycle ensures the battery always provides full capacity. Only the GKL221 charger offers this refresh function.

The GKL221 charger also offers a **trickle** charge for **NiCd** and **NiMH** batteries (Li-Ion batteries do not require a trickle charge). This compensates for the self-discharge of these batteries which occurs over time and means these batteries are always available with full capacity.

GKL211 & GKL112 BASIC CHARGERS

The **GKL211** and **GKL112 Basic Chargers** provide rapid charging of a single battery. A country specific adaptor and a car adaptor cable are included.



These chargers have no battery refresh function. The GKL112 does have trickle charge, whereas the GKL211 does not.

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CHARGING TIMES

Charging times depend primarily on the maximum charging current and charge state of batteries when connected.

Typical charging times are given below.

Instrument	Name	Charging time
System1200	GEB221	3hrs
	GEB211	2.5hrs
TPS800/700 /400/300	GEB121	2.5hrs
	GEB111	2.0hrs
TPS1100	GEB121	2.5hrs
	GEB111	2.0hrs
System500	GEB121	2.5hrs
External batteries	GEB171	5.0hrs
	GEB70	1.5hrs

Additionally, the ambient temperature at which the battery is being charged will affect the charging time – at temperatures above +20°C, the charging time can increase by 1 hour.

MAINS SUPPLY

For applications requiring long periods of uninterrupted power, such as with TPS monitoring surveys or GPS reference stations, a mains supply or external 12V DC power supply can be used.

MAINS SUPPLY

The **GEV208 Power Supply** accepts an input range of 100-240V AC and is suitable for all Leica instruments.

With a 5-pin Lemo socket, it is suitable for connection to all power cables.

Never be tempted to make your own cables to connect an instrument to a mains power supply!

12V DC SUPPLY

The **GEV71 Cable** allows instruments to be powered from a 12V DC power supply such as a car battery. This is then connected to the standard battery cable used for Leica external batteries.

The GEV71 cable protects the instrument from damage due to pole reversal, voltage spikes occurring over a limited period and electrostatic discharges. The cable also provides a deep discharge protection to the connected battery.

Never be tempted to make your own cables to connect an instrument to a car battery!

TECHNICAL SPECIFICATION

For further detailed information on Leica Geosystems Power Supply products, please refer to the Chargers & Batteries Brochure.

This brochure is available from the Downloads Site, in the Accessories section:

http://www.leica-geosystems.com/s-e/en/downloads/lgs_page_catalog.htm?cid=2078

It may be also useful to read the appropriate charger and/or instrument user manuals.



Please contact your local Leica representative if there are specific topics you would like covered in these newsletters.

We welcome all suggestions for TPS1200, GPS1200, specific applications or LGO. We look forward to receive your ideas.