PAGlink™

PAG™

Gold Mount Intelligent Linking Batteries

User Guide

U5132G

GAS INTERNATIONAL
ISO 9001:2015
REGISTERED COMPANY
Certificate No. CA10167

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Thank you for choosing PAGlink Gold Mount Intelligent Linking Batteries. Please read the important safety information and instructions before using your battery.

1. Introduction

1.1 Models covered by these instructions:

PAGlink Gold Mount batteries are designed for compatibility with the Anton Bauer Gold Mount system. There is a choice between 96Wh and 150Wh capacities.

Model	Name	Capacity	Display
9306	PAGlink HC-PL94T	96Wh	Numeric
9313	PAGlink HC-PL150T	150Wh	Numeric

1.2 The unique PAGlink system allows up to 8 batteries to be linked for charge or discharge, regardless of their rated capacity or their state-of-charge.

1.3 When linked, PAGlink batteries form a network that allows them to communicate with each other and report to the camera as one battery.

1.4 The PAGlink system will automatically select the most suitable batteries for discharge, according to their charge status. Batteries do not discharge into each other. The system ensures that the maximum linked output is kept to a safe level.

1.5 PAGlink batteries can deliver a current of up to 12A when linked, using superior, high-current pin contacts.

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1. Introduction

1.6 PAGlink batteries can be hot-swapped to deliver continuous power, which means no more time-wasting camera reboots.

1.7 All PAGlink batteries feature a display that provides remaining run-time for the total of all linked batteries, and remaining capacity for each individual battery.

1.8 The battery display maintains accuracy by tracking performance and adjusting calibration values to compensate for the ageing of the cells.

1.9 PAGlink Gold Mount batteries will automatically detect and adapt to the camera data system that allows Anton Bauer Gold Mount batteries to provide capacity information in the camera viewfinder/LCD.

1.10 Batteries in any state of charge, regardless of capacity, can be linked for charging, in multiples of 8 or less. During charging, the least-charged batteries are given priority. The charge status for each battery is shown on its own display.

1.11 The intelligent PAGlink batteries manage their own charging safely and efficiently, and can be charged, whilst linked, using other reputable manufacturer's Li-Ion chargers.

1.12 PAGlink battery and charger firmware can be updated easily by the customer, via external contacts, using an update tool provided by PAG.

1.13 PAGlink Li-Ion batteries are tested by an independent authority to UN standards in compliance with IATA Air Transport regulations.

PAGlink PL16 Gold Mount Charger

2. Specification

2.1 Cell Technology: Premium-grade Lithium-Ion sealed rechargeable cylindrical cells.

2.2 Capacities:

Model 9306:
Nominal 6.4 Ampere-hours (94 Watt-hours).

Models 9313:
Nominal 10 Ampere-hours (150 Watt-hours).

2.3 Voltage: 14.8V nominal. 12 cells connected in series/parallel. Each cell has a nominal voltage of 3.7V.

2.4 Output Current: The rated maximum continuous output current for two or more linked batteries is 12 Amperes (10 Amperes for individual batteries).

2.5 Temperature Range:

Charging:

0°C to +45°C	Optimum +10 to +40°C
+32°F to +113°F	Optimum +50°F to +104°F

Discharging:

-20°C to +50°C	Optimum +10°C to +40°C
-4°F to +122°F	Optimum +50°F to +104°F

Storage:
+10°C to +30°C (+50°F to +86°F).

2.6 Dimensions (L x W x H):
129mm (5″) x 87mm (3.42″) x 58mm (2.25″)

2.7 Weight:

Model 9306:	735g (1.6lbs) approx.
Model 9313:	770g (1.7lbs) approx.

3. Charging

3.1 IMPORTANT: READ THE CHARGER HANDBOOK BEFORE ATTEMPTING TO CHARGE THE BATTERY.

3.2 The following PAGlink chargers will charge PAGlink Gold Mount batteries, individually or linked, regardless of their capacity or state of charge:

9707A	PAGlink PL16 Charger	2-positions, 8 batteries on each
9711A	PAGlink PL16+ Charger	4-positions, 4 batteries on each
9713	PAGlink Micro Charger	1-position, 4 batteries in total

Anton Bauer Gold Mount Li-Ion chargers are also suitable. The number of linked batteries that can be charged on each position is dependent on the charger model and firmware version.

PAG Pulsar and Quasar Gold Mount chargers are not suitable for charging PAGlink Gold Mount batteries.

3.3 The batteries incorporate a temperature sensor which will inhibit charging if their temperature is below 0°C. See Section 2 Specification for the charging temperature range of PAGlink batteries.

3.4 PAGlink batteries display their individual status, during charging, on their built-in display. When using PL16 chargers, the characters of the numeric display can be inverted, for legibility, with a single button press. The display reverts automatically after removal from the charger.

3.5 **Charge Times:** Times given are for fully-discharged batteries to fully-charged, using a PAGlink PL16 charger.

1 x 94Wh battery	2 hrs	30 mins
2 x 94Wh batteries	3 hrs	
4 x 94Wh batteries	6 hrs	
6 x 94Wh batteries	9 hrs	30 mins
8 x 94Wh batteries	11 hrs	45 mins
16 x 94Wh batteries	24 hrs	

1 x 150Wh battery	3 hrs	45 mins
2 x 150Wh batteries	4 hrs	30 mins
4 x 150Wh batteries	9 hrs	
6 x 150Wh batteries	13 hrs	
8 x 150Wh batteries	18 hrs	
16 x 150Wh batteries	36 hrs	

3.6 PAGlink batteries are put into sleep mode, prior to shipping, to reduce their rate of self-discharge. **NOTE: The battery must be woken before charging by pressing its display button.**

4. Discharging

4.1 The batteries incorporate a precision fixed end-of-discharge cutoff set to 12.5V, as measured by the battery. This cutoff will only operate if the battery capacity is less than 5%, eliminating unwanted operation due to high current and low battery temperature.

4.2 The maximum continuous discharge current for a single PAGlink Gold Mount battery is 10A. The batteries incorporate a current limit, and consumption above this for more than 5 seconds will trigger the over-current protection, turning the battery output off.

4.3 If the battery is discharged at too high a rate, even momentarily, the protection circuit may be triggered, disconnecting the battery output. It can be recovered by simply removing it from the load and pressing the display button, provided the battery still retains some charge.

4.4 Where total continuous consumption is above 10A, two or more PAGlink batteries should be linked. This will increase the maximum continuous discharge current to 12A, provided the batteries are in a similar state of charge.

4.5 The battery may be discharged within the temperature range -20°C to +50°C, but for optimum performance, +10°C to +40°C is recommended. The operating time will be shorter in conditions of low temperature, and discharging will be electronically inhibited if the battery temperature is below -20°C.

4.6 When the battery has been discharged at a high rate it will become warm, and it is advisable to let it cool before charging it.

4.7 Computer Reset
The battery features a computer reset function. In exceptional circumstances, a computer reset may be required. This is achieved by holding the display button in for 20 seconds.

5. Storage

5.1 For the short term, PAGlink batteries can be left stacked on a charger until required; the charger will keep them topped-up ready for use.

5.2 For long-term storage, batteries should be in a half-charged state (between 20% and 80%), and unlinked. Storing batteries linked accelerates the rate at which they self-discharge.

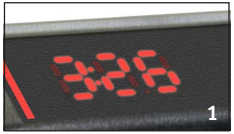
5.3 After 2 weeks of inactivity, PAGlink batteries will automatically enter **Sleep Mode**, which greatly reduces their rate of self-discharge. They can be woken prior to use by pressing the display button.

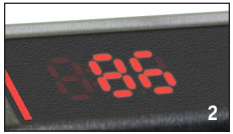
5.4 Batteries should be stored in a cool, dry place at a temperature between +10°C to +30°C (+50°F to +86°F). Long-term storage outside of this temperature range may reduce the battery's life. Maintenance charging is not required during long term storage.

5.5 After storage it is advisable to fully-charge batteries before use.

6. Run-Time, Capacity & Data

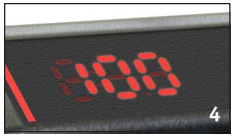
6.1 The Battery Display:
The battery is able to display a numeric run-time prediction against load, and charge status as a percentage.





(1) When connected to a camera that is turned on, two presses of the battery's display button will show a predicted run-time against the given load, expressed in hours and minutes. When batteries are linked the run-time displayed relates to the **total** for the connected batteries.

(2) A single button press of the display, off or on-load, shows a percentage figure of available capacity. When the batteries are linked this figure still relates to the battery's individual capacity.



(3) When battery capacity drops below 5% the display will indicate that the battery should be charged as above.

(4) When the battery is fully charged the display will indicate 100%.

6.2 Display Data Output:
Data stored in the battery's microprocessor can be revealed using the battery display.

Press display button x3 in 1 sec intervals & hold for data mode

Release to see 1st menu item: 'Pd' (voltage)

Press & hold for 3 seconds to see voltage reading

Press without holding for 2nd menu item

Press & hold for temperature in degrees celsius

Press twice without holding for 3rd menu item

Press & hold for number of charge/ discharge cycles

6. Run-Time, Capacity & Data

Press x3 without holding for software version

Press & hold for version number...

...which appears in 2 parts indicating version 2.0

After selecting to view the software version number, the battery will enter **Sleep Mode** automatically. Sleep Mode reduces battery self-discharge and can be used when you are going to store or ship your batteries. To exit Sleep Mode or 'wake' the battery, press the display button twice, link 2 batteries or connect the battery to a charger.

Press x4 for computer reset

Press & hold to perform reset & do not release until 3 lines disappear

6.3 In-Viewfinder Battery Status

Battery status can be shown as a percentage of available capacity in the viewfinder/LCD of cameras designed to accept this data. Different data standards are used by camera and battery manufacturers. PAGlink Gold Mount batteries automatically adjust the data output standard to support the system that allows Anton Bauer batteries to display capacity information in the viewfinder/LCD. When the batteries are linked, the data displayed is for the combined capacity available.

7. Battery Protection Features

7.1 Over-charge Protection
Charging will be inhibited if the battery voltage exceeds a pre-set level.

7.2 Over-discharge Protection
When the battery voltage reaches 12.5V, discharging is inhibited.

7.3 Over-current Protection
If a single battery is subjected to a current greater than 10A, but less than 15A, the output will be turned off after 5 seconds. If the current is greater than 15A, the output will be turned off immediately. In either case, the battery display will be inoperative and there will be no voltage available at the terminals. The battery can be reset by removing it from the load and pressing the display button.

7.4 Thermal Protection
Software protection inhibits charging if the battery temperature is below 0°C. Return the battery to the charger when the battery temperature rises above 0°C.

Software protection inhibits discharging if the battery temperature falls to -20°C, or if it rises to +70°C. The output can be restored when the battery temperature becomes within the specified range by pressing the display button.

A thermal fuse is incorporated within the battery construction as a 'backstop' protection device, and this cannot be reset. In the unlikely event of this fuse operating, please contact PAG or your dealer.

7.5 Construction
The battery cases consist of high-impact injection mouldings, designed to protect the cells from impact damage.

The circuits are coated, making them resistant to electrolyte and ensuring the operation of the safety systems in the event of damage to the battery.

Internal wiring is rated for high current and high temperature, and is double-insulated for added safety and protection.

8. PAGlink Features

8.2 Linking Batteries:

Align the gold studs of one battery with the claws on the front of another. Slide the battery across until you hear a click and the white locking indicator is visible on the battery release button.

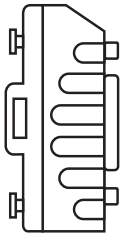
To release the battery, hold down the release button and slide the battery to the left.

8. PAGlink Features

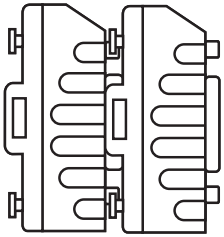
8.1 PAGlink batteries can be linked to combine their capacities, for example, two 94Wh batteries provide 188Wh, and 3 offer 282Wh. Two 150Wh batteries offer 300Wh when linked. Batteries of any rated capacity, in any state of charge, can be linked for charge or discharge. Linking batteries also increases the maximum continuous current draw capability from 10A to 12A, provided they are in a similar state of charge.

The maximum number of PAGlink batteries that may be linked has been limited to 8. If more than 8 batteries are linked, the management system will shut-down the supply, and no current will flow.

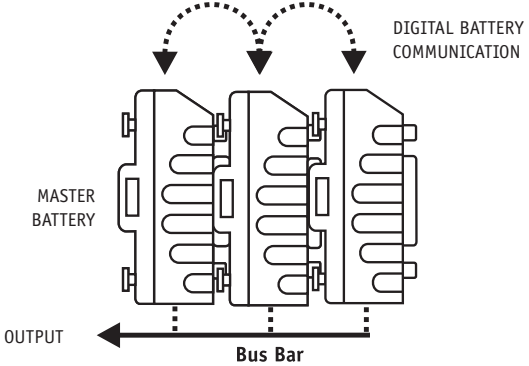
CAPACITY IN WATT-HOURS / MAX. CURRENT DRAW IN AMPS



94Wh / 10A
150Wh / 10A



188Wh / 12A
300Wh / 12A



Linked batteries form a network which allows communication between batteries, ensuring that a safe protocol is followed under all circumstances. The PAGlink management system elects the battery with one or more connected to its front contacts to be the 'master' and ensures that this battery is always active (but not necessarily delivering current). The system makes the most efficient use of the energy available, and prevents a transfer of charge between batteries.

As discharge progresses, batteries are electronically added to or subtracted from the bus bar to deliver the current required. The status of individual batteries and total run-time can be viewed via the battery displays. As long as the 'master' remains connected, batteries may be added to or removed from the stack (hot-swapped) in order to achieve continuous running.

9. Sleep Mode

9.1 To reduce the self-discharge rate during storage, PAG has incorporated a sleep mode in the PAGlink battery program. After 2 weeks of inactivity the battery will automatically switch to sleep mode. Waking the battery can be achieved by pressing the display button twice.

Prior to shipping, the PAGlink battery is charged to no more than 30% capacity, and put into sleep mode. **You must wake the battery by pressing the display button twice, prior to charging.**

10. Safety Information

10.1 PLEASE READ THESE IMPORTANT SAFETY INSTRUCTIONS BEFORE USING THE BATTERY AND RETAIN THEM FOR FUTURE REFERENCE.

When used correctly, Lithium-Ion batteries are a rugged and safe method of storing power. However, incorrect treatment of the battery could present a hazard. In the interest of safety, and the protection of our environment, please read and observe the following health and safety information.

WARNING:

Do not drop, throw, puncture, crush or incinerate the battery. Severe mechanical abuse of the battery could result in damage to the cells, and short-circuit internal to the battery. Li-Ion cells can deliver power at very high rates. Arcing, excessive heat and the liberation of combustible gas could result, with the potential for personal injury or ignition of adjacent flammable materials.

Do not short-circuit the battery.

Keep the battery away from fires, strong sunlight and excessively hot environments.

Avoid getting the battery wet and do not use it if it has been immersed in water.

Do not attempt to disassemble the battery. Refer faults to authorised service personnel.

Do not continue to use the battery if there is any change in the appearance of the casing.

CAUTION:

The battery electrolyte is an alkaline solution, which can cause chemical burns to human tissue. Leakage can occur as a result of severe damage to the battery. Wear protective gloves when handling all contaminated materials. In the event of contact with the skin, flood copiously with clean water. If significant amounts of electrolyte are involved, or if any has touched the eyes, seek immediate medical attention.

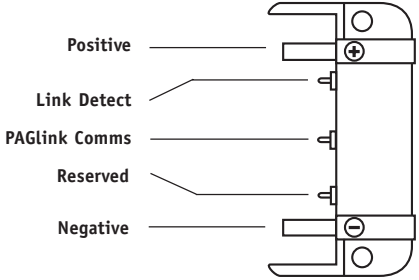
ELECTRIC SHOCK: This symbol appears where the information relates to the risk of electric shock.

WARNING: This symbol appears where the information relates to an issue of personal safety.

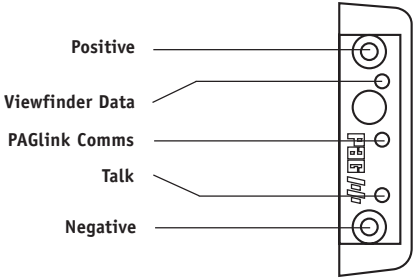
11. Servicing

11.1 The following assemblies are separate to the battery case and can be replaced by customers in the event of damage. Parts and instructions can be obtained from PAG Ltd. or an authorised PAG service centre (listed at the end of this section).

Front Contact Assembly:



Rear Contact Assembly:



11.2 Customers should not attempt to open the battery case for repair or any other purpose. Unauthorised servicing invalidates the battery guarantee and its air safety status (IATA).

If a fault develops, please contact your nearest PAG Service Centre to receive a fault diagnosis, which can be carried out over the phone, via a video call or via email.

Batteries that require further analysis must be returned to your nearest PAG Service Centre. Li-Ion batteries are classified as dangerous goods and cannot be returned without prior contact. Please provide the serial numbers of the batteries you are returning for servicing in advance.

The battery may need to be returned to the UK Service Department for repair. After investigation, it will be classified as either: a warranty repair (WR), a chargeable repair (CR), or beyond economic repair (BER). This will be communicated to the customer in a service report, along with an estimate of the cost of repair, before any work is undertaken.

It is PAG's policy to repair its batteries, in keeping with ‘the right to repair’, unless it is uneconomic for the customer to do so. Circumstances that make a battery beyond economic repair include physical damage to the cells or a combination of low battery capacity and a damaged case. In these circumstances the cost of the repair would be better put towards a new battery.

11. Servicing

If the battery is BER and you would like it returned, you must communicate this to the PAG Service Centre. If possible, batteries should be marked with a sticker that says “to be returned to the customer” before they are sent for servicing.

If the battery is BER and there is no indication that it should be returned, PAG will ask the customer when it submits the servicing report.

If PAG does not receive instruction from the customer after 6 months from the date of the report, the battery will be sent for recycling.

Please be aware that PAG is only able to return batteries that are legally safe for shipping. Batteries that have damaged cases as a result of being dropped, water-damaged batteries and batteries that have damaged cells cannot be returned.

Authorised PAG Service Centres:

The Americas:
PAG America (a division of the Carr Distribution Group)
18 Center Street, Ramsey, NJ 07446, USA
Tel: +1 631 300 8215
Email: sales@pagamerica.com

Europe & Middle East:
Aspectra B.V.
Spoorhaven 78, 2651 AV, Berkel en Rodenrijs, Netherlands
Tel: +31 (10) 5140680
Email: info@aspectra.nl

UK & RoW: PAG Ltd.
Epsom Downs Metro Centre, Units 9 & 10, Waterfield, Tadworth, Surrey KT20 5LR, UK
Tel: +44 (0)20 8543 3131
Email: support@paguk.com

12. Recycling

12.1 Do not dispose of batteries or cells in a charged condition. Expired batteries should be disposed of in accordance with the appropriate regulations or legislation.

PAG offers a recycling service for its expired batteries in the UK. They can be returned to PAG Ltd. only by prior arrangement. They must be in a discharged state, and clearly marked "FOR RECYCLING".

Please do not attempt to return Li-Ion batteries for recycling without first contacting an authorised PAG Service Centre.

13. Guarantee

13.1 Notwithstanding any provision of any agreement the following guarantee is exclusive: PAG Limited guarantees each PAGlink battery it manufactures to be free of defects in material and workmanship, under normal use and service, from the date of purchase, for the period indicated below:

3 YEAR GUARANTEE	**PL94 Model 9306**
2 YEAR GUARANTEE	**PL150 Model 9313**

This guarantee extends only to the original purchaser. This guarantee shall not apply to fuses or any product or parts which have been subject to misuse, neglect, accident or abnormal conditions of operation.

In the event of failure of a product covered by this guarantee, PAG Limited will repair and calibrate equipment returned to an authorised Service Facility within the period of the guarantee, provided the guarantor's examination discloses to its satisfaction the product was defective.

The guarantor may, at its option, replace the product in lieu of repair. With regard to any equipment returned within this period, said repairs or replacements will be made without charge. If the failure has been caused by misuse, neglect, accident or abnormal conditions of operation, repairs will be billed at a nominal cost. In such a case, an estimate will be submitted before work is started, if requested.

The foregoing guarantee is in lieu of all other guarantees, express or implied, including but not limited to any implied guarantee or merchantability, fitness or adequacy for any particular purpose or use. PAG Limited shall not be liable for any special, incidental, or consequential damages, whether in contract, tort, or otherwise.

14. Air Transport Regulations

14.1 Compliance with IATA Dangerous Good Regulations

All PAG Li-Ion batteries comply with the International Air Transport Association (IATA) Dangerous Goods Regulations, Section 2.3.5.9, which state that Li-Ion batteries must be tested in accordance with the UN Manual of Tests and Criteria, Part III, subsection 38.3, and manufactured by a company that has been approved to an internationally recognised standard such as ISO 9001:2015.

PAGlink Li-Ion batteries have been independently tested and approved by Intertek Group PLC to comply with UN Standard 38.3.

Models 9306 & 9313:	**Test Report No. 101520017**

Copies of the test certificate and report can be obtained from PAG.

Each PAG Li-Ion battery is labelled with the test report number applicable to that battery design:

PAG has been assessed and approved by QAS International to the standard ISO 9001:2015

14.2 Advice for Travelling by Air with Li-Ion Batteries

Li-Ion batteries cannot be transported in the hold unless attached to a camera. Spare Li-Ion batteries **MUST** be carried in your hand luggage.

YOU CAN carry-on up to 20 spare Li-Ion batteries that have capacities of **100Wh or less**, however, the operator is the final arbiter.

In addition **YOU CAN** fly with two Li-Ion batteries that have capacities **greater than 100Wh, but less than 160Wh**, with the approval of the operator.

YOU CANNOT fly with Li-Ion batteries that have capacities **greater than 160Wh.** These are **FORBIDDEN** from passenger aircraft, unless a state exemption has been obtained (ie CAA/FAA operator).

Batteries **DO NOT** need to be discharged to **30% state of charge** for transport as personal luggage, this is a requirement of **cargo shipments only.**

It is advisable to keep the batteries in separate plastic bags and to bring with you copies of the UN test certificate and UN test report.

Since the interpretation and application of regulations may vary with each aviation company, PAG advises that you contact the carrier prior to travelling.