PAG L90 Slim Battery

User Guide

U5129

PAG Ltd.
565 Kingston Road
London SW20 8SA
United Kingdom

E: sales@paguk.com
T: +44 (0)20 8543 3131
www.paguk.com

Disclaimer
The information contained in this document is correct at the time of publication. PAG Ltd. reserves the right to change specifications or product details without notification. Changes to product details will be incorporated in the next version of the document. PAG updates documents on a regular basis.

Trademarks
All PAG registered trademarks are the property of PAG Ltd. All third party trademarks are acknowledged as such.

Contents

Thank you for choosing the PAG L90 Slim Battery. Please read the important safety information and instructions before using your battery.

1. Introduction

1.1 Models covered by these instructions:

The PAG L90 Slim is a V-Mount battery designed for compatibility with the Sony V-Mount specification.

Model	Name	Capacity	Output Connector
9307V	PAG L90 Slim	90Wh	D-Tap

1.2 The PAG L90 Slim battery has a low-profile and lightweight design, coupled with a high-current capability, making it ideal for use with small cameras that have a high power consumption, in situations where battery size and weight must be kept to a minimum.

1.3 It has been designed to withstand the vibration associated with multi-rotor aerial platforms.

1.4 It incorporates the latest high-capacity, high-current cells which give it a greater energy density than most V-Mount Li-Ion batteries of an equivalent capacity.

1.5 It has a capacity of 90 Watt-hours and delivers a maximum continuous current of 10A.

1.6 It is an intelligent battery which manages its own charge and discharge safely. It can be charged using the Li-Ion chargers of most reputable manufacturers.

1.7 The PAG L90 Slim incorporates a superior design, a high-quality construction and long-life, premier-quality Li-Ion cells, which have no memory effect and are completely recyclable.

1.8 It features a D-Tap output to enable thpowering of 12V camera accessory in addition to powering the camera.

1.9 It incorporates the industry's first numeric Run Time, Capacity & Data Display, which senses the orientation of the battery and rotates to ensure legibility.

1.10 Run-Time is displayed, on-load, to a resolution of minute. Capacity/ state-of-charge is displayed to a resolution of 1%. Data displayed includes the number of charge/discharge cycles and software version.

1.11 The L90 Slim detects and adapts automatically to multiple camera data systems, to provide capacity information in the viewfinder/LCD of various cameras.

1.12 The L90 Slim is future-proof; its firmware can be updated easily by the user in the field.

1.13 The battery features a comprehensive and fail-saf electronic protection system, which guards against conditions that reduce battery life.

1.14 The protection system circuit is coated to ensure operation of the safety systems in the event of damage to the battery.

1.15 PAG's battery design philosophy ensures that the L90 Slim provides the longest possible working life. The battery is guaranteed for 2 years, without restrictions on the conditions of use.

1.16 The PAG L90 Slim has been tested to UN 38.3 standard by an independent authority and certified safe for air transport in accordance with IATA regulations.

1.17 The battery has a capacity that is below 100Wh and is therefore suitable for transport on passenger aircraft, in carry-on luggage, without quantity restriction.

2. Specification

2.1 Cell Technology: Premium grade, high-capacity, high-current, sealed, Lithium-Ion rechargeable cells.

2.2 Capacity: 6.1 Ampere-hours nominal, 90 Watt-hours.

2.3 Voltage: 14.8V nominal. 8 cells connected in series/parallel (4S2P). Each cell has a nominal voltage of 3.7V.

2.4 Output Current: The rated maximum continuous output current is 10 Amperes.

2.5 Output Connector (Model 9307V only):
1 x D-Tap (2-pin), 12V (unregulated).

2.6 Temperature Range:

Charging:

0°C to +40°C	Optimum +10 to +30°C
+32°F to +104°F	Optimum +50°F to +86°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).

2.7 Dimensions (L x W x H):
140mm (5.51") x 85mm (3.34") x 35mm (1.37")

2.8 Weight:
567g (1.25lbs).

3. Charging

3.1 IMPORTANT: The battery has been discharged for transit, and should be fully charged before use.

Read the charger handbook before attempting to charge the battery.

The battery is protected electronically, and will not accept a charge from unsuitable chargers.

3.2 PAG L90 Slim batteries can be charged using the following PAG V-Mount Li-Ion chargers:

9707	PAGlink PL16 Charger	2-positions	
9711	PAGlink PL16+ Charger	4-positions	
9713V	PAGlink Micro Charger	1-position	
9702VR	PAG RMC4X Charger	4 positions	
9708	PAGlink Cube Charger	4-positions	Discontinued
9702V	PAG Cube Charger	4 positions	Discontinued
9710	PAGlink Micro Charger	1-position	Discontinued
9700V	PAG V4-iPC Charger	4-positions	Discontinued
9613V	PAG V2 Charger	2-positions	Discontinued

Constant-voltage, V-Mount Li-Ion chargers of other reputable manufacturers are also suitable.

3.3 PAG L90 Slim batteries display their individual status on their display, when charging. The orientation of the display adjusts automatically according to the orientation of the battery.

3.4 **Charge Times:** Times given are for fully-discharged batteries to fully-charged, using a PAGlink PL16 Charger:

1 battery	2 hrs 30 mins
2 batteries	3 hrs
4 batteries	6 hrs

Times given are for fully-discharged batteries to fully-charged, using a PAGlink Micro Charger.

1 battery	4 hrs
2 batteries	8 hrs

4. Discharging

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

4.2 Maximum continuous discharge current is 10A. The battery incorpo rates an accurate precision current limit, and consumption above 10A (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.

4.4 If the battery has been shut down by its protection circuit it can be recovered by simply removing it from the load and pressing the display button, provided the battery still retains some 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. When the battery has been discharged at a high rate it will become warm, and it is advisable to let it cool before charging. 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 Computer Reset
The battery features a computer reset function, which may be required in exceptional circumstances. This is achieved by holding-in the display button for 20 seconds.

5. Storage

5.1 For long-term storage, the battery should be initially in the half charged state (between 20% and 80%).

5.2 The battery can be put into 'Sleep Mode' for long term storage. This will reduce the level of self-discharge. *See Section 6.4 Data Display* to discover how to put the battery into 'Sleep Mode' and how to wake the battery.

5.2 Maintenance charging is not required during storage.

5.3 Store in a cool, dry place at a temperature between +10°C and +30°C (+50°F to +86°F). Long-term storage outside of this temperature range may reduce the battery's life.

5.4 The battery should be in a fully charged state before use. After extended storage it is advisable to give the battery a top-up charge.

6. Battery Display

6.1 Run-Time & Capacity

1

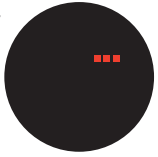
2

1. When connected to equipment 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.

2. A single button press of the display, whether the battery is off or on-load, shows a percentage figure of available capacity, to a resolution of 1%.

3

4



3. When the battery is fully charged the display will indicate 100%.

4. When battery is fully-discharged the display will indicate as above.

The accuracy of the display is maintained by tracking battery performance and adjusting calibration values to compensate for the aging of the cells.

6.2 Data Display

The battery display can reveal data stored in the battery's internal microprocessor using a series of button presses:

Press x3 in 1 second intervals & hold to enter 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. Battery Display

Press x3without holding for software version

Press & hold for version number

The number appears in 2 parts (indicating 1.7)

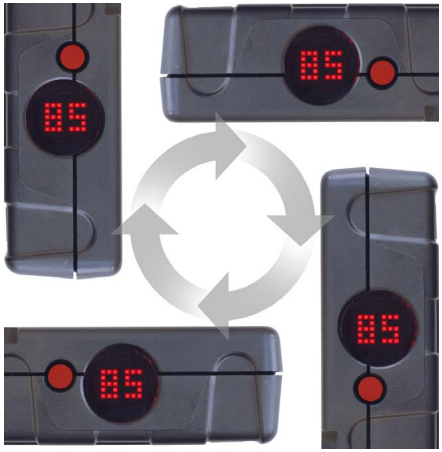
After selecting to view the software version number, the battery will enter **Sleep Mode** automatically. Sleep Mode reduces battery self-discharge and can be used when you are going to store or ship your batteries. To exit Sleep Mode or 'wake' the battery, press the display button twice.

Press x4 for computer reset

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

6.3 Reorientation

The Run-Time & Capacity display senses the orientation of the battery and adjusts to ensure legibility.



6.4 In-Viewfinder/LCD Battery Status

The PAG L90 Slim allows battery capacity to be displayed as a percentage in the viewfinder or on the LCD of cameras designed to accept this data. The battery automatically adjusts the data output standard to support SMB (Sony & Red) and I^2C (IDX).

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 a PAG service centre.

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

Although PAG batteries are designed to survive the rigours of everyday use in a professional environment, it is common sense to handle batteries with care and to avoid subjecting them to severe impact.

PAG has incorporated spacers between cells to prevent the negative affects of vibration, when mounted to multi-rotor aerial platforms.

The protection circuit is coated to ensure the operation of the safety cut-outs in the event of damage to the battery.

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

8. Safety Information

8.1 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.

9. Servicing

9.1 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.

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:

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

Continued over

9. Servicing

UK & RoW: PAG Ltd.
565 Kingston Road, Raynes Park, London SW20 8SA, UK
Tel: +44 (0)20 8543 3131
Email: support@paguk.com

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

10. Recycling

10.1 PAG Ltd. offers a **Recycling Service** for its expired batteries in the UK. They can be returned to PAG Ltd. by prior arrangement only.

They must be in a discharged state, and clearly marked:

"FOR RECYCLING"

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

11. Guarantee

11.1 Notwithstanding any provision of any agreement the following guarantee is exclusive: PAG Limited guarantees each L90 Slim 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:

L90 Slim Models 9307V & 9307GS

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.

12. Air Transport Regulations

12.1 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.

Model 9307V:	Test Report No: 102471069

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

12.2 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 beenobtained (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.