

# V-MOUNT INTELLIGENT LINKING BATTERIES USER GUIDE



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A User Guide for Mini PAGlink V-Mount Intelligent Linking Batteries.

Please read the important safety information and instructions before using your battery.

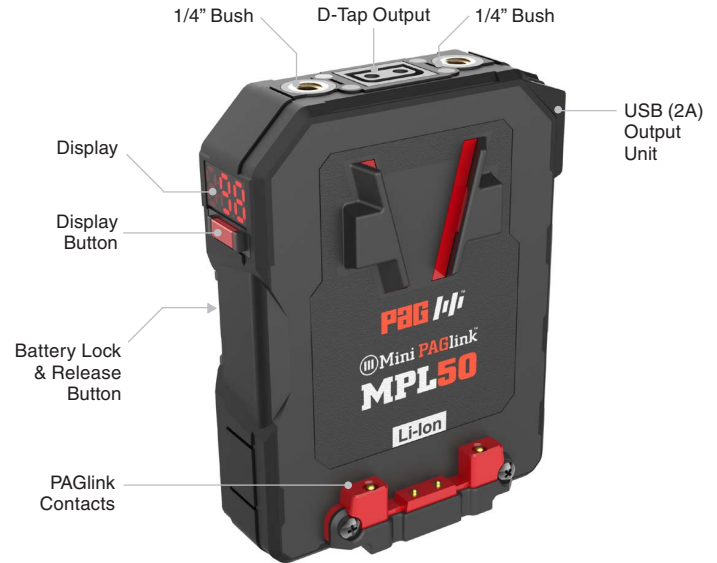
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# 1. Introduction

## 1.1 Models covered by these instructions:

Model No.	Name	Capacity	Mount
8141	MPL50	50Wh	V-Mount
8241	MPL99	99Wh	V-Mount

- 1.2 Mini PAGlink V-Mount batteries are designed to be compatible with the Sony V-Mount battery plate.
- 1.3 They feature all the benefits of PAGlink intelligent linking technology combined with a reduced form factor and increased durability.
- 1.4 They are available in 2 flight-friendly capacities: 50Wh and 99Wh. Batteries can be linked on location, allowing you to travel with all the power you need.
- 1.5 The unique PAGlink technology allows up to 10 batteries to be linked for charge or discharge, regardless of their rated capacity or their state-of-charge. The MPL50V and MPL99V can be linked with each other for charge or discharge.
- 1.6 The batteries can be used as a single power source for smaller camcorders and their accessories. In this application they replace a multitude of incompatible batteries. However, they can also be used to power larger cameras and other production equipment, such as monitors.



MPL50 Front

# 1. Introduction

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- 1.7 The batteries feature built-in D-Tap outputs (12V) and a replaceable USB output unit (5V 2A) that can be swapped for USB-C PD 36W, Lemo, Hirose, D-Tap or 2. 1-2.5mm output units.
- 1.8 These smaller, lighter batteries allow you to control the capacity and weight of your power source to suit the application: 1 battery is ideal for handheld applications, 2 or more linked batteries provide longer run-time or an increased current draw of up to 12A, ideal for powering multiple accessories. Current is delivered using superior, high-current pin contacts.
- 1.9 PAGlink allows seamless hot-swapping for continuous power, or the ability to add another battery just to keep shooting, which means fewer time-wasting camera reboots.
- 1.10 Simultaneous discharge from linked batteries means no dead weight on your camera. Sharing the current load extends overall battery life to provide a better return on investment. Both the MPL50 and MPL99 batteries have a 2 year warranty.
- 1.11 The PAGlink technology 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.
- 1.12 The intelligent PAGlink batteries manage their own charging safely and efficiently, and can be charged, whilst linked, using PAGlink chargers, as well as V-Mount Li-Ion chargers of other reputable manufacturer's, for maximum versatility and economic integration.



# 1. Introduction

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- 1.13** Batteries in any state of charge can be linked for charging, in multiples of 10 or fewer. During charging, the least-charged batteries are given priority. When the batteries reach a similar state of charge, they will charge simultaneously. The charge status of each battery is shown on its individual display.
- 1.14** The batteries feature an ergonomic design and a 'soft-touch' coated, protective band for safer handling and increased durability.
- 1.15** 1/4" bush inserts have been incorporated to enable the mounting of accessories to individual or linked batteries.
- 1.16** The battery display provides remaining run-time, on-load, in 1 minute increments, for the total of all linked batteries. It shows state of charge for each individual battery in 1% increments, at any time. It also provides useful data, such as the number of charge/discharge cycles, to assist with battery management.
- 1.17** They will automatically detect and adapt to camera data systems that allow batteries to provide capacity information in the viewfinder/LCD.
- 1.18** The batteries feature a fully-serviceable, modular construction that allows authorised replacement of the cell-pack whilst maintaining conformity with UN standards and IATA air transport regulations. The battery cases and internal electronics can be reused in the interest of greater sustainability.
- 1.19** The battery firmware can be updated easily by the customer, via external contacts, using an update tool provided by PAG.
- 1.20** PAG's patented intelligent battery linking technology remains far in advance of any other camera battery system available today.
- 1.21** PAG Li-Ion batteries are tested by Intertek Group PLC to UN 38.3 standard in compliance with IATA Air Transport regulations.

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## 2. Specification

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### 2.1 Cell Technology:

Premium-grade Lithium-Ion sealed rechargeable cylindrical cells.

### 2.2 Capacity:

**Model 8141:** 50 Watt-hours (nominal 3.5 Ampere-hours).

**Model 8241:** 99 Watt-hours (nominal 6.7 Ampere-hours).

### 2.3 Voltage:

14.8V nominal.

### 2.4 Output Current:

The rated maximum continuous output current for an individual 50Wh battery is 8A, and for a 99Wh battery it is 10A. Two or more linked batteries of any rated capacity, in a similar state of charge, will deliver an increased continuous current of up to 12A.

### 2.5 Fixed D-Tap Outputs:

12V (unregulated), designed for powering camera accessories. Model 8141 MPL50G features 1 built-in D-Tap output. Model 8241 MPL99G features 2 built-in D-Tap outputs.

### 2.6 Removable USB Output:

Each battery incorporates 1 removable USB output unit, 5V regulated, 2A continuous, 3A peak. The unit can be removed and replaced with a USB-C PD 36W, Hirose (4-pin), Lemo (2-pin), D-Tap or a 2.1-2.5mm DC output unit. These are available individually from PAG or its resellers.

### 2.7 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).

### 2.8 Overall Dimensions (L x W x H):

**Model 8141 MPL50V:** 109mm (4.3") x 87mm (3.4") x 31mm (1.2")

**Model 8241 MPL99V:** 109mm (4.3") x 87mm (3.4") x 50mm (2.0")

### 2.9 Weight:

**Model 8141 MPL50V:** 360g (12.7oz) approx.

**Model 8241 MPL99V:** 590g (21oz) approx.

## 3. Charging

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- 3.1 IMPORTANT: READ THE CHARGER HANDBOOK BEFORE ATTEMPTING TO CHARGE THE BATTERY.**
- 3.2 NOTE: The battery is put into ‘ship mode’ prior to transit. It can be activated by connecting it to a charger that is powered-up, or by linking it to a battery that is already active.**
- 3.3** Mini PAGlink batteries can be charged individually or linked, regardless of their rated capacity or state of charge. They can be partially charged and discharged without suffering any damaging effects. It is not possible to link V-Mount Mini PAGlink batteries with the larger V-Mount PAGlink batteries, because the linking contacts are located in different positions.
- 3.4** Up to 10 Mini PAGlink batteries can be linked for charging on each position. The least-charged batteries are given priority until all the batteries are within 20% state-of-charge, when they will all be fully-charged simultaneously. If you connect only one battery to the charger it will receive all the current, and charge in the quickest possible time. The following PAGlink chargers can be used:

9707	PAGlink PL16 Charger	2-positions, 10 batteries on each
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9711	PAGlink PL16+ Charger	4-positions, 10 batteries on each
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9713V	PAGlink Micro Charger	1-position, 10 batteries in total
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Sony and older PAG V-Mount chargers will charge linked batteries to 100% if the difference in SoC between them is less than 40% at the start. You can pre-charge batteries individually until they are within 40%.

- 3.5 Charge Times:** From fully-discharged to fully-charged:

Capacity	PL16	Micro Charger
50Wh	01:15	02:00
100Wh	01:30	04:00
200Wh	03:00	08:00
300Wh	04:45	12:00
400Wh	06:00	16:00
600Wh	09:00	24:00
800Wh	12:00	-
1600Wh	24:00	-

Each charging position of the PL16 charger receives the same current simultaneously and it is better to spread batteries evenly across both channels to achieve the fastest charge time. Batteries that have a similar state-of-charge should also be stacked together for the most efficient use of power.

- 3.6** Mini PAGlink batteries display their individual state-of-charge during charging on their built-in display.
- 3.7** The batteries incorporate a temperature sensor which will inhibit charging if their temperature is below 0°C. See **Specification** for the charging temperature range.



## 4. Discharging

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- 4.1 Mini PAGlink batteries can be discharged individually or linked. The batteries can be in any state of charge for linked discharging. The maximum number of PAGlink batteries that may be linked has been limited to 10. If more than 10 batteries are linked, the management system will shut-down the supply, and no current will flow.
- 4.2 Where total continuous consumption is above 8A, two or more batteries, of any rated capacity, should be linked. This will increase the maximum continuous discharge current to 12A, provided the batteries are in a similar state of charge. Sharing the current load across multiple batteries prolongs individual battery life and provides a better return on investment.
- See Section 6 Battery Linking Features.*
- 4.3 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 10%, eliminating unwanted operation due to high current and low battery temperature.
- 4.4 The batteries incorporate a current limit of 8A for an individual 50Wh battery, 10A for an individual 99Wh battery, and 12A for linked batteries of any rated capacity. Consumption above this for more than 5 seconds will trigger the over-current protection, turning the battery output off. 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 batteries 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.
- 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 When not in use, batteries should be kept in an **unlinked state** to ensure a lower self-discharge rate.

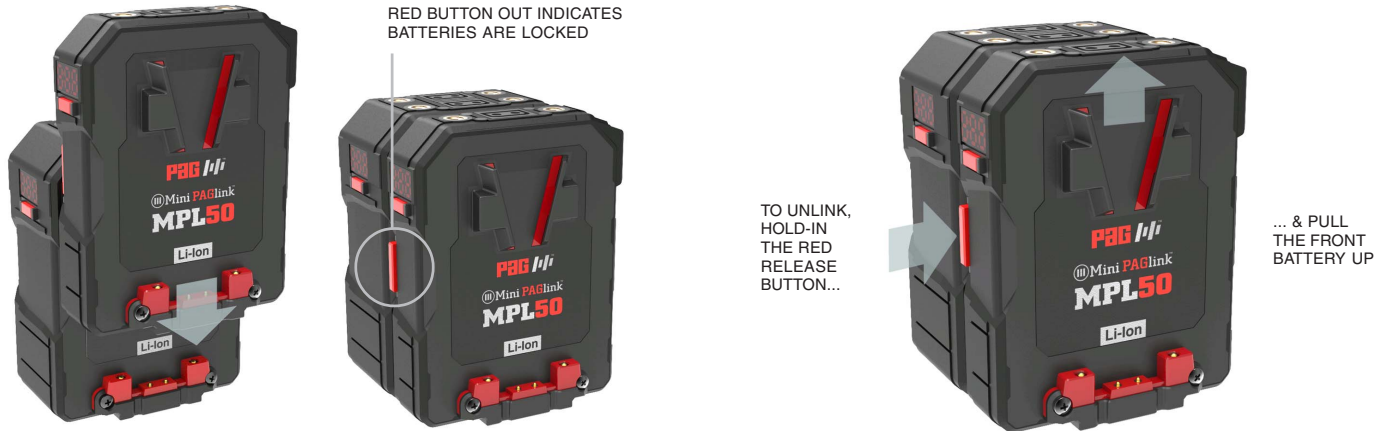
## 5. Storage

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- 5.1 It is important to note that frequent use is the best practice for Li-Ion batteries, in preference to storing them for long periods.
- 5.2 In the short term, batteries can be left safely stacked on a charger until they are required. The charger will only top-up the battery when it sees that it can accept more charge.
- 5.3 If the batteries are not going to be used for a number of weeks then they should be removed from the charger and stored, unlinked, in a half-charged state, at normal room temperature. NOTE: Leaving batteries unused, in a fully-discharged or fully-charged state should be avoided. Batteries can be put into '**ship mode**' by viewing the software version (Sft) on the display menu ([see page 15](#)). This greatly reduces the rate of self-discharge.
- After 14 days of inactivity, a Mini PAGlink battery will automatically enter 'ship mode'. It can be reactivated by connecting it to a charger that is powered-up, or by linking it to a battery that is already active.
- 5.4 For long-term storage, ensure that the batteries are unlinked and in 'ship mode'. Keep them in a 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 batteries' life. During storage, it is best to cycle the batteries (full-discharge and charge) at least once every 4 to 6 weeks.
- 5.5 After storage it is advisable to fully-charge batteries before use.

# 6. Battery Linking Features

## 6.1 Linking Batteries:



To link batteries, align the V-shaped connector on the rear of a battery with the V-shaped slot on the front of another. Slide the front battery down until the batteries lock and the front battery's red locking/ release button is protruding from the side.

To unlink batteries, grip the rear battery firmly, hold-in the front battery's red locking/release button, then pull the front battery up and away.

## 6. Battery Linking Features

6.2 PAGlink enables you to link batteries and discharge them simultaneously as well as individually. Instead of leaving your spare battery in the camera bag you can start your day's shooting with 2 linked batteries on your camera and experience a number of benefits.

Linking batteries combines their capacities into one large power source that you can unlink, and fly with legally. Individual Li-Ion batteries that have capacities greater than 160Wh are banned from passenger aircraft.

The combined capacity extends the run-time of your camera set-up. Two linked 50Wh batteries will provide 100Wh; a 50Wh and a 99Wh battery linked will provide 149Wh; two 99Wh batteries will provide 198Wh.



Linking batteries increases the maximum continuous current draw capability to 12A, provided the batteries linked are in a similar



## 6. Battery Linking Features

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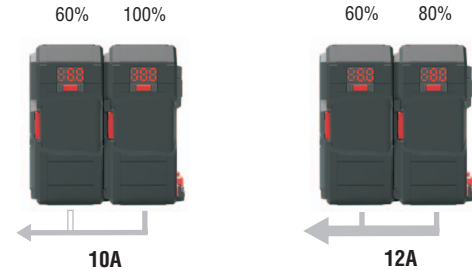
state of charge (within 20%). Individually, the MPL50 battery will provide up to 8A, and the MPL99 will provide up to 10A.

The maximum number of PAGlink batteries that may be linked has been limited to 10. If more than 10 batteries are linked, the management system will shut-down the supply, and no current will flow.

Linked batteries communicate with each other, ensuring a safe protocol under all circumstances. The battery with one or more other batteries connected to its front contacts, controls the delivery of power, and remains active at all times. Fully-charged batteries discharge together sharing the current demand and delivering power via a bus bar. This is what we mean by 'intelligent linking'.

**NOTE:** The rear battery does not fully-discharge first, followed by the battery connected directly to the camera. The rear battery does not discharge into the front battery.

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. The combined state of charge is displayed automatically in the viewfinder/LCD, when the camera has a compatible data system and has been set-up to recognise the battery.



Batteries can be added to the stack or 'hot-swapped' to achieve continuous running, regardless of their rated capacity or state-of-charge. Current delivery will remain at 10A while there is a large difference in individual battery capacity (>20%). The rear battery will be prioritised to deliver power until the batteries are within 20% SoC. They will then start to discharge together again, and it will be possible to draw more current.

# 7. Run-Time, Charge Status & Data Display

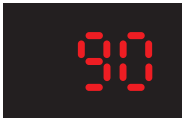
## 7.1 The Battery Display:

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



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. 3 button presses will keep the run-time information on display until the camera is turned-off, or until you press the display button again. If the predicted run-time is more than 9hrs 59mins, the display will not provide a figure.



A single button press of the display, off or on-load, shows **state of charge** as a percentage. When the batteries are linked this figure still relates to the battery's individual SoC.



When individual battery SoC drops below 5% the display will indicate that the battery should be charged, as shown. The battery should not be left in this state.

## 7.2 Display Data Output:

Data stored in the battery's microprocessor can be revealed using the battery display:



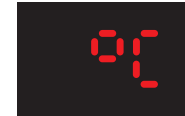
Press display button x3 in 1 sec intervals & hold for data mode



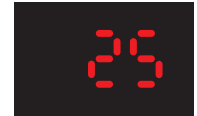
Release to see 1st menu item: 'Pd' (voltage)



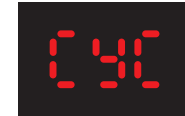
Press & hold for 3 seconds to see voltage reading



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

# 7. Run-Time, Charge Status & Data Display



Press x3 without holding for software version

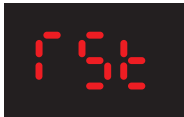


Press & hold for version number...



...which appears in 2 parts indicating version 2.0

After selecting to view the software version number, the battery will enter **Ship Mode** automatically. Ship Mode reduces battery self-discharge and can be used when you are going to store or ship your batteries. To exit Ship Mode, link the battery to another active battery or connect it to a charger that is powered-up.



Press x4 without holding for computer reset

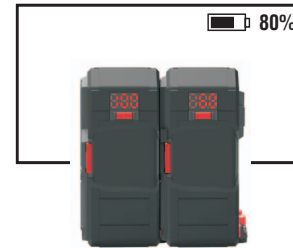


Press & hold to perform reset. Do not release until 3 lines disappear

Reset reverts the battery to its power-on state.

## 7.3 In-Viewfinder Battery Status

Battery state-of-charge 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. Mini PAGlink batteries automatically adjust to support the following: SMB (Sony and Red), I2C (IDX), analogue 0V to 5V (Anton/Bauer).



When the batteries are linked, the data displayed is for the combined capacity available. If there are 2 linked batteries, one at 100% SoC and one at 60%, available capacity is 160% of 200%, which is equal to 80%. It will always display as a fraction of 100%. If both batteries were 100% the display would still say 100%.

If the data does not display, it could be because your camera has not been set-up to communicate with the battery, or the camera mount does not have the required contacts to deliver the information to the viewfinder/LCD. Certain manufacturers do not include the data pins in their V-Mount connectors.

## 8. Battery Outputs

- 8.1 Mini PAGlink batteries feature built-in D-Tap outputs (unregulated) designed for powering 12V camera accessories. They also incorporate a USB output unit, regulated at 5V (2A), which is interchangeable with other output unit types (see 8.2).



To remove the USB output unit, push the release slider on the rear of the battery to the left. When the unit is protruding from the battery case it can be pulled-out easily. To fit a different output unit type, align the locator at the top of the output unit with locator in the port, and push-in the unit until a click indicates that it is secured.

- 8.2 Output Units for Mini PAGlink batteries:



D-Tap  
Model 9712D



Hirose (4-pin)  
Model 9712H



Lemo (2-pin)  
Model 9712L



2.1 - 2.5mm  
Model 9712P



USB (5V 2A)  
Model 9712U



USB-C (PD 36W)  
Model 6002



# 9. Battery Protection Features

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## 9.1 Over-Charge Protection

Charging will be inhibited if the battery voltage exceeds a pre-set level.

## 9.2 Over-Discharge Protection

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 10%, eliminating unwanted operation due to high current and low battery temperature.

## 9.3 Over-Current Protection

If a single 50Wh battery is subjected to a current greater than 8A (10A for a 99Wh battery), 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.

## 9.4 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 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.

## 9.5 Construction

The battery cases consist of high-impact ABS injection mouldings, designed to protect the cells from impact damage. The battery has been drop-tested.

The circuits are coated, making them resistant to electrolyte and ensuring the operation of the electronic 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.

# 10. Safety Information

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## 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 safe and reliable 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

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- 11.1** Assemblies that are external to the cell-pack enclosure can be replaced by customers in the event of damage. Parts and instructions can be obtained from PAG Ltd. or from an authorised PAG Service Centre (listed at the end of this section).
- 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.

For an initial period, a Mini PAGlink 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.

# 11. Servicing

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## **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

### **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

### **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

# 12. Recycling

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- 12.1** Mini PAGlink Batteries are the first to feature PAG's new modular design concept. This has a dual benefit of making the batteries easier to service locally, and allowing authorised replacement of modules, including the cell-pack, whilst maintaining compliance with UN standards and IATA regulations for flight safety.

Instead of discarding working electronics and components when the cell-pack expires, they can be reused, contributing towards a more sustainable approach to resources. The modules that can be transferred to your new battery include the battery's output units, the display, the protection circuit and the front and back of the battery case. The cell-pack and the outer band are the only parts that will need to be replaced.

PAG offers its UK customers a recycling service for their expired PAG Li-Ion batteries, by prior arrangement only.

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

The Li-Ion cells are recycled in accordance with EU regulations, with a 'recycling efficiency' of 59.3%.

# 13. Warranty

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- 13.1** Notwithstanding any provision of any agreement the following warranty is exclusive: PAG Limited warranties each Mini 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:



**MPL50V Model 8141**

**MPL99V Model 8241**

This warranty extends only to the original purchaser. This warranty 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 warranty, PAG Limited will repair and calibrate equipment returned to an authorised Service Facility within the period of the warranty, provided the warrantor's examination discloses to its satisfaction the product was defective.

The warrantor 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 warranty is in lieu of all other warranties, express or implied, including but not limited to any implied warranty 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.

- 13.2** PAG does not limit its warranty to an arbitrary number of cycles that may or may not be achievable within the time frame of the warranty. Li-Ion cell-technology deteriorates with age and a time limited warranty is essential. The number of cycles will depend on how the battery is used. While Li-Ion batteries benefit from regular use their overall life will be shortened by high-current demands, use outside of the optimum temperature range and charging at high-currents. PAG batteries are protected against life-shortening practices, and linking them for discharge contributes to a longer overall battery life.

Mini PAGlink batteries are warranted for 2 years, with unlimited cycles during that period. There are no restrictions on the conditions of use. If the full-capacity of a PAG battery falls below 75% of its rated full-capacity, within the warranty period, PAG will replace it without cost to the customer.

# 14. Air Transportation

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## 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 quality standard such as ISO 9001:2015.

PAG Li-Ion batteries are independently tested and approved by Intertek Group PLC to comply with UN Standard 38.3.

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

Since the interpretation and application of regulations may vary with each state and each operator, PAG advises that you contact both prior to travelling.

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, including power banks, that have capacities of **100Wh or less**.

In addition, you can fly with **2** Li-Ion batteries that have capacities **greater than 100Wh, but less than 160Wh**.

You cannot fly with Li-Ion batteries that have capacities **greater than 160Wh**. These are **forbidden** from passenger aircraft.

You cannot fly with Li-Ion batteries that the manufacturer deems to be damaged. These are **forbidden** from passenger aircraft.

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, which can be provided by PAG Ltd.