



# ISOLUX llc

## *OPERATION MANUAL RevD*

### **IsoLED PLUS + PORTABLE LED HEADLIGHT (09/02/2020)**



## 1.0 Purpose and Features

### 1.1 Purpose

The headlight is used for examination, diagnostics and surgical operations for multifarious uses including microsurgery.

### 1.2 Features

- 50,000 hours of LED life provides for a maintenance free device with an end life of approximately 20 years.
- The unit has infinite mobility, not confined by access to power sockets, and its charge will last more than 4 hours at full intensity.
- Its light beam is extremely homogeneous and free of imperfections.
- Its high CRI rating of 92 is very desirable in color-critical applications such as neonatal care, medicine and surgery, as it shows the true colors of tissues and skin, thereby reducing the time to diagnosis and surgery.
- The light-weight battery packs have a retention clip to be used on the user's belt or pocket.
- The wall mounted Battery Charger comes with a Charge Monitor that alerts the operator when the Battery is fully charged.
- The unit comes with two (2) Battery packs, allowing for "Hot Swap" and the extension of its operating time to > 8 hours.

## 2.0 Description

The IsoLED Plus system consists of:

- 2 Re-chargeable control units (Battery pack) with belt clip
- LED Illuminator with variable spot control
- Choice of dual adjust ratchet or soft headband
- Wall mounted Battery Charger

### IsoLED Control Unit (Battery pack)

- Weighs only 190 grams
- On/Off Intensity Control Knob (12-100% adjustability)
- On indicator
- Re-Charge Plug-in Connector
- Belt clip
- Additional units can be purchased separately

### IsoLED Illuminator

- Variable spot, 10-100mm diameter at 400mm/16" or 20-230mm diameter at 1m/39"
- Flexible linkage for infinite positional control
- Removable/sterilizable positioning joystick
- Attached to dual adjustable ratchet headband or soft Velcro headband

### Battery Charger

- Universal AC input, 100 to 240 VAC
- Indicator light, goes from red to green when fully charged
- Wall mounted unit



### 3.0 Operating Instructions

#### 3.1 Charging the Battery

1. Plug the charger's male connector into the receptacle on the Battery pack.
2. Plug the AC connection into a 100-240 VAC source.
3. The charger indicator light will illuminate red while charging and turn green when charging is complete (approximately 2.5 hours).
4. An 85% partial charge may be performed in 2 hours.
5. Disconnect the charger from the AC source and unplug the charger from the control unit.

#### 3.2 Illuminator and Headband Operation

1. The illuminator unit comes with an integral pendant cable assembly.
2. The cable should be routed and snapped into place through a set of two cable clips. For dual ratchet headsets one is located on the top on the crown and one on the rear of the headband. The user has the choice of using the set on the left or the right.
3. For softband/velcro headsets, the cable should be routed through two clips along the circumference.
4. The illumination spot size may be adjusted by turning the grooved dial on the headlight.
5. The linkage assembly on the headband allows for personal positioning control. The joystick is used to further adjust the position of the light beam.

#### 3.3 Control Unit / Battery Pack Operation

1. Assure the pendant Cable Assembly is plugged into the Control Unit/Battery pack receptacle. There are red orientation dots that must be aligned.
2. Clip the control unit where desired or place in a pocket.
3. Turn the ON/OFF and intensity control knob clockwise to turn unit On (switch will close). This knob also controls the intensity.
4. To turn unit Off, turn control knob counterclockwise until switch opens.
5. When battery has discharged to a level too low to maintain operation, the Illuminator will dim or flicker and the green LED on the control panel will turn off.
6. The unit's operational time could be extended from 4 hours at full intensity to greater than 8 hours by using the illuminator at half intensity.

### 4.0 Specifications

Illumination	> 40,000 lux @ 30 cm
LED Life	> 50,000 hours
Color Temperature	4,000 °K
Color Rendition Index (CRI)	92 Typical
Light Degradation	None
Spot Size	10mm to 100mm at 400mm/16" working distance
Intensity Range	12% to 100%
Operating Time	>4 hours typical at maximum intensity; 8 hours with 2 Battery packs
Normal Recharge Time	<2.5 hours
Quick Recharge Time	1.5 hours, for 3 hours of maximum intensity
Headband	Dual ratchet or soft velcro
Weight (headlight)	137 grams (LED, cable and optics)
Weight (Battery Pack)	190 grams
Size (control unit/battery pack)	4.25" x 2.7" x 1.1"

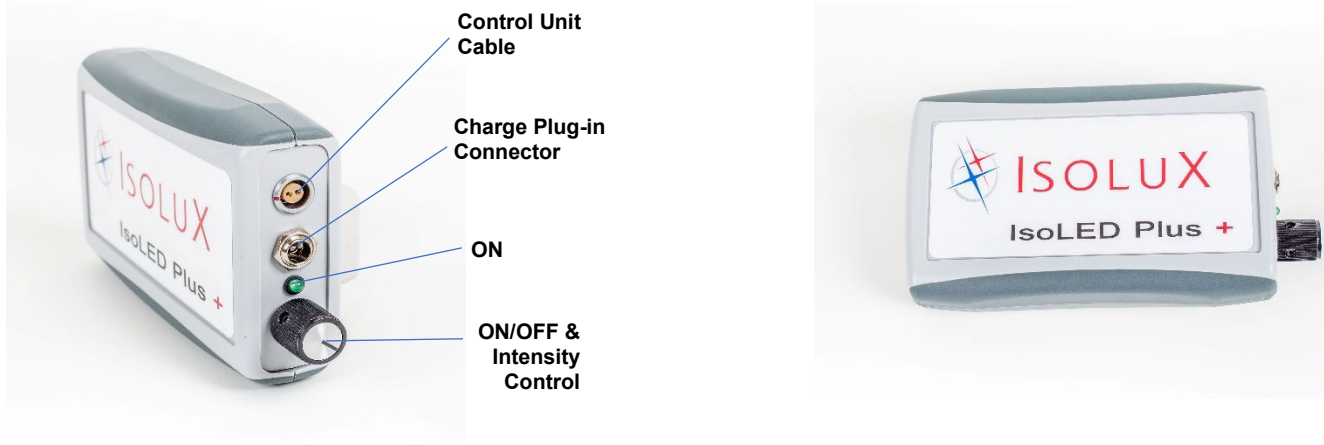


Figure 1 - Control Unit / Battery pack

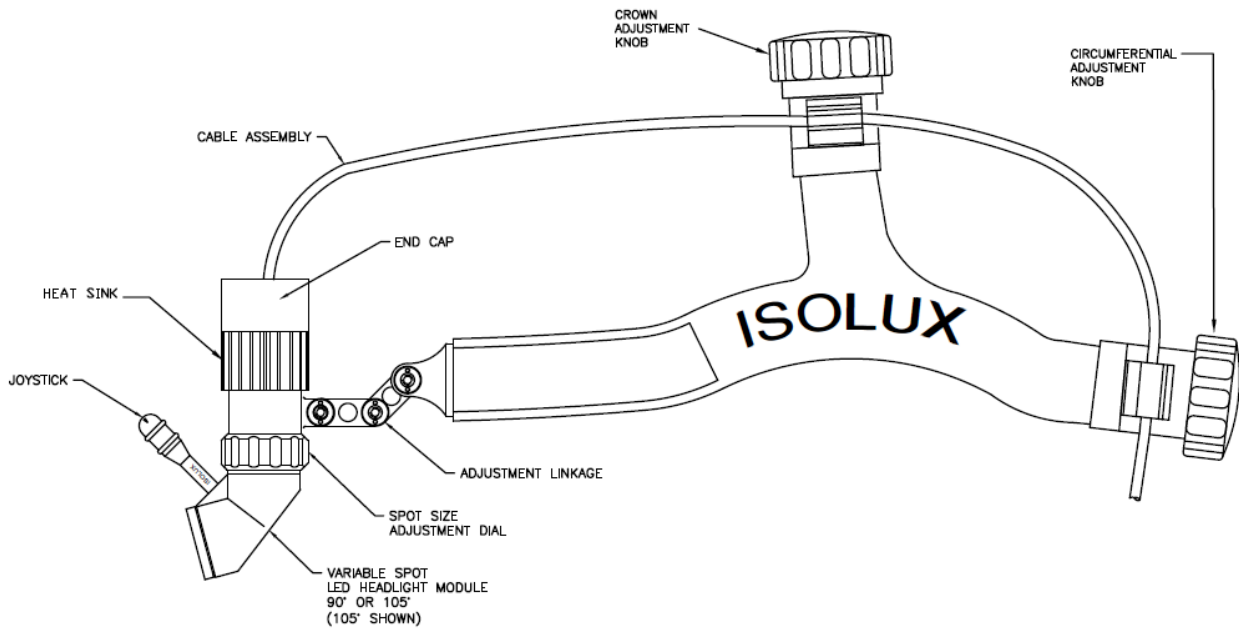


Figure 2 - Headlight Assembly with Illuminator

## 5.0 Care and Maintenance

### 5.1 Headlight, Headgear and Cable

#### **DO NOT AUTOCLAVE !**

Exterior surfaces of headlight, headgear and cable can be wiped clean with any of these solutions:

- Banicide
- Cidex, Cidex Plus, Cidex 7
- Metracide
- 10% Wescodyne
- 10% bleach
- 70% isopropyl alcohol
- Wavecide-01
- Mild soap

Headbands and headlight modules can not be immersed into disinfecting liquids or sterilizers.

Keep ends of cable clean by wiping with a damp cloth. Allow to dry before use.

Clean the optics only with lens tissue available at any camera store. Follow the instructions on the package.

To ensure long life for the headgear, cable and power source, store them in a cool dry environment.

### 5.2 Joystick

Joystick can be sterilized after unscrewing from headlight.

**DO NOT AUTOCLAVE ANY OTHER PARTS OF THE HEADLIGHT SYSTEM !**

## 6.0 Warnings and Cautions

### 6.1 Warnings

**Users of this headlight should be trained in the appropriate surgical procedures. They should read and understand the owner's manuals for this Headlight and all equipment used in conjunction with it.**

### 6.2 Cautions



**Do not look directly into headlight when illuminated. Eye injury may result.**



**Do not use at distances closer than 10in(25cm) for extended periods. may result.**



**Service must be performed only by IsoLux authorized repair personnel.**

## 7.0 Color Rendition Index (CRI)

The color rendering index (CRI), with a scale from 0 to 100 %, is a quantitative measure of the ability of a light source to reveal the colors of various objects faithfully in comparison with an ideal or natural light source like the light from the sun. Light sources with a high CRI are desirable in color-critical applications such as neonatal care, medicine and surgery, as it shows the true colors of tissues and skin, thereby reducing the time to diagnosis and surgery.

The IsoLED Plus+ unit has a high CRI of 92, which brings it close to the optimum value of 100, and is one of the few units in the global market with this specification.

## 8.0 Warranty and Service

### 8.1 Headlight

The IsoLux IsoLED Plus+ Headlight System is guaranteed against all defects in materials and workmanship. All surgical Headlight Optical Modules and Connecting XYZ Mechanisms are warranted for 5 years. The Battery pack is warranted for 1 year. This warranty covers the replacement of the parts only and does not include any on-site labor costs. This warranty is void if service is performed by persons other than authorized IsoLux llc distributors or representatives or if equipment is interconnected with components not manufactured by IsoLux llc and/or have not been approved by IsoLux llc for compatibility.

### 8.2 LEDs

IsoLux llc warrants the LED's a full five (5) years, by normal use only. IsoLux reserves the right to void this warranty if any non authorized power source is used in conjunction with the head set or if liquids are allowed to ingress the optical head or control unit.

## 9.0 Ordering Parts and Components

**The IsoLux llc IsoLED Plus + Headlight is designed for use with the IsoLux llc power source only.**

### 9.1 List of Spare Components

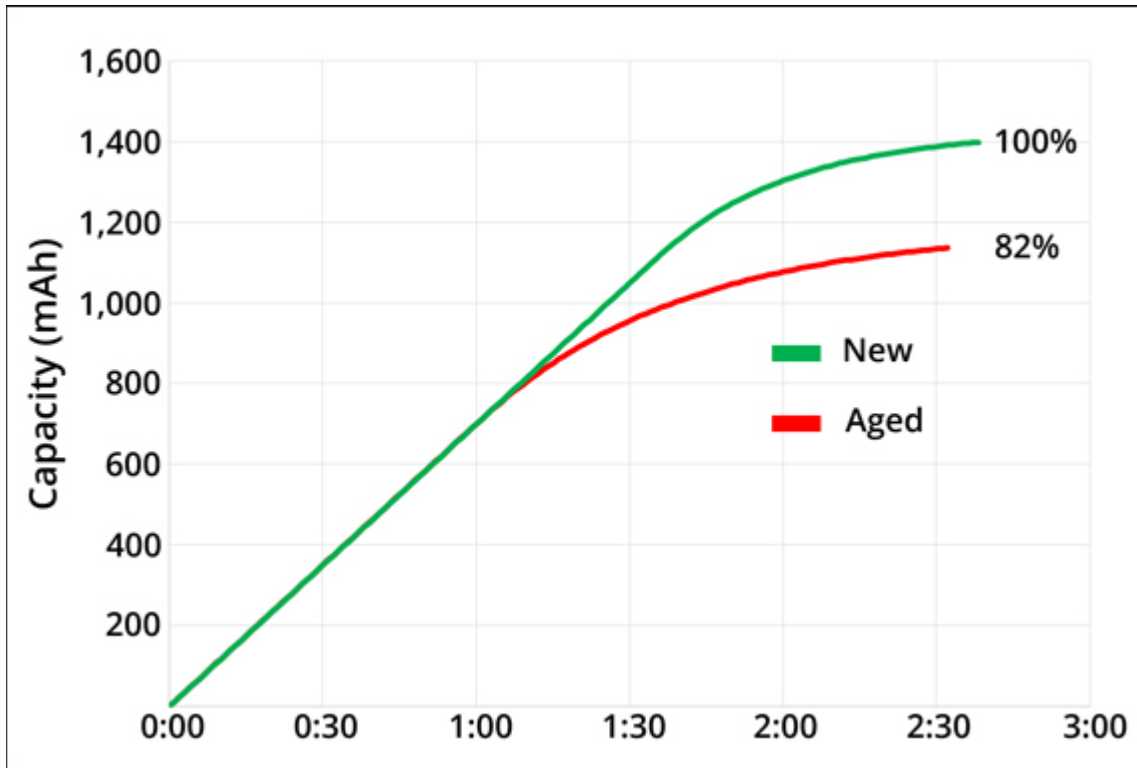
Item	Qty.	Description	Part No.
1	1	Battery pack	IL-2411
2	1	AC/DC Battery Charger	IL-2435
3	1	Sweatbands (pack of 5 sets)	FO-0881
4	1	Joystick (pack of 2)	FO-0911
7	1	Replacement Head Gear	FO-2072

## **10.0 APPENDIX A – BATTERY MAINTENANCE**

Users should be aware of the performance and limitations of Ion-Lithium rechargeable batteries; the leading parameters are capacity and number of charge-discharge cycles.

As the battery gets older, the battery takes its time to charge even if there is little to fill.

Figure A1 illustrates the charge time of a new Li-ion with a **capacity** of 100 percent against an aged pack delivering only 82 percent. Both take roughly 150 minutes to charge.



**Figure A1: New and aged Li-ion batteries are charged.**

Both packs take roughly 150 minutes to charge. The new pack charges to 1,400mAh (100%) while the aged one only goes to 1,150mAh (82%).

Additionally, Full discharge cycles will impact the battery's number of charging cycles, as well as charge/discharge rates and temperature. Avoid high and low State of Charge (SoC); 30 % to 80 % is appropriate. Maximum voltage should be limited to 4.2 V/cell.

Refer to Table A1 below for general Li-ion Battery care.

**Table A1: Li-Ion rechargeable Battery care**

Battery care		Lithium-ion rechargeable Batteries
Best way to charge		Partial and random charge is fine; does not need full charge; lower voltage limit preferred; keep battery cool.
Charge methods		Constant voltage to 4.20V/cell; no trickle charge; battery can, no trickle charge, battery can stay in charger Rapid charge = 3h (recommended) Fast charge = 1h
Discharge		Prevent full cycles, apply some charge after a full discharge to keep the protection circuit alive.
How to prolong battery		Keep cool. Operate in mid SoC of 30–80%. Prevent ultra-fast charging and high loads (most Li-ion)
Storage		Store at 40% charge in cool place (40% SoC reads 3.75–3.80V/cell). Do not go below 2.0V/cell.
Disposal		Low toxicity. Can be disposed in low volume. Best to recycle.

**Table A2: Estimates the number of discharge/charge cycles Li-ion can deliver at various DoD levels before the battery capacity drops to 70 percent. DoD constitutes a full charge followed by a discharge to the indicated state-of-charge (SoC) level in the table.**

Depth of discharge	Discharge cycles
100% DoD	~300 / 600
80% DoD	~400 / 900
60% DoD	~600 / 1,500
40% DoD	~1,000 / 3,000
20% DoD	~2,000 / 9,000
10% DoD	~6,000 / 15,000

**Table A2: Cycle life as a function of depth of discharge.\*** A partial discharge reduces stress and prolongs battery life, so does a partial charge. Elevated temperature and high currents also affect cycle life.

**Note:** 100% DoD is a full cycle; 10% is very brief. Cycling in mid-state-of-charge would have best longevity.

**Isolux's Battery system design provides the following Battery Life extension advantages:**

- Maximum Battery voltage: 4.2 V/cell (8.4 V for IsoLED Plus +)
- Depth of Discharge (DoD):  $4.2\text{ v} - 3\text{ v} = 1.2\text{ v/cell} = 29\%$  (For minimum of 1000 cycles)
- Maximum Charge Current:  $1.3\text{ A} = 1.3/3.5 = 0.37\text{C}$  Charge Rate



- Maximum Load (Discharge Rate): 0.8 A = 0.8/3.5 = 0.23C Discharge Rate
- Temperature Range: 0 to 40°C
- Overcharge Protection: >8.4 V
- Overdischarge Protection: <6 V
- Short Circuit Protection: Yes

The following Table A3 provides questions and answers for Isolux's rechargeable Li-ion batteries' care

**Table A3 – Questions and Answers on Isolux's Battery Maintenance**

QUESTIONS		ANSWERS
How should I prepare a new battery?		Apply a topping charge before use. No priming needed
Can I damage a battery with incorrect use?		Keep partially charged. Low charge can turn off protection circuit
Do I need to apply a full charge?		Partial charge better than a full charge
Can I disrupt the charge cycle?		Partial charge causes no harm
Should I use up all battery energy before charging?		Deep discharge wears the battery down and reduces its number of charging cycles.
Do I have to worry about "memory"?		No memory
Do I remove the battery when full?		Not necessary; charger turns off
How do I store my battery		Store in cool place partially charged
Does battery heat up on charge?		Must stay cool or slightly warm
How do I charge when cold?		Do not charge below freezing
Can I charge at hot temperatures?		Do not charge above 50° C (122° F)
What should I know about chargers?		Battery must stay cool; no trickle charge when ready
Batteries In Storage or in Battery packs		Charge Batteries for 10 minutes when not in use every 4 weeks.
What to do after daily use		After use, at the end of the day, plug the Battery pack to the Charger.