



ISOLUX

LUXTEL: A BRILLIANT CHOICE

IsoLED MAGNUM MANUAL

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Version 3.1

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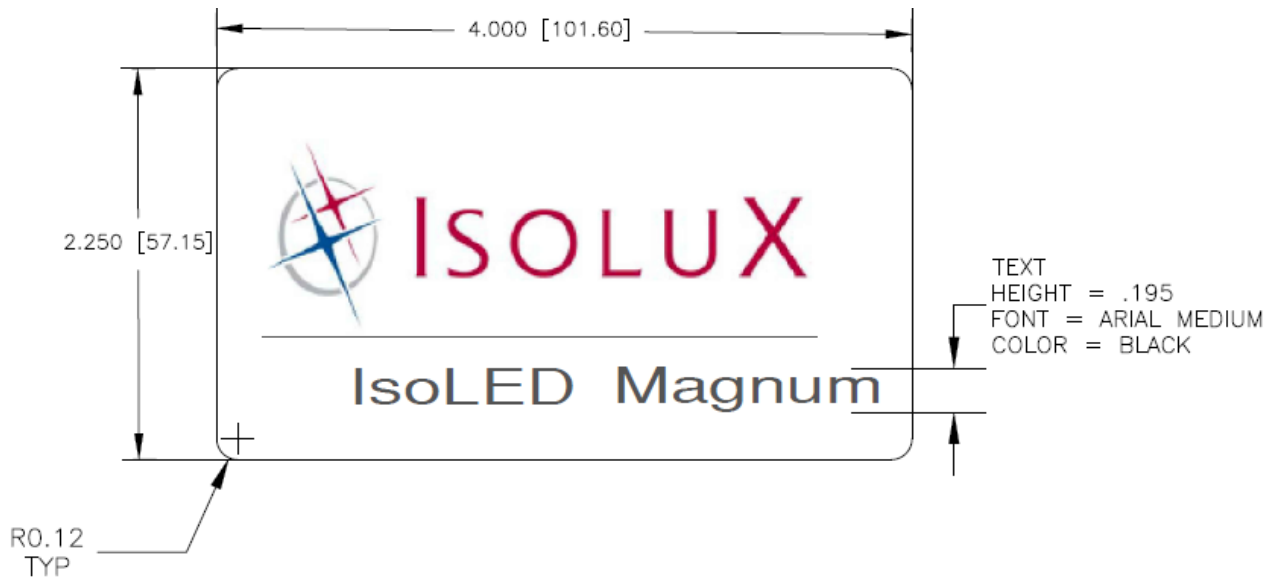
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1.0 REVISION HISTORY

Version	Release Date	Comments
0.1	08/25/2018	Rough Draft
1.0	09/04/2018	Original: Review by S.M. P.B.
2.0	11/01/2018	Final Review by LR
3.0	02/11/2019	Addition of Appendix A

2.0 LABEL



MATERIAL: .002" POLYESTER WITH PERMANENT ADHESIVE BACKING V344
 BACKGROUND: WHITE
 COLORS: BLACK, BLUE–PMS653, GRAY–PMS429, RED–PMS194
 FINISH: OVER LAMINATED WITH .001" CLEAR POLYESTER

3.0 INTRODUCTION

The IsoLED Magnum is an optimal luminaire option for Neuro, Plastic or Thoracic surgeries

The unit provides infinite mobility and isn't confined by access to power sockets; with its charge lasting more than 3 ½ hours at full intensity.

The Magnum's light beam is extremely homogeneous and free of imperfections. The diameter is adjustable, allowing for modification of the illuminated area.

Three fixed settings allow for quick change of illumination. The "Low Battery" alarm, provided in both vibration and flashing red indicator forms, provide the operator with a 3 minute window in which to hot switch Battery Packs.

A safety feature shuts the drive to the LED if its cooling fan is damaged or the connection is broken.

In the low illumination setting, the fan is disabled for "no-noise" operation; at Medium and High settings, the whisper quiet fan is engaged at reduced drive for very low noise operation.

The Magnum's light-weight battery packs have a retention clip to be used on the user's belt/pocket. The wall mounted Battery Charger includes a Charge Monitor that alerts the operator when the Battery is fully charged.



The IsoLED Magnum system consists of:

- Two re-chargeable Battery packs with belt clips
- LED Illuminator with variable spot control
- Choice of dual adjust ratchet or soft headband
- 2 meter Cable Assembly
- Wall Mounted Battery Charger
- User's Guide

IsoLED Magnum Battery pack

- Contains the Battery Cells
- Weighs only 350 grams
- On/Off control with green indicator
- 3 position Gain switch with Low Battery red indicator
- Re-Charge Plug-in DC Connector
- Belt clip

IsoLED Illuminator

- Headlight Assembly with pendant cable
- 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



4.0 SPECIFICATIONS

Maximum Illumination	> 75,000 lux @ 300 mm; > 38,000 lux @ 400 mm
LED Life	>50,000 hours
Color Temperature	5000 °K
Color Rendition Index (CRI)	70 Typical
Light Degradation	None
Spot Size	10mm to 110mm at 400mm/16" working distance
3 Intensity Settings	Low: >32,000 lux; Medium: > 45,000 lux; High: > 75,000 lux
Operating Time	Low intensity: 9 Hrs; Medium Intensity: 6 Hrs; High Intensity: 3.2 Hrs
Normal Recharge Time	3.0 hours
Quick Recharge Time	2 hours, for 3 hours of maximum intensity
Headband	Dual ratchet or soft velcro
Weight (headlight)	300 grams (LED, cable, optics, headgear)
Weight (battery pack)	350 grams
Size (control unit/battery pack)	Width: 100 mm x Length: 120 mm x Depth: 30 mm

Battery Pack Specifications

Type	3 – Cell Battery Pack
Chemistry	Li-ion
Nominal Voltage	10.8 VDC
Capacity	3.5 A-Hr
Continuous Discharge Current	4.0 A maximum
Battery Charging Current	
Standard	0.6 A
Rapid	1.5 A
Weight	150 gms
Dimensions (mm)	67 L x 59 W x 19 H
Connector	Bare Leads, 6" long
Operating Temperature Range	
Charging	0 to 40°C
Discharging	20 to 60°C
Storage	0 to 40°C
Overcharge Protection	>13.05 VDC
Over Discharge Protection	<7.2 VDC
Short Circuit Protection	Yes

Battery Charger Specifications

INPUT	SPECIFICATION
Input Voltage Range	90 – 264 VAC, 50/60 Hz
Input Current	0.2 Arms at 220 VAC input and full load
Max., Input Power	20 watts
OUTPUT	
Output Voltage Range	6 to 12.6 VDC
Constant Charge Current	1.5 A ± 6 %
Constant Voltage	12.6 VDC, ± 1 %
Charge End Current	< 0.15 A
Typical Charge Time	2 – 2.5 Hours
Max. Output Power	19 W
Ripple Current	50 mA
Charge Monitor	LED: Red – charging, Green – finish / idle
Output short circuit Prot.	YES
Efficiency	> 70 %
ENVIRONMENT	
Operating Temperature	-10 to +40 °C
Operating Humidity	<90 % RH, non-condensing
Storage Temperature	-10 to +70 °C
Storage Humidity	0 to <96 % RH
MECHANICAL	
Weight	120 grams
Size	81 x 43 x 40 mm
Connectors	5.5 x 2.1 mm barrel
SAFETY	
Safety Standards	UL1950, EN60950 (CE)
EMC Standard	EN55022 B
MTBF	30000 Hours

5.0 OPERATING INSTRUCTIONS

5.1 Charging the Battery

1. Plug the charger male connector into the DC receptacle on the Battery pack Unit.
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 3.0 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 Battery pack unit.

5.2 Illuminator and Headband Operation

1. Plug the Cable Assembly from the illuminator into the unit's headlight receptacle in the Battery pack unit. There are red orientation dots that must be aligned.
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.

5.3 Control Unit / Battery Pack Operation

1. Press Power switch SW1, its indicator will turn green and the unit will Turn ON
2. Unit will be at its lower gain of 1A, press Gain switch SW2 and the unit will be set at its Middle gain of 1.5 A, press SW2 once again and the unit will be set at its maximum gain of 2.5A. Pressing SW2 one more time will set the unit back down to its lowest gain.
3. When the battery charge is down 90 to 95%, the Low Battery Indicator part of SW2 will flash red at a 1 second interval and the unit will start vibrating.
4. Replace Battery pack with a new charged unit.

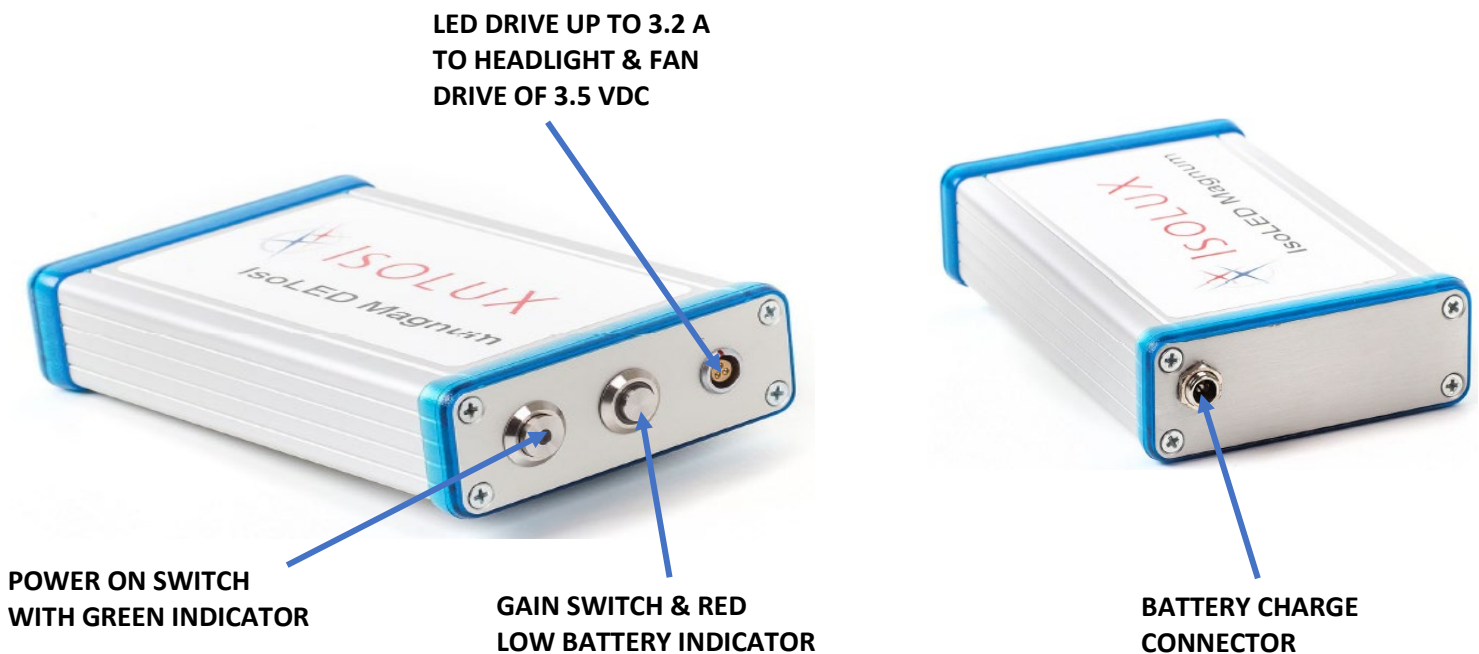


Figure 5.1 - Control Unit / Battery Pack

6.0 FUNCTIONAL DESCRIPTION

The IsoLED Magnum Medical Luminaire consists of two major components and its Battery Charger, reference Figure 6.1 Magnum's Interconnecting Diagram:

- The Headlight Assembly composed of the 10 watts LED, its heatsink and its cooling fan.
- The Controller / Battery pack.
- The universal input 20 watts Battery Charger.

The Battery pack provides the drive (1A, 1.5A, 2.5A) for the 10 watts LED and the drive for the cooling Fan (3.5 VDC) Its three fixed settings allow for quick change of illumination. The "Low Battery" alarm, provided in both vibration and flashing red indicator forms, provide the operator with a 3 minute window in which to hot switch Battery Packs.

A safety feature shuts the drive to the LED if its cooling fan is damaged or the connection is broken.

In the low illumination setting, the fan is disabled for "no-noise" operation; at Medium and High settings, the whisper quiet fan is engaged at reduced drive for very low noise operation.

The Magnum's light-weight Battery Packs have a retention clip to be used on the user's belt/pocket. The wall mounted Battery Charger includes a Charge Monitor that alerts the operator when the Battery is fully charged.

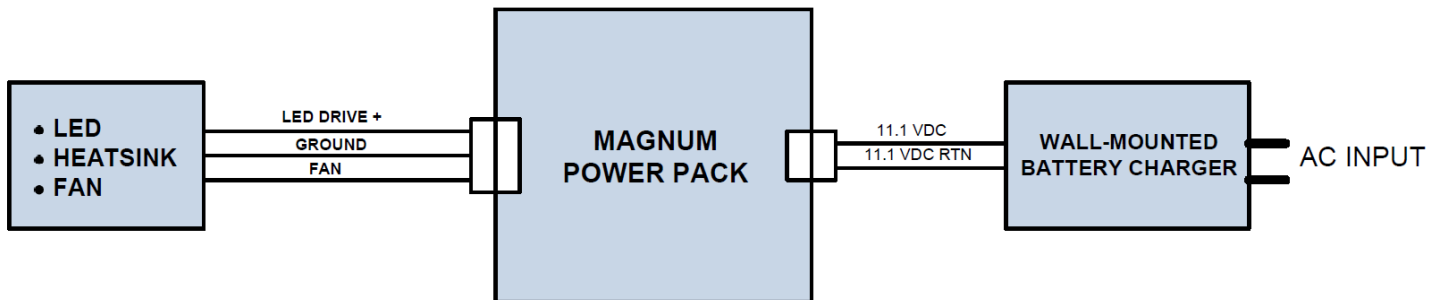


Figure 6.1 IsoLED Magnum System Interconnecting Diagram

The Magnum's Battery pack (see Figure 6.2 Magnum's Battery pack Block Diagram), depicts the components, controls and connectors and interconnects of the Magnum's Battery pack.

It consists of the following components:

- Magnum's Control Board; provides all the necessary drives for the unit's Headlight through connector J3. It also provides the drive to the vibrational sensor in it.
- Controls:
 - SW1- Power Switch and indicator: It turns the unit ON and OFF, and when ON, it sets the unit's gain to LOW.
 - SW2 – It sets the unit's gain to MEDIUM when pressed one time, if pressed a second time, it sets the gain to HIGH; pressed one more time, it sets the unit's gain back down to LOW. The SW2 indicator will flash red at a one second interval when the Battery charge is almost depleted.
- Battery Charger: Provides the necessary charge to fully charge the Magnum's battery in less than 3 hours.

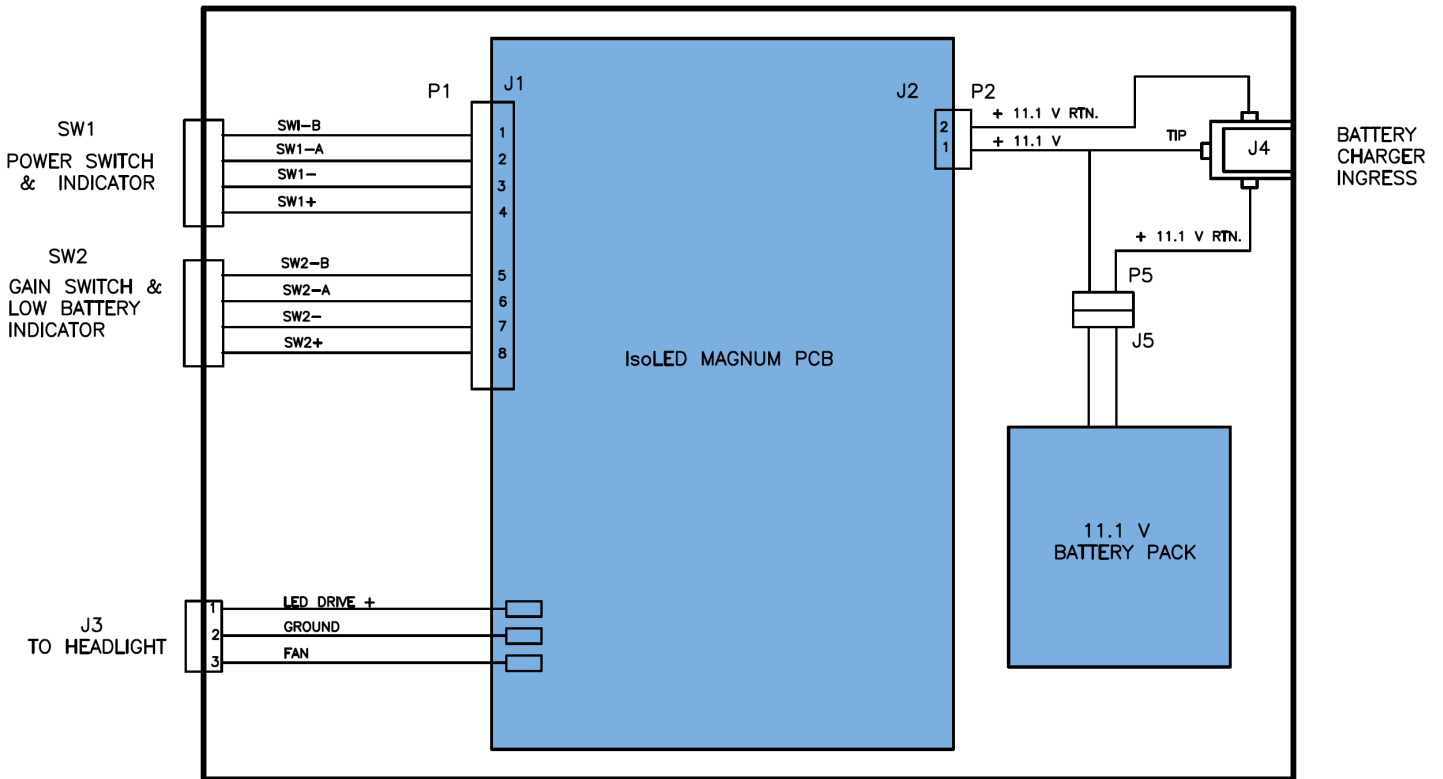


Figure 6.2 Magnum's Battery pack Block Diagram

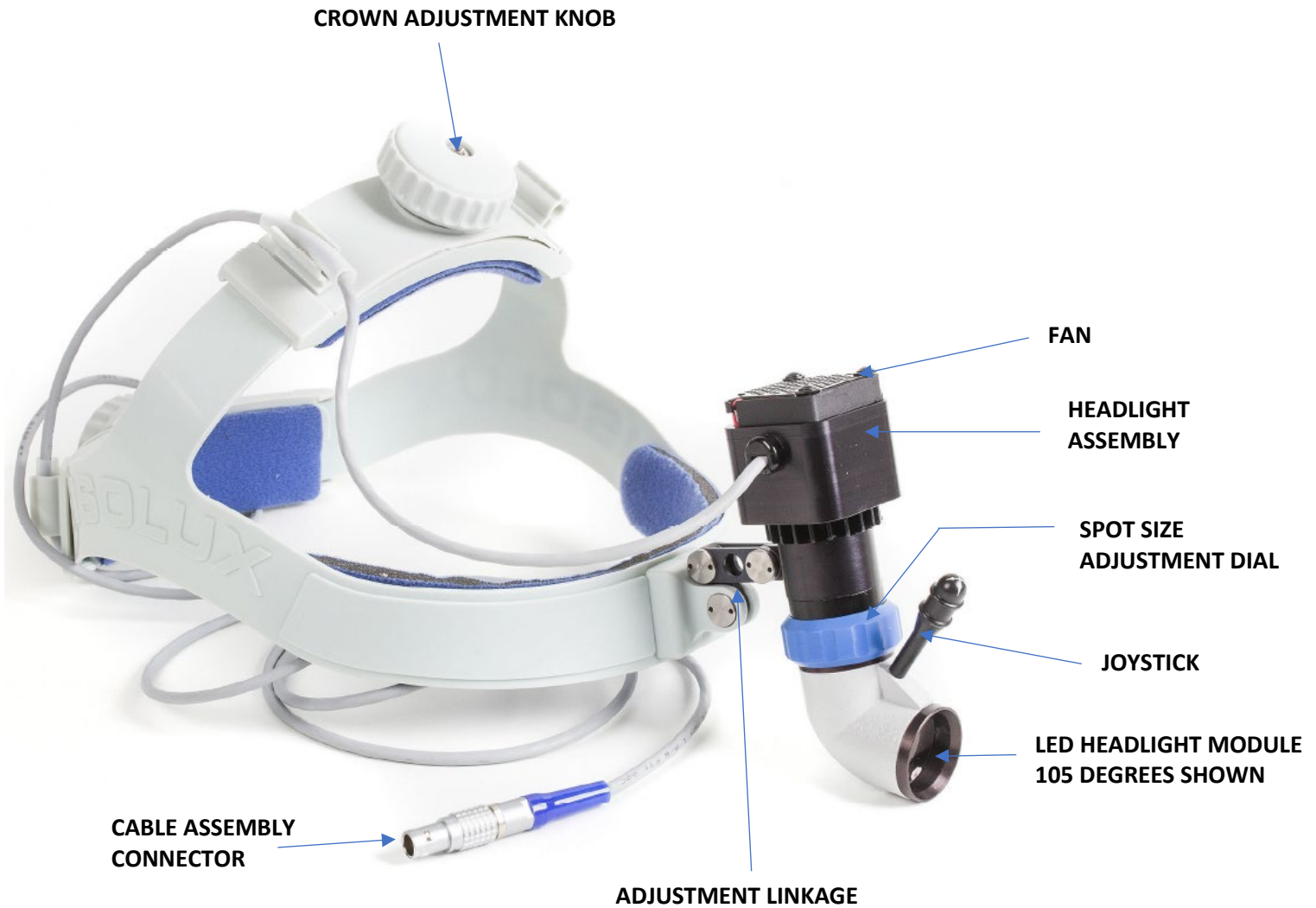


Figure 6.3 – Headlight Assembly with Illuminator

7.0 CARE & MAINTENANCE

7.1 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

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

7.2 Joystick

Joystick can be sterilized after unscrewing from headlight.

DO NOT AUTOCLAVE ANY OTHER PARTS OF THE HEADLIGHT SYSTEM !

8.0 WARNINGS & CAUTIONS

8.1 Warnings

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

8.2 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. Erythema may result.



Service must be performed only by IsoLux authorized repair personnel.

9.0 WARRANTY & SERVICE

9.1 Headlight

The IsoLED Magnum Headlight System is guaranteed against all defects in materials and workmanship. All surgical Headlight Optical Modules and Connecting XYZ Mechanisms are warranted for 2 years.

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 been approved by IsoLux llc for compatibility. The Battery Pack is warranted for 1 year after purchase.

9.2 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 the Battery pack unit.

10.0 AC POWERED VERSION

The IsoLED Magnum luminaire can be used as an AC powered unit

AC to DC Medical Adaptor Specifications

INPUT	<i>Voltage Range</i>	80 to 264 VAC
	<i>Frequency Range</i>	47 to 63 Hz
	<i>Efficiency</i>	86%
	<i>Leakage Current</i>	< 50 uA at 264 VAC
OUTPUT	<i>DC Voltage</i>	12 VDC ± 3%
	<i>Rated Power</i>	18 watts maximum
	<i>Current Range</i>	0 to 1.5 A
	<i>Ripple & Noise</i>	120 mV p-p
ENVIRONMENTAL	<i>Temperature</i>	-25 to +60° C
	<i>Humidity</i>	20 to 90% RH, non-condensing
	<i>Storage Temperature</i>	-40 to +85° C
	<i>Storage Humidity</i>	10 to 95% RH
	<i>Vibration)</i>	10 – 500 Hz, 2G 10 minutes /1 cycle, 60 minutes for each axis
SAFETY & EMC	<i>Safety Standards</i>	ANSI / AAMI ES60601-1, ES60601-1-11, EAC TP TC004
	<i>Withstand Voltage</i>	IP/OP: 4 KVAC
	<i>EMC Emission</i>	Compliance to FCC part 15 class B
MECHANICAL	<i>Size</i>	Width: 54 mm x Length: 79 mm x Depth: 33 mm
	<i>Weight</i>	375 grams

11.0 ORDERING PARTS & COMPONENTS

The IsoLux Ilc IsoLED Magnum Luminaire is designed for use with the IsoLux Ilc Battery pack only.

Accessories	Order#
Magnum Battery pack	IL-2336
Magnum Headlight Illuminator Assembly	IL-2390
Magnum Battery Charger	IL-2341
Replacement Sweatbands (pack of four sets):	FO-0881
Replacement Joysticks (pack of 2):	FO-0911
Replacement Headband	FO-2072

12.0 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.

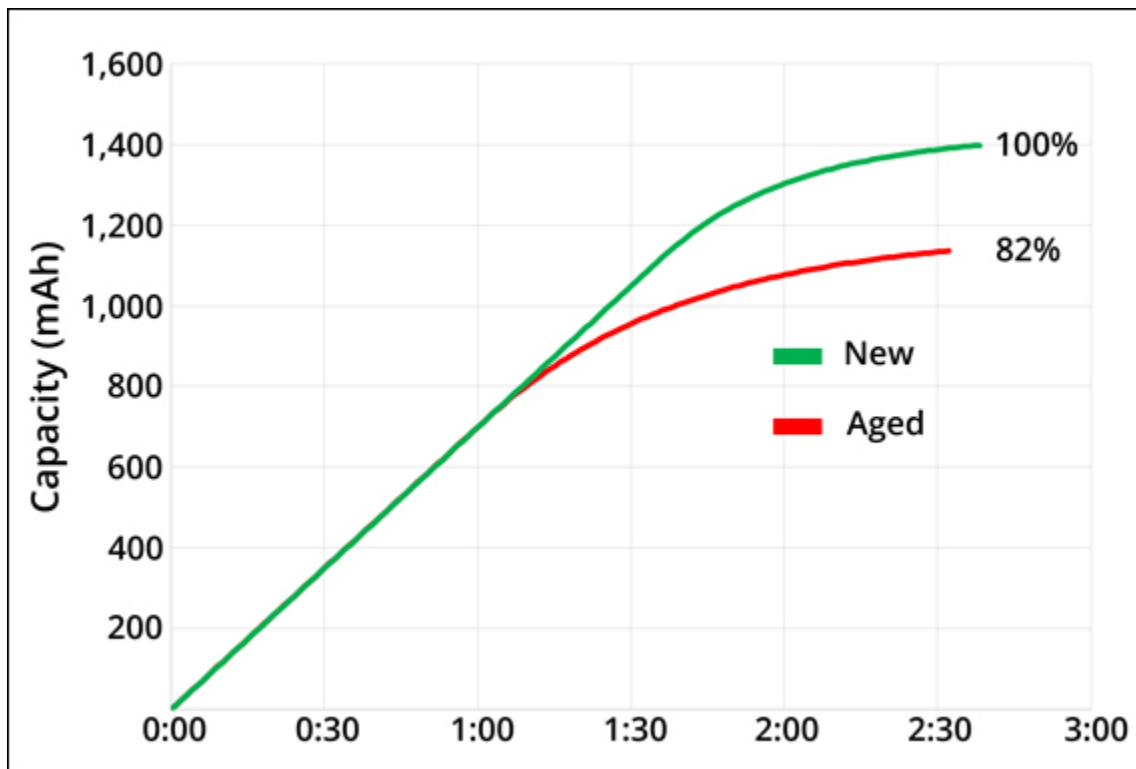


Figure A1: New and aged Li-ion batteries are charged.

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 (12.6 V for IsoLED Magnum)
- 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: $1.5\text{ A} = 1.5/3.5 = 0.43\text{C}$ Charge Rate
- Maximum Load (Discharge Rate): $1.0\text{ A} = 1/3.5 = 0.29\text{C}$ Discharge Rate
- Temperature Range: 0 to 40°C
- Overcharge Protection: >13.05 V
- Overdischarge Protection: <8 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.