

ISOLED XII

OPERATIONAL / SERVICE MANUAL



ISOLED XII OPERATING and SERVICE MANUAL

Document No. OM-1201

Version 2.0

MAY 04, 2012

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1. REVISION HISTORY

<u>Version</u>	<u>Release Date</u>	<u>Comments</u>
0.1	03/15/2012	Rough Draft
1.0	04/15/2012	First Draft for Review
2.0	05/04/2012	Final Draft

2. LABEL

<u>LED SURGICAL LAMP class I</u>		
MODEL No.: Isoled XII	INPUT	OUTPUT
S/N: XXXXX	120 VAC / 60 Hz	Optical Output: >50 Klux @ 1 m.
	38 Watts	Operating Temp.: -10 to 50 C
		Storage Temp.: -20 to 85 C
<u>ISOLUX LLC</u>		
NAPLES, FL. USA		

- Material:
1. Transparent Gloss Polyester with permanent Acrylic Adhesive backing.
 2. Background color: Transparent.
 - 3 .Lettering and Markings: Black.
 4. Size: 3.00" by 1.00"

Notes:

1. Unit is designed with protection against electric shock as per the requirements of IEC 60601 – 1.1, class 1.
2. Equipment is not suitable for use in the presence of a flammable anesthetic mixture with air or with oxygen or nitrous oxide.

3. SYMBOLS



QPS LISTING MARKING



Caution



Protective Earth Ground



Read accompanying documents



Temperature Range: Operating
Storage and Transportation



Relative Humidity Range



This Side Up



Keep Dry



Recycle

4. Definition of Terms

I.E.C.

International Electrotechnical Commission

Medical Electrical Equipment

Electrical equipment intended to diagnose, treat the patient under medical supervision.
Electrical equipment that transfers energy to the patient.

Central Illuminance

Illuminance of light head measured at 1 meter from the light emitting area with no obstructions. Expressed in Foot-candles or Lux.

Light Field Center

Point of maximum illuminance in lighted area. This is the reference point for light field size and light distribution measurements.

Light Field Diameter

Diameter of the circle where illuminance reaches 10% of light field center illuminance.

Depth of Illumination

The overall distance from 1 meter where the central illuminance is reduced to 20%.

Shadow Dilution

Ability of the equipment to minimize the impact of shadows in the working area due to partial obstruction by an operator or other medical personnel.

Correlated Color Temperature

The color temperature of the light fixture when compared to a blackbody radiator stated in degrees Kelvin.

Total Irradiance

The total amount of energy imparted to the patient by the lighting system expressed in Watts/meter squared.

Color Rendering Index (CRI)

A method of how well a light source will render other colors when illuminating them based upon eight CIE chromaticity coordinates measured with a spectral radiometer.

Handle Sterility

Device when properly sterilized maintains a sterile area in order to handle it under aseptic conditions when attached to the equipment.

Neutral Conductor

In an AC circuit, the return line for current.

Protective earth ground

The conductor used to connect the non-current-carrying metal parts of the equipment to the system grounded conductor, the grounding electrode conductor, or both, of the circuit at the service equipment or at the source of a separately derived system.

Ft-Lbs

Foot-pounds; the unit of measurement of torque which is caused by an off-center load.

5. IEC 60601-1 Safety Tests Compliance (Class I, minor surgery)

REQUIREMENTS	TEST PARAMETERS	COMPLIANCE	REMARKS
Protective Earthing	40 amps , < 6 volts compliance, for 2 minutes.	≤ 100 milliohms	Production tests will be done with an audible continuity meter.
Dielectric Strength	1.2 KV AC for 1 seconds	No voltage breakdown	Test will be performed in all production units.

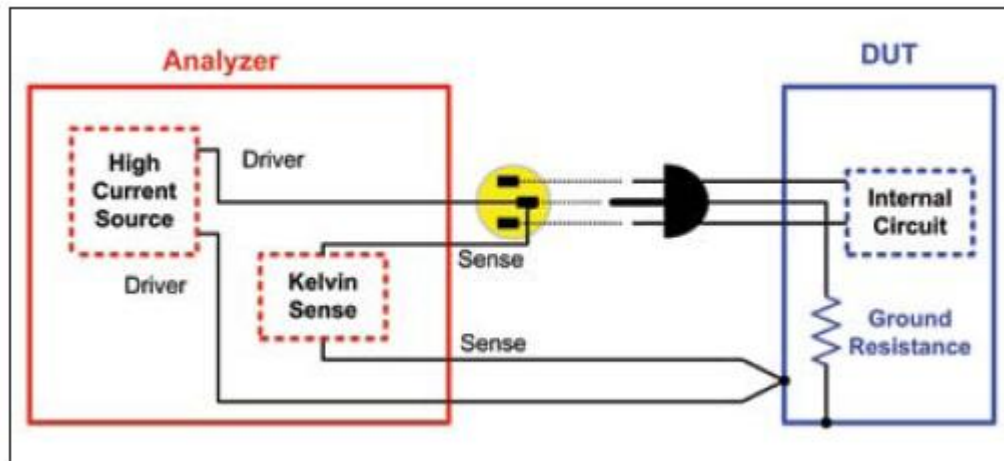


Figure TBD Protective Earthing Test Set Up

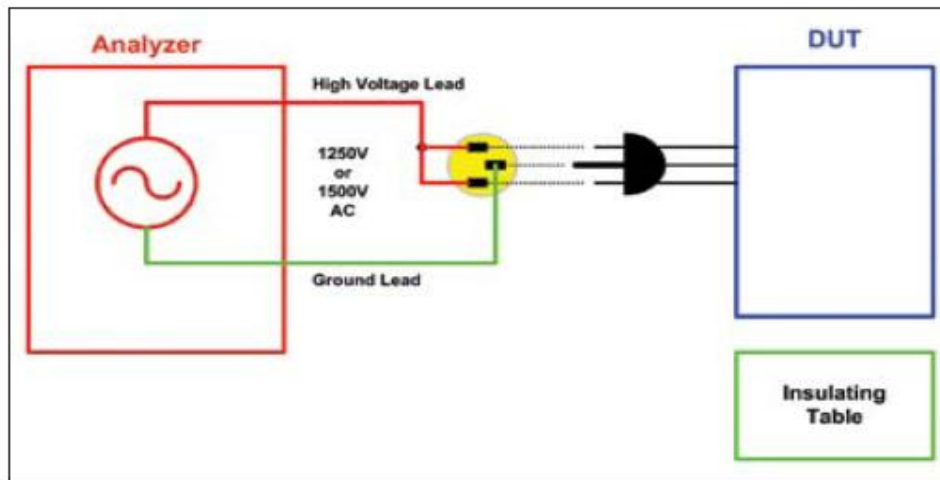


Figure TBD Typical AC Dielectric Strength Test Set Up

6. Table of Surgical Luminaires from IEC 60601 - 2- 41

Requirements	Clause	Type of Luminaire		
		Luminaires for diagnosis	Surgical Luminaires	
			Minor (treatment)	Major and system
EQUIPMENT classification	14.2 a)2)	No requirement	Class I, or Class II with connector to PA ^a	Class I, or Class II with connector to PA ^a
Fail Safe	2.10.101	No	No	Yes
Anesthesia (intended purpose)		Localized	Local/general	Local/general
Intended location		Examination room	Operating room	Operating room
Sterile handle (standard)		No	Yes	Yes
Central illuminance (E_c)	50.102.1.1 a)	No requirement	$40 \text{ klx} \leq E_c \leq 160 \text{ klx}$	$40 \text{ klx} \leq E_c \leq 160 \text{ klx}$
Light field diameter (d_{10})	50.102.1.1 b)	No requirement	Yes ^b	Yes ^b
Light distribution	50.102.1.1 b)	No requirement	Yes ^c	Yes ^c
Shadow dilution	50.102.1.1 c)	No requirement	Yes ^d	Yes ^d
Colour temperature	50.102.2.1	$3000 \text{ K} \leq T_c \leq 6700 \text{ K}$	$3000 \text{ K} \leq T_c \leq 6700 \text{ K}$	$3000 \text{ K} \leq T_c \leq 6700 \text{ K}$
Colour rendering index	50.102.2.1	$85 \leq P_a \leq 100$	$85 \leq P_a \leq 100$	$85 \leq P_a \leq 100$
Maximum value for total irradiance E_a	50.102.3.1	Yes ^e	Yes ^e	Yes ^e

a PA means potential equalization conductor.
b LIGHT FIELD DIAMETER (d_{10}) where the illuminance reaches 10% of CENTRAL ILLUMINANCE E_c .
c Diameter (d_{50}) where the illuminance reaches 50% of CENTRAL ILLUMINANCE E_c .
d Percentage of remaining illuminance when the beam is obstructed by one or two masks, with or without tube.
e Information on the total irradiance E_a for the given CENTRAL ILLUMINANCE E_c .

7. Compliance to the requirements of IEC 60601 2-41 and additional safety issues

REQUIREMENTS	CLAUSE	SURGICAL	REMARKS
Equipment Classification	14.2 a 2)	Class I Minor (treatment)	
Sterile Handle		Yes	see Note 1
Central Illuminance (Ec)	50.102.1.1 a	50,140 lux	40 K lux to 160 K lux
Light Field Diameter (d10)	50.102.1.1 b	276 mm	No Limits
<u>Light Distribution:</u>	50.102.1.1 b		
Light Field dist. (d50)		139 mm	>50 % of d10
Depth of Illumination		226 cm	L1 + L2; 20% from 1 m
Shadow Dilution % of Ec with pair of masks % of Ec with single mask % of Ec with tube and 2 masks % of Ec with tube and 1 mask % of Ec with tube and no mask	50.102.1.1 c	Yes 91 % 0.06 % 91 % 0.01 % 99 %	see Note 2
Color Temperature	50.102.2.1	3675 ° K	3000 ° K to 6700 ° K
Color Rendering Index (CRI)	50.102.2.1	96	85 to 100
Total Irradiance (Ee) @ 1 m	50.102.3.1	116 watts / m ²	< 1000 watts / m ²
EMC		No susceptibility nor interference	see Note 3

Note 1: Sterilization of the fixed handle is accomplished as follows:

Clean with a damp cloth using a 70 % isopropyl alcohol (be sure to cover all surfaces of the handle) and then wipe clean with a dry clean cloth. This procedure will be used after each use of the luminaire. The head light body will also be sterilized at the end of the daily use of the luminaire.

Note 2: Shadow Dilution The IsoLED XII surgical lamp is a single luminaire with 12 LED light sources, it produces a well defined and homogeneous light spot that when combined with its mobility and maneuverability with 5 degrees of freedom (2 translational and 3 rotational) will allow for shadowless operation for minor surgical procedures.

Note 3: The power supply used in the unit is a medical grade unit with EMC certification. The additional circuitry of the unit does not contain any significant RF sources; additionally the unit is completely shielded from the outside world by its metal construction.

8. Introduction

The IsoLED XII is an exam plus minor surgery and procedure lamp using the latest state-of-the-art LED lighting technology, providing the highest illumination at 1 meter of the industry (55,000 lux typical). Its CRI of 95 rating produces a very high color rendition for accurate diagnosis; and the life of the LEDs used is kept high by limiting their junction temperature to less than 55 ° C for a better than 50,000 hours of operation; while its meager power consumption of 38 watts provides for very efficient and eco-friendly lamp.

Furthermore, the use of sharp cutoff optics allows for a well defined spot with a very small “Halo” effect and good depth of field.

The IsoLED XII lamp has been designed taking into account all of the different disciplines that makes up for true latest-state-of-the-art LED technologies:

Efficiency

The AC to DC power supply has an efficiency of 91 % and at 40 watts is one of the smallest available (2” x 3”). The LED driver board uses a buck – p channel design for an efficiency of 91.5 % to produce the 0.72 A drive for the 12 LEDs, the 0.83 watts for the fan and the 5 VDC for the logic circuitry, for an overall electrical efficiency of 0.82 %.

Power Grid Interface and Energy Star Compliance

Its Power Factor Correction (PFC) of >95 %, its Input current Harmonics of < 20 % and the 66 Lumens / watts ratings of its luminaires (LEDs) provides additional increase in overall efficiency, surpassing the guidelines of the Energy Star Specifications.

Color Rendition Index

Typical CRI of 95 yields excellent color rendition.

Illumination

The LED optical efficiency plus the optical efficacy of the secondary optics used, provides > 50,000 lux (candela) at 1 meter from source, for a Figure of Merit of **1496 lux/watt**

Thermal

The thermal design has been designed around keeping the Junction temperature of the LEDs lower than 55 ° C (for a 27 ° C ambient). This ensures the long life of 50,000 hours (70% of max.) and the minimum decrease of the lamp’s illuminance vs. time. The fan and heat sink are positioned for maximum cooling of the MCPCB, additionally the fan’s voltage was reduced from 12 VDC to 9 VDC to reduce its noise (< 26 dBA).

9. Functional Description

The unit's functional diagram is depicted in Figure 2.1

All of the electronics and optics are housed in the head; the head enclosure is an Aluminum cylinder 5" in diameter by 7.625" long containing four sub-assemblies: the power supply, the LED Driver board, the Control board and the Light Engine.

The unit's three controls are located at the round panel at the back end of the head. (see figure 2.X). The three membrane switches are momentary SPST switches with a common ground.

The 2" x 3" AC to DC power supply board is a vendor's item with the following safety approvals: EN60601-1, UL60601-1, IEC60601-1, EN60950-1, UL60950 and IEC60950-1 (see attached specifications, Figures 2.2 and 2.3); it provides 30 VDC to supply the rest of the electronics. The AC to DC power supply is grounded internally to the Lamp's Head Aluminum enclosure; the same ground point is used to connect the 3rd (earth) conductor to the chassis.

The 2" x 3.5" LED Driver Board provides the 0.72 A to drive the IsoLED XII 12 LEDs and the 9 VDC needed to drive the unit's cooling fan (for lower audible noise). It also generates the 5 VDC for the logic circuitry of the Control Bd.

The 2" x 3.5" Control board provides all of the control signals needed by the system and the interface between the membrane switch assembly and it. The dimming DC signal used by the 3A LED Driver is also provided by this sub-assembly.

The Light Engine contains the unit's 12 LEDs and optics, mounted on a MCPCB, plus a 10 K thermistor to measure the junction temperature of the LEDs. It also has the heat sink together with the cooling fan to dissipate the heat produced by the LEDs and additional unit's circuitry.

The mobile stand has a 3-male-pins AC receptacle that accepts a 3 – 18 AWG, 8 ft. power cord. Additionally, the stand has a 3-conductor rotary joint to allow for 3 dimensional movements of the head.

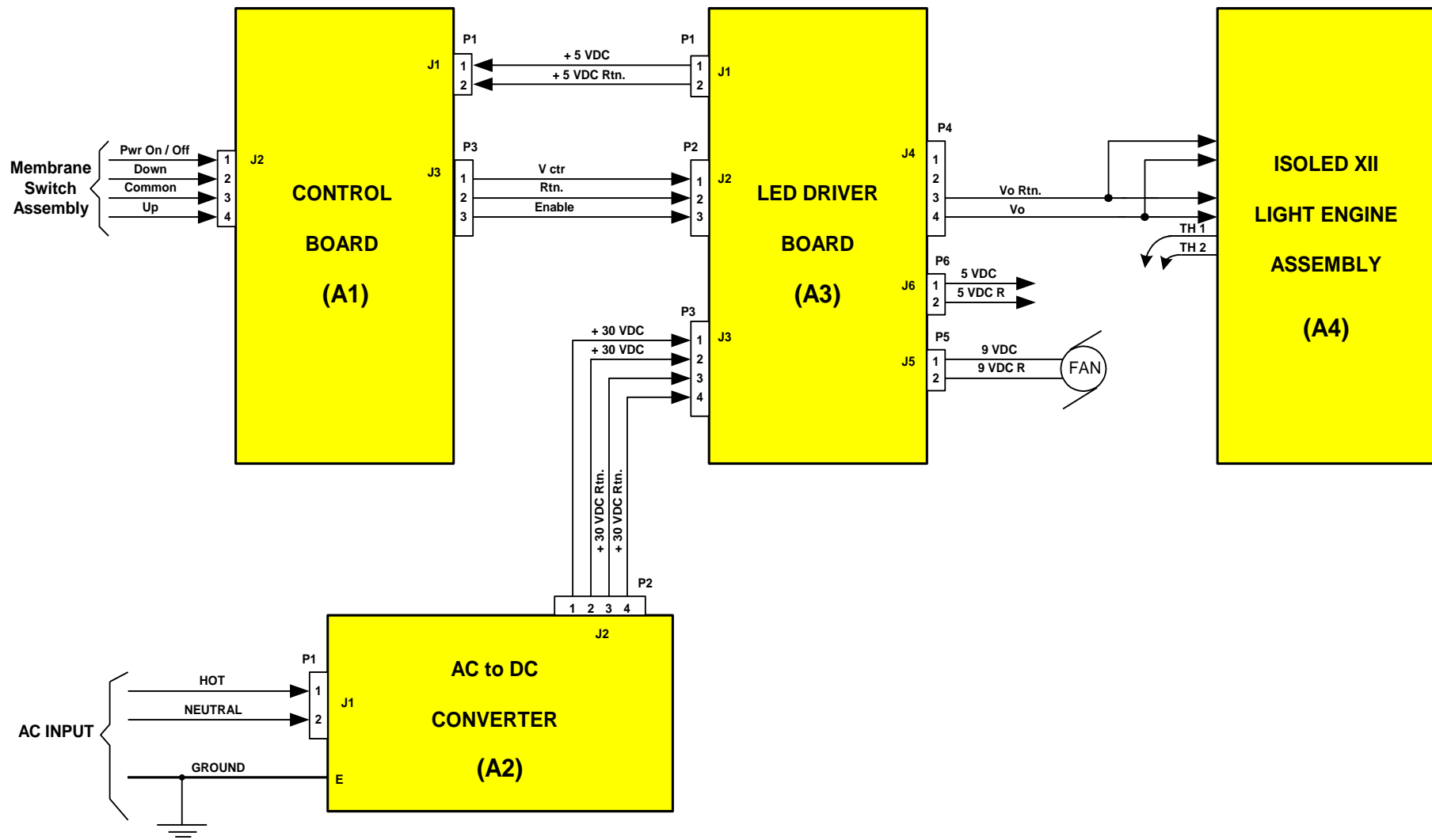
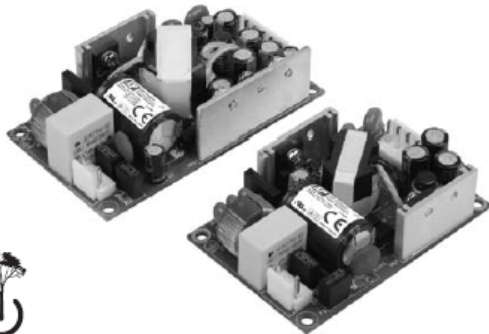


Figure 2.1 IsoLED XII INTERCONNECT DIAGRAM

ECP Series



GREEN•POWER

- Low Profile Design
- Ultra Compact Size from 3" x 2" x 0.9"
- IT & Medical Approvals
- Single, Dual and Triple Output
- <0.3 W No Load Input Power
- Peak Load Capability
- 3 Year Warranty

Specification

Input

Input Voltage	• 85-264 VAC
Input Frequency	• 47-63 Hz
Input Current	• 0.85 A max at 115 VAC
Inrush Current	• 65 A max at 230 VAC
Power Factor	• EN61000-3-2, Class A
No Load Input Power	• <0.3 W
Earth Leakage Current	• <250 μ A at 264 VAC, 60 Hz
Input Protection	• Internal T2 A/250 V fuse in line and neutral

Output

Output Voltage	• See table
Initial Set Accuracy	• Single output: \pm 1% at 60% load, Multiple output: \pm 1% on V1, \pm 5% on V2 & V3 at 60% load
Minimum Load	• 10% minimum load required on V1 & V2 of multi output versions
Start Up Delay	• 1.3 s max
Start Up Rise Time	• 15 ms typical
Hold Up Time	• 10 ms min at full load at 115 VAC
Line Regulation	• \pm 0.5% max
Load Regulation	• V1 & V3: \pm 2%, V2: \pm 4% (see note 3)
Cross Regulation	• V2: 5%, 10-100% load change on V1
Transient Response	• 4% max deviation, recovering to less than 1% within 500 μ s for 50% step load change at 1 A/ μ s
Ripple & Noise	• 1% pk-pk, measured with 20 MHz bandwidth
Overvoltage Protection	• 110-140% of nominal output voltage on V1 only, recycle input to reset
Overload Protection	• Single output: 140-160% of nominal power Multiple output: 120-150% of nominal power on V1 and V2 only

General

Efficiency	• 91 %
Isolation	• 4000 VAC Input to Output 1500 VAC Input to Ground 500 VAC Output to Ground
Switching Frequency	• 40-130 kHz variable
MTBF	• >400 kHrs to MIL-HDBK-217F at 25 °C, GB

Environmental

Operating Temperature	• -10 °C to +70 °C, derate from 100% load at 50 °C to 50% load at 70 °C
Cooling	• Natural convection
Operating Humidity	• 5% to 95% RH, non condensing
Storage Temperature	• -40 °C to +85 °C
Shock	• 30 g pk, half sine, 6 axes
Vibration	• 2 g rms, 5 Hz to 500 Hz, 3 axes

EMC & Safety

Emissions	• EN55022, level B conducted & radiated
Harmonic Currents	• EN61000-3-2, class A
Voltage Flicker	• EN61000-3-3
ESD Immunity	• EN61000-4-2, \pm 4 kV indirect contact, Perf Criteria A
Radiated Immunity	• EN61000-4-3, level 2, Perf Criteria A
EFT / Burst	• EN61000-4-4, level 3 Perf Criteria A
Surge	• EN61000-4-5, installation class 3, Perf Criteria A
Conducted Immunity	• EN61000-4-6, level 3, Perf Criteria A
Dips & Interruptions	• EN61000-4-11, 30% 10 ms, 60% 100 ms, 100% 5000 ms, Perf Criteria A, B, B
Safety Approvals	• EN60950-1, cUL60950, IEC60950-1, EN60601-1, cUL60601-1, IEC60601-1

Figure 2.2 40 watts AC to DC Power Supply Specifications

Medical Approved Models (UL60601):

Model No. (ITE Models)*	Output Rail	Load			Initial Accuracy*	Ripple & Noise*	Efficiency
		Min	Rated	Peak*			
SNP-G047-M	+12V	0A	3.33A	4.70A	+11.9V~+12.1V	100mVpp	84%
SNP-G048-M	+15V	0A	2.66A	3.80A	+14.8V~+15.2V	100mVpp	84%
SNP-G045-M	+18V	0A	2.22A	3.20A	+17.8V~+18.2V	100mVpp	84%
SNP-G049-M	+24V	0A	1.66A	2.40A	+23.7V~+24.3V	150mVpp	85%
SNP-G04G-M	+28V	0A	1.42A	2.00A	+27.7V~+28.3V	150mVpp	86%
SNP-G04J-M	+36V	0A	1.11A	1.60A	+35.8V~+36.2V	150mVpp	86%
SNP-G04T-M	+48V	0A	0.83A	1.16A	+47.5V~+48.5V	150mVpp	86%

— Input & Output —		— EMC —	
Input voltage range	90VAC to 264VAC	Emission	FCC / CISPR, level B
Label voltage	100VAC to 240VAC	Harmonic currents	EN61000-3-2, class A
Nominal line voltage	115VAC / 230VAC	Voltage flicker	EN61000-3-3
Input frequency range	47Hz to 63Hz	ESD	EN61000-4-2, criterion A
Inrush current*	<30A at 115VAC, <60A at 230VAC		6kV contact, 8kV air discharge
Line regulation	<±0.5%	Radiated immunity	EN61000-4-3 10V/M with 80% AM, criterion A
Load regulation	<±1%	EFT/Burst	EN61000-4-4, 2kV, criterion A
Hold-up time	>18ms typ.	Surge	EN61000-4-5, 1kV L-L, criterion A
No Load input power	<0.3W	Conducted immunity	EN61000-4-6, 10V with 80% AM, criterion A
		MS	EN61000-4-8, 10A/m, criterion A
		Voltage dips	EN61000-4-11
			30% dips 10ms, criterion A
			60% dips 100ms, criterion C
			95% dips 5000ms, criterion C
— Protection —		— Safety —	
Over Voltage*	Latch-off	Approvals	60950-1, 2 nd edition (TUV, UL, CSA)
Over Load / Short	Auto-recovery		60601-1, 3 rd edition (TUV, UL, CSA)
			CB Report, CE Mark, RM report/file
— Environmental —			
Operating temperature	-20°C to +70°C		
Cooling	Convection cooling		
Power derating	Refer to Power Derating Curve		
Storage temperature	-40°C to +85°C		
Relative humidity	5% to 90% RH, non-condensing		
Operating altitude	0 to 3000m		
MTBF*	>0.45Mhr		

Figure 2.3 Alternative 40 watts Power Supply Specifications

10. Theory of Operation

The membrane switch assembly controls the complete unit. It consists of three momentary SPST switches: The Power ON switch, the down switch and the up switch; their outputs go to the Control Board to be conditioned and processed. By depressing once the power ON switch (momentary connection to ground), the signal goes to a delay circuit comprised of one-shot U12 and set – reset flip flop U11. The resulting signal (LED Driver Enable) is sent to the LED Driver Board to turn on various DC voltages on the board.

The Control Board takes the output of the two remaining membrane switches (down and up) and converts the duration that they are pressed into a digital value produced by an 8 bit up/down counter comprised of U1 and U2, the counter drives an 8 bit D/A converter (U7) whose output, after being conditioned by U13a, feeds the Led Driver Board as the V control signal which controls the light intensity of the system; this set intensity value is stored in memory while unit is operating, eliminating any set ability drift.

The LED Driver Board provides the + 5 VDC needed by the Control Board, and when the Enable signal is high, it turns on the switched + 9 VDC for the fan and the constant current (0.72 A) drive to the 12 LEDs on the Light Engine. It also takes the 0 to 1.25 volts Control signal to provide the dimming of the 12 LEDs (1.25 VDC equal maximum intensity).

The AC to DC power supply takes the universal AC input power and converts it to 30 VDC to supply the LED Driver Board to generate all of the dc voltages required by the system.

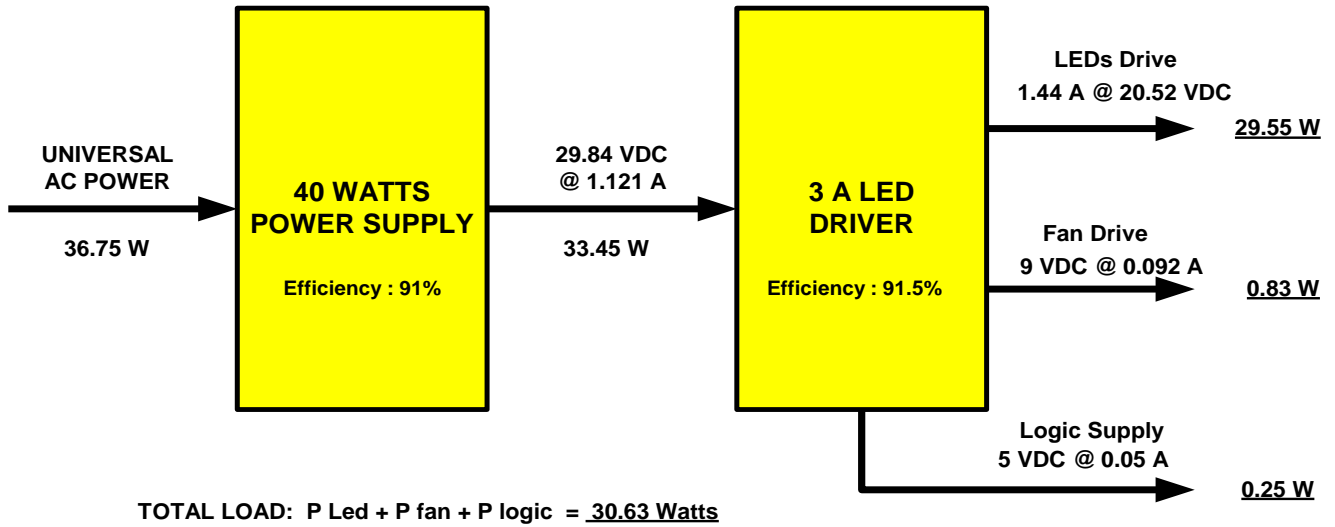
11. Isolux XII Performance

The unit's performance is depicted in Figure 4.1: IsoLED XII Specifications and Figure 4.2: Efficiency Calculations.

Figure 4.1 ISOLED XII SPECIFICATIONS

Typical Optical Power @ 0.5 meters	> 110,000 lux
Typical Optical Power @ 1 meter	> 50,000 lux
Spot Size	13 cm
Color temperature	4000 ° K Typical
CRI (Color Rendition Index)	95 typical
LED Life	> 50,000 hours
Power Consumption	32 watts
Dimming Range	3 to 100 %
Audible Noise	< 26 dBA
Safety Standards	CAN/CSA C22.2 No. 601.1-M90, UL60601-1, IEC 60601-2-41
Energy Star	The unit's design complies and surpasses Energy Star requirements.
Operating Temperature Range	- 10 ° C to + 50 °
Storage Temperature Range	- 10 ° C to + 70 °
Operating Humidity	10 to 90 % RH, non-condensing
Head Rotation	Vertical ± 40°, Horizontal 345°, Head 360°
AC Input Voltage Range	Universal: 100 to 240 VAC
Input Frequency	47 to 63 Hz.
Head Assembly Dimensions	5" diameter by 7.625" long
Head Assembly Weight	4.28 pounds

Figure 4.2 Efficiency Calculations



The total electrical efficiency is = $0.9 \times 0.91 = \underline{\underline{0.82\%}}$

The typical illumination at 1 meter was measured at 55,000 lux

The overall efficiency of the system is equal to: $55,000 \text{ lux} / 36.75 \text{ watts} = \underline{\underline{1496 \text{ lux / watt}}}$

12. Mechanical Specifications and Options

The general mechanical specifications for the Ondal's Acrobat Swing arm are shown in Figure 5.1 and the three mounting options are depicted in Figure 5.2.

The complete Head assembly and its components (sub-assemblies) are depicted in Figure 5.3 and the Switch assembly is depicted in Figure 5.4.

Figure 5.1 ACROBAT Swing Technical Data

Models

Ceiling mounted
Wall mounted
Mobile floor unit

Features: comfortable load adjustment

Safety factor: 4-times pay load towards the yield strength according to EN 60601

Maximum load capacity of spring-balanced arm:

3 kg - 720 mm
6 kg - 550 mm length

Electricity -

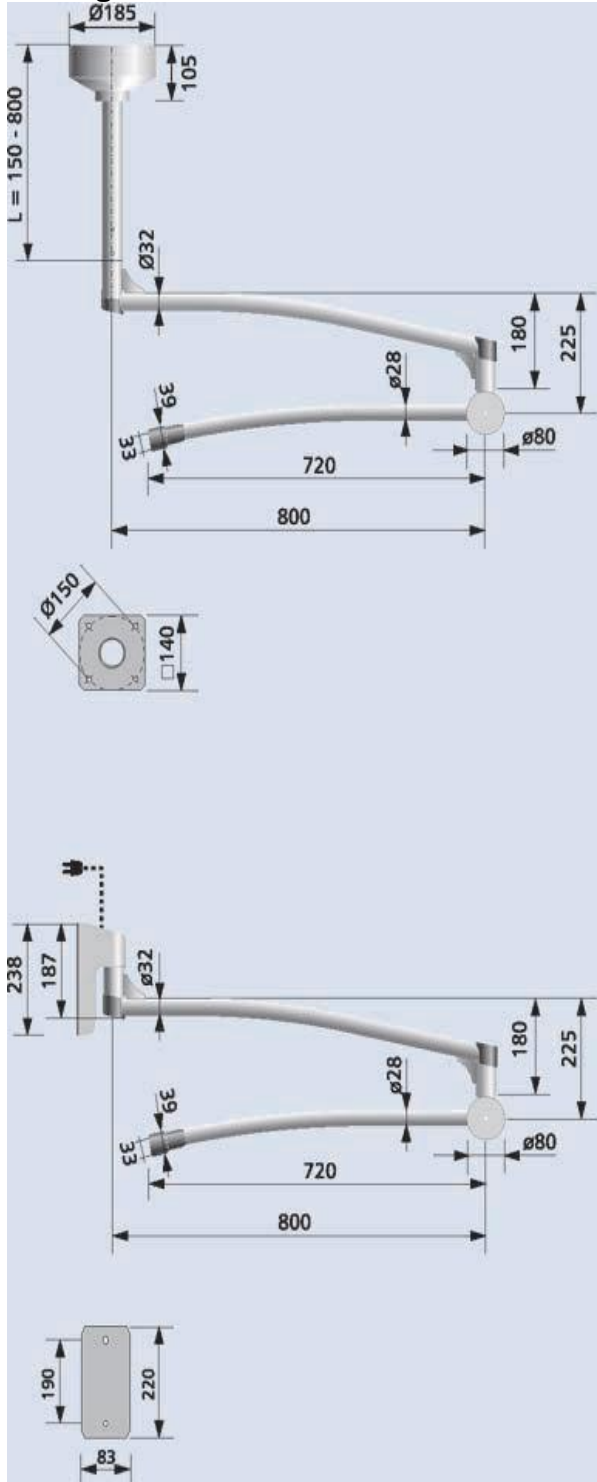
non-stop 3-pole rotating commutator:
230 V, 16 Amp., 1.5 mm²

Load ranges: 1-2, 2-3, 3-6 kg

Initiating Force at: 2N

Extension arm: 800 mm

Ceiling unit



Mobile Floor unit

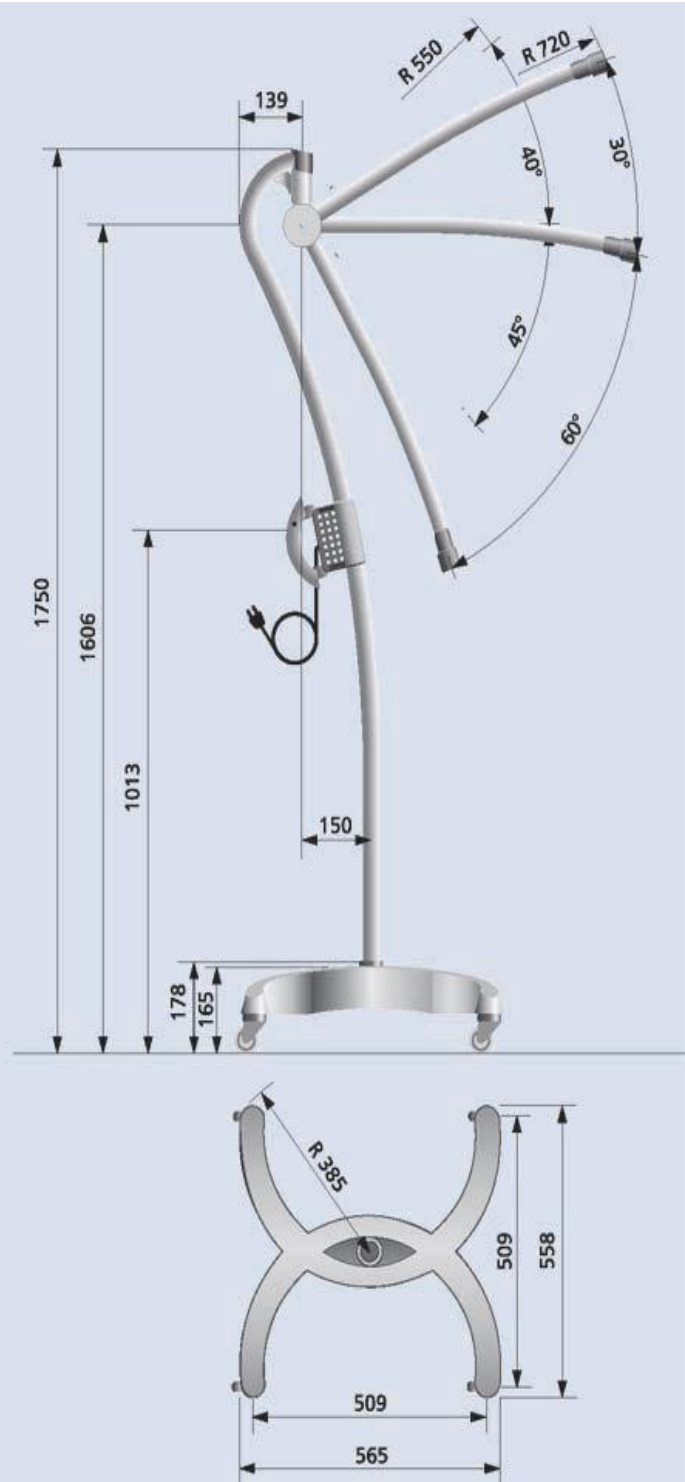


Figure 5.2 ISOLED XII Mounting Options

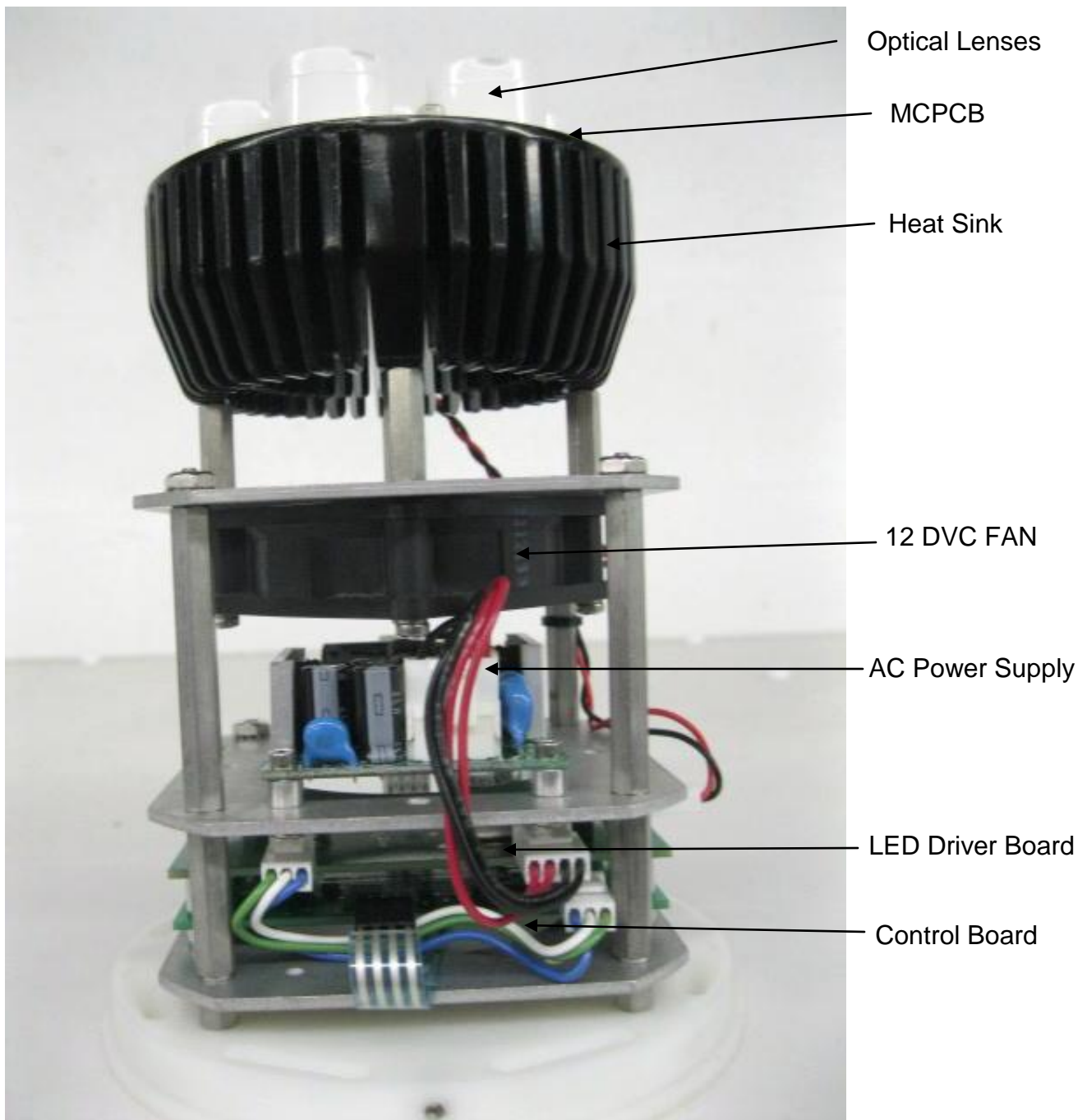


Figure 5.3 IsoLED XII LAMP ASSEMBLY, showing subassemblies

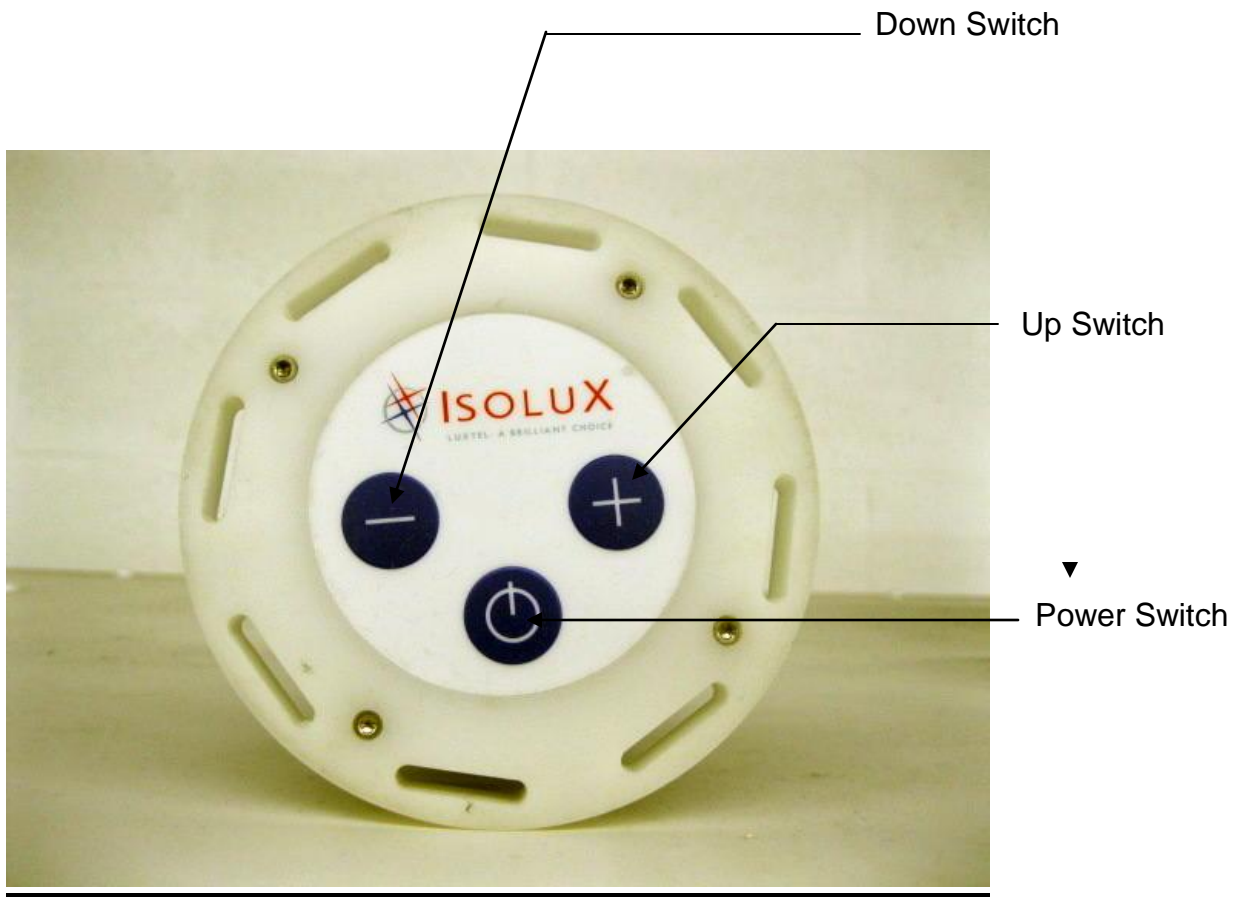
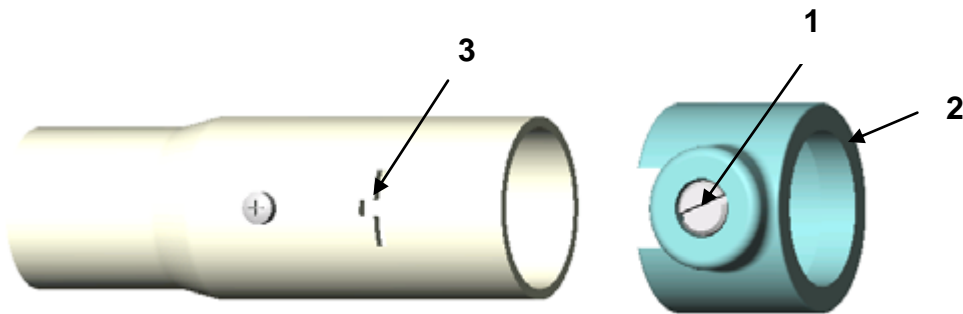


Figure 5.4 Switch Assembly and its components

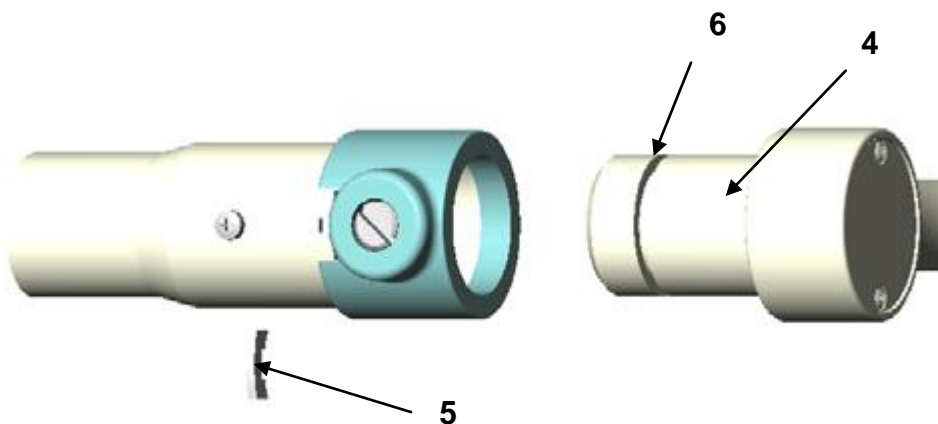
13. Head (Lamp) Installation



Attention: If the spring arm is pushed downwards (the arm is under spring tension) it may bounce up and cause harm. While mounting the lamp head no other persons are allowed to be within the swivel range of the spring arm. During removal of the lamp head from the swing arm should only be done by Isolux LLC.

Mounting the ISOLED XII Head to the spring arm

- Loosen brake screw 1, so the plastic bushing 2 can be slipped easy onto the spring arm.
- Slip plastic bushing 2 onto the spring arm to overlap slots 3.
- Check if the journal 4 of the lamp is greased.
- Insert the greased journal 4 of the lamp and insert security segment 5 completely into slot 3, so that the security segment leads in groove 6.
- Rotate plastic bushing 2 by 180° **up to the provided drilling for the brake screw** and screw in brake screw 1 until you reach the desired brake effect for lamp head 4.
- Check if lamp head 4 is firmly fixed.



14. Operating Instructions

The operation of the IsoLED XII unit is simplicity on itself:

- Turn power ON and observe that unit is set at maximum intensity, if not, depress the up switch for 7 seconds maximum to make sure unit is at its maximum illumination. Adjust the intensity to the desired setting by depressing the down switch or the up switch.
- The transition time from low light output to high is 7 seconds maximum. Once the illumination has been set it will stay at that level when the unit is cycled off – on, and will remain at that setting unless the unit is disconnected from the mains.
- The unit will go to maximum illumination after unit is connected to the mains and gets turned on.

15. Cleaning Instructions

Overall appearance

- Check the general aesthetics of the IsoLED XII Surgery Lamp. The unit should be kept clean and dust free. Clean and dust as necessary.

Optical Window

- The front lens is made from a UV resistant polycarbonate plastic that has an external hard coating to resist scratching. Clean the lens using glass/plastic cleaner or mild soap and water mix. It is very important to use a clean, soft cloth to avoid any scratching of the diffuser. Never spray the cleaning fluid directly onto the lens surface, but instead spray into clean cloth and then wipe the lens.

Do not expose the unit to excessive moisture. Failure to do so could result in personal injury and/or property damage.

Clean and Sterilize Handle

Clean with a damp cloth using a 70 % isopropyl alcohol (be sure to cover all surfaces of the handle) and then wipe clean with a dry clean cloth. This procedure will be used after each use of the luminaire. The head light body will also be sterilized at the end of the daily use of the luminaire.

After Each Procedure	Every day	Every week
Clean / Sterilize Handle	Clean / disinfect Light Head	Clean Optical Window

16. Care and Maintenance

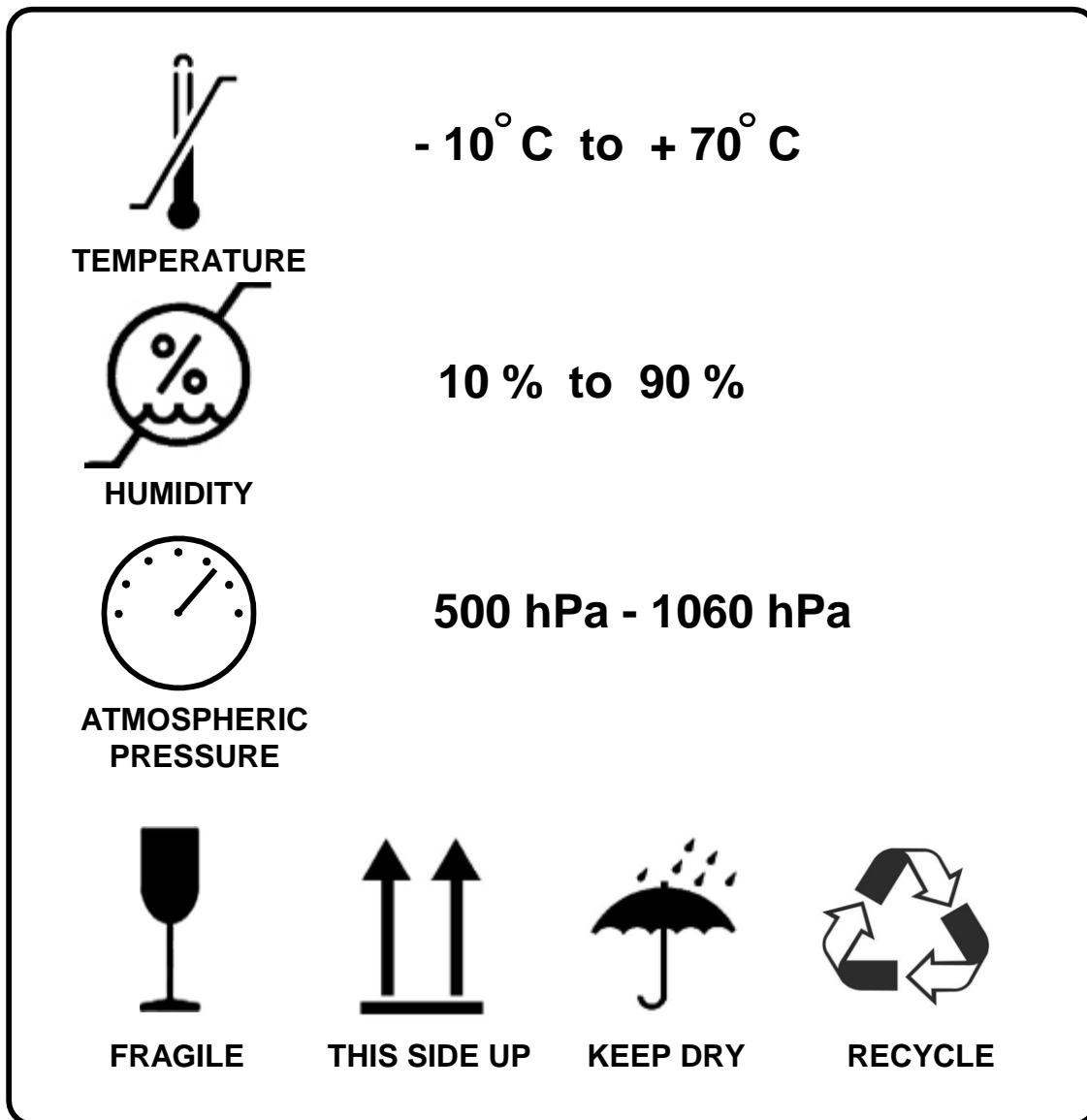
Unit does not require any special handling. The only maintenance required is to wipe the unit's window with a soft non-lint cloth and warm soapy water as required with its use (as needed). Unit should perform to over 50,000 hours with a minimum 70 % degradation of its light output. If unit fails to turn on, send back to factory for repairs.

The IsoLED XII will give you years of failure free performance and no maintenance cost except for the meager 36 watts of power consumed (around 1/3 of comparable halogen lamps), for a low cost of ownership.

17. Packing and unpacking

The Isolux LLC packing label shows three symbols depicting the environmental ranges of the unit under transportation. The additional four symbols relates to the conditions required for shipping the unit.

17.1 Transportation Label



- Material:
1. Transparent Gloss Polyester with permanent acrylic adhesive backing.
 2. Background color: White
 3. Lettering and Markings: Black.
 4. Size: 4.00" High by 3.00" Wide

17.2 Unpacking



**WHEN REMOVING PARTS FROM THE SHIPPING CARTONS, BE CAREFUL NOT TO DAMAGE THE COMPONENTS.
IMPORTANT: THOROUGHLY CHECK EACH BOX FOR PARTS THAT MAY BE LOCATED IN AREAS THAT CAN BE OVERLOOKED.**

18. TROUBLESHOOTING



ONLY FACILITY AUTHORIZED MAINTENANCE PERSONNEL SHOULD TROUBLESHOOT THE ISOLED XII SYSTEM. TROUBLESHOOTING BY UNAUTHORIZED PERSONNEL COULD RESULT IN PERSONAL INJURY AND/OR PROPERTY DAMAGE AND COULD VOID WARRANTY.

19. Disposal of Waste Products



NO WASTE PRODUCTS ARE PRODUCED BY THE ISOLUX XII SURGICAL LAMP. THE UNIT IS COMPOSED OF NON-TOXIC MATERIALS AND COULD BE DISPOSED OF IN A STANDARD WAY AT THE END OF ITS LIFE.