



# SOLA SE Light Engine<sup>®</sup>

## Instruction Manual





## **Regulatory Models**

Lumencor utilizes regulatory model names for all certified and CE marked products. The regulatory model names are traceable to all regulatory documentation, third party reports and certifications.

“**Regulatory Model: Sola**” is used as a representative model for all certified and CE marked Sola Products.

## **Emissions**

This equipment has been tested and found to comply with the limits of EMC directive 2014/30/EU. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications.

## **Safety Certifications**

TUV SUD America, CB Certification (IEC 61010-1:2010)

TUV SUD America, NRTLus Certification (UL 61010-1:2012-05)

TUV SUD America, cNRTL Certification (CAN/CSA-C22.2 No. 61010-1:2012)

TUV SUD America, EN Certification (EN 61010-1:2010)

## **CE Marking**

Low Voltage Directive (2014/35/EU)

EMC Directive (2014/30/EU)

RoHS Directive (2011/65/EU)

REACH Regulation (EC) No. (1907/2006/EC)

EU Declarations of Conformity and China RoHS hazardous substance tables can be found at <http://lumencor.com/company/regulatory-compliance/>

## **Lumencor, Inc.**

14940 NW Greenbrier Parkway  
Beaverton, OR 97006

T 503.213.4269

[www.lumencor.com](http://www.lumencor.com)

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## 1. Introduction

Lumencor's SOLA SE light engines are designed for laboratory use by bioanalytical researchers and/or developers of life science instrumentation. SOLA SE light engines generate white light output by combining the outputs of five solid state light sources. The on/off status and intensity of the white light output is electronically controlled via serial commands from a USB-connected computer workstation or a controller pod accessory (part number 83-10007). On/off status can also be controlled manually via a rocker switch located on the front panel or a foot switch accessory (part number 29-10045) that plugs into the 3.5 mm connector on the rear panel. This manual covers SOLA SE, SOLA SE 365, SOLA SE V-nIR and SOLA SE U-nIR light engine models, which are defined in the table below.

<b>SOLA SE light engines PRODUCT MATRIX</b>	<b>SOLA SE</b>	<b>SOLA SE 365</b>	<b>SOLA SE V-nIR</b>	<b>SOLA SE U-nIR</b>
Manual control	✓	✓	✓	✓
Electronic control	✓	✓	✓	✓
365 nm ultraviolet source		✓		✓
395 nm violet source	✓		✓	
735 nm near-IR source			✓	✓
4 visible sources 420–680 nm	✓	✓	✓	✓

## 2. Precautions and Warnings {Précautions et mises en garde}

A few simple practices will ensure trouble-free operation for the life of the light engine.

Les quelques règles simples suivantes permettront d'assurer un fonctionnement fiable pendant toute la durée de service de la source lumineuse.

### Safety Instructions:

Please read and follow all safety instructions provided **BEFORE** using your new SOLA SE light engine. Failure to comply with the safety instructions may result in fire, electrical shock, or personal injury and may damage or impair protection provided by equipment. Please save all safety instructions.

### Instructions de sécurité:

Veiller à lire et à respecter toutes les instructions de sécurité fournies **AVANT** d'utiliser le nouveau SOLA SE afin d'écartier les risques d'incendie, de décharge électrique, de blessure corporelle et de possibles dommages ou défaillance de la protection offerte par l'appareil. Conserver toutes les instructions de sécurité.

### Safety Definitions {Définitions relatives à la sécurité}:



**Warning:** Statements identify conditions or practices that could result in personal injury.



**Avertissement:** déclarations qui identifient des situations ou des pratiques susceptibles d'entraîner des blessures corporelles.

**Caution:** Statements identify conditions or practices that could result in damage to your equipment.

**Attention:** déclarations qui identifient des situations ou des pratiques susceptibles d'endommager le matériel.

**Safety Items {Mesures de sécurité}:**

**Warning: DO NOT use an unapproved power supply.** The Lumencor-supplied external power supply is recommended for use with the SOLA SE light engine. Alternative 24 V DC power supplies may be used provided that the current is limited to 5.0 A max. Also, it is imperative that the alternative power supply has output over-current protection, as the power input of the SOLA SE is not fused. The equipment is required to be supplied by a properly approved/certified DC power source meeting the minimum electrical ratings of the product. Connect the AC power cord to a receptacle with a protective safety (earth) ground terminal.

**Avertissement : NE PAS utiliser une alimentation électrique non homologuée.** Il est conseillé d'utiliser l'alimentation électrique externe fournie par Lumencor avec la source lumineuse SOLA SE. Il est possible d'utiliser une autre alimentation électrique continue 24 V à condition que l'intensité soit limitée à 5,0 A maximum. En outre, il est impératif qu'elle présente une protection de sortie contre les surintensités, car l'entrée d'alimentation du SOLA SE ne comporte pas de fusible. L'équipement doit être fourni par un / certifié DC réunion de source d'alimentation correctement approuvé les ratings électriques minimales du produit. Brancher le cordon électrique sur une prise de courant protégée par une borne de terre.

**Warning: DO NOT look into the output of the light engine.** The brightness of this light source is higher than most commercial lighting fixtures and is required to couple directly into a microscope or other bioanalytical instrument.

**Avertissement: NE PAS regarde directement la sortie de la source lumineuse.** L'intensité lumineuse de cette source est supérieure à celle de la majorité des appareils d'éclairage disponibles dans le commerce et est conçue pour un raccordement direct à un microscope ou autre appareil de bioanalyse.

**Warning: DO NOT turn on the light unless the output end of the light guide is safely directed into an enclosed optical path. DO NOT point the light output directly onto any flammable or burn-susceptible material. This includes all animal or vegetable tissues, plastics, fabrics, paper and liquids.**

**Avertissement: NE PAS allumer la lumière sans l'extrémité de sortie du guide de lumière dirigée en toute sécurité dans un chemin optique fermé.** NE PAS pointer la sortie de lumière directement sur un matériau susceptible d'être inflammable ou susceptible de brûler. Cela comprend tous les tissus, les plastiques, les tissus, le papier et les liquides animaux ou végétaux.

### RISK GROUP 3



**Warning:** Possibly hazardous optical radiation emitted from this product. Do not look at operating lamp. Eye injury may result.

**Warning:** Infrared (IR) emitted from this product. Do not look at operating lamp.

**Warning:** UV emitted from this product. Avoid eye and skin exposure to unshielded product.

### GROUPE DE RISQUE 3

**Avertissement:** Rayonnement optique peut-être dangereux émis par ce produit. Ne regardez pas la lampe d'exploitation. Une blessure oculaire peut entraîner.

**Avertissement:** Infrarouge (IR) émise par ce produit. Ne regardez pas la lampe d'exploitation.

**Avertissement:** UV émis par ce produit. Évitez les yeux et la peau exposition au produit non blindé.

**Caution: DO NOT open the unit.** There are no serviceable parts inside and opening the light engine enclosure will void the manufacturer's warranty.

**Attention: NE PAS ouvrir l'appareil.** Il ne contient aucune pièce réparable et l'ouverture de son boîtier a pour effet d'annuler la garantie.

**Caution: DO NOT set liquids on the light engine.** Spilled liquids may damage your light engine.

**Attention: NE PAS placer de liquide sur la source lumineuse.** Les liquides renversés peuvent endommager la source lumineuse.

**Caution: DO NOT drop the light engine.** It contains glass optical components that could be damaged or misaligned by the shock produced by a drop onto a hard surface.

**Attention: NE PAS laisser tomber la source lumineuse.** Elle contient des composants optiques en verre susceptibles d'être endommagés ou désalignés par le choc résultant d'une chute sur une surface dure.

**DISCLAIMER: Lumencor shall not be liable for injury to the user or damage to the product resulting from the SOLA SE light engine being used in a way for which it was not intended and in complete disregard for all posted safety precautions and warnings.**

**AVIS DE NON-RESPONSABILITÉ: Lumencor décline toute responsabilité pour les blessures corporelles ou les dommages au produit résultant d'une utilisation du SOLA SE autre que celle prévue et du mépris total de toutes les mesures de sécurité et mises en garde affichées.**

### 3. Operating Instructions

#### 3.1 Contents

The SOLA SE light engine ships with the following list of standard components:

1. SOLA SE light engine configured with an output adapter for coupling to a 3 mm diameter liquid light guide.
2. A 24 V /5 A DC power supply (Lumencor part number 27-10001).
3. A region-specific 6 ft AC power cord for the power supply (see adjacent table).
4. A 6 ft USB A (M) to USB (B) M cable (29-10058) for serial connection to a light engine control pod or host computer.

AC Power Cords

Region	Part Number
North America	29-10002
Europe	29-10005
United Kingdom	29-10004
Israel	29-10008
Australia/New Zealand	29-10024

The model name and unique 4- or 5- digit serial number of the light engine are marked on a label affixed to the back panel (Figure 1). SOLA SE 365 and SOLA SE U-nIR light engines are identified by a **UV** marking on the rear panel (Figure 1). Performance specifications for individual light engines are listed on the certificate of conformance included with the shipping documents e-mailed to the customer. It is important to retain the certificate of conformance for reference. In the event that the light engine is sold or transferred, the certificate of conformance should be conveyed to the new owner.

#### 3.2 Installation

When setting up the SOLA SE light engine for use, be sure to place the unit on a hard surface and avoid blocking or restricting airflow at the air intake (front panel) and exhaust port (rear panel, Figure 1). Restricting the airflow will cause the unit to operate at elevated temperatures and will result in decreased product life and/or premature failure.

Position the unit in an orientation that allows unrestricted access to the DC power connector at the back of the light engine. In an emergency, you may need to disconnect power to the unit quickly. The rocker switch in the top left corner of the rear panel controls electrical power to the unit. A green LED above the switch indicates that power to the light engine is ON. Refer to Figure 1 for the rear panel locations of the input DC power connection, the foot pedal connection and the master electrical power switch. Note that the foot pedal is an on/off toggle switch. Its on/off status cannot be determined from its position. Before connecting the foot pedal, make sure the electrical power switch (Figure 1) is in the OFF position to avoid unintentional initiation of light output. After connecting the foot pedal, and with the light guide output safely directed into an enclosed optical path (e.g. microscope input collimator or a beam dump), turn the power switch ON to begin operation.



**Figure 1.** Model and serial number identification label on the SOLA SE 365 light engine rear panel.



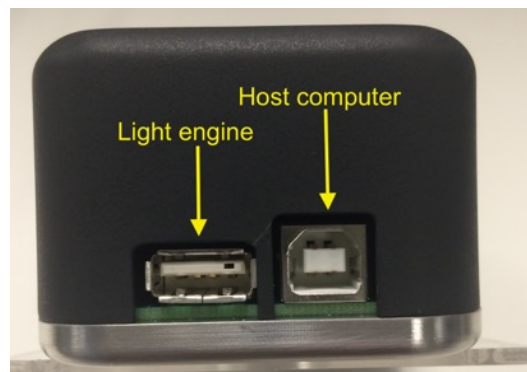
The SOLA SE light engine has a safety interlock for the light guide that prevents light output unless a liquid light guide is fully inserted into the light guide port. Before operating the unit, make sure the 3 mm diameter liquid light guide is properly installed in the light guide port (Figure 2). The set screw should be loosened using a 2 mm hex wrench so the light guide slides all the way into the receptacle without obstruction. Once the light guide is fully inserted, lightly tighten the set screw to hold it in place and prevent inadvertent disconnection. Prior to turning the light on, be sure the output end of the light guide is safely directed into an enclosed optical path (e.g. microscope input collimator or a beam dump). **Do not bend the light guide beyond its specified minimum bending radius (40 mm or 1.6 inches).** Extreme bending of the light guide may cause permanent deformation, resulting in decreased light transmission. In the event that the light guide is retracted from the output port during operation, light output will cease immediately. To restart light output: 1) turn the electrical power switch (Figure 1) **off**, 2) fully insert and secure the light guide in the output port (Figure 2), 3) turn the electrical power switch back **on**, and then 4) activate light output using the front panel rocker switch, foot pedal or serial control device (control pod or computer workstation). **Take necessary precautions to protect yourself and others from the high intensity light when turning on the unit.**



**Figure 2.** 3 mm diameter liquid light guide inserted in front panel light output port.

### 3.3 Operation Using Light Engine Control Pod

1. Connect the USB A port of the light engine control pod accessory (Figure 3) to the USB B port on the SOLA SE (“external”. Figure 1) using the USB A-to-USB B cable (29-10058) [1]. For pass-through control from a computer workstation, connect the USB B port of the control pod to a USB A port on the host computer.
2. The manual light output switch above the light output port on the front panel of the SOLA SE should be in the off (o) position. This is necessary to avoid manual override of serial on/off commands from the pod.
3. Press and hold the **right** button on the pod until a menu of light engines appears. Turn the rotary dial to select “SOLA SE” from the menu. Press the **right** button again to return to the main (0–100 analog intensity) display screen.
4. Before turning the light output on, be sure the output end of the light guide is safely directed into an enclosed optical path (e.g. microscope input collimator or a beam dump).
5. Press the **right** button to turn the light output on. An amber indicator LED above the manual light output switch on the SOLA SE front panel indicates active light output. Adjust the output intensity using the rotary dial [3,4]. Press the **right** button again to turn the light output off [2].



**Figure 3.** USB connectors on the rear of the light engine control pod.





6. Press and hold the **left** button to view a digital rendition of the intensity setting [5]. Press the **right** button to return to the main display screen.
7. Serial commands sent from a host computer to the USB B port of the control pod will automatically switch the pod from local to pass-through mode, indicated by the message “PC pass through mode active” shown on the pod display screen. Local command mode is disabled as long as pass-through mode remains active.
8. To quit pass-through mode and return to local command mode, press the **right** button on the pod twice.
9. Further details of control pod operation are provided in a [downloadable instruction sheet](#).

#### Notes

- [1] This connection supplies electrical power to the pod from the SOLA SE. The pod will turn on when the connection is made.
- [2] There is no warm-up time; the light engine output stabilizes less than 1 second after the light output is switched on. Light output can be switched off during intervals when it is not required for active viewing or data collection. After light output is switched off, the cooling fan will continue to run for 5 minutes, after which it will automatically stop until light output is turned back on.
- [3] Output intensity can be set from 0–100% in 1% increments; however operation in the 0–5% range is not recommended.
- [4] Dialing intensity to zero automatically issues an OFF command to the light engine. Press the **right** button to turn the light output on again.
- [5] The current intensity settings are internally stored. When the pod is powered down, the settings are retained and will be restored at the next restart.

### 3.4 Operation Using Computer Workstation

1. Although the following instructions specify Lumencor’s SOLA GUI, operations using third-party image acquisition control software providing co-ordinated operation of the light engine with cameras and other peripherals are generally similar.
2. Operation and installation of the SOLA GUI requires a computer running the Windows operating system with a free USB port.
3. Download the zip file for the SOLA GUI INSTALLER from <http://lumencor.com/resources/documentation-software/>.
4. Unzip the file and run setup.exe to install the SOLA GUI.
5. Connect the USB A-to-USB B cable between the computer and the USB B B (external) port on the SOLA (Figure 1).
6. Successful installation is indicated by the appearance of “USB Serial Port (COM #)” under the “Ports (COM & LPT)” tab in the Windows Device Manager. If the virtual COM port (VCP) is not registered by the operating system, download and install the VCP driver from <http://lumencor.com/resources/documentation-software/>.
7. Connect the DC power supply to the SOLA.
8. Check that the liquid light guide is fully inserted and locked in the front panel receptacle (Figure 2) and that the output end is safely directed into an enclosed optical path (e.g. microscope input collimator or a beam dump).
9. Toggle the power switch on the rear panel to the ON position. The green LED above the switch (Figure 1) should light.



10. The manual light output switch above the light output port on the front panel of the SOLA SE should be in the off (o) position. This is necessary to avoid manual override of serial on/off commands from the computer.
11. Run the GUI by going to the Program Menu and selecting LLE SOLA SE-2 Controller.
12. In the COM pulldown menu (GUI window, upper left), select COM # assigned to USB-Serial port.
13. Press the "INIT" button in the GUI
14. The computer should now have control of the SOLA. In the GUI window, the ON-OFF button below the intensity slider turns light output on or off. An amber indicator LED above the manual light output switch on the SOLA SE front panel indicates active light output. The graduated slider in the GUI window controls the source output intensity [1,2].
15. There is no warm-up time; the light engine output stabilizes less than 1 second after the light output is switched on. Light output can be switched off during intervals when it is not required for active viewing or data collection. After light output is switched off, the cooling fan will continue to run for 5 minutes, after which it will automatically stop until light output is turned back on.

#### Notes

[1] Output intensity can be set from 0–255; however operation in the range 0–13 (0–5%) is not recommended.

[2] Setting the intensity slider to zero is **not** functionally equivalent to turning light output off using the ON-OFF button. In this condition, the fan will continue to run as the light sources are still energized, even though their output may not be detectable.

### 3.5 Using the Electronic Shutter Function

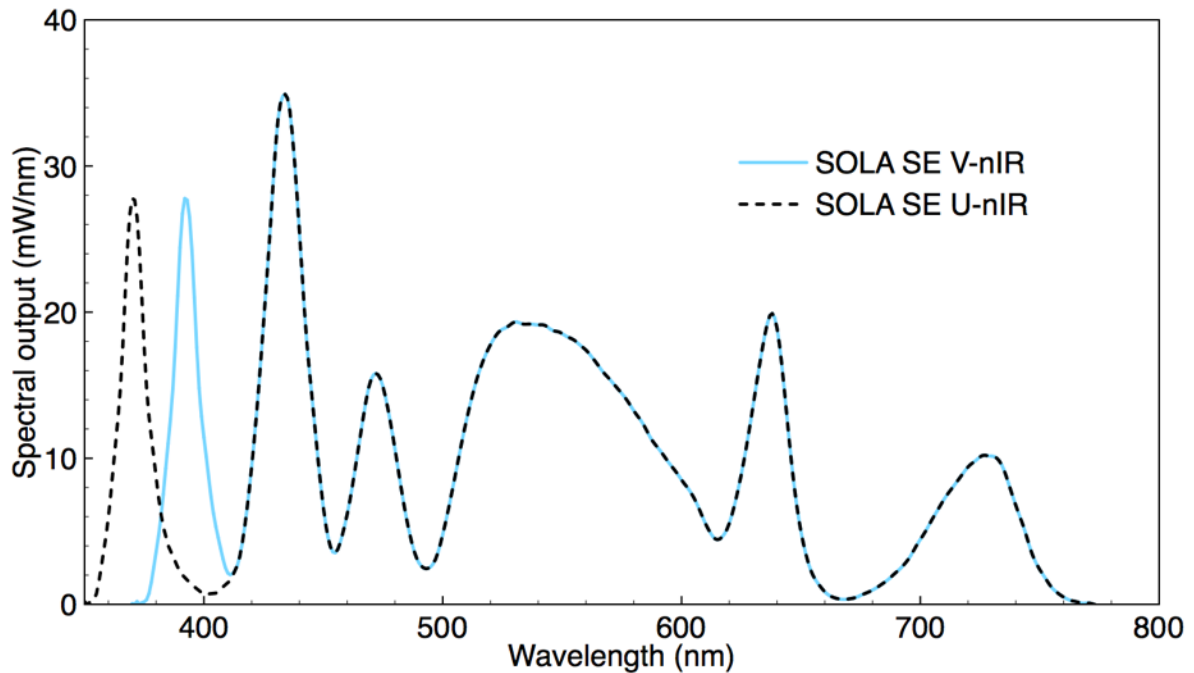
The SOLA SE light engine output can be selectively enabled and disabled using TTL levels applied to the BNC connector marked "shutter in" on the rear panel (Figure 1). A  $> 3.3$  V "high" signal applied to the BNC connector will enable white light output, while a  $< 1.5$  V signal will disable it. The SOLA SE light engine can support an on/off switching rate up to approximately 1 kHz. Note that DC control levels applied to the shutter in connector are **not** TTL source triggers. Light output must first be turned on using the front panel light output switch, foot pedal or a serial control device (control pod or computer workstation; Sections 3.3, 3.4). The output intensity remains under the control of the serial device.

### 3.6 Manual/Foot Pedal Operation

The SOLA SE light output can be turned on or off using the manual light output switch on the front panel or using the foot pedal toggle switch accessory (part number 29-10045). Do not intermix the operation of these switches or light output on/off commands from serial control devices (control pod or computer workstation).

## 4. Spectral Output

Typical output spectral distributions of SE V-nIR and SOLA SE U-nIR light engines are shown below (Figure 4).



**Figure 4.** SOLA SE V-nIR and SOLA SE U-nIR light engine spectral output distributions.

## 5. Product Specifications

SOLA SE light engines must be operated and stored within the environmental conditions specified in the table on page 11. Performance specifications for individual light engines are listed on the certificate of conformance included with the shipping documents e-mailed to the customer. It is important to retain the certificate of conformance for reference. In the event that the light engine is sold or transferred, the certificate of conformance should be conveyed to the new owner. Certificates of conformance are also recorded in Lumencor's database and copies can be requested by e-mail to [techsupport@lumencor.com](mailto:techsupport@lumencor.com). The request message must include the 4- or 5- digit serial number of the light engine.

Specification	Detail
<b>Temperature</b>	
Operating	32 to 95° F (0 to 35° C)
Non-operating	-4 to 158° F (-20 to 70° C)
<b>Humidity</b>	
Operating and non-operating	0 to 80% relative humidity, non-condensing
<b>Altitude</b>	
Operating	0 to 10,000 feet (3,048 meters)
Non-operating	0 to 45,000 feet (13,176 meters)
<b>Dimensions (WxLxH)</b>	12.5 cm x 26.3 cm x 16.3 cm (4.90 in x 10.4 in x 6.40 in)
<b>Weight</b>	8.0 lb / 3.6 kg
<b>Input Power Requirements</b>	24 V DC / 5.0 A, 120 W maximum, power supply included
Power consumption	90 W (light output on at 100%); 3 W (light output off, fan on)
Warm-up Period	1 s
Electronic Shutter	On/Off rate up to 1 kHz
Protection	IP Rating of X0
Sound Level	Sound Level at 1 m < 10 db(A)
Connections	3.5 mm foot switch (optional accessory), USB B for serial connection to controller pod or host computer, two BNC connections for (1) TTL electronic shutter input and (2) 3.3V DC /25 mA power output.
Warranty	36 months parts and labor

## 6. Routine Maintenance and Troubleshooting

No routine maintenance is required. There are no user-replaceable components or sub-assemblies in the SOLA SE light engine. Opening the light engine enclosure will void the manufacturer's warranty. In the event that the light engine fails to perform in accordance with the specifications listed on the certificate of conformance, review the troubleshooting procedures on page 12. If the problem remains unresolved, please contact Lumencor Technical Support for assistance, as directed in Section 7.

SOLA SE Light Engine Troubleshooting	
Problem	Check the following
Green power indicator does not light up when the master power switch is in the ON position	Check that the liquid light guide is fully inserted in the front panel receptacle and is secured by the set screw.
Light engine does not respond to light on/off commands from the control pod or PC	Check that the manual light output switch on the front panel is in the OFF position.
Unusually weak fluorescence signals across all detection channels	Weak fluorescence in all detection channels (DAPI, FITC, TRITC, Cy5 etc) is likely to be due to poor light transmission by the liquid light guide, the collimating adaptor or another distal component of the microscope optical path and not to abnormally low light output from the SOLA SE light engine.
Unusually weak fluorescence signals in a single detection channel (e.g. DAPI)	Check that the filter cube in the microscope is compatible with the output spectrum of the SOLA SE model that you are using. If no filter compatibility problem is found, then contact Lumencor Technical Support as directed in Section 7.

## 7. Customer Support

For technical support of SOLA SE light engines, please contact Lumencor by phone at 503.213.4269 or via e-mail at [techsupport@lumencor.com](mailto:techsupport@lumencor.com). Please be prepared to provide the 4- or 5-digit serial number of the light engine (see Figure 1), a description of the problems encountered and information on the usage context (e.g. what microscope and what control software is being used). This information will help to determine whether the problems can be resolved in situ by adjustments to the system configuration, or whether a fault has developed in the light engine that requires its return to Lumencor's facility in Beaverton, Oregon for evaluation and, if necessary, repair. Any light engine return to Lumencor for service or repair requires a material authorization (RMA) number. To obtain a RMA number, submit the online request form at <http://lumencor.com/support/lumencor-rma-request-form>. It is the customer's responsibility to properly package and safely ship products to Lumencor. Instructions for shipping will be provided in the e-mail giving notification of the RMA number.

## 8. Warranty

SOLA SE light engines come with a 36 month warranty, starting on the original date of shipment from Lumencor. Light Engines qualifying for warranty service must be verifiably delivering performance that is substantially at variance with the levels documented in the certificate of conformance. The light engine must also have been used and maintained under operating conditions consistent with the specifications given in Section 5, and observing all the Precautions and Warnings notified in Section 2. This warranty does not extend to light engines that have been subject to misuse, accident, tampering or improper installation. Accessories including (but not limited to) liquid light guides, optical fibers, collimators, cables and control consoles are not covered by the warranties attached to light engines. Please fill out and submit the [online warranty registration form](#). This will facilitate provision of warranty service should it be required.