From Eye to Insight

LEICA LED1
LEICA LED3
LEICA LED5
LEICA LED8

External light sources for Leica microscopes

Instructions for use

Leica Microsystems CMS GmbH. Instructions for use, 11934173, Revision 1.0, 2019.05.01

Document Number 57-10022 Revision A

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The instructions contained in the following documentation reflect state-of-the-art technology and knowledge standards. We have compiled the texts and illustrations as accurately as possible. Nevertheless, no liability of any kind shall be accepted for the accuracy of this manual's contents. Still, we are always grateful for comments and suggestions regarding potential errors within this documentation.

The information included in this manual may be changed without prior notice.

As the official manufacturer of Leica branded light engine products, Lumencor is the responsible owner of this instructions for use 57-10022, Revision A.

Leica Microsystems CMS GmbH is the distributor of the Lumencor illumination products detailed herein, 11934173, Revision 1.0 2019.05.01 is for Leica internal tracking purposes only.

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Contents

1. Important Notes about this Manual

Attention!

This User Manual is an essential component of the instrument and must be read carefully before assembly, commissioning or use.

This User Manual contains important instructions and information for the operational safety and maintenance of the instrument and accessories. Therefore, it must be kept in a safe place.

Text symbols, pictograms and their meanings:

(1.2)

Numbers in parentheses refer to illustrations; for example, (1.2) refers to Fig. 1, item 2.

→ page 20

Numbers with a pointer arrow (for example → page 20), point to a certain page of this manual.

WARNING indicates a potentially hazardous situation with a medium degree of risk that, if not avoided, could result in death or serious injury.

CAUTION indicates a potentially hazardous situation with a low degree of risk that, if not avoided, may result in minor or moderate injury.

Attention!
In this manual, additional safety notes are indicated with the triangle symbol shown here, and have a gray background.

!

Attention! The instrument and its accessories can be damaged when operated incorrectly.

Warning of hazardous electrical voltage! Danger of electric shock!

Warning of hot surface.

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

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

Warning: IR emitted from this product. Do not look at operating lamp.

Warning of electromagnetic field

Instructions for disposing of the instrument, its accessories and consumables.

Earth (Ground) terminal

Explanatory note.

*

Item not contained in all configurations.

Manufacturer's address with manufacturing date

China RoHS 50 years EFUP
(Environmentally friendly use period)

2. Function of the Compact Light Source

The Leica LED1, LED3, LED5 and LED8 compact light sources, with which this instructions for use are associated, are intended for biological routine and research work as well as examinations in materials science or mineralogy.

Reasonably foreseeable misuse

The following are prohibited:

- Using the light source for any purpose not in accordance with the Declaration of Conformity (e.g. use as a medical product in accordance with EU Directive 93/42/EEC).
- Cleaning the light source in a way other than specified in the manual.
- Modifying the built-in safety circuits in the instrument.
- Allowing unauthorized personnel to open the instrument.
- Using cables that Leica has not provided or permitted.
- Using combinations with non-Leica components that go beyond the scope of the User Manual.
- Operating the light source while it is not connected to the stand.

Attention!

The manufacturer assumes no liability for damage caused by, or any risks arising from, using the light source for other purposes than those for which they are intended or not using them within the specifications of Leica Microsystems CMS GmbH.
In such cases, the Declaration of Conformity shall be invalid.

Attention!

This instrument is not intended for use in a patient environment as defined by DIN VDE 0100-710. It is also not intended to be combined with medical devices as defined by EN 60601-1. If a microscope is electrically connected to a medical instrument in accordance with EN 60601-1, the requirements defined in EN 60601-1-1 shall apply.

3. Safety Notes

3.1 Regulatory safety notes

Leica Microsystems 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: LED1/LED3/LED5/LED8 is used as a representative model for all certified and CE marked LED1/LED3/LED5/LED8 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.

It also meets the requirements of EN 61326-1, Electrical equipment for measurement, control and laboratory use – EMC requirements.

Photobiological Safety

The compact light sources have also been tested in accordance with EN 62471 / IEC 62471 Photobiological safety of lamps and lamp systems and is classified in risk group 3 (high risk).

Safety Certifications

TÜV SÜD America, CB Certification
(IEC 61010-1:2010)
TÜV SÜD America, NRTLus Certification
(UL 61010-1:2012)
TÜV SÜD America, cNRTL Certification
(CAN/CSA-C22.2 No. 61010-1:2012)
TÜV SÜD 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) plus (2015/863/EU)
REACH Regulation (EC) No. (1907/2006/EC)

In accordance with the REGULATION (EU) No. 1194/2012 OF THE COMMISSION for the implementation of the Directive 2009/125/EC of the European Parliament and Council with regard to the requirements for the environmentally friendly design of lamps with highly focused light, LED lamps and associated instruments, the products described here, Leica LED1, LED3, LED5 and LED8, are special products because they are not suitable for general lighting purposes.

3.1.1 Introduction LED1

The LED1 light source is a compact solid-state light source for fluorescence microscopy and other bioanalytical applications. The light source incorporates efficient thermal management, requiring no fan and providing quiet and vibration-free operation. This enables direct coupling to the fluorescence epi-illumination port of a microscope.

The light source provides four distinct color bands of light output that are controlled using either manual control knobs on the side panel or the light source control POD accessory. The COLOR knob located on the side panel is used for on/off control, selection of color channels and for enabling external tablet control. The INTENSITY knob provides four different levels of output attenuation between 100% and 10% of maximum.

3.1.2 Introduction LED3

The LED3 light sources are designed for laboratory use by bioanalytical researchers and/or developers of life science instrumentation. The light sources generate white light output by combining the outputs of multiple solid state light sources. The light output on/off status is manually controlled via a rocker switch located on the front panel or a foot pedal toggle switch accessory that plugs into the 3.5 mm connector on the rear panel.

3.1.3 Introduction LED5/LED8

The LED light source consists of 4 (LED5) and 8 (LED8) individually addressable solid-state light sources with integrated electronic control systems. The constituent light sources may be LEDs or luminescent light pipes.
The outputs of the constituent light sources are refined by bandpass filters and merged into a common optical train directed to the light output port on the front panel. The light output port has a built-in adapter for connection to a liquid light guide (LLG). An onboard photodiode continuously monitors the light output and generates reference signals that can be applied to the constituent sources in a feedback loop to maintain constant light output over time.
The LED5/8 light sources are controlled by onboard micro-processors that connect to LAS X imaging software via a RS-232 (PC) serial interface. The user can enable or disable each source independently by serial commands, as well as change the intensity of each source independently. Alternatively, the light sources may be turned on and off by TTL inputs from a trigger device such as a camera or a real-time controller. The only manual control is the master power switch on the front panel. Optimal internal operating temperature is maintained by negative pressure air cooling with the air intake at the front of the light engine and the exhaust fan at the the rear.

3.1.4 Precautions and Warnings

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

Safety Instructions:

Please read and follow all safety instructions provided BEFORE using the light source. 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.

In order to maintain this condition and to ensure safe operation, the user must follow the instructions and warnings contained in this User Manual.

Safety Definitions

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

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

Safety Items

Warning: ONLY use the power supply provided by Leica. It is imperative that the DC power supply has output over-current protection, as the power input of the light sources are not fused. The DC power supply must have the AC power cord connected to a receptacle with a protective safety (earth) ground terminal

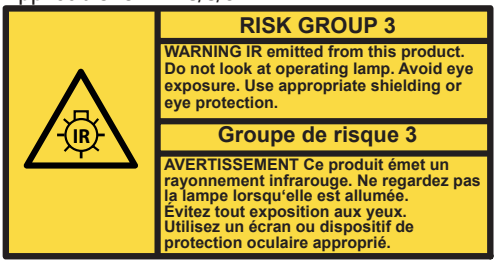
Warning: DO NOT look into the output of the light engine. The brightness of this light source is higher than most commercial lighting fixtures and is intended to couple directly into a microscope or other bioanalytjcal instrument.

Warning: DO NOT turn on the light without the output end of the light guide 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

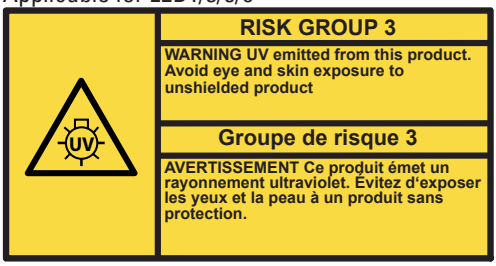
RISK GROUP 3

Applicable for LED1/3/5/8

Applicable for LED3/5/8



Applicable for LED1/3/5/8



The Leica LED1, LED3, LED5 and LED8 compact light sources generate high-energy light with invisible UV components and has been classified in risk group 3 (high risk) in accordance with EN62471-1 while the light guide is not connected to the microscope/system. There is a general risk of being dazzled or blinded by light! Never look directly into the light guide output of the instrument or into the output of the light guide connected to the instrument. Always ensure that the output of the connected light guide is securely connected to the system to be illuminated before switching on the compact light source. Furthermore, before switching on the compact light source, dim the light output to prevent damage to the connected system. During operation, the light guide must not be removed from the microscope/system. While connected to the microscope/system, the risk group 1 (low risk) has been classified. Please see the instructions on this topic in the microscope instructions for use.

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.

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

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

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.

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

Attention!

The instruments and accessories described in this Instructions for use have been tested for safety and potential hazards.
The responsible Leica representative or the main plant in Wetzlar must be consulted whenever the instrument is altered, modified or used in conjunction with non-Leica components that are outside of the scope of this manual!

Unauthorized alterations to the instrument or noncompliant use shall void all rights to any warranty claims!

Attention!

If any safety defects or malfunctions of the compact light sources are identified, the instrument must be immediately taken out of operation, disconnected from the power system at all poles and secured against further use. For repair, the compact light source must be sent to the vendor or an authorized representative of the vendor.

3.2 Electrical safety

General specifications

For indoor use only.

Frequency:	50/60 Hz
Ambient temperature:	0 to 35 °C
Relative humidity:	10 to 80 % non-condensing
Overvoltage category:	II
Pollution degree:	2

LED1

Supply voltage:	9 V DC, 4.45 A
Power input:	40 W max.
Fuses:	Integrated in external power supply unit, not replaceable

Specifications of the external power supply

One of the power supply units listed below (LPS-certified) must be used:

Mean Well GST40A09-P1J

Shared technical data:

Input:	100-240 V AC 50/60 Hz
Output:	9 V DC 4.45 A max. 40 W max.

LED3

Supply voltage:	24 V DC, 5.00 A
Power input:	120 W max.
Fuses:	Integrated in external power supply unit, not replaceable

Specifications of the external power supply

One of the power supply units listed below (LPS-certified) must be used:

Mean Well GST120A24-P1M

Shared technical data:

Input:	100-240 V AC 50/60 Hz
Output:	24 V DC 5.00 A max. 120 W max.

LED5

Supply voltage:	24 V DC, 9.20 A
Power input:	220 W max.
Fuses:	Integrated in external power supply unit, not replaceable

Specifications of the external power supply

One of the power supply units listed below (LPS-certified) must be used:

Mean Well GST220A24-LC

Shared technical data:

Input:	100-240 V AC 50/60 Hz
Output:	24 V DC 9.2 A max. 220 W max.

LED8

Supply voltage:	24 V DC, 9.20 A
Power input:	220 W
Fuses:	Integrated in external power supply unit, not replaceable

Specifications of the external power supply

One of the power supply units listed below (LPS-certified) must be used:

Mean Well GST220A24-LC

Shared technical data:

Input:	100-240 V AC 50/60 Hz
Output:	24 V DC 9.2 A max. 220 W max.

Only use original power cables or alternative cables with VDE/HAR codes that minimally fulfill the following conditions: 3 x 0.75 mm^2 and 10 A / 250 V.

By definition, the main circuit breaker of this instrument is the connection between the power cable and instrument port. The user must ensure unobstructed access to the main circuit breaker at all times.

Disconnect the power plug before cleaning!
Protect electrical components from moisture.

The light source must be placed at least 15 cm away from the wall and away from flammable substances.

Attention!

This light source must not be used at altitudes over 2,000 m above sea level.

The power plug may only be plugged into an outlet equipped with a grounding contact.
Do not invalidate the grounding function by using an extension cord without a ground wire. Any interruption of the ground wire inside or outside of the instrument, or release of the protective conductor terminal, can cause the instrument to become hazardous. Intentional ground interruption is not permitted!

Attention!

The compact light source are designed for a voltage range of 100 to 240 VAC, 50/60 Hz. Within this voltage and frequency range, the instrument always adapts to the connected power supply. Operating the instrument with a power supply voltage outside this range can destroy the instrument and the connected components!

Attention!

Do not plug in or unplug data lines and control circuits unless the instrument has been shut down; otherwise, the instrument may be damaged.

Attention!

The instrument is intended exclusively for operation in dry rooms. Do not use the instrument in rooms with explosion hazard.

Attention!

Do not use this instrument near sources of high electromagnetic radiation (for example, unshielded, intentionally operated ultra-high frequency sources), because these can disrupt proper operation.

We recommend assessing the electromagnetic environment before operation of this instrument and then giving corresponding instructions.

Light sources pose a potential irradiation risk (glare, UV radiation, IR radiation). Therefore, lamps have to be operated in closed housings and in installed condition.
Never look directly into the beam path (blinding hazard).

3.3 Disposal

Once the product has reached the end of its service life, please contact Leica Service or Sales about disposal.

Please observe and comply with the national and federal laws and regulations implementing the WEEE EC directive, for example.

Note!

Like all electronic devices, the microscope, its accessory components and consumables must never be disposed of with general household waste.

4. Transport, Storage, Unpacking

Attention!

Transport and storage at -20 °C to +70 °C and max. 80 % humidity (non-condensing).

Attention!

The environmental conditions regarding transport and storage specified in this Instructions for use must be complied with. For safe transport of the external light source, the original packaging must be used.
If during unpacking of the light source, damage to the instrument is detected, the vendor or the shipping company contracted by the vendor must be notified immediately.

Attention!

For unpacking, open the box on its top. It is then possible to lift the light source out of the box complete with the transport protection made of foam. After that, the foam corners and the plastic bag must be removed from the instrument. After unpacking, the light source should acclimatize for about 1 hour before starting up. This is done to prevent damage by condensation water that can form due to temperature differences in the interior of the instrument.

5. Notes on Warranty

The manufacturer of the instrument warrants that the instrument is free of material or production defects at the time of delivery. Any defects that have occurred must be reported immediately, and everything must be done to minimize damage. If such a defect is reported, the vendor of the instrument is obliged to remedy the defect at the State Laboratory Services Office's discretion either by repair or by shipment of an instrument free of defects. There is no warranty for defects resulting from natural wear (in particular, in wear parts) and improper handling.

Attention!

The instrument manufacturer and the vendor of the instrument assume no liability for damage caused by incorrect operation, negligence, impermissible use, intervention on the instrument or the use of spare parts and components that are not approved. In these cases, all warranty claims are voided.

No maintenance or repair tasks except for those listed in this instructions for use may be carried out on the instrument. Repairs may be performed only by the vendor of the instrument or the vendor's specially authorized representatives.

6. Overview of the Instrument

6.1 Intended use

! **Attention!**

The LED 3,5, and 8 light sources are used to generate light with a very high intensity and couple it into the light guide, preferably a liquid light guide with an active diameter of 3 mm. Any other use of the instrument is considered noncompliant use.

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6.2 Identification of the instrument

The nameplate of the instrument is on its rear side. It includes the necessary information for identifying the instrument.

In order to maintain this condition and to ensure safe operation, the user must follow the instructions and warnings contained in this Instructions for use.

6.3 Special features of the instrument

For LED3/LED5/LED8, the external light source has an electrical light output interlock. This ensures that the light beam output of the instrument is closed when the light guide is detached. This prevents the user from being harmed by the intense light beam generated by the instrument.

Depending on the model of light engine, the light source can be turned on/off through a variety of methods. Please confirm the correct light source operating methods are being used for the instrument:

LED1: The light source can be turned on/off with the manual light on/off switch on the side panel.
LED3: The light source can be turned on/off with the manual light on/off switch on the front panel or in combination with the electronic shutter input on the rear panel.
LED5/8: There is no manual light on/off switch on the light engine. The light source can be turned on/off with either the LAS X software or with the Leica Control POD.

The power supply must be set up so that the power voltage input is not obstructed and the instrument can quickly be removed from the power supply if necessary.

6.4 Overview Light Sources

Fig. 1 LED1
1 Output adapter
2 On/Off and color switch
3 Intensity switch
4 Light output indicator light

Fig. 2 LED1
1 USB A connection for POD
2 Electronic shutter TTL input
3 Power indicator light
4 Receptacle DC power supply

Table 1 Output power spectrum LED1

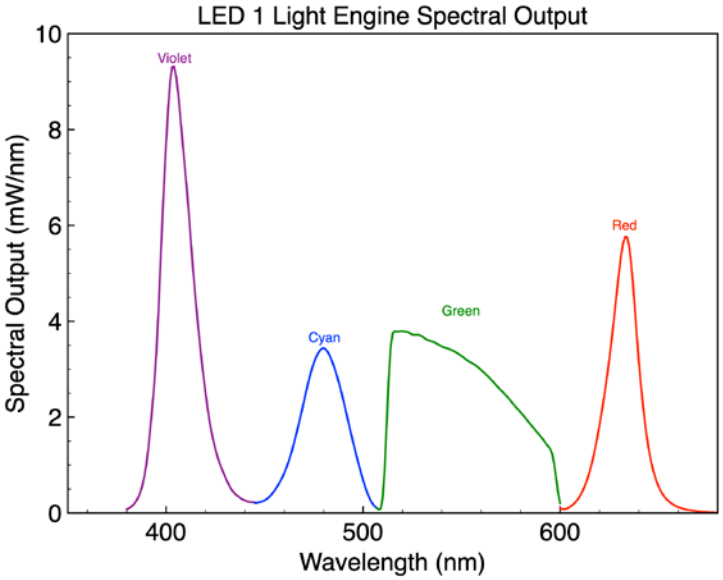


Fig. 3 LED3
1 Light indicator
2 Light switch
3 Output adapter

Fig. 4 LED3
1 Power indicator light
2 On/Off switch
3 Foot switch
4 Receptacle DC power supply
5 Electronic shutter TTL input

Table 2 Output power spectrum LED3

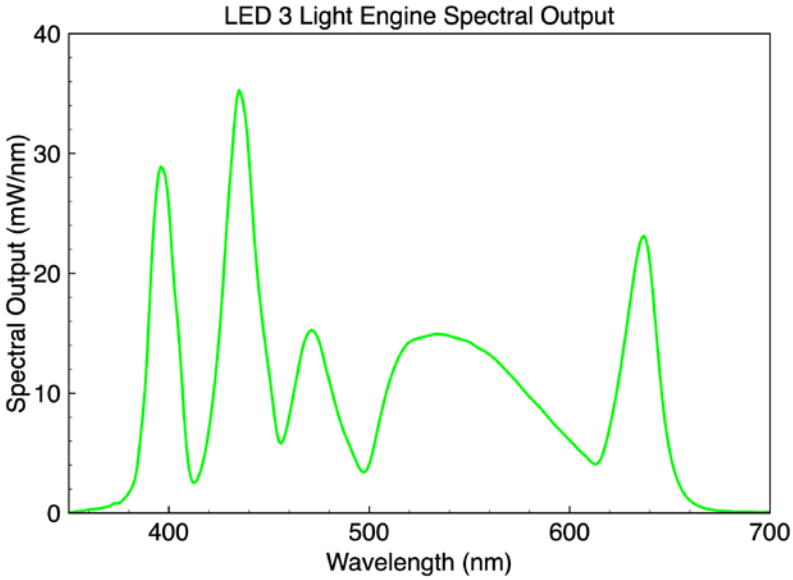


Fig. 5 LED5 front

1 Status indicator display
2 Light indicator
3 Interlock
4 TTL connection
5 USB B connection
6 RS-232 connection
7 Receptacle DC power supply
8 On/Off switch
9 Key control
10 Output adpater
11 Manual interlock reset

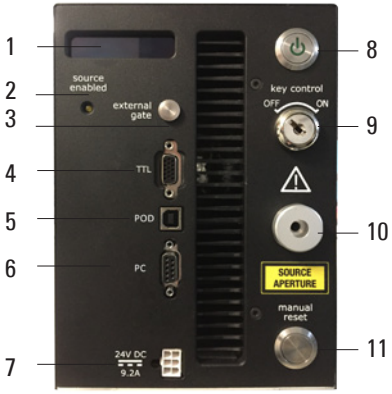


Fig. 6 LED5 rear

Table 3 Output power spectrum LED5

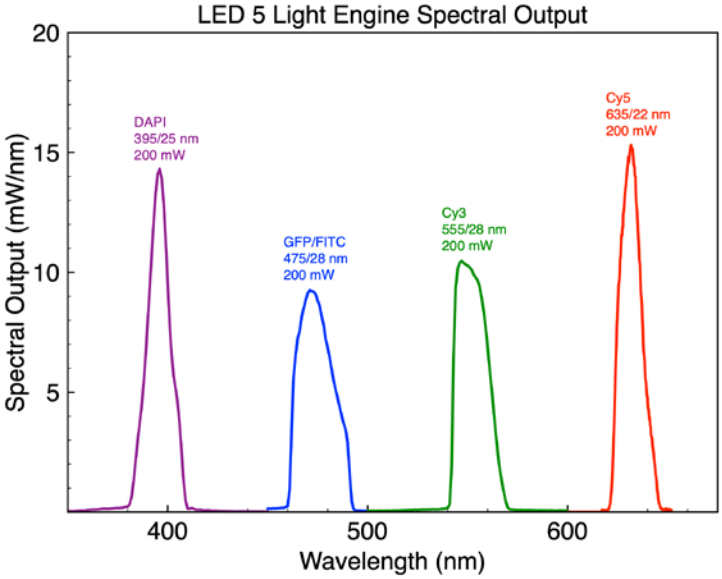


Fig. 7 LED5 front

1 Status indicator display
2 Light indicator
3 Interlock
4 TTL connection
5 USB B connection
6 RS-232 connection
7 Receptacle DC power supply
8 On/Off switch
9 Key control
10 Adpater
11 Manual interlock reset

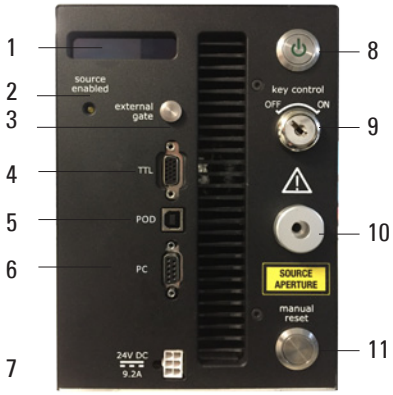
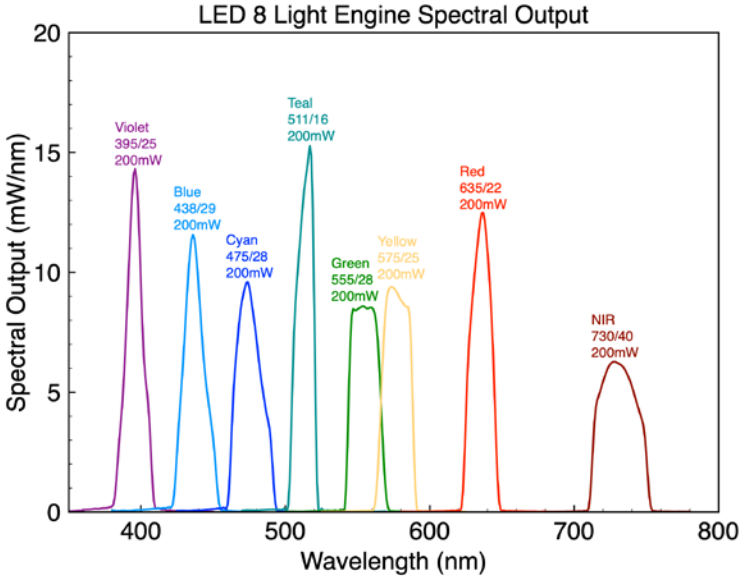


Fig. 8 LED5 rear

Table 4 Output power spectrum LED8



6.5 Connecting LED1

The LED1 can be directly installed to the lamp housing receptacle.

6.6 Connectable light guides (LED3-8)

The light source is compatible with liquid light guides that are compatible with a "Storz long" light inlet and whose transmission curve fits the lamp used. Where applicable, refer to the lamp's data sheet for its spectral light distribution. The instrument is optimized for light guides with an active diameter of 3 mm.

Your Leica vendor will be glad to provide information about suitable light guides.

7. Instrument Setup

7.1 Installation

Attention!

Set up the external light source its control and display elements is readily accessible and visible. The instrument must stand upright safely and so that it does not skid. The ventilation slots on the sides and back panel of the instrument must not be covered. Maintain a free room of at least 150 mm on the rear panel of the instrument. The cables and light guides to be connected to the light source must not cause any hazard.

7.2 Connecting the LED1

The LED1 has to be connected to the microscope before it is turned on.
Be aware that although the human visual system does not register the wavelengths of light from the violet color channel, exposure can quickly produce eye damage. When setting up the light source, be sure that the output adapter is securely attached to the appropriate illumination port of the microscope.

Fig. 9 LED1
1 Output adapter

Usually this will be the fluorescence epi-illumination port. Be careful to properly support the light source until it is securely attached to the instrument.

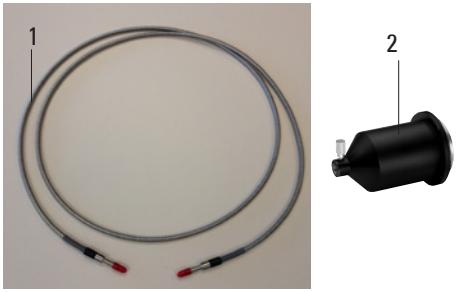
7.3 LED3/5/8 – connecting the light guide

Attention!

The red dust caps MUST BE removed before the light guide is connected to the light source and the microscope.

Always connect the light guide to be connected to the instrument to the target system by its output first to prevent a hazard to the user from the high-energy light emitted by the light source.
The light guide (Storz standard) is inserted into the provided microscope adapter (Fig. 10.2) or into the external DMi8 fluorescence axis as far as it goes and fastened using a clamping screw. Before that, fasten the adapter on the standard interchangeable surface of the fluorescence lamp housing. (Upright microscope – directly on the stand, inverted microscope – on the lamp housing mount, stereomicroscope – directly on the stand). The light source has a safety interlock

Fig. 10 Light guide with adapter
1 Light guide
2 Adapter



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.

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.

The input of the light guide (Storz long) is inserted into the light output on the front side of the light source into the light output (Fig. 11.1, Fig. 12.1) of the instrument. There must be a noticeable click.

! Attention!

When connecting the light guide to the light source or the microscope adapter, make sure not to kink or damage the light guide. Avoid turning the clamping screw too far. Make sure that the light guide is securely in place to prevent it from sliding out of the adapter.
Only use a light guide with a light input of the "Storz long" type, as otherwise damage to the instrument and hazard to the user can result (risk of being dazzled).

Fig. 12 LED5/8
1 Output adapter

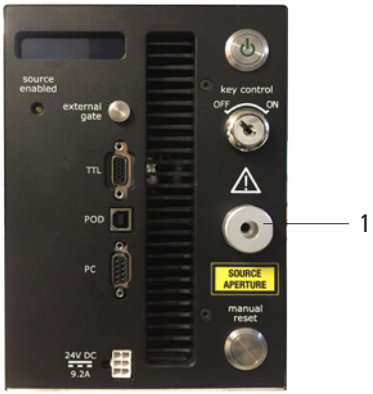


Fig. 11 LED3
1 Output adapter

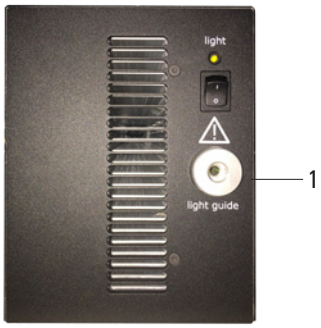


Fig. 13 LED1 Connections
1 USB A connection

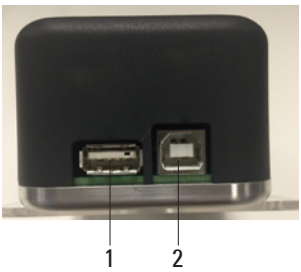
Attention!

Connect the light guide **on either side** (light source AND adapter) **before** switching on the light source!
The escaping light can cause injury to eyes and skin and damage to furniture.
Never look into the light escaping from the light guide!

CAUTION

Do not switch on the light source until the light guide is firmly connected to the microscope.
Uncontrolled light output from the light guide poses a burning hazard at the light guide output in addition to the blinding hazard!

Fig. 14 Leica POD
1 Connection to light source
2 Connection to PC



7.4 Connecting the Leica POD (optional)

As an alternative the light source can be connected to Leica POD.

LED1

Connect the USB A port of the light source control pod (Fig. 14.1) accessory to the USB A ("external") port on the LED1 (Fig. 13.1) using the USB-A to-USB A cable.

LED5/8

Connect LED5/8 to pod using USB A-to-USB B cable.

7.5 Connecting the power cable

The power cable is a standard C13 cable included in the standard delivery.

Connect the DC power cable to the DC power input of the light source.

Before connecting the power cable, the power switch of the light source must be set to zero position (OFF).

The power cable must first be connected with the external power supply and then inserted into a properly functioning grounded socket. The ground contact connection must not be interrupted (e.g. by unsuitable extension cables).

8. Operation

8.1 Operation LED1

Two control knobs are located on the side panel (Fig. 15.2). The “COLOR” knob allows the user to select light output from any or all of the four color channels. The selections are “V” for violet, “C” for cyan, “G” for green and “R” for the red color channel. The “W” setting is for white light, when all four color bands are simultaneously illuminated. The “ext” setting allows the light source to be controlled using the Pod. There are two “off” settings at opposite ends of the knob range. Both of these “off” settings turn the electrical power to the light engine off. The “INTENSITY” control knob (Fig. 15.3) sets four different levels of output attenuation between 100% and 10% of maximum. This setting is applied to the current source selection according to the position of the “COLOR” knob. It is recommended that the intensity be set to the “10%” position when a source is first turned on, and then increased as necessary. A yellow indicator light (Fig. 15.4) below the INTENSITY control knob on the side panel alerts the user that light output is active.

Fig. 15 LED1
1 Output adapter
2 On/Off and color switch
3 Intensity switch
4 Light indicator

8.2 Operation LED3

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 Fig. 16.4 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 (Fig. 16.1) 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 en-

Fig. 16 LED3 rear
1 Power indicator light
2 On/Off switch
3 Foot switch
4 Receptacle DC power supply
5 Shutter

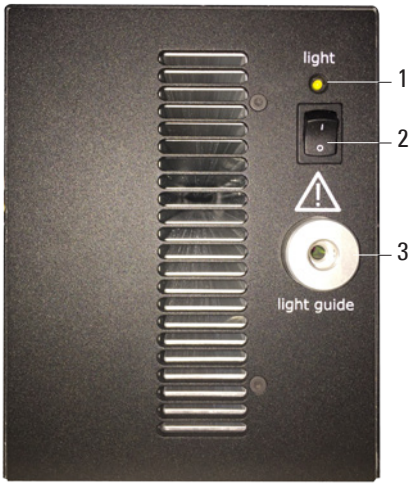
closed optical path (e.g. microscope input collimator or a beam dump), turn the power switch ON to begin operation.

The LED3 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. Do not intersperse the operation of these switches. If the front panel rocker switch is used to turn the light on, that same switch should be used to turn it off. If the foot pedal is used to turn the light on, the foot pedal be used to turn the light off. An amber indicator LED above the manual light output switch indicates active light ouput. There is no warm-up time; the light engine output stabilizes less than 1 second after the manual light output switch is moved to the "on" position.

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. Light output is set to a single maximum intensity level. LED3 do not provide electronically-controlled output attenuation.

In the event that the liquid light guide becomes disconnected from the unit during operation, the safety interlock will be opened and light output will cease immediately. In order to turn the light output back on, you will need to: 1) turn the electrical power off, 2) fully insert the light guide into the light guide port, 3) turn the electrical power back on and then 4) activate light output using either the front panel rocker switch or the foot pedal toggle switch.

Fig. 17 LED3 front
1 Light indicator
2 Light switch
3 Output adapter



8.3 Operation LED5/8

The Master Power Switch button on the front panel (Fig. 18.8) turns the electrical power to the unit on or off. A green power indicator embedded in the button is lit when the power supply is connected to the light engine and the power button is in the on position. Initialization of the onboard computer takes about 30 seconds after the master power switch is turned on. When initialization is complete, the status indicator display (Fig. 18.1) will activate

The Key Control must be in the on position before light output can be turned on. The key must be removed and stored in a secure location when the product is not in use. ONLY trained individuals should use and have access to the key. The Master Power Switch button, Key control and Remote interlock can be used to shut off light output.

The Source Enabled indicator LED (Fig. 18.2) provides a warning indication that one or more light sources are active and emitting invisible and/or visible radiation.

Fig. 18 LED5/8 front
1 Status indicator display
2 Light indicator
3 Interlock connection
4 TTL connection
5 USB B connection
6 RS-232 connection
7 Receptacle DC power supply
8 On/Off switch
9 Key control
10 Output adapter
11 Manual interlock reset

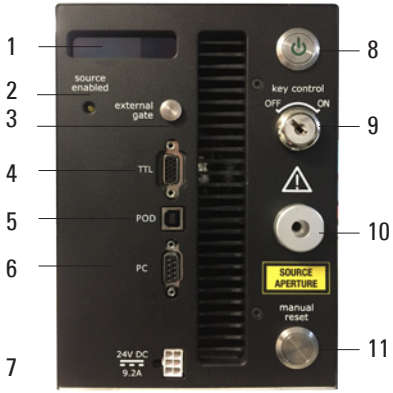


Fig. 19 LED5/8 rear

The Remote Interlock Connector (Fig. 18.3) is provided to allow for connection of a remote interlock. When this interlock is open it will shut off light output. After the interlock has been opened, the Manual Interlock Reset (Fig. 18.11) button will need to be pushed to resume light output.

Note: In the event of ANY normal or abnormal interlock fault condition (including high ESD/EMP/EFT conditions ~2kV) you MUST clear the latch fault condition by depressing the manual reset button.

8.3.1 Start Up

- Insert the external gate jumper in the labeled socket on the front panel (Fig. 18.3).
- Insert the control key (Fig. 18.9), turn it to the ON position.
- As soon the DC power supply is energized, the master power button (Fig. 18.8) will automatically light up. The light engine automatically starts when the power is connected; there is no need to push the master power button.
- Wait 30–45 seconds for the initiation sequence (onboard microprocessor boot-up) to complete. Do not press any buttons or insert any plugs during this time.
- When initiation sequence completes, LEICA flashes on the front display panel. The display will then show the MODEL identification (LED5 or LED8), the internal temperature and fan status. . At the same time, the fan will come on at HI for about 2 seconds and then shut off automatically.
- The light source is now ready for use.

The light source has two serial ports, labeled POD and PC (Fig. 18.5, Fig. 18.6), which can be set to receive either LEGACY or STANDARD mode commands. Connection to the computer requires a USB-A-to-USB B cable or USB-to-RS-232 cable.

The COM port address assigned by the computer to the light engine USB serial port must be correctly registered. These selections are typically found under the “Devices” tab in the Leica LAS X software.

9. Service

9.1 Maintenance and cleaning

The light source has no need of regular maintenance. This does not void the obligation of carrying out legally controlled regular checks with regard to electrical safety and accident prevention.

Attention!

Before carrying out cleaning tasks, switch off the light source.

Use only a dry, lint-free cloth for cleaning. When cleaning, ensure that no dust or other foreign bodies enter the instrument through the ventilation slots.
In case of damage (even external damage), immediately stop using the light source and send it to Service.
If it will not be used for a long time, protect the light source from dust using a suitable cover (such as the plastic bag from the original packaging).

9.2 Repairs

Repairs may be carried out by the manufacturer of the instrument or specially authorized representatives only.
Should the necessity arise to send the light source to the vendor or its authorized representative in case of a defect, the original packaging of the instrument must be used.

10. Troubleshooting

No routine maintenance is required. There are no user-replaceable components or sub-assemblies in the light source. Opening the light engine enclosure will void the manufacturer's warranty. If problems are encountered during installation or routine operation, review the troubleshooting procedures described below. If the problem remains unresolved, please contact your local Leica sales representative for assistance.

Troubleshooting Procedures	
Problem	**Check the following**
No response to TTL trigger commands	Check that TTL trigger inputs are polarity positive, and that serial ON/OFF controls (PC or Control POD) are set to OFF state.
No response to TTL trigger commands (LED1/3)	The light output must be turned ON by either the manual light output switch (LED1 and LED3) or by the Leica POD (LED1) BEFORE applying the TTL control signal to the shutter.
No light output in response to source ON command (serial or TTL). (LED5/LED8 only)	There are 3 interlocks that need to be closed, check all of these: • Liquid light guide must be inserted in light output receptacle. • External gate jumper must be inserted in front panel • Control key must be inserted in front panel and turned to "on" 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 light source.
Unusually weak fluorescence signals in a single detection channel (e.g. DAPI)	• Check that the dichroic beamsplitter and emission bandpass filter in the microscope are compatible with light engine excitation filter specifications shown on the certificate of conformance.
High, spatially uniform fluorescence background	Check that the dichroic beamsplitter and emission bandpass filter in the microscope are compatible with light engine excitation filter specifications shown on the certificate of conformance (Figure 1).
Green power indicator does not light up when the DC power supply is connected and the master power switch (rear panel) is in the ON position. (LED3 only)	Check that the liquid light guide is fully inserted in the front panel receptacle and is secured by the set screw.

11. EC Declaration of Conformity

To download the EC Declaration of Conformity, use this link

http://www.leica-microsystems.com/products/light-microscopes/

Select the LED Light Source and go to the "Download" page.

If you have any further questions or require technical support, please contact your country's Leica branch office or your local contact person directly. The appropriate contacts can be found on the Internet under:
http://www.leica-microsystems.com

有害物质标记表
Hazardous Substance Marking Table

部件名称 Part Name	有害物质 Hazardous Substances					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr(VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板 Printed circuit boards	×	○	○	○	○	○
电子元器件 Electronic components	×	○	○	○	○	○
机械部件 Mechanical parts	○	○	○	○	○	○
电缆和电缆配件 Cables and cable accessories	○	○	○	○	○	○
显示屏 Displays	○	○	○	○	○	○
光源 Light sources	○	○	○	○	○	○
光学 Optics	○	○	○	○	○	○

这些表是按照SJ/T 11364 的规定编制。
This table is prepared in accordance with the provisions of SJ/T 11364.
○：表示该有害物质在该部件所有均质材料中的含量均在GB/T 26572 规定的限量要求以下。
Indicates that said hazardous substance contained in all of the homogeneous materials for this part is below the limit requirement of GB/T 26572.
×：表示该有害物质至少在该部件的某一均值材料中的含量超出GB/T 26572 规定的限量要求。
Indicates that said hazardous substance contained in at least one of the homogeneous materials used for this part is above the limit requirement of GB/T 26572

有害物质标记表涵盖了这里列出的产品。
The "Hazardous Substance Marking Table" covers the here listed products.

显微镜	控制	光源	光学和照相机	电源和服务模块
Microscopes	Controls	Light Sources	Optics and Cameras	Service Modules

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