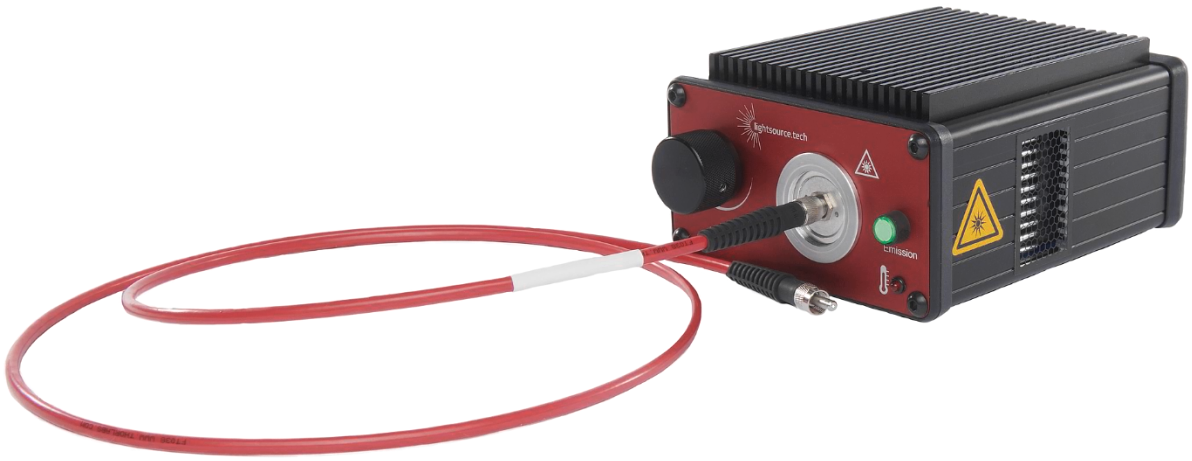
lightsource.tech®



LS-WL1

Laser-pumped white light source

rev. 1.2

LS-WL1

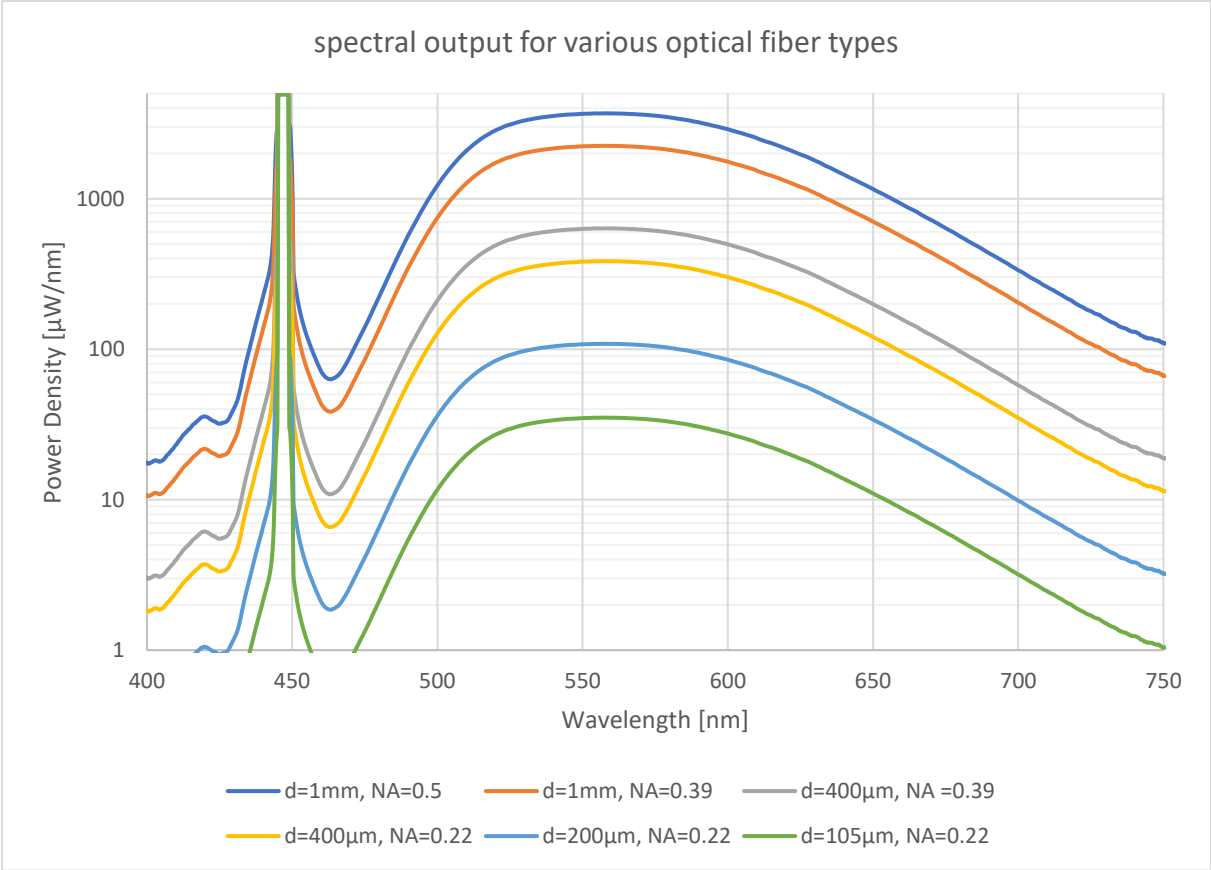
Laser-pumped white light source

The LS-WL1 is a compact, fiber-coupled powerful light source with extremely high luminance.

Technology: Two GaN laser diodes that are focused on a ceramic phosphor converter generate an extremely bright fluorescent point light source with a diameter of less than 300 µm. The LS-WL1 couples this light efficiently into a multimode fiber with a core diameter between 50µm and 1mm. It therefore provides the user with a flexible point light source with ultra-high luminance.

Its luminance at the fiber output exceeds other white, broadband LED light sources many times over and – in its spectral range – also exceeds the luminance of fiber-coupled laser plasma light sources.

Spectrum



Specifications

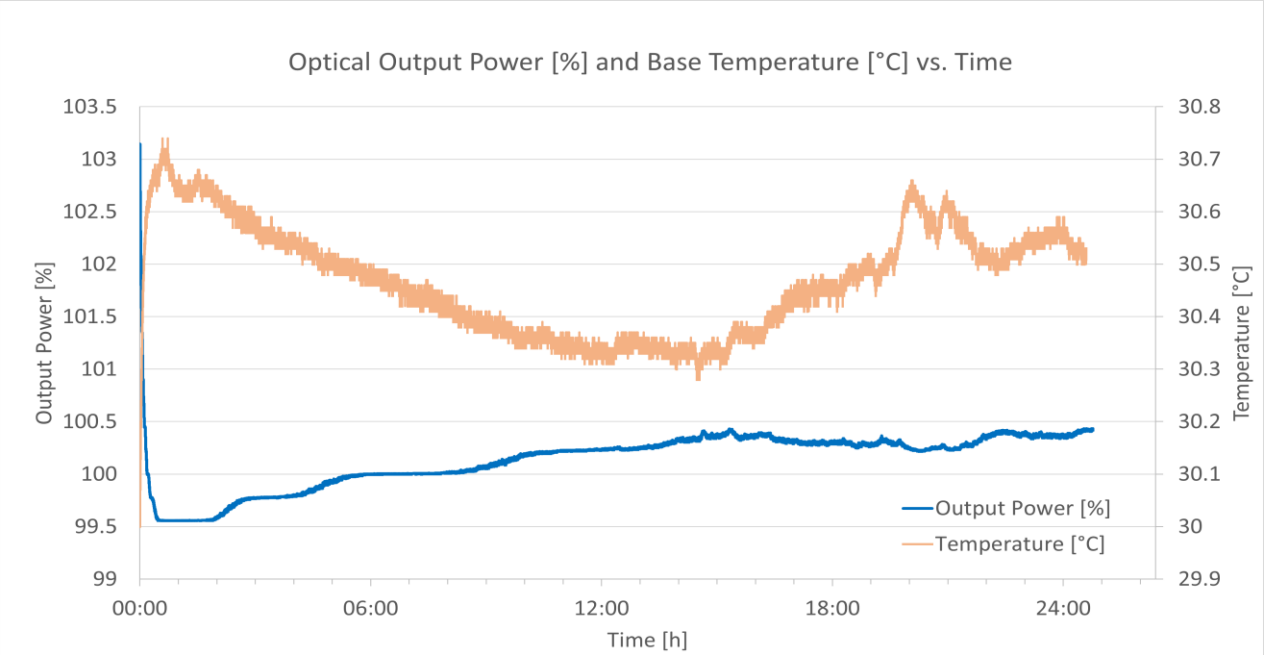
<table>
<tr><td>Emitter</td><td>Incoherent[1] white light source, laser-pumped phosphor converter (450nm excitation laser)</td></tr>
<tr><td>Optical output</td><td>SMA optical fiber connection for multimode fibers with a core diameter of 50-1000µm, maximum fiber aperture that can be used NA=0.5</td></tr>
<tr><td>Optical output power
(typical)</td><td>Core diameter of optical fiber 1mm NA 0.5: >500mW
600µm, NA 0.5: 440mW
400µm, NA 0.39: 200mW
200µm, NA 0.22: 30mW
Power adjustable via jogwheel or software 1–100%</td></tr>
<tr><td>Power stability</td><td>typ. 1% per 24h (in thermal equilibrium, see graph)</td></tr>
<tr><td>Wavelength range</td><td>440–750nm, see spectrum above</td></tr>
<tr><td>Manual operation</td><td>Software controlled configurable jogwheel (output, frequency, switch-on duration) depending on selected mode.</td></tr>
<tr><td>Operating modes</td><td><table><tr><td>Constant output</td><td>CW</td></tr><tr><td>Stroboscope</td><td>Frequency 0.12 Hz–200 kHz
Duty cycle 0–100%</td></tr><tr><td>Pulse trigger</td><td>Pulse width: 10µs–4000ms
Delay: 4µs–4000ms
(Width + Delay <= 4000ms)</td></tr><tr><td>Direct mode</td><td>Analog/digital modulation to 100 kHz</td></tr></table>All modes allow output setting of 1–100%</td></tr>
<tr><td>Interface</td><td>Mini-USB type B connection, RS-232 via USB (COM interface, FTDI chipset, 115200 baud)</td></tr>
<tr><td>Software</td><td>LabVIEW™-based GUI or control with commands via RS-232, therefore able to be integrated into all programmable environments or direct terminal input.</td></tr>
<tr><td>Signal In</td><td>TTL level for trigger or digital modulation, analog input (0-5V, biased) for analog modulation (via SMA connection)</td></tr>
<tr><td>Signal Out</td><td>Selectable output signals (via SMA connection); Signal reference (TTL), Laser driver input (0-5V), Laser power monitor (165mV/A), Signal In looped through</td></tr>
<tr><td>Option output</td><td>4 via firmware adaptable inputs/outputs for external sensors, interlocks, etc. (DIO/analog/I2C, +5V, GND)</td></tr>
<tr><td>Thermal management</td><td>2 miniature high-performance fans, low-noise, air input on top, air output on both sides and underneath. Temperature sensor (readable using software), overheating protection, LED signal.</td></tr>
</table>

[1] Residual coherence and polarization of scattered excitation laser light may be present, see text.

	Environmental temperature 5-30 °C. (Other temperature ranges possible on request.) If using multiple LS-WL1 devices alongside / on top of each other, ensure unimpeded air circulation.
Power supply	Plug-in power supply 12V DC, 2.5A (included with delivery), coaxial power connector 5.5x2.1, power input approx. 20W max.
Dimensions	130mm(L) x 106mm(W) x 56mm(H) w/o controls and connections

Power stability and polarization

After reaching thermal equilibrium, the optical power typically drifts by <1% within 24 hours. Thermal equilibrium may be monitored using the built-in temperature sensor.

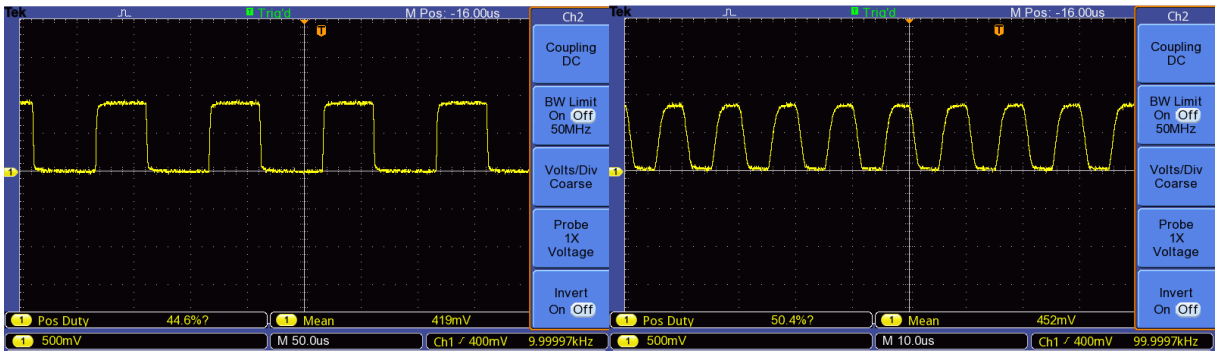


Graph: reaching thermal equilibrium at full output power (measurement conditions: 1000µm/NA0.5 fiber, Artifex OPM150 power meter with Ulbricht sphere)

The white light generated by conversion shows no measurable polarization nor coherence. However, the blue part of the spectrum, around 450nm, is obtained from scattered light from the excitation lasers. Here, some residual coherence may be observed (e.g. some laser speckles even after passing through the optical fiber). Residual polarization of less than 1% for the total spectrum can be seen. Using longpass filtering at 460nm completely removes polarization and speckles, with a 50% reduction of output power.

Pulse and stroboscope operation

The light of the LS-WL1 can be switched on and off quickly. Switching frequencies of up to 100 kHz are easily possible. An external trigger input with an adjustable delay is available for this. The minimum delay is approx. 4 µs, jitter is less than 1 µs. Thanks to the built-in microprocessor, the LS-WL1 can also be operated as a free-running stroboscope with an adjustable frequency and duty cycle.

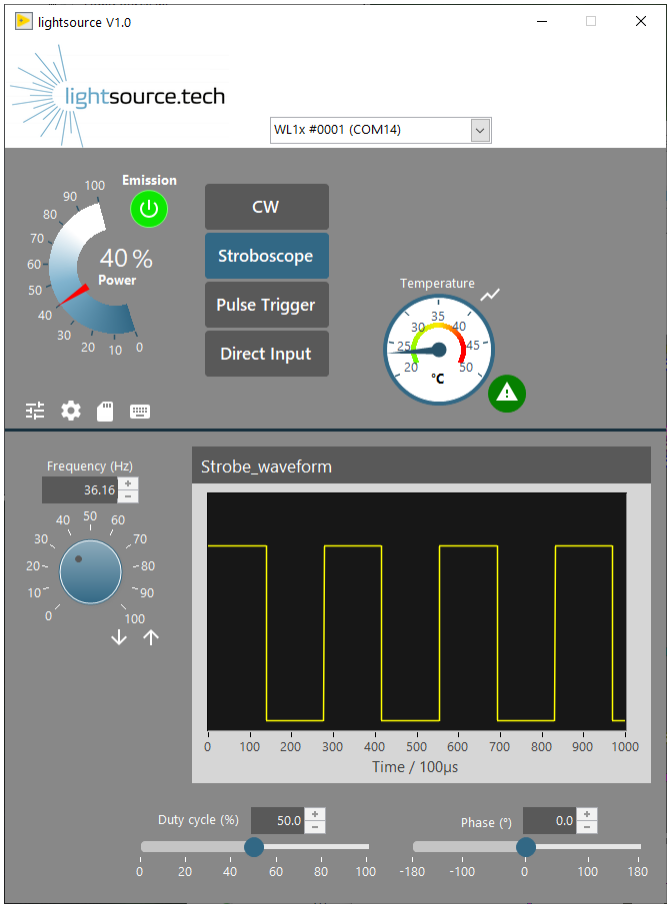


Optical pulse shape at 100% output power in stroboscopic operation with 10Hz (left) or 100kHz (right), measured with Thorlabs PDA36A2 Si Amplified Photodetector

Software

Brightness and (depending on the operating mode) other parameters can be conveniently controlled using a rotary knob. The light source can also be completely controlled via a serial RS232 interface (via USB). This can be done either directly using simple commands from any programming environment or using the convenient GUI provided.

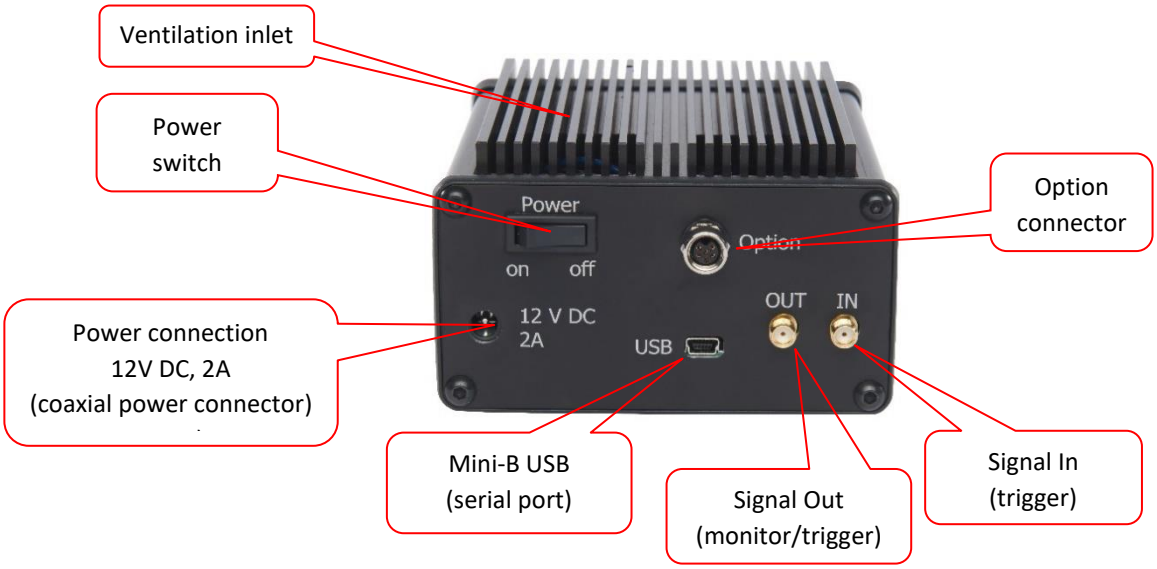
A VI library is available on request for integration into LabVIEW® programs.



Operating program LS-WL1

Front with controls:

Back with connections:



Scope of delivery

- Light source LS-WL1
- Plug-in power supply
- Safety sheet
- Operating instructions
- USB cable (A to Mini-B, 2m)
- Software (as download)

An optical fiber is not included in the delivery scope. Suitable optical fibers for your application with various core diameters, numerical apertures and of various materials are available from us or other suppliers. We recommend using quartz optical fibers.

CE The LS-WL1 has been tested according to the following guidelines:
2014/35/EU Low Voltage Directive, LVD
2014/30/EU EMC directive, EMC test standard DIN-EN 61326-1 2018-09 [VDE 08433-20-1] Electrical measuring, control, regulating and laboratory equipment – General EMC requirements

Test certificate available on request.

Any other plug-in power supply with suitable connection (coaxial power connector 5.5x2.1) and output may be used in place of the plug-in power supply provided.

Safety Instructions - Please read before use -

The light source LS-WL1 is an ultra-bright point light source. Emitted light output and luminance can reach very high, potentially dangerous levels!

The LS-WL1 is **not a toy** and may only be used by technically trained personnel. If the LS-WL1 or the underlying optics module is built into devices or instruments, or is connected to such devices or instruments via an optical fiber, appropriate protective measures must be taken to ensure the safe operation of the entire system. If the LS-WL1 is operated as a stand-alone device, please ensure that emission is switched off when the device is not being supervised.

Risk of eye damage: avoid direct observation of:

- the outlet opening if no fiber is inserted, or

- the glowing fiber end, or

- narrow, collimated beams or focal points.

Use protective glasses to reduce light intensity to a safe and comfortable level. Most of the light emitted by the LS-WL1 is in the range below 600 nm. Many laser safety glasses for blue and green are therefore well-suited (OD>2, i.e. the residual transmission for UV yellow should amount to less than 1%. Suitable protective glasses are also available from lightsource.tech.

Many applications require the beam to be collimated or focused. Depending on the optical technology used, dangerous luminance levels can arise even far from the source.

Particularly when coupling into optical microscopes or similar visual observation devices, light may be focused in areas that result in direct exposure to the user (eyes, hands, etc.). It is imperative that optical systems of this kind are professionally designed to avoid dangerous exposure.

Neurologically photo-sensitive persons should note: The LS-WL1 provides pulsed or stroboscopic modes. Avoid visual observation of intense, low-frequency flickering illumination conditions.

Risk of burns arises in the range of focused or narrow, collimated beams.

Fire risk: Do not place flammable substances in focus.

For users of the Try Out Box: Please note the general safety instructions above and the special information on the individual experiments! Use the safety glasses enclosed!

The light-emitting element in the LS-WL1 has an independent UL certification acording to ANSI/UL 8750 (solid-state lighting safety standard) and is classified as a Class 1 Laser Product according to IEC 60825-1. The photo-biological safety level is Risk Group 1 (RG1, low risk) according to IEC 62778. The laser built into the device is encapsulated and not directly visible. Visible, however, is diffuse, scattered laser light as well as incoherent white light that arises from conversion of laser light on a ceramic converter. This light is in turn focused on the outlet opening (SMA connection).

If you feel unsure about whether safety measures are sufficient, speak to the Laser Safety Officer or contact us on lightsource.tech.

lightsource.tech

is a brand from

Technologie Manufaktur GmbH & Co. KG
Hannah-Vogt-Straße 1
37085 Göttingen
Commercial register: District court of Göttingen, HRB 201595
Registered office: Göttingen

Personally liable partner:
Technologie Manufaktur Verwaltungs GmbH
Commercial register: District court of Göttingen, HRA 204846
Registered office: Göttingen
Managing Directors: Dr. Dirk Hönig, Dr. Jan Thirase

web: lightsource.tech

email: info@lightsource.tech

phone: +49 (0) 551 270765-0