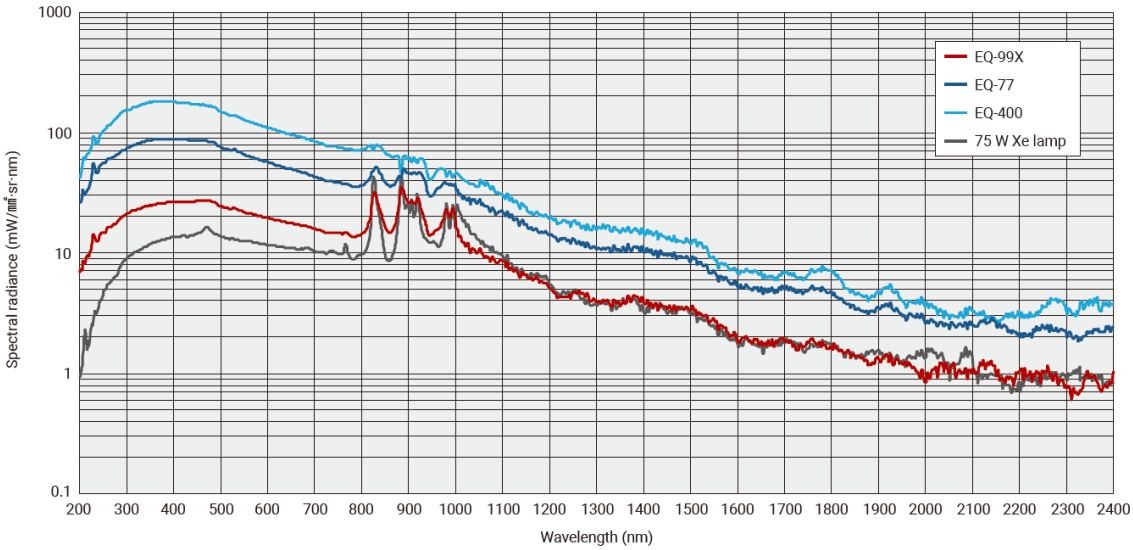
Laser-Driven Light Source
LDLS™

ENERGETIQ
A HAMAMATSU Company

Features

Extremely broad wavelength range

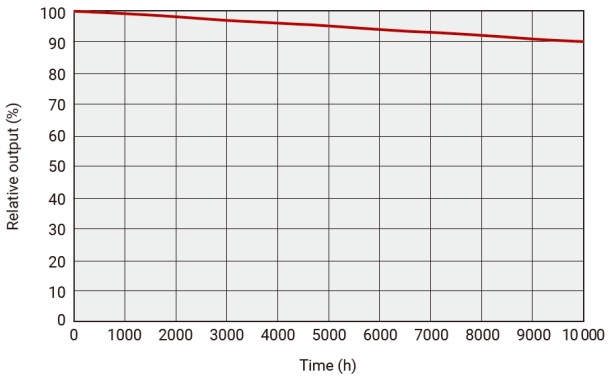
● Broad emission wavelength range from vacuum UV to visible and near-infrared (170 nm to 2500 nm)



* We have confirmed wavelength radiation from 170 nm to 2500 nm, but we have not acquired the wavelength band Less than 200 nm and after 2400 nm for spectral radiance data.

Long lifetime

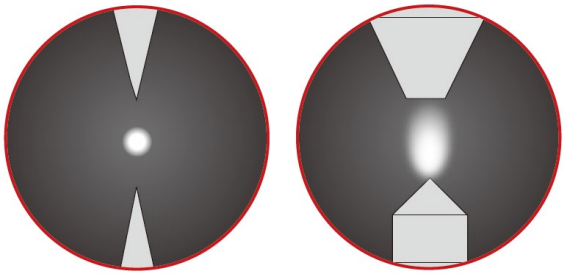
● Lifetime characteristics



* This is the typical lifetime of EQ-99X-QZ-S measured light output at 500 nm.

High radiance from a small plasma

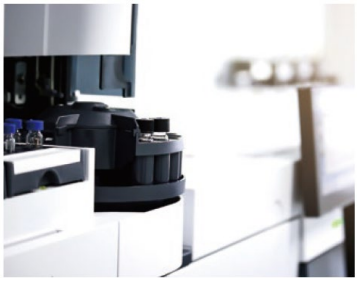
● High radiance emission from a luminous point of 0.1 mm diameter



LDLS　　Xe lamps

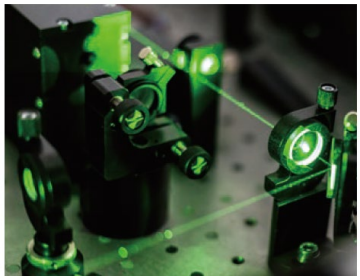
Applications

● UV-visible-NIR spectral measurement



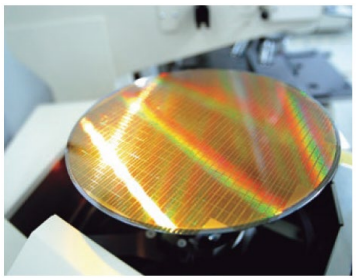
● Absorption measurement, reflected light measurement
● Color measurement (jewels, plastics, polymers)
● Narrow-slit monochromators

● Evaluation of optical products



● Evaluation of optical filters and lenses
● Evaluation of optical fiber transmission
● Evaluation of image sensors

● Film thickness measurement



● Substrate coating inspection
● Deposition measurement

Product Technology

The Laser-Driven Light Sources or LDLS is an innovative light source developed by Energetiq Technology inc. in the US, which is a subsidiary of HAMAMATSU PHOTONICS. LDLS is the only light source in the world that utilizes a focused laser beam to generate and maintain plasma between the discharge electrodes in the xenon gas filled bulb.

High technology supported by a number of proprietary patents
The unique laser-driven technology which is the basic principle behind LDLS is supported by patents owned by Energetiq. The related patent numbers are as follows:
(US 7435982, 7786455, 8525138, 8969841, 9048000, 9185786; Japan 5410958, 5628253; Korea 10-1507617; UK GB2450045.)
For more detailed information, please refer to the following site.
https://www.energetiq.com/patents

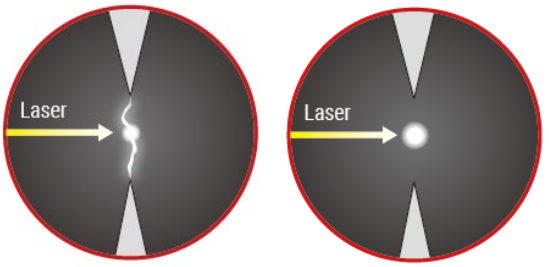
High-temperature plasma sustained by laser

The high-temperature plasma sustained by the laser emits a nearly flat spectrum that spans the UV to near-infrared region and has much higher brightness than xenon lamps.

Light emission technology that causes no wear on the discharge electrodes

LDLS utilizes its two discharge electrodes in the bulb only to ignite the plasma. After that, there is absolutely no wear and tear on the electrodes while plasma is sustained between them. This means the bulb has a very long service lifetime compared to traditional light sources that fully use and consume the electrodes during operation.

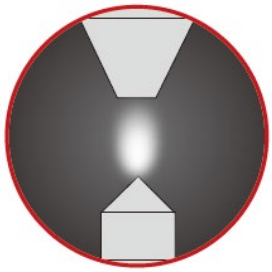
LDLS: Utilizes electrodes ONLY during ignition



Pulse discharge during ignition

Plasma is sustained only by laser beam

Xenon lamps: Utilizes electrodes during operation

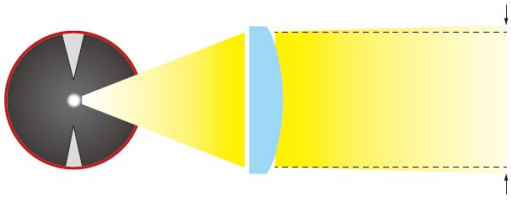


Arc discharge

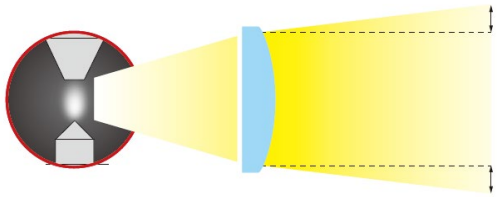
Very small emitting point

Because light emission occurs only at the laser-focused point, the emitting point is very small compared to that of xenon lamps. This offers many benefits such as focusing light onto a small point, efficient utilization of light, and suppression of stray light.

LDLS: Allows forming ideal parallel light



Xenon lamps: Large divergence angle compared to LDLS

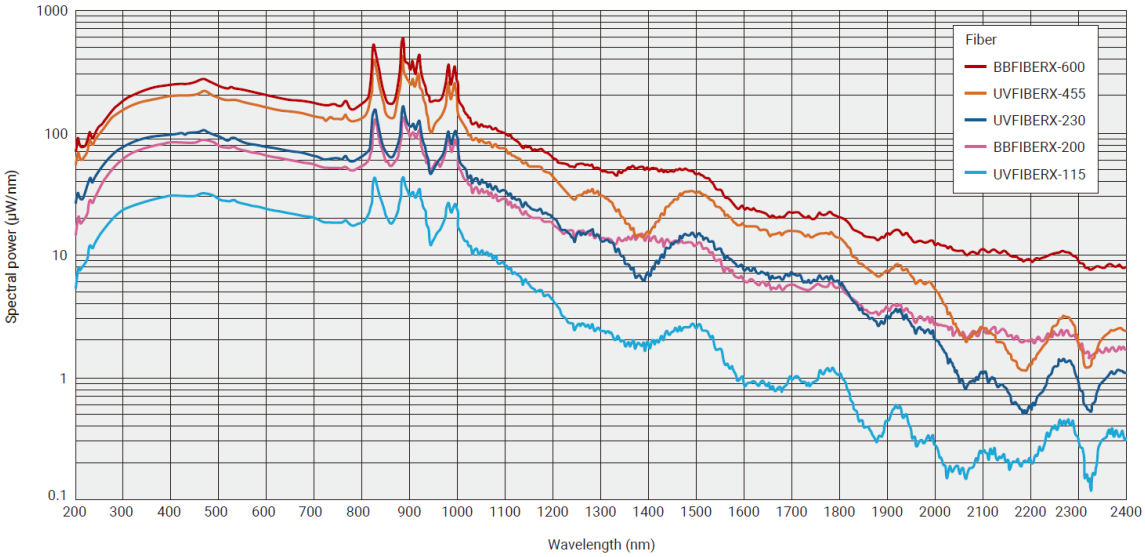


When collimating light from traditional light sources, the beam divergence or widening angle usually becomes a problem.
LDLS allows forming ideal collimated light with a smaller divergence angle than xenon lamps. The small emitting point is also advantageous for efficiently focusing the light onto a very small area.

EQ-99X-FC-S

The EQ-99X-FC-S is a fiber-coupled LDLS.
Two types of optical fibers are available for selecting a wavelength range that matches your application. The lamphead of the EQ-99X-FC-S is compact and generates lower heat, making it ideal for experiments in cramped spaces or for installation into equipment. The lamphead is designed to cool by natural convection thus eliminating vibrations caused by cooling fans and ensuring a highly stable light output.

●Broadband optical power



Product standard specifications

Parameter		Description / Value	Unit
Optical interface		Fiber coupled output	-
Wavelength range ①		190 to 2500	nm
Plasma size (FWHM)	Typ.	100 × 180	µm
Numerical aperture	NA	0.22	-
Lifetime	Typ.	10 000	h
Warm-up time		30	min
Laser class		Class 1	-
Broadband optical power ②		95	mW
Output termination		FC or SMA 905	-
Cooling method		No auxiliary cooling required	-
Nitrogen purge		Recommended. Grade 4.8 or higher, filtered to 5 µm. 20 psiG ±2 psiG	-
Applicable standards		EN 61010-1, EN 61326-1, IEC 60825-1, IEC 62471, EN 50581	-
Device configuration		Lamphead, Power supply controller, Remote control, AC adapter, Necessary cables	-
Power rating	Input voltage (AC)	100 to 240	V
	Power frequency	50 / 60	Hz
	Power consumption	175	W

① The optical fiber should be selected according to wavelength range required for the application.
② Optical power from the optical fiber (UVFIBERX-230) was measured with a thermopile.

Fiber

Optical fibers can be selected with the following core diameters, lengths and connector terminations.

Parameter	UV type						Broadband type								Unit
Type	UV FIBERX						BB FIBERX								-
Recommended wavelength range	190 to 900						350 to 2500 ③								nm
Broadband optical power	30		95		195		25		80		180		215		mW
Core size	115		230		455		100		200		400		600		µm
Length	1	2	1	2	1	2	1	2	1	2	1	2	1	2	m
Termination	FC-FC or FC-SMA														-

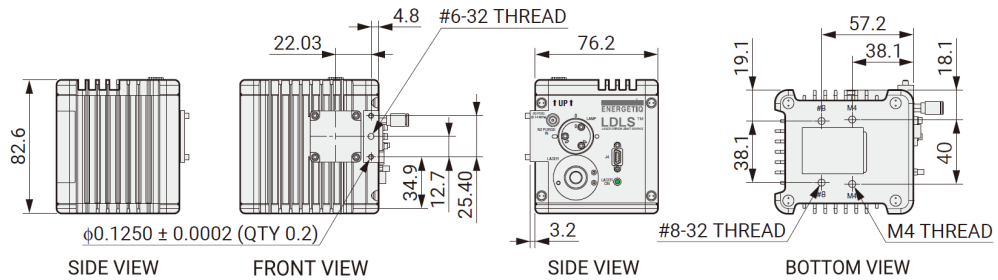
* The model number of each optical fiber is determined by fiber type, core diameter, length and connector termination.
Example: UVFIBERX-230-1M-FC-SMA (UV type, fiber core diameter: 230 µm, length: 1 m, connector: FC-SMA)

* The EQ-99X-FC must use the above dedicated optical fibers.
Attempting to use any other optical fibers will cause optical fiber connector problems, damage to the lamphead and will affect performance.

③ Although light at wavelengths shorter than 350 nm also passes through the broadband type optical fiber, the fiber transmittance within that wavelength range will drop within a short time. For applications that require UV output, we strongly recommend selecting the UV type optical fiber as they are optimized for that wavelength range.

Dimensional outlines (Unit: mm)

● Lamphead



*The controller is same to EQ-99X-QZ-S (P.06).

Precautions for use

Input ratings

To ensure safe product use, comply with the input ratings and precautions. For instructions on how to operate, refer to the user manual that comes with the product.

UV light

LDLS emits UV light harmful to eyes and skin. Looking directly at the operating lamp or exposing the skin to light emission may cause inflammation. Always wear light-shielding protective glasses or goggles (JIS T8141 or equivalent safety standards) during operation.

Ozone

Light emitted from the LDLS output window decomposes oxygen molecules in the air and produces ozone. Provide good ventilation during operation.

Nitrogen purge

If the LDLS is operated without nitrogen purging, ozone will be generated inside the lamphead. The generated ozone will absorb UV light causing loss of transmittance in the bulb and window thus reducing output in the UV region. Nitrogen purging is strongly recommended and in some cases required for applications that require UV output.

Replacing the bulb

When the bulb needs to be replaced, return the lamphead along with all other components and accessories to us and we will replace the bulb with a new one (a replacement fee will be charged). Only the bulb in the EQ-99X-QZ-S is replaceable by the customer. Please contact our sales office for detailed information. We do recommend standard maintenance in the form of a bulb and window change once every year or ~10,000 hours.

Do not disassemble and modify

The internal components of each product are precisely adjusted. Disassembly or modification might not only cause improper operation but also product failure leading to unsatisfactory performance. Never try to disassemble or modify any part of the product.

⚠ Warning Caution points regarding laser light exposure

Laser Class of lasers used in LDLS

Laser-Driven Light Sources (LDLS) listed in this catalog are classified as Class 1 except for the EQ-400 series which is classified as Class 4. Take necessary safety measures according to the laser class of each light source.

Precautions for exposure to laser light

Before operating the LDLS, confirm the laser product classification defined by IEC 60825-1 (JIS C 6802) and take safety measures that comply with the laser class. Also comply with the latest regulations and safety standards in your own country.

Examples of label

● Class 1 (EQ-99X / EQ-77)

Laser class label

● Class 4 (EQ-400)

Laser class label

Warning label

Disposal

When disposing of the product, be sure to comply with the local regulations in your country.

Warranty

Products listed in this catalog are warranted for a period of one year from the date of shipment. During the bulb warranty period, we warranty that the light output at 500 nm will not degrade more than 50 % from the initial value under nitrogen purging. The warranty is limited to repair or replacement of the defective product.
Even if within the warranty period this warranty shall not apply to product failures in cases where the product has been misused, altered or damaged by accidents such as due to natural or man-made disasters.

●Manufacturer and seller
LDLS is developed and manufactured by Energetiq Technology, inc. and sold through Hamamatsu sales channel. Please refer to following URL for detailed contacts.
https://www.energetiq.com/contact-energetiq-and-global-distributors

Light Done Right!

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