LIGHT SOURCE

Xenon lamp, Xenon flash lamp, Mercury-Xenon lamp, Deuterium lamp and Hollow cathode lamp

HAMAMATSU

PHOTON IS OUR BUSINESS

Long Life High Stability

Light measurement technology is utilized in many applications including industry, medical diagnosis, environmental monitoring, and academic research fields. Light sources (lamps) as well as optical sensors used in light measurement equipment must have high performance characteristics. Over a long period of years, Hamamatsu Photonics has been manufacturing various lamp types that deliver high stability and long life, including light sources used for chemical analysis equipment.

We continually develop and improve electrode materials and lamp structures so that each lamp delivers exceptional features and benefits.

We also offer an extensive line of peripheral products and accessories such as power supplies, trigger sockets and lamp housings that are optimally designed to deliver maximum lamp performance.

Hamamatsu light source lamps enhance the accuracy of customer measuring equipment, simplify maintenance, and reduce running costs.

ASNITE is the comprehensive accreditation system operated by National Institute of Technology and Evaluation (NITE) according to the international and foreign national standards where there are no relevant national standards in Japan. (JCSS does not meet those international standards.)
The Planning Engineering Dept. of Hamamatsu Photonics K. K. was accredited as an ASNITE calibration company in the "Light" field on May 7, 2004 and is entitled to issue calibration certificates bearing the ASNITE logo mark (ASNITE accreditation symbol).

This is the logo mark for the Accreditation System of National Institute of Technology and Evaluation (ASNITE), an independent administrative agency in Japan. NITE independently implements calibration standards based on international standards.

The Planning Engineering Dept. of Hamamatsu Photonics K. K. was accredited as a calibration company in the "Light" field on May 21, 1999 and is entitled to issue calibration certificates bearing the JCSS logo mark (JCSS accreditation symbol). Those calibration certificates assure the traceability to National Measurement Standards and can be used, for example, as a traceability certificate for ISO9000 series.

This is the logo mark for the traceability system approved by the Japan Calibration Service System (JCSS) based on the Measurement Law.

LIGHT SOURCE

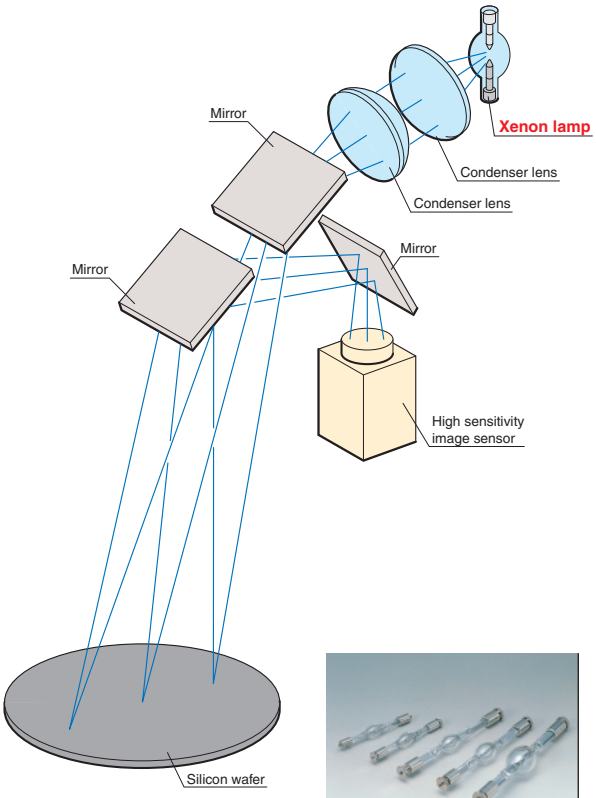
CONTENTS

APPLICATIONS

Hamamatsu light source has been distributing in world wide, and well known for plenty of application besides below figures.

Semiconductor

Wafer surface inspection system

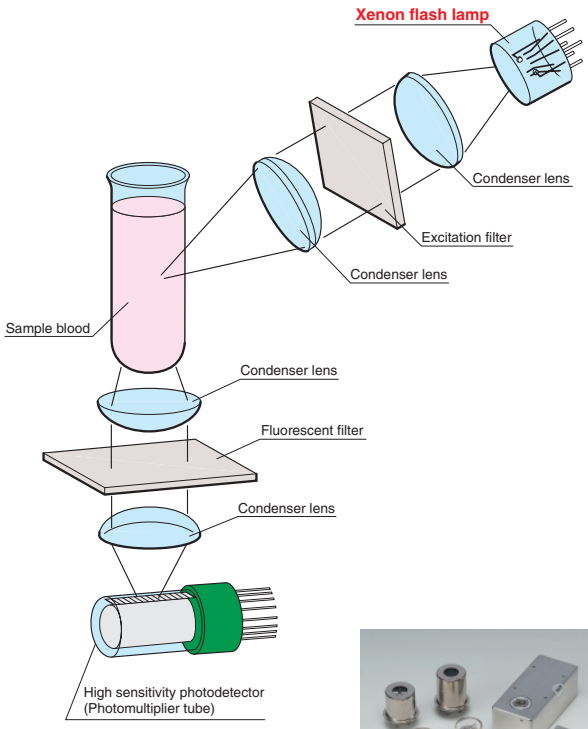


TLSOC0024EC

Xenon Lamps

Medical

Blood analyzer



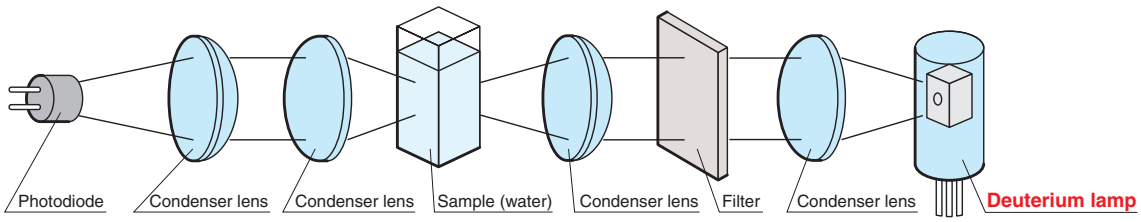
TLSOC0027EB

Xenon Flash Lamps

Environment

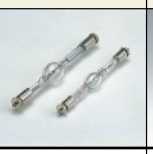
Water pollution analysis

Deuterium Lamps



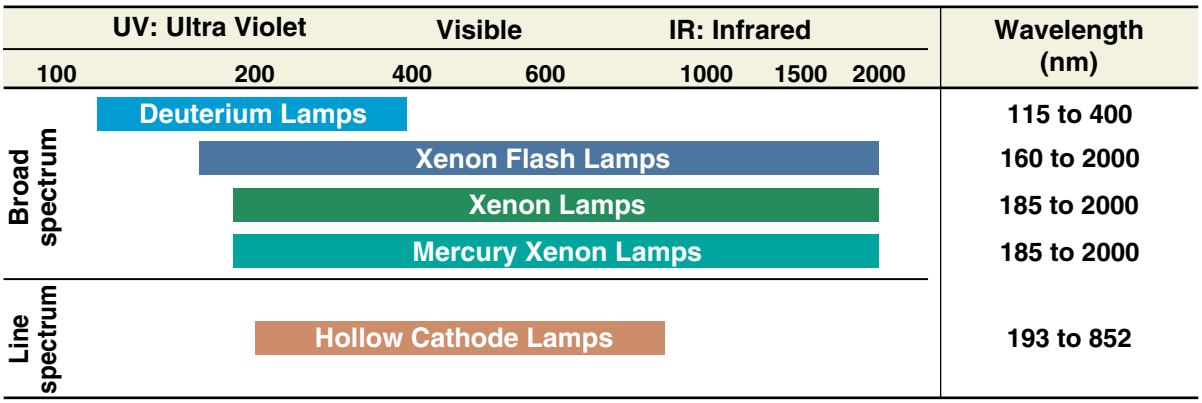
TLSOC0051EA

QUICK REFERENCE TO PRODUCT SELECTION

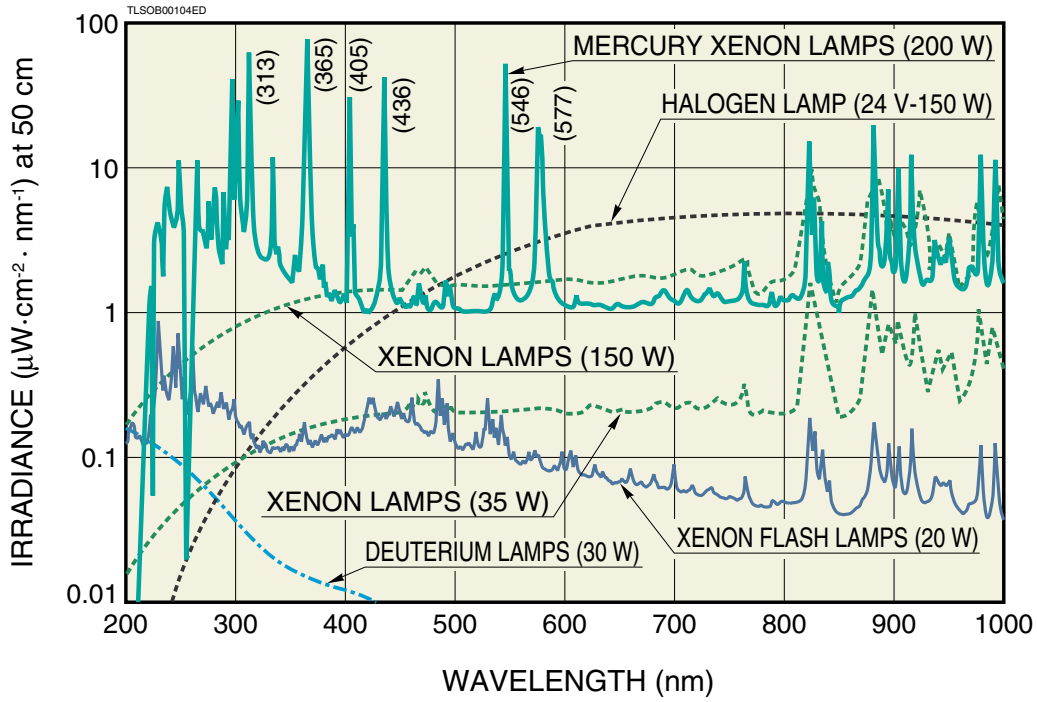
Field	Light Source / Applications	XENON LAMPS	XENON FLASH LAMPS	MERCURY XENON LAMPS	DEUTERIUM LAMPS	HOLLOW CATHODE LAMPS	OTHERS
							
Semiconductor	UV EXPOSURE SYSTEMS ON THE WAFER			●			SPOT LIGHT SOURCES
	WAFER INSPECTION SYSTEMS	●	●	●	●		
	FILM THICKNESS MEASUREMENT			●	●		UV-VIS FIBER LIGHT SOURCES
	PARTICLE MEASUREMENT FOR PURE WATER				●		
	PHOTO CVD				●		VUV LIGHT SOURCE UNITS
	ELECTROSTATIC REMOVAL				●		VUV LIGHT SOURCE UNITS
FA	FA STROBOSCOPES		●				FLASH LIGHT SOURCES
	UV CURING SYSTEMS			●			SPOT LIGHT SOURCES UV-LED MODULE
	UV INK DRY OR FREEZE		●	●			SPOT LIGHT SOURCES UV-LED MODULE
Information	SOLAR SIMULATORS	●					
	COLOR SCANNERS	●					
	COLOR ANALYZERS	●	●				
	FLUORESCENCE MICROSCOPES	●		●			
Medical	DNA SEQUENCERS				●		
	IN-VITRO DIAGNOSIS		●				
	BLOOD ANALYZERS	●	●	●	●		
	FLOW CYTOMETERS	●		●			
	CAPILLARY ELECTROPHORESIS	●			●		
	ENDOSCOPES	●					
	FLUORESCENCE SPECTROPHOTOMETERS	●	●	●	●		
	POLARIMETERS	●		●			
Environment	BOD/COD ANALYZERS	●			●		
	SOx/NOx ANALYZERS	●	●	●	●		UV-VIS FIBER LIGHT SOURCES
	WATER ANALYSIS		●		●	●	
Analysis	ATOMIC ABSORPTION SPECTROPHOTOMETERS				●	●	
	HIGH PERFORMANCE LIQUID CHROMATOGRAPHY	●	●		●		
	WAVELENGTH CALIBRATION	●			●	●	
	UV / VISIBLE SPECTROPHOTOMETERS	●	●		●		
	PHOTOIONIZATION				●		VUV LIGHT SOURCE UNITS
Bio-logical	LIGHT SOURCE FOR LIVING BODY STIMULATION EXPERIMENTS	●					OSG (OPTO-SPECTRUM GENERATOR)

WAVELENGTH

Hamamatsu light sources can be broadly divided by radiant spectrum distribution into two groups: one is "broad spectrum light sources" that cover a wide spectral range from "UV to visible" or "UV through infrared", and the other is "line spectrum light sources" that emit sharp line spectrum characterized by the metallic elements sealed within the lamp.



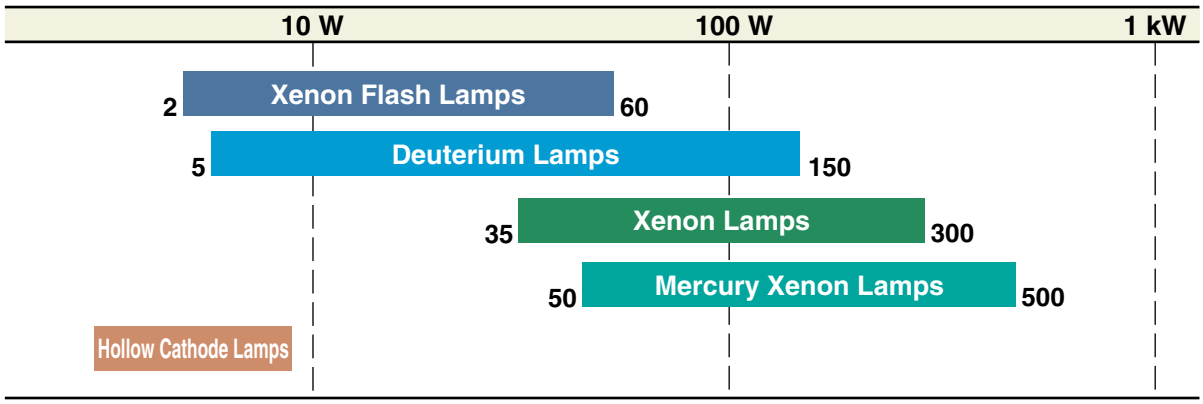
●Spectral Distribution — Broad spectrum



WATTAGE

Light output from a lamp is basically proportional to the input power. However, pulsed lighting can provide a momentary (in microseconds) higher brightness than the continuous lighting type. This makes pulsed lighting ideally suited for applications requiring high output power for a short duration. The radiant distribution of lamps must also be taken into account in order to utilize the optimum emission point with high stability and high output power.

■ INPUT WATTAGE



Instantaneously high peak output: Xenon flash lamp

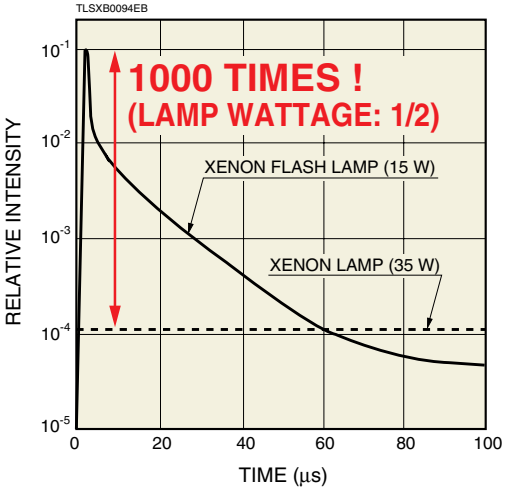
1000 times at several micro seconds!

Light output intensity usually increases in proportion to the input power. However, when evaluating intensity in units of an extremely short duration, pulsed lighting can momentarily provide a very intense light output. For several microseconds, this is about 1000 times higher than that in continuous mode lamps. (For more details, refer to our technical data sheet on Xenon flash lamps.)

TLSXF0116

Xenon flash lamps

TLSXB0094EB

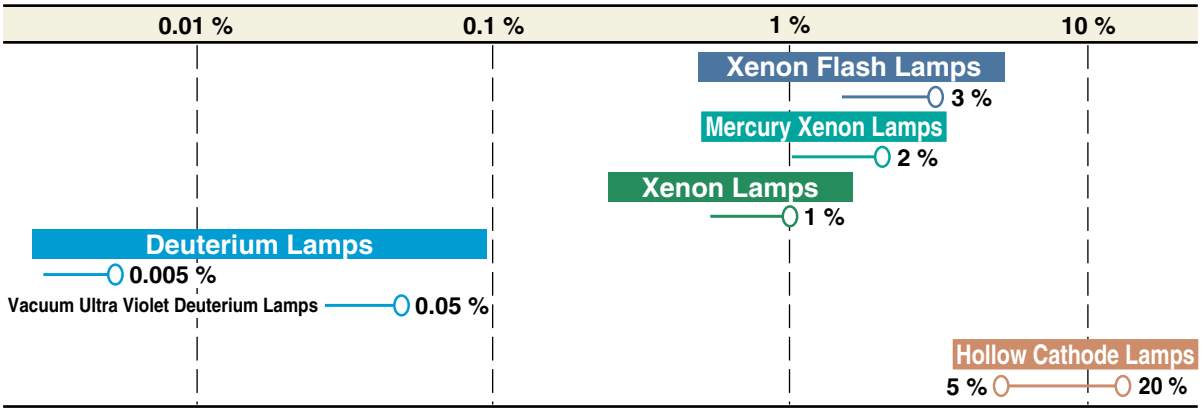


STABILITY

Light output stability can be classified into "fluctuation" (short-term stability) and "drift" (long-term stability). To select optimum lamps that meet your application, these stability characteristics must be taken into account.

$$\left[\frac{\text{Small variations in light output}}{\text{Mean Light output}} \times 100 = \text{Light output stability (\%)}\right]$$

■ FLUCTUATION (Short-term stability)

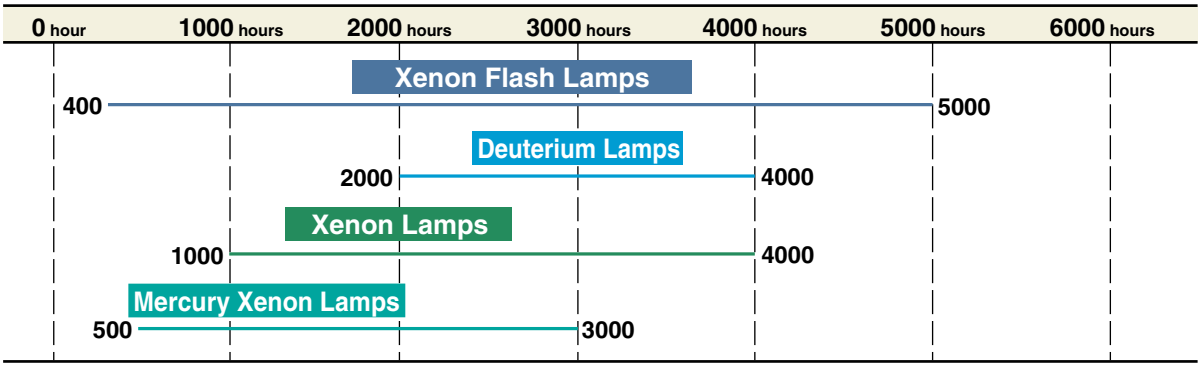


Lamp light output stability is an important factor that affects measurement accuracy and reliability of equipment. To supply lamps with high output stability, Hamamatsu has made consistent efforts to achieve "ideal electrode construction and positioning accuracy" and also to develop "optimum power supplies".

LIFE

Lamp life characteristics directly affect maintenance costs of the equipment in which the lamp is installed. In view of this, Hamamatsu define the lamp life end as the time when the output fluctuation exceeds a specified range (excluding some types of lamps), in addition to the guaranteed life generally used to define the life end (the time when the light output falls to a certain point).

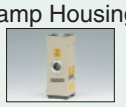
■ OPERATION TIME



* Hollow Cathode Lamps Life is defined at the operation current and the operation time

Using a lamp with a longer service life leads to the reduction of "maintenance cost and time" and "running cost" of equipment. Due to unique electrode structures with minimum electrode wear, Hamamatsu lamps feature unprecedented high stability over extended periods of operating time.

FEATURES

Lamp	Features of Lamp	Features Made in Hamamatsu	Spectral Distribution (nm)	Wattage (W)	Output Stability Fluctuation (p-p)	Life (hour)	Accessory
Xenon Lamp	• Broad spectrum from UV to IR • Color temperature: 6000K • Point source	• Long life: 4000 hours • High stability Fluctuation (p-p): 0.2 % Typ. • No arc point shift	185 to 2000	35 to 300	Less than 1 %	1000 to 4000	Lamp Housing  Power Supply 
Xenon Flash Lamp	• Broad spectrum from UV to IR • Color temperature: 15000K • Pulse light • Instantaneously high peak output • Low heat • Point source	• Long life: 5000 hours • High stability Fluctuation (p-p): 1.0 % Typ.	160 to 2000	2 to 60	Less than 3 %	400 to 5000 (Depends on the repetition rate)	Trigger Socket  Shield Box  Power Supply 
Mercury Xenon Lamp	• Continuous spectrum from UV to IR and strong line spectra in the UV to visible • Point source	• Long life: 3000 hours • Instantaneous starting and restarting • High UV intensity	185 to 2000	50 to 500	Less than 2 %	500 to 3000	Lamp Housing  Power Supply 
Deuterium Lamp	• Broad spectrum in UV range • High stability: 0.005 % typ. • Point source	• High stability: 0.005 % (Typ.) - L2D2®, X2D2®, S2D2® • Long life: 4000 hours - L2D2® • Stationary emission point ensures high accuracy (Flange type) • Less variation of intensity	115 to 400	5 to 150	0.005 % Typ.	2000 / 4000	Lamp Housing  Power Supply 
Hollow Cathode Lamp	• Metal-vapor discharge lamp	• 66 types of single element lamps and 11 types of multi-element lamps	193 to 852	Less than 10	5 % to 20 % (Depends on the element)	—— (Depends on the type and operating condition)	——

SUPER-QUIET XENON LAMPS

Semiconductor | Information | Medical | Environment | Analysis

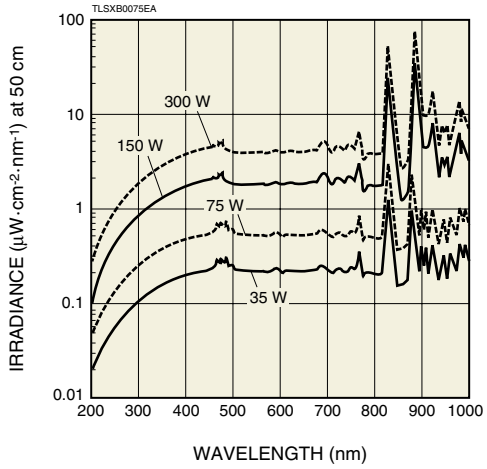
Hamamatsu super quiet xenon lamps are point light sources with extremely high brightness and color temperature that emit a continuous spectrum from the UV to infrared region, making them ideal as light sources in a variety of photometric applications such as spectrophotometers. These super quiet lamps employ a high performance BI cathode that ensures extremely enhanced stability and long service life.

The long life xenon lamp series features a new electrode that significantly extends product life compared to conventional xenon lamps. This significant increase in service life helps reduce time-consuming maintenance tasks such as lamp replacement and lamp position alignment.

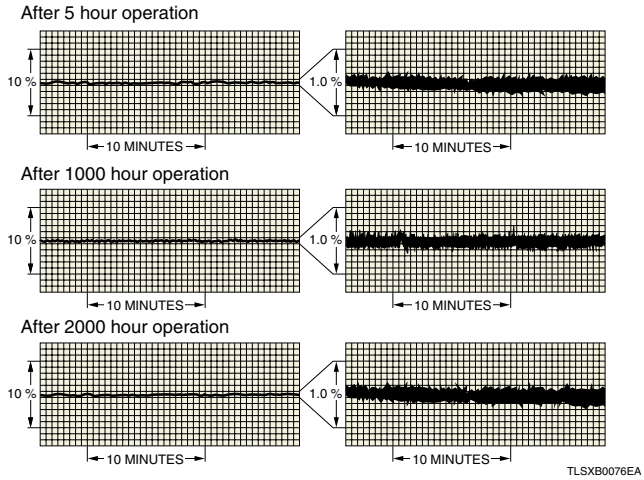
Other benefits from using the long life xenon lamp include saving natural resources and a smaller burden on the environment.

TLSXF0024

■ Spectral Distribution (Fused Silica Type)



■ Fluctuation vs. Operating Time



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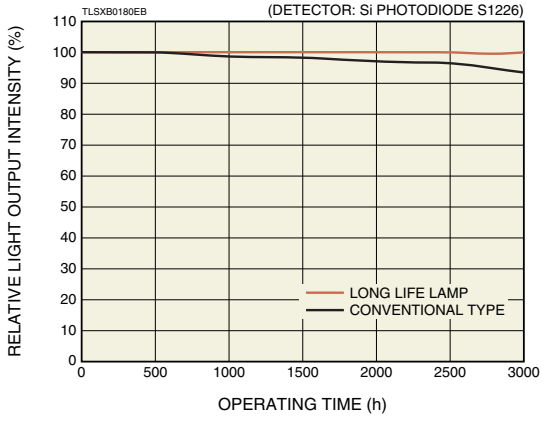
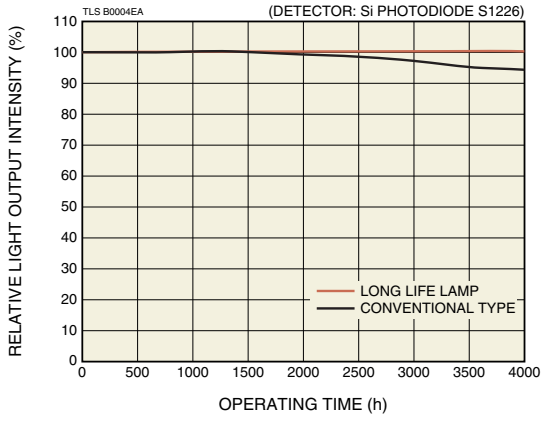
■ Light Output Intensity and Operating Time

●75 W Xenon Lamp



●150 W Xenon Lamp



Related Products

Power supplies and lamp housings are also available.
Please refer to the individual catalog for details.

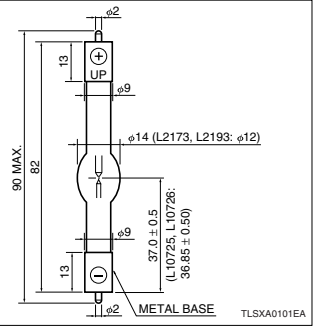
Characteristics

Type No.	Lamp Rating (W)	Arc Length (mm)	Dimensional Outline	Window Material	Spectral Distribution (nm)	Lamp Current (A dc)	Lamp Voltage (V dc)	Output Stability		Operating Life	
								Drift Typ. (%/h)	Fluctuation (p-p) Max. (%)	Guaranteed Life (h) Ⓐ	Average Life (h)
L2173	35	1.0	❶	Fused Silica	185 to 2000	3.5±0.2	11	±0.5	1.0	1000	2000
L2193				Ozone-free Silica	240 to 2000						
L2174	75	1.3	❶	Fused Silica	185 to 2000	5.4±0.5	15	±0.5	1.0	1000	2000
L2174-01			❷								
L2174-02			❸								
L10725		1.0	❶			5.7±0.3	13.5			2000	3000
L10725-01			❷								
L10725-02			❸								
L2194		1.3	❶	Ozone-free Silica	240 to 2000	5.4±0.5	15	±0.5	1.0	1000	2000
L2194-01			❷								
L2194-02			❸								
L2194-11		1.0	❷				13				
L10726			❶			5.7±0.3	13.5			2000	3000
L10726-01			❷								
L10726-02			❸								
L11307	100	1.3	❶	Fused Silica	185 to 2000	7.0±0.5	15	±0.5	1.0	1500	2500
L11307-01			❷								
L9289			❶	Ozone-free Silica	240 to 2000						
L9289-01			❷								
L2175	150	2.5	❹	Fused Silica	185 to 2000	7.5±0.5	19	±0.5	1.0	1200	2500
L2195				Ozone-free Silica	240 to 2000						
L2273 (GS Type)Ⓑ		2.0		Fused Silica	185 to 2000	8.5±0.5	17			1800	3000
L2274 (GS Type)Ⓑ				Ozone-free Silica	240 to 2000						
L11033				Fused Silica	185 to 2000					3000	4000
L11034				Ozone-free Silica	240 to 2000						
L2479	300	3.0	❺	Fused Silica	185 to 2000	15.0±1.0	20	±0.5	1.0	1000	2000
L2480				Ozone-free Silica	240 to 2000						

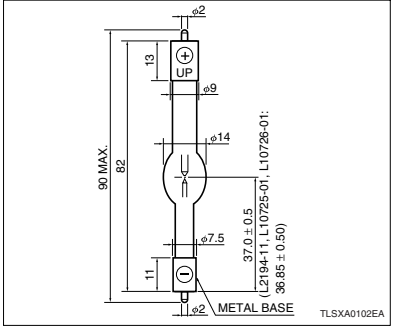
ⒶThe life end is defined as the time at which the radiant intensity falls to 50 % of its initial value or when the output fluctuation (p-p) exceeds 1.0 %. ⒷGS (short gap) type

Dimensional Outline Unit: mm

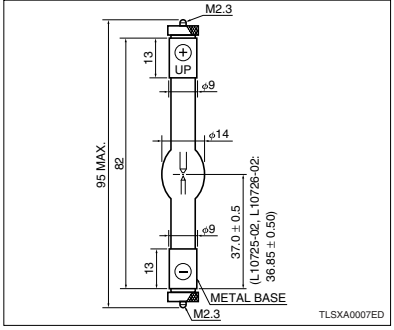
❶ L2173, L2193, L2174, L2194, L9289, L10725, L10726, L11307



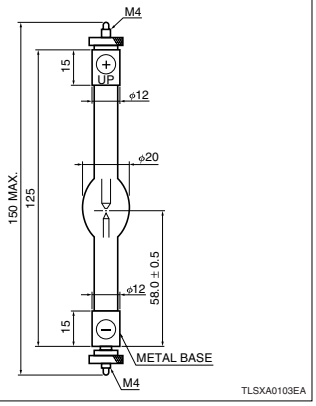
❷ L2174-01, L2194-01/-11, L9289-01 L10725-01, L10726-01, L11307-01



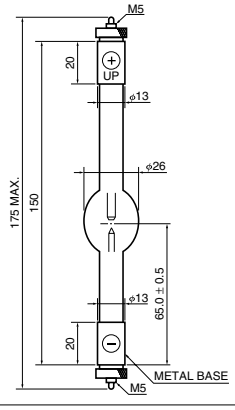
❸ L2174-02, L2194-02, L10725-02 L10726-02



❹ L2175, L2195, L2273 (GS Type), L2274 (GS Type), L11033, L11034



❺ L2479,L2480

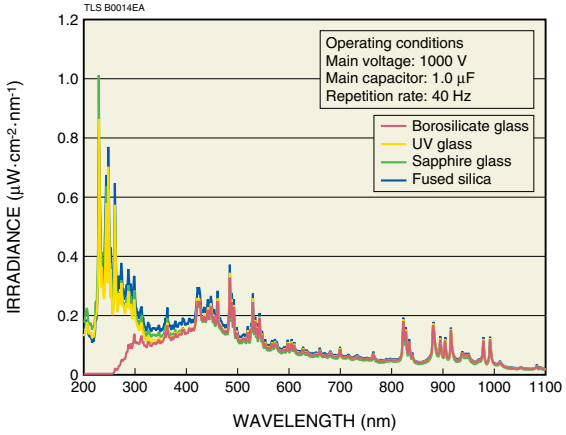


SUPER-QUIET XENON FLASH LAMPS

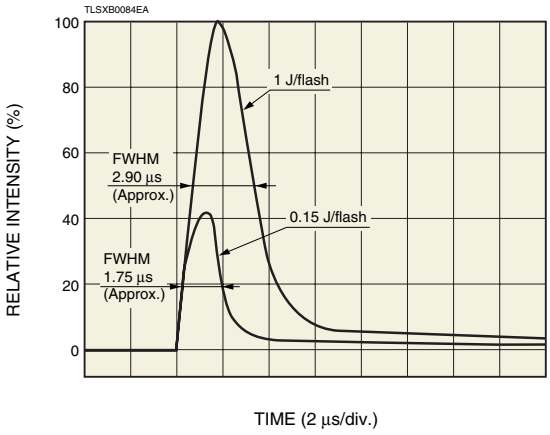
Semiconductor | FA | Information | Medical | Environment | Analysis

Xenon flash lamps emit a brilliant continuous spectrum from UV to infrared and feature a compact construction and less heat generation compared to continuous mode lamps.
Hamamatsu super quiet xenon flash lamps are ideally suited for precision photometry because of outstanding characteristics such as higher light output stability and longer service life due to the improved electrode construction and material.
Hamamatsu provides 5 types of super quiet xenon lamps: the SQ type using a high performance BI cathode, the general-purpose HQ type having characteristics similar to the SQ type, the built-in reflector type that emits light output 4 times higher than conventional lamps, the 20 W / 60 W high power type constructed with a metal can package and built-in reflector type 60 W high power type constructed with a metal can package.
Our product lineup includes compact lamp modules with lamp, trigger socket and power supply all integrated into one unit.

■ Spectral Distribution (20 W Type)



■ Flash Pulse Waveform (60 W type) [Typ.]



Xenon Flash Lamp Modules

Easy-to-use lamp modules with built-in xenon flash lamp, power supply and trigger socket.
Hamamatsu provides a wide product lineup of compact 2 W types and 5 W types. The 5 W types include a side-on type, head-on type, high output type having double the light output, silent type, and high precision type.

■ LINE-UP

Type No. (series)	Type	Arc size (mm)	Main Discharge Capacitor (µF)	Maximum Input Energy [per flash] (mJ)	Window Material	Main Discharge Voltage Adjustable (V)	Max.Average Input [continuous] (W)	Input Voltage Range (V)	Dimensions (W × H × D) (mm)
L12336 Ⓐ	2 W	1.0	0.141 0.094 0.047 0.020	25	UV Glass	400 to 600	2	11 to 15	42 × 37 × 42
L9455 Ⓐ	5 W Side-on	1.5	0.22 0.11	50	UV Glass / Borosilicate Glass / Synthetic Silica	400 to 600	5	11 to 28	44 × 35 × 98
L9456		3.0	0.047 0.28						
L11035 Ⓐ	5 W Head-on	1.5	0.22 0.11	50					
L11036		3.0	0.047 0.28						
L11316 Ⓐ	5 W High output	1.5	0.2	100		500 to 1000			
L11317		3.0	0.1						

NOTE: ⒶSMA fiber adapter types are also available.

Related Products

Power supplies, trigger sockets, shield box and cooling jacket are also available.
Please refer to the individual catalog for details.

■ Characteristics

Type No.	Type	Arc Size (mm)	Dimensional Outline	Bulb Shape	Window Material	Spectral Distribution (nm)	Recommended Supply Voltage (V dc)	Trigger Voltage p-p (kV)	Max. Average Power [Continuous] (W)	Max. Average Energy per Flash (J/Flash)	Repetition Rate Max. (Hz)	Output Stability Ⓐ Output Fluctuation Ⓓ Max. (%)	Guaranteed Life Ⓐ Min. (Number of Flashes)	Suitable Trigger Socket
L4644	10 W HQ Type	3.0	❶-ⓐ	Hemisphere	UV Glass	185 to 2000	700 to 1000	5 to 7	10	0.1	100	3 Ⓓ	1.0×10^9	E2418 / E6188
L4646			❷-ⓐ	Flat										
L4645			❶-ⓐ	Hemisphere	Borosilicate Glass	240 to 2000								
L4647			❷-ⓐ	Flat										
L4640		1.5	❶-ⓑ	Hemisphere	UV Glass	185 to 2000								
L4642			❷-ⓑ	Flat										
L4641			❶-ⓑ	Hemisphere	Borosilicate Glass	240 to 2000								
L4643			❷-ⓑ	Flat										
L2358	15 W SQ Type	3.0	❸-ⓑ	Flat	Synthetic Silica	160 to 2000	700 to 1000	5 to 7	15	0.15	100	2.5 Ⓓ	1.2×10^9	E2361 Series
L2359					UV Glass	185 to 2000								
L2360					Borosilicate Glass	240 to 2000								
L4633	15 W Built-in Reflector Type	1.5	❹	Converging	Borosilicate Glass	240 to 2000	700 to 1000	5 to 7	15	0.15	100	5 Ⓓ	5.0×10^8	E4370-01
L4634			—Ⓕ	Collimating										
L11957	20 W Type	3.0	❺-ⓐ	Flat	UV Glass	185 to 2000	700 to 1000	5 to 7	20	0.5	300	2 %CV Ⓔ	1.0×10^8	E10978
L11956				Flat	Borosilicate Glass	240 to 2000								
L11937		1.5	❺-ⓑ	Flat	UV Glass	185 to 2000								E10977
L11936				Flat	Borosilicate Glass	240 to 2000								
L11967	20 W Built-in Reflector Type	3.0	❺-ⓐ	Flat Ⓒ	UV Glass	185 to 2000	700 to 1000	5 to 7	20	0.5	300	2 %CV Ⓔ	1.0×10^8	E10978
L11966				Flat Ⓒ	Borosilicate Glass	240 to 2000								
L11947		1.5	❺-ⓑ	Flat Ⓒ	UV Glass	185 to 2000								E10977
L11946				Flat Ⓒ	Borosilicate Glass	240 to 2000								
L6604	60 W Type	3.0	❻	Flat	Borosilicate Glass	240 to 2000	700 to 1000	5 to10	60	1	60	3 ⒷⒹ	8.0×10^7	E6647
L6605					Sapphire Glass	190 to 2000								
L7684	60 W Built-in Reflector Type			Flat Ⓒ	Borosilicate Glass	240 to 2000								
L7685					Sapphire Glass	190 to 2000								

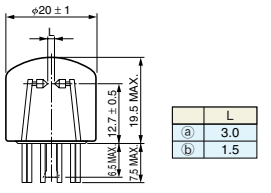
Ⓐ Measured with supply voltage of 1000 V, main discharge capacitor of 0.1 µF, repetition rate of 50 Hz and wavelength of 400 nm.
Ⓑ Measured with supply voltage of 1000 V, main discharge capacitor of 2 µF, repetition rate of 10 Hz and wavelength of 400 nm.
Ⓒ Built-in reflector

Ⓓ Output stability (%) = $\frac{\text{(Max. output – Min. output)}}{\text{Average output}} \times 100$ Ⓔ Light output stability (%CV) = $\frac{\text{Light output standard deviation}}{\text{Average light output}} \times 100$

Ⓕ Please refer to the individual catalog for detailed information.

■ Dimensional Outline Unit: mm

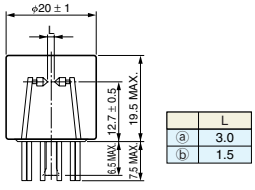
❶ L4644, L4645, L4640, L4641



	L
ⓐ	3.0
ⓑ	1.5

TLSXA0033EC

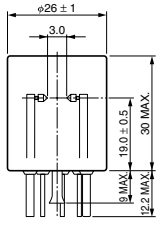
❷ L4646, L4647, L4642, L4643



	L
ⓐ	3.0
ⓑ	1.5

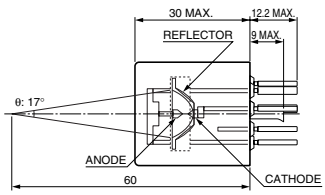
TLSXA0036EC

❸ L2358, L2359, L2360



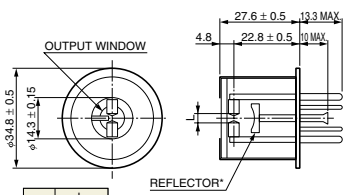
TLSXA0027EC

❹ L4633



TLSXA0003ED

❺ L11957, L11956, L11937, L11936 L11967, L11966, L11947, L11946

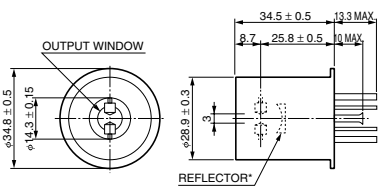


	L
ⓐ	3.0
ⓑ	1.5

* L1194X, L1196X only

TLS A0011EA

❻ L6604, L6605, L7684, L7685



* L7684, L7685 only

TLSXA0049EC

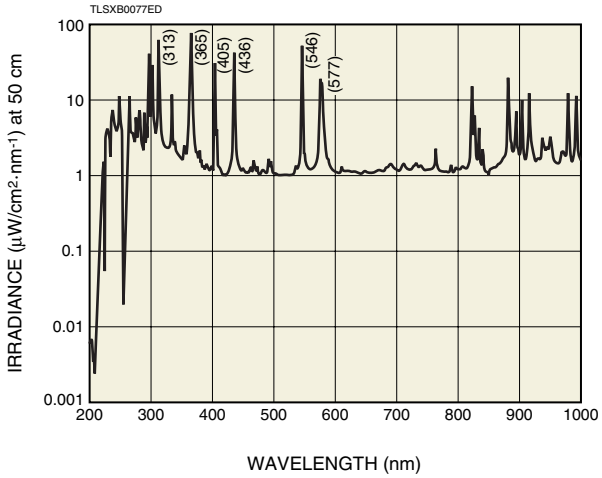
SUPER-QUIET MERCURY XENON LAMPS

Semiconductor | FA | Information | Medical | Environment

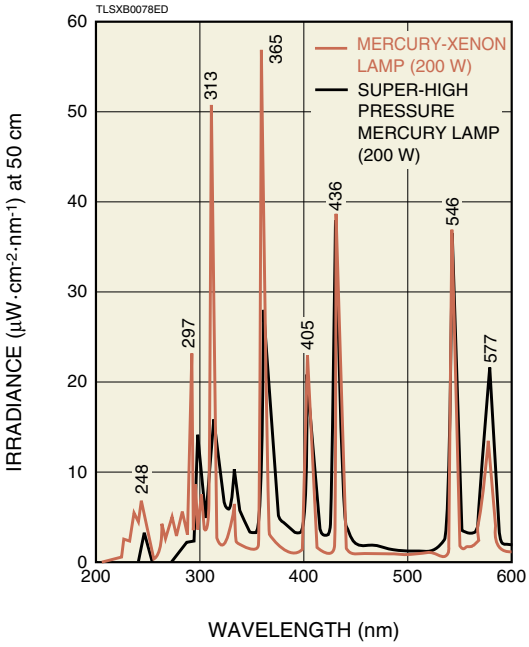
Mercury-xenon lamps are designed to provide high radiant energy in the UV region. These lamps are sealed with an optimum mixture of mercury and xenon gas that offer the best characteristics of both xenon lamps and super-high-pressure mercury lamps. For example, the spectral distribution includes the continuous spectrum from UV to infrared of xenon gas and the intense line spectra of mercury in the UV to visible region. The radiant spectrum in the UV region is higher in intensity and sharper in width when compared with super-high-pressure mercury lamps and Xenon lamps. Mercury-xenon lamps also feature instantaneous lighting and re-lighting, which are difficult to obtain in super-high-pressure mercury lamps, thus making these mercury-xenon lamps an excellent choice as UV light sources.
Just as with super quiet Xenon lamps, Hamamatsu super quiet mercury-xenon lamps employ a high performance BI cathode (barium-impregnated electrode) that ensures extremely enhanced stability and long service life.

TLSXF00047

■ Spectral Distribution (200 W)



■ Comparison of Spectral Distribution between Mercury-Xenon Lamps and Super-High-Pressure Mercury Lamp



Related Products

Power supplies and lamp housings are also available.
Please refer to the individual catalog for details.

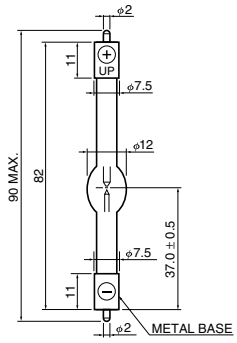
■ Characteristics

Type No.	Lamp Rating (W)	Arc Length (mm)	Dimensional Outline	Window Material	Spectral Distribution (nm)	Lamp Current (A dc)	Lamp Voltage (V dc)	Output Stability		Operating Life	
								Drift Typ. (%)	Fluctuation (p-p) Max. (%)	Ⓐ Guaranteed Life (h)	Average Life (h)
L2421	50	1.0	❶	Fused Silica	185 to 2000	3.5±0.2	14	±0.5	2.0	500	1000
L2481	75	1.0	❷	Fused Silica	185 to 2000	5.4±0.5	14	±0.5	2.0	500	1000
L2481-01			❸								
L2481-02			❹								
L2422	100	1.3	❷	Fused Silica	185 to 2000	5.5±0.5	18	±0.5	2.0	500	1000
L2422-01			❸								
L2422-02			❹								
L7046			❷	Ozone-free Silica	240 to 2000						
L8029		0.8	❸	Fused Silica	185 to 2000						
L8029-01										1000	2000
L2482	150	1.7	❺	Fused Silica	185 to 2000	7.5±0.5	20	±0.5	2.0	1000	2000
L7047				Ozone-free Silica	240 to 2000						
L2423	200	2	❺	Fused Silica	185 to 2000	8.0±0.5	24	±0.5	2.0	1000	2000
L2570				Ozone-free Silica	240 to 2000						
L8706	250	1.8	❻	Fused Silica	185 to 2000	8.5±0.5	27	±0.5	3.0	2000	3000
L2483	350	2.5	❼	Fused Silica	185 to 2000	14.0±1.0	25	±0.5	2.0	500	1000
L2917				Ozone-free Silica	240 to 2000						
L8288	500	3.0	❼	Fused Silica	185 to 2000	20.0±1.0	25	±0.5	2.0	1000	2000

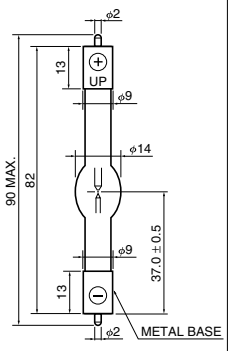
ⒶThe life end is defined as the time at which the radiant intensity falls to 50 % of its initial value or when the output fluctuation (p-p) exceeds 2.0 % (3.0 % for 250 W type L8706).

■ Dimensional Outline Unit: mm

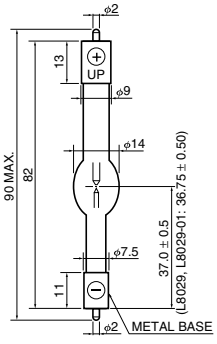
❶ L2421



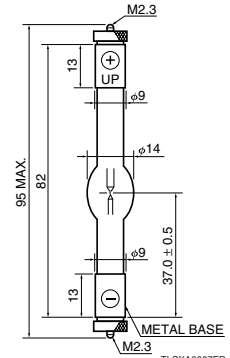
❷ L2481, L2422, L7046



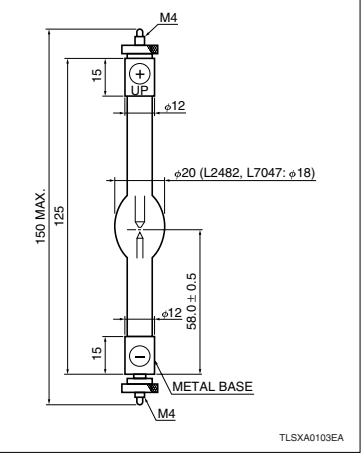
❸ L2481-01, L2422-01, L8029/-01



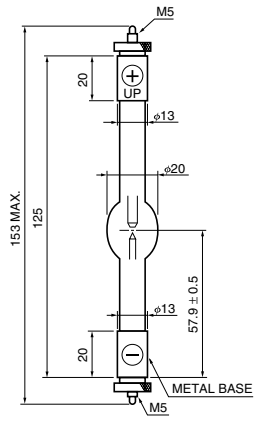
❹ L2481-02, L2422-02



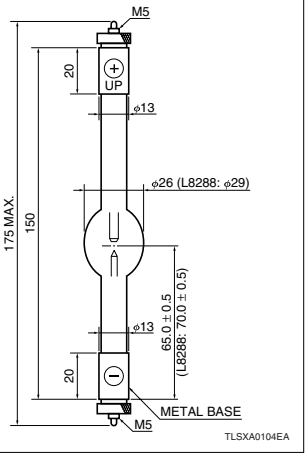
❺ L2482, L7047, L2423, L2570



❻ L8706



❼ L2483, L2917, L8288

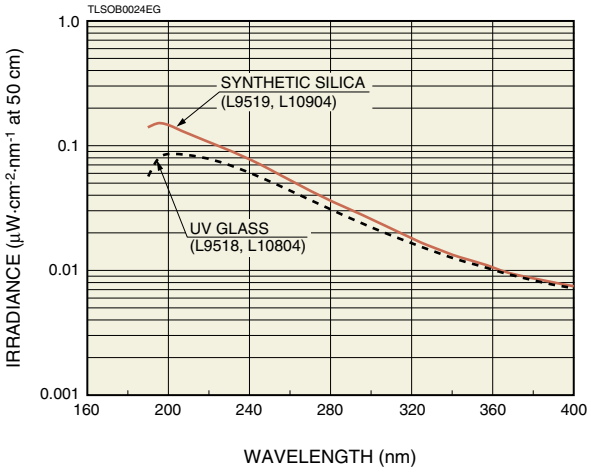


DEUTERIUM LAMPS (L2D2® LAMPS / X2D2® LAMPS / S2D2® LAMPS)

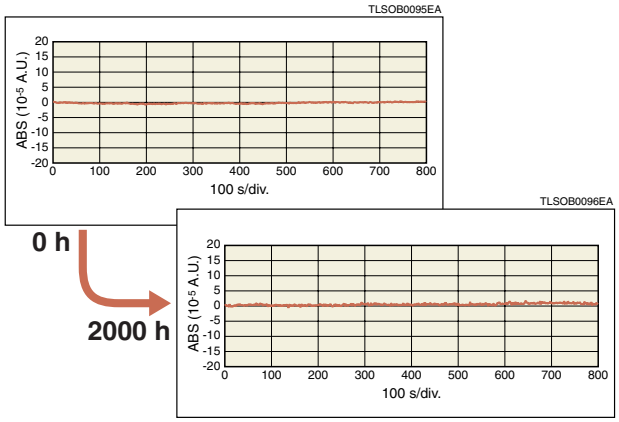
Semiconductor | Medical | Environment | Analysis

Deuterium lamps are discharge lamps utilizing the arc discharge from deuterium (D2) gas. These lamps emit light at wavelengths shorter than 400 nm and are widely used as continuous UV spectrum light sources for analytical instruments such as spectrophotometers and high-performance liquid chromatographs (HPLC).
The L2D2 lamp series offers high stability and minimal fluctuations in light output between individual lamps due to our unique advanced electrode (ceramic electrode) technology.
The X2D2 lamp series produces high luminance twice that of L2D2 lamps (0.5 mm diameter aperture type) which enhances the sensitivity and throughput of various photometric instruments.
The S2D2 lamp is a point light source with a drastically reduced size compared to conventional deuterium lamps. Despite its compact size, the S2D2 lamp ensures high stability comparable to that of conventional lamps.

■ Spectral Distribution



■ Light Output Stability

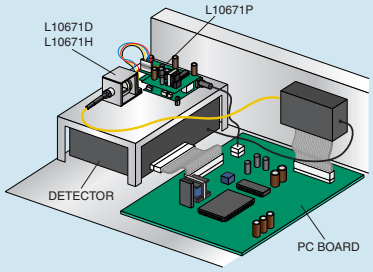


■ S2D2® Module

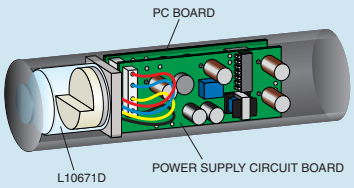
The S2D2 compact deuterium lamp is a UV point light source with a drastically reduced size compared to ordinary deuterium lamps.
This compact size of the S2D2 module makes it easy to install in all types of equipment. The dedicated lamp housing and power supply are designed to extract maximum performance from the S2D2 lamp.

■ Usage Example

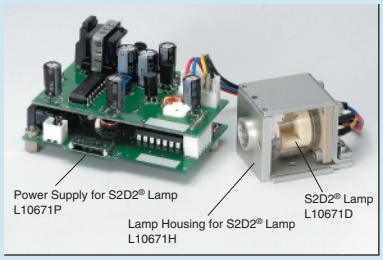
●Installation Example



●Customized Example *



* We also accept orders for custom products to meet special needs. Feel free to contact us as needed.



* Lamp housing is supplied with attached cover.

Related Products

Power supplies and lamp housings are also available.
Please refer to the individual catalog for details.

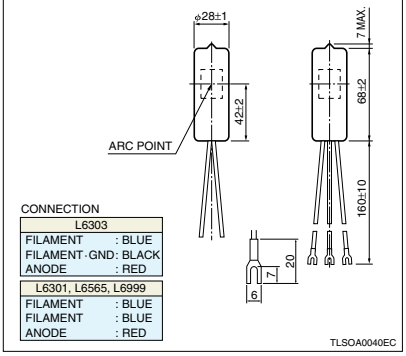
■ Characteristics

Series	Type No.	Dimensional Outline	Spectral Distribution (nm)	Aperture Diameter Ⓐ (mm)	Output Stability at 230 nm: Drift Max. (%/ h)	Output Stability at 230 nm: Fluctuation (p-p) Typ. (%)	Guaranteed Life Ⓑ (at 230 nm) (h)	Required Discharge Starting Voltage Ⓒ Min. (V dc)	Anode Current (mA dc)	Tube Drop Voltage Typ. (V dc)	Filament Ratings: Warm-up Voltage (V dc, ac)	Filament Ratings: Warm-up Current Typ. (A dc, ac)	Filament Ratings: Warm-up Time Min. (s)	Filament Ratings: Operating Voltage (V dc)	Filament Ratings: Operating Current Typ. (A dc)
Standard type															
L2D2-4000	L6565	❶	185 to 400	1.0	±0.3	0.005	4000	350	300±30	80	2.5±0.25	4	20	1.0±0.1	1.8
	L6566	—Ⓔ									3.0±0.3	5		0 to 1	0 to 1.8
L2D2-2000	L6301	❶	185 to 400	0.5	±0.3	0.005	2000	400	300±30	80	2.5±0.25	4	20	1.0±0.1	1.8
	L6301-50	❺													
	L6303	❶												1.7±0.2	3.3
	L7296	❷-ⓐ	160 to 400									1.2		7.0±0.5	1
	L7292	❷-ⓑ	115 to 400	1.0	—	—	2000Ⓓ	350			10±1	0.8		2.5 to 6.0	0.3 to 0.6
	L7293	❷-ⓑ									2.5±0.25	4		1.0±0.1	1.8
X2D2	L9518	❸	185 to 400	0.5	±0.3	0.005	2000	400	300±30	90	2.5±0.25	4	20	1.7±0.2	3.3
	L9519	❹-ⓐ	160 to 400							85					
	L9841	❹-ⓑ	115 to 400												
See-through Type															
L2D2-2000	L6999	❶	185 to 400	0.5	±0.3	0.005	2000	400	300±30	80	2.5±0.25	4	20	1.0±0.1	1.8
	L6999-50	❺													
	L9030	❷-ⓐ	160 to 400												
X2D2	L10804	❸	185 to 400	0.5	±0.3	0.005	2000	400	300±30	90	2.5±0.25	4	20	1.7±0.2	3.3
	L10904	❹-ⓐ	160 to 400							85					
Compact type															
S2D2	L10671D	❻	185 to 400	1.0	±0.25	0.005	1500	250	30±2	135	4.2±0.2	0.6	25±5	3.5±0.2	0.5

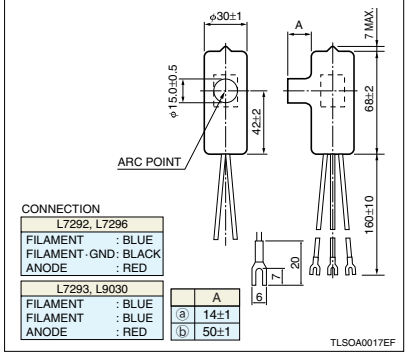
ⒶLamps with an aperture of 0.5 mm diameter are high brightness types. These lamps provide 1.4 times higher brightness than standard lamps with an aperture of 1.0 mm diameter.
ⒷThe lamp life end is defined as the point when the light output falls to 50 % of its initial value at 230 nm or when output fluctuation (p-p) exceeds 0.05 %.
ⒸA trigger voltage higher than this value is required to start lamp discharge. For reliable lighting, an application of 500 V to 600 V is recommended.
ⒹOperating life depends on environmental conditions (vacuum atmosphere). It is recommended that these lamps be used in an oil-free environment.
ⒺPlease refer to the individual catalog for detailed information.

■ Dimensional Outline Unit: mm

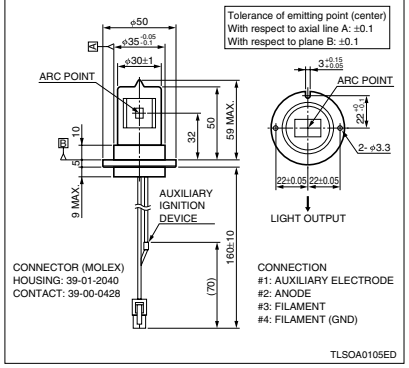
❶ L6565, L6301, L6303, L6999



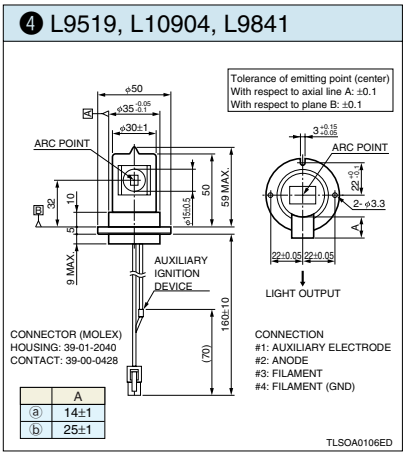
❷ L7296, L7292, L7293, L9030



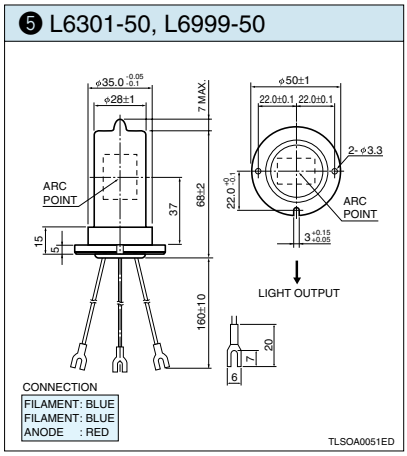
❸ L9518, L10804



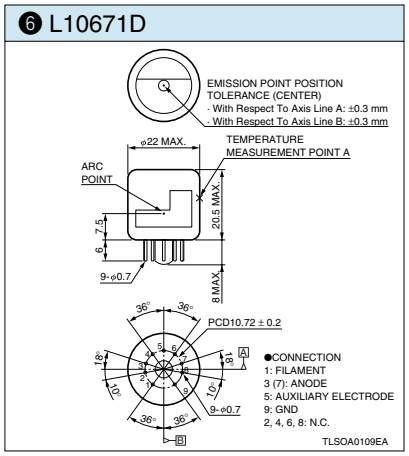
❹ L9519, L10904, L9841



❺ L6301-50, L6999-50



❻ L10671D



HOLLOW CATHODE LAMPS

Analysis | Environment

Hollow cathode lamps are metal-vapor discharge lamps developed for atomic absorption analysis. This analysis requires a special lamp for each element to be measured. Hamamatsu provides 66 types of single element hollow cathode lamps including silver, aluminum and arsenic, and 11 types of multi-element lamps such as Na-K and Ca-Mg. Lamp configurations are available in 38 mm diameter types (L233, L733 series). Also available are the L 2433 series giant-pulse hollow cathode lamps (38 mm diameter) designed for AA spectroscopy using the S-H method background correction.

TLSOF0133

■ Multi-Element Lamps: L733 Series (38mm dia.)

Elements	Element Name	Type No. (suffix)
Na-K	Sodium Potassium	-201NB
Ca-Mg	Calcium Magnesium	-202NU
Si-Al	Silicon Aluminum	-203NU
Fe-Ni	Iron Nickel	-204NQ
Sr-Ba	Strontium Barium	-205NB
Al-Ca-Mg	Aluminum Calcium Magnesium	-321NU

Elements	Element Name	Type No. (suffix)
Ca-Mg-Zn	Calcium Magnesium Zinc	-322NQ
Cu-Mo-Co-Zn	Copper Molybdenum Cobalt Zinc	-401NQ
Cd-Cu-Pb-Zn	Cadmium Copper Lead Zinc	-402NQ
Cu-Fe-Mn-Zn	Copper Iron Manganese Zinc	-405NQ
Co-Cr-Cu-Fe-Mn-Ni	Cobalt Chromium Copper Iron Manganese Nickel	-601NQ

*: Analysis line varies according to the wavelength of each single element.

■ Single-Element Lamps: L233 Series (38mm dia.), L2433 Series (for S-H background correction)

Elements		Type No. (suffix)	Analysis Lines (nm)
◉ Ag	Silver	-47NB	328.07 ✻ 338.28
◉ Al	Aluminum	-13NB	309.27 ✻ 396.15
◉ As	Arsenic	-33NQ	193.70 ✻ 197.20
◉ Au	Gold	-79NQ	242.80 ✻ 267.59
◉ B	Boron	-5NQ	249.68 ✻ 249.77
◉ Ba	Barium	-56NB	553.55 ✻
◉ Be	Beryllium	-4NQ	234.86 ✻
◉ Bi	Bismuth	-83NQ	223.06 ✻ 306.77
◉ Ca	Calcium	-20NU	422.67 ✻
◉ Cd	Cadmium	-48NQ	228.80 ✻
◉ Co	Cobalt	-27NU	240.73 ✻ 346.58
◉ Cr	Chromium	-24NB	357.87 ✻ 425.44
Cs	Cesium	-55NB	852.11 ✻
◉ Cu	Copper	-29NB	324.75 ✻ 327.40
◉ Dy	Dysprosium	-66NB	404.59 ✻ 421.17
◉ Er	Erbium	-68NB	400.79 ✻ 415.11
◉ Eu	Europium	-63NB	459.40 ✻ 462.72
◉ Fe	Iron	■ -26NU	248.33 ✻ 371.99
◉ Ga	Gallium	-31NU	287.42 294.36 ✻
Gd	Gadolinium	-64NB	407.87 422.58 ✻
◉ Ge	Germanium	-32NU	265.16 ✻
◉ Hf	Hafnium	-72NU	286.64 ✻ 307.29

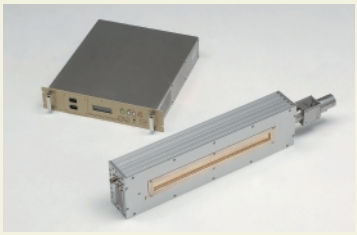
Elements		Type No. (suffix)	Analysis Lines (nm)
Hg	Mercury	-80NU	253.65 ✻
◉ Ho	Holmium	-67NB	410.38 ✻ 416.30
In	Indium	-49NB	303.94 ✻ 325.61
Ir	Iridium	-77NQ	208.88 ✻ 266.47
◉ K	Potassium	-19NB	766.49 ✻ 769.90
◉ La	Lanthanum	-57NB	357.44 550.13 ✻
◉ Li	Lithium	-3NB	610.36 670.78 ✻
Lu	Lutetium	-71NB	328.17 331.21 ✻
◉ Mg	Magnesium	-12NU	285.21 ✻
◉ Mn	Manganese	-25NU	279.48 ✻ 403.08 ✻
◉ Mo	Molybdenum	-42NB	313.26 ✻ 320.88
◉ Na	Sodium	-11NB	589.00 ✻ 589.59
Nb	Niobium	-41NB	334.91 ✻ 405.89
Nd	Neodymium	-60NB	463.42 492.45 ✻
◉ Ni	Nickel	-28NQ	232.00 ✻ 341.48
Os	Osmium	-76NU	290.90 ✻ 305.86
◉ Pb	Lead	-82NQ	217.00 ✻ 283.30
◉ Pd	Palladium	-46NQ	244.79 ✻ 247.64
Pr	Praseodymium	-59NB	495.13 ✻ 513.34
◉ Pt	Platinum	-78NU	265.95 ✻ 299.80
Rb	Rubidium	-37NB	780.02 ✻ 794.76
Re	Rhenium	-75NB	346.05 ✻ 346.47

Elements		Type No. (suffix)	Analysis Lines (nm)
Rh	Rhodium	-45NB	343.49 ✻
◉ Ru	Ruthenium	-44NB	349.89 ✻
◉ Sb	Antimony	-51NQ	217.58 ✻ 231.15
Sc	Scandium	-21NB	390.74 391.18 ✻
◉ Se	Selenium	-34NQ	196.03 ✻
◉ Si	Silicon	-14NU	251.61 ✻ 288.16
◉ Sm	Samarium	-62NB	429.67 ✻ 484.17
◉ Sn	Tin	-50NQ	224.61 ✻ 286.33
◉ Sr	Strontium	-38NB	460.73 ✻
Ta	Tantalum	-73NU	271.47 ✻ 275.83
Tb	Terbium	-65NB	431.88 432.64 ✻
◉ Te	Tellurium	-52NQ	214.27 ✻
◉ Ti	Titanium	-22NB	364.27 ✻ 365.35
Tl	Thallium	-81NU	276.78 ✻ 377.57
Tm	Thulium	-69NB	371.79 ✻ 410.58
◉ V	Vanadium	-23NB	306.64 318.40 ✻
W	Tungsten	-74NU	255.14 ✻ 400.87
◉ Y	Yttrium	-39NB	410.23 ✻ 412.83
◉ Yb	Ytterbium	-70NB	346.43 398.79 ✻
◉ Zn	Zinc	-30NQ	213.86 ✻ 307.59
Zr	Zirconium	-40NB	360.12 ✻ 468.78
D_2	Deuterium	-1DQ	240.00 (peek)

"✻" mark indicates the maximum absorption wavelength.
"◉" mark indicates L2433 series element.
"■" mark indicates that the final suffix will be "NQ" instead of "NU" in the case of the L2433 series.

APPLIED PRODUCTS

RF Discharge Type Excimer Lamp



Conventional cylindrical excimer lamps have the problem of poor irradiation uniformity because they can only be used to irradiate close objects directly under the center of the lamp.
RF (radio frequency) discharge type excimer lamps, however, have uniform emission over a wider area since they use a long, flat rectangular bulb.
RF (radio frequency) discharge also gives a highly uniform and stable output with minimum of flicker that is often a problem in conventional dielectric barrier discharge.

■ Features

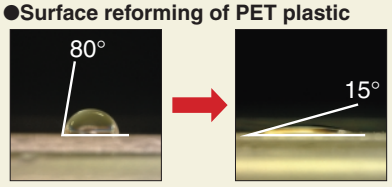
- ●Uniformly irradiates a large area
- ●Stable output with minimal flicker
- ●Efficient light emission
- ●High efficient processing
- ●Instantaneous lamp ON/OFF operation

■ Applications

- ●Surface reforming with light
  - Bonding pre-processing
  - Adhesion improvement during printing
- ●Material dry cleaning
  - Silicon wafer cleaning
  - Oil stain removal

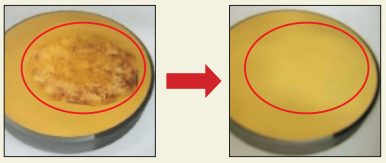
■ Application Examples

●Surface reforming of PET plastic



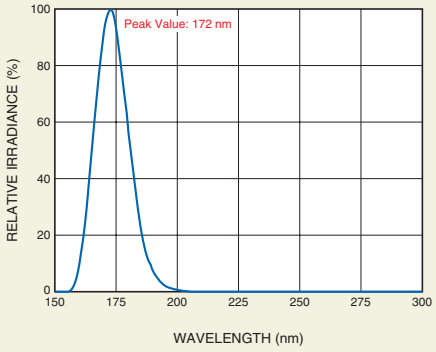
Before irradiation　　After irradiation

●Dry cleaning of gold-coated mirror for laser



Before irradiation　　After irradiation

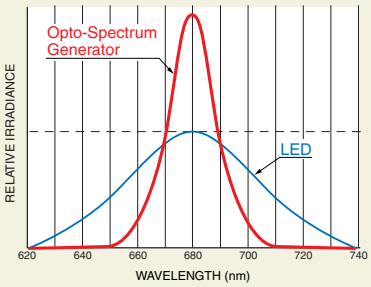
■ Spectral Distribution



OSG: Opto-Spectrum Generator

With just this light source unit, any desired wavelength can be freely selected in 1 nm steps. Our standard product lineup gives a light emission spectrum ranging from 390 to 700 nm, and from 430 to 790 nm. This light source delivers a spectral half-width of approximately 20 nm, making it the ideal light source for evaluations and tests that require even higher accuracy.

■ Spectrum Comparison *



* Spectrum comparison between typical 680 nm LED and 680 nm monochromatic light emitted form OSG

■ Features

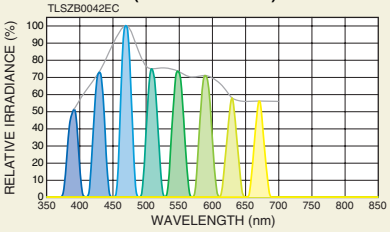
- ●Emits light when & where you need it over a wide range of wavelengths
- ●High-accuracy evaluations and tests
- ●High output, High stability
- ●Compact
- ●Easy control from your PC

■ Applications

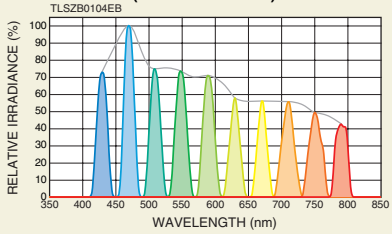
- ●Light stimulus to living body
- ●Spectral characteristic evaluation of devices
- ●Optical property evaluation of materials
- ●Illumination

■ Emission Spectrum Example

L12194-00-39070 (390 nm to 700 nm)

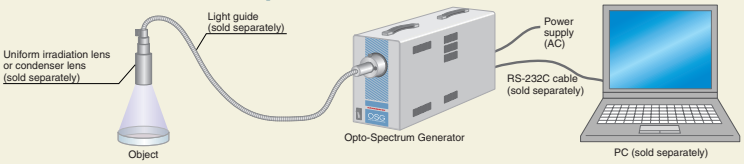


L12194-00-43079 (430 nm to 790 nm)



* Each graph shows emission spectra at a wavelength interval of 40 nm.

■ Connection Example



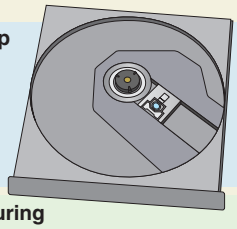
APPLIED PRODUCTS

Spot Light Sources LIGHTNINGCURE®

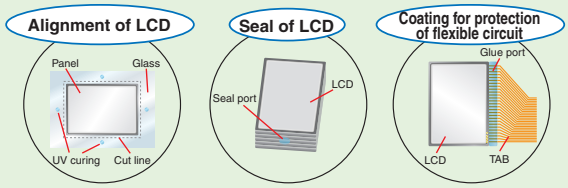
Hamamatsu spot light sources employ long life, high intensity mercury-xenon lamps and optical systems specifically designed to minimize light loss. Our UV spot light sources have gained a solid reputation for long life and high power and now fill a vital role in different fields, especially in FA (factory automation). UV spot light sources generate less heat and so are ideal for UV curing in bonding of micro components and optical components vulnerable to heat.

Application Examples

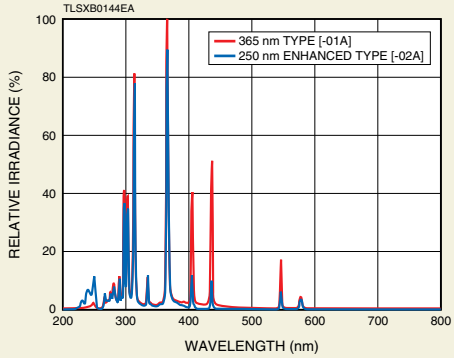
●UV curing for CD/DVD pick up



●UV curing for FPD manufacturing



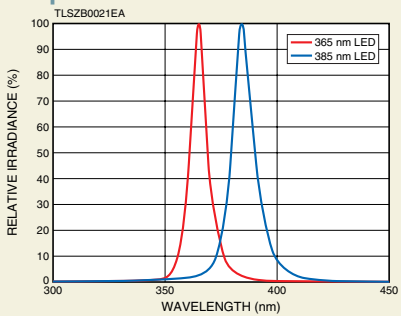
Spectral Distribution



UV-LED Spot Light Source LIGHTNINGCURE® LC-L1 V3

By cutting wasted space to an absolute minimum we came up with a unit that drives 4 heads but is small enough to fit in the palm of your hand. Unit can also be freely placed standing or horizontal in just a tiny space, so it needs no special layout.

Spectral Distribution



Applications

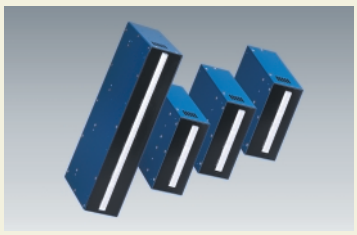
●Compact
●High stability and high output
●Low cost

Applications

●UV curing
●High output UV irradiation

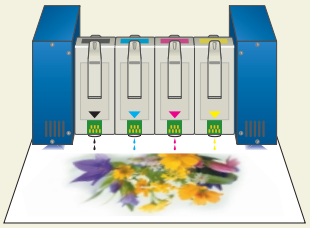
Linear Irradiation Type UV-LED Unit LIGHTNINGCURE® LC-L5

The LC-L5 is a linear type UV-LED unit with an irradiation width of 100 mm or 300 mm. It maximizes the LED characteristics by using the unique cooling structure and dedicated optical system, and delivers a whole new level in the two important but opposing factors of "high output" and "long service life."
The LC-L5 contributes to alleviating the environmental load, reducing costs, and improving productivity due to its low power consumption, low heat generation, and instantaneous on-off operation.



Applications

• UV ink drying



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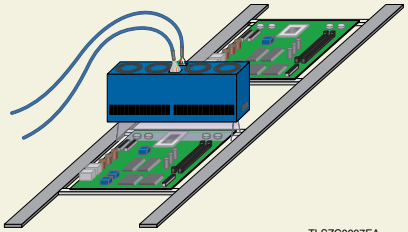
• UV coating agent drying



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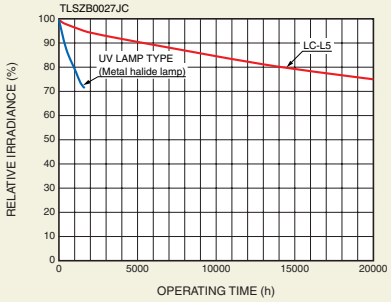
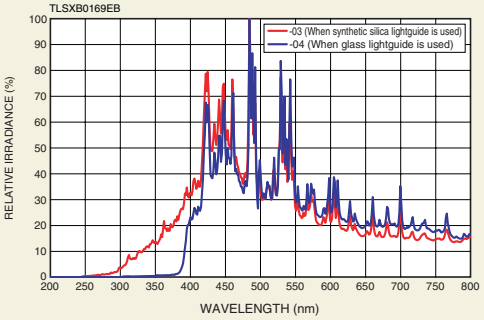
Service Life Characteristics



Flash Light Sources LIGHTNINGFLASH™

These flash light sources consist of a xenon flash lamp, power supply and control circuit, all integrated into one package. Selecting the desired optical system components such as the lightguide allows the flash light source to emit a variety of different types of light. Light emission is highly intense for a period of microseconds, making the flash light source ideal for strobe light sources. The flash light sources are also easy to use and handle, offering features such as programmable light emission, flash count and control from a PC.

Spectral Distribution



Applications

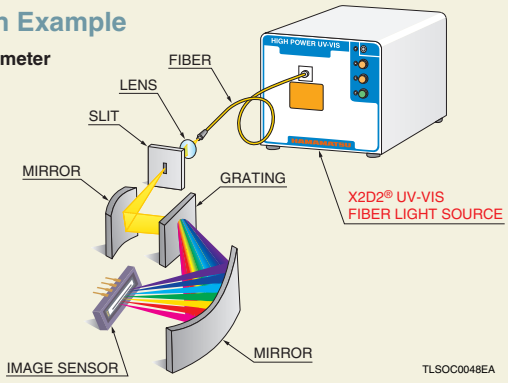
●Strobe light source

X2D2® UV-Visible Fiber Light Source

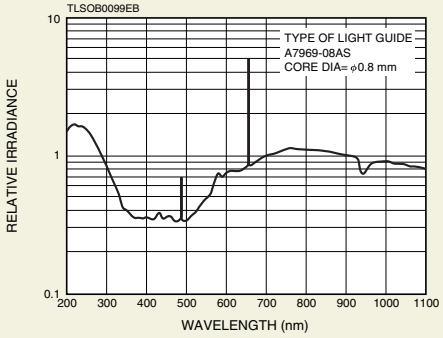
This light source contains a X2D2 lamp and a tungsten-halogen lamp in a compact case and outputs 200 nm to 1600 nm light through a light guide. (Light guide is optional and sold separately.)
The X2D2 lamp and tungsten-halogen lamp are precision-assembled into a dedicated lamp housing to ensure optimum operation. This allows highly stable lamp operation over a long service life without any special alignment. This light source is easy to carry due to compact size and light weight, and so is ideal for use with all types of portable devices.

Application Example

●**Spectrophotometer**



Spectral Distribution



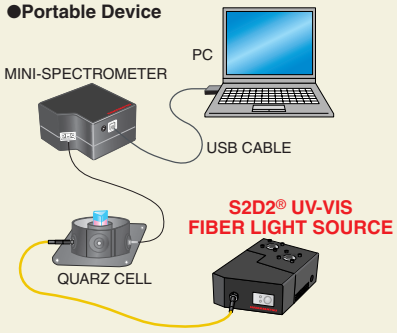
S2D2® UV-Visible Fiber Light Source

The L12515 is a UV-visible fiber light source containing the world's smallest* compact deuterium lamp (S2D2 lamp).
Compared to conventional S2D2 lamps, the L12515 gives a higher S/N ratio by enhancing the light output in the UV region.
Despite a small and easy-to-carry size, the L12515 delivers high output, high stability, and low voltage operation, making it ideal for assembly into compact chemical analysis devices. (Light guide is sold separately.)

* As of September 2013 by our research

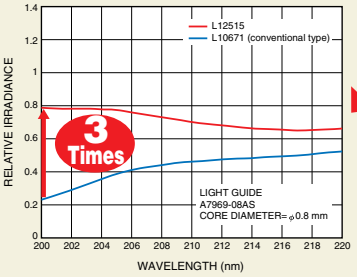
Application Examples

●**Portable Device**

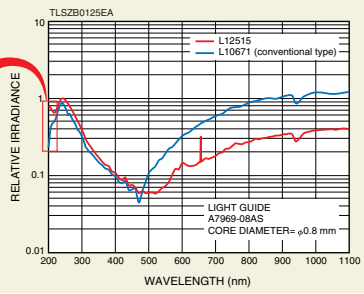


Spectral Distribution

●**200 nm to 220 nm (enlarged view of enhanced output region)**



●**200 nm to 1100 nm**



APPLIED PRODUCTS

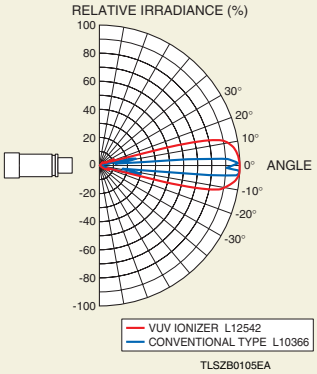
VUV Ionizer L12542

The L12542 is a newly developed electrostatic charge remover that makes use of VUV (vacuum ultraviolet) light. Due to its wide irradiation angle about 3 times larger than our current VUV light source, the L12542 efficiently removes electrostatic charges over large areas in depressurized or vacuum environments. Up until now two or more VUV light sources were needed to neutralize electrostatic charges in large areas due to their limited irradiation angle. The L12542 solves this problem and efficiently neutralizes large areas in a vacuum.

Features

- Large irradiation(neutralizing) area
- Highly efficient ion generation in vacuum
- No air flow needed
- No overshoot(generates no opposite-polarity static charges)
- No dust and electromagnetic noise emissions
- Long life

Directivity (Light Distribution)



Applications

- Dechucking of electrostatic chunks
- Semiconductor manufacturing equipment
- LCD manufacturing equipment
- Organic EL manufacturing equipment
- Hard disk manufacturing equipment
- Film manufacturing equipment

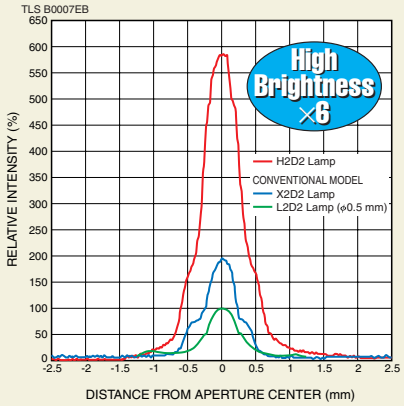
H2D2 Light Source Unit

The H2D2 light source unit contains a high-brightness, high-end deuterium lamp (H2D2 lamp) that emits light at a brightness 6 times higher than our current deuterium lamps (L2D2 lamps). Despite its high brightness, the H2D2 is highly stable, has a long service life, and allows air-cooled operation by a specially designed housing. This feature makes it much more convenient and easy to use than ordinary water-cooled lamps.

Features

- Air Cooling (needs no cooling water)
- High Stability:
  Fluctuation 0.05 %p-p (Max.)
  Drift ±0.3 %h (Max.)
- Long Life: Warranty of 1000 hours

Brightness Distribution



Applications

- Semiconductor Inspection
- Film Thickness Measurement
- Electrostatic Remover
- Spectrophotometry
- Environmental Measurement
- Photoionization

S2D2® VUV LIGHT SOURCE UNIT

The S2D2® VUV light source unit is a vacuum ultraviolet light source unit that incorporates a compact deuterium lamp with an MgF_2 window.
Equipped with a SUS flexible tube with a vacuum flange and a unique cooling mechanism, this light source unit allows irradiating objects or samples at a very close distance, and can be installed and operated under depressurized conditions. The compact lamp unit and SUS flexible tube offer greater flexibility in attaching the light source unit to various types of equipment.

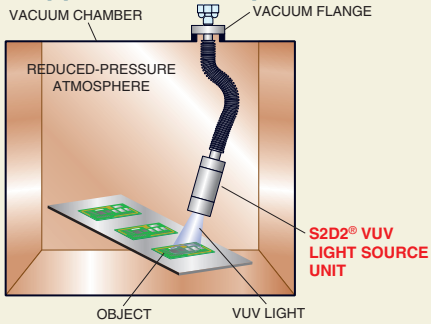
Features

- Enable Proximity Irradiation
- Compact
- Spectral Distribution:
  115 nm to 400 nm

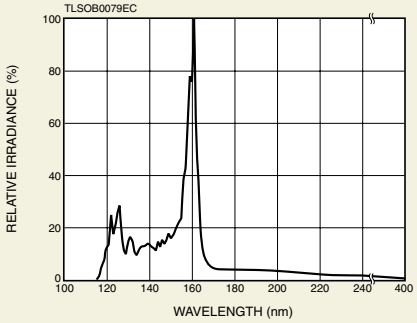
Applications

- Electrostatic Remover
- VUV Spectrophotometer
- Photoionization
- UV Resistance Testing of Various Material
- Excitation Light Source

Application Example



Spectral Distribution



Calibrated Lamp Light Source Series

These light sources deliver the extremely high levels of "stability" and "repeatability" essential to calibrated light sources. These are available as an optimal set including a lamp, lamp housing and power supply, so that anyone can easily reproduce a highly stable light output.
The L7810-02 xenon lamp light source is calibrated over a wide spectral range from 200 nm to 800 nm, and the L7820-02 deuterium lamp light source is calibrated in the UV range from 200 nm to 400 nm as Japan Calibration Service System (JCSS). Certification of accreditation with JCSS logo mark is attached.
Along the expansion of range of Measurement Act, certification of accreditation is integrated to JCSS.

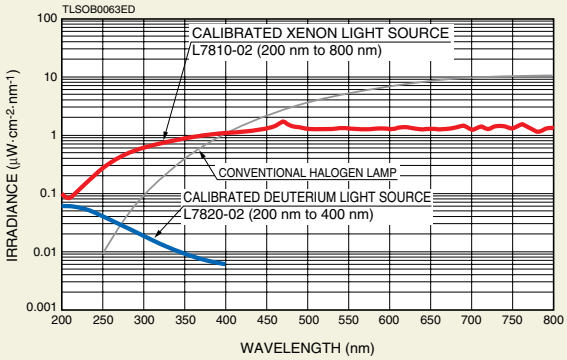
■ Features

- ●Proofreading certificate issue
- ●High repeatability
- ●High stability

■ Applications

- ●Light level control of light source
- ●Sensitivity control of optical sensor
- ●Light intensity measurement and studies of photoreactions (Light resistance, light curing, etc.)
- ●Quality control of photometric equipment (Medical analysis equipment, semiconductor inspection systems, imaging devices, etc)

■ Spectral Distribution



CAUTIONS AND WARRANTY

1. These lamps radiate strong UV rays which are harmful to the eyes and skin. Do not look directly into the lamp or allow the light rays to directly strike the skin. Always wear protective glasses or other protective gear when operation.
2. The bulbs of some lamps become extremely hot during operation. Do not touch them with bare hands or bring the hot lamp bulbs close to flammable material.
3. Do not subject these lamps to mechanical vibration or shock, as this type of treatment can cause the stability to deteriorate.
4. Before operating the lamp, wipe the bulb and/or window with cloth moistened with alcohol or acetone, otherwise dirt or contaminant on the window may cause a significant drop in UV transmittance. To prevent such contamination on the window, avoid touching it with your bare hands.
5. Lamps use high voltages, so take sufficient care to avoid electrical shocks.
6. Hamamatsu lamps come with a warranty valid for one year from the date of delivery.

   The warranty is limited to replacement of the lamp. The warranty shall not apply, even within this one year period, to cases where the operating time of the lamp exceeds the guaranteed life, or in cases where trouble or failure has been encountered as a result of natural calamity, accident, or misuse.

* For more details, refer to the technical data sheet for each lamp.

●WHEN SCRAP THE PRODUCT

When scrap the product, please follow the appropriate disposal regulation for wasted products, if any, of the country/state/region/province in use, or pass to those who can handle the disposal at proper manner like approved/licensed.
Further detail can be obtained from technical literature or instruction manual provided with each product, if any. Any question may arise, feel free to contact at nearby our office shown on the last page.

HAMAMATSU

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Main Products

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Photomultiplier Tubes
Photomultiplier Tube Modules
Microchannel Plates
Image Intensifiers
Xenon Lamps / Mercury Xenon Lamps
Deuterium Lamps
Light Source Applied Products
Laser Applied Products
Microfocus X-ray Sources
X-ray Imaging Devices

Opto-semiconductors
Si photodiodes
APD
Photo IC
Image sensors
PSD
Infrared detectors
LED
Optical communication devices
Automotive devices
X-ray flat panel sensors
Mini-spectrometers
Opto-semiconductor modules

Imaging and Processing Systems
Cameras / Image Processing Measuring Systems
X-ray Products
Life Science Systems
Medical Systems
Semiconductor Failure Analysis Systems
FPD / LED Characteristic Evaluation Systems
Spectroscopic and Optical Measurement Systems

Laser Products
Semiconductor lasers
Applied products of semiconductor lasers
Solid state lasers

REVISED APR. 2014

* L2D2, X2D2, S2D2, LIGHTNINGCURE are registered trademarks of Hamamatsu Photonics K.K. in Japan, U.S.A and EU.

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