LIGHT SOURCE

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 sources enhance the accuracy of customer measuring equipment, simplify maintenance, and reduce running costs.

LIGHT SOURCE

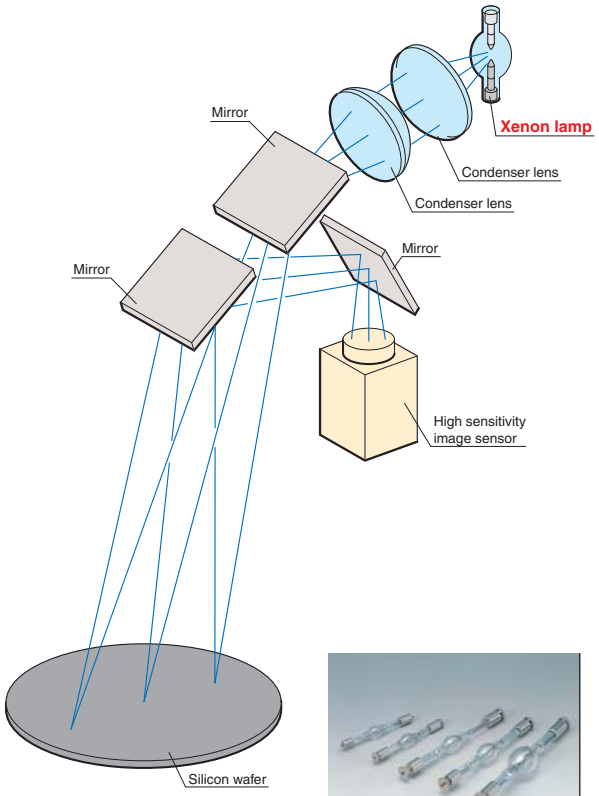
CONTENTS

APPLICATIONS

Hamamatsu light sources have been distributing in worldwide, and well known for plenty of applications besides below figures.

Semiconductor

Wafer surface inspection system

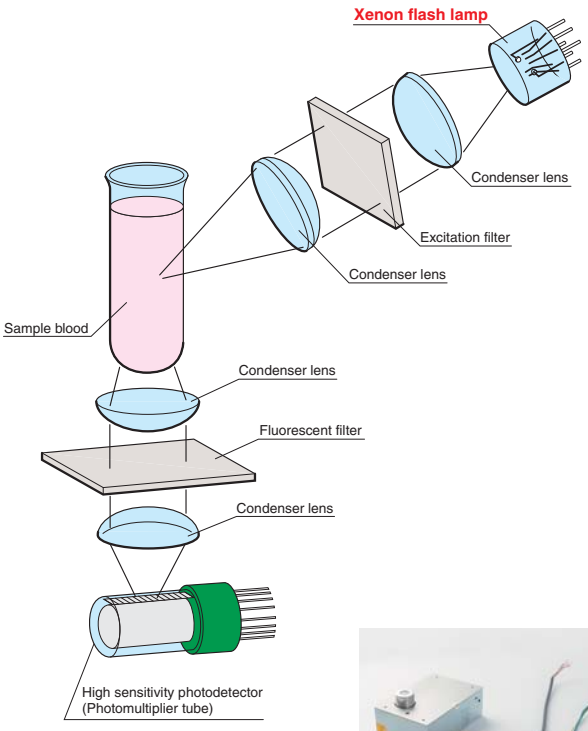


TLSOC0024EC

Xenon Lamps

Medical

Blood analyzer



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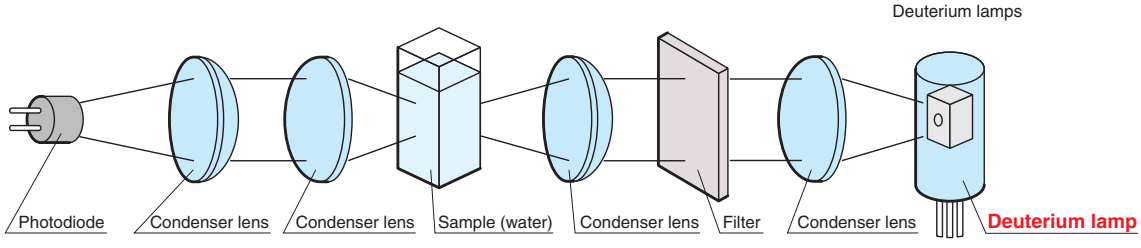
Xenon flash lamps

Environment

Water pollution analysis

Deuterium lamps



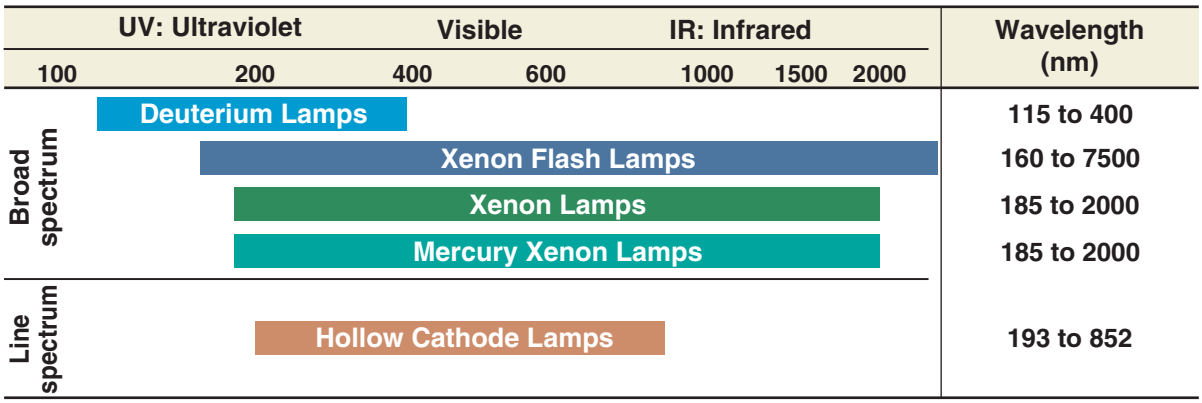
TLSOC0051EA

QUICK REFERENCE TO PRODUCT SELECTION

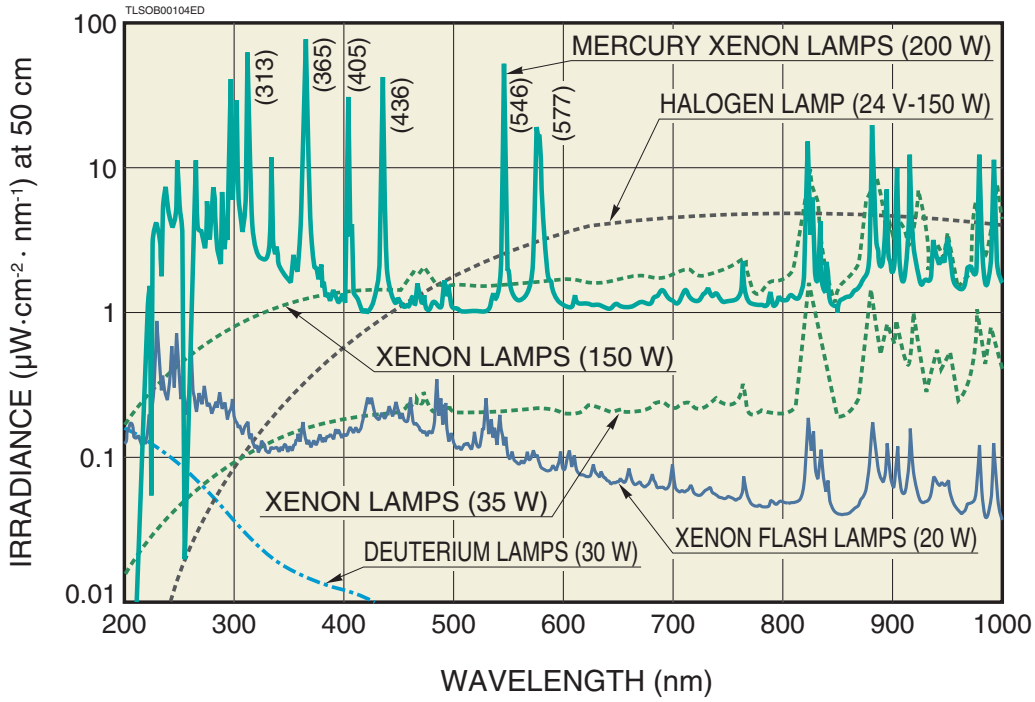
Field	Application \ Light Source	XENON LAMPS	XENON FLASH LAMPS	MERCURY XENON LAMPS	DEUTERIUM LAMPS	HOLLOW CATHODE LAMPS	OTHERS
							
Semiconductor	UV EXPOSURE			●			SPOT LIGHT SOURCES
	WAFER INSPECTION	●	●	●	●		
	FILM THICKNESS MEASUREMENT			●	●		
	PARTICLE MEASUREMENT FOR PURE WATER				●		
	PHOTO CVD				●		VUV LIGHT SOURCE UNITS
	ELECTROSTATIC REMOVAL				●		VUV LIGHT SOURCE UNITS
FA	FA STROBOSCOPES		●				
	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 MONITORS	●	●	●	●		
	WATER ANALYSIS		●		●	●	
Analysis	ATOMIC ABSORPTION SPECTROPHOTOMETERS				●	●	
	LIQUID CHROMATOGRAPHY	●	●		●		
	WAVELENGTH CALIBRATION	●			●	●	
	UV / VISIBLE SPECTROPHOTOMETERS	●	●		●		
	PHOTOIONIZATION				●		VUV LIGHT SOURCE UNITS
Bio-logical	LIGHT SOURCE FOR LIVING BODY STIMULATION EXPERIMENTS	●					

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 IR", and the other is "line spectrum light sources" that emit sharp line spectrum characterized by the metallic elements sealed within the lamp.



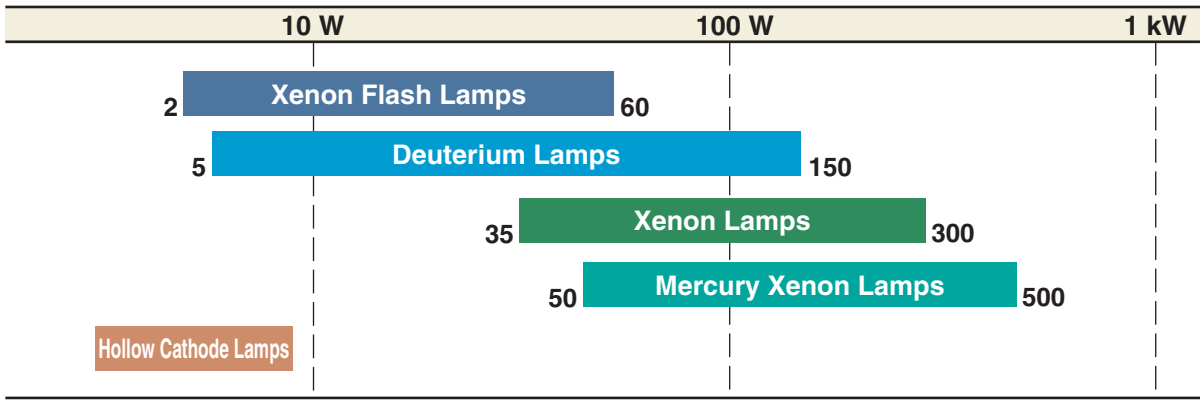
●Spectral distribution — Broad spectrum



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

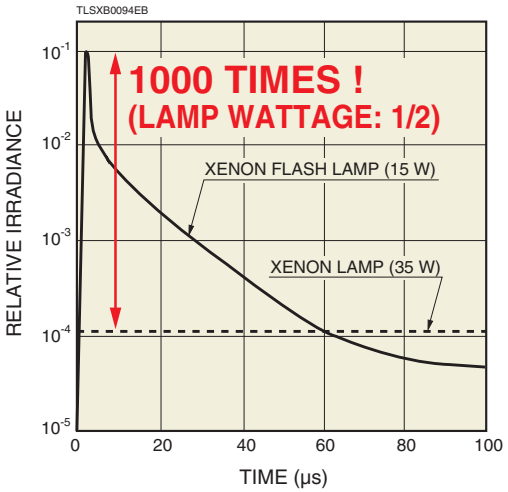


Instantaneously high peak output: Xenon flash lamp

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.)

Xenon flash lamps

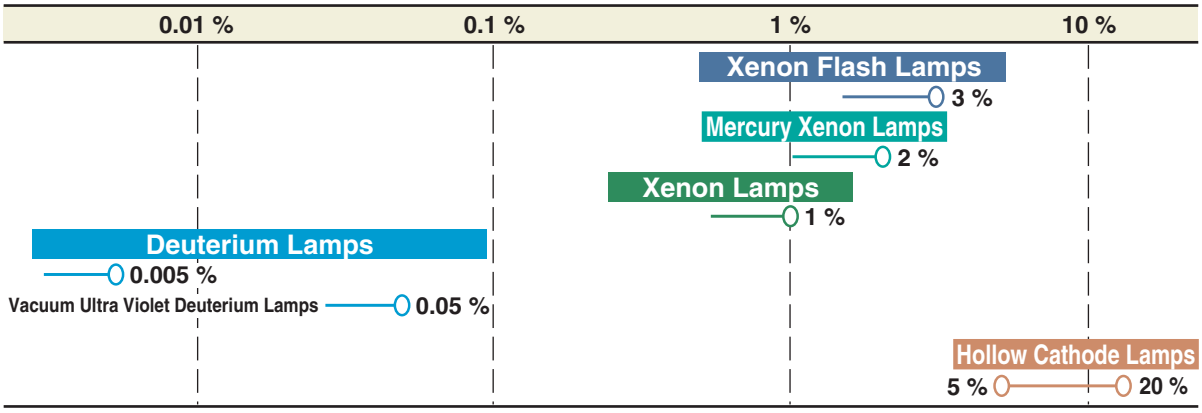


STABILITY

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.

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

■ FLUCTUATION (Short-term stability)

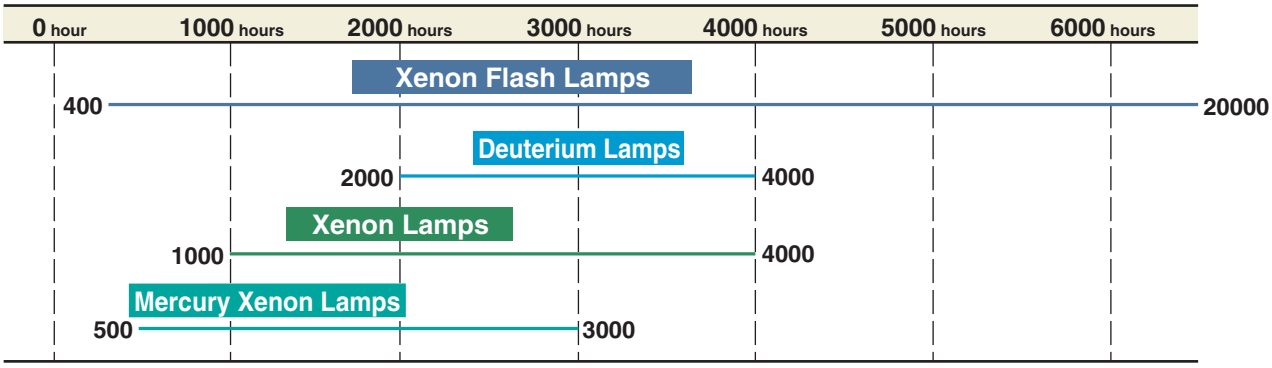


Lamp light output stability is an important factor that affects measurement accuracy and reliability of equipment. To supply lamps with high output stability, Hamamatsu has made consistent efforts to achieve "ideal electrode construction and positioning accuracy" and also to develop "optimum power supplies".

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 of Hamamatsu	Spectral distribution (nm)	Wattage (W)	Output stability fluctuation (p-p)	Life (hour)	Accessory
Xenon Lamps	• 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 Lamps	• Broad spectrum from UV to IR • Color temperature: 15000K • Pulsed light • Instantaneously high peak output • Low heat	• Long life: 20000 hours • High stability Fluctuation (p-p): 1.0 % Typ.	160 to 7500	2 to 60	Less than 3 %	20000 (At 10 Hz operation)	Trigger socket  Shield box  Power supply 
Mercury Xenon Lamps	• 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 Lamps	• 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 Lamps	• 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

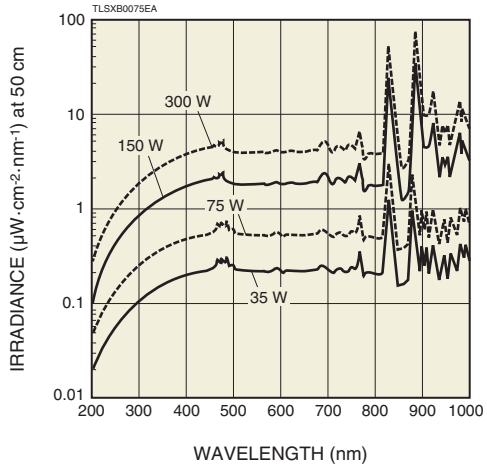
Hamamatsu super quiet xenon lamps are point light sources with extremely high brightness and color temperature that emit a continuous spectrum from the UV to infrared region, making them ideal as light sources in a variety of photometric applications such as spectrophotometers. These super quiet lamps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

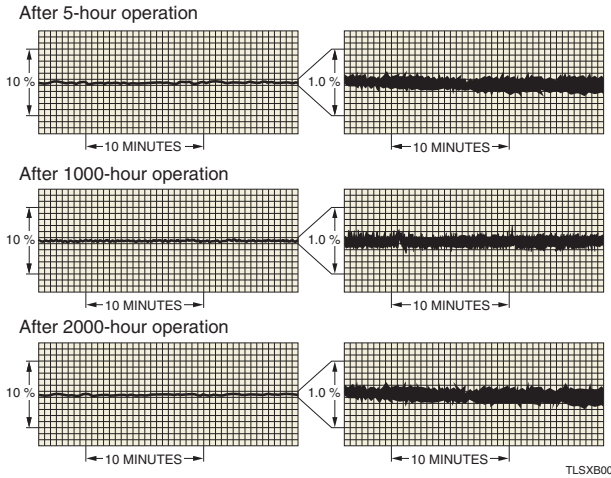
Other benefits from using the long life xenon lamp include saving natural resources and a smaller burden on the environment.

TLSXF0024

■ Spectral distribution



■ Light output stability (Fluctuation)



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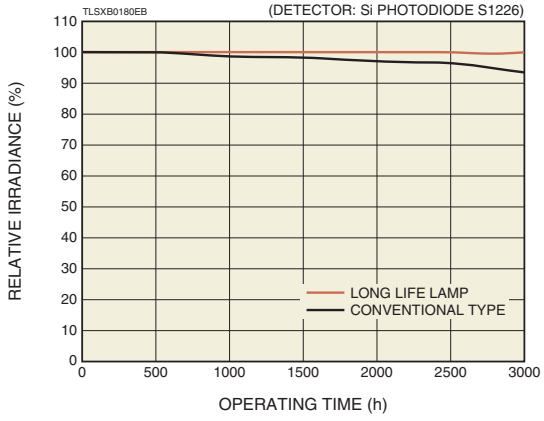
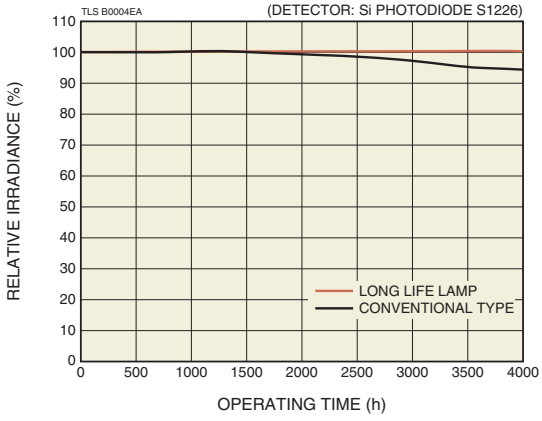
■ Life characteristics

●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.

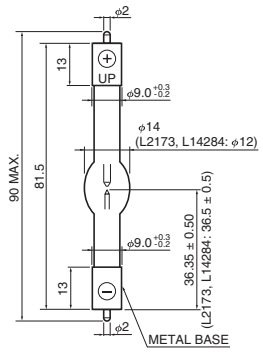
■ Characteristics

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: Drift Typ. (%/h)	Output stability: 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
L14284				Low ozone fused silica							
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								
L14285-01			❷	Low ozone fused silica							
L14285-02			❸								
L10725		1.0	❶	Fused silica		5.7±0.3	13.5			2000	3000
L10725-01			❷								
L10725-02			❸								
L11307	100	1.3	❶	Fused silica	185 to 2000	7.0±0.5	15	±0.5	1.0	1500	2500
L2175	150	2.5	❹	Fused silica	185 to 2000	7.5±0.5	19	±0.5	1.0	1200	2500
L2273		2.0				8.5±0.5	17			1800	3000
L14286				Low ozone fused silica							
L11033				Fused silica						3000	4000
L14287				Low ozone fused silica							
L2479	300	3.0	❺	Fused silica	185 to 2000	15.0±1.0	20	±0.5	1.0	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 1.0 %.

■ Dimensional outline Unit: mm

❶ L2173, L14284, L2174, L10725 L11307



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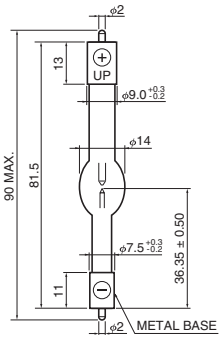
❷ L2174-01, L14285-01, L10725-01



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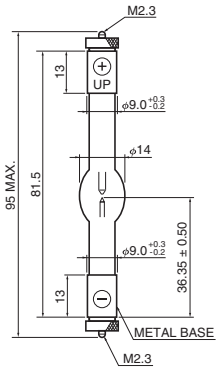
❸ L2174-02, L14285-02, L10725-02



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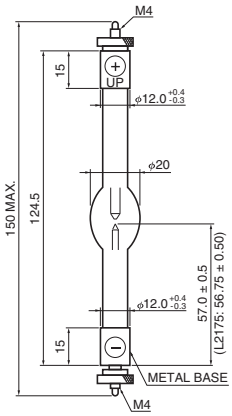
❹ L2175, L2273, L14286, L11033 L14287



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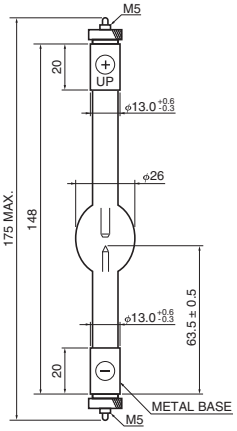
❺ L2479



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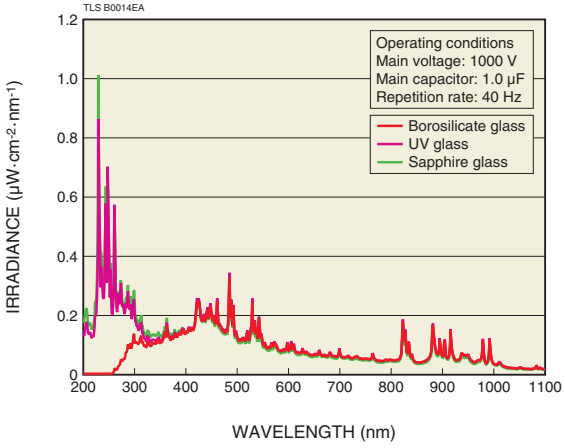
SUPER-QUIET XENON FLASH LAMPS

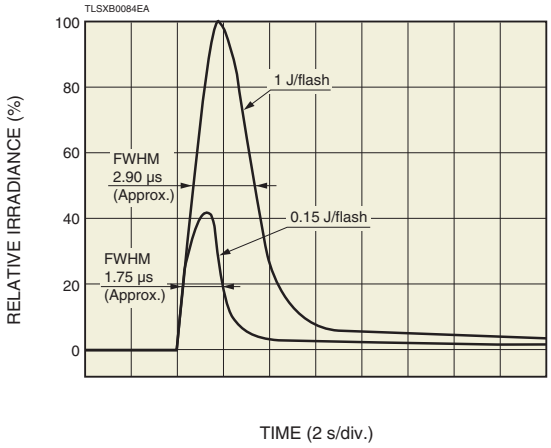
Semiconductor | FA | Information | Medical | Environment | Analysis

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. Our product lineup includes compact lamp modules with lamp, trigger socket and power supply all integrated into one unit.

■ Spectral distribution (20 W type)



■ Emission pulse waveform (60 W type)



Xenon flash lamp modules

Easy-to-use lamp modules with built-in xenon flash lamp, power supply and trigger socket.

■ LINE-UP

Type No. (series)	Type	Arc size (mm)	Main discharge capacitance (μF)	Maximum input energy [per flash] (mJ)	Window material	Main discharge voltage variable range (V)	Maximum average input [continuous] (W)	Input voltage range (V)
L13651 Ⓐ L13821	2 W	1.0	0.141 0.094 0.047 0.020	25	UV glass MgF_2	400 to 600	2	4.75 to 5.5, 10.8 to 13.2
L9455 Ⓐ	5 W	1.5	0.22 0.11	100	UV glass	400 to 600	5	11 to 28
L9456		3.0						
L11316 Ⓐ	5 W High output	1.5	0.2	100	UV glass	500 to 1000	5	21.6 to 26.4
L11317		3.0						
L12745	20 W	1.5	0.64 0.32 0.1	320	UV glass MgF_2	400 to 1000	20	21.6 to 26.4

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)	Average input Max. [Continuous] (W)	Input energy Max. [per flash] (J)	Repetition rate Max. (Hz)	Output Ⓑ stability fluctuation (p-p) Max. (%)	Guaranteed life Min. (Number of flashes)
L4644	10 W type	3.0	❶-ⓐ	Hemisphere	UV glass	185 to 2500	700 to 1000	5 to 7	10	0.1	100	4.0 Ⓑ	1.0×10^9
L4646			❷-ⓐ	Flat									
L4645			❶-ⓐ	Hemisphere	Borosilicate glass	240 to 2500							
L4647			❷-ⓐ	Flat									
L4640		1.5	❶-ⓑ	Hemisphere	UV glass	185 to 2500							
L4642			❷-ⓑ	Flat									
L4641			❶-ⓑ	Hemisphere	Borosilicate glass	240 to 2500							
L4643			❷-ⓑ	Flat									
L4633	15 W type	1.5	❸	Converging	Borosilicate glass	240 to 2500	700 to 1000	5 to 7	15	0.15	100	5.0 Ⓑ	1.4×10^8
L4634			—Ⓓ	Collimating									
L11957	20 W type	3.0	❹-ⓐ	Flat	UV glass	185 to 2500	700 to 1000	5 to 7	20	0.5	1000	2 %CV Ⓒ	1.0×10^8
L11956				Flat	Borosilicate glass	240 to 2500							
L14693				Flat	MgF_2	160 to 7500							
L11937		1.5	❹-ⓑ	Flat	UV glass	185 to 2500							
L11936				Flat	Borosilicate glass	240 to 2500							
L14691				Flat	MgF_2	160 to 7500							
L11967	20 W Built-in reflector type	3.0	❹-ⓐ	Flat Ⓐ	UV glass	185 to 2500	700 to 1000	5 to 7	20	0.5	1000	2 %CV Ⓒ	1.0×10^8
L11966				Flat Ⓐ	Borosilicate glass	240 to 2500							
L14694				Flat Ⓐ	MgF_2	160 to 7500							
L11947		1.5	❹-ⓑ	Flat Ⓐ	UV glass	185 to 2500							
L11946				Flat Ⓐ	Borosilicate glass	240 to 2500							
L14692				Flat Ⓐ	MgF_2	160 to 7500							
L6604	60 W type	3.0	❺	Flat	Borosilicate glass	240 to 2500	700 to 1000	5 to10	60	1	100	4.2 Ⓑ	8.0×10^7
L6605					Sapphire glass	190 to 5000							
L7684	60 W Built-in reflector type			Flat Ⓐ	Borosilicate glass	240 to 2500							
L7685					Sapphire glass	190 to 5000							

Ⓐ Built-in reflector

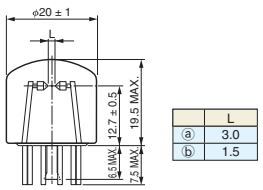
Ⓑ Output stability (%) = $\frac{\text{(Max. output – Min. output)}}{\text{Average output}} \times 100$

Ⓒ Light output stability (%CV) = $\frac{\text{Light output standard deviation}}{\text{Average light output}} \times 100$

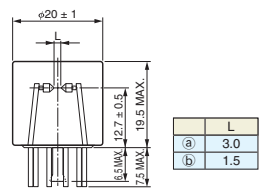
Ⓓ Please refer to the individual catalog for detailed information.

■ Dimensional outline Unit: mm

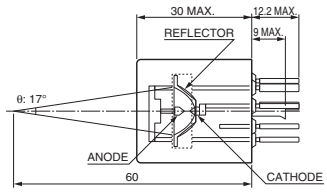
❶ L4644, L4645, L4640, L4641



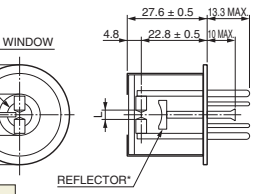
❷ L4646, L4647, L4642, L4643



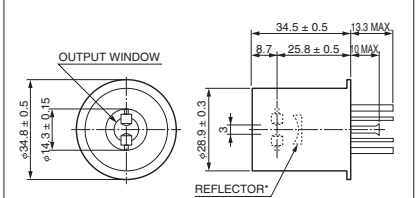
❸ L4633



❹ L11957, L11956, L14693, L11937, L11936, L14691 L11967, L11966, L14694, L11947, L11946, L14692



❺ L6604, L6605, L7684, L7685



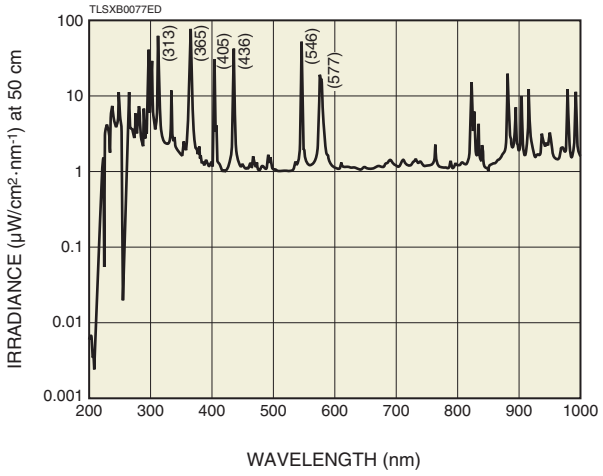
SUPER-QUIET MERCURY XENON LAMPS

Semiconductor | FA | Information | Medical | Environment

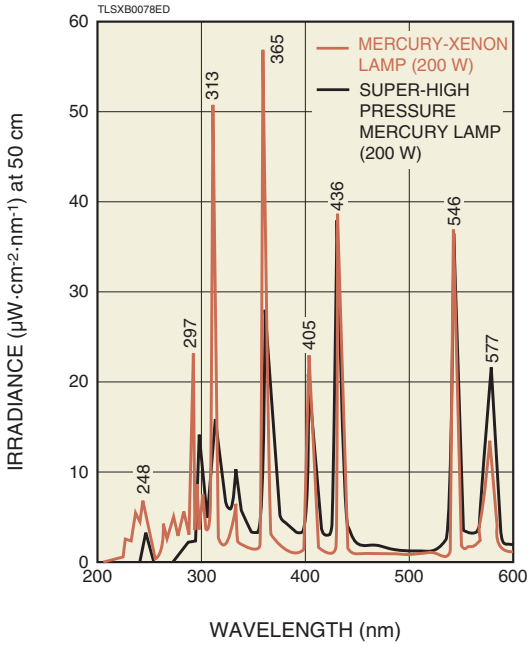
Mercury-xenon lamps are designed to provide high radiant energy in the UV region. These lamps are sealed with an optimum mixture of mercury and xenon gas that offer the best characteristics of both xenon lamps and super-high-pressure mercury lamps. For example, the spectral distribution includes the 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.
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.

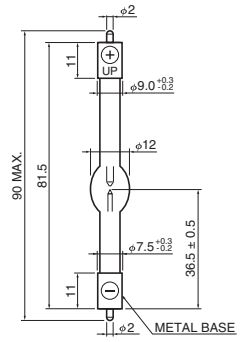
Characteristics

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: Drift Typ. (%)	Output stability: 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								
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
L2423	200	2	❺	Fused silica	185 to 2000	8.0±0.5	24	±0.5	2.0	1000	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
L8288	500	3.0	❼	Fused silica	185 to 2000	20.0±1.0	25	±0.5	2.0	1000	2000

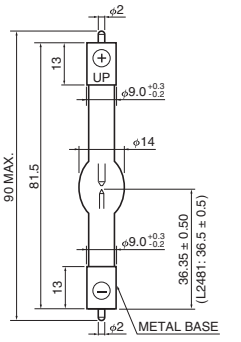
ⒶThe life end is defined as the time at which the radiant intensity falls to 50 % of its initial value or when the output fluctuation (p-p) exceeds 2.0 % (3.0 % for 250 W type L8706).

Dimensional outline Unit: mm

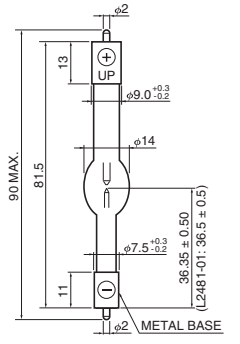
❶ L2421



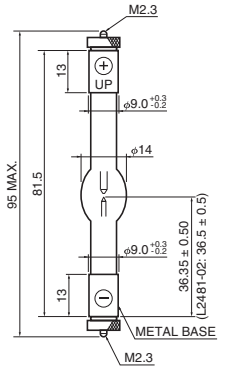
❷ L2481, L2422



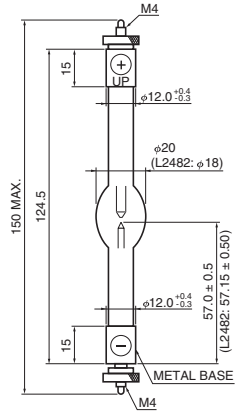
❸ L2481-01, L2422-01, L8029/-01



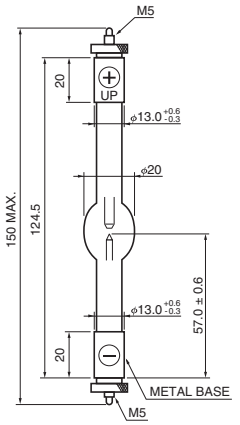
❹ L2481-02, L2422-02



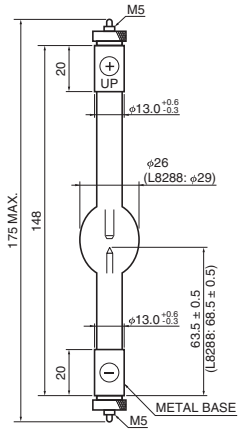
❺ L2482, L2423



❻ L8706



❼ L2483, L8288

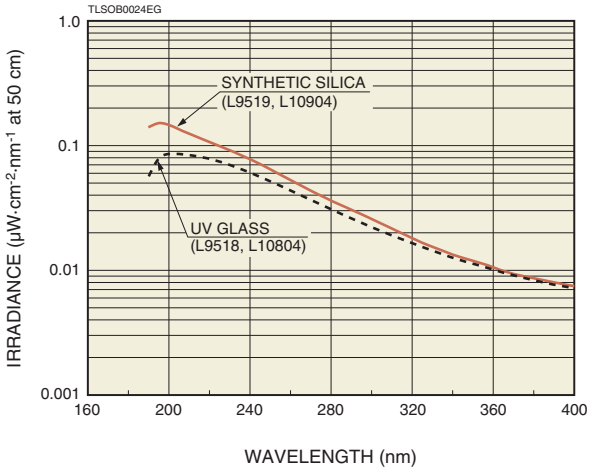


DEUTERIUM LAMPS (L2D2® LAMPS / X2D2® LAMPS / S2D2® LAMPS)

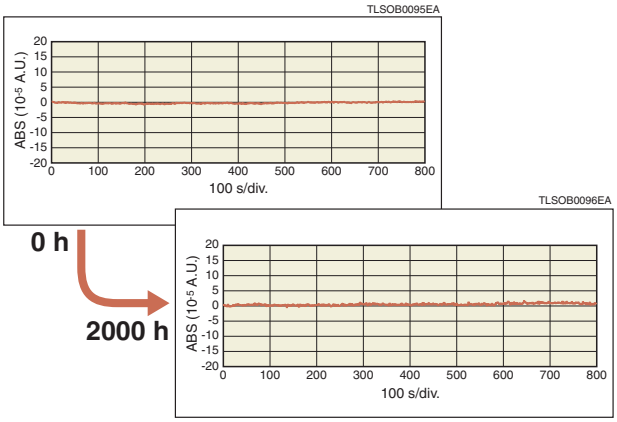
Semiconductor | Medical | Environment | Analysis

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

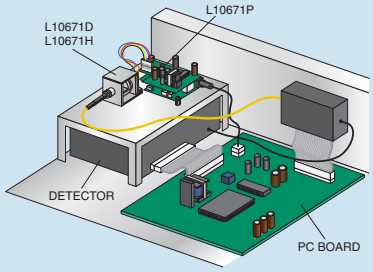


■ S2D2® module

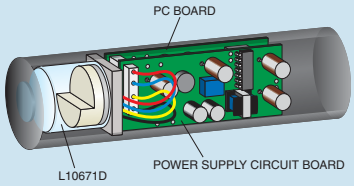
The S2D2 compact deuterium lamp is a UV point light source with a drastically reduced size compared to ordinary deuterium lamps.
This compact size of the S2D2 module makes it easy to install in all types of equipment. The dedicated lamp housing and power supply are designed to extract maximum performance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

■ Usage example

●**Installation example**



●**Customized example**



Related products

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

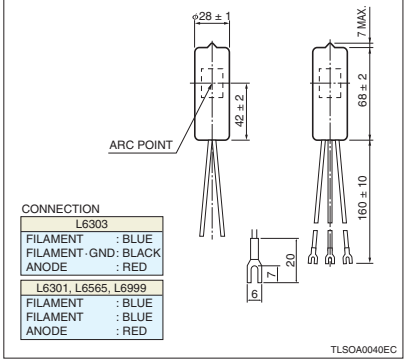
■ Characteristics

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)	Warm-up Current Typ. (A dc, ac)	Warm-up Time Min. (s)	Operating Voltage (V dc)	Operating Current Typ. (A dc)
Standard type															
L2D2	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
	L6301	❶		0.5			2000	400							
	L6301-50	❺												1.7±0.2	3.3
	L6303	❶													
	L7296	❷-ⓐ	160 to 400								10±1	1.2		7.0±0.5	1
	L7293	❷-ⓑ	115 to 400	1.0	—	—	2000Ⓓ	350			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												
S2D2	L10671D	❻	185 to 400	1.1	±0.25	0.005	1500	250	30±2	135	4.2±0.2	0.6	25	3.5±0.2	0.5
See-through type															
L2D2	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					

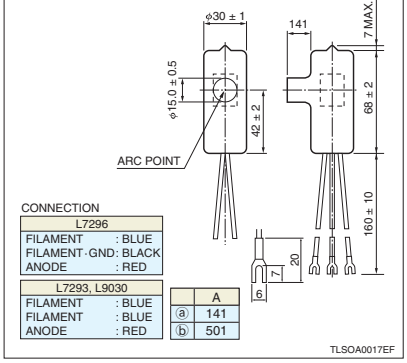
ⒶLamps with an aperture of 0.5 mm diameter are high brightness types. These lamps provide 1.4 times higher brightness than standard lamps with an aperture of 1.0 mm diameter.
ⒷThe lamp life end is defined as the point when the light output falls to 50 % of its initial value at 230 nm or when output fluctuation (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.

■ Dimensional outline Unit: mm

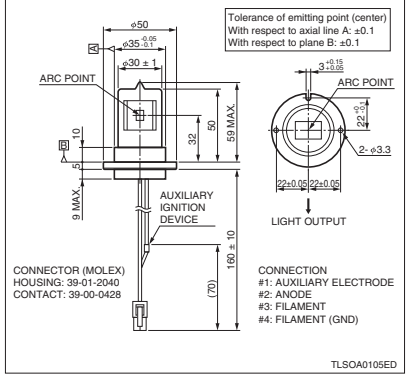
❶ L6565, L6301, L6303, L6999



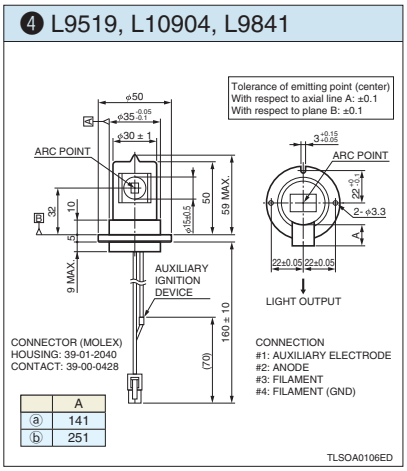
❷ L7296, L7293, L9030



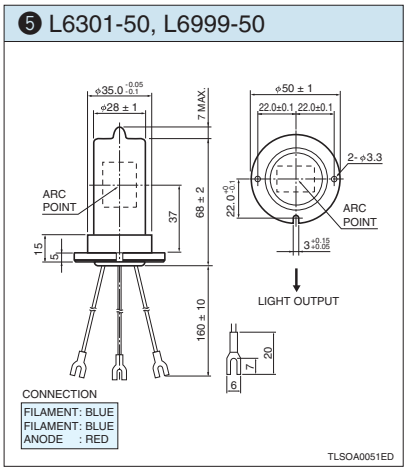
❸ L9518, L10804



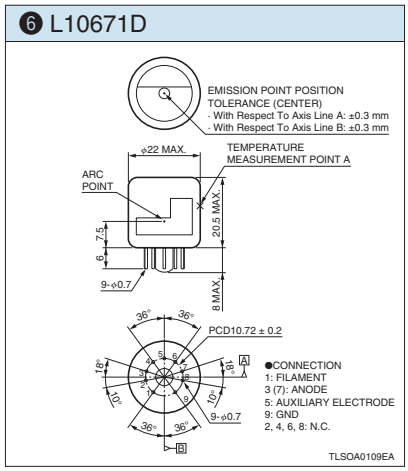
❹ L9519, L10904, L9841



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 L2433 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.

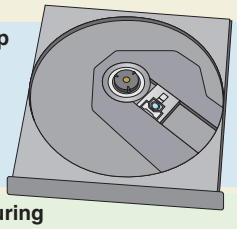
APPLIED PRODUCTS

Spot Light Sources LIGHTNINGCURE® LC8

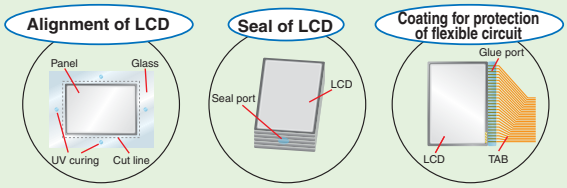
Hamamatsu spot light sources employ long life, high intensity mercury-xenon lamps and optical systems specifically designed to minimize light loss. Our UV spot light sources have gained a solid reputation for long life and high power and now fill a vital role in different fields, especially in FA (factory 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

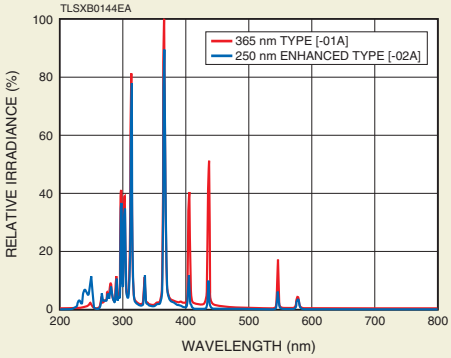
●UV curing for CD/DVD pick up



●UV curing for FPD manufacturing



Spectral distribution



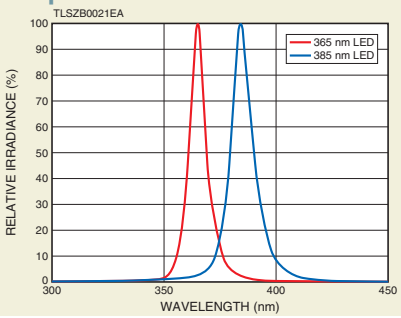
UV-LED Spot Light Source LIGHTNINGCURE® LC-L1 V5

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.

Applications

●Compact
●High stability and high output
●Low cost

Spectral distribution



Applications

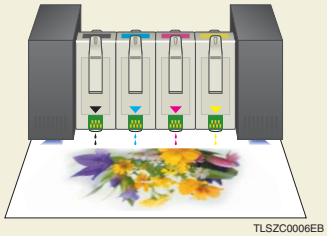
●UV curing
●High output UV irradiation

Linear Irradiation Type UV-LED Unit LIGHTNINGCURE® LC-L5G

The LC-L5 is a linear type UV-LED unit. 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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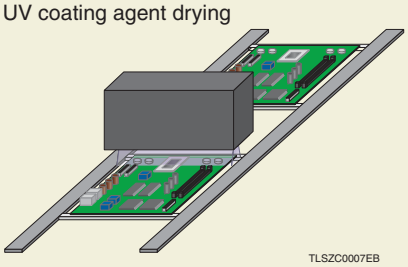
• UV coating agent drying



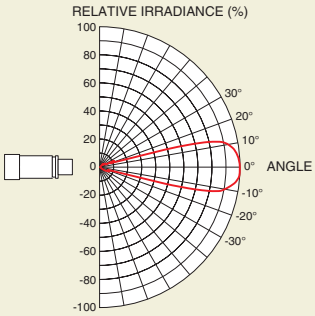
TLSZC0007EB

APPLIED PRODUCTS

Electrostatic Charge Removers VUV Ionizer

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.

Directivity (Light distribution)



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

Applications

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

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.

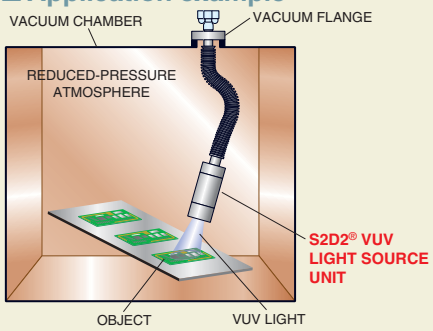
Features

- Enable proximity irradiation
- Compact
- Spectral distribution:
  115 nm to 400 nm

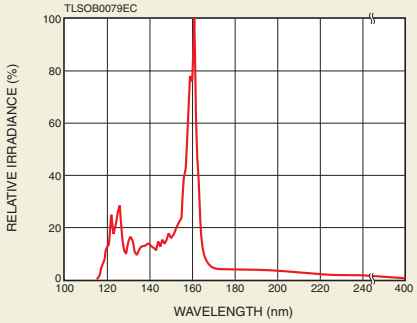
Applications

- Electrostatic remover
- VUV spectrophotometer
- Photoionization
- UV resistance testing of various material
- Excitation light source

Application example



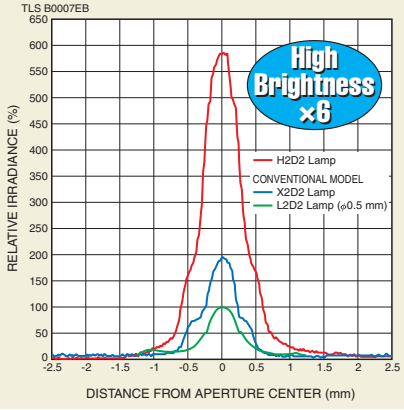
Spectral distribution



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.

Brightness distribution



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

Applications

- Semiconductor inspection
- Film thickness measurement
- Electrostatic remover
- Spectrophotometry
- Environmental measurement
- Photoionization

Excimer Lamp Light Sources FLAT EXCIMER™

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

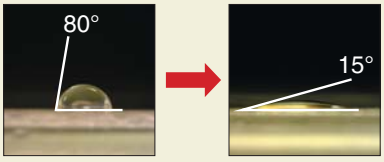
- ●Uniformly irradiates a large area
- ●Stable output with minimal flicker
- ●Efficient light emission
- ●High efficient processing
- ●Instantaneous lamp ON/OFF operation

■ Applications

- ●Surface modification
  - Bonding pre-processing
  - Adhesion improvement before printing
- ●Dry cleaning
  - Silicon wafer cleaning
  - Oil stain removal
- ●Bonding
  - Bonding of microfluidic devices
  - Bonding of wearable devices

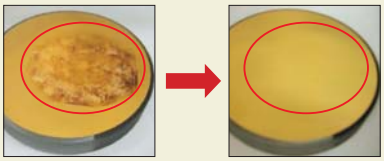
■ Application examples

●Surface modification of PET plastic



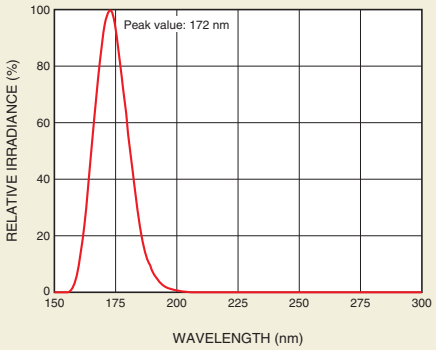
Before irradiation　　After irradiation

●Dry cleaning of gold-coated mirror for laser



Before irradiation　　After irradiation

■ Spectral distribution



EX-400

EX-86U

EX-mini

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

For proper disposal of the product, please follow the appropriate 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.

MEMO

HAMAMATSU

PHOTON IS OUR BUSINESS

Main Products

Opto-semiconductors

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

Electron Tubes

- 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

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

- Single chip laser diodes
- Laser diode bar modules
- Quantum cascade lasers
- Direct diode lasers
- Applied products of semiconductor lasers
- Solid state lasers / Fiber lasers
- Laser related products

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