

LIGHT SOURCE

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



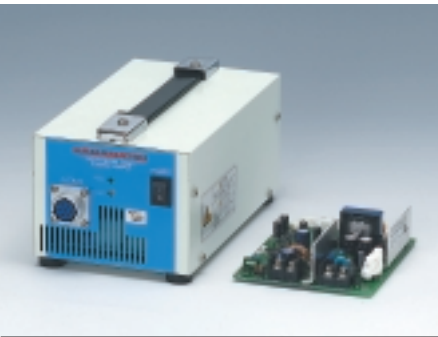
HAMAMATSU

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.





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.

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 traceability system approved by the Japan Calibration Service System (JCSS) based on the Measurement Law.

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.

LIGHT SOURCE CONTENTS

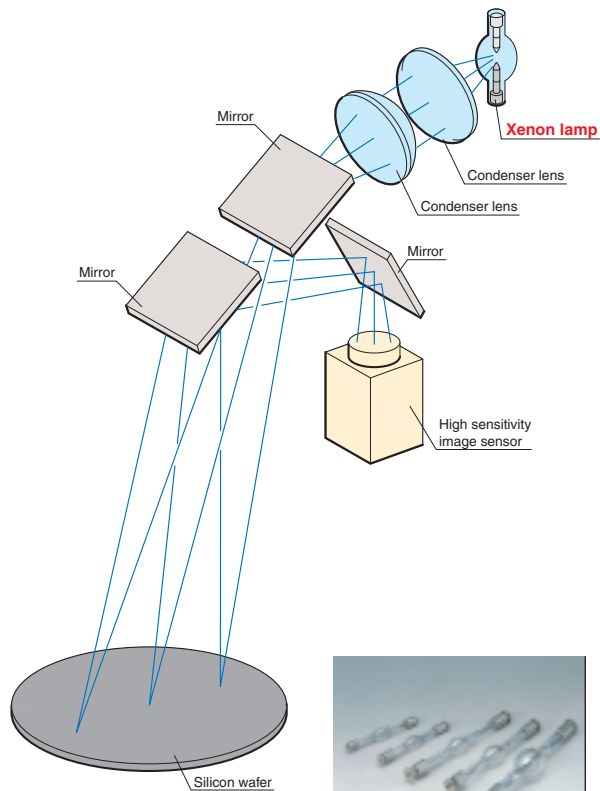
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APPLICATIONS

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

Semiconductor

Wafer surface inspection system

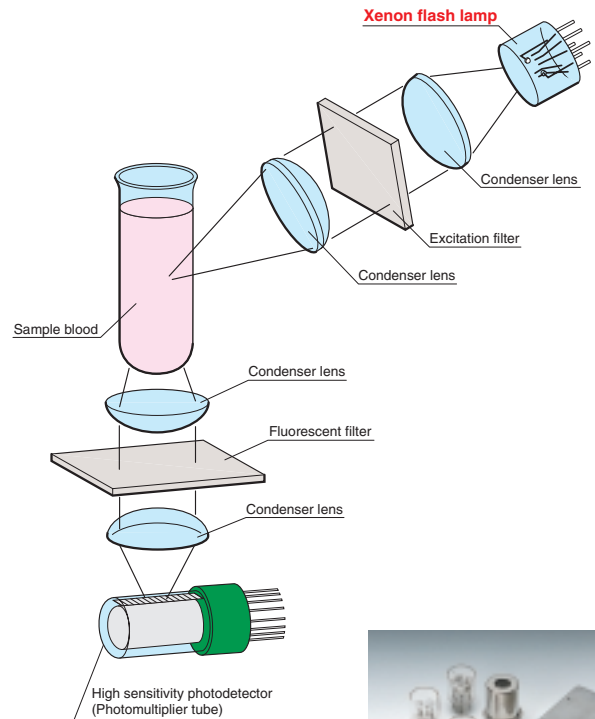


TLSOC0024EC

Xenon Lamps

Medical

Blood analyzer

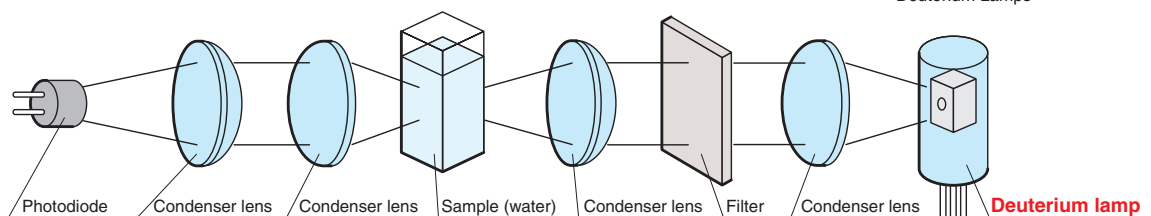


TLSOC0027EB

Xenon Flash Lamps

Environment

Water pollution analysis



TLSOC0051EA

Deuterium Lamps

QUICK REFERENCE TO PRODUCT SELECTION

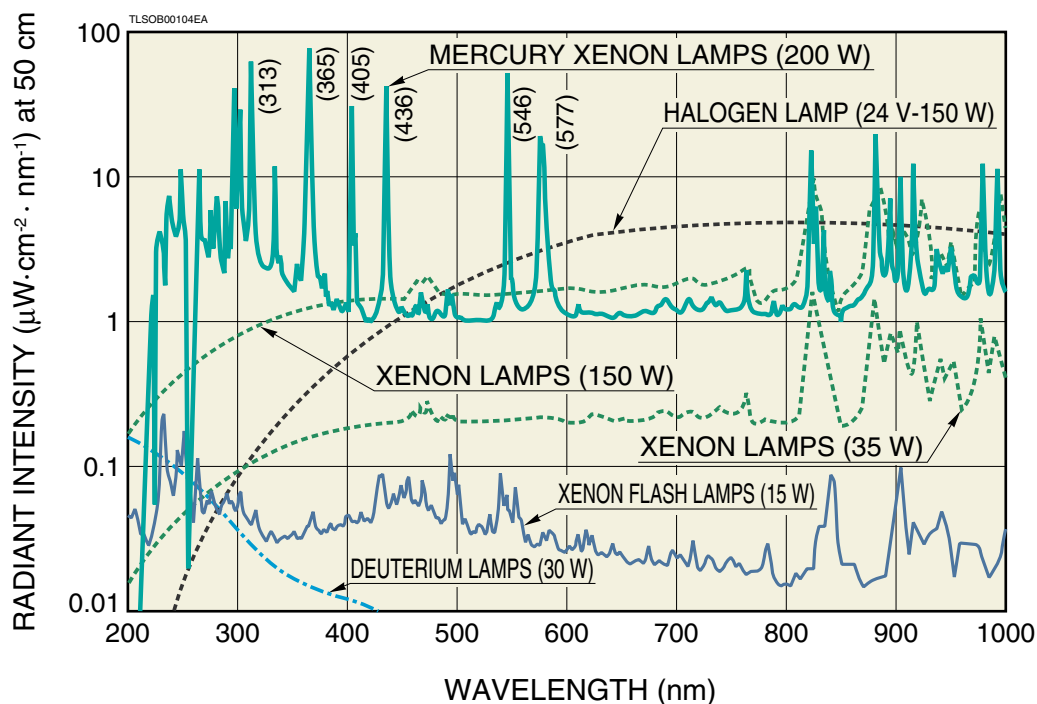
Field	Light Source	XENON LAMPS	XENON FLASH LAMPS	MERCURY XENON LAMPS	DEUTERIUM LAMPS	HOLLOW CATHODE LAMPS	OTHERS
	Applications						
Semiconductor	UV EXPOSURE SYSTEM ON THE WAFER						SPOT LIGHT SOURCES
	WAFER INSPECTION SYSTEMS						
	FILM THICKNESS MEASUREMENT						UV-VIS FIBER LIGHT SOURCE
	PARTICLE MEASUREMENT FOR PURE WATER						
	PHOTO CVD						
FA	FA STROBOSCOPES						
	UV CURING SYSTEMS						SPOT LIGHT SOURCES
	UV INK DRY OR FREEZE						SPOT LIGHT SOURCES
Information	SOLAR SIMULATORS						
	COLOR SCANNER						
	COLOR ANALYZERS						
	FLUORESCENCE MICROSCOPES						
Medical	DNA SEQUENCER						
	IN-VITRO DIAGNOSIS						
	BLOOD ANALYZERS						
	FLOW CYTOMETERS						
	CAPILLARY ELECTROPHORESIS						
	ENDOSCOPE						
	FULUORESCENCE SPECTROPHOTOMETER						
	POLARIMETERS						
Environment	BOD/COD ANALYZERS						
	POLLUTION ANALYZER						
	WATER ANALYSIS						
	ATOMIC ABSORPTION SPECTROPHOTOMETER						
	HIGH PERFORMANCE LIQUID CHROMATOGRAPHY						
Analysis	WAVELENGTH CALIBRATION						
	UV / VISIBLE SPECTROPHOTOMETER						

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.

	UV: Ultra Violet		Visible		IR: Infrared	
	100 nm	200 nm	400 nm	600 nm	1000 nm	2000 nm
Broad spectrum	115	Deuterium Lamps		400		
	160	Xenon Flash Lamps				2000
	185	Xenon Lamps				2000
	185	Mercury Xenon Lamps				2000
Line spectrum		193	Hollow Cathode Lamps		852	

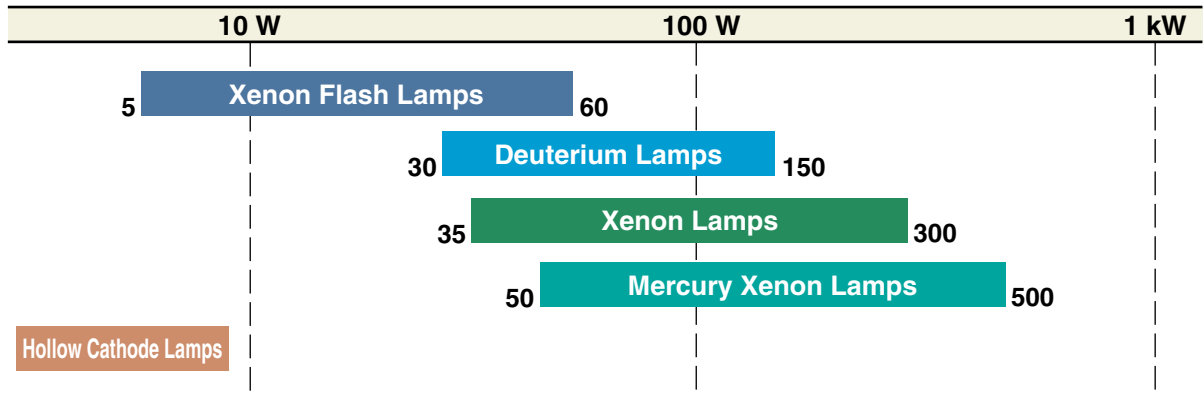
●Spectral Distribution — Broad spectrum



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



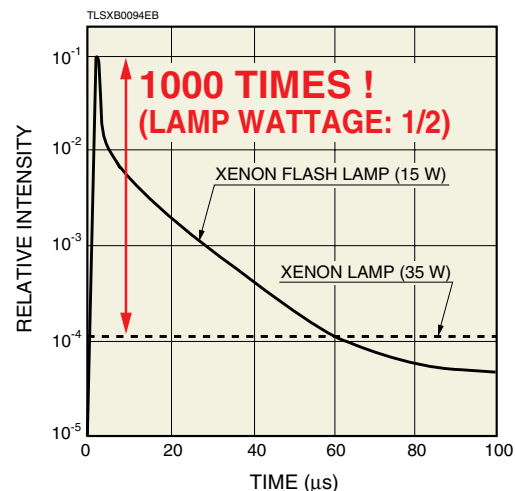
Instantaneously high peak output: Xenon flash lamp

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



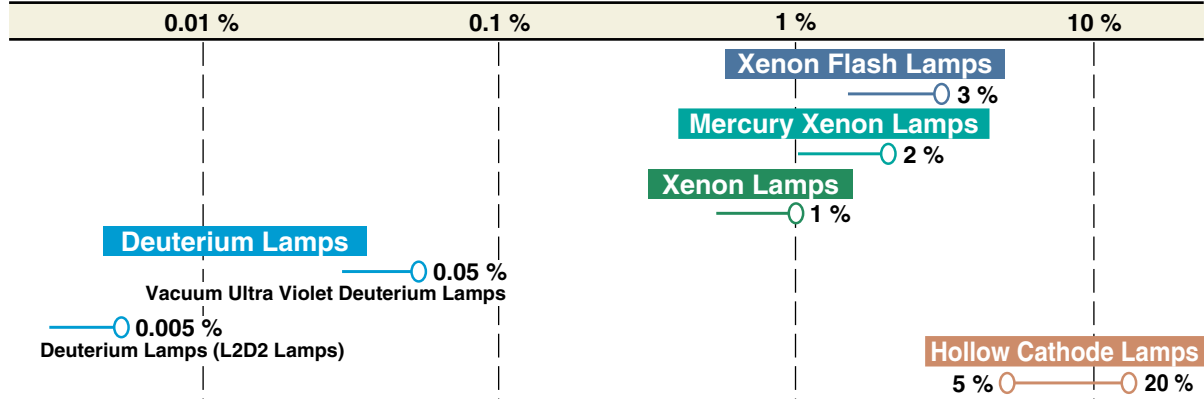
Selection Guide by Characteristics

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.

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

■ FLUCTUATION (Short-term stability)



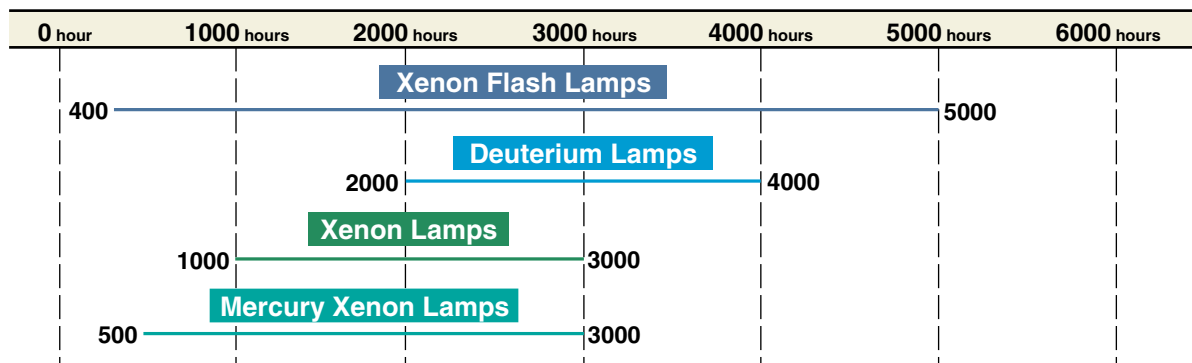
Lamp light output stability is an important factor that affects measurement accuracy and reliability of equipment. To supply lamps with high output stability, Hamamatsu has made consistent efforts to achieve "ideal electrode construction and positioning accuracy" and also to develop "optimum power supplies".

Selection Guide by Characteristics

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: 3000 hours - High stability Fluctuation (p-p): 0.2 % Typ. - No arc point shift	185 to 2000	35 to 300	Less than 1 %	1000 to 3000	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	5 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.	- High stability: 0.005 % (Typ.) - 30 W type - Long life: 4000 hours - 30 W type - Less variation of intensity	115 to 400	30 / 150	0.005 % Typ.	2000 / 4000	Lamp Housing  Power Supply 
Hollow Cathode Lamp	Metal-vapor discharge lamp	66 types of single element lamps and 7 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

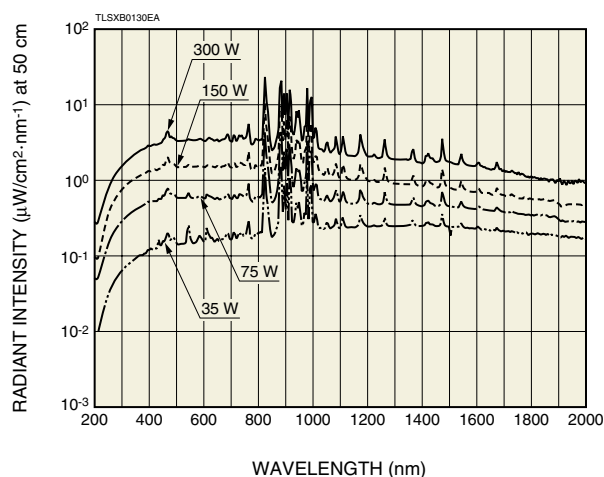
Analysis

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.

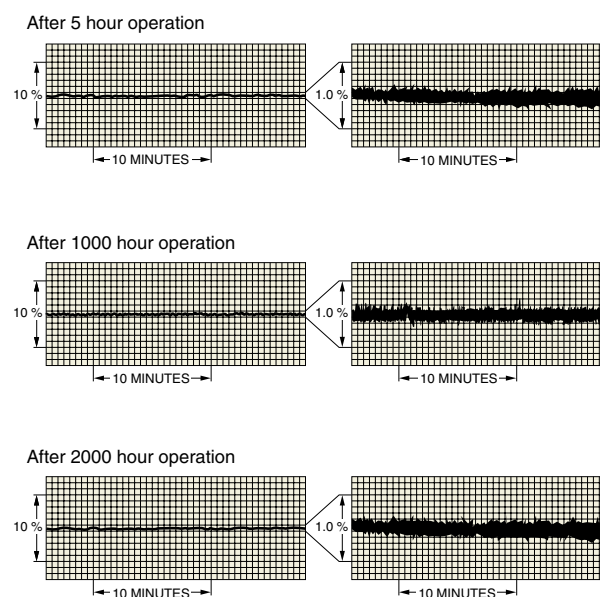


TLSXF0024

■ Spectral Distribution (Fused Silica Type)



■ Fluctuation vs. Operating Time



TLSXB0076EA

Related Products

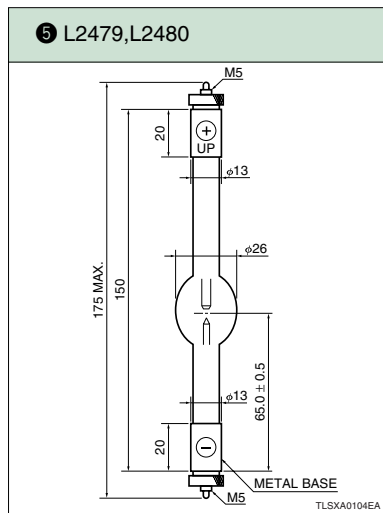
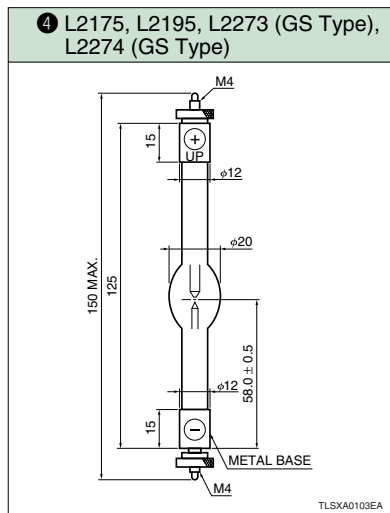
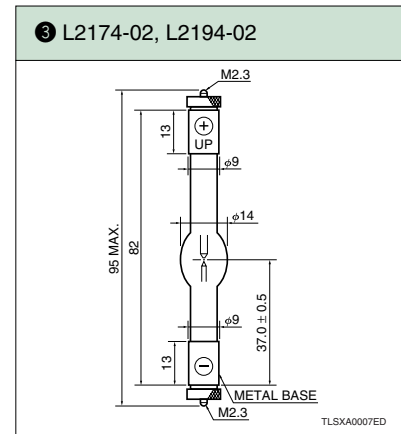
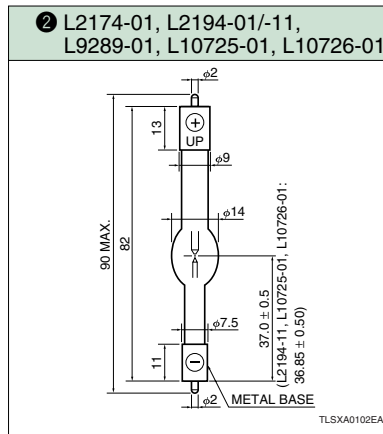
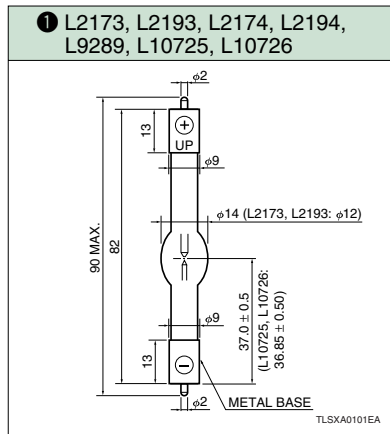
Power supplies and lamp housings are also available. Please refer to the individual catalog for details.

■ 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 ^(A) (h)	Average Life (h)	
L2173	35	1.0	①	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	②	Fused Silica	185 to 2000	5.4±0.5	15	±0.5	1.0	1000	2000	
L2174-01												③
L2174-02												
L10725		1.0	①	Fused Silica	185 to 2000	5.7±0.3	13.5	±0.5	1.0	2000	3000	
L10725-01												②
L2194		1.3	①	Ozone-free Silica	240 to 2000	5.4±0.5	15	±0.5	1.0	1000	2000	
L2194-01												②
L2194-02												
L2194-11		1.0	②	Ozone-free Silica	240 to 2000	5.7±0.3	13	±0.5	1.0	2000	3000	
L10726												①
L10726-01												
L9289	100	1.3	①	Ozone-free Silica	240 to 2000	7.0±0.5	15	±0.5	1.0	1500	2500	
L9289-01												②
L2175	150	2.5	④	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) ^(B)		2.0		Fused Silica	185 to 2000	8.5±0.5	17			1800	3000	
L2274 (GS Type) ^(B)				Ozone-free Silica	240 to 2000							
L2479	300	3.0	⑤	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 type is short gap type

■ Dimensional Outline Unit: mm



SUPER-QUIET XENON FLASH LAMPS

Semiconductor

FA

Information

Medical

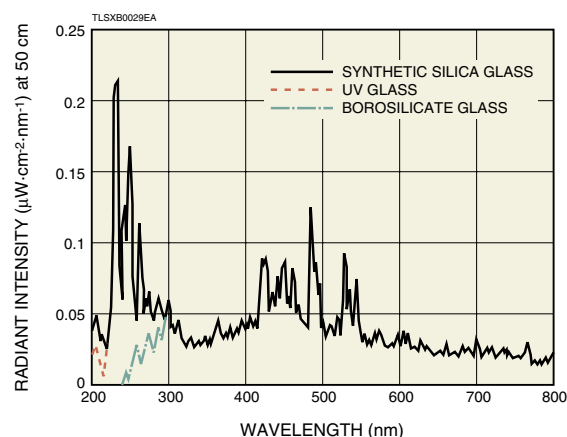
Environment

Analysis

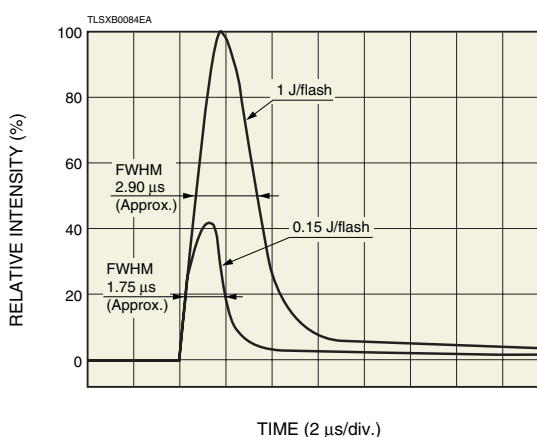
Xenon flash lamps emit a brilliant continuous spectrum from UV to infrared and feature a compact construction and less heat generation compared to continuous mode lamps. Hamamatsu super quiet xenon flash lamps are ideally suited for precision photometry because of outstanding characteristics such as 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 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 newly developed 5 W lamp, trigger socket and power supply all integrated into one unit.



Spectral Distribution



Flash Pulse Waveform (60 W type)



Compact 5 W Xenon Flash Lamp Modules L9455 Series, L9456 Series

Easy-to-use lamp modules with built-in 5-watt xenon flash lamp, power supply and trigger socket. These flash lamp modules operate up to a maximum emission frequency of 530 Hz*. Guiding the output light via optical fiber is simple since lamp modules have an SMA connector. * Depends on the input energy per flash.

LINE-UP

Standard Type (without Fiber Adapter)

Type No.	Arc Size (mm)	Main Discharge Capacitor (μF)
L9455-01	1.5	0.22
L9455-02		0.11
L9455-03		0.047
L9456-01	3.0	0.22
L9456-02		0.11
L9456-03		0.047

With SMA Fiber Adapter Type

Type No.	Arc Size (mm)	Main Discharge Capacitor (μF)
L9455-11	1.5	0.22
L9455-12		0.11
L9455-13		0.047

SPECIFICATIONS

Parameter	Description / Value
Window Material	UV glass
Spectral Distribution	185 nm to 2000 nm
Main Discharge Voltage	400 V to 600 V
Adjustable Range [Ⓐ]	
Max. Average Input (continuous) [Ⓑ]	5 W
Light Output	L9455 2.0 % CV
Stability (Max.) [Ⓒ]	L9456 1.5 % CV
Guaranteed Life [Ⓓ]	1.0 × 10 ⁹ Flash
Input Voltage Range	11 V to 28 V
Input Current	1 A
Dimensions (W × H × D)	44 mm × 35 mm × 98 mm

NOTE:

- Ⓐ Adjustable with internal trimmer potentiometer or external voltage supply of 3.2 V to 4.8 V.
- Ⓑ Maximum average input (continuous) W is given by: $W = E \times f$ [W], where E is the maximum input energy (J) and f is the repetition frequency (Hz).
- Ⓒ Calculated by: standard deviation / average light output × 100 [%]
- Ⓓ At 5-watt operation



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.	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 ^{A)}		Guaranteed Life (Number of Flashes)	Suitable Trigger Socket
											Jitter Typ. (ns)	Output Fluctuation Max. (%)		

HQ – 20 mm Diameter Type

L4644	3.0	①-(a)	Hemisphere	UV Glass	185 to 2000	700 to 1000	5 to 7	10	0.1	100	200	3	1×10^9	E2418 E6188
L4646		②-(a)	Flat											
L4645		①-(a)	Hemisphere	Borosilicate Glass	240 to 2000									
L4647		②-(a)	Flat											
L4640	1.5	①-(b)	Hemisphere	UV Glass	185 to 2000	700 to 1000	5 to 7	10	0.1	100	200	3.5	1×10^9	E2422 E6186
L4642		②-(b)	Flat											
L4641		①-(b)	Hemisphere	Borosilicate Glass	240 to 2000									
L4643		②-(b)	Flat											

SQ – 26 mm Diameter Type (22 mm and 28 mm types are also available)

20 mm Diameter, Type 1 (22 mm and 25 mm types are also available)														
L2187	8.0	③-Ⓐ	Flat	Synthetic Silica	160 to 2000	700 to 1000	5 to 7	15	0.15	100	200	2.5	1.2×10^9	E2191 Series
L2188				UV Glass	185 to 2000									
L2189				Borosilicate Glass	240 to 2000									
L2358	3.0	③-Ⓑ	Flat	Synthetic Silica	160 to 2000	700 to 1000	5 to 7	15	0.15	100	200	2.5	1.2×10^9	E2361 Series
L2359				UV Glass	185 to 2000									
L2360				Borosilicate Glass	240 to 2000									
L2435	1.5	③-Ⓒ	Flat	Synthetic Silica	160 to 2000	700 to 1000	5 to 7	15	0.15	100	200	3.5	1.2×10^9	E2438 Series
L2436				UV Glass	185 to 2000									
L2437				Borosilicate Glass	240 to 2000									

Built-in Reflector – 26 mm Diameter Type

L4633	1.5	4	Converging	Borosilicate Glass	240 to 2000	700 to 1000	5 to 7	15	0.15	100	200	5	5×10^8	E4370-01
L4633-01*			UV Glass	185 to 2000										
L4634		5	Collimating	Borosilicate Glass	240 to 2000									
L4634-01*			UV Glass	185 to 2000										

60 W Type

L6604	3.0	6	Flat	Borosilicate Glass	240 to 2000	700 to 1000	5 to 10	60	1	60	200 ^(B)	3 ^(B)	8 × 10 ⁷	E6647
L6605				Sapphire Glass	190 to 2000									

Built-in Reflector – 60 W Type

L7684	3.0	6	Flat	Borosilicate Glass	240 to 2000	700 to 1000	5 to 10	60	1	60	200 ^B	3 ^B	8 × 10 ⁷	E6647
L7685				Sapphire Glass	190 to 2000									

Ⓐ Measured with supply voltage of 1000 V, main discharge capacitor of 0.1 μ F, repetition rate of 50 Hz and wavelength of 400 nm.

ⓑ Measured with supply voltage of 1000 V, main discharge capacitor of 2 μ F, repetition rate of 10 Hz and wavelength of 400 nm.

© Variation in delay from input of the flash signal (trigger signal) to peak flash

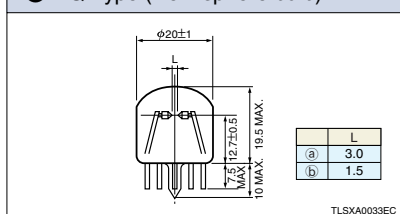
(This varies depending on the main voltage value.)

$$\textcircled{D} \text{ Output stability} = \frac{(\text{Max. output} - \text{Min. output})}{\text{Average output}} \times 100$$

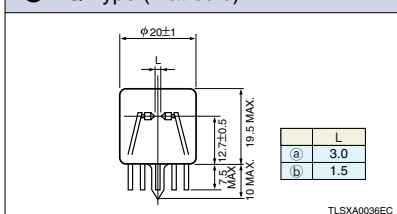
* Manufactured upon receiving your order

■ **Dimensional Outline** Unit: mm

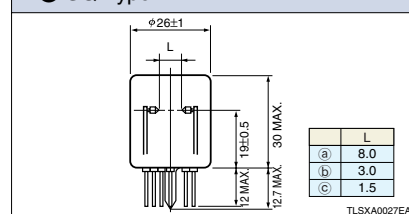
① HQ Type (Hemisphere bulb)



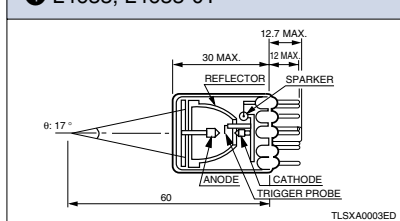
② HQ Type (Flat bulb)



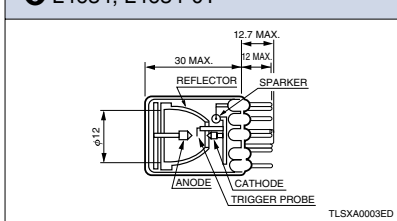
③ SQ Type



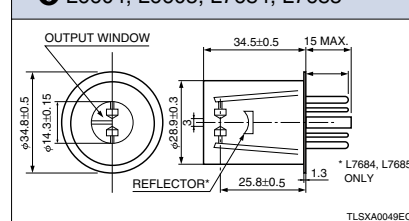
④ L4633, L4633-01



⑤ L4634, L4634-01



⑥ L6604, L6605, L7684, L7685



SUPER-QUIET MERCURY XENON LAMPS

Semiconductor

FA

Information

Medical

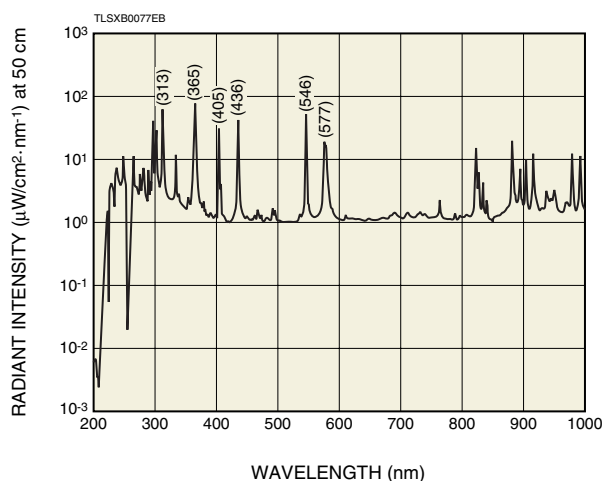
Environment

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. 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.

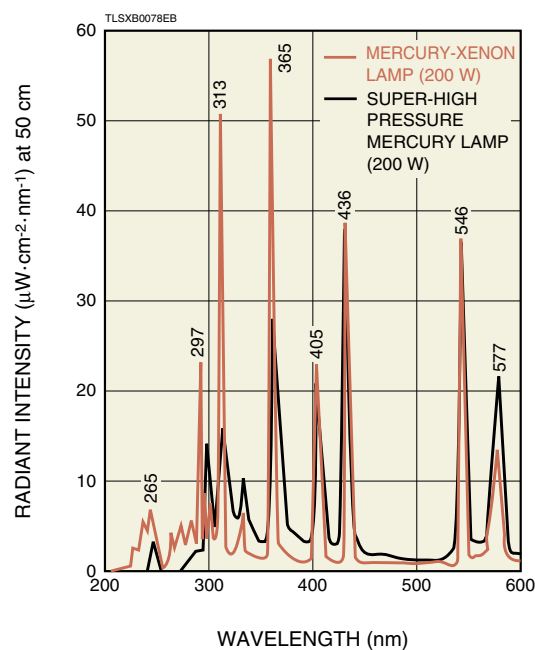


TLSXF00047

■ Spectral Distribution (200 W)



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



Related Products

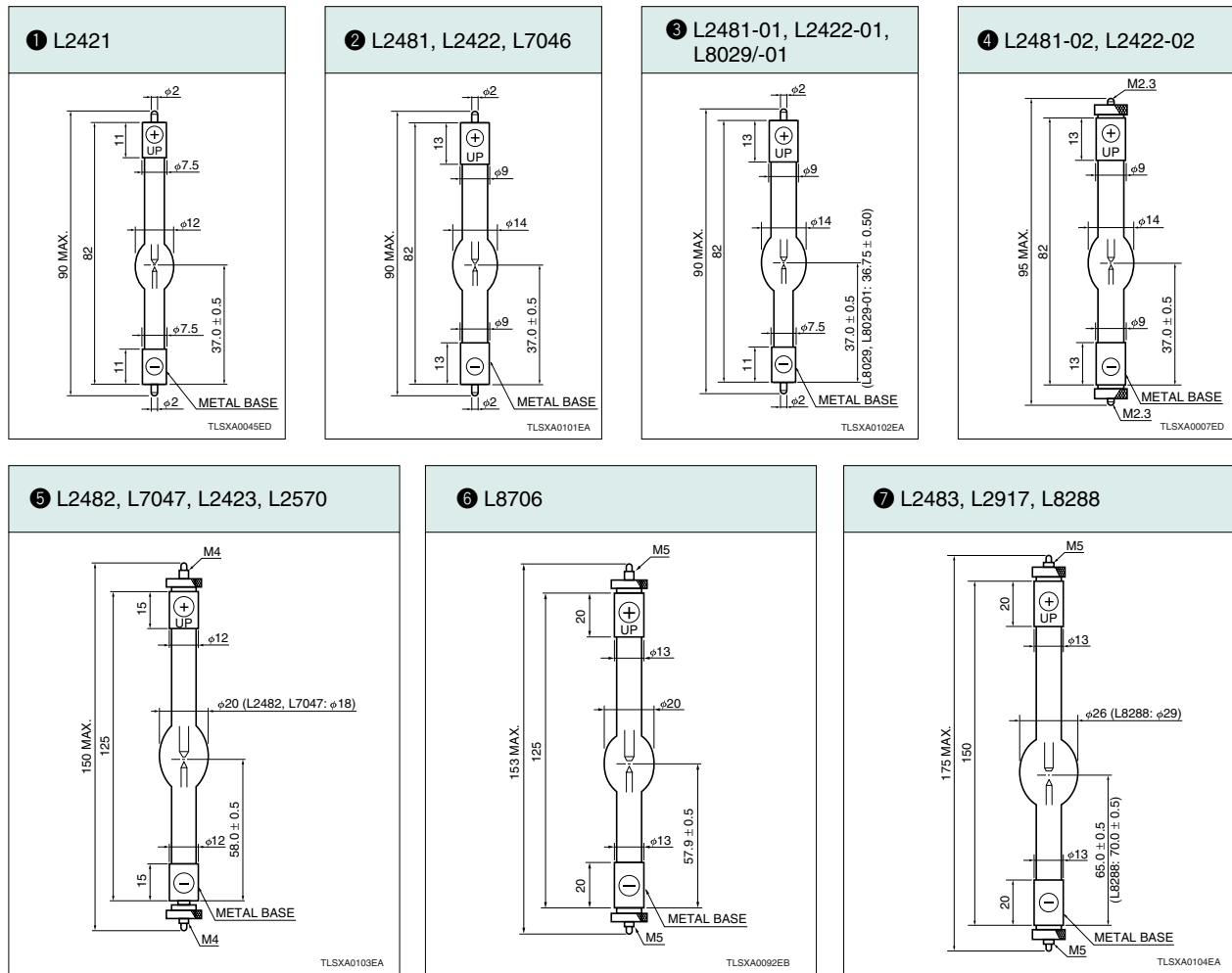
Power supplies and lamp housings are also available. Please refer to the individual catalog for details.

■ 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) ^(A)	Average Life (h)				
L2421	50	1.0	①	Fused Silica	185 to 2000	3.5±0.2	14	±0.5	2.0	500	1000				
L2481	75	1.0	②	Fused Silica	185 to 2000	5.4±0.5	14	±0.5	2.0	500	1000				
L2481-01			③												
L2481-02			④												
L2422	100	1.3	②	Fused Silica	185 to 2000	5.5±0.5	18	±0.5	2.0	500	1000				
L2422-01			③												
L2422-02			④												
L7046			②									Ozone-free Silica	240 to 2000		
L8029		0.8	③	Fused Silica	185 to 2000									1000	2000
L8029-01															
L2482	150	1.7	⑤	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	⑤	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	⑥	Fused Silica	185 to 2000	8.5±0.5	27	±0.5	3.0	2000	3000				
L2483	350	2.5	⑦	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	⑦	Fused Silica	185 to 2000	20.0±1.0	25	±0.5	2.0	1000	2000				

(A) 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



DEUTERIUM LAMPS (L2D2 LAMPS / X2D2 LAMPS)

Semiconductor

Medical

Environment

Analysis

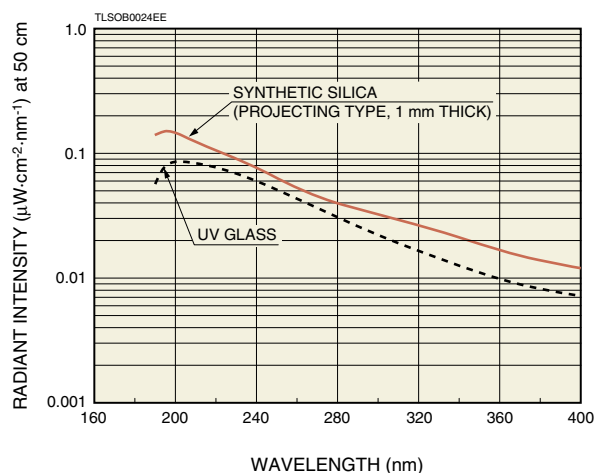
Deuterium lamps are discharge lamps utilizing the arc discharge from the deuterium gas (D₂) sealed inside the lamp. These lamps produce a continuous spectrum of UV light shorter than 400 nm, and are widely used in analytical instruments such as spectrophotometers and high performance liquid chromatographs (HPLC). Hamamatsu deuterium lamps are described as "L2D2 lamps" that offer longer life and higher stability than conventional lamps. In particular, the L2-4000 series lamps guarantee an operating life "4000 hours".

Our unique advanced electrode (ceramic electrode) technology delivers precision lamps with high stability and minimal variations in light output between lamps.

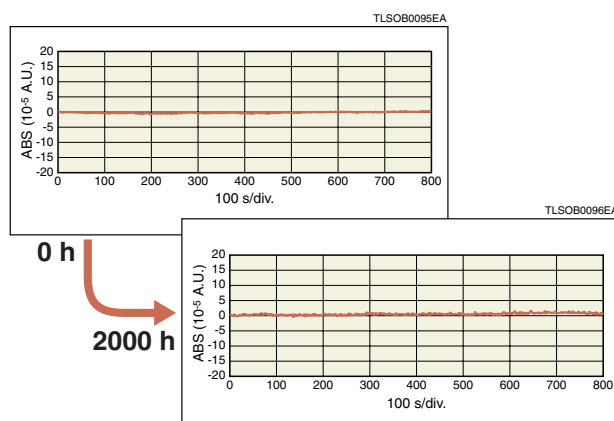


TLSOF0178

Spectral Distribution



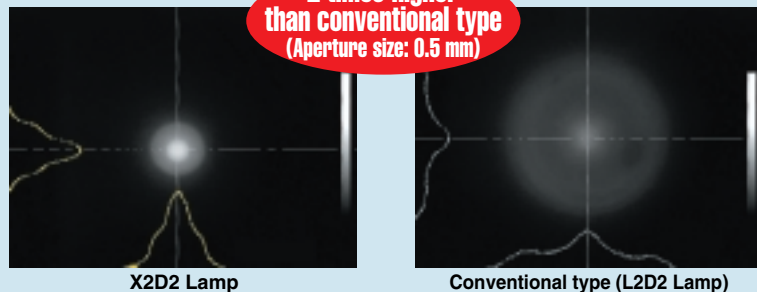
Light Output Stability



X2D2 Lamp (High Brightness Deuterium Lamp)

The X2D2 lamp (brightness of new deuterium lamp) is two times higher than conventional deuterium lamp ($\phi 0.5$ mm aperture type). It can realize high resolution and high throughput of the instruments.

Arc Distribution



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	Aperture Diameter	Output Stability at 230 nm		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					
					Drift Max. (%/ h)	Fluctuation (p-p) Typ. (%)					Warm-up			Operating		
											Voltage (V dc, ac)	Current Typ. (A dc, ac)	Time Min. (s)	Voltage (V dc)	Current Typ. (A dc)	
Standard type																
L2-4000	L6565	①	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	②-a									3.0±0.3	5		0 to 1	0 to 1.8	
L2-2000	L6301	①	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	⑥									2.5±0.25	4		1.7±0.2	3.3	
	L6303	①									3.0±0.3	5		0 to 1	0 to 1.8	
	L6305	②-a									3.0±0.3	5		2.5 to 6.0	0.3 to 0.6	
	L6307	②-b									10±1	0.8		7.0±0.5	1	
	L6309	②-b										1.2				
	L7296	③-a	160 to 400	1.0	—	—	2000 ⑥	350	300±30	80	12 to 15	0.5 to 0.55	0	0		
	L7296-50	④-a									10±1	0.8	2.5 to 6.0	0.3 to 0.6		
	L6311	②-c	185 to 400	1.0	—	—	2000 ⑥	350	300±30	80	2.5±0.25	4	20	1.0±0.1	1.8	
	L6311-50	⑤									2.5±0.25	4		1.0±0.1	1.8	
	L7292	③-b									10±1	0.8		2.5 to 6.0	0.3 to 0.6	
	L7293	③-b									2.5±0.25	4		1.0±0.1	1.8	
X2	L9518	— ⑥	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	— ⑥	160 to 400							85						
	L9841	— ⑥	115 to 400							85						

Standard type

See-through Type

L2-2000	L6999	①	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	⑥	185 to 400												
	L9030	③-a	160 to 400												
	L9030-50	④-a	160 to 400												
X2	L10804	—E	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	—E	160 to 400							85					

① 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.

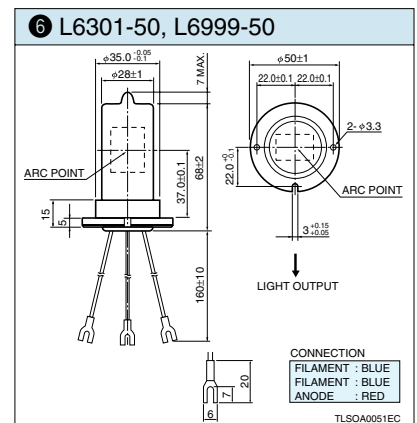
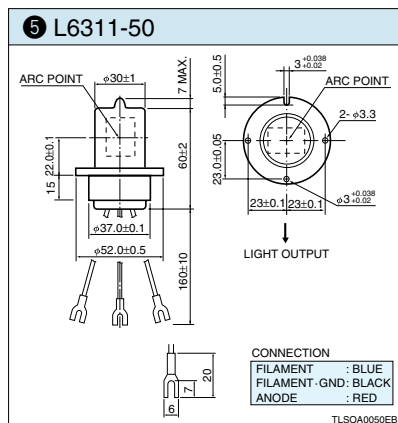
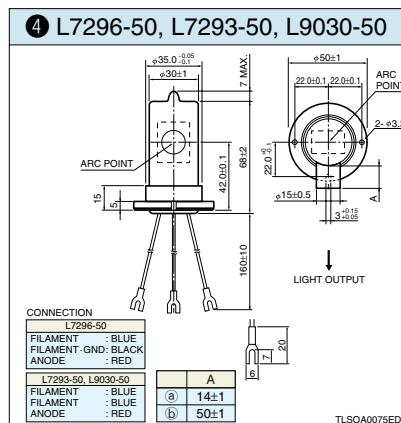
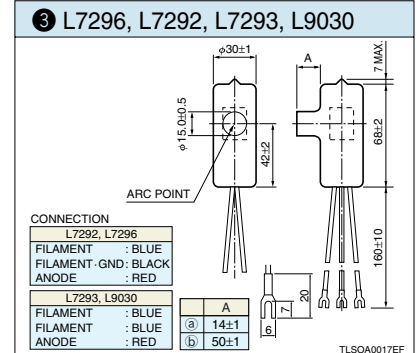
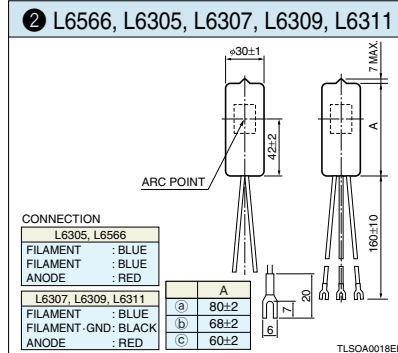
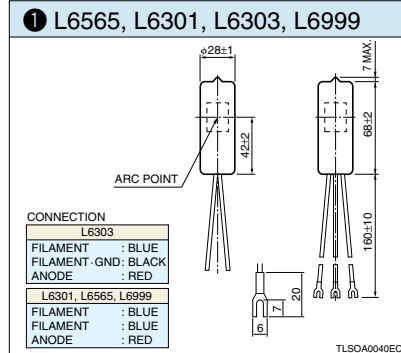
② The lamp life end is defined as the point when the light output falls to 50 % of its initial value at 230 nm or when output fluctuation (p-p) exceeds 0.05 %.

③ 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.

④ Operating life depends on environmental conditions (vacuum atmosphere). It is recommended that these lamps be used in an oil-free environment.

⑤ Please refer to X2D2 data sheet.

Dimensional Outline Unit: mm



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 7 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.



TL50F0133

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
Ca-Mg-Zn	Calcium Magnesium Zinc	-322NQ

*: 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
D2 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®

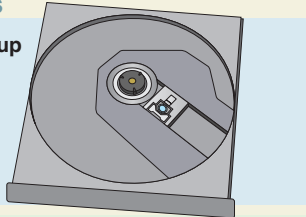
Hamamatsu spot light sources employ long life, high intensity mercury-xenon lamps and optical systems specifically designed to minimize light loss. Our UV spot light sources have gained a solid reputation for long life and high power and now fill a vital role in different fields, especially in FA (factory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

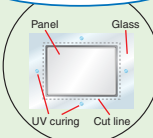
●UV curing for CD/DVD pick up

Adhesion
fix

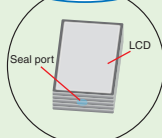


●UV curing for FPD manufacturing

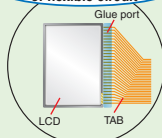
Alignment of LCD



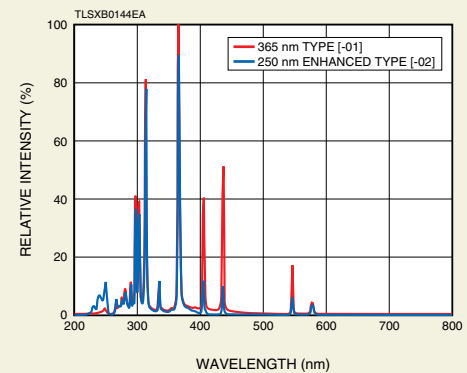
Seal of LCD



Coating for protection of flexible circuit



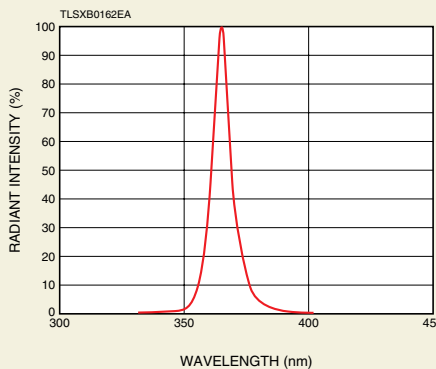
Spectral Distribution



UV-LED Spot Light Sources LIGHTNINGCURE® LC-L1

The LC-L1 is a UV-LED spot light source that emits UV light at 365 nm. This monochromatic light source causes no thermal damage or harmful DUV (deep UV) effects to objects being irradiated. Its low power consumption makes it an energy-saving and environmentally friendly light source. The built-in LED has a very long life of 20 000 hours. This reduces costly down time from having shut the production line down to replace lamps. The LC-L1 light source was designed by integrating lamp and semiconductor technologies.

Spectral Distribution



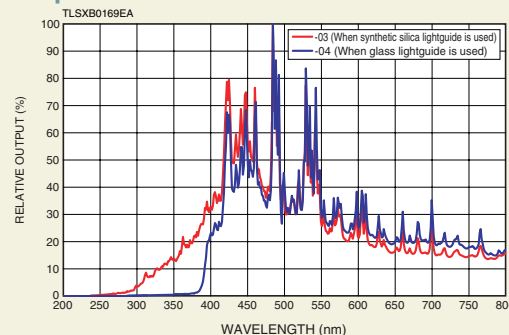
Applications

- Experiments using intense UV irradiation
- UV curing

Flash Light Sources LIGHTNINGFLASH®

This flash light source, called "LF1", consists 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 LF1 to emit a variety of different types of light. Light emission is highly intense for a period of microseconds, making the LF1 ideal for strobe light sources. The LF1 is 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

APPLIED PRODUCTS

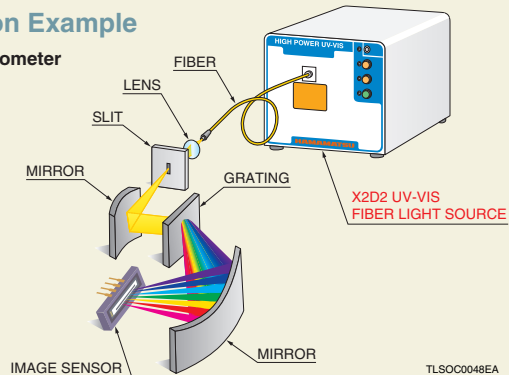
X2D2 UV-Visible Fiber Light Source

This light source contains a X2D2 lamp and a tungsten-halogen lamp in a compact case and outputs 200 nm to 1100 nm light through a light guide. (Light guide is optional and sold separately.)

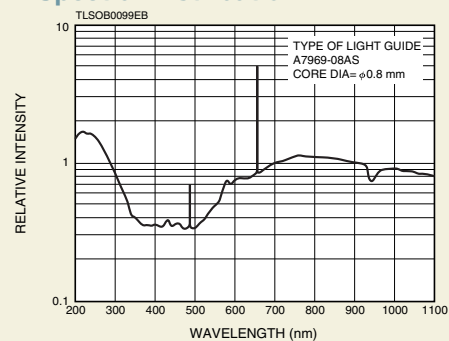
The X2D2 lamp and tungsten-halogen lamp are precision-assembled into a dedicated lamp housing to ensure optimum operation. This allows highly stable lamp operation over a long service life without any special alignment. This light source is easy to carry due to compact size and light weight, and so is ideal for use with all types of portable devices.

Application Example

●Spectrophotometer



Spectral Distribution



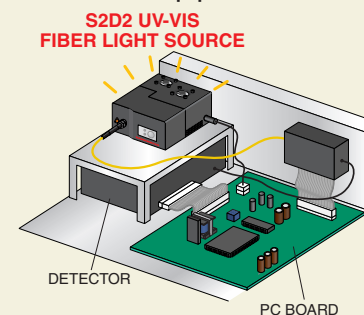
S2D2 UV-Visible Fiber Light Source

The L10671 is the compact UV-VIS fiber light source using a S2D2 (Stable and Small Deuterium) lamp.

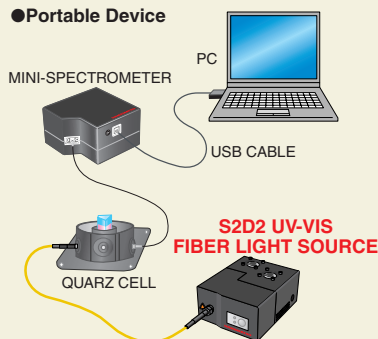
The L10671 is the light source that offers high radiant power and high stability despite its compact size. Besides being compact and easy to carry, the L10671 operates on a low voltage. These features make the L10671 ideal for all types of portable devices requiring a UV-VIS light source.

Application Examples

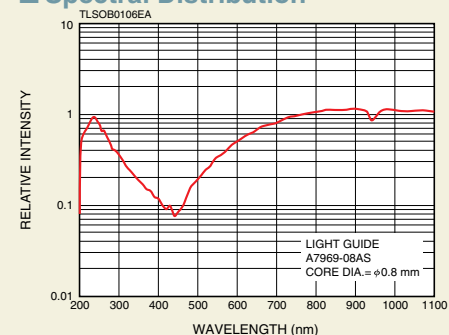
●Assemble into Equipment



●Portable Device



Spectral Distribution



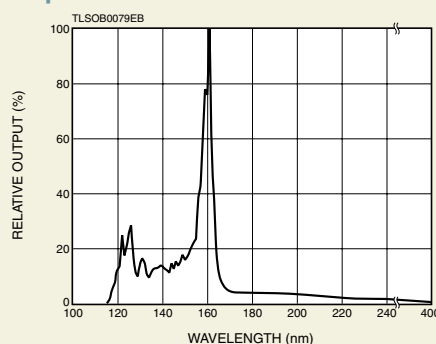
X2D2 VUV Light Source Unit

Hamamatsu introduces a vacuum ultraviolet (VUV) light source that combines a X2D2 lamp. Its compact size and air-cooled configuration allow easy handling and operation. The deuterium lamp uses an MgF₂ (magnesium fluoride) window to efficiently transmit VUV radiation down to 115 nm.

Features

- High VUV intensity
- Air-cooled (no cooling water required)
- No optical Axis Alignment Required

Spectral Distribution



Applications

- VUV spectrophotometers
- Light CVD (Chemical Vapor Deposition)
- Light chemical reaction
- Experiment and study using VUV light

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 MgF₂ 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.



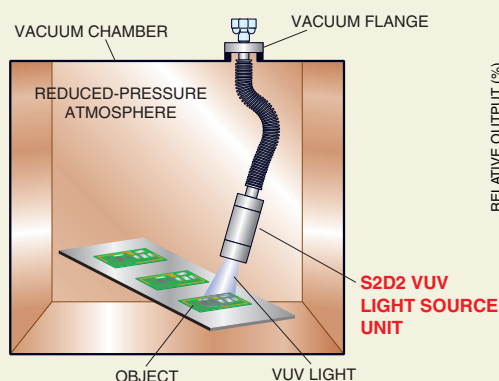
■ Features

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

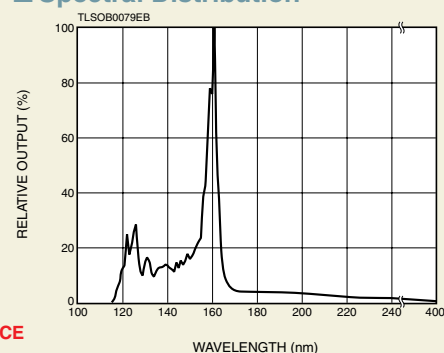
■ Applications

- 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, while the L7820-02 deuterium lamp light source is calibrated in the UV range from 200 nm to 400 nm.

The spectral range at wavelengths shorter than 250 nm is calibrated based on the ASNITE calibration system (Accreditation System of National Institute of Technology and Evaluation), while the spectral range at wavelengths longer than 250 nm is calibrated based on the JCSS (Japan Calibration Service System).



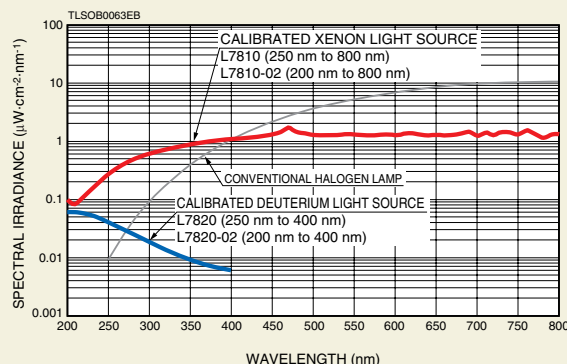
■ Features

- 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.

INTRODUCTION OF OUR WEBSITE



Please visit our website for information about our latest products, news, technology introduction and corporate outline.

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