HAMAMATSU

SUPER-QUIET XENON LAMPS

Xenon short-arc lamps are point light sources with ample luminance and high color temperature, which emit a continuous spectrum of light ranging from ultraviolet to visible and infrared. Though ideal as light sources for various types of measuring instruments including spectrophotometers, conventional types of Xenon short-arc lamps inadequate as light sources for precision photometry since their light emissions are unstable due to arc point shift and fluctuation.

Solving the problems of arc point shift and fluctuation is essential in order to use Xenon short-arc lamps in photometric applications. Hamamatsu super-quiet Xenon lamps completely have solved these problems by using a highly durable cathode. This cathode exhibits virtually no shift and minimal fluctuation of the arc point until the lamp life end is reached. Our super-quiet Xenon lamps also deliver unprecedentedly long service life.

FEATURES

- **High stability**
  Fluctuation (p-p) ..... 0.2 to 0.3 % Typ.
  1.0 % Max.
  Drift ..... ±0.5 %/h Typ.
- **No arc point shift ..... 0.1 mm Max.**
- **Long life**
  Guaranteed life ... 1000 h, 1200 h or 1800 h (GS type)
  Average life ..... 2000 h, 2500 h or 3000 h (GS type)
- **Low wattage input ..... 35 W, 75 W, 150 W, 300 W**
- **High color temperature ..... 6000 K**
- **Wide spectral distribution**
  Fused silica ..... 185 nm to 2000 nm
  Ozone-free silica ..... 220 nm to 2000 nm
- **Point light source, high intensity**

APPLICATIONS

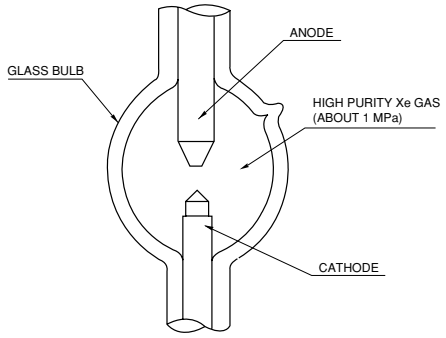
- **Spectrophotometer**
- **Liquid chromatograph**
- **Fluorospectrophotometer**
- **Microscope**
- **Color analyzer, Color scanner**
- **Spectropolarimeter**
- **Blood cell counter**
- **Colorimeter**
- **Solar simulation**
- **Densitometer**
- **Photochemistry**
- **Environmental inspection**
- **Photoetching**
- **Excitation light source**

SUPER-QUIET XENON LAMPS

CONSTRUCTION AND OPERATION

Figure 1 shows the construction of the lamp. The lamp has the same shape as that of the conventional short-arc lamp with two electrodes, cathode and anode, facing each other in an oval glass bulb which is filled with high purity Xenon gas under about 1 MPa of pressure.

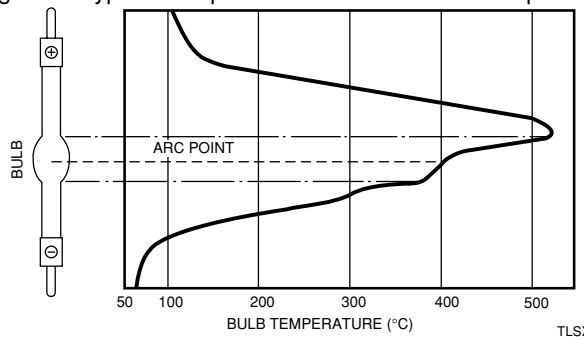
Figure 1: Construction of Lamp



TLSXC0003EA

The lamp utilizes the emission of light by arc discharge. The lamp is installed vertically with the anode at the upper side (or horizontally) and is operated by dc. Arc discharge is formed when the specified voltage is applied across the cathode and anode. The light emission from the arc discharge has a continuous spectrum ranging from ultraviolet to infrared radiation. It takes several minutes for the radiant intensity to reach the maximum value, as the gas pressure inside the bulb increases after the bulb is lit up until it reaches a thermal equilibrium. The gas pressure during operation is approximately 3 times higher than that when the lamp is not operated. Figure 2 shows the typical temperature distribution of a lamp bulb after thermal equilibrium.

Figure 2: Typical Temperature Distribution of a Lamp Bulb



TLSXB0007EA

STABILITY OF ARC (FLUCTUATION)

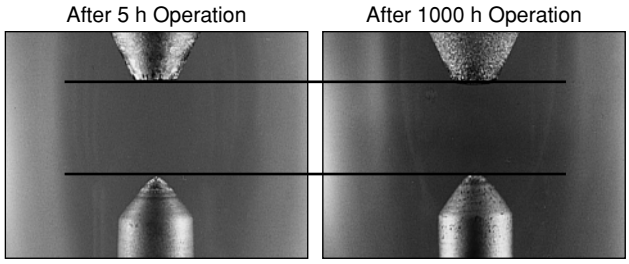
The elimination of arc fluctuation has been an important goal for Xenon short-arc lamps used as light sources for measuring purposes. Hamamatsu examined this “fluctuation” from every angle, and ascertained that it is basically an irregular movement of the arc point caused by lack of electrons emitted from the cathode. The SQ Xenon lamp has solved this problem by incorporating a high-performance cathode especially developed for this purpose.

MOVEMENT OF ARC POINT

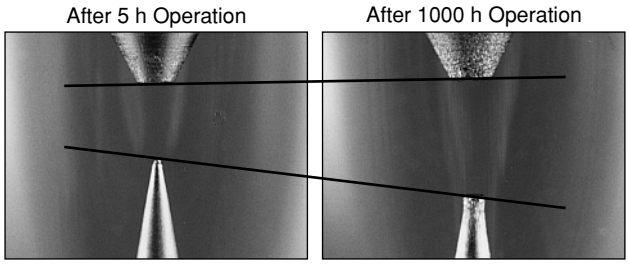
Conventional Xenon short-arc lamps have a shortcoming in that the arc point moves gradually as a result of the cathode consumption with operating time. The SQ Xenon lamp uses a specially developed, durable cathode which has no consumption with operating time. Therefore, after once the optical system is set up, it is not necessary to re-adjust it over the entire operating life of the lamp.

Figure 3: Comparison of Cathode Consumption

SQ Xenon Lamp



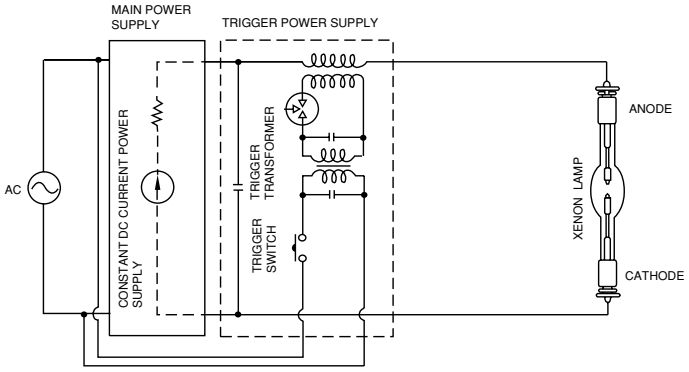
Conventional Lamp



POWER SUPPLY

Xenon lamp must have a stable light emission output to be used as a light source for measuring purposes. The output radiant intensity is approximately in proportion to the current flowing into the lamp. This means that a stabilized power supply must be provided for the lamp. Figure 4 shows a diagram of the stabilized power supply device consisting of a main power supply and a trigger power supply. Stabilized power supplies specifically designed for Hamamatsu SQ Xenon lamps are provided (See page 8).

Figure 4: Stabilized Power Supply Device



TLSXC0005EB

1) Main Power Supply

Besides supplying the lamp with stable dc power, the main power supply keeps the cathode at the optimal operating temperature with a specified current. The cathode temperature is essential for lamps: when too high, evaporation of the cathode materials is accelerated; when too low, cathode drop is increased, causing cathode sputtering and greatly reducing the lamp’s life.

The lamp current must be set within a specified range to ensure lamps to operate stably for a long time. For this reason, 35 W, 75 W, 150 W, and 300 W lamps have their respective operating lamp current values and ranges.

Since the radiant intensity is approximately in proportion to the lamp current values, the power supply must be designed with higher stability than is required from the lamp.

2) Trigger Power Supply

This is for starting the lamp to discharge. As shown in Figure 4, it gives a high frequency triggering pulse to the lamp load by inductive coupling. The lamp's initial discharge characteristic is that its starting voltage is approximately 10 kV. However, the characteristic fluctuates according to cathode fatigue or variations of the filled-in gas pressures. Therefore, in actual devices a triggering voltage of approximately 20 kV should be applied, taking safety margin into consideration as well.

CHARACTERISTICS

1) Spectral Distribution

The radiation spectrum of the lamp is continuous over the ultraviolet, visible, and infrared light ranges. Some line spectra are radiated in the visible light range and conspicuous line spectra in the infrared light range. Figure 5 (a) shows typical spectral distributions of SQ Xenon Lamps and other lamps. There are two types of bulbs available: the fused silica type which radiates a strong spectrum in the ultraviolet light range down to 185 nm and the ozone-free type which eliminates the ultraviolet light range shorter than 220 nm. Their respective spectral distributions are different in the ultraviolet region, as shown in Figure 5 (b).

Figure 5(a): Spectral Distribution of Various Lamps

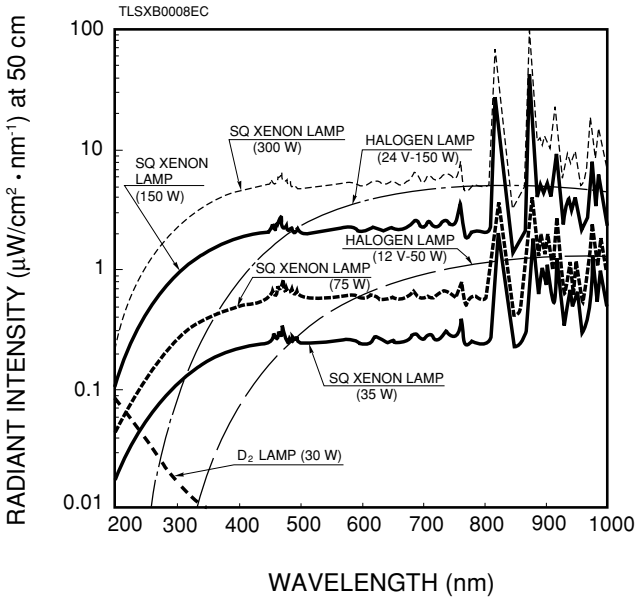
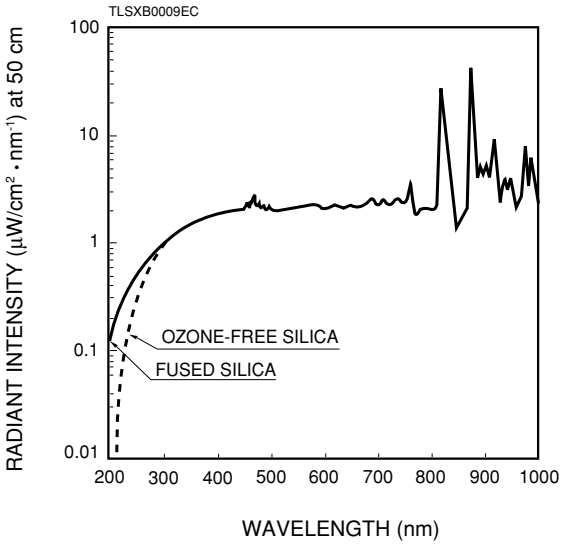


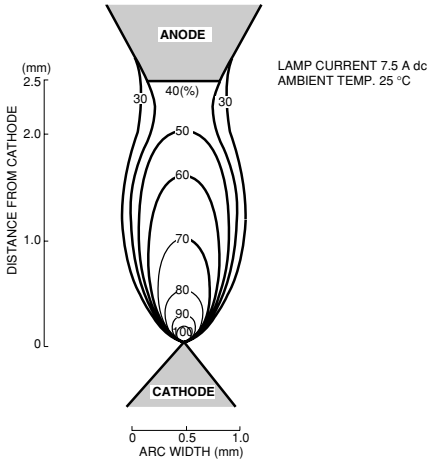
Figure 5(b): Spectral Distribution with Different Bulbs (150 W Lamp L2175 and L2195)



2) Luminance Distribution

Maximum luminance is located around the cathode, and it decreases towards the anode. Figure 6 shows the distributions of luminance.

Figure 6: Luminance Distribution (150 W Lamp L2195)

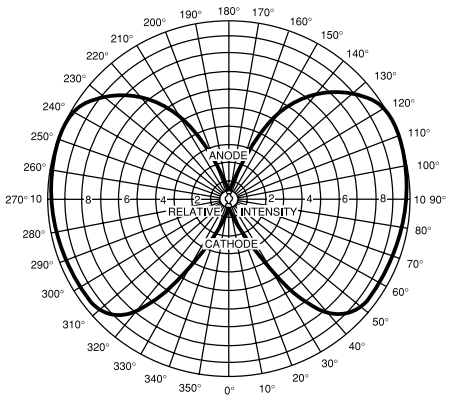


TLSXC0006EA

3) Flux Distribution

Figure 7 shows the flux distribution of the lamps. It has uniform distribution in the horizontal direction.

Figure 7: Flux Distribution

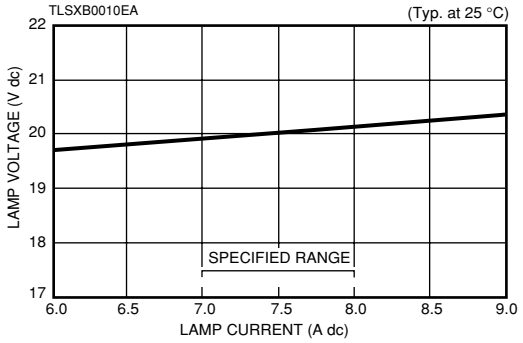


TLSXC0007EA

4) Lamp Current and Lamp Voltage

Figure 8 shows the current-voltage characteristic. The lamp voltage slightly increases in accordance with the lamp current.

Figure 8: Current-Voltage Characteristic
(150 W Lamp L2195)



5) Stability of Radiant Intensity

5)–1 Radiant Intensity and Lamp Current

The output radiant intensity is in proportion to the lamp current, as estimated from Figure 9. Therefore, the power supply stability must be taken into consideration if high stability of the lamp is desired. It takes about 5 minutes until the radiant intensity reaches the maximum value. Figure 10 shows how the intensity reaches the balanced state. This is due to the gas pressure inside the bulb increasing after the bulb is lit up.

Figure 9: Radiant Intensity vs. Lamp Current
(150 W Lamp L2195)

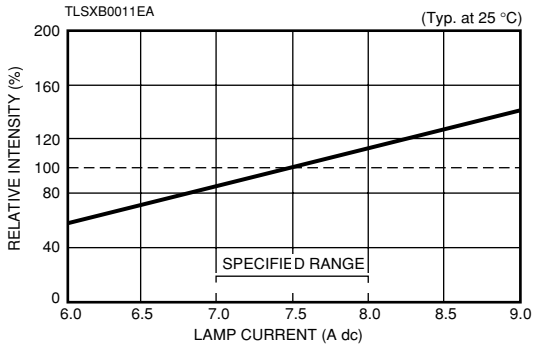
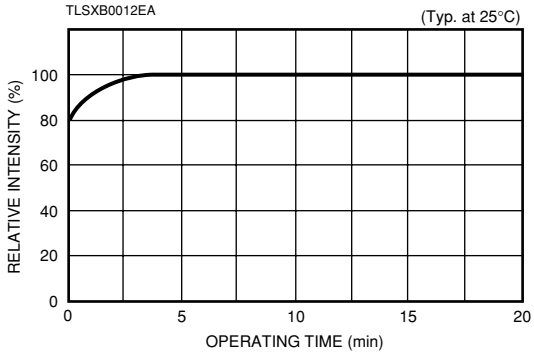


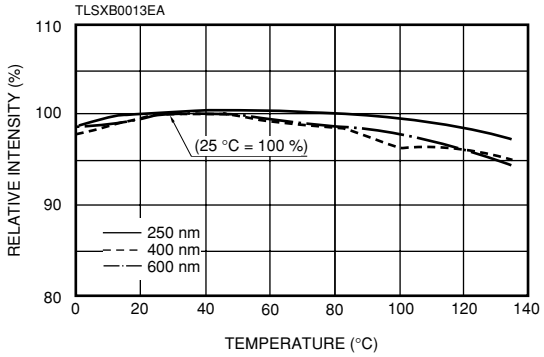
Figure 10: Radiant Intensity vs. Initial Operating Time
(150 W Lamp L2195)



5)–2 Radiant Intensity and Temperature

Radiant intensity varies with ambient temperature, as shown in Figure 11. This is mainly due to the change in emission effciency as a result of the change in gas pressure with temperature. To operate the lamp stably, it is recommended that the ambient temperature be kept constant.

Figure 11: Radiant Intensity vs. Ambient Temperature
(150 W Lamp L2195)

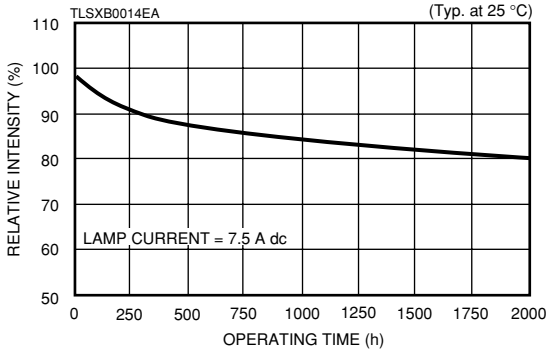


LIFE

1) Radiant Intensity and Operating Time

The light output intensity decreases with operating time. This is because of a loss of glass transmittance caused by blacking of the bulb wall due to evaporation of the cathode material, and solarization effects of ultraviolet radiation on glass crystals. Figure 12 shows the change of radiant intensity as a function of the operating time.

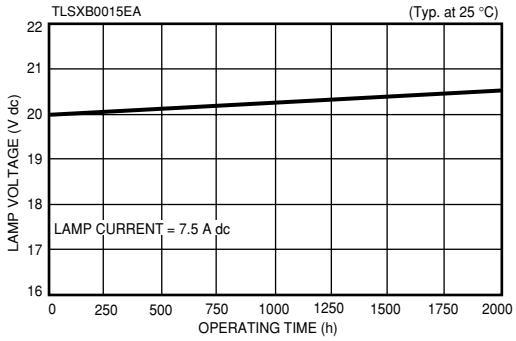
Figure 12: Radiant Intensity vs. Operating Time
(150 W Lamp L2195)



2) Lamp Voltage and Operating Time

The electrode distance in conventional lamps is gradually increased by sputtering phenomenon, resulting in increased lamp current. In contrast to this, the SQ Xenon Lamp exhibits no electrode sputtering and therefore, the lamp voltage is almost constant over a long period of operation. Figure 13 shows the change of the lamp voltage vs. operating time.

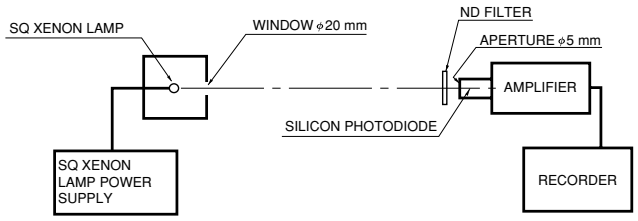
Figure 13: Lamp Voltage vs. Operating Time
(150 W Lamp L2195)



3) Fluctuation and Operating Time

As has been stated, the radiant intensity decreases with operating time. No conspicuous change in fluctuation, however, occurs with the elapsing of operating time. Figure 14 a) - d) show the change in fluctuation according to the elapsed operating time and Figure 15 shows the block diagram for fluctuation measurement.

Figure 15: Block Diagram for Fluctuation Measurement



TLSXC0008EB

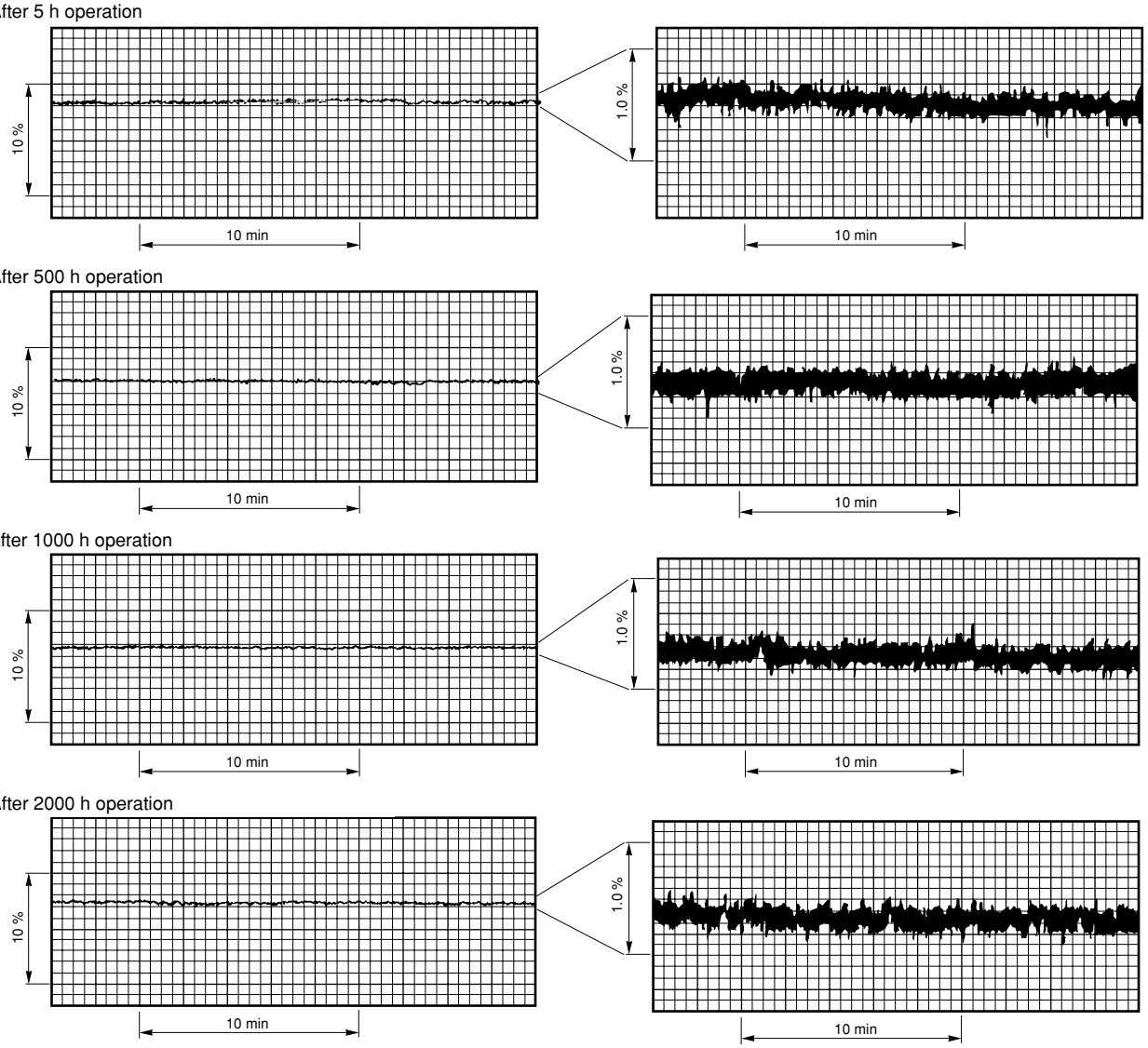
Figure 14: Fluctuation vs. Operating Time

a) After 5 h operation

b) After 500 h operation

c) After 1000 h operation

d) After 2000 h operation



TLSXB0016EB

SUPER-QUIET XENON LAMPS

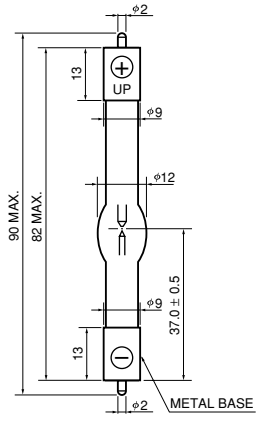
Type No.	Remarks	Power Consumption (W)	Arc Length (mm)	Outline	Window Material	Spectral Distribution (nm)	Lamp Current (A dc)	Lamp Voltage Typ. (V dc)	Supply Voltage Min. Ⓐ (V dc)	Trigger Voltage (kV)
L2173	35 W, Fused Silica Bulb	35	1.0	❶	Fused Silica	185 to 2000	3.5±0.5	11	50	15
L2193	35 W, Ozone-free Silica Bulb				Ozone-free Silica	220 to 2000				
L2174	75 W, Fused Silica Bulb, Cathode Metal Base ϕ 9 mm	75	1.3	❷	Fused Silica	185 to 2000	5.4±0.5	15	50	15
L2174–01	75 W,Fused Silica Bulb,Cathode Metal Base ϕ 7.5 mm			❸						
L2174–02	75 W, Fused Silica Bulb, Metal Base with Screw			❹						
L2194	75 W, Ozone-free Silica Bulb Cathode Metal Base ϕ 9 mm			❷	Ozone-free Silica	220 to 2000				
L2194–01	75 W, Ozone-free Silica Bulb Cathode Metal Base ϕ 7.5 mm			❸						
L2194–02	75 W, Ozone-free Silica Bulb, Metal Base with Screw			❹						
L2175	150 W ,Fused Silica Bulb	150	2.5	❺	Fused Silica	185 to 2000	7.5±0.5	20	65	20
L2195	150 W ,Ozone-free Silica Bulb				Ozone-free Silica	220 to 2000				
L2273	150 W, GS (Short Gap) Type, Fused Silica Bulb		2.0		Fused Silica	185 to 2000	8.5±0.5	18	65	20
L2274	150 W, GS (Short Gap) Type, Ozone-free Silica Bulb				Ozone-free Silica	220 to 2000				
L2479	300 W, High Output Power, Fused Silica Bulb	300	3.0	❻	Fused Silica	185 to 2000	15.0±1.0	20	80	25
L2480	300 W, High Output Power, Ozone-free Silica Bulb				Ozone-free Silica	220 to 2000				

NOTE Ⓐ Open-circuit voltages necessary for certain lighting of lamps.

Ⓑ The life end is defined as the time when the radiant intensity falls to 50 % of its initial value or when the output fluctuation exceeds ±0.5 %.

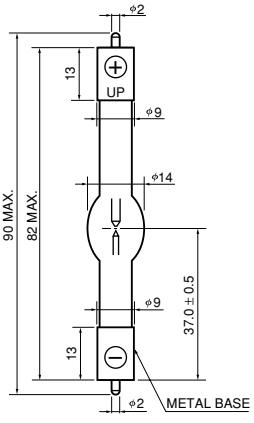
Ⓒ These dropper type power supplies need trigger unit. Please refer the page 8.

❶ L2173, L2193



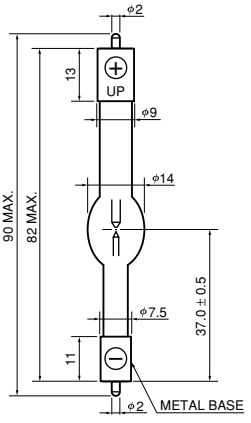
TLSXA0004EC

❷ L2174, L2194



TLSXA0005EC

❸ L2174–01, L2194–01



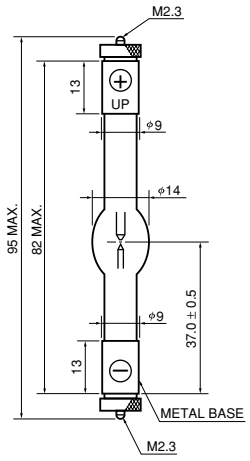
TLSXA0006EC

(at 25°C)

Radiant Intensity (μW/cm² · nm⁻¹ at 50 cm)			Output Stability		Life		Orientation	Cooling	Weight	Hamamatsu© Power Supply Type No.	Equivalent Lamps	Type No.
250 nm	550 nm	800 nm	Drift Typ. (%/h)	Fluctuation (p-p) Max. (%)	Guaranteed® Life (h)	Average Life (h)	(degree)		(g)			
0.05	0.25	0.23	±0.5	1.0	1000	2000	Vertical ± 15 or Horizontal ± 15	Not required	14	C6979 C2577	—	**L2173**
											—	**L2193**
0.13	0.56	0.52	±0.5	1.0	1000	2000	Vertical ± 15 or Horizontal ± 15	Not required	15	C6979 C2577	USHIO UXL–75–XO	**L2174**
												L2174–01
											OSRAM XBO 75W/2	**L2174–02**
												L2194
											WACOM KXL–75	**L2194–01**
												L2194–02
0.52	2.00	1.90	±0.5	1.0	1200	2500	Vertical ± 15 or Horizontal ± 15	Not required	45	C7535 C2577	USHIO UXL–151S OSRAM XBO150W/1 WACOM KXL–151	**L2175**
												L2195
0.52	2.11	2.05	±0.5	1.0	1800	3000	Vertical ± 15 or Horizontal ± 15	Not required	45	C7535 C2577	USHIO UXL–150MO OSRAM XBO150W/GS	**L2273**
												L2274
1.27	5.06	4.49	±0.5	1.0	1000	2000	Vertical ± 15 or Horizontal ± 15	Forced Air Cooling	68	C4338 C2578	USHIO UXL–300D–0 WACOM KXL–300F	**L2479**
												L2480

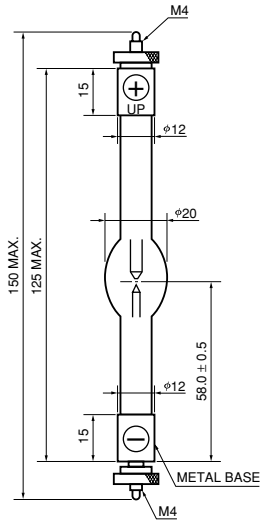
Unit: mm

❹ L2174–02, L2194–02



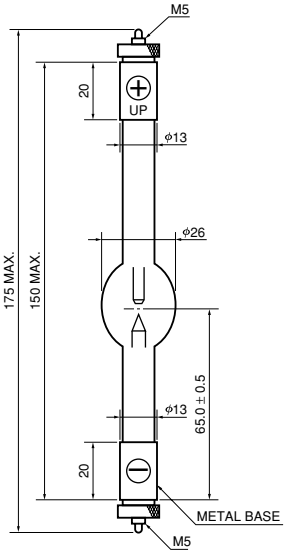
TLSXA0007EC

❺ L2175, L2195, L2273, L2274



TLSXA0008EC

❻ L2479, L2480



TLSXA0009EC

ACCESSORIES

LAMP POWER SUPPLIES

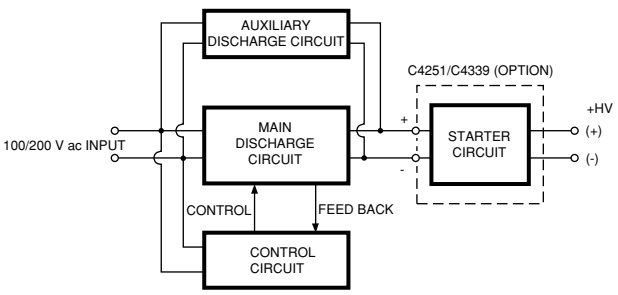
Using Xenon lamps in photometric applications requires an extremely stable power supply. We recommend using Hamamatsu power supplies to obtain full performance from Super-Quiet Xenon lamps. Hamamatsu provides two types of power supplies: dropper type and switching type. Dropper type power supplies feature extremely high stability. Switching type power supplies have less stability but offer advantages such as light weight and high cost performance. Select the type that meets your application. Hamamatsu also manufactures various types of OEM power supplies. Please feel free to consult us with your specific needs.

▲ C6979

Type No.	Control Method	Suitable Lamps (W)	Input (V ac)	Discharge Current Stability (at 25°C) Ripple (p-p) Max. (%)	Discharge Current Stability (at 25°C) Drift Max. (%/h)	Dimensions Ⓐ W × H × D (mm)	Weight (kg)	Trigger Unit Ⓑ	Start Method	NOTE
C6979	Dropper Type	35/75	100/118 200/230	0.1	±0.1	144 × 176 × 280	10	C4251	Manual Ⓒ	High stability, with time counter
C7535		150/150(GS type)								
C4338		300				220 × 150 × 330	15	C4339	Auto	High stability
C2577	Switching Type	35/75 150/150 (GS type)	100/118 200/230	5	±4	150 × 180 × 280	4	—	Manual	Light weight, for general purpose
C2578		300				250 × 340 × 350	5			

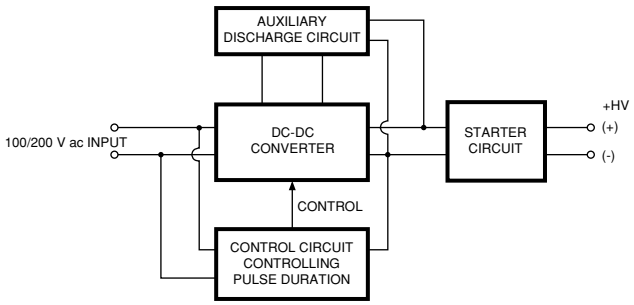
NOTE: ⒶExclud projection parts.
ⒷThe dropper type power supplies are used in conjection with the C4251 or C4339 Trigger Unit (option).
ⒸAuto-start type power supplies are also available upon request.
These power supplies use a trigger mode in which a positive high voltage is applied to the anode; so use care concerning the insulation for the anode.

● **Block Diagram of Dropper Type**



TLSXC0009EB

● **Block Diagram of Switching Type**



TLSXC0010EB

LAMP HOUSINGS

For simple and safe use of lamps, Hamamatsu provides lamp housings that give optimal performance in terms of light output stability, efficiency and life.

There are three types of lamp housings: the E7536 (for 150 W and 150 W [GS type] lamps) is designed to improve handling, while the E2419 (for 35 W and 75 W lamps) and E2420 (for 150 W lamps) feature simplified configurations.

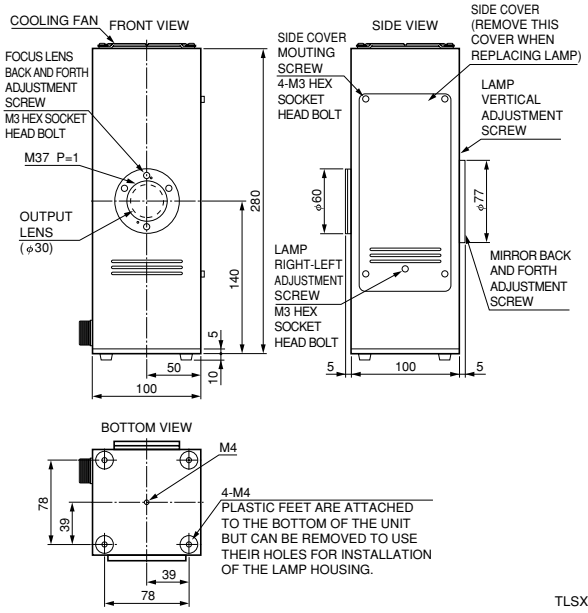
The E7536 ensures excellent lamp stability and high output of collimated light by means of the built-in reflecting mirror and exit lens. A built-in interlock function, lamp starter and air cooling fan enhance operator safety. The temperature within the lamp housing is held below 40 °C. Moreover, 3-axis adjusting screws are provided on the outside of the housing to allow simple optical-axis alignment, making it really easy to use.

Simplified type E2419 and E2420 lamp housings are compact and ideal for experimental setups. These lamp housings can be readily mounted on a commercially available optical stand.

▲ E7536

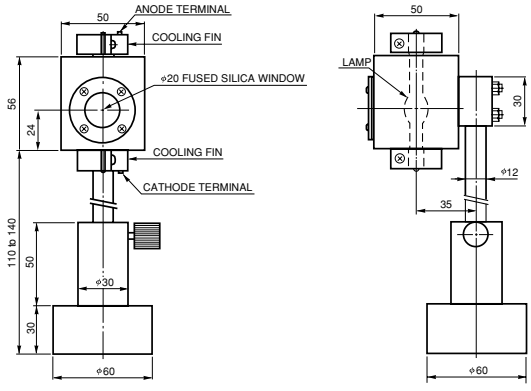
Unit: mm

E7536 (For 150 W, 150 W[GS type] Lamps)



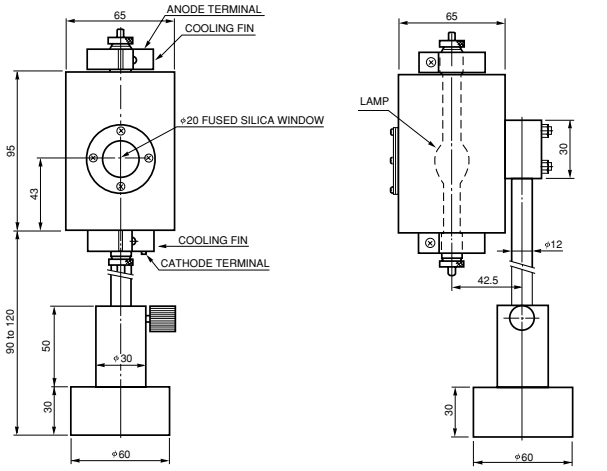
TLSXA0083EA

E2419 (For 35 W, 75 W Lamp)



TLSXA0010EA

E2420 (For 150 W, 150 W [GS type] Lamp)



TLSXA0011EA

HANDLING PRECAUTION

HANDLING PRECAUTIONS
(Read before using)

Installation Precautions

1. Always handle the lamp with the protective cover in place.

High pressure gas (approx. 1 MPa at room temperature, approx. 4 MPa during operation) is contained in the lamps. Inflicting strong shocks to the lamp or scratching of the surface of the glass bulb may cause the bulb to burst, causing danger from flying glass fragments.

When handling lamps, always wear a long sleeved shirt and gloves for protection.

This protective cover is also necessary when replacing lamps; so store it for future use. (Refer to item 8.)

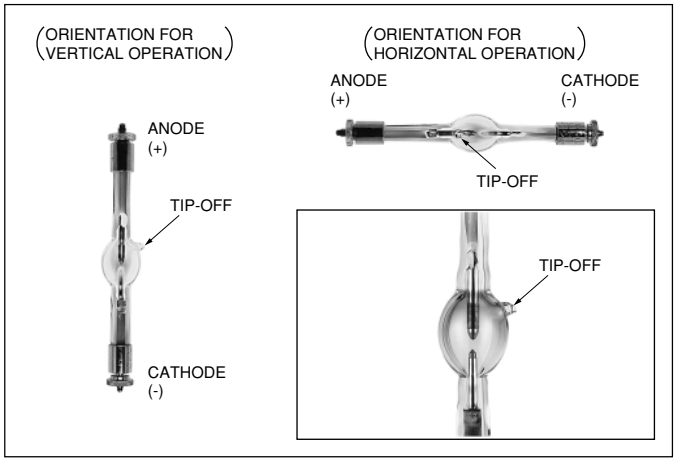
2. Never touch the glass portion of a lamp with bare hands.

Lighting a lamp with dust or fingerprints on it causes printing and loss of bulb transmittance, thus lowering the light output and the mechanical strength of the glass bulb. To remove dust and fingerprints, wipe the bulb off using cotton or gauze moistened with high-quality alcohol or acetone, and throughly wrung out. Use care not to apply any strong shocks.

3. Install the lamp correctly.

(A) Correct polarity of the lamp is important. Even momentary reversal of the polarity will damage the cathode, causing failure of the lamp and will void the warranty. When installing the lamp vertical to the ground, insure that the indication marking which denotes “UP” is in the proper position. This indication marking can be found on the anode side of the metal base, and also on the plastic lamp protector.

(B) When installing the lamp in the horizontal position make sure the “tip-off” is parallel to the ground. Adjust the arc point of the lamp so that the discharge stays along the center line of both electrodes. This can be accomplished by the use of a magnetic field.

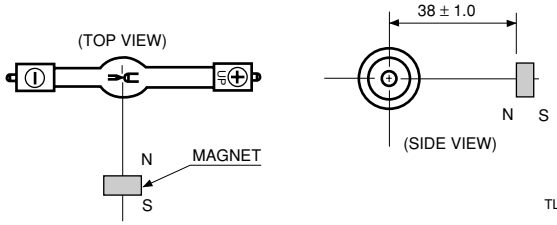


It is necessary to use an adequate magnet and set it at correct position in order to get the best performance of lamps, according to the following table.

Type	Surface Magnetic Flux Density (mT)	Distance (mm)	Position (Direction)	Magnet Example
75W	9.5 to 10.5	38±1.0	See Fig. 1	TDK Co. FB3G D10–5 (10 mm dia. 5 mm thickness)
150W 300W	12 to 12.5	55±1.0	See Fig. 2	TDK Co. FB3G D15–7 (15 mm dia. 7 mm thickness)

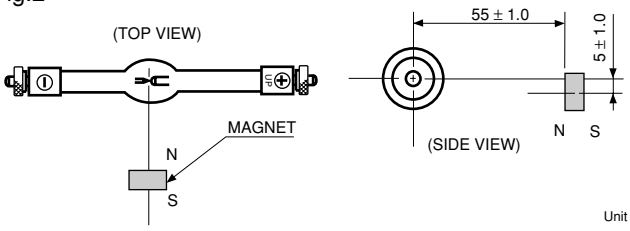
NOTE : “DISTANCE” in the table defines the distance between the center of arc and the surface of a magnet.

Fig.1



Unit : mm
TLSXC0011EA

Fig.2



Unit : mm
TLSXC0012EA

Operational Precautions

4. Use caution concerning the high temperature and high voltage.

These lamps start discharge at a high triggering voltage of 20 kV. Be sure insulation is sufficient to prevent danger of electrical shock. During operation and immediately after, the lamp is extremely hot, so never touch with the hands or get the lamp close to easily combustible material.

5. Caution concerning ultraviolet radiation.

These lamps radiate ultraviolet rays which are harmful to the eyes and skin. Avoid looking directly at a lamp or allowing its light to fall directly on the skin,as there is danger of burning.

6. Always observe the rated values.

The rated operating current for these lamps is specified (refer to pages 6, 7.). If used outside the specified range, operation will become unstable and the life will be shortened drastically. The 300 W type requires forced air cooling.

7. Replace the lamp when the total operating time exceeds the average life plus 500 h, or when the inner walls of the bulb become extremely blackened.

When the total operating time exceeds the average life plus 500 h, vaporization of the electrodes and sputtering on the bulb causes progressive darkening, lowering the heat radiation and increasing the interior heat of the lamp to dangerous levels that could lead to breakage. When either condition is observed, replace the lamp immediately.

Removal Precautions

8. Handle used lamps with the protective cover.

When removing a lamp from the lamp housing, wait until it cools. Since high-pressure gas is contained in the lamp, rough handling can lead to dangerous breakage, so handle used lamps as carefully as new lamps. Then enclose it to the protective cover as it was. When discarding a lamp, wrap it completely in a thick cloth,etc., to prevent danger from flying glass fragments, and break it with a hammer, or the like.

CONCERNING LAMP HOUSINGS

Consider The Following Point When Designing A Lamp Housing

A. A lamp housing should always have a sturdy cover.

High pressure gas (approx. 1 MPa at room temperature, approx. 4 MPa during operation) is contained in the lamps. Lamp housings should always have a sturdy cover in anticipation of the possibility of breakage for any reason.

B. Do not fasten lamps at both ends when installing.

The glass bulbs of lamps expand from heat during operation. Use a flexible fitting at one end (normally the anode side) and construction that can absorb the heat expansion.

C. When focusing the light, take care to avoid excessively high lamp operation temperatures.

When focusing the light from a lamp with a mirror, etc., the lamp operating temperature can become extremely high if there is a focal point on the bulb wall or electrode. Use care concerning operating temperature when using such a mirror, etc.

D. Use caution concerning high operating temperatures.

Maintain the lamp surface temperature at less than 750 °C (1382 °F) and the metal base surface temperature (anode side) at less than 200 °C (392 °F). (The temperature at the anode is normally higher than at cathode.)

If the lamp operating temperature exceeds these upper limits, oxidation of the electrode wire and excessive consumption of electrodes and filled gas occur and greatly shorten the lamp life. The pressure inside the lamp may also increase excessively and cause dangerous beakage. Leave allowance for the heat capacity of the lamp housing for efficient heat radiation.

Forced air cooling with a fan is necessary for the 300 W lamps, so take care that the fan does not stop during operation or for 3 to 5 min after turning the lamp off. Convection currents in the xenon gas filled in the lamps increase considerably when a strong breeze from a fan blows directly on a lamp, lowering the light output stability, so position the fan carefully.

E. Install sufficient high voltage insulation to avoid leakage of trigger high voltage.

Use high quality insulation materials and maintain adequate insulating distances since the trigger voltage reaches 20 to 30 kV upon start-up. A 1 cm (3/8") air gap will withstand only about 10 kV before arc discharge occurs. The power supply output should be delivered with a high-voltage (more than 10 kV) and heat resistant, nonflammable cable, which should be as short as possible. Make sure there is no contact between the power supply cable and the metal chassis of the lamp housing. Wherever the possibility of contact exists, a high quality silicon insulating material should be employed.

F. Ensure the lamp holder is not oxidized.

Ensure the lamp holder is not oxidized. If it is oxidized, there will be heating in the lamp holder and the radiant intensity may become unstable. When it is oxidized, the lamp holder should be replaced or the oxide should be removed.

⚠ WARNING

- Do not look at the lamp without proper eye protection while in operation.
  - UV (ultraviolet) rays can damage the eyes and permanently may impair eyesight.
- The lamp radiates UV rays which are harmful to your skin. Proper skin protection must be worn or avoid any direct exposure.
  - UV ray may injure skin exposed to it.
- Do not place flammable material near the lamp when in operation.
  - Placing the operating lamp near flammable materials may cause a fire.

- The lamp reaches high temperature while in operation, and shortly after turn-off, use care when touching the lamp.
  - High temperature lamps will cause burns.
- The lamp has high internal gas pressure, do not subject it to shock, stress or scratches. These stresses may result in the explosion of the envelope.

- The lamp must be installed in proper housing before operation.
  - If broken, flying glass fragments may cause injury.

- The power supply to the lamp must be turned off before installation or removal, or any maintenance.
  - Failure to do this may result in electrical shocks, damage to eyesight or skin burns, etc.

⚠ CAUTION

- Observe the installation direction and polarity of lamps.
  - Incorrect installation may damage the lamp.
- Be sure to use a power supply that provides an optimal current value for the lamp.
  - Use of an improper power supply may cause overheating or damage the lamp.

- Do not use the lamp in damp locations subject to high humidity, precipitation, or condensation.
  - Operating the lamp in high humidity may result in electrical shocks or damage to the lamp.

- Always wear a protective mask and garment when installing or removing the lamp.
  - If broken, exploding glass fragments may cause injury.

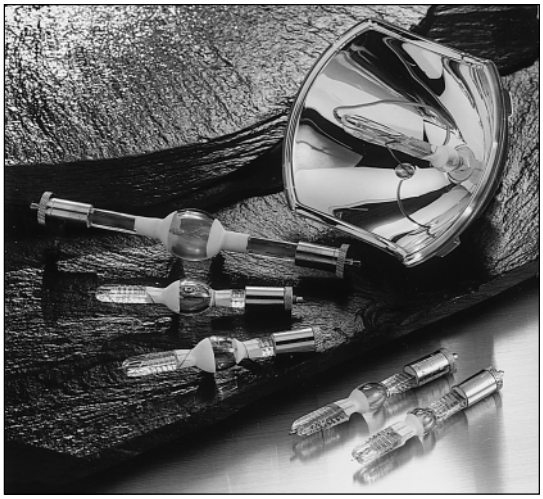
WARRANTY

The warranty period will be one year after shipment or specified life time comes first. The area of warranty is limited to replacement of the faulty lamp. Faults resulting from natural disasters and incorrect usage will also be excluded from warranty.

RELATED LAMPS

Metal Halide Lamps

Since Metal Halide Lamps have a flash efficiency approx. 4 times higher than halogen lamps and xenon lamps, they can produce an output 4 times higher if power consumption is same. In addition, the short-arc type is similar to a point light source, making optical design easy. The short life problem caused by the short arc has also been solved, thereby achieving a long life of more than 3000 h in the case of the 575 W type. As their color temperature characteristics are similar to daylight color, exact colors (RGB) can be reproduced.
Metal Halide Lamps are suitable in applications such as overhead projectors and liquid crystal projectors.

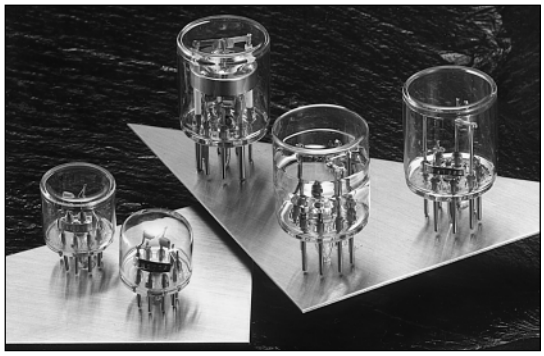


Super-Quiet Mercury-Xenon Lamps

Hamamatsu also provides Super-Quiet Mercury-Xenon lamps as deep UV light sources for precision photometry. The spectral intensity in the ultraviolet region is higher than with Xenon lamps and the spectral width is sharp. Also, the use of a high-performance cathode assures highly stable, long life lamps with little arc point shift and fluctuation. Various types of these lamps are available from 50 to 500 W for a variety of applications.

Super-Quiet Xenon Flash Lamps

The Super-Quiet Xenon lamp lineup also includes compact, flash mode types with little heat generation. The arc stability of this type is 5 times higher than that of conventional Xenon flash lamps, making them ideal for high-precision photometry. Awide range of sizes and pin connection types are available for various applications.
The High Power Xenon Flash Lamps having 4 times higher radiant intensity than Super-Quiet Xenon Flash Lamps are also available.



For details,refer to the catalogs which are available from our sales offices.

HAMAMATSU WEB SITE http://www.hamamatsu.com
HAMAMATSU PHOTONICS K.K., Electron Tube Center
314-5, Shimokanzo, Toyooka-village, Iwata-gun, Shizuoka-ken, 438-0193, Japan, Telephone: (81)539/62-5248, Fax: (81)539/62-2205
U.S.A.: Hamamatsu Corporation: 360 Foothill Road, P. O. Box 6910, Bridgewater. N.J. 08807-0910, U.S.A., Telephone: (1)908-231-0960, Fax: (1)908-231-1218 E-mail: usa@hamamatsu.com
Germany: Hamamatsu Photonics Deutschland GmbH: Arzbergerstr. 10, D-82211 Herrsching am Ammersee, Germany, Telephone: (49)8152-375-0, Fax: (49)8152-2658 E-mail: info@hamamatsu.de
France: Hamamatsu Photonics France S.A.R.L.: 8, Rue du Saule Trapu, Parc du Moulin de Massy, 91882 Massy Cedex, France, Telephone: (33)1 69 53 71 00, Fax: (33)1 69 53 71 10 E-mail: infos@hamamatsu.fr
United Kingdom: Hamamatsu Photonics UK Limited: 2 Howard Court, 10 Tewin Road Welwyn Garden City Hertfordshire AL7 1BW, United Kingdom, Telephone: 44-(0)1707-294888, Fax: 44(0)1707-325777 E-mail: info@hamamatsu.co.uk
North Europe: Hamamatsu Photonics Norden AB: Smidesvägen 12, SE-171-41 SOLNA, Sweden, Telephone: (46)8-509-031-00, Fax: (46)8-509-031-01 E-mail: info@hamamatsu.se
Italy: Hamamatsu Photonics Italia: S.R.L.: Strada della Moia, 1/E, 20020 Arese, (Milano), Italy, Telephone: (39)02-935 81 733, Fax: (39)02-935 81 741 E-mail: info@hamamatsu.it

TLSX1002E07
OCT. 2002 IP
Printed in Japan (1000)