# LIGHT SOURCE

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

HAMAMATSU

PHOTON IS OUR BUSINESS

# Long Life High Stability

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

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

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

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

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

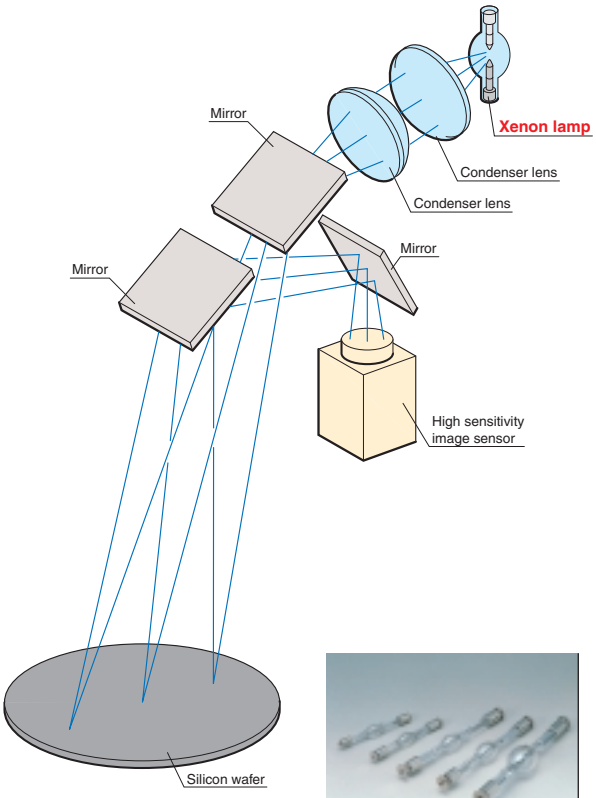
# CONTENTS

# 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

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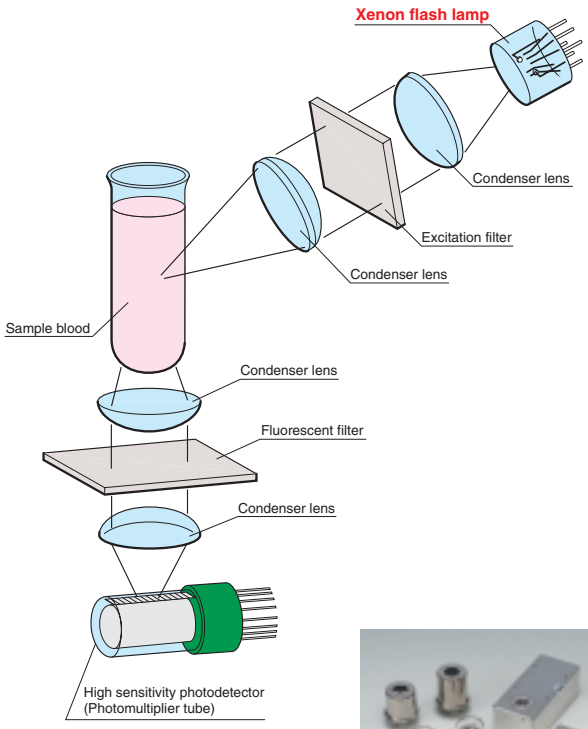
Xenon Lamps

## Medical

### Blood analyzer

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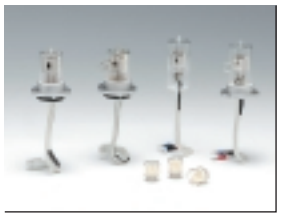
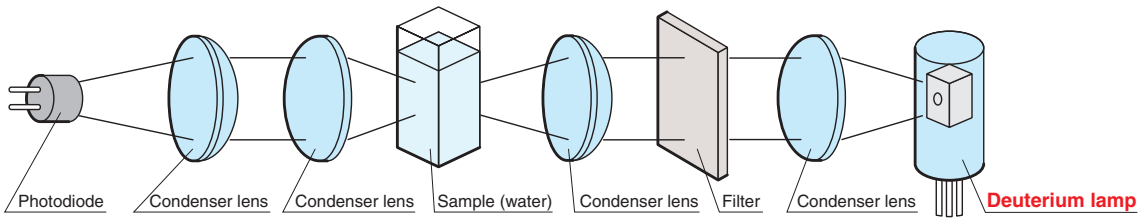
Xenon Flash Lamps

## Environment

### Water pollution analysis



Deuterium Lamps

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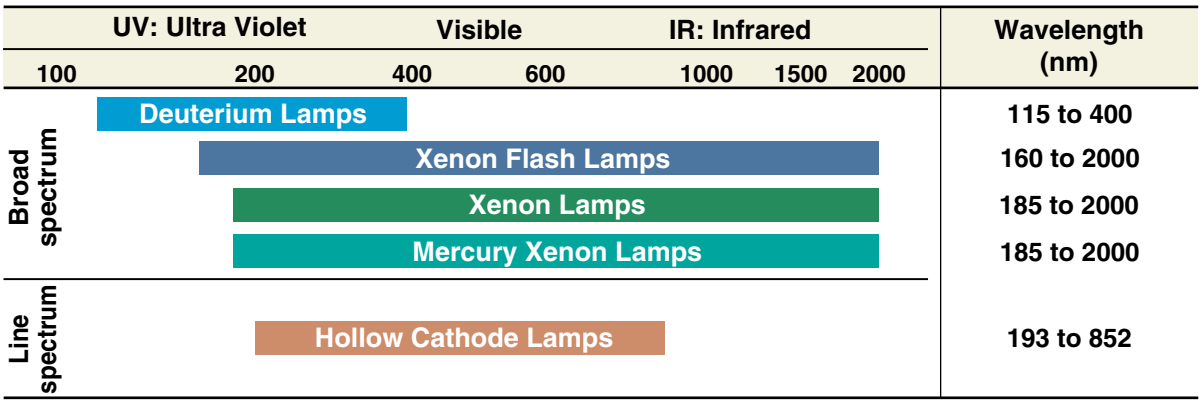
# QUICK REFERENCE TO PRODUCT SELECTION

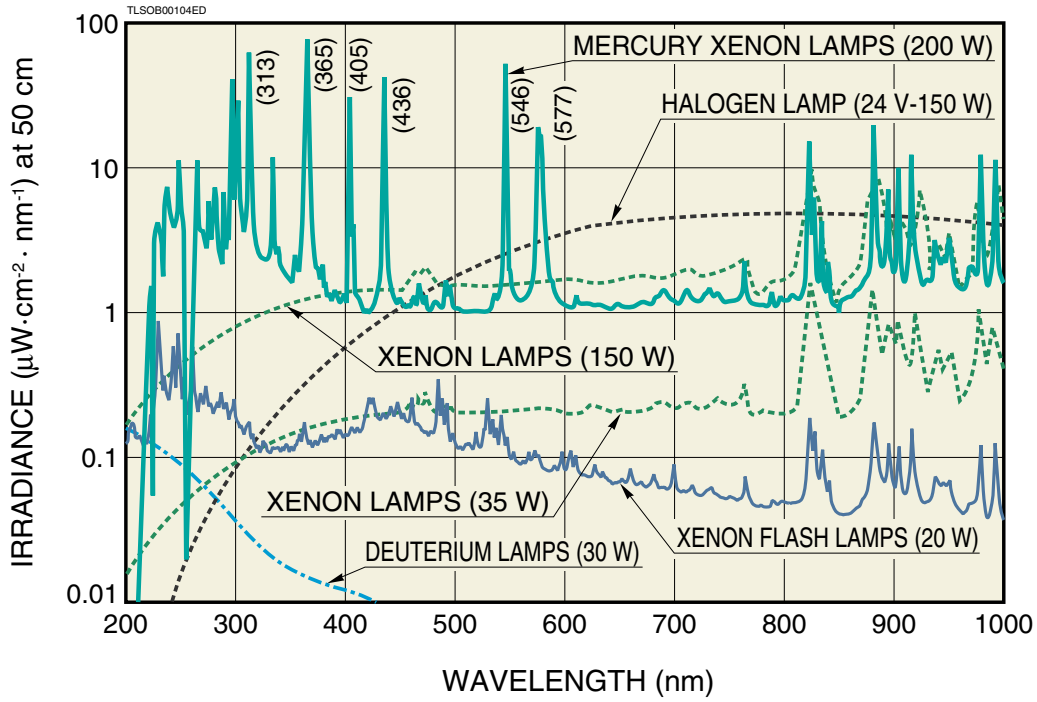
| Field | Light Source / Applications | XENON LAMPS | XENON FLASH LAMPS | MERCURY XENON LAMPS | DEUTERIUM LAMPS | HOLLOW CATHODE LAMPS | OTHERS |
|---|---|---|---|---|---|---|---|
| | |  |  |  |  |  | |
| Semiconductor | UV EXPOSURE SYSTEMS ON THE WAFER | | | ● | | | SPOT LIGHT SOURCES |
| | WAFER INSPECTION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

# WAVELENGTH

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



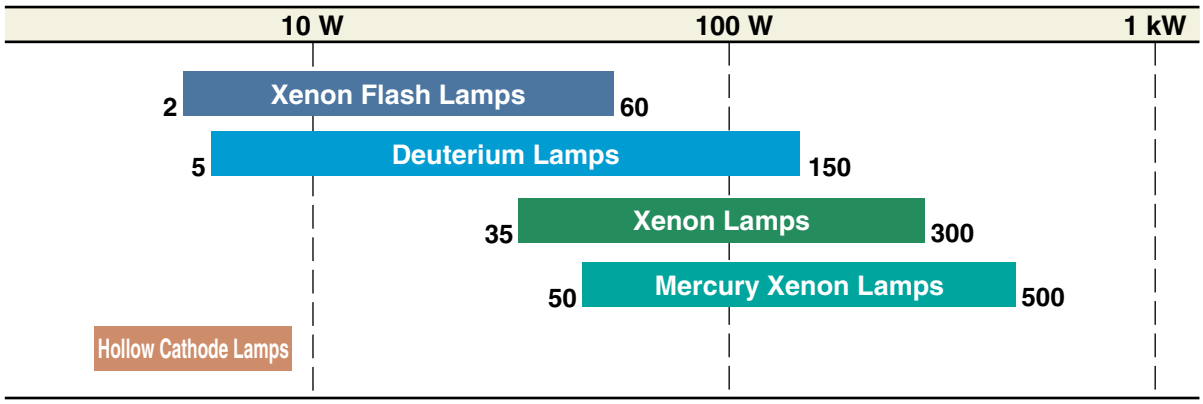

## ●Spectral Distribution — Broad spectrum



# WATTAGE

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

## ■ INPUT WATTAGE




## Instantaneously high peak output: Xenon flash lamp

### 1000 times at several micro seconds!

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

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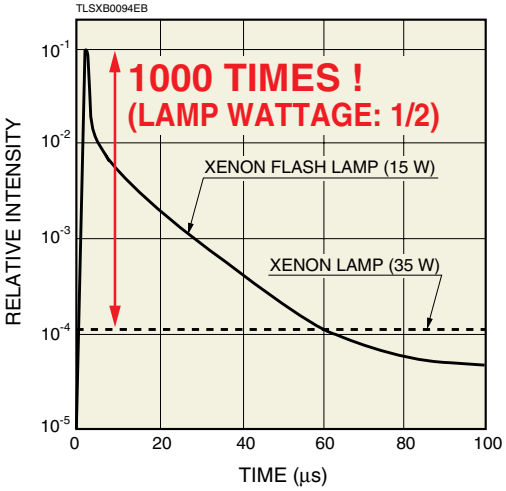
Xenon flash lamps

TLSXB0094EB

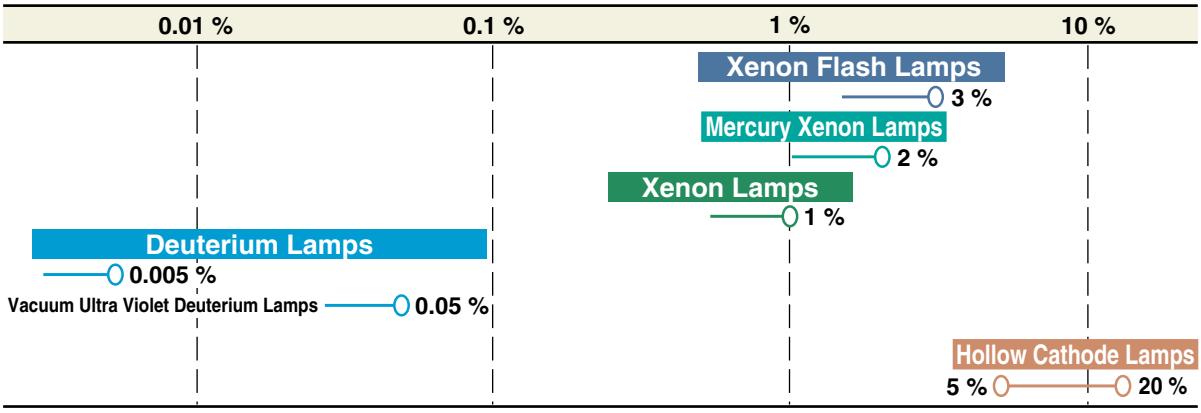


# STABILITY

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

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

## ■ FLUCTUATION (Short-term stability)



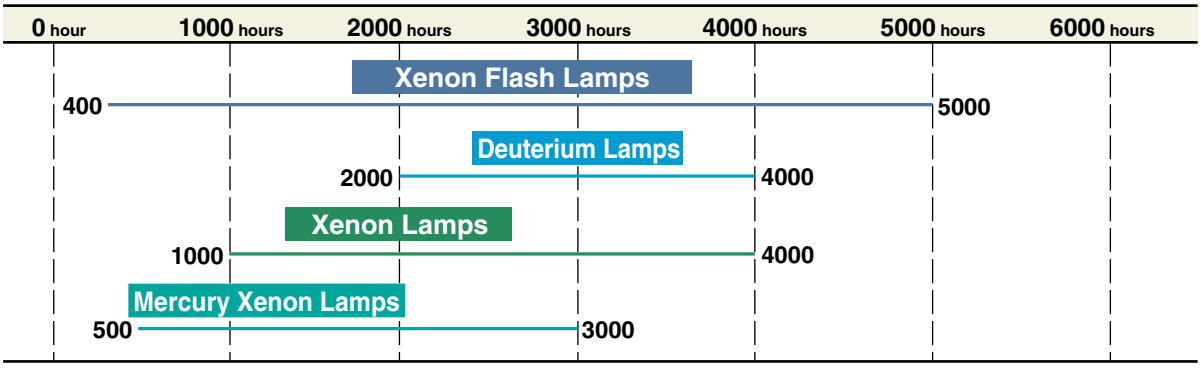

Lamp light output stability is an important factor that affects measurement accuracy and reliability of equipment. To supply lamps with high output stability, Hamamatsu has made consistent efforts to achieve "ideal electrode construction and positioning accuracy" and also to develop "optimum power supplies".



# LIFE

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

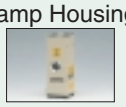
## ■ OPERATION TIME




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

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

# FEATURES

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

# SUPER-QUIET XENON LAMPS

Semiconductor | Information | Medical | Environment | Analysis

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

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

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

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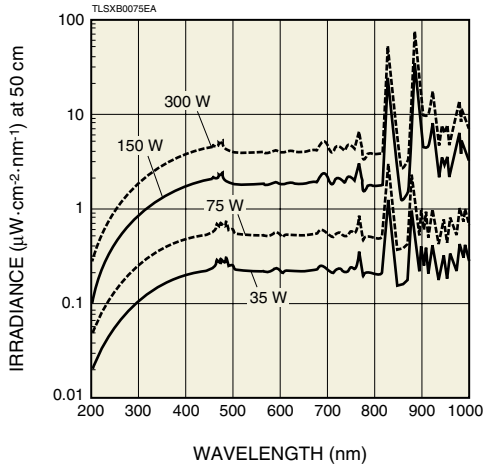
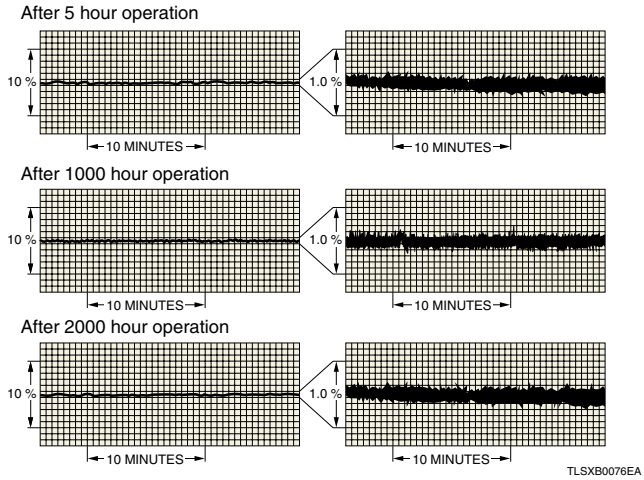
## ■ Spectral Distribution




## ■ Fluctuation vs. Operating Time

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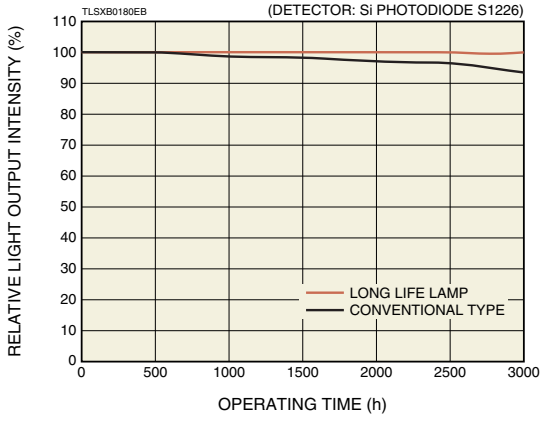
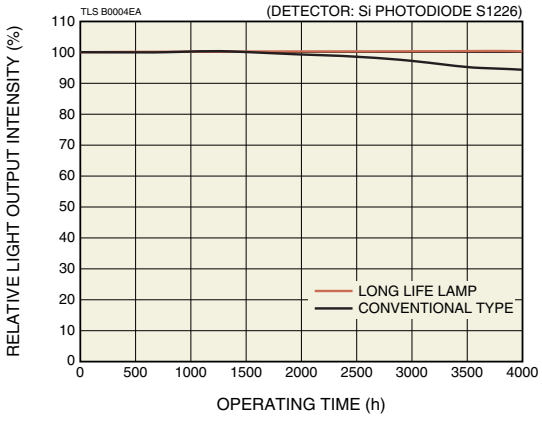
## ■ Light Output Intensity and Operating Time

### ●75 W Xenon Lamp




### ●150 W Xenon Lamp




**Related Products**

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

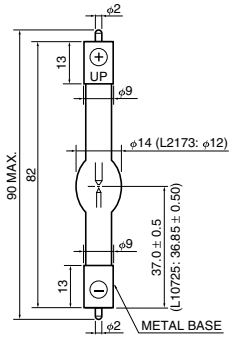
## Characteristics

| Type No. | Lamp Rating (W) | Arc Length (mm) | Dimensional Outline | Window Material | Spectral Distribution (nm) | Lamp Current (A dc) | Lamp Voltage (V dc) | Output Stability | | Guaranteed Life (h) Ⓐ | Average Life (h) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Drift Typ. (%/h) | Fluctuation (p-p) Max. (%) | | |
| L2173 | 35 | 1.0 | ❶ | Fused Silica | 185 to 2000 | 3.5±0.2 | 11 | ±0.5 | 1.0 | 1000 | 2000 |
| L2174 | 75 | 1.3 | ❶ | Fused Silica | 185 to 2000 | 5.4±0.5 | 15 | ±0.5 | 1.0 | 1000 | 2000 |
| L2174-01 | | | ❷ | | | | | | | | |
| L2174-02 | | | ❸ | | | | | | | | |
| L10725 | | 1.0 | ❶ | | | 5.7±0.3 | 13.5 | | | 2000 | 3000 |
| L10725-01 | | | ❷ | | | | | | | | |
| L10725-02 | | | ❸ | | | | | | | | |
| 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 | | Fused Silica | 185 to 2000 | 8.5±0.5 | 17 | | | 1800 | 3000 |
| L11033 | | | | Fused Silica | 185 to 2000 | | | | | 3000 | 4000 |
| L2479 | 300 | 3.0 | ❺ | Fused Silica | 185 to 2000 | 15.0±1.0 | 20 | ±0.5 | 1.0 | 1000 | 2000 |

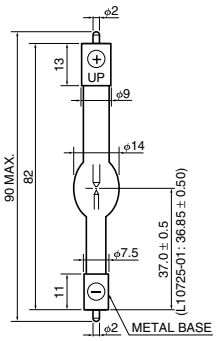
Ⓐ The life end is defined as the time at which the radiant intensity falls to 50 % of its initial value or when the output fluctuation (p-p) exceeds 1.0 %.

## Dimensional Outline Unit: mm

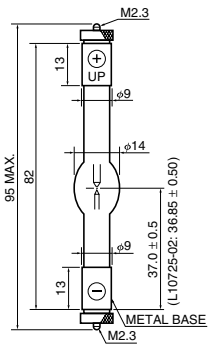
### ❶ L2173, L2174, L10725, L11307



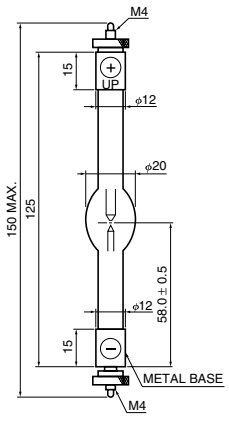

### ❷ L2174-01 L10725-01



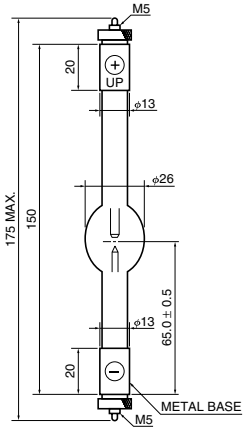

### ❸ L2174-02, L10725-02




### ❹ L2175, L2273, L11033




### ❺ L2479

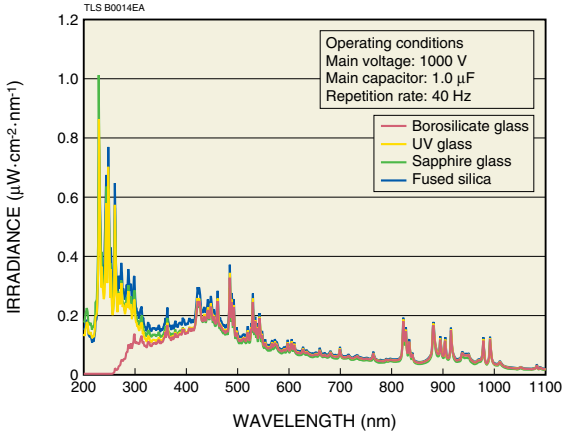


# SUPER-QUIET XENON FLASH LAMPS

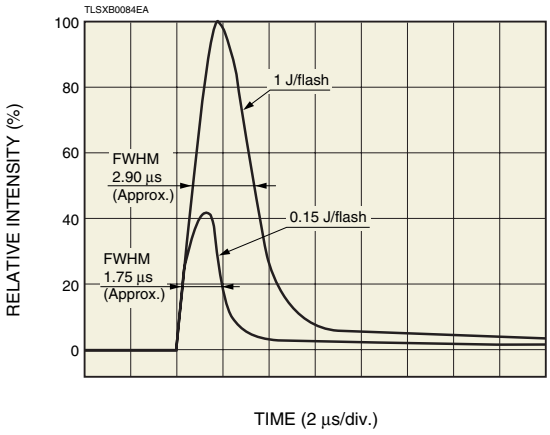
Semiconductor | FA | Information | Medical | Environment | Analysis

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

## ■ Spectral Distribution (20 W Type)




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




## Xenon Flash Lamp Modules

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

### ■ LINE-UP

| Type No. (series) | Type | Arc size (mm) | Main Discharge 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 Ⓐ<br>L13821 | 2 W Compact | 1.0 | 0.141<br>0.094<br>0.047<br>0.020 | 25 | UV Glass | 400 to 600 | 2 | 4.75 to 5.5,<br>10.8 to 13.2 |
| L9455 Ⓐ | 5 W Side-on | 1.5 | 0.22<br>0.11 | 50 | UV Glass | 400 to 600 | 5 | 11 to 28 |
| L9456 | | 3.0 | 0.047<br>0.28 | | | | | |
| L11035 Ⓐ | 5 W Head-on | 1.5 | 0.22<br>0.11 | 50 | | | | |
| L11036 | | 3.0 | 0.047<br>0.28 | | | | | |
| L11316 Ⓐ | 5 W High output | 1.5 | 0.2 | 100 | | 500 to 1000 | | 21.6 to 26.4 |
| L11317 | | 3.0 | 0.1 | | | | | |

**NOTE:** ⒶSMA fiber adapter types are also available.

**Related Products**

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

## ■ Characteristics

| Type No. | Type | Arc Size (mm) | Dimensional Outline | Bulb Shape | Window Material | Spectral Distribution (nm) | Recommended Supply Voltage (V dc) | Trigger Voltage p-p (kV) | Max. Average Power [Continuous] (W) | Max. Average Energy per Flash (J/Flash) | Repetition Rate Max. (Hz) | Output Ⓐ Stability: Output Ⓓ Fluctuation Max. (%) | Ⓐ Guaranteed Life Min. (Number of Flashes) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L4644 | 10 W HQ Type | 3.0 | ❶-ⓐ | Hemisphere | UV Glass | 185 to 2000 | 700 to 1000 | 5 to 7 | 10 | 0.1 | 100 | 3 Ⓓ | $1.0 \times 10^9$ |
| L4646 | | | ❷-ⓐ | Flat | | | | | | | | | |
| L4645 | | | ❶-ⓐ | Hemisphere | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L4647 | | | ❷-ⓐ | Flat | | | | | | | | | |
| L4640 | | 1.5 | ❶-ⓑ | Hemisphere | UV Glass | 185 to 2000 | 700 to 1000 | 5 to 7 | 10 | 0.1 | 100 | 3.5 Ⓓ | $1.0 \times 10^9$ |
| L4642 | | | ❷-ⓑ | Flat | | | | | | | | | |
| L4641 | | | ❶-ⓑ | Hemisphere | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L4643 | | | ❷-ⓑ | Flat | | | | | | | | | |
| L2358 | 15 W SQ Type | 3.0 | ❸-ⓑ | Flat | Synthetic Silica | 160 to 2000 | 700 to 1000 | 5 to 7 | 15 | 0.15 | 100 | 2.5 Ⓓ | $1.2 \times 10^9$ |
| L2359 | | | | | UV Glass | 185 to 2000 | | | | | | | |
| L2360 | | | | | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L4633 | 15 W Built-in Reflector Type | 1.5 | ❹ | Converging | Borosilicate Glass | 240 to 2000 | 700 to 1000 | 5 to 7 | 15 | 0.15 | 100 | 5 Ⓓ | $5.0 \times 10^8$ |
| L4634 | | | —Ⓕ | Collimating | | | | | | | | | |
| L11957 | 20 W Type | 3.0 | ❺-ⓐ | Flat | UV Glass | 185 to 2000 | 700 to 1000 | 5 to 7 | 20 | 0.5 | 300 | 2 %CV Ⓔ | $1.0 \times 10^8$ |
| L11956 | | | | Flat | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L11937 | | 1.5 | ❺-ⓑ | Flat | UV Glass | 185 to 2000 | | | | | | | |
| L11936 | | | | Flat | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L11967 | 20 W Built-in Reflector Type | 3.0 | ❺-ⓐ | Flat Ⓒ | UV Glass | 185 to 2000 | 700 to 1000 | 5 to 7 | 20 | 0.5 | 300 | 2 %CV Ⓔ | $1.0 \times 10^8$ |
| L11966 | | | | Flat Ⓒ | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L11947 | | 1.5 | ❺-ⓑ | Flat Ⓒ | UV Glass | 185 to 2000 | | | | | | | |
| L11946 | | | | Flat Ⓒ | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L6604 | 60 W Type | 3.0 | ❻ | Flat | Borosilicate Glass | 240 to 2000 | 700 to 1000 | 5 to10 | 60 | 1 | 60 | 3 ⒷⒹ | $8.0 \times 10^7$ |
| L6605 | | | | | Sapphire Glass | 190 to 2000 | | | | | | | |
| L7684 | 60 W Built-in Reflector Type | | | Flat Ⓒ | Borosilicate Glass | 240 to 2000 | | | | | | | |
| L7685 | | | | | Sapphire Glass | 190 to 2000 | | | | | | | |

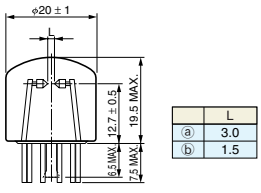
Ⓐ Measured with supply voltage of 1000 V, main discharge capacitor of 0.1 µF, repetition rate of 50 Hz and wavelength of 400 nm.
Ⓑ Measured with supply voltage of 1000 V, main discharge capacitor of 2 µF, repetition rate of 10 Hz and wavelength of 400 nm.
Ⓒ Built-in reflector

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

Ⓕ Please refer to the individual catalog for detailed information.

## ■ Dimensional Outline Unit: mm

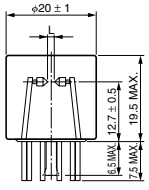
### ❶ L4644, L4645, L4640, L4641




| | L |
|---|---|
| ⓐ | 3.0 |
| ⓑ | 1.5 |

TLSXA0033EC

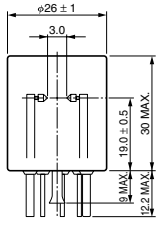
### ❷ L4646, L4647, L4642, L4643




| | L |
|---|---|
| ⓐ | 3.0 |
| ⓑ | 1.5 |

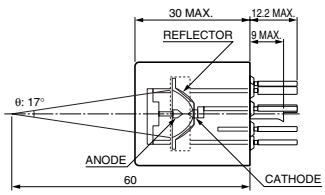
TLSXA0036EC

### ❸ L2358, L2359, L2360



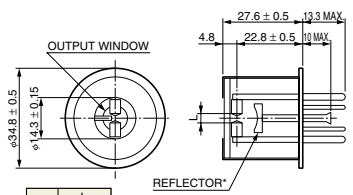

TLSXA0027EC

### ❹ L4633




TLSXA0003ED

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

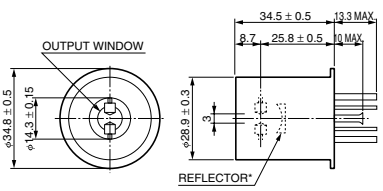



| | L |
|---|---|
| ⓐ | 3.0 |
| ⓑ | 1.5 |

* L1194X, L1196X only

TLS A0011EA

### ❻ L6604, L6605, L7684, L7685




* L7684, L7685 only

TLSXA0049EC

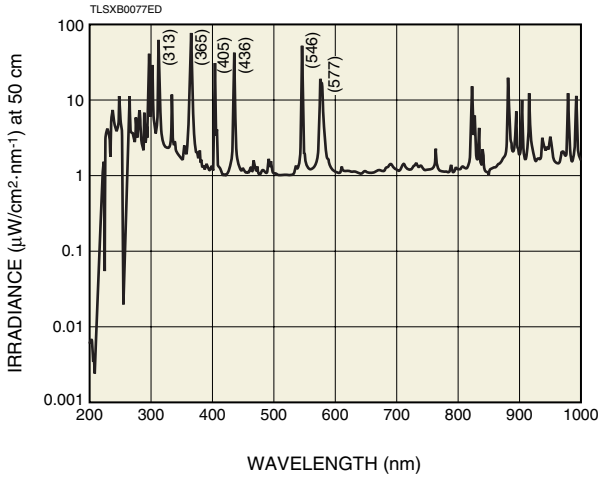
# SUPER-QUIET MERCURY XENON LAMPS

Semiconductor | FA | Information | Medical | Environment

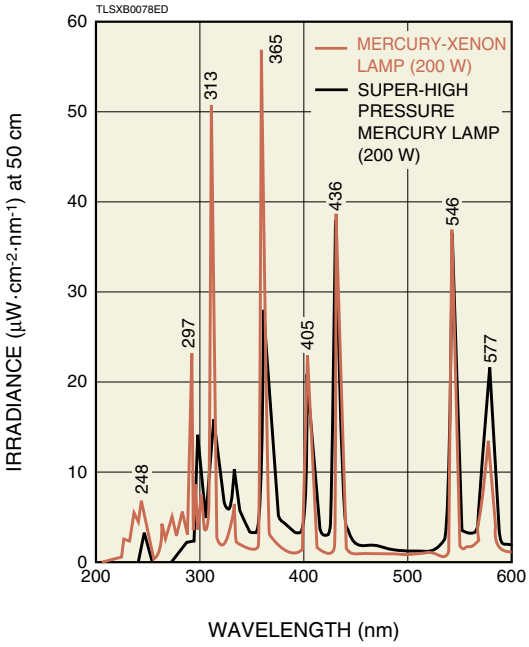
Mercury-xenon lamps are designed to provide high radiant energy in the UV region. These lamps are sealed with an optimum mixture of mercury and xenon gas that offer the best characteristics of both xenon lamps and super-high-pressure mercury lamps. For example, the spectral distribution includes the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

TLSXF00047

## ■ Spectral Distribution (200 W)




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




**Related Products**

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

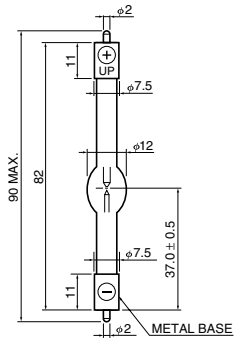
## Characteristics

| Type No. | Lamp Rating (W) | Arc Length (mm) | Dimensional Outline | Window Material | Spectral Distribution (nm) | Lamp Current (A dc) | Lamp Voltage (V dc) | Output Stability: 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 |

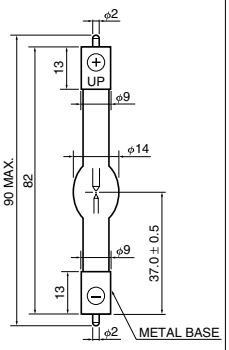
Ⓐ The life end is defined as the time at which the radiant intensity falls to 50 % of its initial value or when the output fluctuation (p-p) exceeds 2.0 % (3.0 % for 250 W type L8706).

## Dimensional Outline Unit: mm

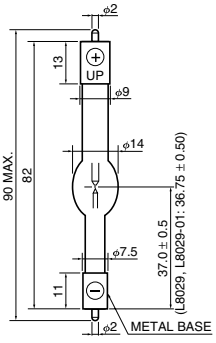
❶ L2421



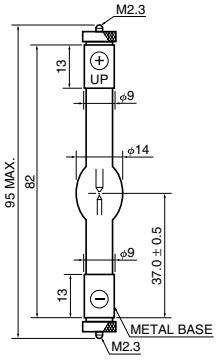

❷ L2481, L2422



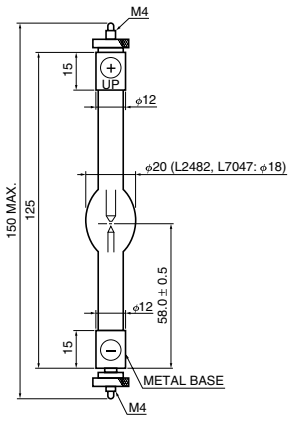

❸ L2481-01, L2422-01, L8029/-01



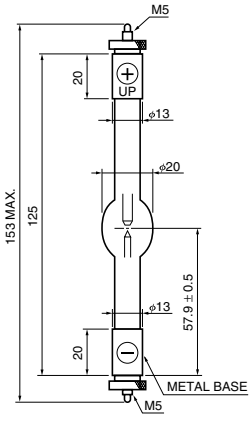

❹ L2481-02, L2422-02



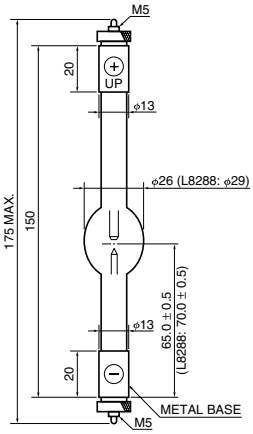

❺ L2482, L2423




❻ L8706




❼ L2483, L8288

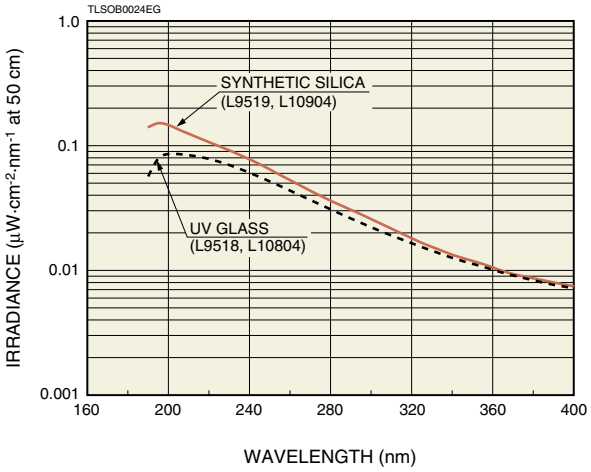


# DEUTERIUM LAMPS (L2D2® LAMPS / X2D2® LAMPS / S2D2® LAMPS)

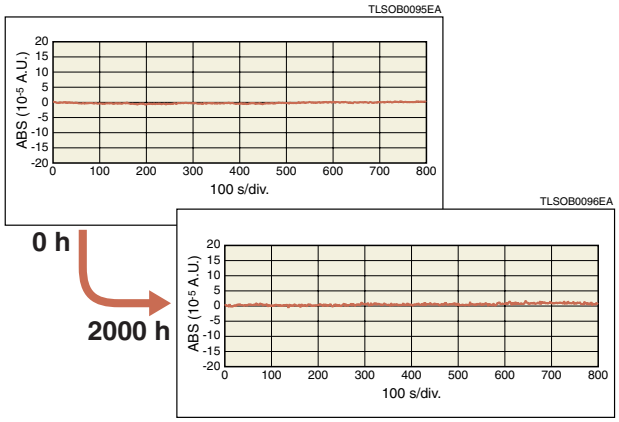
Semiconductor | Medical | Environment | Analysis

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

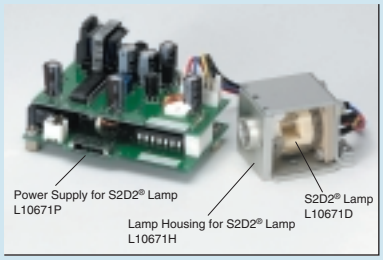



## ■ Light Output Stability




## ■ S2D2® Module

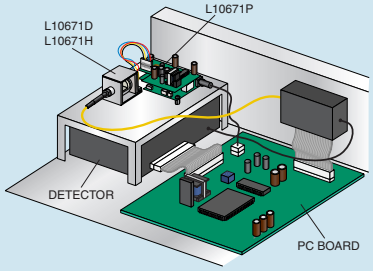
The S2D2 compact deuterium lamp is a UV point light source with a drastically reduced size compared to ordinary deuterium lamps.
This compact size of the S2D2 module makes it easy to install in all types of equipment. The dedicated lamp housing and power supply are designed to extract maximum performance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



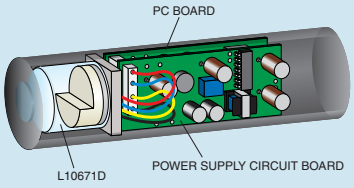

* Lamp housing is supplied with attached cover.

### ■ Usage Example

●Installation Example




●Customized Example *




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

**Related Products**

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

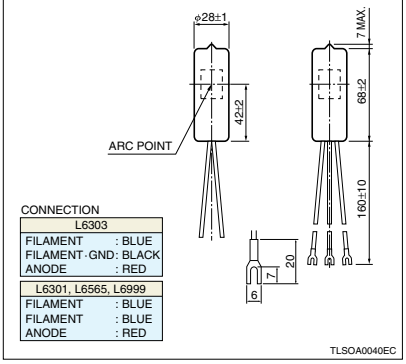
## ■ Characteristics

| Series | Type No. | Dimensional Outline | Spectral Distribution (nm) | Aperture Diameter Ⓐ (mm) | Output Stability at 230 nm: Drift Max. (%/ h) | Output Stability at 230 nm: Fluctuation (p-p) Typ. (%) | Guaranteed Life Ⓑ (at 230 nm) (h) | Required Discharge Starting Voltage Ⓒ Min. (V dc) | Anode Current (mA dc) | Tube Drop Voltage Typ. (V dc) | Filament Ratings: Warm-up Voltage (V dc, ac) | Filament Ratings: Warm-up Current Typ. (A dc, ac) | Filament Ratings: Warm-up Time Min. (s) | Filament Ratings: Operating Voltage (V dc) | Filament Ratings: Operating Current Typ. (A dc) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Standard type** | | | | | | | | | | | | | | | |
| L2D2 | 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 | 1.0 | ±0.25 | 0.005 | 1500 | 250 | 30±2 | 135 | 4.2±0.2 | 0.6 | 25±5 | 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 | | | | | |

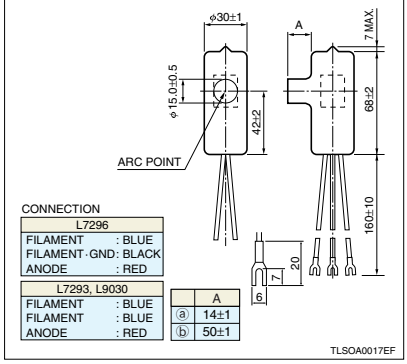
ⒶLamps with an aperture of 0.5 mm diameter are high brightness types. These lamps provide 1.4 times higher brightness than standard lamps with an aperture of 1.0 mm diameter.
ⒷThe lamp life end is defined as the point when the light output falls to 50 % of its initial value at 230 nm or when output fluctuation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

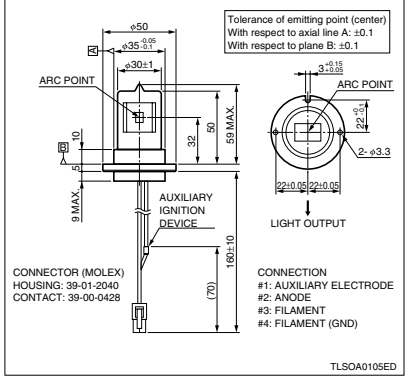
### ❶ L6565, L6301, L6303, L6999



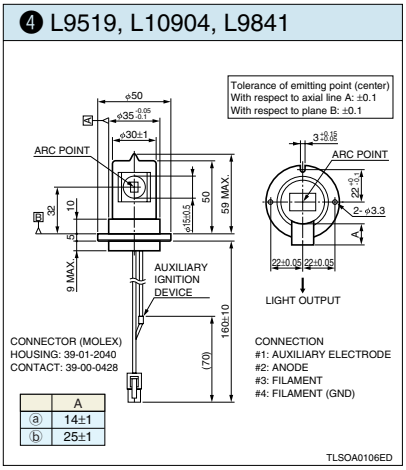

### ❷ L7296, L7293, L9030



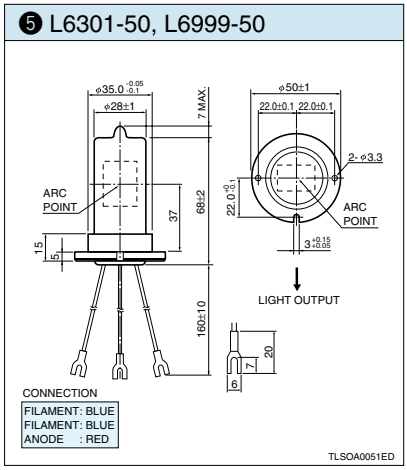

### ❸ L9518, L10804



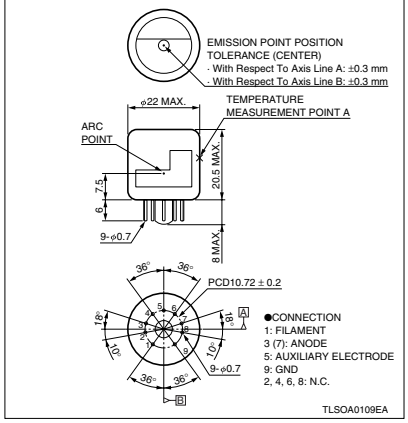

### ❹ L9519, L10904, L9841




### 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 L 2433 series giant-pulse hollow cathode lamps (38 mm diameter) designed for AA spectroscopy using the S-H method background correction.

TLSOF0133

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

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

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

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

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

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

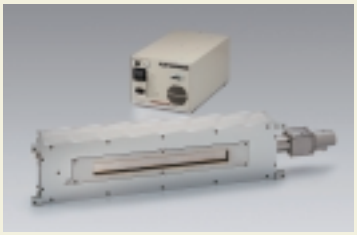
| Elements | | Type No. (suffix) | Analysis Lines (nm) |
|---|---|---|---|
| ◉ Hg | Mercury | -80NU | 253.65 ✻ |
| ◉ Ho | Holmium | -67NB | 410.38 ✻<br>416.30 |
| In | Indium | -49NB | 303.94 ✻<br>325.61 |
| Ir | Iridium | -77NQ | 208.88 ✻<br>266.47 |
| ◉ K | Potassium | -19NB | 766.49 ✻<br>769.90 |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

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

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

# APPLIED PRODUCTS

## RF Discharge Type Excimer Lamp



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

### ■ Features

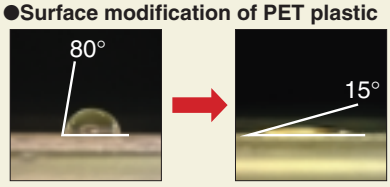
- ●Uniformly irradiates a large area
- ●Stable output with minimal flicker
- ●Efficient light emission
- ●High efficient processing
- ●Instantaneous lamp ON/OFF operation

### ■ Applications

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

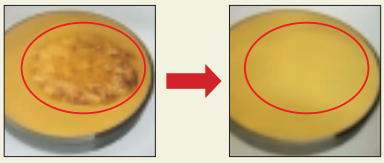
### ■ Application Examples

**●Surface modification of PET plastic**



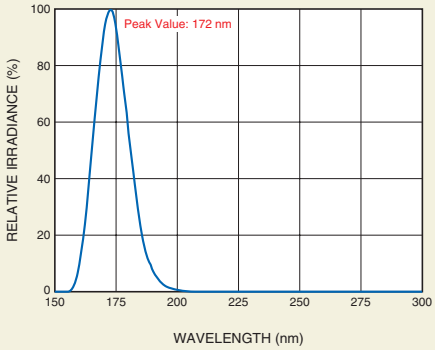

Before irradiation　　After irradiation

**●Dry cleaning of gold-coated mirror for laser**



Before irradiation　　After irradiation

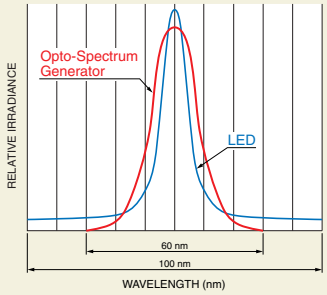
### ■ Spectral Distribution




## Opto-Spectrum Generator

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

### ■ Spectrum Comparison (Reference Data)




### ■ Features

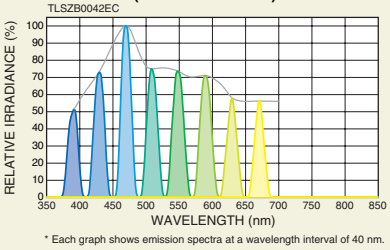
- ●Emits light when & where you need it over a wider range of wavelengths
- ●High-accuracy evaluations and tests
- ●High output, High stability
- ●Compact
- ●Easy control from your PC

### ■ Applications

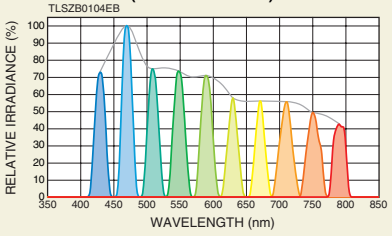
- ●Light stimulus to living body
- ●Spectral characteristic evaluation of devices
- ●Optical property evaluation of materials
- ●Illumination

### ■ Spectral Distribution

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

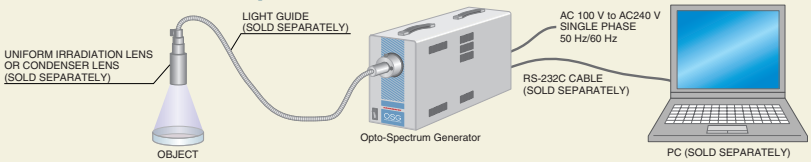



**L12194-00-43079 (430 nm to 790 nm)**




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

### ■ Connection Example



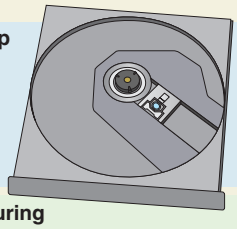
# APPLIED PRODUCTS

## Spot Light Sources LIGHTNINGCURE®

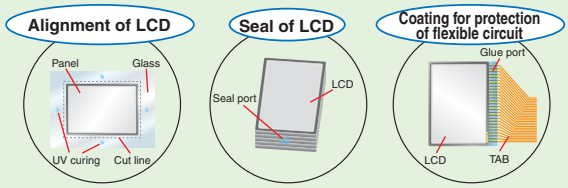
Hamamatsu spot light sources employ long life, high intensity mercury-xenon lamps and optical systems specifically designed to minimize light loss. Our UV spot light sources have gained a solid reputation for long life and high power and now fill a vital role in different fields, especially in FA (factory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

### Application Examples

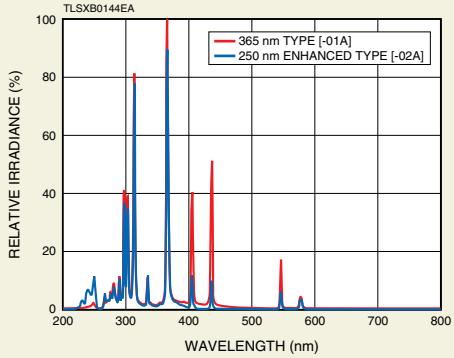
●UV curing for CD/DVD pick up




●UV curing for FPD manufacturing



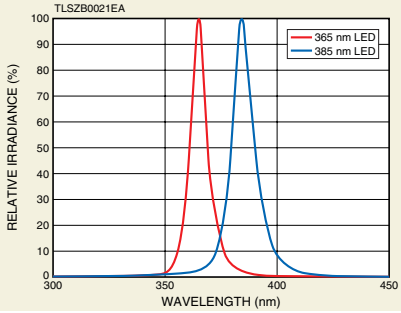

### Spectral Distribution




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

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

### Spectral Distribution




### Applications

●Compact
●High stability and high output
●Low cost

### Applications

●UV curing
●High output UV irradiation

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

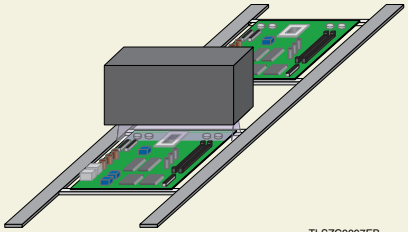
The LC-L5 is a linear type UV-LED unit. It maximizes the LED characteristics by using the unique cooling structure and dedicated optical system, and delivers a whole new level in the two important but opposing factors of "high output" and "long service life."
The LC-L5 contributes to alleviating the 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

TLSZC0006EB

• UV coating agent drying

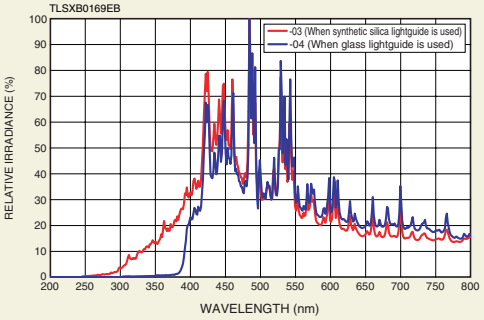


TLSZC0007EB

# Flash Light Sources LIGHTNINGFLASH™

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

## Spectral Distribution




## Applications

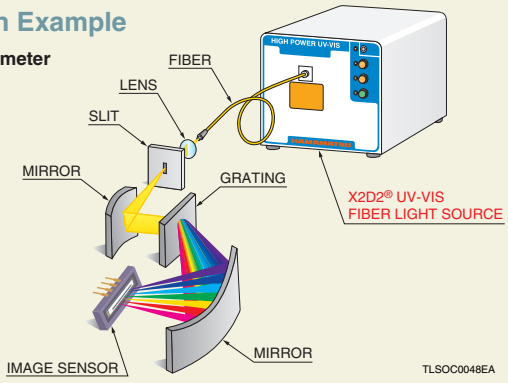
●Strobe light source

# X2D2® UV-Visible Fiber Light Source

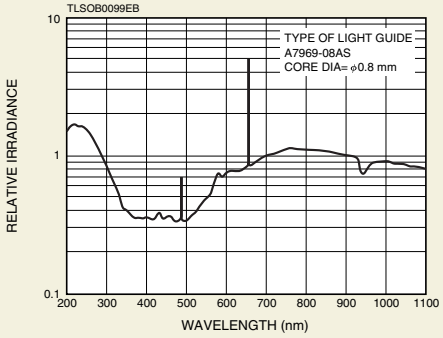
This light source contains a X2D2 lamp and a tungsten-halogen lamp in a compact case and outputs 200 nm to 1600 nm light through a light guide. (Light guide is optional and sold separately.)
The X2D2 lamp and tungsten-halogen lamp are precision-assembled into a dedicated lamp housing to ensure optimum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

## Application Example

●**Spectrophotometer**




## Spectral Distribution



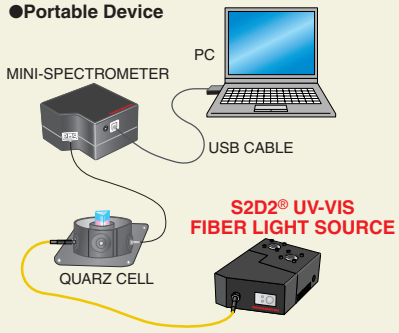

# S2D2® UV-Visible Fiber Light Source

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

* As of September 2013 by our research

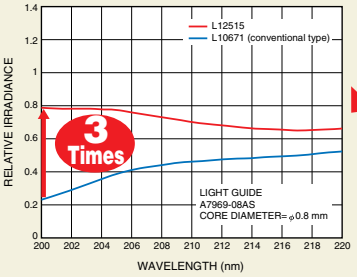
## Application Examples

●**Portable Device**

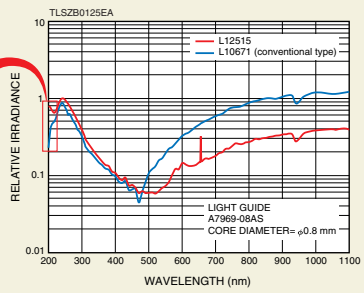



## Spectral Distribution

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




●**200 nm to 1100 nm**



# APPLIED PRODUCTS

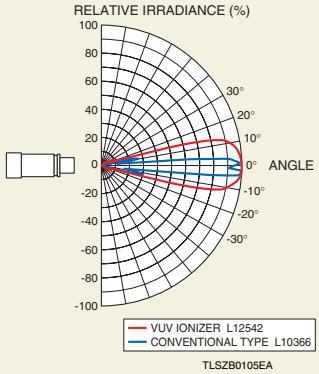
## VUV Ionizer L12542

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

### Features

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

### Directivity (Light Distribution)




### Applications

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

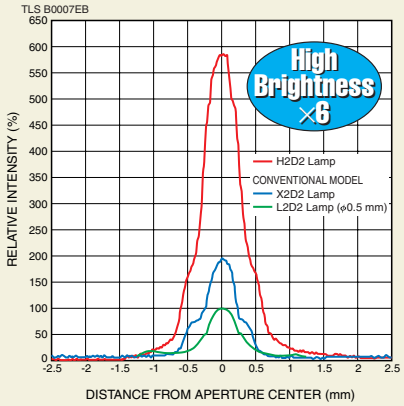
## H2D2 Light Source Unit

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

### Features

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

### Brightness Distribution




### Applications

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

## S2D2® VUV LIGHT SOURCE UNIT

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

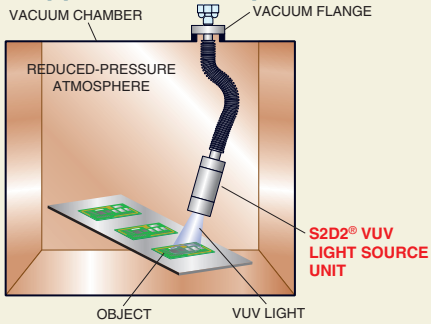
### Features

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

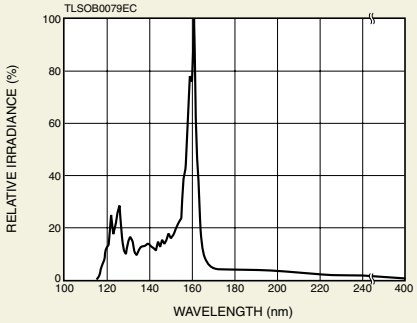
### Applications

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

### Application Example




### Spectral Distribution



# Calibrated Lamp Light Source Series

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

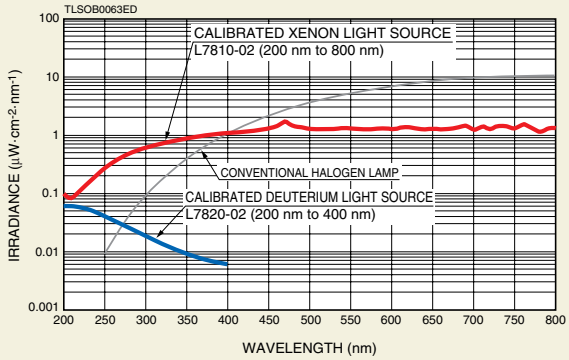
## ■ Features

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

## ■ Applications

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

## ■ Spectral Distribution




# CAUTIONS AND WARRANTY

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

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

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

# ●WHEN SCRAP THE PRODUCT

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

# HAMAMATSU

**HAMAMATSU PHOTONICS K.K., Electron Tube Division**
314-5, Shimokanzo, Iwata City, Shizuoka Pref., 438-0193, Japan
Telephone: (81)539/62-5248, Fax: (81)539/62-2205
www.hamamatsu.com

## Main Products

**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

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

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

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

**REVISED JUN. 2017**



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

## Sales Offices

*Japan:*
**HAMAMATSU PHOTONICS K.K.**
325-6, Sunayama-cho, Naka-ku,
Hamamatsu City, Shizuoka Pref. 430-8587, Japan
Telephone: (81)53-452-2141, Fax: (81)53-456-7889
E-mail: intl-div@hq.hpk.co.jp

*China:*
**HAMAMATSU PHOTONICS (CHINA) Co., Ltd.**
Main Office
1201 Tower B, Jiaming Center, 27 Dongsanhuan Beilu,
Chaoyang District, 100020 Beijing, China
Telephone: (86)10-6586-6006, Fax: (86)10-6586-2866
E-mail: hpc@hamamatsu.com.cn

Shanghai Branch
4905 Wheelock Square, 1717 Nanjing Road West,
Jingan District, 200040 Shanghai, China
Telephone: (86)21-6089-7018, Fax: (86)21-6089-7017

*Taiwan:*
**HAMAMATSU PHOTONICS TAIWAN Co., Ltd.**
Main Office
8F-3, No.158, Section2, Gongdao 5th Road,
East District, Hsinchu, 300, Taiwan R.O.C.
Telephone: (886)03-659-0080, Fax: (886)07-811-7238
E-mail: info@tw.hpk.co.jp

Kaohsiung Office
No.6, Central 6th Road, K.E.P.Z. Kaohsiung 806,
Taiwan R.O.C.
Telephone: (886)07-262-0736, Fax: (886)07-811-7238

*U.S.A.:*
**HAMAMATSU CORPORATION**
Main Office
360 Foothill Road, Bridgewater, NJ 08807, U.S.A.
Telephone: (1)908-231-0960, Fax: (1)908-231-1218
E-mail: usa@hamamatsu.com

California Office
2875 Moorpark Ave. San Jose, CA 95128, U.S.A.
Telephone: (1)408-261-2022, Fax: (1)408-261-2522
E-mail: usa@hamamatsu.com

Chicago Office
4711 Golf Road, Suite 805, Skokie, IL 60076, U.S.A.
Telephone: (1)847-825-6046, Fax: (1)847-825-2189
E-mail: usa@hamamatsu.com

Boston Office
20 Park Plaza, Suite 312, Boston, MA 02116, U.S.A.
Telephone: (1)617-536-9900, Fax: (1)617-536-9901
E-mail: usa@hamamatsu.com

*United Kingdom:*
**HAMAMATSU PHOTONICS UK Limited**
Main Office
2 Howard Court, 10 Tewin Road, Welwyn Garden City,
Hertfordshire AL7 1BW, UK
Telephone: (44)1707-294888, Fax: (44)1707-325777
E-mail: info@hamamatsu.co.uk

South Africa Office:
9 Beukes Avenue, Highway Gardens, Edenvale, 1609,
South Africa
Telephone/Fax: (27)11-609-0367

*France, Portugal, Belgium, Switzerland, Spain:*
**HAMAMATSU PHOTONICS FRANCE S.A.R.L.**
Main Office
19, 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

Swiss Office
Dornacherplatz 7 4500 Solothurn, Switzerland
Telephone: (41)32-625-60-60, Fax: (41)32-625-60-61
E-mail: swiss@hamamatsu.ch

Belgian Office
Axisparc Technology, rue Andre Dumont 7 1435
Mont-Saint-Guibert, Belgium
Telephone: (32)10 45 63 34, Fax: (32)10 45 63 67
E-mail: info@hamamatsu.be

Spanish Office
C. Argenters, 4 edif 2 Parque Tecnológico del Vallés
08290 Cerdanyola (Barcelona), Spain
Telephone: (34)93 582 44 30, Fax: (34)93 582 44 31
E-mail: infospain@hamamatsu.es

*Germany, Denmark, The Netherlands, Poland:*
**HAMAMATSU PHOTONICS DEUTSCHLAND GmbH**
Main Office
Arzbergerstr. 10, D-82211 Herrsching am Ammersee,
Germany
Telephone: (49)8152-375-0, Fax: (49)8152-265-8
E-mail: info@hamamatsu.de

Danish Office
Lautruphøj 1-3, DK-2750 Ballerup, Denmark
Telephone: (45)70-20-93-69, Fax: (45)44-20-99-10
Email: info@hamamatsu.dk

Netherlands Office
Televisieweg 2, NL-1322 AC Almere, The Netherlands
Telephone: (31)36-5405384, Fax: (31)36-5244948
E-mail: info@hamamatsu.nl

Poland Office
02-525 Warsaw, 8 St. A. Boboli Str., Poland
Telephone: (48)22-646-0016, Fax: (48)22-646-0018
E-mail: poland@hamamatsu.de

*North Europe and CIS:*
**HAMAMATSU PHOTONICS NORDEN AB**
Main Office
Torshamnsgatan 35 16440 Kista, Sweden
Telephone: (46)8-509 031 00, Fax: (46)8-509 031 01
E-mail: info@hamamatsu.se

Russian Office
11, Christoprudny Boulevard, Building 1, Office 114,
101000, Moscow, Russia
Telephone: (7)495 258 85 18, Fax: (7)495 258 85 19
E-mail: info@hamamatsu.ru

*Italy:*
**HAMAMATSU PHOTONICS ITALIA S.r.l.**
Main Office
Strada della Moia, 1 int. 6, 20020 Arese (Milano), Italy
Telephone: (39)02-935-81-733, Fax: (39)02-935-81-741
E-mail: info@hamamatsu.it

Rome Office
Viale Cesare Pavese, 435, 00144 Roma, Italy
Telephone: (39)06-50513454, Fax: (39)02-935-81-741
E-mail: inforoma@hamamatsu.it

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