Xenon Flash Lamps
HAMAMATSU Xenon Flash Lamps

Xenon flash lamps are pulsed light sources that emit light with an instantaneously high peak output. The emitted light is a continuous spectrum spanning from the UV to the infrared region and is used for a wide range of applications including chemical analysis and imaging.

Hamamatsu provides high-quality, high-precision xenon flash lamps designed and manufactured entirely in-house. Peripheral devices such as specially designed power supplies and trigger sockets are also available to extract maximum performance from xenon flash lamps.

Selection guide by application

<table>
<thead>
<tr>
<th>Module &amp; lamp</th>
<th>Water quality analysis</th>
<th>Air pollution analysis</th>
<th>Gas analysis</th>
<th>UV - VIS spectroscopy</th>
<th>HPLC (Fluorescence analysis)</th>
<th>IFTF reader (Absorption analysis, Fluorescence analysis)</th>
<th>Blood analysis</th>
<th>Metallography analysis</th>
<th>Imaging cytometry</th>
<th>Imaging microscopy</th>
<th>Color analysis</th>
<th>Stereoscopic inspection</th>
<th>Sterilization</th>
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</thead>
<tbody>
<tr>
<td>2 W xenon flash lamp module</td>
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<td>✓</td>
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</tr>
</tbody>
</table>

**Light output intensity (Typ.)**

- High efficiency
  - Compared to halogen lamps, xenon flash lamps emit high-intensity light that is instantaneously 1000 times greater even when operated at 1/10 of the input power.

- Low heat generation
  - Xenon flash lamps generate low heat, so the warm-up time (time required until stable operation) at initial operation is reduced.

- High stability
  - The unique electrode design provides a highly stable discharge with less electrode wear, and it eliminated the need for readjusting the optical system.

- Long life
  - The unique electrode design ensures minimum electrode wear and allows to maintain high performance over long-term operation.

**Applications**

- Water quality analysis
- Air pollution analysis
- Gas analysis
- UV - VIS spectroscopy
- HPLC (Fluorescence analysis)
- IFTF reader (Absorption analysis, Fluorescence analysis)
- Blood analysis
- Metallography analysis
- Imaging cytometry
- Imaging microscopy
- Color analysis
- Stereoscopic inspection
- Sterilization

**INDEX**

- TOPICS
- Modules
- Lamps
- Q&A
- Related products

P04
P06
P08
P10
P12
P13
P14
P16
P18
P20
P22
P24
P28
P34
Xenon flash lamps emit light across a continuous spectrum from 160 nm to 7500 nm, making them useful in a diverse range of applications from the UV, visible to infrared region.

**IR (infrared) applications**

Xenon flash lamps are also ideal as a multi-wavelength infrared light source. Compared to halogen lamps and MEMS infrared light sources, xenon flash lamps generate less heat and emit light with an instantaneously high peak output, making them ideal for applications where high accuracy is required.

**Spectral distribution (Typ.)**

- Food-related inspections
  - Food analysis (Sugar, fat, water / moisture content, etc.)
  - Foreign matter inspections (Plastic, etc.)
  - Food sorting

**Emission pulse waveform (Typ.)**

Applications
- Food-related inspections
- Gas measurement and analysis
  - Multiple gas analysis (CH₄ (methane), CO₂ (carbon dioxide), etc.)
- Food sorting

**DUV (deep UV) applications**

Xenon flash lamps emit light with an instantaneously high peak output and are also attracting attention as a high-performance deep UV light source that maintains excellent characteristics over a long period of operation.

**Spectral distribution (Typ.)**

- Photoionization
- Spectrophotometry
- Sterilization

Designing an optimal drive circuit is essential for obtaining maximum performance from a xenon flash lamp. Peripheral devices such as power supplies and trigger sockets designed specifically for xenon flash lamps are available, and also technical support for designing those circuits and devices can be provided. Any requests for custom products not listed in our catalog are welcome, so please feel free to consult us about your applications and operating conditions.

**Customization**

- Custom product examples

**Measurement method**

Xenon flash lamps are pulsed light source and may cause large noise in the detected signal if using a measurement method for DC light sources. To avoid this, measurements must be made in synchronization with each flash of the lamp and a peak-hold circuit or sample-and-hold circuit. When using a camera or spectrometer, it is important to set the integration time so that the signal is acquired only at the timing of light emission.

**Setup example**

- Peak-hold circuit: Holds the peak value of the input signal at a constant level.
- Sample-and-hold circuit: Stores (samples) an input signal and holds its value at a constant level.

A xenon flash lamp produces a light flash several microseconds after the trigger signal is input (delay time). Also, time fluctuations (jitter time) of a few hundred nanoseconds occur with each flash. This delay and jitter time must be taken into account in order to make accurate measurements.
These lamp modules integrate a 2 W xenon flash lamp with a power supply and trigger socket, and are designed to extract maximum performance from the lamp. The lamp is available in a housing that has the smallest size among lamps of comparable wattage and operates on a 5 V battery to allow assembly into portable analytical instruments. 2 modules are available: one is an easy-to-handle packaged model with low electromagnetic noise, and the other is a cylindrical circuit board model offering a high degree of design freedom.
These lamp modules integrate a 5 W xenon flash lamp with a power supply and trigger socket and are designed to extract maximum performance from the lamp, including high luminous efficiency, high stability, and long lifetime. These will be ideal for high-performance analytical instruments and are selectable from either the high stability model or high power model.

## Spectral distribution (Typ.)

- **Wavelength (nm)**
- **Radiation (%)**

## Emission pulse waveform (Typ.)

- **Time (µs)**
- **Radiation (%)**

## Life characteristics (Typ.)

- **Number of flashes**
- **Radiation (%)**

### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>High stability model</th>
<th>High output model</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arc size (µm)</td>
<td>1.5</td>
<td>3.0</td>
<td>1.5</td>
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<tr>
<td>Wavelength material</td>
<td>UV glass</td>
<td></td>
<td></td>
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<tr>
<td>Spectral distribution</td>
<td>185 to 2500</td>
<td></td>
<td>nm</td>
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<tr>
<td>Main discharge voltage (V)</td>
<td>Internal: 400 to 600</td>
<td>650 to 1000</td>
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<tr>
<td>Ex.: 400 to 650</td>
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<tr>
<td>Main discharge capacitance (µF)</td>
<td>0.2/0.11</td>
<td>0.2</td>
<td></td>
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<tr>
<td>Maximum lamp input energy (per flash)</td>
<td>See operating condition examples</td>
<td></td>
<td>mJ</td>
</tr>
<tr>
<td>Maximum average lamp input energy (continuous)</td>
<td>See operating condition examples</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>Light output stability (%)</td>
<td>0.4</td>
<td>0.3</td>
<td>0.9</td>
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<tr>
<td>Max.</td>
<td>2.8</td>
<td>1.7</td>
<td>4.8</td>
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<td>Inrush current (A)</td>
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<td>0.75</td>
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<tr>
<td>Trigger signal</td>
<td>Rectangular wave 5 V to 10 V pulse width 10 µs or more</td>
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<td>Trigger input impedance (µA)</td>
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<td>Cooling method</td>
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<td>℃</td>
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<tr>
<td>Storage temperature range</td>
<td>-40 to +90</td>
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<td>℃</td>
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<tr>
<td>Operating humidity range</td>
<td>Below 85 % (no condensation)</td>
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<tr>
<td>Storage humidity range</td>
<td>Below 95 % (no condensation)</td>
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<td>Applicable standards</td>
<td>IEC/EN 61326-1</td>
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<td>Emission limits: CISPR 11 Group 1 Class A</td>
<td>IEC/EN 60950-1:1993, RoHS</td>
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<tr>
<td>Immunity requirements: Table 2</td>
<td>IEC/EN 60950-1:1993, RoHS</td>
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<tr>
<td>Vibration resistance</td>
<td>5 Hz to 200 Hz, 15 m/s²</td>
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<tr>
<td>Shock resistance</td>
<td>Œ</td>
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</tbody>
</table>

**NOTES:**
- Measurement with a Hamamatsu Si photodiode S1336-8BQ. The life is defined as the time at which the light output has decreased to 50 % of the initial output level or the light output fluctuation of 10 % becomes greater than 10 Hz.

### Type number guide

<table>
<thead>
<tr>
<th>Model</th>
<th>Type</th>
<th>Module type</th>
<th>Main discharge capacitance (µF)</th>
<th>Main discharge voltage (V)</th>
<th>Guaranteed life (flashes)</th>
<th>Guaranteed life (continuous) (W)</th>
</tr>
</thead>
<tbody>
<tr>
<td>L9455-01 / -02 / -11 / -12</td>
<td>A</td>
<td>Standard type</td>
<td>3.0 to 5.0</td>
<td>1000</td>
<td>1×10⁸</td>
<td>1.5×10³</td>
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<tr>
<td>L9456-02 / -04</td>
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<td>1.5×10³</td>
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<tr>
<td>L9457-02 / -04</td>
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<td>1.5×10³</td>
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<td>L9460-02 / -04</td>
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<tr>
<td>L9461-02 / -04</td>
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<td>Standard type</td>
<td>3.0 to 5.0</td>
<td>1000</td>
<td>5×10⁹</td>
<td>1.5×10³</td>
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<tr>
<td>L9462-02 / -04</td>
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<td>Standard type</td>
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<td>6×10⁹</td>
<td>1.5×10³</td>
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<td>1.5×10³</td>
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<td>Standard type</td>
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<td>1000</td>
<td>9×10⁹</td>
<td>1.5×10³</td>
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<td>1000</td>
<td>1×10ⁱ⁰</td>
<td>1.5×10³</td>
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<td>1.5×10³</td>
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<td>0.5×10³</td>
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</table>

### Operating condition examples

<table>
<thead>
<tr>
<th>Type No.</th>
<th>Main discharge capacitance (µF)</th>
<th>Main discharge voltage (V)</th>
<th>Maximum lamp input energy (per flash) (µJ)</th>
<th>Maximum repetition rate (Hz)</th>
<th>Maximum average lamp input (continuous) (W)</th>
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</thead>
<tbody>
<tr>
<td>L9455-01 / -11</td>
<td>0.22</td>
<td>400</td>
<td>17.6</td>
<td>822</td>
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<td>L9460-01</td>
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<td>L9465-01</td>
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<td>530</td>
<td>4.7</td>
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<td>L9475-01</td>
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<td>L11317-01</td>
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<td>102</td>
<td>5.0</td>
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</tbody>
</table>

**NOTES:**
- Minimum lamp input energy (per flash) (µJ) = V × Lamp discharge voltage (V) × Lamp discharge current (A) × Trigger signal (µA) / 1000
- Minimum average lamp input (continuous) (W) = E × f / 1000

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*If you are interested in the silent type, please feel free to contact us.*
These lamp modules integrate a 20 W xenon flash lamp with a power supply and trigger socket and are designed to extract maximum performance from the lamp. These will prove ideal for a wide variety of applications including those requiring a high flash repetition rate or high lamp input energy. With the electrodes positioned precisely, there is no need for troublesome optical axis alignment which is required sometimes during installation or wiring tasks.
**Dimensional outlines (Unit: mm)**

### 2 W xenon flash lamp modules

**Packaged model (standard type)** L13651-01/-02/-03/-04, L13651-01-3/-02-3/-03-3/-04-3

- **Cylindrical circuit board type** L13821-01/-02/-03
- **Weight**: Approx. 10 g

**Packaged model (SMA fiber adapter type)** L13651-11/-12/-13/-14

- **Cylindrical circuit board type** L13821-01/-02/-03
- **Weight**: Approx. 10 g

**20 W xenon flash lamp modules**

- **L12745-01/-02/-03, L12745-01-3/-02-3/-03-3**

### 5 W xenon flash lamp modules

**High stability model (standard type)** L1455-01/-02, L1456-01/-02

- **Cable connections**
- **Weight**: Approx. 108 g

**High stability model (SMA fiber adapter type)** L1455-11/-12

- **Cable connections**
- **Weight**: Approx. 140 g

**High output model (standard type)** L11316-01, L11317-01

- **Cable connections**
- **Weight**: Approx. 165 g

**High output model (SMA fiber adapter type)** L11316-11

- **Cable connections**
- **Weight**: Approx. 195 g

### Option

**D-sub input connector cable A11690**

- **Dimensional outlines (Unit: mm)**
- **Weight**: Approx. 97 g

- **This is a shielded low-noise cable terminated with a D-sub connector for signal input. The cable length is 300 mm.**

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**Cable connections**

- **Color**: White, Black, Gray, Blue
- **Signal**: Input voltage (4.75 V to 5.5 V, 10.8 V to 13.2 V), Main discharge voltage control (3.2 V to 4.8 V), Trigger signal

**Input connector (9-pin D-sub) connection**

- **Pin No.** 1-8
- **Signal**: Input voltage (11 V to 28 V), Trigger input RTN

**Input connector (9-pin D-sub male) connection**

- **Pin No.** 1-8
- **Signal**: Input voltage (24 V to 35 V), Trigger input RTN

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**Compatible fiber:**

- **SMA fiber adapter (905 type)**

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**Weight:**

- **Approx. 108 g**
- **Approx. 57 g**
- **Approx. 165 g**
- **Approx. 195 g**
- **Approx. 140 g**

---

**Main discharge voltage**

- **44.0 ± 3.0 mm**
- **41.6 ± 2.5 mm**

**Input voltage**

- **41.6 ± 2.5 mm**
- **13.3 ± 0.5 mm**

**Trigger input RTN.**

- **13.3 ± 0.5 mm**
- **13.3 ± 0.5 mm**

---

**Dimensional outlines**

- **Unit: mm**
- **Weight**: Approx. 57 g

---

**Dimensional outlines**

- **Unit: mm**
- **Weight**: Approx. 108 g

---

**Dimensional outlines**

- **Unit: mm**
- **Weight**: Approx. 165 g

---

**Dimensional outlines**

- **Unit: mm**
- **Weight**: Approx. 195 g

---

**Dimensional outlines**

- **Unit: mm**
- **Weight**: Approx. 140 g
10 W xenon flash lamps

In spite of using low-cost electrodes, these 10 W xenon flash lamps feature high stability and long lifetime, making them versatile and easy to use in a wide range of applications. The lamp shape is selectable from either a hemispherical or flat window.
These 15 W xenon flash lamps integrate a reflector to deliver higher output, yet these lamps are also compact and generate less heat. The built-in reflector is available with a choice of converging type and collimating type. The converging type is ideal for applications where the output light must be guided to an optical light guide.

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>L4633</th>
<th>L4634</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Built-in reflector</td>
<td>Collimating type</td>
<td>Collimating type</td>
<td>---</td>
</tr>
<tr>
<td>Window material</td>
<td>Bismuth oxide glass</td>
<td>Bismuth oxide glass</td>
<td>---</td>
</tr>
<tr>
<td>Side tube material</td>
<td>Bismuth oxide glass</td>
<td>Bismuth oxide glass</td>
<td>---</td>
</tr>
<tr>
<td>Spectral distribution</td>
<td>200 to 2500 nm</td>
<td>200 to 2500 nm</td>
<td>---</td>
</tr>
<tr>
<td>Main discharge voltage range</td>
<td>700 to 1000 V</td>
<td>700 to 1000 V</td>
<td>---</td>
</tr>
<tr>
<td>Recommended main discharge voltage range</td>
<td>700 to 1000 V</td>
<td>700 to 1000 V</td>
<td>---</td>
</tr>
<tr>
<td>Maximum lamp input energy (per flash)</td>
<td>See operating condition examples</td>
<td>See operating condition examples</td>
<td>mJ</td>
</tr>
<tr>
<td>Maximum repetition rate (Hz)</td>
<td>100</td>
<td>100</td>
<td>---</td>
</tr>
<tr>
<td>Maximum average lamp input (continuous)</td>
<td>See operating condition examples</td>
<td>See operating condition examples</td>
<td>W</td>
</tr>
<tr>
<td>Light output stability</td>
<td>0.5%</td>
<td>0.5%</td>
<td>---</td>
</tr>
<tr>
<td>Trigger voltage</td>
<td>5 to 7 V</td>
<td>5 to 7 V</td>
<td>---</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>-5 to +40 °C</td>
<td>-5 to +40 °C</td>
<td>---</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>-40 to +90 °C</td>
<td>-40 to +90 °C</td>
<td>---</td>
</tr>
<tr>
<td>Operating humidity range</td>
<td>Below 95% (no condensation)</td>
<td>Below 95% (no condensation)</td>
<td>---</td>
</tr>
<tr>
<td>Storage humidity range</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Trigger socket (sold separately)</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

**Operating condition examples**

<table>
<thead>
<tr>
<th>Main discharge capacitance (µF)</th>
<th>0.3</th>
<th>0.2</th>
<th>0.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Main discharge voltage (V)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Maximum lamp input energy (per flash) (W)</td>
<td>150.0</td>
<td>100.0</td>
<td>50.0</td>
</tr>
<tr>
<td>Maximum repetition rate (Hz)</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>Maximum average lamp input (continuous) (W)</td>
<td>15.0</td>
<td>7.4</td>
<td>5.0</td>
</tr>
<tr>
<td>Power supply (sold separately)</td>
<td>C13316-03</td>
<td>C13316-02</td>
<td>C13315</td>
</tr>
</tbody>
</table>

**Dedirectivity (light distribution)**

The Directedness (light distribution) of the converging type is measured by placing an opal glass plate at a position 10 mm away from the lamp. The Directedness (light distribution) of the collimating type is measured by placing an opal glass plate at a Perfect point of the reflector. The Directedness (light distribution) is defined as the time at which the light output energy of 0.15 J to 0.05 J. To ensure highly stable operation, 10 Hz or more repetition rate is recommended.

**Measurement method**

To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
20 W xenon flash lamps

These 20 W xenon flash lamps employ a metal can package to achieve high output. An MgF2 window type that emits a spectrum of light from 160 nm to 7500 nm is also available for a wide range of applications including inspections, measurements, and chemical analysis. A high output type with a built-in reflector is also provided that enables 1.5 times higher output.

Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>L11936</th>
<th>L11938</th>
<th>L11937</th>
<th>L11957</th>
<th>L11958</th>
<th>L11959</th>
<th>L14491</th>
<th>L14493</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arc size</td>
<td>1.5</td>
<td>3.0</td>
<td>1.5</td>
<td>3.0</td>
<td>1.5</td>
<td>3.0</td>
<td>1.5</td>
<td>3.0</td>
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<tr>
<td>Window material</td>
<td>Borosilicate glass</td>
<td>UV glass</td>
<td>Sapphire glass</td>
<td>MgF2</td>
<td>---</td>
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<tr>
<td>Side tube material</td>
<td>Metal</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>Spectral distribution</td>
<td>240 to 2500</td>
<td>180 to 2500</td>
<td>160 to 5000</td>
<td>160 to 7500</td>
<td>---</td>
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<tr>
<td>Main discharge voltage range</td>
<td>300 to 1000</td>
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<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>Recommended main discharge voltage range</td>
<td>700 to 1000</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<td>---</td>
</tr>
<tr>
<td>Maximum lamp input energy (per flash)</td>
<td>See operating condition examples</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>Maximum repetition rate</td>
<td>10 Hz</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Maximum average lamp input (continuous)</td>
<td>See operating condition examples</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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</tr>
<tr>
<td>Light output stability (Typ.)</td>
<td>1% CV</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>Maximum</td>
<td>2%</td>
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<td>---</td>
<td>---</td>
<td>---</td>
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<tr>
<td>Max.</td>
<td>6%</td>
<td>---</td>
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<td>---</td>
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</tr>
<tr>
<td>Guaranteed life</td>
<td>1×10^7 to 1×10^8 flashes</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Trigger voltage</td>
<td>5 to 7 kV p-p</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Cooling method</td>
<td>Not required</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operating temperature range</td>
<td>0 to +40°C</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Storage temperature range</td>
<td>0 to +40°C</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Operating humidity range</td>
<td>Below 85% (no condensation)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Storage humidity range</td>
<td>Below 85% (no condensation)</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Trigger socket (sold separately)</td>
<td>E10977</td>
<td>E10978</td>
<td>E10977</td>
<td>E10978</td>
<td>---</td>
<td>---</td>
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</tbody>
</table>

Operating condition examples

<table>
<thead>
<tr>
<th>Main discharge capacitance (µF)</th>
<th>Main discharge voltage (V)</th>
<th>Maximum lamp input energy (per flash) (mJ)</th>
<th>Maximum repetition rate (Hz)</th>
<th>Maximum average lamp input (continuous) (mJ)</th>
<th>Power supply ⑧ (sold separately)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>1000</td>
<td>500</td>
<td>40</td>
<td>20</td>
<td>C1310-10</td>
</tr>
<tr>
<td>0.5</td>
<td>1000</td>
<td>200</td>
<td>100</td>
<td>20</td>
<td>C1310-04</td>
</tr>
<tr>
<td>0.0</td>
<td>1000</td>
<td>98</td>
<td>204</td>
<td>20</td>
<td>C1310-03</td>
</tr>
<tr>
<td>0.0</td>
<td>700</td>
<td>150</td>
<td>132</td>
<td>20</td>
<td>C1310-03</td>
</tr>
<tr>
<td>0.2</td>
<td>700</td>
<td>100</td>
<td>200</td>
<td>20</td>
<td>C1310-02</td>
</tr>
<tr>
<td>0.0</td>
<td>700</td>
<td>49</td>
<td>408</td>
<td>20</td>
<td>C1310-02</td>
</tr>
<tr>
<td>0.1</td>
<td>700</td>
<td>50</td>
<td>490</td>
<td>20</td>
<td>C1310-01</td>
</tr>
<tr>
<td>0.0</td>
<td>700</td>
<td>25</td>
<td>816</td>
<td>20</td>
<td>C1310-01</td>
</tr>
</tbody>
</table>

NOTES:
- ①: To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
- ②: Measured with a Hamamatsu Si photodiode S1336-8BQ. The life is defined as the time at which the light output at 190 nm to 1100 nm decreases to 50% of the initial output level or the light output fluctuation exceeds the specified maximum value when the lamp is operated at 20 W (0.5 J to 0.02 J).
- ③: Measured with a Hamamatsu Si photodiode S1336-8BQ. The light output stability (% CV) is defined as the ratio of the light output fluctuation to the specified maximum output when the lamp is operated at 20 W (0.5 J to 0.2 J).
- ④: Measured with a Hamamatsu Si photodiode S1336-8BQ. The light output stability (% p-p) is defined as the ratio of the light output fluctuation to the specified maximum output when the lamp is operated at 20 W (0.5 J to 0.2 J).
- ⑤: Measured with a Hamamatsu Si photodiode S1336-8BQ. The light output stability (% p-p) is defined as the ratio of the light output fluctuation to the specified maximum output when the lamp is operated at 20 W (0.5 J to 0.2 J).
- ⑥: Measured with a Hamamatsu Si photodiode S1336-8BQ. The light output stability (% p-p) is defined as the ratio of the light output fluctuation to the specified maximum output when the lamp is operated at 20 W (0.5 J to 0.2 J).
- ⑦: Measured with a Hamamatsu Si photodiode S1336-8BQ. The light output stability (% CV) is defined as the ratio of the light output fluctuation to the specified maximum output when the lamp is operated at 20 W (0.5 J to 0.2 J).
- ⑧: See page 28 to 29 for information on power supplies.
These are 60 W xenon flash lamps that deliver the highest output among our xenon flash lamps. Despite their high output, these lamps are highly stable. A built-in reflector type with an even higher output is also provided that boosts the output 1.5 times higher than that of other 60 W lamps.

**Specifications**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Standard model</th>
<th>High output model</th>
</tr>
</thead>
<tbody>
<tr>
<td>L6604</td>
<td>L6605</td>
<td>L7684</td>
</tr>
<tr>
<td>Air size</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wavelength (nm)</td>
<td>Si photodiode (680 nm to 1100 nm)</td>
<td></td>
</tr>
<tr>
<td>Side tube material</td>
<td>Metal</td>
<td></td>
</tr>
<tr>
<td>Spectral distribution</td>
<td>240 ~ 2500</td>
<td>190 ~ 5000</td>
</tr>
<tr>
<td>Main discharge voltage range (V)</td>
<td>500 ~ 1000</td>
<td></td>
</tr>
<tr>
<td>Recommended main discharge voltage range (V)</td>
<td>700 ~ 1000</td>
<td></td>
</tr>
<tr>
<td>Maximum lamp input energy (per flash) (mJ)</td>
<td>See operating condition examples</td>
<td></td>
</tr>
<tr>
<td>Maximum repetition rate (Hz)</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Light output stability (% p-p) = (maximum light output – minimum light output) / average light output</td>
<td>3.0</td>
<td></td>
</tr>
<tr>
<td>% CV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guaranteed life (% of initial output)</td>
<td>8 × 10^5 flashes</td>
<td></td>
</tr>
<tr>
<td>Trigger voltage (kV)</td>
<td>3 to 10</td>
<td></td>
</tr>
<tr>
<td>Main discharge capacitance (µF)</td>
<td>2.1</td>
<td></td>
</tr>
<tr>
<td>Main discharge voltage (V)</td>
<td>975</td>
<td></td>
</tr>
<tr>
<td>Measured with a Hamamatsu Si photodiode S1336-8BQ. The life is defined as the time at which the light output at 190 nm to 1100 nm decreases to 50% of the initial output level. The life is determined based on the light output at maximum light output and initial light output. See pages 25 to 27 for information on dedicated power supplies.</td>
<td>See pages 25 to 27 for information on trigger sockets.</td>
<td>See pages 25 to 27 for information on operating conditions.</td>
</tr>
</tbody>
</table>

**Operating condition examples**

<table>
<thead>
<tr>
<th>Main discharge capacitance (µF)</th>
<th>Main discharge voltage (V)</th>
<th>Maximum lamp input energy (per flash) (mJ)</th>
<th>Maximum repetition rate (Hz)</th>
<th>Main discharge capacitor (external connection) (sold separately)</th>
<th>Power supply (sold separately)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1</td>
<td>975</td>
<td>1000</td>
<td>60</td>
<td>40</td>
<td>E7289-02</td>
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<td>2.5</td>
<td>700</td>
<td>515</td>
<td>100</td>
<td>51.5</td>
<td>E6611</td>
</tr>
<tr>
<td>0.1</td>
<td>700</td>
<td>50</td>
<td>100</td>
<td>5</td>
<td>E6611</td>
</tr>
</tbody>
</table>

**NOTE**

- To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
- Measured with a Hamamatsu Si photodiode S1336-8BQ. The life is defined as the time at which the light output at 190 nm to 1100 nm decreases to 50% of the initial output level. The life is determined based on the light output at maximum light output and initial light output. See pages 25 to 27 for information on dedicated power supplies. | See pages 25 to 27 for information on trigger sockets. | See pages 25 to 27 for information on operating conditions. | See pages 25 to 27 for information on dedicated power supplies. |
**10 W xenon flash lamps**

<table>
<thead>
<tr>
<th>L4642, L4643, L4644, L4645</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type No.</strong></td>
</tr>
<tr>
<td>L4642</td>
</tr>
<tr>
<td>L4643</td>
</tr>
<tr>
<td>L4644</td>
</tr>
<tr>
<td>L4645</td>
</tr>
</tbody>
</table>

**Applicable type No.:** L4642, L4643, L4644, L4645

**Pin connections:**
- 2: Sparker
- 3: Sparker
- 4: No connection
- 5: No connection
- 6: Cathode

**Weight:** Approx. 4.3 g

---

**20 W xenon flash lamps**

**Standard type** L11936, L11937, L11938, L14691, L11956, L11957, L11958, L14693

<table>
<thead>
<tr>
<th>L11936</th>
<th>L11937</th>
<th>L11938</th>
<th>L14691</th>
<th>L11956</th>
<th>L11957</th>
<th>L11958</th>
<th>L14693</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
<td><strong>Pin connections</strong></td>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
<td><strong>Pin connections</strong></td>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
</tr>
<tr>
<td>L11936</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L11937</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11938</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L14691</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11956</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L11957</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11958</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L14693</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Pin connections:**
- 2: No connection
- 3: Cathode
- 4: Signal
- 5: Signal
- 6: Signal

**Weight:** Approx. 28 g

---

**High output type** L11946, L11947, L11948, L14692, L11966, L11967, L11968, L14694

<table>
<thead>
<tr>
<th>L11946</th>
<th>L11947</th>
<th>L11948</th>
<th>L14692</th>
<th>L11966</th>
<th>L11967</th>
<th>L11968</th>
<th>L14694</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
<td><strong>Pin connections</strong></td>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
<td><strong>Pin connections</strong></td>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
</tr>
<tr>
<td>L11946</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L11947</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11948</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L14692</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11966</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L11967</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>L11968</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
<td>L14694</td>
<td>14.8 ± 0.1</td>
<td>2: No connection, 3: Cathode</td>
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</tbody>
</table>

**Pin connections:**
- 2: No connection
- 3: Cathode
- 4: Signal
- 5: Signal
- 6: Signal

**Weight:** Approx. 30 g

---

**15 W xenon flash lamps**

<table>
<thead>
<tr>
<th>L4633</th>
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<tbody>
<tr>
<td><strong>Type No.</strong></td>
</tr>
<tr>
<td>L4633</td>
</tr>
<tr>
<td>L4634</td>
</tr>
</tbody>
</table>

**Pin connections:**
- 2: No connection
- 3: Cathode
- 4: Signal
- 5: Signal
- 6: Signal

**Weight:** Approx. 14 g

---

**60 W xenon flash lamps**

**Standard type** L6604, L6605

<table>
<thead>
<tr>
<th>L6604</th>
<th>L6605</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
</tr>
<tr>
<td>L6604</td>
<td>14.8 ± 0.1</td>
</tr>
<tr>
<td>L6605</td>
<td>14.8 ± 0.1</td>
</tr>
</tbody>
</table>

**Pin connections:**
- 2: No connection
- 3: Cathode
- 4: Signal
- 5: Signal
- 6: Signal

**Weight:** Approx. 34 g

---

**High output type** L7684, L7685

<table>
<thead>
<tr>
<th>L7684</th>
<th>L7685</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type No.</strong></td>
<td><strong>Size</strong></td>
</tr>
<tr>
<td>L7684</td>
<td>14.8 ± 0.1</td>
</tr>
<tr>
<td>L7685</td>
<td>14.8 ± 0.1</td>
</tr>
</tbody>
</table>

**Pin connections:**
- 2: No connection
- 3: Cathode
- 4: Signal
- 5: Signal
- 6: Signal

**Weight:** Approx. 30 g
The E7289-02 is a main discharge capacitor (2 µF) intended to operate a 60 W xenon flash lamp with a maximum average lamp input (continuous) of 60 W. By just connecting to the dedicated power supply, the E7289-02 starts safe operation.

The E6611 is a cooling jacket specifically designed for 60 W xenon flash lamps. It helps keep the temperature of the xenon flash lamp and trigger socket at a constant level within the tolerance range to ensure highly stable operation. *The cooling jacket must be used when the lamp is operated with an input of 15 W or more.

Hamamatsu provides trigger sockets specifically designed for xenon flash lamps. These trigger sockets are integrated with a high-voltage transformer, voltage-divider resistors, and capacitors in the same compact housing thus reducing the hassle of drawing up circuit and device designs.

Options

**Trigger sockets** E2418, E2442, E4370-01, E10977, E10978, E6647

**Cooling jacket** E6611

**Main discharge capacitor (external connection)** E7289-02
Hamamatsu provides power supplies specifically designed to bring out maximum performance of xenon flash lamps. These are switching power supplies with a built-in high-speed charging circuit and discharge stop circuit. Despite their compact size and large capacity, the power supplies ensure highly stable xenon flash lamp operations.

### Options

#### Power supplies C13315 / C13316 series, C14352

The main discharge capacitance can be selected from 0.2 to 1.0 µF in 0.1 µF steps. Necessary for trigger mode adjustment. The reference voltage (0 V) for these products is referred to as RTN instead of GND. It is because making connections separately from GND is recommended in consideration of the influence of external noise on the trigger signal.

### Specifications

<table>
<thead>
<tr>
<th>Parameter</th>
<th>C13315</th>
<th>C13316 series</th>
<th>C14352</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Main discharge section</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output voltage (DC)</td>
<td>300 to 1000</td>
<td></td>
<td></td>
<td>V</td>
</tr>
<tr>
<td>Output capacitance (µF)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max.</td>
<td>20</td>
<td>60</td>
<td></td>
<td>W</td>
</tr>
<tr>
<td>Min.</td>
<td>0.2</td>
<td>0.1</td>
<td></td>
<td>%</td>
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<tr>
<td>Internal/main discharge capacitance (µF)</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max.</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
<td>µF</td>
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<tr>
<td>Min.</td>
<td>0.2 to 1.0</td>
<td>0.2 to 1.0</td>
<td></td>
<td>µF</td>
</tr>
<tr>
<td>Maximum repetition rate (Hz)</td>
<td>100</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Trigger section</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Trigger mode</td>
<td>Internal / External</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Trigger capacitance (µF)</td>
<td>0.22</td>
<td></td>
<td></td>
<td>µF</td>
</tr>
<tr>
<td>Trigger impedance (µF)</td>
<td>0.33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input waveform</td>
<td>Rectangular wave</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage (V)</td>
<td>4.5 V to 5.5 V (pulse width 5 µs or more)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Input voltage (DC)</td>
<td>24.0 ± 0.4</td>
<td></td>
<td>24.0 ± 0.4</td>
<td>V</td>
</tr>
<tr>
<td>Power consumption (W)</td>
<td>26</td>
<td></td>
<td>72</td>
<td>W</td>
</tr>
<tr>
<td>Cooling method</td>
<td>Not required</td>
<td>Focused air cooling by fan</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Type number guide (C13316 series)

<table>
<thead>
<tr>
<th>Suffix</th>
<th>Main discharge capacitance (µF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>02</td>
<td>0.2</td>
</tr>
<tr>
<td>04</td>
<td>0.4</td>
</tr>
<tr>
<td>06</td>
<td>0.6</td>
</tr>
<tr>
<td>08</td>
<td>0.8</td>
</tr>
<tr>
<td>10</td>
<td>1.0</td>
</tr>
<tr>
<td>20</td>
<td>2.0</td>
</tr>
</tbody>
</table>

### Dimensional outlines (Unit: mm)

<table>
<thead>
<tr>
<th>C13315</th>
<th>C13316 series</th>
<th>C14352</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input connector (Front D-sub male)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Power type connector for main discharge voltage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal / External selector switch for trigger mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal / External selector switch for trigger mode</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**NOTE:**
- The main discharge capacitance can be selected from 0.2 µF to 1.0 µF in 0.1 µF steps.
- Adjust the repetition rate so that the maximum average lamp input (at discharge) is lower than 20 W.
- The reference voltage (0 V) for these products is referred to as RTN instead of GND. This is because making connections separately from GND is recommended in consideration of the influence of external noise on the trigger signal.
Q1. How are the maximum lamp input energy (per flash) and the maximum repetition rate of a lamp calculated?

A1. Refer to the following equations:

\[ E = \frac{1}{2} \times C \times V^2 \]
\[ P = E \times f \]

For example, when operating a 20 W xenon flash lamp at a main discharge voltage of 1000 V using a recommended power supply C13316-10 (main discharge capacitance: 1.0 \( \mu \)F (10\(^{-6}\) F)), the maximum lamp input energy (per flash) is 0.5 J as calculated by the following equation:

\[ E = \frac{1}{2} \times 10^{-6} \times (1000)^2 = 0.5 \text{ [J]} \]

In the above case, the maximum repetition rate of the 20 W xenon flash lamp is 40 Hz as calculated by the following equation:

\[ f = \frac{20 \text{ [W]}}{0.5 \text{ [J]}} = 40 \text{ [Hz]} \]

When selecting a lamp, the maximum lamp input energy and maximum repetition rate must be taken into account so that the maximum average lamp input (continuous) will not exceed the rating.

Q2. What happens if a lamp is used at a main discharge voltage higher than its rating?

A2. The electrodes will wear down faster, and this will shorten the life of the xenon flash lamp. While referring to the description in A1, be sure to use the lamp under the operating conditions within the specified rating.

Q3. What happens if a lamp is used at a repetition rate that exceeds the maximum repetition rate?

A3. The lamp will not emit light at the desired lamp input energy. The electrodes will also be damaged by continuous lighting, and the life of the lamp will be shortened. While referring to the description of A1, be sure to use the lamp under the operating conditions within the specified rating.

Q4. How do the characteristics change depending on the arc length?

A4. Xenon flash lamps with a long arc length provide higher light output with a wider flash pulse width (longer flash duration) and are ideal for applications that require a large irradiation area. On the other hand, xenon flash lamps with a short arc length emit higher brightness light and are used for applications that require higher accuracy.

Q5. How do the characteristics change depending on the main discharge capacitance?

A5. The larger the main discharge capacitance, the greater the maximum lamp input energy. This will produce a higher light output with a wider flash pulse width (longer flash duration).

Q6. How do the characteristics change depending on the main discharge voltage?

A6. The higher the main discharge voltage, the greater the maximum lamp input energy and the higher the light output that can be obtained. Unlike the main discharge capacitance (A5), the flash pulse width (flash duration) does not change.
Q7. What type of trigger signal input is needed from signal source in order to operate xenon flash lamp module or power supply for xenon flash lamp?

A7. Input rectangular wave signal referring to the repetition rate and trigger signal on each specification page.
(Operate at 10Hz or more is recommended for high stability)
In addition, use signal source for trigger signal input that can output 15 to 30 mA.

Q8. Is there any difference in life characteristics for each wavelength?

A8. In general, the light output on the short wavelength side tends to decrease significantly. The lamp life is defined as the time when the light output at 190 nm to 1100 nm decreases to 50% of the initial output level or the light output fluctuation exceeds the specified maximum value.

Q9. Is there any difference in life characteristics at each lamp input energy (energy per flash)?

A9. In general, the larger the lamp input energy (energy per flash), the shorter the life.

Q10. What should be done to ensure the lamp to be operated stably?

A10. Following solutions are recommended:

① Use the light in the center of the arc.

The light output stability of a xenon flash lamp differs depending on the arc discharge measurement position. The closer to the center of the arc, the more stable the light output.

② Do not use the light at the initial lighting.

Highly stable output light can be obtained from a xenon flash lamp by avoiding the warm-up time (time taken to reach stable operation) at the initial lighting.

③ Average the data.

Light output stability is improved by processing and averaging multiple acquired data.
Q11. What device setup is used to measure the spectral distribution, emission pulse waveform and life characteristics of xenon flash lamps?

A11. Typical measurement setups are as follows:

**Spectral distribution**
- Xenon flash lamp
- Monochromator
- Pulse generator
- Dedicated power supply
- DC power supply
- Multimeter
- PC

**Emission pulse waveform**
- Xenon flash lamp
- Monochromator
- Pulse generator
- Dedicated power supply
- DC power supply
- Oscilloscope

**Life characteristics**
- Xenon flash lamp
- Pulse generator
- Dedicated power supply
- Sample-and-hold circuit
- Oscilloscope
- Multimeter
- PC

Q12. What devices are needed to operate a lamp?

A12. Prepare the following devices:

- Operating a xenon flash lamp module
  - Required: DC power supply (input power)
  - Optional: Pulse signal source such as a pulse generator (for external control of maximum repetition rate)
  - Optional: External control power supply (external control of main discharge voltage)

- Operating a xenon flash lamp using a trigger socket and dedicated power supply
  - Required: DC power supply (input power)
  - Optional: Pulse signal source such as pulse generator (for external control of maximum repetition rate)
  - Optional: External control power supply (external control of main discharge voltage)

Q13. What is an important factor when selecting an optical fiber?

A13. Be sure to select an optical fiber that is resistant to UV light.

Q14. Are there any restrictions on the direction for installing a xenon flash lamp?

A14. Installing a lamp with its light output window facing downward is not recommended. Debris particles from the inside of the lamp may adhere to the light output window, causing a drop in the light output.

Q15. What should be checked before using a xenon flash lamp that has been stored for a long time?

A15. Check the lead pins for any deterioration such as rust before checking the operation. Although depending on how the lamp has been stored, there will be basically no problems with operating it unless deterioration such as rust is found on the lead pins.

Q16. Is it possible to change the cable length of the trigger socket?

A16. The cable length of the trigger socket affects the flash pulse width (flash duration) and lamp input current. When the cable length is increased, the flash pulse width becomes longer and the lamp input current tends to decrease, which might cause the lamp to fail to light up. When the cable length is reduced, the flash pulse width becomes shorter and the lamp input current tends to increase, which might shorten the lamp lifetime. Therefore, changing the trigger socket cable length is not recommended.
Related products

**Photomultiplier tubes**

**Optical sensors with extremely high sensitivity**

Photomultiplier tubes are versatile photodetectors having extremely high sensitivity and high-speed response. We have a complete line of photomultiplier tubes with different shapes, spectral response ranges, structures and effective areas which are developed and manufactured by our unique, advanced technology. Each product offers its own features and characteristics that have proven beneficial in countless applications including chemical analysis and scientific measurement.

**Si photodiodes**

**Compact, lightweight optical sensors with high sensitivity**

Utilizing our unique semiconductor process technology, we have developed Si photodiodes that are compact and lightweight. The optical sensors with a broad spectral response range from UV to near-infrared regions have features such as high-speed response, high sensitivity, and low noise. A variety of packages including metal, ceramic, plastic, and surface mount type is available to flexibly meet custom requirements.

**InAsSb photovoltaic detectors**

**Optical sensors with high sensitivity in the mid-infrared region**

These sensors have achieved high-sensitivity in the mid-infrared region, namely in the wavelength 5 µm band, 8 µm band, and 10 µm band, using Hamamatsu unique crystal growth technology. They feature high-speed response and are used for rapidly changing temperature measurements, and so on.

**Mini-spectrometers**

**Small portable spectrometers**

These are portable, compact spectrometers (polychromators) consisting of an optical system, image sensor, and circuit. Various types are available for the wavelength range from UV to near infrared. They can be used in color measurements, film thickness measurements, environmental analysis, plastic screening, and so on.

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**Precautions for use**

- Xenon flash lamps emit intense ultraviolet rays which can be harmful to eyes and skin. Never look directly at the emitted light or let it come in contact with your skin.
- When handling lamps, always wear protective gear and goggles (refer to JIS TB141 or equivalent safety standards).
- Never apply vibrations or impacts to lamps that could damage the lamps or ruin their performance.
- High pressure gas is filled in the lamp, do not drop it or scratch the surface of irradiation window or side tube. It will result in breakage. Please design the instrument so that broken pieces of glass do not scatter.
- Wipe irradiation window and side tube with cloth soaked with high quality alcohol or acetone before operation. In case the lamp is operated with finger marks or contamination attached, it will be burnt on the glass and becomes destigmatization. It results in decrease of irradiance.
- Strong UV-rays can possibly decompose organic matter, do not irradiate it directly.
- When the decomposed matter is attached to the irradiation window, it will cause decrease in irradiance.
- Do not expose metal part to highly concentrated corrosive gases. It will cause gas leakage due to metallic corrosion (and result in low irradiance). Please consider having anticorrosion irradiation window or taking some measures not to expose the metal part to corrosive gases when the instrument is designed.
- Insert the lamp into the trigger socket securely. The lead wires of the trigger socket must be connected to the power supply terminal block.
- High voltage is used to operate xenon flash lamps. Use sufficient caution to avoid electrical shock.
- Before installing or removing a lamp or cleaning the equipment, always be sure to turn off the power.
- An electric charge still remains in the main discharge capacitor of the dedicated power supply even after the power is turned off, so take precautions to avoid electrical shock.
- UV rays below 200 nm decompose oxygen in the atmosphere and generate ozone. Ozone has strong oxidation and it could generate reaction product. In case it is attached to irradiation window, it results in decrease in irradiance. Please consider having antiozone radiation window or taking some measures not to expose the metal part to corrosive gases when the instrument is designed.
- Avoid using or storing lamps with an MgF2 window in locations subject to extremely high temperatures and humidity. When not using these lamps for a long period of time, store them in a desiccator filled with inert gas.

**Warranty**

The lamps listed in this catalog are warranted for one year from the date of delivery. Please note that even if within the warranty period, this warranty does not apply to those cases where the lamp operation time has exceeded the guaranteed lifetime. Please note that the warranty does not cover the following cases:

1. Failure or malfunctions were caused by incorrect usage that did not comply with the instructions or precautions in this manual.
2. Failure or malfunctions were caused by electrical or mechanical modifications made by the user.
3. Failure or malfunctions were caused or brought about by unavoidable accidents such as natural disasters.

**Disposal**

When disposing of a product listed in this catalog, take appropriate measures in compliance with applicable regulations regarding waste disposal, and correctly dispose of it by yourself, or entrust proper disposal to a licensed industrial waste disposal company. In any case, be sure to comply with the regulations in your country or state to ensure lawful disposal.
Main Products

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

Electron Tubes
- Photomultiplier tubes
- Photomultiplier tube modules
- Microchannel plates
- Image intensifiers
- Xenon lamps / Mercury-xenon lamps
- Deuterium lamps
- Light source applied products
- Laser applied products
- Microfocus X-ray sources
- X-ray imaging devices

Imaging and Processing Systems
- Cameras / Image processing measuring systems
- X-ray products
- Life science systems
- Medical systems
- Semiconductor failure analysis systems
- FPD / LED characteristic evaluation systems
- Spectroscopic and optical measurement systems

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

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Please thoroughly read the precautions and the prohibited uses included in the user manual before installation and use.