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HAMAMATSU
PHOTON IS OUR BUSINESS

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.

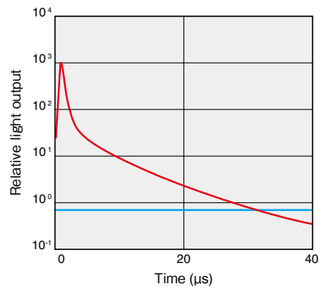


1. High efficiency
2. Low heat generation
3. High stability
4. Long life

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.

Light output intensity (Typ.)

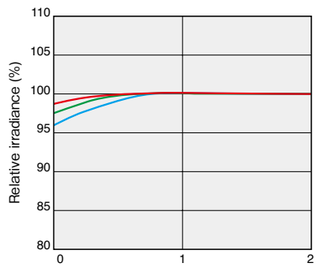


Xenon flash lamp (5 W)
Halogen lamp (50 W)

Low heat generation

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

Light output stability (Initial operation) (Typ.)



Repetition rate
50 Hz 126 Hz 530 Hz

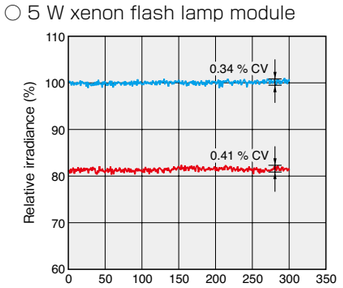
Measurement conditions Main discharge voltage: 600 V
Main discharge capacitance: 0.047 µF

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.

Light output stability (Typ.)

○ 5 W xenon flash lamp module



Arc size
1.5 mm 3.0 mm

Measurement conditions Main discharge voltage: 600 V
Main discharge capacitance: 0.22 µF
Repetition rate: 126 Hz

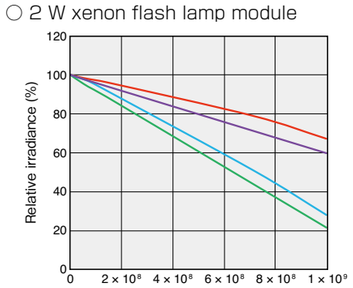
Light output stability (% CV)
= light output standard deviation / average light output × 100

Long life

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

Life characteristics (Typ.)

○ 2 W xenon flash lamp module



Wavelength
190 nm to 1100 nm 228 nm
270 nm 400 nm

Measurement conditions Main discharge voltage: 600 V
Main discharge capacitance: 0.141 µF
Repetition rate: 79 Hz

Selection guide by application

Module & lamp / Applications	2 W xenon flash lamp module	5 W xenon flash lamp module	20 W xenon flash lamp module	10 W xenon flash lamp	15 W xenon flash lamp	20 W xenon flash lamp	60 W xenon flash lamp
Water quality analysis	✓	✓		✓			
Air pollution analysis	✓	✓		✓			
Gas analysis			✓			✓	✓
UV - VIS spectroscopy	✓	✓		✓			
HPLC (Fluorescence analysis)			✓			✓	✓
MTP reader (Absorption analysis, fluorescence analysis)		✓	✓	✓	✓	✓	✓
Blood analysis	✓	✓	✓	✓		✓	
Imaging cytometry	✓	✓					
Mineral gem inspection		✓	✓	✓	✓	✓	✓
Stroboscopy		✓	✓	✓	✓	✓	✓
Color analysis			✓		✓	✓	✓
Semiconductor inspection			✓		✓	✓	✓
Sterilization			✓		✓	✓	✓

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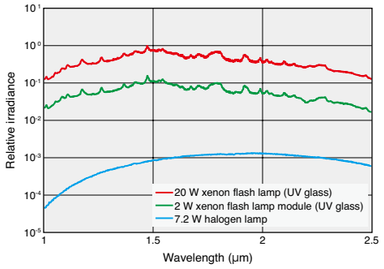
TOPICS

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.)



Measurement conditions Detector: Ocean Optics NIRQuest 512-2.5 spectrometer (slit 25 µm, integration time 1 ms) Optical fiber: Thorlabs MF11L1 (core diameter 100 µm, InF_3 transmission wavelength range 0.3 µm to 5.5 µm)
* Light output depends on the detector sensitivity. Use this data as reference for comparison with other infrared light sources. * The halogen lamp light output is corrected so as to correspond to the peak value (flash duration: approx. 6 µs) of the xenon flash lamp.

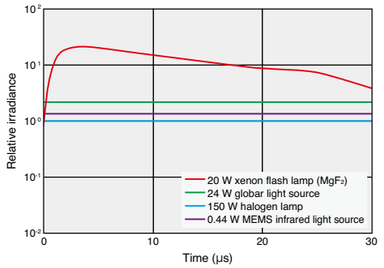
Applications

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



Emission pulse waveform (Typ.)

● Wavelength: 7 µm



Applications

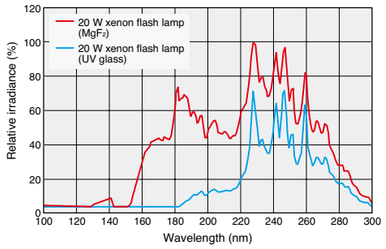
○ Gas measurement and analysis
- Multiple gas analysis (CH_4 (methane), CO_2 (carbon dioxide), etc.)



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.)



Measurement conditions
Under nitrogen atmosphere

Applications

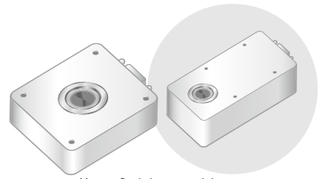
○ Photoionization
○ Spectrophotometry
○ Sterilization



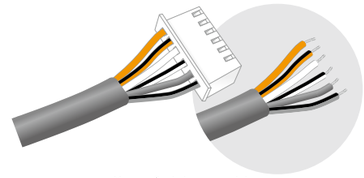
Designing an optimal drive circuit is essential for obtaining maximum performance from a xenon flash lamp. Peripheral devices such as power supplies and trigger sockets designed specifically for xenon flash lamps are available, and also technical support for designing those circuits and devices can be 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

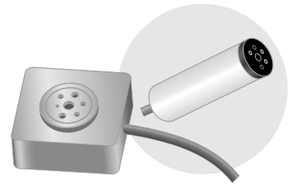
● Custom product examples



Xenon flash lamp modules with customized shape



Xenon flash lamp modules with customized input cable connector

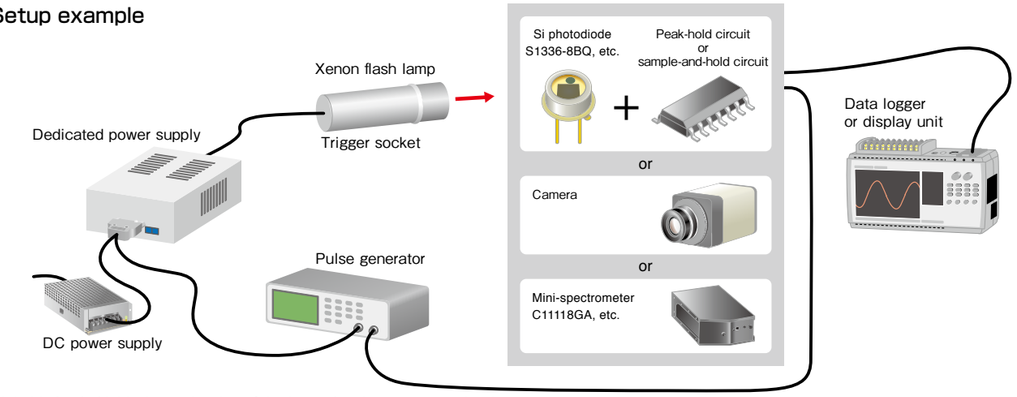


Trigger socket with customized shape

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.

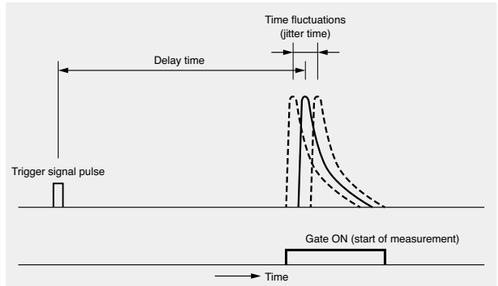
● Setup example



- 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 micro seconds 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.

● Flash operation



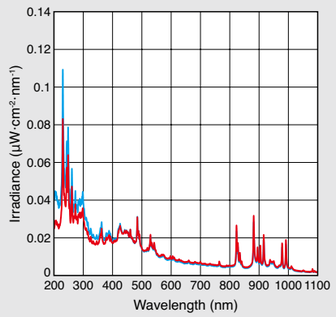
2 W xenon flash lamp modules



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 models 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.



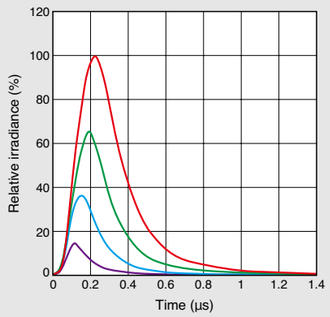
Spectral distribution (Typ.)



Window material
UV glass (L13651-01)
MgF_2 (L13651-01-3)

Measurement conditions
Main discharge voltage: 600 V
Main discharge capacitance: 0.141 μF
Repetition rate: 79 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)
Measurement distance: 500 mm

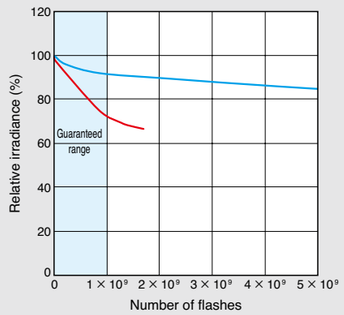
Emission pulse waveform (Typ.)



Main discharge capacitance
0.141 μF (L13651-01)
0.094 μF (L13651-02)
0.047 μF (L13651-03)
0.02 μF (L13651-04)

Measurement conditions
Arc size: 1.0 mm
Main discharge voltage: 600 V
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (Typ.)



Main discharge capacitance
0.141 μF (L13651-01)
0.02 μF (L13651-04)

Measurement conditions
Main discharge voltage: 600 V (L13651-01)
400 V (L13651-04)
Repetition rate: 79 Hz (L13651-01)
1250 Hz (L13651-04)
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Type number guide

Main discharge capacitance

L○○○○○ - A B - C

Model ↑ Module type ↑ Window material ↑

Model

Type No.	Model
L13651	Packaged model
L13821	Cylindrical circuit board model

A: Module type

Suffix	Type
0	Standard type
1	SMA fiber adapter type

∗ Only standard type is available for L13821.

B: Main discharge capacitance

Suffix	Capacitance
1	0.141 μF
2	0.094 μF
3	0.047 μF
4	0.02 μF

C: Window material

Suffix	Window material	Spectral distribution
–	UV glass	185 nm to 2500 nm
3	MgF_2	160 nm to 7500 nm

∗ MgF_2 window is available only for standard module type of L13651 (L13651-0X-3).
∗ Suffix is omitted for UV glass.

Specifications

Parameter		Packaged model		Cylindrical circuit board model	Unit
		L13651-01 / -02 / -03 / -04 L13651-11 / -12 / -13 / -14	L13651-01-3 / -02-3 / -03-3 / -04-3	L13821-01 / -02 / -03 / -04	
Arc size		1.0			mm
Window material		UV glass	MgF_2	UV glass	–
Spectral distribution		185 to 2500	160 to 7500	185 to 2500	nm
Main discharge voltage variable range	Internal ①	400 to 600			V
	External ②	400 to 600			
Main discharge capacitance		0.141 / 0.094 / 0.047 / 0.02			μF
Maximum lamp input energy (per flash)		See operating condition examples			mJ
Maximum repetition rate		See operating condition examples			Hz
Maximum average lamp input (continuous)		See operating condition examples			W
Light output stability ③	Typ.	0.4			% CV
		3.0			% p-p
	Max.	2.0			% CV
		5.0			% p-p
Guaranteed life ④		1×10^9			flashes
Operating time when used with battery		4 ⑤			h
Input voltage		4.75 to 5.5, 10.8 to 13.2			V
Input current		1			A
Inrush current		1.5			A
Trigger signal		Rectangular wave 2.5 V to 5 V, pulse width 10 μs or more ⑥			–
Trigger input impedance		330			Ω
Cooling method		Not required ⑦			–
Operating temperature range		0 to +40			℃
Storage temperature range		-40 to +90			℃
Operating humidity range		Below 85 % (no condensation)			–
Storage humidity range		Below 95 % (no condensation)			–
Applicable standards	EMC standards	IEC/EN 61326-1 Emission limits: CISPR 11 Group 1 Class B Immunity requirements: Table 1	–		–
	Safety standards	IEC/EN 62471 Risk Group 3			
	Environmental standards (RoHS)	IEC/EN 63000			
Vibration resistance		5 Hz to 200 Hz, 15 m/s^2			–
Shock resistance		500			m/s^2

NOTE: ① Internal: Adjustable with a trimmer
② External: Variable with control voltage from 3.2 V to 4.8 V
③ Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p)= (maximum light output – minimum light output) / average light output × 100
④ 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 2 W.
⑤ Time until the lamp operation stops under the following conditions (spectral irradiance and light output stability are not considered).
Input voltage: 5 V, main discharge voltage: 600 V, main discharge capacitance: 0.141 μF, repetition rate: 79 Hz, battery specs: 5400 mAh / 3.7 V
⑥ External trigger only, synchronized at rising edge
⑦ Cooling is necessary if the housing temperature exceeds 45 °C during operation.

Operating condition examples

Type No.	Main discharge capacitance (μF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑧ (mJ)	Maximum repetition rate (Hz) ⑨		Maximum average lamp input (continuous) (W) ⑩	
				Input voltage: 4.75 V to 5.5 V	Input voltage: 10.8 V to 13.2 V	Input voltage: 4.75 V to 5.5 V	Input voltage: 10.8 V to 13.2 V
L13651-01 / -11 L13651-01-3 L13821-01	0.141	400	11.3	177	177	2.0	2.0
		500	17.7	113	113	2.0	2.0
		600	25.4	79	79	2.0	2.0
L13651-02 / -12 L13651-02-3 L13821-02	0.094	400	7.5	266	266	2.0	2.0
		500	11.9	170	170	2.0	2.0
		600	16.9	118	118	2.0	2.0
L13651-03 / -13 L13651-03-3 L13821-03	0.047	400	3.8	400	532	1.5	2.0
		500	5.9	255	340	1.5	2.0
		600	8.5	177	236	1.5	2.0
L13651-04 / -14 L13651-04-3 L13821-04	0.02	400	1.6	625	1250	1.0	2.0
		500	2.5	400	800	1.0	2.0
		600	3.6	278	555	1.0	2.0

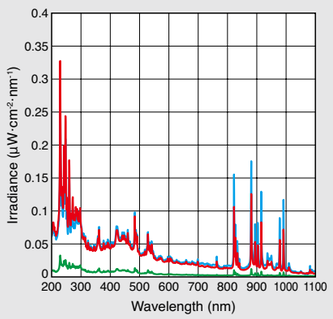
NOTE: ⑧ Maximum lamp input energy (per flash) (J)
$E = 1/2 \times C \times V^2$ C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑨ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑩ Maximum average lamp input (continuous) (W)
$P = E \times f$ E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)

5 W xenon flash lamp modules

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.



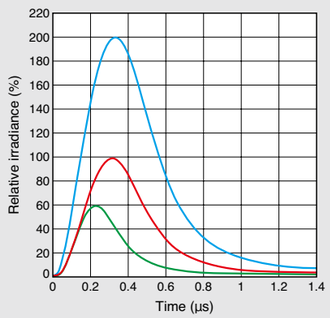
Spectral distribution (Typ.)



Main discharge capacitance
○High stability model — Standard type (L9455-01)
SMA fiber adapter type (L9455-11)
○High output model — Standard type (L11316-01)

Measurement conditions
Window material: UV glass Measurement distance: 500 mm
○High stability model Main discharge voltage: 600 V
Main discharge capacitance: 0.22 μF
Repetition rate: 126 Hz
○High output model Main discharge voltage: 1000 V
Main discharge capacitance: 0.2 μF
Repetition rate: 50 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)

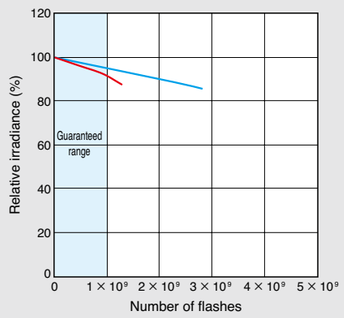
Emission pulse waveform (Typ.)



Main discharge capacitance
○High stability model — 0.22 μF (L9455-01)
0.11 μF (L9455-02)
○High output model — 0.2 μF (L11316-01)

Measurement conditions
○High stability model Arc size: 1.5 mm
Main discharge voltage: 600 V
○High output model Arc size: 1.5 mm
Main discharge voltage: 1000 V
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (Typ.)



Main discharge capacitance
— 0.22 μF (L9455-01)
— 0.11 μF (L9455-02)

Measurement conditions
Main discharge voltage: 600 V
Repetition rate: 126 Hz (L9455-01)
252 Hz (L9455-02)
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Type number guide

Main discharge capacitance ↓
L○○○○○ - A B
Model ↑ Module type ↑

Model

Type No.	Model	Arc size
L9455	High stability model	1.5 mm
L9456		3.0 mm

A: Module type

Suffix	Type
0	Standard type
1	SMA fiber adapter type

＊Only standard type is available for L9456.

B: Main discharge capacitance

Suffix	Capacitance
1	0.22 μF
2	0.11 μF

Model

Type No.	Model	Arc size
L11316	High output model	1.5 mm
L11317		3.0 mm

A: Module type

Suffix	Type
0	Standard type
1	SMA fiber adapter type

＊Only standard type is available for L11317.

B: Main discharge capacitance

Suffix	Capacitance
1	0.2 μF

＊If you are interested in the silent type, please feel free to contact us.

Specifications

Parameter		High stability model		High output model		Unit
		L9455-01 / -02 / -11 / -12	L9456-01 / -02	L11316-01 / -11	L11317-01	
Arc size		1.5	3.0	1.5	3.0	mm
Window material		UV glass				—
Spectral distribution		185 to 2500				nm
Main discharge voltage variable range	Internal	400 to 600 ①		650 to 1000 ①		V
	External	400 to 600 ②		500 to 1000 ③		
Main discharge capacitance		0.22 / 0.11		0.2		μF
Maximum lamp input energy (per flash)		See operating condition examples				mJ
Maximum repetition rate		See operating condition examples				Hz
Maximum average lamp input (continuous)		See operating condition examples				W
Light output stability ④	Typ.	0.4	0.3	0.9	0.4	% CV
		2.8	1.7	4.8	2.3	% p-p
	Max.	2.0	1.5	3.0	2.5	% CV
		5.0	5.0	8.0	4.0	% p-p
Guaranteed life ⑤		1 × 10⁹		5 × 10⁸		flashes
Input voltage		11 to 28		21.6 to 26.4		V
Input current		1		0.75		A
Inrush current		4		3		A
Trigger signal		Rectangular wave 5 V to 10 V, pulse width 10 μs or more ⑥				—
Trigger input impedance		330				Ω
Cooling method		Not required ⑦				—
Operating temperature range		0 to +40				℃
Storage temperature range		-40 to +90				℃
Operating humidity range		Below 85 % (no condensation)				—
Storage humidity range		Below 95 % (no condensation)				—
Applicable standards	EMC standards	IEC/EN 61326-1 Emission limits: CISPR 11 Group 1 Class A Immunity requirements: Table 2				—
	Safety standards	IEC/EN 62471 Risk Group 3				
	Environmental standards (RoHS)	IEC/EN 63000				
Vibration resistance		5 Hz to 200 Hz, 15 m/s²				—
Shock resistance		500				m/s²

NOTE: ① Internal: Adjustable with a trimmer
② External: Variable with control voltage from 3.2 V to 4.8 V
③ External: Variable with control voltage from 2.44 V to 4.88 V
④ Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p)= (maximum light output – minimum light output) / average light output × 100
⑤ 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 5 W.
⑥ External trigger only, synchronized at rising edge
⑦ Cooling is necessary if the housing temperature exceeds 45 ℃ during operation.

Operating condition examples

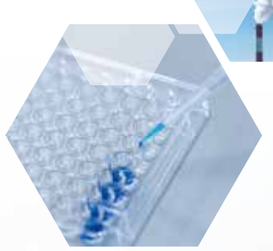
Type No.	Main discharge capacitance (μF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑧ (mJ)	Maximum repetition rate ⑨ (Hz)	Maximum average lamp input (continuous) ⑩ (W)
L9455-01 / -11 L9456-01	0.22	400	17.6	284	5.0
		500	27.5	182	5.0
		600	39.6	126	5.0
L9455-02 / -12 L9456-02	0.11	400	8.8	530	4.7
		500	13.8	362	5.0
		600	19.8	252	5.0
L11316-01 / -11 L11317-01	0.2	500	25.0	200	5.0
		700	49.0	102	5.0
		1000	100.0	50	5.0

NOTE: ⑧ Maximum lamp input energy (per flash) (J)
E = 1/2 × C × V² C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑨ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑩ Maximum average lamp input (continuous) (W)
P = E × f E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)

20 W xenon flash lamp modules



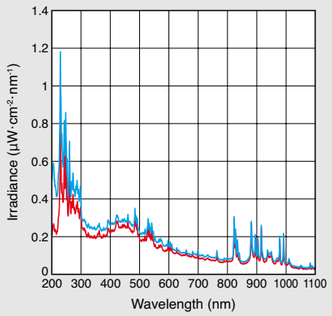




These lamp modules integrate a 20 W xenon flash lamp with a power supply and trigger socket and are designed to extract maximum performance from the lamp. These will prove ideal for a wide variety of applications including those requiring a high flash repetition rate or high lamp input energy. With the electrodes positioned precisely, there is no need for troublesome optical axis alignment which is required sometimes during installation or wiring tasks.



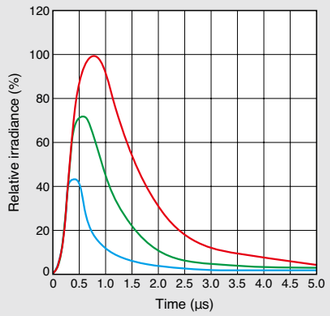
Spectral distribution (Typ.)



Window material
UV glass (L12745-01)
MgF_2 (L12745-01-3)

Main discharge voltage: 1000 V
Main discharge capacitance: 0.64 μF
Repetition rate: 63 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)
Measurement distance: 500 mm

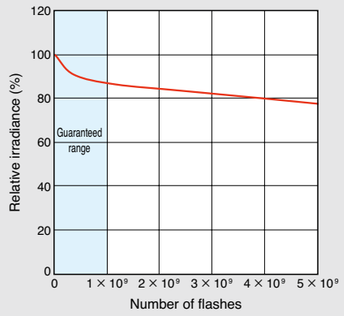
Emission pulse waveform (Typ.)



Main discharge capacitance
0.64 μF (L12745-01)
0.32 μF (L12745-02)
0.1 μF (L12745-03)

Measurement conditions
Arc size: 1.5 mm
Main discharge voltage: 1000 V
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (L12745-03) (Typ.)



Measurement conditions
Main discharge voltage: 632 V
Main discharge capacitance: 0.1 μF
Repetition rate: 1000 Hz
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Type number guide

Window material
L12745 - 0A - B
Main discharge capacitance

A: Main discharge capacitance

Suffix	Capacitance
1	0.64 μF
2	0.32 μF
3	0.1 μF

B: Window material

Suffix	Window material	Spectral distribution
—	UV glass	185 nm to 2500 nm
3	MgF_2	160 nm to 7500 nm

* Suffix is omitted for UV glass.

Specifications

Parameter		L12745-01 / -02 / -03	L12745-01-3 / -02-3 / -03-3	Unit
Arc size		1.5		mm
Window material		UV glass	MgF_2	—
Spectral distribution		185 to 2500	160 to 7500	nm
Main discharge voltage variable range	Internal ①	400 to 1000		V
	External ②	400 to 1000		
Main discharge capacitance		0.64 / 0.32 / 0.1		μF
Maximum lamp input energy (per flash)		See operating condition examples		mJ
Maximum repetition rate		See operating condition examples		Hz
Maximum average lamp input (continuous)		See operating condition examples		W
Light output stability ③	Typ.	0.9		% CV
		4.5		% p-p
	Max.	2.0		% CV
		6.0		% p-p
Guaranteed life ④		1.5×10^8 to 1×10^9		flashes
Input voltage		21.6 to 26.4		V
Input current		1.5		A
Inrush current		3		A
Trigger signal		Rectangular wave 5 V to 10 V, pulse width 10 μs or more ⑤		—
Trigger input impedance		330		Ω
Cooling method		Not required ⑥		—
Operating temperature range		0 to +40		°C
Storage temperature range		-40 to +90		°C
Operating humidity range		Below 85 % (no condensation)		—
Storage humidity range		Below 95 % (no condensation)		—
Applicable standards	EMC standards	IEC/EN 61326-1 Emission limits: CISPR 11 Group 1 Class B Immunity requirements: Table 1		—
	Safety standards	IEC/EN 61010-1 Risk Group 3		
		IEC/EN 62471		
	Environmental standards (RoHS)	IEC/EN 63000		
Vibration resistance		5 Hz to 200 Hz, 15 m/s^2		—
Shock resistance		500		m/s^2

NOTE: ① Internal: Adjustable with a trimmer
② External: Variable with control voltage from 1.9 V to 4.76 V
③ Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p)= (maximum light output – minimum light output) / average light output × 100
④ 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 (0.32 J to 0.02 J).
⑤ External trigger only, synchronized at rising edge
⑥ Cooling is necessary if the housing temperature exceeds 45 °C during operation.

Operating condition examples

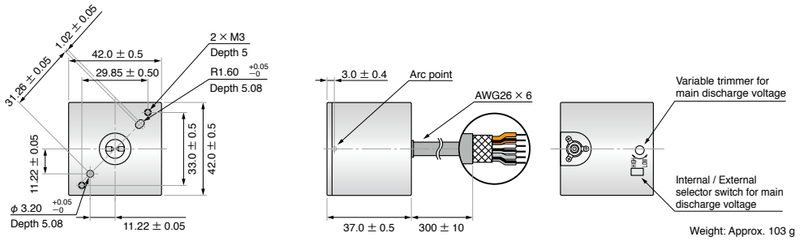
Type No.	Main discharge capacitance (μF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑦ (mJ)	Maximum repetition rate ⑧ (Hz)	Maximum average lamp input (continuous) ⑨ (W)
L12745-01 L12745-01-3	0.64	400	51.2	391	20.0
		500	80.0	250	20.0
		700	156.8	128	20.0
		1000	320.0	63	20.0
L12745-02 L12745-02-3	0.32	400	25.6	781	20.0
		500	40.0	500	20.0
		700	78.4	255	20.0
		1000	160.0	125	20.0
L12745-03 L12745-03-3	0.1	400	8.0	1000	8.0
		500	12.5	1000	12.5
		700	24.5	816	20.0
		1000	50.0	400	20.0

NOTE: ⑦ Maximum lamp input energy (per flash) (J)
$E = 1/2 \times C \times V^2$ C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑧ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑨ Maximum average lamp input (continuous) (W)
$P = E \times f$ E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)

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



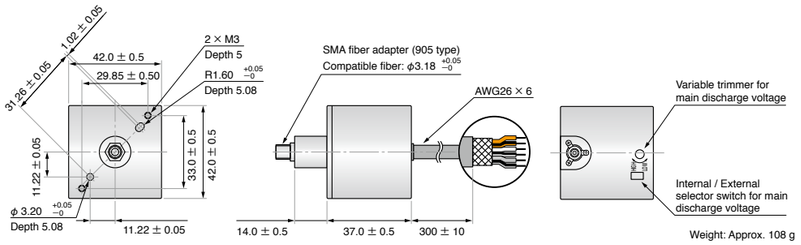
Weight: Approx. 103 g

Cable connections

Color	Signal
Orange	+Input voltage (4.75 V to 5.5 V, 10.8 V to 13.2 V)
Orange + Black	Input voltage RTN.
White	+Trigger input
White + Black	Trigger input RTN.
Gray	+Main discharge voltage control (3.2 V to 4.8 V)
Gray + Black	Main discharge voltage control RTN.

* 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.

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



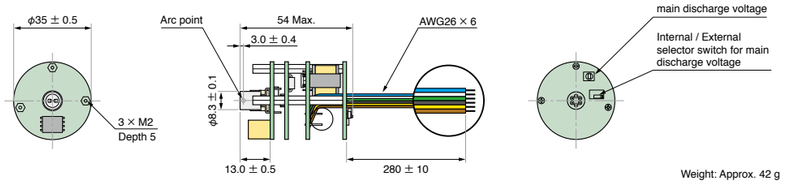
Weight: Approx. 108 g

Cable connections

Color	Signal
Orange	+Input voltage (4.75 V to 5.5 V, 10.8 V to 13.2 V)
Orange + Black	Input voltage RTN.
White	+Trigger input
White + Black	Trigger input RTN.
Gray	+Main discharge voltage control (3.2 V to 4.8 V)
Gray + Black	Main discharge voltage control RTN.

* 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.

Cylindrical circuit board type L13821-01 / -02 / -03 / -04



Weight: Approx. 42 g

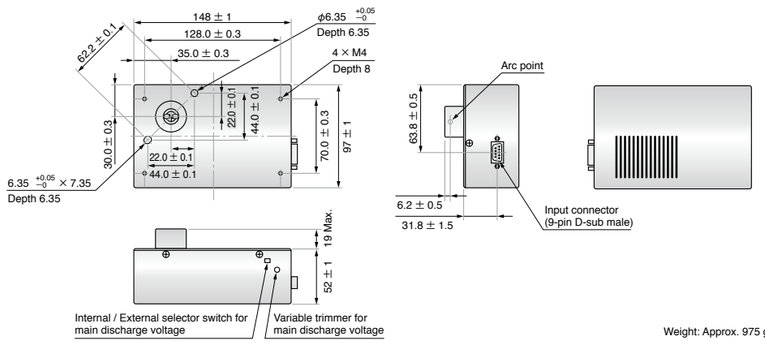
Cable connections

Color	Signal
Blue	+Input voltage (4.75 V to 5.5 V, 10.8 V to 13.2 V)
White	Input voltage RTN.
Green	+Trigger input
Black	Trigger input RTN.
Yellow	+Main discharge voltage control (3.2 V to 4.8 V)
Brown	Main discharge voltage control RTN.

* 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.

20 W xenon flash lamp modules

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



Weight: Approx. 975 g

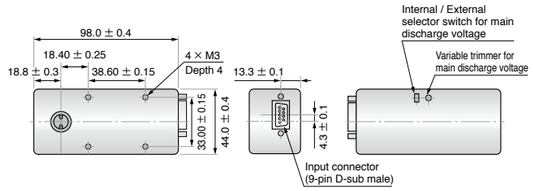
Input connector (9-pin D-sub) connection

Pin No.	Signal
1	+Input voltage (21.6 V to 26.4 V)
2	+Input voltage (21.6 V to 26.4 V)
3	+Main discharge voltage control (1.9 V to 4.76 V)
4	Trigger input RTN.
5	+Trigger input
6	Input voltage RTN.
7	Input voltage RTN.
8	Main discharge voltage control RTN.
9	No connection

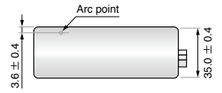
* The reference voltage (0 V) for these products is referred to as RTN. instead of GND.. This is because making connections separately from GND. is recommended in consideration of the influence of external noise on the trigger signal.
* Use the housing chassis or an M4 mounting screw hole to make ground connection.

5 W xenon flash lamp modules

High stability model (standard type) L9455-01 / -02, L9456-01 / -02



Weight: Approx. 155 g

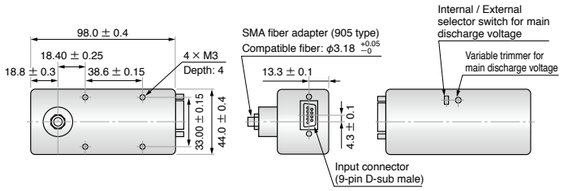


Input connector (9-pin D-sub) connection

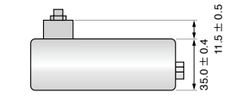
Pin No.	Signal
1	+Input voltage (11 V to 28 V)
2	+Input voltage (11 V to 28 V)
3	+Main discharge voltage control (3.2 V to 4.8 V)
4	Trigger input RTN.
5	+Trigger input
6	Input voltage RTN.
7	Input voltage RTN.
8	Main discharge voltage control RTN.
9	No connection

* 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.
* Use the housing chassis or an M3 mounting screw hole to make ground connection.

High stability model (SMA fiber adapter type) L9455-11 / -12



Weight: Approx. 165 g

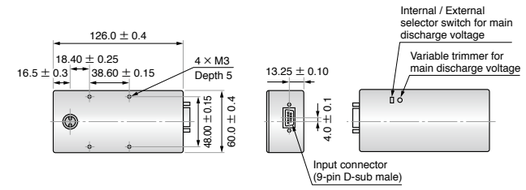


Input connector (9-pin D-sub) connection

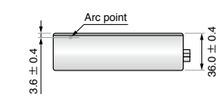
Pin No.	Signal
1	+Input voltage (11 V to 28 V)
2	+Input voltage (11 V to 28 V)
3	+Main discharge voltage control (3.2 V to 4.8 V)
4	Trigger input RTN.
5	+Trigger input
6	Input voltage RTN.
7	Input voltage RTN.
8	Main discharge voltage control RTN.
9	No connection

* 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.
* Use the housing chassis or an M3 mounting screw hole to make ground connection.

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



Weight: Approx. 328 g

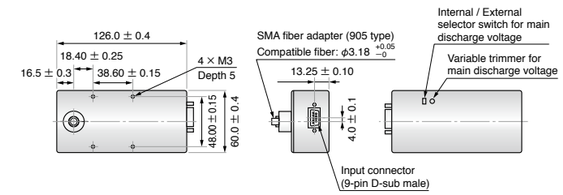


Input connector (9-pin D-sub) connection

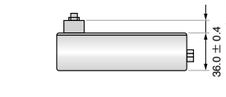
Pin No.	Signal
1	+Input voltage (24 V ± 2.4 V)
2	+Input voltage (24 V ± 2.4 V)
3	+Main discharge voltage control (2.44 V to 4.88 V)
4	Trigger input RTN.
5	+Trigger input
6	Input voltage RTN.
7	Input voltage RTN.
8	Main discharge voltage control RTN.
9	No connection

* 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.
* Use the housing chassis or an M3 mounting screw hole to make ground connection.

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



Weight: Approx. 338 g



Input connector (9-pin D-sub) connection

Pin No.	Signal
1	+Input voltage (24 V ± 2.4 V)
2	+Input voltage (24 V ± 2.4 V)
3	+Main discharge voltage control (2.44 V to 4.88 V)
4	Trigger input RTN.
5	+Trigger input
6	Input voltage RTN.
7	Input voltage RTN.
8	Main discharge voltage control RTN.
9	No connection

* 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.
* Use the housing chassis or an M3 mounting screw hole to make ground connection.

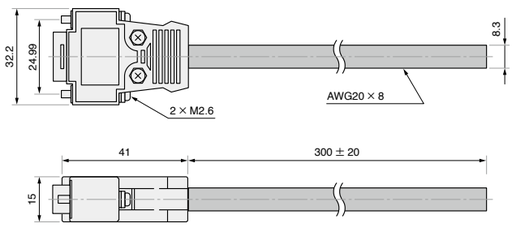
Option

D-sub input connector cable A11690 For 5 W For 20 W



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

Dimensional outlines (Unit: mm)



Weight: Approx. 57 g

Cable connections

Color	Signal	Color	Signal
Brown	+Input voltage	Green	+Trigger input
Red	+Input voltage	White	Input voltage RTN.
Blue	+Main discharge voltage control	Black	Input voltage RTN.
Yellow	Trigger input RTN.	Gray	Main discharge voltage control RTN.

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.





Specifications

Parameter		L4640	L4642	L4644	L4646	L4641	L4643	L4645	L4647	Unit
Lamp shape		Hemi-spherical	Flat	Hemi-spherical	Flat	Hemi-spherical	Flat	Hemi-spherical	Flat	–
Arc size		1.5		3.0		1.5		3.0		mm
Side tube material		UV glass	Borosilicate glass	UV glass	Borosilicate glass	Borosilicate glass				–
Window material		UV glass				Borosilicate glass				–
Spectral distribution		185 to 2500				240 to 2500				nm
Main discharge voltage range		300 to 1000								V
Recommended main discharge voltage range		700 to 1000								V
Maximum lamp input energy (per flash)		See operating condition examples								mJ
Maximum repetition rate ①		100								Hz
Maximum average lamp input (continuous)		See operating condition examples								W
Light output stability ②	Typ.	0.5		0.4		0.5		0.4		% CV
		2.5		2.0		2.5		2.0		% p-p
	Max.	1.0		0.8		1.0		0.8		% CV
		4.5		4.0		4.5		4.0		% p-p
Guaranteed life ③		1×10^9								flashes
Trigger voltage		5 to 7								kV p-p
Cooling method		Not required								–
Operating temperature range		+5 to +40								℃
Storage temperature range		-40 to +90								℃
Operating humidity range		Below 85 % (no condensation)								–
Storage humidity range		Below 95 % (no condensation)								–
Trigger socket (sold separately) ④		E2442		E2418		E2442		E2418		–

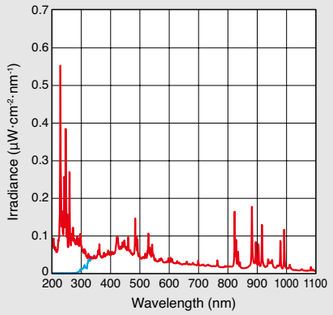
NOTE: ① To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
② Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p)= (maximum light output – minimum light output) / average light output × 100
③ 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 a main discharge voltage of 1000 V, main discharge capacitance of 0.2 µF and a repetition rate of 100 Hz.
④ See page 24 for information on trigger sockets.

Operating condition examples

Main discharge capacitance (µF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑤ (mJ)	Maximum repetition rate ⑥ (Hz)	Maximum average lamp input (continuous) ⑦ (W)	Power supply ⑧ (sold separately)
0.2	1000	100.0	100	10.0	C13316-02
	700	49.0	100	4.9	
0.1	1000	50.0	100	5.0	C13315
	700	24.5	100	2.5	

NOTE: ⑤ Maximum lamp input energy (per flash) (J)
$E = 1/2 \times C \times V^2$ C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑥ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑦ Maximum average lamp input (continuous) (W)
$P = E \times f$ E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)
⑧ See pages 26 to 27 for information on power supplies.

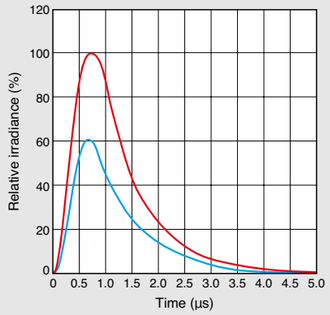
Spectral distribution (Typ.)



Window material
UV glass (L4640) — Borosilicate glass (L4641)

Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 0.2 µF
Repetition rate: 100 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)
Measurement distance: 500 mm

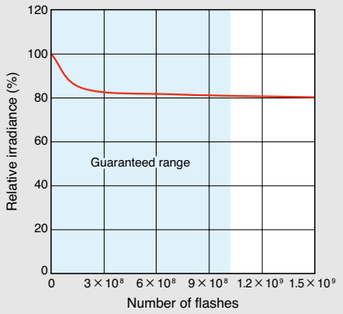
Emission pulse waveform (L4640) (Typ.)



Main discharge capacitance
0.2 µF — 0.1 µF

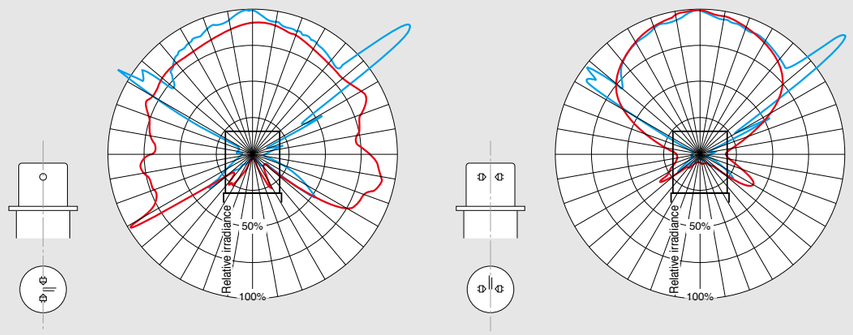
Measurement conditions
Arc size: 1.5 mm
Main discharge voltage: 600 V
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (L4640) (Typ.)



Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 0.2 µF
Repetition rate: 100 Hz
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Directivity (light distribution) (Typ.)



Hemi-spherical (L4640)
Flat (L4642)

Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 0.1 µF
Repetition rate: 100 Hz
Detector: Phototube R765
(160 nm to 320 nm)
Measurement distance: 500 mm

15 W xenon flash lamps

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

Parameter		L4633	L4634	Unit
Built-in reflector		Converging type	Collimating type	–
Window material		Borosilicate glass		–
Side tube material		Borosilicate glass		–
Spectral distribution		240 to 2500		nm
Main discharge voltage range		500 to 1000		V
Recommended main discharge voltage range		700 to 1000		V
Maximum lamp input energy (per flash)		See operating condition examples		mJ
Maximum repetition rate ①		100		Hz
Maximum average lamp input (continuous)		See operating condition examples		W
Light output stability ②	Typ.	0.5		% CV
		2.9		% p-p
	Max.	1.0		% CV
		5.0		% p-p
Guaranteed life ③		1.4×10^8 to 5×10^8		flashes
Trigger voltage		5 to 7		kV p-p
Cooling method		Not required		–
Operating temperature range		+5 to +40		℃
Storage temperature range		-40 to +90		℃
Operating humidity range		Below 85 % (no condensation)		–
Storage humidity range		Below 95 % (no condensation)		–
Trigger socket (sold separately) ④		E4370-01		–

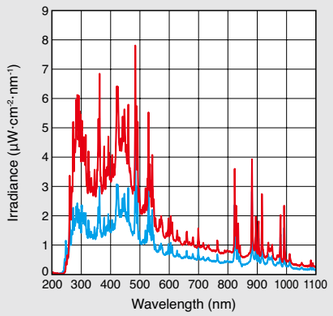
NOTE: ① To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
② Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p)= (maximum light output – minimum light output) / average light output × 100
③ 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 a lamp input energy of 0.15 J to 0.05 J.
④ See page 24 for information on trigger sockets.

Operating condition examples

Main discharge capacitance (μF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑤ (mJ)	Maximum repetition rate ⑥ (Hz)	Maximum average lamp input (continuous) ⑦ (W)	Power supply ⑧ (sold separately)
0.3	1000	150.0	100	15.0	C13316-03
	700	73.5	100	7.4	
0.2	1000	100.0	100	10.0	C13316-02
	700	49.0	100	4.9	
0.1	1000	50.0	100	5.0	C13315
	700	24.5	100	2.5	

NOTE: ⑤ Maximum lamp input energy (per flash) (J)
$E = 1/2 \times C \times V^2$ C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑥ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑦ Maximum average lamp input (continuous) (W)
$P = E \times f$ E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)
⑧ See pages 26 to 27 for information on power supplies.

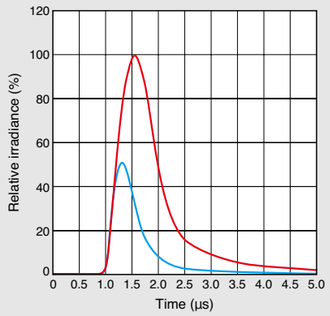
Spectral distribution (Typ.)



Built-in reflector
Converging type (L4633) Collimating type (L4634)

Measurement conditions
Window material: Borosilicate glass
Main discharge voltage: 1000 V
Main discharge capacitance: 0.3 μF
Repetition rate: 100 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)
Measurement distance: 500 mm

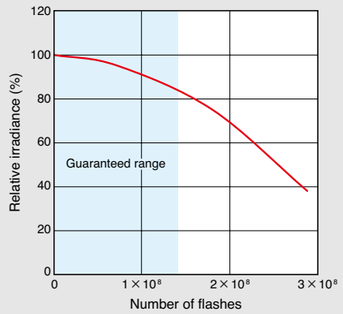
Emission pulse waveform (L4633) (Typ.)



Main discharge capacitance
0.3 μF 0.1 μF

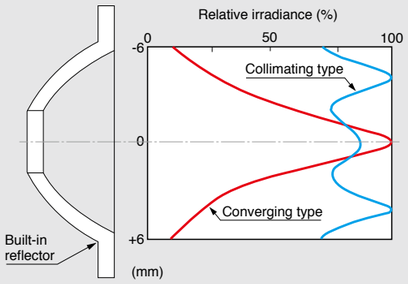
Measurement conditions
Main discharge voltage: 1000 V
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (L4633) (Typ.)



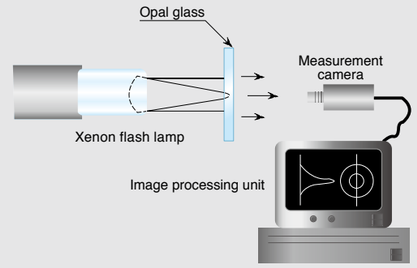
Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 0.3 μF
Repetition rate: 100 Hz
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Directivity (light distribution)



● Measurement method

The Directivity (light distribution) of the converging type is measured by placing an opal glass plate at the focal point of the reflector. The Directivity (light distribution) of the collimating type is measured by placing an opal glass plate at a position 10 mm away from the lamp.



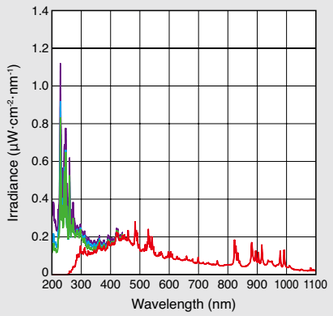
20 W xenon flash lamps



These 20 W xenon flash lamps employ a metal can package to achieve high output. An MgF_2 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.



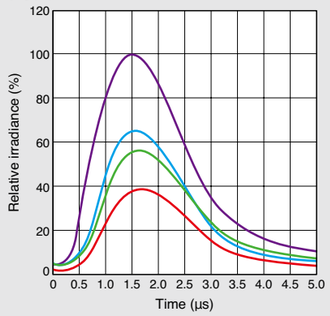
Spectral distribution (Typ.)



Window material
- Borosilicate glass (L11936)
- UV glass (11937)
- Sapphire glass (L11938)
- MgF_2 (L14691)

Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 1.0 μF
Repetition rate: 40 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)
Measurement distance: 500 mm

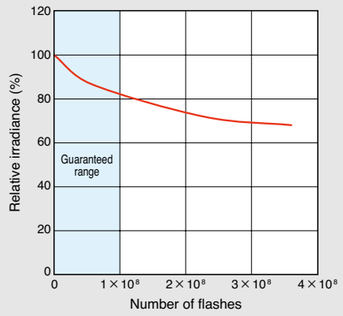
Emission pulse waveform (Typ.)



Arc size
- ○Standard model
  - 1.5 mm (L11937)
  - 3.0 mm (L11957)
- ○High output model
  - 1.5 mm (L11947)
  - 3.0 mm (L11967)

Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 1.0 μF
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (L11947) (Typ.)



Measurement conditions
Main discharge voltage: 1000 V
Main discharge capacitance: 1.0 μF
Repetition rate: 40 Hz
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Specifications

Parameter		Standard model								Unit
		L11936	L11956	L11937	L11957	L11938	L11958	L14691	L14693	
Arc size		1.5	3.0	1.5	3.0	1.5	3.0	1.5	3.0	mm
Window material		Borosilicate glass		UV glass		Sapphire glass		MgF_2		–
Side tube material		Metal								–
Spectral distribution		240 to 2500		185 to 2500		190 to 5000		160 to 7500		nm
Main discharge voltage range		300 to 1000								V
Recommended main discharge voltage range		700 to 1000								V
Maximum lamp input energy (per flash)		See operating condition examples								mJ
Maximum repetition rate ①		1000								Hz
Maximum average lamp input (continuous)		See operating condition examples								W
Light output stability ②	Typ.	1.0								% CV
		4.5								% p-p
	Max.	2.0								% CV
		6.0								% p-p
Guaranteed life ③		1×10^8 to 1×10^9								flashes
Trigger voltage		5 to 7								kV p-p
Cooling method		Not required								–
Operating temperature range		+5 to +40								℃
Storage temperature range		-40 to +90								℃
Operating humidity range		Below 85 % (no condensation)								–
Storage humidity range		Below 95 % (no condensation)								–
Trigger socket (sold separately) ④		E10977	E10978	E10977	E10978	E10977	E10978	E10977	E10978	–

Parameter		High output model								Unit
		L11946	L11966	L11947	L11967	L11948	L11968	L14692	L14694	
Arc size		1.5	3.0	1.5	3.0	1.5	3.0	1.5	3.0	mm
Window material		Borosilicate glass		UV glass		Sapphire glass		MgF_2		–
Side tube material		Metal								–
Spectral distribution		240 to 2500		185 to 2500		190 to 5000		160 to 7500		nm
Main discharge voltage range		300 to 1000								V
Recommended main discharge voltage range		700 to 1000								V
Maximum lamp input energy (per flash)		See operating condition examples								mJ
Maximum repetition rate ①		1000								Hz
Maximum average lamp input (continuous)		See operating condition examples								W
Light output stability ②	Typ.	1.0								% CV
		4.5								% p-p
	Max.	2.0								% CV
		6.0								% p-p
Guaranteed life ③		1×10^8 to 1×10^9								flashes
Trigger voltage		5 to 7								kV p-p
Cooling method		Not required								–
Operating temperature range		+5 to +40								℃
Storage temperature range		-40 to +90								℃
Operating humidity range		Below 85 % (no condensation)								–
Storage humidity range		Below 95 % (no condensation)								–
Trigger socket (sold separately) ④		E10977	E10978	E10977	E10978	E10977	E10978	E10977	E10978	–

NOTE: ① To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
② Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p)= (maximum light output – minimum light output) / average light output × 100
③ 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).
④ See page 24 for information on trigger sockets.

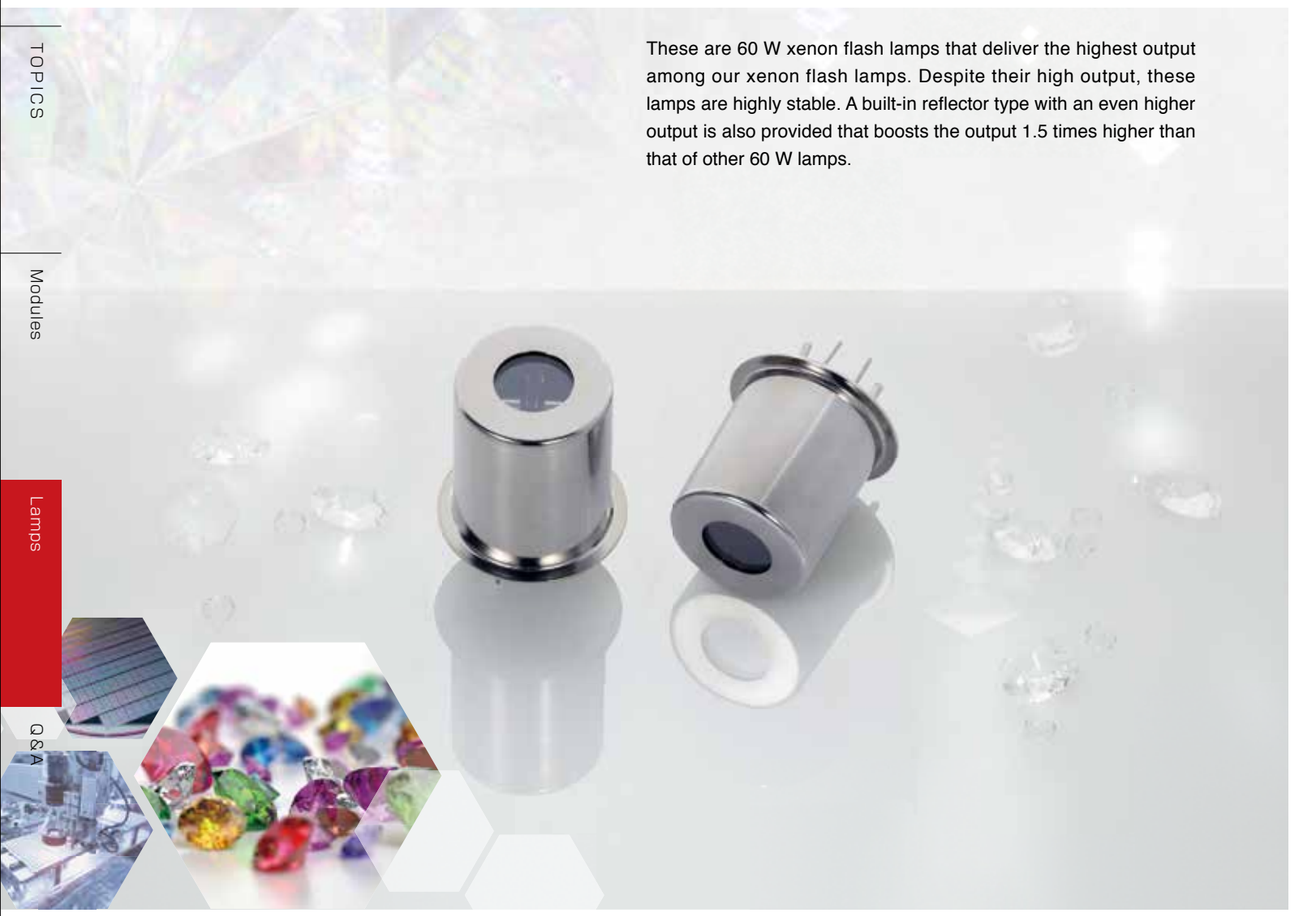
Operating condition examples

Main discharge capacitance (μF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑤ (mJ)	Maximum repetition rate ⑥ (Hz)	Maximum average lamp input (continuous) ⑦ (W)	Power supply ⑧ (sold separately)
1.0	1000	500	40	20	C13316-10
	700	245	82	20	
0.4	1000	200	100	20	C13316-04
	700	98	204	20	
0.3	1000	150	133	20	C13316-03
	700	74	272	20	
0.2	1000	100	200	20	C13316-02
	700	49	408	20	
0.1	1000	50	400	20	C13315
	700	25	816	20	

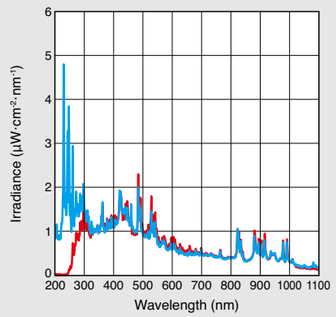
NOTE: ⑤ Maximum lamp input energy (per flash) (J)
$E = 1/2 \times C \times V^2$ C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑥ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑦ Maximum average lamp input (continuous) (W)
$P = E \times f$ E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)
⑧ See pages 26 to 27 for information on power supplies.

60 W xenon flash lamps

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.



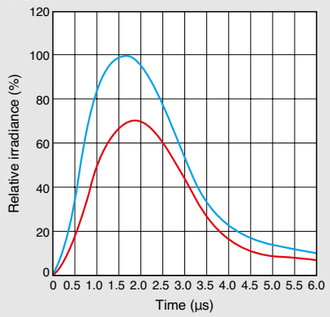
Spectral distribution (Typ.)



Window material
— Borosilicate glass (L7684) — Sapphire glass (L7685)

Measurement conditions
Main discharge voltage: 975 V
Main discharge capacitance: 2.1 μF
Repetition rate: 60 Hz
Detector: Photomultiplier tube (Cs-Te photocathode) (200 nm to 320 nm)
Photomultiplier tube (Multialkali photocathode) (280 nm to 720 nm)
Si photodiode (680 nm to 1100 nm)
Measurement distance: 500 mm

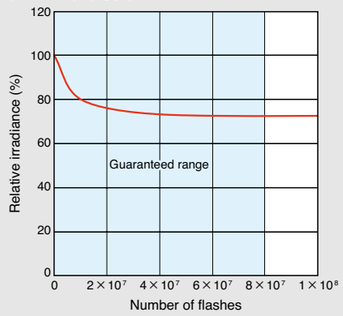
Emission pulse waveform (Typ.)



Model
— Standard model (L6605) — High output model (L7685)

Measurement conditions
Arc size: 3.0 mm
Main discharge voltage: 975 V
Main discharge capacitance: 2.1 μF
Detector: Biplanar phototube R1328U-52 (185 nm to 650 nm)

Life characteristics (L7685) (Typ.)



Measurement conditions
Main discharge voltage: 975 V
Main discharge capacitance: 2.1 μF
Repetition rate: 60 Hz
Detector: Si photodiode S1336-8BQ (190 nm to 1100 nm)

Specifications

Parameter		Standard model		High output model		Unit
		L6604	L6605	L7684	L7685	
Arc size		3.0				mm
Window material		Borosilicate glass	Sapphire glass	Borosilicate glass	Sapphire glass	—
Side tube material		Metal				—
Spectral distribution		240 ～ 2500	190 ～ 5000	240 ～ 2500	190 ～ 5000	nm
Main discharge voltage range		500 ～ 1000				V
Recommended main discharge voltage range		700 ～ 1000				V
Maximum lamp input energy (per flash)		See operating condition examples				mJ
Maximum repetition rate ①		100				Hz
Maximum average lamp input (continuous)		See operating condition examples				W
Light output stability ②	Typ.	0.7				% CV
		3.0				% p-p
	Max.	1.0				% CV
		4.2				% p-p
Guaranteed life ③		8×10^7				flashes
Trigger voltage		5 to 10				kV p-p
Cooling method ④		Not required				—
Operating temperature range		+5 to +40				℃
Storage temperature range		-40 to +90				℃
Operating humidity range		Below 85 % (no condensation)				—
Storage humidity range		Below 95 % (no condensation)				—
Trigger socket (sold separately) ⑤		E6647				—
Cooling jacket (sold separately) ⑥		E6611				—

NOTE: ① To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
② Light output stability (at a repetition rate of 10 Hz or more)
Light output stability (% CV) = light output standard deviation / average light output × 100
Light output stability (% p-p) = (maximum light output – minimum light output) / average light output × 100
③ 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 a main discharge voltage of 975 V, main discharge capacitance of 2.1 μF and a repetition rate of 60 Hz.
④ When the maximum average lamp input (continuous) is 15 W or more, cooling is necessary to keep the lamp bulb temperature lower than 150°C. Use the E6611 cooling jacket available as an option.
⑤ See page 24 for information on trigger sockets.
⑥ See page 25 for information on cooling jackets.

Operating condition examples

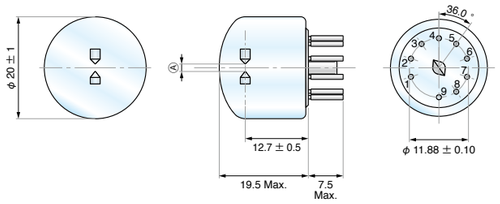
Main discharge capacitance (μF)	Main discharge voltage (V)	Maximum lamp input energy (per flash) ⑦ (mJ)	Maximum repetition rate ⑧ (Hz)	Maximum average lamp input (continuous) ⑨⑩ (W)	Main discharge capacitor (external connection) ⑪ (sold separately)	Power supply ⑫ (sold separately)
2.1	975	1000	60	60	E7289-02	C14352
	700	515	100	51.5		
0.1	1000	50	100	5	—	
	700	25	100	2.5		

NOTE: ⑦ Maximum lamp input energy (per flash) (J)
$E = 1/2 \times C \times V^2$ C: Main discharge capacitance (F), V: Main discharge voltage (V)
⑧ To ensure highly stable operation, 10 Hz or more repetition rate is recommended.
⑨ Maximum average lamp input (continuous) (W)
$P = E \times f$ E: Maximum average lamp input energy (per flash) (J), f: Repetition rate (Hz)
⑩ When operating the maximum average lamp input (continuous) at 60W, use the E7289-02 main discharge capacitor (external connection) available as an option.
⑪ See pages 25 for information on Main discharge capacitor (external connection).
⑫ See pages 26 to 27 for information on dedicated power supplies.

Dimensional outlines (unit: mm)

10 W xenon flash lamps

L4640, L4641, L4644, L4645



Ⓐ Type No.	Size
L4640	1.5 ± 0.2
L4641	
L4644	3.0 ± 0.3
L4645	

Weight: Approx. 4.3 g

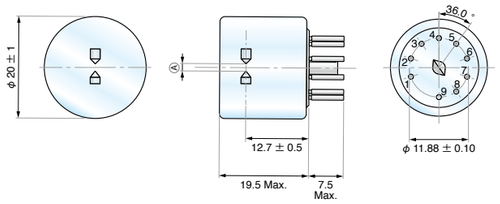
Applicable type No.: L4640, L4641
Pin connections

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	No connection	4	Anode	7	Trigger / Probe
2	No connection	5	No connection	8	Sparker
3	No connection	6	No connection	9	Cathode

Applicable type No.: L4644, L4645
Pin connections

Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	No connection	4	Anode	7	Trigger / Probe
2	No connection	5	No connection	8	Sparker
3	No connection	6	Trigger / Probe	9	Cathode

L4642, L4643, L4646, L4647



Ⓐ Type No.	Size
L4642	1.5 ± 0.2
L4643	
L4646	3.0 ± 0.3
L4647	

Weight: Approx. 5.4 g

Applicable type No.: L4642, L4643
Pin connections

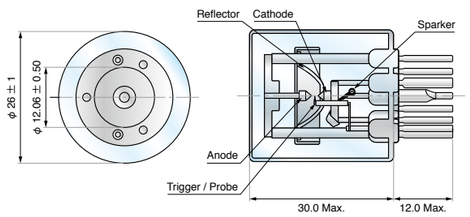
Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	No connection	4	Anode	7	Trigger / Probe
2	No connection	5	No connection	8	Sparker
3	No connection	6	No connection	9	Cathode

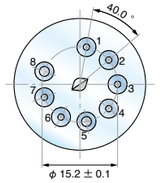
Applicable type No.: L4646, L4647
Pin connections

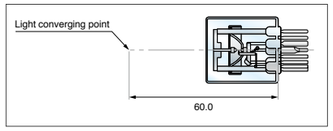
Pin No.	Signal	Pin No.	Signal	Pin No.	Signal
1	No connection	4	Anode	7	Trigger / Probe
2	No connection	5	No connection	8	Sparker
3	No connection	6	Trigger / Probe	9	Cathode

15 W xenon flash lamps

L4633





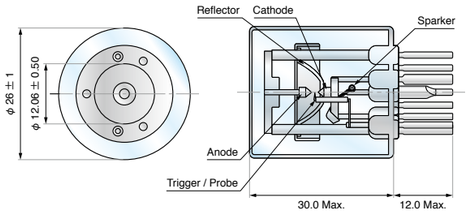


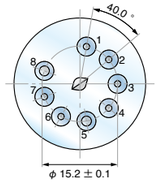
Weight: Approx. 14 g

Pin connections

Pin No.	Signal	Pin No.	Signal
1	Internal connection	5	Anode
2	Internal connection	6	Trigger / Probe
3	Sparker	7	No connection
4	Internal connection	8	Cathode

L4634





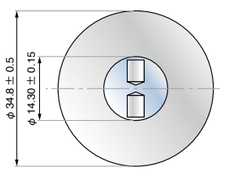
Weight: Approx. 14 g

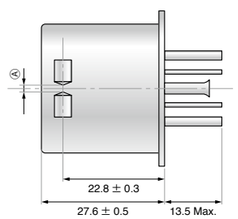
Pin connections

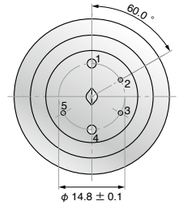
Pin No.	Signal	Pin No.	Signal
1	Internal connection	5	Anode
2	Internal connection	6	Trigger / Probe
3	Sparker	7	No connection
4	Internal connection	8	Cathode

20 W xenon flash lamps

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







Ⓐ Type No.	Size
L11936	1.5 ± 0.2
L11937	
L11938	
L14691	
L11956	3.0 ± 0.3
L11957	
L11958	
L14693	

Weight: Approx. 28 g

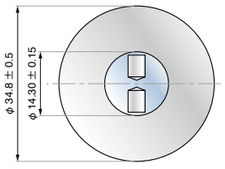
Applicable type No.: L11936, L11937, L11938, L14691
Pin connections

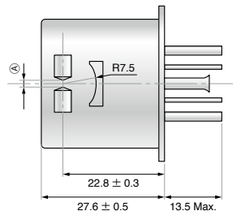
Pin No.	Signal	Pin No.	Signal
1	Anode	4	Cathode
2	No connection	5	Sparker
3	Trigger / Probe		

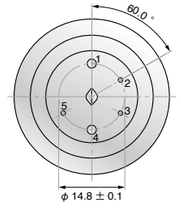
Applicable type No.: L11956, L11957, L11958, L14693
Pin connections

Pin No.	Signal	Pin No.	Signal
1	Anode	4	Cathode
2	Trigger / Probe	5	Sparker
3	Trigger / Probe		

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







Ⓐ Type No.	Size
L11946	1.5 ± 0.2
L11947	
L11948	
L14692	
L11966	3.0 ± 0.3
L11967	
L11968	
L14694	

Weight: Approx. 30 g

Applicable type No.: L11946, L11947, L11948, L14692
Pin connections

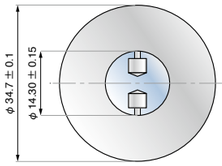
Pin No.	Signal	Pin No.	Signal
1	Anode	4	Cathode
2	No connection	5	Sparker
3	Trigger / Probe		

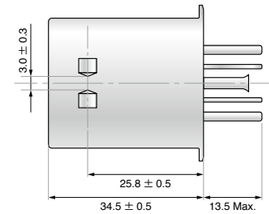
Applicable type No.: L11966, L11967, L11968, L14694
Pin connections

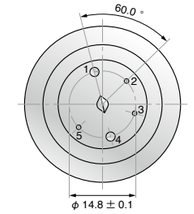
Pin No.	Signal	Pin No.	Signal
1	Anode	4	Cathode
2	Trigger / Probe	5	Sparker
3	Trigger / Probe		

60 W xenon flash lamps

Standard type L6604, L6605





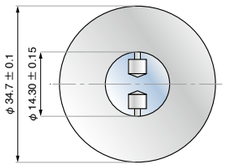


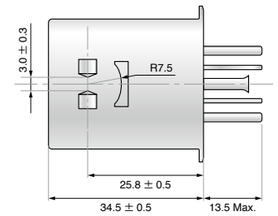
Weight: Approx. 34 g

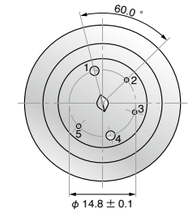
Pin connections

Pin No.	Signal	Pin No.	Signal
1	Anode	4	Cathode
2	Trigger / Probe	5	Sparker
3	Trigger / Probe		

High output type L7684, L7685







Weight: Approx. 36 g

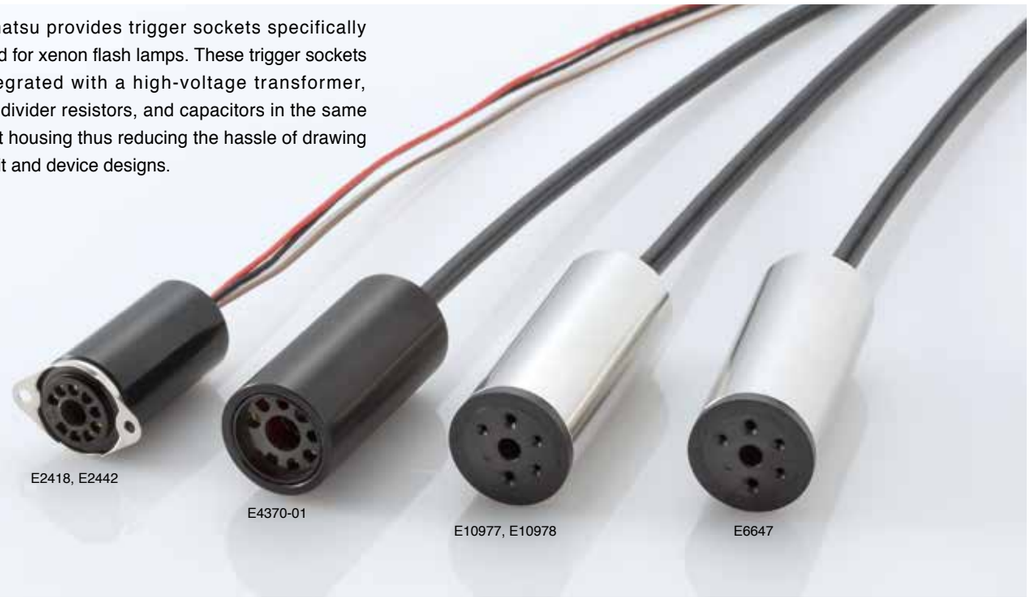
Pin connections

Pin No.	Signal	Pin No.	Signal
1	Anode	4	Cathode
2	Trigger / Probe	5	Sparker
3	Trigger / Probe		

Options

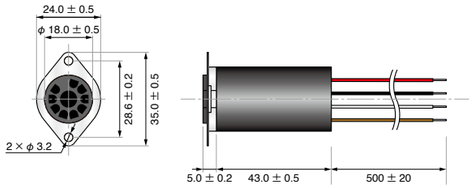
Trigger sockets E2418, E2442, E4370-01, E10977, E10978, E6647

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.



Dimensional outlines (Unit: mm)

E2418, E2442 For 10 W

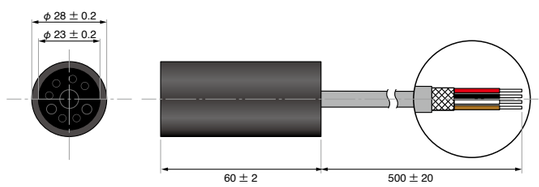


Weight: Approx. 62 g

Cable connections

Color	AWG	Signal	Color	AWG	Signal
Red	18	Main discharge voltage	White	22	Trigger voltage
Black	18	Main discharge voltage GND.	Brown	22	Trigger GND.

E4370-01 For 15 W

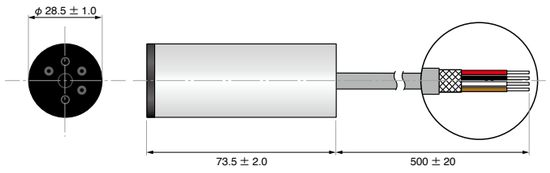


Weight: Approx. 128 g

Cable connections

Color	AWG	Signal	Color	AWG	Signal
Red	18	Main discharge voltage	Brown	22	Trigger GND.
Black	18	Main discharge voltage GND.	Shield mesh	—	Case GND.
White	22	Trigger voltage			

E10977, E10978 For 20 W

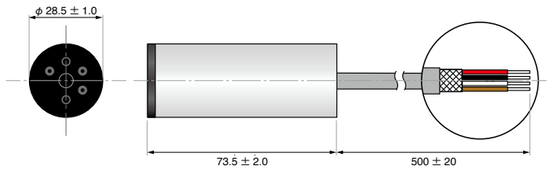


Weight: Approx. 159 g

Cable connections

Color	AWG	Signal	Color	AWG	Signal
Red	16	Main discharge voltage	Brown	22	Trigger GND.
Black	16	Main discharge voltage GND.	Shield mesh	—	Case GND.
White	22	Trigger voltage			

E6647 For 60 W



Weight: Approx. 159 g

Cable connections

Color	AWG	Signal	Color	AWG	Signal
Red	16	Main discharge voltage	Brown	22	Trigger GND.
Black	16	Main discharge voltage GND.	Shield mesh	—	Case GND.
White	22	Trigger voltage			

Cooling jacket E6611 For 60 W

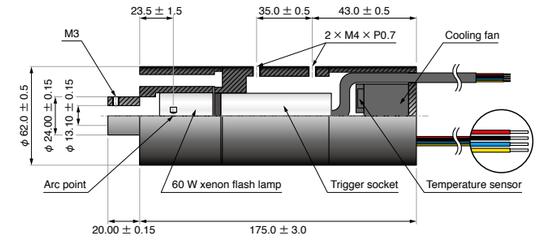


The E6611 is a cooling jacket specifically designed for 60 W xenon flash lamps. It helps keep the temperature of the xenon flash lamp and trigger socket at a constant level within the tolerance range to ensure highly stable operation.

∗ The cooling jacket must be used when the lamp is operated with an input of 15 W or more.

Dimensional outlines (Unit: mm)

(With lamp socket assembled)



Weight: Approx. 680 g

Cable connections

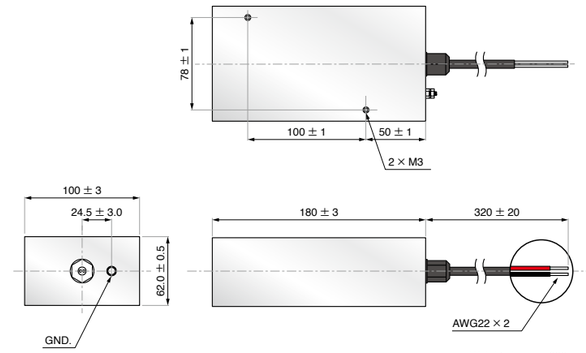
Color	AWG	Signal	Color	AWG	Signal
Red	22	Cooling fan input voltage (24 V)	Blue	22	Temperature sensor
Black	22	Cooling fan GND.	Yellow	22	Temperature sensor

Main discharge capacitor (external connection) E7289-02 For 60 W



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.

Dimensional outlines (Unit: mm)



Weight: Approx. 900 g

Options

Power supplies C13315 / C13316 series, C14352

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.



Type number guide (C13316 series)

C13316 - AA

↑ Main discharge capacitance

Main discharge capacitance

Suffix	Capacitance	Suffix	Capacitance	Suffix	Capacitance	Suffix	Capacitance	Suffix	Capacitance
02	0.2 µF	04	0.4 µF	06	0.6 µF	08	0.8 µF	10	1.0 µF
03	0.3 µF	05	0.5 µF	07	0.7 µF	09	0.9 µF		

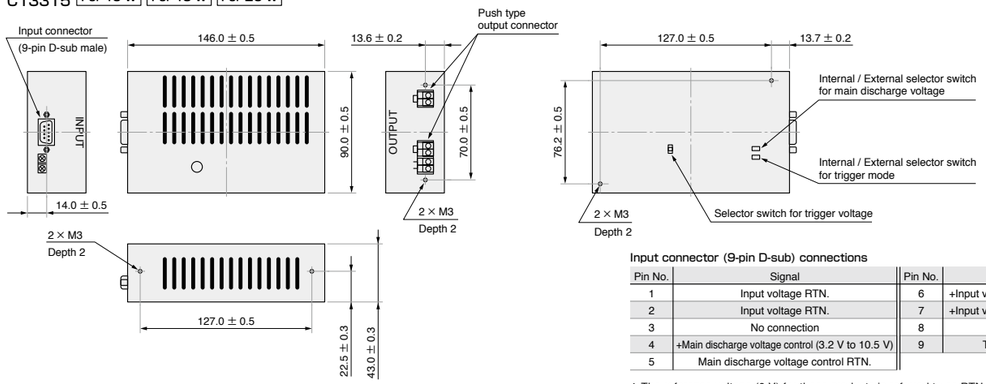
Specifications

Parameter			C13315	C13316 series	C14352	Unit
Main discharge section	Output voltage (DC)		300 to 1000			V
	Output capacitance	Max.	20		60	W
	Stability	Max.	± 0.2		± 1.0	%
	Internal main discharge capacitance		0.1	0.2 to 1.0 ①	0.1	µF
	Maximum repetition rate		1000 ②		100 ③	Hz
Trigger section	Trigger voltage	Typ.	140 / 170 ④		180	V
	Trigger capacitance		0.22			µF
Trigger input section	Trigger mode		Internal / External			—
	Internal oscillation frequency		10 to 100			Hz
	Input impedance		0.33		1	kΩ
	Input waveform		Rectangular wave			—
	Input voltage		5 V to 10 V (pulse width 10 µs or more)		4.5 V to 5.5 V (pulse width 5 µs or more)	—
Input voltage (DC)			24.0 ± 2.4		24.0 ± 1.2	V
Power consumption		Typ.	26		72	W
Cooling method			Not required		Forced air cooling by fan	—
Applicable standards	EMC standards		IEC/EN 61326-1 Emission limits: CISPR 11 Group 1 Class A Immunity requirements: Table 2			—
	Safety standards		IEC/EN 61010-1			
	Environmental standards (RoHS)		IEC/EN 63000			
	UL standards		E249677		—	
Compatible lamps			10 W xenon flash lamps 15 W xenon flash lamps 20 W xenon flash lamps		60 W xenon flash lamps	—

NOTE: ① The main discharge capacitance can be selected from 0.2 µF to 1.0 µF in 0.1 µF steps.
② Adjust the repetition rate so that the maximum average lamp input (continuous) is lower than 20 W.
③ Adjust the repetition rate so that the maximum average lamp input (continuous) is lower than 60 W.
④ Switch the trigger voltage to 140 V for 10 W and 15 W xenon flash lamps, and to 170 V for 20 W xenon flash lamps.

Dimensional outlines (Unit: mm)

C13315 For 10 W For 15 W For 20 W

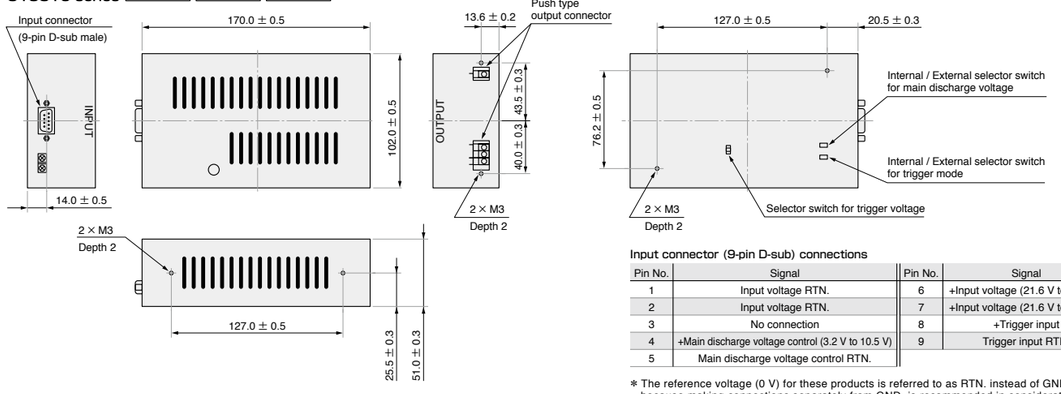


Input connector (9-pin D-sub) connections

Pin No.	Signal	Pin No.	Signal
1	Input voltage RTN.	6	+Input voltage (21.6 V to 26.4 V)
2	Input voltage RTN.	7	+Input voltage (21.6 V to 26.4 V)
3	No connection	8	+Trigger input
4	+Main discharge voltage control (3.2 V to 10.5 V)	9	Trigger input RTN.
5	Main discharge voltage control RTN.		

* 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.

C13316 series For 10 W For 15 W For 20 W

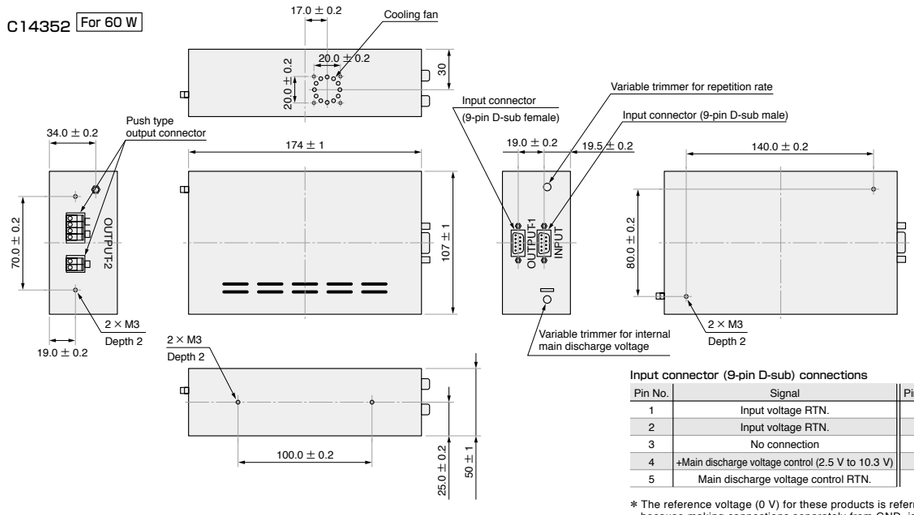


Input connector (9-pin D-sub) connections

Pin No.	Signal	Pin No.	Signal
1	Input voltage RTN.	6	+Input voltage (21.6 V to 26.4 V)
2	Input voltage RTN.	7	+Input voltage (21.6 V to 26.4 V)
3	No connection	8	+Trigger input
4	+Main discharge voltage control (3.2 V to 10.5 V)	9	Trigger input RTN.
5	Main discharge voltage control RTN.		

* 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.

C14352 For 60 W



Input connector (9-pin D-sub) connections

Pin No.	Signal	Pin No.	Signal
1	Input voltage RTN.	6	+Input voltage (24 V)
2	Input voltage RTN.	7	+Input voltage (24 V)
3	No connection	8	+Trigger input
4	+Main discharge voltage control (2.5 V to 10.3 V)	9	Trigger input RTN.
5	Main discharge voltage control RTN.		

* 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.

Q & A

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:

$$E = 1/2 \times C \times V^2$$
$$P = E \times f$$

E: Maximum lamp input energy (per flash) [J]
P: Maximum average lamp input (continuous) [W]
C: Main discharge capacitance [F]
V: Main discharge voltage [V]
F: Maximum repetition rate [Hz]

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 µF (10^{-6} F)), the maximum lamp input energy (per flash) is 0.5 J as calculated by the following equation:

$$E = 1/2 \times 10^{-6}\ [F] \times 1000\ [V]^2 = 0.5\ [J]$$

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

$$f = 20\ [W] / 0.5\ [J] = 40\ [Hz]$$

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.

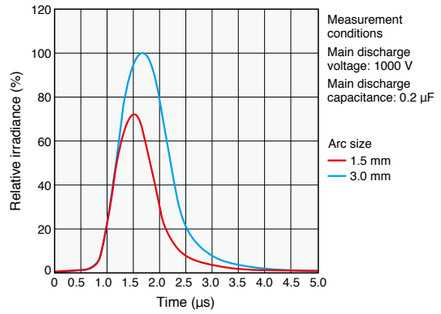
Q3. What happens if a lamp is used at a repetition rate that exceeds the maximum repetition rate?

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.

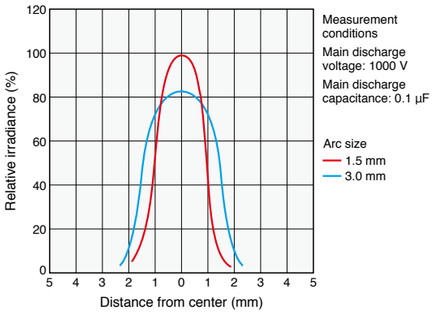
Q4. How do the characteristics change depending on the arc length?

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.

Emission pulse waveform (Typ.)



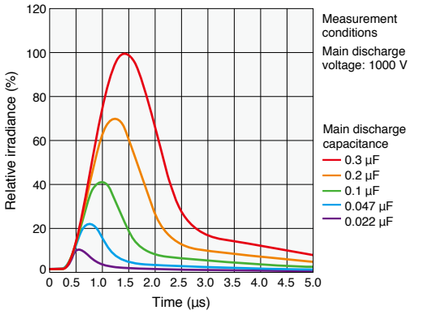
Brightness characteristics (Typ.)



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).

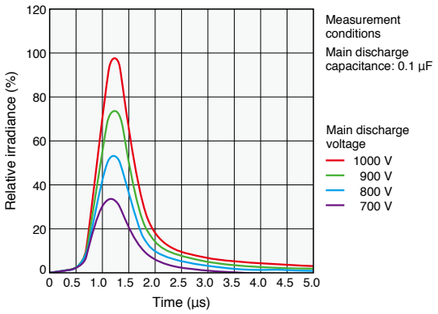
Emission pulse waveform (Typ.)



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.

Emission pulse waveform (Typ.)

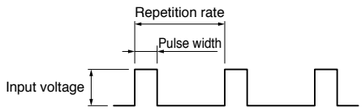


Q & A

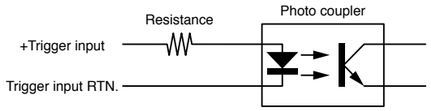
Q7. What type of trigger signal input is needed from signal source in order to operate xenon flash lamp module or power supply for xenon flash lamp?

A7. Input rectangular wave signal referring to the repetition rate and trigger signal on each specification page. (Operation 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.

Trigger signal waveform



Internal circuit diagram example of trigger signal input section

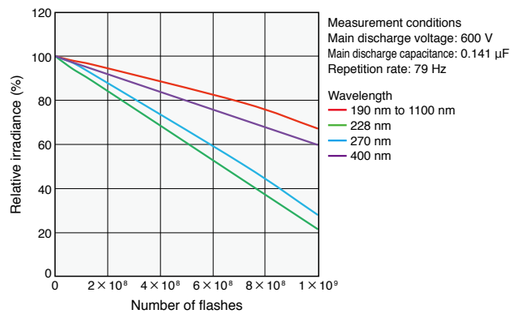


Q8. Is there any difference in life characteristics for each wavelength?

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.

Life characteristics (Typ.)

Examples: 2 W xenon flash lamp modules

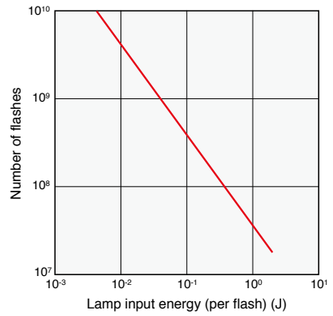


Q9. Is there any difference in life characteristics at each lamp input energy (energy per flash)?

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

Life characteristics (Typ.)

Examples: 10 W xenon flash lamp



* Guaranteed input energy for 10 W xenon flash lamps is 0.01 J to 0.1 J.

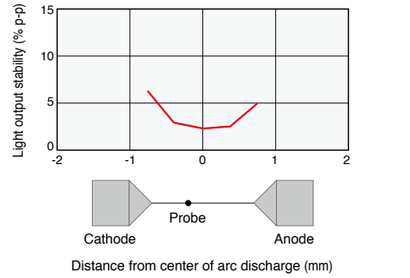
Q10. What should be done to ensure the lamp to be operated stably?

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.

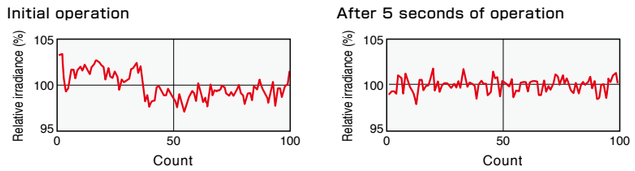
Light output stability with respect to arc discharge measurement position (Typ.)



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.

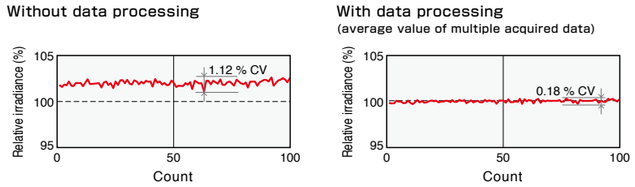
Light output stability with respect to operating time (Typ.)



③ Average the data.

Light output stability is improved by processing and averaging multiple acquired data.

Light output stability for data processing (Typ.)

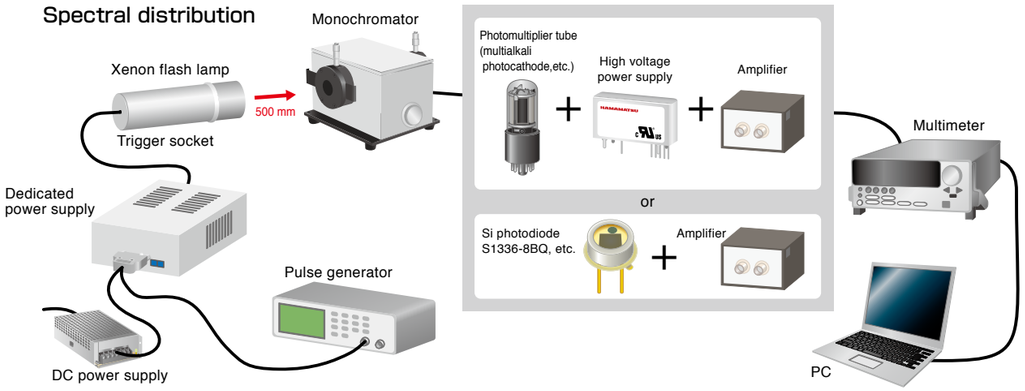


Q & A

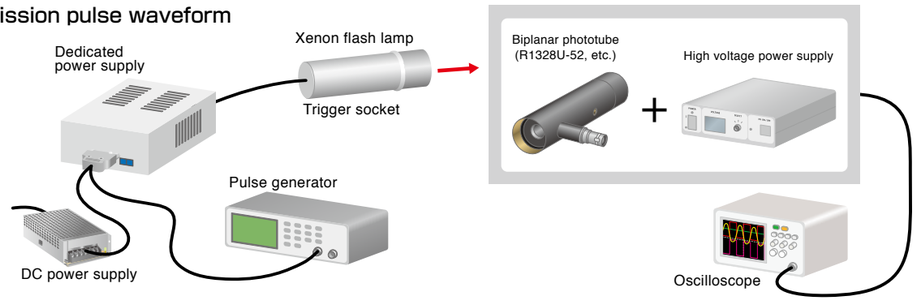
Q11. What device setup is used to measure the spectral distribution, emission pulse waveform and life characteristics of xenon flash lamps?

A11. Typical measurement setups are as follows:

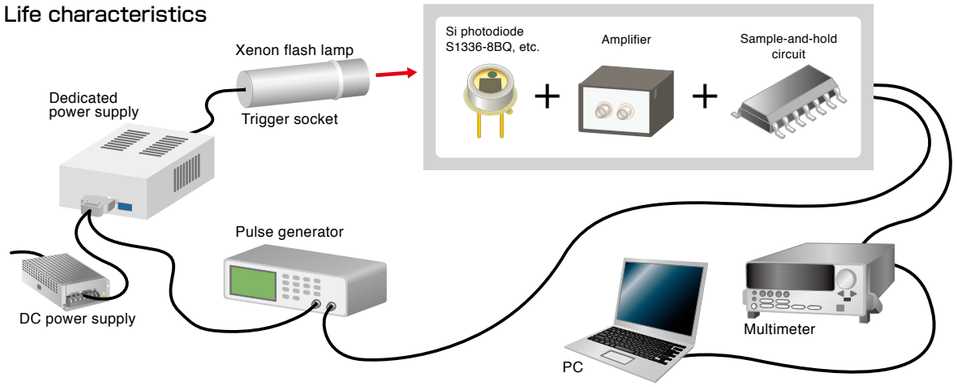
Spectral distribution



Emission pulse waveform



Life characteristics



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)
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)
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

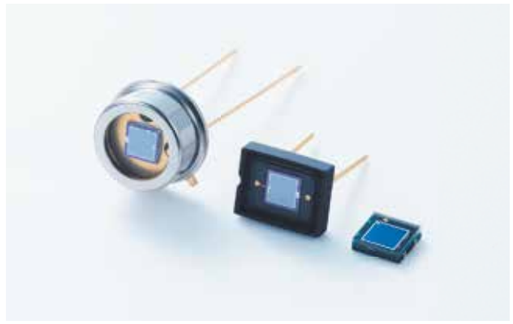
Photomultiplier tubes are versatile photodetectors having extremely high sensitivity and high-speed response. We have a complete line of photomultiplier tubes with different shapes, spectral response ranges, structures and effective areas which are developed and manufactured by our unique, advanced technology. 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

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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.



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 T8141 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 devitrification. It results in decrease of irradiance.
- As 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 air ventilation to avoid influence of ozone when the instrument is designed.
- Ozone will be generated when the window material is either UV glass, sapphire glass or MgF_2. Therefore, please provide adequate ventilation when the lamp is operated in confined space for long time.
- MgF_2 (magnesium fluoride) utilized for the light output window is an optical crystal having deliquescent (absorbs moisture from air and liquefies) properties. Avoid using or storing lamps with an MgF_2 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.

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- LED
- Optical communication devices
- Automotive devices
- X-ray flat panel sensors
- MEMS devices
- Mini-spectrometers
- Opto-semiconductor modules

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- Photomultiplier tube modules
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- X-ray imaging devices

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- Semiconductor failure analysis systems
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