HAMAMATSU
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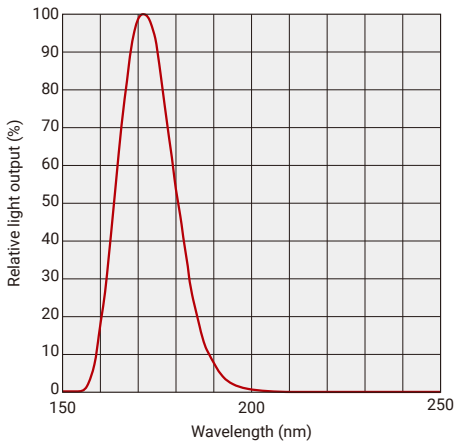
FLAT EXCIMER™

Excimer Lamp Light Sources

Characteristics and features

This excimer lamp light source employs a flat lamp and RF (radio frequency) discharge to achieve uniform irradiation and stable output with minimal flickering. Compared to conventional corona discharge and plasma methods, it causes no damage and generates no dust.

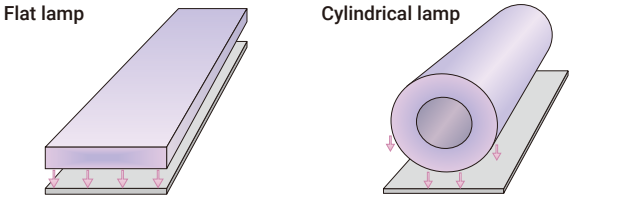
Spectral distribution (Typ.)



Features

- **Uniform irradiation by flat lamp**
- **Stable output with minimal flickering by adopting RF (radio frequency) discharge**
- **Highly efficient lighting by auto-tuning function of power supply**

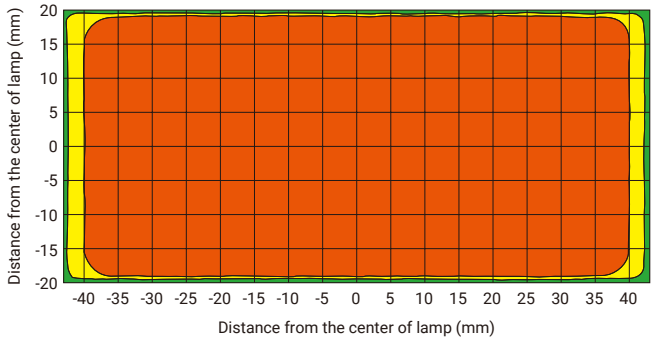
● Uniform irradiation by flat lamp



Close proximity across the entire surface
Good uniformity

Close proximity only directly under the center of the lamp
Poor uniformity

Irradiance distribution (Typical examples: EX-86U/EX-mini)

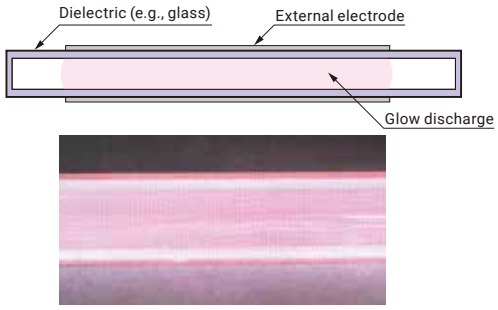


Measurement conditions
UV power meter: Hamamatsu C9536, H9535-172
Distance between the lamp and UV power meter: 5 mm
Irradiation atmosphere: Atmospheric

80 % and above
60 % to 80 %
60 % and below

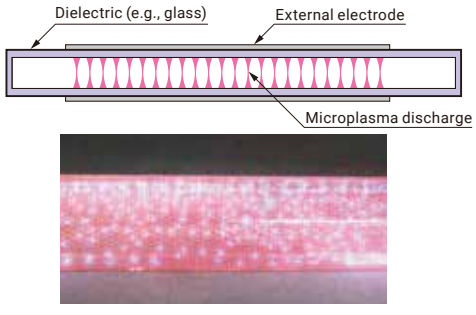
● Stable output with minimal flickering by adopting RF (radio frequency) discharge

RF discharge



Uniform discharge for no uneven light emission

Dielectric barrier discharge



Thread-like discharge with uneven light emission

Product lineup

Model	Type		Irradiation window size (mm)	Product information page
In-line process	EX-86U		86 × 40	P06
R&D	EX-mini		86 × 40	P08

Applications

Surface modification

Irradiation with vacuum UV light alters the composition of the material surface, providing new functions such as hydrophilicity. Modification using an excimer lamp light source is based on chemical reactions at the atomic and molecular level, allowing for more precise modification compared with conventional methods. It is also damage-free and does not generate dust.

Application examples

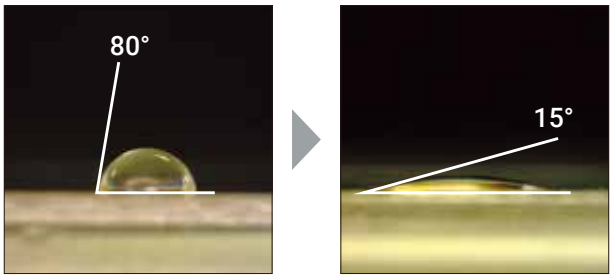
■ **Improving ink adhesion**
Modifying the substrate surface before ink application improves ink adhesion.

■ **Reducing coating unevenness and Improving adhesion of coating agents**
Modifying the substrate surface before coating application reduces coating unevenness and improves adhesion of the coating.

■ **Improving adhesive strength of adhesives**
Modifying the surface of the material before adhesive application improves adhesive strength.

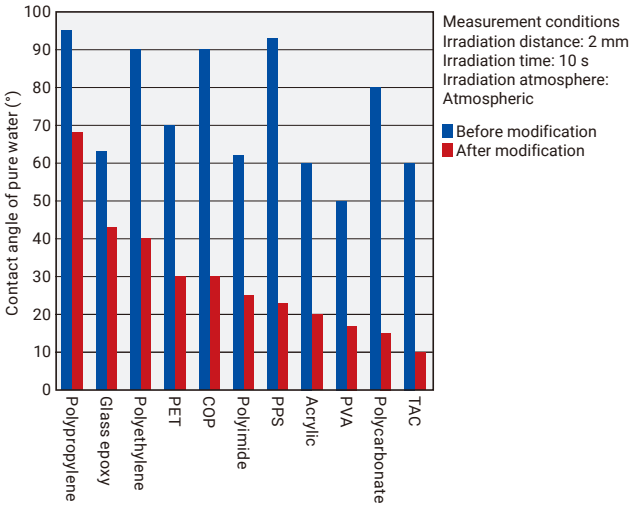
■ **Improving wettability of resin, rubber, metal, etc.**
Modifying the surface of materials adds functions such as hydrophilicity.

● Improving wettability of resin

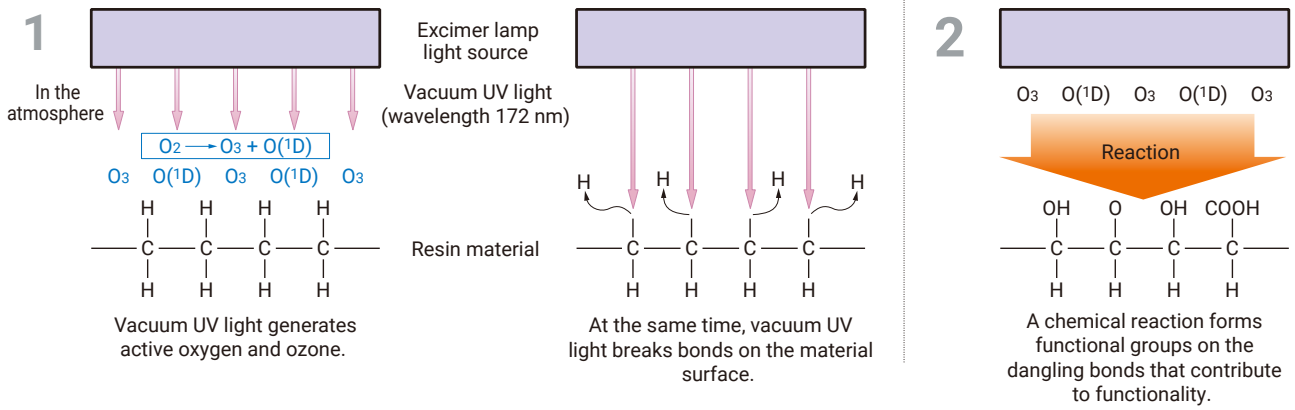


Before modification　　After modification

● Improving wettability of various materials



Principle (typical example)



Dry cleaning

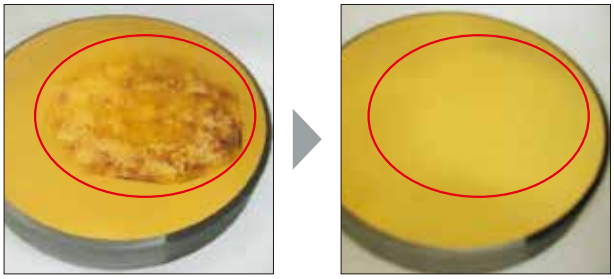
Irradiation with vacuum UV light breaks the chemical bonds of organic materials and oxidizes and volatilizes them to remove organic contaminants on the surface. The 172 nm wavelength vacuum UV light emitted from an excimer lamp light source has a high absorption coefficient for oxygen, generating a high concentration of active oxygen and ozone, as well as excellent ability to break molecular bonds of organic materials. This method has advantages such as improving yield due to its high cleaning quality and is especially effective for materials that cannot be wet-cleaned or materials that are sensitive to heat.

Application examples

■ Cleaning of wafers and glass substrates

■ Removal of resist residues, adhesive residues, organic films, and oil stains

● Cleaning of Au-deposited mirrors for lasers

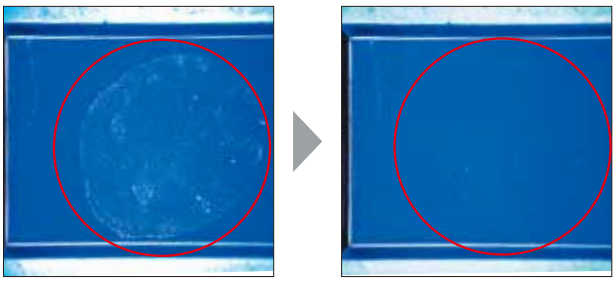


Before cleaning　　After cleaning

● Removal of space liquid residue from wafers

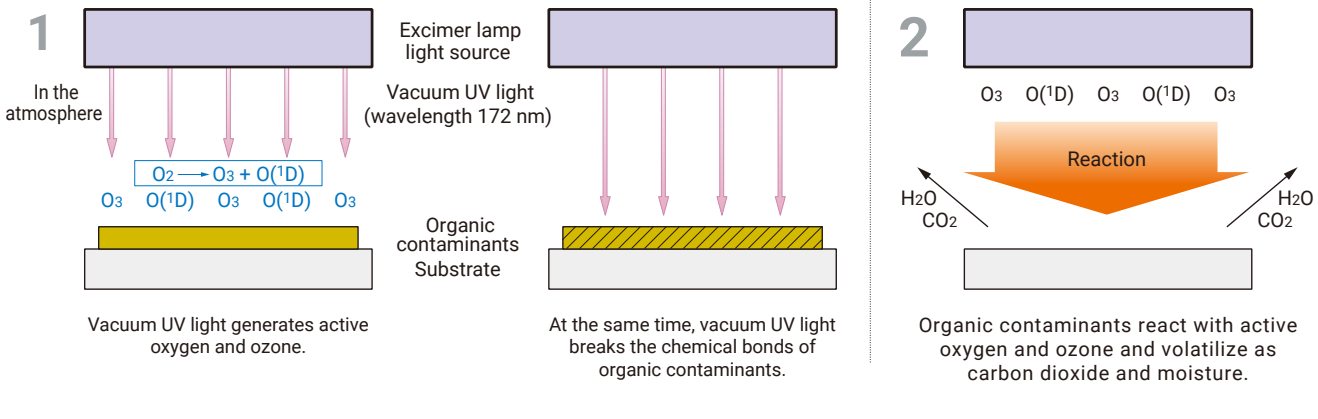
Before cleaning　　After cleaning

● Removal of acetone cleaning residue



Before cleaning　　After cleaning

Principle (typical example)



Vacuum UV light generates active oxygen and ozone.

At the same time, vacuum UV light breaks the chemical bonds of organic contaminants.

Organic contaminants react with active oxygen and ozone and volatilize as carbon dioxide and moisture.

Product information | EX-86U

The all-in-one design with a compact, lightweight, and built-in power supply enables easy introduction into the manufacturing process, regardless of the installation location.

Specifications

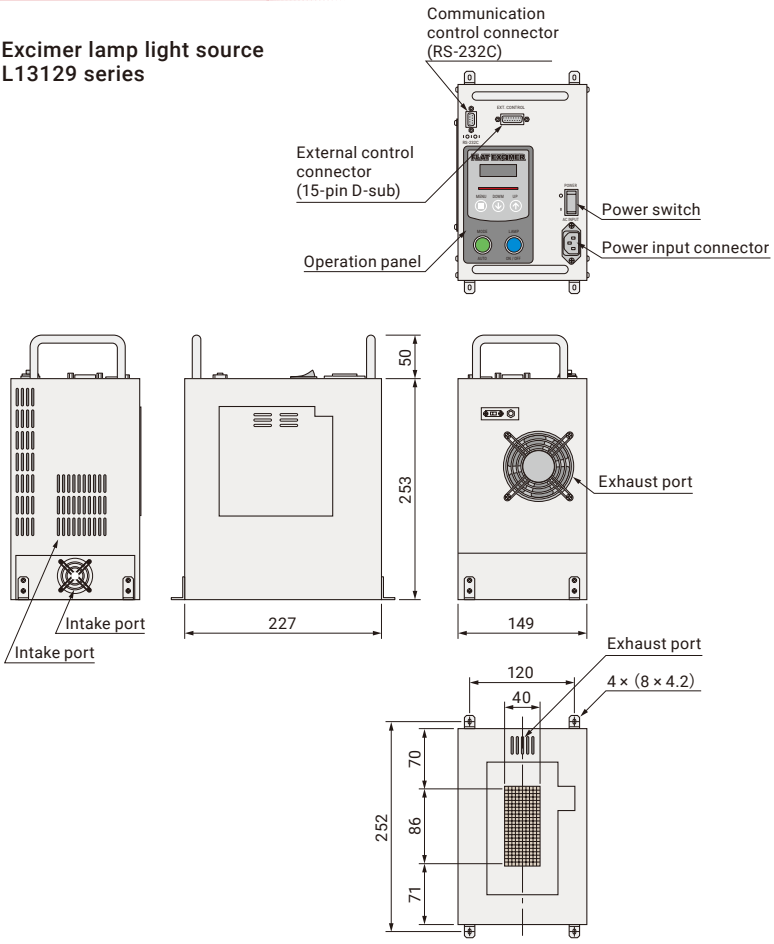
■ Excimer lamp light source L13129-□□*1

Items		Description / Value	Unit
Window material		Quartz glass	–
Irradiation window size		86 × 40	mm
Peak wavelength		172	nm
UV irradiance *2	Min.	50	mW/cm^2
Lamp guaranteed life *3		1000	h
Lamp design life		2000	h
Replacement lamp (sold separately)		L12681	–
Input voltage (AC)		100 V to 240 V, single-phase 50 Hz / 60 Hz	–
Power consumption	Max.	150	VA
Cooling method		Forced air cooling with built-in fan	–
Operating temperature range		+5° C to +35° C	–
Storage temperature range		-5° C to +55 °C (no freezing)	–
Operating humidity range		30 % to 80 % (no condensation)	–
Storage humidity range		80 % or below (no condensation)	–
External control		Lighting control, lighting signal, various alarms/error signals	–
Communication control		Lighting control, lighting signal, cumulative lighting time display, various alarms/error signals	–
Applicable standards	EMC standards	IEC 61326-1 Emission limits: CISPR 11 Group 2 Class A Immunity requirements: Table 2	–
	Safety standards	IEC 61010-1/A1	
		IEC 62471 Risk Group 2	

*1: The "□" part of the model's name is a suffix for each AC cable specification.
C1: For Japan/C2: For the United States/C3: For Europe
*2: Value measured by Hamamatsu UV power meter C9536, H9535-172 at the nearest position to the lamp.
*3: The lifetime is defined as the point at which the UV irradiance drops to 70 % of the initial value or when the lamp stops lighting.

Dimensional outlines (Unit: mm)

■ Excimer lamp light source
L13129 series



NOTE: Install with the irradiated surface facing up or down

Weight: Approx. 4.8 kg

External control connector (15-pin D-sub) connection

Pin No.	Signal	
1	Manual irradiation/ lighting control signal (+)	Input
2	Manual irradiation/ lighting control signal (-)	Input
3	Auto irradiation/ lighting control signal (+)	Input
4	Auto irradiation/ lighting control signal (-)	Input
5	Lighting signal	Output
6	Error signal	Output
7	No connection	–
8	No connection	–
9	Output voltage (+24 V)	Output
10	Output voltage (+24 V)	Output
11	Output voltage (+24 V)	Output
12	GND.	–
13	GND.	–
14	GND.	–
15	GND.	–

Accessories

■ AC cable (2 m)

Product information | EX-mini

Its amazing lightness makes it easy to conduct high-precision experiments and evaluations anywhere. It has the same lamp performance as the EX-86U.

Features

■ Compact and lightweight for portability

The portable size and weight mean that there are no restrictions in terms of installation location or operating environment.

■ All-in-one light source integrated with the irradiation box

Since there is no need to design an irradiation box, etc., you can use it immediately with just this one unit.

■ Ozone decomposition unit E12685 (optional)

It has cooling and ozone decomposition functions, and by installing it on the EX-mini, an exhaust duct is no longer required, enabling indoor exhaust.

Internal dimensions (W × H × D): 204 mm × 118 mm × 139 mm (excluding protruding parts)
NOTE: Sample stand (jack, etc.) is not included.

Specifications

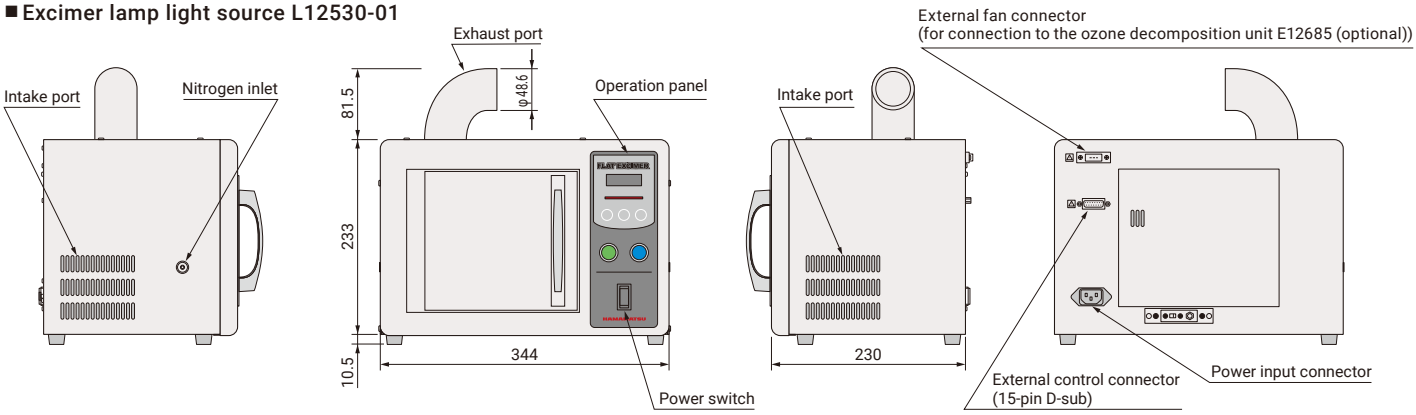
■ Excimer lamp light source L12530-01

Items			Description / Value	Unit
Window material			Quartz glass	–
Irradiation window size			86 × 40	mm
Peak wavelength			172	nm
UV irradiance *1		Min.	50	mW/cm^2
Lamp guaranteed life *2			1000	h
Lamp design life			2000	h
Replacement lamp (sold separately)			L12681-02	–
Nitrogen flow rate			10 to 30	L/min
Input voltage (AC)			100 V to 240 V, single-phase 50 Hz / 60 Hz	–
Power consumption		Max.	150	VA
Cooling method			Forced air cooling by the ozone decomposition unit E12685 or duct *3	–
Operating temperature range			+5 °C to +35 °C	–
Storage temperature range			-5 °C to +55 °C (no freezing)	–
Operating humidity range			30 % to 80 % (no condensation)	–
Storage humidity range			80 % or below (no condensation)	–
External control			Lighting control, lighting signal, various alarms/error signals	–
Applicable standards	EMC standards		IEC 61326-1 Emission limits: CISPR 11 Group 2 Class A Immunity requirements: Table 2	–
	Safety standards		IEC 61010-1/A1	
			IEC 62471 Risk Group 2	

*1: Value measured by Hamamatsu UV power meter C9536, H9535-172 at the nearest position to the lamp.
*2: The lifetime is defined as the point at which the UV irradiance drops to 70 % of the initial value or when the lamp stops lighting.
*3: The optional ozone decomposition unit E12685 has cooling and ozone decomposition functions, and by using it an exhaust duct is no longer required.
When an exhaust duct is used, exhaust at a duct suction rate of 0.25 m^3/min to 0.35 m^3/min. Also, since the exhaust air contains ozone, install an ozone decomposition filter as necessary.

Dimensional outlines (Unit: mm)

■ Excimer lamp light source L12530-01



Weight: Approx. 7 kg

External control connector (15-pin D-sub) connection

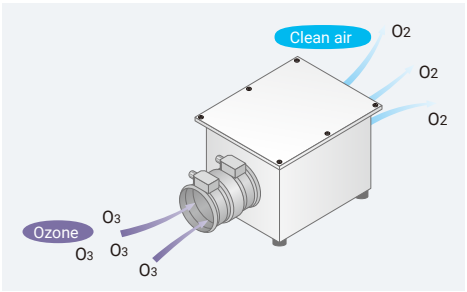
Pin No.	Signal		Pin No.	Signal	
1	Manual irradiation/lighting control signal (+)	Input	9	Output voltage (+24 V)	Output
2	Manual irradiation/lighting control signal (-)	Input	10	Output voltage (+24 V)	Output
3	Auto irradiation/lighting control (+)	Input	11	Output voltage (+24 V)	Output
4	Auto irradiation/lighting control (-)	Input	12	GND.	–
5	Lighting signal	Output	13	GND.	–
6	Error signal	Output	14	GND.	–
7	No connection	–	15	GND.	–
8	No connection	–			

Accessories

■ AC cable (2 m)
■ External fan shorting connector

Ozone decomposition unit E12685

This is an ozone decomposition unit with cooling and ozone decomposition functions.
By installing it on the EX-mini, an exhaust duct is no longer required, enabling indoor exhaust. Therefore the EX-mini can be easily used anywhere. By connecting the unit to the EX-mini via a connector, it is powered by the EX-mini through the connector for operation.



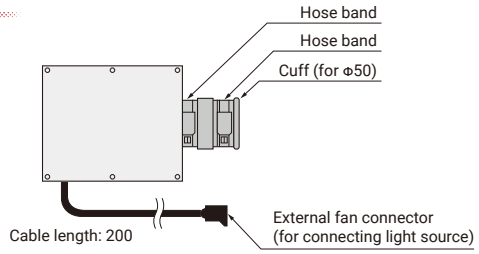
Specifications

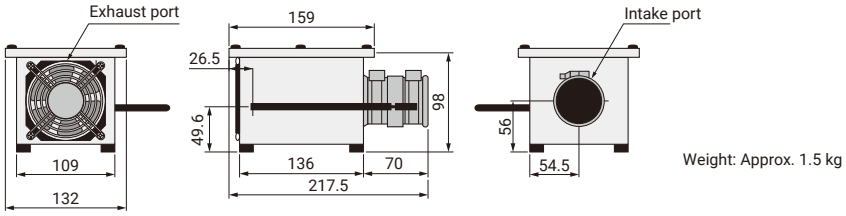
Items		Description / Value	Unit
Exhaust air volume		0.26	m³/min
Exhaust ozone concentration	Max.	0.1	ppm
Filter guaranteed life *1		2000	h
Replacement filter (sold separately)		A12686	–
Operating temperature range		+5 °C to +35 °C	–
Storage temperature range		-5 °C to +55 °C (no freezing)	–
Operating humidity range		30 % to 80 % (no condensation)	–
Storage humidity range		80 % or below (no condensation)	–
Applicable standards	EMC standards	IEC 61326-1 Emission limits: CISPR 11 Group 2 Class A Immunity requirements: Table 2	–
	Safety standards	IEC 61010-1/A1	
		IEC 62471 Risk Group 2	

*1: The lifetime is defined as the point at which the usage time reaches 2,000 hours, or the usage period reaches one year.

NOTE: The ozone decomposition unit only removes ozone.
Some materials may generate hazardous substances when exposed to vacuum UV light; in such cases, please use an exhaust duct.

Dimensional outlines (Unit: mm)





Weight: Approx. 1.5 kg

Related products

UV power meter
C9536, H9535-172

This is a UV power meter that enables absolute light intensity management (mW/cm^2).
The sensor head can be separated and operated independently, allowing measurements on a conveyor belt or in locations where it is difficult to handle cables. The filter-less system reduces degradation caused by vacuum UV light.

EX-PEN
Excimer lamp light source

One of the world's smallest built-in excimer lamp.
Its compact and lightweight allow for flexible design, contributing to equipment downsizing and higher performance. In addition, it is an environmentally friendly product because it does not use any mercury, an environmentally hazardous substance.

FAQs

■ About the light source

Q1. Are there any classifications like lasers?

A1. Excimer lamp light sources do not belong to the laser class, but are classified under IEC62471 “Photobiological safety of lamps and lamp systems,” and a risk group assessment is performed for each model.

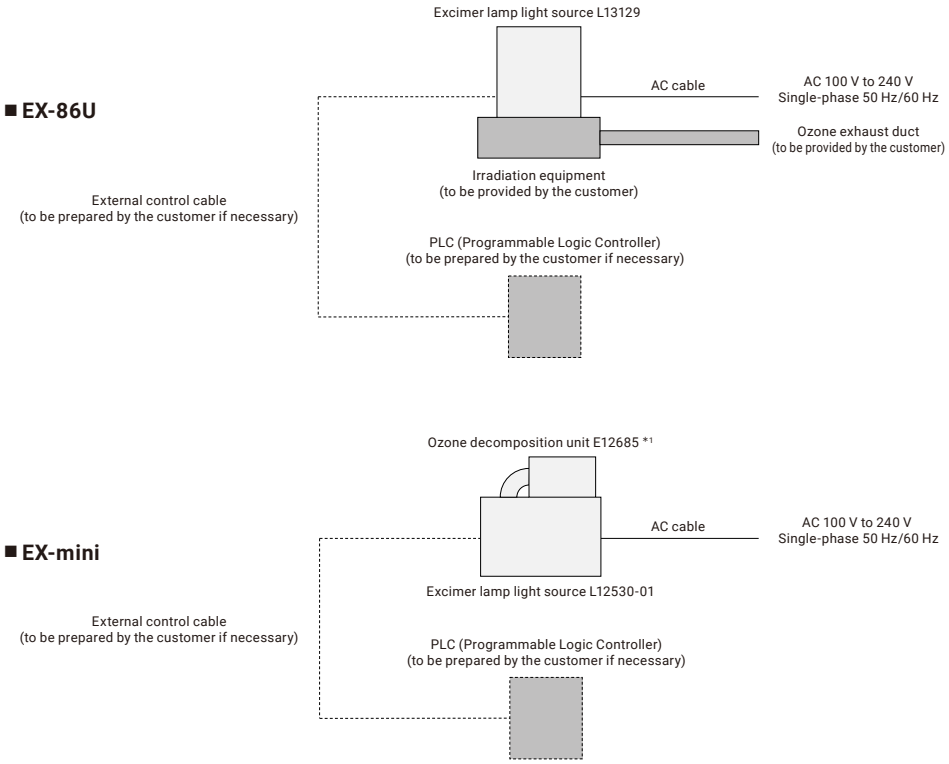
Q2. Is customization possible?

A2. Please feel free to contact us to discuss your needs based on the specifications and quantity.

■ About the light source installation environment

Q3. What will I need to operate an excimer lamp light source besides the light source itself?

A3. The items indicated on the connection diagram are required.



*1: The optional ozone decomposition unit E12685 has cooling and ozone decomposition functions, and by using it an exhaust duct is no longer required.
If E12685 is not used, use an exhaust duct.

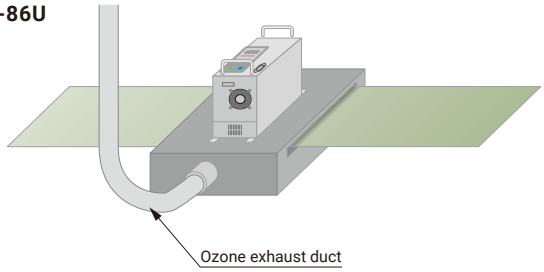
Q4. Is it necessary to enclose the irradiated atmosphere?

A4. For EX-86U, irradiation equipment is required to prevent UV leakage and to exhaust ozone.
We recommend that the irradiation equipment be made of SUS or aluminum, which are less susceptible to deterioration by vacuum UV light.

Q5. Is an ozone exhaust duct required for the irradiation equipment?

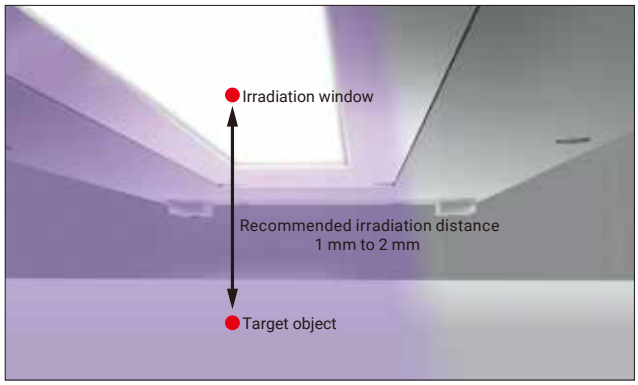
A5. An ozone exhaust duct is required.
However, for the EX-mini, the need for an exhaust duct can be eliminated by using the optional ozone decomposition unit E12685, which has cooling and ozone decomposition functions.
The required exhaust level is not specified because it depends on the volume and airtightness of the irradiation equipment. The customer should adjust the exhaust volume so that the irradiation atmosphere has negative pressure.

■ **EX-86U**



Q6. What is the appropriate irradiation distance?

A6. The irradiation distance should be as short as possible.
Since vacuum UV light has a high attenuation rate in the atmosphere, we recommend an irradiation distance of 1 mm to 2 mm. The farther the irradiation distance, the longer the irradiation time until the desired effect is obtained. Depending on the material, the irradiation time may be several tens of seconds or longer.



Q7. Is nitrogen (N_2) purge required on using an excimer lamp light source?

A7. Our excimer lamp light source essentially does not require nitrogen (N_2) purges.
However, if the irradiation distance is more than 5 mm, we recommend nitrogen purging be performed.

FAQs

■ About the target object

Q8. Are there any restrictions on target materials?

A8. Regarding surface modification, a certain effect can be expected regardless of the material.
Dry cleaning can decompose and remove organic materials but cannot remove inorganic materials.
If vacuum UV light is irradiated on materials containing halogens, such as fluororesins or chlorine-based resins, the decomposition products may adversely affect the excimer lamp light source, so do not irradiate materials containing halogens with vacuum UV light.

Q9. Are there thermal effects on the object irradiated with vacuum UV light?

A9. There is almost no thermal effect on the irradiated object.
When the surface temperature of a polyethylene (PE) plate irradiated at an irradiation distance of 2 mm was measured with a thermocouple, the result was 36 °C in 1 min and 58 °C in 10 min.

Q10. How long does the processing effect from surface modification last?

A10. While it varies depending on the material, the processing effect tends to decrease over time.
In most cases, the processing effect lasts for a few minutes, so we recommend moving on to the next process immediately after modification.

■ About light intensity management

Q11. How should the light intensity be managed?

A11. We recommend managing light intensity with our UV power meter.
You can also use your own calibrated UV power meter to manage light intensity.

■ About light source evaluation

Q12. Is it possible to evaluate the light source?

A12. We have a demo unit available, so please feel free to contact us.

■ Others

Q13. Are there any precautions for use?

A13. Since strong UV rays that are harmful to eyes and skin are emitted, be sure to wear protective equipment when handling the product (See JIS T 8141). When installing the equipment, design it to prevent the leakage of UV rays. In addition, since ozone generated in the irradiation equipment cannot be removed with the cooling exhaust duct of the lamp house, please install a separate ozone exhaust duct.

Q14. Are there any standards for the use of ozone?

A14. According to the standard recommended by the Japan Society for Occupational Health, the ozone concentration should be 0.1 ppm or less (8 hours a day, 5 days a week).

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