ozone production and surface activation

Unique advantages

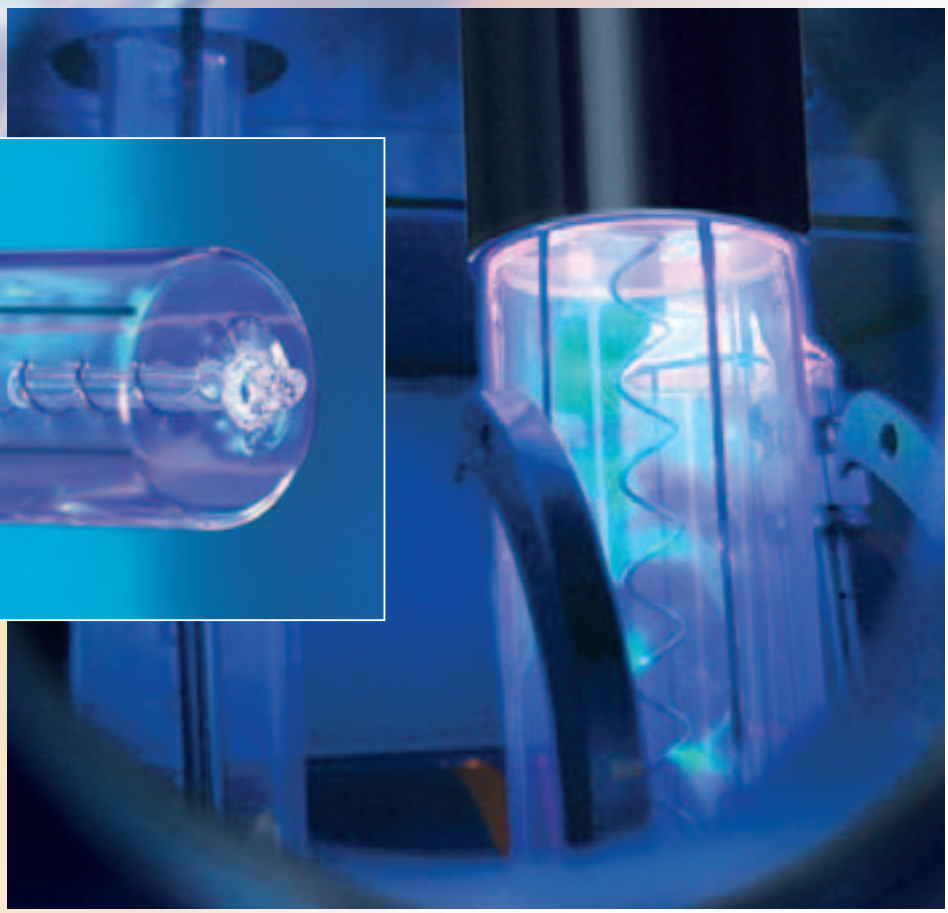
The compact XERADEX® systems offer a multitude of advantages to the user:

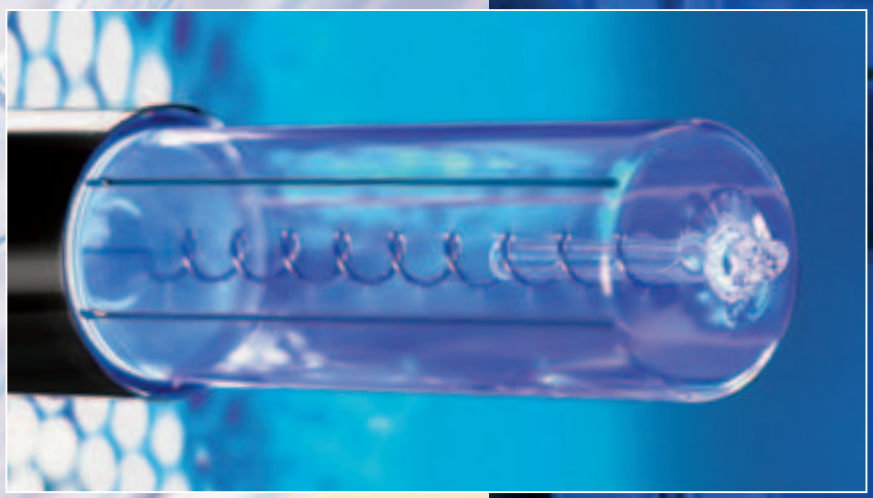
- For the first time, a highly efficient VUV radiation source is available for different demanding industrial applications
- Its 40 percent efficiency eliminates the need for cooling of the lamp – the temperature of the radiator never exceeds 80°C (176°F) “cold radiation”; low temperature processing is possible
- The system of lamp and electronic control gear is compact and easy to handle
- Convenient, compact irradiation systems are possible, minimizing space in costly cleanroom environments
- Lamp starts instantly with no warm-up phase; the ignition is independent of the ambient temperature; no shutters are necessary
- No limitations on switching cycles; capable of instant restrike with no detriment to lamp life
- PLC control output
- Operation of the lamp in different environments is possible, such as in gaseous media and under vacuum conditions
- The lamp is environmentally friendly; it contains inert gases exclusively with no mercury used

Fit for the future: OSRAM XERADEX® excimer systems

A profitable investment:
The use of the superior OSRAM Xeradex systems in place of conventional surface treatment methods is highly worthwile in spite of higher inital costs.

View inside the process chamber from the previous page

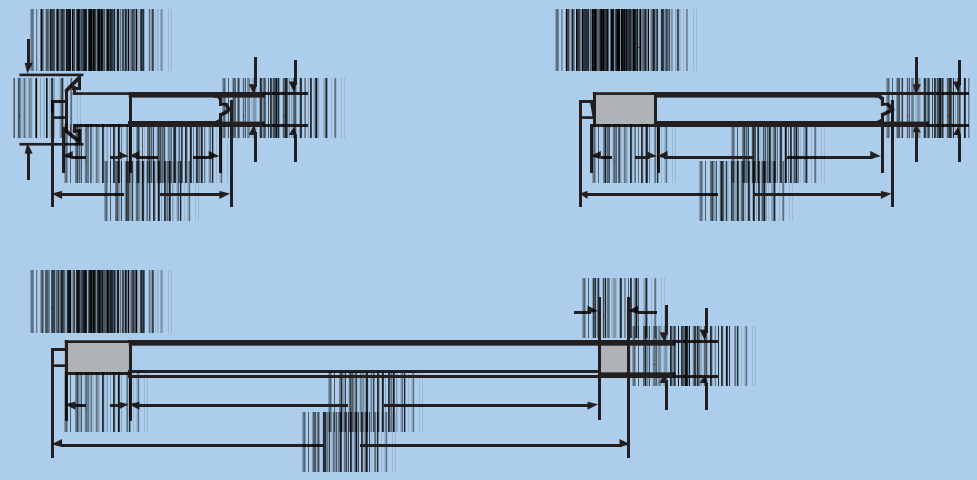




XERADEX® Excimer System 20 W lamp in operation

Technical data

Dimensions in mm



Lamp	XERADEX® 20	XERADEX® 50	XERADEX® 100
Electrical input power	20 W	50 W	100 W
VUV radiation power	8 W	20 W	40 W
Lamp length	235 mm (9.6 in.)	475 mm (18.7 in.)	760 mm (27.4 in.)
Bulb diameter	40 mm (1.5 in.)	40 mm (1.5 in.)	40 mm (1.5 in.)
Bulb length	120 mm (4.7 in.)	360 mm (14.2 in.)	620 mm (23.5 in.)
Base	DN 50 KF flange	Cylindrical	Cylindrical
Irradiance	50 mW/cm²	50 mW/cm²	50 mW/cm²
Order code	20W/L40/120/SB-SX46/KF50	50W/L40/360/SB-SX46/85	100W/L40/620/DB-SX46/85

ECG (electronic control gear)	DBD-20-110/240	DBD-100-110/240 (2 lamps)	DBD-100-110/240
Supply voltage	110 V, 120 V, 230 V, 240 V optional	110 V, 120 V, 230 V, 240 V optional	110 V, 120 V, 230 V, 240 V optional
Mains frequency	50 Hz/60 Hz	50 Hz/60 Hz	50 Hz/60 Hz
System power consumption	28 W	150 W (2 lamps)	150 W
Dimensions (length, width, height)	(223 mm, 112 mm, 55 mm)	(282 mm, 175 mm, 80 mm)	(282 mm, 175 mm, 80 mm)
Cable length (ECG–Lamp)	600 mm	600 mm (y-shape)	600 mm
Figure number	1	2	3

Other lamp lengths and bases are available on request

Note: Each radiator may only be operated with specified control gear DBD-20-110/240 or DBD-100-110/240
XERADEX® 50 must be used with 2 lamps and one ECG DBD-100-110/240

Tailor-made lamps and electronic control gear (ECG)

XERADEX® is of modular design. Different bases and bulb lengths can be combined, either for use in standard conditions (from atmospheric pressure down to 300 mbar) or at high vacuum (below 10^{-3} mbar).

For each system, the appropriate power supply must be used. Standard systems are available in 20 W, 50 W, and 100 W configurations (technical data above).

Other wattages, bases, bulb geometries and lengths are available upon request.

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Higher efficiency, higher profitability

The revolution in excimer radiation: OSRAM XERADEX® systems

SEE THE WORLD IN A NEW LIGHT

OSRAM

Highest efficiency for wafer cleaning,

The revolutionary XERADEX® xenon excimer lamp system from OSRAM opens up entirely new possibilities in process technology. Our patented pulsed mode of operation yields four times the radiation power of conventional excimer radiators: 40 percent of the input energy is converted into useable vacuum ultraviolet (VUV) radiation. Their high efficiency makes these systems ideal for very effective, flexible use in many demanding applications, such as surface treatment, ozone production, laquer frosting, water purification, and many more.

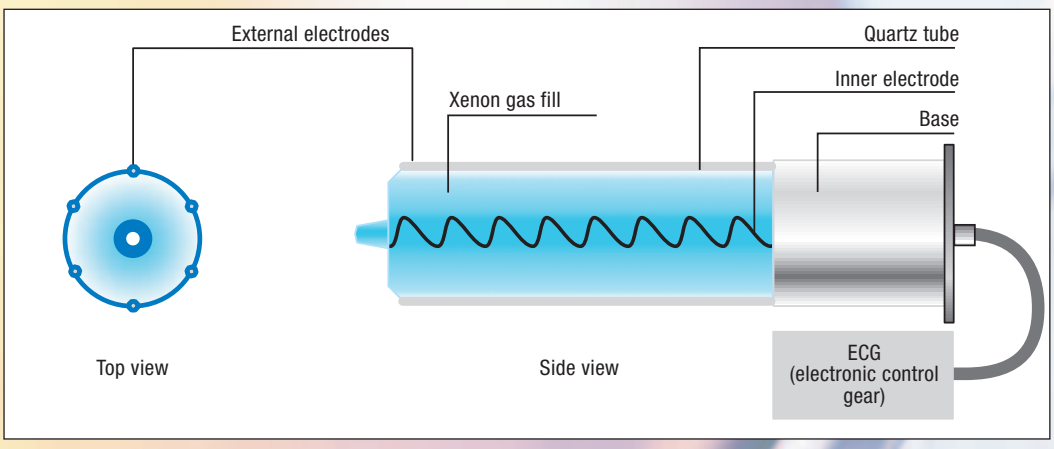
The unique operating principle leads to unbeatable efficiency – with no cooling required

The XERADEX® system has an outstanding 40 percent conversion efficiency (electrical to UV) compared to 10 percent in conventional sinusoidally driven systems. This tremendous advantage is due to our patented pulsed operation mode and to the innovative lamp design of XERADEX®. When operated using the companion electronic control gear (ECG), the result is a compact system of remarkable performance.

The quartz bulb functions as a dielectric barrier within a unique electrode system, which prevents the formation of an electric arc during the discharge phase. If xenon is the fill gas – as in the XERADEX® lamps – and if a special pulsed voltage is applied across the electrodes, unstable xenon excimer molecules (Xe_2^*) are formed from the xenon atoms. These molecules dissociate by emitting VUV radiation at 172 nm. The XERADEX® lamps emit incoherent VUV radiation.
The exceptional efficiency of these systems means no cooling of the lamp is required, as the temperature of the radiator never exceeds 80°C (175°F). This flexibility facilitates the integration of XERADEX® systems into even the most sophisticated processes and advanced production equipment.

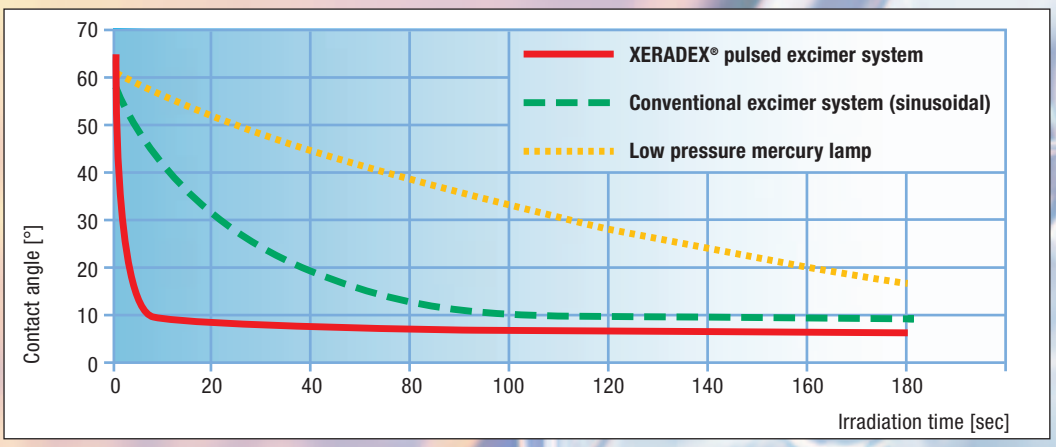
XERADEX® Systems

The structure is evident, the secret is in the detail: By means of innovative lamp design and revolutionary technology, the XERADEX® Excimer Systems achieves unprecedented efficiency



Contact angle vs. irradiation time for different radiation systems

Modification of contact angle (wettability) of glass surfaces by irradiation with UV energy



ozone production and surface activation

Versatile applications

XERADEX® unleashes the imagination and opens the doors for new concepts in process technology. Its impressive efficiency and simplicity makes this system ideal for highly cost-effective solutions in the most demanding applications, particularly in surface cleaning and modification, the production of ozone, water purification and numerous other applications.

Fast, thorough and precise: UV/ozone cleaning for semiconductor and FPD production

Due to more complex surface structures and increasing packaging densities of electronics, demand for new cleaning methods is increasing in both semiconductor and flat panel display (FPD) industries.

The XERADEX® systems open new possibilities for innovative dry cleaning processes. At 166 kcal/mol (7.2 eV), the high photon energy of the radiation breaks even tenacious molecular bonds quickly and efficiently.

The concurrent production of ozone and oxygen radicals accelerates cleaning and thus reduces process time considerably.

In particular, oxygen radicals O(^{1}D), which are the major contributor to surface cleaning effects, are formed in large quantities by the XERADEX® technology.

The UV/ozone cleaning mechanism enables processes like the removal of organics (e.g., photoresist from wafers and photo masks) and the activation of surfaces in semiconductor applications, often minimizing or eliminating the use of harsh chemical treatment steps.

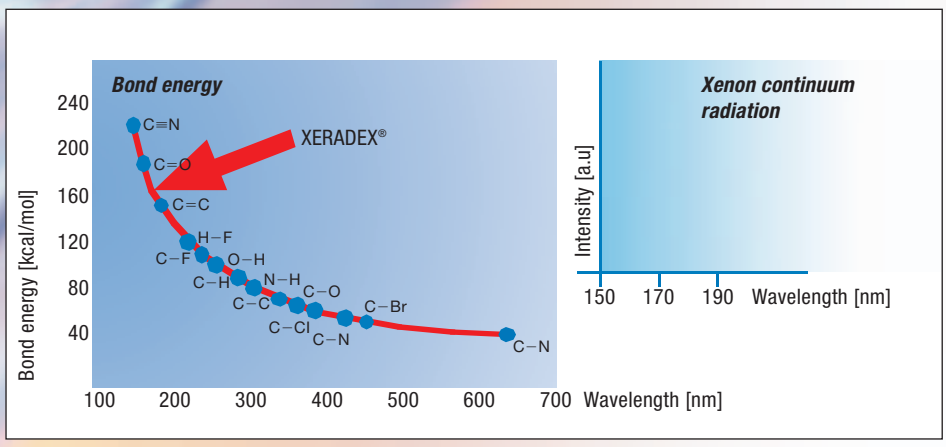
In liquid crystal display and plasma display panel manufacturing, the wettability of the mother glass must be increased for subsequent wet cleaning, coating and etching. Irradiation with XERADEX® improves the wettability of glass substrates considerably and 20 times faster than low-pressure mercury lamps.

Bond energy

At a wavelength of 172 nm, the XERADEX® Excimer Systems generate pure ultraviolet radiation – high energy at low temperature

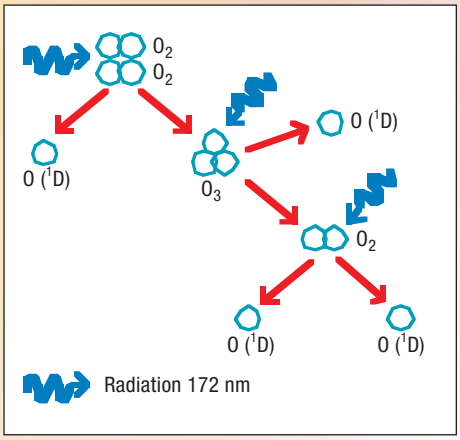
Xenon continuum radiation: 166 kcal/mol

The XERADEX® VUV excimer radiation breaks all molecular bonds with an bond energy of up to 166 kcal/mol



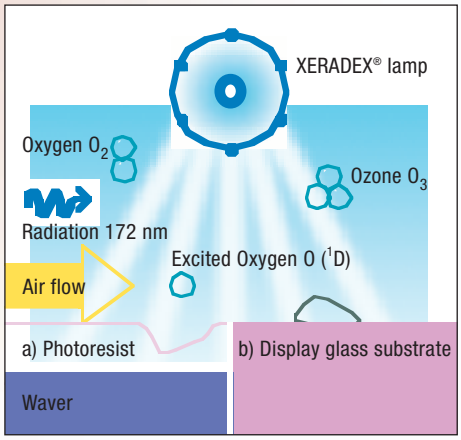
Left: Production of ozone and excited oxygen atoms

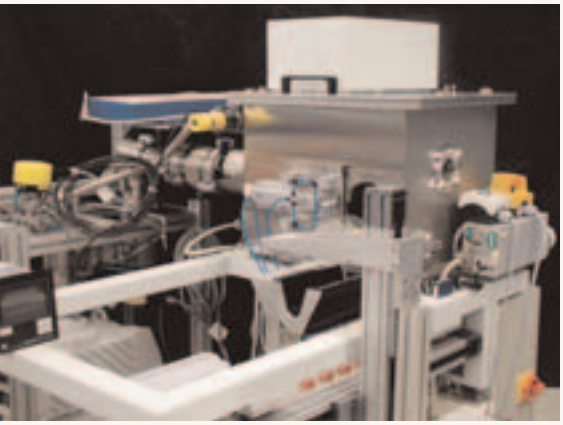
Absorption of 172 nm VUV radiation by oxygen molecules: One reaction leads to the production of ozone and then to excited oxygen. The other reaction produces excited oxygen directly



Right: UV/ozone cleaning

Combined effort for clean results: High-energy photons break molecular bonds. The ozone and excited oxygen produced by the radiation accelerates the cleaning process.
a) Photoresist removal
b) Display cleaning





Vacuum process chamber

Fully automatical dual side treatment of glass and other substrate materials under different pressures and process gases

Surface activation and modification

- Removal of polymers:
  - Removal of organic residue
  - Cleaning of photo masks
  - Improved coating properties of photosensitive resist
  - Improved yield of deposition
  - Resist removal
  - Etching (e.g., Teflon)
- Surface treatment:
  - Activation of surface bonds
  - Adjustment of wetting angle
  - Higher coating yield
  - Better bonding performance
  - Faster and better vacuum in process chambers
- No external ozonator required for the UV/ozone cleaning process
- Photo induced metallization at room temperature on various surfaces, e.g., plastics
- Photo induced CVD at lower process temperatures (high k-deposition, high growth rate, low temperature)
- Laquer frosting: microfolding of radiation curable coatings to generate dull surfaces

Ozone production

- Direct dissociation of oxygen by the high energetic XERADEX® radiation and formation of ozone: no by-products, such as NOx are produced
- Highly efficient ozone production with the XERADEX® lamps. Ozone yield: 82 g/kWh
- No cooling required
- In-situ production of ozone

Water cleaning and ultra-pure water preparation

- Efficient production of reactive -OH radicals
- Complete mineralization of organic components
- Preparation of ultra-pure water

Other fields of application

- Evaluation of fluorescent substances
- Photochemical experiments

Irradiation of glass substrates for improving wettability before deposition of magnetic layers