

Deuterium light sources

30 W deuterium sources

- Smooth continuous UV spectrum
160 - 370 nm
- High UV output with little VIS and IR;
therefore ideal for UV spectroscopy
- Systems are simple and safe to operate

Deuterium lamps are arc lamps filled with 99.7 % pure deuterium at low pressure (some Torr). They produce an intense UV continuum from 160 - 370 nm and have some structure above 400 nm. For typical spectral distribution compared to arc or halogen lamps go to "Lamp spectra and irradiance data" on www.lot-qd.com/lightsources ("Basics").

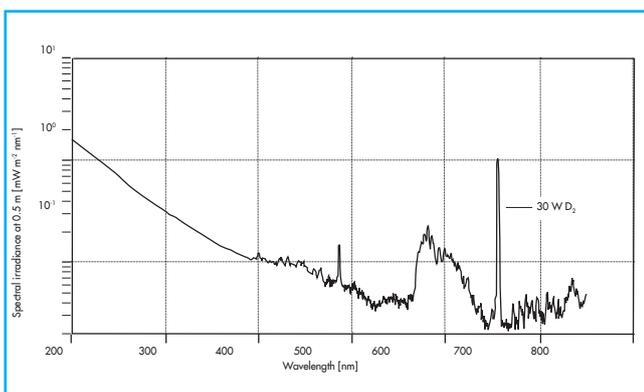
Special feature

Deuterium lamps have advantages in UV spectroscopy, where stray light often is a significant problem. Sources like halogen or arc lamps have blackbody type spectra: relatively low UV and high VIS and IR output. Most detectors show higher response in the visible. As a result the signal produced by scattered visible light may exceed the real signal in the UV. But with D₂ lamps, a high signal to noise ratio is obtained for many UV measurements due to the intense continuum from the vacuum UV to 400 nm, and the low VIS and IR output.

Different lamps

We offer several D₂ lamps, differing in their window/envelope material, arc diameter and electrode technology. The "high stability lamps offer longer life and higher stability than the "conventional" lamps. The "high intensity" lamps provide two times more output intensity compared to the "conventional" D₂ lamps.

All of these are rated at 30 W. The lamps with small arc diameter produce both the highest irradiance and radiance (see fig. below).



Some models have UV glass envelopes with a lower transmission between 167 - 250 nm. The 167 nm line (responsible for most of the produced ozone) is completely absorbed.

Ozone has a strong absorption band in the UV peaking at 250 nm. If the gas remains in the lamp housing and condensing system or a long enclosed optical path, then the observed UV radiation level may change accordingly and lead to misinterpretation of lamp or sample performance (especially with single beam measurements). A lamp with UV glass envelope reduces this problem.

D₂ lamps are either cylindrical in shape or they can have a nose which emerges from their side. A flat window is sealed to the nose giving high transmittance during lamp life.

Housing

Our 150 W lamp housing is a versatile, low noise housing. The natural convection and radiation cooling of this housing keeps the deuterium lamps at the proper operating temperature. We recommend the F/1.3 or F/1.0 UV quartz condenser for light collection. With a secondary focusing lens you can image the arc onto fiber optics or monochromator slits. For more details about the lamp housing go to "50 - 150 W arc light source" on www.lot-qd.com/lightsources ("Arc light sources").

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Noise and drift

The noise comes from the performance characteristics of the cathode and lamp operating conditions. Typical values are 0.01 - 0.1%.

The lamp's contribution to drift is mainly from the gradual reduction in output that comes from the natural ageing of the lamp. This is typically better than 1 % per hour. Other factors that considerably contribute to drift are:

Thermal operation conditions, stability of anode current and ozone concentration.

The lamp output is influenced by the ambient temperature. The temperature coefficient at shorter wavelengths typically is $-0.3\%/^{\circ}\text{C}$, resulting in a drop in output with an increase in temperature. Therefore the lamp should be protected from direct air flow.

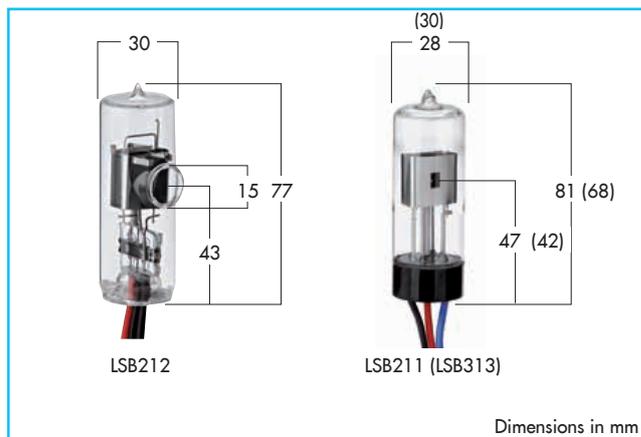
Ozone has an absorption band in the 220 - 280 nm region. Changing the gas concentration (and therefore absorption) will result in drift.

D₂ lamps and fibers

UV radiation below 260 nm causes "solarization" of quartz. High-energy UV photons may generate defects, which cause significant transmittance losses at shorter wavelengths. The fiber becomes unusable at wavelengths below 260 nm. This effect can be reduced (for a period of time) by special manufacturing processes. Our solarization resistant fibers (600 and 1000 μm) withstand prolonged DUV radiation for up to 1.5 years.

A word on safety

Deuterium lamps emit dangerous levels of UV radiation. Always wear UV protective eyewear and gloves. We recommend using an electronic shutter to block the beam when the source is not in use. For DUV work, vent the ozone to the outside. In a well ventilated laboratory, none of our lamps produce medically concerning concentrations of ozone.



Ordering information

For a complete D₂ light source you need:
Lamp housing and condensing optics, D₂ lamp, lamp mount, interface and power supply

Housing

LSH102	Lamp housing (no optics, no interface)
LSC115	UV quartz condenser; F/1.3 ; 33 mm aperture
LSC110	UV quartz condenser; F/1.0; 33 mm aperture
LSA140	Lamp mount

D₂ lamps and specifications

	Arc Ø [mm]	Envelope or window material	Spectral output [nm]	Average life [h]*	Type
LSB211	1.0	Synth. quartz	160 - 400	1400	1
LSB212	0.5	Synth. quartz	160 - 400	1400	1
LSB313	0.5	UV glass	185 - 400	2000	2
LSB314	0.5	UV glass	185 - 400	2000	3
LSB315	0.5	Synth. quartz	160 - 400	2000	3

Filament voltage: 10 V. Anode voltage: 60 - 90 V. Rated current: 300 mA

*) To half of initial intensity in UV range, at 300 mA.

Type 1: conventional

Type 2: high stability

Type 3: high intensity

Power supply and interface

LSN121	Power supply for deuterium lamps Anode current 300 mA
LSE130	Interface for deuterium lamps

Fiber optics

LLS306	UV fiber, solarization resistant, 600 μm core
LLS310	UV fiber, solarization resistant, 1000 μm core
LSZ152	Fiber coupler for direct mounting to the condenser
LLZ002	Adapter for fibers with SMA termination