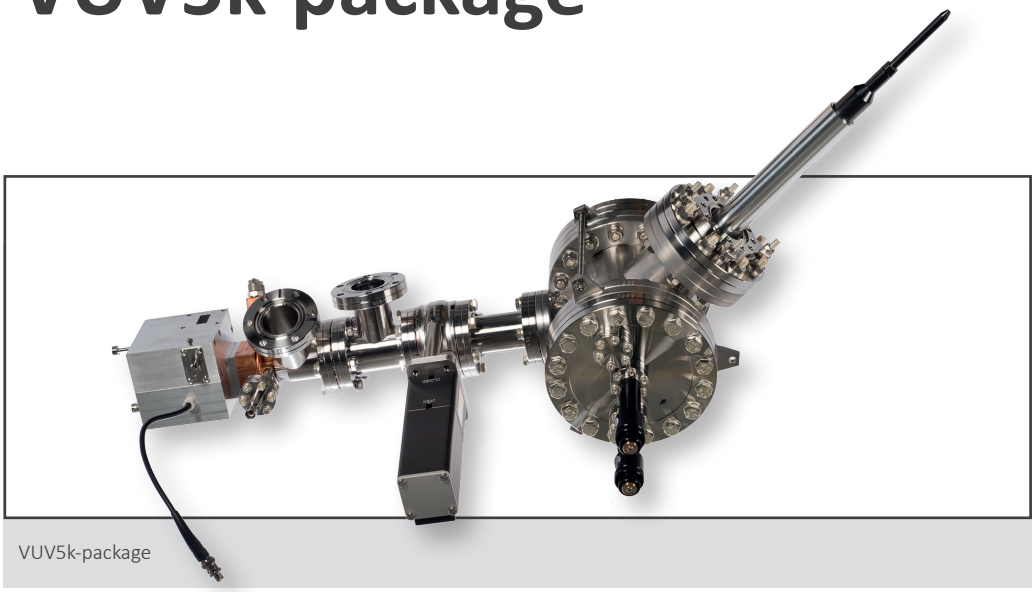
scientaomicron

VUV5k
Retractable VUV5k-package

The retractable VUV5k-package is the combination of the VUV5000 UV-source and the VUV5047 UV-monochromator. These components form a unique light source.



VUV5k-package

The VUV5000 is the most intense He-light source on the market and has the narrowest line width. The unique feature of the VUV5047 UV monochromator is that it can utilise the full output of the VUV5000 giving extremely high intensity at the sample even after monochromatisation. Another feature of the VUV5047 has a 60 mm exit capillary retraction further described below. The retractable VUV5k-package also includes the VUV5051 differential pumping stage and the VUV5045 monochromator entrance valve. The retractable VUV5k-package allows a working pressure in the 10^{-11} mbar range during lamp operation.

VUV5000 Photon source
The Scienta Omicron VUV5000 photon source is based on a He-plasma, generated with the ECR (Electron Cyclotron Resonance) technique. A microwave generator is coupled to a small discharge cavity in a magnetic field tuned to the microwave frequency to meet the ECR condition. The photon flux emitted through a 2 mm aperture is about 500 times higher than that from conventional discharge VUV sources. Still, Scienta Omicron VUV 5000 operates at 1 meV resolution since the ion temperature is low due to the small microwave energy coupling to the ions and the low discharge pressure.

The excellent stability of the Scienta Omicron VUV 5000 makes it ideal for measurements such as studies of ultra-thin films and nanomaterials, requiring extremely high intensity and long measurement series. In addition, the ~1 meV bandwidth allows high resolution gas phase and cluster measurements.

VUV5047 UV-monochromator
The Scienta Omicron VUV5047 is a compact monochromator optimised for high efficiency at both He I and He II. Complete separation of He Iα and He Iβ is achieved while maintaining a 1 meV bandwidth. The VUV5047 also includes a retractable exit stage with inter-changeable capillaries and port aligner. 60 mm linear travel ensures compatibility with the Scienta Omicron Cryo manipulator models. The in-vacuum capillary-retraction is done by a turn on an easily accessible knob. Three capillaries are included and delivered with the set-up.

VUV5045 Monochromator Entrance Valve
The VUV5045 is a manual shut-off valve placed between the UV-source lamp head and the UV-monochromator to enable easy servicing of the UV-source without venting the experimental set-up.

VUV5051 Differential pumping addition
VUV5050 UV-source head differential pumping addition. The VUV5051 includes both an entrance and an exit capillary in order to maximise the differential pumping efficiency.

Technical Highlights:

- Extremely high photon flux
- Unchallenged stability and uptime
- Very low maintenance requirements
- Small spot option (with ARPES Capillary Upgrade)
- Very high resolution

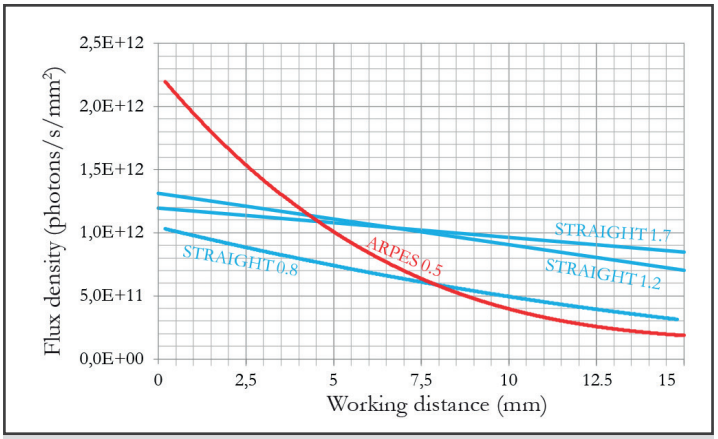


Figure 2: ARPES Capillary Upgrade
The retractable VUV5k-package can be equipped with a newly developed exit stage. This exit stage contains a capillary custom made from glass with an exit inner diameter of 0.5 mm. This option offers the highest flux density in a very small spot. The figure to the right shows the flux density for the different capillaries available with the Scienta Retractable VUV5k package.

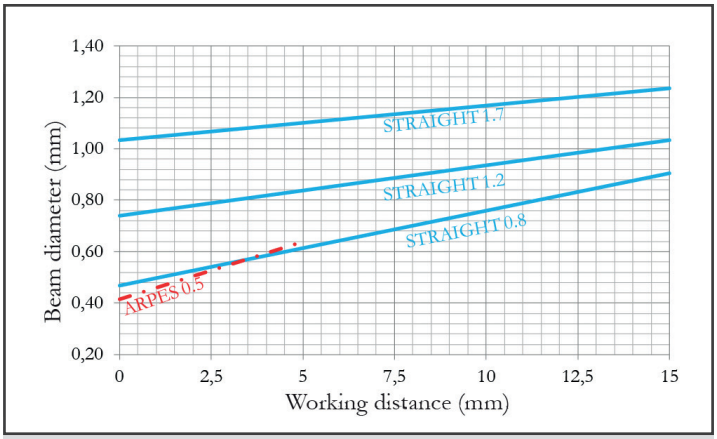


Figure 3: UV spot sizes
The spot size of the retractable VUV5k package depend on the mounted exit capillary. Generally, the spot size descreases with capillary inner diameter. For optimum performance, we recommend the ARPES capillary upgrade. Note, however, that in order to benefit from the increased performance of the ARPES capillaries, the working distance need to be 5 mm. Obtainable spot sizes (Gaussian FWHM) are shown above.

Technical Data

Technology Overview

Wavelengths emitted:
584 Å (21 eV), FWHM ≈ 1 meV
304 Å (41 eV), FWHM ≈ 2 meV
537 Å (23 eV), FWHM ≈ 1 meV

Total VUV flux :

Capillary	Flux (photons/s)
ARPES 0.5 mm	$3.2*10^{11}$
STRAIGHT 0.8 mm	$2.1*10^{11}$
STRAIGHT 1.2 mm	$6.0*10^{11}$

He inlet flange: 16 CF
Pump flanges: 3xNW35CF
1xNW100CF

Bake-out temperature: 120°C
Microwave generator: Klystron amplifier, 10.0 GHz, 250 W
Mains power: 190-240 V, 16 A, 50-60 Hz
Microwave generator cooling: Forced air
Source head cooling: Water 3 l/min, < 20 ºC

Monochromator gratings:
- Geometry: toroidal
- Dimensions: 80x30 mm
- Coating: Pt
- Groove density: 1200 l/mm
- Groove profile: laminar, ion-etched
- Efficiency He I, 1st order: 10%
- Efficiency He II, 1st order: 20%
- Efficiency He II, 2nd order: <0.25%
- Bake-out temperature: <120°C

Capillary retraction: 60 mm
Mounting flange: NW35CF
Port length: 200 mm
Working distance: 10 mm (straight capillaries)
5 mm (ARPES capillaries)
UV spot size: See below
UHV suitability:
10^{-11} mbar range in analysis chamber during operation (with suitable pumping)

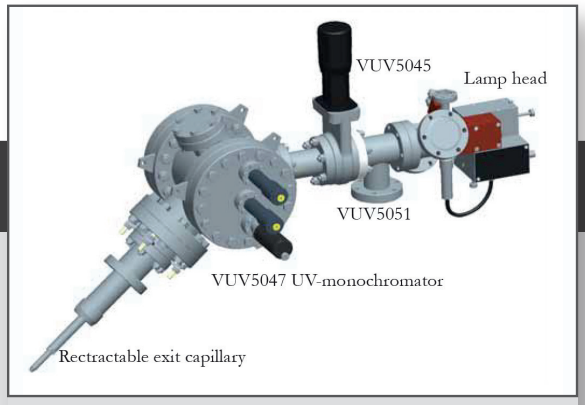


Figure 4: CAD illustration of the retractable VUV5k-package indicating the parts described.

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