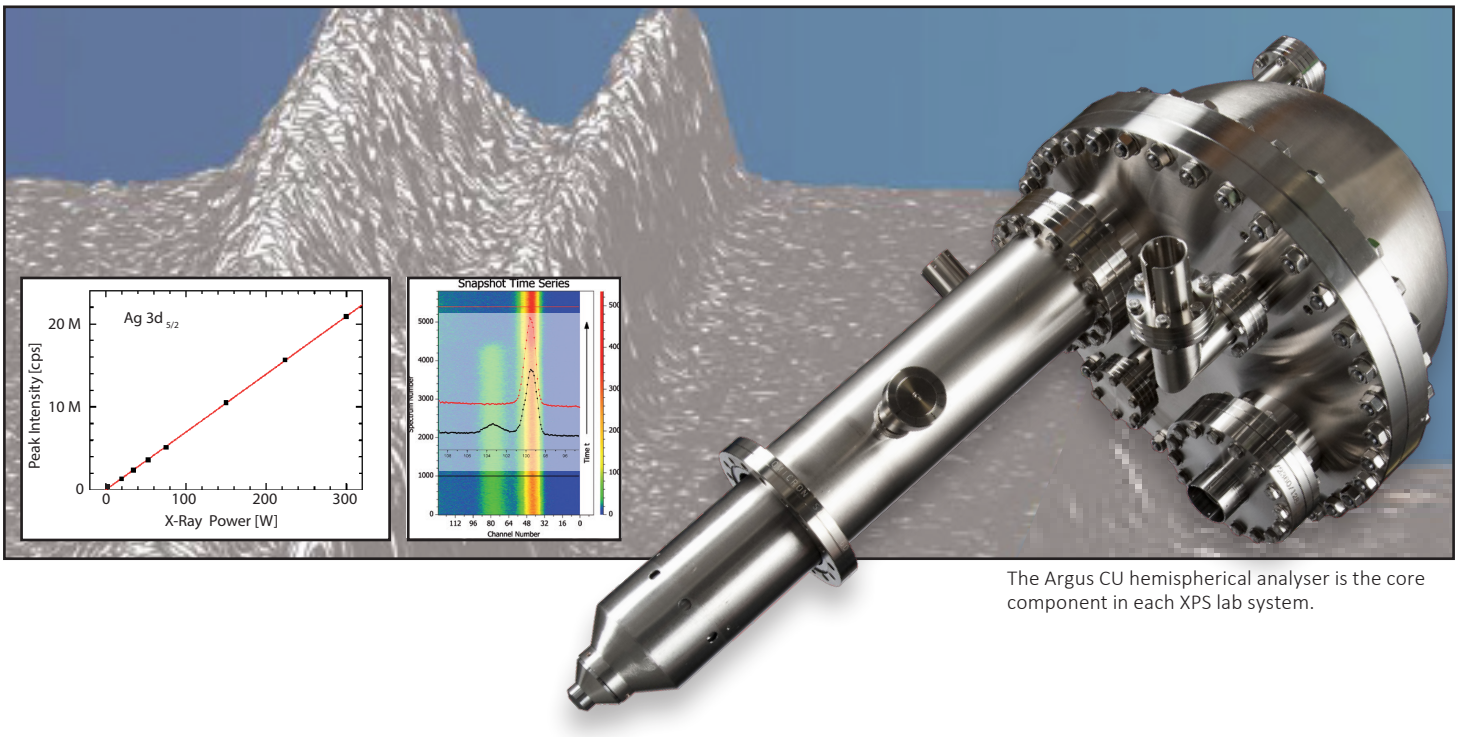
# ARGUS CU

## High Performance XPS Analyser for Ultimate Quantitative XPS




The Argus CU hemispherical analyser is the core component in each XPS lab system.


**Key Features:**

- Compression Lens for highest count rates and excellent sensitivity
- Quantitative XPS powered by true counting Multi-Anode Detector
- Linear Response up to the Highest Count Rates
- Excellent Dynamic Range
- Scanning, Snapshot, and Dynamic XPS Modes
- Chemical State Mapping

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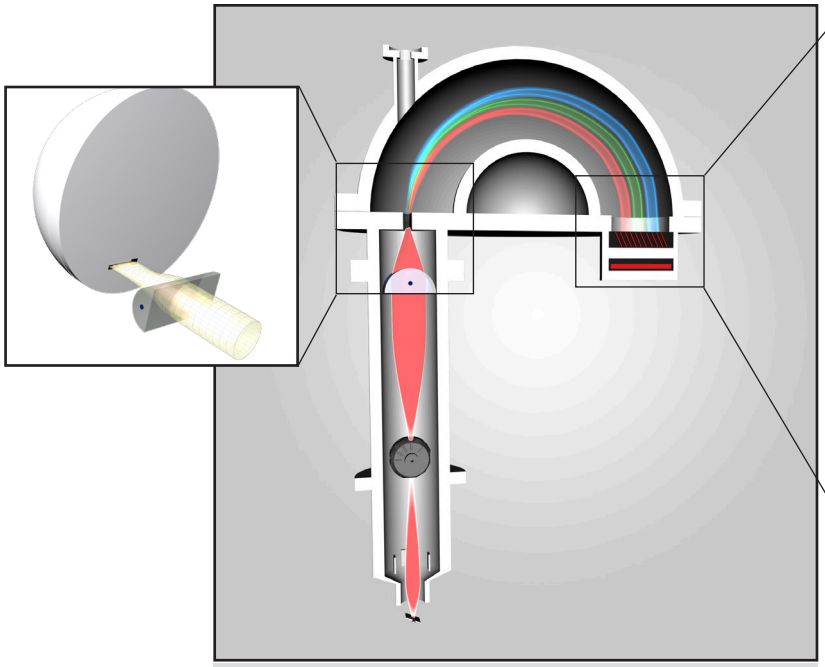
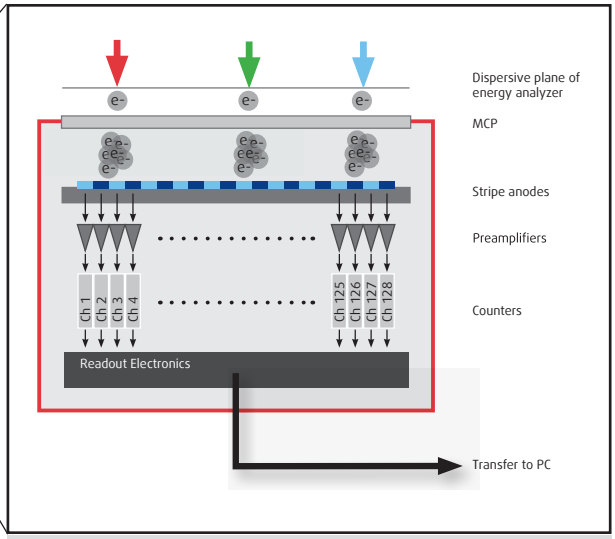
# ARGUS CU

## An ideal analyser for quantitative XPS



Aperture defining the sample area seen by the analyser.

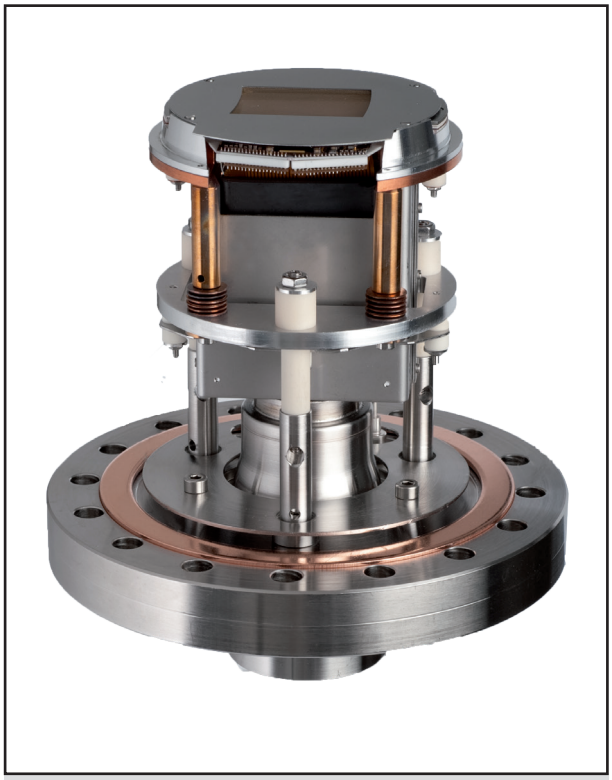



Detector scheme: each electron impact starts a cascade of electrons propagating through the MCP stack. The amplified electron signals are collected by a stripe anode array which is connected to 128 dedicated amplifiers and counters. Dedicated in-vacuum readout electronics ensure fast data transfer to the ex-vacuum electronics.

**The Argus CU is a high-performance hemispherical analyser designed for precise photoelectron spectroscopy and quantitative analysis. Its multi-channel detection technology provides fast, reliable XPS data with superior sensitivity and efficiency, surpassing traditional channeltron-based systems.**

The analyser features an optimised compression unit that transforms a divergent electron beam into a flat beam at the hemisphere's entrance. This design eliminates transmission losses and boosts sensitivity, enabling high count rates and efficient data acquisition. The hemisphere acts as a non-magnifying lens, projecting the image at the entrance slit directly to the exit with a 1:1 ratio, ensuring optimal beam alignment.

In the heart of an Argus CU there is a unique 128-channel striped-anode detector with low-noise pulse counters, providing exceptional energy resolution and high-count rates. The detector therefore records at different energies in parallel (as the number of channels) while integrating signals along the non-dispersive plane. This design minimizes crosstalk, ensures accurate quantitative analysis, and delivers reliable, high-performance data for both routine and advanced analyses.



Inside the new Argus CU hemispherical analyser: 128 channel multi-anode detector with in-vacuum counter electronics.

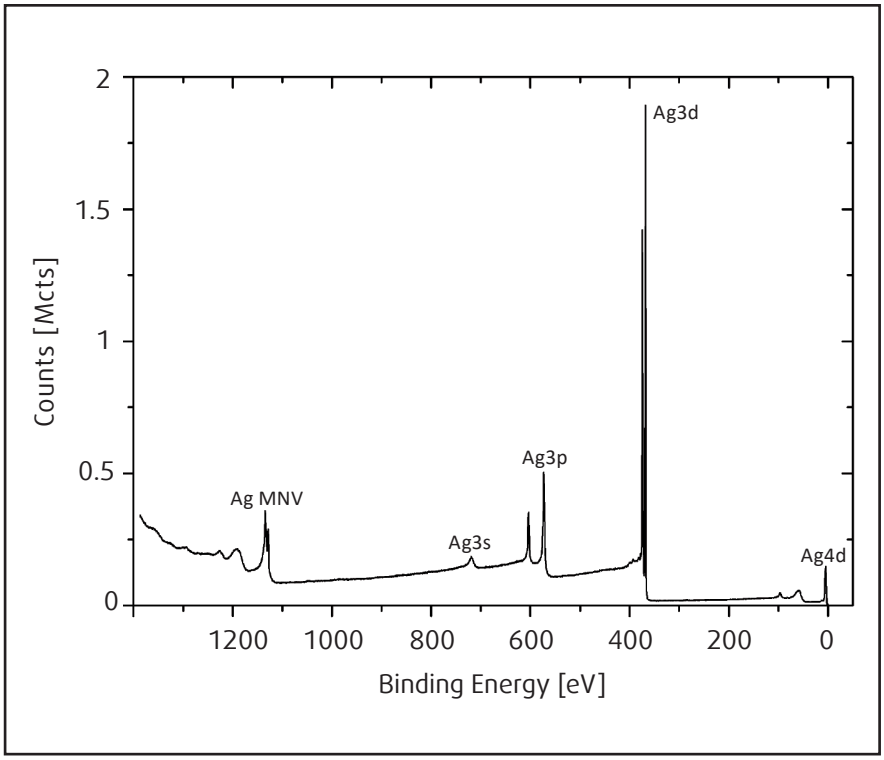
# EXCELLENT SENSITIVITY AND LINEARITY

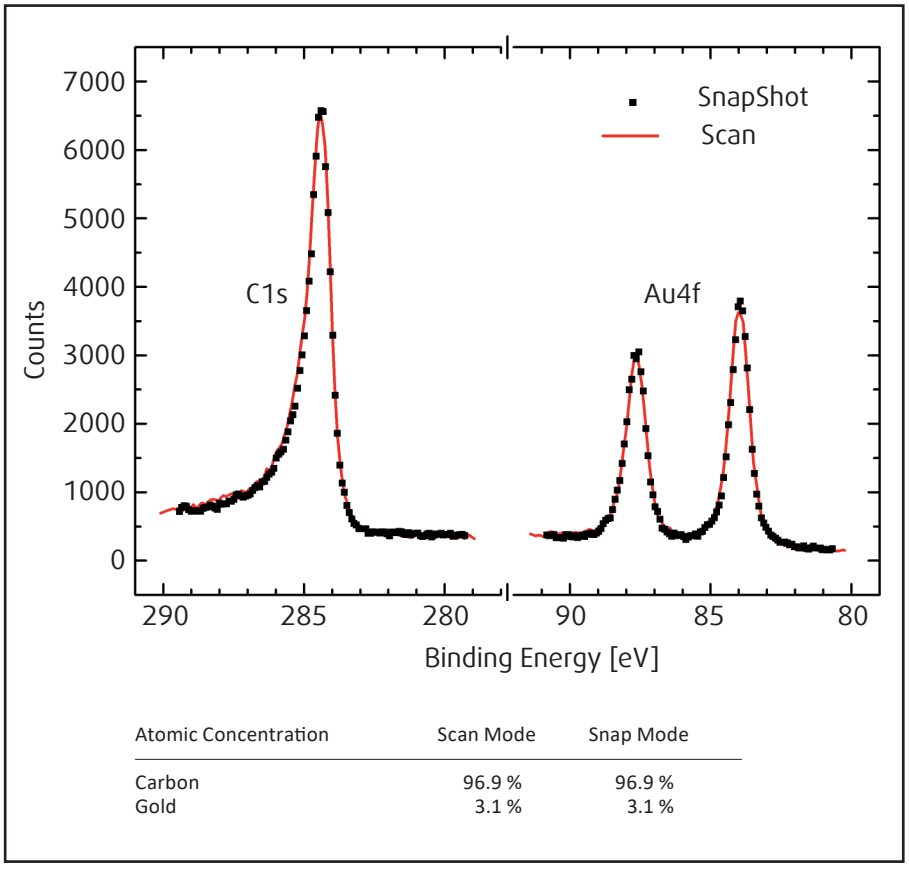
## Rapid data acquisition

Photoelectron spectra often require a wide range of count rates, requiring a linear, well-characterized detector for accurate quantification, which is exactly what Argus CU provides. Paired with the Matrix XPS control system, it streamlines data acquisition, boosting efficiency and enabling real-time (dynamic) experiments, previously unattainable with conventional detectors.

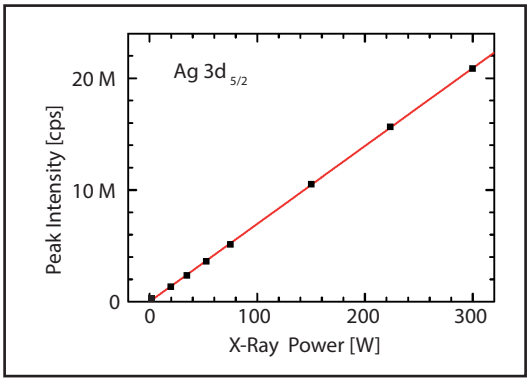
The Argus CU's hard-wired amplifiers and counters eliminate non-linear artefacts common in other snapshot detectors, ensuring precise, artefact-free parallel detection even at high count rates.

- Exceptional linearity
- Sensitivity
- Snapshot XPS
- High-speed depth profiling
- Rapid chemical state imaging




| Atomic Concentration | Scan Mode | Snap Mode |
|---|---|---|
| Carbon | 96.9 % | 96.9 % |
| Gold | 3.1 % | 3.1 % |




The snapshot mode enables faster data acquisition than conventional scanning systems, recording energy intervals in milliseconds with excellent resolution and accuracy. Its 128-channel design ensures optimal snapshot performance. This mode replaces narrow scans for individual peaks, which typically have longer acquisition times while maintaining precise and reliable results. This measuring mode is ideal for complex samples, depth profiling, and chemical mapping, offering fast and efficient results.

# SNAPSHOT MODE

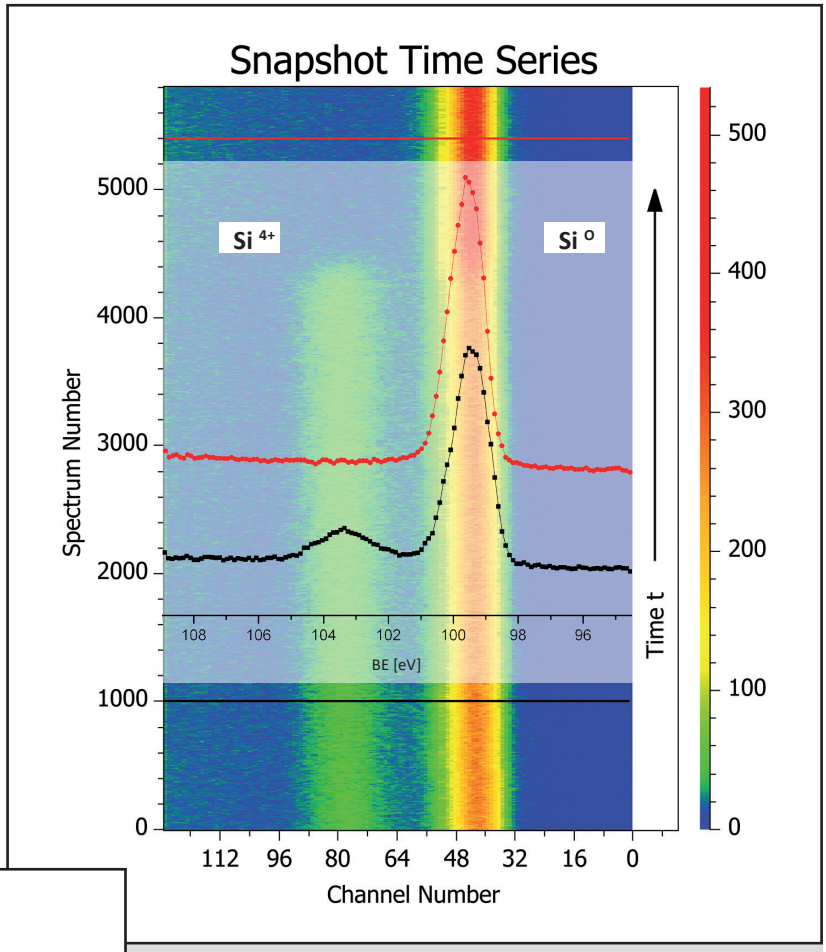
## Discover the dynamics in XPS

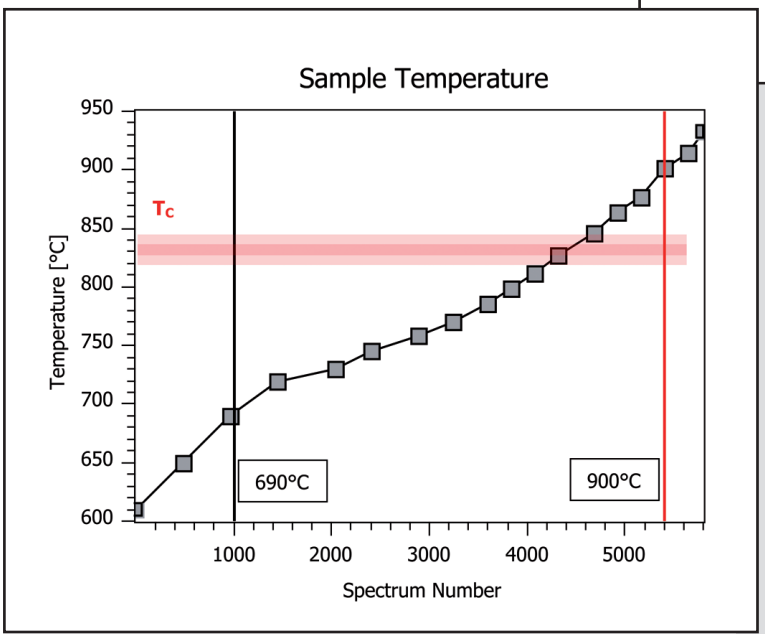
**Dynamic XPS has become a powerful tool, enabled by advances in analysers and detectors, overcoming limitations of channeltron technology.**

Key to dynamic XPS is fast variation of measurement parameters (e.g., sputter time, temperature, light) combined with an optimised analyser and 128-channel detector for rapid data acquisition. The detector achieves high energy resolution without exit apertures, maximizing sensitivity, dynamic range, and linearity, even at high count rates.

An example of dynamic XPS with the Argus CU shows thermal deoxidation of a SiO2 layer, where snapshot mode with high repetition rate and good resolution identified the critical deoxidation temperature at 850 °C.

Snapshot mode is ideal for real-time XPS observations of fast processes, such as changes in chemical composition in the millisecond range.




The measurement tracks XPS spectra while removing an in-situ grown $SiO_2$ layer from a Si substrate by ramping the temperature from 600 °C to 950 °C within one hour.

Over 6,000 snapshot spectra (0.5 s acquisition times) captured the in-situ transformation of $Si^{4+}$ to $Si^0$ during the heating process. The Si-oxide was fully removed within a narrow temperature range around 850 °C, with the process taking 2.5 minutes

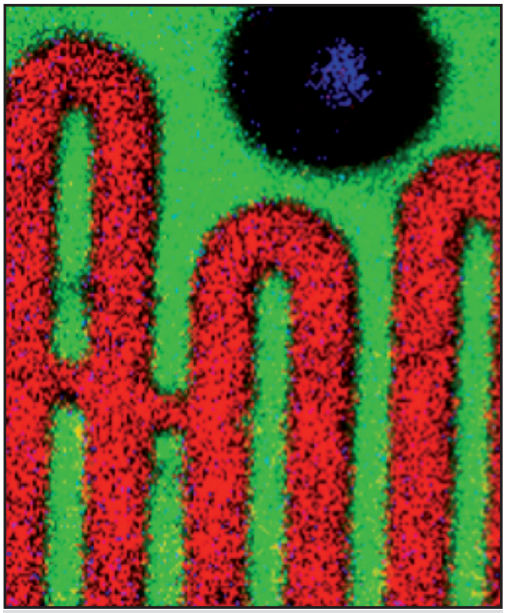
# COMPLEX CHEMICAL STATE MAPPING

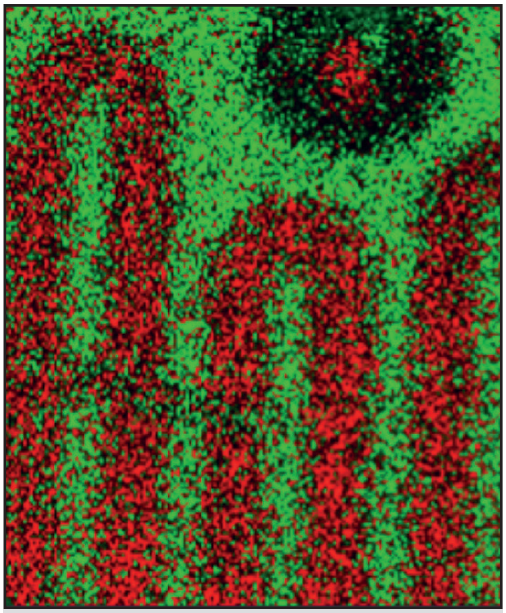
## Selected area XPS and deflector scanning

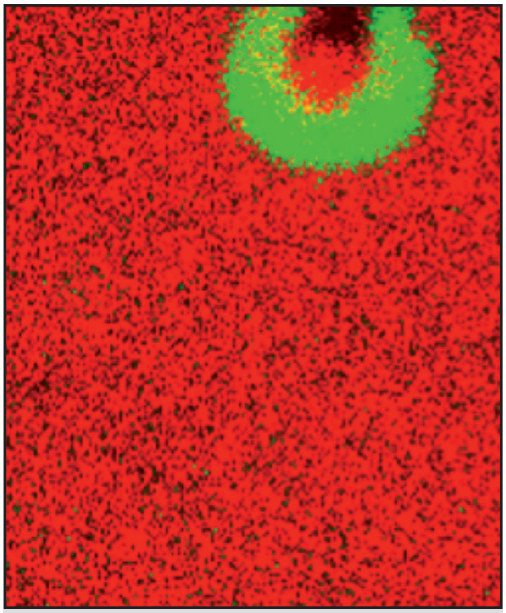
The Argus CU input lens design, with proven imaging scan deflector technology, enables fast and reliable chemical state mapping of samples. Instead of serially scanning peak count rates, the multi-channel detector records a full energy interval, capturing the XPS peak, tails, and background at each pixel. This data is acquired quickly with lateral resolution down to <60 µm, defined by the analyser's aperture.

Off-line analysis of these spectral maps reveals complex local chemistry. The deflectors scan the analysis area across the sample while keeping the sample and X-ray source fixed. This technology also allows local spectroscopy without moving the sample stage.

The Argus CU's dedicated aperture mechanism minimizes tailing, enabling accurate analysis of small features and well-defined image resolution. This technique, demonstrated in a study of a light-dependent resistor (LDR), maps 40,000 snapshot spectra for each of 8 elements (Cd, In, Ag, S, Sn, Ni, C, O). The maps clearly show the structure of the CdS-based active layer on the ITO substrate, providing valuable insights for monitoring and improving fabrication processes.

# Technical Data

**Acquisition modes**

- Scanned
- Snapshot

**XPS ***

Intensity vs FWHM. Intensities and FWHM for Ag $3d_{5/2}$-photo electrons excited by 300 W Mg Kα (DSX400).

| Peak-width FWHM (eV) | Countrate ** |
|---|---|
| 0.85 eV | 7 Mcps |
| 1.00 eV | 27.0 Mcps |

**Monochromated XPS**

Intensity for Ag $3d_{5/2}$ photoelectrons excited by monochromatized Al Kα, in high magnification mode.

| Peak-width FWHM (eV) | Countrate ** |
|---|---|
| 0.60 eV | 0.9 Mcps |
| 1.00 eV | 2.7 Mcps |

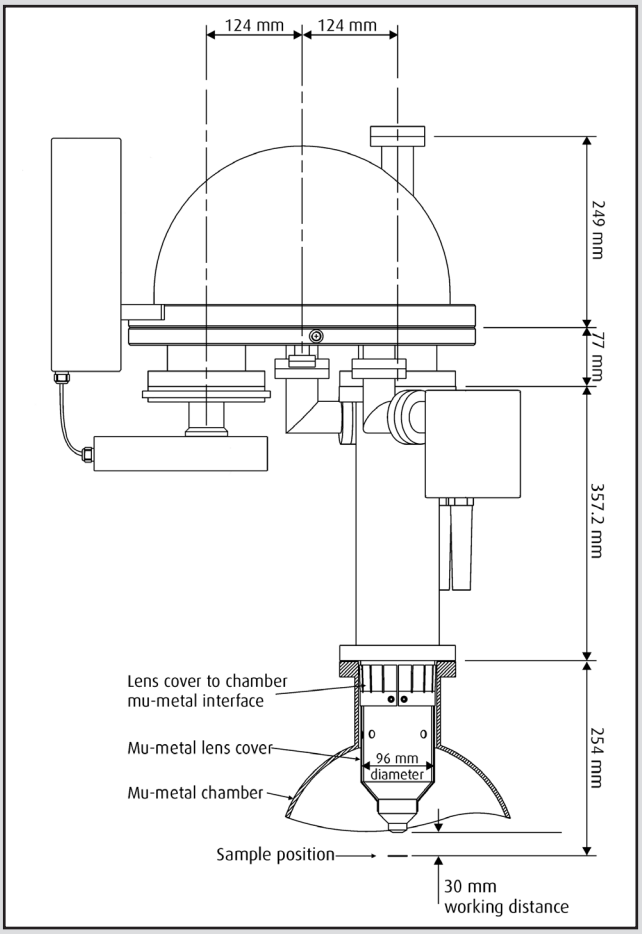
**UPS on solids**

Intensity and FWHM of Fermi edge width and Ag 4d peak countrate excited by a HIS 13 VUV source (He I).

| Resolution 16-84 % [meV] | Countrate |
|---|---|
| 120 | 9 Mcps |

* minimum 120 active channels in the detector

** 90° angle between Argus CU analyser




Get in touch with us at **scientaomicron.com/ARGUSCU**