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ESCALAB QXi XPS Microprobe

Quantitative imaging and multi-technique surface analysis



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Designed for performance

The Thermo Scientific™ ESCALAB™ QXi XPS (X-ray Photoelectron Spectroscopy) Microprobe is the latest development in the highly successful ESCALAB product line. The ESCALAB QXi XPS Microprobe is an expandable, optimized, multi-technique platform with unparalleled flexibility and configurability. Cutting-edge technology, driven by intuitive software and hardware, leads to world-class results and productivity. System control, data acquisition, processing and reporting are seamlessly integrated by the powerful Thermo Scientific Avantage™ Data System.



Leading analytical performance

- Quantitative spectral imaging
- Fast parallel imaging
- Signature-free detector
- Best-in-class energy resolution
- Microfocused monochromator
- Compositional image analysis
- Auto-tuning, high-flux ion profiling source
- Turn-key charge compensation

Streamlined operation

- Advanced automation
 - Selection of analysis area and angular resolution
 - Automatic gas handling and vacuum control
 - Automated Sample Exchange (optional)
- Calibration on demand
 - Energy Scale and transmission function
 - Ion gun alignment and beam focusing
- Point-and-click sample navigation and analysis setup
 - Live view of analysis position
 - High-intensity illumination

Flexibility by design

- ISS and REELS as standard
- Preloc chamber as standard
- Automated UPS option
- Field emission electron source option for AES/SEM/EDS
- IPES (on request)
- Optional preparation accessories include:
 - Fracture Stage
 - Specimen heating/cooling
 - Sputter cleaning ion gun
 - High-pressure gas cell (on request)

Versatile tool for surface analysis

Large area spectroscopy (LAXPS)

The combination of high-efficiency lenses and detectors ensures the highest sensitivity for large area spectroscopy applications. Acquire high-resolution spectra in seconds.

- Maximum chemical detectability
- Six-channel electron multipliers for maximum dynamic range
- Twin crystal monochromator for maximum X-ray flux

Small area spectroscopy (SAXPS)

The ESCALAB QXi XPS Microprobe provides fast and precise small area analysis.

- Small feature analysis from greater than 900 μm to less than 5 μm
- Software-enabled feature selection via real-time iris and image control

Fast parallel imaging (XPI)

Parallel imaging produces rapid, high-resolution XPS chemical images.

- Less than 3 μm chemical imaging resolution
- Signature-free detection system
- Imaging of both large and small features
- Single-input lens and analyzer for imaging and spectroscopy
- Collection of image stacks for quantitative chemical state imaging
- PCA for composition image analysis

Energy resolution

Excellent energy resolution is achieved with the combination of advanced analyzer design and a twin-crystal microfocusing X-ray monochromator.

- Identification and quantification of individual chemical states
- Resolution of overlapping peaks and subtle differences in surface chemistry

Insulator analysis

Insulating samples are easily analyzed using state-of-the-art charge compensation.

- Automated analysis of insulators
- Excellent performance under all analysis conditions

Depth profiling

The advanced ion gun provides high current density even at low beam energy. Auto-tuning of the ion gun ensures optimum crater quality and profiling speed.

- Azimuthal and off-axis sample rotation during profiling
- Full computer control of the ion gun operation modes
- Automated gas handling for etch rate repeatability

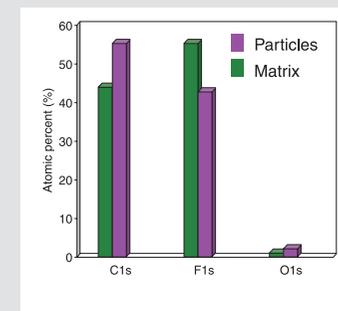
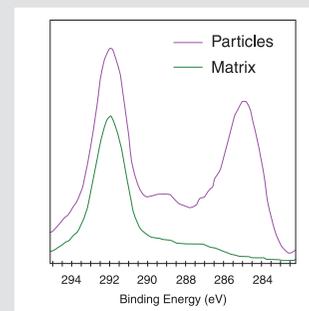
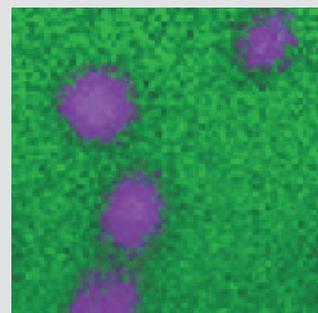


Angle resolved XPS

- Software-controlled angular resolution ensures optimum repeatability
- Eucentric tilt for constant analysis position regardless of sample thickness
- Direct mechanical drive ensures accuracy and precision of tilt position
- Integrated suite of ARXPS processing tools, including Max-Ent (profile reconstruction) and multilayer thickness calculator

Automated Sample Exchange option

- Software-controlled switching of sample holders into analysis chamber
- Sample holder image capture for navigation and definition of analysis points



Spectroscopic imaging of contaminant particles in a fluoropolymer matrix.

Additional techniques

Standard

Reflection electron energy loss spectroscopy (REELS)

Complementary electronic, structural, and phase information can be provided using the ESCALAB QXi XPS Microprobe's in-lens electron source.

- Hydrogen identification and quantification for polymers and other materials
- Narrow energy spread and an energy range of 0 to 1,000 eV

Ion scattering spectroscopy (ISS)

Reversible polarity lens and analyzer power supplies make ISS a standard feature.

- Channel electron multipliers provide maximum dynamic range while avoiding image detector damage

Optional

Auger electron spectroscopy (AES, SEM, SAM)

The ESCALAB QXi XPS Microprobe can be configured with a Schottky field emission source.

- Auger analysis at very high spatial resolution, 95 nm spot size at 5 nA
- Multiple channel electron multiplier detector essential for high count rates

Ultra-violet photoelectron spectroscopy

Rapid, high-resolution UPS measurements are possible with the high-flux UV lamp option.

- Excellent electronics stability and low-energy performance required for work-function measurements
- Mu-metal analysis chamber provides optimum magnetic shielding



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Configuration details

Electron analyzer

- Double-focusing full 180° spherical sector analyzer
- Magnetic and multi-element electrostatic input lenses
- Motorized, computer-controlled irises to define lateral and angular resolution

Detection system

- Channel electron multipliers—For applications that need high dynamic range: LAXPS, REELS, AES, ISS
- Image Detector—Two-dimensional detector based on a pair of channel plates and having true pulsecounting capability

Microfocused monochromated X-ray source

- 0.5-meter Rowland circle
- Microfocused electron gun
- Multi-position aluminum anode
- Optional silver anode
- Two toroidal quartz crystals

Flood gun

- Charge compensation
- Electron imaging
- REELS

Ion source

- Depth profiling
- Sample cleaning
- ISS operating mode

Sample navigation and manipulation

- Point-and-shoot sample navigation and analysis setup
- Live optical view of sample and analysis markers
- Automated 5-axis sample manipulator
- Heating and cooling enabled¹
- Azimuthal rotation²
- Optional automated sample exchange system

Avantage Data System

- Full digital instrument control
- Advanced acquisition, processing, and reporting package
- Recipe mode, from acquisition to report
- Auto analysis function available

Twin-anode, non-monochromated XPS option

- Dual-anode (MgK α /AlK α) X-ray source
- Other anodes available (e.g., Ag, Zr, etc.)

Thermo Scientific MAGCIS™ option (monatomic and gas cluster ion source)

- Dual-mode ion source
- Cluster mode for profiling “soft” materials such as polymers and gentle cleaning of samples prior to XPS
- Monatomic mode for standard ion gun operation

UV photoelectron spectroscopy (UPS) option

- High-intensity UV lamp
- Automated noble-gas admission system

95 nm AES/SEM/SAM electron gun option

- Schottky type field emission source
- Dedicated source ion pump
- SEM detector
- Optional EDS detector
- System vibration isolation
- Charge compensation for insulating samples



Notes

1. Sample heating requires the use of one of the optional heated sample holders.
2. Sample rotation requires the use of the rotation sample holder.

Find out more at thermofisher.com/escalab

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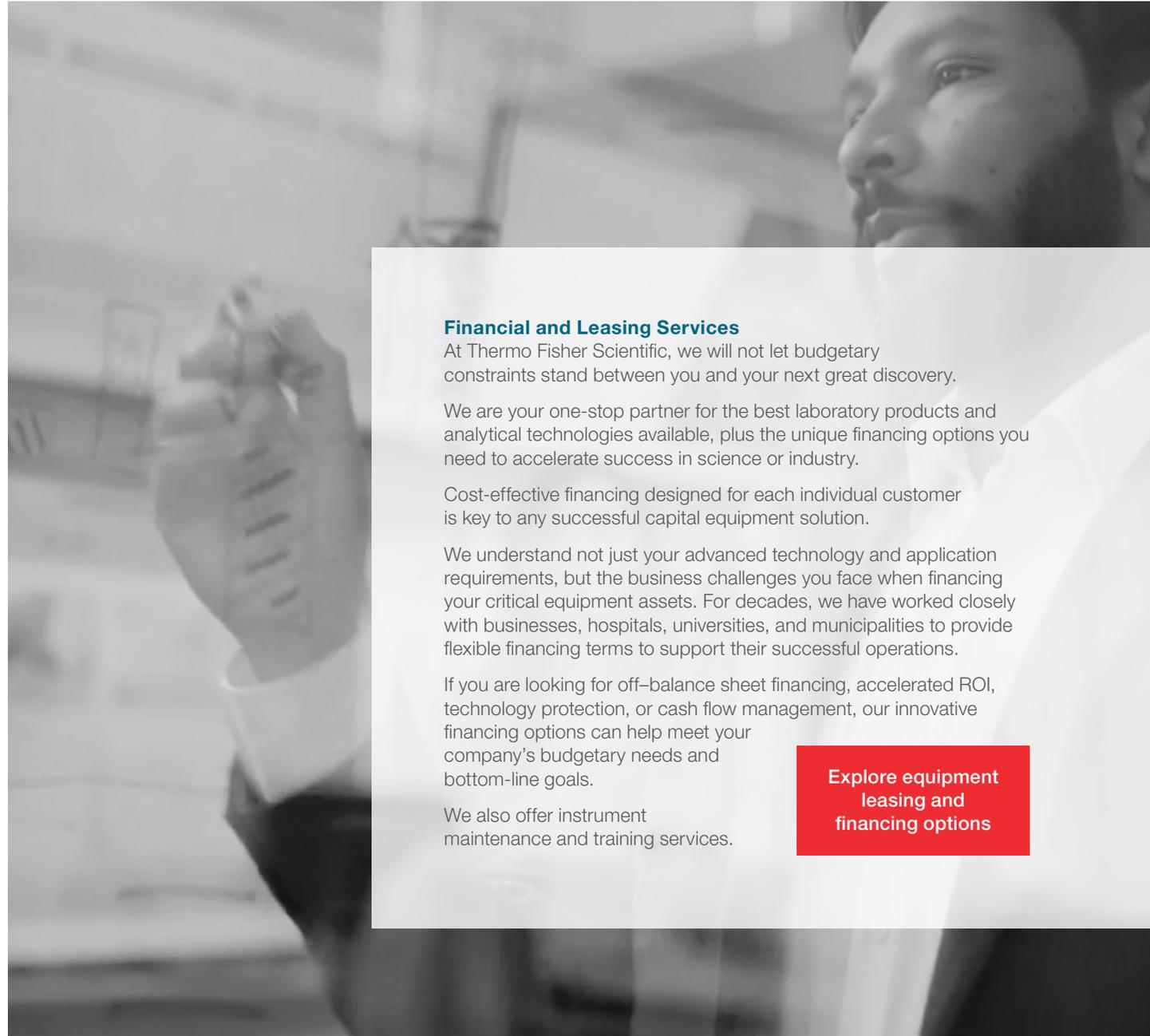
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Our innovative solutions for 3D electron microscopy, spectroscopy, and microanalysis help materials science researchers advance their sample characterization to gain deeper insight into materials using the latest advances in analytical instruments. Our multiscale, multimodal solutions provide the additive manufacturing industry with imaging and characterization of powders and parts at nano- to atomic-level resolution.

Our TEMs, DualBeam™ FIB/SEMs, surface analysis systems, and comprehensive portfolio of SEMs, combined with software suites, take customers from questions to usable data by combining high-resolution imaging with physical, chemical, elemental, mechanical, and electrical analysis across scales and modes—through the broadest sample types.



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