Dimension Edge
Atomic Force Microscope System

- Best Value Closed-Loop Dimension AFM
- Accurate, High-Resolution Results Even Faster
- Solutions for All Applications on Any Sample
- Advanced Nanoscale Capabilities for Beginners and Experts

www.veeco.com/Edge
Dimension Edge
The Performance and Value AFM Solution

The Dimension® Edge™ Atomic Force Microscope (AFM) System incorporates Veeco’s latest technology advances to provide the highest levels of performance, functionality, and accessibility in its class. Based on the ultimate Dimension Icon® platform, the Edge System has been designed from top to bottom to deliver the low drift and low noise necessary to achieve publication-ready data in minutes instead of hours, all at price points well below expectations for such performance. In addition, integrated visual feedback and preconfigured settings enable expert-level results simply and consistently, making the most advanced large-sample atomic force microscopy capabilities and techniques available to every facility and user.

**BEST VALUE CLOSED-LOOP DIMENSION AFM**
- Proprietary sensor design achieves closed-loop accuracy with open-loop noise levels
- Significantly reduced noise and drift values unite to bring small-sample AFM imaging performance to a large-sample platform
- Microscope and electronics design enable high image fidelity at moderate cost

**ACCURATE, HIGH-RESOLUTION RESULTS EVEN FASTER**
- Linear workflow with visual feedback ensure an optimized setup in the shortest time, without guesswork or complications
- High-resolution 5-megapixel camera and motorized, programmable stage provide fast sample navigation and efficient multi-site measurements
- Seamless transitions from survey to highest resolution deliver accurate results in a short time

**SOLUTIONS FOR ALL APPLICATIONS ON ANY SAMPLE**
- Open stage access accommodates a wide variety of experiments and samples
- New instrument design and software take full advantage of Veeco AFM modes and techniques to meet the needs of even advanced applications
- Built-in access to signal routing enables custom measurements to take research in new directions

**ADVANCED NANO SCALE CAPABILITIES FOR BEGINNERS AND EXPERTS**
- Innovative, modular system design provides high performance at moderate cost
- New version 8 software with experiment-selection modes distills decades of AFM expertise into preconfigured settings
- Integrated stage control enables intuitive navigation as well as powerful stage programming
**THE NEW STANDARD IN TIME TO PUBLICATION-READY DATA**

With more published research results than any other large-sample AFM, the Dimension platform is widely recognized as the leader in productivity. With its streamlined software workflow and user-friendly design, the Dimension Edge raises the bar yet again. The software ensures the most efficient setup in both basic and advanced modes, while providing integrated real-time control of the motorized stage and high-resolution optics, including programmed stage movement for automated, multi-site measurements. The hardware combines high performance with easy sample access. The result is a seamless path from sample placement through optical identification of the region of interest, continuing from AFM survey mode to zoomed-in feature identification, seriously accelerating your time to expert-level data. There are no sample-cutting issues, no closed-loop versus open-loop worries, and no lengthy parameter setups or disruptive scanner exchanges. The highest resolution challenge becomes routine measurements.

**DIMENSION PLATFORM DELIVERS OPTIMIZED AFM PERFORMANCE**

The Dimension Edge leverages the many innovations of the Dimension Icon System to provide astounding performance in a mid-price range AFM. At the heart of this system’s capabilities is Veeco’s revolutionary closed-loop scanner. Incorporating temperature-compensating position sensors and driven by modular, low-noise control electronics, this tip-scanning component reduces closed-loop positioning noise levels to the length scale of a single chemical bond. To maximize this benefit, the scanner is mounted to a rigid, drift-compensated bridge structure that features FPGA-based thermal control and provides fast stabilization to ultra-low drift rates. Thus, the Dimension Edge combines the productivity, accuracy, and sample versatility of a large-sample, closed-loop platform with the acquisition of high-resolution images traditionally only achieved by small-sample, open-loop instruments. The result is superior image fidelity on any sample, to reveal previously unseen aspects in your research.
EXCEPTIONAL VERSATILITY

The Dimension Edge also offers standard and proprietary AFM modes, as well as application-specific solutions, for such techniques as nanoscale electrical measurements and materials characterization in controlled environments. This functionality enables accurate imaging and single-point spectroscopy for a wide range of applications, from the characterization of solar and semiconductor devices and the mapping of heterogeneous polymer-based materials to in situ imaging of life science samples from single molecules to whole cells and the interrogation of individual nanoparticles.

Electrical Characterization

Utilizing Dark Lift, the Dimension Edge goes beyond merely connecting an AFM probe to a low-noise current amplifier. Dark Lift is the only means to distinguish unambiguously intrinsic sample conductivity from photoelectric effects in conductive AFM data. It is based upon Veeco’s patented LiftMode™, which has become well known for its capabilities in magnetic and electric force microscopy. The system draws upon both of these to ensure the optimized approach for any electrostatic potential mapping application. Combining Dark Lift with closed-loop (constant depletion volume) scanning capacitance microscopy (SCM) provides the most accurate dopant profiling solution available today. However, if instead researchers want the highest sensitivity to detect small potential variations, then they can easily combine LiftMode with surface potential microscopy. By offering the dual frequency approach, the Dimension Edge system provides the ideal solution to any electrostatic potential mapping application.

Controlled Environments

The Dimension Edge also offers unique application solutions in mechanical characterization and material mapping. Using the heater-cooler accessory, sample structure and properties can be tracked over a temperature range from -35°C to +250°C in a controlled atmosphere. Alternatively, nanoscale thermal analysis can be performed using local heating up to 400°C. Biological specimens can be interrogated in situ simply and effectively with the liquid accessory. The system’s closed-loop control on all axes ensures the most accurate force ramps with thermal tune, which provides force calibration, as well as simplified resonance identification in liquid.

Easy Access and Control

The large sample stage of the Dimension Edge is not only motorized and programmable for efficient multi-site measurements, but it also lets you fit more types of samples directly under the AFM scanner with less preparation time. The physically open access to the probe-sample junction enables more direct investigation of geometrically challenging device structures, as well as the attachment of electrical connections or other custom experiment accessories. The same streamlined functionality is found in the controller, which provides cost-effective but powerful customization capabilities with its standard internal signal access and user-accessible configuration of signal routing, digital feedback, and dual digital lock-in amplifiers.

Accurate 2-D dopant profiling on SRAM sample using Dark Lift SCM. Image size 15µm.

Closed-loop topography map of a kerf test structure showing contact holes inside dual-damascene trenches. The combination of the Dimension scanner and a Veeco FIB probe enabled mapping of this challenging geometry without damage to the probe tip.
The ultrastructure of wheat grain has a strong impact on cereal technology and its derived products. High-performance AFM is able to investigate the nanometer-scaled organization of the component biopolymers of wheat grain, leading to improved understanding of their relationship to the macroscopic properties of the resulting cereal products. Image size 90µm.

SERIOUS AFM CAPABILITIES FOR EVERY RESEARCHER

The Dimension Edge is about moving quickly in a competitive environment and making steady advances in challenging research. Building on its modular low noise digital control electronics and ergonomic microscope stage, the Dimension Edge offers not only high-end AFM performance but also the most efficient setup, even for challenging experiments. Streamlined control of advanced modules from within the main user interface shortens the setup time and learning curve. Likewise, the integrated stage control enables intuitive navigation as well as powerful stage programming.

You will find that every step of your Dimension Edge AFM research follows a logical workflow with linear setup progression, from your first encounter with the graphical interface and experiment selection, through visual status feedback, to direct access to relevant help on each active window. The result is trustworthy, publishable results right away.

With its focus on streamlined access to a new performance level, the Dimension Edge AFM represents a new level of productivity and attainability for the most advanced nanoscale research. Just place a sample on the stage to discover new information about your samples faster than you thought was possible.
SPECIFICATIONS

<table>
<thead>
<tr>
<th>Specification</th>
<th>Details</th>
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<tbody>
<tr>
<td>X-Y scan range</td>
<td>90µm x 90µm typical, 85µm minimum</td>
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<tr>
<td>Z range</td>
<td>10µm typical in imaging and force ramp modes, 9.5µm minimum</td>
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<td>Vertical noise floor</td>
<td>&lt;50pm RMS in appropriate environment, typical imaging bandwidth [up to 625Hz]</td>
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<tr>
<td>XY position noise [closed loop]</td>
<td>&lt;0.5nm RMS typical imaging bandwidth [up to 625Hz]</td>
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<tr>
<td>Z position sensor noise level [closed loop]</td>
<td>&lt;0.2nm RMS typical imaging bandwidth [up to 625Hz]</td>
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<tr>
<td>Sample size/holder</td>
<td>150mm vacuum chuck, 15mm thick; up to 40mm thick with optional frame spacer</td>
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<tr>
<td>Motorized positioning stage [X-Y axis]</td>
<td>150mm x 150mm inspectable area; Programmable for multi-site measurements</td>
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<tr>
<td>Microscope optics</td>
<td>5-megapixel digital camera; 180µm to 1465µm viewing area; digital zoom and motorized focus</td>
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<td>Signal access</td>
<td>Configurable I/O signal access built into controller; Includes customizable signal routing, digital feedback, and dual digital lock-in</td>
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<td>Single point spectroscopy</td>
<td>Three-axis closed loop control for point-and-shoot positioning and ramping; Spring constant calibration with built-in thermal tune;</td>
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<tr>
<td>Sample temperature control</td>
<td>-35 to +250°C with optional heater/cooler accessory; includes gas purging capability</td>
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AFM MODES

- **Standard**: Contact Mode, Lateral Force Microscopy, TappingMode™, Phaselmaging™, LiftMode, Magnetic Force Microscopy, Electric Force Microscopy, Dark Lift, Force Spectroscopy, Nanoindentation, Nanolithography

FACILITY REQUIREMENTS AND REGULATORY INFORMATION

- **Vibration isolation**: Vibration isolation table or integrated vibration/acoustic isolation enclosure required
- **Laser classification**: Class 2M
- **Certification**: CE

Note: Performance specifications are typical and subject to change without notice. Visit the Veeco website for most up-to-date specifications.

Cover Image Captions:
Bottom left: MFM phase image showing the magnetic domain structure on a rough nickel alloy surface. Veeco’s LiftMode enables efficient acquisition of magnetic field information without topographic artifacts, independent of sample roughness. Image size 17µm.
Bottom right: Closed-loop phase image of C₆₀H₁₂₂ alkane on HOPG. Individual lamellae are clearly visible with spacing (~7.5nm) consistent with the length of C₆₀H₁₂₂ chains in all-trans configuration. Image size 280nm.

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