

# Dimension Icon

Atomic Force Microscope System with ScanAsyst

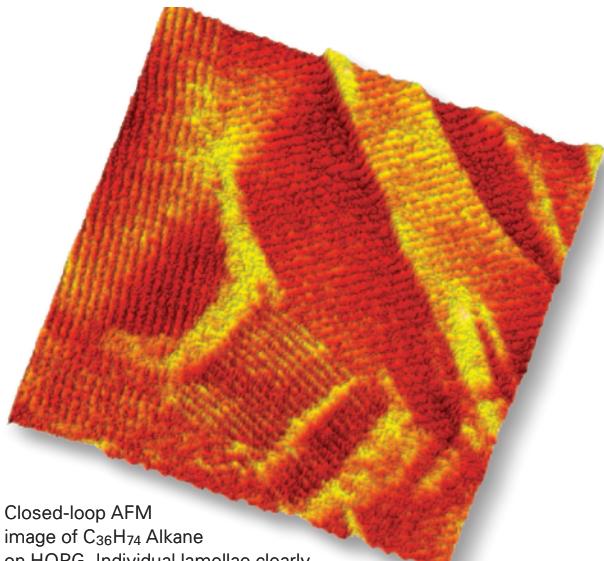
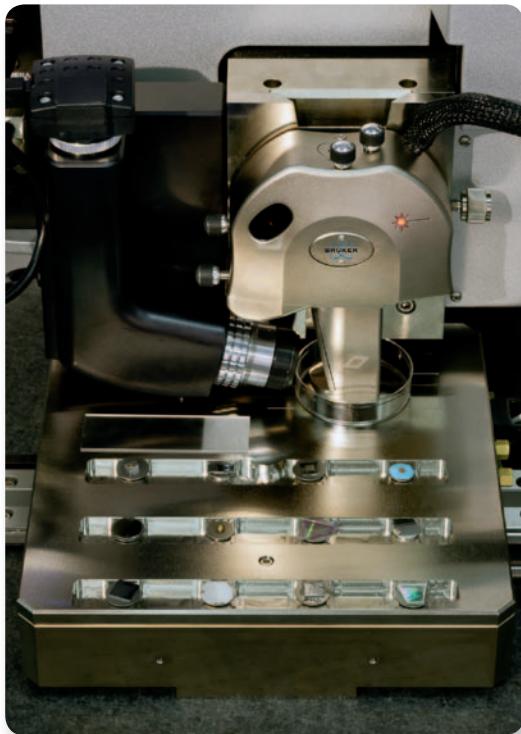
- Ultimate Performance
- Immediate Research-Quality Results
- Ease of Use with Expert Functionality
- One Platform — Endless Possibilities

Atomic Force Microscopy

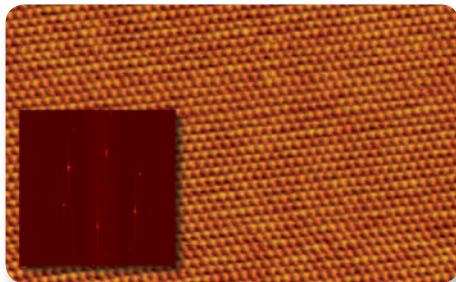
Innovation with Integrity

# Dimension Icon

## AFM Performance and Productivity Redefined



Closed-loop AFM image of C<sub>36</sub>H<sub>74</sub> Alkane on HOPG. Individual lamellae clearly visible with spacing (~4.5nm) consistent with length of C<sub>36</sub>H<sub>74</sub> chains in fully extended conformation.



Atomically resolved lattice of mica imaged in contact mode at 0.6Hz.

Bruker's Dimension Icon® Atomic Force Microscope (AFM) System introduces new levels of performance, functionality, and AFM accessibility to nanoscale researchers in science and industry. Building upon the world's most utilized large-sample AFM platform, the latest Dimension system is the culmination of decades of technological innovation, customer feedback, and industry-leading application flexibility. The system has been designed from top to bottom to deliver the revolutionary low drift and low noise that allows users to achieve artifact-free images in minutes instead of hours. The Dimension Icon also is now equipped with proprietary ScanAsyst® automatic image optimization technology, which enables easier, faster, and more consistent results, regardless of user skill level. Highest level AFM research with radical productivity gains has never been easier to achieve.

### ULTIMATE PERFORMANCE

- Proprietary sensor design achieves closed-loop performance with open-loop noise levels for previously unseen resolution on a large-sample, tip-scanning AFM
- Significantly reduced noise floor enables imaging at atomic level in contact mode, with less than 30pm in TappingMode™
- Drift rates less than 200pm per minute render distortion-free images

### EXCEPTIONAL PRODUCTIVITY

- Integrated feedback alignment tools deliver quick and optimized probe positioning
- High-resolution camera and X-Y positioning permit faster, more efficient sample navigation
- New ScanAsyst Imaging and NanoScope® software with default experiment modes distill decades of knowledge into preconfigured settings

### SUPERIOR VERSATILITY

- Wide-open access to tip and sample accommodates a large variety of standard and customized experiments
- Instrument and software designed to take full advantage of all current and future Bruker AFM modes and techniques
- Custom user-programmable scripts offer semi-automated measurement and analysis

# Dimension Icon



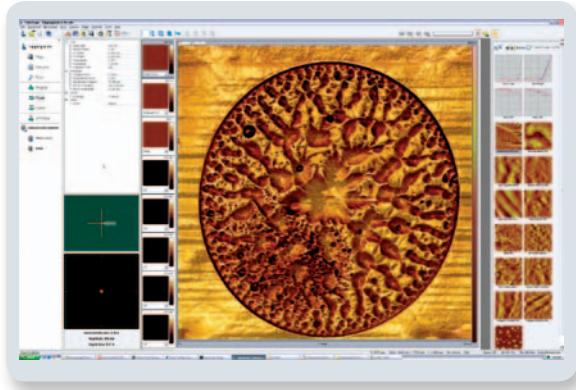
## ULTIMATE PERFORMANCE

The Dimension Icon's superior resolution, in conjunction with Bruker's proprietary electronic scanning algorithms, provide the user with a significant improvement in measurement speed and quality. The Icon is the latest evolution of our industry-leading, tip-scanning AFM technology, incorporating temperature-compensating position sensors to render noise levels in the sub-angstrom range for the Z-axis, and angstroms in X-Y. This is extraordinary performance in a large-sample, 90-micron scan range system, surpassing the open-loop noise levels of high-resolution AFMs. The new design of the XYZ closed-loop head also delivers higher scan speed, without loss of image quality, to enable greater throughput for data collection.

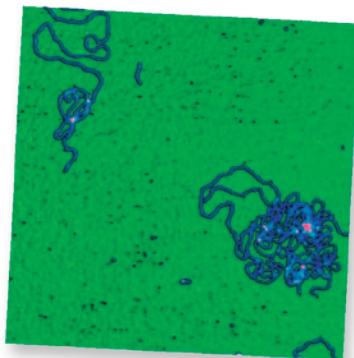
**The Icon has a lower noise floor and higher accuracy than any large-sample AFM on the market today. These innovations, combined with new proprietary scan and engage algorithms, deliver higher image fidelity on even the most difficult samples.**

## EXCEPTIONAL PRODUCTIVITY

The Dimension family of AFMs has enabled more published data than any other large-sample AFM platform, gaining an iconic reputation in both research and industry in the process. The Icon takes the platform to a new level of excellence, providing higher performance and faster results. The software's intuitive workflow makes performing even the most advanced AFM techniques much easier than ever before. Icon users achieve immediate high-quality results without the usual hours of expert tweaking. Every facet of the Dimension Icon — from wide-open tip and sample access to preconfigured software settings — has been specifically engineered for trouble-free operation and surprising AFM ease of use.



**Less than 200pm per minute of drift rate over hours, an all-new intuitive user interface, and the world-renowned platform of the Dimension AFM combine to provide unmatched productivity, ensuring you faster time to results and publication.**



## WORLD'S MOST FLEXIBLE PLATFORM

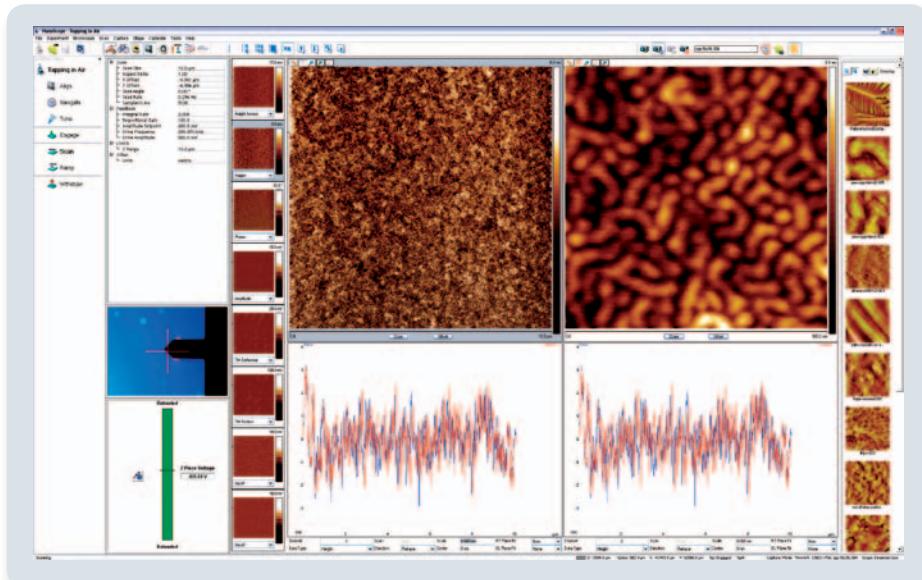
The Icon system delivers uncompromised performance, robustness, and flexibility to perform nearly every measurement at scales previously obtained by extensively customized systems. Utilizing an open-access platform, large- or multiple-sample holders, and numerous ease-of-use features, it opens up the power of AFM to research and industry alike, setting a new standard for high-quality AFM imaging and nanomanipulation.

**The Dimension platform has evolved to meet your growing research needs. Icon is powered by the full suite of AFM accessories and modes, and is designed for Bruker's future AFM expansion.**

# with ScanAsyst

## POWERFUL AFM CONTROL

With the NanoScope V Controller, the Dimension Icon is able to display and capture up to eight images simultaneously with a signal-to-noise ratio previously unseen in a large-sample, tip-scanning AFM. This fifth-generation controller delivers high-speed data capture and high-pixel-density images (5120 x 5120) in eight channels simultaneously, allowing researchers to record and analyze tip-sample interactions that probe nanoscale events at timescales previously inaccessible to AFM.

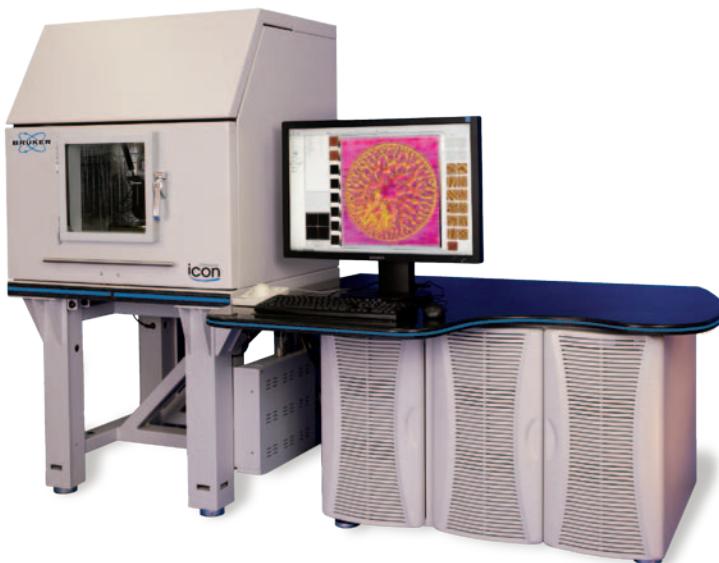


The intuitive graphical user interface provides immediate access to eight channels and extensive controller functions. Image data (left) show topography of triblock copolymer with 5Kx5K data points, 10µm scan size in closed-loop. Zoomed image (right) is a 500nm section of the larger scanned image.

With more features than any other AFM, the new NanoScope-based control system sets the standard for power and flexibility. At the same time, the software's simplified workflow and ergonomic system design make the Icon ideal for multi-user environments.

## THE SOLUTION YOU HAVE BEEN LOOKING FOR

Researchers need every advantage they can find to get ahead in today's urgent world of discovery. The new Dimension Icon will give you that edge. With the lowest noise of any closed-loop scanner, higher resolution, faster time-to-results, and the world's most powerful controller at your disposal, your data will reveal more than you ever imagined.



## MORE MODES = HIGHER PRODUCTIVITY

Contact Mode

TappingMode

PhaseImaging™

ScanAsyst

HarmoniX

PeakForce QNM

PeakForce TUNA™

LiftMode™

Dark Lift

Nano-Indentation

Nanolithography

Nanomanipulation

Force Volume

Piezo Response

Force Modulation

Lateral Force Microscopy (LFM)

Magnetic Force Microscopy (MFM)

Electric Force Microscopy (EFM)

Surface Potential

Scanning Capacitance Microscopy (SCM)

Scanning Spreading Resistance Microscopy (SSRM)

Tunneling Atomic Force Microscopy (TUNA)

Conductive Atomic Force Microscopy (CAFM)

Scanning Tunneling Microscopy (STM)

Torsional Resonance Mode (TRmode)

TR-TUNA

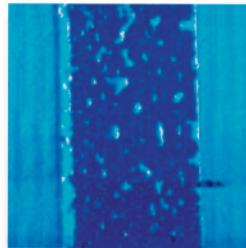
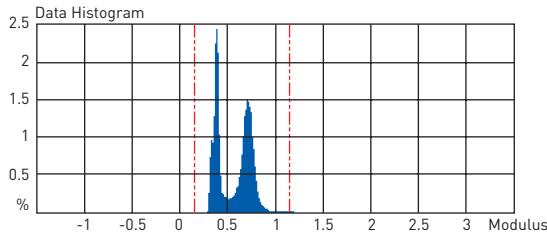
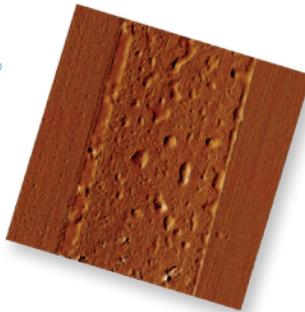
Thermal Analysis (VITA)

## SUPERIOR APPLICATION VERSATILITY

The Dimension Icon captures multiple data channels at high speeds, producing more channels of high-quality data. Combined with our many proprietary AFM techniques, modes, and mode enhancements, the Icon provides the unique capabilities that can take your nanoscale research to the next level.

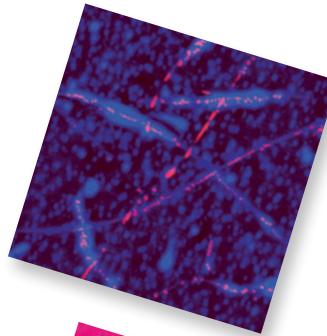
### Material Mapping:

Icon supports Bruker's patent-pending PeakForce QNM® Imaging Mode, enabling researchers to map and distinguish quantitatively between nanomechanical properties while simultaneously imaging sample topography at high resolution. This technology operates over an extremely wide range (1MPa to 50GPA for modulus and 10pN to 10μN for adhesion) to characterize a large variety of sample types.



### Electrical Characterization:

Carry out electrical characterization at the nanoscale with greater sensitivity and dynamic range using proprietary modes. Combine these investigations with other techniques, such as Dark Lift, for artifact-free results in scanning capacitance microscopy, scanning spreading resistance, tunneling AFM or torsional resonance tunneling AFM.



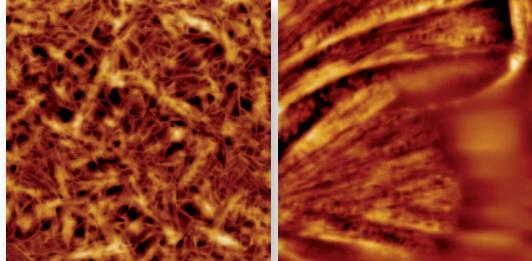
### Nanomanipulation:

Perform manipulation and lithography at the nanometer and molecular scales. The Icon's XYZ closed-loop scanner provides precise probe positioning with no piezo creep and extremely low noise for the best positioning of any available nanomanipulation system.



### Heating and Cooling:

Execute temperature control and thermal analysis on samples from -35°C to 250°C while scanning in various AFM modes. Alternately, perform sub-100nm local heating to 400°C using a thermal probe.



With its extensive complement of techniques, simplified software, and full suite of advanced accessories, the Dimension Icon is the obvious choice for practically every AFM application.

### Specifications

X-Y scan range	90µm x 90µm typical, 85µm minimum
Z range	10µm typical in imaging and force curve modes, 9.5µm minimum
Vertical noise floor	<30pm RMS in appropriate environment typical imaging bandwidth (up to 625Hz)
X-Y position noise (closed-loop)	≤0.15nm RMS typical imaging bandwidth (up to 625Hz)
X-Y position noise (open-loop)	≤0.10nm RMS typical imaging bandwidth (up to 625Hz)
Z sensor noise level (closed-loop)	35pm RMS typical imaging bandwidth (up to 625Hz); 50pm RMS, force curve bandwidth (0.1Hz to 5kHz)
Integral nonlinearity (X-Y-Z)	<0.5% typical
Sample size/holder	210mm vacuum chuck for samples, ≤210mm diameter, ≤15mm thick
Motorized position stage (X-Y axis)	180mm x 150mm inspectable area; 2µm repeatability, unidirectional; 3µm repeatability, bidirectional
Microscope optics	5-megapixel digital camera; 180µm to 1465µm viewing area; Digital zoom and motorized focus
Controller	NanoScope V
Workstation	Integrates all controllers and provides ergonomic design with immediate physical and visual access
Vibration isolation	Integrated, pneumatic
Acoustic isolation	Operational in environments with up to 85dBC continuous acoustic noise
AFM modes	Standard: ScanAsyst, PeakForce Tapping, TappingMode (air), Contact Mode, Lateral Force Microscopy, PhaselImaging, Lift Mode, MFM, Force Spectroscopy, Force Volume, EFM, Surface Potential, Piezoresponse Microscopy, Force Spectroscopy; Optional: PeakForce QNM, HarmoniX, Nanoindentation, Nanomanipulation, Nanolithography, Force Modulation (air/fluid), TappingMode (fluid), Torsional Resonance Mode, Dark Lift, STM, SCM, C-AFM, SSRM, PeakForce TUNA,TUNA, TR-TUNA, VITA
Certification	CE

### IMAGE CAPTIONS

Cover

Bottom left, Contact mode atomic mica lattice at 0.6Hz;

Bottom right, Closed-loop, syndiotactic polpropylene in TappingMode, 5µm.

Page 3

Top, Closed-loop, high-resolution 100nm AFM image of C<sub>36</sub>H<sub>74</sub> alkane on HOPG;

Middle, Graphical user interface;

Bottom, Closed-loop TappingMode AFM image of DNA on mica in air, 2µm, 4.88Hz.

Page 5 (fold-over flap)

1st row, Surface topography of an industrial packaging material clearly identifies three distinctive layers, with the two outside layers looking similar;

2nd row-left, PeakForce Tapping modulus image and modulus histogram clearly identifies the different modulus of the inner structure with respect to the outside layers. Furthermore, some interesting effects at the boundary region between layers can be observed;

2nd row-right, HarmoniX Adhesion force mapping with insignificant contribution from capillary interaction;

3rd row, Simultaneous topography and conductivity mapping of single-wall carbon nanotubes loosely attached on Au-patterned silicon using TR-TUNA, 1µm;

4th row, Piezoresponse Force Microscopy Amplitude image of a lithography of the Dimension Icon logo on a thin film of piezoelectric material. Demonstrates precise XY positioning of the Icon probe for lithographic process, 20µm;

5th row, Investigation of crystallization kinetics of syndiotactic polypropylene. Original polymer was subjected to quick heating from room temperature (left) to a completely melting state at 160°C. High-temperature isothermal crystallization at 128°C promoted an equilibrium of conditions and the formation of bigger than original lamellae crystals. Right image shows partial crystallization at 101min.

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