

ATOMIC FORCE MICROSCOPY
Dimension Icon

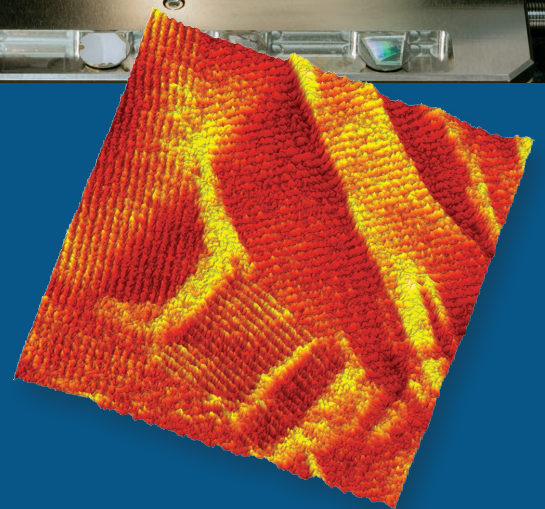
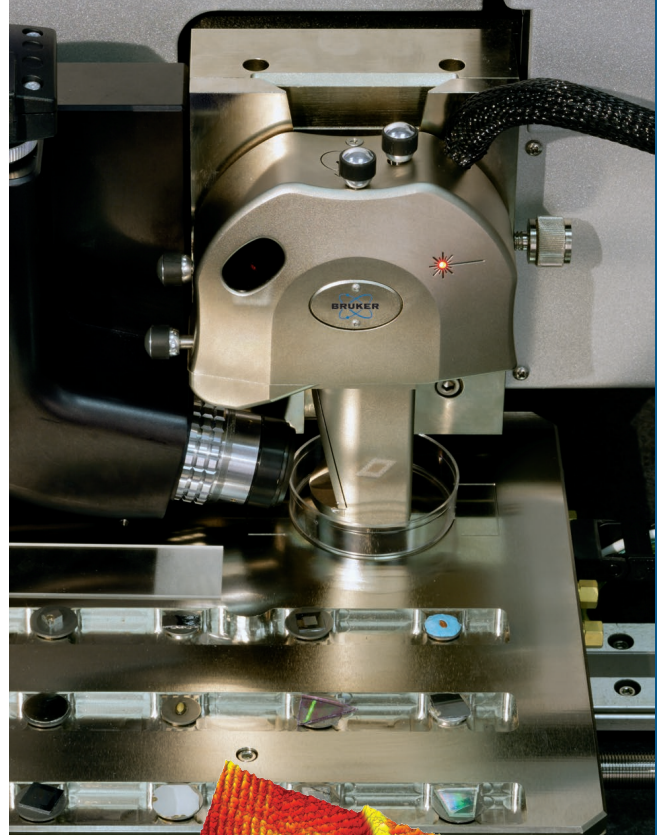
World's Highest Performance Large-Sample AFM

Dimension Icon

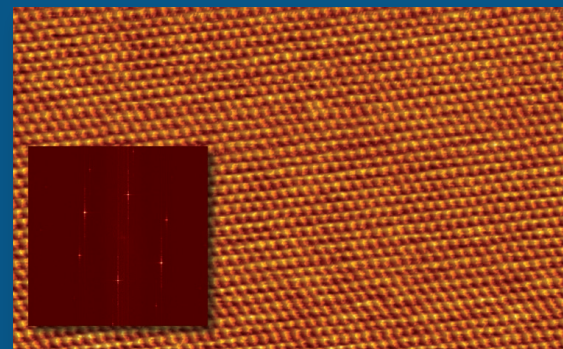
Bruker's Dimension Icon[®] Atomic Force Microscope (AFM) System introduces new levels of performance, functionality, and AFM accessibility to nanoscale researchers in science and industry. As the world's most utilized large-sample AFM platform, the Dimension Icon is the culmination of decades of technological 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. Icon also is fully optimized with proprietary PeakForce Tapping[®] technology and ScanAsyst[®] automatic image optimization technology, which enable 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.

Dimension Icon is Bruker's best-selling AFM for a host of reasons:

- Highest performance closed-loop tip scanning delivers unmatched large-sample resolution with open-loop noise levels, reduced noise floor, and <200 pm drift rates
- Hardware and software optimized for productivity provides surprisingly simple setup, intuitive workflow, and fast time to results for publication-quality data every time
- Open-access platform delivers unprecedented versatility to accommodate the widest variety of experiments, modes, techniques and semi-automated measurements



Closed-loop AFM image of C₃₆H₇₄ Alkane on HOPG. Individual lamellae clearly visible with spacing (~4.5 nm) consistent with length of chains in fully extended conformation.



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

AFM Performance and Productivity Redefined

Ultimate Performance

Dimension Icon's superior resolution, in conjunction with Bruker's proprietary electronic scanning algorithms, provides the user with a significant improvement in measurement speed and quality. As Bruker's best-selling AFM, Icon's industry-leading, tip-scanning AFM technology incorporates 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 competing high-resolution AFMs. The design of the XYZ closed-loop head also delivers higher scan speed, without loss of image quality, to enable greater throughput for data collection.

Exceptional Productivity

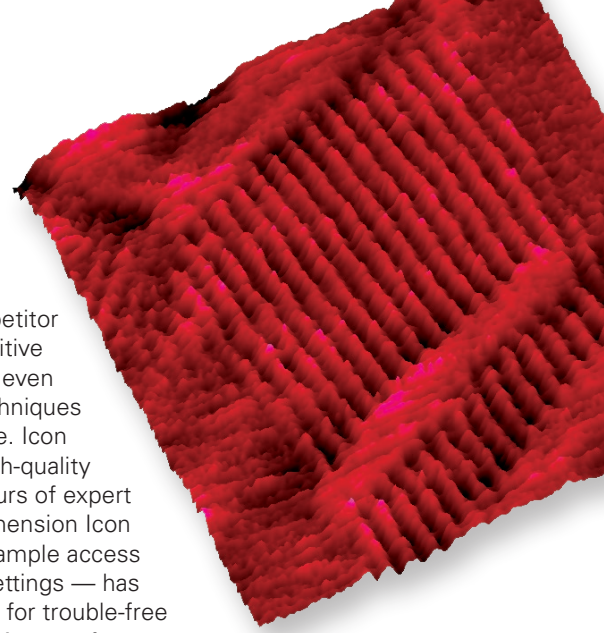
Dimension Icon has enabled more published data than any other large-sample AFM platform, gaining an enduring reputation in both research and industry in the process. The system has set the gold standard of excellence, providing higher performance

and faster results than competitor systems. 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 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.

World's Most Flexible Platform

Utilizing an open-access platform and full access to all signal lines, the Icon system provides the flexibility to perform nearly every measurement at scales previously unavailable on a commercial instrument. Combined with its large- or multiple-sample holders and numerous ease-of-use features, it is simply the most customizable AFM system on the planet.

Closed-loop, high-resolution 100 nm AFM image of $C_{36}H_{74}$ alkane on HOPG.



Superior Application Versatility

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

Material Mapping:

Icon supports Bruker's patented 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 (1 MPa to 50 GPa for modulus and 10 pN to 10 μ m for adhesion) to characterize a large variety of sample types.

Bruker's new AFM-nDMA mode allows researchers to perform, for the first time, complete and quantitative viscoelastic analysis of polymers at the nanoscale, probing materials at rheologically relevant frequencies, in the linear regime. Proprietary dual-channel detection, phase-drift correction, and reference frequency tracking enable a small strain measurement in the rheologically relevant 0.1 Hz to 20 kHz range for nanoscale measurements that tie directly to bulk DMA.

Electrical Characterization:

Carry out electrical characterization at the nanoscale with greater sensitivity and dynamic range using proprietary modes such as the new DataCube 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.

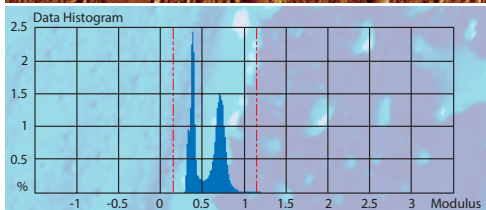
Heating and Cooling:

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



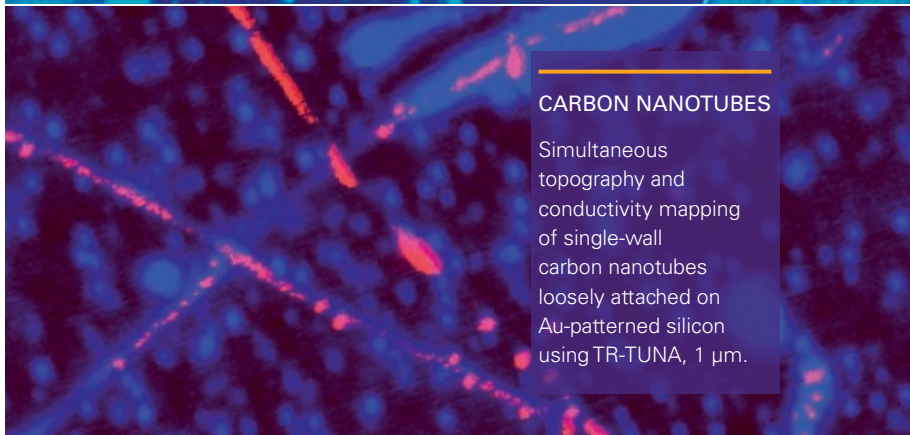
INDUSTRIAL PACKAGING

Surface topography of an industrial packaging material clearly identifies three distinctive layers, with the two outside layers looking similar.



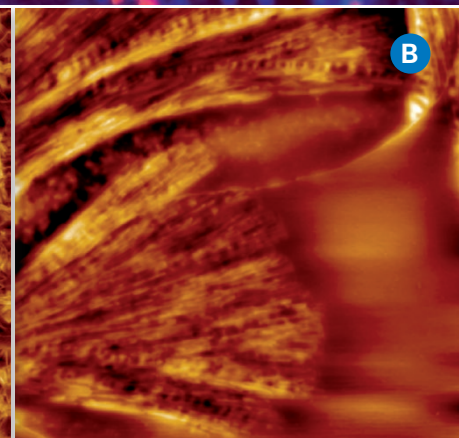
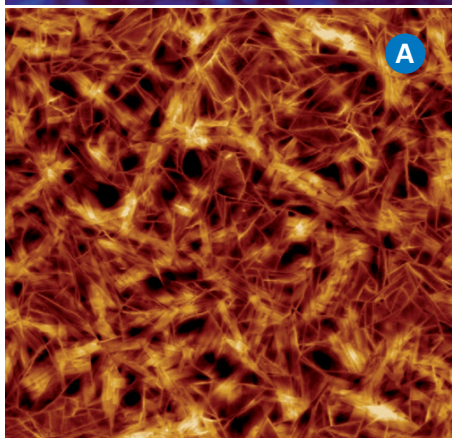
MODULUS

(Inset) PeakForce Tapping modulus channel clearly identifies different moduli for the inner and outer packaging material layers. (Background) Adhesion mapping shows insignificant contribution from capillary interaction.



CARBON NANOTUBES

Simultaneous topography and conductivity mapping of single-wall carbon nanotubes loosely attached on Au-patterned silicon using TR-TUNA, 1 μ m.

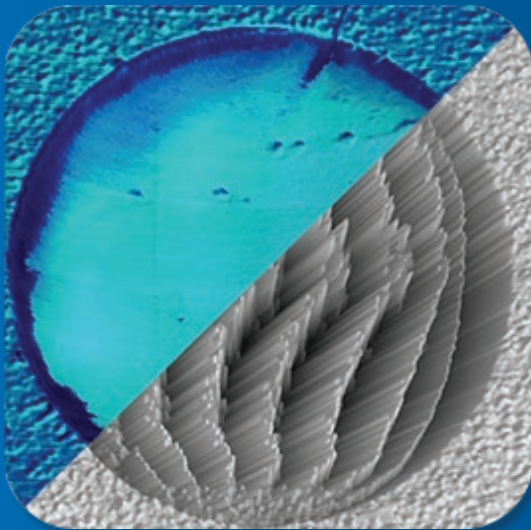


POLYMERS

Investigation of crystallization kinetics of syndiotactic polypropylene. Original polymer was subjected to quick heating from room temperature (A) 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. (B) shows partial crystallization at 101 min.

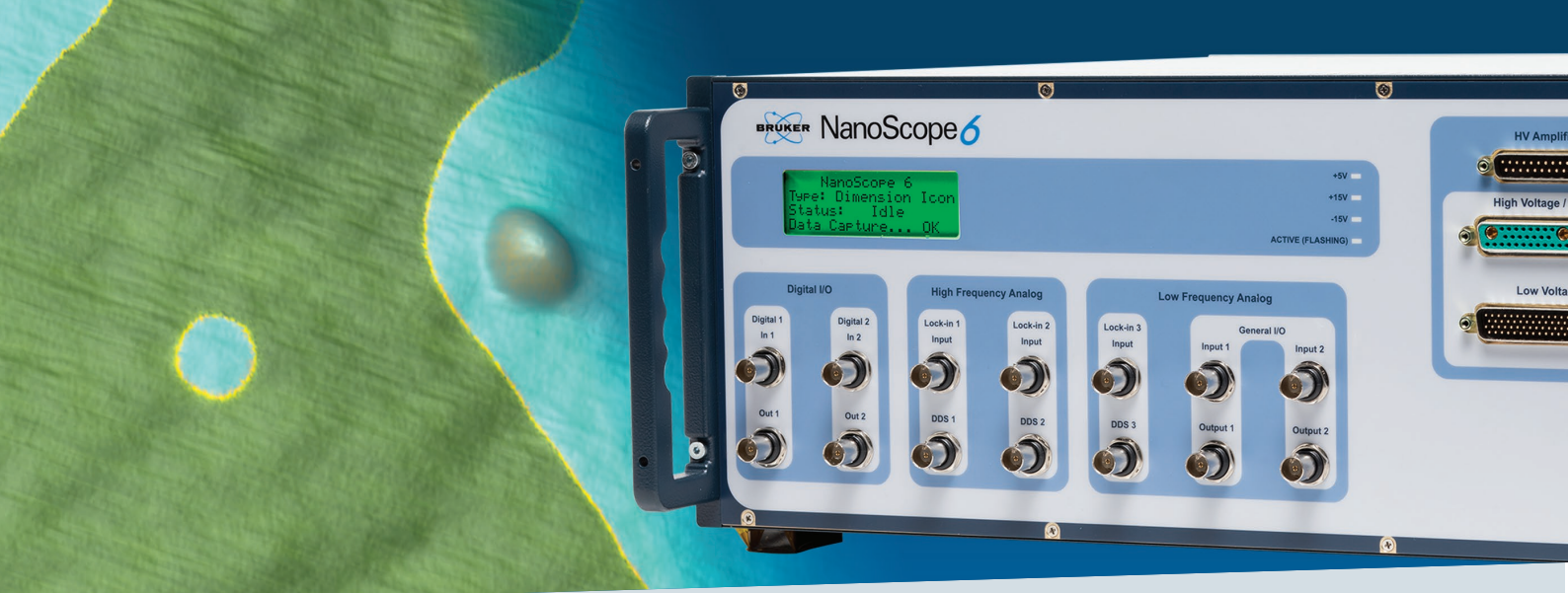
PeakForce Tapping Increases Your Application Capabilities

APPLICATIONS	ScanAsyst	PeakForce QNM	PeakForce Capture	PeakForce TUNA	PeakForce KPFM	PeakForce SECM	Invent Your Own
2D materials/perovskites characterization							PeakForce PFM
Composite materials nanomechanics							PeakForce Contact Res
Energy/devices materials research							
In situ lithium ion battery studies							
Other energy research							
Local electrochemistry/ conductivity in liquid							
Molecular bio-imaging							
In situ live- and fixed-cell imaging							
Semiconductor device characterization/FA							PeakForce SCM; PeakForce SSRM
Industrial defect analysis							
Roughness/deep trench measurements							



Suspended graphene membrane imaged in PeakForce Tapping (blue) where TappingMode fails (grey).

- AFM-nDMA
- Conductive Atomic Force Microscopy (CAFM)
- Contact Mode
- Dark Lift
- DataCube Modes
- Electric Force Microscopy (EFM)
- Force Modulation
- Force Volume
- Lateral Force Microscopy (LFM)
- LiftMode™
- Magnetic Force Microscopy (MFM)
- Nano-Indentation
- Nanolithography
- Nanomanipulation
- PeakForce QNM
- PeakForce TUNA™
- PhaseImaging™
- Piezo Response
- ScanAsyst
- Scanning Capacitance Microscopy (SCM)
- Scanning Spreading Resistance Microscopy (SSRM)
- Scanning Tunneling Microscopy (STM)
- Surface Potential
- TappingMode
- Thermal Analysis (VITA)
- Torsional Resonance Mode (TRmode)
- TR-TUNA
- Tunneling Atomic Force Microscopy (TUNA)

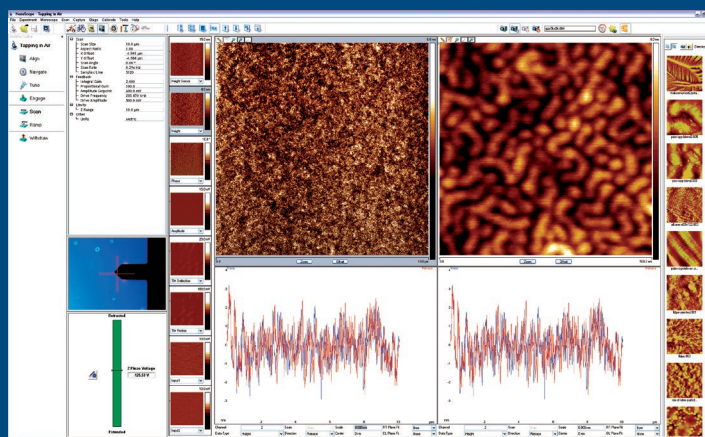


Powerful AFM Control

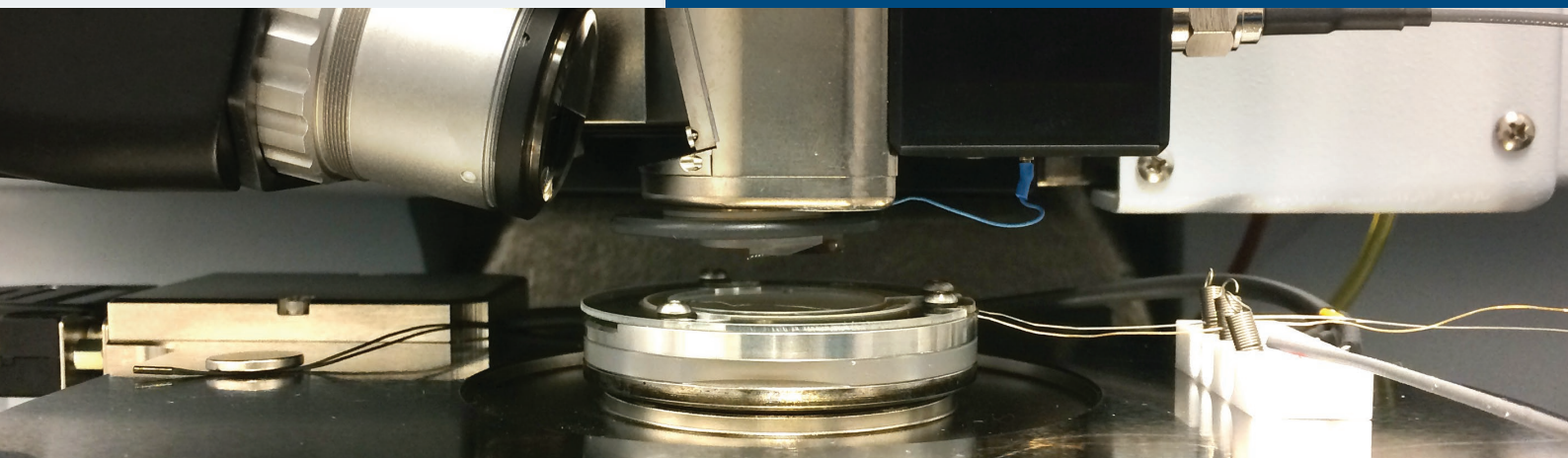
With the NanoScope 6 Controller, the Dimension Icon is able to display and capture up to eight images simultaneously with a signal-to-noise ratio previously unseen in a large-sample, tip-scanning AFM. This sixth-generation controller delivers high-speed data capture and high-pixel-density images (5120 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.

NanoScope 6 also takes PeakForce Tapping to the next level of performance and capability with fully variable actuation rates, 4x faster DDS for precise high-speed actuation, and 20x faster deflection sampling capturing previously inaccessible high-speed data.

With more features than any other AFM, the new NanoScope-based control system sets the standard for power and flexibility. NanoScope 6 enhances the capabilities of Bruker's AutoMET software to provide fully automated AFM operation for industrial applications. At the same time, the software's simplified workflow and ergonomic design make the Icon ideal for multi-user environments.



The intuitive graphical user interface provides immediate access to eight channels and extensive controller functions. Topographical imaging (left) and property mapping (right) shows nanoscale features of a triblock copolymer with 5Kx5K data points, 10 μ m scan.



The Solution You Have Been Looking For

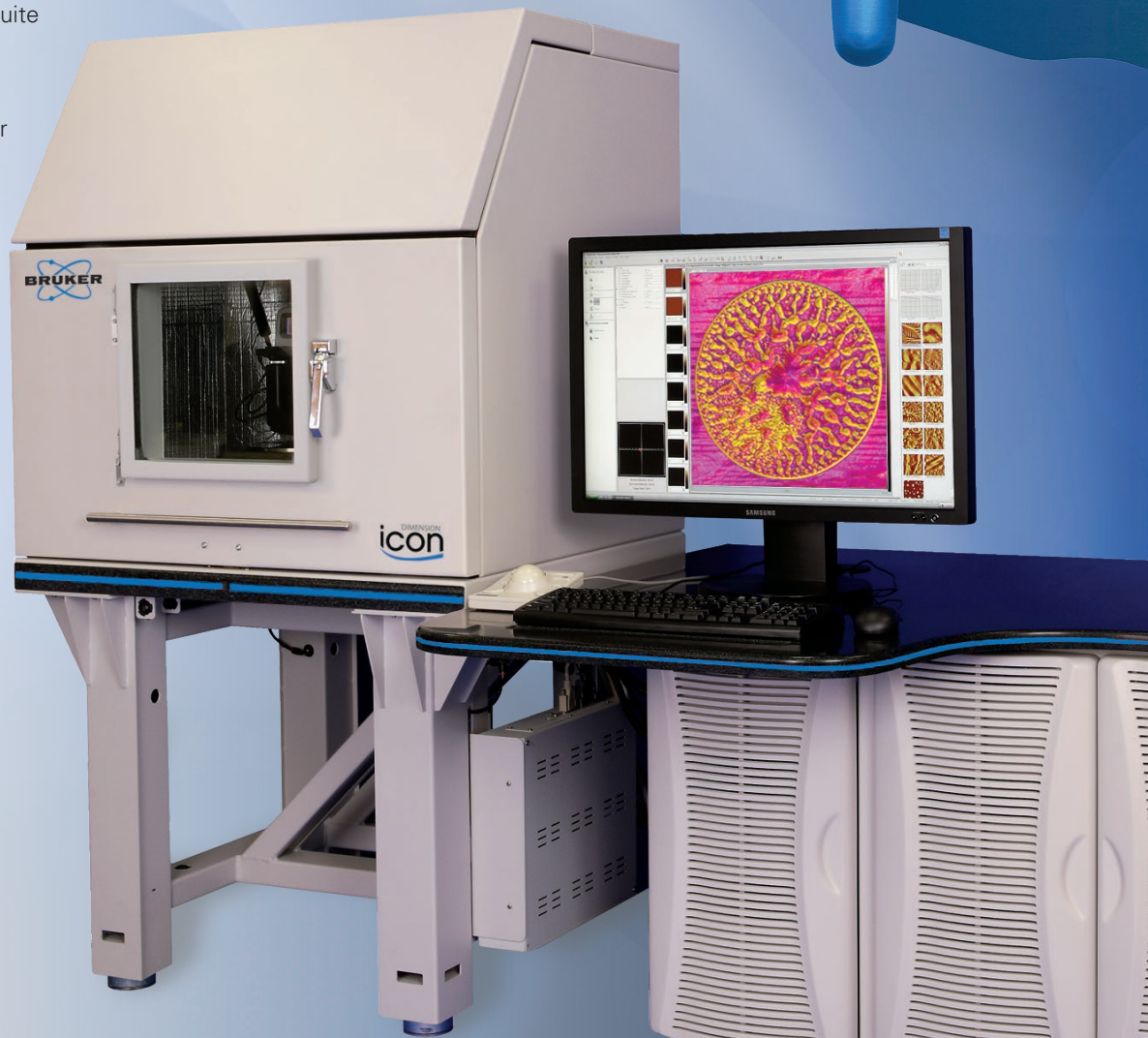
Researchers need every advantage they can find to get ahead in today's urgent world of discovery. Dimension Icon will give you that edge. With the lowest noise of any closed-loop scanner, high resolution, fast time-to-results, and the world's most powerful controller at your disposal, your data will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

Dimension 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, and ensure faster time to results and publication.

Dimension Icon is continually evolving to meet your growing research needs. Icon is powered by the full suite of Bruker's unmatched AFM accessories and modes, and is specifically designed for future AFM expansion.

With a full complement of Bruker AFM probes

Dimension Icon uses Bruker proprietary Silicon Nitride probe technology to maximize performance. A range of ScanAsyst probes are available for imaging in both fluid and air, and are available from Bruker Probes at BrukerAFMprobes.com.



Specifications



X-Y scan range	90 µm x 90 µm typical, 85 µm minimum
Z-range	10 µm typical in imaging and force curve modes, 9.5 µm minimum
Vertical noise floor	<30pm RMS in appropriate environment typical imaging bandwidth (up to 625Hz)
X-Y position noise (closed loop)	≤0.15 nm RMS typical imaging bandwidth (up to 625Hz)
X-Y position noise (open loop)	≤0.10 nm 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	210 mm vacuum chuck for samples, ≤210 mm diameter, ≤15 mm thick
Motorized position stage (X-Y axis)	180 mm × 150 mm inspectable area; 2 µm repeatability, unidirectional; 3 µm repeatability, bidirectional
Microscope Optics	5-megapixel digital camera; 180 µm to 1465 µm viewing area; Digital zoom and motorized focus
Controller	NanoScope 6
Workstation	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, Phasemaging, Lift Mode, MFM, Force Spectroscopy, Force Volume, EFM, Surface Potential, Piezoresponse Microscopy, Force Spectroscopy; Optional: AFM-nDMA, DataCube modes, PeakForce QNM, 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 and UKCA

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