

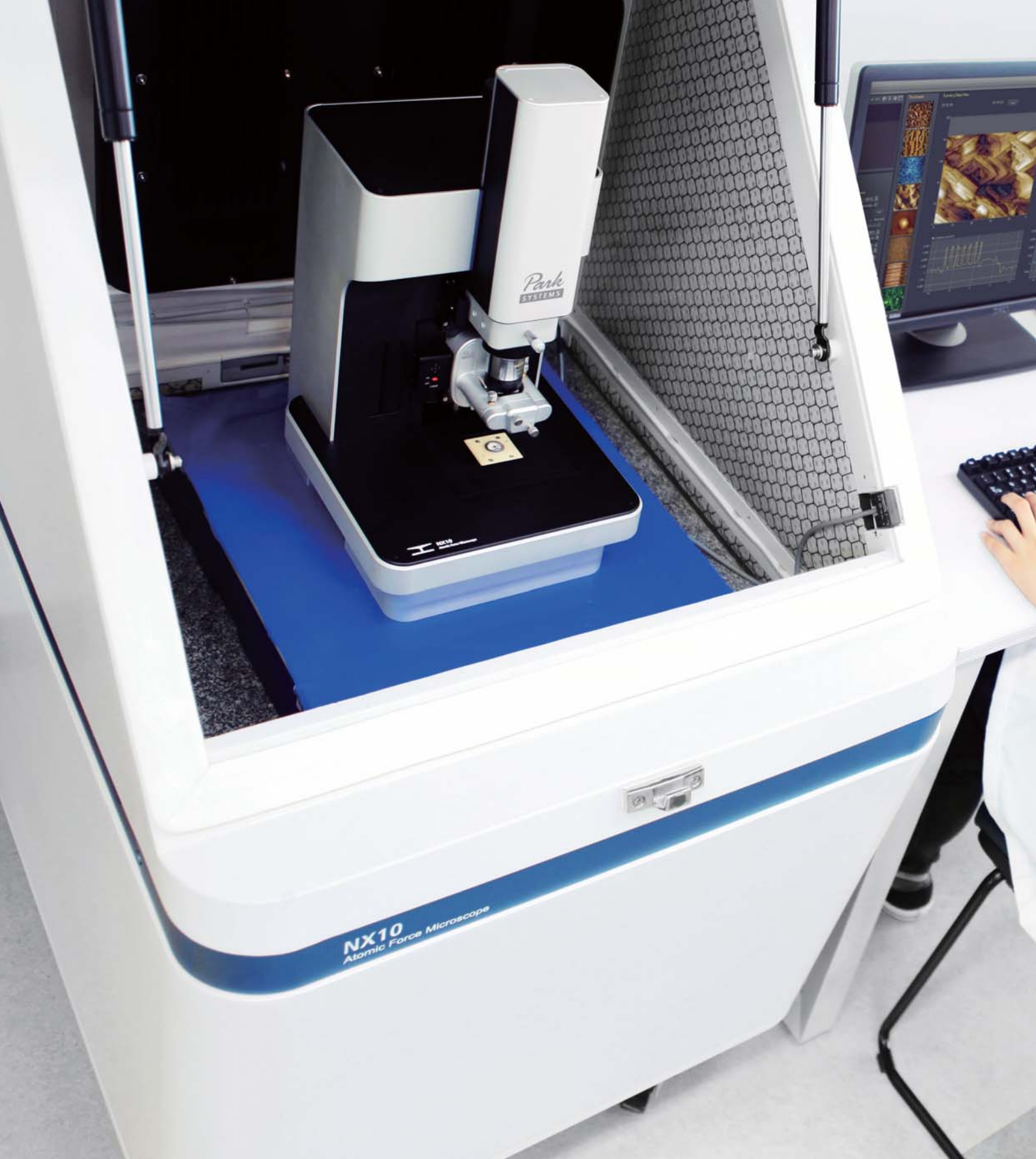


Park NX10

The most accurate and easiest to use
Atomic Force Microscope

www.parkAFM.com

Park
SYSTEMS



Park Systems *Enabling Nanoscale Advances*



Park NX10

The premiere choice for nanotechnology research

Better data

Park NX10 produces data you can trust, replicate, and publish at the highest nano resolution. It features the world's only true non-contact AFM that prolongs tip life while preserving your sample, and flexure based independent XY and Z scanner for unparalleled accuracy and resolution.

Better productivity

Powered by our revolutionary operating software **Park SmartScan™**, Park NX10 is capable of quicker, easier setup and more optimal data collection than ever before. Park SmartScan's **auto mode** allows novices to quickly collect high quality nanoscale images with just **three clicks** of a mouse while its manual mode provides all of the functionality necessary for veterans to **customize** their workflow as needed.

Better research

With more time and better data, you can focus on doing more innovative research. And the Park NX10's wide range of measurement modes and customizable design means it can be easily tailored to the most unique projects.

Park NX10

Innovative features for innovative work

Accurate XY Scan by Crosstalk Elimination

- Two independent, closed-loop XY and Z flexure scanners for sample and probe tip
- Flat and orthogonal XY scan with low residual bow
- Out-of-plane motion of less than 1 nm over an entire scan range
- Z scanner linearity deviation of less than 0.015% over an entire scan range
- Accurate height measurements without any need for software processing

Accurate AFM Topography with Low Noise Z Detector

- Sample topography measured by industry leading low noise Z detector
- True Sample Topography™ without edge overshoot or piezo creep error
- Accurate surface height recording, even during high-speed scanning
- Reduced XY scanner ringing by forward sine-scan algorithm
- Industry leading forward and backward scan gap of less than 0.15%

Best Tip Life, Resolution and Sample Preservation by True Non-Contact™ Mode

- Industry leading Z-scanner bandwidth of more than 9 kHz
- Fastest Z-servo speed of more than 62 mm/sec tip velocity
- Minimum tip wear for prolonged high-quality and high-resolution imaging
- Minimized sample damage or modification
- Immune from parameter-dependent results common in tapping imaging

User Experience-Driven Software and Hardware Features

- Open side access for easy sample or tip exchange
- Easy, intuitive laser alignment with pre-aligned tip mount
- Easy head removal by dovetail-lock mount
- Direct on-axis optics for high resolution optical viewing
- Fast automatic tip approach to sample surface within 10 seconds
- **Park SmartScan™** - AFM operating software versatile enough to empower both novices and power users alike toward great nanoscale research.
 - **Auto mode:** Automated image acquisition in three easy steps to determine probe setup, scan position, and scan area.
 - **Manual mode:** Opens various up scan parameters and macro/scripting support to advanced users for fine-tuned scan control.

The Most Comprehensive and Extensible AFM Solution

- The most extensive range of SPM modes
- The largest number of sample measurement options
- The best option compatibility and upgradeability in the industry
- 24 bit digital electronics with three internal lock-ins, Q-control, and spring constant calibration
- Active temperature control of acoustic enclosure



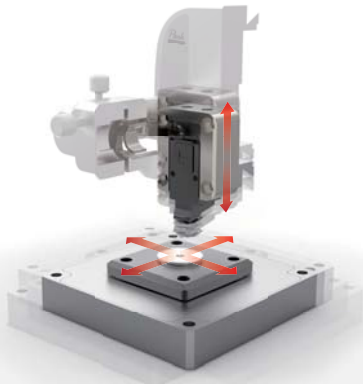


Park NX10

AFM Technology

Flat Orthogonal XY Scanning Without Scanner Bow

Park's Crosstalk Elimination removes scanner bow, allowing flat orthogonal XY scanning regardless of scan location, scan rate, and scan size. It shows no background curvature even on flattest samples, such as an optical flat, and with various scan offsets. This provides you with a very accurate height measurement and precision nanometrology for the most challenging problems in research and engineering.



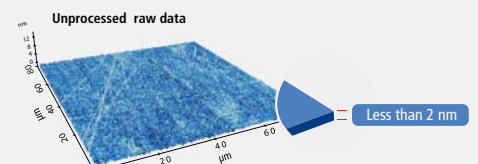
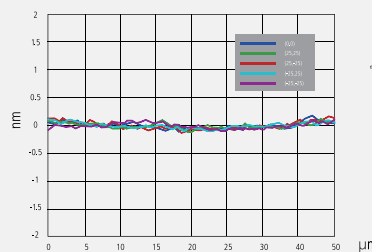
Decoupled XY and Z Scanners

The fundamental difference between Park and its closest competitor is in the scanner architecture. Park's unique flexure based independent XY scanner and Z scanner design allows unmatched data accuracy in nano resolution in the industry.

Accurate Surface Measurement

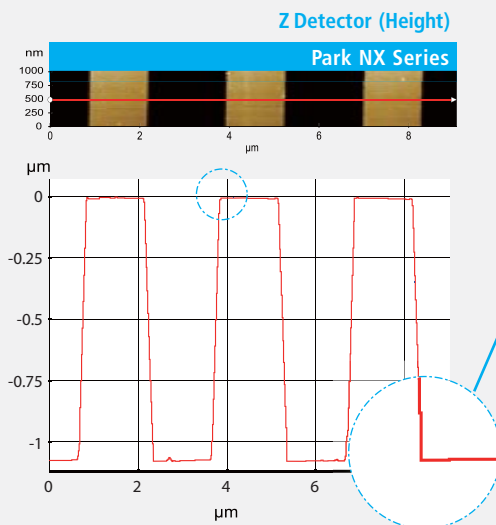
"Flat" sample surface as it is!

- Low residual bow
- No need for software processing (raw data)
- Accurate results independent of scan location



Industry Leading Low Noise Z Detector

Our AFMs are equipped with the most effective low noise Z detectors in the field, with a noise of 0.02 nm over large bandwidth. This produces highly accurate sample topography, no edge overshoot and no need for calibration. Just one of the many ways Park NX10 saves you time and gives you better data.



No creep effect

Accurate Sample Topography Measured by Low Noise Z Detector

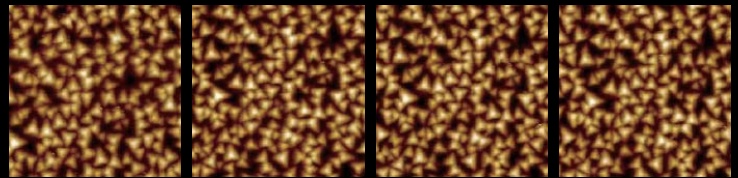
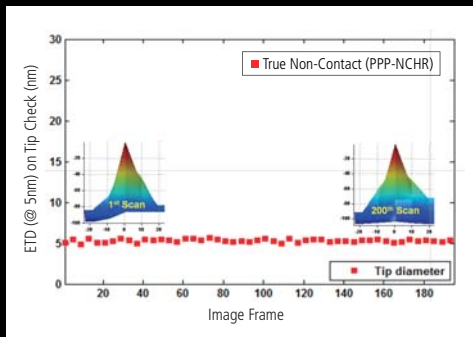
- Uses low noise Z detector signal for topography
- Has low Z detector noise of 0.02 nm over large bandwidth
- Has no edge overshoot at the leading and trailing edges
- Needs calibration done only once at the factory

Sample: 1.2 μm Nominal Step Height
(9 μm x 1 μm , 2048 pixels x 128 lines)

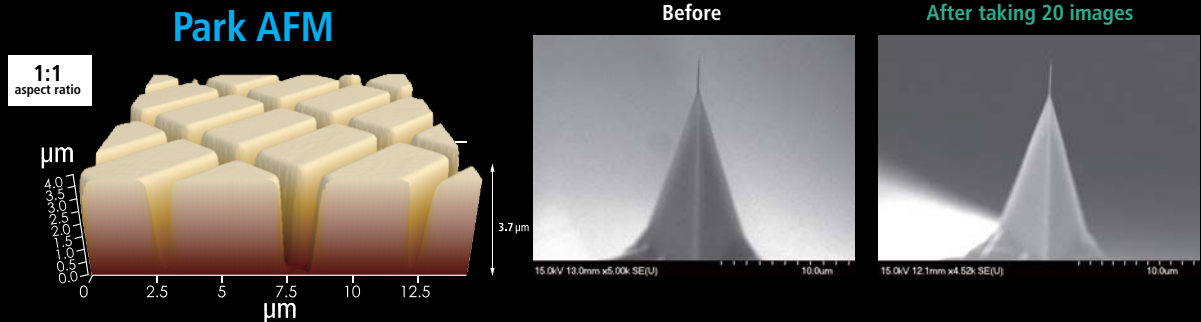
True Non-Contact™ Mode

True Non-Contact™ Mode is a scan mode unique to Park AFM systems that produces high resolution and accurate data by preventing destructive tip-sample interaction during a scan.

Unlike in contact mode, where the tip touches the sample continuously during a scan, or in tapping mode, where the tip touches the sample periodically, a tip used in non-contact mode does not touch the sample. Because of this, use of non-contact mode has several key advantages. Scanning at the highest resolution throughout imaging is now possible as the tip's sharpness is maintained. Non-contact mode avoids damaging soft samples as the tip and sample surface avoid direct contact. Money is also saved as turnover on costly tips is reduced.



Furthermore, non-contact mode senses tip-to-sample force interactions occurring all around the tip. Forces occurring laterally to tip approach to the sample are detected. Therefore, tips used in non-contact mode can avoid crashing into tall structures that may suddenly appear on a sample surface. Contact and tapping modes only detect the force coming from below the tip and are vulnerable to such crashes.



Accurate Feedback by Faster Z-servo enables True Non-Contact AFM



True Non-Contact™ Mode

- Less tip wear = Prolonged high-resolution scan
- Non-destructive tip-sample interaction = Minimized sample modification
- Maintains non-contact scan over a wide range of samples and conditions.

Park NX10

Equipped with the most innovative AFM technology

1 2D Flexure-Guided Scanner with 50 μm x 50 μm Scan Range

The XY scanner consists of symmetrical 2-dimensional flexure and high-force piezoelectric stacks. It provides high orthogonal movement with minimal out-of-plane motion and high responsiveness that is essential for precise sample scanning in the nanometer scale. The compact and rigid structure of Park NX10 enables low noise, high-speed servo response.

2 High Speed Z Scanner with 15 μm Scan Range

Driven by a high-force piezoelectric stack and guided by a flexure structure, the standard Z scanner has a high resonant frequency of more than 9 kHz (typically 10.5 kHz) and an ultra fast Z-servo speed of more than 48 mm/sec tip velocity. The maximum Z scan range can be extended from 15 μm to 30 μm with the optional long range Z scanner.

3 Low Noise XYZ Position Sensors

The industry leading low noise Z detector replaces the applied Z voltage as the topography signal while the low noise XY closed loop scan minimizes the forward and backward scan gap to less than 0.15% of the scan range.

4 Motorized XY Sample Stage

XY Sample Stage is motorized to make it easy for navigating and positioning the sample to the region of interest. This motorized stage has a resolution of 0.6 μm (using micro-stepping) on both axis.

5 Step-and-Scan Automation

Using the motorized sample stage, Step-and-Scan enables programmable multiple region imaging. Here's how it works:

- 1 Scan an image
- 2 Lift cantilever
- 3 Move motorized stage to a user defined coordinate
- 4 Approach
- 5 Repeat scan

This automated feature greatly increases productivity by reducing the need for your interaction during the scan process.

6 Accessible Sample Holder

The Park NX10's unique head design handles up to 50 mm x 50 mm x 20 mm (width x length x height) sample size, and it allows easy side access to the sample and tip.

7 Expansion Slot for Advanced SPM Modes and Options

Advanced SPM modes are enabled by simply plugging an option module to the expansion slot. The modular design of the NX-series AFM allows option compatibility throughout its product line.

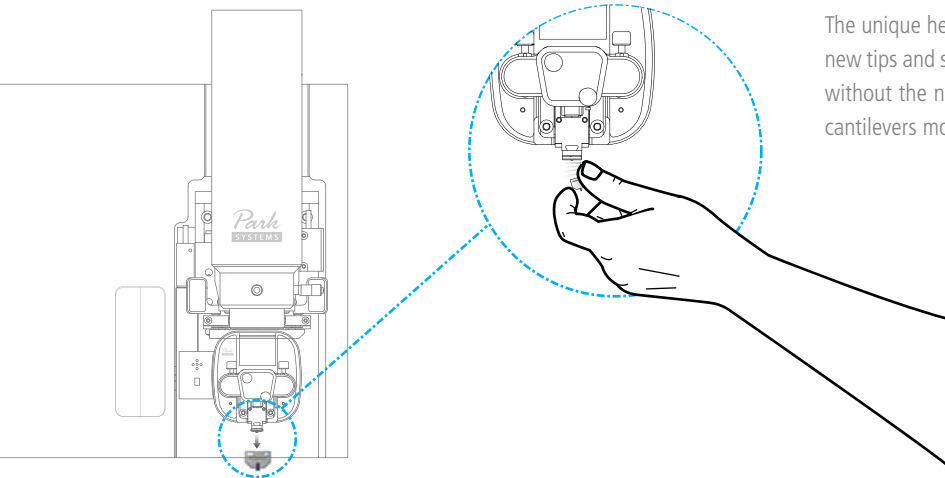


Park NX10

Why the world's most accurate small sample AFM is also the easiest to use

Easy Tip and Sample Exchange

The unique head design allows easy side access allowing you to easily snap new tips and samples into place by hand. The cantilever is ready for scanning without the need for any tricky laser beam alignment by using pre-aligned cantilevers mounted on to the cantilever tip holder.



Easy Snap by Hand



Lightning Fast Automatic Tip Approach

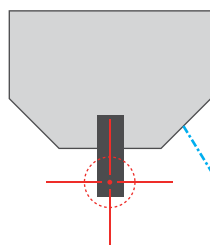
Our automatic tip to sample approach requires no user intervention and engages in just 10 seconds after loading the cantilever. By monitoring the cantilever response to the approaching surface, Park NX10 can initiate an automatic fast tip to sample approach within 10 seconds of cantilever loading. Fast feedback by the high-speed Z scanner and low noise signal processing by the NX electronics controller enable quick engagement to the sample surface without any user intervention. It just works, minimal user involvement required.

Easy, Intuitive Laser Beam Alignment

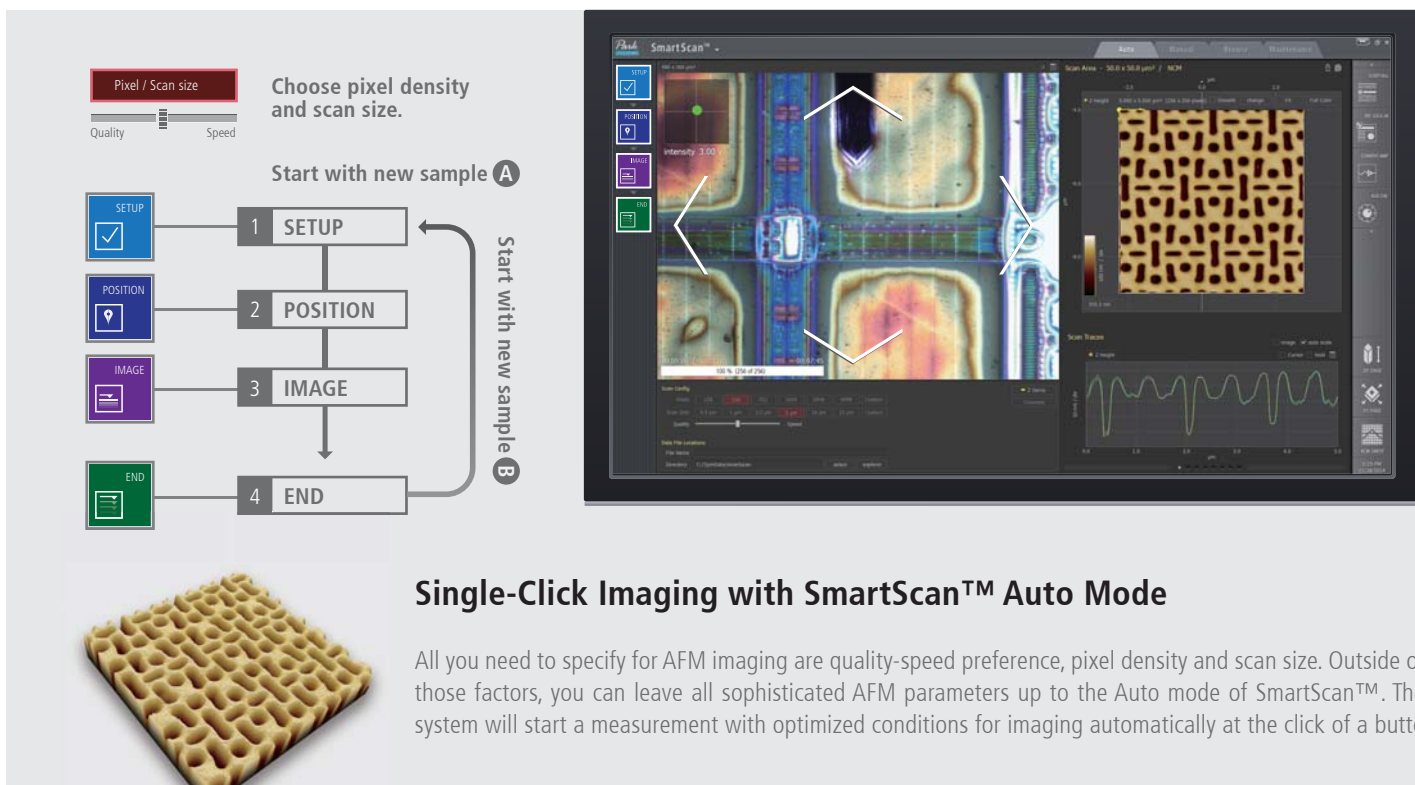
With our advanced pre-aligned cantilever holder, the **laser beam** is focused on the cantilever upon placement. Furthermore, the natural on-axis top-down view, the only one in the industry, allows you to easily find the laser spot. Since the laser beam falls vertically on the cantilever, you can intuitively move the laser spot along the X- and Y-axis by rotating its two positioning knobs. As a result, you can easily find the laser and position it on PSPD using our beam alignment user interface. From there, all you will need is a minor adjustment to maximize the signal to start acquiring the data.



The Laser beam is always focused on the cantilever upon replacement



Park SmartScan™



Pixel / Scan size
Quality | Speed

Choose pixel density and scan size.

Start with new sample **A**


1 SETUP

2 POSITION

3 IMAGE

4 END

Start with new sample **B**

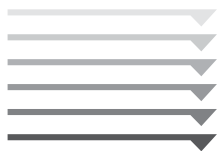


Single-Click Imaging with SmartScan™ Auto Mode

All you need to specify for AFM imaging are quality-speed preference, pixel density and scan size. Outside of those factors, you can leave all sophisticated AFM parameters up to the Auto mode of SmartScan™. The system will start a measurement with optimized conditions for imaging automatically at the click of a button.

An AFM OS for everyone, from amateurs to experts

Whether your AFM needs are focused on academic research, industrial metrology or failure analysis, SmartScan's Auto mode offers a streamlined system to generate publishable high quality AFM data. Moreover, SmartScan™ promises productive sessions with an AFM even for beginners to obtain quality data as good as an expert's, in much shorter time.



FastApproach™

Click the Position button, and the Z scanner approaches the sample automatically and at a much higher speed than the typical manual approach. Park's patented FastApproach™ safely takes the probe down to the sample surface at full speed without the user's intervention and engages in just 10 seconds after loading the cantilever.



Easy to Find an Area of Interest

After probe-to-surface engagement, the optical camera will automatically focus on the sample to find your area of interest (AOI). The UX of SmartScan™ easily enables intuitive navigation of the sample by controlling the motorized stages in the integrated optical window. You can move the AOI of the sample directly by clicking the desired position in the optical window.

Speeds Up Imaging with AdaptiveScan™

Park's innovative AdaptiveScan™ controls the scan speed automatically based on the peaks and valleys of the sample surface. AdaptiveScan™ adjusts the optimum scan speed dynamically to acquire a quality image of an unknown morphology at a higher speed. This effectually shortens the imaging time while retaining top image quality comparable to that obtained by a well-trained expert manually. When moving to neighboring locations or zooming-in to a target, AdaptiveScan automatically applies a new optimal condition.

Park NX10

Adaptable to any project

The wide range of scanning modes and modular design of the NX series allows it to be easily tailored to the needs of any scanning probe microscopy project.

Standard Imaging

- True Non-Contact AFM
- Basic Contact AFM
- Lateral Force Microscopy (LFM)
- Phase Imaging
- Intermittent (tapping) AFM

Chemical Properties

- Chemical Force Microscopy with Functionalized Tip
- Electrochemical Microscopy (EC-STM and EC-AFM)

Thermal Properties

- Scanning Thermal Microscopy (SThM)

Mechanical Properties

- Force Modulation Microscopy (FMM)
- Nanoindentation
- Nanolithography
- Nanolithography with High Voltage
- Nanomanipulation
- Piezoelectric Force Microscopy (PFM)

Electrical Properties

- Conductive AFM
- I-V Spectroscopy
- Scanning Kelvin Probe Microscopy (SKPM/KPM)
- SKPM with High Voltage
- Scanning Capacitance Microscopy (SCM)
- Scanning Spreading-Resistance Microscopy (SSRM)
- Scanning Tunneling Microscopy (STM)
- Scanning Tunneling Spectroscopy (STS)
- Time-Resolved Photo Current Mapping (Tr-PCM)

Optical Properties

- Tip-Enhanced Raman Spectroscopy (TERS)
- Time-Resolved Photo Current Mapping (Tr-PCM)

Magnetic Properties

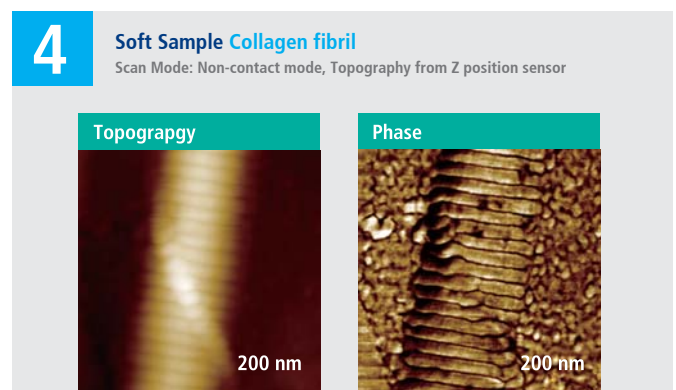
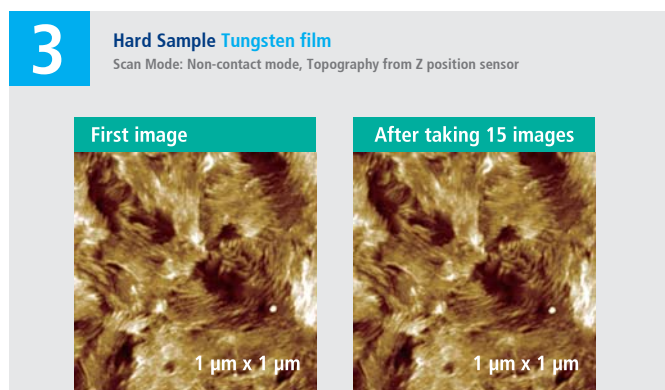
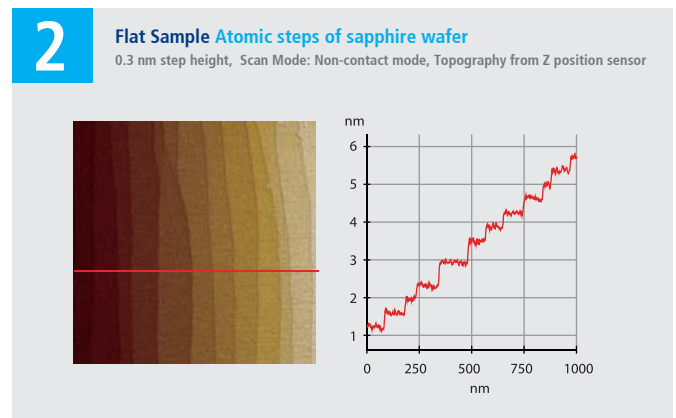
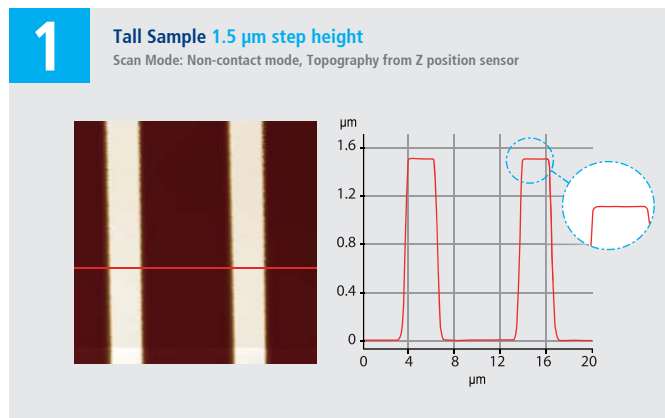
- Magnetic Force Microscopy (MFM)
- Tunable MFM

Dielectric/Piezoelectric Properties

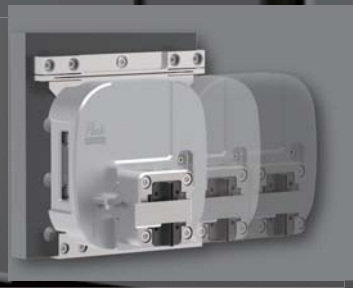
- Electric Force Microscopy (EFM)
- Dynamic Contact EFM (DC-EFM)
- Piezoelectric Force Microscopy (PFM)
- PFM with High Voltage

Force Measurement

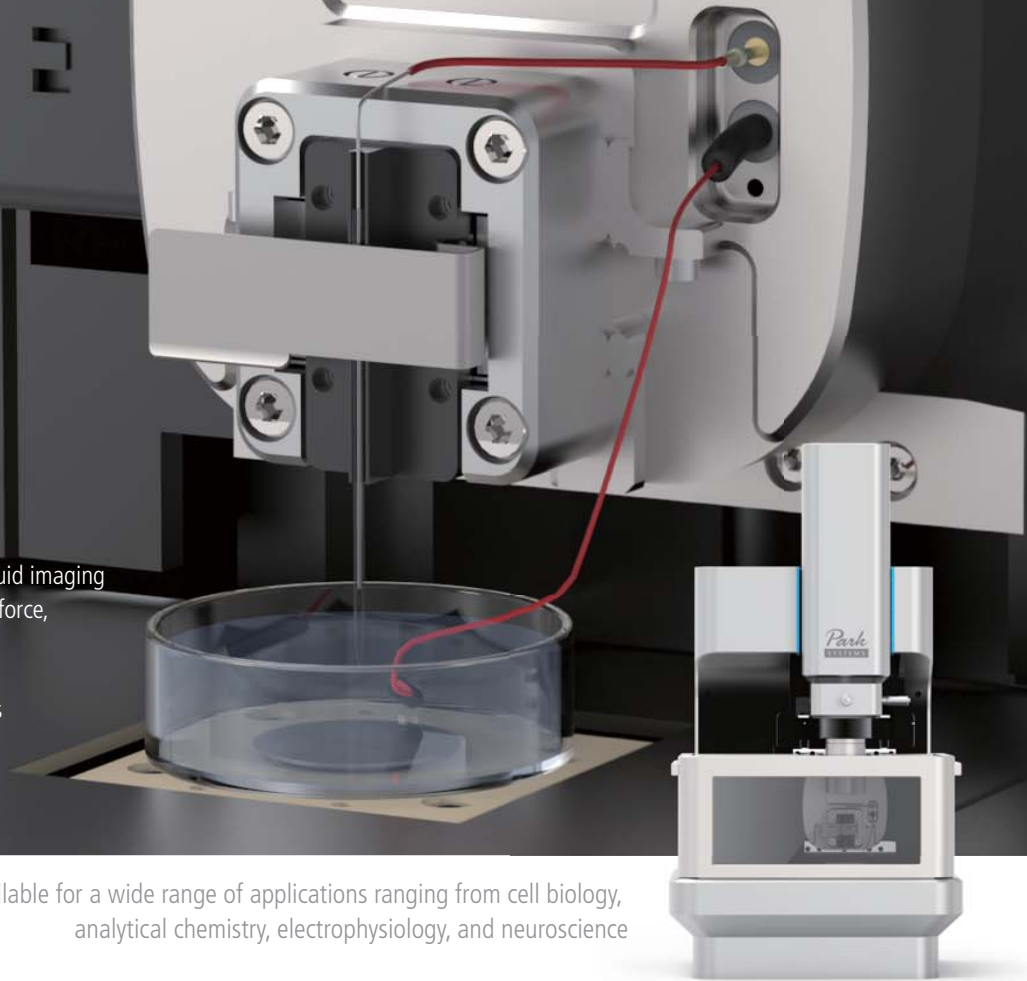
- Force Distance (F-D) Spectroscopy
- Force Volume Imaging
- Spring Constant Calibration by Thermal Method



Park NX10 Options



Park NX10 SICM permits truly non-invasive in-liquid imaging by combining the usage of nanopipettes with a no force, non-contact technique under aqueous conditions. This approach is powered by our dedicated Approach-Retract-Scan (ARS) software that enables both streamlined scanning automation through nanoscale probe-sample distance control.



Park NX10 SICM is now available for a wide range of applications ranging from cell biology, analytical chemistry, electrophysiology, and neuroscience



Park NX10 SICM Module

- A new hardware module for the Park NX10 to enable Scanning Ion Conductance Microscopy (SICM) functionality.



XY Scanners

- 10 μm x 10 μm XY Scanner
- 50 μm x 50 μm XY Scanner
- 100 μm x 100 μm XY Scanner



Temperature Control

- Heating & Cooling Stage (0~180 °C)
- 250 °C Heating Stage
- 600 °C Heating Stage



Liquid Probehand

- Designed for imaging in general liquid environment
- Resistant to most buffer solutions including acid
- Contact and Non-contact AFM imaging in liquid



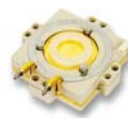
Magnetic Field Generator

- Applies external magnetic field parallel to sample surface
- Tunable magnetic field
- Range: -300 ~ 300 gauss
- Composed of pure iron core & two solenoid coils



Z Scanner Heads

- 15 μm Z Scanner Head
- 30 μm Z Scanner Head
- Wide optical access from the side



Liquid Cells

- Universal Liquid Cell
- Electrochemistry Cell
- Open Liquid Cell



Clip-type Chip Carrier

- Can be used with unmounted cantilever
- Tip bias function available for Conductive AFM and EFM
- Tip bias range: -10 V ~ 10 V



Active Temperature Controlled Acoustic Enclosure

- **Easy to use controls** - Innovative control design allows Park NX10 to quickly reach temperature equilibrium
- **Get scanning faster** - Temperature stability of less than 0.05 °C within 10 minutes of closing the Acoustic Enclosure door

Park NX10

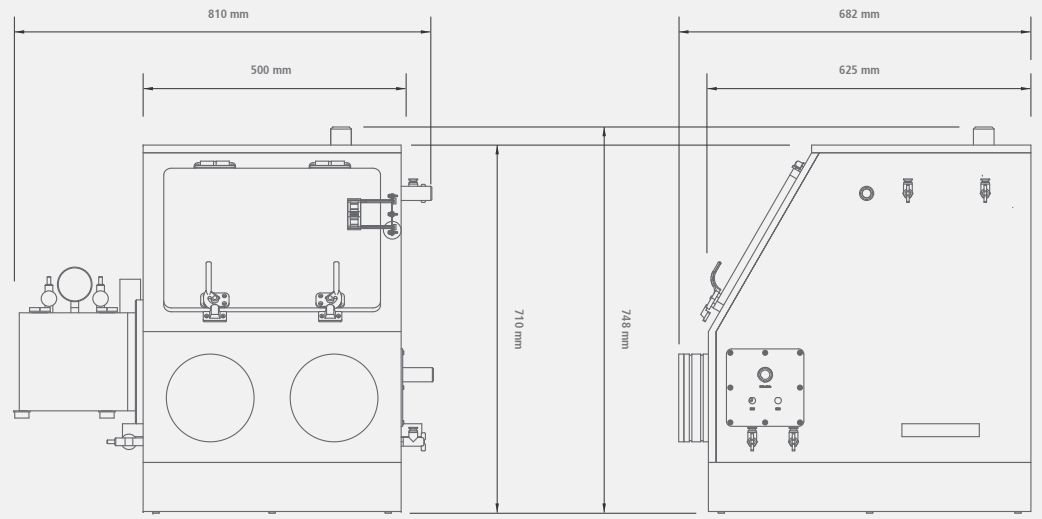
Specification

Scanner	Z scanner	SICM Head	XY scanner
	<p>AFM Head</p> <p>Guided high-force flexure scanner</p> <p>Scan range: 15 μm (optional 30 μm)</p> <p>Resolution: 0.015 nm</p> <p>Position detector noise: 0.03 nm (bandwidth: 1 kHz)</p> <p>Resonant frequency: > 9 kHz (typically 10.5 kHz)</p>	<p>SICM Head</p> <p>Flexure-guided structure driven by multiply-stacked piezoelectric stacks</p> <p>Z scan range: 25 μm</p> <p>Position detector noise: 0.03 nm (bandwidth: 1 kHz)</p>	<p>Single module flexure XY-scanner with closed-loop control</p> <p>Scan range: 50 μm \times 50 μm (optional 10 μm \times 10 μm or 100 μm \times 100 μm)</p> <p>Resolution: 0.05 nm</p> <p>Position detector noise: < 0.25 nm (bandwidth: 1 kHz)</p> <p>Out-of-plane motion: < 2 nm (over 40 μm scan)</p>
Stage	<p>Sample size: Open space up to 100 mm \times 100 mm, thickness up to 20 mm</p> <p>Sample weight: up to 500 g</p> <p>XY stage travel range: 20 mm \times 20 mm</p> <p>Z stage travel range: 25 mm</p> <p>Focus stage travel range: 15 mm</p>	Vision	<p>Direct on-axis vision of sample surface and cantilever</p> <p>Field-of-view: 480 μm \times 360 μm (with 10\times objective lens)</p> <p>CCD: 1 Mpixel (pixel resolution: 0.4 μm)</p> <p>5 Mpixel (pixel resolution: 0.2 μm)</p> <p>Objective lens</p> <p>10x (0.21NA) ultra-long working distance lens (1 μm resolution)</p> <p>20x (0.42 NA) high-resolution, long working distance lens (0.6 μm resolution)</p>
Electronics	Signal processing	Integrated functions	External signal access
	<p>ADC: 18 channels</p> <p>ADC channels (64 MSPS)</p> <p>24-bit ADCs for X, Y, and Z scanner position sensor</p> <p>DAC: 11 channels</p> <p>DAC channels (64 MSPS)</p> <p>20-bit DACs for X, Y, and Z scanner positioning</p> <p>Maximum data size: 4096 \times 4096 pixels</p>	<p>3 channels of flexible digital lock-in amplifier</p> <p>Spring constant calibration (Thermal method)</p> <p>Digital Q control</p>	<p>20 embedded signal input/output ports</p> <p>5 TTL outputs: EOF, EOL, EOP, Modulation, and AC bias</p>
Options/Modes	Standard Imaging	Chemical Properties	Dielectric/Piezoelectric Properties
	<ul style="list-style-type: none"> • True Non-Contact Mode • Basic Contact Mode • Lateral Force Microscopy (LFM) • Phase Imaging Mode • Tapping Mode 	<ul style="list-style-type: none"> • Chemical Force Microscopy with Functionalized Tip • Electrochemical Microscopy (EC-STM and EC-AFM) 	<ul style="list-style-type: none"> • Electric Force Microscopy (EFM) • Dynamic Contact EFM (EFM-DC) • Piezoelectric Force Microscopy (PFM) • PFM with High Voltage
	Force Measurement	Magnetic Properties	Thermal Properties
	<ul style="list-style-type: none"> • Force Distance (F-D) Spectroscopy • Force Volume Imaging 	<ul style="list-style-type: none"> • Magnetic Force Microscopy (MFM) • Tunable MFM 	<ul style="list-style-type: none"> • Scanning Thermal Microscopy (SThM)
	Electrical Properties	Mechanical Properties	
	<ul style="list-style-type: none"> • Pinpoint Conductive AFM (CP-AFM) • I-V Spectroscopy • Scanning Kelvin Probe Microscopy (SKPM/KPM) • SKPM with High Voltage • QuickStep Scanning Capacitance Microscopy (SCM) 	<ul style="list-style-type: none"> • Scanning Spreading-Resistance Microscopy (SSRM) • Scanning Tunneling Microscopy (STM) • Scanning Tunneling Spectroscopy (STS) • Photo Current Mapping (PCM) • Current-Distance Spectroscopy (with SICM) 	<ul style="list-style-type: none"> • Pinpoint Mode • Force Modulation Microscopy (FMM) • Nanoindentation • Nanolithography • Nanolithography with High Voltage • Nanomanipulation
Software	Park SmartScan™	Accessories	
	<ul style="list-style-type: none"> • AFM system control and data acquisition software • Auto mode for quick setup and easy imaging • Manual mode for advanced use and finer scan control <p>XEI</p> <ul style="list-style-type: none"> • AFM data analysis software • Stand-alone design—can install and analyze data away from AFM • Capable of producing 3D renders of acquired data 	<p>Electrochemistry Cell</p> <p>Universal Liquid Cell with Temperature Control</p> <p>Sample Stages with Temperature Control</p> <p>GloveBox</p> <p>Magnetic Field Generator</p> <p>Active Temperature Controlled Acoustic Enclosure</p>	

Dimensions in mm

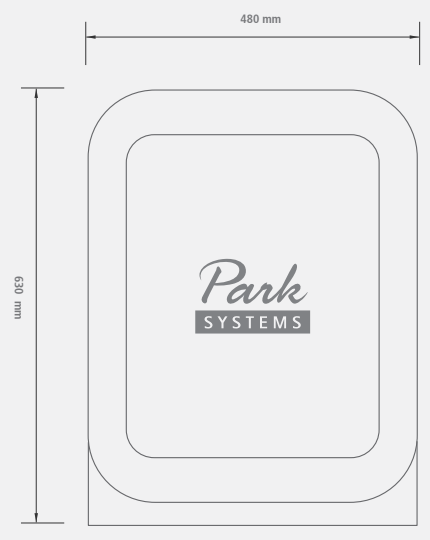
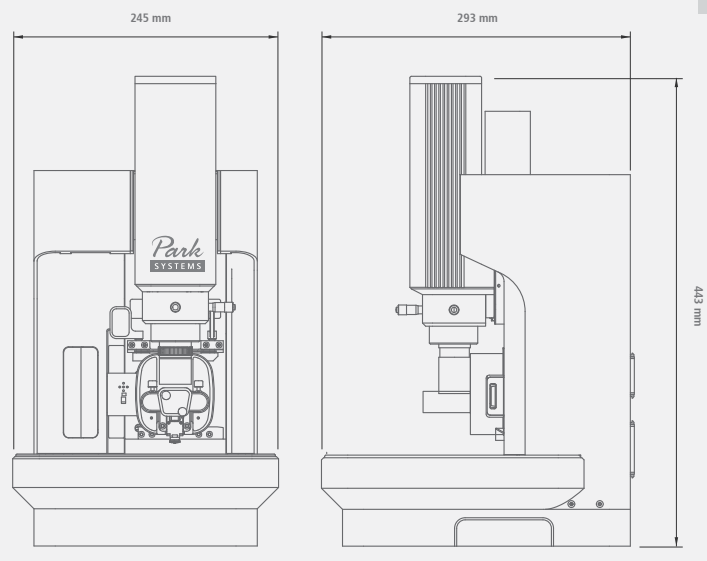
GloveBox

* Optional

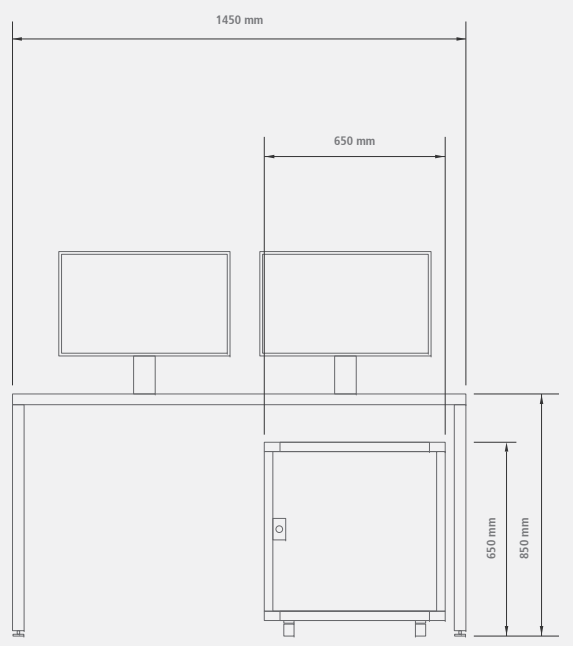
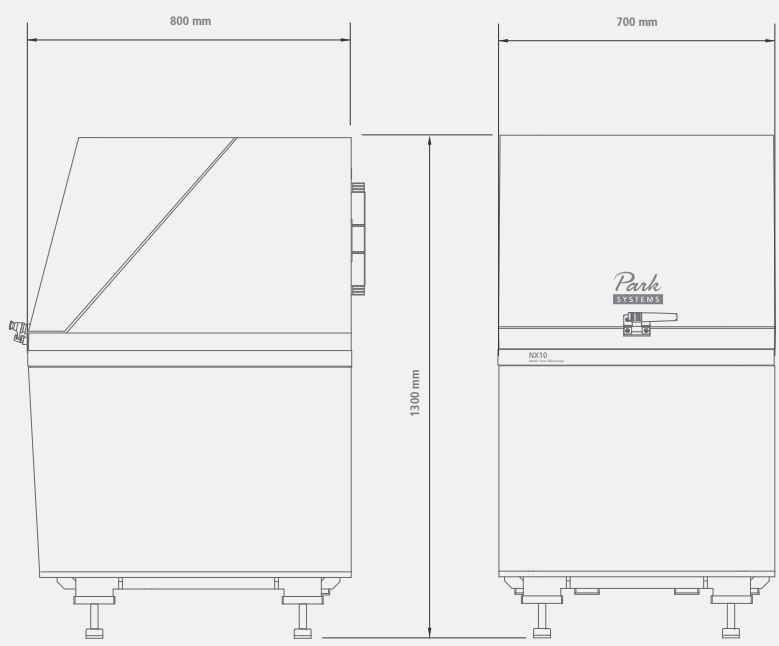


Park NX10

* Optional Acoustic Enclosure 101



* Optional Park NX10 Full System with Acoustic Enclosure 203



Park Systems

Dedicated to producing the most accurate and easiest to use AFMs

The global headquarters is located at
Korean Advanced Nanotechnology Center (KANC) in Suwon, Korea.



More than a quarter century ago, the foundations for Park Systems were laid at Stanford University where Dr. Sang-il Park, the founder of Park Systems worked as an integral part of the group that first developed AFM technology. After perfecting the technology, he then went on to create the first commercial AFM and later Park Systems was born.

Park Systems strives everyday to live up to the innovative spirit of its beginnings. Throughout our long history, we have honored our commitment to providing the most accurate and yet very easy to use AFMs, with revolutionary features like True Non-Contact™ mode, and many automated software tools. We are not simply content to rest on our past success. All of our products are designed with same care and creativity that went into our first, allowing you to focus on getting results without worrying about the integrity of your tools.



www.parkAFM.com

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 Note: All specifications are subject to change without notice.
Please visit our website for the most up-to-date specifications.

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