

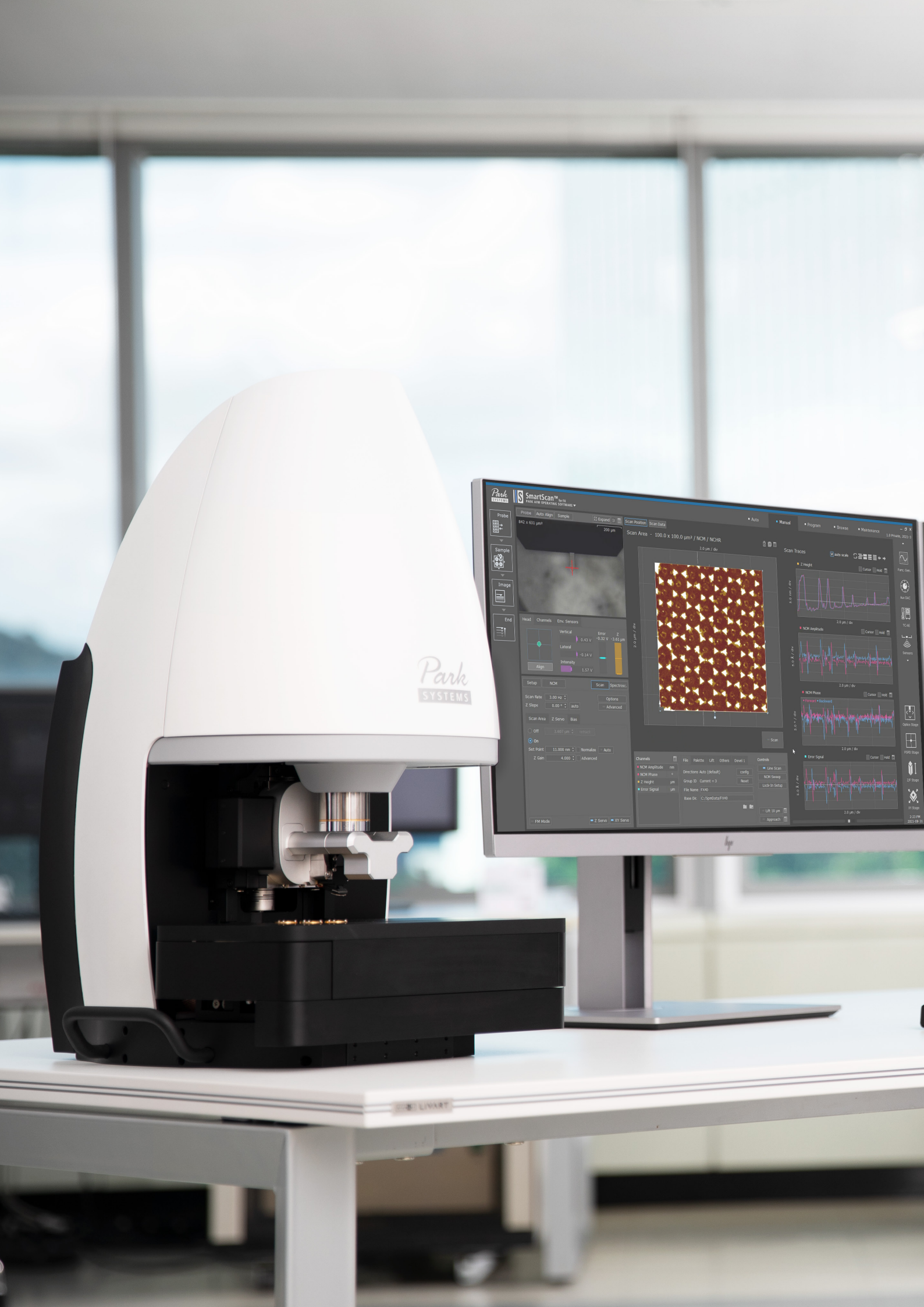
Enabling Nanoscale Advances



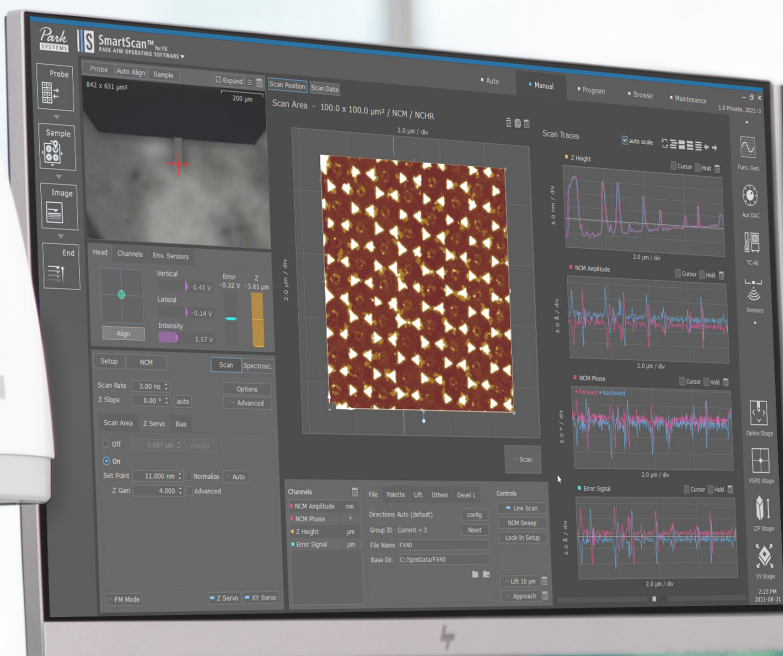
# Park FX40

A New Class of Atomic Force Microscope  
The Automatic AFM

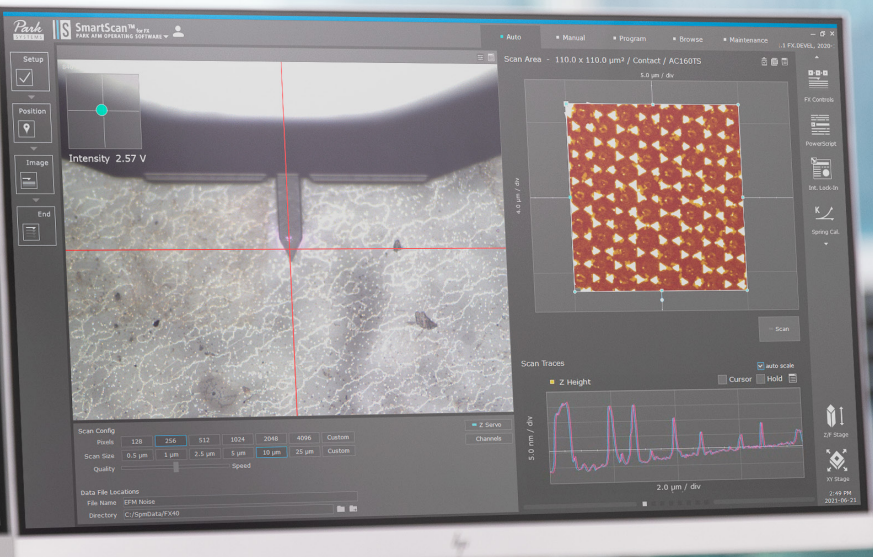




Park  
SYSTEMS



LIVARY



# Park FX40

## The Automatic AFM

### *Accelerate Your Research*

Get the highest resolution images and most accurate data autonomously, thereby accelerating your research. Unlike others, Park FX40 takes care of everything automatically: from probe pick up to landing to full autonomous scanning of the sample at a click of a button. It does this by infusing robotics, AI and machine learning into its groundbreaking FX system.

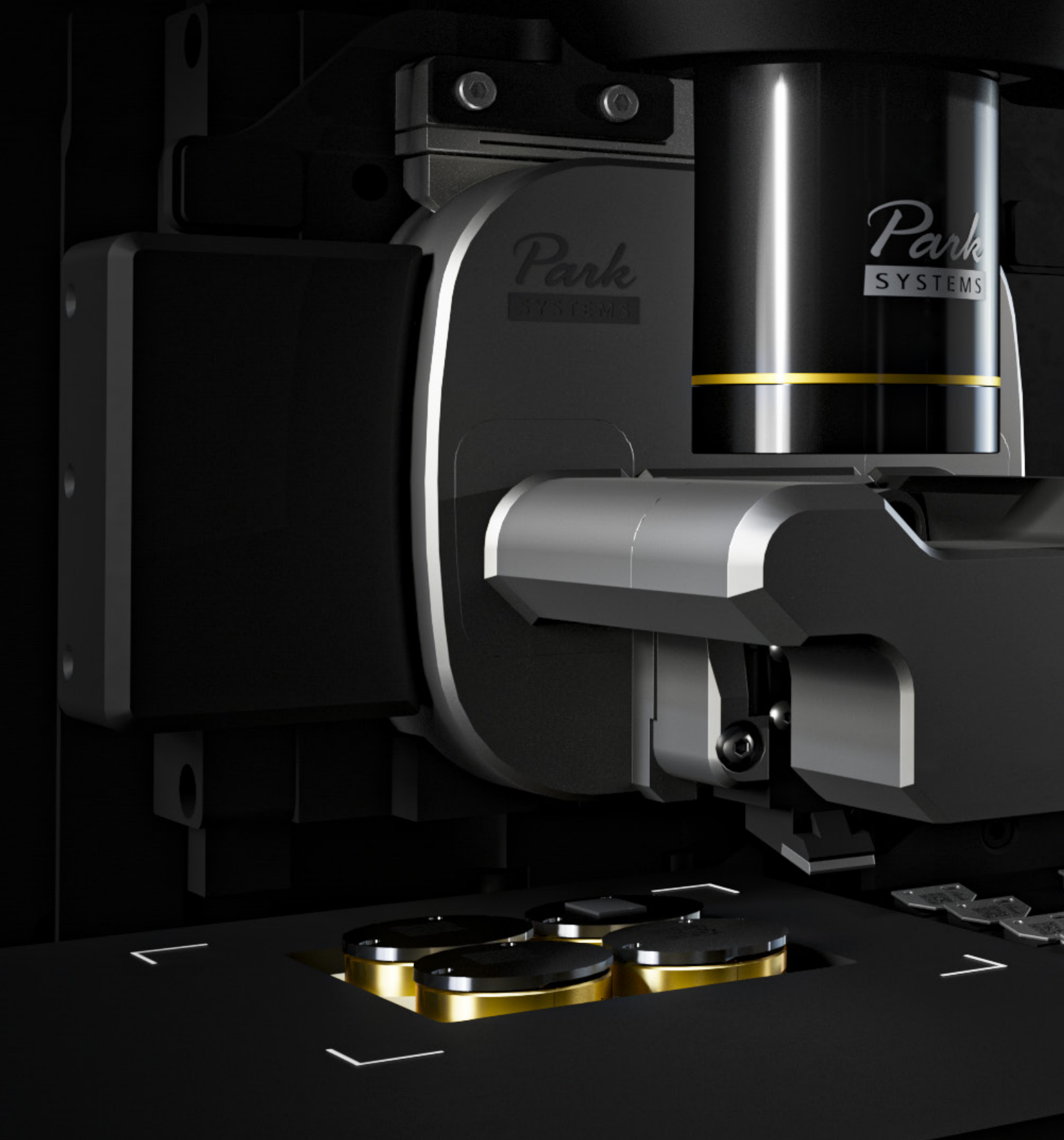
# Park FX40

The Automatic AFM

*Accelerate Your Research*

## Sail Through your Research and Development:

- The first dual-camera system ever adopted in research AFM
- Machine learning automation with updatable data

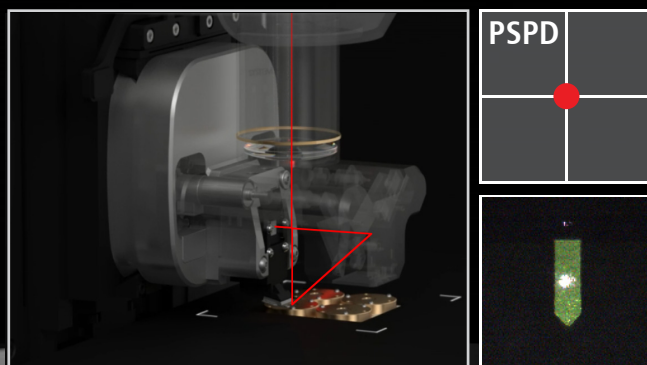


## Auto Probe Identification

The Probe Recognition Camera identifies the QR code imprinted on the chip carrier of a newly loaded probe and extracts and displays all pertinent information on each of the probes available, including the type, model, application, and usage. This enables you to quickly select the best probe for each job.

## Auto Probe Exchange

With Automated Probe Exchange, you can now replace old probes easily and safely in full automation. Harnessing the convenience of an 8-probe cassette, along with a magnetic controlled mechanism, the Park FX40 autonomously mounts the probes.



## Auto Beam Alignment

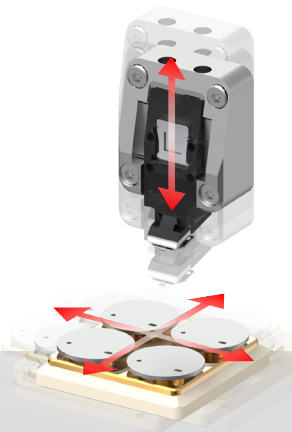
Automatic Beam Alignment positions the laser beam onto the proper location of a cantilever and further optimizes the PSPD position both vertically and laterally. It shifts the X,Y and Z axis for clearer images, with no distortion, all autonomously at the click of a button.

# Park FX40

## The Park AFM Technology

### Flat Orthogonal XY Scanning without Scanner Bow

Park's Crosstalk Elimination scanner structure 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.

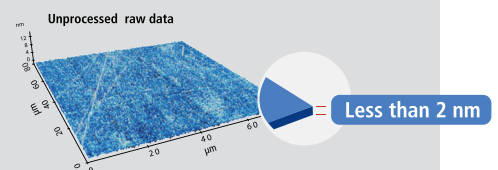
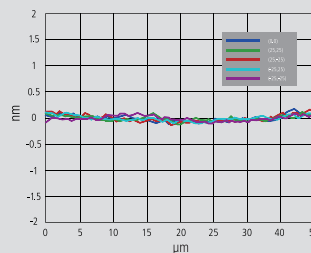


### Decoupled XY and Z Scanners

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.

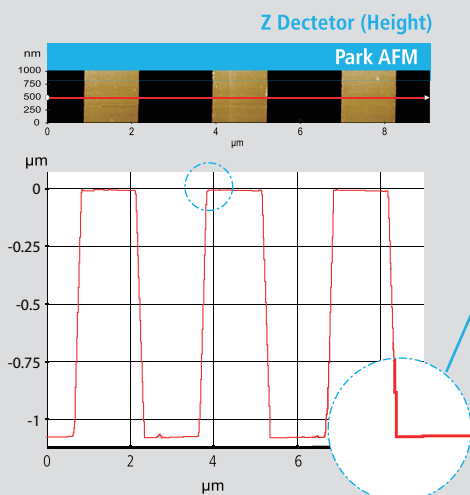
### Accurate Surface Measurement "Flat" sample surface as it is!

- Low residual bow
- No need for software processing
- Accurate results independent of scan location



### Industry Leading Low Noise Z Detector

Park 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 and no edge overshoot. Just one of the many ways Park AFM saves you time and gives you better data.



### No creep effect

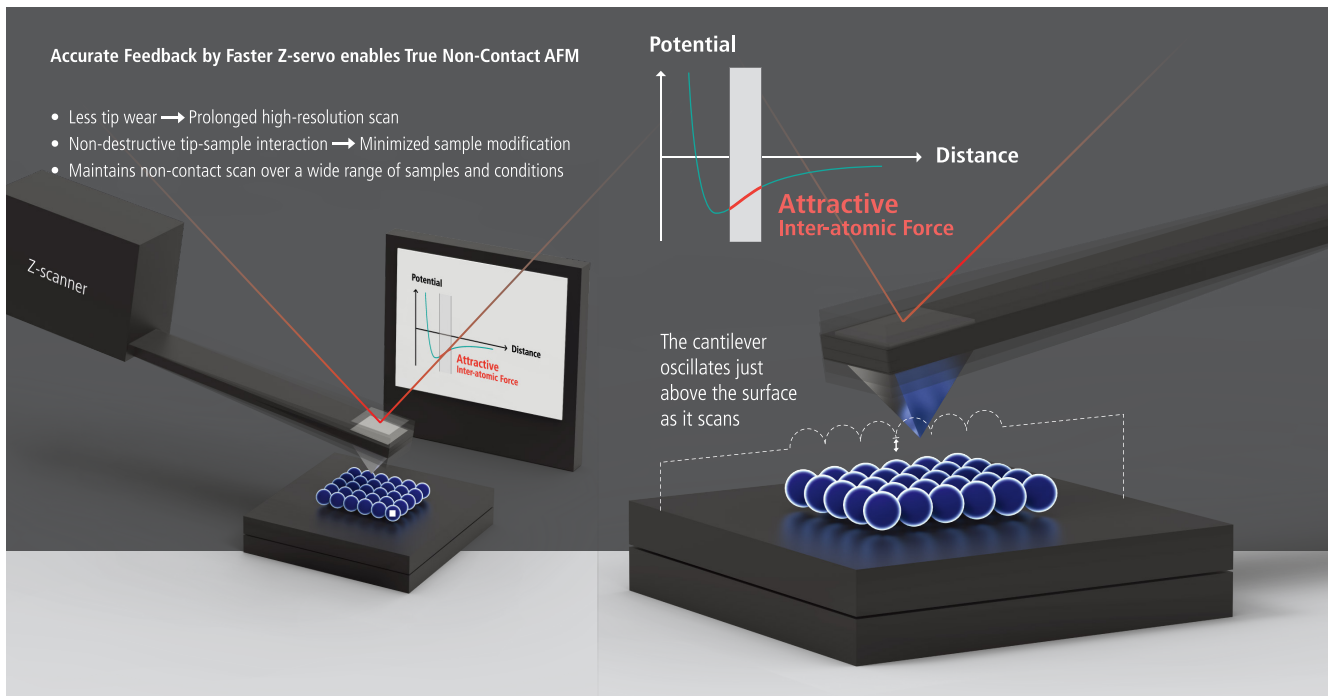
### Accurate Sample Topography Measured by Low Noise Z Detector

- 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

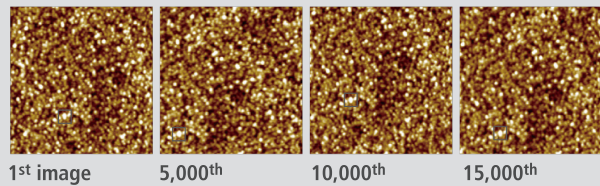
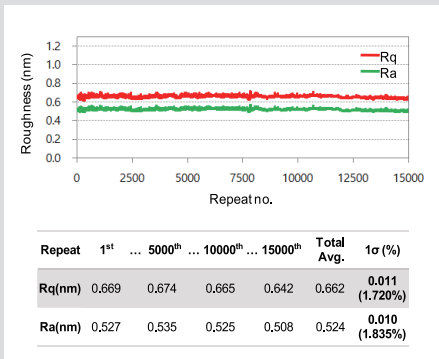
Sample: 1.2 μm Nominal Step Height  
(9 μm x 1 μm, 2048 pixels x 128 lines)

# True Non-Contact™ Mode

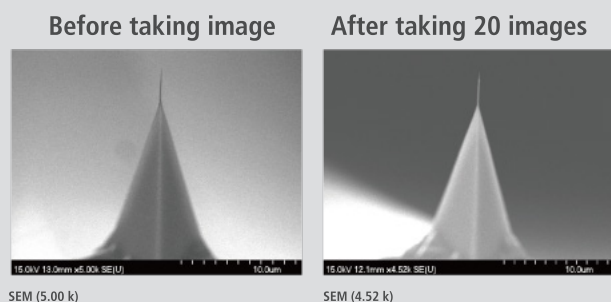
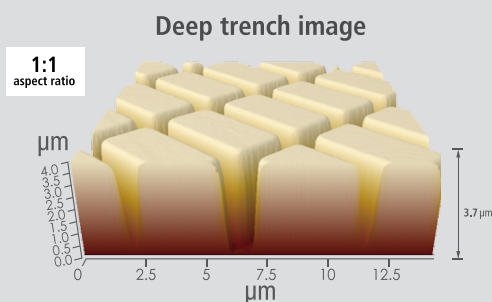
True Non-Contact™ Mode is a scan mode unique to Park AFM systems that produces high resolution and accurate data by preventing destructive tip-sample interaction during a scan.

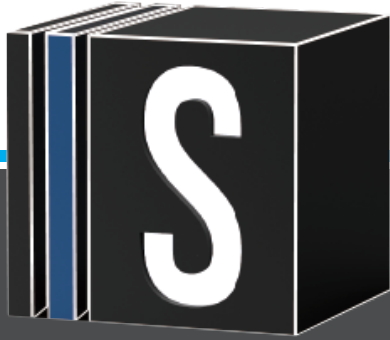


Unlike in contact mode, where the tip contacts the sample continuously during a scan, or in tapping mode, where the tip touches the sample periodically, a tip used in non-contact mode does not touch the sample. Because of this, use of non-contact mode has several key advantages. Scanning at the highest 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.



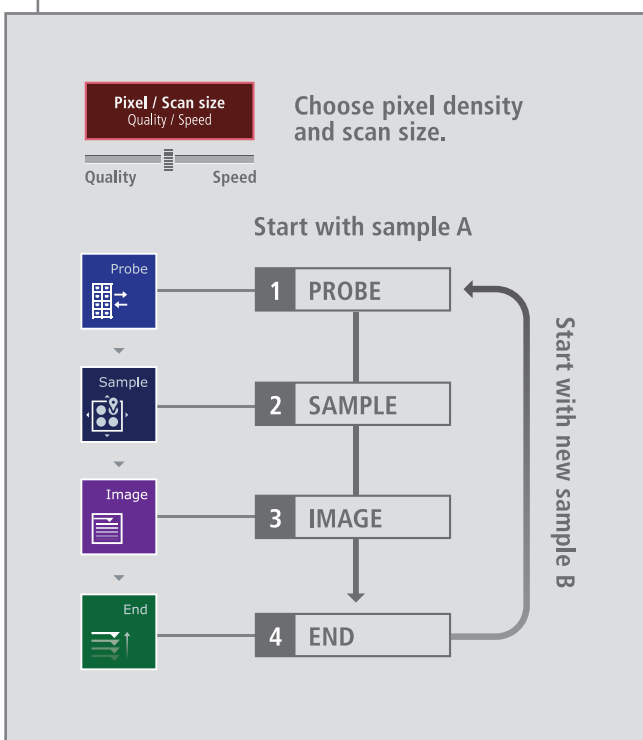
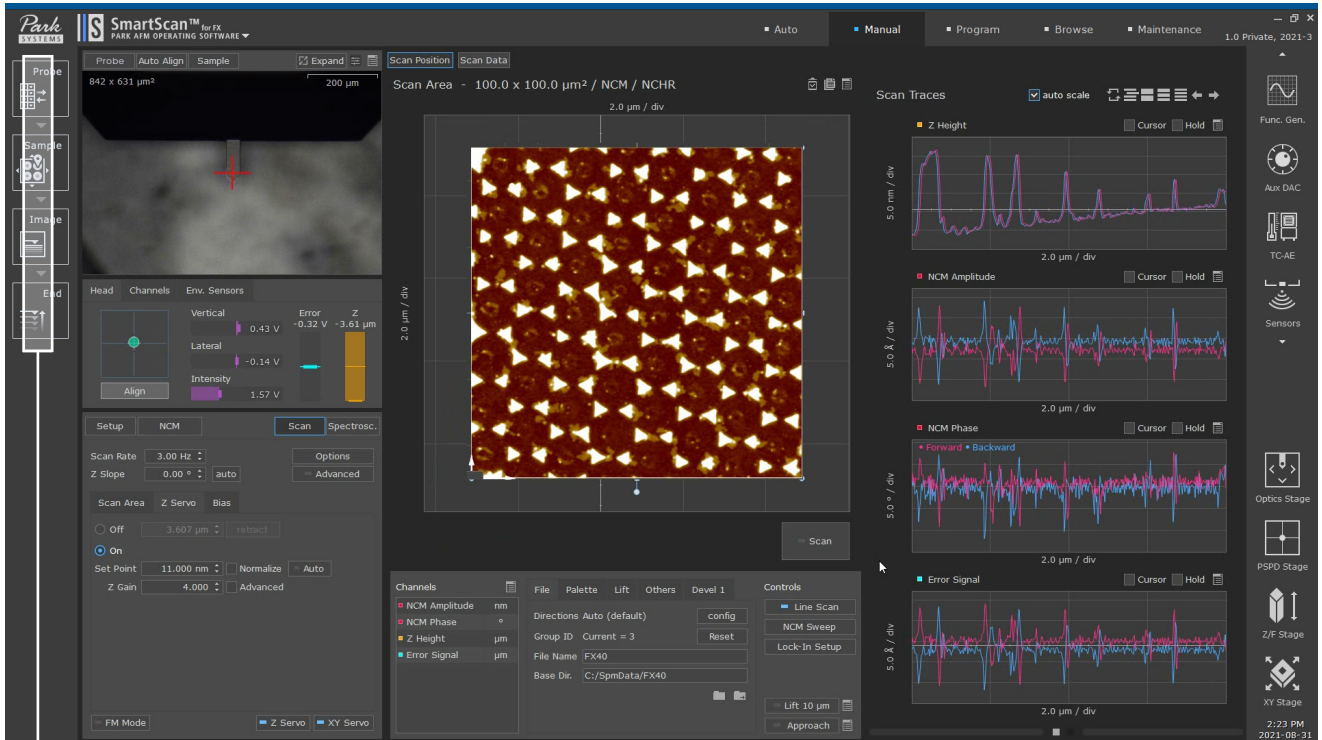
Furthermore, non-contact mode senses tip-sample interactions occurring all around the tip. Forces occurring laterally to tip approach to the sample are detected. Therefore, tips used in non-contact mode can avoid crashing into tall structures that may suddenly appear on a sample surface. Contact and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





# SmartScan™ for FX PARK AFM OPERATING SOFTWARE

The Most Intelligent Operating Software  
Park SmartScan™ for FX



## Start to finish with 3 steps of Park SmartScan™

### SETUP

Park SmartScan does all your setup including the probe exchange and laser alignment, ready for imaging.

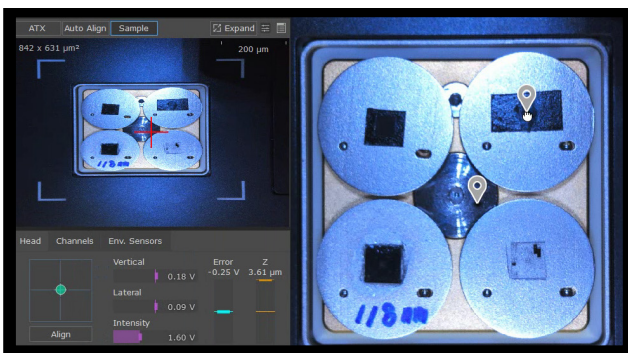
### POSITION

Autonomously, it performs the frequency sweep for the cantilever and brings down the Z-stage to the sample. The added sample camera of Park FX40 enables you to navigate effortlessly to the area of your interest for scanning.

### IMAGE

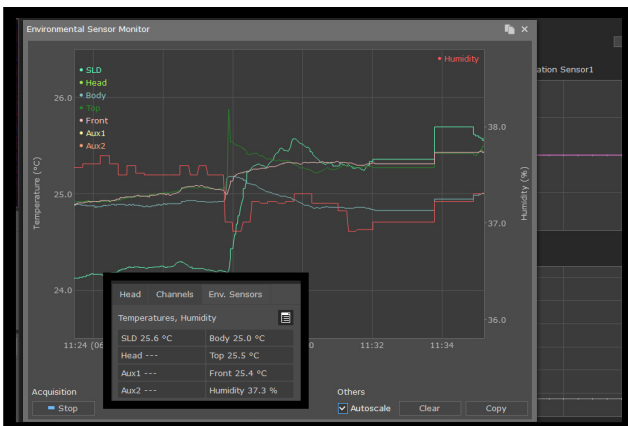
The system sets all the necessary parameters for optimum imaging, and starts scanning the sample. It continues to scan until the image is acquired and completed with best result.





## Easy Sample Navigation

With the new sample camera, you can automatically pair probes to sample locations. The sample camera effortlessly locates the most relevant spot for scanning. Park SmartScan allows you to surf the sample intuitively by controlling the motorized stages through its sample navigation window.



## Environmental Sensors for Self-diagnostics

Park SmartScan displays and stores data from sensors, which measures essential environmental conditions such as temperature, humidity and vibration. This allows you to evaluate your environmental conditions which may affect both system and image quality.



## Auto Set-up for Imaging

Park FX does all your set up with the simple click of a button, automatically changing and replacing its own tips, to avoid any contamination or user-related errors. Operators are offered tip choices including the type, model, application, and usage.

# Park FX40

The Automatic AFM

Accelerate Your Research

## Park FX40



Park FX40

Place the sample ■ 1

Select the region of interest ■ 2

Auto scan ■ 3

End ■ 4



### Save Time

- Let FX40 do automatically and fast all time-consuming tasks of AFM

### Save Energy

- Free stress from probe and scanning operation

### Accomplish More

- Focus on your research
- Publish your work faster
- Win recognition

## Conventional AFM

START

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

End

START

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

End

End

End

End

End



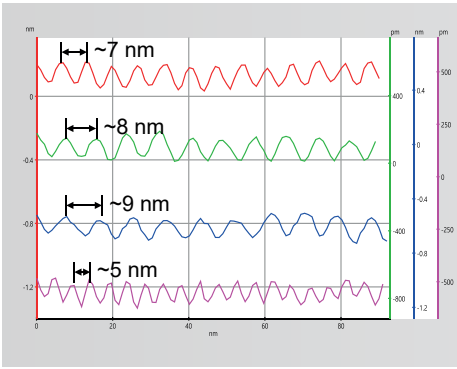
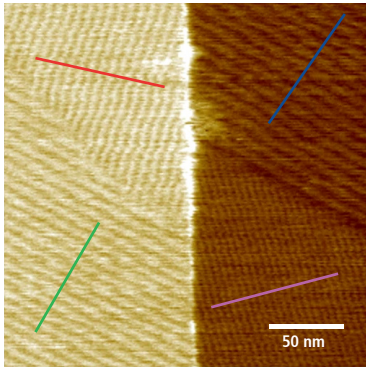
Go to back to step 1 for a new sample

Save time. Save energy.  
Accomplish more!

Ask for a demo, and experience the FX difference.

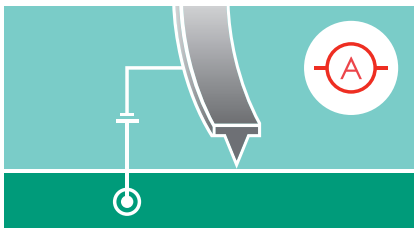


### NCM: C36H74 on HOPG

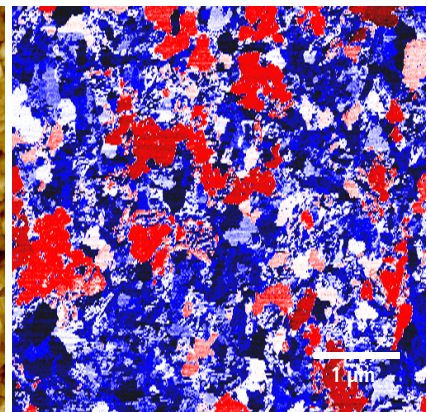
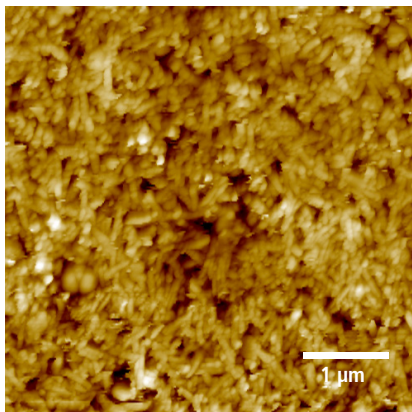


Scanning conditions  
Scan Mode: NCM

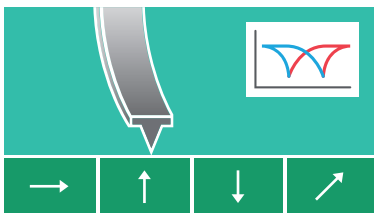
### C-AFM: Cobalt doped iron oxide



Scanning conditions  
Scan Mode: C-AFM



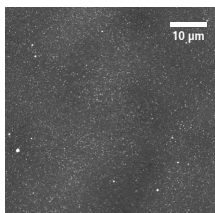
### PFM: PZT thin film (bias lithography conducted by SmartLitho)



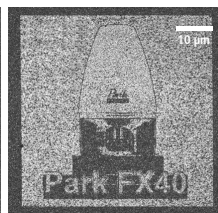
PFM



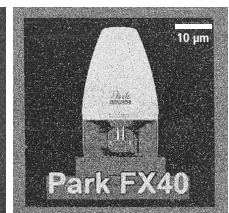
Design



Height

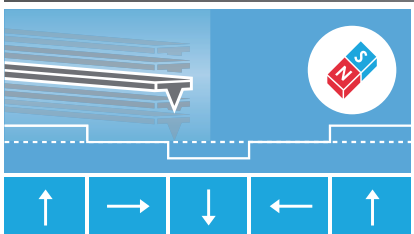


PFM amplitude

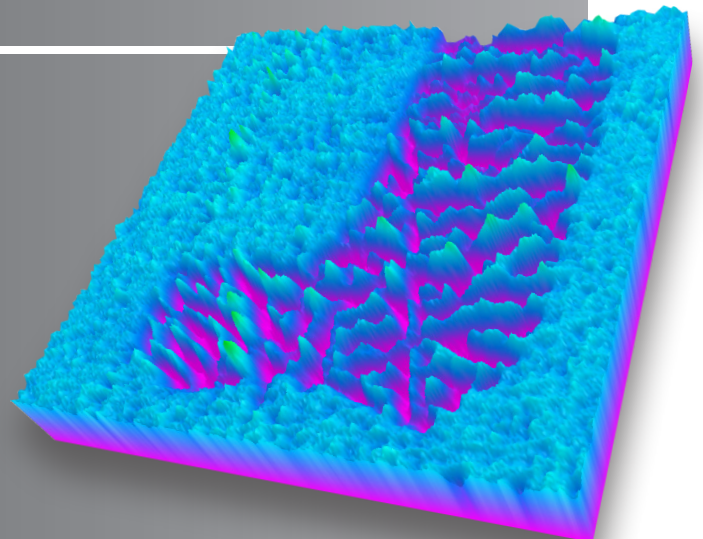
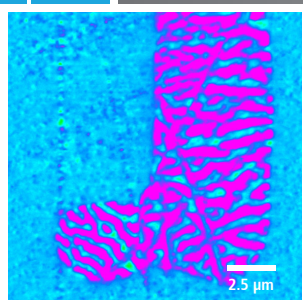
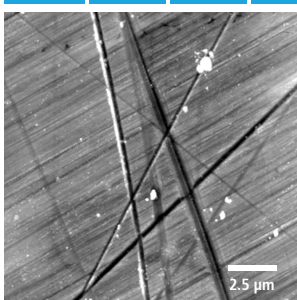


PFM phase

### MFM: Cr-Co-Mo alloy



Scanning conditions  
Scan Mode: MFM



\* optional

<b>Scanner</b>	Z scanner	XY scanner		
	Flexure guided high-force scanner Scan range: 15 $\mu\text{m}$ (optional 30 $\mu\text{m}$ )	Single module flexure XY-scanner with closed-loop control Scan range : 100 $\mu\text{m}$ $\times$ 100 $\mu\text{m}$ (optional 10 $\mu\text{m}$ $\times$ 10 $\mu\text{m}$ or 50 $\mu\text{m}$ $\times$ 50 $\mu\text{m}$ )		
<b>Stage</b>	XY stage travel range	Z stage travel range	Focus stage travel range	
	105 mm x 40 mm (Motorized)	22 mm (Motorized)	25 mm (Motorized)	
<b>Sample Mount</b>	Sample size	Mounting	On-Axis Optics	
	20 mm x 20 mm recommended, thickness up to 20 mm	Magnetic holder (Max. 4 sample disc) FX Snap-in Sample Disk for Multi Snap-in Sample Chuck	10x (0.21 N.A.) ultra-long working distance lens (1 $\mu\text{m}$ resolution) Direct on-axis vision of sample surface and cantilever Field-of-view : 840 $\times$ 630 $\mu\text{m}$ (with 10 $\times$ objective lens) CCD : 5.1 M pixel	
<b>Electronics</b>	Integrated functions	Automated Probe Exchange	Probe exchange	Probe mount
	4 channels of flexible digital lock-in amplifier Spring constant calibration (Thermal method) Digital Q control		Probe exchange in less than 1 minutes using Automated Probe Exchange (No need to remove head to exchange cantilevers)	Pre-aligned mount using chip carrier
<b>Options/Modes</b>	Standard imaging	Dielectric/Piezoelectric properties	Magnetic properties	Electrical properties
	<ul style="list-style-type: none"> <li>• True Non-Contact</li> <li>• Contact</li> <li>• Tapping</li> <li>• PinPoint™</li> <li>• Lateral Force Microscopy (LFM)</li> <li>• Phase Imaging</li> </ul>	<ul style="list-style-type: none"> <li>• Electric Force Microscopy (EFM)</li> <li>• Piezoresponse Force Microscopy (PFM)</li> <li>• PFM with High Voltage*</li> </ul>	<ul style="list-style-type: none"> <li>• Magnetic Force Microscopy (MFM)</li> <li>• Tunable Magnetic Field MFM*</li> </ul>	<ul style="list-style-type: none"> <li>• Conductive AFM (C-AFM)*</li> <li>• IV Spectroscopy*</li> <li>• Kelvin Probe Force Microscopy (KPFM)</li> <li>• Sideband FM-KPFM</li> <li>• Scanning Capacitance Microscopy (SCM)*</li> <li>• Scanning Spreading-Resistance Microscopy (SSRM)*</li> <li>• Scanning Tunneling Microscopy (STM)*</li> <li>• Photo Current Mapping (PCM)*</li> </ul>
	Chemical properties*	Force measurement	Mechanical properties	
	<ul style="list-style-type: none"> <li>• Chemical Force Microscopy with Functionalized Tip</li> <li>• Electrochemical Microscopy (EC-AFM)</li> </ul>	<ul style="list-style-type: none"> <li>• Force Distance (F/d) Spectroscopy</li> <li>• Force Volume Imaging</li> </ul>	<ul style="list-style-type: none"> <li>• Force Modulation Microscopy (FMM)</li> <li>• Nanoindentation</li> <li>• Nanolithography*</li> <li>• Nanolithography with High Voltage*</li> <li>• Nanomanipulation*</li> </ul>	
<b>Software</b>	Park SmartScan™	Accessories*		
	<ul style="list-style-type: none"> <li>• AFM system control and data acquisition software</li> <li>• Auto mode for quick setup and easy imaging</li> <li>• Manual mode for advanced use and finer scan control</li> </ul>	<ul style="list-style-type: none"> <li>• Liquid Proband</li> <li>• Universal Liquid Cell with Temperature Control</li> <li>• Temperature Controlled Stage 1, 2 and 3</li> <li>• Electrochemistry Cell</li> <li>• GloveBox</li> <li>• High-field Magnetic Field Generator</li> <li>• Tilting Sample Chuck</li> </ul>		
	Park SmartAnalysis™			
	<ul style="list-style-type: none"> <li>• AFM data analysis software</li> <li>• Stand-alone design—can install and analyze data away from AFM</li> <li>• Capable of producing 3D renders of acquired data</li> </ul>			

## Committed to contributing to impactful science and technology

Park Systems Corporation is a leading manufacturer of nanoscale microscopy and metrology solutions that encompasses the atomic force microscopy, white light interferometry, infrared spectroscopy and ellipsometry systems. Its products are widely used for scientific research, nanoscale engineering, and semiconductor fabrication and quality assurance. Park Systems provides a full range of AFM products from desktop to fully automated systems with integrated robotic arms. Furthermore, its product line includes WLI AFM, Photo-induced Force Microscopy spectroscopy and ellipsometry systems for those in the chemistry, materials, physics, life sciences, and semiconductor industries. In 2022, Park Systems acquired and merged Accurion GmbH, a leader in high-end ellipsometry and active vibration isolation, to form Park Systems GmbH, Accurion Division.

Park Systems is a publicly traded corporation on the Korea Stock Exchange (KOSDAQ) with corporate headquarters in Suwon, Korea, and regional headquarters in Santa Clara, California, Mannheim, Germany, Paris, France, Beijing, China, Tokyo, Japan, Singapore, India, and Mexico. To learn more, please visit [www.parksystems.com](http://www.parksystems.com).

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