

Enabling Nanoscale Advances



Park NX20

The leading nanometrology tool for failure analysis and large sample research





Park NX20

The premiere choice for failure analysis

Accurate AFM Solutions for FA and Research Laboratories

- Surface roughness measurements for media and substrates
- Defect review imaging and analysis
- High resolution electrical scan mode
- Sidewall measurements for 3D structure study*

Accurate and Reproducible Measurements for Better Productivity

- Non-contact mode to preserve tip sharpness for surface roughness accuracy
- Fastest defect imaging in non-contact mode
- Decoupled XY scanning system for 3D structure measurements
- Minimized system drift and hysteresis using thermally matched components

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
- Industry leading forward and backward scan gap of less than 0.15%

Cost Savings with True Non-Contact™ Mode

- 10 times or longer tip life during general purpose and defect imaging
- Less tip wear from prolonged high-quality scans
- Minimized sample damage or modification

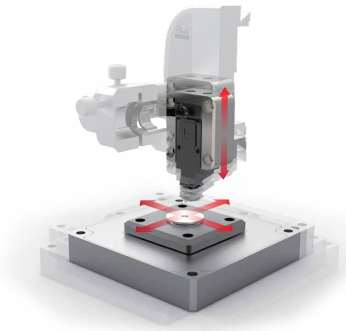
* tilting sample chuck

Park NX20

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.



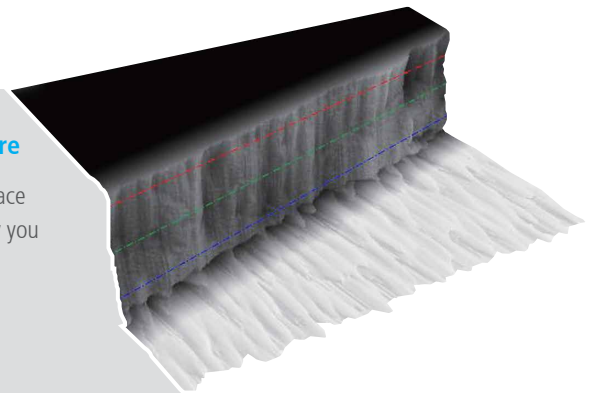
Decoupled XY and Z Scanners

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.

Tilting Sample Chuck for Sidewall Imaging lets you see more

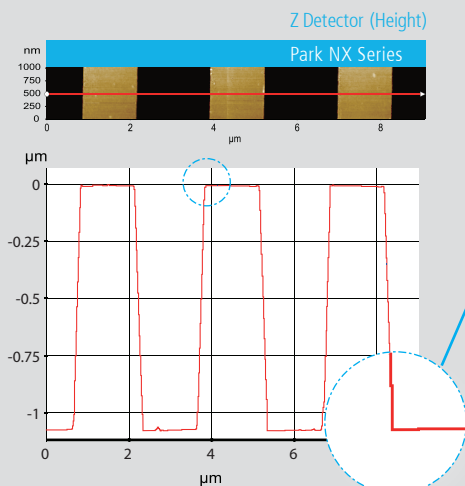
The NX20's innovative architecture lets you detect the sidewall and surface of the sample, and measure their angle. This gives the unit the versatility you need to do more innovative research and gain deeper insights.

- Tilting angle: 10°, 15°, and 20°
- Sample thickness: Up to 2 mm
- Sample size: Up to 20 mm x 20 mm



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 NX20 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

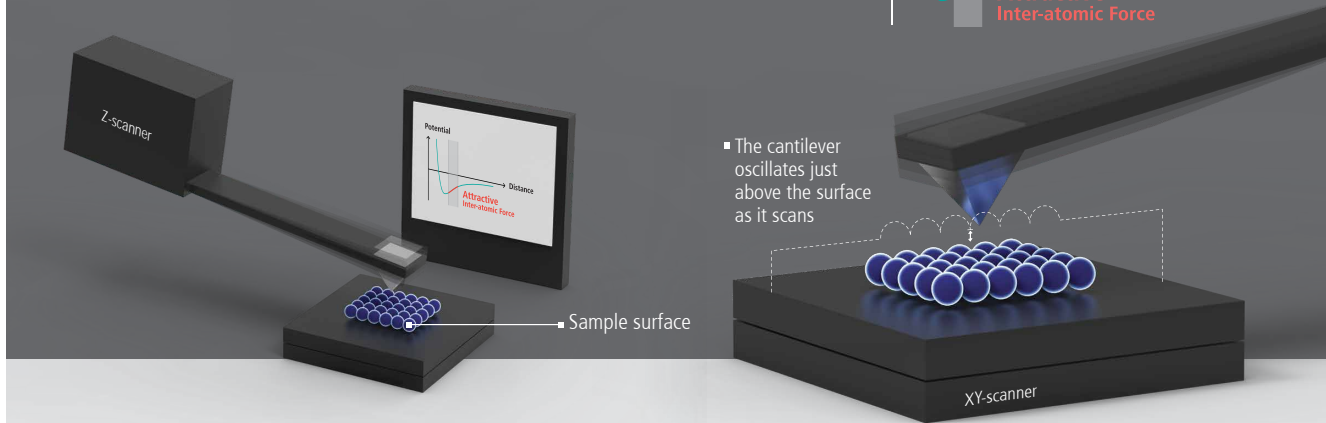
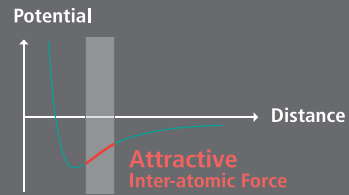
Sample: 1.2 μm Nominal Step Height
(9 μm x 1 μm, 2048 pixels x 128 lines)

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.

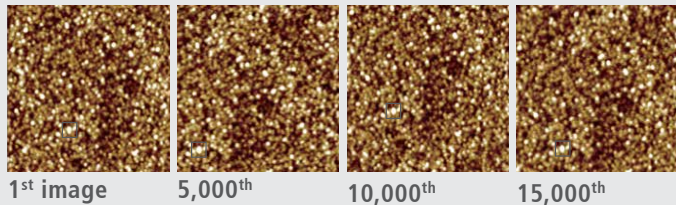
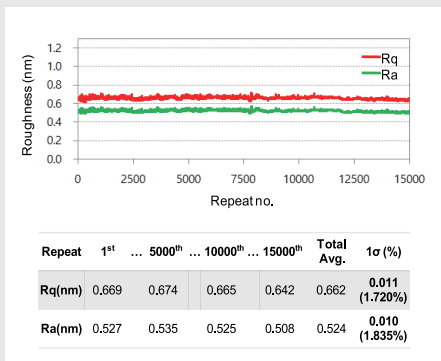
Accurate Feedback by Faster Z-servo enables True Non-Contact AFM

- 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

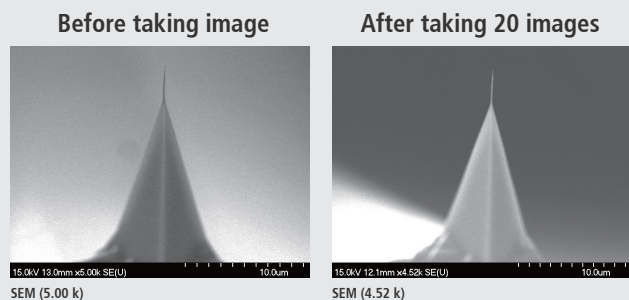
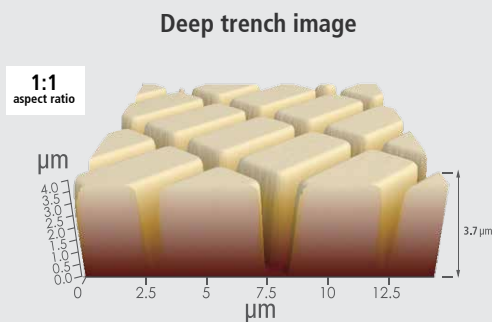


Unlike in contact mode, where the tip contacts the sample continuously during a scan, or in tapping mode, where the tip touches the sample periodically, a tip used in non-contact mode does not touch the sample.

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.



Park SmartScan™

Park AFM Operating Software



Pixel / Scan size
Quality / Speed

Quality Speed

Start with 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.

Park SmartAnalysis™

The Park AFM Image Analytics Software



Park SmartAnalysis™ is an atomic force microscopy image processing and data analysis software for Park AFM. It is the next generation image analytics software with powerful features and newly added automated functions. Park SmartAnalysis enables users to swiftly prepare, analyze and publish their AFM acquired images and measurements.

Line	Min(nm)	RpV(nm)	Rq(nm)	Ra(nm)
Top layer	10.265	6.825	0.795	0.667
Bottom layer	8.661	2.837	0.152	0.115
Substrate	-0.235	1.291	0.057	0.044

Park Atomic Force Microscopy Modes

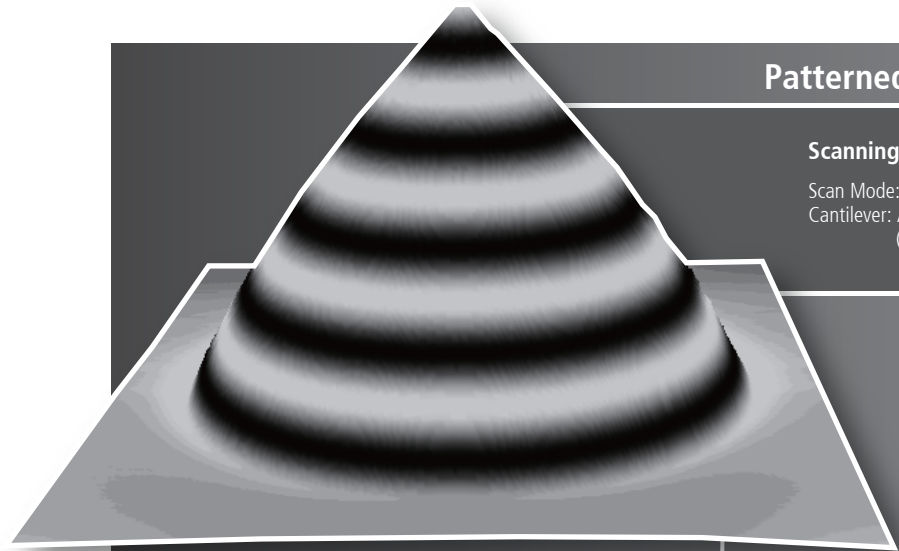
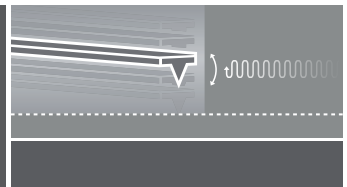
Get the data you need with Park's selection of scanning modes

Contact	Non-Contact	Tapping	
Conductive AFM	PinPoint Conductive AFM	IV Spectroscopy	Photocurrent Mapping
Scanning Tunneling Microscopy	Scanning Spreading Resistance Microscopy	Scanning Capacitance Microscopy	Electrostatic Force Microscopy
Kelvin Probe Force Microscopy	Piezoresistance Force Microscopy	Magnetic Force Microscopy	Tunable Magnetic Field MFM
Force Distance Spectroscopy	PinPoint Nanomechanical	Force Modulation Microscopy	Lateral Force Microscopy
Nanoindentation	Nanolithography	Nanomanipulation	
Scanning Thermal Microscopy	Scanning Ion Conductance Microscopy		

Patterned Sapphire Substrate (PSS)

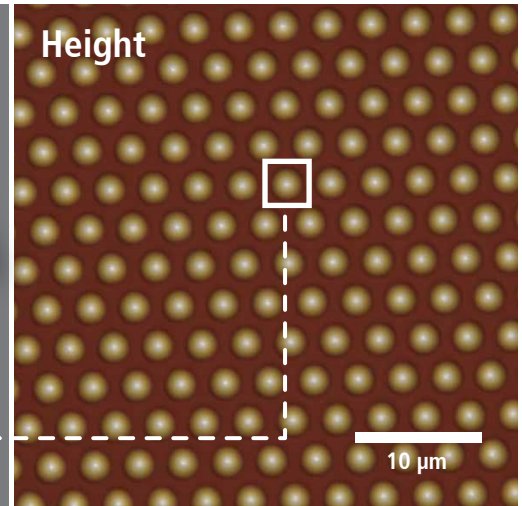
Scanning conditions

Scan Mode: Non-Contact
Cantilever: AR5T-NCHR
($k=42\text{N/m}$, $f=330\text{kHz}$)

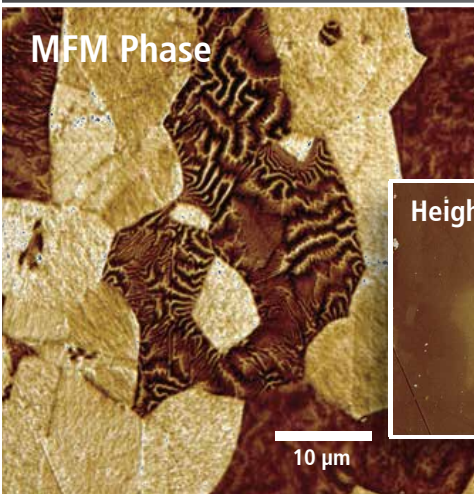


Zoom in 3D
X:Y:Z scale=1:1:1

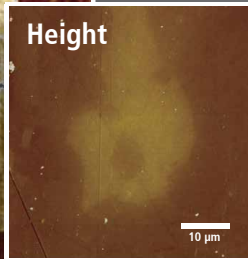
Height



MFM Phase



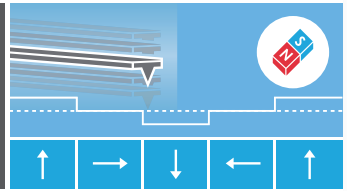
Height



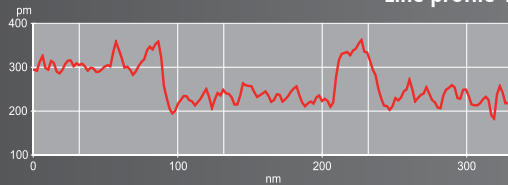
Stainless Steel (Ferrite, Austenite)

Scanning conditions

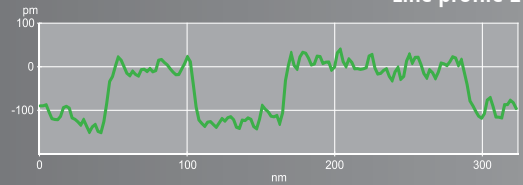
Scan Mode: MFM
Cantilever: PPP-MFMR
($k=2.8\text{N/m}$, $f=75\text{kHz}$)



Line profile 1



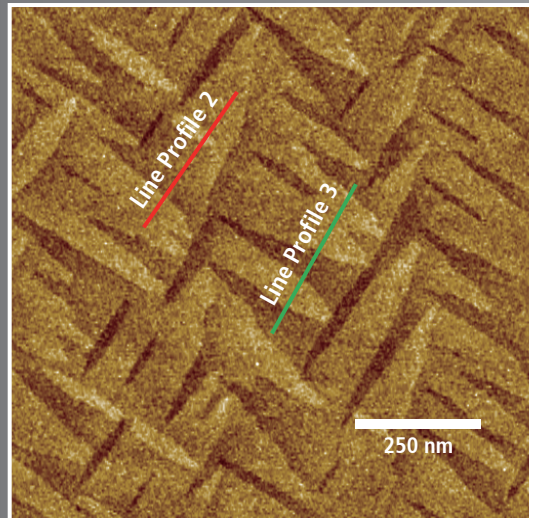
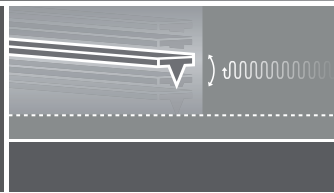
Line profile 2



(100) Si Epi Wafer

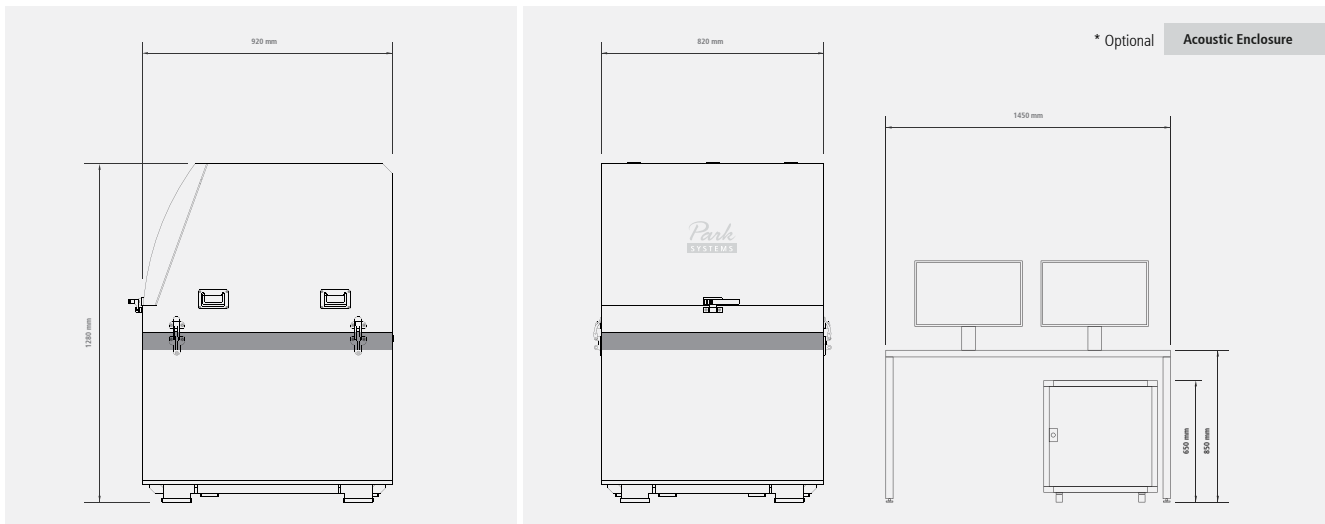
Scanning conditions

Scan Mode: Non-Contact
Cantilever: PPP-NCHR
($k=42\text{N/m}$, $f=330\text{kHz}$)



* optional

Scanner	Z scanner	XY scanner	Stage	
	AFM Head Flexure guided high-force scanner Scan range: 15 µm (optional 30 µm)	SICM Head Flexure-guided structure driven by multiply-stacked piezoelectric stacks Z scan range: 15 µm (optional 30 µm)	Single module flexure XY-scanner with dual servo closed-loop control Scan range: 100 µm × 100 µm (optional 50 µm × 50 µm)	XY stage travel range: 200 mm (Motorized) (150 mm optional) optional precision encoders for better XY stage repeatability Z stage travel range: 25 mm (Motorized) optional precision encoders for better Z stage repeatability Focus stage travel range: 15 mm (Motorized)
Sample Mount	Sample size	On-Axis Optics	Electronics	Integrated functions
	Up to 150 mm wafer (optional: up to 200 mm wafer) or 1 small sample (10 mm × 10 mm, 20 mm thickness) Vacuum grooves to hold wafer samples Up to 16 small samples (10 mm × 10 mm, 20 mm thickness) (Optional Multi Sample Chuck)	10x (0.21 N.A.) ultra-long working distance lens (1µm resolution) Direct on-axis vision of sample surface and cantilever Field-of-view : 840 × 630 µm (with 10x objective lens) CCD : 5 M pixel		4 channels of flexible digital lock-in amplifier Spring constant calibration (Thermal method) Digital Q control
Options/Modes	Standard imaging	Dielectric/Piezoelectric properties	Electrical properties	Mechanical properties
	<ul style="list-style-type: none"> True Non-Contact Contact Tapping PinPoint™ Lateral Force Microscopy (LFM) Phase Imaging Scanning Ion Conductance Microscopy (SICM) 	<ul style="list-style-type: none"> Electric Force Microscopy (EFM) Piezoresponse Force Microscopy (PFM) PFM with High Voltage* Contact Resonance PFM (CR-PFM)* 	<ul style="list-style-type: none"> Conductive AFM (C-AFM)* IV Spectroscopy* Kelvin Probe Force Microscopy (KPFM) Sideband FM-KPFM Scanning Capacitance Microscopy (SCM)* Scanning Spreading-Resistance Microscopy (SSRM)* Scanning Tunneling Microscopy (STM)* Photo Current Mapping (PCM)* 	<ul style="list-style-type: none"> Force Modulation Microscopy (FMM) Nanoindentation Nanolithography* Nanolithography with High Voltage* Nanomanipulation*
	Magnetic properties	Thermal properties*	Force measurement	
	<ul style="list-style-type: none"> Magnetic Force Microscopy (MFM) Tunable Magnetic Field MFM* 	<ul style="list-style-type: none"> Scanning Thermal Microscopy (SThM) 	<ul style="list-style-type: none"> Force Distance (F/d) Spectroscopy Force Volume Imaging 	
	Chemical properties*			
	<ul style="list-style-type: none"> Chemical Force Microscopy with Functionalized Tip Electrochemical Microscopy (EC-AFM) 	<ul style="list-style-type: none"> Scanning Ion Conductance Microscopy (SICM) Scanning Electrochemical Cell Microscopy Single Barrel (SECCM Single Barrel) 	<ul style="list-style-type: none"> Scanning Ion Conductance Microscopy-Scanning Electrochemical Microscopy (SICM-SECM) Current-Distance (I/d) Spectroscopy (with SICM) 	
Software	Park SmartScan™	Park SmartAnalysis™	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 	<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 	<ul style="list-style-type: none"> Universal Liquid Cell with Temperature Control Temperature Controlled Stages Electrochemistry Cell Glove Box 	<ul style="list-style-type: none"> High-field Magnetic Field Generator Tilting Sample Chuck Snap-in Sample Chuck



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.

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