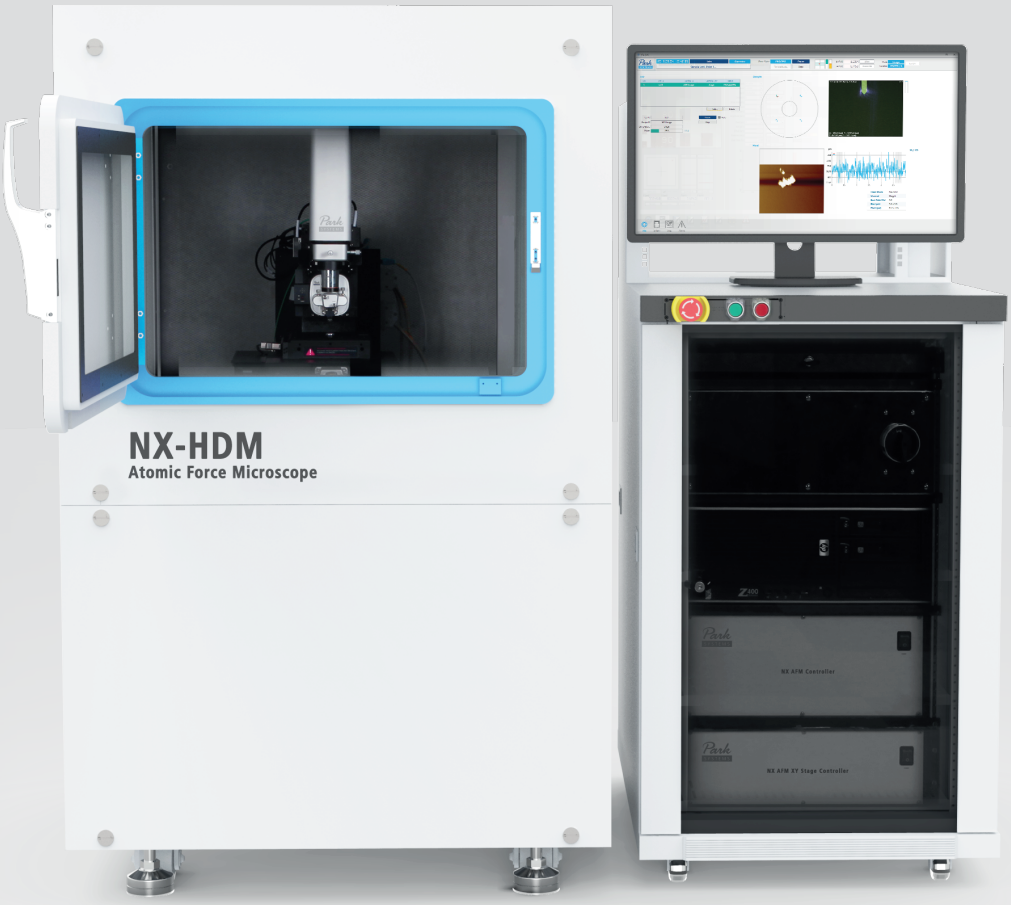
Enabling Nanosacle Advances

Park SYSTEMS

Park NX-HDM

Automatic Defect Review and Sub-Angstrom Surface Roughness Measurement for Media and Substrates



Park NX-HDM

Simply the best AFM for automatic defect review and surface roughness measurement

Automatic Defect Review for Media and Substrates

- Fast defect imaging in non-contact mode
- Automated survey scan of defects mapped by optical inspection tools
- Automated zoom-in scan of specified defects
- Automated analysis of imaged defect types
- Links to a wide range of automated optical inspection (AOI) tools

Accurate Sub-Angstrom Surface Roughness Measurement

- Automated surface roughness measurements for media and substrates
- Industry's lowest system noise of less than 0.5 angstrom rms
- Immunity from parameter-dependent results by True Non-Contact™ technology
- True Non-Contact™ maintains accuracy without degradation in scan resolution
- Automatic tip exchange module (optional)

Cost Savings with True Non-Contact™ Mode

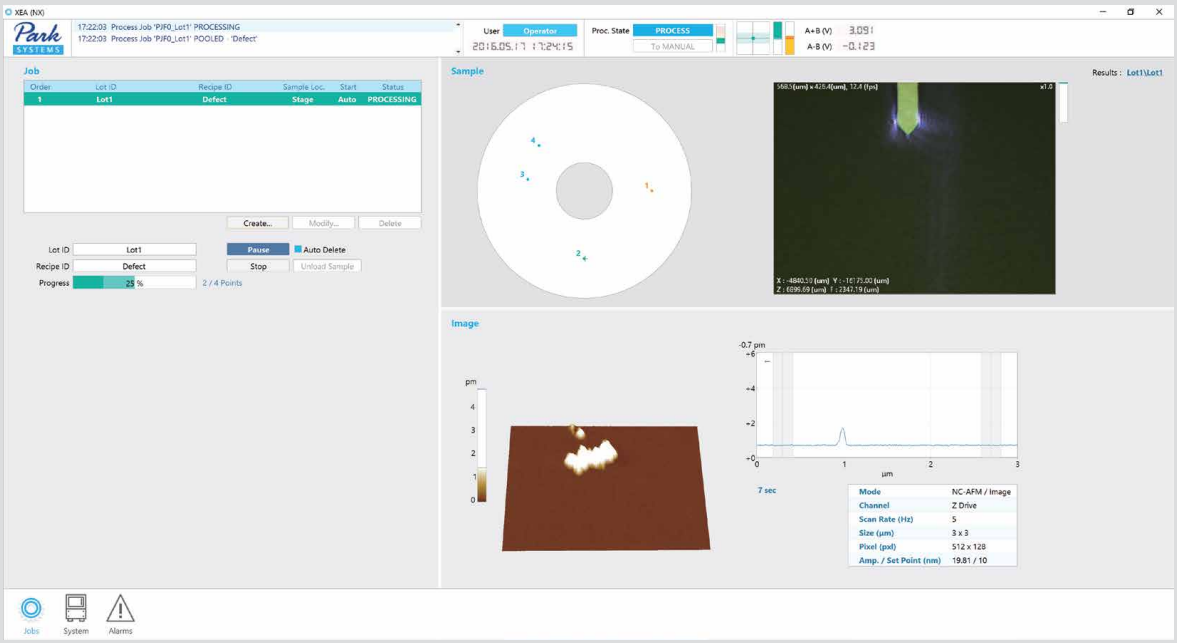
- 10 times or longer tip life during general purpose and defect imaging than any other AFMs
- Minimal tip wear from prolonged high-quality scans
- Minimized sample damage or modification

Accurate AFM Topography with 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%

Park NX-HDM

The most innovative AFM technology in one powerful package



Automatic Measurement Control so you can get accurate scans with less work

The NX-HDM is equipped with automated software that makes operation nearly effortless. Just select the desired measurement program to get precise multi-site analysis with optimized setting for cantilever tuning, scan rate, gain, and set point parameters.

Park's user-friendly software interface gives you the flexibility to create customized operation routines so you can access the full power of the NX-HDM and get the measurements you need.

Creating new routines is easy. It takes about 10 minutes to create a new routine from scratch, or less than 5 minutes to modify an existing one.

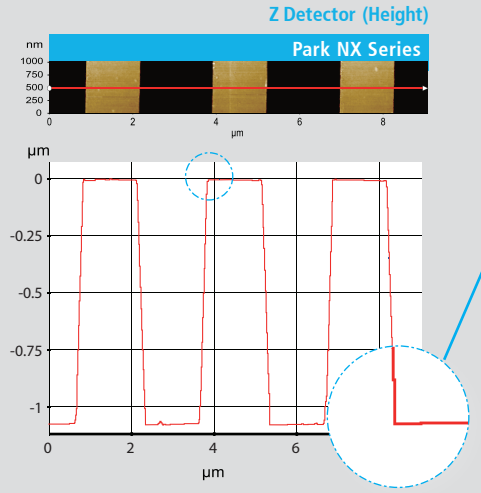
Park NX-HDM's automated system features:

- Auto, semi-auto, and manual mode so you have complete control
- Editable measurement method for each automated routine
- Live monitoring of the measurement process
- Automatic analysis of acquired measurement data

Park NX-HDM
AFM Technology

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 NX-HDM saves you time and gives you better data.



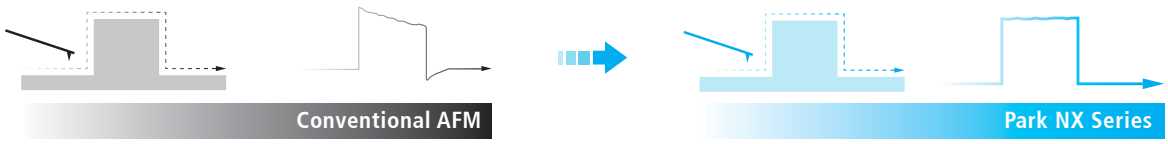
No creep effect

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)

No artifacts by AFM scanner in low noise closed-loop topography



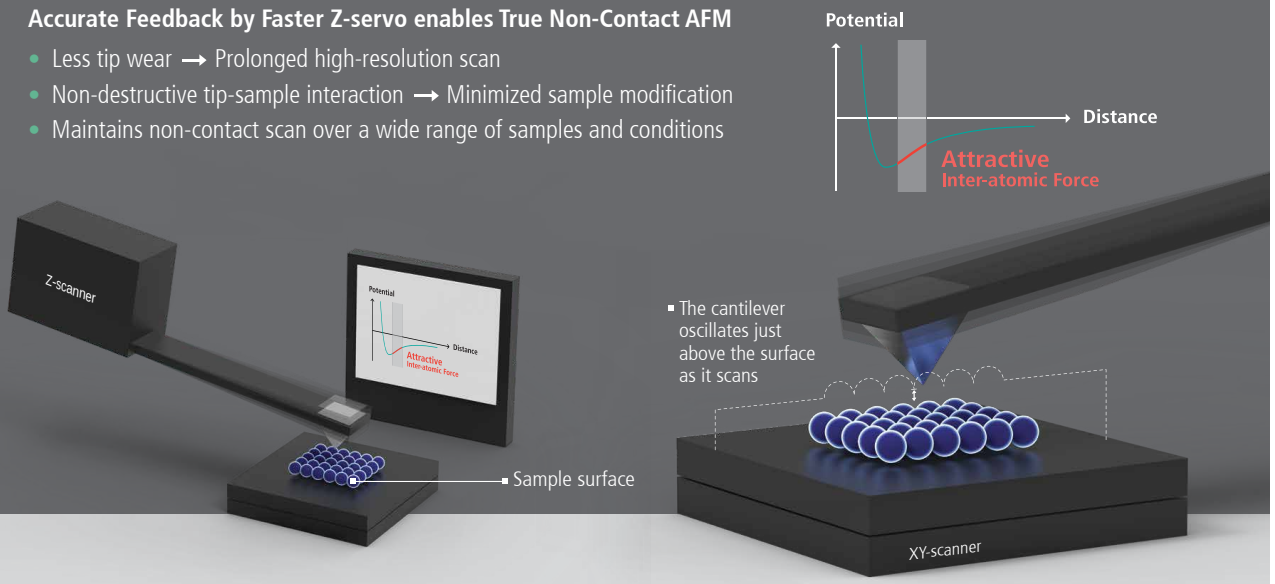
- Uses low noise Z detector signal for topography
- Has no edge overshoot at the leading and trailing edges
- Needs calibration at the factory and maintenance purpose only

True Non-Contact™ Mode

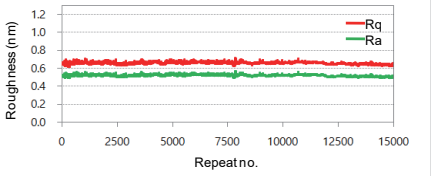
True Non-Contact™ Mode is a scan mode unique to Park AFM systems that produces high resolution and accurate data by preventing destructive tip-sample interaction during a scan.

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

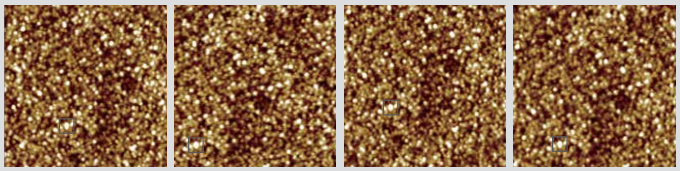
- Less tip wear → Prolonged high-resolution scan
- Non-destructive tip-sample interaction → Minimized sample modification
- Maintains non-contact scan over a wide range of samples and conditions



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.



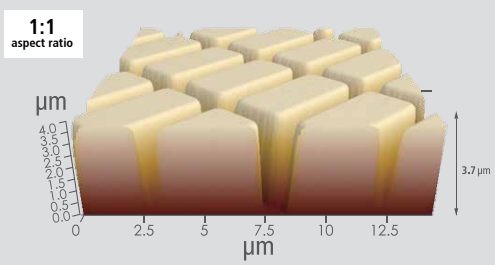
Repeat	1st	...	5000th	...	10000th	...	15000th	Total Avg.	1σ (%)
Rq(nm)	0.669		0.674		0.665		0.642	0.662	0.011 (1.720%)
Ra(nm)	0.527		0.535		0.525		0.508	0.524	0.010 (1.835%)



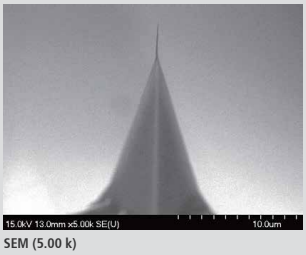
1st image | 5,000th | 10,000th | 15,000th

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.

Deep trench image

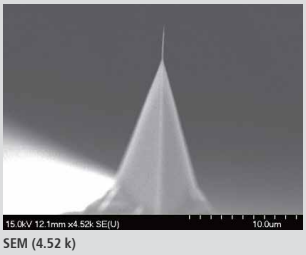


Before taking image



SEM (5.00 k)

After taking 20 images



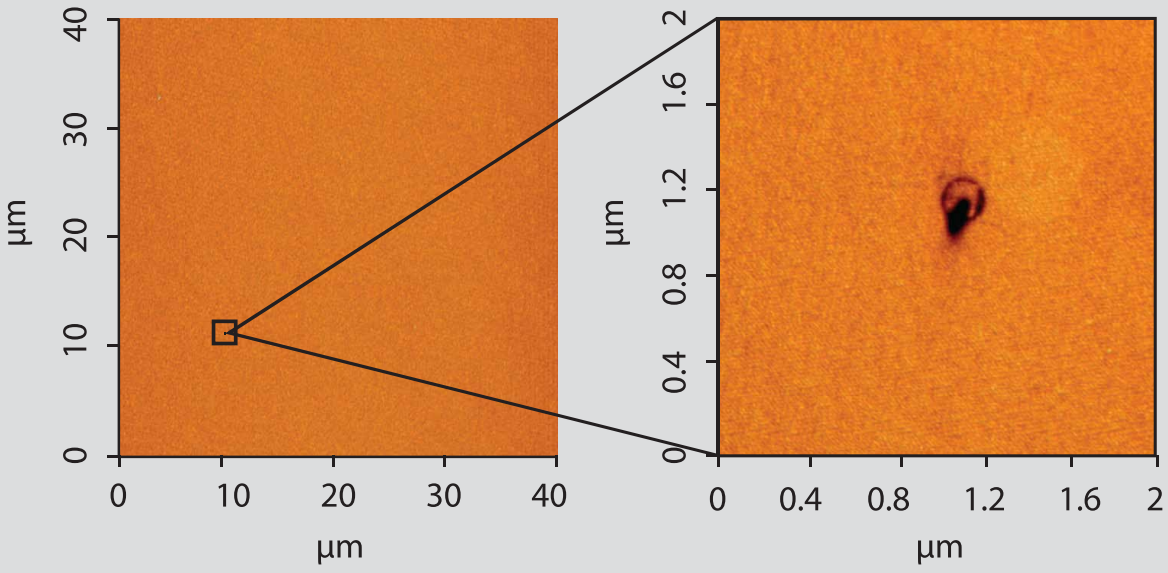
SEM (4.52 k)

Park NX-HDM

Productivity meets Accuracy

Automatic Defect Review (ADR) to locate defects quickly and easily

The integrated ADR software lets you easily initiate a fully automated search and imaging routine for specified defects. The ADR software automatically goes to each of defect location and images the defects in two ways: (1) a larger survey scan to refine the defect location, (2) then a smaller zoom-in scan so you can see the defect in greater detail.



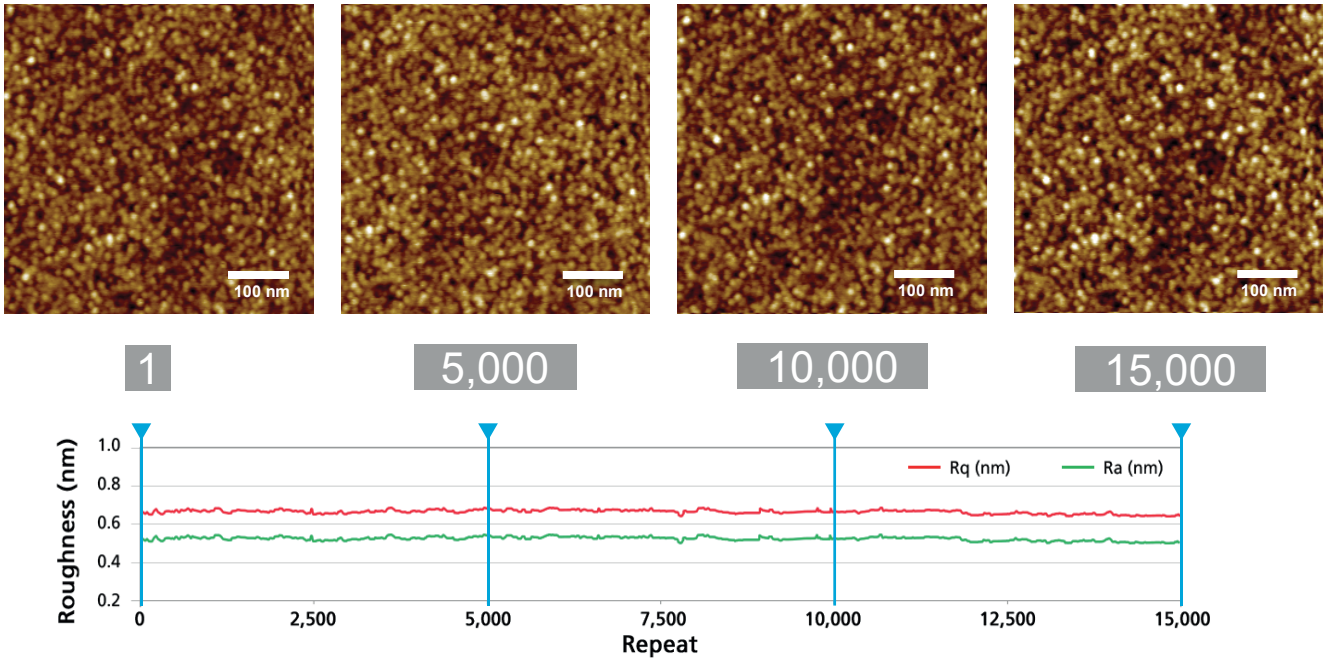
Automated Search Scan & Zoom-in Scan

Optimized scan parameters enable a fast two step scan: (1) a quick, low resolution search scan to locate the defect, then (2) a high resolution zoom-in scan to obtain defect details. The scan size and scan speed parameters are adjustable to match the user's need.

Accurate Sub-Angstrom Surface Roughness Measurement

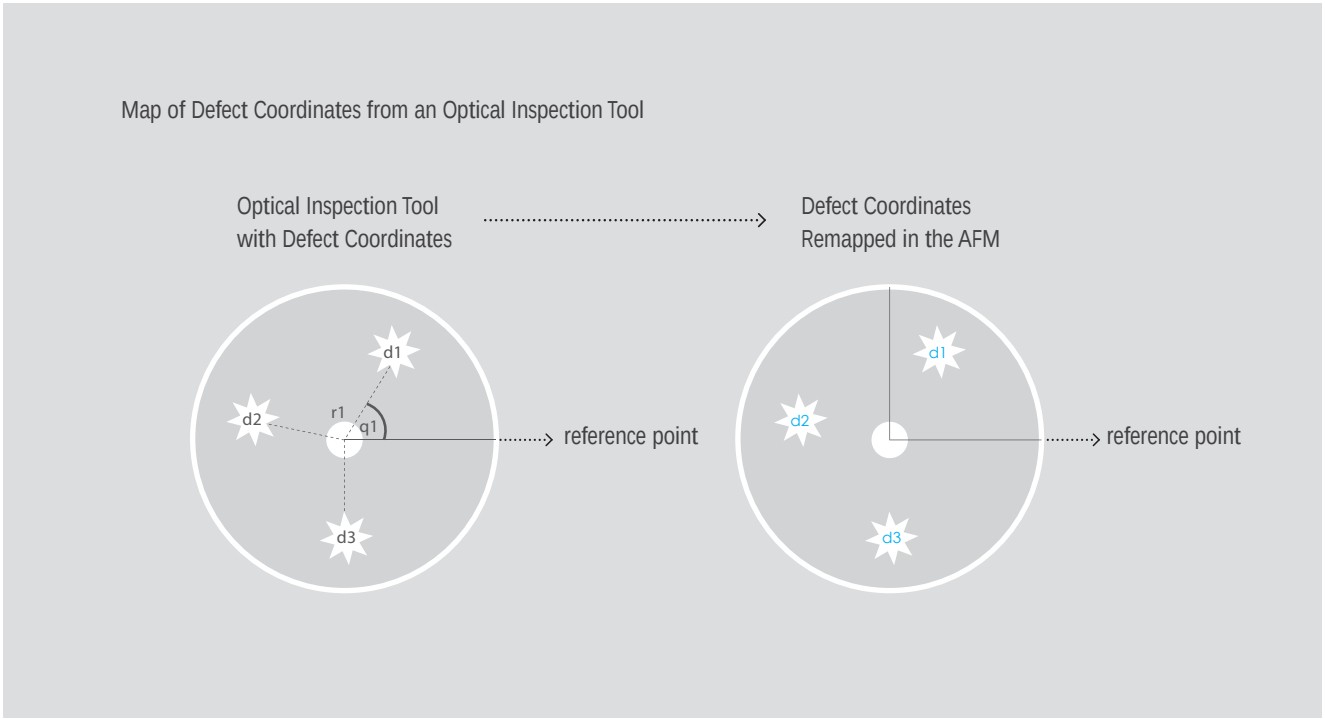
Sub-Angstrom, Surface Roughness Measurement

Increasingly, industries require ultra-flat media and substrate to address the ever-shrinking device dimensions. Park NX-HDM provides accurate sub-angstrom surface roughness measurements, scan after scan. Park NX-HDM, together with its industry's lowest noise floor, and its unique True Non-Contact™ technology, it is the most accurate AFM for surface roughness measurement in the market.



Automatic Transfer and Alignment of

Utilizing an advanced proprietary mapping algorithm, the defect map obtained from automated optical inspection (AOI) tool is accurately transferred and mapped onto Park NX-HDM. This technology allows full automation for high throughput defect imaging.



System Specification	Motorized XY stage	Motorized Z Stage	Motorized Focus Stage	Sample Thickness Allowance	COGNEX Pattern Recognition
	travels up to 150 mm × 150 mm, 2 μm resolution	25 mm Z travel distance 0.1 μm resolution, < 1 μm repeatability	15 mm Z travel distance for on-axis optics	Up to 20 mm	pattern align resolution of 1/4 pixel

Scanner Performances	XY Scanner Range	XY Scanner Resolution	Z Scanner Range	Z Scanner Resolution
	100 μm × 100 μm	0.095 nm (20 bit position control)	15 μm	0.01 nm

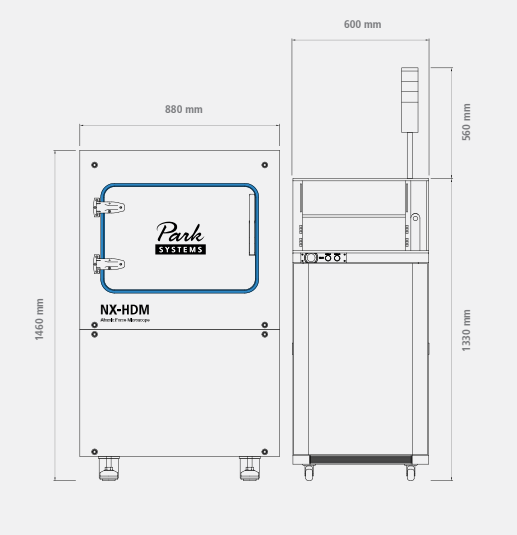
Dimension & Weight	Acoustic Enclosure	System Floor Space	Control Cabinet	Ceiling Height	Operator Working Space
	880 mm (w) x 980 mm (d) x 1,460 mm (h) 620 kg approx. (incl.basic NX-HDM System)	1,720 mm (w) x 920 mm (d)	600 mm (w) x 900 mm (d) x 1,600 mm (h) 170 kg approx. (incl. controllers)	2,000 or more	2,400 mm (w) x 2450 mm (d), minimum

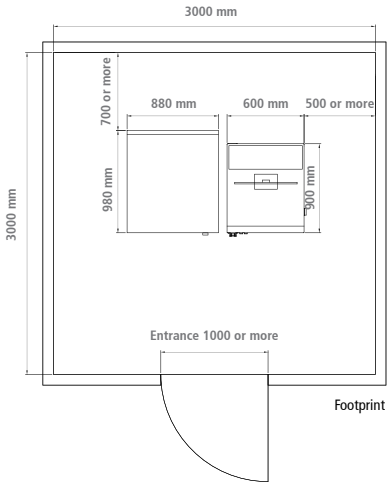
Facility Requirements	Room Temperature (Stand By)	Room Temperature (Operating)	Humidity	Floor Vibration Level	Acoustic Noise
	10 °C ~ 40 °C	18 °C ~ 24 °C	30% to 60% (not condensing)	VC-D (6 μm/sec)	Below 65 dB

Systems with profiler specification may differ from standard system configurations. Please consult Park Systems for detailed information.

	Pneumatics	Power Supply Rating
	Vacuum: -60 kPa	100 / 120 V / 208 ~ 240 V, single phase, 15 A (max)

	Total Power Consumption	Ground Resistance
	2 KW (typical)	Below 100 ohms





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.

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