Enabling Nanosacle Advances

Park SYSTEMS

Park NX-3DM

Innovation and Efficiency for 3D Metrology

Park NX-3DM

An Indispensable Tool for Wafer Fabrication

A fully automated industrial AFM using NX technology

- Clean room compatible and fully automated for measurement and data analysis at the nanoscale level
- NX technology automatically constructs an extremely accurate topographical image and collects essential dimensional data
- The Industry leading, low noise Z-detector works on an independent, closed loop to minimize errors in topography (the "creep effect")
- Non-contact mode allows for the collection of high resolution and accurate data without tip-sample damage, something that could otherwise cost youvaluable time and money

Innovative head design for undercut and overhang structures

- Z-head's unique sideways orientation allows access to the undercut and overhang structures of photoresist and other industrial material
- Patented decoupled XY and Z scanning systems work together with the tilted Z-scanner, letting users overcome normal challenges in accurate sidewall analysis associated with normal and flare tip methods
- Sidewall trench line profile, roughness, critical angle and critical dimension can all be measured using the NX-3DM
- Z-head tilting mechanism allows access to the sidewalls using an ultra-sharp tip to obtain the same high resolution and definition as is obtained over the rest of the material

A Reliable, Seamless Measurement Tool for 3D materials

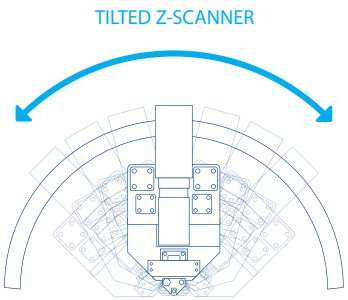
- No sample preparation (e.g. cutting, mounting or coating) is required to obtain the sidewall roughness or critical dimension measurements in this process
- By utilizing Z-head tilting and true Non-contact mode, the NX-3DM allows for both tip-preserving and high resolution collection of sidewall data

Park NX-3DM

A revolutionary all-in-one system for 3D Metrology

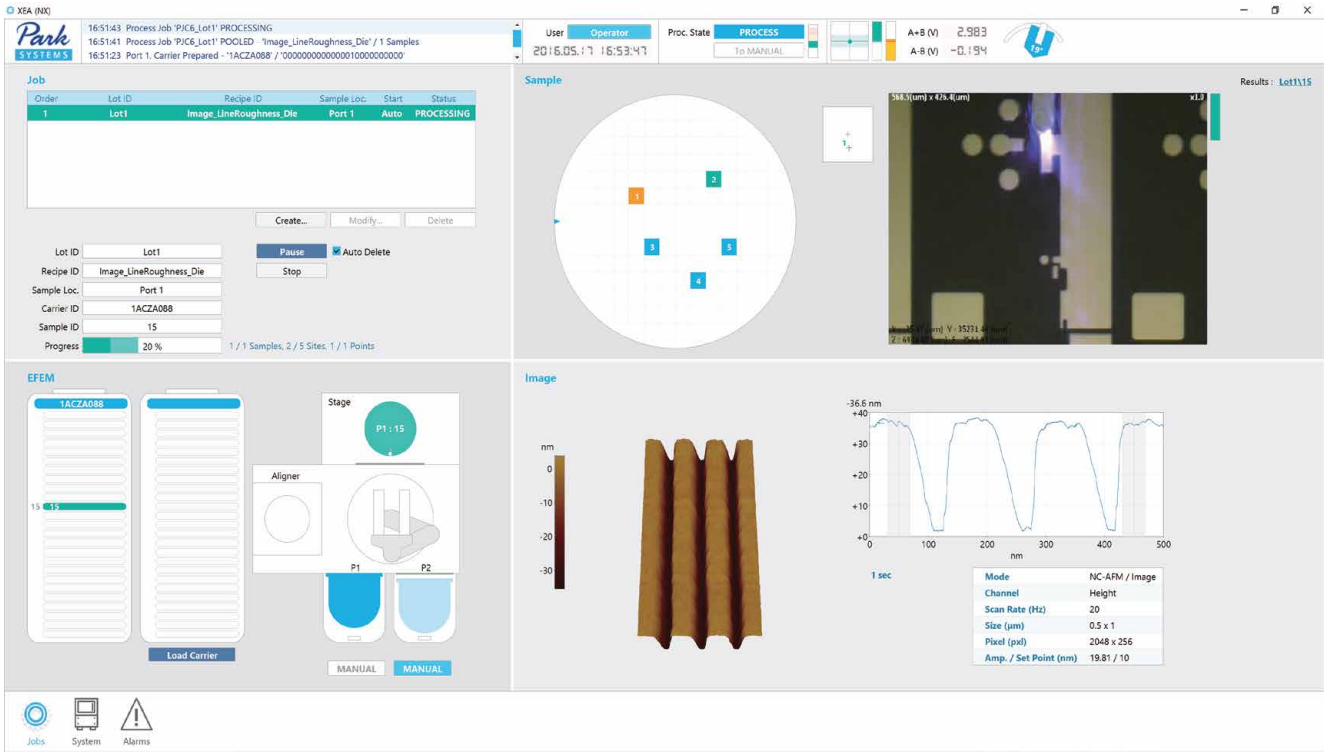
Innovative Z-Scan System

The many unique features of the NX-3DM are made possible by independently tilting the Z-scanner in its patented Crosstalk Eliminated platform, where XY and Z scanners are completely decoupled. This design allows users to access the vertical sidewalls as well as theundercut structures at various angles. Unlike in systems with flared tips, here high resolution and high aspect ratio probes can be used.



Automatic Measurement Control for Increased Efficiency

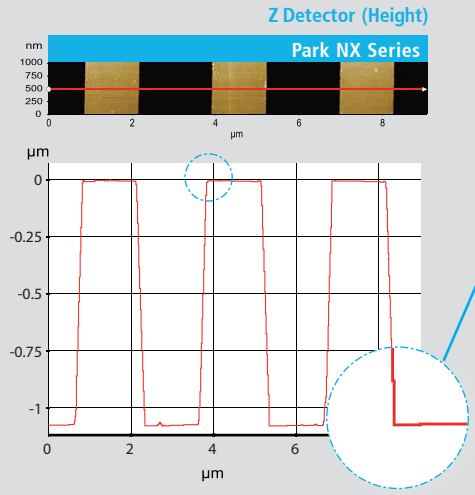
The NX-3DM is equipped with automated software that makes operation seamless. Just select the desired measurement program to get precise multi-site analysis and auto-optimized settings for cantilever tuning, scan rate, gain, and set-point parameters. Park's user-friendly software interface gives you the flexibility to create customized operation routines so you can make the most of the NX-3DM with the least amount of effort. Creating new routines is easy. On average it takes only 10 minutes to make a new routine, and less than 5 to modify an existing one.



Park NX-3DM
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-3DM saves you time and gives you better data.



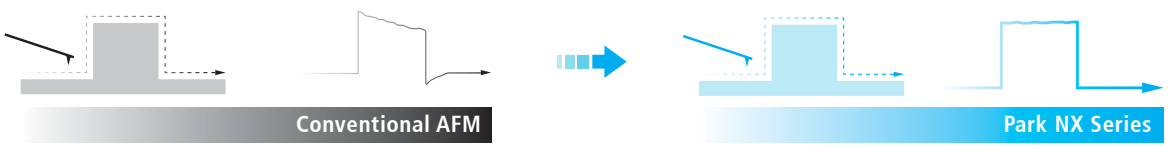
No creep effect

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



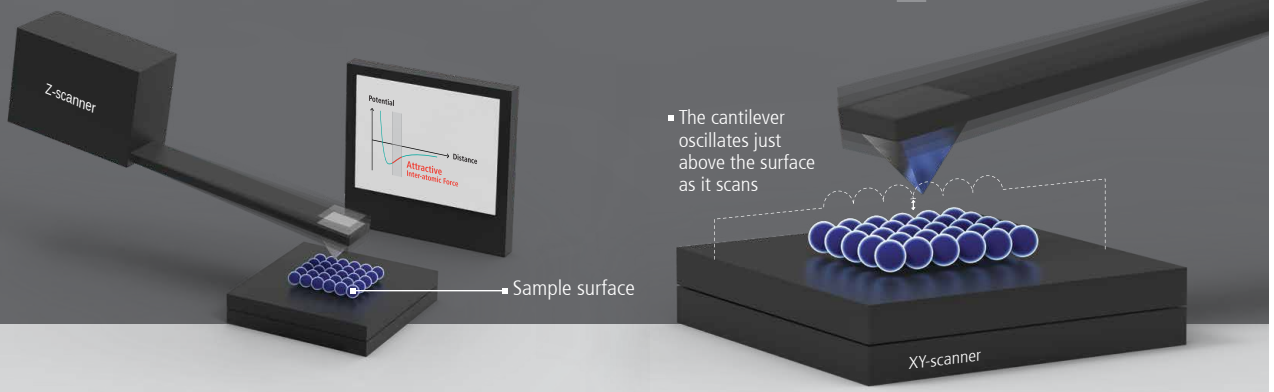
- Uses low noise Z detector signal for topography
- Has no edge overshoot at the leading and trailing edges
- Needs calibration at the factory and maintenance purpose only

True Non-Contact™ Mode

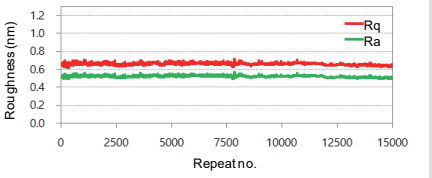
True Non-Contact™ Mode is a scan mode unique to Park AFM systems that produces high resolution and accurate data by preventing destructive tip-sample interaction during a scan.

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

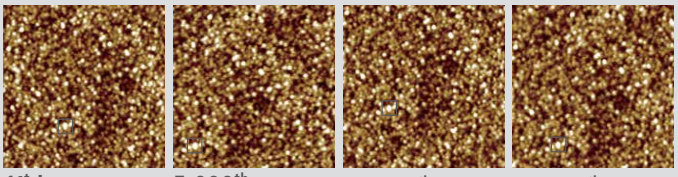
- Less tip wear → Prolonged high-resolution scan
- Non-destructive tip-sample interaction → Minimized sample modification
- Maintains non-contact scan over a wide range of samples and conditions



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.



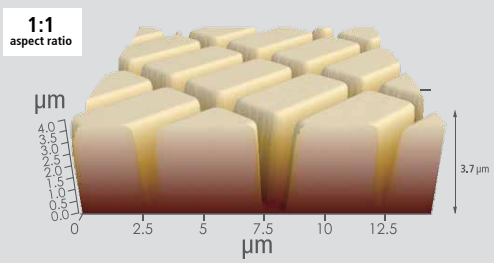
Repeat	1st	...	5000th	...	10000th	...	15000th	Total Avg.	1σ (%)
Rq(nm)	0.669		0.674		0.665		0.642	0.662	0.011 (1.720%)
Ra(nm)	0.527		0.535		0.525		0.508	0.524	0.010 (1.835%)



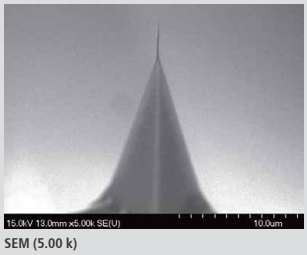
1st image | 5,000th | 10,000th | 15,000th

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

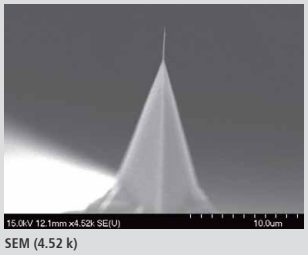


Before taking image



SEM (5.00 k)

After taking 20 images



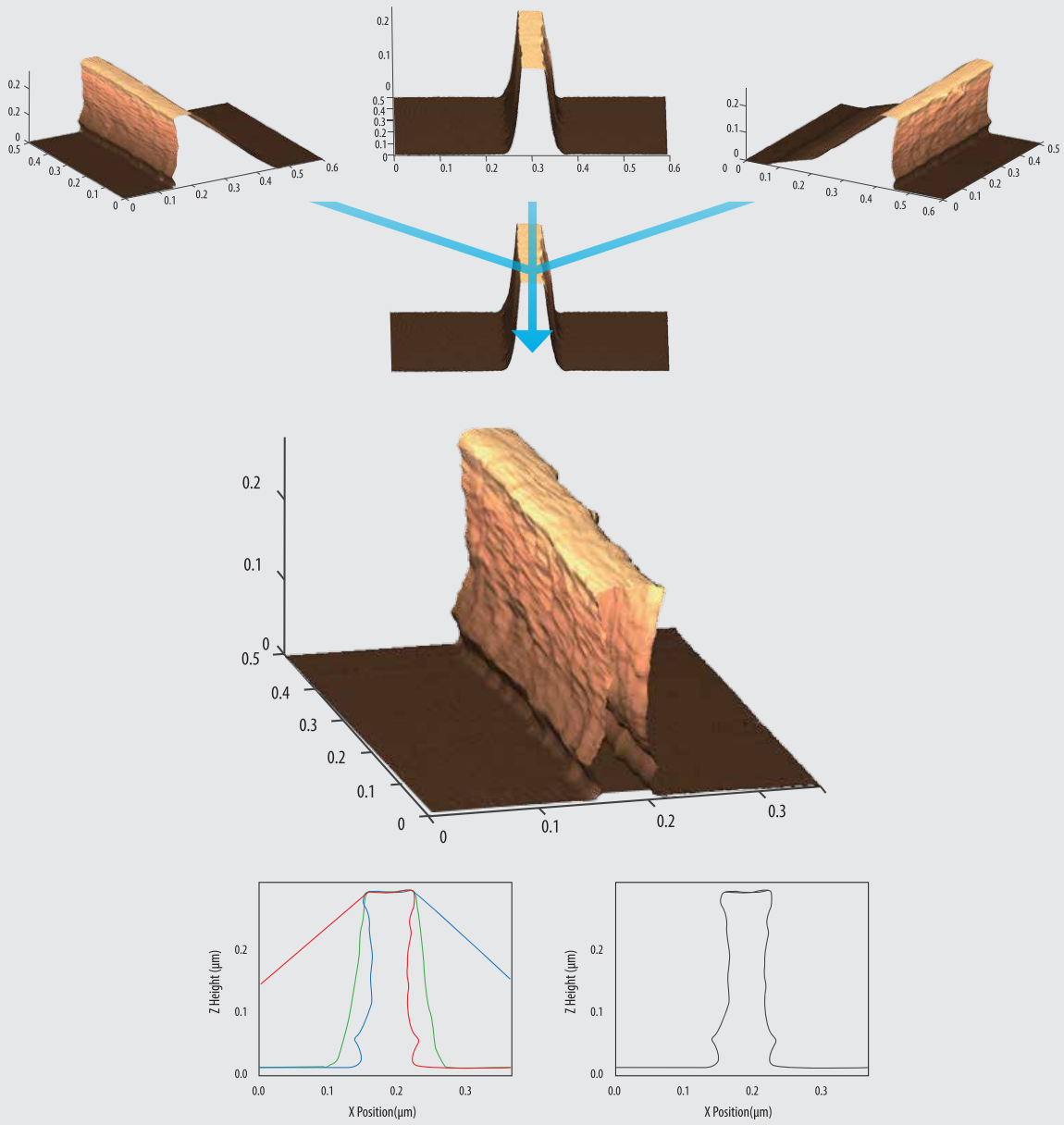
SEM (4.52 k)

Park NX-3DM

An innovative 3D metrology solution

Undercut and Overhang Profiling

The NX-3DM allows unique access to the undercut and overhang structures of photoresist and other industrial materials, ensuring users receive accurate topographical data throughout the entire sample.



■ Images taken at three different tilting angles can be stitched to combined together automatically to form a complete 3D image

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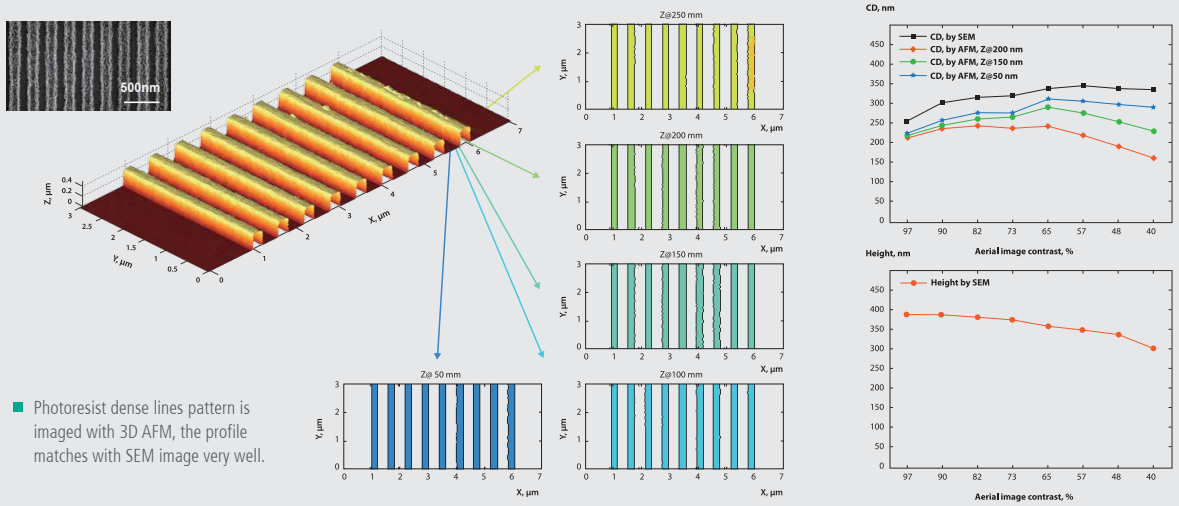
An innovative 3D metrology solution

Critical Dimension Measurement

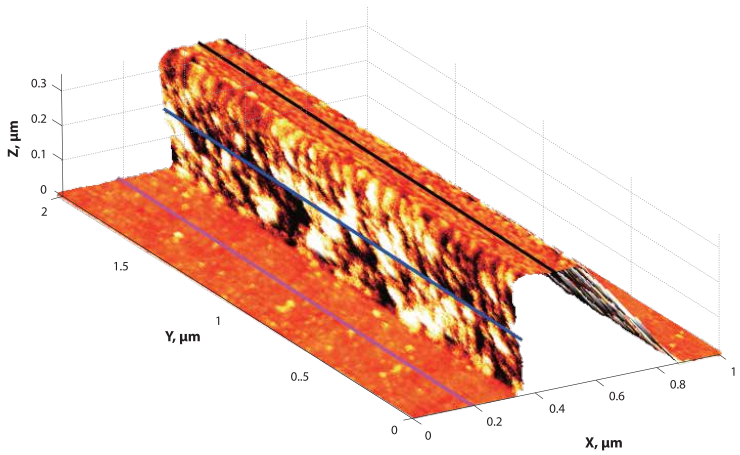
True Non-contact mode enables instrument and subject-preserving CD measurement without sacrificing image fidelity.

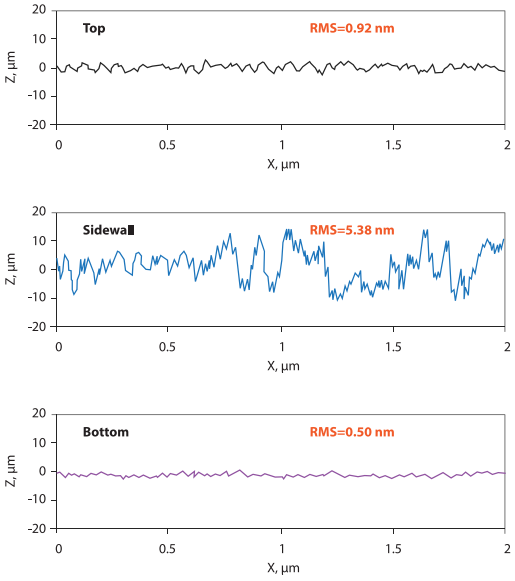


- Photoresist dense lines pattern is imaged with 3D AFM, the profile matches with SEM image very well.

Sidewall Roughness Measurement

The NX-3DM's innovative head tilting design allows access to the sidewalls using an ultra sharp tip to obtain high resolution, well-defined details of the area and its roughness. Innovative head tilting design allows access to the sidewalls using ultra sharp tip to obtain high resolution and(more defined)details of the side wall roughness.





- 3D AFM image provide high resolution profiles for bottom, sidewall, and top of the photoresist line, which can be used for LER/sidewall roughness analysis of the structure

System Specification	200 mm Motorized XY stage	300 mm Motorized XY stage:	Motorized Z Stage	Motorized Focus Stage	Motorized Angle Range	COGNEX Pattern Recognition
	travels up to 275 mm × 200 mm, 0.5 µm resolution	travels up to 400 mm × 300 mm, 0.5 µm resolution, < 1 µm repeatability	27 mm Z travel distance 0.08 µm resolution < 1 µm repeatability	9 mm Z travel distance for on-axis optics	-19 degrees and +19 degrees -38 degrees and +38 degrees < 0.5 degrees angle repeatability	pattern align resolution of 1/4 pixel

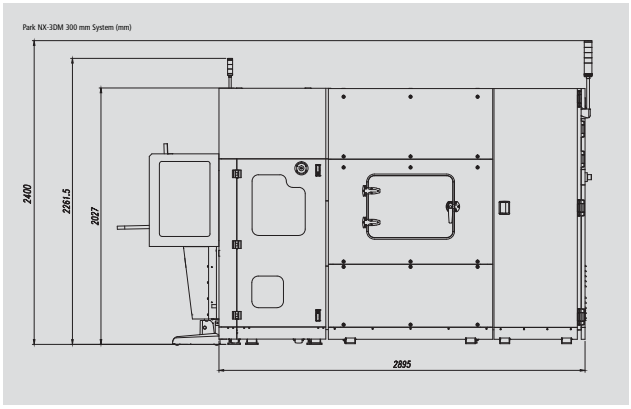
Scanner Performances	XY Scanner	XY Scanner Resolution	Z Scanner Range	Z Scanner Resolution	Z Scanner Noise Floor	Z Scanner Detector Noise
	Single-module flexure XY scanner with closed-loop control: 100 µm × 100 µm (large mode) 50 µm x 50 µm (medium mode) 10 µm × 10 µm (small mode)	0.28 nm (large mode) 0.03 (small mode)	15 µm (large mode) 2 µm (small mode)	0.016 nm (large mode) 0.002 nm (small mode)	< 0.05 nm	0.02 nm @ 1 kHz

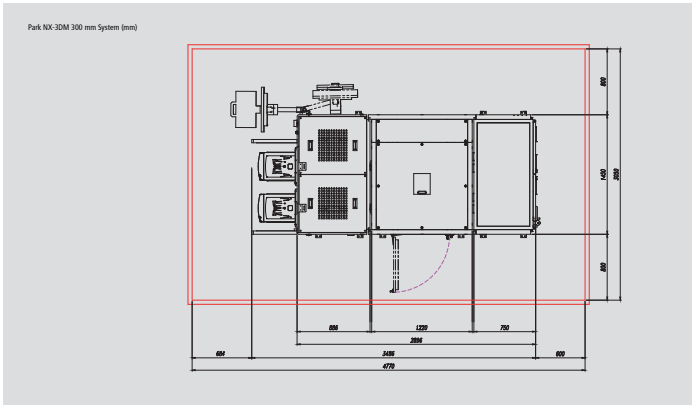
Dimension & Weight	200 mm System	300 mm System
	2732 mm (w) x 1100 mm (d) x 2400 mm (h) w/ EFEM, 2110 kg approx. (incl. Control Cabinet) Ceiling Height: 2000 mm or more Operator Working Space: 3300 mm (w) x 1950 mm (d), minimum	3486 mm (w) x 1450 mm (d) x 2400 mm (h) w/ EFEM, 2950 kg approx. (incl. Control Cabinet) Ceiling Height: 2000 mm or more Operator Working Space: 4770 mm (w) x 3050 mm (d)

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

	Pneumatics	Power Supply Rating	Total Power Consumption	Ground Resistance
	Vacuum: -80 kPa CDA (or N2): 0.7 MPa	208 ~ 240 V, single phase, 15 A (max)	2 KW (typical)	Below 100 ohms

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





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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