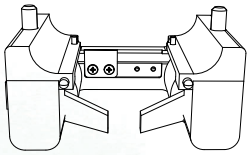
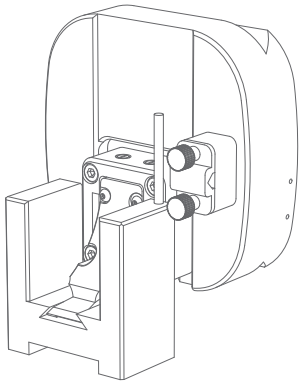




Expand Your Research to New Possibilities

Park AFM

Options & Accessories

Park SYSTEMS

www.parksystems.com

Park AFM Options & Accessories

Introduction

Boost your research by extending your Park AFM with add-ons

We offer a large selection of options and accessories for your Park AFM system. Because all of our AFMs is built on modular and simple to modify designs, you can easily add new options to expand your AFM functionality.

NX10

The quickest path to innovative research

Park NX10 produces data you can trust, replicate, and publish at the highest nano resolution. From sample setting to full scan imaging, measurement, and analysis, Park NX10 saves you time every step of the way. With more time and better data, you can focus on doing more innovative research.

NX20

The leading nano metrology tool for failure analysis and large sample research

As an FA engineer, you're expected to deliver results. There's no room for error in the data provided by your instruments. Park NX20, with its reputation as the world's most accurate large sample AFM, is rated so highly in the semiconductor and hard disk industry for its data accuracy.

NX12

Discover the physiological phenomena of living cells at nanoscale

As a life scientist, you want to see how biological materials look like at nanoscale resolution and how soft they are in liquid and buffer conditions. Park NX-Bio enables that with its innovative in-liquid imaging Scanning Ion Conductance Microscopy (SICM) and its highly acclaimed Atomic Force Microscopy (AFM) technology.

Table of Contents

XE15

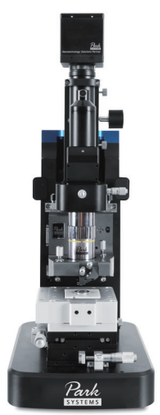
Increase your productivity with our powerfully versatile atomic force microscope

The Park XE15 includes many unique capabilities that make it ideal for shared labs that handle a diverse range of samples, researchers doing multi variant experiments, and failure analysis engineers working on wafers. Its reasonable price and robust feature set also make it one of the best value large-sample AFMs in the industry.

XE7

The economical choice for innovative research

Park XE7 has all the state-of-the-art technology you've come to expect from Park Systems, at a price your lab can afford. Designed with the same attention to detail as our more advanced models, the XE7 allows you to do your research on time and within budget.



Park AFM Options & Accessories

Park XY Scanner

Unlike today's conventional AFM systems, Park's AFM employs a flexure based XY scanner that moves laterally independent from the Z height movement. This AFM architecture provides superior accuracy and precision free from bowing effects and orthogonal distortions found in piezo-tube based scanners.

Flat scan motion

Park XY Scanner consists of symmetrical two-dimensional flexures and high-force piezoelectric stacks. This provides minimal out-of-plane motion, virtually eliminating topographic artifact in the AFM data.

Closed-loop feedback

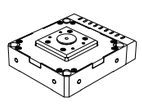
Park XY Scanner can be operated in closed-loop or in open-loop. In closed-loop control, intrinsic non-linearity movement of the XY scanner is corrected on the fly for precise positioning and scanning. Together with this feature and the low noise XY position sensor of Park XY Scanner, it can resolve sub-nanometer scale images without losing its linear control.

Dual-servo feedback

Dual-servo feedback employs four feedback sensors, two for each X and Y direction, that enables it to cover wider scan areas as much as full 100-µm range without deviation. The four sensor signals provide the XY scanner with feedback control that suppresses any undesired movements.

SmartScan™ compatible

Park SmartScan features an Auto function that allows the user to take highly professional quality AFM image with 3 clicks of a button: Setup, Position, Scan. Park XY Scanner has high resonance frequency bandwidth that enables SmartScan to scan at high speed adapting on the fly the topographic variations.

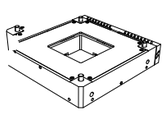


50 µm XY scanner

NX10

NX10 XY Scanners

- XY scan range: 10 µm, 50 µm and 100 µm (typical)
- Closed-loop feedback control for precise XY positioning
- SmartScan™ compatible
- 20-bit XY position control and 24-bit XY positioning sensor

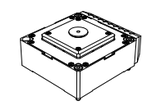


100 µm XY scanner

NX20

NX20 XY Scanners

- XY scan range: 50 µm and 100 µm (typical)
- Dual-servo closed-loop feedback control for precise XY positioning (50 µm and 100 µm XY scanners only)
- SmartScan™ compatible
- 20-bit XY position control and 24-bit XY positioning sensor

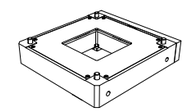


50 µm XY scanner

XE7

XE7 XY Scanners

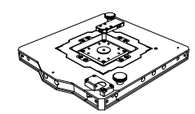
- XY scan range: 10 µm, 50 µm and 100 µm (typical)
- Closed-loop feedback control for precise XY positioning
- 3×16-bit DAC XY position control and 16-bit XY positioning sensor



XE15

XE15 XY Scanner

- XY scan range: 100 µm (typical)
- Closed-loop feedback control for precise XY positioning
- 3×16-bit DAC XY position control and 16-bit XY positioning sensor



NX12

NX12 XY Scanner

- XY scan range: 100 µm (typical)
- Closed-loop feedback control for precise XY positioning
- SmartScan™ compatible
- 3×16-bit DAC XY position control and 16-bit XY positioning sensor

Park AFM Options & Accessories

Park AFM Head

The AFM head holds the AFM probe that scans the topography and measures various physical properties of a sample. The AFM head should be able to respond fast to changes in its Z scanner movements. Furthermore, it should be upgradeable easily to address the needs for various modes and options.

Independent scanner

Park AFM Head is on a Z scanner that is physically independent from the XY scanner. The independent movement of Z from the XY movement allows the Park AFM to respond faster to height changes, and it is free from XY-Z crosstalk problems typically found with single XYZ tube scanners.

Resonant frequency

The feedback performance of the AFM topography measurement depends highly on the resonant frequency of the Z scanner, the rate the AFM probe moves to follow the sample surface. Park AFM Head's dedicated flexure-guided scanner drives the probe at a rate several times faster than those found in tube-based scanners.

Cantilever deflection detection

Park AFM Head provides accurate topographic spectroscopic measurements through its superior cantilever deflection detection system. The topographic interaction of the probe with the sample surface is monitored by a light beam generated by a light emitting diode or laser. As laser is prone to interference artifacts, a super-luminescent diode (SLD) is widely adopted for accurate topographic measurements and F-d spectroscopic measurements.

NX10 NX20

Standard NX AFM Head

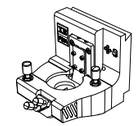
- Flexure-guided structure driven by multiply-stacked piezoelectric stacks
- Z scan range: 15 µm
- 20-bit Z position control and 24-bit Z position sensor
- Low coherent SLD at 830 nm for cantilever deflection detection
- Slide-to-Connect head mount for easy mount/removal

NX10 NX20

Long Travel NX AFM Head

- NX AFM head for extended 30 µm Z scan range
- Flexure-guided structure driven by multiply-stacked piezoelectric stacks
- 20-bit Z position control and 24-bit Z position sensor
- Low coherent SLD at 830 nm for cantilever deflection detection
- Slide-to-Connect head mount for easy mount/removal

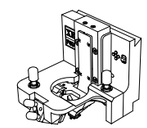
XE15 XE7



SLD XE AFM Heads

- Flexure-guided structure driven by multiply-stacked piezoelectric stacks
- Z scan ranges: 12 and 25 µm
- 3×16-bit DAC Z position control and 16-bit Z positioning sensor
- Low coherent SLD at 830 nm for cantilever deflection detection
- Dovetail-lock head mount for easy mount/removal

XE15 XE7



SLD Optical XE AFM Heads

- Optical access from side of an objective lens
- Z scan ranges: 12 and 25 µm
- Other features are identical with its respective non-optical (or standard) SLD XE AFM Head

NX10 NX12

Scanning Ion Conductance Microscopy (SICM) Head

- SICM Head with pipette probe holder
- Flexure-guided structure driven by multiply-stacked piezoelectric stacks
- Z scan range: 25 µm
- 20-bit Z position control and 24-bit Z position sensor
- Slide-to-Connect head mount for easy mount/removal

Park AFM Options & Accessories

Park XY Stage

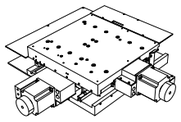
The design and construction of Park XY Stage allows precise positioning of sample in horizontal directions that facilitate locating the area of interest with ease. Furthermore the Park Motorized XY Stage can revisit the exact locations within a few micrometer repeatability for applications with multiple regions of interest. This is very important because samples with large feature size are not only difficult to image, but they are also difficult to locate the area of interest prior to imaging. This is critical for example in semiconductor samples that carry patterns on wafer surfaces, with multiple areas of interest with defined coordinates, which can be easily accessible by the motorized XY stage.

Resolution

Resolution, or the travel step of a stage, is the smallest position change unit that a stage can move. For accurate movement control, the position of a stage is monitored with an encoder and its accuracy is expressed by its repeatability.

Repeatability

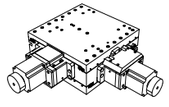
The repeatability shows how far the actual position of the stage may deviate from the desired position. Good repeatability allows efficient navigation to the target position with accuracy.



NX20

Motorized XY Stages for Park NX20

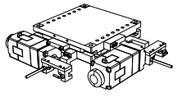
- Software-controlled motorized sample stage for sample positioning in the XY direction
- Stage travel ranges: 150 mm and 200 mm
- Stage travel step: 0.6 µm



XE15

Motorized XY Stage for Park XE15

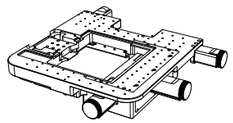
- Software-controlled motorized sample stage for sample positioning in the XY direction
- Stage travel range: 150 mm × 150 mm
- Stage travel step: 1 µm



NX10

Motorized XY Stage for Park NX10

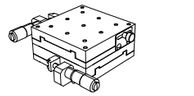
- Software-controlled motorized sample stage for sample positioning in the XY direction
- Stage travel range: 20 mm
- Stage travel step: 0.6 µm



NX12

Motorized XY Stage for Park NX12

- Software-controlled motorized sample stage for sample positioning in the XY direction
- Stage travel range: 5 mm
- Stage travel step: 0.5 µm



XE7

Manual XY Stage for Park XE7

- Manual precision sample stage for sample positioning in the XY direction
- Stage travel range: 13 mm

XE15 NX20

Precision Encoders for Motorized XY Stage

- XY stage encoders for high precision XY stage movement with better repeatability
- Encoder resolution: 0.5 µm
- Stage position repeatability: 2 µm (uni-directional), 3 µm (bi-directional)

Park AFM Options & Accessories

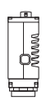
Vision Optics

Park provides various vision options to enable you to see and locate the exact area on a sample of your interest much more easily. It is easy to take for granted the importance of optical vision although it contributes highly to the researcher's productivity. Park's vision option provides optical resolution as high as 1 μm or better without compromising the field of view.

NX10 XE15

1.2 MP CCD

- Field of view: 480 μm × 360 μm (with 10× objective lens)
- Pixel size: 1.2 MP



NX20 XE15 XE7

5 MP CCD

- Field of view: 840 μm × 630 μm (with 10× objective lens)
- Pixel size: 5 MP

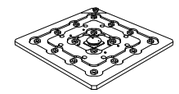
XE15 XE7

20× Objective Lens

- Resolution: 1 μm (0.28 N.A.)
- Interchangeable with the 10× objective lens
- Field of view: 240 × 180 μm

Sample Mounts

The sample mount allows you to place various types of sample for the AFM measurement. It provides easier means to fix and access the sample.



NX20 XE15

Multi Sample Chuck

- Sample plate to load multiple small samples for automated sequential scanning
- Up to 16 samples of less than 10 mm × 10 mm, 20 mm thickness each
- Sample weight: less than 200 g (in total)

XE15

150-mm Vacuum Sample Chuck

- Sample size: 2, 4, 6 inch wafers, and up to 10 × 10 mm of arbitrary shape, 20 mm thickness
- Sample weight: less than 500 g

NX20

Tilting Sample Chuck

- Sample plate to tilt the sample for sidewall measurements
  - Tilting angle: 10, 15, and 20°
  - Sample size: 20 mm × 20 mm, 2 mm thickness
  - Sample weight: less than 200 g

NX20 NX10 XE15 XE7

Non-magnetic Sample Holder

- A sample holder to hold samples on top of the XY scanner using clips
- Recommended for magnetically sensitive samples and / or configuration

NX10

Snap-In Sample Holder

- Sample holder to place samples on a repeatable position
- Positioning repeatability: 5 μm in X and Y direction each

XE15 XE7

Cross-sectional Sample Holder

- Sample holder to vertically mount a cross-sectioned sample held by a metallic clip
- Allowable sample thickness: 3 mm max.

Park AFM Options & Accessories

Noise Control Options

Park provides noise control options to suit your needs to isolate your AFM from mechanical floor vibration, acoustic vibration, and ambient light disturbances. Measurements at nanoscale are highly susceptible to slightest noise from the ambience surrounding the AFM. Although it is recommendable to install the microscope in an isolated place, this may not be always practical or possible. Park's noise control option provides the right enclosure option to shield your AFM from these noises.

Acoustic Enclosures

NX20

Acoustic Enclosure 202

- Environmentally sealed acoustic enclosure to block external acoustic and light noise
- (Optional) Temperature Stabilization to minimize thermal drift of the AFM body
- Dimension: 820 × 920 × 1360 mm (outer)
- Weight: 350 kg (including the system weight)

NX10

Acoustic Enclosure 203

- Environmentally sealed acoustic enclosure to block external acoustic and light noise
- (Optional) Temperature Stabilization to minimize thermal drift of the AFM body
- Dimension: 700 × 800 × 1345 mm (outer)
- Weight: 300 kg

XE15 XE7

Acoustic Enclosure 201

- Environmentally sealed acoustic enclosure to block external acoustic and light noise
- Dimension: 820 × 920 × 1345 mm (outer)
- Weight: 350 kg

NX10 XE7

Acoustic Enclosure 101

- Environmentally sealed acoustic enclosure to block external acoustic and light noise
- Dimension: 510 × 715 × 630 mm (outer)
- Weight: 40 kg

NX12

Acoustic Enclosure 204

- Best solution for high resolution in-liquid imaging ergonomic design for a convenient access to the instrument
- Dimension: 800 × 1,000 × 1,500 mm (outer)
- Weight: 385 kg

Vibration Isolations

NX10 XE15 XE7 NX12

Active Vibration Isolation (AVI)

- Provides active vibration isolation with direct velocity feedback via electromagnetic transducers to cancel out the floor vibration.
- Strongly recommended for high resolution imaging.
- Dimension: 400 x 500 x 80 mm

z

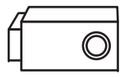
XE7

Passive Vibration Isolation (PVI)

Provides economic and highly effective vibration isolation optimized for the XE7

- 1.5 ~ 2.5 Hz horizontal natural frequency and 0.5 Hz vertical natural frequency.
- Vertical frequency is tunable to 0.5 Hz

Static Discharge Elimination



NX10 XE7 NX20 XE15 NX12

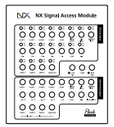
Photo Ionizer

- Ionization system to remove electrostatic charges using photoionization effect
  - Source: Soft X-ray
  - Peak power: 5 keV

Park AFM Options & Accessories

System Options

Expand the functionality of your AFM with the following hardware and software options. These options can provide wider access to your AFM signals, and better control of your AFM performance.



NX10 NX20 XE15 XE7 NX12

Signal Access Module

- Access to analog input and output signals of the AFM instrument
- Signals can be individually switched from normal operation to user input

NX10 NX20 XE15 XE7 NX12

Spring Constant Calibration by Thermal Method

- Spring constant calibration by analyzing the thermal vibration of a cantilever

XE15 XE7

Active Q control

- Active control of cantilever oscillation Q factor, in air, from zero to over 5000
- Range of Q reduction/enhancement ratio: 1/40 ~ 20 (typical)
- Bandwidth: 180 Hz to 640 kHz

NX10 NX20 XE15 XE7 NX12

XER

- Command protocol to control the XEP by user-coded programs
- Functions to access/control the scan control parameters

NX20

XEA Software for Automatic Navigation System

- Enables automated sequential SPM scans and analysis routine, specified by a customer recipe.
- Automatically locates the areas of interest, navigates to a desired measurement point by pattern recognition.
- Automatically recognizes a probing tip by identifying the pattern of a cantilever

Liquid Imaging Options

Park provides extensive range of options and accessories including temperature and liquid-flow controls for in-liquid sample scanning. This allows your AFM to scan not only materials in ambient conditions but also those which are immersed in liquid, especially the biological samples.

NX10 NX20 XE15 XE7

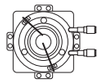
Liquid Probehand

- Contact and Non-contact AFM imaging in liquid environment
- Closed-cell environment when combined with Universal Liquid Cell
- Chemically resistive to acid/base conditions

NX10 NX20 XE15 XE7

Open Liquid Cell

- A liquid vessel made of PTCFE
- Resistive against corrosive solutions



NX10 NX20 XE15 XE7

Universal Liquid Cell with Heating and Cooling stage

- Open/closed liquid cell with liquid/gas perfusion and sample heating/cooling
- Temperature range: 4 °C - 70 °C (in liquid), 0 °C - 110 °C (in air)
- Liquid volume: 1000 µl
- Sample size: max dia. 15 mm, up to 1.5 mm max

Electrochemistry Upgrade Kit for Universal Liquid Cell

- Upgrade for EC capability to the Universal Liquid Cell

NX12

Live Cell Chamber and Gas Mixer for Live Cell Chamber

- Controls temperature, humidity, and pH
- Temperature control range: RT - 60 °C
- Controls the pH of the Live Cell Chamber by supplying mixed CO_2 gas

NX10 NX20 XE15 XE7 NX12

Electrochemistry (EC) Cell

- Made of PEEK (cell body) and FFKM (O-ring) for chemical resistance
- Sample size: 12 to 38 mm / 5 mm thickness

Park AFM Options & Accessories

Environmental Control Options

Park's environmental control provides optimal measurement condition by protecting the sample from environmental effects. Samples can change its characteristics, degrade or alter in form depending on the environmental changes. Park's environmental control prevents or isolates the sample from such conditions.

Temperature control options

NX10 NX20 XE15 XE7 NX12

Temperature Controlled Stage 1

- Temperature control of a sample in ambient condition using Peltier device
- Temperature range: -25 °C ~ 170°C
- Active heating and cooling

NX10 NX20 XE15 XE7 NX12

Temperature Controlled Stage 2

- Temperature control of a sample in ambient condition
- Active heating and passive cooling
- Temperature range: Ambient temperature to 250 °C

NX10 NX20 XE15 XE7 NX12

Temperature Controlled Stage 3

- Temperature control of a sample in ambient condition
- Active heating and passive cooling
- Temperature range: Ambient temperature to 600 °C

NX10 NX20 XE15 XE7 NX12

Coolant Circulation Kit for Temperature Controlled Stage

- Circulates coolant used in Universal Liquid Cell and Temperature Control Stage 1
- Includes a water pump and water bath

Atmospheric control options

NX10

EnviroChamber (Glove Box) for NX10

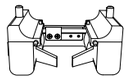
- Dimension: 740(L) x 625(D) x 710(H)mm / Weight: 50Kg
- Working Pressure range: -12mbar to +12mbar
- Working gas: Air, Ar, N_2
- Humidity Gauge: 20 ~ 80% (± 5%)

NX10 NX20 XE7 NX12

Humidity Control System

- Controls the humidity of the Glove Box option
- Humidity control range: from 20 to 80 %

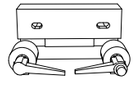
Magnetic Field Control Options



NX10 NX20

Magnetic Field Generator for NX

- Attachment to Park NX AFM Standard Head to apply magnetic field to the sample
- Adjustable intensity of a magnetic field
- Maximum field intensity: 500 gauss (±10% variation)



XE7

Magnetic Field Generator for XE

- Attachment to Park XE7's 50 µm XY scanner to apply magnetic field to the sample
- Adjustable intensity of a magnetic field
- Maximum field intensity: 300 gauss (±10% variation)

Park AFM Options & Accessories

Accessories

NX10 NX20 XE15 XE7 NX12

High Voltage Tool Kit

- Tool kit to apply high voltage for Nanolithography, EFM, Conductive AFM, or ULCA
- Applies high voltage bias to a tip or sample by mixing DC and AC signals
  - DC bias range: 300 V (external), ±10 V (internal)
  - AC bias range: ±10 V

NX10 NX20 XE15 XE7 NX12 NX-Hivac

Clip-type Probehand

- Probehand to which a cantilever chip carrier is attached by clip
  - NCM oscillation frequency: Up to 3 MHz
  - Non-magnetic
- Tip bias applicable from - 10 V to +10 V

NX10 NX20 XE15 XE7 NX12 NX-Hivac

Clip-type Chip Carrier

- Chip carrier to mount cantilevers using a spring clip
- Electrically conductive
- Two holes for the pre-aligned mounting to the probehand

Advanced AFM Modes

SCM for NX
- Scanning Capacitance Microscopy
- Includes the SCM module, SCM resonator, Clip-type probehand, and software
  - RF frequency range: 600 - 1500 MHz

SCM for XE
- Scanning Capacitance Microscopy
- Includes the SCM module, SCM resonator, probehand, and software

Conductive AFM (C-AFM) for NX
- Measures the conductivity of a sample with high lateral resolution
  - Gain range: 7 steps (Effective range from 10^6 to 10^12 V/A)
  - Maximum measurable current range: -10 μA to 10 μA (at 10^6 V/A gain)

Variable Enhanced Conductive AFM (VECA)
- Measures the conductivity of a sample with high lateral resolution and sensitivity
  - Gain range: 7 steps (10^3 to 10^9 V/A)
  - Maximum measurable current range: -10 mA to 10 mA (at 10^3 V/A gain)

Ultra Low-Noise Conductive AFM (ULCA)
- Measures sub-picoampere electric currents of highly resistive samples with low noise
  - Maximum measurable current: 100 pA
  - Minimum measurable current as small as 0.1 pA (rms) or less

SSRM
- Scanning Spread Resistance Microscopy
- Maximum measurable current: 1 mA

Photocurrent Mapping (PCM)
- Measures photoelectric response to a time-resolved illumination without interference from unwanted light source including the feedback laser
  - Acquisition time resolution: 20 μsec
  - Automatic analysis of life-time from photocurrent curves

Enhanced EFM
- For Enhanced EFM, Kelvin Probe Force Microscopy (KPFM), Dynamic Contact EFM (DC-EFM) and Piezoresponse Force Microscopy (PFM) modes

STM
- Scanning Tunneling Microscopy
  - Gain range: 7 steps (10^6 to 10^12 V/A)

STM Tool Kit
- Scanning Tunneling Microscopy using an external current amplifier
- Add on Tool Kit to the C-AFM, VECA

SThM
- Scanning Thermal Microscopy
- Measures thermal properties of sample surface

Nanolithography
- Software package for nanolithography and nanomanipulation modes from Park