

Now with optional
PeakForce Tapping



NANO WIZARD[®] SENSE+ AFM

- High quality imaging with excellent resolution
- Proven integration with optical microscopy
- Revolutionary new workflow-based software
- High flexibility with a broad range of modes and accessories
- Upgradable to a full NanoWizard[®] 4 XP system



NANO WIZARD[®] SENSE+ AFM

Start with leading technology

PROVEN NANOWIZARD PERFORMANCE

The **NanoWizard[®] Sense+** is a high-quality, entry level AFM, designed to deliver unparalleled performance, highest mechanical and thermal stability and excellent resolution, even on an inverted microscope.

Based on the proven NanoWizard technology, it is a true multipurpose tool, suitable for measurements in air and liquid and samples ranging from single molecules, living cells and tissues to polymers and nanomaterials.

The unique tip-scanning design is key to providing outstanding flexibility and modularity. It enables simultaneous AFM integration with advanced optical measurements.

Bruker strives to meet the needs of its users by offering customized solutions to individual requirements. The highly versatile **NanoWizard Sense+** delivers superior quality at a competitive price. It enables users to streamline their system by selecting the features and accessories best suited to their specific needs, present and future.

PEAKFORCE TAPPING OPTION

MAKING EVERY USER AN AFM EXPERT

Bruker's exclusive **PeakForce Tapping[®]** provides superior force control and unparalleled ease of use, no matter what the sample or environment. It enables long-term, high-quality imaging of the widest range of samples, even for non-experts or occasional users.

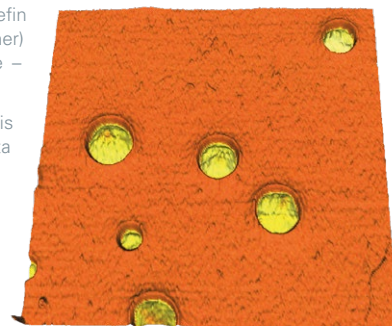
INTUITIVE OPERATION WITH THE WORKFLOW BASED V7 SOFTWARE

Achieve valuable results faster with the newly developed **software V7** interface. The optimized workflow guides users through a straightforward set-up, allowing non-experts to get started quickly and accomplish their goals.

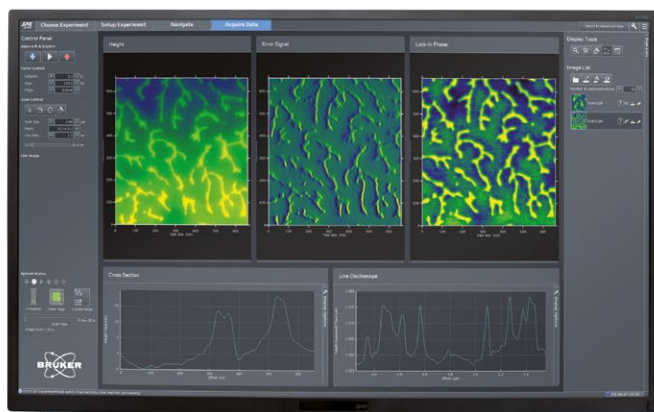
More experienced users have direct access to expert features and advanced feedback modes, while also benefitting from single-click calibration and a streamlined setup for increased productivity.

A blend of Polystyrene and Polyolefin Elastomer (ethylene-octene copolymer) spin-casted onto a silicon substrate – imaged using Force Mapping mode.

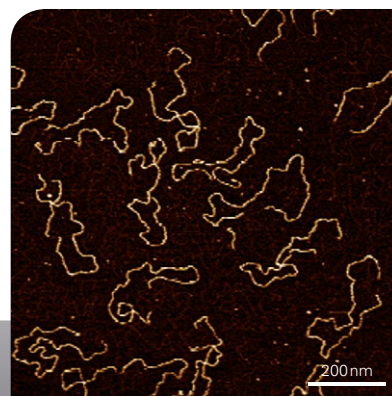
Scan size 5 μm \times 5 μm . Topography is overlaid with Young's modulus data (range 1 GPa).



NanoWizard Sense+ setup with TopviewOptics™ module



DNA molecules in liquid on a polycationic covered mica substrate – imaged using PeakForce Tapping mode, height range 3 nm.



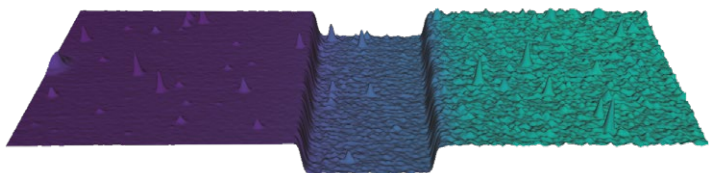
Versatility, flexibility and modularity

NANOWIZARD AFMs – HIGHEST VERSATILITY

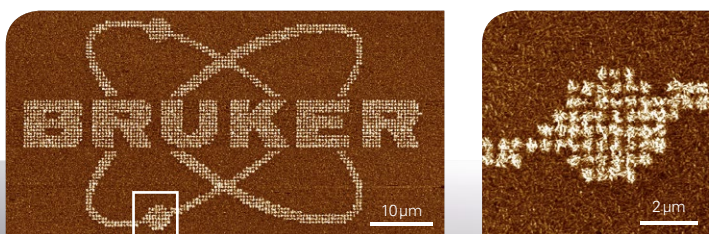
JPK has a long-standing reputation for providing state-of-the-art solutions and next-generation BioAFMs. The NanoWizard family is renowned for its wide range of optional accessories, modes and features, providing the highest flexibility for all your applications.

- **Sample handling:** The large standard sample volume ($\text{Ø}140 \times 18 \text{mm}^3$) can be enhanced with specialized options, such as motorized positioning, StretchingStage for AFM on samples under mechanical load, Head-up Stage extension to 14 cm in Z for taller samples, and shuttle stage for high NA upright optics with BioMAT™.
- **Temperature control:** High and low temperature options (e.g., unique CryoStage: -120°C up to 220°C), with and without perfusion or gas control.
- **Open access:** Utmost versatility in experiment design, e.g. simultaneous use of micro-pipettes or electrical probes in contact with the sample with AFM.
- **Electrical measurements:** Conductive AFM, KPM, EFM, MFM, STM, Piezoresponse microscopy, electrochemistry with temperature control and optics.
- **Mechanical measurements:** Optimized Force Mapping, Contact Resonance imaging, NanoManipulation, NanoLithography and NanoIndentation. Advanced Force Spectroscopy for applications ranging from single molecule force spectroscopy to viscoelastic mechanics.

3D representation of an interface between islands of aluminum and gold deposited on silicon, overlaid with colorized CPD (contact potential difference) data. Scan size $50 \mu\text{m} \times 17 \mu\text{m}$, height range 86 nm; CPD data range -120mV to 750mV .



Piezoresponse Force Microscopy (PFM) of a ferroelectric copolymer (P(VDF-TrFE)). A sequence of voltage pulses ($\pm 20 \text{V}$ range) was generated from a bitmap to write the pattern into the piezoelectric polarization of the sample.

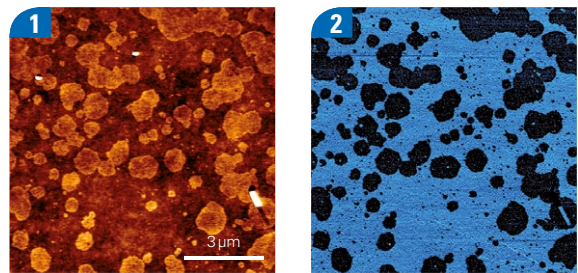


OPTICAL INTEGRATION PERFECTED

NanoWizard AFMs stand for unparalleled optical integration. Thanks to its unique tip-scanning design, the system can be combined with advanced optics and used simultaneously with standard condensers and reflection microscopy, even through thin coverslips, and on all major inverted optical microscopes.

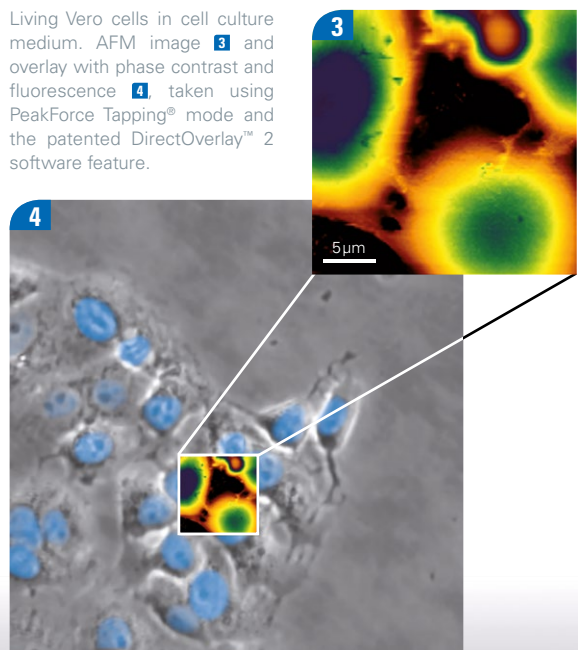
UPGRADABILITY, THE KEY TO FUTURE FLEXIBILITY

The highly modular design ensures that each Sense+ can be upgraded to a full NanoWizard 4 XP system for BioScience or NanoScience applications.



Topography **1** and Contact Resonance frequency **2** images of a glass surface showing surface contamination from the production process. Height range 3 nm; pI-frequency range 4 kHz.

Living Vero cells in cell culture medium. AFM image **3** and overlay with phase contrast and fluorescence **4**, taken using PeakForce Tapping® mode and the patented DirectOverlay™ 2 software feature.



Specifications for the NanoWizard Sense+ AFM

System specifications

- Atomic lattice resolution
- Tip-scanning stand-alone system, the only choice for simultaneous AFM and optics experiments
- Rigid low noise and liquid-safe design
- Low noise cantilever deflection detection system < 15 pm RMS
- Closed-loop for reproducible tip positioning and longtime position stability
- IR deflection detection light source with low coherence
- Transmission illumination with standard condensers for precise brightfield, DIC and phase contrast
- Intelligent and automated approach with user defined parameters for soft landing
- Scanner unit:
 - Flexure stage scanner design with decoupled, low mass z scanner
 - 100 × 100 × 15 μm³ scan range for the head

Sense+ Controller

- State-of-the-art digital controller with lowest noise levels
- Passive cooling without a fan
- Front connectors for electrical modules and other accessories

New workflow-based V7 SPMControl software

- True multi-user platform, perfect for imaging facilities
- User-programmable software
- Fully automated sensitivity and spring-constant calibration using thermal noise or Sader method
- New DirectOverlay 2 option for combined optical and AFM information
- Improved ForceWatch™ and TipSaver™ mode for force spectroscopy and imaging
- Advanced spectroscopy modes such as various force clamp modes or ramp designs
- Powerful Data Processing (DP) with full functionality for data export, fitting, filtering, edge detection, 3D rendering, FFT, cross section, etc.
- Powerful batch processing of force curves and images including WLC, FJC, step-fitting, JKR, DMT model and other analyses

Stages and sample holders

- Stages are available for all major inverted optical microscope manufacturers
- Liquid-safe, robust and drift-minimized design
- Manual precision stage with 20 × 20 mm² travel range and independent positioning of tip and sample with respect to the optical axis
- Holders for Petri dishes, coverslips, microscope slides, metal SPM stubs, etc.
- Special holders and liquid cells possible
- Large Ø 140 × 18 mm³ free sample volume

Fluid cell options

- Inert glass standard cantilever holders for experiments in droplets or custom fluid cells
- Patented BioCell™ for high-NA immersion lenses and high-resolution AFM down to the single molecule level
- CoverslipHolder offers the same capability as the BioCell for ambient temperature experiments
- Temperature controlled electrochemistry cell ECCell™ with transmission illumination
- PetriDishHeater™, perfect for living cells
- SmallCell™ small volume version for aqueous solutions

Optical configurations

- Fits on inverted microscopes from
 - Zeiss (Axio Observer, Axio Vert 100/200, Axio Vert A1)
 - Olympus (IX line)
 - Nikon (TE 2000, Ti/Ti2 line)
 - and Leica (DMi line)
- Fully simultaneous operation with optical phase contrast and DIC using standard condensers
- Compatible with commercial confocal microscopes and fluorescence techniques such as TIRF, FRET, FCS, FRAP, FLIM, spinning disk, PALM, STORM, STED
- AFM and upright high-NA optics combination with the JPK BioMAT workstation (see BioMAT brochure)
- Large variety of high-end EM-CCD cameras supported
- TopViewOptics™ video optics for opaque samples



Temperature control options

- Ambient to 300 °C temperature range with 0.1 °C precision with the JPK High Temperature Heating Stage (HTHS™)
- 35 °C to 120 °C temperature range with 0.1 °C precision with the JPK Heating Cooling Module (HCM™)
- 120 °C up to 22 °C with the JPK CryoStage

Options (see Accessories Handbook)

- Motorized precision stage with 20 × 20 mm² travel range with joystick or software control
- Different sample holders, cantilever holders and stages for every application
- Stage-up kit for tall samples
- StretchingStage for AFM and samples under mechanical load
- Large choice of add-ons such as temperature controls and liquid cells even for aggressive solvents
- CellHesion® module with extra 100 μm closed loop z range
- FluidFM® ADD-ON from Cytosurge
- Cameras and light sources for video imaging or fluorescence
- Vibration and acoustic isolation

STANDARD OPERATING MODES

Imaging modes

- Tapping Mode™ with PhaselMaging™
- Contact mode with lateral force microscopy (LFM)

Force measurements

- Static and dynamic spectroscopy
- Advanced Force Mapping

OPTIONAL MODES

- PeakForce Tapping **NEW**
- Higher harmonics imaging **NEW**
- Contact resonance AFM
- Conductive AFM
- Kelvin Probe Microscopy
- MFM and EFM
- STM
- Electrical spectroscopy modes
- Piezoresponse Microscopy
- Electrochemistry with temperature control and optical microscopy
- NanoLithography
- NanoManipulation
- Nanoindentation
- Scanning Thermal AFM
- FluidFM solution from Cytosurge **NEW**
- ExperimentPlanner™ for designing a specific measurement workflow
- RampDesigner™ for custom designed clamp and ramp experiments
- ExperimentControl™ feature for remote experiment control
- DirectOverlay 2 for combined AFM and optical microscopy **NEW**

NanoWizard Sense+ AFM with TopViewOptics



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JPK BioAFM Business
Bruker Nano GmbH
 Am Studio 2D · 12489 Berlin, Germany
 productinfo@bruker.com
 www.bruker.com/bioafm



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