

## Solver PRO-M



### Description

Solver PRO-M is a powerful and well-designed universal scientific SPM applicable to almost all areas that SPM can ever be exploited in. Some features make it unique in terms of electronics capability, probe movement precise measurements, and optical system convenience.

The Solver PRO-M model has been suited to be driven by the new-generation controller. It has been designed to incorporate modern achievements in microelectronics. Elegant module architecture and many new design solutions allowed creating one of the most powerful "brain" that SPM ever possessed. It contains more than 10 000 components from the world-best manufacturers as Analog Devices, Burr Brown etc.

Very important feature is that the new controller is perfectly suited to work with high frequencies (up to 5 MHz). Thus it is compatible with high frequency cantilevers that can be required to obtain the best quality images. High frequency compliance measurements are also important to perform AFAM (Atomic Force Acoustic Microscopy) – NT-MDT unique microscopy technique for imaging samples with differences in local stiffness. The controller is also designed to process capacitive sensors feed-back signal providing precision scanning.

Closed-loop control is used to improve the scanning performance and to expand the instrument functionality. Some scanners are equipped with low-noise capacitive XYZ

sensors that provide precise positioning by measuring the exact scanner movement. Others can be used with the scanner equivalent equipped with capacitive sensors. The technique compensates common piezoceramics imperfections such as nonlinearity, creep and hysteresis. This is especially fruitful for nanolithographies and nanomanipulations. Integrated low-noise capacitive sensors allow high resolution measurements with sensors switched on for down to 50–100 nm scan size. Even smaller areas can be successfully measured with the use of closed-loop scanner equivalent.

In addition to standard optical microscope with 3  $\mu\text{m}$  spatial resolution, the Solver PRO-M can be supplied with 1  $\mu\text{m}$  resolution optics set enabling to search and see individual objects on the sample surface separated by 1  $\mu\text{m}$  distance from each other

### Applications

- New materials
- Thin films
- Polymers
- Semiconductors
- Biological samples
- Any other applications which require atomic or molecular resolution in air, gas or fluid environments, as well as in-situ examination of structural changing on the sample surface during heating

## Operation modes

### Microscopies:

**in air:** STM/ Atomic Force Microscopy (AFM) (contact + semicontact + noncontact)/ Lateral Force Microscopy (LFM)/ Phase Imaging mode/ Force Modulation mode/ Adhesion Force Imaging/DC&AC Magnetic Force Microscopy (MFM) / DC&AC Electrostatic Force Microscopy (EFM)/ Scanning Capacitance Microscopy (SCM)/ Kelvin Probe Microscopy (KPM)/ Spreading Resistance Imaging (SRI)/ Atomic Force Acoustic Microscopy (AFAM);

**in liquid:** Atomic Force Microscopy (AFM) (contact + semicontact + non-contact)/ Lateral Force Microscopy (LFM)/ Phase Imaging mode/ Force Modulation mode/ Adhesion Force Imaging.

### Spectroscopies:

AFM (force-volume imaging, amplitude-distance, phase-distance curves), STM (I(z), I(V), Local Barrier Height (LBH), Local Density of States (LDOS).

### Lithographies:

**in air:** AFM (Force (scratching + dynamic plowing) and Current (DC&AC) )/ STM;

**in liquid:** AFM (scratching + dynamic plowing).

### Nano-manipulations:

Contact Force.

## Specifications

<b>Sample size</b>	Scanning by sample Up to Ø 40x10 mm Up to 12x12x2 mm with the liquid cell use	Scanning by probe Up to Ø 100x20 mm and unlimited for measuring head used for stand alone operation
<b>Scanners</b>	3x3x2.6 µm (±10%); 10x10x4 µm (±10%); 50x50x5 µm (±10%)	50x50x5 µm (±10%); 100x100x7 µm (±10%) (only for Shear Force) 100x100x10 µm (±10%)
<b>Min. scanning step (DAC)</b>	0.0004 nm; 0.0011 nm; 0.006 nm	0.006 nm; 0.012 nm; 0.012 nm
<b>SPM heads</b>	AFM STM: 30 pA-50 nA, RMS noise 4 pA (standard preamplifier); 10 pA-5 nA, RMS noise 1.5 pA (low current preamplifier)	AFM Shear Force
<b>Optical viewing system</b>	Resolution 1 µm Numerical aperture 0.28 Magnification with CCD 230x to 2900x Horizontal field of view 1.2 to 0.1 mm	
	Resolution 3 µm Numerical aperture 0.1 Magnification with CCD 48x to 578x Horizontal field of view 6.1 (2) to 0.49 mm	
<b>XY sample positioning</b>	5x5 mm	
<b>Positioning resolution</b>	5 µm	
<b>Heating</b>	130°C	
<b>Temperature stability</b>	0.1°C	
<b>Vibration isolation</b>	Active vibration isolation system: Active damping (0.6-100 Hz), >100 Hz – passive damping. Electric shielding and acoustic isolation is provided by the special cast metal hood.	