NT-MDT
Molecular Devices and Tools for NanoTechnology

CATALOG
of NT-MDT products

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NT-MDT Solver Line

The company NT-MDT was found in 1995 in Zelenogrrad - the center of Russia microelectronics.

The purpose of the company is supplying the word market with high quality scanning probe microscopies combining a variety of capabilities, high reliability, work convenience in combination with operating service support.

The company has in the arsenal a full set of scanning probe microscopes for all known now applications.

The company builds the development strategy resting on the powerful Russian technological potential accumulated in the defenna branches of the industry.

The products development of the company is based on the combination of MEMS technology, capabilities of modern software, high level microelectronic components and precision mechanics.

Using of Zelenograd microelectronics manufacturing base allows to produce both devices and all set of micromechanical units for them, carry out effective developments of probe systems complex designs oriented on a modern microscope capabilities.

Now in the company work 110 men. The average age is 30 years.

By the middle of 1999 more than 100 devices have been made. They were installed both in the Russian scientific and manufacturing centers and in centers of Europe, Japan, USA etc.

The devices of the company are working in 17 countries of the world.

The company is the leader of the Russian market and is planning to become the world leader in this field.

The primary goal of the company - customer success and satisfaction.

Scanning Probe Microscopes SOLVER line produced by NT-MDT Co. are reliable and easy to assimilate devices that provides a user with a wide range of tools for investigation and modification of various objects on solid surface with high resolution surface measurements - from micrometer down to atomic scale in different environmental and temperature conditions.

NT-MDT company produces and sells world wide a complete line of Scanning Probe Microscopes for high-resolution studies in ambient, controlled gas, liquid and ultra high vacuum environment and Accessories for SPM utilization (cantilevers and SNOM probes, calibration gratings and Highly Oriented Pyrolytic Graphite).

SOLVER P47 - modern design and powerful electronics. A device for complex material investigations, scanning by the sample configuration.

SOLVER P47EC - a special device for electrochemical application.

SOLVER P47H - modification of P47 model, scanning by the cantilever configuration.

STAND ALONE SMENA - a special device for investigation of samples with unlimited size.

SOLVER P7LS - special industrial SPM which allows to research big samples (wafers) up to 250 (300)mm in diameter as well as smaller ones.

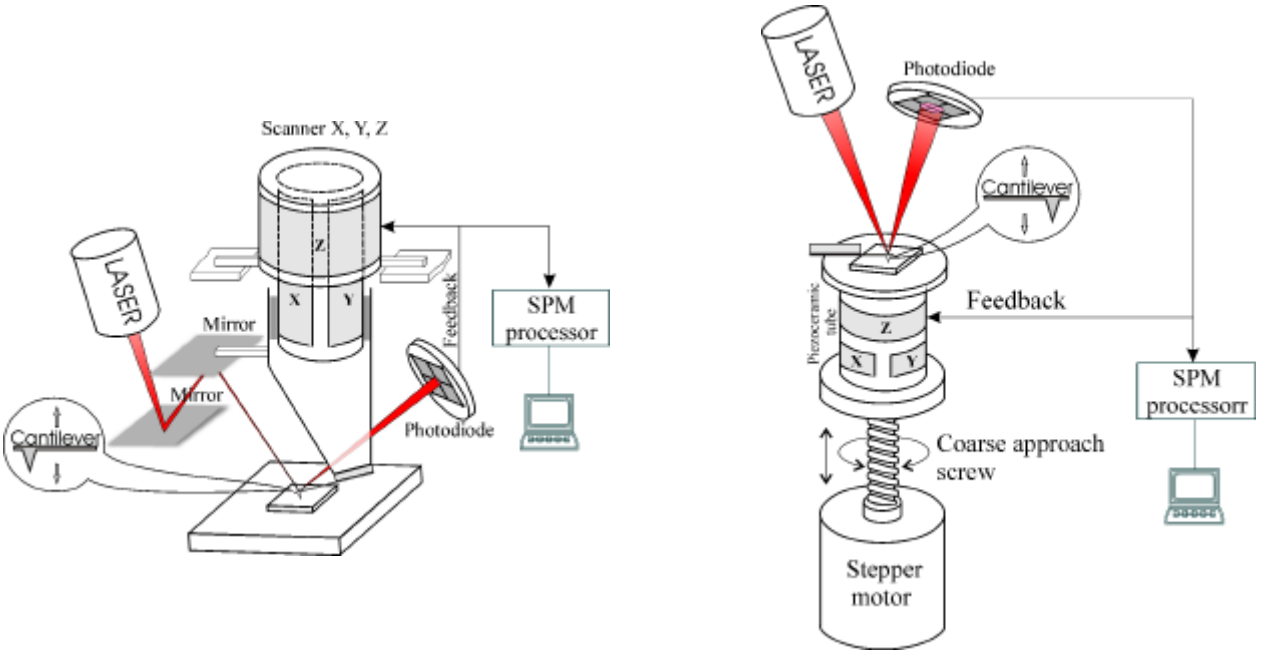
SOLVER P47BIO - a special device for biological and medical applications, integrated with inverted optical microscope.

SOLVER P7UHV - Ultra High Vacuum Multimode SPM for complex researches of different objects in ultra high vacuum.

SPM processor - all sufficient unit intended for Scanning Probe Microscope control. It allows to work in all basic SPM modes.

What is Scanning Probe Microscopy?

Scanning Probe Microscopy



Scheme of scanning:

a) by a cantilever

b) by a sample

Scanning Probe Microscope is a highest resolution surface measurement tool which accomplishes «feeling» a sample surface by special microprobe (cantilever). This «feeling» can be realized in ambient, controlled gas, vacuum and liquid environment.

The SPM head uses a beam deflection scheme to monitor the cantilever displacement caused by physical properties of measuring surface. This scheme is quite simple and permits registration of both normal deflection of the cantilever with sub-angstrom resolution and its twisting angle, so normal and lateral force can be measured simultaneously.

A semiconductor laser is used as a light source with wavelength 670nm and optical power 0.9mW. A laser beam is focused onto the back surface of the cantilever close to a tip position, and reflected beam falls onto the quadrant photodiode. Cantilever deflection causes displacement of the reflected beam over sections of the photodiode. An amplified differential signal from the quadrant photodiode permits measurement of angular deviation with the accuracy of less than 0.1′′, that corresponds to normal cantilever deflection of the order ~2 x 10^{-7} rad.

Now SPMs are used in a wide variety of disciplines, including fundamental surface science, routine surface roughness analysis, and spectacular three-dimensional imaging-from atoms of silicon to micron-sized protrusions on the surface of a living cell.

So, scanning probe microscope is a device that enables investigation of various surfaces with high resolution from micrometers down to atomic scale, versus optical microscopes. Scanning probe microscopes can measure physical properties such as: geometrical relief, localized friction, viscoelastisity, adhesion, surface conductivity, potentially allocation, magnetic fields, detection of electrostatics and electrodynamics forces etc.. As a result, applications of SPMs are very diverse.

Solver P47

Solver P47 scanning probe microscope is a universal device for a complex researches of different objects with highest resolution in ambient, liquid and controlled gas environment at the temperature up to 150°C (scanning by the sample system configuration).

Multimode Scanning Probe Microscope Solver P47
(scanning by the sample system configuration)

Measuring modes:

STM/ low current STM/ STS/ contact AFM/ contact AFM in liquids/ LFM/ ResonantMode (semicontact AFM+noncontact AFM)/ Phase Imaging/ Force Modulation/ Spreading Resistance Imaging/ MFM/ EFM/ SCM/ SKM/ Adhesion Force Imaging/ Shear Force mode/ AFM, STM and RM Lithographies

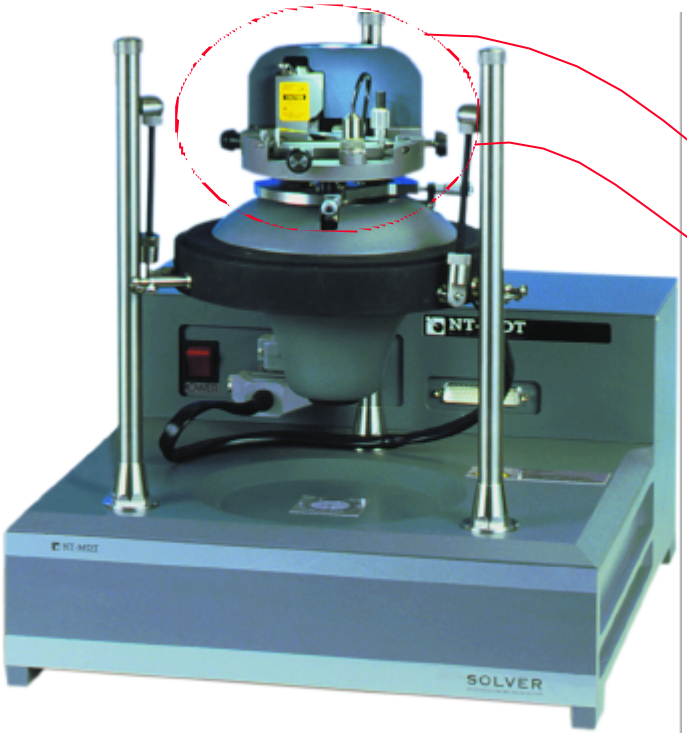
Solver P47

Technical specification	
Sample sizes	40x40 mm, thickness up to 10 mm
Size of scanning area	14x14x1.4 μm; 50x50x3 μm
Min scanning step	0.02 Å; 0.07 Å
Advanced electronics High-Q	22 bits XY resolution
Range of measuring frequencies	0.01 Hz - 2 MHz
Range of operation frequencies for modulation and resonance microscopy	0.5 kHz - 1.8 MHz
Minimum step of frequency increment	0.01 Hz
Resolution of phase measurements	0.1°
Minimum step of additional phase shift	0.4°
Tunneling current	30 pA - 50 nA standard preamplitier 3 pA -5 nA (low current preamplitier)
Maximum namber of scanning points	4 (2+2)
Maximum number of points in lines and columns	1000x1000
Supply voltage	80 - 260 V, 50 - 60 Hz
Maximum distance between a device and workstation	up to 300 m
Environmental conditions	
temperature	25±15°C
humidity	up to 80%

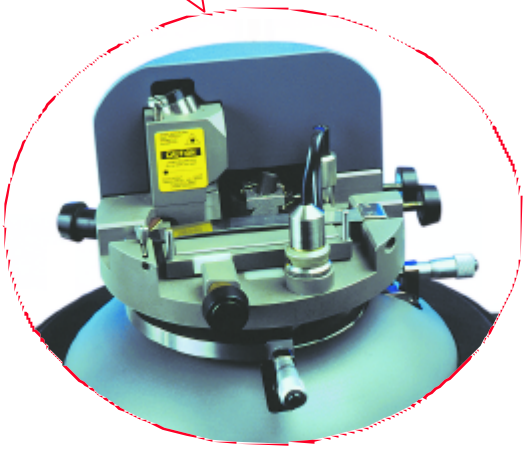
This device can be used in a small companies and university laboratories as well as in large research centres since it provides a user with a big number of research methods combined in a one compact machine and does not require any additional vibroprotective system even for atomic resolution getting.

P47 microscope is widely used for science of materials, nanomanipulation, nanolithography, nanometrology, thin film tecnology, general microscopy, magnetic materials, semiconductor investigations, high resolution spectroscopy, developing medium for information recording and storing, semiconductor devices studying, corrosion and destruction materials investigations biology, medicine.

Solver P47 measuring head



Multimode Scanning Probe Microscope Solver P47
(scanning by the sample system configuration)



Universal SPM measuring head of Solver
P47 microscope

The SPM measuring head of Solver P47 microscope contains an optical positioning system for the registration of cantilever position. It includes a 1mW semiconductor laser, a 4-sectional photodiode, probes system, adjustment with cantilever holder for cantilever adjustment and preamplifiers, different types of adjustment units allows to set the measuring mode, of universal SPM unit.

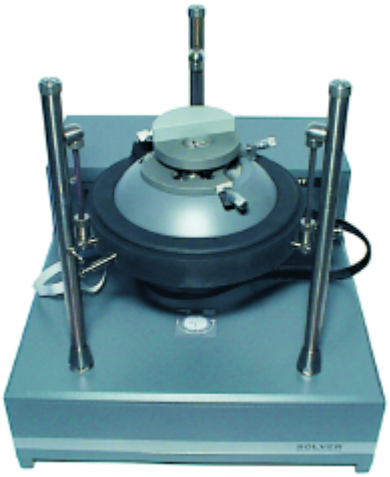
A semiconductor laser is used as a light source with wavelength 670nm and optical power 0.9mW. A laser beam is focused onto the back surface of cantilever close to tip position, and reflected beam falls onto the quadrant photodiode. Cantilever deflection causes displacement of the reflected beam over sections of the photodiode. An amplified differential signal from the quadrant photodiode permits measurement of angular deviation with the accuracy of less than 0.1″, that corresponds to normal cantilever deflection of the order ~2 x 10^{-7} rad.

Solver P47 measuring head allows to implement all AFM modes and provide measurements in air, controlled gas and liquid environment.

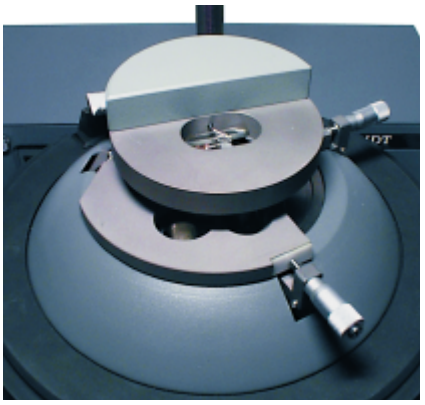
Solver P47 STM measuring heads

The use of these heads makes it possible to work in the tunneling microscopy, tunneling spectroscopy modes, to carry out electrically induced surface modification.

Measuring modes:
STM/ low current STM/ STSpectroscopy/ STM Lithography

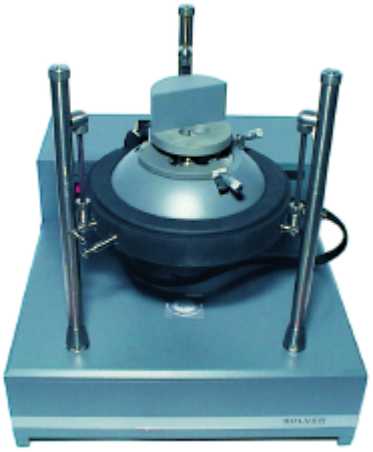


P47 with standard STM head



STM head with preamplifier (30pA-50nA)

The operation range - 10 pA - 10 nA. This preamplifier noise is about 5 pA in the frequency range of 12 kHz.

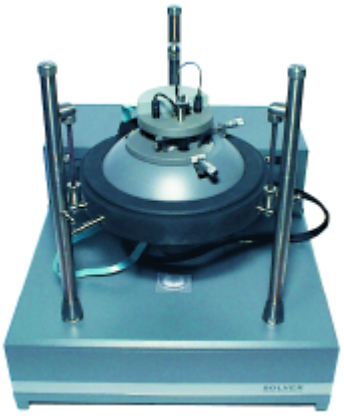


P47 with low-current STM head

STM head with precise preamplifier (3pA-5nA)

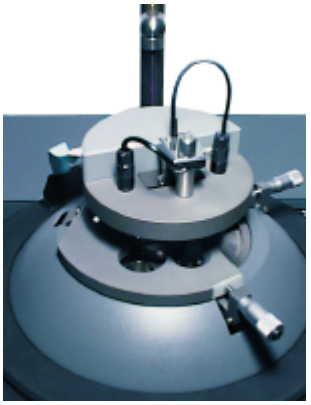
The head contains a precise preamplifier allowing operation at low currents. This preamplifier noise is under 1.5 pA in the frequency range of 5.5 kHz.

Solver P47 Shear Force Microscope



Solver P47 with Shear Force head

Shear Force head of Solver P47

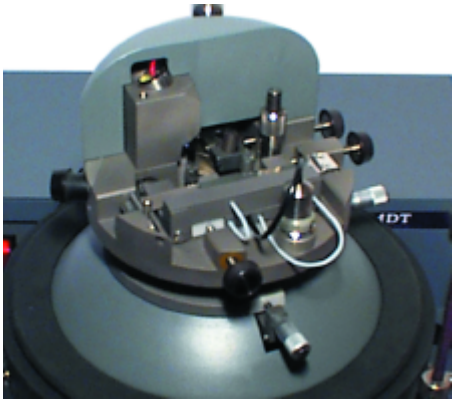


A Shear-force mechanism is widely used to regulate fiber tip-sample separation in SNOM. In our SNOM construction we use a tuning fork with attached tapered fiber and piezoelectric element to apply lateral vibration to the system: A Q-factor of tuning fork without fiber is commonly $10^4 \div 2x10^4$ (in air), after attaching the tapered fiber Q-factor decreases to $10^3 \div 5x10^3$. Usually a resonant frequency changes weakly (it is about 32Hz). The electrical response of tuning fork is used to control the tip-sample separation and for measuring an AFM profile. At the same time it is possible to record the optical signal from light-conducting fiber by means of photoelectric device or photodiode while the scanning progress. The SNOM resolution capability (AFM-resolution and optical resolution) depends on the light-conducting fiber point curvature-radius and on the probe-oscillation amplitude. We have obtained 50nm AFM resolution (Shear force microscope) using own light-conducting fiber. In our Solver P47 Shear Force construction any other probes such as: nanotubes, RtIr, W probes etc. can be used instead of light -conducting fibers.

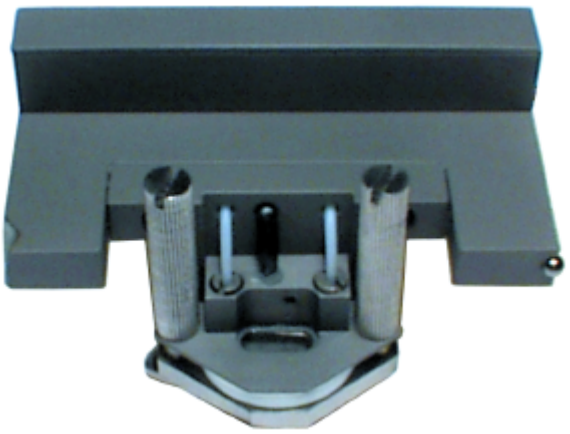
Technical specification	
Solver P47 Shear Force head has non optical feedback control system which consists of tuning fork and light conducting tapered fiber attached to the piezoelectric element which applies vibration to the system	
Minimum amplitude of micro fiber top oscillations is 10 nm	
Maximum AFM resolution 50 nm (depends on curvature radii of micro fiber tip)	
Sample size	up to 40x40x10 mm
Z Resolution	~1 nm
Resonant frequency of atuning folk	32 kHz (±0,5 kHz).
Solver P47 Shear Force head gives a possibility of using micro fibers of any manufactures.	
The microscope has external input which allows to use customer's receiving-amplifying equipment.	
The scheme is as the following:	
Micro fiber tip output	customer receiving-amplifying
Equipment	Solver P47 Shear Force
Ext. Input at	Umax = +10 V
	Umin = -10 V
Sensitivity	
Umin	$(10/2^{16})$V (16-bit-DAC)
Optical fiber (SNOM probes) characteristics	
Tipe	single mode optical fiber coated by alluminium
Transmitled wave length	488÷550 nm
Optical fiber tip apperture	50 nm÷100 nm (optional 600-680 nm)
Maximal optical input power	5-6 mW
Maximum optical output power	5μW
Optical efficiency	10^{-3} (10^{-4}) for 100 nm radii of fiber
Optical efficiency	10^{-6} (10^{-7}) for 30 nm radii of fiber

Gas - Liquid cell

Gas - liquid cell provides a possibility to investigate solid-liquid interface and samples in gas environment in contact AFM/ LFM mode. Gas - liquid cell is useful for AFM studies of hydrophilic surfaces to avoid large capillary forces by total dipping the cantilever inside liquid and it becomes indispensable in the case of some objects like living cell which will be damaged in air environment.



AFM head of Solver P47 with gas-liquid cell



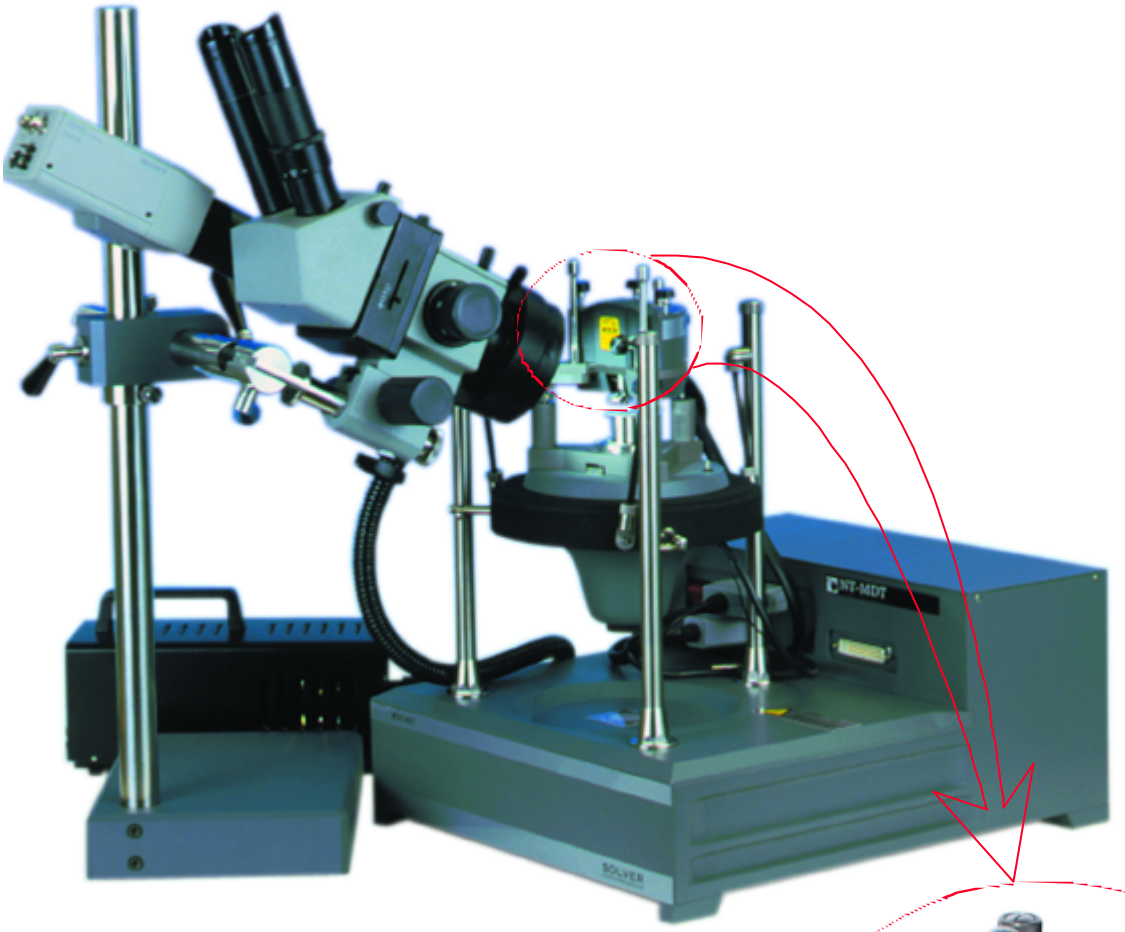
Hermetic gas-liquid cell of Solver-P47

The design of our liquid cell eliminates the usual liquid cell problems due to bubble entrapment and fluid leakage. Our liquid cell has the cylindrical form made from fluoroplastic and titanium. This admits to use a wide range of liquids from water and organic solvents to some acids and alkalis. It is possible to supply the liquid cell with heating and liquid temperature control feature. The diode detector located in 2 mm from the measuring point to guarantee the low temperature gradient and high accuracy of liquid temperature control. Samples in controlled gas environment can be investigated as well in Solver P47 gas-liquid cell.
From the upper side it has the glass window for laser beam adjustment. Under glass - cantilever at the distance ~2mm.

Technical specifications:	
Fully hermetic design eliminates any fluid leakage	
System of glass tubes allows to eject all bubbles from the liquid.	
The possibility to insert reagents while working procedure	
The cell is designed so that the speed of scanning in liquid stays practically the same as in air	
Depth	5mm
Internal diameter	16mm
External diameter	22mm
Material of the cell	organic glass (fluoroplastic)
The liquid cell has 3 tubes	2 stainless tubes and 1 fluoroplastic: stainless tube for filling the empty cell stainless tube for liquid input while working fluoroplastic tube for ejecting the bubbles of air

Solver P47H

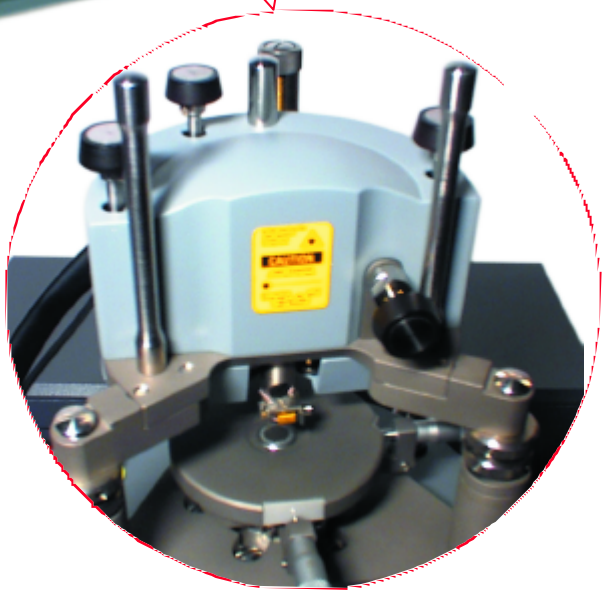
Solver P47H scanning probe microscope is a modification of P47 device (scanning by the cantilever configuration) which allows bigger size samples investigation of and provides sample heating up to 300C, ambient and controlled gas environment during the measurements; does not require additional antivibration isolation.



Scanning Probe Microscope Solver P47H
(scanning by the cantilever configuration)

Measuring modes:

Contact AFM/ LFM/ ResonantMode (semi-contact AFM+noncontact AFM)/ Phase Imaging/ Force Modulation/ Spreading Resistance Imaging/ MFM/ EFM/ SCM/ SKM/ Adhesion Force Imaging/ Shear Force Mode/ AFM, voltage, RM Lithography



Solver P47H measuring head with
the sample holder

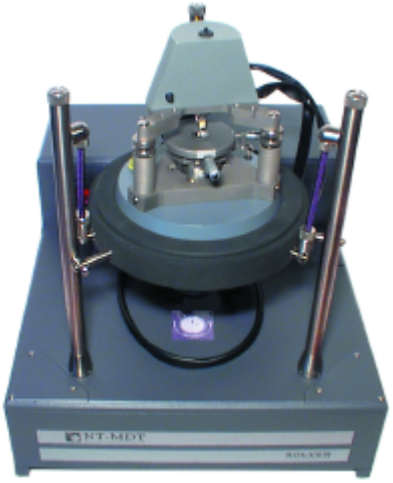
Solver P47H

Technical specification	
Sample size	100x100 mm, thickness up to 20 mm
Size of scanning area	30x30x1.5 µm; 60x60x3 µm; 100x100x5 µm;
Min scanning step	0.04 Å; 0.07 Å; 0.1 Å
Advanced electronics High-Q	22 bits XY resolution
Word length used digital-to analog converter for X, Y deflection	22
Transverse resonance scanner frequency	2 kHz
Longitudinal scanner frequency resonance	8 kHz
Range of measuring frequencies	0.01Hz - 2MHz
Range of operational frequencies in modes of modulation and resonance microscopy	20kHz - 1.8MHz
Minimum step of the setting device of frequency and increments of frequency registrar	0.01Hz
Resolution of phase measurements	0.1°
Increment of the setting device of phase shift between measuring signals	0.4°
Maximum amount of simultaneously noted and deducedon a screen, during scanning signals	4
Maximum number of points in lines and columns	1000
Supply voltage	80 - 260 V, 50 - 60 Hz
Maximum distance between a device and workstation	up to 300m
Environmental conditions	
Temperature	25±15 °C
Humidity	80%

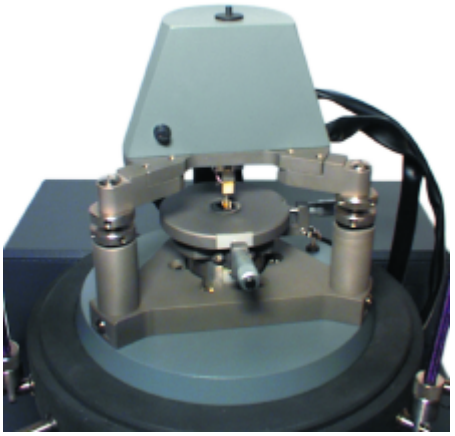
P47H is widely used in science of materials, nanomanipulation, nanolithography, nanometrology, thin film tecnology, general microscopy, magnetic materials, semiconductor investigations, high resolution spectroscopy, developing medium for information recording and storing, semiconductor devices studying biology, physiology, medicine corrosion and destruction materials measurements.

Solver P47H

Solver P47H Shear Force Microscope



Solver P47H with Shear Force head



Shear Force head of Solver P47H

Solver P47 Shear Force Microscope based on the same ideas as Solver P47 system (see page 2), but has the following advantages:

- Sample size up tyo 100x100x20mm.
- It is possible to measure heavy samples up to 1.5 kg.
- Open design makes the system much more open for any external applications because of easy access to the sample and the tip.

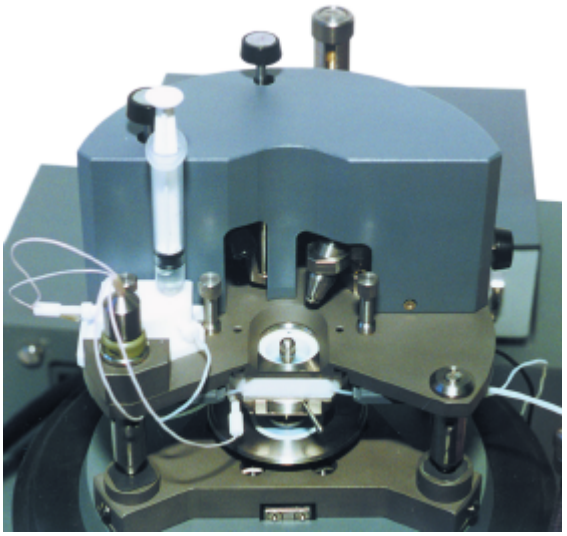
This simplify surface illumination by external light sourse and detecting light signal from the surface by external detector.

Technical specification	
Solver P47H Shear Force head has non optical feedback control system which consists of tuning fork and light conducting tapered fiber attached to the piezoelectric element apply vibration to the system	
Sample size	up to 100x100x20mm or unlimited in Stand Alone configuration
Minimum amplitude of micro fiber top oscillations is 10 nm	
Maximum AFM resolution 50 nm (depends on curvature radii of micro fiber tip)	
Z Resolution	~1 nm
Resonant frequency of system	32 kHz (±0.5 kHz).
Solver P47H Shear Force head gives a possibility of using micro fibers of any manufactures.	
The microscope has external input which allows to use customer receiving-amplifying equipment.	
The scheme is as the following	
Micro fiber tip output	customer receiving-amplifying
Equipment	Solver P47H Shear Force
Ext. Input at	Umax = +10V Umin = -10V
Sensitivity	
Umin	$(10/2^{16})$V (16-bit-DAC)
Optical fiber characteristics (delivered by NT-MDT)	
Tipe	single mode optical fiber coated by alluminium
Transmitled wave length	488÷550nm
Optical fiber tip apperture	100nm (50nm)
Maximal optical input	5 - 6 mW
Maximum optical output power	5μW
Optical efficiency	10-3 (10-4) for 100 nm radii of fiber
Optical efficiency	10-6 (10-7) for 30 nm radii of fiber

Solver P47EC

Solver P47EC scanning probe microscope is used for study chemical properties and surface topography of conducting materials in electrolytes. The electrochemical system Solver P47EC makes it possible to effect electrochemical measurements and it is able to conduct measurements of a surface being in chemically active medium

Solver P47EC with EC head



Solver P47EC measuring head
(with closed hermetic EC cell)

P47EC works on air and in liquids in the following measuring modes:

In liquid: EC STM/ contact EC AFM/ LFM in liquids/ Adhesion Force Imaging.

On air: STM/ STS/ contact AFM/ LFM/ ResonantMode (semicontact AFM+noncontact AFM)/ Phase Imaging/ Force Modulation/ Adhesion Force Imaging/ AFM, voltage, RM Lithography

Technical specification	
Maximum output voltage	± 10 V
Maximum output current	± 30 mA
Range of potential/current control	
Resolution	16 bit DAC
Range (Potentiostat)	± 5 V
Range (Galvanostat)	± 20 mA
System performance	
Min Potential Step	150 µV
Min Current Step	3 µA
Current Measurement	
Ranges	100 mA - 10µA, 1 mA - 100 µA
Input Bias Current (reference electrode)	<10 pA at 25°C
Max Voltage range:	±5 V

P47EC allows to implement:
Electrolytic deposition of metal from electrolytic solution at an electrode made of the same metal; electrolytic deposition of metal from electrolytic solution at an electrode made of different metal or electrically conductive material (for example, graphite); anodic oxidation of metals up to ions forming an insoluble compound with solution components resulting in a film-coated electrode covering; anodic oxidation of metals with formation of solvable ions; anodic oxidation of metals with immediate formation of surface film (solution components participate at the charge transmission stage).

Solver P7LS

Solver P7LS scanning probe microscope was specially designed for investigations and technical control of big size samples and wafers up to 300 mm in diameter and 15 mm thick though small samples can be studied as well.
The motorized positioning stage allows to choose any place visually via an optical system with CCD camera and define a number of areas to be scanned in different parts of the sample.
The repeated approach and scanning of the predefined areas is done automatically, so the researcher has just to return after a while to get the results of measurements.

Scanning Probe Microscope Solver P7LS.

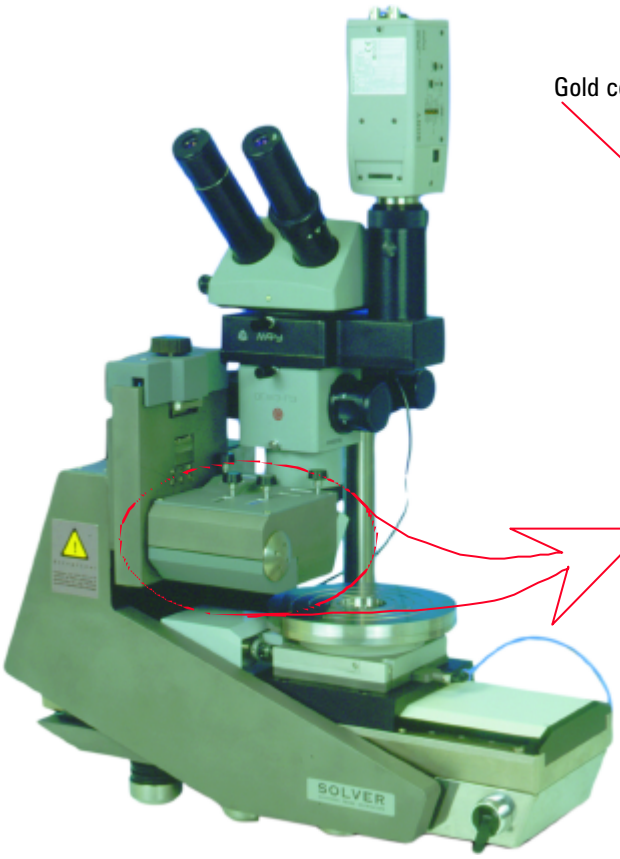
Measuring modes:
Contact AFM/ LFM/ ResonantMode (semicontact AFM+noncontact AFM)/ Phase Imaging/ Force Modulation/ Adhesion Force Imaging/ MFM/ EFM/ Spreading Resistance/ SCM/ SKM/ AFM, voltage, RM Lithography/ Voltage Lithography

Solver P7LS

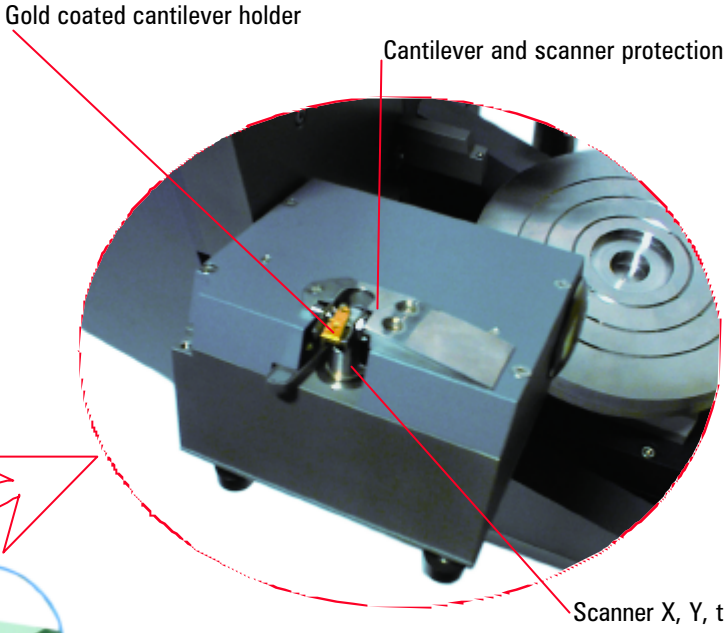
Technical specification	
Noise level	<1 Å RMS in vertical (Z) direction
SPM configuration:	
Scanner	60x60x3 µm, 100x100x5 µm
Min scanning step	0.07 Å, 0.1 Å (effective 22 bits XY resolution)
Residual lateral nonlinearity (in XY - direction)	less than 1%
Advanced electronics High-Q allows to set the resonance frequency with an accuracy	0.01 Hz
Sample size	
	Up to 250mm (300mm optional) in diameter
	Up to 15mm thick
Sample holder	
Vacuum chuck	for CD stampers, replicas and glass master discs
Vacuum chuck	for hard discs (48mm, 65mm, 95mm, and 130mm) and other samples
Semiconductor wafer vacuum chuck	for 50mm, 100mm,125mm, 150mm, 200mm and 250mm wafers
Motorized Positioner	
Inspectable area	up to 250mm in diameter with linear and rotary stage
Linear resolution	2µm
Bidirectional repeatability	1µm
Angular Resolution	0.002 degree
Angular Repeatability	0.0014 degree
Environmental conditions	
Temperature	25±15 °C
Humidity	80%
Optional top view	
Resolution	5µm (with optional objective — up to 1.5µm)
Field of view with 14X eyepieces	2.4mm to 28mm
Magnification with 14X eyepieces	8.4X to 100X
Magnification with color CCD	43X to 470X
Tip Viewing:	
Scanning cantilever can be viewed on the monitor screen during scanning procedure	
Preview	
Surface defects can be located during whole wafer preview operation with 8X eyepieces (field of view 39mm). The cantilever can be positioned on the predefined area for further scanning.	
Environmental conditions	
Temperature	25±15 °C
Humidity	80%

The range of applications: semiconductors, roughness control of silicon wafers, topography defects control and characterisation, conductivity control of contact plates, cleaning process control, resist residuals identification, data storage media, morphology control of magnetic films, roughness control of starting materials, visualization of magnetic bits and their orientation, controlled surface modification using the Lithography modes, optical components, surface quality control, visualization and 3D measurements of polishing residuals such as scratches, wells, grooves, etc, final control of surface roughness.

Solver P7LS AFM measuring head



Solver P7LS with AFM measuring head



Solver P7LS AFM measuring head

Measuring modes:

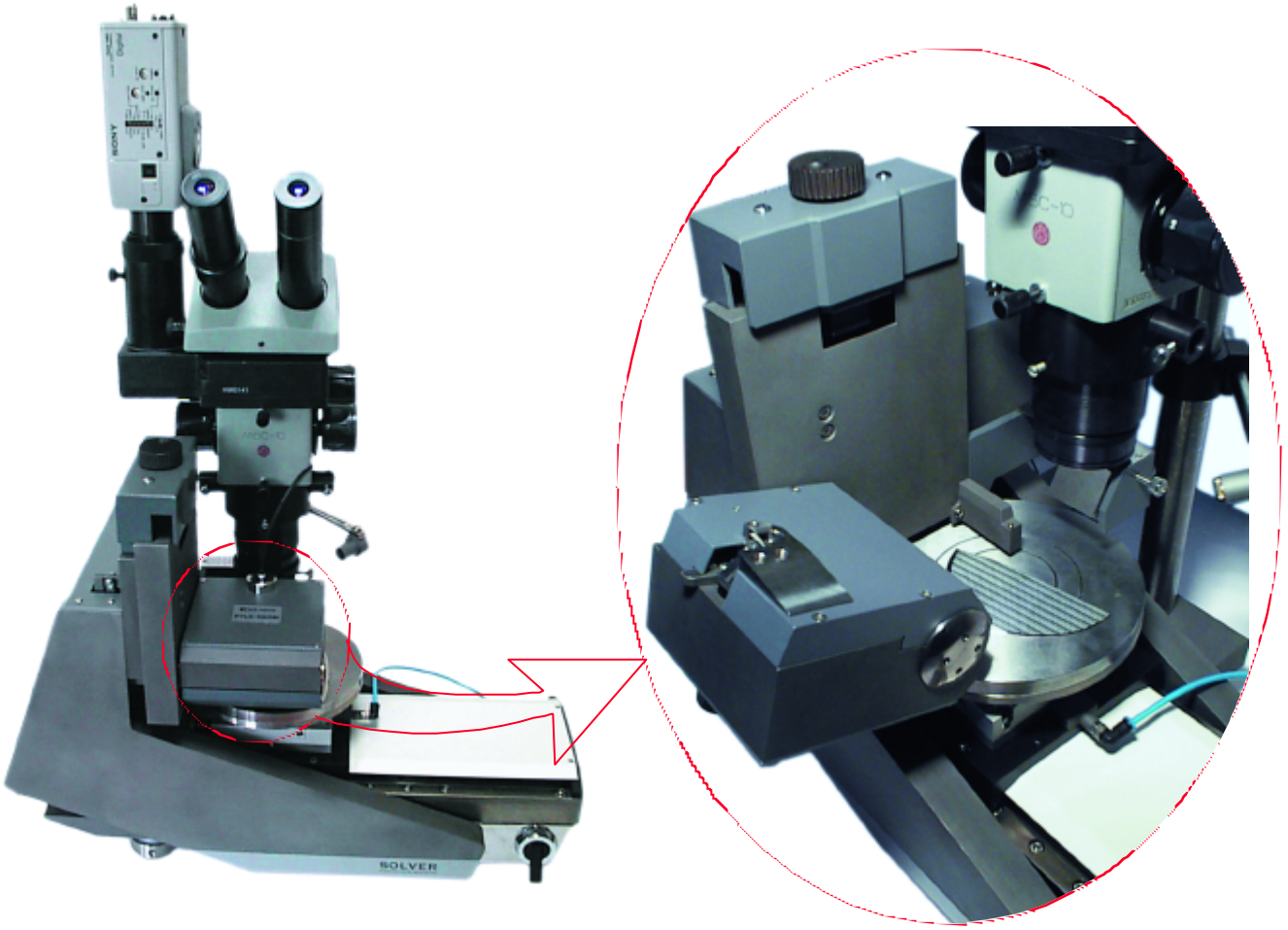
Contact AFM/ LFM/ ResonantMode (semicontact AFM+noncontact AFM)/ Phase Imaging/ Force Modulation/ Adhesion Force Imaging/ MFM/ EFM/ Spreading Resistance/ SCM/ SKM/ AFM,voltage, RM Lithography/ Voltage Lithography

The AFM scanning head of Solver P7LS microscope contains an optical positioning system for the registration of cantilever position. It includes a 1mW semiconductor laser, a 4-sectional photodiode, piezoscanner, probes positioning system and preamplifiers.

A semiconductor laser is used as a light source with wavelength 670nm and optical power 0.9mW. A laser beam is focused onto the back surface of cantilever close to tip position, and reflected beam falls onto the quadrant photodiode. Cantilever deflection causes displacement of the reflected beam over sections of the photodiode. An amplified differential signal from the quadrant photodiode permits measurement of angular deviation with the accuracy of less than 0.1″, that corresponds to normal cantilever deflection of the order of 0.05 nm.

Solver P7LS measuring head realizes a scanning by the cantilever configuration and allows to implement all AFM modes.

Solver P7LS Shear Force Microscope



Solver P7LS Shear Force Microscope

Solver P7LS Shear Force measuring head

Solver P7LS Shear Force measuring head uses a tuning fork attached tapered fiber and a piezoelectric element to apply lateral vibration tp the system: a Q-factor of tuning fork without fiber is commonly $10^4 \div 2x10^4$ (in air), after attaching the tapered fiber Q-factor decreases to $10^3 \div 5x10^3$. Usually a rsonant frequency changes weakly (it is about 32Hz). The electrical response of tuning fork is used to control the tip-sample separation and for measuring an AFM profile. At the same time it is possible to record the optical signal from light-conducting fiber by means of photoelectric device or photodiode while the scanning progress. The SNOM resolution capability (AFM resolution and optical resolution) depends on the light-conducting fiber point curvature radius and on the probe-oscillation amplitude. We have obtained 50nm AFM resolution (Shear Force microscope) using own light-conducting fiber. In out Solver P7LS Shear Force microscope construction any other probes such as nanotubes, PtIr and W probes etc. can be used instead of light-conducting fibers.

Solver P47BIO

Solver P47BIO scanning probe microscope is a special device for biological and medical applications. It is based on a combination of an inverted optical and a scanning probe microscopes that enables visualisation of a sample surface by optical system during the scanning process in different SPM modes. An inverted optical microscope simplifies adjustment and positioning processes. The device provides investigations in ambient and liquid environment.

Solver P47BIO Microscope

Measuring modes:

Contact AFM/ LFM/ contact AFM in liquids/ ResonantMode AFM (semicontact +non contact)/ Phase Imaging/ Force Modulation (viscoelastisity)/ MFM/ EFM/ Adhesion Force Imaging/ Force Spectroscopy/ Spreading Resistance/ SCM/ SKM/ AFM, voltage, RM Lithography

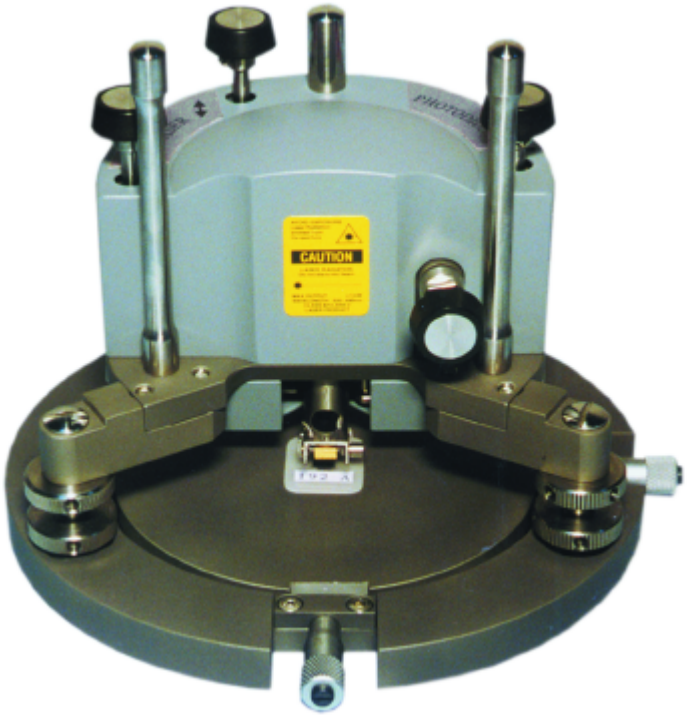
Solver P47BIO

Technical specification	
Sample size	∅90 mm (max)
Scanning area	60x60x3 µm, 100x100x5 µm
Min scanning step	0.06 Å, 0.1 Å
XY sample positioning	30x30 mm (within 30 mm circle) 1 mm scale count.
Fine cantilever positioning	4x4 mm range, 5 µm resolution
Optical system	inverted microscope (and optional color CCD camera SONY SSC-DC500P)
Tip viewing	scanning cantilever can be viewed on the monitor screen during the scanning procedure
Scanning resolution	22-bit DAC in X, Y, Z
ADC resolution	16 bit
Frequency range	10Hz-2MHz
Accuracy of modulation frequency setting	digital 32-bit (0.01 Hz)
Sample holder	
Vacuum chuck for Petri dishes	∅60 mm and ∅90 mm
Holder with spring clamp for samples	up to 30x100 mm
Inverted Optical Microscope	
Objectives	2.5x0.08; 6.3x0.20; 10x0.22; 20x0.45
Field of view	0.5 mm to 6.2 mm
Magnification with eyepieces	30X to 360X
Bright field, phase contract and polarization contrast	
Trinocular head for CCD camera	
Optional top view	
Resolution	5 µm (with optional objective up to 1.5 µm)
Field of view 14X eyepieces	2.4 mm to 28 mm
Magnification	
with 14X eyepieces	8.4X to 100X
with color CCD	43X to 470X
Environmental conditions	
Temperature	25±15 °C
Humidity	80%

P47BIO applications include imaging of:
DNA and chromatin structure, protein/enzyme interactions, protein adsorption, biomacromolecules, cell surface antigens, intracellular interactions, cell morphology and motility, synaptic release and signal transduction processes, membranes, viruses and other microbes, force measurements.

Stand Alone SMENA

Stand Alone SMENA is a special scanning probe microscope for investigation samples with unlimited size. This device is realised in a compact low weight configuration with a full number of SPM measuring modes. Stand Alone SMENA is available in three configurations with different set of measuring modes which you can choose depending on application and budget requirements.



Stand Alone SMENA scanning probe microscope with X, Y stage

Measuring modes:
Contact AFM/ LFM/ ResonantMode (semicontact AFM+noncontact AFM)/ Phase Imaging/ Force Modulation (viscoelastisity)/ Spreading Resistance Imaging/ MFM/ EFM/ SCM/ SKM/ Adhesion Force Imaging/ AFM, voltage, RM Lithography

X,Y stage for Stand Alone SMENA

Stand Alone SMENA

This device can be used for polymer investigations, biological and medical sciences (in combination with Inverted Optical Microscope), semiconductor structures, magnetic materials, DVD and CD discs, material investigations, car polishing control, turbine blades, surface control of Large Optic, aeroplane surface etc.

Technical specification:	
Sample size	Unlimited Small samples of maximum diameter up to 110 mm can be placed between the legs of the head
Scan range	60x60x3μm, 100x100x5μm
Min scanning step	0.06Å, 0.1Å
Positioning stage	range of positioning 6mm, positioning accuracy 5μm.
Resolution	22 bit DAC in X,Y, Z direction and 16 bit ADC
Range of frequency settings	10Hz-2MHz
Accuracy of frequency setting	digital 32 bit (0.01Hz)
Environmental conditions	
temperature	25±15°C
humidity	up to 80%

SMENA-B

is all you need to start in modern SPM science

The basic model supplies you with modern measuring modes such as ResonantMode (RMS feedback), Contact (Normal and Lateral Force) AFM modes, low sensitive MFM/ Force Modulation (viscoelastisity)/ RM Lithography/ Adhesion Force Imaging/ ResonantMode AFM with RMS + synchronous detection of amplitude and phase of 1st to 9th harmonics for feedback control, Phase Imaging/ MFM/ EFM.

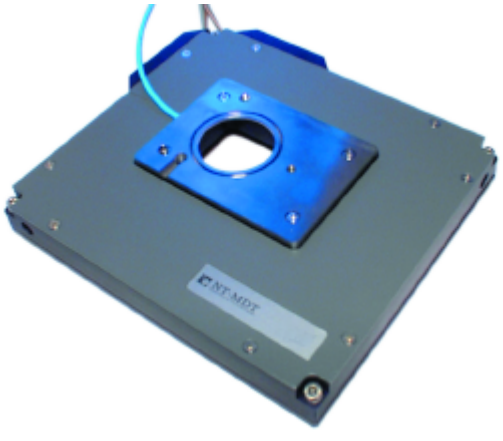
SMENA-A

COMPLETE Stand Alone system

In addition to SMENA B this system version allows Spreading Resistance Imaging/ SCM/ SKM (SPoM)/ Voltage Lithography and provides a customer with a COMPLETE set of SPM techniques. It makes the system easily upgradeable to FULLY CONFIGURED SOLVER P47H multi-technique SPM. Shear Force measuring head is available as an option.

Closed - loop XY Stage

«Closed - loop XY Stage» – X, Y directions scanner which contains a sensor with a feedback by X and Y directions that provides non-linearity 0,1 % during the scanning. «Close loop system XY Stage» control is realized by SPM processor (electronics block for Solver P7). There is also a possibility of combination it with Stand Alone SMENA scanning probe microscope that increases scanning range of SMENA microscope up to 100x100x5μm and provides the full absence of non-linearity while the scanning process by SMENA SPM.



Closed-loop XY Stage

Closed-loop XY Stage with
Stand Alone SMENA microscope

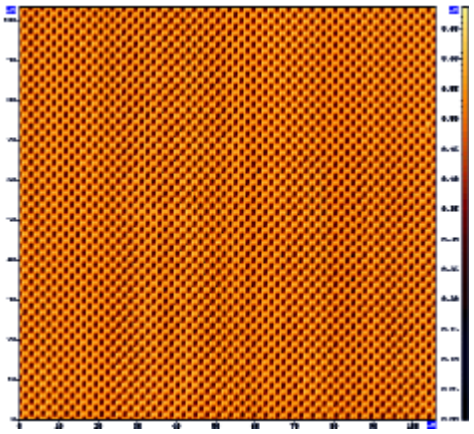


Image of TGX01 silicon grating with the step 3x3 μm

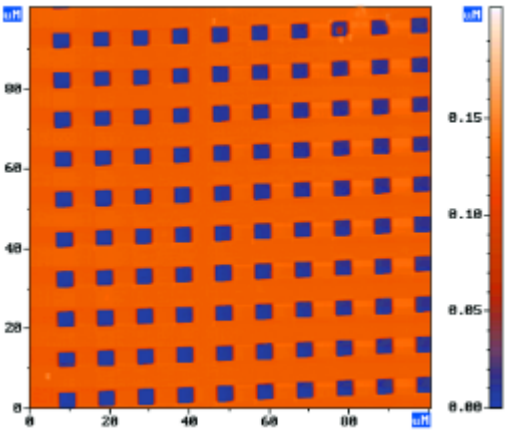


Image of silicon grating with step 10x10 μm

Technical specification	
Scanning range, X/Y axes	100x100 μm
Closed loop maximum scanning rate of XY stage	2 Hz
Open loop maximum scanning rate of XY stage	20 Hz
Closed loop resolution	2 nm
Open loop resolution	1 nm
Closed loop linearity (typically)	0.1%, not more then 0.2% from a total range
Closed loop repeatability(typically)	30 nm, not more then 0.2% from a total range
Maximum load	2 kg
Weight	1.45 kg