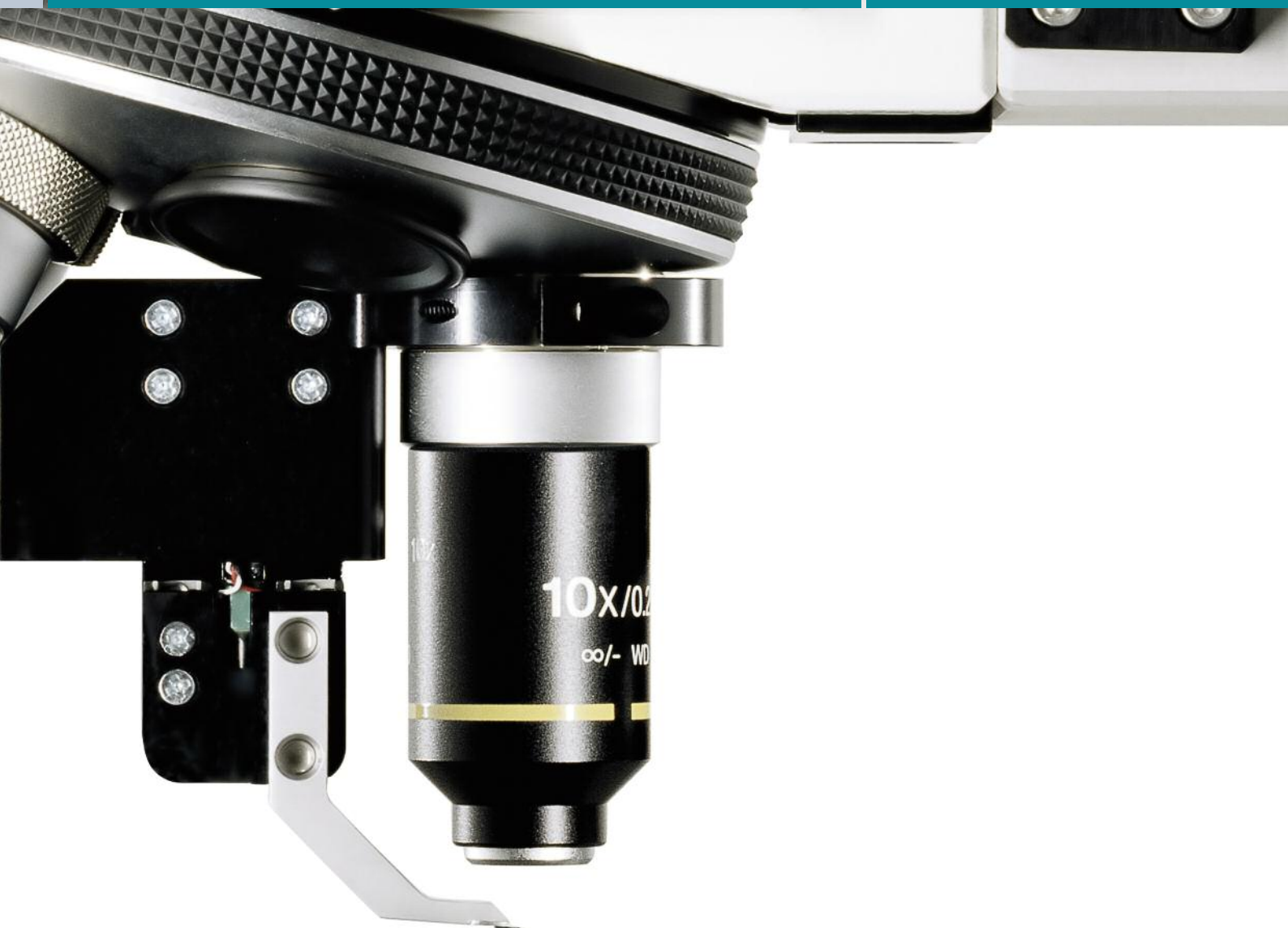


alpha300 S

Scanning Near-field Optical Microscope

www.witec.de

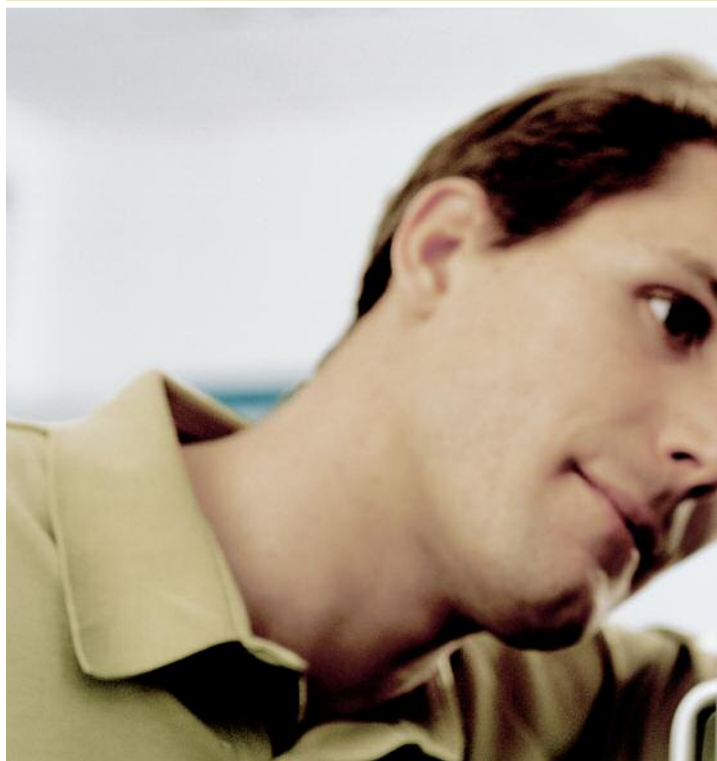
WITec
focus innovations



alpha300 S

SNOM System with unique Cantilever Sensors

The alpha300 S is a user friendly Scanning Near-field Optical Microscope (SNOM) that combines the advantages of SNOM, Confocal Microscopy and Atomic Force Microscopy in a single instrument. Switching between the different modes can easily be done by rotating the objective turret. The alpha300 S uses unique micro-fabricated SNOM Cantilever Sensors for optical microscopy with spatial resolution below the diffraction limit.

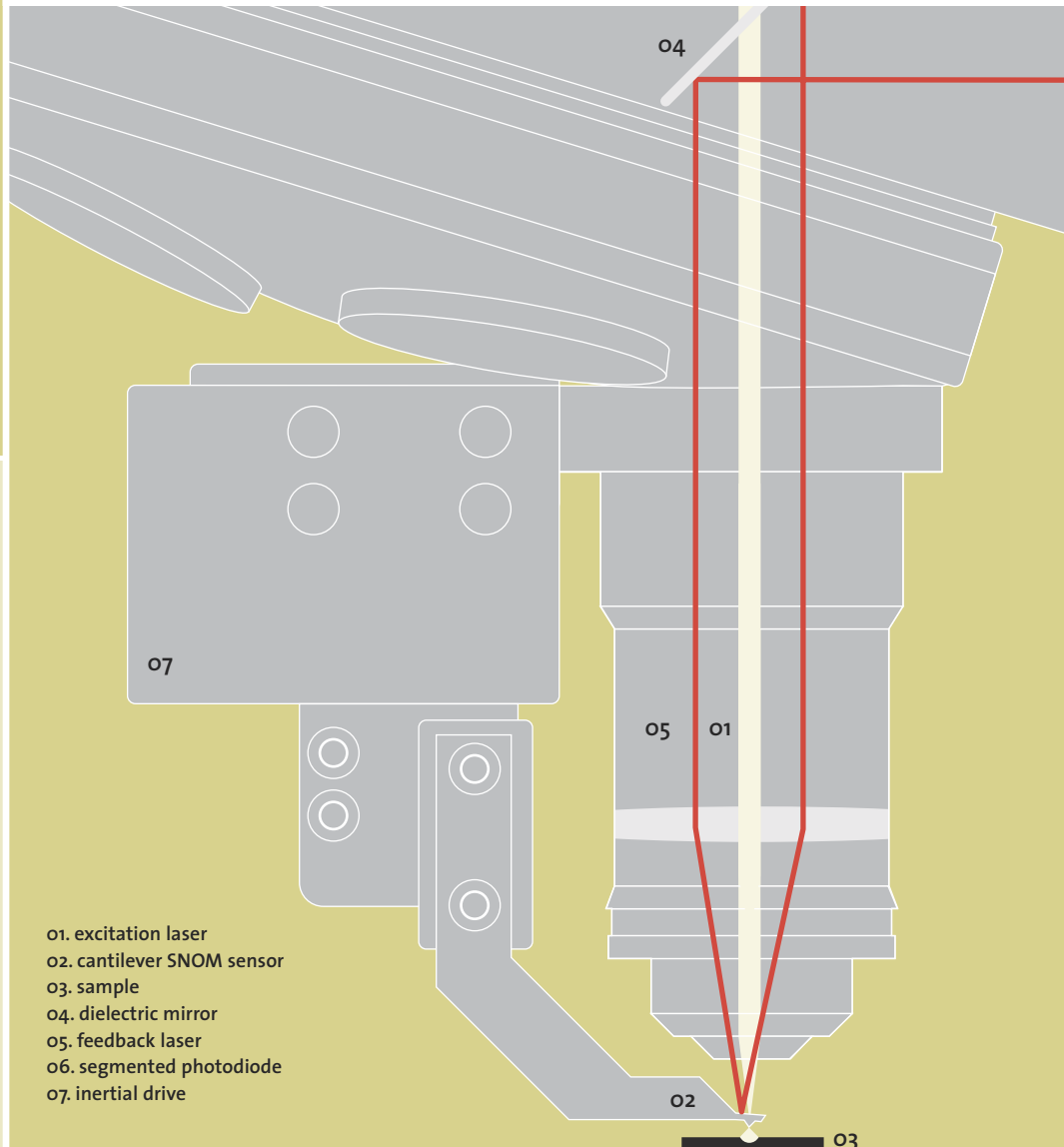


SNOM Objective

The WITec Scanning Near-field Optical Microscope alpha300 S operates using a unique near-field objective. It is mounted in the objective turret and provides access to SNOM or AFM mode by simply rotating the turret.

The micro-fabricated SNOM sensors are held magnetically at the end of the objective's arm, enabling simultaneous observation of the cantilever and sample. For quick cantilever alignment, the arm can be moved in the x, y and z axes automatically by an attached highly-precise inertial drive. The movements are controlled by the WITec Control

software, which also provides convenient alignment routines. The objective not only focuses the excitation laser beam but also the beam-deflection laser for distance control. Highly focused, ultra-stable optics guarantee low-noise measurements without interference from the two laser systems. Using standard AFM cantilevers, the alpha300 S includes full Atomic Force Microscope capability.



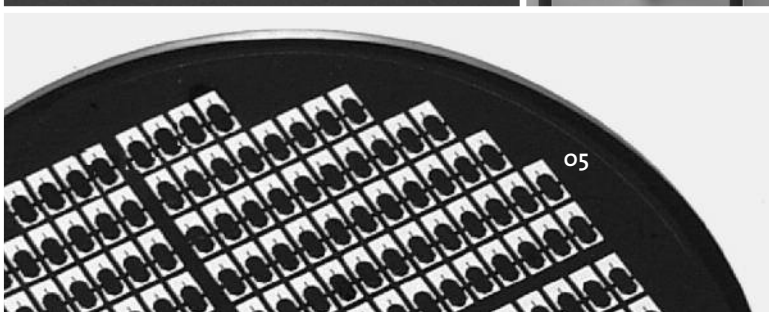
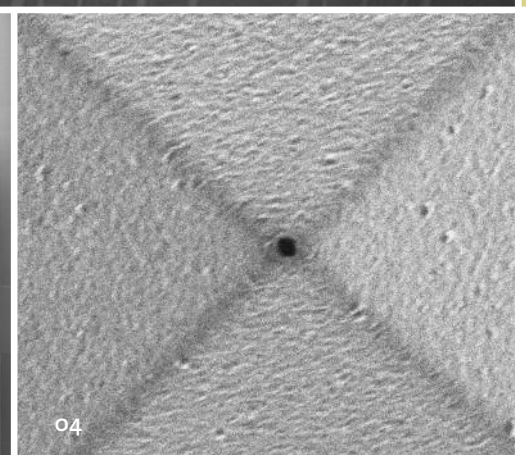
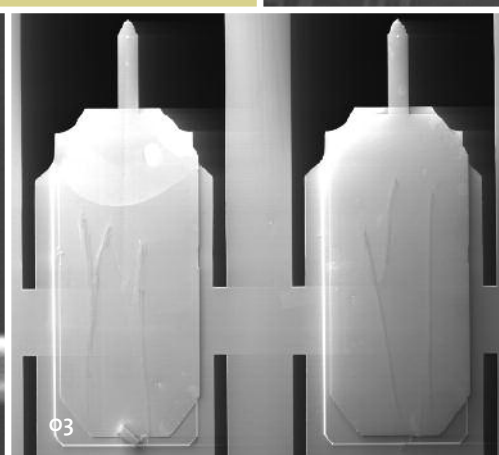
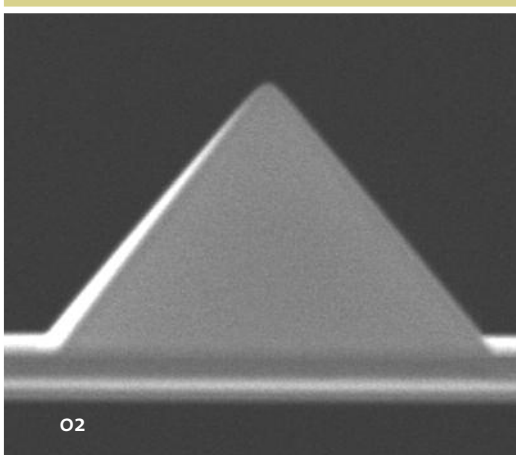
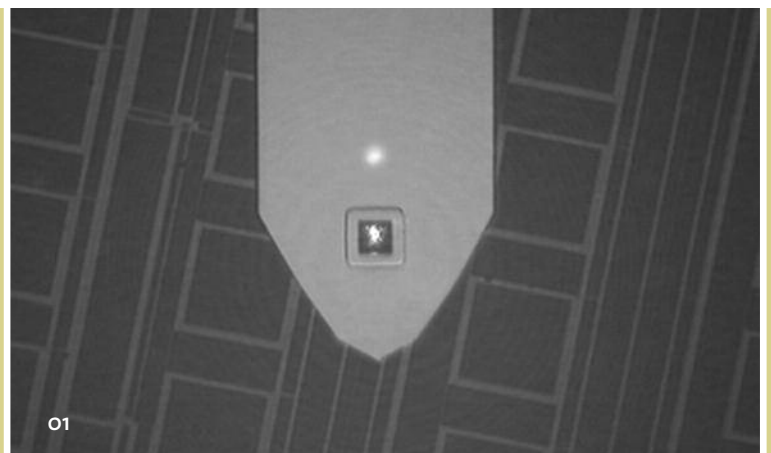
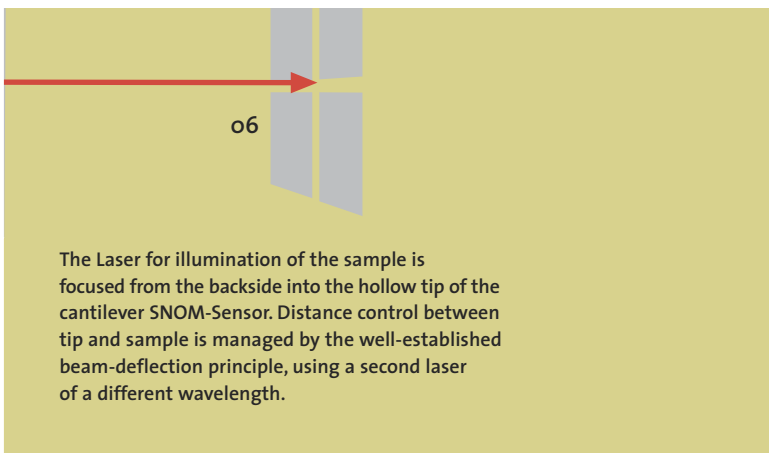
Cantilever SNOM Sensors

The alpha300 S uses unique, patented, high-quality micro-fabricated SNOM sensors, consisting of a silicon cantilever with a hollow aluminum pyramid as a tip. The SNOM aperture is at the apex of the pyramid. The laser light used for optical imaging is focused into the backside of the hollow tip and then onto the sample.

Due to the wide opening angle of the hollow pyramid, the transmission coefficient is very high. An established and proven method of mass-production enables tips with apertures of varying size to be specified according to customers' individual requirements.

Cantilever SNOM Sensors are, unlike fiber tips, very robust and flexible in the z-direction and allow the beam deflection technique to precisely control the tip-sample distance.

All of these innovative characteristics make the handling of probes during near-field microscopy very easy and user-friendly for the most reliable optical imaging available below the diffraction limit.



- o1. video camera top view of SNOM sensor and sample
- o2. side view of cantilever pyramid
- o3. SEM image of SNOM sensors
- o4. SEM image of aperture at the apex of the pyramid
- o5. SNOM cantilever wafer



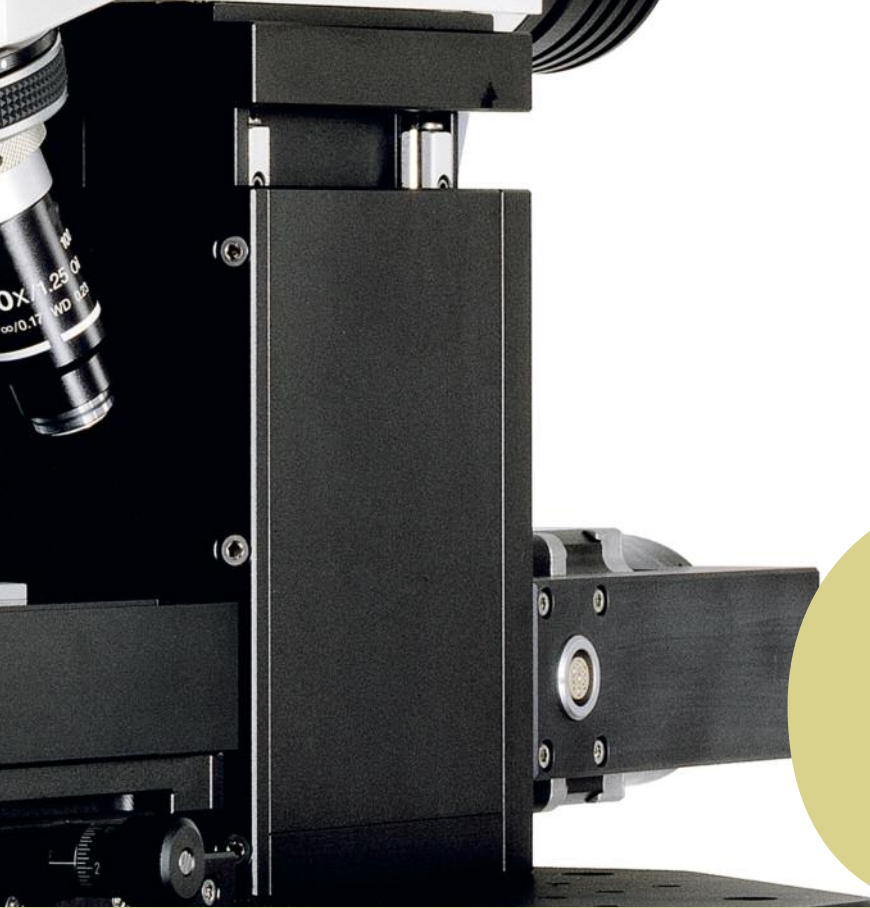
Versatility & User-friendliness

The combination of Confocal Microscopy, SNOM and AFM in one instrument allows the use of confocal overview scans for quick and easy selection of the most appropriate sample area for the SNOM measurement. The SNOM mode can then be accessed instantly with a special SNOM objective holding the SNOM cantilever. While acquiring the SNOM image, the AFM topography is recorded simultaneously. This is another benefit of the cantilever sensors, enabling the well-established beam deflection principle to be used for distance control. All standard optical modes such as transmission, reflection or fluorescence are available as well as all standard AFM modes. Various automatic measurement procedures such as a high-speed automatic cantilever approach and adjustment, controlled by the intuitive software, make the operation of the system straightforward. For SNOM and confocal excitation, a variety of laser sources can be used for maximum experimental flexibility. To detect the scattered light, either a single counting photomultiplier or an avalanche photodiode detector can be used, both guarded by a high-speed overload protection system.

SNOM – Optical Resolution below the diffraction limit

In Scanning Near-field Optical Microscopy, the excitation laser light is focused through an aperture with a diameter smaller than the excitation wavelength, resulting in an evanescent field (or near-field) on the far side of the aperture. When the aperture is then scanned above the sample at a distance smaller than the wavelength of the excitation laser, the scattered light is detected and the optical resolution is limited only by the diameter of the aperture. The aperture itself is located at the apex of a hollow pyramid on the micro-fabricated WITec SNOM Cantilever. The optical resolution attainable with the alpha300 S is in the range of 50 – 100 nm.

key features



Q2

Operating Modes

Near-field microscopy:

transmission, reflection, fluorescence, collection, polarization, lithography, air and liquid measurements, temperature-controlled

Confocal microscopy:

transmission, reflection, fluorescence, Raman, polarization, lithography, air and liquid measurements, temperature-controlled

Atomic Force Microscopy:

contact, lateral force, Pulsed Force and AC-Mode, MFM, Nanolithography/Nano-manipulation, air and liquid measurements, temperature-controlled

Probes

Micro-fabricated Cantilever SNOM Sensors, aperture size typically 100 nm, others optional
Standard AFM cantilever sensors

Beam-deflection distance control for SNOM and AFM

Low noise, highly focused optics for beam deflection laser
No interference with excitation laser
Ultra-low laser noise

Optical System

Integrated scientific-grade upright microscope
Integrated inverted microscope

Motorized focusing stage

Color video camera system

Highly sensitive b/w video camera system

Direct and simultaneous sample and cantilever observation

Easy and precise automatic cantilever alignment

Automatic approach and beam path alignment

Optical Resolution: Near-field Mode 100 nm, depending on aperture size; Confocal Mode typically 200 nm, diffraction-limited

Optical beam delivery via single mode optical fibers

Signal pickup via multimode optical fibers

Linear Scan Stage

Sample scanning

Highly linear piezo-driven feedback-controlled scan stage

Capacitive feedback-control on all axes to eliminate hysteresis, creep and non-linearity
True Scan™ Dynamic Position Control

Scan Range: 100 x 100 x 20 μm (200 x 200 x 20 μm optional)

Capacity for large samples

No image distortion

Exceptional accuracy over entire scan range

Detectors

Single counting photomultiplier tube (PMT)

Avalanche Photodiode (APD), optional

Automatic high-speed overload protection

Spectroscopy extension (optional)

Excitation Lasers

Multiple laser sources easily interchangeable

Various lasers available, to best fulfill individual excitation requirements

Flexible setup through single mode fiber connections

Control Unit alphaControl

Fully digital system-on-a-chip concept for the highest speed, flexibility, accuracy, expandability and timing precision

Complete access to internal signals

Software

WITec Control for measurement control and data acquisition

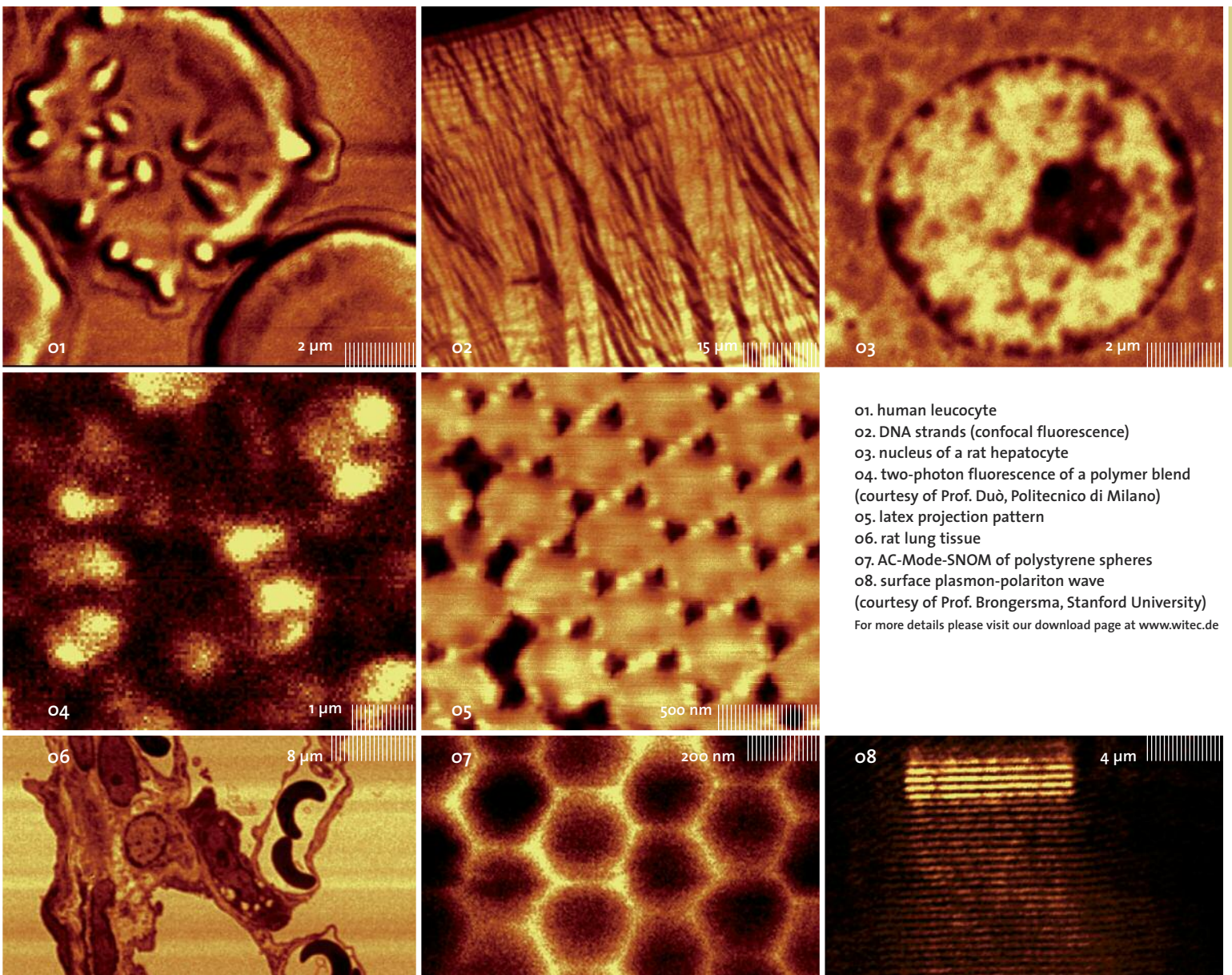
Includes specialized routines and default safety features

Control Window for immediate access to various parameters

WITec Project for data evaluation and post-processing

applications

As scanning near-field microscopy requires only minimal sample preparation if any, it is ideally suited to quickly and effortlessly image the optical properties of a sample with resolution below the diffraction limit. Typical applications are found in nanotechnology research and particularly in the highly relevant fields of Nano-Photonics and Nano-Optics. In Life Science and materials research, SNOM allows the optical detection of the most miniscule surface structures of transparent as well as opaque samples. Using fluorescence techniques, even single molecule detection can be easily achieved.

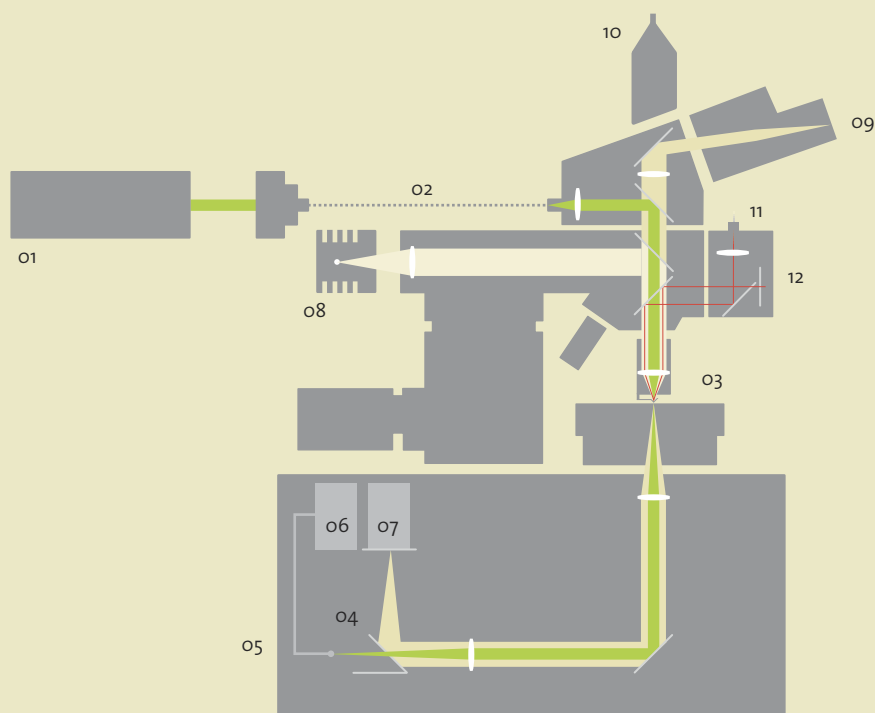


flexible platform

The modular and flexible design of the alpha300 S and all the configurations of the WITec alpha300 microscope series guarantees easy and cost effective upgrade and extension possibilities. A spectroscopy upgrade package allows fluorescence spectroscopy or confocal Raman microscopy to be performed in order to chemically image the sample at the highest resolution. Access to the optical beam path as well as the internal signals provides the creative user with all the flexibility necessary for a successful experiment.

Upgrades

Our modular product line incorporates nearly all scanning probe and optical microscopy techniques to meet your individual requirements. Each WITec microscope model can always be equipped with the functionality of another variation of the alpha300 family.



Beam path of the microscope

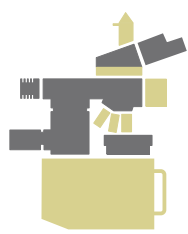
- 01. laser
- 02. single mode fiber
- 03. cantilever SNOM sensor
- 04. flip mirror
- 05. multimode fiber with SMA connector
- 06. detector

- 07. highly sensitive video camera
- 08. white light source for Köhler illumination
- 09. color video camera
- 10. SMA connector for signal pick-up in reflection
- 11. FC fiber connector for beam deflection laser
- 12. segmented photo diode

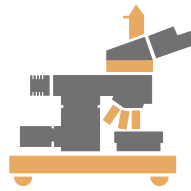


The Atomic Force Microscope alpha300 A is a modular, user-friendly Atomic Force Microscope. It integrates a scientific-grade optical microscope for superior optical access, easy cantilever alignment and high resolution sample survey. All standard AFM-modes are supported, ensuring high flexibility throughout the full range of AFM applications. Local surface properties can be investigated with the Pulsed Force Mode along with topographic structures on the nanometer scale.

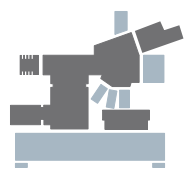
The confocal Raman microscope alpha300 R combines an ultrahigh-throughput confocal microscope with an extremely sensitive spectroscopy system for unprecedented chemical sensitivity. Raman images with resolution down to 200 nm laterally can be easily acquired. The confocal setup reduces unwanted background signals, enhances contrast, and provides depth information.



alpha300 S
SNOM



alpha300 R
Raman



alpha300 A
AFM

WITec Headquarters
WITec GmbH
Lise-Meitner-Straße 6 . D-89081 Ulm . Germany
fon +49 (0) 731 140700 . fax +49 (0) 731 14070200
info@WITec.de
www.WITec.de

WITec North America
WITec Instruments Corp.
200 East Broadway Ave . Suite 30
Maryville . TN 37804 . USA
phone 865 984 4445 . fax 865 984 4441
info@WITec-Instruments.com
www.WITec-Instruments.com

Confocal Raman Microscopy
Scanning Near-field Optical Microscopy
Atomic Force Microscopy

WITec
focus innovations

www.witec.de

