

# The *ULTRA*Objective

Resolution down to the Nanometer

Do you use optical methods for surface analysis and often wish for a higher resolution - 50,000 times or even greater than 500,000 times? Or maybe you want to perform quantitative structural measurements? The *ULTRA*Objective is the ideal partner for your optical microscope. The measuring head, whose size, shape and mounting take up the same space as a normal optical objective, is a complete atomic force microscope. Enter the fascinating world of the nanosphere with your microscope in the blink of an eye. The *ULTRA*Objective fits into the nosepiece of your microscope just like an optical objective. It can be adapted to fit all common types of microscopes (Zeiss, Leica, Nikon, Olympus). Simply choose an interesting area of the sample with the optical microscopy method you already use, and then swivel in the *ULTRA*Objective for a direct examination with the SPM. Within minutes, you will receive a high-resolution image which can be further evaluated with *analySIS*, the powerful image analysis software available with the *SCANControl C* electronics.

SURFACE IMAGING SYSTEMS



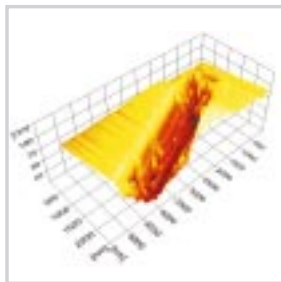
Top left: *ULTRA*Objective mounted on a Zeiss microscope  
Top right: *ULTRA*Objective mounted on an Olympus microscope

## Measuring modes

The *ULTRA*Objective offers maximum versatility. All AFM/SPM measuring modes can be used. The measuring head can be easily changed for new applications. The following standard measuring modes are available: contact, non-contact mode, phase contrast, field contrast for magnetic or electrical characterisations (MFM/EFM), force modulation (FM), lateral force (LFM), fluid compatibility, and metrology-compatible measuring head with sensor. Other modes available on request.

Far left: Detail from the illustration above

Left: 3D image of a scratch on a lense, measured in the non-contact mode

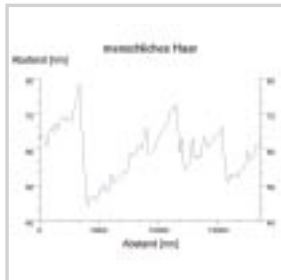
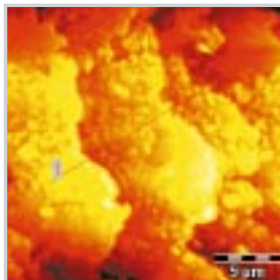


## Applications

The *ULTRA*Objective can be used to inspect all biological or inorganic surfaces. The *ULTRA*Objective liquid immersion can even be used in fluids.

Far left: 2D image of a human hair, measured in non-contact mode with *ULTRA*Objective mounted on a Zeiss microscope

Left: Cross-section through the image to the left



## Specifications of the *ULTRA*Objective-SPM-System

Scan range:	20 $\mu\text{m}$ x 20 $\mu\text{m}$ x 3 $\mu\text{m}$ 40 $\mu\text{m}$ x 40 $\mu\text{m}$ x 4 $\mu\text{m}$ 80 $\mu\text{m}$ x 80 $\mu\text{m}$ x 5 $\mu\text{m}$ hardware linearized scan motion in X-Y-direction (optional in Z-direction)	Tip change:	adjustment free
Noise level:	< 1 nm rms in vertical direction (Z), depending on microscope	Digital input resolution:	16 bit A/D
Lateral accuracy:	typically within 1%, closed loop scanning	Digital output resolution:	16 bit D/A
Scan speed:	typ. 1 to 10 Hz	Output voltage:	$\pm 165$ V, with 2 $\mu\text{V}$ rms
Detection principle:	fiber optic interferometry, noise level < 0,01 nm rms	Input channels:	max. 4 simultaneous
Tips:	silicon tips, various types	External inputs:	max. 3 high speed with 16 bit resolution
		Image size:	freely selectable, from 128 to 1024 pixels, even rectangular sizes
		Processing:	internal 32 bit DSP, typ. 50 MHz
		Computer interface:	USB (standard universal serial bus)
		Operating system:	MS-Windows 2000®