

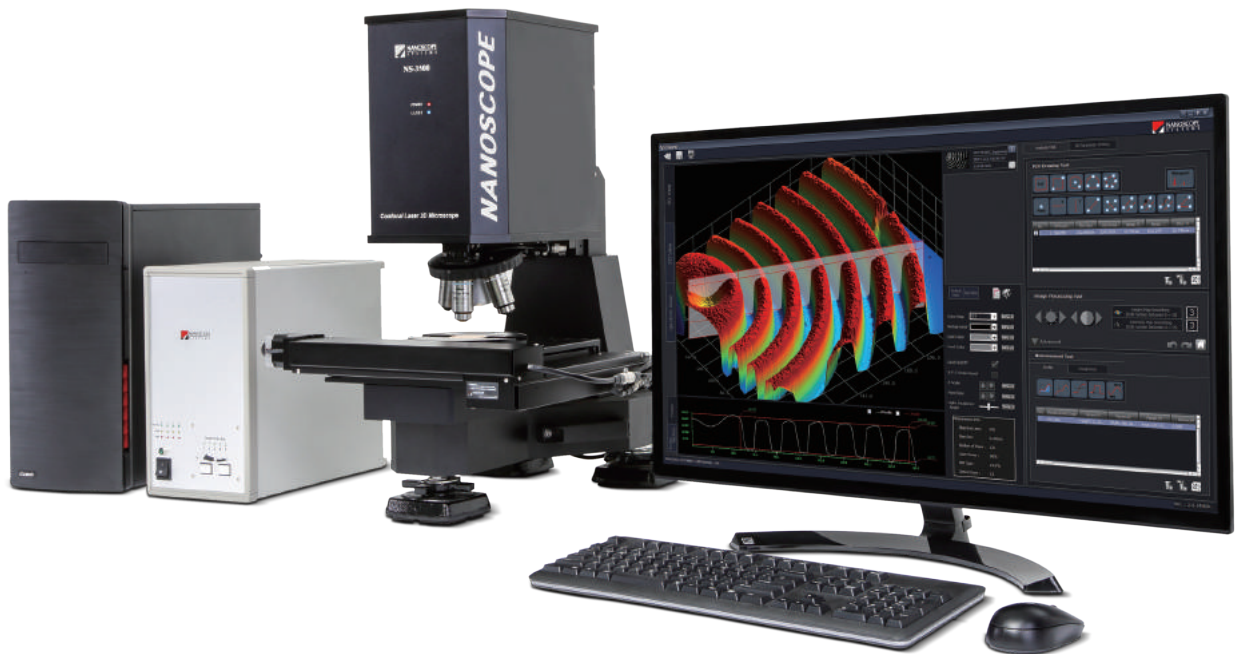
NS-3500

High Speed 3D Laser Confocal Microscope



High speed laser confocal microscope

NS-3500 is a high-speed confocal laser scanning microscope (CLSM) for precise and reliable 3-dimensional (3D) measurement. A real time confocal microscopic image is achieved by fast optical scanning modules and signal processing algorithms. It is a promising solution to measure and inspect the microscopic 3D structures such as semiconductor wafers, FPD products, MEMS devices, glass substrates, and material surfaces.

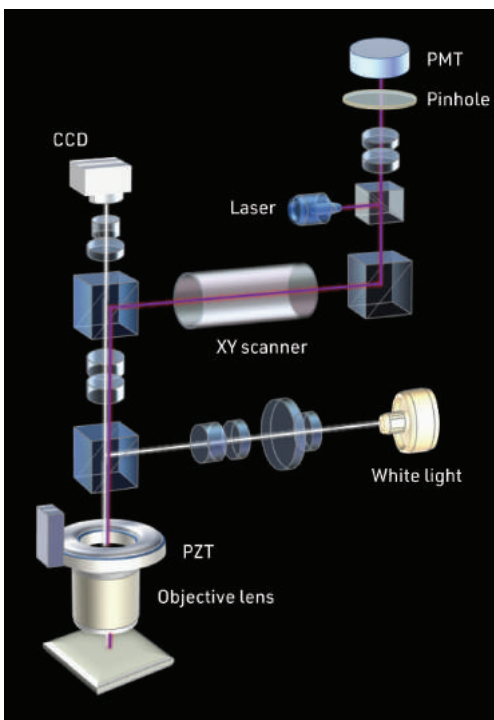


Real time confocal imaging with simple operation

Features & Benefits

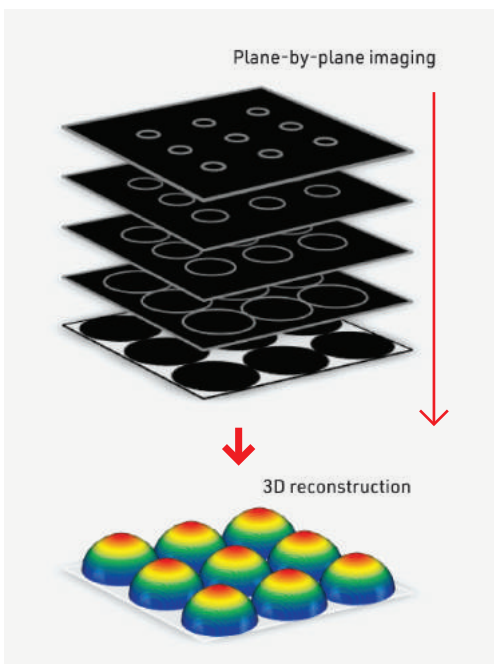
- High resolution nondestructive optical 3D measurement
- Real time confocal imaging
- Various optical zoom
- Simultaneous bright field and confocal imaging
- Automatic gain search with fine auto focus
- Inclination compensation
- Easy analysis mode
- Precise and reliable high-speed height measurement
- Inspection of features through semi-transparent substrate
- No sample preparation
- Dual Z-scanning mode
- Image stitching for wide range inspection

Measurement principle



NS-3500 provides a color CCD image and a laser scanning confocal image at one time.

The height measuring ability comes from the confocal arrangement of a source, a sample, and a detector. By the out-of-focus signal rejection of confocal technique, only the in-focus signal is collected by a photo detector. It gives the optical sectioning ability to confocal microscope NS-3500. The confocal aperture also improves the imaging quality by rejecting the noise outside the focal point.

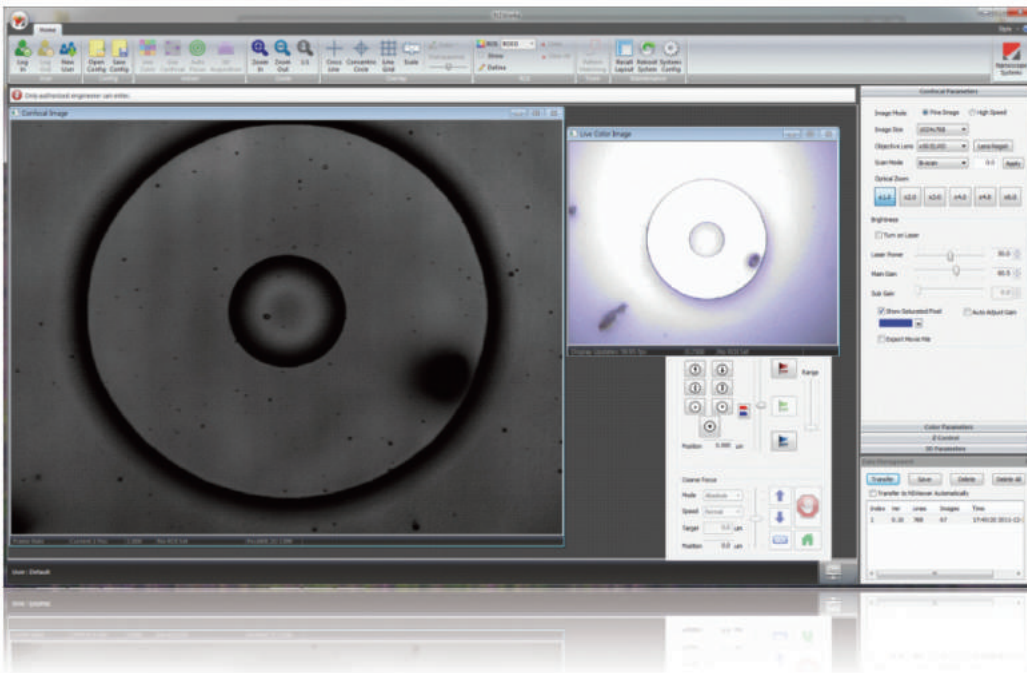


To get the 3D surface profile of the sample, optically sectioned plane-images are collected along the z-axis. As the light intensity becomes its maximum when the sample surface is placed in the focal plane, axial coordinates of sample surface can be directly found. With a violet laser, a photo-multiplier tube (PMT), and a piezoelectric axial scanner, NS-3500 performs the confocal optical sectioning in a most reliable manner.

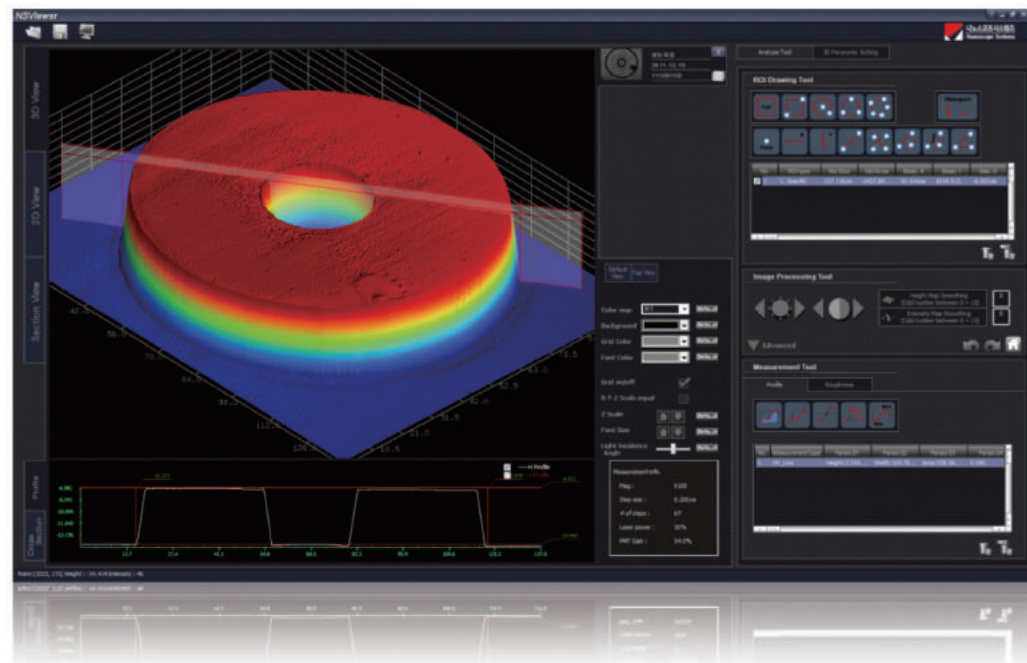
User interface software NSWorks & NSViewer

- Simple and plain operation even to a first-time user.
- A CCD image, a confocal image, and a main control panel are displayed in one operation window.
- Various adjustable parameters are provided for the advanced application.
- A real-time confocal image provides the immediate feedback from hardware.
- Separated analysis window with the convenient graphical reporting tools.
- The 3D graphical view makes a user easily recognize the microscopic structure of a sample.

Operation software NSWorks



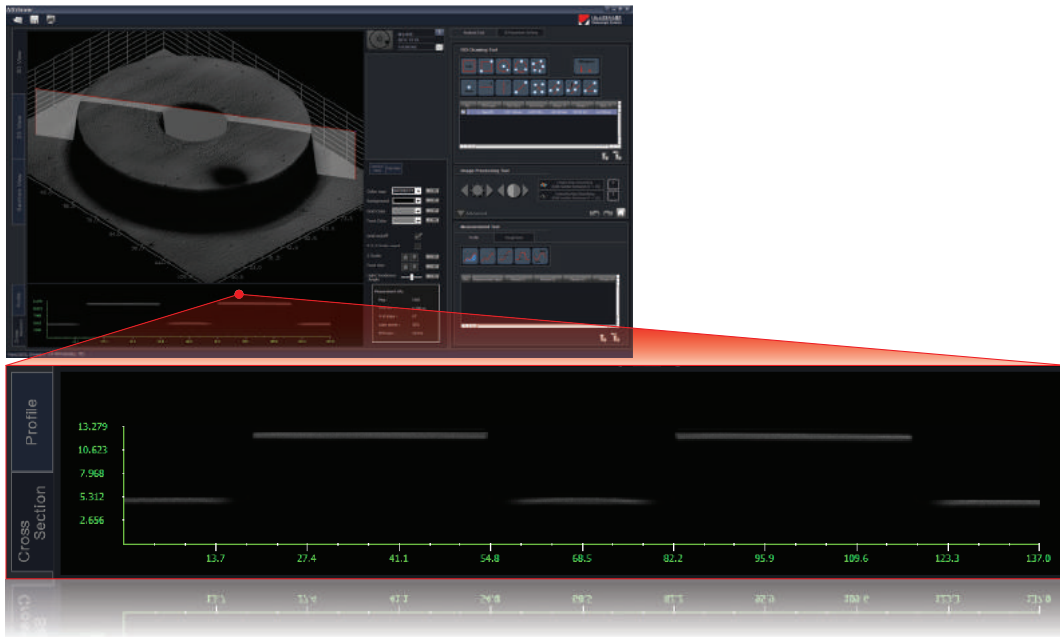
Analysis software NSViewer



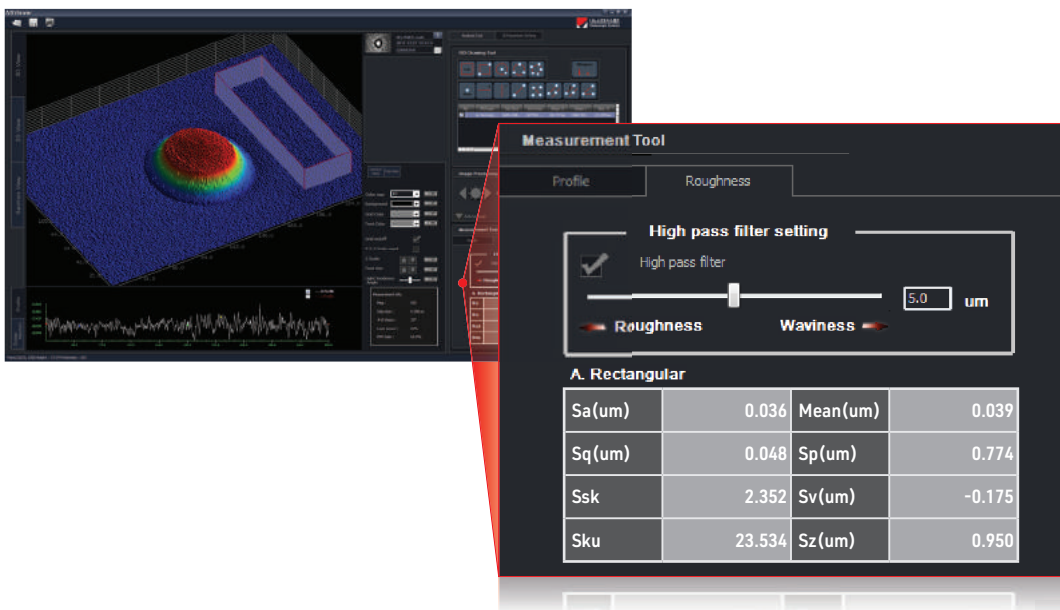
Analysis of measurement

Cross-sectional image is directly converted to the 3D profile data. User can see the raw cross-sectional image in NSViewer. The internal structure can be imaged through the semi-transparent surface layers, which is uniquely realized only by confocal microscopy. The analysis of the measured data can be easily performed with various function tools.

Cross sectional image display



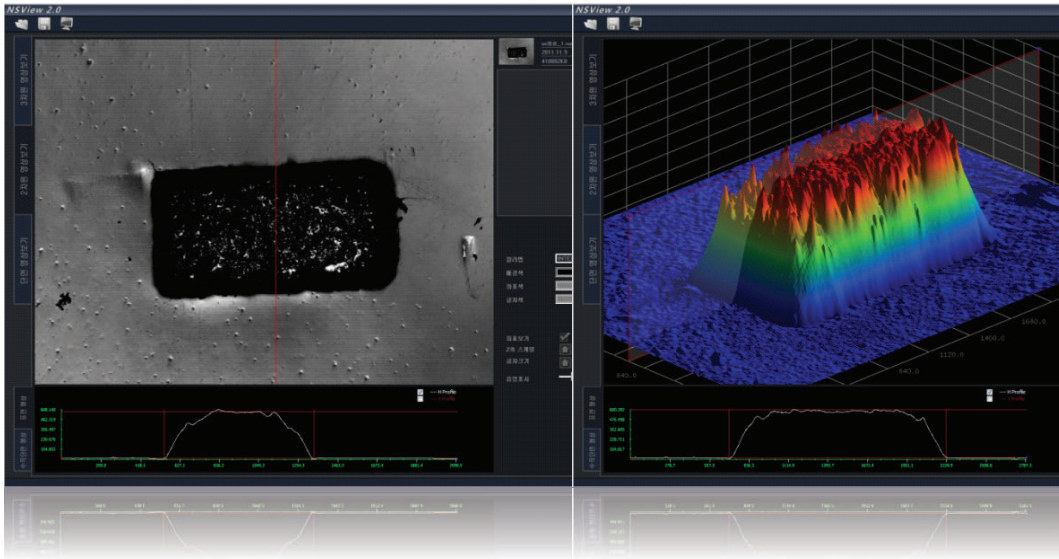
Roughness measurement for specified ROI (region of interest)



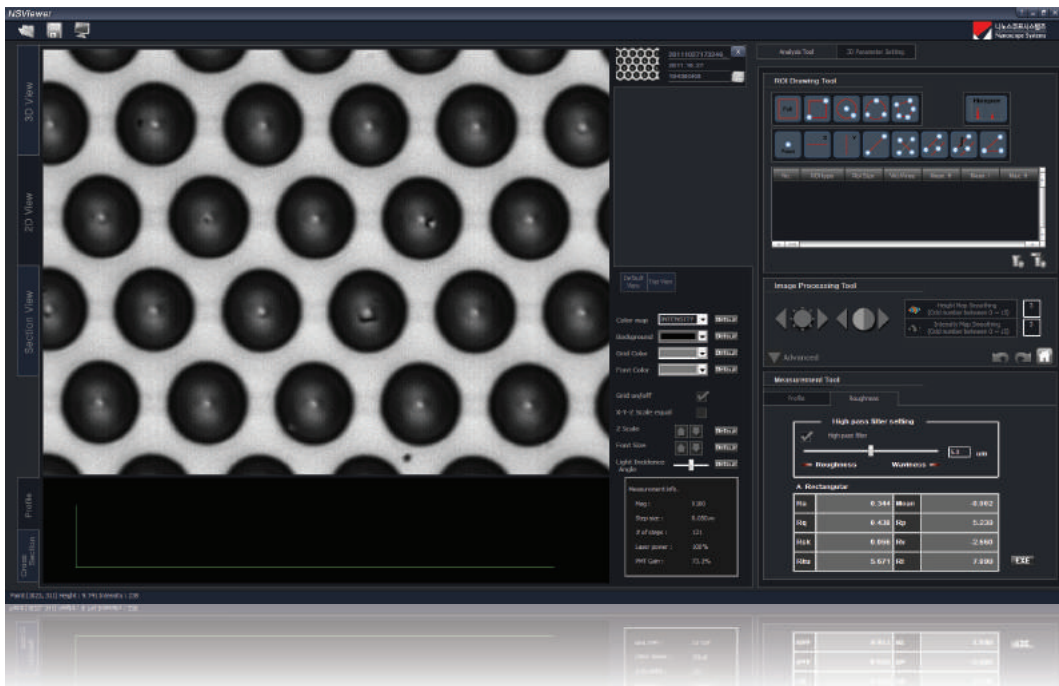
Most reliable optical 3D measurement

NS-3500 can be used for most kinds of 3D profiling applications. The 3D measurement of NS-3500 is based on the most reliable real-time confocal image definitely superior to the image from other optical technologies.

Height measurement of the material of very low reflectivity



High contrast image of a patterned sapphire wafer substrate (PSS)



Powerful and convenient optical solution

With powerful and unique performance of NS-3500, the application area of optical microscope imaging is enlarged. The image of the features under the transparent or semi-transparent layers can be clearly inspected, and the surface image of light-emitting or highly-heated materials can be distinctly monitored, which are not possible with the conventional optical microscope technology. NS-3500 is widely proven as a final and successful optical solution in the various application fields.

Film thickness measurement

If transparent, or semi-transparent such as a film-coated surface, NS-3500's cross sectional image directly shows how the layers are constituted, and its thickness can be measured directly from this cross sectional image.

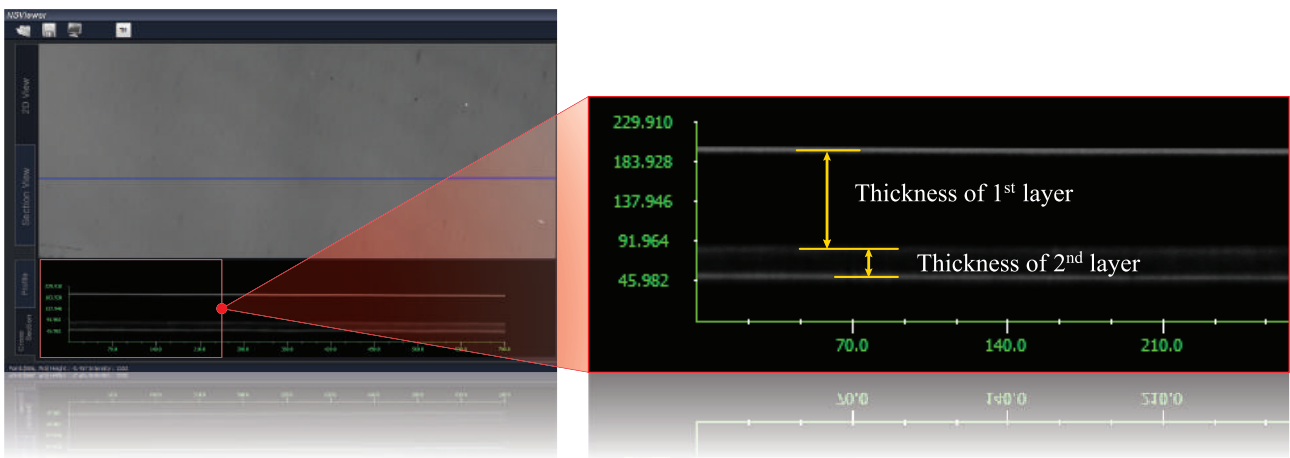
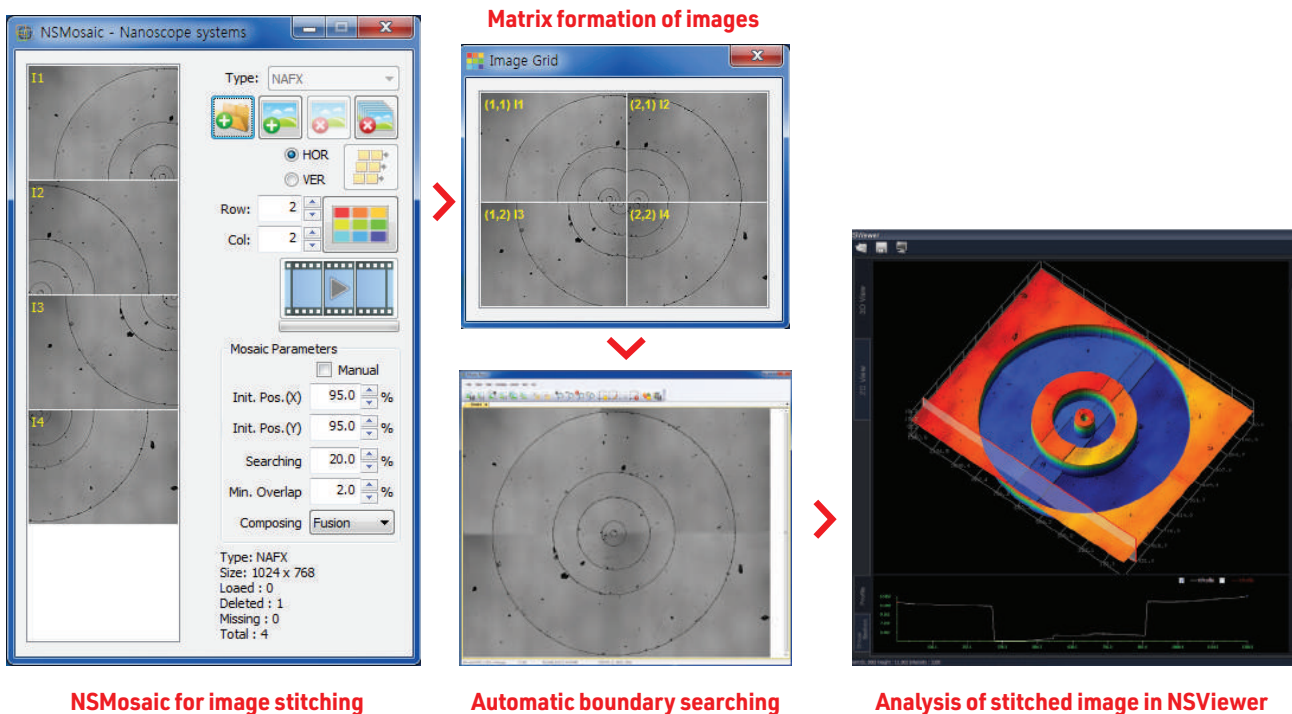


Image stitching

For wide range inspection, the consecutive measurement and image tiling of pre-defined area is available with the motorized XY stage and NSMosaic, the image stitching software of NS-3500. The stitched image can be analyzed as one single measurement result.

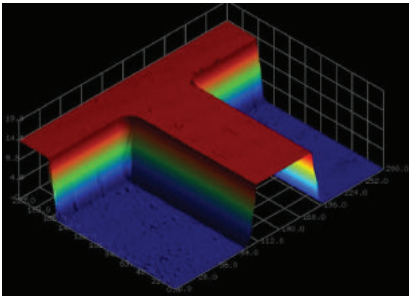


Application field

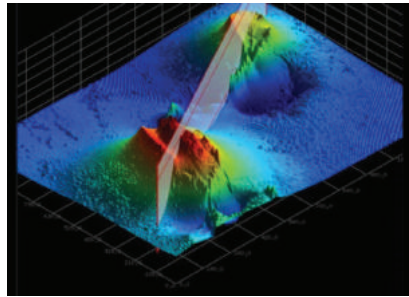
NS-3500 is a promising solution for the measurement of height, width, angle, area, and volume of micro and submicro structures such as

- Semiconductor – IC pattern, bump height, wire loop height, defect inspection, CMP process
- FPD product – Touch panel screen inspection, ITO pattern, LCD column spacer height
- MEMS device – 3D profile of structure, surface roughness, MEMS pattern
- Glass surfaces–Thin film solar cell, solar cell texture, laser pattern
- Material researches–Tooling surface inspection, roughness, crack analysis

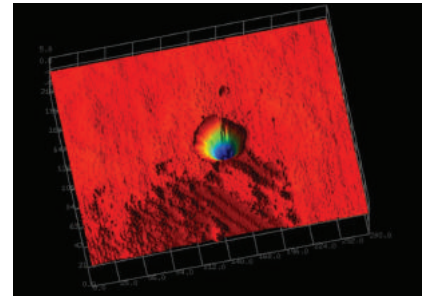
Sample images



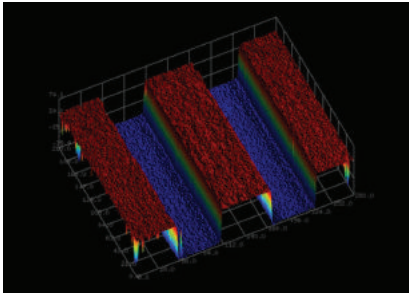
VLSI height standard
FOV : 280 × 210 μm (50×)



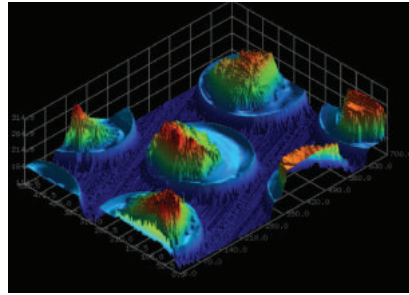
OLED glass protrusion
FOV : 280 × 210 μm (50×)



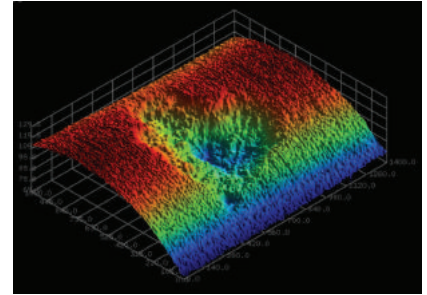
OLED laser processing
FOV : 280 × 210 μm (50×)



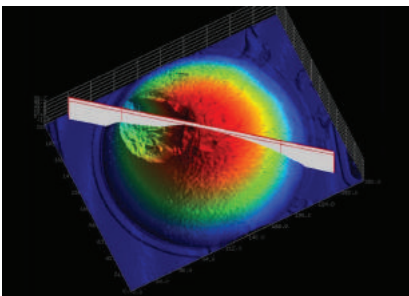
Quartz pattern
FOV : 280 × 210 μm (50×)



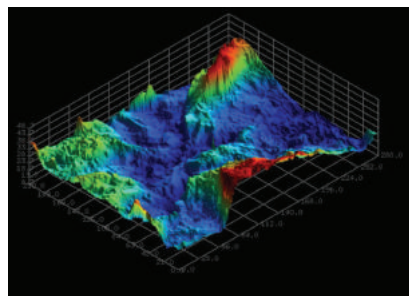
Diamond tool
FOV : 700 × 525 μm (20×)



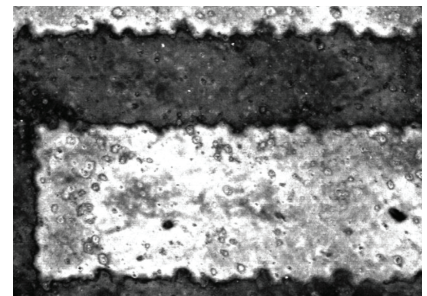
Metal pillar
FOV : 1400 × 1050 μm (10×)



Bump
FOV : 280 × 210 μm (50×)



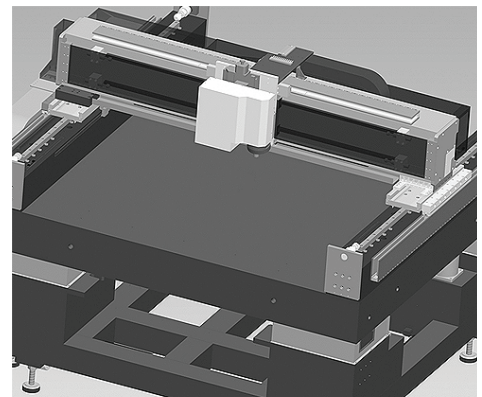
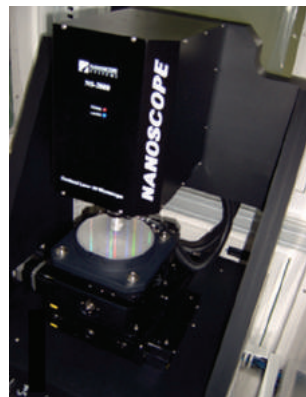
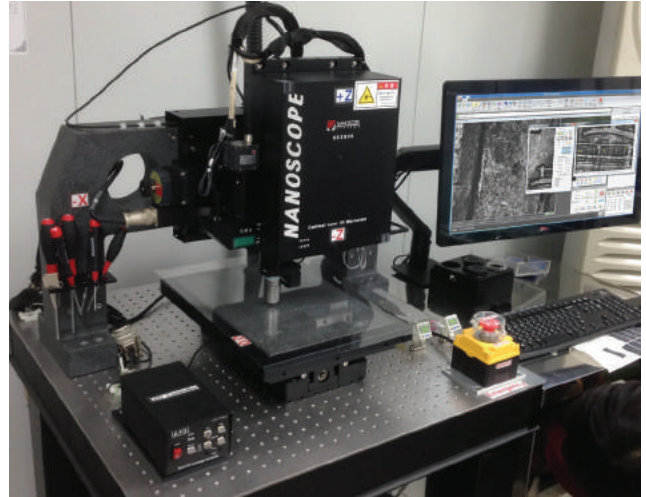
Graphene
FOV : 280 × 210 μm (50×)



ITO pattern
FOV : 1400 × 1050 μm (10×)

Industrial module application

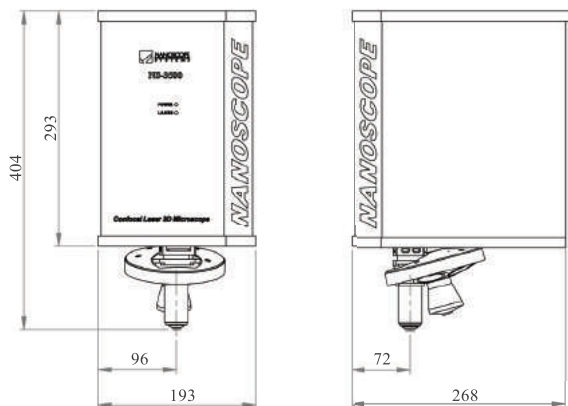
Easy-to-install, and robust design for industrial equipment provides a good solution to the field applications. Customized design change is available.



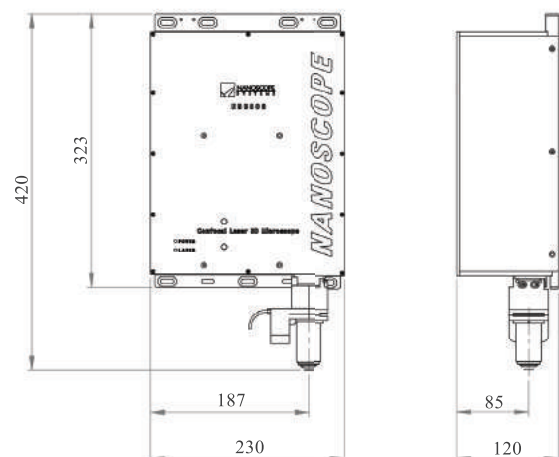
Head dimensions

[Unit : mm]

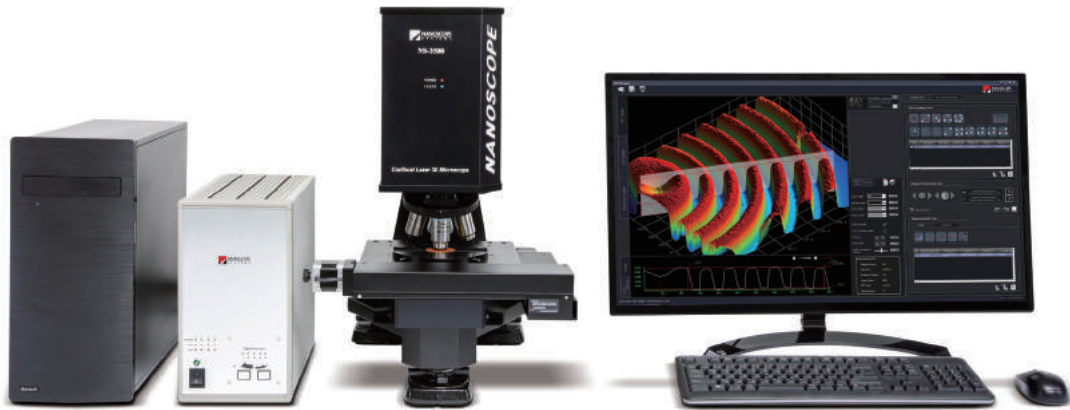
NS-3500-T Head



NS-3800-S Head



System configuration



Hardware option



Objective lens

Special configuration of objective lenses can be made by the customers' needs. Appropriate selection of objective lenses considering customers' application and environment will optimize optical performance of NS-3500.



Motorized nosepiece

Objective lens switching by a motorized revolving nosepiece will increase the work efficiency.

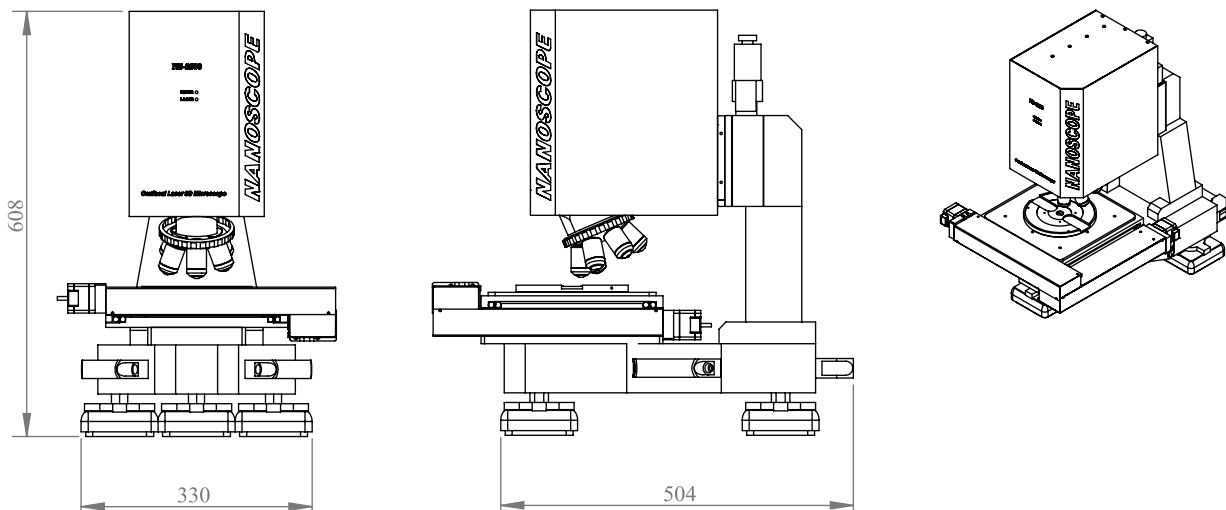


Motorized XY stage

Motorized XY stage with customized travel length can be interfaced with NS-3500. Automatic measurement of pre-defined target position can be programmed.

Dimensions

[Unit : mm]



Specifications

Model	Microscope	NS-3500					Remark
	Controller	NS-3500E					
Objective lens magnification		10x	20x	50x	100x	150x	
Observation/ Measuring range	Horizontal (H): μm	1400	700	280	140	93	
	Vertical (V): μm	1050	525	210	105	70	
Working distance: mm		16.5	3.1	0.54	0.3	0.2	
Numerical aperture (N.A.)		0.30	0.46	0.80	0.95	0.95	
Optical zoom		x1 to x6					
Total magnification		178x to 26700x					
Optical system for observation/measurement		Pinhole confocal optical system					
Height Measurement	Measuring scan range	Fine scan : 400 μm (and/or) Long scan : 10 mm [NS-3500-S]					Note 1
		Long scan : 10mm [NS-3500-T]					
	Display resolution	0.001 μm					
	Repeatability σ	0.010 μm					Note 2
Width measurement	Display resolution	0.001 μm					
	Repeatability 3σ	0.02 μm					Note 3
Frame memory	Pixel count	1024x1024, 1024x768, 1024x384, 1024x192, 1024x96					
	For monochrome image	12 bit					
	For color image	8-bit for RGB each					
	For height measurement	16 bit					
Frame rate	Surface scan	20 Hz to 160 Hz					
	Line scan	~8 kHz					
Auto function		Auto gain, Auto focus					
Laser beam light source for confocal measurement	Wavelength	Violet laser, 405nm					
	Output	~2mW					
	Laser Class	Class 3b					
Laser light-receiving element		PMT (Photomultiplier Tube)					
Light source for optical observation	Lamp	10W LED					
Color camera for Optical observation	Imaging element	1/2" Color CCD image sensor					
	Recording resolution	640x480					
	Auto adjustment	Gain, Shutter speed, White balance					
Data processing unit		Dedicated PC					
Power supply	Power-supply voltage	100 to 240 VAC, 50/60 Hz					
	Current consumption	500 VA max.					
Weight	Microscope	Approx. ~50 kg (Measuring head unit : ~12 kg)					
	Controller	~8 kg					
Vibration isolating system		Active isolator					Option

Note 1: Fine scan is performed by piezoelectric actuator (PZT).

Dual scan mode by fine and long scanner is available only for NS-3500-S (Single lens type).

Note 2 : 100 times measurement of standard sample (1 μm step height) with 100 \times / 0.95 objective.

Note 3 : 100 times measurement of standard sample (5 μm pitch) with 100 \times / 0.95 objective.

NS-3500

High Speed 3D Laser
Confocal Microscope



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