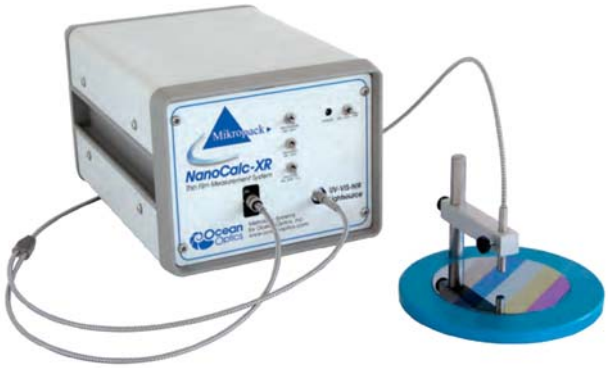
Thin Film Metrology

Spectroscopic Reflectometry Systems

NanoCalc systems are versatile and configurable thin film measurement systems utilizing spectroscopic reflectometry to accurately determine optical and non-optical thin film thicknesses for applications in consumer, semiconductor, medical and industrial applications.

NanoCalc is part of the Mikropack line of thin film metrology systems. Options are available for measurements ranging from the deep UV to the shortwave NIR.

Preconfigured versions for VIS and XR are now available.



Sample NanoCalc Applications

- Transmission and reflection measurements of anti-reflective and hardness coatings
- Analysis of medical coatings and catheter balloon foils
- Testing of the hardness and wear of coatings
- Measurement of the thickness of thinned silicon wafers
- Determination of photoresist layers for masks
- Analysis of coatings applied for weather or dirt resistance (Lotus Effect)
- Measurement of coatings inside beverage containers
- Air gap measurements
- Analysis of optical disk coatings

NanoCalc Features

- Resolution to 0.1 nm
- Able to measure stacks of up to 10 layers
- Thickness and refractive index data
- Sophisticated algorithms for defect and roughness tolerance measurements
- Large database to ensure accuracy of a broad range of materials
- Adapters for complex geometries and accessories for thickness mapping

Specifications

Specification	NANOCALC-VIS-PRECON	NANOCALC-XR-PRECON	NANOCALC-DUV	NANOCALC-NIR
Wavelength range:	400-850 nm	250-1050 nm	~200-1100 nm	900-1700 nm
Thickness range:	50 nm-20 µm	10 nm-100 µm	1 nm-100 µm	100 nm-250 µm
Optical resolution:	0.1 nm	0.1 nm	0.1 nm	0.1 nm
Repeatibility:	0.3 nm	0.3 nm	0.3 nm	1.0 nm
Angle of incidence:	90°	90°	90°	90°
Number of layers:	Up to 10	Up to 10	Up to 10	Up to 10
Refractive index:	Yes	Yes	Yes	Yes
Test materials:	Transparent or semi-transparent thin film materials	Transparent or semi-transparent thin film materials	Transparent or semi-transparent thin film materials	Transparent or semi-transparent thin film materials
Reference needed:	Yes (bare substrate)	Yes (bare substrate)	Yes (bare substrate)	Yes (bare substrate)
Measurement modes:	Reflection and Transmission	Reflection and Transmission	Reflection and Transmission	Reflection and Transmission
Rough materials capable:	Yes	Yes	Yes	Yes
Measurement speed:	100 ms to 1 s	100 ms to 1 s	100 ms to 1 s	100 ms to 1 s
On-line capable:	Yes	Yes	Yes	Yes
Height adjustment:	with COL-UV-6.35 (10-50 mm)	with COL-UV-6.35 (10-50 mm)	with COL-UV-6.35 (10-50 mm)	with COL-UV-6.35 (10-50 mm)
Spot size:	200 µm or 400 µm standard; 100 µm available upon request	200 µm or 400 µm standard; 100 µm available upon request	400 µm standard; 200 µm available upon request	400 µm standard; 200 µm available upon request
Microspot:	Yes (w/microscope)	Yes (w/microscope)	Yes (w/microscope)	Yes (w/microscope)
CCD color:	Yes (w/microscope)	Yes (w/microscope)	Yes (w/microscope)	Yes (w/microscope)
Mapping option:	150 mm (6") and 300 mm (12") xy-scanning stages	150 mm (6") and 300 mm (12") xy-scanning stages	150 mm (6") and 300 mm (12") xy-scanning stages	150 mm (6") and 300 mm (12") xy-scanning stages
Vacuum capable:	Yes	Yes	Yes	Yes

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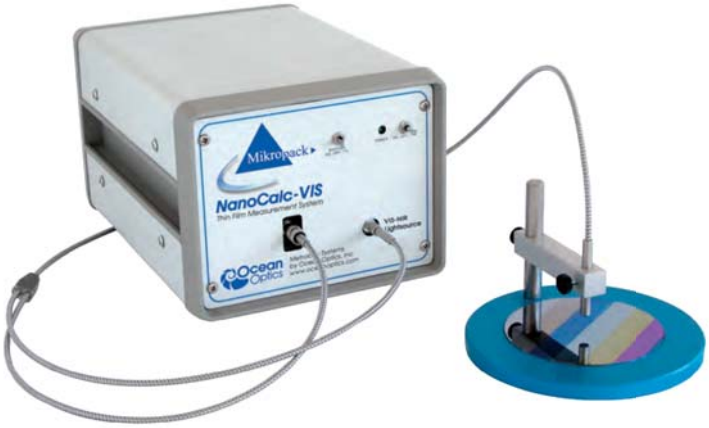
NanoCalc systems come with a spectrometer, light source and USB interface and require software and a reflection probe, which are available separately. Also available is an extensive range of add-on software, optical fibers and metrology accessories.

With NanoCalc systems, you can select from among four models, several software options, reflection probes and optical fibers, and more than a dozen accessories designed to accommodate microscopes, mapping stages and more. Preconfigured versions for VIS and XR are now available. Custom options for the thick and transparent films are also available. Here are your options:



Selecting Your NanoCalc System

Model	Wavelength Range	Optical Layer Thicknesses
NANOCALC-VIS-PRECON	400-850 nm	50 nm-20 µm
NANOCALC-XR-PRECON	250-1050 nm	10 nm-100 µm
NANOCALC-DUV	~200-1100 nm	1 nm-100 µm
NANOCALC-NIR	900-1700 nm	100 nm-250 µm

Selecting Your NanoCalc Software

Each NanoCalc system requires the purchase of NANOCALC10-N operating software. Add-on modules for functions such as spectrum simulation, mapping and external triggering are also available. Note: all NanoCalc preconfigured systems come with software.

Standard Operating Software (Required)

Item	Description	Required for
NANOCALC-10-N	Thin film measurement software for Windows; measurement, simulation and analysis of up to 10 layers; refractive index analysis also possible (refractive index for multiple layers requires SCOUT software)	Any NanoCalc measurement of thin films up to 10 layers

Add-on Software Options

Item	Description	Required for
SCOUT-FULL VERSION	Spectrum simulation program for Windows XP/7 (32 bit). Computes reflectance, transmittance, absorbance or ellipsometry spectra and fits your model to measured spectra by manual, graphical or automatic parameter variation. SCOUT can be controlled by OLE automation controllers.	Spectral simulation; use w/NANOCALC-10-N
NANOCALC-MAPPING	Mapping module software (needs NANOCALC -10-N) is 3D-mapping module with control of 150 mm and 300 mm mapping stages	Systems using mapping stages
NANOCALC-ONLINE	On-line module software (needs NANOCALC-10-N) includes external trigger and manual multipoint measurement with data transfer into Excel, plus statistical feature and 1D-Plot; also provides online display of XY-graphs and histograms of layer thickness and removal rate	On-line applications
NANOCALC-MULTI-POINT	Multipoint module software (needs NANOCALC -10-N) for manual multipoint measurement; provides result list with data transfer into Excel, CSV data, statistical and 1D-graphic; lets you measure on a mouse click, keyboard key or external trigger	Multipoint measurements
NANOCALC-REMOTE	Remote module (needs NANOCALC -10-N). Active-X functionality allows control of most NanoCalc functions from any other software.	Controlling NanoCalc functions w/other software

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Selecting Your Reflection Probe or Fiber Assemblies
For all NanoCalc systems you'll need to purchase a fiber assembly or reflection probe. Preconfigured NanoCalc systems include the fiber assembly.

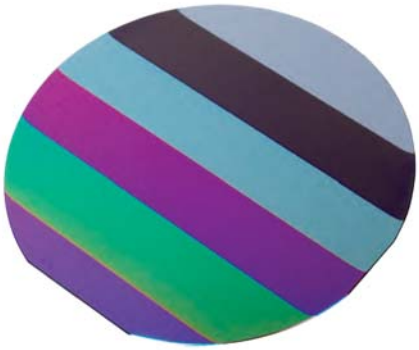
Fiber Assemblies for NanoCalc Systems

Item	Description	Use with NanoCalc Models
NC-2UV-VIS400-2	Bifurcated UV-VIS fiber, 400 µm, 2 m long, 2 x SMA 905 connectors, flexible metal jacketing, common end with stainless steel ferrule 6.35 mm x 50 mm	NANOCALC-VIS NANOCALC-XR
NC-7UVS400-2	NANOCALC-DUV reflection probe, 400 µm, 2 m long, 6 illuminated fibers, flexible metal jacketing, common end with stainless steel ferrule 6.35 mm x 50 mm	NANOCALC-DUV
NC-7VIS-NIR400-2	NANOCALC-NIR reflection probe, 400 µm, 2 m long, 6 illuminated fibers, flexible metal jacketing, common end with stainless steel ferrule 6.35 mm x 50 mm	NANOCALC-NIR

Reflection Probes for NanoCalc Systems

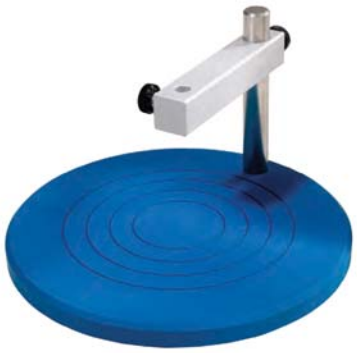
Item	Description	Use with NanoCalc Models
NC-7UV-VIS200-2	Reflection probe, 6 illumination, 1 read fiber, 200 µm UV-VIS fibers, 2 m long, flexible metal jacketing, stainless steel ferrule 6.35 mm x 50 mm, 2 x SMA 905 connectors	NANOCALC-VIS NANOCALC-XR
NC-7UV-VIS200-2-SMA	Reflection probe for use w/MFA-PT microscope adapter, 6 illumination, 1 read fiber, 200 µm UV-VIS fibers, 2 m long, with flexible metal jacketing, stainless steel ferrule 6.35 mm x 50 mm, 3 x SMA 905 connectors	NANOCALC-VIS NANOCALC-XR

Additional Accessories
NanoCalc systems are available with accessories for use with microscopes, mapping stages and various mounting configurations. Here are some of our most popular accessories:



Reference Wafers
We offer two Si-SiO2 reference wafer options for measuring the thickness of thin, transparent films on substrates such as silicon wafers and optical layers. The STEP-WAFER covers UV-VIS wavelengths and the STEP-WAFER-600-1100 covers VIS-NIR wavelengths. Each wafer is a 100 mm diameter, 5-step wafer with calibrated thickness range of 0-500 nm or 600-1100 nm.

Reflection-Transmission Stage
The versatile STAGE-RTL-T is a handy tool for reflection and transmission measurements of various substrates (for transmission setups you'll need two extra optical fibers). The STAGE-RTL-T consists of a variable rail, fiber holder, sample holder and light trap and comes with two collimating lenses.



Single-point Stage
The STAGE is a Single-point Reflection Stage for measurement of non-transparent samples. It's a good option if you're also using a reference wafer, as the wafer fits nicely on the base plate of the stage.