SENSOFAR

METROLOGY

Product Guide

S neox

S neox Cleanroom

Sumary

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Optional softwares

Basic features

Description

The S neox outperforms existing optical 3D profiling microscopes in terms of performance, functionality, efficiency, and design, providing Sensofar with a class-leading areal measurement system.

With the 5th generation of the S neox systems, the goal has been to make it easy to use, intuitive, and faster. So even if you are a beginner, the user can manage the system with just one click. In addition, software modules have been created to adapt the system to user requirements.

S neox 3D measurement technologies cover a wide range of scales, including form (Ai Focus Variation), sub nanometric roughness, and large areas (Interferometry) or critical dimensions that require high lateral resolution as well as vertical resolution (Confocal).

With new intelligent and unique algorithms and a new camera, everything is faster than before. Data acquisition is taken at 180 fps. As a result, standard measurement acquisition is 5X faster than before.

S neox is offered in two versions: table-top system or integrable head. As an integrable head, there is a compatible option with Class 1 particle classification, known as the S neox Cleanroom.

Technology

Our systems operate with different optical measurement techniques. Joining these technological benefits, incorporating the latest technology and the software which runs them, results in high-level equipment of maximum competitiveness in the market.

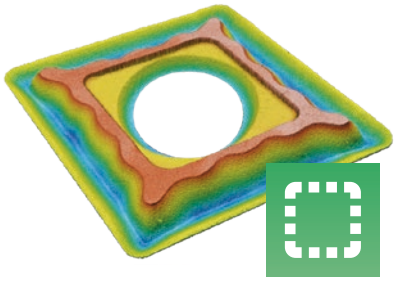
Learn more about Sensofar's technologies >

Table-top system >

Integrable head systems >

AI FOCUS VARIATION

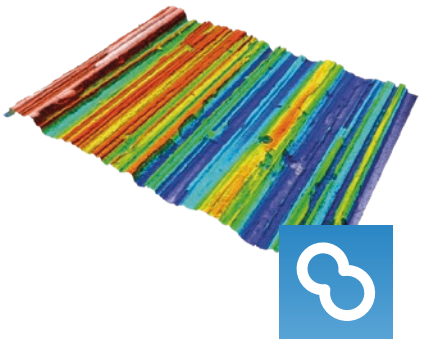
Active illumination Focus Variation is an optical technology developed for measuring the shape of large rough surfaces. This technology is based on Sensofar's extensive expertise in the field of combined confocal and interferometric 3D measurements. It is specifically designed to complement confocal measurements at low magnification. It has been improved with active illumination to get a more reliable focus location, even on an optically smooth surface. Highlights of the technology include high slope surfaces (up to 86°), the highest speeds (mm/s), and large vertical range measurements.



CONFOCAL

Confocal is an optical technology developed to measure the surface height from smooth to very rough surfaces. Confocal profiling provides the highest lateral resolution that an optical profiler can achieve. Thus, spatial sampling can be reduced to 0.01 µm, which is ideal for critical dimension measurements. High NA (0.95) and magnification (150X) objectives are available to measure smooth surfaces with steep local slopes over 70° (for rough surfaces up to 86°). In addition, the proprietary confocal algorithms provide vertical repeatability on the nanometer scale.

Sensofar develops a Continuos Confocal algorithm to acquire in continuous Z axis scan. As a result, acquisition speed is roughly 3X faster than Sensofar's own Confocal approach while maintaining comparable repeatability and accuracy.



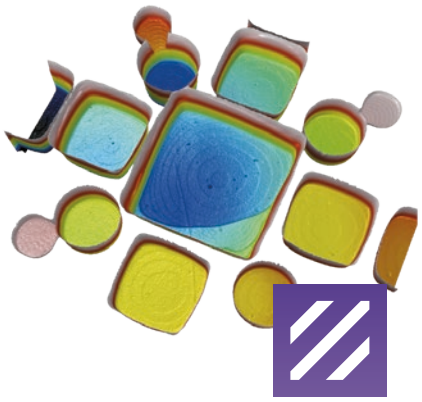
INTERFEROMETRY

Interferometry has been developed to measure the surface height of very smooth to moderately rough surfaces, achieving the same system noise at any magnification.

- **PSI**: Phase Shift Interferometry has been developed to measure the surface height of very smooth and continuous surfaces with sub-Angstrom resolution, for all numerical apertures (NA). Very low magnifications (2.5X) can be employed to measure large fields of view with the same height resolution.

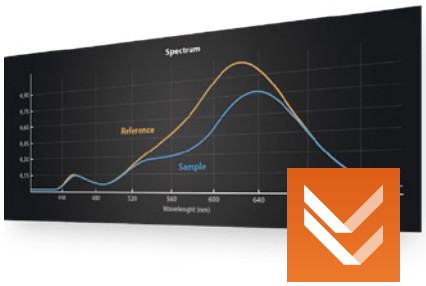
- **EPSI**: Extended Phase Shift Interferometry combines two interferometric technologies, CSI and PSI, overcoming the limitations of the two by achieving 0.1 nm of measurement noise in a larger range of some hundreds of microns.

- **CSI**: Coherence Scanning Interferometry uses white light to scan the surface height of smooth to moderately rough surfaces, achieving 1 nm height resolution at magnification.



SPECTROSCOPIC REFLECTOMETRY

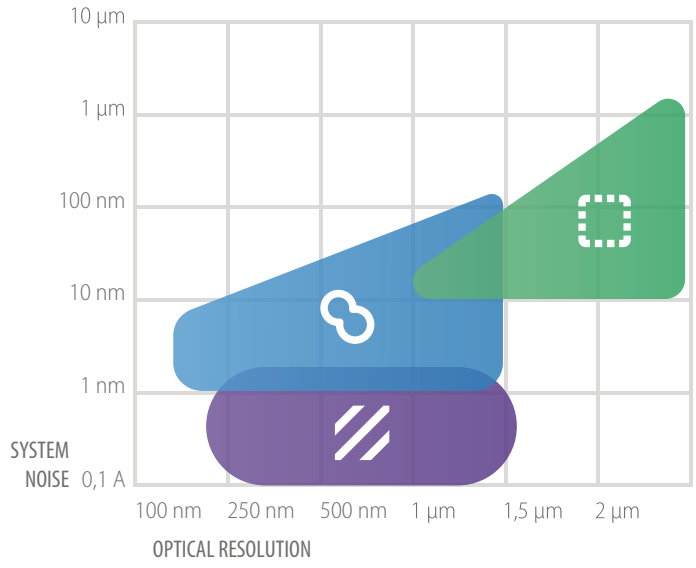
For samples with transparent layers, spectroscopic reflectometry is the key to performing thickness measurements quickly, accurately, and non-destructive.



Techniques comparison

	Ai Focus Variation	Confocal	Interferometry
Magnification	High magnifications up to 150X	High magnifications up to 150X	Low magnifications down to 2.5X (large FOVs with Armstrong system noise)
NA	Even NA slopes up to 86º with scattering surfaces can be measured	Very high NA from 50X magnifications allowing measurement of slopes up to 70º for smooth surfaces (86º for rough surfaces)	The highest NA is 0.70 (100X)
System noise	The minimum system noise is 10 nm	High repeatability (low noise) for high NA, from 0.90 NA, the noise is close to 1 nm	High repeatability independently from the NA for PSI down to 0.01 nm and CSI down to 1 nm
Optical resolution	Short wavelength and high NA, lateral resolutions up to 0.44 µm	Short wavelength and high NA, lateral resolutions up to 0.15 µm	Short wavelength, lateral resolutions up to 0.20 µm
Acquisition speed	Speedy acquisition of 200 planes in 3 seconds	Fast acquisition for 20 planes, 3 seconds	Speed does not depend on the magnification
Film thickness	Not applicable	Thick film (several mm) measured with low NA, and thin film (2 µm) measured with high NA. The substrate image coincides with the focus position allowing measurement of the rough substrate	Transparent films from 50 nm to 1.5 µm with reflectometry (10X MR) and thickness measurement from 1.5 µm to 100um in CSI mode

SYSTEM NOISE VS OPTICAL RESOLUTION



Configuration

S neox is a modular system with several configurable and optional parts. It is composed of a system unit, an electronic controller, and the main controller.

The sensor head can be mounted directly to the bridge or to an adjustable column attached to the bridge. Depending on the configuration, the bridge can be fixed either to a base or a breadboard. All these sets will be framed within the group stands.

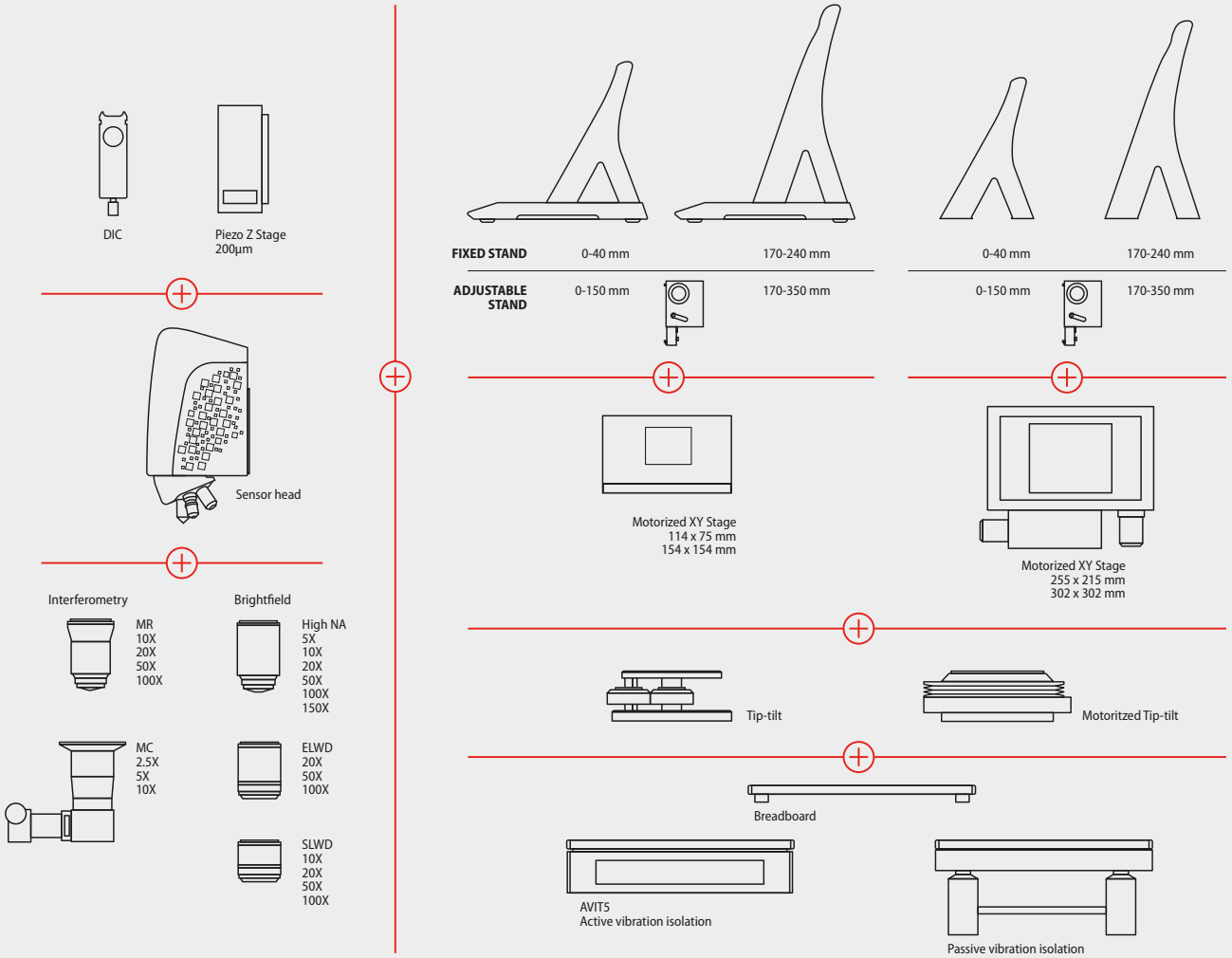
The sample is placed under the objective lens held by a motorized nosepiece. And on the top of a manual or a motorized XY stage and tip-tilt.

Brightfield and interferometry objective lenses are available depending on the technique required.

Optionally, a piezo actuator vertical scanner with a 200 µm travel length is recommended for the highest accuracy and repeatability measurements. There is also the option of a DIC (Differential Interference Contrast)[1] to emphasize very small height features with no contrast.

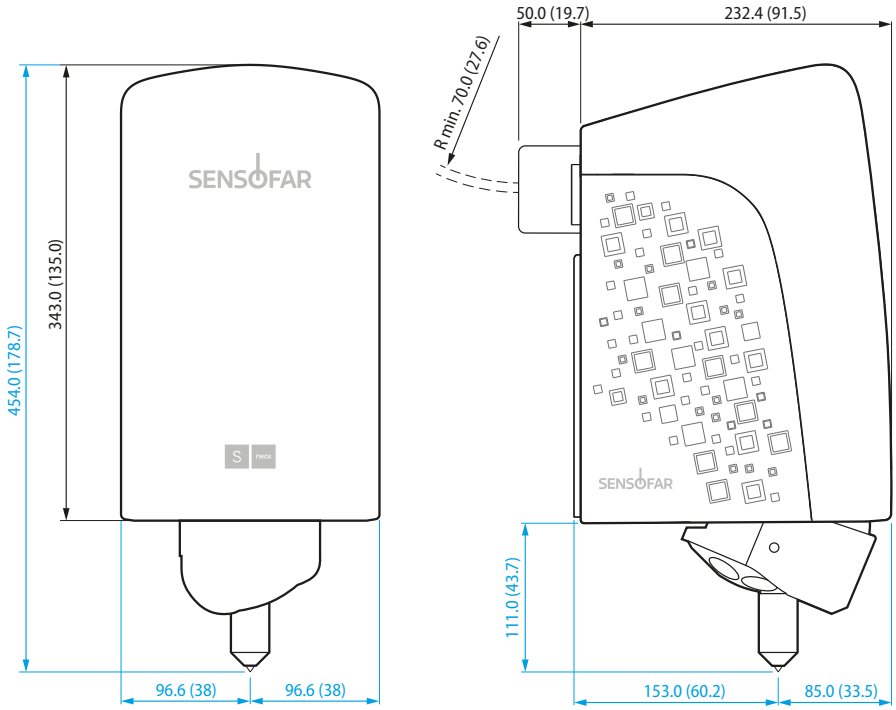
1 DIC is not compatible with the S neox Cleanroom.

■ Hardware options

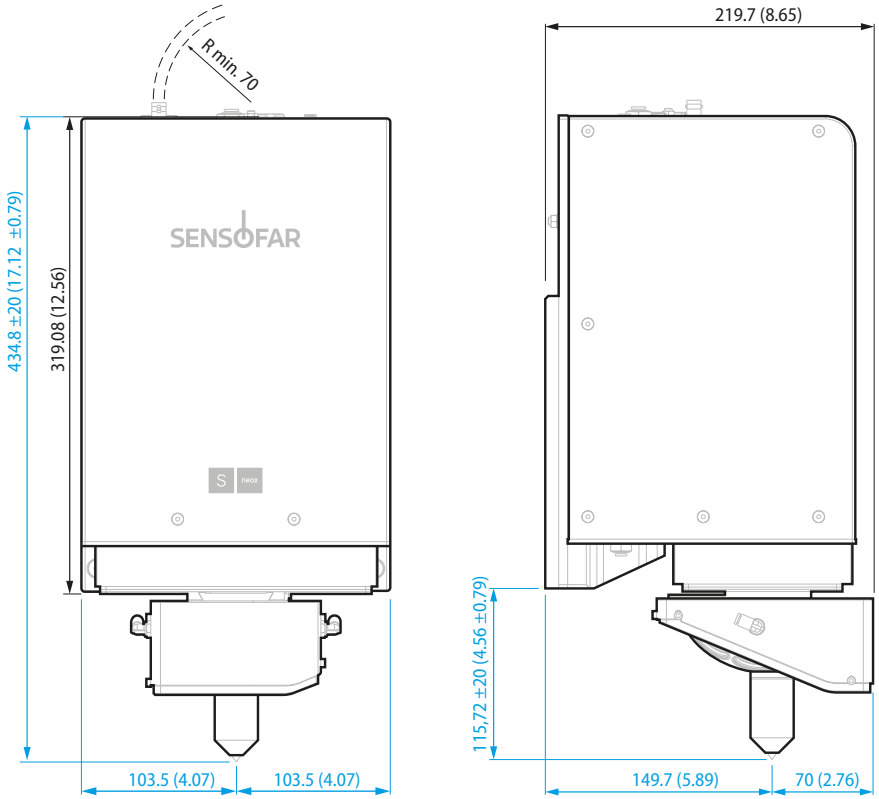


■ Mechanical dimensions

S neox

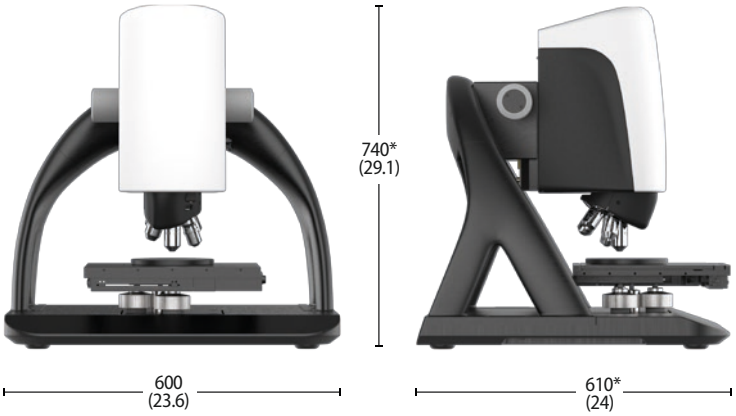


S neox Cleanroom

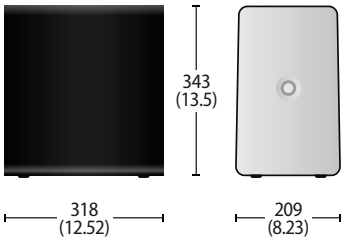


mm (inches)
Head dimensions
Working distances

STANDARD



CONTROLLER



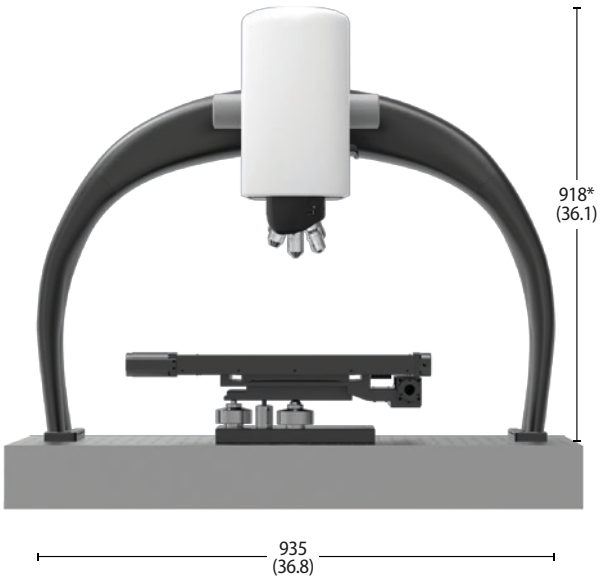
HIGH

Stand	Dimensions[1] L mm	L in	H mm	H in	W mm	W in	Weight[2] kg	Weight[2] lbs
Standard	600	23.6	740	29	610	24	61	134
High	635	25	945	37.2	610	24	66	145
Wide	900	35.4	744	29.3	560	22	59	130
High & Wide	935	36.8	918	36	560	22	63	139

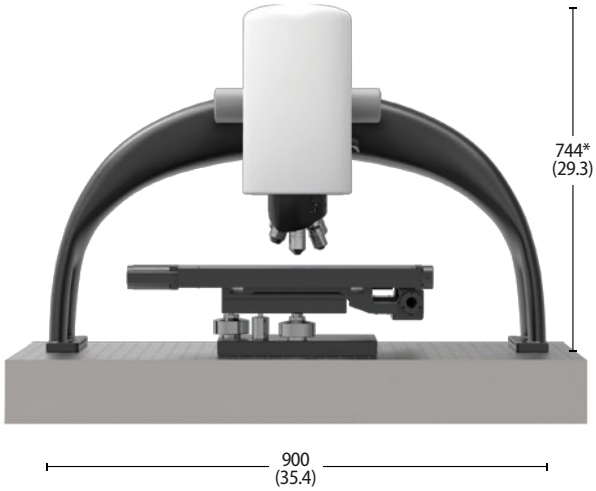
1 Height & Width refer to maximum values due to different settings and configurations.

2 Weight refers to the sensor head, stand, XY stage and manual tip-tilt.

HIGH+WIDE



WIDE



Specifications

■ System specifications

Measuring principle	Confocal, PSI, ePSI, CSI, Ai Focus Variation and Thin Film
Observation types	Brightfield, Sequential Color RGB, Confocal, Interferential Phase Contrast DIC (optional)
Measurement types	Image, 3D, 3D thickness, profile and coordinates
Camera	5Mpx: 2448x2048 pixels (60 fps)
Total magnification (27")	60X - 21600X
Display resolution	0.001 nm
Field of view	from 0.018 to 6.7 mm (single shot)
Max. extended measurement area	10x12 (Max. Resolution); 175x175 (Low resolution) (500 Mpx)
Confocal frame rate	60 fps (5Mpx); 180 fps (1.2 Mpx)
Vertical scan range	Linear stage: 40 mm range. Piezoelectric scanner with capacitive sensor: 200 µm range (optional)
Max. Z measuring range	PSI 20 µm; CSI 10 mm; Confocal & Ai Focus Variation 34 mm
LED light sources	Red (630 nm); green (530 nm); blue (460 nm) and white (580 nm; center)
Sample reflectivity	0.05 % to 100%
Sample weight	40 mm (standard); 150 mm and 350 mm (optional)
Sample height	Up to 20 kg More information
User management rights	Administrator, supervisor, advanced operator, operator
Power	Line Voltage 100-240 V AC; frequency 50/60 Hz single phase
Computer	Latest INTEL processor; 3840x2160 pixels resolution (4K) (27")
Operating system	Microsoft Windows 10, 64 bit
Environment	Temperature 10 ºC to 35 ºC; Humidity <80 % RH; Altitude <2000 m

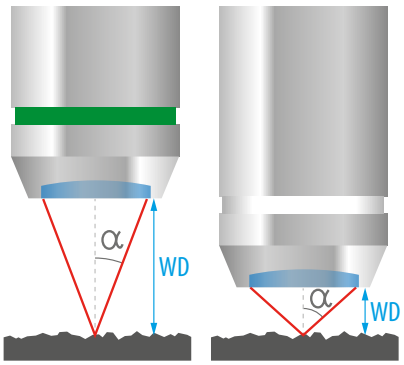
Objective lenses

The S neox uses premium objective lenses designed to correct for chromatic aberrations and produce sharp, flat, and clear images with high contrast and high resolution. In addition, phase Fresnel lenses improve the operability and the working distance, meaning that S neox lenses provide the most extensive available working distance for each NA.

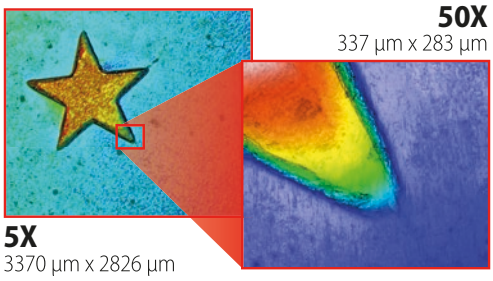
The S neox also uses objective interferometry lenses. The MC series are based on a Michelson interferometer with an external reference mirror mounted on two tip-tilt screws. The MR series are based on Mirau lenses that create interference internally by dividing the wavefront with a beamsplitter. The MC series are ideal objective lenses for very flat and thin samples due to their low magnification and numerical aperture. The MR series can have up to 0.7 NA.

BASIC PARAMETERS FOR SYSTEM OPERATION

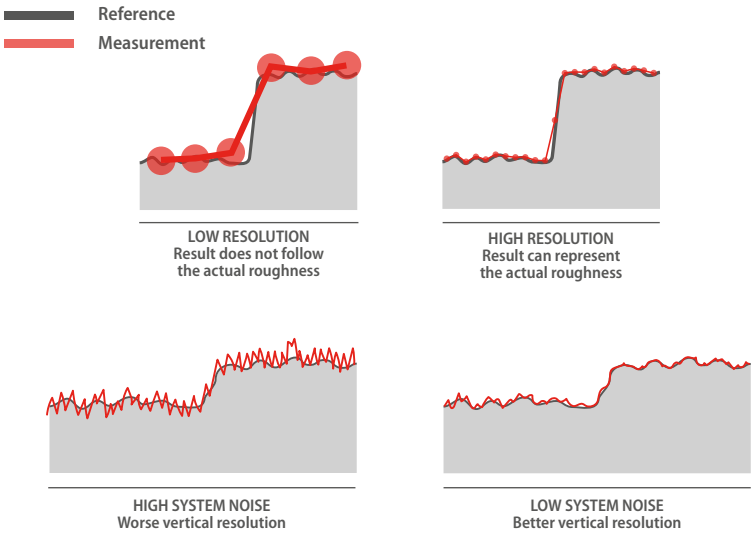
Here are some useful concepts that will help you through the operation of the S neox system. These will help to understand all the product specifications of your optical metrology tool for surface measurement.

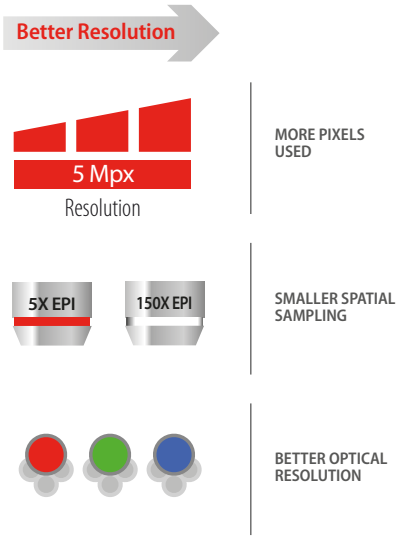


- **Numerical Aperture (NA)**: determines the largest slope angle on the surface that can be measured and affects optical resolution. Its mathematical expression is NA=n·sinα, where n is the index of refraction of the working medium (air, water, or oil) and α is the maximum half-angle of the cone of light that enters or exits the lens.
- **Working Distance (WD):** distance is taken from the end of the objective at which the focus plane is found.
- **Field of View (FOV)**: area of the sample that is measured; depends on the magnification.



- **Resolution**: smallest detectable distance between two features of the sample. For 2D images, the lateral resolution depends on: i) the number of used pixels of the camera and ii) the dimensions of the field of view. It can be pixel-size limited (spatial sampling) or optically limited (optical resolution). For the 3D case, the vertical resolution is related to the system noise.





SELECTION GUIDE

The objective lens selection depends on the application, the sample under test, and the 3D optical profiler placement conditions.

S neox uses brightfield and interferometry objective lenses. Therefore, a vibration-isolated environment is required to perform interferometric and confocal measurements at high magnifications. The following table tries to classify the sample under test by its surface finish and geometry to the best technique.

Surface under test description	Optical technique	Objective needed	Description
Smooth surface			
High local slope	Confocal	50X to 150X	High light efficiency and high numerical aperture
Low local slope with few nanometer features (flat samples)	Confocal Interferometry (CSI)	50X to150X 10X to 100X	High repeatability, moderate numerical aperture and low to high magnification
Low local slope and large FOV	Interferometry (ePSI or PSI)	2.5X to 5X	Low magnification and high repeatability
Rough surface			
Large FOV	Confocal Interferometry (CSI)	10X to 20X 10X to 20X	Extended measurements and moderate numerical aperture for low magnification
High local slope with few nanometer features	Confocal	50X to 150X	High numerical aperture and magnification
High aspect ratio	Confocal	10X to 100X SLWD	Low numerical aperture and super long working distance
High local slope	Ai Focus Variation	5X to 20X	Low magnification
Form and shape	Ai Focus Variation	5X to 20X	Low magnification
Transparent layers			
Thin film	Reflectometry	10X	Low magnification
Thick film	Confocal Interferometry (CSI)	5X to 20X 2.5X to 10X	Low magnification for CSI and high NA for confocal

OBJECTIVE LIST

	Magnification	NA	WD (mm)	FOV[1] (µm)	Spatial Sampling[2] (µm)	Optical Resolution[3] Green (µm)	Optical Resolution Blue (µm)	Optical Resolution Red (µm)	Optical Resolution White (µm)	Maximum Slope[4] (º)	System noise[5] (nm)
Brightfield	**2.5X EPI**	0.075	6.50	6756 x 5652	2.76	2.16	1.87	2.57	-	4	300
	5X BF	0.15	20.00	3378 x 2826	1.38	1.08	0.94	1.29	-	9	115
	10X BF	0.30	15.80	1689 x 1413	0.69	0.54	0.47	0.64	-	17	30
	10X SLWD	0.20	37.00	1689 x 1413	0.69	0.81	0.70	0.96	-	12	50
	20X BF	0.45	3.00	845 x 707	0.34	0.36	0.31	0.43	-	27	8
	20X EPI	0.60	3.00	845 x 707	0.34	0.27	0.23	0.32	-	37	6
	20X ELWD	0.40	19.00	845 x 707	0.34	0.41	0.35	0.48	-	24	10
	20X SLWD	0.30	30.00	845 x 707	0.34	0.54	0.47	0.64	-	17	20
	22X WI	0.50	3.50	767x642	0.31	0.32	0.28	0.39	-	-	15
	50X BF	0.80	1.00	338 x 283	0.13	0.20	0.18	0.24	-	53	4
	50X EPI	0.80	2.00	338 x 283	0.13	0.20	0.18	0.24	-	53	4
	50X EPI	0.95	0.35	338 x 283	0.13	0.17	0.15	0.20	-	72	3
	50X ELWD	0.60	11.00	338 x 283	0.13	0.27	0.23	0.32	-	37	5
	50X SLWD	0.40	22.00	338 x 283	0.13	0.41	0.35	0.48	-	24	15
	100X BF	0.90	1.00	169 x 141	0.07	0.18	0.16	0.21	-	64	3
	100X EPI	0.90	2.00	169 x 141	0.07	0.18	0.16	0.21	-	64	3
	100X EPI	0.95	0.32	169 x 141	0.07	0.17	0.15	0.20	-	72	2
	100X ELWD	0.80	4.50	169 x 141	0.07	0.20	0.18	0.24	-	53	3
	100X SLWD	0.60	10.00	169 x 141	0.07	0.27	0.23	0.32	-	37	12
	150X	0.90	1.50	113 x 94	0.05	0.18	0.16	0.21	-	64	2
	150X	0.95	0.20	113 x 94	0.05	0.17	0.15	0.20	-	72	1

1 Maximum field of view with 3/2" camera and 0.5X optics.

2 Pixel size on the surface.

3 L&S: Line and Space, half of the diffraction limit according to the Rayleigh criterion. Spatial sampling could limit the optical resolution for interferometric objectives.

4 On smooth surfaces, up to 71º. On scattering surfaces, up to 86º.

5 System noise is measured as the difference between two consecutive measures on a calibration mirror placed perpendicular to the optical axis. For interferometry objectives, PSI, 10 phase averages with vibration isolation activated. The 0.01 nm is achieved with a Piezo stage scanner and temperature-controlled room. Values for green LED (white LED for CSI). Resolution HD. Values obtained in a VC-E vibration environment.

	Magnification	NA	WD (mm)	FOV[1] (µm)	Spatial Sampling[2] (µm)	Optical Resolution[3] Green (µm)	Optical Resolution Blue (µm)	Optical Resolution Red (µm)	Optical Resolution White (µm)	Maximum Slope[4] (°)	System noise[5] (nm)
Interferometry	**2.5X[6]**	0.075	10.30	6756 x 5652	2.76	2.16	1.87	2.57	2.34	4	PSI/ePSI 0.1 nm (0.01 nm with PZT) CSI 1 nm
	5X MC	0.14	13.00	3378 x 2826	1.38	1.15	1.00	1.37	1.25	8	
	10X MC	0.10	25.00	1689 x 1413	0.69	1.62	1.40	1.92	1.75	6	
	10X MR[7]	0.28	8.00	1689 x 1413	0.69	0.58	0.50	0.69	0.63	16	
	20X MC	0.10	16.70	845 x 707	0.34	1.62	1.40	1.92	1.75	6	
	20X MR[7]	0.38	6.00	845 x 707	0.34	0.43	0.37	0.51	0.46	22	
	50X MR	0.50	3.60	338 x 283	0.13	0.32	0.28	0.38	0.35	30	
	100X MR	0.70	2.00	169 x 141	0.07	0.23	0.20	0.27	0.25	44	

1 Maximum field of view with 3/2" camera and 0.5X optics.

2 Pixel size on the surface.

3 L&S: Line and Space, half of the diffraction limit according to the Rayleigh criterion. Spatial sampling could limit the optical resolution for interferometric objectives.

4 On smooth surfaces, up to 71°. On scattering surfaces, up to 86°.

5 System noise is measured as the difference between two consecutive measures on a calibration mirror placed perpendicular to the optical axis. For interferometry objectives, PSI, 10 phase averages with vibration isolation activated. The 0.01 nm is achieved with a Piezo stage scanner and temperature-controlled room. Values for green LED (white LED for CSI). Resolution HD. Values obtained in a VC-E vibration environment.

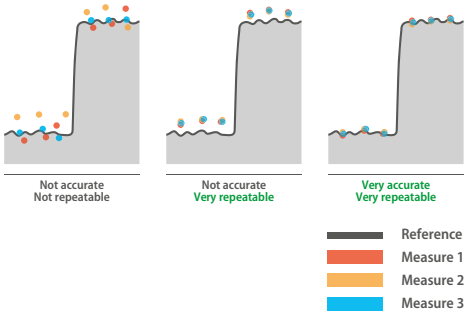
6 The objective comes with an adapter that makes it compatible with the nosepiece. The nosepiece is encoded but not motorized with the 2.5XTI in the turret. System is no longer parfocal.

7 Not parfocal.

Accuracy and repeatability

The following brief descriptions of statistical concepts are applied to metrology and will help you understand the performance specifications according to NPL (National Physical Laboratory).

- **Uncertainty**: generic term for the quantification of doubt in a measured value. It is shown as an expanded uncertainty U.
- **Precision**: dispersion of a number of measurements when repeated. More often called repeatability, quantified by the standard deviation σ.
- **Accuracy**: qualitative term describing the closeness of a measured value to the true value. Low values of U and σ concerning the measured value provide highly accurate systems.



Standard	Value (nm)	Piezoelectric scanner[1] U , σ	Linear scanner [1] U , σ	Technique
Step height	48600	U = 300 nm σ = 10 nm	U = 300 nm σ = 35 nm	Confocal & CSI
	7616	U = 79 nm σ = 5 nm	U = 70 nm σ = 12 nm	Confocal & CSI
	941.6	U = 7 nm σ = 1 nm	U = 14 nm σ = 4 nm	Confocal & CSI
	186	U = 4 nm σ = 0.4 nm	U = 4 nm σ = 1 nm	Confocal & CSI
	44.3	U = 0.5 nm σ = 0.1 nm	U = 0.5 nm σ = 0.15 nm	PSI
	10.8	U = 0.5 nm σ = 0.05 nm	U = 0.5 nm σ = 0.15 nm	PSI
Areal roughness (Sa)[2]	0.79	U = 0.04 µm σ = 0.0005 µm	U = 0.03 µm σ = 0.002 µm	Confocal, AiFV & CSI
Profile roughness (Sa)[3]	2.40	U = 0.03 µm σ = 0.002 µm	U = 0.025 µm σ = 0.004 µm	Confocal, AiFV & CSI
	0.88	U = 0.015 µm σ = 0.0005 µm	U = 0.015 µm σ = 0.004 µm	Confocal, AiFV & CSI
	0.23	U = 0.005 µm σ = 0.0002 µm	U = 0.01 µm σ = 0.001 µm	Confocal, AiFV & CSI

1 Values obtained in a VC-E vibration environment. Objective used for Confocal and Ai Focus Variation 50X 0.80 NA and for CSI and PSI 50X 0.55NA. Resolution 1220x1024 pixels. Uncertainty (U) according to ISO/IEC guide 98-3:2008 GUM:1995, K=1,96 (level of confidence 95%). σ according to 25 measures.

2 Area of 1x1 mm.

3 Profile of 4 mm length.

Standard configuration

Sensor head

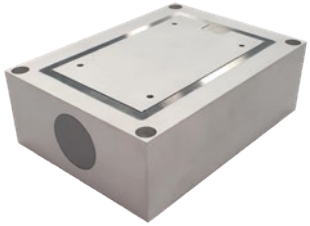
S neox, a non-contact 3D optical profiler, measures and characterizes 3D surfaces using multiple technologies: Confocal, Interferometry (CSI, PSI & ePSI), Ai Focus Variation, and Thin Film (only available with piezo option).

The standard configuration includes the following:

- Sensor head
  - 4 high-power LEDs integrated into the light source (RGB & white)
  - A Hi-Res CMOS camera with 2448x2048 pixels (5 Mpx)
  - A 6-position motorized nosepiece can hold up to six objectives simultaneously, including brightfield and interferometry objectives. The SensoSCAN software handles the motorized change automatically and corrects automatically any possible parfocality adjustment
- Electronic controller
- Main controller
- 4K monitor of 3840 x 2160 pixels (27")
- Joystick
- Calibration pack
- Emergency stop

Options for sensor head are as follows:

- **Piezo**: The piezo scanner z-axis is optional for S neox. This scanning device has a total travel length of up to 200 µm with a capacitive sensor for a high position resolution of 0.7 nm and 1 nm accuracy on the entire travel range. In addition, it improves the interferential measurements with repeatability down to 0.01 nm.



- **DIC**: Differential Interference Contrast emphasizes very small height features with no contrast in normal observation. Using a Nomarski prism, an interferential image is created, resolving sub-nanometer scale structures not visible in brightfield or confocal images.

	Table-top system	Integrable head
S neox	SSN09000	SSN090OEM00
S neox with piezo	SSN090P00	SSN090POEM00
S neox with DIC	SSN090D00	
S neox with piezo & DIC	SSN090PD00	

Cleanroom sensor head

The S neox Cleanroom has all the versatility of an S neox. This version of the S neox has been carefully engineered to overcome the strict test to be ISO Class 1 and ESD compatible.

The configuration includes the following:

- Sensor head
  - 4 high-power LEDs integrated into the light source (RGB & white)
  - A Hi-Res CMOS camera with 2448x2048 pixels (5 Mpx)
  - A 6-position motorized nosepiece can hold up to six objectives simultaneously, including brightfield and interferometry objectives. The SensoSCAN software handles the motorized change automatically and corrects automatically any possible parfocality adjustment
- Electronic controller
- Main controller
- Vacuum connection to extract the particles out of the sensor head
- Grounding connection for ESD compatibility
- 4K monitor of 3840 x 2160 pixels (27")
- Joystick
- Calibration pack
- 5 m high-flex cable set
- Emergency stop
- Vaccum: To connect the vacuum properly, here there are some recommended values:

Cleanroom vacuum specifications	
Pressure	-150 mbar/ -150hPa/ -112mmHg
Flow rate	4.1mm^3/h
Connecting tube	Hoose connection on top OD 6mm
Recommended materials	PU

Options for sensor head are as follows:

- **Piezo**: The piezo scanner z-axis is optional for S neox. This scanning device has a total travel length of up to 200 µm with a capacitive sensor for a high position resolution of 0.7 nm and 1 nm accuracy on the entire travel range. In addition, it improves the interferential measurements with repeatability down to 0.01 nm.

	Table-top system	Integrable head
S neox	SSN090CR00	SSN090OEMCR00
S neox with piezo	SSN090PCR00	SSN090POEMCR00

Cables for sensor head

For integrable heads, once the sensor head is selected, the cable must be chosen.

PN CABLE3MSNEOXOEMCXP00 | S neox 3 m high-flex CXP cable set

PN CABLE5MSNEOXOEMCXP00 | S neox 5 m high-flex CXP cable set

PN CABLE10MSNEOXOEMCXP0 | S neox 10 m high-flex CXP cable set

For piezo configurations, 5 m cable is only available:

PN CABLE5MPSNEOXOEMCXP0 | S neox 5 m high-flex CXP cable set w/Piezo

Main controller and monitor

The main controller set an HP computer (latest INTEL processor) with Windows 10 64-bit, high-resolution display of 3840x2160 pixels (27"), keyboard, mouse, and joystick.

Main controller features	
	HP Workstation Z1 MT G8
Operating system	Windows® 10 Enterprise LTSC 64-bit
Processor	Intel® Core™ i7-11700 (3.20 GHz, 8 cores)
RAM Memory	32 Gb DDR4
Hard Drive	256 GB SSD PCIe® NVMe™ 1 Tb SATA (7200 rpm)
Graphics	NVIDIA® GeForce RTX™ 3070 (dedicated 8 GB GDDR6)
Network	Intel® I219LM GbE LOM
Dimensions (W x H x D)	15.4 x 37 x 36.5 cm // 6.06 x 14.56 x 14.37 in
Weight	5.95 Kg // 13.11 lb
Power Supply	500 W 92% efficient, wide-ranging, active PFC

Monitor features	
	LG 27UL500
Dimensions (W x H x D)	62.2 x 45.9 x 20.8 cm - 24.5 x 18.1 x 8.2 in
Weight	5.13 Kg - 11.31 lb
Power Supply	29.5 W

PN PR001541SV | HP computer Sneox 090

Joystick

The joystick controls the three axes of the two motorized stages, XY and Z.

The buttons around the joystick are function keys to access application commands such as Autofocus, Image view, Autolight, etc.

In the case of having a motorized tip-tilt, the joystick can also manage tilt of the XY stage.

PN PR000724SV | Space Mouse

Calibration pack

The system has a case to store the reference mirror, calibration specimen, calibration standards, and objectives.

The calibration pack is composed of a reference mirror and a calibration specimen:

A reference mirror of high surface finish quality (λ/10) is included. It is used to calibrate the brightfield and interferometry lenses.

PN ESPJCAL20 | 2 inch calibration mirror

A calibration specimen is used to calibrate Ai Focus Variation and Confocal Continuous techniques. The nominal roughness is Sa 0.80 µm. The engraved area size is 20x20 mm.

PN PR001417 | Calibration specimen

Configurable parts

XY stages

The XY stages are optimized for 2D and 3D measurement. The user can center the sample manually with the manual stage or by using a 3D external joystick (included) or the virtual joystick of the software with the motorized stages. Travel range depends on the stage model.

XY stage	Dim.(mm)	Dim. (in)	Accuracy (µm/mm)	Repeatability (µm)
Motorized 114x75 mm (4.6x3") XY stage	114x75	4x3	0.20	±0.2
Motorized 154x154 mm (6x6") XY stage	154x154	6x6	0.15	±0.7
Motorized 255x215 mm (10x8.5") XY stage	255x215	10x8.5	0.15	±0.7
Motorized 302x302 mm (12x12") XY stage	302x302	12x12	0.15	±0.7

PN XYH10109000 | Motorized 114x75 mm (4.6x3") XY stage

PN XYH10509000 | Motorized 154x154 mm (6x6") XY stage

PN XYH11609000 | Motorized 255x215 mm (10x8.5") XY stage[1]

PN XYH11209000 | Motorized 302x302 mm (12x12") XY stage[1]

The encoded XY stages offer the same measurement capabilities as the motorized stage but use linear optical encoders to achieve better repeatability and accuracy.

PN XYH101E09000 | Encoded motorized 114x75 mm (4.6x3") XY stage

PN XYH105E09000 | Encoded motorized 154x154 mm (6x6 ") XY stage

PN XYH116E09000 | Encoded motorized 255x215 mm (10x8.5") XY stage[1]

PN XYH112E09000 | Encoded motorized 302x302 mm (12x12") XY stage[1]

1 Breadboard required.

A precision XY stage with linear optical encoders measures the position at the platform directly. This stage is recommended for applications that demand high accuracy in flatness measurements.

XY stage	Dim.(mm)	Dim. (in)	Repeatability (µm)	Flatness (µm)	Pitch (µrad)
High precision	305x305	12x12	±0.5	±4	±60

This stage comes in a granite platform with dimensions of 760x500x100 mm and a weight of 102 kg. The bridges compatible are the adjustable wide stand (**PN** STAND090AW) and the adjustable wide and height stand (**PN** STAND090AWH). Also, note that the precision XY stage is not compatible with any tip-tilt.

PN XYH74100 | High-precision motorized 305x305 mm (12x12") XY stage

Tip-tilt

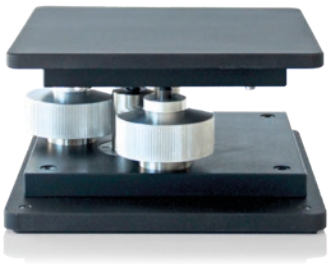
MANUAL

A manual tip-tilt stage is used to balance the tilt of the surface under measurement. The maximum angle is ± 4º. It allows the surface to be placed perpendicular to the optical axis. It is helpful to achieve a null fringes position for interferometric measurements.

PN TIPTILTH10X00 | Tip-tilt stage for H10X XY stage[1]

PN TIPTILTH11600 | Tip-tilt stage for 255x215 mm XY stage

PN TIPTILTH11200 | Tip-tilt stage for 302x302 mm XY stage

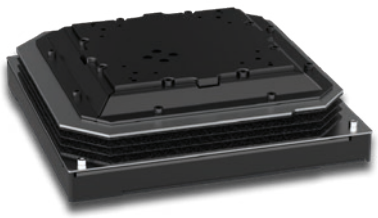


MOTORIZED

The motorized tip-tilt is designed to automatically level the sample in less than 3 s. The maximum tilt is ± 3º. It reduces sample preparation time and allows sample leveling in multiple positions for automated applications. All imaging techniques can use the auto-tilt function with all imaging techniques.

PN TIPTILTMOTH10X00 | |Motorized Tip-tilt stage for H10X stage[2]

PN TIPTILTMOTH11X00 | |Motorized Tip-tilt stage for H11X stage[3]



1 Compatible with XY stage 114x75 mm or 154x154 mm.

2 Compatible with XY stage 114x75 mm or 154x154 mm.

3 Compatible with XY stage 255x215 mm or 302x302 mm.

Here are key specifications for the accuracy and performance of the tilting correction of the motorized tip-tilt:

	Bright field lens	Interferometric lens
Objective	20X BF 0.45NA 3WD	20X BR 0.28NA 8.0WD
Initial tilt (º)	1	1
Tilt after first tilt correction (º)	0.020	0.026
Tilt after second tilt correction (º)	0.001	0.003
Tilt correction repeatability (º)	0.001	0.001

The table below displays the weight capacity of various combinations of XY stage and tip-tilt:

XY stage	Max. load		
	Stage alone	Stage & manual tip-tilt	Stage & motorized tip-tilt
Manual 40x40mm (1.6x1.6")	-	3-5kg (1-7lbs)	-
Motorized 114x75 mm (4.6x3")	-	10kg (22lbs)	8kg (18lbs)
Motorized 154x154 mm (6x6")	-	15kg (33lbs)	6kg (13lbs)
Motorized 255x215 mm (10x8.5")	-	12,5kg (28lbs)[1]	12,5kg (28lbs)[1]
Motorized 302x302 mm (12x12")	-	12,5kg (28lbs)[1]	12,5kg (28lbs)[1]
Motorized high precision 305x305 mm (12x12")	20kg (44lbs)	-	-

1 Up to 20kg. Contact sales@sensofar.com for more information.

Sample supports

Samples can be held by a regular flat plate or a rotary plate which helps to find the right view by rotating the sample. There is also an accessory to lift the sample when the high stand is used.

FLAT PLATE

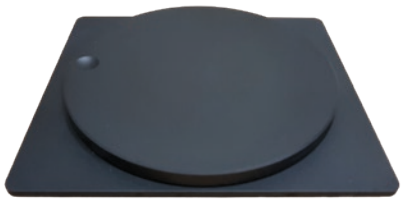
PN PCH101 | Flat plate for 114x75 mm XY stage

PN PCH105 | Flat plate for 154x154 mm XY stage

PN PCH116 | Flat plate for 255x215 mm XY stage

PN PCH112 | Flat plate for 302x302 mm XY stage

ROTARY PLATE



PN RPH101 | Rotary plate for 114x75 mm XY stage

PN RPH105 | Rotary plate for 154x154 mm XY stage

PN RPH116 | Rotary plate for 255x215 mm XY stage

PN RPH112 | Rotary plate for 302x302 mm XY stage

RISER

PN PR001731 | Riser for H101

PN PR001732 | Riser for H105

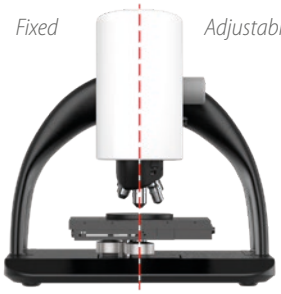
MICROPOROUS VACUUM CHUCK

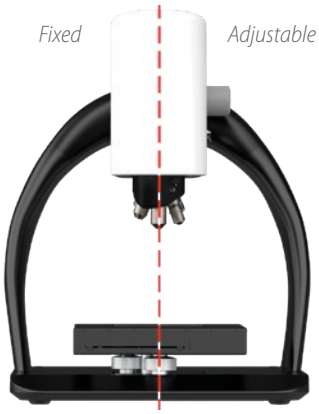
The microporous vacuum chuck enables the clamping of delicate, thin-walled, and flexible substrates, providing an ideal solution for stabilizing and securing items during measurement and testing procedures. It securely holds samples which might be challenging to grip, including delicate wafers, papers, foils, or flexible PCBs.

This component goes under request. Contact sales@sensofar.com.

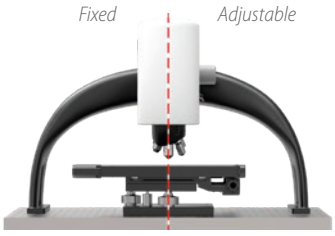
Stands

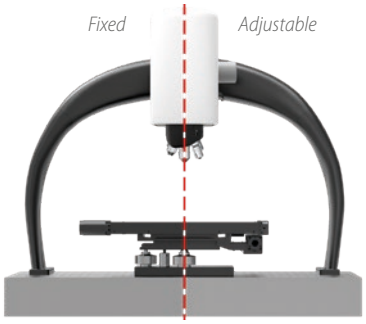
The base and column holder supplied with S neox are made of aluminum. The stand is designed for thermal stability.





Stage		Sample height (minimum-maxiumum) (mm)			
		Fixed	Adjustable	Fixed	Adjustable
Manual XY stage		0 - 40	0 - 150	172 - 242	172 - 352
H101	**Flat plate**	0 - 40	0 - 150	172 - 239	172 - 349
	Rotary plate	0 - 40	0 - 150	172 - 239	172 - 349
H105	**Flat plate**	0 - 40	0 - 150	172 - 239	173 - 349
	Rotary plate	0 - 40	0 - 150	172 - 237	173 - 347
PN		STAND090F	STAND090A	STAND090FH	STAND090AH





Stage		Sample height (minimum-maxiumum) (mm)			
		Fixed	Adjustable	Fixed	Adjustable
H116	**Flat plate**	0 - 40	0 - 150	172 - 246	172 - 356
	Rotary plate	0 - 40	0 - 150	172 - 233	172 - 343
H112	**Flat plate**	0 - 40	0 - 150	172 - 225	185 - 335
	Rotary plate	0 - 40	0 - 150	172 - 212	172 - 322
PN		STAND090FW	STAND090AW	STAND090FWH	STAND090AWH

Optional parts

Ring light

The ring light is based on an LED ring for illuminating samples uniformly and efficiently. It is mounted above and around the objective. The ring light provides more signal for the Ai Focus Variation technique. Out of the box, this new illumination option is controlled through the SensoSCAN user interface to deliver green light to the sample. There are two ring light models: one for 5X and 10X magnification and another for 2.5X and 20X magnification. The ring light pack includes two ring lights and cabling.

PN RLN09001 | S neox ring light

Basemounts

When the S neox is used in a vibration environment, it is required to isolate the vibrations. The active vibration-isolation table is an intelligent device that actively senses the vibration and compensates for it by using fast actuators.

ACTIVE VIBRATION ISOLATION SUPPORT

The AVIT 5 is a state-of-the-art active benchtop vibration isolation system. Aside from its low-profile carbon design, the AVIT 5 has expanded application capabilities. The main features are the automated transport locking mode and fully automatic load adjustment, making handling extremely straightforward. The control technology is based on piezoelectric-type acceleration pickup, fast signal processing, and electro-dynamic force transducers. Isolation starts at 0.6 Hz, effectively isolating disturbing vibrations. Active isolation in all six degrees of freedom. The dimensions are 600x600x92 mm, and the maximum load capacity is 105 Kg (232 lbs). Smooth top surface.

PN TAB25 | AVIT5 Active vibration isolation

ACTIVE SUPPORT FRAME

The vibration isolation lab table offers excellent low-frequency vibration isolation in all axes and maintains its performance specifications even when subjected to extremely low input levels of excitation. It is finished with a medium texture black powder coat frame and stainless steel top with a grid of M6/25 tapped holes.

PN TAB27 | Active support frame & breadboard 750x1200

■ Calibration standard

Optional calibration standard can be used to check the accuracy of the system, as well as to calibrate the step height measurement. All calibration standards are made with monocrystalline silicon. Several step heights are available, from a few nm to some tens of microns.

STEP HEIGHT

Step height standards designed to calibrate and check the accuracy of the systems. The nominal step height is 20 µm. The chip size is 16 mm x 16 mm. To improve handling, the standards are mounted on borosilicate glass measuring 50 x 50 mm as substrate and are stored in a membrane box. It is certificated by Sensofar or by CEM (the national metrology institute of Spain) .

PN PR001820 | Step height 1 µm (Sensofar traceable)

PN PR001820C | Step height 1 µm (CEM traceable)

PN PR001001 | Step height 10 µm (Sensofar traceable)

PN PR001001C | Step height 10 µm (CEM traceable)

PN PR001741 | Step height 20 µm (Sensofar traceable)

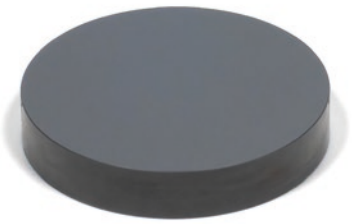
PN PR001741C | Step height 20 µm (CEM traceable)

PN PR001749 | Step height 50 µm (Sensofar traceable)

PN PR001749C | Step height 50 µm (CEM traceable)

LATERAL CALIBRATION STANDARD

The lateral calibration standard is manufactured with anti-reflective chromium on soda-lime glass using highly accurate semiconductor manufacturing equipment. The overall scale extends over 150 mm with 0.01 mm increments with all labeling in mm. The ruler is designed to be viewed from either side, as the markings are both right-reading and mirror images. The overall size is 25 x 180 x 3 mm thick. They are ideal for simultaneously measuring magnification in X and Y directions or determining image distortions. The measurement uncertainty (accuracy) is ± 0.5 µm over 0-10 mm and ± 2.5 µm over the entire 150 mm length as measured by the NPL (National Physical Laboratory). The standard is offered as a certified reference material (a traceable standard), and recertification is recommended in 5-year intervals.



PN PR001149 | Lateral calibration standard (NPL traceable)

SILICON CARBIDE MIRROR

The silicon carbide mirror exhibits a superior level of flatness (λ/8) and exceptional durability. This mirror is strongly recommended for applications where very low flatness (Sz <50 µm) and roughness (Sa <1 nm) are measured.

PN ESPJCAL20SIC

ROUGHNESS STANDARD

A traceable high-precision areal standard with typical roughness of Sa 790 nm. It is designed to calibrate the metrological characteristics of areal surface topography measuring instruments. It is calibrated by NPL.

PN PR001641 | Roughness standard 790nm NPL calibrated

SET OF 4" REFERENCE AND THICKNESS WAFERS

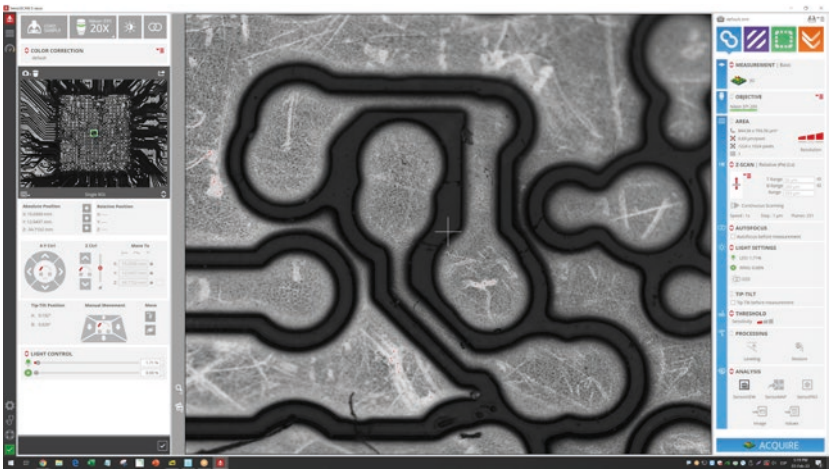
Set of 4" reference and thickness wafers consists of 5 wafers of 4 inches each. One silicon wafer with four silicon dioxide (SiO2) wafers with different thicknesses: 100nm, 200nm, 300nm, and 500nm. The set is supplied with the corresponding calibration sheet.

PN RE12 | Set of 4" Reference and Thickness Wafers

Software

SensoSCAN S neox

SensoSCAN S neox 64-bit software drives the system with its clear and intuitive user-friendly interface. The user is guided through the 3D environment, delivering a unique user experience.



SensoSCAN S neox software provides an easy-to-use interface and comprehensive tools for displaying and analyzing data. The main ones are:

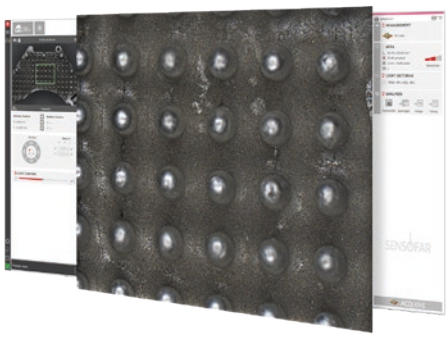
- The system is automatically optimized depending on the measurement technique selected (Confocal, Interferometry, or Ai Focus Variation).
- Type of measurement: Image, 3D, 3D auto, profiles, and coordinates.
- Sample viewing is very accessible and flexible with all live image options.
- Type of observations: Brightfield, Sequential Color RGB, Confocal, Interferential Phase Contrast.
- The user can adjust several acquisition parameters to best suit the intended measurement. Like various autofocus settings help to reduce the acquisition time, multilevel light strategies help improve the illumination of complex 3D structures, and selectable Z-scan options also provide an opportunity to optimize the acquisition for varying 3D surfaces.

The system comes with a fully functional license of SensoSCAN S neox. It can be installed on as many computers as you want to review, measure and report.

OPTIONAL MODULES

Extended measurements module

Allows the user to easily define the measurement layout on the surface by means of the overiew image. The area can be automatically croped to rectangular, circular or anular areas of interest. Wide areas up to 500 million pixels are possible. Several scanning strategies such us autofocusing on each field, or sample tracking to minimize vertical scanning range are available.



PN EMM | SensoSCAN Extended measurement module

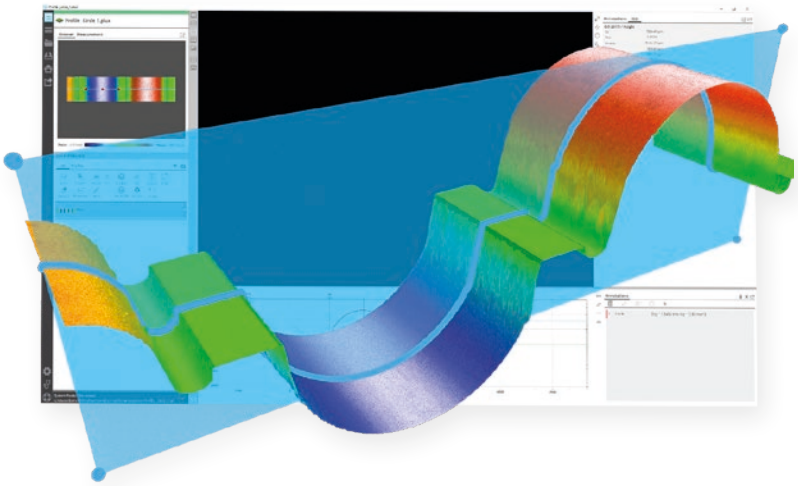
Automated procedures module

Automated measurements are obtained using the Recipes tool, an easily customizable way to create quality control procedures. It is ideal for Quality Control inspection, defining strategies for automating measurements with the profile manager tool, sample identification, data exportation, and 'pass or fail' criteria.

PN APM | SensoSCAN Automated procedures module

SensoVIEW

SensoVIEW is an ideal software for a broad range of analysis tasks. The system comes with a fully functional license of SensoVIEW and can be installed on as many computers as you want to review, measure and report.



The main tasks are:

- 3D (isometric) and 2D (contour, profile, histogram & bearing curve) interactive views providing multiple scaling, display & render options.
- A comprehensive suite of operators and filters: retouch data points, restore non-measurable data, form removal (plane, sphere, or polynomial), apply a range of filers (thresholding, smart, kernel, ISO, FFT, and rescale) and/or generate alternative layer by cropping, subtracting, retouching, rotating or extracting profile for examination and analysis.
- Calculation of shape and roughness parameters. A complete selection of ISO 25178 3D areal surface texture parameters: height, spatial, hybrid, functional and volumetric.
- Profile surface texture parameters from ISO 4287 and ISO 21920 are also available
- 3D measurement of points, distances, radius, and angles with automatic edge detection of circles and lines.
- 2D measurements of distance, step height, radius, and angle with smart fitting.
- Analysis templates and customized reports.
- Export JPG, TXT, TIFF, STL, and Normal Map.

Several packs of licenses are available depending on your needs. Choose the one that fits better for you. The educational license is only for universities.

PN SENSOVIEW23L | SensoVIEW 2 Bundle of 3 users[1]

PN SENSOVIEW210L | SensoVIEW 2 Bundle of 10 users

PN SENSOVIEW225L | SensoVIEW 2 Bundle of 25 users

PN SENSOVIEW250L | SensoVIEW 2 Bundle of 50 users

PN SENSOVIEW2200L | SensoVIEW 2 Bundle of 200 users

PN SENSOVIEW2EDU | SensoVIEW 2 Educational bundle

1 It is included, by default, three licenses with the system.

Optional softwares

SensoPRO

SensoPRO is the 64-bit data analysis solution from Sensofar. It provides an environment for quality assurance (QA) engineers and technicians to quickly and easily analyze production parameters. When combined with the SensoSCAN acquisition program, SensoPRO offers a one-click solution for data acquisition through data analysis.

Included by default plugins:

- **Step Height**: analyze a single step height with any shape in the given FOV.
- **Step Height ISO**: analyze single step height standards according to ISO 5436-1:2000 7.1 Type A1.
- **Surface Texture**: analyze surface texture in accordance with the corresponding parameters defined by the ISO 25178: Geometric Product Specifications (GPS) –Surface texture: areal standard.
- **Surface Texture Profile**: analyze amplitude parameters of profile(s) on the surface, in accordance with either ISO 21920: Geometrical product specifications (GPS)-Surface texture: Profile Parts 1, 2 and 3 standard or the withdrawn ISO 4287: Geometrical product specifications (GPS)-Surface texture: profile standard.
- **Operator**: apply filters and other processing settings to a surface prior to analyzing it with other plugins.

PN SENSOPRO | SensoPRO analysis software

OPTIONAL PLUGINS

This plugin-based data analysis approach also provides high flexibility and specificity, using targeted algorithms optimized to the exact application needs

Plugin	Description	PN
Aspheric	Analysis of deformation coefficients and the residual roughness from aspheric surfaces.	SENSOPROASPHERIC
Ball Bond	Dimensions of the primary bonding structure of wires on PCBs.	SENSOPROBALLBOND
Ball Stitch	Analysis of multiple parameters of wire bonding structures, such as height and diameters.	SENSOPROBALLSTITCH
Barcode	Read a sample's barcode and calculate the desired dataset's flatness (Sz).	SENSOPROBARCODE
Blobs	Detection of blobs present on a surface.	SENSOPROBLOBS
Bolet	Analysis of squared-shaped structures of the MEMs.	SENSOPROBOLET
Bump	Analysis of bumps across a surface.	SENSOPROBUMP
Bump Distance	Calculates the distances between rectangular bumps, along with their height and width.	SENSOPROBUMPDISTANCE
C Trace	Analysis of trenches across a non-completely flat surface.	SENSOPROCTRACE
C Trench	Analysis of traces across non-completely flat surface.	SENSOPROTRENCH
Center Dimple	Enables the characterization of concave and convex dimples right at the center of the circular pad area.	SENSOPROCENTERDIMPLE
Center Width	Width and height of a very critical structure on PCBs.	SENSOPROCENTERWIDTH
Chip Angle	Provides the angle between each chip and its closest substrate area within a chip array.	SENSOPROCHIPANGLE
Circle centers	Analysis of circle diameteres and distance between circle centers.	SENSOPROCIRCLECENTERS
Circle Pad	Analysis of conductive circular pads on the surface of a printed circuit board (PCB).	SENSOPROCIRCLEPAD
Color Concentricity	Analysis of concentricity between three circles of the topography using color information.	SENSOPROCCONCENTRI
Concentricity	Analysis of the concentricity between two circles of different depths.	SENSOCONCETRI
Concentricity A	Analysis of concentricity of -two non-consecutive circles.	SENSOCONCETRIA
Concentricity B	Analysis of concentricity of checking structure in a PCB.	SENSOCONCETRIB
Cross A Pad	Analysis of concentric cross-like pad structures in PCBs.	SENSOPROCROSSAPAD
Cross B Pad	Analysis of cross-like pad structures with two different depths in PCBs.	SENSOPROCROSSBPAD
Cross Kerf	Analysis of kerf marks in the form of a cross present on a wafer.	SENSOPROCROSSKERF
Cruz	Analysis of cross-shaped structures of the MEMs.	SENSOPROCRUZ
C Trace	Analysis of trenches across a non-completely flat surface.	SENSOPROCTRACE
C Trench	Analysis of traces across a non-completely flat surface.	SENSOPROCTRENCH
D Distance	Analysis of the most and least prominent distance between the selected areas.	SENSOPRODDISTANCE
Dimple	Analysis of single dimple structures on a printed circuit board (PCB), both above the surface (bump) and below (hole).	SENSOPRODUALHOLE

Dimple T	Analysis of height of dimple as a control parameter for a good connection between PCB's layers.	SENSOPRODIMPLE
Display Lens	Height, width, and radius of display lenses.	SENSOPRODISPLAYLENS
Double Circle	Analysis of the inner and outer diameters of a PCB's pad.	SENSOPRODOUBLECIRCLE
Double Step Height	Analysis of a double step height in the given FOV.	SENSOPRODOUBLESH
Dual Hole	Analysis of dual round hole structures (also known as vias), either individually or in any pattern.	SENSOPRODUALHOLE
Edge	Analysis of cutting edges.	SENSOPROEDGE
F Trace	Analysis of all kinds of trace marks across a surface, including diagonally oriented traces.	SENSOPROFTRACE
Flatness	Analysis of flatness following ISO 12781.	SENSOPROFLATNESS
Four Step Height	Analysis of the height of the layers that compose a PCB.	SENSOPROFOURSH
Glass Bump Height	Quantifies bumps between a glass plate sample and a photomask.	SENSOPROGBUMPHEIGHT
Glue	Analysis of different glue traces for optimizing glue dispense.	SENSOPROGLUE
Glue Height	Analysis of different glue traces for optimizing glue dispense.	SENSOPROGLUEHEIGHT
Groove Profile	Analysis of barbs and depths of a laser cut.	SENSOPROGROOVEPROF
Groove Spacing	Measurement of the width and length of a laser's groove.	SENSOPROGROOVESPACIN
Halfcut	Depth and width of the cutting groove of a wafer.	SENSOPROHALFCUT
Hole	Analysis of round hole structures (aka vias), either individually or in any pattern.	SENSOPROHOLE
Image trace	Performs a mean and perpendicular profile analysis of a diagonal single trace.	SENSOPROITRACE
IMCC	Analysis of intermetallic layer coverage (IMC).	SENSOPROIMCC
L Groove	Dimensional analysis of an L structure present in semiconductors.	SENSOPROLGROOVE
L Pad	Analysis of L shaped pad structures found on PCBs.	SENSOPROLPAD
Laser Cut	Analysis of laser cut across a surface.	SENSOPROLASERCUT
Laser Drill	Analysis of the height of a wafer's pad.	SENSOPROLASERDRILL
Laser Groove	Analysis of the height and the width of laser grooves present on Flexible Printed Circuits (FPCs).	SENSOPROLASERGROOVE
Laser Hole	Analysis of laser hole structures (aka vias), either individually or in any given pattern.	SENSOPROLASERHOLE
LED Angle	Analysis of the left and right angles of a microlens.	SENSOPROLEDANGLE
LED Chip	Analysis of several critical dimensions in PCBs for MicroLEDs.	SENSOPROLCHIP
Multiple Step Height	Analysis of the height difference between five separate levels.	SENSOPROMULTIPLESTEP
Pad	Analysis of the pad structures found on PCBs, either individually or in any given pattern.	SENSOPROPAD
Pad Coplanarity	Detects and analyzes all rectangular pads on PCBs, providing data on their position, area, and coplanarity.	SENSOPROPADCOP
Pad Distance	Measures the distance between pads in PCBs.	SENSOPROPADDISTANCE
Panel Particle Height	Measures the height of airborne particles present in panels.	SENSOPROPPARTHEIGHT
Piller	Analysis of round piller structures, either individually or in any given pattern.	SENSOPROPILLER

Panel Slope	Quantifies the slope on a panel's edge, as it can affect its light transmittance properties.	SENSOPROPANELSLOPE
Piller	Analysis of round piller structures, either individually or in any given pattern.	SENSOPROPILLER
POP Trim	Measure multiple width and height statistics of a trench on a PCB.	SENSOPROPOPTRIM
Power	Determines the power and irregularity of flat lenses.	SENSOPROPOWER
Probe Mark Depth	Analysis of probe marks in PCB pads.	SENSOPROPROBEMARK
Profile Trace	Measure the lateral distances between traces in a 2D image.	SENSOPROPROFILETRACE
PTV	Analysis of conformal structures to ensure all the other structures on the PCB are in the proper position.	SENSOPROPTV
Q Groove	Analysis of the depth of a groove created by a small indentation or channel in quartz material.	SENSOPROQGROOVE
R Bump	Analysis of rectangular hole structures (also known as vias), either individually or in any given pattern.	SENSOPRORBUMP
R Hole	Analysis of rectangular hole structures (also known as vias), either individually or in any given pattern.	SENSOPRORHOLE
R Pad	Analysis of rectangular pad structures found on PCBs.	SENSOPRORPAD
Resist Bridge	Analysis of structures that prevent solder mask paste flow from one solder point to another.	SENSOPRORBRIDGE
Slope Groove	Analysis of the height and width of slopes present on a PCB's groove.	SENSOPROSLOPEGROOVE
Slot Hole	Analysis of the rotation of non-circular holes and slots.	SENSOPROSLOTHOLE
Solder Mask	Analysis of Solder Mask traces. Solder Mask layers are usually applied to printed circuit boards (PCB) as protective layers.	SENSOPROSOLDERMASK
Spacer	Analysis of spacers across a surface.	SENSOPROSPACER
Spheric	Analysis of radius and the residual roughness from Spheric surfaces.	SENSOPROSPHERIC
Square	Automatic detection and analysis of squared pads with two different depths.	SENSOPROSQUARE
Square Groove	Analysis of the width and depth of grooves within squares in PCBs..	SENSOPROSQUAREPAD
Square Pad	Analysis of square pads on Solder Resist Opening (SRO).	SENSOPROSQUAREPAD
Step Height	Analysis of a single step height present on a surface.	SENSOPROSTEPHEIGHT
Step Height ISO	Analysis of a single standard step heights according to ISO 5436.	SENSOPROSTEPHEIGHTISO
Step Number	Finds defects in optical surfaces and characterizes their size.	SENSOPROSTEPNUMBER
Surface Texture	Analysis of surface texture in accordance with the corresponding parameters defined by ISO 25178.	SENSOPRO
Surface Texture Profile	Analysis of amplitude parameters of a centered profile on the surface, in accordance with ISO 21929.	SENSOPRO
T Padl	Analysis of T shaped pad structures found on PCBs.	SENSOPROTPAD
Taper Anglel	Analysis of an etched film dimensions.	SENSOPROTAPERANGLE
Three Step Height	Analysis of the height difference between three different levels.	SENSOPROMULTIPLESTEP
Trace Climb	Thickness analysis of an inclined trace.	SENSOPROTRACECLIMB
Traces	Analysis of trace marks across a surface.	SENSOPROTRACE
Trench	Analysis of trenches across a surface.	SENSOPROTRENCH
Trim	Characterizes the blades that cut the wires after the wire bonding.	SENSOPROTRIM

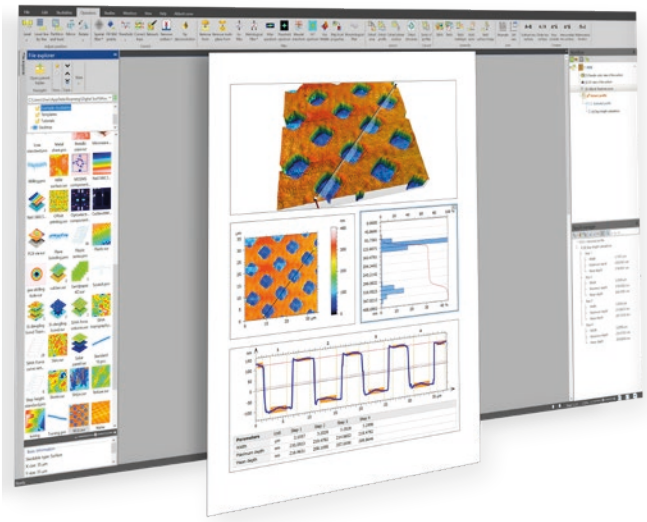
Triple Bump	Analysis of bumps with three-step-height.	SENSOPROTRIPLEBUMP
V Groove	Angle analysis of the v-shaped grooves in optical communications.	SENSOPROVGROOVE
V Hole	Excels at detecting V-shaped holes as small as 200 nm, meticulously crafted using laser technology.	SENSOPROVHOLE
VTP	Analysis of conformal structures, to ensure all the other structures on the PCB are in the right position.	SENSOPROVPT
Wafer Glue	Analysis of the glue between the die and the PCB board.	SENSOPROWAFERGLUE
Wafer Groove	Analysis of key parameters for the cut practiced on a wafer for chip separation, known as Sawing process.	SENSOPROWGROOVE
Wafer Groove Single Line	Analysis of one dicing trace.	SENSOPROWGSL
Wafer Groove Single Line Far	Analysis of three dicing traces.	SENSOPROWGSLF
Wafer Groove Two Lines	Analysis of two dicing traces.	SENSOPROWGTL
Wafer Groove Two Lines Far	Analysis of three cuts made during dicing.	SENSOPROWGTLF
Wafer Pad	Analysis of pads on the surface of a wafer, either individually or in any given pattern.	SENSOPROWPAD
X Pad	Analysis of cross pad structures found on PCBs.	SENSOPROXPAD

SensoMAP

SensoMAP software is the perfect surface imaging, analysis, and metrology solution fully integrated with Sensofar 3D optical profilers. Designed for use with the broadest range of research and industrial applications, it includes:

- Imaging – visualization of surface data using cutting-edge imaging technology and intelligent filters.
- Metrology – analytical studies in accordance with the latest standards and methods.
- Report Creation – a creation of detailed, accurate, multi-page surface analysis reports in a smart desktop publishing environment with powerful automation features to speed up analysis.

SensoMAP is a powerful 3D analysis, documentation, and reporting tool. It contains a complete and comprehensive set of tools, surface transformations, and measurements focused on obtaining 3D data for your sample. These include:



- Position adjustment (mirror, rotate)
- Surface correction (spatial filtering, fill non-measured points, threshold, outliers...)
- Filtering (metrological filter, remove form, morphological filter...)
- Extraction (profile, contour, area, channels, detect structures...)
- Assemble options (patch, stitch, create series of surfaces...)
- Comparison (subtraction, division or intercorrelation between surfaces)
- 2D and 3D advanced visualization modes (configurability of the frame style, palette, rendering, axis settings…)

- Geometrical analysis (manual measurements, step height, contour analysis in profiles...)
- Structural Analysis (fractal, volume, peak count distribution...)
- Roughness Analysis (2D and 3D roughness parameters)
- Frequency Analysis (texture direction, frequency spectrum, average power spectral density...)
- Functional analysis (Abbot curve, Sk parameters, volume parameters, histogram...)
- Shell analysis (freeform visualization and refining, shell roughness parameters, surface texture parameters, extraction of topographies and contours)
- CAD compare functionality, automatic or manual alignment options, and configurable color palette of the CAD compare deviation display.

SensoMAP is a scalable software available on two product levels:

SensoMAP Standard provides the features required for standard surface imaging and analysis. In addition, it has numerous optional modules that can be added anytime for advanced and specialized applications.

PN SENSOMAPV10 STD | SensoMAP Standard analysis software v10

SensoMAP Premium is a much more powerful solution in terms of features. It includes all the modules except Advanced contour, Shell extension, Shell topography, Shell CAD compare, Colocalization, Lead analysis (Twist), Fiber analysis, Scale-sensitive fractal analysis and Thickness analysis. Other highly specialized modules can be added if required.

PN SENSOMAPV10 PRE | SensoMAP Premium analysis software v10

SensoMAP Software Network License allows using the software on several computers on a network. The number of computers that can use the software simultaneously depends on the number of "seats" purchased with the network license.

PN SENSOMAPV10 NET | SensoMAP Software network license v10

OPTIONAL MODULES

Module	Description	PN
4D Surface change	Analyze surface change with respect to time, temperature, or another dimension. Quantify wear & deposit.	SENSOMAPV10 M 4DSC
Advanced contour	Advanced dimensioning and tolerancing, DXF CAD compare, Gothic arch.	SENSOMAPV10 M ADVCONT
Advanced profile	Advanced profile filtering, fractal and Fourier analysis, statistical analysis of series of profiles.	SENSOMAPV10 M ADVPROF
Advanced topography	Advanced studies, parameters & filters for 3D ("areal") surface texture analysis.	SENSOMAPV10 M ADVTOPO
Automotive	Assess functional performance with a full set of profile parameters developed by the automotive industry.	SENSOMAPV10 M AUTO
Colocalization	Colocalize and adjust surface and image data from different detectors or instrument types.	SENSOMAPV10 M COL
Contour	Basic geometric dimensioning & tolerancing of contour profiles and horizontal contours extracted from images and surfaces.	SENSOMAPV10 M CONT
Fiber analysis	Analysis of fiber morphology, including diameter and direction, on topographical data, among other data types.	SENSOMAPV10 M FIBER
Fourier & Wavelets	FFT-based texture analysis, advanced FFT filtering and multi-scale analysis by wavelets.	SENSOMAPV10 M FFTWAVE
Lead analysis	2nd generation lead (twist) analysis for the automotive industry.	SENSOMAPV10 M TWIST
Particle analysis	A comprehensive toolset for detecting and analyzing particles, pores, grains, islands, etc. on structured surfaces.	SENSOMAPV10 M PART
Scale-sensitive analysis	Multi-scale analysis based on length-scale or area-scale analyses (formerly in Sfrax software).	SENSOMAPV10 M SSFA
Shell extension	Freeform surface management, complex shape analysis, high-quality 3D visualization.	SENSOMAPV10 M SHELL
Shell topography	A metrological toolbox for shell data (freeform surfaces). Visualize surface curvature and deviation as colors in 3D view. Apply Gaussian-like filtering to calculate a smooth reference surface. It gives access to all features contained in the Shell Extension module.	SENSOMAPV10 M SHELLT
Shell CAD compare	Compare measured Shell (freeform surface) data with CAD models (nominal) or generated meshes. It includes manual or automatic alignment, fine-tuned fitting, and deviation visualization using color coding. This module gives access to all features contained in the Shell Extension and Shell Topography modules.	SENSOMAPV10 M SHELLC
Thickness	Global or zone-specific interactive thickness characterization based on a pair of surfaces or profiles.	SENSOMAPV10 M THSS

SDK

SensoSCAN software development kit (SDK) offers the tools and protocols needed to create proprietary applications that can communicate and manage SensoSCAN. The developers can choose between DLL and XML to develop their applications. SensoSCAN SDK commands and events can remotely inspect a sample and perform measurements based on acquisition recipes. Once a proprietary application has been developed using SensoSCAN SDK, multiple systems can use it.

Interface of communication	Language	Operating system
Dll library	C++, C#	Windows 64 bits
XML+ TCP/IP UDP/IP	Any	Any

The SDK Client application to see the SDK's capabilities. It contains all the commands listed and exemplifies what a specific command does, how it is written, and what the resulting events are. Furthermore, users have access to the SDK client source code.

PN SSDKDLL | SDK DLL license

Additionally, there is the SDK stitching module. It provides different stitching algorithms so that integrators can stitch offline with the data acquired in their measuring station.

PN SDKEMM | SDK EMM module

SENSOFAR

METROLOGY

SENSOFAR is a leading-edge technology company that has the highest quality standards within the field of surface metrology

Sensofar provides high-accuracy optical profilers based on confocal, interferometry, and focus variation techniques, from standard setups for R&D and quality inspection laboratories to complete non-contact metrology solutions for in-line production processes. The Sensofar Group has its headquarters in Barcelona, a European technology and innovation hub. The Group is represented in over 30 countries through a global network of partners and has its own offices in Asia, Germany, and the United States.

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