



3D Optical Profiler

SENSOFAR
METROLOGY

Product Guide



Basic Features

■ Description



The new 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.

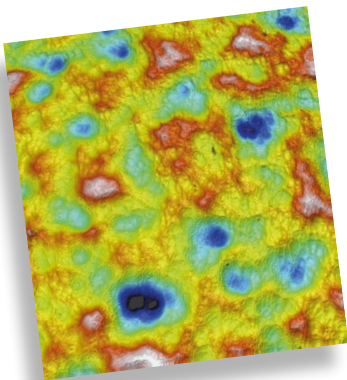
With the 5th generation of the S neox systems, the goal has been to make it easy to use, intuitive and faster. Even if you are a beginner, the system can be managed with just one click. Software modules have been created to adapt the system to the user requirements.

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).

Everything is faster than before with new smart and unique algorithms and a new camera. Data acquisition is taken at 180 fps. Standard measurement acquisition is 5X faster than before.

■ Technology

CONFOCAL



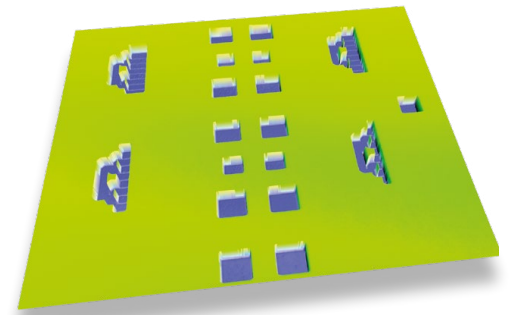
Confocal profilers have been developed to measure the surface height of smooth to very rough surfaces. Confocal profiling provides the highest lateral resolution that can be achieved by an optical profiler. Thus, spatial sampling can be reduced to $0.01\ \mu\text{m}$, which is ideal for critical dimension 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°). The proprietary confocal algorithms provide vertical repeatability on the nanometer scale.

- **CONTINUOUS CONFOCAL** has been developed to acquire in Confocal technique using a continuous z-axis scan. Acquisition speed is roughly 3X faster than Sensofar's own Confocal approach while maintaining comparable repeatability and accuracy.
- **CONFOCAL FUSION** refers to new measurement technique that draws the best out of Sensofar's Confocal and Focus Variation

techniques by using a unique smart algorithm that yields the most reliable data from a single scan. It is ideal for highly complex or technical surfaces exhibiting both steep rough and steep smooth areas, and where a traditional confocal approach alone would fail to capture the surface adequately.

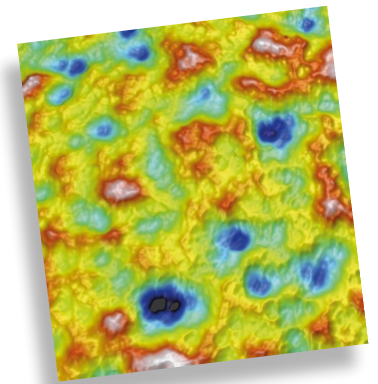
INTERFEROMETRY

- ❑ **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:** The system scans the required range in Z. The PSI algorithm is applied in. Used for: Measuring ultra-polished / polished / flat surfaces with low / mid roughness, achieving low system noise (down to 1 nm) independent of the magnification of the objective.
- ❑ **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.



Ai FOCUS VARIATION^{NEW}

Active illumination Focus Variation is an optical technology that has been 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, and is specifically designed to complement confocal measurements at low magnification. It has been improved with the use of active illumination to get more reliable focus location even on optically smooth surface. Highlights of the technology include high slope surfaces (up to 86°), highest speeds (mm/s) and large vertical range measurements.



■ Configuration

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

HARDWARE OPTIONS

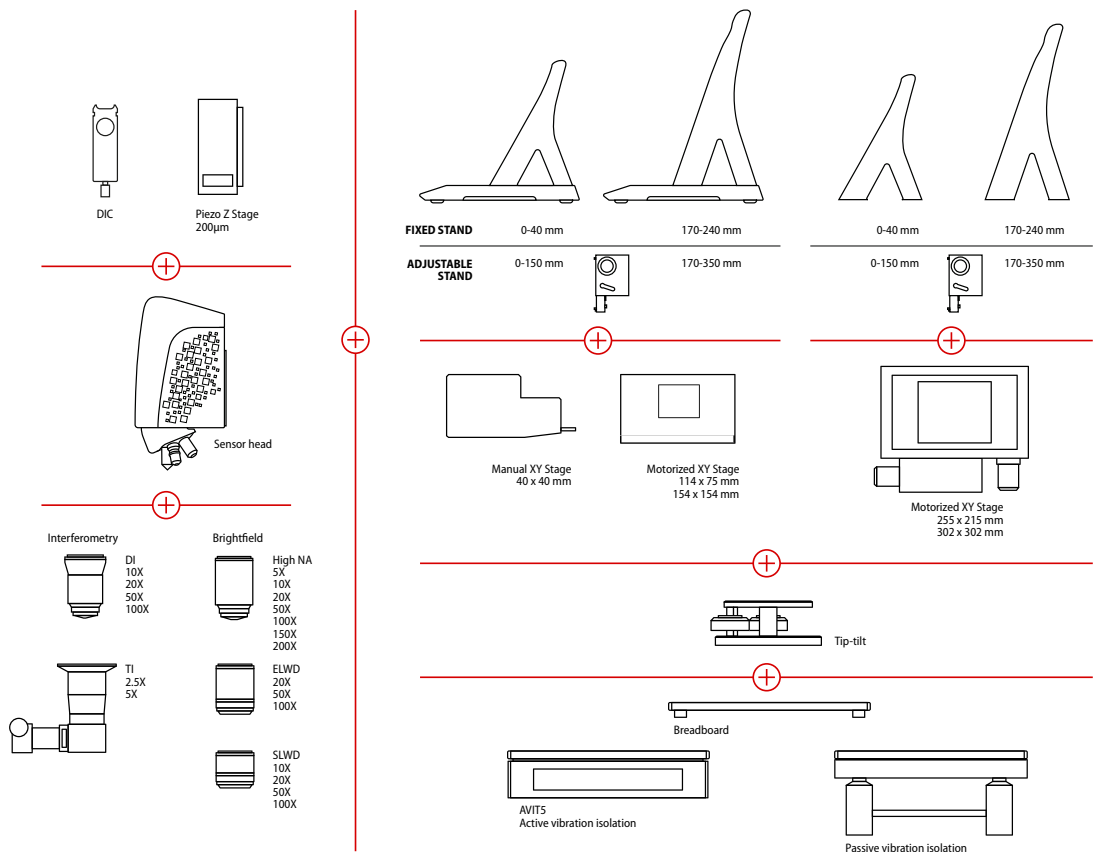
The sensorhead can be mounted either to the bridge directly or to an adjustable column also attached to the bridge. The bridge can be fixed either to a base or a breadboard depending on the configuration. All these sets will be framed within the group Stands.



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 a manual tip-tilt.

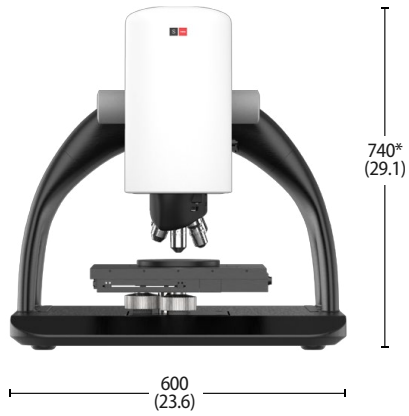
The S neox can be configured with brightfield and interferometry objective lenses depending on the technique required.

Optionally, for highest accuracy and repeatability measurements a PZT vertical scanner with 200 µm travel length is recommended. There is also the option of a DIC (Differential Interference Contrast) to emphasize very small height features that has no contrast in normal observation.

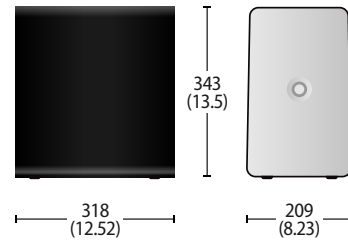


MECHANICAL DIMENSIONS

STANDARD



CONTROLLER



HIGH

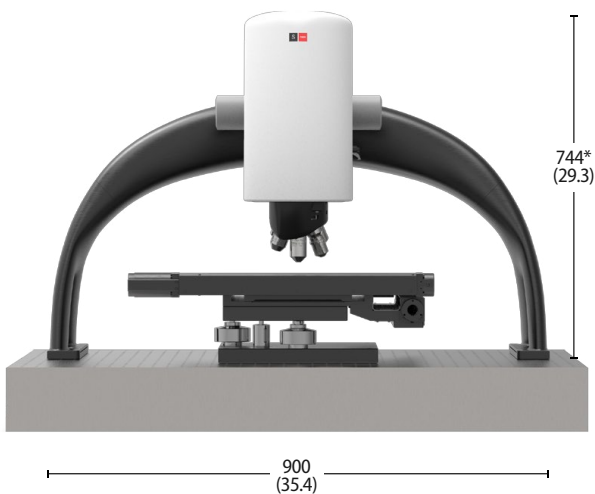


S neox	Dimensions						Weight**	
	L		H*		W*		kg	lbs
	mm	in	mm	in	mm	in		
STANDARD	600	23.6	740	29	610	24	61	134
HIGH	635	25	945	37.2	610	24	66	145
WIDE	900	35.4	744	29.3	560	22	59	130
HIGH+WIDE	935	36.8	918	36	560	22	63	139

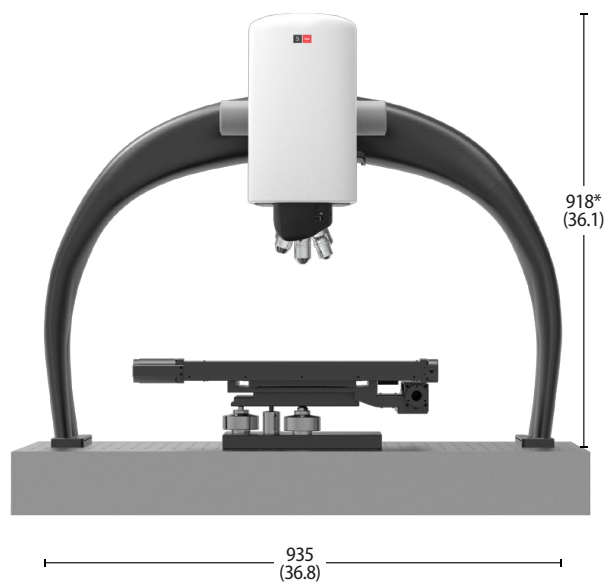
*Height & Width refer to maximum values due to different settings and configurations.

**Weight refers to the system only.

WIDE



HIGH+WIDE



SYSTEM SPECIFICATIONS

Measuring principle	Confocal, PSI, ePSI, CSI, Ai Focus Variation and Thin Film
Observation types	Brightfield, DIC, Sequential Color RGB, Confocal, Interferential Phase Contrast
Measurement types	Image, 3D, 3D thickness, profile and coordinates
Camera	5Mpx: 2448x2048 pixels (60 fps)
Total magnification (27")/Display Res.	60X - 21600X / 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 coarse	Linear stage: 40 mm range; 5 nm resolution
Vertical scan range fine	Piezoelectric scanner with capacitive sensor: 200 μ m range; 1.25 nm resolution
Max. Z measuring range	PSI 20 μ m; CSI 10 mm; Confocal & Ai Focus Variation 34 mm
XY stage range	Manual: 40x40 mm; Motorized: 114x75 mm, 154x154 mm, 255x215 mm, 302x302 mm
LED light sources	Red (630 nm); green (530 nm); blue (460 nm) and white (575 nm; center)
Ring light illumination	Green ring light compatible with 6 position nosepiece
Nosepiece	6 position fully motorized
Sample reflectivity	0.05 % to 100%
Sample weight / height	up to 25 Kg / 40 mm (standard); 150 mm and 350 mm (optional)
User management rights	Administrator, supervisor, advanced operator, operator
Advanced software analysis	SensoMAP, SensoPRO, SensoMATCH, SensoCOMP (optional)
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 °C to 35 °C; Humidity <80 % RH; Altitude <2000 m

ACCURACY AND REPEATABILITY¹

Standard	Value (nm)	Piezoelectric scanner U, σ	Linear scanner 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

Standard	Value (μ m)	Piezoelectric scanner U, σ	Linear scanner U, σ	Technique
Areal roughness (Sa) ²	0.79	U = 0.04 μ m σ = 0.0005 μ m	U = 0.03 μ m σ = 0.002 μ m	Confocal, AiFV & CSI
	2.40	U = 0.03 μ m σ = 0.002 μ m	U = 0.025 μ m σ = 0.004 μ m	Confocal, AiFV & CSI
Profile roughness (Sa) ³	0.88	U = 0.015 μ m σ = 0.0005 μ m	U = 0.015 μ m σ = 0.004 μ m	Confocal, AiFV & CSI
	0.23	U = 0.005 μ m σ = 0.0002 μ m	U = 0.01 μ m σ = 0.001 μ m	Confocal, AiFV & CSI

¹ 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.

Objective Lenses

■ Specifications

The S neox uses premium CF60-2 Nikon objective lenses that have been designed to correct for chromatic aberrations and produce sharp, flat and clear images with high contrast and high resolution. Phase Fresnel lenses improve the operability and the working distance, meaning that S neox lenses provide the largest available working distance for each NA.

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

Brightfield objective lenses

Magnification	NA	WD (mm)	FOV (μm)	Spatial Sampling (μm)	Optical Resolution Green (μm)	Optical Resolution Blue (μm)	Optical Resolution Red (μm)	Optical Resolution White (μm)	Maximum Slope (°)	System noise (nm)
1X EPI	0.03	3.80	16891 x 14131	6.90	5.41	4.68	6.43	5.85	2	-
2.5X EPI	0.075	6.50	6756 x 5652	2.76	2.16	1.87	2.57	2.34	4	300
5X EPI	0.15	23.50	3378 x 2826	1.38	1.08	0.94	1.29	1.17	9	100
10X EPI	0.30	17.50	1689 x 1413	0.69	0.54	0.47	0.64	0.58	17	30
20X EPI	0.45	4.50	845 x 707	0.34	0.36	0.31	0.43	0.39	27	8
50X EPI	0.80	1.00	338 x 283	0.13	0.20	0.18	0.24	0.22	53	4
50X EPI	0.80	2.00	338 x 283	0.13	0.20	0.18	0.24	0.22	53	4
50X EPI	0.95	0.35	338 x 283	0.13	0.17	0.15	0.20	0.18	72	4
100X EPI	0.90	1.00	169 x 141	0.07	0.18	0.16	0.21	0.19	64	3
100X EPI	0.90	2.00	169 x 141	0.07	0.18	0.16	0.21	0.19	64	3
100X EPI	0.95	0.32	169 x 141	0.07	0.17	0.15	0.20	0.18	72	3
150X EPI	0.90	1.50	113 x 94	0.05	0.18	0.16	0.21	0.19	64	2
150X EPI	0.95	0.20	113 x 94	0.05	0.17	0.15	0.20	0.18	72	2
20X ELWD	0.40	19.00	845 x 707	0.34	0.41	0.35	0.48	0.44	24	10
50X ELWD	0.60	11.00	338 x 283	0.13	0.27	0.23	0.32	0.29	37	5
100X ELWD	0.80	4.50	169 x 141	0.07	0.20	0.18	0.24	0.22	53	3

10X SLWD	0.20	37.00	1689 x 1413	0.69	0.81	0.70	0.96	0.88	12	50
20X SLWD	0.30	30.00	845 x 707	0.34	0.54	0.47	0.64	0.58	17	20
50X SLWD	0.40	22.00	338 x 283	0.13	0.41	0.35	0.48	0.44	24	15
100X SLWD	0.60	10.00	169 x 141	0.07	0.27	0.23	0.32	0.29	37	10

Interferometry objective lenses

Magnification	NA	WD (mm)	FOV (µm)	Spatial Sampling (µm)	Optical Resolution Green (µm)	Optical Resolution Blue (µm)	Optical Resolution Red (µm)	Optical Resolution White (µm)	Maximum Slope (°)	
2.5X TI*	0.075	10.30	6756 x 5652	2.76	2.16	1.87	2.57	2.34	4	
5X TI	0.13	9.30	3378 x 2826	1.38	1.25	1.08	1.48	1.35	7	
10X DI	0.30	7.40	1689 x 1413	0.69	0.54	0.47	0.64	0.58	17	
20X DI	0.40	4.70	845 x 707	0.34	0.41	0.35	0.48	0.44	24	
50X DI	0.55	3.40	338 x 283	0.13	0.30	0.26	0.35	0.32	33	
100X DI	0.70	2.00	169 x 141	0.07	0.23	0.20	0.28	0.25	44	
System noise				PSI/ePSI	0.1 nm (0.01 nm with PZT)		CSI	1 nm		

*The 2.5X TI objective cannot be used simultaneously with other objectives.

■ Selection Guide

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

S neox uses brightfield and interferometry objective lenses. To perform interferometric and confocal measurements at high magnifications, a vibration isolated environment is required. 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 EPI to 150X EPI	High light efficiency and high numerical aperture
Low local slope with few nanometer features (flat samples)	Confocal and CSI	50X EPI to 150X EPI 10X DI to 100X DI	High repeatability, moderate numerical aperture and low to high magnification
Low local slope and large FOV	PSI	2.5X TI to 5X TI	Low magnification and high repeatability
Rough surface			
Large FOV	Confocal and CSI	10X EPI to 20X EPI 10X DI to 20X DI	Extended measurements and moderate numerical aperture for low magnification

High local slope with few nanometer features	Confocal	50X EPI to 150X EPI	High numerical aperture and magnification
High aspect ratio	Confocal	10X SLWD to 100X SLWD	Low numerical aperture and super long working distance
High local slope	Ai Focus Variation	5X EPI to 20X EPI	Low magnification
Form and shape	Ai Focus Variation	5X EPI to 20X EPI	Low magnification

Transparent layers

Thin film	Reflectometry	10X DI	Low magnification
Thick film	Confocal and CSI	5X EPI to 20X EPI 2.5X TI to 10X DI	Low magnification for CSI and high NA for confocal

■ Techniques Comparison

	Confocal	Interferometry	Ai Focus Variation
Magnification	High magnifications up to 150X	Low magnifications down to 2.5X (large FOVs with Armstrong system noise)	High magnifications up to 150X
NA	Very high NA from 50X magnifications allowing measurement of slopes up to 70° for smooth surfaces (86° for rough surfaces)	Highest NA is 0.70 (100X)	Even NA slopes up to 86° with scattering surfaces can be measured
System noise	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	Minimum system noise is 10 nm
Optical resolution	Short wavelength and high NA, lateral resolutions up to 0.15 μm	Short wavelength, lateral resolutions up to 0.20 μm	Short wavelength and high NA, lateral resolutions up to 0.44 μm
Acquisition speed	Fast acquisition for 20 planes, 3 seconds	Speed does not depend on magnification	Really fast acquisition 200 planes in 3 seconds
Film thickness	Thick film (several mm) measured with low NA and thin film (2 μm) measured with high NA. Substrate image coincides with the focus position allowing measurement of the roughness substrate	Transparent films from 50nm to 1,5 μm with reflectometry (10XDI) and thickness measurement from 1,5 μm to 100um in CSI mode	Not applicable

Standard Configuration



■ Sensorhead

S neox, 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 PZT option).

The standard configuration includes:

- Sensorhead
 - 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
- Electronic controller
- Main controller
- 4K monitor of 3840 x 2160 pixels (27")
- Joystick
- Calibration pack

Options for sensorhead are as follows:



- Piezo: the PZT scanner z-axis is optional for S neox. This scanning device has a total travel length up to 200 μm with piezo resistive sensors for high position resolution of 0.7 nm and 1 nm of accuracy on the full travel range. It improves the interferential measurements with repeatability down to 0.01 nm.
- DIC: Differential Interference Contrast is used to emphasize very small height features that has no contrast in normal observation. With the use of a Nomarski prism, an interferential image is created resolving sub-nanometer scale structures not visible in brightfield or confocal images.

PN SSN09000 | S neox 3D Optical Profiler

PN SSN090OEM00 | S neox 3D Optical Profiler OEM

PN SSN090P00 | S neox 3D Optical Profiler w/Piezo

PN SSN090POEM00 | S neox 3D Optical Profiler w/Piezo OEM

PN SSN090D00 | S neox 3D Optical Profiler w/DIC

PN SSN090PD00 | S neox 3D Optical Profiler w/DIC -Piezo

■ Motorized Nosepiece

The 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.

PN NM00 | Motorized nosepiece

■ 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.

PN PR001541SV | HP computer Sneox 090

Main controller features	
HP Z1 Entry Tower G5 RTX 2070	
Operating system	Windows® 10 Pro 64-bit
Processor	Intel® Core™ i7-9700 (3.00 GHz, 8 cores)
RAM Memory	32 Gb
Hard Drive	256 GB SSD PCIe® NVMe™ 1 Tb SATA (7200 rpm)
Graphics	NVIDIA® GeForce RTX™ 2070 (dedicated 8 GB GDDR5)
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	9.86 Kg 21.73 lb
Power Supply	500 W

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





Joystick

The Joystick can be used to control the three axes of the motorized stage. Tilting the Joystick right to left or backward to forward moves the stage in X and Y directions, respectively. Turning the Joystick control clockwise or counterclockwise slowly moves the Z axis down or up, respectively. To move rapidly up or down on the Z axis, or left and right on XY axes, press the appropriate coarse movement buttons.

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

PN PR000724SV | Space Mouse

Calibration Pack

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

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

PN ESPJCAL20 | 2 inch calibration mirror

Calibration specimen designed to calibrate Ai Focus Variation and Confocal Continuous techniques. The nominal roughness is S_a 0.80 μm . The engraved area size is 20x20 mm.

PN PR001417 | Calibration specimen



Configurable & Optional Parts

■ XY Stages

XY stages 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.



The encoders XY stages offers the same measurement capabilities of the motorized stage but using linear optical encoders to achieve better repeatability and accuracy.

Title	Dim.(mm)	Dim. (in)	Accuracy (µm/mm)	Repeatability (µm)	Max. load (Kg)	Max. load (lbs)
Manual 40x40mm (1.6x1.6") XY stage	40x40	1.6x1.6	-	-	10	22
Motorized 114x75 mm (4.6x3") XY stage	114x75	4x3	0.20	±0.2	10	22
Motorized 154x154 mm (6x6") XY stage	154x154	6x6	0.15	±0.7	10	22
Motorized 255x215 mm (10x8.5") XY stage*	255x215	10x8.5	0.15	±0.7	25	55
Motorized 302x302 mm (12x12") XY stage*	302x302	12x12	0.15	±0.7	25	55

PN XYM09000 | Manual 40x40mm (1.6x1.6") XY stage

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*

PN XYH11209000 | Motorized 302x302 mm (12x12") XY stage*

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

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

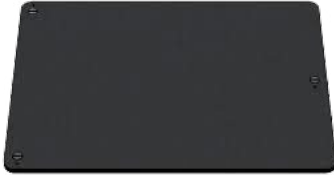
PN XYH116E09000 | Encoded motorized 255x215 mm (10x8.5") XY stage*

PN XYH112E09000 | Encoded motorized 302x302 mm (12x12") XY stage*

**Breadboard required*

■ 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.



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



PN RPH101 | Rotary plate for 114x75 mm XY stage

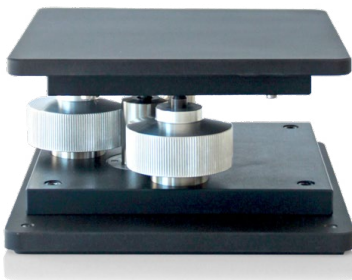
PN RPH105 | Rotary plate for 154x154 mm XY stage

PN RPH116 | Rotary plate for 255x215 mm XY stage

PN RPH112 | Rotary plate for 302x302 mm XY stage

■ Tip-tilt

A manual tip-tilt stage is used to balance the tilt of the surface under measurement. It allows the surface to be placed perpendicular to the optical axis. It is of great benefit when taking interferometric measurements, as it places the surface at a position called null fringes.



PN TIPTILTM00 | Tip-tilt stage for manual XY stage

PN TIPTILTH10X00 | Tip-tilt stage for H10X XY stage**

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

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

**Breadboard required*

*** Compatible with Stage 101/105*

■ Stands

The base and column holder supplied with S neox is made on aluminium. The stand is designed for thermal stability.



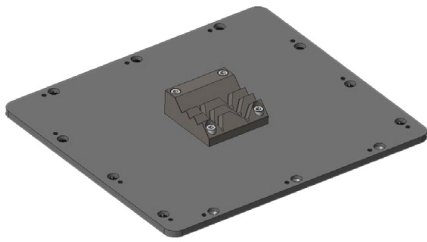
Stage	Max. sample height* (mm)		Max. sample height* (mm)		
	Fixed	Adjustable	Fixed	Adjustable	
Manual XY stage	0 - 40	0 - 150	172 - 242	172 - 352	
H101	Flat plate	0 - 40	0 - 150	172 - 239	172 - 349
	Rotary plate	0 - 40	0 - 150	172 - 239	172 - 349
H105	Flat plate	0 - 40	0 - 150	172 - 239	173 - 349
	Rotary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

*Minimum and maximum sample heights



Stage	Max. sample height (mm)		Max. sample height (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	

*Minimum and maximum sample heights



■ **Insert Holder** OPTION

The insert holder helps position this kind of cutting tools. In this way, the insert remains ideally placed for correct measurement. There are two part numbers depending on the XY Stage.

PN PR001665 | H101 Flat Plate + Insert Holder

PN PR001666 | H105 Flat Plate + Insert Holder

■ **Basemounts** OPTION

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 senses the vibration and compensates it actively by using fast actuators.

ACTIVE VIBRATION ISOLATION SUPPORT



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 senses the vibration and compensates it actively by using fast actuators.

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. Main features are the automated transport locking mode and fully automatic load adjustment which makes the handling extremely straightforward. The control technology is based on piezoelectric type acceleration pickup, fast signal processing and electrodynamic 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

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

PN TAB22 | Active support frame

■ Ring Light OPTION

Ring light is based on a LED ring for illuminating samples in a uniform an efficient way. It is mounted above and around the objective, the ring light provides more signal for 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 lights models: one for 5X and 10X magnification and another one for 2.5X and 20X magnification. The ring light pack includes two ring lights and cabling.



PN RLN09001 | S neox Ring Light

■ EMO OPTION

Emergency stop function and emergency switching off function button.

PN PR001638 | Emergency Stop



■ Calibration Standard OPTION

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. There are several step heights 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 10 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 PTB (Physikalisch- Technische Bundesanstalt, the national metrology institute of Germany) .

PN PR001001 | Step height 10 μm (Sensofar traceable)

PN PR000853 | Step height 10 μm (PTB traceable)

PN PR000854 | Step height 1 μm (PTB traceable)

PN PR001685 | Step height 50 μm (PTB 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 measuring magnification simultaneously in X and Y directions or to determine image distortions such as skew, pincushion, barreling or other non-linearities. The measurement uncertainty (accuracy) is $\pm 0.5 \mu\text{m}$ over 0-10 mm and $\pm 2.5 \mu\text{m}$ 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), recertification is recommended in 5-year intervals.

PN PR001149 | Lateral calibration standard (NPL traceable)

ROUGHNESS STANDARD

Areal roughness standard with typical roughness of Sa 790 nm. This traceable high precision areal standard, 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

5-STEP REFERENCE

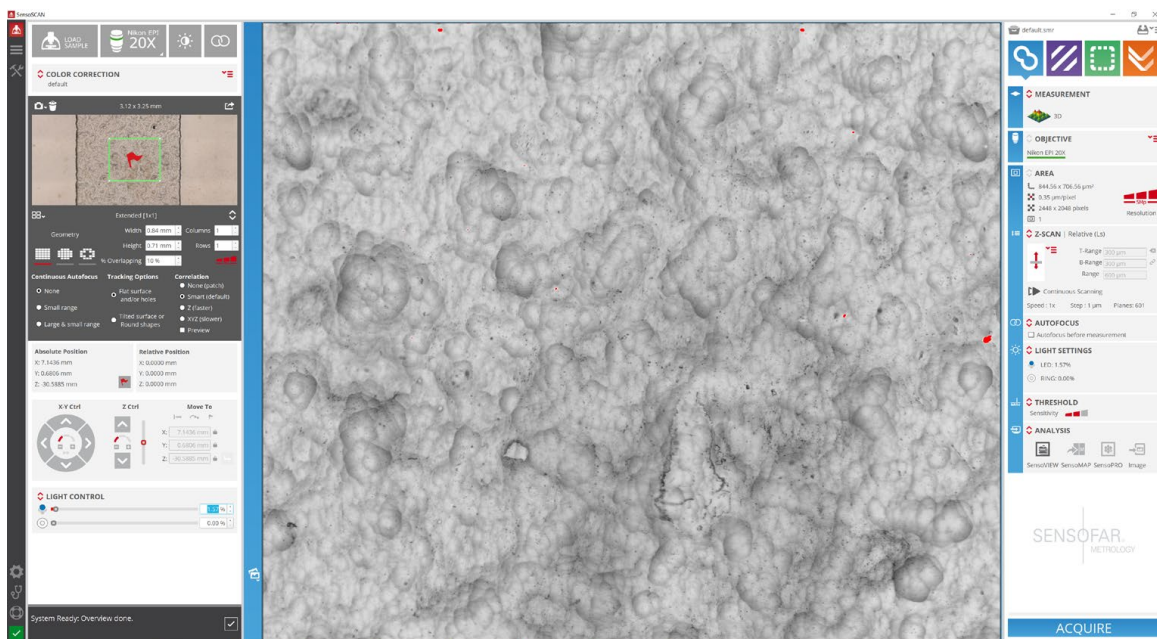
Reference step wafer consists of a 4" silicon wafer with six silicon dioxide (SiO₂) steps between 0 nm (native oxide) and 500 nm. Each thickness step has a laser marked area for which accurate ellipsometric thickness data are supplied on the corresponding calibration sheet.

PN RE05 | 5-step reference

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 interface with which any measurement can easily be taken, as well as a comprehensive set of tools for displaying and analyzing data. Main ones are:

- ❑ The system is automatically optimized depending on the measurement technique selected (Confocal, Confocal Fusion, Continuous 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).
- ❑ Numerous acquisition parameters can be adapted to best suit the intended measurement. For example, 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 and it can be installed in as many computers as you want to review, measure and report.

OPTIONAL MODULES

SensoSCAN's extended measurements module allows the user to easily define the measurement layout on the surface by means of the overview image. The area can be automatically cropped to rectangular, circular or annular areas of interest. Wide areas up to 500 million pixels are possible. Several scanning strategies such as autofocusing on each field, or sample tracking to minimize vertical scanning range are available.

PN EMM | SensoSCAN Extended measurement 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 procedures for automating measurements with the profile manager tool, sample identification, data exportation and 'pass or fail' criteria.

PN APM | SensoSCAN Automated procedures module

■ **SensoVIEW**

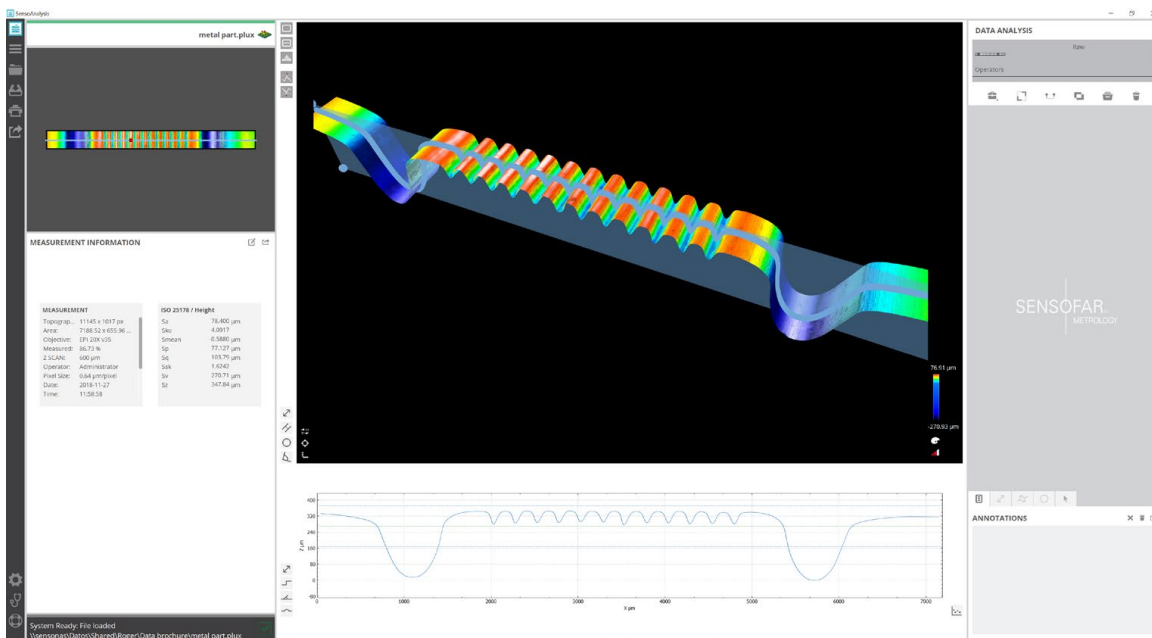
SensoVIEW is an ideal software for a broad range of analysis tasks.

Main tasks are:

- ❑ 3D (isometric) and 2D (contour, profile, histogram and bearing curve) interactive views provide multiple scaling, display and render options.
- ❑ A comprehensive suite of operators and filters to retouch data points, restore non-measurable data, form removal (plane, sphere or polynomial), apply a range of filters (thresholding, smart, kernel, ISO, FFT and rescale) and/or generate alternative layer by cropping, subtracting 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.

- ❑ 3D measurement of distance, parallel, circle and angle.
- ❑ 2D measurements of distance, step height, radius and angle.
- ❑ Analysis templates.
- ❑ Customized reports.
- ❑ Compliance with Mountains Map and other analysis softwares.
- ❑ Multiple Results Analysis in Inspection Drives Knowledge.
- ❑ Export JPG, TXT, TIFF,...



The system will come with a fully functional license of SensoVIEW and can be installed in as many computers as you want to review, measure and report.

PN SENSOVIEW | SensoVIEW

■ SensoPRO OPTION

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 SensoSCAN acquisition program, SensoPRO provides a one-click solution for data acquisition through to data analysis. Include three default plugins:

- ❑ Surface texture: Analyze surface texture in accordance with the surface texture parameters defined by the ISO 25178.
- ❑ Surface texture profile: Analyze amplitude parameters to center profile of the surface (X cut) in accordance with ISO 4287
- ❑ Step height: Analyze a single step height with any shape in the given FOV.

PN SENSOPRO | SensoPRO analysis software

OPTIONAL MODULES

Plugin	Description	PN
Bump	Analyze bumps across a surface	SENSOPROBUMP
Circle PAD	Analyze conductive circular pads present on the surface of a printed circuit board (PCB)	SENSOPROCIRCLEPAD
Cross kerf	Analyze kerf marks in the form of a cross present on a wafer	SENSOPROCROSSKERF
Double step height	Analyze a double step height in the given FOV	SENSOPRODOUBLES
Dual hole	Analyze dual round hole structures (also known as vias), either individually or in any pattern	SENSOPRODUALHOLE
Edge	Analyze cutting edges	SENSOPROEDGE
F traces	Analyze all kind of trace marks across a surface, including diagonally oriented traces	SENSOPROFTRACE
Hole	Analyze round hole structures (aka vias), either individually or in any pattern	SENSOPROHOLE
Laser cut	Analyze laser cut across a surface	SENSOPROILASERCUT
Laser hole	Analyze laser holes structures (aka vias), either individually or in any given pattern	SENSOPROLASERHOLE
Pad	Analyze the pad structures found on PCBs, either individually or in any given pattern	SENSOPROPAD
Rectangular hole	Analyze rectangular hole structures (also known as vias), either individually or in any given pattern	SENSOPRORHOLE
Solder mask	Analyze Solder Mask traces. Solder Mask layers are usually applied to printed circuit boards (PCB) as protective layers	SENSOPROSOLDERMASK
Spacer	Analyze spacers across a surface	SENSOPROSPACER
Trace	Analyze trace marks across a surface	SENSOPROTRACE
Trench	Analyze trenches across a surface	SENSOPROTRENCH

applications, SensoMAP software is the perfect surface imaging, analysis and metrology solution that is fully integrated with Sensofar 3D optical profilers. It includes:

- ❑ Imaging – visualization of surface data using cutting-edge imaging technology and intelligent filters.
- ❑ Metrology – analytical studies in accordance with the very latest standards and methods.
- ❑ Report Creation – 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 (level, mirror, rotate...)
- ❑ Surface correction (spatial filtering, fill non-measured points...)
- ❑ Filtering (form, roughness, outliers...)
- ❑ Surface extraction (profile, contour, area, layers...)
- ❑ Surface comparison and stitching
- ❑ 2D and 3D advanced visualization modes
- ❑ Geometrical analysis (distance, step height, contour...)
- ❑ Structural Analysis (fractal, volume...)
- ❑ Roughness Analysis (2D and 3D roughness parameters)
- ❑ Frequency Analysis (Fourier, wavelet decomposition...)
- ❑ Functional analysis (Abbot curve, Rk parameters, histograms...)

SensoMAP is an scalable software available on two product levels:

SensoMAP Standard provides the features required for standard surface imaging and analysis. It comes with numerous optional modules that can be added at any time for advanced and specialized applications.

PN SENSOMAPV8 STD | SensoMAP Standard analysis software v8

SensoMAP Premium is a much more powerful solution in terms of features and includes all the modules except: *Advance contour*, *Shell extension*, *Lead (Twist) analysis* and *Scale-sensitive fractal analysis*. Other highly-specialized modules that can be added if required.

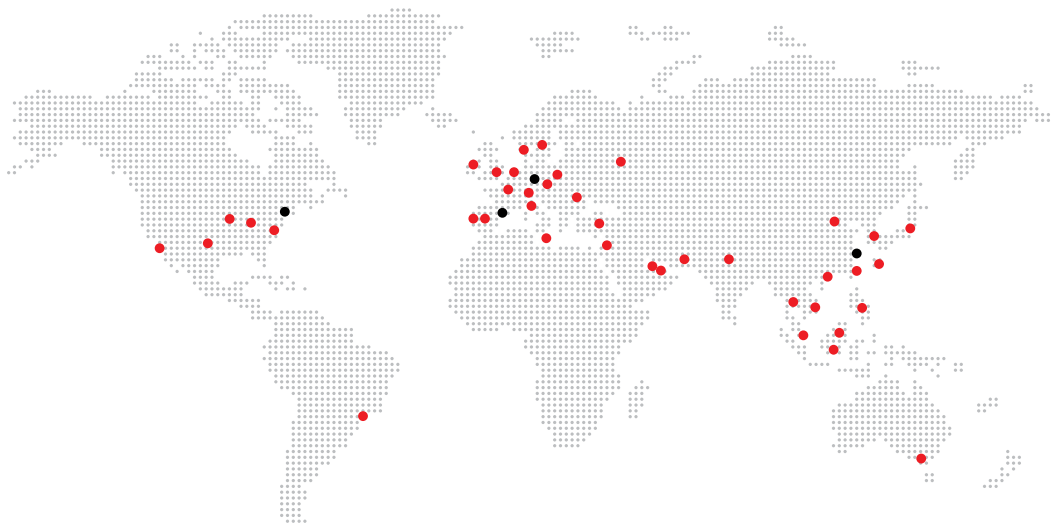
PN SENSOMAPV8 PRE | SensoMAP Premium analysis software v8

SensoMAP Software Network License allows to use 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 SENSOMAPV8 NET | SensoMAP Software network license v8

OPTIONAL MODULES

Module	Description	PN
4D Series	Analyze surface evolution with respect to time, temperature, magnetic field or another dimension	SENSOMAPV8 M 4D
Contour	Basic geometric dimensioning & tolerancing of contour profiles and horizontal contours extracted from images	SENSOMAPV8 M CONT
Advanced contour	Advanced dimensioning and tolerancing, DXF CAD compare, Gothic arch	SENSOMAPV8 M ADVCONT
Advanced profile	Advanced profile filtering, fractal and Fourier analysis, statistical analysis of series of profiles	SENSOMAPV8 M ADVPROF
Advanced topography	Advanced studies, parameters & filters for 3D (“areal”) surface texture analysis	SENSOMAPV8 M ADVTOPO
Automotive	Assess functional performance with a full set of 2D parameters developed by the automotive industry	SENSOMAPV8 M AUTO
Fourier & Wavelets	FFT-based texture analysis, advanced FFT filtering, multi-scale analysis by wavelets	SENSOMAPV8 M FFTWAVE
Particle Analysis	A comprehensive toolset for detecting and analyzing particles, pores, grains, islands etc. on structured surfaces	SENSOMAPV8 M PART
Shell Extension	Freeform surface management, complex shape analysis, high quality 3D visualization	SENSOMAPV8 M SHELL
Scale-sensitive fractal analysis	Implements a multi-scale analysis based on length-scale or area-scale analyses (formerly in Sfrax software)	SENSOMAPV8 M SSFA
Statistics	Automated statistics for multiple data populations, process capability	SENSOMAPV8 M STATS
Surface stitching	Increase profilometer range. Use stitching to expand range of all axes (including Z) and overcome instrument limitations.	SENSOMAPV8 M STITCH
Lead (Twist) Analysis	2nd generation lead (twist) analysis for the automotive industry	SENSOMAPV8 M TWIST



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

Sensofar Metrology provides high-accuracy optical profilers based on confocal, interferometry, focus variation and fringe projection techniques. Current portfolio ranges from standard setups for R&D and quality inspection laboratories to complete non-contact metrology solutions for in-line production processes. The Sensofar Group is headquartered in Barcelona, known as a technology and innovation hub in Europe. 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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