SENSOFAR

METROLOGY

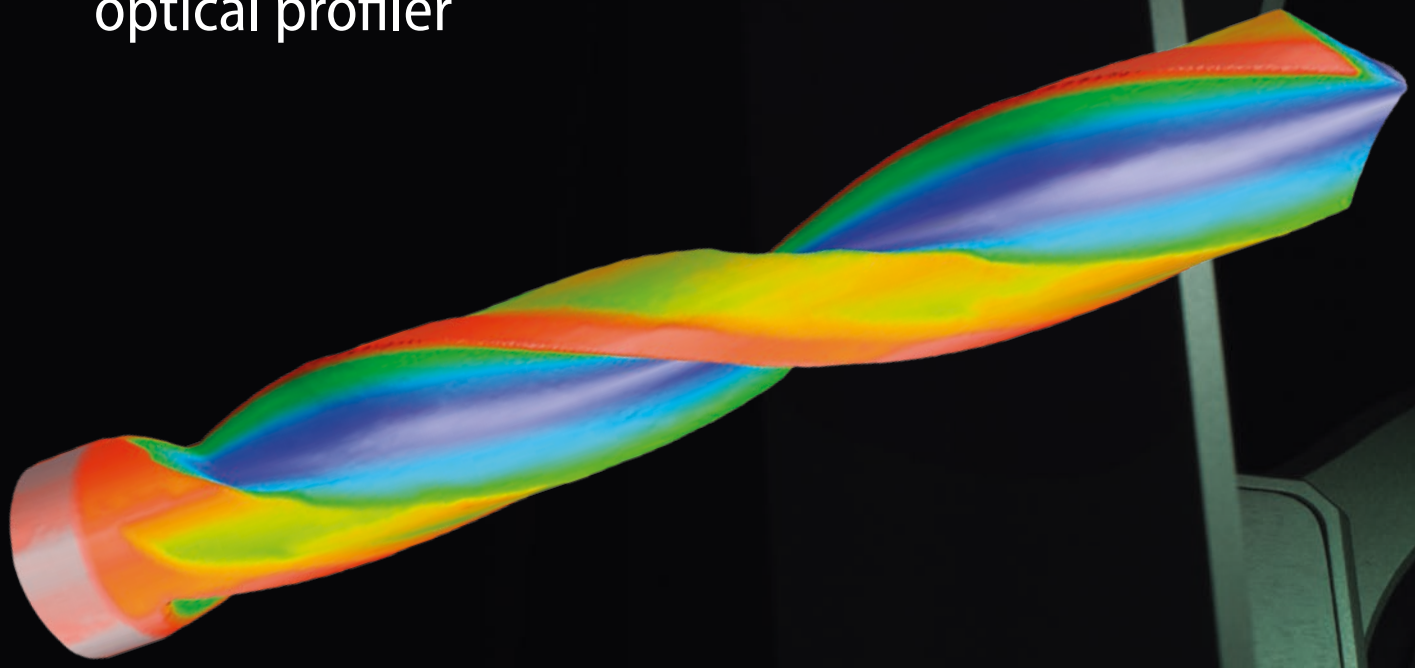
Complete 3D Measurement Solution

S neox

Five Axis

Complete acces

The **S neox Five Axis 3D optical profiler** combines a high-accuracy rotational module with the advanced inspection and analysis capabilities of the **S neox 3D optical profiler**



This enables automatic 3D surface measurements at defined positions which can be combined to create a complete 3D volumetric measurement. S neox 3D measurement technologies cover a wide range of scales, including form (Ai Focus Variation), sub nanometric roughness (Interferometry) or critical dimensions that require high lateral resolution as well as vertical resolution (Confocal).

sibility

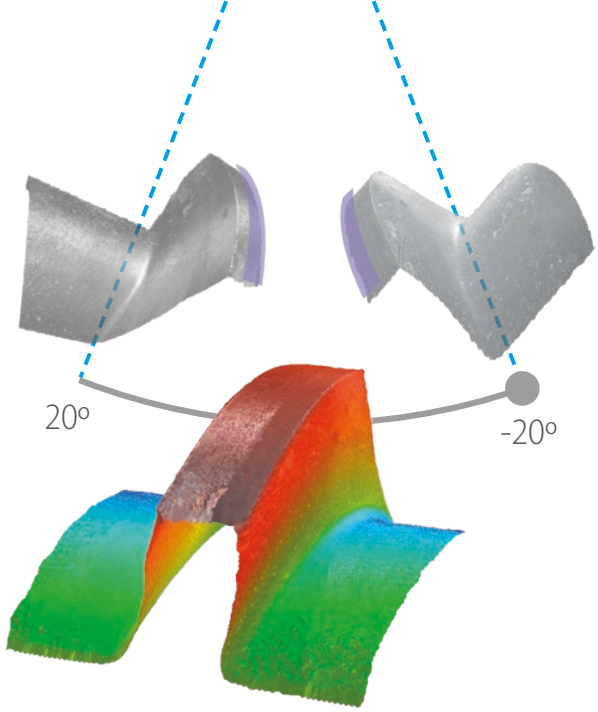
Rotational stage

The Five Axis rotational stage consists of a high-precision motorized rotating A axis with 360º of endless rotation, 10 arc sec positioning repeatability, a motorized B axis, -30º to 110º, 0.5 arc sec resolution, with limit switch. It is equipped with a System3R clamping system.

Markets and applications

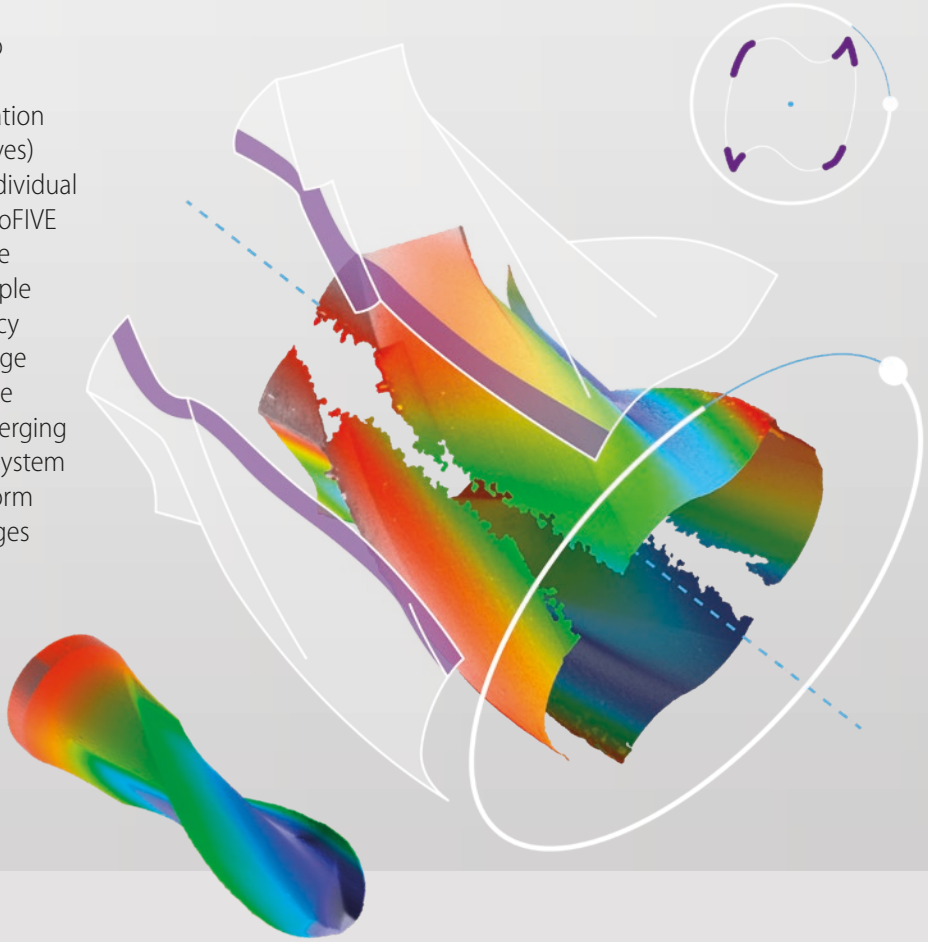
- Aerospace & Automotive
- Forensics
- Gears
- Medical Implants
- Micromanufacturing
- Surface Finish
- Cutting Tools
- Watch Manufacturing

The S neox Five Axis makes it possible to take automatic 3D surface measurements at defined positions, and combine them to create a complete 3D volumetric measurement



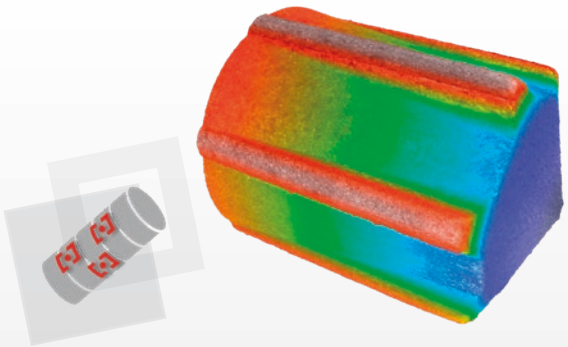
A complete 3D measurement

S neox Five Axis is able to measure the sample at different positions of rotation and elevation (perspectives) generating a group of individual measurements. The SensoFIVE software merges all of the surfaces providing a sample surface with high accuracy by using the stacked image information of each single surface measurement. Merging different elevations, the system can provide shape and form information on sharp edges and/or critical surfaces.



Connecting adjoining surfaces to measure angles greater than 90º

Measuring complex surfaces which contain steep angles is very difficult due to shadowing effects that prevent you from obtaining a complete measurement within a single acquisition. It is necessary to tilt the sample in order to measure it from two different positions and combine the two topography results to obtain the complete measurement. Five Axis rotational stage allows the sample to be positioned in opposite directions to make the entire surface visible. The system will acquire the individual measurements and then, it will merge them automatically to get the complete 3D volumetric measurement.



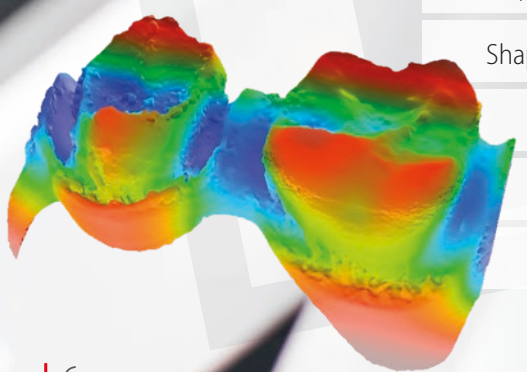
Multiple axis positions, measurements without limitation

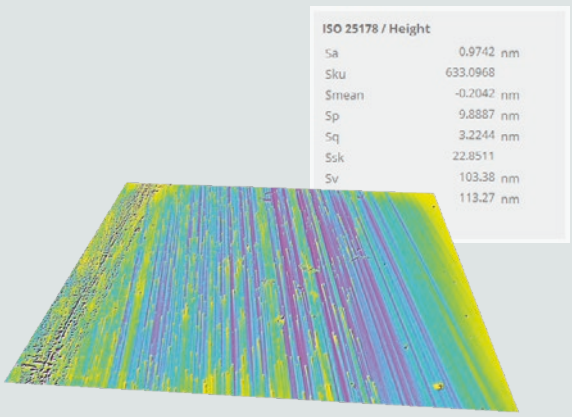
Measuring different parts of the sample with one click is possible thanks to automation routines. A user-friendly interface allows you to find the measurement position without any constraints. Then focus on the critical parts of your sample and add them to the automation routine. Finally click Acquire to obtain all parts measured with one single click. This is an incredibly fast and easy way to automate the measurement routines.

The **S neox Five Axis** is the most comprehensive and complete solution in the market for micro- and nano- scale imaging

Maxim

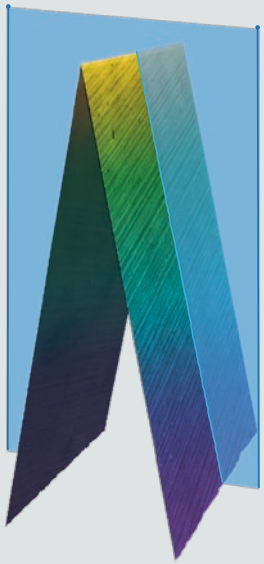
	Ai FOCUS VARIATION	CONFOCAL	INTERFEROMETRY
Shape & Form rough surfaces	★★★	★★	
Shape & Form shine surfaces	★	★★★	
Surface finish	★	★★	★★★
Small details	★	★★★	★★★
High local slopes	★★★	★	





Accurate and reliable surface finish measurements

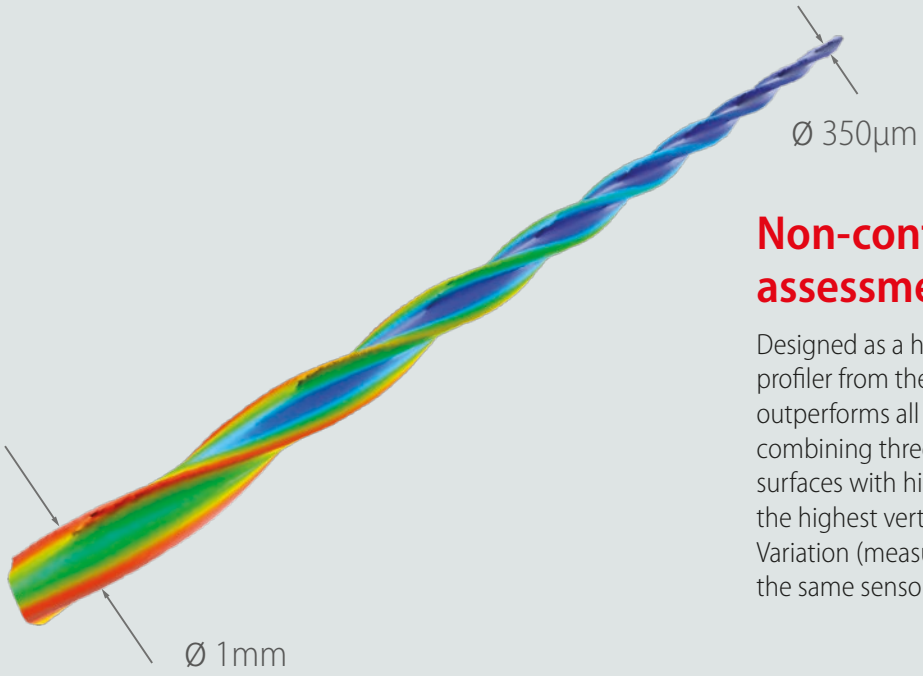
Our Confocal and Interferometry technologies allow you to measure surfaces with any kind of roughness from extremely rough (typical of additive manufacturing applications) to highly reflective surfaces of the order of 1 A as a diamond mirror-like surface. Converting our system into repetitive and traceable, according to NPL, NIST and PTB roughness standards. Ai Focus Variation technology provides a quick and easy response for measuring outstanding slopes independently of the objective lenses.



Overcoming the limitations of Focus Variation

S neox Five Axis is able to measure the shape and surface finish. Focusing on the shape, the system is able to measure samples with small diameters up to 0.5 mm and cutting edge radius up to 150 nm. Using Confocal technology and high numerical apertural (0.95) allows you to measure small cutting edge radius.

um versatility



Non-contact surface assessment

Designed as a high-performance 3D optical profiler from the outset, S neox Five Axis outperforms all existing optical profilers by combining three techniques – Confocal (best for surfaces with high slope), Interferometry (yields the highest vertical resolution) and Ai Focus Variation (measure shape in mere seconds) – in the same sensor head without any moving parts.

Discover any geometric deviation or tolerance limit of your measured part

SensoFIVE

Automatic Measurement Recipes

Five Axis measurement recipes allow you, the user, to capture the entire surface area in order to measure critical dimensions (angles, radius, contour), along with surface finish acording to ISO 25178 (form and roughness) and volume. Automated measurement routines can be executed for batch processing of parts for QA/QC applications.

ISO parameters

SensoFIVE is compliant with several ISOs. A complete selection of ISO 3D areal surface texture parameters is available: height, spatial, hybrid, functional and volumetric parameters.

Multiple exportable formats

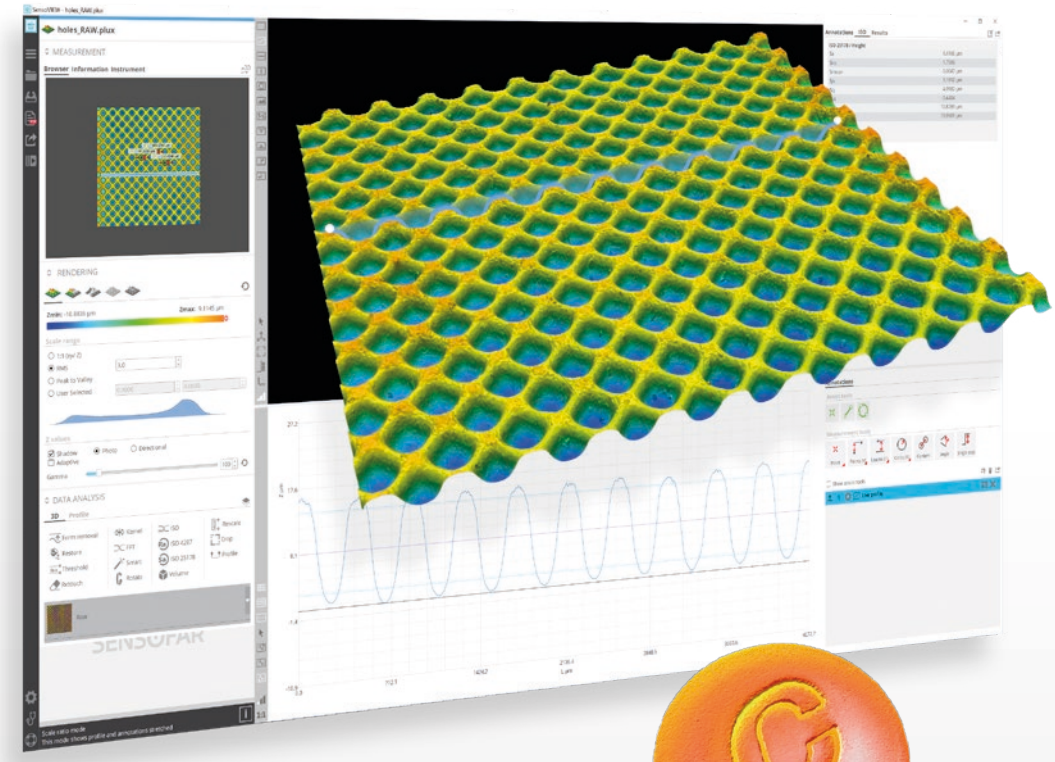
All data is exportable as PLY, STL, STEP, IGES, g3d, xyz and PCD files.

Geomagic® Control X

Geomagic® Control X is a comprehensive metrology software platform that delivers the industry's most powerful tools within straightforward workflows. With Geomagic® Control X quality managers are enabled with revolutionary ease-of-use, intuitive, comprehensive controls and traceable, repeatable workflows for the quality measurement process. Its fast, precise, information-rich reporting and analysis enable significant productivity and quality gains in any manufacturing workflow.

SensoVIEW

Powerful analysis software



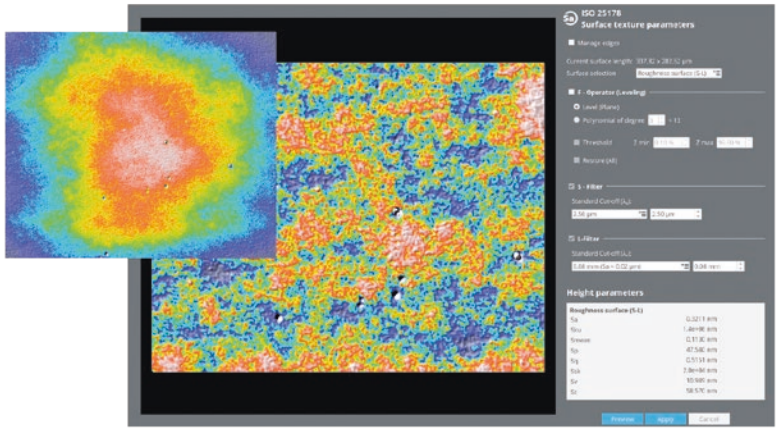
SensoVIEW is the ideal analysis software for a broad range of analysis tasks. It includes a comprehensive suite of tools for preliminary examination and analysis of 3D or 2D measurements, allowing roughness or volume calculations and measuring critical dimensions with a set of analysis tools. The analysis can be saved and applied to several measurements.

The most perceptive visualization of your topographies

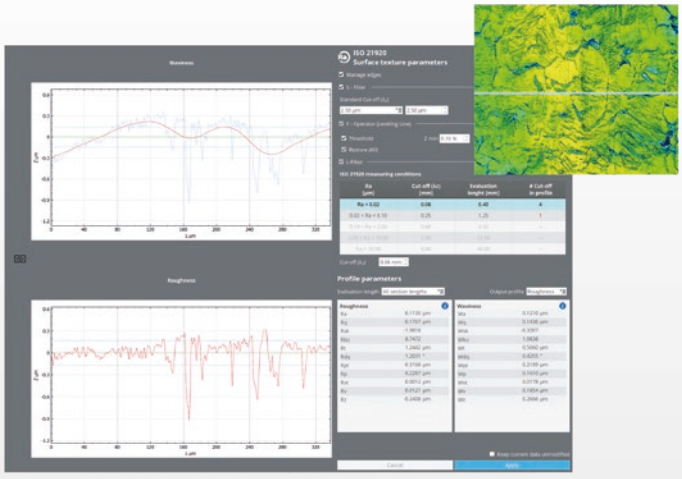
Five smart visualization modes (false color, stack, stack & false color, true color or directional luminance) are always within reach in the main screen.

Image control options are always in continuous development for an excellent fit to all sample types and customer needs. A full range of image processing settings are included in each of the rendering visualizations choices and presented together with scale options for a better adjustment.

Berechnungen nach ISO 21920, 25178 und 12781



Spezielle Operatoren stehen zur Verfügung, um die Berechnung von Oberflächentexturparametern gemäß ISO-Normen zu vereinfachen: ISO 21920 für die Rauheit von Profilen, ISO 25178 für die Rauheit von Flächen und ISO 12781 für die Ebenheit.



Simple yet powerful, designed for you

This dynamic software provided with the Sensofar systems offers a complete set of user friendly tools for displaying and analyzing measurements. The user is trained and guided through the 3D environment, delivering a unique user experience: Access to operators in just one-click; icons with eye-catching design; a better function understanding; and simultaneous 3D, 2D and profile views are just some of the key features of the SensoVIEW analysis software.

Choose your own view

3D and 2D interactive views provide multiple scaling, display and render options.

Process your data

Full set of operators to process the data information or generate alternative layers.

Interact with analysis tools

Broad range of analysis tools for preliminary examination and analysis of 3D or 2D measurements.

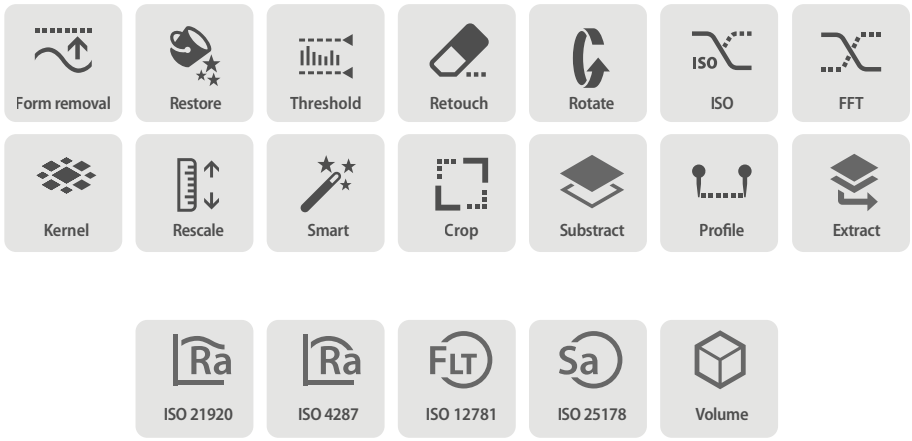
Apply your analysis

Create analysis templates to apply several presets to a series of topographies.

Get your results

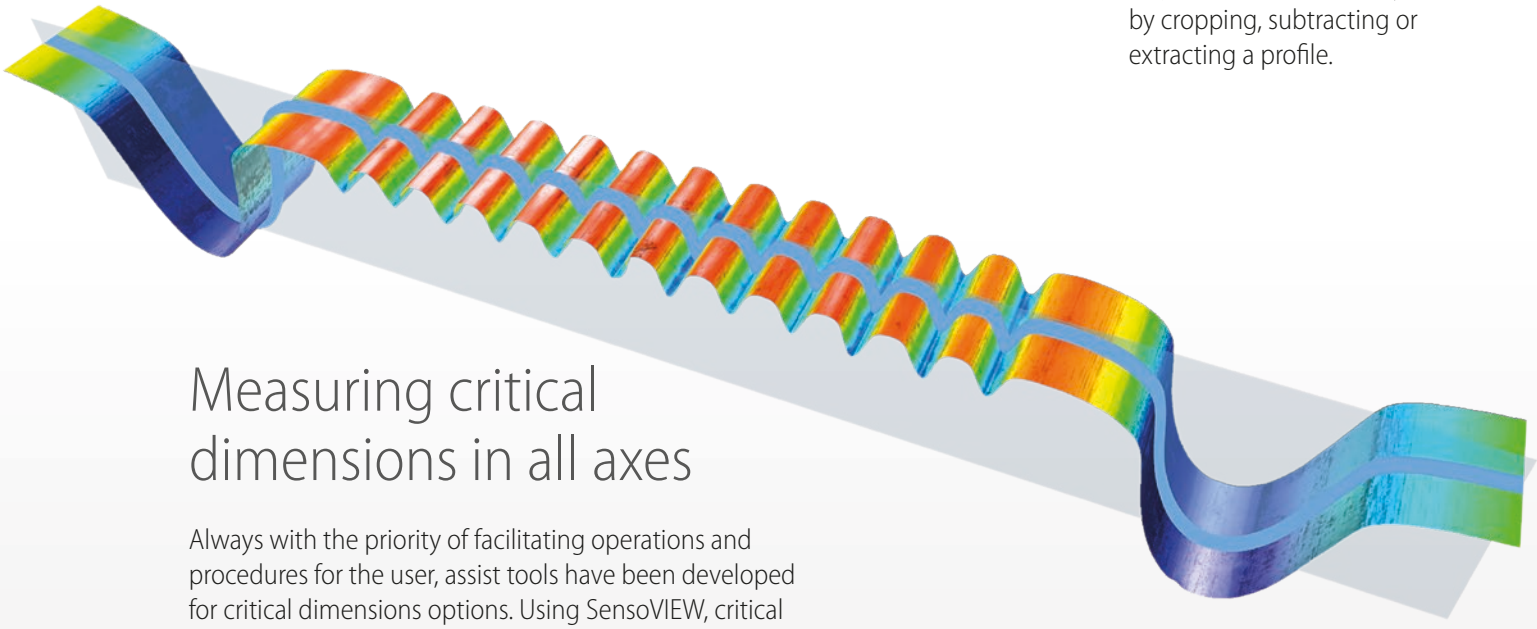
Get a customizable report or export the 3D measurement data in multiple formats.

Guided measurement



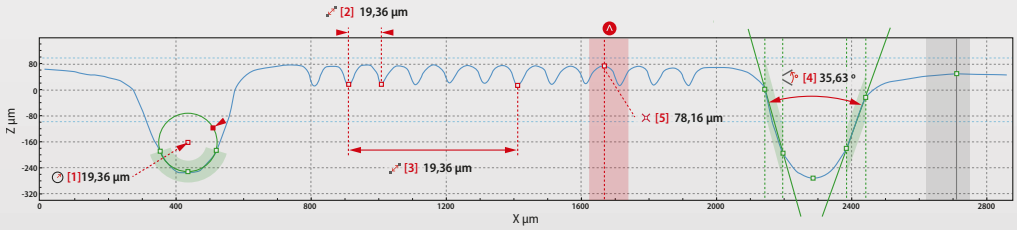
Sequential operators

A smart suite of operators, which can be applied to 3D/2D measurements and profiles, provides the opportunity to remove form, apply a threshold, retouch data points, restore non-measurable data and apply a range of filters and/ or generate alternative layers by cropping, subtracting or extracting a profile.



Measuring critical dimensions in all axes

Always with the priority of facilitating operations and procedures for the user, assist tools have been developed for critical dimensions options. Using SensoVIEW, critical dimensions such as angles, distances and diameters can be easily measured on a 3D topography measurement, a 2D profile measurement and a 2D section profile.



Multiple measurement tools

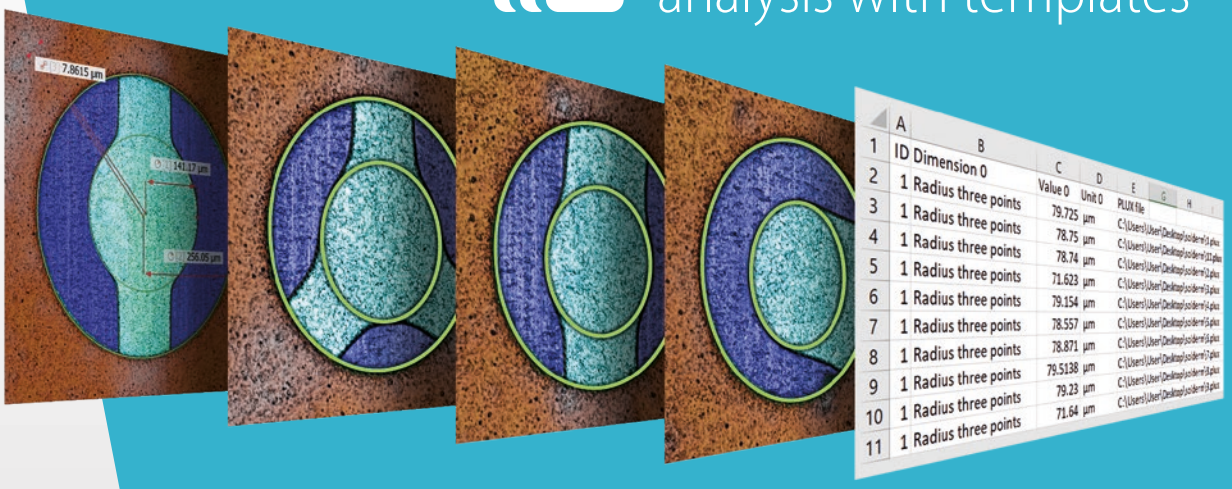
A complete assortment of tools ready to add the most essential dimensions when measuring (radiuses, angles, diameters, step heights and perpendicular & parallel distances). These tools will return a numerical value for a particular dimension.

examination

Customizable reports

With the possibility to choose from different report templates, the user can configure every section to fit as much as possible to their requirements. A flexible way to obtain clear and well-structured reports for each measurement, showing the acquisition information, 3D data, a 2D profile and all the ISO parameters, among others.

Automate your data analysis with templates



	A	B	C	D	E
1	ID Dimension 0		Value 0	Unit 0	PLUX file
2	1	Radius three points	79.725	µm	C:\Users\User\Desktop\scidem\3.plux
3	1	Radius three points	78.75	µm	C:\Users\User\Desktop\scidem\12.plux
4	1	Radius three points	78.74	µm	C:\Users\User\Desktop\scidem\2.plux
5	1	Radius three points	71.623	µm	C:\Users\User\Desktop\scidem\3.plux
6	1	Radius three points	79.154	µm	C:\Users\User\Desktop\scidem\4.plux
7	1	Radius three points	78.557	µm	C:\Users\User\Desktop\scidem\5.plux
8	1	Radius three points	78.871	µm	C:\Users\User\Desktop\scidem\6.plux
9	1	Radius three points	79.5138	µm	C:\Users\User\Desktop\scidem\7.plux
10	1	Radius three points	79.23	µm	C:\Users\User\Desktop\scidem\8.plux
11	1	Radius three points	71.64	µm	C:\Users\User\Desktop\scidem\9.plux

When the analysis process is defined, the user can create a template to apply it to multiple measurements. The template will contain all the information from the filters, operators, and critical dimensions used, as well as the export settings. Besides that, any possible shift or rotation between the template and the topography can be corrected using SensoVIEW's pattern recognition algorithms.

Hardware

Ring light

The ring light is based on an LED ring for illuminating samples in a uniform and efficient way. It is mounted above and around the objective, the ring light provides increased signal for both Confocal and Ai Focus Variation techniques. This ensures proper illumination at the focal plane.

Assorted holders & collets

Different types of holders are available depending on the sample. For rotational samples, a collet holder (multiple options are available on request) with fifteen collets, and for the others, a flat holder. It also includes a calibration pack composed of a flat mirror and a calibration specimen.

Objective lenses

	Brightfield													Interferometry						
MAG	5X EPI	10X EPI	10X SLWD	20X EPI	20X ELWD	20X SLWD	50X EPI	50X ELWD	50X SLWD	100X EPI	100X ELWD	100X SLWD	150X EPI	5X MC	10X MC	10X MR	20X MC	20X MR	50X MR	100X MR
NA	0.15	0.30	0.20	0.45	0.40	0.30	0.80	0.60	0.40	0.90	0.80	0.60	0.90	0.14	0.10	0.28	0.10	0.38	0.50	0.70
WD (mm)	23.50	17.50	37.00	4.50	19.00	30.00	1.00	11.00	22.00	1.00	4.50	10.00	1.50	13.00	25.00	8.00	16.70	6.00	3.60	2.00
Spatial sampling[1] (µm)	1.38	0.69	0.69	0.34	0.34	0.34	0.13	0.13	0.13	0.07	0.07	0.07	0.05	1.38	0.69	0.69	0.34	0.34	0.13	0.07
Optical resolution[2] (µm)	0.94	0.47	0.70	0.31	0.35	0.47	0.18	0.23	0.35	0.16	0.18	0.23	0.16	1.00	1.40	0.50	1.40	0.37	0.28	0.20
Measurement noise[3] (nm)	100	30	50	8	10	20	4	5	15	3	3	12	2	PSI/ePSI 0.1 nm (0.01 nm with PZT) CSI 1 nm						
Maximum slope[4] (º)	9	17	12	27	24	17	53	37	24	64	53	37	64	8	6	16	6	22	30	44

MAG	5X	10X	20X	50X	100X	150X
FOV[5](µm)	3378x2826	1689x1413	845x707	338x283	169x141	113x94

System specifications

Measuring principle	Confocal, PSI, ePSI, CSI, Ai Focus Variation and Thin Film
Observation types	Brightfield, 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" screen)	60X - 21600X
Display resolution	0.001 nm
Field of view	From 0.11 to 3.38 mm (single shot)
Max. Extended measuring 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; Piezoelectric scanner: 200 µm (Optional)
Vertical scan range	Piezoelectric scanner with capacitive sensor: 200 µm range; 1.25 nm resolution
XY stage range	Motorized: 154x154 mm
LED light sources	Red (630 nm); green (530 nm); blue (460 nm) and white (580 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	up to 3 Kg
User Management rights	Administrator, supervisor, advanced operator, operator
Optional Advanced Software Analysis	SensoVIEW, SensoMAP, SensoPRO, SensoMATCH, SensoCOMP, Geomagic®
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 64 bit
Dimensions HxWxD	945 x 635 x 610 mm (37.2 x 25.0 x 24.0 in)
Weight[13]	77 kg (170 lbs)
Environment	Temperature 10 ºC to 35 ºC; Humidity <80 % RH; Altitude <2000 m

Accuracy and repeatability[6]

Standard	Value	U , σ	Technique
Step height	48600 nm	U = 300 nm σ = 10 nm	Confocal & CSI
	7616 nm	U = 79 nm σ = 5 nm	Confocal & CSI
	941.6 nm	U = 7 nm σ = 1 nm	Confocal & CSI
	186 nm	U = 4 nm σ = 0.4 nm	Confocal & CSI
	44.3 nm	U = 0.5 nm σ = 0.1 nm	PSI
	10.8 nm	U = 0.5 nm σ = 0.05 nm	PSI
Areal roughness (Sa)[7]	0.79 µm	U = 0.04 µm σ = 0.0005 µm	Confocal, AiFV & CSI
Profile roughness (Ra)[8]	2.40 µm	U = 0.03 µm σ = 0.002 µm	Confocal, AiFV & CSI
	0.88 µm	U = 0.015 µm σ = 0.0005 µm	Confocal, AiFV & CSI
	0.23 µm	U = 0.005 µm σ = 0.0002 µm	Confocal, AiFV & CSI

Rotational stage[9]

Max. measurable diameter	200 mm
Max. clamping diameter[10]	44 mm
Max. workpiece weight	3 Kg
Accuracy (A)	5 Arc sec/º
Bidirectional repeatability (A)	10 Arc sec
Resolution (B)	0.5 Arc sec
Straightness error[11]	3.6 µm/40 mm
Parallelism error[11]	53.9 µm/40 mm
Flatness error[12]	20 µm

1 Pixel size on the surface. **2** L&S: Line and Space. Values for blue LED. **3** System noise measured as the difference between two consecutive measures on a calibration mirror placed perpendicular to the optical axis. For interferometric objectives, PSI, 10 phase averages with vibration isolation activated. The 0.01 nm are achieved with Piezo stage scanner and temperature controlled room. Values for green LED (white LED for CSI). Resolution HD. **4** On smooth surfaces, up to 71º. On scattering surfaces, up to 86º. **5** Maximum field of view with 3/2" camera and 0.5X optics. **6** Objective used for Confocal and Ai Focus Variation 50X 0.80 NA and for CSI and PSI 50X 0.50NA. Resolution 1220x1024 pixels. All measurements are done using PZT. Uncertainty (U) according to ISO/IEC guide 98-3:2008 GUM:1995, K=1,96 (level of confidence 95%). σ according to 25 measures. **7** Area of 1x1 mm. **8** Profile of 4 mm length. **9** All values according to ISO1101 at 20ºC +/- 1º in an anti-vibration environment. **10** 3-Jaw Chuck holder. **11** St Flatness deviation according to ISO25178-2 taken on a SiC reference flat mirror and 20X objective in Confocal acquisition mode. **12** All values are taken with a 20X objective in Confocal acquisition mode and 40 mm evaluation length. **13** Adjustable stand with 154 x154 mm XY stage.

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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