SENSOFAR
METROLOGY

INTEGRATABLE HEADS

Integratable solutions

They are designed from the outset to be integrated into the harshest manufacturing environments. Compact, lightweight and with flexible mounting options, Sensofar sensors put high-performance surface metrology right where you need it – at the application.

Applications

- Display
- Optics
- PCB
- Semiconductors
- Surface finish
- Tooling

metrology

Sensofar's integratable metrology systems are the culmination of more than 20 years experience in surface metrology systems

Robust and reliable

Production environments are not always the most friendly: variable conditions, vibrations, aggressive materials, etc. making measurement tasks more difficult. Our integrable sensors have been designed with exactly this in mind. The sealed sensor head keeps out debris and particles and our optical assembly contains no moving parts, so the sensors stay clean and aligned.

Compact, light, and orientation independent

Small size and low weight make designing for integration easy. Functional in any orientation, Sensofar sensors can be positioned as the application requires. Cable lengths are up to 20 m. Our sensors are perfectly adaptable for both in-line production and robot-mounted sensing applications.

S wide

The S wide is designed to measure large areas in one single shot, suited for those applications where speed and shape measurement is the priority.

S neox

The S neox addresses the need for maximum measurement flexibility in an integrable sensor and is thus the most versatile industrial system on the market.

	S wide	S neox
Technologies	Fringe Projection	Ai Focus Variation, Confocal, Interferometry, Spectroscopic Reflectometry
FOV (single shot)	34.7 x 29.1 mm	Up to 6.8 x 5.6 mm [1]
Speed acq.	3 s	4 s [2]
Optical Resolution	9.35 µm	Down to 148 nm [3]
System noise	1 µm	Down to 0.01 nm [4]
Weight	8 kg	10.1 kg
Cable length	5 or 10 m	5 or 10 m
Software comunication	DLL (C++ or C#, Windows 10® - 64 bits)	
Export files	SensoSCAN: Data: .plux, .dat Images: bmp	

1 2,5X TI (NA 0.075, WD 10.3 mm) objective. **2** Confocal, 20X EPI and Z range=500 µm, speed 5X. **3** 150X EPI (NA 0.95 L&S Line and Space values for blue LED) objective. **4** PSI with PZT using any interferometric objective.

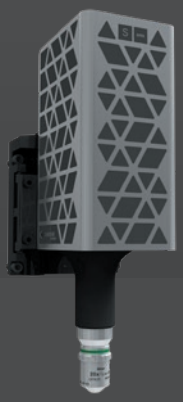
S mart

The S mart is the smallest areal confocal sensor on the market. The perfect combination of compact design and versatility.

Up to 3.4 x 2.8 mm[1]
7 s [2]
Down to 177 nm [3]
Down to 1 nm [4]
5.5 kg
10 m

1 5X EPI (NA 0.15, WD 23.5 mm) objective. **2** Confocal, 20X EPI and Z range=500 µm, speed 4X. **3** 150X EPI (NA 0.95 L&S Line and Space values for white LED) objective. **4** CSI using any interferometric objective.

S onix



The S onix is an areal interferometer that fits perfectly in industrial environments because of its astonishing resolution and speed.

Up to 5.0 x 3.8 mm [1]
3 s [2]
Down to 190 nm [3]
Down to 1 nm [4]
3.6 kg
5, 15 or 20 m

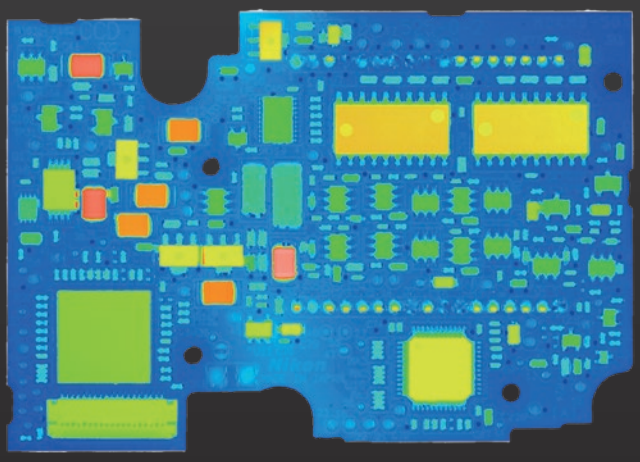
1 2,5X TI (NA 0.075, WD 10.3 mm) objective. **2** CSI, 20X DI and z range=500 µm, speed 9X. **3** 100X DI (NA 0.70 L&S Line and Space values for green LED) objective. **4** CSI using any interferometric objective.

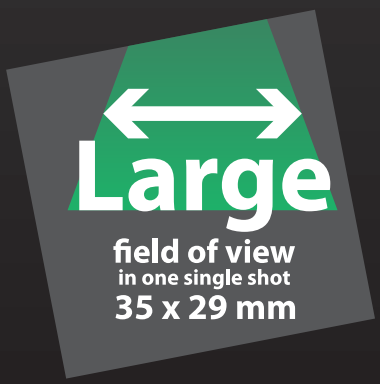
XML (any operating system)

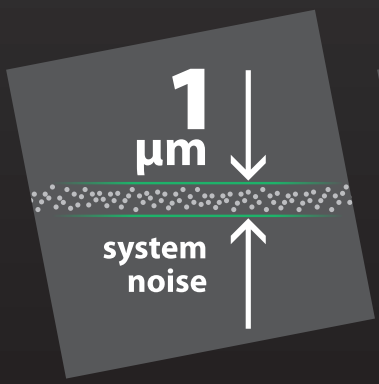
SensoVIEW: Data (SensoVIEW), .plux, .x3p, .dat, .pcl, .stl

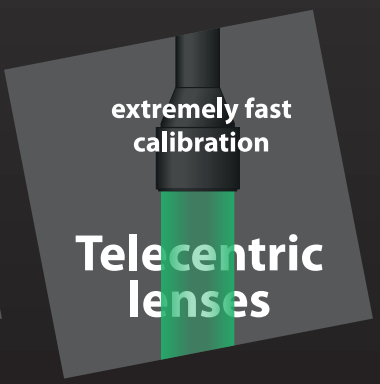
Single shot areal imaging

The S wide provides all the benefits of a digital microscope integrated into a high resolution measuring instrument. With only one shot, it acquires 33 x 29 mm of XY area and 40 mm of depth without any Z movement. The combination of proprietary Fringe Projection technology with telecentric lenses yields an excellent performance and 1 µm system noise.









Objective lens

Fringe Projection

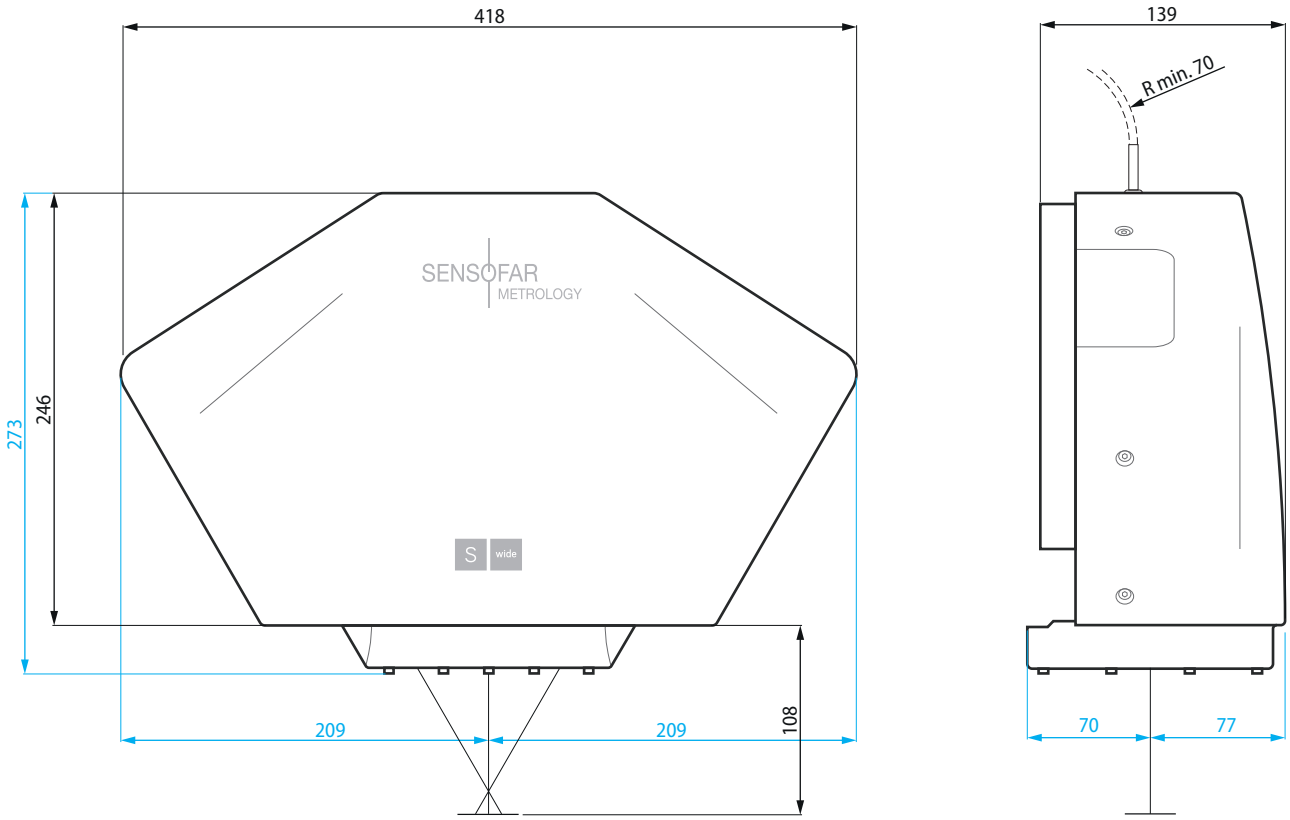
MAG	0.243X
NA	0.015
WD (mm)	80
FOV[1] (mm)	34.7 x 29.1
Spatial sampling[2] (µm)	14.2
Optical resolution[3] (µm)	9.35

System specifications

Measuring principle	Fringe Projection (Gray code & Slit, Gray code & Phase Shift)
Observation types	Bi-telecentric lens with 0.243X magnification and 0.015 NA
Color camera	5Mpx: 2448x2048 pixels (60 fps)
Total magnification (27" screen)	11X
Display resolution	0.001 µm
Max. Extended measuring area	300x300 mm with 10x12 stitched fields (Max. resolution 450 Mpx)
Vertical measuring range	10 mm (up to 40 mm)
XY stage range	Manual: 150x100 mm; Motorized: 154x154 mm, 302x302 mm
LED light sources	Green (530 nm) and blue (460 nm)
Ring light illumination	White
User management rights	Administrator, advanced operator, operator
Advanced software analysis	Included: SensoVIEW; Optional: SensoPRO, SensoMAP, Geomagic®
Power	Line Voltage 100-240 V AC; frequency 50/60 Hz single phase
Software communication	DLL (C++ or C#, Windows 10® - 64 bits) - XML (any operating system)
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

Dimensions mm

Weight: 8 Kg (18 lbs)



SPECIFICATIONS

1 Maximum field of view with 3/2" camera. **2** Pixel size on the surface. **3** L&S: Line and Space, half of the diffraction limit according to the Rayleigh criterion. Values for blue LED.

Extreme versatility

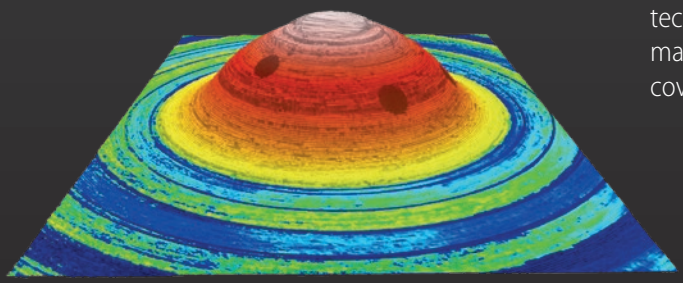
with high performance

4x4

4-in-1 technologies
Ai Focus Variation | Confocal
Interferometry | SR

4 LEDs
Red I Green I Blue I White

The **S neox** pushes versatility to the extreme: with 4-in-1 technology, providing unparalleled adaptability for shifty application requirements and maximum measurement flexibility on any surface. The re-design of some algorithms has increased the speed and capability of all technologies. The option to add a piezoelectric Z motor makes the **S neox** our top performer. The **S neox** also covers thicknesses measurements from 50 nm to 5 mm.



AUTOMATIC 3D

0.01 nm
system noise

X5 Speed
thanks to new algorithms

Objective lenses

	Brightfield						Interferometry					
MAG	5X	10X	20X	50X	100X	150X	2.5X	5X	10X	20X	50X	100X
NA	0.15	0.30	0.45	0.80	0.90	0.95	0.075	0.13	0.30	0.40	0.55	0.70
WD (mm)	23.5	17.5	4.5	1.0	1.0	0.2	10.3	9.3	7.4	4.7	3.4	2.0
FOV[1] (µm)	3378x2826	1689x1413	845x707	338x283	169x141	113x94	6756x5652	3378x2826	1689x1413	845x707	338x283	169x141
Spatial sampling[2] (µm)	1.38	0.69	0.34	0.13	0.07	0.05	2.76	1.38	0.69	0.34	0.13	0.07
Optical resolution[3] (µm)	0.94	0.47	0.31	0.18	0.16	0.148	1.87	1.08	0.47	0.35	0.26	0.20
System noise[4] (nm)	100	30	8	5	3	1	PSI/ePSI 0.1 nm (0.01 nm with PZT) CSI 1 nm					
Maximum slope[5] (°)	9	17	27	44	64	72	4	7	17	24	33	44

System specifications

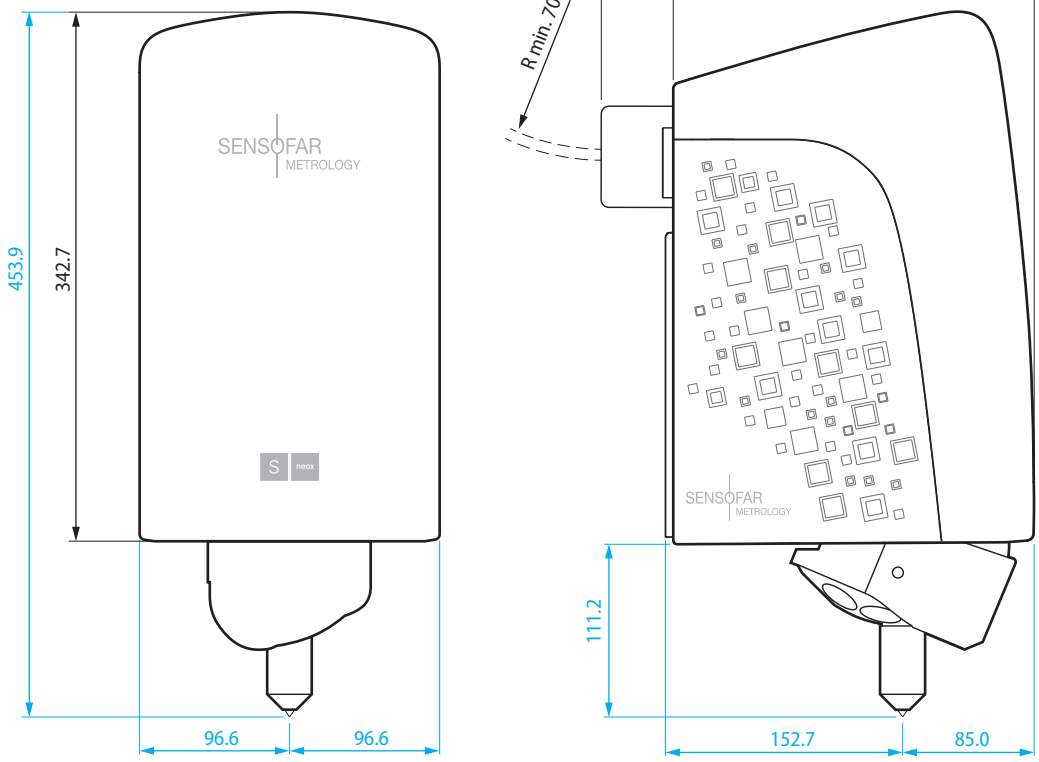
Measuring principle	Confocal, PSI, ePSI, CSI, Ai Focus Variation and Thin Film
Measurement types	Image, 3D, 3D thickness, profile and coordinates
Camera	5Mpx: 2448x2048 pixels (60 fps)
Confocal frame rate	60 fps (5Mpx); 180 fps (1.2 Mpx)
Vertical scan range coarse	Linear stage: 40 mm range; 5 nm resolution
Vertical scan range fine	Piezoelectric scanner with capacitive sensor: 200 µm range; 1.25 nm resolution
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 (575 nm; center)
Nosepiece	6 position fully motorized

Sample reflectivity	0.05 % to 100%
Advanced Software Analysis	Inc: SensoVIEW; Op: SensoPRO, SensoMAP
Software communication	DLL (C++ or C#, Windows 10® - 64 bits) XML (any operating system)
Computer	Latest INTEL processor
Operating system	Microsoft Windows 10®, 64 bit
Cable Length	5 or 10 m
Environment	Temperature 10 ºC to 35 ºC; Humidity <80 % RH; Altitude <2000 m

Dimensions

mm

Weight: 10.1 Kg
(22.2 lbs)



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. Values for blue LED. **4** System noise 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. The 0.01 nm are achieved with Piezo stage scanner and temperature-controlled room. Values for green LED (white LED for CSI). Values obtained in a VC-E vibration environment. **5** On smooth surfaces. Up to 86° on rough surfaces.

Compact design

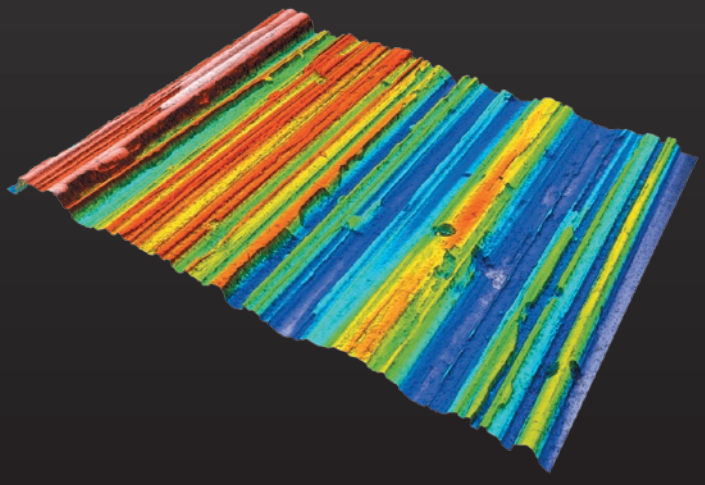
Affordable

3-in-1
Focus Variation
Confocal
Interferometry

3D
AUTOMATIC

Compact versatility

The **S mart** provides the necessary measurement versatility to cope with a diverse range of surface types and topographies. With Sensofar's 3-in-1 technology – three measurement technologies combined into a single sensor head via a patented microdisplay approach – the system can be easily switched to the most appropriate technique for the task at hand. An affordable, compact and versatile solution.



Objective lenses

	Brightfield							Interferometric				
Magnification	2.5X	5X	10X	20X	50X	100X	150X	5X	10X	20X	50X	100X
NA	0.075	0.15	0.30	0.45	0.80	0.90	0.95	0.13	0.30	0.40	0.55	0.70
WD (mm)	6.5	23.5	17.5	4.5	1.0	1.0	0.2	9.3	7.4	4.7	3.4	2.0
FOV[1] (µm)	6800x5675	3400x2837	1700x1420	850x710	340x284	170x142	113x95	3400x2837	1700x1420	850x710	340x284	170x142
Spatial sampling[2] (µm)	5.52	2.76	1.38	0.69	0.28	0.14	0.09	2.76	1.38	0.69	0.28	0.14
Optical resolution[3] (µm)	2.23	1.11	0.55	0.37	0.21	0.18	0.17	2.76	1.38	0.69	0.30	0.24
System noise (nm)	300	75	25	8	3	2	1	1				
Maximum slope[5] (º)	3	8	14	21	42	51	71	3	8	14	21	42

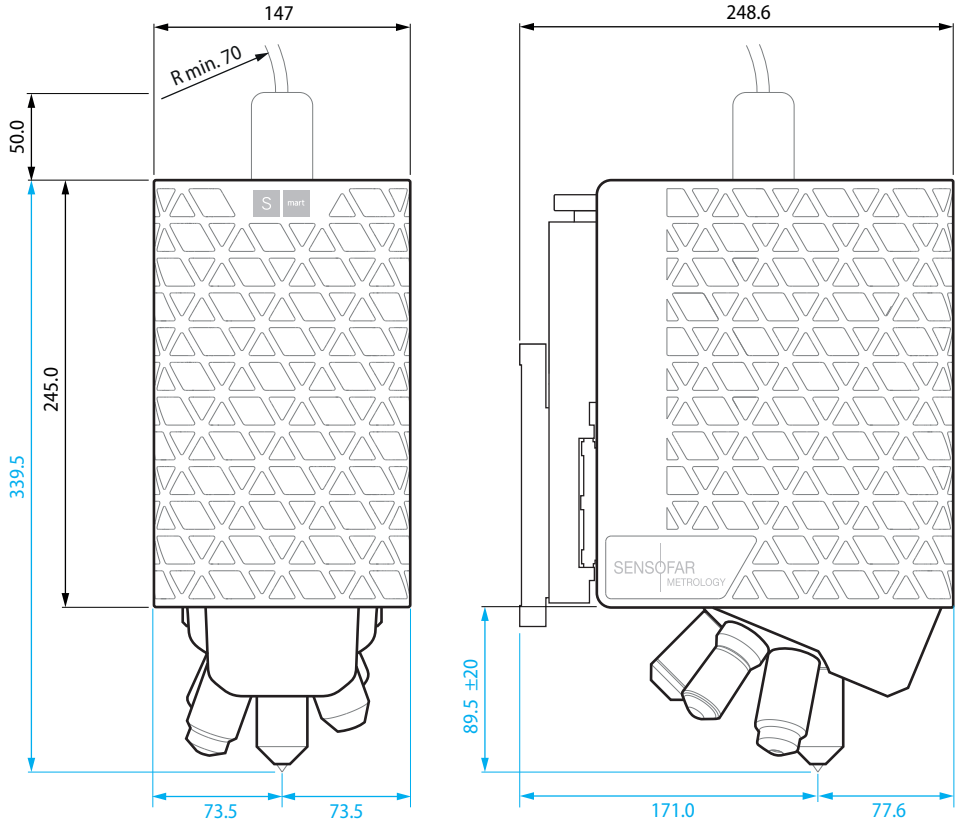
System specifications

Measuring principle	Confocal, CSI and Focus Variation
Measurement types	Image, 3D, 3D thickness, profile and coordinates
Camera	1.2Mpx: 1232x1028 pixels (28 fps)
Confocal frame rate	9,5 fps
Vertical scan range	Linear stage: 40 mm range; 2 nm resolution
Max. Z measuring range	Confocal 36 mm; CSI 7 mm; Focus Variation 25 mm
LED light sources	white 575 nm (default, lifetime 40.000 h – other options available)
Nosepiece	5 position fully motorized
Sample reflectivity	0.05 % to 100%

Advanced Software Analysis	Inc: SensoVIEW; Op: SensoPRO, SensoMAP
Software communication	DLL (C++ or C#, Windows 10® - 64 bits) XML (any operating system)
Computer	Latest INTEL processor
Operating system	Microsoft Windows 10®, 64 bit
Cable Length	10 m
Environment	Temperature 10 ºC to 35 ºC; Humidity <80 % RH; Altitude <2000 m

Dimensions mm

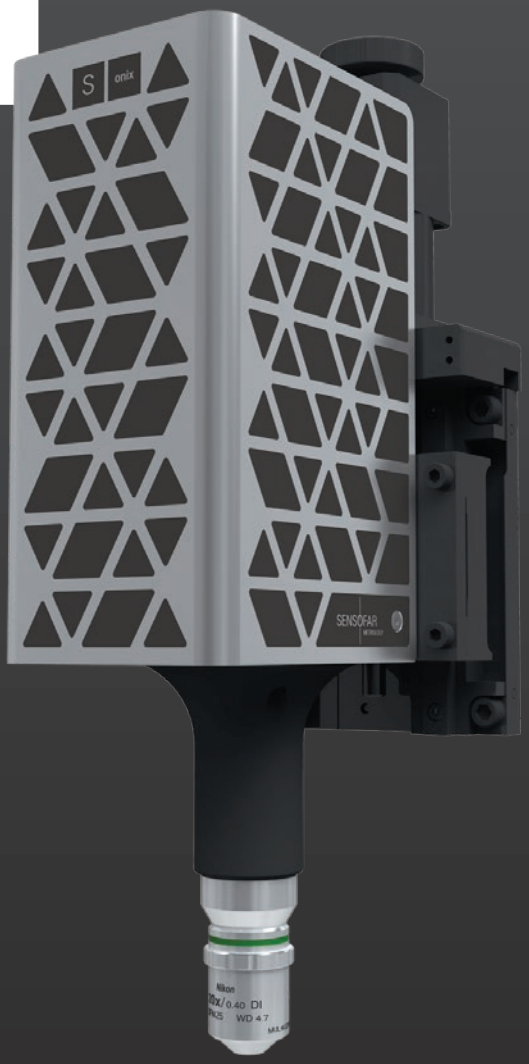
Weight 5.5 kg (12.1 lbs)



1 Maximum field of view with 2/3" 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. Values for white LED. **4** System noise measured as the difference between two consecutive measurements of a calibration mirror placed perpendicular to the optical axis. Values obtained in a VC-E vibration environment. **5** On smooth surfaces. Up to 86° on rough surfaces. Other objectives are available.

Unprecedented speed

The **S onix** provides the speed needed for a high-throughput industrial metrology system. With its high-speed camera and optimized optical and mechanical design, the **S onix** represents our fastest interferometric system. System noise is maintained with the added bonus of improved resistance against vibration.

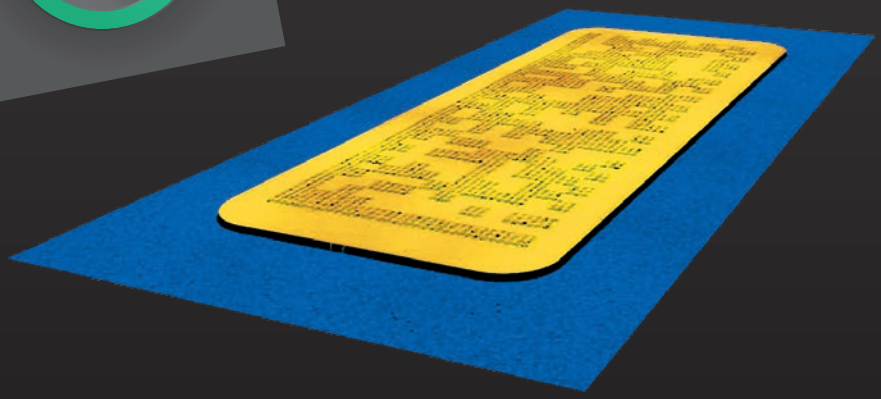


X9
Faster
interferometer

Resistance to
vibration

Compact design

AUTOMATIC 3D



Objective lenses

Interferometric

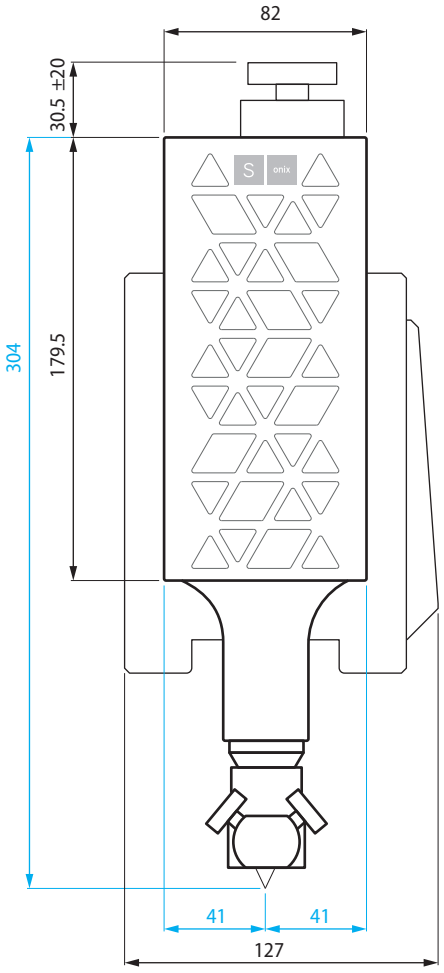
Magnification	2.5X	5X	10X	20X	50X	100X
NA	0.075	0.13	0.30	0.40	0.55	0.70
WD (mm)	10.3	9.3	7.4	4.7	3.4	2.0
FOV[1] (µm)	5040 x 3780	2520 x 1890	1260 x 945	630 x 472	252 x 189	126 x 94
Spatial sampling[2] (µm)	7.88	3.94	1.97	0.98	0.39	0.19
Optical resolution[3] (µm)	7.62	3.81	1.91	0.95	0.38	0.23
Vertical resolution[4] (nm)	1					
Maximum slope[5] (º)	3	8	14	21	25	42

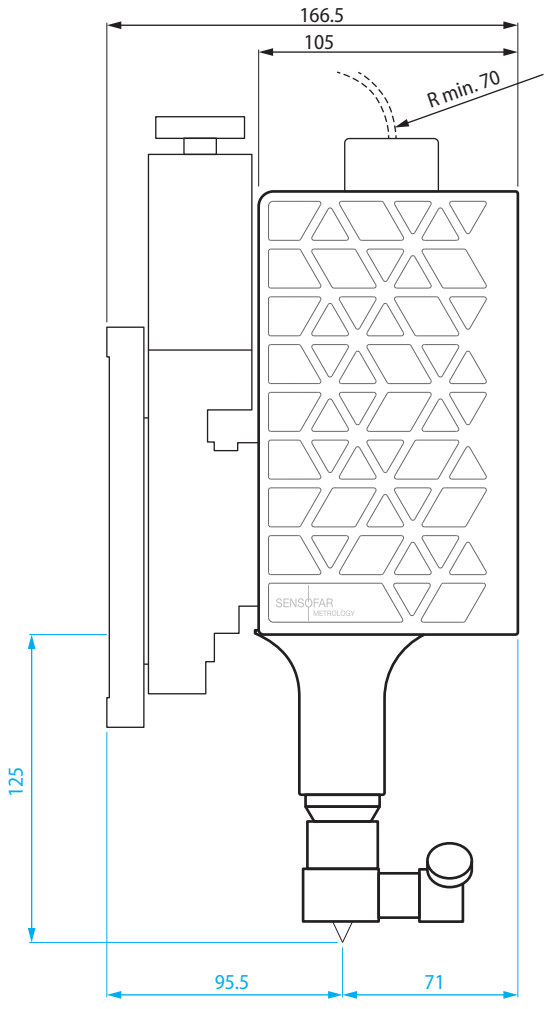
System specifications

Measuring principle	CSI
Measurement types	Image, 3D and 3D thickness
Camera	640 x 480 pixels
Vertical scan range	Linear stage: 40 mm range; 2 nm resolution
Max. Z measuring range	7 mm
LED light sources	White (575 nm)and green (532 nm)
Nosepiece	1 position (default) or 6 manual position (optional)
Sample reflectivity	0.05 % to 100%
Advanced Software Analysis	Inc: SensoVIEW; Op: SensoPRO, SensoMAP
Software communication	DLL (C++ or C#, Windows 10® - 64 bits) XML (any operating system)
Computer	Latest INTEL processor
Operating system	Microsoft Windows 10®, 64 bit
Cable Length	5, 15 or 20 m
Environment	Temperature 10 ºC to 35 ºC; Humidity <80 % RH; Altitude <2000 m

Dimensions mm

Weight 3.6 kg (7.9 lbs)





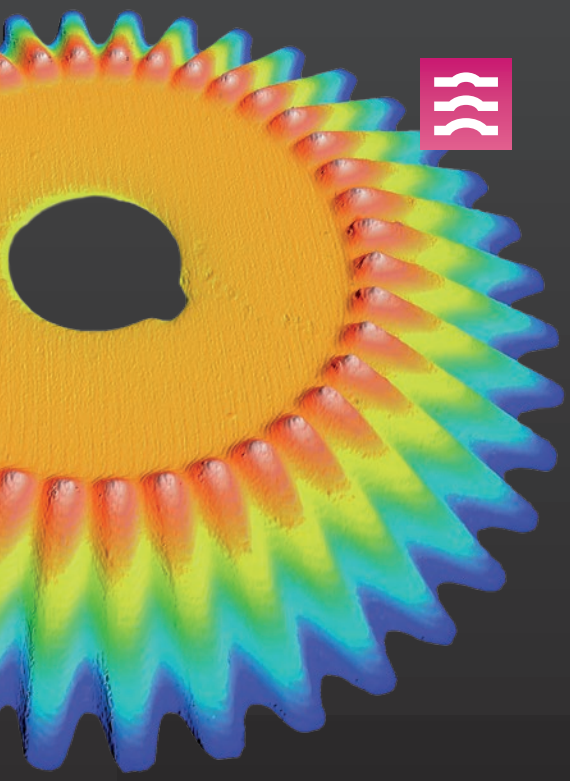
SPECIFICATIONS

1 Maximum field of view with 1/3" camera and 0.375X optics. **2** Pixel size on the surface. **3** L&S: Line and Space, half of the diffraction limit according to the Rayleigh criterion. Values for green LED. Spatial sampling could limit the optical resolution. **4** System noise measured as the difference between two consecutive measurements of a calibration mirror placed perpendicular to the optical axis. Values obtained in a VC-E vibration environment. **5** On smooth surfaces.

Sensofar tech

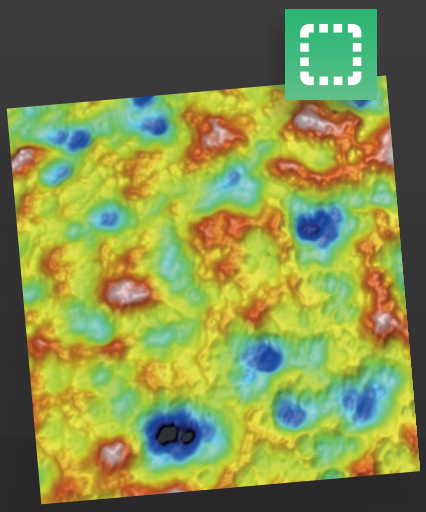
Fringe projection

Fringe projection is ideal for large area measurements, providing high vertical accuracy and repeatability with low system noise. Highest about the technology include: true single shot acquisition, very large areas with high vertical accuracy and repeatability ($\sigma = 0.01$ µm), and system noise down to 1 µm, real image color and no Z-scanning.



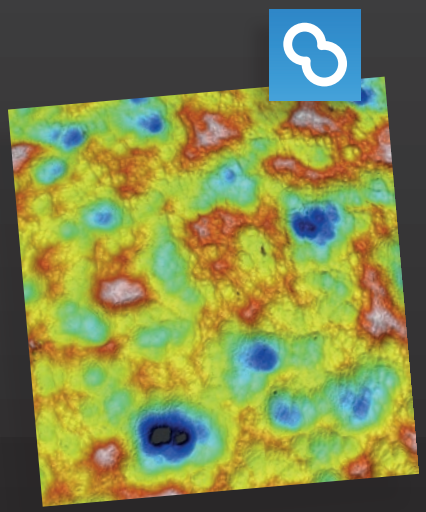
Ai Focus Variation

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 surfaces. Highlights of the technology include high slope surfaces (up to 86°), highest speed (up to 3mm/s) and large vertical range measurements.



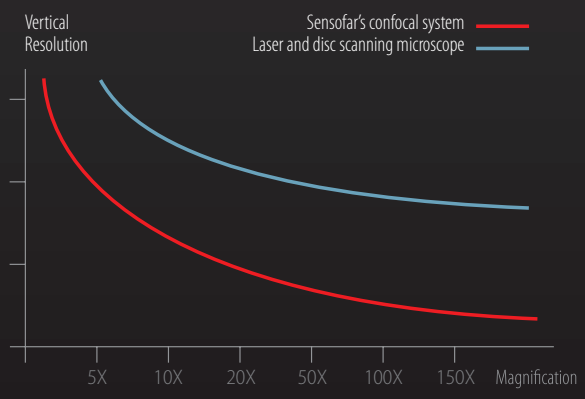
Confocal

Confocal profilers have been developed to measure the surface height of smooth to very rough surfaces. Confocal profiling provides the highest lateral resolution, up to 0.15 µm line & space, with spatial sampling can be reduced to 0.01 µm, which is ideal for critical dimension measurements. High NA (0.95) and high 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.



No moving parts

The confocal scanning technique implemented in Sensofar's systems is a Microdisplay Scan Confocal Microscope (ISO 25178-607). The microdisplay creates a rapidly switching device with no moving parts, making data acquisition fast, reliable and accurate. Due to this and the associated algorithms, Sensofar's confocal technique yields a class-leading vertical resolution, better than other confocal approaches and even better than laser scanning confocal systems.



nologies

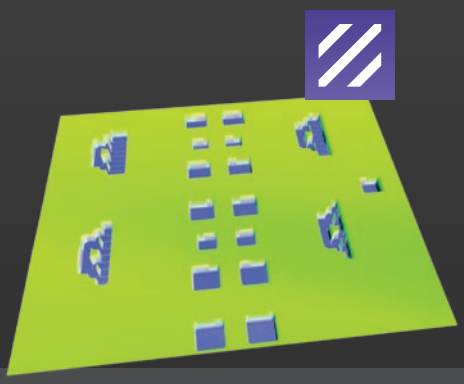
Interferometry

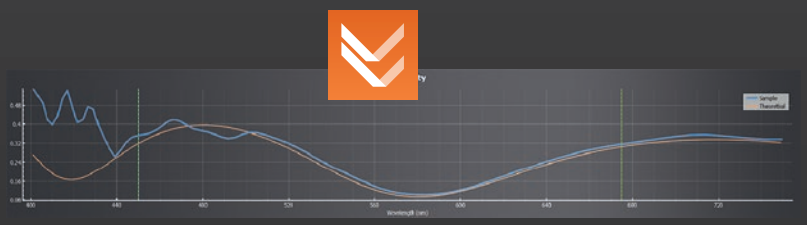
PSI **Phase Shift Interferometry** has been developed to measure the surface height of very smooth and continuous surfaces with sub-Angstrom resolution, for all numerical apertures (NA). Very low magnifications (2.5X) can be employed to measure large fields of view with the same height resolution.

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

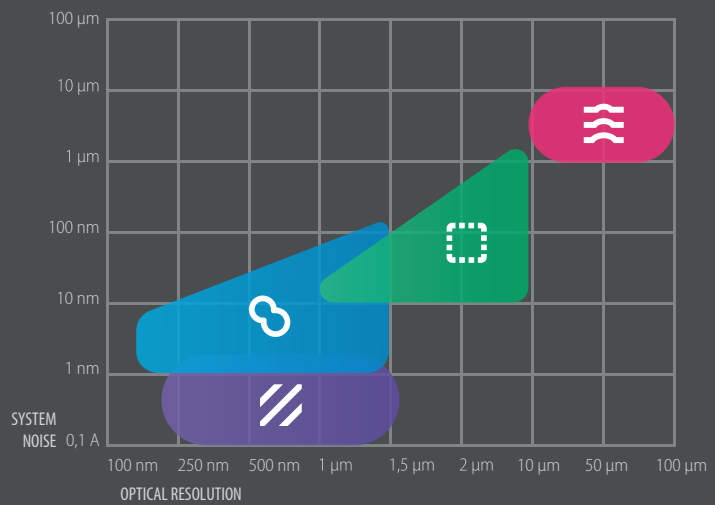
Spectroscopic Reflectometry

Thin film measurement technique measures the thickness of optically transparent layers quickly, accurately, non-destructively and requires no sample preparation. The system acquires the reflectance spectrum of the sample in the visible range, and is compared with a simulated spectra calculated by the software, with layer thickness modification until the best fit is found. Transparent films from 50 nm to 1.5 µm can be measured in less than one second. Sample evaluation spot diameter is dependent on the objective magnification which can be as low as 0.5 µm and up to 40 µm.



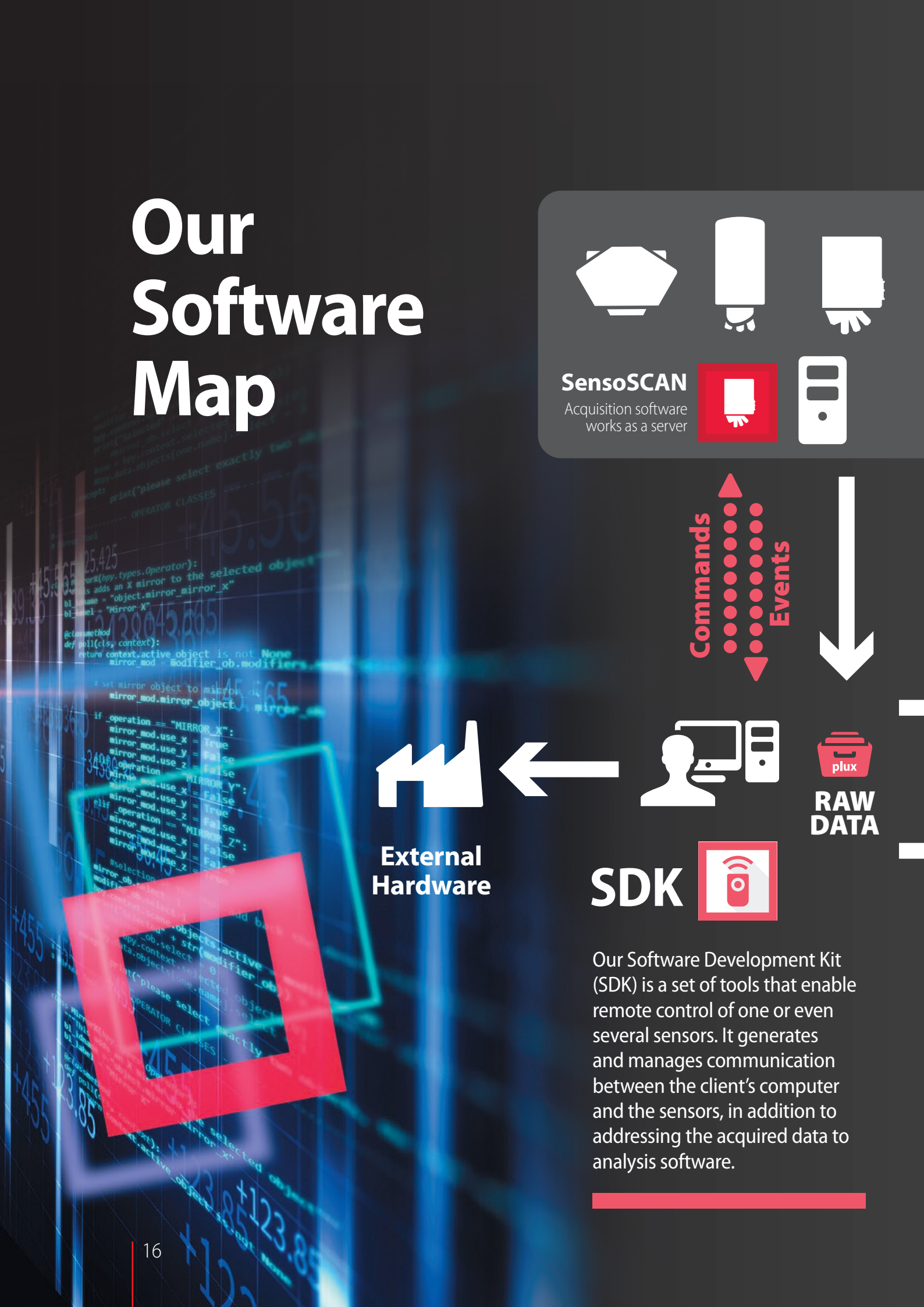


Technology performance comparisons

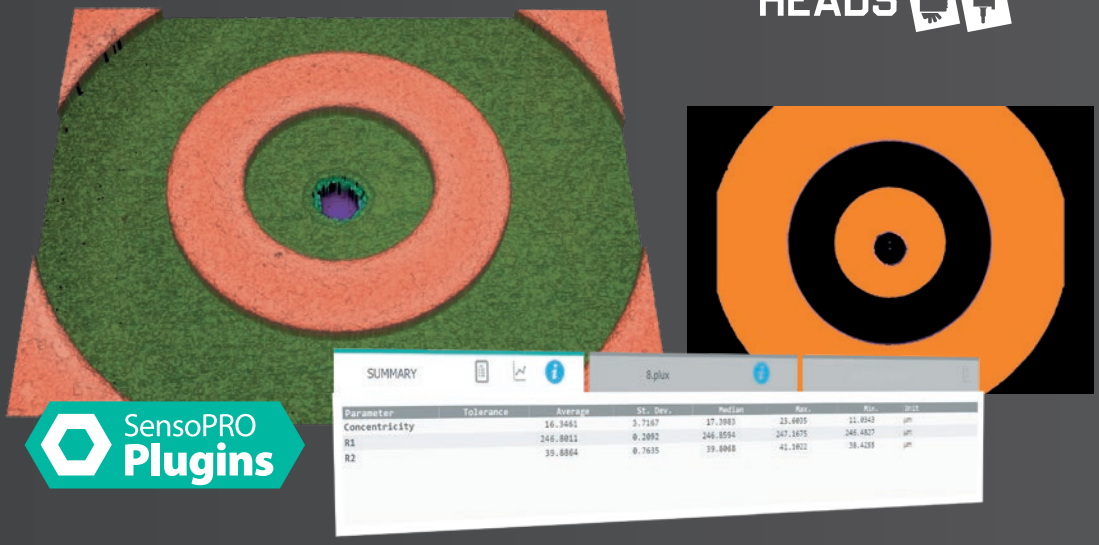


	Ai FOCUS VARIATION	CONFOCAL	INTERFEROMETRY
Rough samples	★★★	★★★	★
Smooth samples	★	★★	★★★
Micro-scale features	★★	★★★	★★★
Nano-scale features		★★	★★★
High local slopes	★★★	★★	★
Thickness		★★★	★★★

Our Software Map



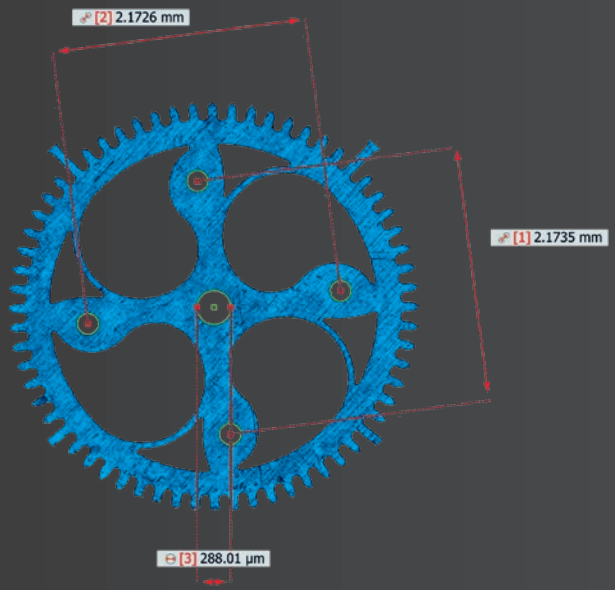
Our Software Development Kit (SDK) is a set of tools that enable remote control of one or even several sensors. It generates and manages communication between the client's computer and the sensors, in addition to addressing the acquired data to analysis software.



The speed of production line demands is matched by SensoPRO: with custom-based plugin data analysis algorithms, specific features will be automatically detected and analyzed, quickly creating a pass/fail report.

SensoPRO

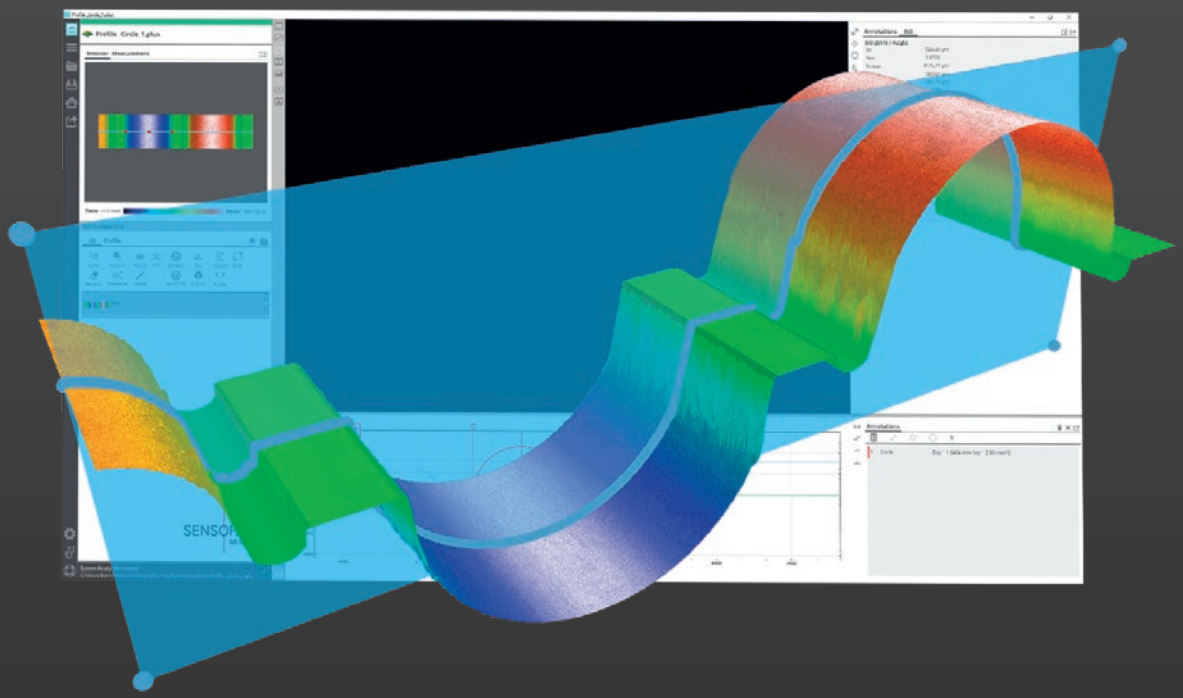
SensoVIEW



SensoVIEW is the ideal 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, provides roughness or volume calculations and measures critical dimensions with a set of analysis tools, which can be exported as a report or data set (csv file).

SensoVIEW

Powerful analysis software



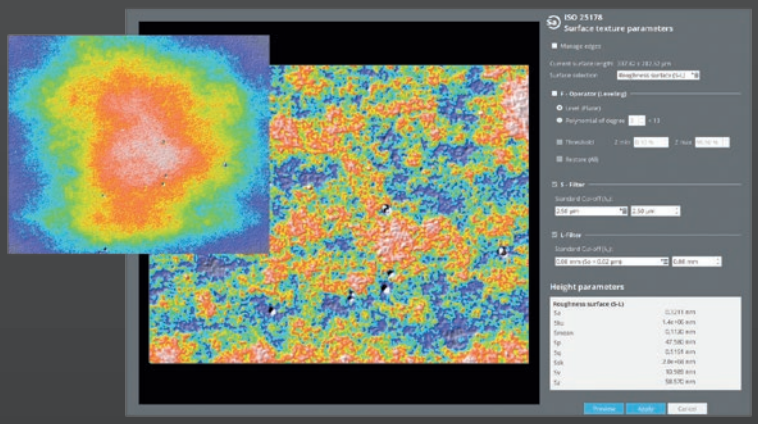
- Form removal
- Restore
- Threshold
- Retouch
- Smart
- Kernel
- FFT
- ISO
- ISO 4287
- ISO 25178
- Volume
- Rescale
- Crop
- Profile

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.

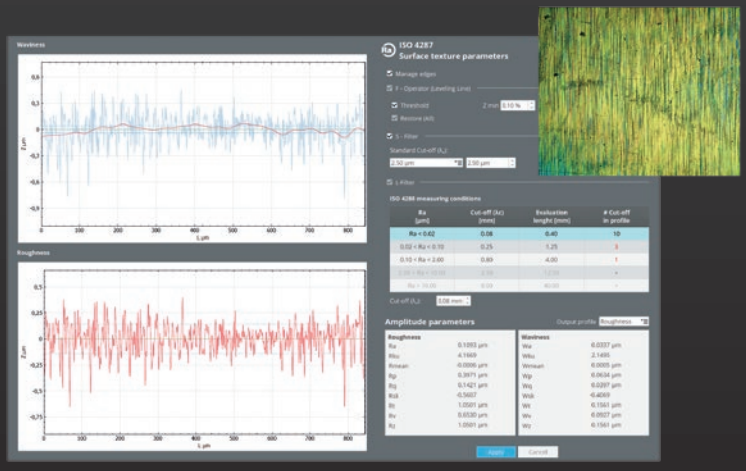
Smart calculation tools for key parameters

SensoVIEW provides a specific step-by-step to get surface texture parameters according to ISO 4287 and 25178 with just one click.



ISO 25178 calculations

Designed for users without a deep knowledge of ISO filters, who can now extract this information, by simply selecting the type of surface being analyzed. This operator filters the surface according to ISO 25178, returning the surface texture parameters.



ISO 4287 calculations

It automatically filters the primary profile according to ISO 4287 and ISO 4288, returning the roughness (Rx) and waviness (Wx) parameters. The calculation of the parameters consists of a set of predefined operators, filters (F-Operator, S-Filter and L- Filter) and additional settings.

Simple yet powerful, designed for you

This dynamic software provided with the system 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 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

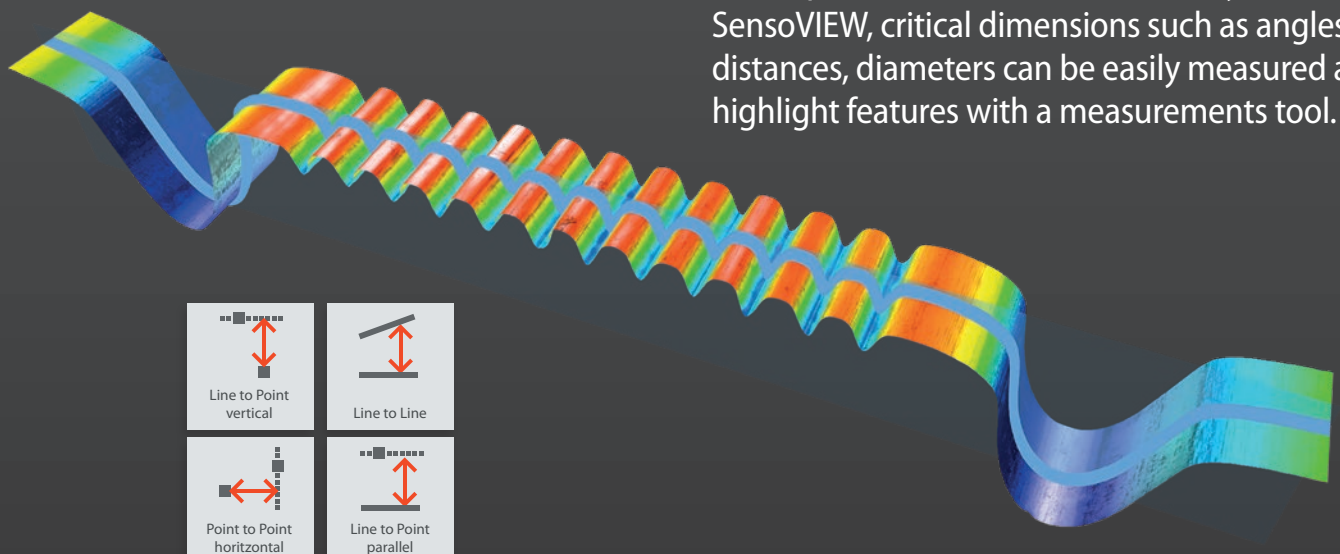
Broad range of analysis tools for preliminary examination and analysis of 3D or 2D measurements.

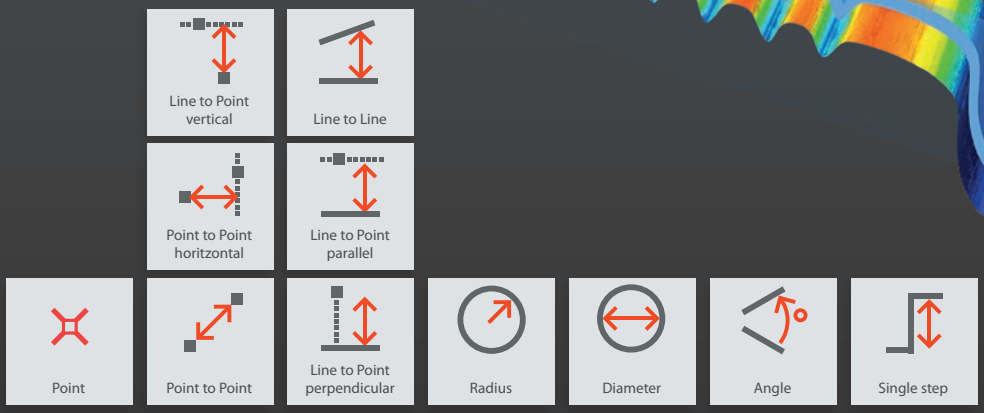
Get your results

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

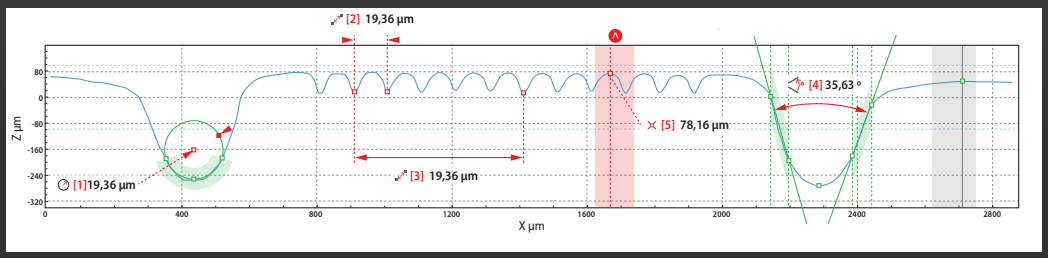
Measuring critical

Always with the priority of facilitating operations and procedures for the user, assist tools have been developed for critical dimension analysis. With SensoVIEW, critical dimensions such as angles, distances, diameters can be easily measured and highlight features with a measurements tool.





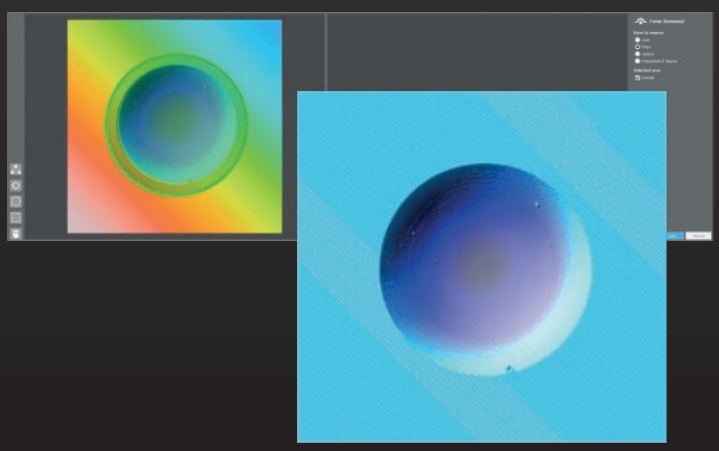
Multiple measurement tools



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.

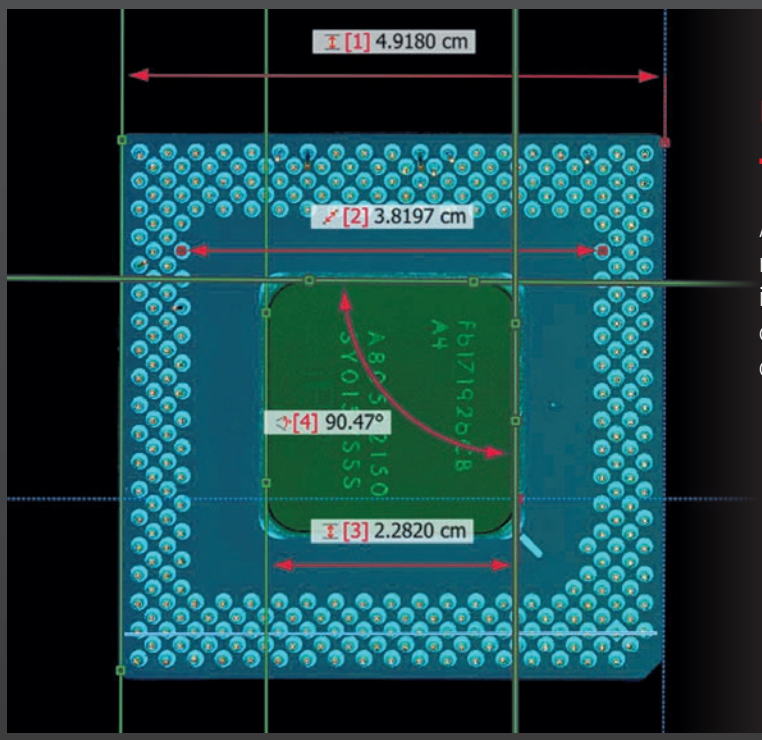
Volume geometries

Volume calculation allows the user to get the volume of a 3D topography region. Two modes are possible: thresholding (defining the minimum and maximum Z limits) or leveling (defining a ROI by circle, polygonal or rectangular geometries).



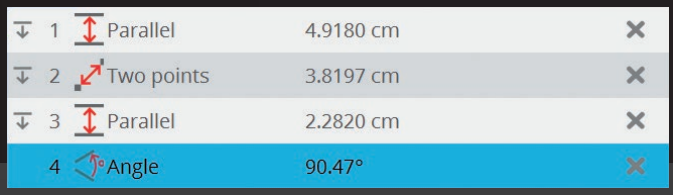
INTEGRATABLE HEADS

dimensions in all axes



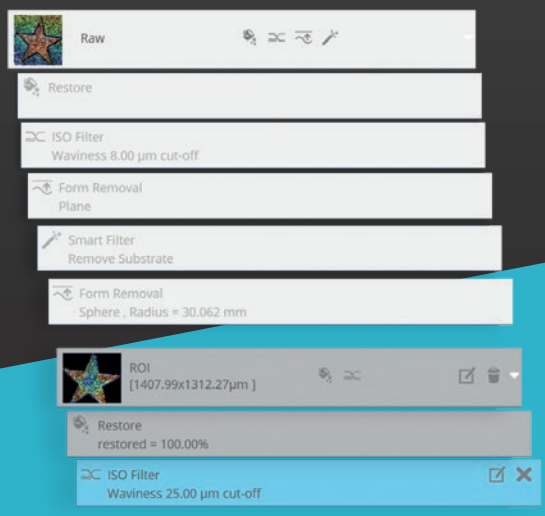
Useful assist measurement tools

Assist tools are a quick and handy way to draw the most basic and primary forms (points, lines and circles) in selected rendering views to, later on, add the corresponding dimensions. It is an optional aid when drawing the measurement tools.



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.



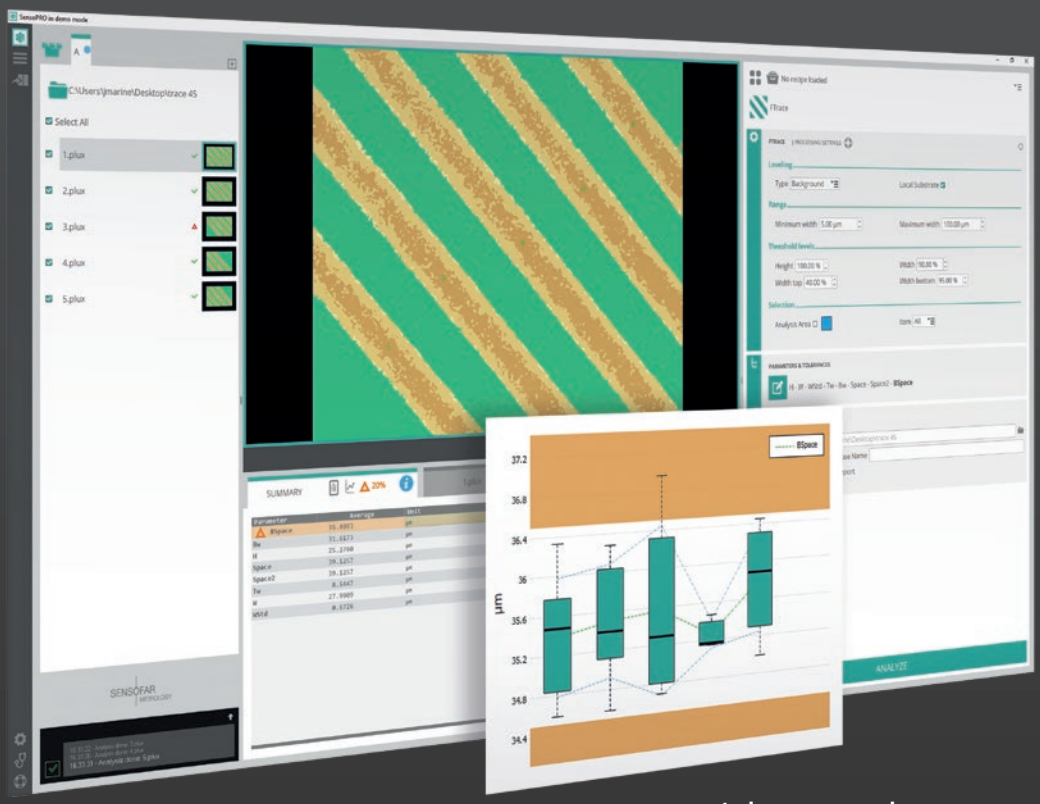
Doing repetitive tasks, efficiently

When a process data analysis is defined, it is possible to create analysis templates to apply these pre-determined filters and operator configurations to repetitive measurements.

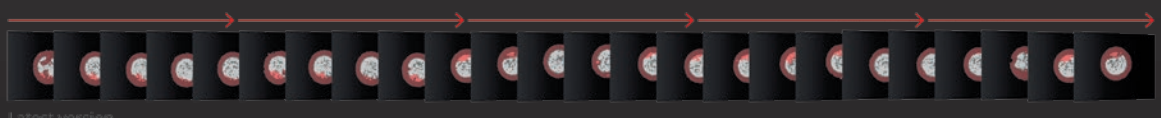
SensoPRO

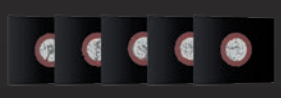
24/7

Rapid Quality Control



It has never been so easy to perform fast quality control in a production line. Thanks to SensoPRO, the operator in the production line only needs to load the sample and follow guided instructions. Plug-in-based data analysis algorithms provide a high degree of flexibility.



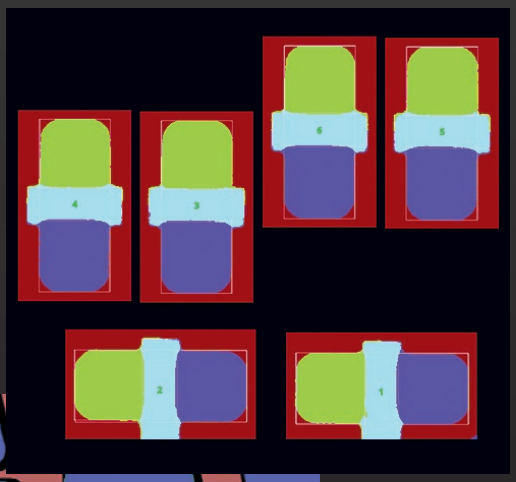


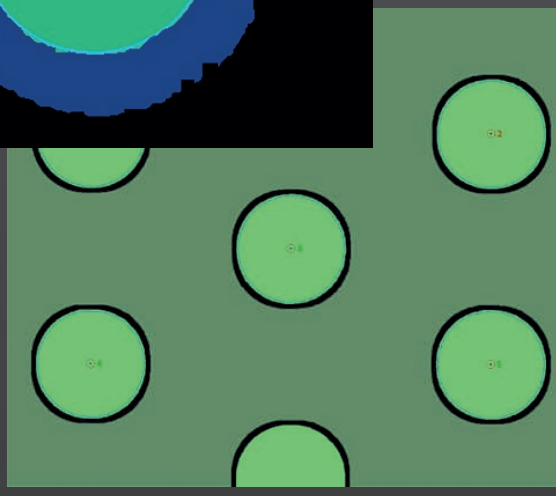
Extremely fast

As multiple cores can now be fully utilized, a larger number of actions can be implemented in parallel, thus resulting in higher overall system performance. Easy to handle larger files, and/or larger multiple data sets.

Guided tool for the QC manager

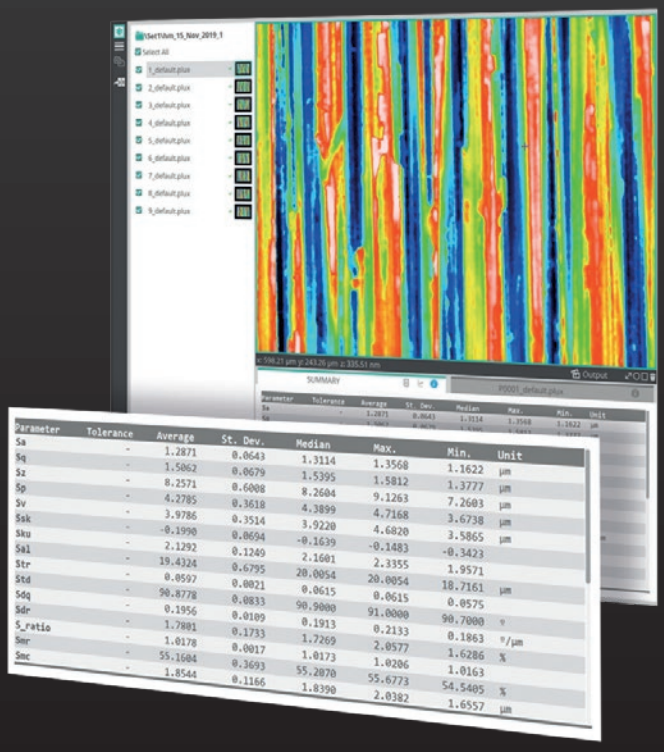
A revolutionary innovation for optical profilometers which substantially improves its usability and simplifies the task of setting tolerances when creating a recipe, as well as deciding which are the key parameters to control the production line by comparing multiple sets of data. Specially conceived for non-expert users who need traceable production control.





Results

Once the analysis is done, the results and the standard deviations for each parameter are shown on a table. If any tolerances are applied, these will be highlighted in the summary section. When multiple features are detected, they are numbered and can be selected to reveal the individual fit parameters.



SensoPRO Plugins

This Plugin-based data analysis approach also provides a high degree of flexibility and specificity, making use of targeted algorithms that are optimized to the exact application needs.

Processing settings

Comprising threshold settings, filters, operators, crop settings, etc., that can be applied to the measured data before the analysis. Each Plugin has its own suite of processing settings.

Parameters & Tolerances

Set of fitting parameters and selection of tolerances for further analyses. Optimizes the results, e.g. according to known results, scaling, (manufacturing) conditions and tolerances.

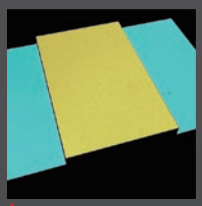
Parameter	Average	St. Dev.	Unit
L1	182.965	1.26832	µm
W1	186.62	0.666153	µm
Z1	16.3865	0.195507	µm
Z2	15.8412	0.2756	µm
ZO1	9.23902	0.539519	µm
ZO2	9.78429	0.621179	µm
L2	192.425	2.06669	µm
W2	186.62	1.05328	µm
SL	455.8	1.94215	µm
SW	189.2	1.05328	µm
D	89.655	1.57992	µm
D1	1.29	1.15381	µm
D2	1.29	2.15858	µm
D3	0.86	1.33231	µm
D4	1.72	1.33231	µm

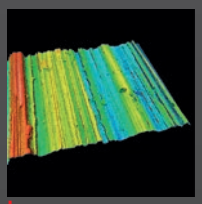
Customizable Plugins

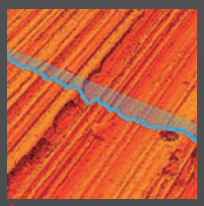
Sensofar adapts and develops all the analysis solutions you may need for your specific application.

Default Plugins

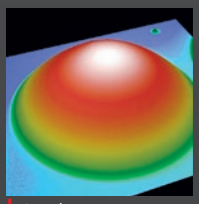

Step Height

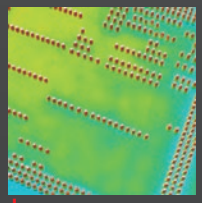

Step Height ISO


Surface Texture

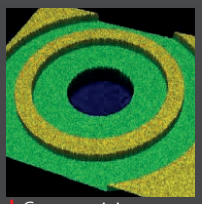

Surface Texture Profile

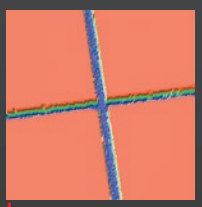
Optional Plugins

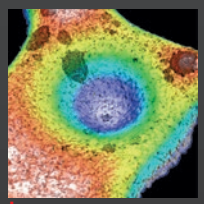

Aspheric

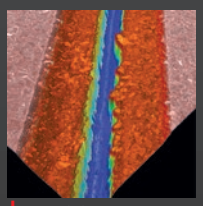

Bump


Circle Pad

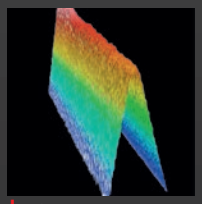

Concentricity

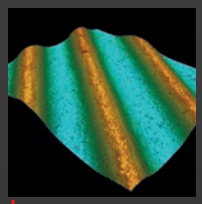

Cross Kerf

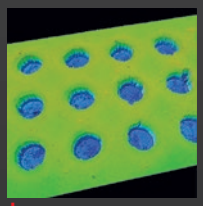

Dimple

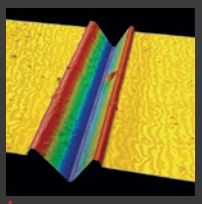

Double SH

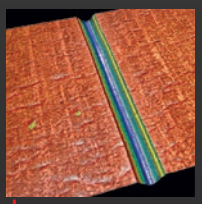

Dual Hole

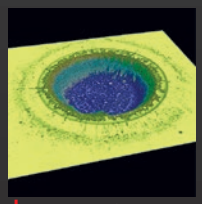

Edge

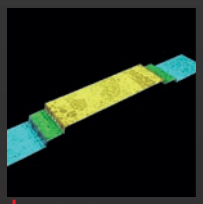

FTrace

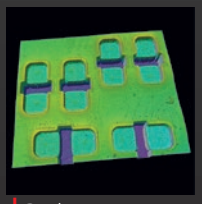

Hole

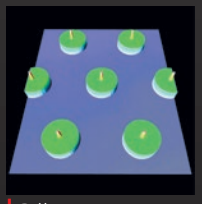

Laser Cut


Laser Groove

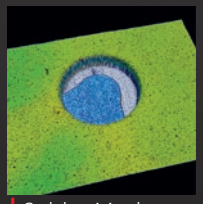

Laser Hole


Multiple SH

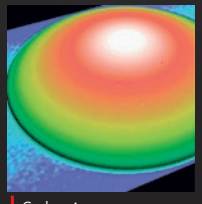

Pad

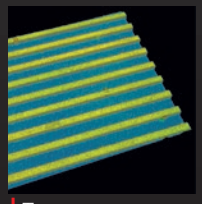

Piller

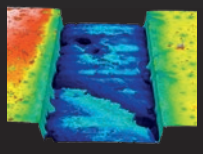

R Hole


Solder Mask


Spacer


Spheric


Trace


Trench


Wafer Pad

SDK

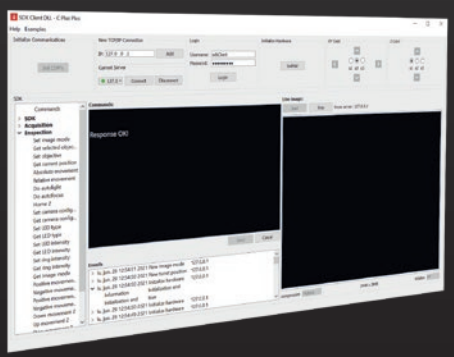
The Software Development Kit (SDK) is an array of tools for creating proprietary applications to control our sensors. System integration is easy and provides the means to obtain automated measurements and to customize the acquisition interface. The SDK combines our sensor with additional hardware to create a metrology station.

Communication Protocol	Language	Operating system
Dll library	C++, C#	Windows® 8/10 64bits
XML + TCP/IP and UDP/IP	Any	Any

Using SDK you can manage our acquisition software SensoSCAN which works as a server. To do so, you can send SDK commands and subscribe to SDK events. SDK DLL (C++, C#, Windows 64 bits) reduces integration time while XML can be used with any language and any operating system.

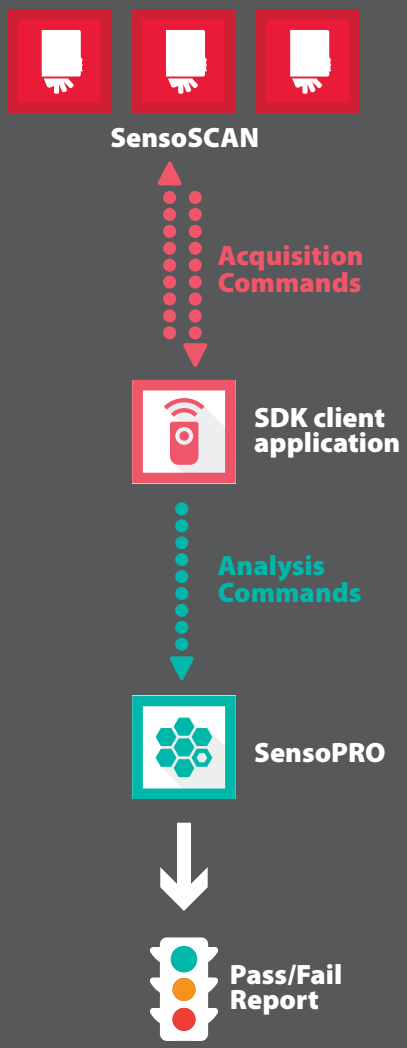
SDK client application

For both options, SDK Client application can be used to utilize SDK capabilities. It contains all the commands listed and it exemplifies what a specific command does exactly, how the commands are written and what are the resulting events. Furthermore, we also share the SDK client source code.

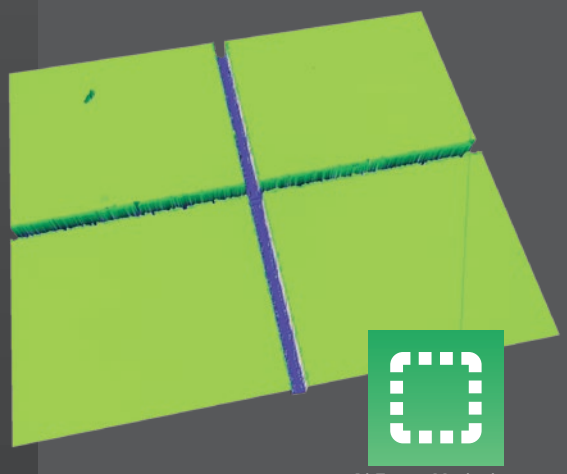


Fully automatic characterization

SDK and SensoPRO commands can automate measurements running several sensor heads at the same time while conducting the analysis. As a result, we get a pass and fail report of the feature of interest shortly after the last measurement is acquired, meeting requirements of high throughput applications.



Applications

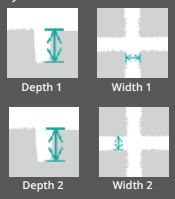


Ai Focus Variation

SEMICONDUCTORS

3D Cross kerf

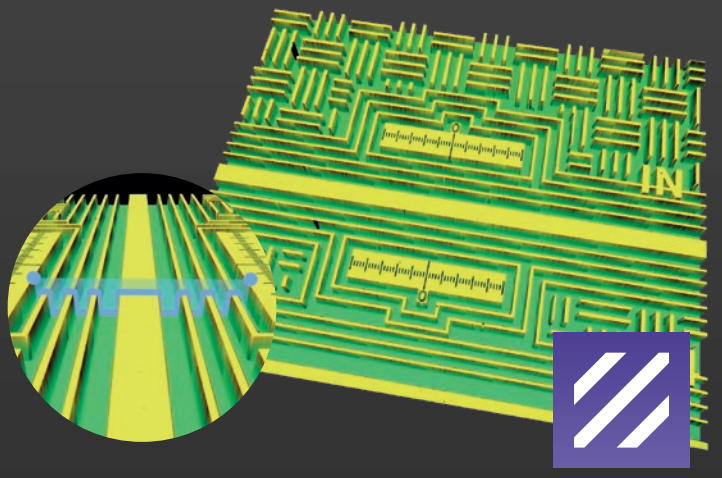
Chip segmentation has two main dimensions to characterize: height, to ensure that the bottom is not damaged, and width, which is a measure of the quality of the cut. The high aspect ratio of those dimensions is challenging and only Ai Focus Variation can resolve this application.



Cross kerf

SensoPRO **Plugin**

This plugin not only detects the cross and extracts the desired parameters but also levels the surface to make sure that an existing angle in the wafer doesn't affect the extracted data.



Interferometry (CSI)

SEMICONDUCTORS

Etched circuit

After an etching process, it is typical to evaluate the height of the resulting features. To ensure the best accuracy on the measurement, interferometry is used.

Step height

SensoPRO **Plugin**

Immediate recognition of the two levels of height regardless of the pattern analyzed.

SEMICONDUCTORS

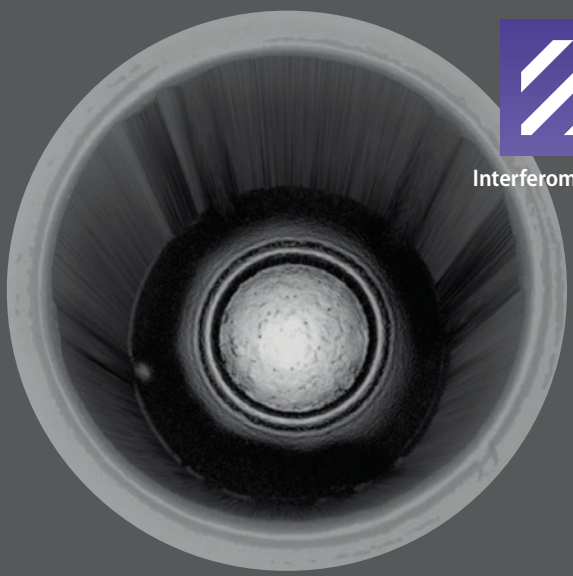
Passivation layer hole

Passivation layer holes determine the access of wire bonding on a chip.

Hole

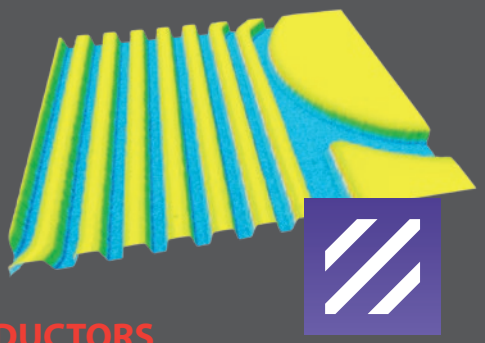
SensoPRO **Plugin**

The Hole plugin is useful in this application since it can measure holes from 50 µm to 2 mm in diameter.



Interferometry (CSI)

INTEGRATABLE HEADS



Interferometry (Thickness mode)

SEMICONDUCTORS

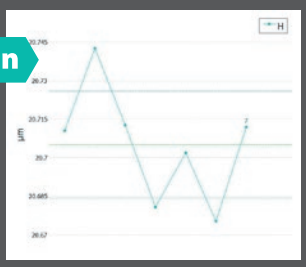
Copper trace thickness under dry film

Interferometry and Confocal thickness are key technologies for this application. We can use both technologies to see which one images better through the layer, but also to verify and correct the results when the layer affects the measured height.

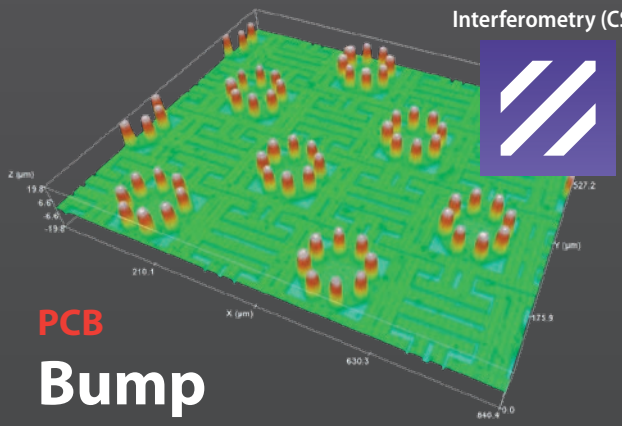
FTrace

SensoPRO **Plugin**

It automatically detects traces with different directions. All the plugins in SensoPRO have the possibility to see the tendency of values per each parameter.



Sq values of background



Interferometry (CSI)

PCB

Bump characterization

These structures are the base of the pins that the chip will have. Their position, height and diameter will determine the bump-pin union.

Bumps

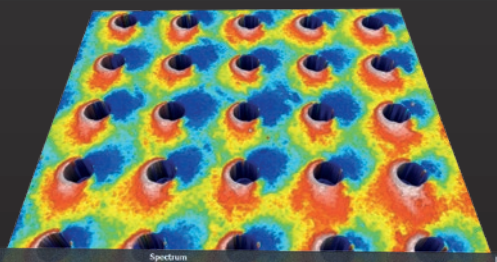
SensoPRO **Plugin**

The Bumps plugin can analyze up to 14.500 bumps.

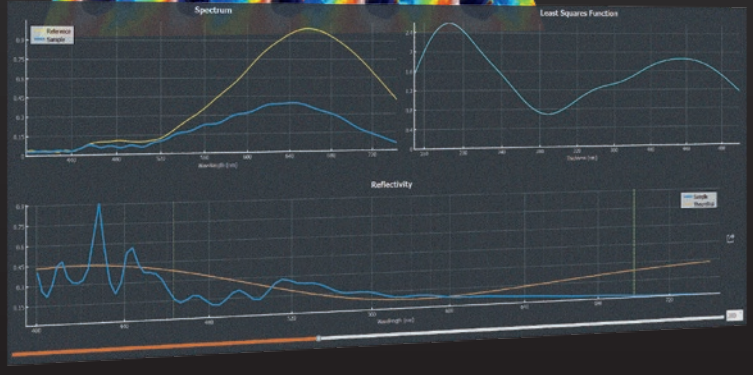
SEMICONDUCTORS

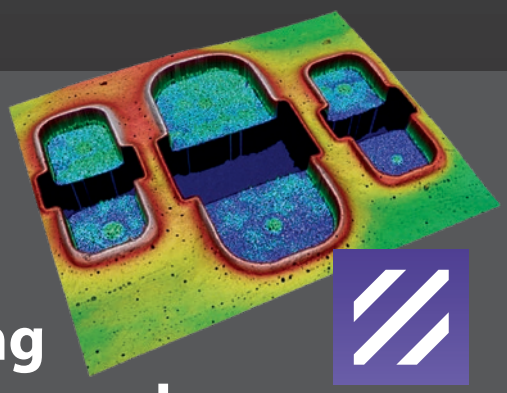
Thin film inside holes

The S neox exceeds the applications for Spectroscopic Reflectometry since it can measure inside holes with very small diameters using a spot size down to 3 µm!



Spectroscopic Reflectometry





Interferometry (CSI)

PCB

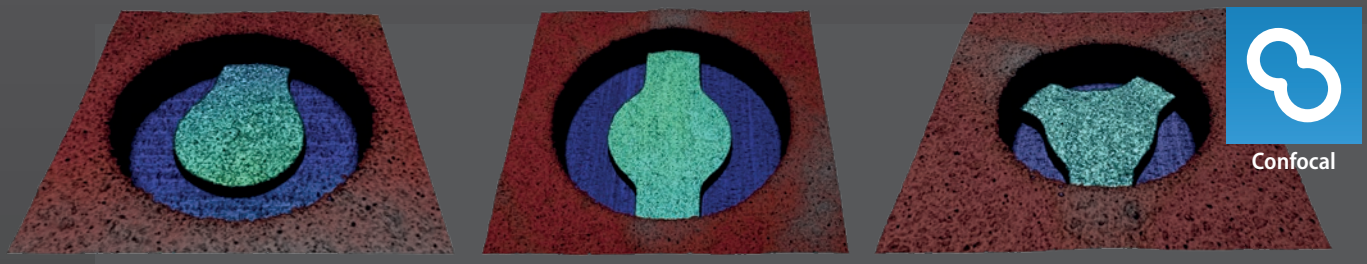
Welding opening pad

Knowing the most common disposition of pads, Sensofar has developed a specific plugin to recognize the individual pads or in any given pattern.

Pads

SensoPRO **Plugin**

Applications



SEMICONDUCTORS

Solder mask welding

Solder Mask layers are usually applied to printed circuit boards (PCB) as protective layers. Openings for connections can have multiple number of connectors. The Solder mask plugin can easily recognize the different configurations and analyze the key parameters.

Solder mask

SensoPRO **Plugin**

PCB

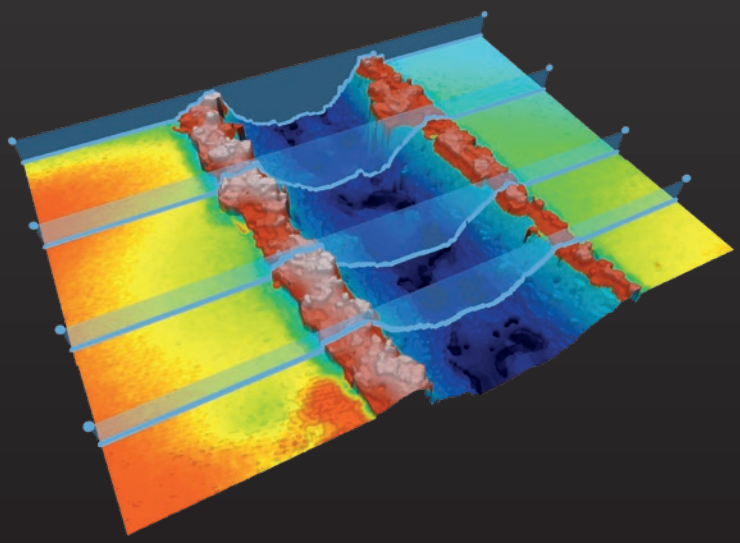
Laser groove

Laser cutting is one of the main front end processes in the semiconductors field. In the case of PCBs, it is used for fabricating bias and channels of communication that are characterized (barbs, depth, etc.).

Groove profile

SensoPRO **Plugin**

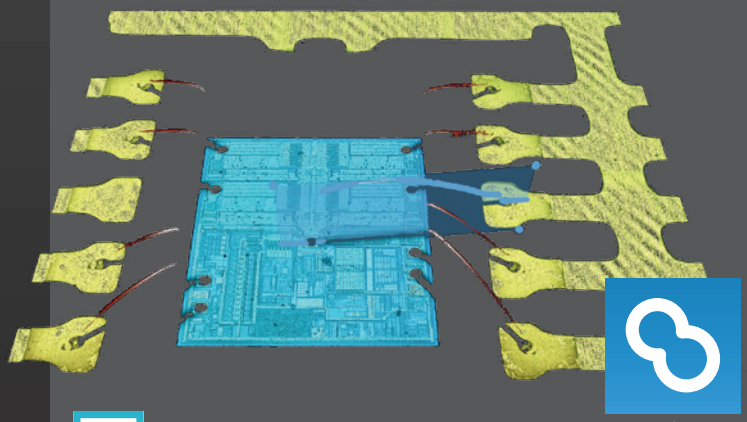
Four different plugins have been developed to analyze different structures generated with laser methodology.



IC PACKING

Wire bonding

Technology always pushes limits. Sensofar wants to be at the forefront. Vanguard technologies reduced the diameter of gold wires down to 30 µm, a significant improvement.



SensoVIEW

SensoVIEW can create as many profiles as needed and measure critical dimensions. This example shows the height difference between the maximum point of the wire and the chip since that parameter will determine whether or not the cable makes contact with the chip's cover.

IC PACKING

Thermal pad

When there are parts that need to be characterized in multiple ways such as this thermal pad, SensoPRO has a solution: it can analyze the sample with different plugins simultaneously, getting a very comprehensive analysis.

SensoPRO Plugin

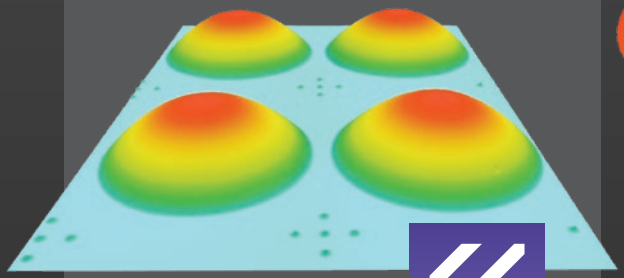
Multiple HS | RHole | Surface Texture

Confocal

OPTICS

Microarray of aspheric lenses

Aspherical lenses, distinguished by their lower aberrations, are often used to build compact opto-electrical devices.



Interferometry (CSI)

Aspheric

SensoPRO Plugin

The Aspheric plugin calculates critical dimensions, 10 aspheric deformation coefficients and Sa, Sq and Sz roughness parameters.

Spheric

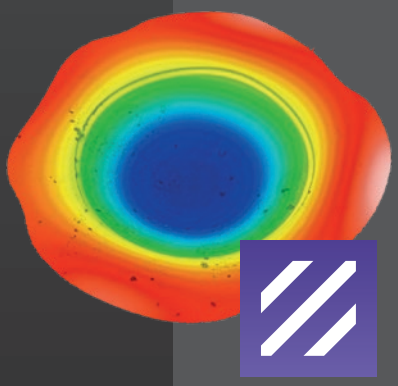
SensoPRO Plugin

The Spheric plugin gives both dimensional parameters and residual roughness.

OPTICS

Camera lenses

Volume calculations of the area of interest can be performed in our software.



Interferometry (CSI)

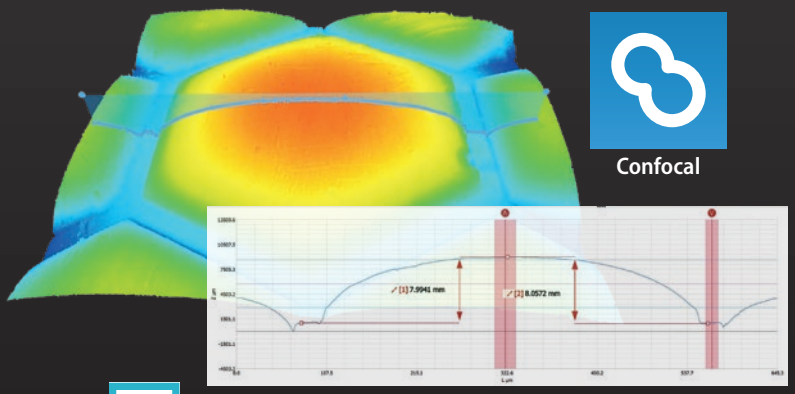
SensoVIEW

The software has very high sensitivity to different dimensions of holes (this sample has d=2 mm).

OPTICS

Polygonal lenses

Hexagonal microlenses are a typical geometry used in lens microarrays and they stand out for their high density.



Confocal

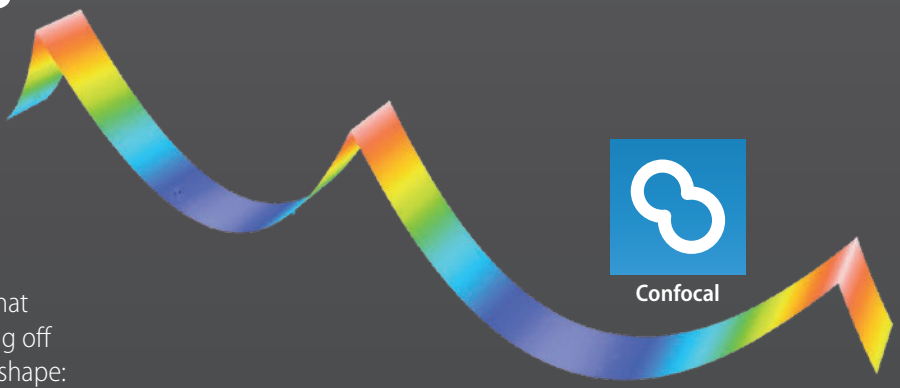
SensoVIEW

Applications

DISPLAY

UV filter measurement

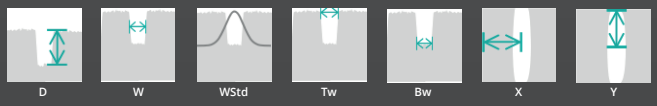
There are layers inside some displays that filter potentially hazardous light coming off devices, and some have the following shape:



Confocal

Trench

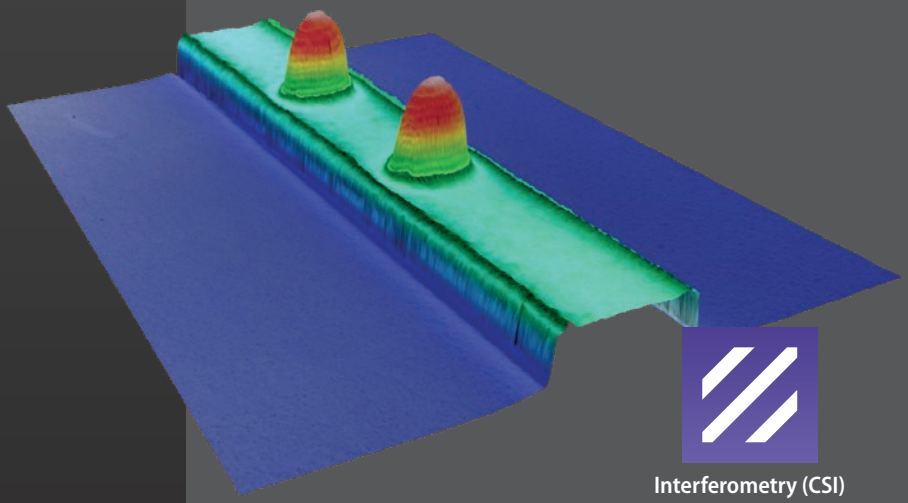
SensoPRO **Plugin**



DISPLAY

Spacer TFT

Displays are made of multiple layers that need to be separated a certain distance. Spacers are structures distributed all over the screen to ensure that gap.

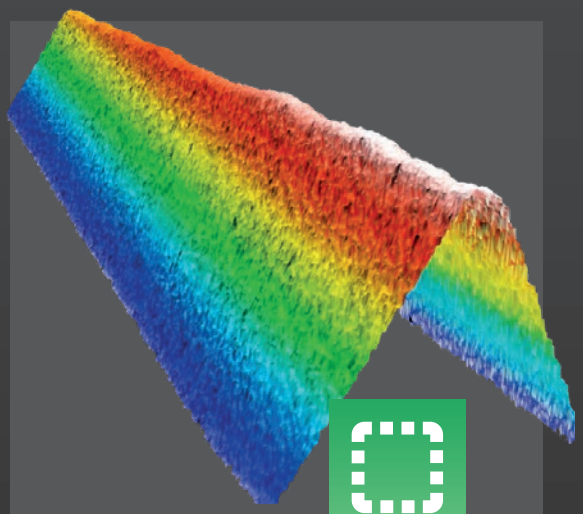


Interferometry (CSI)

Spacer

SensoPRO **Plugin**

The Spacer plugin automatically detects different shapes of spacers: oval, round and square.



Ai Focus Variation

TOOLING

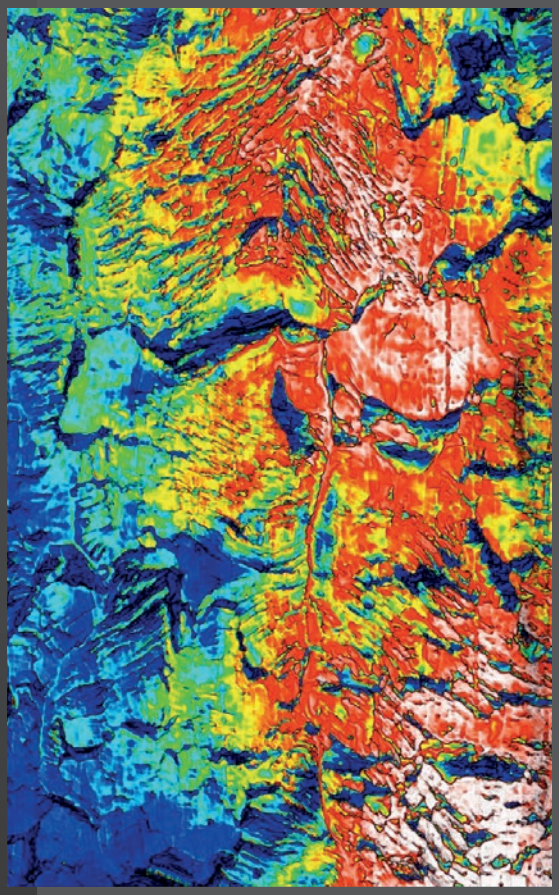
Drill cutting edge

The edge of a cutting tool is directly related to the result of the cut part. Its characterization will then predict its performance.

Edge

SensoPRO **Plugin**

The Cutting edge plugin measures the edge radius and other important parameters plus the top surface profile roughness (height parameters).



SURFACE FINISH

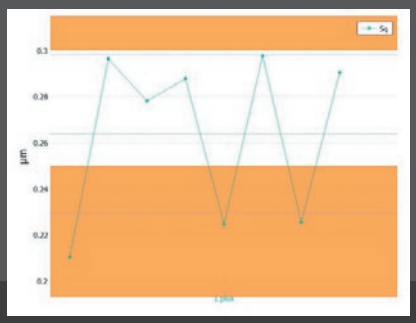
Gold foil

Interferometry (CSI)

High-end microelectronics use a gold foil since this metal has a better performance than other materials used in the application. Defects on the surface or roughness values different than the optimal can severely affect the top layers.

Surface texture

SensoPRO **Plugin**



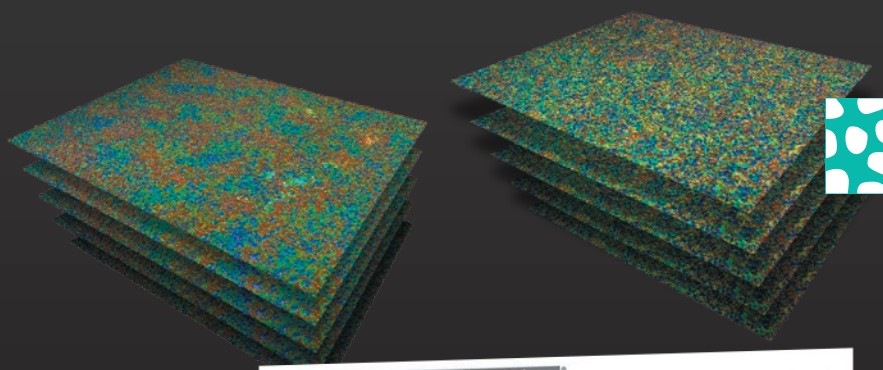
With the powerful Surface texture plugin, it can apply tolerancing to know which parts do not comply.

SURFACE FINISH

Copper wire adhesion

The surface finish of a material impacts material behavior. In this case, the interesting property is the adhesion of copper with a conductive material used in the welding process.

Confocal



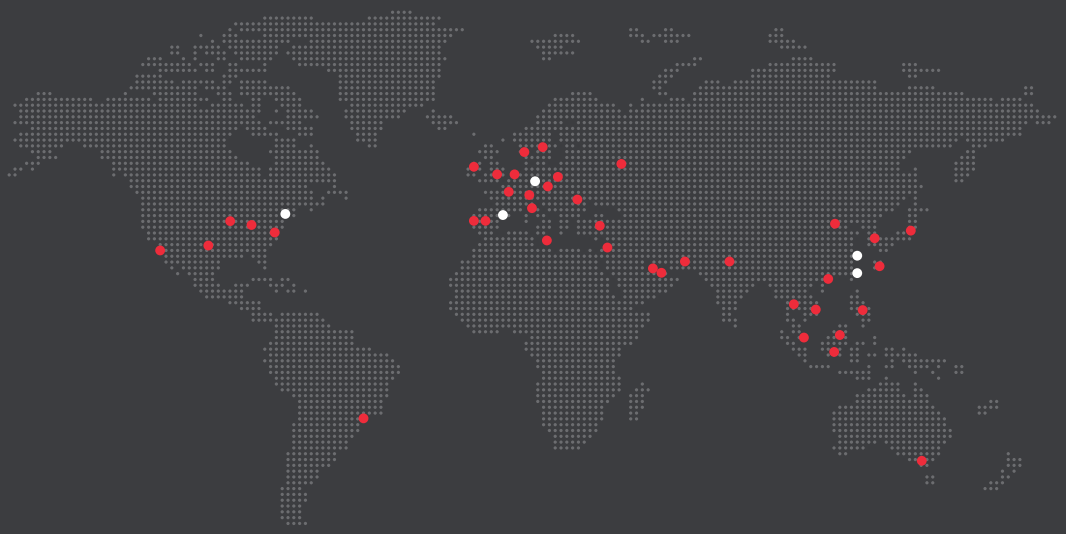
Parameter	A	B	Unit	Rating
Bb	127.676	134.229	µm	
Depth	119.734	131.028	µm	
ECC	0.91321	0.636939		
Y	230.027	254.88	µm	
A	1.66038	9.81782	µm	
X	326.351	301.986	µm	
BX	326.572	305.282	µm	
Ba	113.145	123.995	µm	
TopDiameter	242.372	243.787	µm	
BY	230.652	245.859	µm	
BottomDiam…	170.07	158.078	µm	
Bab	0.886056	0.923778	/	

Surface Texture

SensoPRO **Plugin**

Understanding which roughness parameter differentiates two sets of samples with different adhesion can help the user to correlate specific roughness parameters with adhesion.

SENSOFAR
METROLOGY



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, 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, 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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