



## Manufacturing Metrology Team – Instrument Data Sheet

### Sensofar S-Neox 3D Profiler



#### Purpose

- Optical 3D measurement of surface form and texture

#### Working principle

- The Sensofar S-Neox is a hybrid non-contact measuring instrument, employing Confocal, Interferometry (both Phase Shift and Coherence Scanning) and Active Illumination Focus Variation techniques to support a wide range of precision applications.



## Related research focus

- Calibration of the ISO metrological characteristics based on each measurement principle
- Advanced methods of surface texture measurement and analysis
- Calibration of the instrument's transfer function to improve measurement capability and accuracy
- Performance verification of the instrument for geometrical metrology
- Automatic inspection strategy for freeform surface
- Measurement uncertainty estimation

## Objective Lenses

	Brightfield						Interferometry					
MAG	5×	10×	20×	50×	100×	150×	2.5×	5×	10×	20×	50×	100×
NA	0.15	0.30	0.45	0.80	0.90	0.90	0.075	0.13	0.30	0.40	0.55	0.70
WD (mm)	23.5	17.5	4.5	1.0	1.0	1.5	10.3	9.3	7.4	4.7	3.4	2.0
FOV <sup>1</sup> (μm)	3370× 2826	1685× 1413	842× 707	337× 283	168× 141	112× 94	6740× 5652	3370× 2826	1685× 1413	842× 707	337× 283	168× 141
Spatial sampling <sup>2</sup> (μm)	1.38	0.69	0.34	0.14	0.07	0.05	2.76	1.38	0.69	0.34	0.14	0.07
Optical resolution <sup>3</sup> (μm)	0.94	0.47	0.31	0.18	0.16	0.16	1.87	1.08	0.47	0.35	0.26	0.20
Objective Lenses												
	Confocal / Ai Focus Variation						PSI / ePSI / CSI					
System noise <sup>4</sup> (nm)	100	25	6	3	2	1	PSI/ePSI 0.1 nm (0.01 nm with PZT). CSI 1 nm					
Maximum slope <sup>5</sup> (°)	9	17	26	53	65	65	4	8	17	23	33	44

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

2 Pixel size on the surface.

3 L&S: Line and Space. 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 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.

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



## Accuracy and Repeatability<sup>6</sup>

Standard	Value	U, $\sigma$	Technique
Step Height	48600 nm	U = 300 nm, $\sigma$ = 10 nm	Confocal & CSI
	7616 nm	U = 79 nm, $\sigma$ = 5 nm	Confocal & CSI
	941.6 nm	U = 7 nm, $\sigma$ = 1 nm	Confocal & CSI
	186 nm	U = 4 nm, $\sigma$ = 0.4 nm	Confocal & CSI
	44.3 nm	U = 0.5 nm, $\sigma$ = 0.1 nm	PSI
	10.8 nm	U = 0.5 nm, $\sigma$ = 0.05 nm	PSI
Areal roughness ( $S_a$ ) <sup>7</sup>	0.79 $\mu\text{m}$	U = 0.04 $\mu\text{m}$ , $\sigma$ = 0.0005 $\mu\text{m}$	Confocal, AiFV & CSI
Profile Roughness ( $R_a$ ) <sup>8</sup>	2.4 $\mu\text{m}$	U = 0.03 $\mu\text{m}$ , $\sigma$ = 0.0002 $\mu\text{m}$	Confocal, AiFV & CSI
	0.88 $\mu\text{m}$	U = 0.015 $\mu\text{m}$ , $\sigma$ = 0.0005 $\mu\text{m}$	Confocal, AiFV & CSI
	0.23 $\mu\text{m}$	U = 0.005 $\mu\text{m}$ , $\sigma$ = 0.0002 $\mu\text{m}$	Confocal, AiFV & CSI

**6** Objective used for Confocal and Ai Focus Variation 50 $\times$  (0.80 NA) and for CSI and PSI 50 $\times$  (0.55NA). Resolution 1220 $\times$ 1024 pixels.

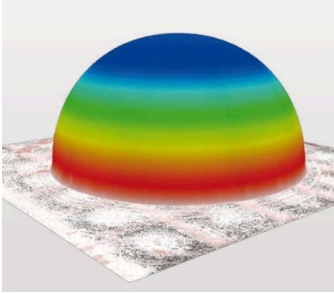
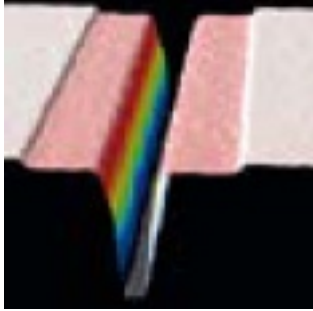
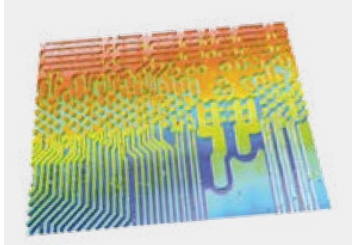
All measurements are done using PZT. Uncertainty (U) according to ISO/IEC guide 98-3:2008€ GUM:1995, K=1.96 (level of confidence 95%).  $\sigma$  according to 25 measurements.

**7** Area of 1x1 mm.

**8** Profile of 4 mm length.



## Measurement examples

		
High slope components	Double step height	Microelectronics

**For contract measurement enquiries, please contact:**

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