

Non-contact «point» sensors

■ Introducing Spectral Confocal Interferometry technology

The measurement accuracy in non contact profilometric techniques is generally limited by mechanical vibrations and by positional inaccuracies of the micro-scanning table. In order to free the measurement from these environmental perturbations, STIL has developed a new vibration insensitive interferometric method. With this new type of interferometric system, the potential subnanometric accuracy of interferometric microscopy is effective.

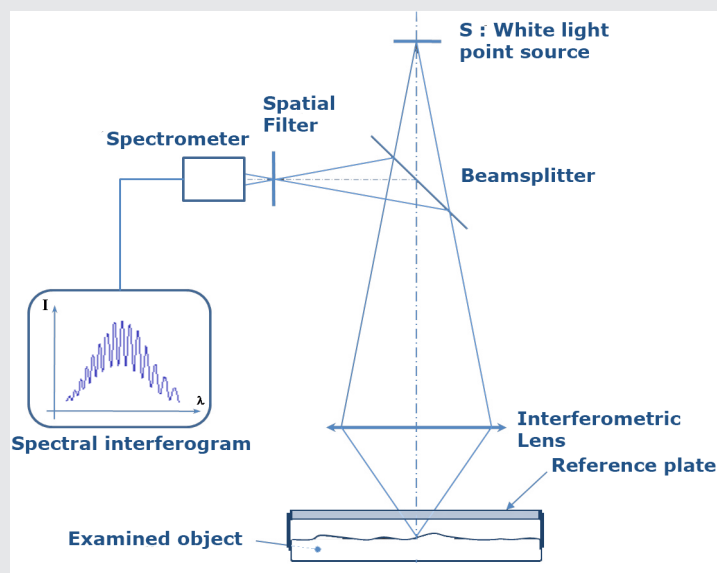
Moreover this new sensor can be used for measuring transparent films that are too thin to allow the “Chromatic Confocal” technique to be used. The minimum measurable thickness is about $1\mu\text{m}$.



■ Confocal Spectral Interferometry principle

The STIL interferometric method is based on Spectroscopic Analysis of White Light Interferograms (SAWLI). It consists in analysing the interference signal observed on a spectrometer in order to measure the air gap thickness between the reference plate and the sample. The originality of the developed system lies in the fixation of the reference plate on the inspected object. As reference plate and sample are fixed together, the mechanical vibrations do not affect the measurements.

The interferometric signal is a channelled spectrum. From this signal, the spectral phase is calculated using a numerical seven points phase shifting algorithm allowing the measurement of the local height of the analyzed surface with a subnanometric resolution.



■ The STIL DUO controller line

The new sensor STIL DUO double technology, a new standard in the world of dimensional measurement.

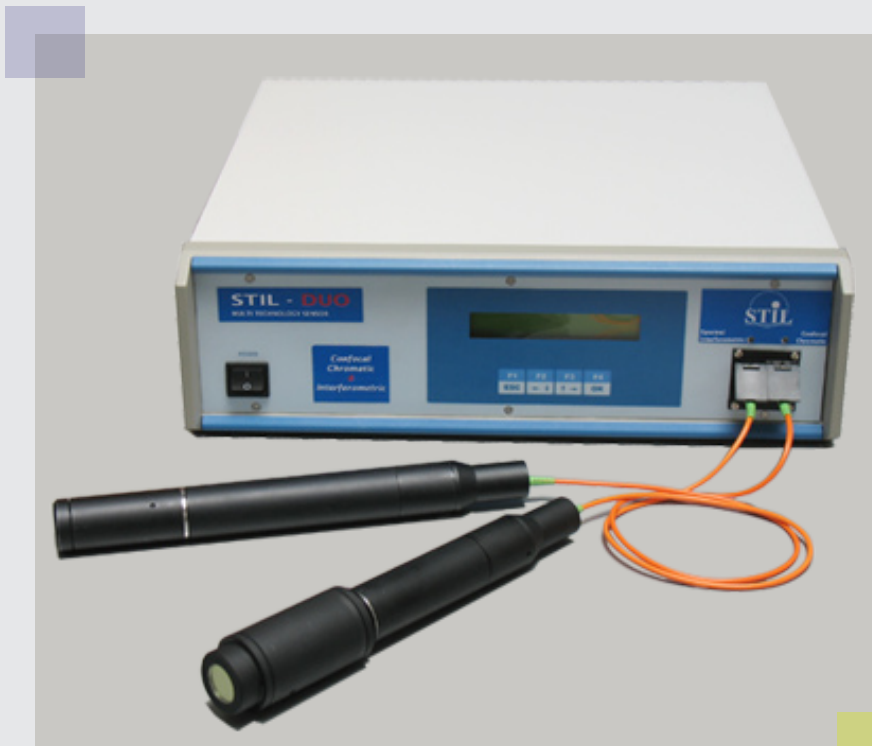
The sensor STIL DUO is the first system in the world that offers two simultaneous measurement technologies: the Confocal Chromatic and the White Light Spectral Interferometry with an original confocal setup.

By associating these two technologies (two STIL processes) the sensor STIL DUO creates a new standard in the world of dimensional measurement because it allows the user to get the very best out of these two operating principles:

- STIL's Confocal Chromatic principle makes it possible to work with a large measurement scale going from 20 μ m to 25mm. This characteristic is perfect for rugosity and surface topography measurements, which give very high precision results on any type of material, be it reflective or diffusing. The measurement is in compliance with the new ISO 25178 standard.
- STIL's Confocal Spectral Interferometry process gives access to sub-nanometric resolutions (<1 nm) for thickness and topography measurements that can be performed within a measurement scale larger than 100 μ m. Moreover, the minimum measurable thickness of the samples can be lower than 1 μ m, and the measurements are insensitive to vibrations.

The new sensor STIL DUO possesses the same qualities as any sensor from STIL's products range: it is perfectly fitted to the industrial environment and its interfacing is very easy, thanks to the many inputs and outputs and an offer including software development kits.

Soon available, the sensor STIL TRIO will offer a third measurement technology enabling the colorimetric analysis. The combination of microspectrometry and microtopography will at last make "true color" 3D metrology available.



■ Advantages

- Vibration insensitive (OPILB-RP optical pen),
- High signal to noise ratio (OPILB-RP optical pen),
- No vertical scanning required,
- Minimum measurable thickness less than 1µm,
- Subnanometric resolution inherent to the optical principle.

■ Configurations

- The sensor consists of:
- A STIL DUO controller,
 - One or more interference optical pen(s),
 - One or more chromatic confocal optical pen(s) (optional),
 - a fiber optic cable for each optical pen.

■ Optoelectronic controllers: technical specifications

	DUO
Measuring frequency	up to 2000 Hz
Wavelength range	400-900 nm
Spectral resolution	0.6 nm / pixel
Light Source	Tungsten halogen lamp and White LED
Digital outputs	Ethernet / RS232
Synchronization I/O	1 input (TTL) / 1 output (TTL)
Optical fiber connectors	E2000
Humidity limits	5%-80% HR without condensation
Temperature in use	5 - 50° C
Dimensions	376mm x 363mm x 114mm
Weight	6 Kg
Measuring mode: Distance/Thickness	1- Confocal Chromatic 2- Confocal spectral Interferometry

■ Interferometric optical pens

Objective model		OPILB-RP		OPILB-LWD-D		OPILB-LWD-T		
Measuring mode	-	Distance		Distance		Thickness		
Measuring range	[μm]	135		135		0.5-90 ⁽¹⁾		
Working distance	[mm]	5.3		5.3		5.3		
Axial resolution	[nm]	0.5		2		0.5		
Axial accuracy	[nm]	10		10		10		
Max object slope	[deg]	7		7		7		
Reference plate ⁽²⁾	-	Yes		No		No		
Vibration insensitive ⁽³⁾	-	Yes		No		Yes		
Magnifier model		MG210	MG140	MG210	MG140	MG70	MG35	MG20
Spot size diameter	[μm]	3.8	5.6	3.8	5.6	11.4	22.8	40
Lateral resolution	[μm]	1.9	2.8	1.9	2.8	5.7	11.4	20
Length ⁽⁴⁾	[mm]	200	164	200	164	131	100	84
Weight ⁽⁴⁾	[g]	200	127	200	127	126	67	52
Mechanical diameter	[mm]	27	27	27	27	27	27	27

(1) The values are given for transparent samples of 1.5 refractive index value.

(2) The reference plate is placed directly on the sample.

(3) In distance mode the reference plate of the OPILB-RP acts as an absolute reference. It compensates for the mechanical imperfections of the scanning system.

In thickness mode there is no need for the reference plate, since the sample's rear face acts as the absolute reference.

(4) Excluding optical fiber.