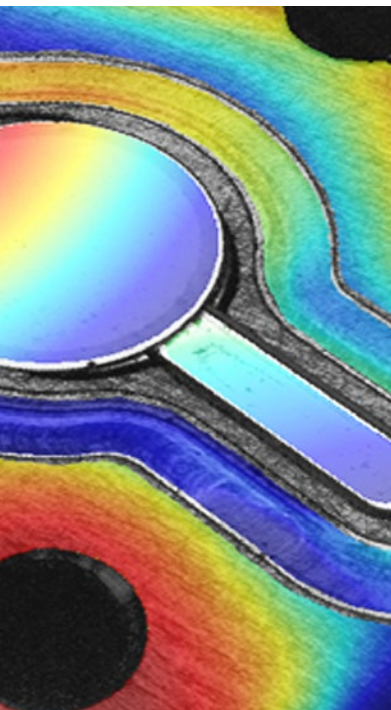
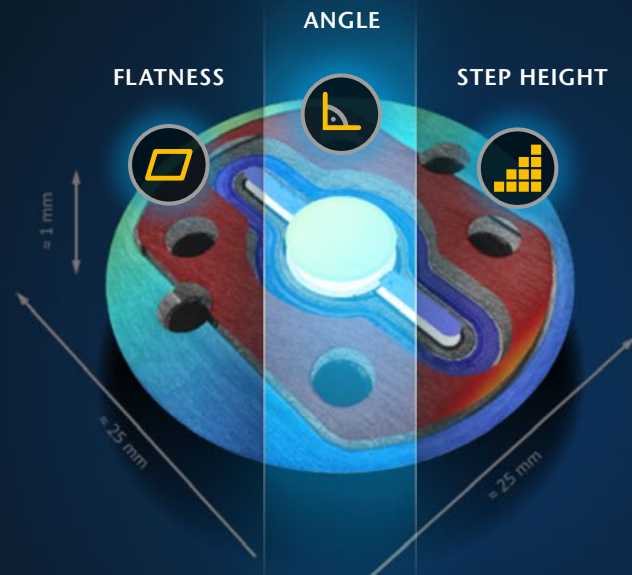


Characterizing precision surfaces



Characterizing precision surfaces for interferometers Application note



Milk is a fundamental source of nutrition for humans, making its quality control of paramount importance. To meet the high demands placed on the end products, continuous monitoring in dairy milk production facilities is required. Infrared spectroscopy offers non-destructive and rapid means to evaluate several essential substances contained in cow milk. Furthermore, it allows for real-time detection of potential adulteration, spoilage, and microbial contamination, contributing to enhanced consumer safety. The quality of infrared spectroscopy is closely related to the quality of the mechanical parts involved in the spectroscopic equipment – a perfect job for the TopMap Pro.Surf. This is also the belief of the company FOSS. As a global provider of high-tech analysis solutions, FOSS relies on Polytec's optical 3D surface metrology to monitor product quality of key components.

Infrared spectroscopy, encompassing both mid-infrared (MIR) and near-infrared (NIR) techniques, measures the absorption, transmission, or reflection of infrared light as it interacts with molecular vibrations. By analyzing the received light, spectroscopy can provide highly accurate information regarding fat content and protein concentration. The cuvette is a critical component in infrared spectroscopy which contains the milk being analyzed. Any misalignment or imperfection in the cuvette can lead to variations in sample presentation, impacting the accuracy and reliability of concentration measurements. Cuvettes consist of high-quality optically transparent materials which are accurately positioned in the assembly using very precise mechanical fixtures. Relevant parameters are the position and orientation of the window in relation to the fixture but also the surface flatness of the

fixture as well as vertical step heights between different levels of the cuvette. Both the sensitivity of the components and the high demands regarding their accuracy require an optical, full-field measurement of the cuvette.

The TopMap Family from Polytec comprises Coherence Scanning Interferometers that offer contactless characterization of form, step height and texture providing best vertical resolution independently of the field of view. The TopMap Pro.Surf covers an area of 45 mm x 34 mm without stitching allowing to measure the cuvette in a single measurement within seconds. Compared to tactile measurement techniques which mechanically touch the surface at dedicated measurement positions, the optical full-field measurement of the cuvette contains almost a million measurement points. The resulting 3D display

	Evaluation	Area	Reference	Value	Result	Measurement	1	2	3	4
	Flatness	Top	5 μm	1.8 μm						
	Flatness	Window	1 μm	0.42 μm						
	Angle	Top / Window	0.075 $^\circ$	0.073 $^\circ$						
	Parallelism	Top / Bottom	10 μm	2.7 μm						
	Step height	Top / Bottom	1 mm	0.997 mm						
	Remeasure area	Remeasure line	Accept results							

All values given are fictitious

of the results provides considerable added value to the purely numerical measurement result since deviations in shape and position can be immediately detected visually and problems in the manufacturing process can be identified. Challenging for the cuvette is the mixture of materials and surface finishes which result in very different reflective properties. Using “Smart Scanning Technology”, the TopMap Pro.Surf provides the required adaptability to measure both smooth and rough surfaces from very shiny to dull.

With TMS software, the whole inspection process can be fully automated, including the data representation and exportation to report or data base. Equipped with a motorized stages and Pattern Matching functionality, the software can compensate for sample misalignments in XY, rotation and tilt and thus provide a stable inspection

process even without using a dedicated sample fixture. Powerful functionality doesn't mean it's difficult to use: The Operator Interface offers intuitive operation and does not require any training on the instrument.

About FOSS:

The company offers innovative analytical solutions for the agri-food industry, covering laboratory, at-line, and in-line applications. Empowering the world's top 100 agri-food producers and 40,000 others worldwide, **FOSS** optimizes valuable natural resources, ensures food safety, and improves quality across the dairy, feed, grain, meat, raw milk testing, wine, and beer industries.



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