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PRESS RELEASE

Digital holography in production

In the journal "Light: Advanced Manufacturing", researchers at Fraunhofer IPM in Freiburg provide a current overview on the range of industrial applications of digital holography with multiple wavelengths. Digital holographic measurement systems differ from other optical sensors by virtue of their high measurement accuracy combined with short measurement times.

Over the past decade, digital holography has evolved into one of the fastest and at the same time most accurate methods for recording the surface topography of components in the production line. A survey article by Fraunhofer IPM scientists in the journal "Light: Advanced Manufacturing" now describes how this came about. A wide variety of industrial applications of digital holographic sensors is presented – from the first installation in the manufacture of sealing surfaces for the automotive sector in 2015 to current use in high-precision processor production in 2021. Holographic sensors enable inline measurements with accuracies down to the sub-micrometer range on macroscopic measuring fields, which makes them unique. Over the past years, digital holographic measuring systems have become more and more compact and robust so that they can also be used in 5-axis machine tools for quality control.

In holographic measurements, the height information is obtained from the phase of the laser light reflected or scattered by the object to be inspected. By skillfully combining a number of lasers with different wavelengths, even macroscopic objects can be measured with submicron accuracy. "Digital holographic measurements work on both reflective and matt surfaces. The fact that measurements are independent from sample roughness plus the ability to measure steep flanks make this method universally applicable in industrial production," says Dr. Alexander Bertz, Group Manager at Fraunhofer IPM. "As an extension of classical interferometry, digital holography offers another very useful feature: The reconstructed wavefront can be numerically propagated. This means that the object plane can be refocused within the digital data as desired, even after the recording has been completed. This holds many advantages for industrial applications – especially in the production line."

Digital multi-wavelength holography can be used for all applications in which several square centimeter-sized measurement fields must be topographically recorded and inspected with submicron precision. Comparatively short measurement times of well under one second enable quantitative 100 percent inspection in the line, where previously only inspections of random samples were possible.

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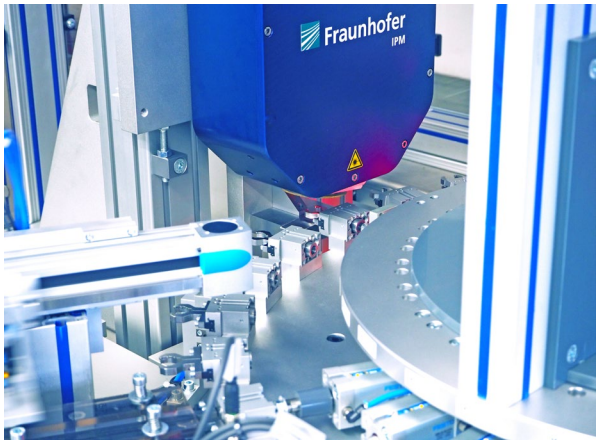

Where 3D measurement tasks could previously only be carried out in measuring rooms on a random basis, digital holography now allows us to perform them directly in the line on the entire surface of every single component. © Fraunhofer IPM

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