



HoloAMS

Digital holographic inline measurement system

Full-surface quality control with micrometer precision

The HoloAMS measurement system enables 100 percent automated inspection of the component topography in the production line.

Poor manufacturing parameters or even slightly worn tools can impair the quality of precision components and cause rejects. The HoloAMS measurement systems enables full-surface quality control of precision components with accuracies in the micrometer range directly in the production line. The entire component surface is measured in 2D and 3D, which allows defects such as particles, discolorations, scratches, dimensional accuracy and roughness to be evaluated.

Precise surface measurement and defect detection

The full-field inspection, measurement and documentation of functional surfaces with regard to important parameters such as planarity and roughness or particulate contamination and microdefects is already required in many industrial areas today. However, in mass production, inspection is usually only carried out qualitatively or on a random basis. This no longer meets the growing requirements of 100 percent quality control.

With HoloAMS (Holographic Automated Measuring System), Fraunhofer IPM offers a system family of optical measurement systems for automated 3D inline measurement. The systems use [HoloTop sensors](#) from Fraunhofer IPM to measure components quickly, precisely and with no contact. They capture the component's topography with interferometric accuracy and, at the same time, are so fast and robust that they can also be integrated directly into production facilities.

Measuring macroscopic topography with microscopic accuracy

HoloTop sensors measure according to the principle of digital holography, capturing the complete information (amplitude and phase) of the laser light used to illuminate the object. Fully recording the light wave makes it possible to calculate its propagation in space numerically. The measurement system can even measure a surface in fractions of a second if it is not optically focused on the camera chip. By using several eye-safe lasers of different wavelengths, unambiguous measurement ranges in the centimeter range along with sub-micrometer accuracies can be achieved.

In addition, LED lighting can be integrated: with bright and dark field illumination, even the smallest defects can be detected and analyzed using methods of classical image processing – and all with just a single optical sensor. The component surface can



The HoloAMS software makes the measurement system easy to operate – directly in the production line or via remote access. The sensors, as well as the analysis and optimization of process stability, are implemented according to specific requirements.

thus be fully measured in 2D and 3D according to requirements and particles, discolorations, scratches, dimensional accuracy and roughness e.g. can be evaluated.

A wide range of applications thanks to flexible system design

Fraunhofer IPM develops HoloAMS systems to meet specific requirements, using a variety of sensors and actuators to solve the measurement task reliably and economically. The core elements of the measurement system are one or more HoloTop sensor heads and the Holo-Software. The HoloAMS-Software is individually adapted for intuitive operation in the production line. The intuitive graphical user interface allows for easy control of the measurement system and provides a quick overview of the individual measured values, thus creating the basis for optimizing the production process. The measured values are automatically evaluated and documented.

HoloAMS ensures sustainable quality control and minimizes production waste. It can be used for a wide range of applications, from precision-engineered metal surfaces to the finest microbump structures for contacting computer chips, as well as for large-area measurement of electronic circuit boards made of different materials.

Technical specifications

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|--------------------|---|
| Installation area | Customer-specific, typ. < 2 m ² |
| Resolution | Customer-specific, typ. 65 MPx |
| Measurement field | Customer-specific, typ. 13.4 × 17.8 mm ² |
| Reproducibility | Axial typ. < 0.2 µm (3σ) / lateral typ. < 10 µm |
| Measurement time | Approx. 1 s per measuring field |
| Operating distance | Customer-specific, typ. bis 300 mm |



HoloAMS is set up with application-specific sensors and actuators to solve the measurement task reliably and economically. Components can be fed into the system manually or automatically by a robot.

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