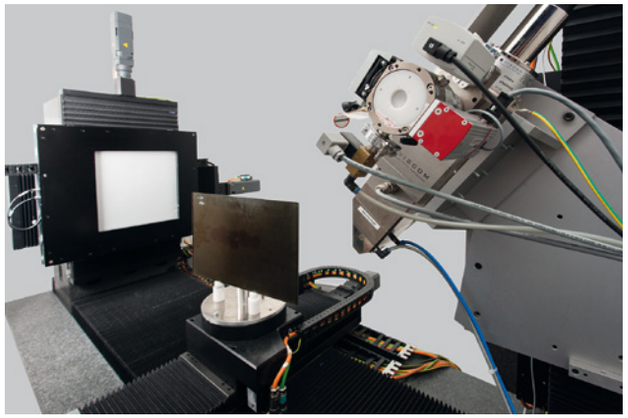

Service Offering

Fraunhofer Center HTL offers services and R&D in the field of non-destructive material and component testing. Samples and components with dimensions up to 700 mm diameter and 2500 mm height can be examined. In a consultation, the procedure is discussed and the appropriate methods are selected.

- Damage analyses on components
- Geometric measurement and dimensional inspection (nominal/actual comparisons, creation of CAD/CAM-compatible geometry models)
- Volumetric microstructure analyses up to 2 µm resolution with the aid of micro-computed tomography
- Failure analysis and service life prediction by comparative measurements of components before, during and after load tests
- In-situ investigations of component or material behavior due to thermal, mechanical or chemical loads
- Investigation of small series and compilation of failure catalogs

The test results are provided in the form of test reports, image and video files or CAD or STL files. On request, an interpretation of the measurement data with detailed reporting is provided.

Fraunhofer Center HTL
is certified acc. to ISO 9001:2015

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Center for High Temperature Materials and Design HTL

Non-destructive Testing Methods

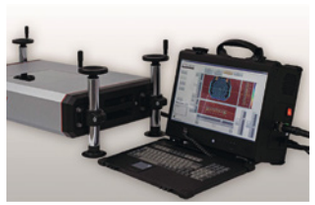
Non-destructive Testing Methods

Non-destructive testing methods have the advantage that samples or components are not changed during the test. After a test, samples can be subjected to further test procedures and components can be used for their intended application. At Fraunhofer Center HTL, imaging non-destructive testing methods are used to:

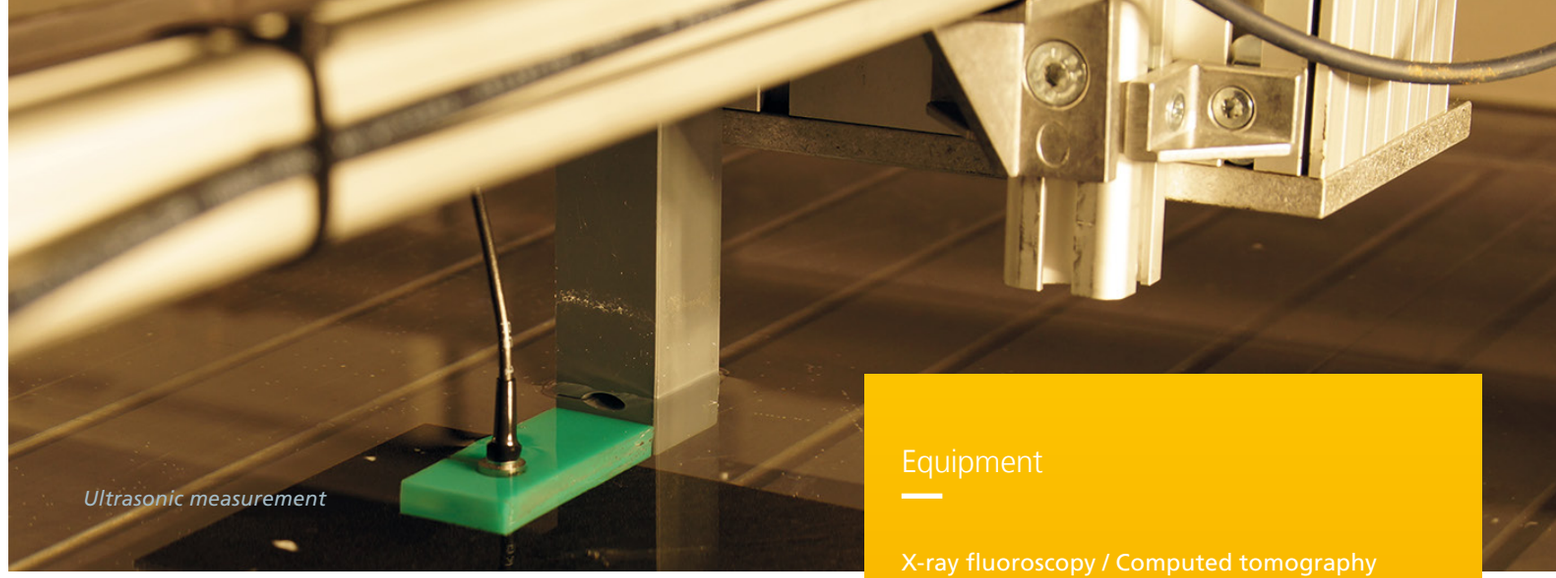
- identify defects, such as cracks, pores, blowholes, delaminations or other inhomogeneities, inside components.
- determine quantitative microstructural features, such as phase fractions, neighborhood ratios, fiber orientations or density variations.
- perform dimensional measurements – also on internal structures.
- detect structural changes under mechanical and thermal loads.

The detection of defects serves the quality monitoring and optimization of manufacturing processes. This also applies to the determination of quantitative microstructural characteristics. Dimensional measurements can also be used for quality monitoring. However, they also serve to create CAD data sets for FE analyses or 3D printing, etc.

Thermography



Terahertz analysis



Ultrasonic measurement

Testing methods

Non-destructive testing methods differ in terms of experimental effort, detectable defect sizes, allowable component geometries and materials. The following methods for non-destructive material and component testing are available at Fraunhofer Center HTL:

- Computed tomography
- Water and air coupled ultrasonic measurement
- Thermography
- Terahertz technology
- X-ray fluoroscopy

With these testing methods, almost all materials (ceramics, plastics, metals) as well as composites can be tested. The HTL has extensive experience in the testing and evaluation of series components for industrial customers. Computer programs developed in-house are available for the determination of quantitative microstructural characteristics and can be adapted to customer-specific requirements.

In addition to non-destructive testing, detailed microstructural examinations can be carried out on materials at the various stages of production.

Equipment

X-ray fluoroscopy / Computed tomography

- 225 kV nanofocus tube / 225 kV microfocus tube / 450 kV minifocus system
- Sensitive high speed detector
- Serial measurements by automatic sample changer

Ultrasonic measurement

- High-resolution water-coupled ultrasound with up to 100 MHz inspection frequency for defect detection
- Non-contact measurement with air-coupled ultra-sonic ultrasound for porous / water-sensitive materials

Thermography

- Highly accurate imaging with 640 x 512 px image size
- Detection of small temperature differences ($\Delta T < 20$ mK) in the temperature range from -20°C to 3000°C
- High-speed observation of temperature changes with up to 4500 frames/sec

Terahertz analysis

- Fast volumetric defect analysis with 100 µm resolution
- Dual probes with 0.1 THz and 0.3 THz excitation
- Rugged design for outdoor use