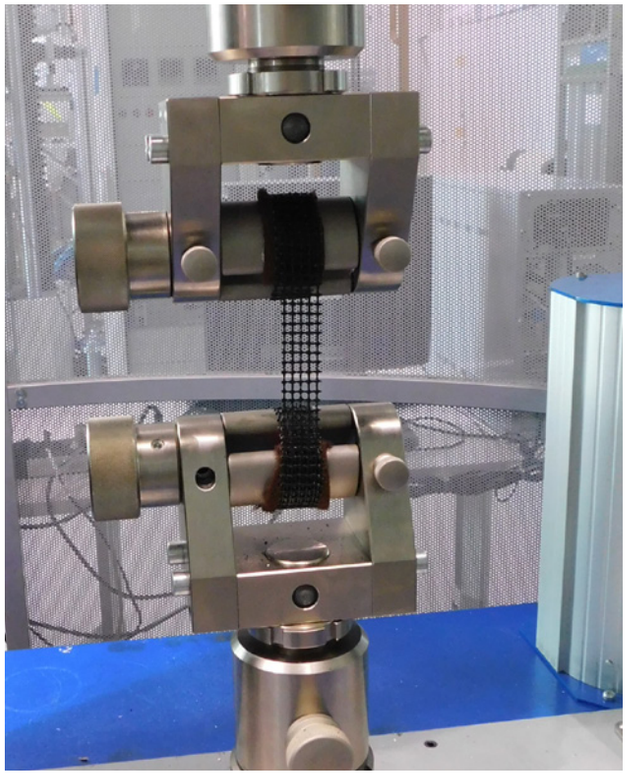

Service Offering

The HTL offers services and R&D in the field of mechanical materials testing. Orders are carried out by experienced specialist personnel in a timely manner and in accordance with standards. The testing equipment used is regularly calibrated. The LabMaster operating software, which was specially developed for use in materials and component testing, guarantees optimum measurement data acquisition.

In close coordination with the customer, the test sequences are defined and, if necessary, optimal test conditions for customer-specific requirements are set via pretests. The test results are made available to the customer in the form of standardized test reports. An interpretation of the measurement data can be provided on request.

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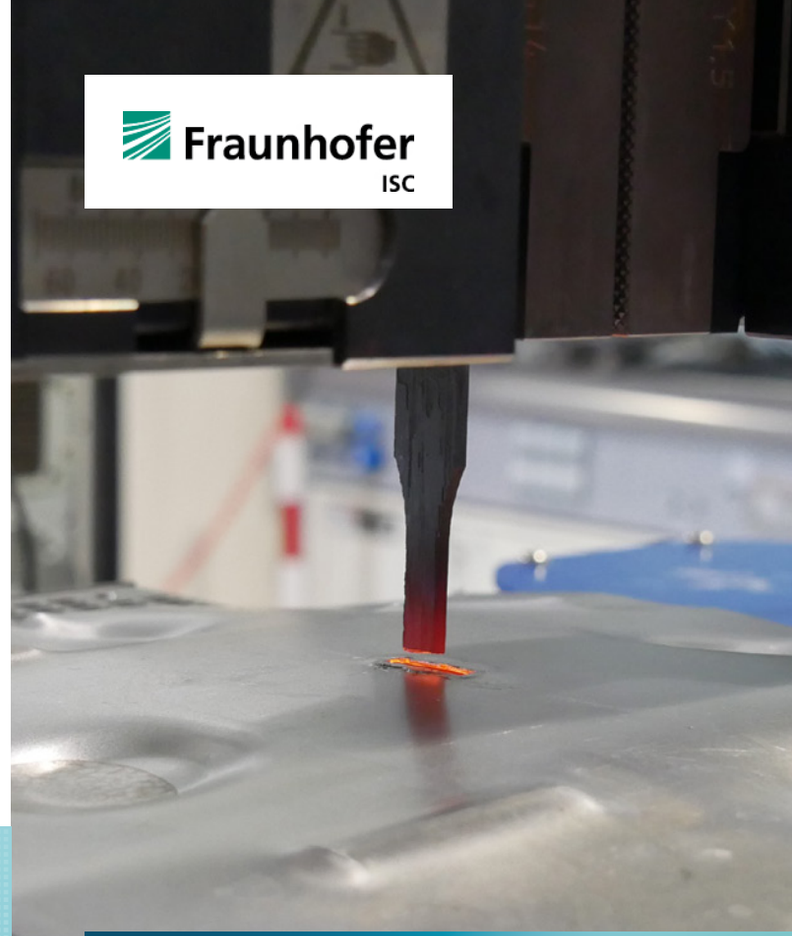
Fraunhofer Center HTL
is certified acc. to ISO 9001:2015

Fraunhofer ISC



Center for High Temperature Materials and Design HTL

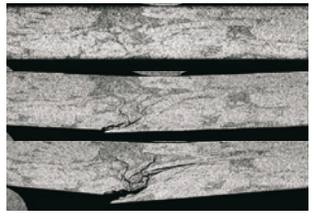
Mechanical Testings

Mechanical Testings

The mechanical properties of materials are decisive for the design of components made from them. They significantly determine the service life of the components in use. Depending on the application, very different mechanical properties must be determined in accordance with standards:

- Flexural strength
- Tensile / compressive strength
- Stress intensity factor / fracture energy
- Weibull modulus
- Stiffness
- Storage modulus / loss modulus / internal damping
- Fatigue strength
- Shear strength
- Shear strength of joints

In addition to a representative number of specimens, knowledge of microstructural properties, such as structural anisotropy, grain size distribution and microstructural defects of any kind, is also important for evaluating the characteristic values obtained. At Fraunhofer Center HTL, these can be additionally recorded by density and porosity measurements, computed tomography (CT) examinations or other test methods accompanying mechanical testing.



Testing Mesthods

Standardized testing of test specimens

- Tensile test (e.g. DIN EN 658-1, ASTM C1359, RT up to 1300°)
- Bending test via 3-point and 4-point bending (e.g. DIN EN 658-3, DIN ISO 843, ASTM C1341, RT up to 1500°)
- Compression tests
- Interlaminar shear strength (ILSS)
- Compliance measurements
- Strain measurements with strain gauges
- Shear tests (e.g. Iosipescu, Double Notch according to ASTM C1392)
- Transverse contraction measurements to determine Poisson's ratio

Component-specific testings

- Single point tensile failure
- Area compression failure
- Bending test on large components up to 1 m in length and 1200°C

3D in-situ material imaging under load

- 3D CT investigation of materials as well as failure mechanisms and crack propagation under load
- 3D investigation by means of a specially developed X-ray transparent 3-point bending set-up for CT

DMTA up to 1500°C

- Tensile test (RT up to 500 °C)
- Compression test (RT up to 500 °C)
- Symmetrical 3- and 4-point bending (RT up to 1500 °C)
- Asymmetric 3-point bending (RT up to 1500 °C)
- Fatigue strength (RT up to 1500 °C)

Measuring Devices

Universal testing machines Inspect table and Inspect mini

- Max. static force 3 N to 100 kN
- Test speed 0.005 to 400 mm/min
- Testing of test specimens or components made of plastics, ceramics, glass, metal and CMCs
- Testing of fibers, textiles, plastics

DMTA Eplexor 4000

- Max. static force 5000 N
- Max. dynamic force 1500 N
- Frequency range 0.01 to 300 Hz
- Temperature control furnace RT up to 500 °C
- High temperature furnace RT up to 1500 °C
- Test types: pure static, temperature sweep, frequency sweep, temperature-frequency sweep, static/dynamic strain, force or stress sweep, combinations of the above test modes
- Mechanical testing of ceramics, glass and metal