Calibration, Bearing, Passive Safety

- **Calibration**
- **Bearings and Expansion Joints in Structural Engineering**
- **Passive Safety**

MPA University of Stuttgart is equipped with an excellent calibration laboratory which is accredited by the Deutschen Akkreditierungsstelle GmbH (DAkkS). With more than 45,000 calibration certificates under the accreditation the MPA University of Stuttgart has a lot of experience. The unit Bearings and Expansion Joints in Structural Engineering is an officially approved as well as notified inspection and certification body with testing, third party surveillance and certification (PÜZ) of bridge bearings, expansions joints and anti-seismic devices. The unit Passive Safety is designated as technical service category A and D by the Kraftfahrt-Bundesamt (KBA) and as a technical service for the Vehicle Safety Certification Center (VSCC) in Taiwan for Safety-belts / restraint systems.

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The Materials Testing Institute University of Stuttgart is a central facility of the university of Stuttgart. The institute operates successfully in materials testing and research in almost all areas of mechanical and plant engineering as well as civil engineering.

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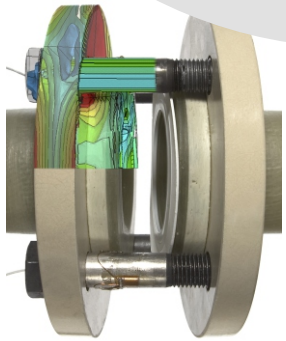
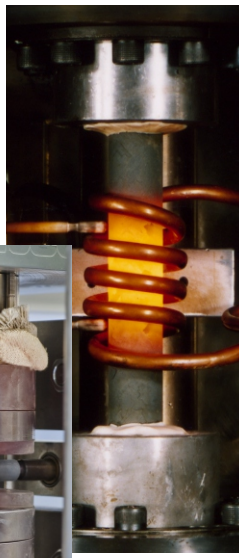
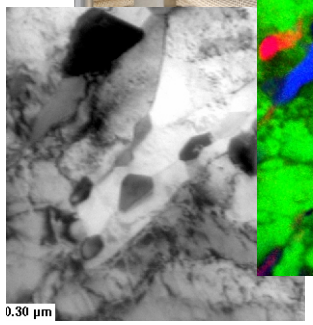
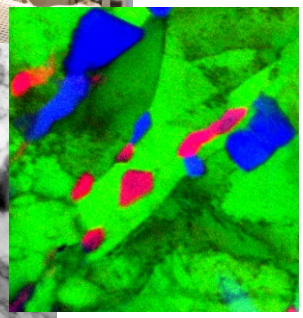
MPA STUTTGART
Materials Testing Institute
University of Stuttgart

Mechanical Engineering









University of Stuttgart
Germany

Plant Assessment and Operational Concepts

- **Quality Surveillance and Damage Analysis**
- **Plant Life Assessment**

The life cycle of more complex plants in the chemical Industry and for energy supply is mostly dependent of material and component behavior. The department´s work is focused on lifetime analyses for plants aimed to optimise operational strategies and maintenance. Beside lifetime analyses using conventional and advanced methods, maintenance and inspection schemes such as risk based maintenance and inspection are part of the research and development and definition, implementation and evaluation of measures to ensure quality during manufacturing as well as operation of plants. The department´s services are completed by root cause analyses for a broad range of component failures and damage. The analyses of our specialists are based on analytical and numerical calculations and numerous methods for material investigations available at MPA.

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Component Assessment and Reliability

- **Structural Durability**
- **Integrity Assessment**
- **Reliability and Probabilistic Assessment**

The department is mainly concerned with computational stress and fatigue analyzes as well as safety analyzes and aging management. The application covers components, structures and systems of power plants, general mechanical engineering, transport technology and aerospace.

The available calculation methods and models are capable to evaluate the whole life cycle of a component, structure or system, starting with the manufacturing process, including the evolution of damages and the various stages of failure. In addition, calculations and certificates are provided on the basis of relevant codes and standards.

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Materials Behavior and Materials Modelling

- **High Temperature Materials Testing**
- **Material Models and Microstructure Calculations**
- **High Speed Loading**

High-temperature materials testing means to represent a material's behaviour at high temperatures via appropriate experiments.
In general, time-dependent inelastic deformation plays a key role in the high temperature field. The main task of the Material Law and Microstructure Calculation Unit is to describe the processes and mechanisms during loading and to analyse them on different scales.
The Unit of High-Speed Loading applies loading rates up to 20m/s as well as impact loads on simple specimens and on components and structures. The analysis of the material and component behaviour at those loading rates is essential for safety analysis and also the simulation of manufacturing processes.

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Operational Behavior under Medium Influence

- **Influence of Hydrogen and Oxygen**
- **Corrosion**
- **Fatigue and High-Pressure Testing**

This department works to determine the behavior of materials and components. To achieve this, deformation, crack initiation, crack propagation and failure of materials are performed with regard to deformation, crack initiation, crack propagation and failure.
These investigations are performed under static or cyclic load, at temperatures in the range of 4 K up to the creep range.
Additionally the corrosion behavior of materials in different media, temperatures and pressure is examined, optionally components can be subjected to mechanical loads. Particular testing competences are the testing in compressed gaseous hydrogen and in cryogenic hydrogen.

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Non-Destructive Testing and Materials Characterization

- **Non-Destructive Testing**
- **Electron Microscopy and Metallography**
- **Research Network AMICA**

The behavior of components under service loading and the lifetime of components as well as plants are determined by material's properties and often by the type and size of possible defects.

The visualization and characterization of microstructure at different length scales and the non-destructive material testing are important tools when studying the material behavior under realistic loading as well as for the analysis of damage and failure mechanisms in technical materials. For this purpose, equipment which allows studying and characterizing materials up to nanoscale range is available at the department.

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Joining Technology and Additive Manufacturing

- **Additive Manufacturing**
- **Joining Technology**
- **Stress Analysis and Residual Stress**

The department Joining Technology and Additive Manufacturing consisting of both joining technologies and additive manufacturing as a system of process technology, material condition and the resulting strength properties. The influence of process parameters on emerging microstructure, formation of geometry and finally the mechanical properties is investigated in experimental studies and numerical process simulations. A well-equipped laboratory is available for experimental studies of manufacturing and processing problems. Besides experimental investigations of process limits and determination of stable parameters for existing joining processes, we develop new and derived processes; especially for joining of different materials.

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