

# INSTRUMENT DATABASE

## Advanced mechanical testing of materials

### II GLEEBLE 3500: THERMAL AND MECHANICAL TESTING SYSTEM



Fig.1: Thermal and mechanical testing of a 100Cr6 test specimen inside the Gleeble 3500.

The Gleeble 3500 simulates high temperature forming processes for metals like forging, welding or annealing. At its core, the device is a servohydraulic dilatometer for metallic materials with conductive heating at a maximum rate of 10.000 K/s up to 1.200 °C. Heat treatments with various quenching speeds up to 2.000 K/s can be realized while detecting phase transformations or determining mechanical properties at high temperatures. Tension and compression can be

applied simultaneously to investigate stress/strain characteristics like the Bauschinger effect. The determination of such material properties are a core competence of the department of Metallic Materials and Structures since 15 years and are based on the expertise of the SFB 570 (Distortion Engineering).

As an example, the Young's modulus in dependence of the test temperature for 100Cr6 as a typical bearing steel and 20MnCr5 as a typical case hardening steel is shown in the diagram. Here, the Young's modulus has been determined in the temperature range between 250-800 °C for the metastable austenite, which will transform into ferrite, perlite or bainite with different mechanical properties shortly after the test temperature has been reached.

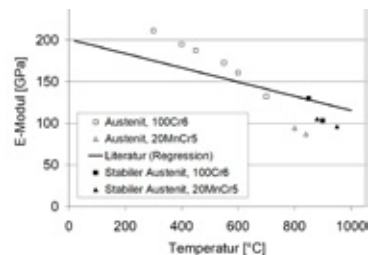


Fig.2: Young's modulus of different steels for metastable austenite as measured with the Gleeble 3500.

### 01 II General Information

**Keywords:** Hot tensile test, phase transformation, heat treatment, dilatometer, quenching

**Categories:** Material properties of metallic materials

**Main Application:** Characterization of microstructural transformations, simulation of heat treatments

**Measured Quantities:** Temperature; longitudinal strain; lateral strain

**Year of Fabrication:** 2004

**Manufacturer:** Dynamic Systems Inc.

### 02 II Specifications

maximum force: 100 kN (tension & compression);

conductive heating 75kW;

heating rate: 10.000 K/s;

quenching rate: 2.000 K/s;

contact-free laser extensometer;

possible materials: steel, aluminium, titanium

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