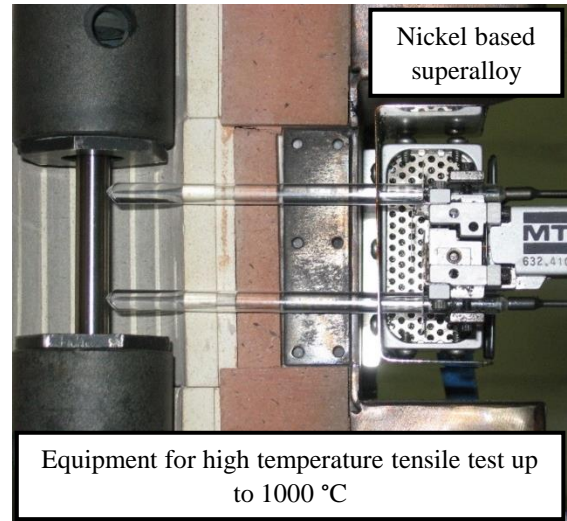
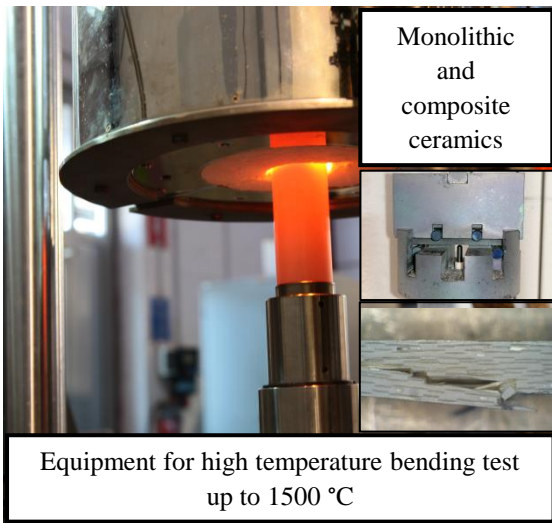


# Thermomechanical testing for aerospace applications

The mechanical characterization allows to define the limits of use for a material in a specific application, identifying its mechanical properties. This activity can be performed as an essential part of the development of new processes and materials, and for service activities targeted at industry as well. The acquired expertise and equipment of the ENEA Faenza research laboratories, permit to test materials and components, even at high temperature, under standard and operating conditions. The main typologies of characterized materials are monolithic ceramics and composites, polymeric matrix composites, fiber metal laminates and metals. Activities include:

- the implementation of quasi-static and dynamic standard tests
- the design and developing of mechanical testing methods (customized as well)
- data processing and statistical analysis of results.

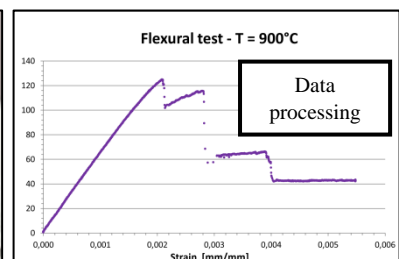
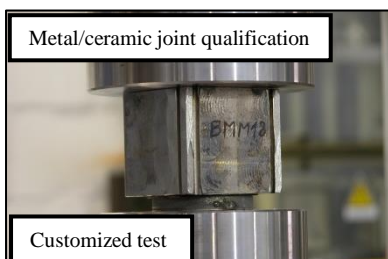


The main mechanical measurements, carried out at room or high temperature, on materials or components include among others: tensile, compression, bending, fracture toughness, creep, fatigue, impact and pressurization (according to ASTM or UNI EN ISO standards).

The main equipment for mechanical tests of ENEA Faenza research laboratories consist of three MTS servo-hydraulic testing machines with different max load capacity (485, 67 and 50 kN), ten Mayes testing machines for tensile creep tests on metals up to 900 °C, three SFL testing machines for bending creep tests on ceramic materials up to 1500 °C, a Schenck rotating bending machine for fatigue tests on metals, a Charpy pendulum with mallets of 150 and 300 J used for impact tests on metal, composite and plastic materials, an MTS pressurization unit for static and dynamic tests up to 200 bar.

The MTS testing machines can be equipped with furnaces, specific test fixtures and accessories that allow to design and perform customized tests, using extensometers or strain gages to instrumented test samples or components.

The mechanical characterization allows to detect the mechanical properties and the constitutive equations of materials. The study of the mechanical behaviour of new materials, the experimental qualification of structural components and the validation of numerical models, allow to develop new production processes. So, the knowledge of mechanical properties leads to correctly design and realize components and structures, allowing to verify their mechanical properties as well, previously determined by FEM.



# Thermomechanical testing for aerospace applications



MTS servo-hydraulic testing machine 67 kN



MTS servo-hydraulic testing machine 485 kN

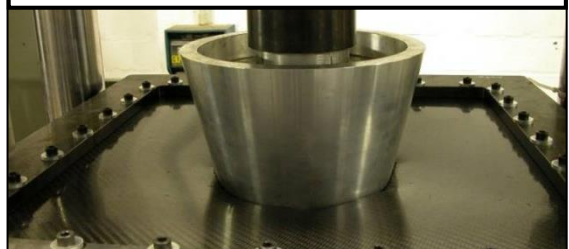


MTS servo-hydraulic testing machine 50 kN

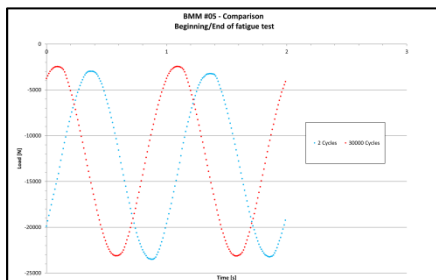


Servo-hydraulic testing machines RT3 control system

Composite structure for racing car



FIA F1 Regulation – Side Intrusion Test



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## Aerospace application - Case study - SMAL-SAT project.

Sistema di Monitoraggio Ambientale nano-SATellitare.

Project funded by Emilia-Romagna Region PR FESR 2021-2027 with EU contribution.

Deployment system for photovoltaic panels of a cube sat. A fatigue testing campaign will be carried out to characterize a 3D printed aluminum alloy will be used to realize the deployment system structures.