Department of Structural Mechanics
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Laboratory of Structural Risk Analysis

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Testing Facilities

The experimental laboratory is divided into two parts, one for materials testing and one for dynamics.

Laboratory for material testing

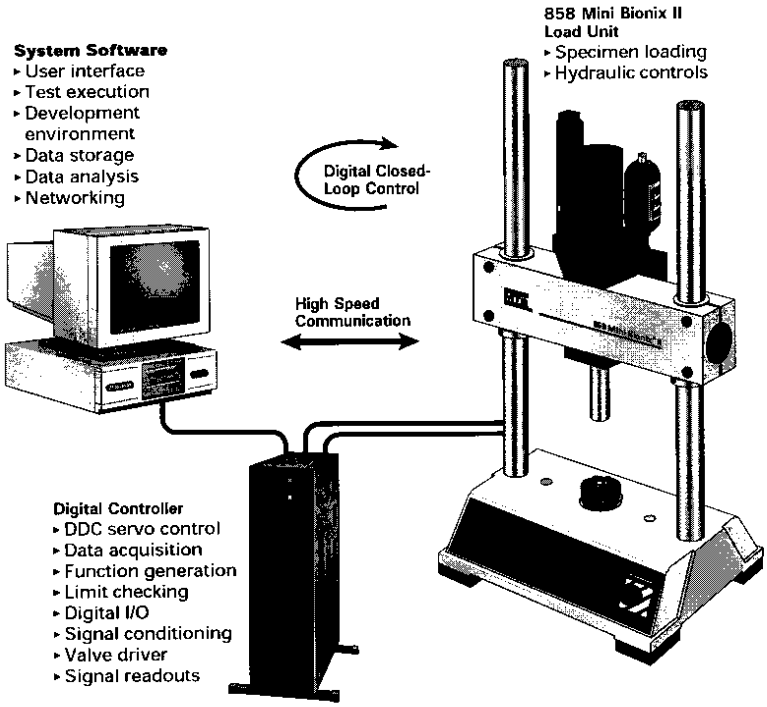
The laboratory for structural and intelligent material is a complete unit for the characterisation of the constitutive law of materials. The laboratory comprises a material testing system from MTS Systems and a data acquisition system from National Instruments.

The MTS system consists of a biaxial servo-hydraulic machine, an environmental chamber, an axial estensometer and an axial-torsional estensometer. It has the following characteristics:

Materials test system MTS 858 Mini Bionix II

The system consists of a loading unit with cross-head mounted actuator, a hydraulic power unit and a test controller with two control channels (force and displacement).
This test system allows to carry out static and dynamic tests with frequencies higher than 30 Hz in the case of biomaterials. The system has the following operating limits:

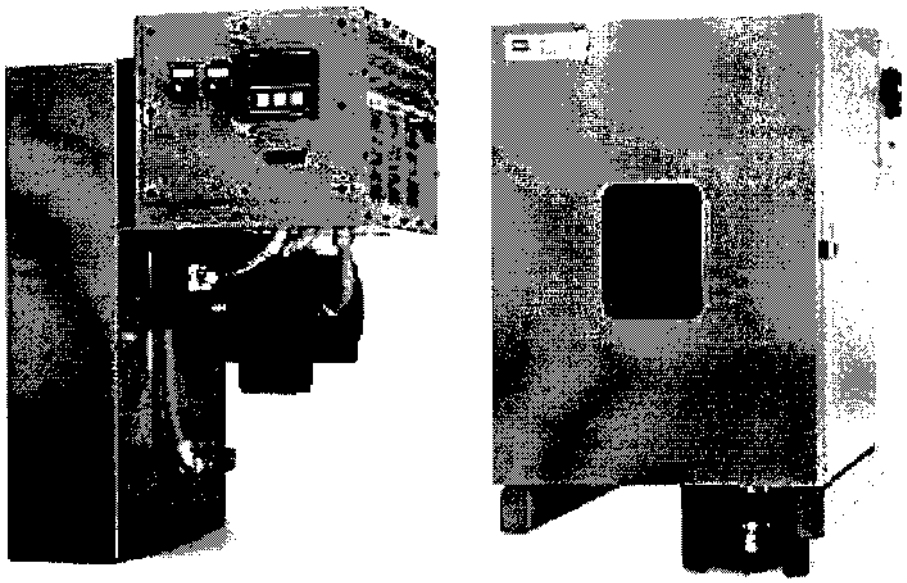
- Axial loads between ± 25 kN with standard displacements ±·50 mm.
- Torsional moments in the range ±·250 Nm with total rotations of 270^0 .



The material testing unit

Environmental chamber mod. 651.06E-03

The environmental chamber is internally equipped with a controller which allows to run tests for temperatures in the range –129C°--+315^0 (either CO_2 or N_2 is used). The chamber can maintain a constant temperature within a few degrees from the desired setting with very little temperature gradient across the specimen.



Environmental chamber

Estensometers:

An estensometer is a device mounted directly on the test object which allows to carry out tests in deformation control. In the laboratory there are two types ofthem:

1) Axial estensometer mod 632.31F-24

It has a measure base of 20 mm and can measure deformations between +20% and -10%.

2) Axial-torsional estensometer mod. 632.80F-04 Opt. 001

The axial channel has a measure base of 25mm and can be used for deformations between 4.8 % and –2 %. The torsional channel has a range of rotations between ±5.

The data acquisition system from National Instruments makes it possible to acquire and to manipulate the signals from the different sources

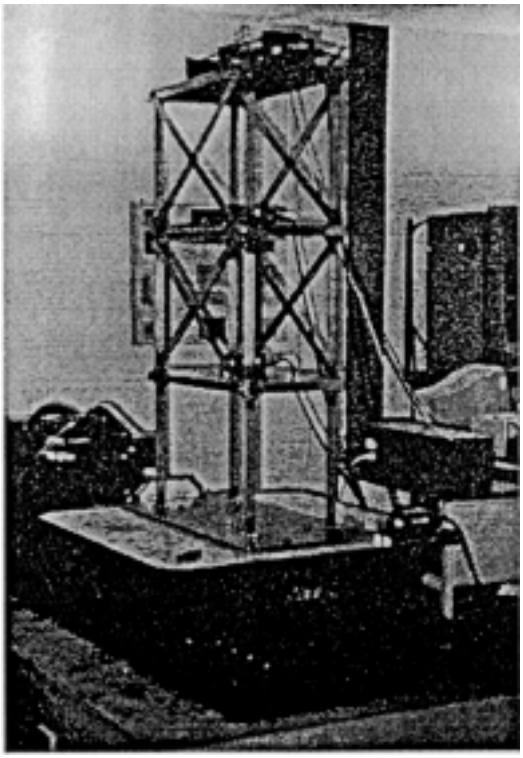
This system consists of a PC, where the NI card and the software LABVIEW are installed. A chassis links the card with the wires coming from the sensors.

Laboratory for structural dynamics

The laboratory for structural control consists of a shaking table from MTS systems for the excitation of the system, a data acquisition system from National Instruments, and a many types of controllers. Among them one relies on a fuzzy chip, produced by ST microelectronics.

Horizontal vibration table MTS

The shaking table has a square 92x92 cm plate and a single axis of motion. A hydraulic actuator of 10 KN provides the acceleration for the table. The hydraulic circuit is kept at a constant pressure of 220 bar.



Shaking table

The nominal characteristics are:

- maximal displacement 7.5 cm,
- maximal acceleration 4 g,
- usable frequency interval 0-25 Hz.

By using a special software it is possible to drive the table following a given accelerogram.

Software facilities

For the computational treatment of the reliability problems are available:

- The program package STRUREL from RCP for time-invariant and time-variant reliability analysis with FORM and SORM methods,
- The program package SYSREL from RCP for the analysis of the reliability of systems with dependencies,
- The MATLAB program package with various packages for control and data analysis: fuzzy, linear-quadratic etc., which allow a wide variety of control design,
- Response surface fitting programs which can be used in conjunction with FORM and SORM methods.