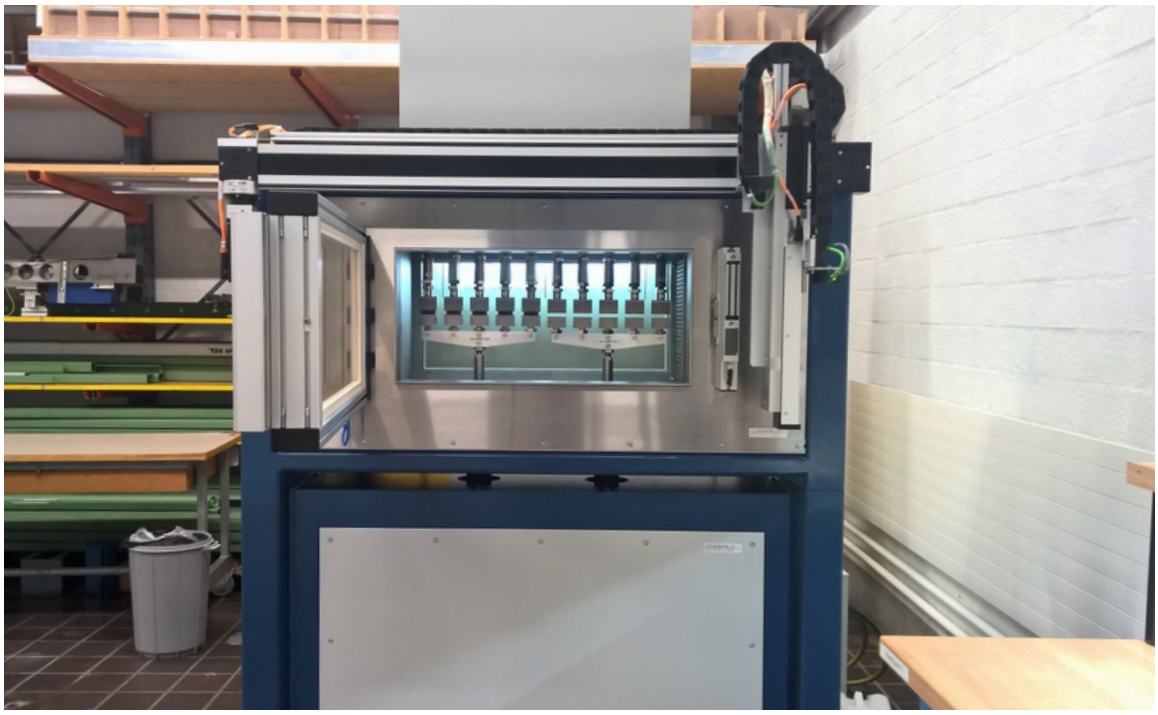
Zurich University
of Applied Sciences

School of
Engineering

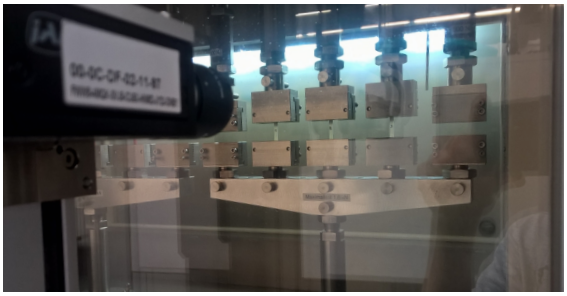
IMES Institute of
Mechanical Systems

Tear and Fatigue Analyzer

The Tear and Fatigue Analyzer is part of the equipment in the laboratory of the Institute of Mechanical Systems (IMES). It allows for dynamic fatigue and crack propagation measurements in a fully automated measurement cycle. Additionally, static creep tests can be run.



Samples
On each of the two crossbars, up to five samples can be tested. The clamping area is 40x10 mm. Since the two clamps can be moved to up to 3 mm distance, the machine is suitable for mini pure shear sample geometries.



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Dynamic Drives

Two stroke-controlled electric linear motors with a maximum dynamic force of 3500 N can be set to apply periodic Sine-, Gauss- or user defined patterns. The peak amplitude is 50 mm, accurate to 1 micron. The frequency range for the stroke lies within 0.1...100 Hz (for high frequencies, the maximum stroke is reduced), while the recording frequency is up to 1 kHz. The motors are cooled using a heat exchange unit and fluid cooling.

Force Controlled Motors

One half of the motors is designed for up to 1000 N load, while the other half can sustain 500 N. The accuracy of the load cells is 0.03 % of the nominal load. Each motor has a maximal amplitude of 50 mm. Using a control unit, the force on the specimens is held constant.

Heating and Cooling Chamber

Using electric heating, up to 150°C can be achieved in the insulated chamber. With a heat exchanger, cooling can be achieved. Additionaly, using liquid Nitrogen, minimal temperatures down to -50°C can be achieved and regulated. An additional interface allows for the chamber to be flooded with gas, for example Argon to test without oxygen influence. To avoid dew formation on the glass window of the door, the door can be flooded using pneumatics.

Crack Growth Measurement

With a moving camera operating in the infrared part of the light spectrum, the crack length for each specimen can be measured at specified trigger points. Due to the use of infrared light, errors from daylight are omitted. The machine is also able to calculate several parameters like elastic energy (-density), dissipated energy (-density), storage modulus, loss modulus and loss angle.

Creep Measurements

Using the force controlled motors, creep tests can be run up to the maximum load (1000 / 500 N per specimen position or 1600 N per 5 specimens). The camera is used to measure the strain in the samples optically.

Contact

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