Split Hopkinson (Kolsky) pressure bar

Laboratory for materials testing at high strain rate

The laboratory is located in the building of the **Institute of Mechanics**

on Bulgarian Academy of Sciences.

Acad. Georgi Bonchev str., building 4, floor -2, room 19
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Project BG05M2OP001-1.001-0008 „National centre on mechatronics and clean technologies“
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Purpose

The machine is used to fast determine *the diagram of elastic and plastic deformation under pressure* at high strain rate. Consecutively, we can determine the *elastic modulus*, *yield strength* (if applicable) and *compressive strength*. The maximum stress and maximum deformation depend on the selected impact conditions (mass and velocity of the striker).

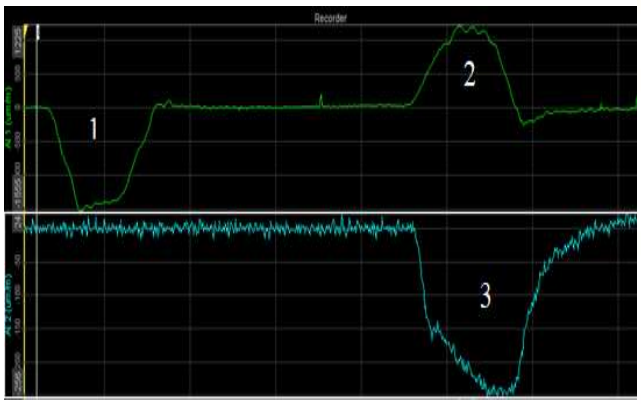
Description of the main elements

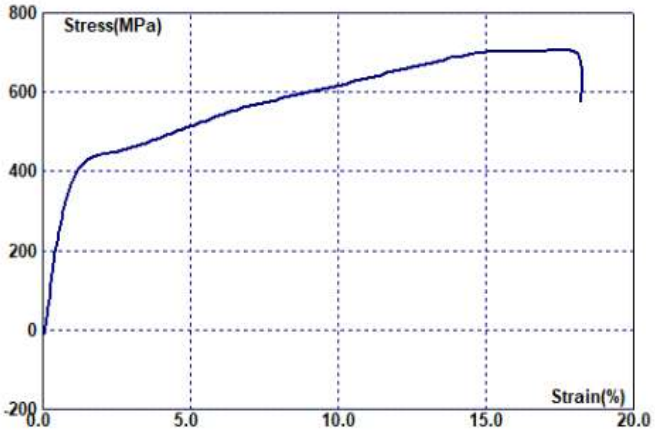
The system consists of 3 bars made of high-strength steel with a 20 mm diameter. They are mounted on plain bearings and are movable in longitudinal direction. The test specimen is cylindrical with recommended dimensions of 5 or 8 mm in diameter and 5 or 8 mm in length. The sample is located between the first and second bars. Strain gauges are glued in the middle of them. There is equipment for acquiring the strain in the middle of the bars with one million records per second sample rate. There are four strikers with a length between 200 mm and 800 mm and a device for firing a selected striker with compressed air. There is a computer for data recording and processing.

Operating principle

After the first rod is struck (by a fired striker), the test body is deformed between the two bars. An incident wave pulse - 1 passes through the first bar, and later a reflected wave - 2 (reflected from the end surface of the rod) returns to the strain gage, see the figure below. The strain gage on the second bar registers the transmitted wave - 3. The diagram of the test body is extracted from the recorded strain pulses. The last bar serves to absorb some part of the kinetic energy.

Registered signals and calculated diagram





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Services for external contractors

1. Quick determination of deformation and strength characteristics under impact load. (for one material and selected striker and speed).
2. Comparison of deformation and strength characteristics under impact load of several materials (with selected striker, speed and sample sizes).
3. Production of samples with the required dimensions from the client's material.
4. Consultations

Indicative requirements and conditions

1. Samples with a cylindrical shape, 5 or 8 mm in diameter and 5 or 8 mm in height, shall be tested. Recommended size: d = 8 mm, h = 8 mm.
2. Impact speed: up to 28 m/s. Recommended speed: 15 m/s.
3. Dimensions of the available strikers: 200, 400, 600, 800 mm. (Weight from 0.5 kg to 2 kg). Recommended size: 400 mm.
4. Recommended number of test specimens of one type: 3 pieces.
5. Price for testing of three samples: EUR 150 without VAT.
6. Price for production of samples (from the client's material and if we can): EUR 5 / specimen.
7. Price for consultations: free or negotiable.

Indicative procedure for providing services to external contracting authorities

- Clarification and negotiation of an experimental plan, incl. final price and deadline
- Preparation and signing of a contract
- Delivery of materials and samples
- Production of samples (if it’s agreed and possible)
- Testing
- Preparation of a protocol with experimental results
- Payment
- Transmission of the protocol

For questions, negotiation and orders

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