

# Laboratory of mechanical and transport processes in rocks

Institute of Geonics of the CAS



## Contact

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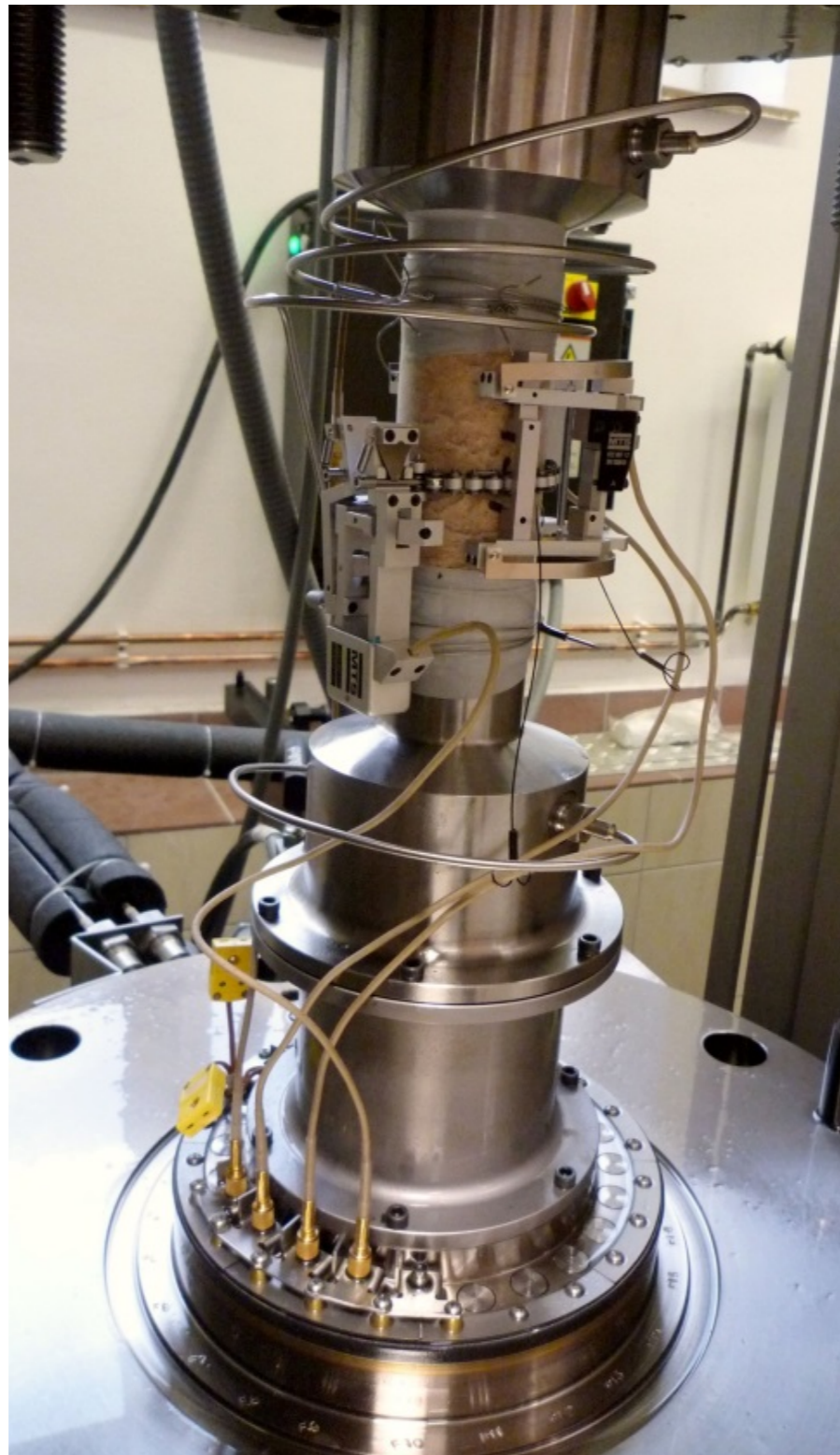
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## Competences

The laboratory has long been dealing with mechanical behaviour of rocks and other geomaterials under various physical conditions and with physical interactions of rock materials with fluids. The laboratory conducts a comprehensive research and testing on physico-mechanical properties of rocks, specific geomaterials (e.g. rocks and soils modified by polymer grouts, alkali-activated materials, or others), and selected building materials. Furthermore, changes in the permeability of rocks in the deformation process, as well as rock fracturing processes and the character of crack propagation are studied.



Setup for triaxial test of rock sample exposed to pore water pressure

## Key devices

- Servo-hydraulic loading system (MTS Systems Corp.) for testing strength and deformational properties of rocks, equipped with a hydraulic actuator of axial loading (max force 2,6 MN, frame stiffness 10,5 GN/m)
- High-pressure triaxial cell furnished with intensifiers of in-chamber and pore pressures (max pressures 140 MPa), with cascade control of temperature during the loading (up to 200 °C) and with accessories for measuring permeability of rocks to water and other inert liquids
- ZWICK 1494 mechanical press (max force 600 kN)
- KTK 100 Karman's triaxial cell with possibility of permeability measurements in deformation process (confining pressure up to 50 MPa)
- FP 10 mechanical press for testing tensile strength of rocks
- FPZ 100 mechanical press for testing uniaxial compression strength, splitting tensile strength, flexural and shear strength, and fracture toughness (CB test) of rocks
- Micro Hardness Tester (CSM Instruments) with measurements of micro-indentation Young modulus

## Our services

- Determination of strength and deformation parameters of rocks and other geomaterials under uniaxial and triaxial states of stress
- Uniaxial compression or tension tests, Brazilian test (indirect tension), bending and shear tests
- Triaxial tests: standard triaxial testing (including determination of



Multipurpose servo-hydraulic loading system with triaxial cell

- failure envelope), special multiaxial tests (specific conditions and evolution of loading including axial extension tests), creep and relaxation tests, cyclic loading tests (separation of plastic and elastic strains), analysis of limit states (strain driven tests)
- Analysis of stress-strain characteristics, determination of standard mechanical moduli (Young modulus, Poisson ratio, bulk modulus, compressibility etc.) or special parameters for particular constitutive models
- Determination of fracture toughness of rocks
- Measurements of microhardness and micro-indentation Young's modulus
- Measurements of gas permeability of rocks under triaxial state of stress
- Assessment of physical interactions between rocks and water (dynamics of water absorption and evaporation)

- Preparation of geomaterial test specimens by drilling and cutting
- Professional consultation and expertise

## Target groups

Target groups for cooperation are industrial as well as academic institutions focusing on the use of rock mass, either as a source of mineral raw materials and energies (mining, oil and gas extraction, geothermal energy) or as an environment for building underground structures (tunnels, fuel and energy storage systems, repositories of industrial and radioactive waste, etc.). We also offer cooperation to partners from the field of geotechnics, to producers of building stone and aggregates, to companies engaged in processing of geomaterials, building materials development and application, or to monument care institutions.