Automatic system for uniaxial and triaxial tests on rock cores
including stress path and permeability determination

ADVANTEST

➡ Advanced testing system suitable for extremely variable materials, from soft sandstone to high-strength marbles

➡ Determination of Elastic modulus, Poisson's ratio and strength characteristics of rock specimens under uniaxial and triaxial conditions including permeability measurement

➡ Automatic performance of triaxial tests with combined control of axial load and confining pressure

➡ Multiple failure stages triaxial test (stress – path mode) carried out automatically, the entire failure path is derived from a single specimen including post-peak softening phase

➡ Suitable for prolonged tests

➡ 19 bit effective resolution

➡ Also suitable for load, stress, displacement and strain-controlled testing on concrete, fibre-reinforced and shotcrete specimens (with the relevant options and accessories)

➡ Fully programmable test procedures including axial load and confining pressure levels and combinations

➡ Integrated data acquisition and results elaboration including failure envelope plotting

➡ Extremely flexible system ideal for research purposes

Standards ASTM D7012 | ASTM D2664 | ASTM D2938 | ASTM D3148 | ASTM D5407 | EN 14580 | EN 1926 | ISRM

CONTROLS Automatic system for uniaxial and triaxial tests on rock cores, including STRESS PATH and PERMEABILITY DETERMINATION, is suitable for various materials, from soft sandstone to high strength marbles.

In the triaxial mode, a water pressure gradient may be applied to the specimen for measuring permeability.

The test system comprehends:

ADVANTEST ROCK

servo-hydraulic control console for axial load application in conformity with the relevant Standards. Includes a dedicated software for triaxial testing which also controls the SERCOMP ROCK and automatically determines failure envelope and water permeability.

The ADVANTEST ROCK performs loading-unloading ramps and can also be used for load/stress/displacement/strain controlled testing on concrete, fiber reinforced concrete, shotcrete, etc. (with the suitable options and accessories)

SERCOMP ROCK

Servo-hydraulic control console for confining pressure control into the Hoek cell (triaxial test only). It runs as a remotely controlled unit, fully operated by the Advantest Rock software.

Includes 4 additional channels for strain / displacement transducers.

HYDROMATIC

is a general-purpose water pressure source and volume change stand alone controller. It is driven by a stepper motor, which enables the unit to measure the volume change. The unit consists of a hydraulic piston, driven by a ball-screw and gearbox, mounted on a ball-slide, and is managed under closed-loop control.

ADVANCED SOFTWARE

ADVANTEST ROCK, SERCOMP ROCK and HYDROMATIC STAND-ALONE are linked to a single PC for data acquisition and results elaboration.

The overall test information and readings are always available on the PC screen:
- Axial load and sample strength
- Hoek cell confining pressure
- Sample deformation measured by strain gauges and external displacement transducers
- Water pore pressure and volume change of the rock sample

Plus any additional load/strain/displacement readings from external transducers that may be useful for research purposes.

HIGH STIFFNESS COMPRESSION FRAME

to be selected from the wide CONTROLS product range, conforming to the size of the sample and the expected strength.

Due to the typical high strength and fragility of rocks we recommend high capacity test frame (4000kN or 5000kN capacity).

HOEK CELL

Various models for different sample size are available: from EX type with dia. 21.46 mm up to HQ type for core with dia. 63.5 mm.

Hoek cells can be fitted with optional end caps suitable for permeability test.
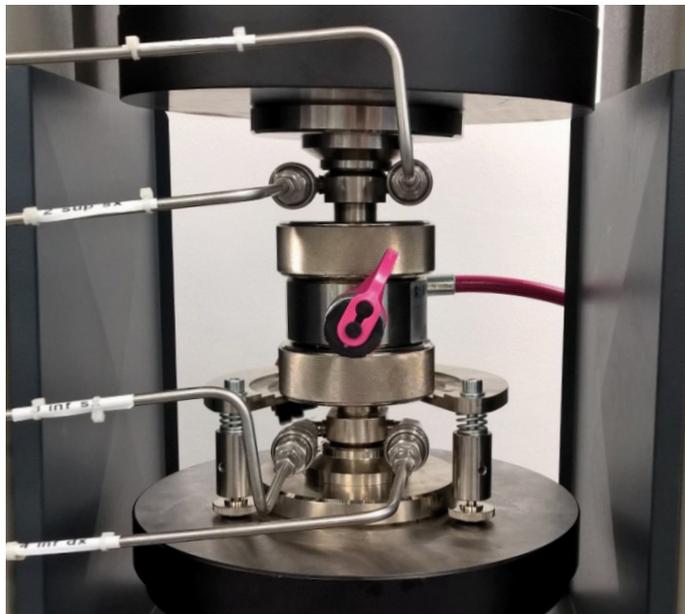
Hoek cell fitted with permeability end cups for permeability test

Water pressure and volume change measurement system, Hydromatic

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ADVANTEST 9 ROCK

Hydraulic group
Max. working pressure: 700 bar
Max. oil delivery: 2 lpm at low pressure, 0.7 lpm at high pressure
4 hydraulic ports for connection of test frames
Flow control via servo-controlled proportional valve
Oil cooling system with forced ventilation
4 ON/OFF valves with electronic switch and remote software control

Hardware and on board software
Maximum resolution: 1/524,000 divisions
8 input channels:
- 4 for load sensors (load cells or pressure transducers)
- 4 for displacement transducers (potentiometric, LVDT amplified or analogical) and for deformation transducers (clip gauge, strain gauge).
- Electrical characteristics of the conditioners:
- VEXC: from 0.5 to 10 V DC selected via software
- Single/dual ended input
- Input signal from –2.5 to +2.5 V DC
- Zero and gain adjustable via software
Data acquisition synchronized on all channels
8 analogical outputs corresponding to each channel for possible use of an external data acquisition system
Test execution with control of:
- Load/specific load
- Displacement
- Strain

Auto-diagnostic system including oil level and oil filter obstructed
320x240 pixel display
Storage of multiple calibration curves for immediate connection of different sensors.
Low frequency Dynamic tests: max. frequency 0.1 Hz (depending on the wave amplitude)

Physical specifications
Power rating 750 W
Voltage: 230V, 50Hz, 1ph or 230V, 60Hz, 1ph or 110V, 60Hz, 1ph
Dimensions (L x W x h) approx..: 470x410x1000 mm
Weight approx.: 120 kg, excluding PC and printer

SERCOMP 7 ROCK

Max. working pressure: 700 bar
Max oil delivery: 0.7 l/min
Flow control via servo-controlled proportional valve
4 additional channels for strain / displacement transducers
Power rating: 750 W
Dimensions (L x W x h) approx..: 470x410x1000 mm
Weight approx.: 120 kg

HYDROMATIC STAND-ALONE

Max pressure: 1700 or 3500 kPa
Pressure resolution: 0.1 kPa
Volume capacity: 250 cc
Volume resolution: 0.001 cc
No air compressor required

PC and SOFTWARE

PC and printer of the latest generation
Remotely control the entire system.
Display graphical and numerical data including multi-plot mode, e.g. 3 different deformation curves with respect to a single time axis
Execute tests and sequences of steps/cycles programmable by the user
Print out test reports
Allow the real time modification of the test parameters during the test execution, including active control channel
Language selection: English, French, Spanish, Italian, plus another language which can be created by the user

Ordering information

Contact us for more information
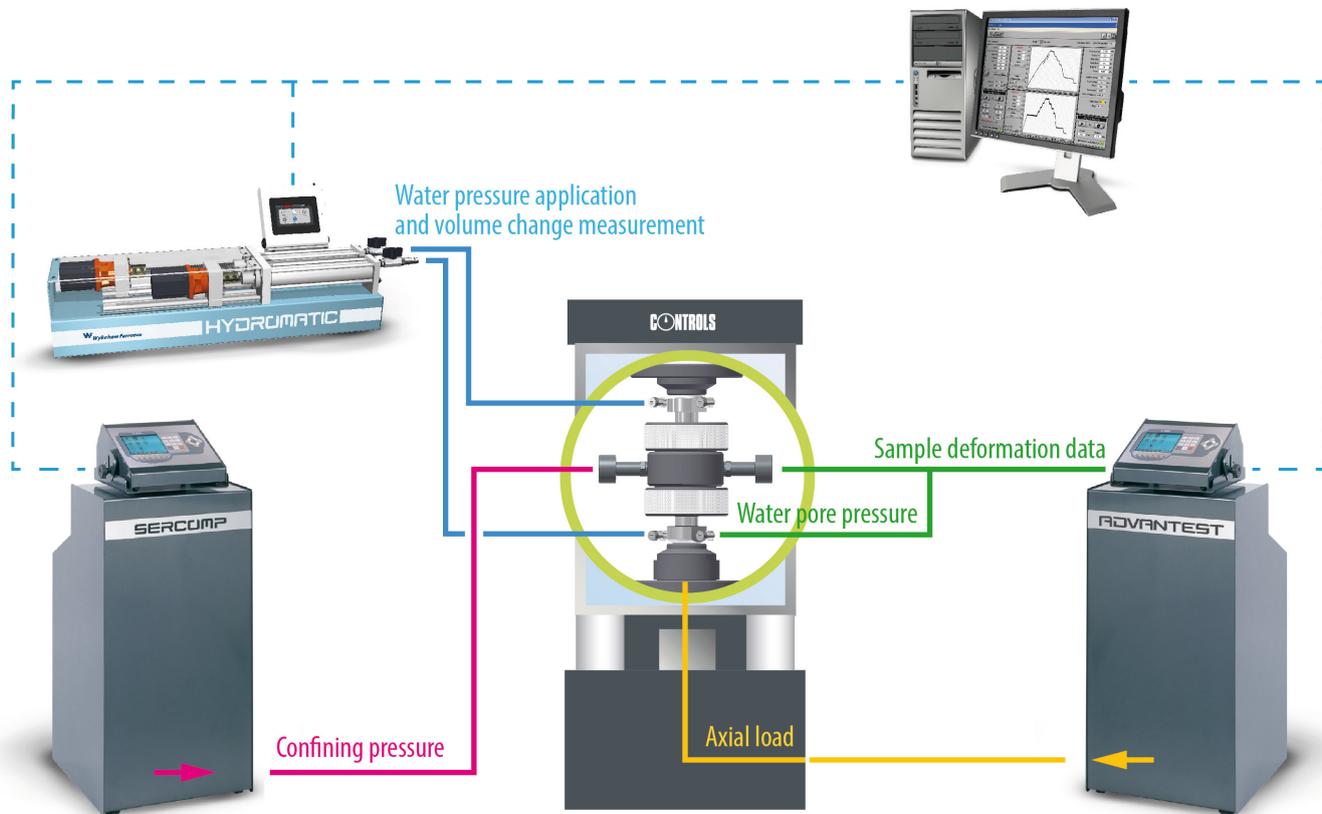
Layout of the automatic system for uniaxial and triaxial tests (with stress-path analysis) and permeability determination

Accessories

Hoek cell and sample extruder

Strain gauges for uniaxial and triaxial tests

Compression device for uniaxial tests

Compression frames in compliant with EN 12390-4, EN 772-1

Compression frames in compliant with ASTM C39, C140, AASHTO T22

Hydromatic stand-alone

PC cabinet

Widening info

Triaxial test is carried out automatically with multiple failure stages: from a single specimen it is possible to plot the entire failure envelope, permeability analysis is determined at each stage.

Test procedure:
- Axial and horizontal stresses are increased hysotropically up to a defined level
- Cell pressure is maintained constant and axial stress is increased
- When the sample approximates maximum strength, cell pressure is automatically increased up to a defined level
- Cell pressure is again maintained constant and axial stress is increased

- When the sample again approximates maximum strength, the cell pressure is further increased
- The above procedure is automatically repeated several times
- Maximum peak strength is reached and, in case of displacement control, the test is continued (softening phase)
- Cell pressure is reduced in steps and, for each step, the residual strength is measured
- All the maximum peak loads are plotted against the corresponding values of the cell pressure building the complete failure envelope.
- At each stage, the permeability value is calculated by measuring the through-specimen water flow.

The water pressure gradient is generated by the Hydromatic Stand-alone unit which also measure the volume change. The water pore pressure is read by a dedicated transducer.
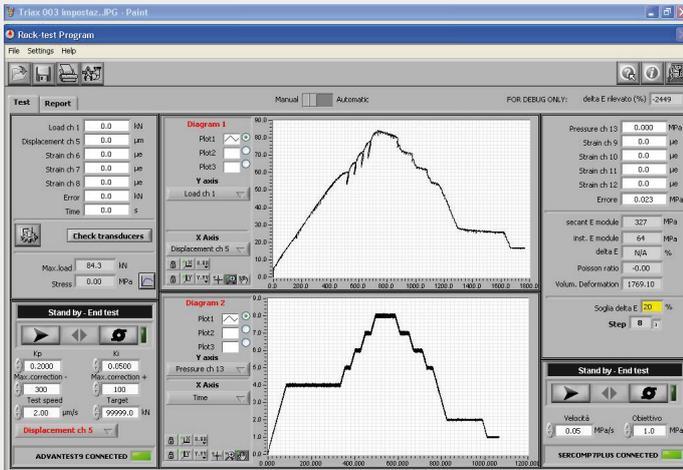
Screenshot of a stress-path triaxial test on rock performed with the ADVANCED system (load vs. displacement and cell pressure vs. time diagrams)
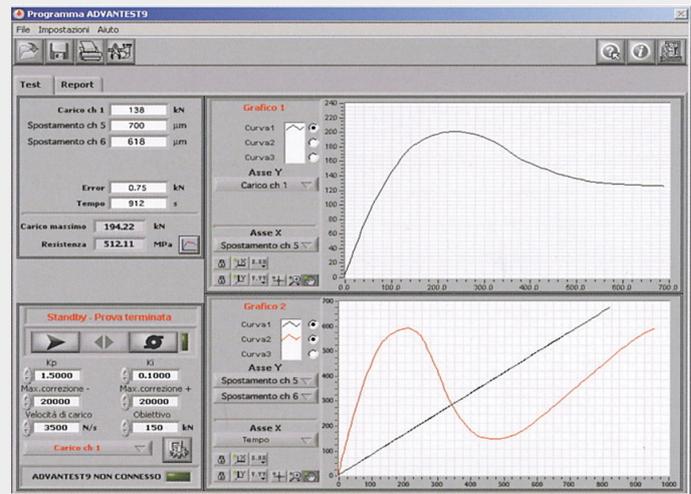
ADVANTEST Software, Results of flexure test on a fiber reinforced concrete beam performed under deflection rate control