NER

Laboratory Systems: AutoLab Series

AutoLab 1500

AutoLab 1500 is a compact, fully functional triaxial apparatus designed to perform standard coupled process petrophysical and rock mechanics experiments on specimens up to 50 mm (2.0 in) in diameter at reservoir conditions of overburden pressure, pore pressure, and temperature.

Many systems generate force parallel to the core axis with a large hydraulic cylinder operating at 20 MPa (3,000 psi), which necessitates a large and inconvenient load frame. NER adopted an alternative approach. A movable piston divides the pressure vessel into two chambers. The overburden pressure on the rock is developed in the lower chamber. When the pressure in the top chamber is greater, a differential stress is exerted on the specimen. The pressure in each chamber is controlled with high-pressure servo-hydraulic intensifiers.

For each type of measurement, dedicated coreholders, electronic modules for signal conditioning, and AutoLab software to control the measurement sequence and acquire and process the data have been integrated into a turnkey unit.

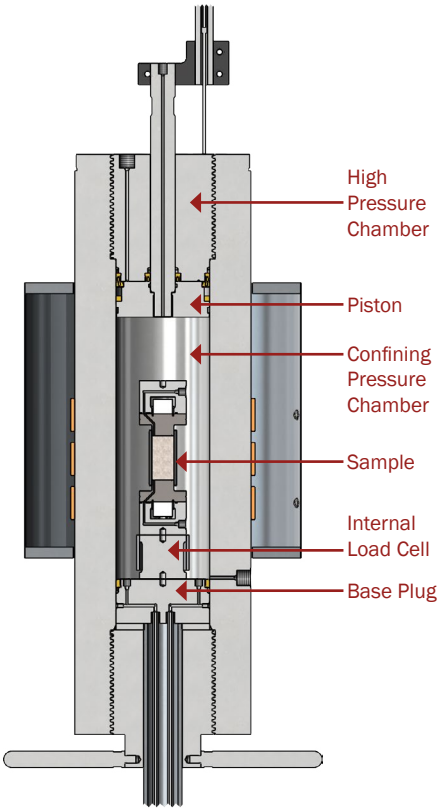
A global leader in rock testing devices, NER offers the AutoLab 1500 as a fully functional triaxial apparatus to test specimens up to 2 inches in diameter at reservoir conditions.

Key Features

- Deformation experiments for conventional and specialized loading paths
- Servo-hydraulic control of strain rate, force, confining pressure, pore pressure, and flow rate
- Pore pressure intensifier compatible with water, brine, oil, and gas (including CO_2)
- Strain measurement with LVDTs or strain gauges
- Control of pressures and temperature at reservoir conditions
- Integrated electronics console for servo amplifiers and signal conditioning
- AutoLab software for system control and data acquisition
- Supports standard rock mechanics tests and coupled process management

AutoLab 1500 is available in two versions:

Model	Confining Pressure	Pore Pressure	Axial Force at Rated Confining Pressure	Maximum Axial Force Unconfined
1500_70	70 MPa (10,000 psi)	70 MPa (10,000 psi)	175,000 lbs	315,000 lbs
1500_140	140 MPa| (20,000 psi)	140 MPa (20,000 psi)	175,000 lbs	460,000 lbs



Schematic of the AutoLab 1500 pressure vessel

Coreholders for the System

PS2 Ultrasonic Transducer

These coreholders measure one compressional and two orthogonally polarized shear waves at confining pressures, pore pressures, and temperatures appropriate for each system.

Steady State Permeability

For these measurements, a constant pore pressure gradient across the sample is controlled. The pressure difference across the sample and pore fluid flow rate are used to compute permeability. This method requires two pore pressure intensifiers with automated recycling. The standard configuration is designed for permeabilities between 0.1 and 500 millidarcies.

Transient Permeability

Developed at NER, this technique measures fluid permeability at *in situ* conditions. The method involves the control of a complex transient in pore pressure at the upstream side of the sample while monitoring the pore pressure response at the downstream end. Permeability is computed by fitting the response to analytical solutions.

Low Permeability

Utilizing a special CO_2 holder with a small dead volume and integral pressure transducer, the standard configuration is designed for low permeability materials of 5 nanodarcies to 50 microdarcies. This option uses NER's complex transient method for permeability analysis, allowing use of customizable pressure transients as well as more traditional sinusoidal oscillation and pulse decay.

Complex Electrical Impedance (Formation Factor)

Resistivity is measured as a function of frequency, stress, and temperature using both two- and true four-electrode techniques. NER's ZMeter impedance analysis is used to perform true four-electrode measurements at frequencies between 0.02 Hz and 100 kHz.