

ROCK AND SOIL TESTING EQUIPMENT

Soil Mechanics

Rock Mechanics



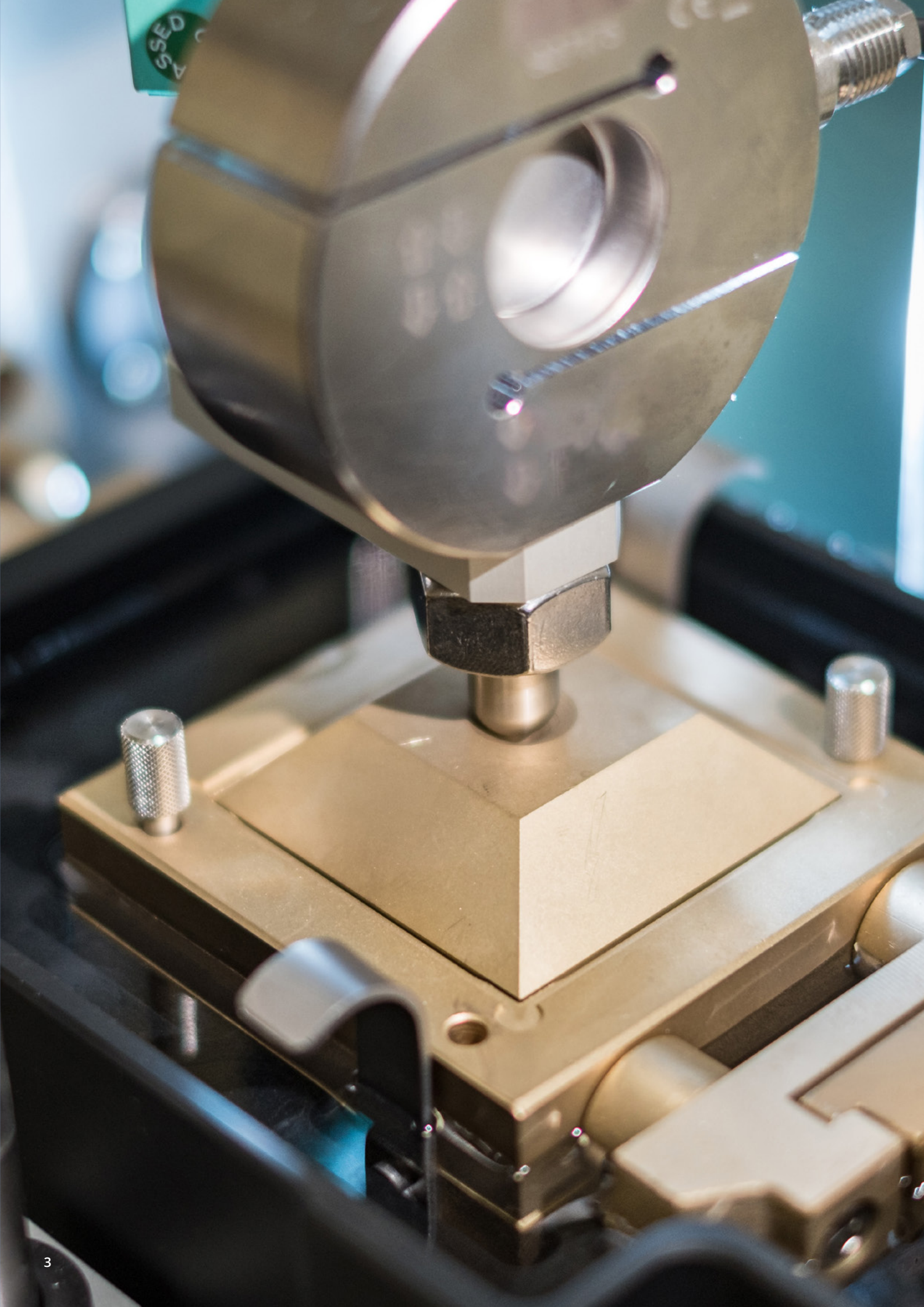
Soil & Rock Mechanics Made Easy

Testing Forward

For almost 70 years, Wykeham Farrance has been at the forefront of geomechanics and we're continuing this pioneering tradition with a new market-leading range of affordable, easy-to-use, soil and rock testing equipment.

From entry-level to fully automatic PC-controlled systems, our range benefits from the latest technologies with various levels of automatization for commercial and research geotechnical laboratories.

Wykeham Farrance can offer a wide range of testing equipment that covers the major tests typically required from the civil engineering industry.



SOIL AND ROCK TESTING

SOIL MECHANICS
ROCK MECHANICS

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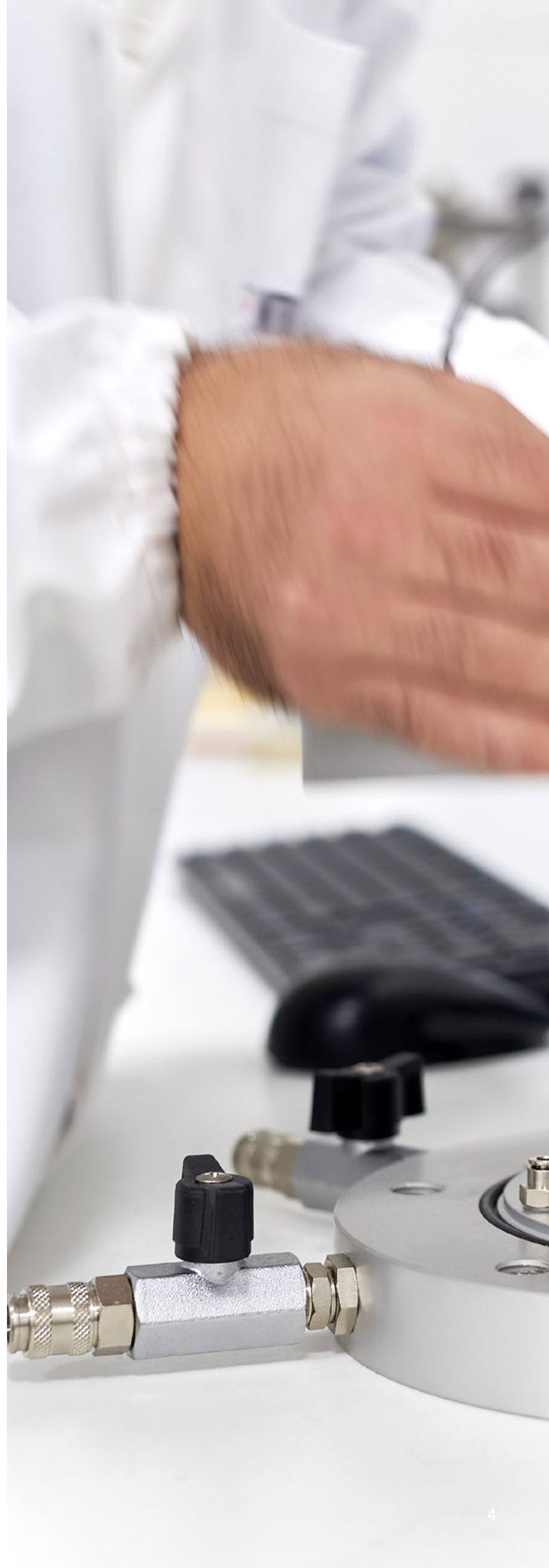
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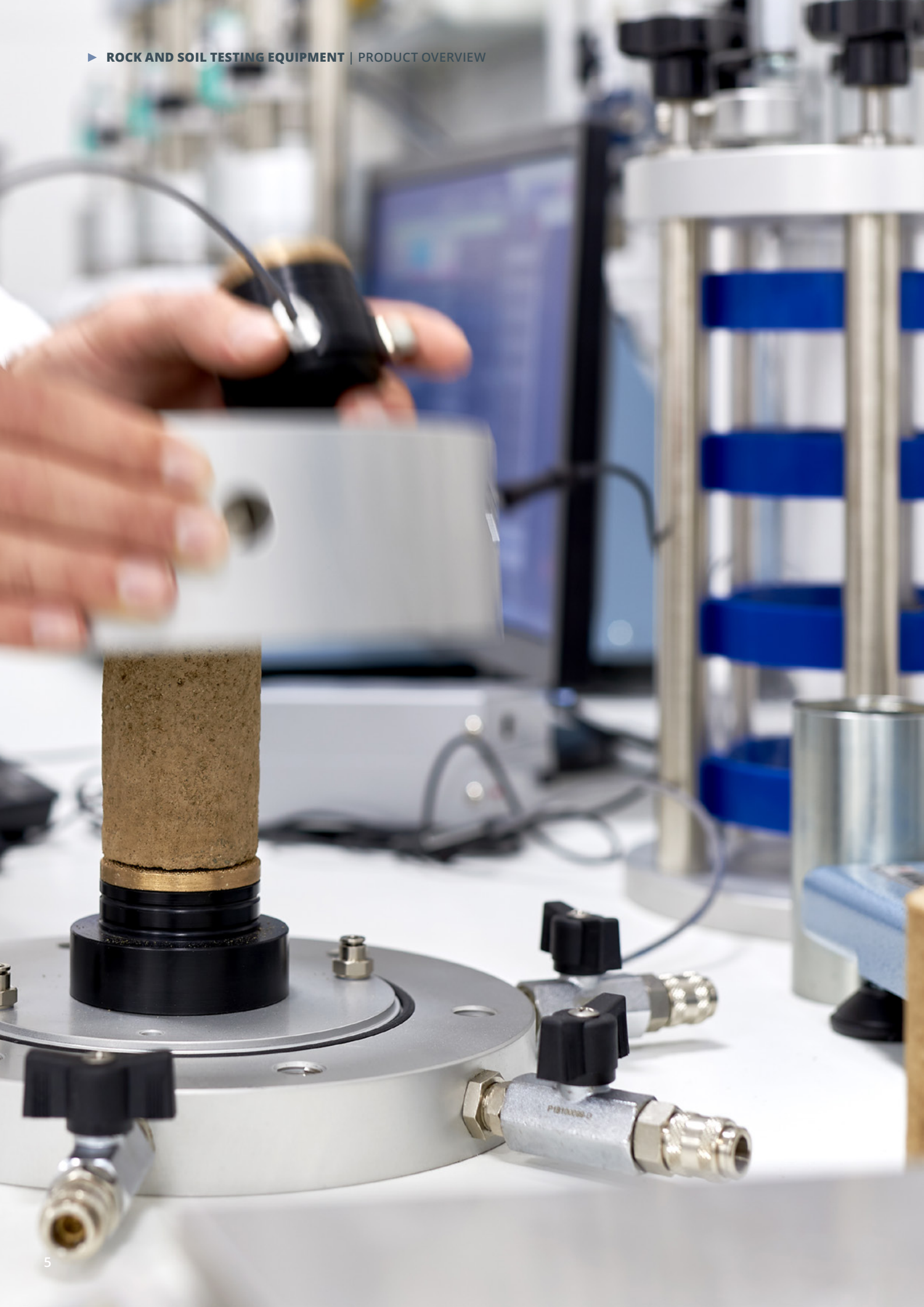
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Soil Mechanics

Soil mechanics testing is a fundamental element of geotechnical engineering.

It involves the study and understanding of the physical properties and behavior of soils, especially in planning foundations for structures and highways.

How the soil of a given site will support the weight of structures or respond to movement in the course of construction depends on a number of properties (compressibility, elasticity, and permeability).

Soil testing not only allows geotechnical engineers to obtain information on a soil's physical properties but also allows them to understand the level of stress applied. By extracting and testing representative samples, an engineer can create a model very close to the real situation.

Example applications are the building of large infrastructures, bridge foundations, retaining walls, dams, and buried pipeline systems.

Flexible, Modular and User-friendly

Our product development process helps to future-proof your lab. We design each of our machines to be completely modular, giving you maximum flexibility in how to set-up your laboratory. Start with an entry-level system fitted with manual or electronic data acquisition and gradually progress to a more advanced and fully automatic PC-controlled system.



Smart Electromechanical Servoactuation Technology (EmS)

By incorporating testing automation and Electromechanical Servoactuation technology (EmS) in all our products, your laboratory will benefit from equipment that is efficient at producing accurate and repeatable results time after time, enhancing your lab's reputation.

EmS

Easy, quick, versatile and low maintenance

- Environmentally-friendly
- Silent and clean operation with no bulky HPS or associated noise
- No compressed air or hydraulic power supply
- Easy maintenance only requiring machine lubrication cycles every 500 hours
- Unparalleled value




Automatic Triaxial Testing

Triaxial tests are performed to determine the stress/strain relationship of a soils subjected to differing strain levels and drainage conditions, simulating as closely as possible the site conditions and the effects of constructions, excavations, embankments and landslides.



AUTOTRIAXQUBE

 The AUTOTRIAXQube is a revolutionary, all-in-one automatic triaxial testing system that integrates the many components of triaxial testing into one, single compact system. Designed to make triaxial testing easier than ever before, the AUTOTRIAXQube will fit neatly in any laboratory and compliment your existing testing capability.



Space saving

Occupying less than one square meter, the AUTOTRIAXQube is the ideal solution for any laboratory where space is at a premium.



Easy to install

There's no need for external panels, tank or hydraulic connection — simply connect the AUTOTRIAXQube to water and power supply and start testing.



Integrated triaxial cell

Thanks to its lifting system and its three internal columns frame, the triaxial cell is easy to handle.



Fast water de-airing

The built-in vacuum pump, tank, control valves and cavitation system will de-air the water quickly and efficiently down to levels of dissolved air acceptable for triaxial test methods.



Integrated vacuum system

For a streamlined and time saving sample preparation process.

Optional Local Strain Measurement

The light Sample Hall Effect Transducers can be easily mounted to the sample with minimal disturbance. Use them to get rid of errors caused by the loading system's deflections and bending of the porous stone onto the ends of the specimen which affect the evaluation of deformation, especially at the initial small strain.



AUTOTRIAX EmS



The AUTOTRIAX has been carefully designed to provide a wide variety of triaxial tests such as CU / CAU / CD / CAD / UU / Stress Path / K_0 and even Permeability on up to 150 mm samples. The system can also perform Unsaturated, Unconfined, CBR and CRS tests by adding dedicated software and accessories giving your lab access to many test configurations.

The most flexible and versatile triaxial testing system



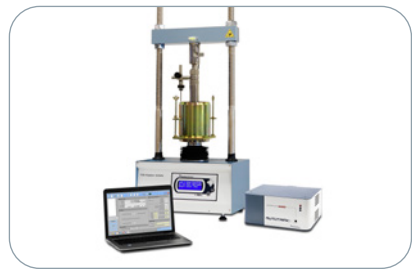
Permeability Configuration

This test allows your laboratory to measure the hydraulic conductivity (coefficient of permeability) of water saturated porous materials.



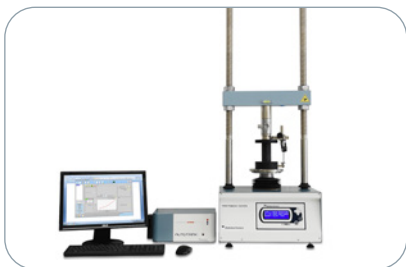
Unsaturated Configuration

Unsaturated triaxial tests simulate the behavior of soil in unsaturated conditions by adopting the axis translation method with High Air Entry Stone (HAES).



CBR Configuration

California Bearing Ratio test (CBR) is a penetration test for evaluating the bearing capacity of subgrade natural or compacted soil for design of flexible pavement.



Unconfined Configuration

Unconfined test measures the unconfined compressive strength of cohesive soils using axial strain-controlled conditions. The soil is subjected to a constant rate of compressive strain during which, axial force and axial deformation are measured.



CRS Configuration

Constant Rate of Strain test (CRS) is performed to determine the one-dimensional consolidation properties of saturated cohesive soils using axial strain-controlled conditions, when the soil specimen is restrained laterally and drained axially to one surface.

Standard Triaxial Testing

Over 7,000 configurations available

Wykeham Farrance provides state-of-the-art triaxial testing systems that strictly comply with all major International Standards. They are designed to perform many tests including Unconsolidated Undrained (UU), Consolidated Undrained (CU), Consolidated Drained (CD), Unconfined Compression (UC), and Permeability. Three main standard configurations are at your disposal to increase your lab's testing sophistication and performance.



Analog Measurements



This simple and efficient triaxial system with analog measurements is the ideal solution

to perform basic standard triaxial tests, such as effective and total stress, and is best suited to laboratories not requiring digital or automatic measurement.



Built-in Data Acquisition



Our simplest compact solution for standard triaxial testing to which you can also fit a standard air / water

pressure interface or automatic pressure / volume controllers. Thanks to its integrated data acquisition, there is no need to acquire data externally or use a separate PC.



External Data Acquisition



Modular compact solution for standard triaxial testing, effective and total stress as well as for

many other soil tests. Flexible, it can be fitted with either a standard air / water pressure interface or automatic pressure / volume controllers.

The universal external data acquisition can be shared with other soil testing equipment such as consolidation, shear, triaxial and many other systems.

Main Triaxial Components

Triaxial Cells



Triaxial cells are one of the main components of a triaxial system. They are used to house soil samples during triaxial testing. Three models are available and vary according to the type of test and performance required. Each model comes in various dimensions and pressure capacities.

Standard triaxial cells work well for effective / total stress tests while banded triaxial cells have similar features but are designed for Stress Path and dynamic testing. Meanwhile, double wall triaxial cells enable you to perform unsaturated soil tests.

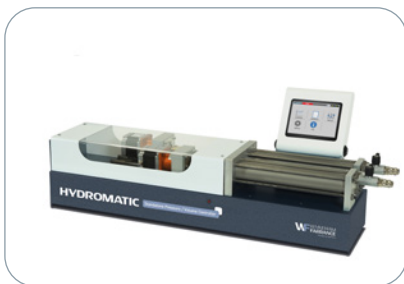
De-airing Water



A de-airing water system removes the dissolved air from water present in soils and is used for Soil Mechanics tests

including triaxial and permeability tests. Our all-in-one unit will de-air water quickly and efficiently down to levels of dissolved air that are acceptable for geotechnical test methods.

Pressure Measurement Systems



Hydromatic Standalone



Hydromatic standalone is a general-purpose water pressure source and volume change controller driven by a stepper motor that enables the unit to measure the volume change.

The unit consists of a hydraulic piston, driven by a low friction screw and gearbox, mounted on a ball-slide, and is managed under closed-loop control by the built-in data acquisition and 6" touch-screen colour control panel.



Bladder Cylinders



Bladder air/water cylinders are used to deliver pressurized water up to 1,000 kPa to triaxial cells by the pressure distribution panels.

Data Acquisition



Geodatalog 8



Our geodatalogger acquires, displays in real-time and stores data for a wide variety of laboratory soil mechanics testing equipment, such as oedometers, shear machines and triaxial systems.

Geodatalog 8 connects all typical sensors such as load cells, displacement transducers, volume change, pressure transducers and other type of sensors to your system.

Dynamic Testing

Soil dynamic testing must be conducted on specimens representative of the soil of the area where the desired structure will be built on. The dynamic properties of soils, such as stress and strain, are integral aspects of the design of maritime and seismic engineering constructions. As such, the correct analysis of a soil behavior is crucial for predicting its dynamic response and the likely movement of the structures that will lay on it.



DYNATRIAX EmS

Dynamic Electromechanical Triaxial System



Dynatriax EmS can perform a complete range of triaxial tests, from static (Effective Stress and Stress Path) to cyclic, in saturated and unsaturated conditions (with the axis translation method applied in a double wall triaxial cell). Resilient Modulus tests can also be performed with additional software.



The Bender Elements P&S Waves system is also available to measure the maximum shear modulus (G_{max}) of a soil sample to evaluate its stiffness.



Reliable and accurate

Fitted with the new Electromechanical Servoactuation (EmS) technology, it is extremely reliable, more accurate than conventional systems and requires almost zero maintenance.



High-speed PC control system

The triple axe closed-loop control continuously monitors the status of all transducers and adapts to any changes in the pre-set parameters to provide complete automation of all the test stages.



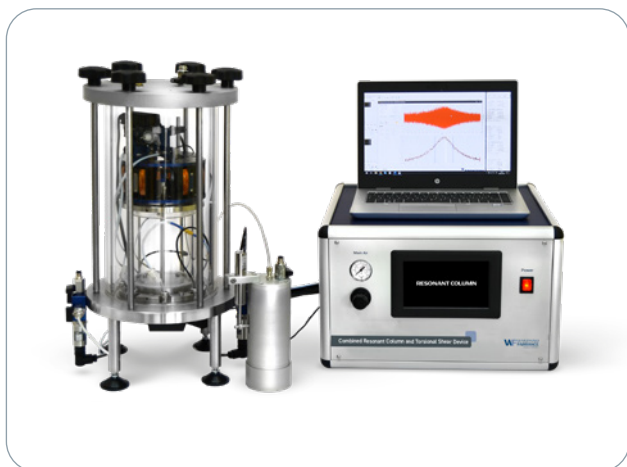
High performing and versatile

The high performing actuator applies vertical dynamic load of up to 15 kN using a sophisticated P.I.D. closed-loop control allowing the system to perform Static or Dynamic tests in Saturated or Unsaturated conditions.



Environmentally-friendly and low maintenance

Dynatriax benefits from the new EmS technology and cell / back pressure control system with reduced energy consumption, low maintenance and long life.



RESONANT COLUMN

Combined Resonant Column / Torsional Shear Device



Combined resonant column / torsional shear device for the automatic determination of damping ratio from half power bandwidth and with free vibration decay method.

A current-driven motor built with eight drive coils encircling four magnets attached to a drive plate applies torsional force to the specimen whilst simultaneously controlling confining and back pressures.

Material damping can be determined from the half-power bandwidth or from a free-vibration decay curve.

Torsional Shear tests are deformed cyclically at low frequencies whilst continuously monitoring torque and deformation.



CYCLIC SIMPLE SHEAR

Cyclic Shear Test Apparatus



Shear strain is induced by lateral horizontal movement at the bottom of the sample relative to the top.

The closed-loop servo-pneumatic system applies dynamic vertical and horizontal load / displacement to a simple shear load frame. Designed to consolidate and then dynamically shear soil specimens under constant volume conditions, it simulates undrained shear of a saturated specimen.

Shear Testing

In direct / residual shear testing, the soil specimen is placed in a rigid metal box composed of two halves that slide horizontally against each other and are subjected to a constant stress.

Our geotechnics experts have also developed the Ring Shear Apparatus for the determination of residual shear strength of cohesive soils under high deformations, due to landslides or subsidence problems.



SHEARMATIC EmS Automatic Direct / Residual Shear Testing



Shearmatic EmS is a fully automatic shear testing machine that benefits from the low maintenance, efficient and environmentally-friendly Electromechanical Servoactuation (EmS) technology.



Time saving and accurate

Straight horizontal transmission of force eliminates horizontal load measurement inaccuracies.



High performing

Maximum vertical and horizontal forces of up to 10 kN deliver infinite variable speed and adjustable number of cycles from 1 to 99.



Modular and expandable

Connects up to six units



Long-life and low maintenance

The top-quality techno-polymeric material of the shear box carriage resists to corrosion, wear and tear and chemicals.



SHEARMATIC 300 Automatic Large Direct / Residual Shear Testing



The automatic Direct/residual large shear box machine is used to measure the shear strength properties of soil. It is ideal for soil and other materials that contain large particles of up to 20 mm.

Direct/residual and Ring Shear Testing Machines



AUTOSHEAR

Direct / Residual Shear Testing



Standalone automatic machine incorporating a high-resolution stepper motor with a high precision load transfer mechanism. The controller with a large 6" touch screen color display provides easy control over all test parameters and in-built data acquisition. Optional user-friendly software provides easy interface and the possibility to connect up to six machines to a single PC.



DIGISHEAR

Entry Level Direct / Residual Shear Testing



Entry level machine with user-friendly interface and digital LCD display. Flexible, DIGISHEAR is available in two versions: **Analog** featuring two dial gauges and one load ring. **Electronic** with two displacement transducers and load cell connected to our easy-to-use and automatic data acquisition system Geodatalog 8 for performing unsaturated soil tests.



TORSHEAR EmS

Automatic Ring Shear Testing



Torshear EmS is a versatile and fully automatic Ring Shear testing machine that benefits from the low maintenance, efficient and environmentally-friendly EmS technology.

This tester, by measuring the residual shear strength properties of soil automatically, delivers accurate and reliable results without any need for manual intervention, reducing the risk of human errors.



VANE TESTER

Laboratory Vane Shear Apparatus



Vane shear testing is a fast and economical method of measuring the shear strength of clay compared with elaborate triaxial or direct shear tests.

The laboratory Vane Shear Apparatus measures the shear strength of cohesive soils and is particularly useful for soils with low shear strength.

Consolidation Testing

The behavior of saturated soils during one-dimensional loading can be tested with the standard oedometer test. In oedometric conditions, the soil specimen is restrained laterally and subjected to a number of successive increments of vertical loads.



ACE EmS

Automatic Computerized Oedometer

Versatile and fully automatic Oedometer soil consolidation testing system that benefits from the new low maintenance, efficient and environmentally, friendly Electromechanical Servoactuation (EmS) technology.



Time saving, accurate and repeatable results

The Fully automatic ACE EmS can complete the whole test in automatic mode by selecting the load (stress), offering a practical and accurate way to obtain reliable results without any need for manual intervention, reducing the risk of human error.



Low maintenance and easy installation

EmS technology requires only single phase power and almost zero maintenance.



Modular and expandable

Connects up to sixty units



High performing

High performance with load capacity of up to 20 kN, equivalent to 10,000 kPa on 50.47 mm Oedometer consolidation cell.

CRS Configuration

In addition to the most common incremental loading consolidation, different tests can be performed measuring the magnitude and rate-of-consolidation of saturated cohesive soils using continuous controlled-strain axial compression allowing also the base excess pressure. Consolidation test using CRS cells can be performed more quickly, without compromising results accuracy, compared to the standard incremental loading test.

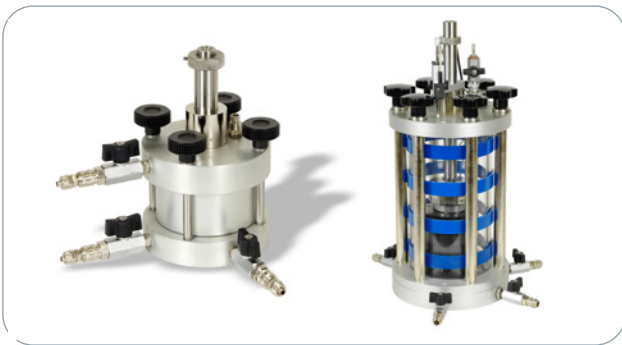


Standard Front Loading Oedometer Available in Analog and Electronic Configurations



Robust dead-weight oedometer with either manual-analog or automatic-electronic measurement of axial settlement using linear transducers and Geodatalog 8 for data acquisition and processing.

CRS Constant Rate of Strain Cells



Using CRS cells, it is possible to continually monitor the excess pore pressure so tests can run at maximum speed, further increasing test specimen throughput.

The CRS Cell is used in conjunction with other equipment (load frame, pressure system, pore pressure and accessories).

For this reason, different options are available:

- Upgrading kit for Ace EmS
- Activation kit for Autotriax
- Standard Triaxial System with Geodatalog 8

Hydraulic Consolidation



Incremental loading consolidation test can also be performed with a different device that applies vertical force using hydraulic pressure.

This type of cell overcomes the complexity usually associated with hydraulic oedometers and allows more information to be gathered from the soil sample (e.g. low permeability by hydraulic pressure).

Rock Mechanics

Rock mechanics is an important field of geotechnical engineering as it is the theoretical and applied science concerning the physical behavior of rocks and rock masses.

Wykeham Farrance offer an extensive range of modern laboratory solutions for strength, stiffness and durability determinations according to international Standards suitable for a wide range of rock types.

When a rock sample is subjected to defined stress conditions in the laboratory, the stress-strain diagram can also show non-linear relations for very small strains, hysteresis, anisotropy, etc. All these phenomena can be mathematically described and used for mechanical design simulations.

Great Value, with the Wykeham Farrance Seal of Quality



Most of the information obtained from laboratory tests on rock are primarily related to the stress and strain characteristics of the tested materials. The most common tests on cylindrical rock samples are the evaluation of the compressive strength and strain under either uniaxial or triaxial conditions.



From Specimen Preparation to Triaxial Testing

Other equipment used in conjunction or in addition to the typical uniaxial and triaxial test they mainly cover Specimen Preparation, Classification Tests, Behaviour of Joints, Abrasion/Durability.



Lab Core Trimmer

The Lab Core Trimmer is used for the preparation of rock specimens for strength and deformation testing obtained from block samples or drill core from the field, all in full conformity with Standards.



Slake Durability



Rock Shear Testing Apparatus

Uniaxial and Triaxial Testing on Rock

Wykeman Ferrance offer a complete range of testing systems with three different configurations for the determination of Elastic Modulus / Poisson's ratio and strength of rock cores in uniaxial and triaxial conditions, to satisfy every level of testing and budget requirements.



ADVANTEST^{ROCK}

Advantest Rock – Fully automatic triaxial testing on rock



The system is based on the ADVANTEST ROCK and SERCOMP ROCK Servo-hydraulic units.

It features the full automation of triaxial testing including stress path(multi-stage) and post-peak softening analysis.



Fully automatic

Performance of triaxial tests with combined control of axial load and confining pressure.



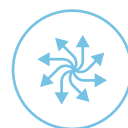
Versatile

Determination of Elastic Modulus, Poisson's Ratio and strength characteristics of rock specimens under uniaxial and triaxial conditions. Can also perform multiple failure stages triaxial tests (Stress – Path mode) automatically: the entire failure path is derived from a single specimen including post-peak softening phase.



High capability

Advanced testing system suitable for a wide variety of materials, from soft sandstone to high-strength marbles.



Flexible system

Ideal for research purposes but also suitable for load, stress, displacement and strain-controlled testing on concrete, fibre-reinforced and shotcrete specimens (with the relevant options and accessories).



100% programmable

procedures including axial load and confining pressure levels and combinations.

Automatic and Semi-automatic Triaxial Testing Systems



Automatic triaxial testing on rock



This configuration is based on the AUTOMAX MULTITEST for axial load and SERCOMP-S for confining pressure. The whole system performs either uniaxial or triaxial automatic tests under load / stress control.



Semi-automatic triaxial testing on rock



This configuration is based on the automatic WIZARD AUTO compression machine for axial loading and a manually-operated pump for confining pressure. It performs either uniaxial or triaxial tests underload/ stress control.

Accessories for Uniaxial and Triaxial Testing on Rock



Uniaxial and triaxial testing systems on rocks need to be complemented with suitable accessories such as Hoek cells, strain gauges, compression / splitting devices.

These accessories allow to perform tests such as the determination of Elastic Modulus / Poisson's ratio and strength of rock cores in uniaxial and triaxial conditions.

Rock Testing Equipment

Specimen Preparation



Rock specimen preparation is paramount regardless of what material you are testing or the level of sophistication of your rock testing system.

A poor quality specimen can only produce misleading results, wasting valuable time and resources.

As such, precise and accurate uniaxial or triaxial testing can only be achieved with high quality specimens.

Wykeham Farrance offers a full range of precise specimen preparation equipment (coring, cutting and grinding machines) in order to ensure that you begin your testing with the best possible specimens.

Behavior of Joints



Rock joints originate from geological failures occurring when a break in the rock mass continuity along with no visible displacement has occurred. From a rock mechanics' point of view, the discontinuities are characterized by a lower mechanical strength than the original rock matrix and require the following detailed test investigations:

- Shear strength of the joint performed with the rock shear box apparatus
- Tilt test performed with the tilt test apparatus
- Surface roughness of the joint performed with the profilometer (Barton comb).

Classification Tests



The rock strength index apparatus consists of a high stability 100 kN load frame with hydraulic loading ram actuated by a hand pump. Loading frame and manual pump are independent resulting in a superior functionality and usability of the equipment monitoring torque and deformation.



Rock permeability test is performed to measure the water flow through a rock specimen contained in a Hoek cell and subject to confining pressure. The typical configuration requires the following items:

- Hoek cell and Permeability end caps
- Either a manual or automatic confining pressure system required to maintain a constant pressure during the permeability test.
- A back pressure system to apply a constant pressure to the rock sample positioned in the Hoek cell. The system can be either automatic or manual.

Abrasion / Durability



This range of products is designed to investigate abrasion and durability on natural stone and rocks, in a similar way to other materials such as concrete and aggregates. In order to assess the resistance to abrasion,

our range includes Abrasion testing machines and Bohme Abrasion Wheel machines. Meanwhile, the Slake Durability Apparatus is ideal for assessing the deterioration of material when immersed in water.

CONTROLS

Italy (HEAD OFFICE)

t +39 02 92184 1

f +39 02 92103 333

e sales@controls-group.com

www.controls-group.com



France

info-fr@controls-group.com

Mexico

info-mx@controls-group.com

Poland

info-pl@controls-group.com

UK

info-uk@controls-group.com

USA

info-usa@controls-group.com

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CONTROLS S.p.A. reserves the right to alter specifications to equipment at any time.