WYKEHAM FARRANCE
A Division of CONTROLS

SOIL AND ROCK MECHANICS TESTING

Innovative Electromechanical Servoactuation Product range

EmS TECH

Soil Mechanics Testing Made Easy

www.controls-group.com

Wide Range of Automatic Tests

Wykeham Farrance's Soil Mechanics range now benefits from the cutting-edge Electromechanical Servoactuation (EmS) technology allowing users to perform all advanced soil testing in full automatic mode, with ease.

Discover what makes our EmS soil testing equipment among the best on the market:

Fully automatic
24/7 testing without interruption for maximizing your productivity and minimizing staff requirements.

User friendly software
Perform routine Research tests smoothly and obtain reliable and repeatable results according to the standards without any need for manual intervention thus reducing the risk of human error.

Environmentally friendly and quiet
Systems equipped with the NEW Electro-mechanical Servoactuation (EmS) technology requiring no dead weights or large and noisy air compressors, drastically reducing noise levels.

High performance
Our range of machines covers a wide range of stresses (loads/pressures) on soil thanks to our reliable and robust systems.

Unique and exclusive modular system
allowing you to build your system gradually resulting in excellent Return-On-Investment ensuing that your laboratory machines never become obsolete.

Ergonomic and compact
All machines are designed to have a small footprint for any type of laboratory, office or mobile facility.

ACE EmS

Consolidation test

SHEARMATIC EmS

Direct/residual shear test

TORSHEAR EmS

Ring shear test

AUTOTRIAX EmS

Effective/Total stress
Stress path
K_0
Permeability
Unsaturated
Other tests (CRS-UC-CBR)

AUTOTRIAXQube

Effective/Total stress
Stress path & K_0
Permeability
Other tests (UC)

DYNATRIAX EmS

Static triaxial test
Cyclic triaxial test
Unsaturated test
Resilient modulus test

ACE EmS

Advanced Automatic Oedometer System for Soil Consolidation

BS 1377:5 | ASTM D2435 | ASTM D3877 | ASTM D4546 | NF P94-091 | EN 17892:5

Robust, versatile load frame, with adjustable vertical clearance using dedicated extension rods.

High performing 20 kN capacity load cell to measure vertical force (supplied with traceable calibration certificate).

Multisize standard fixed ring cell for soil specimen are available with diameter ranging from 50.47 mm to 112.80 mm.

Small footprint less than 300 mm wide.

10 mm displacement transducers measuring vertical settlement (supplied with traceable calibration certificate). Optional transducers with different travels also available.

Ground breaking, low maintenance and environmentally friendly EmS technology, with automatic "next step" time-driven actuation. No dead weights or compressor required.

Optimized PID closed-loop control delivering fast, smooth and accurate loading and precise load holding through multiple test steps.

Technical Specifications

- **Maximum vertical force:** 20 kN
- **Ram travel:** 25 mm
- **Minimum testing speed:** 0.00001 mm/min
- **Maximum testing speed:** 50.00000 mm/min
- **Horizontal clearance:** 175 mm
- **Vertical Clearance:** 185 mm (265 mm with extension columns)
- **Dimension:** 300 x 390 x 600 mm
- **Weights:** 40 kg (approx.)
- **Power:** 220-110 V, 50-60 Hz, 1ph

Wide Range of Consolidation Tests

- → Incremental loading test – BS 1377:5 | ASTM D2435 | EN 17892:5
- → Swelling test – ASTM D4546
- → UC (Unconfined compression) – ASTM: D2166/ BS 1377:7
- → CRS (Constant Rate of Strain) – ASTM D4186

For more details, please refer to our dedicated ACE EmS brochure.

Access to Various Standard Configurations

PC Controlled Configuration

ACE EmS modular and expandable configuration connects up to 60 units via LAN port using the one PC software allowing you to build your laboratory without interruption — increasing productivity and profitability.

Connect up-to 60 units

ACE EmS LAN – PC connection allows gradual modular expansion

Local User Interface Configuration

Our most compact configuration — the combination of the ACE EmS with our high resolution 6" touch screen color display will give you full control of a single unit, without the need of a PC.

Numerical and graphical display of the readings are presented clearly and data is recorded on a sturdy, high-storage-capacity USB pen drive supplied with the system. All data is conveniently output in TXT format.

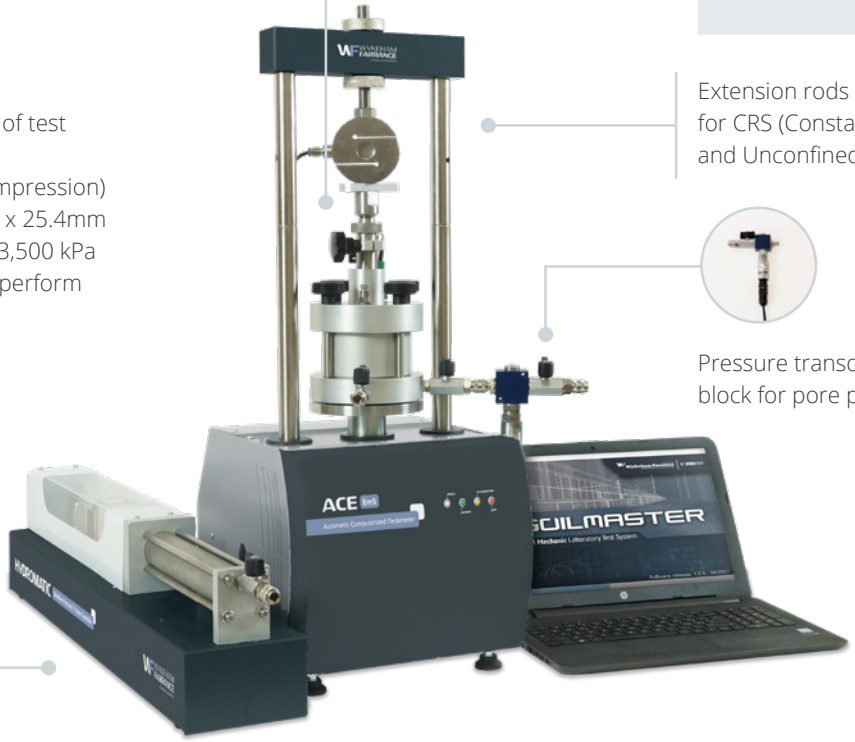
CRS Test Configuration

Additional accessories required for this configuration:

- CRS cell
- Extension rods
- Pressure transducers
- One water pressure line

CRS cell

- Continuous monitoring of test parameters (axial load, pore pressure, axial compression)
- Sample dimension 63.5 x 25.4mm
- Max. working pressure 3,500 kPa
- Relatively short time to perform consolidation test



Extension rods and centering pin for CRS (Constant rate of strain) and Unconfined (UC) test

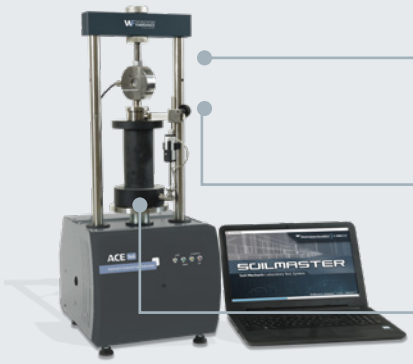
Pressure transducer with de-airing block for pore pressure measurement

Hydromatic Stand-alone

Hydromatic standalone is a compact and general-purpose water pressure source that also enables the ACE unit to measure volume change:

- Powers up-to two hydraulic pressure lines and measures the associated volume changes
- Generates water pressure regulated under closed-loop control up to either 3,500 kPa or 1,700 kPa
- High resolution measurement of pressure (0.1 kPa)
- High volume capacity, 250 cc
- Lightweight with a small footprint
- No air compressor required

Unconfined Configuration



Extension rods and centering pin for CRS (Constant Rate of Strain) and Unconfined (UC) test

Additional **displacement transducers** 25 mm travel

Upper and lower platens with mounting bracket

For a complete test configuration, visit our web site or contact our dedicated team of experienced geotechnical engineers on wfsupport@controls-group.com.

SHEARMATIC EmS

Advanced Automatic Direct/Residual Shear Testing Machine

ASTM D3080 | AASHTO T236 | BS 1377:7 | EN 17892-10 | NF P94-071

Ground breaking, low maintenance and environmentally friendly EmS technology, with automatic "next step" time-driven actuation.

No dead weights or compressor required.

High performing 10 kN capacity load cells to measure vertical and horizontal force (supplied with traceable calibration certificates).

Save space with its small footprint shorter than one meter.

Fast, smooth and accurate loading delivered by integrated optimized PID closed-loop control with precise load ensured by a load cell directly mounted on the loading tip.

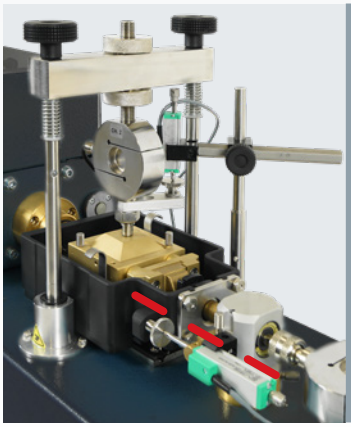
10 mm and 25 mm displacement transducers available for measuring vertical settlement and horizontal displacement (supplied with traceable calibration certificates).

Technical Specifications

- **Maximum vertical force:** 10 kN
- **Maximum horizontal force:** 10 kN
- **Max horizontal travel:** 23 mm
- **Max vertical travel:** 12 mm
- **Test speed:** from 0.00001 to 15.00000 mm/min.
- **Maximum number of consolidation steps:** 99
- **Maximum number of shear cycles:** 50
- **Weight approx.:** 60 kg
- **Sample type and size:** up to 100 mm square or round
- **Dimensions approx. [l x h x d]:** 990 x 550 x 350 mm
- **Multivoltage – Multifrequency power supply:** 230 V, 50 Hz or 110 V, 60 Hz

High Stiffness and Sturdy Design

The accurate axial transmission of the horizontal force is facilitated by a straight connection between shear box, shaft and load cell. This design avoids load measurement errors occurring with the commonly used basic "swan neck" design.



Light weight and easy to clean, the shear box carriage is made of high quality techno-polymeric material, offering excellent resistance to corrosion and wear and tear caused by presence of chemicals often mixed with soil specimens.

For more details, please refer to our dedicated SHEARMATIC EmS brochure.

PC-controlled | Network Option

Totally New and Ingenious Software (optional)

- → Allows the remote control, from a single PC, of multiple Shearmatic EmS machines. When using the Remote control mode, the PC software becomes the user interface and manages the main functions as well as the channels calibration by linear, polynomial and multi-coefficient curves.
- → Can pilot up to six Shearmatic EmS units from one single PC with the user able to select single or multiple unit batches.
- → Easily add more units by enabling the associated LAN communication (IP address) without complications or costs.
- → Store calibrations of displacement transducers and load cells as txt file and easily recall up to 10 calibration points for each channel.

Versatile Machine with Consolidation Option

Shearmatic can be easily reconfigured to automatically perform oedometric consolidation tests by adding the following optional accessories:

- Consolidation cell
- Base adapter
- Tip

Apply axial force steps instantaneously, using a pre-defined load sequence.

Ability to skip time, consolidation rate and swelling monitoring and move straight to the next step, even in automatic mode.

Vertical force load cell directly mounted on the loading tip delivers highly accurate readings and control signal.

Benefit from the use of standard consolidation cells.

TORSHEAR EmS

Automatic Ring Shear Testing Machine for Residual Strength of Soils

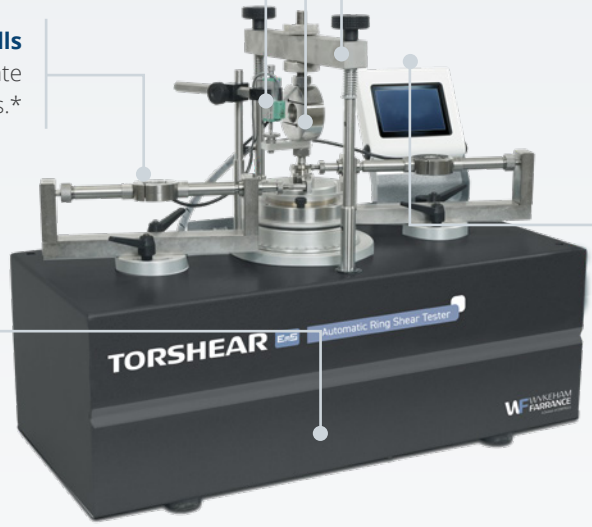
ASTM D6467 | ASTM D7608 | BS 1377:7

10 mm displacement transducer for measuring vertical settlement.*

High performing 5 kN capacity load cells to measure vertical force.*

Easily removable 1 kN load cells (for re-calibrating) deliver accurate measurement of torsional shear stress.*

Reliable, smooth and accurate torsional shear application thanks to the rotational shearing action continuously applied by an electromechanical stepper motor.



Fast, smooth and accurate loading delivered by integrated optimized PID closed-loop control with precise load ensured using a load cell directly mounted on the loading tip.

Large 6" intuitive touchscreen color display Start, pause and stop the test, access display readings during the tests and perform transducers calibrations with ease.

Totally new and ingenous software allowing the remote control, from a single PC, of multiple Torshear Ems machines.

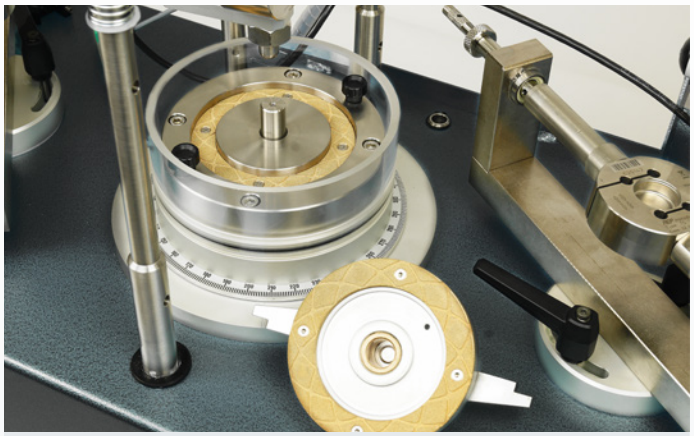
* Supplied with traceable calibration certificate.

Technical Specifications

• **Maximum Vertical stress:** 1,200 kPa	• **Specimen dimensions:** Internal dia. 70 mm; external dia. 100 mm
• **Maximum Shear stress:** 1,000 kPa	• **Sample Area:** 40 cm^2
• **Test speed:** from 0.00001 – 1000°/min	• **Sample thickness:** 5 mm (various thicknesses available on request)
• **Weight approx.:** 60 kg	• **Constant Volume option:** Yes (only via software)

For more details, please refer to our dedicated TORSHEAR EmS brochure.

Fully automatic standalone ring shear soil testing system managed by local user interface with 6” touch screen high resolution color display for performing torsional ring shear tests in drained condition to determinate the residual shear strength of cohesive soil.



High Performing

High-performing with maximum vertical stress 1,200 kPa and maximum shear stress 1,000 kPa, infinite variable speed from 0.00001 to 1000°/min, with pre-shearing stage selectable and adjustable number of cycles of shearing.

High Quality Material

Stainless steel ring shear box (Area 40 cm^2) with fitted easy removable sintered porous stones designed with special pattern.

AUTOTRIAX EmS

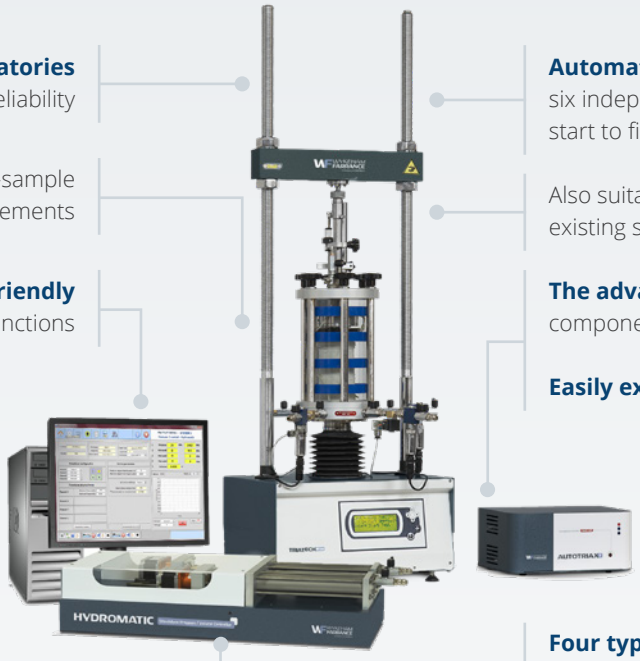
Fully Automatic Triaxial System

ASTM D2850 | ASTM D4767 | ASTM D7181 | BS 1377:6 | BS 1377:7 | BS 1377: 8 | EN 17892:8 | EN 17892:9

Ideal for demanding laboratories needing high productivity and total reliability

Compatible with on-sample transducers and bender elements

Comprehensive and user-friendly PC software controlling all functions



Automatic execution of up to six independent triaxial tests from start to finish with only one PC

Also suitable to upgrade existing systems

The advanced CPU links all the system components and the PC software

Easily expandable

Four types of water pressure / volume controller for maximum flexibility when selecting your configuration

Technical Specifications

- **Maximum no. of simultaneous tests:** 6
- **Maximum no. of channels:** 96 (in the most extended configuration)
- **Load capacity:** 50 kN and 100 kN
- **Speed range:** from 0.00001 mm/min to 99.99999 mm/min
- **Specimen range:** 38, 50, 70, 100, 150 mm diameter
- **Water working pressure:** 1,700 or 3,500 kPa
- **Pressure resolution:** 0.1 kPa
- **Maximum capacity of pressure / volume controller:** 250 cc
- **Volume resolution:** 0.001 cc
- **Effective resolution:** 131,000 points

Benefits

- **Efficiency** – 24/7 testing without interruption, maximizing productivity and reducing demands on your staff.
- **Flexibility** – Ability to install software and fit additional accessories as required will enable the Autotriax to perform many types of tests.
- **Expandability** – The modular concept of the Autotriax allows for easy expansion and upgrade.
- **Reliability** – External factors and inconsistencies between different operators are eliminated; test procedures are always repeatable and compliant.

For more details, please refer to our dedicated AUTOTRIAX EmS brochure.

Wide Range of Triaxial Tests

ASTM D2850 | ASTM D4767 | ASTM D7181 | BS 1377:6 | BS 1377:7 | BS 1377: 8 | EN 17892:8 | EN 17892:9

Effective stress test

The soil is first consolidated and is then taken to failure:

- **CU/CAU* (Consolidated Undrained)**
- **CD/CAD* (Consolidated Drained)**

Total stress test

The consolidation is not performed until to failure is reached:

- **UU (Unconsolidated Undrained)**

Stress path test

To replicate the changes in stress experienced in-situ during natural events, excavations and constructions.

K_0 test

To perform stress paths along the k0 loading line.

Permeability test

To measure, during a triaxial test, the hydraulic conductivity (coefficient of permeability) of water saturated porous materials.

Unsaturated test

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

Additional Tests

CRS – Constant Rate of Strain Test ASTM D4186

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. It quickly allows you to determine the consolidation properties of soils with continuous monitoring of base pore pressures, vertical stress and vertical displacement.

UC – Unconfined COMPRESSION Test ASTM D2166 | EN 17892:7

The Unconfined Compression (UC) test measures the unconfined compressive strength of cohesive soils using axial strain-controlled conditions. This test will allow you to subject the soil to a constant rate of strain during which, axial force and axial deformation are measured.

CBR – CALIFORNIA BEARING RATIO Test ASTM D2166 | EN 17892:7

The 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.

* Anisotropic consolidation according to EN 17892:9 is available. For anisotropic consolidation vacuum, top cap, submersible load cell, dedicated load frame and triaxial cells are required.

Triaxial Tests and Many Others

You can gradually expand the Autotriax configurations to control further tests by adding the necessary components. This can easily be done on-site by configuring our user-friendly and Plug-and-Play software. The closed-loop feedback control system continuously monitors the components status so that, at each stage of the test, it can adapt to any change in the pre-set parameters.

Over 100 configurations are available enabling your system to perform many triaxial and geotechnical tests, each using its dedicated software package and corresponding accessories.

Dedicated Software Packages

Up to six independent systems with different configurations can be controlled by the same PC.

Triaxial Test Configuration

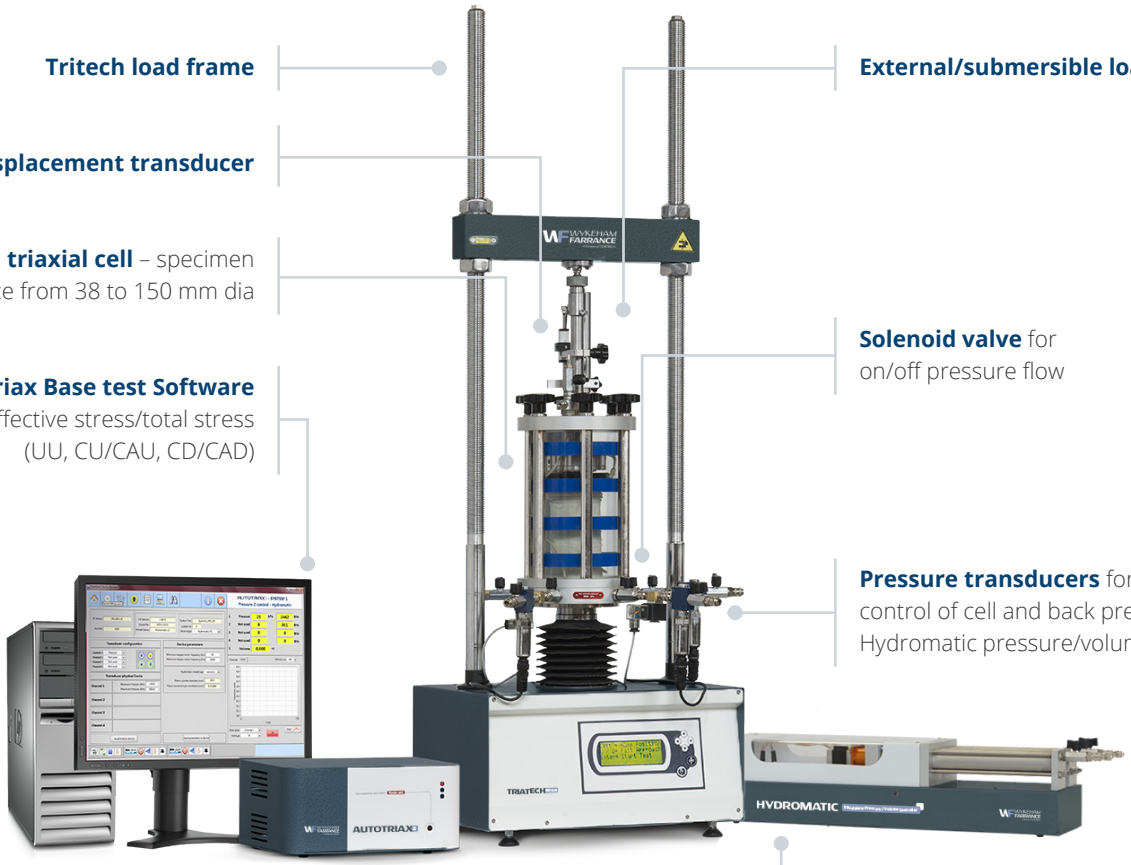
Effective/Total Stress Tests

Tritech load frame

Vertical displacement transducer

Banded triaxial cell – specimen size from 38 to 150 mm dia

Autotriax Base test Software
Effective stress/total stress (UU, CU/CAU, CD/CAD)



External/submersible load cell

Solenoid valve for on/off pressure flow

Pressure transducers for closed loop control of cell and back pressure via Hydromatic pressure/volume controller

Master Control Unit
Four data-acquisition and active-control channels for vertical load, displacement, cell and back pressure

Automatic Pressure and Volume Controller for cell pressure, back pressure and volume control

K_0, Stress Path Tests

K_0 and Stress Path triaxial tests allow you to replicate the changes in stresses experienced in-situ during natural events, excavations and constructions.

Additional accessories required for this configuration:

- Submersible load cell
- Vacuum top cap for triaxial tension
- K_0 test module software
- Stress Path test module software

Triaxial Test Configuration

Permeability Tests

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

Additional accessories required for this configuration:

- Pressure extension control unit
- Hydromatic single pressure line
- Permeability test module software

Autotriax module software for permeability tests

Single pressure extension control unit for permeability tests

Automatic Pressure and Volume Controller single pressure line

Unsaturated Triaxial Tests

Additional accessories required for this configuration:

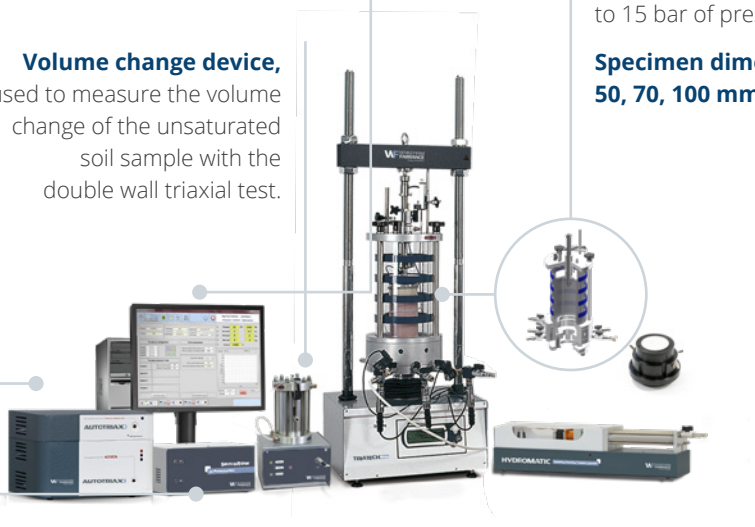
- Double-wall triaxial cell
- Air pressure extension unit
- Automatic volume change device
- Servoflow air pressure controller
- Unsaturated test module software

Autotriax module software for unsaturated tests

Volume change device, used to measure the volume change of the unsaturated soil sample with the double wall triaxial test.

Double wall triaxial cell, with **High Air Entry stone (HAES)** from 1 bar to 15 bar of pressure.

Specimen dimensions 50, 70, 100 mm dia.



Air pressure extension control unit for unsaturated tests

Servoflow air pressure controller

Other Test Configuration

CRS Test Configuration

ASTM D4186

Additional accessories required for this configuration:

- CRS cell, among the two possible types listed below
- Base plate
- CRS test module software

CRS cell

- Continuous monitoring of test parameters (axial load, pore pressure and axial compression)
- Sample dimension 63.5 x 25.4 mm
- Max. working pressure 3,500 kPa
- Relatively short time to perform consolidation test

Unconfined Test Configuration

ASTM D2166 | EN 17892:7

The 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.

Additional accessories required for this configuration:

- Upper and lower platens
- Transducer bracket
- External load cell
- Unconfined test module software

CBR Test Configuration

EN 13286-47 | ASTM D1883 | AASHTO T193

The 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.

Additional accessories required for this configuration:

- CBR Penetration piston
- CBR mold
- External load cell 50 kN
- CBR test module software

AUTOTRIAXQube

The new 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.

Benefits

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.

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

Integrated Vacuum System
For a streamlined and time saving sample preparation process.

Reliable and Accurate
The system is programmed with standardized test procedures reducing inconsistencies from operator variables, or other unpredictable external factors. So there is no need to collect and save data manually, or perform complex calibration procedures.

Efficient and Repeatable
AUTOTRIAXQube can complete the whole test — from saturation to failure — in full automatic mode without any interruption, saving time, minimizing operator intervention while increasing accuracy.

Versatile and Expandable
Capabilities can be expanded to perform permeability testing simply by adding a third pressure line. Advanced measurements can be also obtained with the addition of a Bender Element system, or local strain sensors.

For more details, please refer to our dedicated AUTOTRIAXQube brochure.

All-In-One Automatic Triaxial Testing System

ASTM D2850 | ASTM D4767 | ASTM D7181 | BS 1377:6 | BS 1377:7 | BS 1377: 8 | EN 17892:8 | EN 17892:9

25 kN submersible load cell
suitable for compression and extension test using vacuum top cap.

Built-in 50 mm potentiometric transducer
for measuring the deformation of samples from 38-70 mm diameter.

Three 3,500 kPa pressure transducers
with de-airing block panel for cell, back and pore pressure measurements.

Integrated de-airing water system
including vacuum pump, tank, control valves and cavitation system.

Four sturdy wheels
for easy positioning and manoeuvrability anywhere in the laboratory.

Reinforced Triaxial cell
with internal frame and lifting system to assist the operator.

All-in-one PC (optional)
with effective/total stress and stress path k_0 software.

Leak-proof top plate
designed to safely collect and drain excess water.

Compact front panel
to manage preliminary action such as de-airing water, water saturation circuits, sample positioning and filling of triaxial cell. In case of an emergency, simply stop the process by pressing the Emergency stop button at any time.

Easy monitoring of the water level
of hydromatic pressure volume and cell/back pressure lines from front panel. Pre-arrangement additional pressure line for performing permeability test.

Technical Specifications

• **Maximum load capacity:** 25 kN	• **Volume resolution:** 0.001 cc
• **Maximum sample size:** 70 mm diameter x 140 mm height	• **Piston travel:** 100 mm
• **Maximum confining pressure:** 3,500 kPa	• **Integrated de-airing tank:** 20 liters
• **Maximum back pressure:** 3,500 kPa	• **Units:** SI or US Customary
• **Pressure resolution:** 0.1 kPa	• 110, 220V 50-60 Hz, 1 pH
• **Maximum volume capacity:** 250 cc	

Key Components & Functionality

Secure Triaxial Cell Lifting System

The new lifting mechanism allows the operator to raise the cell to its highest position and rotate it through 90 degrees, until it's safely held in place with a magnetic latch. This removes the need to lift the total weight of the cell while freeing space on the work bench for sample preparation tools.

Easy Sample Preparation with Clever Internal Load Frame Mechanism

The integrated triaxial cell includes an internal load frame consisting of three columns supporting an upper pivoting crosshead. It is able to rotate, clearing the necessary space to prepare the sample. This is particularly useful when compacting a non-cohesive sandy specimen than can be prepared with "soft" compaction, or by pluviation method. Once the specimen is complete, the operator can easily center the upper plate so that the load cell connects through the top cap to the specimen. They can then easily lower the triaxial cell with the specimen already connected to the submersible load cell, without any disturbances (crucial for a low density specimen).

High-Precision Submersible Load Cell

The AutoTRIAXQube uses a unique high-precision 25 kN submersible load cell in which pressure does not affect the load reading. This makes it a perfect solution for performing stress path and K0 tests.

Universal Accessories Compatibility

All existing accessories already in use with the 38 to 70 mm banded triaxial cells are fully compatible with the AutoTRIAXQube system, including:

1. Top cap – vacuum top cap
2. Pedestal
3. Base disc
4. Pair of porous stone
5. Rubber membrane
6. O-rings
7. Membrane stretcher
8. O-ring placing tool
9. Two part split mould
10. Lateral filter drains
11. Filter disk
12. Hand sampler
13. Two part split former with vacuum attachment

Built-in Ingenious Hydraulic System

The preliminary system set-up including water circuit saturation, pressure system and triaxial cell filling can be quite time-consuming in any triaxial testing. Yet, it is crucial to get this preparation right in order to avoid any possible damage or compromise to the sample already positioned in the triaxial cell.

With the AUTOTRIAXQube the whole process is simplified to make triaxial testing as easy as possible:

Multi-function Control Panel

The manual valves that were once fitted to a wall panel have now been replaced by internal electro-valves connected to the control panel, making the initial set-up simple and straightforward. The whole procedure for de-airing water can be managed via the integrated de-airing system, and sample positioning has been simplified by enabling the control panel to move the platen up and down. This is especially helpful when you need to connect a sample to the submersible load cell.

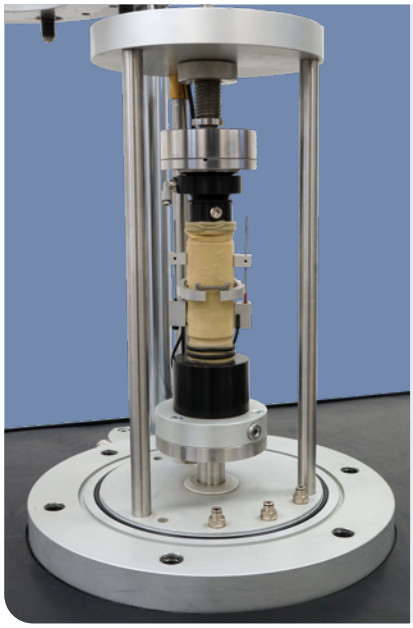
De-airing Block Panel

All pressure transducer sensors can be easily de-aired thanks to the de-airing block panel, located near to the base of the triaxial cell. The panel is designed to accommodate water, so any water pushed through the line during the circuit saturation process can be caught in the tray and drained away.

Integrated Standalone De-airing System

The full water de-airing process can be managed quickly and efficiently thanks to the compact multi-function control panel. The integrated de-airing system includes a vacuum pump, a 20 liter tank, three operating control valves and high-speed cavitation system.

At the end of the de-airing process, water can be easily pushed through the pipes to fill the whole hydraulic circuit and triaxial cell. The multi-function control panel is also used to manage discharge of the water from the triaxial cell to the de-airing tank, when testing is complete.



User-friendly Software

AUTOTRIAXQube benefits of our our flexible and renowned AUTOTRIAX software, please for more info see pag 14.

Additional Testing with Optional Upgrades

- ADVANCED MEASUREMNTS
  - Bender elements
  - Local strain measurement
- Permeability test
- Unconfined test

DYNATRIAX EmS

Dynamic Triaxial System

ASTM D2850 | ASTM D4767 | ASTM D7181 | ASTM D3999 | ASTM D5311 | BS 1377:7 | BS 1377:8 | AASHTO T307

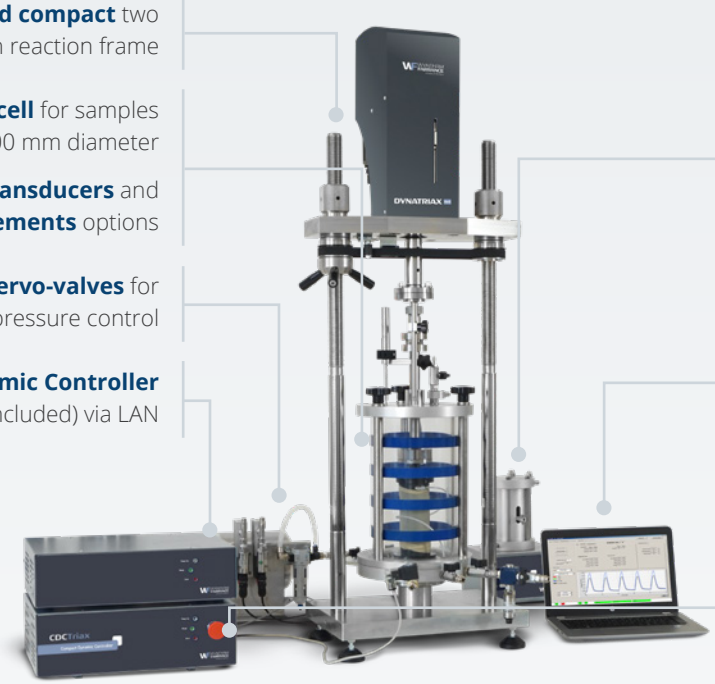
Robust and compact two column reaction frame

Triaxial cell for samples up to 100 mm diameter

On-sample transducers and **bender elements** options

High accuracy servo-valves for cell and back pressure control

Compact Dynamic Controller connected to PC (included) via LAN



Electromechanical Servoactuation, no air compressor or hydraulic pump for vertical load

Volume change device with automatic flow invertion

Standard and user defined wave shapes matching the on-site measurements (earthquakes)

Optimized PID algorithm merging high sensitivity, easy tuning, accurate wave shapes

Transducers calibration and verification controlled by software

Manual and automatic emergency shut off functions

Technical Specifications

- **Maximum Dynamic force:** ±15 kN
- **Maximum Static force:** ±10 kN
- **Maximum vertical travel:** 50 mm (longer travels available)
- **Maximum testing frequency:** more than 10 Hz (depending on testing conditions)
- **Volume change measure:** 100 cc volume change device with automatic flow inversion
- **Maximum confining pressure:** 1,000 kPa
- **Maximum back pressure:** 1,000 kPa
- **Close loop control frequency:** 10 kHz
- 16-bit ADC input channels for transducers (16 channels)
- 208–220 V, 50–60 Hz, 1 ph OR 110 V, 60 Hz, 1 ph

Benefits

→ **Electromechanical Servoactuation technology** offers excellent reliability, is more accurate and requires less maintenance.

→ **Three axis closed loop control** for axial load or displacement, cell and back pressure.

→ **Multitasking, user-friendly Windows-based,** PC software supplied pre-installed and ready to use to control the entire triaxial test and associated parameters.

→ **Complete automation of all test stages** using high sensitivity closed-loop P.I.D. feedback control

→ **Versatile** with ability to perform Static, Dynamic and Unsaturated soils triaxial tests.

→ **Standard and user defined wave shapes** also derived from on-site measurements (from violent earthquakes to sedate ocean waves).

For more details, please refer to our dedicated DYNATRIAX EmS brochure.

Static and Cyclic Triaxial Tests

ASTM D2850 | ASTM D4767 | ASTM D7181 | BS 1377:6 | BS 1377:7 | BS 1377: 8

The Dynatriax EmS allows to perform a complete range of triaxial tests:

- Effective stress
- Stress path
- K_0
- Cyclic

Additional Tests

Unsaturated soil testing package

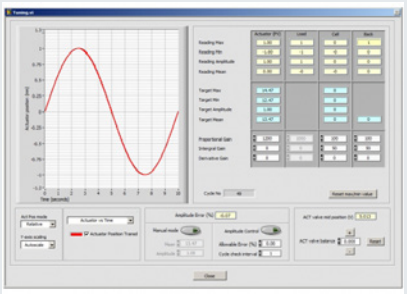
For the determination of mechanical parameters and soil water retention properties of soils in unsaturated condition.

Resilient modulus

For the determination of Resilient modulus on compacted samples under conditions representing a simulation of the physical conditions and stress states of materials beneath flexible pavements subjected to moving wheel loads.

High Performance Actuator with Sophisticated P.I.D Control

The high performance actuator provides the electromechanical application of vertical loads in dynamic conditions up to 15 kN with a sophisticated PID closed-loop control, ensuring load is reached fast, smoothly and accurately and then maintained with a high level of accuracy. The submersible load cell delivers high accuracy from the lowest values.



Dynatriax Software Stages

The multi-tasking, user-friendly, windows-based software is pre-installed on the computer supplied with the system. The software provides control of the following test stages and utilities of a cyclic triaxial test:

Saturation cell

- Cell pressure increments with B value check
- Back pressure increments with volume change measurement
- Cell and back pressure ramp

Stress path stage

- Horizontal and Vertical Stress
- s, t (average stress and shear stress)
- p, q (mean normal stress and deviator stress)
- Vertical stress using strain control

Consolidation stage

- Isotropic consolidation with continuous volume change measurement

Monotonic shear stage

- Strain controlled static shear stage, drained or undrained
- Loading in compression or extension, using the vertical mechanical actuator

K_0 consolidation stage

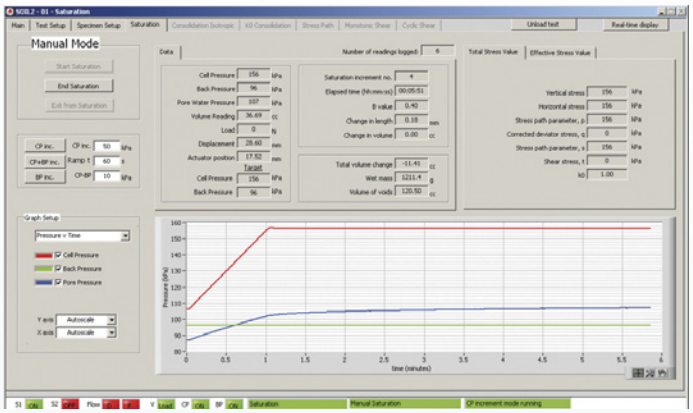
Vertical loading with sample diameter control using either:

- Direct measurement by radial belt with on-sample transducers
- Measurement of sample volume change and height

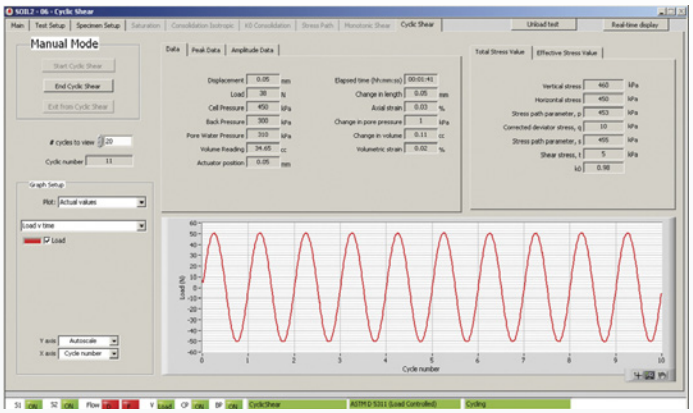
Cyclic shear stage

A cyclic shear method can be selected from the following options:

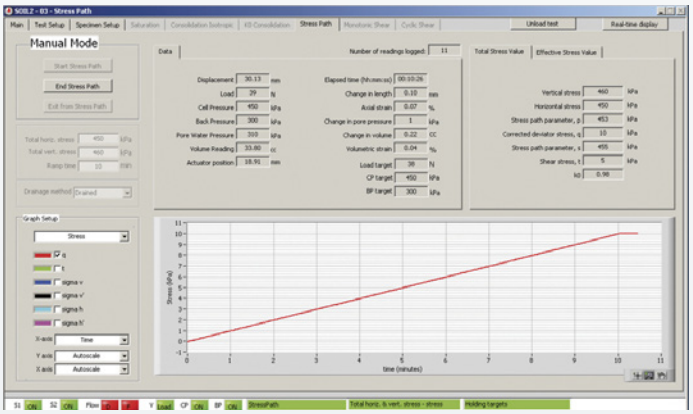
- ASTM D5311 Load Controlled Cyclic Strength
- ASTM D3999 Load Controlled Modulus & Damping
- ASTM D3999 Displacement Controlled Modulus & Damping
- Non Standard Single or multi Cycle test
- User defined or imported wave shapes



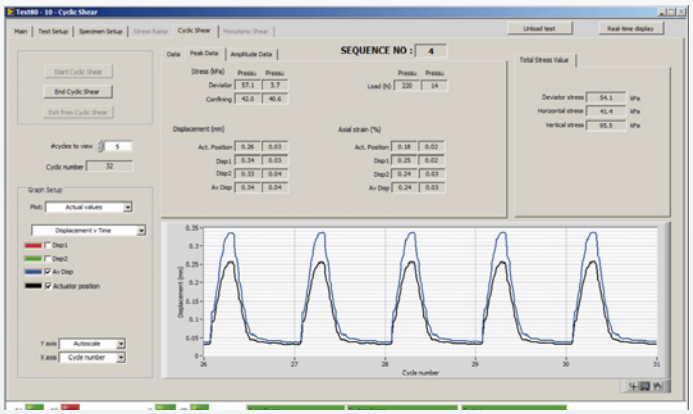
The graph on the saturation panel can display cell, back, pore pressure and volume change vs. time.



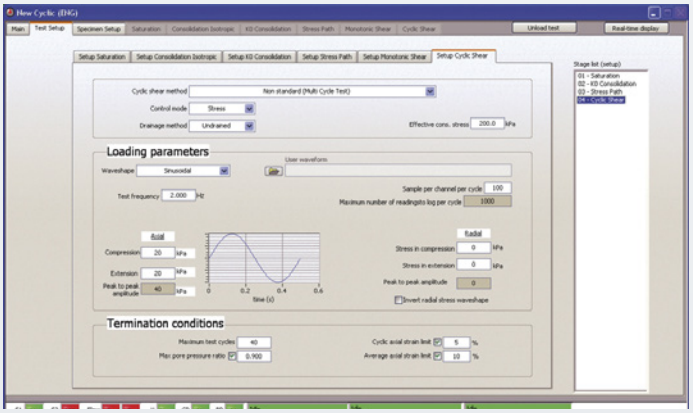
Stress-controlled cyclic shear stage. Real time measurements, compression/extension and amplitude values are displayed.



The graph on the stress path panel displays calculated stresses and strain vsa. time.



Resilient modulus software package provides live monitoring of the sample's compression during the application of the pulse sequence.



Cyclic stage set-up panel showing parameters for a non-standard test method.

Young's and shear modulus are monitored during the cyclic stage.

Complete Market-leading Range

From entry-level soil testing equipment to fully automatic PC-controlled machines for consolidation, shear, triaxial, static and dynamic testing, **our equipment range suits all needs and budgets.** Advanced systems are also available for research applications requiring an even higher degree of complexity.

OEDOMETRIC CONSOLIDATION

Standard front-loading oedometer

Analogue configuration
Dial Gauge

Electronic Configuration
Displacement transducer and GEODATALOG8

DIRECT/RESIDUAL SHEAR TESTING MACHINE

DIGISHEAR

- Analogue configuration
- Electronic configuration, GEODATALOG8

AUTOSHEAR

Electronic configuration
with built-in data acquisition

STANDARD STATIC TRIAXIAL SYSTEMS

Built In Data Acquisition

Configuration with automatic pressure/ volume controller, HYDROMATIC STANDALONE

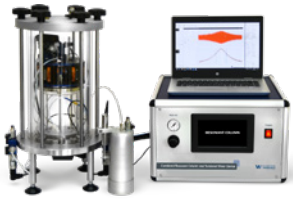
Configuration with Air/ water bladders and volume change device

External Data Acquisition

Configuration with automatic pressure/ volume controller, HYDROMATIC STANDALONE

Configuration with Air/ water bladders and volume change device

DYNAMIC TESTS



Resonant Column

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

Bender Elements

Bender elements allow you to measure the maximum shear modulus (Gmax) of soil samples in order to evaluate their stiffness.

Cyclic Simple Shear

Dynamic shear test apparatus for soil beahavior prediction under dynamic conditions.

WYKEHAM FARRANCE
A Division of CONTROLS

Wykeham Farrance Customer Care

Wykeham Farrance is the Soil and Rock Testing Division of CONTROLS. As one of the longest established manufacturing companies in the world of Construction Materials Testing solutions, we are dedicated to supplying high quality, accurate, affordable, easy to use systems.

As a valued customer of CONTROLS, you will receive continuous, expert support and advice for your Wykeham Farrance equipment. Furthermore, we can offer full installation and training in the correct operation of your equipment.

For support from our expert Customer Care Team, contact your local CONTROLS office / distributor or email **wfsupport@controls-group.com.**

For more information, please visit **www.controls-group.com.**

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