# DYNATRIAX EmS

## Automatic dynamic triaxial testing machine

**Standards**

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

Dynatriax EmS automatically performs dynamic triaxial tests in saturated and unsaturated conditions. Versatile, it can simulate a wide range of dynamic loading,from user-defined and experimental, to waveshapes obtained from on-site

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

### Efficient and repeatable
Perform a complete dynamic triaxial test in automatic mode without interruption or operator intervention, saving time and ensuring accuracy and repeatibility of results.

### High-speed PC control system
The triple axes 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 test stages.

### Smart and user-friendly software
The easy-to-use Dynatriax software provides standard and user-defined wave shapes derived from on-site measurements (from violent earthquakes to sedate ocean waves).

### High performing and versatile
The high performance actuator applies vertical dynamic loading up to 15 kN using a sophisticated P.I.D. closed-loop control allowing the system to perform Static or Dynamic tests.
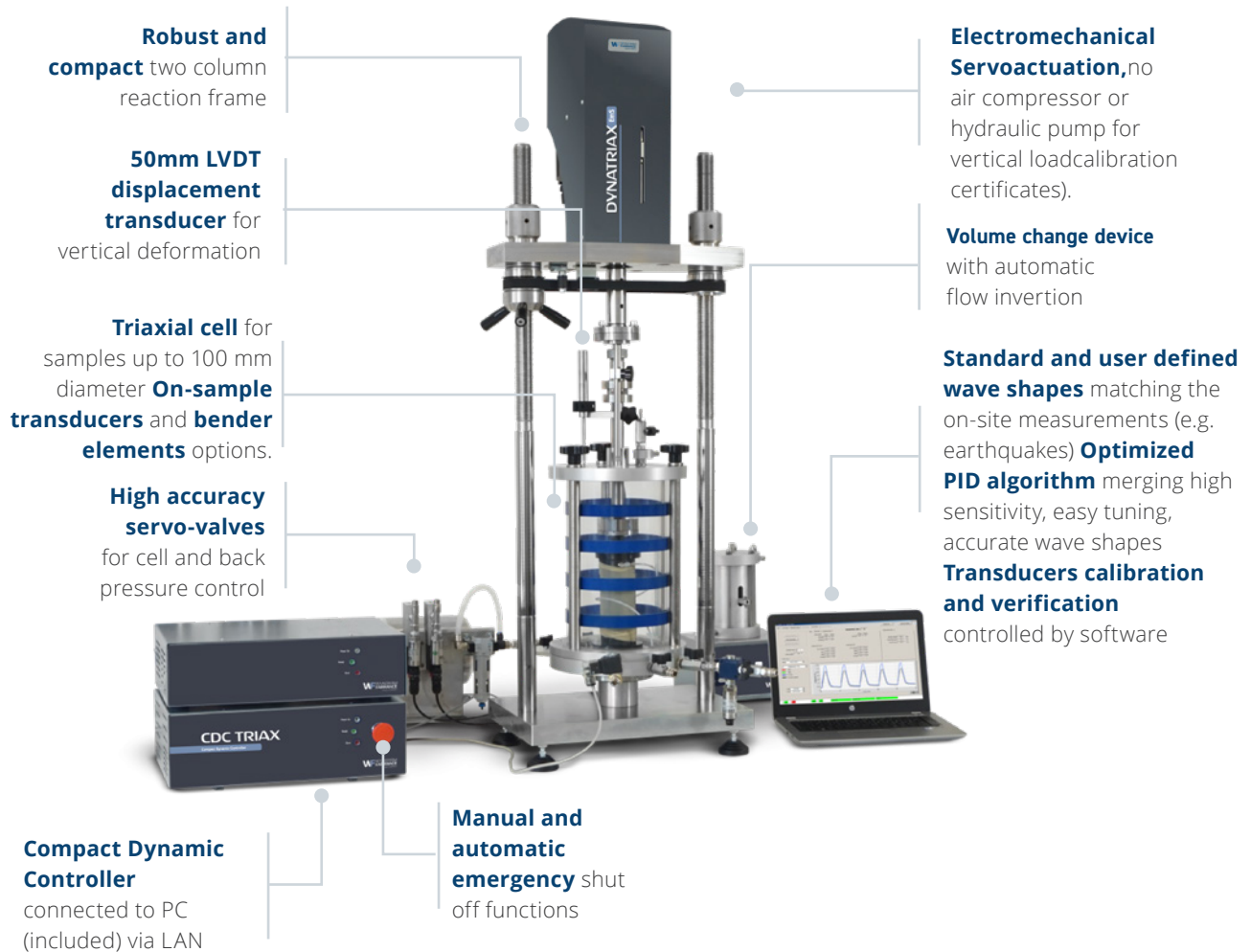
### Environmentally-friendly and low maintenance
Dynatriax benefits from the new EmS technology and cell/back pressure control system with reduced energy consumption, low maintenance and long life.

# DYNATRIAX EmS

## Automatic dynamic triaxial testing machine

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

**50mm LVDT displacement transducer** for vertical deformation

**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

**Manual and automatic emergency** shut off functions

**Electromechanical Servoactuation,** no air compressor or hydraulic pump for vertical loadcalibration certificates).

**Volume change device** with automatic flow invertion

**Standard and user defined wave shapes** matching the on-site measurements (e.g. earthquakes) **Optimized PID algorithm** merging high sensitivity, easy tuning, accurate wave shapes **Transducers calibration and verification** controlled by software

## Technical specifications

- **Maximum Dynamic force:** ±15 kN

- **Maximum Static force:** ±10 kN

- **Maximum vertical travel:** 100 mm

- **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) 110 -220 V, 50-60 Hz, 1 ph

# Dynatriax test range

The 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 on double wall triaxial cell). Resilient Modulus tests can also be performed with additional software package.

## 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 test

**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.
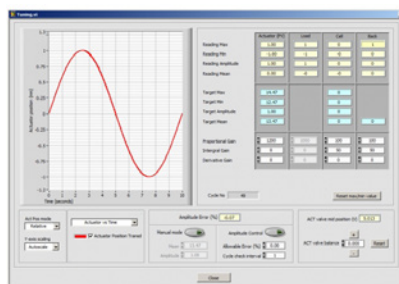
# Dynatriax smart software

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 stage

Different methods of saturation can be performed, according to the relevant standards:

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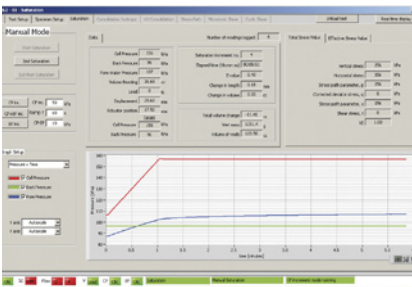


The graph on the saturation panel can display cell, back, pore pressure and volume change vs. time.

## > Consolidation stage

Choose the consolidation method among the following stages:

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

### $K_0$ 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

### Isotropic consolidation stage

With continous volume change, pore pressure and degree of consolidation measurements.

### Stress path stage

Drained and undrained load-controlled ramping targets of:

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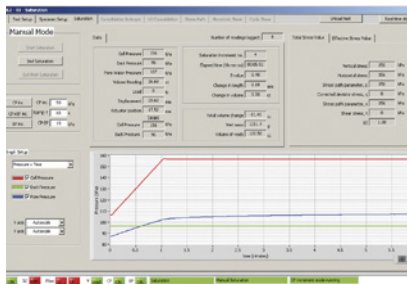


The graph on the stress path panel displays calculated stresses and strain vs. time.

## > Shear stage

The shear stage simulates static or cyclic loads among the following shear types:

### Monotonic shear stage

Strain-controlledd, drained or undrained static shear stage, in compression or extension, using either the actuator or the load frame platen.

### 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
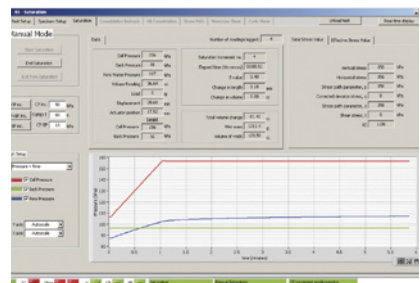


Stress-controlled cyclic shear stage.

Real time measurements, compression/extension and amplitude values are displayed.

# Additional Software Packages

## ❯ Resilient Modulus software package

This package is designed to perform Resilient Modulus tests according to AASHTO T307 standards and includes:

- Two standard sequences of dynamic cyclic and static confining stress for subgrade soils and base/sub-base materials.
- The option to create customize sequences that can then be saved and replicated automatically.
- Real-time monitoring of recorded and processed data of each single sequence.
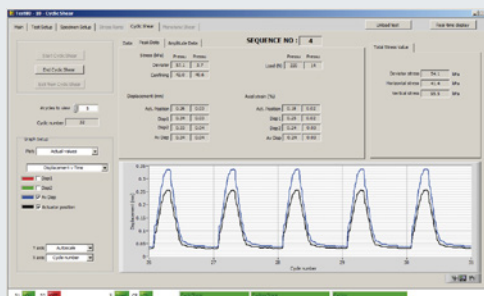


Resilient Modulus software package provides live monitoring of the sample's compression during the application of the pulse sequence.

# Ordering information

## Cyclic system and reaction frame

### Electro-Mechanical verticall load application

- High performance motorized actuator, 15 kN capacity, backlash-free and silent.
- Sophisticated P.I.D. closed-loop control guarantees a fast, smooth and accurate loading ensuring it remains consistent throughout the test. Meanwhile, the submersible load cell delivers high accuracy from the lowest values.

### Reaction Frame
Robust and compact two-column reaction frame

### Data acquisition, process and control

The CDC (Compact Dynamic Controller) manages up to three closed-loop axes (axial load displacement, cell and back pressure) with an effective loop rate of 10 kHz plus performs the test automatically including turning the valves to the drainage line and triaxial cell's air supply "on" and "off".

**31-WF70E06**
15 kN Electromechanical Servoactuation, 220V, 50Hz , 1ph.

**31-WF70E04**
15 kN Electromechanical Servoactuation, 110V, 60Hz ,1ph.

## Banded triaxial cells

(Double wall triaxial cells for unsaturated tests are available).

**28-WF4070***
Banded Triaxial cell up to 70 mm

**28-WF4100***
Banded Triaxial cell up to 100 mm

*\* Triaxial sample accessories are available for each model*

## Pressure system

**28-WF4320**
Air/water interface up to 1,000 kPa. Please note that system requires a small air compressor and air filter.

## Displacement

**31-WF7121**
LVDT linear transducer ±25 mm travel

## Volume change

**29-WF4412**
For the measurement of the change in volume, 100 cc, resolution 0.01cc

## Pore pressure and de airing block

**28-WF6300**
Pore pressure transducer 1,000 kPa capacity for pore water pressure

**28-WF6310**
De-airing block for pore pressure transducer

## Sensors

| Type | Model | Capacity |
|---|---|---|
| | 31-WF7117 | 5 kN |
| Submersible load cells | 31-WF7118 | 10 kN |
| | 31-WF7119 | 25 kN |

28-WF4070
Banded Triaxial cell up to 70 mm

29-WF4412
Automatic volume chage device

31-WF7117
Submersible load cells sensor

28-WF4320
Air/water interface

For detailed information, including a complete test configuration, please contact our dedicated team of experienced geotechnical engineers at info@controls-group.com

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

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

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