

b. System with Bishop –Wesley triaxial cell

General Description and Main Features

The system includes the following:

Stress path cell

Bishop-Wesley type

System Control

Computer controlled with pressures supplied via three motorised screw control cylinders.

Axial Pressure System

Consisting of stepper motor controlled screw cylinder, with pressure feedback from the axial force transducer.

Cell and Back Pressure Systems

Consisting of two stepper motor controlled screw cylinders, with pressure feedback from the cell pressure and back pressure transducers respectively.

Volume Change Transducer

The volume change is measured directly in the back pressure line. This method is more accurate than indirect ones, which are calculated from the stepper motor movement.

Pore Water Pressure Transducer

It is connected to the triaxial cell by a de-airing block.

Axial Load submersible load cell

This is fixed to the ram in the stress path cell. The load cell is oil filled to transmit the confining pressure into the load cell housing.

This ensures that the measurements are not influenced by changes in the confining pressure.

Axial Strain Displacement Transducer

It is mounted on the triaxial cell, to monitor the axial ram movement.

Stress path triaxial cell

General description

The stress path cell is a Bishop-Wesley type with a large diameter chamber and includes two pore pressure and two back pressure ports. The cell includes also five electrical outlets to facilitate the use of on sample transducers for specimens from 38 to 50 mm diameter.

A rigid connection (the vacuum top cap) between the sample top cap and the internal submersible load cell is available (see accessories).

Therefore both compression and extension tests, where the vertical stress is reduced with respect of the radial stress, can be easily performed.

A Bishop-Wesley triaxial cell for samples up to 100 mm diameter can be supplied on request.

WF12407

Stress Path Cell for 38-50 mm samples with two pore pressure and two back pressure ports and five electrical outlets for "on sample" transducers. Complete with load cell 5 kN* capacity

* Upon request the 5 kN submersible load cell can be replaced by 1 kN submersible load cell WF 17091

Specification

Sample diameter: 38 – 50 mm

Cell pressure: 2000 kPa

Axial load: 5 kN, 1N resolution

Ram travel: 25 mm

Ports : 2 extra drainage ports

Outlets: 5 electrical outlets

Height of the cell: 690 mm

Diameter of the cell: 420 mm

Weight: 30 kg approx.

Vacuum top cap for extension tests available for all models (see accessories)



WF 12407

b. System with Bishop –Wesley triaxial cell (continued)

Triaxial cells accessories

The stress path cell can receive two sample sizes 38 and 50 mm. Therefore the cells are supplied without internal accessories, these must be ordered separately.

Cell type	Max. working pressure (kPa)	Sample size	Pedestal and top cap sets	Top cap vacuum type*	Porous disc	Membrane	O ring
WF 12407	2000	38 mm	WF 12414	WF 12416	WF 10560	WF 10500	WF 10530
WF 12407	2000	50 mm	WF 12415	WF 12417	WF 10571	WF 10510	WF 10540

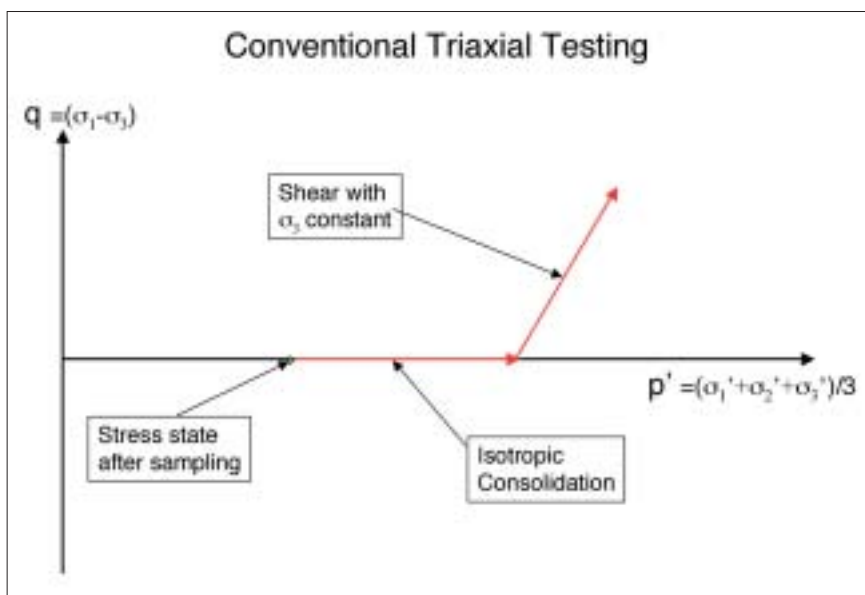
* Complete with drainage lead

Sample accessories

Sample size	Suction device	O ring placing tool	Three part split former	Two part split mould	Filter drains	Hand sampler and extrusion dolly
38 mm	WF 10460	WF 10542	WF 10410	WF 10440	WF 10670	WF 10623
50 mm	WF 10480	WF 10544	WF 10421	WF 10451	WF 10671	WF 10624



WF 12416, WF 12417



Geotechnical: Advanced soil testing

b. Stress Path System (Bishop-Wesley) (continued)

Control system and data acquisition

WF 12476

Closed loop stress path system complete with 24 bit control and data acquisition system, cabinet, three screw control cylinders, pressure transducers, axial strain transducer, volume change transducer, operating software and p.c. 110-230 V, 50-60 Hz, 1 ph.

The three screw control cylinders are required to apply and control the level of cell pressure, axial pressure and back pressure during the different steps of triaxial tests: saturation, consolidation and shear.

The control of the stepper motors and data acquisition is managed by software via a 24 bit-16 channels data logger.

Specification

	capacity	resolution
Controllers		
Pressure:	2000 kPa	1 kPa
Capacity:	200 cc	0.001 cc
Transducers		
Volume:	100 cc	0,01 cc
Pressure:	1000 kPa	0,1 kPa
Axial strain transducer:		
25 mm		0,01 mm
Overall dimensions: 2000x2000x250 mm (complete apparatus)		
Weight approx.: 250 kg		

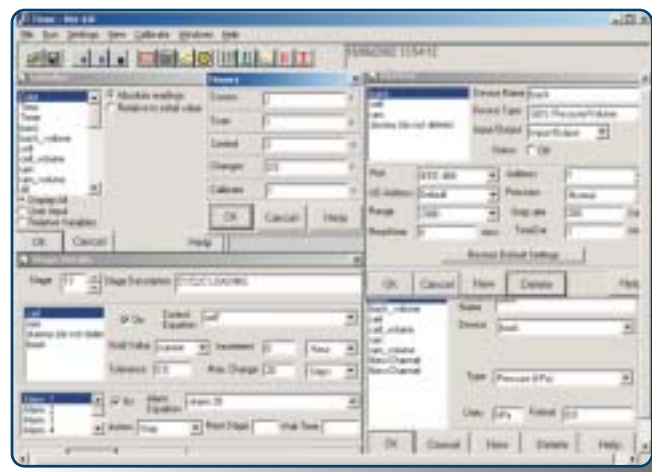
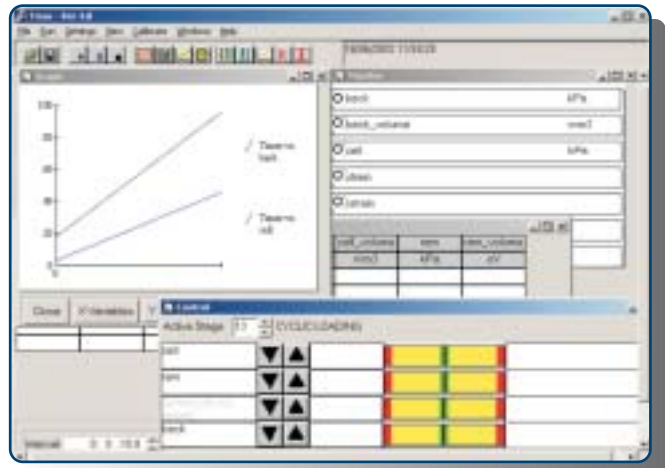
Software description

Windows software for control and data acquisition, to perform UU, CU, CD, and stress path tests.

The Windows® software allows the following tests to be controlled and performed:

- Saturation
- Consolidation
- B check
- Anisotropic consolidation
- K_0 consolidation
- Quick Undrained
- Consolidated undrained with or

- without pore water pressure measurement
- Consolidated drained with or without pore water pressure measurement
- Extension tests
- Stress path



Transducers *

Pressure transducers

For monitoring the cell, back and pore pressure. To be completed with de-airing blocks for connecting to the triaxial cell.

WF 17060

Pressure transducer 1000 kPa, 3 metre cable, 0,1 kPa resolution

WF 17029

De-airing block for pressure transducers complete with on-off valve

Displacement transducers

WF 17006

Linear displacement potentiometric transducer 25 mm travel 0,01 mm resolution. Mounting bracket available separately

WF 17082

Mounting block for connecting WF 17006 displacement transducers to the stress path cell

Volume change transducer

For monitoring sample volume change. Supplied complete with a change over valve system and transducer.

WF 12499

Volume change apparatus 100 cc capacity, 0,1 cc resolution complete with change over valves and transducer (see page 36)

Load transducer

WF 17104**

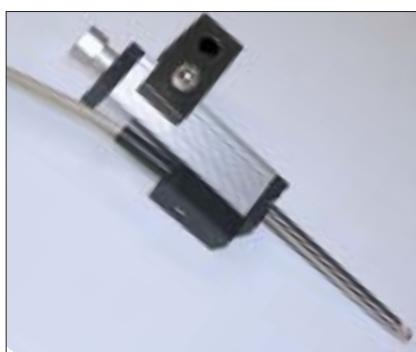
Submersible load cell 5 kN cap., 1 N resolution

* Included in the stress path systems WF 12512 and WF 12476

** Included in the stress path triaxial cell WF 12407

Transducer specifications

Type of measurement	Pressure	Displacement
Model	WF 17060	WF 17006
Range	1000 kPa	25 mm
Input voltage	10 V DC	10 V DC
Output	100 mV full scale	from 0 to input voltage
Repeatability	better than 0.25%	better than 0.002 mm
Accuracy	better than 0.1 kPa	better than 0.002 mm



WF 17006 with WF 17082



WF 17060



WF 12499



WF 17082

Geotechnical: Advanced soil testing

1. Stress Path Systems. "On sample" Transducers

Introduction

The Stress Path Triaxial test can be upgraded and improved by the accurate measurement of sample deflections and stiffness evaluation of the soil using on sample strain transducers and Bender elements.

"On sample" transducers

These are displacement transducers supplied in a set for axial and radial measurement of sample size, fitted directly on the soil sample. On sample measurements of small deflections eliminate the errors in measurement due to the bedding effect of the porous stones on either end of the sample. Different kits are available for different size of samples, 38 - 50 mm sample size are too small for this applications.

Description	Sample size		
	70 mm	100 mm	150 mm
On sample transducer kit including 2 linear, 1 radial transducers and all plugs used with DataMan loggers (page 38)	WF 17072	WF 17073	WF 17075



WF 17072 - On sample transducer kit

Bender elements

Fitted in the top cap and base pedestal, the bender elements are used to determine the sample stiffness. The stiffness of a soil can be measured using bender elements. This system, consisting of a transmitter, which is energised to produce a shear wave through the sample and a receiver, measures the stiffness of the soil sample as calculated by the equation:

$$G_{\max} = \rho \cdot (V_s)^2$$

where

V_s = shear wave velocity

ρ = mass density of the soil sample

This stiffness value is a constant when the shear strain applied to the sample does not exceed its elastic limit. G_{\max} is a key parameter in small strain dynamic analysis, such as those to predict soil behaviour or soil structure interaction during earthquakes, explosions or machine and traffic vibrations. *For more details see pages 78-79*

WF 17320

PC based oscilloscope and signal generator for driving and recording data from bender elements. PC not included

Top cap and base pedestal with bender elements

These accessories can be mounted into the different models of triaxial cells (advanced type) to perform the tests. Please make reference to the table on page 78 where the accessories codes are given relative to the sample size and triaxial cell model.



Bender elements