Options available for GDSTTS

Load ranges

7kN ✓ **25kN** ✓

Cell or back pressure ranges

500kPa ✓ **4000kPa** ✓
1000kPa ✓ **8000kPa** ✓
2000kPa ✓ **10MPa** ✓
3000kPa ✓

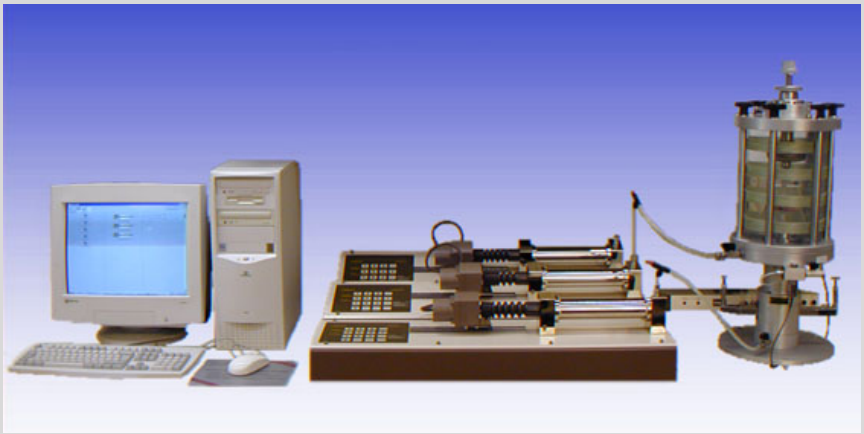
Triaxial cells **from:**

2000kPa ✓ **to 10MPa** ✓

for sizes:

38mm ✓ **to 100mm** ✓

Triaxial Testing Systems (GDSTTS) including STDTTS, ADVTTS and HPTTS



What is it?

The GDS Triaxial Testing System (GDSTTS) is a fully automated advanced triaxial testing system designed principally for stress path testing due to the direct actuation of axial stress through the hydraulically controlled ram in the base of each cell. GDSTTS can run advanced tests such as stress paths, slow cyclic and K0, all under PC control. In fact, using the flexibility of GDSLAB software, almost any user-defined test may be performed. Due to the extensive GDS range of pressure controllers and triaxial cells, each system may be configured exactly to the customers specification and budget.

Overview

The system is based on the classic Bishop & Wesley-type stress path triaxial cell, and the GDS pressure/volume controller. Three of these pressure controllers link the computer to the test cell as follows:

- one for axial stress and axial displacement control.
- one for cell pressure control.
- one for setting back pressure and measuring volume change.

System elements

The fundamental system hardware elements are shown in Fig. 1 on the following page. The actual hardware used may be chosen to suit your testing and budgetary requirements. Common arrangements are as follows:

- Standard Triaxial Testing System (STDTTS) which is based on 3 x 3MPa Standard Pressure/Volume Controllers (STDDPC)
- Advanced Triaxial Testing System (ADVTTS) which is based on 3 x 2MPa Advanced Pressure/Volume Controllers (ADVDPC)
- High Pressure Triaxial Testing System (HPTTS) which is based on 3 x High Pressure Controllers

All elements of the ADVTTS system in particular are biased towards achieving the greatest resolution and accuracy, for the highest quality tests achievable in a research environment. The STDTTS system is a low cost version of ADVTTS.

Technical specification

- Accuracy of Pressure measurement = <0.1% full range (ADVTTS) or <0.15% full range (STDTTS)
- Resolution of Pressure measurement = 0.5kPa (ADVTTS) or 1kPa (STDTTS). For >8MPa see individual specs.
- Accuracy of Volume measurement = <0.1% measured value (ADVTTS) or <0.25% measured value (STDTTS)
- Resolution of Volume measurement = 0.5mm^3 (ADVTTS) or 1mm^3 (STDTTS and ADVTTS > 8MPa)
- Transducer Resolution = 16bit
- computer-automated control of testing - not just data logging
- MS Windows® software (GDSLAB) for test control and post-test processing
- Fully expandable software to allow additional testing or hardware to be incorporated at any time

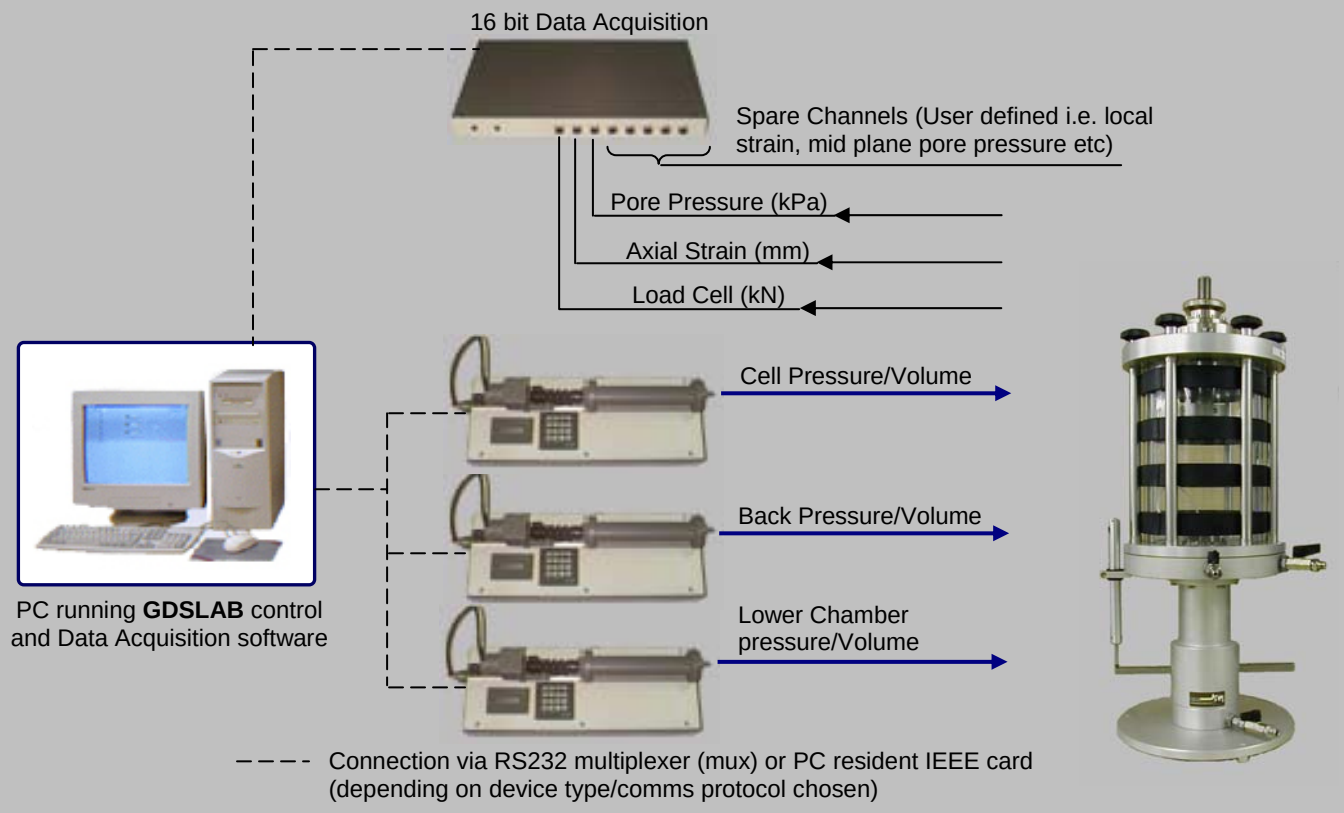


Fig. 1 Diagram of the STDTTS hardware elements

Bishop and Wesley triaxial cells

GDS manufactures 3 Bishop and Wesley stress path cells as follows:

- 7kN/2000kPa, for specimens up to 50mm (38mm and 50mm as standard). See Fig. 2.
- 25kN/2000kPa, for specimens up to 101.8mm (38, 50, 70 and 100mm as standard).
- 20kN/10MPa, for specimens up to 50mm (38mm and 50mm as standard). See Fig. 3.

Updated GDS 2000kPa cells

Both the 7kN/2000kPa and the 25kN/2000kPa Bishop and Wesley cells have recently had a design review and as such a new, improved Bishop and Wesley cell has been developed by GDS. Design features of the new cells include:

- reduced axial ram friction
- improved vertical guidance
- improved lateral ram stiffness
- options for potentiometric or smaller LVDT transducers to be attached for measurement of axial displacement
- reduced backlash in ram adjustment head
- stainless steel pedestal as standard
- cell can be incorporated with the HKUST unsaturated soil testing inner cell
- full range of access rings available for entry/exit of additional transducer cables

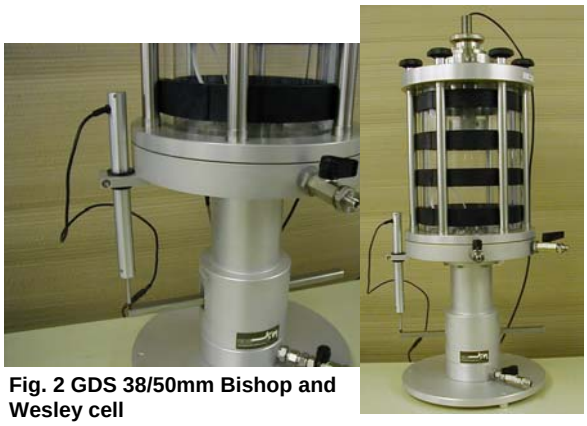


Fig. 2 GDS 38/50mm Bishop and Wesley cell

Fig. 3 GDS 10MPa Bishop and Wesley cell

Pressure/volume controllers

The cell pressure and back pressure controllers may be mixed and matched. There is the Standard Pressure/Volume Controller (STDDPC – see Fig. 4), with pressure ranges from 1 to 4MPa, serial PC connectivity and 200 cc volumetric capacity.

Fig. 4 STDDPC

Or there is the Advanced Pressure/Volume Controller (ADVDPC – see Fig. 5) with pressure ranges of 2MPa, 3MPa, 4MPa, 8MPa, 16MPa, 32MPa, 64MPa and 128MPa with serial or IEEE PC connectivity and 200cc volumetric capacity. (Also, the ADVDPC 2MPa controller can be bought as 1000cc volumetric capacity item).

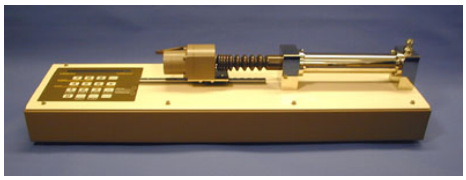


Fig. 5 ADVDPC

The back pressure controller which applies back pressure, also measures volume change of the test specimen.

GDSLAB control software

The GDSLAB control and acquisition software is a highly developed, yet extremely flexible software platform. Starting with the Kernel module and the ability to perform data acquisition only, additional modules may be chosen for your testing requirements. Some currently available modules are as follows:

- SATCON (saturation and consolidation)
- standard triaxial
- stress path testing (p, q and s, t)
- advanced loading tests (cyclic, user defined)
- unsaturated testing
- K0 consolidation
- permeability

GDSLAB has the ability to be configured to your hardware of choice, no matter how unique the arrangement. A text file (*.ini) or initialisation file is created that describes the hardware connectivity to the PC. The hardware layout is available in graphical format via the GDSLAB 'object display'. This makes setting up the devices and checking the connectivity extremely simple (see Fig. 6).

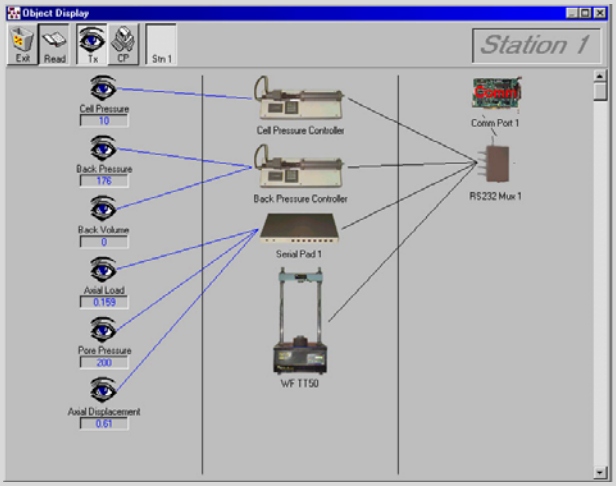


Fig. 6 Object display showing a standard STDTAS arrangement

For further information on GDSLAB, please refer to the dedicated GDSLAB datasheet.

GDSLAB REPORTS presentation software

GDSLAB REPORTS is a triaxial, shearbox and oedometer presentation package to National Standards (eg. BS 1377). This program is used to present data which is saved in a GDSLAB data file or input by hand.

GDSLAB REPORTS is a program which combines the simplicity of a MS Windows® user interface, with the power of MS Excel®. Data obtained using GDSLAB control and data acquisition software may be selected, viewed and manipulated where necessary (see Fig.7) before being exported directly as an MS Excel® spreadsheet.

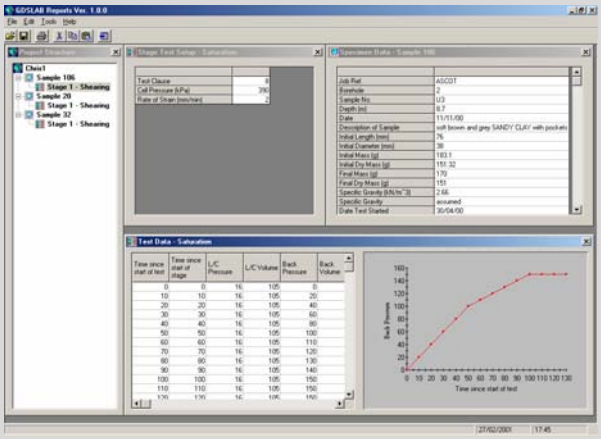


Fig. 7 GDSLAB Reports user interface

For further information on GDSLAB REPORTS, please refer to the dedicated GDSLAB datasheet.

Upgrade to local strain measurement

Any GDSTTS system may be upgraded to perform Local Strain measurement using either Hall Effect or LVDT transducers (see Fig. 8). Both device types enable axial and radial deformation to be measured directly on the test specimen via lightweight aluminium holders.

Hall Effect transducers may be used in water up to 1700kPa. LVDT transducers come in 2 versions:

- **low pressure** (up to 3500 kPa) version for use in water
- **high pressure** (up to 200 MPa) version for use in non-conducting oil

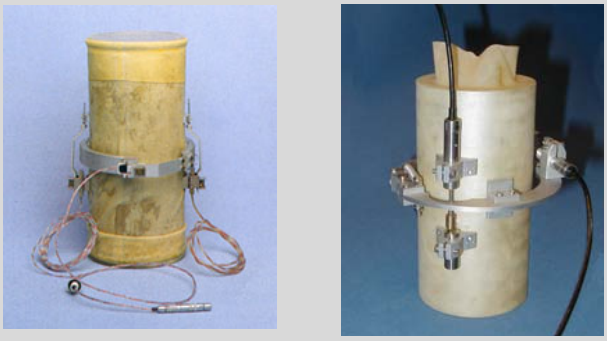


Fig. 8 Hall Effect and LVDT local strain transducers

For further information on local strain measurement, please refer to the dedicated Hall Effect Local Strain and LVDT Local Strain datasheets.

Upgrade to unsaturated testing

Any GDSTTS system may be upgraded to perform unsaturated triaxial testing with the addition of the following items:

- unsaturated pedestal with high air entry porous stone
- 1000cc Advanced Pressure/Volume Controller (for application of pore air pressure and measurement of air volume change) as in Fig. 9.
- Other unsat methods available (HKUST, double cell etc).

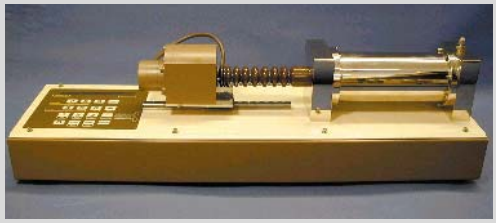


Fig. 9 1000cc Advanced Pressure/Volume Controller (ADVDPC)

For further information on unsaturated testing, including further unsaturated testing methods, please refer to the dedicated Unsaturated datasheet.

Upgrade to bender element testing

Any GDSTTS system may be upgraded to perform P and S wave bender element testing with the addition of the following items:

- bender element pedestal with bender element insert
- bender element top-cap with bender element insert
- high-speed data acquisition card
- signal conditioning unit which includes amplification of source and received signals (P and S-wave) with user controlled gain levels (via software).

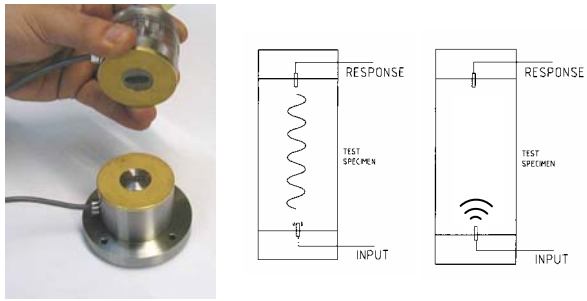


Fig. 10 P and S wave elements

For further information on bender element testing, please refer to the dedicated Bender Element Testing datasheet.

Why buy GDSTTS?

- ADVTTS remains the leading stress path system for research testing throughout the world
- STDTTS provides a low cost alternative with all the features of the ADVTTS system
- New improved GDS designed triaxial cells based on the original Bishop and Wesley concept
- Resolution of measurement of volume change in all systems = 0.5 or 1mm^3 (see specification on page 1)
- Flexibility in the capacity of the system (specimen size, load, pressures etc) ensures a system is created to specifically suit the testing required and the budget
- May be upgraded at any time for additional transducers, software modules, bender element testing, unsaturated testing and more – i.e. future proof!
- GDS worldwide technical support for peace of mind

Due to continued development, specifications may change without notice.