Suitable for ASTM D6528

Test Types:

Dynamic Simple Shear ✓

Dynamic Triaxial ✓

Available Load ranges:

Axial Load: 5kN ✓

Axial Load: 10kN ✓

Shear Load: 5kN ✓

Shear Load: 10kN ✓

Software

Fully automated ✓

Control Parameters:
Axial Load/Displacement
Shear Load/Displacement

Active Height Control ✓

GDS Combined Advanced Dynamic Cyclic Simple Shear (ADVDCSS)

What is it?

The GDS Combined Advanced Dynamic Cyclic Simple Shear (ADVDCSS) testing system is a new innovation by GDS in that it combines Simple shear and Triaxial testing without the use of a separate loadframe. The ADVDCSS uses our established technology of Electro-Mechanical actuators which are designed for long life and highly accurate position control. Unlike pneumatic actuators this type of actuator is even suitable for carrying out small strain testing, long term creep tests and dynamic tests up to 5Hz. The system converts from a simple shear test to triaxial test in about 15 minutes by replacing the cell wall with a shorter one and raising the position of the lower platen using the built in lift system to allow for the shorter sample length of simple shear tests

Features

Axial and shear loads or displacements are provided by proven GDS electro-mechanical force actuators. Axial and shear load readings are controlled under closed-loop feedback. During shearing the constant axial strain for the specimen is maintained using active height control via the axial force actuator. Topcap fixity is assured through a system of linear guides to minimise topcap rocking during shearing.

During simple shear tests constant volume conditions are ensured in the sample by use of PTFE coated low friction slip rings around the sample. These rings are finely machined for smoothness and flatness to ensure minimum friction. Optionally wire reinforced membranes can be used in the GDS system. Height control of the specimen is active and readings are taken from a very small range LVDT to ensure accurate control of the topcap position.

Triaxial tests such as stress paths, K-zero and permeability can all be carried out in the ADVDCSS subject to the correct test modules being present.

Technical Specifications

- Accurate electro-mechanical actuators
- Available sample sizes (one size supplied with system):
  - Φ50mm x 100mm
  - Φ70 x 140mm
  - Φ100 x 200mm
  - Other sizes available on request
- 8 Channel Dynamic 16 Bit data logger
- Low friction sample slip rings
- High quality, low friction linear guides used to ensure strength and alignment in normal and shear directions.
- Available control parameters:
  - Axial Load / Stress
  - Axial Strain / Displacement
  - Shear Load / Stress
  - Shear Strain
  - Available control modes for each control parameter: Ramp (monotonic), Cycle (slow speed) and hold.
- Dimensions: 1.2m long x 0.5m wide x 1.4m high.

TU Delft Delft University of Technology

Developed in association with Delft University of Technology.

Advantages of the GDS ADVDCSS

- The system can carry out Simple Shear and Triaxial testing,
- The ADVDCSS can saturate Simple shear samples in a similar way to normal triaxial testing, using cell pressure and back pressure. This cannot be achieved in a normal simple shear system
- The ADVDCSS has been designed to be extremely stiff in the axial and shear directions, this leads to very low system compliance.
- Upgrades can be added to allow:
    - Bender element testing
    - Unsaturated Testing
    - Local strain measurement
- Saving of laboratory space as the system can carry out two types of testing.
- Electro-mechanical actuators that give superior performance when compared to pneumatic equivalents. Meaning full amplitude tests (up to +/-1mm) can be carried out at 5Hz.

Upgrade to Bender Element Testing

The ADVDCSS system may be upgraded to perform P and S wave bender element testing with the addition of the following items (see Fig. 1):

- Bender element pedestal with *new* inserted element
- Bender element top cap with *new* inserted element
- High-speed data acquisition card

Signal conditioning unit, amplification of source and received signals (P and S wave) with user-controlled gain levels (via software).

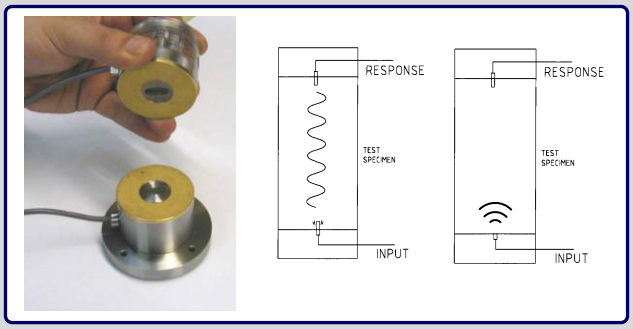

Fig. 1 P and S wave elements
For further information on bender element testing, please refer to the dedicated Bender Element Testing datasheet.

Upgrade to Unsaturated Testing (Method A)

There are four main methods GDS use for unsaturated testing. The ADVDCSS can be upgraded to UNSAT testing by using method A. Method A is the direct volume measurement using a GDS pore air pressure/volume controller.

Resolution of measurement of pore pressure/volumes (air & water): pressure = 0.2kPa, volume = 1cu mm
Accuracy of measurement of pore pressure/volumes (air & water): pressure = <0.1% full range, volume = 0.25%

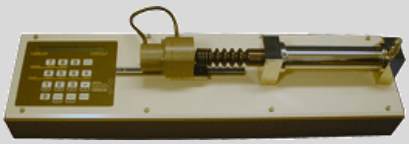

Fig. 2 2MPa/1000cc air pressure/volume controller

Upgrade to Local Strain Measurement

The ADVDCSS can be upgraded to perform Local Strain measurement using either Hall Effect or LVDT transducers (see Fig. 3). Both device types enable axial and radial deformation to be measured directly on the test specimen via lightweight aluminum 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

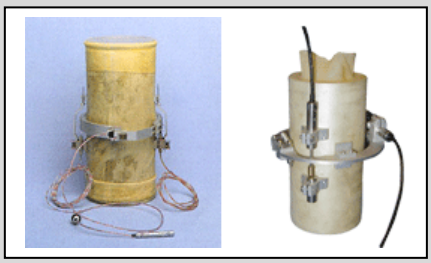

Fig. 3 Hall Effect and LVDT local strain transducers

GDSLAB control software

The GDSLAB control and acquisition software from GDS 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 available are as follows:

- Simple Shear
- Dynamic Triaxial
- SATCON (saturation and consolidation)
- Standard triaxial
- Stress path testing (p, q and s, t)
- Advanced loading tests
- Unsaturated testing
- K0 consolidation
- Permeability

GDSLAB has the ability to be configured to your hardware choice, no matter how unique the arrangement. 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, as in Fig. 4.

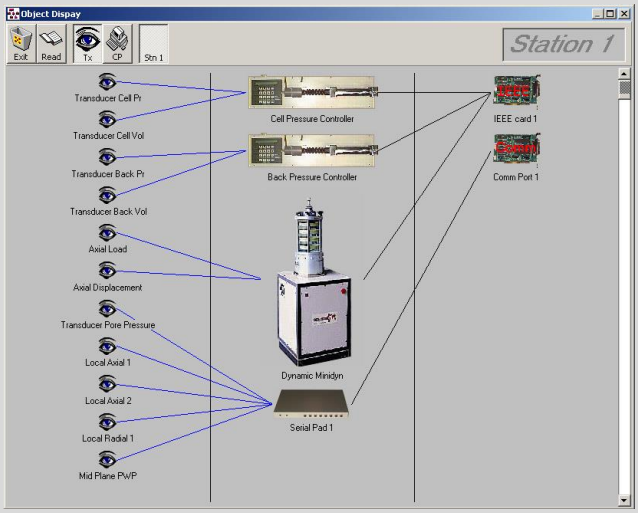

Fig. 4 GDSLAB object display showing a DYNTTS setup

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

Note: Due to continued development, specifications may change without notice.