Electro-mechanical	✓	
Standard Ranges:	**2.5kN**	**5kN**
Axial Load:	X	✓
Direct Shear Load:	X	✓
Simple Shear Load:	✓	X
Fully Automated Software	✓	

Control Parameters:
Axial Load / Stress Displacement
Shear Load / Stress Displacement

Active Height Control	✓	
Available options:	**SS**	**DS**
10kN Upgrade Axial	✓	✓
10kN Upgrade Shear	X	✓
Bender Elements	✓	X

GDS Shearbase System (GDSSS)

What is it?

The GDS Shearbase System (GDSSS) is an electro-mechanical shear testing device that comes in two options, a simple shear or direct shear apparatus. The benefit of the new apparatus is that it can be upgraded to perform both tests. This can take place at the time of build or at a later date.

Features

This desktop apparatus comes with built in controllers, resulting in a small footprint of just H x 660mm, L x 660mm, D x 220mm. This allows the system to fit into most laboratories. The only laboratory service required for the system is mains electricity (110Vac – 240Vac). The GDSSS comes with an integrated power supply and 16 bit data acquisition, making the apparatus smaller, neater and smoother than previous models.

The apparatus is a fully self contained system with no requirements for compressed air or hanging weights. Normal (axial) and shear forces are applied using GDS electro-mechanical force actuators. The use of GDS Force actuators makes the system very flexible, each axis (normal or shear) can be controlled in displacement (strain or velocity) mode as well as load or stress mode.

Axial and shear load readings are controlled under closed-loop feedback. Topcap fixity is assured through a system of crossed roller linear guides to minimise topcap rocking during shearing.

Simple shear sample preparation and insertion into the system is made easy by using the included sample preparation and topcap support apparatus. This ensures that no load is applied to the sample during preparation and insertion.

Technical Specifications for Simple Shear

- Accurate electro-mechanical actuators,
- Available sample sizes (one size supplied with system):
  - Φ50mm,
  - Φ70mm,
  - Other sizes available on request,
- Built in data logging for axial and shear loadcells,
- 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.
- ***ASTM D6528 - 07***
- ***Note: Simple Shear limited to 2.5kN for shear axis.***

Technical Specification for Direct Shear

- Available sample sizes (one size supplied with system):
  - Φ50mm to Φ100mm
  - 50mm to 100mm
- Direct Shear Test Module Controls:
  - Simple rate of displacement (forward and reverse),
  - Continuous reversal cyclic displacement (constant velocity),
- Advanced Shear Test Module Controls:
  - Shear Load,
  - Shear Stress,
  - Displacement,
- Available control modes for each control parameter:
  - Constant, Ramp and Cyclic*,
    *available Cyclic waveforms: triangular and sinusoidal
- Transducer resolution = 16 bit,
- Computer automated control of testing – not just data logging,
- MS Windows Windows® software (GDSLAB) for test control and post test processing.
- ***BS 1377-7, ASTM D3080***
- ***CEN ISO/TS 17892-10:2004/AC:2005***

Simple Shear Test

- The apparatus uses the steps of the stepper motor to report axial and shear displacement. Additional accuracy can be achieved with the addition of an external GDS 16-bit Data logger and separate axial and shear displacement transducers for a more direct reading of the sample movement.
- The system can be upgraded by the addition of bender elements to measure small strain stiffness, please see below for further details.
- System designed to conform to and above the requirements of *ASTM D6528 - 07*.

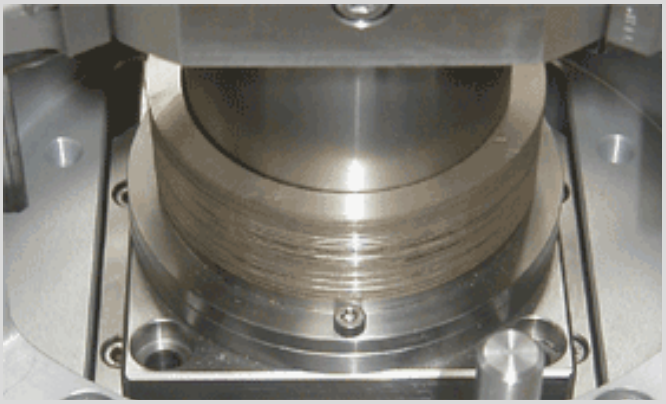
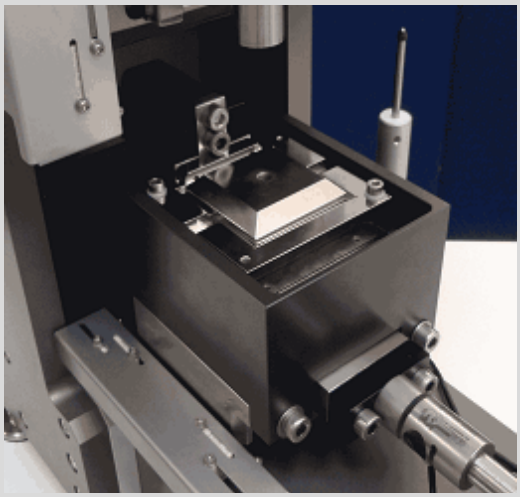


Fig. 1 Sample under test.

Direct Shear Test

- The GDSADS system shown above (with simple shear actuator upgrade) is a fully self contained system with no requirements for compressed air or hanging weights. Normal (axial) and shear forces are applied using GDS electro-mechanical force actuators. The use of GDS Force actuators makes the system very flexible, each axis (normal or shear) can be controlled in displacement (strain or velocity) mode as well as load or stress mode.
- System designed to conform to and above the requirements *BS 1377-7, ASTM D3080 CEN ISO/TS 17892-10:2004/AC:2005,*
- Conventional + Parallel Controlled.



The Electro-Mechanical Advantage

The use of GDS electro-mechanical actuators has the following advantages over pneumatic or weight based systems:

- Energy Efficiency - No inefficient and noisy air compressor is required,
- No manual intervention – no operator is required to be present to add weights during consolidation stages, the stage can move on automatically under software control,
- The loads applied to the sample are measured by calibrated loadcells not assumed from weight hangers.

The Automation Advantage

GDS have consistently demonstrated that the slightly higher cost of automated systems is far outweighed by efficiency savings during the course of the systems life due to the following:

- Less human intervention is needed,
- Under software control tests histories can be repeated more easily and more consistently,
- Less repeated tests due to human error,
- Test can proceed more rapidly, for example where a test stage is due to finish in the middle of the night or at a weekend a manual system would have to wait for intervention where as an automated system can move directly on to the next stage.

Upgrade to Bender Element Testing

The simple shear system can be upgraded to perform P and S wave bender element testing with the addition of the following items (see Fig. 2):

- 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).

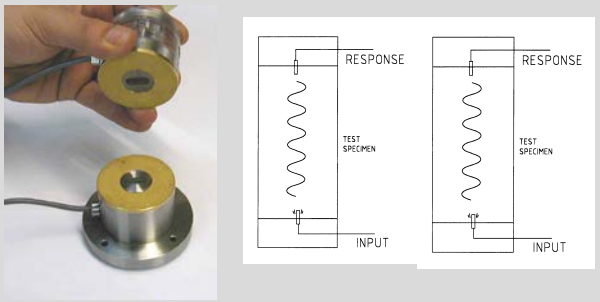


Fig. 2 P and S wave elements
For further information on bender element testing, please refer to the dedicated Bender Element Testing datasheet.

GDSLAB control software

Additional transducers may be easily configured at any time due to the flexible nature of the GDSLAB software. Spare channels may also be configured for use with an adjacent system, therefore enabling computer control and acquisition from multiple systems simultaneously from the same PC. This makes the system "future proof", as the software is expandable to include additional transducers, hardware or complete systems. GDSLAB has the ability to be configured to your hardware choice, no matter how unique the arrangement.

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:

- Direct Shear Box Control,
- Advanced Direct and Simple Shear Module
- Dynamic Simple Shear

Depending on the module, 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, as in Fig. 2.

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