SOIL > PHYSICAL PROPERTIES

DIRECT SIMPLE SHEAR TESTING MACHINE (Electromechanical)

Code : T521



- One of the most frequently performed tests in geotechnical laboratories is the Direct Shear Test, which is used to determine the shear strength parameters of soil, namely cohesion (C) and the internal angle of friction (φ). The test is widely preferred due to its simple setup, ease of operation, and quick testing procedure. In this test, the soil specimen is forced to shear along a predefined horizontal plane, which may not necessarily coincide with the weakest plane of the soil. As a result, the test may sometimes overestimate the actual shear strength of the material.
- The Direct Simple Shear (DSS) Test was developed to address this limitation. Unlike the direct shear test, the DSS test allows the specimen to deform uniformly, enabling it to fail naturally at its weakest point rather than along a forced plane. This makes the measured shear strength more representative of the true in-situ behavior of the soil under shear loading.
- This fundamental difference between constant load (drained) and constant volume (undrained) testing has a significant impact on the stress–strain response and measured shear strength parameters. Drained

tests generally show lower pore pressure buildup and higher effective stress control, while undrained tests reflect pore pressure generation and strength loss mechanisms more realistically for saturated soils under rapid loading.

A key difference between the two methods is the way vertical stress and volume change are controlled during shearing:

- Direct Shear Test (Drained Condition – Constant Load Mode):
  - In this method, the vertical stress is kept constant throughout the shearing stage, allowing the specimen to freely change its height and volume as the shear displacement increases. This setup is typically used to simulate drained conditions, where pore water is allowed to dissipate during loading. It is well-suited for coarse-grained soils like sands and gravels where drainage occurs rapidly.
- Direct Simple Shear Test (Undrained Condition – Constant Volume Mode):
  - In the DSS test, the volume of the specimen is kept constant, which means any tendency of the sample to expand or contract during shearing is compensated by a change in vertical stress. This simulates undrained conditions, as commonly encountered in saturated clays and silts under rapid loading. The vertical position remains fixed, and the applied vertical stress is allowed to vary in response to shear deformation, closely replicating field conditions such as those experienced during earthquakes or rapid construction loading.

STANDARDS

ASTM D6528 • ASTM D2435 • ASTM D4186 • ASTM D4546 • BS 1377-5 • BS 1377-6 • EN ISO 17892-5

TECHNICAL SPECIFICATIONS

trol: Displacement- or strain-controlled shearing

- Drained Mode: Constant vertical load, allowing volume change
- Undrained Mode: Constant volume with passive or active vertical stress control
- Consolidation Mode: Fully automatic oedometer/consolidation testing under vertical load control

- Vertical Travel: 100 mm (3.94 in)
- Horizontal Travel: 100 mm (±1.97 in) (50 mm in both directions)
- Specimen Size: from Ø 38 to 100 mm (Supplied with Ø 63.5 mm mould)
- Different Capacities and specimen sizes are available upon request
- Optional ALFA Cloud integration for secure, real-time data upload, centralized storage, and web access to results.
- Power Supply: 220 - 240 V / 50 - 60 Hz

EQUIPPED WITH

- Shear: Servo-motor with closed-loop controller
- Normal Vertical Load: Servo-actuator with constant-height (CU) feedback loop
- Standard DSS ring set for Ø 63.50 mm x 20 mm specimens
- Loadcells for Shear and Normal Stress measurements
- Displacement Sensors for Vertical and Horizontal deformation measurements
- Drainage/vent lines, saturation accessories, and water trap
- Touch Screen Controlling and data acquisition Unit.

SUPPLIED WITH

- Sample preparation mold (Ø 63.50 mm)
- Membrane
- Porous Stones (x2)
- Teflon-coated confinement rings, 1 mm thickness with standard inner diameter: 63.50 mm (2.5 in) (Different diameters are available upon request)
- PC Software with CD/CU monotonic DSS templates

Optional Accessories (To be purchased separately):

- Laser sample height measurement system

- Vacuum motor
- Vacuum pressure control knob

ORDERING INFORMATION

To be added soon ...