

Technical Datasheet

# Dynamic Simple Shear Testing System

## APPLICABLE STANDARDS

### AMERICAN

ASTM D3080-04 | ASTM D6528-07

ASTM D3080-11 | ASTM D6528-17

### BRITISH / EUROPEAN

BS1377-7 (1990)

EN ISO 17892-10 (2018)

### AUSTRALIAN

AS1289.6.6.2 (1998)



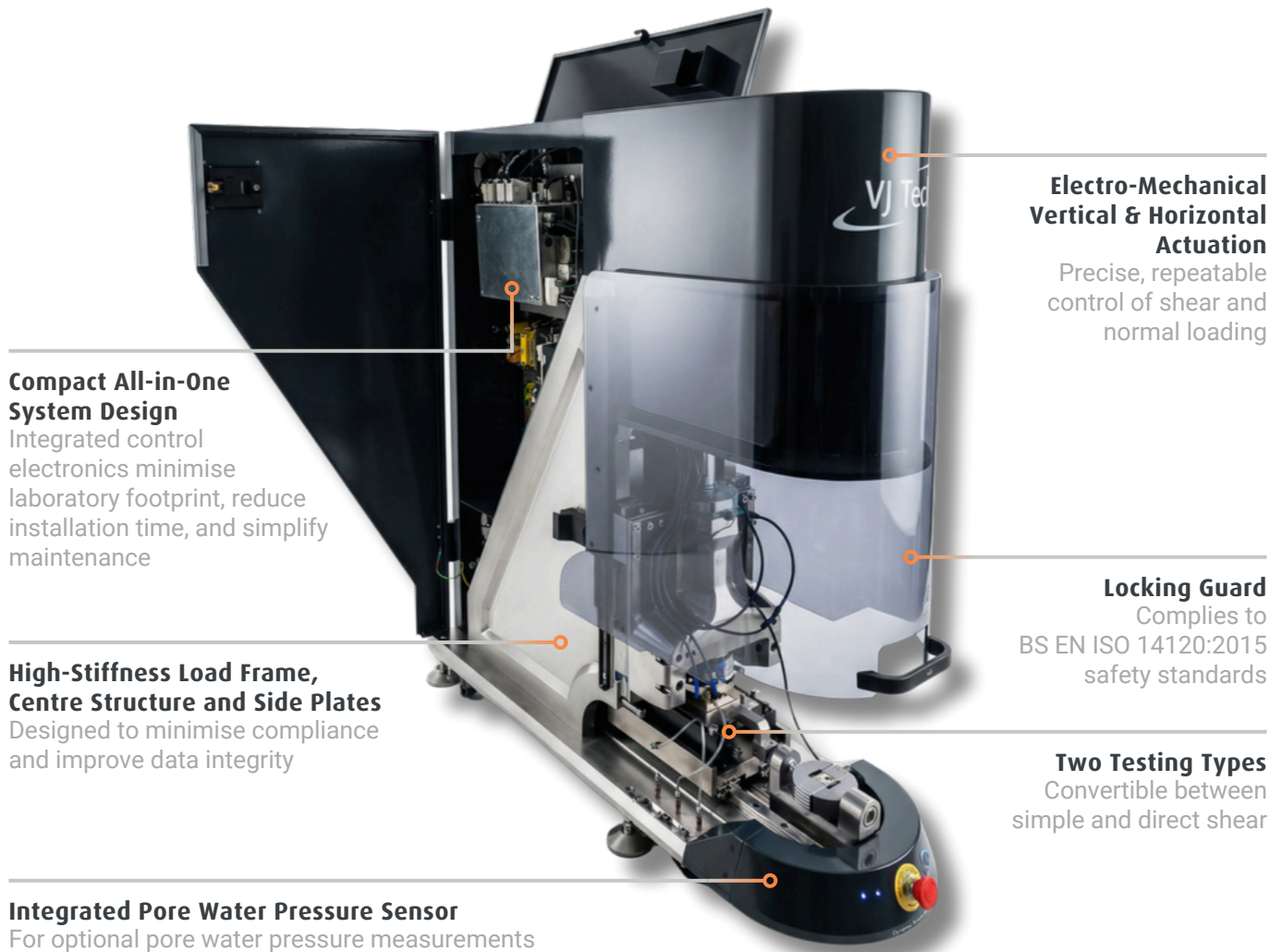
## Fully-Automated Dynamic Simple Shear System for high-precision soil testing

The VJ Tech Dynamic Simple Shear (DSS) System is engineered to deliver reliable, repeatable, and standards-compliant simple shear testing for both academic research and commercial laboratories.

Designed with both precise electro-mechanical control and integrated test automation, the DSS provides high-quality static and cyclic simple shear testing, delivering loading accuracy and data integrity confidence.

Interchangeable assemblies allow seamless transition between **simple shear** and **direct or residual shear** testing, providing a flexible platform for a wide range of geotechnical applications.

# System Features



**Compact All-in-One System Design**  
Integrated control electronics minimise laboratory footprint, reduce installation time, and simplify maintenance

**High-Stiffness Load Frame, Centre Structure and Side Plates**  
Designed to minimise compliance and improve data integrity

**Integrated Pore Water Pressure Sensor**  
For optional pore water pressure measurements

**Electro-Mechanical Vertical & Horizontal Actuation**  
Precise, repeatable control of shear and normal loading

**Locking Guard**  
Complies to BS EN ISO 14120:2015 safety standards

**Two Testing Types**  
Convertible between simple and direct shear

## > Features and Benefits



**High-Stiffness Linear Guidance**  
A reinforced load path and extended linear bearing guidance minimises structural deflection and rotational effects during shearing, improving stability and repeatability in both static and cyclic testing.



**High-Resolution Measurement**  
A multi-axis load cell positioned directly above the specimen top cap measures axial load and shear force at the point of load transfer ( $\pm 10$  kN capacity). High-resolution displacement sensors ( $0.1 \mu\text{m}$ ), with high-speed data acquisition and optional frame & crosstalk correction, ensure accurate capture of specimen response in static and cyclic testing.



**Active Height and Load Control**  
Supports both controlled normal stress and controlled specimen height testing modes, allowing conventional and cyclic simple shear testing in accordance with international standards. Optional local strain measurement enables enhanced feedback control and high-resolution strain monitoring.



**Integrated Electro-Mechanical Control**  
Precision electro-mechanical actuators independently control vertical and horizontal loading axes, enabling stable application of static and cyclic loads without the complexity of hydraulics.

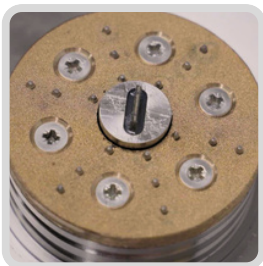
# Specifications and Optional Upgrades

## > Technical Specification

<b>Maximum Load and Frequency Range</b>	<b>Load:</b> ±10kN; <b>Frequency:</b> 0.0001Hz to 5Hz
<b>Travel Range</b>	<b>Vertical Axis:</b> ±50mm; <b>Horizontal Axis:</b> ±25mm
<b>Minimum Achievable Shear Strain</b>	0.005%
<b>Simple Shear Sample Sizes (mm)</b>	50, 63.5, 66, 70, 100, 150
<b>Direct Shear Sample Sizes (mm)</b>	60, 63.5, 70, 100 (Square and circular options available)
<b>Load Cells</b>	A multi-axis load cell positioned above the specimen for direct axial and shear measurement. In addition, there are independent load cells in each axis.
<b>Sensor Resolution</b>	<b>Displacement:</b> 0.1µm. <b>Load:</b> 0.1N
<b>Electrical Requirements</b>	<13A
<b>Dimensions &amp; Weight</b>	1200mm (H) x 1270mm (L) x 410mm (W); 430kg
<b>Health &amp; Safety</b>	Interlocked guard with force & speed limited mode when guard unlocked for safe sample preparation Emergency Stop Switch on front fascia for quick access Compliant with Machinery Directive 2006/42/EC Lifting point centrally mounted at the top of the system

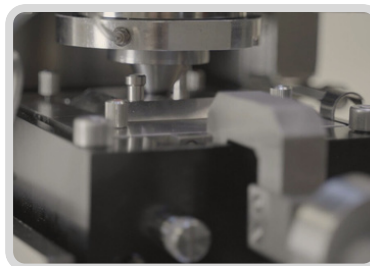
## > Accessories & Optional Upgrades

### Bender Element Testing



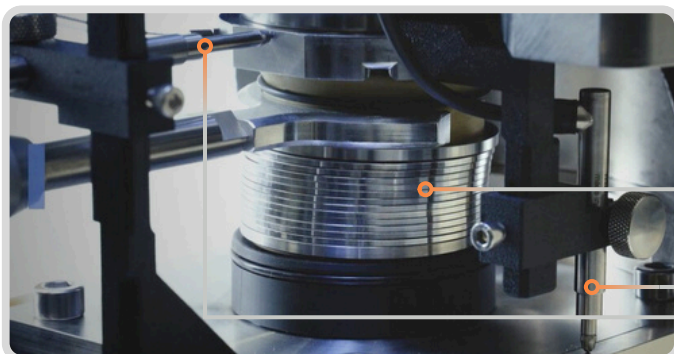
Top cap and base pedestal pair with encapsulated piezoelectric bender elements, along with a Bender Scope all-in-one signal generator and receiver. For performing shear wave velocity measurements and small strain shear modulus testing, with both S and P waves.

### Direct Shear Testing



Replace your simple shear base pedestal with a direct shear water bath and shearbox, and connect the horizontal S-beam load cell to easily transition from simple shear testing to direct shear.

### Local Strain Measurement



Optional local strain sensors provide high-resolution displacement measurement directly at the specimen, enabling enhanced control, precision, and research-grade strain analysis.

#### **Low-Friction Retaining Rings**

*Provide consistent lateral confinement while minimising frictional resistance*

#### **Local Strain LVDTs**

*Positioned in close proximity to the specimen*

# Dynamic Simple Shear

## System Architecture & Design Philosophy

The **VJ Tech Dynamic Simple Shear system** is engineered around a **'stiffness-first' design philosophy**, recognising that structural compliance and friction directly affect test accuracy.

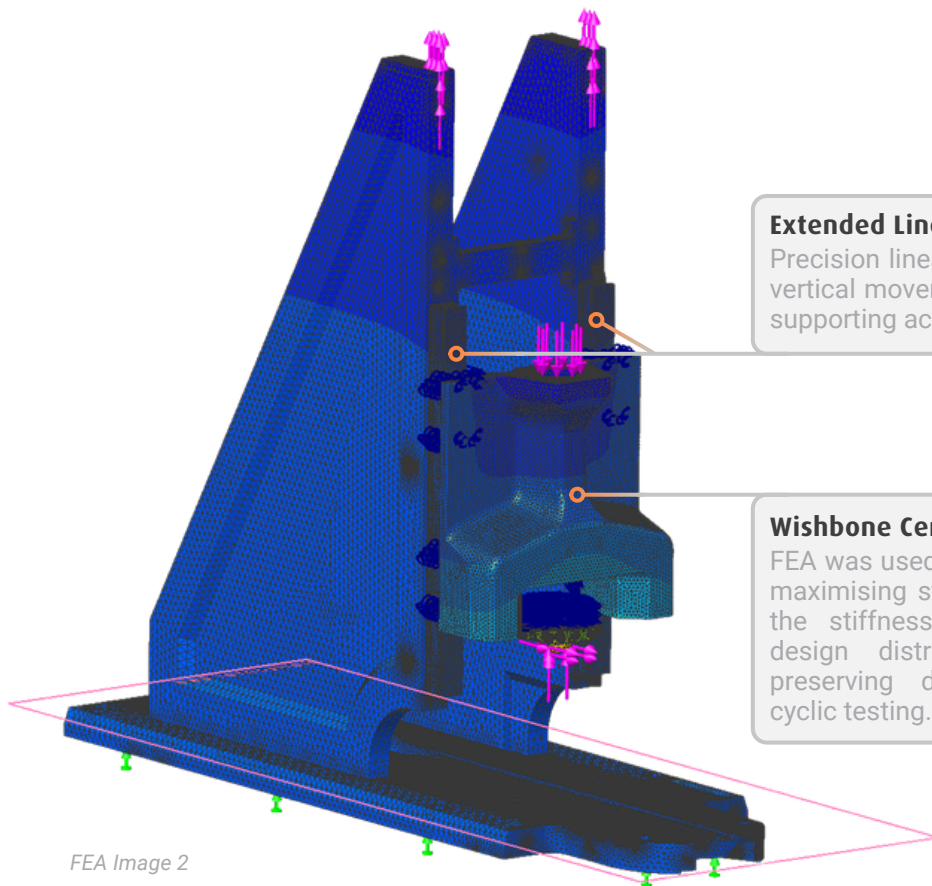
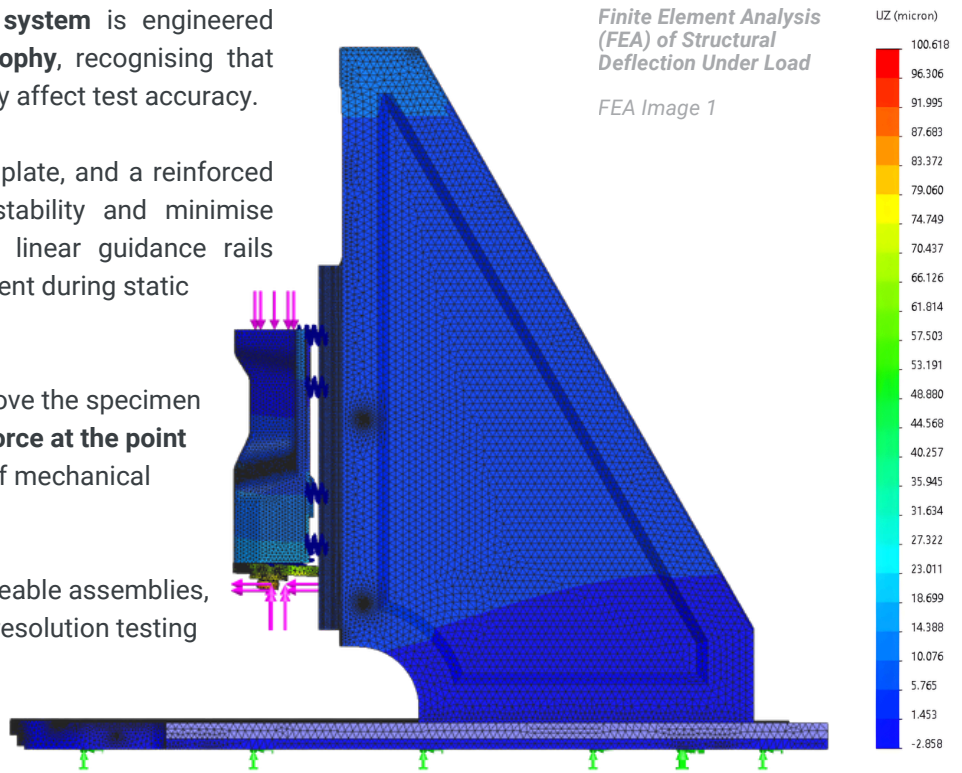
Stainless steel side plates, a rigid base plate, and a reinforced central load path provide structural stability and minimise deflection under load, while extended linear guidance rails provide stable, low-friction shear movement during static and cyclic testing.

A **multi-axis load cell** located directly above the specimen top cap measures axial load and **shear force at the point of load transfer**, reducing the influence of mechanical friction on recorded results.

**Optional local strain sensors**, interchangeable assemblies, and calibration kits further support high-resolution testing and long-term performance verification.

*Finite Element Analysis (FEA) of Structural Deflection Under Load*

*FEA Image 1*



*FEA Image 2*

**Extended Linear Guidance Rails**  
Precision linear rails provide stable, low-friction vertical movement and reduce rotational effect; supporting accurate simple shear testing.

**Wishbone Central Structure**  
FEA was used to refine the wishbone load path, maximising structural stiffness and optimising the stiffness-to-weight ratio. This balanced design distributes loads efficiently while preserving dynamic responsiveness during cyclic testing.

# Clisp Studio - csDYNSS

## Cyclic Simple Shear Testing Module

The VJ Tech DSS system is powered by Clisp Studio, an integrated control and data management platform designed for advanced geotechnical testing. The software provides structured test configuration, real-time monitoring, dynamic waveform control, and automated reporting within a single intuitive environment.



### > Key Features and Benefits

#### Structured Test Configuration

Clisp Studio provides a guided, stage-based configuration workflow covering consolidation, shear, and dynamic loading. Each stage allows precise definition of loading mode, stress or displacement control, ramp or maintain conditions, and trigger or stop criteria.

Instrument channels, calibration parameters, logging rates, and control limits are configured within a single structured environment, ensuring repeatable setup and reducing operator variability across tests.

#### Advanced Automation and Simultaneous Testing

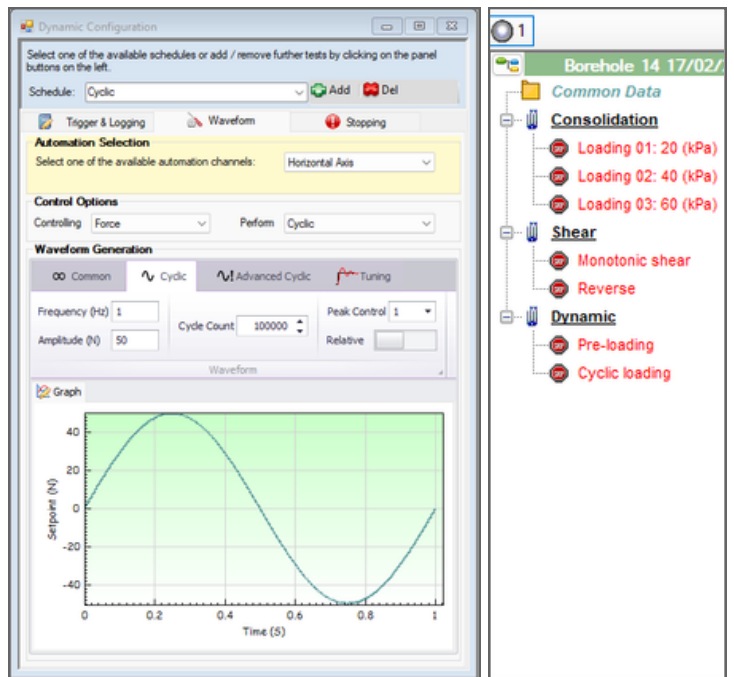
Saves time and increases productivity with selectable stage automation, enabling simultaneous specimen saturations and tests running to completion without manual intervention.

#### High-Resolution Dynamic Logging

Configurable data acquisition supports up to 200 points per cycle, ensuring accurate capture of cyclic stress-strain behaviour while maintaining efficient data management.

#### Advanced Dynamic Waveform Control

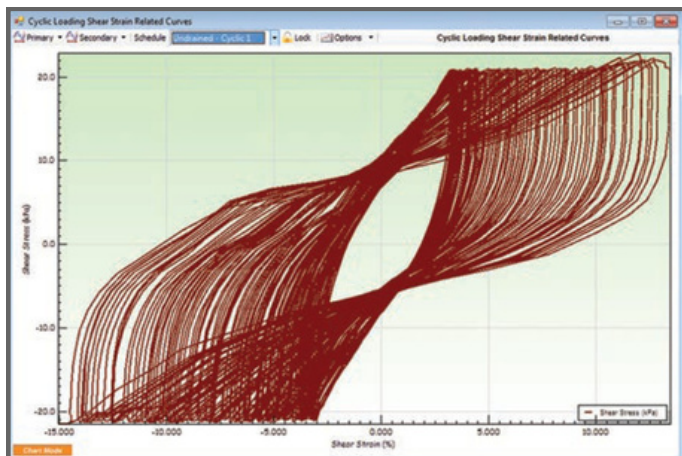
Supports sinusoidal, triangular, haversine, square, and saw-tooth waveforms with configurable amplitude, frequency (0.0001–5 Hz), and cycle count. Custom waveforms can be created or imported, enabling full research flexibility.



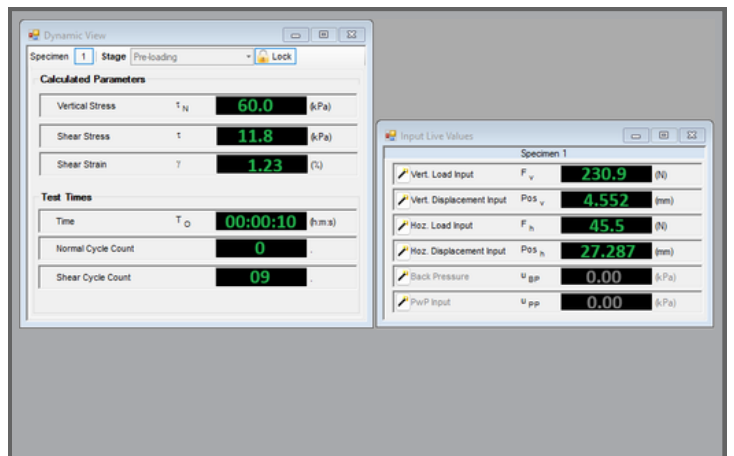
Cyclic Test Configuration Screen (Left) and Test Sequence Scheduler (Right)

#### Real-Time Monitoring

Live graphical and tabular views provide continuous insight into consolidation behaviour, hysteresis response, and cyclic performance throughout testing.



Cyclic Loading Shear Strain Related Curves Graph



Real-time Monitoring - Live Views