

# Dynamic Triaxial Testing Systems

## Related Standards: ASTM D5311-13

VJ Tech Dynamic Triaxial Systems are capable of providing fully automatic dynamic Triaxial testing in Single or Multi Axis configurations. The systems can incorporate any of the following:

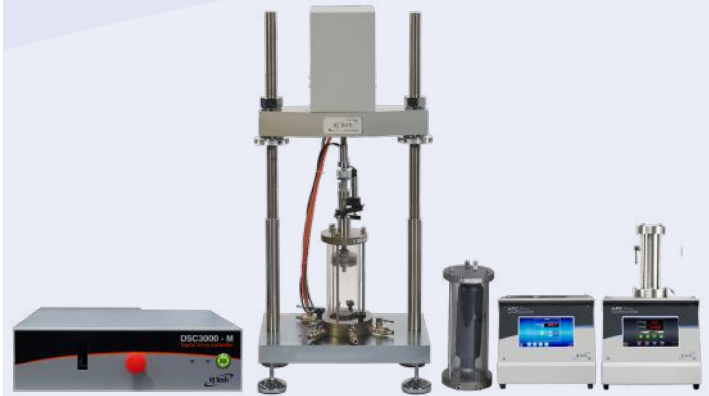
- Loading frame with mechanical or hydraulic actuator(s)
- Hydraulic Power Pack (for hydraulic actuator)
- Dynamic Servo Controller (one per axis)
- Bottom Loading Dynamic Frame with DPC (see below)
- Dynamic Pressure Controller (for Dynamic Cell Pressure)
- Pneumatic Automatic Pressure Controller for cell pressure control and feedback (requires air/water bladder)
- Hydraulic Automatic Pressure Controller for back pressure control and feedback
- Dynamic Triaxial Cells (can be fitted with a Balance Ram so that a Hydraulic APC can be used for Cell Pressure)
- Transducers for Dynamic Systems
- User friendly Clisp Studio software providing the necessary test configuration, control and data acquisition.

For lower dynamic loads and frequencies, the loading frame can either be our Triscan 50 or a BASIC frame fitted with a beam mounted 5 kN actuator with a frequency of up to 5 Hz. The BASIC Frame can optionally be fitted with a sliding Base, for easier access to the Cell. Alternatively, we now manufacture a bottom loading Dynamic Unit with integrated hoist mechanism for easy sample access

For higher dynamic loads and frequencies, the loading frame can either be a BASIC or TriSCAN 100 frame fitted with a 10 or 20 kN beam mounted electro-mechanical actuator for frequencies up to 10 Hz, or our Triscan 250 fitted with a hydraulic actuator for Dynamic Loads up to 50 kN and frequency up to 20 Hz. Please note that 3-phase power will be required for these higher specification frames.

## Specifications (System dependent)

Frequency Range	0.0001 up to 20.0000 Hz
Maximum Dynamic Load	Up to +/- 50 kN
Maximum Static Load	Up to 250 kN (TriSCAN Frames only)
Actuator(s)	Electro-Mechanical or Hydraulic
Dynamic Displacement	-35.000 to 35.000 mm possible
Load Frame Capacities	50 kN, 100 kN or 250 kN (TriSCAN only)
Input Channels	Up to 8 per axis
Resolution	24 Bit
PC Interface	Ethernet or USB
Waveforms	Sinusoidal, Square, Triangular, Haversine, Saw Tooth, Inverted Saw Tooth, Rectangle, User Defined
Data Logging Rate	200 Points/Cycle or 500 Points/Sec
Sample Size	38 - 150 mm (depends on cell size)
Maximum Pressure	2 MPa
Power Supply	Single or three phase (dependent on system specification)



*Dynamic Triaxial system with Basic Frame and electro- mechanical actuator up to 5Hz/10kN*



*Dynamic Triaxial system with Static Frame and electro- mechanical actuator up to 5Hz/10kN*



*Dynamic Triaxial (Hydraulic) System (1 Hz 50 kN) (3 APCs) (2)*

### Pro Instrument Features

- Integrated 7" Touchscreen for Standalone use
- On-board data logging with large data storage (up to 14 million records) using SD card (8GB standard)
- Data export to PC for manipulation within Excel
- High Speed sensor conversion (24 bit, up to 4000 samples/cycle or 500/sec)
- Auto reverse from limit switch activation
- Built-in auto protection for sensor limits

### Dynamic Servo Controller Features

- Up to 8 analogue input channels, Load Channel included, additional Channels as required
- Closed loop control
- Built-in signal conditioning
- Adaptive PID (Peak and Trough Control)
- Lower and upper limit switch motion control

### Frame Ordering Information

<b>VJT5000-P-EM</b>	TriSCAN Pro 50kN Load Frame with Electro-mechanical actuator up to 5Hz/10kN
<b>VJT5010-EM-B</b>	BASIC Load Frame with Electro- mechanical actuator up to 5Hz/10kN
<b>SUB17-706</b>	50kN BASIC Load Frame Dynamic Cell Slider Base (option to enable easy Cell access)
<b>VJT5110-P-EM</b>	TriSCAN Pro 100kN Load Frame with Electro-mechanical actuator up to 10Hz / 10kN
<b>VJT5100-EM-B</b>	BASIC Load Frame with Electro- mechanical actuator up to 10Hz / 10kN
<b>VJT5100-EM-B3</b>	BASIC Load Frame with Electro- mechanical actuator up to 10Hz / 20kN
<b>VJT5125-P-EM</b>	TriSCAN Pro 250kN Load Frame with Electro-Mechanical actuator up to 10Hz / 10kN
<b>VJT5025-20HM</b>	TriSCAN 250kN Load Frame with Hydraulic actuator up to 20Hz / 50kN
<b>VJT-DTX-30</b>	Bottom Loading Dynamic Triaxial (30kN)
<b>VJT-HYD1</b>	Hydraulic Power Pack (3-Phase)

### Dynamic Servo Controller Ordering Information

<b>VJT-DSC3000M or VJT-DSC3003M</b>	Dynamic Servo Controller Mechanical (Single Axis) (1ph or 3ph)
<b>VJT-DSC3000H</b>	Dynamic Servo Controller Hydraulic (Single Axis) (1ph )
<b>VJT-DSC3000MM</b>	Dynamic Servo Controller Mechanical (Dual Axis) with Rack Cabinet
<b>VJT-DSC3000HM</b>	Dynamic Servo Controller Hydraulic-Mechanical (Dual Axis) with Rack Cabinet
<b>MIS0166D*</b>	Single Channel Signal Conditioning Card
<b>VJT-PSU0015</b>	Isolation Transformer 230VAC with Cables
<b>VJT-PSU0015-110</b>	Isolation Transformer 110VAC with Cables



Bottom Loading Dynamic Triaxial (30kN) with optional Dynamic Cell Pressure Controller for Dynamic Cell Pressure

### Pressure Controller Ordering Information

<b>VJT2266-P</b>	Pro Hydraulic APC (1000 kPa)
<b>VJT2250-P</b>	Pro Pneumatic APC (1000 kPa)
<b>VJT2267D-P</b>	Pro Dual Hydraulic APC (3500 kPa)
<b>VJT-DYN-CP2</b>	Dynamic Cell Pressure Controller (2000 kPa)
<b>VJT0500</b>	Air/Water Cylinder

### Triaxial Cell Ordering Information

<b>VJT0549-DYN</b>	Dynamic Triaxial Cell (50 mm)
<b>VJT0475-DYN</b>	Dynamic Triaxial Cell (75 mm)
<b>VJT0400-DYN</b>	Dynamic Triaxial Cell (100 mm)
<b>VJT0400-AR</b>	8-Port Access Ring
<b>VJT0450-DYN</b>	Dynamic Triaxial Cell (150 mm) (with 12-Port Access Ring included)
<b>VJT0450-DYN-BR</b>	Dynamic Triaxial Cell (150 mm) with Balance Ram (12-Port Access Ring included)

### Transducer Ordering Information

<b>VJT0351B-DYN</b>	Dynamic Internal Submersible Load Cell (5 kN)
<b>VJT0352B-DYN</b>	Dynamic Internal Submersible Load Cell (10 kN)
<b>VJT0353B-DYN</b>	Dynamic Internal Submersible Load Cell (25 kN)
<b>VJT0359B-DYN</b>	Dynamic Internal Submersible Load Cell (50 kN)
<b>VJT0271-DYN</b>	Dynamic Displacement Transducer (25 mm)
<b>VJT0272-DYN</b>	Dynamic Displacement Transducer (50 mm)
<b>VJT0250-DYN</b>	Dynamic Pressure Transducer (10 bar)
<b>VJT0260-DYN</b>	Dynamic Pressure Transducer (20 bar)

If On-Sample Dynamic Testing is required, please refer to our On-Sample Transducers datasheet for details

# Clisp Studio – csDYNA Software

The csDYNA Clisp Studio module is user friendly software designed specifically for dynamic Triaxial testing, providing test functionality and automation, easily viewed results data which can be exported to Excel, and test script import and export.

## Related Standards: ASTM D5311-11

## Ordering Information

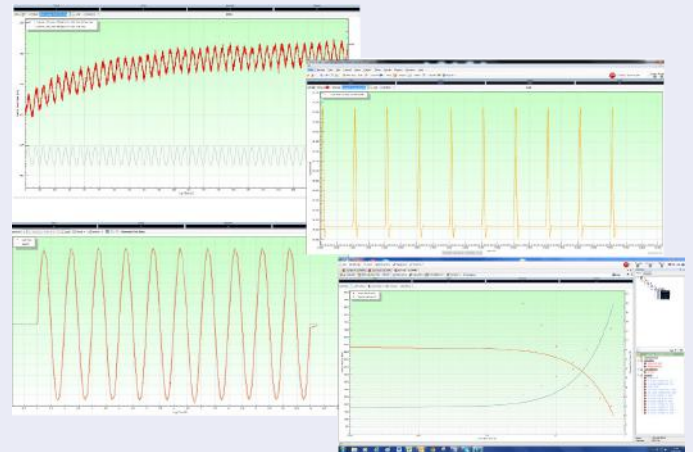
**VJT-csDYN** Clisp Studio Dynamic (Cyclic) Triaxial Testing Software

## Features

- Easy Test configuration using the built-in wizard
- Transducer configuration and calibration
- Live view of sensor readings and calculated parameters
- Live Graphs & Tabulated Data
- Live Test status
- Data export to Excel
- Entire Test Export and Import using Scripts
- On screen measurement of T100, cohesion and angle of friction
- Data storage in SQL data base
- User configurable Views, Tables and graphs
- Configurable test automation
- Email test status
- Optional customised reports available on request
- Saturation (both Step & Ramp Methods)
- Consolidation (Isotropic, An-Isotropic & K0)
- Stress Path
- Shear
- Dynamic Loading

Specimen	Log Time (s)	Cycle Count	Cycle Count (1/2)	Load Input (kPa)	Cycle Count (1/2)	Strain Input (mm)	Cell Pressure (kPa)	Back Pressure (kPa)	Current Load (kPa)	Sample Flow (cm <sup>3</sup> /s)	Pore Pressure (kPa)	Deviator Stress (kPa)
1	0.726	-1	0	67	0	23.735	526	449	0	0.001	445	0.001
2	0.730	-1	0	67	0	23.735	526	449	0	0.000	445	0.000
3	0.740	-1	0	67	0	23.734	526	449	0	0.001	445	0.001
4	0.750	-1	0	67	0	23.736	526	449	0	0.001	445	0.001
5	0.760	-1	0	67	0	23.735	526	449	0	0.000	445	0.000
6	0.770	-1	0	67	0	23.735	526	449	0	0.000	445	0.000
7	0.780	-1	0	67	0	23.735	526	449	0	0.000	445	0.000
8	0.790	-1	0	67	0	23.735	526	449	0	0.000	446	0.000
9	0.800	-1	0	67	0	23.735	526	449	0	0.000	446	0.000
10	0.810	-1	0	67	0	23.734	526	449	0	0.001	446	0.001
11	0.820	-1	0	67	0	23.735	526	449	0	0.001	446	0.001
12	0.830	-1	0	67	0	23.736	526	449	0	0.001	445	0.001
13	0.840	-1	0	67	0	23.736	526	449	0	0.001	445	0.001
14	0.850	-1	0	67	0	23.735	526	449	0	0.000	445	0.000
15	0.870	-1	0	67	0	23.734	526	449	0	0.000	445	0.000
16	0.880	-1	0	67	0	23.735	526	449	0	0.000	445	0.000
17	0.890	-1	0	67	0	23.735	526	449	0	0.000	446	0.000
18	0.900	-1	0	67	0	23.736	526	449	0	0.000	446	0.000

Measured Parameters	
Cell Pressure Input	$\sigma_c$ 520 (kPa)
Back Pressure Input	$u_b$ 459 (kPa)
Pore W Press Input	$u_w$ 496 (kPa)
Load Input	$N_{IP}$ 0 (N)
Strain Input	$\epsilon_{IP}$ 42.198 (mm)
Volume Input	$V$ 144.067 (cm <sup>3</sup> )
Mid - PwP Input	$u_{W-MID}$ 0 (kPa)
Radial Sensor input	$\epsilon_{rad}$ 0.000 (mm)
Calculated Parameters	
Deviator Stress	$q$ 12.2 (kPa)
Effective Stress Ratio	$\sigma_1' / \sigma_3$ 1.165 (kPa)
Axial Strain	$\epsilon\%$ 0.011 (%)
Test Times	
Dynamic StageTime	03:42:06 (h:m:s)
Time	$T_o$ 00:00:13 (h:m:s)



Modulus and Damping	
Damping Coefficient	$D$ 6.19 (%)
Young's Modulus	$E$ 10748.2 (kPa)
Strain Results	
Cyclic Shear Strain	$\gamma_{SA}$ 0.00974 (%)
Poisson's Ratio	0.50
Shear Modulus (Low Strain)	$G_{max}$ 7020.2 (kPa)