



FULLY AUTOMATIC TRIAXIAL TESTER (T-5001/A)

ASTM D2850 • D4767 • D7181

- Used to perform large range of Triaxial tests on soil samples to determine the strength parameters and the mechanical properties.
- Capable of performing:
 - Standard Triaxial Tests:
 - UU Test (Unconsolidated Undrained Test)
 - CU Test (Isotropically Consolidated Undrained Test)
 - CD Test (Isotropically Consolidated Drained Test)
 - Wide range of advanced Triaxial tests (ie, K_0 consolidation, custom stress paths, extension tests ... etc)
- Capacity:

▪ Frame	: 200 kN (20 tons)
▪ Load Cell	: 20 kN (2 tons)
▪ Cell	: 2000 kPa
▪ Pressure Transducer	: 25 bar
▪ Water Tank	: > 30 lt
▪ Ram travel	: 50 mm
- Sample Dimensions

▪ Triaxial Tests	: 35 – 70 mm
▪ Flexible Wall Permeability	: 35 – 90 mm
- The load cell is installed inside the cell to eliminate the piston friction calculations from the test and provide very precise measurements, which is directly applied on the sample. The water-proof load cell is made completely of stainless steel.



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- The load is applied by servo-motor, which allows sensitive control on loading speed ranging from 0.00001 – 9.99999 mm/min.
- The cell is made of high-strength plexiglass specially designed for this particular device with thickness of 10 mm.
- Equipped with 2 PVAs (Pressure-Volume Actuator) which controls and measures both pressure change volume change in the cell and the sample. The PVA is completely controlled from computer with the supplied software.
- The pressure is measured using very precise pressure transducer that sends the data to the equipped acquisition system.
- The acquisition system gathers the data from all the sensors (load cell, pressure transducers, electronic position indicators ... etc), analyses it and sends it to the computer via USB.
- The water tank is fitted with a magnetic stirrer to de-air the water before pumping it into the system. Adding this feature significantly reduces the time required to saturate the sample and provide air-free water during the test to the whole system.
- The LCD indicator at the front of the system shows the readings from all the sensors and the position of the PVA pistons with the amount of water left in each one simultaneously.
- The tests are all performed from computer with the help of ALFA's state-of-the-art Triaxial Control software (refer to appendix A for more details).
- The device is supplied with all the required accessories to perform Triaxial Tests, Uniaxial UCS Tests, Permeability Tests, and all the tools for proper sample preparation.

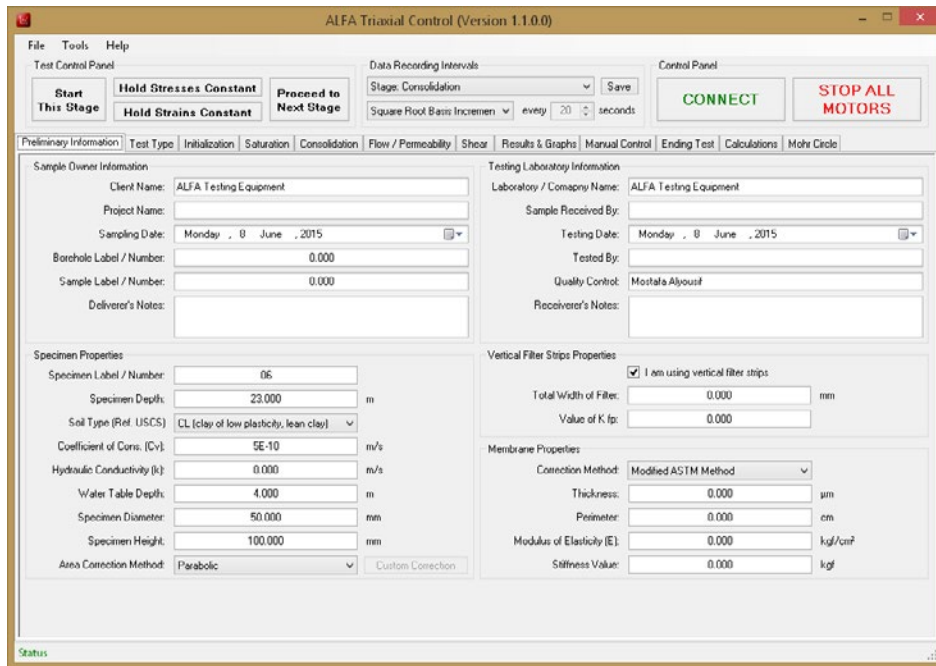
SUPPLIED WITH



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TRIAXIAL SOFTWARE



- The software provides full control on ALFA's Triaxial Tester (T-5001/A). It consists of different tabs with self-explanatory notes and guides taken from the international standards and based on the findings of reliable researchers and universities in the world.
- Each tab guides the user to what should be done in very simple step-by-step progress. The top part of the software is constant that provides quick access to some important control functions on the software and the machine like proceeding to next stage, changing the data recording method for the report, emergency stop for the machine ... etc.

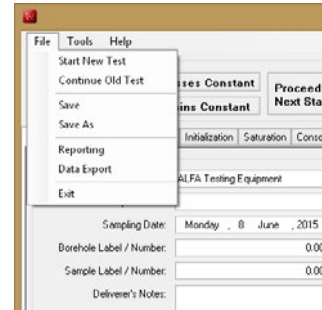
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● TRIAXIAL SOFTWARE

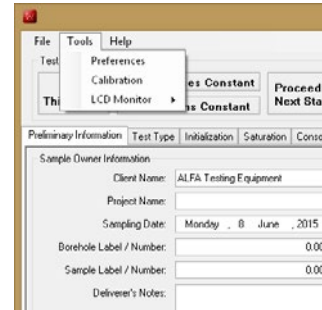
File Menu

- Start New Test
Used to start new test from beginning
- Continue Old Test
Used to continue an old test and merge the data of sets together for comparison
- Save
Saves the current test
- Save As
Saves the current test to different file
- Reporting
Adjust the report settings and what to include in it
- Data Export
Export the data to third-party applications like Excel
- Exit
Closes the software



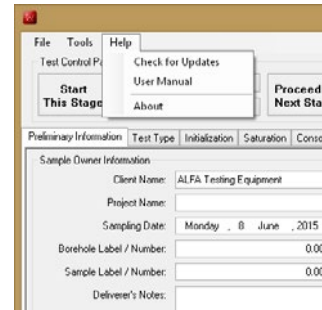
Tools Menu

- Preferences
Adjust test preferences like units, connections ... etc
- Calibration
Perform / check the sensors' calibration
- LCD Monitor
Turn ON and OFF the LCD monitor



Help Menu

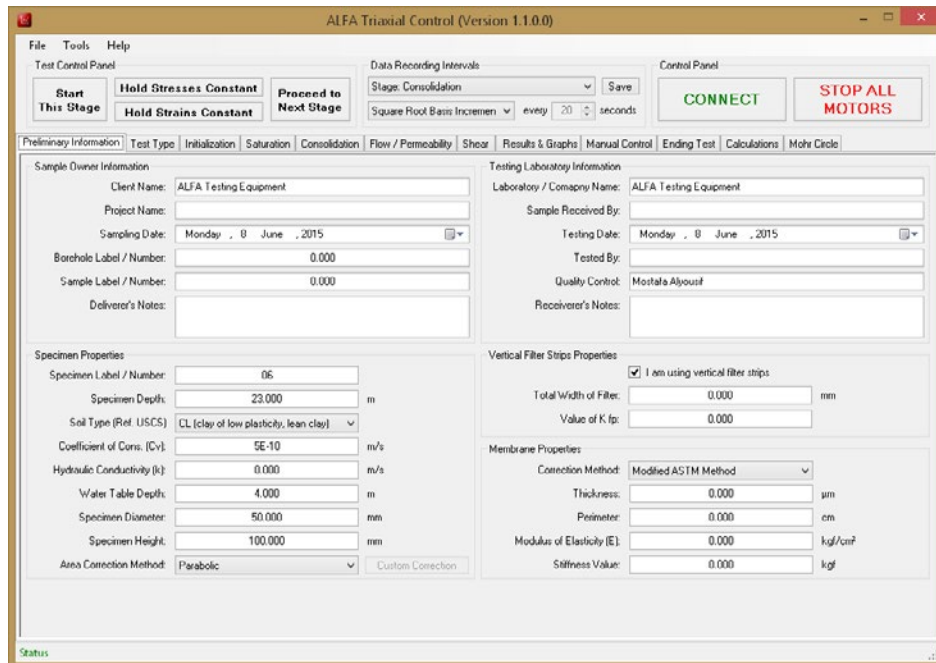
- Check for Updates
Check if there is any update available for the software (requires internet connection)
- User Manual
Views the user manual
- About
Gives information about the software and its version



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TRIAXIAL SOFTWARE : Preliminary Information Tab



The screenshot shows the 'Preliminary Information' tab of the ALFA Triaxial Control software. The interface includes a menu bar (File, Tools, Help), a toolbar with buttons like 'Start This Stage', 'Hold Stresses Constant', and 'Proceed to Next Stage', and a 'Data Recording Intervals' section. The main area is divided into several sections for data entry:

- Sample Owner Information:** Client Name (ALFA Testing Equipment), Project Name, Sampling Date (Monday, 8 June, 2015), Borehole Label / Number (0.000), Sample Label / Number (0.000), and Deliverer's Notes.
- Testing Laboratory Information:** Laboratory / Company Name (ALFA Testing Equipment), Sample Received By, Testing Date (Monday, 8 June, 2015), Tested By, Quality Control (Mostafa Alyousfi), and Receiver's Notes.
- Specimen Properties:** Specimen Label / Number (06), Specimen Depth (23.000 m), Soil Type (CL (clay of low plasticity, lean clay)), Coefficient of Cons. (Cv) (5E-10 m/s), Hydraulic Conductivity (k) (0.000 m/s), Water Table Depth (4.000 m), Specimen Diameter (50.000 mm), Specimen Height (100.000 mm), and Area Correction Method (Parabolic).
- Vertical Filter Strips Properties:** A checkbox 'I am using vertical filter strips' is checked. Fields include Total Width of Filter (0.000 mm) and Value of K_{fs} (0.000).
- Membrane Properties:** Correction Method (Modified ASTM Method), Thickness (0.000 μm), Perimeter (0.000 cm), Modulus of Elasticity (E) (0.000 kgf/cm²), and Stiffness Value (0.000 kgf).

The bottom status bar shows 'Status'.

Sample Owner Information:

- To be filled with the sample owner's information. These information are used in the final report.

Testing Laboratory Information:

- To be filled with the testing laboratory or institute's information. These information are used in the final report.

Specimen Properties:

- Specimen number, depth, coefficient of consolidation, water table, soil type, diameter, height, area correction method ... etc are all selected and specified from this section. These information are crucial and to be used in further calculations and to decide the behavior of the equipment based on the sample properties.

Vertical Strips:

- Specifying whether the vertical strips are used or not, with its properties.

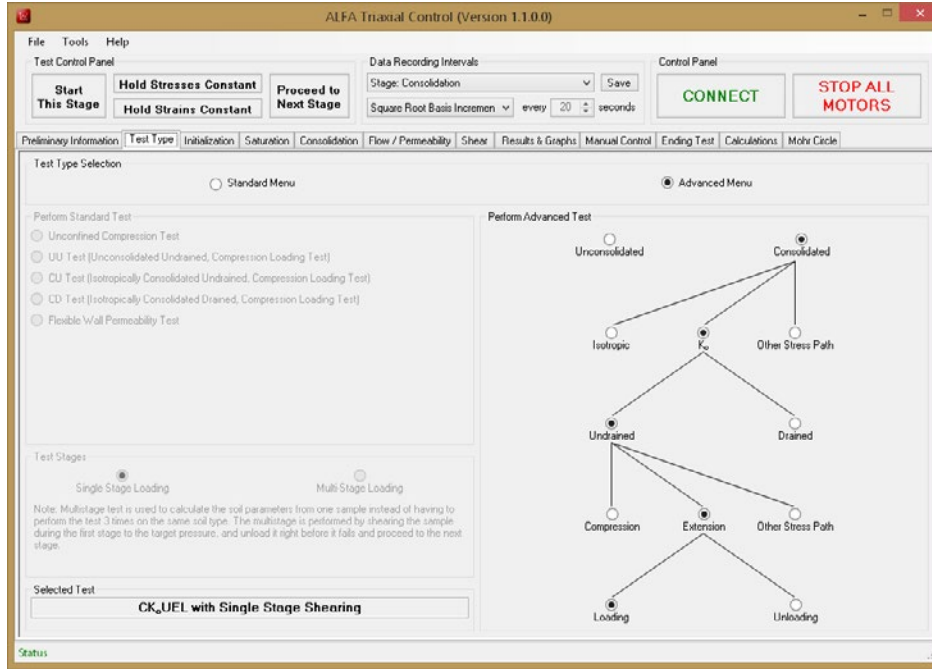
Membrane Properties:

- Specify the correction method for the membrane and specify its properties.

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TRIAXIAL SOFTWARE : Test Type Tab



Test Type Selection:

- Select whether to have simplified menu (for standard tests) or advanced menu (for custom tests).

Perform Standard Test:

- Choose the test type from simplified selections.

Perform Advanced Test:

- Choose the test from stage-by-stage selection. This option gives the ability to perform any custom test on the sample from very wide range of functions based on international standards and findings of reliable researchers and institutes.

Test Stages:

- Select between single-stage or multi-stage tests. This option gives the ability to obtain 3 mohr circles and determine the strength parameters from a single Triaxial soil sample.

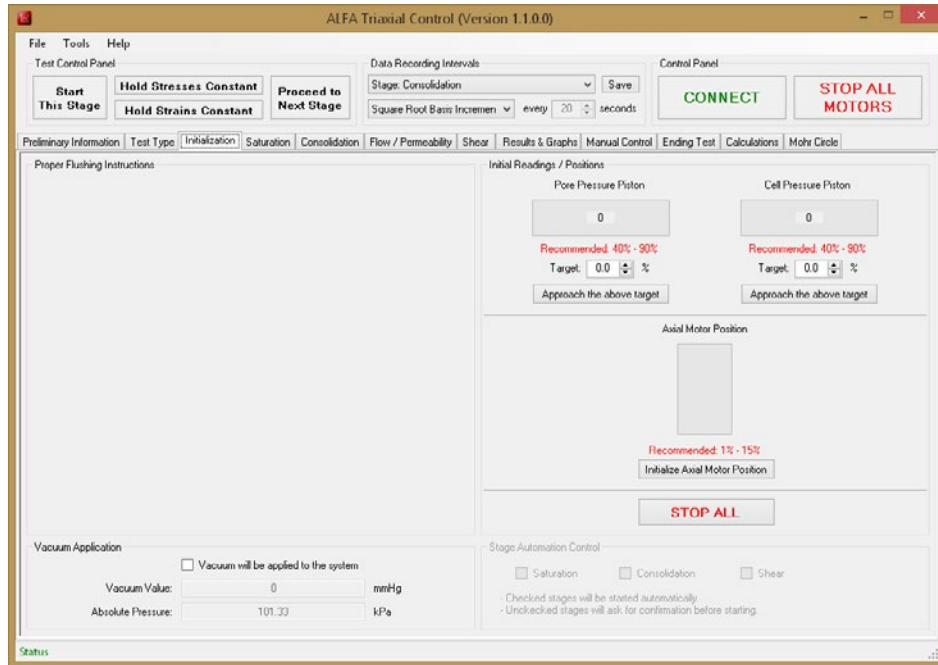
Selected Test:

- Displays the chosen test type.

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● TRIAXIAL SOFTWARE : Initialization Tab



Proper Flushing Instructions:

- Some instructions to perform proper flushing for the setup to avoid having air bubbles left over.

Initial Readings / Positions:

- Shows and controls the initial positions of each piston/motor to avoid over-travelling or running out of water during the test.

Vacuum Application:

- Gives the ability to include the vacuum calculations to the software if applied (used for sand samples).

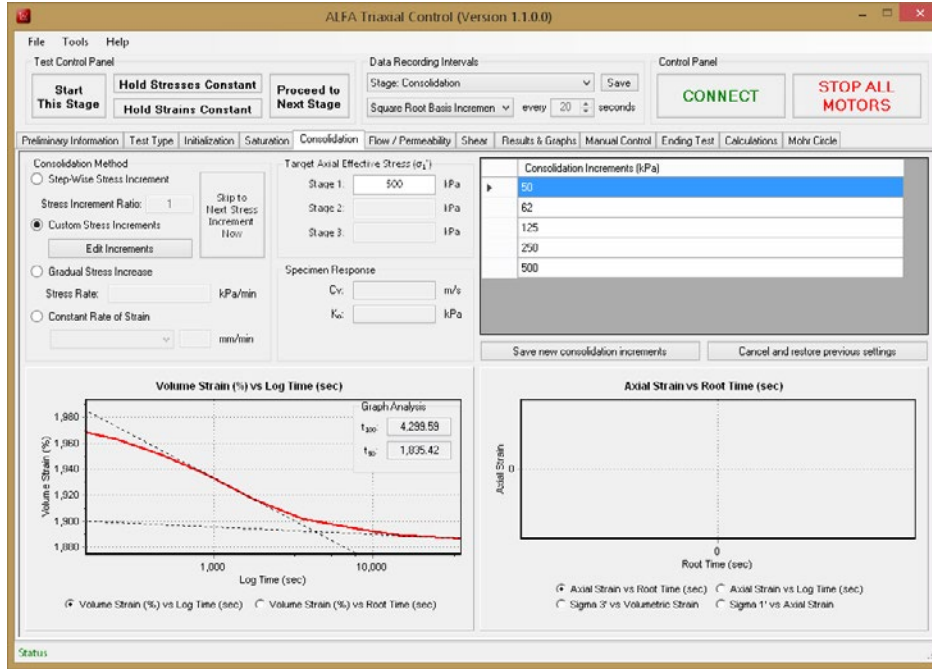
Stage Automation Control:

- Gives the option to select which stage to start automatically.

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TRIAXIAL SOFTWARE : Consolidation Tab



Consolidation Method:

- Gives the ability to select which method to follow in order to consolidate the sample.

Target Pressures:

- Gives the option to target 3 consolidation pressures in multi-stage mode to obtain the strength parameters from single sample.

Specimen Response:

- Shows the consolidation value and the K₀ value.

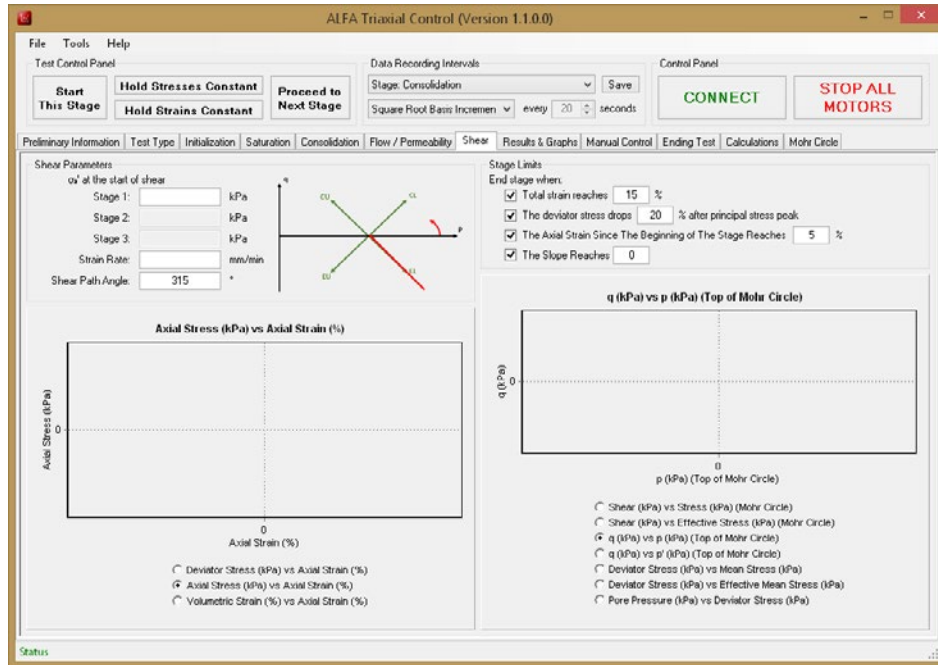
Graphs:

- Axial Strain vs σ_1
- σ_3 vs σ_1
- Volumetric strain vs time (for t₅₀ and t₁₀₀ calculations)

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TRIAXIAL SOFTWARE : Shear Tab



Shear Parameters:

- Displays the target pressure for each stage and gives the ability to draw any custom path for the sample. The strain rate is also specified in this section.

Stage Limits:

- Gives the option to end the test with any desired limitations..

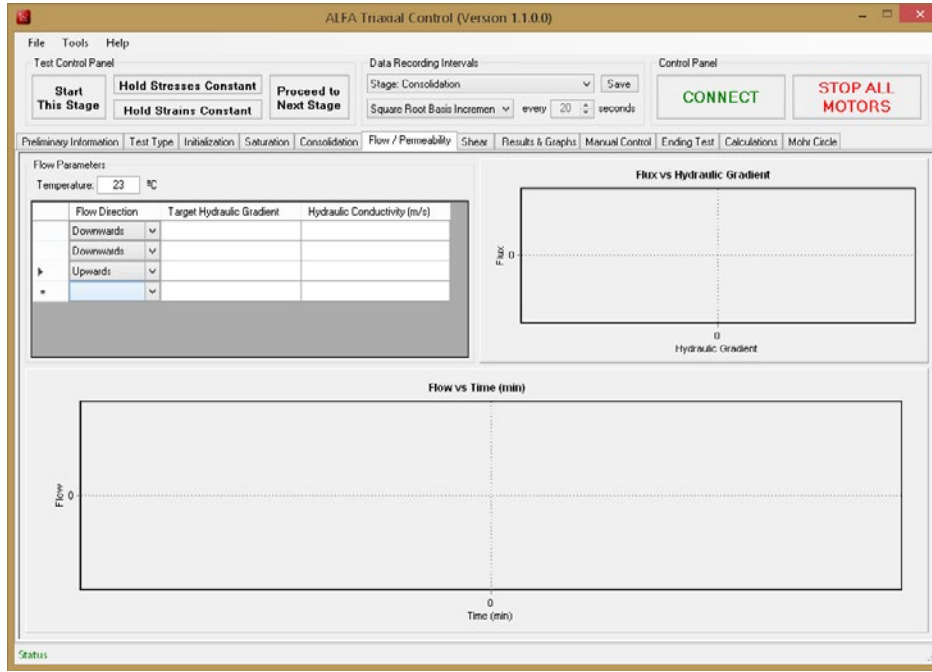
Graphs:

- Mohr Circle graphs and calculations
- q vs p
- q vs p'
- Deviator stress vs mean stress
- Pore pressure vs deviator stress

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● TRIAXIAL SOFTWARE : Flow/Permeability Tab



Flow Parameters:

- Displays the target pressure for each stage and gives the ability to draw any custom path for the sample. The strain rate is also specified in this section.

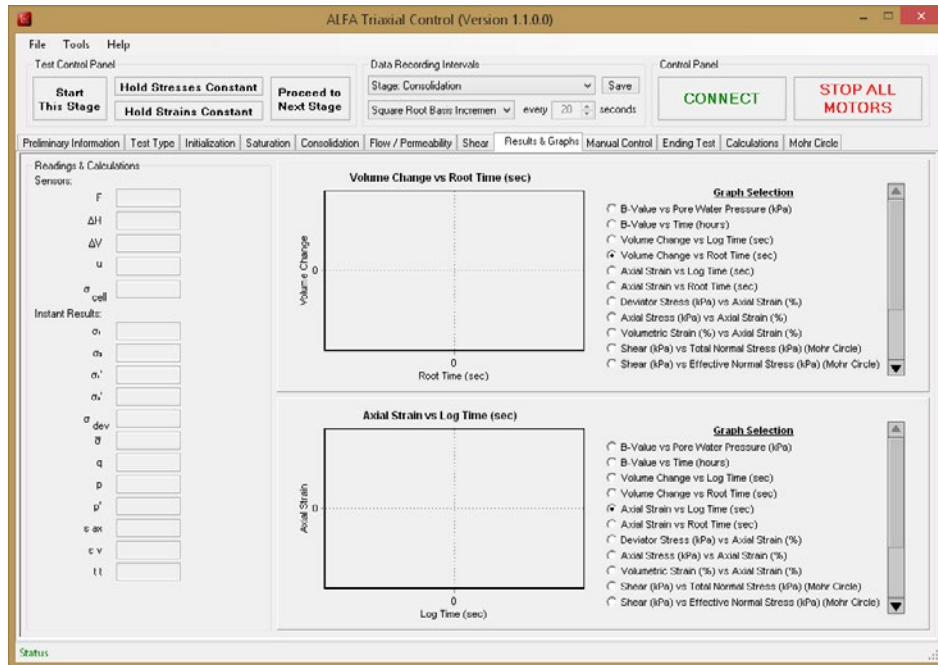
Graphs:

- Flow vs time
- Flux vs hydraulic gradient

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TRIAXIAL SOFTWARE : Results & Graphs Tab



Readings and Calculations:

- Shows the readings from all the sensors and the calculated values for each parameter simultaneously.

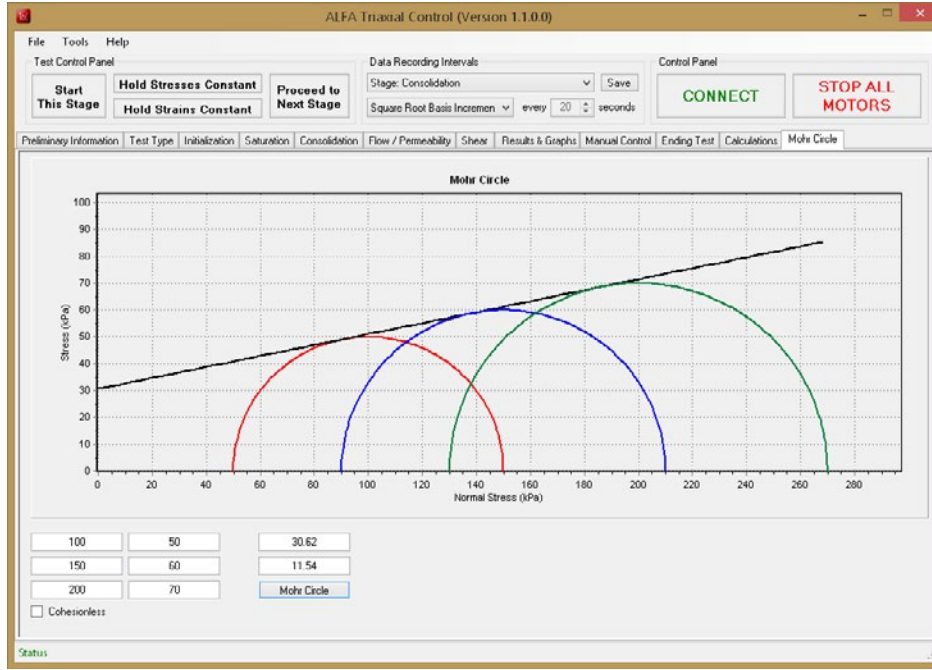
Graphs:

- B-Value vs Pore Water Pressure (kPa)
- a-Value vs Time (hours)
- Volume Change vs Log Time (sec)
- Volume Change vs Root Time (sec)
- Axial Strain vs Log Time (sec)
- Axial Strain vs Root Time (sec)
- Deviator Stress (kPa) vs Axial Strain
- Axial Stress (kPa) vs Axial Strain
- Volumetric Strain vs Axial Strain
- Shear (kPa) vs Total Normal Stress (kPa) (Mohr Circle)
- Shear (kPa) vs Effective Normal Stress (kPa) (Mohr Circle)
- q (kPa) vs p (kPa) (Top of Mohr Circle)
- q (kPa) vs p' (kPa) (Top of Mohr Circle)
- Deviator Stress (kPa) vs Mean Stress (kPa)
- Deviator Stress (kPa) vs Effective Mean Stress (kPa)
- Pore Pressure (kPa) vs Deviator Stress (kPa)

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● TRIAXIAL SOFTWARE : Mohr Circle Tab



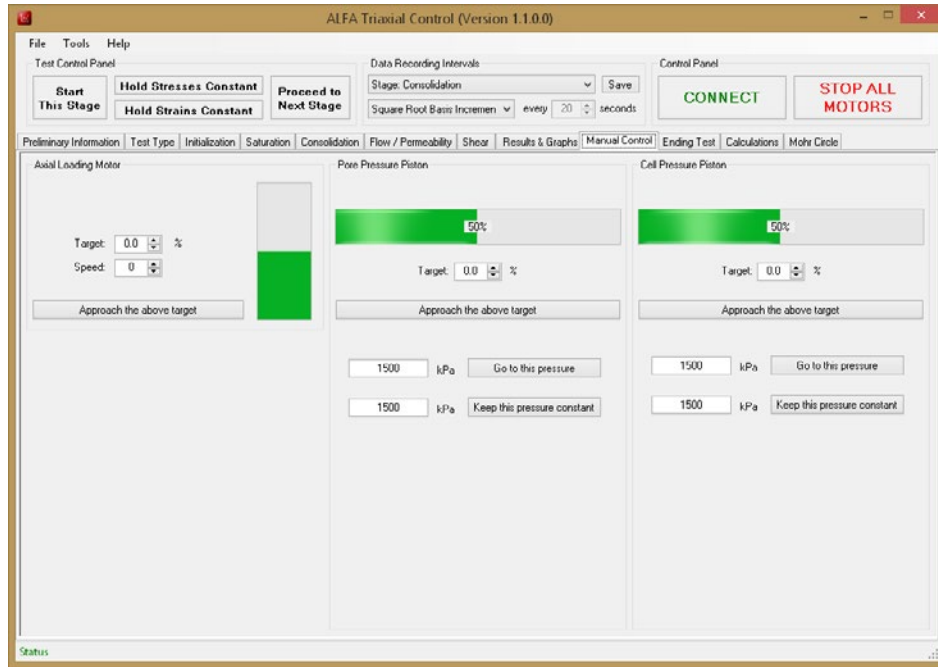
Mohr Circle

- The software allows the user to combine and compare tests from different samples together in one single report, draw the corresponding mohr circles and calculate the related soil characteristics.

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● TRIAXIAL SOFTWARE : Manual Control Tab



- Provides manual control on each motor/PVA.

Ending Test Tab:

- Gives instructions on how to end the test properly and empty the cell from water ... etc.